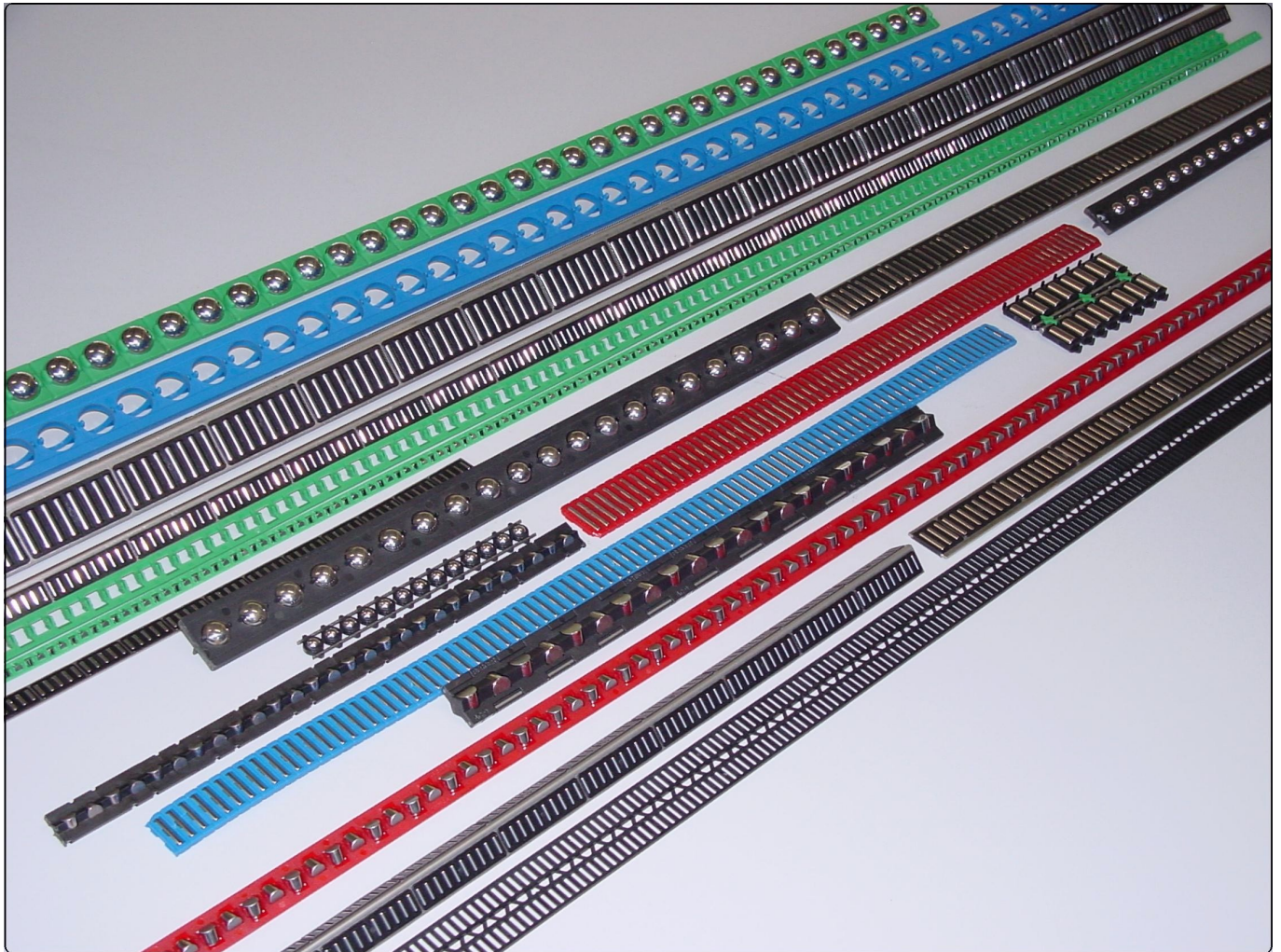


# Linear ball cages



**Standard range**

Page

## Linear ball cages

2	General	Description of product
3	General	Shape, advantages
4	General	Material
5	PA 12 / PA 12 GF 30	Material data
6	Strength	Temperature, vacuum, argon gas etc.

## Ball cage

9	Series KCLK
10	Series KCLK 101
11	Series KKVK
12	Series KKAK ...L
14	Series KKNK 104

## (Tables of dimensions)

Filled with balls
Linear ball cage with guide and support
Compound ball cage
Flat ball cage
Ball mesh

## Roller cage

16	Series KKXL-01 / 02
17	Series KKXL-03 / 06 / 09
18	Series KKBN (SLS)
19	Series KKBN 06 (SLS)
20	Series KLBF
22	Series KLBF 5020
23	Series KKFF
24	Series KKHW

## (Tables of dimensions)

Cross roller cage
Cross roller cage tape
Cross roller cage
Example of order / inquiry
Flat roller cage
Flat roller cage (ZW)
Needle roller / flat roller cage
Angle flat cage

## Special linear ball cage

25	Series KCLR / KKVR	Angle flat cage
26	Series KXV	Cross roller cage
27	Series KKUK / KKUX / KKUR	Circumferential cage
28	Roller bodies	Balls, rollers, needle rollers
29	KMF linear systems	Product information
30	Publications	Survey
31	KMF - Directions to find firm	

This booklet was prepared with the greatest care and all the data were checked for correctness. However, we cannot be liable for any wrong or incomplete data.

For reasons of constant further development, we must reserve the right to modify our products.

# Linear ball cages

General



## Description of the product

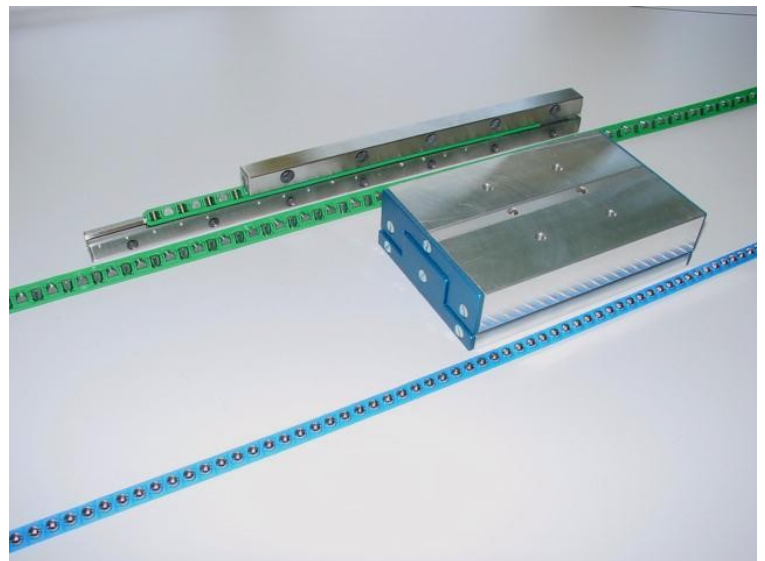
Since 1986, KMF has developed roller bearing components especially for track systems and here special cages for all types of roller bodies, such as balls, rollers and needle rollers. The main customers are reputable roller bearing and linear system manufacturers in Europe and overseas, who use the KMF standard range or the results of joint development.

There are products of this development work which will have a positive effect on linear and rotary movement for decades.

While rotating roller bearings have been used in modern industry for more than 100 years, roller bearings for linear movement and industrial linear system manufacturers are relatively recent.

It was noticeable at the start of KMF's activities that the well-known linear system manufacturers did not want to or could not use the positive results of plastic cages of roller bearing manufacturers. Expensive mechanically produced metal cages were the main components of many units. They had neither roller guides nor suitable roller supports, which were already standard in the roller bearing industry.

**Plastic cage taps for linear bearings  
in metre lengths**



Only the manufacturing process developed by KMF, the manufacture of cage tapes in metre lengths, could be used by linear system manufacturers.

Two row, angled needle cages and cross roller cages in compound construction (steel / plastic), two row plastic flat needle cages as an alternative to FF ...ZW (dovetail elements) and flat ball cages with steel reinforcement belong to the development of KMF, as do the current and popular ball chain with slot guides, which were introduced by KMF in 1987.

Development engineers and decision-makers in the linear industry very quickly noticed the great advantages, so that within a very short period of time, whole series of cages were designed and manufactured.

The LLK 100 linear bearing cage publication shows the current standard range and examples of special developments.

# Linear ball cages

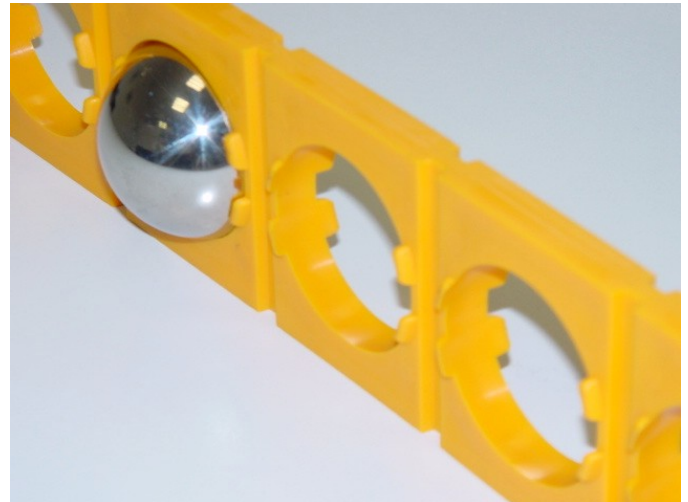
General



## Shape

KMF linear bearing cages for balls, rollers or needle rollers are basically guided by roller bodies. The rollers are held in pockets. They can be manufactured in any length.

**Rollers are guided and held  
in pockets**



The basic material for KMF linear bearing cages is injection moulded polyamide PA 12, POM or PA 12 GF (reinforced with glass fibres).

The plastic cage can be additionally stiffened by reinforcement with steel inserts in the linear longitudinal direction, so-called supports. The stiffening can be done by fixed compounding (sprayed support) or combination (clipped on support).

The ball pockets can be made with one-sided ball surround or partial surround. This prevents the balls from falling out.

## Summary of advantages

- Improved running properties and high running speeds from ball guides and supports
- Low mass of plastic or compound plastic cages
- Suitability of plastic compound cages for vertical position for adjacent, emerging cages
- Optimum roller division for higher strength and stiffness
- Individual cutting for any length
- Corrosion resistant and resistant to most solvents and alkalis and weak organic acids
- Economic supply in metre length
- Large reduction in costs compared with mechanically produced metal cages or those produced without machining.
- Combined cages are very suitable for the production of several rows of flat cages and they offer a cheap alternative when repairing guides.

# Linear ball cages

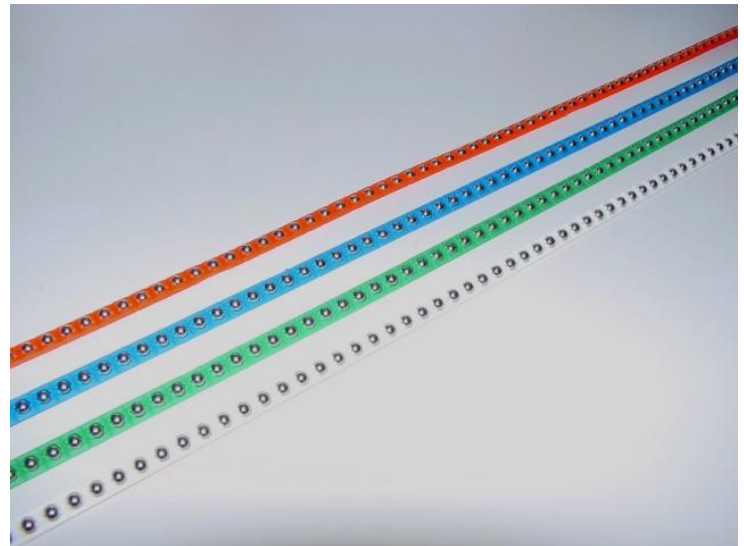
General



## Material

The main feature in the development of the KMF linear bearing cages, apart from precision, was to find a suitable material, which with various GF additives, fulfils and even improves important functional requirements for linear movements.

**Colouring is possible,  
at customer`s request**



As material for KMF linear bearing cages, a thermoplastic material is preferred. Injection moulded polyamide PA 12 is a poly-condensation product of Laurinlactam.

