

## TECHNICAL INFORMATION

### MCE & MSCE MINI ELECTRIC CYLINDERS & SLIDERS

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# Product overview

## Characteristics

Mini electric cylinder and sliders are small linear drives. The MCE has a piston rod and the MSCE has an integrated linear guiding system and slide.

By using an integrated precision ball screw drive, the rotary motion (rotation) of the drive shaft is converted to linear motion (translation) of the piston rod or slide with high mechanical efficiency and low internal friction.

High-performance features such as high speed, good positioning accuracy, and high repeatability are ensured through a precision ball screw drive and an anti-rotating piston rod device or a linear guiding system.

A preassembled standard motor (in-line with a motor adapter and a coupling or in-parallel with a motor side drive and a timing belt) together with the standard drive, makes the system plug and play ready. Compact dimensions and optimally selected motor combinations cover a wide range of applications.

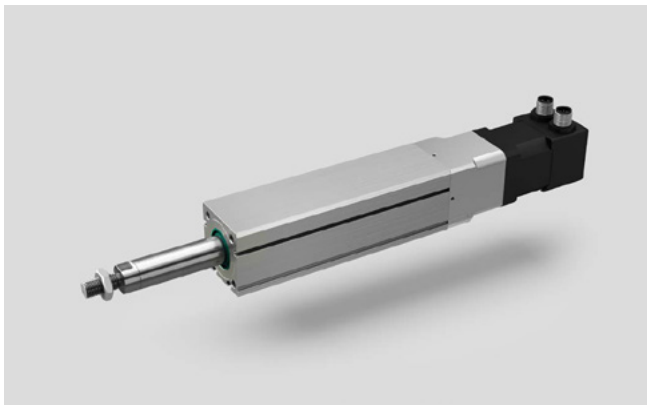
The aluminium cylinder profile includes T-slots on the bottom for fixing the electric cylinder/slider, as well as side slots for clamping fixtures and magnetic field sensors.

Excellent price-performance ratio and a quick delivery time, due to standard lengths, are ensured.

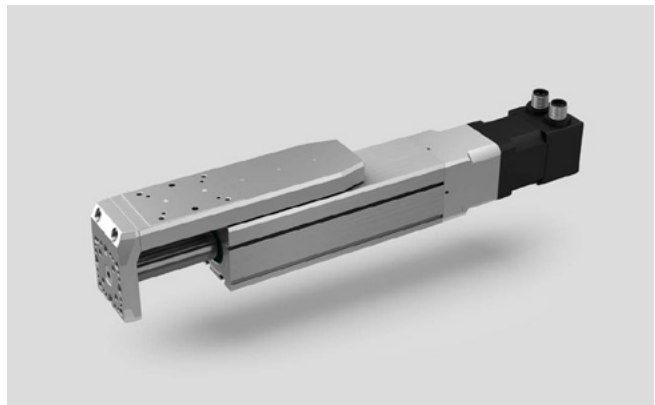
Each MCE/MSCE is optimally pre-lubricated and ready for a maintenance-free operating process. MCE/MSCE allows relatively high load capacities and optimal cycles for moving the larger payloads at high speeds in both horizontal and vertical directions.

The aluminium profiles are manufactured according to the medium EN 12020-2 standard.

### Motor adapter VK with a coupling and a motor

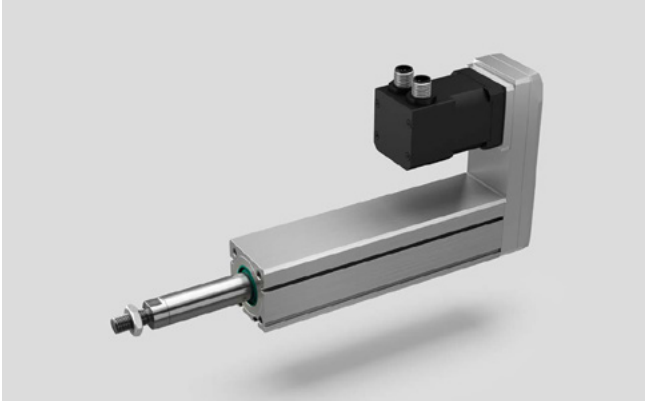


MCE



MSCE

**Motor side drive with timing a belt and a motor**

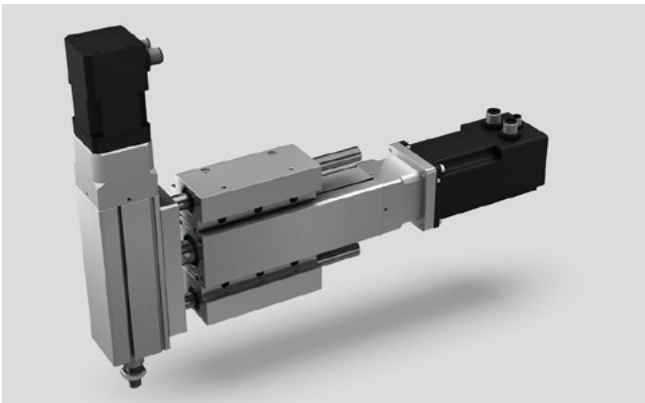


MCE

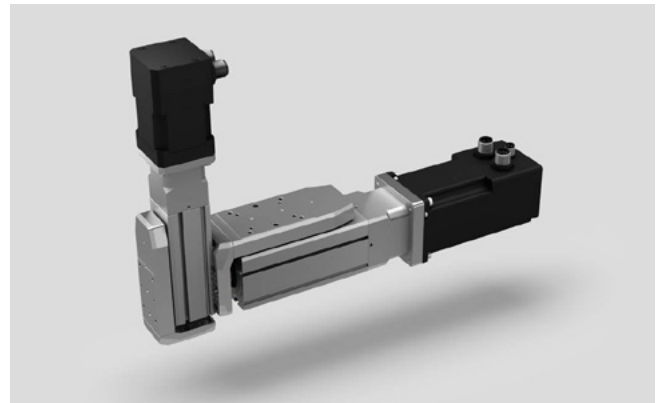


MSCE

**Multi-axis system**

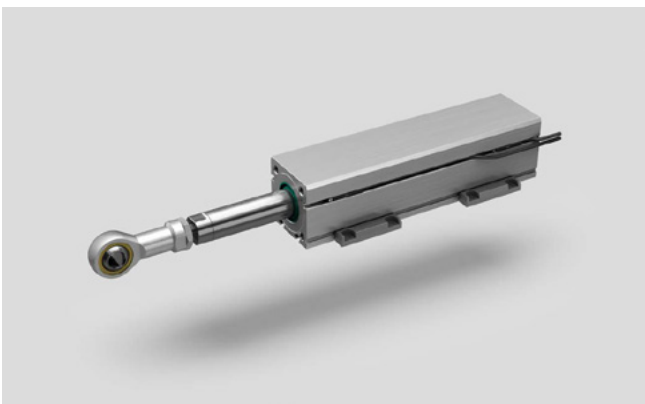


MCE (guiding unit GUC is used)

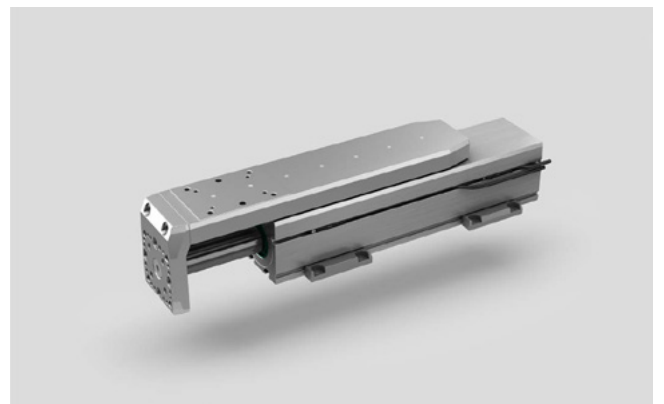


MSCE

**Accessories**

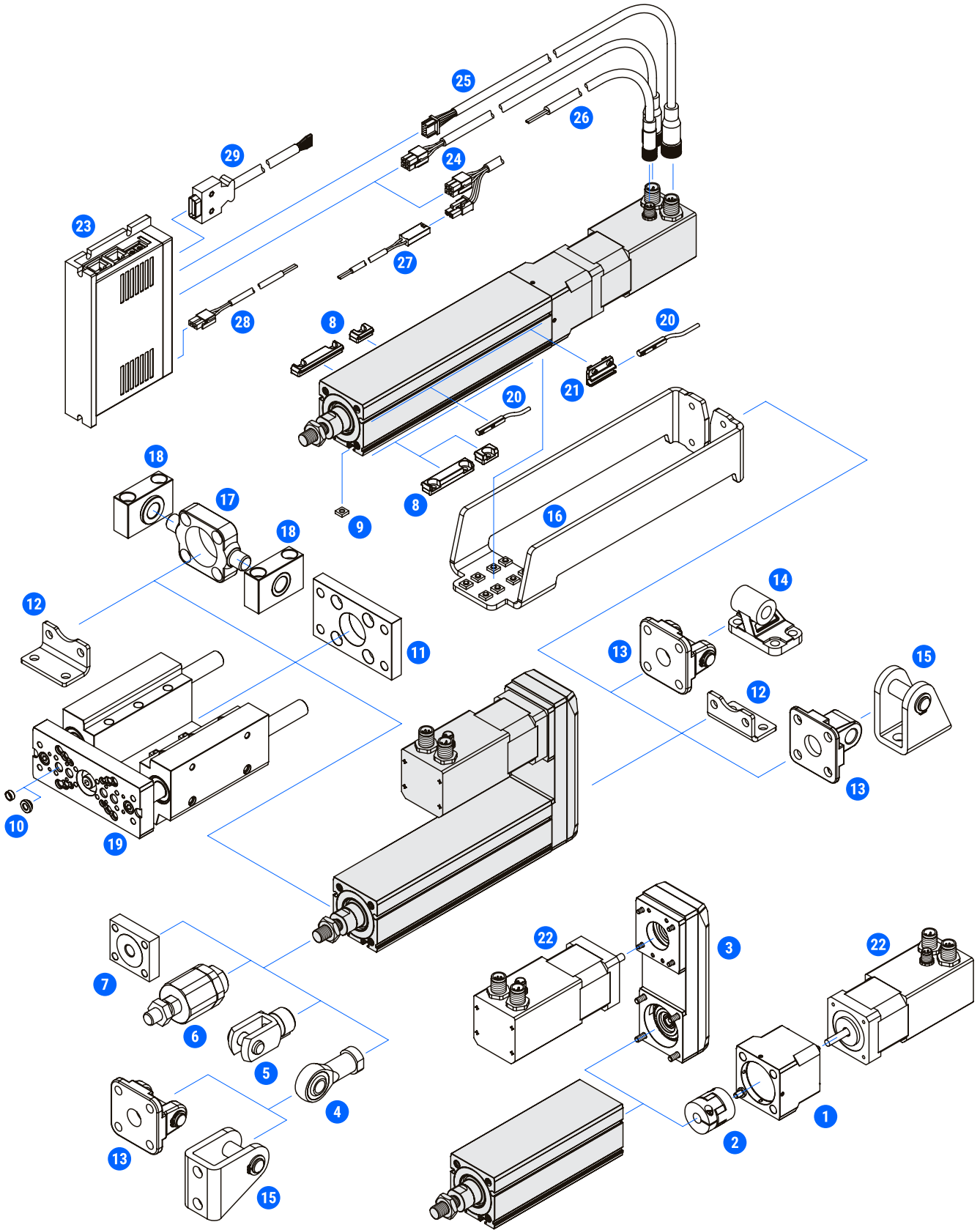


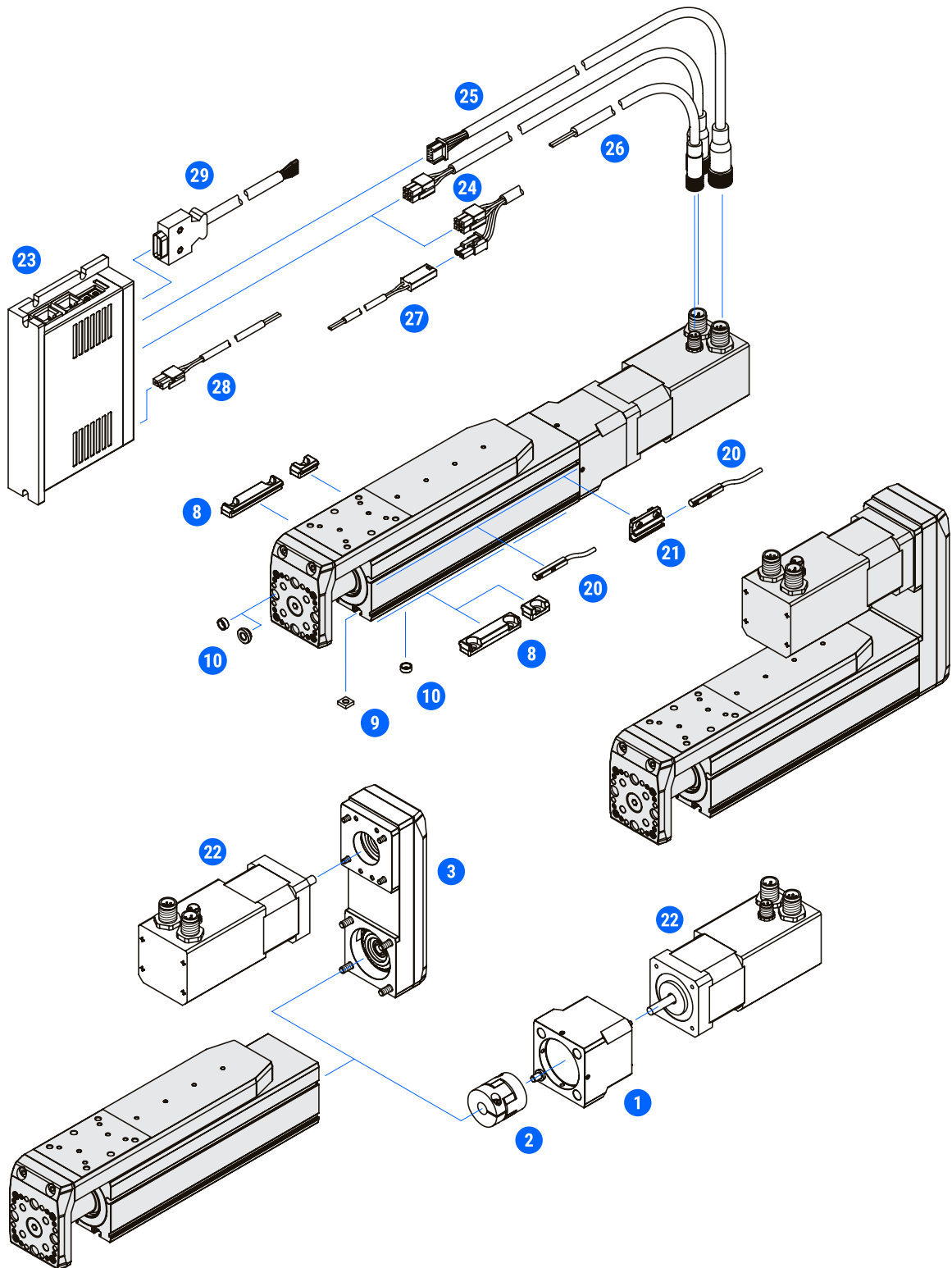
MCE (without a preassembled motor)



MSCE (without a preassembled motor)

# Accessory overview





#	Accessories	Compatible with MCE/MSCE size			Type
		25	32	45	
1	Motor adapter VK	•	•	•	Motor adapters
2	Coupling	•	•	•	Elastomer couplings
3	Motor side drive MSD	•	•	•	Motor side drives
4	Rod eye SGS	•	•	•	Piston rod accessories
5	Rod clevis SG	•	•	•	
6	Self-aligning joint FK	•	•	•	
7	Coupling piece KSZ	•	•	•	
8	Clamping fixture	•	•	•	
9	Slot nut	•	•	•	Mounting attachment accessories
10	Centering ring	•	•	•	
11	Flange mounting MAFL	•	•	•	
12	Foot mounting MAHP	•	•	•	
13	Swivel/clevis mount MASU	•	•	•	
14	Swivel foot mounting MLG	-	-	•	
15	Clevis foot mounting MLBU	•	•	-	
16	Back mount ABM	•	•	•	
17	Trunnion mount MZK	-	•	•	
18	Trunnion support MLZ	-	•	•	
19	Guiding unit GUC	•	•	•	Guiding units
20	Magnetic field sensor	•	•	•	Limit switches
21	Sensor holder HMG	•	-	-	
22	Motor	•	•	•	Motors
23	Drive	•	•	•	Drives
24	Motor cable	•*	•*	•	Cables
25	Encoder cable	•	•	•	
26	Brake cable	•*	•*	•	
27	Brake to terminal cable*	•	•	-	
28	Power cable	•	•	•	
29	Signal cable	•	•	•	

\*For the stepper motor size of 28, the motor and brake cables are combined into one cable. For connectivity between the brake and terminal, an additional brake to terminal cable is used.



# Mini electric cylinder MCE

## Operating conditions

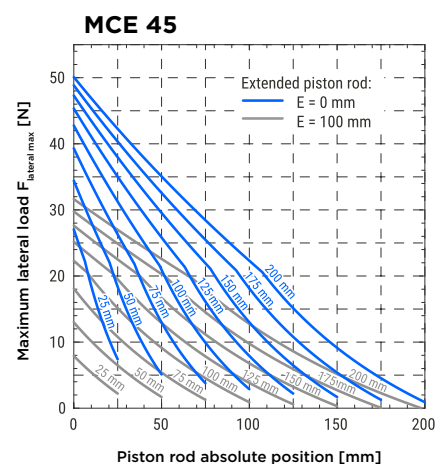
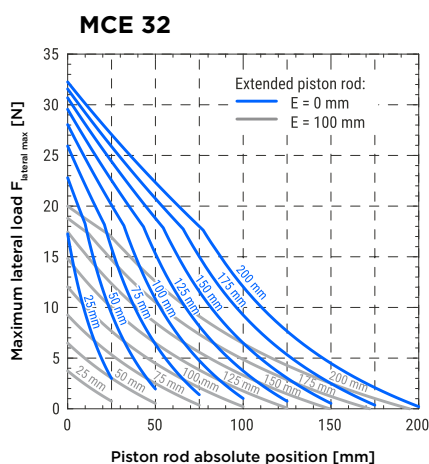
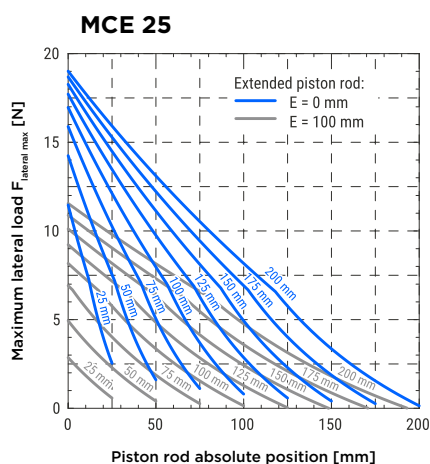
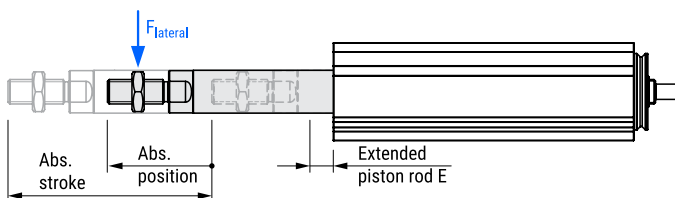
Ambient temperature	0 °C ~ +50 °C
Ambient temperature without a motor	0 °C ~ +60 °C
Protection class	IP40
Duty cycle	100 %
Maintenance	Life-time pre-lubricated

## Maximum lateral loading as a function of the piston rod absolute position

On the following diagrams, the maximum lateral loads acting on the piston rod end as a function of the piston rod absolute position for different values of the absolute stroke are presented. There is also an extended piston rod (E) taken into consideration.

Values on the curves represent an absolute stroke of the cylinder. Diagrams consider the maximum travel speed of the particular size of the cylinder. When operating with lower travel speeds, the maximum lateral load may be higher.

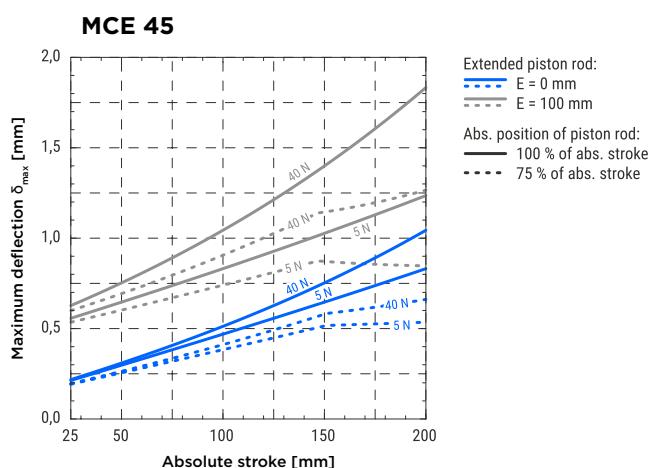
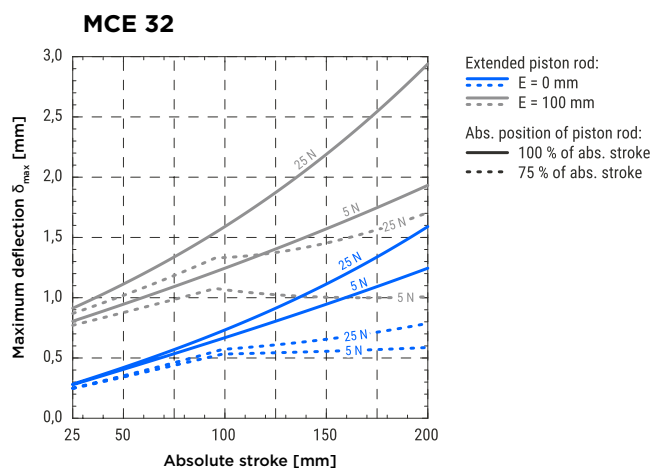
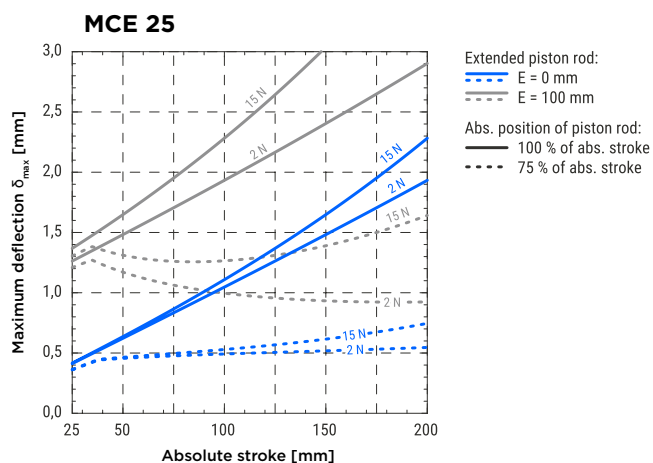
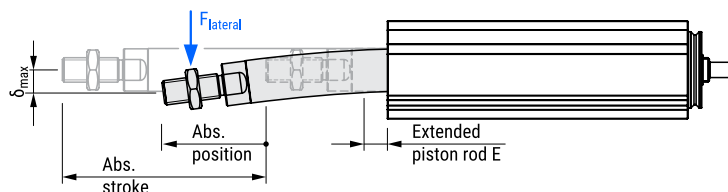
Diagrams consider the maximum travel speed of the particular size of the cylinder. When operating with lower travel speeds, the maximum lateral load may be higher.



## Maximum deflection of the piston rod end as a function of the cylinder absolute stroke

On the following diagrams, the maximum deflections of the piston rod end subjected to different lateral loads for different absolute positions (defined as a portion of the absolute stroke) are presented. There is also an extended piston rod (E) taken into consideration.

Values on the curves represent lateral load applied to the piston rod end.

