SGO
OILLESS BEARING

Head office - Factory
28-10, Namdongseo-ro 113beon-gil, Namdong-gu, Incheon, Republic of Korea
TEL : +82-32-813-3401 / **FAX :** +82-32-813-4259 / **Homepage :** www.sgoilless.co.kr / **E-mail :** info@sgoilless.co.kr

Seoul office
15, Gyeongin-ro 53-gil, Guro-gu, Seoul, Republic of Korea
TEL : +82-2-2614-8837 / **FAX :** +82-2-2614-8878

Changwon office
21, Wollim-ro 39beon-gil, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Republic of Korea
TEL : +82-55-262-3401 / **FAX :** +82-55-262-3403

Online Shopping Mall
www.oilless.net / **E-mail :** sgoshop@sgoilless.co.kr

Homepage

Online Shopping Mall

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OILLESS BEARING

SGO
OILLESS BEARING

Technical **Value Creator**

SGO

Fulfilling **SGO's** Commitment for Customer Satisfaction through Clean Environment and Management

Mfg. Facilities


Furnace


Continuous Casting


2,750 Ton Extrusion Machine


Graphite Plug Molding Machine


Sintering Press


Machining Line


Automated Machining Line


Turning Machine for Big bearings


MES (Manufacturing Execution System)

Inspection Facilities


Spark Spectrometer


Hardness Tester


Tensile Strength Tester

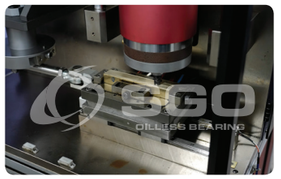

Optical Microscope


3D Measuring Machine


Shape Measuring Machine


Electronic Densimeter


Friction & Wear Tester - Bushing


Friction & Wear Tester - Plate

What is **Oilless bearing?**

A bearing that can improve productivity and save cost/time by having the material properties which can withstand both high & low temperature, corrosive environment, foreign particles, and impact load. There are various kind of shapes and materials for oilless bearings such as metal, non-metal, plastic and ceramic.

Applications

- Place where lubrication cannot be applied or lubrication is dangerous.
- Place where product can be contaminated or failure is occurred due to lubrication.
- Low / High temperature, under-water, and place that is exposed to chemicals.
- Place that can prevent decrease in productivity due to machine stop while lubricating.
- Place where oiling is not effective due to harsh conditions such as frequent stop motion.
- Impact and vibration, high-load low-speed motion, rust occurrence, foreign substance penetration.
- Sliding motion, angular pitching motion.

Advantage & Disadvantage of each lubricating method

Lubrication Type

- **Dry Lubrication = Using solid lubricant**
  Example) SGO SDU Dry Bearing ➡ Teflon + Special additive
  SGO #500 Bearing ➡ Natural graphite + Teflon lubricant
- **Liquid lubrication (Using oil or water)**
  Example) SGO #300 ➡ Oil impregnation in porous cast iron

What is solid lubricant?
Powder or solid type lubricant that is used in harsh conditions such as high temperature and corrosion environment and where oil or grease cannot be used. Generally it is mainly made with natural graphite, molybdenum disulfide, and P.T.F.E.

Advantage & Disadvantage of each lubricating method

Classification	Dry lubrication	Liquid lubrication
Advantage	• Can be used in high / low temperature. • Can be used in corrosive atmosphere. • Can be applied for high-load low-speed motion, reciprocating motion, impact load, angular pitching motion, and discontinuous frequent stop motion where oil lubrication is not effective. • Can be used without lubrication	• Ideal for high speed in light and medium load. ※ Liquid lubrication prevent friction between metal to metal by forming oil film with continuously rotating by centrifugal force in the clearance of shaft and housing.
Disadvantage	• Can be used in low speed in principle without lubrication. ※ Using it in high speed condition may occur seizure or shorten life cycle of bearing, because solid lubricant has higher friction coefficient than liquid lubricant.	• Oiling is required in regular basis. • Cannot be used in low / high temperature. • Cannot be used in corrosive atmosphere. • Not suitable for high-load & low-speed motion, reciprocating motion, impact load, angular pitching motion, and discontinuous frequent stop motion where oil film is difficult to be formed. • Not suitable for use in high load and high speed, which reduces lifetime due to excessive PV value.

Base metal and its use

CODE	SP	BP	Al	B	F	SUS	S
Base metal	High Strength Brass Casing	Brass Casting	Aluminum Bronze Casting	Bronze Casting	Cast iron	Stainless Steel	Steel
USE	General	General	General	General	High Temperature	Chemical Resistance	High Pressure
	High Pressure	Low load	Seawater	High speed		High temperature	Shock Resistance
	Under water		Underwater				

Solid Lubricant type

CODE	USE
SL1	High Temperature
SL2	General

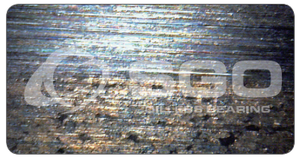
CODE	USE
SL4	Underwater
SL7	Underwater, Eco-friendly

What is solid lubricant dispersed bearing, **THEDVELON?**

Solid lubricant dispersed bearing, THEDVELON is made with steel in external layer and with special solid lubricant in internal layer. This bi-layer metal bearing can be used for medium and high load with excellent abrasion resistance.

Bearing structure

- Sintered bearing layer (1~1.2mm)
  ➡ It is composed of solid lubricant such as Cu, Fe, Ni, Sn, MoS^2, graphite and pores filled with oil.
- Backing steel ➡ KS SS400/ SM45C



Bi-layer structure

Distribution shape of solid lubricants

Characteristics

- Since solid lubricant is evenly distributed, it can be used for any motion direction.
- Since sintering and solid lubricant are applied, lubrication is multiplied, which can be used in high speed.
- Since it has lower heat expansion rate compared to general non-metal bearing, temperature change is low and it maintains high accuracy.
- Since heat processing is applied on external material, it is suitable for high load and it can be used without lubrication.
- Additional oil impregnation is needed to prevent oil washing after it has been stored for a long time or additional processing has been applied.
- Standards parts and custom-made parts available.

Mechanical & Physical properties

Code	Type	Lubrication	P Contact pressure	V velocity	PV value	T temperature	Specific gravity	Hardness	Elongation	Tensile strength
			kgf/㎠ N/㎟	m/min m/s	kgf/㎠·m/min N/㎟·m/s	℃	g/㎤	HRB	%	kgf/㎟ N/㎟
200S	Fe-sintering	Dry	290 (760) 29 (76)	30 0.5	1,000 (3,000) 1.65 (4.90)	-40 ~ +120	6.3 ~ 7.1	0 ~ 20	17	41 400
		Periodic lubrication	500 (760) 50 (76)	60 1	1,500 (3,000) 2.45 (4.90)					
200SP	Cu-sintering	Dry	250 (700) 25 (70)	30 0.5	980 (2,800) 1.60 (4.58)	-40 ~ +120	6.0 ~ 6.8	-15 ~ 15	17	41 400
		Periodic lubrication	450 (700) 45 (70)	60 1	1,500 (3,000) 2.45(4.90)					
200H	Fe-sintering	Dry	450 (750) 45 (75)	30 0.5	1,000 (3,000) 1.63 (4.90)	-40 ~ +120	6.3 ~ 7.1	35 ~ 45	28	48 470
		Periodic lubrication	700 (1,200) 70 (120)	70 1.16	1,500 (3,000) 2.45 (4.90)					

※ ( ) : Allowable static contact pressure (no sliding or sliding at extremly slow speed (0.1m/min or below))
※ Above data is based on backing steel KS SS400 / SM45C and its mechanical characteristics may be changed when backing steel is changed.
※ Value indicated above is general value and it can be changed without notification for improvement.

Operating **Conditions**

Material Code		Allowable Range				Mechnical Properties				
		Lubrication	P Contact Pressure (kgf/cm²) 〈N/mm²〉	V Velocity (m/min) 〈m/s〉	PV Value (kgf/cm²·m/min) 〈N/mm²·m/s〉	T Temperature (℃)	Specific Gravity (g/㎤)	Hardness (HB)	Elongation (%)	Tensile Strength (kgf/mm²) 〈N/mm²〉
#500	SP20	Dry	300(1,500) 〈29(150)〉	30 〈0.5〉	1,000 〈1.65〉	-40 ~ +150	7.8	200	12	77 〈755〉
		Periodic lubrication		60 〈1〉	2,000 〈3.25〉					
#500	SP24	Dry	740(1,800) 〈73(180)〉	6 〈0.1〉	1,000 〈1.65〉	-40 ~ +150	7.8	245	12	77 〈755〉
		Periodic lubrication		15 〈0.25〉	2,000 〈3.25〉					
#500	SP28	Dry	920(2,050) 〈90(200)〉	15 〈0.25〉	1,000 〈1.65〉	-40 ~ +150	7.6	280	1	79 〈780〉
		Periodic lubrication		30 〈0.5〉	2,000 〈3.25〉					
THE DEVELON	200S (Fe-Sintering)	Dry	290(760) 〈29(76)〉	30 〈0.5〉	1,000(3,000) 〈1.65(4.90)〉	-40 ~ +120	6.3 ~ 7.1	HRB 0 ~ 20	17	41 〈400〉
		Periodic lubrication	500(760) 〈50(76)〉	60 〈1〉	1,500(3,000) 〈2.45(4.90)〉					
THE DEVELON	200SP (Cu-Sintering)	Dry	250(700) 〈25(70)〉	30 〈0.5〉	980(2,800) 〈1.60(4.50)〉	-40 ~ +120	6.0 ~ 6.8	HRB -15 ~ 15	17	41 〈400〉
		Periodic lubrication	450(700) 〈45(70)〉	60 〈1〉	1,500(3,000) 〈2.45(4.90)〉					
THE DEVELON	200H (Fe-Sintering for High Load)	Dry	450(750) 〈45(75)〉	30 〈0.5〉	1,000(3,000) 〈1.63(4.90)〉	-40 ~ +120	6.3 ~ 7.1	HRB 35~45	28	48 〈470〉
		Periodic lubrication	700(1,200) 〈70(120)〉	70 〈1.16〉	1,500(3,000) 〈2.45(4.90)〉					

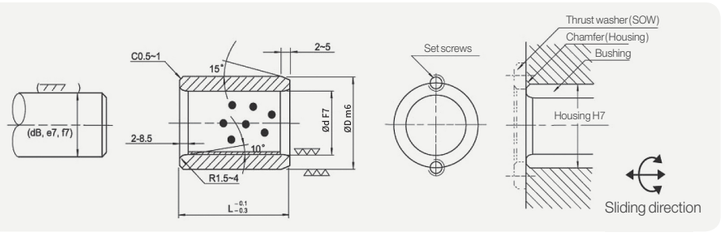
※ ( ) : Allowable static contact pressure (no sliding or sliding at extremly slow speed (0.1m/min or below))
※ Above data is based on backing steel KS SS400 / SM45C and its mechanical characteristics may be changed when backing steel is changed.
※ Value indicated above is general value and it can be changed without notification for improvement.

Non-ferrous Metal **Materials**

Type	Code	Old Code	Tensile Strength	Elongation	Hardness	Foreign Standards	
			N/㎟	%	HB	ASTM	DIN
Brass	CAC202	YBsC2	195 or above	20 or above	-	C85400	CuZn33Pb
	CAC203	YBsC3	245 or above	20 or above	-	C85700	CuZn37Pb
High Strength Brass	CAC301	HBsC1	430 or above	20 or above	-	C86500	CuZn35Al1
	CAC302	HBsC2	490 or above	20 or above	-	C86400	CuZn34Al1
	CAC303	HBsC3	635 or above	18 or above	165 or above (10 / 3,000)	C86200	CuZn25Al5
	CAC304	HBsC4	755 or above	12 or above	200 or above (10 / 3,000)	C86300	CuZn25Al5
Bronze	CAC401	BC1	165 or above	15 or above	-	C84400	-
	CAC402	BC2	245 or above	20 or above	-	C90300	-
	CAC403	BC3	245 or above	15 or above	-	C90500	CuSn10Zn
	CAC406	BC6	195 or above	15 or above	-	C83600	CuSn5ZnPb
	CAC407	BC7	215 or above	18 or above	-	C92200	-
Phosphorous Bronze	CAC502A	PBC2	195 or above	5 or above	60 or above (10 / 1,000)	-	CuSn10
	CAC502B	PBC2B	295 or above	5 or above	80 or above (10 / 1,000)	C90700	CuSn12
	CAC503B	PBC3B	265 or above	3 or above	90 or above (10 / 1,000)	C91000	CuSn12
Lead Bronze	CAC602	LBC2	195 or above	10 or above	65 or above (10 / 500)	-	CuPb5Sn
	CAC603	LBC3	175 or above	7 or above	60 or above (10 / 500)	C93700	CuPb10Sn
	CAC604	LBC4	165 or above	5 or above	55 or above (10 / 500)	C93800	CuPb15Sn
	CAC605	LBC5	145 or above	5 or above	45 or above (10 / 500)	-	CuPb20Sn
	CAC607	C93200	207 or above	15 or above	-	C93200	-
Aluminum bronze	CAC701	AlBC1	440 or above	25 or above	80 or above (10 / 1,000)	C95200	CuAl10Fe
	CAC702	AlBC2	490 or above	20 or above	120 or above (10 / 1,000)	C95400	CuAl9Ni
	CAC703	AlBC3	590 or above	15 or above	150 or above (10 / 1,000)	C95800	CuAl10Ni
	CAC704	AlBC4	590 or above	15 or above	160 or above (10 / 1,000)	C95700	-
	CAC705	C95500	620 or above	6 or above	190 or above (10 / 3,000)	C95500	-
	CAC706	C95300	450 or above	20 or above	110 or above (10 / 3,000)	C95300	-

※ Refer to KS D 6024

Straight Bushing SOB / SBSB



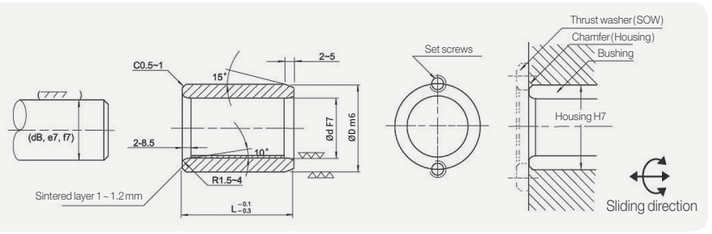
Material

- **SOB :** #500 SP20 (CAC304+Graphite)

Tolerance

- **Housing :** H7
- **Shaft :** d8-For high load, f7-For high precision, b9-For underwater

Code	Dimension & Tolerance				Length L (-0.1 / -0.3)								
	Inner Diameter dF7		Outer Diameter D m6		8	10	12	15	16	20	25	30	35
SOB SBSB	6	+0.022 / +0.010	10	+0.015 / +0.006	•	•	•	•		•			
	8	+0.028 / +0.013	12	+0.018 / +0.007	•	•	•	•					
	10	+0.028 / +0.013	14	+0.018 / +0.007	•	•	•	•		•			
	12	+0.034 / +0.016	18	+0.018 / +0.007		•	•	•	•	•	•	•	
	13	+0.034 / +0.016	19	+0.021 / +0.008		•		•		•			
	14	+0.034 / +0.016	20	+0.021 / +0.008		•	•	•		•	•	•	
	15	+0.034 / +0.016	21	+0.021 / +0.008		•	•	•	•	•	•	•	
	16	+0.034 / +0.016	22	+0.021 / +0.008		•	•	•	•	•	•	•	•
	18	+0.034 / +0.016	24	+0.021 / +0.008				•	•	•	•	•	•
	20	+0.041 / +0.020	28	+0.021 / +0.008				•	•	•	•	•	•
	20	+0.041 / +0.020	30	+0.021 / +0.008					•	•	•	•	•
	25	+0.041 / +0.020	33	+0.025 / +0.009					•	•	•	•	•
	25	+0.041 / +0.020	35	+0.025 / +0.009					•	•	•	•	
	30	+0.041 / +0.020	38	+0.025 / +0.009						••	••	••	••
	30	+0.041 / +0.020	40	+0.025 / +0.009						••	••	••	••
	31.5	+0.050 / +0.025	40	+0.025 / +0.009								••	
	35	+0.050 / +0.025	44	+0.025 / +0.009						••	••	••	••
	35	+0.050 / +0.025	45	+0.025 / +0.009						••	••	••	••
	40	+0.050 / +0.025	50	+0.025 / +0.009						••	••	••	••
	40	+0.050 / +0.025	55	+0.030 / +0.011								••	••
	45	+0.050 / +0.025	55	+0.030 / +0.011								••	••
	45	+0.050 / +0.025	56	+0.030 / +0.011								••	••
	45	+0.050 / +0.025	60	+0.030 / +0.011								••	••
	50	+0.050 / +0.025	60	+0.030 / +0.011								••	••
	50	+0.050 / +0.025	62	+0.030 / +0.011								••	••
	50	+0.050 / +0.025	65	+0.030 / +0.011								••	
	55	+0.060 / +0.030	70	+0.030 / +0.011									
	60	+0.060 / +0.030	74	+0.030 / +0.011								••	••
	60	+0.060 / +0.030	75	+0.030 / +0.011								••	••
	63	+0.060 / +0.030	75	+0.030 / +0.011									
	65	+0.060 / +0.030	80	+0.030 / +0.011									
	70	+0.060 / +0.030	85	+0.035 / +0.013									••
	70	+0.060 / +0.030	90	+0.035 / +0.013									
	75	+0.060 / +0.030	90	+0.035 / +0.013									
	75	+0.060 / +0.030	95	+0.035 / +0.013									
	80	+0.060 / +0.030	96	+0.035 / +0.013									
	80	+0.060 / +0.030	100	+0.035 / +0.013									
	90	+0.071 / +0.036	110	+0.035 / +0.013									
	100	+0.071 / +0.036	120	+0.035 / +0.013									
	110	+0.071 / +0.036	130	+0.040 / +0.015									
	120	+0.071 / +0.036	140	+0.040 / +0.015									
	125	+0.083 / +0.043	145	+0.040 / +0.015									
	130	+0.083 / +0.043	150	+0.040 / +0.015									
	140	+0.083 / +0.043	160	+0.040 / +0.015									
	150	+0.083 / +0.043	170	+0.040 / +0.015									
	160	+0.083 / +0.043	180	+0.040 / +0.015									



