HPLA Linear Actuator

Product Manual

Installation, Commissioning, Maintenance and Repair

Reg. Nr. 36 38

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Contents

1 Safety

1.1 Intended Use

The HPLA linear actuator has a number of uses including:

Positioning, transporting, feeding, removing, pallet handling, loading, unloading, processing and manipulating workpieces or tools.

Since it can be used in a very wide range of applications, the user is responsible for use of the axis in specific applications.

The user must ensure that the mounting workpieces or tools on the carriage of the linear actuator does not cause danger of injury to persons and/or damage to property. This also applies, for example, to the case of a broken toothed belt.

The linear actuator must only be used in areas that are not accessible to persons during operation.

If the linear actuator is used in areas accessible to persons, it must be installed in such a manner that no one can be endangered during operation.

1.2 Identifying Residual Dangers and Hazardous Areas

If there are still residual dangers present to persons or property from the linear actuator in spite of operating it in a safe manner, the user must make reference to these residual dangers through signs and written rules requiring appropriate procedures.

The following safety signal words are used:

Danger	Indicates that an imminent hazardous situation may lead to death or serious bodily harm if not prevented using appropriate safety measures.
Warning	Indicates a potentially hazardous situation which, if not avoided using appropriate safety measures, could result in serious or minor injury.
Caution	Indicates a potentially hazardous situation which, if not avoided using appropriate safety measures, may result in minor injury or damage.
Hint	Provides important information about the product, how to handle the product or about the part of the manual to which particular attention must be paid.

1.3 General Hazards on Non-Compliance with the Safety Instructions

This machine component has been designed in accordance with state-of-the-art technical developments and is operationally reliable. If it is not operated by qualified or at least trained personnel or if it is operated improperly or not in accordance with the operating instructions, however, the unit may bear the risk of hazards.

The following danger may occur:

1. Physical danger and threat to the life of the user or other parties
2. Detriment to the machine and the property of the user

If the linear actuator is installed in a machine, the safety requirements listed in the operating instructions for that machine must be combined with those described in this manual.

1.4 Safety-Conscious Working

1.4.1 Observing Instructions

The information (such as instructions and notes) contained in the commissioning instructions must be heeded for all work involved in installing, commissioning, setting up, operating, changing operating conditions and modes, servicing, inspecting and repairing the unit.

1.4.2 Operating Personnel

The following jobs must only be performed by appropriately trained and authorized personnel:

1. Installation and set-up tasks on the linear actuator
2. Attaching safety limit switches (initiators)
3. Attaching and connecting the drive and testing the rotation direction

1.5 Safety Instructions for the Company Using the System

Supervisors must also become familiar with the entire chapter entitled "Safety" and handling required on the linear actuator.

Supervisors must ensure that installation and operating personnel have read and understand the chapter entitled "Safety" and the description of how to work with the machine, and that they observe the instructions.

The linear actuator must always be in flawless condition during operation.

1.6 Safety Instructions for Operating Personnel

Any work step that has a negative effect on the operating safety of the linear actuator must be omitted.

Operating and supervisory personnel are required to check the linear actuator or machine at least once per shift for externally visible damage or defects. Changes that have occurred (including the operating behaviour) that could have a negative effect on the operating safety must be reported immediately.

Components and accessories are designed especially for this product. When purchasing spare and wearing parts, use only original Parker parts. We note here explicitly that we are unable to check or release spare parts or accessories that were not provided by us. Installing and/or using such products may cause negative changes in the required design properties in some circumstances, which in turn could negatively effect the active and/or passive operating safety of the machine.

The manufacturer is unable to accept any liability for damage caused by using non-original parts and accessories.

As a rule, it is impermissible to dismount or take out of operation any safety devices!

Safety devices must not be rendered inoperative or bypassed.

Applicable requirements and national accident prevention regulations must always be observed when installing and operating our mechanical linear actuators.

1.7 Instructions for Special Hazards

The HPLA must be fixed or supported at the required minimum distances according to information provided in this manual.

The operator must ensure that movements of the HPLA do not cause any danger.

If the HPLA moves in hazardous areas, these areas can be safeguarded with safety limit switches.

1.8 User Conversions and Changes are Not Permitted

The linear actuator must not be changed in its design or in terms of safety without our approval. Any change as defined here made by the user excludes any liability on our part.

1.9 Transport

Danger	Never step under overhead loads – danger of being injured! Moving parts must always be secured against slipping or moving.

Hint	Danger when transporting long actuators. Because the actuator bends under its own weight, guiding accuracy may deteriorate significantly. In addition, the shape of the profile may change and the travel behaviour of the carriage may be negatively affected.

Use only transport equipment with sufficient lifting capacity. When using ropes, make certain they are not twisted or knotted. If you are using more than one rope, all the ropes should be equally taut.

When transporting the HPLA with a forklift, establish a condition of equilibrium and secure the load if necessary.

An estimated value for the weight of the HPLA can be determined as follows: 11

Measure the length L of the profile and read the rough guiding value for the weight from the Diagram 1:

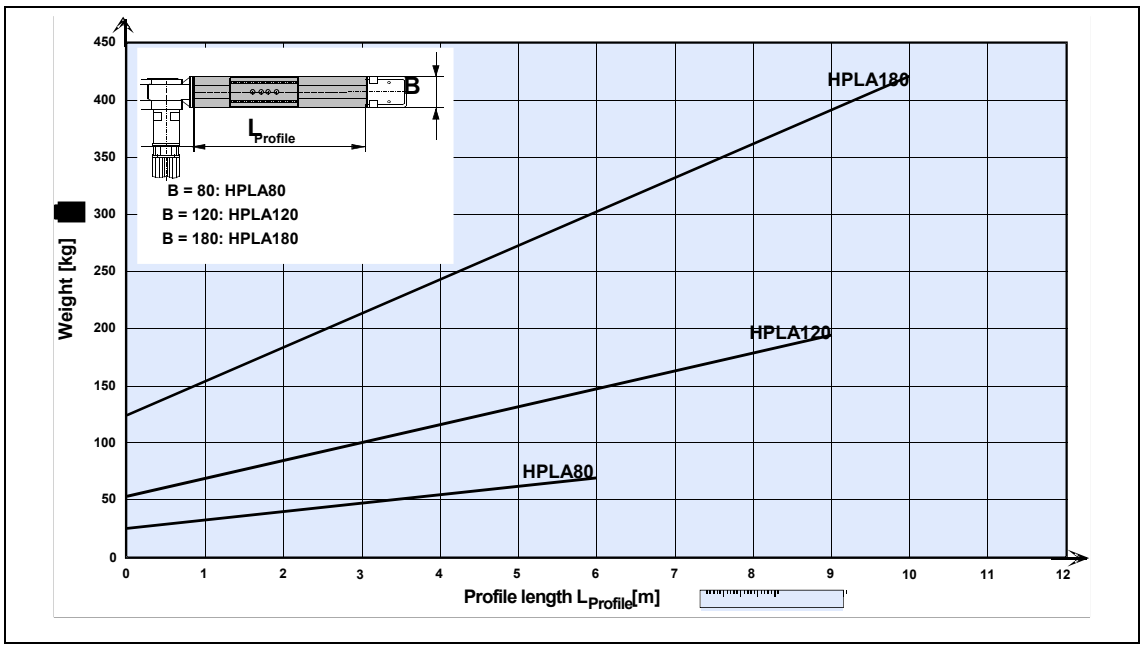


Diagram 1: Rough guiding values for the HPLA transport weight (single axis with motor and gearing)

2 Description

2.1 HPLA product description

The highly dynamic linear actuator...

For guiding, moving and positioning, even over long travels with:

- Long strokes:
  - up to 50 m with rack-and-pinion drive (HPLA180)
  - up to 20 m with toothed belt drive
- High speeds in practice up to 5 m/s
- High payloads up to 1600 kg
- Nominal drive torque up to 244 Nm
- Nominal thrust force up to 5500N
- Repeatability up to ± 0.05 mm
- High mechanical efficiency
- With rack-and-pinion drive, several individual carriages can run in one actuator
- Three frame sizes: HPLA80, HPLA 120 and HPLA180 – allow the combination of actuators, including other types of linear actuators, to create complete handling systems.
- With FEM optimized extruded aluminium profile: for highest resistance to flexing and torsion
- Simple, non-critical installation and start up

The modular concept ...

provides the ideal solution for every application:

The modular drive system:

- either toothed belt:
  - high dynamic performance
  - extremely low maintenance
- or rack-and-pinion (HPLA180):
  - high dynamic performance
  - high precision and rigidity

The modular guiding system:

- either plastic roller guiding:
  - clean operation, as the travel surface is free of lubricants
  - low maintenance
- or steel roller guiding on an integrated steel strip:
  - high load bearing capacity
  - high stiffness

Several adaption options for the most different applications:

- Steel Strip Option
- stainless VA version as a prerequisite for use in clean-room applications or in the food industry
- integrated length measuring system for highest precision (on request)

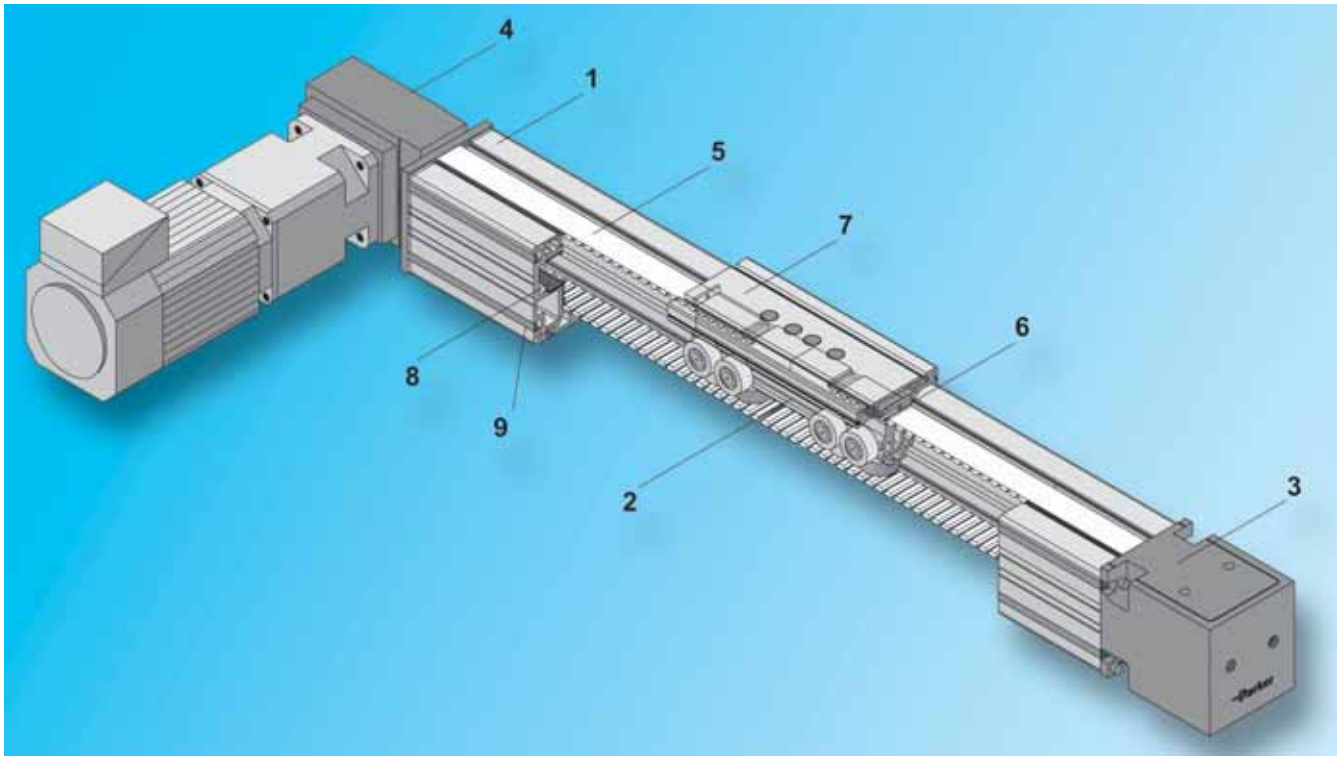
Typical areas of application...

within the scope of innovative and cost-effective machine and system design:

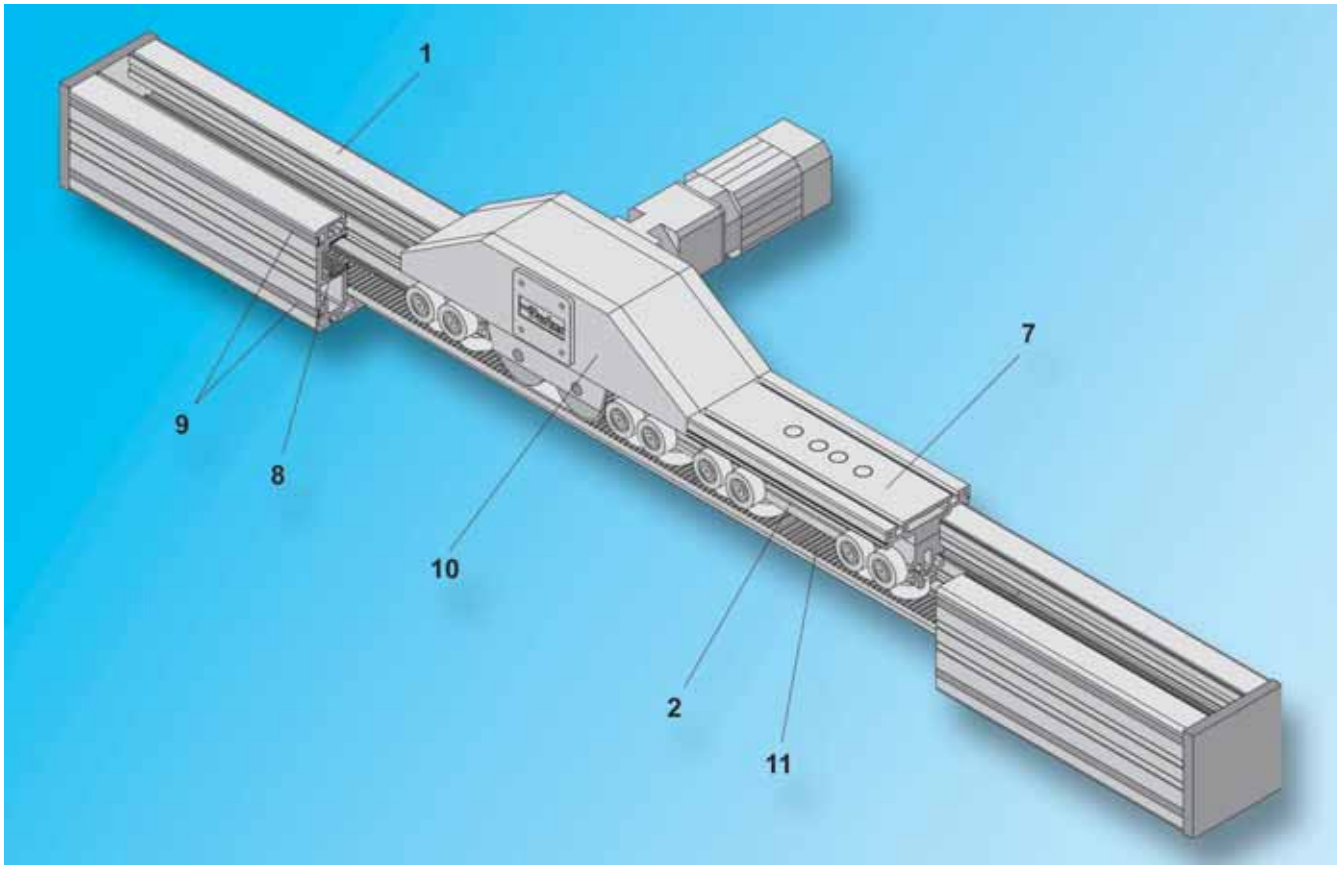
- **Handling technology:** e.g. palettizing, material feed and removal
- **Textile machine construction:** e.g. cross-, length cutting and stacking, quilting, seaming
- **Process engineering:** e.g. varnishing, coating, glueing, engraving
- **Stock technology:** e.g. commissioning, stock-keeping
- **Construction technology:** e.g. encasing, inserting steel reinforcements into concrete
- **Clean room technology:** e.g. wafer transport, wafer coating
- **Machine tool manufacturing:** e.g. charging of the workpieces, changing the tools
- **Testing technology:** e.g. guiding of ultrasonic sensors

Description

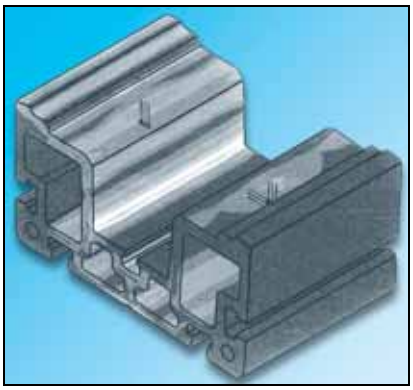
HPLA with toothed belt drive



HPLA with rack-and-pinion drive



(1) The profile



The extruded aluminium profile is optimized for highest stiffness (torsion and deflection) at the lowest possible mass by means of the FEM method.
The modular concept permits to use the same profile for all HPLA versions:

- Toothed belt drive version
- Rack-and-pinion drive version
- Guiding with plastic rollers on anodized aluminium
- Guiding with steel rollers on a steel strip integrated into the profile.

(2) The carriage

The aluminium carriage profile was also optimized by means of the FEM method The rolling-contact plastic or steel rollers with lifetime lubrication are aligned backlash-free in all directions via eccentric mountings. The carriage is available in two sizes as a standard carriage with twelve rollers or as an extended carriage with twenty-four rollers.

(3) The tensioning station

Easy-to-access, simple maintenance and mounting tensioning station for setting the required pre-tension of the toothed belt and its alignment (parallelism of the toothed pulleys).

(4) The drive station

The HPLA features several drive options. Everything is possible from the pulley directly on the gear shaft, via a hollow shaft with bearing directly in the housing to the version with drive shaft on the left, on the right or on both sides.

(5) The toothed belt

The practically backlash-free toothed belt drive reinforced by steel tension cords guarantees high travel speeds and repeatabilities.

(6) Toothed belt clamping

The toothed belt fixing bracket and the wide area toothed belt clamp ensure a safe connection of toothed belt and carriage.
The clamping system allows the toothed belt to be changed without removing the load attachment plate. This means that it is in most cases not necessary to remove the mounted components.

(7) The load attachment plate

- Many possibilities to mount parts by integrated longitudinal grooves at the upper side of the plate. In connection with the clamping profiles, this allows an easy integration into multi-axis systems.
- Simple and variable fixing of tripping plate by means of longitudinal grooves on the sides of the profile.
- The unit height and the fixing points remain unchanged even if a steel strip cover is mounted subsequently.

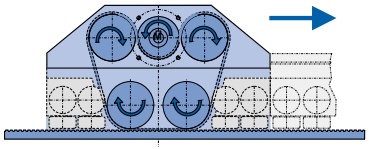
(8) The steel strips

In the steel roller version, 6 steel strips are inserted into the profile.

(9) Mounting grooves

The profile is available in cross sections 80 x 80 (HPLA80), 120 x 120 (HPLA120), 180 x 180 (HPLA180). Mounting grooves on both sides and on the underside of the profile allow to mount additional mechanic components or to connect several linear actuators with the aid of nuts according to DIN-508. These grooves are also suitable as cable ducts if equipped with the available cover profile (9).

(10) The drive module



The rack-and-pinion drive offers all advantages of a toothed belt drive, eliminates however the typical disadvantages. The consistently short toothed belt, which is independent of the travel stroke, reduces belt stretch to a minimum. The combination of a plastic toothed belt with an aluminium rack is a safe drive which does not require lubrication.

(11) The tooth rack

The tooth rack is well protected within the profile. Therefore this drive variant also offers the possibility to use a steel strip cover.

Advantages of the rack-and-pinion drive:

- high, consistent stiffness independent of the stroke length or position
- very long strokes can be realized
- high precision
- High speeds are possible
- No lubrication required
- Any fitting position possible

Available options

- Steel Strip Option
- Integrated linear encoder for highest precision (on request)
- Longitudinal flanges permit to extend the profile for long strokes
- Stainless version for rough environments or as a prerequisite for use in clean rooms or in the food or pharmaceutical industry

2.2 Technical Data

HPLA frame size	Unit	HPLA080		HPLA120		HPLA180		
	Drive:	Toothed belt		Toothed belt		Toothed belt		Tooth racks
	Guiding rollers:	Plastic	Steel	Plastic	Steel	Plastic	Steel	Plastic
Masses, Mass moments of inertia								
Weight of base unit without stroke								
HPLA with standard carriage (S)	kg	6.0	6.6	18.6	19.8	49.8	53.4	71.8
dito with steel strip cover		6.8	7.5	20.2	21.6	57.2	61.6	78.4
HPLA with extended Läufer (E)	kg	7.8	8.6	23.5	25.2	67.4	72.6	88.6
dito with steel strip cover		8.6	9.5	25.2	27.1	74.8	80.9	95.2
Mass of carriage + load attachment plate (S)	kg	1.5	1.6	5.5	5.7	11.4	11.8	9.9
dito with steel strip cover		1.7	1.8	5.8	6.0	12.3	12.6	12.5
Mass of carriage + load attachment plate (E)	kg	2.4	2.6	8.5	8.9	20.3	21.0	17.2
dito with steel strip cover		2.6	2.8	8.8	9.2	21.1	21.8	19.8
Mass of drive module	kg	--	--	--	--	--	--	20.0
Additional weight per metre of stroke	kg/m	6.0	7.2	13.5	15.4	29.2	33.4	31.4
dito with steel strip cover		6.1	7.3	13.7	15.5	29.4	33.6	31.5
Mass moment of inertia with respect to drive shaft 1)								
HPLA with standard carriage (S)	Kgmm²	1 600	1 660	13 600	14 000	66 800	69 500	64 600
dito with steel strip cover		1 780	1 840	14 200	14 600	72 500	74 300	69 800
HPLA with extended carriage (E)	Kgmm²	2 360	2 470	19 100	19 800	107 400	110 700	79 300
dito with steel strip cover		2 540	2 650	19 700	20 400	112 100	115 400	84 500
Travels and speeds								
Maximum travel speed	m/s	5.0						
Maximum acceleration	m/s²	10.0						
Max. travel, standard carriage (S/T)2) with one profile	mm	5610	5590	9560	9530	9440	9400	8880
dito with steel strip cover		5540	5520	9470	9440	9240	9200	8680
Max. travel, extended carriage (E/F) 2) with one profile	mm	5460	5440	9360	9330	9140	9100	8580
dito with steel strip cover		5390	5370	9270	9240	8940	8900	8380
Overall dimensions and physical data of guiding profile								
Cross-section (heightxwidthxprofile width)	mmxmm	80 x 80		120 x 120		180 x 180		
Moment of inertia Ix[4)]	10^4 mm⁴	139		724		3610		
Moment of inertia Iy[4)]	10^4 mm⁴	165		830		4077		
E-modulus (aluminium)	N/mm²	0.72 * 105						
Forces, Torques and efficiency								
Nominal drive torque	Nm	26.5		74.2		244		58
Maximum drive torque	Nm	47.4		131.4		368		58
Nominal thrust force with hollow shaft bearing	N	925		1696		3733		--
with other bearings:		see on page 11		see on page 13		see on page 14		1300
Repeatability up to 3m 3)	mm	± 0.05		± 0.05		± 0.05		± 0.05
Repeatability up to 3m 3)	mm	± 0.1		± 0.1		± 0.1		± 0.1
Efficiency	%	95		95		95		80
Toothed pulley- and toothed belt characteristics								
Travel distance per revolution	mm/rev	180		270		420		280
Number of teeth of pulley		18		27		21		28
Timing belt width / pitch	mm	25 / 10		32 / 10		56 / 20		42 / 10
Weight of timing belt	kg/m	0.166		0.213		0.550		0.251
Effective radius of the drive pinion (RA)	mm	28.7		43.0		66.8		44.56

1) Additional mass moment of inertia due to payload and belt mass of toothed belt drives: see on page 73
2) Longitudinal flanges for longer strokes are possible. The following constraints are to be expected with toothed belt driven linear actuators: maximum permissible load, drive torque, speed, acceleration and repeatability (see page 65). Linear actuators with rack-and-pinion drive feature an infinite travel on the part of the actuator – it depends solely on the energy supply of the drive.
3) At a constant ambient and operating temperature of the actuator.
4) Second moment of in ertia.

Characteristics, safety factor S=1 taken into consideration. The data apply for a temperature range of –10°C to +40°C. The characteristics are valid under normalized conditions and only for the individual operating and load type. In the case of compound loads, it is necessary to verify in accordance with normal physical laws and technical standards whether individual ratings should to be reduced. In case of doubt please contact Parker Hannifin.

2.2.1 Load bearing capacity of toothed belt and carriage

2.2.1.1 Operating force Fx transmitted by the toothed belt / pretension

The operating force Fx transmitted by the toothed belt depends on its pretension. If not stated otherwise, the HPLA is furnished with a default pretension. With this default pretension, the HPLA can maximally transmit the thrust force F_nominal. If a higher thrust force is required, the toothed belt pretension is increased and forces up to F_max can be transmitted. If the operating force Fx is higher than the belt pretension, toothed belt spread might be the result.

2.2.1.2 Lifetime

The lifetime (s_nominal / s_max) of the drive train (with the exception of the guiding system and, if the pulley is mounted directly on the drive shaft, the gear bearings), depends on the pretension and on the operating force present.

2.2.1.3 Forces and torques transmitted by the carriage

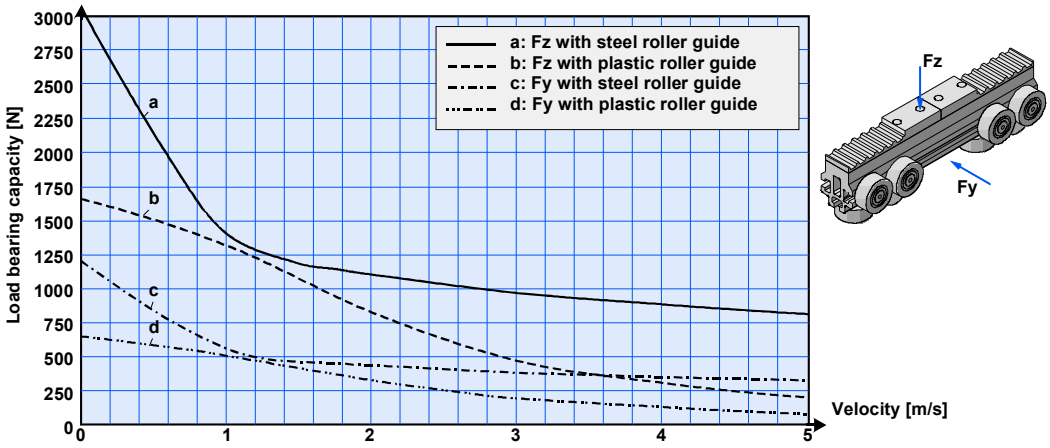
Forces and torques transferred by the carriage are speed-dependant. The graphs shown in the diagrams only apply to a standard carriage (S or T).
In the case of extended carriages (E or F), all values with the exception of Fx can be doubled if the load is introduced in pairs or is distributed evenly over the entire length of the carriage.
The curves show the maximum load-bearing capacity of a carriage in one direction of force or torque. If several loads are applied in different directions, the values specified in the curves must be derated, i.e. the load or speed should be reduced.
Please refer to our "DimAxes" software for precise sizing (see page 71).

2.2.2 Transmissible forces and torques HPLA80

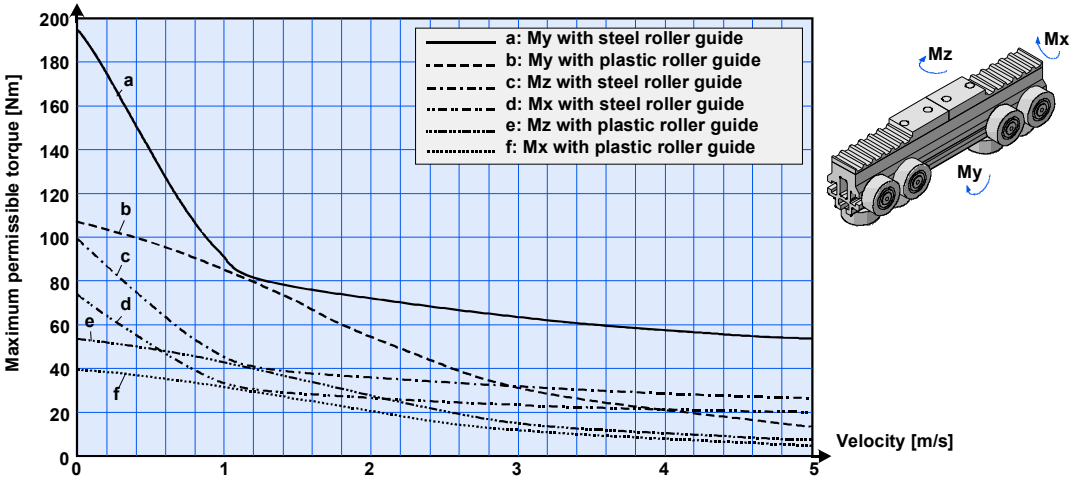
Please note the explanations in the "load bearing capacity of toothed belt and carriage" chapter on page 11!

	Transmissible thrust force (Fx) (for double axes: per belt drive)		Nominal lifetime[1]	
Drive option (=> page 73 and page 73)	**F_nom [N]**	**F_max [N]**	**s_nom [km]**	**s_max [km]**
NL/NR / LR/RL (single-/double axis, hollow shaft bearing)	925	1114	81000	46000
SL/SR / SB (single-/double axis, massive shaft bearing)	925	1114	81000	46000
FL/FR, single axis, pulley directly on the shaft with gear P3 (A)	474	602	81000	40000
FL/FR, single axis, pulley directly on the shaft with gear P3V (A)	925	1114	81000	46000
FL/FR, single axis, pulley directly on the shaft with gear P4 (B)	557	671	81000	46000
FL/FR, single axis, pulley directly on the shaft with gear P4V (B)	925	1114	81000	46000
FL/FR, single axis, pulley directly on the shaft with gear PE4 (Q)	500	600	81000	46000
FL/FR, single axis, pulley directly on the shaft with gear PE5 (R)	675	900	81000	46000

Load bearing capacity HPLA80 (Fy and Fz)



Moment load capacity HPLA80 (mx, My and Mz)



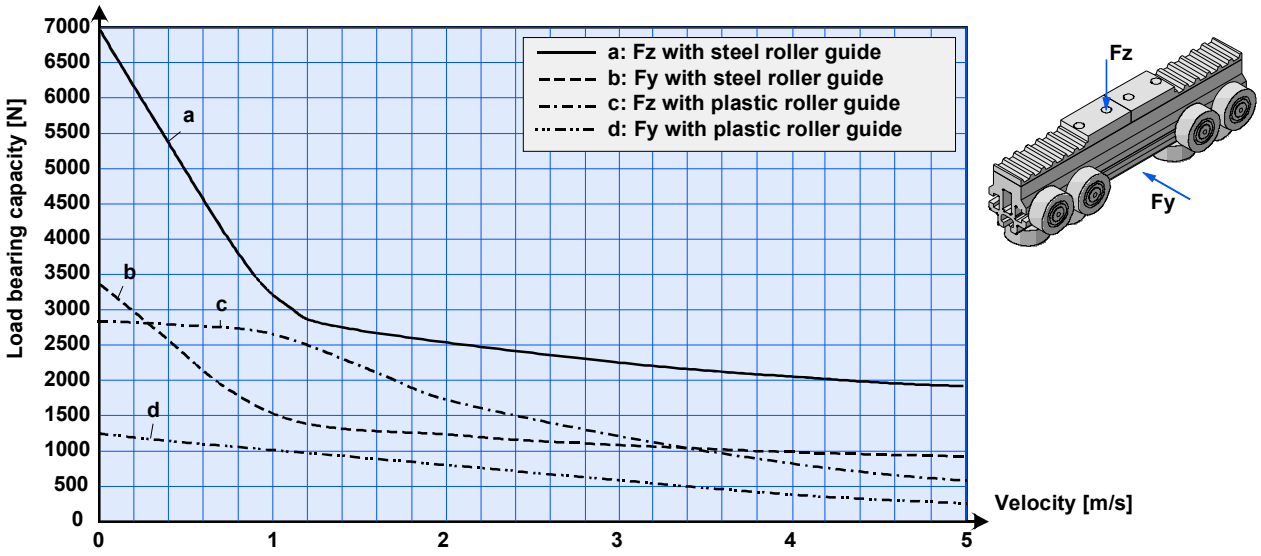
[1] Basis of the nominal life time calculation for anti-friction bearings: At least 90% of all bearings attain or even exceed the nominal lifetime, in part even by far.

2.2.3 Transmissible forces and torques HPLA120

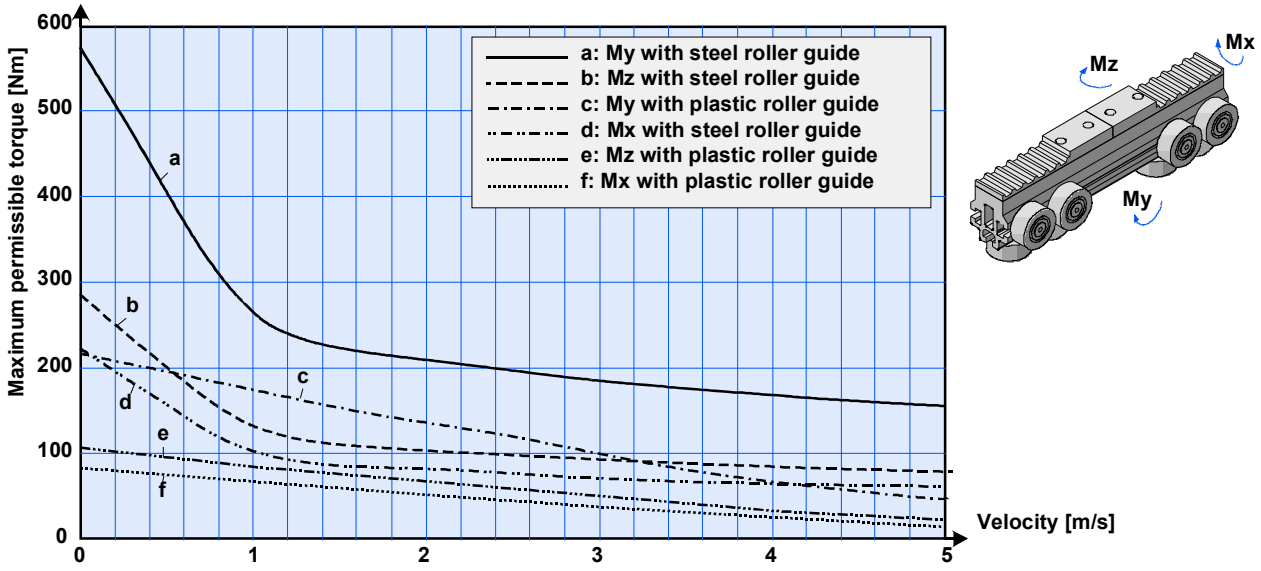
Please note the explanations in the "load bearing capacity of toothed belt and carriage" chapter on page 11!

