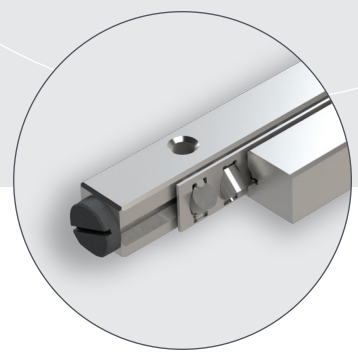
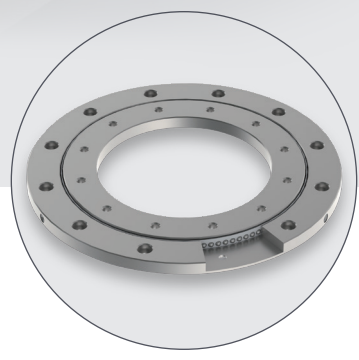
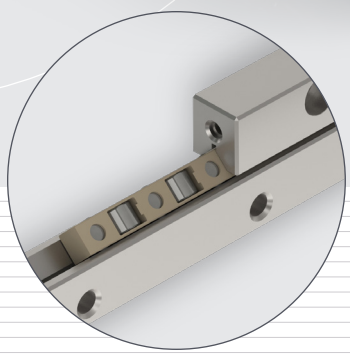
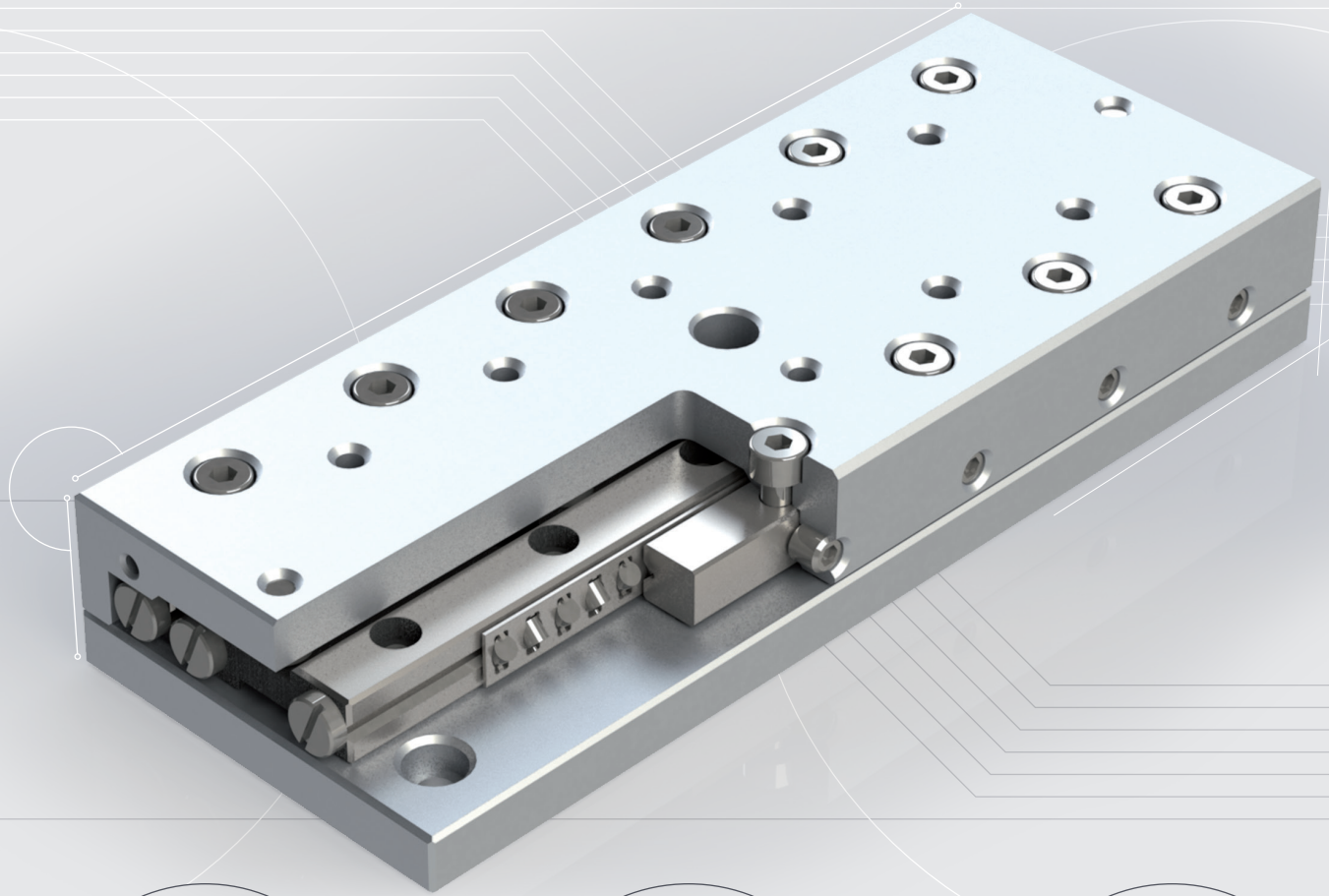


