

FULL COMPLEMENT NEEDLE BEARINGS



Full complement needle bearings have a through hardened outer ring which results in high static and dynamic load capacities and an ability to withstand overloading, shocks and vibration.

They are particularly suitable for operations involving oscillating motion but may not accept high speed conditions where good alignment is necessary. This can more easily be achieved using a convex inner ring raceway.

The retention of needles in outer ring enables the bearings to be installed easily during assembly.

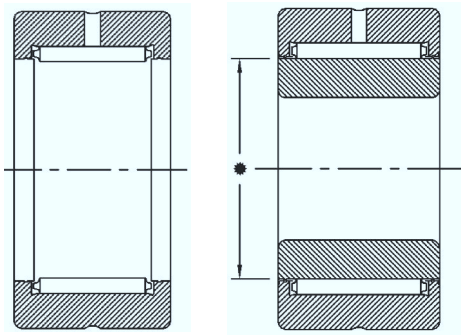
These bearings are available with or without an inner ring from 12 mm bore size. Standard complete bearings type NA have an inner ring with convex raceway form. If extra wide inner rings or rings with lubrication hole are required, they should be ordered separately for use with the corresponding RNA series.

FULL COMPLEMENT BEARINGS WITHOUT INNER RING

Standard type RNA (old designation Na...sa/Bi) Series 1 000, 2 000, 22 000, 3 000

The shaft journal which is used directly as the inner ring raceway of the bearing should have adequate hardness and satisfactory surface finish. A hardness of 58-64 HRC will ensure full load capacity for the bearing. Lower hardness will entail a reduction in both static and dynamic capacities as shown in the table of dimensions (see Technical Section).

In cases of misalignment a convex inner ring raceway can be machined directly at the shaft journal position by grinding, using a concave profile and inclining the diamond impregnated grinding wheel. A convex inner ring raceway calculated to permit misalignment of 1 in 1 000 does not affect bearing load capacity. A larger convex radius is necessary for greater degree of misalignment but this will reduce the effective bearing load capacity. Further information is available on request.



RNA

NA

* Standard convex inner ring R6

STANDARD TYPES

Bearings without inner ring	Inner rings with cylindrical raceway		
	Same width as bearings (with lubrication hole)	Extra wide inner rings ²⁾	
RNA ¹⁾ series 1 000, 2 000, 22 000, 3 000		with lubrication hole	without lubrication hole
		BIC series 1 000, 2 000, 22 000, 3 000	BICG
Inner rings with cylindrical raceway			
NA series 1 000, 2 000, 3 000			

1) Old designation Na...sa/Bi

2) Widths quoted on request

INNER RINGS

Inner rings made from high quality bearing steel heat treated and through hardened avoid any necessity for heat treatment of the shaft and enable the bearings to operate within their full load capacity (with the exception of special convex inner ring).

Inner Rings with convex raceway R6

These inner rings without lubrication hole are of the same width as the outer ring and are supplied with series NA complete, types 1 000, 2 000, 22 000, and 3 000. They can accept a misalignment of 1 in 1 000 in continuous operation and upto 2 in 1 000 temporarily, as in the case of sudden deflection due to overload conditions. The inner and outer rings may be displaced axially from one to the other by up to 5 % of the ring width.

Inner Rings with cylindrical raceway

Cylindrical inner rings of the same bore as those with convex raceway may be supplied on request:

- with oil hole permitting lubrication through the shaft
- wider than corresponding outer ring to enable a

displacement in position of one ring relative to the other (e.g. expansion of the shaft) or lateral shaft movement. (Please consult NRB Technical Department).

The use of cylindrical inner rings with standard bearings type RNA series 1 000, 2 000, 22 000 and 3 000 requires that the housing and shaft be correctly aligned at assembly with due regard to the application under load. If it is not essential to use these inner rings, it is always preferable to use complete bearings type NA with convex inner rings type R6, without oil hole, of the same width as the outer ring. In particular cases where lubrication is provided through the shaft, the inner ring with oil hole may be replaced by a lubrication hole at the face of the inner ring (see figure).

