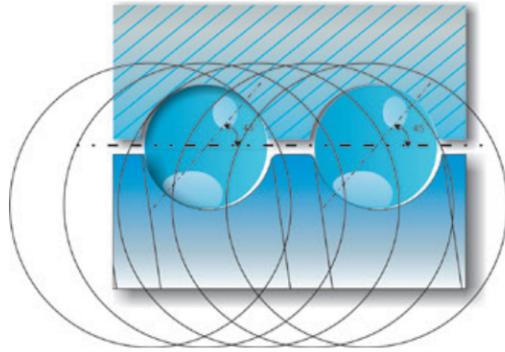


## Planetary Roller Screw Pair

### 1. Comparison between Planetary Roller Screw Pair and Ball Screw Pair

The load-bearing capacity of a roller screw mainly depends on the curvature radius of the contact surface between the rolling elements, the number of contact points, and the hardness and smoothness of the contact surface.

Under the same conditions of contact surface hardness, smoothness, and precision, the roller screw has more contact points than the ball screw. The curvature radius of the envelope circle of the roller contact surface is also much larger than the curvature radius of the steel balls in the ball screw. This determines that the roller screw has a higher load-bearing capacity than the ordinary ball screw.

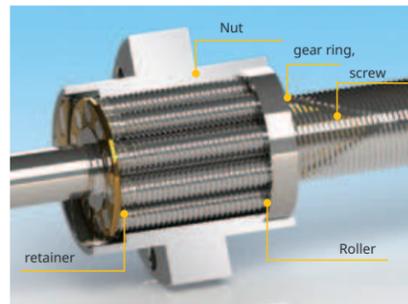


Comparison diagram of the number of roller screw rolling elements, curvature radius, and roller screw rolling element contact surface envelope circle

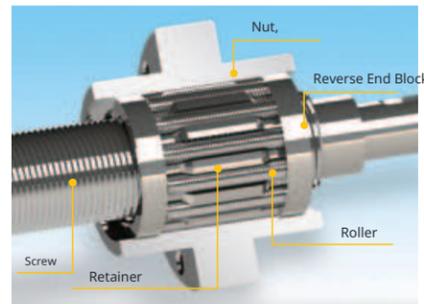
Figure-1

### 2. Classification and Applications of

According to the different structures, the roller screw pair can be divided into two types: planetary roller screw pair and circulating roller screw pair. The two have essential differences in the operation of the rollers: the rollers of the planetary roller screw pair do not have axial movement relative to the nut when they rotate and revolve, while the circulating roller screw pair not only rotates and revolves but also has cyclic axial movement relative to the nut.



Planetary Roller Screw Pair



Cyclic Planetary Roller Screw Pair

Figure-2

The structural differences determine their different application areas. Planetary roller screw pairs are mainly used in heavy-duty fields, while ball screw pairs are more inclined towards precision equipment.

Planetary roller screw pairs have high load-bearing capacity and reliability, and are mainly used in:

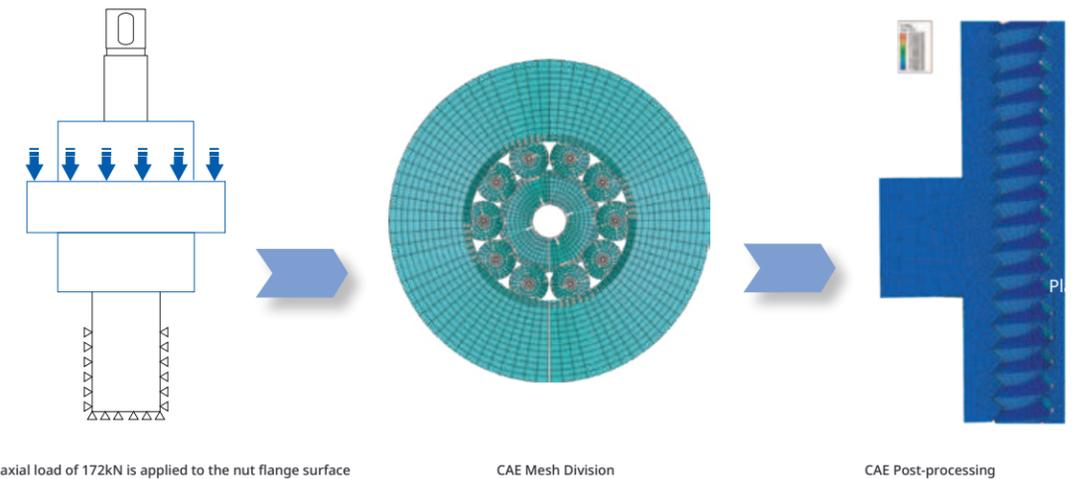
- Steel industry
- Nuclear industry
- Press machines
- Military equipment

