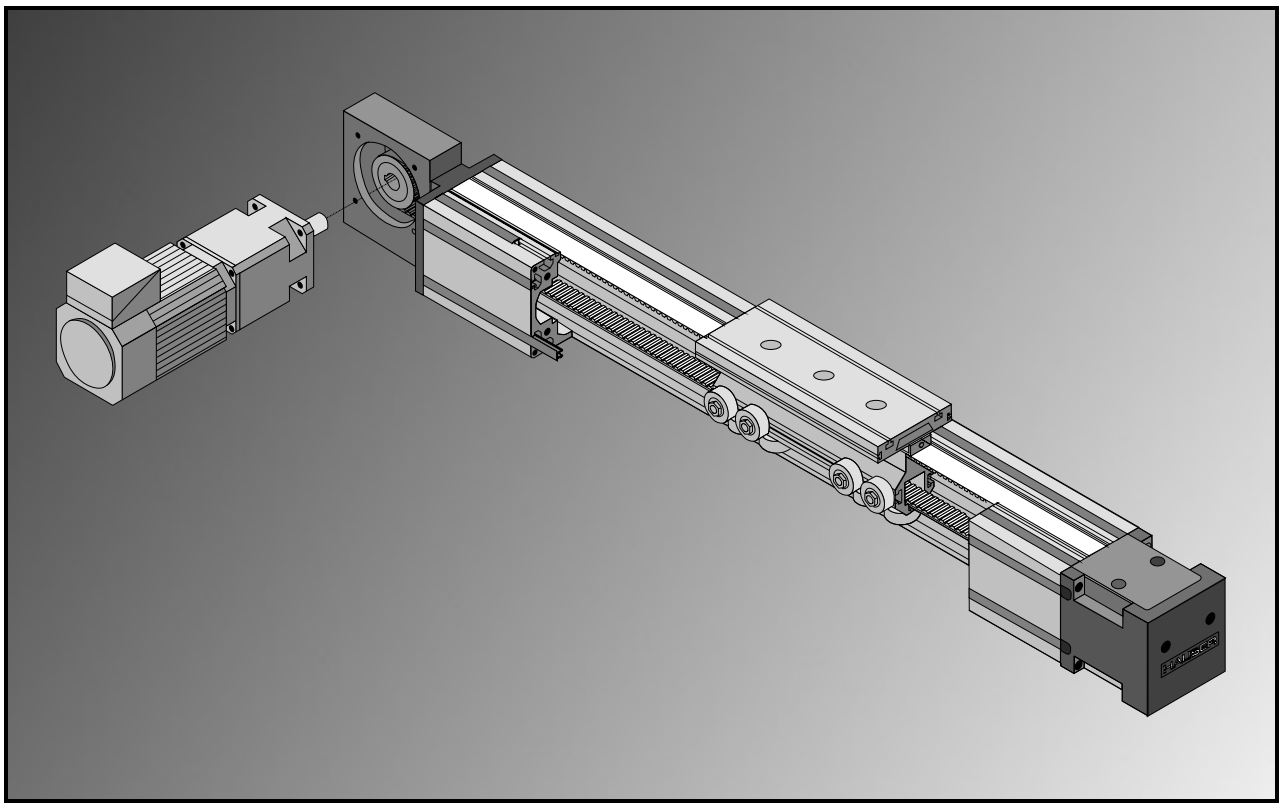
HLE-c Product manual

Mounting, start-up, maintenance and repair



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We automate motion

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Reg. Nr. 36 38 - 01

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Contents

1 Safety

1.1 Proper use

The HAUSER HLE linear unit can be used, amongst other things, for:

positioning, transporting, feeding, removing, palletting, loading, unloading, handling and manipulating workpieces or tools.

As it can be used in the most widely differing areas, the responsibility for use in specific purposes is handed over to the user.

The user must ensure that in mounting workpieces or tools on the carriage of the linear unit there is no danger for persons and/or possible damage to property. This also applies, for example, in the case of the timing belt breaking.

The linear unit may only be used in those areas which are inaccessible to persons during operation.

If the linear unit is used in areas which are accessible to persons, then it must be installed in such a way that persons are not endangered during operation.

1.2 Identification of residual dangers and danger areas

If there are residual dangers for persons or property, in spite of the linear unit being used under safely constructed conditions, then the user must indicate these residual dangers by the use of signs and written rules of conduct.
Safety notices used:

 **Danger**	means that a dangerous situation can lead to death or serious physical injury if not otherwise prevented by corresponding safety measures.
 **Warning**	means that a possibly dangerous situation can lead to possible serious injury if not otherwise prevented by corresponding safety measures.
 **Caution**	means that a possible dangerous situation can lead to minor physical injury or damage to property if not otherwise prevented by corresponding safety measures.
 **Note**	is an important piece of information on the product, its handling or the respective section of the handbook to which you should refer in particular.

1.3 General dangers on non-observance of the safety notices

This machine component has been constructed according to the state of the art and is safe in operation. However, dangers can arise through the machine if persons who are untrained or have not at least been instructed in the machine opration, use it incorrectly or put it to improper use.

As a consequence, there may be a threat of:

- Dangers to the life and limb of the user or a third party
- Damage to the machine and the user's other property

On installing the linear unit in a machine, the safety regulations given in this introduction must be sensibly integrated into the operating instructions for the machine.

1.4 Safety-conscious working

1.4.1 Following the advice

In all work which involves the installation, the start-up, the set-up, the operation, the modification of conditions of use and operation methods, maintenance, inspections and repairs, the advice given in the start-up instructions must be followed.

1.4.2 Operating personnel

The following work may only be carried out by correspondingly trained and authorised personnel:

- Mounting of, and calibration work on the linear unit
- Attachment of safety limit switches (initiators)
- Attachment and connection of the drive and checking the direction of rotation

1.5 Safety notices for the user company

Superiors must familiarise themselves with both the whole chapter on "Safety" and the necessary handling of the linear unit.

Superiors must ensure that the chapter "Safety" and the description of the corresponding handling have been read, understood and are being maintained by the personnel responsible for mounting and operation.

The linear unit must only be operated in perfect condition.

1.6 Safety notices for the operating personnel

Do not use any method of working which adversely affects the operating safety of the linear unit.

The operating personnel and supervisory staff are obliged to check the linear unit / the machine at least once per shift for any signs of external visible damage or faults, any changes whch have occurred (including the operating behaviour) which adversely affect the safety, and to report these immediately.

Components and accessories have been specially designed for the product. In acquiring replacement parts and replacing worn parts, only our genuine replacement parts must be used. We would like to make you expressly aware that genuine parts and accessories not supplied by us have also not been checked and released by us. The installation and/or use of such products can therefore, under certain circumstances, have a negative effect on the constructional characteristics of the machine and thus affect active and/or passive operating safety.

We accept no liability as manufacturers for damages arising through the use of non-genuine parts and accessories.

On no account may any safety fixtures be removed or put out of operation.

Protective fixtures may not be made ineffective or circumvented.

The relevant requirements and national accident-prevention regulations are always to be complied with when installing and operating our mechanical linear units.

1.7 Advice on particular dangers

The HLE must be fastened or supported at the prescribed minimum distances in accordance with the details in these instructions.

Please ensure that no danger can arise through movement of the HLE.

If the HLE moves in danger areas, then these areas can be defined using final limit switches.

1.8 Ban on unauthorised conversions and modifications

The linear unit may not be altered either in construction or in any way which affects safety without our permission. Any unauthorised alteration of this sort excludes any liability on our part.

1.9 Transport

Danger	Do not walk under the suspended load - there is a risk of injury! Ensure that parts subject to movement do not move off-centre or out of position.

Caution	Take care when transporting long axles. Deflection can badly affect the guidance. Equally, the profile can change and adversely affect the performance of the carriage.

Only use transport equipment with adequate lifting capacity. When using ropes, ensure that these are not twisted or knotted. If several ropes are used, all should be under equal tension.

When transporting the HLE using a high-lift truck, the position of equilibrium must be counterbalanced and the load secured if necessary.

An estimate of the weight of the HLE can be made as follows:

- Measure the length L of the profile and read off the reference value for the weight from the diagram.

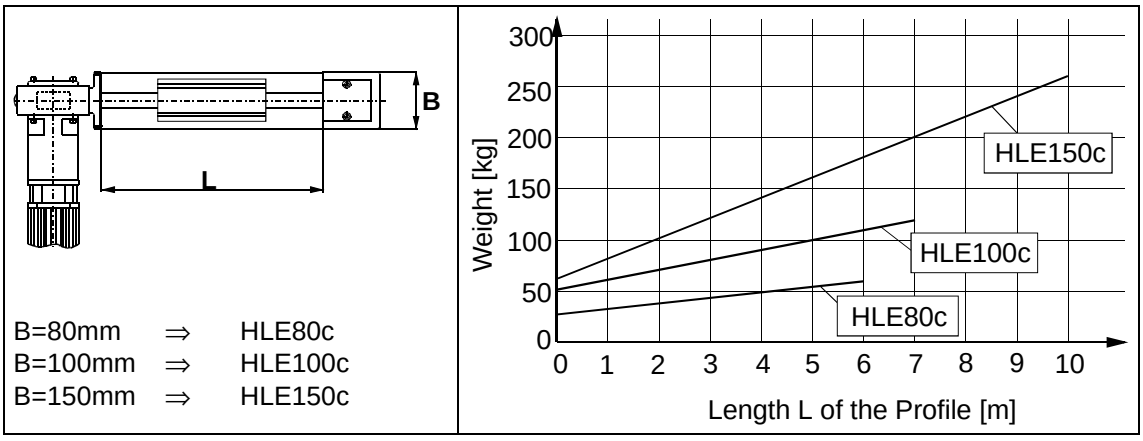
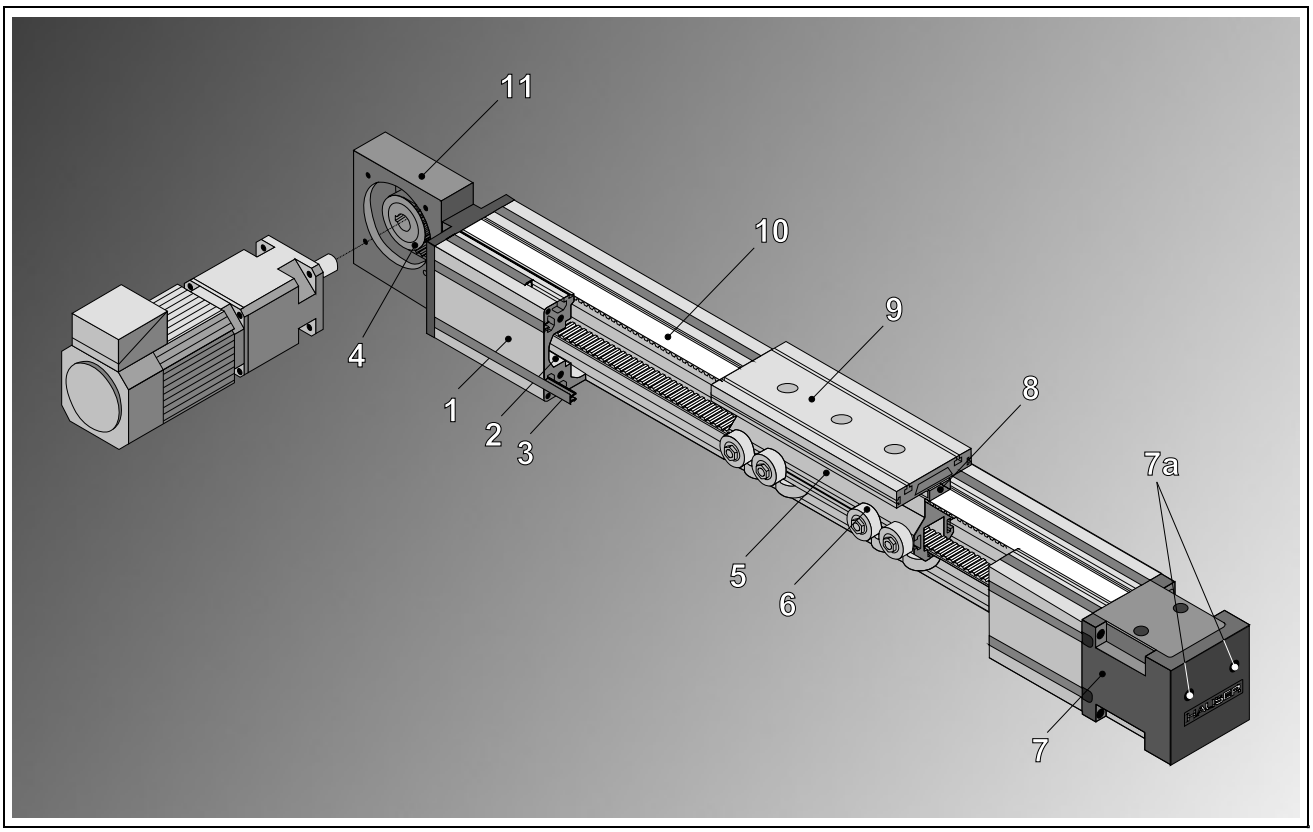


Figure 1: Reference values for the HLE transportation weight (with motor and gearbox)

2 Technical data

2.1 Product construction and description



Aluminium profile (1)

with 8 externally integrated fixing slots and 6 inner running surfaces (2). On the left and right of the profile opening there are slots for locating the magnetic strips (in the steel-strip cover option).

Running surfaces (2)

Each 2 running surfaces positioned opposite one another form a slideway for the wheels.

Plastic cover profile (3)

supplements the fixing slots of the aluminium profile to the cable channels and protects these from dirt

Pulley with flange (4)

transfers the drive torque to the timing belt (10) and simultaneously guides it.

Carriage (5)

This carries the load and carries out the travelling motion. It fits tightly without play to the aluminium profile slideways (2) using wheels (6).

Wheels (6)

Plastic wheels mounted on roller bearings in two designs:

Rigid wheel: transfers the main load to the aluminium profile

Eccentric wheel: is used for adjusting the carriage without play

Tensioning station (7)

by using two tensioning screws (7a), the timing belt is pre-tensioned and the orientation adjusted.

Timing belt holding bracket (8)

fixes the position of the timing belt between the load attachment plate and the carriage. It makes changing the timing belt possible without having to dismantle the load attachment plate.

Load attachment plate (9)

Aluminium profile with integrated fixing slots and openings for the steel strip.

Timing belt (10)

slip-free polyurethane timing belt reinforced with inlaid steel-cord drawbar is used as a link for the power transmission between the drive and the carriage.

Drive station (11)

contains two standard dimension flange bore-holes.
There are different variants:

- **over-mounting (standard)**

- the pulley is mounted directly over the drive shaft of the gearbox.

- **Left shaft (WL) / right shaft (WR) / both shafts (WB)**

Fixed mounting of the pulley by means of shaft and two ball-bearings. The gearbox is flange-mounted above the sleeve shaft or coupling.

- **Drive and shaft (DS)**

the pulley mounted on the gearbox-driven shaft is additionally supported using a shaft and a ball-bearing.

2.2 Technical data

Note	The technical data stated in this chapter may not be exceeded. Please pay particular attention to the maximum permitted speed which can be exceeded with some drives.

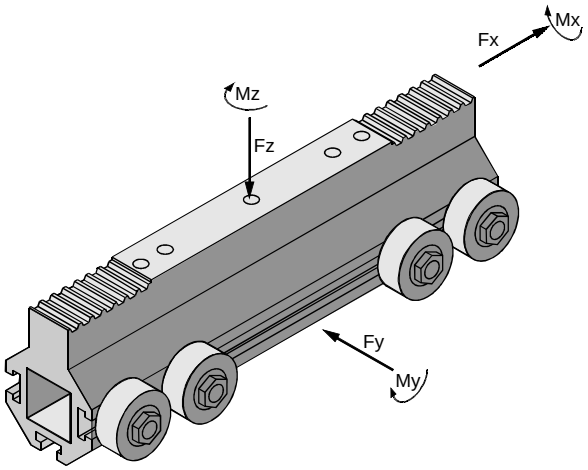
HLE	Unit	80c		100c		150c	
		Standard	Steel strip cover opt.	Standard	Steel strip cover opt.	Standard	Steel strip cover opt.
Dimensions, mass moments of inertia							
Dimension of base unit, 1m stroke							
Normal carriage NL	kg	15.9	16.6	22.4	23.4	51.6	53.6
Extended carriage VL	kg	17.9	18.7	25.5	26.5	58.8	60.8
Carriage + load attachment plate NL	kg	1.6	1.7	2.7	2.8	7.1	7.2
Carriage + load attachment plate VL	kg	2.6	2.7	4.3	4.4	11.2	11.3
Mass of extension	kg/m	7.0	7.1	9.9	10.0	21.1	21.2
Mass moment of inertia related to the drive shaft							
Normal carriage NL	$kgcm^2$	19.8	20.5	25.5	26.9	125.2	127.2
Extended carriage VL	$kgcm^2$	29.3	30.4	37.7	39.0	185.5	187.4
Travel paths and speeds							
Maximum travel speed[1]	m/s	5.0		5.0		5.0	
Maximum acceleration[1]	m/s^2	10.0		10.0		10.0	
Maximum travel distance, normal carriage NL[2]	mm	5350	5260	6300	6210	9150	9060
Maximum travel distance, extended carriage VL[2]	mm	5200	5110	6150	6060	9000	8910
Geometrical data							
Cross-section	mm x mm	80x80		100x100		150x150	
Moment of inertia I_x	cm^4	152		383		1940	
Moment of inertia I_y	cm^4	177		431		2147	
Modulus of elasticity	N/mm^2	$0.72*10^5$					
Pulley data, torques and forces							
Travel distance per revolution	mm/rev	190		170		240	
Pulley diameter	mm	60.479		54.113		76.394	
Nominal drive torque	Nm	17.5		15.7		51.4	
Maximum drive torque[3]	Nm	32		40		108	
Nominal belt traction (effective load)	N	580		580		1350	
Max. belt traction [3] (effective load)	N	1058		1478		2827	
Repeatability[4]	mm	±0.2		±0.2		±0.2	

Please contact HAUSER in the event of the following deviations from the standard technical data:

[1] Travel speeds below 5m/s and accelerations of over $10m/s^2$.
[2] Longitudinal flange connection possible for longer travel distances. In this case, the reduced technical data in chapter 5.8 apply.
[3] increased tension of timing belt necessary.
[4] Repeatability up to ± 0.05 mm

Technical data as at 01/98, Safety taken into consideration S=1. Datas valid for a temperature-range from -10°C to +40°C.

2.3 Permitted loads on the carriage and on the timing belt



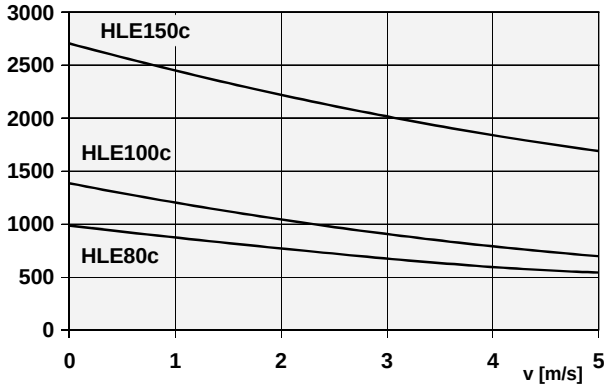
The forces which can be transferred by the carriage and the timing belt are dependent on the speed.

The curves shown in the graphs are valid for a normal carriage (NL).

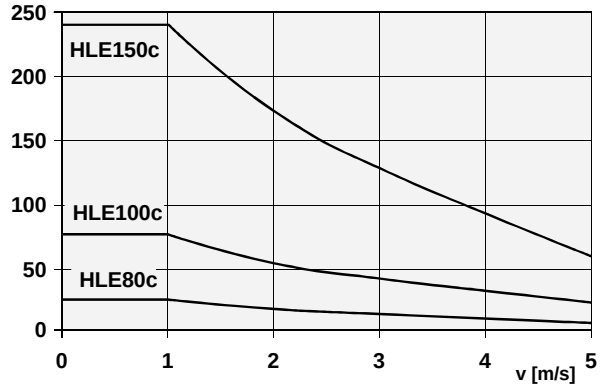
With the extended carriage (VL), all the values apart from Fx (load-bearing capacity of timing belt) can be doubled if the load is applied in pairs or distributed uniformly along the entire length of the carriage.

