

# BALL SCREWS



**ROLLCO**

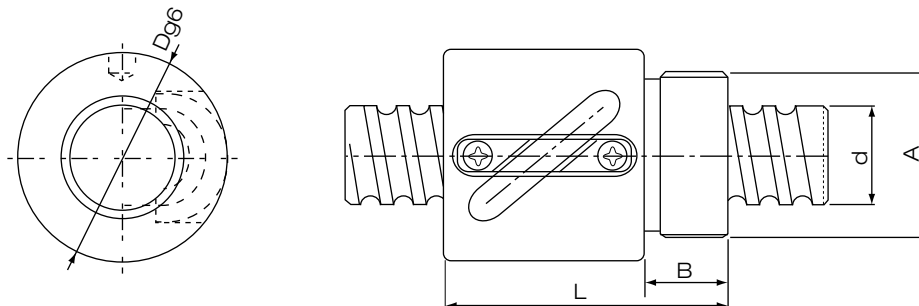
SPECIALIZED  
ON LINEAR MOTION



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**Type: RSWR - Single nut, cylindrical with thread**



**l:** Lead

**Ca:** Basic Dynamic Load Rating (N)

**Da:** Ball Dia.

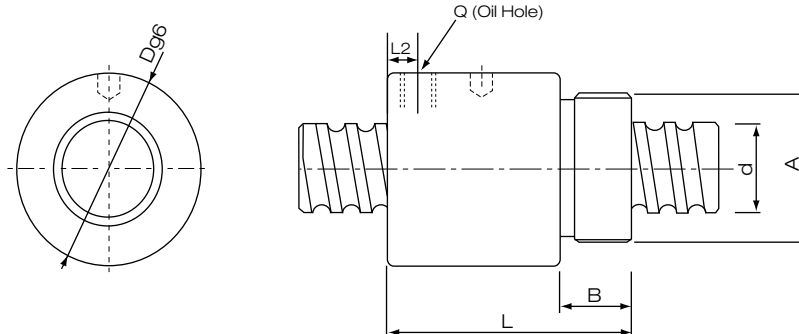
**Coa:** Basic Static Load Rating (N)

**n:** Number of Circuits

All other dimensions in mm.

Model no.				Effective Turns	Nut				Basic Rate Load	
	d	l	Da		n	Dg6	L	A	B	Ca
RSWR082,5	8	2,5	1.2	2,5 x 1	17.5	23.5	M15 x 1	7.5	1510	2320
RSWR1204	12	4	2.381	3.5 X 1	25.5	34	M20 x 1	10	4250	7380
RSWR1605	16	5	3.175	2.5 X 1	32.5	42	M26 x 1.5	12	7160	12300

**Type: RSCR - Single nut, cylindrical with thread - internal recirculation**



**l:** Lead

**Da:** Ball Dia.

**n:** Number of Circuits

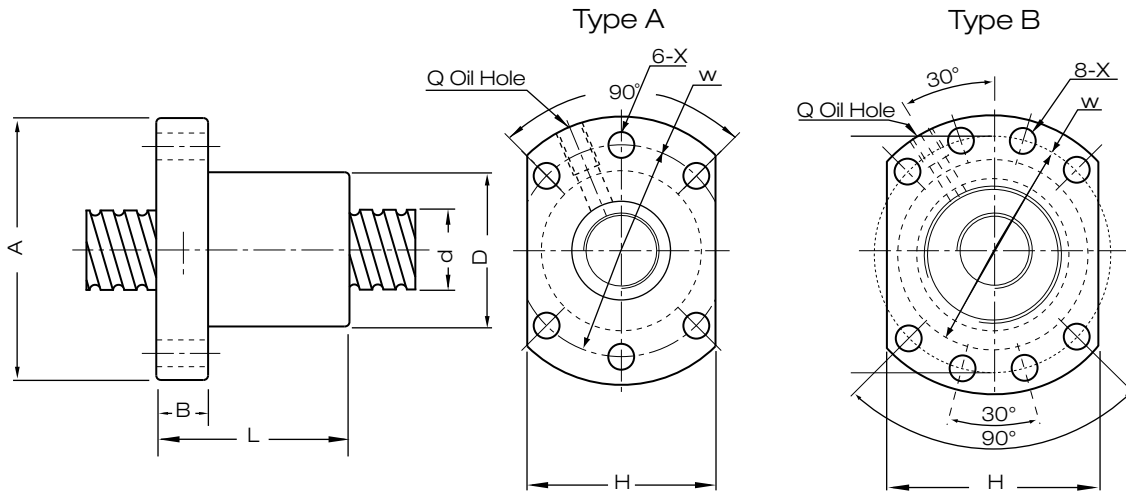
**Ca:** Basic Dynamic Load Rating (N)

**Coa:** Basic Static Load Rating (N)

All other dimensions in mm.

Model no.	Effective Turns			Nut							Basic Rate Load	
	d	l	Da	n	Dg6	L	A	B	L2	Q	Ca	Coa
RSCR1605	16	5	3.175	1 x 4	32	56	M30x1.5	16	7	M6	7800	17900
RSCR2005	20	5	3.175	1 x 4	38	59.5	M35x1.5	16.5	7	M6	11300	23800
RSCR2505	25	5	3.175	1 x 4	42	60	M40x1.5	17	7	M6	12800	31100
RSCR2510	25	10	4.762	1 x 4	42	90	M40x1.5	17	10	M6	19440	38770
RSCR3205	32	5	3.175	1 x 4	52	60	M48x1.5	19	7	M6	14500	41500
RSCR3210	32	10	6.35	1 x 4	52	93	M48x1.5	19	12	M6	33900	71700
RSCR4005	40	5	3.175	1 x 4	58	59	M56x1.5	19	6	M8	16100	53300
RSCR4010	40	10	6.35	1 x 4	65	102	M60x2	27	12	M8	39100	95200
RSCR5010	50	10	6.35	1 x 4	78	104	M72x2	29	12	M8	44500	125000

**Type: FSCR - Single nut with flange (DIN 69051)**



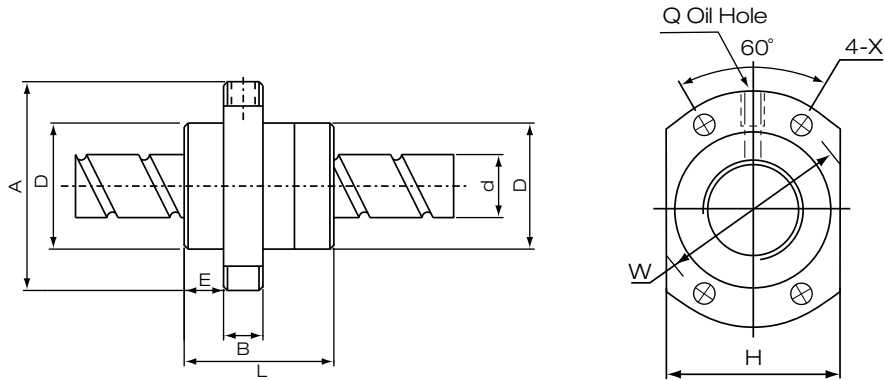
- I:** Lead
- K:** Stiffness (N/μm)
- Da:** Ball Dia.
- Ca:** Basic Dynamic Load Rating (N)
- n:** Number of Circuits
- Coa:** Basic Static Load Rating (N)

All other dimensions in mm.

