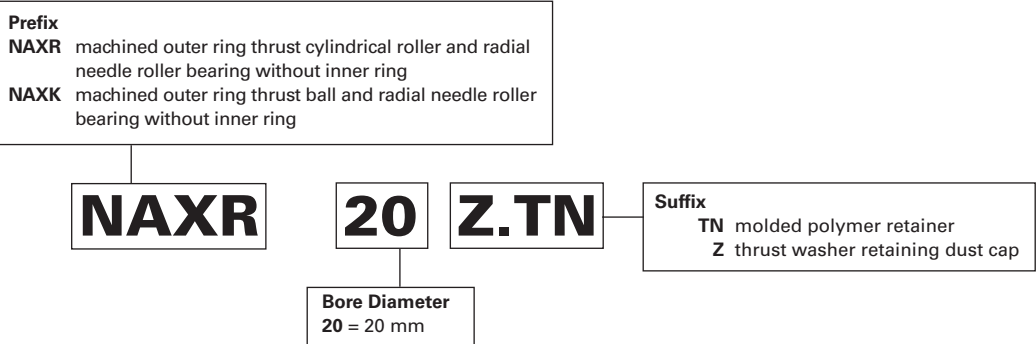
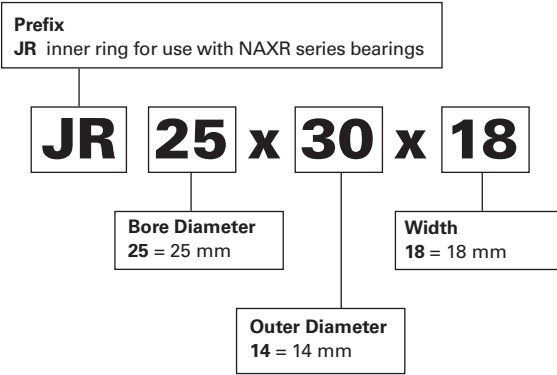


Combined Needle Roller Bearings – Metric Nominal Dimensions



Inner Rings for Combined Needle Roller Bearings – Metric Nominal Dimensions



Combined Needle Roller Bearings

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Ball Thrust Series – Metric Series	B-7-6
Cylindrical Roller Thrust Series – Metric Series.....	B-7-10



COMBINED BEARINGS

METRIC SERIES

Combined bearings consist of a radial bearing (needle roller bearing) and a thrust bearing (ball, roller or needle bearing). The thrust roller bearing is usually a cylindrical roller thrust bearing.

Combined bearings make an effective alternative in place of two separate bearings—in terms of cost, handling and packaging. Combined bearings can be used with or without matching inner rings and thrust washers—though these are listed opposite the bearing part numbers, where possible, on the following pages of tables for convenience.

REFERENCE STANDARDS ARE:

- **DIN 5429, Part 1** – needle roller – thrust cylindrical roller bearings, series NAXR, NAXR.Z.
- **DIN 5429, Part 1** – needle roller – thrust ball bearings, series NAXK, NAXK.Z.
- **ISO 1206** – needle roller bearings – light and medium series – dimensions and tolerances.

Needle roller-ball thrust bearing Needle roller-cylindrical roller thrust bearings

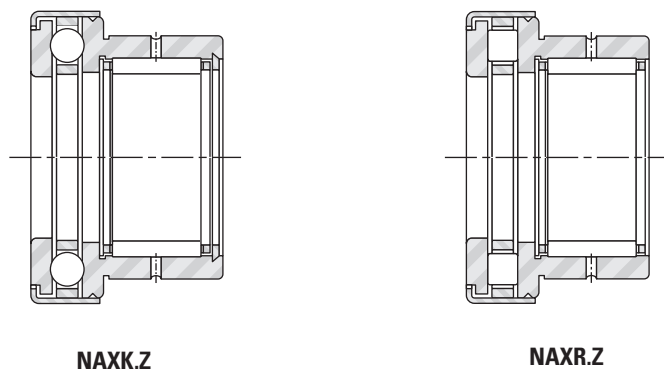


Fig. B7-1. Types of metric series combined bearings

Suffixes

TN	molded cage of reinforced engineered polymer
Z	retained with a dust cap
Z.TN	retained with a dust cap, molded cage of reinforced engineered polymer

CONSTRUCTION

Needle roller-cylindrical roller thrust bearings of series NAXR is available with dust caps. They have the highest axial load-carrying capability of all combined bearings. The NAXR and NAXR.Z Series have the same dimensions as needle roller-ball thrust bearings (series NAXK and NAXK.Z).

