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BALL SCREW

GTEN is THE LEADERSHIP of BALL SCREW

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GTEN

YST AUTOMATION

YST AUTOMATION CO.,LTD.

2. Technological Description of Ball Screws

2.1 Accuracy

2.1.1 Lead/Travel Accuracy

- Lead accuracy of **GTEN** ball screws (grade C0~C5) is specified in 4 basic terms (E,e,e_{300}, $e_{2\pi}$). There are defined in Fig. 2.1 Tolerance of deviation (±E) and variation (e) of accumulated reference travel are shown in Table 2.2 and 2.3.
- Accumulated travel deviations for grade C7 and C10 are specified only by the allowable value per 300mm measured within any portion of the thread length. They are 0.05mm for C7 and 0.21mm for C10.

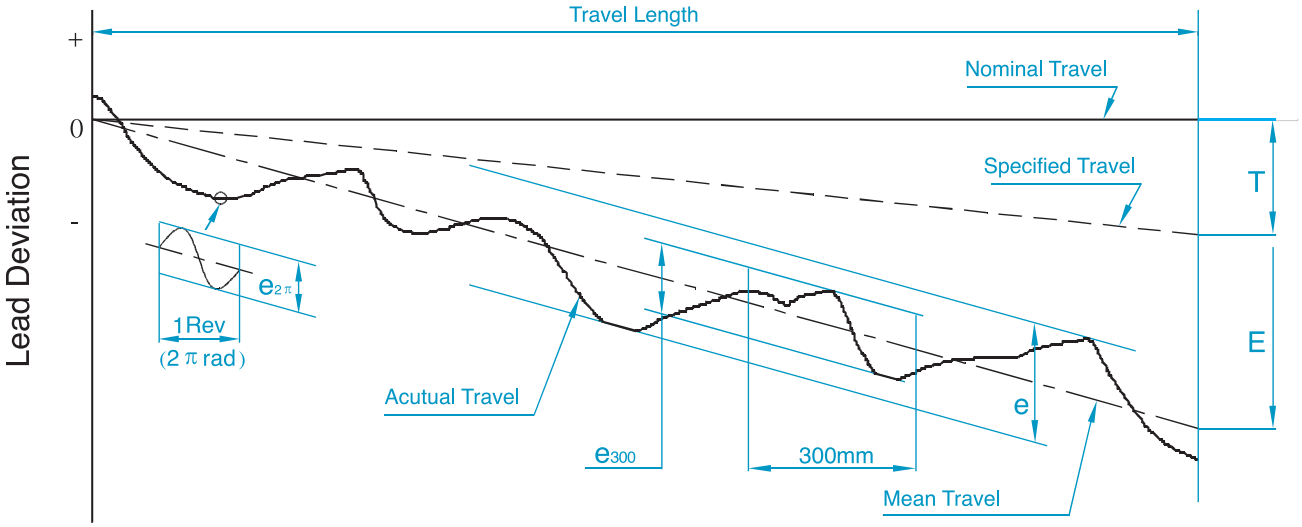


Fig. 2.1 Diagram of Lead Accuracy

Table 2.1 Definition of Terms for Lead Accuracy

Terms	Reference	Definition	Allowable
Travel Compensation	T	Travel compensation is the difference between specified and nominal travel within the useful travel. A slightly smaller value compared to the nominal travel is often selected by the customer to compensate for an expected elongation caused by temperature rise or external load. Therefore 〝T〞 is usually a negative value. Note : if no compensation is needed , specified travel is the same as nominal travel.	
Actual Travel		Actual travel is the axial displacement of the nut relative to the screw shaft.	
Mean Travel		Mean travel is the linear best fit line of actual. This could be obtained by the least quares method. This line represents the tendency of actual travel.	
Mean Travel Deviation	E	Mean travel deviation is the difference between mean travel and specified travel within travel length.	Table 2.2
Travel Variations	e e_{300} $e_{2\pi}$	Travel variations is the band of 2 lines drawn parallel to the mean travel , on the plus and minus side. Maximum width of variation over the travel length. Actual width of variation for the length of 300mm taken anywhere within the travel length. Wobble error , actual width of variation for one revolution (2 π radian)	Table 2.2 Table 2.3 Table 2.3

Table 2.2 Mean Travel Deviation(±E)and Travel Variation(e) (JIS B 1192)

Grade			C0		C1		C2		C3		C5		C7	C10
Travel Length(mm)	Over	Incl.	±E	e	±E	e	±E	e	±E	e	±E	e	e	e
		100	3	3	3.5	5	5	7	8	8	18	18		
	100	200	3.5	3	4.5	5	7	7	10	8	20	18		
	200	315	4	3.5	6	5	8	7	12	8	23	18		
	315	400	5	3.5	7	5	9	7	13	10	25	20		
	400	500	6	4	8	5	10	7	15	10	27	20		
	500	630	6	4	9	6	11	8	16	12	30	23		
	630	800	7	5	10	7	13	9	18	13	35	25		
	800	1000	8	6	11	8	15	10	21	15	40	27		
	1000	1250	9	6	13	9	18	11	24	16	46	30		
	1250	1600	11	7	15	10	21	13	29	18	54	35	±50/300mm	±210/300mm
	1600	2000			18	11	25	15	35	21	65	40		
	2000	2500			22	13	30	18	41	24	77	46		
	2500	3150			26	15	36	21	50	29	93	54		
	3150	4000			30	18	44	25	60	35	115	65		
	4000	5000					52	30	72	41	140	77		
	5000	6300					65	36	90	50	170	93		
	6300	8000							110	60	210	115		
	8000	10000									260	140		
	10000	12500									320	170		

Table 2.3 Variation per 300mm(e_{300})and Wobble Error($e_{2\pi}$) (JIS B 1192)

Unit : μm

Grade	C0	C1	C2	C3	C5	C7	C10
e_{300}	3.5	5	7	8	18	50	210
$e_{2\pi}$	3	4	5	6	8		

2.2 Axial Play

GTEN Axial Direction of Standard Backlash and Preload

Table2.4 Clearance in the Axial Direction of Ball Screw (P0)

Clearance in the Axial Direction of Ball Screw		Unit: mm
Screw Shaft OD	Rolled Ball Screw Clearance in the Axial Direction (max.)	Ground Ball Screw Clearance in the Axial Direction (max.)
4mm~14mm	0.05	0.015
15mm~50mm	0.08	0.025
50mm~80mm	0.12	0.05

Table2.5 Clearance in the Axial Direction (P1)

Clearance in the Axial Direction of Ball Screw		Unit: mm
Screw Shaft OD	Rolled Ball Screw Clearance in the Axial Direction (max.)	Ground Ball Screw Clearance in the Axial Direction (max.)
4mm~80mm	0	0

Table2.6 Spring Force of Internal Circulation

Spring Force of Internal Circulation (kgf.cm)						
Model No	P2		P3		P4	
	3%Spring Force	TP Reference Torque	8%Spring Force	TP Reference Torque	13%Spring Force	TP Reference Torque
1404-4	0.1	0.13	0.2	0.34	0.3	0.56
1604-3	0.1	0.17	0.3	0.45	0.5	0.73
1604-4	0.1	0.21	0.3	0.57	0.5	0.93
1605-3	0.2	0.29	0.4	0.79	0.7	1.28
1605-4	0.2	0.3	0.4	0.8	0.7	1.3
1610-3	0.2	0.39	0.5	1.04	0.9	1.69
2005-4	0.2	0.47	0.5	1.26	0.9	2.05
2504-4	0.1	0.33	0.3	0.88	0.6	1.43
2505-4	0.2	0.6	0.6	1.6	1.0	2.59
2510-3	0.4	1.11	1.2	2.95	1.9	4.79
2510-4	0.6	1.47	1.2	3.93	2.5	6.38
3205-4	0.2	0.76	0.6	2.02	1.0	3.28
3206-4	0.3	1.14	0.8	3.03	1.3	4.93
3210-3	0.6	2.02	1.7	5.37	2.7	8.73
3210-4	0.8	2.62	2.2	6.99	3.5	11.36
4005-4	0.2	0.95	0.6	2.53	1.1	4.11
4006-4	0.3	1.25	0.9	3.32	1.4	5.4
4010-3	0.8	2.59	2.2	6.91	3.6	11.23
4010-4	0.8	3.31	2.3	8.84	3.7	14.36
5010-3	0.9	3.29	2.3	8.77	3.8	14.26
5010-4	0.9	4.21	2.4	11.23	3.9	18.25
6310-4	1.0	5.42	2.7	14.46	4.4	23.49
6320-3	2.3	13.08	6.1	34.87	9.9	56.66
8010-4	1.1	6.68	2.9	17.82	4.6	28.96
8020-3	2.3	16.87	6.2	44.98	10.1	73.1

Table2.7 Spring Force of Plastic Circulation (kgf.cm)

Spring Force of Plastic Circulation (kgf.cm)						
Model No	P2		P3		P4	
	2%Spring Force	TP Reference Torque	5%Spring Force	TP Reference Torque	8%Spring Force	TP Reference Torque
1210-2	0.1	0.12	0.1	0.2	0.2	0.32
1605-4	0.2	0.32	0.4	0.81	0.7	1.29
1610-3	0.1	0.26	0.3	0.65	0.5	1.04
1610-4	0.1	0.33	0.4	0.83	0.6	1.33
1616-3	0.2	0.44	0.6	1.09	0.9	1.75
2005-4	0.2	0.42	0.4	1.04	0.7	1.67
2505-4	0.2	0.52	0.5	1.29	0.8	2.07
2510-4	0.3	0.84	0.8	2.09	1.3	3.34
3205-4	0.2	0.79	0.6	1.98	1.0	3.17
3220-3	0.4	1.45	1.1	3.62	1.8	5.8
4005-4	0.3	1.19	0.8	2.98	1.2	4.77
4020-3	0.8	3.14	2.0	7.85	3.2	12.55
5010-4	0.7	3.47	1.9	8.66	3.0	13.86
5020-5	1.5	6.98	3.8	17.46	6.0	27.93
1616-2	0.2	0.33	0.4	0.83	0.7	1.3
2020-2	0.2	0.45	0.4	1.12	0.7	1.79
2525-2	0.3	0.88	0.7	2.2	1.2	3.52
3232-2	0.4	1.61	1.1	4.04	1.7	6.46
4040-2	0.7	3.3	1.8	8.24	2.8	13.18
5050-2	1.3	7.35	3.3	18.38	5.3	29.41

