MONTECH®

USER MANUAL

Handling Components
Linear Unit
LEP

BA-100015

ENGLISH

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Revision index

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Directory

1 Important information

EC Declaration of Conformity (see MRL Appendix II A)

1.1 Manufacturer's declaration

Rules and standards complied with:

- Machinery guidelines 89/392 EWG, 91/368/EWG

Manufacturer

MONTECH AG
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Purpose

Linear units LEP are used where regular, linear movements in either the forward or reverse direction are required, primarily in a horizontal or vertical plane, e.g. as in automatic material handling.
Under all circumstances attention must be paid to the performance limits, as given in the technical data.
Correct setting of a device to the factors influencing a particular application guarantees optimal performance, operation free from faults and a long useful life.

Hazards

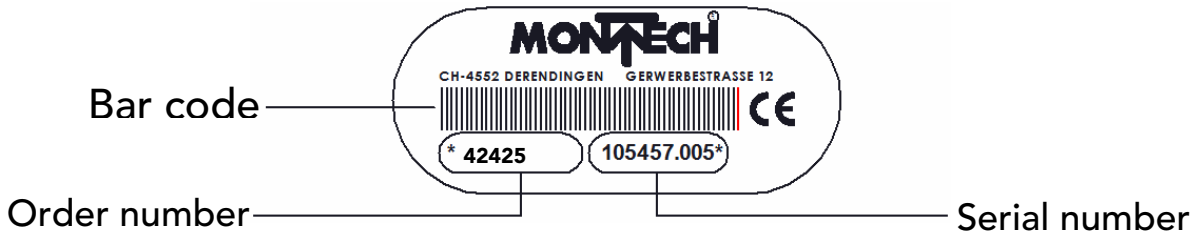
The use of linear units LEP in an installation is only permissible when they are guarded by MOVING, ISOLATING PROTECTIVE DEVICES as per EN 292-2, para.4.2.2.3. Failure to comply with this protective measure can result in injury due to squeezing or impact, especially when automatically starting machines are involved.

- Never allow a unit to run without its side cover in position!

Additional information

The aim of the present operating instructions is to enable users to employ linear units LEP correctly and safely.Should further information be required relating to the particular application, do not hesitate to contact the manufacturer.
When ordering user manual it is essential to quote the type and serial number.

Fig. 1-1: Nameplate



Montech AG
Management

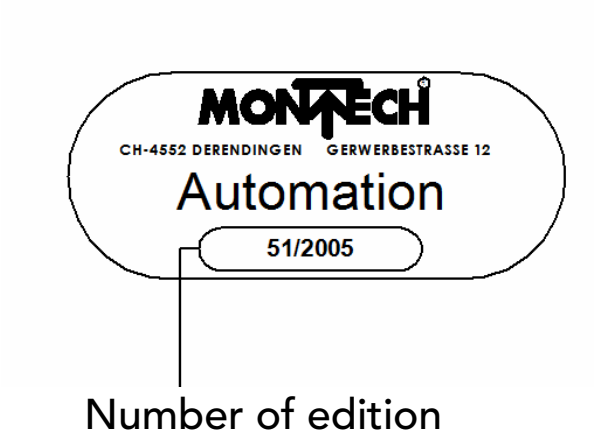
U. D. Wagner C. Wullschleger

1.2 Scope of the Operating Instructions

We adapt our products constantly to the newest state of the art and the realizations from practice.

Operating instrsuctions are regularly updated in accordance with modifications made to the products.

Fig. 1.2–1: Validity of the User Manual



1.3 Technical Data of Horizontal Units size 1

Stroke (min. / max.)		[mm]
Stroke, step range	1)	[mm]
Dia. of piston- Ø / dia. of piston rod - Ø		[mm]
Outward / inward force at 5 bar		[N]
Max, permissible additional mass $m_{adm.}$		[kg]
$F_{z\ adm.}$	2)	[N]
$F_{Y\ adm.}$	2)	[N]
$(F_z \cdot L_Y)_{adm.}$	2)	[Ncm]
Weight		[kg]
Operating pressure		[bar]
Operating medium		
Damping in end positions		
Repeatability	3)	[mm]
Check of end positions	4)	
Plug-in pneumatic connection		
Speed regulation	5)	
Noise level	6)	[dBA]
Degree of protection		
Lead between control system and LEP		
Connection capacity of printed circuit board		
Ambient: Temperature		[°C]
Rel. humidity		
Air purity		
Guaranty period		
Maintenance		
Material		

LEP-90-1A	LEP 90-1B	LEP 160-1A	LEP 160-1B	LEP 225-1A	LEP 225-1B
15/90	15/90	15/160	15/160	15/225	15/225
–	0–80	–	0–100	–	0–100
16/6	16/6	16/6	16/6	16/6	16/6
88/76	88/76	88/76	88/76	88/76	88/76
8	8	8	8	8	8
130	190	95	155	160	160
70	100	50	85	85	85
1200	1200	1200	1200	1200	1200
2.5	3.1	3.2	3.8	4.5	4.6
3-6					
air, oiled or unoiled, filtered to 5μm, dew point <6°C					
hydraulic shock-absorbers with fine adjustment					
< 0.005					
inductive proximity switches					
main cylinder: hose-Ø 4 mm					
variable stop: hose-Ø 4 mm					
adyustable exhaust throttles M5					
< 64					
IP 42					
max.17-core incl. 0 V and 24 V, 0.14-0.5 mm^2					
for 15 proximity switches					
10-50					
< 95% (without condensation)					
normal workshop atmosphere					
2 years from the date of delivery					
oiling the felt pads and rods					
aluminium, steel, bronze, plastic					

1) Difference between the two extended strokes
2) The values quoted for F_z, F_y and F_z L_Y apply to the entire stroke range
3) Scatter of the end setting during 100 successive strokes, conditions as 6)
4) With LED visible from outside
5) The pneumatically actuated variable stop has fixed throttles
6) Measured at 5 bar, maximum stroke, with attached mass m = 6.5 kg and fully open throttles

Diagrams of the linear unit size 1

Fig. 1-2: Travel time diagram LEP-90-1A/B

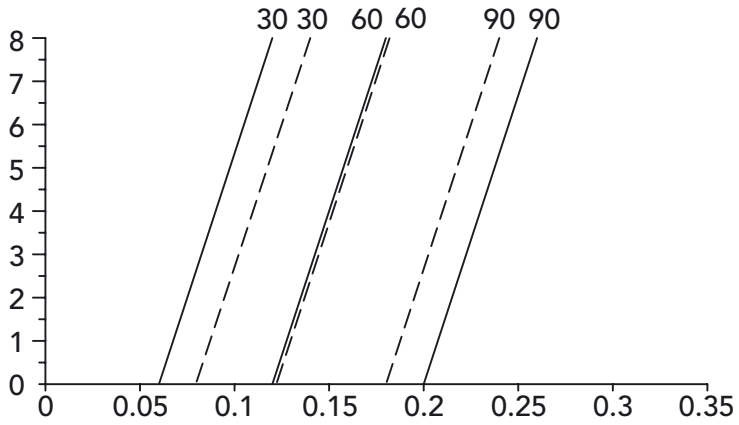
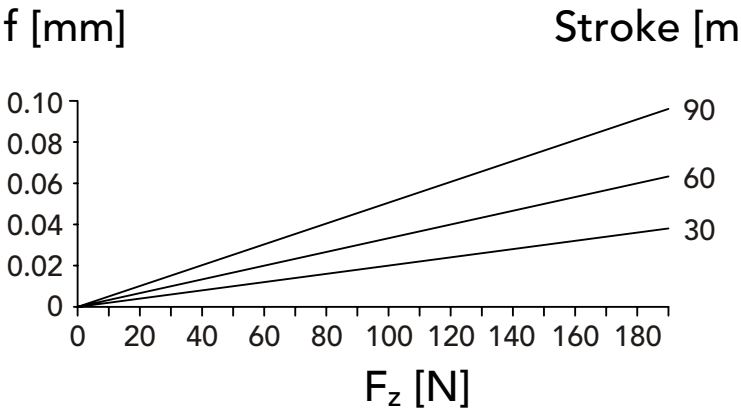


Fig. 1-3: Deformation diagram LEP-90-1A/B



- - Extension time
--- Retraction time unthrottled at 5 bar

f = Deflection (measured at the clamping plate)
F_z = Sum of all vertical forces

Fig. 1-4: Travel time diagram LEP-160-1A/B

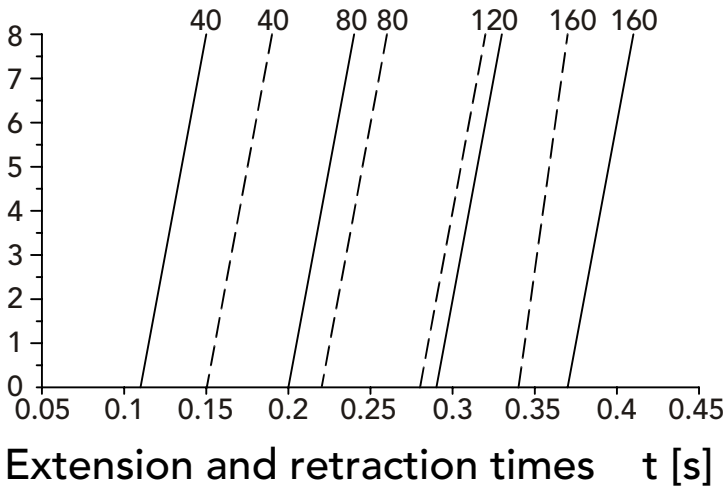
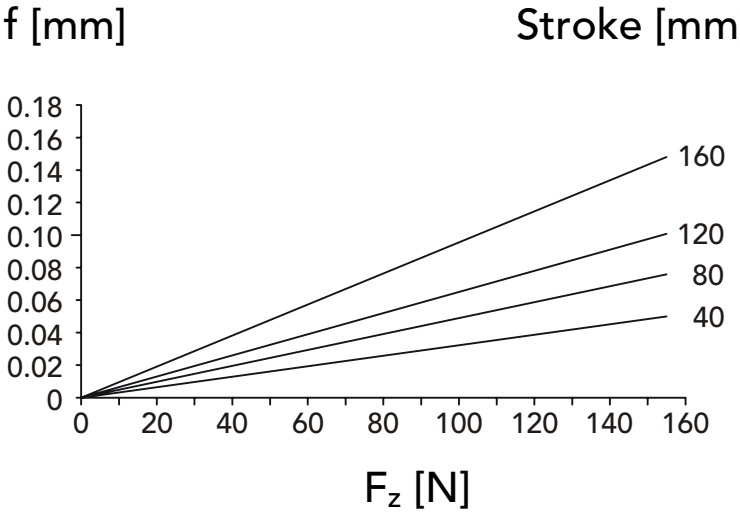


Fig. 1-5: Deformation diagram LEP-160-1A/B



- - Extension time
--- Retraction time unthrottled at 5 bar

f = Deflection (measured at the clamping plate)
F_z = Sum of all vertical forces

Fig. 1-6: Travel time diagram LEP-225-1A/B

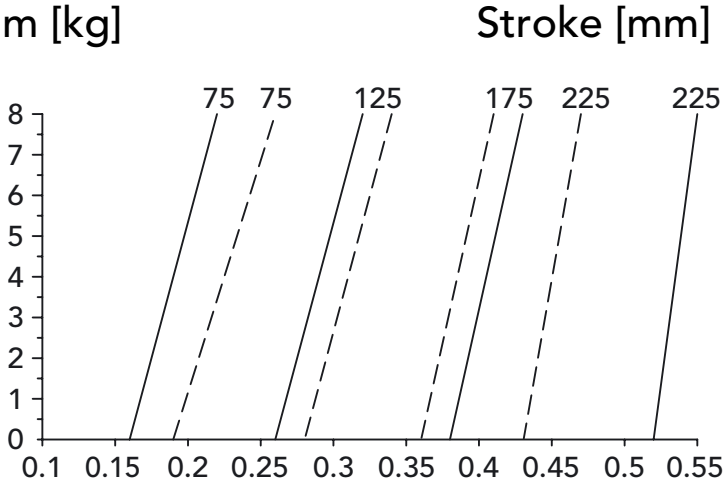
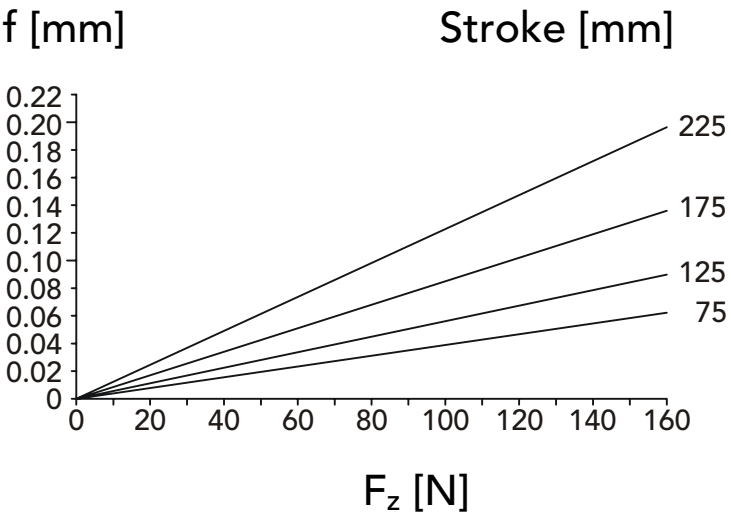


Fig. 1-7: Deformation diagram LEP-225-1A/B

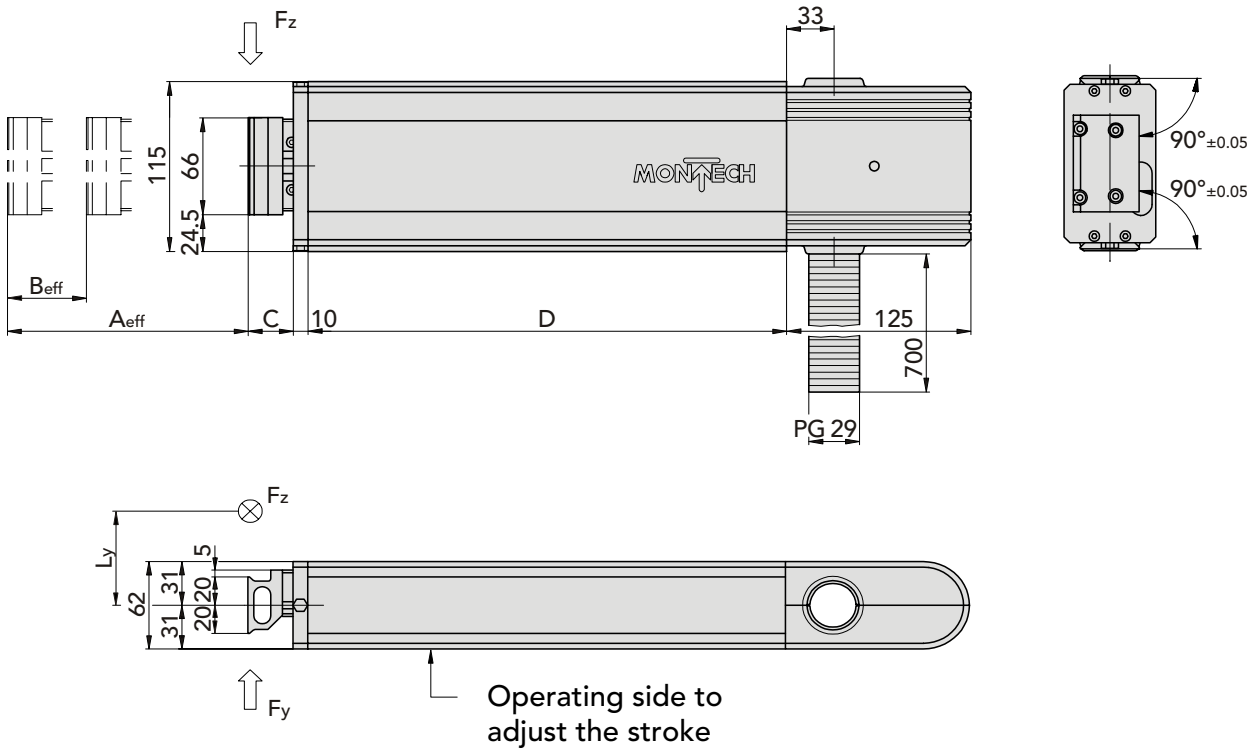


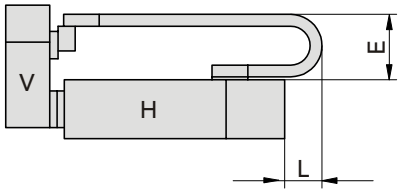
- - Extension time
--- Retraction time unthrottled at 5 bar

f = Deflection (measured at the clamping plate)
F_z = Sum of all vertical forces

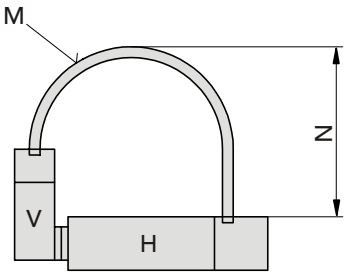
1.4 Dimensional drawing linear unit size 1

Fig. 1-8: Dimensional drawing linear unit size 1





Option with power supply chain



Standard with protective hose

horizontal	Amax	Bmax	C	D	E	L	M	N
LEP-90-1A	90	–	30-120	208	175	150	770	450
LEP-90-1B	90	80	30-120	265	175	150	820	460
LEP-160-1A	160	–	30-190	277	175	150	850	490
LEP-160-1B	160	100	30-190	345	175	150	900	500
LEP-225-1A	225	–	30-255	475	175	150	1170	590
LEP-225-1B	225	100	30-255	475	175	150	1170	590

A_{eff} Setting range of the first position ($A_{max} \geq A_{eff} \geq 15$)

B_{eff} Set difference in stroke between 1st and 2nd positions ($B_{eff} \leq B_{max}$ and $B_{eff} \leq A_{eff} - 10$)*)

C Distance from body to end face of clamping plate (dovetail)

D Mounting range (dovetail)

E Maximum height of the power supply chain above the body

L Maximum projection of the power supply chain

M Necessary extended length of protective hose from a vertical axis to the horizontal axis

N Maximum height of protective hose above the body

*) Both conditions must be fulfilled

1.5 Technical Data of Horizontal Units size 2

Stroke (min. / max.)		[mm]
Stroke, step range	1)	[mm]
Dia. of piston- Ø / dia. of piston rod - Ø		[mm]
Outward / inward force at 5 bar		[N]
Max, permissible additional mass $m_{adm.}$		[kg]
$F_{z\ adm.}$	2)	[N]
$F_{Y\ adm.}$	2)	[N]
$(F_z \cdot L_Y)_{adm.}$	2)	[Ncm]
Weight		[kg]
Operating pressure		[bar]
Operating medium		
Damping in end positions		
Repeatability	3)	[mm]
Check of end positions	4)	
Plug-in pneumatic connection		
Speed regulation	5)	
Noise level	6)	[dBA]
Degree of protection		
Lead between control system and LEP		
Connection capacity of printed circuit board		
Ambient: Temperatur		[°C]
Rel. humidity		
Air purity		
Guaranty period		
Maintenance		
Material		

LEP-320-2A	LEP 320-2B	LEP 450-2A	LEP 450-2B
50/320	50/320	50/450	50/450
–	0–150	–	0–150
20/8	20/8	25/10	25/10
136/114	136/114	211/177	211/177
8	8	8	8
120	190	145	145
100	160	120	120
3850	3850	3850	3850
8	9.6	10.5	11
3-6			
air, oiled or unoiled, filtered to 5μm, dew point <6°C			
hydraulic shock-absorbers with fine adjustment			
< 0.005			
inductive proximity switches			
main cylinder: hose-Ø 4 mm variable stop: hose-Ø 4 mm			
adyustable exhaust throttles G⅛"			
< 64			
IP 42			
max.17-core incl. 0 V and 24 V, 0.14-0.5 mm^2			
for 15 proximity switches			
10-50			
< 95% (without condensation)			
normal workshop atmosphere			
2 years from the date of delivery			
oiling the felt pads and rods			
aluminium, steel, bronze, plastic			