Polyamide PA 12 with the smallest water absorption and a density of 1,01 is the easiest polyamide obtainable. As technical plastic, this material has the following favourable properties for cage tapes

- High strength together with high toughness
- Excellent abrasion and smoothness properties
- Chemical properties, eg: resistance to petrol, grease and oil
- Excellent behaviour at low temperatures
- Good stability of dimensions
- Low water absorption

With these properties, the basic material polyamide PA 12 meets many requirements made of roller or ball cage tapes for linear systems.

The general thermal, electrical and mechanical properties of the cage material used by KMF are listed in the following datasheet.

All the test data were measured on test samples that had been stored for two weeks in a standard climate (23°C / 50% relative humidity).

# Linear ball cages

Polyamide injection moulded (PA 12 / PA 12 GF30)



Basic types				PA 12	PA 12 GF30
Melting temperature DSC max.		°C	dry	178	178
Density	DIN 53479	kg/dm <sup>3</sup>	dry	1.01	1.22
Water absorption 23° / 50% RF	DIN 53417	%	--	0.7	0.5
in water at 23°C	DIN 53495	%	--	1.5	1.1
linear moulding reduction		%	--	0.8 / 2.0	0.1 / 1.0
Shape maintenance ISO 75 0.46 N/mm <sup>2</sup> (B)		°C	after storage	150	170
	DIN 53461				
1.82 N/mm <sup>2</sup> (A)		°C	5 hours at 150°	50	163
Vicat softening temperature 9.81 N (A)	DIN 53460	°C	dry	170	172
49.05 N (B)		°C	dry	135	170
Linear coeff. of expansion	DIN 52328	K <sup>-1</sup>	dry	12 · 10 <sup>-5</sup>	8 · 10 <sup>-5</sup>
Max. permanent temp. of use		°C	--	80	90
Short term temperature of use		°C	--	140	150
Specific through resistance	DIN 53482	Ω cm	dry cond.	10 <sup>13</sup>	10 <sup>13</sup>
Breakdown strength (elec)	DIN 53481	kV/mm	dry cond.	38	40
Creep current strength stage KC	DIN 53480	V	dry cond.	> 600	> 600
Yield stress	DIN 53455	N/mm <sup>2</sup> N/mm <sup>2</sup>	dry cond.	-- 40	-- --
Extension at yield	DIN 53455	% %	dry cond.	-- 8	-- --
Tearing strength	DIN 53455	N/mm <sup>2</sup> N/mm <sup>2</sup>	dry cond.	-- 60	-- 105
Extension when tearing	DIN 53455	% %	dry cond.	-- 275	-- 5
Tensile elastic modulus	DIN 53457	N/mm <sup>2</sup> N/mm <sup>2</sup>	dry cond.	-- 1100	-- 5900
3,5% bending stress	DIN 53452	N/mm <sup>2</sup> N/mm <sup>2</sup>	dry cond.	-- 35	-- 130
Shore hardness D	DIN 53505	--	dry cond.	-- 67	-- 77
Impact toughness at -40°C	DIN 53453	kJ/m <sup>2</sup> kJ/m <sup>2</sup>	dry cond.	-- --	-- 55
Impact toughness	DIN 53453	kJ/m <sup>2</sup> kJ/m <sup>2</sup>	dry cond.	-- --	-- 60
Notch impact toughness (Charpy)	DIN 53453	kJ/m <sup>2</sup> kJ/m <sup>2</sup>	dry cond.	-- 10	-- 20
Notch impact toughness (Charpy) at -40°C	DIN 53453	kJ/m <sup>2</sup> kJ/m <sup>2</sup>	dry cond.	-- 6	-- 15

# Linear ball cages

Strength



## Temperature

Roller bearing and linear bearing manufacturers who use our cage tapes made of plastic have determined the suitability of the material by internal investigations and have safely included them in their catalogues.

For the material PA 12 for continuous operation, the limit is 90° to 100°C and for short periods of use the permitted temperature is 100° to 120°C.

Glass fibre reinforced PA 12 (30% GF) has a limit in continuous use of 100 to 110°C and for short periods of use of 120° to 130°C.

For short term use, 300 to 500 hours are allowed for the material PA 12 and 500 to 1000 hours for the material PA 12 GF.

The actual heat resistance of the material to the occurrence of embrittlement is considerably higher.

**The limiting temperatures of roller bearing cages in the standard version in continuous operation are –40°C and +100°C and for short periods of operation up to +120°C.**

## Vacuum

One can say about using our cages under vacuum, that in a vacuum, low molecular parts can evaporate. According to the experts, the proportion of these parts is very small and it has no effect on the mechanical properties of the cage material.

## Argon (inert gas)

According to various tests on the material, it is 100% resistant to argon.

## Halogen gas

Halogen gases are based on bromine or chlorine.

As halogen gases are very aggressive, the use of our cages made of PA 12 and PA 12 GF material is unsuitable for them.

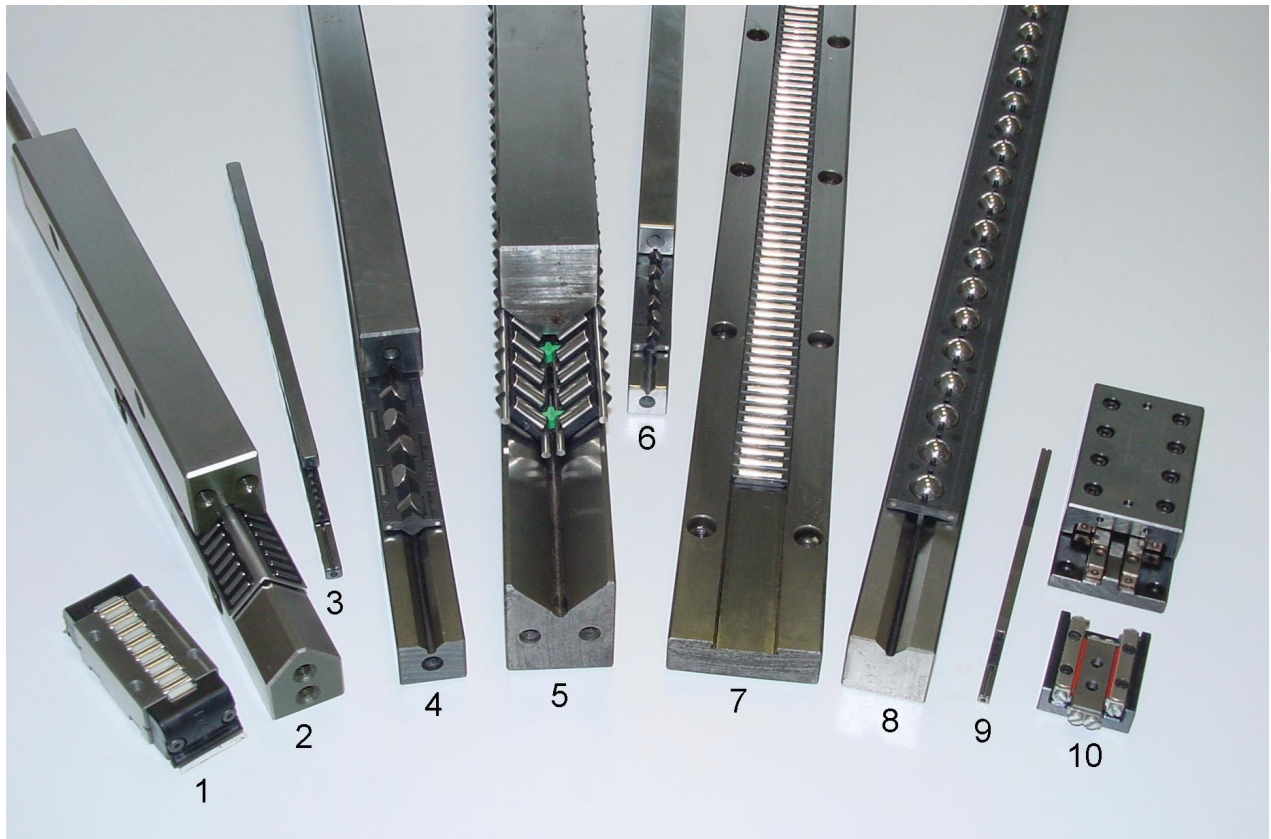
Halogen gases cause changes in dimension and a reduction in the mechanical properties.

# Linear ball cages

Areas of application



## Linear bearing cages for roller guides



- 1 Roller circumferential shoe with circumferential cage KKVK
- 2 V/M guide rails with angled flat cage KKVR
- 3 Roller guide Gr. 3 with cross roller cage KKXL
- 4 Roller guide Gr. 9 with cross roller cage KKXV
- 5 V/M guide rails with angled flat cage KKHV
- 6 Roller guide Gr. 6 with cross roller cage KKXV
- 7 Flat guide with flat needle cage KKVR
- 8 Cross roller guide Gr. 9 with flat ball cage KKVK
- 9 Cross roller guide Gr. 1,5 with cross roller cage KKXL
- 10 Miniature roller table Gr. 2 with cross roller cage KKXL



# Linear bearing cage KKLK

Series KKLK ball cage tape filled with balls



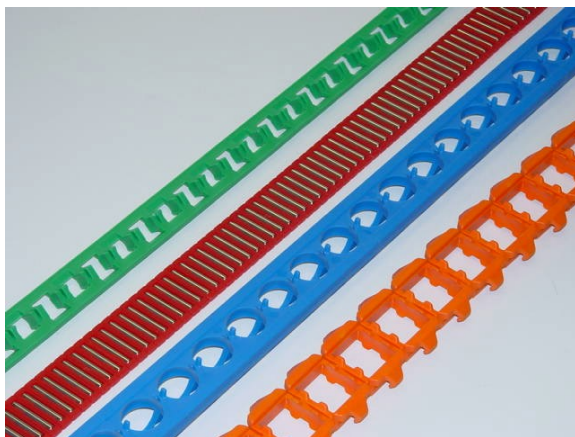
## General

Linear ball cages of series KKLK are pure plastic cage tapes which were mostly taken from the standard range (roller bearing cages) for the linear area. The cage tapes are made in metre lengths and are specially made by a separate tempering process for linear applications in greater lengths.

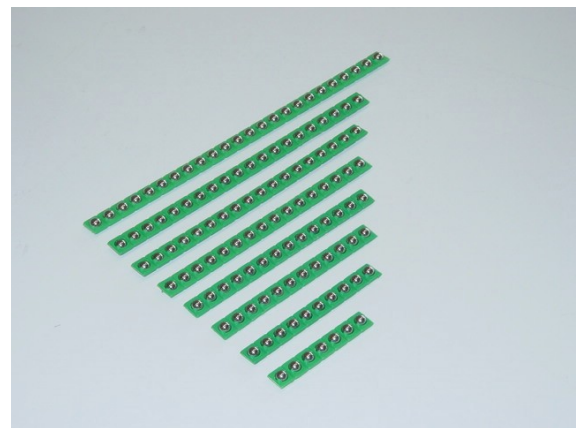
Ball cages of series KKLK have ball pockets with ball guides and supports. They are offered including the balls, in metre lengths or ready to install. The standard balls for filled linear ball cages are made according to DIN 5401 / Grade 15 (Class 2) of 100 Cr6 material. Variants made of other materials, eg: corrosion-resistant steel (X46Cr13 / 1.4034) or plastic (POM) or ceramic ( $AL_2O_3$ ) are also possible.

## Further options

KMF cage tapes for roller bearing and linear systems from the standard range are coloured according to the manufacturer's choice. For large quantities and call-up orders, special colours can be considered. Different colours are useful if different sorts of rollers are in use and these require quick allotment in assembly, or if different materials (chromium steel and stainless steel balls) are optically indistinguishable.



Differently coloured linear cages



Linear ball cages in different lengths ready to instal

KMF supply ready-to-install linear bearing cages, but prefer and advise many customers to use conventional „metre length“ to cut up themselves. For economic and logistical reasons, the manufacturing and supplied lengths are between 1000 and 1500 mm.

If longer lengths are required, these must be discussed with the manufacturer.