Table2.8 Spring Force of External Circulation (kgf.cm)

Spring Force of External Circulation (kgf.cm)						
Model No	P2		P3		P4	
	3%Spring Force	TP Reference Torque	8%Spring Force	TP Reference Torque	15%Spring Force	TP Reference Torque
082.5-2.5	0.1	0.05	0.1	0.08	0.1	0.13
1003-2.5	0.1	0.06	0.1	0.15	0.2	0.24
1204-3.5	0.1	0.13	0.3	0.34	0.4	0.55
1205-3.5	0.2	0.22	0.5	0.59	0.7	0.95
1605-2.5	0.2	0.28	0.5	0.73	0.7	1.19
1520-1.5	1.5	3.41	4.0	9.08	6.6	14.76
2010-2.5	0.2	0.7	0.6	1.88	1.0	3.05

Table 2.9 Permissible ranges of torque variation rates

Reference torque kgf • cm		Effective threading length (mm)										
		Below 4000								4000~10000		
		Slenderness 1 : below 40				Slenderness 1:40 ~ 1:60				–		
		Grade				Grade				Grade		
Over	Incl.	C0	C1	C2、C3	C5	C0	C1	C2、C3	C5	C1	C2、C3	C5
2	4	±35 %	±40 %	±45 %	±55 %	±45 %	±45 %	±55 %	±65 %	–	–	–
4	6	±25 %	±30 %	±35 %	±45 %	±38 %	±38 %	±45 %	±50 %	–	–	–
6	10	±20 %	±25 %	±30 %	±35 %	±30 %	±30 %	±35 %	±40 %	–	±40 %	±45 %
10	25	±15 %	±20 %	±25 %	±30 %	±25 %	±25 %	±30 %	±35 %	–	±35 %	±40 %
25	63	±10 %	±15 %	±20 %	±25 %	±20 %	±20 %	±25 %	±30 %	–	±30 %	±35 %
63	100	–	–	±15 %	±20 %	–	–	±20 %	±25 %	–	±25 %	±30 %

Remarks 1.Slenderness is the value of dividing the screws shaft outside diameter with the screws shaft threading length.
2.For reference torque less than 2 kgf • cm, **GTEN** specifications will apply.

Calculation of reference torque Tp

The formula for computing reference torque of the ball screws is given in following:

$$Tp = 0.05\ (\tan\beta)^{-0.5} \cdot \frac{Fao \cdot \ell}{2\pi}$$

Where , Fao : Preload (k f)
β : Lead angle
ℓ : Lead (cm)

Measurement conditions

The preload dynamic torque Tp is determined first by adopting the following measurement conditions together with the method illustrated in Diagram 3.4 for measuring the force F needed to rotate the screws shaft without bringing the nuts to rotate along with the shaft after the screws shaft has started rotating, then multiplying the measured value of F with the arm of force L, the product is Tp.

Tp=F • L

Measure conditions
(1) Measurement is executed under the condition of not attaching with scraper.
(2) The rotating speed during measurement maintains at 100 rpm.
(3) According to JSK 2001 (industrial lubrication oil viscosity classification standards), the lubrication oil used should be in compliance with ISO VG68.

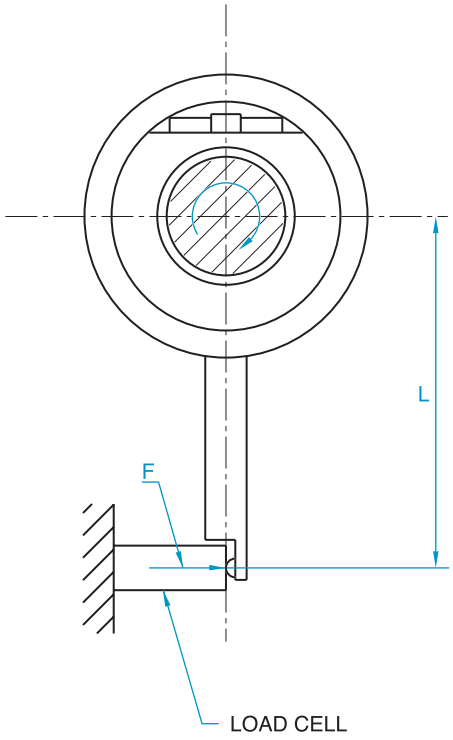


Fig. 2.4 Preload dynamic torque measuring method

3. Screw Shaft Design

3.1 Mounting Methods

- Both the critical speed and column bucking load depend upon the method of mounting and the unsupported length of the shaft,the most common mounting methods for ball screws are shown in Fig. 3.1~3.15.