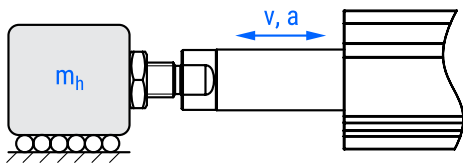


## Maximum horizontal payload as a function of the travel speed and acceleration of the piston rod

On the following diagrams, the maximum horizontal payloads applied to the piston rod as a function of the travel speed for different accelerations, different ball screw leads and different combinations of the standard motors are presented. Motor adapter VK and a motor side drive MSD are also considered.

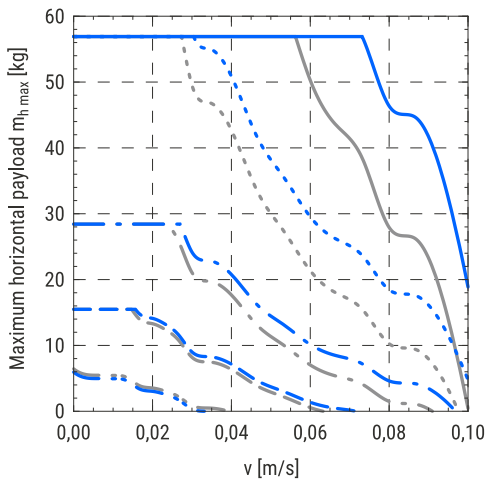
Diagrams are valid when the payload is supported by an external guiding (coefficient of friction 0,1 has been considered).

It should be noted that the diagrams are also valid for the case where a guiding unit GUC is considered.

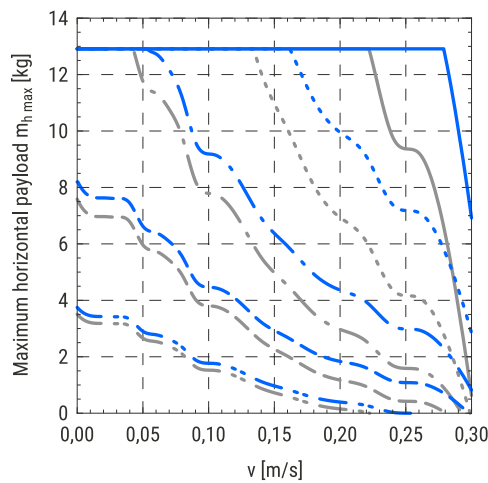


### MCE 25

6 × 2 with a stepper motor □28



6 × 6 with a stepper motor □28



MCE in combination:

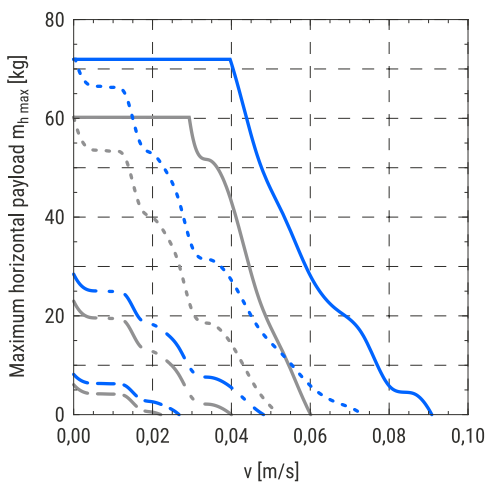
— with VK  
— with MSD

Acceleration/Deceleration:

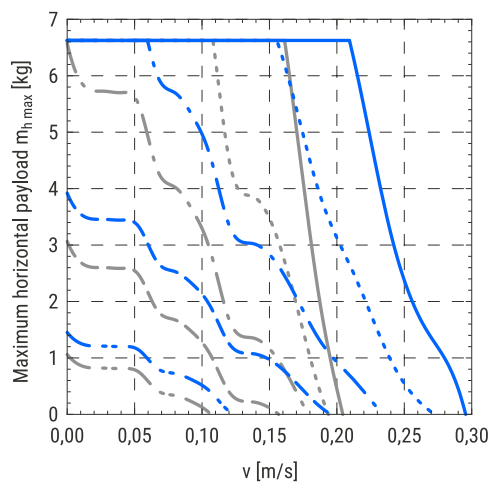
— a = 0,5 m/s<sup>2</sup>  
- - - a = 2 m/s<sup>2</sup>  
- · - · a = 5 m/s<sup>2</sup>  
- - - a = 10 m/s<sup>2</sup>  
- · - · a = 20 m/s<sup>2</sup>

### MCE 32

8 × 2 with a stepper motor □28



8 × 8 with a stepper motor □28



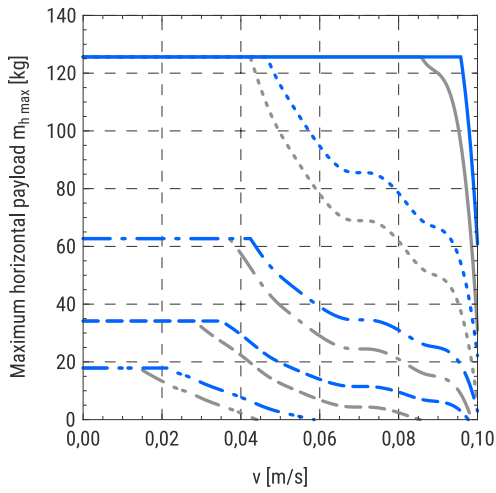
MCE in combination:

— with VK  
— with MSD

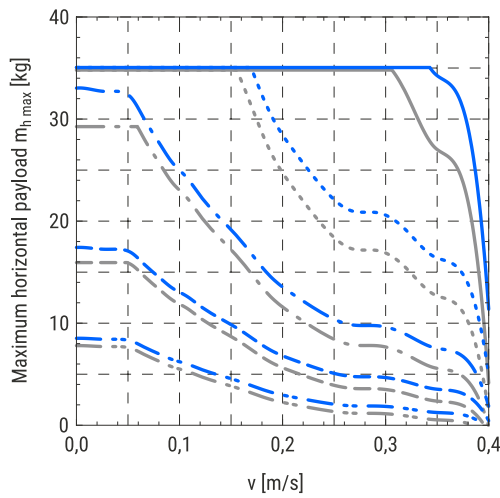
Acceleration/Deceleration:

— a = 0,5 m/s<sup>2</sup>  
- - - a = 2 m/s<sup>2</sup>  
- · - · a = 5 m/s<sup>2</sup>  
- - - a = 10 m/s<sup>2</sup>  
- · - · a = 20 m/s<sup>2</sup>

8 × 2 with a stepper motor □42



8 × 8 with a stepper motor □42

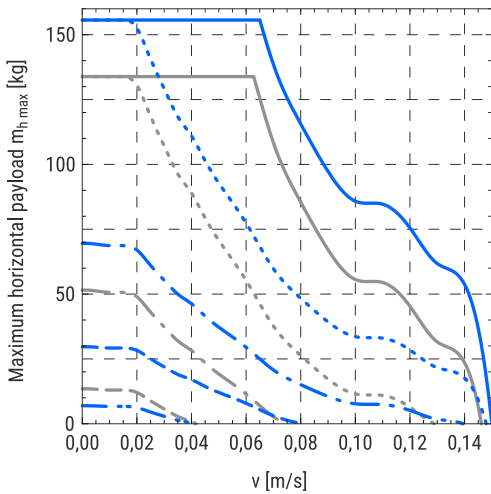


MCE in combination:  
 — with VK  
 — with MSD

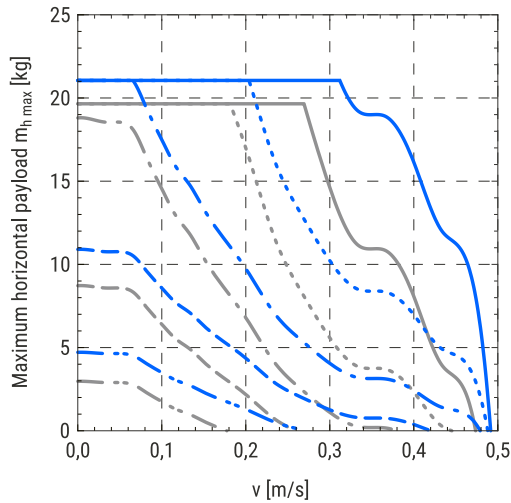
Acceleration/Deceleration:  
 — a = 0,5 m/s<sup>2</sup>  
 - - - a = 2 m/s<sup>2</sup>  
 - · - a = 5 m/s<sup>2</sup>  
 - - - a = 10 m/s<sup>2</sup>  
 - · - a = 20 m/s<sup>2</sup>

**MCE 45**

10 × 3 with a stepper motor □42



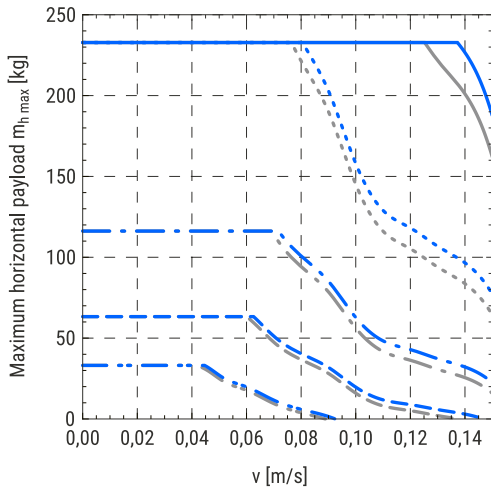
10 × 10 with a stepper motor □42



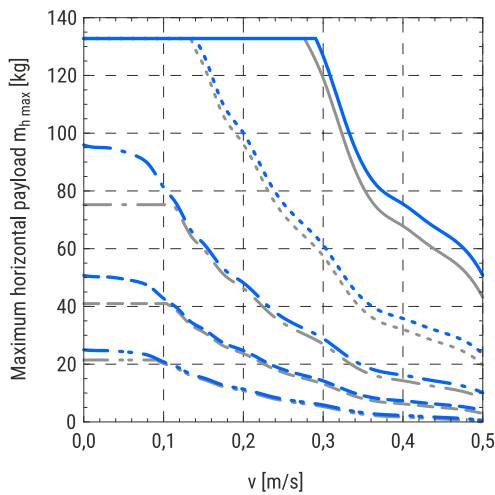
MCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 — a = 0,5 m/s<sup>2</sup>  
 - - - a = 2 m/s<sup>2</sup>  
 - · - a = 5 m/s<sup>2</sup>  
 - - - a = 10 m/s<sup>2</sup>  
 - · - a = 20 m/s<sup>2</sup>

10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56



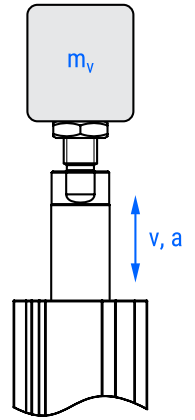
MCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 — a = 0,5 m/s<sup>2</sup>  
 - - - a = 2 m/s<sup>2</sup>  
 - · - a = 5 m/s<sup>2</sup>  
 - - - a = 10 m/s<sup>2</sup>  
 - · - a = 20 m/s<sup>2</sup>

## Maximum vertical payload as a function of the travel speed and acceleration of the piston rod

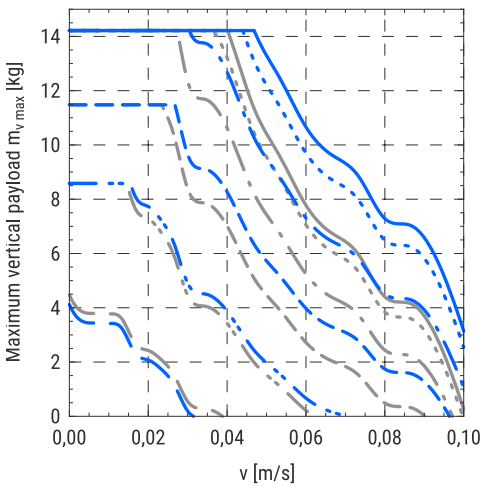
On the following diagrams, the maximum vertical payloads applied to the piston rod as a function of the travel speed for different accelerations, different ball screw leads and different combinations of the standard motors are presented. Motor adapter VK and a motor side drive MSD are also considered.

For the case that guiding unit GUC is taken into consideration, the value obtained from the diagram should be decreased by the moving mass of the guiding unit (please refer to the Guiding unit section).

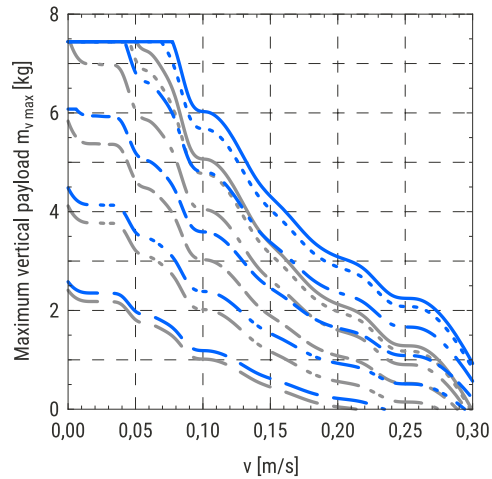


### MCE 25

6 × 2 with a stepper motor □28



6 × 6 with a stepper motor □28



MCE in combination:

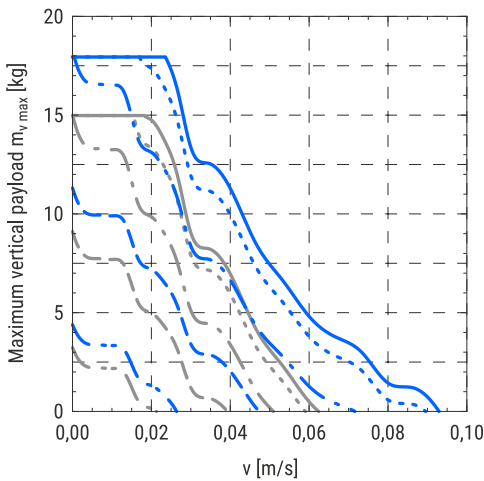
— with VK  
- - - with MSD

Acceleration/Deceleration:

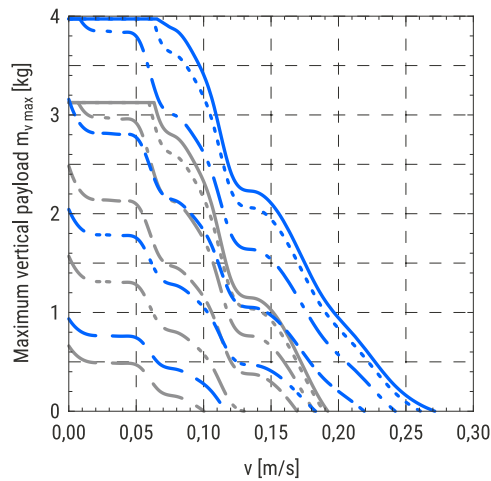
—  $a = 0 \text{ m/s}^2$   
- - -  $a = 0,5 \text{ m/s}^2$   
- · -  $a = 2 \text{ m/s}^2$   
- - -  $a = 5 \text{ m/s}^2$   
- · · -  $a = 10 \text{ m/s}^2$   
- - -  $a = 20 \text{ m/s}^2$

### MCE 32

8 × 2 with a stepper motor □28



8 × 8 with a stepper motor □28



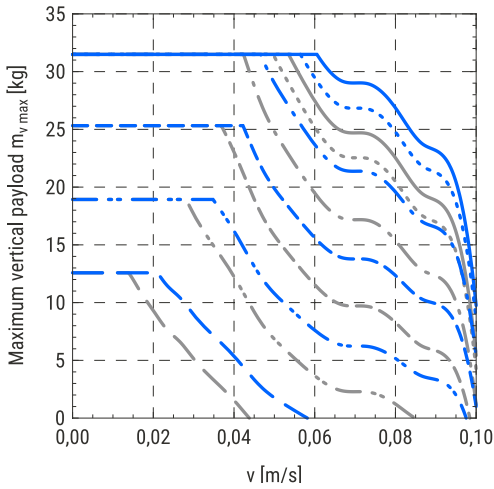
MCE in combination:

— with VK  
- - - with MSD

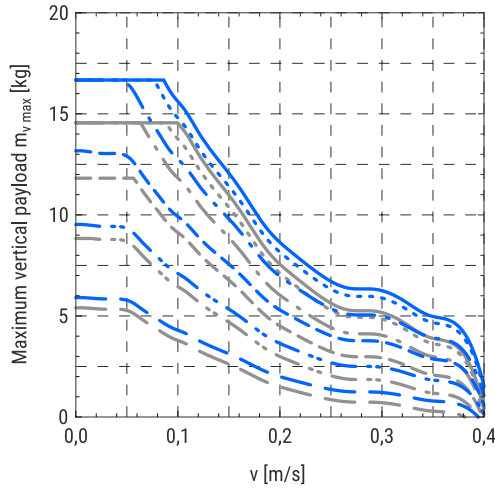
Acceleration/Deceleration:

—  $a = 0 \text{ m/s}^2$   
- - -  $a = 0,5 \text{ m/s}^2$   
- · -  $a = 2 \text{ m/s}^2$   
- - -  $a = 5 \text{ m/s}^2$   
- · · -  $a = 10 \text{ m/s}^2$   
- - -  $a = 20 \text{ m/s}^2$

8 × 2 with a stepper motor □42



8 × 8 with a stepper motor □42

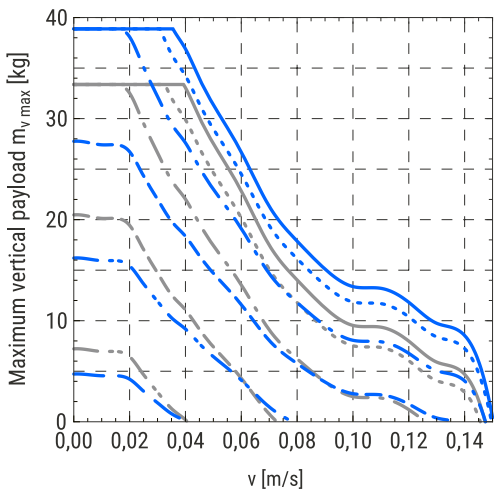


MCE in combination:  
 — with VK  
 — with MSD

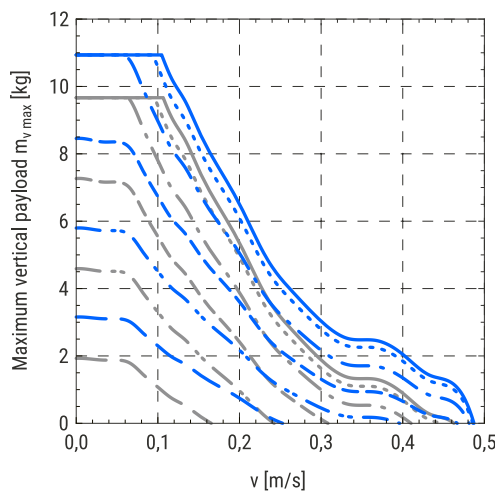
Acceleration/Deceleration:  
 — a = 0 m/s<sup>2</sup>  
 - - - a = 0,5 m/s<sup>2</sup>  
 - · - a = 2 m/s<sup>2</sup>  
 - - - a = 5 m/s<sup>2</sup>  
 - · - a = 10 m/s<sup>2</sup>  
 - - - a = 20 m/s<sup>2</sup>

**MCE 45**

10 × 3 with a stepper motor □42



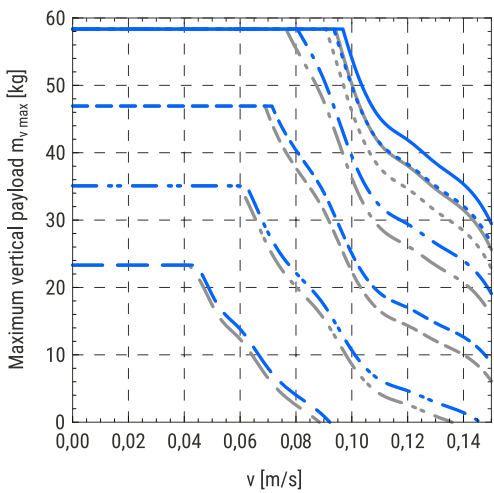
10 × 10 with a stepper motor □42



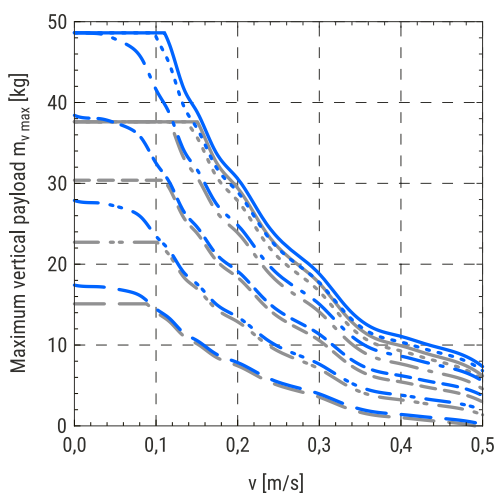
MCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 — a = 0 m/s<sup>2</sup>  
 - - - a = 0,5 m/s<sup>2</sup>  
 - · - a = 2 m/s<sup>2</sup>  
 - - - a = 5 m/s<sup>2</sup>  
 - · - a = 10 m/s<sup>2</sup>  
 - - - a = 20 m/s<sup>2</sup>

10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56



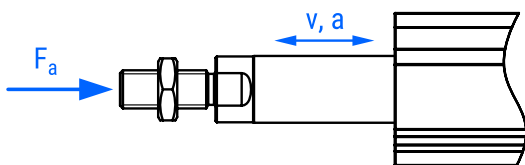
MCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 — a = 0 m/s<sup>2</sup>  
 - - - a = 0,5 m/s<sup>2</sup>  
 - · - a = 2 m/s<sup>2</sup>  
 - - - a = 5 m/s<sup>2</sup>  
 - · - a = 10 m/s<sup>2</sup>  
 - - - a = 20 m/s<sup>2</sup>

## Maximum axial load as a function of the travel speed and acceleration of the piston rod

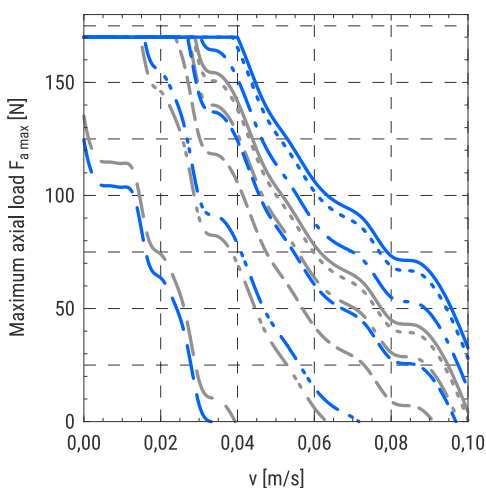
On the following diagrams, the maximum axial load applied to the piston rod as a function of the travel speed for different accelerations, different ball screw leads and different combinations of the standard motors is presented. Motor adapter VK and a motor side drive MSD are also considered.

For the case where a guiding unit GUC is used, the value obtained from the diagram should be decreased by the moving mass of the guiding unit (please refer to the Guiding unit section) multiplied by the acceleration of the piston rod.