## Example of order / inquiry

KKLK 060	/	18	200 off	KKLK 060	100 metres
type incl.		no. of	quantity	type incl.	quantity in metres
balls		ball pockets	off	balls	or number off for
					cutting off yourself
					(1 m = 1 off)

# Linear bearing cages KKLK

Series KKLK ball cage tapes filled with balls

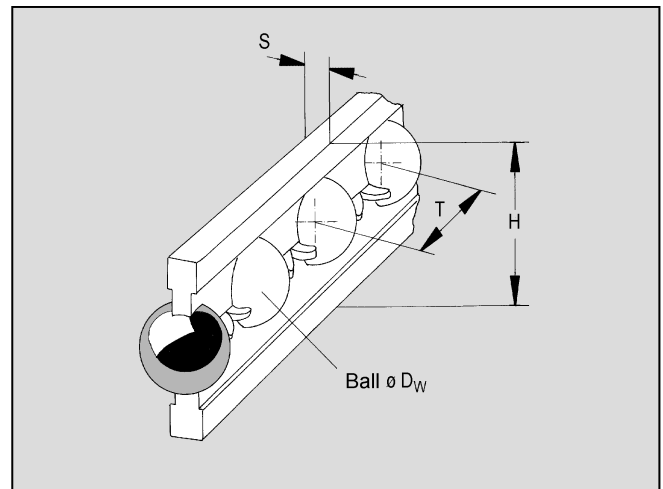
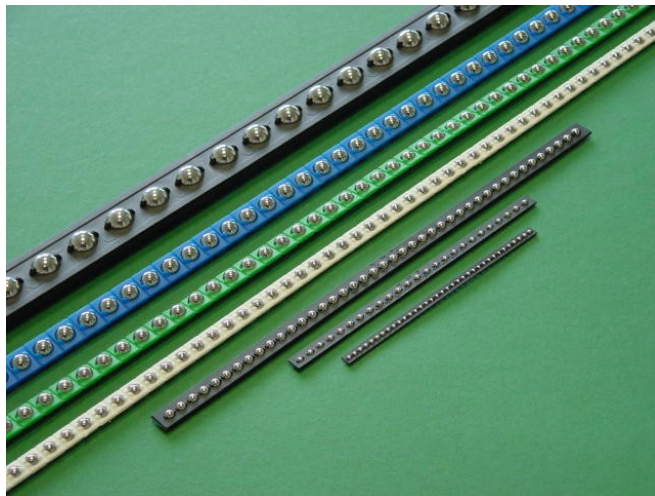


Table of dimensions [dimensions in mm]

KMF-type 1)	Ball Ø		H	S	T	HLG
	D <sub>w</sub>	[inch]				
KKLK 015/...	1,500		3,5	0,45	2,2	80 2)
KKLK S16/...	1,588	1/16	3,1	0,50	2,2	85 2)
KKLK 016/...	1,588	1/16	3,5	0,50	2,2	85 2)
KKLK 020/...	2,000		5,0	0,75	3,9	102 2)
KKLK 021/...	2,000		5,0	0,75	3,0	MW
KKLK 023/...	2,381	3/32	6,0	0,80	3,6	MW
KKLK 030/...	3,000		7,0	1,00	4,2	180 2)
KKLK 031/...	3,000		7,0	1,00	4,2	MW
KKLK S32/...	3,175	1/8	4,4	0,70	4,2	MW
KKLK 032/...	3,175	1/8	7,0	1,00	4,2	MW
KKLK 039/...	3,969	5/32	6,3	1,30	5,8	MW
KKLK 040/...	4,000		6,3	1,30	5,8	MW
KKLK 047/...	4,762	3/16	8,0	1,50	6,8	MW
KKLK 050/...	5,000		8,0	1,50	6,8	MW
KKLK 060/...	6,000		9,0	1,60	7,8	MW
KKLK 063/...	6,350	1/4	9,0	1,60	7,8	MW
KKLK 079/...	7,938	5/16	12,0	2,00	12,0	MW
KKLK 080/...	8,000		12,0	2,00	12,0	MW
KKLK 090/...	9,000		15,0	2,00	11,5	MW
KKLK 095/...	9,525	3/8	12,6	2,50	12,0	MW
KKLK 100/...	10,000		13,2	2,50	12,5	MW
KKLK 110/...	11,000		13,7	2,50	14,0	MW
KKLK 111/...	11,112	7/16	13,7	2,50	14,0	MW
KKLK 127/...	12,700	1/2	22,0	3,50	16,0	MW

1) Other dimensions on request

MW = metre length

2) Material POM

For linear bearing cages with limited manufacturing length (HLG) from individual tools, the material POM (polyacetalene) is used.

The most important thermal properties are

- keeping its shape up to 105°C
- melting temperature 177°C
- linear coefficient of thermal expansion ( $1 \times 10^{-5}$ ) 10,4 for -40°C to 30°C (complete datasheet on request)

# Linear bearing cages KKLK 101

Series KKLK 101 linear ball cages

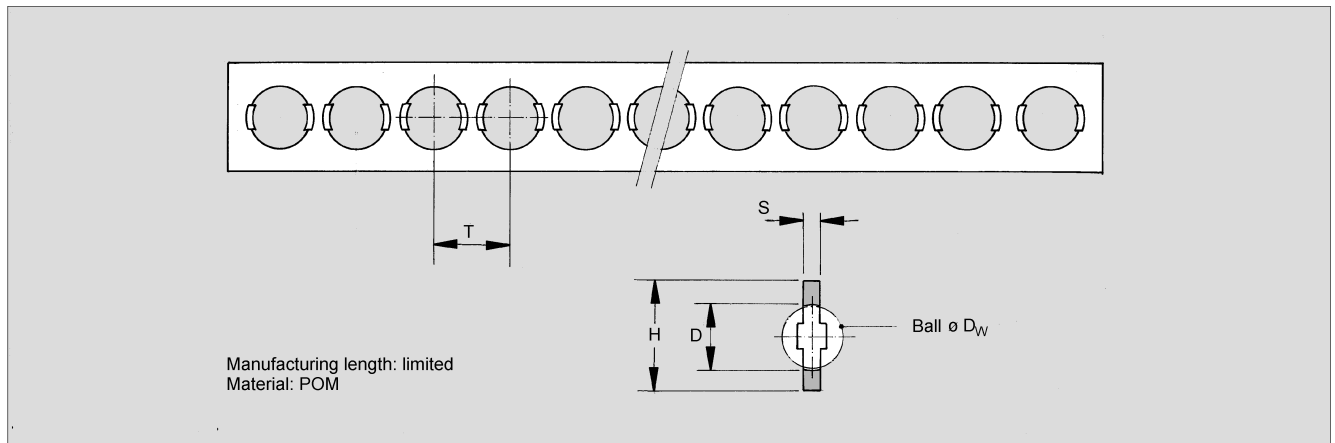
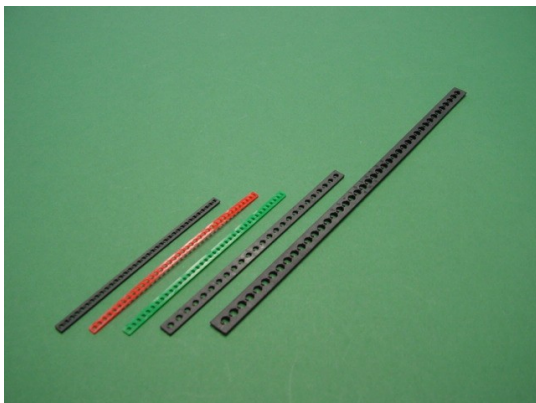


Table of dimensions [dimensions in mm]								
KMF type 1)	ball Ø		H	S	T	D	HLG	No. of balls each
	D <sub>w</sub>	(inch)						
<b>KKLK 101-01</b>	1,500		3,5	0,45	2,2	1,6	~ 80	35
<b>KKLK 101-016</b>	1,588	1/16	3,5	0,50	2,2	1,7	~ 85	38
<b>KKLK 101-S16</b>	1,588	1/16	3,1	0,50	2,2	1,7	~ 85	38
<b>KKLK 101-02</b>	2,000		5,0	0,75	3,9	2,1	~102	25
<b>KKLK 101-03</b>	3,000		7,0	1,00	4,2	3,1	~180	42

1) Other dimensions on request

The linear ball cages of series KKLK 101 are plastic flat cages. The ball pockets have a ball support. The cages are produced with a limited manufacturing length (HLG) and cannot be obtained in metre lengths. They are supplied without balls and with a minimum quantity of 100 off. Linear ball cages with limited manufacturing length are made of the material POM (polyacetalene). The most important properties are keeping its shape up to 105°C and a linear thermal coefficient of expansion of  $10,4 \times 10^{-5}$ , determined over a temperature range of -40°C to 30°C. The complete material data of mechanical, thermal and electrical properties can be obtained on request. For cages of this type filled with balls see page 9 (KKLK).



### Example of order / inquiry

KKLK 101 - 03 / 500 off

type for ball Ø 3  
not filled with balls

quantity  
off

# Linear bearing cages KKVK

Series KKVK compound ball cage

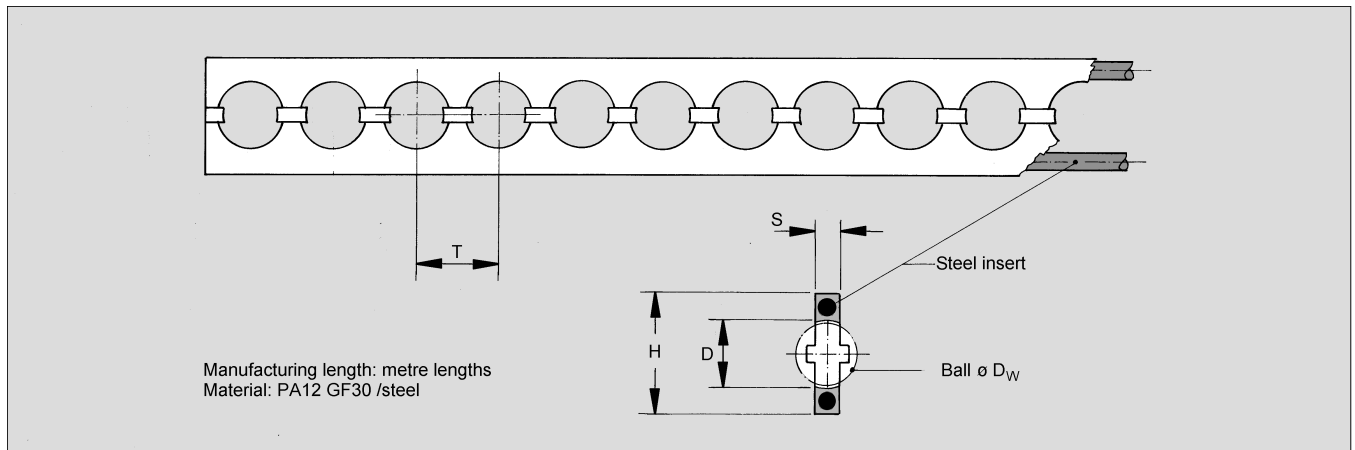


Table of dimensions [dimensions in mm]							
KMF-type 1) without balls	KMF-type with balls	ball $\varnothing D_w$	H	S	T	D	No. of balls per metre
KKVK 111-06	KKVK-06	6	14	2,5	9,0	6,2	111
KKVK 112-09	KKVK-09	9	20	3,5	14,0	9,2	71
(KKVK 113-12) 2)	(KKVK-12) 2)	12	20	4,0	15,5	12,2	64

1) Other dimensions on request

2) Expiring type, alternative is shown on page 12 – KKAk 12...L

Linear bearing cages of series KKVK are plastic flat cages with integrated steel inserts. They are manufactured by a special compound technology in metre lengths.

The standard manufacturing lengths of linear bearing cages of compound construction are 1400 mm. Due to the two steel inserts, which act as stiffening of the plastic flat cage, the latter can easily be used vertically.

The ball pockets are made so that the balls can only be pressed into the pockets from one side. The opposite side has a partial surround of the ball bodies, so that they cannot fall out on this side.