OVER
50
YEARS
of success



LINEAR BEARINGS TYPE N/O



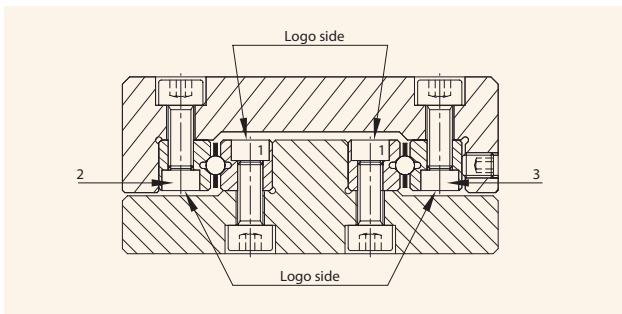
ASSEMBLY PROCEDURE

BEFORE START ASSEMBLY

PM linear bearings are precision components; they have to be handled with meticulous care. To achieve a perfect linear bearing, please pay due attention to the following notes:

- Be careful in handling the components. Do not drop it or hit it with anything like a hammer. Damages on the rail surface will have his impact on the running performance and operation life.
- Keep out any foreign material when mounting the rails.
- During assembly, all linear bearing components must have the same room temperature.
- For an uniform tightening of the bolts the use of a torque screw driver is recommended. Various models and bits are available. Please consult PM.

ASSEMBLY LINEAR BEARINGS



For a satisfying installation of all types of linear bearings in this catalog, the following should be observed:

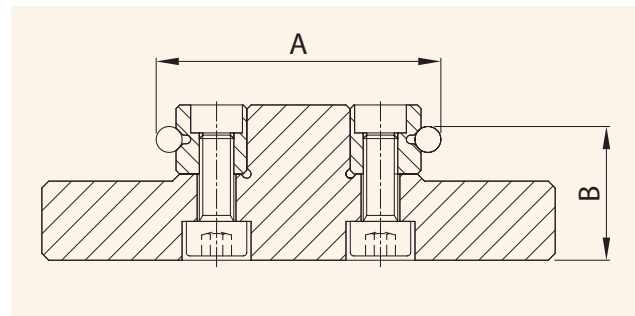
- 1) Fixing holes in the support structure (slide-base) should be "spotted through" from the holes in the rails. This is highly desirable as the original pitch of individual holes may have altered during hardening by as much as 0.4 mm. To compensate this, in part at least, special attachment screws type GD or GDN can be supplied. The dimensions of these are listed in the tables under the relative linear bearings for sizes.
- 2) Carefully de-burr and clean all constructional elements, to ensure a flat surface and a perfect seating of the rails.
- 3) The inner rail-pair (1), mounted "shoulder-to-shoulder" should be bolted down first, as follows: The base and reference face 1 of the linear bearing rails should be lightly oiled before they are clamped

against the mounting and reference shoulder.