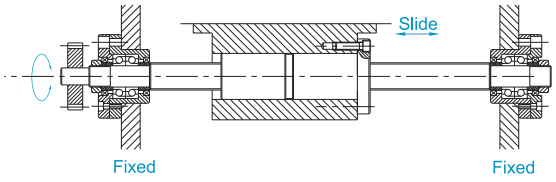


Fig. 3.1

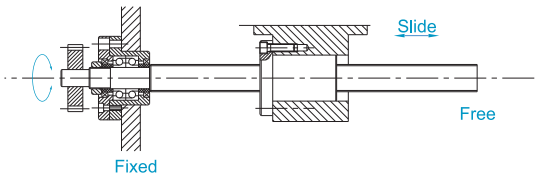


Fig. 3.2

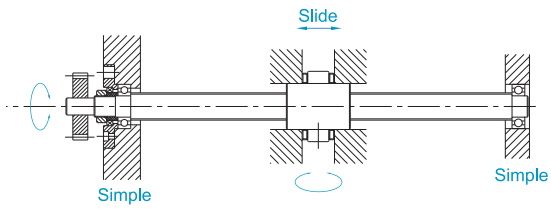


Fig. 3.3

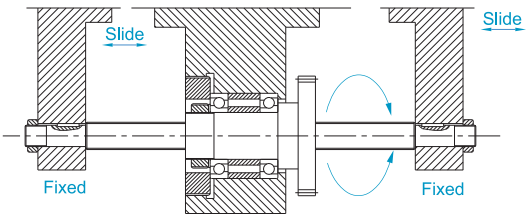


Fig. 3.4

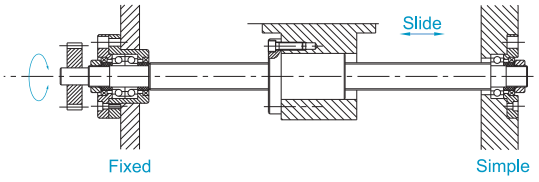


Fig. 3.5

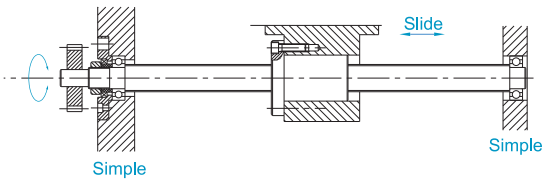


Fig. 3.6

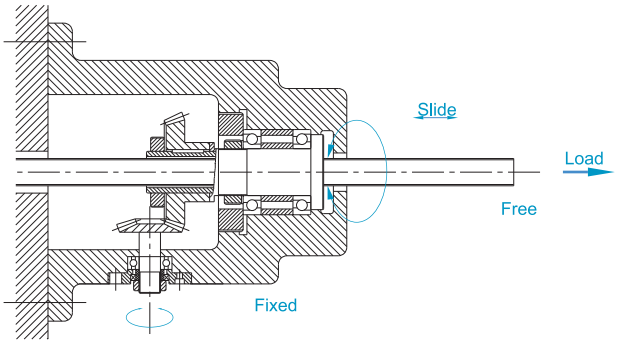


Fig. 3.7

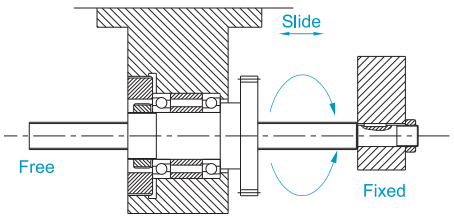


Fig. 3.8

Most Common Mounting Methods for Ball Screws

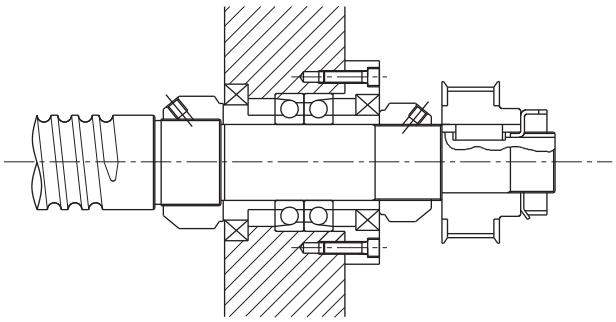


Fig. 3.9

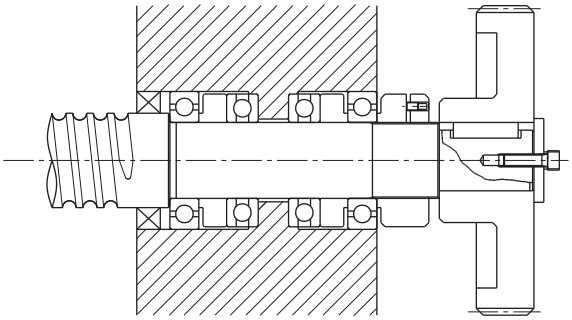


Fig. 3.11

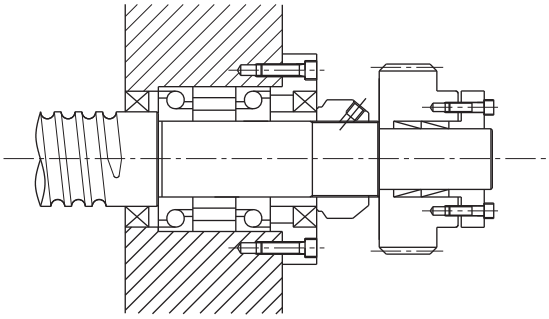


Fig. 3.10

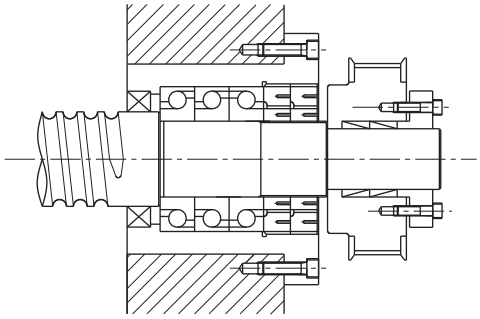


Fig. 3.12

Most Machines Mounting Methods for Ball Screws

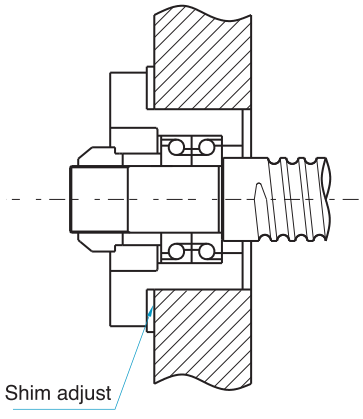


Fig. 3.17

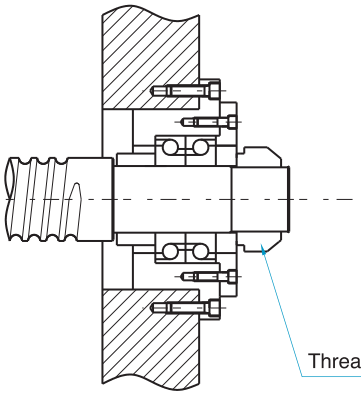


Fig. 3.18

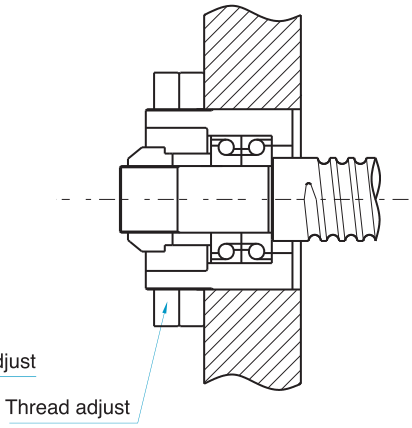
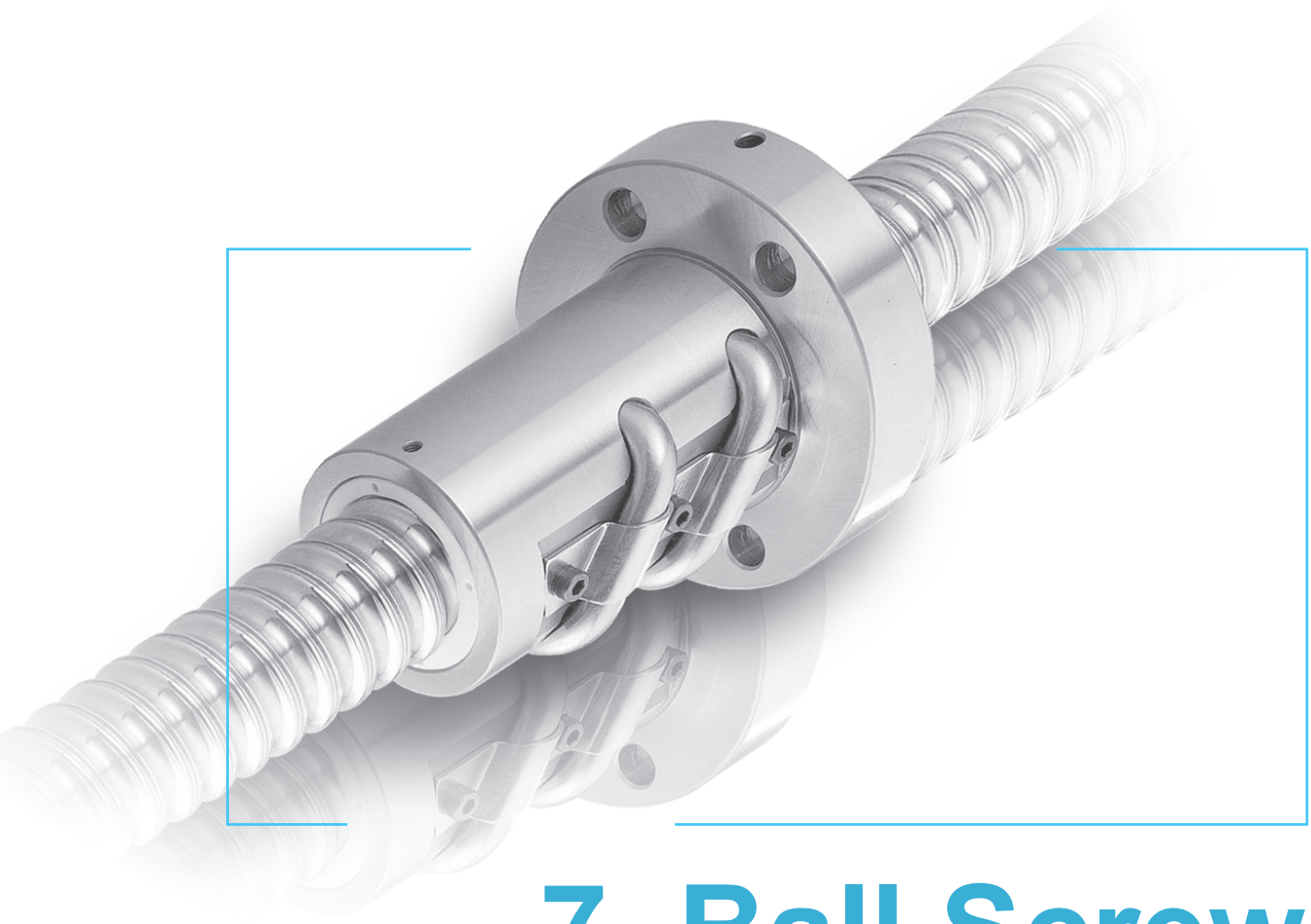


Fig. 3.19

Most Common Mounting Methods for Ball Screws

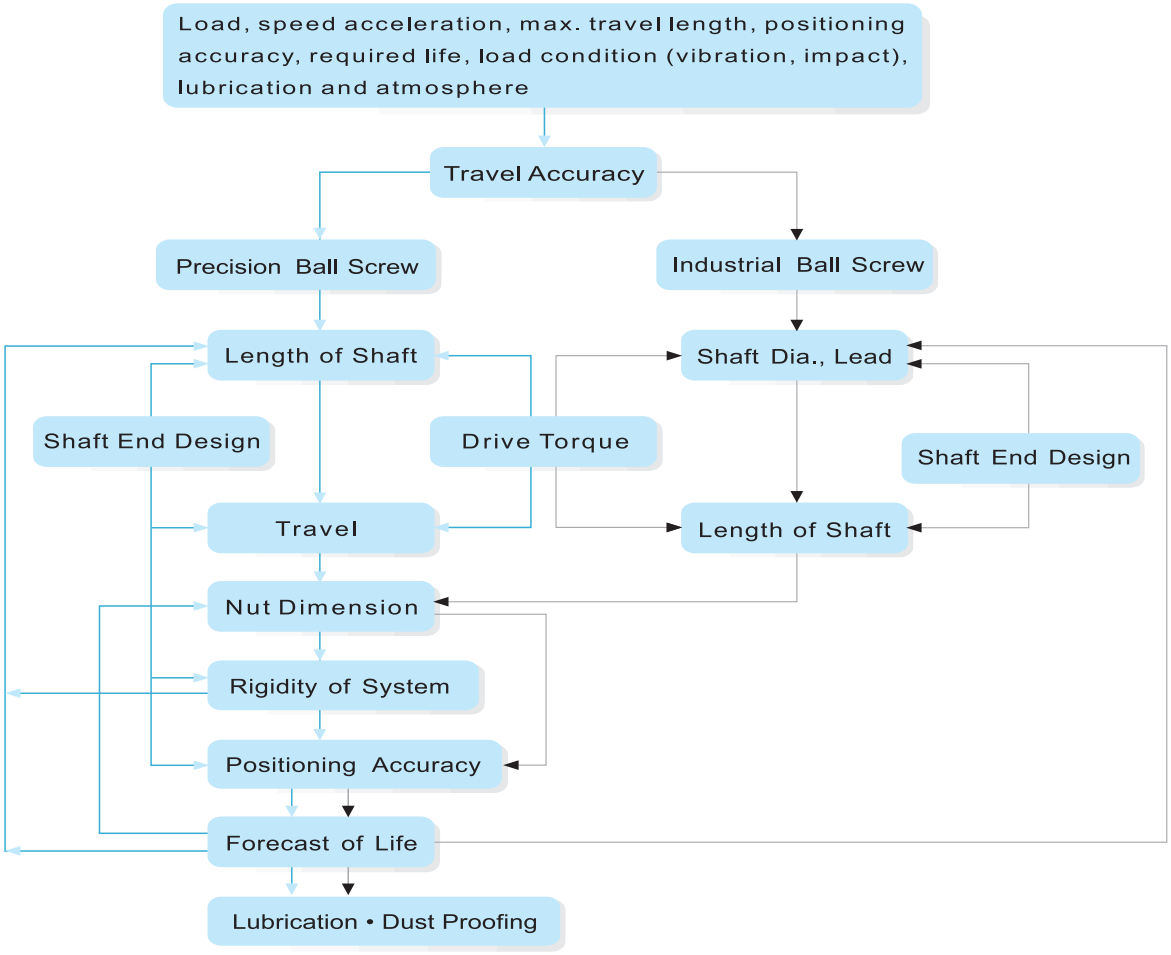


7. Ball Screw

Selecting Correct Type of Ballscrew

Condition

- Accuracy
- Screw Shaft Design
- Drive Torque
- Nut Design
- Rigidity
- Positioning Accuracy
- Life Design
- Lubrication and safety design

