14. NTN Products

14-1. Cam followers for pallet changer

Cam followers are often used on work piece transfer systems (such as pallet changers) of machine tools (such as machining centers) to handle the large loads generated by these systems.

NTN offers various types of cam followers that include a ready-to-install cam follower optimized for pallet changers.

① Structure and features

- The outer ring wall thickness is maximized for resistance to heavy load or impact load.
- **NTN** cam followers for pallet changers feature a compact design and can be easily mounted by tightening a setscrew.
- The outer diameter, outer ring width, and stud diameter are identical to the dimensions of **NTN**'s standard cam followers (KR type).
- Because cam followers for pallet changers are actuated less frequently, they do not need to be relubricated. The oil hole has been deleted.
- Cost is reduced by removing the grease hole and the thread from the stud.

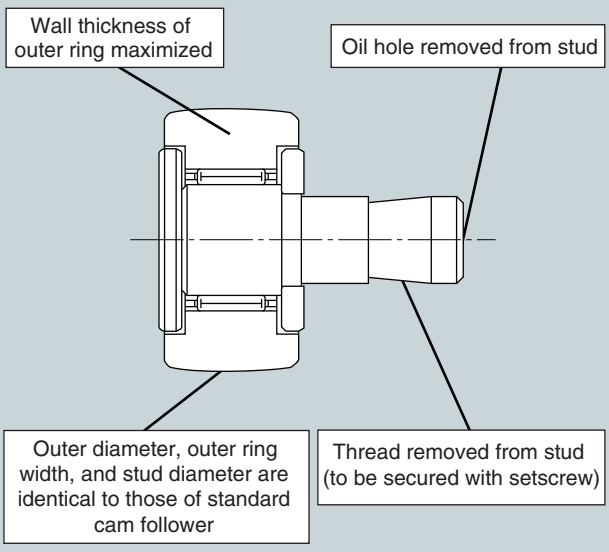
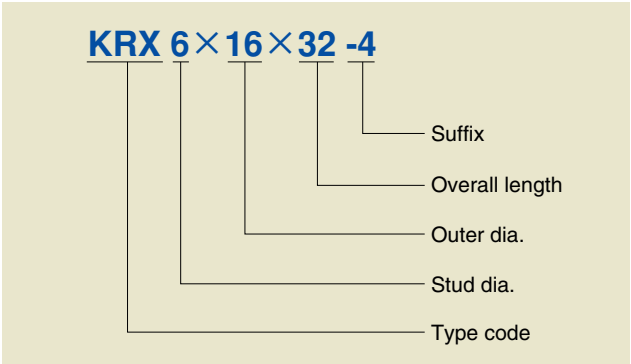


Fig. 14-1 Schematic of NTN pallet changer cam follower

② Cam follower numbering

The part number for cam followers for pallet changers is same as that of **NTN** special cam followers.



③ Accuracy

The accuracy of **NTN** cam followers for pallet changer is same as that of **NTN** standard cam followers (JIS class 0).

④ Fit

The **NTN** pallet changer cam follower has a special stud that is readily secured with a setscrew. As illustrated below, a setscrew locks the pallet changer cam follower in the axial and circumferential directions.

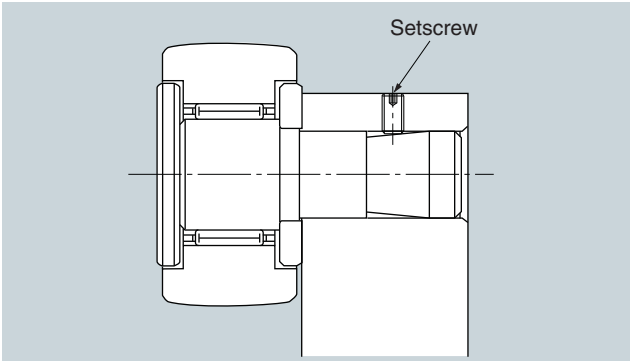


Fig. 14-2 Typical mounting arrangement

⑤ Radial internal clearance

The radial clearance of **NTN** cam followers for pallet changers is same as that of **NTN** standard cam followers (**Table 14-1**).