Material

- **SBSB :** #200S (SS400 + Sintered Layer)

Tolerance

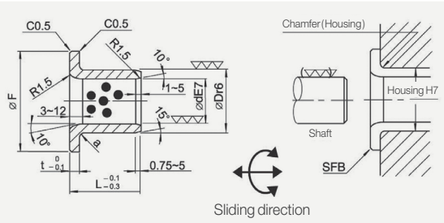
- **Housing :** H7
- **Shaft :** g6-General, f7-For high load

Length L (-0.1 / -0.3)										Inner Diameter d	Outer Diameter D	Applicable Washer
40	50	60	70	80	100	120	130	140	150			
										6	10	-
										8	12	-
										10	14	SOW-10
										12	18	SOW-12
										13	19	SOW-13
										14	20	SOW-14
										15	21	SOW-15
•										16	22	SOW-16
•										18	24	SOW-18
•	•									20	28	SOW-20
•										20	30	SOW-20
•	•	•								25	33	SOW-25
•	•	•								25	35	SOW-25
••	••	••								30	38	SOW-30
••	••	••								30	40	SOW-30
••										31.5	40	-
••	••	••								35	44	SOW-35
••	••	••								35	45	SOW-35
••	••	••	••	••						40	50	SOW-40
••	••	••								40	55	SOW-40
••	••	••								45	55	SOW-45
••	••	••								45	56	SOW-45
••	••	••	••	••						45	60	SOW-45
••	••	••	••	••						50	60	SOW-50
••	••	••	••							50	62	SOW-50
••	••	••	••	••	••					50	65	SOW-50
••	••	••	••							55	70	SOW-55
••	••	••	••	••						60	74	SOW-60
••	••	••	••	••	••					60	75	SOW-60
		••	••	••						63	75	-
••	••	••	••	••						65	80	SOW-65
••	••	••	••	••	••					70	85	SOW-70
	••	••	••	••						70	90	SOW-70
	••	••	••	••	••					75	90	SOW-75
		••	••	••	••					75	95	SOW-75
•	•	•	•	•	•	•				80	96	SOW-80
•	•	•	•	•	•	•		•		80	100	SOW-80
	•	•		•	•	•				90	110	SOW-90
	•	•	•	•	•	•		•		100	120	SOW-100
	•		•	•	•	•				110	130	-
			•	•	•	•		•		120	140	SOW-120
					•	•				125	145	-
					•		•			130	150	-
					•			•		140	160	-
					•				•	150	170	
					•				•	160	180	-

• SOB • SBSB

How to order ➡ Code - d X D X L (Example) SOB -20 X 28 X 40

Flange Bushing SFB



Detail of a

d	10 ~ 16	55	60 ~
a	R 0.3	R 0.5	R 1

Material

- **SFB :** #500 SP20 (CAC304+Graphite)

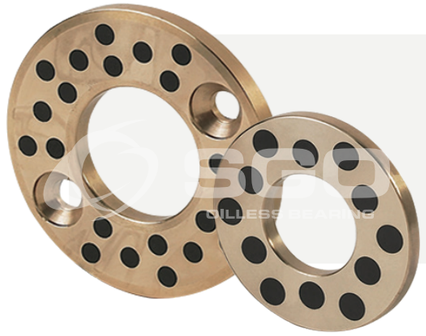
Tolerance

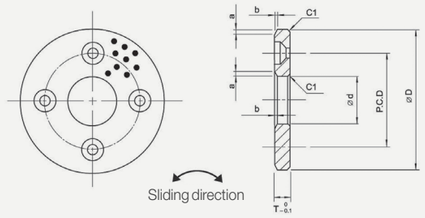
- **Housing :** H7
- **Shaft :** d8-For high load, f7-For high precision, e7-For light load

Code	ID d		OD D		F.D F	Flange L t	Length L (-0.1 / -0.3)												
							10	15	20	25	30	35	40	45	50	60	67	80	100
SFB	8	+0.040 +0.025	12	+0.034 +0.023	16	2	0810												
	10	+0.040 +0.025	14	+0.034 +0.023	22	2		1015	1020										
	12	+0.050 +0.032	18	+0.034 +0.023	25	3	1210	1215	1220	1225									
	13	+0.050 +0.032	19	+0.041 +0.028	26	3		1315	1320										
	14	+0.050 +0.032	20	+0.041 +0.028	27	3		1415	1420										
	15	+0.050 +0.032	21	+0.041 +0.028	28	3	1510	1515	1520	1525	1530								
	16	+0.050 +0.032	22	+0.041 +0.028	29	3		1615	1620	1625	1630								
	20	+0.061 +0.040	30	+0.041 +0.028	40	5		2015	2020	2025	2030	2035	2040	2045					
	25	+0.061 +0.040	35	+0.050 +0.034	45	5			2520	2525	2530		2540						
	30	+0.061 +0.040	40	+0.050 +0.034	50	5			3020	3025	3030	3035	3040	3045	3050				
	31.5	+0.075 +0.050	40	+0.050 +0.034	50	5				31.525	31.530	31.535	31.540						
	35	+0.075 +0.050	45	+0.050 +0.034	60	5			3520	3525	3530	3535	3540		3550	3560			
	40	+0.075 +0.050	50	+0.050 +0.034	65	5			4020	4025	4030	4035	4040	4045	4050	4560			
	45	+0.075 +0.050	55	+0.060 +0.041	70	5					4530	4535	4540	4550		4560			
	50	+0.075 +0.050	60	+0.060 +0.041	75	5					5030	5035	5040		5050	5060			
	55	+0.090 +0.060	65	+0.060 +0.041	80	5							5540			5560			
	60	+0.090 +0.060	75	+0.062 +0.043	90	7.5							6040		6050	6060		6080	
	63	+0.090 +0.060	75	+0.062 +0.043	85	7.5											6367		
	65	+0.090 +0.060	80	+0.062 +0.043	95	7.5										6560			
	70	+0.090 +0.060	85	+0.073 +0.051	105	7.5								7050				7080	
	75	+0.090 +0.060	90	+0.073 +0.051	110	7.5										7560			
	80	+0.090 +0.060	100	+0.073 +0.051	120	10							8040			8060		8080	80100
	90	+0.107 +0.072	110	+0.076 +0.054	130	10							9040			9060		9080	
	100	+0.107 +0.072	120	+0.076 +0.054	150	10												10080	100100
	120	+0.107 +0.072	140	+0.088 +0.063	170	10												12080	120100

How to order ➡ Code - d X L (Example) SFB - 20 X 20

Thrust Washer SOW





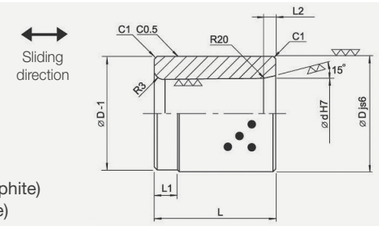
Material

- **SOW :** #500 SP20 (CAC304+Graphite)

Code	Nominal Dia.	ID d	OD D	P.C.D	Set screws		Thickness T	a	b
					Dimension	Qt'y			
SOW	10	10.2	30	20	M3	2	3	1.5	0.3
	12	12.2	40	28	M3	2	3	2	0.4
	13	13.2	40	28	M3	2	3	2	0.4
	14	14.2	40	28	M3	2	3	2	0.4
	15	15.2	50	35	M3	2	3	2	0.4
	16	16.2	50	35	M3	2	3	2	0.4
	18	18.2	50	35	M3	2	3	2	0.4
	20	20.2	50	35	M5	2	5	2.5	0.4
	25	25.2	55	40	M5	2	5	2.5	0.4
	30	30.2	60	45	M5	2	5	2.5	0.4
	35	35.2	70	50	M5	2	5	2.5	0.4
	40	40.2	80	60	M6	2	7	3	0.5
	45	45.3	90	70	M6	2	7	3	0.5
	50	50.3	100	75	M6	4	8	4	0.7
	55	55.3	110	85	M6	4	8	4	0.7
	60	60.3	120	90	M8	4	8	5	0.9
	65	65.3	125	95	M8	4	8	5	0.9
	70	70.3	130	100	M8	4	10	5	0.9
	75	75.3	140	110	M8	4	10	5	0.9
	80	80.3	150	120	M8	4	10	5	0.9
	90	90.5	170	140	M10	4	10	5	0.9
	100	100.5	190	160	M10	4	10	5	0.9
	120	120.5	200	175	M10	4	10	5	0.9

How to order ➡ Code - Nominal D (Example) SOW-10

Guide Bushing SGB



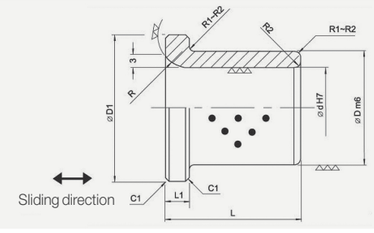
Material

- **SGB :** #500 SP20 (CAC304+Graphite)
- **SGB :** FC 500F(GC250+Graphite)

Code	ID d		OD D		Length L		L1	L2
SGB	25	+0.021 / 0	40	± 0.008	40	0 / -0.2	10	5
	30	+0.021 / 0	50	± 0.008	50	0 / -0.2	10	5
	35	+0.025 / 0	60	± 0.0095	55	0 / -0.2	15	5
	40	+0.025 / 0	60	± 0.0095	50, 60	0 / -0.2	10	5
	50	+0.025 / 0	70	± 0.0095	50, 75	0 / -0.2	15	10
	60	+0.030 / 0	80	± 0.011	60, 90	0 / -0.2	20	10
	80	+0.030 / 0	100	± 0.011	100, 120	0 / -0.2	25	10
	100	+0.035 / 0	120	± 0.011	150	0 / -0.2	25	10
	120	+0.035 / 0	140	± 0.0125	180	0 / -0.2	25	10

How to order ➡ Code - d X L - Material (Example) SGB - 20 X 20 - FC

Guide Flange Bushing SGFB



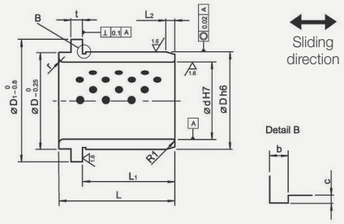
Material

- **SGFB :** #500 SP20 (CAC304+Graphite)

Code	ID d		OD D		Flange D D1	Length L		Flange L L1	R
SGFB	25	+0.021 / 0	35	+0.025 / +0.009	45	40	0 / -0.3	7	10
	30	+0.021 / 0	40	+0.025 / +0.009	50	50	0 / -0.3	10	20
	40	+0.025 / 0	55	+0.030 / +0.011	65	70	0 / -0.3		
	50	+0.025 / 0	65	+0.030 / +0.011	75	80	0 / -0.3		
	60	+0.030 / 0	75	+0.030 / +0.011	85				
	65	+0.030 / 0	80	+0.030 / +0.011	90	120	0 / -0.3		
	80	+0.030 / 0	100	+0.035 / +0.013	110	100	0 / -0.3		
						140	0 / -0.3		
	100	+0.035 / 0	120	+0.035 / +0.013	130	100	0 / -0.3		
						140	0 / -0.3		

How to order ➡ Code - d X L (Example) SGFB - 80 X 100

Guide Bushing SGO9834 (DIN 9834)



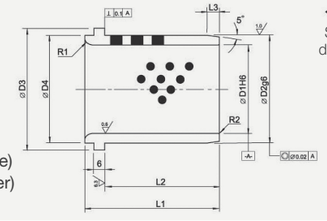
Material

- **SGO9834 :** #500 SP20 (CAC304+Graphite)
  #200S (SS400 + Sintered Layer)

Code	d	H7	D	h6	L	D1	L1	L2	t	r	bxc
SGO9834-025	25	+0.021 / 0	32	0 / -0.016	40	40	30	3	6.3	3	0.6 X 0.3
SGO9834-032	32	+0.025 / 0	40	0 / -0.016	50	50	40	4	6.3	3	
SGO9834-040	40	+0.025 / 0	50	0 / -0.016	63	63	50	5	6.3	3	
SGO9834-050	50	+0.025 / 0	63	0 / -0.019	71	71	56	6.3	6.3	5	
SGO9834-063	63	+0.030 / 0	80	0 / -0.019	80	90	63	8	10	6	1.0 X 0.4
SGO9834-080	80	+0.030 / 0	100	0 / -0.022	100	112	80	10	10	8	
SGO9834-100	100	+0.035 / 0	125	0 / -0.025	125	140	106	12.5	10	10	
SGO9834-125	125	+0.040 / 0	160	0 / -0.025	160	180	132	16	10	12	
SGO9834-160	160	+0.040 / 0	200	0 / -0.029	200	220	170	16	10	18	

How to order ➡ Code (Example) SGO9834-025 **Make-to-order**

Guide Bushing SGO61



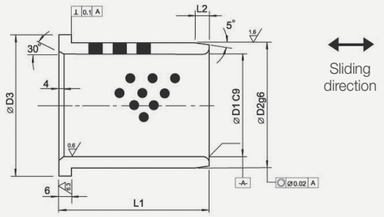
Material

- **SGO61 :** #500 SP20 (CAC304+Graphite)
  #200S (SS400 + Sintered Layer)

Code	D1	D2	D3	D4	L1	L2	L3	R1
SGO612540	25	32	40	32	40	30	4	3
SGO613250	32	40	50	40	50	40	4	3
SGO614063	40	50	63	50	63	50	5	3
SGO615071	50	63	71	63	71	56	6	5
SGO616380	63	80	90	80	80	63	8	6
SGO618010	80	100	112	100	100	80	10	8
SGO611012	100	125	140	125	125	106	12	10
SGO611114	115	140	155	140	140	120	12	10
SGO611216	125	160	180	160	160	132	12	12

How to order ➡ Code (Example) SGO613250 **Make-to-order**

Guide Bushing SGO71



Material

● **SGO71 :** #500 SP20 (CAC304+Graphite) / #200S (SS400 + Sintered Layer)

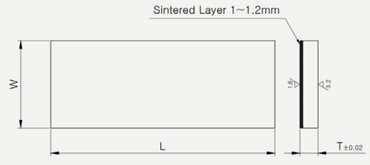
Code	D1	D2	D3	L1	L2
SGO712540	25	32	40	40	4
SGO713250	32	40	50	50	4
SGO714055	40	50	63	55	5
SGP715063	50	63	71	63	6
SGO716375	63	80	90	75	8
SGO718090	80	100	112	90	10
SGO711011	100	125	140	115	12
SGO711213	125	160	180	138	12

How to order ➡ Code (Example) SGO718090 **Make-to-order**

THEDVELON Wear Plate Material SBPM

Material

● **SBPM :** #200S (SS400 + Sintered Layer)



Code	W	L	T
SBPM	75	320	10
	100		
	125		
	150		20
	75		
	100		
	125		
	150		
	100		25

Processing Precautions

※ When cutting or drilling to the required size, process from the back steel direction to the sintering direction, for protection of sintered surface.