RING TOLERANCES

Inner and outer rings for full complement standard needle bearings are manufactured in accordance with the normal tolerance class of ISO 492 (class zero according to DIN 620). Closer tolerances corresponding to classes 6,5 and 4 may be necessary for special high precision applications (symbols P6, P5, P4).

SHAFT AND HOUSING TOLERANCES

Type of Operation	Direction of load	Shaft						
		Bearings without inner ring Dim Ci	Bearings with inner ring ¹⁾ Dim Di					
			< 80	85 - 130	140 - 220			
Shaft rotating housing fixed	Fixed rotating with shaft unknown	h5	k5	m5	n6	p6	J6(J7)	
		g5	h5	h5	h6	h6	M6(M7)	
	g5	k5*	m5*	n6	p6	M6(M7)		
Shaft fixed rotating housing	Fixed rotating with shaft Unknown	g5	h5	h5	h6	h6	M6(M7)	
		h5	k5	m5	n6	p6	J6(J7)	
	g5	k5*	m5*	n6	p6	M6(M7)		
Shaft & housing rotating	Any direction	g5	k5*	m5*	n6	p6	M6(M7)	
Oscillating motion	Any direction	h5	k5*	m5*	m6	m6	M6(M7)	

RADIAL PLAY

Bearings without inner ring

The radial play of a bearing without inner ring results from the difference in diameter beneath the needles and the size of the shaft. The standard diameter beneath the needles for RNA bearings with the recommended shaft tolerances should provide suitable radial play for most normal applications.

For special applications (high precision, close fits, etc.), NRB can offer the diameter beneath the needles selected as follows:

- Ø in the bottom half of the normal tolerance (RNA...TB)
- Ø in the upper half of the normal tolerance (RNA...TC)

Bearings without inner ring tolerance Class TB mounted on a shaft with k5 tolerance will have a reduced radial play suitable for certain applications.

A nominal diameter under the needles further reduced and having a tolerance of 10,15 or 20 microns according to size may be required for certain precision applications (Type RNA...TA).

Should a larger clearance than normal be necessary the shaft diameter must be controlled nearer to the nominal size than the tolerance h5 or g5 would normally provide.

Standard complete bearings with inner ring

Complete bearings type NA are offered with radial play that is suitable for a majority of applications. They can be supplied if necessary:

Ø with the radial play selected from the bottom half of the normal tolerance (NA...TB).

Ø with the radial play selected from the upper half of the normal tolerance (NA...TC).

For bore dimensions $D_i > 130$ mm bearings NA...TB or NA...TC are supplied only on special request.

A reduced radial play in the 10,15 or 20 micron groups, can be supplied for special precision applications (NA...TA..).

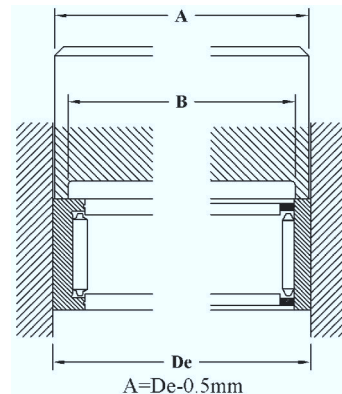
A radial play larger than normal may be necessary for certain applications, for example an inner ring subject to expansion mounted on a shaft running at high temperature (NA...TS...).

INSTALLATION OF RINGS

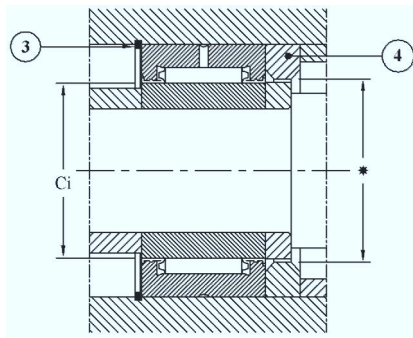
Outer Rings

The force applied to the face of the ring must be exerted only on the area bounded by the outer diameter D_e and the inner diameter B. The area of a ring with shoulders must not be subjected to loads or shocks.