The curves show the maximum load-bearing capacity of a carriage in one direction of force or torque. If several loads are applied from different directions, the values stated in the curves **may not be fully exploited**, i.e. the load or speed should be reduced if necessary. For the precise carriage dimensioning, our software "DimHLE" is available to you (Art.No: 840-014400).

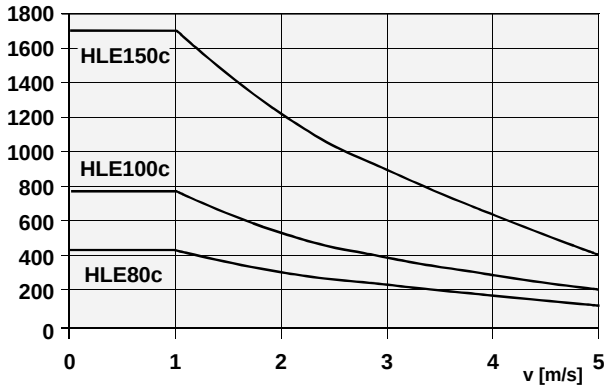
Fx [N] (Zahnriemenbelastbarkeit)



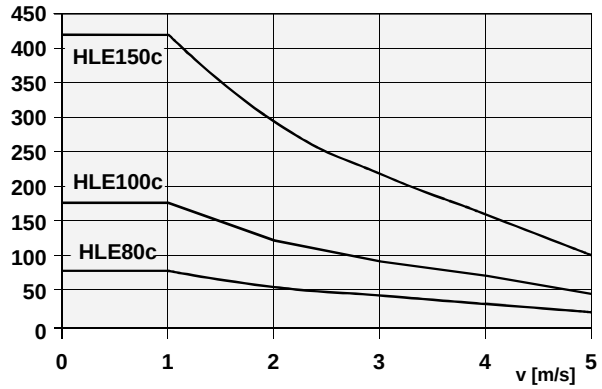
Mx [Nm]



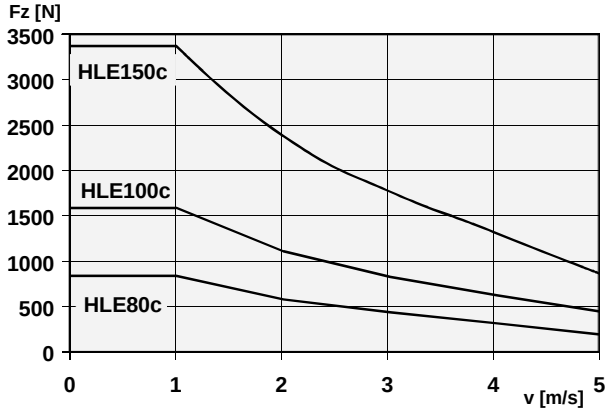
Fy [N]



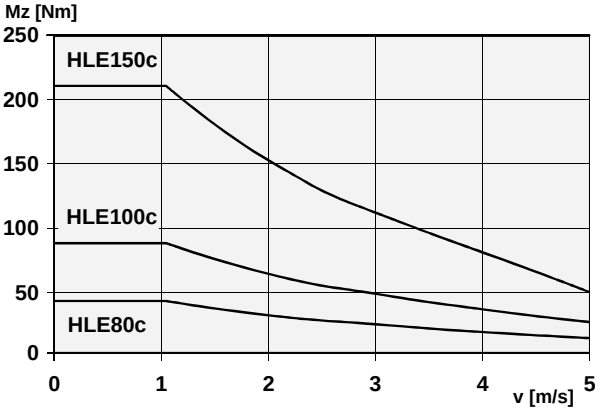
My [Nm]



Fz [N]



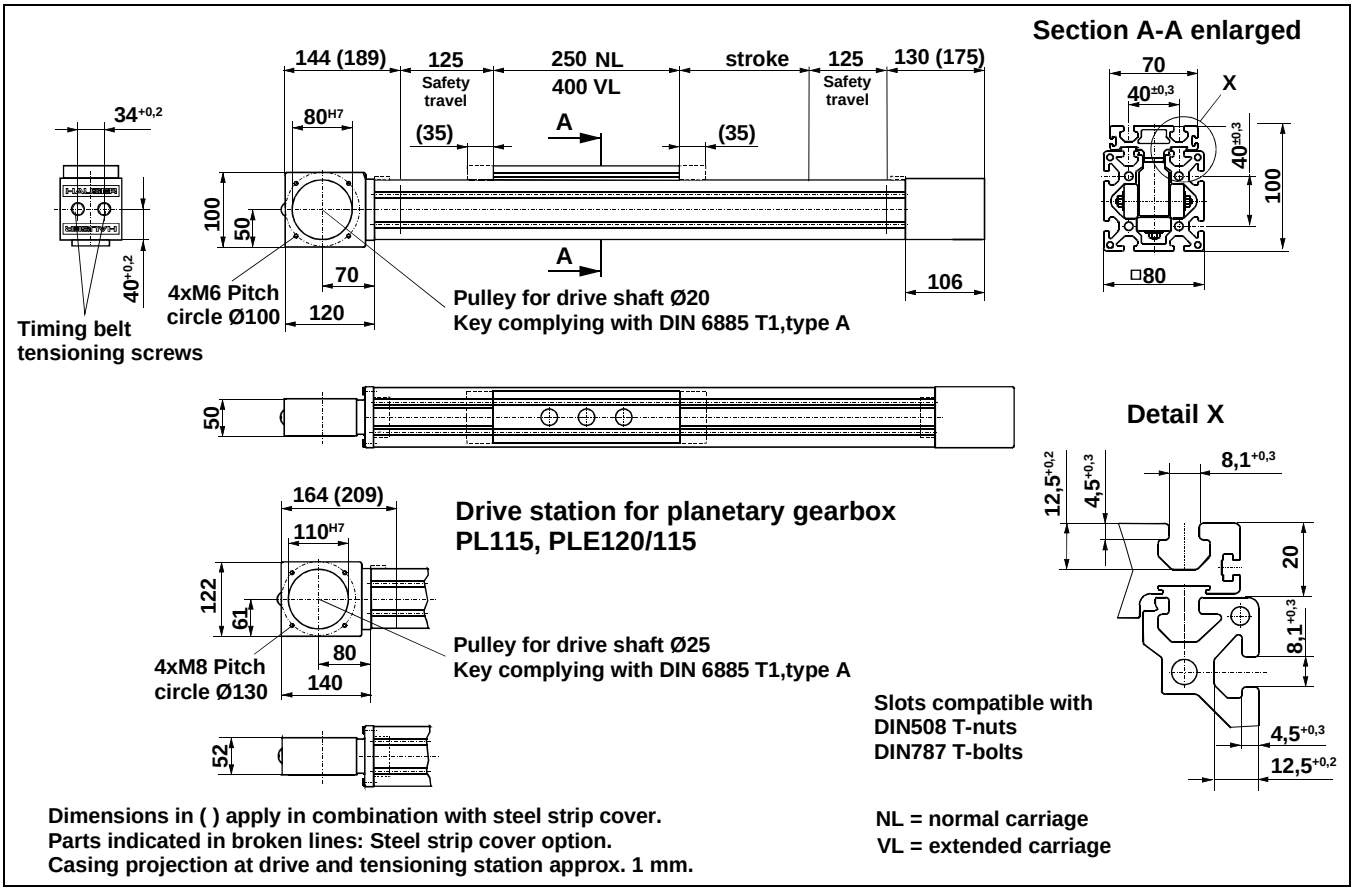
Mz [Nm]



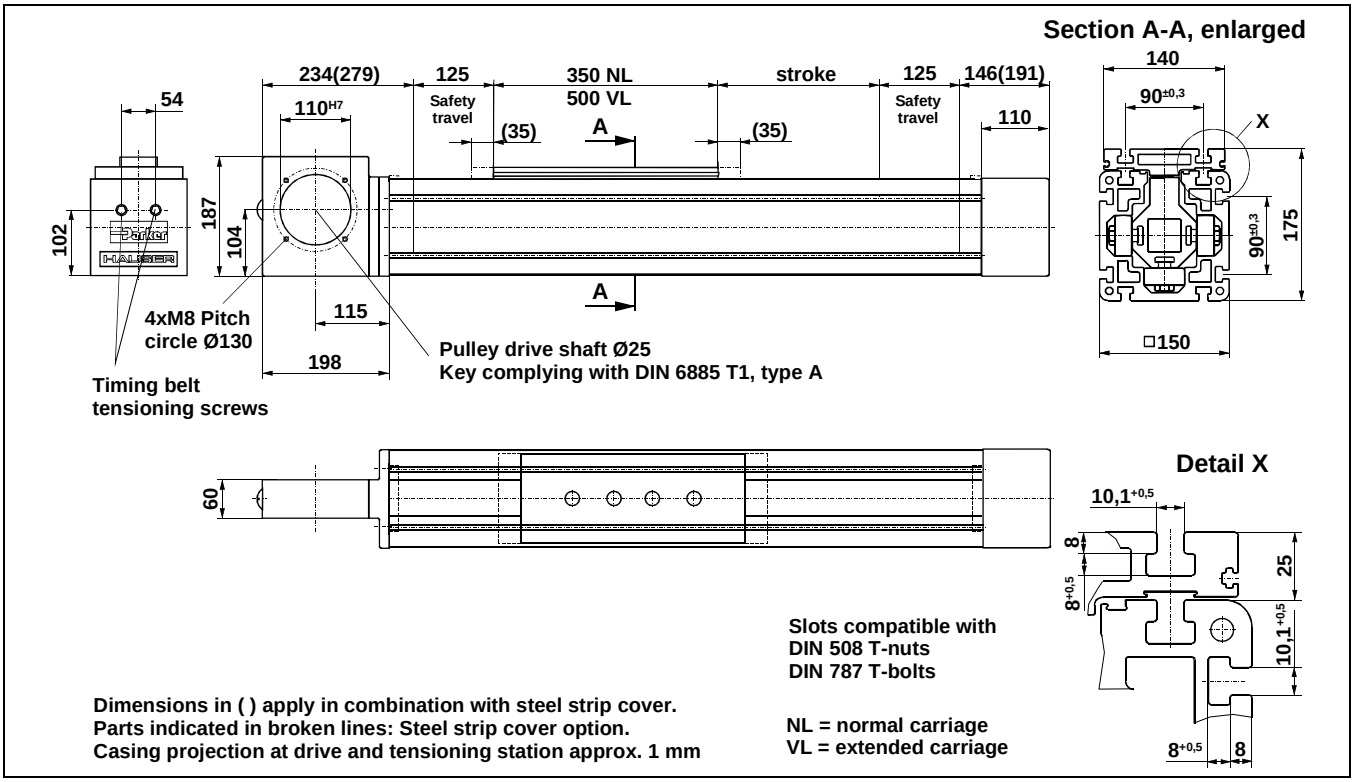
Technical data as at 01/98. Safety taken into consideration S=1. Datas valid for a temperature-range from -10°C to +40°C.

2.4 Dimensions

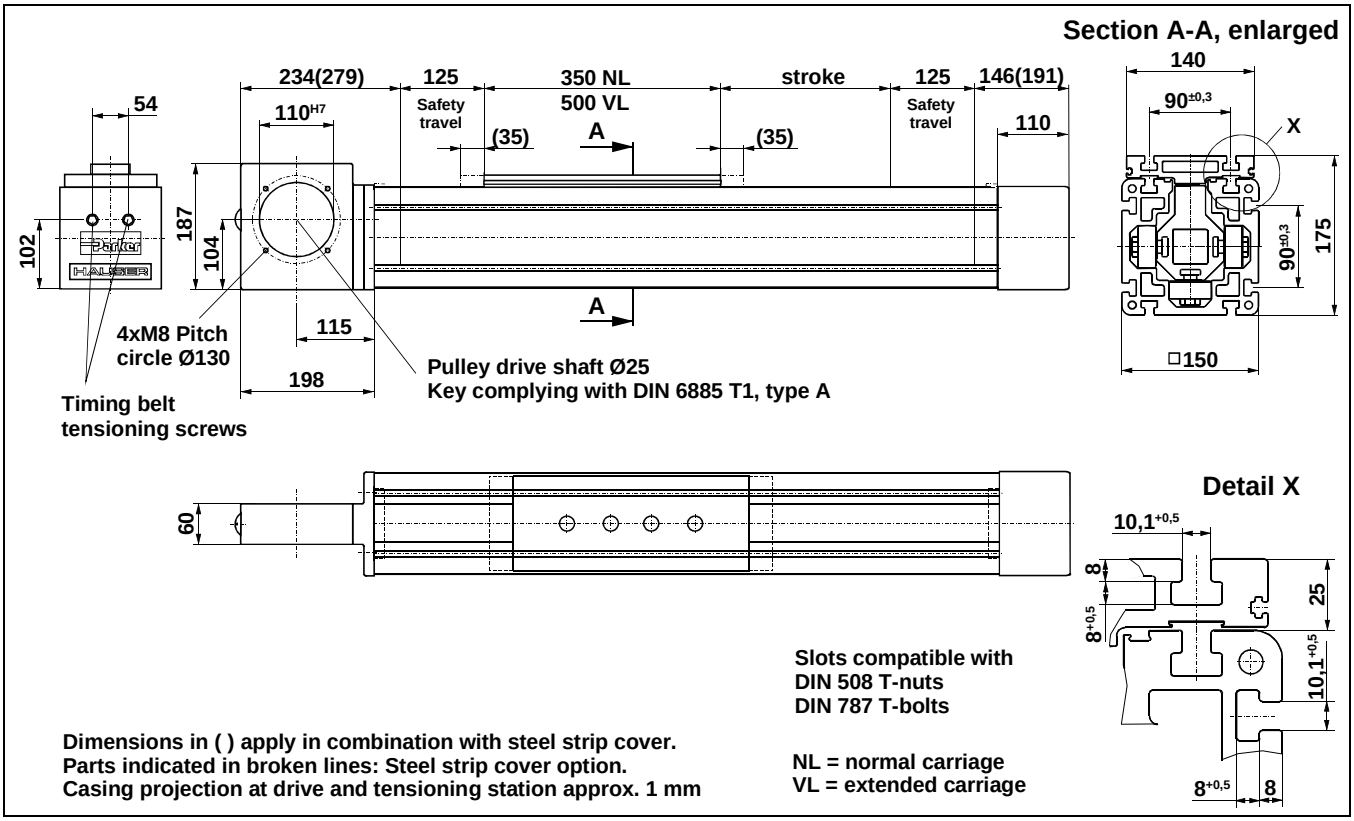
2.4.1 Dimensions HLE80c



2.4.2 Dimensions HLE100c



2.4.3 Dimensions HLE150c



3 Putting into operation

3.1 General

If you have ordered the HLE standard axle with drive and initiators, then this will be supplied completely mounted and mechanically ready for operation.

Over-long HLE axles and/or HLE double axles will be supplied in a dismantled state for delivery and safety reasons. (Asembly instructions in chapters 5.8 and 5.7).

If you have not planned to use a HAUSER drive, attach your motor gearbox combination according to the manufacturer details which apply.

The fitting position of the HLE is always horizontal and with the profile opening facing upwards, unless planned otherwise.

Note	If the axle is fitted vertically, then because of the pushing and pulling strains of the belt, make sure that the drive is on top.

3.2 Substructure preparation

- Each point of support must be level and must be plane parallel to 0.2 mm.
- All points of support must be aligned to one another with a parallelism better than 0.5 mm.
- In the case of double axle systems, a one axle parallelism of 0.2 mm must be guaranteed.
- For the ideal distances between supports (with an axle deflection in this of ca. 1 mm), see Diagram 1
- To simplify mounting and adjustment, the points of support for the HLE fastening can also consist of adapter plates which can be levelled using clamping screws and forcing screws.

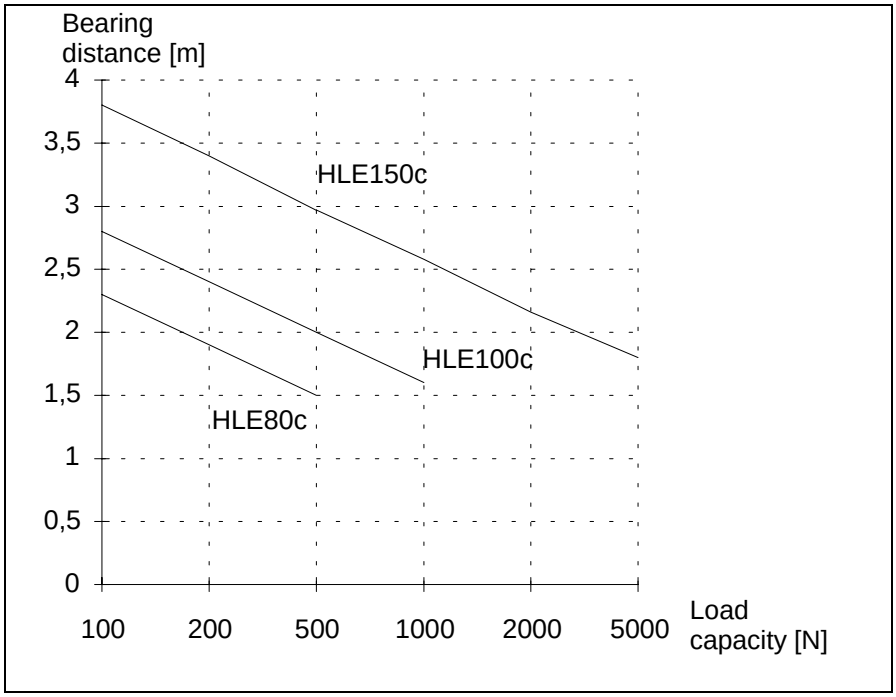


Diagram 1: Ideal distance between supports (Deflection here is approx 1 mm)

3.3 Installing

Caution	Take care when transporting long axles. Deflection can badly affect the guidance. Equally, the profile can change and adversely affect the performance of the carriage.

Note	When in the HLE fitting position, the carriage projection is upwards, do not remove the adhesive film until the conclusion of all assembly work in order to avoid dirt getting into the interior of the HLE.

Note	When installing the HLE in your installation, make sure there is adequate access to the tensioning station and the carriage for maintenance purposes!

3.3.1 Installing a single axle

1. Remove the HLE axle from the transportation box.
2. Place the HLE on the levelled connection points (spirit level, levelling instrument).
3. Fasten the axle. To do this, place sliding blocks in the t-slot groove of the profile and fasten with screws at the screw points. Do not drill the profile!
4. Fasten the add-on pieces.
5. Remove the dust cover (adhesive film).

3.3.2 Installing a double axle

1. Remove the HLE axle from the transportation box.
2. Place the HLE on the levelled connection points (spirit level, levelling instrument).
3. Fasten the axle. To do this, place sliding blocks in the t-slot grooves of the profile and fasten to the screw points using screws. Do not drill the profile!
4. 2. Put on the axle and fasten loosely.
5. measure the parallelism (tape measure) [Figure 2 left].
6. Measure both diagonals to check that it is square (tape measure) [Figure 2 right]. If needs be, correct the diagonal measurement by parallel movement of the 2nd axle.
7. Check the horizontal orientation of both axles to one another (spirit level, levelling instrument), and correct if needs be
8. Finally, fasten the 2nd axle.
9. Fastening the add-on pieces.
10. Remove the dust cover (adhesive film).