Model no.	Dimension													Basic load rate		
	d	I	Da	D	A	B	L	W	X	Type	H	Q	n	Ca	Coa	K
FSCR1605	16	5	3.175	28	48	10	50	38	5.5	A	40	M6	4	7800	17900	170
FSCR1610	16	10	3.175	28	48	12	43.3	38	5.5	A	40	M6	3	7160	12320	150
FSCR2005	20	5	3.175	36	58	10	53	47	6.6	A	44	M6	4	11000	22800	210
FSCR2505	25	5	3.175	40	62	10	53	51	6.6	A	48	M6	4	12500	30700	260
FSCR2510	25	10	4.762	40	62	12	85	51	6.6	A	48	M6	4	19440	38770	270
FSCR3205	32	5	3.175	50	80	12	53	65	9	A	62	M6	4	14000	40800	320
FSCR3210	32	10	6.35	50	80	16	90	65	9	A	62	M6	4	33900	71700	340
FSCR3220	32	20	3.969	50	80	13	78	65	9	A	62	M6	3	20090	34370	270
FSCR4005	40	5	3.175	63	93	16	56	78	9	B	70	M8	4	15750	52900	380
FSCR4010	40	10	6,35	63	93	18	93	78	9	B	70	M8	4	38500	94700	410
FSCR4020	40	20	5.556	63	93	15	83	78	9	B	70	M8	3	38660	64060	340
FSCR5010	50	10	6.35	75	110	18	93	93	11	B	85	M8	4	43900	124000	500
FSCR6310	63	10	6,35	90	125	18	98	108	11	B	95	M8	4	50700	166000	800

Left hand FSCL2005 (nut length 34 mm) and FSCL 3205 are in stock - other types on request. Please contact Rolco.

**Type: FSER - Single nut with flange - long lead**



**I:** Lead

**Da:** Ball Dia.

**n:** Number of Circuits

**K:** Stiffness (N/μm)

**Ca:** Basic Dynamic Load Rating (N)

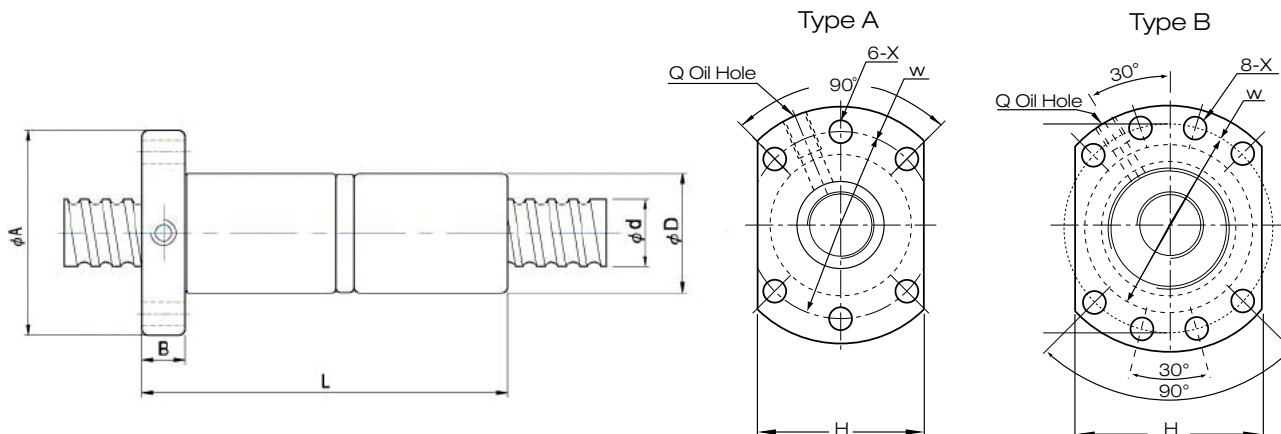
**Coa:** Basic Static Load Rating (N)

All other dimensions in mm.

Model no.	Dimension														Basic load rate		
	d	I	Da	D	A	B	E	L	W	X	H	Q	n	Ca	Coa	K	
FSER1616	16	16	3.175	32	53	10	10,5	48	42	4.5	38	M6	1.8x2	7190	14290	90	
FSER2020	20	20	3.175	39	62	10	10,8	55	50	5.5	46	M6	1.8x2	7800	22800	210	
FSER2525	25	25	3.969	47	74	12	11,2	67	60	6.6	56	M6	1.8x2	12300	35700	270	
FSER3232	32	32	4.762	58	92	15	14	82	74	9	68	M6	1.8x2	17600	55000	330	
FSER4040	40	40	6.35	73	114	17	17	100	93	11	84	M6	1.8x2	28700	91700	420	
FSER5050	50	50	7,938	90	135	20	21,5	125	112	14	92	M6	1.8x2	51000	138000	580	

Other types on request - please contact Rollco

# Type: FDCR - Double nut with flange (DIN 69051)



**l:** Lead

**Da:** Ball Dia.

**n:** Number of Circuits

**K:** Stiffness (N/μm)

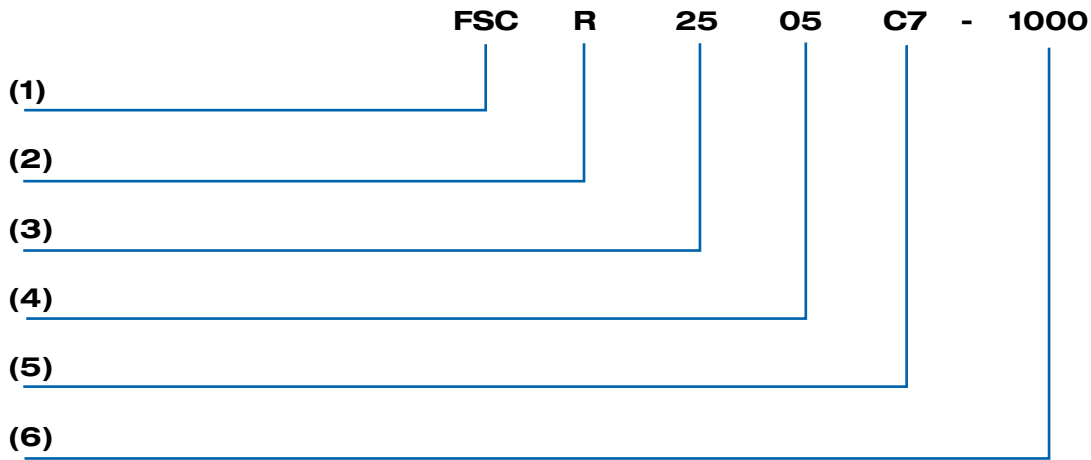
**Ca:** Basic Dynamic Load Rating (N)

**Coa:** Basic Static Load Rating (N)

All other dimensions in mm.