1) Difference between the two extended strokes
2) The values quoted for F_z, F_y and F_z L_Y apply to the entire stroke range
3) Scatter of the end setting during 100 successive strokes, conditions as 6)
4) With LED visible from outside
5) The pneumatically actuated variable stop has fixed throttles
6) Measured at 5 bar, maximum stroke, with attached mass m = 6 kg LEP-320-2 / 7.25 kg LEP-450-2 and fully open throttles

Diagrams of the linear unit size 2

Fig. 1-9: Travel time diagram LEP-320-2A/B

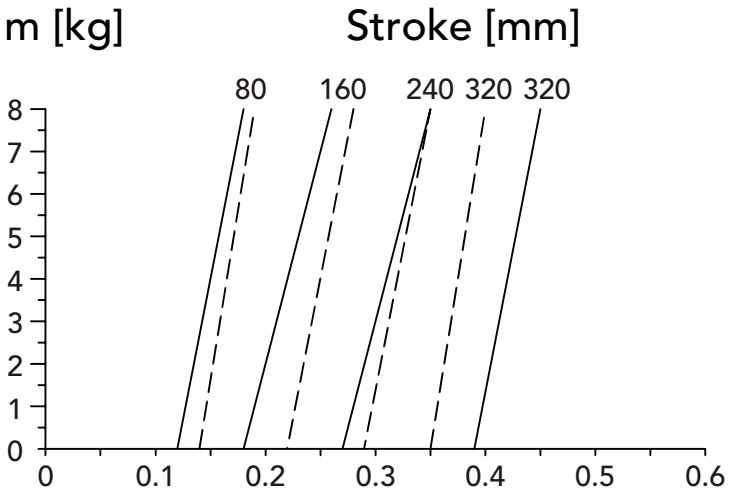
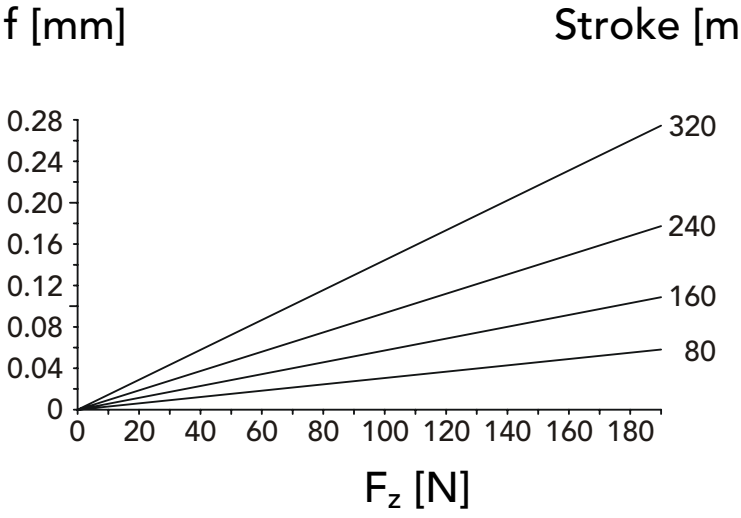


Fig. 1-10: Deformation diagram LEP-320-2A/B



- - Extension time
--- Retraction time unthrottled at 5 bar

f = Deflection (measured at the clamping plate)
F_z = Sum of all vertical forces

Fig. 1-11: Travel time diagram LEP-450-2A/B

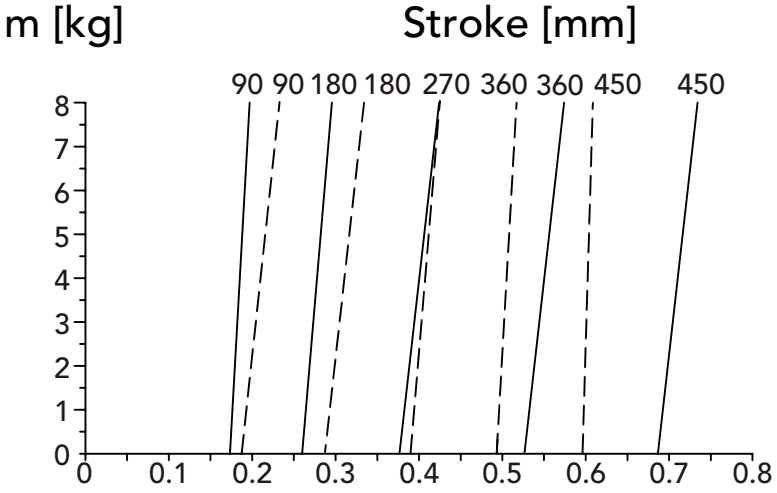
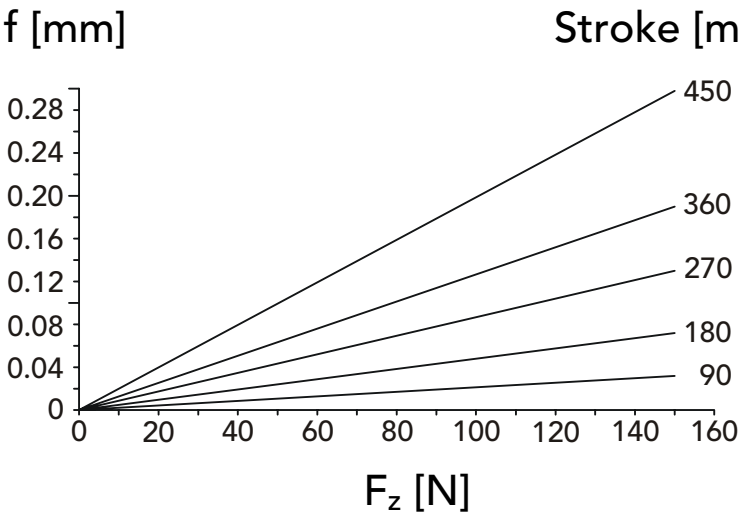


Fig. 1-12: Deformation diagram LEP-450-2A/B

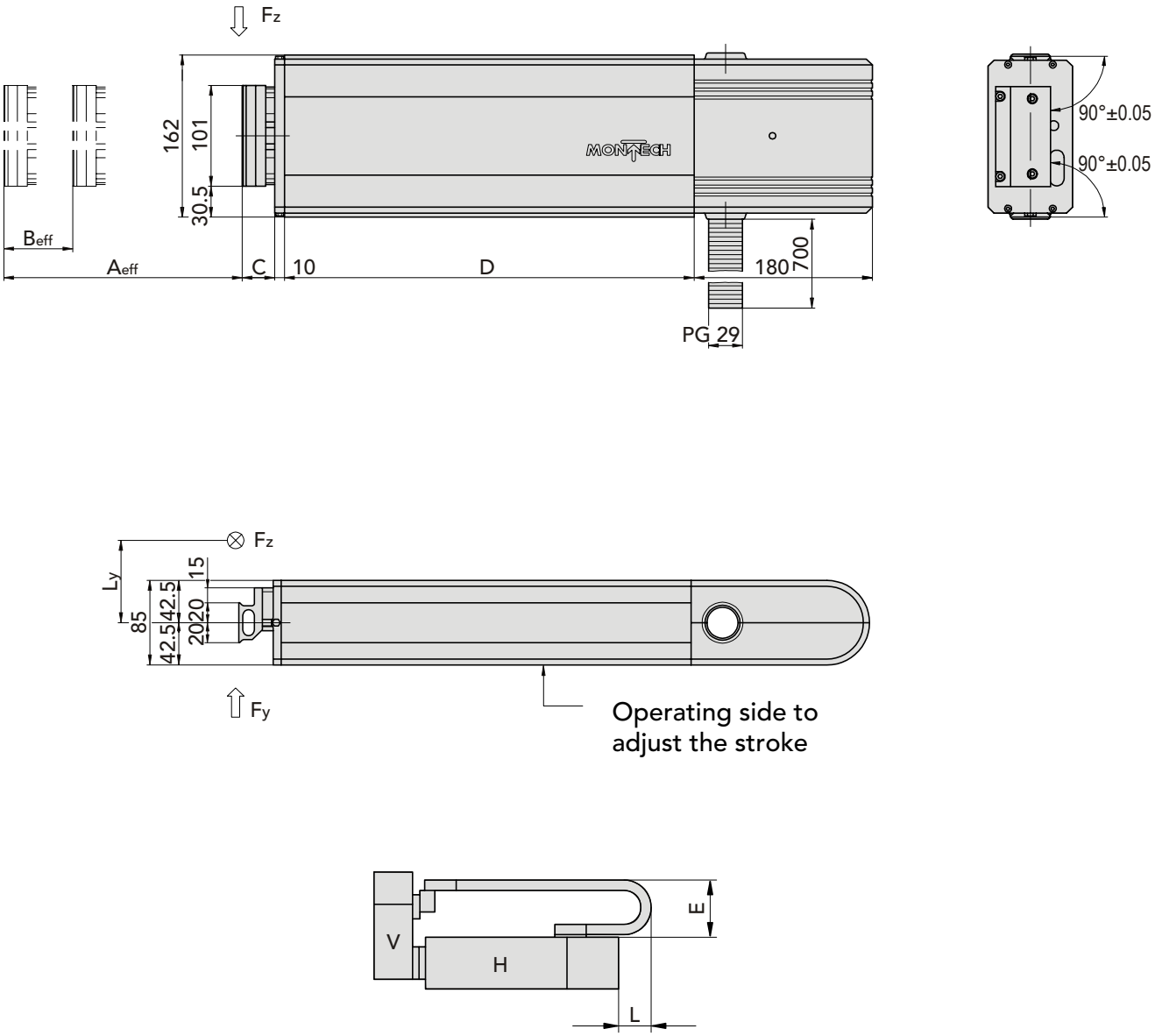


- - Extension time
--- Retraction time unthrottled at 5 bar

f = Deflection (measured at the clamping plate)
F_z = Sum of all vertical forces

1.6 Dimensional drawing linear unit size 2

Fig. 1-13:Dimensional drawing linear unit size 2



Standard with power supply chain

horizontal	Amax	Bmax	C	D	E	L
LEP-320-2A	320	–	32-352	500	175	150
LEP-320-2B	320	150	32-352	600	175	150
LEP-450-2A	450	–	32-482	725	175	150
LEP-450-2B	450	150	32-482	725	175	150

A_{eff} Setting range of the first position ($A_{max} \geq A_{eff} \geq 50$)

B_{eff} Set difference in stroke between 1st and 2nd positions ($B_{eff} \leq B_{max}$ and $B_{eff} \leq A_{eff} -15$)*)

C Distance from body to end face of clamping plate (dovetail)

D Mounting range (dovetail)

E Maximum height of the power supply chain above the body

L Maximum projection of the power supply chain

*) Both conditions must be fulfilled

Notes:

1.7 Technical data of the linear unit vertically

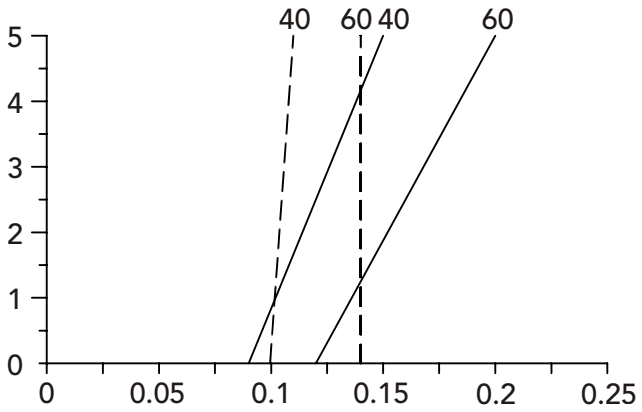
Stroke (min./max.)		[mm]
Stroke, step range	1)	[mm]
Dia. of piston-Ø/Dia. of piston-rod-Ø		[mm]
Outward / inward force at 5 bar		[N]
Max. permissible additional mass $m_{adm.}$		[kg]
$F_{x\ adm.}$	2)	[N]
$F_{Y\ adml.}$	2)	[N]
$(F_x \cdot L_Y)_{\ adm.}$	2)	[Ncm]
Weight		[kg]
Operating pressure		[bar]
Operating medium		
Damping in end positions		
Repeatability	3)	[mm]
Check of end positions	4)	
Plug-in pneumatic connection		
Speed regulation	5)	
Noise level	6)	[dBA]
Degree of protection		
Ambient: Temperatur		[°C]
Rel. humidity		
Air purity		
Guaranty period		
Maintenance		
Material		

LEP-60-1A	LEP 60-1B	LEP 90-1A	LEP 90-1B	LEP 160-1A	LEP 160-1B
15/60	15/60	15/90	15/90	15/160	15/160
–	0–50	–	0–80	–	0–100
16/6	16/6	16/6	16/6	16/6	16/6
see force diagram					
5	5	5	5	5	5
150	190	130	190	95	155
80	100	70	100	50	85
1200	1200	1200	1200	1200	1200
2.15	2.5	2.35	3.0	3.1	3.7
3-6					
air, oiled or unoiled, filtered to 5 µm, dew point < 6°C					
hydraulic shock-absorbers with fine adjustment					
< 0.005					
induktive proximity switches					
main cylinder: hose-Ø 4 mm variable stop: hose-Ø 4 mm					
adyustable exhaust throttles M5					
< 64					
IP 42					
10-50					
< 95% (without condensation)					
normal workshop atmosphere					
2 years from the date of delivery					
oiling the felt pads and rods					
aluminium, steel, bronze, plastic					

1) Difference between the two extended strokes
2) The values quoted for F_z, F_y and F_z L_Y apply to the entire stroke range
3) Scatter of the end setting during 100 successive strokes, conditions as 6)
4) With LED visible from outside
5) The pneumatically actuated variable stop has fixed throttles
6) Measured at 5 bar, maximum stroke, with attached mass m = 3 kg and fully open throttles

Diagrams of the linear unit vertically size 1

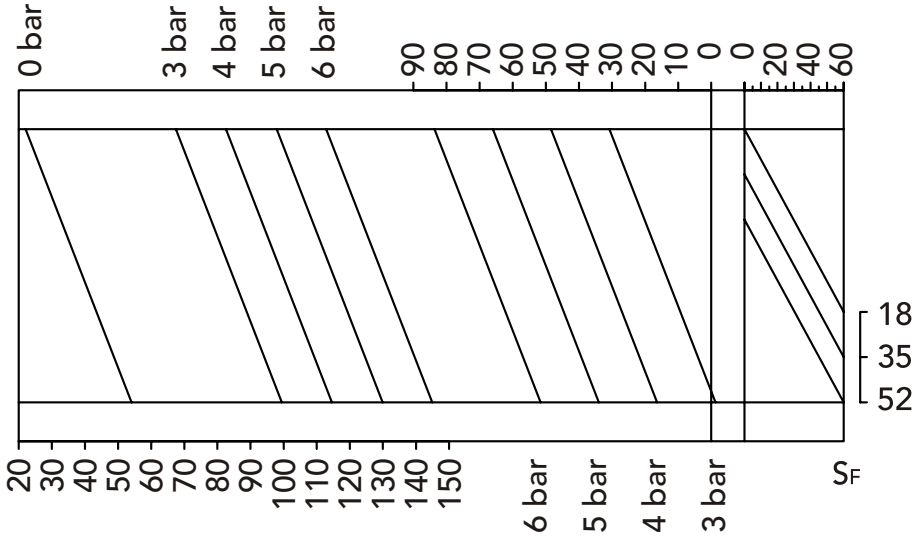
Fig. 1-14: Travel time diagram LEP-60-1A/B



- - Extension time
--- Retraction time unthrottled at 5 bar

Fig. 1-15: Force diagram LEP-60-1A/B

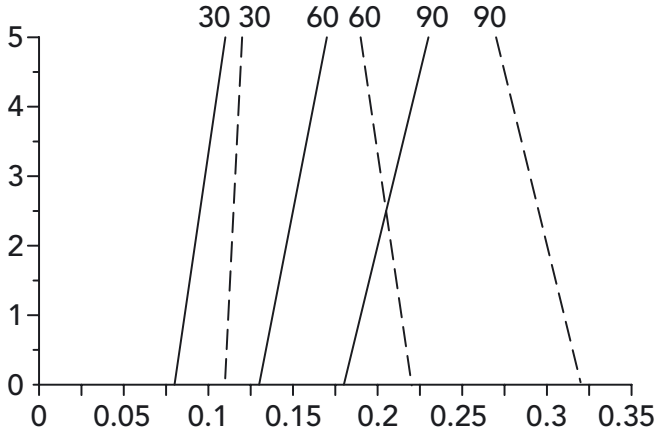
Retraction pressure [bar] Extension force [N] Stroke [mm]



Retraction force [N] Extension pressure [bar]
S_F = Range of adjustment of the spring force [mm]

Fig. 1-16: Travel time diagram LEP-90-1A/B

m [kg] Stroke [mm]

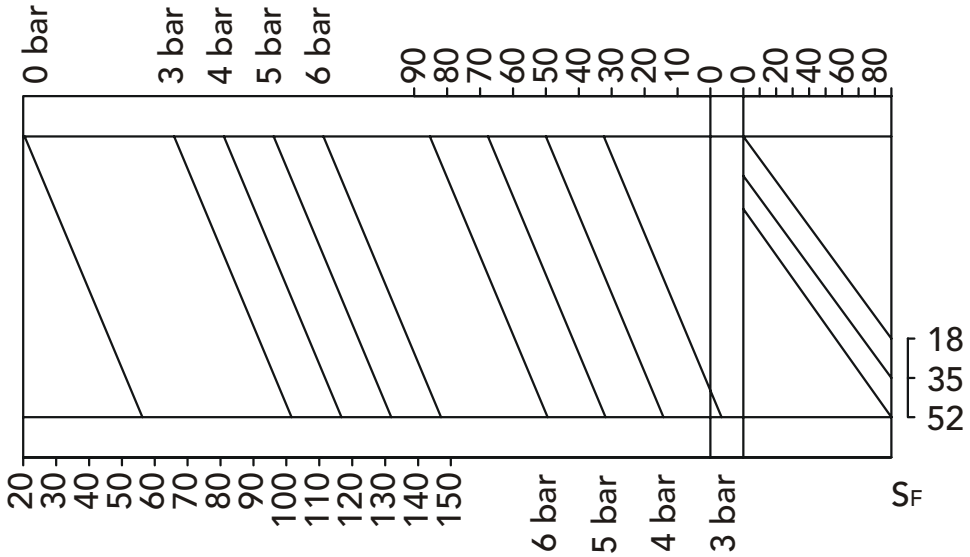


Extension and retraction times t [s]

- - Extension time
--- Retraction time unthrottled at 5 bar

Fig. 1-17: Force diagram LEP-90-1A/B

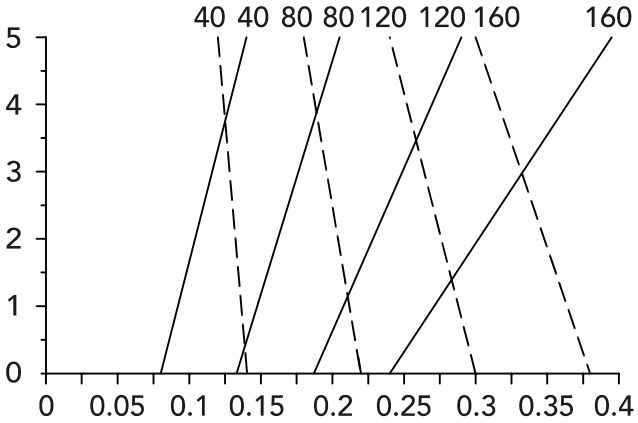
Retraction pressure [bar] Extension force [N] Stroke [mm]



