DINJISO

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DINJISO GLOBAL SUPPLIES CO., LTD

久 富 全 球 企 業 有 限 公 司

More Motion & Solution

Reliable Quality & Techno

ECHANICAL STANDARD COMPONENTS FOR FACTORY AUTOMA

DINJISO GLOBAL SUPPLIES CO.,LTD
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More Motion & Solution

Reliable Quality & Technology

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COMPANY INFO

DINJISO GLOBAL SUPPLIES CO., LTD is a one of the Asia largest supplier of custom components for assembly Mold, Automation & Medical industry, Our Company provides more than 1000 unique components manufactured to the Inch & Metric standard.

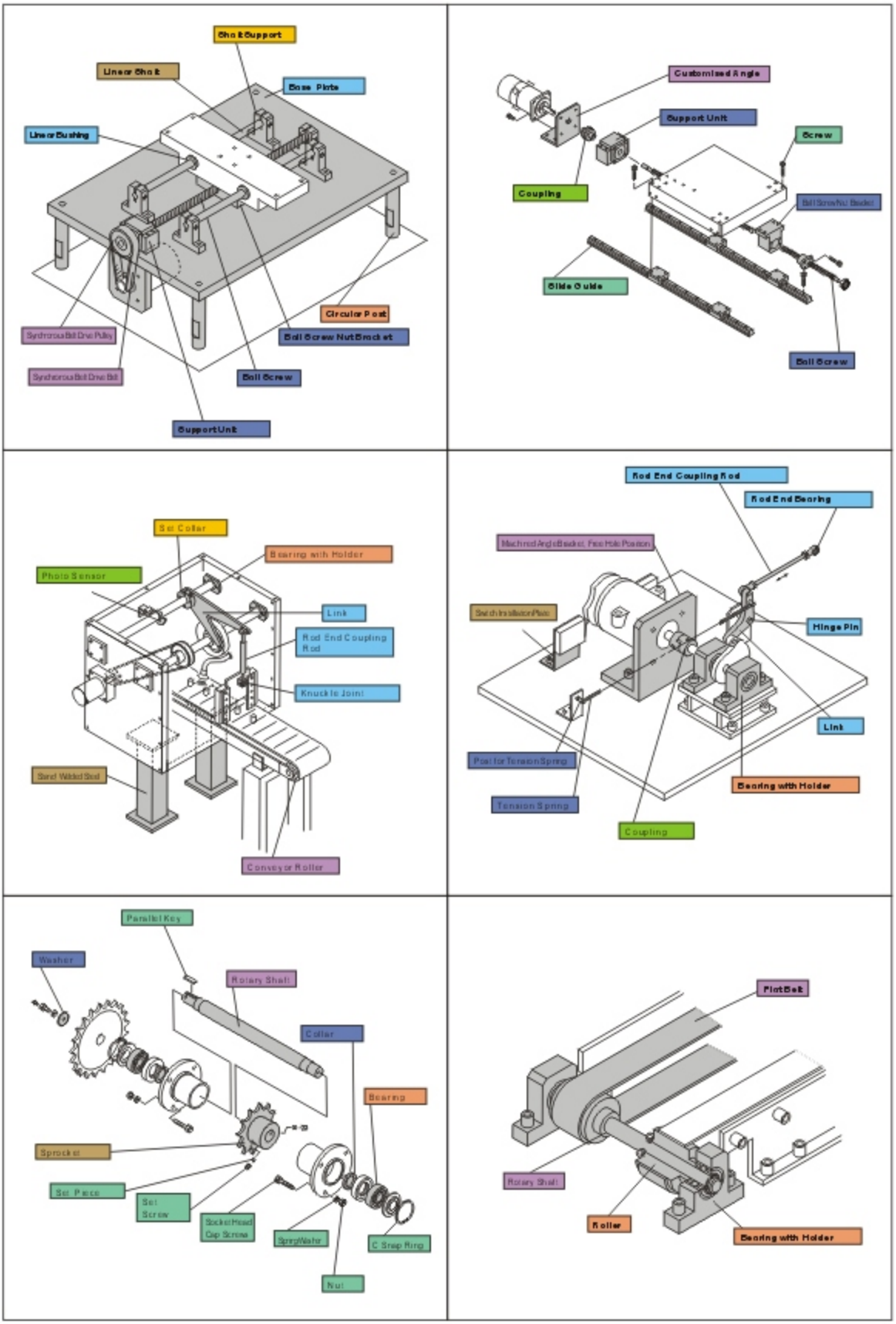
Our specialty is providing these components fast, high quality, low prices and a short delivery period.

