

InnTec Bearing

AUTOMOTIVE BEARINGS

Tapered roller
bearings

AUTOMOBILWÄLZLAGER

KEGELROLLENLAGER

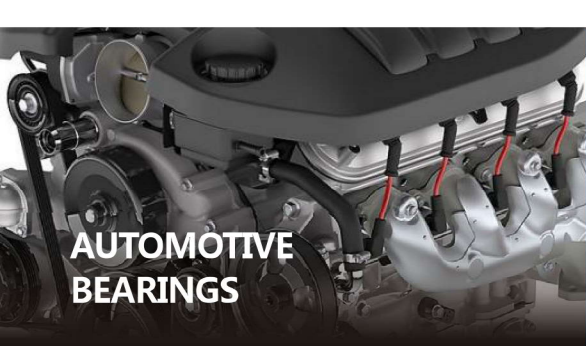


TAPERED ROLLER BEARINGS

Tapered roller bearings are separable with tapered raceways in inner and outer rings. They have single-row, double-row and four-row structures. Tapered roller bearings are capable of taking high radial loads and axial loads in one direction. Load capacity depends on the raceway angle in the cup. The larger the angle is, the greater the load capacity is. When the bearing takes a radial load, a component force in axial direction is generated. Thus another bearing is needed to take the axial load in the opposite direction. They are generally mounted in pairs in a manner similar to single-row angular contact ball bearings. The clearance of single-row tapered roller bearings needs readjusting before application while double-row and four-row tapered roller bearings does not with clearance finely adjusted before delivery.

Tapered roller bearings have tapered rollers in between the outer ring and inner ring having raceways. Tapered roller bearings are designed so the apices of the cones formed by the raceways of the cone and cup and the conical rollers all coincide at one point on the axis of the bearing making the bearing capable of taking both radial loads and axial loads. Load capacity is determined by contact angle α . The larger α is, the greater load capacity is. The magnitude of the angle is described by the calculation coefficient e . The greater e is, the larger the angle is and the larger the load capacity is. Tapered roller bearings are separable with the cup and the cone assembly comprising the inner ring, tapered rollers and the cage. The cone assemblies and cups can be mounted independently.

Inntec roller bearings are widely used in cars, rolling mills, engineering machinery, mining machinery and metallurgical machinery.

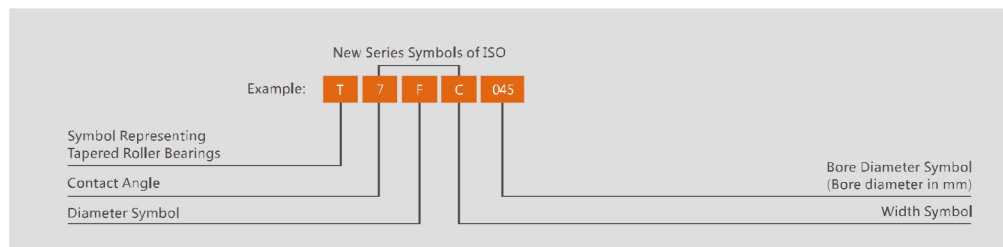


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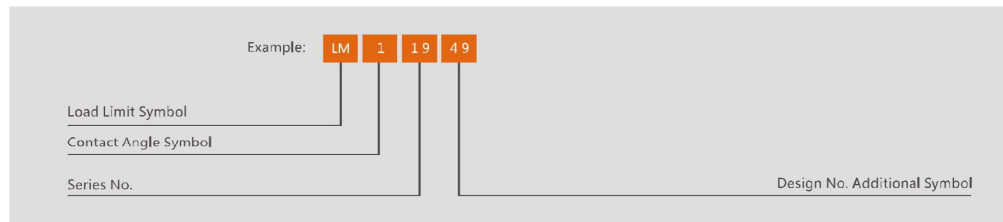
Table 1 Design and Features of Combinations of Tapered Roller Bearings

Figure	Arrangement	Examples of Bearing No.	Features
	Back-to-back	HR3021JDB+KLR10	Two standard bearings are combined. The bearing clearances are adjusted by cone spacers or cup spacers. The cones and cups and spacers are marked with serial numbers and mating marks. Components with the same serial number can be assembled referring to the matching symbols.
	Face-to-face	HR3021JDF+KR	
	KBE Type	100KBE31+L	The KBE type is a back-to-back arrangement of bearings with the cup and spacer integrated, and the KH type is a face-to-face arrangement in which the cones are integrated. Since the bearing clearance is adjusted using spacers, it is necessary for components to have the same serial number for assembly with reference to matching symbols.
	KH Type	100KH31+L	