Retraction force [N] Extension pressure [bar]
S_F = Range of adjustment of the spring force [mm]

Fig. 1-18: Travel time diagram LEP-160-1A/B

m [kg] Stroke [mm]

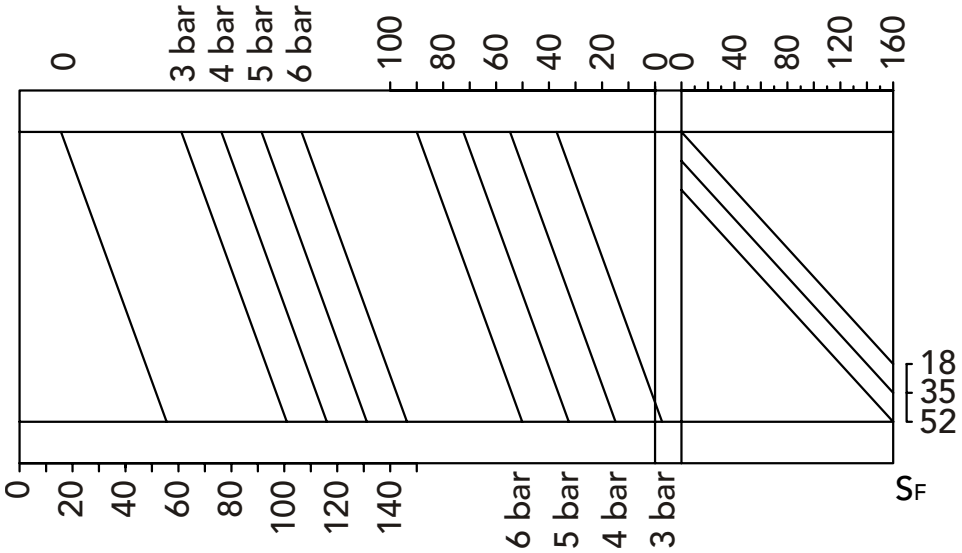


Extension and retraction times t [s]

- - Extension time
--- Retraction time unthrottled at 5 bar

Fig. 1-19: Force diagram LEP-160-1A/B

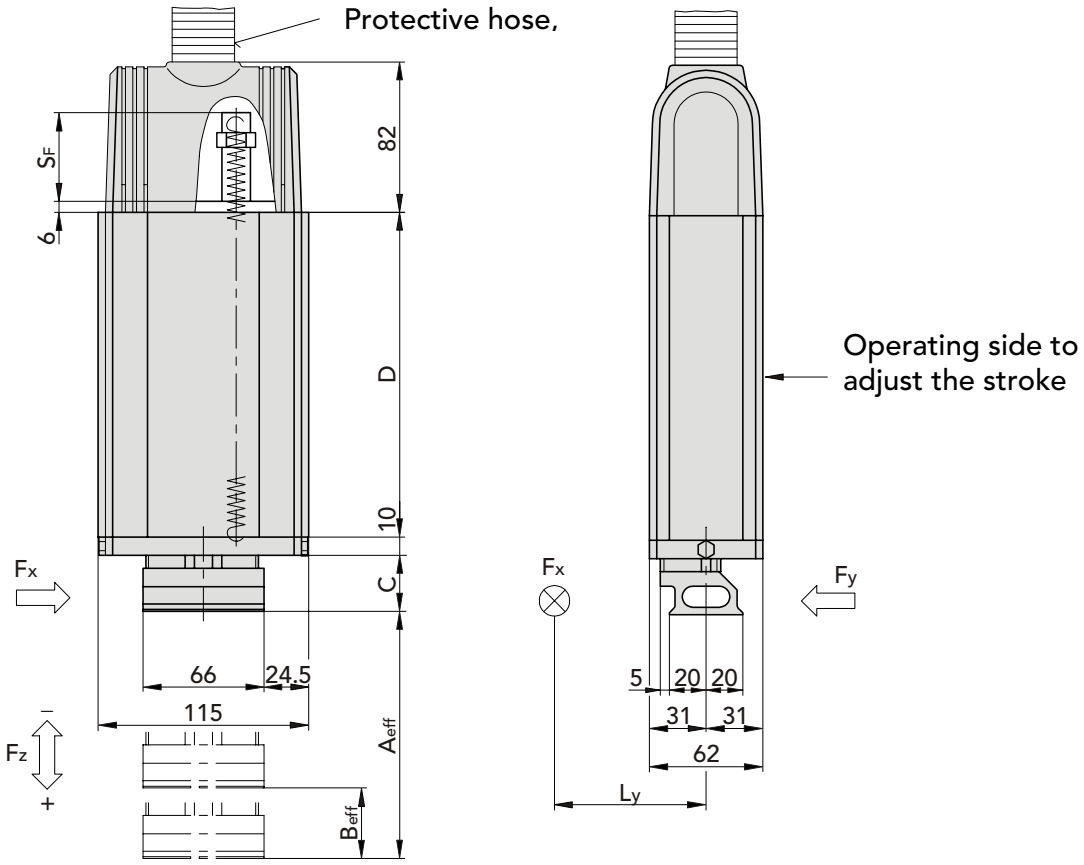
Retraction pressure [bar] Extension force [N] Stroke [mm]



Retraction force [N] Extension pressure [bar]
S_F = Range of adjustment of the spring force [mm]

1.8 Dimensional drawing linear unit vertically

Fig. 1-20: Dimensional drawing linear unit vertically



vertikal	Amax	Bmax	C	D
LEP-60-1A	60	–	30-90	177
LEP-60-1B	60	50	30-90	208
LEP-90-1A	90	–	30-120	208
LEP-90-1B	90	80	30-120	365
LEP-160-1B	160	–	30-190	277
LEP-160-1B	160	100	30-190	345

A_{eff} Setting range of the first position ($A_{max} \geq A_{eff} \geq 15$)

B_{eff} Set difference in stroke between 1st and 2nd positions ($B_{eff} \leq B_{max}$ und $B_{eff} \leq A_{eff} -10$)*)

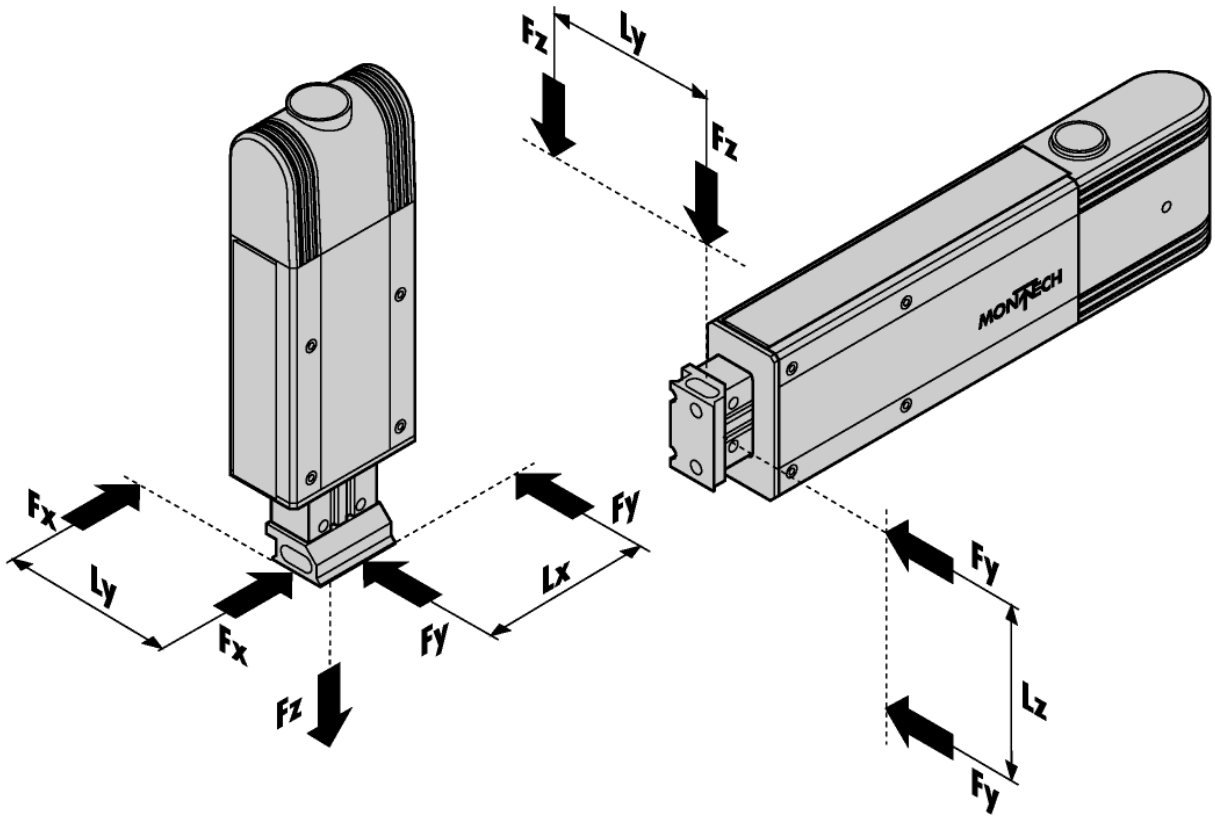
C Distance from body to end face of clamping plate (dovetail)

D Mounting range (dovetail)

*) Both conditions must be fulfilled

1.9 Points of Action of Forces and Torques

Fig. 1-21: Points of Action of Forces and Torques



Vertical units:

$(F_X \cdot L_Y)adm. = (F_Y \cdot L_X)adm.$

Horizontal units:

$(F_Z \cdot L_Y)zul. = (F_Y \cdot L_Z)adm.$

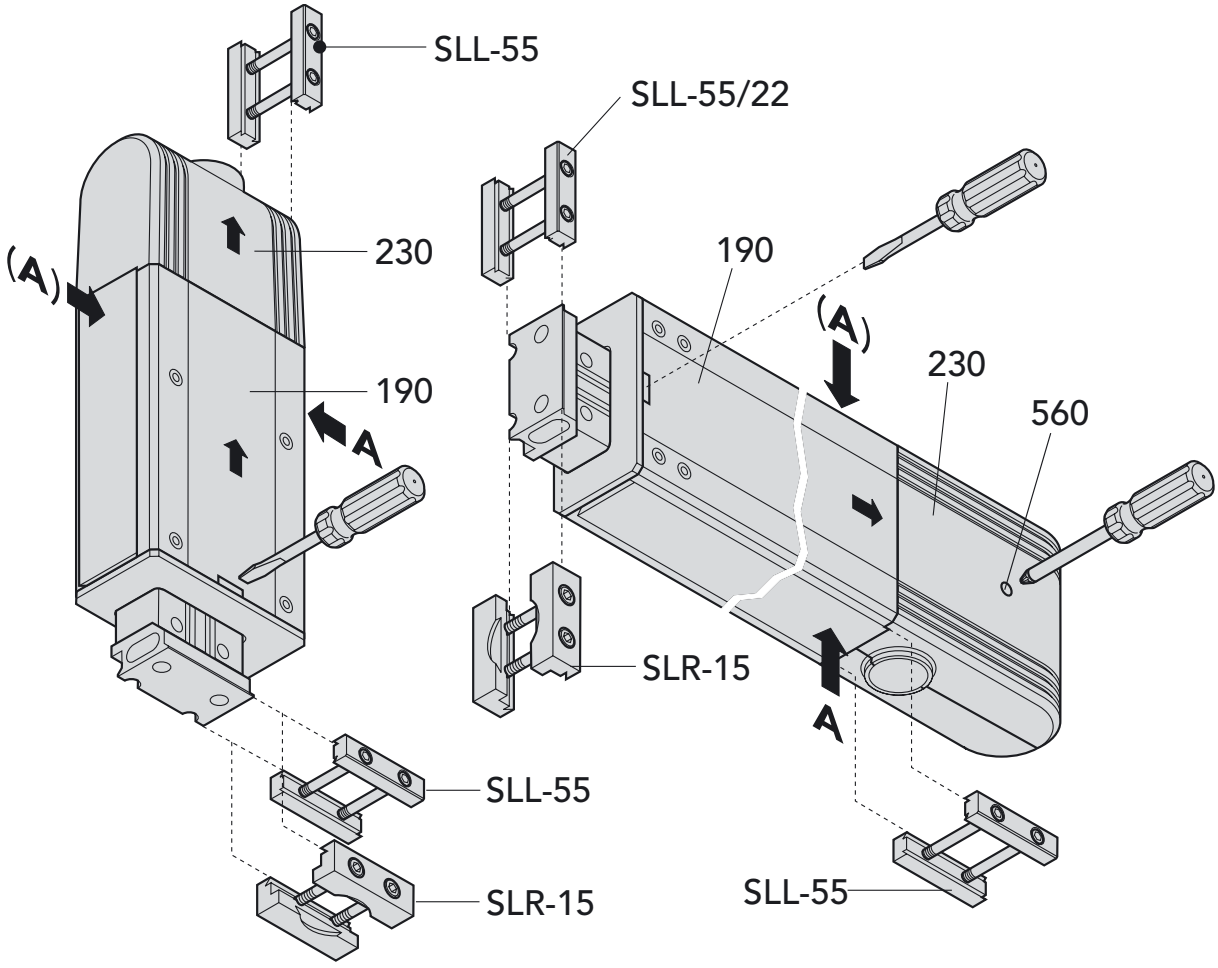
The effective static sum of the forces occurring (+ Fz or – Fz) can be determined with due allowance for the attached mass, the operating pressure, the set stroke and the setting of the return spring from the force diagrams in the linear unit brochure.

2 Commissioning

2.1 Assembly

All linear units type LEP have an external dovetail along the bottom and the top of the housing (A). The units may be mounted on this dovetail with the Quick-Set system The range of linear units type LEP contains includes both horizontal and vertical units. Vertical units have a return spring. If the desired mounting position differs from horizontal or vertical consult a Montech applications engineer. The values given by the travel time diagram and force diagram have to be corrected accordingly.

Fig. 2-1: Assembly the LEP



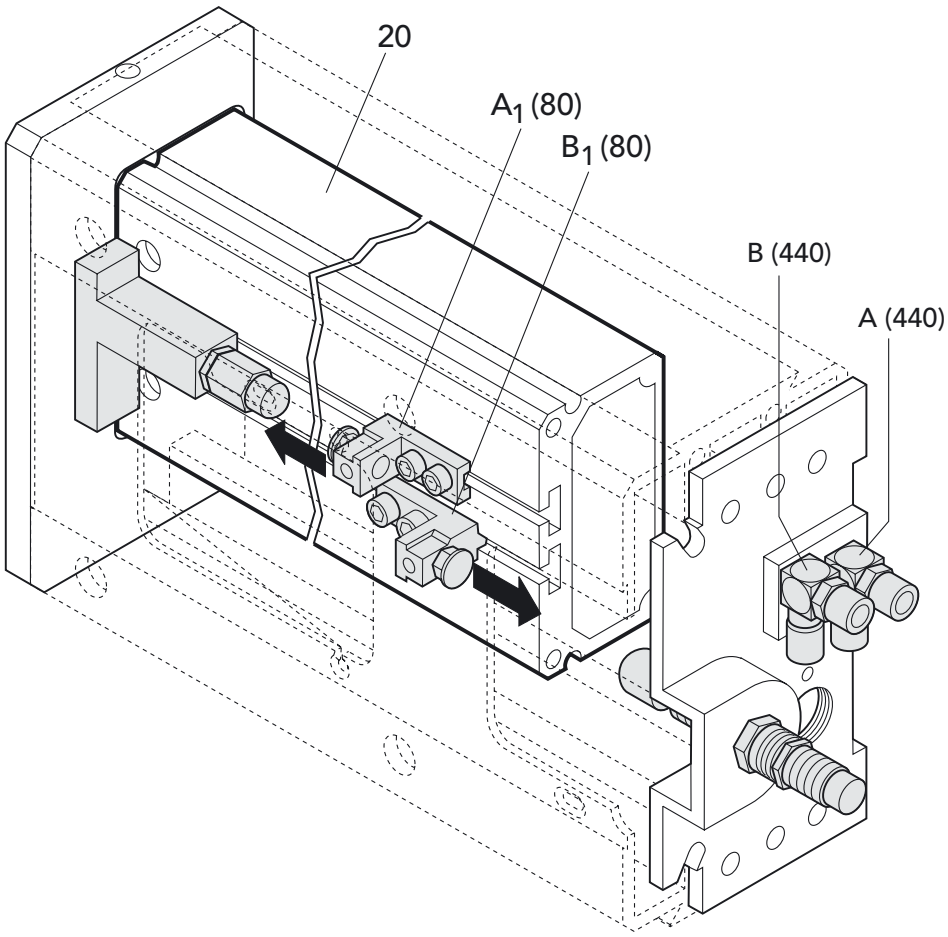
- SLL-55 for connections suitable for linear adjustment.
- SLR-15 for connections suitable for rotation.

The bolts of these "Quick-Set" mounting elements may be tightened with a torque not exceeding 6 Nm.

2.2 Pneumatic Connection to Horizontal Units

Open the horizontal hood (230) by unscrewing the screw (560) in (Fig. 2.1–1) with a Philips screwdriver 4 mm dia.. Pull off the side cover (190) with a screw-driver towards the rear.

Fig.2-2: Pneumatics connection of linear unit, version A



To move the slide out (extended)

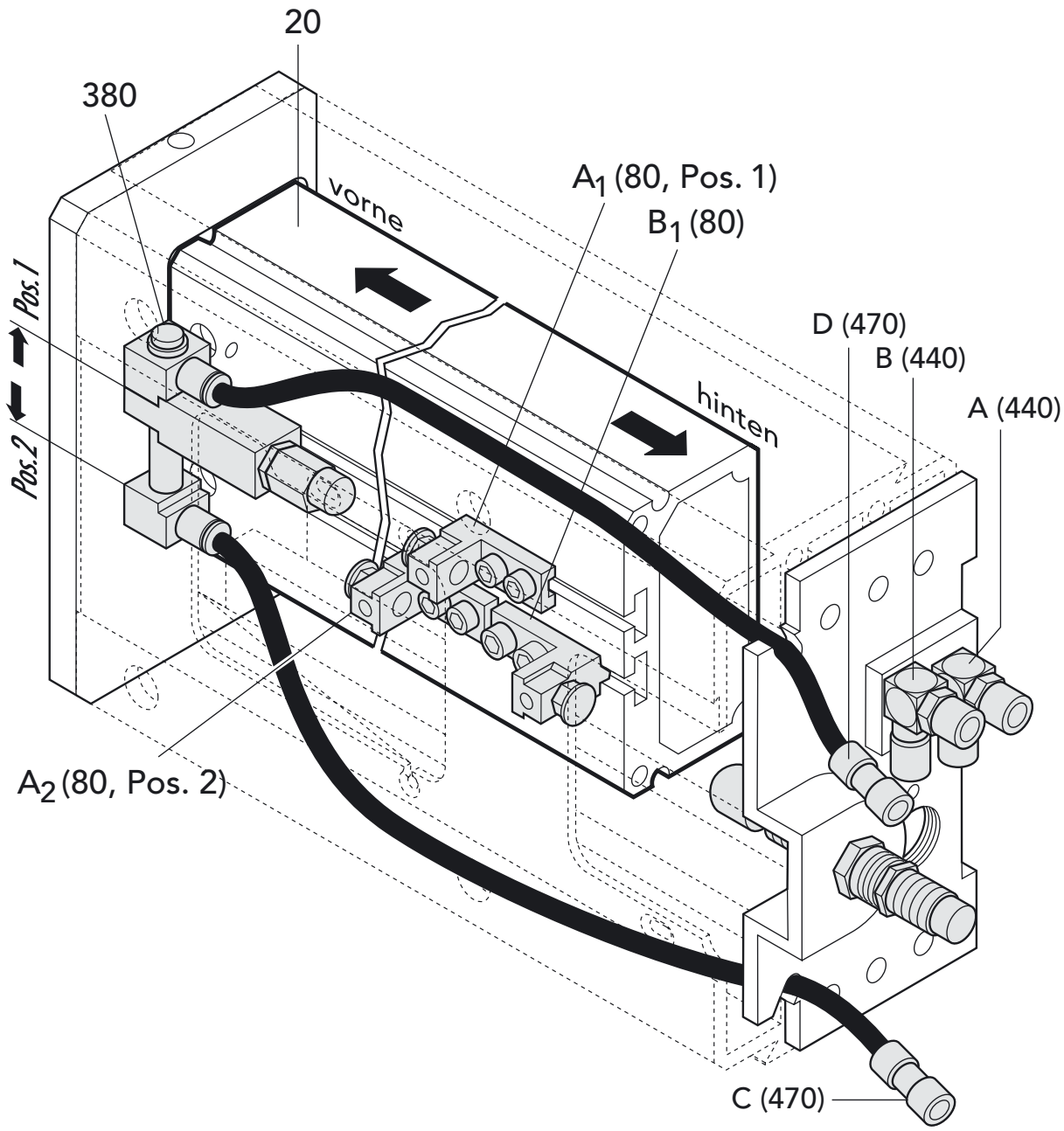
Via the pneumatic union (A; 440) the slide (20) moves forwards. The movement is limited by the stop (A1; 80).

