Installation and Operating Instructions

Linear Unit

Type: LSM; LSK

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Edition 04/2017
Translation of Original Installation and Operating Instructions

NOTICE

Important! – Read carefully before use – Keep for future reference!

The installation and operating instructions are an integral part of the device and must be available to the operating and maintenance personnel at all times. The safety information contained in them must be heeded accordingly.

If the device is resold, these installation and operating instructions must always be delivered with it as well. The latest version is to be found on the Internet at the manufacturer's website: http://www.wagnerautomation.de

Warranty and guarantee conditions:
See chapter 6.1, Warranty and guarantee conditions.

The **warning and safety symbols** are explained in chapters 3.1 and 3.1.1.

Translation
If the device is sold to a country in the EEA, these installation and operating instructions must be translated into the language of the country in which the device is to be used. Should the translated text be unclear, the original installation and operating instructions (German) must be consulted or the manufacturer contacted for clarification.

Document name:
Dss737 BA_722_Lineareinheit-LSM_LSK-04_08_2016_Druckversion gez_7_2016.doc

1 Contents

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1.4 Declaration of incorporation

Friedemann Wagner GmbH
Robert-Bosch-Straße 5
D-78559 Gosheim / Germany

Declaration of incorporation

pursuant to the

- **EC Machinery Directive 2006/42/EC**
- **EC EMC Directive 2014/30/EU**

We hereby declare that the design of the

Designation: Linear Unit

Type: LSM-X-SM-X-X-X-X-P / LSK-X-X-X-X-X-P

as delivered complies with the above directives.
Harmonized DIN EN standards applied pursuant to the Official Journals for the directives:

Directive / Standard	Title
DIN EN ISO 82079-1 :2012	Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements
2006/42/EC	**EC Directive: Machinery** *effective from 2009-12-29*
DIN EN ISO 12100 :2010	Safety of machinery – General principles for design – Risk assessment and risk reduction

- This declaration only applies to the linear unit in the state in which it was placed on the market.
- The essential health and safety requirements according to Annex I of the Machinery Directive were applied and are fulfilled.
- The following chapters in Annex I of the Machinery Directive 2006/42/EC were considered in the risk assessment:
  1.1.2, 1.1.3, 1.1.5, 1.2.6, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.6, 1.3.7, 1.3.8.2, 1.3.9,
  1.4.1, 1.4.2.1, 1.5.3, 1.5.4, 1.5.9, 1.5.11, 1.5.15, 1.6.1, 1.6.4, 1.7.1, 1.7.2, 1.7.3, 1.7.4.
- The special technical file according to Annex VII B was compiled and will be presented to the competent national authorities in electronic form on demand.
- **The linear unit may not be put into service until the final machinery into which it is incorporated has been declared in conformity with the provisions of the directives.**
- The person authorized to compile the technical documentation is:
  Name: Mr. Andreas Wagner
  Address: Robert-Bosch-Straße 5, D-78559 Gosheim / Germany

Gosheim, April 2017

Authorized Signature
(A. Wagner, Managing Director)

2 Overview and intended use

2.1 Overview of the device

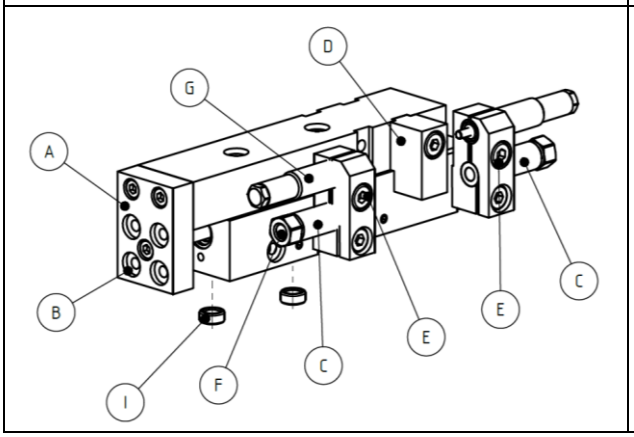
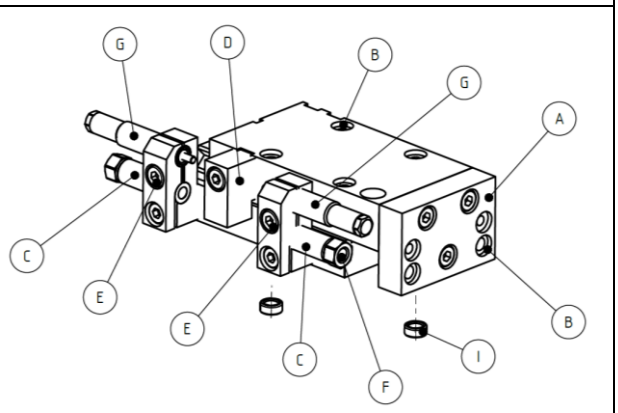
LSM	LSK
	

Fig. 2-1 Diagram of the parts of the linear unit

The LSM / LSK linear unit consists of the following main components:	
(A) Head plate	**(F)** Mount for proximity switch
(B) Bores for fastening with centering rings	**(G)** Hydraulic shock absorber
(C) Stop screws, hardened	**(I)** Centering rings
(D) Stop plate, hardened	
(E) Fastening screws to clamp the stop screws	

2.2 Intended use

The linear units were developed to move components or superstructures a defined distance horizontally or vertically. They are suitable for positioning in assembly work or processing of components.

This device was developed, designed and built exclusively for industrial and light-industrial use. Private use is prohibited.

DANGER

This device is intended solely for the purpose described above. Any other use or modification of the device without the written consent of the manufacturer is deemed improper.
Modification without written agreement will lead to ***serious to deadly injuries****.*
The manufacturer accepts no liability for resultant damage. The risk is borne solely by the operator. The device may only be put into operation when it has been ensured that all safety devices have been installed and are fully functional.

Proper use of the device in accordance with its intended purpose includes compliance with the manufacturer's instruction handbooks and operating manuals and performance of all specified maintenance and service work.

Foreseeable misuse:

NOTICE

Products that could form explosive dust/air or gas/air mixtures may not be processed in critical concentrations (above LEL)!
The device does not fulfil any EX requirements and may therefore also not be installed and operated in ATEX zones!
**) LEL = Lower Explosive Limit*

The device is not suitable for use in machining operations, especially of aluminum, titanium and magnesium, as, depending on product compositions, particle sizes, chip sizes and distribution of quantities, potentially explosive atmospheres can result. The final decision on use lies in the end user's judgment.

2.2.1 Product identification

The type key is laser-engraved on the connection side of the linear unit. The following table explains the type key:

Module	Design size	Version	Stroke	Shock absorber	Energy feedthrough	Drive
LSM	3	SM	20 35 50	K H	0--0	-P
LSM	4	SM	35 65	K H	0--0	-P
LSK	4	SK HK	20 30 45 60 75 90	K H	0--0	-P
LSK	6	SK	30 50 75 100 125 150 175 200	K H	0--0	-P
LS linear slide		**SM** slide mini **SK** slide + cross roller guide stop at side **K** slide + cross roller guide stop at face		**K** unavailable **H** hydraulic	**0-** pneumatic **-0** electric	**-P** pneumatic

2.2.2 Incorporation information (for the partly completed machinery) for the constructor of the final machinery

- Control is effected via a 4/2 or 5/2 directional-control valve (not included in the delivery).
- The threaded bores and centering rings enable easy mounting.
- The speed can be adjusted freely with an external exhaust regulator (not included in the delivery).

After considering the above points, the integrator of the final machinery can put this device into service as a safe device.

He must supply overall instructions for use and a declaration of conformity for the complete machinery and affix a type plate with CE marking to the machinery. The responsibility for the risk assessment for the complete machinery lies internally with the integrator.

2.3 Technical data

2.3.1 Dimensions and weight

	LSM-3-SM	LSM-4-SM	LSK-4-SK	LSK-4-HK	LSK-6-SK
Guide	Recirculating ball bearing guide with two carriages		Cross roller guide		
Design	For smallest installation spaces		For small installation spaces		
Stop	Side	Side	Side	Face	Side
Stroke lengths [mm]	20/35/50	35/65	20/30/45 60/75/90	20/30/45 60/75/90	30/50/75/ 100/125/ 150/175/200
Adjustment range [mm] Type	15 Both sides	14 Both sides	14 Both sides	14 Both sides	23 Both sides
Repeatability [mm]	±0.01	±0.01	±0.01	±0.01	±0.01
Push force at 6 bar [N]	11	18	45	45	76
Retraction force at 6 bar [N]	7	13	33	33	66
Cylinder Ø [mm]	6	8	12	12	16
Drive	Compressed air (4-8 bar), constant, filtered (10 µm) and dry				
Connection	M3		M5		
Control	4/2; 5/2 directional-control valve, bistable				
Housing material	High strength aluminum, anodized				
Stop system material	Hardened steel				
Stop screw material	Hardened steel				

Module	LSM-3-SM			LSM-4-SM		LSK-4-SK LSK-4-HK					
Stroke length [mm]	20	35	50	35	65	20	30	45	60	75	90
Weight [kg]	0.06	0.08	1	0.2	0.3	0.5	0.5	0.62	0.74	0.86	0.98
Air consumption double stroke [cm^3]	1.13	2	2.83	3.5	6.5	5.7	6.8	10.2	13.5	17.0	20.4
Max. payload [kg]	0.5	0.5	0.5	1.2	1.2	3	3	3	3	3	3