Model no.	Dimension													Basic load rate		
	d	l	Da	D	A	B	L	W	X	Type	H	Q	n	Ca	Coa	K
FDCR1605	16	5	3,175	28	48	10	80	38	5,5	A	40	M6	3	7800	17900	370
FDCR2005	20	5	3,175	36	58	12	92	47	6,6	A	44	M6	4	11000	22800	490
FDCR2505	25	5	3,175	40	62	12	92	51	6,6	A	48	M6	4	12500	30700	580
FDCR2510	25	10	4,762	40	62	12	153	51	6,6	A	48	M6	4	19440	38770	490
FDCR3205	32	5	3,175	50	80	12	92	65	9	A	62	M6	4	14000	40800	700
FDCR3210	32	10	6,35	50	80	16	160	65	9	A	62	M6	4	33900	71700	790
FDCR4005	40	5	3,175	63	93	15	96	78	9	B	70	M8	4	15750	52900	840
FDCR4010	40	10	6,35	63	93	18	162	78	9	B	70	M8	4	38500	94700	970
FDCR5010	50	10	6,35	75	110	16	162	93	11	B	85	M8	4	43900	124000	1150

# Order Code



## (1) Nut type codes

- RSW** = Single nut, cylindrical with thread
- RSC** = Single nut, cylindrical with thread
- FSC** = Single nut with flange
- FSE** = Single nut with flange long lead
- FDC** = Double nut with flange
- Other types on request

## (2) Direction of helix

**R:** Right (standard)    **L:** Left

## (3) Shaft dia. (mm)

## (4) Lead (mm)

## (5) Accuracy grade code

C0 ´ C1 ´ C2 ´ C3 ´ C5 ´ C7 ´ C10 (C7 is standard)

## (6) Total length of shaft (mm)

Nuts and screw-shaft can be ordered separately in example FSCR2505 for the nut.  
Screw shaft SR2505C7-1000 means right thread, length 1000 mm - accuracy C7.

## Lead and Travel Accuracy

Lead accuracy of ball screws (grade C0-C5) is specified in 4 basic terms ( $E$ ,  $e$ ,  $e_{300}$ ,  $e_{2\pi}$ ). Accumulated travel deviations for grade C7 and C10 are specified only by the allowable value per 300 mm measured within any portion of the threaded length. They are 0.05 mm for C7 and 0.21 mm for C10.

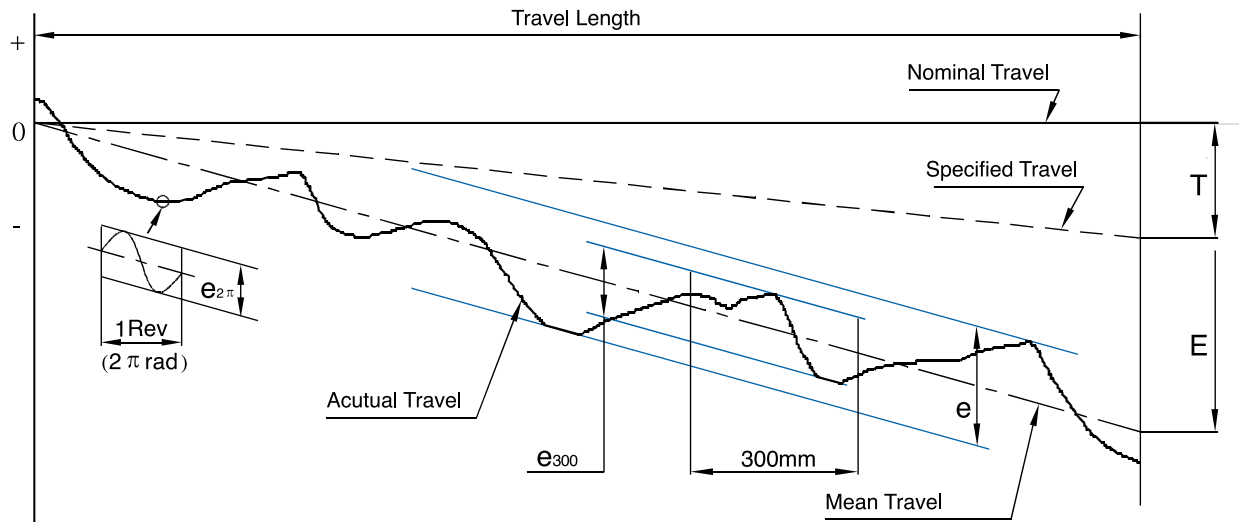


Diagram of Lead Accuracy

## Definition of Terms for Lead Accuracy

Terms	Reference	Definition
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 screwshaft.
Mean travel		Mean travel is the linear best fit line. 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.
Travel variations	e	Travel variations is the band of 2 lines drawn parallel to the mean travel, on the plus and minus side.
	e <sub>300</sub>	Maximum width of variation over the travel length.
	e <sub>2π</sub>	Actual width of variation for the length of 300 mm taken anywhere within the travel length.
	e <sub>2π</sub>	Wobble error, actual width of variation for one revolution (2π radian).

