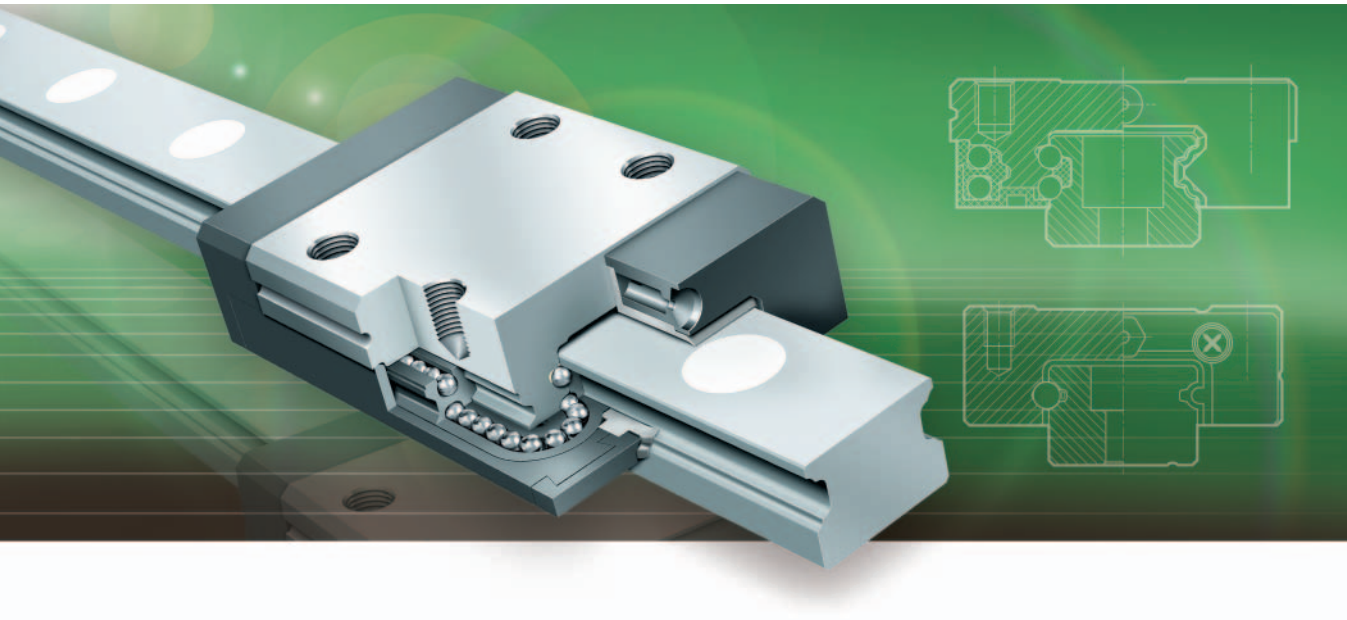


Corrosion-Resistant Miniature Linear Ball Bearing and Guideway Assemblies

Two-row and four-row designs

SCHAEFFLER GROUP
INDUSTRIAL

Foreword

Linear bearings for the miniature applications sector require a different approach in the design of guidance systems. While normal criteria such as load carrying capacity, rigidity and operating life are important, the additional factor of size also applies for miniature bearing arrangements.

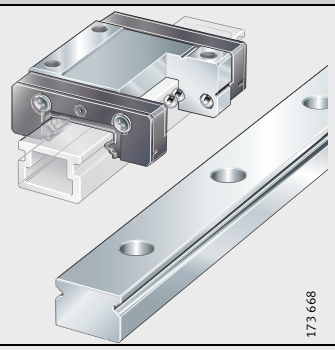
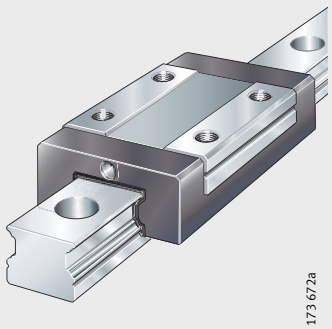
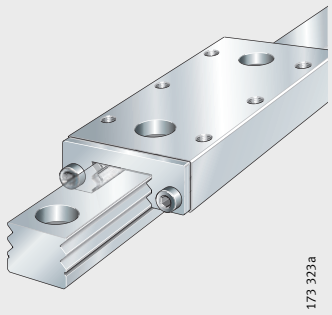
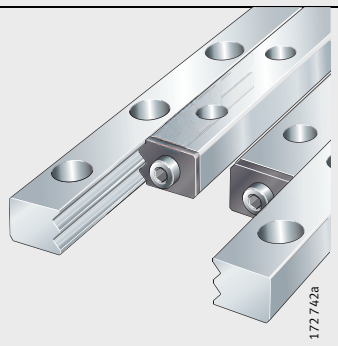
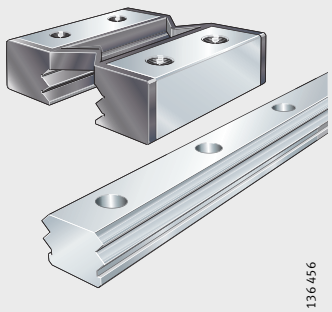
Two-row and four-row designs

However, simply “scaling down” the standard sizes to smaller dimensions is not very successful in technical terms. We therefore developed the four-row miniature linear ball bearing and guideway assembly KUME..-C.

For applications with a lower requirement for load carrying capacity, this high-performance guidance system is supplemented by a two-row guidance system.

In order to extend the lubrication intervals, the two-row miniature linear ball bearing and guideway assemblies are also available with a long term lubrication unit. Where there are increased requirements in relation to temperature, radiation or dynamics, the two-row miniature linear ball bearing and guideway assemblies are also available with metal end pieces.

Any information in earlier catalogues and publications that does not correspond to the data in this TPI is therefore invalid.

Linear guidance systems	Series	
Corrosion-resistant miniature linear ball bearing and guideway assemblies Two-row	**TKDM** **KWEM**	
Four-row	**KUME..-C**	
Corrosion-resistant miniature carriage units	**RMWE**	
Miniature linear guidance sets	**RWS**	
Miniature plain guidance systems Maintenance-free	**GFS** **GFW**	

Features	Load carrying capacity	Rigidity	Publications
– Linear locating bearing for unlimited stroke lengths – Comprising guideway and carriage – Two-row design, four point contact of rolling elements with raceways – Preloaded – Seals on end faces of carriages – Greased, suitable for lubrication with oil or grease – Interchangeable	Moderate to high	Moderate to high	TPI 163
– Linear locating bearing for unlimited stroke lengths – Comprising guideway and carriage – Four-row, two point contact of rolling elements with raceways – Preloaded – With lubricant reservoir – Seals on end faces – Suitable for lubrication with oil or grease	High to very high	High to very high	TPI 163
– Linear locating bearing for limited stroke lengths – Comprising guideway and carriage, single or double row cylindrical roller flat cages, end pieces – Cylindrical rollers in O or X arrangement – Higher load carrying capacity and rigidity than recirculating guidance systems – Comparable design envelope – Preloaded – Greased, suitable for lubrication with oil or grease	Very high	Very high	TPI 160
– Linear locating bearing for limited stroke lengths – Comprising guideways, cylindrical roller flat cages, end pieces – Cylindrical rollers in O or X arrangement – Higher load carrying capacity and rigidity than recirculating guidance systems – Comparable design envelope – Spacing between guidance systems can be selected as required – Preloaded – Suitable for lubrication with oil or grease	Very high	Very high	TPI 162
– Linear locating bearing for stroke lengths up to 3 m – Maintenance-free – Comprising guideway and carriage with plain sliding layer – Highly suitable for light metal constructions – Wear-resistant – Insensitive to contamination – Adjustable clearance – Interchangeable as required	Low	Low	TPI 161

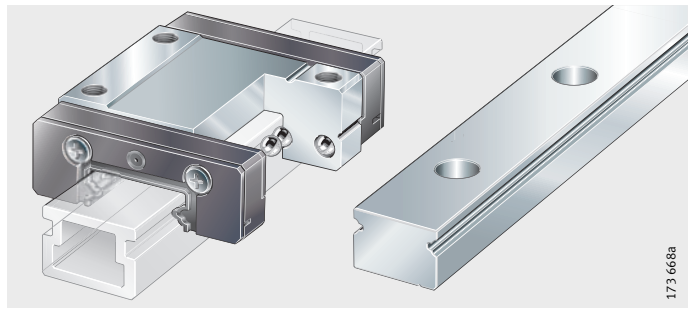
Corrosion-resistant miniature linear ball bearing and guideway assemblies