They should then be bolted down by tightening up progressively, starting from one end and working to the other.

- 4) Parallelism of the V-tracks of the rails (A and B) should be checked. The tolerance must be within the tolerance of the linear bearings (page 14). When this has been done, the slide element in question is now ready for assembly.

Parallelism of rails V-track: ΔA und ΔB



- 4.1) The slide top can now be assembled. The fixed bearing rail (2) should be mounted as described at 3.1 above, but the adjustable rail (3) should only be screwed down lightly, to leave a gap between V-tracks for the insertion of ball-, roller- or needle cages.
- 5) This point only in cases where end stops are already inserted in the rail ends. Remove the end stop screws.
- 6) Carefully insert the cages. When the cages are exact in position, bolt down the adjustable V-rail lightly, until the screws are finger-tight.
- 7) Fit the end stop screws or end pieces.
- 8) The linear bearing set can now be play-free adjusted using the lateral preload setscrews. (chapter Preload Setting Linear Bearings, page 18).
- 9) Secure the attachment screws on the adjusting rail.
- 10) When assembly is finished, the linear bearings must be inspected for absence of play and for running the accuracy.



TABLES

RECOMMENDED PRELOAD SETTINGS

Table 1 Linear bearings RSD with roller cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
1.5	3	M 2.5	10	0.75
2	4	M3	15	1.50
3	5	M5	25	4.50
4	7	M5	40	11.50
6	12	M6	100	18.50
9	14	M8	100	105.50
12	22	M10	100	176.50
15	20	M12	100	370.00

Table 2 Linear bearings RSD with ball cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
1.5	3	M 2.5	10	0.20
2	4	M3	15	0.40
3	5	M5	25	1.10
4	7	M5	40	2.70
6	9	M6	50	4.00
9	14	M8	100	11.70
12	15.5	M10	100	25.00
15	20	M12	100	34.50

Table 3 Linear bearings RSDE with roller cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
3	3.3	M5	25	16
4	4.4	M5	40	41
6	6.6	M6	50	86
9	On request			

Table 4 Linear bearings RNG with roller cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
4	4.4	M3	25	14
6	6.6	M4	25	25

Table 5 Linear Bearings N/O and M/V with needle cages

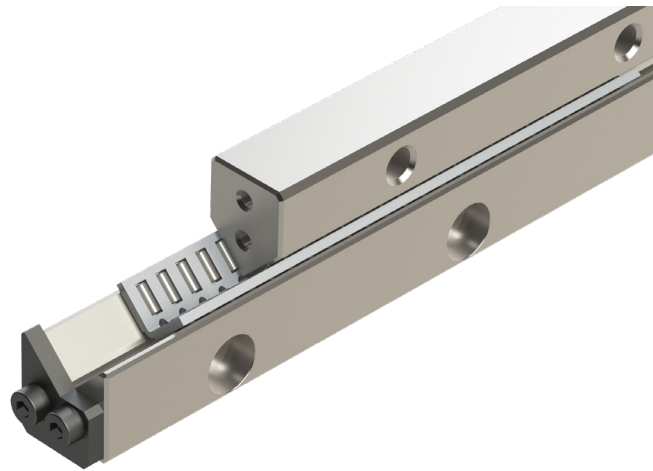
Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
2	4.5	M6	50	1.05
2	4.5	M8	100	1.30
2.5	5	M8	100	2.70
2.5	5.5	M8	100	2.90
3	6	M12	100	5.70
3.5	7	M14	100	7.70

RECOMMENDED TIGHTENING TORQUE FOR ATTACHMENT SCREWS

Table 6 Tightening torque strength grade 12.9

Max. Tightening torques (Ncm)		
Size	Tightening Torque DIN 912	Attachment screws GD and GDN
M2	0.60	0.48
M3	2.00	1.60
M4	4.90	3.92
M5	9.60	7.68
M6	17.00	13.60
M8	41.00	32.80
M10	79.00	63.20
M12	140.00	112.00
M14	220.00	176.00

*pitch between the preload setscrews



Linear needle bearings type N/O and M/V are suitable to support and guide high loads and moments very accurate. Due to the close arranged needle rollers they provide extremely high rigidity, high linear motion accuracy and a compact size. Often used in the machine tool industry.

