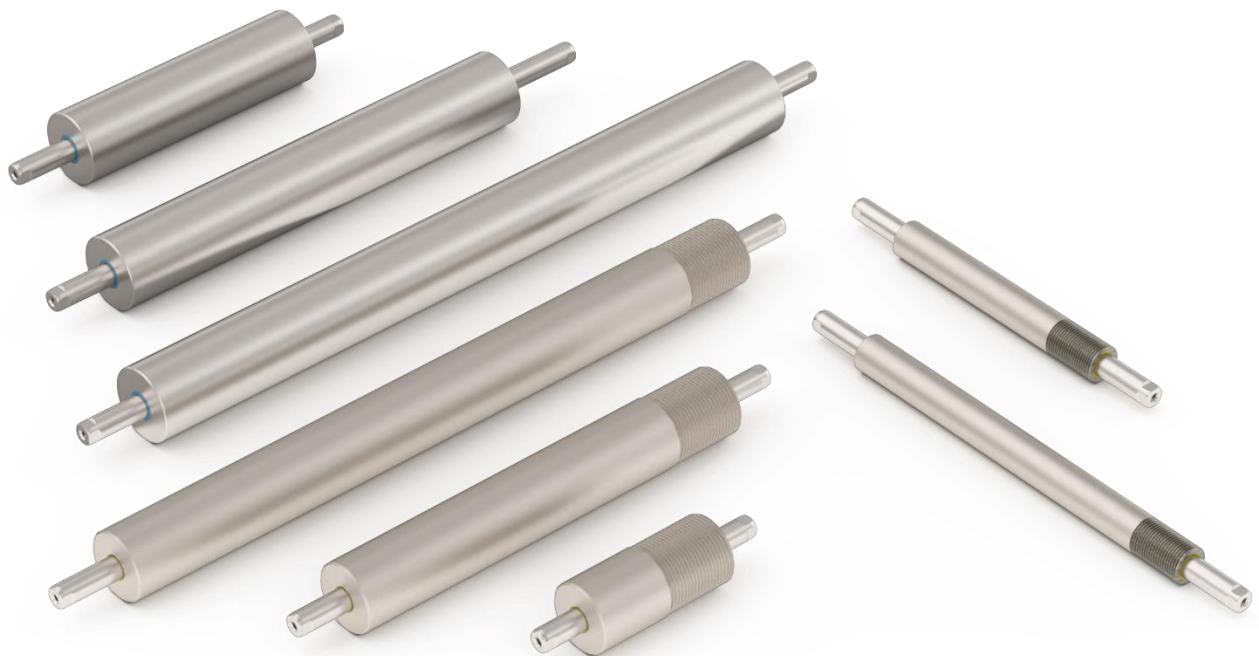


# Installation Guide MagSpring MS01

ENG



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# 1 General Information

## 1.1 Introduction

This manual describes the assembly, installation, maintenance, transport and storage of MagSpring products.

The document is intended for electricians, fitters, service technicians and storage personnel. Read this manual before handling the product and observe the general safety instructions and those in the relevant section at all times.

Keep these operating instructions accessible and make them available to the authorised personnel.

## 1.2 Explanation of symbols



Triangular warning signs warn of a hazard.



The round commandment sign is used to prescribe certain behaviour.

## 1.3 Qualified Personnel

All work such as installation, commissioning, operation and service of the product may only be carried out by qualified personnel.

The personnel must have the required qualification for the corresponding activity and be familiar with the installation, commissioning, operation and service of the product. For this purpose, the manual and especially the safety instructions must be carefully read, understood and observed.

## 1.4 Liability

NTI AG (as manufacturer of LinMot and MagSpring products) excludes any liability for itself and its employees for damages and expenses caused by incorrect use of the products. This also applies to incorrect applications caused by NTI AG's own information and instructions, for example in the course of sales, support or application activities. It is the responsibility of the user to check the information and instructions provided by NTI AG for their safety-related correct applicability. Furthermore, the entire responsibility for the safety-related correct product functionality lies exclusively with the user. Likewise, any warranty claim is void when used or in combination with third-party products such as stators, sliders, servo drives and cables. With your purchase, you confirm that you have read and understood the warnings listed in the assembly instructions.

Please also refer to our General Terms and Conditions.

## 1.5 Copyright

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LinMot® and MagSpring® are registered trademarks of NTI AG.

## 2 Safety Instructions



### Bruises

Sliders are made of neodymium magnets and have a strong attractive force. If handled carelessly, you can pinch your fingers or skin between two sliders. This can lead to bruises, haematomas and even broken bones in the affected areas. Wear thick protective gloves when handling runners and keep a minimum distance between sliders. Information on the minimum distance can be found in the section "Minimum distances to the sliders".

To reduce the risk of injury, never hold or transport more than one slider without packaging by the same person.



### Pacemaker / Implanted Defibrillator

Sliders can affect the function of pacemakers and implanted defibrillators. For the duration of too strong an approach to a magnetic field, these devices switch into a test mode and do not function properly.

- As a wearer of one of these devices, keep the following minimum distances between the pacemaker or defibrillator and the slider:
  - Min. 250 mm for MagSpring slider (ML01-12)
  - Min. 100 mm for MagSpring stators (MS01-37 and MS01-40-SSC)
- Inform wearers of such devices about compliance with the minimum distances!



### Moving machine elements

The MagSpring products are highly dynamic machine elements. All necessary precautions must be taken to exclude the approach of persons in the area of the moving elements during operation by means of covers, shuttering, etc.



### Automatic restart

MagSpring products can start automatically in certain configurations! If necessary, a corresponding warning symbol must be attached and protection against entering the danger zone or a suitable, safe electronic shutdown must be provided!



### Risk of injury due to a defect or fault

For those areas where a defect or fault could result in significant property damage or even serious bodily injury, additional external precautions must be taken or devices installed to ensure safe operation even if a defect or fault occurs (e.g. suitable, safe electronic shutdown, mechanical interlocks, barriers, etc.).



### Magnetic field

The magnets built into the slider generate a strong magnetic field. Among other things, they can damage televisions, laptops, computer hard drives, credit cards and EC cards, data carriers, mechanical watches, hearing aids and loudspeakers.

- Keep magnets away from all devices and objects that can be damaged by strong magnetic fields.
- Maintain a minimum distance for the above objects as indicated in the section "Pacemaker / Implanted Defibrillator".
- For non-anti-magnetic clocks, double the minimum distance applies.



### Flammability

When mechanically machining neodymium magnets, the drilling dust can easily ignite. It is not permitted to work on runners and the magnets they contain.

**Grounding**

All touchable metal parts that may be live during operation or maintenance must be connected to protective earth.

**Mechanical processing**

Neodymium magnets are brittle and sensitive to heat.

Mechanical processing of sliders and the magnets they contain is not permitted.

- When two magnets collide, they can shatter. Sharp-edged splinters can be thrown for metres and injure your eyes.
- Machining the slider would generate heat that demagnetises the magnets.

**Slider and stator**

Sliders consist of a high-precision, thin-walled stainless steel tube, stators of coated iron. As the permanent magnets may be present in both components, MagSpring sliders and stators should be handled with care. Avoid contact with other sliders, stators or iron parts as this may damage the magnets and the surface. Do not grip sliders and stators with pliers, as this can also damage the surface. Sliders with already damaged surfaces (scratches, deformations, etc.) should not be used further (this can damage the stator).

**Effect on humans**

According to current knowledge, magnetic fields from permanent magnets have no measurable positive or negative effect on humans. A health hazard from the magnetic field of a permanent magnet is unlikely, but cannot be completely ruled out.

- For your safety, avoid permanent contact with the magnets.
- Keep large magnets at least one metre away from your body.