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row

Carriage
with dummy guideway

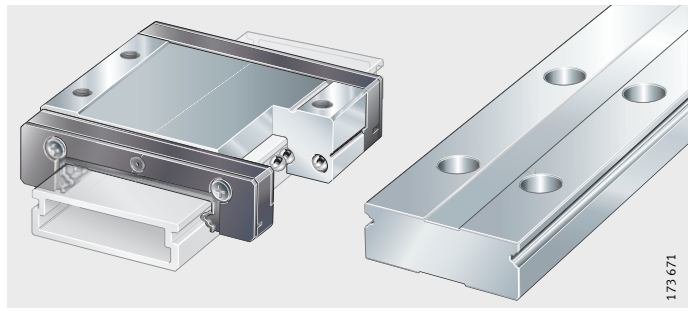
KWEM, TKDM



Wide carriage
with dummy guideway

Wide guideway

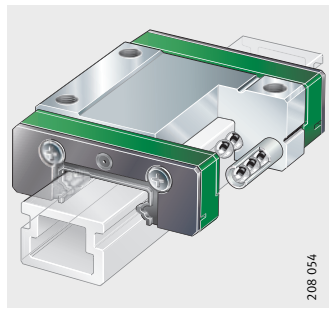
KWEM..-W, TKDM..-W



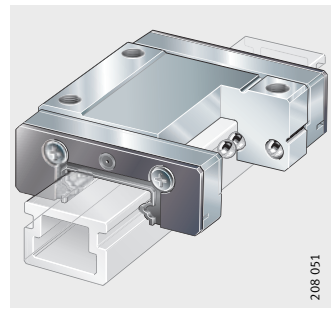
Carriages

with long term lubrication unit
with metal end piece

KWEM..-LZM



KWEM..-MKS

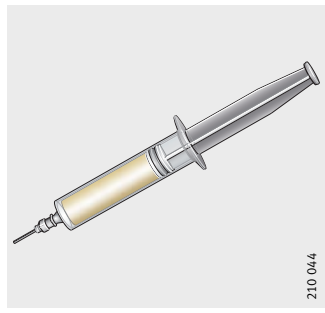


Accessories

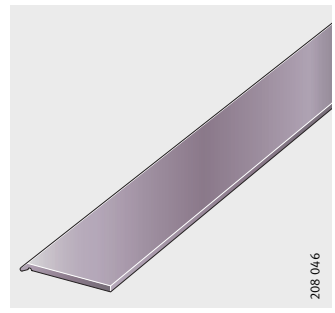
Grease syringe

Sealing strips
for carriage

SPRI-KWEM

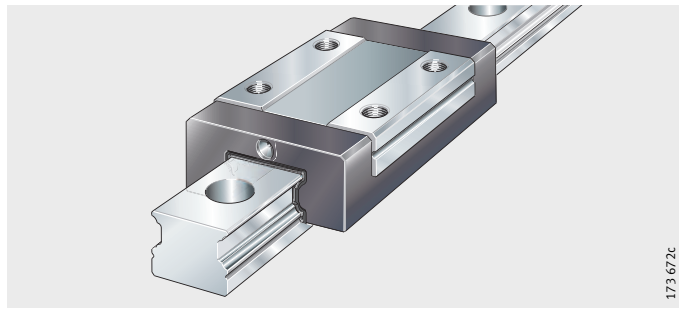


..-LD



Four-row

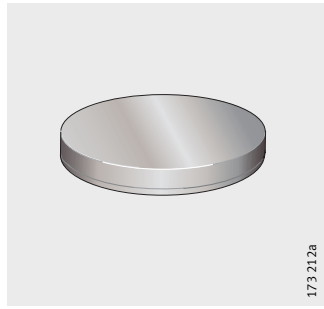
KUME..-C



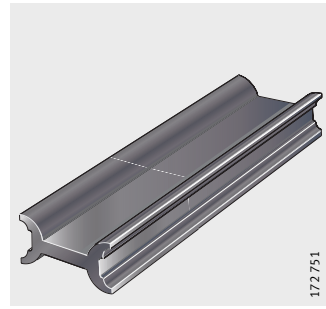
Standard accessories

Plastic closing plug
Dummy guideway

KA..-TN

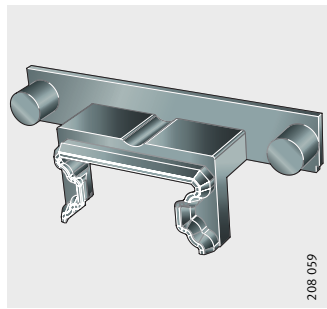


MKMD



Contact type end wiper

..-PP



Corrosion-resistant miniature linear ball bearing and guideway assemblies

Features

Two-row and four-row miniature linear ball bearing and guideway assemblies are full complement, preloaded linear locating bearings for unlimited stroke lengths.

A unit comprises at least one carriage with a locating face and a guideway.

Load carrying capacity

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

The two-row units have two rows of rolling elements in four point contact with the raceways. KUME..-C has four rows of rolling elements in two point contact with the raceways that transmit forces at a contact angle of 45°.

Corrosion-resistant

The miniature linear ball bearing and guideway assemblies are corrosion-resistant due to the steels used in the manufacture of the saddle plates and guideways.

If very high levels of corrosion resistance are required, the suitability of the units for the specific application must be investigated.

Two-row units

In the case of the two-row design, the guideways and carriages are supplied separately. There is a plastic dummy guideway in the carriage. The dummy guideway prevents damage to the rolling element system.

The guideways and carriages are also available in a wide version.

Moderate to high load carrying capacity

The guidance systems have moderate load carrying capacity and moderate to high moment load carrying capacity.

They are suitable for accelerations up to 50 m/s^2 and speeds up to 180 m/min.

Interchangeability

Guideways and carriages can only be combined or replaced within the same accuracy and interchangeability class (A or B), *Figure 1*.

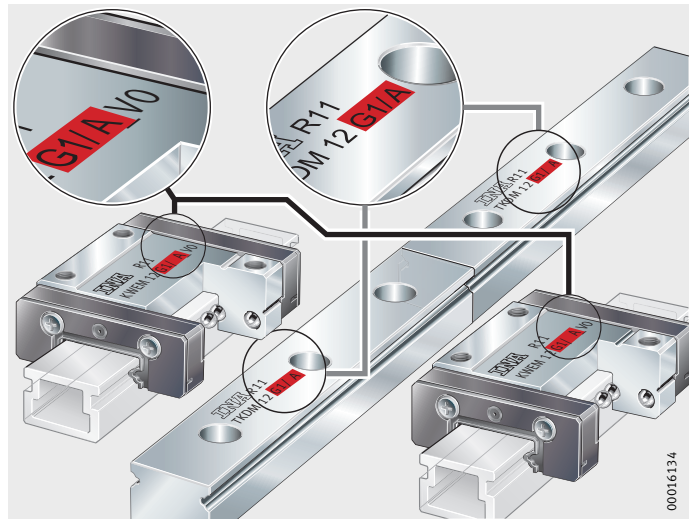


Figure 1
Interchangeability class A or B

Sealing

Seals on the end faces of the carriages protect the rolling element system against contamination.

In order to prevent damage to the guidance systems, the raceways must be kept clean at all times. If the wipers used as standard are not adequate for this purpose, additional seals must be provided in the adjacent construction.

Lubrication

The carriages are greased, but can also be supplied ungreased. They can be relubricated via lubrication holes in the end pieces; in size 15, suitable lubrication nipples are included in the delivery.

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Four-row units

Four-row units are supplied preassembled, so there is at least one carriage on the guideway.

Very high load carrying capacity

The units have very high load carrying capacity and rigidity and moment load carrying capacity.

They are suitable for accelerations up to 40 m/s^2 and speeds up to 180 m/min.

Sealing

Gap seals on the end faces of the carriages protect the rolling element system against contamination.

In order to prevent damage to the guidance systems, the raceways must be kept clean at all times. If the wipers used as standard are not adequate for this purpose, additional seals must be provided in the adjacent construction.

Lubrication

Due to the lubricant reservoir in the carriage, they are maintenance-free in many applications. The guidance systems are not greased but can be lubricated via lubrication holes in the end piece of the carriages; in the case of size 15, lubrication nipples are mounted in the end pieces.

The units have a preservative coating; the preservative is compatible with oils and greases.

The carriage must be oiled or greased before initial operation and protected against solid and liquid contaminants.

Guideways

The guideways have two locating edges. They are made from corrosion-resistant steel, hardened and ground on all faces, the rolling element raceways are precision ground.

For fixing to the adjacent construction, they have threaded holes with counterbores for the screw heads. In the case of the four-row units, plastic plugs are also supplied for closing off the counterbores. The guideways are fixed from above.

Operating temperature

The miniature linear ball bearing and guideway assemblies are suitable for operating temperatures from –10 °C to +100 °C.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
LD	Two-row carriage with sealing strips	Special design
LZM	Two-row carriage with long term lubrication unit	
MKS	Two-row carriage with metal end pieces	
PP	Four-row carriage with contact wipers	
UG	Two-row carriage without greasing	

Applications

These recirculating units are particularly suitable for applications:

- in the microelectronics industry and related sectors
- in optical equipment
- in medical equipment
- in textile machinery
- that require high speeds and very uniform running behaviour
- where particularly economical miniature guidance systems are needed for moderate to high loads and moderate to high rigidity requirements.

Design and safety guidelines

Load carrying capacity and life

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 ratings C and basic static load ratings C_0, see dimension tables.

Basic rating life

The basic rating life is determined as follows:

$$L = \left(\frac{C}{P}\right)^p$$

$$L_h = \frac{8{,}33 \cdot 10^5}{H \cdot n_{osc}} \cdot \left(\frac{C}{P}\right)^p$$

C N
Basic dynamic load rating, see dimension tables
H mm
Distance between ends of stroke
L mm
Basic rating life in 100 000 m
L_h h
Basic rating life in operating hours
n_{osc} min^{-1}
Number of return strokes per minute
p –
Life exponent p = 3
P N
Equivalent dynamic load.

Basic load ratings to DIN, basic load ratings as used in the Far East

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

$$C_{50000} = \mathbf{1{,}26} \cdot C_{DIN}$$

$$C_{DIN} = \mathbf{0{,}79} \cdot C_{50000}$$

C_{DIN} N
Basic dynamic load rating C for distance of 100 000 m, definition according to DIN 636
$C_{50\,000}$ N
Basic dynamic load rating C for distance of 50 000 m.

Static load safety factor

The static load safety factor S_0 indicates the security with regard to permanent deformation at the rolling contact that can be regarded as permissible without affecting the guidance accuracy and smooth running of the bearing.

Static load safety factor

It can be determined using the following formula:

$$S_0 = \frac{C_0}{P_0}$$

$$S_0 = \frac{M_0}{M}$$

The equivalent static bearing load is determined by the maximum load F_{max}.

$$P_0 = F_{max}$$

$$M_0 = M_{max}$$

C_0 N
Basic static load rating, see dimension tables

F_{max} N
Maximum load

M Nm
Moment acting on the element

M_{max} Nm
Maximum moment acting on the element

M_0 Nm
Basic static moment rating in load direction;
M_{0x}, M_{0y}, M_{0z}, see dimension tables

P_0 N
Maximum equivalent static load

S_0 –
Static load safety factor.

If high demands are placed on accuracy and smoothness of running, the static load safety factor should not be less than $S_0 = 3$.

For high loads, the load carrying capacity of the fixing screws must always be checked (see VDI Guideline 2 230).

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Preload

Miniature linear ball bearing and guideway assemblies are available in the preload classes V0 and V1, see table.

TKDM05 (-W)/KWEM05 (-C, -W, -WC) are only available in the preload class V0.

Preload classes

Preload class	Preload setting
V0 (standard)	Zero to light preload
V1	Preload

Influence of preload on the linear guidance system

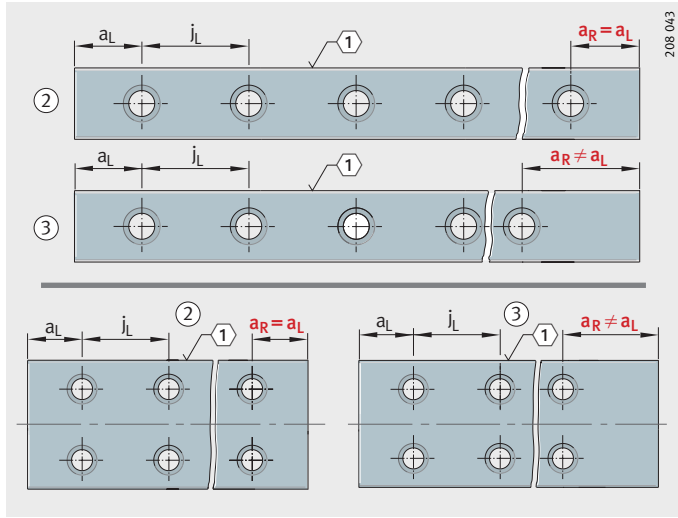
Increasing the preload increases the rigidity, the moment load carrying capacity and the guidance accuracy.