Circulating roller screw pairs have a small helix lead (1~2mm), which results in high lead resolution. In addition to their high load-bearing capacity and reliability, they are mainly used in:

- Precision instruments
- Medical equipment
- Precision grinding machines
- Aerospace industry

### III. Contact analysis of planetary roller screw pairs under given load

Taking the 3020 planetary roller screw as an example, the contact stress under the given axial load is analyzed. The contact elements are divided into hexahedral elements to improve the calculation accuracy of CAE contact analysis. The analysis process is shown in the figure below:



An axial load of 172kN is applied to the nut flange surface

CAE Mesh Division

CAE Post-processing

Figure-3

IV. Numbering Rules and Meanings

1、滚珠丝杆编号

$\frac{2}{①} \frac{5}{②} \frac{0}{③} \frac{5}{④} \frac{L}{⑤} - \frac{3}{⑥} - \frac{P}{⑦} \frac{3}{⑧} / \frac{8}{①} \frac{0}{②} \frac{0}{③} \frac{X}{④} \frac{7}{⑤} \frac{2}{⑥} \frac{0}{⑦} - \frac{M}{⑧}$

- ① Screw Shaft Outer Diameter
- ② Lead
- ③ Thread Rotation: Right-hand thread without marking; Left-hand thread marked with L
- ④ Number of Load Ball Circuits
- ⑤ Accuracy Grade
- ⑥ Total Length of Screw Shaft
- ⑦ Effective Thread Length of Ball Screw
- ⑧ Note: Stainless steel screw shaft marked with M; Hollow screw shaft marked with H

2、滚珠螺母编号

$\frac{S}{①} \frac{J}{②} - \frac{S}{③} \frac{F}{④} \frac{A}{⑤} \frac{2}{⑥} \frac{5}{⑦} \frac{0}{⑧} \frac{5}{⑨} \frac{L}{⑩} - \frac{0}{⑪} \frac{1}{⑫}$

- ① Shenzhen Jiajing Electromechanical Product Logo: S J
- ② Nut Structure: S Single Nut; D Double Nut
- ③ Nut Flange: F with Flange; C without Flange
- ④ Nut flange hole structure types: A Six evenly distributed inner loop mounting holes or four holes with a 60-degree angle  
B Six inner loop mounting holes with a 45-degree angle  
C End plug type  
S High-speed silent type  
K Small diameter, small lead  
Y Large lead  
I Inner loop nut  
V Return tube protrudes beyond the outer diameter of the nut  
W Return tube within the outer diameter of the nut  
Z Heavy load  
R Rotating nut
- ⑤ Nominal diameter of the screw
- ⑥ Nominal lead of the screw
- ⑦ Thread rotation direction: Right-hand thread without marking; Left-hand thread marked with L
- ⑧ Corresponding series numbers of Shenzhen Jiajing Electromechanical products