To move the slide in (retracted)

Via the pneumatic union (A; 440) the slide (20) moves to the rear. The movement is limited by the stop (B1; 80)

LEP…-1B = Use pneumatic hose Ø 2.7/4 mm
LEP…-2B = Use pneumatic hose 4/6 mm

Abb. 2-3: Pneumatics connection of linear unit, version B



The variable stop (via connections C; 470 and D; 470) may only be actuated when the slide (20) is retracted.

To move the slide out to pos. 1

Via the pneumatic connection (C; 470) the variable stop moves upwards. Via the pneumatic connection (A; 440) the slide (20) moves forwards, limited by stop (A1; 80).

To move the slide out to pos. 2

Via the pneumatic connection (D; 470) the variable stop moves down. Via the pneumatic connection (A; 440) the slide (20) moves forwards,limited by stop (A2 80).

To move the slide in

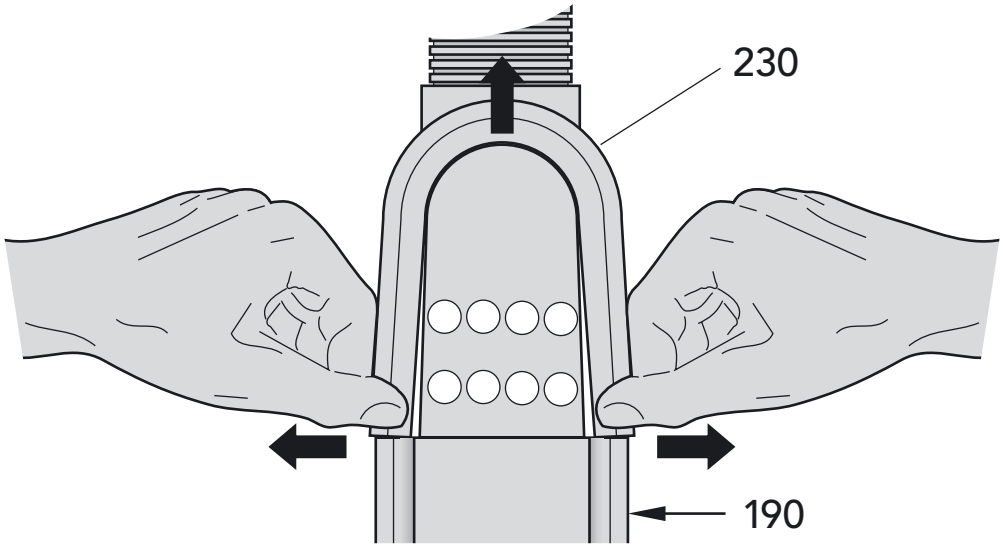
Via the pneumatic connection (B; 440) the slide (20) moves to the rear, limited by the variable stop (B1 80).

LEP…-1B = Use pneumatic hose -Ø 2.7/4 mm
LEP…-2B = Use pneumatic hose -Ø 4/6 mm

2.3 Pneumatic Connection to Vertical Units

Unlatch the vertical hood (230) by lightly pulling apart as shown below.

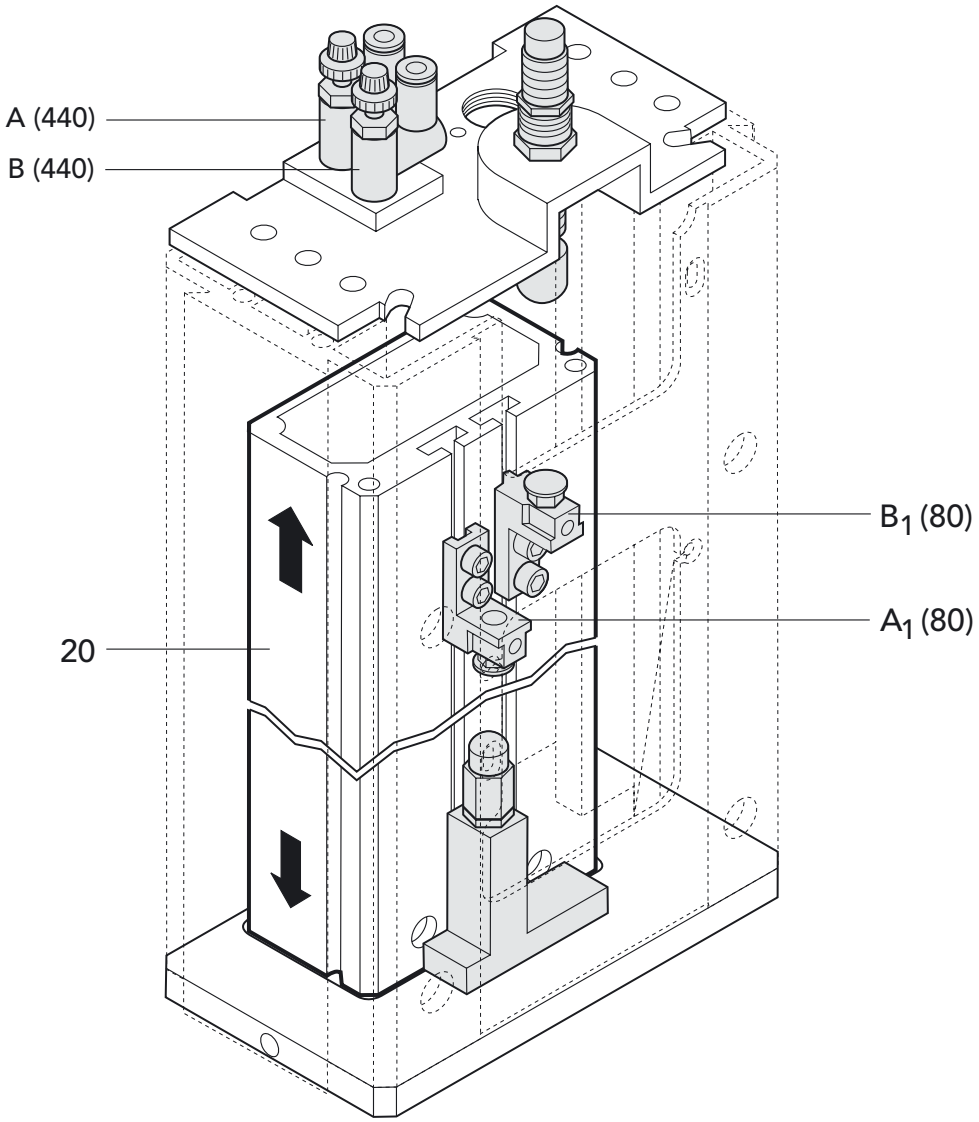
Fig. 2-4: Remove of the cover



Pull the side cover (190) upwards.

A-Versions

Fig. 2-5: Pneumatics connection of linear unit vertically, version A



To move the slide out (extend)

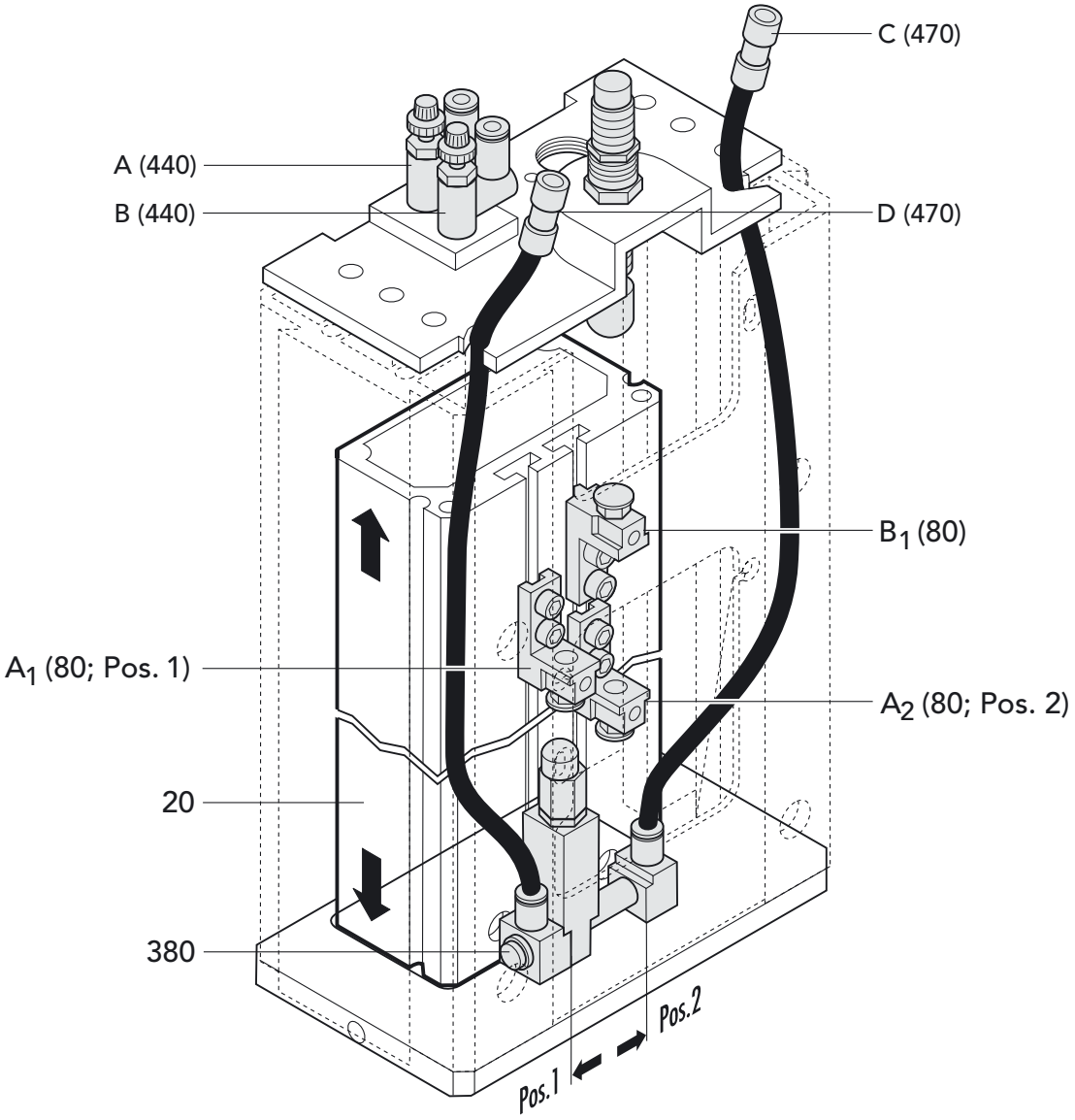
Via the pneumatic connection (A; 440) the slide (20) moves down, limited by the stop (A1; 80)

To move the slide in (retract)

Via the pneumatic connection (B; 440) the slide (20) moves up, limited by the stop (B1; 80).

B Versions

Fig. 2-6: Pneumatics connection of linear unit vertically, version B



The variable stop may only be actuated (via connections C; 470 and D; 470) when the slide is retracted.

To move the slide out to pos.1

Via the pneumatic connection (C; 470) the variable stop moves to the left. Via the pneumatic connection (A; 440) the slide (20) moves down, limited by the stop (A1; 80).

To move the slide out to pos.2

Via the pneumatic connection (D; 470) the variable stop moves to the right. Via the pneumatic connection (A; 440) the slide (20) moves down, limited by the stop (A2; 80).

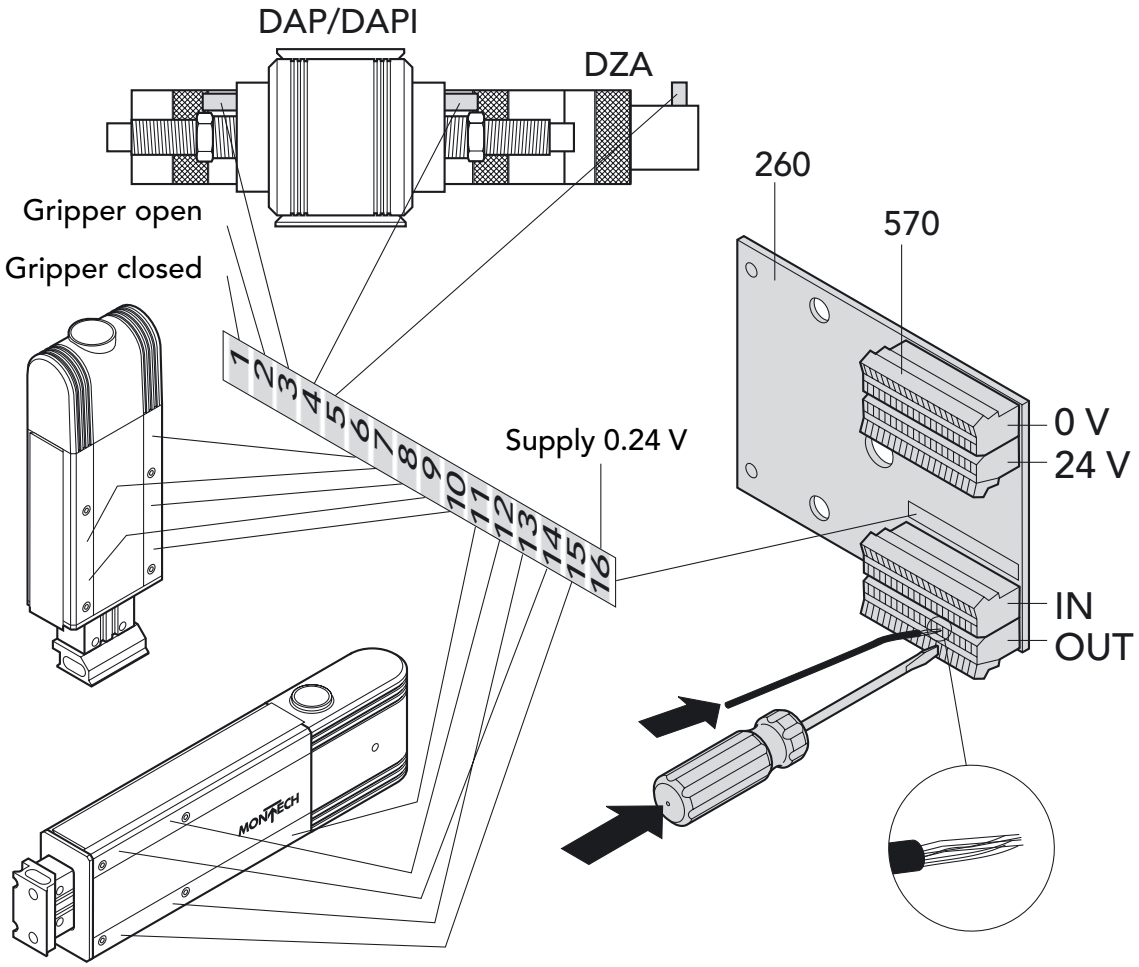
To move the slide in

Via the pneumatic connection (B; 80) the slide (20) moves upwards, limited bythe stop (B1; 80).

For all connections to the vertical units pneumatic hoses 2.7/4 mm dia. are used.

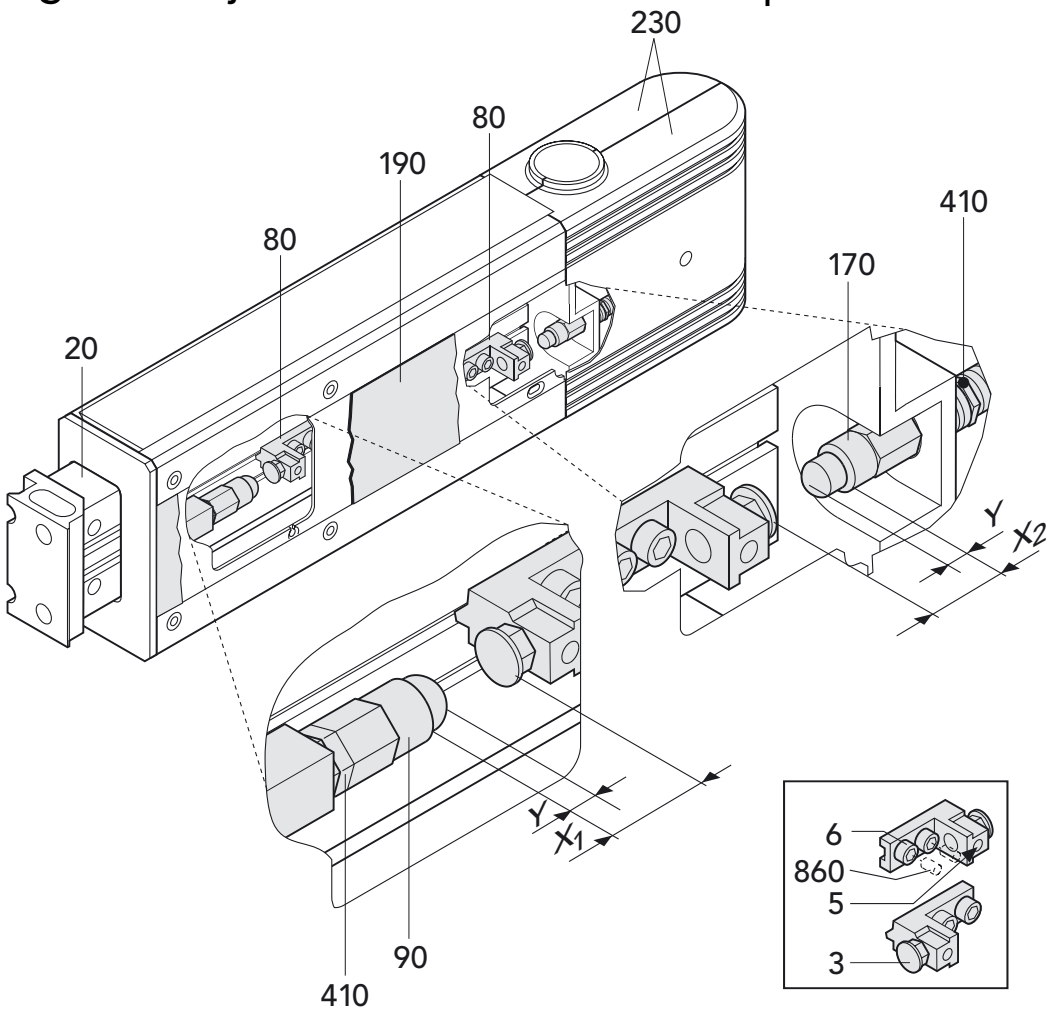
2.4 Details of the printed circuit board
(only on horizontal units)

Fig. 2-7: Plan of the plugs for the linear unit horizontal



2.5 Setting the mechanical end-stops

Fig. 2-8: Adjust the mechanical final stops for all sizes



Remove the hood (230) and side cover (190) as shown in Fig. 2.1-1 .