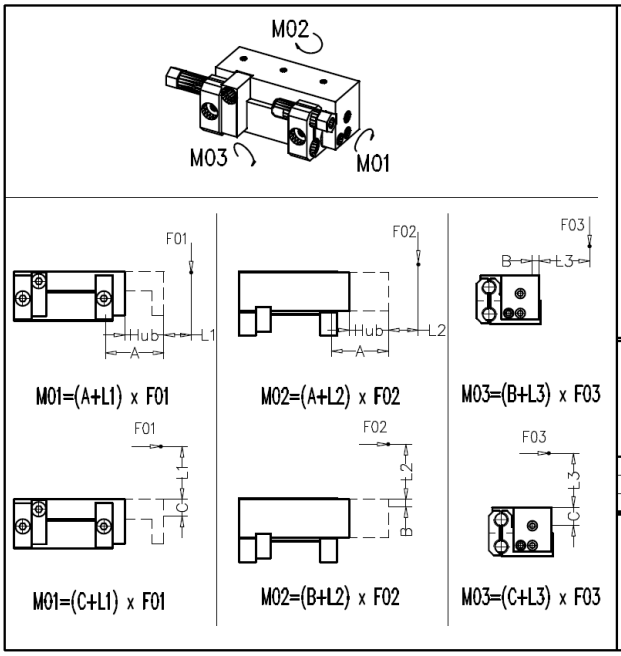
Module	LSK-6-SK							
Stroke length [mm]	30	50	75	100	125	150	175	200
Weight [kg]	1.07	1.07	1.47	1.47	1.83	1.83	2.2	2.2
Air consumption double stroke [cm^3]	11.2	18.7	28	37.4	46.8	56.1	65.5	74.8
Max. payload [kg]	22	22	18	18	14	14	10	10

2.3.2 Environmental conditions

- Operation only in closed rooms and low-vibration environments (no potentially explosive or condensing atmospheres).
- No operation in environments with spray water, vapors, process dusts or abrasion dusts.
- Linear units with proximity switches should not be used in areas with static discharges, high-frequency oscillations or strong magnetic fields. Otherwise it can happen that the proximity switches for recognition of the end positions deliver wrong signals.
- The linear units are only suitable for use in environments with spray water to a limited extent. It might be necessary to protect them against ingressing spray water with a suitable cover.

2.3.3 Characteristics and allowable loads

LSM-3-SM



Minischlitten LSSM-3-SM-20/35/50

Zulässige Belastungen statisch/dynamisch
Allowable loads static/dynamic

M01 [Nm]	M02 [Nm]	M03 [Nm]	A [mm]	B [mm]	C [mm]
4	4	2	9+Hub	3.5	7

Lebensdauerberechnung mit Momenten
Lifetime calculation with moments

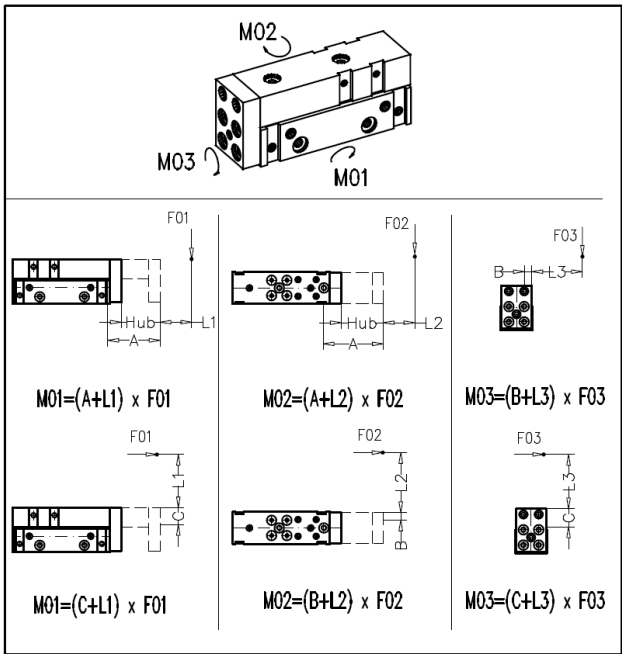
$$L=\left(\frac{M_{zul}}{M_{eff}}\right)^3 \times 10^3$$

L	Lebensdauer [m]	lifetime [m]
M_{zul}	zulässiges Moment [Nm]	allowable moment [Nm]
M_{eff}	effektives (benötigtes) Moment [Nm]	effective (needed) moment [Nm]

Bei kombinierten Belastungen muss folgende Gleichung erfüllt sein:
In combined loads situations the next equation must be met:

$$\frac{M01_{eff}}{M01_{zul}}+\frac{M02_{eff}}{M02_{zul}}+\frac{M03_{eff}}{M03_{zul}} \leq 1$$

LSM-4-SM



Minischlitten LSM-4-SM-35/65

Zulässige Belastungen statisch/dynamisch
Allowable loads static/dynamic

M01 [Nm]	M02 [Nm]	M03 [Nm]	A [mm]	B [mm]	C [mm]
8	8	4	13+Hub	7.5	10

Lebensdauerberechnung mit Momenten
Lifetime calculation with moments

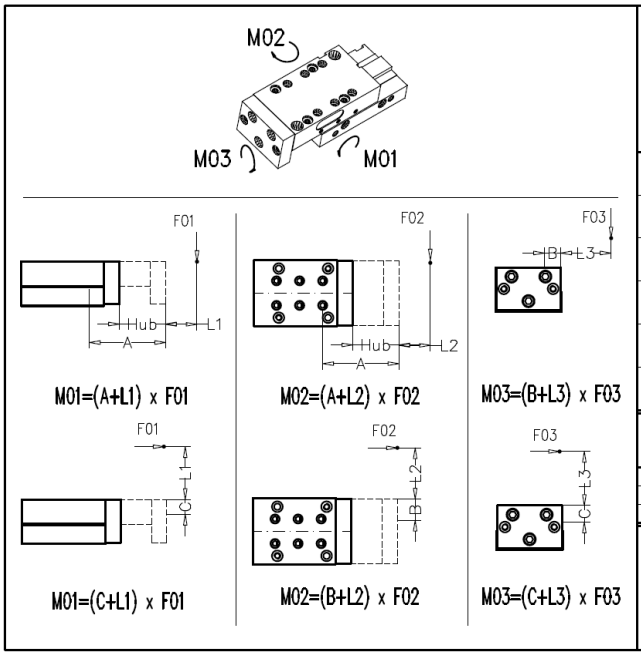
$$L=\left(\frac{M_{zul}}{M_{eff}}\right)^3 \times 10^3$$

L	Lebensdauer [m]	lifetime [m]
M_{zul}	zulässiges Moment [Nm]	allowable moment [Nm]
M_{eff}	effektives (benötigtes) Moment [Nm]	effective (needed) moment [Nm]

Bei kombinierten Belastungen muss folgende Gleichung erfüllt sein:
In combined loads situations the next equation must be met:

$$\frac{M01_{eff}}{M01_{zul}}+\frac{M02_{eff}}{M02_{zul}}+\frac{M03_{eff}}{M03_{zul}} \leq 1$$

LSK-4-SK



Linearschlitten	Zulässige Belastungen statisch/dynamisch Allowable loads static/dynamic					
	M01 (Nm)	M02 (Nm)	M03 (Nm)	A (mm)	B (mm)	C (mm)
LSK-4-SK-20	12	12	17	$29+\frac{Hub}{2}$	9	13
LSK-4-SK-30	12	12	17	$29+\frac{Hub}{2}$	9	13
LSK-4-SK-45	15	15	20	$36+\frac{Hub}{2}$	9	13
LSK-4-SK-60	18	18	23	$44+\frac{Hub}{2}$	9	13
LSK-4-SK-75	21	21	26	$51+\frac{Hub}{2}$	9	13
LSK-4-SK-90	25	25	29	$59+\frac{Hub}{2}$	9	13

Lebensdauerberechnung mit Momenten
Lifetime calculation with moments

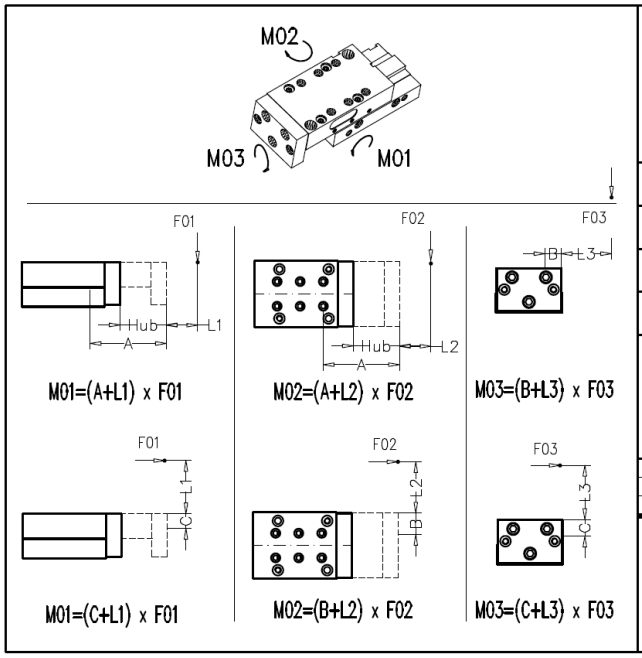
$$L=\left(\frac{M_{zul}}{M_{eff}}\right)^3 \times 10^5$$

L	Lebensdauer [m]	lifetime [m]
M_{zul}	zulässiges Moment [Nm]	allowable moment [Nm]
M_{eff}	effektives (benötigtes) Moment [Nm]	effective (needed) moment [Nm]

Bei kombinierten Belastungen muss folgende Gleichung erfüllt sein:
In combined loads situations the next equation must be met:

$$\frac{M01_{eff}}{M01_{zul}}+\frac{M02_{eff}}{M02_{zul}}+\frac{M03_{eff}}{M03_{zul}} \leq 1$$