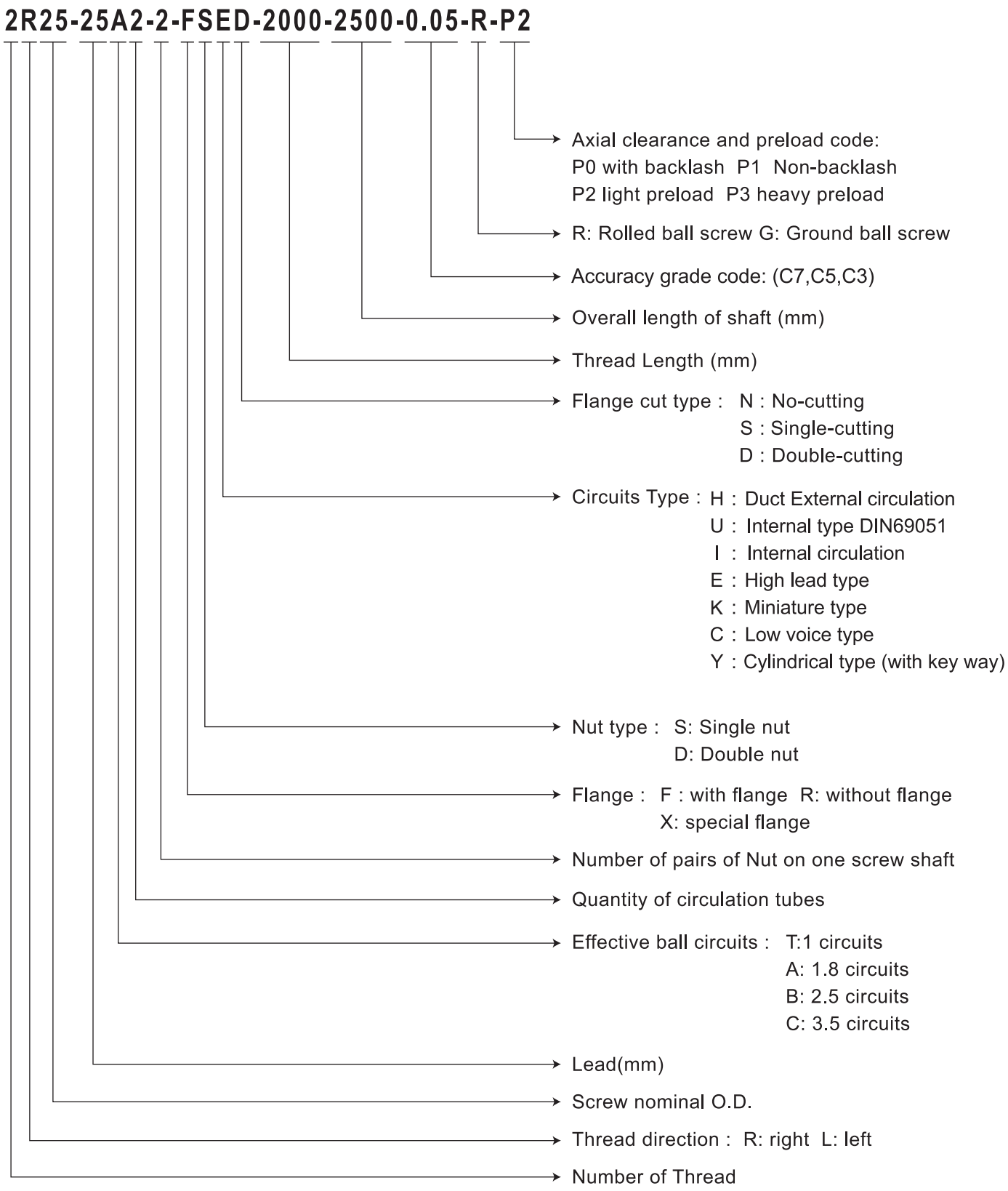


GTEN Ball Screw Size List

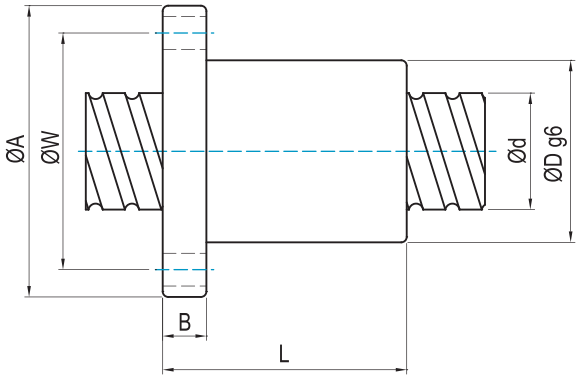
Dia. \ Lead	1	2	2.5	3	4	5	5.08	6	10	12.7	16	20	25	32	40	50
6	⦿															
8	⦿	⦿	⦿													
10		⦿		⦿	⦿											
12		⦿			⦿	⦿			⦿	⦿						
14		⦿			⦿	⦿										
15												⦿				
16		⦿			⦿	⦿	⦿		⦿		⦿					
20					○	⦿			⦿			⦿				
25					⦿	⦿			⦿			⦿	⦿			
32					○	⦿		⦿	⦿			⦿		⦿		
40						⦿		⦿	⦿			⦿			⦿	
50						○			⦿			⦿				⦿
63									⦿			⦿			⦿	
80									⦿			⦿				

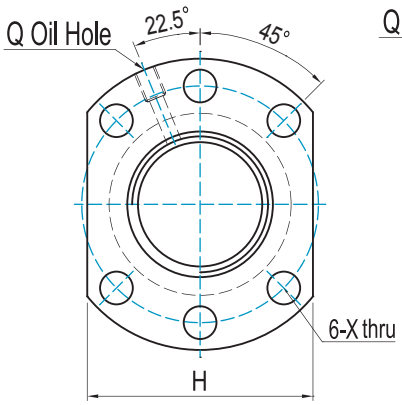
• means rolled ball screw ○ means ground ball screw

