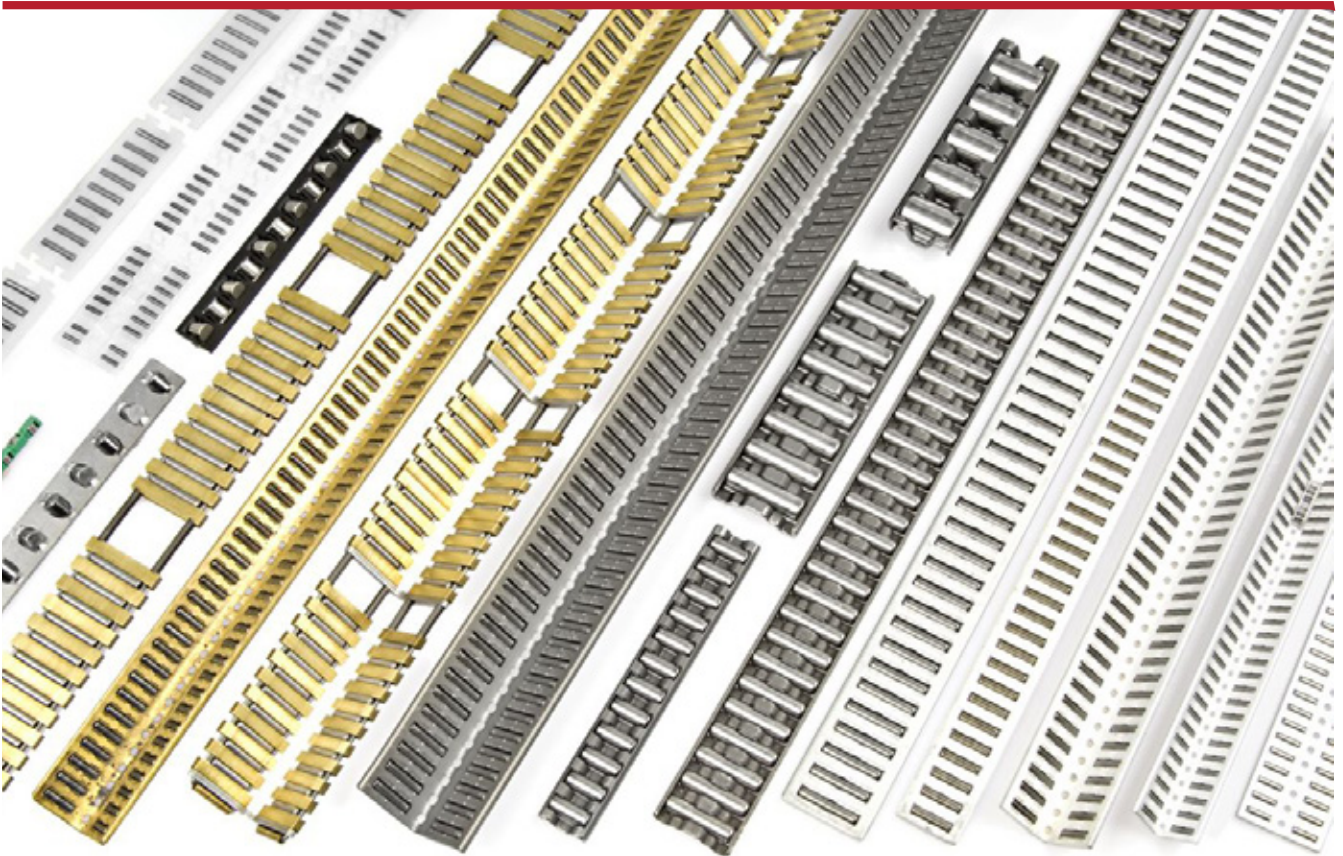


8

FLAT CAGE ASSEMBLIES



A GENERAL ASPECTS

Every cage type possesses specific technical characteristics and application features. The flat cage assemblies presented in the table below are intended for use with the guideways described in this catalogue. However, they can also run directly on raceways in connecting parts which fulfil the necessary characteristics.

The cage length can be adapted to the application in steps according to the spacing LA.