Among metric-design tapered roller bearings specified by ISO 355, there are those having new dimensions that are different than the dimension series 3XX used in the past. Part of them are listed in the bearing tables. They conform to the specifications of ISO for the smaller end diameter of the cup and contact angle. The cone and cup assemblies are internationally interchangeable. The bearing number formulation, which is different than that for past metric design, is as follows:



Besides metric design tapered roller bearings, there are also inch design bearings. For the cone assemblies and cups of inch design bearings, except four-row tapered roller bearings, the bearing numbers are approximately formulated as follows:



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Tapered roller bearings

Table 2 Tolerances for Effective Widths of Cone Assemblies and Cups, and Overall Width (CLASS K)

d (mm) Nominal Bore Diameter	Effective Width Deviation of Cone Assembly Δ_{1s}		Effective Width Deviation of Cup Δ_{2s}		Overall Width Deviation Δ_{3s}		
	High	low	High	low	High	low	
Over 10	incl. 80	+100	0	+100	0	+200	0
80	120	+100	-100	+100	-100	+200	-200
120	315	+150	-150	+200	-100	+350	-250
315	400	+200	-200	+200	-200	+400	-400

Bearings for Front Axles of Automobiles
(In the bearing tables, those preceded by t)

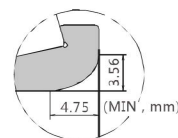
Table 3 Tolerances for Bore Diameter and Overall Width

Nominal Bore Diameter	Bore Diameter Deviation Δ_{ds}		Overall Width Deviation Δ_{3s}				
	High	low	High	low			
Over (mm) 1/25.4	Incl. (mm) 1/25.4	76.200	3.0000	+20	0	+356	0

The tolerances for outside diameter and those for radial runout of the cones and cups.

Special Chamfer Dimensions

For bearings marked "spec." in the column of r in the bearing tables, the chamfer dimension of the cone back-face side is as shown on the following figure.



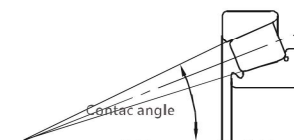
DESIGN, TYPES, AND FEATURES

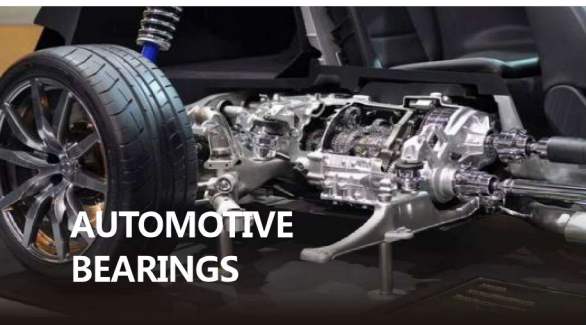
Tapered roller bearings are designed so the apices of the cones formed by the raceways of the cone and cup and the conical rollers all coincide at one point on the axis of the bearing. When a radial load is imposed, an axial force component occurs; therefore, it is necessary to use two bearings in opposition or some other multiple arrangement.

For metric-design medium-angle and steep-angle tapered roller bearings, the respective contact angle symbol C or D is added after the bore number. For normal-angle tapered roller bearings, no contact angle symbol is used. Medium-angle tapered roller bearings are primarily used for the pinion shafts of differential gears of automobiles.

Among those with high load capacity (HR series), some bearings have the basic number suffixed by J to conform to the specifications of ISO for the cup back face raceway diameter, cup width, and contact angle. Therefore, the cone assembly and cup of bearings with the same basic number suffixed by J are internationally interchangeable.