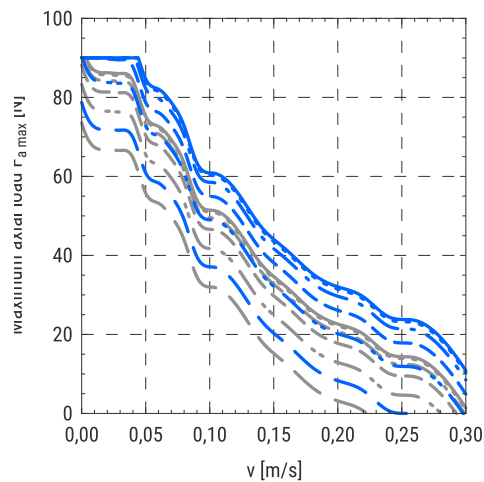


### MCE 25

6 × 2 with a stepper motor □28



6 × 6 with a stepper motor □28

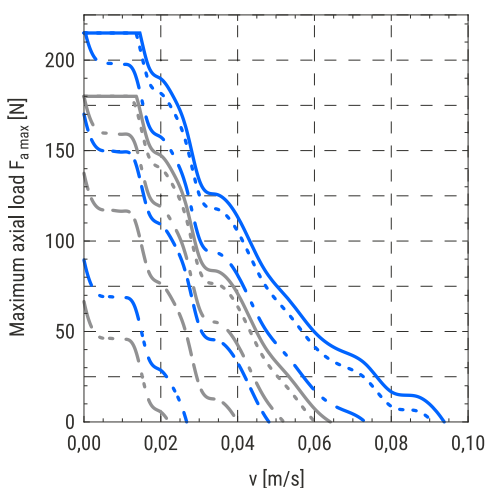


MCE in combination:  
 — with VK  
 - - - with MSD

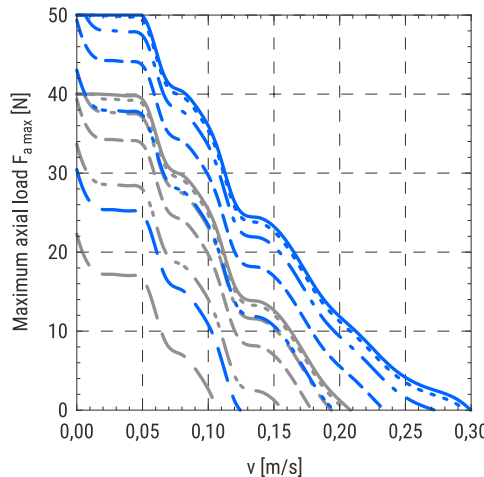
Acceleration/Deceleration:  
 — a = 0 m/s<sup>2</sup>  
 - - - a = 0,5 m/s<sup>2</sup>  
 - · - a = 2 m/s<sup>2</sup>  
 - - - a = 5 m/s<sup>2</sup>  
 - · - a = 10 m/s<sup>2</sup>  
 - - - a = 20 m/s<sup>2</sup>

### MCE 32

8 × 2 with a stepper motor □28



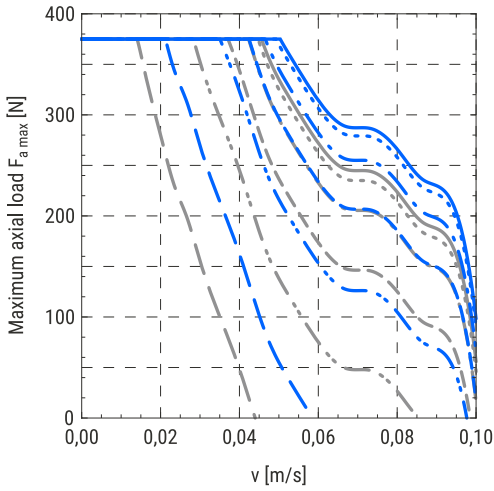
8 × 8 with a stepper motor □28



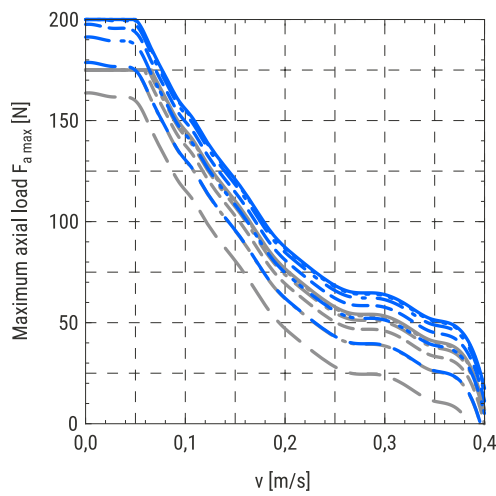
MCE in combination:  
 — with VK  
 - - - with MSD

Acceleration/Deceleration:  
 — a = 0 m/s<sup>2</sup>  
 - - - a = 0,5 m/s<sup>2</sup>  
 - · - a = 2 m/s<sup>2</sup>  
 - - - a = 5 m/s<sup>2</sup>  
 - · - a = 10 m/s<sup>2</sup>  
 - - - a = 20 m/s<sup>2</sup>

8 × 2 with a stepper motor □42



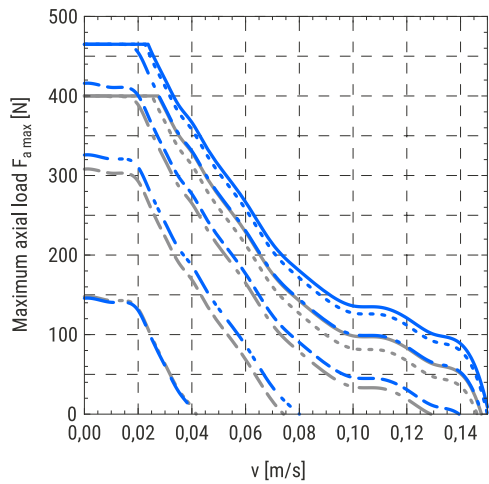
8 × 8 with a stepper motor □42



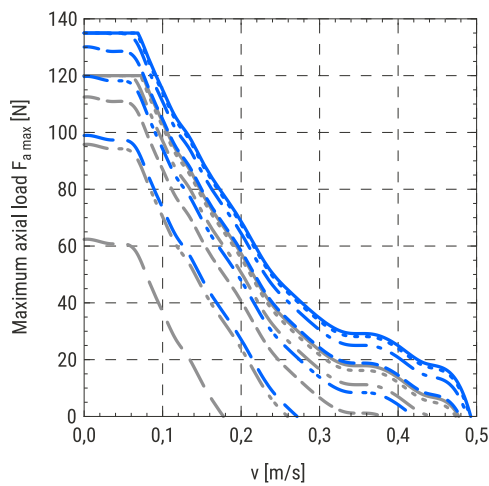
- MCE in combination:
- with VK
  - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - a = 0,5 m/s<sup>2</sup>
  - - - a = 2 m/s<sup>2</sup>
  - · - a = 5 m/s<sup>2</sup>
  - · · a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>

**MCE 45**

10 × 3 with a stepper motor □42

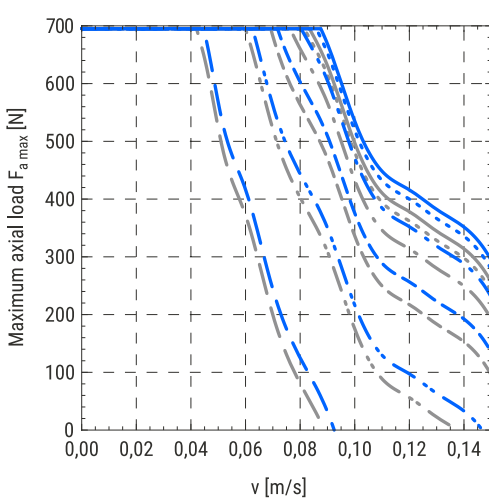


10 × 10 with a stepper motor □42

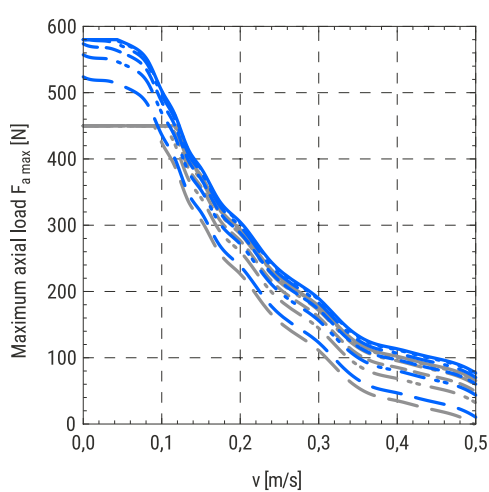


- MCE in combination:
- with VK
  - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - a = 0,5 m/s<sup>2</sup>
  - - - a = 2 m/s<sup>2</sup>
  - · - a = 5 m/s<sup>2</sup>
  - · · a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>

10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56



- MCE in combination:
- with VK
  - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - a = 0,5 m/s<sup>2</sup>
  - - - a = 2 m/s<sup>2</sup>
  - · - a = 5 m/s<sup>2</sup>
  - · · a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>



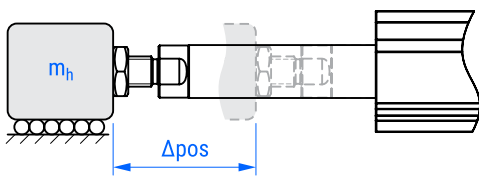
## Maximum horizontal payload as a function of change of the position and positioning time of the piston rod

The following diagrams show the maximum payload that can be moved by a certain horizontal distance within a positioning time frame. Acceleration/deceleration time of 100 ms is taken into account.

Diagrams depend on the ball screw leads and different combinations of the standard motors. Motor adapter VK and a motor side drive MSD are also considered.

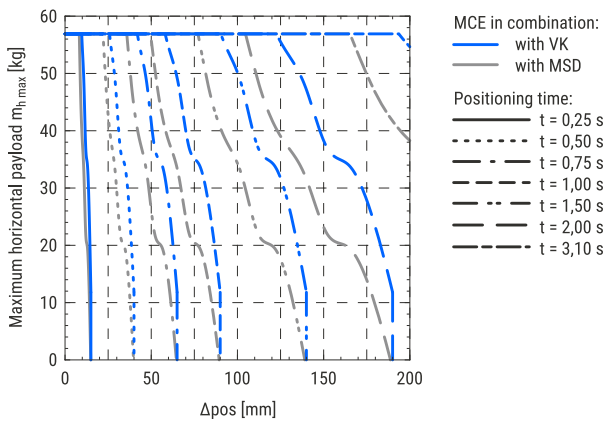
Diagrams are valid when the payload is supported by an external guiding (coefficient of friction 0,1 has been considered).

It should be noted that the diagrams are also valid for the case where a guiding unit GUC is considered.

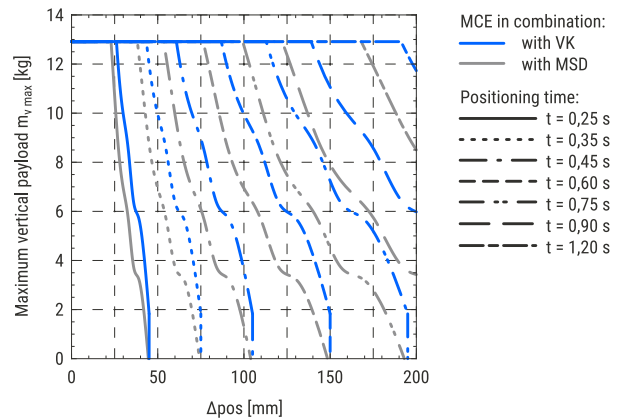


### MCE 25

6 × 2 with a stepper motor □28

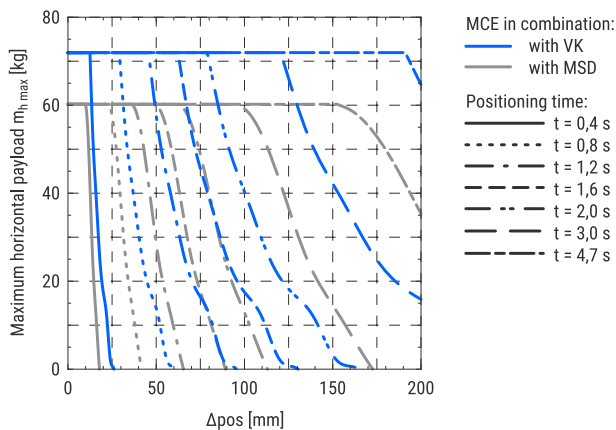


6 × 6 with a stepper motor □28

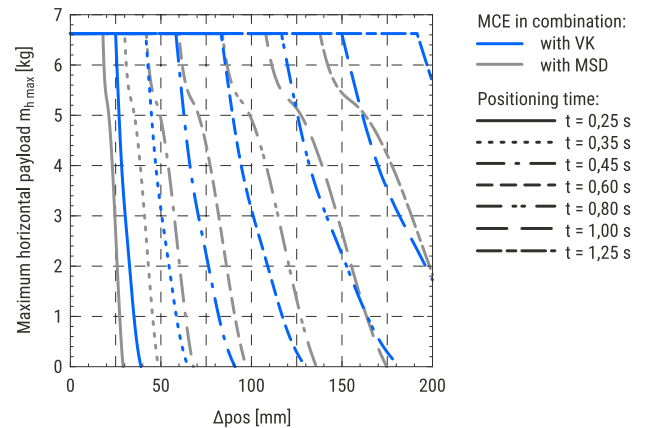


### MCE 32

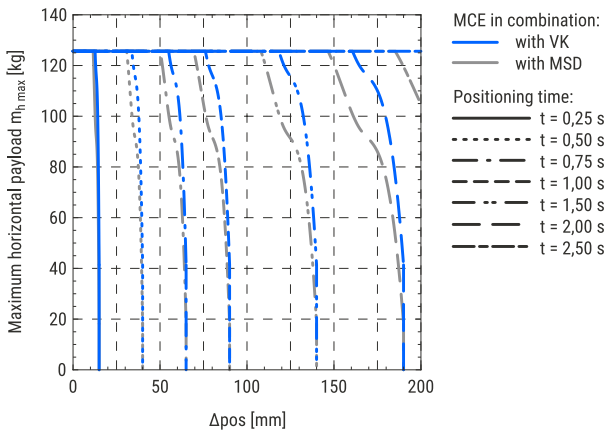
8 × 2 with a stepper motor □28



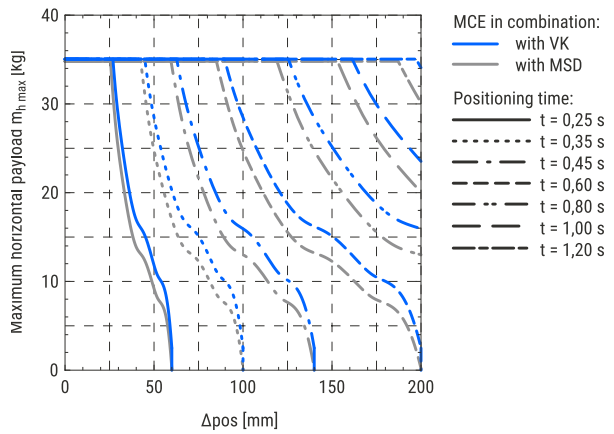
8 × 8 with a stepper motor □28



8 × 2 with a stepper motor □42

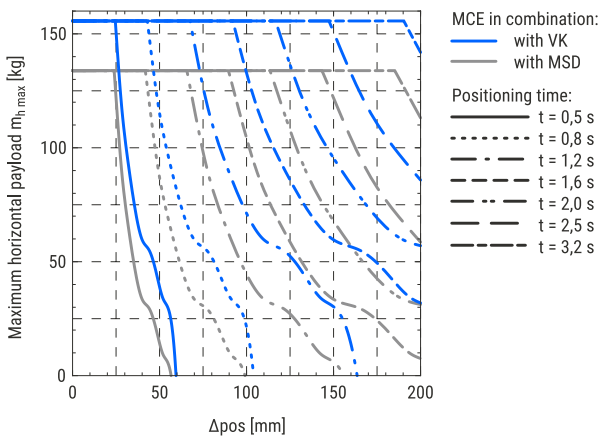


8 × 8 with a stepper motor □42

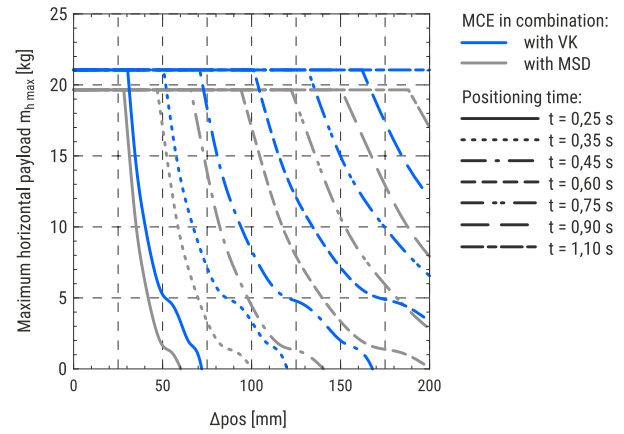


**MCE 45**

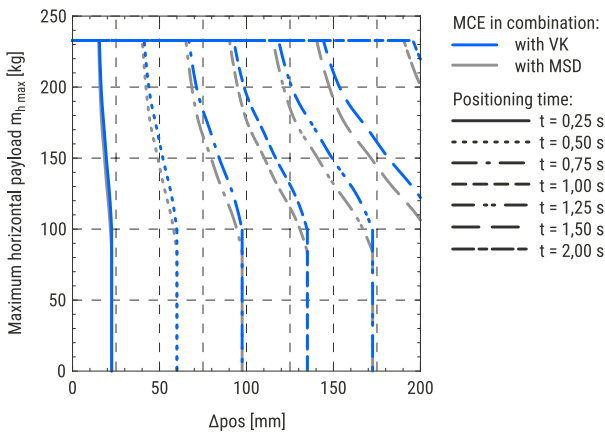
10 × 3 with a stepper motor □42



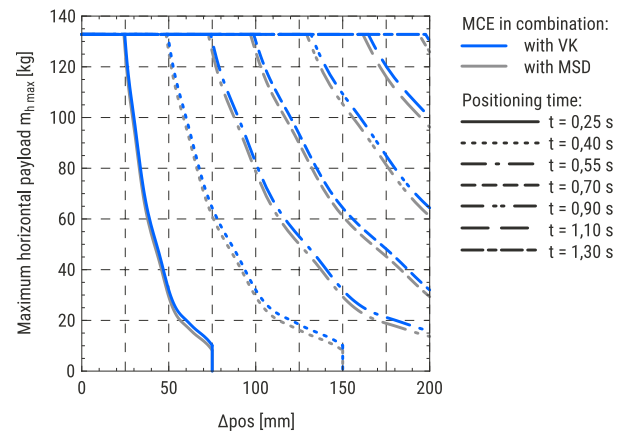
10 × 10 with a stepper motor □42



10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56

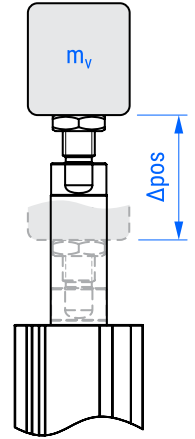


## Maximum vertical payload as a function of change of the position and positioning time of the piston rod

The following diagrams show the maximum payload that can be moved by a certain vertical distance within a positioning time frame. Acceleration/deceleration time of 100 ms is taken into account.

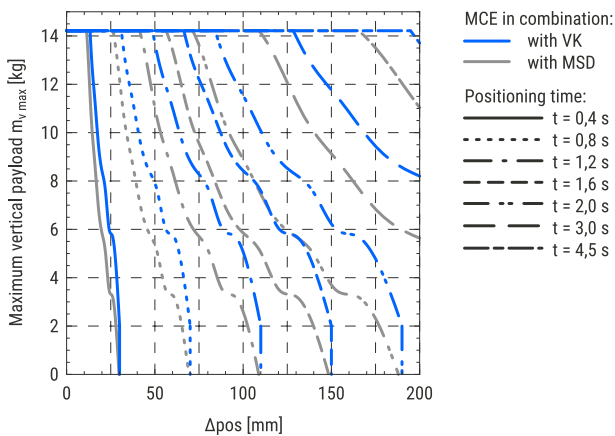
Diagrams depend on the ball screw leads and different combinations of the standard motors. Motor adapter VK and a motor side drive MSD are also considered.

For the case where a guiding unit GUC is used, the value obtained from the diagram should be decreased by the moving mass of the guiding unit (please refer to the Guiding unit section).