**Temperature resistance**

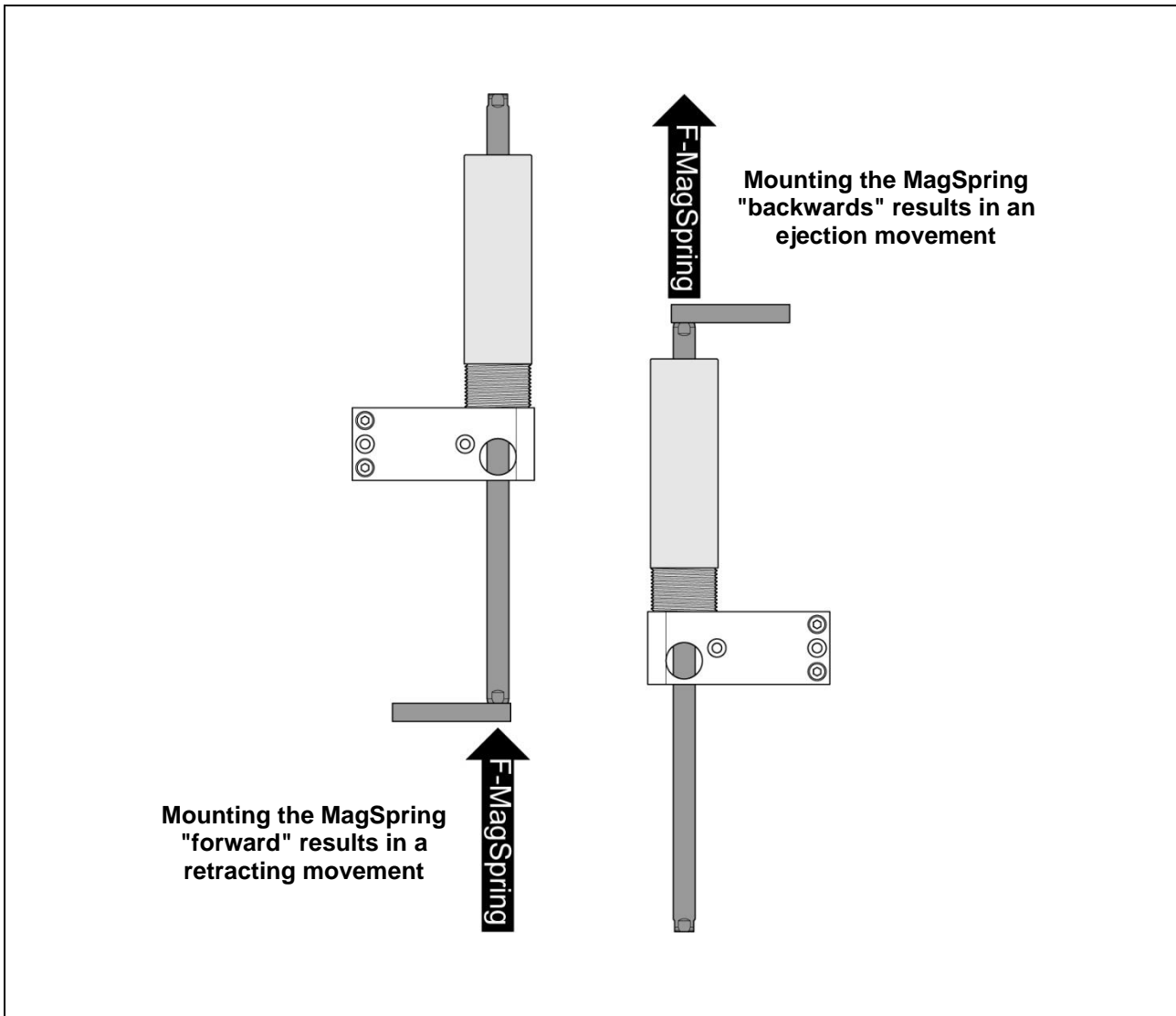
Keep the sliders away from open flame and heat.

At temperatures above 80°C the slider is demagnetised.

### 3 Intended Use

#### 3.1 Functional principle of the MagSpring® magnetic springs

The mode of operation is based on the attractive force of permanent magnets. Accordingly, no energy supply (electricity, compressed air, etc.) is necessary. Depending on the strength class of the MagSpring, the permanent magnets are located in the slider and partly in the stator. The slider is supported by an integrated sliding guide so that the MagSpring can be used in a similar way to gas springs.



#### 3.2 General fields of application of MagSpring® magnetic springs

The MagSpring magnetic springs have the following functions (e.g. together with H-guides):

- Relief of the linear motors from constant forces, especially in vertical arrangements, which means that linear motors can be dimensioned smaller.
- Restoring force against a defined rest position when the machine is switched off or in the event of a power interruption.
- Efficient element for load compensation in vertical applications, without the need for compressed air or energy through electricity.
- Application of a basic force (working point force) in the resting position.

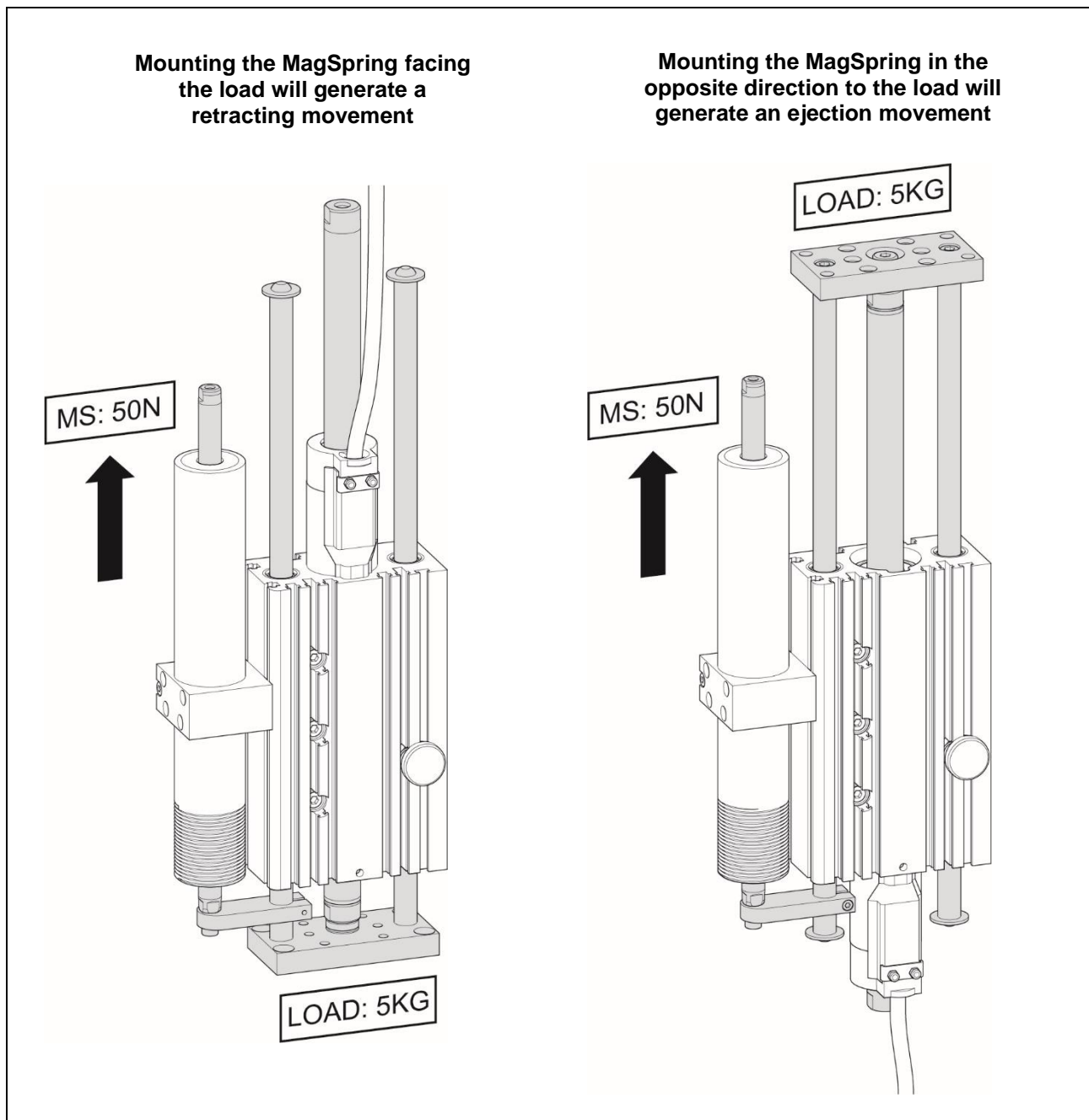
### 3.3 Mounting options depending on functional requirements

Depending on the assembly (see following picture), the direction of movement can be adjusted according to the requirements. The position of the MagSpring on the guide unit depends on the desired stroke range.