※ Please process the back steel, if you need to adjust the thickness, because sintered layer is 1 ~ 1.2mm.

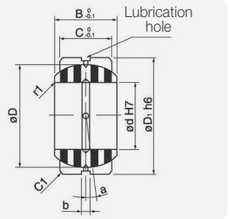
※ After further processing, be sure to apply lubricant before use.

How to order ➡ Code W X L X T (Example) SBPM-75 X 320 X 20

Spherical Bearing SOSB

Tolerance

Tolerance	Shaft	Use
d8	N7	High load
e7	H7	Low load



Material

● **Inner Ring :** #500 SP20 (CAC304+Graphite) ● **Ouer Ring :** Bearing steel (SUJ2)

Code		d H7		D1 h6		B	C	D	b	Alignment angle a
SOSB	015	15	+0.018 / 0	26	0 / -0.013	12	9	22	4	8
	020	20	+0.021 / 0	32	0 / -0.016	16	14	28	4	4
	025	25	+0.021 / 0	42	0 / -0.016	21	18	36	4	5
	030	30	+0.021 / 0	50	0 / -0.016	27	23	44	4	6
	035	35	+0.025 / 0	55	0 / -0.019	30	26	49	4	5
	040	40	+0.025 / 0	62	0 / -0.019	33	28	55	4	6
	045	45	+0.025 / 0	72	0 / -0.019	36	31	62	4	5
	050	50	+0.025 / 0	80	0 / -0.019	42	36	70	4	5
	060	60	+0.030 / 0	100	0 / -0.022	53	45	90	4	6
	070	70	+0.030 / 0	110	0 / -0.022	58	50	99	4	5
	080	80	+0.030 / 0	130	0 / -0.022	70	60	115	4	6
	090	90	+0.035 / 0	140	0 / -0.025	76	65	125	4	6
	100	100	+0.035 / 0	160	0 / -0.025	88	75	145	6	6
	110	110	+0.035 / 0	170	0 / -0.025	93	80	155	6	5
	120	120	+0.035 / 0	190	0 / -0.029	105	90	170	6	6
	130	130	+0.040 / 0	200	0 / -0.029	110	95	180	6	5
	140	140	+0.040 / 0	210	0 / -0.029	90	70	180	6	7
	150	150	+0.040 / 0	220	0 / -0.029	120	105	200	6	5
	160	160	+0.040 / 0	230	0 / -0.029	105	80	200	6	8
	180	180	+0.040 / 0	260	0 / -0.032	105	80	225	6	6
	200	200	+0.046 / 0	290	0 / -0.032	130	100	250	6	7
	220	220	+0.046 / 0	320	0 / -0.036	135	100	275	6	8
	240	240	+0.046 / 0	340	0 / -0.036	140	100	300	9	8
	260	260	+0.056 / 0	370	0 / -0.036	150	110	325	9	7
	280	280	+0.056 / 0	400	0 / -0.036	155	120	350	9	6
	300	300	+0.056 / 0	430	0 / -0.040	165	120	375	9	7

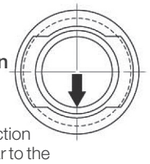
How to order ➡ Code (Example) SOSB-015 **Make-to-order**

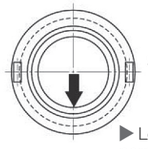
Fixing Direction

Slide Insertion Type

▶ ID (15 ~ 90)

▶ Loading direction perpendicular to the spherical insertion goove



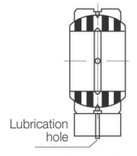


Split Bushing Type

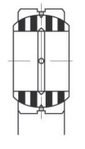
▶ Over ID 100

▶ Loading direction perpendicular to the split surface.

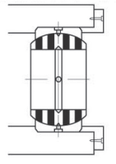
Fixing Method



Press-fit / Cooling Fit



Fixing Bolt



Non-loosening Plate

Wear Plate SWP / SBP

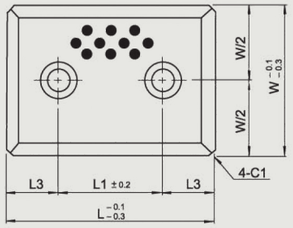
Material

- **SWP-SP :** #500 SP20 (CAC304+Graphite)
- **SWP-FC :** 500F (GC250 + Graphite)
- **SBP :** 200S (SS400 + Sintered layer)

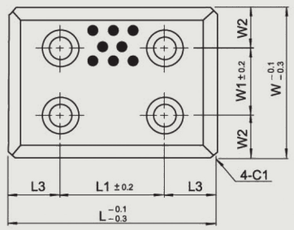
Tolerance

- **Thickness tolerance :** +/-0.01

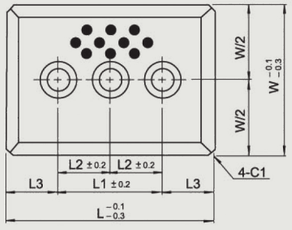
A Type



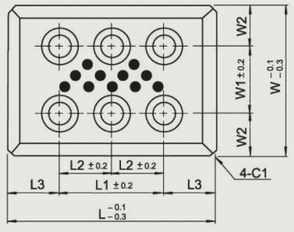
C Type



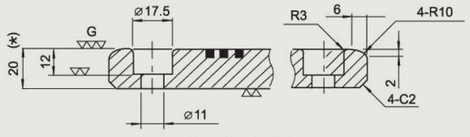
B Type



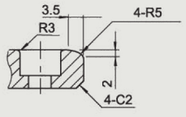
D Type



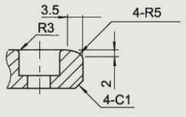
■ Chamfer according to Width



(W=75~200)



(W=48 & 58)



(W=28 & 38)

(1) W=28 &38

Sliding direction

(2) W=48 &200

Sliding direction

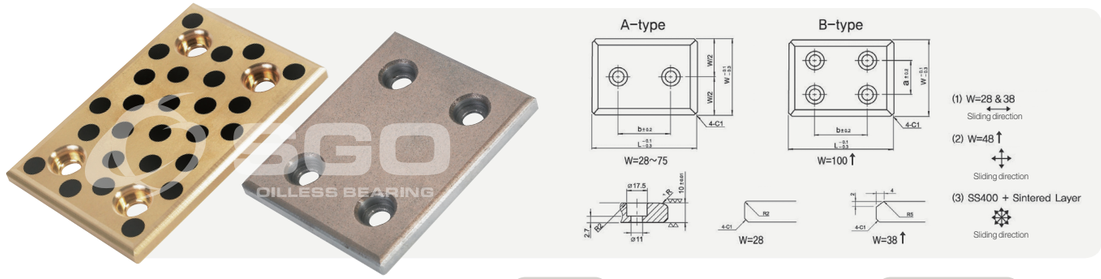
(3) SS400 + Sintered Layer

Sliding direction

Code	W	L	Bolt hole					Type
			W1	W2	L1	L2	L3	
SWP SBP	28	75	-	-	45	-	15	A
		100			50		25	
		150			100			
		200			150			
		250			200			
		300			250	125		B
	38	75			45	-	15	A
		100			50		25	
		125			75			
		150			100			
		200			150			
		250			200			
		300			250	125		B
	48	75			45	-	15	A
		100			50		25	
		125			75			
		150			100			
		200			150			
		250			200			
		300			250	125		B
	58	75			45	-	15	A
		100			50		25	
		150			100			
		200			150			
		250			200			
		300			250	125		B
	75	75			25	-	25	A
		100			50			
		125			75			
		150			100			
		200			150			
		250			200			
		300			250	125		B
	100	100	50	25	50	-		C
		125			75			
		150			100			
		200			150			
		250			200			
		300			200 (250)	- (125)	50 (25)	C (D)
	125	125		37.5	75	-	25	C
		150			100			
		200			150			
		250			200			
		300			200 (250)	- (125)	50 (25)	C (D)
		350			200	-	75	C
	150	150	100	25	100			
		200			150			
		250			200			
		300			250	- (125)	25	C (D)
	200	200	150		150	-		C
		250			200			
		300			250	- (125)		C (D)

How to order ➡ Code - W X L (Example) SWP - 28 X 75 - SP

Thin Wear Plate STWP / SBPT



Material

- **STWP :** #500 SP20 (CAC304+Graphite)
- **SBPT :** 200S (SS400 + Sintered layer)

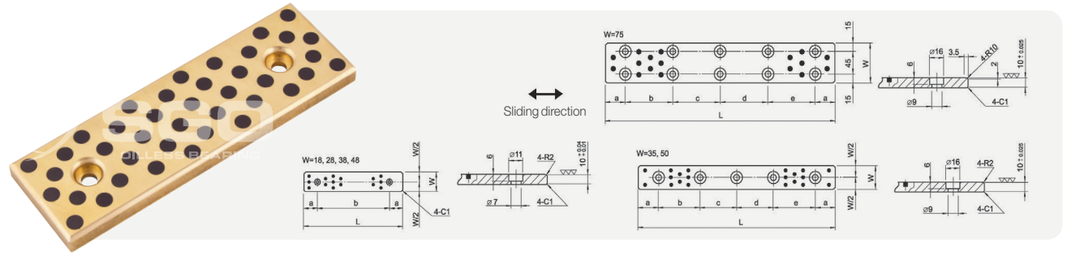
Mounting bolt

- Low head socket cap screw

Code	W	L	a	b	Type	Bolt Qt'y
STWP SBPT	28	75	-	45	A	2
		100		50		
		125		75		
		150		100		
	38	75		45		
		100		50		
		125		75		
		150		100		
	48	75		45		
		100		50		
		125		75		
		150		100		
		200		150		
	58	75		45		
		100		50		
		125		75		
		150		100		
		200		150		
	75	75		25		
		100		50		
		125		75		
		150		100		
		175		125		
		200		150		
	100	100	50	50	B	4
		125		75		
		150		100		
		200		150		
		250		200		
	125	150	50	100		
		200		150		
		250		200		
	150	150	100	100		
		200		150		

How to order ➡ Code - W X L (Example) STWP - 75 X 100

Sliding Plate SP



Material

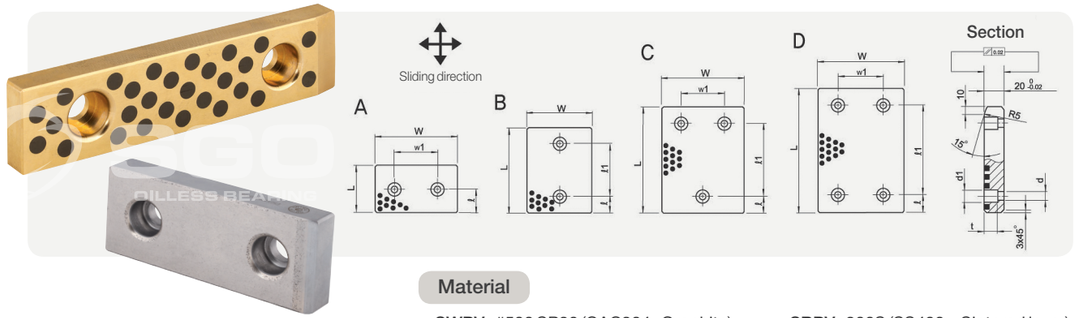
- **SP :** #500 SP20 (CAC304+Graphite)

Code	W	L		Bolt					Moungting bolt	
		Dimension	Tolerance	a	b	c	d	e	Size	Qt'y
SP	18	75	0 / -0.2	15	45				M6	2
		100		25	50					
		125		25	75					
		150		25	100					
	28	75		15	45					
		100		25	50					
		125		25	75					
		150		25	100					
	35	100		20	60				*M8	
		150		20	55	55				3
		200	0 / -0.3	20	55	50	55			4
		250		20	70	70	70			
		300		20	65	65	65	65		5
		350		20	80	75	75	80		
	38	75	0 / -0.2	15	45				M6	2
		100		25	50					
		125		25	75					
		150		25	100					
	48	75		15	45					
		100		25	50					
		125		25	75					
		150		25	100					
	50	100		20	60				*M8	
		150		20	55	55				3
		200	0 / -0.3	20	55	50	55			4
		250		20	70	70	70			
		300		20	65	65	65	65		5
		400	0 / -0.5	20	90	90	90	90		
	75	150	0 / -0.2	20	110					4
		200	0 / -0.3	20	80	80				6
		250		20	105	105				
		300		20	85	90	85			8
		400	0 / -0.5	20	120	120	120			
		500		20	115	115	115	115		10

* **Mark :** Low head socket cap screw

How to order ➡ Code - W X L (Example) SP - 38 X 100

Wear Plate VDI3357 SWPV/SBPV



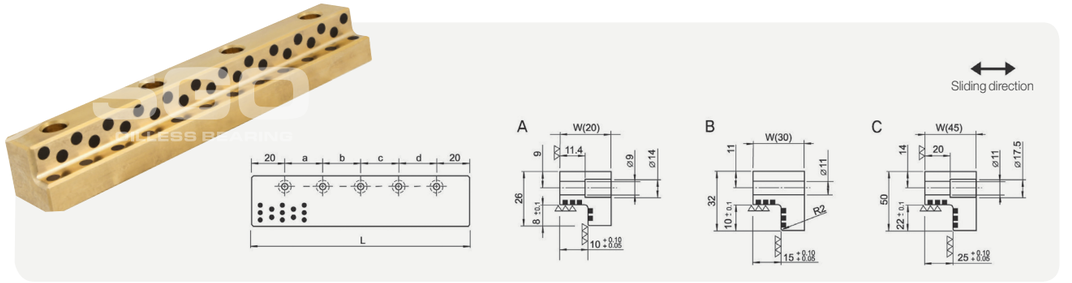
Material

- **SWPV :** #500 SP20 (CAC304+Graphite)
- **SBPV :** 200S (SS400 + Sintered layer)

Code	W	L	ℓ	ℓ1	w1	d	d1	t	Type	Bolt Qt'y
SWPV SBPV	50	80	25	30	-	9	15	9	B	2
		100		50		13.5	20	13		
		125		75						
		160		110						
		200		150						
	80	50		-	30	9	15	9	A	
		80		30	-	13.5	20	13	B	
		100		50						
		125		75						
		160		110						
		200		150						
		250	40	170						
		315		235						
	100	50	25	-	50				A	
		80	40	-						
		100	25	50	-				B	
		125		75						
		160		110						
		200		150						
		250	40	170						
		315		235						
	125	50	25	-	75				A	
		80	40	-						
		100	25	50					C	3
		125		75						
		160		110						
		200		150						
		250	40	170						
		315		235						
	160	50	25	-	110				A	2
		80	40	-						
		100	25	50					C	3
		125		75						
		160		110						
		200		150						
		250	40	170					D	4
		315		235						

How to order ➡ Code - W X L (Example) SWPV - 100 X 100 **Make-to-order**

Sliding Liner SL



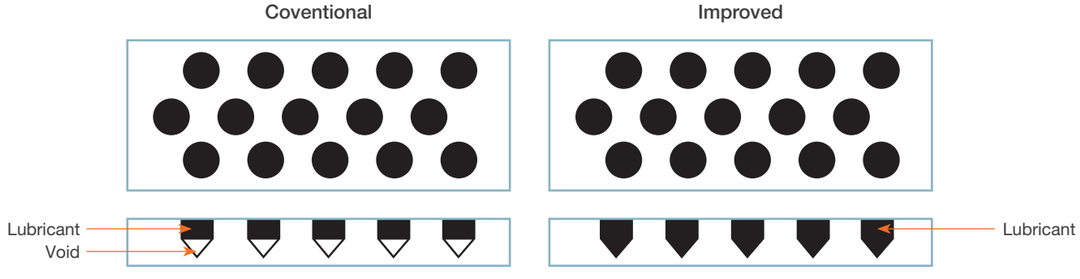
Material

- **SL :** #500 SP20 (CAC304+Graphite)

Code	W	L	Bolt hole				Mounting bolt		Type
			a	b	c	d	Size	Qt'y	
SL	20	100	60	-	-	-	M8	2	A
		150	55	55	-			3	
		200		50	55			4	
	30	100	60	-	-	-	M10	2	B
		150	55	55	-			3	
		200		50	55			4	
		250	70	70	70				
	45	200	55	50	55				C
		250	70	70	70				
		300	65	65	65	65		5	
		350	80	75	75	80			

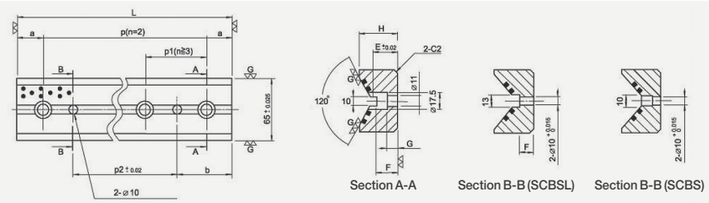
How to order ➡ Code - W X L (Example) SL - 20 X 100

Conical plugs for sliding plates (Design registeration)



▶ Void inside the sliding plate, causing sinking or swelling problems, is eliminated by forming the lubricant in a cone shape.

