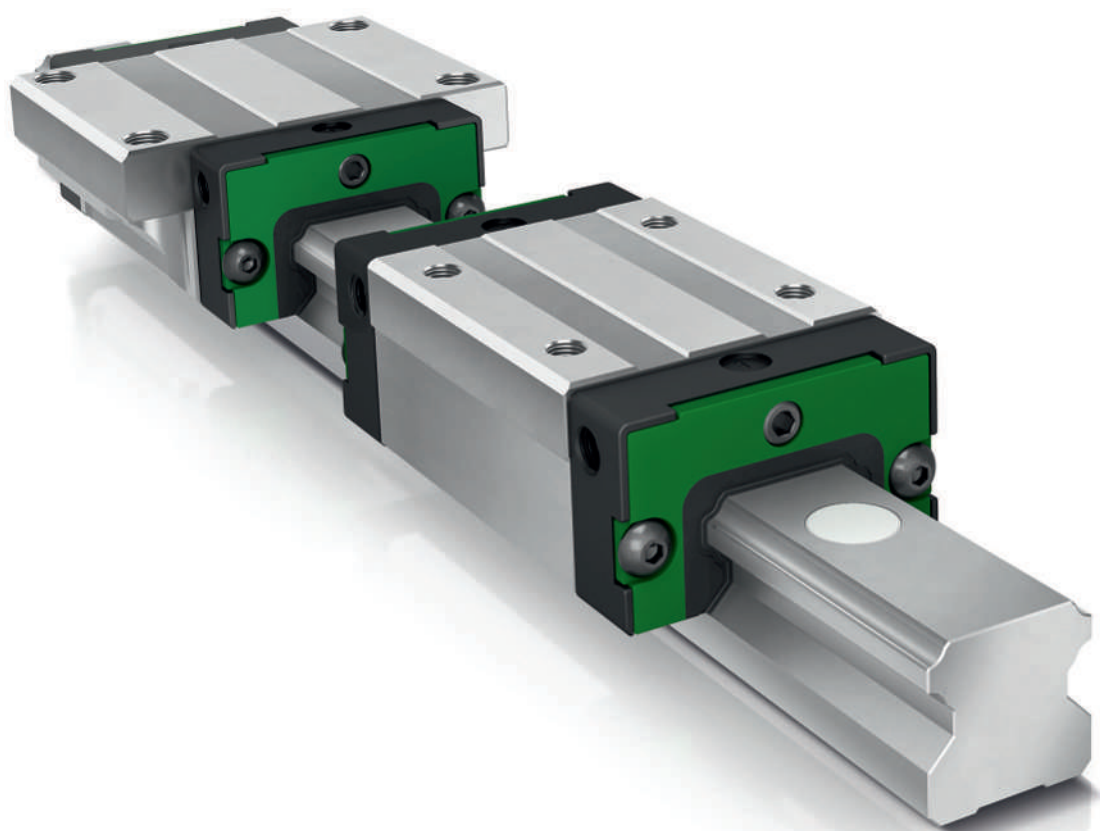




Four-row Linear Recirculating Ball Bearing and Guideway Assemblies in X Arrangement

KLLT

Technical Product Information

We pioneer motion

SCHAEFFLER

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1 Technical principles

1.1 Load carrying capacity and rating life

1.1.1 Load carrying capacity

The size of the guidance unit is determined by the load carrying capacity of the individual elements. The load carrying capacity is described in terms of the basic dynamic load rating C and the basic static load rating C_0 .

Calculation of the basic load rating according to DIN ISO

The calculation of the basic dynamic and static load ratings in the product tables is based on DIN ISO 14728-1 and DIN ISO 14728-2.

Differences between DIN ISO and suppliers from the Far East

Suppliers from the Far East frequently calculate basic load ratings using a basic rating life based on a displacement distance of only 50 km rather than 100 km according to DIN ISO. This results in comparatively higher basic load ratings.

Conversion of basic load ratings

For linear recirculating ball bearing and guideway assemblies, the basic load ratings according to DIN can be converted to basic load ratings as used in the Far East and vice versa:

f1

$$C_{50} = 1,26 \cdot C_{100}$$

f2

$$C_{100} = 0,79 \cdot C_{50}$$

C_{50}	N	Basic dynamic load rating according to DIN ISO 14728-1, based on 50 km
C_{100}	N	Basic dynamic load rating according to DIN ISO 14728-1, based on 100 km

1.1.2 Basic rating life

The basic rating life L and L_h is reached or exceeded by 90 % of a sufficiently large quantity of the same bearings before the first signs of material fatigue occur.

f3

$$L = \left(\frac{C_{100}}{P} \right)^p \cdot 100$$

f4

$$L_h = \frac{833}{H \cdot n_{osc}} \cdot \left(\frac{C_{100}}{P} \right)^p$$

f15

$$L_h = \frac{1666}{v_m} \cdot \left(\frac{C_{100}}{P} \right)^p$$

C ₁₀₀	N	Basic dynamic load rating according to DIN ISO 14728-1, based on 100 km
L _h	h	Basic rating life in operating hours
L	km	Basic rating life as a distance
n _{osc}	min ⁻¹	Number of double strokes per minute
P	N	Equivalent dynamic bearing load
p	–	Life exponent for guide with recirculating ball: p = 3
v _m	m/min	Medium speed

 According to DIN ISO 14728-1:2018-10, the equivalent dynamic load P should not exceed the value 0.5 · C. If lateral forces are present, the frictional locking of the mounting screws should be checked. Ideally, stop edges should be provided.

1.2 Rigidity

1.2.1 Preload

Increasing the preload increases the rigidity of the guidance system. The preload also affects the displacement force of the guidance system: the higher the preload, the greater the displacement force. Furthermore, the preload also influences the operating life of the guidance system.

The approximate calculation of the equivalent static and dynamic load is based on the standard preload.

Under low load and high preload, the values for rating life and static load safety factor may be lower than those calculated using the approximation formulae for the equivalent static and dynamic load.

Linear recirculating ball bearing and guideway assemblies are available in different preload classes.

The preload class affects the characteristics of a carriage.

 1 Preload classes

Preload class	Preload setting
V0 ¹⁾	Light backlash to no backlash
V1	0.02 · C Slight preload
V2	0.08 · C Moderate preload, higher rigidity

¹⁾ Standard preload class

1.3 Friction

Linear guidance systems have a low, uniform resistance to displacement.

Friction is influenced by the following factors:

- load
- preload
- travel velocity
- lubricant (viscosity and quantity)
- temperature
- misalignment
- sliding motion components of the seals

Influence of grease on friction

During commissioning and relubrication, the coefficient of friction increases temporarily due to the presence of fresh grease, but returns to a lower value after a short running-in period.

The friction behavior is determined significantly by the characteristics of the grease used. The consistency and base oil viscosity serve as approximate guide values.



Systems have an increased displacement resistance after initial greasing.

Influence of seals on friction

Contact seals increase the total friction of the linear guide.

The seal friction is at its highest in new guides. It decreases after the running-in period.



Additional wiper variants (accessories) increase the friction to differing extents depending on the seal design.

The coefficient of friction is dependent on the ratio C/P.

2 Coefficient of friction for KLLT

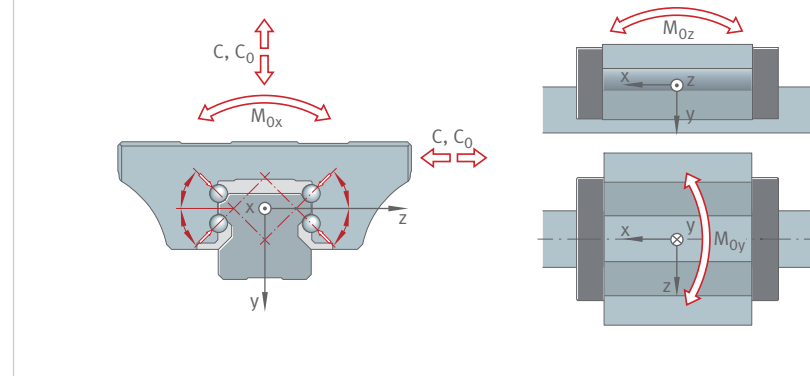
Load C/P		Coefficient of friction μ	
from	up to	from	up to
4.5	35.5	0.003	0.005

1.4 Load carrying capacity

The rows of balls are in an X arrangement on the raceways.

The units can support forces from all directions, apart from the direction of motion, and moments about all axes.

1 Load carrying capacity and contact angle



001B6DF3

1.5 Acceleration and speed

Carriages KWLТ permit accelerations up to 75 m/s^2 and speeds up to 5 m/s .

1.6 Temperature range

As standard, four-row linear recirculating ball bearing and guideway assemblies are suitable for operating temperatures of -10°C to $+80^\circ\text{C}$.

1.7 Coating

To enable standard components to function reliably for long periods without maintenance and even under extreme operating conditions, Schaeffler has developed various coatings for such requirements.

These coatings increase the corrosion resistance or wear resistance of the surface.

❗ Coatings affect system accuracy. Tolerances for coated parts for four-row linear recirculating ball bearing and guideway assemblies in X arrangement ▶ 24 | 14.

❗ Always use coated carriages and coated guideways in combination. Combinations of coated carriages with uncoated guideways lead to a loss of preload.

1.7.1 Corrotect special coating

Corrotect is a surface coating applied by electroplating. The coating gives cathodic corrosion protection and is extremely thin. Under load, it is compacted into the surface roughness profile and partially worn away.

In parts coated with Corrotect, running-in occurs in the area of the seal and an optically bright area develops as a result. The remote cathodic protection mechanism prevents the formation of rust in this area.

Corrotect-coated parts have the suffix RROC, which is also abbreviated to RR.

Benefits of Corrotect

- resistance to moisture, salt spray, dirty water, and weakly alkaline and weakly acidic media
- does not impair the load carrying capacity, in contrast to the use of corrosion-resistant steels
- extremely resistant to corrosion
- protection against rust on all surfaces
- protection against rust on smaller bright spots due to the cathodic protection effect
- protection against EP additives
- good thermal conductivity
- compliant with RoHS Directive 2011/65/EU

Applications

Components coated with Corrotect are particularly suitable when corrosion resistance is paramount.

Ordering designation

The ordering designation for a Corrotect four-row linear recirculating ball bearing and guideway assembly in X arrangement KLLT 45-A with Cr(VI)-free coating is, for example:

- KLLT45-A-W1-...-RROC

Technical/physical data for Corrotect

3 Corrotect data

Features	Data
Suffix	RROC
Color	Colorless, blue to iridescent
Coating thickness ¹⁾	0.5 µm to 3 µm
Composition	Zinc alloyed with iron
Coating hardness	300 HV
Corrosion protection ²⁾	96 h
Coating resistance	Coating has reduced corrosion resistance for pH value 6 and pH value 8
Wear protection	No
Maximum single-piece length	3500 mm
Cr(VI)-free	Yes

¹⁾ Thickness in functional area

²⁾ Salt spray test to DIN EN ISO 9227

2 Four-row linear recirculating ball bearing and guideway assemblies KLLT

2.1 Product design

2.1.1 Carriage

The four-row linear recirculating ball bearing and guideway assemblies KLLT are available in 6 sizes (15, 20, 25, 30, 35, 45) and with carriages in 9 designs. Carriages KWLТ and guideways TKLT can also be ordered separately. The matching guideways are available in freely selectable lengths up to $10 \times l_{\max}$, under consideration of the maximum lengths that can be supplied. The carriages are supplied with a dummy guideway/assembly aid.

! The dummy guideway/assembly aid remains in the carriage during assembly and disassembly to prevent the loss of rolling elements. Use the dummy guideway/assembly aid when assembling and disassembling the carriage. Store the dummy guideway/assembly aid in a safe place.

2 Carriage



001B30A0

1	KWLТ...-A, KWLТ...-AL	2	KWLТ...-H, KWLТ...-HL
3	KWLТ...-S, KWLТ...-SL	4	KWLТ...-US, KWLТ...-ESC
5	KWLТ...-AS		

All carriages KWLТ are first greased at the plant and also have lubricant reservoirs filled with mineral oil.

Overview of carriage designs

- Designs with flange
KWLTL..-A, KWLTL..-AL, KWLTL..-AS
The wider design results in a higher torque rigidity in the direction of travel.
- Designs with standard lengths
KWLTL..-A, KWLTL..-H, KWLTL..-S
- Narrow designs
KWLTL..-H, KWLTL..-HL, KWLTL..-S, KWLTL..-SL, KWLTL..-ESC, KWLTL..-US
- Long designs
KWLTL..-AL, KWLTL..-HL, KWLTL..-SL
Through the long design, a higher basic load rating is achieved.
- Tall designs
KWLTL..-H, KWLTL..-HL
- Shortened designs
KWLTL..-ESC, KWLTL..-US, KWLTL..-AS
- Short design
KWLTL..-ESC



Do not move carriages over counterbores of the mounting holes that have not been closed off. Ensure that the seal lips of the wipers are protected if the carriage is to be moved.

2.1.2 Guideways

Guideways TKLT can be ordered individually.

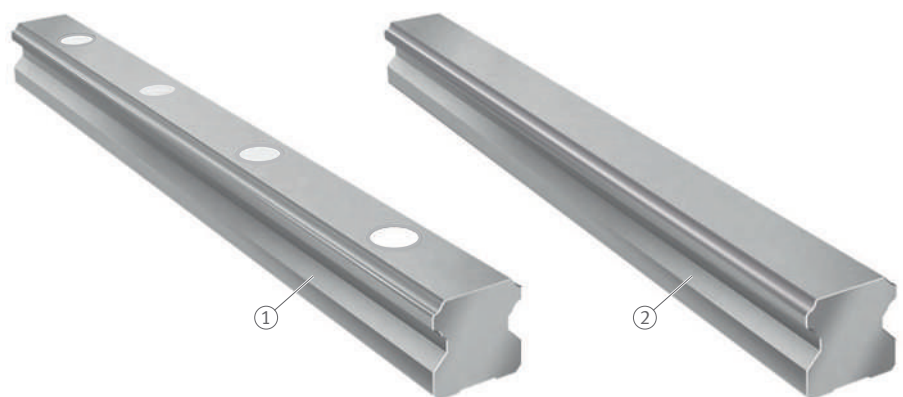
The guideways are made from hardened steel and are ground on all faces, the rolling element raceways are precision ground. For fixing to the adjacent construction, the guideways have mounting holes with sharp-edged counterbores for the screw heads.

The guideways are fixed from above as standard.

Guideways with the suffix U should be mounted from below and have threaded blind holes.