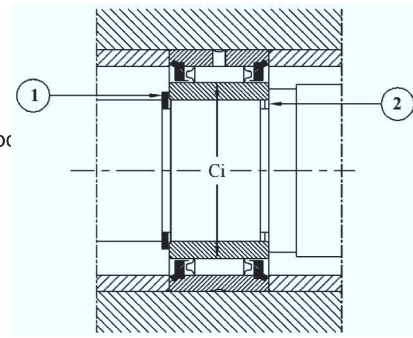
It is recommended to use a mandrel with which to tap small outer rings lightly into position. Alternatively, a press may be used, provided the load exerted is on the center line of the ring.



De mm	B mm	De mm	B mm	B mm	B mm	B mm	B mm	B mm	B mm	B mm	B mm	B mm
16	13.5	52	46.5	100	90	145	135	205	190	300	280	
19	16.0	58	52	105	95	150	138	215	200	315	295	
22	18.5	62	55	110	100	155	143	220	205	325	305	
24	21.0	65	58	115	105	160	148	230	215	340	315	
28	24.0	72	64	120	110	165	153	245	225	350	325	
32	27.5	80	71	125	115	170	158	255	235	365	340	
35	30.5	85	76	130	120	180	168	265	245	375	350	
42	37.0	90	81	135	125	190	175	280	260	385	360	
47	41.5	95	85	140	130	195	180	290	270	395	370	



1. Snap ring
 2. Groove for extraction tool
 3. Snap ring
 4. Guidance ring
- * Dimension $C_i + 0.2$ max



Inner Rings

For inner rings of small dimensions one can proceed in the manner described above. For larger sizes where tight fits are required, the rings should first be immersed in an oil bath at a temperature of 70° C to 80° C to enable them to expand and slide more easily upto their correct position on the shaft.

LATERAL RETENTION OF RINGS

Inner and outer rings for NA bearings must be positioned laterally :

- each lateral abutment for the outer rings must have an inner diameter greater than dimension C_i
- each lateral abutment for the inner rings must have an outer diameter smaller than dimension C_i

In this way correct fitting is ensured and fretting at the face of the bearing is avoided.

Fitting of outer rings

Whenever possible outer rings should be installed in through bored housings, which are easier to manufacture

in cylindrical form without taper than housings with shoulders. Lateral retention of rings can then be assured by snap rings, etc.

If the housing cannot be through bored, its base must possess grooves for engaging a bearing extraction tool.

For those installations using large components and where bearings are inaccessible or difficult to observe, it is advisable to protect the face of the outer ring on the mounting side by a ring having an internal diameter slightly larger than the dimension C_i and possessing a chamfer to help guide the shaft into position during installation.

Fitting of inner rings

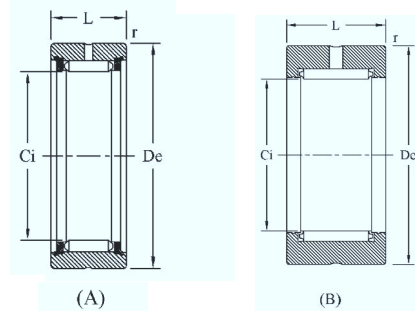
Inner rings may be positioned laterally by snap rings. They may also be supported by a shoulder on the shaft provided that the shoulder radius is smaller than the chamfer on the ring – shown in table of dimensions. Whenever possible, it is preferable to provide a groove for a bearing extraction tool on the shaft. If it is necessary to provide a ring of larger shoulder radius in order to retain the shaft strength, then a ring incorporating a larger chamfer may be placed between the shoulder and the inner ring.

Full Complement needle bearings without inner ring

Series RNA 1 000, 2 000 22 000, 3 000

RNA 1 005 to RNA 1 017 are not manufactured with lubrication hole.