Among metric-design tapered roller bearings specified by ISO 355, there are those having new dimensions that are different than the dimension series 3XX used in the past. Part of them are listed in the bearing tables. They conform to the specifications of ISO for the smaller end diameter of the cup and contact angle. The cone and cup assemblies are internationally interchangeable. The bearing number formulation, which is different than that for past metric design, is as follows:





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Table 3 Tolerances for Cones(CLASS K)

Nominal Bore Diameter d (mm)	?dmp	Vdp	V dmp	Kia		
Over	incl.	high	low	max.	max.	Max.
10	18	0	-12	12	9	15
18	30	0	-12	12	9	18
30	50	0	-12	12	9	20
50	80	0	-15	15	11	25
80	120	0	-20	20	15	30
120	180	0	-25	25	19	35
180	250	0	-30	30	23	50
250	315	0	-35	35	26	60
315	400	0	-40	40	30	70

Table 4 Tolerances for Cups(CLASS K)

Nominal Outside Diameter d (mm)	?Dmp	Vdp	V Dmp	Kia		
Over	incl.	high	low	max.	max.	Max.
18	18	0	-12	12	9	18
30	50	0	-14	14	11	20
50	80	0	-16	16	12	25
80	120	0	-18	18	14	35
120	150	0	-20	20	15	40
150	180	0	-25	25	19	45
180	250	0	-30	30	23	50
250	315	0	-35	35	26	60
315	400	0	-40	40	30	70
400	500	0	-45	45	34	80

DIMENSIONS RELATED TO MOUNTING

The dimensions related to mounting tapered roller bearings are listed in the bearing tables. Since the cages protrude from the ring faces of tapered roller bearings, please use care when designing shafts and housings. When heavy axial loads are imposed, the shaft shoulder dimensions and strength must be sufficient to support the cone rib.

PERMISSIBLE MISALIGNMENT

The permissible misalignment angle for tapered roller bearings is approximately 0.0009 radian (3').

LIMITING SPEEDS

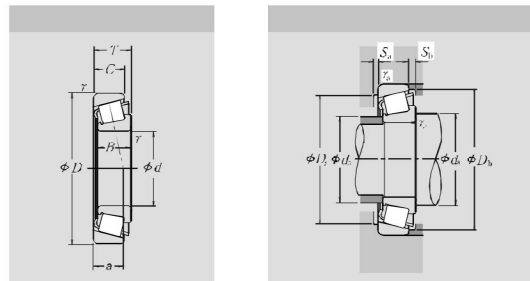
The limiting speeds listed in the bearing tables should be adjusted depending on the bearing load conditions. Also, higher speeds are attainable by making changes in the lubrication method, cage design, etc.

PRECAUTIONS FOR USE OF TAPERED ROLLER BEARINGS

1. If the load on tapered roller bearings becomes too small, or if the ratio of the axial and radial loads for matched bearings exceeds 'e' (e is listed in the bearing tables) during operation, slippage between the rollers and raceways occurs, which may result in smearing. Especially with large bearings since the weight of the rollers and cage is high. If such load conditions are expected, please contact LXB for selection of the bearings.

2. Confirm the dimension of "Abutment and Fillet Dimensions" of Da, Db, Sa, Sb at the time of the HR series adoption.

SINGLE-ROW TAPERED ROLLER BEARINGS

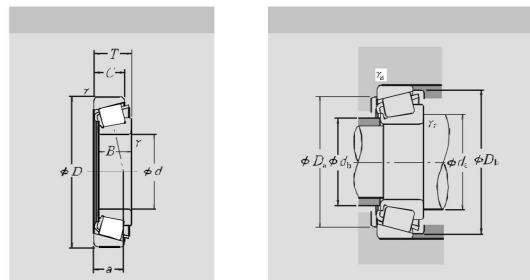


$$P = X F_r + Y F_a$$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y ₁

Dynamic Equivalent Load
Static Equivalent Load
 $P_s = 0.5 F_r + Y_0 F_a$
When $F_r > 0.5 F_r - Y_0 F_a$, use P_s, F_r .
The values of e, Y₁, and Y₀ are given in the table below.

SINGLE-ROW TAPERED ROLLER BEARINGS (INCH DESIGN)

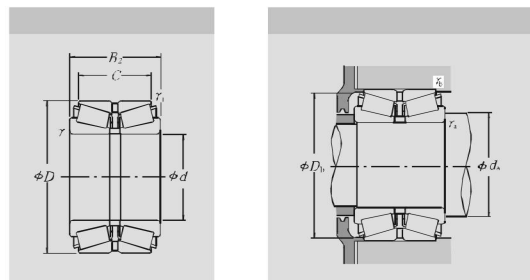


$$P = X F_r + Y F_a$$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	0	0.4	Y ₁

Dynamic Equivalent Load
Static Equivalent Load
 $P_s = 0.5 F_r + Y_0 F_a$
When $F_r > 0.5 F_r - Y_0 F_a$, use P_s, F_r .
The values of e, Y₁, and Y₀ are given in the table below.