We are currently supplying mechanical components for factory automation, press die, plastic mold and cutting tools. Our products are seen in a diverse range of industries including Automotive, Electronic, Semiconductor, Medical, IC packaging, etc, and has been deliver to all around the world such as Latin America, USA, Europe and Southeast Asia.

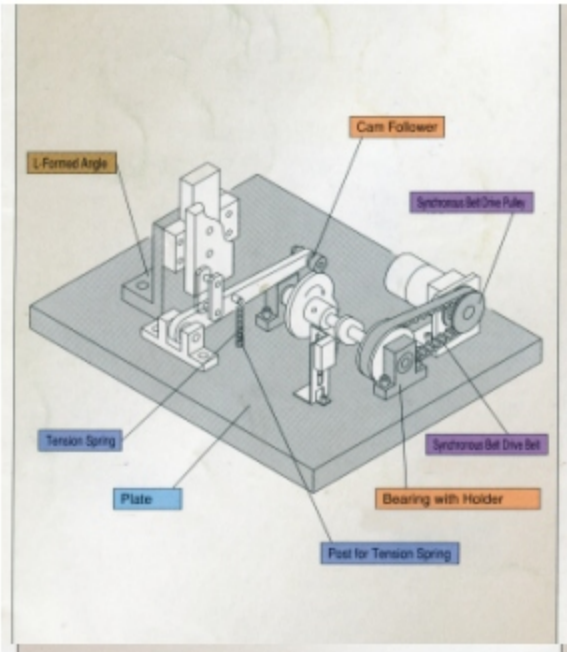
DINJISO GLOBAL SUPPLIES is a leader specializing in the development for OEM and standard components of plastic mold and automation accessories for various industrial and consumer sectors. Dedicated to high-quality production and customer service, therefore, we will constantly searching for state-of-the-art products and technologies for both standardized and customized applications.

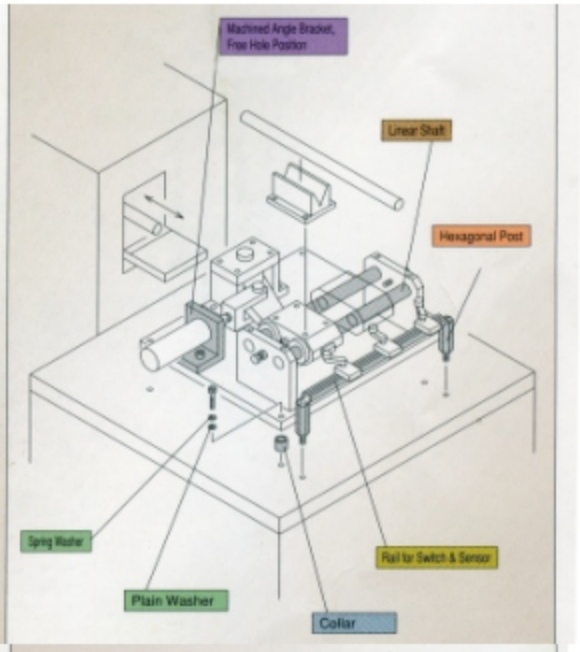
Our mission is to provide more high-quality products and best service to our customers by offer convenient resilience communication to retailer and dealer as the main goal to achieve our position in current globalization.