STRUCTURE AND FEATURES

A typical installation consists of 2 pairs of linear bearings; each pair is made up of (2) rails, 1, N-type (female) and 1, O-type (male), through-hardened and precision ground, with one needle roller cage in-between.

The rails are made to very high tolerances and matched together as a set. Mixing components from different sets may affect the accuracy.

Rails are equipped with countersunk-bored attachment holes, according to a standard configuration. Threaded holes in ends for fixing endstops and wipers. For the attachment, special screws type GD can be ordered separately. (see page 31).

NOTES BY ORDERING

Normally one set linear bearings consists of:
4 pcs. rails (= 2 pairs), 2 pcs. needle cages and 8 pcs. end stops (2 · N or M-type + 2 x O or V-type).

By ordering please specify the following data:

- Quantity and type of rails
- Quantity and type of cages or max. stroke
- Quantity and type of end stop screws or end stop pieces with or without wipers

In case of end stop GH with GH-A wipers, and end stop GW with GW-A wipers only 4 pcs are needed.

Example:

To order one linear bearing set of 600 mm length, size 2025 for a 350 mm stroke in standard quality please specify:

- 2 pcs. Rails N-2025x600
- 2 pcs. Rails O-2025x600
- 2 pcs. Needle cages HW-15x425 mm
- 4 pcs. End pieces GFN-2025
- 4 pcs. End pieces GFO-2025

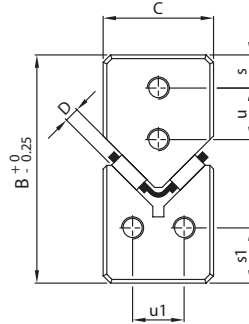
Example:

To order one linear bearing set of 300 mm length, size 3015 for a 150 mm stroke in standard quality please specify:

- 2 pcs. Rails M-3015x300
- 2 pcs. Rails V-3015x300
- 2 pcs. Needle cages HW-10x225 mm
- 2 pcs. End pieces EM-3015
- 2 pcs. End pieces EAM-3015