LSK-6-SK



Linearschlitten LSK-6-SK	Zulässige Belastungen statisch/dynamisch Allowable loads static/dynamic					
	M01 [Nm]	M02 [Nm]	M03 [Nm]	A [mm]	B [mm]	C [mm]
-30/50	33.2	33.2	44.6	$45+\frac{Hub}{2}$	14	16
-75/100	38.7	38.7	59.5	$70+\frac{Hub}{2}$	14	16
-125/150	44.2	44.2	59.5	$95+\frac{Hub}{2}$	14	16
-175/200	49.7	49.7	74.4	$120+\frac{Hub}{2}$	14	16

Lebensdauerberechnung mit Momenten
Lifetime calculation with moments

$$L=\left(\frac{M_{zul}}{M_{eff}}\right)^3 \times 10^3$$

L	Lebensdauer [m]	lifetime [m]
M_{zul}	zulässiges Moment [Nm]	allowable moment [Nm]
M_{eff}	effektives (benötigtes) Moment [Nm]	effective (needed) moment [Nm]

Bei kombinierten Belastungen muss folgende Gleichung erfüllt sein:
In combined loads situations the next equation must be met:

$$\frac{M01_{eff}}{M01_{zul}}+\frac{M02_{eff}}{M02_{zul}}+\frac{M03_{eff}}{M03_{zul}} \leq 1$$

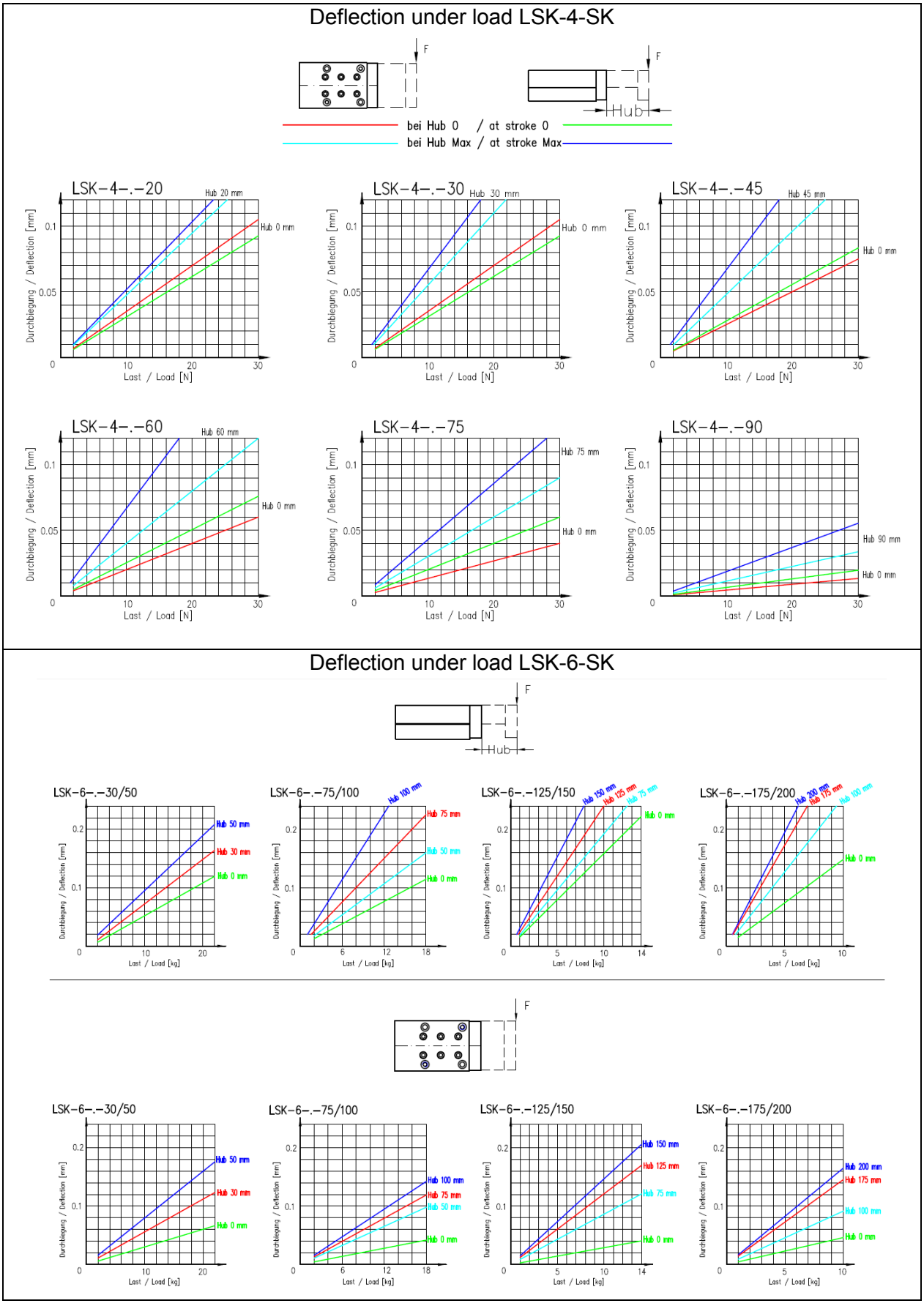


Fig. 2-2 Characteristics and loads

2.3.4 General data

Operating temperature range:	
Temperature range device:	+ 5° … + 65° C
Relative air humidity:	max. 70 %, non-condensing
Storage conditions:	
Minimum temperature:	- 10° C
Maximum temperature:	+ 50° C
Relative air humidity:	max. 70 %, non-condensing

3 Safety

3.1 Notes and explanations

DANGER

"DANGER" warns of dangerous situations. Avoid these dangerous situations!

Otherwise serious injuries or death will result.

WARNING

"WARNING" warns of dangerous situations. Avoid these dangerous situations!

Otherwise serious injuries or death can result.

CAUTION

"CAUTION" in combination with the warning symbol warns of dangerous situations. Avoid these dangerous situations!

Otherwise minor or light injuries could result.

NOTICE

"NOTICE" gives recommendations on how to proceed. Ignoring these recommendations will ***not lead to personal injuries****.*

Follow the recommendations to ***avoid damage to the unit*** *and problems in general!*

NOTICE

References to installation and operating instructions / documentation are marked with a book symbol (see external documentation).

Follow the recommendations to ***avoid damage to the unit*** *and problems in general!*

3.1.1 Explanation of safety symbols used

DANGER

Crushing hazards, dangers of injuries to the hands *(closing movements of mechanical parts).*

Ignoring this warning will result in serious injuries or death.
Do not carry out any manual work on such parts during movements.

WARNING

Mandatory: Safety boots *must be* ***worn.***

Ignoring this warning could result in serious injuries or death.
Take note of the dangers to the lower limbs.

WARNING

Mandatory: Protective gloves *must be* ***worn.***

Ignoring this warning could result in serious injuries or death.
Take note of the dangers to the hands.

WARNING

Mandatory: Hands *must be* ***washed.***

Ignoring this warning could result in serious injuries or death.
Take note of the dangers due to deficient hygiene.

NOTICE

The ***environment sign*** *marks actions to protect the environment (warning of environmental pollution, in the chapter Disposal).*

Damage to the environment will result if ignored.
Improper disposal can result in serious damage to the environment.

3.2 Safety precautions (to be carried out by the operator)

- The linear units may only be installed, serviced and modified by qualified skilled personnel. This personnel must have read and understood the operating instructions.
- The energy and compressed air supply must be disconnected from the linear unit before any service, maintenance or modification work. Make sure there are no residual energies present.
- Only use the linear units if they are in perfect technical condition and do not carry out any unauthorized modifications.
- The linear units can be heavy. Secure them so that they cannot fall down.
- In the event of an emergency, malfunction or other irregularity, switch off the linear unit, disconnect it from the energy and compressed air supply and lock against reconnection.
- Carry out a visual inspection of the compressed air lines regularly. Operation with damaged compressed air lines is prohibited.
- Make sure that the technical specifications and environmental conditions specified in the product documentation are adhered to.
- The linear unit may only be operated in accordance with its intended use.
- Take note of the valid regulations on accident prevention and environmental protection.
- Implement the safeguards required by EC directives.
- Pressurize your complete equipment with compressed air slowly to avoid uncontrolled movements.
- Only put your equipment into service if you are sure that no personnel or foreign objects can be caught by the moving parts.

3.3 Safety inspections and tests

Factory inspections and tests by the manufacturer.

1. Risk assessment according to Machinery Directive 2006/42/EC (to Annex I) and to DIN EN ISO 12100:2010.

4 General warnings

4.1 Dangers

The safety systems and safety instructions described in these installation and operating instructions are to be heeded accordingly.

DANGER

Pay attention to the possible ***danger of injuries to the hands and/or body*** *when carrying out adjustment, maintenance and repair work!*

Otherwise serious injuries or death will result.
The machine builder must implement safety equipment to ensure safe operation.

4.2 Spare and wearing parts

Spare parts and accessories that have not been supplied by us have also not been tested and approved by us. The fitting and/or use of such products could therefore negatively affect the design characteristics of your device.
We accept no liability whatsoever for damage arising from the use of non-original parts and accessories.

Standard parts can be bought through the specialized trade.

NOTICE

Part lists *and* ***technical data sheets*** *are to be found in the* ***technical reference documents****.*

Otherwise the unit will be damaged.
Damage can arise if the technical reference documents are ignored.