Speciation Number of Ball Screw

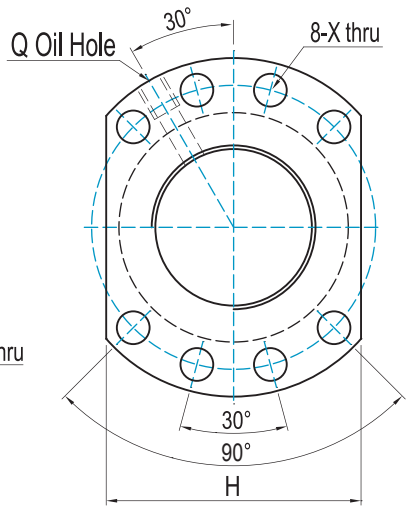


7.1 Type: FSU (DIN69051)





Type A



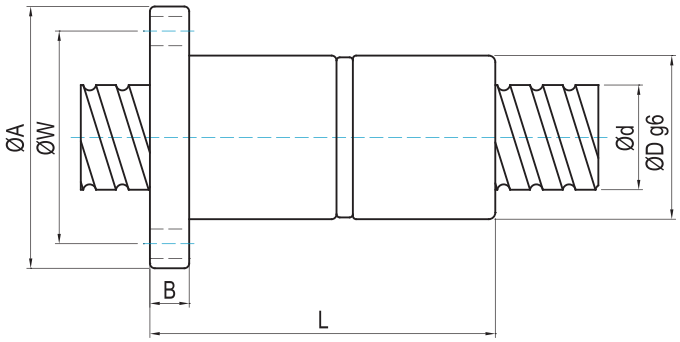
Type B

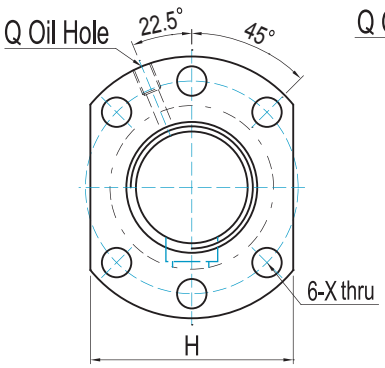
Unit : mm

Model No.	Dimensions														
	d	l	Da	D	A	B	L	W	X	Type	H	Q	n	Ca(Kgf)	Coa(kgf)
1604-4	16	4	2.381	28	48	10	45	38	5.5	A	40	M6	T4	944	1254
★ 1605-3	16	5	3.175	28	48	10	42	38	5.5	A	40	M6	T3	1049	1144
★ 1605-4	16	5	3.175	28	48	10	50	38	5.5	A	40	M6	T4	1344	1525
1610-3	16	10	3.175	28	48	12	65	38	5.5	A	40	M6	T3	1084	1232
2005-3	20	5	3.175	36	58	10	47	47	6.6	A	44	M6	T3	1181	1496
★ 2005-4	20	5	3.175	36	58	10	53	47	6.6	A	44	M6	T4	1512	1995
2006-3	20	6	3.969	36	58	10	52	47	6.6	A	44	M6	T3	1569	1788
2010-3	20	10	3.969	36	58	10	68	47	6.6	A	44	M6	T3	1621	1925
2504-4	25	4	2.381	40	62	11	46	51	6.6	A	48	M6	T4	1178	2046
2505-3	25	5	3.175	40	62	10	47	51	6.6	A	48	M6	T3	1330	1936
★ 2505-4	25	5	3.175	40	62	10	53	51	6.6	A	48	M6	T4	1704	2581
2510-3	25	10	4.762	40	62	12	75	51	6.6	A	48	M6	T3	2250	2772
2510-4	25	10	4.762	40	62	12	85	51	6.6	A	48	M6	T4	2881	3695
★ 3205-4	32	5	3.175	50	80	12	53	65	9	A	62	M6	T4	1924	3403
3206-4	32	6	3.969	50	80	12	58	65	9	A	62	M6	T4	2598	4217
3210-3	32	10	6.35	50	80	16	77.5	65	9	A	62	M6	T3	3775	5877
3210-4	32	10	6.35	50	80	16	90	65	9	A	62	M6	T4	4834	7835
★ 4005-4	40	5	3.175	63	93	16	56	78	9	B	70	M8	T4	2142	4342
4006-4	40	6	3.969	63	93	14	60	78	9	B	70	M6	T4	2877	5318
4010-4	40	10	6.35	63	93	18	93	78	9	B	70	M8	T4	5399	10074
5006-4	50	6	3.969	75	110	15	62	93	11	B	85	M8	T4	3203	6784
5010-4	50	10	6.35	75	110	18	93	93	11	B	85	M8	T4	5933	12313
6310-4	63	10	6.35	90	125	18	98	108	11	B	95	M8	T4	6700	16230
6320-3	63	20	9.525	95	135	20	138	115	13.5	B	100	M8	T3	8957	17945
8010-4	80	10	6.35	105	145	20	98	125	13.5	B	110	M8	T4	7547	21268
8020-3	80	20	9.525	125	165	25	143	145	13.5	B	130	M8	T3	10168	23611

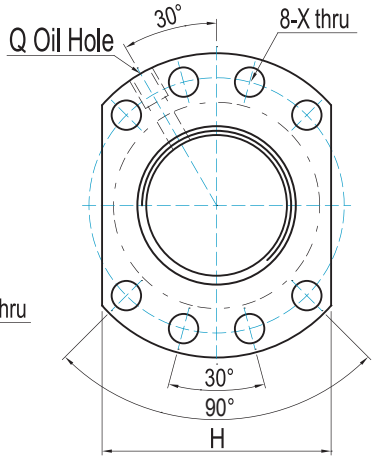
★Note : with sign * can produce left helix

7.2 Type: FDU (DIN69051)





Type A



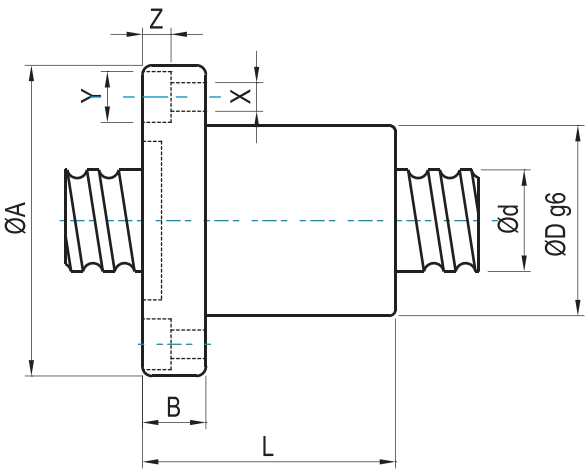
Type B

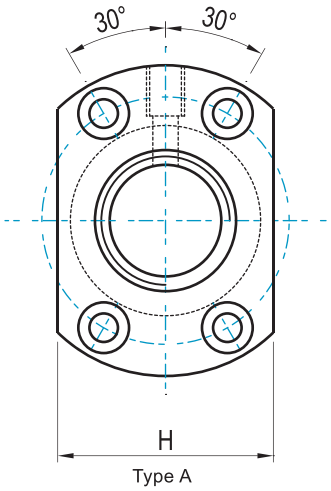
Unit : mm

Model No.	Dimensions														
	d	l	Da	D	A	B	L	W	X	Type	H	Q	n	Ca(Kgf)	Coa(kgf)
★ 1605-3	16	5	3.175	28	48	10	80	38	5.5	A	40	M6	T3	1049	1144
★ 2005-4	20	5	3.175	36	58	12	92	47	6.6	A	44	M6	T4	1512	1995
★ 2505-4	25	5	3.175	40	62	12	92	51	6.6	A	48	M6	T4	1704	2581
2510-4	25	10	4.762	40	62	12	153	51	6.6	A	48	M6	T4	2881	3695
★ 3205-4	32	5	3.175	50	80	12	92	65	9	A	62	M6	T4	1924	3403
3210-4	32	10	6.35	50	80	16	160	65	9	A	62	M6	T4	4834	7835
4005-4	40	5	3.175	63	93	15	96	78	9	B	70	M8	T4	2142	4342
4010-4	40	10	6.35	63	93	18	162	78	9	B	70	M8	T4	5399	10074
5010-4	50	10	6.35	75	110	16	162	93	11	B	85	M8	T4	5933	12313
6310-4	63	10	6.35	90	125	18	182	108	11	B	95	M8	T4	6700	16230
6320-3	63	20	9.525	95	135	20	253	115	13.5	B	100	M8	T3	8957	17945
8010-4	80	10	6.35	105	145	20	182	125	13.5	B	110	M8	T4	7547	21268
8020-3	80	20	9.525	125	165	25	253	145	13.5	B	130	M8	T3	10168	23611

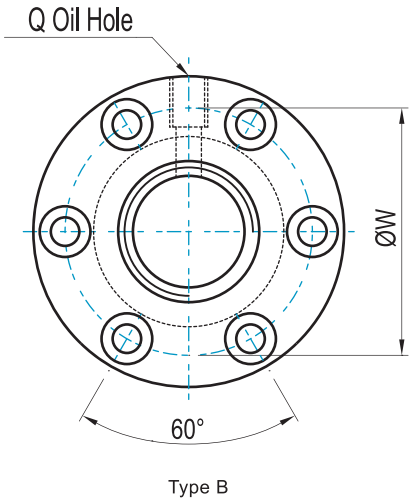
★Note : with sign * can produce left helix