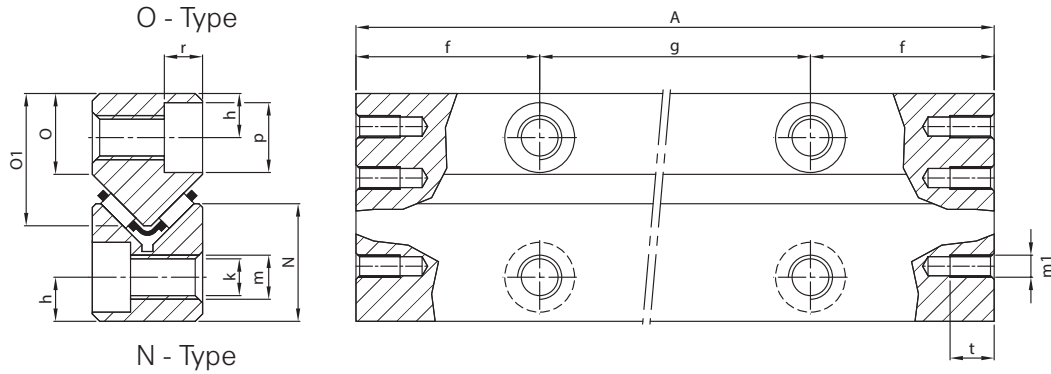
N / O



Rail type		Main dimensions							Mounting holes				
N-Type	O-Type	A	B	C	N	O	O1	D	f	g	h	k	m
N-62015x100	O-62015x100	100								1x50			
N-62015x150	O-62015x150	150								2x50			
N-62015x200	O-62015x200	200								3x50			
N-62015x250	O-62015x250	250								4x50			
N-62015x300	O-62015x300	300								5x50			
N-62015x350	O-62015x350	350								6x50			
N-62015x400	O-62015x400	400	31	15	16	11	18	2	25	7x50	6	5.2	M6
N-62015x450	O-62015x450	450								8x50			
N-62015x500	O-62015x500	500								9x50			
N-62015x600	O-62015x600	600								11x50			
N-62015x700	O-62015x700	700								13x50			
N-62015x800	O-62015x800	800								15x50			
N-62015x900	O-62015x900	900								17x50			
N-62015x1000	O-62015x1000	1000								19x50			
N-92025x200	O-92025x200	200								1x100			
N-92025x300	O-92025x300	300								2x100			
N-92025x400	O-92025x400	400								3x100			
N-92025x500	O-92025x500	500								4x100			
N-92025x600	O-92025x600	600								5x100			
N-92025x700	O-92025x700	700	44	22	24	15	24.5	2	50	6x100	9	6.8	M8
N-92025x800	O-92025x800	800								7x100			
N-92025x900	O-92025x900	900								8x100			
N-92025x1000	O-92025x1000	1000								9x100			
N-92025x1100	O-92025x1100	1100								10x100			
N-92025x1200	O-92025x1200	1200								11x100			

Bold = Short lead time item

Regular = Long lead time item - please request for price and delivery time

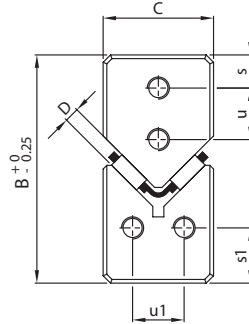


p	r	End holes						Weight (g)		Type N/O	Accessories
		m1	s	s1	t	u	u1	Type N	Type O		
9.5	5.2	M3	4.5	7.5	7	7	7	143	163	62015x100	Cage: HW-10 End pieces: GF, GH, GW Attachment screw: Type GD-6
								214	245	62015x150	
								285	326	62015x200	
								357	408	62015x250	
								438	489	62015x300	
								510	571	62015x350	
								581	652	62015x400	
								652	734	62015x450	
								724	815	62015x500	
								866	979	62015x600	
								1019	1142	62015x700	
								1162	1305	62015x800	
								1305	1468	62015x900	
1448	1631	62015x1000									
10.5	6.2	M4	6	11	8	10	10	683	693	92025x200	Cage: HW-15, FF-2025-ZW End pieces: GF, GH, GW Attachment screw: Type GD-9
								1019	1030	92025x300	
								1346	1356	92025x400	
								1692	1702	92025x500	
								2018	2029	92025x600	
								2365	2375	92025x700	
								2691	2701	92025x800	
								3028	3038	92025x900	
								3364	3374	92025x1000	
								3700	3710	92025x1100	
4027	4037	92025x1200									