## Mean Travel Deviation ( $\pm E$ ) and Travel Variation( $e$ ) (JIS B 1192)

Unit:  $\mu\text{m}$

Grade		C0		C1		C2		C3		C5		C7	C10
Over	Incl.	$\pm E$	$e$	$\pm E$	$e$	$\pm E$	$e$	$\pm E$	$e$	$\pm E$	$e$	$\pm E$	$\pm E$
	100	3	3	3.5	5	5	7	8	8	18	18	$\pm 50 /$ 300mm $\pm 210 /$ 300mm	
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		
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		

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

Unit:  $\mu\text{m}$

Grade	C0	C1	C2	C3	C5	C7	C10
$e_{300}$	3.5	5	7	8	18	50	210
$e_{2\pi}$	2.5	4	5	6	8		

# Clearance in the Axial Direction of the Rolled Ball Screw

## Axial play (P0)

Unit:  $\mu$  m

Screw Shaft OD	Rolled ball Screw Clearance in the Axial Direction (max)	
mm	mm	
4 ~ 14	0.05	small size of ball screw
15 ~ 50	0.08	middle size of ball screw
50 ~ 80	0.12	big size of ball screw

## Reduced preload (P1)

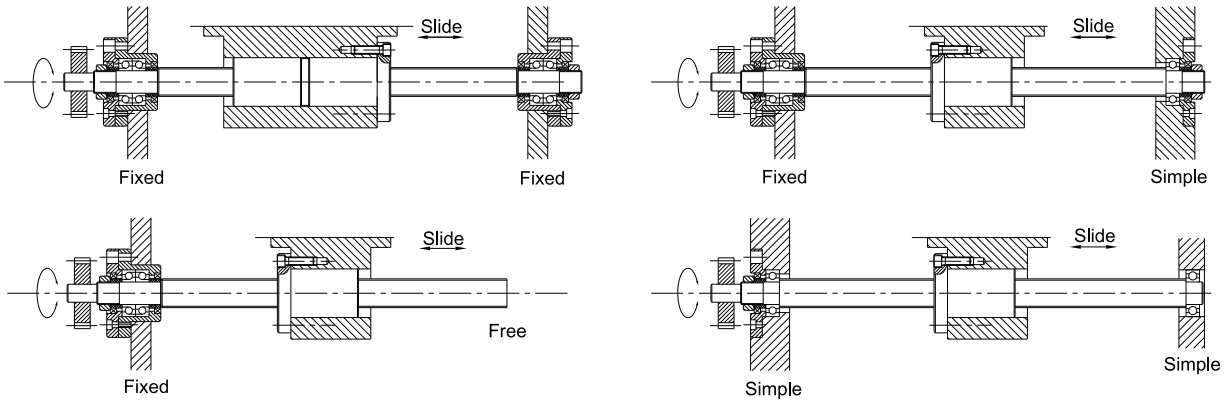
Max 0,02 mm clearance.

## Light preload (P2)

Model No.	Spring Force (Kg) Single Nut
1605	0.1 ~ 0.3
2005	0.1 ~ 0.3
2505	0.2 ~ 0.5
3205	0.2 ~ 0.5
4005	0.2 ~ 0.5
2510	0.2 ~ 0.5
3210	0.3 ~ 0.6
4010	0.3 ~ 0.6
5010	0.3 ~ 0.6
6310	0.6 ~ 1.0
8010	0.6 ~ 1.0

# Mounting Methods

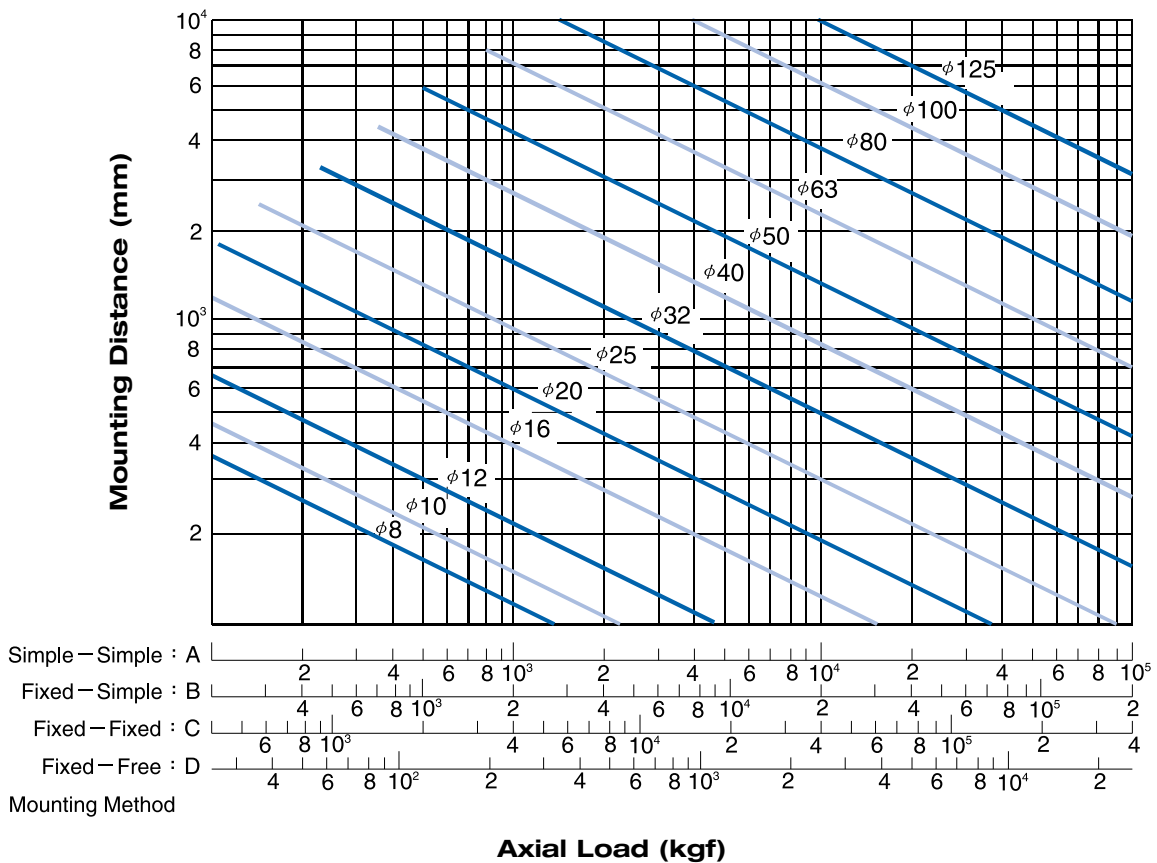
Both the critical speed and column buckling load depend upon the method of mounting and the unsupported length of the shaft.



# Buckling Load

The safety of the screw shaft against buckling needs to be checked when the shaft is expected receive buckling loads. The figure shows a diagram which summarizes the allowable compressive load for buckling for each nominal outside diameter of screw shaft.

Select the graduation of allowable axial load of the ball groove regardless of the mounting method when the mounting distance is short.



# Critical Speed

It is necessary to check if the ball screw rotation speed is resonant with the natural frequency of the screw shaft. We recommend 80% or less of this critical speed as an allowable rotation speed. The figure shows a diagram which summarizes the allowable rotation speed for shaft nominal diameters up to outside diameter of the screw shaft exceeds 125 mm. Select the graduation of allowable rotation speed according to the method of supporting the ball screw. Where the working rotation speed presents a problem in terms of critical speed, it would be best to provide an intermediate support to increase the natural frequency of the screw shaft.