	Transmissible thrust force (Fx) (for double axes: per belt drive)		Nominal lifetime [2]	
Drive option (=> page 73 and page 73)	**F_nom [N]**	**F_max [N]**	**s_nom [km]**	**s_max [km]**
NL/NR / LR/RL (single-/double axis, hollow shaft bearing)	1696	2234	85000	37000
SL/SR / SB (single-/double axis, massive shaft bearing)	1696	2234	85000	37000
FL/FR, single axis, pulley directly on the shaft with gear P4 (B)	627	905	85000	28000
FL/FR, single axis, pulley directly on the shaft with gear P4V (B)	1514	2014	85000	36000
FL/FR, single axis, pulley directly on the shaft with gear P5 (C)	1059	1529	85000	28000
FL/FR, single axis, pulley directly on the shaft with gear P5V (C)	1696	2234	85000	37000
FL/FR, single axis, pulley directly on the shaft with gear PE5 (R)	675	900	85000	37000

Load bearing capacity HPLA120 (Fy and Fz)



Moment load capacity HPLA120 (mx, My and Mz)



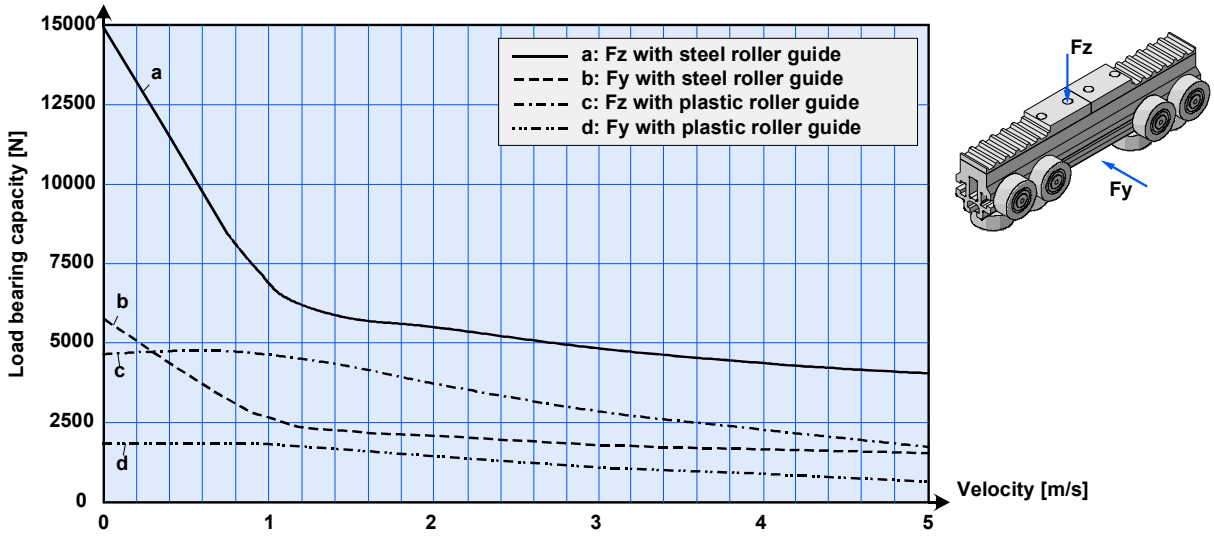
[2] Basis of the nominal life time calculation for anti-friction bearings: At least 90% of all bearings attain or even exceed the nominal lifetime, in part even by far.

2.2.4 Transmissible forces and torques HPLA180 with toothed belt drive

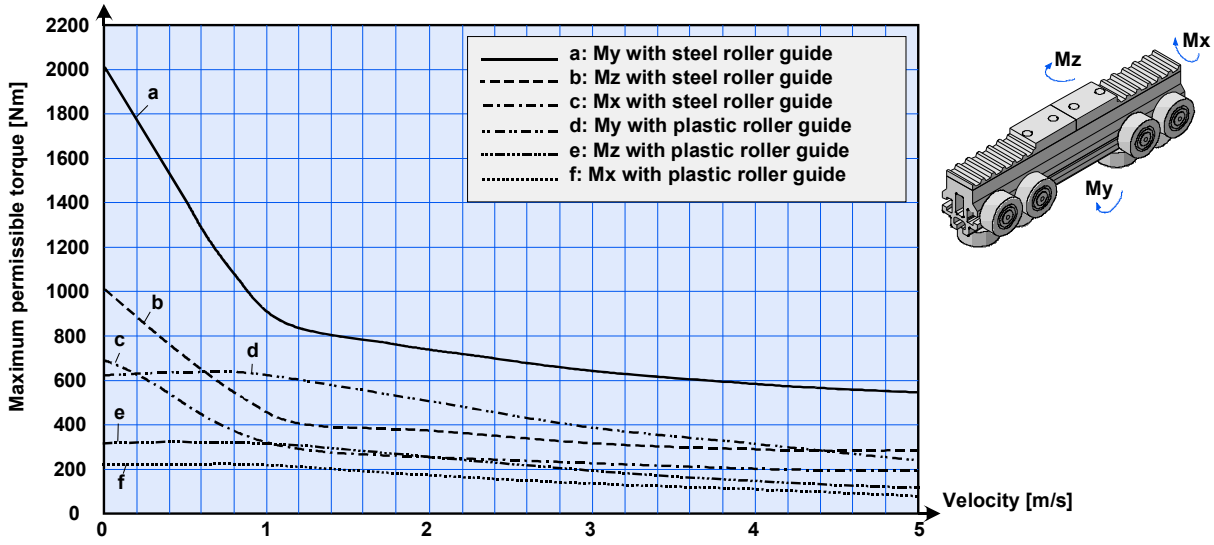
Please note the explanations in the "load bearing capacity of toothed belt and carriage" chapter on page 11!

	Transmissible thrust force (Fx) (for double axes: per belt drive)		Nominal lifetime[3]	
Drive option (=> page 73 and page 73)	**F_nom [N]**	**F_max [N]**	**s_nom [km]**	**s_max [km]**
NL/NR / LR/RL (single-/double axis, hollow shaft bearing)	4169	5457	100000	45000
SL/SR / SB (single-/double axis, massive shaft bearing)	3770	3770	136000	136000
FL/FR, single axis, pulley directly on the shaft with gear P5 (C)	1160	1519	100000	45000
FL/FR, single axis, pulley directly on the shaft with gear P5V (C)	2513	2513	112000	112000
FL/FR, single axis, pulley directly on the shaft with gear P7 (D)	1654	2164	100000	45000
FL/FR, single axis, pulley directly on the shaft with gear P7V (D)	3561	4398	100000	54000

Load bearing capacity HPLA180 (Fy and Fz)



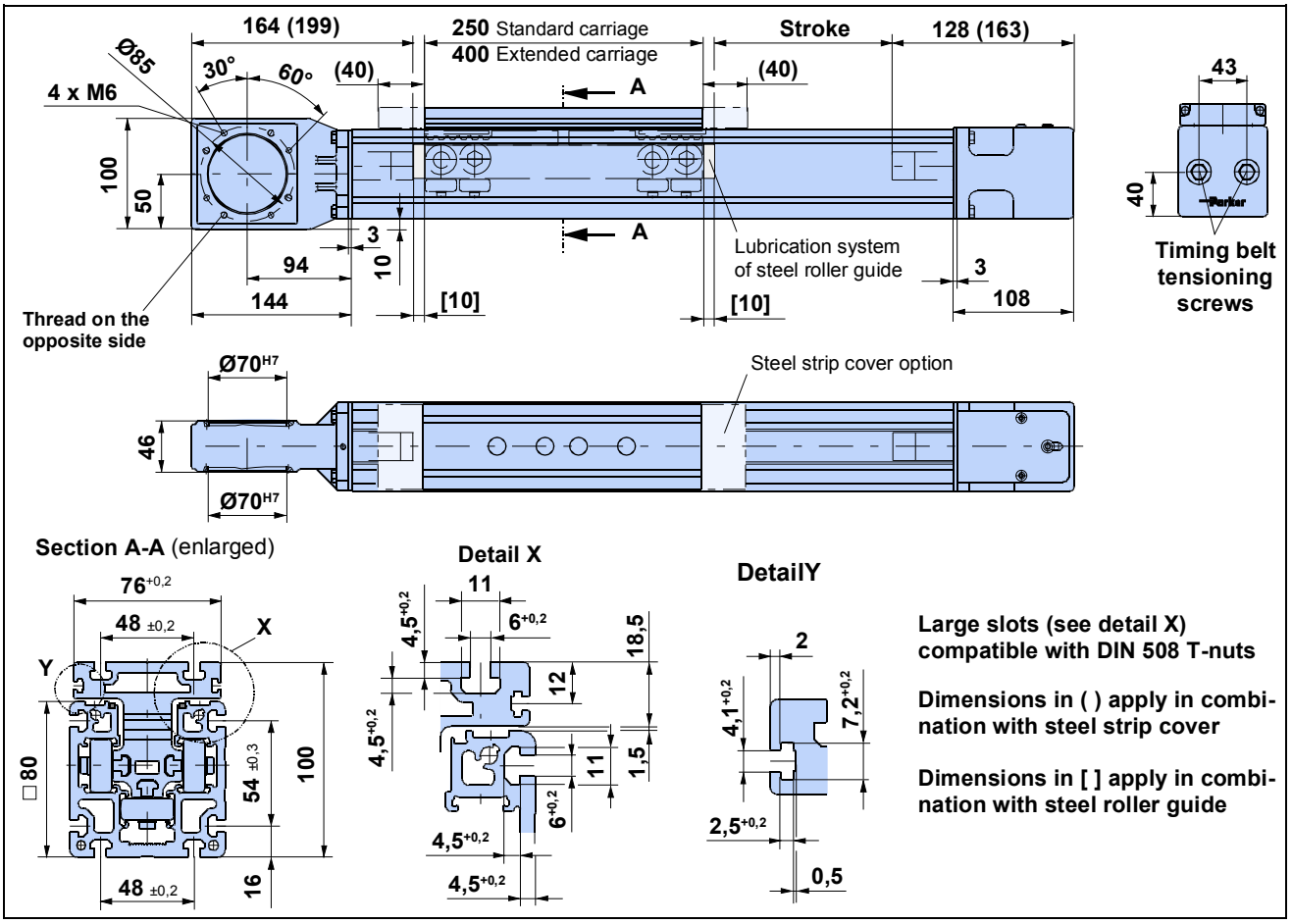
Moment load capacity HPLA180 (mx, My and Mz)



[3] Basis of the nominal life time calculation for anti-friction bearings: At least 90% of all bearings attain or even exceed the nominal lifetime, in part even by far.

2.3 Dimensional Drawings

2.3.1 HPLA80 with toothed belt drive HPLA-LBB 080



Possible drive combinations HPLA-LBB 080

Drive flange[4] → / Drive option[4] ↓	**FL/FR** toothed pulley separately included for bearing directly on the shaft, prepared for drive mounting	**SL/SR/SB** housing with drive shaft	**NL/NR** version with supported hollow shaft without drive – prepared for drive mounting	**LR/RL** supported hollow shaft, gear **A, B, Q, R** mounted. Additional drive shaft
A (for P3/P3V) single axis	Figure HPLA-LBB 080-11	For gears or motors with hollow shaft. Dimensional drawings Figure HPLA-LBB 080- 1, Figure HPLA-LBB 080-2	Figure HPLA-LBB 080-7	Figure HPLA-LBB 080-3
B (for P4/P4V) single-/ double axis	Figure HPLA-LBB 080-12/ only single axis		Figure HPLA-LBB 080-8/ Figure HPLA-LBB 080-17: Double axis drive side	Figure HPLA-LBB 080-4/ Figure HPLA-LBB 080-17: Double axis drive side
E (for motor MH105/ B9/19) single axis	not possible		Figure HPLA-LBB 080-15	non standard
F (for motor MH105/ B6/24) single axis	not possible		Figure HPLA-LBB 080-16	non standard
Q (for PE4) single axis	Figure HPLA-LBB 080-13		Figure HPLA-LBB 080-9	Figure HPLA-LBB 080-5
R (for PE5) single axis	Figure HPLA-LBB 080-14		Figure HPLA-LBB 080-10	Figure HPLA-LBB 080-6

[4] Short designations from the order code: see page 73.

HPLA-LBB 080 – drive housing with drive shafts / drive flanges

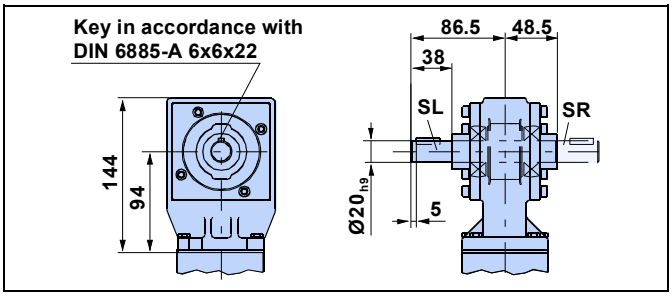


Figure HPLA-LBB 080- 1: SL/SR

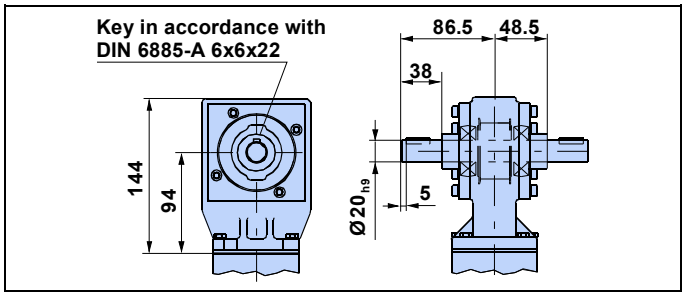


Figure HPLA-LBB 080-2: SB

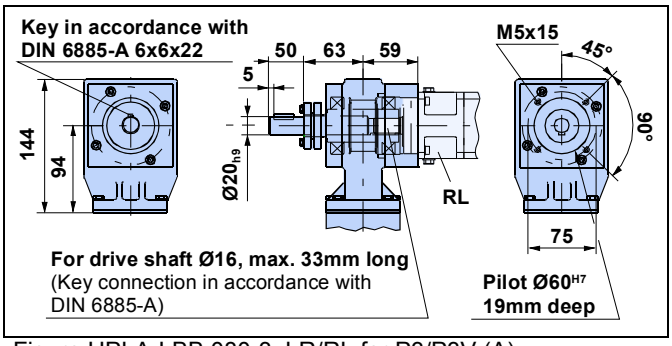


Figure HPLA-LBB 080-3: LR/RL for P3/P3V (A)

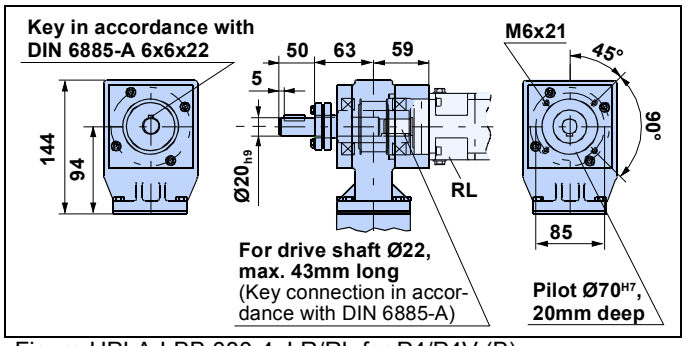


Figure HPLA-LBB 080-4: LR/RL for P4/P4V (B)

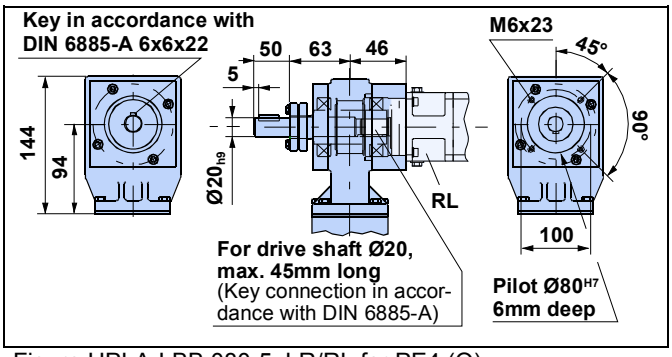


Figure HPLA-LBB 080-5: LR/RL for PE4 (Q)

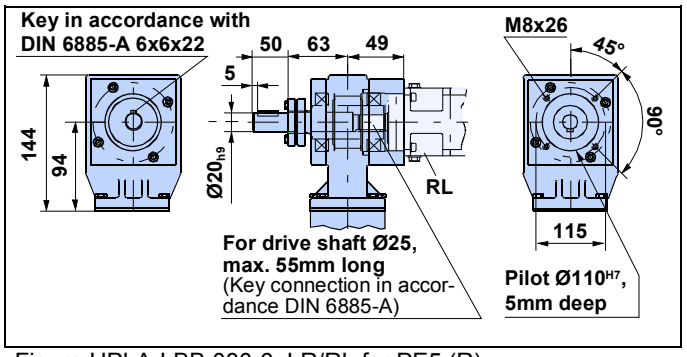


Figure HPLA-LBB 080-6: LR/RL for PE5 (R)

HPLA-LBB 080 – Single axis with hollow shaft or pulley directly on the shaft

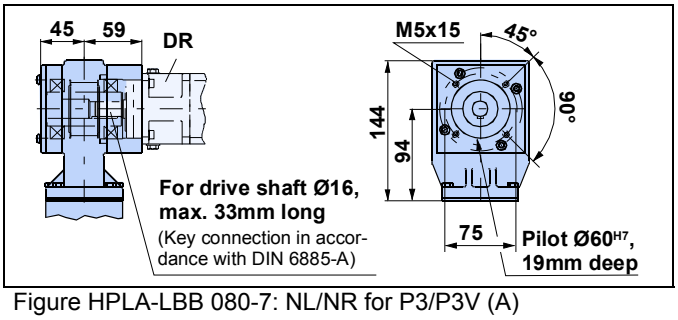


Figure HPLA-LBB 080-7: NL/NR for P3/P3V (A)

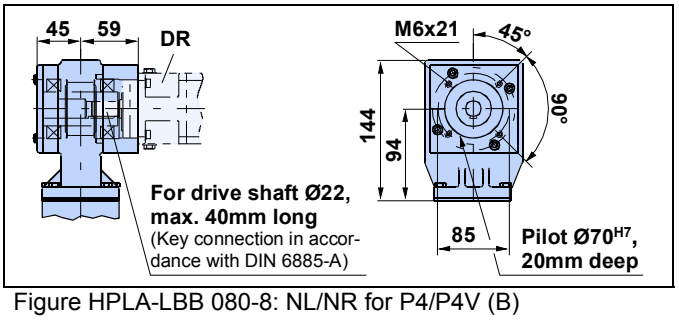


Figure HPLA-LBB 080-8: NL/NR for P4/P4V (B)

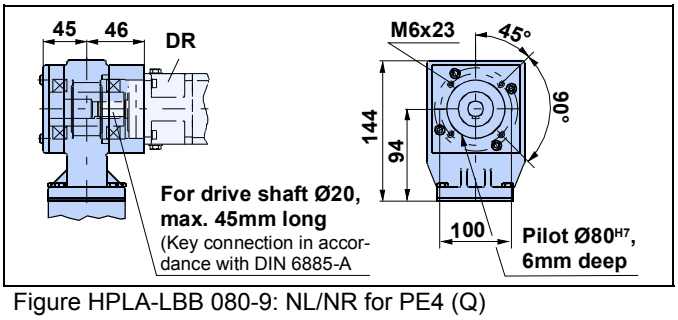


Figure HPLA-LBB 080-9: NL/NR for PE4 (Q)

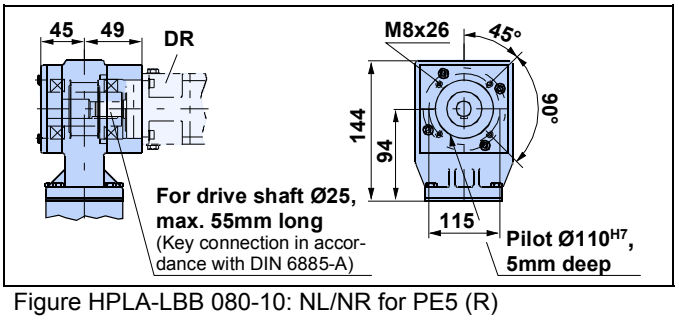


Figure HPLA-LBB 080-10: NL/NR for PE5 (R)

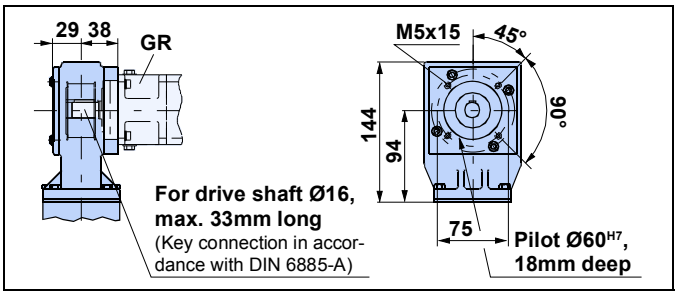


Figure HPLA-LBB 080-11: FL/FR for P3/P3V (A)

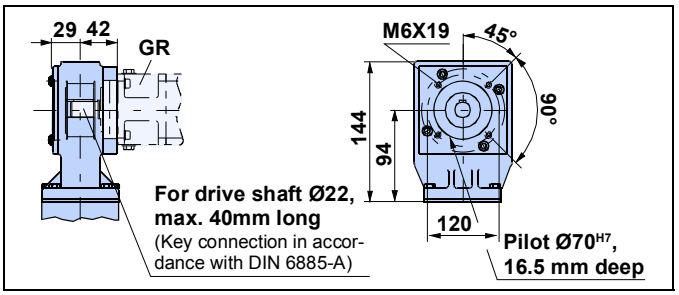


Figure HPLA-LBB 080-12: FL/FR for P4/P4V (B)

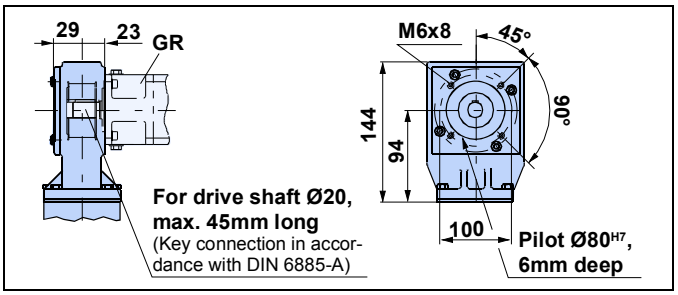


Figure HPLA-LBB 080-13: FL/FR for PE4 (Q)

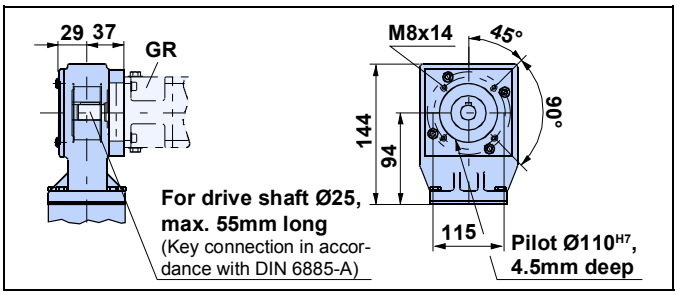


Figure HPLA-LBB 080-14: FL/FR for PE5 (R)

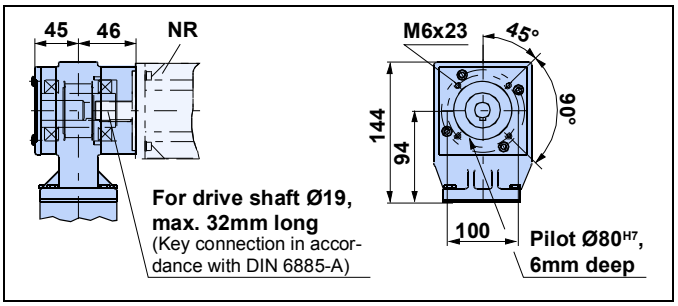


Figure HPLA-LBB 080-15: NL/NR for motor MH105/B9/19 (E)

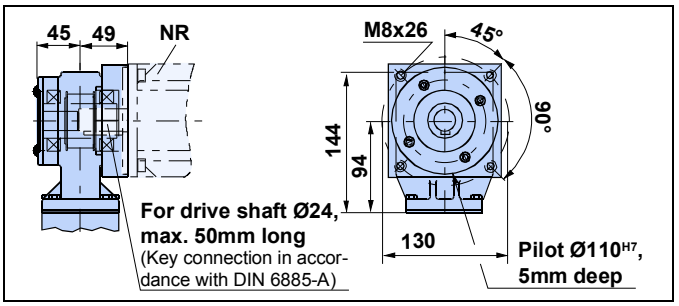


Figure HPLA-LBB 080-16: NL/NR for motor MH105/B6/24 (F)

HPLA-LBB 080 – double axis

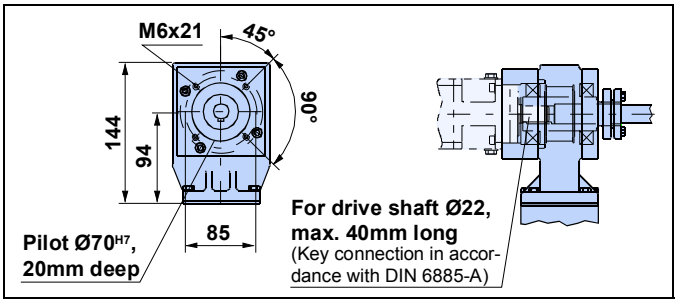
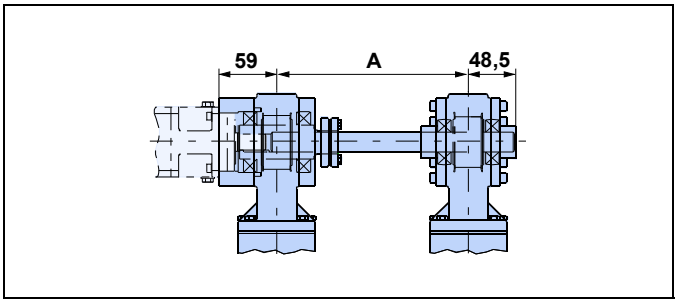
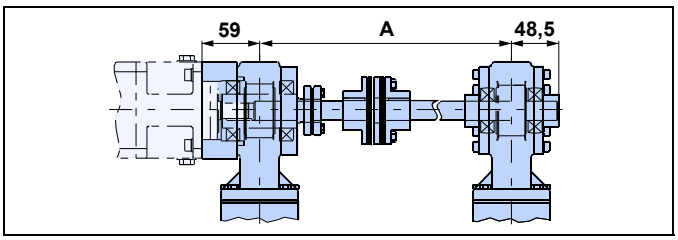


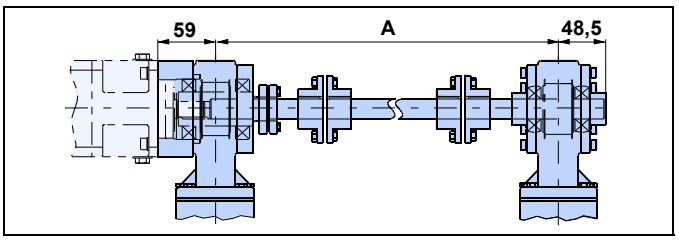
Figure HPLA-LBB 080-17: Double axis drive side: NL/NR or DL/DR or LR/RL for P4/P4V (B)



Axis distance A between 120-350 mm



Axis distance A between 350-600 mm

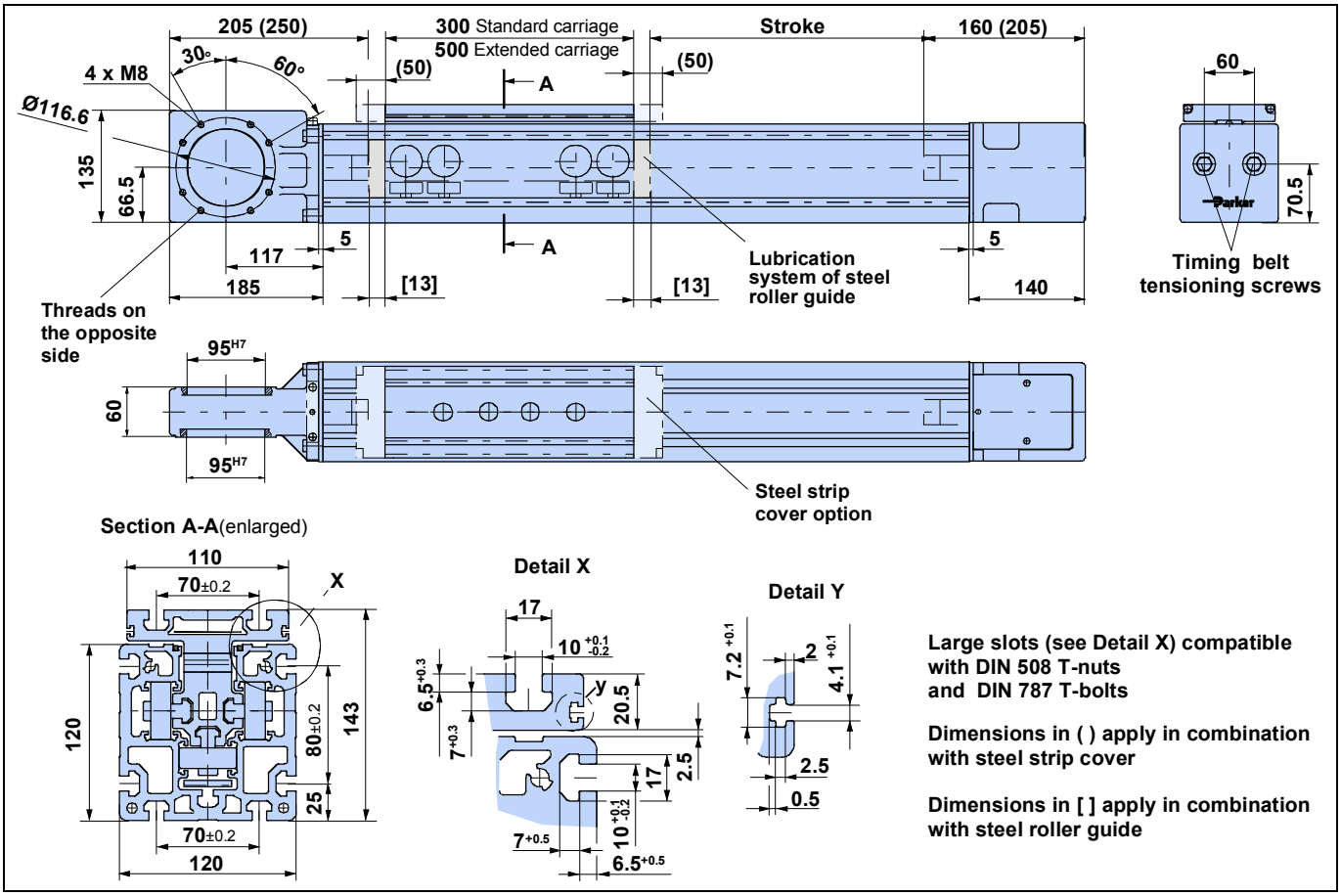


Axis distance A larger than 600 mm

2.3.2

Description

HPLA120 with toothed belt drive HPLA-LBB 120



Possible drive combinations HPLA-LBB 120

Drive flange[5] → / Drive option[5] ↓	**FL/FR** toothed pulley separately included for bearing directly on the shaft, prepared for drive mounting	**SL/SR/SB** housing with drive shaft	**NL/NR** version with supported hollow shaft without drive – prepared for drive mounting	**LR/RL** suppoerted hollow shaft, gear **B, C, Q, R** mounted. Additional drive shaft
B (for P4/P4V) single axis	Figure HPLA-LBB 120- 11	For gears or motors with hollow shaft. Dimensional drawings Figure HPLA-LBB 120- 1, Figure HPLA-LBB 120- 2	Figure HPLA-LBB 120- 7	Figure HPLA-LBB 120- 3
C (for P5/P5V) single-/double axis	Figure HPLA-LBB 120- 12/ only single axis		Figure HPLA-LBB 120- 8/ Figure HPLA-LBB 120- 17	Figure HPLA-LBB 120- 4/ Figure HPLA-LBB 120- 17
G (for motor MH105/ B6/24) single axis	not possible		Figure HPLA-LBB 120- 14	non standard
H (for motor HJ155) single axis	not possible		Figure HPLA-LBB 120- 16	non standard
J (for motor MH145/ B5/24) single axis	not possible		Figure HPLA-LBB 120- 15	non standard
Q (for PE4) single axis	not possible		Figure HPLA-LBB 120- 9	Figure HPLA-LBB 120- 5
R (for PE5) single axis	Figure HPLA-LBB 120- 13		Figure HPLA-LBB 120- 10	Figure HPLA-LBB 120- 6