#### 3.3.1 MagSpring Stators MS01-20 und MS01-37



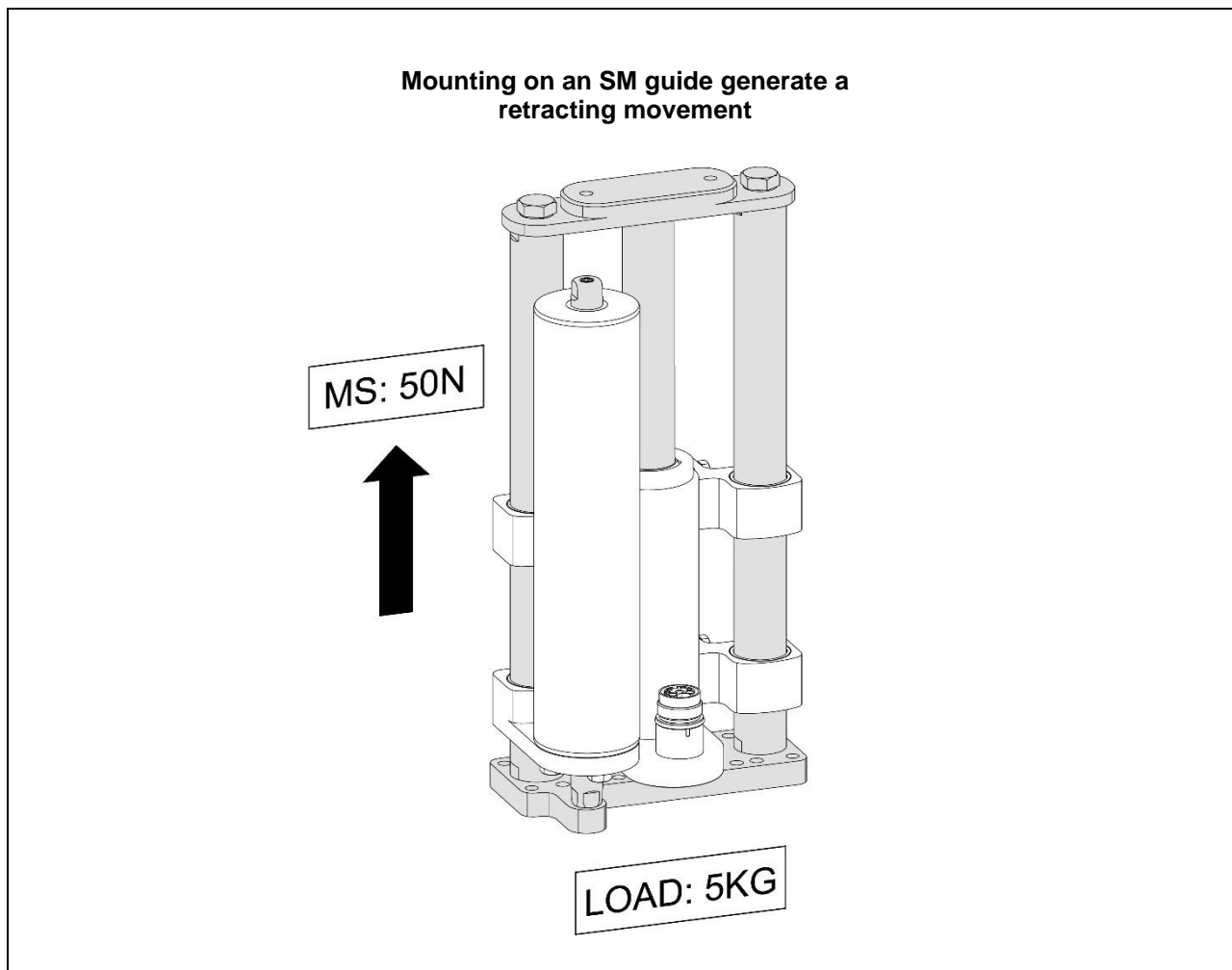
For MagSpring MS01-20 and MS01-37 stators, special attention must be paid to the parallel alignment of the MagSpring in relation to the linear unit.





### 3.3.2 MagSpring Stators MS01-40 SSC

With factory-fitted MagSpring stators of the MS01-40 SSC series, the MagSpring is always oriented towards the load. The result is a retraction movement of the moving part.



## 4 Installation Instructions

### 4.1 Operating conditions



The application temperature range of the MagSpring is from -20°C to 80°C. The constant force decreases slightly with increasing temperature or increases slightly with decreasing temperature. The temperature coefficient is -0.0022/°C

### 4.2 Important notes MagSpring stator and slider



- MagSpring stators and sliders may not be combined arbitrarily. The constant force can be varied by selecting the strength class of the MagSpring slider.
- A doubling of force may only be achieved by mounting two MagSprings in parallel. A serial arrangement (i.e. one slider with two stators) is not possible.
- The stroke cannot be increased. For longer strokes, a longer MagSpring stator-slider combination must be used. Please note that only sliders of the correct length (see dimensions in chapter 7) can be used for all stators.

### 4.3 Installation of Stroke-Extended (SE) and Force-Extended (FE) MagSprings



- The sliders of the Stroke-Extended and Force-Extended MagSprings must be mounted so that they cannot twist. If the slider is not mounted at the correct angle, constant force is not guaranteed.
- With Stroke-Extended (SE) MagSprings, the force in the second half of the stroke may vary slightly from the force in the first half of the stroke and they may have a slight drop in force in the middle of the stroke.
- It is strongly recommended that a mechanical stroke limiter be fitted to the Force-Extended range of sliders, as the force will be reversed if the stroke limit is exceeded.



- If the slider's anti-twist device becomes loose, this can cause a sudden reversal of force.
- With Force-Extended Series MagSprings, exceeding the maximum stroke can result in an abrupt reversal of force.

### 4.4 Material data

MagSpring MS01-20 and MS01-37

Component	Material
Stator	Iron, chemical nickel plated
Slider	Stainless steel 1.4301
Plain bearing	POM-based

MagSpring MS01-40-SSC

Component	Material
Stator	Stainless steel 1.4404
Slider	Stainless steel 1.4301
Plain bearing	PPS-based, food grade

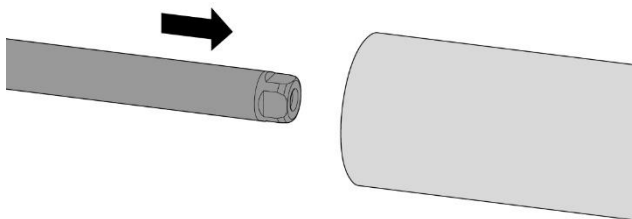
## 4.5 Inserting the slider into the stator



- Be sure to observe the safety instructions in chapter 2 during assembly!
- No lateral force on the slider during assembly or operation!



Attention! During insertion the slider is pulled into the stator with great force and shoots out of the stator on both sides.



1. The force class and serial number are lasered on the two-edged end of the slider:

E.g.: 2301.2304308.022-20 stands for serial number 2301.2304308 and force class 20.

The end of the slider with the lasered lettering is on the side facing away from the load.

2. Clean the slider with a paper towel.
3. Grease the slider according to the lubrication instructions (see chapter 5.2).
4. Insert the slider with the square end exactly in the longitudinal direction into the stator. Here, observe the above note.

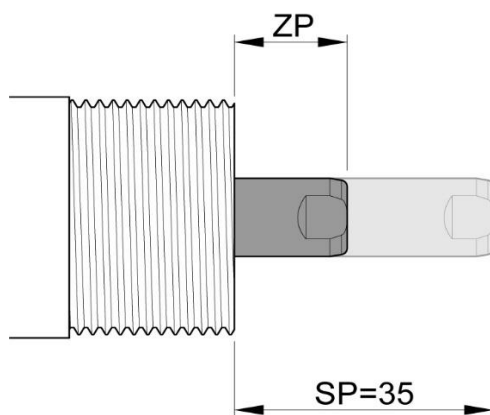


After installing the slider, the warning sticker "Attention Magnets" must be placed on the machine near the MagSpring.

## 4.6 Zero position of the slider and start position of the constant force



During installation, note that the constant force range of the MagSpring begins at a distance of 35 mm (1.38 in) from the end of the slider to the end of the stator.