## dm·n value

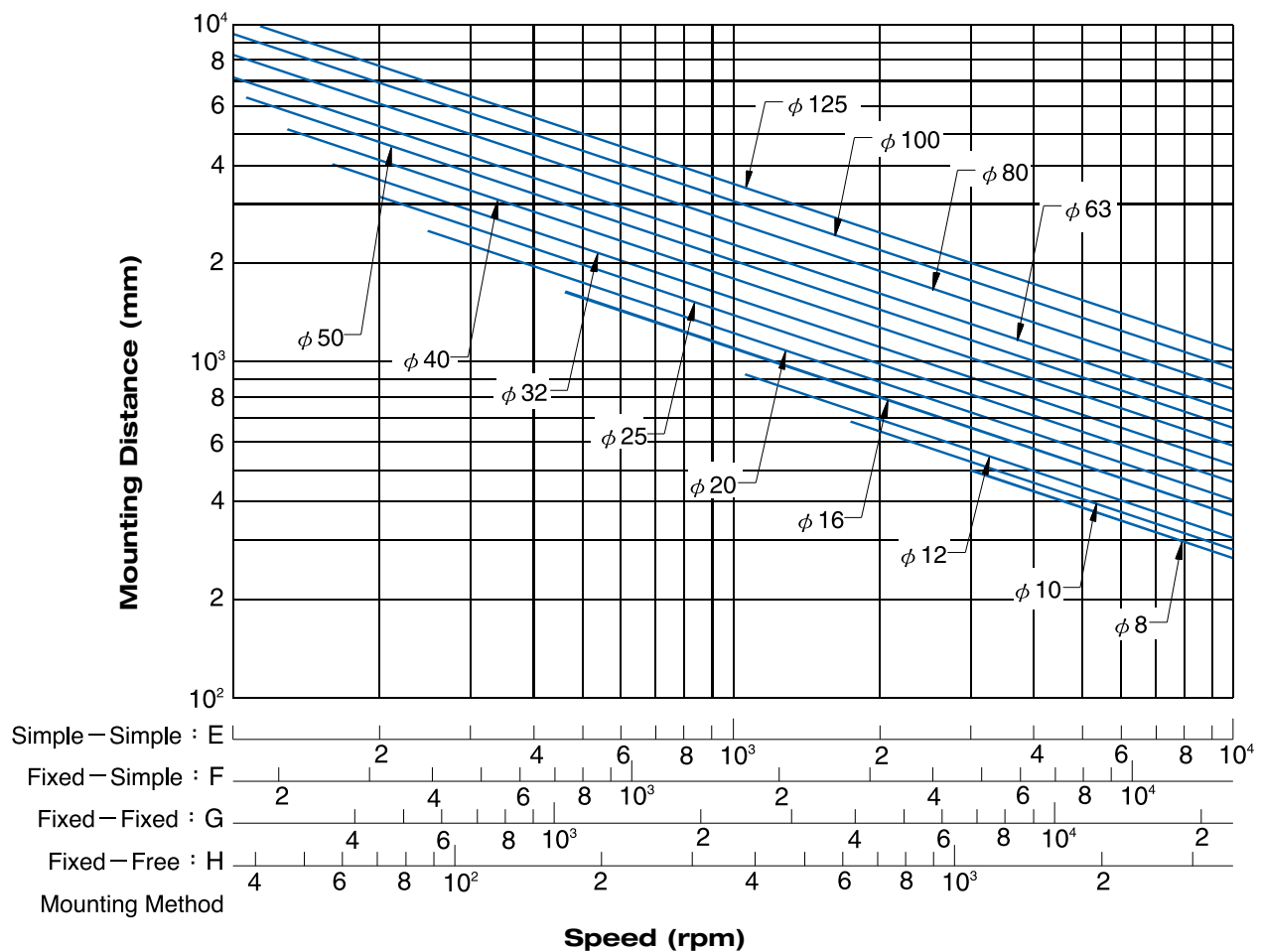
The allowable rotation speed is regulated also by the dm·n value (dm:diameter of central circle of steel ball, n: Revolution speed, rpm) which expresses the peripheral speed.

Generally:

For precision Ball Screws accuracy grade C7  $dm \cdot n \leq 100,000$

For Commercial Ball Screw Accuracy Grade C7  $dm \cdot n \leq 70,000$

Product exceeding the above limits can be produced. Please contact Rollco.



## Calculation of Life

The fatigue life is generally expressed by the total number of revolutions. The total rotation hours or total travel distance may also be used to express life. The fatigue life is calculated as follows:

$$L = \left( \frac{Ca}{Pa \cdot fw} \right)^3 \cdot 10^6$$

$$Lf = \frac{L}{60n}$$

$$Ls = \frac{L \cdot \ell}{10^6}$$

Where

L : Rated fatigue life (rev)

Ls : Life in travel distance (km)

Pa : Axial load (N)

fw : Load factor (factor depending on operation conditions)

Lf : Life in hours (h)

Ca : Basic dynamic load rating (N)

n : Rotating speed (rpm)

ℓ : Lead (mm)

	<b>fw:</b>
Smooth operation without impact	1.0~1.2
Normal operation	1.2~1.5
Operation with impact and vibration	1.5~3.0

**Basic Dynamic Load Rating Ca:**  $Ca = \text{Average Load} \cdot fs$

**Basic Static Load Rating Coa:**  $Coa = \text{Max Load} \cdot fs$

## Factor of Safety (fs)

<b>Usage</b>	<b>Operation</b>	<b>fs</b>
Industrial machines	Normal operation	1.0~1.3
	Operation with impact and vibration	2.0~3.0
Working machines	Normal operation	1.0~1.5
	Operation with impact and vibration	2.5~7.0

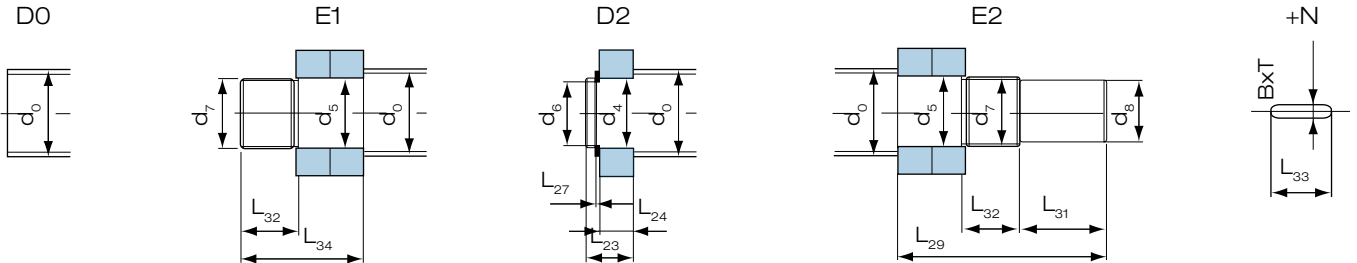
## Lubrication

Adequate lubrication must be provided when ball screw is used, insufficient lubrication will result in contact of metal, which in turn leads to increase of friction and friction loss, this cause failure or shortening of service life. We recommend to use grease with Lithium-based soap.