NOTICE

Lists *of* ***spare parts*** *and* ***wearing parts*** *are to be found in the* ***technical reference documents****.*

Otherwise the unit will be damaged.
Damage can arise if the technical reference documents are ignored.

Service

When necessary, these parts can be obtained from:

Friedemann Wagner GmbH
Robert-Bosch-Straße 5
D-78559 Gosheim / Germany
Telephone: +49 (0) 7426 / 94900-0
Fax: +49 (0) 7426 / 94900-9
Email: info@wagnerautomation.de

5 Installation

5.1 Scope of delivery

Fig. 5-1 Scope of delivery of the device

The scope of delivery comprises:

1 Linear unit
2 These installation and operating instructions with declaration of incorporation
3 Centering ring
4 Cardboard packaging

5.2 Transport and packaging

The customer is sent a specification of the scope of delivery before shipment begins. It contains details on:

- date of delivery,
- number and type of transport units.

The devices are carefully inspected and packed before shipment, but it is nevertheless still possible that they might become damaged during transit.

5.2.1 Delivery (also of spare and replacement parts)

Receiving inspection:

- Check the shipment against the delivery note to ensure that it is complete!

If the packaging is damaged

- Check the shipment itself for damage (visual inspection)!

Complaints

If the shipment was damaged during transit:

- Immediately contact the last carrier!
- Keep the packaging material (for possible inspection by the carrier or for return shipment).

Packaging for return shipment

Use the original packaging material as far as possible.

5.2.2 Temporary storage/Storage conditions

The freight packaging of the device and spare and replacement parts is designed for a storage period of 3 months from delivery.

After dismantling of the device, it must be stored properly to enable reuse.

NOTICE

Temporary storage: Store with desiccant in a dry factory hall.

Otherwise the unit will be damaged.
Moisture could penetrate into the device and cause major damage.

Storage conditions

- No direct sunlight.
- No exposure to direct rain, condensation, water.

5.3 Mounting

WARNING

Disconnect the linear unit from the compressed air supply and lock against reconnection.

Otherwise light to serious injuries can result.

Avoid these dangerous situations!

5.3.1 Mounting of the linear unit

WARNING

When mounting in a vertical position, the slide must always be moved to bottommost position before mounting.

Otherwise light to serious injuries can result from sudden moving masses.

Avoid these dangerous situations!

- ▶ Place at least 2 diagonally offset centering rings (I) (are included in the delivery) in the holes (B) provided.
- ▶ Screw the linear unit tight with screws.
- ▶ Linear units in the LSK series can also be mounted through the housing using through holes and DIN 912 / M4 cylinder head screws (exception: LSK-4-X-30). The guide head must then be moved to reach the holes.

NOTICE

If the linear unit is mounted vertically, it must be checked whether the push force and end-position damping suffice for the respective application in question.

NOTICE

If a centering ring (I) is stuck in a hole, you can remove it from the hole easily from size ZR-4 with a threaded screw. The centering rings have an internal thread specifically for this purpose. Simply screw a suitable screw into the thread of the centering ring and pull the screw plus centering ring out of the hole.

Centering ring	Internal thread
ZR-3	-
ZR-4	M5
ZR-6	M8
ZR-9	M10

5.3.2 Mounting of superstructures

WARNING

Disconnect the linear unit from the compressed air supply and lock against reconnection.

Otherwise light to serious injuries can result.

Avoid these dangerous situations!

▶ Fasten the superstructures with screws in the threaded holes (B) with the centering rings provided.

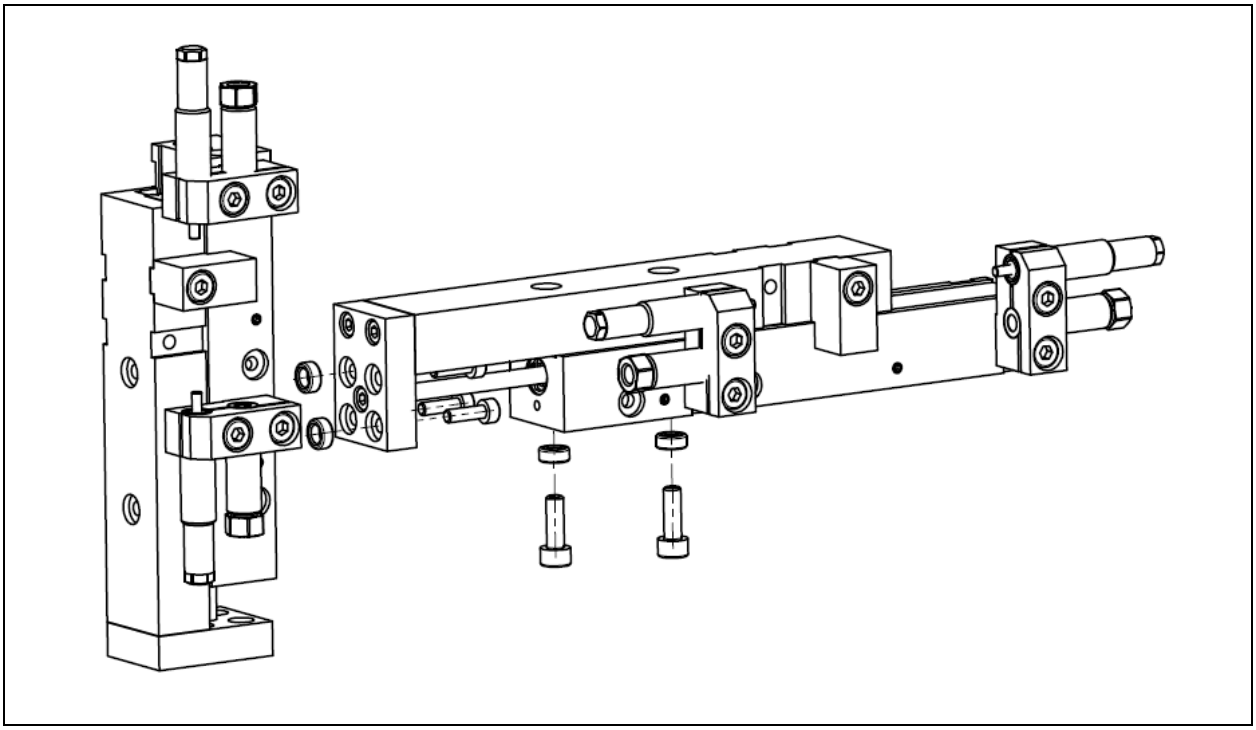


Fig. 5-2 Mounting of superstructures using two linear units of the type LSM as example

5.3.3 Connection examples

	WARNING
	Disconnect the linear unit from the compressed air supply and lock against reconnection. ***Otherwise light to serious injuries can result.*** *Avoid these dangerous situations!*

	NOTICE
	The following figures show connection examples and illustrate how the linear unit can be connected.

	NOTICE
	A function check must be carried out with compressed air after connection.

5.3.3.1 Example of standard pneumatic connection

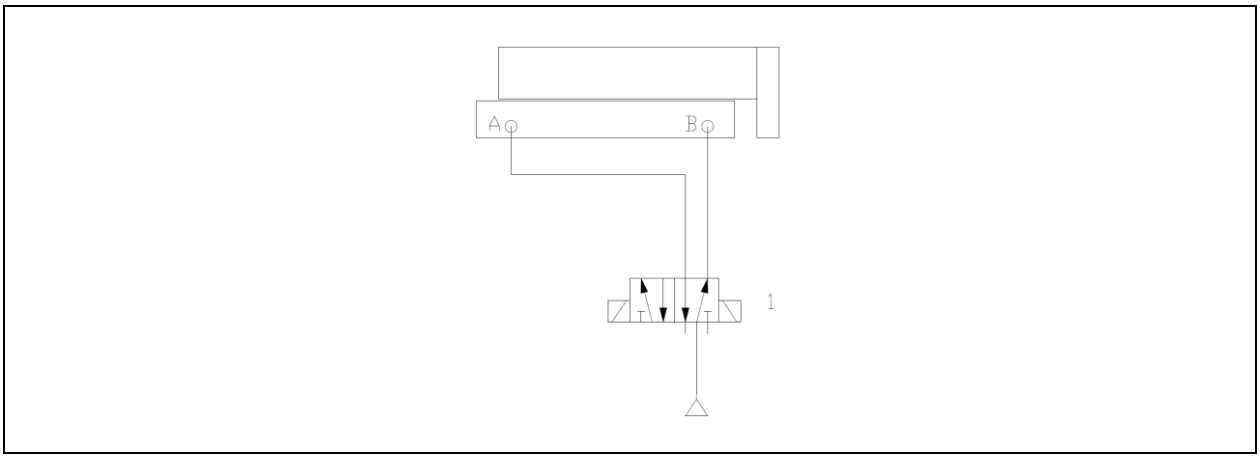


Fig. 5-3 Standard circuit

A. Compressed air connection A (extend/retract, cf. table)

B. Compressed air connection B (extend/retract, cf. table)

1. 5/2 control valve, bistable

Connection	LSM-3-SM	LSM-4-SM	LSK-4-SK	LSK-4-HK	LSK-6-SK
View side A	Extend	Extend	Extend	Extend	Extend
View side B (near head plate)	Retract	Retract	Retract	Retract	Retract
View from below A		Extend			Extend
View from below B (near head plate)		Retract			Retract
View face end, housing bottom Connection left				Retract	Extend
View face end, housing bottom Connection right				Extend	Retract

5.3.3.2 Example of pneumatic connection with EMERGENCY STOP circuit

WARNING

In the event of a sudden loss of pressure the payload can drop uncontrolled into one end position. To prevent this, piloted non-return valves are recommended.

Otherwise light to serious injuries can result.

Avoid these dangerous situations!