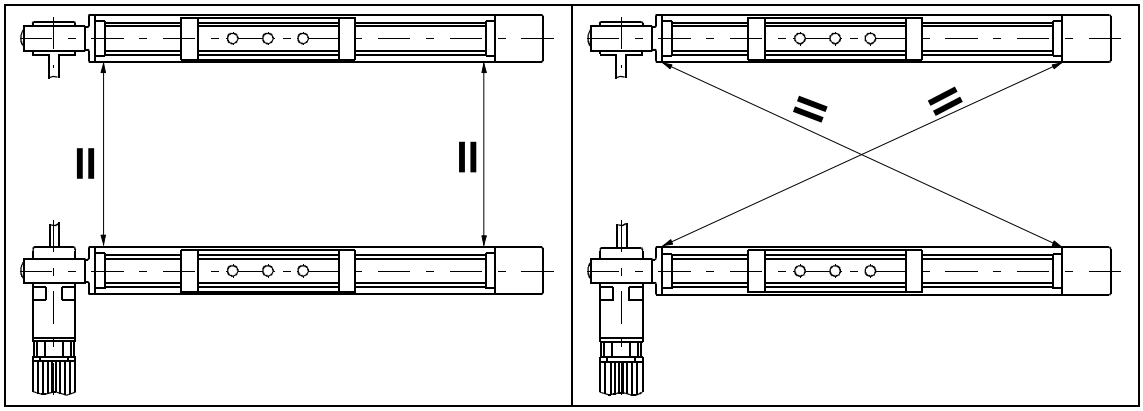


Figure 2: Aligning a double axle

Note	When vertically installing the axle, the above description must be changed accordingly.

3.4 Initiators/Sensors

3.4.1 General

- If you have ordered the linear unit together with initiators and distributor box, they will be supplied completely wired and with pre-adjusted end limits and machine zero point initiators/sensors.

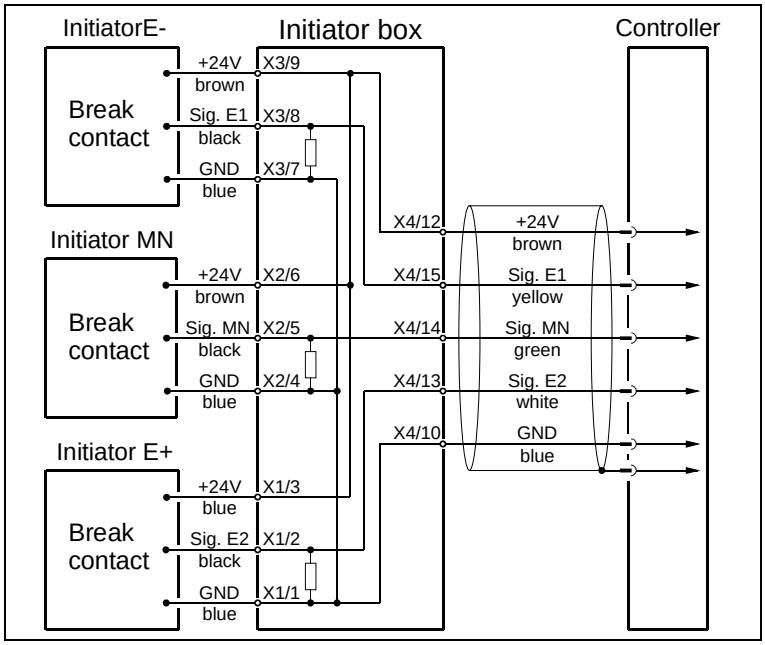
Note	Some servo controls (e.g. COMPAX S from HAUSER) operate with a software end limit - with the COMPAX S, for example, this lies 10mm in front of the initiators. To find out the measurement for the software end limit of your control, please refer to its documentation.

Recommendation: The following safety distances should be maintained:

- Standard: 125mm
- At high speeds and large dimensions, you should increase the safety distance if the stroke of the axle allows this.

Note	The effective stroke of the linear unit can be calculated by: total stroke **-** safety distance.

3.4.2 Wiring initiators/sensors



If the HLE is supplied with initiators and an initiator box, then the components will be wired according to the following Figure 3.

Dependent upon the order request, a cable configured as follows will be connected to the initiator box.

To connect the cable to your controller, refer to the corresponding handbook.

Figure 3: Connecting the position initiators; **MN:** Machine-zero; **Sig.:** Signal

3.4.3 Setting up the end limits

3.4.3.1 External initiators and mechanical switches

Note	Generally, the tripping plate, initiators and distributor box are applied to the flanged side of the motor.

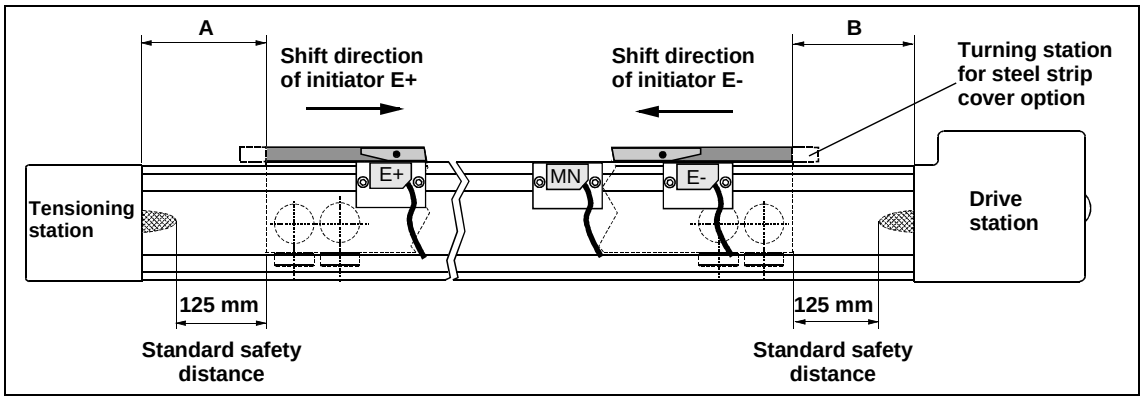


Figure 4: External initiators: setting up end limits and safety distances

Dimen-sions	Unit	Standard - HLE			HLE with steel strip cover option		
		HLE80c	HLE100c	HLE150c	HLE80c	HLE100c	HLE150c
A	mm	149	149	231	194	194	276
B	mm	149	149	161	194	194	191

Table 1: Distances for setting up the external initiators

Setting up the end limits E- and E+

1. Fasten the tripping plate laterally centred on the load attachment plate using the screws supplied.
2. Arrange the limit switches according to the sequence given in Figure 4.
3. **E-:** Bring the carriage with the load attachment plate into the position as in Figure 4 and Table 1 (dimension B). Move limit switch **E-** from the drive station in the direction of the tensioning station until it operates
4. **E+:** Bring the carriage with the load attachment plate into the position as in Figure 4 and Table 1 (dimension A). Move limit switch **E+** from the tension station in the direction of the drive station until it operates.
5. Make sure that the carriage runs smoothly. The distance between the tripping plate and the limit switch should be approx. 1.5 mm with electronic sensor switches (see manufacturer details).

Setting up the machine zero point MN

The sensor switch for the machine zero point is fastened at approx. 150mm removed from the limit switch E- in the direction of the tensioning station. The distance between the tripping plate and the limit switch should be approx. 1.5 mm in the case of electronic sensor switches (see manufacturer details).

3.4.3.2 Integrated initiators (optional for HLE type series c)

Note	Generally, the tripping plate, initiators and distributor box are applied to the flanged side of the motor.

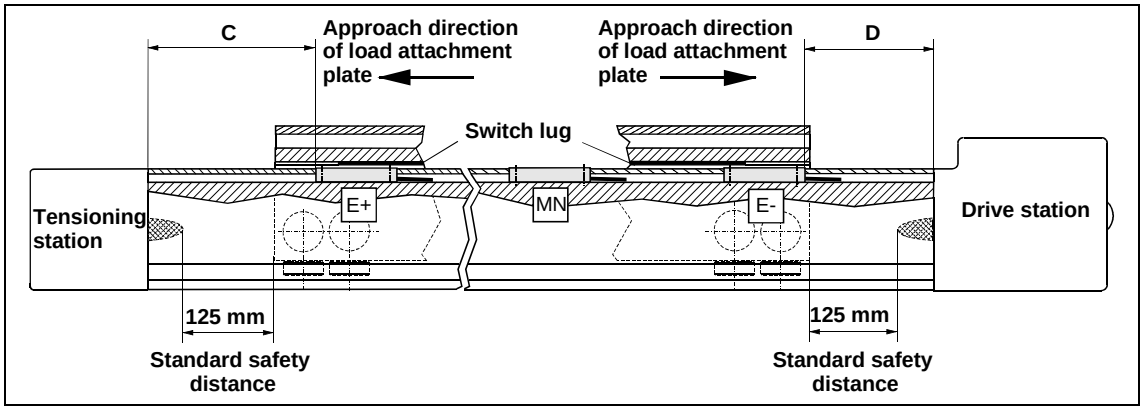
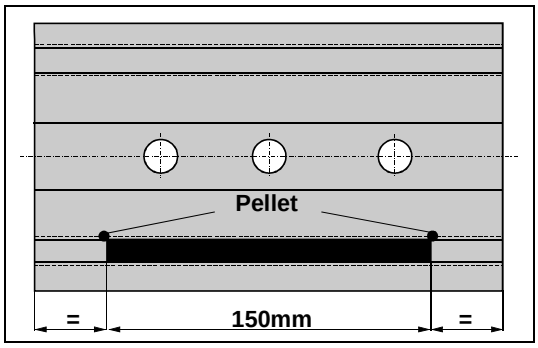


Figure 5: Integrated initiators: Setting up end limits and safety distances

Dimen-sions	Unit	Standard - HLE						HLE with steel strip cover option					
		HLE80c		HLE100c		HLE150c		HLE80c		HLE100c		HLE150c	
		NL	VL	NL	VL	NL	VL	NL	VL	NL	VL	NL	VL
C	mm	187	262	212	287	319	394	232	307	257	332	364	439
D	mm	171	246	196	271	233	308	216	291	241	316	278	353

Table 2: Distances for setting up the integrated initiators

Setting up the end limits E+ and E-



1. Slacken the timing belt (chapter 5.2.2 point 2-5).
2. Dismantle the load attachment plate.
3. Screw the trip lug into the corresponding slot in the underside of the load attachment plate and align it centrally. To locate it, place a small pellet on the left and right of the trip lug.
4. Assemble the load attachment plate and timing belt as described in chapter 5.2.2 .
5. Tension the timing belt and align it (chapter 5.2.3ff and chapter 5.2.4ff).
6. Remove the plastic cover profile from the t-slot groove which lies below the trip lug. Arrange the limit switches in the t-slot groove according to the sequence given in Figure 5.
7. Set up initiators E+ and E- according to Figure 5 and Table 2 and secure (E+ → dimension C, E- → dimension D).
8. Carry out test run at reduced speed and check the adjustments. Correct if necessary. Make sure that the carriage and the load attachment plate run smoothly.
9. Attach the plastic cover profile. Leave open in the area of the initiators.

Setting up the machine zero point MN

The sensor switch for the machine zero point must be fastened about 200mm removed from the limit switch E- in the direction of the tensioning station. This prevents the simultaneous damping of initiators MN and E-.

4 Maintenance

4.1 Maintenance schedule

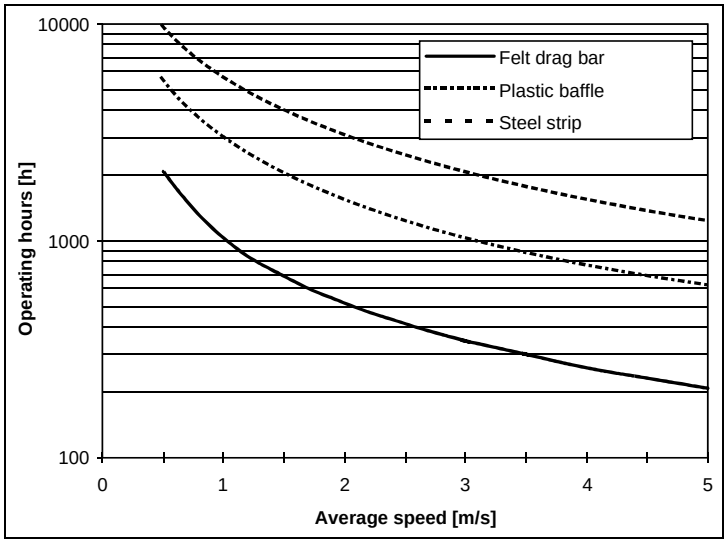
When	What	Action	Removal
after start-up	Carriage	Carry out check with regard to play and adjustment.	Chapter 5.3ff
	Timing belt	Carry out check with regard to pre-tension and adjustment.	Chapter 5.2.3ff
One week later, tension the timing belt	Timing belt	Measure the timing belt tension. If the tension is less than 0.9 x of the operating tension, then increase the timing belt tension to 1.1 x of the operating tension.	Chapter 5.2.3ff
Daily	Dirt	clean all affected parts dependent on the type of dirt (slideway, carriage, tensioning station, drive station). If there is a lot of dirt, retrofit the steel strip cover if needs be.	Chapter 5.9.2
Every six months	Carriage	Check the carriage play	Chapter 5.3.2
	Wheels	Check for wear	Chapter 5.3.4
	Timing belt	Pre-tension, adjustment and wear Judge the wear on the timing belt through a visual check. If there is a large amount, then change the timing belt. If abnormal timing belt wear is found, then using chapter 4.3 , the cause(s)can be found and removed.	Chapter 5.2

Table 3: HLE maintenance schedule

4.2 Replacement interval for steel strip cover wearing parts

Travel	What	Action	Removal
3750 km	Felt drag bar	Replace	Chapter 5.9.1.4
11000 km	Baffle	Replace	Chapter 5.9.1.5
22000 km	Steel strip	Replace	Chapter 5.9.1.3

Table 4: HLE wearing parts with steel strip cover



Using average speeds, the adjacent diagram shows the maximum permitted travel given in Table 4 in operating hours.

4.3 Causes of abnormal timing belt wear

The appearance of a certain amount of wear can have several causes, so that it is not always possible to come to a clear conclusion. The following table shows possible causes in typical faults:

Error type	Cause	Removal
Abnormal wear on loaded tooth profiles	Incorrect belt tension	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
	Overload	Change the timing belt, adjust the pre-tension Chapter 5.2 ff. Check whether the load is within the permitted range.
Abnormal wear on the tooth flank of the belt	Pre-tension too great	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
	Drive torque too high	Check the drive dimensioning
Abnormal wear on the toes of the belt	Incorrect timing belt orientation	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
	Edge of the roller/pulley deformed	Change the roller/pulley
Shearing of belt teeth	Pre-tension too low	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
	Overload	Overload through collision
Tears in the belt teeth	Incorrect belt pre-tension	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
	Overload	Change the timing belt, adjust the pre-tension Chapter 5.2 ff. Check whether the load is within the permitted range.
	Ageing of the belt material	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
Breaking of the timing belt	Incorrect belt tension	Change the timing belt, adjust the pre-tension Chapter 5.2 ff.
	Overload	Change the timing belt, adjust the pre-tension Chapter 5.2 ff. Check whether the load is within the permitted range.
Softening of the belt material	Operating temperature too high	Change the timing belt, adjust the pre-tension Chapter 5.2 ff. Lower operating temperature
	Contact with solvents	Change the timing belt, adjust the pre-tension Chapter 5.2 ff. Do not clean the belt using solvents
Jumping over teeth, loss of machine zero point	Pre-tension too low Incorrect motor position (below) in vertical application	Adjust pre-tension correctly If possible, have drive above. Alternative: increase pre-tension or reduce loiad in longitudinal direction

Table 5: Causes of abnormal tooth wear

5 Assembly/repair

Use only genuine replacements parts from Parker Hannifin GmbH, Hauser Division.

In the case of incorrect repair, no claims will be possible under guarantee against Parker Hannifin GmbH, Hauser Division.

For help with problems:

Parker Hannifin GmbH
Hauser Division
Mechanical production
Service department

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5.1 Safety notices

Before carrying out maintenance and repairs, switch the main switch to ´0´ and secure it against being switched on again by means of a padlock. If the machine must remain ready for operation in the case of certain repair work, particular care must be taken. Make sure that there is no possibility of persons staying in the danger area; if necessary, secure against unauthorized persons by additional barriers or fences.

Repairs may only be carried out by engineers or by HAUSER personnel.

Work on the electrical equipment may only be carried out by engineers qualified for such work - the relevant regulations must be followed (IEC..., EN..., national accident prevention regulations).

Where it is necessary to dismantle safety devices during set up, repair and maintenance work, the safety devices must be refitted immediately on conclusion of the work. The machine must be disabled before disassembly.

As the whole system can be exposed to steady-state vibration during operation, all screws and nuts must be secured.

For this, the following are used, dependent on the case:

- Loctite 243 or
- a Schnorr lock washer.

Unless otherwise indicated, use Loctite 243.

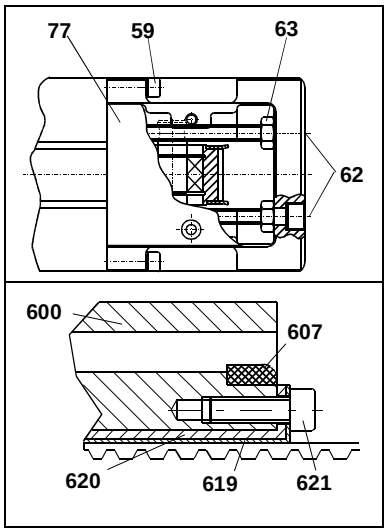
5.2 Changing, tensioning and aligning the Timing belt

5.2.1 General information on the timing belt

- Unpack new timing belts immediately; they must be stored in a circular shape at room temperature in a dry store.
- Timing belts must not be kinked.
- The pitch of the timing belt and the pulley must agree.
- Long-term temperatures of a maximum of 80° C are permitted. In the short term, the temperature can reach 120° C.
- The drives must be protected from dust, dirt, hot water and steam as well as acids and lyes.

5.2.2 Changing the timing belt

1. Move the carriage to a reference point (e.g. machine zero, real zero ...).
   Mark the carriage position on the HLE profile (felt pen).
2. If needs be, remove the steel strip cover (chapter 5.9)



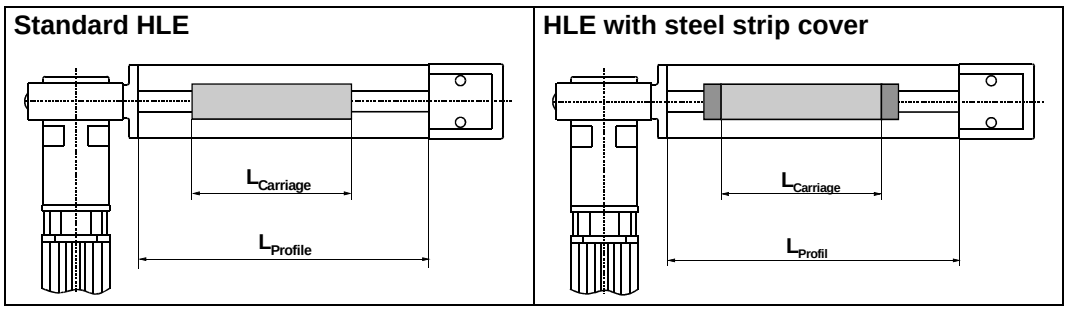
3. Slackening the timing belt: Remove the dust cover (77) of the tensioning station. Loosen the lock-nut (63).
   Loosen the tensioning screws (62) by about 10 turns

4. Loosen the timing belt clamp:
   Unscrew the screw (621), screw in a M6x10 screw, or longer, into the thread of the timing belt retaining bracket (620) and carefully push back the spacer bracket (619) and the timing belt retaining bracket (620) a few mm. Completely pull out and remove the bracket. If the bracket is set tight and cannot be loosened, then the load attachment plate must be removed.

5. Cutting down the new timing belt
   There are three possible ways of finding out the length of the timing belt

   a) Cut down the new timing belt according to the associated piece list

   b) Measure the profile length and calculate the belt length using the table



HLE	80c Standard	80c with PL115 or PLE120/115	100c	150c NL/VL
Correction value	520mm	540mm	547mm	510mm / 530mm

Table 6: Correction values for finding out the belt length

Belt length = 2 x $L_{profile}$ - $L_{carriage}$ + correction value

Formula 1: calculating the timing belt length

   c) Pull out the old timing belt from the HLE and lay it out on the floor. Lay the new timing belt next to it and check the length of the old one to the new. In the case of differences in pitch, transfer the pitch from the old belt to the new.

6. Thread up the new timing belt.
   HLE80c: timing belt must go through under the carriage
   HLE100c/150c: timing belt must go through the carriage.

Note	If the old timing belt has not yet been removed from the HLE, the new one can be attached to the old one using adhesive tape, for example, and thus can be pulled through.