However, preload also influences the displacement resistance and operating life of the linear guidance system.

Hole patterns of guideways

Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 2*.

An asymmetrical hole pattern may also be available upon request. In this case, $a_L \geqq a_{L\,min}$ and $a_R \geqq a_{R\,min}$, *Figure 2*.



Two-row and four-row units

① Locating face
② Symmetrical hole pattern
③ Asymmetrical hole pattern

Figure 2
Hole patterns of guideways with one or two rows of holes

Maximum number of pitches between holes

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

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

The distances a_L and a_R are generally determined as follows:

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

For guideways with a symmetrical hole pattern:

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

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L\,min}$ mm
Minimum values for a_L, a_R, see dimension tables

j_L mm
Distance between holes

l mm
Guideway length

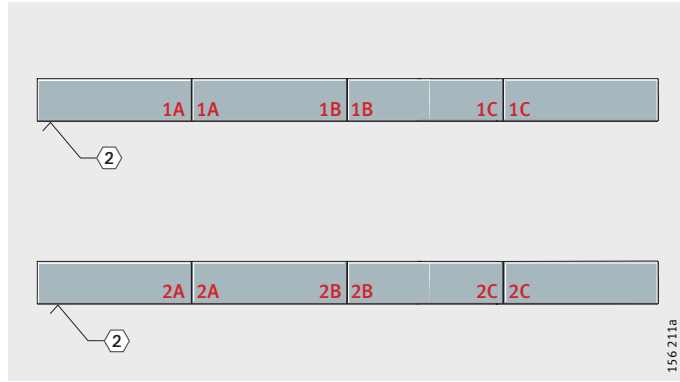
n –
Maximum possible number of hole pitches

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.

Multi-piece guideways

If the guideway length required is greater than l_{max}, a guideway of the total length is made up from individual sections, see dimension tables. The individual sections are matched to each other and marked, *Figure 3*.



〈2〉 Marking
Guideway sections:
1A, 1A
1B, 1B
1C, 1C
2A, 2A
2B, 2B
2C, 2C

Figure 3
Marking of multi-piece guideways

Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when a guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

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.

The tolerances according to *Figure 4*, page 18, *Figure 5*, page 19 and table, page 20 must be observed.

Surfaces should be ground or milled with the aim of achieving a mean roughness value R_a1,6.

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

Height difference ΔH

For ΔH, permissible values are in accordance with the following formula. If larger deviations are present, please contact us.

$$\Delta H = a \cdot b$$

ΔH μm
Maximum permissible deviation from the theoretically precise position, *Figure 4*, page 18

a –
Factor, dependent on the size and preload class, see tables (guidance system clearance-free) and *Figure 5*, page 19

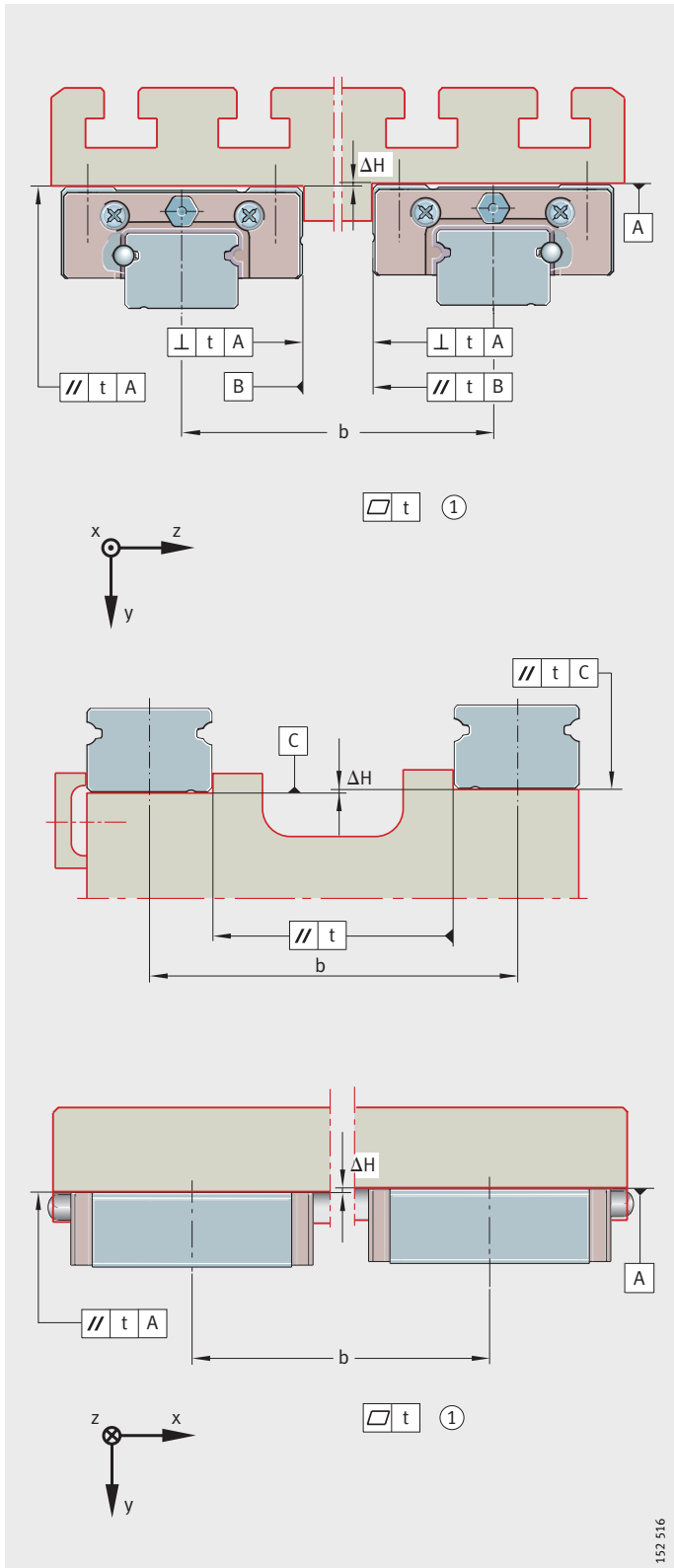
b mm
Centre distance between guidance elements.

Factor for two-row units

Designation		Factor a Preload classes	
Guideway	Carriage	V0	V1
TKDM05 (-W)	KWEM05 (-C, -W, -WC)	0,1	–
TKDM07 (-W)	KWEM07 (-L, -C, -W, -WL, -WC)	0,125	0,02
TKDM09 (-W)	KWEM09 (-L, -C, -W, -WL, -WC)	0,175	0,03
TKDM12 (-W)	KWEM12 (-L, -C, -W, -WL, -WC)	0,25	0,06
TKDM15 (-W)	KWEM15 (-L, -C, -W, -WL, -WC)	0,3	0,15

Factor for four-row units

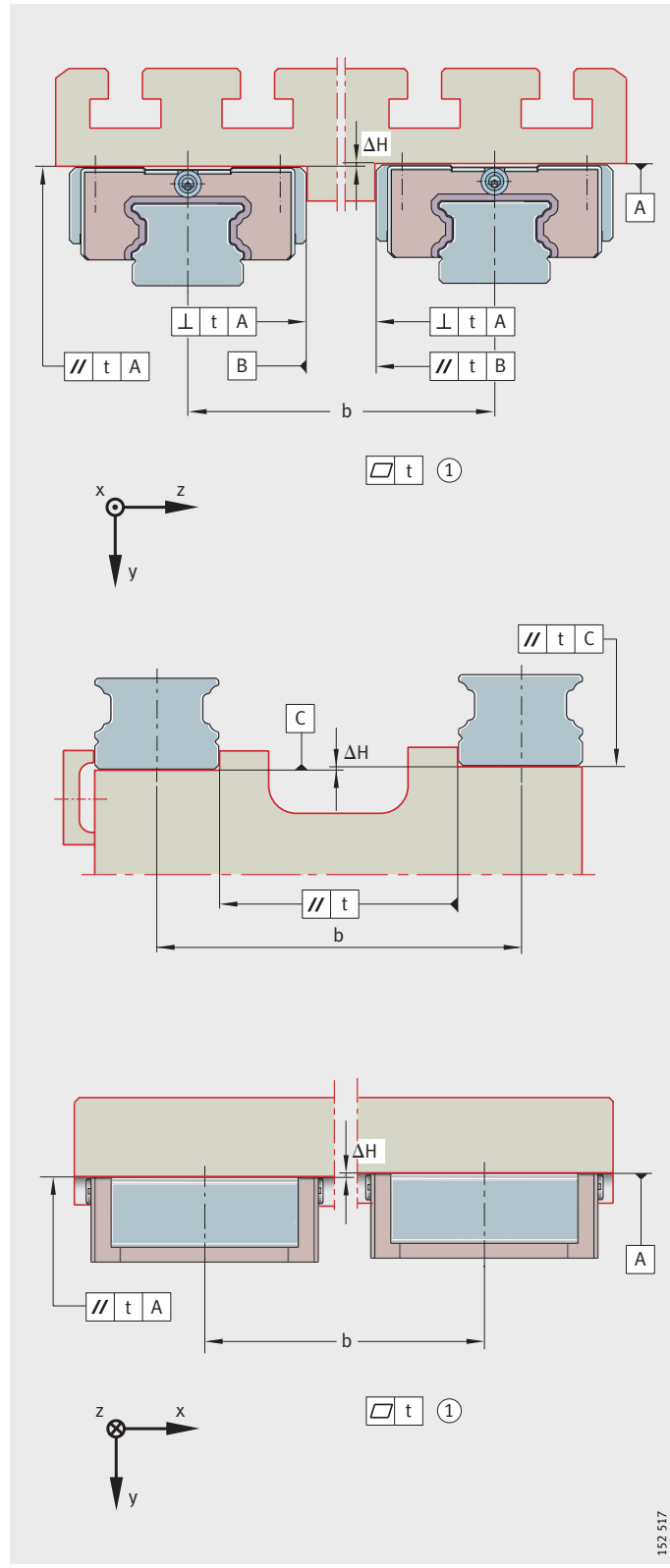
Designation	Factor a
KUME12-C	0,05
KUME15-C	0,1



Two-row units

① Not convex
(for all machined surfaces)

Figure 4
Tolerances of mounting surfaces
and parallelism
of mounted guideways



Four-row units

① Not convex
(for all machined surfaces)

Figure 5
Tolerances of mounting surfaces and parallelism of mounted guideways

Parallelism of mounted guideways

For guideways arranged in parallel, a parallelism t, *Figure 4*, page 18, *Figure 5*, page 19 and tables is required. If the maximum values are used, this may increase the displacement resistance. If larger tolerances are present, please contact us.