C MATERIAL

4 materials for flat basic cages:

- Aluminium (standard) for normal operating conditions and high accelerations
- Steel for difficult operating conditions (suffix "F")
- Plastic for easy operating conditions (series E-FF / E-FFW)
- Brass for special operating conditions (suffix "MS") (Standard for cages with damping)

B RACEWAY CHARACTERISTICS

The raceways must fulfil the same conditions as the raceways on the guideways

- Surface roughness $R_a \leq 0.35 \mu\text{m}$
- Hardness min. 58 HRC / 670 HV

(with lower hardness levels, the hardness factors according to figure 10 page 25 should be taken into account)

D ALTERNATIVE VERSIONS

- Higher precision of rolling elements (suffix G1)
- Corrosion-resistant cages (suffix BK)
- Friction-reducing coating (suffix BR)

DELIVERABLE CAGES

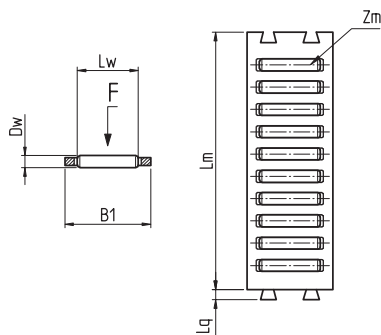
Flat cage material	Rolling elements			
	Type	Cage shape	Single row	Double row
Plastic	Needle rollers	Flat	E-FF	E-FF...ZW
		Angled		E-FFW
Aluminium	Needle rollers	Flat	E-H	E-H ZW
		Angled		E-HW
	Cylindrical rollers	Flat	E-HR	E-HR ZW
		Angled		E-HRW
	Balls	Flat	E-HB	
		Angled		E-HBW
Steel	Needle rollers	Flat	E-H F	E-H ZW F
		Angled		E-HW F
		Profiled sheet	E-BF	
Brass	Needle rollers	Flat	E-H MS	E-H ZW MS
		Angled		E-HW MS
	Needle rollers with damping	Flat	E-HG	
		Angled		E-HGW

ACCURACY OF THE ROLLING ELEMENTS

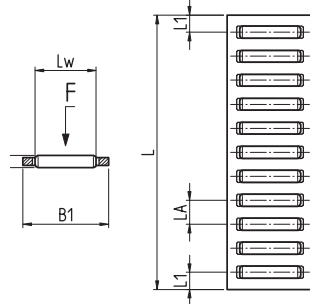
Rolling elements	According to DIN standard	Quality category	Roundness µm	Category tolerance µm
Needle rollers	DIN 5402-3	G2 (standard)	1	2
		G1	0.5	1
Cylindrical rollers	DIN 5402-1	GN	1	2
		G1	0.5	1
Balls	DIN 5401	G5	0.13	1

E SINGLE-ROW FLAT CAGE ASSEMBLIES

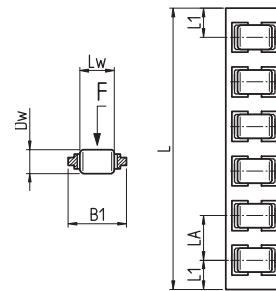
E-FF



E-H, E-BF, E-H F, E-H MS



E-HR



F = Load direction

DIMENSIONS IN MM

Rolling element diameter	Type				Dimensions							Number of rolling elements per row	Basic load ratings***	
	E-FF	E-H E-H F E-H MS	E-BF	E-HR	B1*	Lw	LA	L1	Lq	L**	Lm		Zm	C
2	E-FF2010				10	6.8					32	7	21'160	61'900
		E-H10			10	6.8	4.5	3.5		2000			21'410	62'900
2.5	E-FF2515				15	9.8			2.5		45	8	32'600	92'300
		E-H15			15	9.8	5	3.5		2000			35'620	103'900
3	E-FF3020				20	13.8			3		60	9	47'880	133'300
		E-H20			20	13.8	6	4.5		2000			51'830	148'100
			E-BF3020		20	15.8	6	4.5		2000			57'750	170'200
3.5	E-FF3525				25	17.8			3		75	10	64'990	177'400
		E-H25			25	17.8	7	5		2000			68'450	190'100
5				E-HR50	10.5	5	10	6.5		2000			29'400	50'800
			E-BF5015		15	11.8	8	5.5		2000			70'410	154'700
			E-BF5023		23	19.8	8	5.5		2000			107'080	265'200
			E-BF5032		32	27.8	8	5.5		2000			140'400	375'700
7				E-HR70	17	10	13	8.5		2000			65'800	114'200
			E-BF7028		28	24	11	7.5		2000			153'000	331'900
			E-BF7035		35	30	11	7.5		2000			182'480	416'300
10				E-HR100	24	14	17	10		2000			109'900	174'200
12			E-BF12022		22	18	16	10		2000			183'000	288'400
			E-BF12040		40	36	16	10		2000			317'950	586'800