DOUBLE-ROW TAPERED ROLLER BEARINGS



$$P = X F_r + Y F_a$$

$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	Y ₂	0.67	Y ₂

Dynamic Equivalent Load
Static Equivalent Load
 $P_s = F_r, Y_0 F_a$
When $F_r > 0.5 F_r - Y_0 F_a$, use P_s, F_r .
The values of e, Y₁, Y₃ and Y₀ are given in the table below.



AUTOMOTIVE BEARINGS

SINGLE-ROW TAPERED ROLLER BEARINGS
(INCH DESIGN)
Bore Diameter 22.606 28.575 mm



InnTec Bearing

Tapered roller bearings

Dimensions (mm)							Load ratings (kN)				Revolusion speed limit		Installation dimensions (mm)						Eff. Load	Constant	Axial Load Factors		Weight (Kg)		Bearing numbers	
d	D	T	B	C	Cone	cup	(N)		(Kgf)		Grease	Oil	da	db	Da	Db	Cone	cup	Centers	e	Y1	Y0	Cone	cup	Cone	cup
					R MIN		Cr	Cor	Cr	Cor							Ra MAX	a								
22.626	47.000	15.500	15.500	12.000	1.5	1.0	26300	30000	2680	3100	8000	11000														
23.812	50.292	14.224	14.732	10.668	1.5	1.3	27600	32000	2820	3250	7100	10000														
	56.896	19.368	19.837	15.875	0.8	1.3	38000	40500	3900	4150	7100	9500														
24.000	55.000	25.000	25.000	21.000	2.0	2.0	49500	55000	5050	5650	7100	9500														
24.981	51.994	15.011	14.260	12.700	1.5	1.3	26000	27900	2650	2840	7500	10000														
	52.001	15.011	14.260	12.700	1.5	2.0	26000	27900	2650	2840	7500	10000														
	62.000	16.002	16.566	14.288	1.5	1.5	37000	39500	3750	4000	6300	8500														
25.000	50.005	13.495	14.260	9.0525	1.5	1.0	26000	27900	2650	2840	7500	10000														
	51.994	15.011	14.260	12.700	1.5	1.3	26000	27900	2650	2840	7500	10000														
25.400	50.005	13.495	14.260	9.525	3.3	1.0	26000	27900	2650	2840	7500	10000														
	50.005	13.495	14.260	9.525	1.0	1.0	26000	27900	2650	2840	7500	10000														
	50.292	14.224	14.732	10.668	1.3	1.3	27600	32000	2820	3250	7100	10000														
	57.150	17.462	17.462	13.495	1.3	1.5	39500	45500	4050	4650	6700	9000														
	57.150	19.431	19.431	14.732	1.5	1.5	42500	49000	4300	5000	6700	9000														
	59.530	23.368	23.114	18.288	0.8	1.5	50000	58000	5100	5900	6300	9000														
	62.000	19.050	20.638	14.288	0.8	1.3	46000	53000	4700	5400	6000	8000														
	63.500	20.638	20.638	15.875	3.5	1.5	46000	53000	4700	5400	6000	8000														
	64.292	21.433	21.433	16.670	1.5	1.5	51000	64500	5200	6600	5600	8000														
	65.088	22.225	21.463	15.875	1.5	1.5	45000	47500	4600	4850	5600	8000														
	68.262	22.225	22.225	17.462	0.8	1.5	55000	64000	5600	6550	5600	7500														
	72.233	25.400	25.400	19.842	0.8	2.3	63500	83500	6500	8500	5000	7100														
	72.626	24.608	24.257	17.462	2.3	1.5	60000	58000	6100	5900	5600	7500														
26.988	50.292	14.224	14.732	10.668	3.5	1.3	27600	32000	2820	3250	7100	10000														
	57.150	19.845	19.355	15.875	3.3	1.5	40000	44500	4100	4500	6700	9000														
	60.325	19.845	17.462	15.875	3.5	1.5	39500	45500	4050	4650	6700	9000														
	62.000	19.050	20.638	14.288	0.8	1.3	46000	53000	4700	5400	6000	8000														
28.575	57.150	19.845	19.355	15.875	3.5	1.5	40000	44500	4100	4500	6700	9000														
	59.131	15.875	16.764	11.811	5	1.3	34500	41500	3550	4200	6300	8500														
	62.000	19.050	20.638	14.288	3.5	1.3	46000	53000	4700	5400	6000	8000														
	62.000	19.050	20.638	14.288	0.8	1.3	46000	53000	4700	5400	6000	8000														
	64.292	21.433	21.433	16.670	1.5	1.5	51000	64500	5200	6600	5600	8000														
	68.262	22.225	22.225	17.462	0.8	1.5	55000	64000	5600	6550	5600	7500														
	72.626	24.608	24.257	17.462	4.8	1.5	60000	58000	6100	5900	5600	7500														
	72.626	24.608	24.257	17.462	1.5	1.5	60000	58000	6100	5900	5600	7500														
	73.025	22.225	22.225	17.462	0.8	3.3	54500	64500	5550	6600	5300	7100														