If the desired guideway length exceeds the value $l_{\max}$ in the product tables, the guideway will be delivered in multiple sections.

3 Guideways



001B30DA

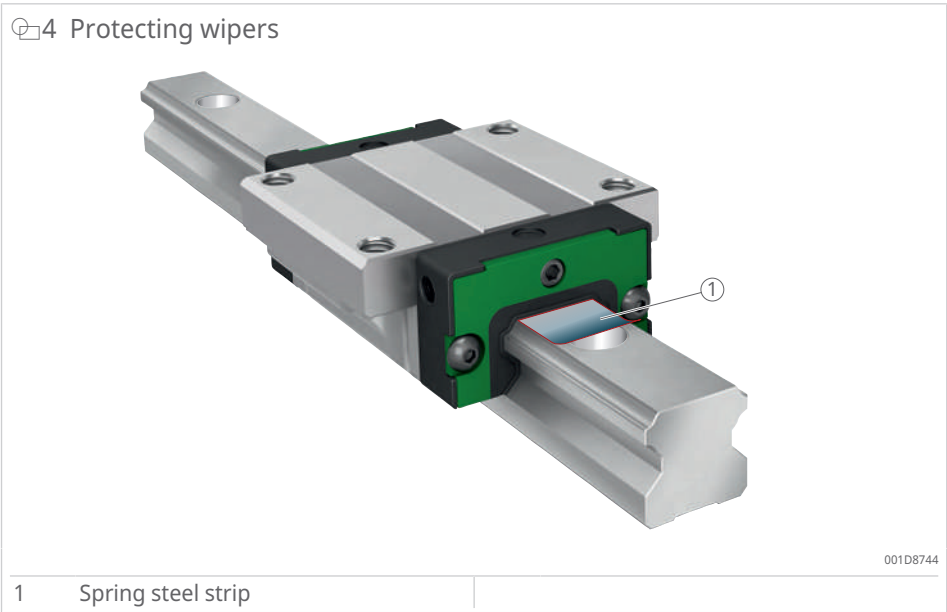
1 Guideway TKLT with plastic closing plugs

2 Guideway TKLT-U, mounted from below

If the carriage is moved over unsealed mounting holes, the wipers may be damaged.

If possible, lightly oil the wipers before they are pushed onto the guideway. To protect the wipers, for example, a spring steel strip (0.2 mm thick) can be inserted between the guideway and the carriage. When doing so, bend the ends of the spring steel strip slightly upward in front of and behind the carriage.

The spring steel strip must be produced by the customer.

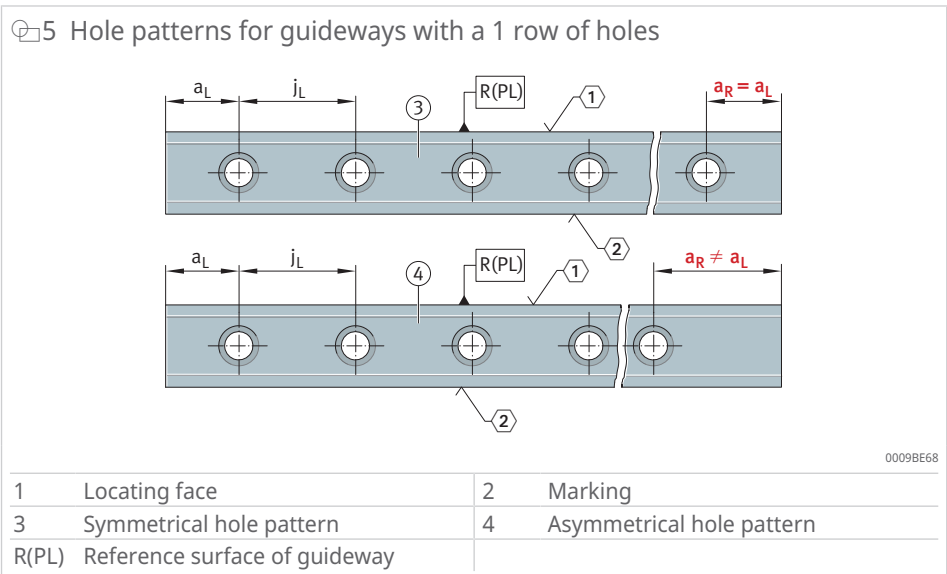


2.1.2.1 Hole patterns for guideways

Unless otherwise specified, the guideway has a symmetrical hole pattern with $a_L = a_R$.

An asymmetrical hole pattern may also be available upon request. In this case, $a_L \geq a_{L \min}$ and $a_R \geq a_{R \min}$.

The guideways have 1 locating face. When ordering a guideway with an asymmetrical hole pattern, the distance from the left is a_L and the distance from the right is a_R .



2.1.2.2 Maximum number of pitches between holes

The number of pitches between holes is the whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L \min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern, the following applies:

$$a_L = a_R = \frac{1}{2} \cdot (l - n \cdot j_L)$$

Number of holes:

$$x = n + 1$$

$a_{L \min}$	mm	Minimum values for a_L
a_L	mm	Distance from the start of the rail to the next hole
$a_{R \min}$	mm	Minimum values for a_R
a_R	mm	Distance from the end of the rail to the next hole
j_L	mm	Distance between holes
l	mm	Rail length
n	–	max. number of pitches
x	–	Number of holes

! If the minimum values for a_L and a_R are not observed, the counterbores of the holes may be intersected. Risk of injury.

2.1.2.3 Multi-piece guideways

Guideways that are longer than l_{max} are assembled from guideway sections and joined. The individual sections are matched to each other and marked. The division is always made at the midpoint between the mounting holes.

6

Marking of multi-piece guideways

000B640D

1	Locating face	2	Marking
R(PL)	Reference surface of the guideways		Guideway sections: 1A, 1A 1B, 1B 1C, 1C 2A, 2A 2B, 2B 2C, 2C

 For multi-piece guideways, the front gap between 2 sections must be < 0.05 mm.

2.1.3 Design

The linear recirculating ball bearing and guideway assemblies KLLT are available in many designs.

4 Available designs

Design	Description
A	Carriage with flange in standard height
AL	Long carriage with flange in standard height
AS	Short carriage in standard height
S	Narrow carriage in standard height
SL	Narrow, long carriage in standard height
H	Narrow, tall carriage
HL	Narrow, tall, long carriage
US	Narrow, short carriage in standard height
ESC	Narrow, short, low carriage

2.1.4 X arrangement

The linear recirculating ball bearing and guideway assemblies KLLT have 4 rows of balls with a contact angle of 45° between the rolling elements and the raceways. The X arrangement ensures even load distribution, load capacity, and rigidity in all 4 main load directions. Deviations in the adjacent construction can thus be compensated for even in preloaded systems, ensuring smooth running. Friction is minimized due to the two-point contact of the rolling elements.

2.1.5 Interchangeability

Carriages KWLТ and guides TKLT of the same size can be combined or replaced.

If a combination or replacement is made within an accuracy class, the accuracy class is retained for the overall system or the combination of carriages and guideways.

The joint delivery of carriages and guideways in separate packaging units is standard.

5 Interchangeability of carriages and guideways

Accuracy class			Preload class		
Carriage KWLТ	Guideway TKLT	Unit KLLT	V0 ¹⁾	V1	V2
G2	G2	G2	✓	✓	✓
G3	G3	G3	✓	✓	✓
G4 ¹⁾	G4 ¹⁾	G4 ¹⁾	✓	✓	✓

✓ available

¹⁾ Standard

2.2 Sealing

Double-lipped elastic end wipers are fitted to the end pieces of the carriages on both sides to retain the lubricant within the system.

Upper and lower sealing strips ensure a secure seal and protect the rolling system from contamination even in critical environmental conditions.



If the contamination level is extremely high, additional wipers can be mounted. If necessary, additional covers should be installed.

2.3 Mounting

2.3.1 Mounting screws and tightening torques

The four-row linear recirculating ball bearing and guideway assemblies KLLT may be secured only using the specified mounting screws.

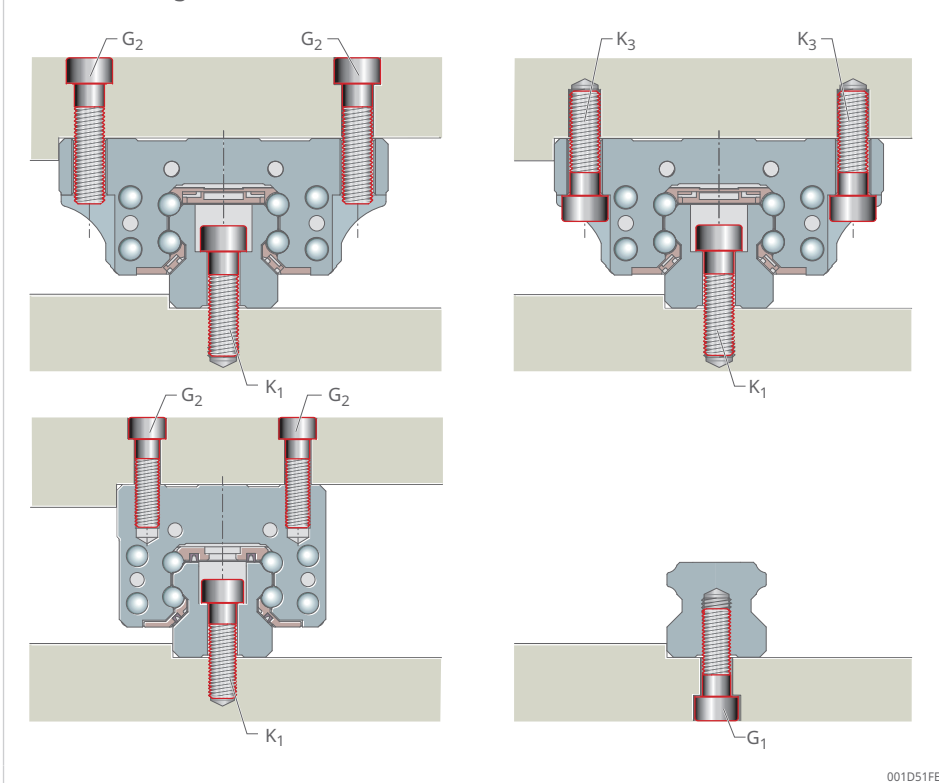
! The tightening torques M_A apply to mounting screws coated with preservative. Any deviations will affect the security of the screw connections as well as the accuracy, rigidity, and operating life of guidance systems. Always observe the specifications for the mounting screws and tightening torques M_A . Use only mounting screws of the specified strength class. Particularly if there is a possibility of settling, the mounting screws must be secured against rotation. Ensure that the adjacent construction has adequate strength.

Mounting screws are not included in the delivery.

The technical performance capability can be achieved only if using:

- all mounting threads
- the specified screw quality
- the prescribed tightening torques for the mounting screws

 7 Mounting screws



001D51FE

G ₁	–	Fixing screw
G ₂	–	Mounting screw
K ₁	–	Mounting screw on the guideway, DIN ISO 4762
K ₃	–	Mounting screw on carriage from below, DIN ISO 4762

6 Tightening torque M_A

Mounting screws	Grade 8.8	Grade 10.9	Grade 12.9
DIN 912	M_A	M_A	M_A
–	Nm	Nm	Nm
M4	3	4.6	5
M5	5.9	8.6	10
M6	10.1	14.9	17
M8	24.6	36.1	41
M8	24.6	36.1	41
M12	84	123	140

2.4 Lubricant and lubrication connections

Linear recirculating ball bearing and guideway assemblies KLLT are suitable for grease lubrication. The systems and carriages are supplied with initial greasing as standard.

Properties of the lubricant:

- KP2N-20 according to DIN 51825
- NLGI 2
- Base oil viscosity ISO VG 150 to ISO VG 220

Lubrication is carried out via lubrication connections in the end or side face of the end piece or from above via the adjacent construction and lubrication hole in the end pieces. A lubrication connection for manual lubricators is included in the delivery to enable front-side relubrication. Other optional lubrication connections are available.

Other optional lubrication connections can be screwed into the side or front of the end piece. The relubrication holes are sealed on the front side by a screw plug and on the side and top of the end piece by a membrane.



Protect the carriages against solid and liquid contaminants.

2.4.1 Lubrication connection

2.4.1.1 Lubrication connection on front face

A lubrication connection for front-face relubrication via manual lubricators is supplied loose; additional lubrication connections are available as an option ►33 | 3.7.2.

Before screwing in the lubrication connection, remove the corresponding screw plug.

2.4.1.2 Lubrication connection on lateral face

Depending on the position of the lubrication connection and other accessories, suitable lubrication connections are available as an option



The lubrication channel is closed and does not open until the lubrication connection is screwed in. Note the permissible lubrication connections ►33 | 3.7.2.

Use a suitable tool to screw the lubrication connection into the side lubrication opening until a quiet clicking sound can be heard.



Once the side lubrication connection is open, it will not close again when the lubrication connection is removed. An open side lubrication connection can be closed using a set screw DIN EN ISO 4026.

Use only permissible lubrication connections. Otherwise, there is a risk that the membrane will not open correctly or the end piece will be damaged.

 7 Set screws

Size	Set screw	Max. tightening torque
		M _A
		Nm
15	M3×8	0.5
20	M5×8	0.5
25	M5×8	0.5
30	M6×12	0.5
35	M6×16	0.5
45	M6×16	0.5

2.4.1.3 Lubrication connection on top face

Before using the upper relubrication hole, pierce the membrane with a hot, pointed object.



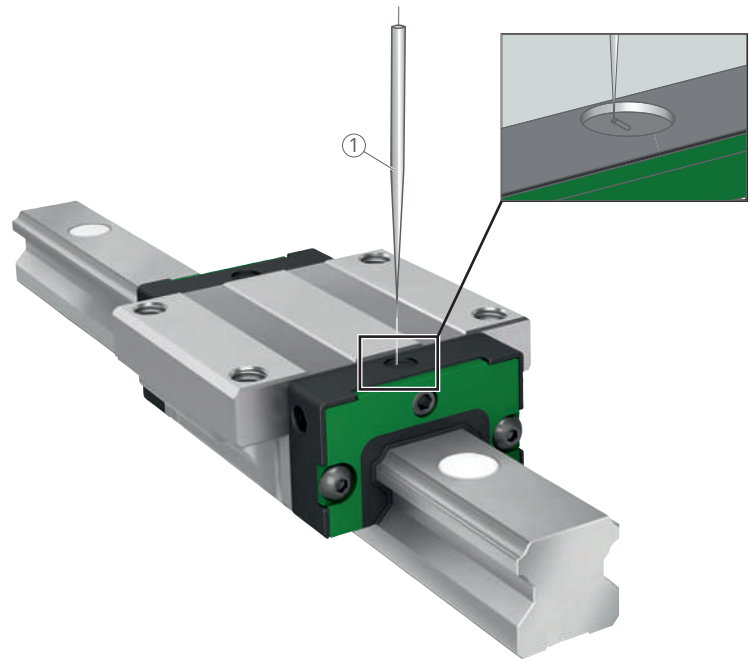
Make sure that the adjacent construction completely covers the carriage (including end pieces) and that the original O-rings or adapter pieces (optional accessories) are correctly mounted. Otherwise, lubricant can escape through the upper lubrication hole.