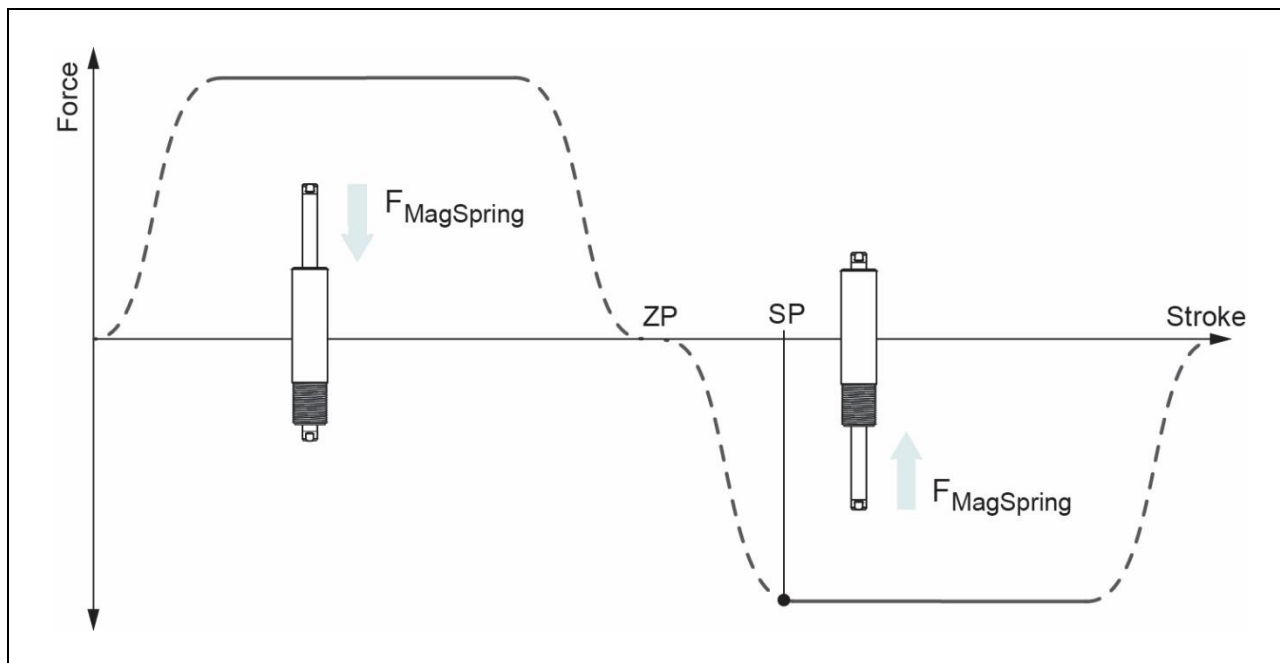


In the relaxed state, the slider is approximately in the centre of the stator, with the square working end, to which the load is to be attached, protruding slightly less from the stator. This is the **Zero Position (ZP)** of the slider.

Starting from this resting position, the restoring force increases to the nominal value when the slider is pulled out of the stator. At a distance of 35 mm from the end of the stator is the **Starting Position of the constant force (SP)**.

The following figure illustrates the entire movement process of the MagSpring:

- The **zero position (ZP)** is the point at which the slider is in stable equilibrium.
- The **knitting lines** show the areas of increasing or decreasing restoring force.
- The **constant force start position (SP)** indicates the start of the constant force range (measured 35 mm (1.38 in) from the four-edged working end of the slider to the end of the stator).



## 4.7 Mounting the Stator

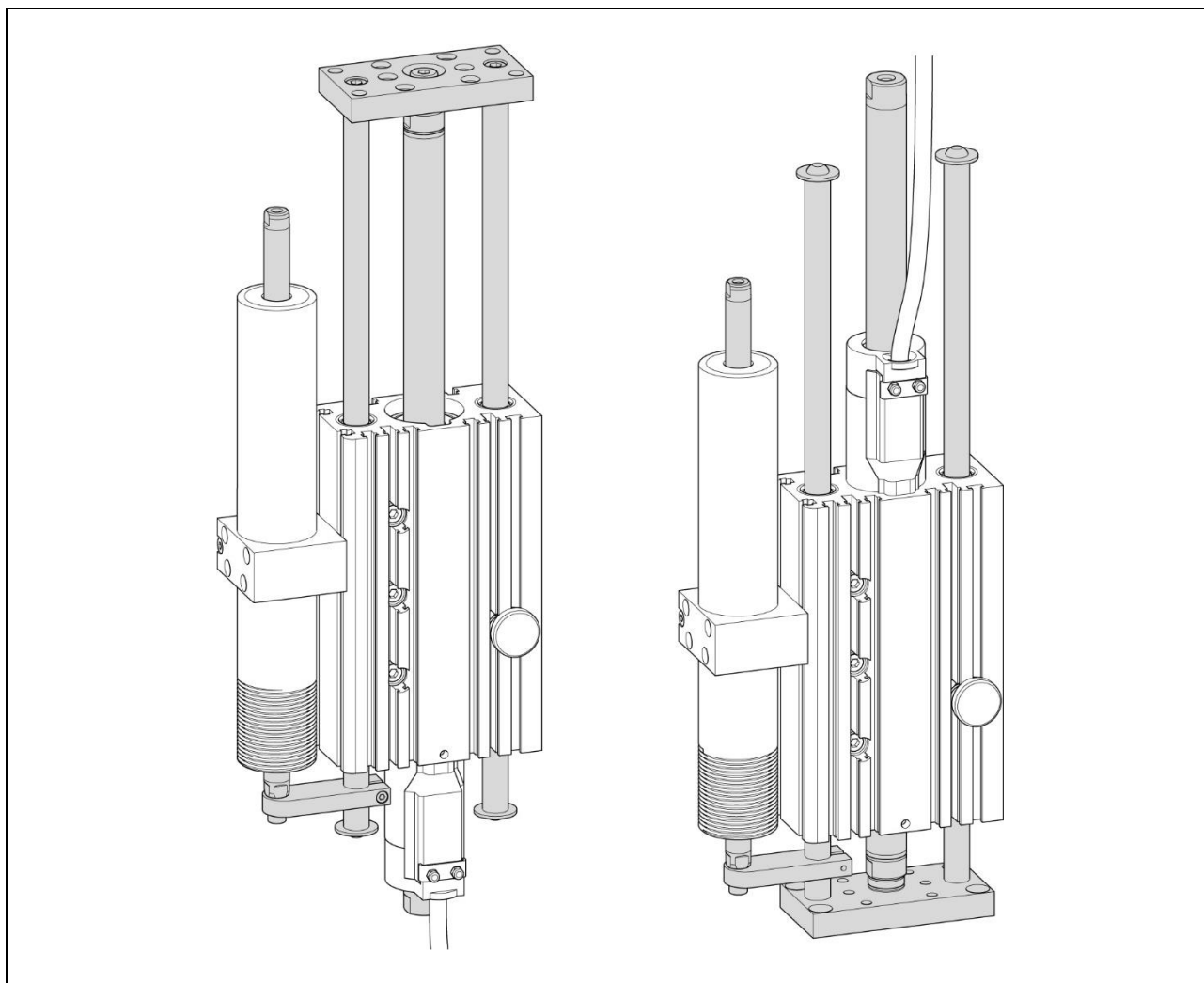
### 4.7.1 MagSpring MS01-20 and MS01-37

The MagSpring stators MS01-20 und MS01-37 can be mounted via a clamp. Suitable mounting flanges are available for both sizes.



The stator must not be deformed by the clamping!

#### Correct assembly of the flange and stator



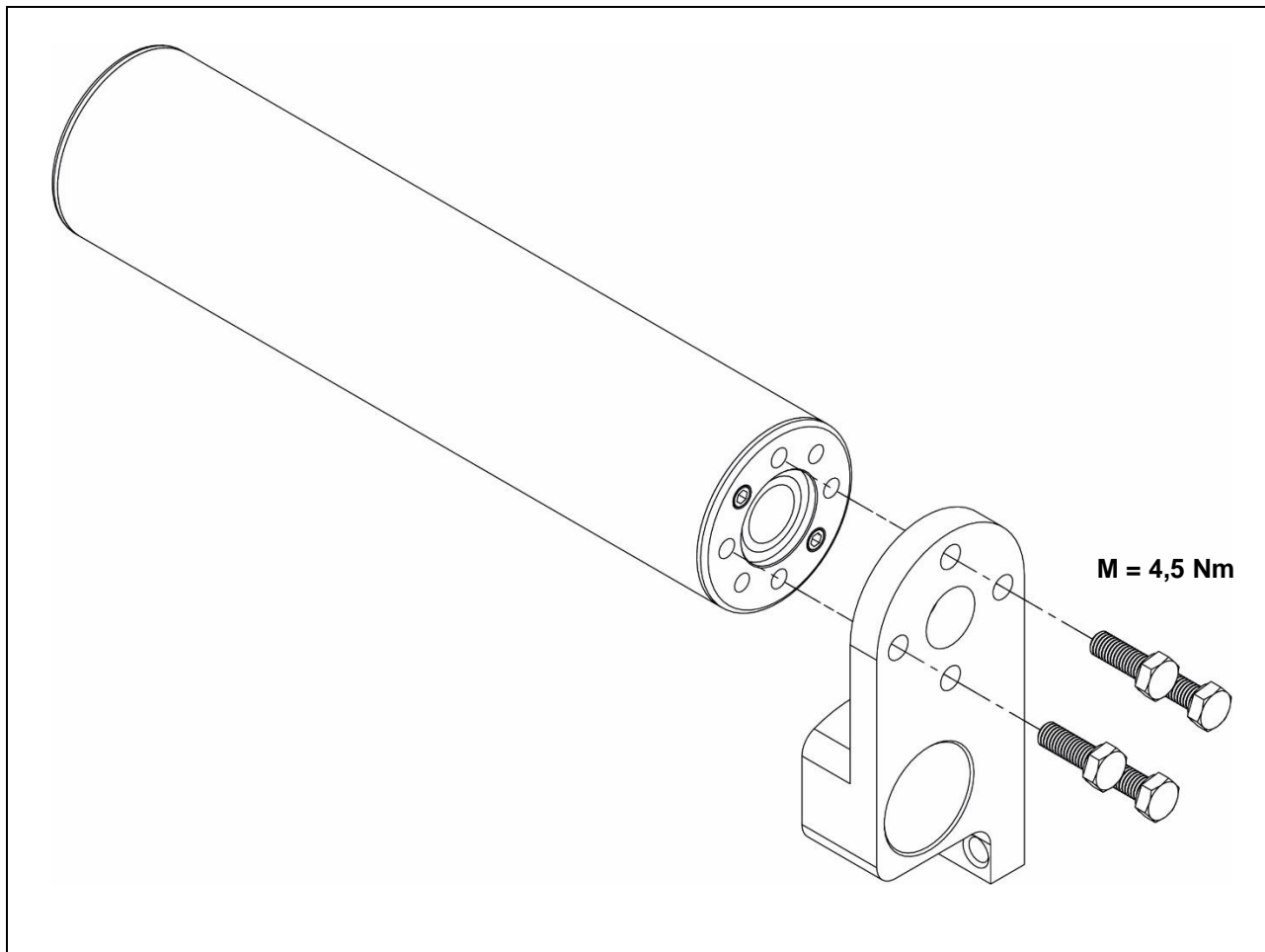
#### 4.7.2 MagSpring MS01-40-SSC

The MagSpring MS01-40-SSC stators are mounted on the front with a suitable mounting flange over all lengths. This provides a form-fit mounting option.