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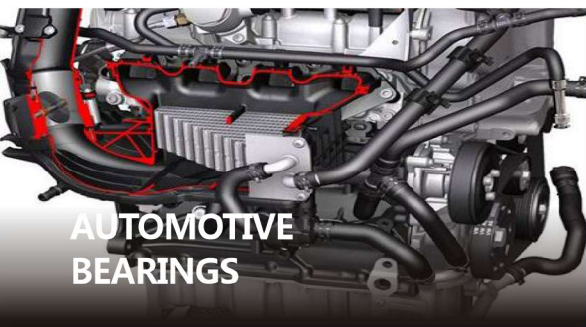
SINGLE-ROW TAPERED ROLLER BEARINGS
(INCH DESIGN)
Bore Diameter 33.338 ~ 35.000 mm



InnTec Bearing

Tapered roller bearings

Table with columns: Dimensions (mm), Load ratings (KN), Revolution speed limit, Installation dimensions (mm), Eff. Load, Constant, Axial Load Factors, Weight (Kg), Bearing numbers. Rows include various bearing models like 33.338, 34.925, 34.976, and 35.000.



AUTOMOTIVE BEARINGS

DOUBLE-ROW TAPERED ROLLER BEARINGS
Bore Diameter 40 ~ 90 mm



InnTec Bearing

Tapered roller bearings

Dimensions (mm)						Load ratings (KN)		Revolution speed limit		Installation dimensions (mm)				Constant	Axial Load Factors			Weight (Kg)	Bearing numbers		
d	D	B2	C	r	r1	Cr	Cor	Grease	Oil	da	Db	ra	rb	e	Y2	Y3	Y0				
				min						min	min	max									
40	80	45	37.5	1.5	0.6	109000	140000	3700	5100	51	75	1.5	0.6	0.37	2.7	1.8	1.8	0.97	HR40KBE	42+L	
45	85	47	37.5	1.5	0.6	117000	159000	3400	4700	56	81	1.5	0.6	0.40	2.5	1.7	1.6	1.08	HR45KBE	42+L	
	85	55	43.5	1.5	0.6	143000	204000	3400	4700	56	81	1.5	0.6	0.40	2.5	1.7	1.6	1.31	HR45KBE	52X+L	
50	90	48	38.5	1.5	0.6	131000	183000	3200	4400	61	87	1.5	0.6	0.42	2.4	1.6	1.6	1.20	HR50KBE	042+L	
	90	49	39.5	1.5	0.6	131000	183000	3200	4400	61	87	1.5	0.6	0.42	2.4	1.6	1.6	1.22	HR50KBE	42+L	
	90	55	43.5	1.5	0.6	150000	218000	3200	4400	61	87	1.5	0.6	0.42	2.4	1.6	1.6	1.39	HR50KBE	52X+L	
	110	64	52.5	2.5	0.6	224000	297000	2700	3700	65	104	2	0.6	0.35	2.9	2.0	1.9	2.77	HR50KBE	043+L	
55	100	51	41.5	2	0.6	162000	226000	2900	3900	67	96	2	0.6	0.40	2.5	1.7	1.6	1.59	HR55KBE	042+L	
	100	52	42.5	2	0.6	162000	226000	2900	3900	67	96	2	0.6	0.40	2.5	1.7	1.6	1.63	HR55KBE	1003+L	
	100	60	48.5	2	0.6	188000	274000	2900	3900	67	97	2	0.6	0.40	2.5	1.7	1.6	1.88	HR55KBE	52X+L	
	120	70	57.0	2.5	0.6	256000	342000	2500	3400	70	113	2	0.6	0.35	2.9	2.0	1.9	3.52	HR55KBE	43+L	
60	110	53	43.5	2	0.6	178000	246000	2700	3600	72	105	2	0.6	0.40	2.5	1.7	1.6	2.03	HR60KBE	042+L	
	110	66	54.5	2	0.6	225000	335000	2700	3600	72	106	2	0.6	0.40	2.5	1.7	1.6	2.52	HR60KBE	52X+L	