Table 14-1. Inner ring

Nominal inscribed circle diameter F_w		Clearance CN (normal clearance)	
over	incl.	min	max
3	6	3	17
6	10	5	20
10	18	5	25
18	30	10	30
30	50	10	40

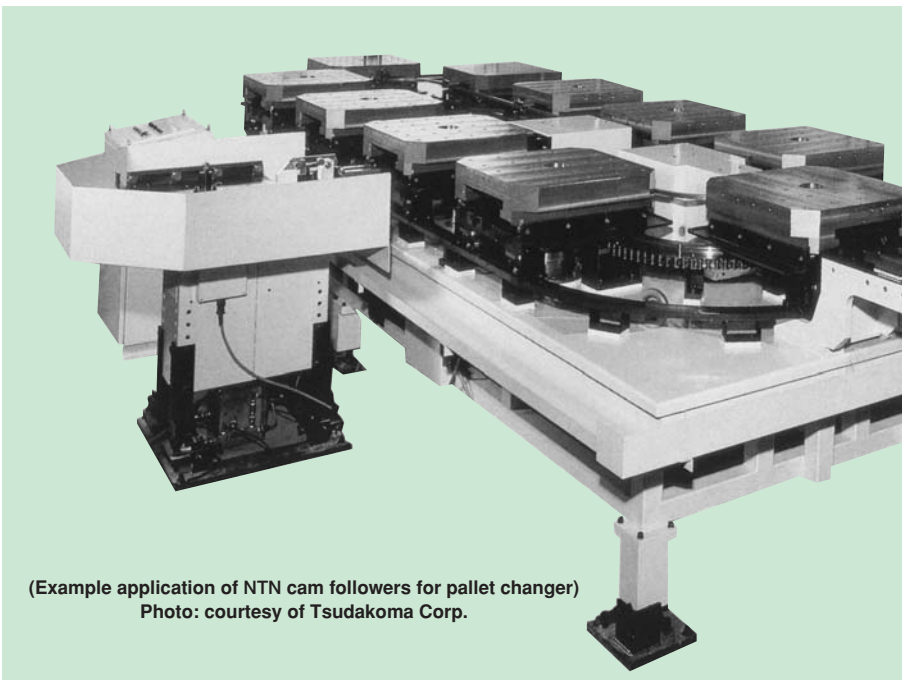
⑥ Lubrication

NTN cam followers for pallet changers are prefilled with lithium based grease and can be used in a temperature range of -25 to +100˚C.

Under the assumption that the user does not perform relubrication with grease, the standard **NTN** pallet changer cam follower does not have an oil hole for relubrication. (If necessary, the cam follower can be provided with an oil hole or a hole for mounting a grease nipple.)

Upon request, **NTN** can also provide cam followers with a synthetic rubber seal.

Lubrication between the outside surface of bearing and track is also necessary. Failure to properly lubricate the outside surface of the cam follower could lead to premature wear of the bearing.

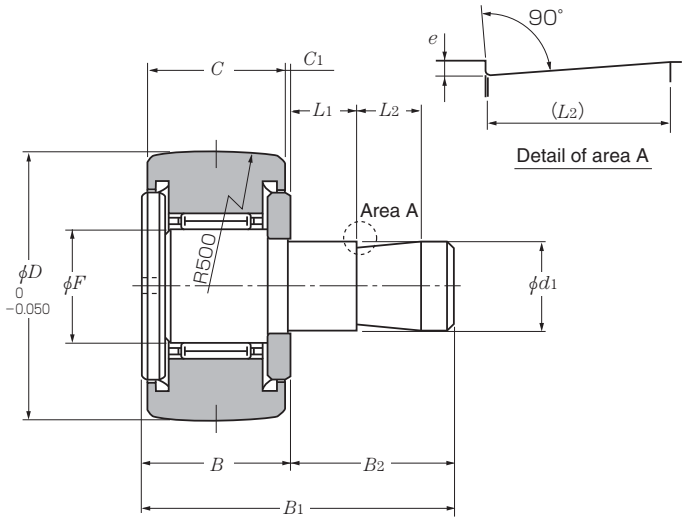


(Example application of NTN cam followers for pallet changer)
Photo: courtesy of Tsudakoma Corp.

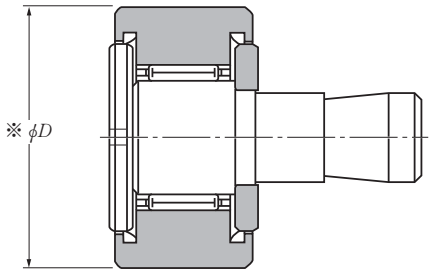
⑦ Cam followers for pallet changers dimension table