Note the tightening torque of the screws:  $M = 4.5 \text{ Nm}$ .

#### Correct assembly of the stator



## 4.8 Mounting the slider

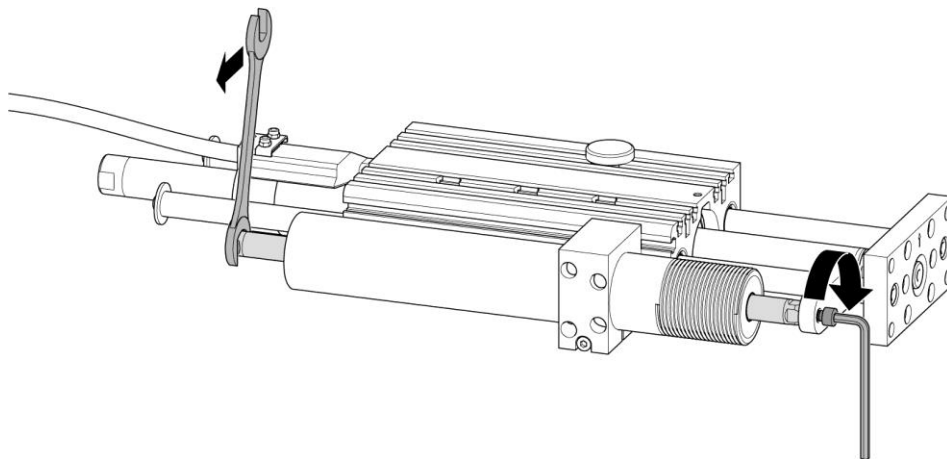
The assembly of the load mass by means of the M5 thread has to be done in such a way that only the end piece of the slider facing the load mass is held with a suitable open-end spanner no.10 (Attention: magnetic attraction!). Under no circumstances may the sensitive slider tube be used as a clamping piece.



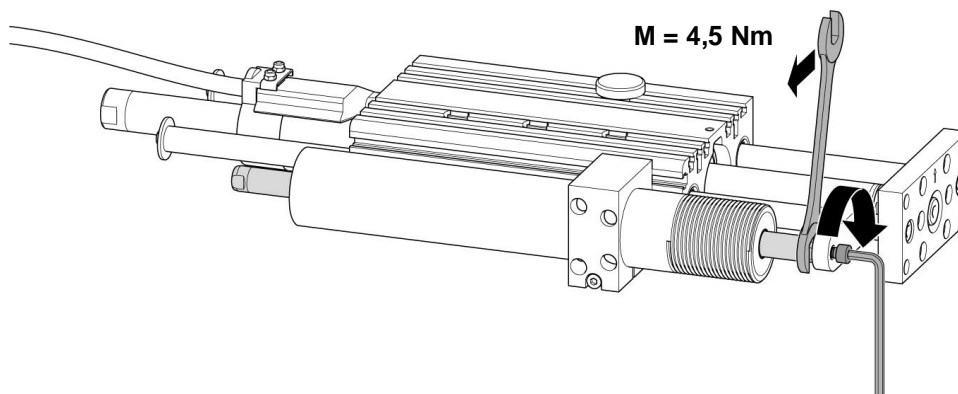
The load must be supported by a linear guide to prevent lateral forces on the slider and wear on the stator and slider.



- When mounting the load, the open-end spanner may only be used to tighten the screw on the side of the slider facing the load (see following illustrations).
- The tightening torque for the M5 screw on the slider is 4.5 Nm.



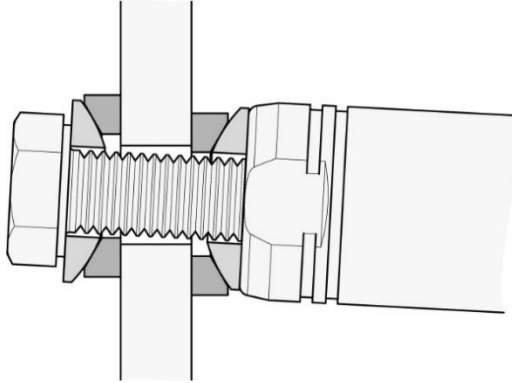
**Incorrect  
assembly**



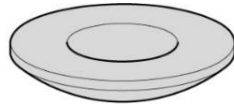
**Correct  
assembly**

### 4.9 Compensation of angular misalignment by spherical washers and conical seats

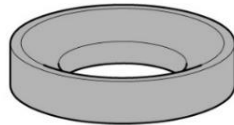
When coupling the slider, a fixed bearing set consisting of two pairs of spherical washers and conical seats should be used to compensate for any angular misalignment. The adjustment of the x- and y- direction is done via an appropriately sized hole for the fixing screw.



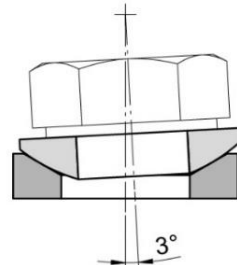
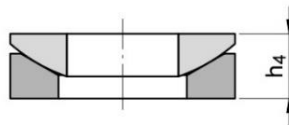
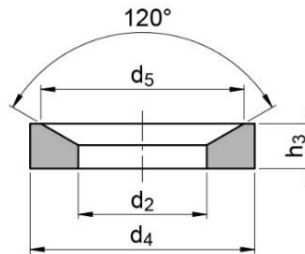
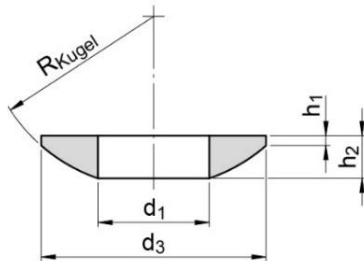
**Function:** The fixed bearing set is used to compensate for misalignment of the MagSpring slider.



Spherical washer DIN 6319 form C



Conical seat DIN 6319 D



Screw	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	h <sub>4</sub>
<b>M5</b>	5.2 mm (0.20 in)	6.0 mm (0.24 in)	10.5 mm (0.41 in)	10.5 mm (0.41 in)	9.5 mm (0.37 in)	0.5 mm (0.02 in)	2.0 mm (0.08 in)	2.1 mm (0.08 in)	3.2 mm (0.13 in)



#### 4.9.1 Ordering information for fixed bearing set

The fixed bearing set, consisting of two pairs of spherical washers and conical seats, is available in two versions.

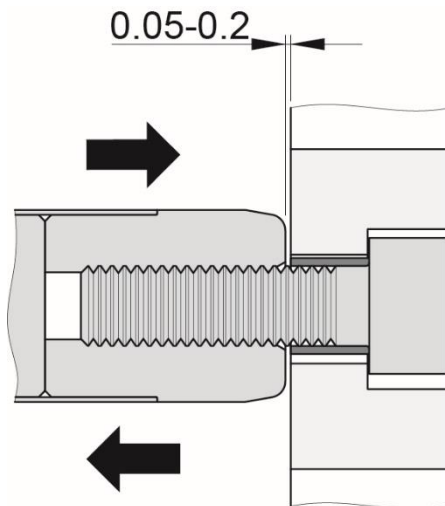
Article	Material	Slider	Thread	d1	d2	d3	h	Item no.
PLF01-12	Case hardened steel	12 mm (0.47 in)	M5	5.2 mm (0.20 in)	6.0 mm (0.24 in)	10.5 mm (0.41 in)	3.2 mm (0.13 in)	<a href="#">0150-3085</a>
PLF01-12-Ni	Steel nickel plated	12 mm (0.47 in)	M5	5.2 mm (0.20 in)	6.0 mm (0.24 in)	10.5 mm (0.41 in)	3.2 mm (0.13 in)	<a href="#">0150-3573</a>

#### 4.10 Compensation of movements in longitudinal direction through clearance ring

The clearance ring enables movement in the longitudinal direction.