Once the relubrication hole has been opened, it cannot be closed again.

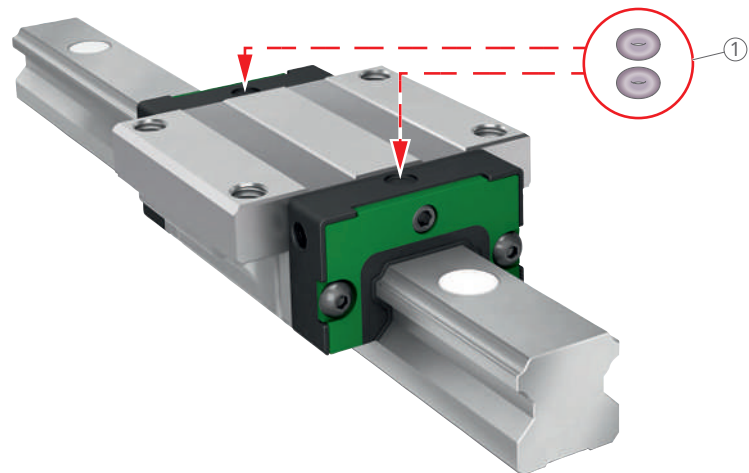
If carriages are lubricated from above by the adjacent construction, note the following:

- Carefully pierce the membrane of the upper relubrication bore using a hot, pointed object (metal needle max. 0.8 mm) ►19 |  8.
- Seal using an O-ring. Use only original MSATZ.KWLT ►32 | 3.6.
- Cover the O-ring completely with the adjacent construction.

 8 Opening the lubrication hole

001DCA1D

1 Metal needle max. 0.8 mm

 9 Inserting the O-rings

001DCA0D

1 O-ring

2.4.2 Relubrication quantity

Relubrication should preferably be carried out with several partial quantities at various times instead of the complete quantity at the time of the relubrication interval.

1. Grease in partial quantities of the total lubricant quantity.
2. After supplying partial quantities of lubricant, move the carriage along the guideway with a minimum stroke of 4× the length of the carriage body. The lubricant is evenly distributed inside the carriage.
3. Before the carriages are screw-mounted to the adjacent construction, check that the O-rings are properly seated if necessary.

 8 Relubrication quantities for carriages KWL T

Size	Relubrication quantity		
	Short carriage	Standard carriage	Long carriage
	≈g	≈g	≈g
15	0.5	0.6	–
20	0.7	0.8	0.8
25	0.8	0.9	1.1
30	1.7	1.8	2.0
35	1.9	2.1	2.3
45	–	2.4	2.8

2.4.3 Lubricant reservoir

The linear recirculating ball bearing and guideway assemblies KLLT are supplied as standard with a lubricant reservoir located in the end piece. The lubricant reservoir ensures long-term and uniform distribution of the lubricant, allowing the assembly to operate over particularly long distances without the need for relubrication.



The lubricant reservoir is filled with a mineral oil ISO VG 680 with EP additives at the factory.

2.4.4 Delivered condition

Linear recirculating ball bearing and guideway assemblies KLLT are supplied with initial greasing (standard), preservative (suffix UG) or special greasing.

- Initial greasing (standard)
Guides are provided with initial greasing and the lubricant reservoir in the end piece is pre-filled.
- Preservative (suffix UG)
Guide and lubricant reservoir are supplied without lubricant.
- Special greasing is possible on customer request

The preservative is compatible with oils and greases having a mineral oil base.

Linear guides run exclusively in the mixed friction range. As a result, doped lubricants (type P to DIN 51502) should preferably be used.



Notes on lubrication

- Do not use drilling oils or other coolant emulsions. These have the effect of thinning the lubricants and may cause corrosion.
- Do not use lubricants with solid additives.

9 Delivered condition

Designation	Delivered condition					
	Lubrication				Mounting	
	With pre-servative	Initial greasing ¹⁾	Basic greasing	Special greasing	Preassembled as unit	Carriages and guideways separately ¹⁾
KLLT	o	✓	–	o	o	✓

- ✓ available
o available as an option
– not available

¹⁾ Standard

2.4.5 Suitable lubricants

The selection of a suitable grease is an essential factor for the performance capability and rating life of a linear guide. For decades, Schaeffler has been researching the development of greases to determine which grease provides the best solution for each application. To ensure that bearings remain reliable, durable, and cost-effective, Schaeffler offers Arcanol greases that are specially designed for use with linear guides. Arcanol greases are a guarantee for maximum performance in linear applications. All Arcanol greases have undergone extensive suitability testing.

10 Recommended greases

Grease	Arcanol LOAD150	Arcanol MULTI2	Arcanol MO-TION2	Arcanol FOOD2	Arcanol CLEAN-M
Application	Point contact, line contact	Point contact	Short stroke	Food industry, NSF H1, kosher, halal	Semiconductor industry, clean room industry, pharmaceutical industry
Base oil type	Lithium complex soap	Lithium soap	Lithium soap	Aluminum complex soap	Ether oil
Classification according to DIN 51825	KP2N	KP2N-30	KPF2K-20	KHC1K-40	–
NLGI grade	2	2	2	1	2
Base oil ISO VG	160	80	100	150	103
Code designation	L271	L057	L409	L460	L430

When using food-grade grease (Arcanol FOOD2), it is recommended to halve the lubrication period determined. Additional greases for use in special environmental conditions are available as options.

Used lubricants should be disposed of using environmentally friendly methods.

The handling and use of lubricants is governed by national environmental protection and occupational safety regulations, as well as by information from the lubricant manufacturers. These regulations must be observed.

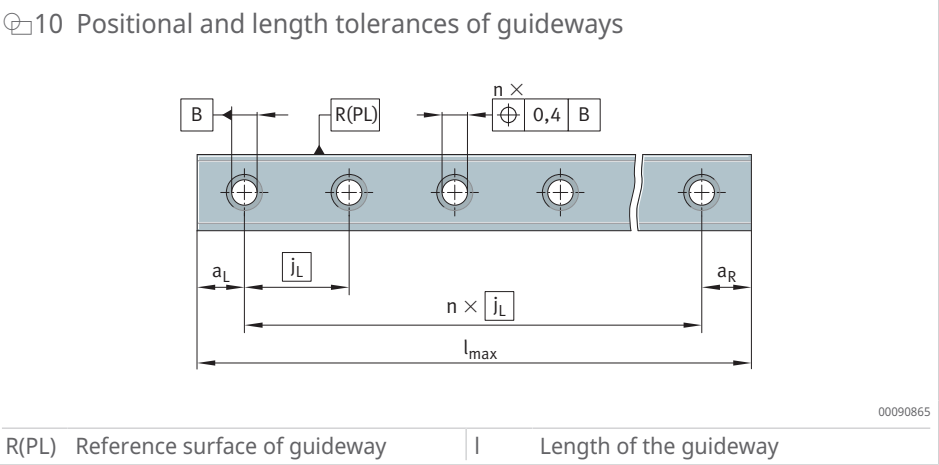
Further information

TPI 168 | Arcanol rolling bearing greases |
<https://www.schaeffler.de/std/1F66>

2.5 Tolerances of guideways

2.5.1 Positional and length tolerances of guideways

The positional tolerances are independent of the guideway length.



11 Length tolerances of guideways

Length tolerance	
Depending on guideway length l	Multi-piece guideways
mm	mm
< 4000	
± 0.1	± 3 over the whole length

12 Sections for multi-part guideways

Rail length ¹⁾	Maximum permissible number of sections ²⁾
mm	
< 4000	1
> 4000	Defined at the factory

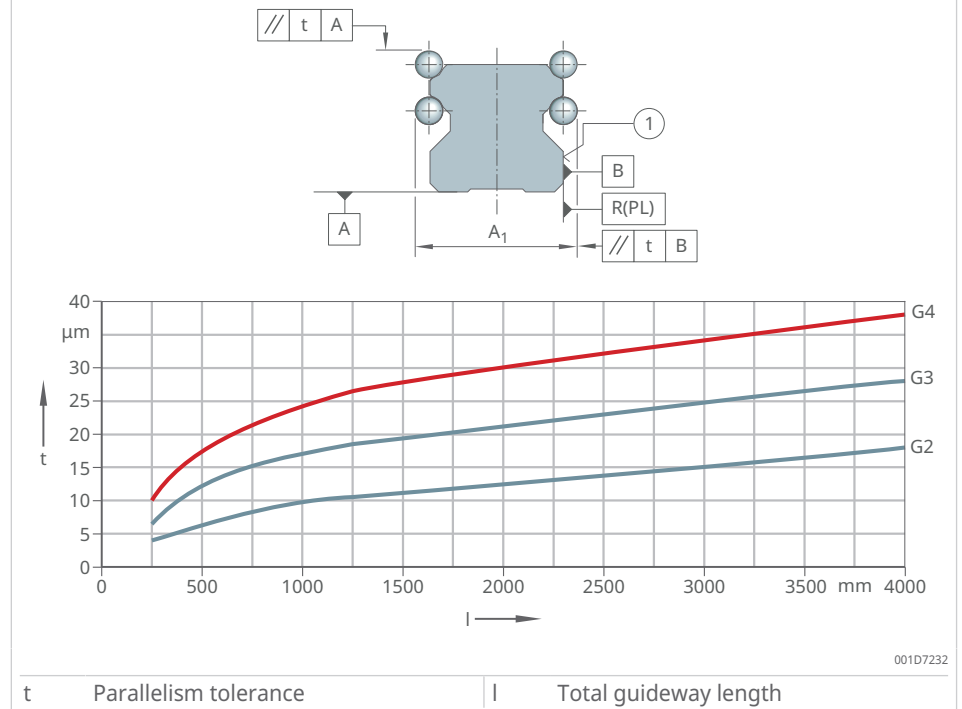
¹⁾ Minimum length of a section = 600 mm

²⁾ Maximum of 10 sections are possible

2.5.2 Accuracy classes

Four-row linear recirculating ball bearing and guideway assemblies KLLT are supplied in the accuracy classes G2, G3, and G4.

11 Accuracy classes and parallelism tolerances



2.5.3 Tolerances

The tolerances are arithmetic mean values. They relate to the center point of the screw mounting surfaces or locating surfaces of the carriage.

The dimensions H and A_1 should always remain within the tolerance irrespective of the position of the carriage on the guideway.

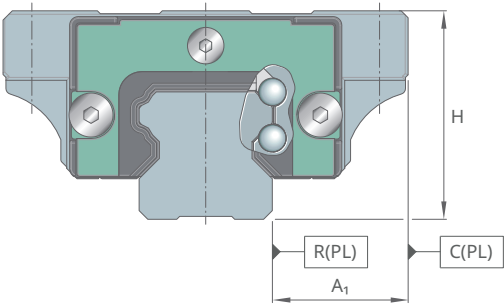
13 Tolerances for height H and spacing A_1

Tolerance		Accuracy		
		G2	G3	G4 ¹⁾
		μm	μm	μm
Tolerance for height	H	± 20	± 25	± 80
Difference in height ²⁾	ΔH	10	15	20
Tolerance for spacing	A_1	± 15	± 20	± 80
Difference in spacing ²⁾	ΔA_1	15	22	30

¹⁾ Standard

²⁾ Dimensional difference between several carriages on one guideway, measured at the same point on the guideway

12 Reference dimensions for parallelism of raceways to locating faces



001D722D

Tolerances with Corrotect coating

For coated units, the values for the appropriate accuracy class must be increased by the values for the coating.

 Coated systems are available only in accuracy class G3.

14 Tolerances for coated parts

Tolerance ³⁾		Corrotect
		RROC
		µm
Tolerance for height	H	+6
Difference in height ⁴⁾	ΔH	+3
Tolerance for spacing	A ₁	+3
Difference in spacing ⁴⁾	ΔA ₁	+3

³⁾ Tolerance range shift for coated guideways and coated carriages

⁴⁾ Dimensional difference between several carriages on one guideway, measured at the same point on the guideway

2.6 Design of the bearing support

2.6.1 Geometrical and positional accuracy of the mounting surfaces

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.



Tolerances of mounting surfaces and parallelism of mounted guideways must be observed.

Surfaces should be ground or milled with the aim of achieving a mean roughness value Ra_{max} 1.6.

Any deviations from the stated tolerances will impair the overall accuracy, alter the preload and reduce the operating life of the guidance system.

2.6.2 Height difference ΔH_L and ΔH_Q

Values according to the following equations are permitted for the height differences in the longitudinal and transverse direction.