7.3 Type: FSI





Type A



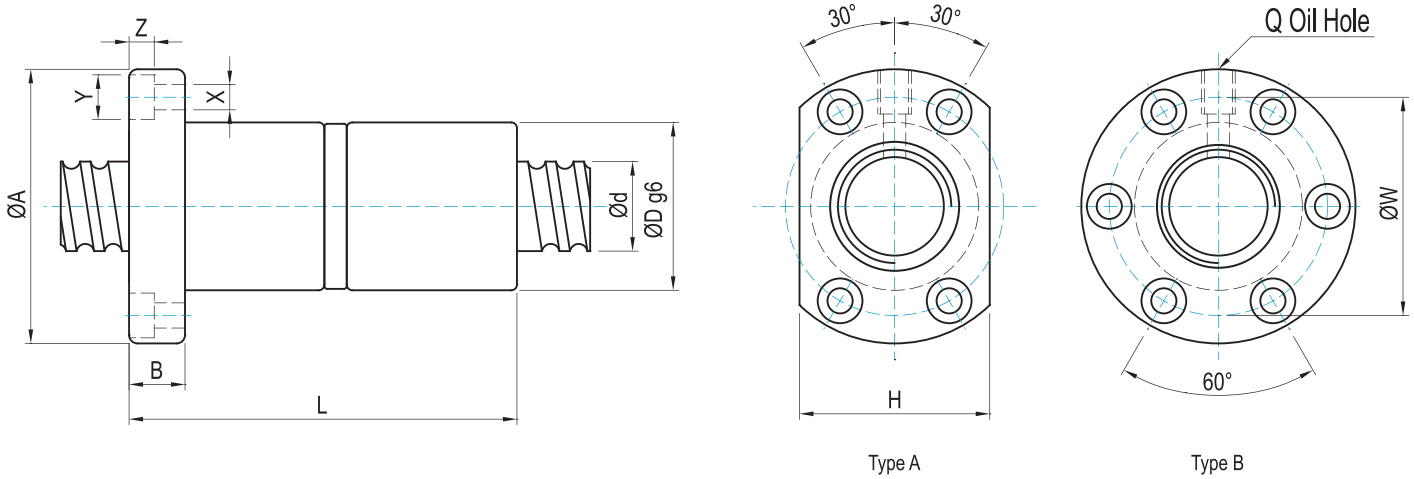
Type B

Unit : mm

Model No.	Dimensions																
	d	l	Da	D	A	B	L	W	X	Y	Z	Type	H	Q	n	Ca(Kgf)	Coa(kgf)
1404-4	14	4	2.381	26	46	10	47	36	4.5	8	4.5	A	34	M6	T4	875	1056
1405-3	14	5	3.175	26	46	10	45	36	4.5	8	4.5	A	34	M6	T3	1013	1056
1604-4	16	4	2.381	30	49	10	45	39	4.5	8	4.5	A	34	M6	T4	944	1254
1605-3	16	5	3.175	30	49	10	42	39	4.5	8	4.5	A	34	M6	T3	1049	1144
★ 1605-4	16	5	3.175	30	49	10	50	39	4.5	8	4.5	A	34	M6	T4	1344	1525
1610-3	16	10	3.175	34	58	10	65	45	5.5	9.5	5.5	A	36	M6	T3	1084	1232
★ 2005-4	20	5	3.175	34	57	12	53	45	5.5	9.5	5.5	A	40	M6	T4	1512	1995
2504-4	25	4	2.381	40	63	11	46	51	5.5	9.5	5.5	A	46	M6	T4	1178	2046
★ 2505-4	25	5	3.175	40	63	12	53	51	5.5	9.5	5.5	A	46	M8	T4	1704	2581
2510-4	25	10	4.762	46	72	12	85	58	6.5	11	6.5	A	52	M6	T4	2881	3695
★ 3205-4	32	5	3.175	46	72	12	53	58	6.5	11	6.5	A	52	M8	T4	1924	3403
3206-4	32	6	3.969	62	89	12	63	75	6.5	11	6.5	B	-	M8	T4	2598	4217
3210-4	32	10	6.35	54	88	16	90	70	9	14	8.5	A	62	M8	T4	4834	7835
★ 4005-4	40	5	3.175	56	90	16	56	72	9	14	8.5	A	64	M8	T4	2142	4342
4010-4	40	10	6.35	62	104	18	93	82	11	17.5	11	A	70	M8	T4	5399	10074
5010-4	50	10	6.35	72	114	18	93	92	11	17.5	11	A	82	M8	T4	5933	12313
6310-4	63	10	6.35	85	131	22	100	107	14	20	13	B	-	M8	T4	6700	16230
6320-3	63	20	9.525	95	153	23	130	123	18	26	17.5	B	-	M8	T3	8957	17945
8010-4	80	10	6.35	105	150	22	92	127	14	20	13	B	-	M8	T4	7547	21268
8020-3	80	20	9.525	115	173	23	130	143	18	26	17.5	B	-	M8	T3	10168	23611

★Note : with sign * can produce left helix

7.4 Type: FDI

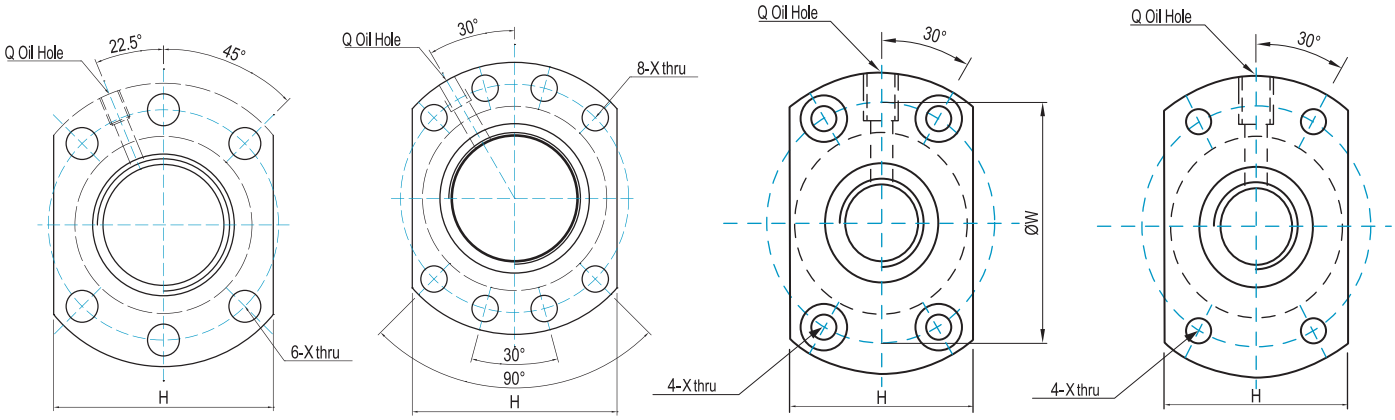


Unit : mm

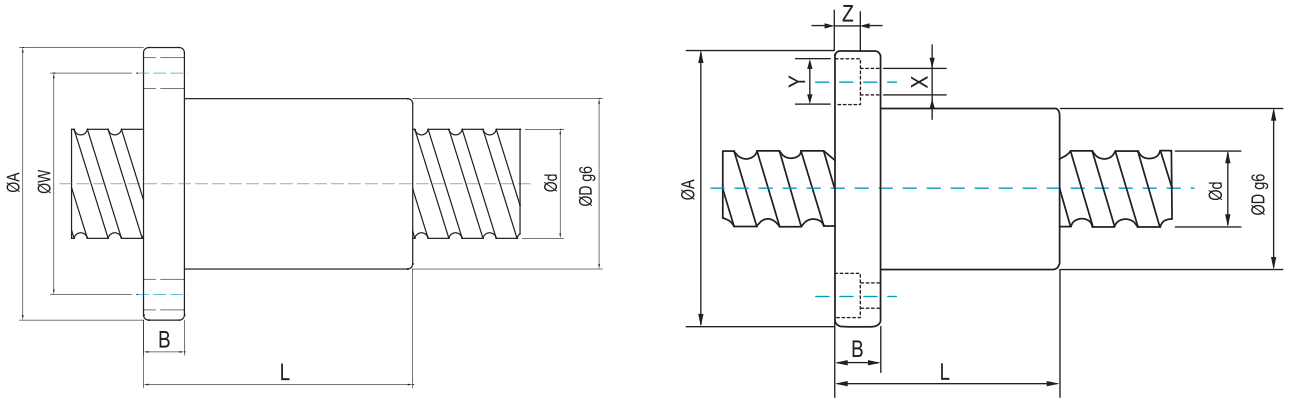
Model No.	Dimensions																
	d	l	Da	D	A	B	L	W	X	Y	Z	Type	H	Q	n	Ca(Kgf)	Coa(kgf)
★ 1605-3	16	5	3.175	30	49	10	80	39	4.5	8	4.5	A	34	M6	T3	1049	1144
★ 2005-4	20	5	3.175	34	57	12	92	45	5.5	9.5	5.5	A	40	M6	T4	1512	1995
★ 2505-4	25	5	3.175	40	63	12	92	51	5.5	9.5	5.5	A	46	M8	T4	1704	2581
2510-4	25	10	4.762	46	72	12	156	58	6.5	11	6.5	A	52	M6	T4	2881	3695
★ 3205-4	32	5	3.175	46	72	12	92	58	6.5	11	6.5	A	52	M8	T4	1924	3403
3210-4	32	10	6.35	54	88	16	160	70	9	14	8.5	A	62	M8	T4	4834	7835
★ 4005-4	40	5	3.175	56	90	16	96	72	9	14	8.5	A	64	M8	T4	2142	4342
4010-4	40	10	6.35	62	104	18	162	82	11	17.5	11	A	70	M8	T4	5399	10074
5010-4	50	10	6.35	72	114	18	162	92	11	17.5	11	A	82	M8	T4	5933	12313
6310-4	63	10	6.35	85	131	22	182	107	14	20	13	B	-	M8	T4	6700	16230
6320-3	63	20	9.525	95	153	23	253	123	18	26	17.5	B	-	M8	T3	8957	17945
8010-4	80	10	6.35	105	150	22	182	127	14	20	13	B	-	M8	T4	7547	21268
8020-3	80	20	9.525	115	173	23	253	143	18	26	17.5	B	-	M8	T3	10168	23611

★Note : with sign * can produce left helix

7.5 Type: FSC



TYPE A　TYPE B　TYPE C　TYPE D



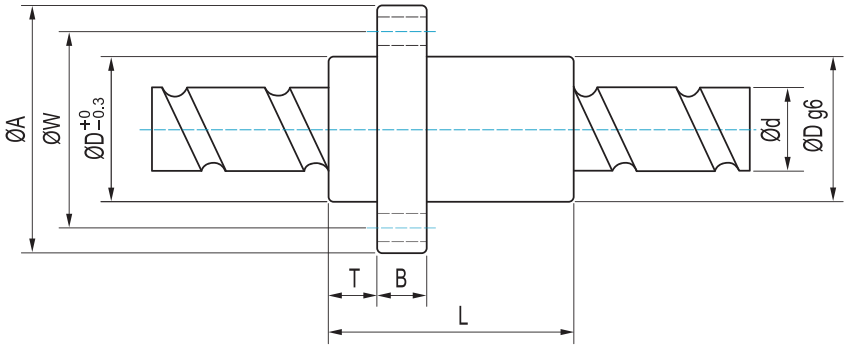
TYPE : A B D　　TYPE : C

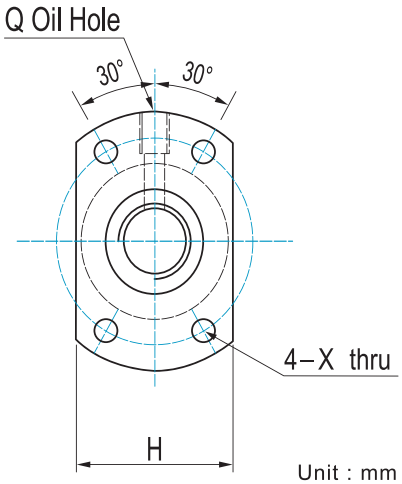
Unit : mm

Model No.	Dimensions																
	d	I	Da	D	A	B	L	W	X	Y	Z	Type	H	Q	n	Ca(Kgf)	Coa(kgf)
1210-2	12	10	2	30	50	10	40	40	4.5	8	4.5	C	32	M6	T2	390	466
1520-2	15	20	3.175	34	55	12	57	45	6	-	-	D	34	M6	T2	833	997
1610-3	16	10	3.175	28	48	12	43	38	5.5	-	-	A	40	M6	T3	1180	1496
1616-3	16	16	3.175	28	48	12	61	38	5.5	-	-	A	40	M6	T3	1180	1496
2010-2	20	10	3.969	46	74	13	54	59	6.6	11	5.5	C	46	M6	T2	1246	1559
2020-4	20	20	3.175	36	58	10	55	47	6.6	-	-	A	44	M6	T4	1659	2464
▲ 2510-4	25	10	3.5	40	62	12	64	51	6.6	-	-	A	48	M6	T4	2067	3280
2525-4	25	25	3.969	47	74	12	67	60	6.6	-	-	A	56	M6	T4	2481	3851
3220-3	32	20	3.969	50	80	13	78	65	9	-	-	A	62	M6	T3	2141	3576
3232-4	32	32	4.762	56	86	16	82	71	9	-	-	A	65	M6	T4	3585	6071
4020-3	40	20	5.556	63	93	15	83	78	9	-	-	B	70	M8	T3	3782	6468
4040-4	40	40	6.35	65	95	18	100	80	9	-	-	B	72	M8	T4	5778	11753
5020-5	50	20	6.35	75	110	18	121	93	11	-	-	B	85	M8	T5	7737	18189