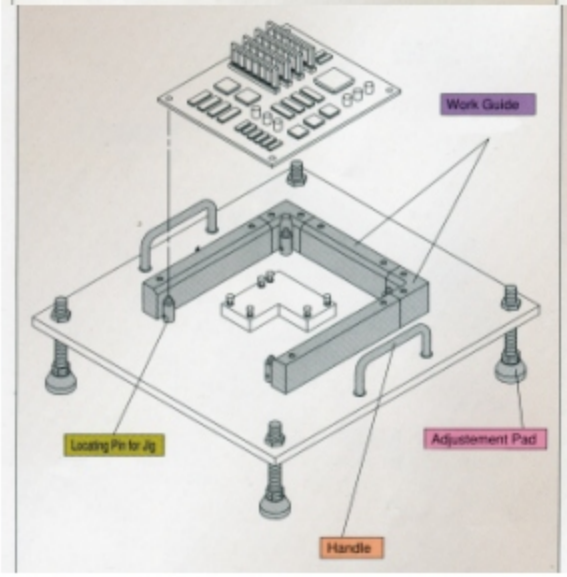
Typical Application For Factory Automation(1)

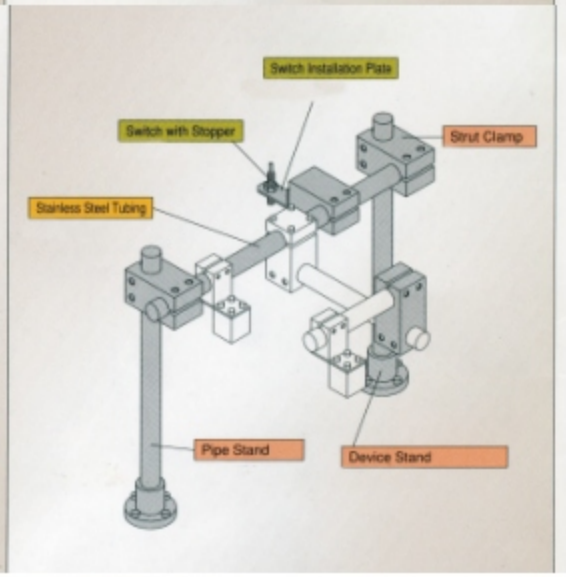


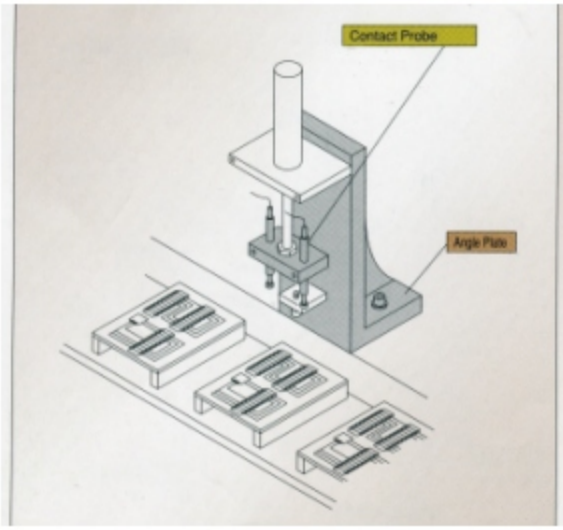
Typical Application For Factory Automation(2)