Height difference in longitudinal direction ΔH_L :

f10

$$\Delta H_L = a_L \cdot a_{L_{BF}} \cdot b_L$$

Height difference in transverse direction ΔH_Q :

f11

$$\Delta H_Q \geq |\Delta H_{QC} + \Delta H_{QR}|$$

f12

$$\Delta H_{QC} = a_Q \cdot b_Q$$

f13

$$\Delta H_{QR} = a_Q \cdot b_Q$$

a_L	–	Factor in longitudinal direction, depending on preload class
$a_{L_{BF}}$	–	Factor in longitudinal direction, depending on design of carriage
a_Q	–	Factor in transverse direction, depending on preload class
b_L	mm	Center distance of carriages in longitudinal direction
b_Q	mm	Center distance of carriages in transverse direction
ΔH_L	μm	Maximum permissible deviation in longitudinal direction from theoretically precise position
ΔH_Q	μm	Maximum permissible deviation in transverse direction from theoretically precise position
ΔH_{QC}	μm	Actual deviation of guide table in transverse direction
ΔH_{QR}	μm	Actual deviation of guide bed in transverse direction

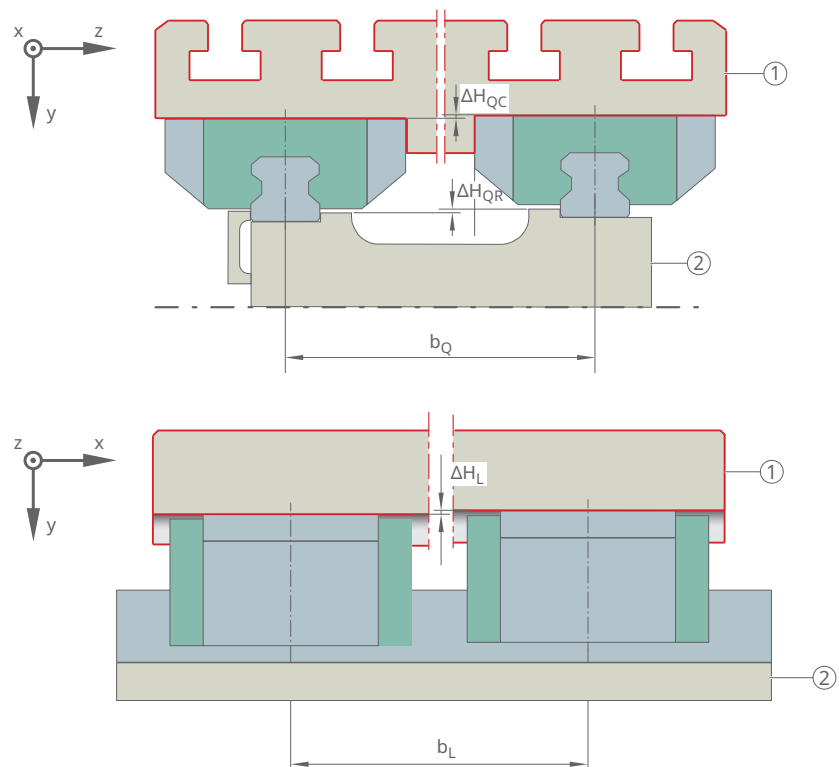
15 Factors a_L and a_Q

Preload class	a_L	a_Q
V0 (standard)	0.09	1.0
V1	0.1	0.8
V2	0.08	0.2

16 Factor a_{LBF}

Carriage design	a_{LBF}
KWLT...-A (-H, -S)	Standard
KWLT...-AL (-HL, -SL)	Long
KWLT...-ESC (-US, -AS)	Short

13 Height difference in longitudinal and transverse direction



001DFF59

1 Guide table

2 Guide bed

For guidance units arranged in parallel, the height differences ΔH_L , ΔH_{QC} and H_{QR} apply. If the maximum values are used, this may increase the displacement resistance.

1. Check the height differences using the specified values.
2. If there is any deviation, rework the contact surfaces on the connecting structure.

2.6.3 Tolerances of mounting surfaces and parallelism of mounted guideways and carriages

The t values apply for parallelism, flatness, and perpendicularity. The t values also apply for guideways and carriages arranged in parallel.

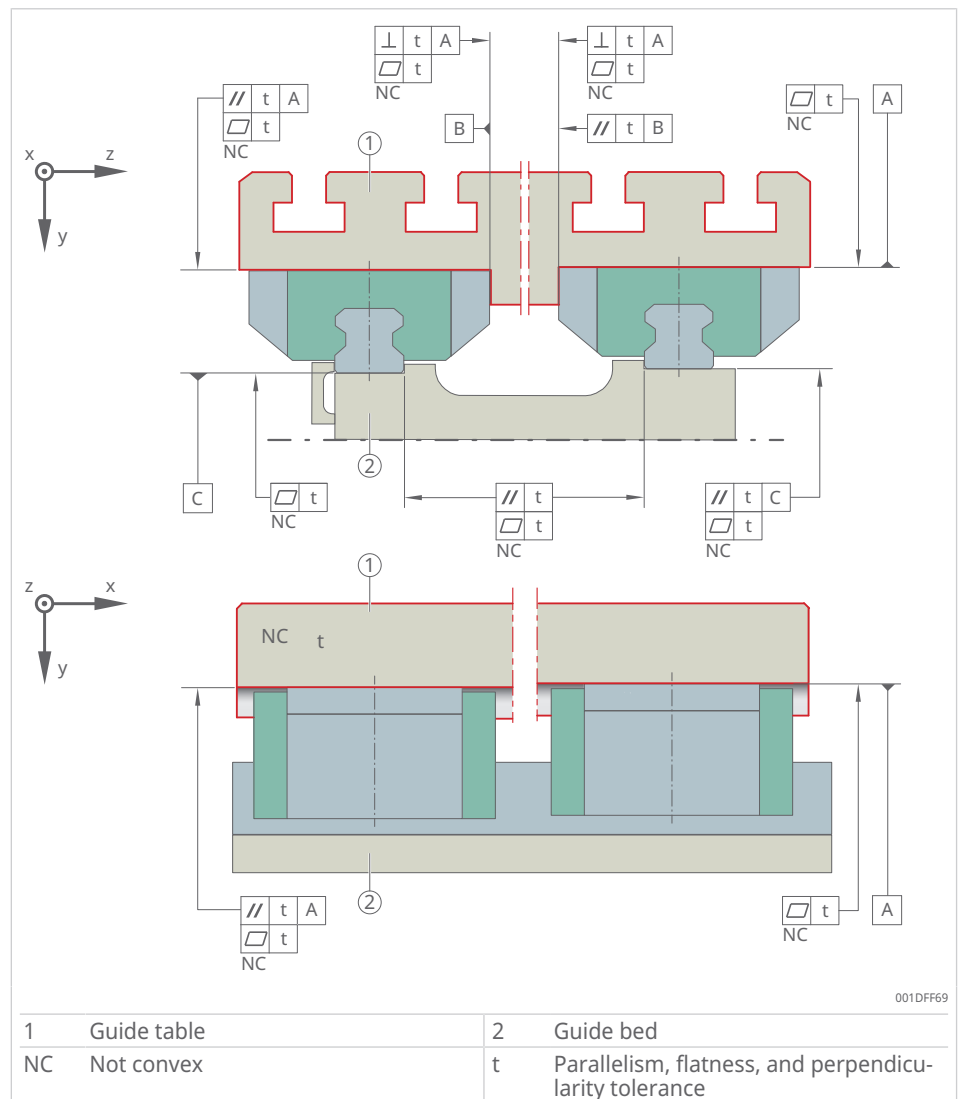
If the maximum values are used, this may increase the displacement resistance.

If larger tolerances apply, please contact us.

17 Parallelism, flatness, and perpendicularity tolerance

Designation	Tolerance t		
	Preload class		
	V0 (standard)	V1	V2
	μm	μm	μm
KWLT15	8	8	5
KWLT20	9	9	6
KWLT25	11	11	7
KWLT30	13	13	8
KWLT35	15	15	10
KWLT45	17	17	12

1. Check tolerance t against the specified values.
2. If there is any deviation, rework the contact surfaces on the locating structure.



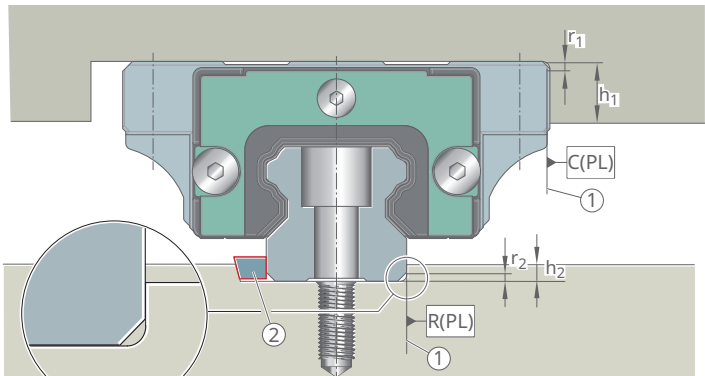
2.6.4 Locating heights and corner radii

The locating heights and corner radii can be designed using these specifications.

18 Locating heights h_1 , h_2 and corner radii r_1 , r_2

Designation	h_1	h_2	r_1	r_2
	mm	mm	mm	mm
	max.	–	max.	max.
KLLT15	3.5	4	0.4	0.6
KLLT20	4	5	0.6	0.6
KLLT25	5	5	0.8	0.8
KLLT30	5	6	0.8	0.8
KLLT35	6	6	0.8	0.8
KLLT45	8	8	0.8	0.8

14 Locating heights and corner radii



001D575F

1 Locating face	2 Wedge strip
C(PL) Reference surface of carriage	R(PL) Reference surface of guideway

3 Sealing and lubrication components

3.1 Sealing components and lubrication components – KIT system

Linear guides with their extensive standard accessories can be used in many areas. Because the guides are used in an extremely wide variety of applications, the lubrication and sealing components often have to meet additional requirements.

3.2 Seals

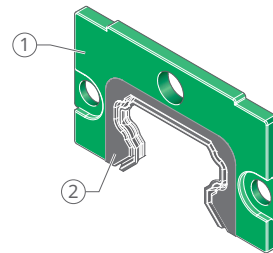
The linear recirculating ball bearing and guideway assemblies are equipped as standard with end wipers and sealing strips to prevent the ingress of contaminants, chips and liquids as well as the escape of lubricant and thereby increase the rating life. The selection of a suitable sealing system is based on the use case for the guide system.

3.3 End wipers

End wipers are double-lipped scraping seals attached to the front faces of the carriages. End wipers have a sealing lip that faces outward and inward. The sealing lip that faces outward prevents the ingress of dirt particles, while the sealing lip that points inward also prevents the lubricant from being discharged from the carriage. Depending on the application, this can increase the relubrication interval.

The carriages and systems are equipped with double-lipped end wipers as standard.

15 End wiper KIT.KWLT..-OS-100



001B5914

1 End wipers

2 Double-lip sealing lip

3.4 Gap wipers

Gap wipers are non-contact wipers attached to the front faces of the carriages. Gap wipers protect against coarse dirt. A narrow gap remains between the guideway and the wiper.

The standard end wiper can be replaced by the gap wiper.

Gap wipers are suitable for applications with a low degree of contamination and affect the guide system through lower friction and shorter relubrication intervals.



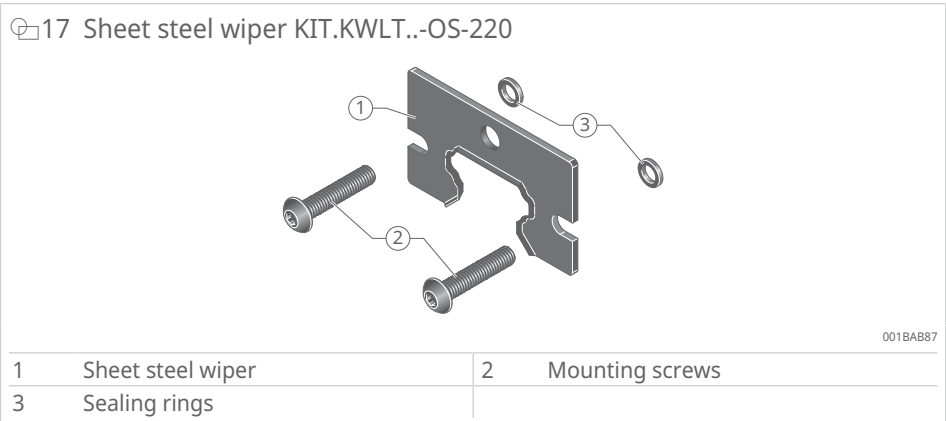
3.5 Additional wipers

In addition to the standard seal, other additional wipers can be used in a cascade.

Depending on the version, additional wipers are suitable for protection against heavy soiling such as coarse chips or liquids. Additional carrier plates or additional wipers cascading in succession enhance the sealing function.

3.5.1 Sheet steel wiper

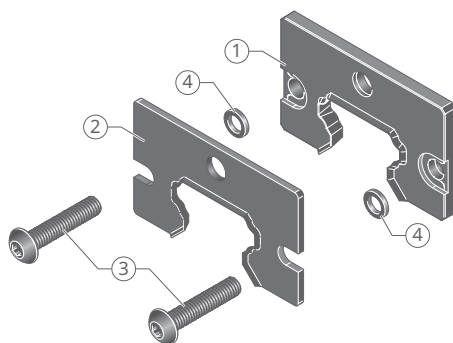
The KIT.KWLT..-OS-220 is a non-contact sheet wiper made of burnished spring steel. It protects the end wiper behind it from coarse dirt.



3.5.2 Additional wipers made of NBR

The KIT.KWLT..-OS-360 is a contact wiper made of NBR with additional non-contact metal wiper made of burnished spring steel to protect the wiper.

18 Additional wiper KIT.KWLT..-OS-360

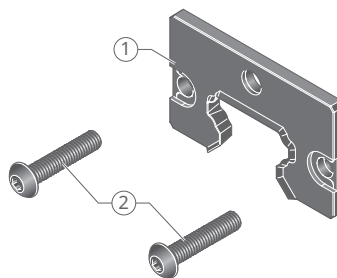


001BAB97

1	Wiper made of NBR	2	Sheet steel wiper
3	Mounting screws	4	Sealing rings

The KIT.KWLT..-OS-370 is a contact wiper made of NBR.

19 Additional wiper KIT.KWLT..-OS-370



001BABB0

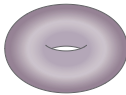
1	Wiper made of NBR	2	Mounting screws
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3.6 Lubrication components

Additional accessories are required if relubrication is carried out from above via the adjacent construction. The listed parts must be ordered separately.

For carriages with a standard height, the MSATZ.KWLT..-0200 enables lubrication from above.

 20 O-ring MSATZ.KWLT..-0200



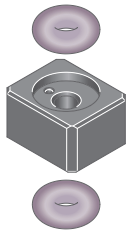
001D81F4

 19 O-ring MSATZ.KWLT..-0200

Size	Designation
15	MSATZ.KWLT15-0200
20	MSATZ.KWLT15-0200
25	MSATZ.KWLT25-0200
30	MSATZ.KWLT25-0200
35	MSATZ.KWLT25-0200
45	MSATZ.KWLT25-0200

For carriages with a tall height, the MSATZ.KWLT..-0100 enables lubrication from above.

 21 Adapter with two O-rings MSATZ.KWLT..-0100



001D81E1

 20 Adapter with two O-rings MSATZ.KWLT..-0100

Size	Designation
15	MSATZ.KWLT15-0100
20	MSATZ.KWLT15-0100
25	MSATZ.KWLT25-0100
30	MSATZ.KWLT30-0100
35	MSATZ.KWLT35-0100
45	MSATZ.KWLT45-0100

3.7 Lubrication connections

The linear guides must be lubricated with grease or oil.