Cam Bottom Plate SCBS / SCBSL

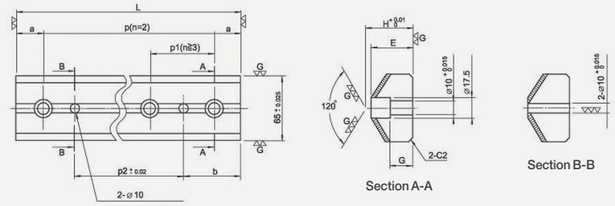


Material ● **SCBS / SCBSL :** #500 SP20 (CAC304+Graphite)

Code	L	H	E	F	G	a	p1	Bolt hole Q'ty	b	p2	p
SCBS	100	35	18	15	8	20	-	2	40	20	60
	125					25			50	25	-
	150						50	3		50	
	200							4		100	
	250							5		150	
	300							6		200	
SCBSL	100	37	20	20	10	20	-	2	40	20	60
	125					25			50	25	75
	150									50	100
	200						75	3		100	-
	250						100			150	
	300						125			200	

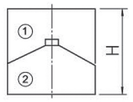
How to order ➡ **Code - L** (Example) SCBS - 150

Cam Bottom Steel Plate SCBSP/ SCBSPL



Material ● **SCBSP / SCBSPL :** SM45C + HRC 50
(High frequency quenching on hatched area)

Assembly

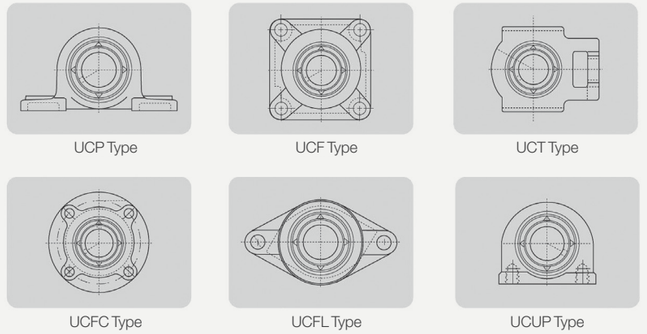


①	②	H
SCBS	SCBSP	65
SCBSL	SCBSPL	50

Code	L	H	E	G	a	p1	Bolt hole Q'ty	b	p2	p
SCBSP	100	47	44	20	20	-	2	40	20	60
	125				25			50	25	-
	150					50	3		50	
	200						4		100	
	250						5		150	
	300						6		200	
SCBSPL	100	30	26	10	20	-	2	40	20	60
	125				25			50	25	75
	150								50	100
	200					75	3		100	-
	250					100			150	
	300					125			200	

How to order ➡ **Code - L** (Example) SCBSP - 150

SGO U/C Bearing



● **Type :** Case specification

Bearing No.	Shaft (mm)
UC 201	12
UC 202	15
UC 203	17
UC 204	20
UC 205	25
UC 206	30
UC 207	35
UC 208	40
UC 209	45
UC 210	50
UC 211	55
UC 212	60
UC 213	65
UC 214	70
UC 215	75
UC 216	80
UC 217	85
UC 218	90
UC 305	25
UC 306	30
UC 307	35

Bearing No.	Shaft (mm)
UC 308	40
UC 309	45
UC 310	50
UC 311	55
UC 312	60
UC 313	65
UC 314	70
UC 315	75
UC 316	80
UC 317	85
UC 318	90
UC 319	95
UC 320	100
UC 321	105
UC 322	110
UC 324	120
UC 326	130
UC 328	140

How to order ➡ **Bearing No.** (Example) UC201 **Make-to-order**

Extrusion Material

High Strength Brass

- Excellent strength, hardness, corrosion resistance, and toughness
- Superior abrasion resistance in high load.
- Used such as bearing, valve seat, lever, arm, gear, fittings for ship, sliding parts with low speed and high load, bearing for bridge, nut, slipper, and water pressure cylinder parts.

▼ Available type and dimension

Type	Dimension	Remarks
Solid bar	ø28 ~ø194	-
Hollow bar	ø23 ~ø194	At least 7T or above

Standards		Chemical composition									Mechanical properties		
KS	Old code UNS NO.	Cu	Zn	Fe	Al	Mn	Sn	Pb	Ni	Si	Tensile strength N/mm²	Elongation %	Hardness HB
CAC301	HBsC1	55.0 ~ 60.0	33.0 ~ 42.0	0.5 ~ 1.5	0.5 ~ 1.5	0.1 ~ 1.5	1.0	0.4	1.0	0.1	430 or above	20 or above	90 or above (10/1000)
CAC302	HBsC2	55.0 ~ 60.0	30.0 ~ 42.0	0.5 ~ 2.0	0.5 ~ 2.0	0.1 ~ 3.5	1.0	0.4	1.0	0.1	490 or above	18 or above	100 or above (10/1000)
CAC303	HBsC3	60.0 ~ 65.0	22.0 ~ 28.0	2.0 ~ 4.0	3.0 ~ 5.0	2.5 ~ 5.0	0.5	0.2	0.5	0.1	635 or above	15 or above	165 or above (10/3000)
CAC304	HBsC4	60.0 ~ 65.0	22.0 ~ 28.0	2.0 ~ 4.0	5.0 ~ 7.5	2.5 ~ 5.0	0.2	0.2	0.5	0.1	755 or above	12 or above	200 or above (10/3000)

Aluminum Bronze

- High strength and toughness are high.
- Excellent resistance to bending, corrosion, heat, and abrasion in low temperature.
- Used in parts such as bearing, bush, gear, belt seat, plunger, paper-making roller, propeller for ship, nut, and safety tools.

▼ Available type and dimension

Type	Dimension
Solid bar	ø40 ~ø194
Hollow bar	Inquire for available dimension

Standards		Chemical composition								Mechanical properties		
KS/JIS	Old code UNS NO.	Cu	Fe	Ni	Al	Mn	Sn	Pb	Zn	Tensile strength N/mm²	Elongation %	Hardness HB
CAC701	AlBC1	85.0 ~ 90.0	1.0 ~ 3.0	0.1 ~ 1.0	8.0 ~ 10.0	0.1 ~ 1.0	0.1	0.1	0.5	440 or above	25 or above	80 (10/1000)
CAC702	AlBC2	80.0 ~ 88.0	2.5 ~ 5.0	1.0 ~ 3.0	8.0 ~ 10.5	0.1 ~ 1.5	0.1	0.1	0.5	490 or above	20 or above	120 (10/1000)
CAC703	AlBC3	78.0 ~ 85.0	3.0 ~ 6.0	3.0 ~ 6.0	8.5 ~ 10.5	0.1 ~ 1.5	0.1	0.1	0.5	590 or above	15 or above	120 (10/1000)

Brass

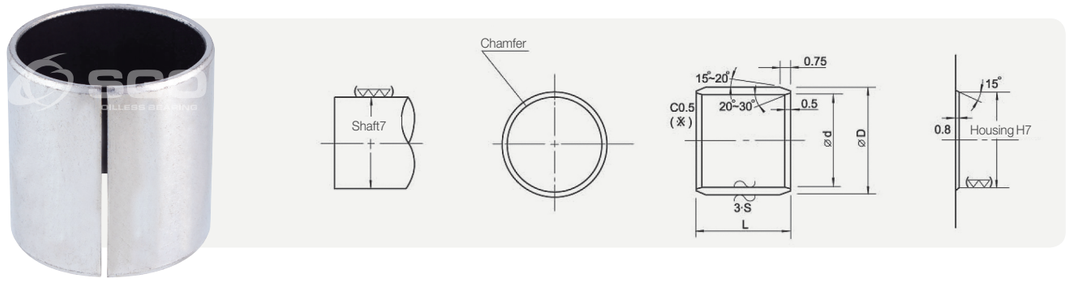
- Excellent hot forging and machinability.
- Used in parts such as bolt, nut, small screw, spindle, gear, valve, and mechanical parts.

▼ Available type and dimension

Type	Dimension
Solid bar	ø28 ~ø194
Hollow bar	Min. ID 23, 7T or above

Standards	Chemical composition					Mechanical properties	
KS/JIS	Cu	Pb	Fe	Fe + Sn	Zn	Tensile strength N/mm²	Elongation %
C3604	57.0 ~ 61.0	1.8 ~ 3.7	0.5	1.0	Rem	335	27
C3771	57.0 ~ 61.0	1.0 ~ 2.5	0.5	0.5	Rem	315	15

Dry Bearing SDU RoHS



Bushing		Shaft		Housing		Length							
ID Ød	OD ØD					3	4	5	6	7	8	10	12
3	5	3	-0.025 / -0.034	5 (H7)	+0.012 / 0	0303	0304	0305	0306				
4	6	4	-0.025 / -0.037	6 (H7)	+0.012 / 0		0404		0406		0408		
5	7	5	-0.025 / -0.037	7 (H7)	+0.015 / 0	0503	0504	0505	0506		0508		
6	8	6	-0.025 / -0.037	8 (H7)	+0.015 / 0			0605	0606	0607	0608	0610	
7	9	7	-0.025 / -0.040	9	+0.015 / 0			0705	0706	0707		0710	0712
8	10	8	-0.025 / -0.040	10 (H7)	+0.015 / 0			0805	0806	0807	0808	0810	0812
9	11	9	-0.025 / -0.040	11	+0.015 / 0							0910	
10	12	10	-0.025 / -0.040	12 (H7)	+0.018 / 0				1006	1007	1008	1010	1012
12	14	12	-0.025 / -0.043	14	+0.018 / 0				1206		1208	1210	1212
13	15	13	-0.025 / -0.043	15	+0.018 / 0						1308	1310	
14	16	14	-0.025 / -0.043	16	+0.018 / 0							1410	1412
15	17	15	-0.025 / -0.043	17	+0.018 / 0						1508	1510	1512
16	18	16	-0.025 / -0.043	18	+0.018 / 0							1610	1612
17	19	17	-0.025 / -0.043	19	+0.021 / 0							1710	
18	20	18	-0.025 / -0.043	20 (H7)	+0.021 / 0							1810	1812
19	22	19	-0.025 / -0.045	22	+0.021 / 0							1910	
20	23	20	-0.025 / -0.045	23	+0.021 / 0							2010	2012
22	25	22	-0.025 / -0.045	25	+0.021 / 0							2210	2212
24	27	24	-0.025 / -0.045	27	+0.021 / 0								
25	28	25	-0.025 / -0.045	28	+0.021 / 0							2510	2512
26	30	26	-0.025 / -0.045	30	+0.021 / 0								
28	32	28	-0.025 / -0.045	32 (H7)	+0.025 / 0								2812
30	34	30	-0.025 / -0.045	34	+0.025 / 0								3012
31	35	31	-0.025 / -0.050	35	+0.025 / 0								
32	36	32	-0.025 / -0.050	36	+0.025 / 0								
35	39	35	-0.025 / -0.050	39	+0.025 / 0								3512
38	42	38	-0.025 / -0.050	42	+0.025 / 0								
40	44	40	-0.025 / -0.050	44	+0.025 / 0								4012
45	50	45	-0.025 / -0.050	50	+0.025 / 0								
50	55	50	-0.025 / -0.050	55 (H7)	+0.030 / 0								
55	60	55	-0.025 / -0.055	60	+0.030 / 0								
60	65	60	-0.025 / -0.055	65	+0.030 / 0								
65	70	65	-0.035 / +0.005	70	+0.030 / 0								
70	75	70	-0.035 / +0.005	75	+0.030 / 0								
75	80	75	-0.035 / +0.005	80	+0.030 / 0								
80	85	80	-0.035 / +0.005	85 (H7)	+0.035 / 0								
85	90	85	+0.035 / 0	90	+0.035 / 0								
90	95	90	+0.035 / 0	95	+0.035 / 0								
100	105	100	+0.035 / 0	105	+0.035 / 0								
110	115	110	+0.035 / 0	115	+0.035 / 0								
120	125	120	+0.035 / 0	125 (H7)	+0.040 / 0								
130	135	130	+0.035 / 0	135	+0.040 / 0								
140	145	140	+0.035 / 0	145	+0.040 / 0								
150	155	150	+0.035 / 0	155	+0.040 / 0								
160	165	160	+0.035 / 0	165	+0.040 / 0								

How to order ➡ Code - d X L (Example) SDU - 03 X 05

Operating Conditions

Item		Value
Max. Allowable Load	Static	250 N/mm^2
	Dynamic	140 N/mm^2
	Oscillating	60 N/mm^2
Linear Velocity	Grease Lubrication	2.5 m/s
	Oil Lubrication	5 m/s
PV Value	Grease Lubrication	3.6 N/mm^2 · m/s
	Oil Lubrication	50 N/mm^2 · m/s

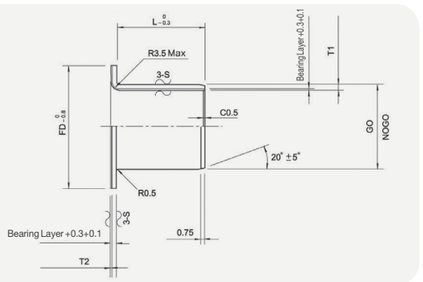
Item		Value
Friction Coefficient	Grease Lubrication	0.08 ~ 0.20
	Oil Lubrication	0.02 ~ 0.07
Shaft	Hardness	> 120 HB
	Roughness	Ra = 0.4 ~ 1.25
Temperature		-200 ~ +280°C
Heat-Conducting Coefficient		40 W/(m·k)
Heat-Expansion Coefficient (Shaft)		11 x 10^{-6}K^{-1}

※ ( ) : indicates static allowable contact pressure with no sliding at extremely low velocity of under 6m/min

Length												
15	20	25	30	35	40	50	60	70	80	90	95	100
0815												
1015	1020											
1215	1220											
1315												
1415	1420											
1515	1520	1525										
1615	1620	1625										
1715												
1815	1820	1825										
1915												
2015	2020	2025	2030									
2215	2220	2225	2230									
2415	2420	2425	2430									
2515	2520	2525	2530	2535								
2615	2620	2625	2630									
2815	2820	2825	2830									
3015	3020	3025	3030	3035	3040							
3115		3125			3140							
	3220	3225	3230		3240							
	3520	3525	3530	3535	3540	3550						
	3820	3825	3830	3835	3840							
4015	4020	4025	4030	4035	4040	4050						
	4520	4525	4530	4535	4540	4550						
	5020	5025	5030	5035	5040	5050	5060					
		5525	5530	5535	5540	5550	5560					
			6030	6035	6040		6060					
			6530		6540	6550	6560					
			7030	7035	7040	7050	7060		7080			
			7530	7535	7540	7550	7560		7580			
					8040	8050	8060		8080			
					8540	8550	8560		8580			
					9040		9060			9090		
						10050		10070			10095	
						11050		11070			11095	
						12050		12070			12095	
						13050			13080			
						14050			14080			140100
						15050			15080			150100
						16050			16080			160100