1) Old designation Na ...s/Bi



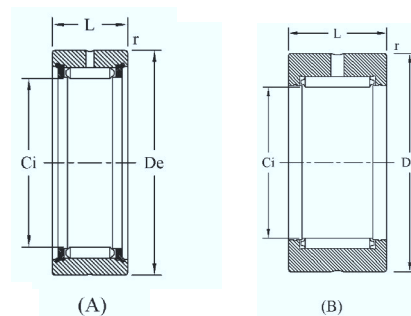
Shaft dia	Designations Series 1000, 2000 22000 fig.A	Series 3000 fig.B	Ci	De	L	r min	Basic capacities		Limiting speed (oil)	Approx weight
							Dyn. C	Stat. Co		
m m			m m	m m	m m	m m	Newtons	Newtons	rpm	gms
7.3	RNA 1 005		7.3	16	12	0.35	3950	4450	52000	10
9.7	RNA 1 007		9.7	19	12	0.35	7260	6070	39000	13
12.1	RNA 1 009		12.1	22	12	0.35	7500	7600	31000	18
14.4	RNA 1 010		14.4	24	12	0.35	8400	9100	26000	20
15.2	RNA 9 5008		15.2	26	26	0.35	29100	45900	25000	65
17.6	RNA 1 012		17.6	28	15	0.35	12900	16700	21600	34
20.8	RNA 1 015		20.8	32	15	0.65	14100	19800	18300	44
22	RNA 22 35 25		22	35	25	0.65	27800	48000	18100	95
	RNA 95 026		22	35	26.5	0.65	28500	43800	17200	95
22.1	RNA 2 015		22.1	35	22	0.65	25800	38500	17200	82
23.9	RNA 1 017		23.9	35	15	0.65	15200	22800	15900	47
24	RNA 24 37 20		24	37	20	0.65	21000	38500	15800	85
28.7	RNA 1 020		28.7	42	18	0.65	22200	34500	13200	84
	RNA 2 020		28.7	42	22	0.65	29800	50300	13200	104
33.5	RNA 1 025		33.5	47	18	0.65	24100	40300	11100	97
	RNA 2 025		33.5	47	22	0.65	32400	58700	11100	122
	RNA 22 025		33.5	47	30	0.65	47300	95800	11100	170
38.2	RNA 1 030		38.2	52	18	0.65	25900	46000	10000	107
	RNA 2 030		38.2	52	22	0.65	34700	67100	10000	139
	RNA 22 030		38.2	52	30	0.65	50800	109500	10000	193
41.275	RNA 95 074		41.275	56	26	1.5	48400	90800	9200	200
44	RNA 1 035		44	58	18	0.65	54500	28500	8600	127
	RNA 2 035		44	58	22	0.65	37300	77200	8600	160
	RNA 22 035		44	58	30	0.65	54600	125900	8600	225
		RNA 3 030		44	62	30	0.65	58700	123200	8600
45.77	RNA 95077		45.77	74	64	NA	125000	188800	8700	1185
48	RNA 95 073		48	62	36	1.5	86000	171500	7900	280
49.7	RNA 1 040		49.7	65	18	0.85	29700	59900	7600	160
	RNA 2 040		49.7	65	22	0.85	39800	87300	7600	200
	RNA 22 040		49.7	65	30	0.85	58300	142400	7600	278
		RNA 3 035		49.7	72	36	0.65	76600	180300	7600
50	RNA 50 65 25		50	65	25	0.85	42000	110000	7600	235
	RNA 50 68 25		50	68	25	0.85	42000	110000	7600	290
55.4	RNA 1 045		55.4	72	18	0.85	31400	66800	6900	193
	RNA 2 045		55.4	72	22	0.85	42100	97400	6900	242
		RNA 3 040		55.4	80	36	0.85	81100	200800	6900
62.1	RNA 1 050		62.1	80	20	0.85	33300	74900	6100	255
	RNA 2 050		62.1	80	28	0.85	55200	143400	6100	375
		RNA 3 045		62.1	85	38	0.85	86000	225500	6100
68.8	RNA 1 055		68.8	85	20	0.85	35200	83000	5500	248
	RNA 2 055		68.8	85	28	0.85	58200	158900	5500	361
		RNA 3 050		68.8	90	38	0.85	90800	250100	5500
72.6	RNA 1 060		72.6	90	20	0.85	36200	87600	5200	283
	RNA 2 060		72.6	90	28	0.85	59900	167700	5200	413
		RNA 3 055		72.6	95	38	0.85	92900	26200	5200
78.3	RNA 1 065		78.3	95	20	0.85	37200	93500	4900	306
	RNA 2 065		78.3	95	28	0.85	62000	179900	4900	433
		RNA 3 060		78.3	100	38	0.85	96600	284600	4900
83.1	RNA 1 070		83.1	100	20	0.85	39600	103200	4500	322
	RNA 2 070		83.1	100	28	0.85	63900	190900	4500	470
		RNA 3 065		83.1	105	38	0.85	100500	303400	4500
88	RNA 1 075		88	110	24	0.85	57300	151200	4300	577