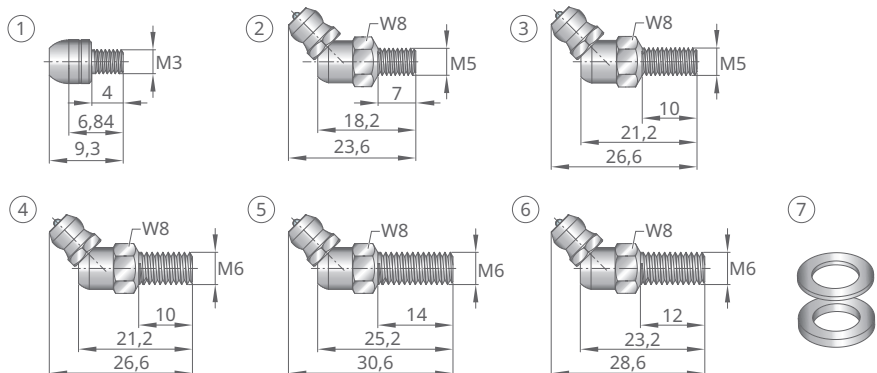
Depending on the position of the lubrication connection and the other accessories, suitable lubrication connections are available as special accessories.

3

3.7.1 Standard lubrication connections

A lubrication connection for front-side relubrication using manual lubricators and shims is supplied loose. Shims can optionally be used to align the lubrication connection.

22 Standard lubrication connections KLLT



001D7589

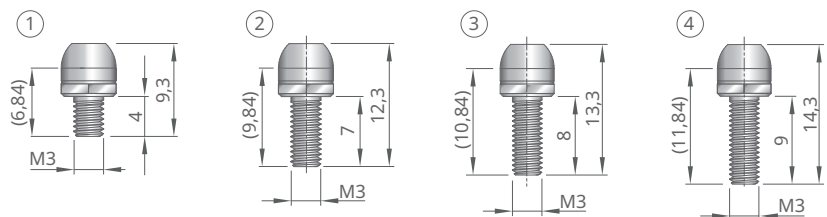
1	Size 15, S500	2	Size 20, S504
3	Size 25, S505	4	Size 30, S510
5	Size 35, S506	6	Size 45, S507
7	Shims		

3.7.2 Lubrication connections for manual lubricators

Lubrication connections are available as an option depending on the relubrication position and the sealing components used ►35 | 21.

Lubrication connections, front, straight

23 Lubrication connections, front, straight



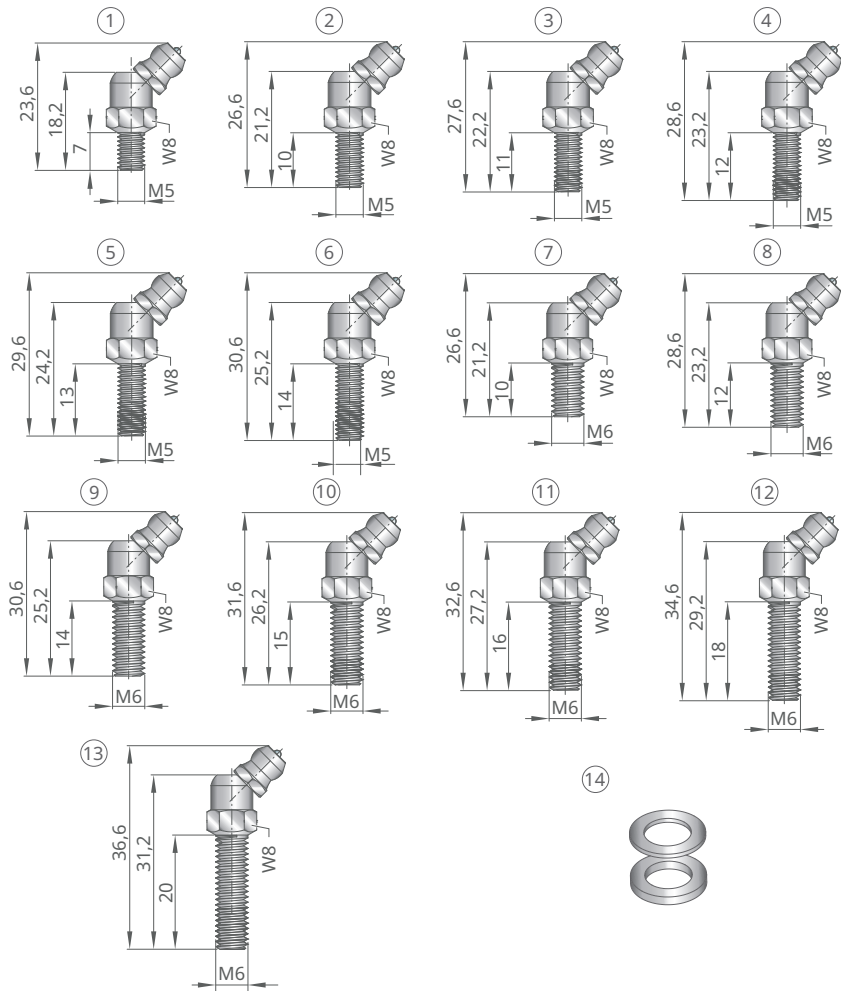
001D7580

1	S500	2	S501
3	S502	4	S503

Lubrication connections, front, angled 45°

The shims provided can optionally be used to align the lubrication connection.

24 Lubrication connections, front, angled 45°

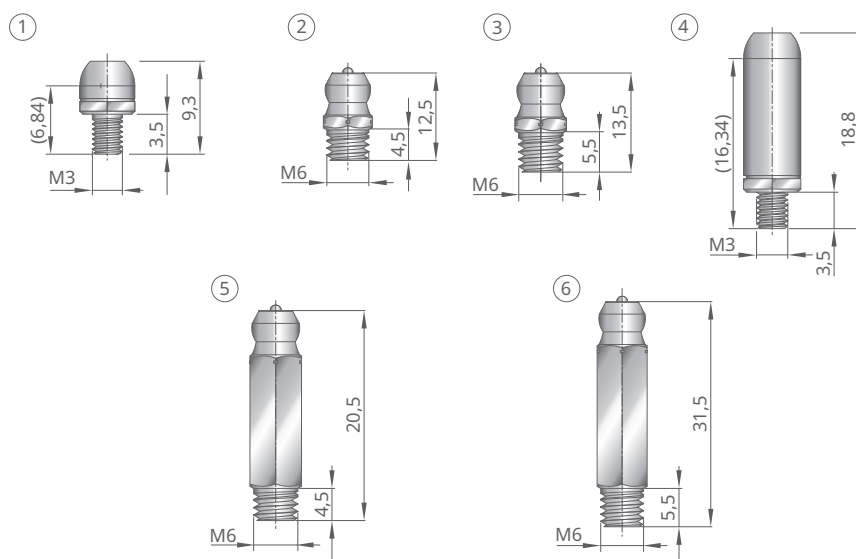


001D7587

1	S504	2	S505
3	S506	4	S507
5	S508	6	S509
7	S510	8	S511
9	S512	10	S513
11	S514	12	S515
13	S516	14	Shims

Lubrication connections, side, straight

25 Lubrication connections, side, straight



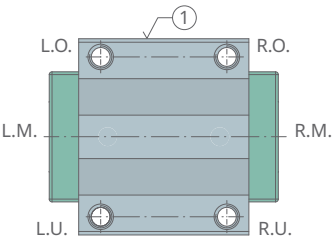
001D7584

1	S517	2	S518
3	S519	4	S520
5	S521	6	S522

21 Usage matrix: lubrication connections for manual lubricators

Size	Designation	Position: L.M., R.M.					Positions: L.U., L.O., R.U., R.O.	
		Thread	KIT				Thread	KIT
	KLLT		100, 110	220	360	370		
15	All	M3	S500	S501	S503	S502	–	–
	-A, -AL, -AS	–	–	–	–	–	M3	S520
	-H, -HL, -S, -SL, -ESC, -US	–	–	–	–	–	M3	S517
20	All	M5	S504	S505	S508	S507	–	–
	-A, -AL, -AS	–	–	–	–	–	M6	S520
	-H, -HL, -S, -SL, -ESC, -US	–	–	–	–	–	M6	S517
25	All	M5	S505	S506	S509	S508	–	–
	-A, -AL, -AS	–	–	–	–	–	M6	S522
	-H, -HL, -S, -SL, -ESC, -US	–	–	–	–	–	M6	S519
30	All	M6	S510	S513	S515	S514	–	–
	-A, -AL, -AS	–	–	–	–	–	M5	S521
	-H, -HL, -S, -SL, -ESC, -US	–	–	–	–	–	M6	S518
35	All	M6	S512	S513	S516	S515	–	–
	-A, -AL, -AS	–	–	–	–	–	M6	S522
	-H, -HL, -S, -SL, -ESC, -US	–	–	–	–	–	M6	S519
45	All	M6	S511	S514	S516	S515	–	–
	-A, -AL, -AS	–	–	–	–	–	M6	S522
	-H, -HL, -S, -SL, -ESC, -US	–	–	–	–	–	M6	S519

26 Definition of lubrication connections



001D4F80

1	Reference side	L.O., R.O.	Top (left or right top relative to reference side)
L.M., R.M.	Center (left or right front)	L.U., R.U.	Bottom (left or right bottom relative to reference side)

3.8 Accessories

Additional components are available as accessories.

3.8.1 One/two-piece plastic closing plug with pressure ring KA..-TN/B

The scope of delivery includes one/two-piece plastic closing plugs with pressure ring KA..-TN/B. The closing plugs close off the counterbores of the guideway holes flush with the surface of the guideway.

The one/two-piece plastic closing plug with pressure ring KA..-TN/B consists of a closing cap and a connected pressure ring. The pressure ring guides the closing plug and ensures ideal alignment to the guideway surface. Retaining lugs on the circumference of the pressure ring ensure a firm and secure hold in the mounting hole. This enables the cap to be installed easily in any orientation. The one/two-piece plastic closing plug with pressure ring KA..-TN/B is particularly user-friendly for overhead mounting, wall mounting, or long guideways.

The closing plug can be securely mounted with little effort using a hammer and a press-in block.

The closing plugs are included in the delivery.

27 One/two-piece plastic closing plug with pressure ring KA..-TN/B



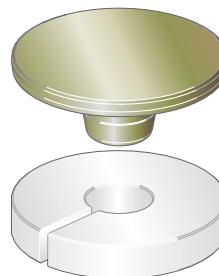
001B1492

3.8.2 Two-piece brass closing plugs with pressure ring KA..-M/A

The two-piece closing plugs KA..-M/A consist of a brass plug and a plastic pressure ring. The pressure ring ensures secure seating of the closing plug in the counterbore.

The closing plugs can be mounted with little effort using a hammer and a press-in block. The head surfaces of the plugs do not need to be processed further.

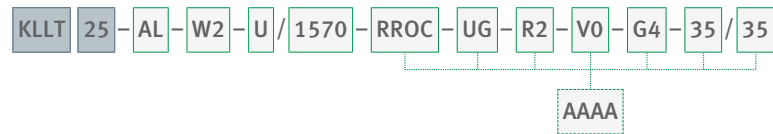
28 Brass closing plug KA..-M/A



001BAD8A

4 Structure of the ordering designation

29 Letter key for guidance unit



Letter code

AAAA These features are stored in a four-digit letter code in the order confirmation.

001E07DB



The joint delivery of carriages and guideways in separate packaging units is standard.

30 Ordering designation structure, guidance unit

	KLLT	25	AL	W2	U	/	1570	RROC	UG	R2	V0	G4	35	/	35
Designation															
KLLT	Guidance unit consisting of carriage and guideway														
Size															
15 ...	Size code for guidance unit (15, 20, 25, 30, 35, 45)														
45															
Design of carriage															
A	Carriage with flange in standard height														
AL	Long carriage with flange in standard height														
AS	Short carriage in standard height														
S	Narrow carriage in standard height														
SL	Narrow, long carriage in standard height														
H	Narrow, tall carriage														
HL	Narrow, tall, long carriage														
US	Narrow, short carriage in standard height														
ESC	Narrow, short, low carriage														
Number of carriages per guideway															
Wn ...	Number of carriages per guideway														
W9	Maximum number of carriages per guideway														
Location of the guideway															
–	Standard (location from above with countersunk bores)														
U	Location from below														
Length of the guideway															
...	Length of the guideway in 1 mm increments up to a maximum of $10 \times l_{\max}$														
l_{max}	For the maximum length of single-piece guideways, see the product tables														
Coating															
RROC	Corotect coated														
Lubrication															
–	Standard														
UG	With preservative														
L271	Arcanol LOAD150														
L057	Arcanol MULTI2														
L409	Arcanol MOTION2														
L460	Arcanol FOOD2														
L430	Arcanol CLEAN-M														
See “Suitable lubricants” chapter															
Number of guideway sets															
Rn ...	Number of guideway sets														
R3	Maximum number of guideway sets														
Preload class															
V0	Light backlash to no backlash (standard), not available for accuracy class G2														
V1	Slight preload														
V2	Moderate preload														
Accuracy class															
G4	Accuracy class G4 (standard)														
G3	Accuracy class G3														
G2	Accuracy class G2 (only available for preload classes V1 and V2)														
Hole spacing, start of guideway															
35	Distance between start of guideway and nearest hole														
Hole spacing, end of guideway															
35	Distance between end of guideway and nearest hole														

001E07EB

31 Ordering designation structure, carriage

		KWLT	25	AL	RROC	UG	V1	G4
Designation								
KWLT	Four-row carriages in X arrangement							
Size								
15 ...	Size code for carriage (15, 20, 25, 30, 35, 45)							
45								
Design								
A	Carriage with flange in standard height							
AL	Long carriage with flange in standard height							
AS	Short carriage in standard height							
S	Narrow carriage in standard height							
SL	Narrow, long carriage in standard height							
H	Narrow, tall carriage							
HL	Narrow, tall, long carriage							
US	Narrow, short carriage in standard height							
ESC	Narrow, short, low carriage							
Coating								
RROC	Corotect coated							
Lubrication								
–	Standard							
UG	With preservative							
L271	Arcanol LOAD150							
L057	Arcanol MULTI2							
L409	Arcanol MOTION2							
L460	Arcanol FOOD2							
L430	Arcanol CLEAN-M							
See “Suitable lubricants” chapter								
Preload class								
V0	Light backlash to no backlash (standard)							
V1	Slight preload							
V2	Medium preload, only in conjunction with accuracy class G4							
Accuracy class								
G4	Accuracy class G4 (standard)							
G3	Accuracy class G3							

001E07FE

32 Ordering designation structure, guideway

Letter code

AAAA These features are stored in a four-digit letter code in the order confirmation.