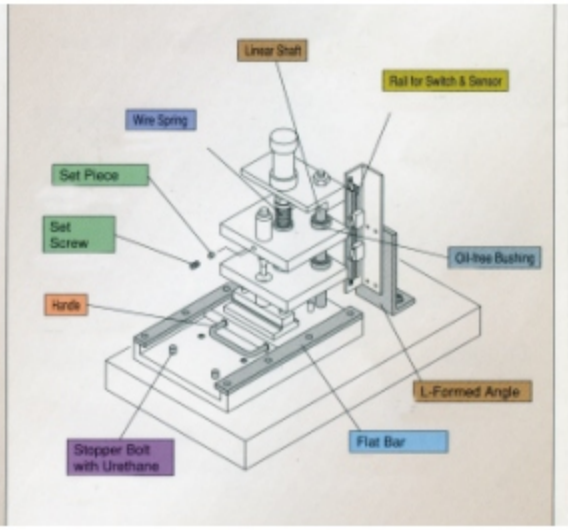












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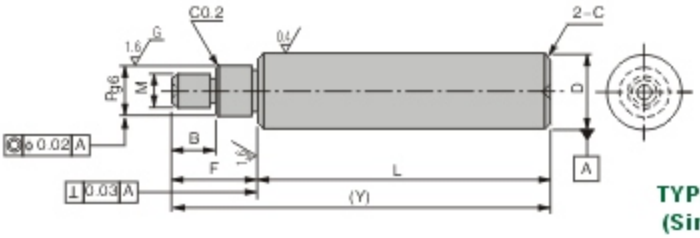
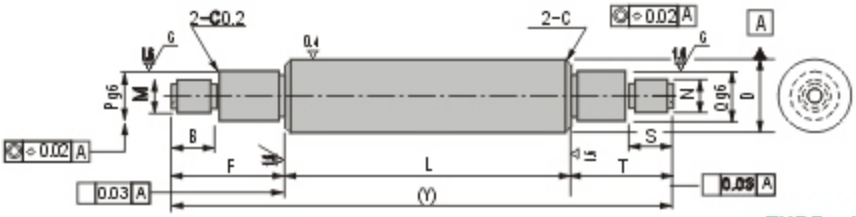
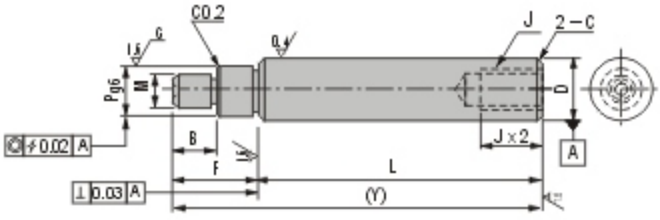


TYPE：JFA01
(Single Bolt)



TYPE：JFA02
(Double Bolt)



TYPE：JFA03
(Inner Bolt + Black Oxidized)

Type：JFA01~JFA03

Material：SUJ2 - 1.3505 - High Carbon Chrome Bearing Steel
Hardness：HRC 58+4 Through High Frequency quenching

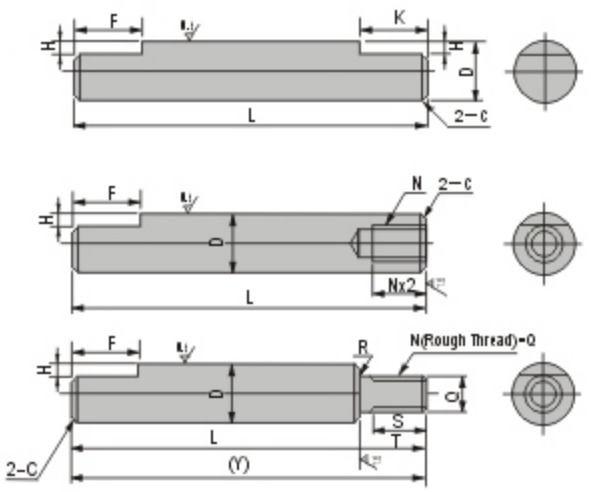
Dg6		1 mm Increments				M・N (Rough Thread) (SELECT)	J (Rough Thread) (SELECT)	(Y) MAX.	C
		L	F・T	B・S	P・Q				
4	-0.004 -0.012	25~195	5≤F≤P×5 5≤T≤N×5	B=0 S=0 M×1≤B≤M×3 N×1≤S≤N×3	M≤P≤D N≤Q≤D	3	2	200	Below 0.2
5		25~295				3 4	2.6 3	300	
6		25~295				3 4 5	3	300	Below 0.5
8	-0.005 -0.014	25~295				3 4 5 6	3 4 5	300	
10		25~345				4 5 6 8	3 4 5 6	350	
12	-0.006 -0.017	25~345				5 6 8 10	4 5 6 8	350	
13		25~345				5 6 8 10	4 5 6 8	350	
15		25~345				5 6 8 10 12	4 5 6 8 10	350	
16		25~345				5 6 8 10 12	4 5 6 8 10	350	
18		25~345				5 6 8 10 12	4 5 6 8 10 12	350	
20	-0.007 -0.020	25~445				6 8 10 12 16	4 5 6 8 10 12	450	Below 1.0
25		25~445				6 8 10 12 16 20	4 5 6 8 10 12 16	450	
30		25~445				8 10 12 16 20 24	6 8 10 12 16 20	450	