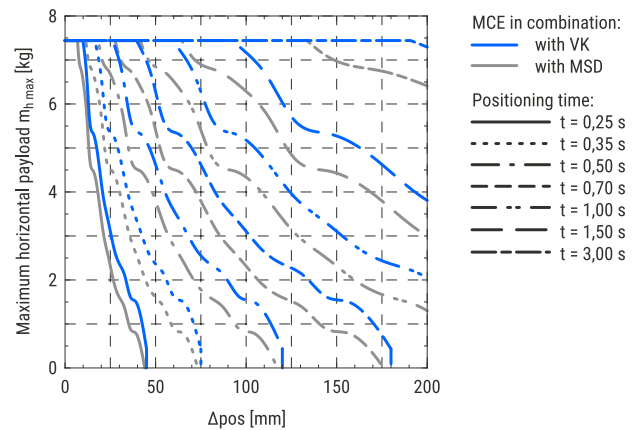


### MCE 25

6 × 2 with a stepper motor □28

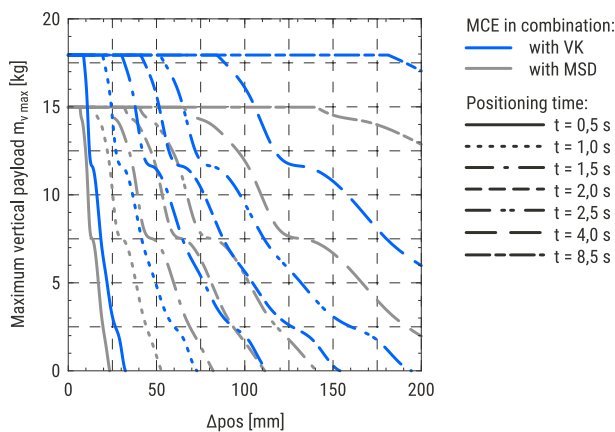


6 × 6 with a stepper motor □28

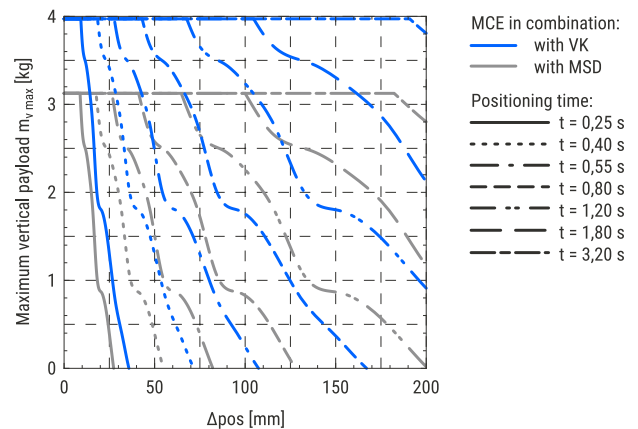


### MCE 32

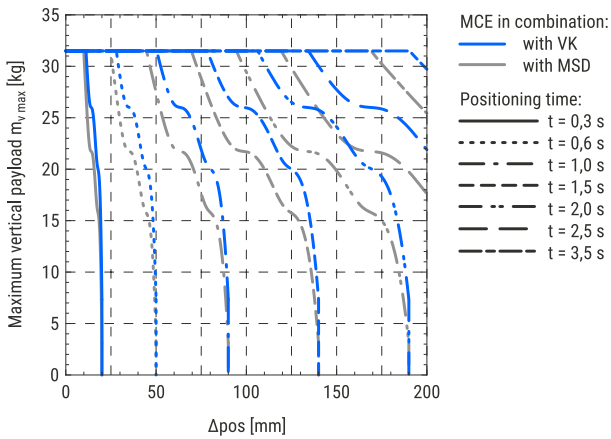
8 × 2 with a stepper motor □28



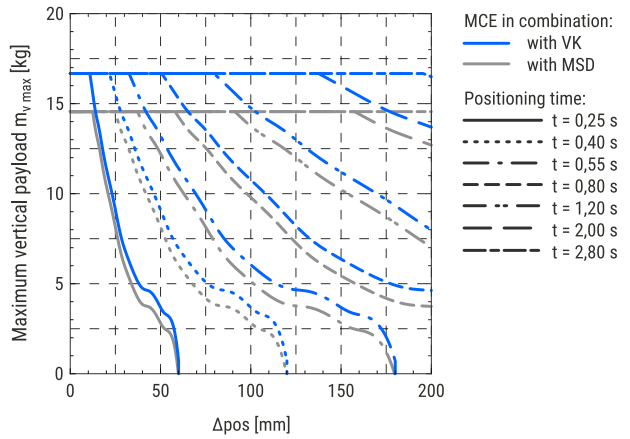
8 × 8 with a stepper motor □28



8 × 2 with a stepper motor □42

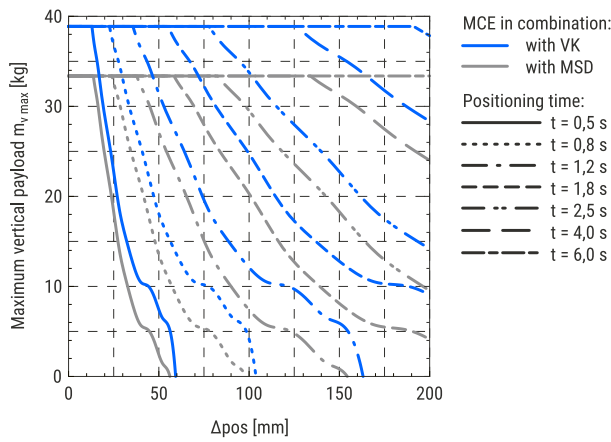


8 × 8 with a stepper motor □42

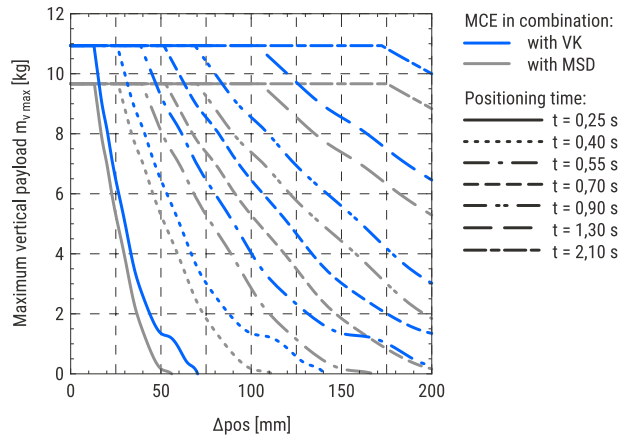


**MCE 45**

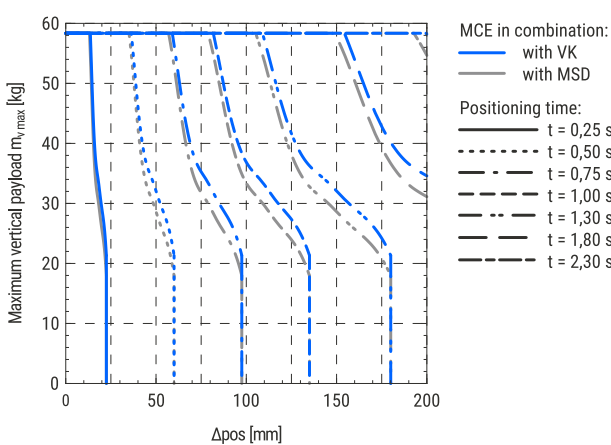
10 × 3 with a stepper motor □42



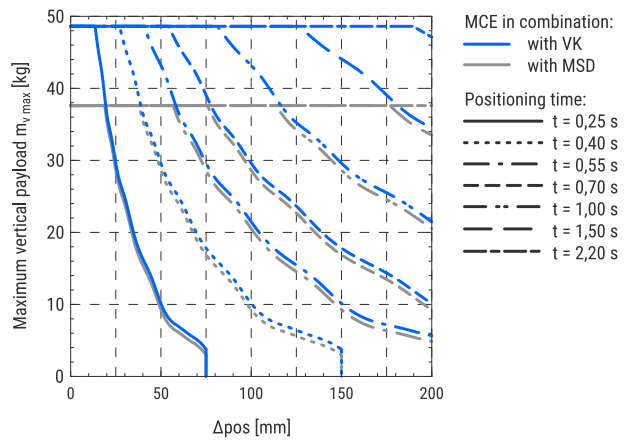
10 × 10 with a stepper motor □42



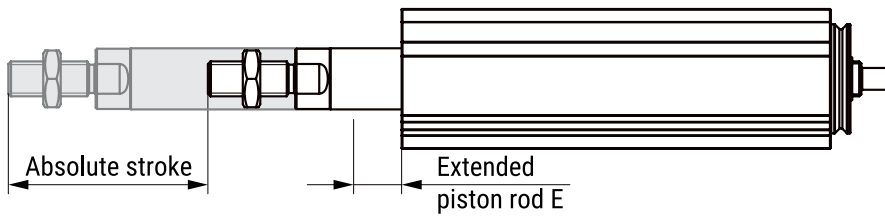
10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56



## Absolute stroke and length of the MCE definition



### Absolute stroke definition

Absolute stroke = Effective stroke + 2 × Safety stroke

The electric cylinder MCE does not include any safety stroke.

### Length definition

$L_t = L + L_2 + E + \text{Abs. position}$

Female thread:

$L_t = L + L_4 + E + \text{Abs. position}$

<b>Abs. stroke</b>	Absolute stroke [mm]
<b>Abs. position</b>	Absolute position [mm]
<b>E</b>	Extended piston rod [mm]
<b>L</b>	Length [mm]
<b><math>L_t</math></b>	Total length [mm]

$E_{\max} = 100 \text{ mm.}$

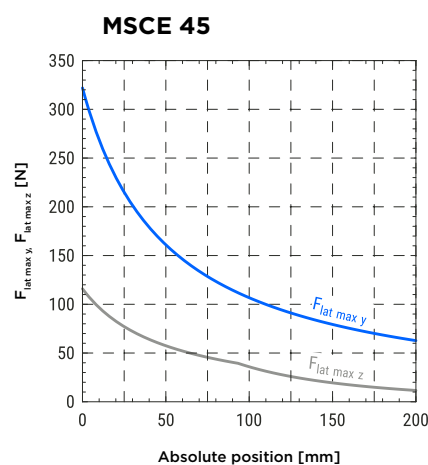
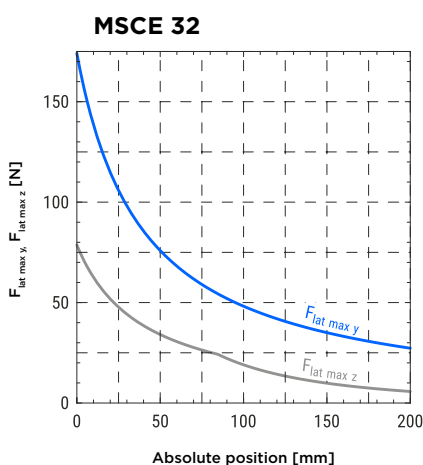
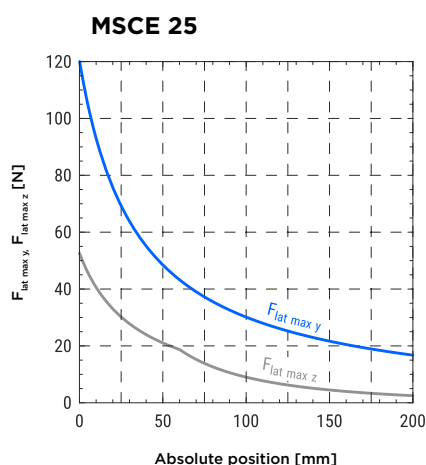
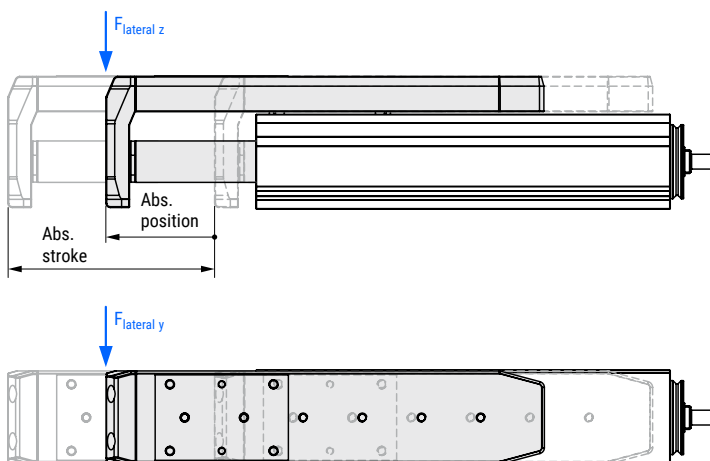
# Mini electric slider MSCE

## Operating conditions

Ambient temperature	0 °C ~ +50 °C
Ambient temperature without a motor	0 °C ~ +60 °C
Protection class	IP40
Duty cycle	100 %
Maintenance	Life-time pre-lubricated

## Maximum lateral loading as a function of the slide absolute position

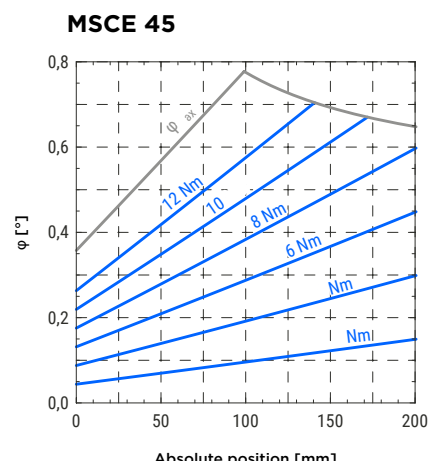
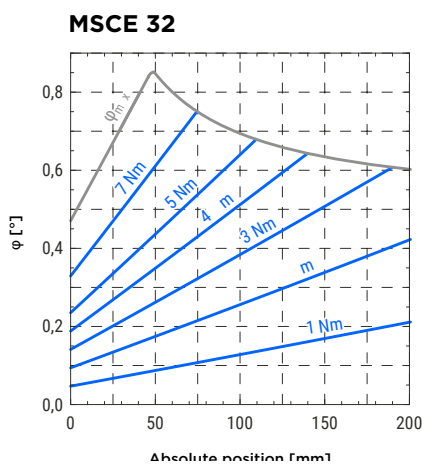
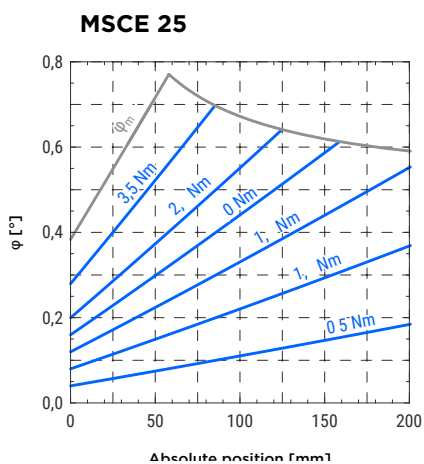
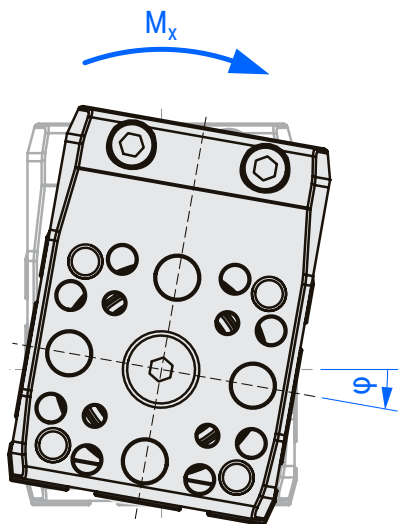
On the following diagrams, the maximum lateral loads acting on the front plate as a function of the slide absolute position are presented. Both lateral loads in y and z directions are considered.



## Angular deflections of the front plate as a function of the slide's absolute position

On the following diagrams, angular deflections of the front plate subjected to the different torsional moments at different absolute positions of the slide are presented. Values on the curves represent the moment about the x-axis applied to the front plate.

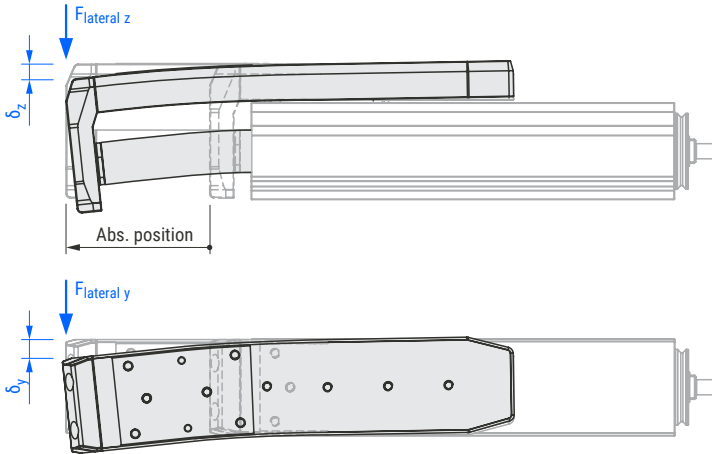
The maximum permissible angular deflection  $\varphi_{max}$  must not be exceeded.



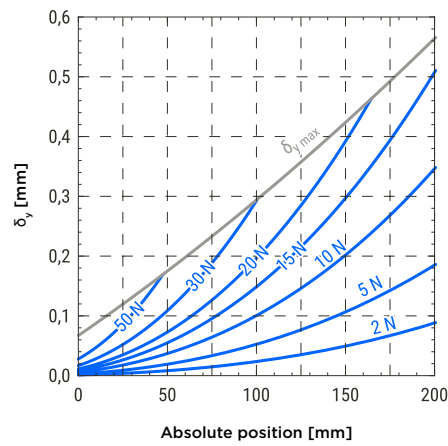
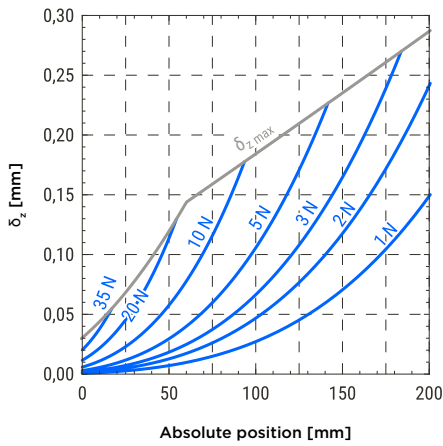
## Deflections of the front plate as a function of the slide's absolute position

On the following diagrams, deflections of the front plate subjected to the different lateral loads at different absolute positions of the slide are presented. Both lateral loads in y and z directions are considered. Values on the curves represent the lateral load applied to the front plate.

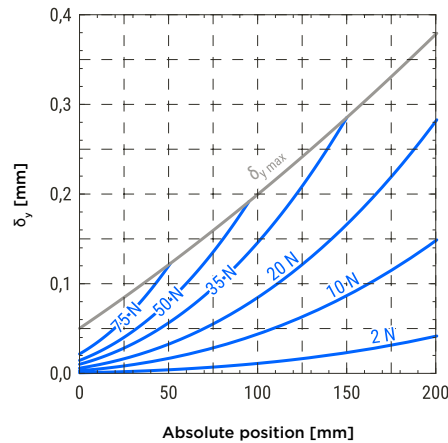
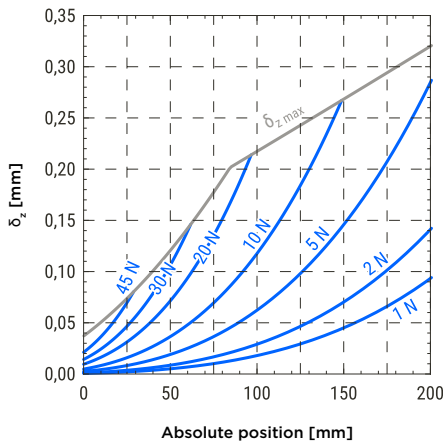
The maximum permissible deflection ( $\delta_{z \max}$  or  $\delta_{y \max}$ ) must not be exceeded.



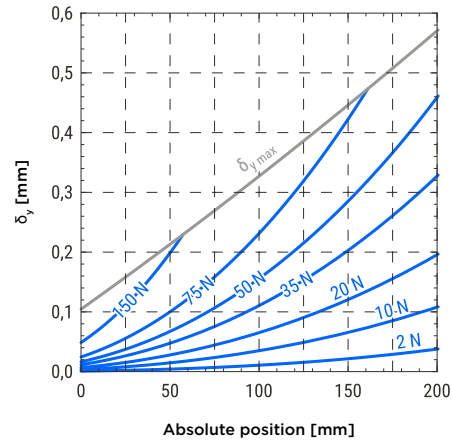
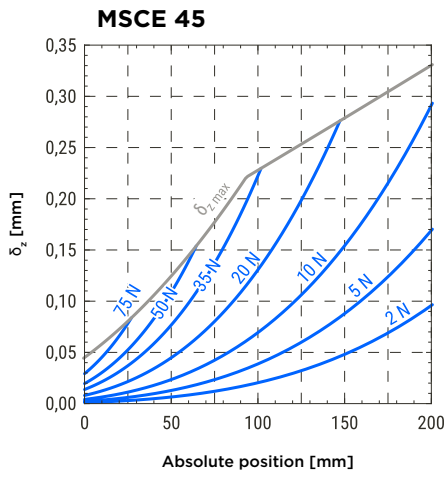
**MSCE 25**



**MSCE 32**



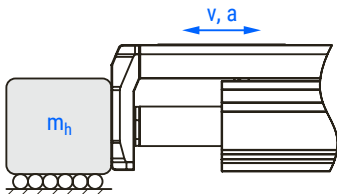




## Maximum horizontal payload as a function of the travel speed and acceleration of the front plate

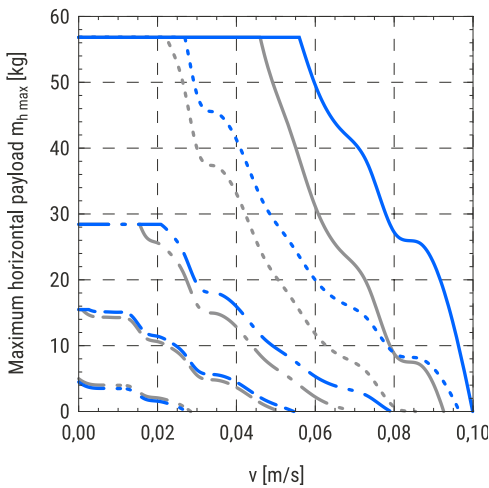
On the following diagrams, the maximum horizontal payloads applied to the front plate as a function of the travel speed for different accelerations, different ball screw leads, and different combinations of the standard motors are presented. Motor adapter VK and a motor side drive MSD are also considered.

Curves are valid for the payload to be pushed and supported by an external guiding (coefficient of friction 0,1 is taken into consideration).

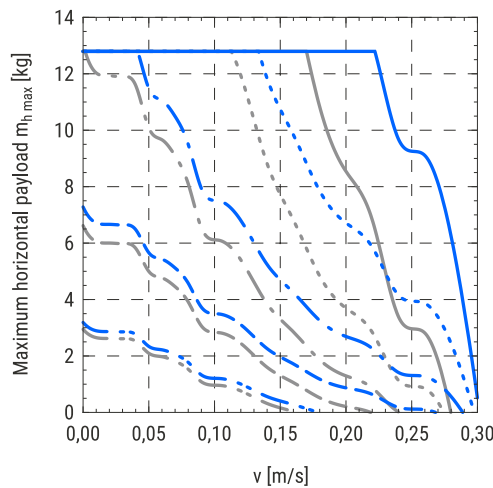


### MSCE 25

6 × 2 with a stepper motor □28



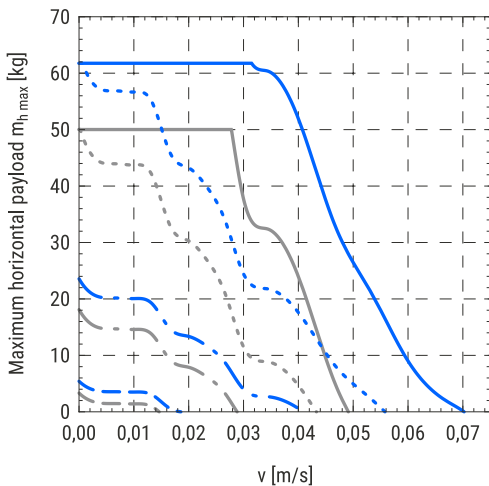
6 × 6 with a stepper motor □28



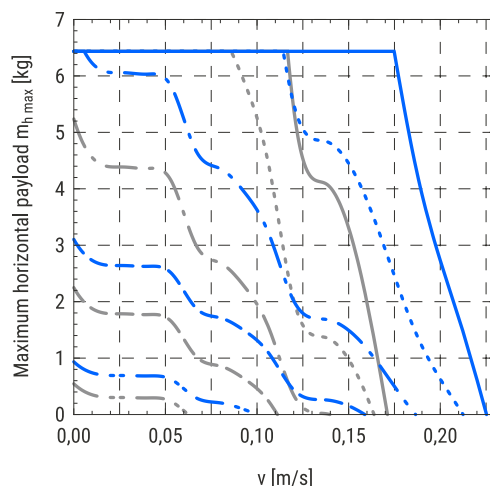
- MSCE in combination:
- with VK
  - with MSD
- Acceleration/Deceleration:
- a = 0,5 m/s<sup>2</sup>
  - - - a = 2 m/s<sup>2</sup>
  - · - a = 5 m/s<sup>2</sup>
  - - - a = 10 m/s<sup>2</sup>
  - · - a = 20 m/s<sup>2</sup>

### MSCE 32

8 × 2 with a stepper motor □28

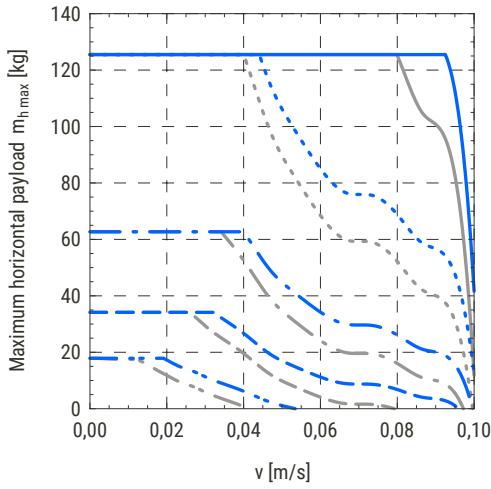


8 × 8 with a stepper motor □28

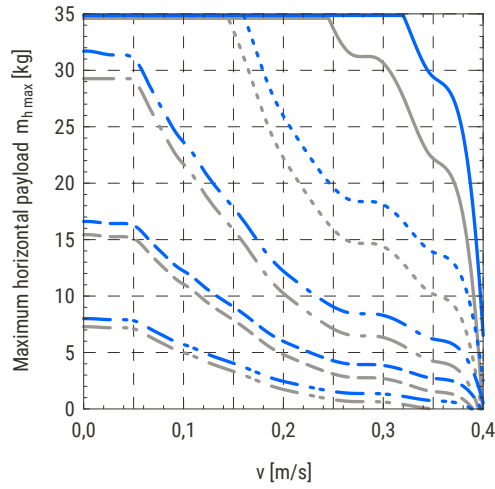


- MSCE in combination:
- with VK
  - with MSD
- Acceleration/Deceleration:
- a = 0,5 m/s<sup>2</sup>
  - - - a = 2 m/s<sup>2</sup>
  - · - a = 5 m/s<sup>2</sup>
  - - - a = 10 m/s<sup>2</sup>
  - · - a = 20 m/s<sup>2</sup>