Designation

TKLT Guideway for carriage KWLT

Size

15 ... Size code for guideway (15, 20, 25, 30, 35, 45)

45

Location of the guideway

– Standard (location from above with countersunk bores)

U Location from below

Coating

RROC Corotect coated

Length of the guideway

... Length of the guideway in 1 mm increments up to a maximum of $10 \times l_{\max}$

$l_{\max}$ For the maximum length of single-piece guideways, see the product tables

Accuracy class

G4 Accuracy class G4 (standard)

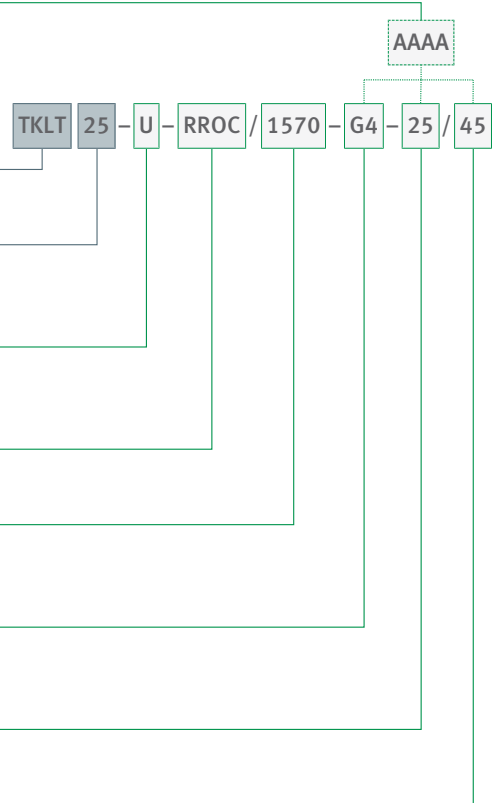
G3 Accuracy class G3

Hole spacing, start of guideway

25 Distance between start of guideway and nearest hole

Hole spacing, end of guideway

45 Distance between end of guideway and nearest hole



001E080E

Linear recirculating ball bearing and guideway assemblies KLLT with carriages and guideways in accuracy class G2

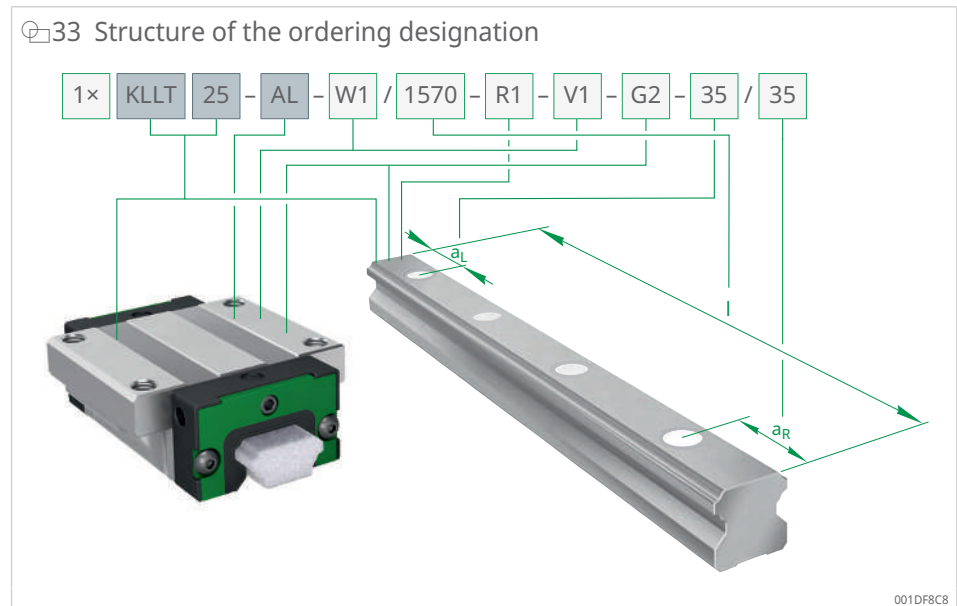
An order is to be placed for one carriage KWL25-AL with accuracy class G2 and a matching guideway.

An order is placed for one linear recirculating ball bearing and guideway assembly KLLT:

- 1 carriage KWL25-AL
- Size 25
- Preload V1
- Accuracy class G2
- With standard end wipers
- 1 matching guideway TKLT
- Size 25
- Accuracy class G2
- Length 1570 mm
- a_L 35 mm
- a_R 35 mm

Ordering designation provided by the customer and in the order confirmation (with sample letter code):

- 1×KLLT25-AL-W1/1570-R1-V1-G2-35/35



The joint delivery of carriages and guideways in separate packaging units is standard.

Carriage

Single carriages can be ordered as follows:

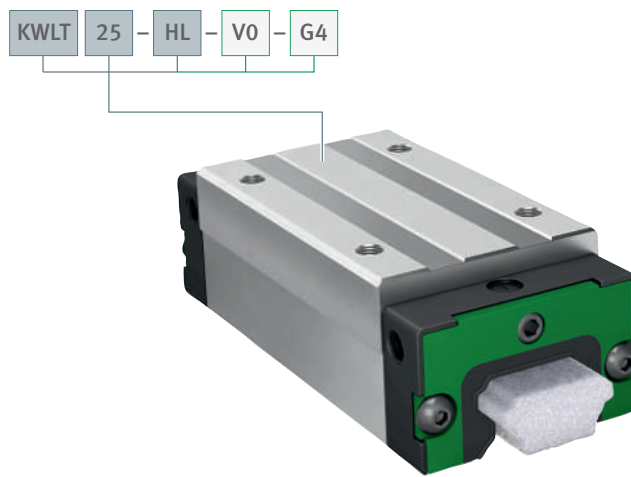
- Carriage KWLT...-HL
- Size 25
- Preload V0
- Accuracy class G4
- With standard end wipers

Ordering designation provided by the customer and in the order confirmation (with sample letter code):

- KWLT25-HL-V0-G4

4

34 Structure of the ordering designation



001B32A1

Guideway

The displacement distance needs to be extended. As a result, a longer guideway is required.

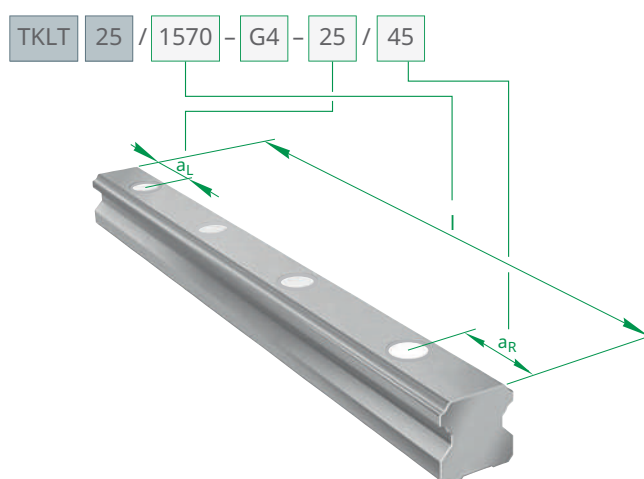
The guideway can be ordered as follows:

- Guideway that can be combined with the existing carriage of identical size and belonging to accuracy class G4
 - TKLT
- Size 25
- Accuracy class G4
- Length 1570 mm
- a_L 25 mm
- a_R 45 mm

Ordering designation provided by the customer and in the order confirmation (with sample letter code):

- TKLT25/1570-G4-25/45

35 Structure of the ordering designation



001D521E

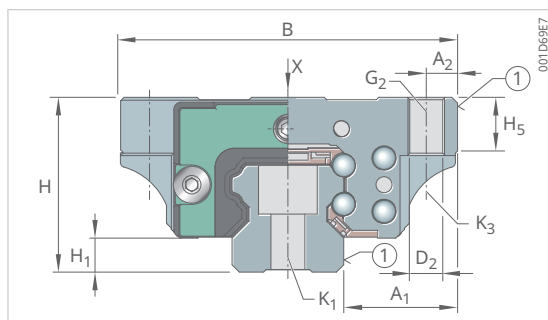
5 Product tables

5.1 Explanations

(1)	–	Locating face
A ₁	mm	Distance from locating edge of the carriage to locating edge of the guideway
A ₂	mm	Distance between locating edge and hole
A ₃	mm	Position of the lubrication connection
a _L	mm	Distance from the start of the rail to the next hole
a _R	mm	Distance from the end of the rail to the next hole
b	mm	Width of guideway
B	mm	Width
C	N	Basic dynamic load rating
C ₀	N	Basic static load rating
d ₁	mm	Guideway through-hole
D ₂	mm	Diameter of the through bore
G ₁	–	Thread, DIN ISO 4762-12.9
G ₂	–	Thread, DIN ISO 4762-12.9
G ₃	mm	Screw-in depth, lubrication connection on the front side
h	mm	Height of guideway
H	mm	Height
h ₁	mm	Height of through hole
H ₁	mm	Guideway clearance
H ₄	mm	Start of incline on carriage
H ₅	mm	Height of stop edge
j _B	mm	Distance between holes
J _B	mm	Distance between fixing threads in carriage
j _L	mm	Distance between holes
J _L	mm	Distance between fixing threads in carriage
K ₁	–	Thread size, DIN ISO 4762-12.9
L	mm	Length of carriage
L ₁	mm	Effective saddle plate length
l _{max}	mm	Maximum length of guideway
L _s	mm	Length of screw head
M _{0x}	Nm	Static moment rating about X axis
M _{0y}	Nm	Static moment rating about Y axis
M _{0z}	Nm	Static moment rating about Z axis
M _A	Nm	Tightening torque
m _c	kg	Mass of carriage
m _r	kg/m	Mass of guideway
T ₅	mm	Thread depth
t ₇	mm	Thread length

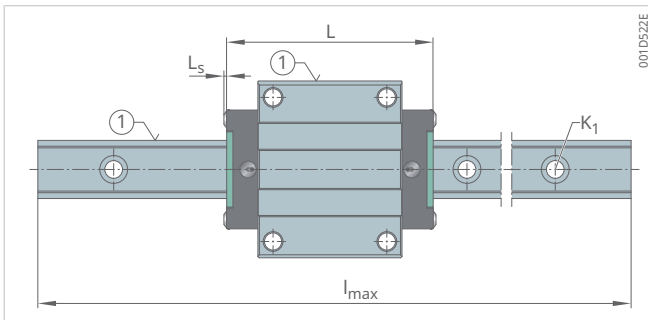
5.2 KLLT..-A, KLLT..-AL System

Four rows in X arrangement

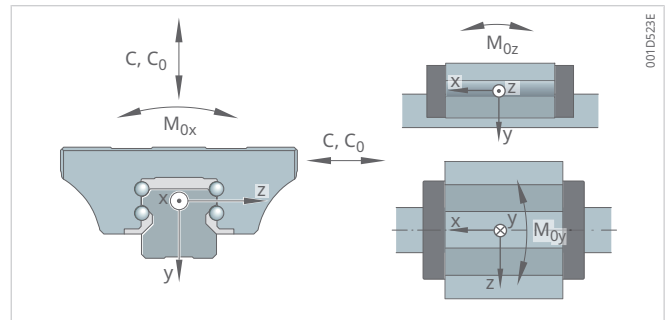


KLLT..-A, KLLT..-AL

System	$l_{\max}$	H	B	L	L_s	A ₁	A ₂	H ₁	H ₅	D ₂
Designation										
-	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KLLT15-A	3900	24	47	62	0.5	16	4.5	4.6	5.9	4.3
KLLT20-A	3900	30	63	71.8	0.5	21.5	5	5	6.9	5.2
KLLT20-AL	3900	30	63	88	0.5	21.5	5	5	6.9	5.2
KLLT25-A	3900	36	70	81.8	1.0	23.5	6.5	7	10.7	6.7
KLLT25-AL	3900	36	70	103.9	1.0	23.5	6.5	7	10.7	6.7
KLLT30-A	3840	42	90	100.4	0	31	9	9	9.0	8.5
KLLT30-AL	3840	42	90	125.4	0	31	9	9	9.0	8.5
KLLT35-A	3840	48	100	114	0.1	33	9	9.5	12.3	8.5
KLLT35-AL	3840	48	100	142.5	0.1	33	9	9.5	12.3	8.5
KLLT45-A	3885	60	120	135	0.6	37.5	10	14	12.2	10.4
KLLT45-AL	3885	60	120	167	0.6	37.5	10	14	12.2	10.4



KLLT..-A, KLLT..-AL, view rotated by 90°

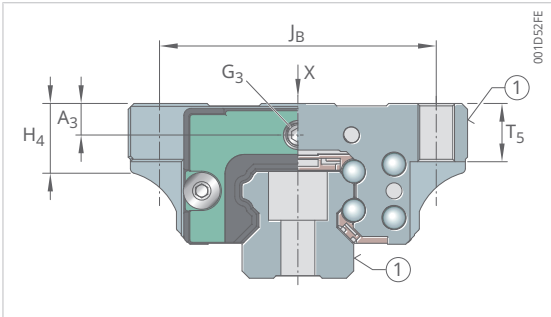


Moments and load direction

G ₂	K ₁	K ₃	C	C ₀	M _{0x}	M _{0y}	M _{0z}
-	-	-	N	N	Nm	Nm	Nm
-	-	-					
M5	M4	M4	8400	16200	140	99	99
M6	M5	M5	12300	22400	244	173	173
M6	M5	M5	15100	30000	325	300	300
M8	M6	M6	19900	36500	480	340	340
M8	M6	M6	24300	48500	640	590	590
M10	M8	M8	27500	49500	790	540	540
M10	M8	M8	34000	66000	1060	940	940
M10	M8	M8	36500	65000	1270	800	800
M10	M8	M8	45000	86000	1680	1390	1390
M12	M12	M10	59000	101000	2700	1520	1520
M12	M12	M10	72000	135000	3600	2600	2600