[5] Short designations from the order code: see page 73

HPLA-LBB 120 – drive housing with drive shafts / drive flanges

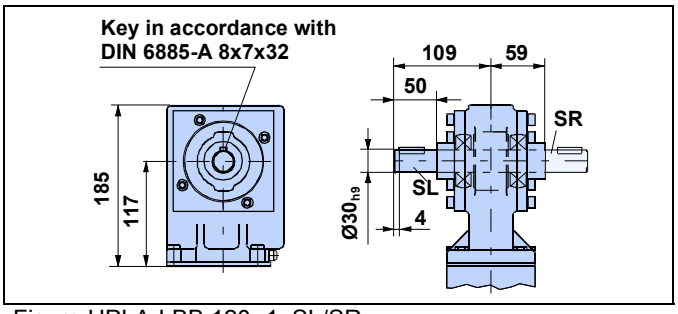


Figure HPLA-LBB 120- 1: SL/SR

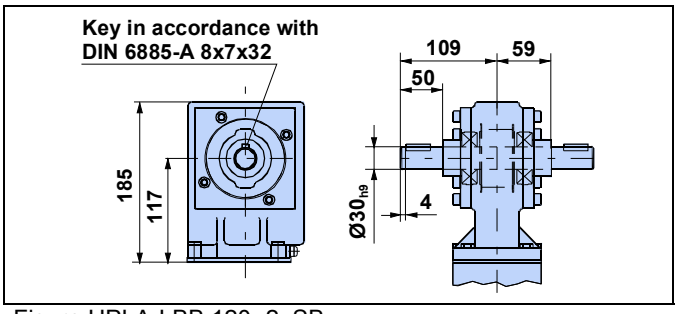


Figure HPLA-LBB 120- 2: SB

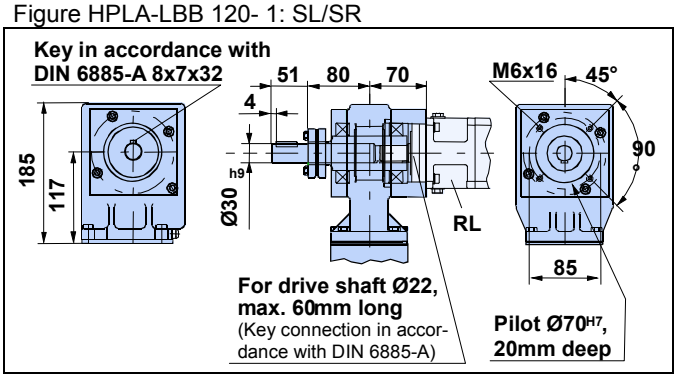


Figure HPLA-LBB 120- 3: LR/RL for P4/P4V (B)

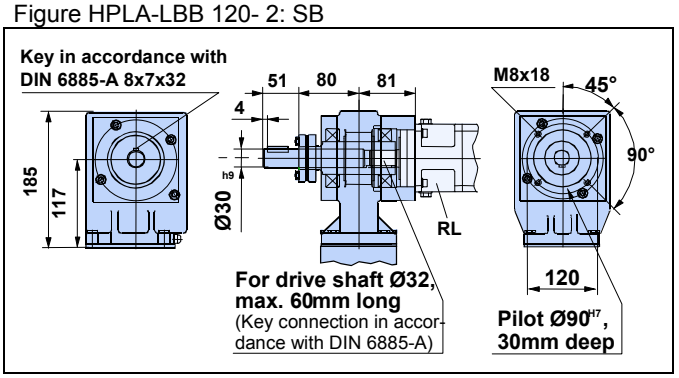


Figure HPLA-LBB 120- 4: LR/RL for P5/P5V (C)

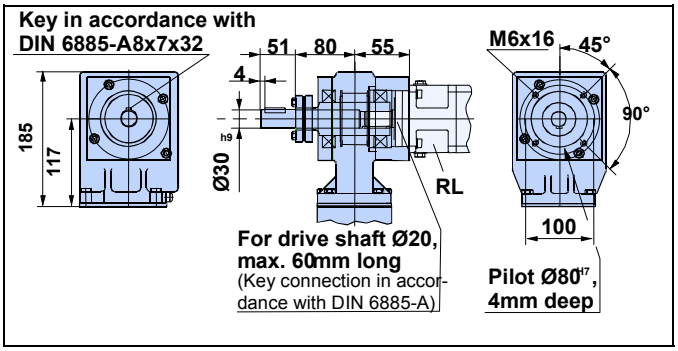


Figure HPLA-LBB 120- 5: LR/RL for PE4 (Q)

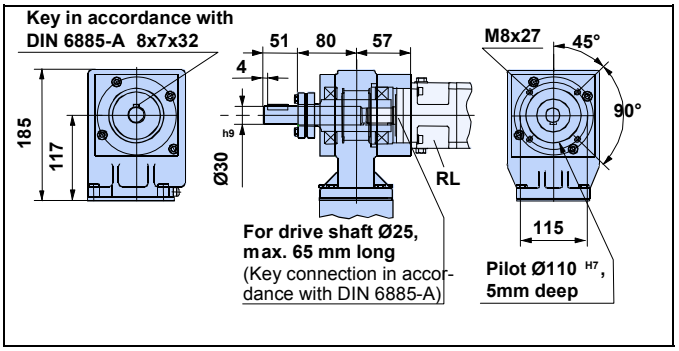


Figure HPLA-LBB 120- 6: LR/RL for PE5 (R)

HPLA-LBB 120 – Single axis with hollow shaft or pulley directly on the shaft

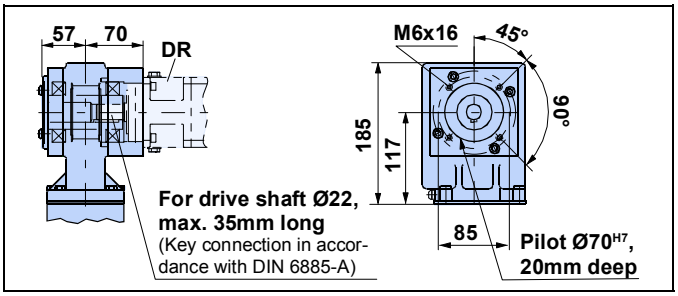


Figure HPLA-LBB 120- 7: NL/NR for P4/P4V (B)

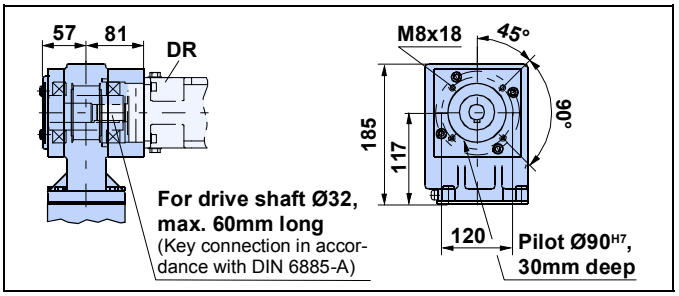


Figure HPLA-LBB 120- 8: NL/NR for P5/P5V (C)

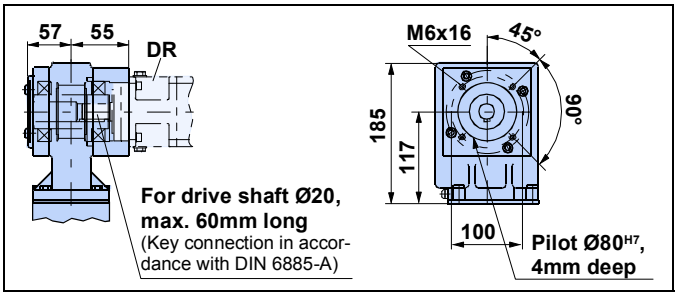


Figure HPLA-LBB 120- 9: NL/NR for PE4 (Q)

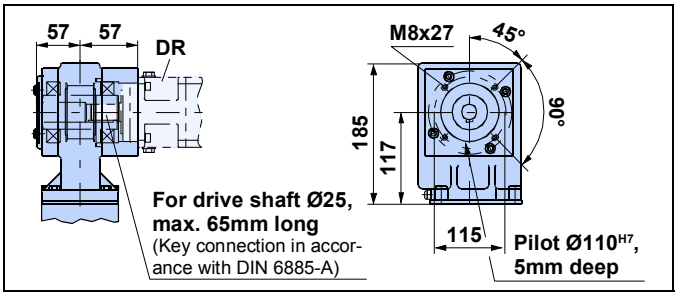


Figure HPLA-LBB 120- 10: NL/NR for PE5 (R)

Description

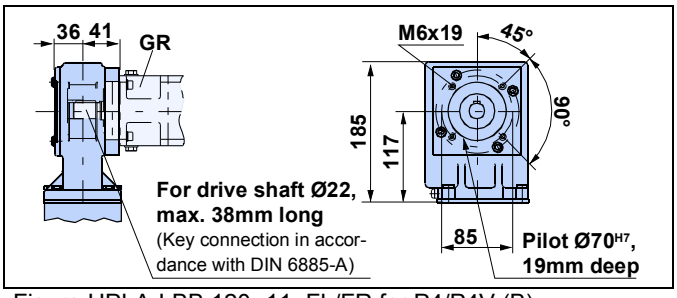


Figure HPLA-LBB 120- 11: FL/FR for P4/P4V (B)

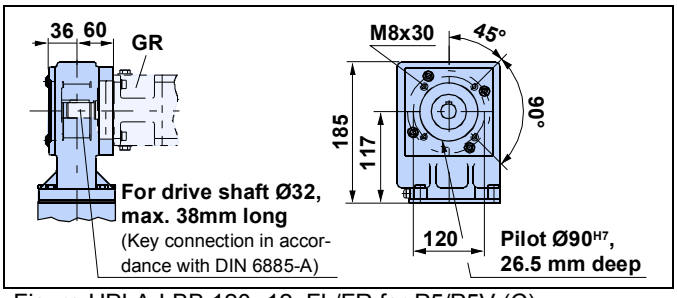


Figure HPLA-LBB 120- 12: FL/FR for P5/P5V (C)

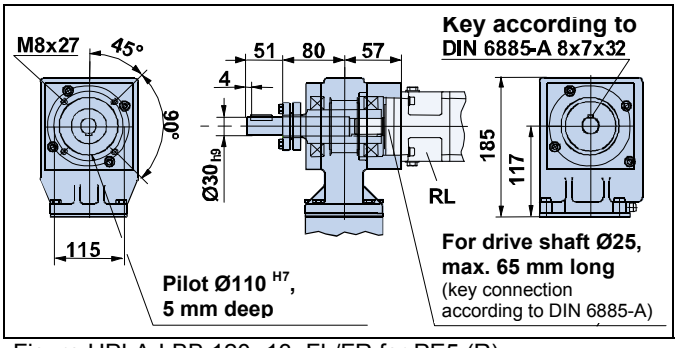


Figure HPLA-LBB 120- 13: FL/FR for PE5 (R)

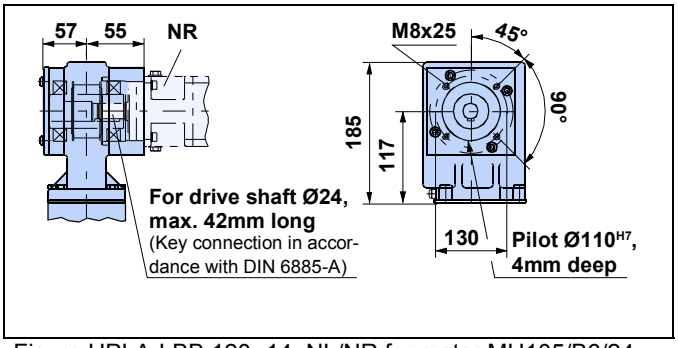


Figure HPLA-LBB 120- 14: NL/NR for motor MH105/B6/24 (G)

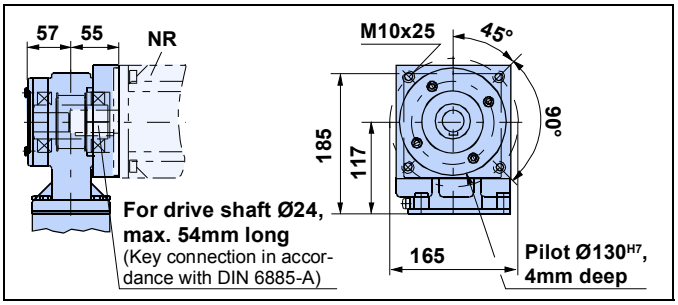


Figure HPLA-LBB 120- 15: NL/NR for motor MH145/B5/24 (J)

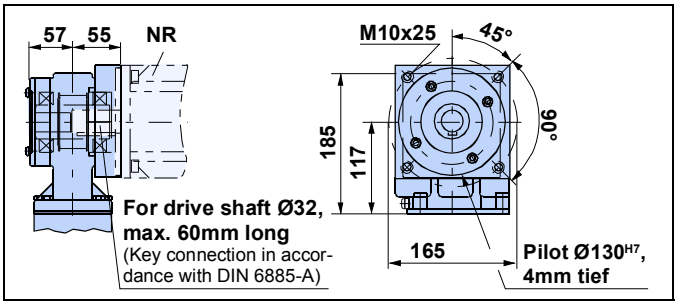


Figure HPLA-LBB 120- 16: NL/NR for motor HJ155 (H)

HPLA-LBB 120 – double axis

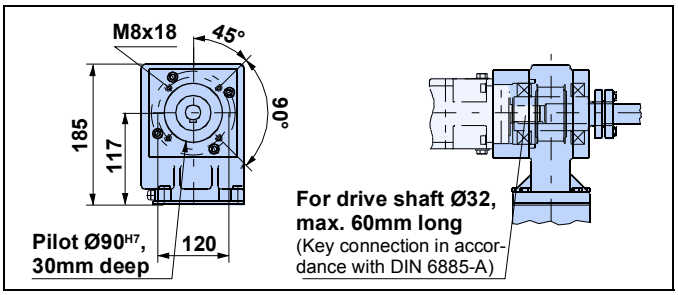
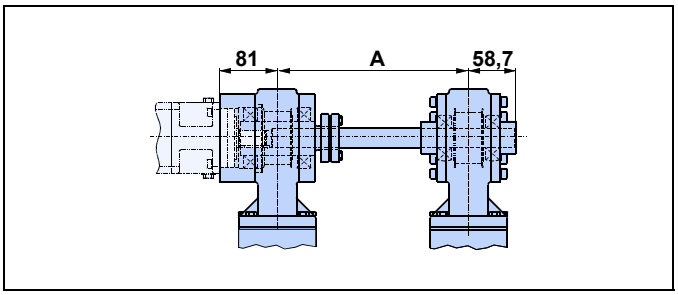
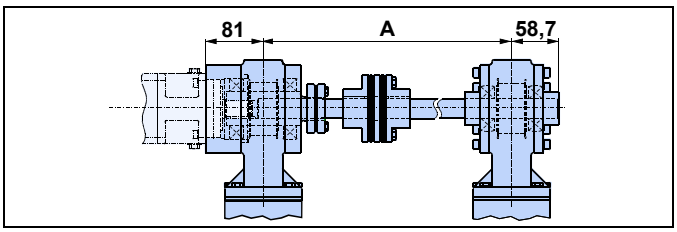


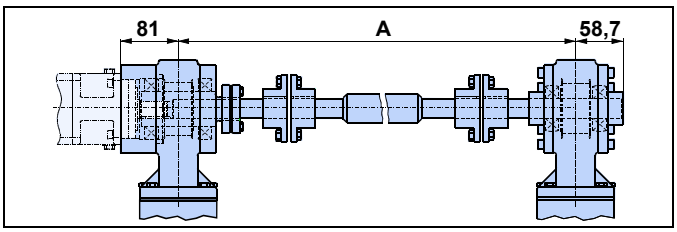
Figure HPLA-LBB 120- 17: Double axis drive side NL/NR or DL/DR or LR/RL for P5/P5V (C)



Axis distance A between 150-350 mm

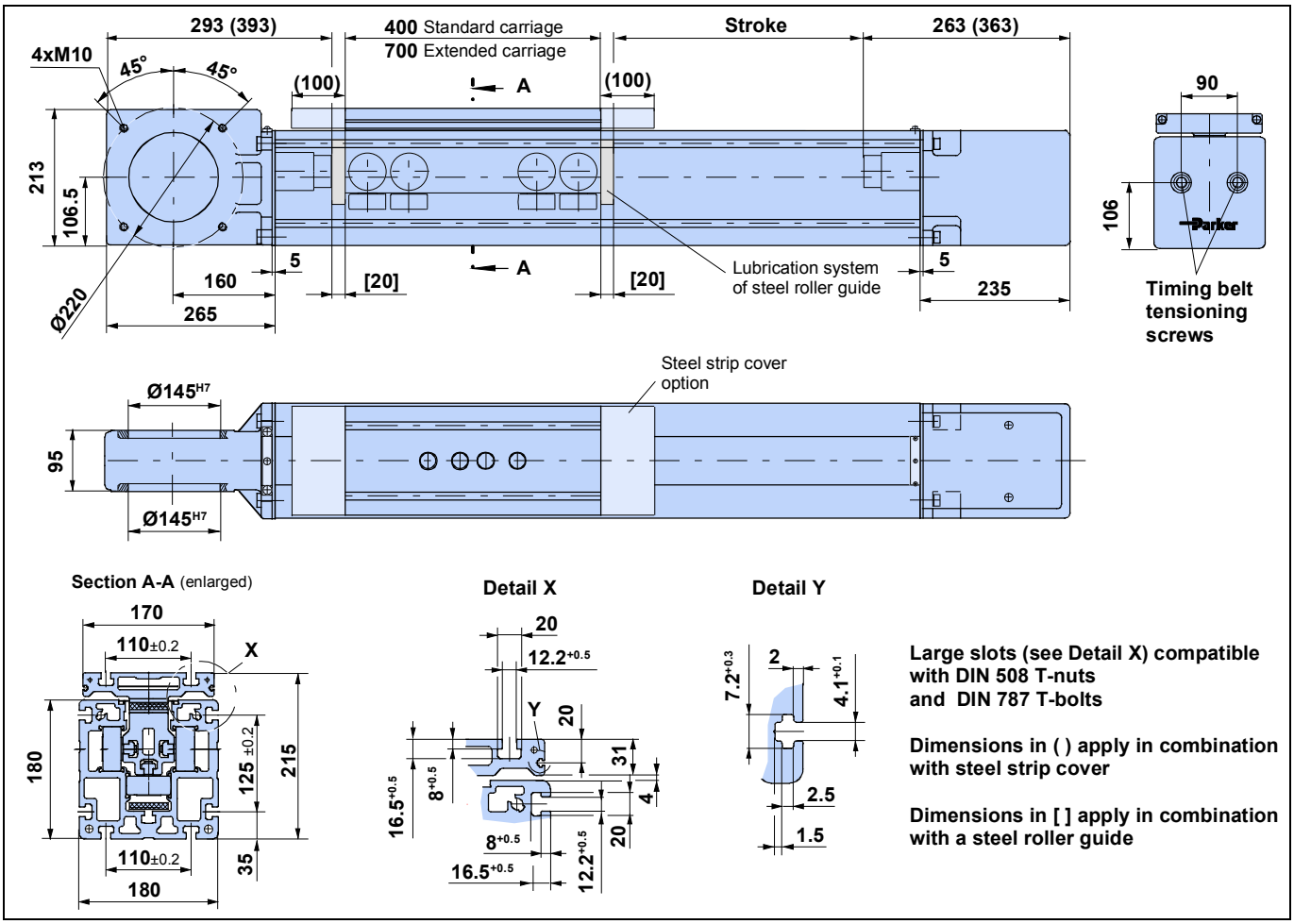


Axis distance A between 350-600 mm



Axis distance A larger than 600 mm

2.3.3 HPLA180 with toothed belt drive HPLA-LBB 180



Possible drive combinations HPLA-LBB 180

Drive flange[6] → / Drive option[6] ↓	**FL/FR** toothed pulley separately included for bearing directly on the shaft, prepared for drive mounting	**SL/SR/SB** housing with drive shaft	**NL/NR** version with supported hollow shaft without drive – prepared for drive mounting	**LR/RL** suppoerted hollow shaft, gears **C** and **D** mounted. Additional drive shaft
C (for P5/P5V) single axis	Figure HPLA-LBB 180- 7	For drives with hollow shaft Dimensional drawings Figure LBB180- 1, Figure HPLA-LBB 180- 2	Figure HPLA-LBB 180- 5	Figure HPLALBB 180- 3
D (for P7/P7V) single/double axis	not possible		Figure HPLA-LBB 180- 6/ Figure HPLA-LBB 180- 8	Figure HPLA-LBB 180- 4/ Figure HPLA-LBB 180- 8

HPLA-LBB 180 – drive housing with drive shafts

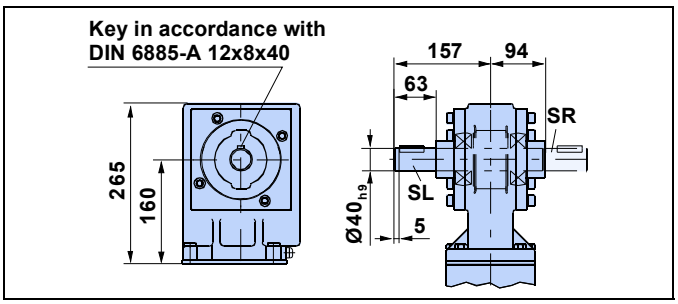


Figure LBB180- 1: SL/SR

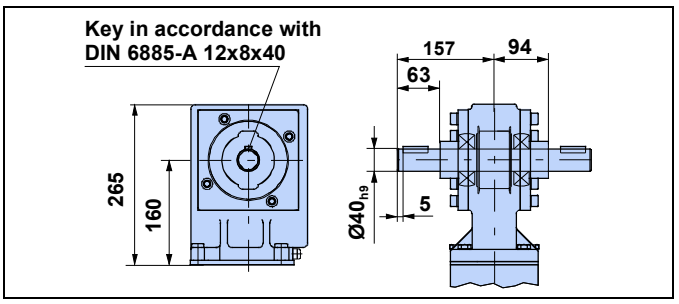


Figure HPLA-LBB 180- 2: SB

[6] Short designations from the order code: see page 73

Description

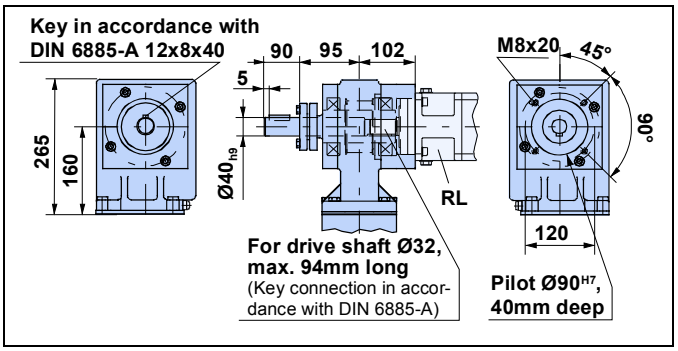


Figure HPLALBB 180- 3: LR/RL for P5/P5V (C)

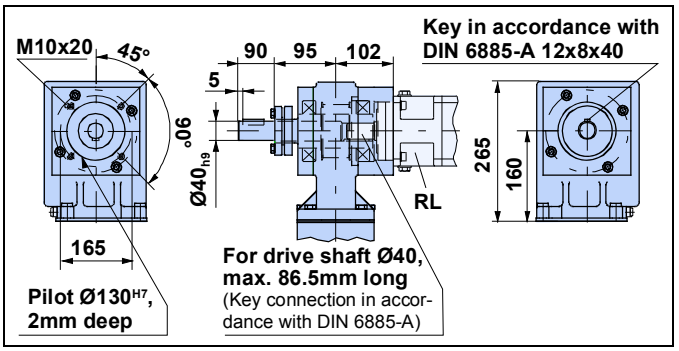


Figure HPLA-LBB 180- 4: LR/RL for P7/P7V (D)

HPLA-LBB 180 – Single axis with hollow shaft or pulley directly on the shaft

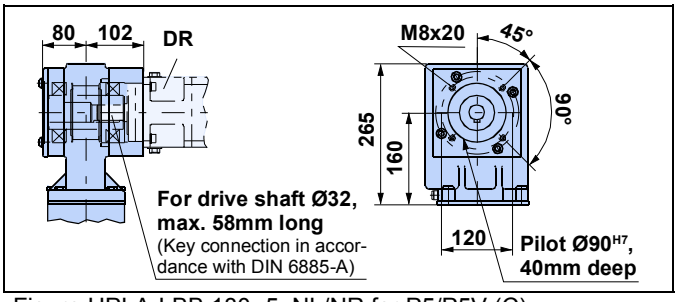


Figure HPLA-LBB 180- 5: NL/NR for P5/P5V (C)

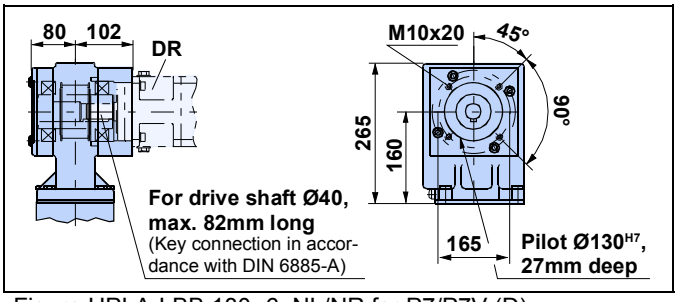


Figure HPLA-LBB 180- 6: NL/NR for P7/P7V (D)

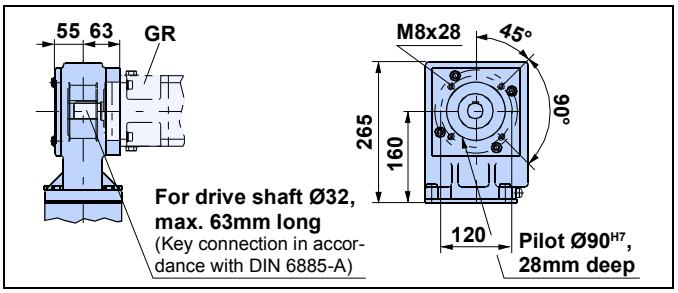


Figure HPLA-LBB 180- 7: FL/FR for P5/P5V (C)

HPLA-LBB 180 – double axis

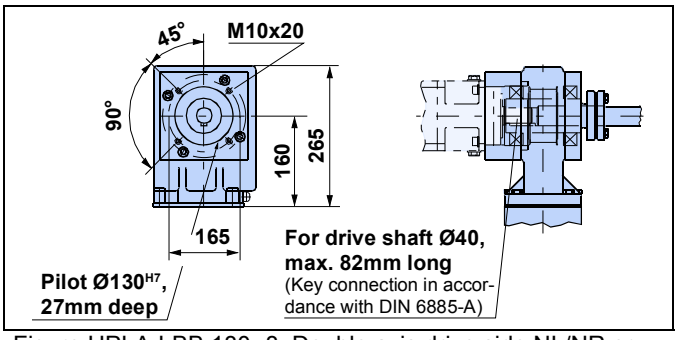
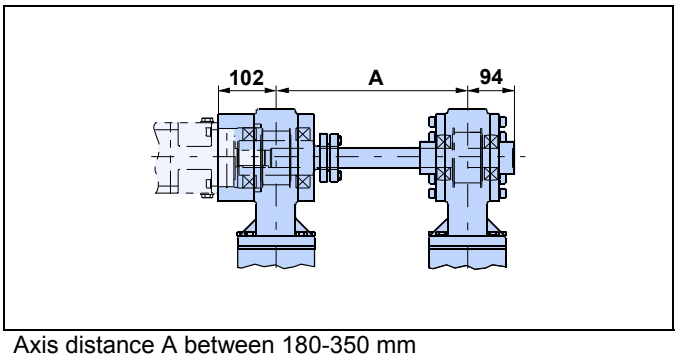
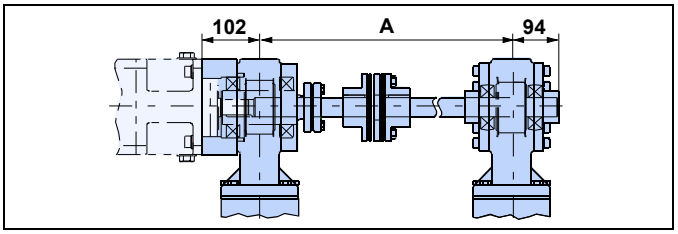


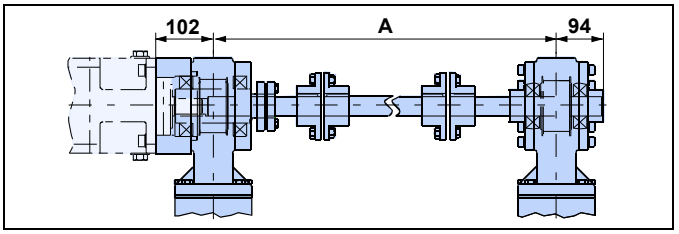
Figure HPLA-LBB 180- 8: Double axis drive side NL/NR or LR/RL for P7/P7V (D)



Axis distance A between 180-350 mm

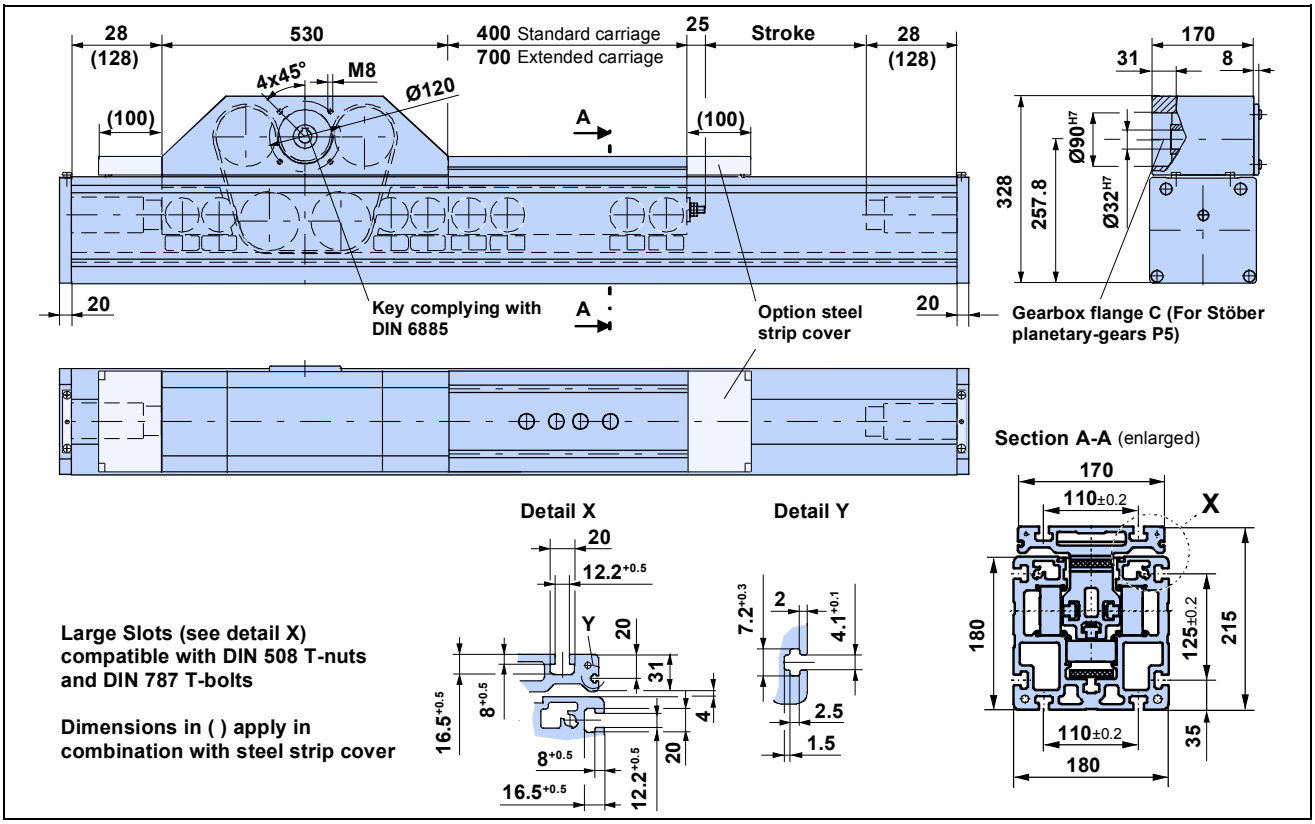


Axis distance A between 350-600 mm

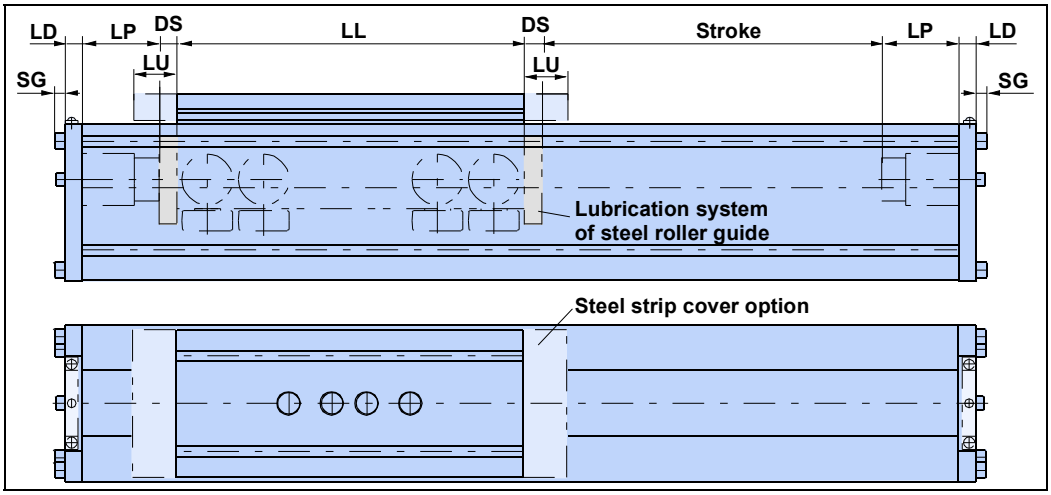


Axis distance A larger than 600 mm

HPLA180 with tooth rack drive HPLA-LBZ 180



2.3.4 Following axis



The HPLA is also available as a driveless following axis. In this case, it serves as a mere guiding. The profile cross section and carriage dimensions correspond to the dimensions of the actuators.