The previous bearing types may be best used without inner rings because the radial internal clearances are smaller if the needle roller and cage assemblies operate directly on a hardened and ground shaft. Tolerance class F6 is the normal specification for the needle roller complement bore diameters of the unmounted bearings.

Quality requirements for shafts, when used as a bearing raceway, are given in the engineering section of this catalog. When it becomes impractical to meet the shaft raceway design requirements, standard inner rings may be used with these bearings.

DIMENSIONAL ACCURACY

TOLERANCES

Metric series combined bearings are manufactured to the normal tolerances which apply to the metric series radial bearings and standard thrust bearings, as shown in the engineering section. The only exceptions are the diameter tolerances of the shaft-piloted washer and the bearing width tolerances. The shaft-piloted washer bore tolerance is E7 for the NAXK, NAXR, NAXK.Z and NAXR.Z Series bearings. The thickness tolerance of the combined bearings thrust component (C₁) can be found in Table B7-2 The matching thrust washer thickness tolerance may be found in the metric unitized thrust bearing section of this catalog.

BEARING MOUNTING

MOUNTING DIMENSIONS

Simple, through-bored housings are adequate for combined bearings. The mounting tolerances for the mechanical-ring combined bearings are provided in Table B7-1.

The shaft-piloted washers of combined bearings must be supported, at least over half of their width. Other quality requirements for shafts and housings are given in the engineering section. Requirements for fillets, recesses and shoulder heights are the same as for needle roller bearings, as shown in the Mounting Dimensions paragraph on pages B-4-9 and B-4-10.

When mounting these bearings in their housings with a tight fit, relatively high press-in forces will be required which may brinell the raceways of the thrust bearing arrangements. Particular care should be exercised when installing needle roller-cylindrical roller thrust bearings with dust caps – and where the roller assembly of the thrust bearings cannot be removed. In order to avoid brinelling of the thrust bearing raceways, the bearings should be installed with uniform, continuous pressure against the installation tool, avoiding sudden impact forces. At times it may even be desirable to heat the housing before bearing mounting.

Table B7-1. Mounting tolerances

Rotation conditions	ISO tolerance zone for housing	Nominal shaft diameters		With inner ring	Without inner ring
		d			
		>	≤	ISO tolerances zone for shaft	
		mm in	mm in		
Load stationary relative to housing	K6 (M6) ⁽¹⁾	10.000 0.3937	40.000 1.5748	k6	h6
		40.000 1.5748	70.000 2.7559	m6	h6
Load rotates relative to housing	M6 (N6) ⁽¹⁾	All diameters		g6	f6

⁽¹⁾ Tighter fit for more secure arrangement.

Table B7-2. Thrust component thickness (C₁) tolerances

Bearing series	Tolerances	
	Max.	Min.
	mm in	mm in
NAXK, NAXK.Z	+0.000 +0.000	-0.200
NAXR, NAXR.Z		-0.0078

LUBRICATION

When the applied axial loads are relatively high and the application allows the use of oil as the desired method of lubrication, bearing types NAXR and NAXK should be given consideration. Combined bearings with a dust cap may use oil lubrication, although their design makes them better suited for use with grease lubrication.

Combined bearings are typically shipped protected with a corrosion-preventive compound that is not a lubricant. The bearings may be used in oil- or grease-lubricated applications, without removal of the corrosion-preventive compound. However, it may be advisable to remove the corrosion-preventive compound before packing the bearings (with a suitable grease) to obtain optimum grease performance and to minimize the possibility of confusing grease bearings with bearings containing corrosion preventive.

LOAD RATINGS

Minimum axial load for combined bearings:

$$F_{a \min.} = C_{0a} / 2200 \quad (\text{kN})$$

Where:

$$C_{0a} = \text{static load rating} \quad (\text{kN})$$

DYNAMIC EQUIVALENT LOAD

Combined bearings can accommodate radial and axial loads.