8 × 2 with a stepper motor □42



8 × 8 with a stepper motor □42

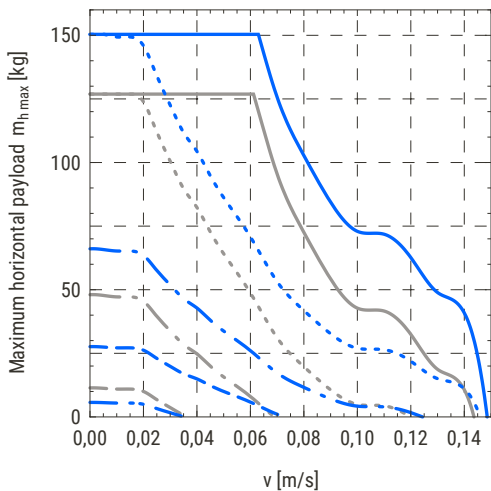


MSCE in combination:  
 — with VK  
 — with MSD

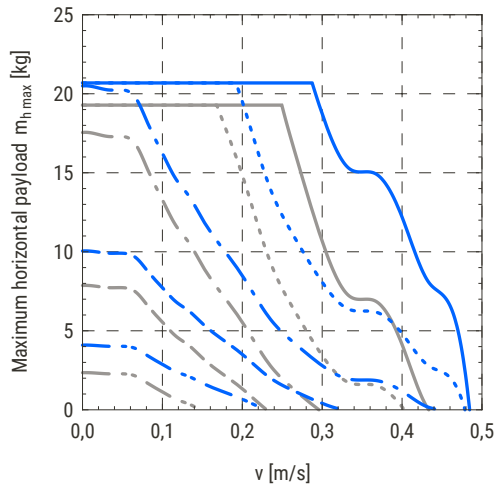
Acceleration/Deceleration:  
 —  $a = 0,5 \text{ m/s}^2$   
 - - -  $a = 2 \text{ m/s}^2$   
 - · -  $a = 5 \text{ m/s}^2$   
 - - -  $a = 10 \text{ m/s}^2$   
 - · -  $a = 20 \text{ m/s}^2$

**MSCE 45**

10 × 3 with a stepper motor □42



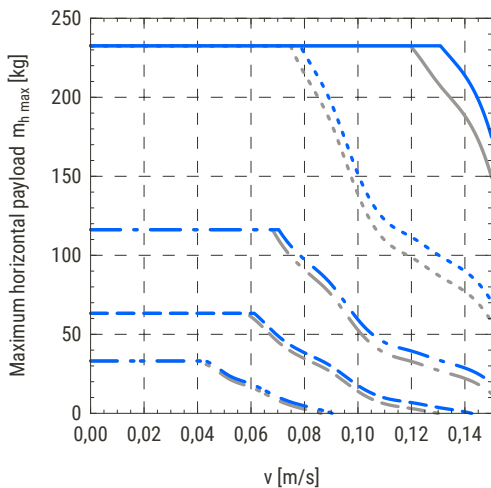
10 × 10 with a stepper motor □42



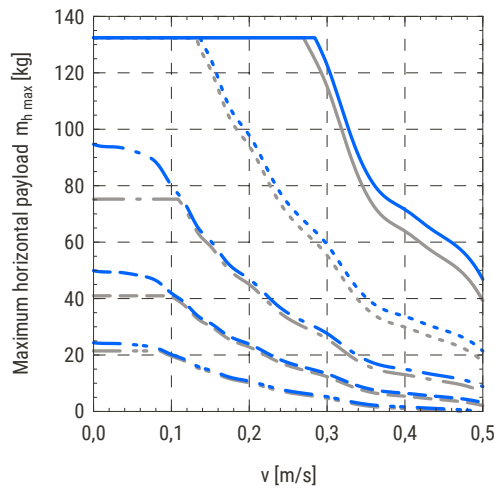
MSCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 —  $a = 0,5 \text{ m/s}^2$   
 - - -  $a = 2 \text{ m/s}^2$   
 - · -  $a = 5 \text{ m/s}^2$   
 - - -  $a = 10 \text{ m/s}^2$   
 - · -  $a = 20 \text{ m/s}^2$

10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56

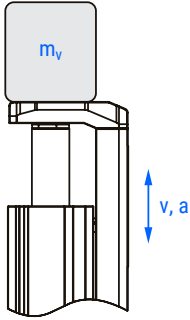


MSCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 —  $a = 0,5 \text{ m/s}^2$   
 - - -  $a = 2 \text{ m/s}^2$   
 - · -  $a = 5 \text{ m/s}^2$   
 - - -  $a = 10 \text{ m/s}^2$   
 - · -  $a = 20 \text{ m/s}^2$

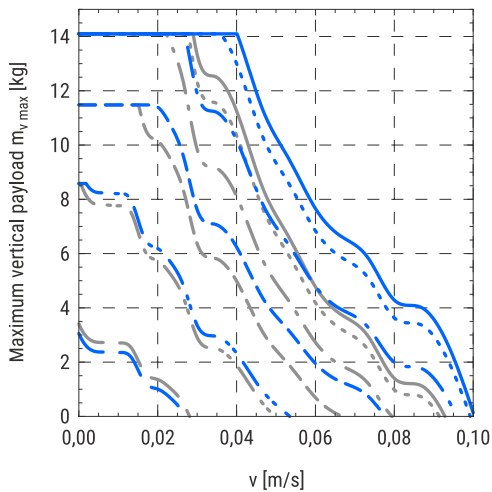
## Maximum vertical payload as a function of the travel speed and acceleration of the front plate

On the following diagrams, the maximum vertical payloads applied to the front plate as a function of the travel speed for different accelerations, different ball screw leads, and different combinations of the standard motors are presented. Motor adapter VK and a motor side drive MSD are also considered.

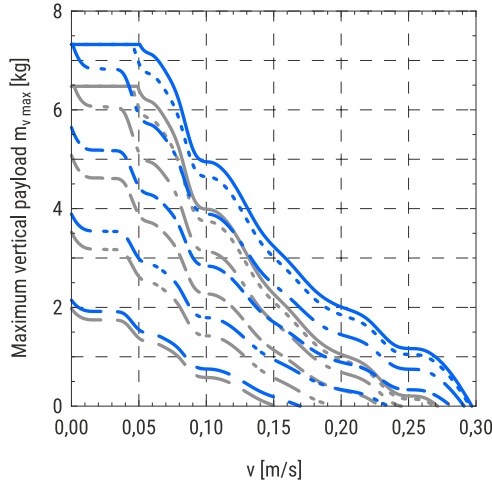


### MSCE 25

6 × 2 with a stepper motor □28



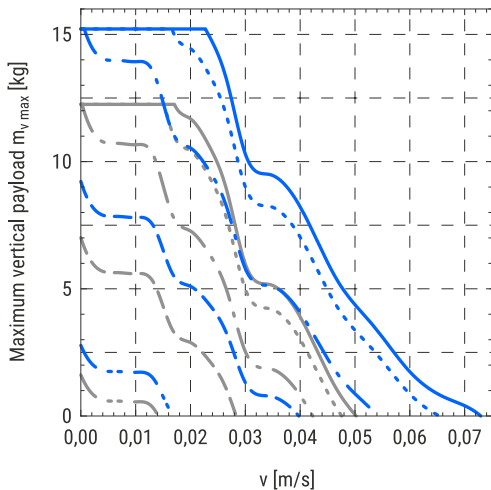
6 × 6 with a stepper motor □28



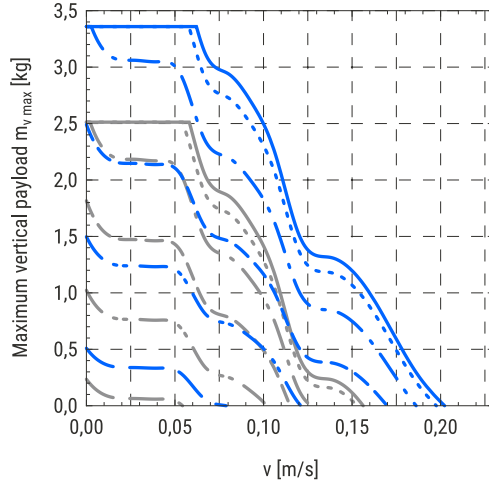
- MSCE in combination:
- with VK
  - - - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - - - a = 0,5 m/s<sup>2</sup>
  - · - a = 2 m/s<sup>2</sup>
  - - - a = 5 m/s<sup>2</sup>
  - · - a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>

### MSCE 32

8 × 2 with a stepper motor □28

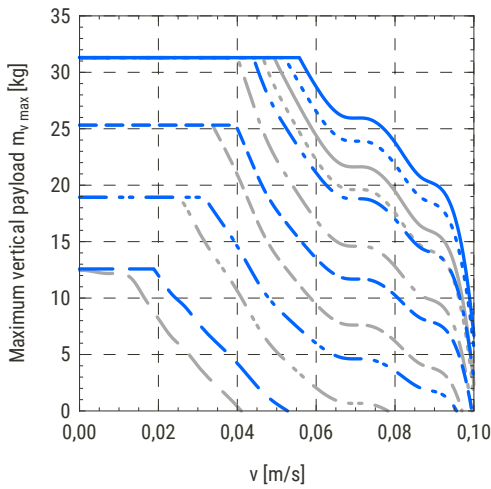


8 × 8 with a stepper motor □28

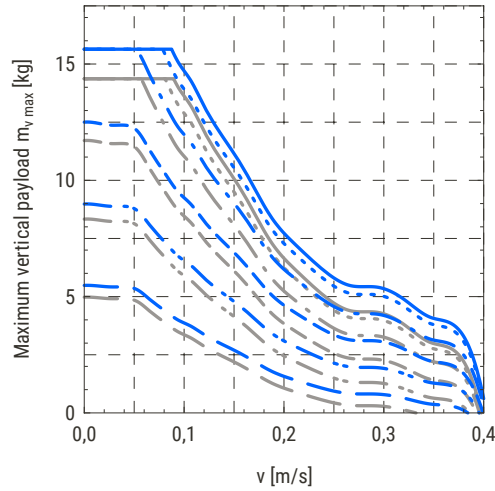


- MSCE in combination:
- with VK
  - - - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - - - a = 0,5 m/s<sup>2</sup>
  - · - a = 2 m/s<sup>2</sup>
  - - - a = 5 m/s<sup>2</sup>
  - · - a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>

8 × 2 with a stepper motor □42



8 × 8 with a stepper motor □42

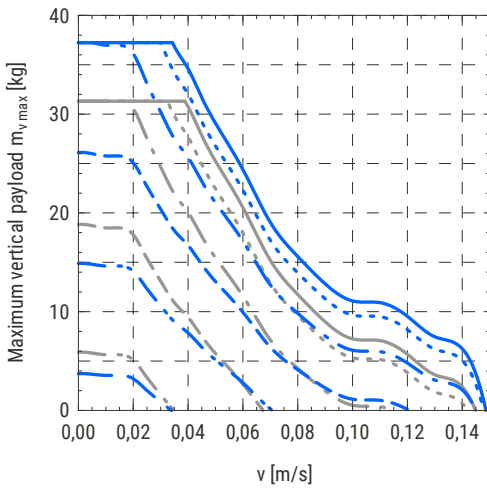


MSCE in combination:  
 — with VK  
 — with MSD

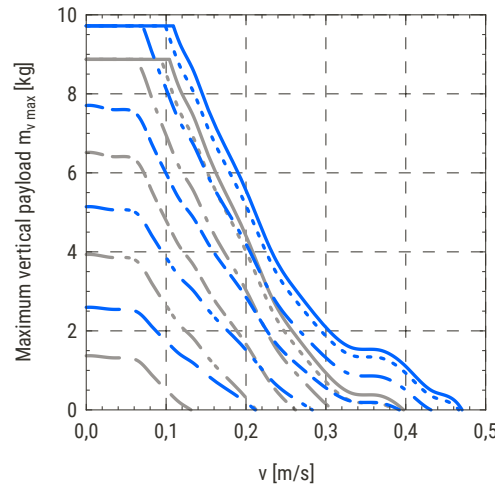
Acceleration/Deceleration:  
 —  $a = 0 \text{ m/s}^2$   
 - - -  $a = 0,5 \text{ m/s}^2$   
 - · -  $a = 2 \text{ m/s}^2$   
 - - -  $a = 5 \text{ m/s}^2$   
 - · -  $a = 10 \text{ m/s}^2$   
 - - -  $a = 20 \text{ m/s}^2$

**MSCE 45**

10 × 3 with a stepper motor □42



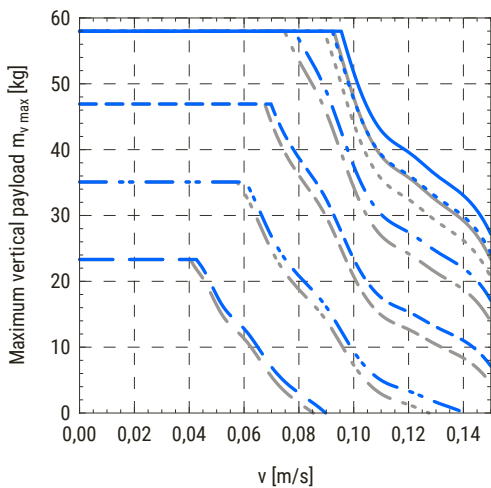
10 × 10 with a stepper motor □42



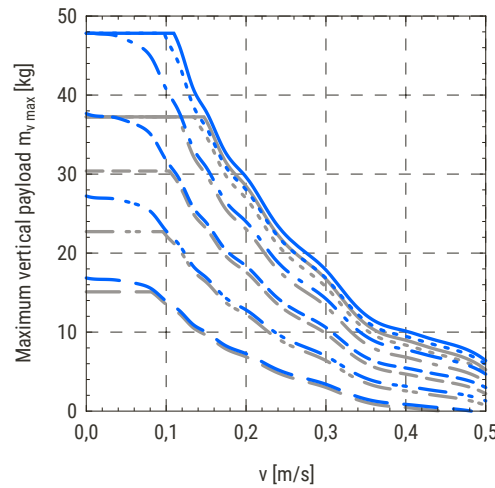
MSCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 —  $a = 0 \text{ m/s}^2$   
 - - -  $a = 0,5 \text{ m/s}^2$   
 - · -  $a = 2 \text{ m/s}^2$   
 - - -  $a = 5 \text{ m/s}^2$   
 - · -  $a = 10 \text{ m/s}^2$   
 - - -  $a = 20 \text{ m/s}^2$

10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56

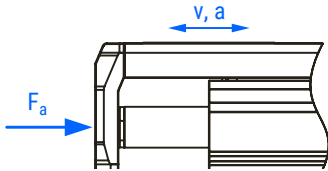


MSCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 —  $a = 0 \text{ m/s}^2$   
 - - -  $a = 0,5 \text{ m/s}^2$   
 - · -  $a = 2 \text{ m/s}^2$   
 - - -  $a = 5 \text{ m/s}^2$   
 - · -  $a = 10 \text{ m/s}^2$   
 - - -  $a = 20 \text{ m/s}^2$

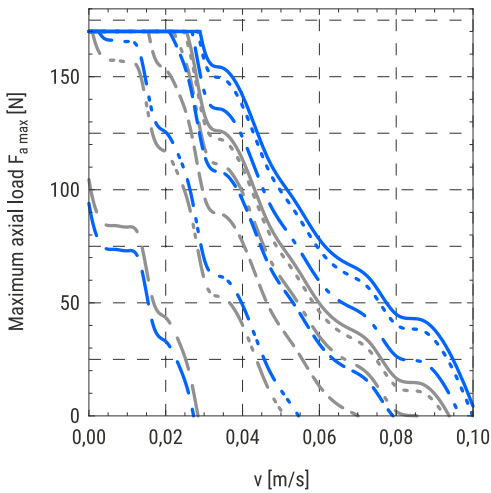
## Maximum axial load as a function of the travel speed and acceleration of the front plate

On the following diagrams, the maximum axial load applied to the front plate as a function of the travel speed for different accelerations, different ball screw leads and different combinations of the standard motors is presented. Motor adapter VK and a motor side drive MSD are also considered.

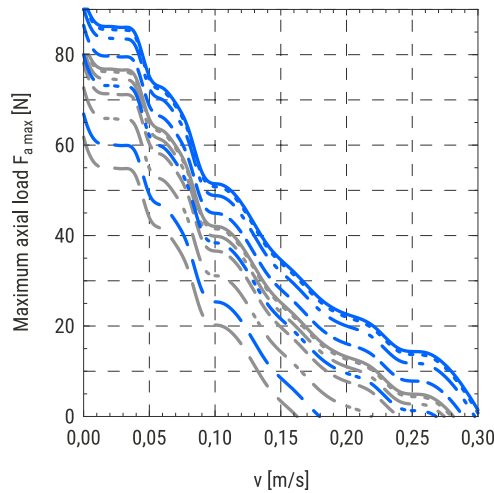


### MSCE 25

6 × 2 with a stepper motor □28



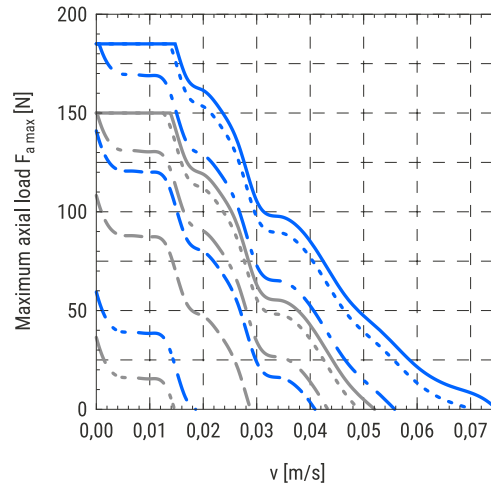
6 × 6 with a stepper motor □28



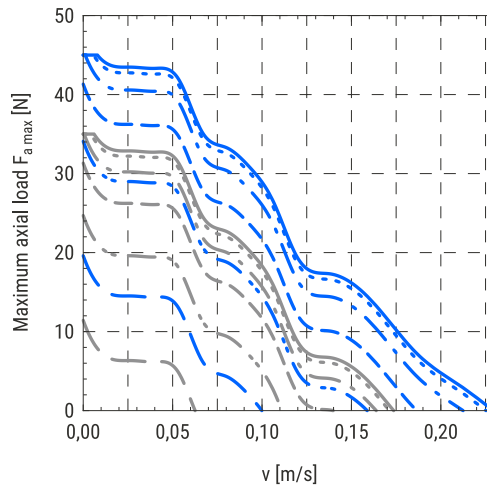
- MSCE in combination:
- with VK
  - - - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - - - a = 0,5 m/s<sup>2</sup>
  - · - a = 2 m/s<sup>2</sup>
  - - - a = 5 m/s<sup>2</sup>
  - · - a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>

### MSCE 32

8 × 2 with a stepper motor □28

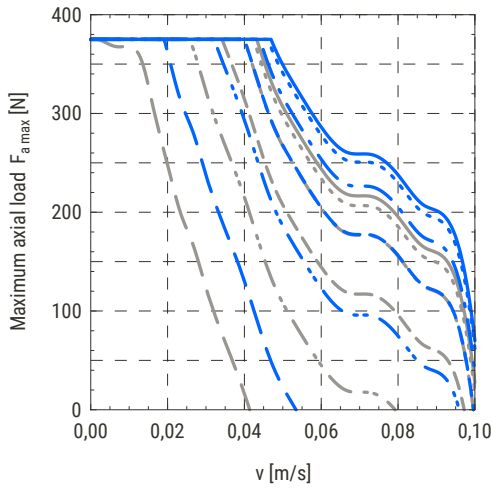


8 × 8 with a stepper motor □28

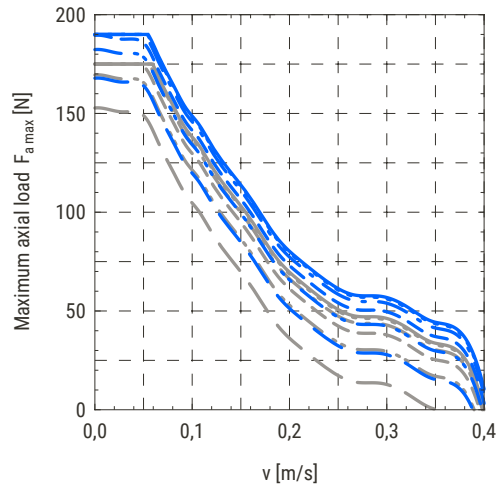


- MSCE in combination:
- with VK
  - - - with MSD
- Acceleration/Deceleration:
- a = 0 m/s<sup>2</sup>
  - - - a = 0,5 m/s<sup>2</sup>
  - · - a = 2 m/s<sup>2</sup>
  - - - a = 5 m/s<sup>2</sup>
  - · - a = 10 m/s<sup>2</sup>
  - - - a = 20 m/s<sup>2</sup>

8 × 2 with a stepper motor □42



8 × 8 with a stepper motor □42

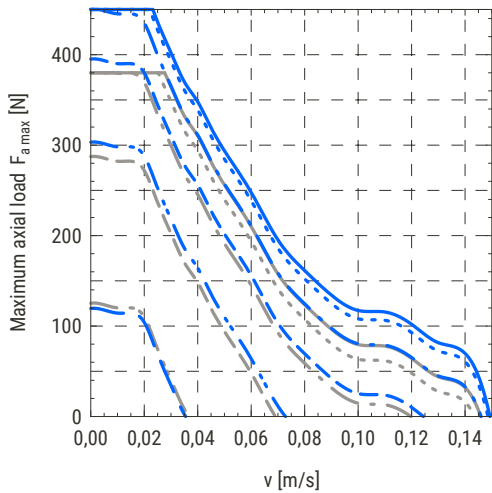


MSCE in combination:  
 — with VK  
 — with MSD

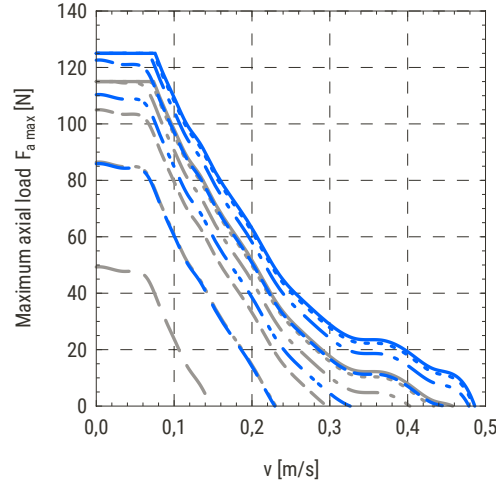
Acceleration/Deceleration:  
 —  $a = 0 \text{ m/s}^2$   
 - - -  $a = 0,5 \text{ m/s}^2$   
 - · -  $a = 2 \text{ m/s}^2$   
 - - -  $a = 5 \text{ m/s}^2$   
 - · -  $a = 10 \text{ m/s}^2$   
 - - -  $a = 20 \text{ m/s}^2$

**MSCE 45**

10 × 3 with a stepper motor □42



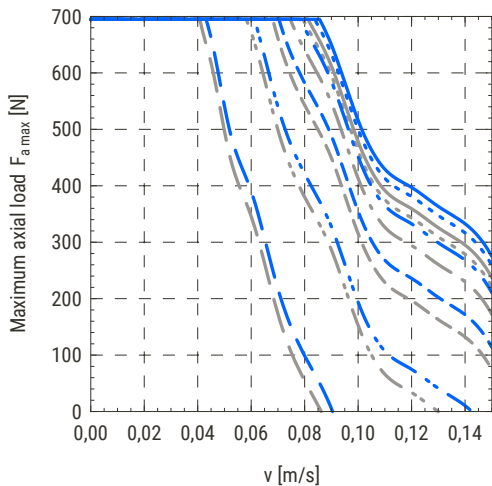
10 × 10 with a stepper motor □42



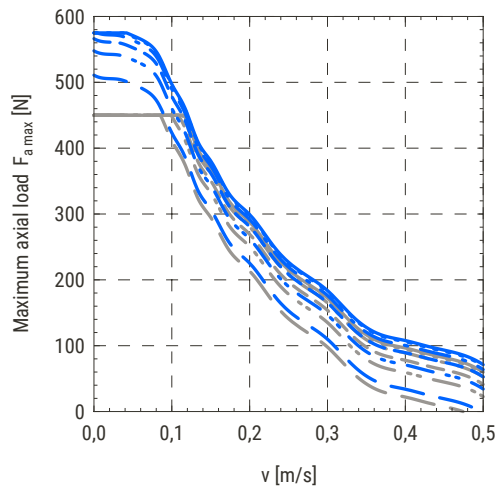
MSCE in combination:  
 — with VK  
 — with MSD

Acceleration/Deceleration:  
 —  $a = 0 \text{ m/s}^2$   
 - - -  $a = 0,5 \text{ m/s}^2$   
 - · -  $a = 2 \text{ m/s}^2$   
 - - -  $a = 5 \text{ m/s}^2$   
 - · -  $a = 10 \text{ m/s}^2$   
 - - -  $a = 20 \text{ m/s}^2$

10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56



MSCE in combination:  
 — with VK  
 — with MSD

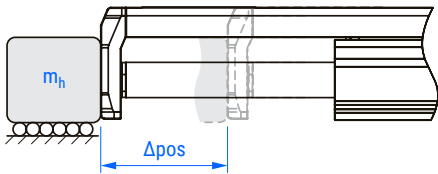
Acceleration/Deceleration:  
 —  $a = 0 \text{ m/s}^2$   
 - - -  $a = 0,5 \text{ m/s}^2$   
 - · -  $a = 2 \text{ m/s}^2$   
 - - -  $a = 5 \text{ m/s}^2$   
 - · -  $a = 10 \text{ m/s}^2$   
 - - -  $a = 20 \text{ m/s}^2$

## Maximum horizontal payload as a function of change of the position and positioning time of the front plate

The following diagrams show the maximum payload that can be moved by a certain horizontal distance within a positioning time frame. Acceleration/deceleration time of 100 ms is taken into account.