Units: mm



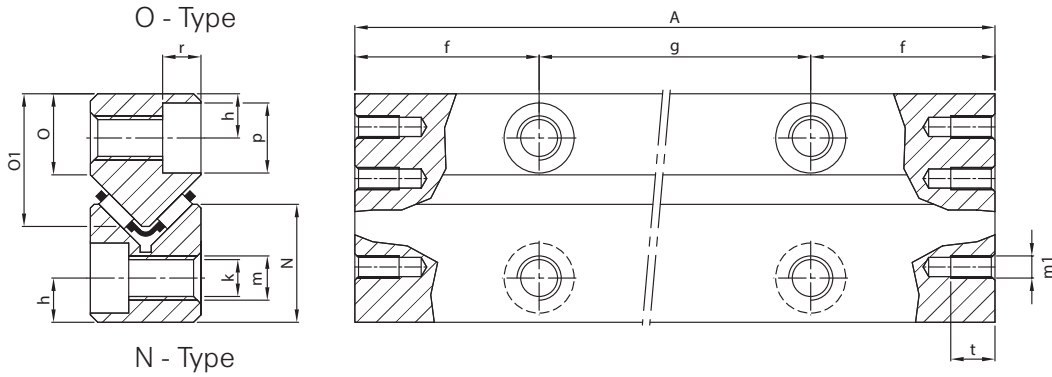
N / O



Rail type		Main dimensions						D	Mounting holes				
N-Type	O-Type	A	B	C	N	O	O1		f	g	h	k	m
N-2025x200	O-2025x200	200								1x100			
N-2025x300	O-2025x300	300								2x100			
N-2025x400	O-2025x400	400								3x100			
N-2025x500	O-2025x500	500								4x100			
N-2025x600	O-2025x600	600								5x100			
N-2025x700	O-2025x700	700	52	25	28	18	29	2	50	6x100	10	8.5	M10
N-2025x800	O-2025x800	800								7x100			
N-2025x900	O-2025x900	900								8x100			
N-2025x1000	O-2025x1000	1000								9x100			
N-2025x1100	O-2025x1100	1100								10x100			
N-2025x1200	O-2025x1200	1200								11x100			
N-2535x300	O-2535x300	300								2x100			
N-2535x400	O-2535x400	400								3x100			
N-2535x500	O-2535x500	500								4x100			
N-2535x600	O-2535x600	600								5x100			
N-2535x700	O-2535x700	700	62	30	34	22	35	2.5	50	6x100	12	10.3	M12
N-2535x800	O-2535x800	800								7x100			
N-2535x900	O-2535x900	900								8x100			
N-2535x1000	O-2535x1000	1000								9x100			
N-2535x1100	O-2535x1100	1100								10x100			
N-2535x1200	O-2535x1200	1200								11x100			

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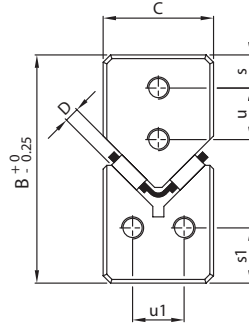


p	r	End holes						Weight (g)		Type N/O	Accessories
		m1	s	s1	t	u	u1	Type N	Type O		
13.5	8.3	M6	7	12	12	11	14	897	897	2025x200	Cage: HW-15, FF-2025-ZW End pieces: GF, GH, GW Attachment screw: GD-2025
								1366	1346	2025x300	
								1835	1804	2025x400	
								2304	2253	2025x500	
								2762	2701	2025x600	
								3231	3150	2025x700	
								3690	3598	2025x800	
								4159	4047	2025x900	
								4618	4506	2025x1000	
								5056	4954	2025x1100	
5556	5403	2025x1200									
16.5	10.2	M6	8	15	12	12	18	1906	1967	2535x300	Cage: HW-20, FF-2535-ZW End pieces: GF, GH, GW Attachment screw: GD-2025
								2548	2620	2535x400	
								3180	3282	2535x500	
								3812	3935	2535x600	
								4455	4587	2535x700	
								5076	5240	2535x800	
								5719	5902	2535x900	
								6351	6646	2535x1000	
								6993	7207	2535x1100	
								7625	7859	2535x1200	