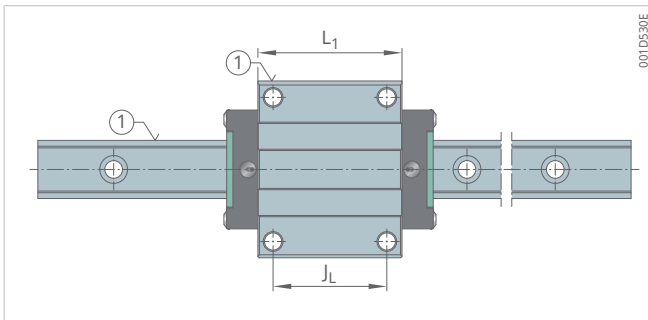
5.3 KLLT..-A, KLLT..-AL
Carriage

Four rows in X arrangement

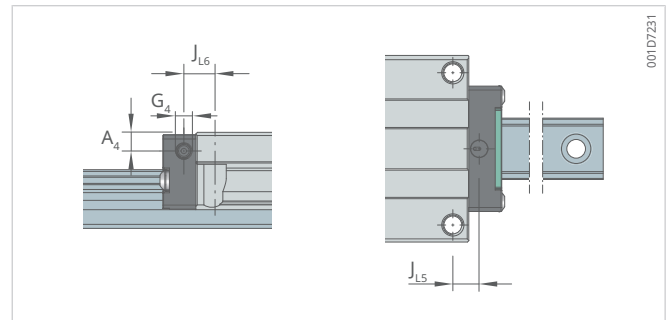


KLLT..-A, KLLT..-AL

Designation	m _c	J _B	L ₁	J _L	T ₅	H ₄
-	kg	mm	mm	mm	mm	mm
KWLT15-A	0.21	38	40	30	8	8.0
KWLT20-A	0.40	53	50	40	9	9.0
KWLT20-AL	0.52	53	66.2	40	9	9.0
KWLT25-A	0.57	57	57	45	12	12.0
KWLT25-AL	0.72	57	79.1	45	12	14.3
KWLT30-A	1.10	72	67.4	52	11.5	11.5
KWLT30-AL	1.40	72	92.4	52	11.5	12.0
KWLT35-A	1.60	82	77	62	13	16.7
KWLT35-AL	2.00	82	105.5	62	13	16.7
KWLT45-A	2.70	100	96	80	15	15.0
KWLT45-AL	3.60	100	128	80	15	15.0



KLLT..-A, KLLT..-AL, view rotated by 90°

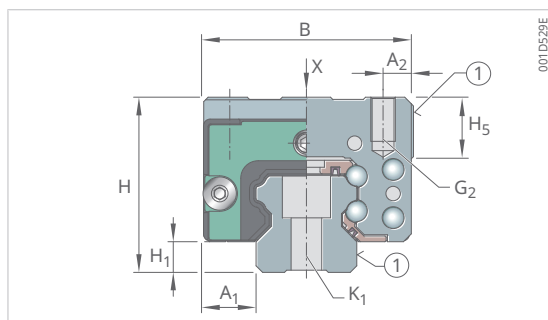


KLLT..-A, KLLT..-AL

G ₃		G ₄		J _{L5}	J _{L6}	A ₃	A ₄
-	mm	-	mm	mm	mm	mm	mm
M3	2.6	M3	9.3	7.8	8.0	4.3	3.7
M5	2.5	M3	9.2	8.5	8.5	5.7	5.7
M5	2.5	M3	9.2	16.6	16.6	5.7	5.7
M5	5.0	M6	11.8	9.9	10.5	6.5	7.0
M5	5.0	M6	11.8	21.0	21.6	6.5	7.0
M6	4.0	M6	13.6	12.7	13.7	8	8.0
M6	4.0	M6	13.6	25.2	26.2	8	8.0
M6	5.0	M6	17.8	13.0	14.5	8	8.5
M6	5.0	M6	17.8	27.3	28.8	8	8.5
M6	8.0	M6	16.7	13.5	15.0	8.5	10.0
M6	8.0	M6	16.7	29.5	31.0	8.5	10.0

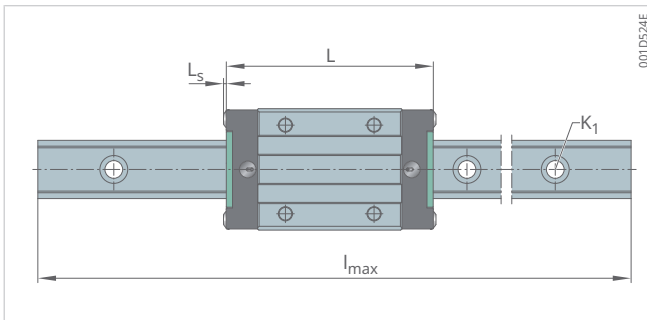
5.4 KLLT...-H, KLLT...-HL, KLLT...-S, KLLT...-SL System

Four rows in X arrangement

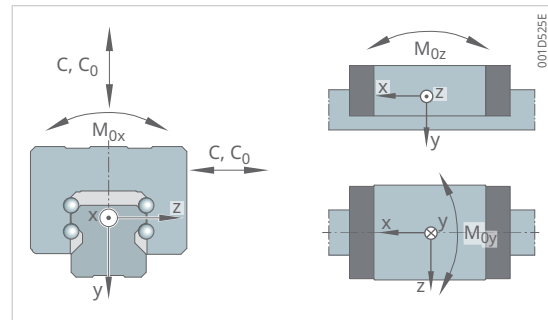


KLLT...-H, KLLT...-HL, KLLT...-S, KLLT...-SL

System	$l_{\max}$	H	B	L	L_5	A_1	A_2	H_1	H_5
Designation									
-	mm	mm	mm	mm	mm	mm	mm	mm	mm
KLLT15-H	3900	28	34	62	0.5	9.5	4	4.6	9.0
KLLT15-S	3900	24	34	62	0.5	9.5	4	4.6	5.0
KLLT20-S	3900	30	44	71.8	0.5	12	6	5	9.5
KLLT20-SL	3900	30	44	88	0.5	12	6	5	9.5
KLLT25-H	3900	40	48	81.8	1.0	12.5	6.5	7	13.8
KLLT25-HL	3900	40	48	99.7	1.0	12.5	6.5	7	13.8
KLLT25-S	3900	36	48	81.8	1.0	12.5	6.5	7	9.8
KLLT25-SL	3900	36	48	99.7	1.0	12.5	6.5	7	9.8
KLLT30-H	3840	45	60	100.4	0	16	10	9	15.8
KLLT30-HL	3840	45	60	125.4	0	16	10	9	15.8
KLLT30-S	3840	42	60	100.4	0	16	10	9	12.8
KLLT30-SL	3840	42	60	125.4	0	16	10	9	12.8
KLLT35-H	3840	55	70	114	0.1	18	10	9.5	19.5
KLLT35-HL	3840	55	70	142.5	0.1	18	10	9.5	19.5
KLLT35-S	3840	48	70	114	0.1	18	10	9.5	12.5
KLLT35-SL	3840	48	70	142.5	0.1	18	10	9.5	12.5
KLLT45-H	3885	70	86	135	0.6	20.5	13	14	22.9
KLLT45-HL	3885	70	86	167	0.6	20.5	13	14	22.9
KLLT45-S	3885	60	86	135	0.6	20.5	13	14	12.9
KLLT45-SL	3885	60	86	167	0.6	20.5	13	14	12.9



KLLT..-H, KLLT..-HL, KLLT..-S, view rotated by 90°

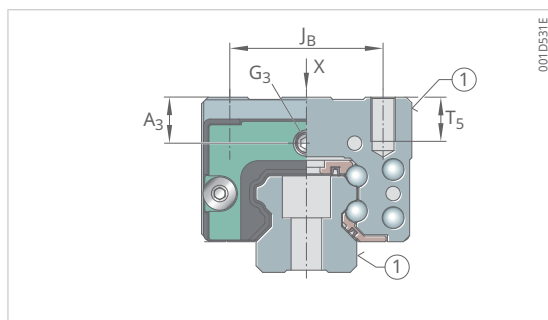


Moments and load direction

G ₂	K ₁	C	C ₀	M _{0x}	M _{0y}	M _{0z}
-	-					
-	-	N	N	Nm	Nm	Nm
M4	M4	8400	16200	140	99	99
M4	M4	8400	16200	140	99	99
M5	M5	12300	22400	244	173	173
M5	M5	15100	30000	325	300	300
M6	M6	19900	36500	480	340	340
M6	M6	24300	48500	640	590	590
M6	M6	19900	36500	480	340	340
M6	M6	24300	48500	640	590	590
M8	M8	27500	49500	790	540	540
M8	M8	34000	66000	1060	940	940
M8	M8	27500	49500	790	540	540
M8	M8	34000	66000	1060	940	940
M8	M8	36500	65000	1270	800	800
M8	M8	45000	86000	1680	1390	1390
M8	M8	36500	65000	1270	800	800
M8	M8	45000	86000	1680	1390	1390
M10	M12	59000	101000	2700	1520	1520
M10	M12	72000	135000	3600	2600	2600
M10	M12	59000	101000	2700	1520	1520
M10	M12	72000	135000	3600	2600	2600

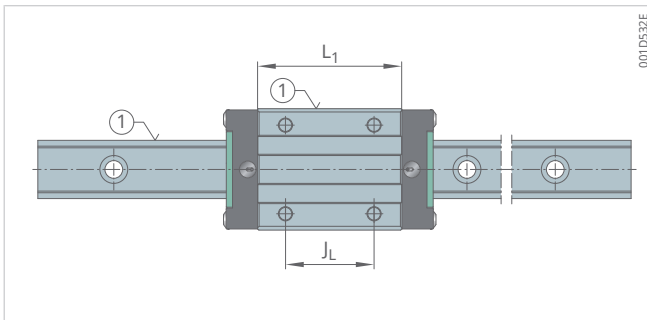
5.5 KLLT..-H, KLLT..-HL, KLLT..-S, KLLT..-SL Carriage

Four rows in X arrangement

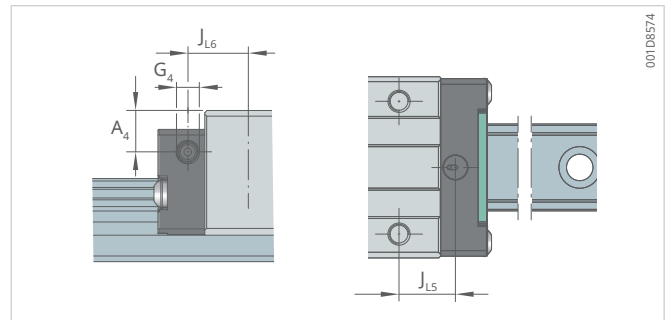


KLLT..-H, KLLT..-HL, KLLT..-S, KLLT..-SL

Designation	m _c	J _B	L ₁	J _L	T ₅
-	kg	mm	mm	mm	mm
KWLT15-H	0.19	26	40	26	7.5
KWLT15-S	0.17	26	40	26	4
KWLT20-S	0.26	32	50	36	6.5
KWLT20-SL	0.47	32	66.2	50	6.5
KWLT25-H	0.45	35	57	35	10
KWLT25-HL	0.56	35	79.1	50	10
KWLT25-S	0.38	35	57	35	6.5
KWLT25-SL	0.47	35	79.1	50	6.5
KWLT30-H	0.91	40	67.4	40	11.2
KWLT30-HL	1.2	40	92.4	60	11.2
KWLT30-S	0.81	40	67.4	40	8.5
KWLT30-SL	0.82	40	92.4	60	8.5
KWLT35-H	1.5	50	77	50	17
KWLT35-HL	1.9	50	105.5	72	17
KWLT35-S	1.2	50	77	50	10
KWLT35-SL	1.26	50	105.5	72	10
KWLT45-H	2.3	60	96	60	20.5
KWLT45-HL	2.8	60	128	80	20.5
KWLT45-S	2.1	60	96	60	12
KWLT45-SL	2.11	60	128	80	12



KLLT..-H, KLLT..-HL, KLLT..-S, KLLT..-SL, view rotated by 90°

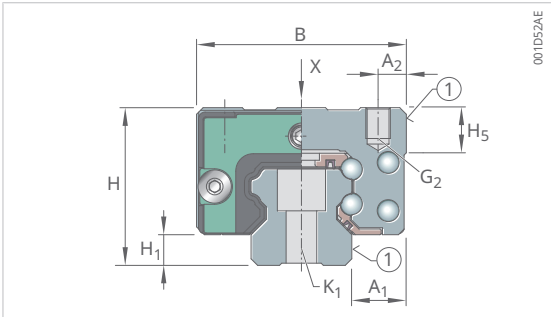


KLLT..-H, KLLT..-HL, KLLT..-S, KLLT..-SL

G3		G4		JL5	JL6	A3	A4
-	mm	-	mm	mm	mm	mm	mm
M3	9.3	M3	2.6	9.8	10.0	8.3	7.7
M3	9.3	M3	2.6	9.8	10.0	4.3	3.7
M3	9.2	M5	2.5	10.5	10.5	5.7	5.7
M3	9.2	M5	2.5	11.6	11.6	5.7	5.7
M6	11.8	M5	5.0	14.9	15.5	10.5	11.0
M6	9.7	M5	5.0	18.5	19.1	10.5	11.0
M6	11.8	M5	5.0	14.9	15.5	6.5	7.0
M6	11.8	M5	5.0	18.5	19.1	6.5	7.0
M6	13.6	M6	4.0	18.7	19.7	11	11.0
M6	13.6	M6	4.0	21.2	22.2	11	11.0
M6	13.6	M6	4.0	18.7	19.7	8	8.0
M6	13.6	M6	4.0	21.2	22.2	8	8.0
M6	17.8	M6	5.0	19.0	20.5	15	15.5
M6	17.8	M6	5.0	22.3	23.8	15	15.5
M6	17.8	M6	5.0	19.0	20.5	8	8.5
M6	17.8	M6	5.0	22.3	23.8	8	8.5
M6	16.7	M6	8.0	23.5	25.0	18.5	20.0
M6	16.7	M6	8.0	29.5	31.0	18.5	20.0
M6	16.7	M6	8.0	23.5	25.0	8.5	10.0
M6	16.7	M6	8.0	29.5	31.0	8.5	10.0