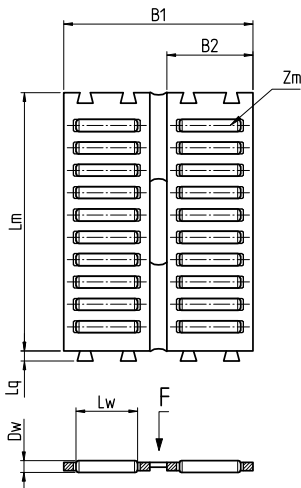
* Mounting dimensions: see table, page 82

** Length tolerance: 0/-1*LA

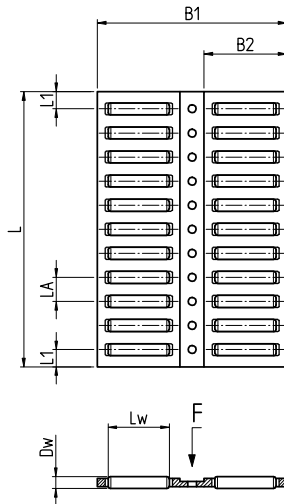
*** Basic load ratings for a theoretical cage length of 100mm in load direction "F"

F DOUBLE-ROW FLAT CAGE ASSEMBLIES

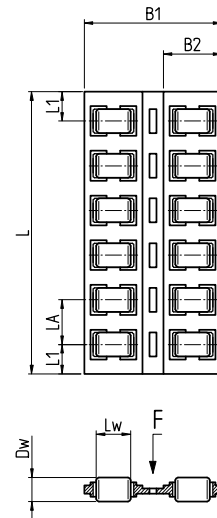
E-FF ZW



E-H ZW, E-H ZW F, E-H ZW MS



E-HR ZW



F = Load direction

DIMENSIONS IN MM

Rolling element diameter	Type			Dimensions								Number of rolling elements per row	Basic load ratings***	
	E-FF ZW	E-H ZW E-H ZW F E-H ZW MS	E-HR ZW	B1*	B2	Lw	LA	L1	Lq	L**	Lm		Zm	C
2		E-H19 ZW F		19.2	8	4.8	4	3		1000			29'960	97'200
	E-FF2025 ZW			25	10	6.8			2		32	7	36'280	123'800
		E-H24 ZW		24	10.5	6.8	4.5	3.5		2000			36'710	125'700
2.5	E-FF2535 ZW			35	15	9.8			2.4		45	8	55'900	184'700
		E-H34 ZW		33.5	14.3	9.8	5.5	4		2000			56'850	188'900
3	E-FF3045 ZW			45	20	13.8			3		60	9	82'090	266'500
		E-H44 ZW		44	19	13.8	6	4.5		2000			88'860	296'100
3.5	E-FF3555 ZW			55	25	17.8			3.2		75	10	111'420	354'800
		E-H55 ZW		55	24	17.8	7	5		2000			117'360	380'100
5			E-HR50 ZW	24	10.5	5	10	6.5		2000			51'080	101'700
7			E-HR70 ZW	40	17	10	13	8.5		2000			114'900	228'500
10			E-HR100 ZW	55	24	14	17	10		2000			193'110	348'400