Units: mm



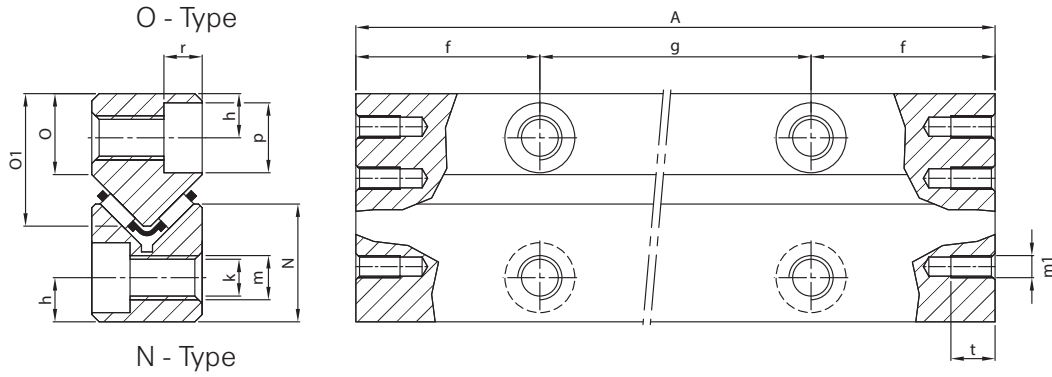
N / O



Rail type		Main dimensions							Mounting holes				
N-Type	O-Type	A	B	C	N	O	O1	D	f	g	h	k	m
N-3045x400	O-3045x400	400								3x100			
N-3045x500	O-3045x500	500								4x100			
N-3045x600	O-3045x600	600								5x100			
N-3045x700	O-3045x700	700								6x100			
N-3045x800	O-3045x800	800	74	35	42.5	25	40	3	50	7x100	14	12.5	M14
N-3045x900	O-3045x900	900								8x100			
N-3045x1000	O-3045x1000	1000								9x100			
N-3045x1100	O-3045x1100	1100								10x100			
N-3045x1200	O-3045x1200	1200								11x100			
N-3555x500	O-3555x500	500								4x100			
N-3555x600	O-3555x600	600								5x100			
N-3555x700	O-3555x700	700								6x100			
N-3555x800	O-3555x800	800	78	45	45	25	45	3.5	50	7x100	14	12.5	M14
N-3555x900	O-3555x900	900								8x100			
N-3555x1000	O-3555x1000	1000								9x100			
N-3555x1100	O-3555x1100	1100								10x100			
N-3555x1200	O-3555x1200	1200								11x100			

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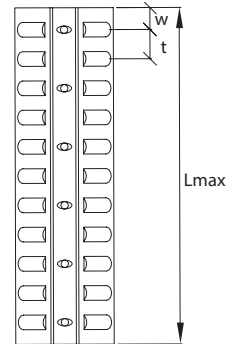
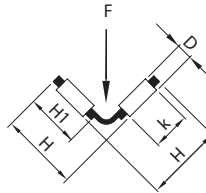
p	r	End holes						Weight (g)		Type N/O	Accessories
		m1	s	s1	t	u	u1	Type N	Type O		
18.5	12.5	M6	10	18	12	16	19	3660	3466	3045x400	Cage: HW-25, FF-3045-ZW End pieces: GF, GH, GW Attachment screw: GD-3045
								4567	4322	3045x500	
								5494	5138	3045x600	
								6402	6055	3045x700	
								7319	6922	3045x800	
								8236	7778	3045x900	
								9154	8654	3045x1000	
								10061	9511	3045x1100	
								10979	10377	3045x1200	
18.5	12.2	M6	12	18	12	20	29	6177	6106	3555x500	Cage: HW-30, FF-3555-ZW End pieces: GF, GH, GW Attachment screw: GD-3555
								7370	7329	3555x600	
								8654	8542	3555x700	
								9888	9766	3555x800	
								11131	10989	3555x900	
								12375	12202	3555x1000	
								13619	13425	3555x1100	
								14852	14648	3555x1200	

Units: mm

ACCESSORIES

Needle cages type HW, size 10 - 30

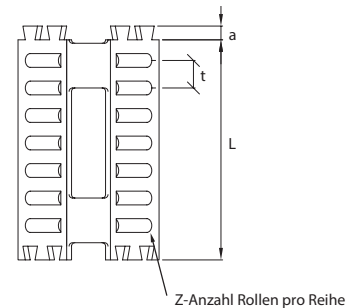
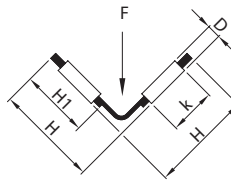
- Needles are retained
- For horizontal and vertical installation
- Material brass / light-alloy
- For protruding cages
- For temperatures up to 150 °C



Length tolerance due to roller distance t: L +0/-t

Needle cages type FF-ZW, size 2025 - 3555

- Needles are retained
- For horizontal and vertical installation
- Material plastic
- For temperatures up to 120 °C



Dovetail grooves on both sides of the cage elements for an easy connection of any number of elements.