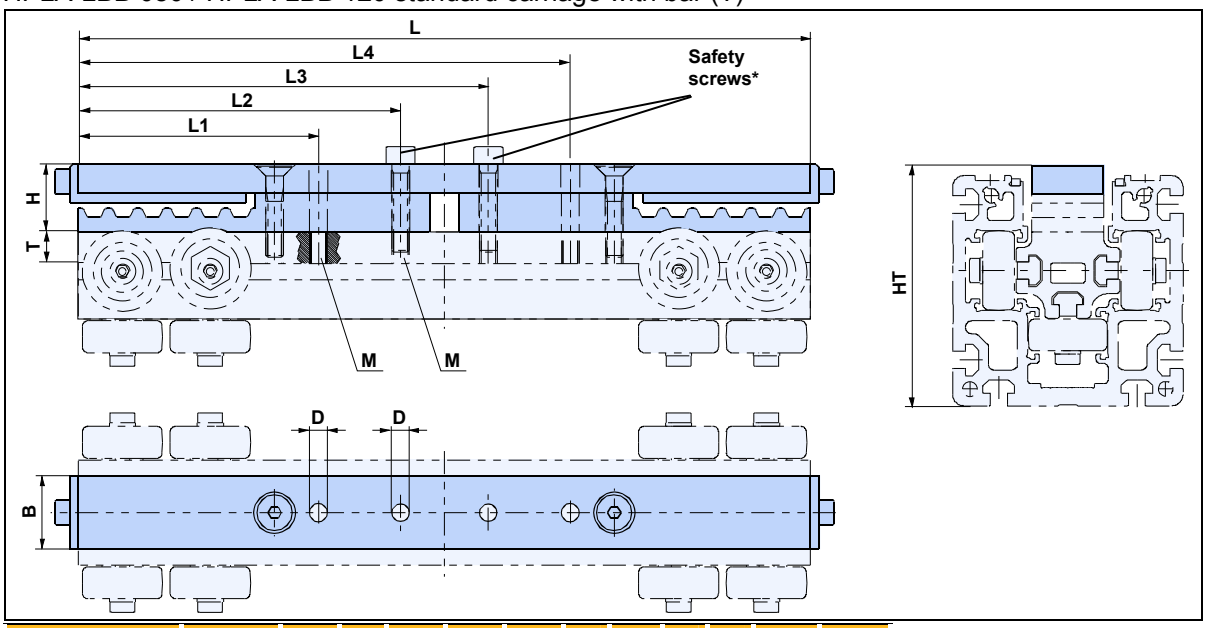
	Without steel strip cover						With steel strip cover					
Axis type	**LD**	**LP**	**DS**	**LL**	**LU**	**SG**	**LD**	**LP**	**DS**	**LL**	**LU**	**SG**
HPLA-LBN080SP	10	20	n.a.	250	n.a.	4	10	55	n.a.	250	40	4
HPLA-LBN080SH			10						10			
HPLA-LBN080EP			n.a.	400					n.a.	400		
HPLA-LBN080EH			10						10			
HPLA-LBN120SP	15	20	n.a.	300	n.a.	6	15	65	n.a.	300	50	6
HPLA-LBN120SH			13						13			
HPLA-LBN120EP			n.a.	500					n.a.	500		
HPLA-LBN120EH			13						13			
HPLA-LBN180SP	20	28	n.a.	400	n.a.	12	20	128	n.a.	400	100	12
HPLA-LBN180SH			20						20			
HPLA-LBN180EP			n.a.	700					n.a.	700		
HPLA-LBN180EH			20						20			

2.3.5 Carriage with bar

- Carriage T/F without load attachment plate; thread drawings for mounting the load -

For an HPLA without load attachment plate, a bar is required as a replacement for the belt clamping. In order to attach your own loads, the threads in the carriage are accessible through bores in the strip.

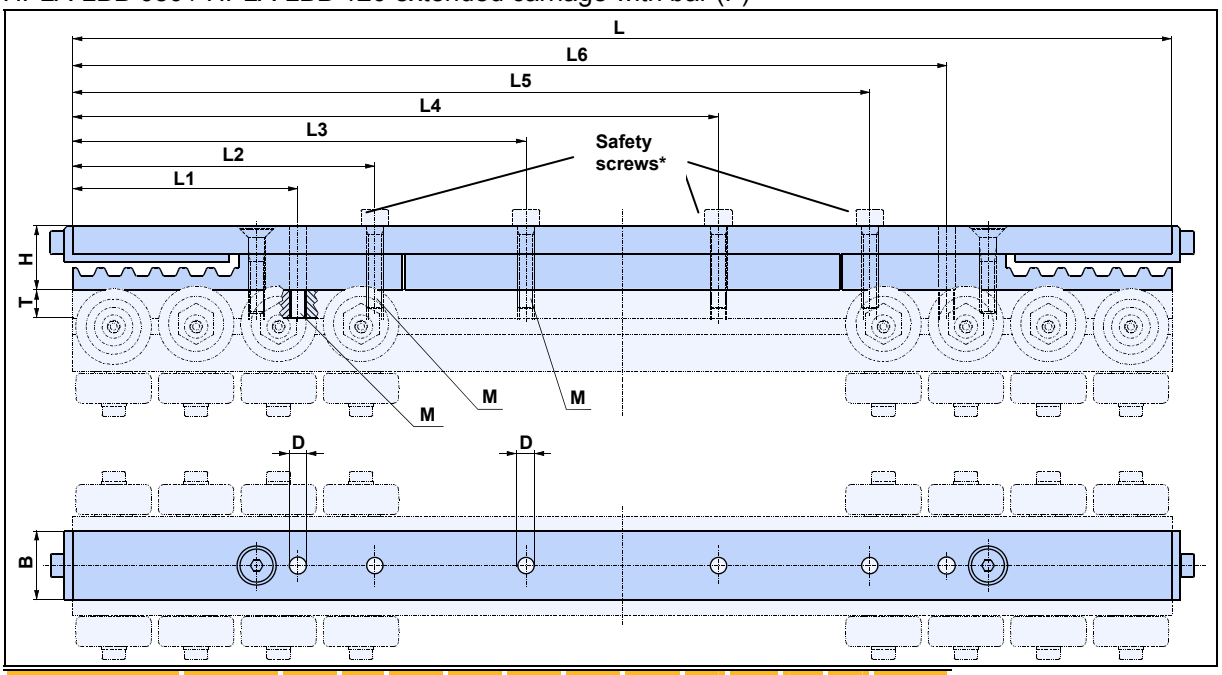
HPLA-LBB 080 / HPLA-LBB 120 standard carriage with bar (T)



Axis type	Unit	L	L1	L2	L3	L4	B	M	T	H	HT	D
HPLA-LBB 080T	mm	250	82	110	140	168	25	M6	11	23	83,5	Ø6.4
HPLA-LBB 120T	mm	300	90	125	175	210	32	M8	14	23	124	Ø8.2

* The retaining screws are mandatory; they may however be replaced by your own screws.

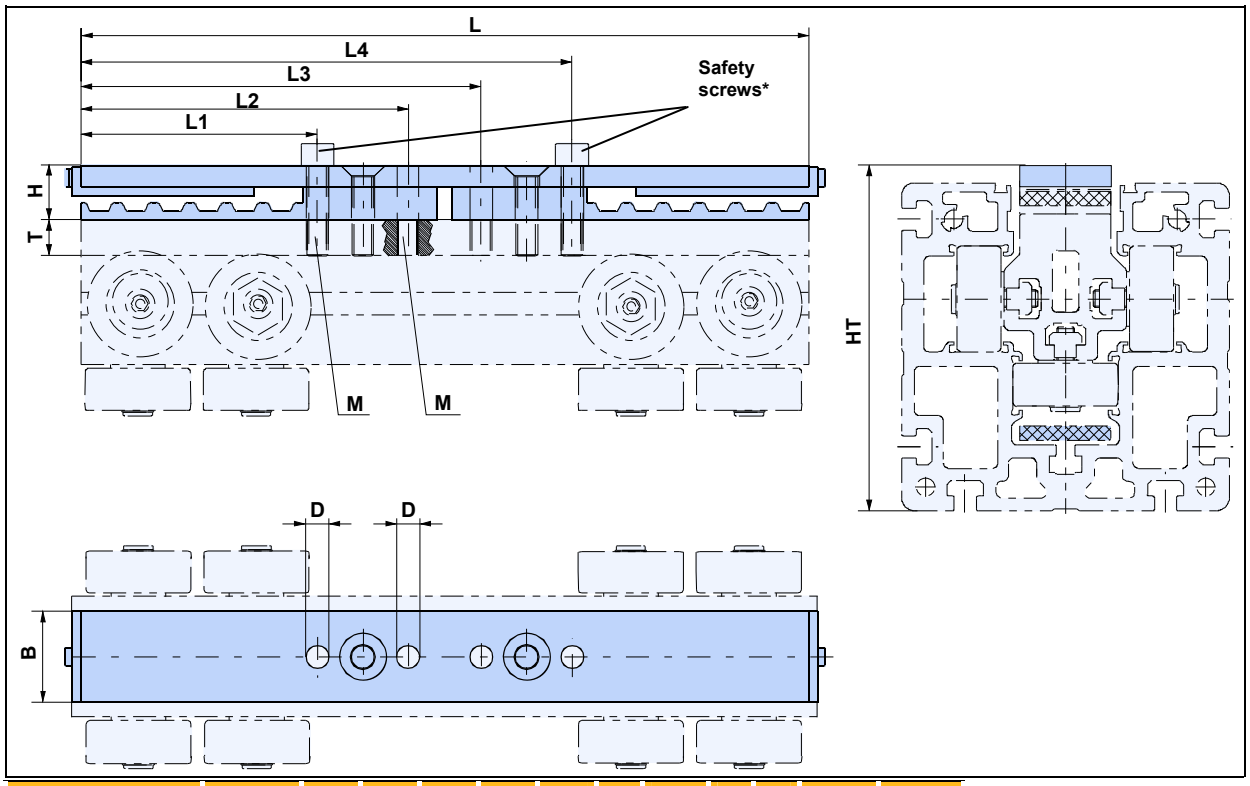
HPLA-LBB 080 / HPLA-LBB 120 extended carriage with bar (F)



Axis type	Unit	L	L1	L2	L3	L4	L5	L6	B	M	T	H	D
HPLA-LBB 080F	mm	400	82	110	165	235	290	318	25	M6	11	23	Ø6.4
HPLA-LBB 120F	mm	500	90	125	195	305	375	410	32	M8	14	23	Ø 8.2

* The retaining screws are mandatory; they may however be replaced by your own screws.

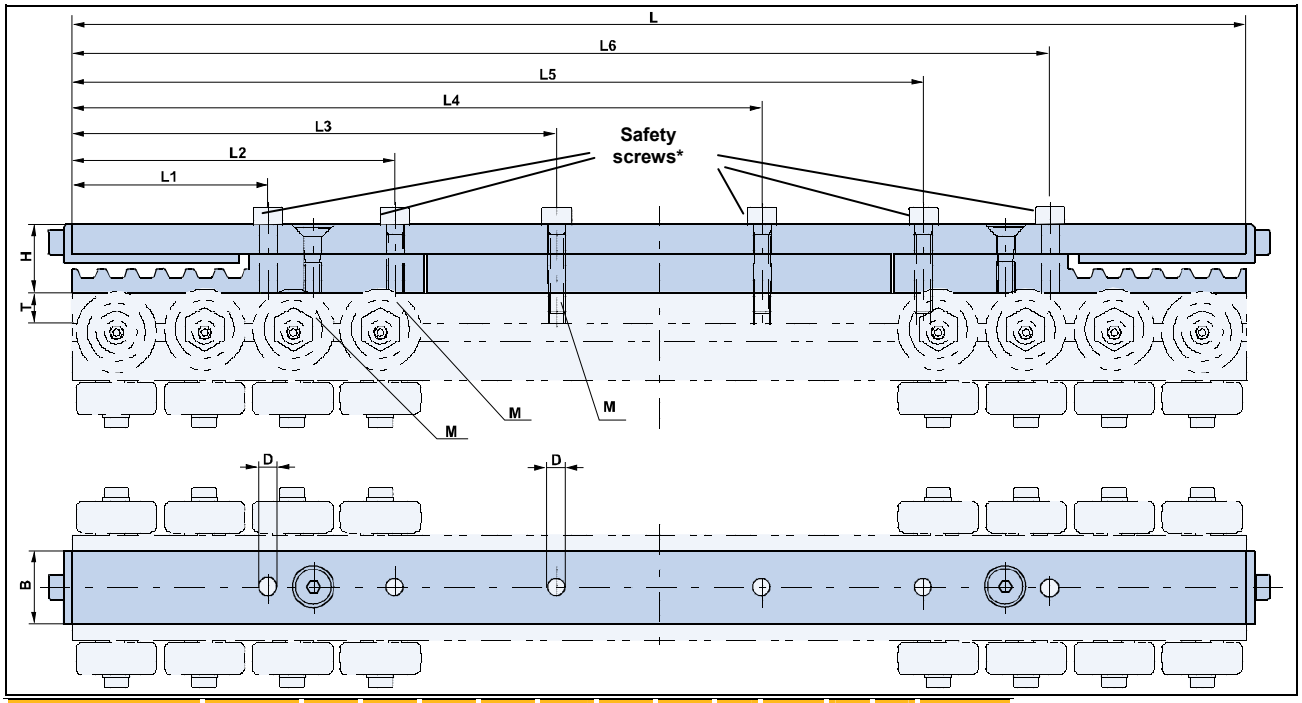
HPLA-LBB 180 standard carriage with bar (T)



Axis type	Unit	L	L1	L2	L3	L4	B	M	T	H	HT	D
HPLA-LBB 180T	mm	400	130	180	220	270	50	M12	20	33	195,5	Ø12.5

* The retaining screws are mandatory; they may however be replaced by your own screws.

HPLA-LBB 180 extended carriage with bar (F)



Axis type	Unit	L	L1	L2	L3	L4	L5	L6	B	M	T	H	D
HPLA-LBB 180F	mm	700	130	180	290	410	520	570	50	M12	20	33	Ø12.5

* The retaining screws are mandatory; they may however be replaced by your own screws.

2.4 Definition of stroke, usable stroke and safety travel

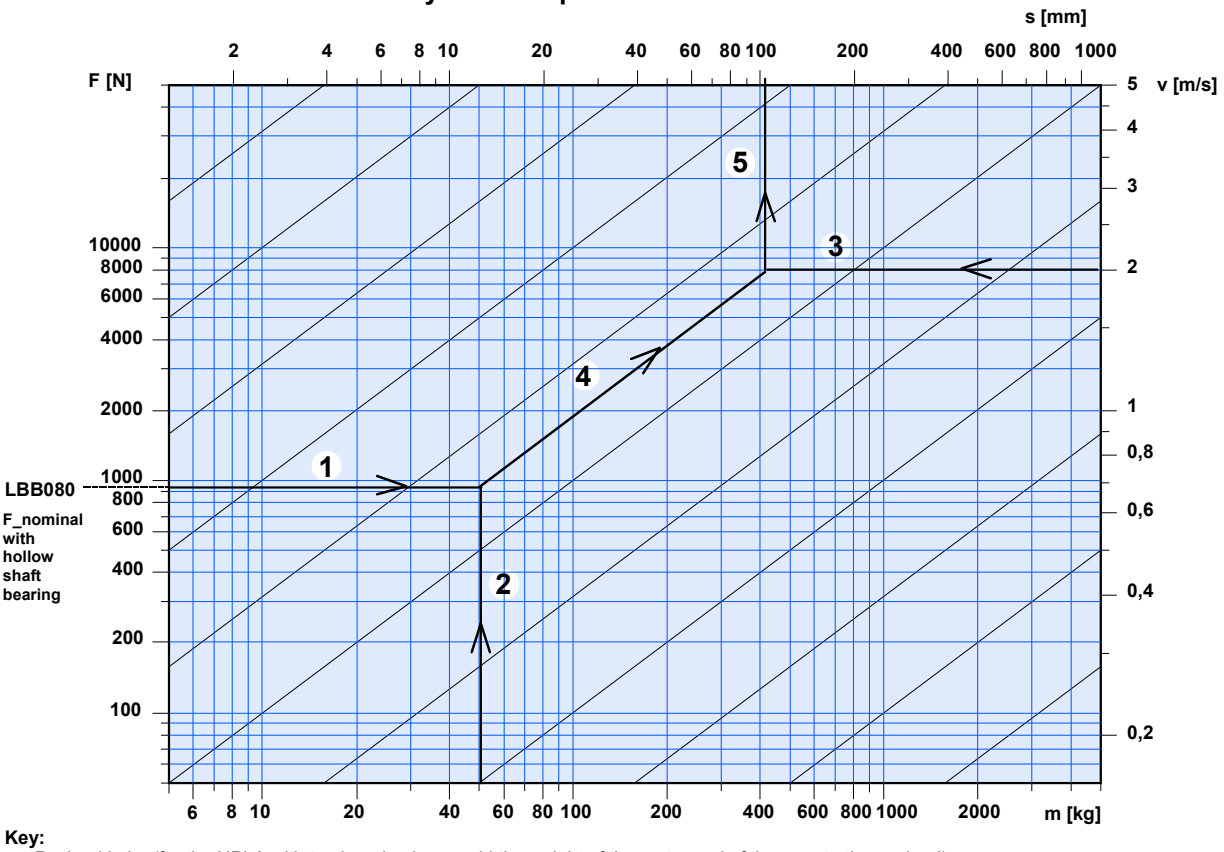
Usable stroke: The usable stroke is the distance which you need to move in your application. It is always shorter than the stroke.

Stroke: The stroke to be indicated in the order code is the maximum possible stroke between the internal end stops. It is composed of:

Stroke = Usable stroke + right safety travel + left safety travel + 20mm*.7

The right and left safety travel is the distance needed in order to decelerate the actuator after activating a limit switch without collision. Fmax shows the maximum permissible braking force for each axis (at the set maximum permissible belt pretension) and may in no case be exceeded (with a lower belt tension, the values for Fx must be derated accordingly). If a braking force lower than Fmax results from the maximum possible braking torque of the drive or of a brake, the safety travel is increased accordingly. Please do also consider the controller reaction times. If needs be, do mount additional buffers.

Calculation of the minimum safety travel required



Key:
m: Payload in kg (for the HPLA with tooth rack, please add the weight of the motor and of the gear to the payload).
v: Travel speed of the actuator before the braking sequence in m/s.
F: Braking force of the drive within the emergency stop ramp in N.
s: The safety travel s in mm resulting from moved mass, speed and braking force.

Example:
The example in the diagram shows the determination of the safety travel for an HPLA80 with a payload of 50 kg (2), braked down from a speed of 2 m/s (3) with the permissible thrust force F_nominal (925 N) (1) for this axis. The required braking distance is approx. 110 mm (5) rounded up.

*7 We recommend to include an extra travel of approx. 10 mm on each side in order to compensate the switching hysteresis of the limit switches or – depending on the controller – as an addition to the software end limit.

3 Commissioning and Startup

3.1 General Information

If you order the HPLA standard actuator with drive and initiators, it will be delivered completely mounted and mechanically ready to operate.

Long HPLA actuators or HPLA double actuators are delivered in dismounted state for reasons of transport and safety (for mounting instructions see chapter 5.10 and 5.11).

If no Parker drive is envisaged, attach your motor-gearbox combination according to the instructions of the respective supplier.

The installation position of the HPLA is, if not otherwise projected, always horizontal with the profile opening on the top.

Hint	If the linear actuator is mounted vertically, it is, due to thrust and traction forces, important that the drive is positioned at the top.

3.2 Preparations for Substructure

Each holding point must be even with a flat parallelism of 0.2 mm.

All holding points must be aligned with parallelism to each other of 0.5 mm.

In double actuator systems, an axis parallelism of 0.2mm must be ensured.

Ideal distance between supports (axis sag is about 1 mm).

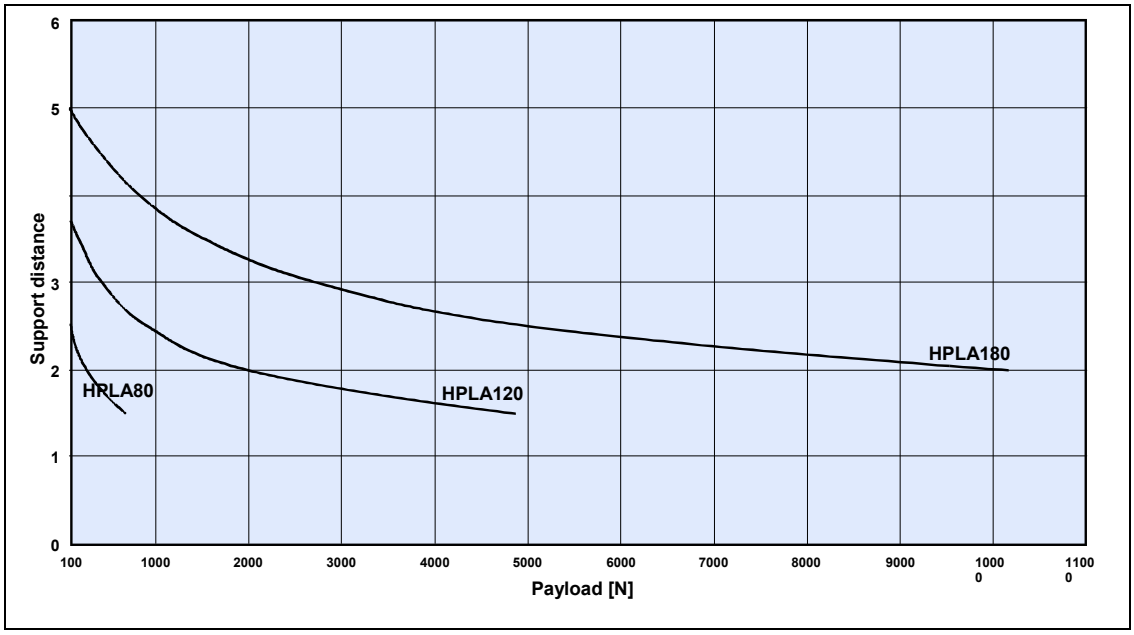


Diagram 2: Ideal distance between supports (axis sag is about 1 mm)

To simplify installation and adjustment, the holding points for the fixing of the HPLA module can also consist of adapter plates. They can be aligned with tightening and pressure screws.

3.3 Mounting

Caution	Danger when transporting long actuators. Because the actuator bends under its own weight, guiding accuracy may deteriorate significantly. In addition, the shape of the profile may change and the travel behavior of the carriage may be negatively affected.

Hint	If the HPLA is mounted with the opening at the top, remove the adhesive foil only after all mounting work has been completed so that no dirt can get inside the HPLA.

Hint	When fitting the HPLA into your system, please make sure that the tensioning station and the carriage are accessible for maintenance! (Please provide sufficient space behind the tensioning station in order to draw out the carriage).

3.3.1 Mounting of a single axis

1. Take the linear module out of the shipping crate.
2. Place the HPLA on the connection points, which have been previously leveled (water level, leveling device).
3. Fasten the actuator in place. Insert nuts into the t-slots of the profile and fasten with screws. Do not bore into the profile!
4. Fasten the connection parts in place.
5. Remove the protective covering (adhesive tape).

3.3.2 Mounting of a double axis actuator

1. Take the linear module out of the shipping crate.
2. Place the HPLA on the connection points, which have been previously leveled (water level, leveling device).
3. Fasten the actuator in place. Insert nuts into the t-slots of the profile and fasten with screws. Do not bore into the profile!
4. Place second actuator and fix slightly.
5. Verify parallelism (measuring tape) (see figure 1).
6. Measure both diagonals in order to verify rectangularity (measuring tape) (see figure 1). Correct diagonal measure by parallel movement of the second linear actuator, if necessary.
7. Verify the horizontal alignment of the linear actuators (water level, leveling device) and correct if needs be.
8. Fix the second actuator permanently.
9. Fasten the connection parts in place.
10. Remove the protective covering (adhesive tape).

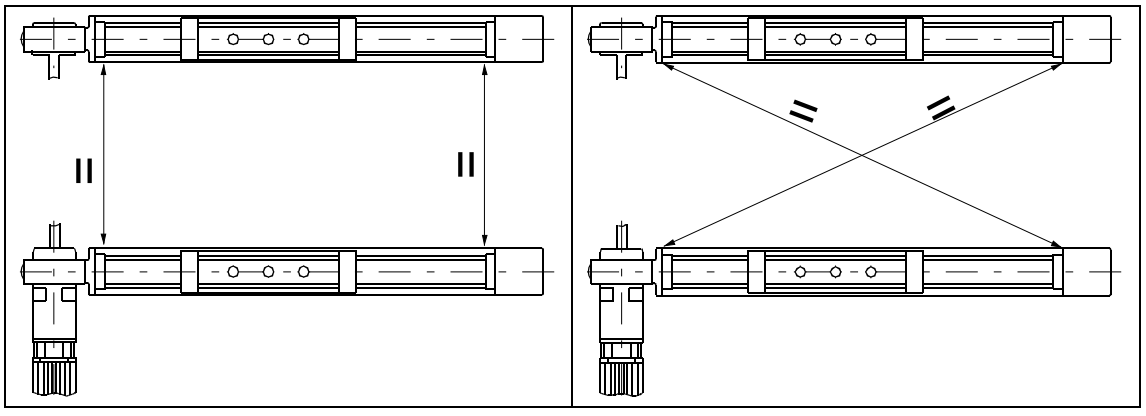


Fig 1: Alignment of a double-axis actuator

Hint	If the axes are mounted vertically, implement the above description correspondingly.

3.4 Initiators/Sensors

3.4.1 General aspects

The HPLA linear actuator is available with five different initiator variants.

1. Version with three initiators:

   If you order the linear actuator with three initiators and a distribution box, it will be furnished completely wired. You may then set the positions of the initiators according to your requirements.

Hint	Some servo controllers (e.g. Compax3 by Parker) work with a software end limit – which is set, for example, 10mm in front of the initiators. For the exact software end limit of your controller, please refer to the respective documentation.

2. Version with one initiator as machine zero:

   If you order a linear actuator with one initiator, please make sure that your controller features software end limits (programmable end limits). They can be used to define the maximum travel path in the positive and negative direction.

   In this version, the initiator is connected directly to the controller.

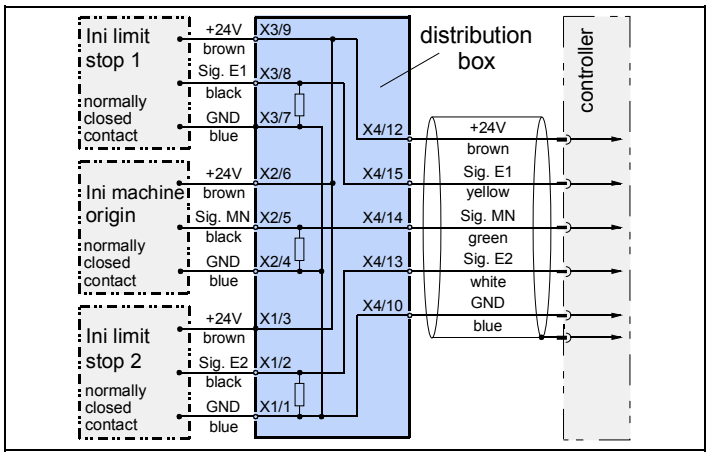
   General recommendation: The following safety travels should be heeded:

   1. Calculation of the safety travel see page 11.
   2. If you need a shorter safety travel, please contact Parker.

Hint	The working stroke of the linear actuator results from: Usable Stroke = Stroke - (right safety travel + left safety travel + 20mm).

3.4.2 Version with three initiators

3.4.2.1 Wiring the initiators/sensors



If the HPLA is furnished complete with initiators and initiator box, the components are wired according to figure 2 at the left.

Depending on the order configuration, a cable with the assignments shown in the drawing at the left is already connected to the initiator box.

For information on the connection of the cable to the controller, please refer to the respective manual.

Fig 2: Connection of the travel initiators; MN: Machine zero; Sig.: Signal

3.4.2.2 Setting up End Limits

Hint	In general the tripping plate, the initiators and the distribution box are fixed on the same side of the motor.

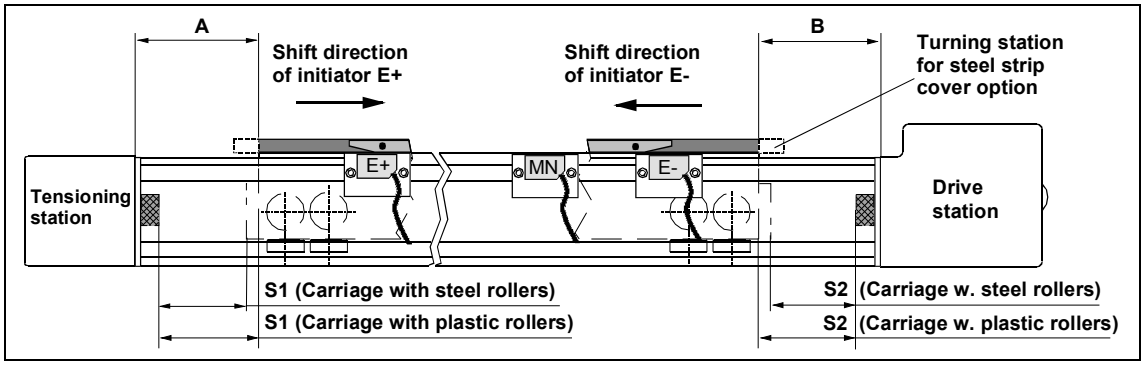


Fig 3: External initiators: Setting up end limits and safety travels

Size	Unit	HPLA with plastic sheathed rollers		HPLA80 with steel rollers	
		Standard	Steel Strip Option	Standard	Steel Strip Option
A	mm	23 + S	58 + S	33 + S	68 + S
B	mm	23 + S	58 + S	33 + S	68 + S

Table 1: Distances for setting the external initiators of the HPLA80. Calculation of the safety travel S see page 11.

Size	Unit	HPLA120 with plastic sheathed rollers		HPLA120 with steel rollers	
		Standard	Steel Strip Option	Standard	Steel Strip Option
A	mm	25 + S	70 + S	38 + S	83 + S
B	mm	25 + S	70 + S	38 + S	83 + S

Table 2: Distances for setting the external initiators of the HPLA120. Calculation of the safety travel S see page 11.

Size	Unit	HPLA180 with plastic sheathed rollers		HPLA180 with steel rollers	
		Standard	Steel Strip Option	Standard	Steel Strip Option
A	mm	33 + S	133 + S	53 + S	153 + S
B	mm	33 + S	133 + S	53 + S	153 + S

Table 3: Distances for setting the external initiators of the HPLA180. Calculation of the safety travel S see page 11.

Setting up the end limits E- and E+

1. Fix tripping plate centered on the load attachment plate with the aid of the furnished screws .
2. Place the limit switches according to the order given in figure 3.
3. E-: Move the carriage with the load attachment plate to the position (size B) given in figure 3 and table 3. Move E- limit switch from the drive station towards the tensioning station until it reacts
4. E+: Move the carriage with the load attachment plate to the position (size A) given in figure 3 and table 3. Move E+ limit switch from the tensioning station towards the drive station until it reacts
5. The carriage must move freely. With an electronic transducer, the distance between the tripping plates and the limit switches should be approximately 1.5mm (see supplier documentation).

Setting the machine zero point MN

The transducer for the machine zero point is fixed with an offset of about 150mm from the E- limit switch in the direction of the clamping station. E+: Move the carriage with the load attachment plate to the position (size A) given in figure 3 and table 3. Move E+ limit switch from the tensioning station towards the drive station until it reacts.

3.4.3 Version with one initiator

If only one initiator is used, please make sure that it is used as machine zero initiator.

3.4.3.1 Wiring of the initiator

As mentioned earlier, the initiator is connected directly to the controller. Please follow the respective product manual when wiring the initiator.

3.4.3.2 Setting the end limits

The software end limits (programmable end limits) can be used to define the maximum travel path in the positive and negative direction. The machine zero initiator (home switch) must always be within the software end limits.

Caution	The software end limits are generally not preset. For this reason, they must be defined and entered into the control system before the unit is placed in service

Hint	Recommendation: the actual zero point of your controller should be the same as the machine zero point.

4 Maintenance

4.1 Maintenance Schedule

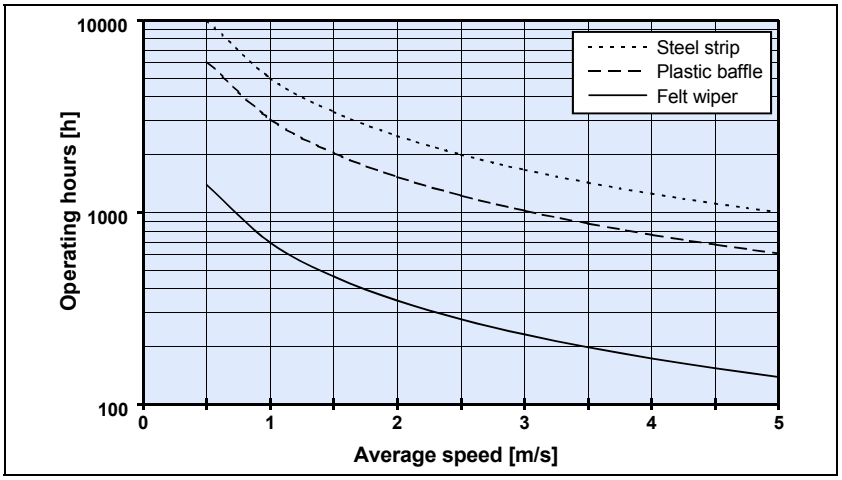
When	What	Action	Elimination
After setup	Carriage	Check backlash and adjust	Chapter 5.4ff
	Toothed belt	Check pretension and adjust	Chapter 5.2ff
one week after tensioning the toothed belt	Toothed belt	Measure belt tension. If the tension is lower than 0.9 x operating tension, increase tension to 1.1 x operating tension.	Chapter 5.2ff
Weekly	Linear actuator	Check all affected parts (guide, carriage, tensioning station, drive station) (visual check) and clean if necessary. In a very dirty environment, please clean daily. In the event of high contamination, retrofit steel strip cover, if necessary.	Chapter 5.12.2
Semiannually	Toothed belt	Check pre-tension, adjustment and wear. Visually assess the wear of the toothed belt. If it is too high, exchange the toothed belt. If an abnormal toothed belt wear is stated, refer to chapter 4.4 in order to identify and eliminate the cause(s).	Chapter 5.2
	Carriage	Check carriage play	Chapter 5.4.2
	Plastic rollers	Check for wear	Chapter 5.4.4
	Steel rollers	Grease guiding	Chapter 5.4.6
Annually	PME bearing	Relubricate	Chapter 5.6

Table 4: HPLA maintenance plan

4.2 Replacement Interval for Wearing Parts, Steel Strip Cover

Travel path	What	Action	Elimination
2500 km	Felt drag bar	to be replaced	Chapter 4
18000 km	Deflection plate	to be replaced	Chapter 5.12.1.5
18000 km	Steel strip	to be replaced	Chapter 10

Table 5: Wearing parts of HPLA with steel strip cover



The diagram on the left shows the conversion of the maximum permissible travel stated in table 5 into operating hours, using the average travel speed.