The end positions«in» or «out» are reached when the distance«X_1» or «X_2» = 0. A **rough setting** (> ± 2 mm) is obtained by slackening screw (6) and shifting the whole stop in the T-slot of the slide.

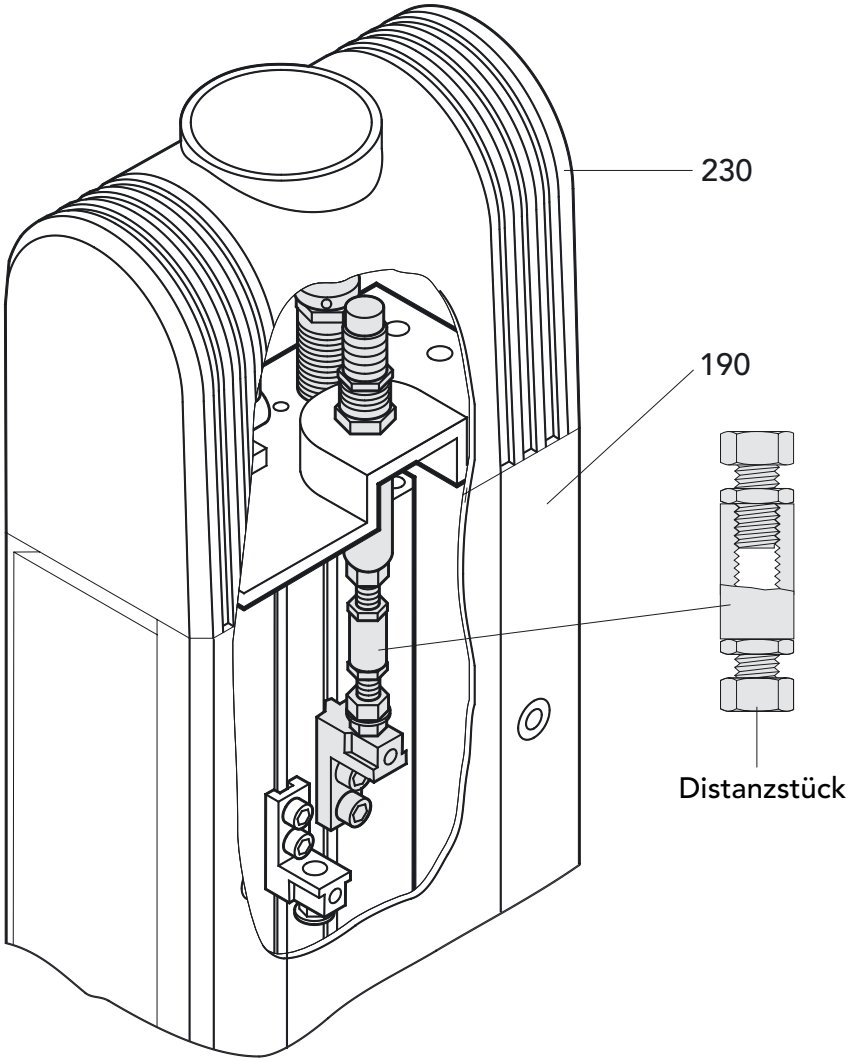
Torque for tightening screw (6): LEP…-1 = 5 Nm / LEP…-2 = 9.5 Nm

The end positions can only be set when the side cover (190) has been dismantled. When shifting the slide pneumatically there is a grave risk of squeezing and cutting.

KEEP HANDS AND TOOLS CLEAR WHEN MOVING THE SLIDE!

The rear stop is fixed and may not be adjusted (secured by screw 860; Fig.2.5–1)!
To set the horizontal unit roughly (> ± 2 mm) to the "in" position, the device has to be actuated pneumatically to the "in" position. Then the whole device is shifted on the dovetail mounting until the proper rough position is reached.With vertical units it is advisable to obtain the rough setting of the desired stroke by inserting a preset spacer.

Fig. 2-9: Stop on the back side



Fine adjustment is generally carried out when the slide has been moved pneumatically to the end position.

- Release securing screw (5; Fig. 2.5–1).
- Fix the exact end position of the slide by turning the stop screw (3).
- Lightly tighten the securing screw (5).

On linear units version B (with variable stop), this stop may only be adjusted in an unloaded state. Finally restore the covers as per the chapter “Mounting the protective covers”.

2.6 Setting the Shock-Absorbers

(see Fig. 5.1–1 / 5.1–2 / 5.3–1 / 5.3–2)

Remove the hood (230) and the side cover (190) as shown in Fig. 2.1–1 The shock-absorbers (Fig. 2.5–1) (410) should be installed so that the damping cap projects
beyond the stop sleeve (90 or 170) by the distance “Y”.

LEP-...-1, Ymax. = 7 mm* / Ymin. = 5 mm
LEP-...-2, Ymax. = 12 mm* / Ymin. = 8 mm

Ymax represents maximum damping, Ymin minimum damping.
* Factory setting

Setting the rear shock-absorber (slide “in” (retracted)) Fig. 2.5–1

- Release the lock-nut of the shock-absorber (410).
- Turn the shock-absorber into or out of the stop sleeve (170).
- Retighten the lock-nut.

Setting the front shock-absorber (slide “out” (extended))

Reducing “Y” as perFig. 2.5-1:

- Hold the lock-nut (410) of the shock-absorber and release the stop sleeve (90).
- Turn out the stop sleeve to the desired distance.
- Release the lock-nut, turn out as far as the stop sleeve and retighten.
- Turn in the shock-absorber with lock-nut and stop sleeve again and retighten.

Increasing "Y" as per Fig. 2.5–1:

- With the spanner release the lock-nut (410) of the shock-absorber with the stop sleeve (90) and turn out slightly with the shock-absorber (410).
- Release the lock-nut of the stop sleeve and turn back slightly.
- Screw in the stop sleeve to the desired distance.
- Turn out the lock-nut as far as the stop sleeve and tighten.
- Turn the shock-absorber in again with lock-nut and stop sleeve and tighten.

The optimal setting of "Y" is reached when under service conditions (operating pressure, mass, speed) the slide operates and runs into the end position at apparently constant speed, without causing an impact..

- If an impact is experienced, increase "Y".
- If approach to the end positions is obviously slowed down in the last 2-3 mm, "Y" must be reduced.

Refit the covers as per "Mounting the protective covers".

Note:

When the shock-absorbers are optimally set a considerable amount of cycle time is saved.

2.7 Connecting the Inductive Proximity Switches

As standard the linear units are supplied with built-in proximity switches PNP.

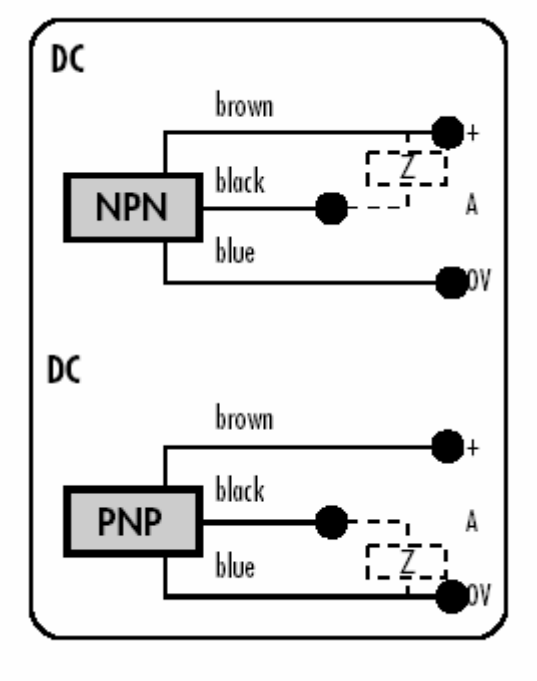
The horizontal and vertical units of version "A" each contain two inductive proximity switches to check the two end positions. The horizontal and vertical units of version "B" each contain 5 switches: one to check the “in” position of the slide, two to check the “out” end positions of the slide and two to check the end positions of the variable stop.

The length of cable of of the proximity switches for vertical units is 2 m.
If a vertical unit is combined with a horizontal unit, the proximity switches of the vertical unit are wired to the printed circuit board of the horizontal unit (see Abb 2.4–1).

The proximity switches of the horizontal unit are pre-wired to the printed circuit board.

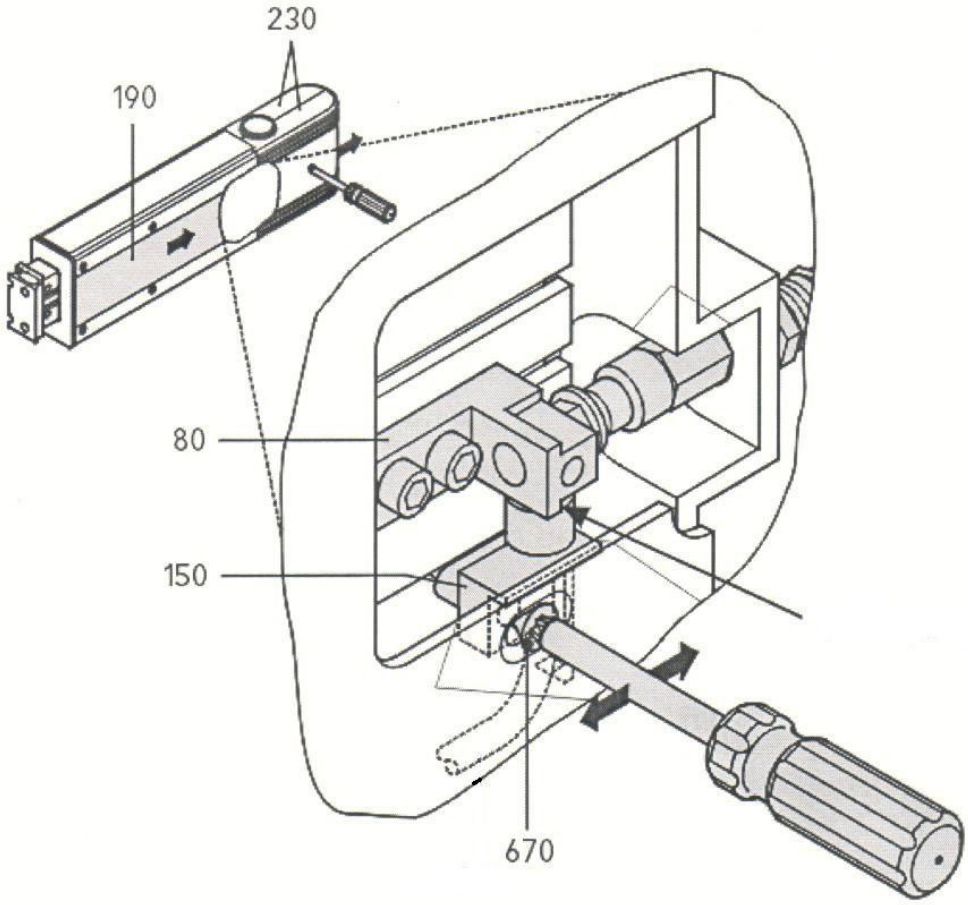
All proximity switches employed in the Montech range of handling devices (including those of grippers, rotary units and slides) possess the same characteristicand are thus interchangeable, provided the cable is sufficiently long.

Fig. 2-10: Connection plan for proximity switches



2.8 Setting the inductive proximity switches

Fig. 2-11: Setting the inductive proximity switches (Fig. 5.1–1 / 5.1–2 / 5.3–1 / 5.3–2)



- Remove the hood (230) and the side cover (190) (Fig. 2.1–1 und 2.3–1).
- With a Philips screwdriver (4 mm dia.) slacken screw (670) by about 1/4 of a turn.
- Displace the sensor holder (150) with the screwdriver until the damping edge of the stop (80) causes the LED of the electrically connected proximity switch to light up.
- Retighten screw (670).

By adjusting the proximity switch the electrical switching point and the mechanical end of movement can be very accurately matched.
Fit the covers as per “Mounting the protective covers”.

Note:

The proximity switch can only be set when the side cover (190) is removed. When the slide is moved pneumatically there is a grave risk of squeezing and cutting.

KEEP HANDS AND TOOLS CLEAR WHEN MOVING THE SLIDE!

2.9 Mounting the Protective Covers

When all setting has been completed, the protective covers of the LEP must be mounted again.

Horizontal units (Fig. 2.1–1 / 5.1–1 / 5.1–2)

- Push in the side cover (190) along the groove in the casing (10).
- Engage the protective hose (500) in the hose holder (200).
- Insert the rear part of the hood (230) with the lug through the opening in the printed circuit board (260).
- Put on the front part of the hood (230) from the opposite side and secure with screw (560).

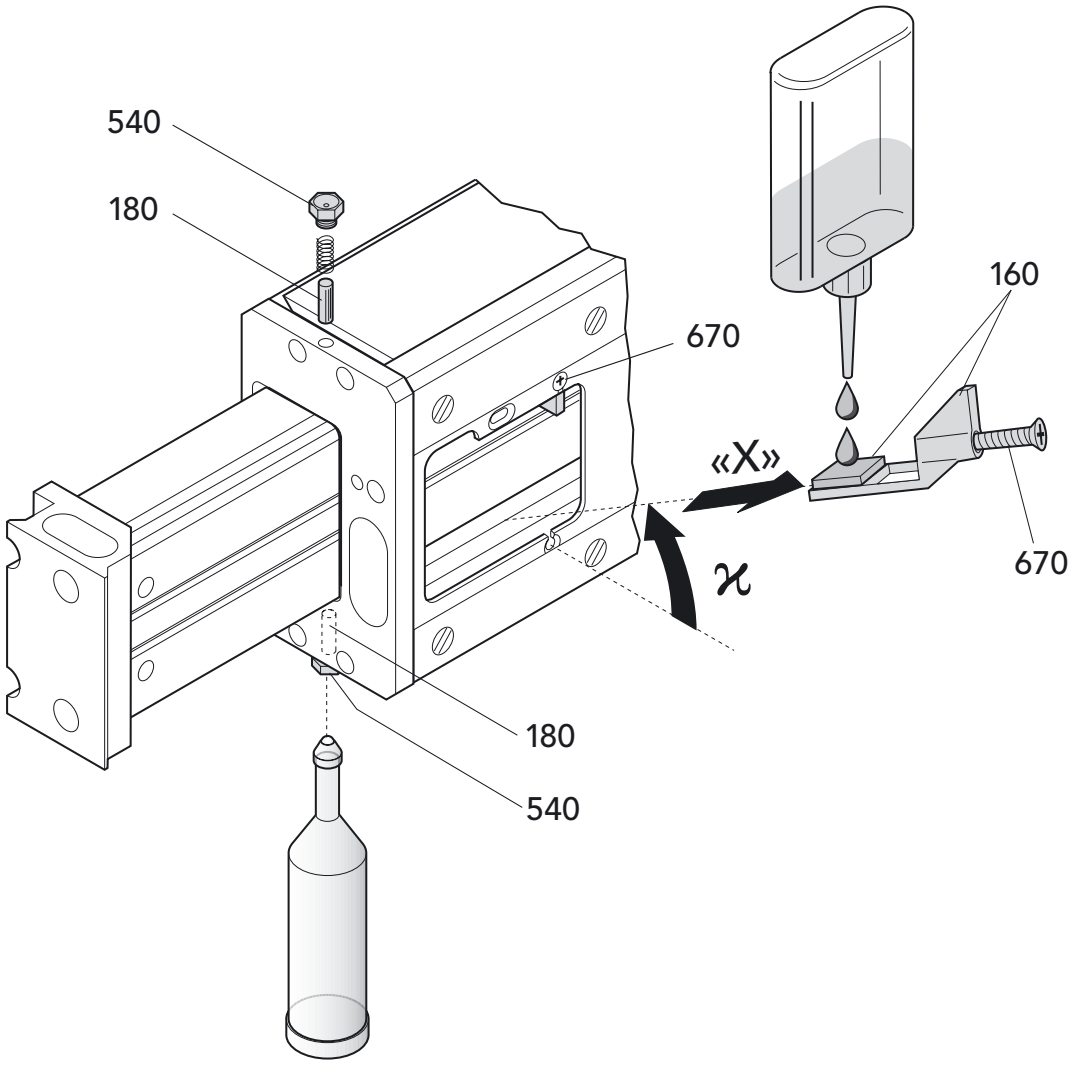
Vertical units (Fig. 2.1–1 / 2.3–1 / 5.3–1 / 5.3–2)

- Push in the side cover (190) along the groove in the casing (10).
- Push the hood (230) of the vertical unit over the rear end-plate (50) and latch into it.

3 Maintenance

3.1 Oiling the Felt Pads and Felt Wicks

Fig. 3-1: Oiling the Felt Pads and Felt Wicks



3.2 Lubrification

The felt pads (160) and felt wicks (180) should be oiled at intervals of 800 hours.

The felt wicks (180) are oiled through the two nipples (540).

The felt pads (160) are mounted in holders. For subsequent lubrication the side cover (190) has to be dismantled as per Fig. 2.1-1.

- Slacken the pad holder (160) by turning screw (670) about 1 turn.
- Swing out the pad holder (160) by the angle χ • in the "X" direction.
- Oil the felt pad. The only lubricant permitted for the feld wicks (180) and felt pads (160) is Paraliq P 460 from Klüber.
- Reinsert the pad holder (160) in the reverse order.
- Fit the side cover as per "Mounting the protective covers".

The felt pads can only be lubricated when the side cover (190) has been dismantled and the unit is stationary. When the slide is pneumatically moved, there is an acute risk of squeezing and cutting.

KEEP HANDS AND TOOLS CLEAR WHEN MOVING THE SLIDE!

3.3 Inspecting the shock-absorbers

All linear units contains shock-absorbers of first-class quality. Nevertheless the failure of a shock-absorber cannot be entirely ruled out. We therefore recommend that during operation attention should be paid to the slides; to ensure that they do not move into their end position with a sharp impact. Where this does happen, the affected shock-absorber must be immediately readjusted in accordance with "Setting the shock-absorbers". If a satisfactory result is not obtained, the shock-absorber will have to be replaced.

4 Repairs

4.1 Replacing the Main Cylinder

Horizontal units (see Fig. 5.1–1 / 5.1–2)

- Switch off the installation.
- Remove the hood (230) and side cover (190) (Fig. 2.1–1).
- Remove the printed circuit board (260) by unscrewing the screws (660).
- Unscrew the two screws (610, cylinder plate/slide). To do this pull the slide (20) by hand out of the casing (10) until the two screws are easily accessible.
- Release the four screws (630) with the two hose-holders (200) from the rear end-plate (50).
- Pull the rear end-plate (50) with the cylinder (400) to the rear out of the casing (10).
- Dismantle the cylinder plate (60) and cylinder sleeve (220) by unscrewing the hex. nut (710).
- Remove the angle connection (420) and pin (310).
- Replace the cylinder (400). The cylinder is mounted in the reverse order.