▲ steel balls 3.5mm, please order 3.5mm shaft to meet

7.6 Type: FSE



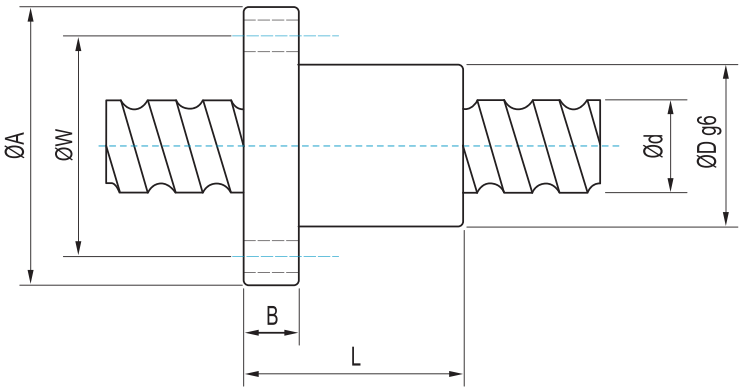


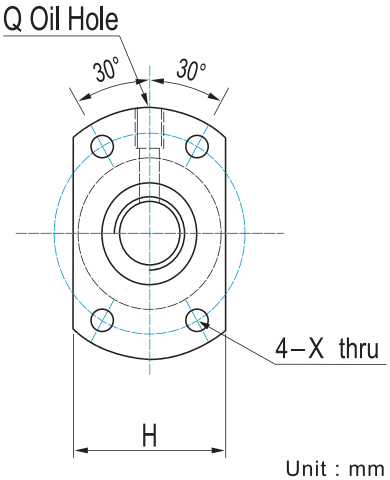
Unit : mm

Model No.	Dimensions														
	d	l	Da	D	A	B	T	L	W	X	H	Q	n	Ca(Kgf)	Coa(kgf)
1616-2	16	16	3.175	32	53	10	10.5	48	42	4.5	38	M6	A2	1512	1995
★ 2020-2	20	20	3.175	39	62	10	10.8	55	50	5.5	46	M6	A2	1659	2464
2520-2	25	20	3.5	47	74	12	11	65	60	6.6	49	M6	A2	2106	3422
2525-2	25	25	3.969	47	74	12	11.2	67	60	6.6	56	M6	A2	2481	3851
3232-2	32	32	4.762	58	92	15	14	82	74	9	68	M6	A2	3585	6071
4040-2	40	40	6.35	73	114	17	17	100	93	11	84	M6	A2	5778	11753
5050-2	50	50	7.938	90	135	20	21.5	125	112	14	92	M6	A2	8819	19241

★Note : with sign * can produce left helix

7.7 Type: FSB

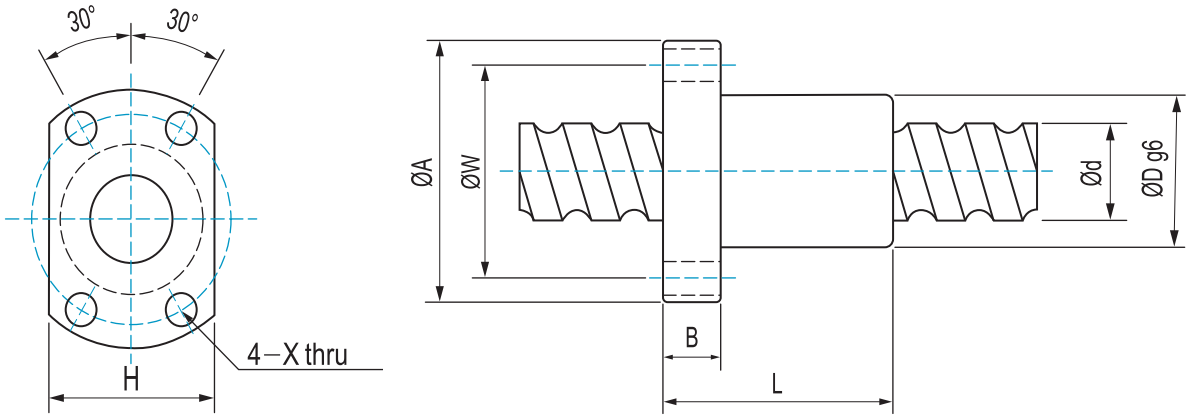




Unit : mm

Model No.	Dimensions													
	d	l	Da	D	A	B	L	W	X	H	Q	n	Ca(Kgf)	Coa(kgf)
1404-3	14	4	2.381	31	50	10	40	40	4.5	37	M6	T3	684	792
1405-3	14	5	3.175	32	50	10	45	40	4.5	38	M6	T3	1013	1056
1605-3	16	5	3.175	34	54	10	42	44	4.5	40	M6	T3	1049	1144
2005-3	20	5	3.175	40	60	10	47	50	4.5	46	M6	T3	1181	1496
2505-3	25	5	3.175	43	67	10	47	55	5.5	50	M6	T3	1330	1936
2510-3	25	10	4.762	60	96	15	75	78	9	72	M6	T3	2250	2772
2510-4	25	10	4.762	60	96	15	97	78	9	72	M6	T4	2881	3695
3210-3	32	10	6.35	67	103	15	78	85	9	78	M6	T3	3775	5877
3210-4	32	10	6.35	67	103	15	97	85	9	78	M6	T4	4834	7835
4010-4	40	10	6.35	76	116	17	100	96	11	88	M6	T4	5399	10074

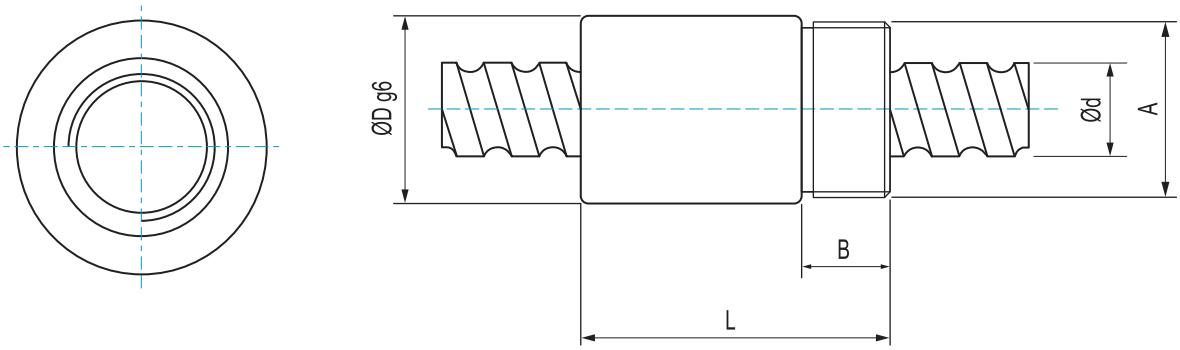
7.8 Type: FSK



Unit : mm

Model No.	Dimensions												
	d	l	Da	D	A	B	L	W	X	H	n	Ca(Kgf)	Coa(kgf)
0601-3	6	1	0.8	12	24	3.5	18	18	3.4	16	T3	111	123
0801-3	8	1	0.8	14	27	4	20	21	3.4	18	T3	126	162
0802-3	8	2	1.2	16	29	4	26	23	3.4	20	T3	215	239
0825-3	8	2.5	1.2	16	29	4	26	23	3.4	20	T3	215	239
1002-3	10	2	1.2	18	35	5	28	27	4.5	22	T3	240	302
1004-3	10	4	2	26	46	10	35	36	4.5	28	T3	472	489
1202-3	12	2	1.2	20	37	5	28	29	4.5	24	T3	265	377
1204-3	12	4	2.381	28	48	6	35	39	5.5	30	T3	645	693
1205-3	12	5	2	28	48	6	35	39	5.5	30	T3	514	594
1402-3	14	2	1.2	21	40	6	28	31	5.5	26	T3	283	440
1602-3	16	2	1.2	25	43	10	32	35	5.5	29	T3	300	503