4.3 Causes for abnormal toothed belt wear

A certain sign of wear may have different causes so that it is not always possible, to determine the exact cause. The following table shows possible causes for typical damages:

Kind of error	Cause	Elimination
Abnormal wear of loaded tooth flanks of the belt	Faulty belt pre-tension	Replace toothed belt, set pretension Chapter 5.2ff.
	Overload	Zahnriemen tauschen, Vorspannung einstellen Kap. 5.2 ff. Check, if the load is in the admissible range.
Abnormal wear in the tooth root surface of the belt	Pre-tension too high Drive torque too high	Replace timing belt, set pretension Chapter 5.2ff. Verify drive dimensioning
Abnormal wear at the side flank of the belt	Faulty alignment of timing belt Twisted edge of the roller/pulley	Replace timing belt, set pretension Chapter 5.2ff. Replace roller/pulley
Sheared off belt teeth	Pre-tensioning too weak Overload (by collision)	Replace timing belt, set pretension Chapter 5.2ff.
Splits at the belt teeth	Faulty belt pre-tension	Replace timing belt, set pretension Chapter 5.2ff.
	Overload	Replace timing belt, set pretension Chapter 5.2ff. Check, if the load is in the admissible range.
	Deterioration of the belt material	Replace timing belt, set pretension Chapter 5.2ff.
Breaking of the timing belt	Faulty belt pre-tension	Replace timing belt, set pretension Chapter 5.2ff.
	Overload	Replace timing belt, set pretension Chapter 5.2ff. Check, if the load is in the admissible range.
Softening of the belt material	Operating temperature too high	Replace timing belt, set pretension Chapter 5.2ff. Lower operating temperature
	Contact with solvent	Replace timing belt, set pretension Chapter 5.2ff. Do not clean belt with solvents
Skipping of teeth, loss of machine zero	Pre-tension too low Wrong motor position (below) with vertical application	Set pre-tension correctly If possible move drive upwards Alternatively: Increase pre-tension or reduce load in lengthwise direction

Table 6: Causes for abnormal toothed belt wear

5 Mounting/Repair

Do only use spare parts of Parker Hannifin GmbH & Co. KG.

Improper or unprofessional repair will lead to an expiry of any warranty.

If you encounter problems, please contact:
Parker Hannifin GmbH & Co. KG
Electromechanical Automation
Service Dept.
☎ +49 (0)781 / 509-700

5.1 Safety Instructions

Before performing any maintenance or repair work, turn the power switch to the '0' setting and secure it with a padlock against manipulation. If the unit needs to be operable for specific repair works, you have to be especially cautious: Ensure by all means that no persons are in the hazardous area. If required, safeguard the hazardous area with additional barriers or gratings against unauthorized persons.

Only qualified expert personnel or Parker personnel are permitted to perform repair works.

Only qualified expert personnel is permitted to perform works on the electric equipment. All the applicable regulations and provisions must be heeded (IEC, EN, national accident prevention regulations etc.).

If set-up, repair or maintenance works require that safety installations be dismounted, these must be reinstalled immediately after the respective works have been completed. The unit must be shut down before any of the safety installations are dismounted.

Since the entire system may be exposed to continuous vibrations during operations, all screws and nuts must be secured.

Depending on the case

Please use Loctite 243 or a Schnorr lock washer. If nothing else is mentioned, Loctite 243 must be used.

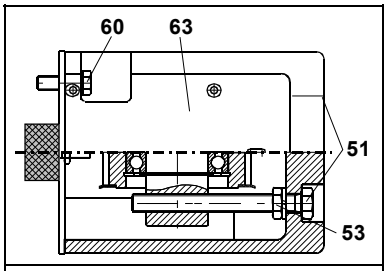
5.2 Replace, tension and align toothed belt

5.2.1 General notes on toothed belts

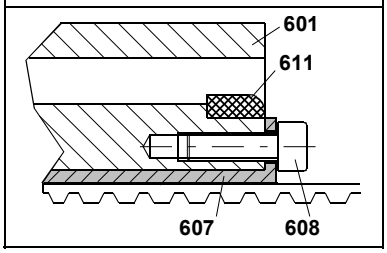
1. Unpack new toothed belts immediately. Store coiled up in dry rooms at room temperature.
2. Do not fold toothed belts.
3. The pitch of toothed belt and pulleys must correspond.
4. Max. permissible permanent temperature: 80°C. Short-time peak temperatures up to 120°C are possible.
5. Protect the drives from dust, dirt, hot water, steam as well as acids and leaches.

5.2.2 Exchange of toothed belt

1. Move carriage to a reference point (e.g. machine zero, real zero,...).
   Mark the position of the carriage on the HPLA profile (with a felt-tip pen).
2. If needs be, remove steel strip cover (chapter 6)



3. Detension the toothed belt: Remove protective cover (63) of the tensioning station. Loosen lock nut (53).
   Loosen tensioning screws (51) by approx. 10 turns



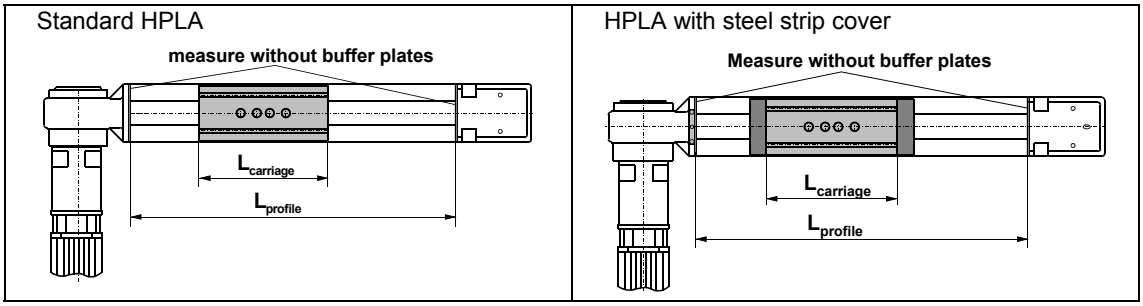
4. Loosen toothed belt clamping:
   Remove screw (608). Draw out bracket completely and remove.
   If the bracket is stuck and cannot be loosened, remove the flange plate.

5. Cutting the new toothed belt to length.

   There are three possibilities to determine the length of the toothed belt :

a) Use the length given in the corresponding parts list

b) Measure profile length and calculate belt length with the aid of 570mm



Length of belt = 2 x Lprofile – Lcarriage + K

Formula 1: Calculation of the timing belt length

Frame Size	K
HPLA80	570mm
HPLA120	740mm
HPLA180	1190mm

Table 7: Correction value K for the calculation of the belt length

c) Remove the old toothed belt from the HPLA and lay out on the floor. Place new toothed belt alongside and cut to the same length. If there are pitch differences, transfer the pitch of the old toothed belt to the new belt.

6. Thread in new toothed belt.

Hint	If the old toothed belt is still in place in the HPLA, you can, for instance, fix the new belt to the old one with adhesive tape and pull it in while pulling out the old belt.

7. Insert toothed belt between carriage and load attachment plate. Place toothed belt holding bracket (607) and fix with screw (608).
8. Tensioning the toothed belt: Chapter 11.
9. Align toothed belt: Chapter 5.3.
10. Fix protective cover (63).
11. Mount steel strip cover if required: Chapter 6
12. Set reference point: Chapter 3

5.2.3 Tensioning the toothed belt

5.2.3.1 Basics

Hint	The toothed belt pretension must be set according to the operating loads; it may, however, not exceed the maximum tension values given in table 9[8].

The toothed belt tension to be set is based on the force Fx (Fx = Fstatic + Fdynamic) to be transmitted by the toothed belt.

In order to prevent the toothed belt from jumping, the toothed belt pretension (operating tension) must be approx. 10% higher than the force to be transmitted Fx.

With new or old de-tensioned toothed belts, the pretension declines by approx. 20% shortly after the first tensioning. It is therefore necessary to set a tensioning force 1.25 times higher than the operating tension . This tensioning force is defined in table 9 as the tension to be set

table 9 distinguishes between standard values and maximum permissible values, which are each based on different lifetime information for the drive system.

	Standard value	Maximum permissible values
Lifetime	20 000 hours	6 000 hours
Average speed	1.5 m/s	1.5 m/s

Table 8: Underlying lifetime for drive units

For this reason, the standard values should be set, if the application permits. If the upper and lower toothed belts touch, the belt tension must be increased gradually until a touching of the belts is no longer possible. The belt tension may however not exceed the maximum permissible value from table 9.

For double axis actuators, the belt tension can be halved, if the load is symmetrically distributed between the two axes

If the tension of a toothed belt in operation for more than a week is below 0.9 times the operating tension, the toothed belt tension must be increased to 1.1 times the operating tension (table 9).

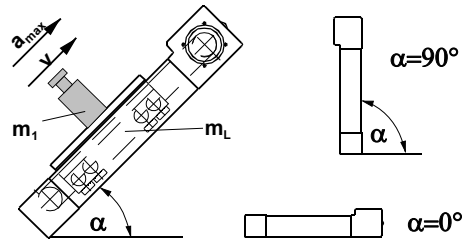
Hint	The HPLA systems are furnished with a pretension corresponding to the respective standard value

[8] If you wish however to exceed these values, please contact Parker.

HPLA	Stöber gear type / bearing	Standard values: Fxmax [N] maximum transmissible force	Standard values: tension to be set [N] new/old detensioned belt	Standard values: tension to be set [N] when retensioning	Standard values: Operating tension [N] sets automatically by and by	Max. permissible values: Fxmax [N] maximum transmissible force	Max. permissible values: tension to be set [N] new/old detensioned belt	Max. permissible values: tension to be set [N] when retensioning	Max. permissible values: Operating tension [N] sets automatically by and by
80	Hollow shaft with P3 /P4/DD	925	1272	1119	1017	1114	1531	1348	1225
	P3 N9	474	651	573	521	602	828	729	662
	P3 V10	925	1272	1119	1017	1114	1531	1348	1225
	P4 N9	557	766	674	613	671	922	812	738
	P4 V10	925	1272	1119	1017	1114	1531	1348	1225
	SR11, SL12, SB13	925	1272	1119	1017	1114	1531	1348	1225
	LR14, RL15	925	1272	1119	1017	1114	1531	1348	1225
	PE4	500	687	605	550	600	825	726	660
	PE5	675	928	817	743	900	1237	1089	990
120	Hollow shaft with P4 / P5/DD	1696	2332	2052	1865	2234	3072	2703	2457
	P4 N9	627	862	759	690	905	1244	1095	995
	P4 V10	1514	2081	1831	1665	2014	2769	2436	2215
	P5 N9	1059	1456	1281	1165	1529	2102	1850	1682
	P5 V10	1696	2332	2052	1865	2234	3072	2703	2457
	SR11, SL11, SB11	1696	2332	2052	1865	2234	3072	2703	2457
	LR14, LR14	1696	2332	2052	1865	2234	3072	2703	2457
	PE5	675	928	817	743	900	1237	1089	990
180	Hollow shaft with P4 / P7/DD	4169	5732	5045	4586	5457	7504	6603	6003
	P5 N9	1160	1595	1404	1276	1519	2089	1838	1671
	P5 V10	2513	3456	3041	2765	2513	3456	3041	2765
	SR11, SL11, SB11	3770	5184	4562	4147	3770	5184	4562	4147
	LR14, LR14	3770	5184	4562	4147	3770	5184	4562	4147
	P7 N9	1654	2274	2000	1819	2164	2975	2618	2380
	P7 V10	3561	4896	4309	3917	4398	6047	5322	4838

Table 9: Recommended and maximum permissible belt tension (tolerance range ±5%).

Determination of the force Fx



System at standstill:

Fx = Fstatic

Fstatic = (mL+m1) * 9.81* sin α

System starts moving:

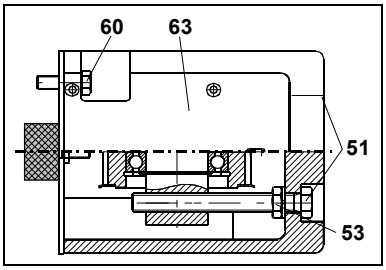
Fx = Fstatic+ Fdynamic

Fstatic = (mL+m1) * 9.81* sin α
Fdynamic = (mL+m1) * amax

Fx	occurring force [N]
Fstatic	static force [N]
Fdynamic	dynamic force [N]
mL	Mass of carriage [kg]
m1	Mass of load [kg]
α	Angle between plane and HPLA [°]
amax	maximum acceleration when starting up [m/s²]

[9] N: Stöber gear with normal bearing
[10] V: Stöber gear with reinforced bearing
[11] SR: Shaft on right
[12] SL: Shaft on left
[13] SB: Shaft on both sides
[14] LR: Gear mounted on the left with additional drive shaft on the right
[15] RL: Gear mounted on the right with additional drive shaft on the left

5.2.3.2 Checking and setting toothed belt tension



1. If needs be, remove steel strip cover (chapter 5.12.1)
2. Measure toothed belt tension (chapter 6)
3. Compare tension with the required value from table 9.
4. If the actual toothed belt tension is lower than 0.9 times the operating tension, the toothed belt tension must be adapted. For this, remove protective cover (63) and loosen lock nut (53).
5. Setting the toothed belt tension:
   Approximate the recommended tension by alternatively setting and verifying. For tensioning, turn both tensioning screws (51) equally clockwise.
6. Align toothed belt: Chapter 5.3.
7. Mount steel strip cover if required: Chapter 6.

5.2.3.3 Measuring the toothed belt tension

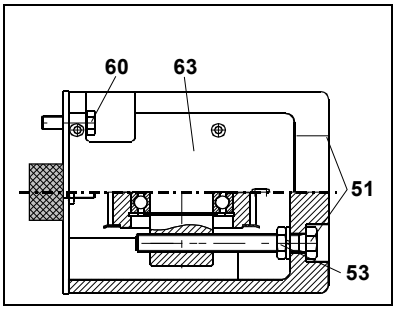
The measurement procedure described below is presently the only possibility to measure the toothed belt tension with the required tolerance of +/- 5%.

RSM Belt tension measuring device

The RSM belt tension measuring device determines the tension of the belt on the basis of preset data (specific mass of belt, freely oscillating length of belt) and the oscillating frequency of the belt.
(RSM: Art. No. 037- 000201).

5.3 Check belt run and align toothed belt

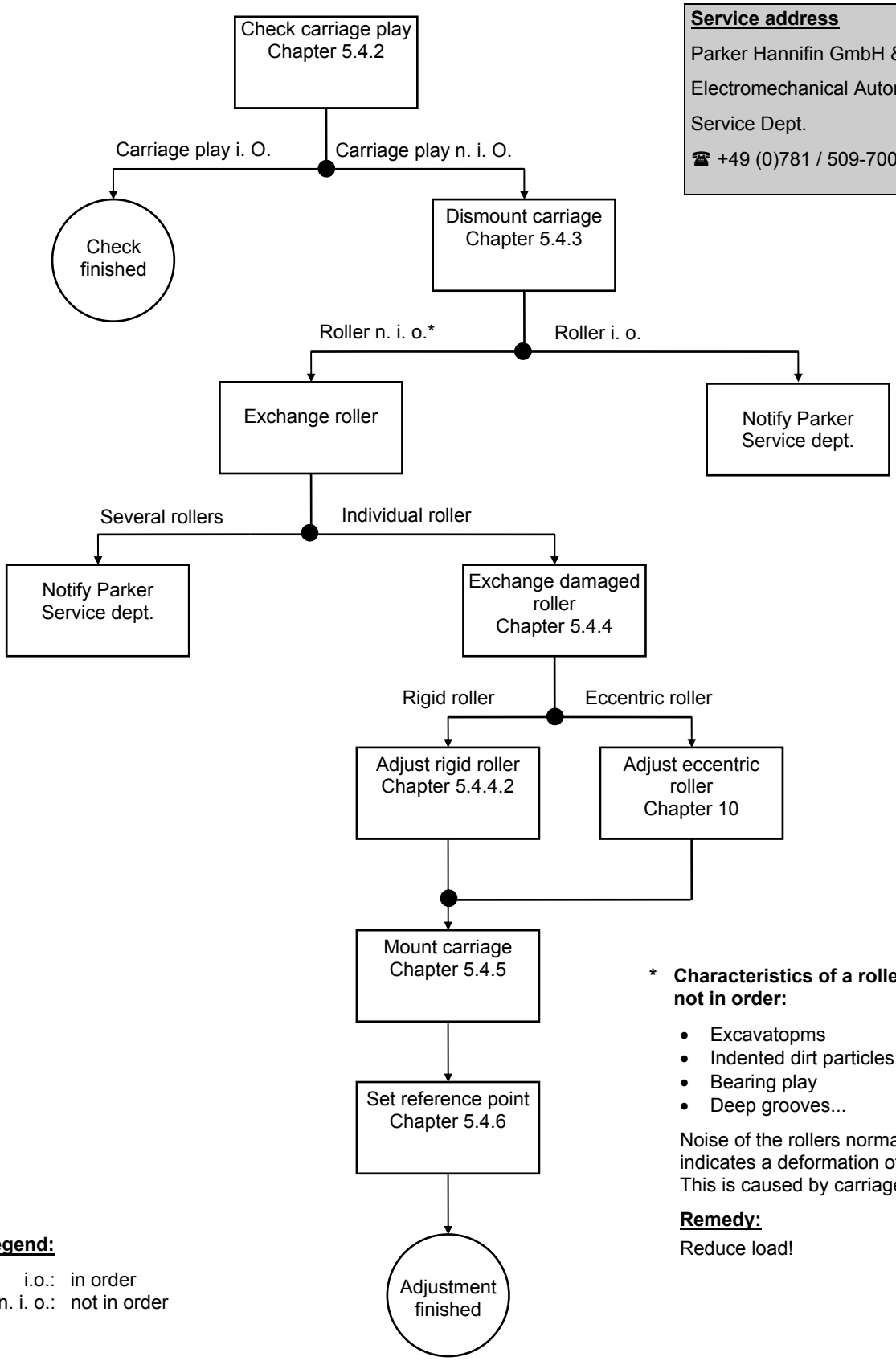
Hint	If the toothed belt must be retensioned, this must be made before the alignment. An exact alignment is only possible during movement of the carriage, with correct adjustment, the toothed belt always oscillates from left to right (in the driving direction). In order to maintain the pretension of the belt, please turn the tensioning screws only in very small steps. If necessary, check belt tension again after the alignment.



1. Remove protective cover (63).
2. Check the belt run by moving the carriage (if possible manually, unless at reduced speed).
   If the belt run is correct according to the above definition,
3. Fix protective cover (63).
4. Unless: Loosen lock nut (53). Loosen the tensioning screw (51) on the side where the toothed belt constantly touches the profile, in small steps counterclockwise, until the toothed belt is aligned according to the above definition.
5. Tighten lock nuts (53) and fix protective cover (63).

5.4 Set carriage play

5.4.1 Replace and set rollers (flow chart)



Service address

Parker Hannifin GmbH & Co. KG

Electromechanical Automation

Service Dept.

☎ +49 (0)781 / 509-700

Legend:

i.o.: in order
n. i. o.: not in order

*** Characteristics of a roller that is not in order:**

- Excavatopms
- Indented dirt particles
- Bearing play
- Deep grooves...

Noise of the rollers normally indicates a deformation of the roller. This is caused by carriage overload.

Remedy:

Reduce load!

5.4.2 Checking Carriage Play

Hint	For a rough estimate, you can tell if there is any carriage play by shaking the carriage or the attachment. The process described below is a more exact method:

1. Prepare as long a travel path as possible.
2. Remove the steel strip cover if present: Chapter 5.12.
3. To move the carriage by hand and be able to see the rollers: Remove attachments from the carriage.
4. Remove toothed belt from carriage: chapter 5.2.2 item 4.
5. Push the carriage along over the entire travel path. All rollers must turn when the carriage moves.
6. To check the contact force, stop the roller from turning with your index finger. You should be able to stop the roller with just a little force.

Characteristics of a correctly set carriage:

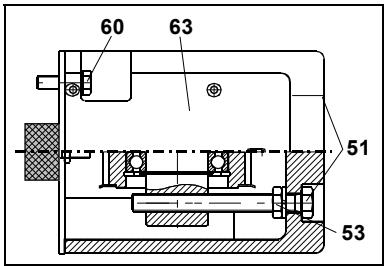
- Carriage does not wobble any more
- Carriage can be moved along the entire travel area without great differences in force.
- Carriage can be inserted into the profile without pressure point (requires dismounting of the tensioning station, see below)

Hint	Guiding rollers that are set too tightly will get dents, which will then cause noises and defects. Replace defectuous rollers (see below).

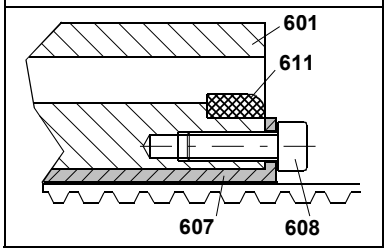
5.4.3 Dismounting the carriage

Danger	If the axis is mounted upright, the carriage must be secured against moving. f the carriage is not secured, it may fall due to gravity. This may lead to injuries or damages to property.

1. Move carriage to a reference point (e.g. machine zero, real zero,...).
   Mark the position of the carriage on the HPLA profile (with a felt-tip pen).
2. Remove steel strip cover – if present (see chapter 5.12)
3. Remove attachments from the carriage.



4. Detension the toothed belt: Remove protective cover (63) of the tensioning station. Loosen lock nut (53).
   Loosen tensioning screws (51) by approx. 10 turns



5. Loosen toothed belt clamping:
   Remove screw (608). Draw out bracket completely and remove.
   If the bracket is stuck and cannot be loosened, remove the flange plate.

6. Remove tensioning station by loosening the four fixing screws (60).
7. Remove carriage from the profile and mark its running direction on the carriage.

Hint	The carriage must later be inserted in the same running direction in order to ensure the correct setting of the rollers!

5.4.4 Replace individual rollers

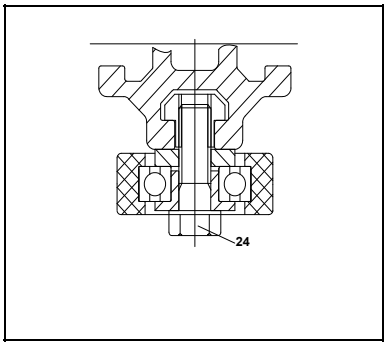
5.4.4.1 General Information

- The exchange procedure of the rollers is the same for both guiding types – plastic or steel roller guiding. Please bestow the greatest care when exchanging the steel rollers.
- The plastic-sheathed rollers consist of ball bearings with plastic coating. The steel rollers are equipped with integrated ball bearings and convex running surfaces.
- The ball bearings used in the plastic-sheathed rollers correspond to the common standards for rolling-contact bearings and are lifetime lubricated.
- After long standstill periods, the plastic rollers show slight flattening, which will however entirely degenerate during continuous operation.
- Both types of rollers are suitable for ambient temperatures from –40°C to +80°C.

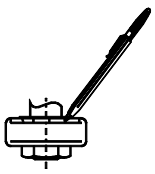
Warning	The control of the roll behavior is only possible while the actuator is moving. Proceed with the utmost caution, danger of injury. If possible, move actuator only by hand (if needs be, dismount motor and gearbox before and bring actuator into horizontal position). Unless, operate actuator at crawling speed (speed < 1 m/min).

Hint	The correct setting of a carriage requires a lot of experience and special knowledge. Therefore, rollers should, if possible, only be replaced by Parker staff.

5.4.4.2 Replacing and setting rigid rollers



1. Dismount carriage (Chapter 5.4.3)
2. Mark position of the roller at the carriage.
3. Loosen and remove screw (24).
4. Remove old roller, place new roller and correct its position at the carriage.
5. Insert screw (24) with tightening torque Ma according to table 10 on page 42.
6. In order to verify the roller movement, mark with felt-tip pen on the roller.

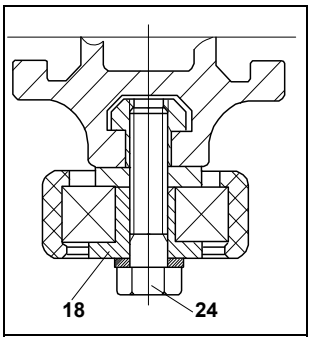


7. Remove dirt and chippings from the travel surface of the actuator.
8. Insert the carriage in the correct running direction into the profile and verify the roller setting over the entire travel distance. The rollers should rotate over the entire travel distance.

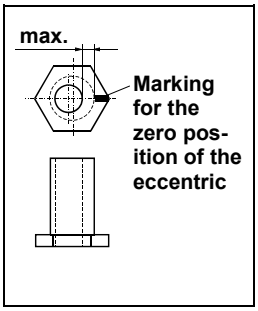
Hint	When setting the roller play, only the roller that was replaced, should be adjusted. If this does not lead to a correct setting of the carriage, the entire carriage must be set again. This task requires a lot of experience and special knowledge and is therefore only to be performed by a Parker technician.

9. To check the contact force, stop the roller from turning with your index finger. You should be able to stop the roller with just a little force.
10. If the settings are made correctly, the task is finished. Unless, correct roller setting.

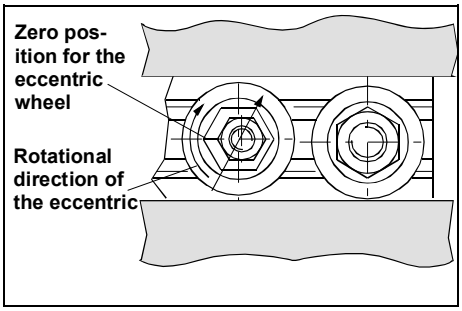
5.4.4.3 Replace and set eccentric roller



1. Dismount carriage (Chapter 5.4.3)
2. Mark position of the roller at the carriage.
3. Unscrew and remove screw (24), remove old washer.
4. Remove old roller and push out eccentric sleeve (18).
5. Fit eccentric sleeve and new roller together and place the parts onto the screw (24) (with new washer). Tighten screw slightly.



6. When turning the eccentric in clockwise direction (18), set the position of the sleeve so that the roller will be positioned at the same guide as the old roller before dismounting.



7. Tighten screw (24) with tightening torque Ma according to table 10.
8. Insert screw (24) with tightening torque Ma according to table 10 on page 42.
9. In order to verify the roller movement, mark with felt-tip pen on the roller.
10. Remove dirt and chippings from the travel surface of the actuator.
11. Insert the carriage in the correct running direction into the profile and verify the roller setting over the entire travel distance. The rollers should rotate over the entire travel distance.

Hint	When setting the roller play, only the roller that was replaced, should be adjusted. If this does not lead to a correct setting of the carriage, the entire carriage must be set again. This task requires a lot of experience and special knowledge and is therefore only to be performed by a Parker technician.

12. Set the eccentric of the guiding roller in small steps so that the carriage can be pushed easily and without play through the HPLA profile. Guiding rollers that are set too tightly will get dents, which will then cause noises.
13. To check the contact force, stop the roller from turning with your index finger. You should be able to stop the roller with just a little force.
14. If the settings are made correctly, the task is finished. If not, repeat steps 10 and 11 until the carriage settings are in order.

HPLA	Rigid roller / eccentric roller	Stainless version
80	12 Nm	9 Nm*
120	34 Nm	25 Nm*
180	70 Nm	50 Nm*

Table 10: Tightening torques for roller fixing screws

*) in the stainless version, the screws must be secured (e.g. with Loctite 245 or WiKo 02K42).

5.4.5 Mounting the carriage

1. Insert the carriage into the profile in the previous running direction.
2. Fix tensioning station with 4 screws (60).
3. Fix toothed belt (chapter 5.2.2 from item 8).
4. Tension toothed belt (chapter 5.2.3, page 36).

5.4.6 Setting the reference point

Correct the machine zero point according to the carriage position marked before. Depending on the motor and on the controller, there are several possibilities. For further details, please refer to the manual of the controller.

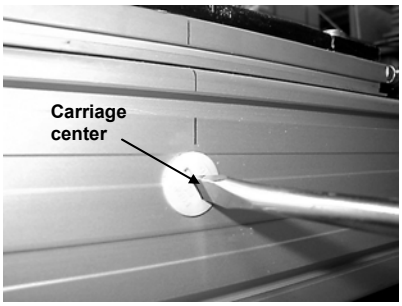
5.5 Relubricating the steel guiding

1. Disable the control system.
2. Align carriage center to the position of the lubricating bore.

Warning	In any case, make certain once again that the control system is disabled, since parts enter the area of the guide during lubrication!

3. Remove sealing plug from the HPLA profile.

Hint	Use the following oil only: Shell Omala Oil 220, Article No: 180-006026.

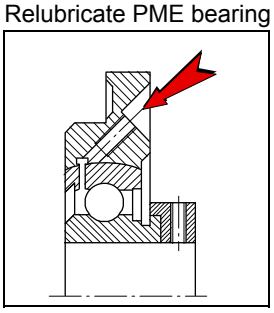


4. Insert lubricating gun into the bore onto the lubricating nipple in the carriage.
5. Apply four to five strokes of grease (amount of lubricant see below).
6. Remove lubricating gun and screw in sealing plug.

Amount of lubricant: HPLA80: 3cm3; HPLA120: 5 cm3; HPLA180: 8 cm3.

5.6 Relubricating PME bearing

Relubricate PME bearing at the drive station



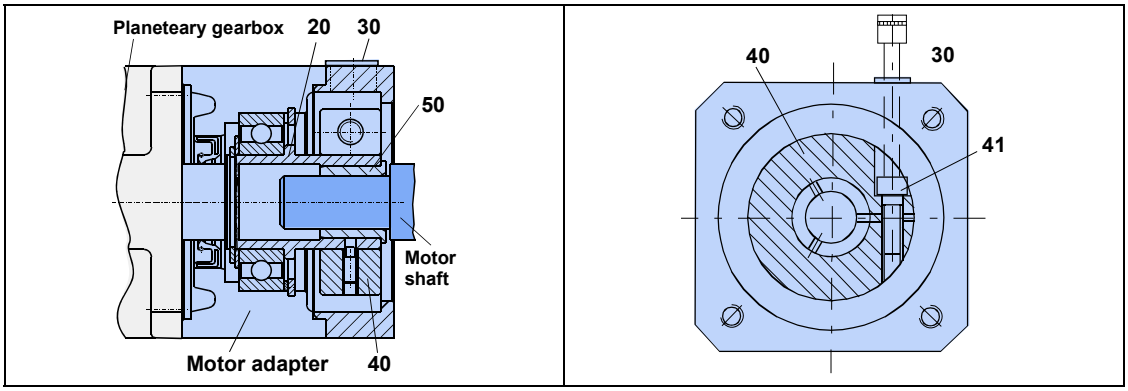
- If there is no lubricating nipple yet, remove plastic cap of the lubricating hole on the bearing housing PME 30
- Insert lubricating nipple M6 (part No. 413-100196)
- Lubricate with a grease gun (use INA SM 03 grease if possible), until a fresh flange of grease protrudes from the gaps.
- The old grease must be able to flow out freely.
- The lubricating nipple may rest in place

5.7 Exchanging or mounting a motor

Danger	Hazardous voltage. Operations on the motor terminal box must only be performed by qualified electricians.

5.7.1 Exchange of a motor in combination with a Stöber planetary gear

1. Move carriage to a reference point (e.g. machine zero, real zero,...). Mark the position of the carriage on the HPLA profile (with a felt-tip pen).



2. Switch off axis at the main switch and cut the power supply. Let cool motor and gearbox.
3. Remove motor and resolver cable.
4. Remove plug from the mounting bore (30) of the adapter housing.
5. Loosen clamping screw (41) at the clamp collar; feed extension piece of torque wrench through mounting bore (30).
6. Loosen motor fixing.
7. Remove motor from the gearbox.

Mount (new) motor

1. Degrease motor shaft with fat solvent.
2. Switch off axis at the main switch and cut the power supply if necessary. Let cool motor and gearbox.
3. Remove motor and resolver cable.
4. Remove plug from the mounting bore (30) of the adapter housing.
5. Place motor on adapter housing. Caution! Insert motor shaft centrically into the clamping hub (20) or in the the clamping bushing (50). Do not tilt!
6. Screw motor to adapter housing.
7. Tigthen greased clamping screw (41) at the clamp collar; feed extension piece of torque wrench through mounting bore (30). Tightening torque MA see table 11
8. Reinsert plug into mounting bore (30).
9. Connect motor cable as well as resolver cable – respect the correct direction of rotation.
10. Switch on axis
11. Set reference point (chapter 5.4.6).

Tightening torques MA		
Clamping screw	Key dimension s [mm]	MA [Nm]
M5	4	10
M6	5	17
M8	6	40
M10	8	75
M12	10	130

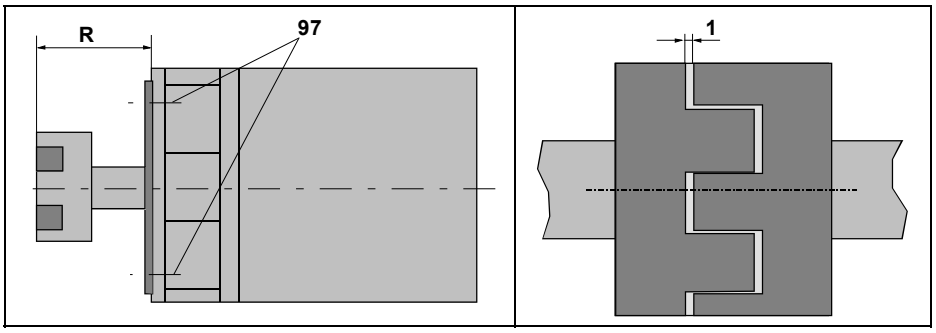
Table 11: Tightening torques of clamping screw

5.7.2 Other gear versions

5.7.2.1 Shaft-hub connection via keyway

1. Move carriage to a reference point (e.g. machine zero, real zero,...). Mark the position of the carriage on the HPLA profile (with a felt-tip pen).
2. Switch off axis at the main switch and cut the power supply. Let cool motor and gearbox.
3. Remove motor and resolver cable.
4. Loosen motor fixing.
5. Remove motor from the gearbox.
6. Degrease motor shaft and hollow shaft bore.
7. If keyway is damaged, replace.
8. Insert keyway into motor shaft.
9. Mount motor (turn motor shaft in order to find groove) and tighten motor fixing (97).
10. Connect motor cable as well as resolver cable – respect the correct direction of rotation.
11. Switch on axis
12. Set reference point (chapter 5.4.6).