Full complement needle bearings with inner ring

Series NA 1 000, 2 000 3 000

RNA 1 005 to RNA 1 017 are not manufactured with lubrication hole.

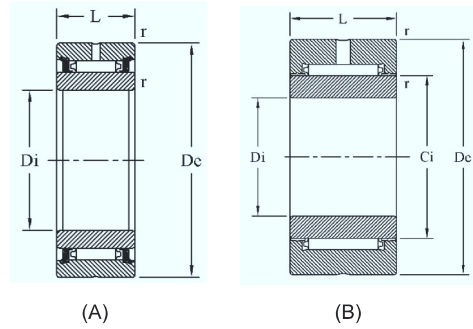
1) Old designation Na ...s/Bi



Shaft dia	Designations		Ci	De	L	r min	Basic capacities		Limiting speed (oil)	Approx weight
	Series 1000, 2000 22000 fig.A	Series 3000 fig.B					Dyn. C	Stat. Co		
m m			m m	m m	m m	m m	Newtons	Newtons	rpm	gms
88	RNA 2 075		88	110	32	0.85	84200	248400	4300	767
		RNA 3 070	88	110	38	0.85	102900	321200	4300	906
96	RNA 1 080		96	115	24	0.85	59800	164600	4000	510
	RNA 2 080		96	115	32	0.85	87900	270400	4000	694
		RNA 3 075	96	120	38	0.85	107900	351800	4000	1098
99.5	RNA 2 085		99.5	120	32	1.35	89500	279900	3800	787
		RNA 3 080	99.5	125	38	0.85	109400	361900	3800	1220
104.7	RNA 2 090		104.7	125	32	1.35	92100	295600	3600	837
		RNA 3 085	104.7	130	38	1.35	112600	382300	3600	1252
100.5	RNA 95 020		100.5	125	45	1.5	115900	391700	3600	2415
109.1	RNA 2 095		109.1	130	32	1.35	94200	308200	3500	882
		RNA 3 090	109.1	135	43	1.35	131700	474000	3500	1522
114.7	RNA 2 100		114.7	135	32	1.35	96700	323900	3300	677
		RNA 3 095	114.7	140	43	1.35	135200	498200	3300	1551
119.2	RNA 2 105		119.2	140	32	1.35	98500	336500	3200	941
	RNA 3 100		119.2	145	43	1.35	137700	517600	3200	1645
124.7	RNA 2 110		124.7	145	34	1.5	102100	358300	3000	1015
		RNA 3 105	124.7	150	45	1.35	140900	541800	3000	1762
132.5	RNA 2 115		132.5	155	34	1.35	103900	374300	2900	1205
		RNA 3 110	132.5	160	45	1.35	145200	575700	2900	2037
137	RNA 2 120		137	160	34	1.35	105700	386900	2800	1265
	RNA 2 120 A		137	160	34	1.5	115800	432500	2770	-
		RNA 3 115	137	165	45	1.35	147700	595100	2800	2140
143.5	RNA 2 125		143.5	165	34	1.35	108500	405000	2700	1218
		RNA 3 120	143.5	170	45	1.35	224000	630000	2700	2107
148	RNA 2 130		148	170	34	1.35	110300	417700	2600	1292
152.8		RNA 3 125	152.8	185	52	1.35	187100	760500	2500	3180
158	RNA 2 140		158	180	36	1.35	157000	455000	2400	1478
		RNA 3 130	158	190	52	1.35	275000	790000	2400	3285
170.5	RNA 2 150		170.5	195	36	1.35	118700	481400	2200	1790
		RNA 3 140	170.5	205	52	1.35	198200	849300	2200	3840
179.3	RNA 2 160		179.3	205	36	1.35	170000	515000	2100	1970
		RNA 3 150	179.3	215	52	1.35	203900	891800	2100	4185