7. Push the timing belt between the carriage and the load attachment plate. Insert the timing belt retaining bracket (620) and shim it with the spacer bracket (619). Fasten both using screws (621).
8. Tensioning the timing belt: chapter 5.2.3.
9. Aligning the timing belt: chapter 5.2.4.
10. Fasten the dust cover (77).
11. If needs be, fasten the steel strip cover: chapter 5.9

12. Setting up the reference point: Chapter 5.3.6

5.2.3 Tensioning the timing belt

5.2.3.1 Fundamentals

Note	The timing belt tension must be adapted to the operating loads but, however, may not exceed the maximum permitted values for setting the tension stated in Table 8 [1].

The timing belt tension to be set depends on:

- the drive used (gearbox, bedding)
- the force to be transferred by the timing belt Fx ($Fx = F_{static} + F_{dynamic}$)

In order to stop the timing belt jumping, the timing belt tension (operating tension) must be approx. 10% above the force to be transmitted Fx.

In the case of new or old slackened timing belts, the pre-tension will reduce by about 20% a short time after first being tensioned. Therefore, on tensioning the belt, a tension must be set which is 1.25 times greater than the operating tension. This tension is defined in Table 8 as the tension to be set.

Here in Table 8 , a differentiation is made between standard values and the maximum permitted values which are based respectively upon different statements of operating life for the drive system.

	Standard value	Maximum permitted values
Service life	30,000 hours	7,000 hours
Average speed	1 m/s	2 m/s

Table 7: Service life used as a basis for drive units

For this reason, the standard value should be set first of all if the application allows. If at the standard value set, the upper and lower timing belt touches, then the belt tension must be increased in stages until the belt can no longer touch. The belt tension may not, however, exceed the maximum permitted value from Table 8 .

In the case of double axles, if the load is applied symmetrically between the axles, the belt tension can be halfed.

If the tension of a timing belt which has been in operation for more than a week is less than 0.9 x operating tension, then the timing belt tension must be increased to 1.1 x operating tension (Table 8).

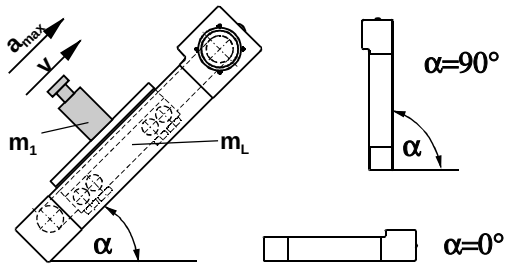
Note	Pre-tensioned HLE systems with built-on gearboxes or drive stations with fixed bearings will be supplied pre-tensioned from the factory at the respective standard value.

[1] If you want to exceed these values, please contact HAUSER.

HLE	Gearbox type / bearings	Standard values				max. perm. values			
		Fx_{max} [N]	Tension to be set [N]		Operating tension [N]	Fx_{max} [N]	Tension to be set [N]		Operating tension [N]
		maximum transferra-ble force	new/ old slackened belts	on re-ten-sioning	adjusts with time	maximum transferra-ble force	new/ old slackened belts	on re-ten-sioning	adjusts with time
80c	PL90	580	810	715	650	780	1090	960	870
	PLE80/90	400	560	495	450	630	870	770	700
	PL115	580	810	715	650	780	1090	960	870
	PLE120/115	580	810	715	650	780	1090	960	870
	U35	580	810	715	650[2]	780	1090	960	870
	WR[3], WL[4], WB[5]	580	810	715	650	780	1090	960	870
	AW[6]	580	810	715	650	780	1090	960	870
100c	PL90	580	810	715	650	780	1090	960	870
	PLE80/90	400	560	495	450	630	870	770	700
	PL115	580	810	715	650	780	1090	960	870
	PLE120/115	580	810	715	650	780	1090	960	870
	U35	580	810	715	650[1]	780	1090	960	870
	WR[2], WL[3], WB[4]	580	810	715	650	780	1090	960	870
	AW	580	810	715	650	780	1090	960	870
150c	PL115	1350	1875	1650	1500	1620	2250	1980	1800
	PLE120/115	900	1250	1100	1000	1350	1875	1650	1500
	PL142	1350	1875	1650	1500	1620	2250	1980	1800
	U35	1350	1875	1650	1500[1]	1440	2000	1760	1600
	WR[2], WL[3], WB[4]	1350	1875	1650	1500	1620	2250	1980	1800
	AW	1350	1875	1650	1500	1620	2250	1980	1800

Table 8: Recommended and maximum permitted belt tension

Determining the force Fx



The installation is stopped:

Fx = F_{static}

$F_{static} = (m_L+m_1) * 9.81* \sin \alpha$

The installation is in acceler-ation/decceleration:

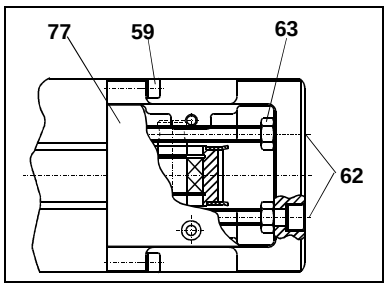
Fx = $F_{static} + F_{dynamic}$

$F_{static} = (m_L+m_1) * 9.81 * \sin \alpha$
$F_{dynamic} = (m_L+m_1) * a_{max}$

Fx	force arising [N]
F_{static}	static force [N]
$F_{dynamic}$	dynamic force [N]
m_L	Mass of carriage [kg]
m_1	Mass of load [kg]
α	Angle between surface plane and HLE [°]
a_{max}	maximum acceleration on approach [m/s²]

2 Basic maximum service life: 12000 operating hours
3 WR = shaft right
4 WL = shaft left
5 WB = shaft both sides
6 AW = free drive shaft (drive + shaft)

5.2.3.2 Checking and adjusting the timing belt tension



1. If needs be, remove the steel strip cover (chapter 5.9.1.1)
2. Measure timing belt tension (chapter 5.2.3.3).
3. Compare the tension with the required value from Table 8.
4. If the actual timing belt tension is less than 0.9 x operating tension, then the timing belt tension must be corrected. To do this, remove the dust cover (77) and loosen the lock-nut (63).
5. Adjusting the timing belt tension:
   Move towards the recommended tension by alternately adjusting and checking. To tension, simultaneously turn both the tensioning screws (62) clockwise.
6. Aligning the timing belt: chapter 5.2.4.
7. If needs be, fasten the steel strip cover: chapter 5.9.

5.2.3.3 Measuring the timing belt tension

The following measuring procedure is currently the only way to measure the timing belt tension at the required tolerance of +/- 5% .

Belt tension measuring device RSM

The RSM belt tension measuring device gives the existing belt tension based on data previously supplied (specific to belt mass, free running belt length) and the oscillation frequency of the belt. The belt tension measuring device can be obtained through HAUSER (Art. No. 037- 000200).

5.2.3.4 Tensioning the timing belt using a dynamometric key

The tension force of the timing belt is proportional to the adjusted torque of the tensioning screw (62).

Based on a required timing belt tension, a tightening torque for the tensioning screws (62) is given and and can be set using a dynamometric key. However, using this method, due to the dispersion of the friction co-efficient, the timing belt tension can only be set at approx. 30% accuracy.

The Diagram 2 represents the interrelationship between the timing belt tension and the tightening torque. The curve applies for new, clean screws and threads.

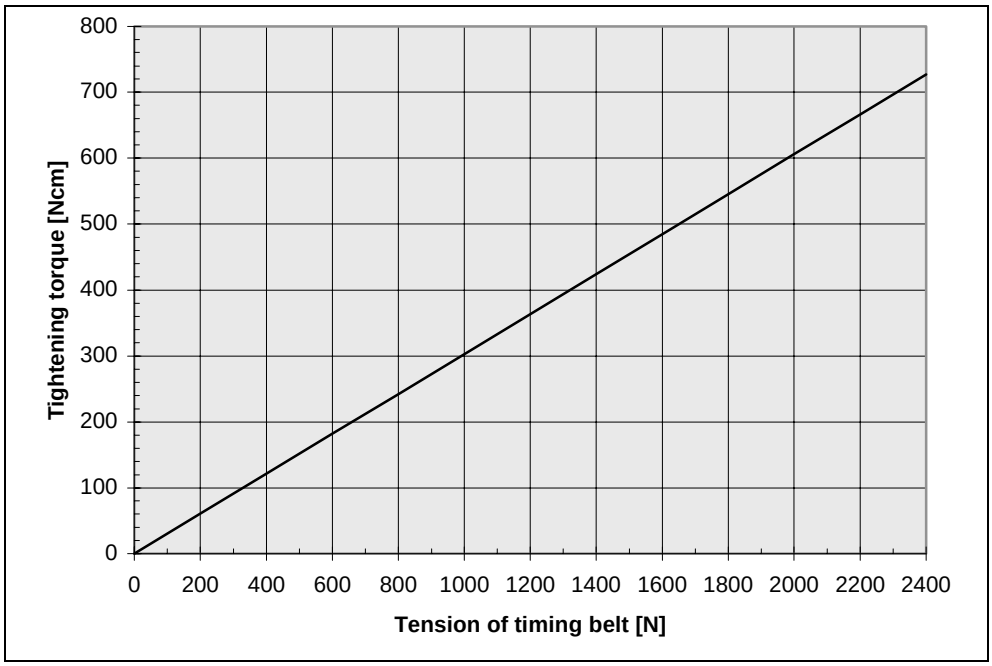
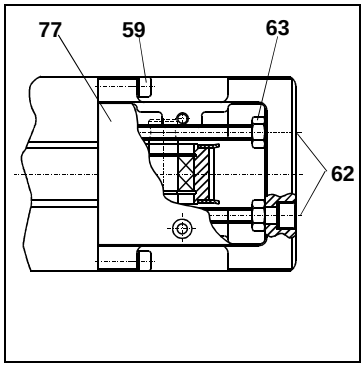


Diagram 2: Timing belt tension and the tightening torques resulting from this.

5.2.4 Checking the belt run and aligning the timing belt

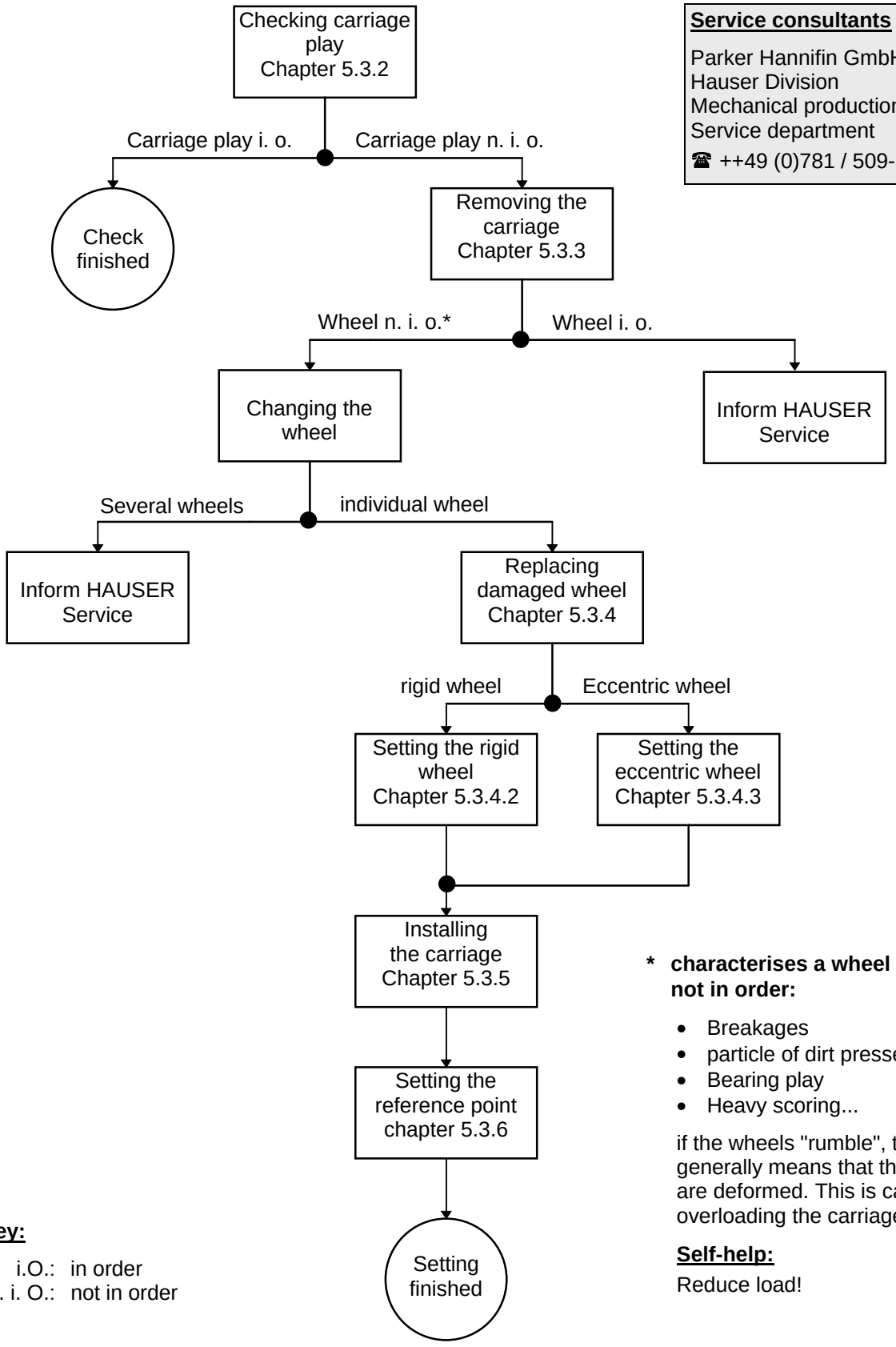
Note	If the timing belt has to be re-tensioned, then this must be done before aligning Exact alignment is only possible while the carriage is running. On reversing the direction of the timing belt, it must start running on the other flanged wheel. This means that with correct adjustment, the timing belt will always oscillate from left to right (looking in the direction of movement). In order to maintain the timing belt tension, only adjust the tensioning screws in small stages. If needs be, check the timing belt tension again after alignment.



1. Remove the dust cover (77).
2. Check the running of the belt by moving the carriage (manually, if possible - otherwise at reduced speed).
   If the running of the belt is correct according to the above definition,
3. tighten the dust cover (77).
4. Otherwise: loosen the lock-nut (63). Loosen the tensioning screw (62) anti-clockwise in small stages on the side on which the timing belt continually appears, until the timing belt runs in accordance with the above definition.
5. Tighten the lock-nuts (63) and fasten the dust cover (77).

5.3 Adjusting the carriage play

5.3.1 Changing and adjusting the wheels (flow chart)



Service consultants

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Key:

i.O.: in order
n. i. O.: not in order

*** characterises a wheel which is not in order:**

- Breakages
- particle of dirt pressed in
- Bearing play
- Heavy scoring...

if the wheels "rumble", then this generally means that the wheels are deformed. This is caused by overloading the carriage.

Self-help:

Reduce load!

5.3.2 Checking the carriage play

Note	You can gain a rough idea of any possible carriage play by shaking the carriage or the mounted installation. A more exact method is described in the following procedure:

1. Prepare the largest possible travel.
2. Remove the steel strip cover - if there is one: chapter 5.9.
3. In order to move the carriage by hand and to be able to see into the wheels: dismantle the built-on sections from the carriage.
4. Remove the timing belt from the carriage: chapter 5.2.2 point 4-5.
5. Push the carriage over the complete travel. All wheels must turn during travel.
6. To check the pressure acting against it, prevent the wheels from turning using your index finger; the wheels should be able to be stopped with minimal force.

   Characteristics of a correctly adjusted carriage:

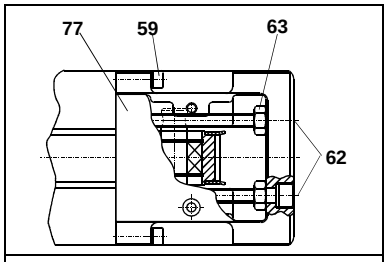
   - The carriage no longer shakes
   - The carriage can move over the whole travel area without any great difference in force
   - The carriage can be inserted into the profile without centre of pressure (requires dismantling of the tensioning station, see below)

Note	Jockey wheels which are adjusted too tightly develop pressure marks which lead to running noise and wheel defects. Replace defective wheels (see below).

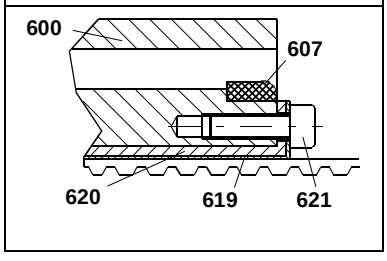
5.3.3 Removing the carriage

Danger	With vertical axle positions, secure the carriage against movement. If the carriage is not secured, then this can fall through as a result of gravity. This can result in damage to people or property.

1. Move the carriage to a reference point (e.g. machine zero, real zero ...) .
   Mark the carriage position on the HLE profile (felt pen).
2. If needs be, remove the steel strip cover (chapter 5.9)
3. Remove built-on sections from the carriage.



4. Slackening the timing belt:
   Remove the dust cover (77) of the tensioning station.
   Loosen the lock-nut (63).
   Loosen the tensioning screws (62) by about 10 turns



5. Loosen the timing belt clamp:
   Unscrew the screw (621), screw in a M6x10 screw, or longer, into the thread of the timing belt retaining bracket (620) and carefully push back the spacer bracket (619) and the timing belt retaining bracket (620) a few mm. Completely pull out and remove the bracket. If the bracket is set tight and cannot be loosened, then the load attachment plate must be removed.
6. Remove the tensioning station by loosening the four fixing screws (59).
7. Pull the carriage out of the profile and mark its direction of running on the carriage.

Note	Re-insert the carriage later in the same direction of running, otherwise the wheel adjustment will be wrong!

5.3.4 Changing individual wheels

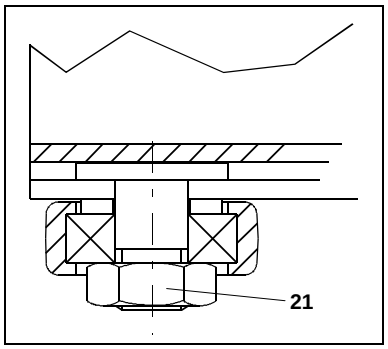
5.3.4.1 General

- The wheels consist of ball-bearings with a plastic casing.
- If they remain standing for a long time, the wheels develop small flattened areas which will completely return to shape after continued use.
- The ball-bearings used conform to the normal roller-bearing standards and have received a lifetime lubrication.
- The wheels can be used in environmental temperatures of -40°C to +80°C.

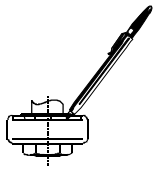
Warning	It is only possible to check the wheel running during movement of the axle. In doing this, particular care is required, as injury is possible. If possible, only move the axle manually (if needs be, dismantle the motor and gearbox in advance and lay the axle horizontal). If not, operate the axle at a crawl using the permission button (speed < 1m/min).

Note	A lot of experience and specialist knowledge is required to correctly adjust a carriage. Therefore wheels should, if possible, only be changed by HAUSER personnel.

5.3.4.2 Changing and adjusting rigid wheel



1. Remove the carriage (chapter 5.3.3)
2. mark the position of the wheel on the carriage.
3. Loosen and remove the hexagon nut (21).
4. Remove the old wheel, put on the new one and correct the position to the carriage.
5. Put on the hexagon nut (21) with screw retention (LOCTITE 243) tighten to tightening torque Ma according to Table 9 page 25.
6. To check the rolling movement, make marks on the wheels using a felt-tip pen.

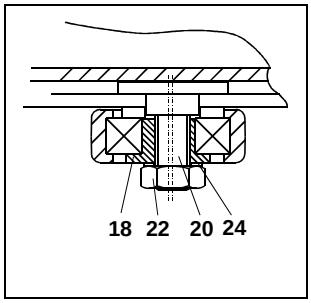


7. Remove all dirt and swarf from the running surfaces of the linear unit.
8. Insert the carriage into the profile according to its direction of running and check the wheel adjustment along the whole of the travel. The wheels should turn along the whole travel.