Radial needle roller complement

$$P = F_r \quad (\text{kN})$$

Cylindrical or needle roller thrust complement

$$P_a = F_a \quad (\text{kN})$$

STATIC EQUIVALENT LOAD

For all combined bearings series:

Radial needle roller complement

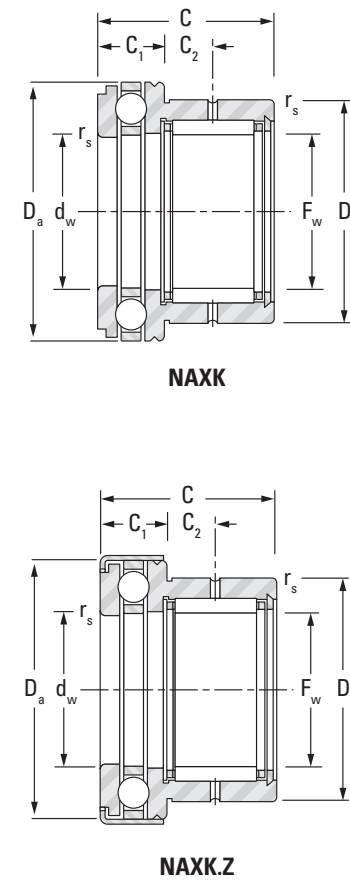
$$P_0 = F_r \quad (\text{kN})$$

Cylindrical or needle roller thrust complement

$$P_{0a} = F_a \quad (\text{kN})$$

BALL THRUST SERIES

METRIC SERIES



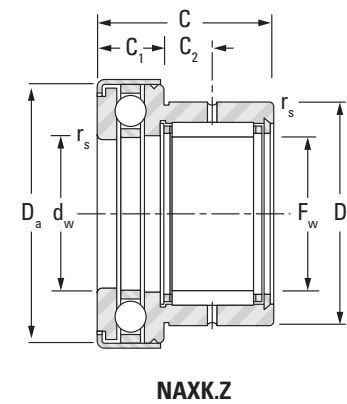
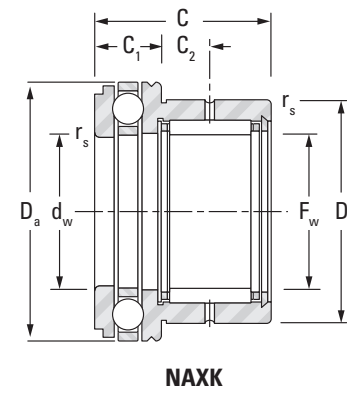
Shaft Diameter	F _w	D	C	d _w	D _a	C ₁	C ₂	r _s min.
				E7				
	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
10 0.394	10 0.394	19 0.748	23 0.906	10 0.394	24 0.945	9 0.354	6.5 0.256	0.3 0.012
	10 0.394	19 0.748	23 0.906	10 0.394	25 0.984	9 0.354	6.5 0.256	0.3 0.012
12 0.472	12 0.472	21 0.827	23 0.906	12 0.472	26 1.024	9 0.354	6.5 0.256	0.3 0.012
	12 0.472	21 0.827	23 0.906	12 0.472	27 1.063	9 0.354	6.5 0.256	0.3 0.012
15 0.591	15 0.591	24 0.945	23 0.906	15 0.591	28 1.102	9 0.354	6.5 0.256	0.3 0.012
	15 0.591	24 0.945	23 0.906	15 0.591	29 1.142	9 0.354	6.5 0.256	0.3 0.012
17 0.669	17 0.669	26 1.024	25 0.984	17 0.669	30 1.181	9 0.354	8 0.315	0.3 0.012
	17 0.669	26 1.024	25 0.984	17 0.669	31 1.220	9 0.354	8 0.315	0.3 0.012
20 0.787	20 0.787	30 1.181	30 1.181	20 0.787	35 1.378	10 0.394	10.5 0.413	0.3 0.012
	20 0.787	30 1.181	30 1.181	20 0.787	36 1.417	10 0.394	10.5 0.413	0.3 0.012
25 0.984	25 0.984	37 1.457	30 1.181	25 0.984	42 1.654	11 0.433	9.5 0.374	0.6 0.024
	25 0.984	37 1.457	30 1.181	25 0.984	43 1.693	11 0.433	9.5 0.374	0.6 0.024
30 1.181	30 1.181	42 1.654	30 1.181	30 1.181	47 1.850	11 0.433	9.5 0.374	0.6 0.024
	30 1.181	42 1.654	30 1.181	30 1.181	48 1.890	11 0.433	9.5 0.374	0.6 0.024
35 1.378	35 1.378	47 1.850	30 1.181	35 1.378	52 2.047	12 0.472	9 0.354	0.6 0.024
	35 1.378	47 1.850	30 1.181	35 1.378	53 2.087	12 0.472	9 0.354	0.6 0.024
40 1.575	40 1.575	52 2.047	32 1.260	40 1.575	60 2.362	13 0.512	10 0.394	0.6 0.024
	40 1.575	52 2.047	32 1.260	40 1.575	61 2.402	13 0.512	10 0.394	0.6 0.024
45 1.772	45 1.772	58 2.283	32 1.260	45 1.772	65 2.559	14 0.551	9 0.354	0.6 0.024
	45 1.772	58 2.283	32 1.260	45 1.772	66.5 2.618	14 0.551	9 0.354	0.6 0.024