Full Complement needle bearings with inner ring

Series NA 1 000, 2 000
22 000, 3 000

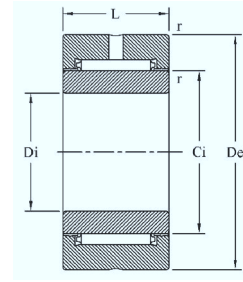


NA 1 012, NA 1 015, NA 1 017 are not manufactured with lubrication hole

Shaft dia	Designation Series 1000, 2000 22000 fig. ^{A)} upto Di=60 fig. ^{B)} above Di=60	Series 3000 fig. ^{B)}	Di	De	L	Ci	r min	Basic capacities		Limiting speed (oil)	Approx weight
								Dyn. C	Stat. Co		
m m			m m	m m	m m	m m	m m	Newtons	Newtons	rpm	gms
12	NA 1 012		12	28	15	17.6	0.35	12900	16700	21600	50
15	NA 1 015		15	32	15	20.8	0.65	14100	19800	18300	62
	NA 2 015		15	35	22	22.1	0.65	25800	38500	17200	117
17	NA 1 017		17	35	15	23.9	0.65	15200	22800	15900	73
	NA 17 37 20		17	37	20	24	0.65	21000	38500	15800	120
20	NA 1 020		20	42	18	28.7	0.65	22200	34500	13200	130
	NA 2 020		20	42	22	28.7	0.65	29800	50300	13200	160
25	NA 1 025		25	47	18	33.5	0.65	24100	40300	11100	151
	NA 2 025		25	47	22	33.5	0.65	32400	58700	11100	187
	NA 22 025		25	47	30	33.5	0.65	47300	95800	11100	259
30	NA 1 030		30	52	18	38.2	0.65	25900	46000	10000	167
	NA 2 030		30	52	22	38.2	0.65	34700	67100	10000	213
	NA 22 030		30	52	30	38.2	0.65	50800	109500	10000	293
		NA 3 030		30	62	30	44	0.65	58700	123200	8600
35	NA 1 035		35	58	18	44	0.65	54500	28500	8600	204
	NA 2 035		35	58	22	44	0.65	37300	77200	8600	253
	NA 22 035		35	58	30	44	0.65	54600	125900	8600	352
		NA 3 035		35	72	36	49.7	0.65	76600	180300	7600
40	NA 1 040		40	65	18	49.7	0.85	29700	59900	7600	254
	NA 2 040		40	65	22	49.7	0.85	39800	87300	7600	315
	NA 22 040		40	65	30	49.7	0.85	58300	142400	7600	434
		NA 3 040		40	80	36	55.4	0.85	81100	200800	6900
45	NA 1 045		45	72	18	55.4	0.85	31400	66800	6900	306
	NA 2 045		45	72	22	55.4	0.85	42100	97400	6900	381
		NA 3 045		45	85	38	62.1	0.85	86000	225500	6100
50	NA 1 050		50	80	20	62.1	0.85	33300	74900	6100	418
	NA 2 050		50	80	28	62.1	0.85	55200	143400	6100	603
		NA 3 050		50	90	38	68.8	0.85	90800	250100	5500
55	NA 1 055		55	85	20	68.8	0.85	35200	83000	5500	453
	NA 2 055		55	85	28	68.8	0.85	58200	158900	5500	649
		NA 3 055		55	95	38	72.6	0.85	92900	264200	5200
60	NA 1 060		60	90	20	72.6	0.85	36200	87600	5200	485
	NA 2 060		60	90	28	72.6	0.85	59900	167700	5200	695
		NA 3 060		60	100	38	78.3	0.85	96600	284600	4900
65	NA 1 065		65	95	20	78.3	0.85	37200	93500	4900	536
	NA 2 065		65	95	28	78.3	0.85	62000	179900	4900	757
		NA 3 065		65	105	38	83.1	0.85	100500	303400	4500