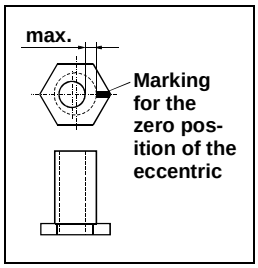
Note	When adjusting the wheel play, only the changed wheels should be regulated. If this means that a correct adjustment of the carriage is impossible, then the carriage must be completely re-adjusted. A lot of experience and specialist knowledge is required for this work and should therefore only be carried out by a HAUSER mechanical engineer.

9. To check the pressure acting against it, prevent the wheels from turning using your index finger; the wheels should be able to be stopped with minimal force.
10. If the adjustment is correct, finish the calibration work. Otherwise correct the wheel adjustments.

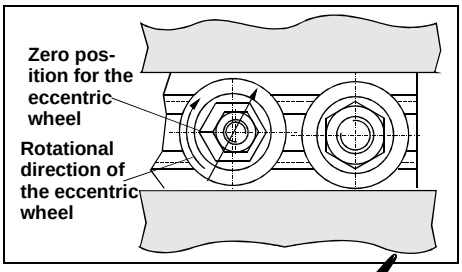
5.3.4.3 Changing and adjusting the eccentric wheel



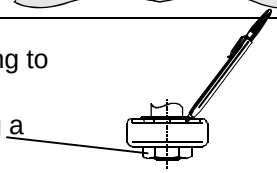
1. Remove the carriage: chapter 5.3.3.
2. Mark the position of the wheel on the carriage.
3. Loosen and remove the hexagon nut (22), remove the old lock washer.
4. Remove the old wheel and push out the eccentric bush (18).
5. Place the eccentric bush together with the new wheel, place the parts on the screw (20). Put on the new Schnorr lock washer (24) , put on the hexagon nut (22) . Correct the position on the carriage. Slightly tighten the hexagon nut.



6. Align the position of the eccentric bush so that on turning the eccentric (18) clockwise, the wheel comes to the same slideway as the one that the old wheel was on before dismantling.



7. Tighten the hexagon nut (21) using tightening torque Ma according to Table 9.
8. To check the rolling movement, make marks on the wheels using a felt-tip pen.
9. Remove all dirt and swarf form the running surfaces of the linear unit.
10. Insert the carriage into the profile according to its direction of running and check the wheel adjustment along the whole of the travel. The wheels should turn along the whole travel.



Note	When adjusting the wheel play, only the changed wheels should be regulated. If this means that a correct adjustment of the carriage is impossible, then the carriage must be completely re-adjusted. A lot of experience and specialist knowledge is required for this work and should therefore only be carried out by a HAUSER mechanical engineer.

11. Adjust the eccentric of the jockey wheel in small stages so that the carriage can be pushed freely and without play through the HLE profile. Jockey wheels which are adjusted too tightly develop pressure marks which lead to running noise.
12. To check the pressure acting against it prevent the wheel from turning using your index finger; the wheel should be able to be stopped using minimal force.
13. If the adjustment is correct, finish the calibration work. Otherwise repeat points 10 and 11 until the carriage adjustment is correct.

HLE	Fastening	Rigid wheel	Eccentric wheel
80c	**Nut**	3.2 Nm	2.6 Nm
	Screw	10.3 Nm	2.7 Nm
100c	**Nut**	35.5 Nm	16.4 Nm
150c	**Nut**	39.6 Nm	26.6 Nm

Table 9: Tightening torque of the wheel fastening elements .

5.3.5 Installing the carriage

1. Place the carriage into the profile in the previous running direction.
2. Fasten the tensioning station using 4 screws (59)
3. Fasten the timing belt (chapter 5.2.2 from point 8 onwards)

5.3.6 Adjusting the reference point

Correct the machine zero point on the basis of the previously marked carriage position. There are several ways of doing this dependent on the motor and the controller. For further details, see the controller handbook.

5.4 Changing the motor

Danger	Danger due to electrical voltage. Work on the motor clamp terminal box may only be carried out by an electrical engineer.

5.4.1 Changing the motor in combination with a Neugart planetary gearbox

Gearbox	PL 90	PL 115	PL 142	PLE 80/90	PLE 120/115
perm. weight	10kg	22kg	50kg	4.5	15

Table 10: Maximum permitted motor weight on Neugart planetary gearbox (horizontal fitting position)

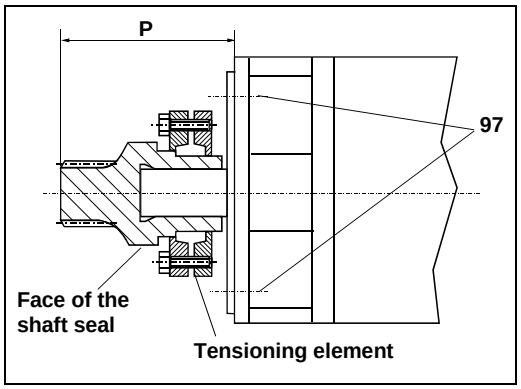


Figure 6: Distance P

Gearbox type	Dimension P [mm]	Tightening torque [Nm]
PLE 80/90	58.5	3
PL 90	58.5	3
PL 115	74	3
PLE 120/115	74	3
PL 142	96	4

Table 11: Details of tensioning elements

1. Move the carriage to a reference point (e.g. machine zero, real zero ...). Mark the carriage position on the HLE profile (felt pen).
2. Switch off the axle at the main switch and separate it from the electrical supply. Leave the motor and gearbox to cool.
3. Remove the motor and resolver cable.
4. Loosen the motor fastening (97).
5. Pull the motor off from the gearbox.

Note	With vertically positioned motor gearbox combinations in particular, grease can come out on pulling the motor off. A loss of lubricant must be avoided!

6. Measure distance P (Figure 6), the dimension from the upper edge of the pinion to the motor flange (accuracy +/-0.1mm).
7. Loosen the clamp screws of the tensioning element connection.
8. Pull off the pinion from the motor shaft.
9. Clean the motor shaft and the pinion hole of all lubricant.
10. With standard HAUSER motors (HDX, HBMR), the pinion can be pushed until it meets the motor shaft. With other motors, put the pinion on the new motor at the distance of P. If necessary, rub down the motor shaft using emery paper, grade 360.

Note	Due to the fitting tolerance, there is an air cushion between the pinion hole and the end of the shaft. Get rid of this by moving the pinion back and forth on the end of the shaft several times until it is completely removed.

11. Tighten the clamp screws of the tensioning element connection in stages in turn until the tightening torque is reached. For the tightening torque, see the stamp on the tensioning element or Table 11.

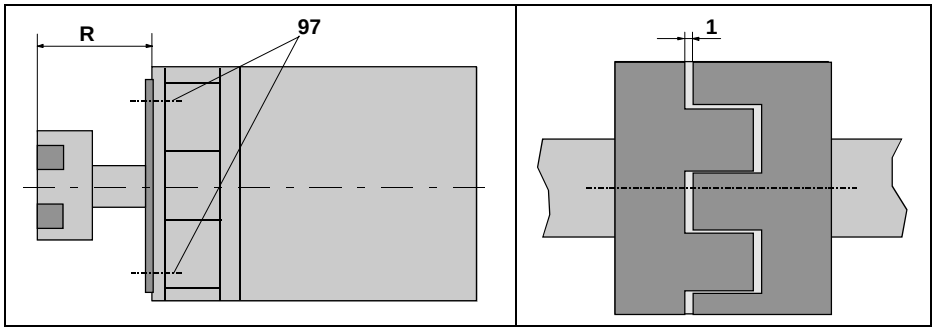
12. Lightly grease the running surfaces of the rotary shaft seal and the seal itself.
13. Install the motor (if needs be, turn the motor in order to find tooth spaces) and tighten the motor fastening (97).
14. Replace the motor and resolver cable.
15. Switch on the axle.
16. Set up the reference point (chapter 5.3.6)

5.4.2 Further gearbox designs

5.4.2.1 Shaft-hub connection through feather key

1. Move the carriage to a reference point (e.g. machine zero, real zero ...). Mark the carriage position on the HLE profile (felt pen).
2. Switch off the axle at the main switch and separate it from the electrical supply. Leave the motor and gearbox to cool.
3. Remove the motor and resolver cable.
4. Loosen the motor fastening (97).
5. Pull the motor off from the gearbox.
6. Clean the motor shaft and the sleeve shaft hole of all lubricant.
7. If the feather key shows signs of damage, replace it.
8. Insert feather key in the motor shaft.
9. Install the motor (if needs be, turn the motor in order to find the groove) and tighten the motor fastening (97).
10. Replace the motor and resolver cable.
11. Switch on the axle.
12. Set up the reference point (chapter 5.3.6)

5.4.2.2 Claw coupling



1. Move the carriage to a reference point (e.g. machine zero, real zero ...). Mark the carriage position on the HLE profile (felt pen).
2. Switch off the axle at the main switch and separate it from the electrical supply.
3. Remove the motor and resolver cable.
4. Loosen the motor fastening (97).
5. Pull the motor off from the gearbox.
6. Measure distance R, dimension from the claw coupling to the motor flange (accuracy +/- 0.1 mm).
7. Loosen the clamp screw of the claw coupling half and pull this off from the motor shaft.
8. Remove all traces of lubricant from the motor shaft and the hole of the claw coupling.
9. Place the claw coupling half on the new motor at the distance R. If necessary, rub down the motor shaft using emery paper, grade 360.

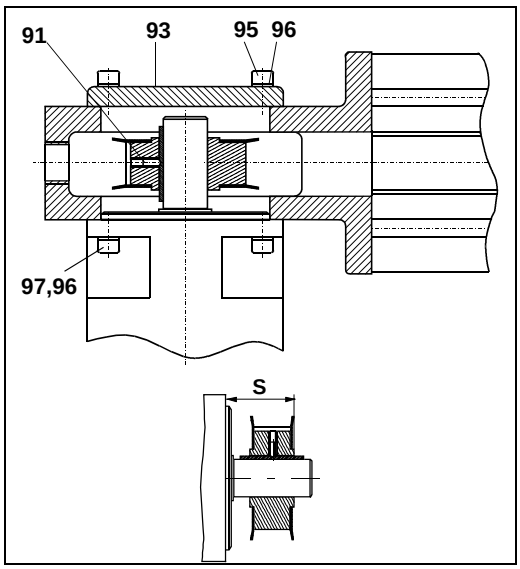
Note	There should be 1mm play in the axial direction between the coupling halves after mounting. Axial pressure must be avoided at all costs!

10. Tighten the clamp screws of the claw coupling.

11. Install the motor (if needs be turn the motor in order to find tooth spaces) and tighten on the motor fastening (97).
12. Replace the motor and resolver cable.
13. Switch on the axle.
14. Set up the reference point (chapter 5.3.6)

5.5 Changing the gearbox (over-mounted) with Neugart gearbox as an example

5.5.1 Changing the gearbox on a single axle



1. Dismantle the motor (chapter 5.4ff, according to the gearbox used).
2. Slacken the timing belt (chapter 5.2.2 point 2-5).
3. Remove the cover plate (93).
4. Loosen the gearbox fastening (97) and carefully remove the gearbox.
5. Measure the distance S, the dimension from the upper edge of the pulley to the gearbox flange (accuracy +/- 0.1 mm).
6. Loosen the set screw (91) and carefully pull off the pulley (use claw puller).
7. Place the pulley on the new gearbox at the distance S (Table 12).

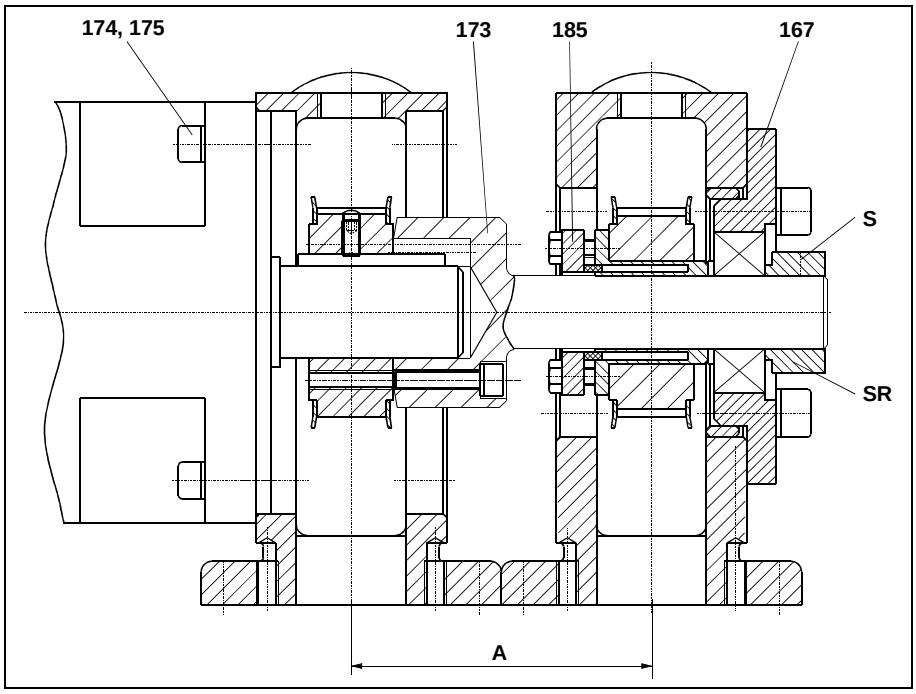
Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

8. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.
9. Screw the set screw into the pulley using screw retention (Loctite).
10. Place the timing belt over the pulley.
11. Build the gearbox on to the linear unit and tighten the gearbox fastening (97).
12. Tension the timing belt (chapter 5.2.3).
13. Fasten the cover plate (93).
14. Re-assemble the motor (chapter 5.4ff, according to the gearbox used).

Gearbox type	HLE80c	HLE100c	HLE150c
PLE80/90	36.5 mm	41.5 mm	--
PL90	36.5 mm	41.5 mm	--
PL115	37.5 mm	41.5 mm	48.5 mm
PLE120/115	37.5 mm	41.5 mm	48.5 mm
PL142	--	--	79 mm

Table 12: Standard distance S between the pulley and the gearbox flange

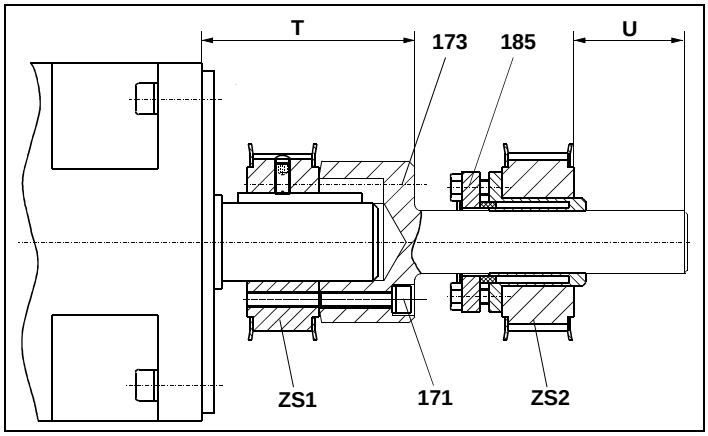
5.5.2 Changing the gearbox on a double axle with x1[7] < Axle distance < x2[8]



1. Dismantle the motor (chapter 5.4ff, according to the gearbox used).
2. Loosen the timing belt on both axles (chapter 5.2.2 point 2-5).
3. Loosen the clamp screw (S) on the set collar of the PME bearing (167).
4. Loosen the set collar (SR) of the PME bearing (167) by turning anti-clockwise.
5. Remove the pressure marks from the clamp screw (S) on the shaft piece (166) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

6. Loosen the gearbox fastening (174) and remove the gearbox.



7. Measure distance U, the dimension from the face side of the shafts to the pulley 2 (ZS2) (accuracy +/- 0.1 mm).
8. Loosen screws of the ETP-split-bushing (185). Carefully pull out the pulley 2 (ZS2) (use a puller tool).
9. Measure the distance T, the dimension from the shaft collar to the gearbox flange (accuracy +/- 0.1 mm).
10. Pull the parallel pins (173) using a puller.
11. Loosen the screws (171) and remove the shaft.
12. Twist out the set screw from the pulley 1 (ZS1) and clean it.
13. Carefully pull out the pulley (use a puller tool).
14. Align the fitting grooves of the pulley and the shaft to one another and loosely connect both parts using the screws (171).

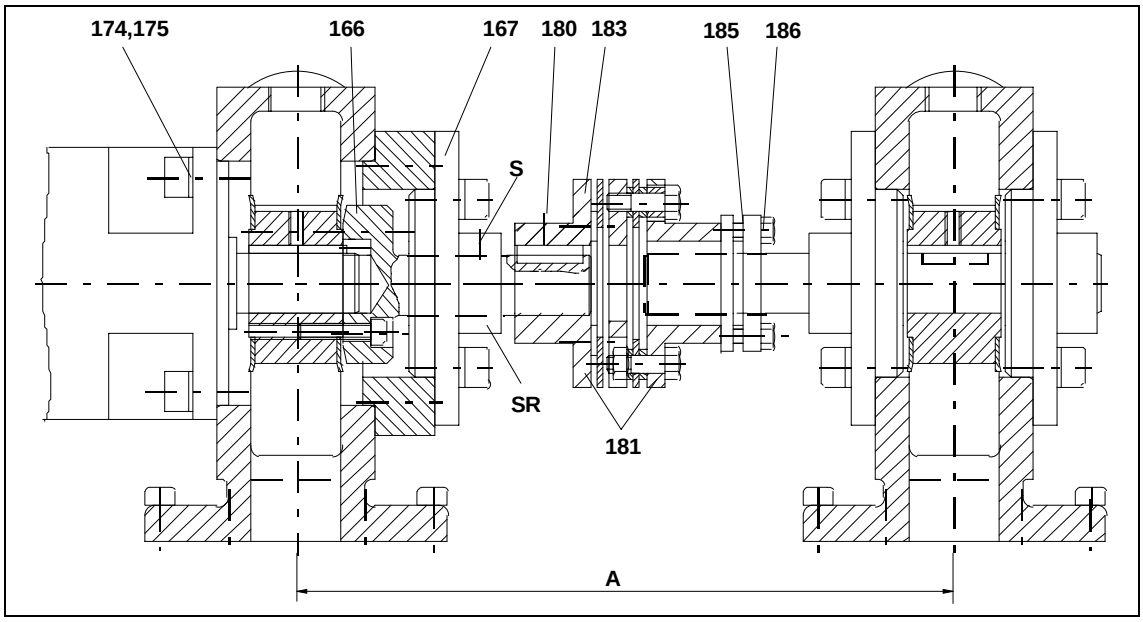
[7] HLE80c = 80mm, HLE100c = 100mm, HLE150c = 150mm
[8] HLE80c = 215mm, HLE100c = 215mm, HLE150c = 260mm

15. Press the parallel pins (173) into the holes and tighten the screws (171).
16. Place pulley 1 with the shaft piece on the new gearbox at the distance T.

Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

17. Spot drill the feather key of the gearbox through the tap in the pulley (ZS) and remove any swarf (see also chapter 5.5.1 right-hand figure).
18. Screw the set screw into the pulley using screw retention (Loctite).
19. Place pulley 2 on the shaft at distance U.
20. Tighten screws of the ETP-Split-bush.
21. Build the gearbox on to the linear unit and tighten the gearbox fastening (174).
22. Place the timing belt over the pulley. Check its position to that of the carriage.
23. Place the set collar (SR) of the PME bearing (167) onto the shafts and slightly tighten (clockwise). Tighten the clamp screw (S).
24. Tension the timing belt a little bit. Loosen the screws of the ETP-split-bush. Align the carriage of the joint-driven axis to the carriage of the driven axis. Tighten screws of the ETP-split-bush.
25. Tension the timing belt on both axles (chapter 5.2.3)
26. Where appropriate align the position of the two carriages to each other. Therefor you have to loosen the screws of the ETP-split-bush and to align the carriage of the joint-driven axis to the carriage of the driven axis and to tighten the bush again.
27. Re-assemble the motor (chapter 5.4ff, according to the gearbox used).

5.5.3 Changing the gearbox on a double axle with x2[9] < Axle distance < 500



1. Dismantle the motor (chapter 5.4ff, according to the gearbox used).
2. Loosen the timing belt on the HLE on the drive side (chapter 5.2.2 point 1-5).
3. Unscrew the screws (186) of the ETP bush (185) one turn at a time in sequence until the bush is completely loosened (anti-clockwise) .
4. Loosen the clamp screw (180) of the coupling half on the drive side (183) and push the coupling ovet the shaft piece (166) to the HLE.