- Possible supplies
- metre lengths without balls (minimum 50 metres)
  - cut to length filled with balls (no minimum limit)
  - metre lengths with balls for cutting oneself (no minimum limit)



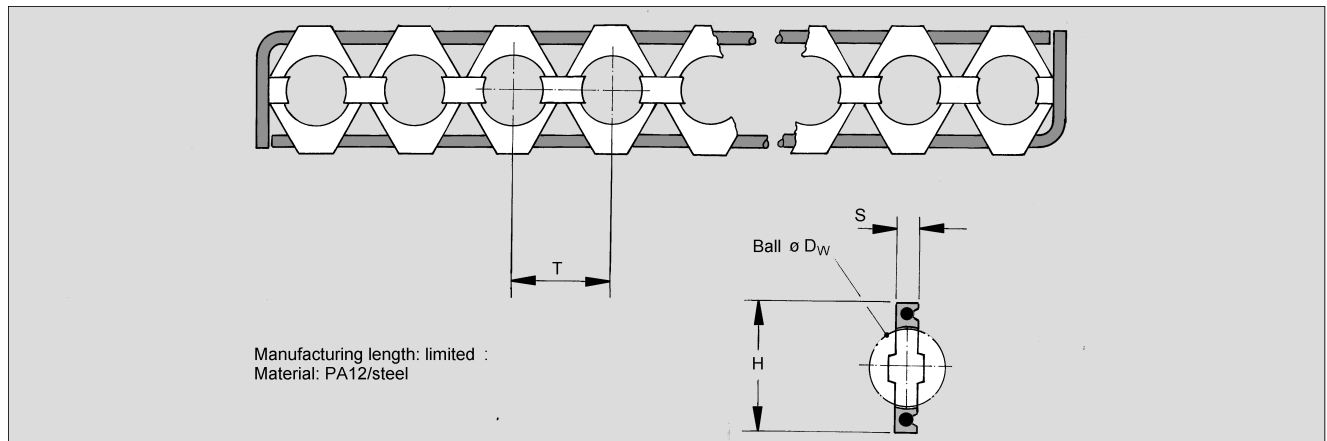
## Example of order / inquiry

<input type="text" value="KKVK 111 - 06"/>	/	<input type="text" value="50 metres"/>
type without balls		quantity in metres
<input type="text" value="KKVK - 06"/>	/	<input type="text" value="59"/>
type incl. balls	no. of ball pockets	<input type="text" value="20 off"/>
		quantity ready for use
<input type="text" value="KKVK - 06"/>		<input type="text" value="100 metres"/>
type incl. balls		quantity in metres

for cutting oneself

# Linear bearing cages KKAK ...L

Series KKAK ...L ball flat cage



**Table of dimensions** [dimensions in mm]

KMF type 1)	balls $\varnothing$		H	S	T
	$D_w$	(inch)			
KKAK 6 ...L	6,000		13	3,0	9,0
KKAK 9,525 ...L	9,525	3/8	20	3,5	20,0
KKAK 11 ...L	11,000		19	4,0	14,5
KKAK 11,906 ...L	11,906	15/32	20	5,0	15,5
KKAK 12 ...L	12,000		20	5,0	15,5
KKAK 14 ...L	14,000		21	6,0	17,0

1) Other dimensions on request

Linear bearing cages of series KKAK ...L are guided and held ball flat cages. The cages are so-called combination cages and consists of precision steel wires (supports) which are completed by clipped on cage tapes. By using curved supports it is possible to produce ball segment cages, eg: for curved guides with restricted range. The combination shape is suitable for producing multi-row versions. The steel supports ensure the necessary stiffening of the ball flat cage and improve the running behaviour in vertical operation. The cages are produced individually to length and are supplied filled with balls. The ends of the cage can be configured differently (see examples of variants).

## Example of order / inquiry

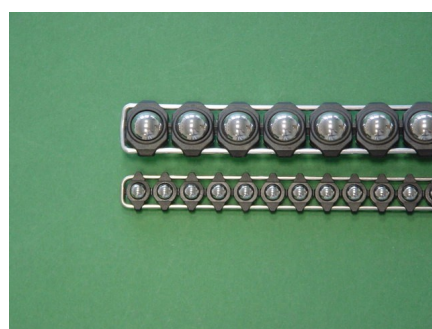
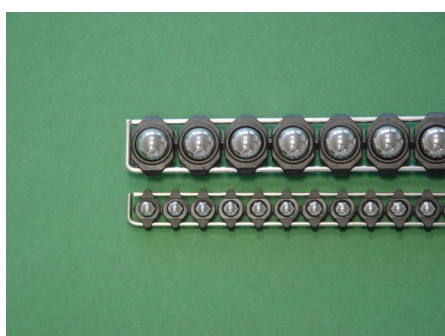
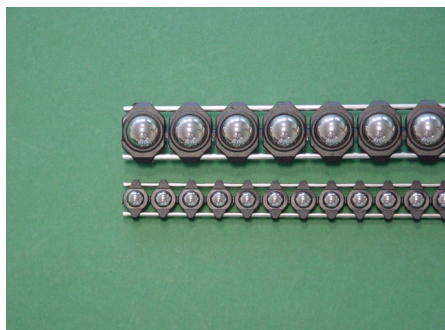
While referring to type KKAK ...L the order or inquiry should contain as much detail as possible. Apart from the ball size, to produce a tender the planned length of cage, no. off and the desired end variant are required.

# Linear bearing cages KKAK ...L

Series KKAK ...L / examples of variants



Example of variant / longitudinal closure



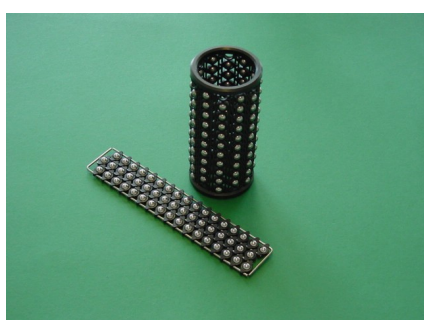
Example of variant / multi-row cages



Ball box



Example of variant / multi-row cages

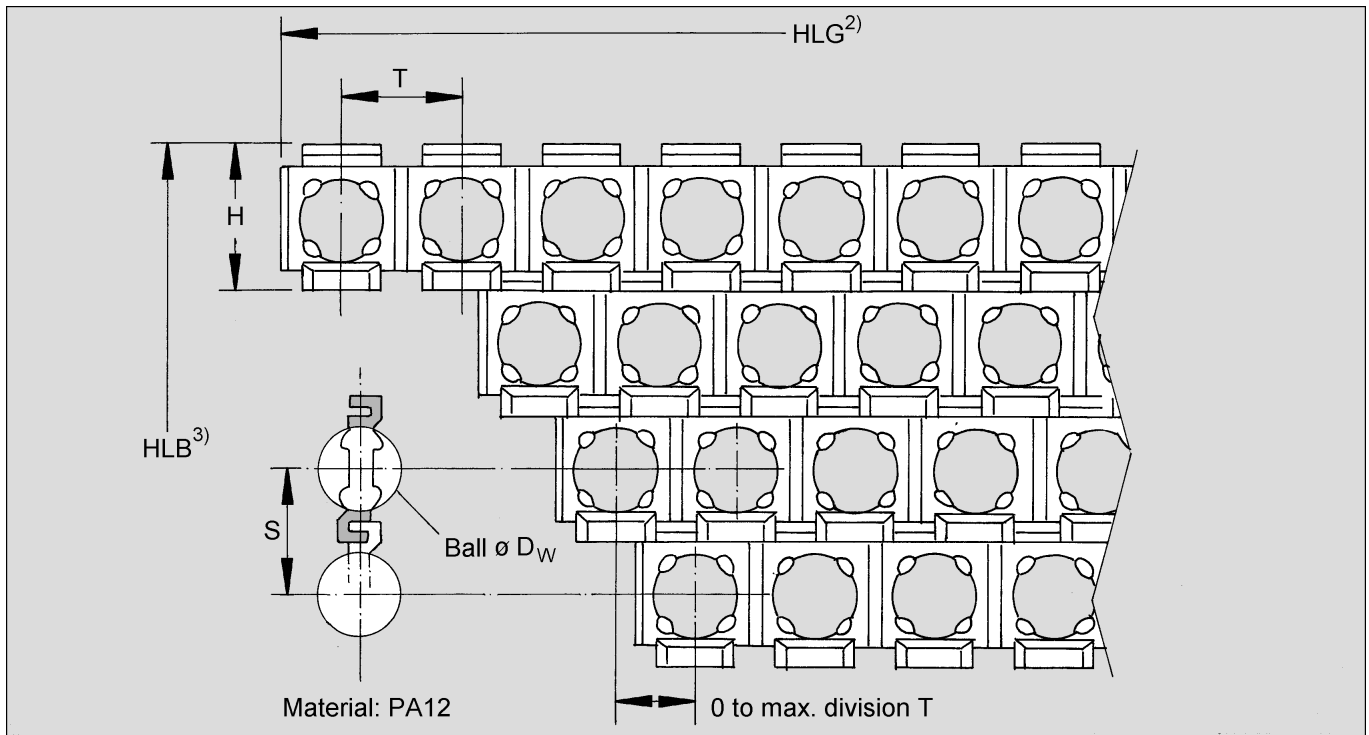


Cage segments



# Linear bearing cages KKNK 104

Series KKNK 104, linear ball mesh



**Table of dimensions** [dimensions in mm]

KMF-type 1) without balls	KMF-type with balls	ball Ø D <sub>w</sub>	H	S	T	No. of balls
KKNK 104-03	KKNK-03	3,00	6,20	4,80	4,50	222
KKNK 104-04	KKNK-04	4,00	7,40	6,45	5,75	173
KKNK 104-05	KKNK-05	5,00	9,30	7,95	6,75	148
KKNK 104-06	KKNK-06	6,00	11,00	9,55	7,75	129

- 1) Other types on request
- 2) HLG = manufacturing length unlimited
- 3) HLB = manufacturing widths unlimited

Linear bearing cages of series KKNK 104 are single row plastic cage tapes, which can be manufactured in unlimited lengths and unlimited widths.

The individual rows are connected by clipping together along the wide side of the cage tape.

The clipping does not produce a firm connection of rows, but is only used for positioning of the ball mesh and the different shapes. Ball networks are mainly used for unordered movements in different directions.

## Possibilities of supply

KMF cage tapes of series KKNK 104 for producing ball networks are supplied in metre lengths. As the shape of the ball networks and their applications are very different, detailed inquiries are necessary.



# Linear bearing cages KKNK 104

Series KKNK 104, ball network



## Shapes (examples)

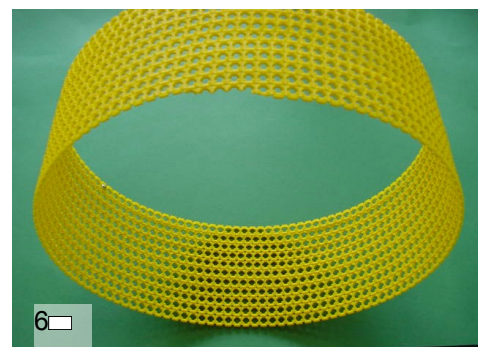
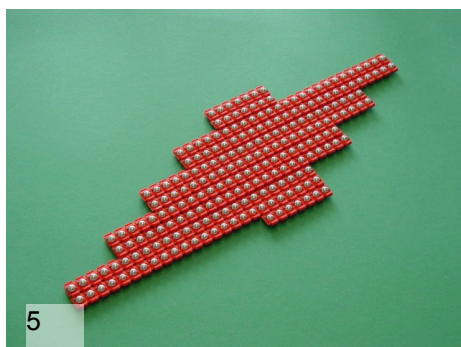
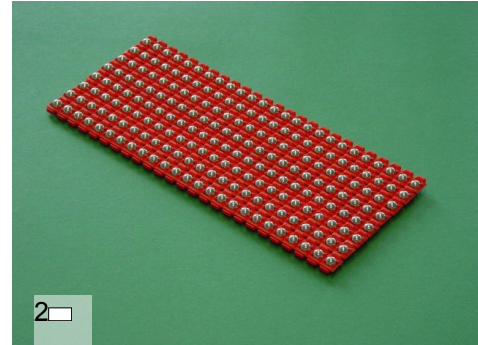


Fig. 1 Ball mesh of curved shape as ball box for simultaneous linear and rotary movement, diameter from about 50 mm

Fig. 2 Ball mesh of rectangular or square shape for linear longitudinal and lateral movement

Bild 3 Ball mesh of circular shape for circular and linear movement

Fig. 4, 5 and 6 Special shapes according to the application.