Calculation of ΔH: see page 17.

Values for parallelism tolerances of two-row units

Designation Guideway	Accuracy class	
	G1	G2
	Parallelism tolerance t µm	
TKDM05 (-W)	20	30
TKDM07 (-W)		
TKDM09 (-W)		
TKDM12 (-W)		
TKDM15 (-W)		

Values for parallelism tolerances of four-row units

Designation Guideway	Parallelism tolerance t µm
TKMD12-C	5
TKMD15-C	7

Locating heights and corner radii

The locating heights and corner radii should be in accordance with the table, *Figure 6* and *Figure 7*, page 22.

Locating heights and corner radii for two-row units

Designation		Locating heights		Corner radii	
Guideway	Carriage	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 [1] mm max.
TKDM05	KWEM05 (-C)	2	0,8	0,3	0,2
TKDM05-W	KWEM05-W (-WL, -WC)	2	1,2	0,3	0,2
TKDM07	KWEM07 (-L, -C)	2,5	1,2	0,2[1]	0,2
TKDM07-W	KWEM07-W (-WL, -WC)	2,5	1,2	0,2[1]	0,2
TKDM09	KWEM09 (-L, -C)	3	1,5	0,2[1]	0,2
TKDM09-W	KWEM09-W (-WL, -WC)	3	2,5	0,2[1]	0,2
TKDM12	KWEM12 (-L, -C)	4	2,5	0,2[1]	0,2
TKDM12-W	KWEM12-W (-WL, -WC)	4	2,5	0,2[1]	0,2
TKDM15	KWEM15 (-L, -C)	4,5	3	0,2[1]	0,2
TKDM15-W	KWEM15-W (-WL, -WC)	5	3	0,2[1]	0,2

[1] Preferably with undercut.

Two-row units

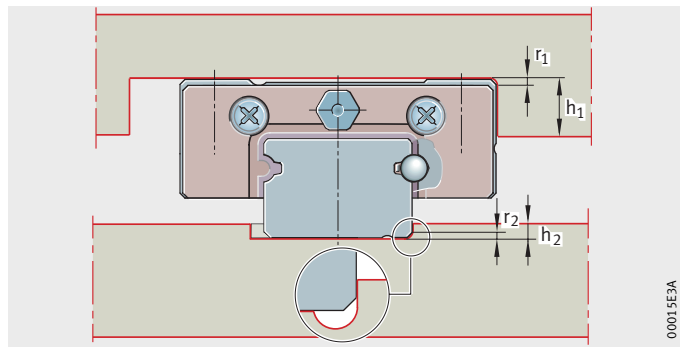


Figure 6
Locating heights and corner radii

Locating heights and corner radii for four-row units

Designation Unit	Locating heights		Corner radii	
	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 mm max.
KUME12-C	3	2,5	0,4	0,4
KUME15-C	5	3	0,7	0,4

Four-row units

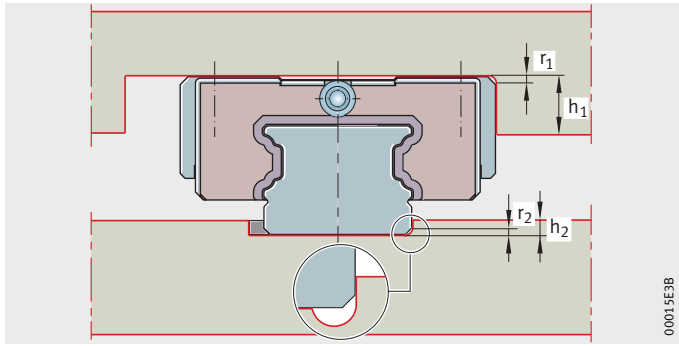


Figure 7
Locating heights and corner radii

Accuracy

Accuracy classes for two-row units

Two-row linear ball bearing and guideway assemblies are supplied in the accuracy classes G1 and G2, *Figure 8*. The standard accuracy class is G2.

t = parallelism tolerance with differential measurement
l = total guideway length
G1, G2 = accuracy classes
① Locating face

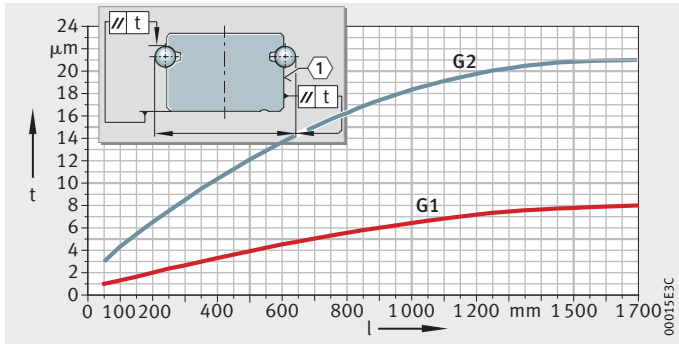


Figure 8
Accuracy classes and parallelism tolerances of guideways

Accuracy classes for four-row units

Four-row linear ball bearing and guideway assemblies are supplied in G2, *Figure 9*.

t = parallelism tolerance with differential measurement
l = total guideway length
G2 = accuracy class
① Locating face

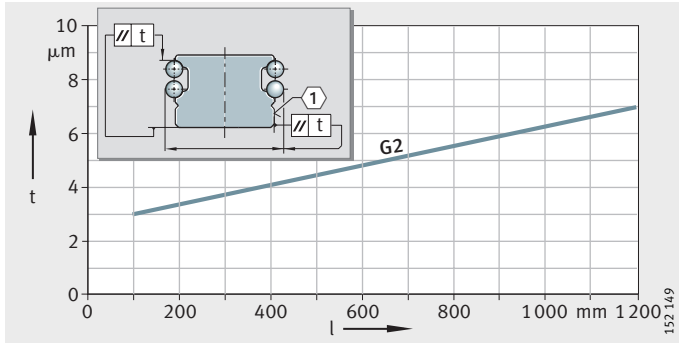


Figure 9
Accuracy classes and parallelism tolerances of guideways

Tolerances

Tolerances, see table;
datum dimensions for accuracy, *Figure 10* and *Figure 11*.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting 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, see table.

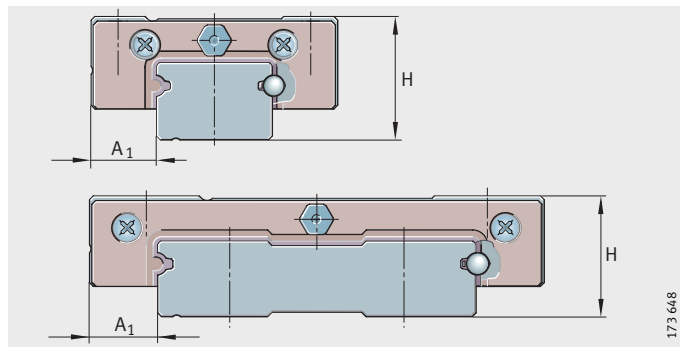
Tolerances of accuracy classes

Tolerance		Accuracy class	
		G1 µm	G2 µm
Tolerance for height	H	±10	±20
Difference in height[1)]	ΔH	7	15
Tolerance for spacing	A_1	±15	±25
Difference in spacing[1)]	ΔA_1	10	20

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

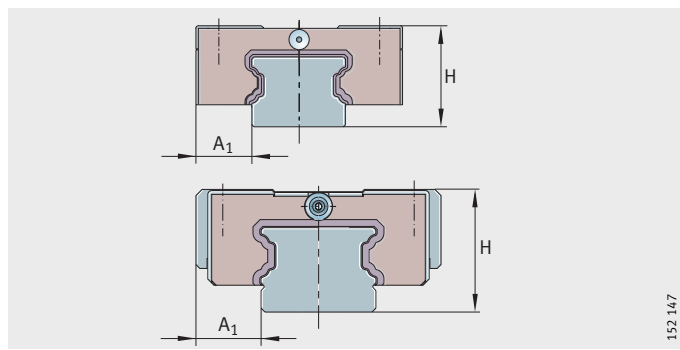
Parallelism of raceways to locating faces

The parallelism tolerances are shown in *Figure 8* and *Figure 9*, page 22.



Two-row units

Figure 10
Datum dimensions for accuracy



Four-row units

Figure 11
Datum dimensions for accuracy

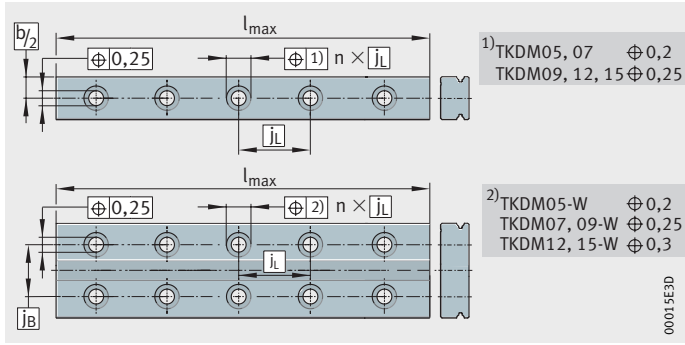
Positional and length tolerances of guideways

The positional and length tolerances are shown in *Figure 12*, *Figure 13* and the tables.

The hole pattern corresponds to DIN ISO 1101.

Length tolerances for two-row guideways

Guideway Designation	Tolerances mm
TKDM05, TKDM05-W	+0,2/−2,2
TKDM07, TKDM07-W	
TKDM09, TKDM09-W	+0,25/−2,25
TKDM12, TKDM12-W	
TKDM15, TKDM15-W	



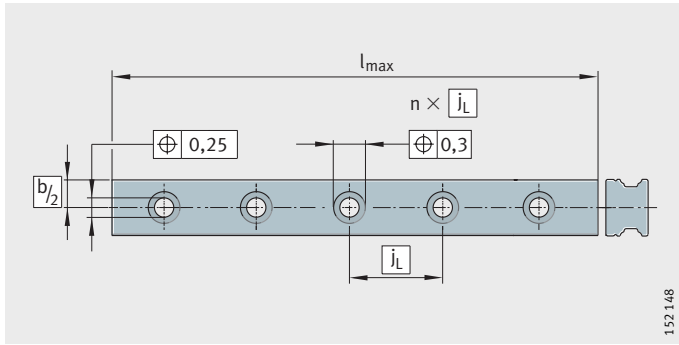
Two-row units

Figure 12
Positional and length tolerances of guideways

The length tolerance of guideways is dependent on the total length of the single-piece guideways.