Sealed KRX type d **6～20mm**

Spherical outer ring type



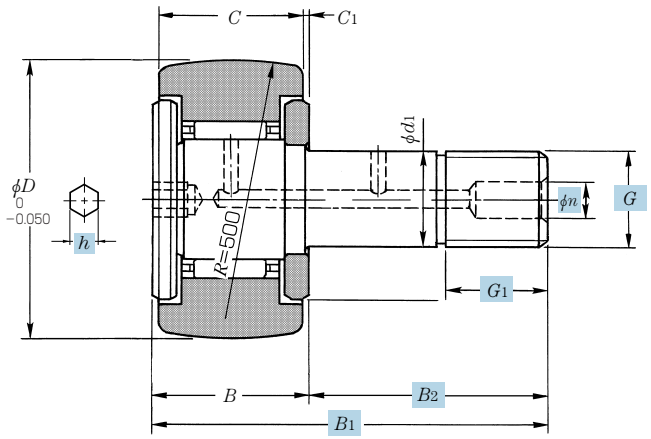
Cylindrical outer ring type



Cam follower number		Dimensions mm											
Spherical outer ring	Cylindrical outer ring	d_1	Tolerance	D	Tolerance※ (cylindrical outer ring)	B_1	B	B_2	C	C_1	L_1	L_2	e
KRX6×16×32-4	KRX6×16×32-2	6	0 −0.012	16	0 −0.008	32	12	20	11	0.6	5	10	0.3
KRX8×19×32-9	KRX8×19×32-7	8	0 −0.015	19	0 −0.009	32	12	20	11	0.6	5	10	0.5
KRX10×22×33-3	KRX10×22×33-1	10	0 −0.015	22	0 −0.009	33	13	20	12	0.6	5	10	0.5
KRX10×26×33-4	KRX10×26×33-2	10	0 −0.015	26	0 −0.009	33	13	20	12	0.6	5	10	0.5
KRX12×30×35-3	KRX12×30×35	12	0 −0.018	30	0 −0.009	35	15	20	14	0.6	5	10	1.0
KRX12×32×35-3	KRX12×32×35-1	12	0 −0.018	32	0 −0.011	35	15	20	14	0.6	5	10	1.0
KRX16×35×44.5-1	KRX16×35×44.5-3	16	0 −0.018	35	0 −0.011	44.5	19.5	25	18	0.8	10	10	1.0
KRX18×40×46.5-6	KRX18×40×46.5-4	18	0 −0.018	40	0 −0.011	46.5	21.5	25	20	0.8	10	10	1.0
KRX20×47×50.5-1	KRX20×47×50.5-3	20	0 −0.021	47	0 −0.011	50.5	25.5	25	24	0.8	10	10	1.0
KRX20×52×50.5-3	KRX20×52×50.5-1	20	0 −0.021	52	0 −0.013	50.5	25.5	25	24	0.8	10	10	1.0

※The cam followers in the table above have seals. However, upon request, **NTN** will offer a cam followers without seals.

(Reference) Standard cam follower KR···H type (w/ hex socket)



The dimensions of standard cam followers (marked with in the diagram above) are different from those of **NTN** pallet changer cam followers. Please see the reference dimensions in the table below.

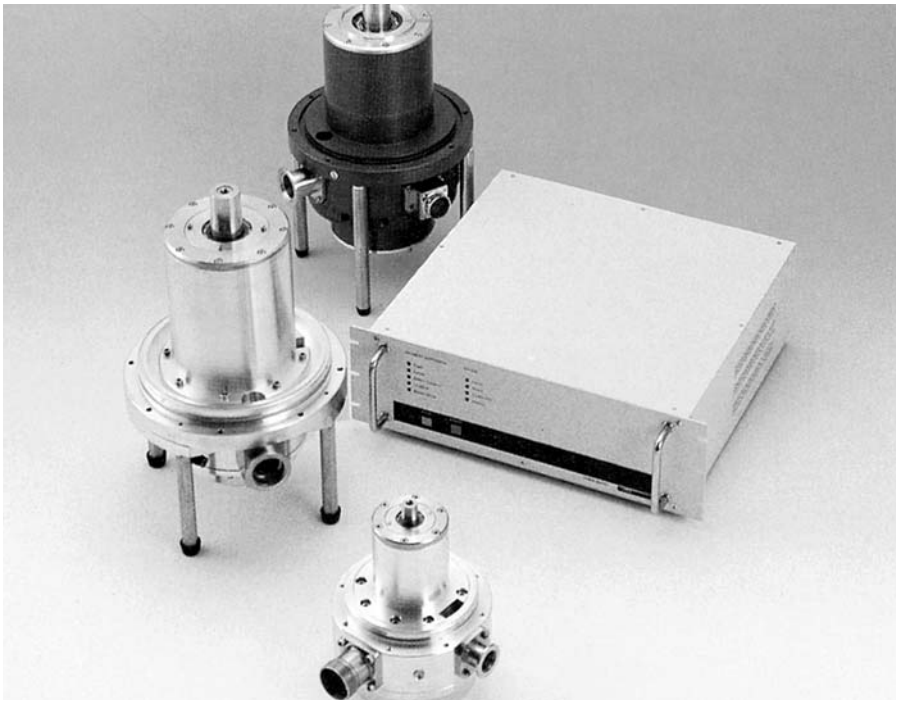
Basic load ratings dynamic C_r	static C_{or}	**Track load capacity** spherical outer ring	cylindrical outer ring	**(Reference dimensions)** mm B_1'	B_2	G	G_1	n	h
N	N	N	N						
kgf	kgf	kgf	kgf						
4 050	4 200	1 080	3 400	28	16	M6×1	8	—	3
415	430	110	350						
4 750	5 400	1 380	4 050	32	20	M8×1.25	10	—	4
480	555	141	415						
5 300	6 650	1 690	5 150	36	23	M10×1.25	12	4	4
540	680	172	525						
5 300	6 650	2 120	6 100	36	23	M10×1.25	12	4	4
540	680	216	620						
7 850	9 650	2 620	7 700	40	25	M12×1.5	13	6	6
800	985	267	785						
7 850	9 650	2 860	8 200	40	25	M12×1.5	13	6	6
800	985	291	835						
12 200	17 900	3 200	11 900	52	32.5	M16×1.5	17	6	6
1 240	1 830	325	1 220						
14 000	22 800	3 850	14 500	58	36.5	M18×1.5	19	6	6
1 430	2 330	390	1 480						
20 700	33 500	4 700	21 000	66	40.5	M20×1.5	21	8	8
2 110	3 450	480	2 150						
20 700	33 500	5 550	23 300	66	40.5	M20×1.5	21	8	8
2 110	3 450	565	2 370						