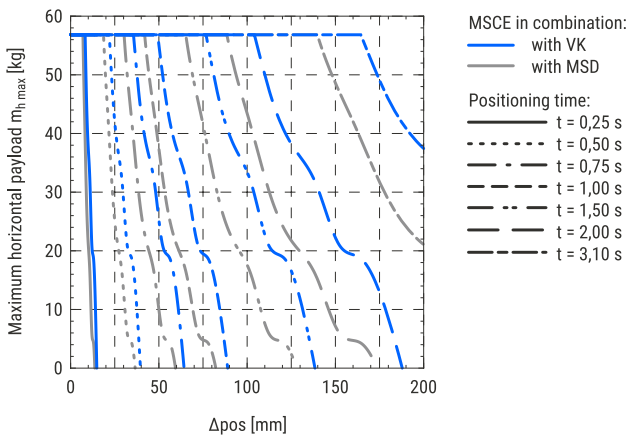
Diagrams depend on the ball screw leads and different combinations of the standard motors. Motor adapter VK and a motor side drive MSD are also considered.

Curves are valid for the payload to be pushed and supported by an external guiding (coefficient of friction 0,1 is taken into consideration).

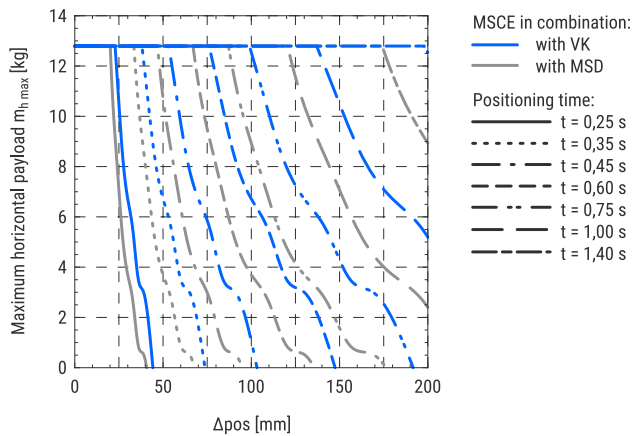


### MSCE 25

6 × 2 with a stepper motor □28

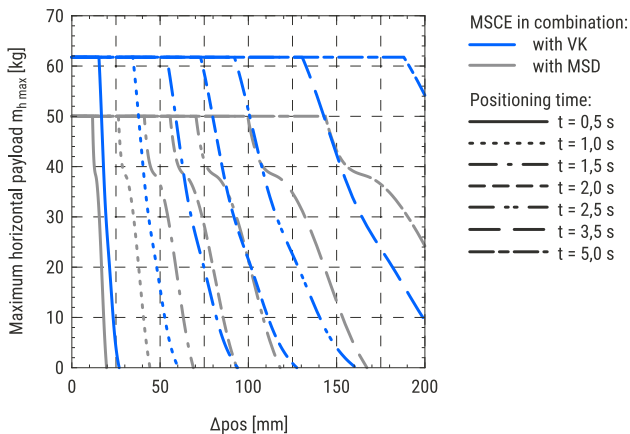


6 × 6 with a stepper motor □28

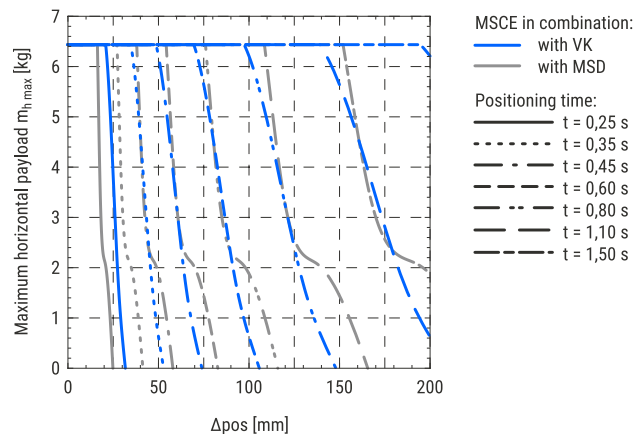


### MSCE 32

8 × 2 with a stepper motor □28

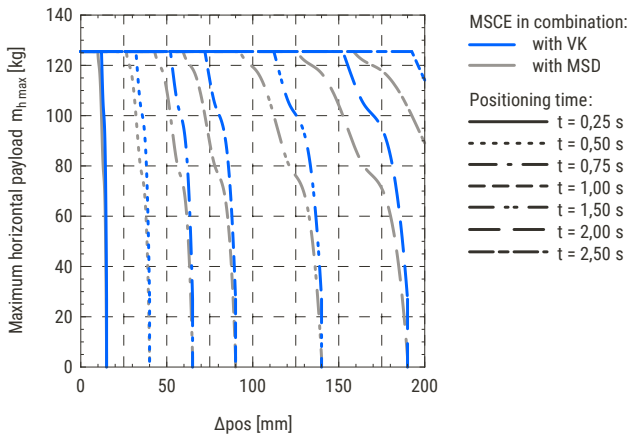


8 × 8 with a stepper motor □28

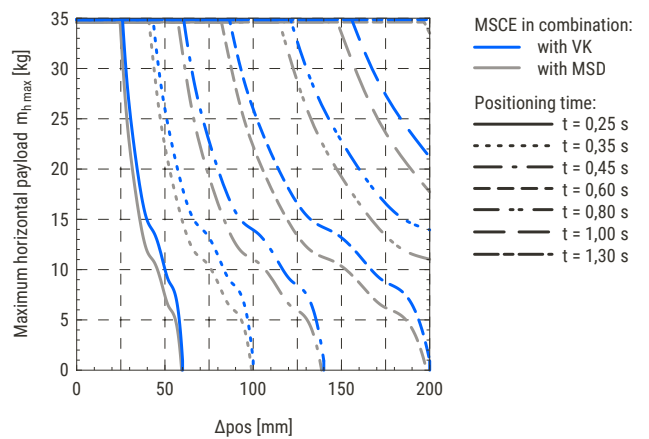




8 × 2 with a stepper motor □42

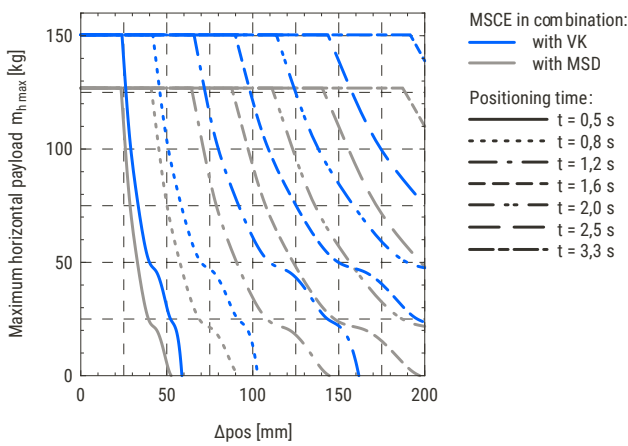


8 × 8 with a stepper motor □42

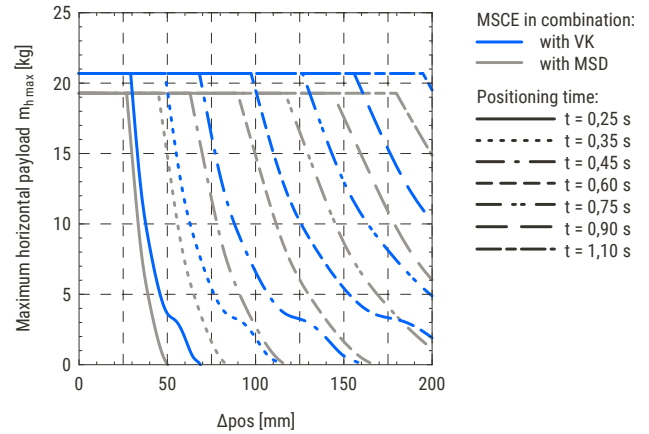


**MSCE 45**

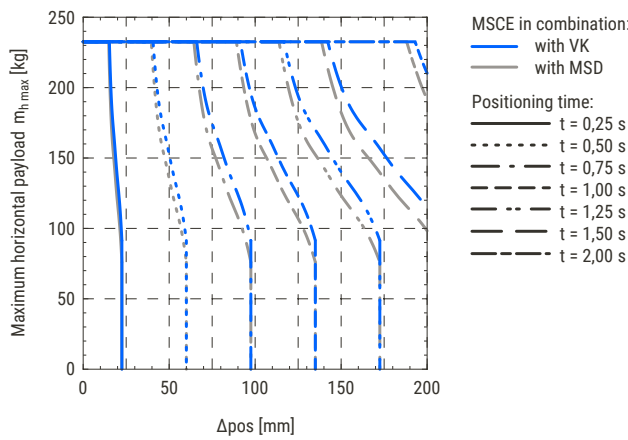
10 × 3 with a stepper motor □42



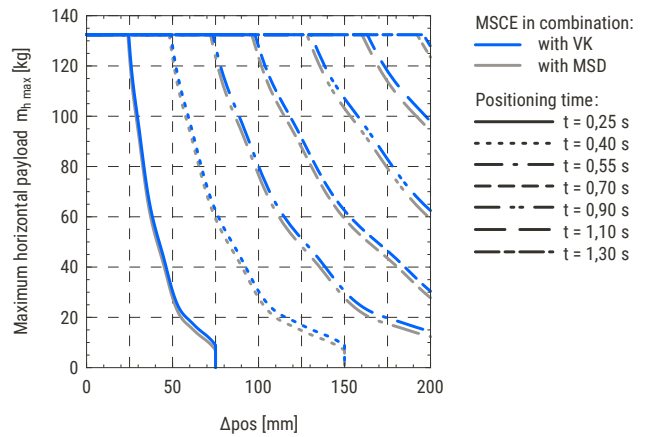
10 × 10 with a stepper motor □42



10 × 3 with a stepper motor □56



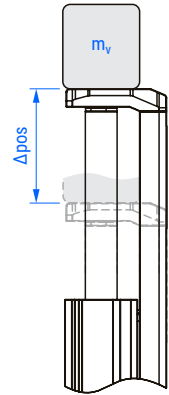
10 × 10 with a stepper motor □56



# Maximum vertical payload as a function of change of the position and positioning time of the front plate

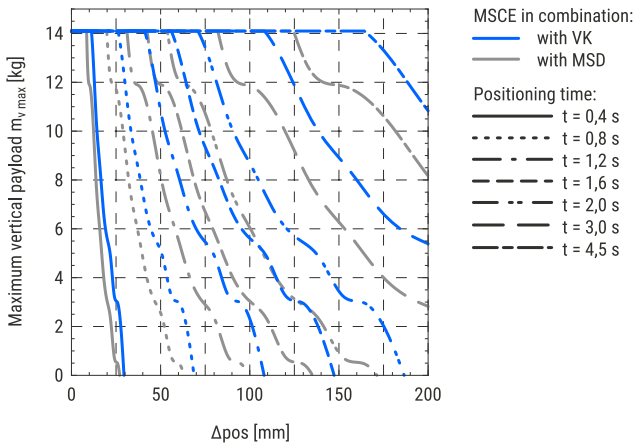
The following diagrams show the maximum payload that can be moved by a certain vertical distance within a positioning time frame. Acceleration/deceleration time of 100 ms is taken into account.

Diagrams depend on the ball screw leads and different combinations of the standard motors. Motor adapter VK and a motor side drive MSD are also considered.

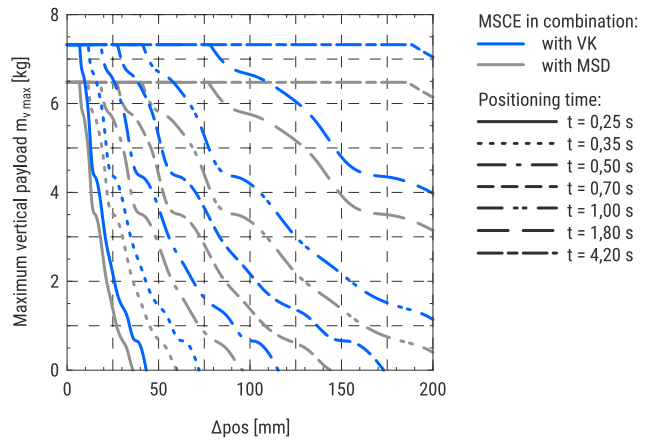


## MSCE 25

6 × 2 with a stepper motor □28

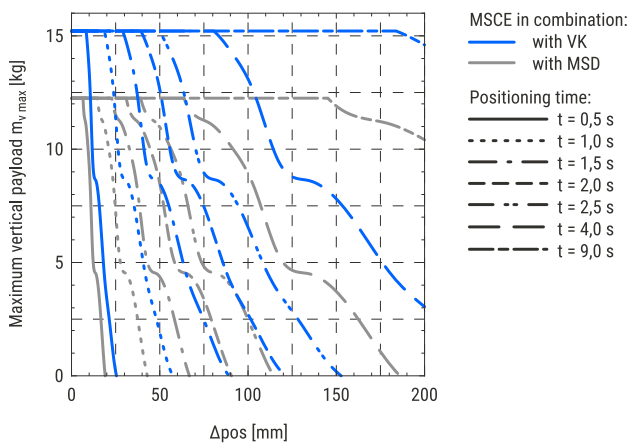


6 × 6 with a stepper motor □28

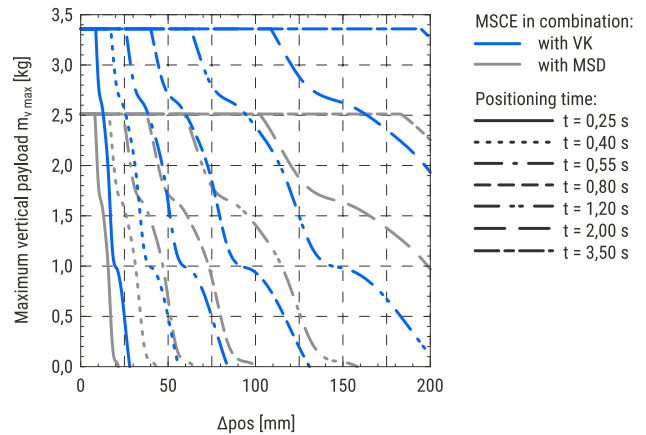


## MSCE 32

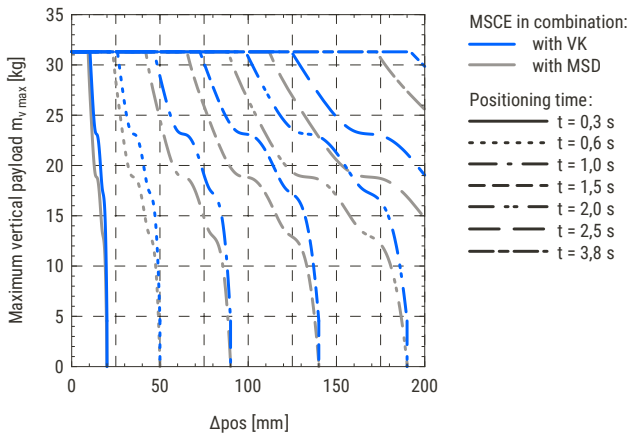
8 × 2 with a stepper motor □28



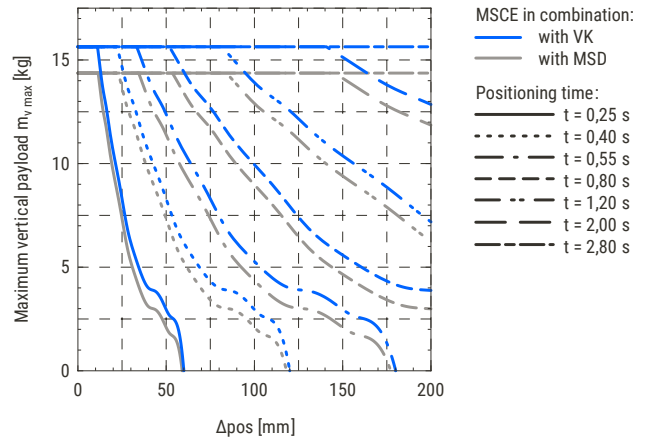
8 × 8 with a stepper motor □28



8 × 2 with a stepper motor □42

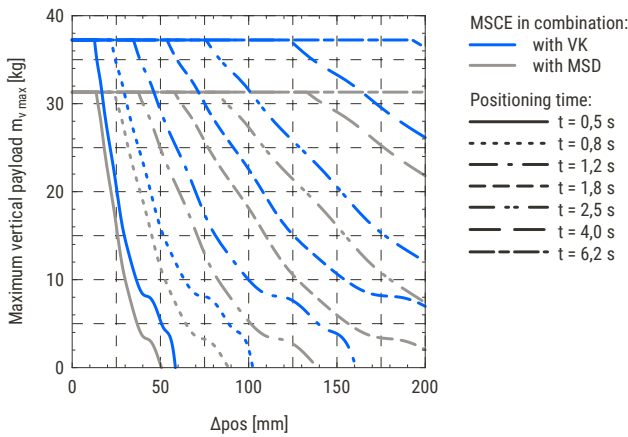


8 × 8 with a stepper motor □42

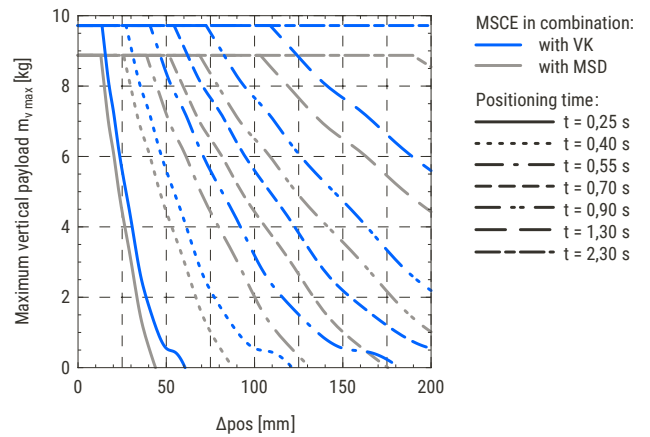


**MSCE 45**

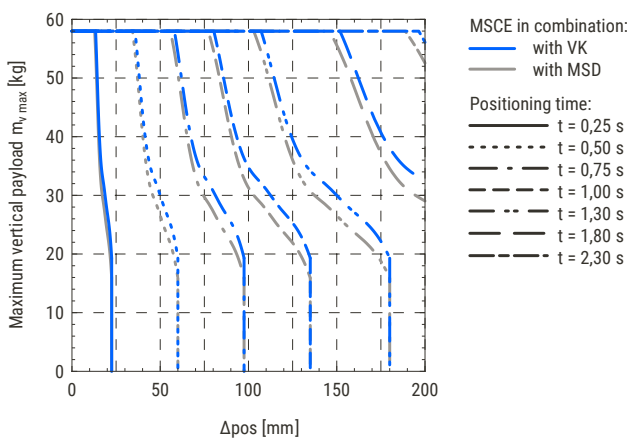
10 × 3 with a stepper motor □42



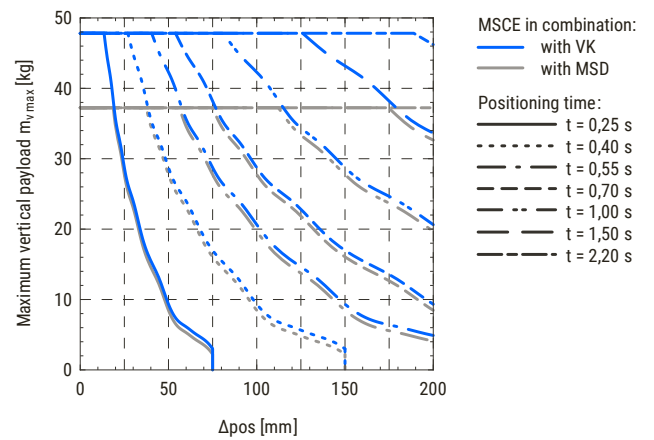
10 × 10 with a stepper motor □42



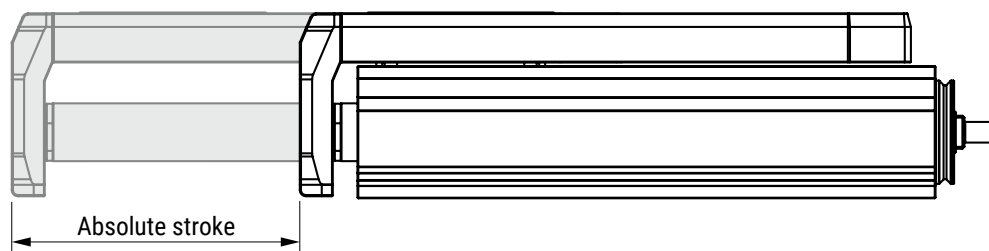
10 × 3 with a stepper motor □56



10 × 10 with a stepper motor □56



## Absolute stroke and length of the MSCE definition



### Absolute stroke definition

Absolute stroke = Effective stroke + 2 × Safety stroke

The electric slider MSCE does not include any safety stroke.

### Length definition

$L_t = L + L_2 + \text{Abs. position}$

Length  $L$  and  $L_t$  are defined as it is presented on the dimensional drawings above, where lengths of a motor, motor adapter VK, and motor side drive MSD are also considered.

<b>Abs. stroke</b>	Absolute stroke [mm]
<b>Abs. position</b>	Absolute position [mm]
<b>L</b>	Length [mm]
<b>L<sub>t</sub></b>	Total length [mm]

# Motor types and sizes

## Motor identification

Designation	Type	Motor	
		Size □ [mm]	Brake
STMN-28-L-E*	Stepper	28	-
STMN-28-L-E-B*	Stepper	28	with
STMN-42-L-E	Stepper	42	-
STMN-42-L-E-B	Stepper	42	with
STMN-56-L-E	Stepper	56	-
STMN-56-L-E-B	Stepper	56	with

\*Available soon.

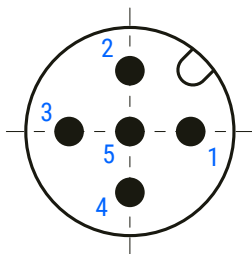
□ = Square cross section

## Motor pin allocation

Valid for stepper motor size of 42 and 56 mm. Stepper motor size of 28 mm is available soon.

### Motor connector

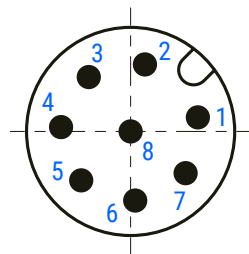
Connector type: M12 5-pole



Pin	Function
1	A-
2	A+
3	B+
4	B-
5	Housing

### Encoder connector

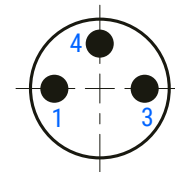
Connector type: M12 8-pole



Pin	Function
1	A-
2	A+
3	B+
4	B-
5	GND
6	I-
7	I+
8	VCC (5 V)
Housing	GND/shielding

### Brake connector

Connector type: M8 3-pole



Valid only for motors with a brake.