No separate sale. The ring is offered and delivered with the modules.



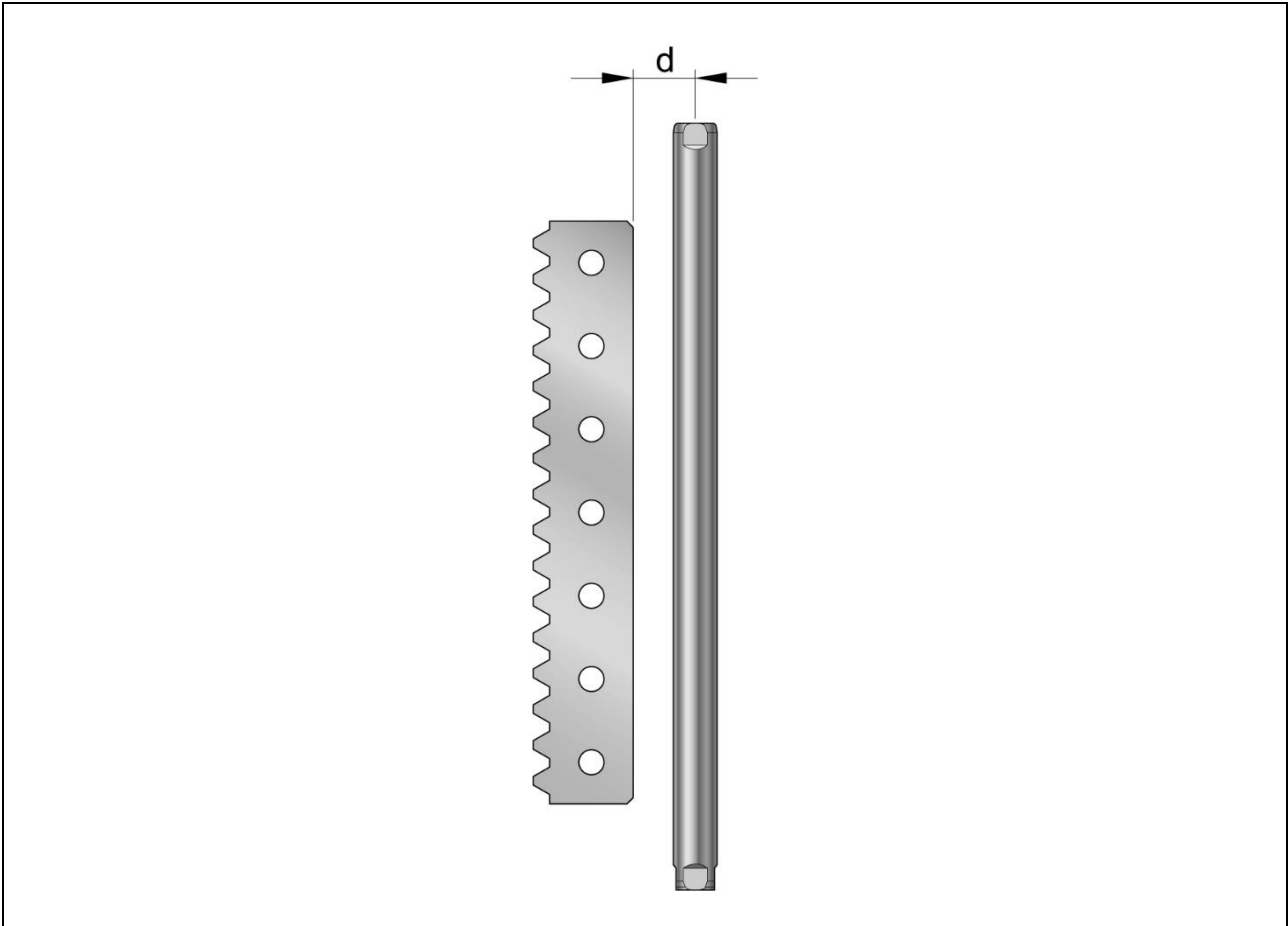
**Function:** The clearance ring allows for minimal movement (0.05 - 0.2 mm) along the longitudinal axis between the MagSpring and the corresponding guide.

## 4.11 Minimum distances for MagSpring sliders



In order to prevent undesirable and dangerous force developments, minimum distances between MagSpring sliders and other magnetic components must be taken into account in the design. The latter include permanent magnetic parts, such as other MagSpring sliders and LinMot sliders or ferromagnetic elements made of iron or steel.

### 4.11.1 Minimum distances to ferromagnetic parts

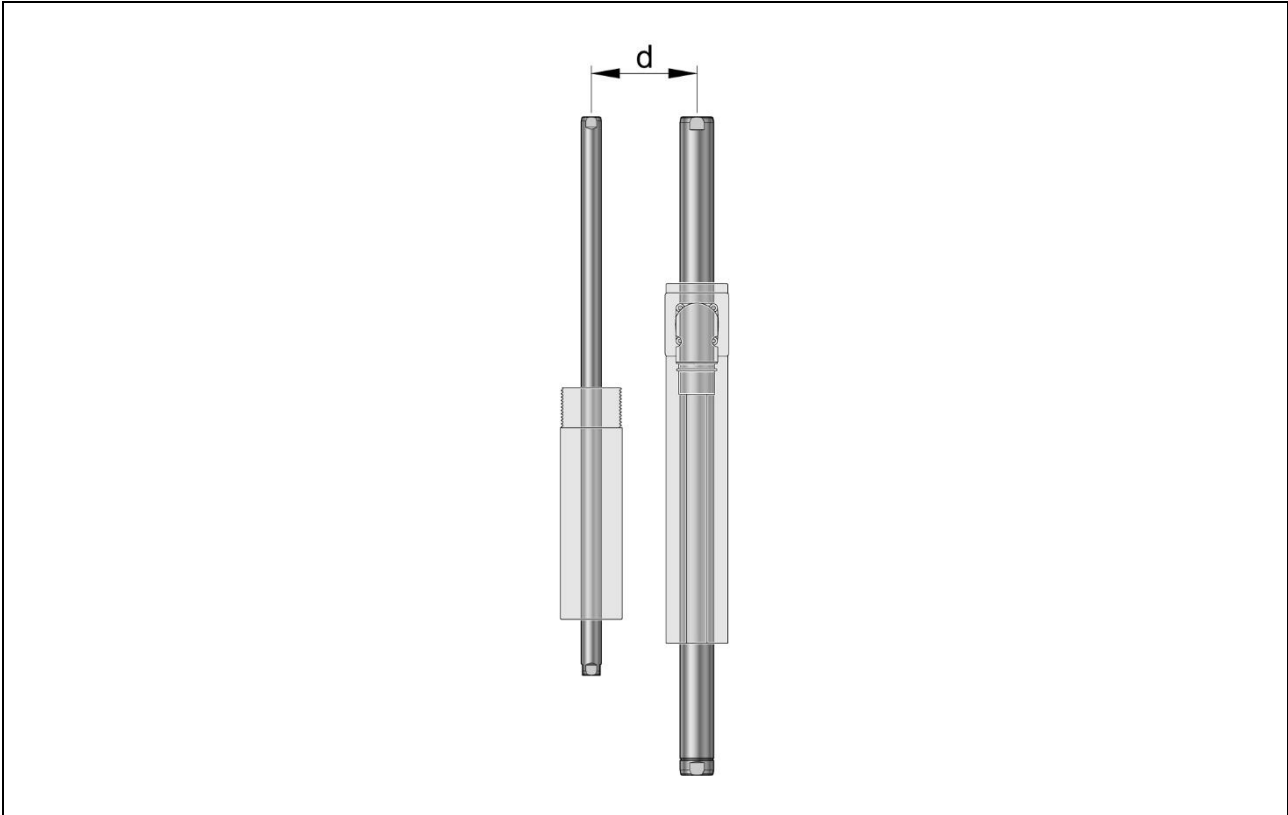


Minimum distance “d” from the MagSpring axis to ferromagnetic parts

MagSpring slider type	... -10	... -15	... -20
ML01-12x130/80...	20 mm (0.79 in)	23 mm (0.90 in)	26 mm (1.02 in)
ML01-12x210/160...	26 mm (1.06 in)	30 mm (1.18 in)	33 mm (1.30 in)
ML01-12x290/240...	30 mm (1.18 in)	34 mm (1.34 in)	36 mm (1.42 in)
ML01-12x370/320...	32 mm (1.26 in)	37 mm (1.46 in)	40 mm (1.57 in)

#### 4.11.2 Minimum distances to LinMot motors

A minimum distance must also be taken into account between MagSpring sliders and LinMot motors. Forces can arise both between the two sliders and between the MagSpring slider and LinMot stator.