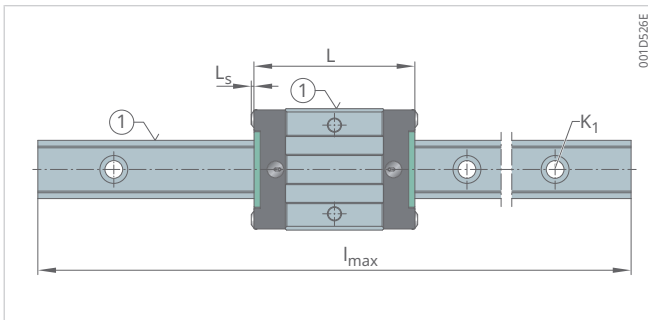
5.6 KLLT..-ESC, KLLT..-US System

Four rows in X arrangement

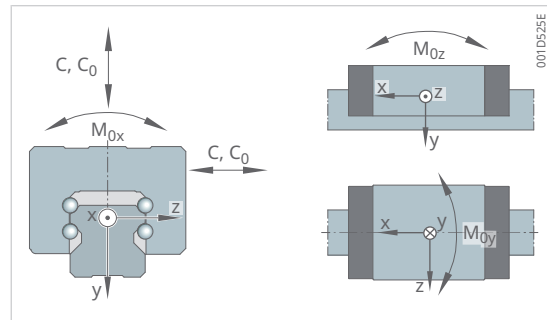


KLLT..-US, KLLT..-ESC

System	$I_{\max}$	H	B	L	L_s	A_1	A_2	H_1	H_5
Designation									
-	mm	mm	mm	mm	mm	mm	mm	mm	mm
KLLT15-ESC	3900	24	34	47.6	0	9.5	4	4.6	5.0
KLLT20-US	3900	30	44	53.9	0.5	12	6	5	9.5
KLLT25-US	3900	36	48	63.6	1.0	12.5	6.5	7	9.8
KLLT30-ESC	3840	42	60	78	0	16	10	9	12.8
KLLT35-ESC	3840	48	70	88.4	0.1	18	10	9.5	12.5



KLLT..-US, KLLT..-ESC, view rotated by 90°

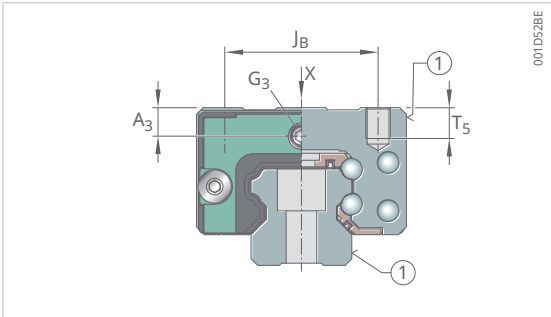


Moments and load direction

G_2	K_1	C	C_0	M_{0x}	M_{0y}	M_{0z}
-	-					
-	-	N	N	Nm	Nm	Nm
M4	M4	6300	10800	95	47	47
M5	M5	9300	15000	163	83	83
M6	M6	14900	24300	320	163	163
M8	M8	20700	33000	530	260	260
M8	M8	27500	43000	940	385	385

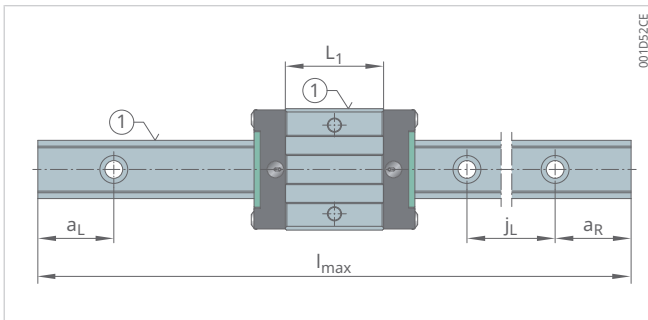
5.7 KLLT..-ESC, KLLT..-US
Carriage

Four rows in X arrangement

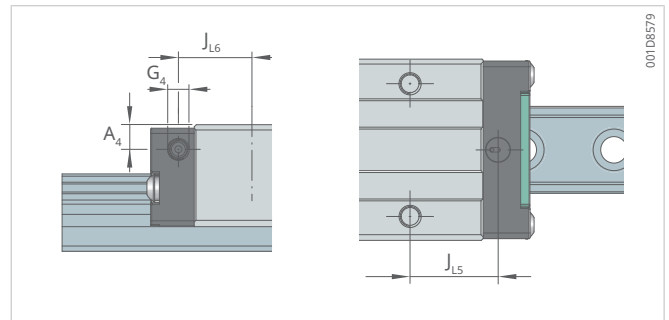


KLLT..-US, KLLT..-ESC

Designation	m _c	J _B	L ₁	T ₅
-	kg	mm	mm	mm
KWLT15-ESC	0.10	26	25.6	4
KWLT20-US	0.17	32	32.1	6.5
KWLT25-US	0.21	35	38.8	6.5
KWLT30-ESC	0.48	40	45	8.5
KWLT35-ESC	0.80	50	51.4	10



KLLT..-US, KLLT..-ESC, view rotated by 90°

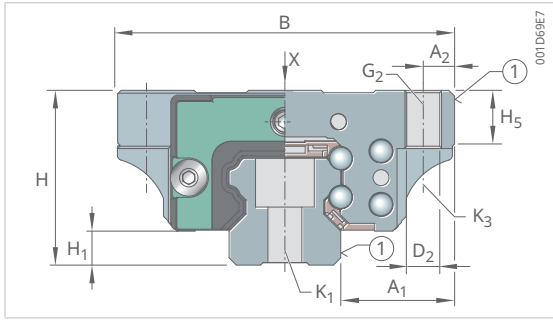


KLLT..-US, KLLT..-ESC

G ₃		G ₄		J _{L5}	J _{L6}	A ₃	A ₄
-	mm	-	mm	mm	mm	mm	mm
M3	9.3	M3	2.6	15.6	15.8	4.3	3.7
M3	9.2	M5	2.5	19.5	19.5	5.7	5.7
M6	11.8	M5	5.0	23.3	23.9	6.5	7.0
M6	13.6	M6	4.0	27.5	28.5	8	8.0
M6	17.8	M6	5.0	31.2	32.7	8	8.5

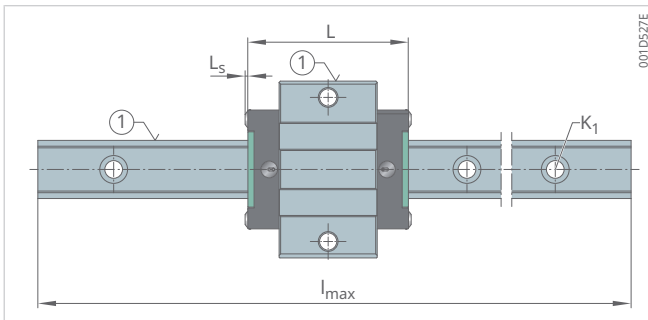
5.8 KLLT..-AS
System

Four rows in X arrangement

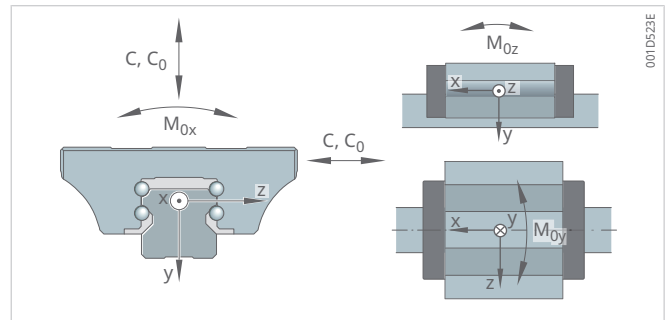


KLLT..-AS

System	l_{max}	H	B	L	L_s	A ₁	A ₂	H ₁	H ₅	D ₂
Designation										
-	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KLLT15-AS	3900	24	47	47.6	0.5	16	4.5	4.6	5.9	4.3
KLLT20-AS	3900	30	63	53.9	0.5	21.5	5	5	6.9	5.2
KLLT25-AS	3900	36	70	63.6	1.0	23.5	6.5	7	10.7	6.7
KLLT35-AS	3840	48	100	88.4	0.1	33	9	9.5	12.3	8.5
KLLT30-AS	3840	42	90	78	0.5	31	9	9	9.0	8.5



KLLT..-AS, view rotated by 90°

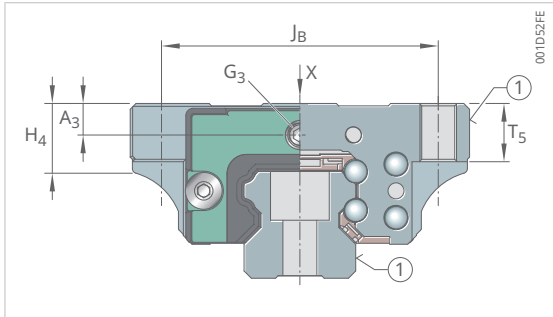


Moments and load direction

G ₂	K ₁	K ₃	C	C ₀	M _{0x}	M _{0y}	M _{0z}
-	-	-	N	N	Nm	Nm	Nm
-	-	-					
M5	M4	M4	6300	10800	95	47	47
M6	M5	M5	9300	15000	163	83	83
M8	M6	M6	14900	24300	320	163	163
M10	M8	M8	27500	43000	940	385	385
M10	M8	M8	20700	33000	530	260	260

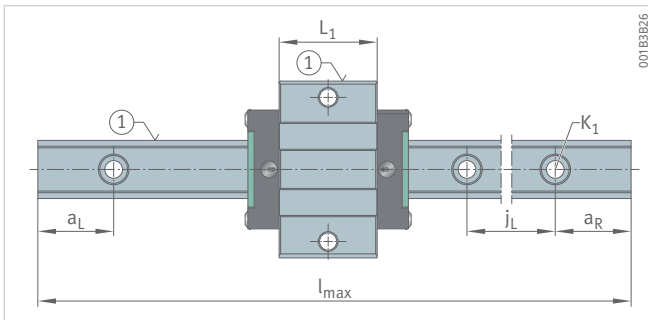
5.9 KLLT..-AS Carriage

Four rows in X arrangement

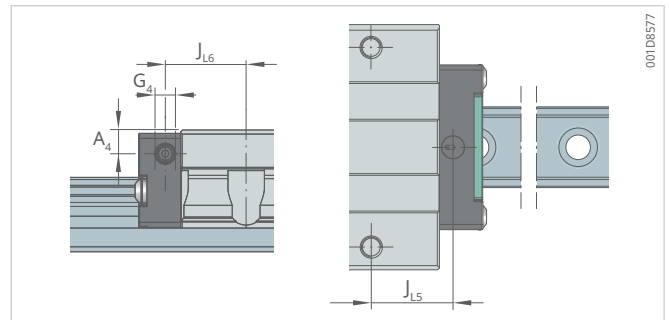


KLLT..-AS

Designation	m_c	J_B	L_1	H_4	T_5
-	kg	mm	mm	mm	mm
KWLT15-AS	0.12	38	25.6	8	8.0
KWLT20-AS	0.25	53	32.1	9	9.0
KWLT25-AS	0.38	57	38.8	12	12.0
KWLT30-AS	0.56	72	45	11.5	11.5
KWLT35-AS	0.83	82	51.4	13	16.7



KLLT..-AS, view rotated by 90°

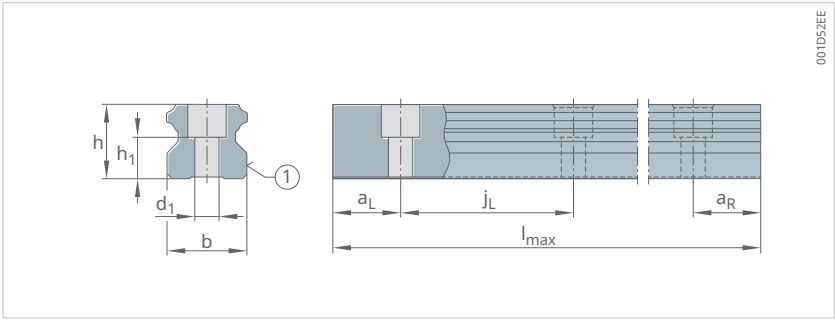


KLLT..-AS

G3		G4		JL5	JL6	A3	A4
-	mm	-	mm	mm	mm	mm	mm
M3	9.3	M3	2.6	15.6	15.8	4.3	3.7
M3	9.2	M5	2.5	19.5	19.5	5.7	5.7
M6	11.8	M5	5.0	23.3	23.9	6.5	7.0
M6	13.6	M6	4.0	27.5	28.5	8	8.0
M6	17.8	M6	5.0	31.2	32.7	8	8.5

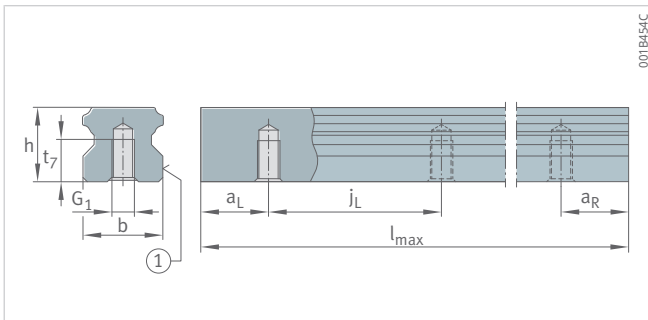
5.10 TKLT
Guideway

Four rows in X arrangement



TKLT

Designation	m_r	l_{max}	h	b	a_L		a_R	
				-0.006 -0.030	min	max	min	max
-	kg/m	mm	mm	mm	mm	mm	mm	mm
TKLT15	1.4	3900	14	15	10	50	10	50
TKLT15-U	1.4	3900	14	15	10	50	10	50
TKLT20	2.3	3900	18	20	10	50	10	50
TKLT20-U	2.3	3900	18	20	10	50	10	50
TKLT25	3.3	3900	22	23	10	50	10	50
TKLT25-U	3.3	3900	22	23	10	50	10	50
TKLT30	4.8	3840	26	28	12	70	12	70
TKLT30-U	4.8	3840	26	28	12	70	12	70
TKLT35	6.6	3840	29	34	12	70	12	70
TKLT35-U	6.6	3840	29	34	12	70	12	70
TKLT45	11.3	3885	38	45	16	90	16	90
TKLT45-U	11.3	3885	38	45	16	90	16	90



TKLT..-U

j_L	d_1	h_1	t_7	G_1	Closing plugs	
-	-	0.05 -0.05	-	-	Plastic	Brass
mm	mm	mm	mm	-	-	-
60	4.6	6.6	-	-	KA07-TN/B	KA07-M/A
60	-	-	8	M5	-	-
60	5.8	9.6	-	-	KA10-TN/B	KA10-M/A
60	-	-	10	M6	-	-
60	6.8	11.5	-	-	KA11-TN/B	KA11-M/A
60	-	-	12	M6	-	-
80	9	13.5	-	-	KA15-TN/B	KA15-M/A
80	-	-	15	M8	-	-
80	9	16.5	-	-	KA15-TN/B	KA15-M/A
80	-	-	15	M8	-	-
105	13.4	19.5	-	-	KA20-TN/B	KA20-M/A
105	-	-	20	M12	-	-

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