Pin	Function
1	Brake +24V
3	Brake/GND
4	NC

## Technical data

### Motor

Designation	Voltage [V DC]	Current per phase [A]	Mass moment of inertia [kg cm <sup>2</sup> ]	Holding torque [Nm]	Step angle [°]
STMN-28-L-E	Available soon				
STMN-28-L-E-B	Available soon				
STMN-42-L-E	3,15	1,8	0,082	0,5	1,8 ± 5 %
STMN-42-L-E-B	3,15	1,8	0,095	0,5	1,8 ± 5 %
STMN-56-L-E	2,4	4,2	0,480	1,87	1,8 ± 5 %
STMN-56-L-E-B	2,4	4,2	0,501	1,87	1,8 ± 5 %

Designation	Resistance per phase [Ohm]	Inductance per phase [mH]	Voltage constant [mV/min <sup>-1</sup> ]	Mass [kg]
STMN-28-L-E	Available soon			
STMN-28-L-E-B	Available soon			
STMN-42-L-E	1,75 ± 10 %	3,3 ± 20 %	23	0,44
STMN-42-L-E-B	1,75 ± 10 %	3,3 ± 20 %	23	0,57
STMN-56-L-E	0,58 ± 15 %	1,9 ± 20 %	32,5	1,14
STMN-56-L-E-B	0,58 ± 15 %	1,9 ± 20 %	32,5	1,33

### Encoder

Designation	Type	Measuring principle	Interface	Resolution [cpr/ppr]	Operating voltage [V DC]
STMN-28-L-...	Available soon				
STMN-42-L-...	Incremental	Opto-electrical	Line drive	500/2000	5
STMN-56-L-...	Incremental	Opto-electrical	Line drive	500/2000	5

### Brake

Designation	Operating voltage [V DC]	Rated output [W]	Holding torque [Nm]	Mass moment of inertia [kg cm <sup>2</sup> ]
STMN-28-L-...	Available soon			
STMN-42-L-...	24 (+6/-10 %)	8	0,4	0,013
STMN-56-L-...	24 (+6/-10 %)	10	1,0	0,021

### Operating conditions

Ambient temperature	-10 °C - +50 °C
Ambient humidity	max. 85 % (non-condensing)
Protection class*	IP65
Duty cycle	100 %

\*Except the shaft output.

# Drive types

## Drive identification and compatibility

Designation	Drive		Compatible with
	Type	Protocol/control	
STDF-28-A-EC*	Stepper	EtherCat	STMN-28-L...
STDF-42-A-EC	Stepper	EtherCat	STMN-42-L...
STDF-56-A-EC	Stepper	EtherCat	STMN-56-L...
STDF-28-A-EN*	Stepper	Ethernet based communication	STMN-28-L...
STDF-42-A-EN	Stepper	Ethernet based communication	STMN-42-L...
STDF-56-A-EN	Stepper	Ethernet based communication	STMN-56-L...
STDF-28-A-PD*	Stepper	Pulse-direction control	STMN-28-L...
STDF-42-A-PD	Stepper	Pulse-direction control	STMN-42-L...
STDF-56-A-PD	Stepper	Pulse-direction control	STMN-56-L...

\*Available soon.

## Technical data

Designation	Operating voltage [V DC]	Current consumption* [mA]	Rotational speed [rpm]	Supported resolution**
				[ppr]
STDF-...-EC	24 ± 10 %	max. 500	0 ~ 3000	500, 1000, 1600, 2000, 3600, 5000, 6400, 7200, 10000
STDF-...-EN	24 ± 10 %	max. 500	0 ~ 3000	500, 1000, 1600, 2000, 3600, 5000, 6400, 7200, 10000
STDF-...-PD	24 ± 10 %	max. 500	0 ~ 3000	500, 1000, 1600, 2000, 3600, 5000, 6400, 7200, 10000

Designation	Input signals	Output signals
STDF-...-EC	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN); 7 user inputs (Photocoupler)	6 user outputs (Photocoupler); Brake
STDF-...-EN	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN); 9 Programmable inputs (Photocoupler)	1 dedicated output (Compare out); 9 programmable outputs (Photocoupler); Brake
STDF-...-PD	Position command pulse; Servo on/off; Alarm reset (Photocoupler input)	In-position; Alarm (Photocoupler output); Encoder signal, brake

\*Except the motor current.

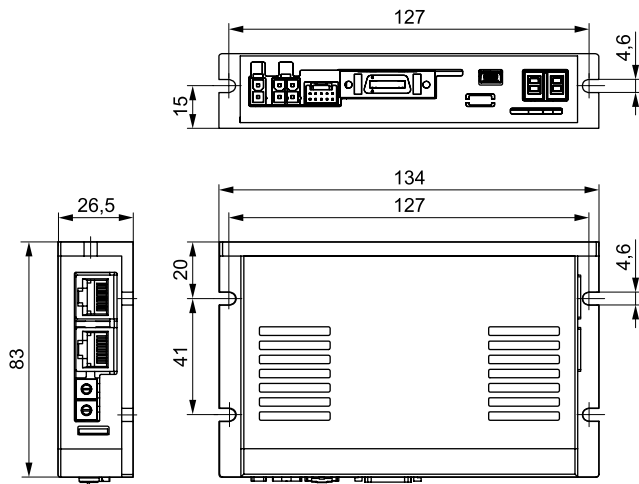
\*\*For the case that resolution is higher than the encoder's resolution, the motor shall operate by micro-step between pulses.

## Operating conditions

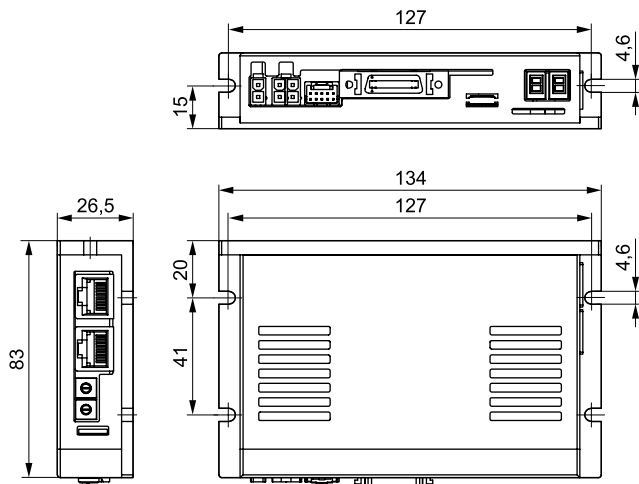
Ambient temperature	0 °C ~ +50 °C
Ambient humidity	35 % ~ 85 % (non-condensing)
Vibration resistance	0,5 G
Duty cycle	100 %

## Dimensions

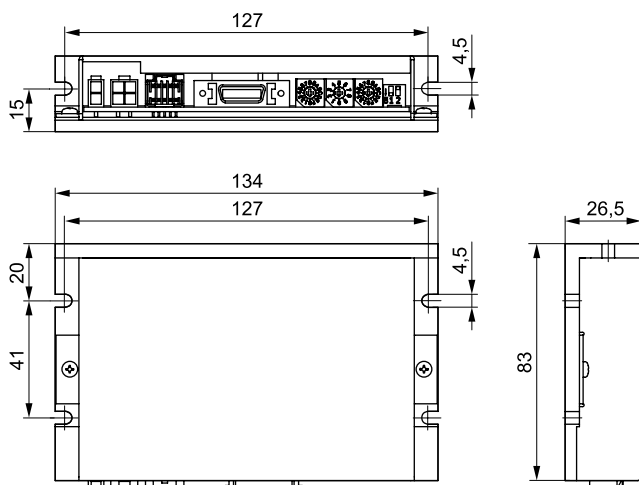
### Stepper drive → EtherCAT protocol



### Stepper drive → Ethernet based communication



### Stepper drive → Pulse-direction control





## Drive-motor cables

Drive to motor cables in general consist of:

- 1 - a motor cable
- 2 - an encoder cable
- 3 - a brake cable (only if a motor with brake is used).

For the stepper motor size of 28 motor and brake cables are combined in one cable.

Additional cable, i.e. brake to terminal cable is included for the case of the motor (□28) with the brake.

## Cables identification and compatibility

Designation	Cable type	Compatible with
STCF-M-_8-...*	Motor; Brake	STMN-28-...; STMN-28-...-B
STCF-M-_12-...	Motor	STMN-42-...; STMN-42-...-B; STMN-56-...; STMN-56-...-B
STCF-BT-02*	Brake to terminal	STMN-28-...-B
STCF-B-_8-...	Brake	STMN-42-...-B; STMN-56-...-B
STCF-E-_8-...*	Encoder	STMN-28-...; STMN-28-...-B
STCF-E-_12-...	Encoder	STMN-42-...; STMN-42-...-B; STMN-56-...; STMN-56-...-B

\*Available soon.

## Technical data

### Stepper motor size of 28 mm

Available soon.

### Stepper motor size of 42 and 56 mm

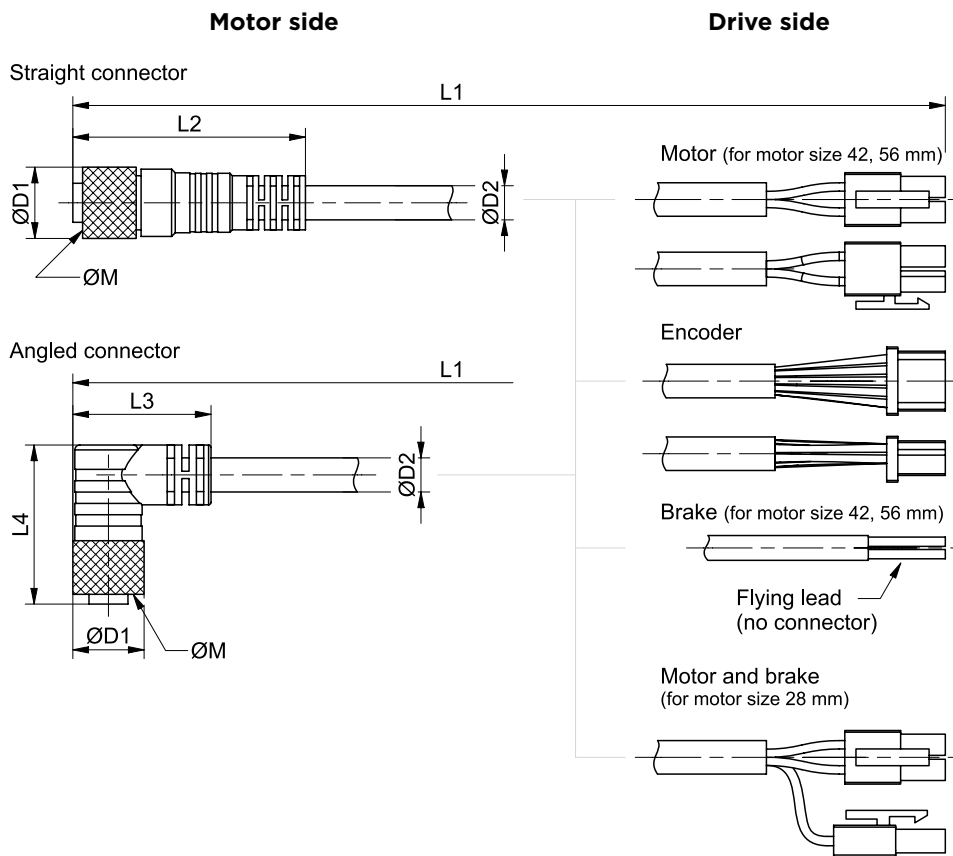
Designation	Length [m]	Cable diameter D [mm]	Material, color	Bending radius (dyn.) [mm]	Shielded?
STCF-M-_12-...	3, 5, 10	5,1	TPE, black	min. 7,5 × D	Yes
STCF-B-_8-...	3, 5, 10	4,5	TPE, black	min. 7,5 × D	Yes
STCF-E-_12-...	3, 5, 10	6,7	TPE, black	min. 7,5 × D	Yes

### Operating conditions

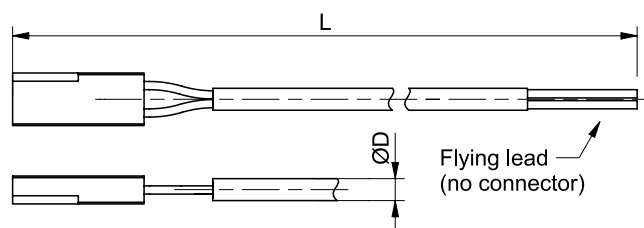
Ambient temperature (fixed laying)	-40 °C ~ +70 °C
Ambient temperature (flexible application)	5 °C ~ +70 °C

## Dimensions

Drive to motor cables for the stepper motors (only for the STDF and STMN motors).



### Brake to terminal cables



### Motor, encoder, brake and brake to terminal cables

Designation	Cable type	L [m]	L1 [m]	L2 [mm]	L3 [mm]	L4 [mm]	$\varnothing D$ [mm]	$\varnothing D1$ [mm]	$\varnothing D2$ [mm]	$\varnothing M$ [mm]
STCF-M-_8-...	Motor	-	-	-	-	-	-	-	-	-
STCF-M-_12-...	Motor	-	3, 5, 10	47,7	28,4	32,6	-	14,6	5,1	M12
STCF-B-_8-...	Brake	-	3, 5, 10	41,7	30,9	25,2	-	9,9	4,5	M8
STCF-BT-02	Brake to terminal	2	-	-	-	-	Available soon	-	-	-
STCF-E-_8-...	Encoder	-	-	-	-	-	-	-	-	-
STCF-E-_12-...	Encoder	-	3, 5, 10	47,7	28,4	32,6	-	14,6	6,7	M12

# Power and signal cables

Power cable is used for supplying the power from power supply to the drive. Signal cable is mandatory for the following cases:

- 1 - If a motor with brake is used
- 2 - If a pulse-direction drive control is used
- 3 - If the limit switches are used.

## Cables identification and compatibility

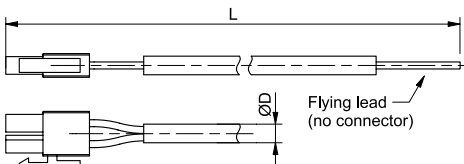
Designation	Cable type	Compatible with
STCF-P-02	Power	STDF-...-EC; STDF-...-EN; STDF-...-PD
STCF-S-EC-02	Signal	STDF-...-EC
STCF-S-EN-02	Signal	STDF-...-EN
STCF-S-PD-02	Signal	STDF-...-PD

## Technical data

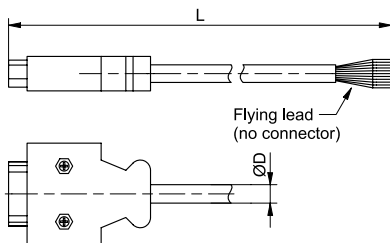
Designation	Length [m]	Cable diameter [mm]	Material, color	Shielded?
STCF-P-02	2	4,6	PVC, black	Yes
STCF-S-EC-02	2	6,4	PVC, black	Yes
STCF-S-EN-02	2	6,9	PVC, black	Yes
STCF-S-PD-02	2	6,4	PVC, black	Yes

## Dimensions

### Power cables for the stepper motors (only for the STDF drives)



### Signal cables for the stepper motors (only for the STDF drives)



Designation	Cable type	L [m]	ØD [mm]
STCF-P-02	Power	2	4,6
STCF-S-EC-02	Signal	2	6,4
STCF-S-EN-02	Signal	2	6,9
STCF-S-PD-02	Signal	2	6,4

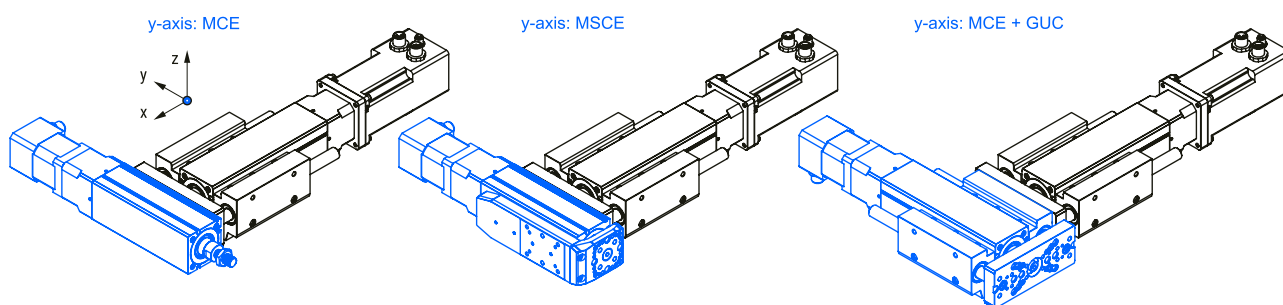
# Mounting examples

Mini electric cylinders MCE and sliders MSCE can easily be combined to the multi-axis systems by using the standard accessories. Already prepared mounting holes on the front plate/slide of the MSCE, guiding unit GUC, and mounting slots on the profiles allow various combinations of MCE and MSCE without additional connection plates.

In the following, compatibility of the mini electric cylinders and sliders are presented.

For non-standard combinations, configurations, or custom connection elements, please contact us.

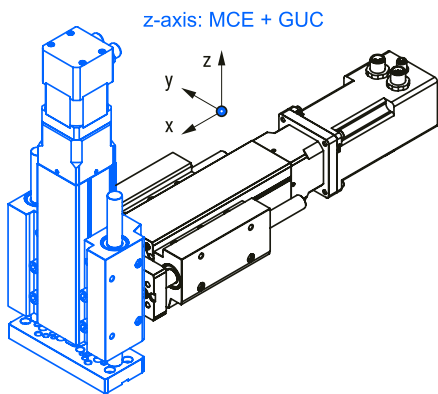
## x-y configuration with the x-axis: MCE + the guiding unit GUC



Mini electric cylinders and sliders can be combined by using the slot nuts together with the standard screws. For the case, where the y-axis is MCE+GUC, only the standard screws can be used.

Configuration		y-axis								
		MCE			MSCE			MCE + GUC		
x-axis	Size	25	32	45	25	32	45	25	32	45
MCE + GUC	25	•	-	-	•	-	-	•	-	-
	32	•	•	-	•	•	-	•	•	-
	45	•	•	•	•	•	•	•	•	•

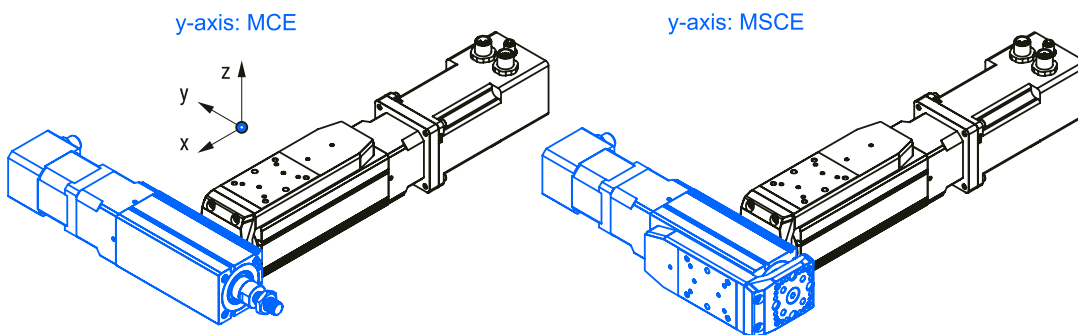
### x-z configuration with the x-axis: MCE + the guiding unit GUC



Mini electric cylinders with GUC can be combined by using the standard screws.

Configuration		z-axis MCE + GUC		
x-axis	Size	25	32	45
MCE + GUC	25	•	-	-
	32	•	•	-
	45	•	•	•

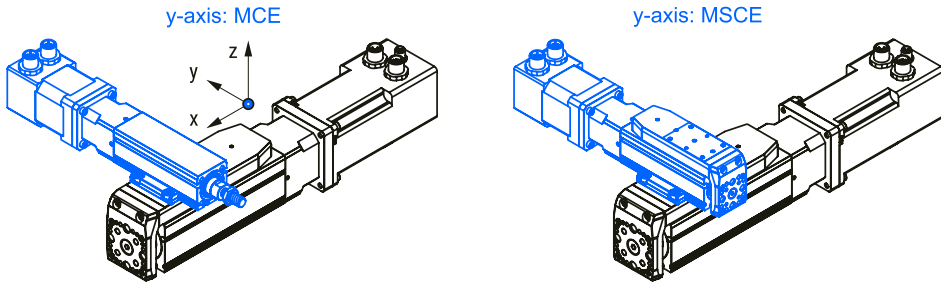
### x-y configuration with the x-axis: MSCE (y-axis is mounted to the front plate)



Mini electric cylinders and sliders can be combined by using the slot nuts together with the standard screws.

Configuration		y-axis					
x-axis	Size	25	MCE 32	45	25	MSCE 32	45
MSCE: front plate	25	•	-	-	•	-	-
	32	•	•	-	•	•	-
	45	•	•	•	•	•	•

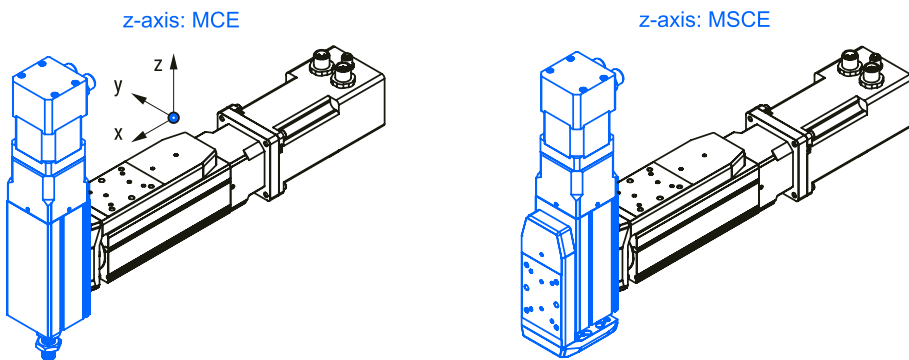
### x-y configuration with the x-axis: MSCE (y-axis is mounted to the slide)



Mini electric cylinders and sliders can be combined by using the clamping fixtures together with the standard screws.

Configuration		y-axis					
x-axis	Size	25	MCE 32	45	25	MSCE 32	45
	25	-	-	-	-	-	-
MSCE: slide	32	•	-	-	•	-	-
	45	•	•	-	•	•	-

### x-z configuration with the x-axis: MSCE (z-axis is mounted to the front plate)



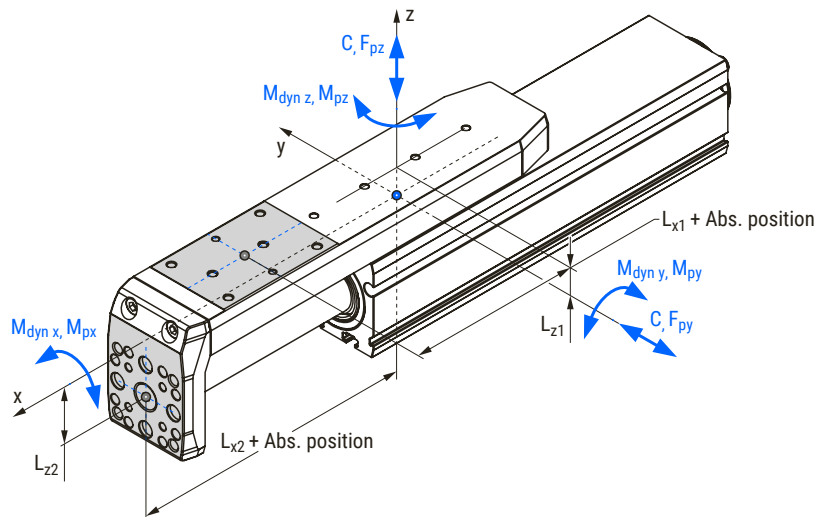
Mini electric cylinders and sliders can be combined by using the slot nuts together with the standard screws.

Configuration		z-axis					
x-axis	Size	25	MCE 32	45	25	MSCE 32	45
	25	•	-	-	•	-	-
MSCE: front plate	32	•	•	-	•	•	-
	45	•	•	•	•	•	•

# Linear guiding

Dynamic load capacity, dynamic moments and maximum permissible loads of the linear guiding system integrated into the mini electric slider refer to the centre of the linear guides.