Vertical units (see Fig. 5.3–1 / 5.3–2)

- Remove the hood (230) and side cover (190) (Fig. 2.1–1 und 2.3–1).
- Unscrew the two screws (660) and remove the hose-holder (200).
- Remove the four screws (630 or 640) of the rear end-plate (50).
- Move the slide (20) pneumatically into its end position.

When the cylinder (400) is moved out, the rear end-plate rises slightly off the end-face of the casing (10). For this reason cables, hoses, etc. have to pushed to one side. Since the side cover (190) was removed, there is a grave risk of squeezing and cutting when the slide is moved pneumatically.

KEEP HANDS AND TOOLS CLEAR WHEN MOVING THE SLIDE!

- Unscrew the two screws (610; cylinder plate and slide).
- Switch off the installation.
- Pull the rear end-plate (50) with the cylinder to the rear out of the casing (10).
- Mark the setting of the threaded sleeve (210) for later mounting.
- Release and remove the tensile spring (290).
- Dismantle the cylinder plate (60) and cylinder sleeve (220) by unscrewing the hex. nut (710).
- Remove the angle connection (420) and pins (310) and replace the cylinder (400).
- The linear unit is reassembled in the reverse order.
- Mount the covers as per “Mounting the protective covers”.

4.2 Replacement of a proximity switches

(see Fig. 2.4–1 / 2.8–1 und 5.1–1 / 5.1–2 / 5.3–1 / 5.3–2)

- Switch off the installation.
- Remove the hood (230) and side cover (190) (see Fig. 2.1–1 / 2.3–1).
- Disconnect the stranded cables from the terminals on the printed circuit board, releasing the clamping spring by pressing on the cradle with a screwdriver (Fig. 2.4–1).
- Mark the position of the sensor holder (150) and unscrew the screw (670) (Fig. 2.8–1).
- Pull in the cable by one of the following methods.

Note: The two methods described below have been found to be very simple and rational in practice. Proximity switches may differ in position and method of mounting, every application cannot be described in detail here. In order to recognize the state of the built-in LED from outside, make sure the LED points towards screw (670).

Method 1

- Release the holder with proximity switch (150; Fig. 2.8–1)
- Cut the wire lead from the defective switch using snips. Now strip the insulation from the strands, solder the latter to the strands of the new switch and pull the new switch wires through the unit by pulling on the old wire.

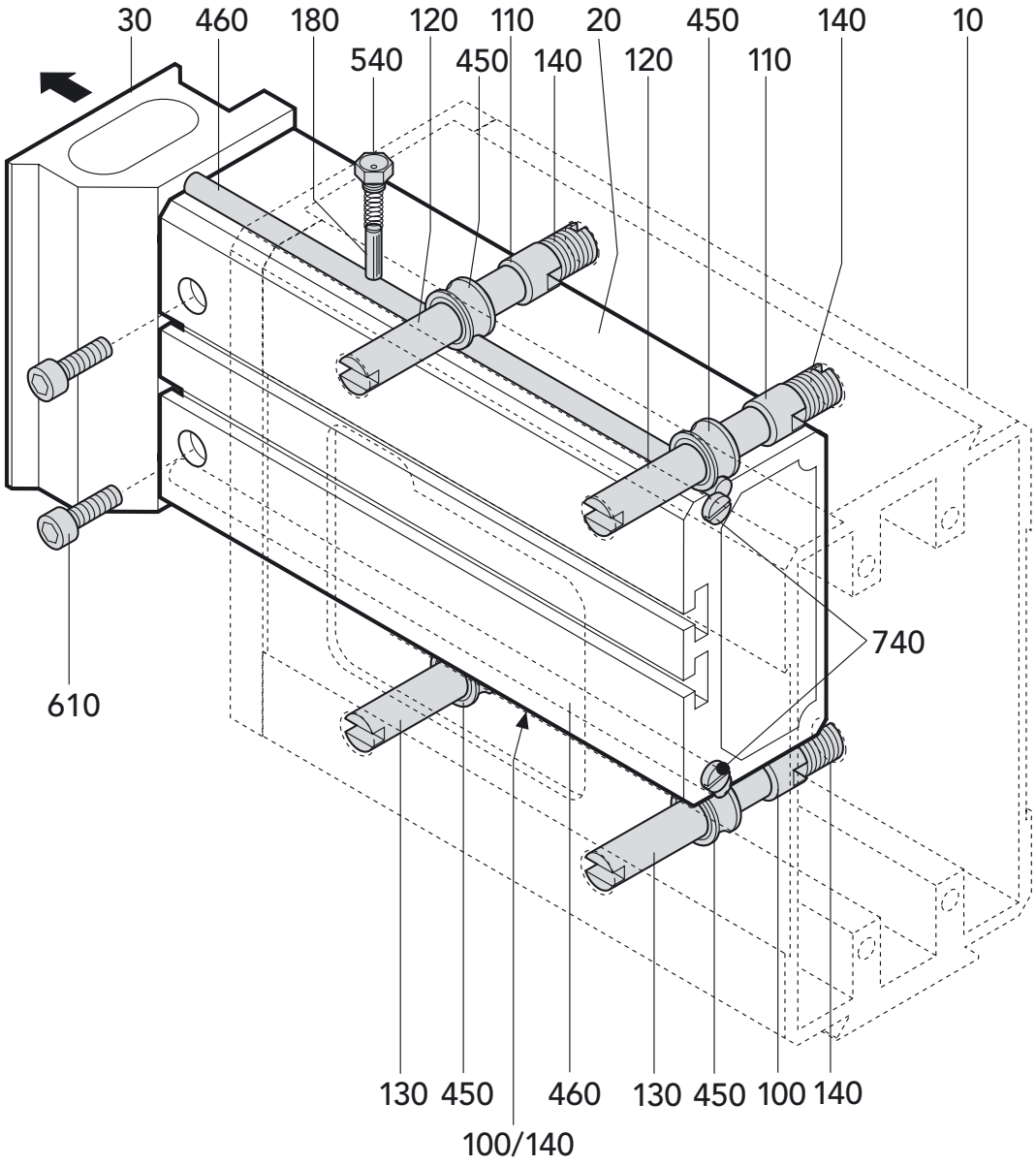
Method 2

- Release the holder with proximity switch (150; Fig. 2.8–1) and pull out complete with lead (possibly in two stages).
- Insert a pneumatic hose (2.7/4 mm dia.) through the same path a the proximity switch lead.
- Push the wire of the new switch into the hose and tape to the cable sheath with adhesive tape.
- Pull through the cable by pulling back the hose.

- Screw the sensor holder to the previously marked point with screw (670).
- Cut the cable to the correct length and strip the insulation from the strands.
- Insert the cable strands into the appropriate terminal on the printed circuit board (260). Relieve the clamping spring before pushing in the cable strands by depressing the cradle with a screwdriver (Fig.2.4–1).
- Mount the cover as per "Mounting the protective covers".

4.3 Replacing Shafts and Rollers

Fig. 4-1: Replacing Shafts and Rollers



For the following description consult
Fig. 5.1–1 / 5.1–2 / 5.3–1 / 5.3–2

The shafts (460) must always be **replaced together** with the corresponding rollers (450)

- Switch off the installation.
- Remove the hood (230) and side cover (190) (see Fig. 2.1–1 / 2.3–1). Mark the position of the stops (80; consult Fig. 2.5–1) Release and remove the stops. At the rear stop the plastic securing screw (860) must first be removed from the hex. socket of the screw (6, Fig. 2.5–1) with a small screwdriver.
- Screw out the lubrication nipple (540).
- Undo screws (670; Fig. 2.8–1 / 3.1–1) and remove the two felt holders.
- Unscrew the two screws (610) holding the cylinder plate to the slide and remove them.
- Move the slide forwards out of the casing (10).

Replacing shafts (460)

- Withdraw the shaft (460) from the underside of the slide and replace it. (The shaft is not mechanically secured to the clamping plate and is easyto remove.)
- Remove clamping screw (740) and pull out the upper shaft to the rear. Place the new upper shaft in the slot, push it forwards into the centering hole of the clamping plate (30) and secure it with the clamping screw (740).

Replacing the rollers (450)

- Remove the tapped journal

Screw the eccentric shaft (110) or concentric shaft (100) out of the clamping nut (120 or 130), holding against the nut with a screwdriver.

Note: The clamping nuts are used for fixing the hoses and cables, and on the B version for fixing the cover of the variable stop (380; Fig. 2.2–2 / 2.3–3). For this reason these nuts should not be removed from the casing.

- Replace the rollers (450) through the opening in the side of the casing.
- Mount new rollers (450) in the reverse order.

Final Assembly

- Place the new upper shaft (460) in the slot in the slide (20), hold it fast andpush it into the casing (10) together with the slide..
- Fix the cylinder plate (60) by means of screws (610).
- Readjust the play of the rollers (450) relative to the shafts (460) as per “Setting the slide play”.
- Screw the lubricating nipple (540) in tight.
- Insert the felt holder (160) as per “Oiling the felt pads and felt wicks” and fix with screws (670).
- Insert the stops (80) in the marked position and fix with screws (6, Fig. 2.5–1) When doing this the tightening torques specified in “Setting the mechanical end-stops” must be complied with.
- Mount the covers as per “Mounting the protective covers”.

4.4 Setting the slide play

see Fig. 4.3–1

- Loosen the two lower threaded journals (140) until the concentric shafts (100) can be easily turned with a screwdriver.
- By turning the lock nut (120) clockwise, adjust the rollers (450) so that they are free from play (no pretension).
- Tighten the upper and lower threaded journals (140) with the torque shown below. It is essential to ensure that the position of the two upper lock nuts (120) does not change.

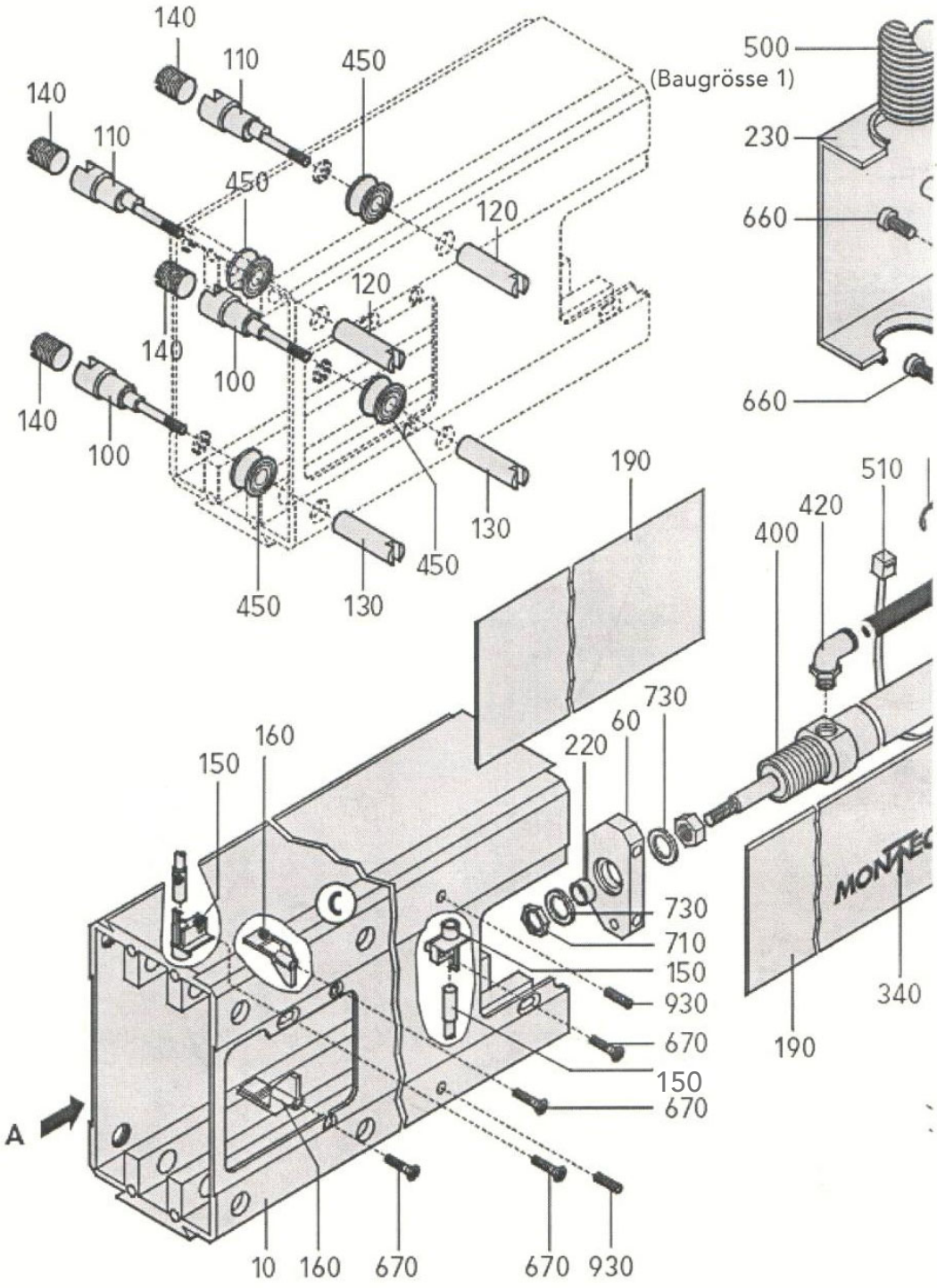
Torques of the threaded journals (140)