Length tolerances for four-row guideways

Designation Guideway	Tolerances of guideway mm	
	≦ 300	> 300
TKMD12-C	±0,3 mm	±0,1% of guideway length
TKMD15-C		



Four-row units

Figure 13
Positional and length tolerances of guideways

Accessories

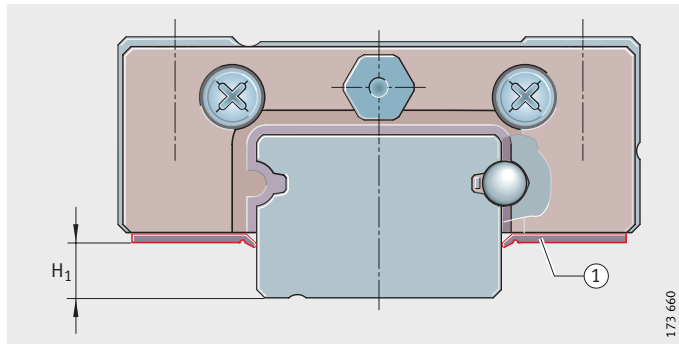
Accessories for four-row units, see page 27.

Two-row units

Carriages with sealing strips

For applications in contaminated environments, the carriages can be fitted on both sides with sealing strips, *Figure 14* and table. The suffix for carriages with sealing strips is LD.

Note the smaller dimension H_1 in this case, see table.



① Sealing strip

Figure 14
Sealing strips and dimension H_1

Dimension H_1 with fitted sealing strips

Designation		H_1
Guideway	Carriage	mm
TKDM09	KWEM09 (-L, -C)	1
TKDM09-W	KWEM09-W (-WL, -WC)	2
TKDM12	KWEM12 (-L, -C)	2
TKDM12-W	KWEM12-W (-WL, -WC)	2
TKDM15	KWEM15 (-L, -C)	3
TKDM15-W	KWEM15-W (-WL, -WC)	3

Carriages without greasing

The carriages can also be supplied without greasing. This variant has the suffix UG.

Clean room applications

For clean room applications, carriages with special grease are available. Please contact us for information about the clean room grease.

Grease syringe

A miniature grease syringe is available for carriages with a lubrication hole. This can be supplied with standard or clean room grease.

The ordering designation for the standard grease is SPRI-KWEM.

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Long term lubrication unit

The long term lubrication unit is fitted in the return bore of the saddle plate KWEM and has the suffix LZM, *Figure 15*

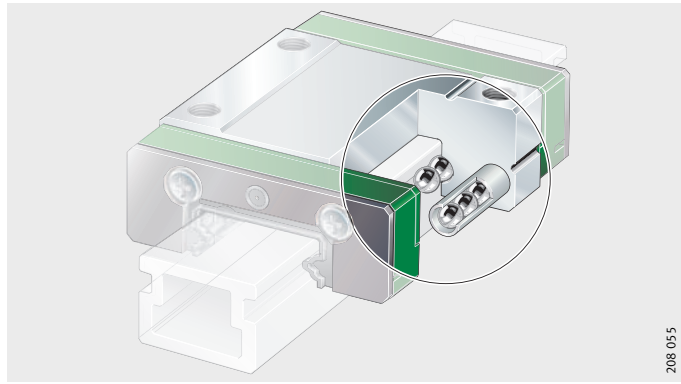
Delivered condition

Two-row miniature linear ball bearing and guideway assembles with a long term lubrication unit are supplied with initial greasing and are ready for immediate use.

The integrated end seal fitted as standard prevents loss of lubricant. Sealing strips are available as an option. These have the suffix LD.

Available sizes

The long term lubrication unit LZM is available for all variants of the sizes KWEM09 to KWEM15.



KWEM..-LZM

Figure 15
Long term lubrication unit

Ordering example

The ordering designation for a two-row miniature linear ball bearing and guideway assembly of size 12, with a long term lubrication unit, accuracy class G2, preload class V0 is:

KWEM12-G2-V0-LZM

Metal end piece

In the two-row miniature linear ball bearing and guideway assembly KWEM..-MKS, an end piece made from corrosion-resistant steel is fitted.

Advantages of the metal end pieces

Their higher strength in comparison with plastic designs allows higher dynamic values.
The resistance to temperatures is effective up to +180 °C.

Delivered condition

Two-row miniature linear ball bearing and guideway assemblies with metal end pieces are only supplied ungreased (suffix UG) and without seals (end seals and sealing strips). The metal end piece has the suffix MKS.

Ordering example

The ordering designation for a two-row miniature linear ball bearing and guideway assembly of size 7, with metal end pieces, accuracy class G2, preload class V0 is:

KWEM07-G2-V0-UG-MKS

Four-row units

Carriages with contact type end wipers

The carriages of four-row miniature linear ball bearing and guideway assemblies can be fitted with contact type end wipers.

In order to protect the end wiper while the carriage is being fitted, these units have a guideway with a larger chamfer, *Figure 16*.

Units with contact type end wipers have the suffix PP.

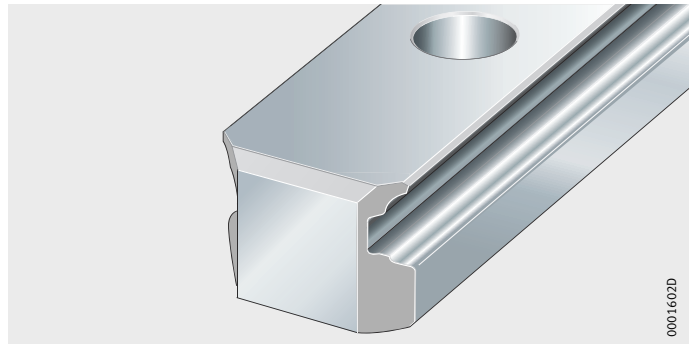


Figure 16
Guideway with larger chamfer

Ordering example, ordering designation

Two-row units

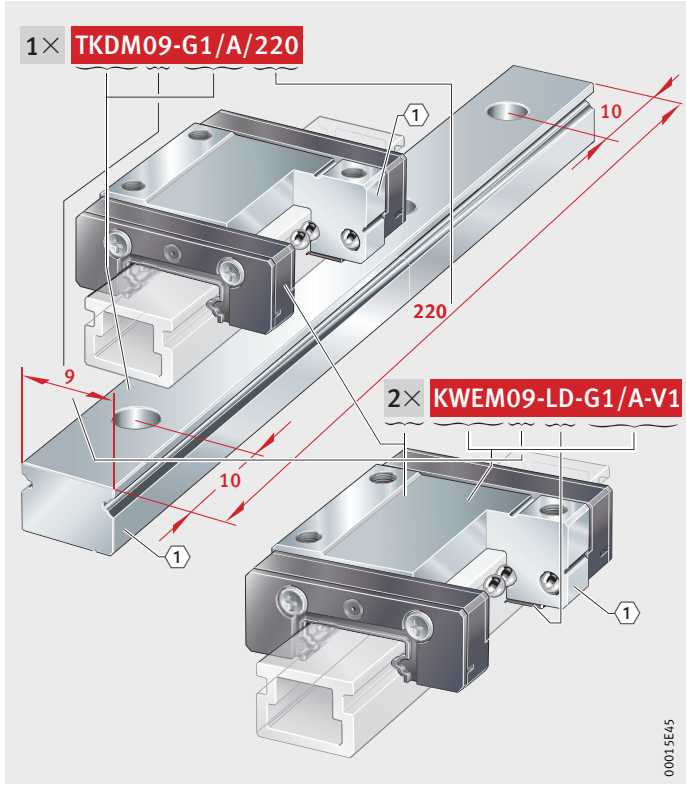
The guideway has a symmetrical hole pattern.

Carriage	Number of carriages	2
	Carriage	KWEM
	Size	09
	Sealing strip	LD
	Accuracy class	G1
	Interchangeability class (must be identical to the guideway)	A or B
	Preload	V1
Guideway	Number of guideways	1
	Guideway	TKDM
	Size	09
	Accuracy class	G1
	Interchangeability class (must be identical to the carriage)	A or B
	Length of guideway	220 mm
	a_L	10 mm
	a_R	10 mm

Ordering designation

2×**KWEM09-LD-G1/A-V1**

1×**TKDM09-G1/A/220**, *Figure 17*



1 Locating face

Figure 17
Ordering example, ordering designation

Two-row units

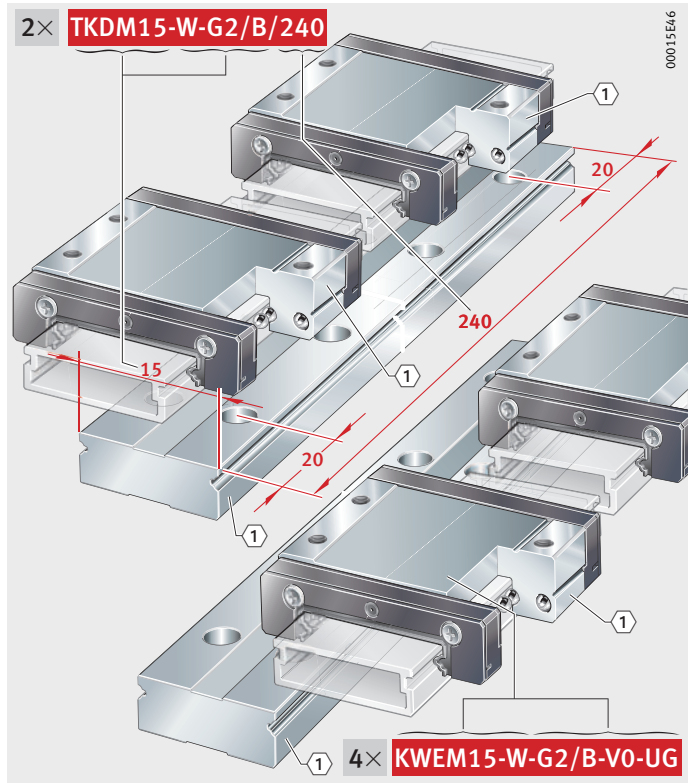
The guideway has a symmetrical hole pattern.