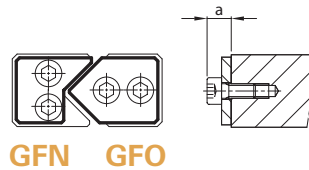
For bending the cage the elements need to be heated to + 70 °C to + 90 °C and bend to the desired angle.

Cage type		Main dimensions									Load rating		
FF.ZW	HW	D	H	H1	a	k	L	t	w	Lmax	Z	C _{dyn} ¹ (N)	C ₀ (N)
FF-2025-ZW	HW-10	2	10	8	-	4.8	-	4	3	2000	-	21400	62700
	HW-15	2	15	10	2	6.8	32	4	-	-	7	25900	87500
FF-2535-ZW	HW-15	2	15	10.5	-	6.8	-	4.5	3.5	2000	-	26200	88900
	HW-20	2.5	20.5	15	2.4	9.8	45	5	-	-	8	39600	130600
FF-3045-ZW	HW-20	2.5	20	14.3	-	9.8	-	5.5	3.5	2000	-	40300	133500
	HW-25	3	26	20	3	13.8	60	6	-	-	9	57900	188500
FF-3555-ZW	HW-25	3	25	19	-	13.8	-	6	4.5	2000	-	62900	209400
	HW-30	3.5	31.5	25	3.2	17.8	75	7	-	-	10	78400	250900
	HW-30	3.5	30	24	-	17.8	-	7	5	2000	-	82700	268700

1) The dynamic load rating C_{dyn} for a theoretical cage length of 100 mm in load direction "F" as shown in the figure.

End pieces type GFN and GFO, size 62015 - 3555

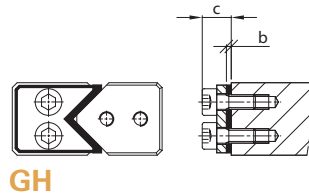
- For horizontal and vertical installation



GFN GFO

End pieces type GH, size 62015 - 3555

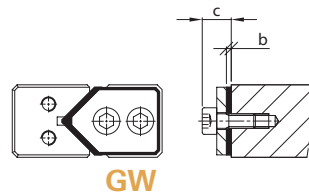
- For horizontal and vertical installation
- Optional with felt-wipers type GH-A



GH

End pieces type GW, size 62015 - 3555

- For horizontal and vertical installation
- Optional with felt-wipers type GW-A



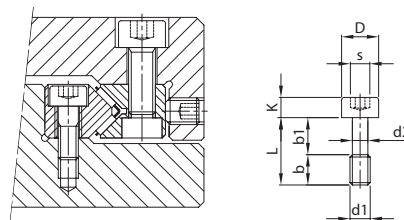
GW

Main dimensions	Rail N/O					
	62015	92025	2025	2535	3045	3555
a	6	7	10	10	10	11
b	3	3	3	3	4	5
c	9.2	10.2	13.2	13.2	13.2	14.2

Bestellbeispiel: 4 End pieces GFN-2025 + 4 End pieces GFO-2025

Attachment screws GD, size 6 - 3555

- For compensation of pitch distances between mounting holes
- Also recommended for the installation of the pre-load



Type	Main dimensions								Rail type	Max. Tightening torque (Nm) ¹
	L	b	b1	D	d1	d2	K	s		
GD-6	20	8	12	8	M5	3.9	5	4	N/O-62015	4.6
GD-9	30	12	18	8.5	M6	4.6	6	5	N/O-92025	7.3
GD-2025	35	16	19	11.3	M8	6.2	8	6	N/O-2025	19.2
GD-2535	40	18	22	13.9	M10	7.9	10	8	N/O-2535	38.4
GD-3045	50	25	25	15.8	M12	9.6	12	10	N/O-3045	66.4
GD-3555	60	25	3	15.8	M12	9.6	12	10	N/O-3555	66.4

Ordering example: 8 pieces attachment screws GD-2025

¹For strength grade 12.9

Units: mm

PM RESEARCH AND PRODUCTION FACILITY



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