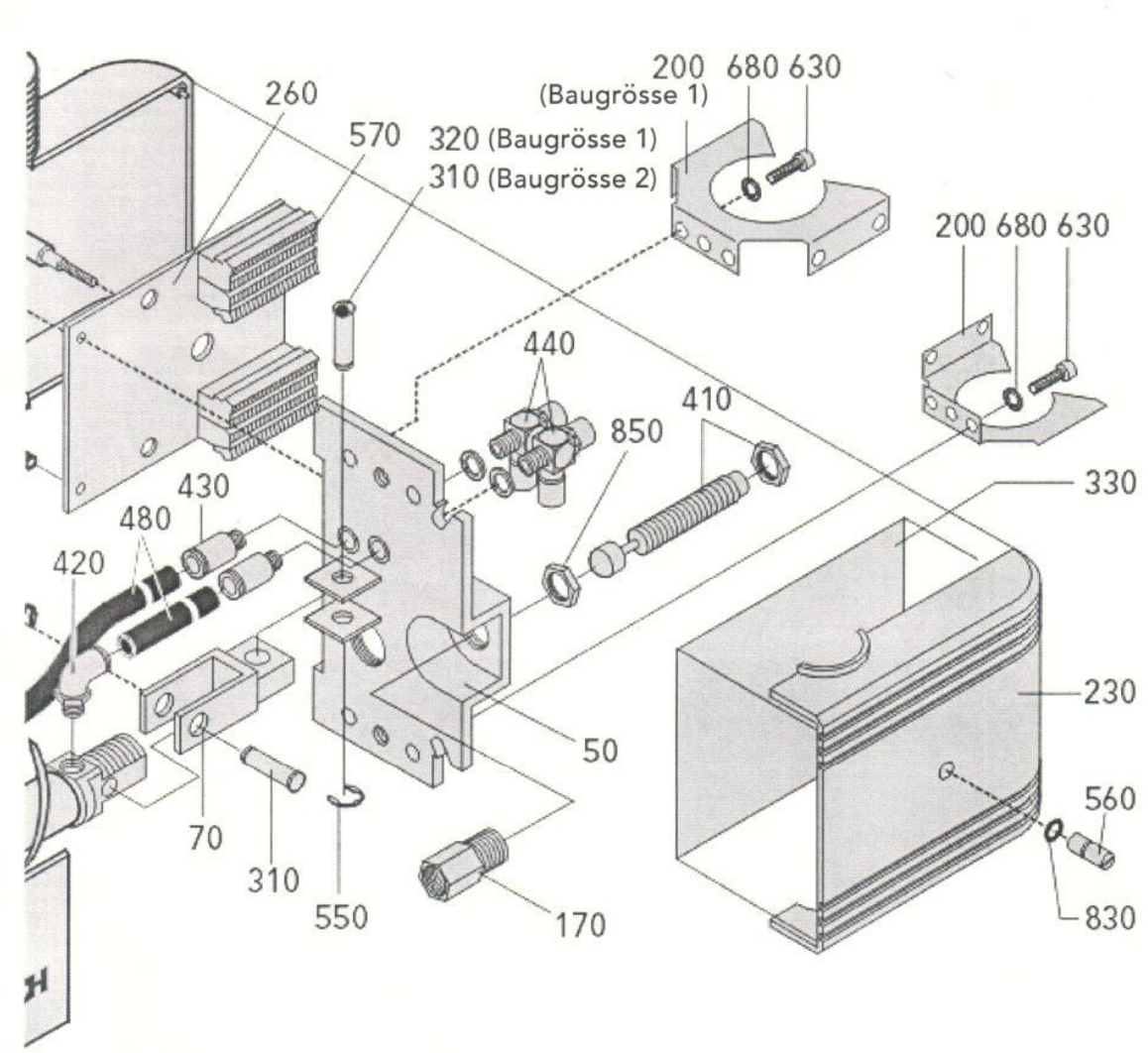
LEP-	-1	3.5Nm
LEP-	-2	4.5Nm

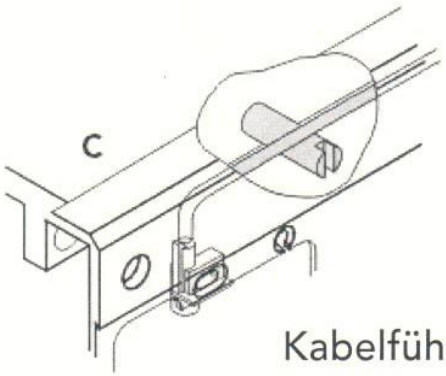
5 Exploded drawings / Spare parts lists

5.1 Exploded drawing linear unit horizontal

Fig. 5-1: Exploded drawing linear unit horizontal







Kabelführung

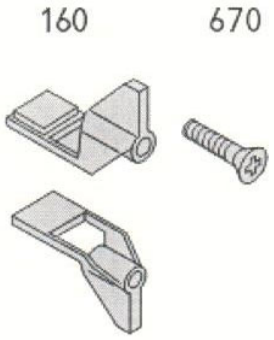
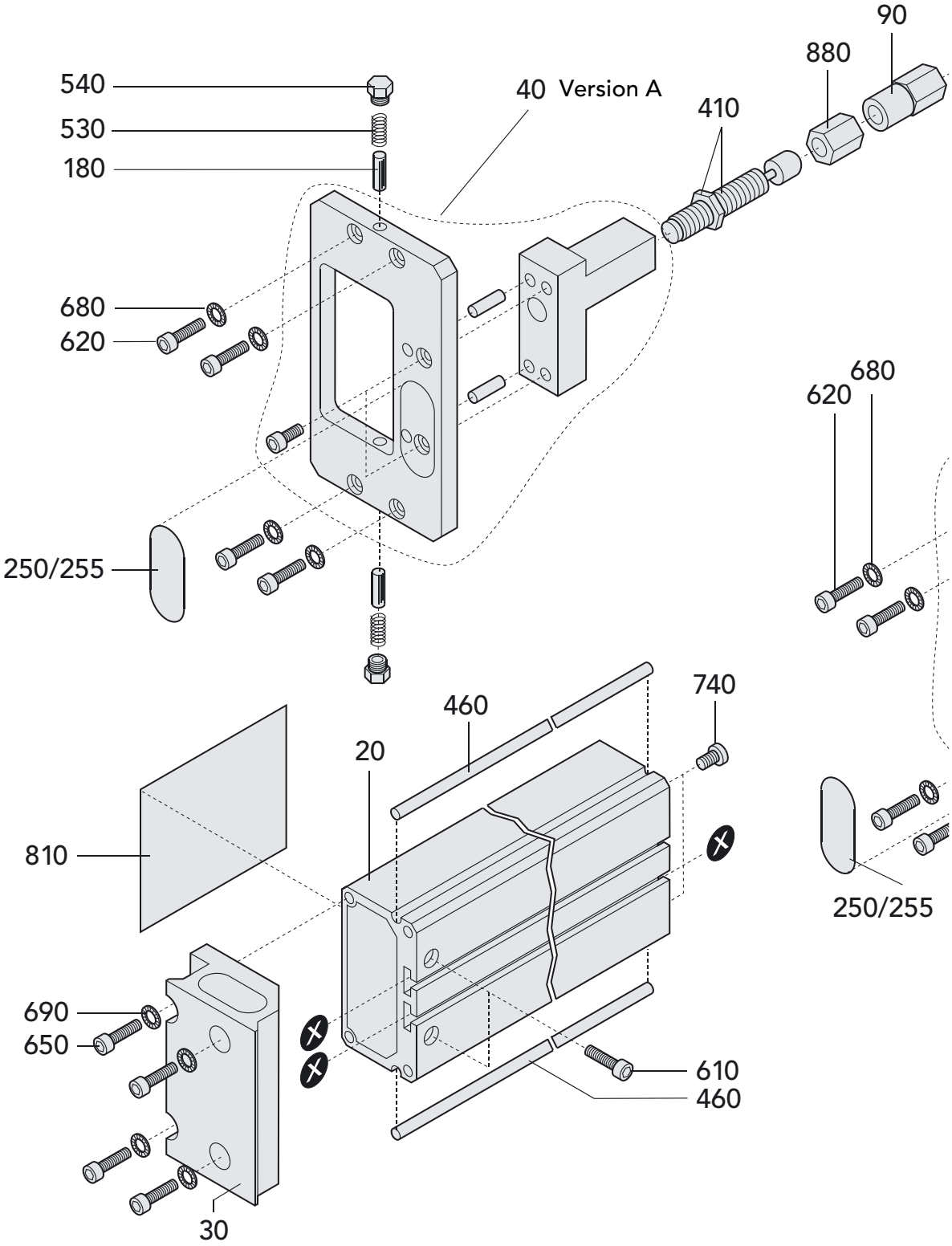
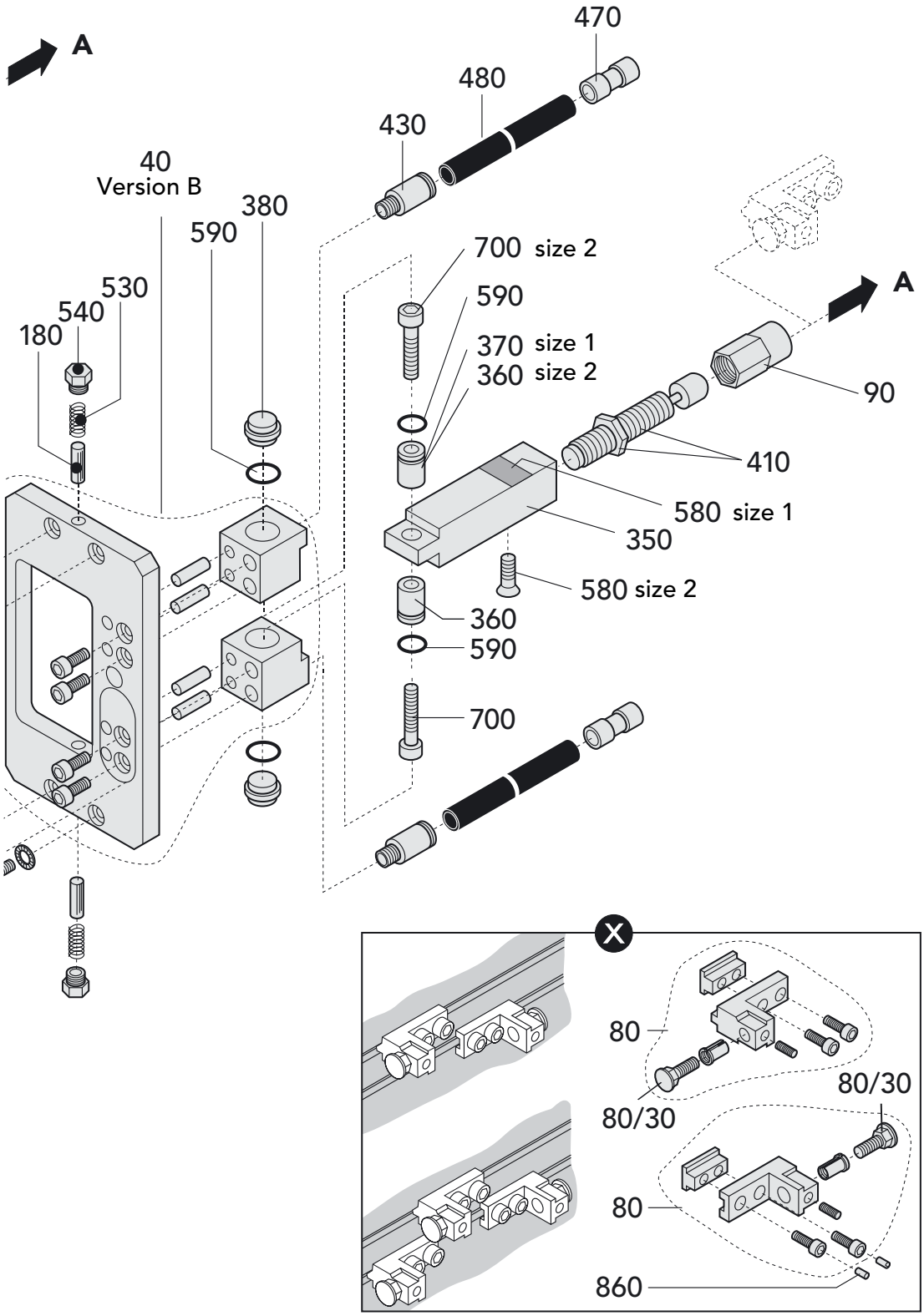


Fig. 5-2: Exploded drawing linear unit horizontal slide




A
470
480
430
40
Version B
380
590
530
540
180
700 size 2
590
370 size 1
360 size 2
A
90
410
580 size 1
350
580 size 2
360
590
700
X
80
80/30
80/30
80
860

5.2 Partial list linear unit horizontal, version A and B

No.	Part		Ref.No.		
			LEP-90-1	LEP-160-1	LEP-225-1
10	Profile casing	Version A	45762	45764	45766
10	Profile casing	Version B	45763	45765	45767
20	Profile slide	Version A	42129	42131	42593
20	Profile slide	Version B	42130	42132	42593
30	Clamping plate		45859	45859	45859
40	Front end-plate com-	Version A	45357	45357	45357
40	Front end-plate com-	Version B	47453	47453	47453
50	Rear end-plate		45769	45769	45769
60	Cylinder plate		41934	41934	41934
70*	Joint		42942	42942	42942
80	Stop complete		47469	47469	47469
80/30*	Stop screw		45946	45946	45946
90*	Stop nut	Version A	45430	45430	45430
90*	Stop nut	Version B	42910	42910	42910
100	Concentric shaft		40281	40281	40281
110	Eccentric shaft		40282	40282	40282
120	Clamping nut		40283	40283	40283
130	Clamping nut		40612	40612	40612
140	Threaded journal		40936	40936	40936
150*	Holder with sensor		56595	56595	56595
160*	Felt holder complete		42261	42261	42261
170*	Stop sleeve		45347	45347	45347
180*	Felt wick		40921	40921	40921
190*	Side cover	Version A	40423	40933	42596
190*	Side cover	Version B	40935	40417	42596
200	Hose holder		42334	42334	42334
220	Cylinder sleeve		41935	41935	41935
230	Hood, horiz.		40208	40208	40208

* The marked articles are available wearing parts and from stock.

		Material
LEP-320-2	**LEP-450-2**	
45807	45809	Aluminium
45808	45810	Aluminium
41962	42442	Aluminium
41963	42442	Aluminium
45860	45860	Aluminium
45359	45359	Aluminium
47454	47454	Aluminium
42958	42958	Cast Aluminium
41936	42448	Steel
42963	42963	Aluminium
48253	48253	Steel
45950	45950	Steel
45432	45432	Steel
42911	42911	Steel
40867	40867	Steel
40868	40868	Steel
40871	40871	Steel
40872	40872	Steel
40869	40869	Steel
56595	56595	ABS / Steel
42262	42262	ABS
45353	45353	Steel
40921	40921	Wool felt
40878	42443	Polystyrol (PS)
40879	42443	Polystyrol (PS)
42334	42334	Steel
41937	42449	Steel
40912	40912	ABS

Partial list linear unit horizontal, version A and B

No.	Part	Ref.No.		
		LEP-90-1	**LEP-160-1**	**LEP-225-1**
250	Nameplate	41620	41620	41620
255	Type plate	48508	48508	48508
260	Printed circuit board	42094	42094	42094
310*	Pin	43882	43882	43882
320*	Pin	44144	44144	44144
330	Layout plan	47054	47054	47054
340	Montech Logo	50658	50658	50658
400*	Pneumatic cylinder	503687	503688	504125
410*	Shock-absorber	503680	503680	503680
420	Angle connection	506319	506319	506319
430	Screw-in connection	504928	504928	504928
440	Non-return throttle valvel	505023	505023	505023
450*	Roller	503678	503678	503678
460*	Shaft Version A	503667	503668	504126
460*	Shaft Version B	503669	503670	504126
480	Hose	–	–	–
480	Hose	504983	504983	504983
500	Protective hose	503693	503693	503693
510	Cable binder	504075	504075	504075
530	Compression spring	504119	504119	504119
540	Lubricating nipple	504554	504554	504554
550	Circlip	502444	502444	502444
560	Cap nut	46185	46185	46185
570	Marking strip	504663	504663	504663
610	Chhd screw M 4x12 Version A	501620	501620	501620

* The marked articles are available wearing parts and from stock.

		Material
LEP-320-2	**LEP-450-2**	
41620	41620	Polyester metall.
48508	48508	Clear PU
42138	42138	Polyester
44145	44145	Steel
—	—	Steel
47054	47054	PVC
50658	50658	PVC Cd free
503598	504123	Alu/stainless steel
503599	503599	Steel
503659	503659	***Brass***
506323	506323	Brass
505016	505016	Brass
503663	503663	Steel
503664	504122	Steel
503665	504122	Steel
502745	502745	PUR
–	–	PUR
503693	503693	Polyamid PA 12
504075	504075	PUR
504553	504553	Steel
504554	504554	Brass
502446	502446	Steel
46186	46186	Steel
504663	504663	PVC
501620	501620	Steel

Partial list linear unit horizontal, version A and B

No.	Part	Ref.No.		
		LEP-90-1	**LEP-160-1**	**LEP-225-1**
610	Chhd screw Version B	501620	501620	501620
620	Chhd screw	501622	501622	501622
630	Chhd screw	501624	501624	501624
650	Chhd screw	501640	501640	501640
660	Panhead screw with cross slot	504563	504563	504563
670	PT screw	503674	503674	503674
680	Ribbed washer	502364	502364	502364
690	Ribbed washer	502365	502365	502365
710	Hex.nut	500039	500039	500039
730	Washer	502417	502417	502417
740	Flathead screw	503675	503675	503675
750	User manual	508463	508463	508463
810	Label “Oiling interval”	42943	42943	42943
830	O-ring	503583	503583	503583
850	Hex.nut	505194	505194	505194
850	Hex.nut	–	–	–
860	Securing screw	45164	45164	45164
880	Counter nut A in front	–	–	–
900	Cable guide-chain (link)	–	–	–
910	Fixing-set cable-chain	–	–	–
930	Set-screw	–	–	–

		Material
LEP-320-2	**LEP-450-2**	
501620	501620	Steel
501622	501622	Steel
501624	501624	Steel
501640	501640	Steel
504563	504563	Steel
503674	503674	Steel
502364	502364	Steel
502365	502365	Steel
504044	502767	Steel
502418	502419	Steel
503675	503675	Steel
508463	508463	Paper
42943	42943	PVC
503583	503583	NBR
–	–	Steel
45181	45181	Steel
45165	45165	POM
45431	45431	Steel
505074	505074	Polyamid
45543	45543	
502647	502647	Steel

Partial list linear unit horizontal, additional item version B

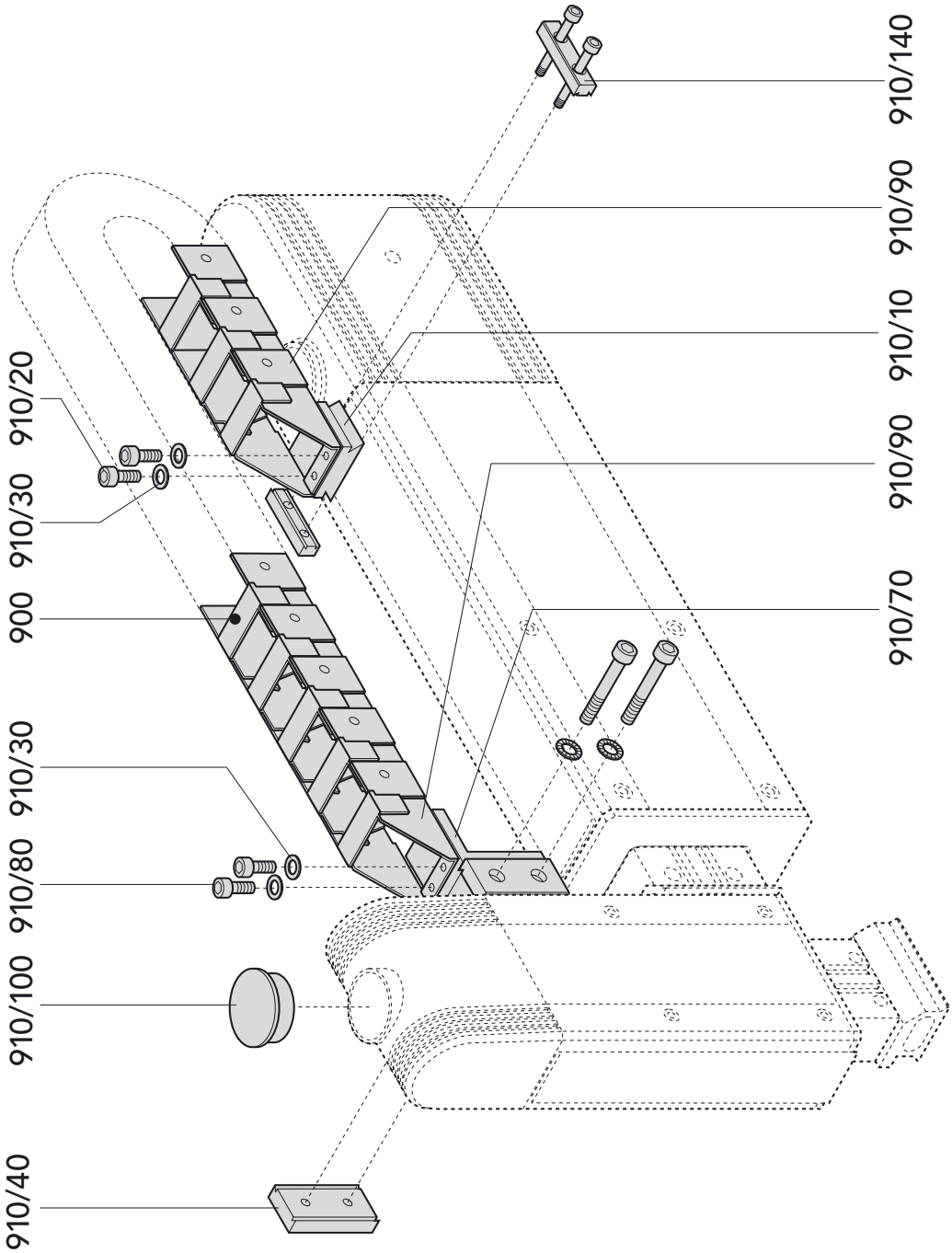
No.	Part	Ref.No.		
		LEP-90-1	**LEP-160-1**	**LEP-225-1**
350*	Switching lug	47452	47451	47451
360*	Piston	44271	44271	44271
370*	Piston	44272	44272	44272
380	Cover, variable stop	45348	45348	45348
430	Screw-in connection	504928	504928	504928
470	Plug joint, straight	505193	505193	505193
480	Hose ø 4/6mm	–	–	–
480	Hose ø 4/2.7mm	504983	504983	504983
580	Csk screw	–	–	–
580	Damping foil	504809	504809	504809
590	O-ring	–	–	–
590	O-ring	505001	505001	505001
700	Chhd screw	501627	501627	501627
* The marked articles are available wearing parts and from stock.				

		Material
LEP-320-2	**LEP-450-2**	
47030	47030	Aluminium
45356	45356	Bronze
–	–	Bronze
45355	45355	POM
506323	506323	Brass
505197	505197	PBT
502745	502745	PUR
–	–	PUR
502546	502546	Steel
–	–	Steel
503104	503104	NBR
–	–	NBR
505192	505192	Steel

Partial list linear unit horizontal, cable drag chain

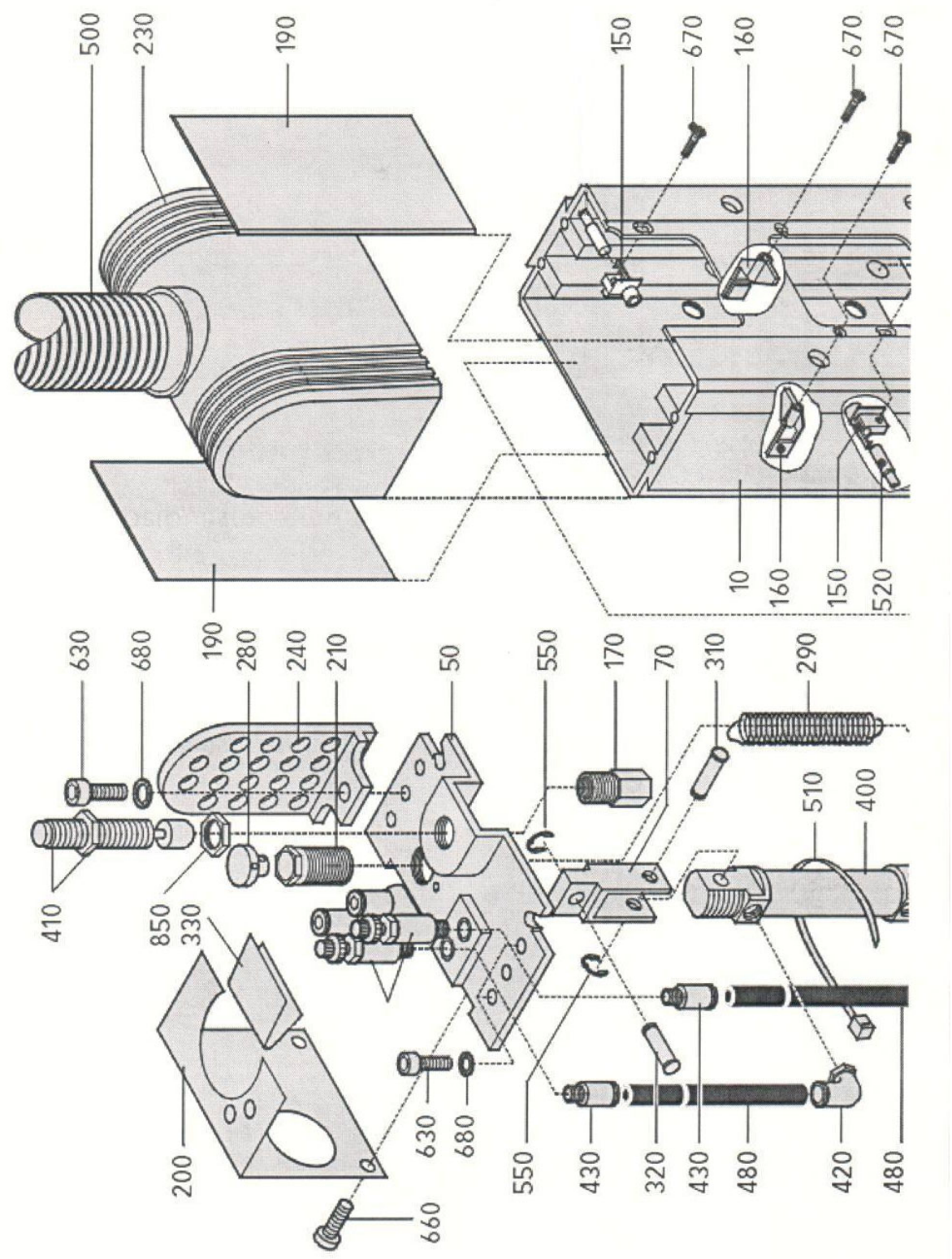
No.	Part	Ref.No.		Material
		LEP-320-2	**LEP-450-2**	
910/10	Fixation linear unit, horizon-	45788	45788	Alu
910/20	Chhd screw	501639	501639	Staeel
910/30	Washer	503646	503646	Steel
910/40	Clamping element SLL-	45942	45942	Alu / Steel
910/70	Fixation linear unit, vertical	45540	45540	Alu
910/80	Chhd screw	501639	501639	Steel
910/90	Connection set	505065	505065	Polyamide
910/100	Cap cover	504780	504780	Polyamide
910/140	Clamping element SLL-55	40201	40201	Alu / Steel