Bearing Designation	Speed Rating Oil	Load Ratings				Fatigue Load Limits C _u		Approx. Wt.	Matching Inner ring Designation	Shaft Diameter
		Radial		Thrust						
		Dynamic	Static	Dynamic	Static					
		C	C ₀	C _a	C _{0a}	Radial	Thrust			
	min ⁻¹	kN lbf		kN lbf		kN		kg		mm in
NAXK10	9500	7.9 1780	8.7 1960	10.4 2340	14 3150	1.35	0.630	0.04	JR7x10x16	10 0.394
NAXK10Z	9500	7.9 1780	8.7 1960	10.4 2340	14 3150	1.35	0.630	0.04	JR7x10x16	
NAXK12	9000	7.5 1690	8.5 1910	10.7 2410	15.4 3460	1.30	0.70	0.046	JR9x12x16	12 0.472
NAXK12Z	9000	7.5 1690	8.5 1910	10.7 2410	15.4 3460	1.30	0.70	0.047	JR9x12x16	
NAXK15	8500	9.7 2180	12.6 2830	10.9 2450	16.8 3780	1.90	0.760	0.047	JR12x15x16	15 0.591
NAXK15Z	8500	9.7 2180	12.6 2830	10.9 2450	16.8 3780	1.90	0.760	0.05	JR12x15x16	
NAXK17	8500	11.4 2560	16.1 3620	11.8 2650	19.6 4410	2.50	0.880	0.06	JR14x17x17	17 0.669
NAXK17Z	8500	11.4 2560	16.1 3620	11.8 2650	19.6 4410	2.50	0.880	0.064	JR14x17x17	
NAXK20	7000	14.8 3330	23.7 5330	15.5 3480	26.6 5980	3.65	1.20	0.089	JR17x20x20	20 0.787
NAXK20Z	7000	14.8 3330	23.7 5330	15.5 3480	26.6 5980	3.65	1.20	0.094	JR17x20x20	
NAXK25	6300	18.9 4250	29.8 6700	18.8 4230	35.5 7980	4.60	1.60	0.134	JR20x25x20	25 0.984
NAXK25Z	6300	18.9 4250	29.8 6700	18.8 4230	35.5 7980	4.60	1.60	0.141	JR20x25x20	
NAXK30	5600	20.3 4560	34.6 7780	19.5 4380	40 8990	5.35	2.15	0.146	JR25x30x20	30 1.181
NAXK30Z	5600	20.3 4560	34.6 7780	19.5 4380	40 8990	5.35	2.15	0.154	JR25x30x20	
NAXK35	5300	22.1 4970	40.8 9170	20.8 4680	46.6 10500	6.35	2.10	0.176	JR30x35x20	35 1.378
NAXK35Z	5300	22.1 4970	40.8 9170	20.8 4680	46.6 10500	6.35	2.10	0.184	JR30x35x20	
NAXK40	4500	25 5620	51 11500	28 6290	63 14200	7.30	2.85	0.224	JR35x40x20	40 1.575
NAXK40Z	4500	25 5620	51 11500	28 6290	63 14200	7.30	2.85	0.233	JR35x40x20	
NAXK45	4500	24.9 5600	51.8 11600	29 6520	69.2 15600	8.05	3.10	0.262	JR40x45x20	45 1.772
NAXK45Z	4500	24.9 5600	51.8 11600	29 6520	69.2 15600	8.05	3.10	0.275	JR40x45x20	

Continued on next page.