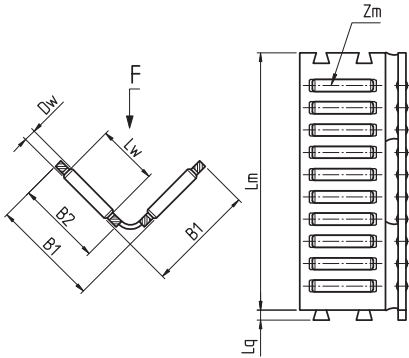
* Mounting dimensions: see table, page 83

** Length tolerance: 0/-1*LA

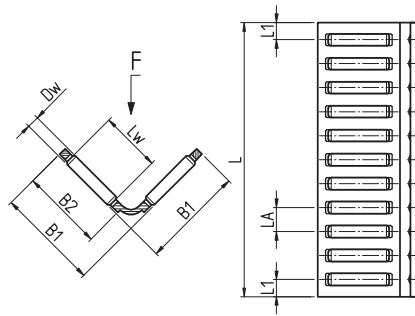
*** Basic load ratings for a theoretical cage length of 100mm in load direction "F"

G ANGLED FLAT CAGE ASSEMBLIES

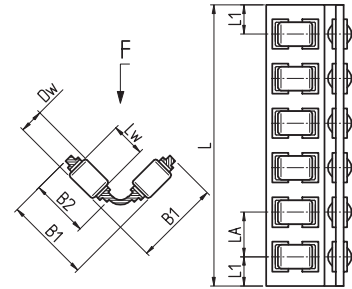
E-FFW



E-HW, E-HW F, E-HW MS



E-HRW



F = Load direction

DIMENSIONS IN MM

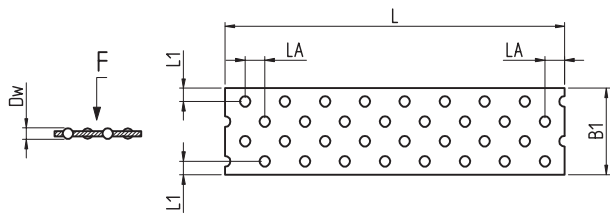
Rolling element diameter	Type			Dimensions								Number of rolling elements per row	Basic load ratings**		
	Dw	E-FFW	E-HW E-HW F E-HW MS	E-HRW	B1	B2	Lw	LA	L1	Lq	L*		Lm	Zm	C
2			E-HW10 F		10	8	4.8	4	3		1000		7	21'190	68'800
		E-FFW2025			15	10	6.8			2		32	7	25'650	87'500
			E-HW15		14	10.5	6.8	4.5	3.5		2000			25'960	88'900
			E-HW16		16	13.5	8.8	3.8	2.8		2000			36'410	138'200
2.5		E-FFW2535			20.5	15	9.8			2.4		45	8	39'530	130'600
			E-HW20		20	14.3	9.8	5.5	4		2000			40'200	133'500
3		E-FFW3045			26	20	13.8			3		60	9	58'050	188'500
			E-HW25		25	19	13.8	6	4.5		2000			62'840	209'400
3.5		E-FFW3555			31.5	25	17.8			3.2		75	10	78'790	250'900
			E-HW30		30	24	17.8	7	5		2000			82'980	268'800
5			E-HRW50		15.5	10.5	5	10	6.5		2000			36'120	71'900
7			E-HRW70		25	17	10	13	8.5		2000			81'240	161'600
10			E-HRW100		34	24	14	17	10		2000			136'550	246'400

* Length tolerance: 0/-1*LA

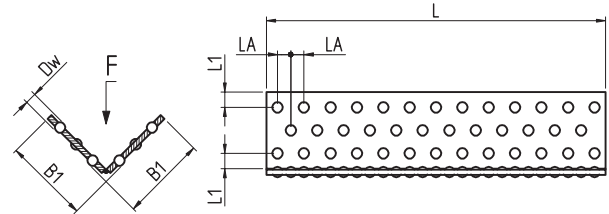
** Basic load ratings for a theoretical cage length of 100mm in load direction "F"