How to order ➡ Code - d X L (Example) SDU - 03 X 05

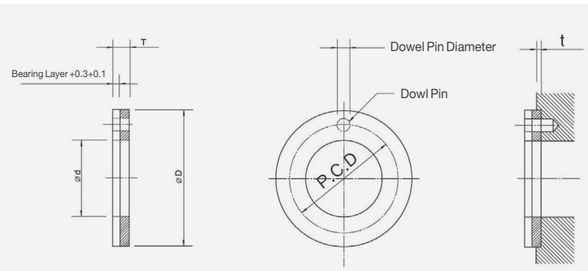
Dry Bearing SDUF RoHS



Bushing		Recommended Tolerance				Thickness				Length (Except flange length T2)													
ID	Flange D ØFD	Housing H7		Shaft		T1		T2		3	4	5	6	7	8	10	12	15	20	25	30	40	50	60
3	7	4.6	+0.012 / 0	3	-0.025 / -0.035	0.8	0 -0.035	0.8	0 -0.15	0303-7														
4	9	5.6	+0.012 / 0	4	-0.025 / -0.037						0404-9		0406-9											
5	10	7	+0.015 / 0	5	-0.025 / -0.037						0504-10	0505-10	0506-10		0508-10									
6	12	8	+0.015 / 0	6	-0.025 / -0.037							0605-12	0606-12	0607-12	0608-12	0610-12								
7	13	9	+0.015 / 0	7	-0.025 / -0.040							0705-13		0707-13		0710-13	0712-13							
8	15	10	+0.015 / 0	8	-0.025 / -0.040							0805-15	0806-15	0807-15	0808-15	0810-15	0812-15	0815-15						
10	18	12	+0.018 / 0	10	-0.025 / -0.040	1.0	0 -0.025	1.0	0 -0.15				1006-18	1007-18	1008-18	1010-18	1012-18	1015-18						
12	20	14	+0.018 / 0	12	-0.025 / -0.043								1206-20		1208-20	1210-20	1212-20	1215-20	1220-20					
14	22	16	+0.018 / 0	14	-0.025 / -0.043											1410-22	1412-22	1415-22	1420-22					
15	23	17	+0.018 / 0	15	-0.025 / -0.043											1510-23	1512-23	1515-23	1520-23	1525-23				
16	24	18	+0.018 / 0	16	-0.025 / -0.043											1610-24	1610-24	1615-24	1615-24	1625-24				
18	26	20	+0.021 / 0	18	-0.025 / -0.043											1810-26	1812-26	1815-26	1820-26	1825-26				
20	31	23	+0.021 / 0	20	-0.025 / -0.046	1.5	0 -0.025	1.5	0 -0.15							2010-31	2012-31	2015-31	2020-31	2025-31	2030-31			
22	33	25	+0.021 / 0	22	-0.025 / -0.046											2210-33	2212-33	2215-33	2220-33	2225-33				
24	35	27	+0.021 / 0	24	-0.025 / -0.046													2415-35	2420-35	2425-35	2430-35			
25	36	28	+0.021 / 0	25	-0.025 / -0.046											2510-36	2512-36	2515-36	2520-36	2525-36	2530-36			
26	38	30	+0.021 / 0	26	-0.025 / -0.046	2.0	0 -0.025	2.0	0 -0.15									2615-38	2620-38					
28	40	32	+0.025 / 0	28	-0.025 / -0.046												2812-40	2815-40	2820-40		2830-40			
30	42	34	+0.025 / 0	30	-0.025 / -0.046												3012-42	3015-42	3020-42	3025-42	3030-42	3040-42		
31	45	35	+0.025 / 0	31	-0.025 / -0.050															3125-45				
32	46	36	+0.025 / 0	32	-0.025 / -0.050														3220-46	3225-46	3230-46			
35	49	39	+0.025 / 0	35	-0.025 / -0.050												3512-49		3520-49	3525-49	3530-49	3540-49	3550-49	
38	52	42	+0.025 / 0	38	-0.025 / -0.050														3820-52		3830-52	3840-52		
40	54	44	+0.025 / 0	40	-0.025 / -0.050												4012-54	4015-54	4020-54	4025-54	4030-54	4040-54	4050-54	
45	60	50	+0.025 / 0	45	-0.025 / -0.050	2.5	0 / -0.025	2.5	0 / -0.15										4520-60	4525-60	4530-60	4540-60	4550-60	
50	65	55	+0.030 / 0	50	-0.025 / -0.050														5020-65		5030-65	5040-65		5060-65
55	70	60	+0.030 / 0	55	-0.025 / -0.055																5530-70	5540-70		5560-70
60	75	65	+0.030 / 0	60	-0.025 / -0.055																6030-75	6040-75		6060-75

How to order ➡ **Code - d X L - FD** (Example) SDUF - 04 X 06 - 9

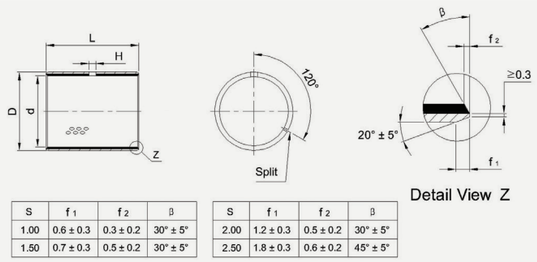
Dry Bearing SWC RoHS



Code	Nominal	ID Ød		OD ØD		Thickness T		Dowel Pin				Housing Depth t	
								Dowel Pin Diameter		P.C.D			
SWC 06	6	8		16				1.100	+0.20 0	12	±0.12		
SWC 08	8	10		18						14	±0.12		
SWC 10	10	12		24				1.625		18	±0.12		
SWC 12	12	14		26						20	±0.12		
SWC 14	14	16		30				2.125		23	±0.12		
SWC 16	16	18		32						25	±0.12		
SWC 18	18	20		36						28	±0.12		
SWC 20	20	22	+0.25 0	38	0 -0.25	1.5	-0.03 -0.08			30	±0.12	1.0	+0.20 -0.05
SWC 22	22	24		42				3.125		33	±0.12		
SWC 24	24	26		44					+0.25 0	35	±0.12		
SWC 25	25	28		48						38	±0.12		
SWC 30	30	32		54						43	±0.12		
SWC 35	35	38		62						50	±0.12		
SWC 40	40	42		66				4.125		54	±0.12		
SWC 45	45	48		74		2.0				61	±0.12	1.5	
SWC 50	50	52		78						65	±0.12		

How to order ➡ **Code - Nominal ID** (Example) SWC 10

Pre-lubricating Bearing SDX RoHS



S	f1	f2	β
1.00	0.6 ± 0.3	0.3 ± 0.2	30° ± 5°
1.50	0.7 ± 0.3	0.5 ± 0.2	30° ± 5°

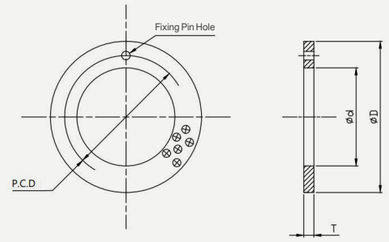
S	f1	f2	β
2.00	1.2 ± 0.3	0.5 ± 0.2	30° ± 5°
2.50	1.8 ± 0.3	0.6 ± 0.2	45° ± 5°

Material ● Low Carbon Steel + Porous Bronze Powder + POM Lining

Bushing		Shaft (h7)		Housing (H7)		Grease Hole ØH	Length L (0 / -0.4)										
ID Ød	OD ØD						10	15	20	25	30	35	40	50	60	80	90	95
10	13	10	0 / -0.015	13	+0.018 / 0	4	SDX 1010	SDX 1015	SDX 1020									
12	15	12	0 / -0.018	15	+0.018 / 0			SDX 1215	SDX 1220									
14	17	14	0 / -0.018	17	+0.018 / 0			SDX 1415	SDX 1420									
15	18	15	0 / -0.018	18	+0.018 / 0			SDX 1515		SDX 1515								
16	19	16	0 / -0.018	19	+0.021 / 0			SDX 1615	SDX 1620	SDX 1625								
18	21	18	0 / -0.018	21	+0.021 / 0			SDX 1815	SDX 1820	SDX 1825								
20	23	20	0 / -0.021	23	+0.021 / 0			SDX 2015		SDX 2025	SDX 2030							
22	25	22	0 / -0.021	25	+0.021 / 0	6		SDX 2215	SDX 2220	SDX 2225								
24	27	24	0 / -0.021	27	+0.021 / 0			SDX 2415	SDX 2420	SDX 2425	SDX 2430							
25	28	25	0 / -0.021	28	+0.021 / 0			SDX 2515	SDX 2520		SDX 2530							
30	34	30	0 / -0.021	34	+0.025 / 0				SDX 3020		SDX 3030		SDX 3040					
35	39	35	0 / -0.025	39	+0.025 / 0				SDX 3520		SDX 3530			SDX 3550				
40	44	40	0 / -0.025	44	+0.025 / 0	8			SDX 4020		SDX 4030		SDX 4040	SDX 4050				
45	50	45	0 / -0.025	50	+0.025 / 0						SDX 4530			SDX 4550				
50	55	50	0 / -0.025	55	+0.025 / 0								SDX 5040	SDX 5050	SDX 5060			
55	60	55	0 / -0.030	60	+0.025 / 0								SDX 5540		SDX 5560			
60	65	60	0 / -0.030	65	+0.030 / 0						SDX 6030	SDX 6035	SDX 6040		SDX 6060			
65	70	65	0 / -0.030	70	+0.030 / 0								SDX 6540	SDX 6540	SDX 6560			
70	75	70	0 / -0.030	75	-+0.030 / 0								SDX 7040			SDX 7080		
75	80	75	0 / -0.030	80	+0.030 / 0	9.5							SDX 7540			SDX 7580		
80	85	80	0 / -0.030	85	+0.035 / 0								SDX 8040			SDX 8080		
85	90	85	0 / -0.035	90	+0.035 / 0								SDX 8540			SDX 8580		
90	95	90	0 / -0.035	95	+0.035 / 0								SDX 9040				SDX 9090	
100	105	100	0 / -0.035	105	+0.035 / 0													
110	115	110	0 / -0.035	115	+0.035 / 0										SDX 11060			SDX 11095

How to order ➡ Code - d X L (Example) SDX 10 x 10

Pre-lubricating Bearing SDX WC RoHS



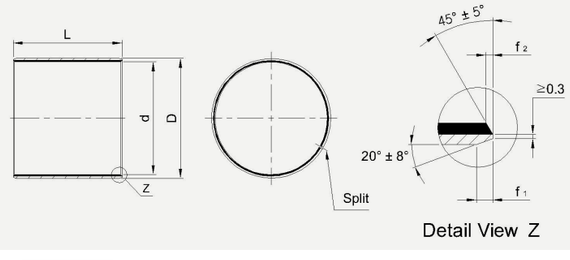
Item		Value
Max. Allowable Load	Static	250 N/mm²
	Dynamic	140 N/mm²
	Oscillating	70 N/mm²
Velocity	Grease Lubrication	2.5 m/s
	Oil Lubrication	3 m/s
PV Value	Grease Lubrication	2.8 N/mm² · m/s
	Oil Lubrication	50 N/mm² · m/s

Item		Value
Friction Coefficient	Grease Lubrication	0.15 ~ 0.25
	Oil Lubrication	0.05 ~ 0.15
Shaft	Hardness	> 270 HB
	Roughness	Ra = 0.4 ~ 1.25
Temperature		-40 ~ +120℃
Heat-Conducting Coefficient		52 W/(m·k)
Heat-Expansion Coefficient (Shaft)		11 x $10^{-6}K^{-1}$

Nominal ID	Code	ID ØD		OD ØD		Thickness T		Fixing Pin Hole				Housing Depth	
								Dia.		P.C.D			
10	SDX WC 10	12	+0.25 0	24	0 -0.25	1.5	-0.07 -0.15	1.625	+0.25 0	18	±0.12	1.0	0 -0.25
12	SDX WC 12	14		26				2.125		20			
14	SDX WC 14	16		30						23			
16	SDX WC 16	18		32						25			
18	SDX WC 18	20		36				3.125		28			
20	SDX WC 20	22		38						30			
22	SDX WC 22	24		42						33			
24	SDX WC 24	26		44						35			
25	SDX WC 25	28		48				4.125		38			
30	SDX WC 30	32		54						43			
35	SDX WC 35	38		62						50			
40	SDX WC 40	42		66						54			
45	SDX WC 45	48		74		2.0				61		1.5	
50	SDX WC 50	52		78						65			

How to order ➡ Code - Nominal ID (Example) SDX WC 10

Bi-metal Bearing SBI 800



Material ● Low Carbon Steel + Lead Bronze Alloy (CuPb10Sn10)

Item		Value
Max. Allowable Load	Static	250 N/mm^2
	Dynamic	140 N/mm^2
Linear Velocity		2.5 m/s
PV Value		2.8 N/mm^2·m/s
Shear Strength		170 N/mm^2

Item	Value
Bronze Alloy Hardness	HB 60 ~ 100
Temperature	-40 ~ +250℃
Friction Coefficient	0.05~ 0.12
Thermal Conductivity	60 W/(m·k)
Heat-Expansion Coefficient (Shaft)	14 x 10^{-6}K^{-1}

Bushing		Shaft (h7)		Housing (H7)		Length L (0 / -0.4)						
ID Ød	OD ØD					10	15	20	25	30	40	50
10	12	10	-0.013 / -0.028	12	+0.018 / 0	1010	1015	1020				
12	14	12	-0.016 / -0.034	14	+0.018 / 0	1210	1215	1220				
14	16	14	-0.016 / -0.034	16	+0.018 / 0	1410	1415	1420				
15	17	15	-0.016 / -0.034	17	+0.018 / 0	1510	1515	1520				
16	18	16	-0.016 / -0.034	18	+0.018 / 0	1610	1615	1620				
18	20	18	-0.016 / -0.034	20	+0.021 / 0	1810	1815	1820	1825			
20	23	20	-0.020 / -0.041	23	+0.021 / 0	2010	2015	2020	2025			
22	25	22	-0.020 / -0.041	25	+0.021 / 0	2210	2215	2220	2225			
24	27	24	-0.020 / -0.041	27	+0.021 / 0	2410	2415	2420	2425	2430		
25	28	25	-0.020 / -0.041	28	+0.021 / 0	2515	2520	2525	2525	2530		
26	30	26	-0.020 / -0.041	30	+0.021 / 0	2615	2620	2625	2625	2630		
28	32	28	-0.020 / -0.041	32	+0.025 / 0	2815	2820	2825	2825	2830	2840	
30	34	30	-0.020 / -0.041	34	+0.025 / 0	3015	3020	3025	3025	3030	3040	
32	36	32	-0.025 / -0.050	36	+0.025 / 0	3215	3220	3225	3225	3230	3240	
35	39	35	-0.025 / -0.050	39	+0.025 / 0		3520	3525	3525	3530	3540	3550
38	42	38	-0.025 / -0.050	42	+0.025 / 0		3820	3825	3825	3830	3840	3850
40	44	40	-0.025 / -0.050	44	+0.025 / 0		3850	4025	4025	4030	4040	4050
45	50	45	-0.025 / -0.050	50	+0.025 / 0		4520	4525	4525	4530	4540	4550

How to order ➡ Code - d X L (Example) SBI 800 35 X 25

Online Shopping Mall

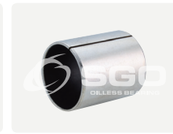
Online Shopping Mall www.oilless.net

Items In Stock


SOB


SFB


SOW


SDU


SDUF


SWC


SGB

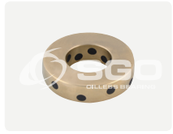

SL


SP


SWP


STWP

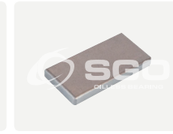

SDX


UC


UCF

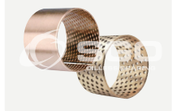

SBP


SBPT


SBPM


Coil Springs

Order-made Items - Dry & Lubricating Bearings


Bronze Roll Bearings


Bi-metal Bearings


Hydraulic DU


Bronze-backing DU


SUS DU


DU Plate


Bronze Mesh PTFE Bearing


DU with OD PTFE-coated


General Plastic Bearing


High-Speed Plastic Bearing


High-Load Plastic Bearing


Food Plastic Bearing

Order-made - Others


Solid Lubricant (Eco-Friendly)


Solid Lubricant (General)


Solid Lubricant (Conical)


Spring Plunger


Guide Post Pin


Ball Retainer

Technical Data

Bearing Life and Wear Amount

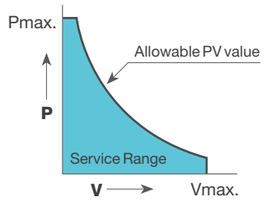
Allowance of abrasion for oil-less bearing depends on its dimension and accuracy, which directly leads to its lifetime. Since abrasion amount can be changed due to other conditions such as speed, load, inflow of foreign substance, temperature, axis processing status, and tolerance, it is difficult to accurately anticipate the abrasion amount and life time without using it. Also, oil-less bearing is mostly used in complex and special conditions compared to ball and roller bearing, so it is difficult to anticipate the life time using calculation formula. However, the wear amount is estimated by the following formula.

W = K.P.V.T

W : Wear amount (mm) / **V :** Velocity (m/min) / **P :** Contact pressure (kgf/cm^2)
T : Running time (hr) / **K :** Specific wear amount (mm/kgf/cm^2 · m/min·hr)

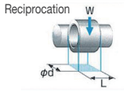
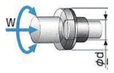
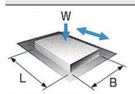
▼ Specific wear amount K

Lubrication	mm/kgf/cm^2·m/min·hr
Dry	1 X 10$^{-3 \sim -5}$
Boundary lubrication under low speed	1 X 10$^{-5 \sim -7}$
Periodic lubrication	1 X 10$^{-6 \sim -8}$
Continuous lubricaiton under water application	1 X 10$^{-8 \sim -10}$



PV Value

PV value is a value that has multiplied surface pressure per unit area P (kgf/cm^2, unit area for bearing is internal diameter x length) and speed per unit time V (m/min), which is used as important criteria for selecting bearing. Therefore, PV value should be calculated and selected as indicated below so that it does not exceed allowable PV value for each bearing. Calculation formula is indicated as below.