Carriage	Number of carriages	4
	Carriage	KWEM
	Size	15
	Wide design	W
	Accuracy class	G2
	Interchangeability class (must be identical to the guideway)	A or B
	Preload	V0
	Ungreased	UG
Guideway	Number of guideways	2
	Guideway	TKDM
	Size	15
	Wide design	W
	Accuracy class	G2
	Interchangeability class (must be identical to the carriage)	A or B
	Length of guideway	240 mm
	a_L	20 mm
	a_R	20 mm

Ordering designation

4×**KWEM15-W-G2/B-V0-UG**

2×**TKDM15-W-G2/B/240**, *Figure 18*



① Locating face

Figure 18
Ordering example, ordering designation

Two-row units

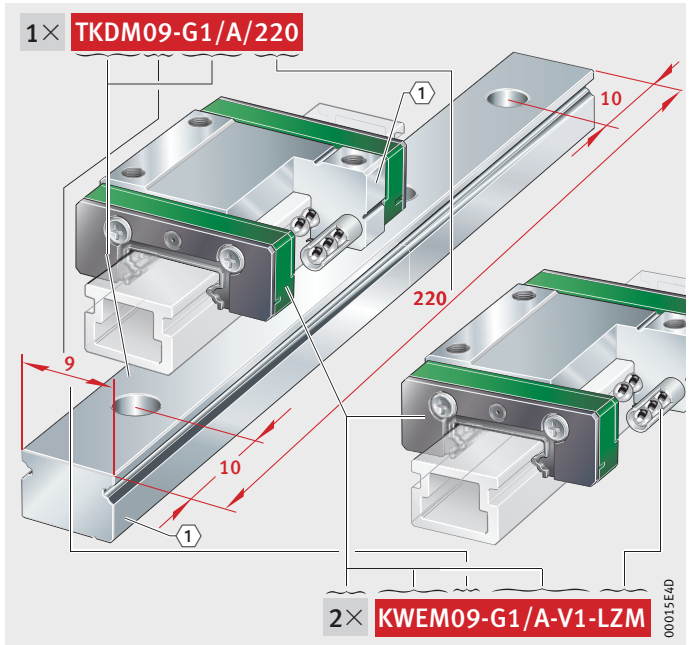
The guideway has a symmetrical hole pattern.

Carriage	Number of carriages	2
	Carriage	KWEM
	Size	09
	Long term lubrication unit	LZM
	Accuracy class	G1
	Interchangeability class (must be identical to the guideway)	A or B
	Preload	V1
Guideway	Number of guideways	1
	Guideway	TKDM
	Size	09
	Accuracy class	G1
	Interchangeability class (must be identical to the carriage)	A or B
	Length of guideway	220 mm
	a_L	10 mm
	a_R	10 mm

Ordering designation

2×**KWEM09-G1/A-V1-LZM**

1×**TKDM09-G1/A/220**, *Figure 19*



1 Locating face

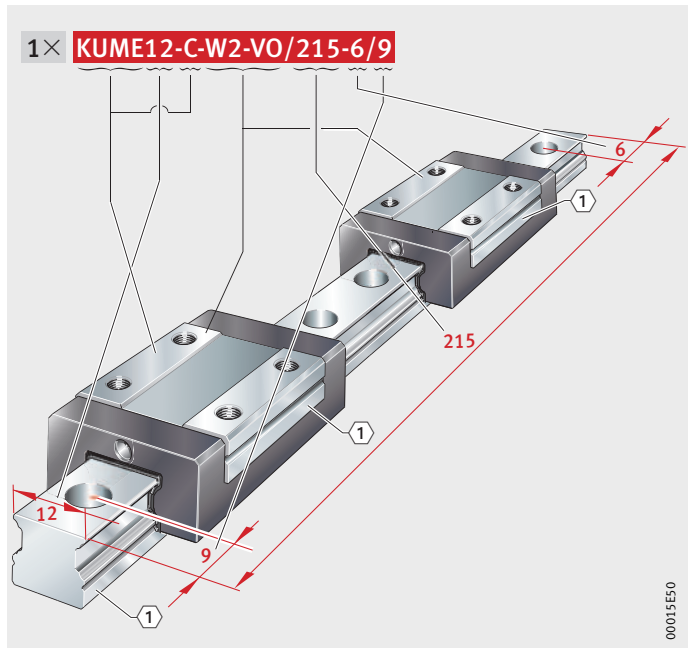
Figure 19
Ordering example, ordering designation

Four-row units

The guideway has an asymmetrical hole pattern.

Miniature linear ball bearing and guideway assembly	KUME-C
Size	12
Number of carriages per unit	W2
Preload	V0
Length of guideway	215 mm
a_L	6 mm
a_R	9 mm

Ordering designation 1×**KUME12-C-W2-V0/215-6/9**, *Figure 20*

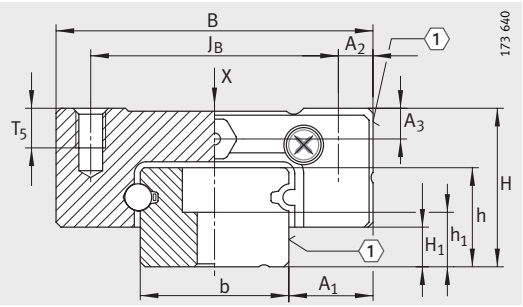


① Locating face

Figure 20
Ordering example, ordering designation

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row



KWEM (-L, -C) with TKDM
1 [3]

Dimension table · Dimensions in mm

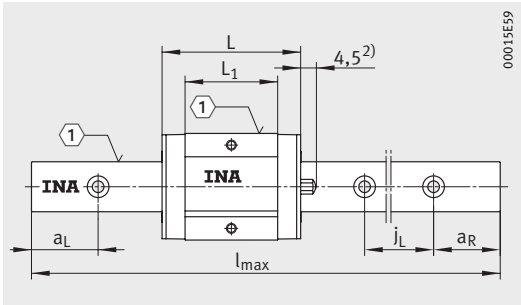
Carriage Designation	Guideway Designation	Dimensions				Mounting dimensions			
		l_{max} [1]	H	B	L	A_1	J_B	b	A_2
KWEM05	**TKDM05**	210	6	12	19	3,5	8	5	2
KWEM05-C			6	12	16	3,5	8	5	2
KWEM07	**TKDM07**	300	8	17	23,5	5	12	7	2,5
KWEM07-L			8	17	31	5	12	7	2,5
KWEM07-C			8	17	19	5	12	7	2,5
KWEM09	**TKDM09**	860	10	20	30	5,5	15	9	2,5
KWEM09-L			10	20	40,5	5,5	15	9	2,5
KWEM09-C			10	20	21,5	5,5	15	9	2,5
KWEM12	**TKDM12**	1 000	13	27	34	7,5	20	12	3,5
KWEM12-L			13	27	44	7,5	20	12	3,5
KWEM12-C			13	27	25	7,5	20	12	3,5
KWEM15	**TKDM15**	1 000	16	32	42	8,5	25	15	3,5
KWEM15-L			16	32	57	8,5	25	15	3,5
KWEM15-C			16	32	32	8,5	25	15	3,5

For further table values, see page 34 and page 35.

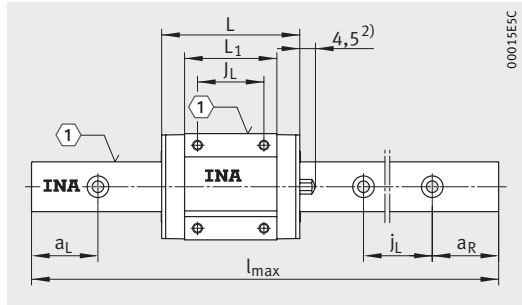
1) Maximum guideway length; longer guideways may be available by agreement.
Available standard lengths: see page 34.

2) A lubrication nipple is supplied with size 15.

3) 1 Locating face.



KWEM05, KWEM..-C with TKDM,
view rotated 90°
1 3)

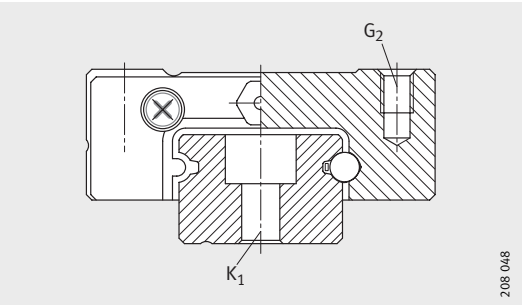


From KWEM07 (-L) with TKDM,
view rotated 90°
1 3)

L_1	J_L	j_L	a_L		a_R		H_1	T_5	A_3	h	h_1
			min.	max.	min.	max.					
12,6	–	15	4	11,5	4	11,5	1	1,5	1,2	3,7	2,9
9,6	–	15	4	11,5	4	11,5	1	1,5	1,2	3,7	2,9
14,3	8	15	4,5	12	4,5	12	1,5	2,5	1,5	5	2,7
21,6	12	15	4,5	12	4,5	12	1,5	2,5	1,5	5	2,7
9,6	–	15	4,5	12	4,5	12	1,5	2,5	1,5	5	2,7
20,8	10	20	4,5	14,5	4,5	14,5	2	3	2,2	6	2,5
30,9	15	20	4,5	14,5	4,5	14,5	2	3	2,2	6	2,5
11,9	–	20	4,5	14,5	4,5	14,5	2	3	2,2	6	2,5
21,6	15	25	5	17,5	5	17,5	3	3,5	2,7	8	3,5
32	20	25	5	17,5	5	17,5	3	3,5	2,7	8	3,5
13	–	25	5	17,5	5	17,5	3	3,5	2,7	8	3,5
27,8	20	40	5,5	25,5	5,5	25,5	4	4	3,1	10	5,5
42,7	25	40	5,5	25,5	5,5	25,5	4	4	3,1	10	5,5
17,7	–	40	5,5	25,5	5,5	25,5	4	4	3,1	10	5,5

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row



KWEM (-L, -C) with TKDM

Dimension table (continued) · Dimensions in mm

Carriage				Guideway	
Designation			Mass	Designation	Mass
Standard	With long term lubrication unit	With metal end pieces[1]	m ≈kg		m ≈kg/m
KWEM05	**KWEM05-LZM**	**KWEM05-UG-MKS**	0,004	**TKDM05**	0,120
KWEM05-C	**KWEM05-C-LZM**	**KWEM05-C-UG-MKS**	0,003		
KWEM07	**KWEM07-LZM**	**KWEM07-UG-MKS**	0,010	**TKDM07**	0,220
KWEM07-L	**KWEM07-L-LZM**	**KWEM07-L-UG-MKS**	0,014		
KWEM07-C	**KWEM07-C-LZM**	**KWEM07-C-UG-MKS**	0,007		
KWEM09	**KWEM09-LZM**	**KWEM09-UG-MKS**	0,019	**TKDM09**	0,350
KWEM09-L	**KWEM09-L-LZM**	**KWEM09-L-UG-MKS**	0,028		
KWEM09-C	**KWEM09-C-LZM**	**KWEM09-C-UG-MKS**	0,011		
KWEM12	**KWEM12-LZM**	**KWEM12-UG-MKS**	0,035	**TKDM12**	0,650
KWEM12-L	**KWEM12-L-LZM**	**KWEM12-L-UG-MKS**	0,051		
KWEM12-C	**KWEM12-C-LZM**	**KWEM12-C-UG-MKS**	0,022		
KWEM15	**KWEM15-LZM**	**KWEM15-UG-MKS**	0,064	**TKDM15**	1,070
KWEM15-L	**KWEM15-L-LZM**	**KWEM15-L-UG-MKS**	0,095		
KWEM15-C	**KWEM15-C-LZM**	**KWEM15-C-UG-MKS**	0,042		

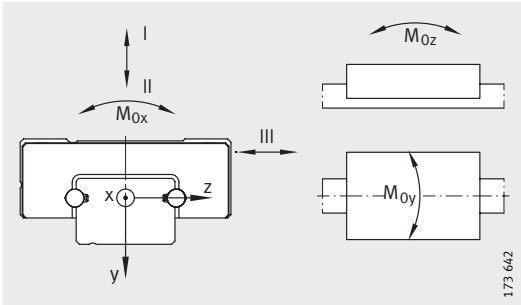
1) Without greasing (preservative coating only) and without seals.