5.7.2.2 Dog clutch



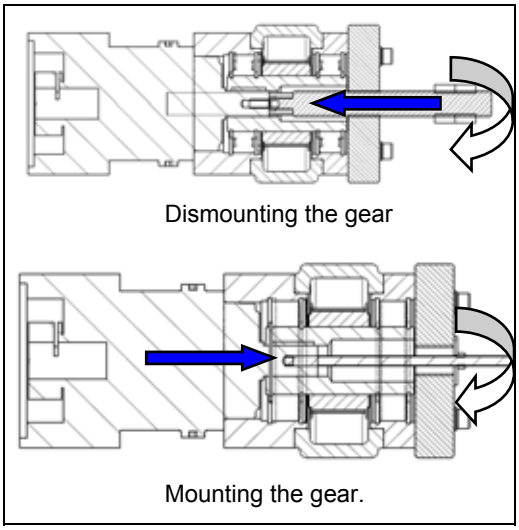
1. Move carriage to a reference point (e.g. machine zero, real zero,...). Mark the position of the carriage on the HPLA profile (with a felt-tip pen).
2. Switch off axis at the main switch and cut the power supply.
3. Remove motor and resolver cable.
4. Loosen motor fixing.
5. Remove motor from the gearbox.
6. Take distance R, from the dog clutch to the motor flange, (precision +/- 0.1 mm)
7. Loosen clamping screws of the dog clutch half and remove from the motor shaft.
8. Degrease motor shaft and bore of the dog clutch.
9. Place dog clutch half on new motor respecting distance R. If necessary, polish motor shaft with grit 360 abrasive paper.

Hint	After mounting, 1mm play in axial direction should be allowed between the coupling halves. Do avoid axial stress under all circumstances!

10. Tighten clamping screws of the dog clutch.
11. Mount motor (turn motor shaft in order to find tooth gap) and tighten motor fixing (97).
12. Connect motor cable as well as resolver cable – respect the correct direction of rotation.
13. Switch on axis
14. Set reference point (chapter 5.4.6).

5.8 Exchange of gear

5.8.1 Exchange of gear with hollow shaft bearing



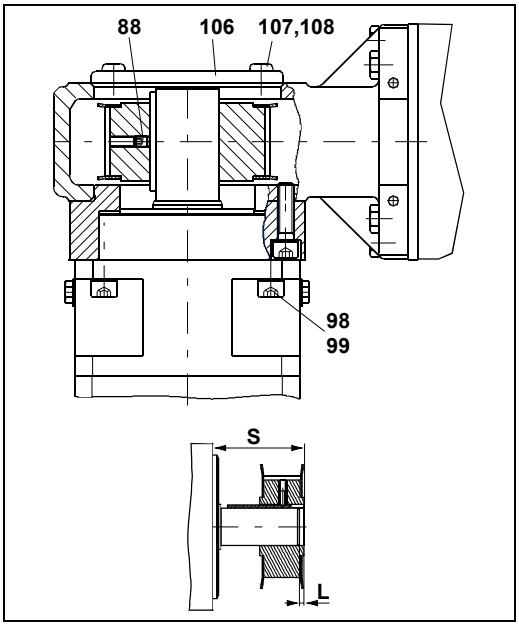
Dismounting the gear

Mounting the gear.

1. Dismount motor
   (chapter 5.6 ff., according to gear used).
2. Detension toothed belt
   (chapter 5.2.2 item 2-5).
3. Remove sealing cover (106).
4. Loosen gear fixing screws and remove.
5. Push off gear with the aid of the push off/pull on tool (Parker part no: for HPLA80 and –120: M4ON4397; For HPLA180: M4ON4398).
6. Check keyway in hollow shaft for damages and replace if necessary.
7. Mount gear with the aid of the push-off/pull-on tool.

Caution	Pull on gear under all circumstances! Do not propel on the shaft with the aid of a hammer, as this might damage the gear. When pulling on, make sure that the gear keyway is aligned with the hollow shaft keyway groove.

5.8.2 Exchange of gear with toothed pulley bearing directly on the shaft



1. Dismount motor
   (chapter 5.6 ff., according to gear used).
2. Detension toothed belt
   (chapter 5.2.2 items 2-5).
3. Remove sealing cover (106).
4. Loosen gear fixing (98) and remove gear with care.
5. Measure distance S (from upper edge of toothed pulley to gear flange) or L (from end of shaft to upper edge of toothed pulley) (precision +/- 0.1 mm).
6. Loosen threaded pin (88) and remove toothed pulley with care (use claw puller).
7. Place toothed pulley on new gear respecting distance S (see table 12)

Caution	Push pulley onto the shaft with the aid of the press. Do not propel onto the shaft with the aid of a hammer, as this might damage the gear.

8. Measure diameter of core hole of the threaded bore in the toothed pulley. Use a 0.5 mm grooved bit to drill 1 mm into the keyway of the gear through the threaded bore in the toothed pulley. Remove chippings.
9. Turn in threaded pin with thread locking (Loctite) into toothed pulley.
10. Place toothed belt on toothed pulley.
11. Mount gear on linear actuator and tighten gear fixing (98).
12. Tension toothed belt (see chapter 5.2.3).
13. Fix sealing cover (106).

14. Mount motor
    (chapter 5.5ff., according to gear used).

Gear type	Unit	HPLA80		HPLA120		HPLA180	
		S	L	S	L	S	L
Stöber P3	mm	38.0	5.5	---	---	---	---
Stöber P4	mm	43.0	1.5	55.5	-9.0	---	---
Stöber P5	mm	---	---	43.0	1.5	70.5	6.5

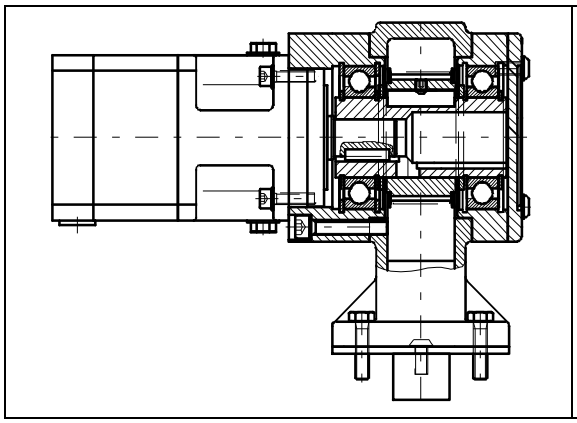
Table 12: Standard distance S (distance between toothed pulley and gear flange) and L (distance between shaft and toothed pulley)

5.9 Exchanging toothed pulley and bearing

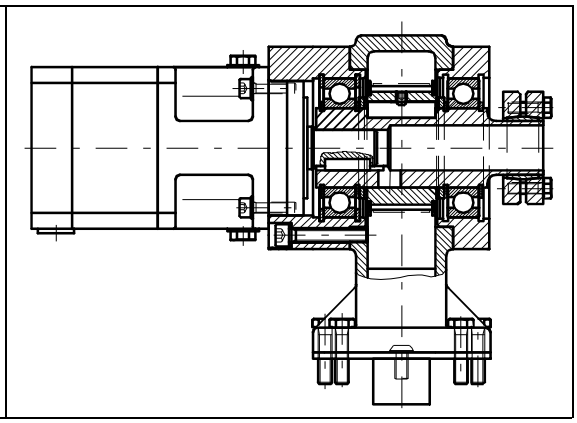
5.9.1 Exchanging the toothed pulley on the drive station

There are three different pulley bearings in the drive housing:

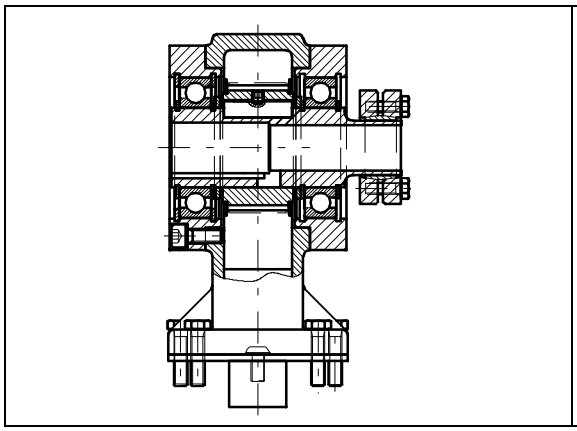
1. Bearing with hollow shaft:
   a) for single axes
   b) for double axes and
   c) for double axes with center drive
2. Bearing directly on the shaft for double axes.
3. Pulley directly on the gear shaft.



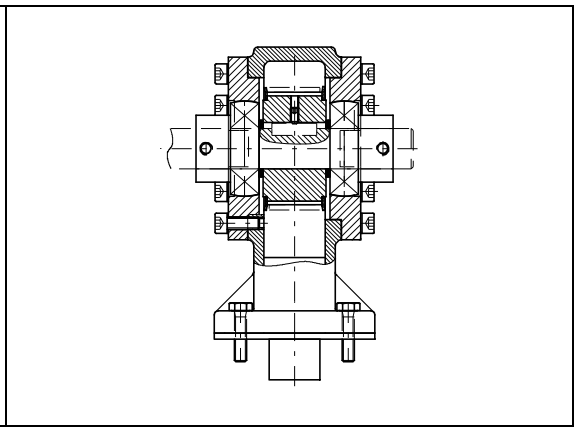
1a) Bearing with hollow shaft for single axes.



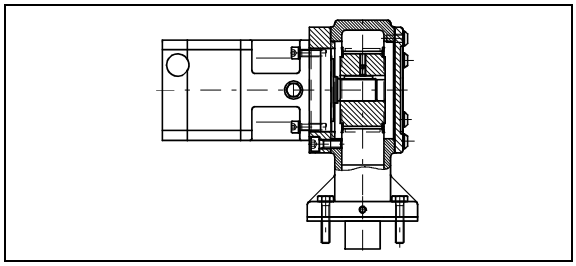
1a) Bearing with hollow shaft for double axes.



1c) Bearing for double axes with center drive



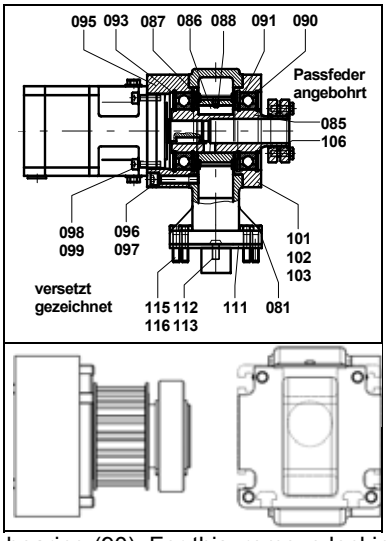
2) Bearing directly on the shaft for double axes.



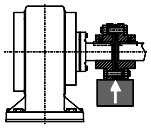
3) Pulley directly on the gear shaft.

The exchange of the toothed pulleys is described in the following chapters.

5.9.1.1 Toothed pulley with bearing on a hollow shaft (1a, 1b und 1c)

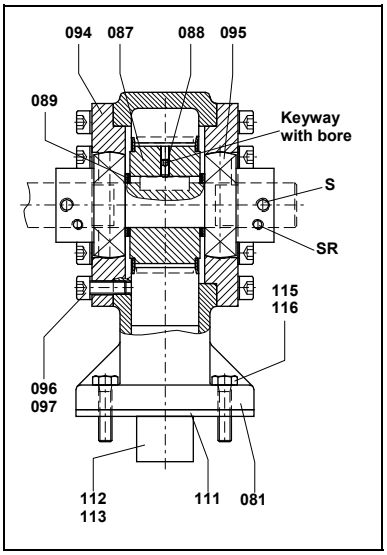


1. Detension the toothed belt: Remove protective cover (63) of the tensioning station. Loosen lock nut (53).
   Loosen tensioning screws (51) by approx. 10 turns (see chapter 5.9.2).
2. With a double axis support coupling beforehand, if necessary.

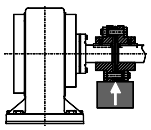


3. We recommend to dismount the drive (see chapter 5.8).
4. Loosen shrink washer (106) and pull from hollow shaft.
5. Loosen screws (96) of the intermediate flange and remove flange (95) together with the hollow shaft (85), bearings (90) and toothed pulley (87).
6. We recommend to exchange the entire prefitted package (drive flange, hollow shaft, two bearings, toothed pulley and gauge rings). Otherwise proceed as described below:
7. Remove bearing (90). For this, remove locking rings from the hollow shaft (91) with the aid of a special gripper. Dismount the first bearing with a pull-off tool.
8. Remove gauge rings and dismount toothed pulley (87) with the aid of a pull-off tool. Turn out threaded pin (88) beforehand.
9. Check keyway for damages and replace later if necessary.
10. Remove rear gauge rings.
11. Dismount locking rings (93) and push rear bearing together with the hollow shaft from the drive flange.
12. Remove locking rings from the hollow shaft (91) with the aid of a special gripper. Dismount the second bearing with a pull-off tool.
13. For mounting proceed in the reverse order – tighten (with double axes) the screws of the shrink washer slightly and then tighten in small increments (1/4 rev.) until the tightening torque Ma is reached. (For tightening torques see table 14 on page 51).
14. When mounting the toothed pulley, drill into keyway and fix with threaded pin.

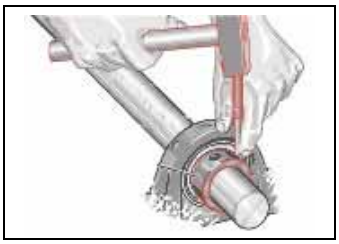
5.9.1.2 Toothed pulley with bearing directly on the shaft (2)



1. Detension the toothed belt: Remove protective cover (63) of the tensioning station. Loosen lock nut (53).
   Loosen tensioning screws (51) by approx. 10 turns (see chapter 5.9.2).
2. With a double axis, the coupling must be dismounted.



3. Loosen S screws of both eccentric tensioning rings of the PME bearings.
4. Loosen the eccentric tensioning rings of both PME bearings (95) (in general, the rings are tightened in the clockwise direction).
5. Loosen fixing screws (96) of the flanges (94) and remove flange together with the bearing (with the aid of the pull-off tool).
6. Pull shaft with toothed pulley (87) out of the drive housing.
7. Remove toothed pulley (87) with washers (89). Turn out threaded pin (88) beforehand.
8. Check keyway for damages and replace if necessary.
9. True new pulley to shaft. Bore the keyway and fix with the aid of a threaded pin.
10. Reinsert shaft with pulley into the housing.
11. Mount washers and flange and tighten the fixing screws of the flanges. Please make sure that the toothed pulley is placed exactly in the center of the housing (an equal distribution of the number of gauge rings on the right and on the left of the toothed pulley is essential.)
12. Thread eccentric tensioning rings SR onto the shaft and push into the right position. Then tighten in the clockwise sense by hand. Next step: item 13 on the next page.



13. Tension eccentric tensioning rings with the aid of an arbor and a hammer with one or two blows.
    Tighten threaded pins (see table 13).

Key width W in mm	Tightening torque MA in Nm
2.5	3.6
3	6
4	14
5	26

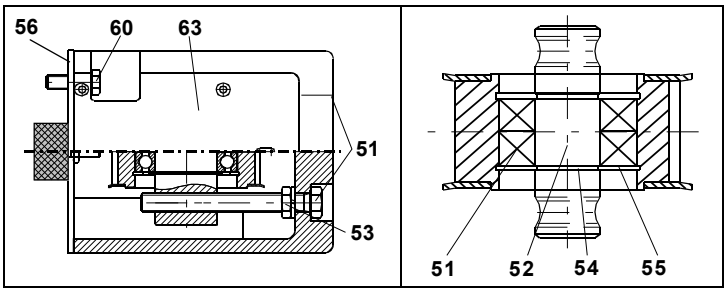
Table 13: Tightening torque for threaded pin

14. Tighten and align toothed belt (see chapter 5.2). Remount coupling on double actuator axis. Align carriage (see Chapter 5.10.2).

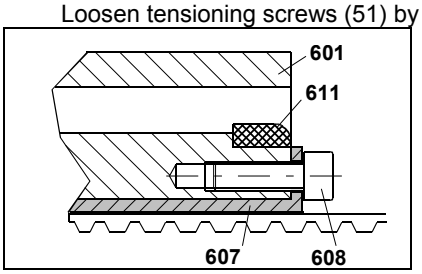
5.9.1.3 Toothed pulley directly on the gear shaft

See chapter 5.8, page 46.

5.9.2 Exchanging toothed pulley and gearing on the tensioning station



1. Place carriage close to the tensioning station.
2. Switch off axis with the aid of the main switch and secure against switching on.
3. If needs be, remove steel strip cover (see chapter 5.12)
4. Detension the toothed belt: Remove protective cover (63) of the tensioning station. Loosen lock nut (53). Loosen tensioning screws (51) by approx. 10 turns.



5. Loosen toothed belt clamping:
   Remove screw (608). Draw out bracket completely and remove. If the bracket is stuck and cannot be loosened, remove the flange plate.
6. Loosen screws (60) and remove tensioning station with buffer plate (56) with care.
7. Turn out tensioning screws (51) from the toothed pulley axis so far that the complete toothed pulley package can be removed.
8. Insert a new toothed pulley package and turn in the tensioning screws (62) by some turns into the bolt.
9. Place toothed belt around toothed pulley and fix tensioning station with screws and new Schnorr washers.
10. Fix toothed belt according to chapter 5.2.2, item 7-12.

5.10 Double axis

5.10.1 General Information

Double axes are generally shipped as single axes. From a defined center distance on, one or two Servoflex couplings are placed on the connection shaft (see chapter 5.10.3 page 51). These couplings ensure a compensation of axial and angular offset. The coupling(s) consist of two half-shells and a spring pack. This spring pack ensures the angular and axial offset compensation. With the aid of a shrink washer, both carriages can be precisely aligned to each other.

5.10.2 Alignment of the carriages with each other

1. Loosen screws of the shrink washer (see illustrations on page 51) one after the other by one turn each until the washer is completely loose (anti-clockwise).
2. Move carriage to defined position (e.g. end block).
3. Tighten screws of the shrink washer one after the other by ¼ turn each until the respective tightening torque is reached (use torque wrench if possible) (see table 14, page 51).

Axis type	Tightening torque Ma
HPLA80	5 Nm
HPLA120	12 Nm
HPLA180	12 Nm

Table 14: Tightening torque for shrink washers

5.10.3 Center distances

The following illustrations visualize the different degrees of center distance, which apply for all three frame sizes, HPLA80, HPLA120 and HPLA180.

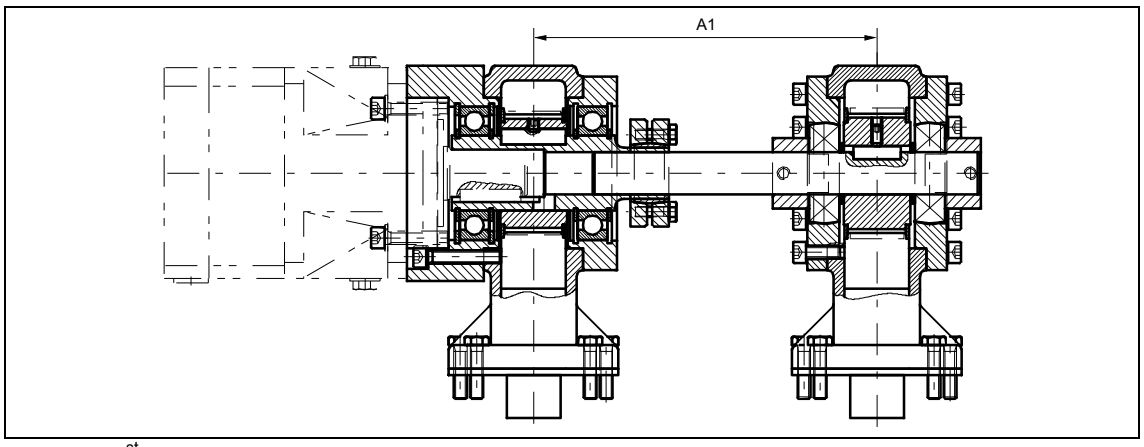


Figure 4: 1st Center distance degree A1: Up to 350mm. Version without coupling.

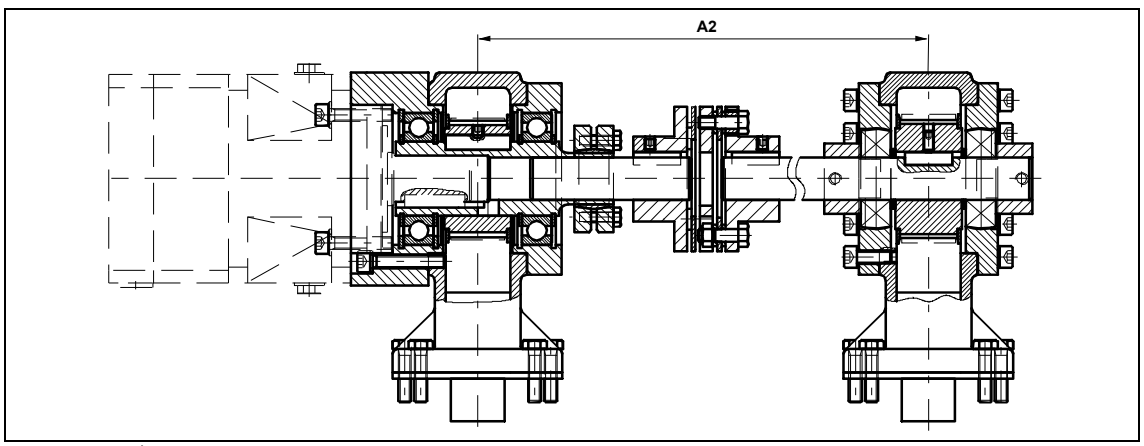


Figure 5: 2nd Center distance degree A2: 350...600mm. Version with one coupling.

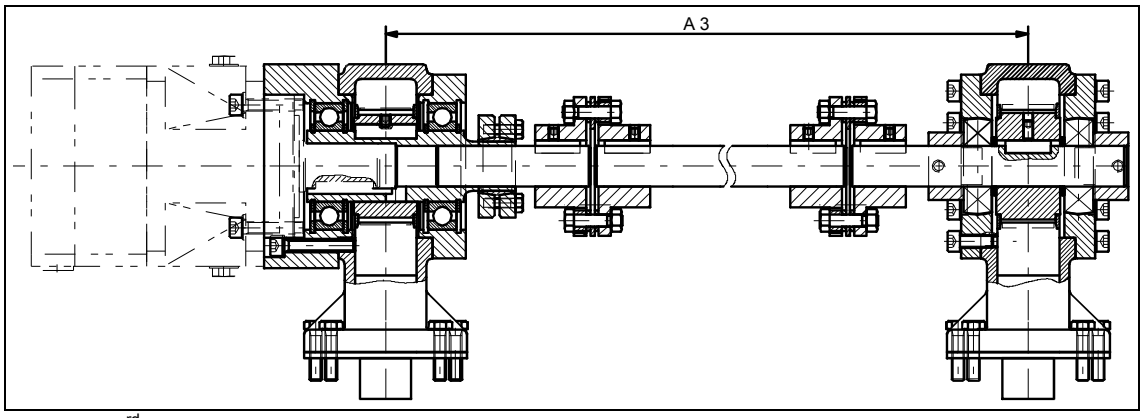


Figure 6: 3rd Center distance degree A3: >600mm. Version with two couplings.

Center distance degree	HPLA80	HPLA120	HPLA180
1. Center distance	120...350mm	150...350mm	250...350mm
2. Center distance	350...600mm		
3. Center distance	>600mm		

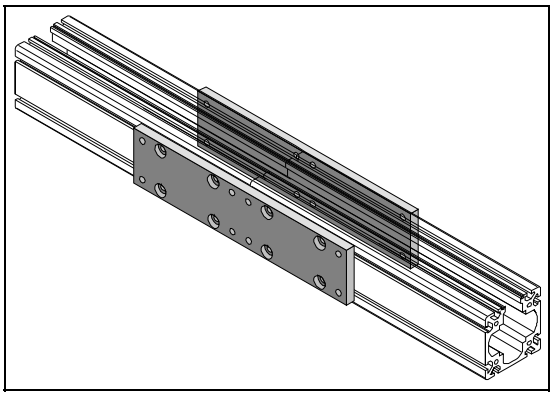
Table 15: Center distance overview

Smaller center distances are possible on request. Please contact Parker.

5.11 Extended axes

5.11.1 General Information

Hint	For axes with steel roller guiding, max. one longitudinal flange is permitted!



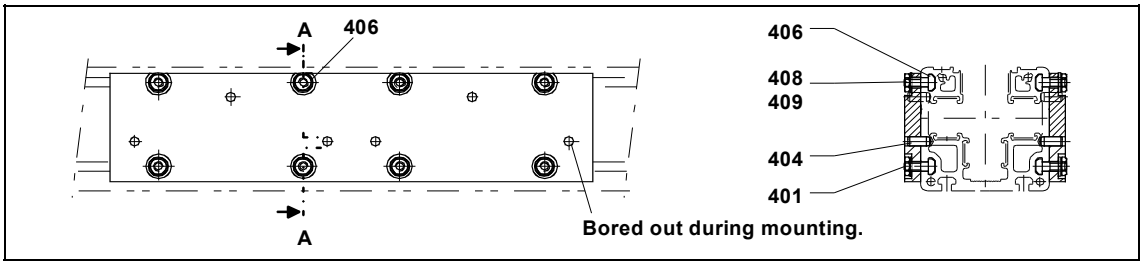
- Longitudinal flanges are used to obtain a longer travel or in order to improve the mounting conditions in mounting places that are difficult to access.
- The cut-off point for the longitudinal flanges should always be located near a fixation point.
- The distance between supports should in general be between 1.0m and 1.5m.
- As a standard, the cut-off point is located in the middle in order to obtain two profile elements of the same length.

- If longitudinal flanges are used to increase the stroke, the performance data must be reduced accordingly (see table 16).

HPLA	Unit	80	120	180
Max. permissible load	N	0.5 x Fx	0.5 x Fx	0.5 x Fx
Speed	m/s	< 1	< 1	< 1
Acceleration	m/s2	< 1	< 1	< 1
Repeatability	mm	> ±0,5	> ±0,5	> ±0,5

Table 16 : Fx: LBB080: page 12 , LBB120: page 13, LBB180: Page 14.

5.11.2 Mounting of longitudinal flanges



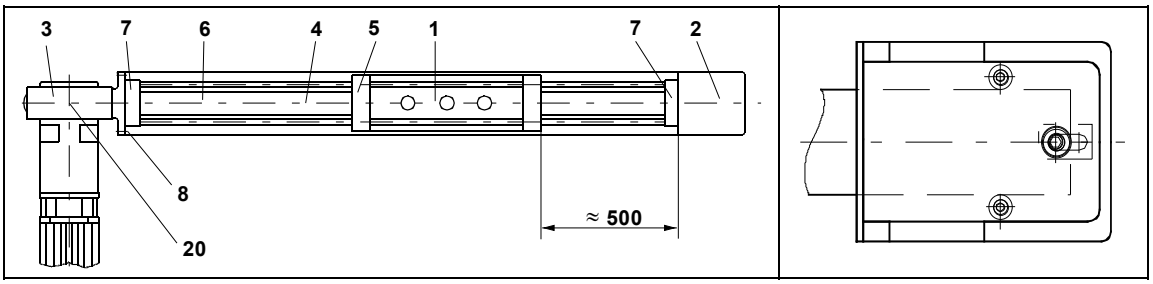
1. Align the profiles.
2. Insert t-bolts (406) (4 pcs. per profile and side).
3. Place perforated plate (401) on the profiles, place safety washers (408) and nuts (409) and fix.
4. Align profiles exactly, check the travel surfaces. Align if necessary. Check joint manually. It must feel smooth without a notch.
5. Check if the pin bores are aligned with each other, if needs be readjust the position of the HPLA. Insert pins (404).
6. Tighten nuts (409).
7. Mount and align toothed belt (see chapter 5.2 ff).

5.12 Steel strip cover

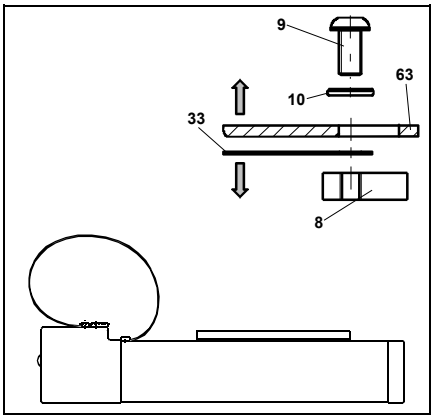
Hint	When working on the steel strip cover, make certain the steel strip is not bent, twisted or damaged in any other way. If a steel strip is damaged, it must be replaced immediately.

5.12.1 Mounting and Dismounting, Replacing Wearing Parts

5.12.1.1 Dismounting the steel strip cover



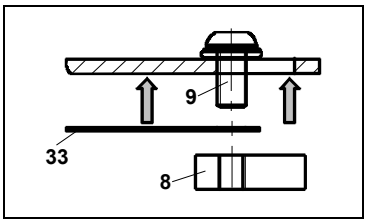
1. Stop the carriage (1) approx. 0.5 m from the tensioning station (2).
2. Turn off the axis with the power switch.



3. Loosen lens head screw fixing the steel strip (you can now shift the screw in the oblong hole).
4. Dismount tensioning station lid (63) and unscrew steel strip (33) from the lid.
5. Dismount the deflection stations (5) positioned on either side of the flange plate. Make certain the drag bars (felt) and springs do not fall out.
6. Carefully pull the steel strip through the load attachment plate of the carriage.
7. Roll up steel strip towards the drive station and fix with adhesive tape.

5.12.1.2 Mounting of the steel strip cover

1. Unroll the steel strip and guide the end through the flange plate of the carriage. Pull lightly on the steel strip to smooth it out over the entire length of the stroke.
2. Fasten the deflection stations (5) on both sides of the flange plate so they are flush on the sides and above. Make certain the springs and drag bar (felt) are in the housing.



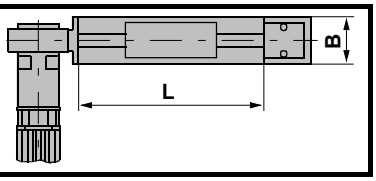
3. Mount the steel strip on the lid of the tensioning station with the aid of the lens head screw (9), lock washer and nut (8) (do not tighten screw).
4. Fix lid (with steel strip) of the tensioning station and tighten. On the HPLA80, loosen clamping sheet if necessary and align steel strip (see chapter 5.12.2, page 57)
5. Tighten steel strip fixing screw (9).

Hint	Do not tighten the steel strip!

6. Turn on the axis drive.
7. Allow the carriage to run about 10 strokes over the entire length at a slow speed (v < 2 m/s). Observe the steel strip to see whether it forms a “ripple“ in the travel direction in front of the respective deflection station.
8. After that, stop carriage moving from drive station (20) 0.5 m in front of the tensioning station (2).
9. Loosen steel strip fixing screw (9) in the tensioning station lid.
10. Smooth out the "ripple", but do not tighten the steel strip as you do so.
11. Tighten screw.

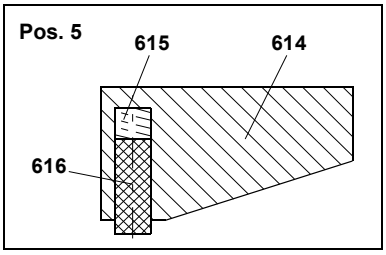
5.12.1.3 Replacing the steel strip

Hint	Always obtain new steel strips from Parker only. We need the length L of the profile for the order. With the aid of this information, we cut the new steel strip to length and drill two fixing holes accordingly.



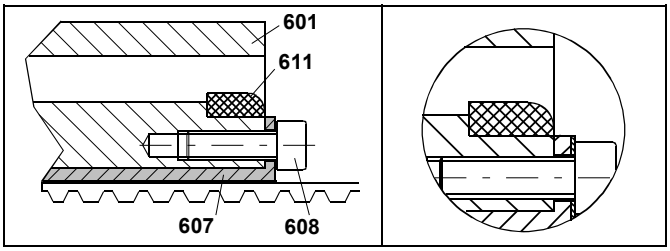
1. Dismount the steel strip (see Chapter 5.12.1.1)
2. Remove clamp from drive station. On the HPLA180 and HPLA120, remove steel strip from groove pin. On the HPLA80, do only loosen clamping sheet (see figure on page 57).
3. On the HPLA180 or HPLA120, connect new steel strip with groove pin.
4. Fix clamp or on the HPLA80 fix steel strip with clamping sheet.
5. Mount the steel strip (see Chapter 5.12.1.2)

5.12.1.4 Replacing the drag bar



1. Turn off the axis with the power switch.
2. Dismount the deflection stations (5) positioned on either side of the flange plate.
3. Replace the felt drag bar (616) with a new one. Make certain the springs (615) do not fall out.
4. Fasten the deflection stations (5) on both sides of the flange plate so they are flush on the sides and above.
5. Turn on the axis drive.

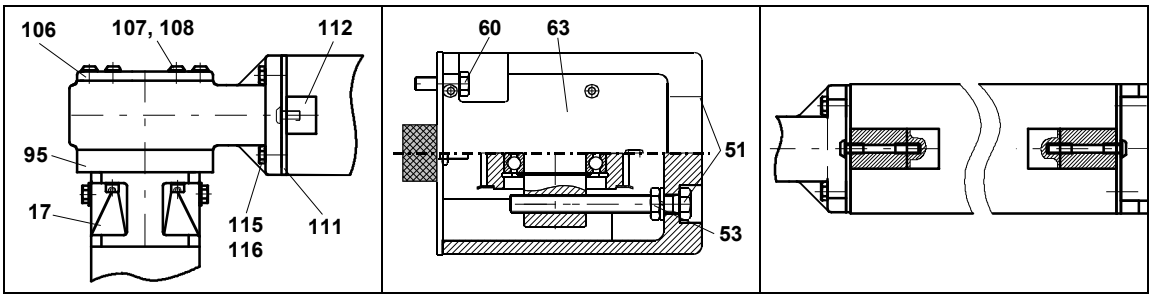
5.12.1.5 Replacing the deflection plate

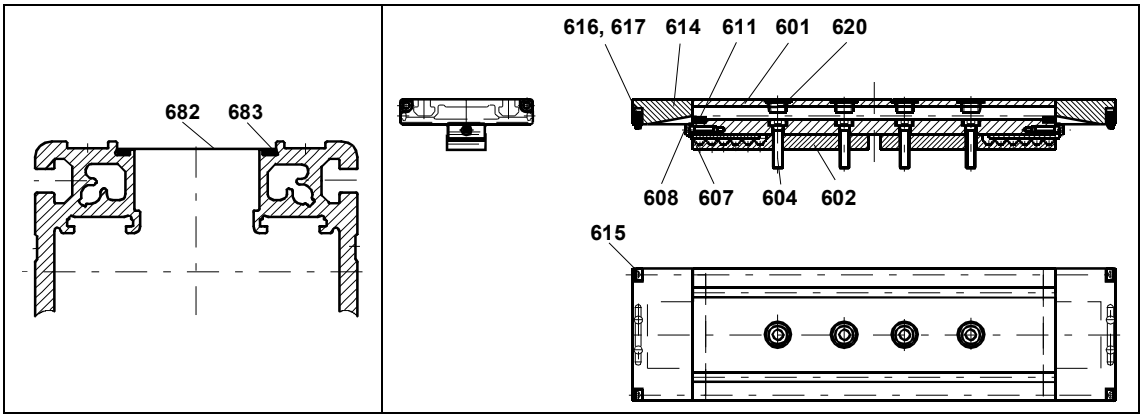


1. Dismount the steel strip (see Chapter 5.12.1.1)
2. Push out the old deflection plates (611) to the side.
3. Push the new deflection plates into the flange plate (601) so that the steel strip runs along the radius of the deflection plate. Align the deflection plate so it is centered.
4. Mount the steel strip (see Chapter 5.12.1.2)

5.12.2 Retrofitting the steel strip cover

Hint	For retrofitting the steel strip cover, you need: A prepared load attachment plate (groove for deflection plate, fixing thread for fixing the deflection stations), fitting parts, magnet strip, steel band, buffer extension. Note: • Overall size and fixing points remain unchanged. • The usable stroke of the HPLA80 is reduced by 70 mm, of the HPLA120 by 90 mm and of the HPLA180 by 200 mm (see also dimensional sheets, page 15 ff.) For retrofitting, the HPLA must be completely dismounted.