	130	74	59	3	1	298000	405000	2300	3200	78	122	2.5	1	0.35	2.9	2.0	1.9	4.40	HR60KBE	43+L	
65	120	56	46.5	2	0.6	210000	300000	2400	3200	77	115	2	0.6	0.40	2.5	1.7	1.6	2.58	HR65KBE	42+L	
	120	57	47.5	2	0.6	210000	300000	2400	3200	77	115	2	0.6	0.40	2.5	1.7	1.6	2.61	HR65KBE	1202+L	
	120	73	61.5	2	0.6	269000	405000	2400	3300	77	117	2	0.6	0.40	2.5	1.7	1.6	3.35	HR65KBE	52X+L	
	140	79	63	6	1	340000	465000	2100	2900	83	132	2.5	1	0.55	2.9	2.0	1.9	5.42	HR65KBE	43+L	
70	125	57	46.5	2	0.6	227000	325000	2300	3100	82	120	2	0.6	0.42	2.4	1.6	1.6	2.79	HR70KBE	042+L	
	125	59	48.5	2	0.6	227000	325000	2300	3100	82	120	2	0.6	0.42	2.4	1.6	1.6	2.85	HR70KBE	42+L	
	125	74	61.5	2	0.6	270000	410000	2300	3100	82	121	2	0.6	0.42	2.4	1.6	1.6	3.58	HR70KBE	52X+L	
	150	83	67	3	1	390000	535000	2000	2700	88	142	2.5	1	0.35	2.9	2.0	1.9	6.45	HR70KBE	43+L	
75	130	62	51.5	2	0.6	245000	365000	2200	3000	87	126	2	0.6	0.44	2.3	1.6	1.5	3.15	HR75KBE	42+L	
	130	74	61.5	2	0.6	283000	440000	2200	3000	87	127	2	0.6	0.44	2.3	1.6	1.5	3.73	HR75KBE	52X+L	
	160	87	69	3	1	435000	600000	1900	2500	93	151	2.5	1	0.35	2.9	2.0	1.9	7.66	HR75KBE	043+L	
80	140	61	49	2.5	0.6	269000	390000	2000	2800	95	134	2	0.6	0.42	2.4	1.6	1.6	3.70	HR80KBE	042+L	
	140	64	51.5	2.5	0.6	269000	390000	2000	2800	95	134	2	0.6	0.42	2.4	1.6	1.6	3.70	HR80KBE	42+L	
	140	78	63.5	2.5	0.6	330000	505000	2000	2800	95	136	2	0.6	0.42	2.4	1.6	1.6	4.59	HR80KBE	52X+L	
	170	92	73	3	1	475000	655000	1700	2400	98	161	2.5	1	0.35	2.9	2.0	1.9	9.02	HR80KBE	043+L	
80	150	70	57	2.5	0.6	315000	465000	1900	2600	100	143	2	0.6	0.42	2.4	1.6	1.6	4.69	HR85KBE	42+L	
	150	86	69	2.5	0.6	360000	555000	1900	2600	100	144	2	0.6	0.42	2.4	1.6	1.6	5.70	HR85KBE	52X+L	
	180	98	77	4	1	530000	745000	1600	2200	106	169	3	1	0.35	2.9	2.0	1.9	10.8	HR85KBE	043+L	
90	160	71	58	2.5	0.6	345000	510000	1800	2400	105	152	2	0.6	0.42	2.4	1.6	1.6	5.53	HR90KBE	042+L	
	160	74	61	2.5	0.6	345000	510000	1800	2400	105	152	2	0.6	0.42	2.4	1.6	1.6	5.71	HR90KBE	42+L	
	160	94	77	2.5	0.6	440000	700000	1800	2400	105	154	2	0.6	0.42	2.4	1.6	1.6	7.26	HR90KBE	52X+L	