2) If there is a possibility of settling, the fixing screws should be secured against rotation.

3) For location, special screws are required that are available by agreement. Standard screws cannot be used.

Standard lengths for guideways

TKDM05		**TKDM07**		**TKDM09**		**TKDM12**		**TKDM15**	
Length mm	Mass ≈kg	Length mm	Mass ≈kg	Length mm	Mass ≈kg	Length mm	Mass ≈kg	Length mm	Mass ≈kg
60	0,007	60	0,013	60	0,021	100	0,065	160	0,171
90	0,011	90	0,020	80	0,028	150	0,098	240	0,257
105	0,013	120	0,026	120	0,042	200	0,13	320	0,342
120	0,014	150	0,033	160	0,056	275	0,179	440	0,471
150	0,018	180	0,040	220	0,077	350	0,228	560	0,599
210	0,025	240	0,053	280	0,098	475	0,309	680	0,728
–	–	300	0,066	860	0,301	1 000	0,65	1 000	1,07

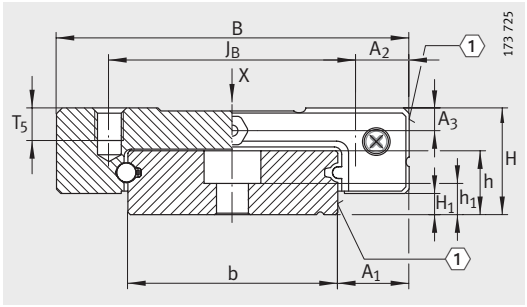


Load directions:
see column Load carrying capacity

Fixing screws[2]				Load carrying capacity						
K_1		G_2		Basic load ratings				Moment ratings		
DIN ISO 4762-12.9				Load directions I and II (tensile and compressive load)		Load directions III (lateral load)				
	M_A Nm		M_A Nm	C N	C_0 N	C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
M2[3]	0,6	M2	0,6	534	1 090	470	916	2,9	1,9	2,3
				444	841	391	706	2,2	1,2	1,4
M2	0,6	M2	0,6	1 051	1 890	925	1 587,6	6,9	3,9	4,7
				1 335	2 650	1 175	2 226	9,7	7,4	8,8
				740	1 140	651	958	4,1	1,5	1,8
M3	2,2	M3	2,2	1 430	2 760	1 258	2 318	12,8	7,6	9,1
				1 872	4 030	1 648	3 385	18,7	15,7	18,7
				932	1 480	820	1 243	6,9	2,4	2,9
M3	2,2	M3	2,2	2 631	4 290	2 315	3 604	26,6	12,9	15,4
				3 405	6 200	2 996	5 208	38,4	25,7	30,6
				1 746	2 380	1 536	1 999	14,8	4,5	5,3
M3	2,2	M3	2,2	3 934	6 490	3 462	5 452	50	24,9	29,7
				5 230	9 740	4 602	8 182	75	53,6	63,9
				2 757	3 890	2 426	3 268	30	9,8	11,7

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row



KWEM..-W (-WL, -WC) with TKDM..-W
1 [2]

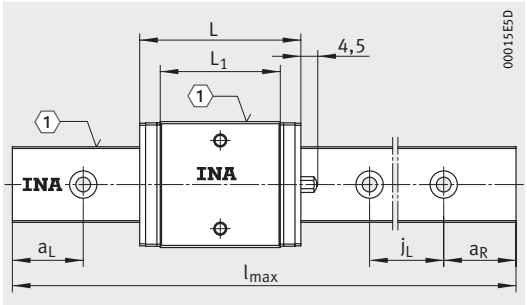
Dimension table · Dimensions in mm

Carriage Designation	Guideway Designation	Dimensions				Mounting dimensions			
		l_{max} [1]	H	B	L	A_1	J_B	b	A_2
KWEM05-W	**TKDM05-W**	300	6,5	17	24,5	3,5	13	10	2
KWEM05-WC			6,5	17	20,5	3,5	13	10	2
KWEM07-W	**TKDM07-W**	300	9	25	31,5	5,5	19	14	3
KWEM07-WL			9	25	42	5,5	19	14	3
KWEM07-WC			9	25	22,5	5,5	19	14	3
KWEM09-W	**TKDM09-W**	690	12	30	39	6	21	18	4,5
KWEM09-WL			12	30	50,5	6	23	18	3,5
KWEM09-WC			12	30	26,5	6	21	18	4,5

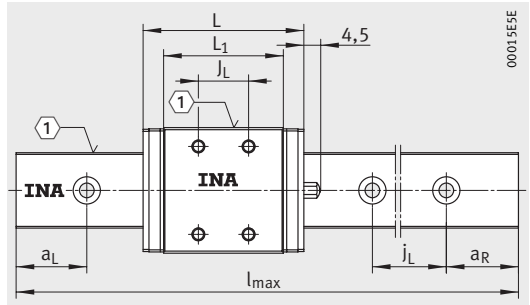
For further table values, see page 38 and page 39.

1) Maximum guideway length; longer guideways may be available by agreement.
Available standard lengths: see page 38.

2) 1 Locating face.



KWEM05-W (-WC) with TKDM05-W,
view rotated 90°
1 2)

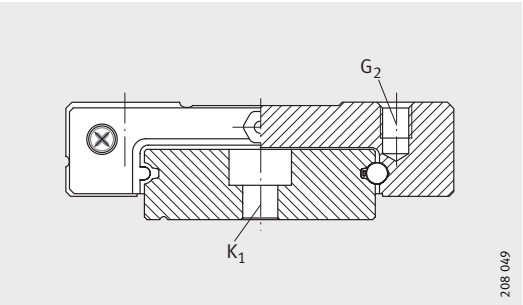


From KWEM07-W (-WL) with TKDM..-W,
view rotated 90°
1 2)

L_1	J_L	j_L	a_L		a_R		H_1	T_5	A_3	h	h_1
			min.	max.	min.	max.					
17,6	–	20	4,5	14,5	4,5	14,5	1,5	1,5	1,3	4	2,4
13,6	–	20	4,5	14,5	4,5	14,5	1,5	1,5	1,3	4	2,4
22	10	30	5,5	20,5	5,5	20,5	2	3	1,7	5,5	2,3
32,5	19	30	5,5	20,5	5,5	20,5	2	3	1,7	5,5	2,3
13	–	30	5,5	20,5	5,5	20,5	2	3	1,7	5,5	2,3
28,6	12	30	5,5	20,5	5,5	20,5	3	3	2,5	7	2,5
40,4	24	30	5,5	20,5	5,5	20,5	3	3	2,5	7	2,5
16,6	–	30	5,5	20,5	5,5	20,5	3	3	2,5	7	2,5

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row



KWEM..-W (-WL, -WC) with TKDM..-W

Dimension table (continued) · Dimensions in mm

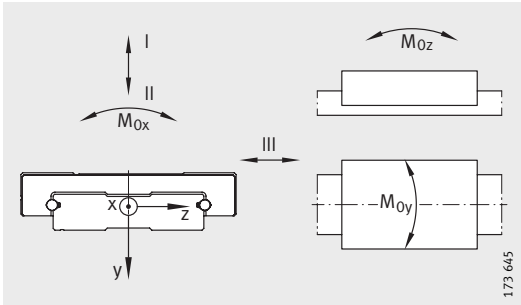
Carriage			Guideway	
Designation		Mass	Designation	Mass
Standard	With metal end pieces[1]	m		m
		≈kg		≈kg/m
KWEM05-W	**KWEM05-W-UG-MKS**	0,008	**TKDM05-W**	0,280
KWEM05-WC	**KWEM05-WC-UG-MKS**	0,006		
KWEM07-W	**KWEM07-W-UG-MKS**	0,021	**TKDM07-W**	0,540
KWEM07-WL	**KWEM07-WL-UG-MKS**	0,031		
KWEM07-WC	**KWEM07-WC-UG-MKS**	0,013		
KWEM09-W	**KWEM09-W-UG-MKS**	0,044	**TKDM09-W**	0,900
KWEM09-WL	**KWEM09-WL-UG-MKS**	0,061		
KWEM09-WC	**KWEM09-WC-UG-MKS**	0,026		

1) Without greasing (preservative coating only) and without seals.

2) If there is a possibility of settling, the fixing screws should be secured against rotation.