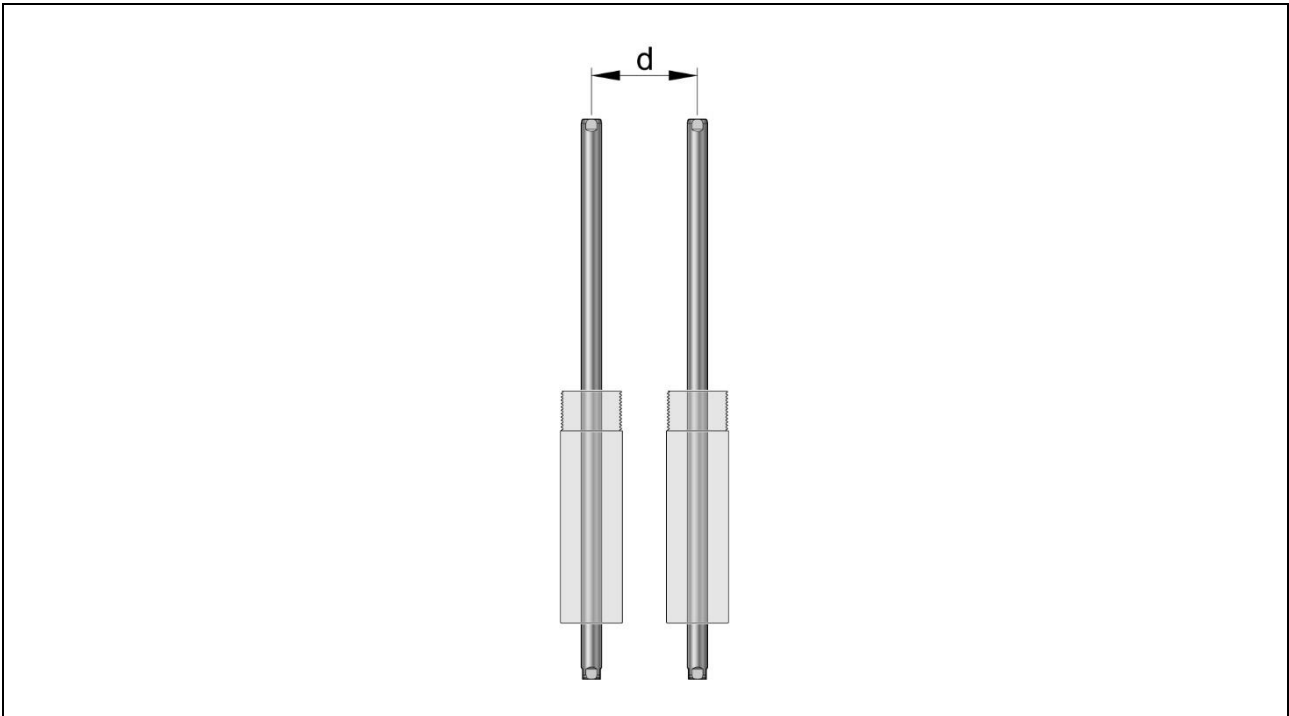


Minimum distance “d” from the MagSpring axis to the axis of the LinMot linear motor

LinMot linear motor family	d
P01-23	45 mm (1.77 in)
P01-37	50 mm (1.97 in)
P01-48	60 mm (2.36 in)
P01-54	65 mm (2.56 in)
P01-70	75 mm (2.95 in)

### 4.11.3 Minimum distances to MagSprings

Minimum distances must also be maintained between a MagSpring slider and other MagSprings.



Minimum distance “d” between two MagSpring axes

MagSpring slider type	... -10	... -15	... -20
ML01-12x130/80...	40 mm (1.57 in)	46 mm (1.81 in)	52 mm (2.05 in)
ML01-12x210/160...	52 mm (2.05 in)	60 mm (2.36 in)	66 mm (2.60 in)
ML01-12x290/240...	60 mm (2.36 in)	68 mm (2.68 in)	72 mm (2.83 in)
ML01-12x370/320...	64 mm (2.52 in)	74 mm (2.91 in)	80 mm (3.15 in)

## 5 Maintenance and Inspection Instructions

### 5.1 Maintenance intervals of MagSpring products



The stators are provided with initial lubrication at the factory. Maintenance is only necessary if the MagSprings **run dry** or are **heavily soiled**.

The following maintenance schedule assumes a 5-day week with a daily operating time of 8 hours. Central European industrial conditions are assumed. In the case of deviating requirements, such as heavy and permanent soiling, direct sunlight, operation outdoors, low humidity, increased operating temperature, etc., the maintenance schedule must be shortened until application-specific empirical values are available.

#### Maintenance plan for standard applications

	Less than 120 strokes/min	120 to 360 strokes/min	Over 360 strokes/min
<b>Commissioning</b>	Inspection	Inspection	Inspection
<b>Every 3 months</b>	--	Inspection	Inspection
<b>every 6 months</b>	Inspection	Inspection	Inspection

#### Maintenance plan for initial applications or under difficult conditions

	Less than 120 strokes/min	120 to 360 strokes/min	Over 360 strokes/min
<b>Commissioning</b>	Inspection	Inspection	Inspection
<b>After the first 8 hours</b>	Inspection	Inspection	Inspection
<b>After one week</b>	Inspection	Inspection	Inspection
<b>Every 3 months</b>	Inspection	Inspection	Inspection
<b>Every 6 months</b>	Inspection	Inspection	Inspection

### 5.2 Inspection, lubrication and cleaning

#### 5.2.1 Lubrication during assembly

When assembling MagSpring products, sliders with a length  $\leq 500$  mm must be inserted into the stator in a cleaned condition.

Sliders must be lightly greased before assembly. To do this, grease the slider along its length with approx. 4 g of LU02 grease (4 g = approx.  $\frac{1}{2}$  hazelnut) per metre.

The grease can be applied by hand or with a soft paper towel.



Basically, make sure that there is only a light film of grease on the sliders. 4 g grease per 1000 mm slider length is sufficient for this. Overgreasing can lead to gumming of the grease! In this case, the MagSpring must be cleaned completely.

#### 5.2.2 Inspection

Depending on the ambient conditions and the load on the MagSprings, inspections must be carried out.

When inspecting the MagSprings, check the following points:

- Is the slider covered with a light film of grease? If no -> lubrication
- Has the lubricant decomposed? If yes -> cleaning (stator, slider) + lubrication
- Can the slider be moved smoothly? If no -> cleaning (stator, slider) + lubrication

#### 5.2.3 Cleaning

- Carefully pull the slider out of the stator.  
**Caution:** Large magnetic attraction forces (observe warning notice on p. 5)! If necessary, cover nearby iron constructions with non-magnetic material (e.g. wood).
- Clean the slider and stator with soft disposable paper, ideally with the aid of LU06 cleaning spray (alternatively methylated spirits or alcohol). Do not use cleaning fluids containing solvent additives, petroleum or similar products.

- Then grease the stator bore with 2-3 g of LU02 grease, whereby there should only be a light film of grease on the inside.  
**Note:** Avoid overgreasing!
- Finally grease the slider according to the previous section "lubrication during assembly".

#### 5.2.4 Detergent / Lubricant

For cleaning MagSpring stators and slider, the cleaning spray LU06 is recommended.

LinMot grease LU02 is prescribed to improve the sliding properties between the chrome-nickel steel surface of the slider and the plastic plain bearing.

##### Ordering information

Article	Description	Item no.
LU06-250	Klüberfood NH1 4-002 Spray* (250 ml)	<a href="#">0150-2394</a>
LU02-50	Lubricant for linear motors** (50 g)	<a href="#">0150-1954</a>
LU02-1000	Lubricant for linear motors** (1000 g)	<a href="#">0150-1955</a>

\* LinMot Spray LU06 is identical to KLÜBERFOOD NH1 4-002 (food grade UH1 approval).  
\*\*LinMot Grease LU02 is identical to KLÜBERSYNTH UH1 14-31 (food grade UH1 approval).