Fig. 5-3: Cable drag chain



5.3 Exploded drawing linear unit vertically

Fig. 5-4: Exploded drawing linear unit vertically



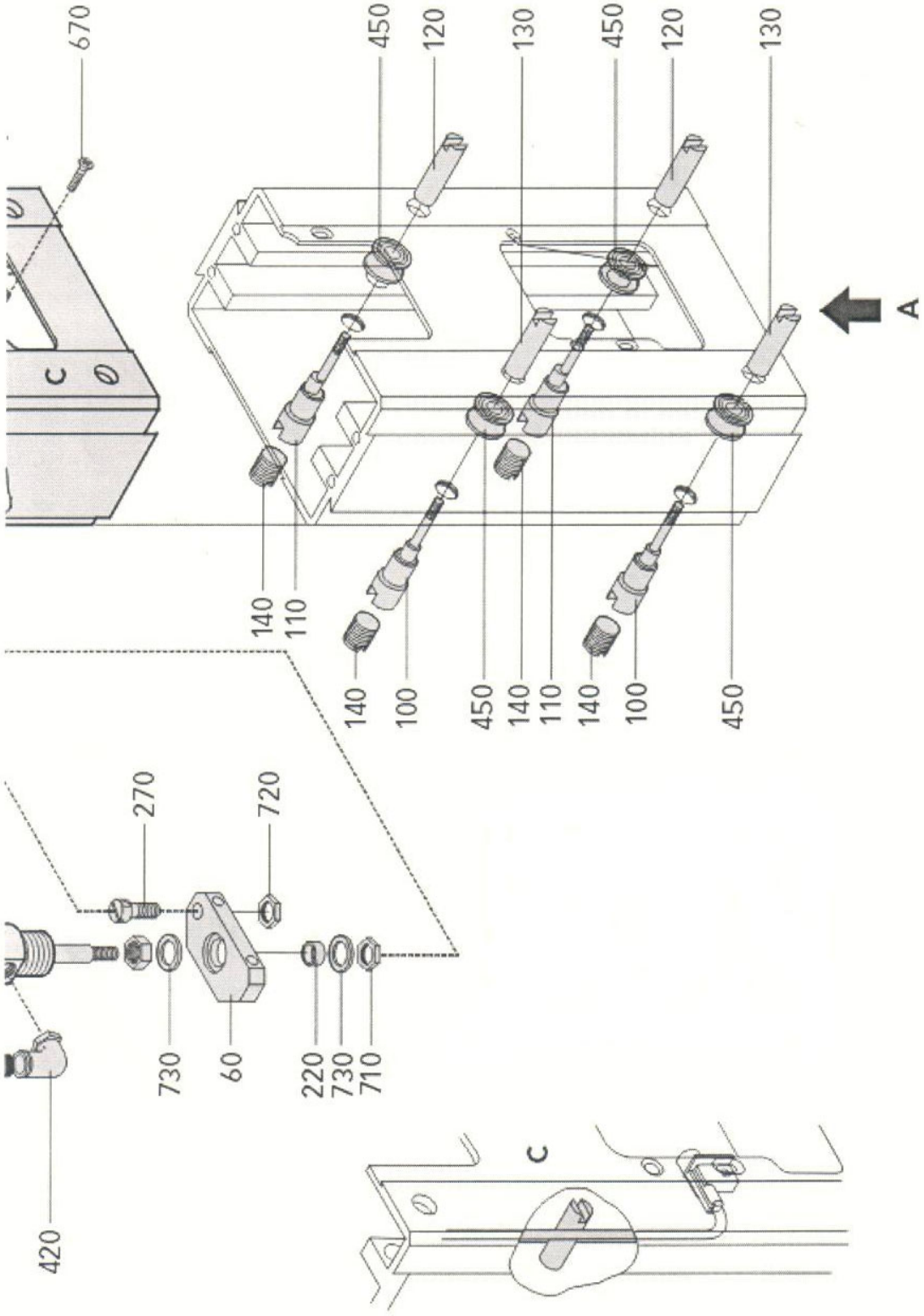
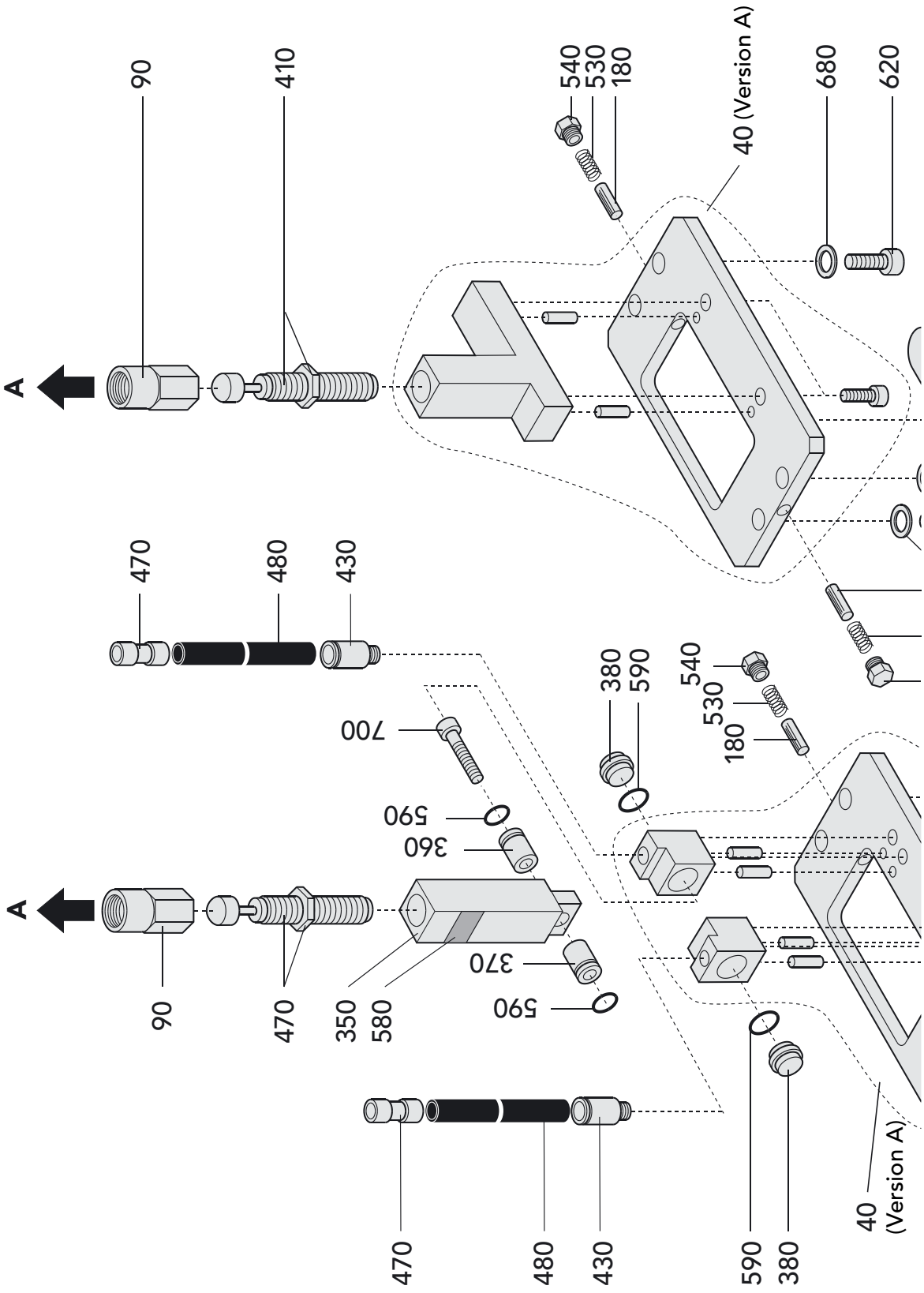
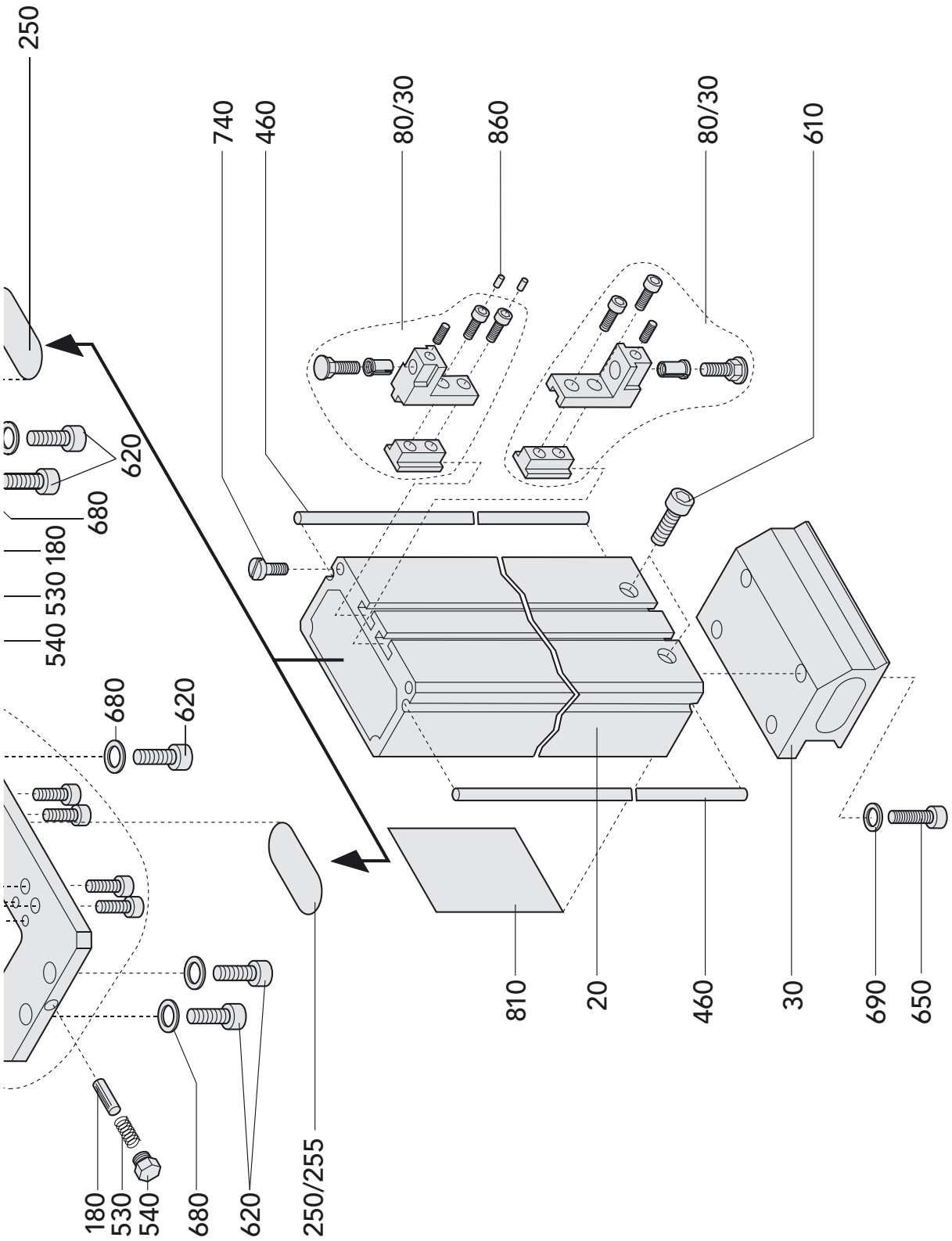

670
450
120
130
450
120
130
A
C
140
110
140
100
450
140
110
140
100
450
270
720
730
60
220
730
710
420
C

Fig. 5-5: Exploded drawing linear unit vertically, slide




250
740
460
80/30
860
80/30
610
620
680
180
530
540
680
620
180
530
540
680
620
250/255
810
20
460
30
690
650

5.4 Partial list linear unit horizontal, version A and B

No.	Part		Ref.No.LEP-			Material
			60-1	90-1	160-1	
10	Profile casing	Vers. A	45760	45762	45764	Aluminium
10	Profile casing	Vers. B	45761	45763	45765	Aluminium
20	Profile slide	Vers. A	42127	42129	42131	Aluminium
20	Profile slide	Vers. B	42128	42130	42132	Aluminium
30	Clamping plate		45859	45859	45859	Aluminium
40	Front end-plate	Vers. A	45357	45357	45357	Aluminium
40	Front end-plate	Vers. B	47453	47453	47453	Aluminium
50	Rear end-plate		45769	45769	45769	Cast Alu
60	Cylinder plate		41934	41934	41934	Steel
70*	Joint		42942	42942	42942	Aluminium
80	Stop complete		47469	47469	47469	Steel
80/30*	Stop screw		45946	45946	45946	Steel
90*	Stop nut	Vers. A	45430	45430	45430	Steel
90*	Stop nut	Vers. B	42910	42910	42910	Steel
100	Concentric shaft		40281	40281	40281	Steel
110	Eccentric shaft		40282	40282	40282	Steel
120	Clamping nut M4		40283	40283	40283	Steel
130	Clamping nut M5		40612	40612	40612	Steel
140	Threaded journal		40936	40936	40936	Steel
150*	Holder and sensor		56595	56595	56595	ABS/Steel
160*	Felt holder com-		42261	42261	42261	ABS
170*	Stop sleeve		45347	45347	45347	Steel
180*	Felt wick		40921	40921	40921	Woll felt
190*	Side cover	Vers. A	40934	40423	40933	PS
190*	Side cover	Vers. B	40423	40935	40417	PS
200	Hose holder		44288	44288	44288	Steel
210	Threaded sleeve		42364	42364	42364	Steel

* The marked articles are available wearing parts and from stock.

No.	Part	Ref.No.LEP-			Material
		60-1	90-1	160-1	
220	Cylinder sleeve	41935	41935	41935	Stahl
230	Hood, vertical	40258	40258	40258	PS
240	Guide bracket	44063	44063	44063	Cast Alu
250	Nameplate	41620	41620	41620	Poly-
255	Nmeplate	48508	48508	48508	PU
270	Phillips screw	42366	42366	42366	Steel
280	Tensile spring loop,	42365	42365	42365	Steel
290*	Tensile spring	42454	42455	42383	Steel
310*	Pin	43882	43882	43882	Steel
320*	Pin	44144	44144	44144	Steel
330*	Layout plan	47072	47072	47072	PVC-Folie
400*	Cylinder	503686	503687	503688	Alu/Steel
410*	Shock-absorber	503680	503680	503680	Steel
420	Angle connection	506319	506319	506319	Brass
430	Screw-in connection	504928	504928	504928	Brass
440	Non-return throttle	505014	505014	505014	PBT/Steel
450*	Rollerrolle	503678	503678	503678	Steel
460*	Shaft Vers. A	503666	503667	503668	Steel
460*	Shaft Vers. B	503667	503669	503670	Steel
480	Hose	504983	504983	504983	PUR
500	Protective hose	503693	503693	503693	Polyamid
530	Compression spring	504119	504119	504119	Steel
540*	Lubricating nipple	504554	504554	504554	Brass
550*	Circlip	502444	502444	502444	Steel
610	Chhd screw	501620	501620	501620	Steel
620	Chhd screw	501622	501622	501622	Steel

* The marked articles are available wearing parts and from stock.

No.	Part	Ref.No.LEP-			Material
		60-1	90-1	160-1	
630	Chhd screw	501624	501624	501624	Steel
650	Chhd screw	501640	501640	501640	Steel
660	Pan-head screw	504563	504563	504563	Steel
670	PT-screw	503674	503674	503674	Steel
680	Ribbed washer	502364	502364	502364	Steel
690	Ribbed washer	502365	502365	502365	Steel
710	Hex.nut	500039	500039	500039	Steel
720	Hex.nut	501999	501999	501999	Steel
730	Washer	502417	502417	502417	Steel
740	Flathead screw	503675	503675	503675	Steel
750	User manual	508463	508463	508463	Paper
810	Label “Oiling interval”	42943	42943	42943	PVC
850	Hex.nut	505194	505194	505194	Steel
860	Securing screw	45164	45164	45164	POM

Partial list linear unit horizontal, additional item version B

No.	Part	Ref.No.			Material
		LEP-60-1	**LEP-90-1**	**LEP-160-1**	
350*	Switching lug	47062	47452	47451	Aluminium
360*	Piston	44271	44271	44271	Bronze
370*	Piston	44272	44272	44272	Bronze
380	Cover, variable stop	45348	45348	45348	POM
430	Screw-in connection	504928	504928	504928	Brass
470	Plug joint, straight	505193	505193	505193	PBT
480	Hose	504983	504983	504983	PUR
580	Damping foil	504809	504809	504809	Steel
590*	O-ring	505001	505001	505001	NBR
700	Chhd screw	501627	501627	501627	Steel

* The marked articles are available wearing parts and from stock.

6 Environmental Compatibility

Materials used:

- Aluminium
- Brass
- Bronze
- Steel
- Acrylnitrile-butadiene-styrene (ABS)
- Polystyrene (PS)
- Polyester
- Polyurethane (PUR)
- Polyamide PA 12
- Polyoxymethylene (polyacetal) (POM)
- Polybutylene nephthalate (PBT)
- Acrylnitrile butdiene rubber (NBR)
- Paraffinic mineral oil, synthetic hydrocarbnon oil

Surface treatment

- Anodizing of aluminium
- Blackening of steel

Shaping processes

- Profilpressen von Aluminium
- Machining of Al, steel, POM, PS, bronze, brass
- Moulding of NBR seals
- Extrusion of PUR
- Injection moulding of ABS, PBT
- Foam coating with PS

Emissions during operation

- None

When the equipment is used with oiled air, it is advisable to return the exhaust air to atmosphere through an oil filter or separator.

Disposal

Linear units which cannot be used any more should be recycled, not as complete units, but dismantled to components and disposed of according to the type of material. The kind of material used for each part is shown in the spare parts list. Material which cannot be recycled should be appropriately disposed of.

7 List of figures