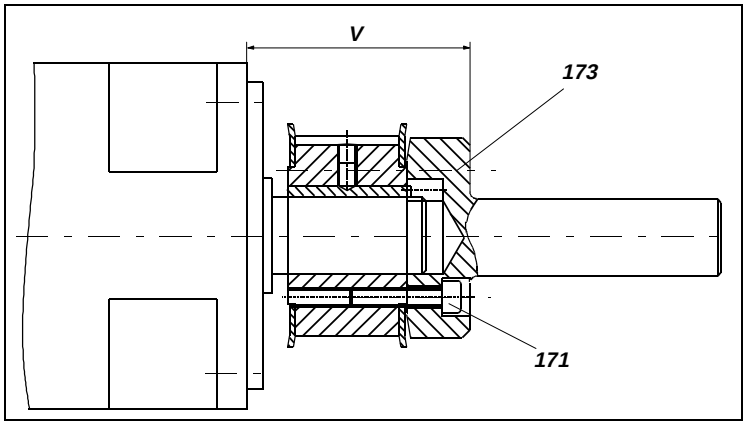
[9] HLE80c = 215mm, HLE100c = 215mm, HLE150c = 260mm

Caution	If the coupling half (183) is sitting firmly, then the coupling (181) should, if possible be loosened by lightly pressing in the axial direction. Never hit the shaft or the coupling half with a hammer, as this can lead to displacement of the timing belt pulley on the drive side. This must be avoided at all costs.

5. Loosen the clamp screw (S) on the set collar of the PME bearing (167) on the side of the drive.
6. Loosen the set collar of the PME bearing (167) by turning anti-clockwise.
7. Remove the pressure marks from the clamp screw (S) on the shaft piece (166) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

8. Loosen the gearbox fastening (174) and remove the gearbox.

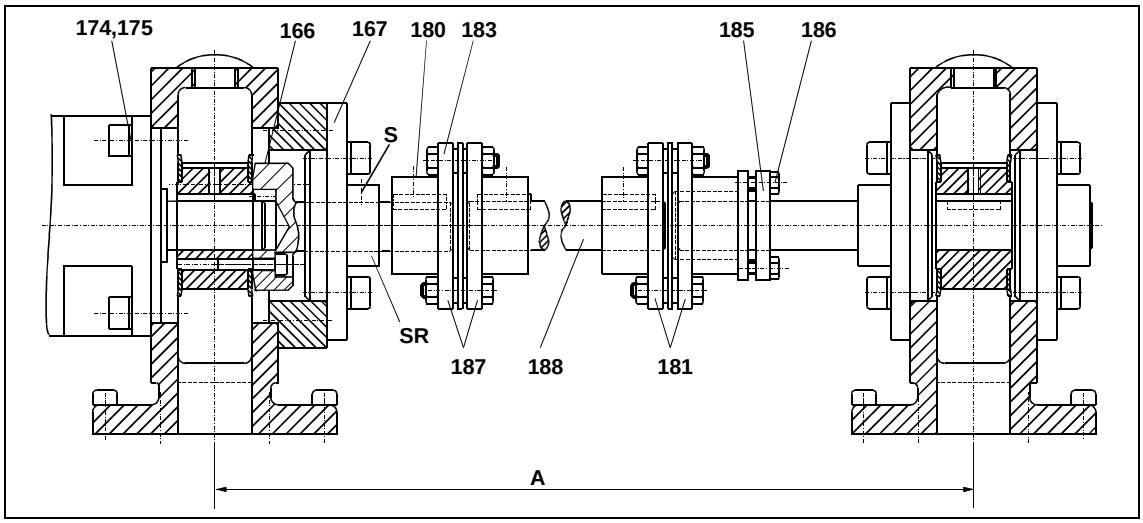


9. Measure the distance V, the dimension from the shaft collar to the gearbox flange (accuracy +/- 0.1 mm).
10. Pull the parallel pins (173) using a puller.
11. Loosen the screws (171) and remove the shaft.
12. Twist out the set screw from the pulley and clean it.
13. Carefully pull out the pulley (use a puller tool).
14. Align the fitting grooves of the pulley and the shaft to one another and loosely connect both parts using the screws (171).
15. Press the parallel pins (173) into the holes and tighten the screws (171).
16. Place pulley with the shaft piece on the new gearbox at the distance V.

Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

17. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.(See also chapter 5.5.1 right-hand figure).
18. Screw the set screw into the pulley using screw retention (Loctite).
19. Build the gearbox on to the linear unit and tighten the gearbox fastening (174).
20. Place the timing belt over the pulley.
21. Place the set collar (SR) of the PME bearing (167) onto the shafts and slightly tighten (clockwise). Tighten the clamp screw (S).
22. Push the coupling (183) over the shaft piece (166) until the end of the shaft piece is united with the coupling half.
23. Twist the clamp screw (180) with screw retention (Loctite) into the coupling half (183) and tighten.
24. Tension the timing belt of the axle on the drive side (chapter 5.2.3).
25. Align it to the position of the carriage (chapter. 5.7.2).
26. Slightly tighten the screws (186) of the ETP tensioning bush (185) and then in small stages (1/4 turns) tighten in sequence to a tightening torque of Ma = 8 Nm.
27. Assemble the motor (chapter. 5.4 ff, according to gearbox used).

5.5.4 Changing the gearbox on a double axle with x2< Axle distance < 500



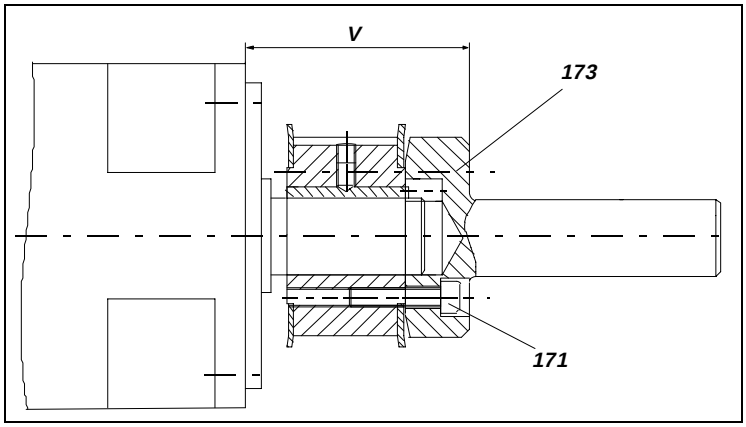
1. Dismantle the motor (chapter 5.4ff, according to the gearbox used).
2. Loosen the timing belt on the HLE on the drive side (chapter 5.2.2 point 2-5).
3. Unscrew the screws (186) of the ETP bush (185) one turn at a time in sequence until the bush is completely loosened (anti-clockwise) .
4. Dismantle the shaft (188). To do this, loosen 4 screws on both couplings (181) and (187). Remove the spacer shaft.
5. Loosen the clamp screw (180) of the coupling half on the drive side (183).

Caution	If the coupling half (183) is sitting firmly, then the coupling (181) should, if possible be loosened by lightly pressing in the axial direction. Never hit the shaft or the coupling half with a hammer, as this can lead to displacement of the timing belt pulley on the drive side. This must be avoided at all costs.

6. Loosen the clamp screw (S) on the set collar of the PME bearing (167) on the side of the drive.
7. Loosen the set collar (SR) of the PME bearing (167) by turning anti-clockwise.
8. Remove the pressure marks from the clamp screw (S) on the shaft piece (166) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

9. Loosen the gearbox fastening (174) and remove the gearbox.



10. Measure the distance V, the dimension from the shaft collar to the gearbox flange (accuracy +/- 0.1 mm).
11. Pull the parallel pins (173) using a puller.
12. Loosen the screws (171) and remove the shaft.
13. Twist out the set screw from the pulley and clean it.
14. Carefully pull out the pulley (ZS2) (use a puller tool).
15. Align the fitting grooves of the pulley and the shaft to one another and loosely connect both parts using the screws (171).
16. Press the parallel pins (173) into the holes and tighten the screws (171).
17. Place pulley with the shaft piece on the new gearbox at the distance V.

Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

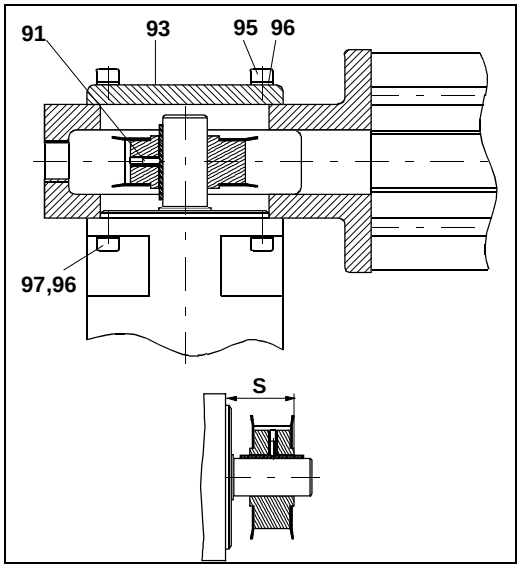
18. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.(See also chapter 5.5.1 right-hand figure).
19. Screw the set screw into the pulley using screw retention (Loctite).
20. Build the gearbox on to the linear unit and tighten the gearbox fastening (174).
21. Place the timing belt over the pulley.
22. Place the set collar (SR) of the PME bearing (167) onto the shafts and slightly tighten (clockwise). Tighten the clamp screw (S).
23. Push the coupling (183) over the shaft piece (166) until the end of the shaft piece is flush with the coupling half.
24. Twist the clamp screw (180) with screw retention (Loctite) into the coupling half (183) and tighten.
25. Tension the timing belt on the axles on the drive side (chapter 5.2.3)
26. Insert the spacer shaft (188). Twist in the 4 screws for each coupling (181) and (187) using screw retention (Loctite).

Note	Do not tighten the screws too tightly. Make sure that the spring assemblies do not bulge.

27. Align it to the position of the carriage (chapter 5.7.2).
28. Slightly tighten the screws (186) of the ETP tensioning bush (185) and then in small stages (1/4 turns) tighten in sequence to a tightening torque of Ma = 8 Nm.
29. Re-assemble the motor (chapter 5.4ff, according to the gearbox used).

5.6 Replacing the pulley with a Neugart gearbox as an example

5.6.1 Pulley on a single axle - over-mounted replacing



1. Dismantle the motor (chapter 5.4ff, according to the gearbox used).
2. Slacken the timing belt (chapter 5.2.2 point 2-5).
3. Remove the cover plate (93).
4. Loosen the gearbox fastening (97) and carefully remove the gearbox.
5. Measure the distance S, the dimension from the upper edge of the pulley to the gearbox flange (accuracy +/- 0.1 mm).
6. Loosen the set screw (91) and carefully pull off the pulley (use claw puller).
7. Turn the feather key. If both sides of the feather key are already drilled, replace the feather key.
8. Place the new pulley on the gearbox at the distance S ().Table 13

Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

9. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.
10. Screw the set screw into the pulley using screw retention (Loctite).
11. Place the timing belt over the pulley.
12. Build the gearbox on to the linear unit and tighten the gearbox fastening (97).
13. Tension the timing belt (chapter. 5.2.3).
14. Fasten the cover plate (93).
15. Re-assemble the motor (chapter 5.4ff, according to the gearbox used).

Gearbox type	HLE80c	HLE100c	HLE150c
PLE80/90	36.5 mm	41.5 mm	--
PL90	36.5 mm	41.5 mm	--
PL115	37.5 mm	41.5 mm	48.5 mm
PLE120/115	37.5 mm	41.5 mm	48.5 mm
PL142	--	--	79 mm

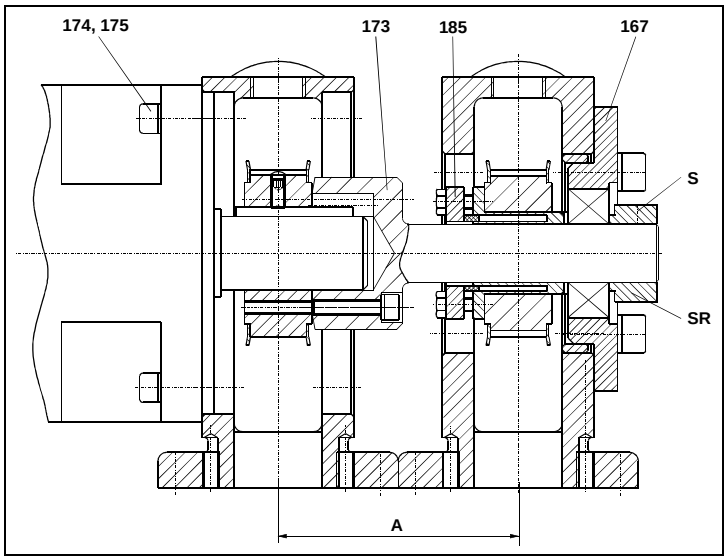
Table 13: Standard distance S between the pulley and the gearbox flange

5.6.2 Replacing the pulley on the drive side of a double axle

Caution	For replacing the pulley on the drive side of a double axle, special devices and tools are required. For this reason, the replacement of this pulley should only be carried out by HAUSER personnel and is therefore not described here.

5.6.3 Replacing the pulley on the drive side of a double axle

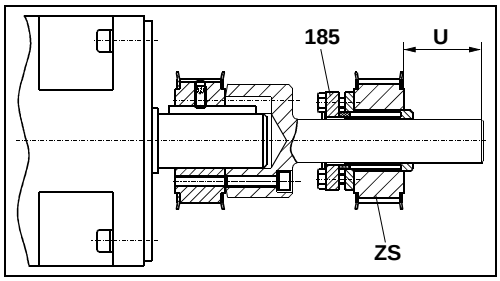
5.6.3.1 Double axle x1[10] < Axle distance < x2[11]



1. Dismantle the motor (chapter 5.4ff, according to the gearbox used).
2. Loosen the timing belt on both axles (chapter 5.2.2 point 2-5).
3. Loosen the clamp screw (S) on the set collar of the PME bearing (167).
4. Loosen the set collar (SR) of the PME bearing (167) by turning anti-clockwise.
5. Remove the pressure marks from the clamp screw (S) on the shaft piece (166) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

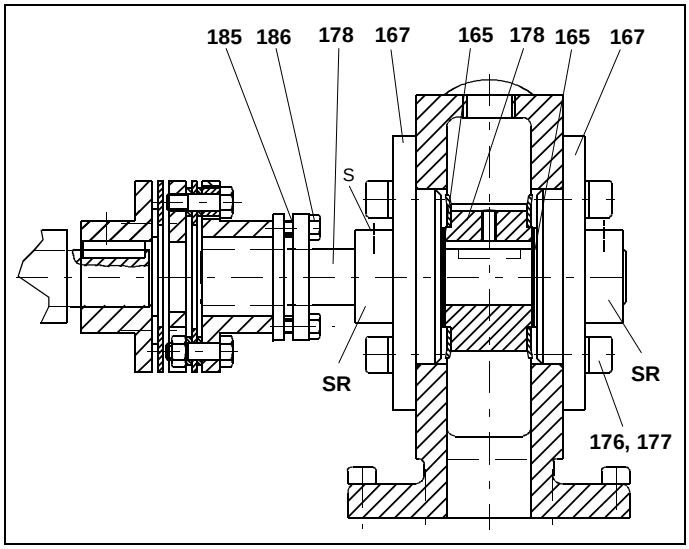
6. Loosen the gearbox fastening (174) and remove the gearbox.



7. Measure distance U, the dimension from the face side of the shafts to the pulley (accuracy +/- 0.1 mm).
8. Loosen screws of the ETP-split-bushing (185). Carefully pull out the pulley 2 (ZS2) (use a puller tool).
9. Place new pulley on the shaft at distance U.
10. Tighten screws of the ETP-split-bushing.
11. Build the gearbox on to the linear unit and tighten the gearbox fastening (174).
12. Place the timing belt over the pulley.
13. Place the set collar (SR) of the PME bearing (167) onto the shaft and slightly tighten (clockwise). Tighten the clamp screw (S).
14. Tension the timing belt a little bit. Loosen the screws of the ETP-split-bush. Align the carriage of the joint-driven axis to the carriage of the driven axis. Tighten screws of the ETP-split-bush.
15. Tension the timing belt on both axles (chapter 5.2.3)
16. Where appropriate align the position of the two carriages to each other. Therefor you have to loosen the screws of the ETP-split-bush and to align the carriage of the joint-driven axis to the carriage of the driven axis and to tighten the bush again.
17. Re-assemble the motor (chapter 5.4ff, according to the gearbox used).

[10] HLE80c = 80mm, HLE100c = 100mm, HLE150c = 150mm
[11] HLE80c = 215mm, HLE100c = 215mm, HLE150c = 260mm

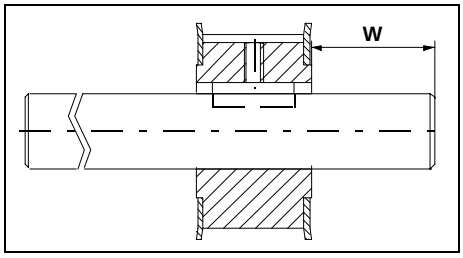
5.6.3.2 Double axle x1[12] < Axle distance < x2



1. Loosen the timing belt on the joint-driven HLE on the drive side (chapter 5.2.2 point 2-5).
2. Unscrew the screws (186) of the ETP bush (185) one turn at a time in sequence until the bush is completely loosened (anti-clock-wise) .
3. Loosen the clamp screw (S) on the set collar of the inner PME bearing (167).
4. Loosen the set collar of the PME bearing (167) by turning anticlock-wise.
5. Remove the pressure marks from the clamp screw (S) on the shaft piece (178) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

6. Loosen the clamp screw (S) on the set collar of the outer PME bearing (167).
7. Loosen the set collar of the outer PME bearing (167) by turning anti-clockwise.
8. Remove the pressure marks from the clamp screw (S) on the shaft piece (178) using rasp or similar.
9. Loosen 4 screws (176) of the outer PME bearing and remove the bearing.
10. Remove the shim ring (165).
11. Carefully remove the shaft with the pulley.
12. Remove the inner shim ring (165).



13. Measure distance W, the dimension from the face side of the shafts to the pulley (accuracy +/- 0.1 mm).
14. Loosen the set screw and carefully pull off the pulley (use claw puller).
15. Turn the feather key. If both sides of the feather key are already drilled, replace the feather key.
16. Place new pulley on the shaft at distance W.

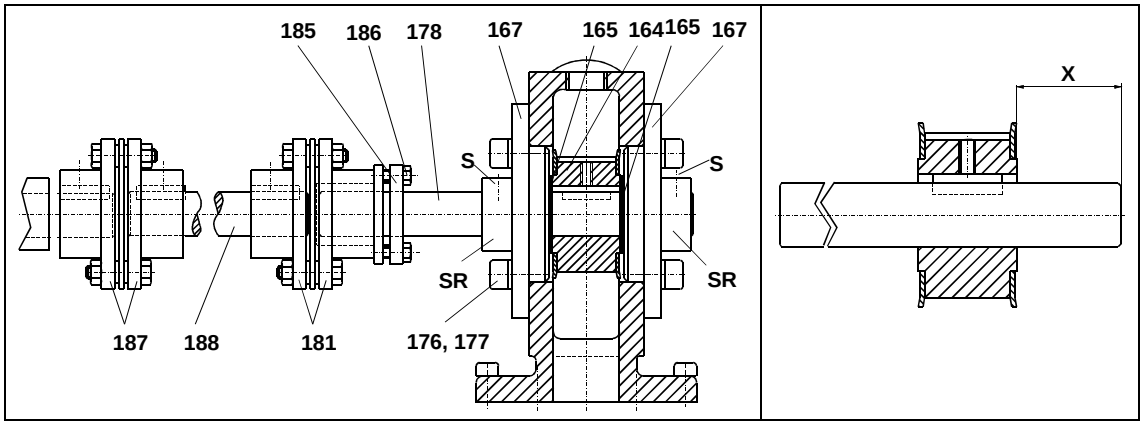
Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

17. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.
18. Screw the set screw into the pulley using screw retention (Loctite).
19. Lay the shim rings (165) on top and push the shaft through the inner PME bearing into the ETP tensioning bush.
20. Place the timing belt over the pulley.
21. Lay the shim rings (165) on the outer side of the shaft.
22. Place the exterior PME bearing on the shaft (178) and fasten using 4 screws (176).
23. Move the shaft in the axial direction. It should have 0.1 - 0.2mm play. If there is no play, then remove a thin shim ring (0.2mm).