BALL THRUST SERIES

METRIC SERIES

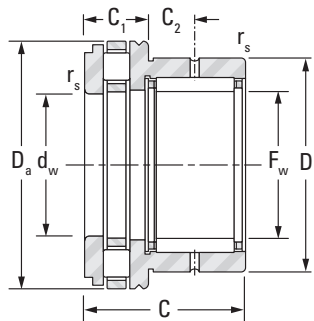


Shaft Diameter	F _w	D	C	d _w	D _a	C ₁	C ₂	r _s min.
				E7				
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
50 1.969	50 1.969	62 2.441	35 1.378	50 1.969	70 2.756	14 0.551	10 0.394	0.6 0.024
	50 1.969	62 2.441	35 1.378	50 1.969	71.5 2.815	14 0.551	10 0.394	0.6 0.024
60 2.362	60 2.362	72 2.835	40 1.575	60 2.362	85 3.346	17 0.669	12 0.472	1 0.039
70 2.756	70 2.756	85 3.346	40 1.575	70 2.756	95 3.740	18 0.709	11 0.433	1 0.039

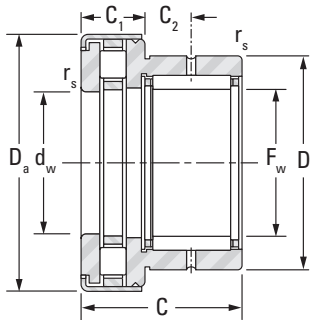
Bearing Designation	Speed Rating Oil	Load Ratings				Fatigue Load Limits C _u		Approx. Wt.	Matching Inner ring Designation	Shaft Diameter
		Radial		Thrust						
		Dynamic	Static	Dynamic	Static					
		C	C ₀	C _a	C _{0a}	Radial	Thrust			
	min ⁻¹	kN lbf		kN lbf		kN		kg		mm in
NAXK50	4300	30.2 6790	68.5 15400	28.8 6470	75.4 17000	10.7	3.40	0.316	JR45x50x25	50 1.969
NAXK50Z	4300	30.2 6790	68.5 15400	28.8 6470	75.4 17000	10.7	3.40	0.332	JR45x50x25	
NAXK60	3600	31.9 7170	78.1 17600	41.4 9310	113 25400	12.2	5.10	0.48	JR50x60x25	60 2.362
NAXK70	3400	44.9 10100	87.1 19600	40.0 8990	110 24700	13.9	4.95	0.659	JR60x70x25	70 2.756



CYLINDRICAL ROLLER THRUST SERIES
METRIC SERIES



NAXR



NAXR.Z

Shaft Diameter	F _w	D	C	d _w	D _a	C ₁	C ₂	r _s min.
				E7				
mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in	mm in
15 0.591	15 0.591	24 0.945	23 0.906	15 0.591	28 1.102	9 0.354	6.5 0.256	0.3 0.012
	15 0.591	24 0.945	23 0.906	15 0.591	29 1.142	9 0.354	6.5 0.256	0.3 0.012
17 0.669	17 0.669	26 1.024	25 0.984	17 0.669	30 1.181	9 0.354	8.0 0.315	0.3 0.012
	17 0.669	26 1.024	25 0.984	17 0.669	31 1.220	9 0.354	8.0 0.315	0.3 0.012
20 0.787	20 0.787	30 1.181	30 1.181	20 0.787	35 1.378	10 0.394	10.5 0.413	0.3 0.012
	20 0.787	30 1.181	30 1.181	20 0.787	36 1.417	10 0.394	10.5 0.413	0.3 0.012
25 0.984	25 0.984	37 1.457	30 1.181	25 0.984	42 1.654	11 0.433	9.5 0.374	0.6 0.024
	25 0.984	37 1.457	30 1.181	25 0.984	43 1.693	11 0.433	9.5 0.374	0.6 0.024
30 1.181	30 1.181	42 1.654	30 1.181	30 1.181	47 1.850	11 0.433	9.5 0.374	0.6 0.024
	30 1.181	42 1.654	30 1.181	30 1.181	48 1.890	11 0.433	9.5 0.374	0.6 0.024
35 1.378	35 1.378	47 1.850	30 1.181	35 1.378	52 2.047	12 0.472	9.0 0.354	0.6 0.024
	35 1.378	47 1.850	30 1.181	35 1.378	53 2.087	12 0.472	9.0 0.354	0.6 0.024
40 1.575	40 1.575	52 2.047	32 1.260	40 1.575	60 2.362	13 0.512	10.0 0.394	0.6 0.024
	40 1.575	52 2.047	32 1.260	40 1.575	61 2.402	13 0.512	10.0 0.394	0.6 0.024
45 1.772	45 1.772	58 2.283	32 1.260	45 1.772	65 2.559	14 0.551	9.0 0.354	0.6 0.024
	45 1.772	58 2.283	32 1.260	45 1.772	66 2.598	14 0.551	9.0 0.354	0.6 0.024
50 1.969	50 1.969	62 2.441	35 1.378	50 1.969	70 2.756	14 0.551	10.0 0.394	0.6 0.024
	50 1.969	62 2.441	35 1.378	50 1.969	71 2.795	14 0.551	10.0 0.394	0.6 0.024