# Linear bearing cages KKXL-01 / 02

Series KKXL-01/02, cross roller cages

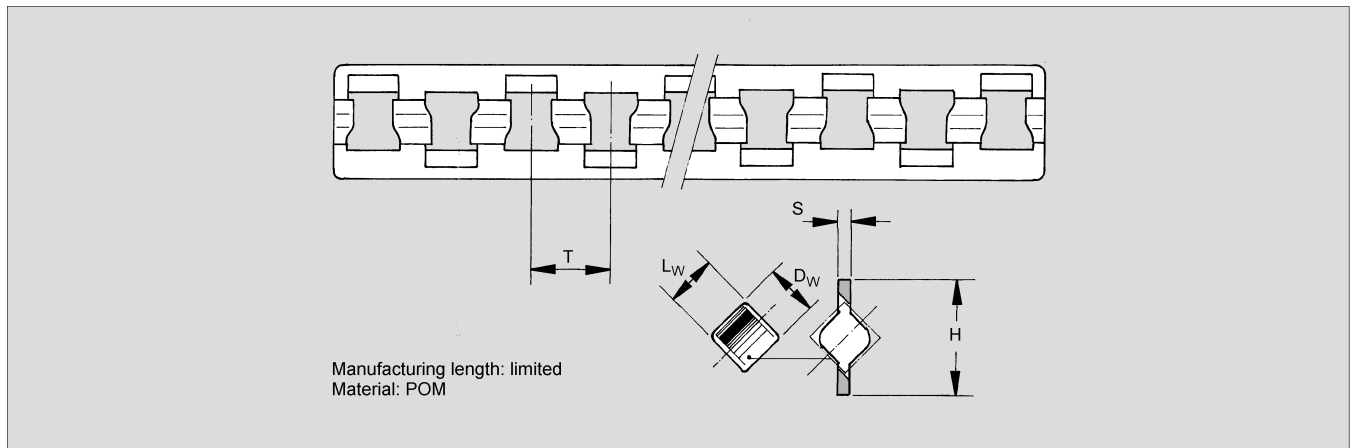


Table of dimensions [dimensions in mm]						
KMF-type 1)	roller Ø D <sub>w</sub> x L <sub>w</sub>	H	S	T	HLG	No. of rollers each
KKXL-01	1,5 x 1,4	3,8	0,5	3	75	24
KKXL-02	2,0 x 1,8	5,5	0,7	4	100	24

1) Other dimensions on request

Linear cross roller cages of series KKXL-01/02 are plastic cages. The roller pockets have a roller support. The cages are produced with a limited manufacturing length (HLG) and therefore cannot be obtained in metre lengths. They are supplied without rollers and with a minimum quantity of 100 off. The rollers can be supplied separately. For other details of cylindrical rollers type KZR 110 see page 28 (rollers).

Linear bearing cages with limited manufacturing length are made of the material POM (polyacetalene). The most important thermal properties are keeping its shape up to 105°C and a linear thermal coefficient of expansion of  $10,4 \times 10^{-5}$  in a temperature range of -40°C to 30°C. The complete material data of mechanical, thermal and electrical properties can be supplied on request.



## Example of order / inquiry

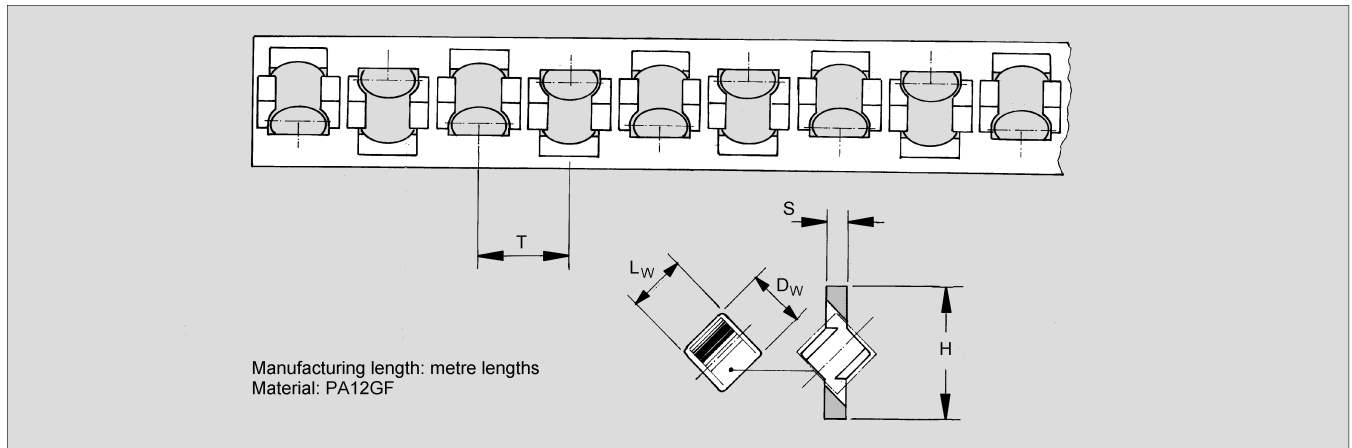
KKXL-01 / 200 off  
type for roller Ø 1,5 quantity  
without rollers

associated cylindrical rollers (see page 28 – rollers)

KZR 110-1,5 / 4.800 off  
roller Ø 1,5 x 1,4 quantity

# Linear bearing cages KKXL-03 / 06 / 09

Series KKXL-03 / 06 / 09, cross roller tape



KMF-type 1) without rollers	KMF-type with rollers	roller Ø Dw x Lw	H	S	T	No. of rollers per metre
KKXL 030	KKXL-03	3 x 2,8	7	1,00	5,0	200
KKXL 060	KKXL-06	6 x 5,8	14	2,00	8,5	118
KKXL 090	KKXL-09	9 x 8,8	20	3,00	14,0	71
KKAC 020	KKAC-02	2 x 1,8	5	0,75	3,9	250

1) Other dimensions on request

Linear bearing cages of series KKAC-02 and KKXL-03 / 06 / 09 are plastic cage tapes for cylindrical rollers in cross arrangement (cross rollers). They are produced in metre lengths, where the standard lengths are 1000mm.

The cross roller cage tapes are filled with rollers and offered without rollers. The rollers can be supplied separately. For further details of cylindrical rollers see page 28 (rollers).

- Possibilities of supply
- metre lengths without rollers, minimum quantity KKXL 030 – 250 m / KKXL 060 – 100 m / KKXL 090 – 50 m / KKAC 020 – 50 m
  - ready to fit, filled with rollers (no minimum limit)
  - metre lengths with roller, to cut up oneself (no minimum limit)



## Example of order / inquiry

<input type="text" value="KKXL 030"/>	/	<input type="text" value="250 off"/>
type without rollers		quantity or metres (1m = 1 off)
<input type="text" value="KKXL-03"/>	/	<input type="text" value="18"/>
type incl. rollers	no off roller pockets	quantity no. off ready to fit
<input type="text" value="KKXL-03"/>		<input type="text" value="100 metres"/>
type incl. rollers		quantity metres or no. off

for cutting off oneself  
(1m = 1 off)

# Linear-crossroller cage KKBN

with „SLIPLESS-System SLS“ Type KKBN 06 SLS



## Crossroller-cagesegment

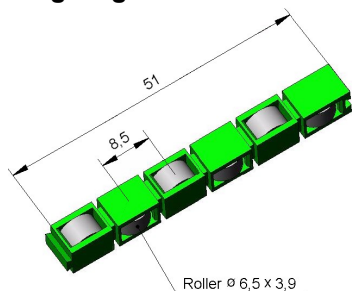


Table of dimensions [dimensions in mm]

Crossroller-cagesegment			
KMF type	Cyl.-roller 1) $D_w \times L_w$	Pitch T	Length L
KKBN 060	Ø 6,5 x 3,9	8,5	51
KKBN 040	Ø 4,0 x 2,8	6,0	36

1) Cyl.-rollers sort. G1 (see page 28 – rolling elements)

## Pinion pocket

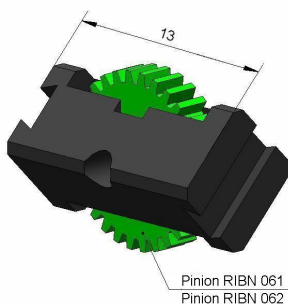
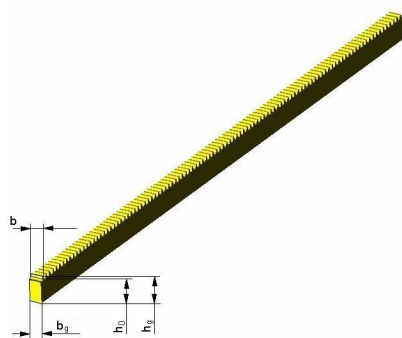


Table of dimensions [dimensions in mm]

Pinion (straight-fluted)		
KMF type	RIBN 061	RIBN 062
Divided circle-Ø	$d_{01}$	9,0
Modulus	m	0,3
Number of tooth	Z	30,0
Crown line-Ø	$d_k$	9,6
Width of tooth	b	1,0
Pressure angle	$\alpha$	20°
Material	Plastic POM	Plastic POM Brass MS58

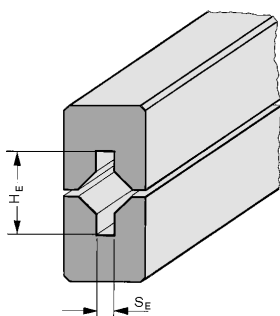
## Gear rack



Gear rack  
(straight fluted)

KMF type	ZABN 061	ZABN 062
High	$h_o$	1,4
Total High	$h_g$	1,7
Length	L	100,0 2) / 250,0 1)
Modulus	m	0,3
Width of tooth	b	1,0
Total width	$b_g$	1,55
Pressure angle	$\alpha$	20°
Material	Plastic PA 6.6 GF	Plastic PA 6.6 GF Brass MS58

## Fitted dimensions



Fitted dimensions			
Gear rack	Pinion	$H_E$	$S_E$
ZABN 061	RIBN 061	12,05	1,60
ZABN 062	RIBN 062	16,70	2,00

1) Gear rack made of plastic TN can be supplied in every length even  $\geq 250$  mm.

Gear rack made of brass MS can only be supplied with a length of 250 mm.

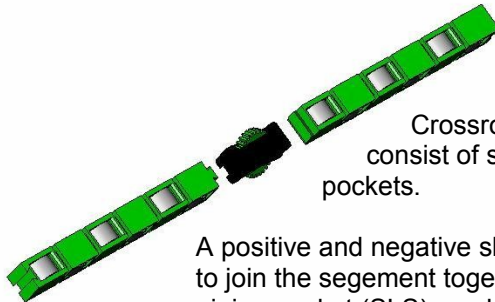
2) Gear rack can only be supplied in plastic TN with a max. length of 100 mm.

# Linear-crossroller cage KKBN

with „SLIPLESS-System SLS“ Type KKBN 06 SLS



## Cagesegment + pinion pocket + cagesegment = KKBN 06 SLS



Crossroller cages type series KKBN consist of segments, having 6 alternate roller pockets.

A positive and negative shaped „dovetail“ sliding connection enables to join the segment together to the required insert length. The pinion pocket (SLS) can be integrated in the cage segments due to this connection style. SLS is a standard for the size 06 (other dimensions on request).

The cagesegments are available without rollers or filled with rollers ready to install. Minimum quantities have to be considered.