# Support Units and Recommended Screw-shaft Diameters

Fixed-side	Fixed-side	Supported-side	Supported-side	Applicable Screw do mm
BK8	FK 8	BF8	FF 8	ø12
BK10	FK 10	BF10	FF 10	ø14
BK12	FK 12	BF12	FF 12	ø16
BK15	FK 15	BF15	FF 15	ø20
BK20	FK 20	BF20	FF 20	ø25
BK25	FK 25	BF25	FF 25	ø32
BK30	FK 30	BF30	FF 30	ø40
BK40	FK 40	BF40	FF 40	ø 50

## Standard end Journals



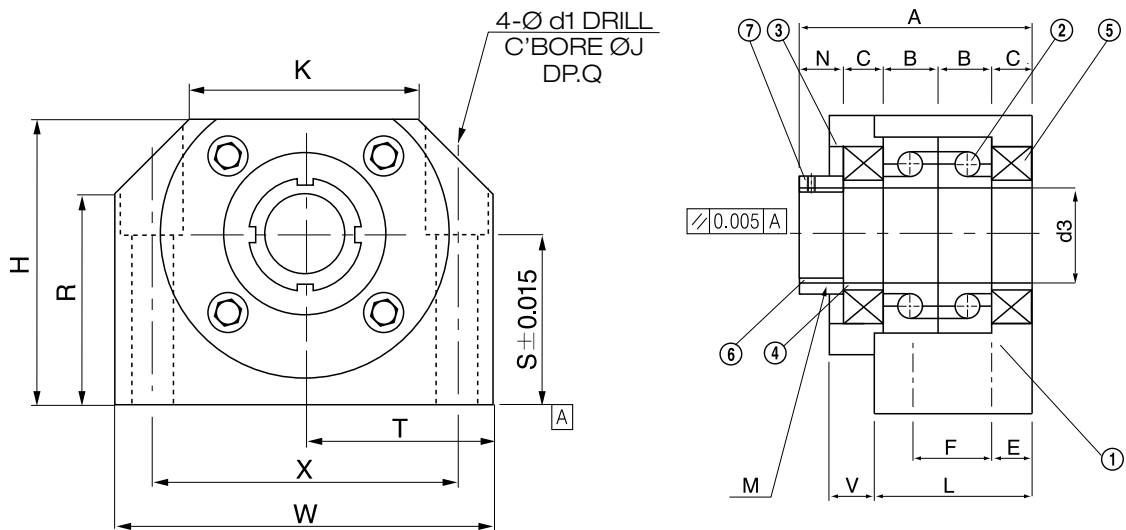
Standard end journals

$d_0$	$d_4$	$d_5$	$d_6$	$d_7$	$d_8$	$L_{23}$	$L_{24}$	$L_{27}$	$L_{29}$	$L_{31}$	$L_{32}$	$L_{34}$	$B_{Pg} \times L_{33} \times T$	Unit size
	j6	j6	h12		h7			H13						
*12	8	8	7.6	M8x0.75	6	9	7	0.9	51	15	10	36	2x10x1.2	8
16	10	12	9.6	M12x1.0	10	10.5	8	1.15	65	25	10	40	3x18x1.8	12
20	15	15	14.3	M15x1.0	12	13	9	1.15	78	35	11	43	4x27x2,5	15
**25	20	20	19.0	M20x1.0	16	16	12	1.35	101	45	14	56	5x36X3	20
32	25	25	23,9	M25x1,5	20	19	15	1.35	120	55	15	65	6x45x3.5	25
40	30	30	28.6	M30x1.5	25	21	16	1.65	133	64	15	69	8x50x4	30
50	40	40	37.5	M40x1.5	36	25	18	1.85	168	78	22	90	10x63x5	40

\*valid for BF8. For FF8  $d_4=6$   $L_{24}=6$   $L_{23}=8$  and  $d_6=5,7$

\*\*valid for BF20. For FF20 is  $L_{23}=18$  and  $L_{24}=14$

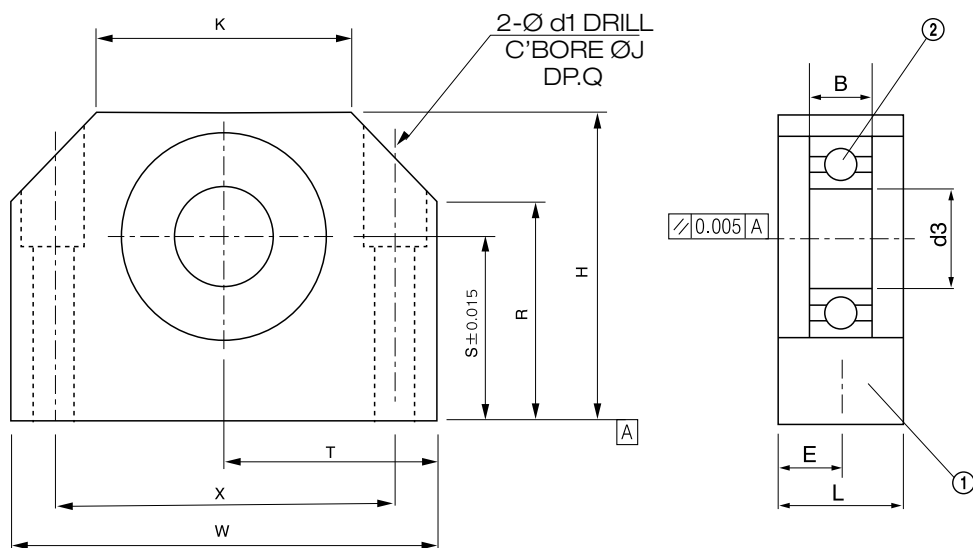
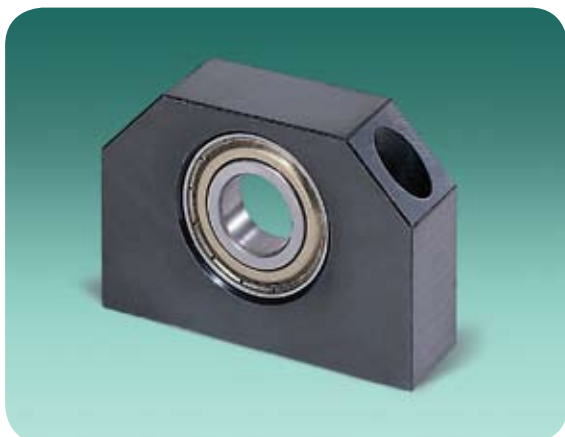
# Type: BK