[12] HLE80c = 215mm, HLE100c = 215mm, HLE150c = 260mm

24. Even out the shaft by hand and gently pull on the set collar (SR) of the exterior PME bearing (167) (clockwise) and the clamp screw (S).
25. Gently tighten the set collar (SR) of the inner PME bearing (167) (clockwise) and the clamp screw (S).
26. Tension the timing belt on the axle also being drive (chapter 5.2.3)
27. Align it to the position of the carriage (chapter 5.7.2).
28. Slightly tighten the screws (186) of the coupling (181) and then in small stages (1/4 turns) tighten in sequence to a tightening torque of Ma = 8 Nm.

5.6.3.3 Double axle axle distance > 500mm



1. Loosen the timing belt on the HLE also being driven (chapter 5.2.2 point 2-5).
2. Unscrew the screws (186) of the ETP bush (185) one turn at a time in sequence until the bush is completely loosened (anti-clockwise) .
3. Dismantle the shaft (188). To do this, loosen 4 screws on both couplings (181) and (187). Remove the spacer shaft.
4. Remove the coupling half with the ETP bush from the shaft (178).
5. Loosen the clamp screw (S) on the set collar of the inner PME bearing (167).
6. Loosen the set collar of the PME bearing (167) by turning anti-clockwise.
7. Remove the pressure marks from the clamp screw (S) on the shaft piece (178) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

8. Loosen 4 screws (176) of the inner PME bearing and remove the bearing.
9. Remove the shim ring (165).
10. Loosen the clamp screw (S) on the set collar of the outer PME bearing (167).
11. Loosen the set collar of the outer PME bearing (167) by turning anti-clockwise.
12. Remove the pressure marks from the clamp screw (S) on the shaft piece (178) using rasp or similar.
13. Carefully remove the shaft with the pulley.
14. Remove the shim ring (165).
15. Measure distance X, the dimension from the face side of the shafts to the pulley (accuracy +/- 0.1 mm).
16. Loosen the set screw and carefully pull off the pulley (use claw puller).
17. Turn the feather key. If both sides of the feather key are already drilled, replace the feather key.
18. Place new pulley on the shaft at distance X.

Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

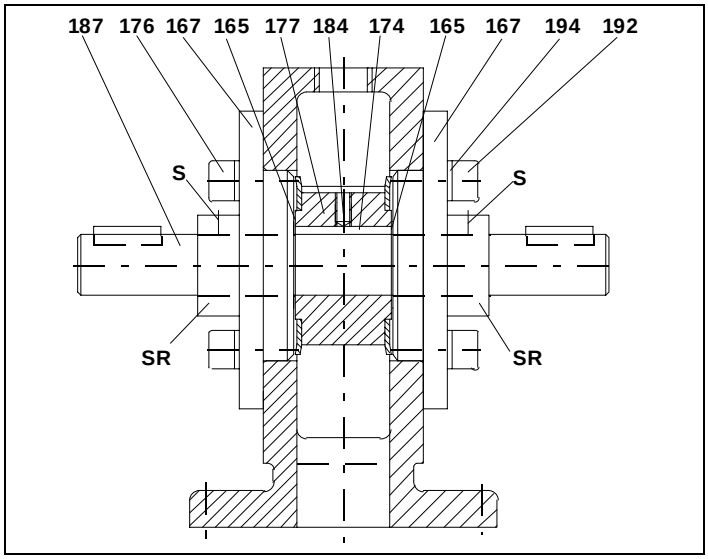
19. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.
20. Screw the set screw into the pulley using screw retention (Loctite).

21. Lay the shim rings (165) on top and install the shaft in the outer PME bearing.
22. Place the timing belt over the pulley.
23. Lay the shim rings (165) on the inner side of the shaft.
24. Place the dismantled PME bearing on the shaft (178) and fasten using 4 screws (176).
25. Move the shaft in the axial direction. It should have 0.1 - 0.2mm play. If there is no play, then remove a thin shim ring (0.2mm).
26. Even out the shaft by hand and gently pull on the set collar (SR) of the inner PME bearing (167) (clockwise) and the clamp screw (S).
27. Gently tighten the set collar (SR) of the outer PME bearing (167) (clockwise) and the clamp screw (S).
28. Tension the axle timing belt (chapter 5.2.3)
29. Push the coupling half with the ETP bush on the shaft (178).
30. Insert the spacer shaft (188). Twist in the 4 screws for each coupling (181) and (187) using screw retention (Loctite).

Note	Do not tighten the screws too tightly. Make sure that the spring assemblies do not bulge.

31. Align it to the position of the carriage (chapter 5.7.2).
32. Slightly tighten the screws (186) of the coupling (181) and then in small stages (1/4 turns) tighten in sequence to a tightening torque of Ma = 8 Nm.

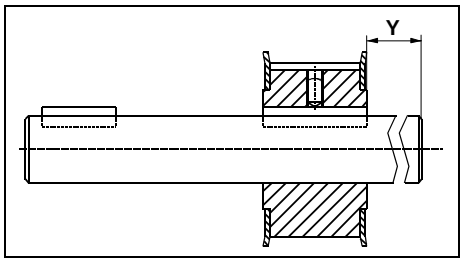
5.6.4 Replacing the pulleys shaft left (WL), shaft right (WR), both sides (WB)



1. Dismantle motor and gearbox.
2. If needs be, dismantle add-on pieces of the second end of the shaft.
3. Loosen the timing belt on the HLE (chapter 5.2.2 point 2-5).
4. Loosen the clamp screw (S) on the set collar of the PME bearing (167) on the side of the drive.
5. Loosen the set collar (SR) of the PME bearing (167) on the drive side by turning anticlockwise.
6. Remove the pressure marks from the clamp screw (S) on the shaft piece (187) using rasp or similar.

Note	If the pressure marks from the clamp screw are not removed, then when the shaft is removed, the PME bearing can be damaged.

7. Loosen 4 screws (176) of the PME bearing on the drive side and remove the bearing.
8. Remove the shim rings (165).
9. Loosen the clamp screw (S) on the set collar of the second PME bearing (167).
10. Loosen the set collar (SR) of the second PME bearing (167) by turning anti-clockwise.
11. Remove the pressure marks from the clamp screw (S) on the shaft piece (187) using rasp or similar.
12. Carefully remove the shaft with the pulley.
13. Remove the shim rings (165).

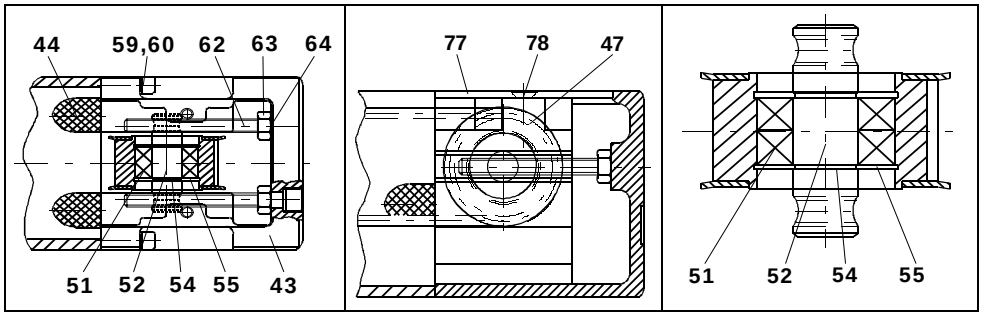


14. Measure distance Y, the dimension from the face side of the shafts to the pulley (accuracy +/- 0.1 mm).
15. Loosen the set screw and carefully pull off the pulley (use claw puller).
16. Turn the feather key. If both sides of the feather key are already drilled, replace the feather key.
17. Place new pulley on the shaft at distance Y.

Caution	Press down the pulley using the press on the shaft. Do not use a hammer on the shaft as this can damage the gearbox.

18. Measure the diameter of the core removing hole of the pulley tap. Using a twist drill 0.5mm smaller, drill carefully 1mm deep into the feather key of the gearbox through the tap in the pulley. Remove any swarf.
19. Screw the set screw into the pulley using screw retention (Loctite).
20. Lay the shim rings (165) on top and install the shaft in the PME bearing.
21. Place the timing belt over the pulley.
22. Lay the shim rings (165) on the side of the shaft facing the drive.
23. Place the dismantled PME bearing on the shaft (187) and fasten using 4 screws (176).
24. Move the shaft in the axial direction. It should have 0.1 - 0.2mm play. If there is no play, then remove a thin shim ring (0.2mm).
25. Even out the shaft by hand and gently tighten the set collar (SR) of the PME bearing (167) facing the drive (clockwise) and the clamp screw (S).
26. Gently tighten the set collar (SR) of the second PME bearing (167) (clockwise) and the clamp screw (S).
27. Tension the axle timing belt (chapter 5.2.3)
28. Fasten the motor, gearbox and other add-on pieces
29. If needs be, mount add-on pieces of the second end of the shaft.

5.6.5 Replacing the pulley on the tensioning station



1. Move the carriage almost up to the tensioning station
2. Switch off the axle at the main switch and ensure that it cannot be switched on again.
3. Slacken the timing belt (chapter 5.2.2 point 2-4).
4. Loosen 4 screws (59) and carefully remove the tensioning station.
5. Twist the tensioning screws (62)out of the pulley socket pins until the complete pulley assembly can be removed.
6. Insert a new pulley assembly and screw the tensioning screws (62) into the bolts a few turns.
7. Place the timing belt around the pulley and fasten the tensioning station using screws and the new Schnorr lock washer.
8. Fasten the timing belt according to chapter 5.2.2 points 7-12.

5.7 Double axle

5.7.1 General

Double axles are generally supplied as single axles. From a certain axle distance there are one or two Servoflex couplings on the spacer shaft. These couplings guarantee a balance between axial and offset angles. The coupling (s) consists of two shells and a spring assembly. This spring assembly takes over the balance between axial and offset angles. Using an ETP tensioning bush, both carriages can be adjusted exactly to one another.

5.7.2 Aligning the carriages with one another

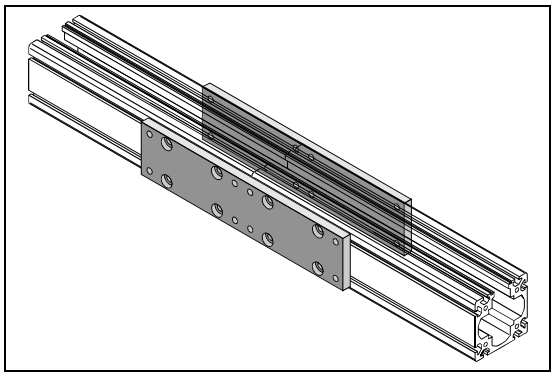
1. Unscrew the screws of the ETP bush one turn at a time in sequence until the bush is completely loosened (anti-clockwise) .
2. Move the carriages to the defined position (e.g. to the end stop).
3. Tighten the screws of the ETP tensioning bush in sequence by a quarter turn each until the stated tightening torque is reached (if possible, use a dynamometric key)(Table 14).

Shaft diameter	Tightening torque Ma
15mm	5Nm
19mm-42mm	**8Nm**
45mm-65mm	13Nm

Table 14: Tightening torque for ETP tensioning bushes

5.8 Overlength axles

5.8.1 General



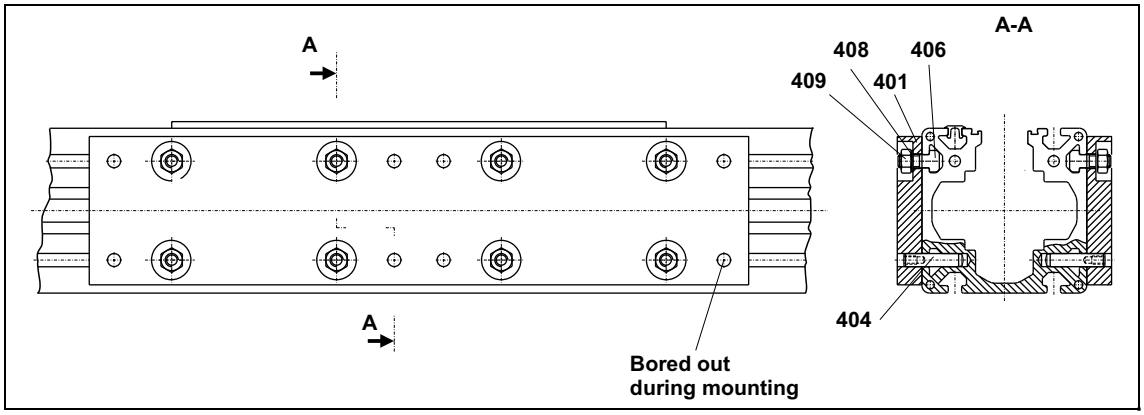
- Splice plates are used to lengthen the travel or to simplify mounting when access is limited.
- The point of separation for the splice plates should always be close to a fixing point.
- The bearing distance should generally be between 1.0m and 1.5m.

- It is standard always to separate the profiles in the middle in order to keep the profile elements the same size.
- If a splice plate is used to lengthen the travel, then the loading data must be reduced. (Table 15)

HLE	Unit	80c	100c	150c
max. perm. load	N	0.5 x Fz [13]	0.5 x Fz [13]	0.5 x Fz[13]
max. drive torque	Nm	16	20	54
Speed:	m/s	< 1	< 1	< 1
Acceleration:	m/s^2	< 1	< 1	< 1
Repeatability:	mm	> ±0.5	> ±0.5	> ±0.5

Table 15: Reduced loading data for overlong axles

5.8.2 Mounting splice plates



1. Align the profiles with one another.
2. Insert the t-bolts (406)(4 per profile and side).
3. Put on and fix the apertured plate (401), the lock washer (408) and nuts (409).
4. Align the profile exactly, check the running surfaces. Align if needs be. Check for bumps manually. You should not be able to feel any transition.
5. Check whether the pin holes are aligned; if needs be, adjust the position of the HLE. Insert the pins (404).
6. Tighten up the nuts (409) .
7. Mount the timing belt and align it (chapter 5.2ff)

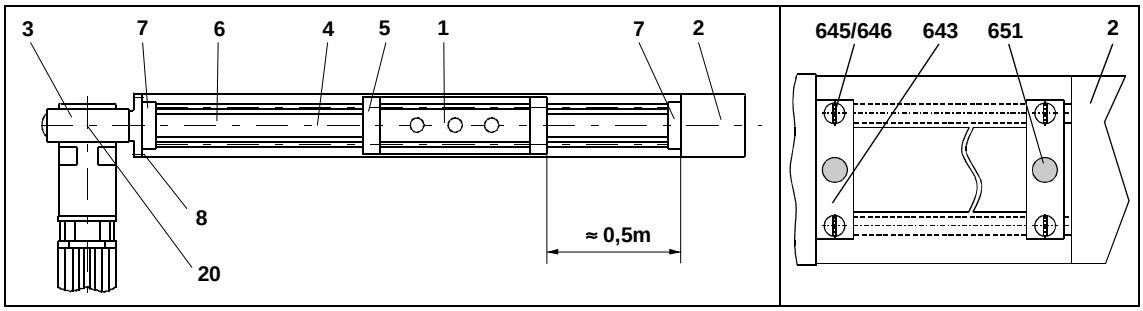
[13] Referring to the details in chapter 2.3 page 6

5.9 Steel strip cover

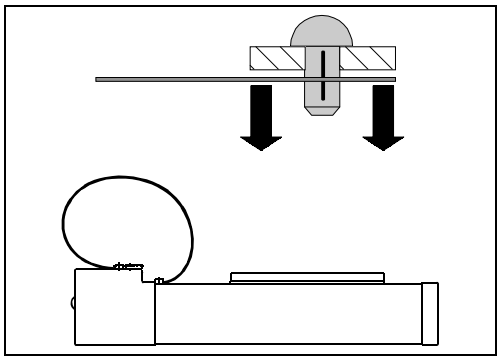
Note	In all work on the steel strip cover, make sure that the steel strip is not kinked, distorted or damaged in any other way. If the steel strip is damaged, it must be changed.

5.9.1 Mounting and dismantling, replacing worn parts

5.9.1.1 Dismantling the steel strip cover



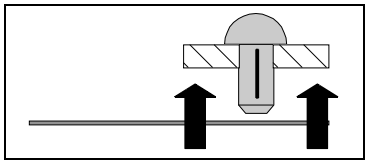
1. Stop the carriage (1) approx. 0.5m in front of the tensioning station (2).
2. Switch off the axle at the main switch.



3. Loosen the screws (645) and lift the clamping piece (643) using the grooved drive stud (651).
4. Carefully remove the steel strip from the grooved drive stud.
5. Dismantle the steering stations (5) on both sides of the load attachment plates. Make sure that the drag bar (felt) and the springs do not fall out.
6. Pull the steel strip carefully through the carriage.
7. Roll up the steel strip carefully in the direction of the drive station and fix using adhesive tape.

5.9.1.2 Mounting the steel strip cover

1. Unroll the steel strip and feed the end through the carriage. Slide the steel strip over the whole length of the stroke by pulling gently on it.
2. The turning stations (5) on both sides of the load attachment plate must be joined fast at the sides and top. Make sure that the springs and drag bar (felt) are still in the housing.

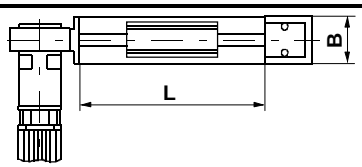


3. Connect the clamping piece (643) carefully to the steel strip (6) using the grooved drive stud (651).
4. Fasten the clamping piece using screws (645).

Note	Do not strain the steel strip!

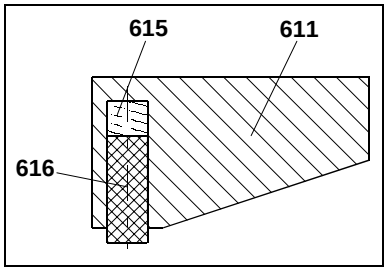
5. Switch on the axle drive.
6. Move the carriage for approx. 10 strokes over the whole length at a low speed (v < 2 m/s). Watch the steel strip to see whether a "wave" forms in front of the respective turning station in the direction of movement.
7. Then stop the carriage coming from the drive station (20) at 0.5m before the tensioning station (2).
8. Loosen the screws of the clamping piece on the tensioning station.
9. Smooth out the "wave", but do not strain the strip in doing so.
10. Screw tight the clamping piece.

5.9.1.3 Replacing the steel strip

Note	New steel strips must only be obtained from HAUSER. To order one, we will need to know the length L of the profile. Using these details, the steel strip will be shortened and equipped with two fastening holes.	

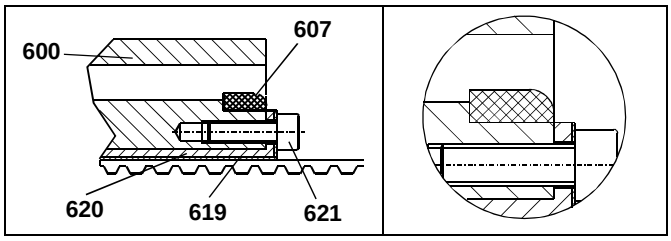
1. Dismantle the steel strip (chapter 5.9.1.1)
2. Remove the second clamping piece. Pull off the steel strip from the grooved drive stud.
3. Connect the new steel strip using the grooved drive stud.
4. Fasten the clamping piece.
5. Mount the steel strip (chapter 5.9.1.2)

5.9.1.4 Replacing the drag bar



1. Switch off the axle at the main switch.
2. Dismantle the turning stations (5) on both sides of the load attachment plates.
3. Replace the felt drag bar (616) with a new one. Make sure that the springs (615) do not fall out.
4. The turning stations (5) on both sides of the load attachment plate must be joined fast at the sides and top.
5. Switch on the axle drive.