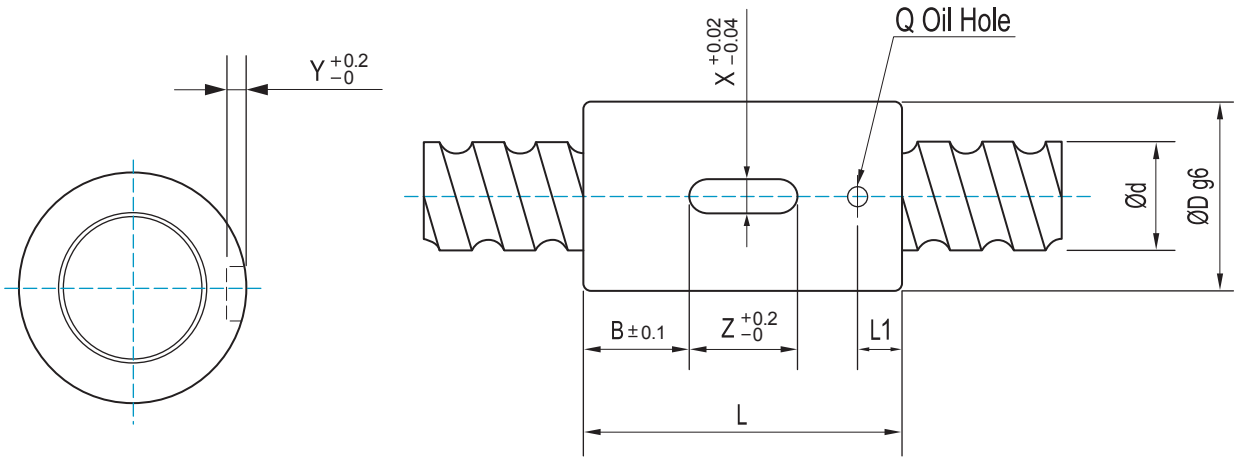
7.9 Type: RSK *(without wipers)*



Unit : mm

Model No.	Dimensions									
	d	l	Da	D	A	B	L	n	Ca(Kgf)	Coa(kgf)
0825-3	8	2.5	1.2	17.5	M15X1P	8	26	T3	215	239
1003-3	10	3	1.8	21	M18X1P	9	29	T3	403	424
1204-3	12	4	2.381	25.5	M20X1P	10	34	T3	645	693
1205-3	12	5	2	25.5	M20X1P	10	39	T3	514	594
1605-3	16	5	3.175	32.5	M26X1.5P	12	42	T3	1049	1144

7.10 Type: RSY

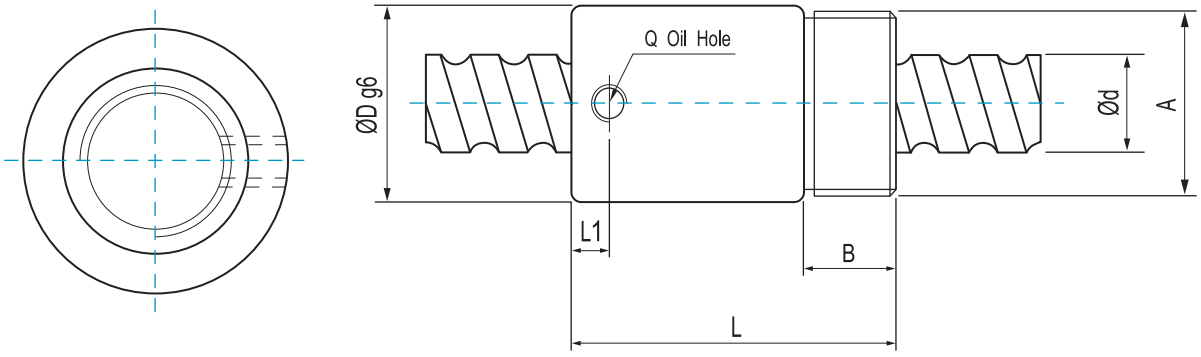


Unit : mm

Model No.	Dimensions													
	d	I	Da	D	L	B	X	Y	Z	Q	L1	n	(Ca Kgf)	(Coa (Kgf)
1202-3	12	2	1.2	24	30	9	3	1.5	12	Ø3	4	T3	265	377
1204-3	12	4	2.381	24	35	11.5	3	1.5	12	Ø3	5	T3	645	693
1205-3	12	5	2	24	40	14	3	1.5	12	Ø3	5	T3	514	594
1210-2	12	10	2	24	40	14	3	1.5	12	Ø3	5	T2	390	466
1602-3	16	2	1.2	28	40	10	5	2	20	Ø3	5	T3	300	503
1604-4	16	4	2.381	28	45	12.5	5	2	20	Ø3	7	T4	944	1254
1605-3	16	5	3.175	28	45	12.5	5	2	20	Ø3	7	T3	1049	1144
★ 1605-4	16	5	3.175	28	50	15	5	2	20	Ø3	7	T4	1344	1525
1610-3	16	10	3.175	28	45	12.5	5	2	20	Ø3	7	T3	1181	1496
1616-2	16	16	3.175	28	45	12.5	5	2	20	Ø3	7	T2	833	997
2005-3	20	5	3.175	36	47	13.5	5	2	20	Ø3	7	T3	1181	1496
★ 2005-4	20	5	3.175	36	53	16.5	5	2	20	Ø3	7	T4	1512	1995
2006-3	20	6	3.969	36	53	16.5	5	2	20	Ø3	7	T3	1568	1787
2010-3	20	10	3.969	36	68	24	5	2	20	Ø3	7	T3	1621	1925
2020-4	20	20	3.175	36	55	17.5	5	2	20	Ø3	7	T4	1659	2464
★ 2505-4	25	5	3.175	40	53	16.5	5	2	20	Ø3	7	T4	1704	2581
▲ 2510-3	25	10	3.5	40	54	17	5	2	20	Ø3	7	T3	1614	2460
★ 3205-4	32	5	3.175	50	53	11.5	6	2.5	30	Ø3	7	T4	1924	3403
3210-3	32	10	6.35	50	70	20	6	2.5	30	Ø3	7	T3	3775	5877
3220-3	32	20	3.969	50	78	24	6	2.5	30	Ø3	7	T3	2141	3576
★ 4005-4	40	5	3.175	63	56	13	6	2.5	30	Ø3	7	T4	2142	4342
4010-3	40	10	6.35	63	80	25	6	2.5	30	Ø3	7	T3	4216	7556
4020-3	40	20	5.556	63	83	26.5	6	2.5	30	Ø3	7	T3	3782	6468
5010-3	50	10	6.35	75	82	23	6	2.5	36	Ø3	7	T3	4633	9235
6310-4	63	10	6.35	85	90	29	6	3.5	32	Ø5	14	T4	6700	16230

★Note : with sign * can produce left helix
▲ steel balls 3.5mm, please order 3.5mm shaft to meet

7.11 Type: RSU

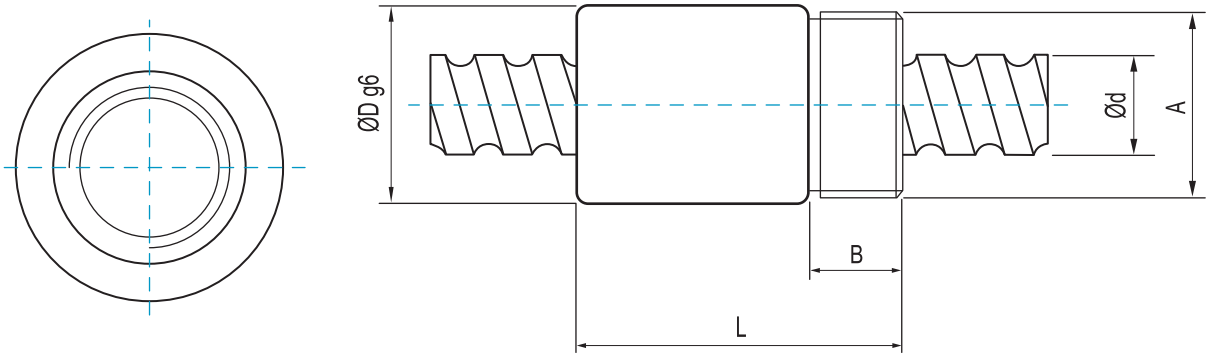


Unit : mm

Model No.	Dimensions											
	d	I	Da	D	A	B	L	Q	L1	n	Ca(Kgf)	Coa(kgf)
▲ 1604-3	16	4	2.381	29	M22X1.5P	8	32	-	-	T3	737	940
1605-4	16	5	3.175	32	M30X1.5P	16	56	M6	6.5	T4	1344	1525
2005-4	20	5	3.175	38	M35X1.5P	16.5	59.5	M6	7	T4	1512	1995
2505-4	25	5	3.175	42	M40X1.5P	17	60	M6	7	T4	1704	2581
2510-4	25	10	4.762	42	M40X1.5P	17	90	M6	10	T4	2881	3695
3205-4	32	5	3.175	52	M48X1.5P	19	60	M6	7	T4	1924	3403
3210-4	32	10	6.35	52	M48X1.5P	19	93	M6	12	T4	4834	7835
4005-4	40	5	3.175	58	M56X1.5P	19	59	M8	6	T4	2142	4342
4010-4	40	10	6.35	65	M60X1.5P	27	102	M8	12	T4	5399	10074
5010-4	50	10	6.35	78	M72X1.5P	29	104	M8	12	T4	5933	12313

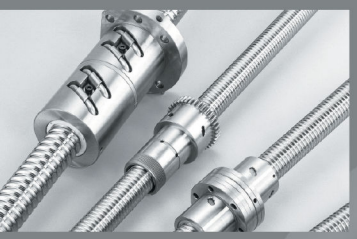
▲ without wipers

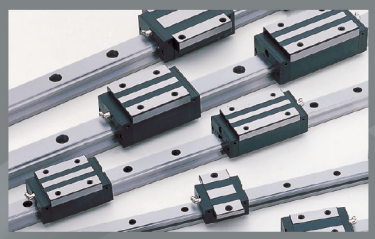
7.12 Type: RSH



Unit : mm

Model No.	Dimensions									
	d	I	Da	D	A	B	L	n	Ca(Kgf)	Coa(kgf)
12H2-1.5	12	12.7	2.381	29.5	M25x1.5P	12	50	A1	397	445
16H5-3.5	16	5.08	3.175	25.4	15/16"x16un	12.7	43.43	C1	1348	1745





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