Full complement needle bearings with inner ring

Series NA 1 000, 2 000
3 000



(B)

NA 1 012, NA 1 015, NA 1 017 are not manufactured with lubrication hole

Shaft dia	Designation Series 1000, 2000 fig. ^(B) above Di=60	Series 3000 fig. ^(B)	Di	De	L	Ci	r mm	Basic capacities		Limiting speed (oil) rpm	Approx weight gms
								Dyn. C	Stat. Co		
m m			m m	m m	m m	m m	m m	Newtons	Newtons		
70	NA 1 070 NA 2 070		70	100	20	83.1	0.85	39600	103200	4500	567
			70	100	28	83.1	0.85	63900	190900	4500	805
		NA 3 070	70	110	38	88	0.85	102900	321200	4300	1568
75	NA 1 075 NA 2 075		75	110	24	88	0.85	57300	151200	4300	882
			75	110	32	88	0.85	84200	248400	4300	1177
		NA 3 075	75	120	38	96	0.85	107900	351800	4000	1923
80	NA 1 080 NA 2 080		80	115	24	96	0.85	59800	164600	4000	920
			80	115	32	96	0.85	87900	270400	3800	1239
		NA 3 080	80	125	38	99.5	0.85	109400	361900	3700	2025
		*NA 95 020	80	125	45	100.5	1.35	106000	395000	3800	2410
85	NA 2 085		85	120	32	99.5	1.35	89500	279900	3600	1302
			85	130	38	104.7	1.35	112600	382300	3600	2117
90	NA 2 090		90	125	32	104.7	1.35	92100	295600	3500	1368
			90	135	43	109.7	1.35	131700	474000	3500	2512
95	NA 2 095		95	130	32	109.1	1.35	94200	308200	3300	1430
			95	140	43	114.7	1.35	135200	498200	3300	2626
100	NA 2 100		100	135	32	114.7	1.35	96700	323900	3200	1497
			100	145	43	119.2	1.35	137700	517600	3200	2735
105	NA 2 105		105	140	32	119.2	1.35	98500	336500	3200	1556
			105	150	45	124.7	1.35	140900	541800	3000	2987
110	NA 2 110		110	145	34	124.7	1.35	102100	358300	3000	1720
			110	160	45	132.5	1.35	145200	575700	2900	3532
115	NA 2 115		115	155	34	132.5	1.35	103900	374300	2900	2100
			115	165	45	137	1.35	147700	545100	2800	3660
120	NA 2 120		120	160	34	137	1.35	105700	386900	2800	2167
			120	170	45	143.5	1.35	224000	630000	2700	3792
125	NA 2 125		125	165	34	143.5	1.35	108500	405000	2700	2240
130	NA 2 130		130	170	34	148	1.35	110300	417700	2600	2325
			130	190	52	158	1.35	275000	790000	2400	5815
140	NA 2 140		140	180	36	158	1.35	157000	455000	2400	2643
			140	205	52	170.5	1.35	198200	849300	2200	6840
150	NA 2 150		150	195	36	170.5	1.35	118700	481400	2200	3230
			150	215	52	179.3	1.35	203900	891800	2100	7230

* Grease retained needles

Notes