NOTICE

Please note that suitable emergency stop systems (e.g. systematic shutdown) and restart systems (e.g. correct valve switching sequence, pressure buildup valves) are needed for pneumatic actuators. Unwanted blocking of the compressed air supply can lead to unwanted situations.

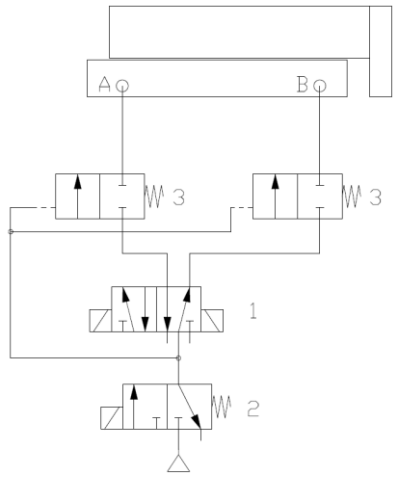


Fig. 5-4 Emergency stop circuit

A. Compressed air connection A (extend/retract, cf. table)
B. Compressed air connection B (extend/retract, cf. table)
1. 5/2 control valve, bistable
2. 3/2 control valve, monostable / emergency stop
3. Piloted non-return valve

5.3.4 Adjustment possibilities for the linear unit

The device is always delivered in its respective “maximum stroke” setting. To adjust, proceed as follows:

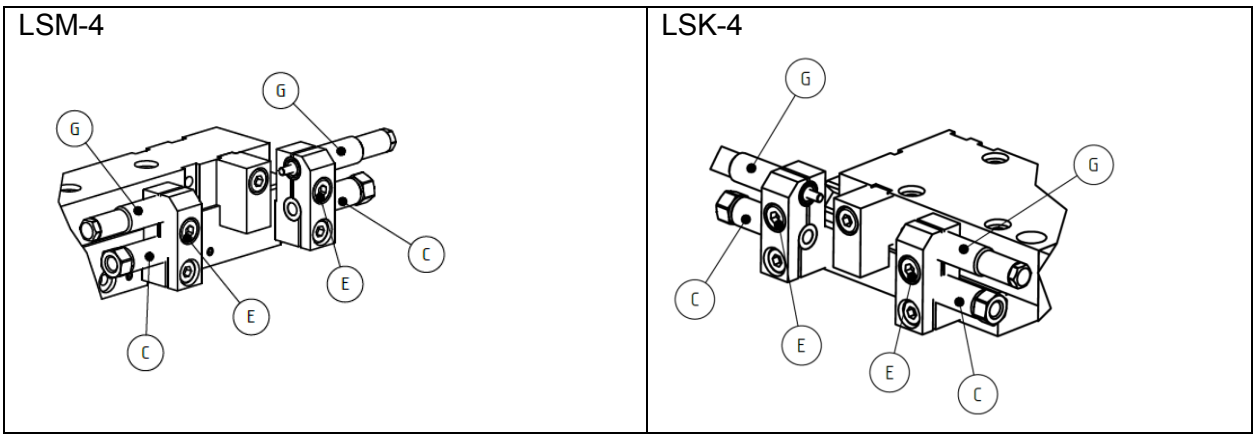


Fig. 5-5 Adjustment possibilities for the linear unit

- ▶ Loosen the clamping screw (E) (hexagonal socket head) of the stop screw.
- ▶ Adjust the stop screws (C) as needed on one or both sides to limit the stroke.
- ▶ Adjust the shock absorbers (G) (cf. separate chapter 5.3.4.2) and fasten the stop screws again with the clamping screws.
- ▶ In the case of the LSM-4 and LSK-6 it is possible to attach the stop systems on both sides to avoid collisions of the connection cable in the superstructure.
- ▶ In the case of the LSK-4 it is possible to obtain *one* stop block as accessory in order to reposition *one* of the stops (system extended (cf. Accessories 9.2).

5.3.4.1 Set speed

	WARNING
	Take special care whenever carrying out adjustment work and keep sufficiently far away from danger zones. ***Otherwise light to serious injuries can result.*** *Wear personal protective equipment such as gloves or safety glasses if necessary.*

The speed can be adjusted to the load by an external exhaust regulator (not included in the delivery). If the regulator is set too fast, this will cause hard stopping and bouncing. This can also have a negative effect on the lifetime of the linear unit and even result in destruction of its mechanical components.

5.3.4.2 Set shock absorber

WARNING

Take special care whenever carrying out adjustment work and keep sufficiently far away from danger zones.

Otherwise light to serious injuries can result.
Wear personal protective equipment such as gloves or safety glasses if necessary.

The strength of the shock absorber must be adjusted to the load. If the shock absorber (G) is set too hard, it is possible for the linear unit to bounce and it does not reach end position. If the shock absorber (G) is set too soft, this will cause hard stopping and bouncing. This can also have a negative effect on the lifetime of the linear unit and even result in destruction of its mechanical components.

- ▶ Depending on the mass being moved and the speed, there are kinetic energies in the system that are absorbed by hydraulic shock absorbers.
- ▶ Move the head plate manually to end position and leave it there.
- ▶ Loosen the clamping screw (E) (hexagonal socket head) of the stop screw (cf. sketch in chapter 5.3.4 Adjustment possibilities).
- ▶ To mount the shock absorber (G), screw it into the mount clockwise.
- ▶ Screw in the shock absorber (G) until its housing rests against the stop.
- ▶ Then screw the shock absorber (G) out again by at least half a revolution and clamp it with the clamping screw (E) (hexagonal socket head).
- ▶ The action of the shock absorber can be influenced/set by screwing in or out. This is particularly necessary when shock absorbers that cannot be adjusted externally with an adjusting

screw are used. In this case screw the shock absorber out a little further!

▶ Proceed in the same way to mount the second shock absorber.

Pressurize the system with compressed air and let the linear unit drive into the end positions. Adjustment is correct when the end positions are reached without visible delay and without bouncing.

NOTICE

The shock absorbers are pre-set on delivery. It is, however, possible that the damping action needs to be set softer or harder.

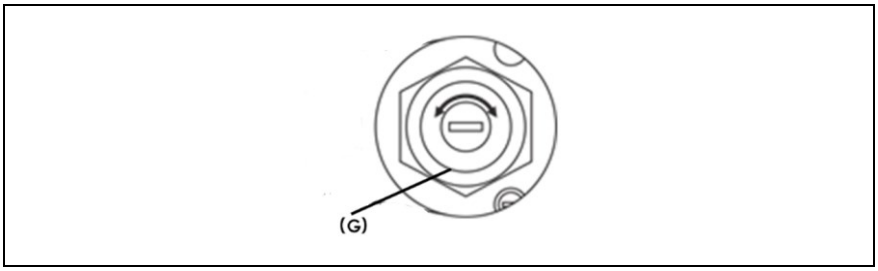


Fig. 5-6 Set shock absorber for STD-14

Set shock absorber harder

Turn the adjusting screw to the right.

Set shock absorber softer

Turn the adjusting screw to the left.

NOTICE

Only adjust the damping action with the adjusting screw (STD-14). If there is no adjusting screw available, the shock absorber should be adjusted via the shock absorber stroke.

5.4 Startup

WARNING

Risk of injury from moving masses.
Make sure that no personnel or foreign objects can be caught by moving parts.
Disconnect the linear unit from the compressed air supply.

Otherwise serious injuries or death can result.

Avoid these dangerous situations!

- ▶ Do not overload the devices.
- ▶ Adjust the stroke length (cf. chapter 5.3.4).
- ▶ Connect all air hoses and signal cables correctly.
- ▶ Pre-set the shock absorbers.
- ▶ Pre-set the sensors.
- ▶ Close all regulators and then open them again by one revolution.
- ▶ Make sure that no personnel or foreign objects can be caught by moving parts.
- ▶ Pressurize your equipment slowly with compressed air. (Extend / Retract, cf. table in chapter 5.3.3.1).
- ▶ Start a trial run.
- ▶ Set the proximity switches (if available).
- ▶ Set the required speed.
- ▶ Set the shock absorbers.
- ▶ End the trial run.

5.4.1 Mounting of proximity switches (accessories)

WARNING

Disconnect the linear unit from the compressed air supply and lock against reconnection.

Otherwise light to serious injuries can result.

Avoid these dangerous situations!

NOTICE

The standard device does not come with proximity switches. However, to query end positions, it is necessary to retrofit proximity switches. The proximity switches can be obtained separately as accessories.

NOTICE

The linear units with proximity switches should not be used in areas with static discharges, high-frequency oscillations or strong magnetic fields. Otherwise it can happen that the proximity switches for recognition of the end positions deliver wrong signals.

NOTICE

Make sure that the proximity switches do not extend over the stop surface of the stop screws - this can lead to damage and destruction of parts.

Unit	Mounting
LSM-3-SM **LSM-4-SM** **LSK-4-SK** **LSK-4-HK**	The proximity switches are mounted in the stop screws. Insert the cylindrical switch into the stop as far as it goes and then lock the switch with the screw (1.5 Nm/size 6 for LSM-3; 2 Nm/size 8). The inside cone fastens the switch in place. In this connection also see chapter 5.3.4 regarding adjustment of the stroke lengths.
LSK-6-SK	Insert the proximity switch set and simply fasten the switches with the thumb screws. We offer a fastening set for conventional proximity switches with a diameter of 6.5 mm, cf. chapter 9.2 Accessories. Make sure that the proximity switches do not extend over the stop surface of the stop screws - this can lead to damage and destruction of parts.

▶ Connect the proximity switches with the cables.

▶ Set the proximity switches so that the LED of the switch lights up when the respective end position is reached. Make sure that the switch signal does not set in too soon because otherwise the linear unit will not reach end position.