BK part list (1):Housing (2):Bearing (3):Bracket (4):Collar (5):Seal (6):Ring nut (7):Set Screw

Reference	Dimension							Mounting													
	W	H	S	R	T	X	K	d1	J	Q	M	L	E	F	V	A	B	C	N	d3	BRG
BK 8	52	32	17	18.5	26	38	25	6.6	11	6.5	M8*0.75	23	-	11.5	5	33	7	6	6	8	608
BK 10	60	39	22	26	30	46	34	6.6	11	6.5	M10*1	25	6	13	6	38	8	7	8	10	7000A
BK 12	60	43	25	30	30	46	34	6.6	11	6.5	M12*1	25	6	13	6	38	8	7	8	12	7001A
BK 15	70	48	28	33	35	54	40	6.6	11	6.5	M15*1	27	6	15	7	40	9	7	8	15	7002A
BK 17	86	64	39	46	43	68	50	9	14	8.5	M17*1	35	8	19	9	52	12	9	10	17	7203A
BK 20	88	60	34	42	44	70	52	9	14	8.5	M20*1	35	8	19	9	52	12	9	10	20	7004A
BK 25	106	80	48	59	53	85	64	11	17.5	11	M25*1.5	42	10	22	11	62	15	10	12	25	7205B
BK 30	128	89	51	63	64	102	76	14	20	13	M30*1.5	45	11	23	12	66	16	11	12	30	7206B
BK 40	160	110	60	80	80	130	100	18	26	17.5	M40*1.5	61	14	33	15	82	18	16	14	40	7208B

# Type: BF



BF part list (1):Housing (2):Bearing (3):Snap Ring

Reference	Dimension							Mounting							
	W	H	S	R	T	X	K	d1	J	Q	L	E	d3	B	BRG
BF 8	52	32	17	18.5	26	38	25	6.6	11	6.5	20	10	8	7	608
BF 10	60	39	22	26	30	46	34	6.6	11	6.5	20	10	8	7	608
BF 12	60	43	25	30	30	46	34	6.6	11	6.5	20	10	10	8	6000
BF 15	70	48	28	33	35	54	40	6.6	11	6.5	20	10	15	9	6002
BF 17	86	64	39	46	43	68	50	9	14	8.5	23	11.5	17	12	6203
BF 20	88	60	34	42	44	70	52	9	14	8.5	26	13	20	12	6004
BF 25	106	80	48	59	53	85	64	11	17.5	11	30	15	25	15	6205
BF 30	128	89	51	63	64	102	76	14	20	13	32	16	30	16	6206
BF 40	160	110	60	80	80	130	100	18	26	17.5	37	18.5	40	18	6208

# Type: FK



FK 8, 10, 12, 15, 20



FK 25, 30, 40

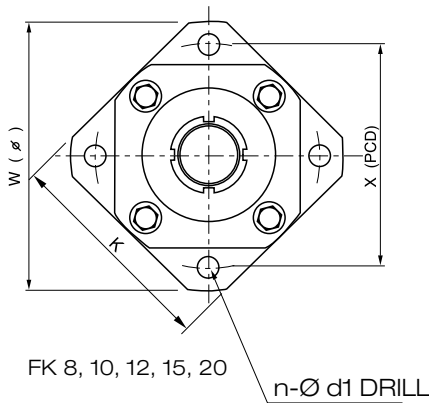


Fig. 1-1

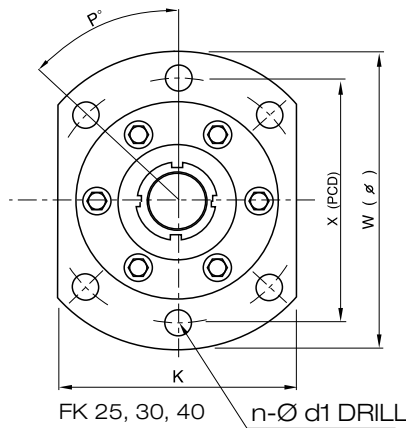
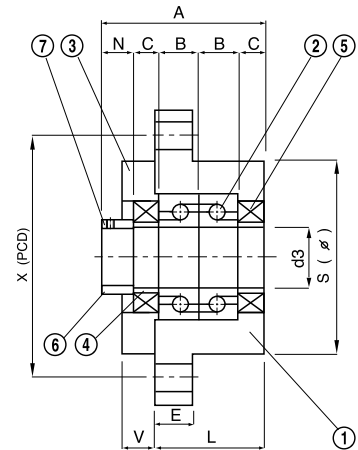


Fig. 1-2



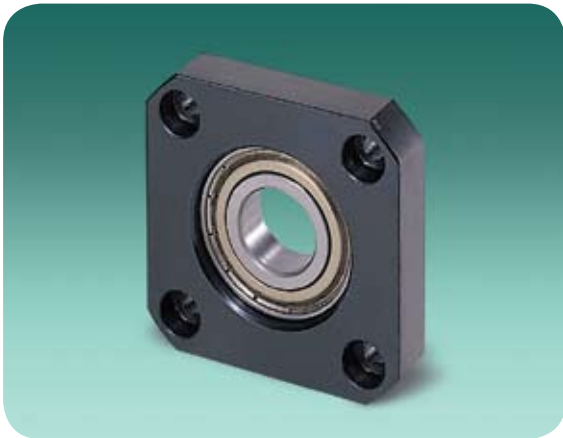
FK part list (1):Housing (2):Bearing (3):Bracket (4):Collar (5):Seal (6):Ring Nut (7):Set Screw

Reference	Dimension							Mounting									
	W	L	S	K	E	V	X	n	d1	p°	M	A	B	C	N	d3	BRG
FK 8	43	21	28	35	7	5	35	4	3.4	90	M8*0.75	30	7	5	6	8	608
FK 10	52	25	34	42	7	6	42	4	4.5	90	M10*1	38	8	7	8	10	7000A
FK 12	54	25	36	44	8	6	44	4	4.5	90	M12*1	38	8	7	8	12	7001A
FK 15	63	27	40	52	10	7	50	4	5.5	90	M15*1	40	9	7	8	15	7002A
FK 20	85	37	57	68	15	7	70	4	6.6	90	M20*1	52	14	7	10	20	7204B
FK 25	122	42	80	92	15	11	100	6	11	45	M25*1.5	62	15	10	12	25	7205B
FK 30	138	45	90	106	16	12	116	6	11	45	M30*1.5	66	16	11	12	30	7206B
FK 40	176	61	120	128	19	15	150	6	14	45	M40*1.5	82	18	16	14	40	7208B