### Example of order / inquiry

Crossroller cage-cagesegment filled with 6 cyl.-rollers Ø 6,5 x 3,9

Designation	KKBN 06 / 6	Quantity	100 off
		Size of cyl.-rollers	Cylinder-roller 6,5 x 3,9
		Cylinder-roller	6,5 x 3,9
		Cage type series	

Crossroller cage-cagesegment filled with 6 cyl.-rollers Ø 6,5 x 3,9  
Stainless Steel (SS)

Designation	KKBN 06 / 6 SS	Quantity	100 off
-------------	----------------	----------	---------

Crossroller-cagesegment not filled

Designation	KKBN 060	Quantity	500 off
		For cylinder-roller 6,5 x 3,9	
		Cage type series	

### Example of order / inquiry

with pinion RIBN 062 and gear rack ZABN 062

Crossroller cage ready to ins

Designation	KKBN 062 / 1
-------------	--------------

Crossroller cage ready to install with cylinder-rollers Ø 6,5 x 3,9  
corrosion resistant steel (SS)

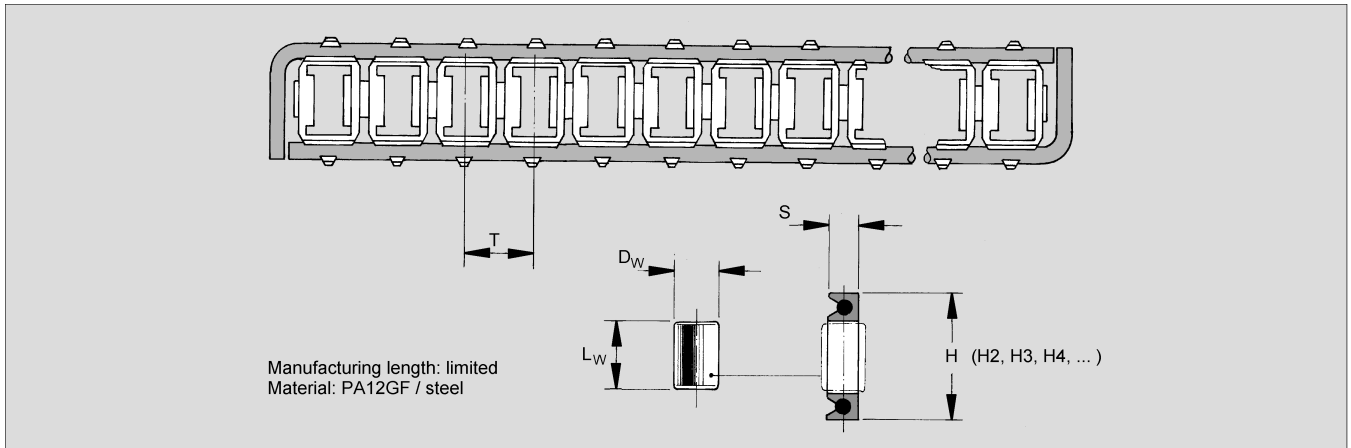
Designation	KKBN 062 / 12 SLS TN SS	Quantity	100 off
-------------	-------------------------	----------	---------

Matching gear rack

Designation	ZABN 062 / 2
-------------	--------------

# Linear bearing cages KLBF

Series KLBF, flat roller cage



**Table of dimensions** [dimensions in mm]

KMF-type 1)	roller Ø D <sub>w</sub> x L <sub>w</sub>	H	S	T	cage height 2)		
					2 row H2	3 row H3	4 row H4
<b>KLBF 4015</b>	4 x 8	15	3,0	7,5	27,0	39,0	51,0
<b>KLBF 5015</b>	5 x 8	15	3,5	8,0	27,0	39,0	51,0
<b>KLBF 7025</b>	7 x 14	25	5,0	11,0	45,5	65,5	85,5
<b>KLBF 18036 3)</b>	18 x 18	36	10,0	23,0	---	---	---

- 1) Other dimensions on request
- 2) Any number of rows of rollers can be added
- 3) Not suitable for mult-rows

Linear bearing cages of series KLBF are guided and held flat roller cages. The cages are so-called combination cages and consist of precision steel wires (supports), which are made into flat roller cages by clipped on cage tapes. Using curved supports, it is possible to produce roller segment cages, eg: for curved guides with restricted range. Combination shapes are also suitable for producing mult-row versions. The steel supports ensure the necessary stiffening of the flat roller cage and improve the running in vertical operation. The cages are produced individually for the required length and supplied filled with rollers. The ends of the cage can be configured differently (see example of variants).

## Example of order / inquiry

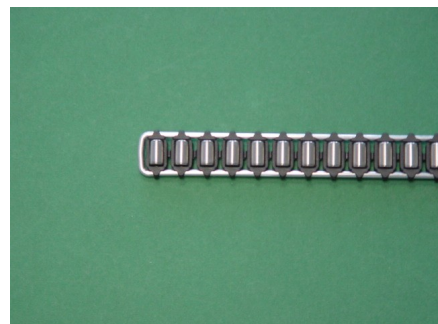
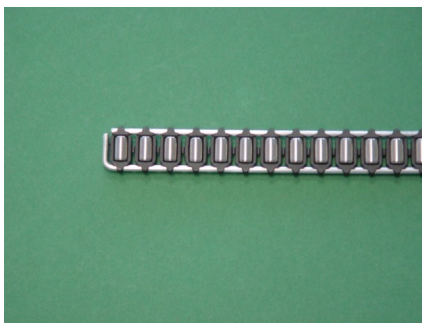
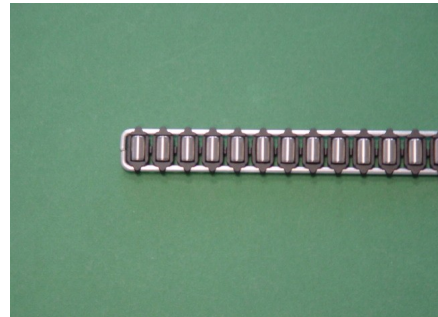
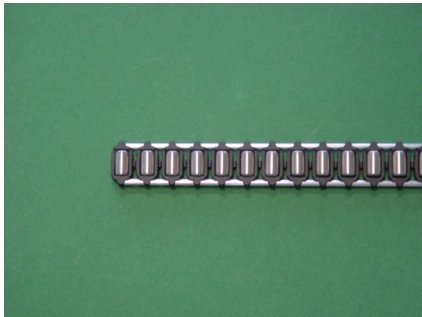
While referring to type KLBF, the order or inquiry should be made with as much details as possible. Apart from stating the type, for making a tender the planned length of cage, number off and the required end closure variant are required.

# Linear bearing cages KLBF

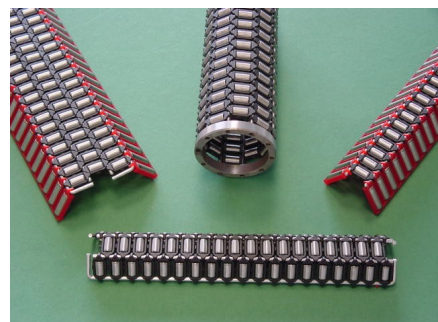
Series KLBF / examples of variants



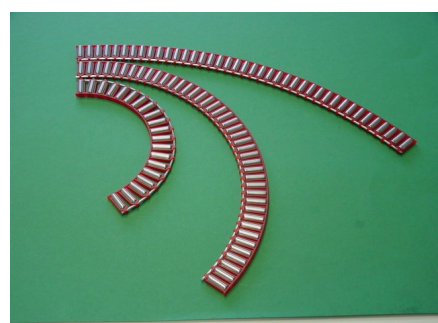
## Variant example / longitudinal closure



## Variant example / multi-row cages



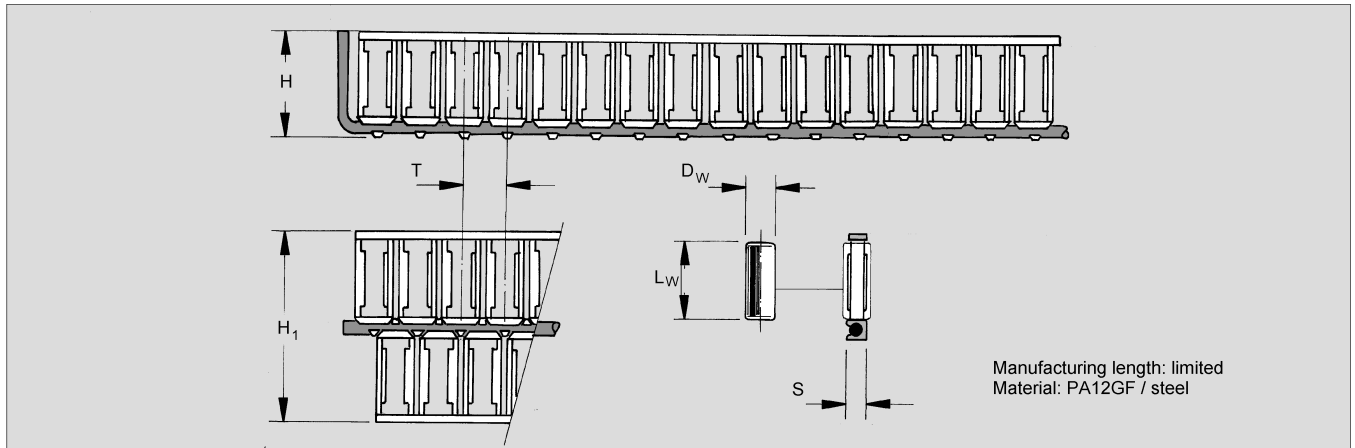
## Variant example / cage segments





# Linear bearing cage KLBF 5020 / KLBF 5020 ZW

Series KLBF 5020/ KLBF 5020... ZW flat roller cage



**Table of dimensions** [dimensions in mm]

KMF-type 1)	roller Ø $D_w \times L_w$	H	S	T	No. of rollers per metre
<b>KLBF 5020</b>	5,0 x 15,0	20	3,5	8	125

**Table of dimensions** [dimensions in mm]

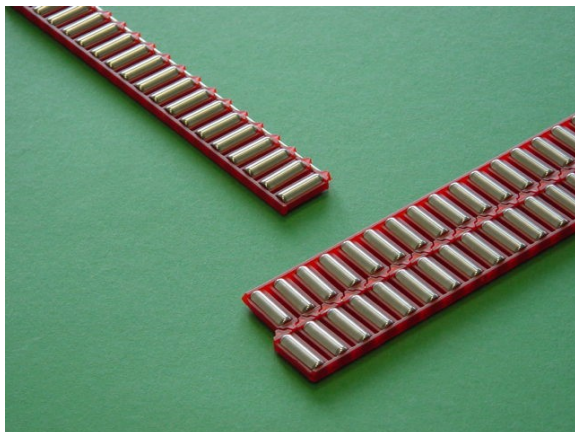
KMF-type 1)	roller Ø $D_w \times L_w$	$H_1$	S	T	No. of rollers per metre
<b>KLBF 5020 ZW</b>	5,0 x 15,0	37	3,5	8	250

1) Other dimensions on request

Linear bearing cages of series KLBF 5020 and KLBF 5020 ZW are guided and held flat roller cages. The cages are combination cages and consist of a precision steel wire together with a roller cage tape to form a single row flat cage.

The cage can be expanded into a two row flat roller cage (ZW) by connecting another row. Other possible combinations are only possible together with type KLBF 5015, see also example of variant on page 21.

The cages are supplied to the customer's data ready to fit, including cylindrical rollers.

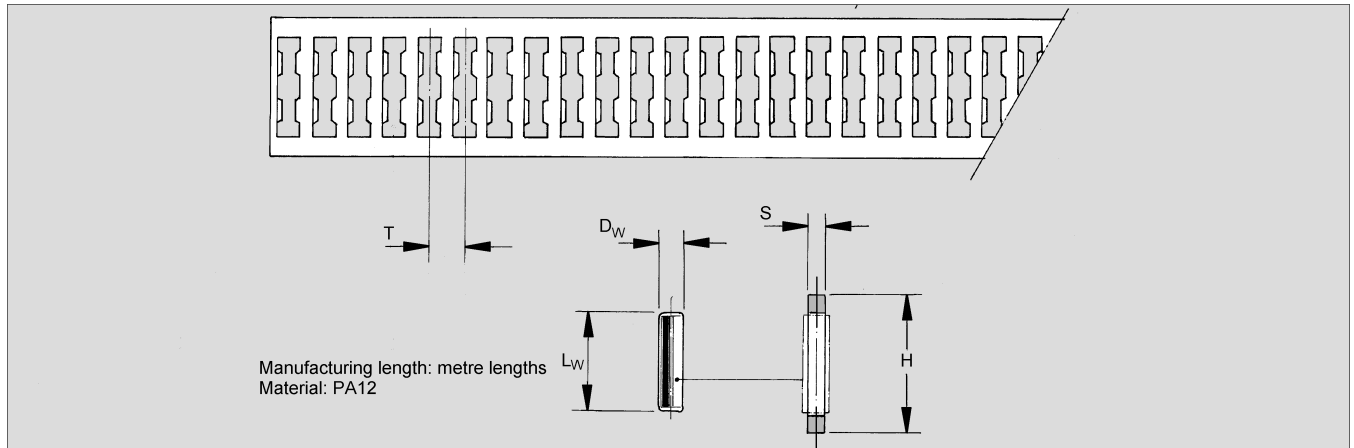


## Example of order / inquiry

While referring to type KLBF 5020 (ZW), the inquiry should contain as much detail as possible. We recommend that you consult us about further possible combinations.