H BALL FLAT CAGE ASSEMBLIES

E-HB



E-HBW



F = Load direction

DIMENSIONS IN MM

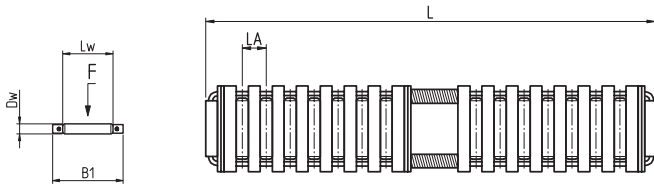
Ball diameter	Type		Dimensions				Basic load ratings**	
	E-HB	E-HBW	B1	LA	L1	L* max.	C	Co
2.5	E-HB2515		15	3	4.5	2000	3'180	3'040
3	E-HB3020		20	3.5	4	2000	5'140	5'000
		E-HBW3x18x18	17.75	3.5	3.5	1000	5'970	5'020
	E-HB3023		23	3.5	5.5	2000	5'140	5'000
		E-HBW3x23x23	22.75	3.5	4	1000	7'300	6'690
4	E-HB4025		25	5	5	2000	7'410	6'220

* Length tolerance: 0/-1*LA

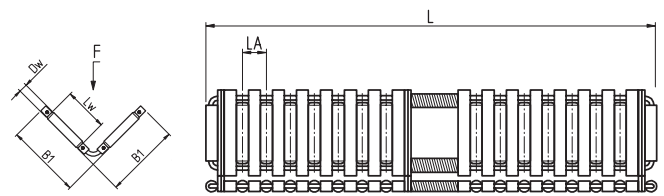
** Basic load ratings for a theoretical cage length of 100mm in load direction "F"

FLAT CAGE ASSEMBLIES WITH DAMPING

E-HG



E-HGW



F = Load direction

DIMENSIONS IN MM

Needle roller diameter	Type		Dimensions				Basic load ratings**		Damping power
	E-HG	E-HGW	B1*	Lw	LA	L max.	C N	Co N	RS***
2	E-HG10		10	6.3	4.5	2000	18'210	50'800	4.5
		E-HGW15	13.5	6.3	4.5	1500	21'760	70'500	9
2.5	E-HG15		15	9.8	5	2000	31'630	88'700	8
		E-HGW20	19.5	9.8	5	1500	37'970	123'800	16
3	E-HG20		20	13.8	6	2000	47'780	132'900	11
		E-HGW25	25	13.8	6	1500	57'370	185'500	22
3.5	E-HG25		25	17.8	7	2000	61'740	165'700	14
		E-HGW30	30.5	17.8	7	1500	74'320	232'100	28

* Mounting dimensions: see table page 82

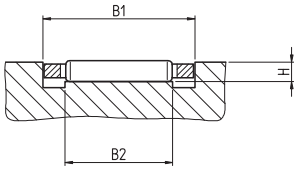
** Basic load ratings for a theoretical cage length of 100mm in load direction "F"

*** For a cage length of 100mm.

Calculation of the damping power for the effective cage length =>RSw=RS* $\frac{L}{100}$

J MOUNTING DIMENSIONS

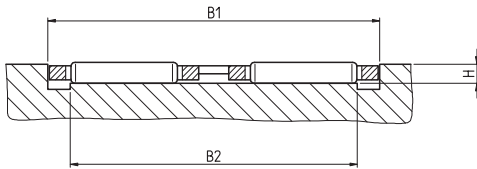
SINGLE-ROW FLAT CAGE ASSEMBLY



Cage type					Mounting dimensions in mm		
E-FF	E-H E-H F E-H MS	E-BF	E-HR	E-HG	B1	B2 min.	H
E-FF2010	E-H10			E-HG10	10.3 ^{+0.2/0}	7	1.7
E-FF2515	E-H15			E-HG15	15.3 ^{+0.2/0}	10	2.2
E-FF3020	E-H20			E-HG20	20.4 ^{+0.2/0}	14	2.7
		E-BF3020			20.4 ^{+0.2/0}	16	2.7
E-FF3525	E-H25			E-HG25	25.4 ^{+0.2/0}	18	3.2
			E-HR50		10.9 ^{+0.2/0}	5	3.4
		E-BF5015			15.3 ^{+0.2/0}	12	4.6
		E-BF5023			23.4 ^{+0.2/0}	20	4.6
		E-BF5032			32.5 ^{+0.3/0}	28	4.6
			E-HR70		17.4 ^{+0.2/0}	10	4.8
		E-BF7028			28.4 ^{+0.2/0}	24	6.5
		E-BF7035			35.6 ^{+0.3/0}	30	6.5
			E-HR100		24.4 ^{+0.2/0}	14	6.5
		E-BF12022			22.4 ^{+0.2/0}	18	11
		E-BF12040			40.5 ^{+0.3/0}	36	11