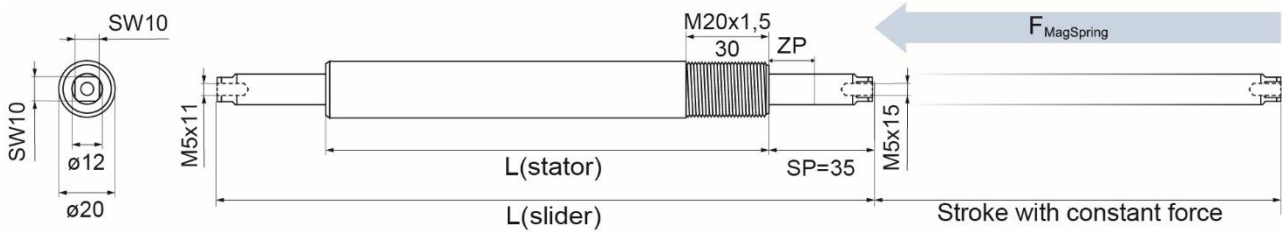
## 6 Storage and Transport

- LinMot and MagSpring sliders may only be transported and stored in their original packaging.
- The sliders should not be removed from the packaging until they are installed.
- The storage room must be dry, dust-free, frost-free and vibration-free.
- The relative humidity should be less than 60 %.
- Prescribed storage temperature: -15 °C...70 °C.
- The MagSpring must be protected from extreme weather conditions.
- The room air must not contain any aggressive gases.

## 7 Dimensions

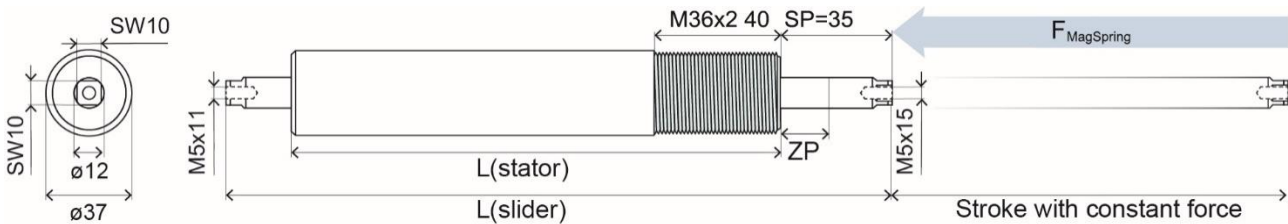
### 7.1 Mechanical dimensions stator

#### 7.1.1 M01-20 stator series



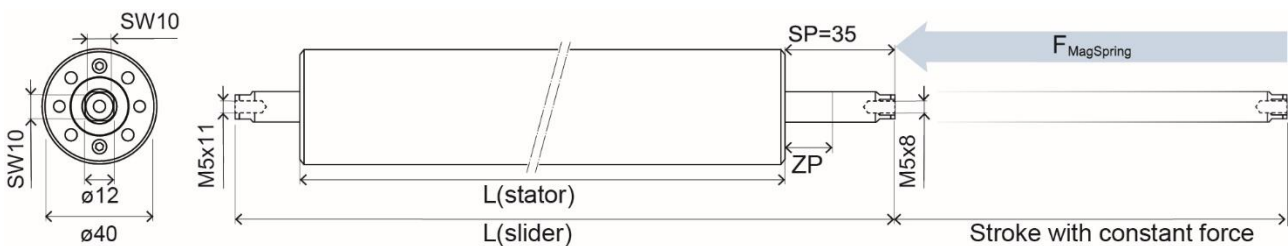
Stator	Item no.	Length L(stator)	Diameter	Mass
MS01-20x60	<a href="#">0250-2200</a>	60 mm [+/-0.3] (2.36 in)	20 mm (0.787 in)	75 g (0.16 lb)
MS01-20x140	<a href="#">0250-2201</a>	140 mm [+/-0.3] (5.51 in)	20 mm (0.787 in)	180 g (0.37 lb)
MS01-20x220	<a href="#">0250-2202</a>	220 mm [+/-0.3] (8.66 in)	20 mm (0.787 in)	285 g (0.58 lb)
MS01-20x300	<a href="#">0250-2207</a>	300 mm [+/-0.3] (11.81 in)	20 mm (0.787 in)	389 g (0.8 lb)

#### 7.1.2 M01-37 stator series



Stator	Item no.	Length L(stator)	Diameter	Mass
MS01-37x80	<a href="#">0250-2203</a>	80 mm [+1/-0.2] (3.15 in)	37 mm (1.46 in)	440 g (0.90 lb)
MS01-37x155	<a href="#">0250-2204</a>	155 mm [+1/-0.2] (6.10 in)	37 mm (1.46 in)	880 g (1.8 lb)
MS01-37x230	<a href="#">0250-2205</a>	230 mm [+1/-0.2] (9.05 in)	37 mm (1.46 in)	1320 g (2.7 lb)
MS01-37x305	<a href="#">0250-2206</a>	305 mm [+1/-0.2] (12.0 in)	37 mm (1.46 in)	1750 g (3.6 lb)
MS01-37x380	<a href="#">0250-2209</a>	380 mm [+1/-0.2] (14.9 in)	37 mm (1.46 in)	2180 g (4.5 lb)

#### 7.1.3 MS01-40-SSC stator series



Stator	Item no.	Length L(stator)	Diameter	Mass
MS01-40x100	<a href="#">0250-1006</a>	80 mm [+1/-0.2] (3.15 in)	40 mm (1.46 in)	440 g (0.90 lb)
MS01-40x175	<a href="#">0250-1005</a>	155 mm [+1/-0.2] (6.10 in)	40 mm (1.46 in)	880 g (1.8 lb)
MS01-40x250	<a href="#">0250-1007</a>	230 mm [+1/-0.2] (9.05 in)	40 mm (1.46 in)	1320 g (2.7 lb)
MS01-40x325	<a href="#">0250-1008</a>	305 mm [+1/-0.2] (12.0 in)	40 mm (1.46 in)	1750 g (3.6 lb)
MS01-40x400	<a href="#">0250-1009</a>	380 mm [+1/-0.2] (14.9 in)	40 mm (1.46 in)	2180 g (4.5 lb)

## 7.2 Mechanical dimensions standard slider

Slider	Item no.	Length L(slider)	Diameter	Mass	Thread
ML01-12x130/80-10	<a href="#">0250-2300</a>	130 mm (5.12 in)	12 mm (0.47 in)	approx. 75 g (0.16 lb)	M5
ML01-12x130/80-15	<a href="#">0250-2308</a>	130 mm (5.12 in)	12 mm (0.47 in)	approx. 75 g (0.16 lb)	M5
ML01-12x130/80-20	<a href="#">0250-2301</a>	130 mm (5.12 in)	12 mm (0.47 in)	approx. 75 g (0.16 lb)	M5
ML01-12x210/160-10	<a href="#">0250-2302</a>	210 mm (8.27 in)	12 mm (0.47 in)	approx. 155 g (0.30 lb)	M5
ML01-12x210/160-15	<a href="#">0250-2309</a>	210 mm (8.27 in)	12 mm (0.47 in)	approx. 155 g (0.30 lb)	M5
ML01-12x210/160-20	<a href="#">0250-2303</a>	210 mm (8.27 in)	12 mm (0.47 in)	approx. 155 g (0.30 lb)	M5
ML01-12x290/240-10	<a href="#">0250-2304</a>	290 mm (11.42 in)	12 mm (0.47 in)	approx. 220 g (0.45 lb)	M5
ML01-12x290/240-15	<a href="#">0250-2310</a>	290 mm (11.42 in)	12 mm (0.47 in)	approx. 220 g (0.45 lb)	M5
ML01-12x290/240-20	<a href="#">0250-2305</a>	290 mm (11.42 in)	12 mm (0.47 in)	approx. 220 g (0.45 lb)	M5
ML01-12x370/320-10	<a href="#">0250-2311</a>	370 mm (14.56 in)	12 mm (0.47 in)	approx. 280 g (0.57 lb)	M5
ML01-12x370/320-15	<a href="#">0250-2312</a>	370 mm (14.56 in)	12 mm (0.47 in)	approx. 280 g (0.57 lb)	M5
ML01-12x370/320-20	<a href="#">0250-2313</a>	370 mm (14.56 in)	12 mm (0.47 in)	approx. 280 g (0.57 lb)	M5
ML01-12x450/400-20	<a href="#">0250-2332</a>	450 mm (17.71 in)	12 mm (0.47 in)	approx. 420 g (0.93 lb)	M5

## 7.3 Mechanical dimensions slider for linear rotary motors

Slider	Item no.	Length L(slider)	Diameter	Mass	Thread
ML01-12x350/160-10	<a href="#">0250-2333</a>	350 mm (13.77 in)	12 mm (0.47 in)	175 g (0.39 lb)	M5
ML01-12x350/160-20	<a href="#">0250-2321</a>	350 mm (13.77 in)	12 mm (0.47 in)	175 g (0.39 lb)	M5
ML01-12x375/160-10	<a href="#">0250-1023</a>	375 mm (14.76 in)	12 mm (0.47 in)	188 g (0.41 lb)	M5
ML01-12x375/160-20	<a href="#">0250-2326</a>	375 mm (14.76 in)	12 mm (0.47 in)	188 g (0.41 lb)	M5
ML01-12x650/320-20	<a href="#">0250-2343</a>	650 mm (25.59 in)	12 mm (0.47 in)	321 g (0.71 lb)	M5



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