# Linear bearing cage KKFF

Series KKFF needle roller- / flat roller cage



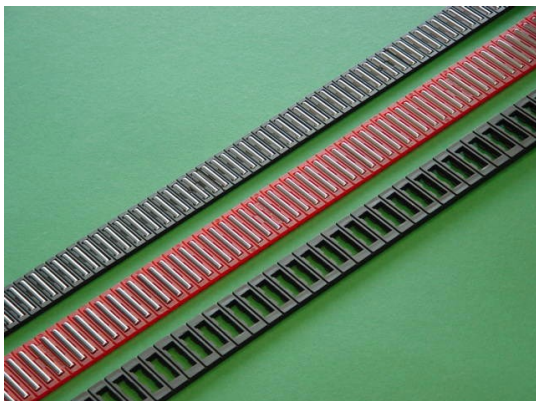
**Table of dimensions** [dimensions in mm]

KMF-type 1)	needle roller Ø D <sub>w</sub> x L <sub>w</sub>	H	S	T	no. of needle rollers per metre
<b>KKFF 1510</b>	1,5 x 7,8	10	1,1	2,9	344
<b>KKFF 2518</b>	2,5 x 13,8	18	2,0	4,8	208
<b>KKFF 3020</b>	3,0 x 15,8	20	2,5	5,2	192
<b>KKFF 4030</b>	4,0 x 23,8	30	3,0	7,0	142
<b>KKFF 5010</b>	5,0 x 5,0	10	2,5	7,5	133
<b>KKFF 5023</b>	5,0 x 15,0	23	3,5	8,0	125
<b>KKFF 5035</b>	5,0 x 27,8	35	3,5	9,0	111
<b>KKFF 10016</b>	10,0 x 10,0	16	2,5	13,0	77
<b>KKFF 12040</b>	12,0 x 30,0	40	5,0	16,0	62
<b>KKFF 16028</b>	16,0 x 16,0	28	4,0	22,0	45

1) Other dimensions on request

Linear bearing cages of series KKFF are one row plastic cage tapes for rollers or needle rollers. The cage tapes are made in metre lengths and have roller supports.

- Possibilities of supply
- ready to fit, cut, filled with rollers / needle rollers (no minimum quantity limit)
  - metre lengths filled with rollers, for cutting up oneself (no minimum quantity limit)



### Example of order / inquiry

KKFF 3020	/	100 metres
type incl. needle rollers		quantity in metres for cutting up oneself
KKFF 3020	/	0490
type incl. needle rollers	/	20 off
	length of cage	quantity ready to fit
	490 mm	



# Linear bearing cage KKHW

Series KKHW, angled flat cage

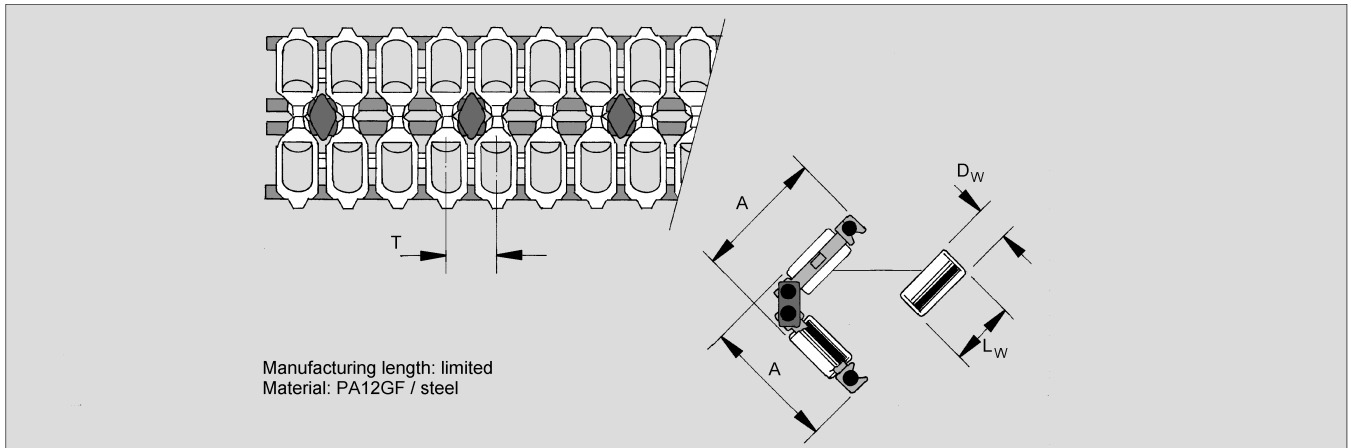
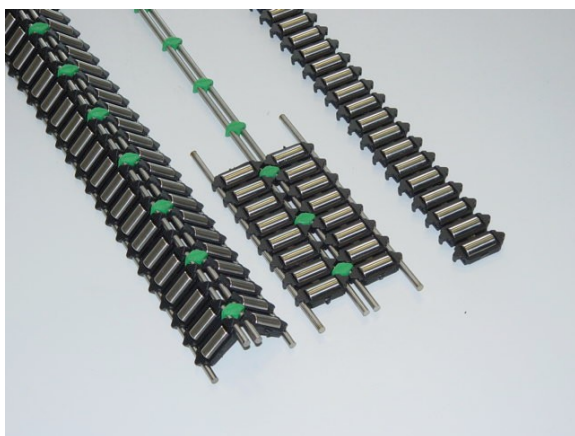


Table of dimensions [dimensions in mm]				
KMF-type 1)	roller $\varnothing$ $D_w \times L_w$	A	T	No. of rollers per metre
<b>KKHW 7030</b>	7 x 14	30	11	180

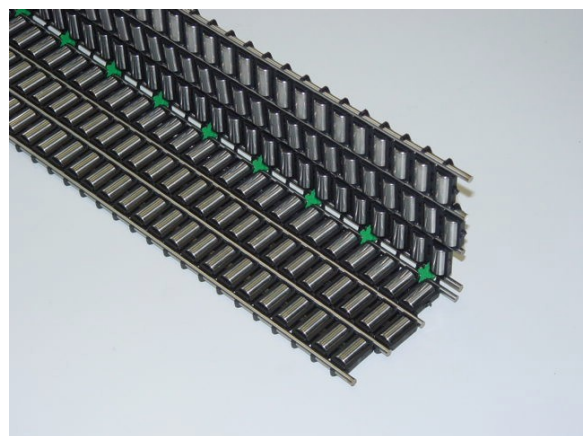
1) Other dimensions on request

Linear bearing cages of series KKHW are single row flat roller cages which are made into angled flat cages by a special support element with fixings. The angle is preferably 90°, but can set to any desired angle.

The shank lengths A with a spacing of 20 mm can be expanded so several row angled flat cages. Angled flat cages are manufactured according to the customers requirements and are supplied ready to fit including rollers.



two row flat cage angled as angled flat cage



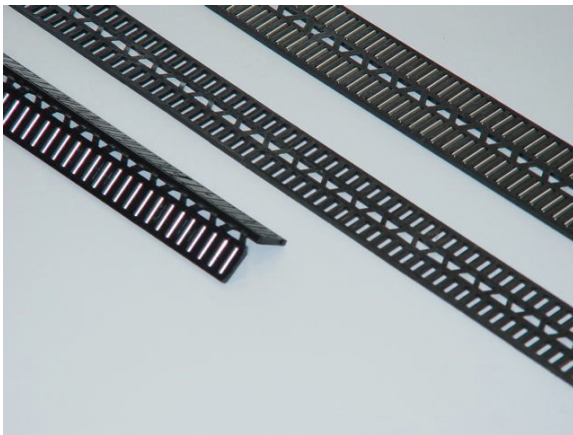
multi-row angled flat cage with spacing of 20 mm can be expanded in any number of rows.

## Special linear bearing cage KCLR

Series KCLR, angled flat cage



Linear cage type KCLR are two row needle flat cages made of plastic. The cage tapes are made in metre lengths and have roller supports. The shanks of the two rows can easily be bent to any angle (preferably 90°) by the special shaping of the middle part. One can produce one row flat cages in metre lengths by separating the two rows.



The angled flat cages shown are KMF developments for certain customers. They are therefore not contained in the standard range and are protected for the customers

KMF will state where to obtain the cages and possible alternatives, on request.

## Special linear bearing cages KKVR

Series KKVR, angled flat cage



Linear bearing cages types KKVR are two row angled flat cages with combined materials of steel / plastic. They are made in metre lengths by a special compound technique. The basic supports are angled, corrosion-resistant steel strips with punched out openings. The openings are made so that the injected plastic pockets can be separated anywhere. Any length can therefore be produced, without any waste.

The linear bearing cages have a rigid angled shank (preferably 90°) and are suitable for vertical use in this version.



The angled flat cages shown are KMF developments for certain customers. They are therefore not contained in the standard range and are protected for the customers.

KMF will state where to obtain the cages and possible alternatives, on request.

## Special linear bearing cage KXXV

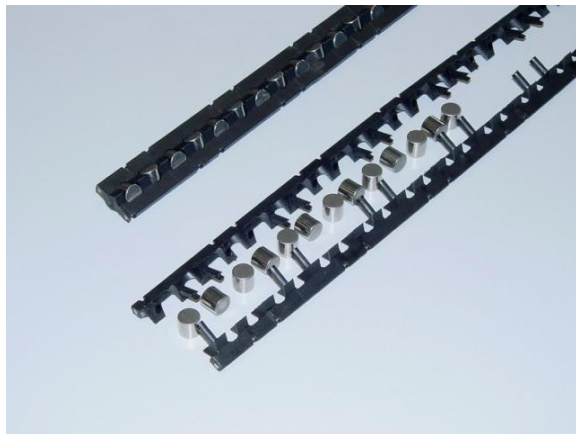
Series KXXV, cross roller cage



Linear bearing cages type KXXV consist of two identical cage tapes, which are made compounded of steel / plastic. The two identical cage halves have a special shape, which makes it possible to produce a cross roller cage of unlimited length by snapping them together.

The steel inserts act to stiffen the glass fibre reinforced plastic basic material and therefore permit running in vertical operation.

The shape permits surrounding the cross cylindrical rollers, so that absolute guidance and support is provided. It is not possible to release the rollers from the cage without destroying it.



horizontally divided cross roller cage  
and the two identical halves with rollers



vertically divided cross roller cage and the  
two identical halves with rollers

The cross roller cages type KXXV and KMF developments for certain customers. They are therefore not contained in the standard range and are protected for the customers. KMF will state where they can be obtained and possible alternatives, on request.

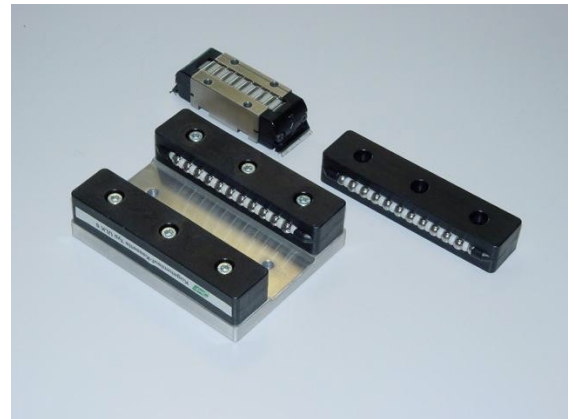
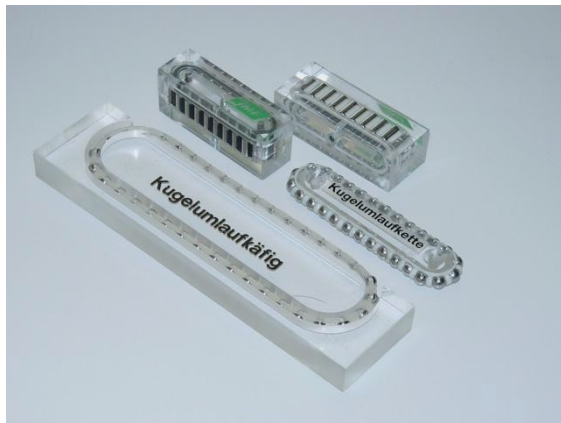
## Special linear bearing cages KKUK, KKUX, KKU

Enclosed cages



Enclosed cages for balls (KKUK), cross rollers (KKUX) or rollers (KKUR) are originally spacers that hold the rollers spaced and which are combined into ball or roller chains.

The ball and roller chains prevent the opposite rotation of the rollers at the point of contact (contact friction) and contribute considerably to lower noise of the enclosed unit. They reduce wear and permit higher running speeds.