The applied loading condition needs to be calculated, with respect to the centre of the linear guides. The presented attachment distances, measured from the centre of the linear guides, together with an absolute position of the slider must be taken into consideration.



Valid for mini electric slider MSCE.

Designation	Attachment distances			
	Slide		Front plate	
	$L_{x1}$ [mm]	$L_{z1}$ [mm]	$L_{x2}$ [mm]	$L_{z2}$ [mm]
MSCE 25	0,0	7,5	34,0	-16,5
MSCE 32	0,0	7,7	39,0	-21,3
MSCE 45	0,0	10,6	50,5	-27,4

Abs. position	Absolute position [mm]
C	Dynamic load capacity [N]
$M_{dyn\ x}$	Dynamic moment about the x axis [Nm]
$M_{dyn\ y}$	Dynamic moment about the y axis [Nm]
$M_{dyn\ z}$	Dynamic moment about the z axis [Nm]
$F_{py}$	Max. permissible force in the y direction [N]
$F_{pz}$	Max. permissible force in the z direction [N]
$M_{px}$	Max. permissible moment about the x axis [Nm]
$M_{py}$	Max. permissible moment about the y axis [Nm]
$M_{pz}$	Max. permissible moment about the z axis [Nm]

## Permissible load

### Permissible load factor $f_{pg}$

A permissible load factor of the linear guiding system  $f_{pg}$  must never exceed the value of 1.

$$f_{pg} = \frac{|F_y|}{F_{py}} + \frac{|F_z|}{F_{pz}} + \frac{|M_x|}{M_{px}} + \frac{|M_y|}{M_{py}} + \frac{|M_z|}{M_{pz}} \leq 1$$

$f_{pg}$	Permissible load factor
$F_y$	Applied force in the y direction [N]
$F_z$	Applied force in the z direction [N]
$M_x$	Applied moment about the x axis [Nm]
$M_y$	Applied moment about the y axis [Nm]
$M_z$	Applied moment about the z axis [Nm]

## Service life

### Service life calculation

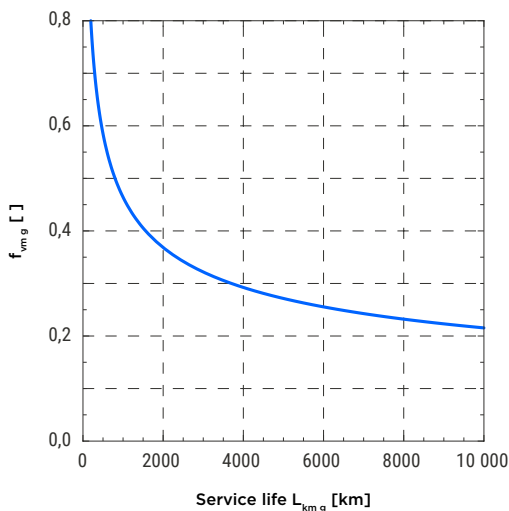
$$L_{km\ g} = \left( \frac{1}{f_{vm\ g}} \right)^3 \cdot 10^2$$

$L_{km\ g}$	Service life of the linear guiding system [km]
$f_{vm\ g}$	Mean load comparison factor

### Mean load comparison factor $f_{vm\ g}$ as a function of service life $L_{km\ g}$

Diagram represents the theoretically determined service life of the linear guiding system when the mean load comparison factor  $f_{vm\ g}$  is considered.

It should be noted that the application conditions may have a significant effect on the service life.



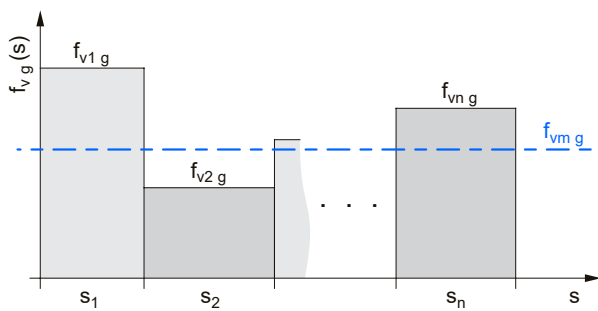


**Mean load comparison factor  $f_{vmg}$**

$$f_{vmg} = \sqrt[3]{\frac{f_{v1g}^3 \cdot s_1 + f_{v2g}^3 \cdot s_2 + \dots + f_{vng}^3 \cdot s_n}{s_1 + s_2 + \dots + s_n}}$$

$f_{vi g}$	i-th load comparison factor of a given loading regime $f_{v g}(s)$ , $i \in \{1, 2, \dots, n\}$
$s_i$	i-th travel path of a given loading regime $f_{v g}(s)$ , $i \in \{1, 2, \dots, n\}$

Loading regime  $f_{v g}(s)$



**Load comparison factor  $f_{v g}$**

$$f_{v g} = \frac{|F_y|}{C} + \frac{|F_z|}{C} + \frac{|M_x|}{M_{dyn x}} + \frac{|M_y|}{M_{dyn y}} + \frac{|M_z|}{M_{dyn z}}$$

$f_{v g}$	Load comparison factor
-----------	------------------------

**Mean dynamic safety factor  $f_{smg}$**

The safety factor depends on the application and its requested safety. A minimum dynamic safety factor of 5,0 or more is recommended.

$$f_{smg} = \frac{1}{f_{vmg}}$$

$f_{sm g}$	Mean dynamic safety factor
------------	----------------------------

# Ball screw drive

Valid for the mini electric cylinder MCE and the slider MSCE.

## Permissible load

### Permissible load factor $f_{p\ bs}$

A permissible load factor of the ball screw drive  $f_{p\ bs}$  must never exceed the value of 1.

$$f_{p\ bs} = \frac{|F_x|}{F_{pa}} \leq 1$$

$f_{p\ bs}$	Permissible load factor
$F_{pa}$	Max. permissible axial load [N]
$F_x$	Applied force in the x direction [N]

## Service life

### Service life calculation

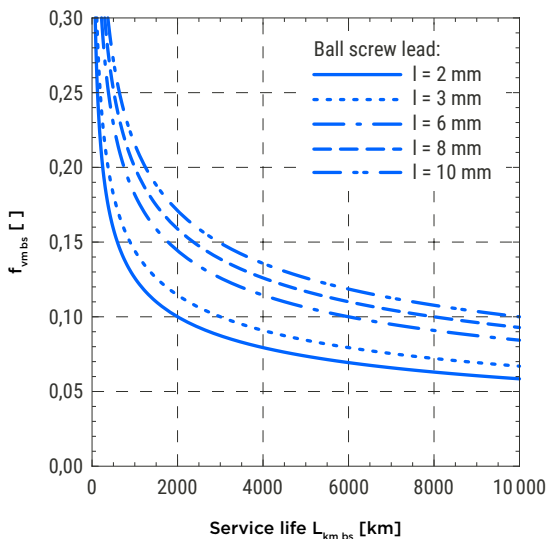
$$L_{km\ bs} = \left( \frac{1}{f_{vm\ bs}} \right)^3 \cdot l$$

$L_{km\ bs}$	Service life [km]
$f_{vm\ bs}$	Mean load comparison factor
$l$	Ball screw lead [mm]

### Mean load comparison factor $f_{vm\ bs}$ as a function of service life $L_{km\ bs}$

Diagram represents the theoretically determined service life of the ball screw drive when the mean load comparison factor  $f_{vm\ bs}$  is considered.

It should be noted that the application conditions may have a significant effect on the service life.

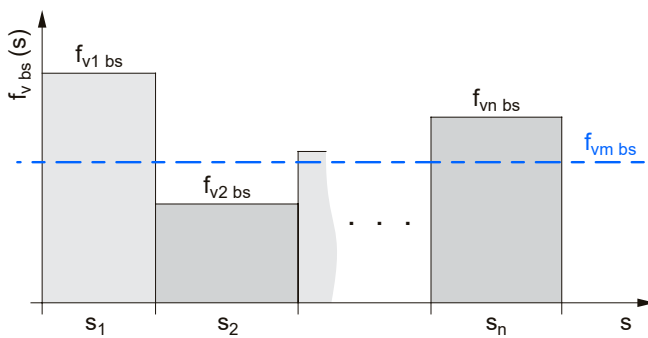


**Mean load comparison factor  $f_{vm\ bs}$**

$$f_{vm\ bs} = \sqrt[3]{\frac{f_{v1\ bs}^3 \cdot s_1 + f_{v2\ bs}^3 \cdot s_2 + \dots + f_{vn\ bs}^3 \cdot s_n}{s_1 + s_2 + \dots + s_n}}$$

$f_{vi\ bs}$	i-th load comparison factor of a given loading regime $f_{v\ bs}(s)$ , $i \in \{1, 2, \dots, n\}$
$s_i$	i-th travel path of a given loading regime $f_{v\ bs}(s)$ , $i \in \{1, 2, \dots, n\}$

Loading regime  $f_{v\ bs}(s)$



**Load comparison factor  $f_{v\ bs}$**

$$f_{v\ bs} = \frac{|F_x|}{C_a}$$

$f_{v\ bs}$	Load comparison factor
$C_a$	Dynamic axial load capacity [N]

**Mean dynamic safety factor  $f_{sm\ bs}$**

The safety factor depends on the application and its requested safety. A minimum dynamic safety factor of 5,0 or more is recommended.

$$f_{sm\ bs} = \frac{1}{f_{vm\ bs}}$$

$f_{sm\ bs}$	Mean dynamic safety factor
--------------	----------------------------

## Mini electric cylinder MCE

Service life of the mini electric cylinder is the calculated service life of the ball screw drive  $L_{km\ bs}$ .

$$L_{km} = L_{km\ bs}$$

 $L_{km}$ 

Service life of the mini electric cylinder or slider [km]

## Mini electric slider MSCE

Service life of the mini electric slider is the minimum value between the calculated service life of the linear guiding system  $L_{km\ g}$  and the ball screw drive  $L_{km\ bs}$ .

$$L_{km} = \text{Min} [L_{km\ g}, L_{km\ bs}]$$

 $L_{km}$ 

Service life of the mini electric cylinder or slider [km]

# Calculations

## Load torque

The load torque is a function of an applied axial load (force) to the mini electric cylinder or slider and can be calculated as follows:

$$M_{load} = \frac{F_x \cdot l}{2000 \cdot \pi \cdot \eta}$$

$M_{load}$	Load torque [Nm]
$F_x$	Applied axial force [N]
$l$	Ball screw lead [mm]
$\eta$	Mechanical efficiency $\approx 0,9$

It should be noted that the load torque  $M_{load}$  must never exceed the maximum drive torque  $M_p$  (or  $M_{p,MSD}$  if a motor side drive MSD is taken into consideration).

# MCE

MCE - 45 - 1003 - 150 - F - E20 - O - AB - AU - AA - AB - AA

**Series:**  
MCE

**Size:**  
- 25  
- 32  
- 45

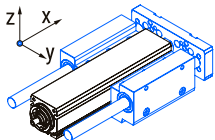
**Ball screw size:**  
- MCE 25:  $\varnothing 6 \times 2$ ,  $\varnothing 6 \times 6$   
- MCE 32:  $\varnothing 8 \times 2$ ,  $\varnothing 8 \times 8$   
- MCE 45:  $\varnothing 10 \times 3$ ,  $\varnothing 10 \times 10$

**Absolute stroke [mm]:**  
(Absolute stroke = Effective stroke + 2 × Safety stroke)  
- 25, 50, 75, 100, 125, 150, 175, 200

**Option 1:**  
- Leave blank: Standard (male thread)  
- F: Female thread

**Option 2:**  
- Leave blank: Without  
- Extended piston rod E [mm]  
(Max. extended piston rod: Emax = 100 mm)

**Guiding unit:**  
- O: Without a guiding unit  
- B: With a guiding unit GUC (ball bushes)



Guiding unit GUC requires a female thread on the piston rod end (Option 1 F).

**Motor type and size:**  
- Leave blank: Without a motor

**Motor type:** \_\_\_\_\_ **A** **B**  
- A: Stepper motor without a brake  
- B: Stepper motor with a brake

**Motor size □:** \_\_\_\_\_  
- A: 28 mm (Available soon)  
- B: 42 mm  
- C: 56 mm

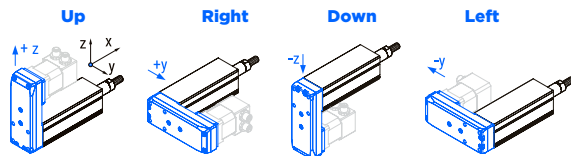
**Available sizes:**  
- MSCE 25: 28  
- MSCE 32: 28, 42  
- MSCE 45: 42, 56

**Motor mounting option:**

- Leave blank: Without a motor

**Mounting option:**

- A: With a motor adapter VK
- B: With a motor side drive MSD facing up
- C: With a motor side drive MSD facing right
- D: With a motor side drive MSD facing down
- E: With a motor side drive MSD facing left

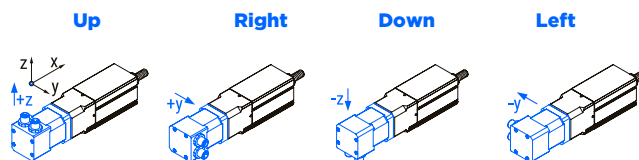


**Direction of the motor connectors:**

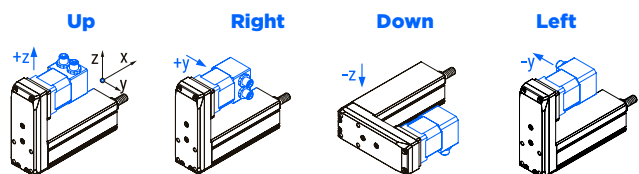
- U: Connectors facing up
- R: Connectors facing right
- D: Connectors facing down
- L: Connectors facing left

If a guiding unit GUC is considered, the motor side drive MSD can only be facing in the up or down directions, otherwise, the motor and the guiding unit may collide!

**In combination with a motor adapter VK**



**In combination with a motor side drive MSD**



When using the motor side drive MSD, the connectors can not be facing the MCE otherwise, the connectors and MCE may collide. These combinations are: BD, CL, DU and ER.

**Drive option:**

- Leave blank: Without a motor or drive

**Drive type:**

- A: Stepper

**Drive protocol/control:**

- A: EtherCAT
- B: Ethernet based communication
- C: Pulse-direction control

**Drive-motor cables option:**

- Leave blank: Without a motor or drive
- 00: Without the cables

**Cables type:**

- A: Robotic with a straight plug
- B: Robotic with an angled plug

**Cables length:**

- A: 3 m
- B: 5 m
- C: 10 m

**Power and signal cables:**

- Leave blank: Without a motor or drive

**Power cable:**

- 0: Without a power cable
- A: With a power cable

**Signal cable:**

- 0: Without a signal cable
- A: With a signal cable

# MSCE

MSCE - 45 - 1003 - 150 - AB - AU - AA - AB - AA

**Series:**  
MSCE

**Size:**  
- 25  
- 32  
- 45

**Ball screw size:**  
- MSCE 25:  $\varnothing 6 \times 2$ ,  $\varnothing 6 \times 6$   
- MSCE 32:  $\varnothing 8 \times 2$ ,  $\varnothing 8 \times 8$   
- MSCE 45:  $\varnothing 10 \times 3$ ,  $\varnothing 10 \times 10$

**Absolute stroke [mm]:**  
(Absolute stroke = Effective stroke + 2 × Safety stroke)  
- 25, 50, 75, 100, 125, 150, 175, 200

**Motor type and size:**  
- Leave blank: Without a motor

**Motor type:** \_\_\_\_\_ **A** **B**  
- A: Stepper motor without a brake  
- B: Stepper motor with a brake

**Motor size □:** \_\_\_\_\_  
- A: 28 mm (Available soon)  
- B: 42 mm  
- C: 56 mm

**Available sizes:**  
- MSCE 25: 28  
- MSCE 32: 28, 42  
- MSCE 45: 42, 56

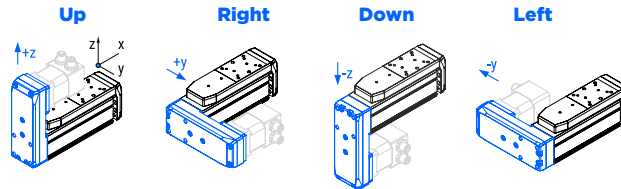


**Motor mounting option:**

- Leave blank: Without a motor

**Mounting option:**

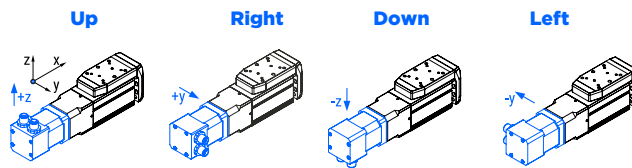
- A: With a motor adapter VK
- B: With a motor side drive MSD facing up
- C: With a motor side drive MSD facing right
- D: With a motor side drive MSD facing down
- E: With a motor side drive MSD facing left



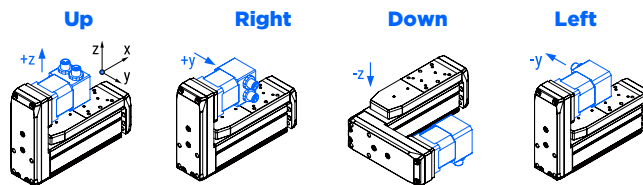
**Direction of the motor connectors:**

- U: Connectors facing up
- R: Connectors facing right
- D: Connectors facing down
- L: Connectors facing left

**In combination with a motor adapter VK**



**In combination with a motor side drive MSD**



When using the motor side drive MSD, the connectors can not be facing the MCE otherwise, the connectors and MCE may collide. These combinations are: BD, CL, DU and ER.

**Drive option:**

- Leave blank: Without a motor or drive

**Drive type:**

- A: Stepper

**Drive protocol/control:**

- A: EtherCAT
- B: Ethernet based communication
- C: Pulse-direction control

**Drive-motor cables option:**

- Leave blank: Without a motor or drive  
- 00: Without the cables

**Cables type:**

- A: Robotic with a straight plug
- B: Robotic with an angled plug

**Cables length:**

- A: 3 m
- B: 5 m
- C: 10 m

**Power and signal cables:**

- Leave blank: Without a motor or drive

**Power cable:**

- 0: Without a power cable
- A: With a power cable

**Signal cable:**

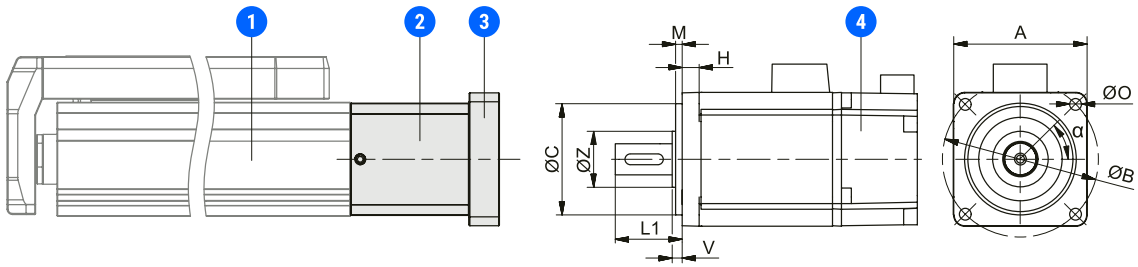
- 0: Without a signal cable
- A: With a signal cable

# Motor Adapter VK

VK - MG 32 - 42,3 - 43,8 - 22 - 2 - 24 - 4,5 - M3 - 0 - 0 - 45

Motor adapter	A	ØB	ØC	M	L1	H	ØO	V	ØZ	α
Mini series: - MG										[°]
Size: - 25 - 32 - 45	Motor dimensions [mm]									

Dimension ØO is also used for tapped holes. In case of tapped holes, prefix M must be applied.



- 1 - MCE/MSCE
  - 2 - Motor adapter housing
  - 3 - Motor adapter flange
  - 4 - Motor
- } Motor adapter VK

# Motor side drive MSD with a timing belt

MSD - MG 32 - T2 - 42,3 - 43,8 - 22 - 2 - 24 - 5 - 4,5 - M3 - 0 - 0 - 45

Motor side drive

Mini series:

- MG

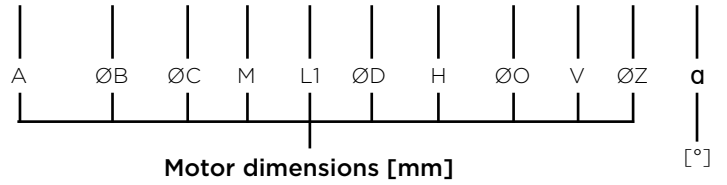
Size:

- 25

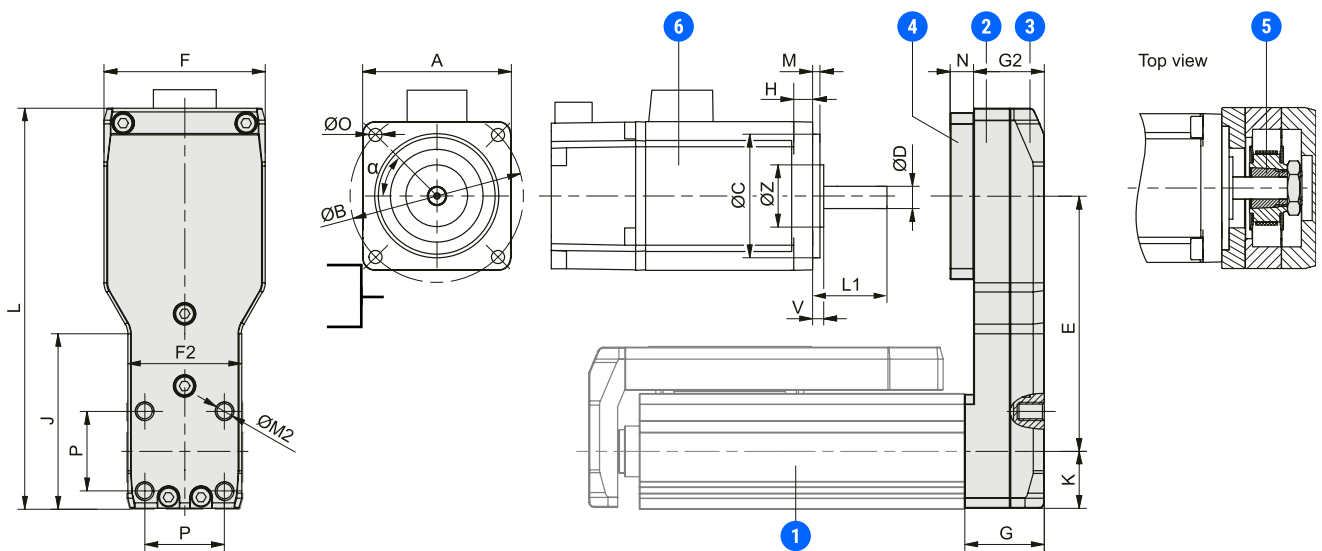
- 32

- 45

Type



Dimension ØO is also used for tapped holes. In case of tapped holes, prefix M must be applied.



1 - MCE/MSCE

2 - Motor side drive housing

3 - Motor side drive cap

4 - Motor side drive tensioning plate

5 - Clamping set

6 - Motor

Motor side drive MSD

# Guiding Unit

	GUC	- 32	- 125	- BB
<b>Guiding unit</b>				
<b>Size:</b> - 25 - 32 - 45				
<b>GUC stroke: absolute stroke + extendend piston rod E [mm]</b>				
<b>Option:</b> - BB: with the ball bushes				

GUC stroke: absolute stroke + extended piston rod E = max. 300 mm.  
For the guiding unit stroke over 300 mm, please contact us.

# Couplings

COUPLING - EKL5 - A - F5 - F6PFN

**Coupling**

**Coupling type/size:**

- 2
- 5

**Elastomer insert type:**

- A

**Hole diameter**

[mm]

**Option:**

- PFN: with the keyway
- Leave blank: without the keyway

**ALWAYS THE RIGHT  
SOLUTION AT THE RIGHT TIME.**

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