2. NTN Roller Follower

This type of bearing is used in mechanisms where the outer ring rolls on a track, such as aligning rollers, guide rollers, rocker arm rollers, cam rollers, and pressure rollers. For increased durability, it features a thick-walled outer ring capable of withstanding greater loads and impacts. The outer surface of the outer ring (rolling surface) can be ordered in either spherical and cylindrical configurations.

3. Magnetic bearing spindle

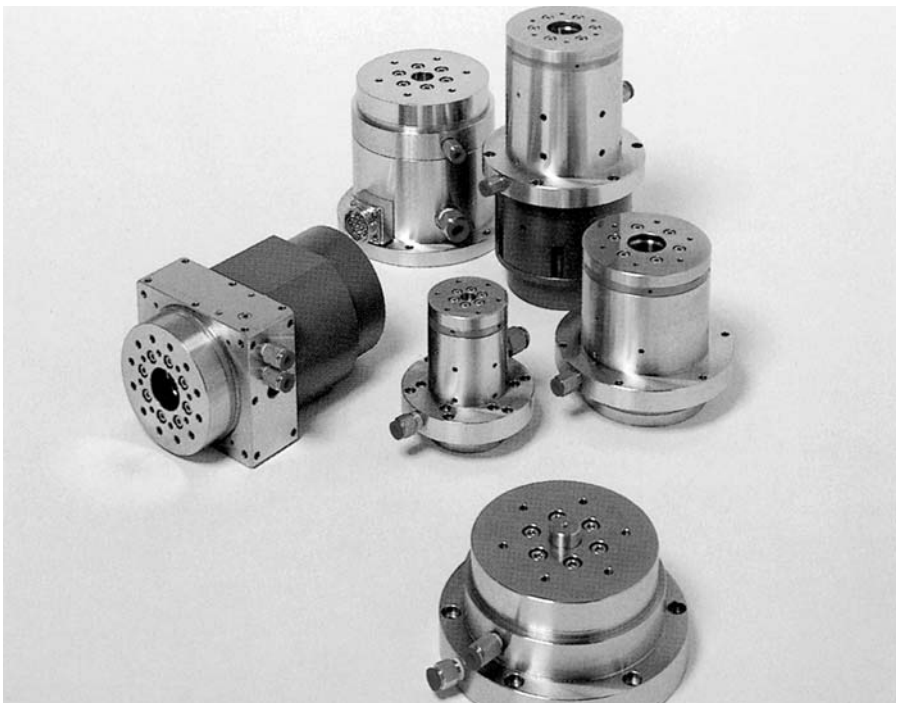
The **NTN** magnetic bearing spindle is comprised of two radial magnetic bearings and one thrust magnetic bearing, which support the spindle by magnetic force. All bearings in the five-axis control type spindle have a position sensor to assist the controller in providing the correct amount of force to keep the spindle in a fixed position.



4. High precision air spindle

This air spindle can be supported without direct contact by feeding clean compressed air between a rotor and a stator to form thin air film .

NTN's super precision machining technique enables precision of rotation up to the sub-micron level. It also features less friction and longer service life.



5. NTN BEAREE FL3305 & FL3307

BEAREE FL3305 & FL3307 are unique sliding materials designed for machine tools. Oil lubrication achieves the smallest friction coefficient possible. These materials have the following features:

- Minimized friction coefficient (with oil lubrication)
- Smaller deformation under compression
- Oil film is not disrupted and friction coefficient remains low during sliding action.
- Withstands frequent starts and stops.