Technical data

Type	NSS-O6,5-S-65	NS-I-04-K/S-27
Switching distance	1.5 mm	0.8 mm
Circuit type	PNP	PNP
Switching characteristic	NO	NO
Supply voltage	10-30 V DC	10-30 V DC
Current consumption	<10 mA	<10 mA
Switching current	Max. 200 mA	Max. 100 mA
Switching frequency	Max. 5 kHz	Max. 3 kHz
LED	Yes	Yes
Protected against polarity reversal	Yes	Yes
Short-circuit proof	Yes	Yes
Protection	IP 67	IP 67
Linear unit	LSK-6-SK	LSM-3-SM LSM-4-SM LSK-4-SK LSK4-HK

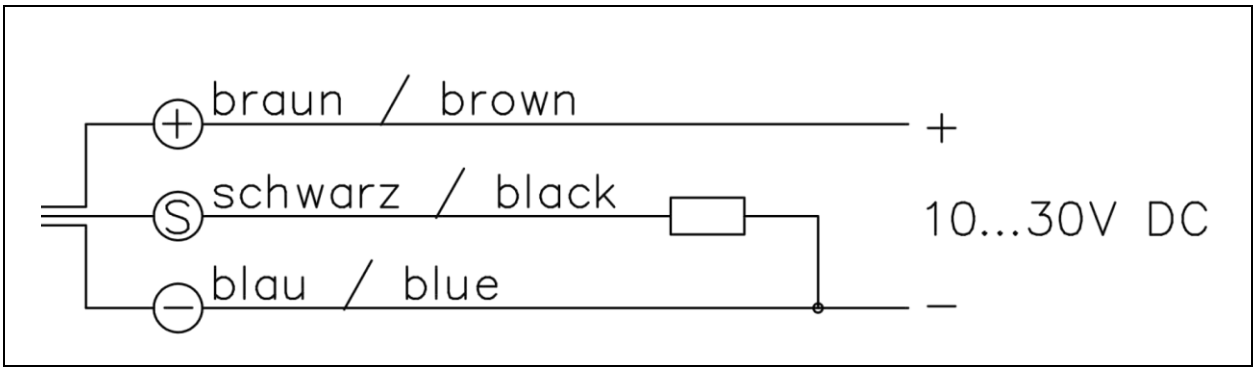


Fig. 5-7 Connection diagram for proximity switches

5.4.2 Repair / Replacement of the hydraulic shock absorber

	WARNING
	Work may only be carried out by specially trained personnel because the device is pressurized. ***Otherwise light to serious injuries can result.*** *Avoid these dangerous situations!*

▶ Loosen the clamping screw (E) (hexagonal socket head) of the stop screw - this also release the shock absorber for adjustment.

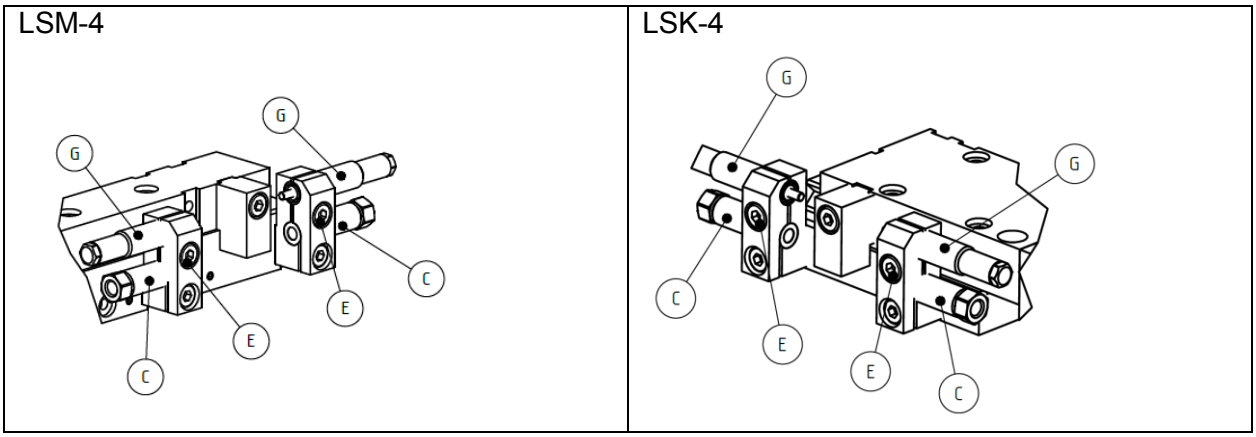


Fig. 5-8 Repair / Replacement of the hydraulic shock absorber

▶ To dismount the shock absorber (G), screw it out of the mount anticlockwise. Screw in the new shock absorber (G) until its housing rests against the stop. Cf. chapter 5.3.4.2 / Set shock absorber

▶ Then screw the shock absorber (G) out again by at least half a revolution and clamp it with the clamping screw (E) (hexagonal socket head).

▶ The action of the shock absorber can be influenced/set by screwing in or out. This is particularly necessary when shock absorbers that cannot be adjusted externally with an adjusting screw are used. In this case screw the shock absorber out a little further!

▶ Proceed in the same way to replace the second shock absorber.

▶ Pressurize the system with compressed air and let the linear unit drive into the end positions. Adjustment is correct when the end positions are reached without visible delay and without bouncing.

Technical data

Type	STD-6-S	STD-8-RS	STD-8-S	STD-14-W
Fastening	M6 x 0.5	M8x1	M8x1	M14 x 1
Stroke	4 mm	5 mm	5 mm	12 mm
Impact speed (min./max.)	1.8-3.5 m/s	1.8-3.5 m/s	1.8-3.5 m/s	0.4-5.0 m/s
Absorption	1.5 Nm	1.5 Nm	3 Nm	30 Nm
Damping work max.	3,200 Nm/h	5,000 Nm/h	8,000 Nm/h	50,000 Nm/h
Material	Steel			
Weight	0.006 kg	0.013 kg	0.012 kg	0.065 kg

Shock absorbers / Linear units	STD-6-S	STD-8-RS	STD-8-S	STD-14-W
LSM-3-SM-X-X-0-0-P	●			
LSM-4-SM-X-X-0-0-P		●		
LSK-4-SK-X-X-0-0-P			●	
LSK-4-HK-X-X-0-0-P			●	
LSK-6-SK-X-X-0-0-P				●

6 Maintenance/Servicing

WARNING

Disconnect the linear unit from the compressed air supply and lock against reconnection!

Otherwise light to serious injuries can result.

Make sure there are no residual energies present.

NOTICE

If you have opted for use with an oil/air mixture, the device should then later not be operated otherwise because the lubricating film could fail.

Shock absorbers

The hydraulic shock absorbers are wearing parts. They should therefore be inspected at regular intervals (about every 2,000,000 strokes). Defective shock absorbers can cause consequential damage. Our STD14 are reparable, and we therefore recommend you arrange the possibility of repair with our customer service.

Servicing

After a modification/repair, all moving parts and their guides should be smeared with our special grease.

The seals and the grease inside the linear unit can age depending on use; we therefore recommend that you send the device in to us for servicing every 3 years, after 20,000,000 cycles or should you notice a fault in the movement.

Only clean the linear unit with soft cloths and agents that do not damage the material.

Contact with aggressive media and grinding dust should be avoided.

6.1 Warranty and guarantee conditions

The statutory warranty period of the manufacturer / distributor is 24 months from the date of delivery.
For spare parts, we guarantee delivery according to chapter (see also DIN EN 82079-1).

We grant a warranty of 24 months (from the date of delivery ex works) on the proviso that the device is treated correctly in 1-shift operation and the application and environmental conditions are complied with. This includes replacement or repair of defective parts of Friedemann Wagner GmbH.

Wearing parts (e.g. shock absorbers) are not covered by the warranty.

During the warranty period repairs may only be carried out or authorized by Friedemann Wagner GmbH.

7 Troubleshooting

Fault	Cause	Correction
Irregular movement	Regulator is turned in too far	Set regulator correctly
	Air ducts are blocked	Clean air ducts with compressed air
No movement	Connected incorrectly	Connect compressed air connections correctly
	Indexing unit controlled incorrectly	Check program and change
	Incorrect switching signal or signal sets in too soon	Set proximity switch correctly, see chapter 5.4.1.
	Faulty switching	Interchange compressed air connections and pressurize with compressed air
	Regulator is turned in too far	Set regulator correctly
Proximity switch emits incorrect signals No switching signal	Proximity switch is set incorrectly	Set proximity switch correctly, see chapter 5.4.1.
	Proximity switch is defective	Replace proximity switch, see chapter 5.4.1.
End-position stop too hard	Shock absorber (G) is set incorrectly	Set shock absorber (G) correctly, see chapter 5.3.4.2.
	Shock absorber (G) is defective	Replace shock absorber (G), see chapter 5.4.2.
End position is not reached No switching signal	Shock absorber turned in too far	Mount shock absorber (G) correctly, see chapter 5.4.2
	Pressure too low	Increase air pressure
	Load too high	Keep to technical data

Table 1 Troubleshooting

You can obtain further help from:

Friedemann Wagner GmbH, D-78559 Gosheim / Germany
Telephone: +49 (0) 7426 / 94900-0
Fax: +49 (0) 7426 / 94900-9
Email: info@wagnerautomation.de

8 Dismantling / Disposal

Dismantling

Dismantling work may only be carried out by skilled personnel. Make sure the shutdown procedure is followed before beginning dismantling work.
Further, the following must be followed where applicable / available:

- Release the energy in the pressure accumulator.
- Make sure there are no residual energies in the system anymore.
- Release all tensioned springs.