J MOUNTING DIMENSIONS

DOUBLE-ROW FLAT CAGE ASSEMBLY



Cage type			Mounting dimensions in mm		
E-FF ZW	E-H E-H F E-H MS	E-BF	B1	B2	H
	E-H19 ZW F		19.6 ^{+0.2/0}	17	1.7
E-FF2025 ZW			25.4 ^{+0.2/0}	22	1.7
	E-H24 ZW		24.4 ^{+0.2/0}	21	1.7
E-FF2535 ZW			35.5 ^{+0.2/0}	30	2.2
	E-H34 ZW		34.0 ^{+0.2/0}	28.5	2.2
E-FF3045 ZW			45.5 ^{+0.2/0}	39	2.7
	E-H44 ZW		44.5 ^{+0.2/0}	38	2.7
E-FF3555 ZW	E-H55 ZW		55.5 ^{+0.2/0}	48	3.2
		E-HR50 ZW	24.4 ^{+0.2/0}	19.5	3.4
		E-HR70 ZW	40.5 ^{+0.2/0}	34	4.8
		E-HR100 ZW	55.5 ^{+0.2/0}	46	6.5

K DELIVERABLE CAGE ASSEMBLIES

Flat cage material	Rolling elements	Cage shape	Number of rows	Designation	Dimensions	Weight per metre (g)	Guideway allocation
Plastic	Needle rollers	Flat	1	E-FF	E-FF2010	46	S3525, J3525
					E-FF2515	84	S4025, J4025, S5025, J5025
					E-FF3020	148	S5030, J5030
					E-FF3525	221	S5530, J5530
		Flat	2	E-FF ZW	E-FF2025 ZW	94	Special guideways
					E-FF2535 ZW	182	Special guideways
					E-FF3045 ZW	315	Special guideways
					E-FF3555 ZW	464	Special guideways
		Angled	2	E-FFW	E-FFW2025	94	M4020, V4020, M5025, V5025, ML5020, ML5520, ML5525, ML6025, ML6525, ML7025
					E-FFW2535	182	M6035, V6035, ML7035, ML8035
					E-FFW3045	315	M7040, V7040, ML8040, ML9040
					E-FFW3555	464	M8050, V8050, ML9050, ML10050
		Aluminium	Needle rollers	Flat	1	E-H	E-H10
E-H15	120						S4025, J4025, S5025, J5025, LUE5025
E-H20	202						S5030, J5030
E-H25	294						S5530, J5530
Flat	2			E-H ZW	E-H24 ZW	138	S6035, J6035, LUE6035
					E-H34 ZW	239	S7040, J7040, LUE7040
					E-H44 ZW	408	S8050, J8050, LUE8050
					E-H55 ZW	598	Special guideways
Angled	2			E-HW	E-HW15	138	M4020, V4020, M5025, V5025, ML5020, ML5520, ML5525, ML6025, ML6525, ML7025, LUE5025
					E-HW16	190	M5025, V5025, ML5525, ML6025, ML6525, ML7025
					E-HW20	239	M6035, V6035, ML7035, ML8035, LUE6035
					E-HW25	408	M7040, V7040, ML8040, ML9040, LUE7040
E-HW30	598			M8050, V8050, ML9050, ML10050, LUE8050			
Cylindrical rollers	Flat		1	E-HR	E-HR50	105	Special guideways
					E-HR70	295	Special guideways
					E-HR100	598	Special guideways
	Flat		2	E-HR ZW	E-HR50 ZW	215	Special guideways
					E-HR70 ZW	602	Special guideways
					E-HR100 ZW	1233	Special guideways
	Angled		2	E-HRW	E-HRW50	215	M4525, V4525
					E-HRW70	602	M6535, V6535
		E-HRW100			1233	M8550, V8550	
Balls	Flat	1	E-HB	E-HB2515	95	S4025, J4025, S5025, J5025	
				E-HB3020	167	S5030, J5030	
				E-HB3023	187	Special guideways	
				E-HB4025	250	S5530, J5530	
	Angled	2	E-HBW	E-HBW3x18x18	300	Special guideways	
				E-HBW3x23x23	480	Special guideways	