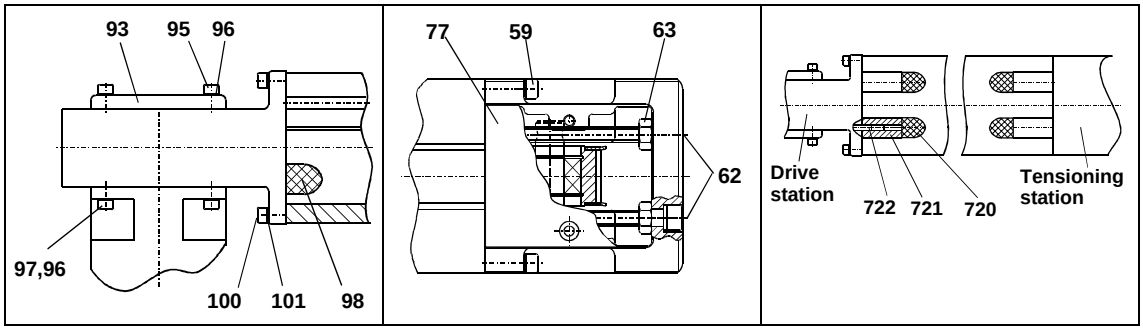
5.9.1.5 Replacing the baffle

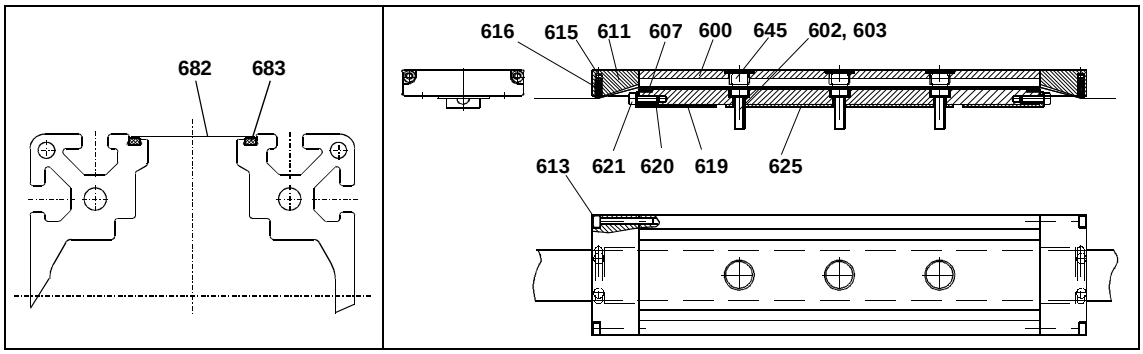


1. Dismantle the steel strip (chapter 5.9.1.1)
2. Push out the old baffles (607) to the side.
3. Push new baffles in the load attachment plate (600) so that the steel strip runs over the radius of the baffle. Align the baffle in the centre.
4. Mounting the steel strip (chapter 5.9.1.2)

5.9.2 Retrofit the steel strip

Note	To retrofit the steel strip cover, you will require: A prepared load attachment plate (groove for the baffle, fastening thread for screwing on the steering stations), add-on pieces, magnetic strip, steel strip, buffer extension. **Note** • The height of the construction and the screw points will remain unchanged. • The effective stroke will reduce by 90mm. In order to retrofit, you will have to completely dismantle the HLE-c.





1. Switch off the axle at the main switch and ensure that it cannot be switched on again.
2. Slackening the timing belt:
   Remove the dust cover (77) of the tensioning station.
   Loosen the lock-nut (63).
   Loosen the tensioning screws (62) by approx. 10 turns (anti-clockwise).
3. Loosen the timing belt: Remove the protective caps (645), loosen the screws (602) and remove the load attachment plate
4. Take the timing belt out of the toothed strip of the carriage.
5. Clean the joints for the magnetic strip (683). Stick double-sided adhesive tape in the groove, remove the protective film, lay the magnetic strip on top but do not tilt it, and press down with the fingers.
6. Place the prepared load attachment plate on the carriage, insert the screws (602), align the load attachment plate centrally and tighten the screws.

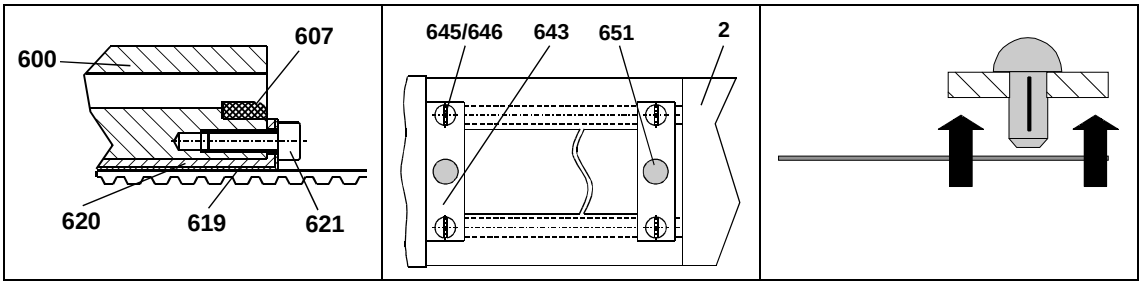
Caution	Secure the carriage with the load attachment plate against moving/ falling out using adhesive tape.

7. Loosen the 4 screws of the tensioning station (59), remove them carefully and remove the timing belt.
8. Remove the rubber buffer (720)

Note	On dismantling the rubber buffer only twist its 2mm thick metal base plate. For safety reasons, the fastening screw of the buffer is glued in with Loctite.

Chuck the rubber buffer in a square edged vice according to the above and carefully turn the tensioning station anti-clockwise; twist out the rubber buffer.

9. Mount the buffer extension:
   Charge the set screw (722) with Loctite and screw half its length into the distance bolt (721).
   Clean the thread of the rubber buffer, charge it with Loctite and screw into the distance bolt from the other side.
   Charge the second side of the set screw with Loctite and screw the assembly into the thread of the tensioning station.
   Using pliers, grip the distance bolt and tighten up the screw well. Make sure that the face of the distance bolt lies completely against the housing of the tensioning station.
10. Place the timing belt around the pulley and fasten the tensioning station using screws (59) and the new Schnorr lock washer.
11. Loosen the 4 screws of the drive station (100), remove them carefully and remove the timing belt.
12. Remove the rubber buffer using a similar procedure to that with the tensioning station, lengthen it and re-fasten.
13. Push two sliding blocks for later fixing the clamping piece (643) of the steel strip in both grooves to the left and the right of the profile opening.
14. Place the timing belt around the pulley of the drive station and fasten this using screws (100) and new Schnorr lock washers (101).



15. Unscrew the timing belt retaining bracket (620) and spacer bracket (619) from the dismantled load attachment plate.
16. Push the timing belt between the carriage and the load attachment plate. Insert the timing belt retaining bracket (620) and shim it with the spacer bracket (619). Fasten both using screws (621) (for screw retention, see also page 16).
17. Tension the axle timing belt (chapter .5.2.3)
18. Align the axle timing belt (chapter 5.2.4)
19. Set up the reference point (chapter 5.3.6)
20. Insert the baffle (607) according to chapter 5.9.1.5 (point 3). Be careful positioning the radius.
21. Clean the magnetic strip from swarf and dirt.
22. Unroll the steel strip carefully, push it through the opening in the load attachment plate and lay it out over the whole HLE profile.
23. Connect the grooved drive stud (651) using the clamping piece (643).
24. On the side of the drive station, carefully connect the clamping piece with the steel strip using the grooved drive stud.
25. Fasten the clamping piece flush with the edge of the drive housing using screws (645).
26. Place two springs (615) and one drag bar (616) in each of the turning stations (611).
27. Mount the steel strip cover according to chapter 5.9.1.2 from point 2 onwards

6 Wearing parts and replacement parts

6.1 Wearing parts and replacement parts HLE80c

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
14	**Timing belt 16AT10 HPF**	Length L see chapter 5.2.2				m	420-000011
16	**Wheel R4OL0028**	12	24	24	48	Pieces	416-201070
18	**Eccentric bush E4XZ0004**	6	12	12	24	Pieces	125-068100
19	**Screw H4LE80006 for fixed wheel**	2	2	4	4	Pieces	125-068120
20	**Screw H4LE80007 for eccentric wheel**	2	6	4	12	Pieces	125-068110
25	**Hexagon nut M5**	8	16	16	32	Pieces	135-702001
26	**Lock washer 5**	10	20	20	40	Pieces	135-201051
27	**Lock washer 8**	4	6	8	12	Pieces	135-201053

Table 16: HLE 80c

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
16	**Wheel R4OL0028**	12	24	24	48	Pieces	416-201072
18	**Eccentric bush E4XZ0004**	6	12	12	24	Pieces	135-703000
19	**V2A screw H4LE80006 for fixed wheel**	2	2	4	4	Pieces	135-703005
20	**V2A screw H4LE80007 for eccentric wheel**	2	6	4	12	Pieces	135-703010
25	**Hexagon nut M5**	8	16	16	32	Pieces	135-728013
26	**Lock washer 5**	10	20	20	40	Pieces	135-728010
27	**Lock washer 8**	4	6	8	12	Pieces	135-728720

Table 17: HLE 80c - low rust design

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
607	**Baffle**	2	2	4	4	Pieces	125-069720
616	**Drag bar**	2	2	4	4	Pieces	180-300059
615	**Drag bar pressure springs**	4				Pieces	130-003005
130	**Steel strip 0.125 x 23**	1 x length: see Chapter 5.9.1.3				m	400-300701
131	**Magnetic film**	2 x length: see Chapter 5.9.1.3				m	400-300712

Table 18: HLE80c, steel-strip cover option[14]

Pulley HLE80		Hole size [mm]	Drawing number	Number [pce.] NL/VL	NL D/VL D	Article number
Tensioning station (complete with bearing and bolt)		32^{K7}	Z4AS 1648	1	2	510-900101
Single axle	**WL/WR/WB**	20^{H7}	Z4AS 1649	1	1	420-100422
Drive station /	**PL90, PLE80/90**	20^{H7}	Z4AS 1649	1	1	420-100422
Gearbox type	**PL115, PLE120/115**	25^{H7}	Z4AS 1669	1	1	420-100424
overhung	**Lenze 52.508.04**	19^{H7}	Z4AS 1650	1	1	420-100421
Bearing	**Lenze 52.508.05**	24^{H7}	Z4AS 1675	1	1	420-100400
Double axle joint-driven station						
Axle distance 80 to 125 mm		28^{H7}	Z4AS 2520	--	1	420-100108
Axle distance > 125 mm		20^{H7}	Z4AS 1649	--	1	420-100422
Double axle driven station		--	on request	--	1	on request

Table 19: Pulley HLE80c

[14] Replacement interval: see chapter 4.2 page 14

6.2 Wearing and replacement parts HLE100c

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
14	**Timing belt 25 AT 10 HF**	Length L see chapter 5.2.2				m	420-000016
16	**Wheel R4OL0027-N4**	12	24	24	48	Pieces	416-201030
18	**Eccentric bush E4XZ0003 N1**	6	12	12	24	Pieces	125-070100
21	**Hexagon nut M12**	6	12	12	24	Pieces	135-702032
22	**Hexagon nut M8**	6	12	12	24	Pieces	135-702030
24	**Lock washer M8**	8	14	16	28	Pieces	135-201053

Table 20:HLE 100c

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
16	**Wheel R4OL0027-N4**	12	24	24	48	Pieces	416-201032
18	**Eccentric bush E4XZ0003 N1**	6	12	12	24	Pieces	135-719000
21	**Hexagon nut M12**	6	12	12	24	Pieces	135-728416
22	**Hexagon nut M8**	6	12	12	24	Pieces	135-728414
24	**Lock washer M8**	8	14	16	28	Pieces	135-728720

Table 21: HLE100c - low rust design

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
607	**Baffle**	2	2	4	4	Pieces	125-069700
616	**Drag bar**	2	2	4	4	Pieces	180-300060
615	**Drag bar pressure springs**	4				Pieces	130-003005
130	**Steel strip 0.125 x 38**	Length: see Chapter 5.9.1.3				m	400-300702
131	**Magnetic film**	2 x length: see Chapter 5.9.1.3				m	400-300712

Table 22:HLE100c, steel-strip cover option[15]

Pulley HLE100c		Hole size [mm]	Drawing number	Number [pce.] NL/VL	NL D/VL D	Article number
Tensioning station (complete with bearing and bolt)		32^{K7}	Z4AS 2500	1	2	510-900206
Single axle	**WL/WR/WB**	20^{H7}	Z4AS 2501	1	1	420-100103
Drive station /	**PL90, PLE80/90**	20^{H7}	Z4AS 2501	1	1	420-100103
Gearbox type	**PL115, PLE120/115**	25^{H7}	Z4AS 2504	1	1	420-100105
overhung	**Lenze 52.508.04**	19^{H7}	Z4AS 2509	1	1	420-100106
Bearing	**Lenze 52.508.05**	24^{H7}	Z4AS 2506	1	1	420-100107
Double axle joint-driven station						
Axle distance 100 to 215		28^{H7}	Z4AS 2520	--	1	420-100108
Axle distance > 215		20^{H7}	Z4AS 2501	--	1	420-100103
Double axle driven station		--	on request	--	1	on request

Table 23: Pulley HLE100c

[15] Replacement interval: see chapter 4.2 page 14

6.3 Wearing parts and replacement parts HLE150c

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
14	**Timing belt 32AT10 HPF**	Length L see chapter 5.2.2				m	420-000031
16	**Wheel R4OL0025**	6	12	12	24		416-201020
17	**Wheel R4OL0026**	6	12	12	24	Pieces	416-201010
18	**Eccentric bush E4XZ0001**	6	12	12	24	Pieces	125-071100
21	**Hexagon nut M12**	6	12	12	24	Pieces	135-702032
22	**Hexagon nut M10**	6	12	12	24	Pieces	135-702031
23	**Lock washer 12**	8	14	16	28	Pieces	135-201055
24	**Lock washer 10**	6	12	12	24	Pieces	135-201054

Table 24:HLE 150c

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
16	**Wheel R4OL0025**	6	12	12	24	Pieces	416-201022
17	**Wheel R4OL0026**	6	12	12	24	Pieces	416-201012
18	**Eccentric bush E4XZ0001**	6	12	12	24	Pieces	125-719100
21	**Hexagon nut M12**	6	12	12	24	Pieces	135-728416
22	**Hexagon nut M10**	6	12	12	24	Pieces	135-728415
23	**Lock washer 12**	8	14	16	28	Pieces	135-728730
24	**Lock washer 10**	6	12	12	24	Pieces	135-728725

Table 25: HLE150c - low rust design

Pos.	Name	Number NL	VL	NL D	VL D	Unit	Article Number
607	**Baffle**	2	2	4	4	Pieces	125-069740
616	**Drag bar**	2	2	4	4	Pieces	180-300061
615	**Drag bar pressure springs**	4				Pieces	130-003005
130	**Steel strip 0.125 x 55**	Length: see Chapter 5.9.1.3				m	400-300703
131	**Magnetic film**[16]	4 x length: see Chapter 5.9.1.3				m	400-300712

Table 26: HLE150c, steel-strip cover option[17]

Pulley HLE150c		Hole size [mm]	Drawing number	Number [pce.] NL/VL	NL D/VL D	Article number
Tensioning station (complete with bearing and bolt)		47^{K7}	Z4AS 3247	1	2	510-900301
Drive station / Gearbox type overhung Bearing	**WL/WR/WB**	30^{H7}	Z4AS 3250	1	1	420-100722
	PL115, PLE120/115	25^{H7}	Z4AS 3248	1	1	420-100721
	PL142	40^{H7}	Z4AS 3246	1	1	420-100718
	Lenze 52.508.05	24^{H7}	Z4AS 3249	1	1	420-100724
	Lenze 52.508.06	28^{H7}	Z4AS 3254	1	1	420-100723
Double axle joint-driven station						
Axle distance 150 to 260 mm		41^{H7}	Z4AS 3260	--	1	420-100726
Axle distance > 260 mm		30^{H7}	Z4AS 3250	--	1	420-100722
Double axle driven station		--	on request	--	1	on request

Table 27: Pulleys HLE150

[16] In each groove there are 2 magnetic films stuck next to one another.
[17] Replacement interval: see chapter 4.2 page 14

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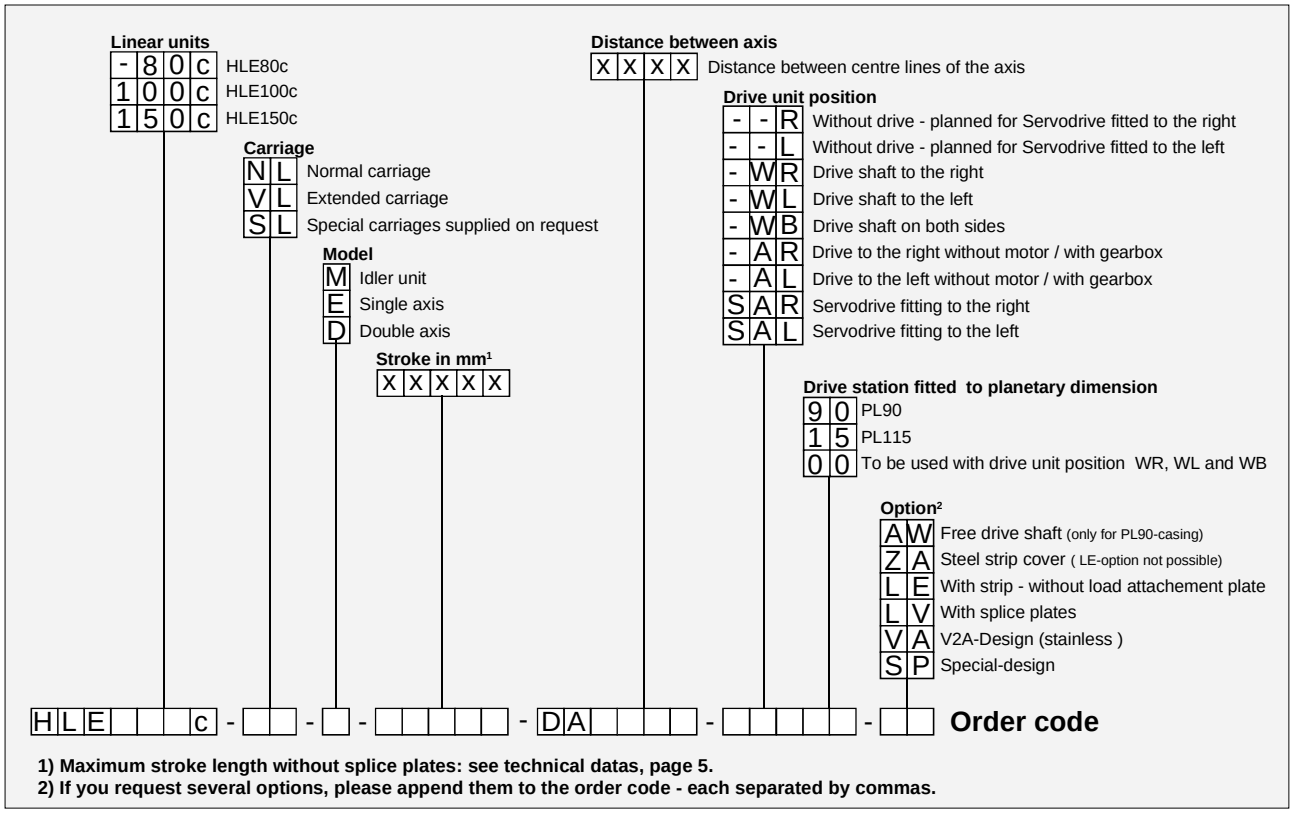
8 Order code

The order code is used to clearly identify a HLE.



Further documentation available:

- ☞ HLEc-System description
- ☞ HLEc-DXF and MI-Files (Manual and CD-ROM) - only in german language available
- ☞ HLEZ-System description (HLE with tooth rack) - only in german language available
- ☞ HZR-System description (Vertical axis)
- ☞ HTR-System description (Telescopic axis) - only in german language available
- ☞ HTR-Product manual (Start-up and projecting)
- ☞ System description Electro-Thrust Cylinder ET - only in german language available
- ☞ Handling and Manufacturing Automation (Brochure)
- ☞ Palletizing System (Brochure)