Bushing		P (Kgf/cm^2)	V (m/min)	PV (Kgf/cm^2·m/min)
	Radial journal rotation	$\frac{10^2 W}{\varnothing d \times L}$	$\frac{\pi \varnothing d n}{10^3}$	$\frac{\pi W n}{10 \times L}$
	Oscillation	$\frac{10^2 W}{\varnothing d \times L}$	$\frac{\pi \varnothing d c \theta}{180 \times 10^3}$	$\frac{\pi W c \theta}{18 \times 10^2 \times L}$
	Reciprocation	$\frac{10^2 W}{\varnothing d \times L}$	$\frac{2 c S}{10^3}$	$\frac{W c S}{5 \times \varnothing d \times L}$
Washer		**P (Kgf/cm^2)**	**V (m/min)**	**PV (Kgf/cm^2·m/min)**
	Thrust motion	Rotation $\frac{400 W}{\pi \times (\varnothing D^2 - \varnothing d^2)}$	Rotation $\frac{\pi \varnothing D n}{10^3}$	Rotation $\frac{4 W \varnothing D n}{10^3 \times (\varnothing D^2 - \varnothing d^2)}$
		Oscillation $\frac{400 W}{\pi \times (\varnothing D^2 - \varnothing d^2)}$	Oscillation $\frac{\pi \varnothing D \theta}{180 \times 10^3}$	Oscillation $\frac{4 W \varnothing D c \theta}{180 \times 10^3 \times (\varnothing D^2 - \varnothing d^2)}$
Plate		**P (Kgf/cm^2)**	**V (m/min)**	**PV (Kgf/cm^2·m/min)**
	Reciprocation	$\frac{10^2 W}{B \times L}$	$\frac{2 c S}{10^3}$	$\frac{W c S}{5 \times B \times L}$

Inner Diameter : Ød mm / **Outer Diameter :** ØD mm / **Length :** L mm / **Width :** B mm / **Rotating Speed :** n rpm
Oscillating Cycle : c cpm / **Stroke Distance :** S mm / **Oscillating Angle :** θ ° / **Load :** W kgf

Effect of Peridic Greasing

Additinoal lubrication with grease or oil can reduce friction heat and abrasion compared to dry lubrication status. Also, it can discharge worn particles abrasion and prevent foreign substance from flowing in (seal effect), and rust from occurring, which can improve bearing performance and life cycle. Also, if initial lubricant is applied on internal diameter where it requires no lubrication, it can reduce rapid initial wear amount that is occurred in starting and achieve soft operation effect.

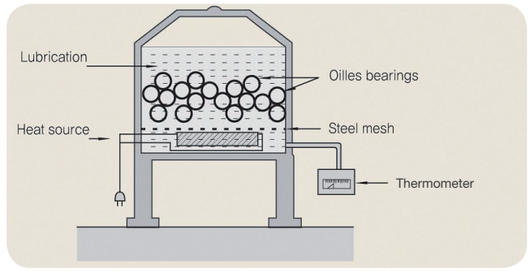
▼ **Lubricant can be used effectively as below depending on the using condition.**

Using condition	Lubricant
Low-load, High-speed	Spindle oil having low viscosity of < 8~17cst (30℃)
Medium-load, Medium-speed	Motor oil and turbine oil having viscosity of < 7~15cst (98.9℃)
High-load, Low-speed	Gear oil and cylinder oil having high viscosity of 100~1,000 cst (37℃) (Oil containing MoS^2 is effective)

※ For using on high-load and resistance to abrasion and heat, grease containing molybdenum disulfide (MoS^2) is most effective, which is recommended for improving performance and life cycle.

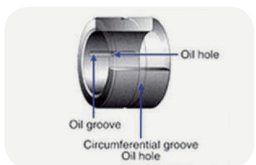
Oil Impregnation Method

When using solid lubricant dispersed bearing, THEDVELON by purchasing the material and machining or grinding, be sure to apply oil impregnation. There are heating type and vacuum type in impregnation method. Heating method contains processed product in the container with lubricant (motor oil) and gradually heats to 100 ~ 110℃ and keep the temperature 1 to 2 hours until bubble does not occur. Cut the heat source and let it cool down to the room temperature and takes products out of the bath. If oil impregnation by heating is not available, leave the products in the oil bath for 24 hours or more. Also, vacuum impregnation can be available on request.

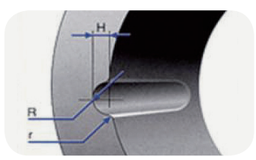


Design for Oil Groove and Oil Hole

- **Oil groove :** Design can be applied evenly on the internal diameter surface based on the maximum load point. Length of oil groove should be 80 % more or less of bearing length. All edges should be chamfered. In case of injecting oil from outside of the housing, it is very effective to make the rotation groove on the housing internal diameter or bearing external diameter surface in order to avoid inadequate lubrication from clogged oil hole caused by shifiting of the oil hole from the housing oil groove.
- **Oil hole :** Normally, 1 oil hole is made to the direction where load is not applied. In case of rotational motion, 2 oil holes are made to both direction based on the maximum load point. Also, when bearing length is long, 2 oil holes are made to length direction.



Oil hold and oil groove



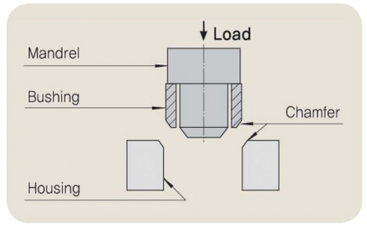
Cross sectional configuraton of oil groove

ID Item	R	r	H	Qt'y
30 or below	1.5	1.5	1.2	1 ~ 2
30 ~ 50	2	2	1.8	3
50 ~ 80	3	3	2.5	3
80 ~ 120	3.5	3.5	3.5	4
120 ~ 180	4	4	5	4
180 ~ 250	5	5	6	5
250 ~ 315	6	6	7	6
315 ~ 400	7	7	8	8
400 ~ 500	8	8	8	8

Technical Data

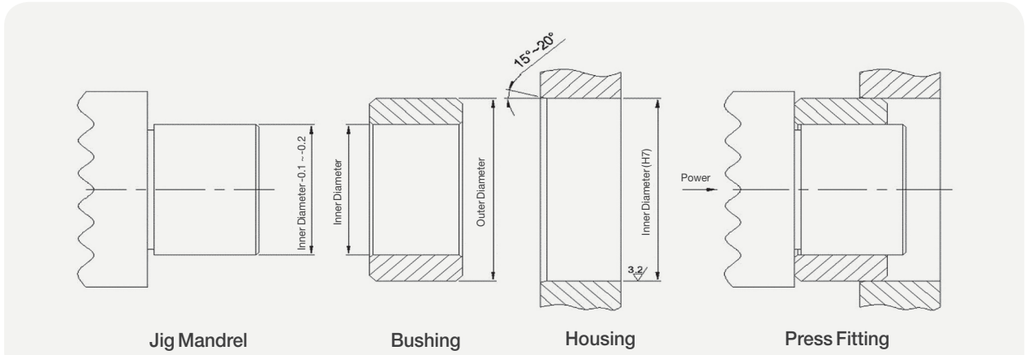
Bearing Mounting

There are pressing fit and cooling fit for inserting the bearing into the housing.



- **Cooling fit**
  - Nitrogen and dry ice are used for cooling fit.
  - Compared to pressing fit, it can acheive more accurate installation.
  - Shrinkage fit can deteriorate the bearing function.

- **Pressing fit**
  - In general, mandrel and press machine are used for pressing the oil-less bearing into the housing.
  - As indicated on the figure, oil-less bearing is pressed into the housinghe with jig (fixing device) by a small press.
  - In case of pressing large product, chamfering should be made on the bearing external diameter and housing internal diameter first before using the oil.



- **Caution**
  - Shaft should be ground (Ra0.8) in principle.
  - Be sure to comply with the tolerance indicated on the dimension table of the catalog for the housing and shaft.
  - Be sure to maintain bearing shaft horizontally so that it is not tilted to one side.
  - Recommended to use the sealing to prevent foreign substance from flowing in.
  - Hardening does not have to be applied on the shaft, but life cycle can be extended if it's chrome plated.

Calculation Formula for Shrinkage Amount by Cooling

$$\Delta D \fallingdotseq D \times a \times (T0 - T1)$$

D : Outer Diameter of the Bearing / **a :** Heat Expansion Coefficient of the Bearing
T0 : RoomTemperature / **T1 :** Cooling Temperature

- **Heat expansion coefficient**

#500SP : $a = 2.2 \times 10^{-5}$℃
#500B : $a = 1.8 \times 10 - 5$℃
#500F : $a = 1.2 \times 10 - 5$℃

※ Refer to it for below diameter 500 mm

Ex) #500SP I.D 100 x O.D 130 x 100L
Room temperature 20℃, Cooling temperature -70℃
➡ $\Delta D \fallingdotseq 130 \times 2.2 \times 0.00001 \times (20 - (-70)) = 0.2574$

Frictional Heat

Frictional heat Q generated per unit time and unit area is indicated as below.

$$Q = \mu \cdot P \cdot V / J \ (kcal/min)$$

J : Frictional heat per unit motion (≒427kgf-m/kcal) / **μ :** Frictional coefficient
P : Contact pressure (kgf/cm²) / **V :** Velocity (m/min)

Frictional heat is mainly affected by speed rather than contact pressure.
Therefore, for simillar PV values, additional lubrication should be considered for a higher velocity application to prevent seizure to the bearing or the mating shaft.

Mating Shaft

Item	Shaft Material	Hardness	Shaft roughness
General purpose	General structural steel wiht SM35C or above	Higher strength material is recommended, when foreign substance flows in	3~12μ
High temperature	Stainless steel or chrome plating		
Corrosive environment	Rockwell "C" 35 or above		

- **Reduce the shaft dimension to account for the heat expansion amount of the material when it is used on high temperature 100℃ or above.**

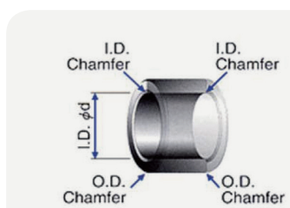
Heat expansion amount = shaft heat expansion coefficient (α) x shaft diameter (d) x (ambient temperature - room temperature)

- **2 ~ 3 chrome plating is ideal for seawater and liquid medicine.**
- **Nitrification on shaft is effective in high pressure and low speed application.**

Chamfering

It is ideal to chamfer the both ends of the oil-less bearing in order to prevent stress concentration.

ID Item	Chamfer
80 or below	0.5C
80 ~ 200	1.0C
200 ~ 300	1.5C
300 or below	2.0C



Calculation Formula for Appropriate Thickness of the Bearing

표준적 베어링의 두께는 다음의 공식으로 구합니다.

$$T = (0.05 \sim 0.07)d + (2 \sim 5mm)$$

Tolerances of Regularly Used **Hole Fits**

Size(mm)		D			E			F			G		H					
Over	Below	D8	D9	D10	E7	E8	E9	F6	F7	F8	G6	G7	H5	H6	H7	H8	H9	H10
0	3	34.0	45.0	60.0	24.0	28.0	29.0	12.0	16.0	20.0	8.0	12.0	4.0	6.0	10.0	14.0	25.0	40.0
		20.0	20.0	20.0	14.0	14.0	14.0	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
3	6	48.0	60.0	78.0	32.0	38.0	50.0	18.0	22.0	28.0	12.0	16.0	5.0	8.0	12.0	18.0	30.0	48.0
		30.0	30.0	30.0	20.0	20.0	20.0	10.0	10.0	10.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
6	10	62.0	76.0	98.0	40.0	47.0	61.0	22.0	28.0	35.0	14.0	20.0	6.0	9.0	15.0	22.0	36.0	58.0
		40.0	40.0	40.0	25.0	25.0	25.0	13.0	13.0	13.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
10	14	77.0	93.0	120.0	50.0	59.0	75.0	27.0	34.0	43.0	17.0	24.0	8.0	11.0	18.0	27.0	43.0	70.0
		50.0	50.0	50.0	32.0	32.0	32.0	16.0	16.0	16.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
14	18	77.0	93.0	120.0	50.0	59.0	75.0	27.0	34.0	43.0	17.0	24.0	8.0	11.0	18.0	27.0	43.0	70.0
		50.0	50.0	50.0	32.0	32.0	32.0	16.0	16.0	16.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
18	24	98.0	117.0	149.0	61.0	73.0	92.0	33.0	41.0	53.0	20.0	28.0	9.0	13.0	21.0	33.0	52.0	84.0
		65.0	65.0	65.0	40.0	40.0	40.0	20.0	20.0	20.0	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0
24	30	98.0	117.0	149.0	61.0	73.0	92.0	33.0	41.0	53.0	20.0	28.0	9.0	13.0	21.0	33.0	52.0	84.0
		65.0	65.0	65.0	40.0	40.0	40.0	20.0	20.0	20.0	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0
30	40	119.0	142.0	180.0	75.0	89.0	112.0	41.0	50.0	64.0	25.0	34.0	11.0	16.0	25.0	39.0	62.0	100.0
		80.0	80.0	80.0	50.0	50.0	50.0	25.0	25.0	25.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0
40	50	119.0	142.0	180.0	75.0	89.0	112.0	41.0	50.0	64.0	25.0	34.0	11.0	16.0	25.0	39.0	62.0	100.0
		80.0	80.0	80.0	50.0	50.0	50.0	25.0	25.0	25.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0
50	65	146.0	174.0	220.0	90.0	106.0	134.0	49.0	60.0	76.0	29.0	40.0	13.0	19.0	30.0	46.0	74.0	120.0
		100.0	100.0	100.0	60.0	60.0	60.0	30.0	30.0	30.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
65	80	146.0	174.0	220.0	90.0	106.0	134.0	49.0	60.0	76.0	29.0	40.0	13.0	19.0	30.0	46.0	74.0	120.0
		100.0	100.0	100.0	60.0	60.0	60.0	30.0	30.0	30.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
80	100	174.0	207.0	260.0	107.0	126.0	156.0	58.0	71.0	90.0	34.0	47.0	15.0	22.0	35.0	54.0	87.0	140.0
		120.0	120.0	120.0	72.0	72.0	72.0	36.0	36.0	36.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
100	120	174.0	207.0	260.0	107.0	126.0	156.0	58.0	71.0	90.0	34.0	47.0	15.0	22.0	35.0	54.0	87.0	140.0
		120.0	120.0	120.0	72.0	72.0	72.0	36.0	36.0	36.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
120	140	208.0	245.0	305.0	125.0	148.0	185.0	68.0	83.0	106.0	39.0	54.0	18.0	25.0	40.0	63.0	100.0	160.0
		145.0	145.0	145.0	85.0	85.0	85.0	43.0	43.0	43.0	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0
140	160	208.0	245.0	305.0	125.0	148.0	185.0	68.0	83.0	106.0	39.0	54.0	18.0	25.0	40.0	63.0	100.0	160.0
		145.0	145.0	145.0	85.0	85.0	85.0	43.0	43.0	43.0	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0
160	180	208.0	245.0	305.0	125.0	148.0	185.0	68.0	83.0	106.0	39.0	54.0	18.0	25.0	40.0	63.0	100.0	160.0
		145.0	145.0	145.0	85.0	85.0	85.0	43.0	43.0	43.0	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0
180	200	242.0	285.0	355.0	146.0	172.0	215.0	79.0	96.0	122.0	44.0	61.0	20.0	29.0	46.0	72.0	115.0	185.0
		170.0	170.0	170.0	100.0	100.0	100.0	50.0	50.0	50.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
200	225	242.0	285.0	355.0	146.0	172.0	215.0	79.0	96.0	122.0	44.0	61.0	20.0	29.0	46.0	72.0	115.0	185.0
		170.0	170.0	170.0	100.0	100.0	100.0	50.0	50.0	50.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
225	250	242.0	285.0	355.0	146.0	172.0	215.0	79.0	96.0	122.0	44.0	61.0	20.0	29.0	46.0	72.0	115.0	185.0
		170.0	170.0	170.0	100.0	100.0	100.0	50.0	50.0	50.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
250	280	271.0	320.0	400.0	162.0	191.0	240.0	88.0	108.0	137.0	49.0	69.0	23.0	32.0	52.0	81.0	130.0	210.0
		190.0	190.0	190.0	110.0	110.0	110.0	56.0	56.0	56.0	17.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0
280	315	271.0	320.0	400.0	162.0	191.0	240.0	88.0	108.0	137.0	49.0	69.0	23.0	32.0	52.0	81.0	130.0	210.0
		190.0	190.0	190.0	110.0	110.0	110.0	56.0	56.0	56.0	17.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0
315	355	299.0	350.0	440.0	182.0	214.0	265.0	98.0	119.0	151.0	54.0	79.0	25.0	36.0	57.0	89.0	140.0	230.0
		210.0	210.0	210.0	125.0	125.0	125.0	62.0	62.0	62.0	18.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0
355	400	299.0	350.0	440.0	182.0	214.0	265.0	98.0	119.0	151.0	54.0	79.0	25.0	36.0	57.0	89.0	140.0	230.0
		210.0	210.0	210.0	125.0	125.0	125.0	62.0	62.0	62.0	18.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0
400	450	327.0	385.0	480.0	198.0	232.0	290.0	108.0	131.0	165.0	60.0	83.0	27.0	40.0	63.0	97.0	155.0	250.0
		230.0	230.0	230.0	135.0	135.0	135.0	68.0	68.0	68.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
450	500	327.0	385.0	480.0	198.0	232.0	290.0	108.0	131.0	165.0	60.0	83.0	27.0	40.0	63.0	97.0	155.0	250.0
		230.0	230.0	230.0	135.0	135.0	135.0	68.0	68.0	68.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0