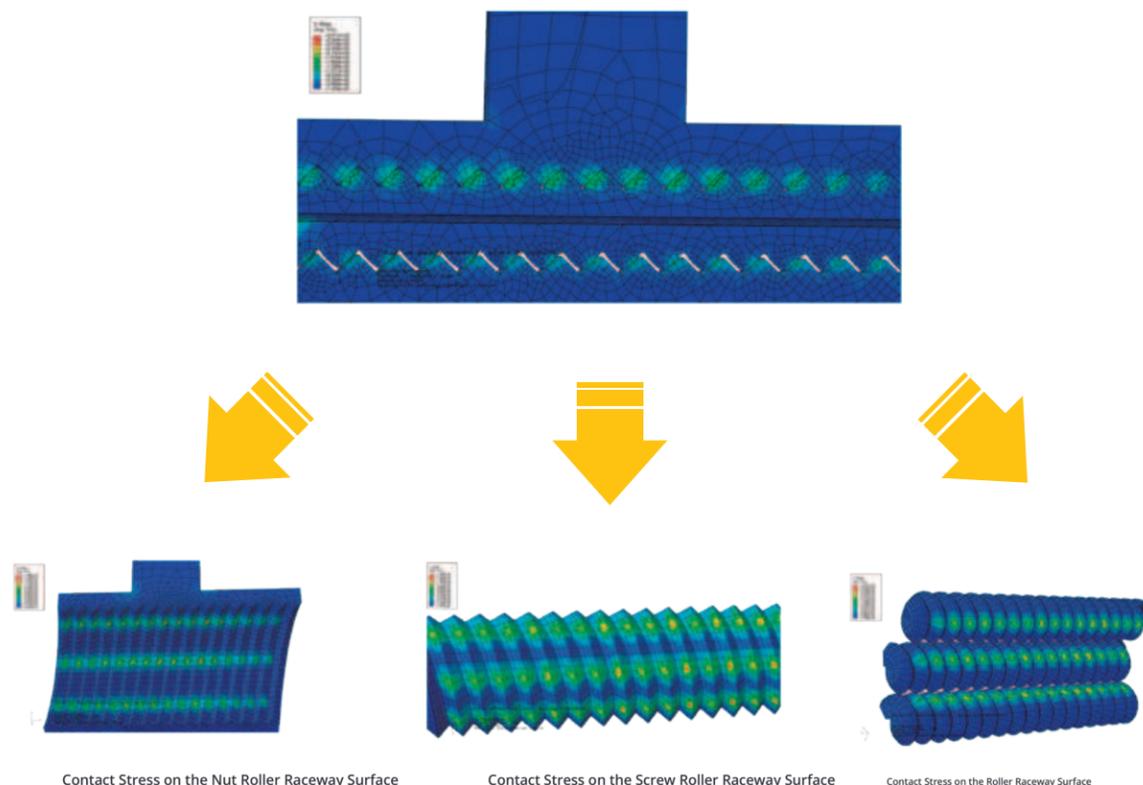
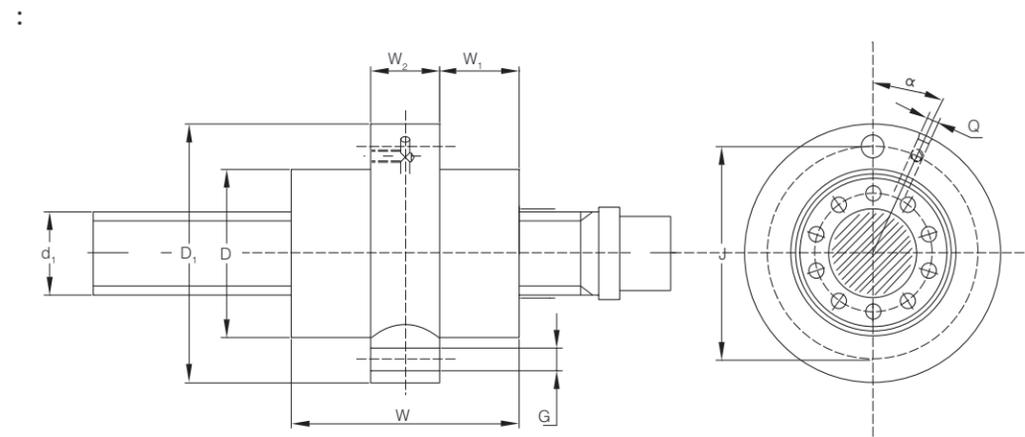


Figure - 4

Based on the above analysis, it can be determined that the maximum contact stress on the surface of each contact element is located on the roller screw raceway surface. According to relevant literature, when the surface hardness of GCr15 material for ordinary screws reaches HRC63 after heat treatment, the allowable contact stress can reach 4000MPa. Based on this, it can be inferred that the rated static load of the 3020 roller screw can meet the requirements.