Bearing Designation		Speed Rating	Load Ratings				Fatigue Load Limits C _u		Approx. Wt.	Matching Inner Ring Designation	Shaft Diameter
			Radial		Thrust						
			Dynamic	Static	Dynamic	Static					
NAXR	NAXR.Z		C	C ₀	C _a	C _{0a}	Radial	Thrust			
		min ⁻¹	kN lbf		kN lbf		kN		kg lbs		mm in
NAXR15		12000	12.4 2790	15.0 3370	12.0 2700	26.3 5910	2.30	3.70	0.032 0.071	JR12x15x16	15 0.591
	NAXR15.Z	12000	12.4 2790	15.0 3370	12.0 2700	26.3 5910	2.30	3.70	0.035 0.077	JR12x15x16	
NAXR17		11000	13.7 3080	17.5 3930	12.6 2830	28.6 6430	2.70	4.05	0.050 0.110	JR14x17x17	17 0.669
	NAXR17.Z	11000	13.7 3080	17.5 3930	12.6 2830	28.6 6430	2.70	4.05	0.053 0.117	JR14x17x17	
NAXR20TN		9500	17.5 3930	25.3 5690	23.5 5280	56.8 12800	4.00	8.00	0.090 0.198	JR17x20x20	20 0.787
	NAXR20Z.TN	9500	17.5 3930	25.3 5690	23.5 5280	56.8 12800	4.00	8.00	0.095 0.209	JR17x20x20	
NAXR25TN		8000	19.2 4320	30.4 6830	31.2 7010	81.0 18200	4.80	11.4	0.146 0.322	JR20x25x20	25 0.984
	NAXR25Z.TN	8000	19.2 4320	30.4 6830	31.2 7010	81.0 18200	4.80	11.4	0.152 0.335	JR20x25x20	
NAXR30TN		6700	24.2 5440	38.3 8610	33.0 7420	91.1 20500	6.10	12.8	0.162 0.357	JR25x30x20	30 1.181
	NAXR30Z.TN	6700	24.2 5440	38.3 8610	33.0 7420	91.1 20500	6.10	12.8	0.169 0.373	JR25x30x20	
NAXR35		6000	26.1 5870	44.4 9980	30.8 6920	86.0 19300	7.05	12.1	0.186 0.410	JR30x35x20	35 1.378
	NAXR35.Z	6000	26.1 5870	44.4 9980	30.8 6920	86.0 19300	7.05	12.1	0.195 0.430	JR30x35x20	
NAXR40		5300	27.9 6270	50.4 11300	44.1 9910	126.0 28300	8.05	12.0	0.288 0.635	JR35x40x20	40 1.575
	NAXR40.Z	5300	27.9 6270	50.4 11300	44.1 9910	126.0 28300	8.05	12.0	0.299 0.659	JR35x40x20	
NAXR45TN		4800	29.5 6630	56.4 12700	52.3 11800	163.0 36600	9.00	15.5	0.360 0.794	JR40x45x20	45 1.772
	NAXR45Z.TN	4800	29.5 6630	56.4 12700	52.3 11800	163.0 36600	9.00	15.5	0.370 0.816	JR40x45x20	
NAXR50		4300	40.8 9170	79.3 17800	49.6 11200	155.0 34800	12.5	14.8	0.432 0.952	JR45x50x25	50 1.969
	NAXR50.Z	4300	40.8 9170	79.3 17800	49.6 11200	155.0 34800	12.5	14.8	0.452 0.996	JR45x50x25	