Size(mm)		Js			K			M			N		P		R	S	T	U	X
Over	Below	Js5	Js6	Js7	K5	K6	K7	M5	M6	M7	N6	N7	P6	P7	R7	S7	T7	U7	X7
0	3	2.0	3.0	5.0	0.0	0.0	0.0	-2.0	-2.0	-2.0	-4.0	-4.0	-6.0	-6.0	-10.0	-14.0	•	-18.0	-20.0
		-2.0	-3.0	-5.0	-4.0	-6.0	-10.0	-6.0	-8.0	-12.0	-10.0	-14.0	-12.0	-16.0	-20.0	-24.0	•	-28.0	-30.0
3	6	2.5	4.0	6.0	0.0	2.0	3.0	-3.0	-1.0	0.0	-5.0	-4.0	-9.0	-8.0	-11.0	-15.0	•	-19.0	-24.0
		-2.5	-4.0	-6.0	-5.0	-6.0	-9.0	-8.0	-9.0	-12.0	-13.0	-16.0	-17.0	-20.0	-23.0	-27.0	•	-31.0	-36.0
6	10	3.0	4.5	7.5	1.0	2.0	5.0	-4.0	-3.0	0.0	-7.0	-4.0	-12.0	-9.0	-13.0	-17.0	•	-22.0	-28.0
		-3.0	-4.5	-7.5	-5.0	-7.0	-10.0	-10.0	-12.0	-15.0	-16.0	-19.0	-21.0	-24.0	-28.0	-32.0	•	-37.0	-43.0
10	14	4.0	5.5	9.0	2.0	2.0	6.0	6.0	-4.0	0.0	-9.0	15.0	-15.0	-11.0	-16.0	-21.0	•	-26.0	-33.0
		-4.0	-5.5	-9.0	-6.0	-9.0	-9.0	-12.0	-15.0	-18.0	-20.0	-23.0	-26.0	-29.0	-34.0	-39.0	•	-44.0	-51.0
14	18	4.0	5.5	9.0	2.0	2.0	6.0	6.0	-4.0	0.0	-9.0	15.0	-15.0	-11.0	-16.0	-21.0	•	-26.0	-38.0
		-4.0	-5.5	-9.0	-6.0	-9.0	-9.0	-12.0	-15.0	-18.0	-20.0	-23.0	-26.0	-29.0	-34.0	-39.0	•	-44.0	-56.0
18	24	4.5	6.5	10.5	1.0	2.0	6.0	-5.0	-4.0	0.0	-11.0	-7.0	-18.0	-14.0	-20.0	-27.0	•	-33.0	-46.0
		-4.5	-6.5	-10.5	-8.0	-11.0	-15.0	-14.0	-17.0	-21.0	-24.0	-28.0	-31.0	-35.0	-41.0	-48.0	•	-54.0	-67.0
24	30	4.5	6.5	10.5	1.0	2.0	6.0	-5.0	-4.0	0.0	-11.0	-7.0	-18.0	-14.0	-20.0	-27.0	-33.0	-40.0	-56.0
		-4.5	-6.5	-10.5	-8.0	-11.0	-15.0	-14.0	-17.0	-21.0	-24.0	-28.0	-31.0	-35.0	-41.0	-48.0	-54.0	-61.0	-77.0
30	40	5.5	8.0	12.5	2.0	3.0	7.0	-5.0	-4.0	0.0	-12.0	-8.0	-21.0	-17.0	-25.0	-34.0	-39.0	-51.0	•
		-5.5	-8.0	-12.5	-9.0	-13.0	-18.0	-16.0	-20.0	-25.0	-28.0	-33.0	-37.0	-42.0	-50.0	-59.0	-64.0	-76.0	•
40	50	5.5	8.0	12.5	2.0	3.0	7.0	-5.0	-4.0	0.0	-12.0	-8.0	-21.0	-17.0	-25.0	-34.0	-45.0	-61.0	•
		-5.5	-8.0	-12.5	-9.0	-13.0	-18.0	-16.0	-20.0	-25.0	-28.0	-33.0	-37.0	-42.0	-50.0	-59.0	-70.0	-86.0	•
50	65	6.5	9.5	15.0	3.0	4.0	9.0	-6.0	-5.0	0.0	-14.0	-9.0	-26.0	-21.0	-30.0	-42.0	-55.0	-76.0	•
		-6.5	-9.5	-15.0	-10.0	-15.0	-21.0	-19.0	-24.0	-30.0	-33.0	-39.0	-45.0	-51.0	-60.0	-72.0	-85.0	-106.0	•
65	80	6.5	9.5	15.0	3.0	4.0	9.0	-6.0	-5.0	0.0	-14.0	-9.0	-26.0	-21.0	-32.0	-48.0	-64.0	-91.0	•
		-6.5	-9.5	-15.0	-10.0	-15.0	-21.0	-19.0	-24.0	-30.0	-33.0	-39.0	-45.0	-51.0	-62.0	-78.0	-94.0	-121.0	•
80	100	7.5	11.0	17.5	2.0	4.0	10.0	-8.0	-6.0	0.0	-16.0	-10.0	-30.0	-24.0	-38.0	-58.0	-78.0	-111.0	•
		-7.5	-11.0	-17.5	-13.0	-18.0	-25.0	-23.0	-28.0	-35.0	-38.0	-45.0	-52.0	-59.0	-73.0	-93.0	-113.0	-146.0	•
100	120	7.5	11.0	17.5	2.0	4.0	10.0	-8.0	-6.0	0.0	-16.0	-10.0	-30.0	-24.0	-41.0	-66.0	-91.0	-131.0	•
		-7.5	-11.0	-17.5	-13.0	-18.0	-25.0	-23.0	-28.0	-35.0	-38.0	-45.0	-52.0	-59.0	-76.0	-101.0	-126.0	-166.0	•
120	140	9.0	12.5	20.0	3.0	4.0	12.0	-9.0	-8.0	0.0	-20.0	-12.0	-36.0	-28.0	-48.0	-77.0	-107.0	•	•
		-9.0	-12.5	-20.0	-15.0	-21.0	-28.0	-27.0	-33.0	-40.0	-45.0	-52.0	-61.0	-68.0	-88.0	-117.0	-147.0	•	•
140	160	9.0	12.5	20.0	3.0	4.0	12.0	-9.0	-8.0	0.0	-20.0	-12.0	-36.0	-28.0	-50.0	-85.0	-119.0	•	•
		-9.0	-12.5	-20.0	-15.0	-21.0	-28.0	-27.0	-33.0	-40.0	-45.0	-52.0	-61.0	-68.0	-90.0	-125.0	-159.0	•	•
160	180	9.0	12.5	20.0	3.0	4.0	12.0	-9.0	-8.0	0.0	-20.0	-12.0	-36.0	-28.0	-53.0	-93.0	-131.0	•	•
		-9.0	-12.5	-20.0	-15.0	-21.0	-28.0	-27.0	-33.0	-40.0	-45.0	-52.0	-61.0	-68.0	-93.0	-133.0	-171.0	•	•
180	200	10.0	14.5	23.0	2.0	5.0	13.0	-11.0	-8.0	0.0	-22.0	-14.0	-41.0	-33.0	-60.0	-105.0	•	•	•
		-10.0	-14.5	-23.0	-18.0	-24.0	-33.0	-31.0	-37.0	-46.0	-51.0	-60.0	-70.0	-79.0	-106.0	-151.0	•	•	•
200	225	10.0	14.5	23.0	2.0	5.0	13.0	-11.0	-8.0	0.0	-22.0	-14.0	-41.0	-33.0	-63.0	-113.0	•	•	•
		-10.0	-14.5	-23.0	-18.0	-24.0	-33.0	-31.0	-37.0	-46.0	-51.0	-60.0	-70.0	-79.0	-109.0	-159.0	•	•	•
225	250	10.0	14.5	23.0	2.0	5.0	13.0	-11.0	-8.0	0.0	-22.0	-14.0	-41.0	-33.0	-67.0	-123.0	•	•	•
		-10.0	-14.5	-23.0	-18.0	-24.0	-33.0	-31.0	-37.0	-46.0	-51.0	-60.0	-70.0	-79.0	-113.0	-169.0	•	•	•
250	280	11.5	16.0	26.0	3.0	5.0	16.0	-13.0	-9.0	0.0	-25.0	-14.0	-47.0	-36.0	-74.0	•	•	•	•
		-11.5	-16.0	-26.0	-20.0	-27.0	-36.0	-36.0	-41.0	-52.0	-57.0	-66.0	-79.0	-88.0	-126.0	•	•	•	•
280	315	11.5	16.0	26.0	3.0	5.0	16.0	-13.0	-9.0	0.0	-25.0	-14.0	-47.0	-36.0	-78.0	•	•	•	•
		-11.5	-16.0	-26.0	-20.0	-27.0	-36.0	-36.0	-41.0	-52.0	-57.0	-66.0	-79.0	-88.0	-130.0	•	•	•	•
315	355	12.5	18.0	28.5	3.0	7.0	17.0	-14.0	-10.0	0.0	-26.0	-16.0	-51.0	-41.0	-87.0	•	•	•	•
		-12.5	-18.0	-28.5	-22.0	-29.0	-40.0	-39.0	-46.0	-57.0	-62.0	-73.0	-81.0	-98.0	-144.0	•	•	•	•
355	400	12.5	18.0	28.5	3.0	7.0	17.0	-14.0	-10.0	0.0	-26.0	-16.0	-51.0	-41.0	-93.0	•	•	•	•
		-12.5	-18.0	-28.5	-22.0	-29.0	-40.0	-39.0	-46.0	-57.0	-62.0	-73.0	-81.0	-98.0	-150.0	•	•	•	•
400	450	13.5	20.0	31.5	2.0	8.0	18.0	-16.0	-10.0	0.0	-27.0	-17.0	-55.0	-45.0	-103.0	•	•	•	•
		-13.5	-20.0	-31.5	-25.0	-32.0	-45.0	-43.0	-50.0	-63.0	-67.0	-80.0	-95.0	-100.0	-166.0	•	•	•	•
450	500	13.5	20.0	31.5	2.0	8.0	18.0	-16.0	-10.0	0.0	-27.0	-17.0	-55.0	-45.0	-109.0	•	•	•	•
		-13.5	-20.0	-31.5	-25.0	-32.0	-45.0	-43.0	-50.0	-63.0	-67.0	-80.0	-95.0	-100.0	-172.0	•	•	•	•