五、行星滚柱丝杠副产品系列

螺母法兰位于中心、无轴向预紧的行星滚柱丝杠副 (XXRS) 产品系列

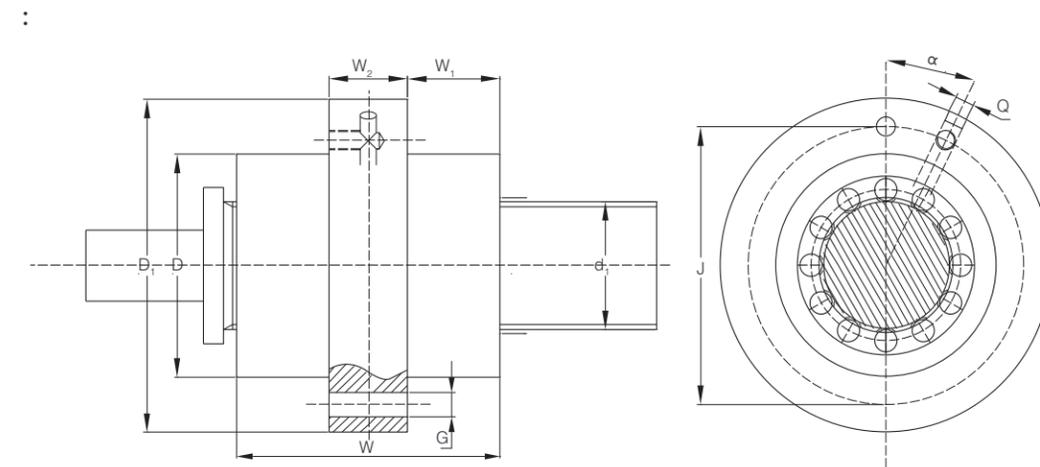


名称	N <sup>①</sup>	d1	D	W	W1	W2	D1	J	G	Q	α	Ca <sup>①</sup>	Coa <sup>①</sup>
	-	mm	mm	mm	mm	mm	mm	mm	mm	mm	°	kN	kN
XXRS 18×05	5	18.3	40	58	20	18	62	51	6×φ5.8	M6	30	35.3	65.9
XXRS 20×05	5	19.8	44	64	23	18	64	53	6×φ5.8	M6	30	46.4	97.5
XXRS 20×10	5	20.2	44	64	23	18	64	53	6×φ5.8	M6	30	50.1	87.6
XXRS 25×05	5	24.3	53	78	29	20	84	70	6×φ5.8	M6	30	72.8	133.7
XXRS 25×10	5	24.7	53	78	29	20	84	70	6×φ5.8	M6	30	84.2	129.2
XXRS 30×05	5	30.3	64	85	29	27	97	81	6×φ9	M6	30	88.4	168.1
XXRS 30×10	5	30.7	64	85	29	27	97	81	6×φ9	M6	30	106.3	174.4
XXRS 30×20	5	31.4	64	85	29	27	97	81	6×φ9	M6	30	123.3	177.3
XXRS 39×05	5	39.3	82	100	33.5	33	124	102	6×φ11	M6	30	129.2	268.9
XXRS 39×10	5	39.7	82	100	33.5	33	124	102	6×φ11	M6	30	152.6	270.9
XXRS 39×15	5	40	82	100	33.5	33	124	102	6×φ11	M6	30	167.6	272.9
XXRS 39×20	5	40.4	82	100	33.5	33	124	102	6×φ11	M6	30	172.8	260.9
XXRS 42×10	5	42.7	87	118	41.5	35	130	109	6×φ11	M6	30	185.3	341.2
XXRS 48×05	5	48.3	105	127	45	37	150	127	6×φ13.5 M8×1		30	195.6	482.3
XXRS 48×10	5	48.7	105	127	45	37	150	127	6×φ13.5 M8×1		30	231.5	475.1
XXRS 48×20	5	49.4	105	127	45	37	150	127	6×φ13.5 M8×1		30	265.7	462.3
XXRS 60×10	5	60.7	122	152	53.5	45	180	150	6×φ17.5 M8×1		30	338.6	779.7
XXRS 60×20	5	61.4	122	152	53.5	45	180	150	6×φ17.5 M8×1		30	395	785.7
XXRS 60×25	5	61.8	122	152	53.5	45	180	150	6×φ17.5 M8×1		30	405	817

①、Ca—额定动载荷；Coa—额定静载荷；N—螺纹头数。

六、循环式滚柱丝杠副产品系列

螺母法兰位于中心、无轴向预紧的循环式滚柱丝杠副 (XHRS) 产品系列



名称	N <sup>①</sup>	d1	D	W	W1	W2	D1	J	G	Q	α	Ca <sup>①</sup>	Coa <sup>①</sup>
	-	mm	mm	mm	mm	mm	mm	mm	mm	mm	°	kN	kN
XHRS 32×2	2	32	56	67	23.5	20	84	70	6×Φ6.6	M6	30	64.3	159.2
XHRS 40×2	2	40	68	84	28.5	27	102	85	6×Φ9	M6	30	49.9	117.2
XHRS 50×2	2	50	82	101	34	33	124	102	6×Φ11	M6	30	98.1	249.4

①、Ca—额定动载荷；Coa—额定静载荷；N—螺纹头数。

Planets

Planetary Roller Screw Pair