Standard lengths for guideways

TKDM05-W		**TKDM07-W**		**TKDM09-W**	
Length	Mass	Length	Mass	Length	Mass
mm	≈kg	mm	≈kg	mm	≈kg
60	0,017	90	0,049	90	0,081
80	0,022	120	0,065	120	0,108
120	0,034	150	0,081	150	0,135
160	0,045	180	0,097	180	0,162
220	0,062	240	0,13	240	0,216
280	0,078	300	0,162	300	0,27
300	0,084	–	–	690	0,621

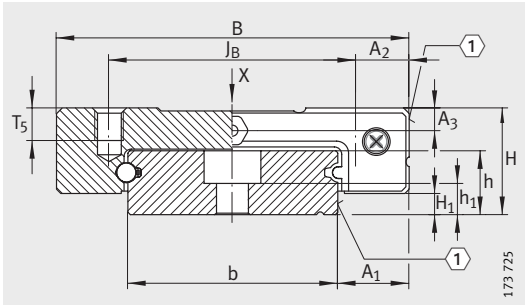


Load directions:
see column Load carrying capacity

Fixing screws[2]				Load carrying capacity						
K_1		G_2		Basic load ratings				Moment ratings		
DIN ISO 4762-12.9				Load directions I and II (tensile and compressive load)		Load directions III (lateral load)				
	M_A Nm		M_A Nm	C N	C_0 N	C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
M2,5	–	M2,5	–	671	1 510	590	1 268	7,8	3,5	4,2
				562	1 180	495	991	6,1	2,2	2,6
M3	2,2	M3	2,2	1 398	2 840	1 231	2 386	20,3	8,4	10,1
				1 833	4 160	1 613	3 494	29,8	17,6	21
				980	1 700	862	1 428	12,2	3,2	3,8
M3	2,2	M3	2,2	1 801	3 810	1 585	3 200	34,9	14,2	16,9
				2 267	5 300	1 995	4 452	48,5	26,7	31,9
				1 193	2 120	1 050	1 781	19,4	4,7	5,5

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row



KWEM12-W (-WL, -WC) with TKDM12-W
1 [3]

Dimension table · Dimensions in mm

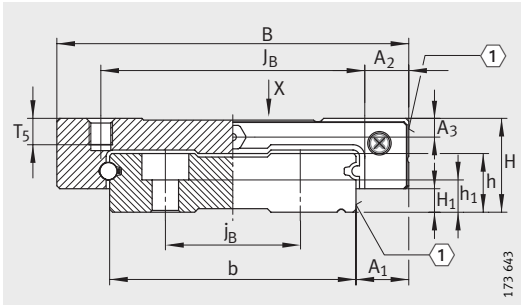
Carriage Designation	Guideway Designation	Dimensions				Mounting dimensions			
		l_{max} [1]	H	B	L	A_1	J_B	b	A_2
KWEM12-W	**TKDM12-W**	680	14	40	44	8	28	24	6
KWEM12-WL			14	40	59	8	28	24	6
KWEM12-WC			14	40	30,5	8	28	24	6
KWEM15-W	**TKDM15-W**	680	16	60	55	9	45	42	7,5
KWEM15-WL			16	60	74,5	9	45	42	7,5
KWEM15-WC			16	60	41,5	9	45	42	7,5

For further table values, see page 42 and page 43.

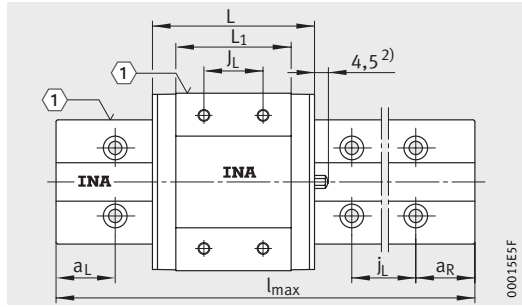
1) Maximum guideway length; longer guideways may be available by agreement.
Available standard lengths: see page 42.

2) A lubrication nipple is supplied with size 15.

3) 1 Locating face.

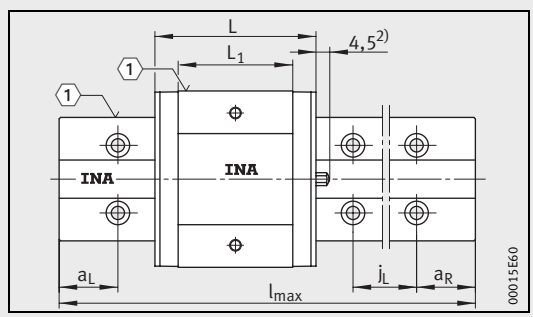


KWEM15-W (-WL, -WC) with TKDM15-W
1 3)



KWEM15-W (-WL) with TKDM15-W,
view rotated 90°
1 3)

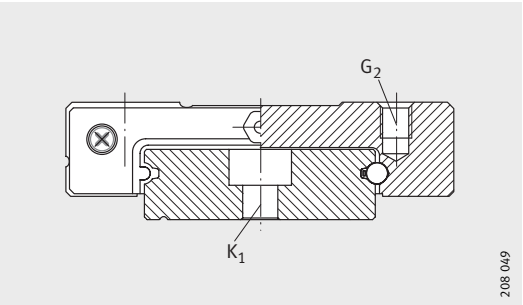
L_1	J_L	j_L	j_B	a_L		a_R		H_1	T_5	A_3	h	h_1
				min.	max.	min.	max.					
31	15	40	–	6,5	26,5	6,5	26,5	3	3,5	3,2	8	3,5
46,3	28	40	–	6,5	26,5	6,5	26,5	3	3,5	3,2	8	3,5
17,7	–	40	–	6,5	26,5	6,5	26,5	3	3,5	3,2	8	3,5
39	20	40	23	6,5	26,5	6,5	26,5	4	4,5	3,2	10	5,5
58,3	35	40	23	6,5	26,5	6,5	26,5	4	4,5	3,2	10	5,5
25,3	–	40	23	6,5	26,5	6,5	26,5	4	4,5	3,2	10	5,5



KWEM15-WC with TKDM15-W,
view rotated 90°
1 3)

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Two-row



KWEM..-W (-WL, -WC) with TKDM..-W

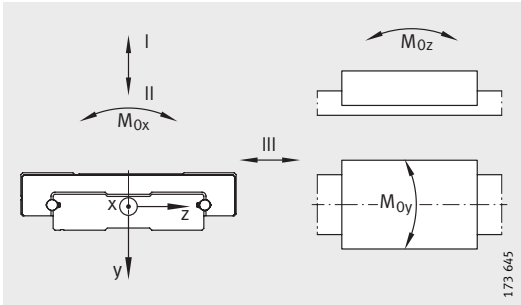
Dimension table (continued) · Dimensions in mm

Carriage			Guideway	
Designation		Mass	Designation	Mass
Standard	With metal end pieces[1]	m		m
		≈kg		≈kg/m
KWEM12-W	**KWEM12-W-UG-MKS**	0,076		
KWEM12-WL	**KWEM12-WL-UG-MKS**	0,111	**TKDM12-W**	1,390
KWEM12-WC	**KWEM12-WC-UG-MKS**	0,045		
KWEM15-W	**KWEM15-W-UG-MKS**	0,140		
KWEM15-WL	**KWEM15-WL-UG-MKS**	0,204	**TKDM15-W**	2,940
KWEM15-WC	**KWEM15-WC-UG-MKS**	0,095		

1) Without greasing (preservative coating only) and without seals.

2) If there is a possibility of settling, the fixing screws should be secured against rotation.

Standard lengths for guideways			
TKDM12-W		**TKDM15-W**	
Length	Mass	Length	Mass
mm	≈kg	mm	≈kg
120	0,167	160	0,470
160	0,222	240	0,706
240	0,334	320	0,941
320	0,445	440	1,294
400	0,556	560	1,646
480	0,667	680	2,000
680	0,945	–	–

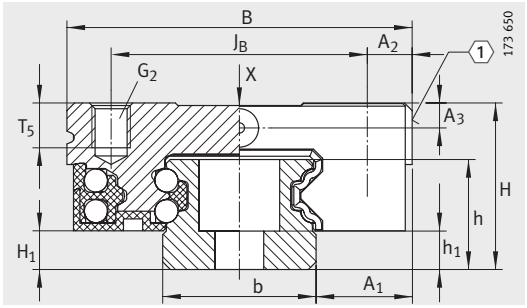


Load directions:
see column Load carrying capacity

Fixing screws[2]				Load carrying capacity						
K_1		G_2		Basic load ratings				Moment ratings		
DIN ISO 4762-12.9				Load directions I and II (tensile and compressive load)		Load directions III (lateral load)				
	M_A Nm		M_A Nm	C N	C_0 N	C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
M3	2,2	M3	2,2	3 405	6 200	2 996	5 208	75,6	25,7	30,6
				4 440	9 060	3 907	7 610	111	53,1	63,3
				2 212	3 340	1 947	2 806	40,7	8,2	9,7
M4	5	M4	5	5 570	9 840	4 901	8 266	209	51,4	61,3
				7 268	14 400	6 396	12 096	305	106	126
				3 974	6 050	3 497	5 082	128	20,8	24,8

Corrosion-resistant miniature linear ball bearing and guideway assemblies

Four-row



KUME..-C
1 3)

Dimension table · Dimensions in mm

Designation	Carriage		Guideway		Closing plug	Mounting dimensions				Dimensions	
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m		l_{max} 1)	H	B	L	A_1	J_B
KUME12-C	**KWME12-C**	0,03	**TKMD12-C**	0,6	KA6-TN	1 000	13	27	35,8	7,5	20
KUME15-C	**KWME15-C**	0,06	**TKMD15-C**	1,1	KA6-TN	1 200	16	32	44	8,5	25

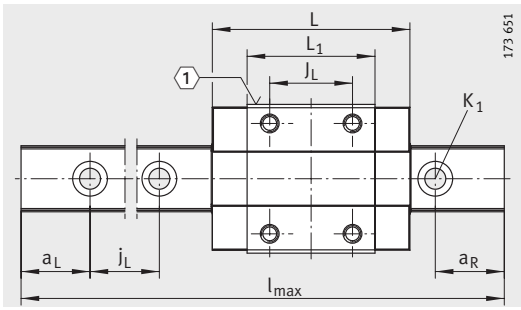
1) Maximum guideway length; longer guideways available by agreement.

2) If there is a possibility of settling, the fixing screws should be secured against rotation.

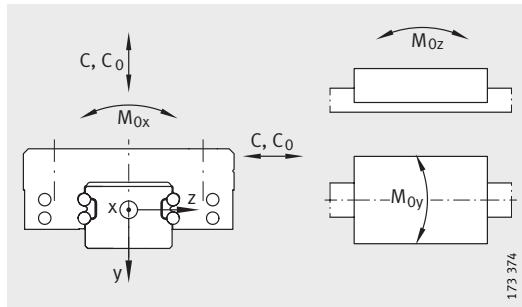
3) 1 Locating face.

Dimension table (continued) · Dimensions in mm

Designation	Load carrying capacity					Fixing screws 2)			
	Basic load ratings		Moment ratings			K_1		G_2	
	C	C_0	M_{0x}	M_{0y}	M_{0z}	DIN ISO 4 762-12.9			
							M_A		M_A
	N	N	Nm	Nm	Nm		Nm		Nm
KUME12-C	2 900	5 200	33	17	17	M3	2,2	M3	2,2
KUME15-C	4 400	8 300	67	34	34	M3	2,2	M3	2,2



KUME..-C,
view rotated 90°
1 3)



Load directions:
see column Load carrying capacity

b	A_2	L_1	J_L	j_L	a_L		a_R		H_1	T_5	A_3	h	h_1
					min.	max.	min.	max.					
12	3,5	23,2	15	25	5	20	5	20	3	3,5	1,95	8,6	3
15	3,5	28	20	40	6	34	6	34	3,5	4	2,46	10,6	4,1

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