Disposal

The device is primarily made of steel and to a certain extent also of aluminum (except for the electrical equipment) and is to be disposed of in accordance with local environmental protection regulations applicable **at the time** of disposal.
Dispose of according to properties, existing laws and regulations as, for example:

- electric and electronic scrap (circuit boards), PC system, keyboard, mouse, monitor (according to WEEE regulations);
- batteries, fluorescent lamps/energy-saving lamps (collection points);
- plastics (housing), rubber;
- metal, steel, copper, aluminum (separated by sorts).

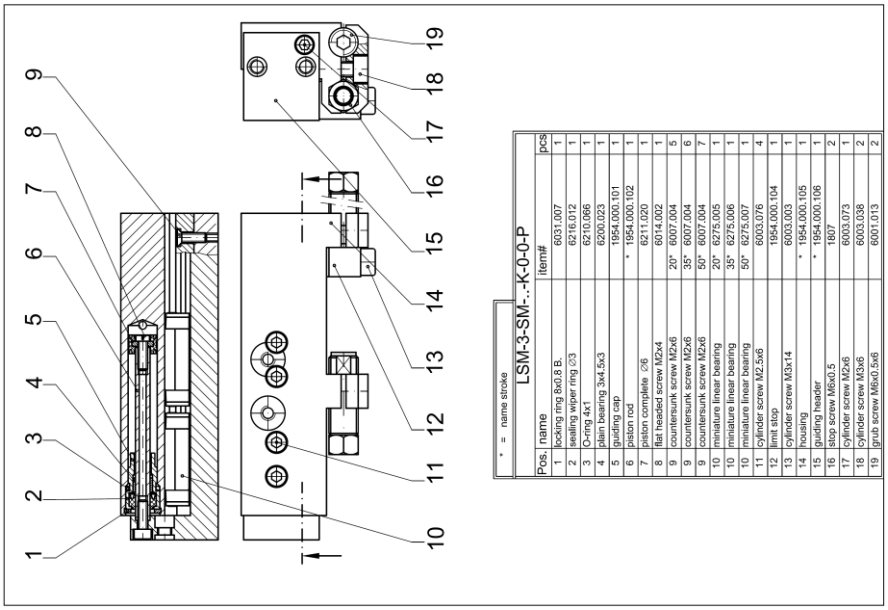
All parts touched by media must be decontaminated before disposal. Hazardous substances are to be removed from the device.
For proper disposal of hazardous substances, observe the material safety data sheets (MSDS) and current applicable disposal regulations.

Oils, solvents, cleaning agents and contaminated cleaning materials (brushes, cloths, etc.) must be disposed of according to local regulations, the applicable disposal codes and the information in the manufacturer's material safety data sheets.

9 Spare part lists and accessories

9.1 Spare part lists

LSM-3

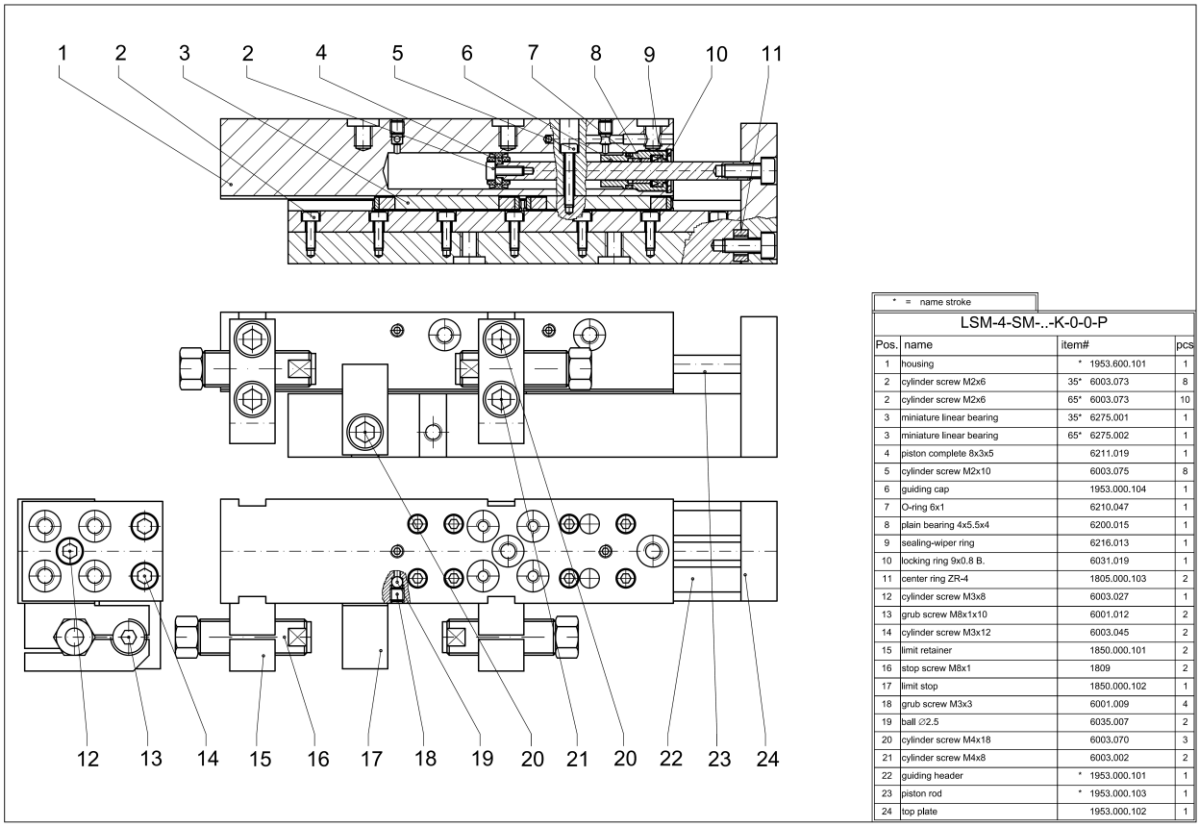


* = name stroke

LSM-3-SM-..-K-0-0-P

Pos.	name	item#	pcs
1	locking ring 8x0.8 B.	6031.007	1
2	sealing wiper ring ∅3	6216.012	1
3	O-ring 4x1	6210.066	1
4	plain bearing 3x4.5x3	6200.023	1
5	guiding cap	1954.000.101	1
6	piston rod	* 1954.000.102	1
7	piston complete ∅6	6211.020	1
8	flat headed screw M2x4	6014.002	1
9	countersunk screw M2x6	20° 6007.004	5
9	countersunk screw M2x6	35° 6007.004	6
9	countersunk screw M2x6	50° 6007.004	7
10	miniature linear bearing	20° 6275.005	1
10	miniature linear bearing	35° 6275.006	1
10	miniature linear bearing	50° 6275.007	1
11	cylinder screw M2.5x6	6003.076	4
12	limit stop	1954.000.104	1
13	cylinder screw M3x14	6003.003	1
14	housing	* 1954.000.105	1
15	guiding header	* 1954.000.106	1
16	stop screw M8x0.5	1807	2
17	cylinder screw M2x6	6003.073	1
18	cylinder screw M3x6	6003.038	2
19	grub screw M8x0.5x6	6001.013	2