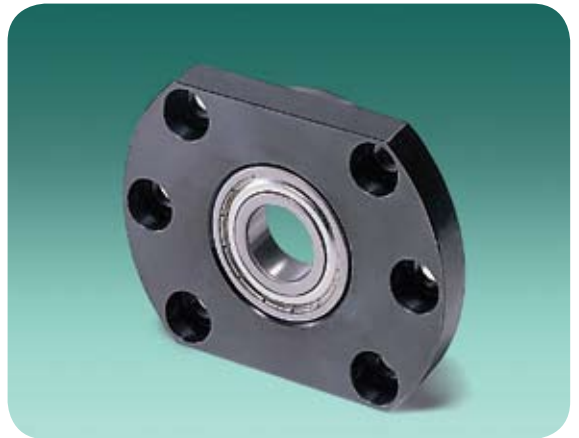
Fig.1-1

Fig.1-2

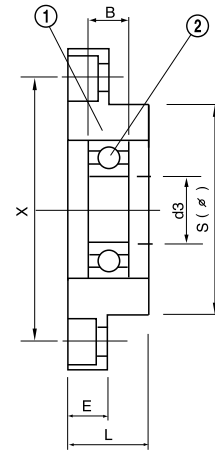
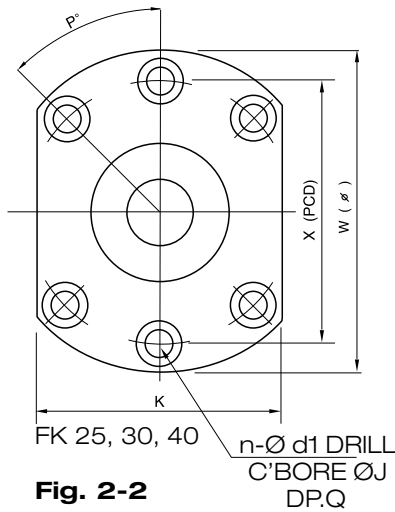
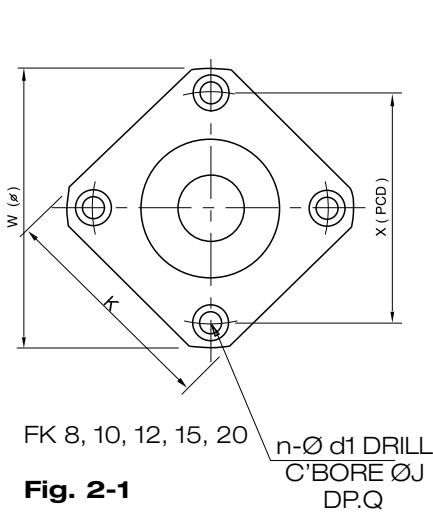
Type: FF



FF 8, 10, 12, 15, 20



FF 25, 30, 40



FF part list    **(1):**Housing    **(2):**Bearing    **(3):**Snap Ring

Reference	Dimension						Mounting							
	W	L	S -0.000 -0.030	K	E	X	n	d1	J	Q	p°	d3	B	BRG
FF 8	43	11	28	35	6	35	4	3.4	6.5	4	90	6	6	606
FF 10	52	12	34	42	7	42	4	4.5	8	5	90	8	7	608
FF 12	54	15	36	44	8	44	4	4.5	8	5	90	10	8	6000
FF 15	63	17	40	52	9	50	4	5.5	9.5	6	90	15	9	6002
FF 20	85	20	57	68	14	70	4	6.6	11	10	90	20	14	6204
FF 25	122	30	80	92	15	100	6	11	17.5	11	45	25	15	6205
FF 30	138	32	90	106	15	116	6	11	17.5	11	45	30	16	6206
FF 40	176	36	120	128	18	150	6	14	20	13	45	40	18	6208

Fig.2-1

Fig.2-2

# Load Capacity of Support Units

Model			Ball Bearing	Axial Dynamic Load (N)	Radial Dynamic Load (N)	Permissible Load (N)
BK 8	Fixed	Block type	608ZZ	1640	3350	
FK 8	Fixed	Flange type				
BF 8	Supported	Block type	606ZZ		2310	
FF 8	Supported	Flange type				
BK 10	Fixed	Block type	7000ADF	6700		2780
FK 10	Fixed	Flange type				
BF 10	Supported	Block type	608ZZ		3350	
FF 10	Supported	Flange type				
BK 12	Fixed	Block type	7001ADF	7250		3100
FK 12	Fixed	Flange type				
BF 12	Supported	Block type	6000ZZ		4650	
FF 12	Supported	Flange type				
BK 15	Fixed	Block type	7002ADF	7750		4070
FK 15	Fixed	Flange type				
BF 15	Supported	Block type	6002ZZ		5700	
FF 15	Supported	Flange type				
BK 17	Fixed	Block type	7203ADF	14000		5950
FK 17	Fixed	Flange type				
BF 17	Supported	Block type	6203ZZ		9750	
FF 17	Supported	Flange type				
BK 20	Fixed	Block type	7004ADF	12950		9700
FK 20	Fixed	Flange type	7204BDF	18300		
BF 20	Supported	Block type	6004ZZ		9550	
FF 20	Supported	Flange type	6204ZZ		13000	
BK 25	Fixed	Block type	7205ADF	20600		11700
FK 25	Fixed	Flange type				
BF 25	Supported	Block type	6205ZZ		14300	
FF 25	Supported	Flange type				
BK 30	Fixed	Block type	7206ADF	28600		16600
FK 30	Fixed	Flange type				
BF 30	Supported	Block type	6206ZZ		19800	
FF 30	Supported	Flange type				
BK 40	Fixed	Block type	7208ADF	45000		27700
FK 40	Fixed	Flange type				
BF 40	Supported	Block type	6208ZZ		29700	
FF 40	Supported	Flange type				

**Notes:**

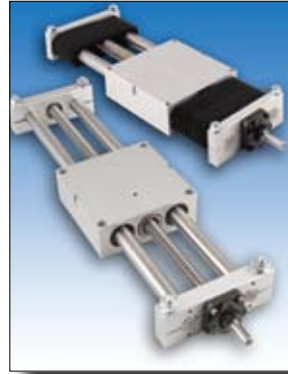
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