Flat cage material	Rolling elements	Cage shape	Number of rows	Designation	Dimensions	Weight per metre (g)	Guideway allocation
Steel	Needle rollers	Flat	1	E-H F	E-H10 F	127	S3525, J3525, LUE5025
					E-H15 F	224	S4025, J4025, S5025, J5025, LUE5025
					E-H20 F	369	S5030, J5030
					E-H25 F	546	S5530, J5530
		Profiled sheet	1	E-BF	E-BF3020	342	S5030, J5030
					E-BF5015	375	LUE6035, LUE7040, LUE8050
					E-BF5023	530	Special guideways
					E-BF5032	722	Special guideways
					E-BF7028	875	Special guideways
					E-BF7035	1080	Special guideways
					E-BF12022	1220	Special guideways
		Flat	2	E-H ZW F	E-BF12040	1970	Special guideways
					E-H19 ZW F	219	Special guideways
					E-H24 ZW F	289	S6035, J6035, LUE6035
					E-H34 ZW F	471	S7040, J7040, LUE7040
		Angled	2	E-HW F	E-H44 ZW F	756	S8050, J8050, LUE8050
					E-H55 ZW F	1117	Special guideways
					E-HW10 F	219	M3015, V3015
					E-HW15 F	289	M4020, V4020, M5025, V5025, ML5020, ML5520, ML5525, ML6025, ML6525, ML7025, LUE5025
					E-HW20 F	471	M6035, V6035, ML7035, ML8035, LUE6035
Brass	Needle rollers	Flat	1	E-H MS	E-HW25 F	756	M7040, V7040, ML8040, ML9040, LUE7040
					E-HW30 F	1117	M8050, V8050, ML9050, ML10050, LUE8050
					E-H15 MS	234	S4025, J4025, S5025, J5025, LUE5025
		Flat	2	E-H ZW MS	E-H20 MS	389	S5030, J5030
					E-H25 MS	575	S5530, J5530
					E-H19 ZW MS	230	Special guideways
					E-H24 ZW MS	306	S6035, J6035, LUE6035
					E-H34 ZW MS	499	S7040, J7040, LUE7040
		Angled	2	E-HW MS	E-H44 ZW MS	798	S8050, J8050, LUE8050
					E-H55 ZW MS	1178	Special guideways
	E-HW10 MS				230	M3015, V3015	
	E-HW15 MS				306	M4020, V4020, M5025, V5025, ML5020, ML5520, ML5525, ML6025, ML6525, ML7025, LUE5025	
	E-HW16 MS				390	M5025, V5025, ML5525, ML6025, ML6525, ML7025	
	E-HW20 MS				499	M6035, V6035, ML7035, ML8035, LUE6035	
	Needle rollers with damping	Flat	1	E-HG	E-HW25 MS	798	M7040, V7040, ML8040, ML9040, LUE7040
					E-HW30 MS	1178	M8050, V8050, ML9050, ML10050, LUE8050
					E-HG10	130	S3525, J3525, LUE5025
					E-HG15	230	S4025, J4025, J5025, LUE5025
		Angled	2	E-HGW	E-HG20	375	S5030, J5030
					E-HG25	560	S5530, J5530
E-HGW15					265	M4020, V4020, M5025, V5025, ML5020, ML5520, ML5525, ML6025, ML6525, ML7025, LUE5025	
E-HGW20					470	M6035, V6035, ML7035, ML8035, LUE6035	
E-HGW25					760	M7040, V7040, ML8040, ML9040, LUE7040	
E-HGW30					1150	M8050, V8050, ML9050, ML10050, LUE8050	