LSM-4

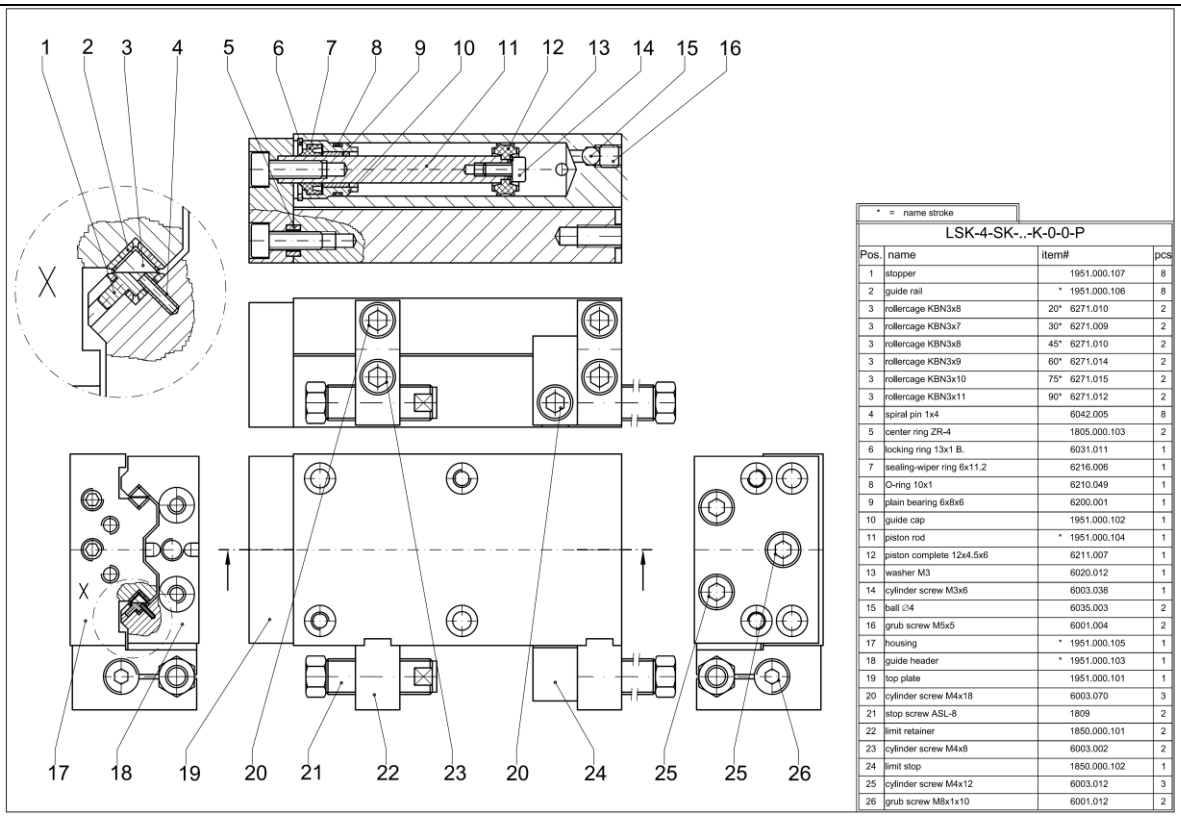


* = name stroke

LSM-4-SM-..-K-0-0-P

Pos.	name	item#	pcs
1	housing	* 1953.600.101	1
2	cylinder screw M2x6	35° 6003.073	8
2	cylinder screw M2x6	65° 6003.073	10
3	miniature linear bearing	35° 6275.001	1
3	miniature linear bearing	65° 6275.002	1
4	piston complete 8x3x5	6211.019	1
5	cylinder screw M2x10	6003.075	8
6	guiding cap	1953.000.104	1
7	O-ring 6x1	6210.047	1
8	plain bearing 4x5.5x4	6200.015	1
9	sealing-wiper ring	6216.013	1
10	locking ring 9x0.8 B.	6031.019	1
11	center ring ZR-4	1805.000.103	2
12	cylinder screw M3x8	6003.027	1
13	grub screw M8x1x10	6001.012	2
14	cylinder screw M3x12	6003.045	2
15	limit retainer	1850.000.101	2
16	stop screw M8x1	1809	2
17	limit stop	1850.000.102	1
18	grub screw M3x3	6001.009	4
19	ball ∅2.5	6035.007	2
20	cylinder screw M4x18	6003.070	3
21	cylinder screw M4x8	6003.002	2
22	guiding header	* 1953.000.101	1
23	piston rod	* 1953.000.103	1
24	top plate	1953.000.102	1

LSK-4

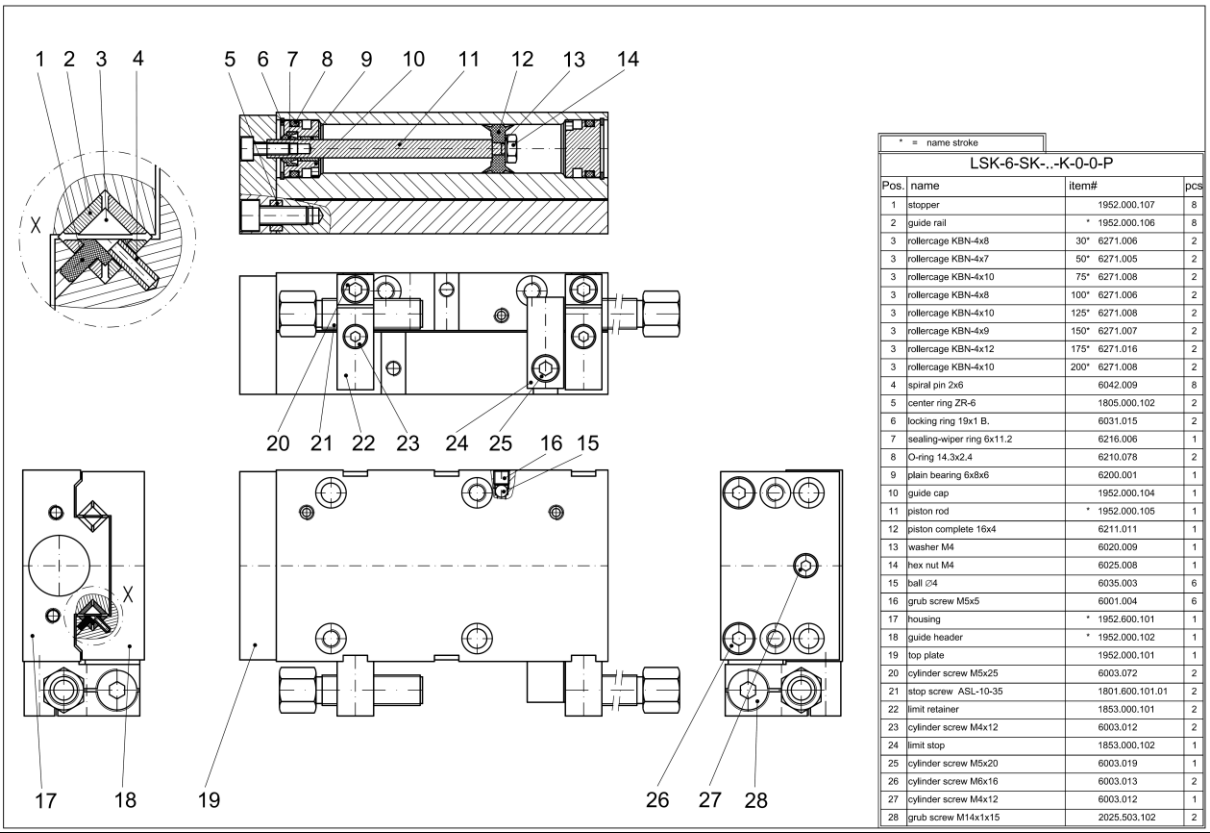


* = name stroke

LSK-4-SK-..-K-0-0-P

Pos.	name	item#	pcs
1	stopper	1951.000.107	8
2	guide rail	* 1951.000.106	8
3	rollercage KBN3x8	20° 6271.010	2
3	rollercage KBN3x7	30° 6271.009	2
3	rollercage KBN3x8	45° 6271.010	2
3	rollercage KBN3x9	60° 6271.014	2
3	rollercage KBN3x10	75° 6271.015	2
3	rollercage KBN3x11	90° 6271.012	2
4	spiral pin 1x4	6042.005	8
5	center ring ZR-4	1805.000.103	2
6	locking ring 13x1 B.	6031.011	1
7	sealing-wiper ring 6x11.2	6216.006	1
8	O-ring 10x1	6210.049	1
9	plain bearing 6x8x6	6200.001	1
10	guide cap	1951.000.102	1
11	piston rod	* 1951.000.104	1
12	piston complete 12x4.5x6	6211.007	1
13	washer M3	6020.012	1
14	cylinder screw M3x6	6003.038	1
15	ball ∅4	6035.003	2
16	grub screw M5x5	6001.004	2
17	housing	* 1951.000.105	1
18	guide header	* 1951.000.103	1
19	top plate	1951.000.101	1
20	cylinder screw M4x18	6003.070	3
21	stop screw ASL-8	1809	2
22	limit retainer	1850.000.101	2
23	cylinder screw M4x8	6003.002	2
24	limit stop	1850.000.102	1
25	cylinder screw M4x12	6003.012	3
26	grub screw M8x1x10	6001.012	2

LSK-6



* = name stroke

LSK-6-SK-..-K-0-0-P

Pos.	name	item#	pcs
1	stopper	1952.000.107	8
2	guide rail	* 1952.000.106	8
3	rollercage KBN-4x8	30° 6271.006	2
3	rollercage KBN-4x7	50° 6271.005	2
3	rollercage KBN-4x10	75° 6271.008	2
3	rollercage KBN-4x8	100° 6271.006	2
3	rollercage KBN-4x10	125° 6271.008	2
3	rollercage KBN-4x9	150° 6271.007	2
3	rollercage KBN-4x12	175° 6271.016	2
3	rollercage KBN-4x10	200° 6271.008	2
4	spiral pin 2x6	6042.009	8
5	center ring ZR-6	1805.000.102	2
6	locking ring 19x1 B.	6031.015	2
7	sealing-wiper ring 6x11.2	6216.006	1
8	O-ring 14.3x2.4	6210.078	2
9	plain bearing 6x8x6	6200.001	1
10	guide cap	1952.000.104	1
11	piston rod	* 1952.000.105	1
12	piston complete 16x4	6211.011	1
13	washer M4	6020.009	1
14	hex nut M4	6025.008	1
15	ball ∅4	6035.003	6
16	grub screw M5x5	6001.004	6
17	housing	* 1952.600.101	1
18	guide header	* 1952.000.102	1
19	top plate	1952.000.101	1
20	cylinder screw M5x25	6003.072	2
21	stop screw ASL-10-35	1801.600.101.01	2
22	limit retainer	1853.000.101	2
23	cylinder screw M4x12	6003.012	2
24	limit stop	1853.000.102	1
25	cylinder screw M5x20	6003.019	1
26	cylinder screw M6x16	6003.013	2
27	cylinder screw M4x12	6003.012	1
28	grub screw M14x1x15	2025.503.102	2

Fig. 9-1 Spare part list

9.2 Accessories

The following accessories are available from us for the linear unit.

Designation	LSM-3-SM	LSM-4-SM	LSK-4-SK LSK-4-HK	LSK-6-SK
Centering rings	ZR-3 ZR-4	ZR-4	ZR-4	ZR-6
Proximity switches	NSI-O4-K-27 NSI-O4-S-27	NSI-O4-K-27 NSI-O4-S-27	NSI-O4-K-27 NSI-O4-S-27	NSS-O6,5-S-65
Cables for proximity switches	•	•	•	•
Fastening set for conventional proximity switches in the stop screw	-	-	-	BFS-O6,5-ASL-35
Shock absorbers	STD-6-S	STD-8-RS	STD-8-S	STD-14-W
1 stop block LSK-4			•	
Face-end stops	-	-	•	-