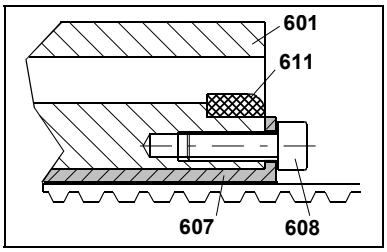
1. Switch off axis with the aid of the main switch and secure against switching on.
2. Detension toothed belt:
   Remove protective cover (63) of the tensioning station.
   Loosen lock nut (53).
   Loosen tensioning screws (51) by approx. 10 turns (anti clockwise).
3. Loosen toothed belt:
   Remove protective hoods (620), loosen screws (604) and remove load attachment plate (601). Pull toothed belt out of the toothed rails (602) and remove toothed rails:
4. Clean groove for magnet strip (683) and spray with Delo-Quick 5002 Activator. Apply Loctite 326 adhesive into groove, insert magnet strip and press on.
5. Place prepared load attachment plate with toothed rails (602) on the carriage, place screws (604), center load attachment plate and tighten screws.

Caution	Secure carriage with load attachment plate against moving/falling out with the aid of adhesive tape.

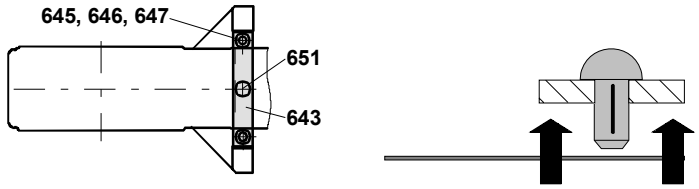
6. Loosen 4 tensioning station screws (60), take them out and remove toothed belt.
7. Clamp rubber buffer (112) into a vice following the above instructions and carefully loosen the screw with the buffer plate.

Hint	When dismounting the rubber buffer, do only turn the metal base. The fixing screw of the buffer is fixed with Loctite for safety reasons.

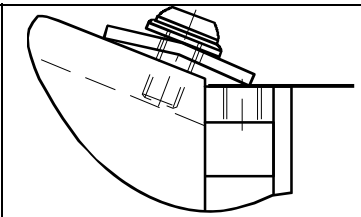
8. Mounting the buffer extension:
   Apply Loctite to threaded pin (14) and screw into the distance bolt (13) up to a half.
   Clean thread of the rubber buffer, apply Loctite and screw onto the threaded pin of the distance bolt.
   Apply Loctite to the thread of the screw (113) and fix the distance bolt as well as the rubber buffer to the buffer plate (111) of the tensioning station.
   Hold the distance bolt with a gripper and tighten screw thoroughly. Please make sure that the front end of the distance bolt rests completely on the tensioning station housing.
9. Place toothed belt around toothed pulley and fix tensioning station with screws (60) and new Schnorr washers.
10. Loosen tensioning station (115) screws (4x) , take them out with care and remove toothed belt.
11. Remove rubber buffer (see: tensioning station), extend and fix again.
12. Place toothed belt around toothed pulley of the drive station and fix with screws (115) and new Schnorr washers (116).



13. Remove toothed belt holding bracket (607) from dismantled load attachment plate.
14. Insert toothed belt between toothed rail and load attachment plate. Fix toothed belt holding bracket (607) with screw (608) (thread locking compound see also page 34).
15. Tension toothed belt following chapter 5.2.3.
16. Align toothed belt following chapter 5.3.
17. Set reference point (see chapter 5.4.6).
18. Push the deflection plate (611) into the flange plate (601) so that the steel strip runs along the radius of the deflection plate. Align the deflection plate so it is centered.
19. Remove chippings and dirt from magnet strips.
20. Unroll steel strip with care, feed through longitudinal aperture of the load attachment plate and outlay on the entire HPLA profile.
21. Fix steel strip to the side of the drive station. On the HPLA80, the steel strip is fixed in a different way than on the HPLA180 and HPLA120:
    - HPLA180/HPLA120: Connect clamp (643) and groove pin (651) carefully to the steel strip (6). Fix clamp with screws (645), washers (646) and support sheet (647) to the drive housing.
    - HPLA80: Clamp steel strip to the drive housing with the aid of clamping sheet, lens head screw and safety washer.



Steel strip fixing HPLA180/HPLA120



Steel strip fixing HPLA80

22. Equip deflection stations (614) with two springs (617) each and a drag bar (616).
23. Mount steel strip cover according to chapter 5.12.1.2 .

6 Spare and Wearing Parts

6.1 Wearing parts

6.1.1 Wearing parts HPLA80

Pos.	Name	Mounting location	Art. No.
16	Roller ROL0028	Carriage plastic roller guiding	416-201070
32	Toothed belt 25AT10 HPF	Belt drive	420-000016

Table 17: Wearing parts of a standard HPLA80

Pos.	Name	Mounting location	Art. No.
33	Steel strip 38mm x 0.152mm	Steel strip cover	400-300708
617	Spare parts package for steel strip deflection (4 felt pads, 4 deflection plates, 8 pressure springs)	Steel strip cover	510-006401

Table 18: Wearing parts of steel strip cover HPLA80

Pos.	Name	Mounting location	Art. No.
36	Steel strip 15mm x 1.5mm	Steel guiding	125-071742
16	NPPU roller	Carriage steel guiding	416-200105
3	Lubricating cassette felt pad	Steel guiding	180-600077

Table 19: Wearing parts of steel guiding HPLA80

Pos.	Name	Mounting location	Art. No.
44	Toothed wheel set, tensioning station	With bearing + bolts D=15	510-900220
87	Toothed pulley for hollow shaft bearing	Z4AS5053 D=35H7	420-100763
87	Directly on the shaft (for double axis)	Z4AS0057 D=20H7	420-100762
87	Pulley directly on the shaft with gear P3	Z4AS0053 D=16H7	420-100760
87	Pulley directly on the shaft with gear P4	Z4AS0054 D=22H7	420-100761

Table 20: Wearing parts toothed pulleys HPLA80

6.1.2 Wearing parts HPLA120

Pos.	Name	Mounting location	Art. No.
16	Roller R4OL0103	Carriage plastic roller guiding	416-201084
32	Toothed belt 32AT10 HPF	Belt drive	420-000031

Table 21: Wearing parts of a standard HPLA120

Pos.	Name	Mounting location	Art. No.
33	Steel strip 45 mm x 0.152mm	Steel strip cover	400-300709
617	Spare parts package for steel strip deflection (4 felt pads, 4 deflection plates, 8 pressure springs)	Steel strip cover	510-007401

Table 22: Wearing parts of steel strip cover HPLA120

Pos.	Name	Mounting location	Art. No.
36	Steel strip 20mm x 2mm	Steel guiding	125-071628
15	NPPU roller	Carriage steel guiding	416-200104
3	Lubricating cassette felt pad	Steel guiding	180-600075

Table 23: Wearing parts of steel guiding HPLA120

Pos.	Name	Mounting location	Art. No.
44	Toothed pulley set, tensioning station	With bearing + bolts D=30	510-900221
87	Toothed pulley for hollow shaft bearing	Z4AS5045 D=50H7	420-100770
87	Directly on the shaft (for double axis)	Z4AS5049 D=30H7	420-100772
87	Pulley directly on the shaft with gear P4	Z4AS5051 D=22H7	420-100774
87	Pulley directly on the shaft with gear P5	Z4AS5050 D=32H7	420-100773

Table 24: Wearing parts toothed pulleys HPLA120

6.1.3 Wearing parts HPLA180

Pos.	Name	Mounting location	Art. No.
16	Roller R4OL0099	Carriage plastic roller guiding	416-201080
32	Toothed belt 56AT20 PAZ	Belt drive	420-000051

Table 25: Wearing parts of a standard HPLA180

Pos.	Name	Mounting location	Art. No.
33	Steel strip 76mm x 0.152mm	Steel strip cover	400-300706
617	Spare parts package for steel strip deflection (4 felt pads, 4 deflection plates, 8 pressure springs)	Steel strip cover	510-008401

Table 26: Wearing parts of steel strip cover HPLA180

Pos.	Name	Mounting location	Art. No.
36	Steel strip 30mm x 3mm	Steel guiding	125-071545
15	NPPU roller	Carriage steel guiding	416-200100
3	Lubricating cassette felt pad	Steel guiding	180-300065

Table 27: Wearing parts of steel guiding HPLA180

Pos.	Name	Mounting location	Art. No.
44	Toothed pulley set, tensioning station	With bearing + bolts D=55	510-900222
87	Toothed pulley for hollow shaft bearing	Z4AS5030 D=60H7	420-100780
87	Directly on the shaft (for double axis)	Z4AS5048 D=40H7	420-100781
87	Pulley directly on the shaft with gear P5	Z4AS5052 D=32H7	420-100782

Table 28: Wearing parts toothed pulleys HPLA180

6.2 Spare parts

6.2.1 Spare parts HPLA80

Pos.	Name	Mounting location	Art. No.
18	Eccentric sleeve: E4XZ0004	Carriage	125-068100
19	Cylinder sleeve B4UC0140	Carriage	125-071705
21	Nut T4NU0075	Carriage	131-700165
22	Disk S4EI0008	Carriage	125-068150
23	Safety washer Schnorr M5	Carriage	135-201051
24	Hexagon screw DIN933 M5x20	Carriage	130-213008
112	rubber buffer	Drive and tensioning station	400-302100

Table 29: Spare parts of a standard HPLA80

Pos.	Name	Mounting location	Art. No.
614	Protective cover P4LA2770	Toothed belt cover	125-071707
615	Cylinder head screw DIN912 M5x50	Toothed belt cover	130-302327

Table 30: Spare parts of steel strip cover HPLA80

Pos.	Name	Mounting location	Art. No.
37	Round cord	Steel guiding	125-071743
--	Lubricating cassette module	Steel guiding	On request

Table 31: Spare parts of steel guiding HPLA80

6.2.2 Spare parts HPLA120

Pos.	Name	Mounting location	Art. No.
18	Eccentric sleeve E4XZ0003	Carriage	125-070100
19	Cylinder sleeve B4UC0135	Carriage	125-071600
21	Nut T4NU0064	Carriage	131-700143
22	Disk S4EI0145	Carriage	125-071601
23	Washer Schnorr M8	Carriage	135-201053
24	Hexagon screw DIN933 M8x25	Carriage	130-213051
112	rubber buffer	Drive and tensioning station	400-302102

Table 32: Spare parts of a standard HPLA120

Pos.	Name	Mounting location	Art. No.
614	Protective cover P4LA2919	Toothed belt cover	125-071635
615	Cylinder head screw DIN912 M6x55	Toothed belt cover	130-302352

Table 33: Spare parts of steel strip cover HPLA120

Pos.	Name	Mounting location	Art. No.
37	Round cord	Steel guiding	125-071642
--	Lubricating cassette module	Steel guiding	on request

Table 34: Spare parts of steel guiding HPLA120

6.2.3 Spare parts HPLA180

Pos.	Name	Mounting location	Art. No.
18	Eccentric bushing E4XZ0014 for plastic sheathed rollers	Carriage	125-071558
	Eccentric bushing E4XZ0015 for steel rollers		125-071560
19	Cylinder bushing B4UC0155 for plastic sheathed rollers	Carriage	125-071559
	Cylinder bushing B4UC0156 for steel rollers		125-071561
21	Nut T4NU0054 12(M10)x130	Carriage	131-700124
22	Disk S4EI0134	Carriage	125-071502
23	Safety washer Schnorr M5	Carriage	135-201054
24	Hexagon screw DIN933 M10x40	Carriage	130-213079
112	Rubber buffer	Drive- and tensioning station	400-302002

Table 35: Spare parts of a standard HPLA180

Pos.	Name	Mounting location	Art. No.
614	Protective cover P4LA 2920	Toothed belt cover	125-071512
615	Cylinder head screw DIN912 M8x110	Toothed belt cover	130-302290

Table 36: Spare parts of steel strip cover HPLA180

Pos.	Name	Mounting location	Art. No.
37	Round cord	Steel guiding	125-071642
	Lubricating cassette module	Steel guiding	on request

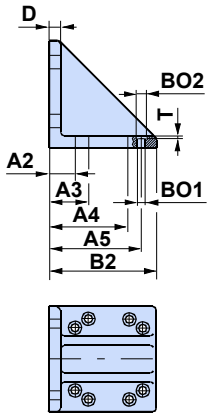
Table 37: Spare parts of steel guiding HPLA180

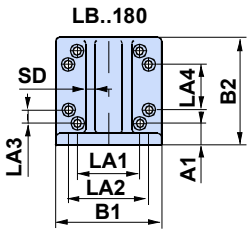
7 Accessories

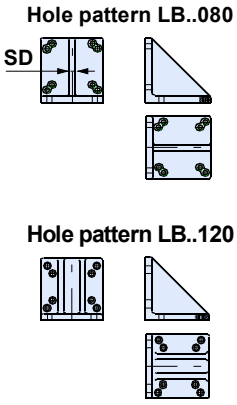
7.1 Assembly angle plate

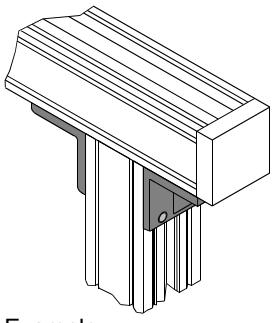
The assembly angle plate is used to connect a HPLA
with another linear actuator
with a base (a Parker profile can be used as support)
to other machine components
It is available in different sizes, isosceles or scalene – each with through holes. Each angle plate can be attached to the load attachment plate or to the corresponding profile in different directions.

7.1.1 Assembly angle plate isosceles



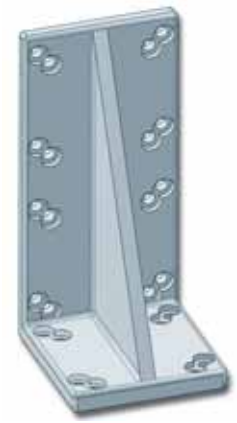


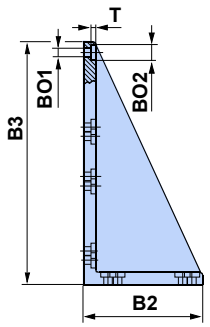


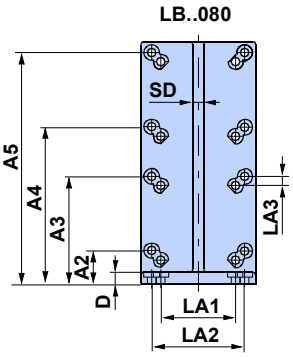


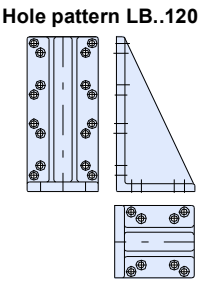
Frame Size	A1	A2	A3	A4	A5	BO1	BO2	B1	B2	D	LA1	LA2	LA3	LA4	SD	T	Art. No.
LB..080	16	16	22	64	70	Ø5.5	Ø10	74	77	8	48	60	6	42	7	3	500-000935
LB..120	25	25	40	90	105	Ø9	Ø15	110	120	15	70	90	15	50	8	2	500-000945
LB..180	35	60	80	140	160	Ø11	Ø22	180	180	20	110	140	20	85	12	1	500-000940

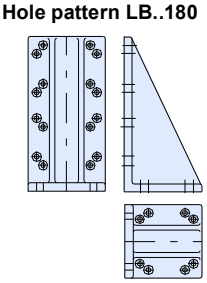
7.1.2 Assembly angle plate scalene

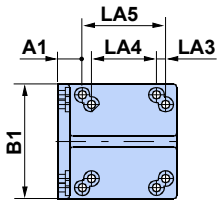


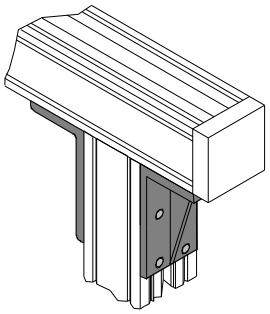










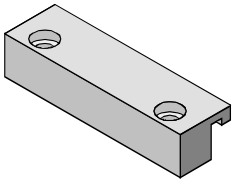


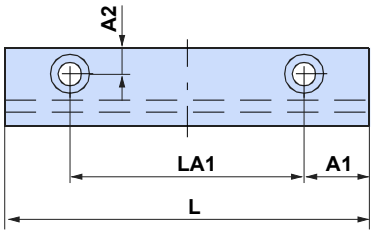
Frame Size	A1	A2	A3	A4	A5	BO1	BO2	B1	B2	B3	D	LA1	LA2	LA3	LA4	LA5	SD	T	Art. No.
LB..080	16	22	70	102	150	Ø5.5	Ø10	74	77	157	8	48	60	6	42	54	7	3	500-000936
LB..120	25	40	105	165	230	Ø9	Ø15	110	120	240	15	70	90	15	50	80	8	2	500-000946
LB..180	35	80	170	250	340	Ø11	Ø22	180	180	360	20	110	140	20	85	125	12	1	500-000941

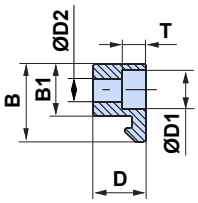
7.2 Clamping profile

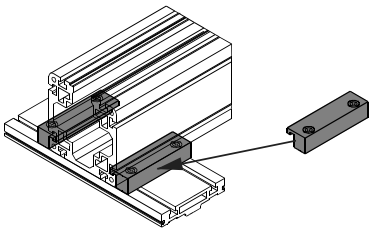
The toe clamps are used in conjunction with the standard load attachment plate to rapidly install and attach various combinations of Parker linear actuators. Two clamping profiles are needed to fix a HPLA on a flange plate. The following table shows the required profiles for the different axis combinations:

upper / lower	LB..080 (HPLA80)	LE..100 (HLE100)	LB..120 (HPLA120)	LE..150 (HLE150)	LB..180 (HPLA180)
LB..080	Order-No.: 500-000931	--	--	--	--
LE..100	Order-No.: 500-000932	Order-No.: 500-000905	--	--	--
LB..120	Order-No.: 500-000930	Order-No.: 500-000908	Order-No.: 500-000925	--	--
LE..150	--	Order-No.: 500-000903	Order-No.: 500-000909	Order-No.: 500-000902	--
LB..180	--	--	Order-No.: 500-000922	Order-No.: 500-000921	Order-No.: 500-000920





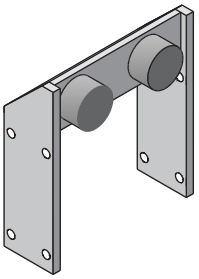


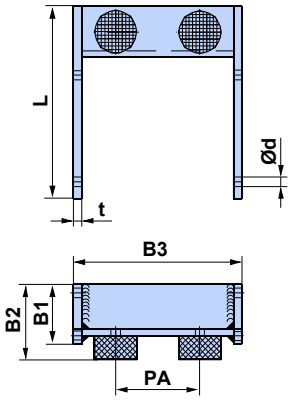


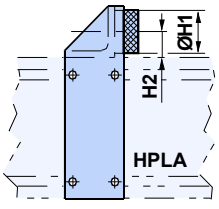
Art. No.	A1	A2	B	B1	D	D1	D2	L	LA1	T
500-000902	25	12	40	25	30	15	9	140	90±0.1	9
500-000903	25	10	30	20	20	15	9	140	90±0.1	9
500-000905	15	10	30	20	20	11	6.6	90	60±0.2	7
500-000908	25	12.5	37.5	25	26	15	9	140	90±0.2	9
500-000909	25	12.5	37.5	25	26	15	9	140	90±0.2	9
500-000920	30	15	45	30	36	18	11	170	110±0.2	11
500-000921	30	12	40	25	30	18	11	170	110±0.2	11
500-000922	25	12.5	37.5	25	26	18	11	160	110±0.2	11
500-000925	20	12.5	37.5	25	26	15	9	110	70±0.2	9
500-000930	20	10	27	20	17	15	9	110	70±0.2	9
500-000931	14	10	27	20	17	10	5.5	76	48±0.2	5.7
500-000932	15	10	27	20	17	15	9	90	60±0.2	9

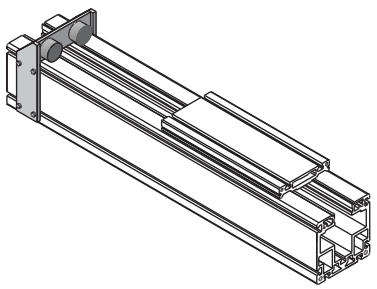
7.3 External stop buffer

The external stop buffer is mounted in the grooves of the HPLA profile and can be adjusted infinitely.





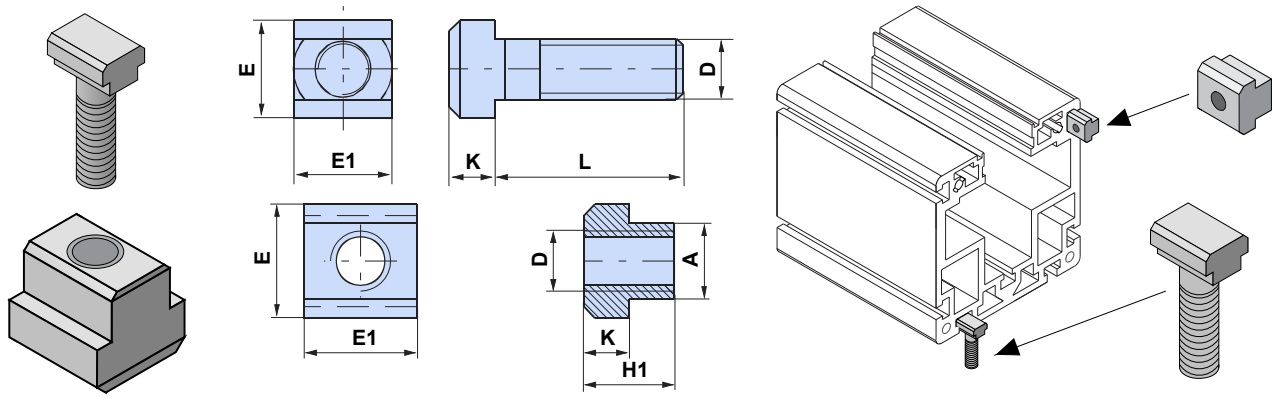




Frame Size	B1	B2	B3	PA	d	L	t	ØH1	H2	Order-No. (Incl. fixing material)
LB..080	30	45	90	56	5.5	91	5	15	11	510-006497
LB..120	50	60	140	74	9	150	10	30	17	510-007497
LB..180	70	88	200	100	11	225	10	50	30	510-008497

7.4 T-nuts and bolts

The T nuts and bolts can be used to attach other components in the T-slots of the profile, or on the upper side of the load attachment plate.



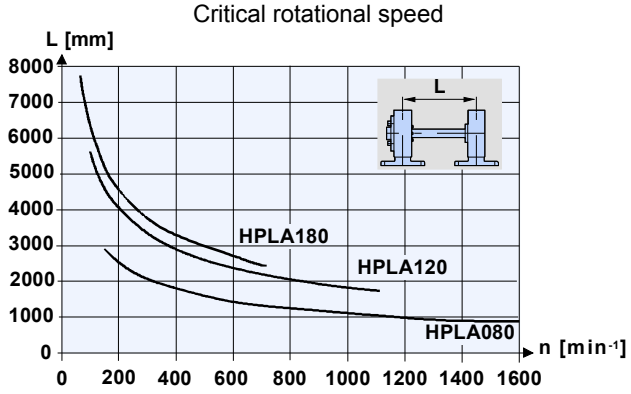
Frame Size	Designation		A	D	E	I1	H1	K	L	Order. No. (stainless)
LB..080	T-slot bolt	DIN787 M6x15	--	M6	10	10	--	4	15	131-700030 (135-725430)
LB..080	T-slot bolt	DIN787 M6x25	--	M6	10	10	--	4	25	131-700031
LB..080	T-slot bolt	DIN787 M6x30	--	M6	10	10	--	4	30	131-700032
LB..080	T-slot bolt	DIN787 M6x40	--	M6	10	10	--	4	40	131-700033
LB..120	T-slot bolt	DIN787 M10x25	--	M10	15	15	--	6	25	131-700007 (135-725459)
LB..120	T-slot bolt	DIN787 M10x32	--	M10	15	15	--	6	32	131-700008 (135-725460)
LB..120	T-slot bolt	DIN787 M10x40	--	M10	15	15	--	6	40	131-700009 (135-725465)
LB..120	T-slot bolt	DIN787 M10x63	--	M10	15	15	--	6	63	131-700011
LB..120	T-slot bolt	DIN787 M10x80	--	M10	15	15	--	6	80	131-700012
LB..180	T-slot bolt	DIN787 M12x25	--	M12	18	18	--	7	25	131-700016 (135-725482)
LB..180	T-slot bolt	DIN787 M12x50	--	M12	18	18	--	7	50	131-700015 (135-725480)
LB..180	T-slot bolt	DIN787 M12x65	--	M12	18	18	--	7	65	131-700025 (135-725468)
LB..180	T-slot bolt	DIN787 M12x80	--	M12	18	18	--	7	80	131-700026 (135-725470)
LB..080	T-nut	DIN508 M4x6x10	5.6	M4	10	10	8	4	--	131-700101 (135-725391)
LB..080	T-nut	DIN508 M5x6x10	5.6	M5	10	10	8	4	--	131-700102 (135-725390)
LB..080	T-nut long	HWN313 ZN M5x6	5.6	M5	10	20	8	4	--	131-700147
LB..080	T-nut	HWN314 ZN M5x6	Rhombus form for retro-fitting							131-700157
LB..120	T-nut	DIN508 M4x10x15	9.6	M4	15	15	12	6	--	131-700134 (135-725403)
LB..120	T-nut	DIN508 M6x10x15	9.6	M6	15	15	12	6	--	131-700135
LB..120	T-nut	DIN508 M8x10x15	9.6	M8	15	15	12	6	--	131-700104 (135-725402)
LB..120	T-nut long	HWN313 M8x10x30	9.6	M8	15	30	12	6	--	131-700141 (135-725406)
LB..120	T-nut	HWN314 M8x10	Rhombus form for retro-fitting							131-700155
LB..180	T-nut	DIN508 M4x12x18	11.6	M4	18	18	14	7	--	131-700113 (135-725422)
LB..180	T-nut	DIN508 M6x12x18	11.6	M6	18	18	14	7	--	131-700112 (135-725421)
LB..180	T-nut long	HWN313M10x12x35	11.6	M10	18	35	14	7	--	131-700111 (135-725420)
LB..180	T-nut	HWN314 M10x12	Rhombus form for retro-fitting							131-700156

* When using the combination of two linear actuators via clamping profiles, we would recommend the use of long nuts.

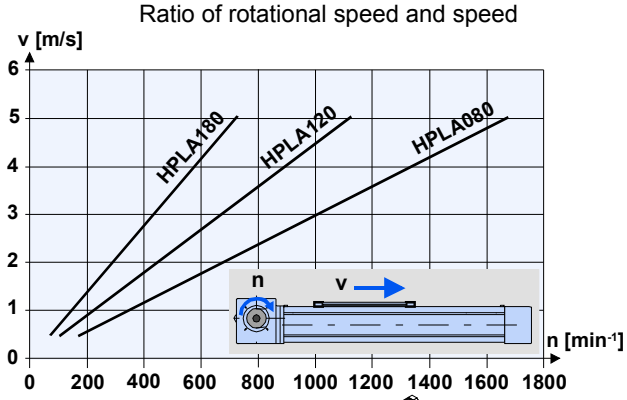
7.5 Intermediate shaft bearing for double axes

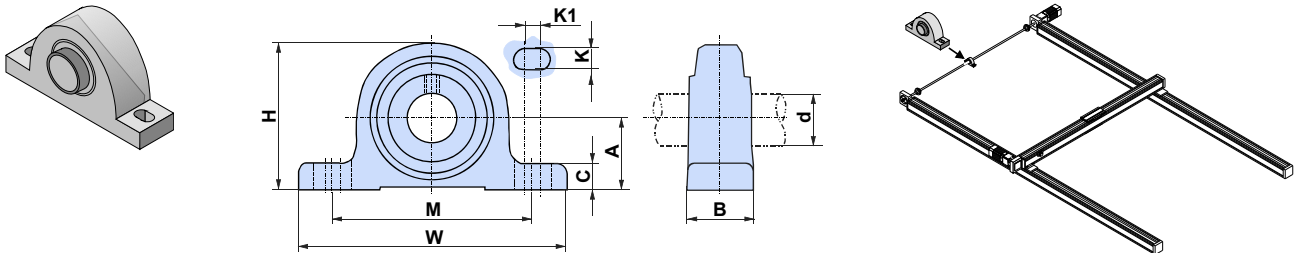
The intermediate shaft bearing is used to support the connection shaft of a double axis in the event of a long axis distance. The intermediate shaft bearing must be used if the critical rotational speed (see diagram) is exceeded with the double axis connection shaft:

Critical rotational speed



Ratio of rotational speed and speed





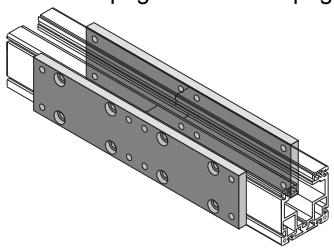
Frame Size	Type	A	B	C	d	H	K	K1	M	W	Art. No.
LB..080	PASE20	33.3	32	14.5	Ø20	64	11	8	97	130	416-000120
LB..120	PASE40	49.2	48	19	Ø40	99	14	12	138	179	416-000200
LB..180	PASE50	57.2	54	21.5	Ø50	115	18	5	158	200	416-000210

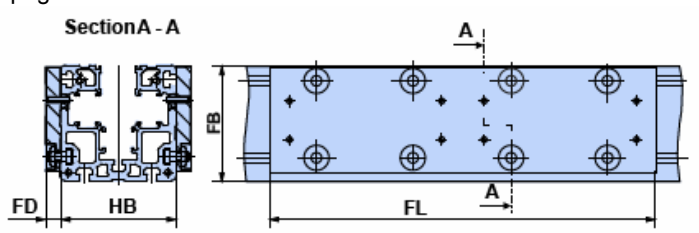
7.6 Longitudinal flanges

The usable stroke can be more than doubled when using the flange plates. A longitudinal flange is required if the travel path exceeds the profile length (see: technical data, page 10). The separation of the profiles is made, if possible and not stated otherwise, in the middle. The cut-off point of the longitudinal flanges should always be located near a fixation point. The distance between supports should be between 1.0 m and 1.5 m. For a HPLA with toothed belt drive and longitudinal flanges, the load characteristics must be derated (if the maximum travel is exceeded, see technical data, page 10) and it should only be used with the profile opening at the top or at the bottom. With a steel roller guiding, max. one longitudinal flange is permitted!

	Unit	LB..080	LB..120	LB..180
maximum permissible load:	N	0.5 x Fx*1	0.5 x Fx*1	0.5 x Fx*1
Speed:	m/s	< 1	< 1	< 1
Acceleration:	m/s²	< 1	< 1	< 1
Repeatability:	mm	> ±0.5	> ±0.5	> ±0.5

*1 Fx: LB..80 page 11 LB..120 page 13, LB..180 page 14





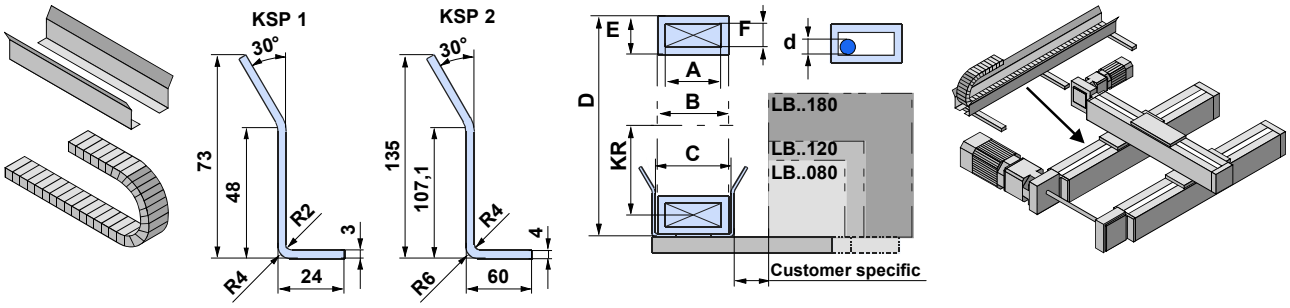
Frame Size	FL	FB	FD	HB
LB..080	300	70	15	80
LB..120	400	110	15	120
LB..180	500	165	20	180

7.7 Cable carrier

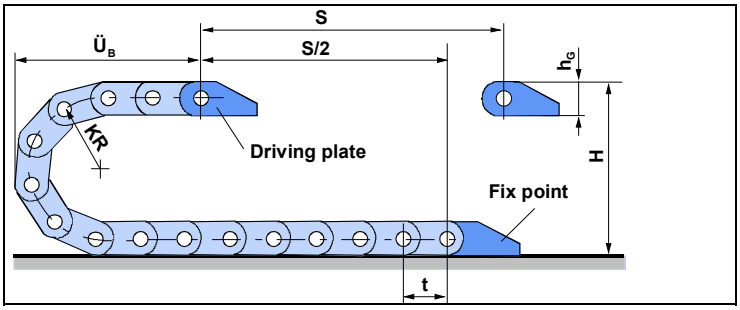
A cable carrier is needed when making power connections to moving elements. The cable carrier chain consists of Igumid® and the support profile is made of aluminium.