## Special linear bearing cages

Further examples



Linear cross roller cage  
Arrangement of rollers 2:1  
(2 support rollers / 1 holding roller)



Ball surround bush  
closed and open

# Rollers

Balls, rollers, needle rollers, special rollers



## Cylindrical rollers KZR 110 / KZR 104

Cross rollers of series KZR 110 / KZR 104 are mainly used for cross roller flat guides. They are cylindrical rollers, whose length (L<sub>w</sub>) is slightly less than their diameter (D<sub>w</sub>). Cross rollers are used in KMF standard linear cross roller cages of quality G1 (assortment 0,001 mm). These rollers can be obtained separately according to the following table.

Table of dimensions [dimensions in mm]					
KMF-type 1)	Diameter Ø D <sub>w</sub>	Length L <sub>w</sub>	Circularity	Assortment	Minimum quantity off
KZR 110-1,5	1,5	1,4	≤ 0,0005	0,001	2000
KZR 110-2,0	2,0	1,8	≤ 0,0005	0,001	2000
KZR 110-3,0	3,0	2,8	≤ 0,0005	0,001	5000
KZR 110-6,0	6,0	5,8	≤ 0,0010	0,001	5000
KZR 110-9,0	9,0	8,8	≤ 0,0010	0,001	1500
KZR 110-12,0	12,0	11,8	≤ 0,0010	0,001	600
KZR 104-4,0	4,0	2,8	≤ 0,0005	0,001	2000
KZR 104-6,5	6,5	3,9	≤ 0,0005	0,001	5000

1) Other dimensions on request

Standard material 100Cr6 (1.3505) hardness 58-65 HRc and corrosion-resistant steel X46Cr13 (1.4034)

## KUG balls

All precision steel balls according to DIN, ISO and AFBMA can be supplied. The ball quality according to DIN 5401 / Grade 15 (Class 2) with 100Cr6 material (hardness 60-66 HRc) is used as standard for KMF linear cages, eg: series KKLK or KKVK. Different qualities from the standard (material, quality, etc) on request.

## NRB needle rollers

All needle rollers according to DIN, ISO and AFBMA can be supplied. The needle roller quality according to DIN 5402 / Grade 2 with 100Cr6 material, hardness 59-65 HRc is used as standard for KMF needle roller cages, eg: series KKFF or KLBF. Needle rollers type NRB have a flat ends of so-called B shape.

Other needle rollers with different qualities and materials are available.



## Special rollers

Rollers of special shapes are made to customer`s specifications. These rollers are also made in small quantities.

This offer is used for producing new running track systems or with special material requirements.



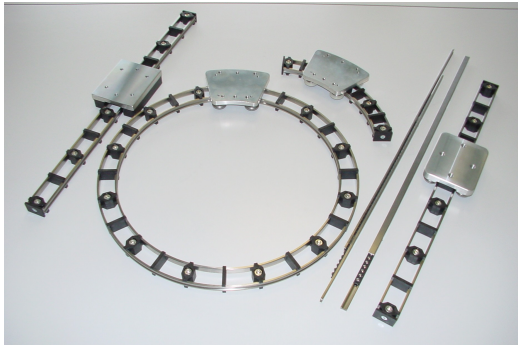
# Product information

## Survey



### Product information

#### Linear guide systems Light, quiet and resistant to corrosion



- |                                       |           |
|---------------------------------------|-----------|
| Profilschienen - Führung              | Typ PSF 6 |
| Laufrollen - Führung                  | Typ LRF 6 |
| Flüster - Laufrollen - Führung        | Typ FLF 6 |
| Kugelumlaufführung                    | Typ KUF 6 |
| Laufrollen - Segmentführung           | Typ LSF 6 |
| Flüster - Laufrollen - Segmentführung | Typ FLS 6 |
| Laufrollen - Kreisführung             | Typ LKF 6 |
| Flüster - Laufrollen - Kreisführung   | Typ FLK 6 |

Postweg 34  
D-73441 Bopfingen  
Telefon 07362/7001    Telefax 07362/7007  
E-Mail Adresse KMF-Bopfingen@t-online.de



KMF Kunststoff-Metall-Formteile GmbH

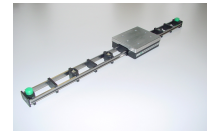
### Product information

#### Light and quiet, straight In arcs and circles

Neue KMF-Profilschienenführungen in Hybridtechnik

##### Kugelumlaufführung Typ KUF 6

bestehend aus:  
Kugelumlaufwagen Typ KUWA 6-80-100  
Hohlraum-Profillaufschiene Typ HRPS 6-500



##### Flüster-Laufrollen-Segmentführung Typ FLS 6

bestehend aus:  
Laufrollenwagen Typ LRWK 6-180-30  
Hohlraum-Segmentschiene Typ HRSS 6-180-80



##### Flüster-Laufrollen-Kreisführung Typ FLK 6

bestehend aus:  
Laufrollenwagen Typ LRWK 6-180-30  
Hohlraum-Kreisschiene Typ HRKS 6-360



KMF Kunststoff-Metall-Formteile GmbH

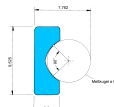
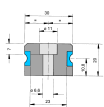
### Product information

#### Light and corrosion-resistant Hollow profile running rails

Neue KMF Hohlraum - Profillaufschiene in Hybridtechnik



- |                              |            |
|------------------------------|------------|
| Hohlraum - Kreisschiene      | Typ HRKS 6 |
| Hohlraum - Profillaufschiene | Typ HRPS 6 |
| Hohlraum - Segmentschiene    | Typ HRSS 6 |



Profillaufschiene Typ PSXC 06

Postweg 34  
D-73441 Bopfingen  
Telefon 07362/7001    Telefax 07362/7007  
E-Mail Adresse KMF-Bopfingen@t-online.de



KMF Kunststoff-Metall-Formteile GmbH

### Product information

#### Light and corrosion-resistant Hollow profile running rails

Neue KMF Hohlraum - Profillaufschiene in Hybridtechnik

##### Hohlraum - Profillaufschiene Typ HRPS 6

bestehend aus:  
Profillaufschiene  
Befestigungselemente  
Abstandshalter  
Endstücke  
Befestigungsschrauben

Typ PSXC 06  
Typ BE 6  
Typ AH 6  
Typ ES 6



##### Hohlraum-Segmentschiene Typ HRSS 6

bestehend aus:  
Profillaufschiene  
Befestigungselemente  
Abstandshalter  
Endstücke  
Befestigungsschrauben

Typ PSXC 06  
Typ BE 6  
Typ AH 6  
Typ ES 6

##### Hohlraum - Kreisschiene Typ HRKS 6

bestehend aus:  
Profillaufschiene  
Befestigungselemente  
Abstandshalter

Typ PSXC 06  
Typ BE 6  
Typ AH 6



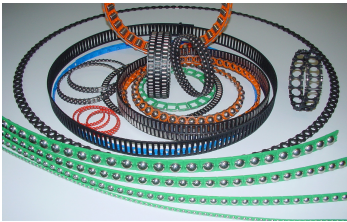
KMF Kunststoff-Metall-Formteile GmbH

Postweg 34  
D-73441 Bopfingen  
Telefon 07362/7001    Telefax 07362/7007  
E-Mail Adresse KMF-Bopfingen@t-online.de

Druckschriß DKL 100  
10/2001

Druckschriß DKL 100  
10/2001

## Ball bearing cages



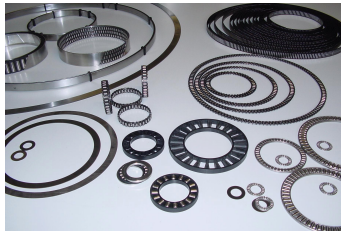
Standard range



Publication WLK 100 E  
09/2004

## Radial - and axial needle roller and cage assemblies

### Axial bearing washers



Type series KKBF  
Type series AXK  
Type series ASS  
Type series KEBF  
Type series ASXK  
Type series SKE



Publication UFT 100 E  
09/2004

## SLIM - SPLIT - BEARING

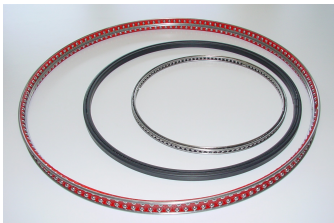


Type series PBXU  
Type series PBXC  
Type series PBAC  
Type series PFXC  
Type series PFAC  
Type series HFXD  
Type series PBDV



Publication DRL 100 E  
09/2004

## Wire ball bearing



Type series KVE  
Type series MVE  
Type series ZVE  
Type series KER  
Type series KED  
Type series DFX  
Type series DSE



Publication DKL 100 E  
10/2004

## Bearing assembly



Special range



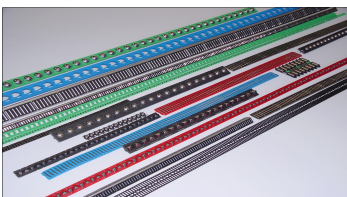
Publication DVS 100 E  
02/2002

## Construction elements



Publication WKE 100 E  
10/2001

## Linear ball cages

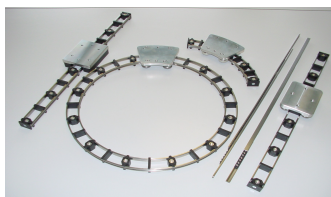


Standard range



Publication LLK 100 E  
09/2004

## Linear motion products



Type series PSF 6  
Type series LRF 6  
Type series FLF 6  
Type series KUF 6  
Type series LSF 6  
Type series FLS 6  
Type series LKF 6  
Type series FLK 6



Publication LFS 100  
08/2002

## Roller - bearing assembly



Typ LFDV 400

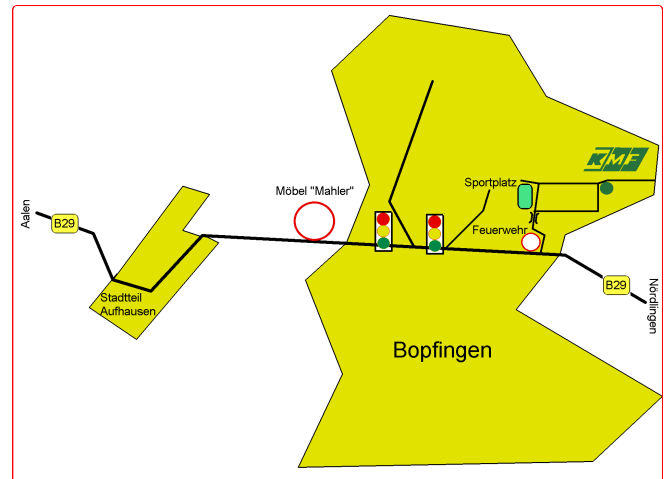
Type series LFDV



## Directions to find firm ...

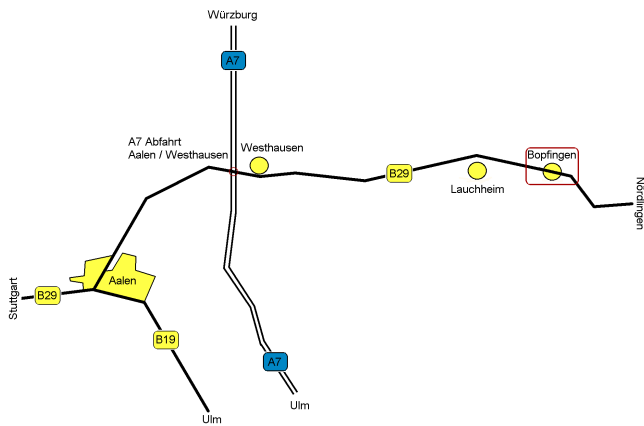
### ... Starting from the B29 in the Nördlingen direction

Shortly after entering the place, turn right at the Fire Station, then after 30 m, turn left again, follow the street, pass the Sports Stadium, turn right to the Postweg, we are 200 m along on the right hand side.



### ... Starting from the A7 exit Aalen / Westhausen

take the B29 in the Nördlingen direction. Shortly before the exit to the Fire Station, turn left, then after 30 m, turn left again, follow the street, pass the Sports Stadium, turn right to the Postweg, we are 200 m along on the right hand side.



KMF Kunststoff-Metall-Formteile GmbH

Postweg 34  
D-73441 Bopfingen  
Telephon 07362/7001    Telefax 07362/7007  
E-Mail Adresse        Info@KMF-Bearings.de