• : NOTHING

Tolerances of Regularly Used **Shaft Fits**

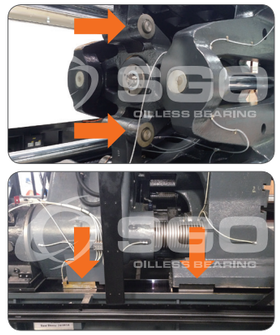
Size(mm)		b	c	d		e			f			g			h			
Over	Below	b9	c9	d8	d9	e7	e8	e9	f6	f7	f8	g4	g5	g6	h4	h5	h6	h7
0	3	-140.0	-60.0	-20.0	-20.0	-14.0	-14.0	-14.0	-6.0	-6.0	-6.0	-2.0	-2.0	-2.0	0.0	0.0	0.0	0.0
		-165.0	-85.0	-34.0	-45.0	-24.0	-28.0	-29.0	-12.0	-16.0	-20.0	-5.0	-6.0	-8.0	-3.0	-4.0	-6.0	-10.0
3	6	-140.0	-70.0	-30.0	-30.0	-20.0	-20.0	-20.0	-10.0	-10.0	-10.0	-4.0	-4.0	-4.0	0.0	0.0	0.0	0.0
		-170.0	-100.0	-48.0	-60.0	-32.0	-38.0	-50.0	-18.0	-22.0	-28.0	-8.0	-9.0	-12.0	-4.0	-5.0	-8.0	-12.0
6	10	-150.0	-80.0	-40.0	-40.0	-25.0	-25.0	-25.0	-13.0	-13.0	-13.0	-5.0	-5.0	-5.0	0.0	0.0	0.0	0.0
		-186.0	-116.0	-62.0	-76.0	-40.0	-47.0	-61.0	-22.0	-28.0	-35.0	-9.0	-11.0	-14.0	-4.0	-6.0	-9.0	-15.0
10	14	-150.0	-95.0	-50.0	-50.0	-32.0	-32.0	-32.0	-16.0	-16.0	-16.0	-6.0	-6.0	-6.0	0.0	0.0	0.0	0.0
		-193.0	-138.0	-77.0	-93.0	-50.0	-59.0	-75.0	-27.0	-34.0	-43.0	-11.0	-14.0	-17.0	-5.0	-8.0	-11.0	-18.0
14	18	-150.0	-95.0	-50.0	-50.0	-32.0	-32.0	-32.0	-16.0	-16.0	-16.0	-6.0	-6.0	-6.0	0.0	0.0	0.0	0.0
		-193.0	-138.0	-77.0	-93.0	-50.0	-59.0	-75.0	-27.0	-34.0	-43.0	-11.0	-14.0	-17.0	-5.0	-8.0	-11.0	-18.0
18	24	-160.0	-110.0	-65.0	-65.0	-40.0	-40.0	-40.0	-20.0	-20.0	-20.0	-7.0	-7.0	-7.0	0.0	0.0	0.0	0.0
		-212.0	-162.0	-98.0	-117.0	-61.0	-73.0	-93.0	-33.0	-41.0	-53.0	-13.0	-16.0	-20.0	-6.0	-9.0	-13.0	-21.0
24	30	-160.0	-110.0	-65.0	-65.0	-40.0	-40.0	-40.0	-20.0	-20.0	-20.0	-7.0	-7.0	-7.0	0.0	0.0	0.0	0.0
		-212.0	-162.0	-98.0	-117.0	-61.0	-73.0	-93.0	-33.0	-41.0	-53.0	-13.0	-16.0	-20.0	-6.0	-9.0	-13.0	-21.0
30	40	-170.0	-120.0	-80.0	-80.0	-50.0	-50.0	-50.0	-25.0	-25.0	-25.0	-9.0	-9.0	-9.0	0.0	0.0	0.0	0.0
		-232.0	-182.0	-119.0	-142.0	-75.0	-89.0	-112.0	-41.0	-50.0	-64.0	-16.0	-20.0	-25.0	-7.0	-11.0	-16.0	-25.0
40	50	-180.0	-130.0	-80.0	-80.0	-50.0	-50.0	-50.0	-25.0	-25.0	-25.0	-9.0	-9.0	-9.0	0.0	0.0	0.0	0.0
		-242.0	-192.0	-119.0	-142.0	-75.0	-89.0	-112.0	-41.0	-50.0	-64.0	-16.0	-20.0	-25.0	-7.0	-11.0	-16.0	-25.0
50	65	-190.0	-140.0	-100.0	-100.0	-60.0	-60.0	-60.0	-30.0	-30.0	-30.0	-10.0	-10.0	-10.0	0.0	0.0	0.0	0.0
		-264.0	-214.0	-146.0	-174.0	-90.0	-106.0	-134.0	-49.0	-60.0	-76.0	-18.0	-23.0	-29.0	-8.0	-13.0	-19.0	-30.0
65	80	-200.0	-150.0	-100.0	-100.0	-60.0	-60.0	-60.0	-30.0	-30.0	-30.0	-10.0	-10.0	-10.0	0.0	0.0	0.0	0.0
		-274.0	-224.0	-146.0	-174.0	-90.0	-106.0	-134.0	-49.0	-60.0	-76.0	-18.0	-23.0	-29.0	-8.0	-13.0	-19.0	-30.0
80	100	-220.0	-170.0	-120.0	-120.0	-72.0	-72.0	-72.0	-36.0	-36.0	-36.0	-12.0	-12.0	-12.0	0.0	0.0	0.0	0.0
		-307.0	-257.0	-174.0	-207.0	-107.0	-126.0	-159.0	-58.0	-71.0	-90.0	-22.0	-27.0	-34.0	-10.0	-15.0	-22.0	-35.0
100	120	-240.0	-180.0	-120.0	-120.0	-72.0	-72.0	-72.0	-36.0	-36.0	-36.0	-12.0	-12.0	-12.0	0.0	0.0	0.0	0.0
		-327.0	-267.0	-174.0	-207.0	-107.0	-126.0	-159.0	-58.0	-71.0	-90.0	-22.0	-27.0	-34.0	-10.0	-15.0	-22.0	-35.0
120	140	-260.0	-200.0	-145.0	-145.0	-85.0	-85.0	-85.0	-43.0	-43.0	-43.0	-14.0	-14.0	-14.0	0.0	0.0	0.0	0.0
		-360.0	-300.0	-208.0	-245.0	-125.0	-148.0	-185.0	-68.0	-83.0	-106.0	-26.0	-32.0	-39.0	-12.0	-18.0	-25.0	-40.0
140	160	-280.0	-210.0	-145.0	-145.0	-85.0	-85.0	-85.0	-43.0	-43.0	-43.0	-14.0	-14.0	-14.0	0.0	0.0	0.0	0.0
		-380.0	-310.0	-208.0	-245.0	-125.0	-148.0	-185.0	-68.0	-83.0	-106.0	-26.0	-32.0	-39.0	-12.0	-18.0	-25.0	-40.0
160	180	-310.0	-230.0	-145.0	-145.0	-85.0	-85.0	-85.0	-43.0	-43.0	-43.0	-14.0	-14.0	-14.0	0.0	0.0	0.0	0.0
		-410.0	-330.0	-208.0	-245.0	-125.0	-148.0	-185.0	-68.0	-83.0	-106.0	-26.0	-32.0	-39.0	-12.0	-18.0	-25.0	-40.0
180	200	-340.0	-240.0	-170.0	-170.0	-100.0	-100.0	-100.0	-50.0	-50.0	-50.0	-15.0	-15.0	-15.0	0.0	0.0	0.0	0.0
		-455.0	-355.0	-242.0	-285.0	-146.0	-172.0	-215.0	-79.0	-96.0	-122.0	-29.0	-35.0	-44.0	-14.0	-20.0	-29.0	-46.0
200	225	-380.0	-260.0	-170.0	-170.0	-100.0	-100.0	-100.0	-50.0	-50.0	-50.0	-15.0	-15.0	-15.0	0.0	0.0	0.0	0.0
		-495.0	-375.0	-242.0	-285.0	-146.0	-172.0	-215.0	-79.0	-96.0	-122.0	-29.0	-35.0	-44.0	-14.0	-20.0	-29.0	-46.0
225	250	-440.0	-280.0	-170.0	-170.0	-100.0	-100.0	-100.0	-50.0	-50.0	-50.0	-15.0	-15.0	-15.0	0.0	0.0	0.0	0.0
		-535.0	-395.0	-242.0	-285.0	-146.0	-172.0	-215.0	-79.0	-96.0	-122.0	-29.0	-35.0	-44.0	-14.0	-20.0	-29.0	-46.0
250	280	-480.0	-300.0	-190.0	-190.0	-110.0	-110.0	-110.0	-56.0	-56.0	-56.0	-17.0	-17.0	-17.0	0.0	0.0	0.0	0.0
		-610.0	-430.0	-271.0	-320.0	-162.0	-191.0	-240.0	-88.0	-108.0	-132.0	-33.0	-40.0	-49.0	-16.0	-23.0	-32.0	-52.0
280	315	-540.0	-330.0	-190.0	-190.0	-110.0	-110.0	-110.0	-56.0	-56.0	-56.0	-17.0	-17.0	-17.0	0.0	0.0	0.0	0.0
		-670.0	-460.0	-271.0	-320.0	-162.0	-191.0	-240.0	-88.0	-108.0	-132.0	-33.0	-40.0	-49.0	-16.0	-23.0	-32.0	-52.0
315	355	-600.0	-360.0	-210.0	-210.0	-125.0	-125.0	-125.0	-62.0	-62.0	-62.0	-18.0	-18.0	-18.0	0.0	0.0	0.0	0.0
		-740.0	-500.0	-299.0	-350.0	-182.0	-214.0	-265.0	-98.0	-119.0	-151.0	-36.0	-43.0	-54.0	-18.0	-25.0	-36.0	-57.0
355	400	-680.0	-400.0	-210.0	-210.0	-125.0	-125.0	-125.0	-62.0	-62.0	-62.0	-18.0	-18.0	-18.0	0.0	0.0	0.0	0.0
		-820.0	-540.0	-299.0	-350.0	-182.0	-214.0	-265.0	-98.0	-119.0	-151.0	-36.0	-43.0	-54.0	-18.0	-25.0	-36.0	-57.0
400	450	-760.0	-440.0	-230.0	-230.0	-135.0	-135.0	-135.0	-68.0	-68.0	-68.0	-20.0	-20.0	-20.0	0.0	0.0	0.0	0.0
		-915.0	-595.0	-327.0	-385.0	-198.0	-232.0	-290.0	-108.0	-131.0	-165.0	-40.0	-47.0	-60.0	-20.0	-27.0	-40.0	-63.0
450	500	-840.0	-480.0	-230.0	-230.0	-135.0	-135.0	-135.0	-68.0	-68.0	-68.0	-20.0	-20.0	-20.0	0.0	0.0	0.0	0.0
		-995.0	-635.0	-327.0	-385.0	-198.0	-232.0	-290.0	-108.0	-131.0	-165.0	-40.0	-47.0	-60.0	-20.0	-27.0	-40.0	-63.0

Size(mm)		h		js				k			m			n	p	r	s	t	u	x
Over	Below	h8	h9	js4	js5	js6	js7	k4	k5	k6	m4	m5	m6	n6	p6	r6	s6	t6	u6	x6
0	3	0.0	0.0	1.5	2.0	3.0	5.0	3.0	4.0	6.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	•	24.0	26.0
		-14.0	-25.0	-1.5	-2.0	-3.0	-5.0	0.0	0.0	0.0	2.0	2.0	2.0	4.0	6.0	10.0	14.0	•	18.0	20.0
3	6	0.0	0.0	2.0	2.5	4.0	6.0	5.0	6.0	9.0	8.0	9.0	12.0	16.0	20.0	23.0	27.0	•	31.0	36.0
		-18.0	-30.0	-2.0	-2.5	-4.0	-6.0	1.0	1.0	1.0	4.0	4.0	4.0	8.0	12.0	15.0	19.0	•	23.0	28.0
6	10	0.0	0.0	2.0	3.0	4.5	7.5	6.0	7.0	10.0	10.0	12.0	15.0	19.0	24.0	28.0	32.0	•	37.0	43.0
		-22.0	-36.0	-2.0	-3.0	-4.5	-7.5	1.0	1.0	1.0	6.0	6.0	6.0	10.0	15.0	19.0	23.0	•	28.0	34.0
10	14	0.0	0.0	2.5	4.0	5.5	9.0	6.0	9.0	12.0	12.0	15.0	18.0	23.0	29.0	34.0	39.0	•	44.0	51.0
		-27.0	-43.0	-2.5	-4.0	-5.5	-9.0	1.0	1.0	1.0	7.0	7.0	7.0	12.0	18.0	23.0	28.0	•	33.0	40.0
14	18	0.0	0.0	2.5	4.0	5.5	9.0	6.0	9.0	12.0	12.0	15.0	18.0	23.0	29.0	34.0	39.0	•	44.0	56.0
		-27.0	-43.0	-2.5	-4.0	-5.5	-9.0	1.0	1.0	1.0	7.0	7.0	7.0	12.0	18.0	23.0	28.0	•	33.0	45.0
18	24	0.0	0.0	3.0	4.5	6.5	10.5	8.0	11.0	15.0	14.0	17.0	21.0	28.0	35.0	41.0	48.0	•	54.0	67.0
		-33.0	-52.0	-3.0	-4.5	-6.5	-10.5	2.0	2.0	2.0	8.0	8.0	8.0	15.0	22.0	28.0	35.0	•	41.0	54.0
24	30	0.0	0.0	3.0	4.5	6.5	10.5	8.0	11.0	15.0	14.0	17.0	21.0	28.0	35.0	41.0	48.0	54.0	61.0	77.0
		-33.0	-52.0	-3.0	-4.5	-6.5	-10.5	2.0	2.0	2.0	8.0	8.0	8.0	15.0	22.0	28.0	35.0	41.0	48.0	64.0
30	40	0.0	0.0	3.5	5.5	8.0	12.5	9.0	13.0	18.0	16.0	20.0	25.0	33.0	42.0	50.0	59.0	64.0	75.0	•
		-39.0	-62.0	-3.5	-5.5	-8.0	-12.5	2.0	2.0	2.0	9.0	9.0	9.0	17.0	26.0	34.0	43.0	48.0	60.0	•
40	50	0.0	0.0	3.5	5.5	8.0	12.5	9.0	13.0	18.0	16.0	20.0	25.0	33.0	42.0	50.0	59.0	70.0	86.0	•
		-39.0	-62.0	-3.5	-5.5	-8.0	-12.5	2.0	2.0	2.0	9.0	9.0	9.0	17.0	26.0	34.0	43.0	54.0	70.0	•
50	65	0.0	0.0	4.0	6.5	9.5	15.0	10.0	15.0	21.0	19.0	24.0	30.0	39.0	51.0	60.0	72.0	85.0	106.0	•
		-46.0	-74.0	-4.0	-6.5	-9.5	-15.0	2.0	2.0	2.0	11.0	11.0	11.0	20.0	32.0	41.0	53.0	66.0	87.0	•
65	80	0.0	0.0	4.0	6.5	9.5	15.0	10.0	15.0	21.0	19.0	24.0	30.0	39.0	51.0	62.0	78.0	94.0	121.0	•
		-46.0	-74.0	-4.0	-6.5	-9.5	-15.0	2.0	2.0	2.0	11.0	11.0	11.0	20.0	32.0	43.0	59.0	75.0	102.0	•
80	100	0.0	0.0	5.0	7.5	11.0	17.5	13.0	18.0	25.0	23.0	28.0	35.0	45.0	59.0	73.0	93.0	113.0	146.0	•
		-54.0	-87.0	-5.0	-7.5	-11.0	-17.5	3.0	3.0	3.0	13.0	13.0	13.0	23.0	37.0	51.0	71.0	91.0	124.0	•
100	120	0.0	0.0	5.0	7.5	11.0	17.5	13.0	18.0	25.0	23.0	28.0	35.0	45.0	59.0	76.0	101.0	126.0	166.0	•
		-54.0	-87.0	-5.0	-7.5	-11.0	-17.5	3.0	3.0	3.0	13.0	13.0	13.0	23.0	37.0	54.0	79.0	104.0	144.0	•
120	140	0.0	0.0	6.0	9.0	12.5	20.0	15.0	21.0	28.0	27.0	33.0	40.0	52.0	68.0	88.0	117.0	147.0	•	•
		-63.0	-100.0	-6.0	-9.0	-12.5	-20.0	3.0	3.0	3.0	15.0	15.0	15.0	27.0	43.0	63.0	92.0	122.0	•	•
140	160	0.0	0.0	6.0	9.0	12.5	20.0	15.0	21.0	28.0	27.0	33.0	40.0	52.0	68.0	90.0	125.0	159.0	•	•
		-63.0	-100.0	-6.0	-9.0	-12.5	-20.0	3.0	3.0	3.0	15.0	15.0	15.0	27.0	43.0	65.0	100.0	134.0	•	•
160	180	0.0	0.0	6.0	9.0	12.5	20.0	15.0	21.0	28.0	27.0	33.0	40.0	52.0	68.0	93.0	133.0	171.0	•	•
		-63.0	-100.0	-6.0	-9.0	-12.5	-20.0	3.0	3.0	3.0	15.0	15.0	15.0	27.0	43.0	68.0	108.0	146.0	•	•
180	200	0.0	0.0	7.0	10.0	14.5	23.0	18.0	24.0	33.0	31.0	37.0	46.0	60.0	79.0	106.0	151.0	•	•	•
		-72.0	-115.0	-7.0	-10.0	-14.5	-23.0	4.0	4.0	4.0	17.0	17.0	17.0	31.0	50.0	77.0	122.0	•	•	•
200	225	0.0	0.0	7.0	10.0	14.5	23.0	18.0	24.0	33.0	31.0	37.0	46.0	60.0	79.0	109.0	159.0	•	•	•
		-72.0	-115.0	-7.0	-10.0	-14.5	-23.0	4.0	4.0	4.0	17.0	17.0	17.0	31.0	50.0	80.0	130.0	•	•	•
225	250	0.0	0.0	7.0	10.0	14.5	23.0	18.0	24.0	33.0	31.0	37.0	46.0	60.0	79.0	113.0	169.0	•	•	•
		-72.0	-115.0	-7.0	-10.0	-14.5	-23.0	4.0	4.0	4.0	17.0	17.0	17.0	31.0	50.0	84.0	140.0	•	•	•
250	280	0.0	0.0	8.0	11.5	16.0	26.0	20.0	27.0	36.0	36.0	43.0	52.0	66.0	88.0	125.0	•	•	•	•
		-81.0	-130.0	-8.0	-11.5	-16.0	-26.0	4.0	4.0	4.0	20.0	20.0	20.0	34.0	56.0	94.0	•	•	•	•
280	315	0.0	0.0	8.0	11.5	16.0	26.0	20.0	27.0	36.0	36.0	43.0	52.0	66.0	88.0	130.0	•	•	•	•
		-81.0	-130.0	-8.0	-11.5	-16.0	-26.0	4.0	4.0	4.0	20.0	20.0	20.0	34.0	56.0	98.0	•	•	•	•
315	355	0.0	0.0	9.0	12.5	18.0	28.5	22.0	29.0	40.0	39.0	46.0	57.0	73.0	98.0	144.0	•	•	•	•
		-89.0	-140.0	-9.0	-12.5	-18.0	-28.5	4.0	4.0	4.0	21.0	21.0	21.0	37.0	62.0	108.0	•	•	•	•
355	400	0.0	0.0	9.0	12.5	18.0	28.5	22.0	29.0	40.0	39.0	46.0	57.0	73.0	98.0	150.0	•	•	•	•
		-89.0	-140.0	-9.0	-12.5	-18.0	-28.5	4.0	4.0	4.0	21.0	21.0	21.0	37.0	62.0	114.0	•	•	•	•
400	450	0.0	0.0	10.0	13.5	20.0	31.5	25.0	32.0	45.0	43.0	50.0	63.0	80.0	108.0	166.0	•	•	•	•
		-97.0	-155.0	-10.0	-13.5	-20.0	-31.5	5.0	5.0	5.0	23.0	23.0	23.0	40.0	68.0	126.0	•	•	•	•
450	500	0.0	0.0	10.0	13.5	20.0	31.5	25.0	32.0	45.0	43.0	50.0	63.0	80.0	108.0	172.0	•	•	•	•
		-97.0	-155.0	-10.0	-13.5	-20.0	-31.5	5.0	5.0	5.0	23.0	23.0	23.0	40.0	68.0	132.0	•	•	•	•

• : NOTHING

Application

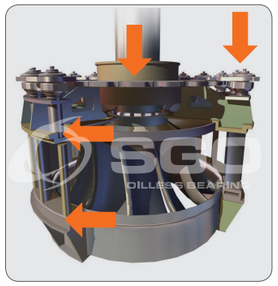
Plastic Injection Molding Machines



Construction Machinery

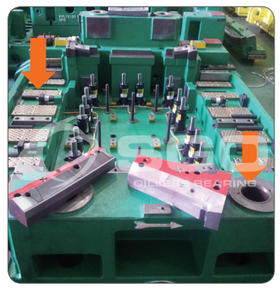

Hydro Power Plants

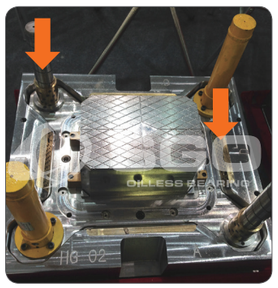




Hydraulic Press Machines


Press Dies and Plastic Molds





Steel Production Facilities