The process for fully determining the dimensions of a cable carrier is very complex. The examples listed below represent simple applications, but more data will normally be required when the situation is less straightforward. The following descriptions are only valid for cable carriers in horizontal configuration supported by a profile – within the limits stated in the technical specifications. If your application is more complicated, please contact us.

7.7.1 Dimensions of supporting profile and cable carrier chain



										Order No. (Length → page 68.)	
	Type	KR	A	B	C	D max.	E	F	d max.	Cable carrier chain	2 x connecting angle (dimensions → p. 67)
KSP1	B15.015.038.0	38	15	26	31	120	23	17.5	14	on request	on request
	B15.025.038.0	38	25	36	41	120	23	17.5	14	on request	on request
	2500.03.055.0	55	38	54	61	170	35	25	23	on request	on request
	2500.03.100.0	100	38	54	61	260	35	25	23	on request	on request
	2500.05.100.0	100	57	73	78	260	35	25	23	on request	on request
	2500.07.150.0	150	77	93	98	360	35	25	23	on request	on request
KSP2	2700.07.200.0	200	75	91	96	485	50	35	32	on request	on request
	2700.12.200.0	200	125	141	146	485	50	35	32	on request	on request
	2700.17.200.0	200	175	194	199	485	50	35	32	on request	on request
KSP1 small cable supporting profile (Please state required length. Length = travel!)										400-010120	
KSP2 large cable supporting profile (Please state required length. Length = travel!)										400-010121	



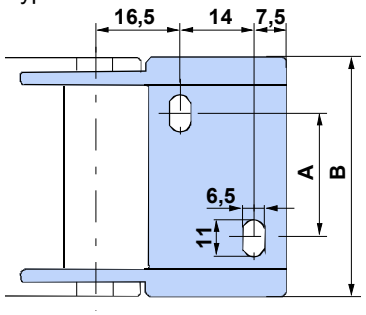
Dimensional drawings of the connection points (fixed point and driving plate): Page 67

Type	Bending radius KR	Bending t	Height hG	Curve length ÜB	Connection height H	Clearance mounting height HF	Connection height weight kg/m
B15.015.038.0	38	30.5	23	80	100	120	˜ 0.35
B15.025.038.0	38	30.5	23	80	100	120	˜ 0.40
2500.03.055.0	55	46	35	125	145	170	˜ 0.81
2500.03.100.0	100	46	35	170	235	260	˜ 0.81
2500.05.100.0	100	46	35	170	235	260	˜ 0.90
2500.07.150.0	150	46	35	220	335	360	˜ 1.01
2700.07.200.0	200	56	50	275	450	485	˜ 1.30
2700.12.200.0	200	56	50	275	450	485	˜ 1.48
2700.17.200.0	200	56	50	275	450	485	˜ 1.85

7.7.2 Dimensional drawings of the connection points

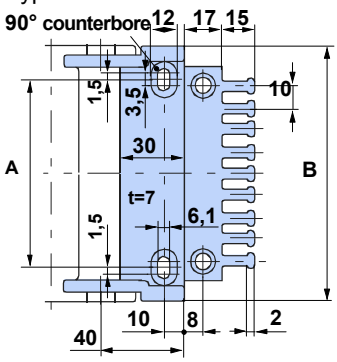
Standard fixed point connection

Type B15.xxx



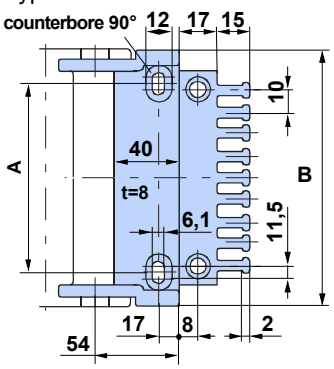
Type	A	B
B15.015..	0	25.5
B15.025..	10	35.5

Type 2500.xxx



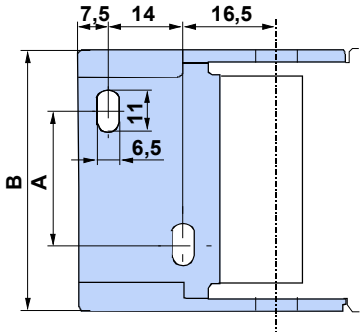
Type	A	B
2500.03..	25	51
2500.05..	44	70
2500.07..	64	90

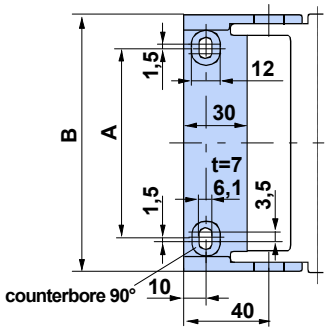
Type 2700.xxx

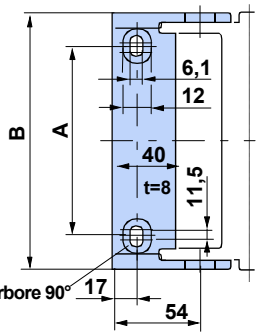


Type	A	B
2700.07..	55	93
2700.12..	105	143
2700.17..	155	196

Standard carrier connection







7.7.3 Technical data for cantilever configuration

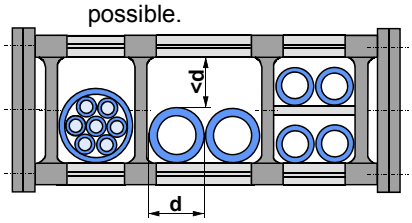
Type		Cantilever configuration			Cantilever configuration with permitted sag		
		Maximum stroke [mm]	Maximum speed [m/s]	Maximum acceleration[16] [m/s²]	Maximum stroke[17] [mm]	Maximum speed [m/s]	Maximum acceleration [m/s²]
B15.xx		2000	10	20	2400	3	6
2500.xx		2300	10	20	4000	3	6
2700.xx		3000	10	20	4300	3	6

[16] Higher speeds and accelerations are possible. This will however reduce the lifetime of the cable carrier. Usual lifetime range with cantilever configuration: 5 - 10 million strokes.

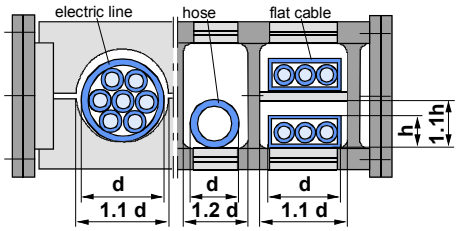
[17] For longer strokes, a sliding chain configuration is used. Please contact the supplier.

7.7.4 Guidelines for using cable carriers

Use only electrical cables suitable for use in cable carriers. Hose lines should be highly flexible and should only extend slightly under pressure. Weight should be distributed across the cable track as evenly as possible. Cables must not be twisted when routed in the cable carrier and should be routed next to one another and as loosely as possible.



Avoid laying several lines on top of each other and laying lines of different diameters directly next to one another. If multiple layers must be used, separating strips should be inserted between each layer – should such circumstances arise, please contact Parker.
If there is no alternative to routing several lines beside each other without sub-divisions, the clearance height within the carrier must be less than the line diameter. This is the only way of preventing the cables from twisting.



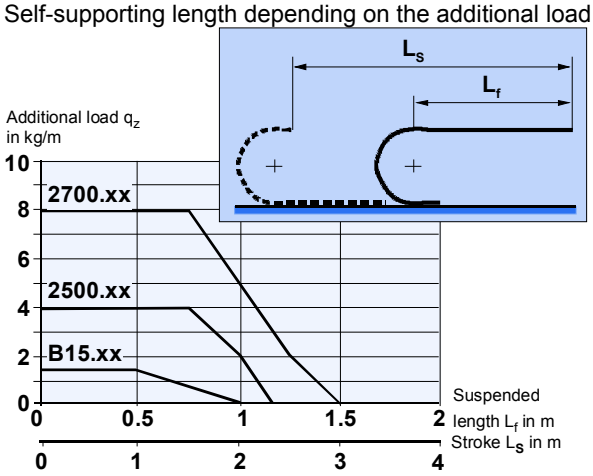
The supply cables must be free to move within the cable carrier. They cannot be fixed to the cable carrier or tied together. Separating strips must always be inserted between flat cables routed in multiple layers.
Recommended dimensions of the space required:

for round cables:	approx. 10% of the line diameter
with hose lines:	for each, approx. 10% of the cable width and cable thickness
with flat cables:	approx. 20% of the hose diameter

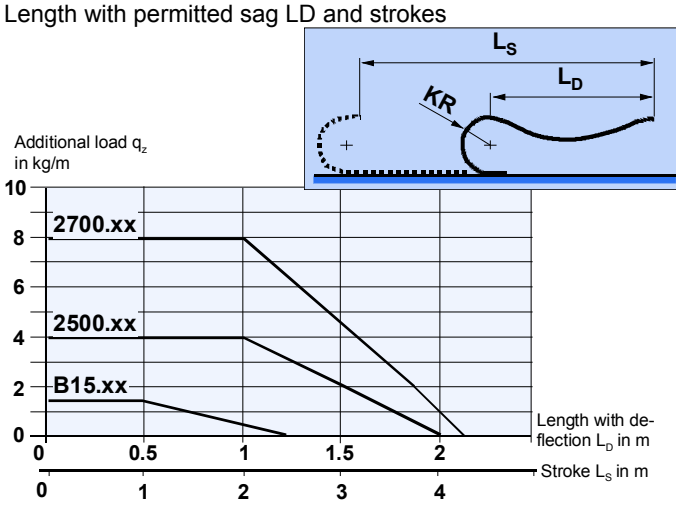
Thin highflex cables with a low bending strength must be bundled and inserted into a protective hose. The cross section of the protective hose must be much larger than the sum of the individual cable cross sections. For the calculation of the cross section you should assume a standard clearance of 10% of the individual line diameter.

7.7.5 Load diagrams

Self-supporting length depending on the additional load



Length with permitted sag LD and strokes



Determination of the chain length

$$L_K = \frac{S}{2} + K$$

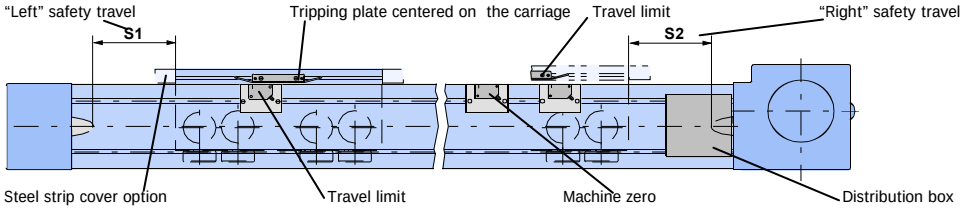
Bending radius KR	K					Round LK to pitch t
	38	55	100	150	200	
B15.xx	185	--	--	--	--	30,5
2500.xx	--	276	414	578	--	46
2700.xx	--	--	--	--	825	56

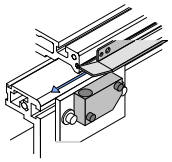
7.8 Mounting of position switches / electronic accessories

As a standard, tripping plate, switches and distribution box are mounted on the motor side. Mounting configuration 5 is used as a standard. The positions of the limit switches and of the machine zero must be set by the customer according to the application requirements. The end limits should, for instance, be set so that they are activated before the beginning of the safety travel (distance for braking the moved mass – see page 21). The tripping plate is enclosed separately into the delivery for the carriage configuration with bar (T/F) (the same applies to the initiator and the limit switches for mounting configuration 3). The tripping plate, position sensor and distribution box are described on page 29Fehler! Es wurde kein Textmarkenname vergeben..

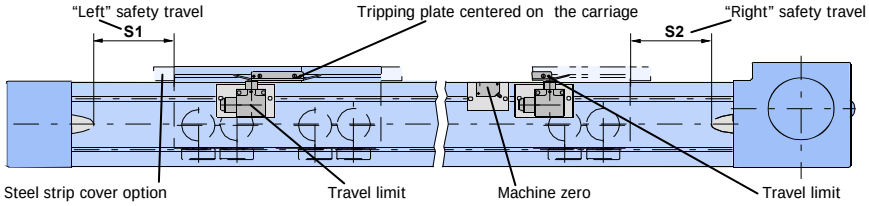
7.8.1 HPLA mounting configurations of the position switch

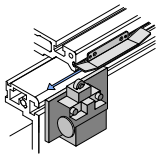
7.8.1.1 Mounting configuration 2: 3 external proximity switches





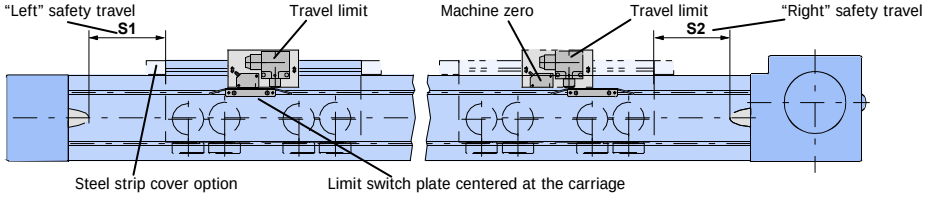
7.8.1.2 Mounting configuration 3: 2 mechanical limit switches and 1 proximity switch





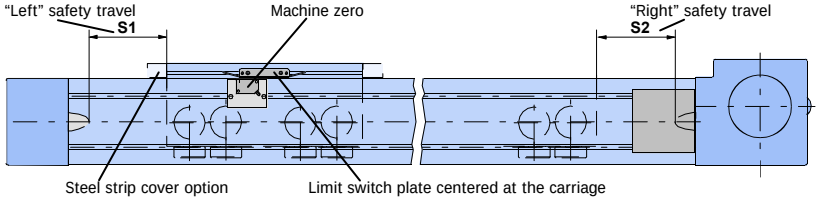
7.8.1.3 Mounting configuration 4: 1 mechanical limit switch / 1 proximity switch / following

This variant is preferred in robotic systems, if the supply of the switches is made via the cable carrier. The tripping plates must be mounted so that the mechanical switch is actuated immediately before the beginning of the safety travel.

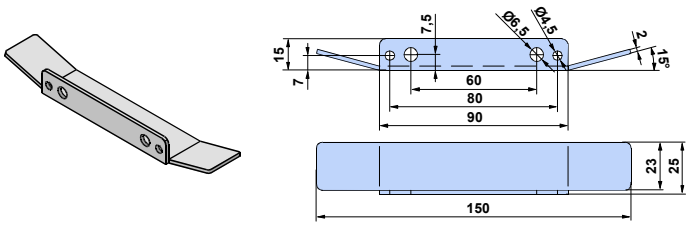


7.8.1.4 Mounting configuration 5 (standard): 1 proximity switch

The proximity switch defines the machine zero. The end limits are software end limits in the Compax3 servo controller

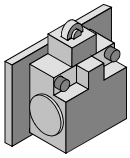


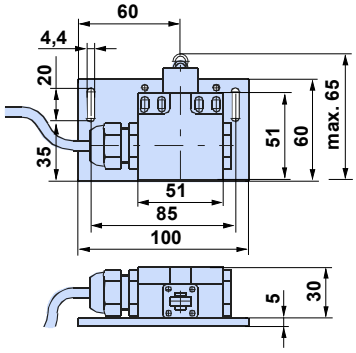
7.8.2 Tripping plate

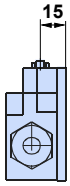


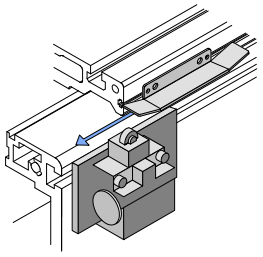
The tripping plate is suitable for all standard load attachment plates. It is fixed to the load attachment plate with the aid of cylinder head screws and square nuts.
Order-No.: tripping plate 500-000531
Order No. Square nut (2 pcs. required): 135-700001
Order No. Cylinder head bolt M4x6 (2 pcs. required): 130-302294.

7.8.3 Mechanical limit switch







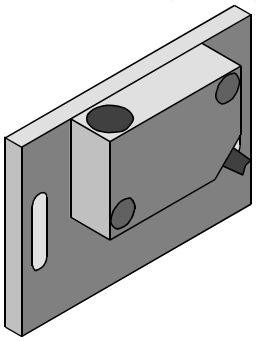


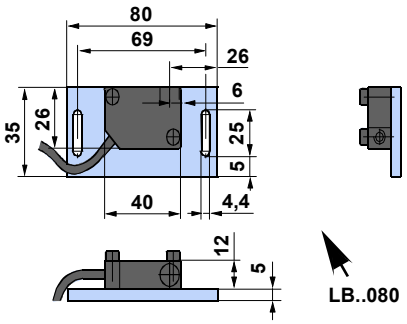
Switching button as per DIN EN50047. The contacts satisfy the safety requirements by forced opening according to EN 60948-5-1.

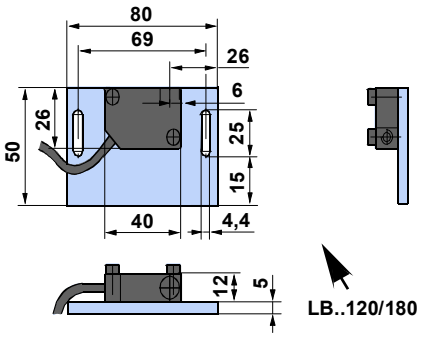
Type	Designation	Art. No.
LB..080	Mechanical limit switch with fixing material	510-900705
LB..120	Mechanical limit switch with fixing material	510-900505
LB..180	Mechanical limit switch with fixing material	510-900675

7.8.4 Electrical limit switches

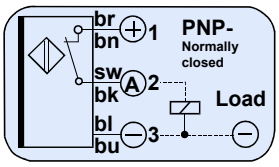
The sensor is activated by a tripping plate on the side on the flange plate.

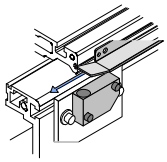






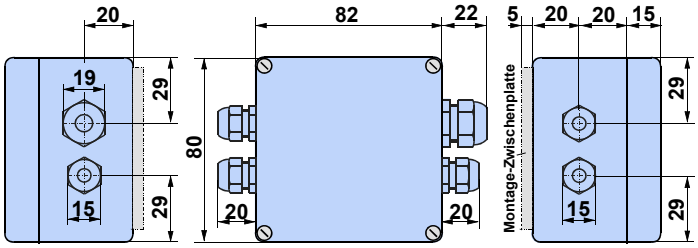
Connection diagram:



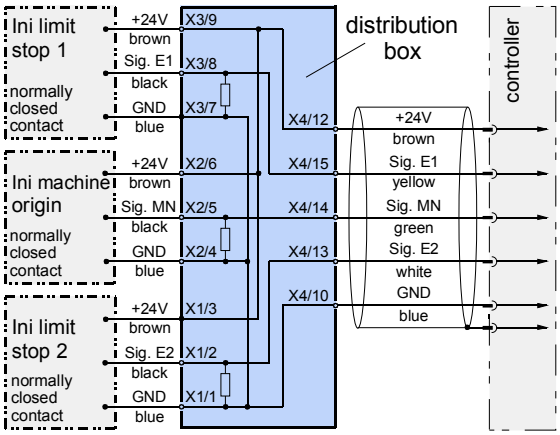


Frame Size	Designation	Art. No.	
		Standard design	Stainless version
LB..080	Electrical limit switch NPN normally closed contact with 6m cable and fixing material	510-900702	On request
LB..080	Electrical limit switch NPN normally open contact with 6m cable and fixing material	510-900700	On request
LB..080	Electrical limit switch PNP normally closed contact with 6m cable and fixing material	510-900701	On request
LB..080	Electrical limit switch PNP normally open contact with 6m cable and fixing material	510-900703	On request
LB..080	Electrical limit switch PNP pluggable normally closed contact for connection to COMPAX	510-900704	On request
LB..120	Electrical limit switch NPN normally closed contact with 6m cable and fixing material	510-900527	510-900622
LB..120	Electrical limit switch NPN normally open contact with 6m cable and fixing material	510-900525	510-900620
LB..120	Electrical limit switch PNP normally closed contact with 6m cable and fixing material	510-900602	510-900621
LB..120	Electrical limit switch PNP normally open contact with 6m cable and fixing material	510-900528	510-900623
LB..120	Electrical limit switch PNP pluggable normally closed contact for connection to COMPAX	510-900603	On request
LB..180	Electrical limit switch NPN normally closed contact with 6m cable and fixing material	510-900652	On request
LB..180	Electrical limit switch NPN normally open contact with 6m cable and fixing material	510-900653	On request
LB..180	Electrical limit switch PNP normally closed contact with 6m cable and fixing material	510-900650	On request
LB..180	Electrical limit switch PNP normally open contact with 6m cable and fixing material	510-900651	On request
LB..180	Electrical limit switch PNP pluggable normally closed contact for connection to COMPAX	510-900654	On request

7.8.5 Distribution box



Only for limit switch attachment variant 2



Designation	Art. No.
Distribution box including 2.5 m cable	800-003102
Distribution box including 5 m cable	800-003103
Distribution box including 7.5 m cable	800-003104
Distribution box including 10 m cable	800-003105
Distribution box including 12.5 m cable	800-003106
Distribution box including 15 m cable	800-003107
Distribution box including 20 m cable	800-003108
Distribution box including 25 m cable	800-003109
Distribution box including 30 m cable	800-003110
Distribution box including 35 m cable	800-003111
Distribution box including 40 m cable	800-003112
Distribution box including 45 m cable	800-003113
Distribution box including 50 m cable	800-003114

Frame Size	Designation	Art. No.	
	Order-No. Of distribution box: See in the following table)	Standard	Stainless version
LB..080	Attachment components for distribution box	510-900710	On request
LB..120	Attachment components for distribution box	510-900612	510-900613
LB..180	Attachment components for distribution box	510-900670	On request

7.8.6 Other accessories / software

DimAxes:

Dimensioning software for Parker linear actuators for your Windows PC.

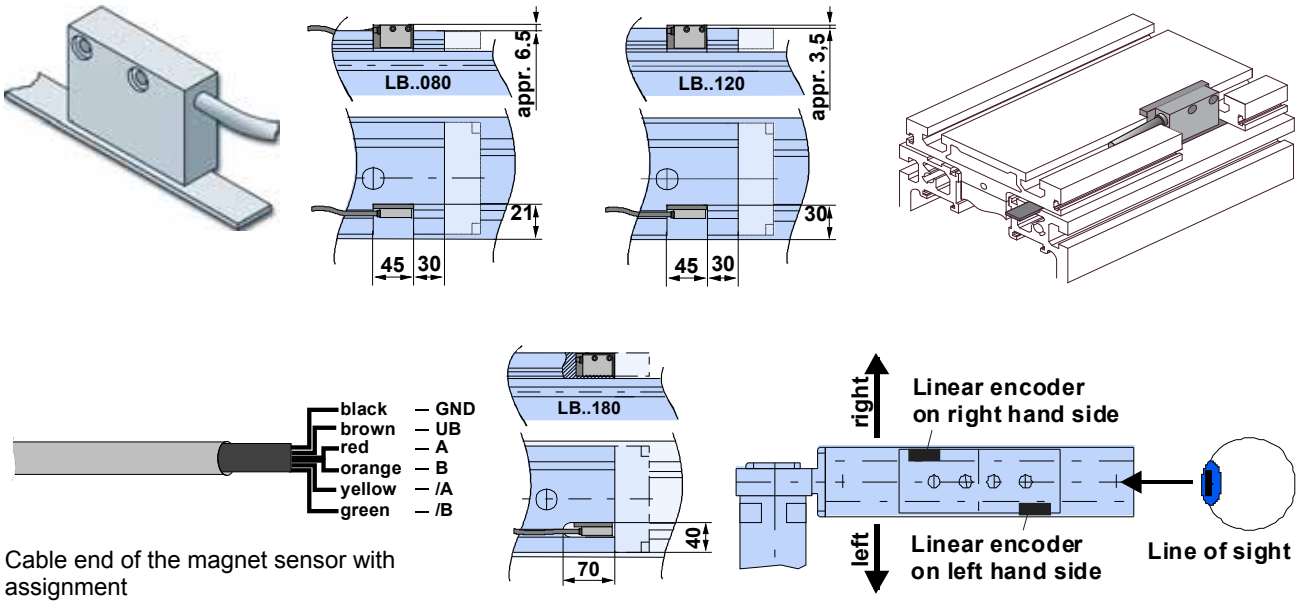
RSM Belt tension measuring device:

For accurately setting the toothed belt tension. Order-No.: 037-000201).

Download of the DimAxes software / CAD files / catalogs / manuals from:
http://www.parker-eme.com/HPLA

7.9 Linear encoder

The use of a linear encoder increases the static position stiffness of the linear actuator as well as the control properties and positioning accuracy. Static stiffness - the capacity to maintain the current position even when exposed to a permanently effective external force (for example processing forces).
An additional cable carrier is required due to the moving sensor see page Fehler! Es wurde kein Textmarkenname vergeben..66
Caution! The cable connected to the sensor is not suitable for use in a cable carrier chain, therefore an additional clamping bar to fix a highflex cable is required.
As a standard and if not stated otherwise, the linear encoder is placed on the drive motor side. Unless, please state “mounting right” or “mounting left” in your order (see figure below).



Cable end of the magnet sensor with assignment

Technical data of MSK500 magnet sensor (incremental) (Order No.: 035-400014)

Characteristic	Technical data	Characteristic	Technical data
Operating voltage	24 V DC ± 20 %	**Output signals**	A, /A, B, /B,
Connection type / cable length	flying leads, 2 m cable	**Distance sensor / magnetic strip**	0.1 - 2.0 mm
Output circuit	LD Line Driver (RS422)	**System precision (sensor system!)**	± (0.025 + 0.01 x L) mm (L in m)
Reference signal	without	**Interference protection class**	3, according to IEC 801
Resolution	0.01 mm	**Temperature Range**	-10°C to +70°C
Pulse interval	1 µs	**Protection class**	IP67 according to DIN 40050 (housing)
Maximum travel speed 18	6.9 m/s	**Material housing / cable**	Black plastic / PUR
Electric current drain	max. 70 mA		

Technical data of magnetic strip MB500 (Order No.: 035-400015)

Characteristic	Technical data	Characteristic	Technical data
Length	Please state desired length (Standard: length = length of profile)	**Reference point**	Without
Width	10 mm	**Temperature coefficient**	(11±1) µm/K
Width	1.7 mm	**Temperature Range**	-10°C to +70°C
Precision class	0.1	**Mounting type**	Adhesive bond
masking tape	with masking tape	**Test mark**	CE

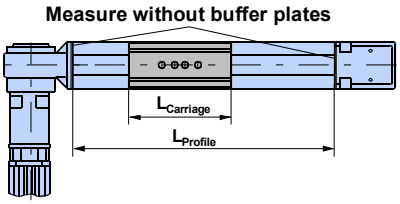
[18] The maximum travel speed depends on the resolution and on the pulse interval.

8 Additional mass moment of inertia due to payload and toothed belt mass

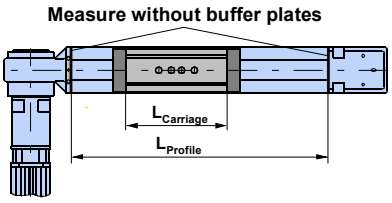
For linear actuators with toothed belt drive it applies:	For linear actuators with rack-and-pinion drive it applies:
JZ = JNL + JR. JNL = mNL x RA2 JR = mR x RA2 mR = LR x mR1M LR ~ 2 x stroke + LR0H	JZ = mNL x RA2 Motor and gear mass must be added to the payload!

JZ = Additional mass moment of inertia [kgmm2]
JNL = Additional mass moment of inertia caused by the payload [kgmm2]:
JR = Additional mass moment of inertia caused by the belt mass [kgmm2]:
mNL = Mass of the payload moved by the linear actuator [kg]
mR = =Mass of the toothed belt [kg]
mR1M = Mass of the toothed belt per meter of additional length, see technical data, page 5 [kg/m]
LR = Length of the toothed belt [m]
LR0H = Toothed belt length of a linear actuator without stroke (see on the right)
RA = Effective radius of the toothed pulley (see technical data, page 5) [mm]

Standard HPLA



HPLA with steel strip cover



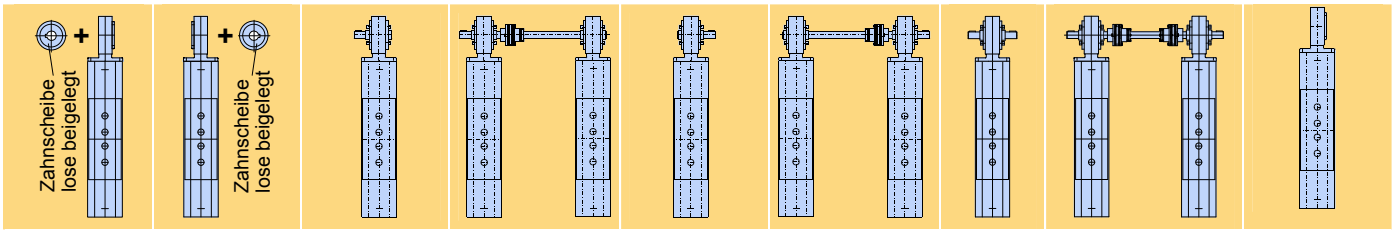
Belt length LROH

HPLA-LBB 080: 2 x LProfile – Lcarriage + 570

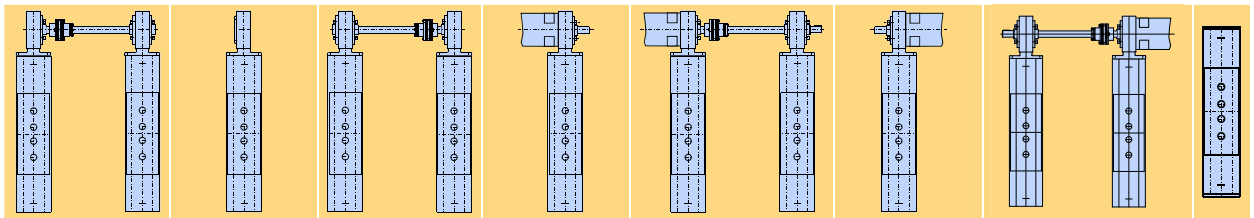
HPLA-LBB 120: 2x LProfile – Lcarriage + 740

HPLA-LBB 180: 2x LProfile – Lcarriage + 1190

9 Drive options



FL Single axis	FR Single axis	SL Single axis	SL Double axis	SR Single axis	SR Double axis	SB single axis	SB Double axis	NL Single axis



NL Double axis	NR Single axis	NR Double axis	LR Single axis	LR Double axis (On request)	RL Single axis	RL Double axis (On request)	NN

The drive mounting side left (L) or right (R) is defined looking from the tensioning station to the drive station.

Order Code

10 HPLA order code

Order code L B

Drive system

Toothed belt drive	B
Rack-and-pinion drive (HPLA180)	Z
Following axis (dimensions page 23)	N

Frame Size

80	(dimensions page 15 and following)	0 8 0
120	(dimensions page 18 and following)	1 2 0
180	(dimensions pages 21, 23)	1 8 0

Carriage

Standard Carriage with Load Attachment Plate	S
Standard carriage with bar	T
Extended carriage with load attachment plate	I
Extended carriage with bar	F
Special carriage with load attachment plate (on request)	C
Special carriage with bar (on request)	D
Special (e.g. two carriages, only drive module)	X

Guide system

Plastic rollers	P
Steel rollers (not for direct drive)	H

Stroke

Stroke (in mm) (stroke to be ordered: (see on page 26)	n n n n n

Drive options (see illustrations on page 73).

		Possible drive flange (E: LBB single axis ; D: LBB double axis; Z: LBZ180)												
		A	B	C	D	I	F	G	H	J	Q	R		
Pulley separately included for bearing directly on shaft, prepared f drive mounting	left	I	I	I							I	I	F	L
	right	I	I	I							I	I	F	R
Version with supported hollow shaft without drive – prepared for drive mounting	left	I	E/D	E/D	E/D	I	I	I	I	I	I	I	N	L
	right	I	E/D	E/D	E/D	I	I	I	I	I	I	I	N	R
additional drive shaft (double axis – on request)	right	I	E/D	E/D	E/D						I	I	L	R
	left	I	E/D	E/D	E/D						I	I	R	L
Shaft on left				Z									S	L
Shaft on right				Z									S	R
Shaft on both sides													S	B
Following axis, no drive housing (Dimensional drawing: Page 23)													N	N
Extras (others, e.g. center drive for double axes) (on request))													X	X

Drive flange for … (including hollow shaft / corresp. pulley)		LBB 080	LBB 120	LBB180	LBZ180	Fitting edge H7	pitch diameter	Ø Shaft (bore H7)	Shaft length	
Stöber gear P3/P3V		x				60	75	16	48	A
Stöber gear P4/P4V		x	x			70	85	22	56	B
Stöber gear P5/P5V			x	x	x	90	120	32	88	C
Stöber gear P7/P7V				x		130	165	40	112	D
Motor MH105-B9/19	(Direct drive)	x				80	100	19	40	I
Motor MH105/B6/24	(Direct drive)	x				110	130	24	50	F
Motor MH105/B6/24	(Direct drive)		x			110	130	24	50	G
Motor HJ155	(Direct drive)		x			130	165	32	58	H
Motor MH 145/B5/24	(Direct drive)		x			130	165	24	50	J
Gear PE4 (PLE80/90) Px90*		x	x			80	100	20	40	Q
Gear PE5 (PLE120/115)		x	x			110	130	25	55	R
without flange (for following axis NN and drive options SL, SR, SB)										N
Special (non standard, on request)										X

Axis distance for double axes (center distance)

Specify required center distance (in mm)	n n n n n
For single axis or following axis please state:	0 0 0 0 0

Steel strip cover

Without steel strip cover	N
With steel strip cover (not for direct drive options E,F,G,H,J) (not for carriage with bar T, F, D)	C

Material design

Standard design	N
Stainless version (V2A) (on request)	V

Linear encoder

Without linear encoder (standard)	N
With linear encoder (see page 72)	L

* nor for direct drive

11 Index