Order Example：

Type	D	L	F	B	P	M	J
JFA01	20	30	10	15	5	3	3

■ Customize are also available

Precision Shaft With Undercut



TYPE：JFA04
(Double Undercut)

TYPE：JFA05
(Single Undercut)

TYPE：JFA06
(Single Undercut+Thread)

Type：JFA04~JFA06

Material：SUJ2 - 1.3505 - High Carbon Chrome Bearing Steel
Hardness：HRC58+4 Through High Frequency quenching

"D" Toleronce			
Dg6		Dt8	
4	-0.004 -0.012	-	-
5		-	-
6		6	-0.010 -0.028
8	-0.005 -0.014	8	-0.013 -0.035
10		10	
12	-0.006 -0.017	12	-0.016 -0.043
13		13	
15		15	
16		16	
18		18	
20	-0.007 -0.020	20	-0.020 -0.053
25		25	
30		30	
35	-0.009 -0.025	35	-0.025 -0.064
40		40	
50		50	

D	1mm Increments				N (Rough Thread) (SELECT)	Q (SELECT)	(Y) MAX.	H	R	C
	L	F K	T	S						
4	25~300	2≤F+K≤3/D F+K≤L/8	2≤T≤Q×5	(Q<6) ST≤T-2	2	3 4	300	0.5	Below 0.2	Below 0.2
5	25~400				2.6 3	3 4 5	400			
6	25~600				3	3 4 5 6	600	1	Below 0.3	Below 0.5
8	25~800				3 4 5	3 4 5 6 8	800			
10	25~800			(Q=8~10) S≤T-3	3 4 5 6	4 5 6 8 10	800			
12	25~1000				4 5 6 8	5 6 8 10 12	1000			
13	25~1000				4 5 6 8	5 6 8 10 12	1000			
15	25~1000			(Q≥12) ST≤T-5	4 5 6 8 10	5 6 8 10 12	1000			
16	30~1200				4 5 6 8 10	5 6 8 10 12 16	1200			
18	30~1200				4 5 6 8 10 12	5 6 8 10 12 16	1200			
20	30~1200			(When no thread) S=0	4 5 6 8 10 12	6 8 10 12 16 20	1200	2	Below 1.0	Below 1.0
25	35~1200				4 5 6 8 10 12 16	8 10 12 16 20 24	1200			
30	35~1500				6 8 10 12 16 20	8 10 12 16 20 24 30	1500			
35	35~1500			①S=Pitch×3	8 10 12 16 20 24	10 12 16 20 24 30	1500			
40	50~1500				10 12 16 20 24 30	12 16 20 24 30	1500			
50	65~1500				12 16 20 24 30	16 20 24 30	1500	3		

Order Example:

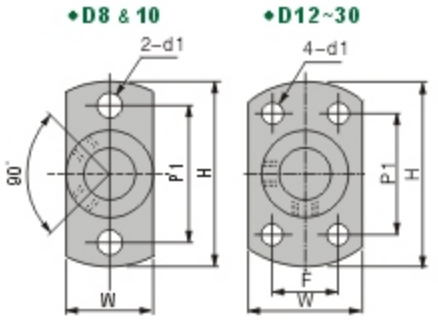
Type	-	L	-	F	-	K	-	T	-	S	-	N	-	Q
JFA04	-	800	-	F40	-	K50	-	Form Request						

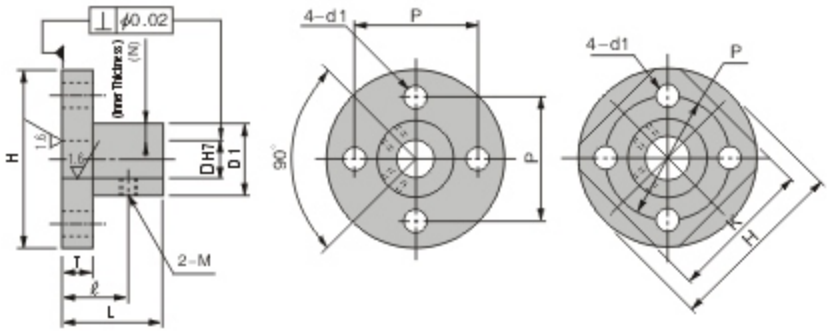
■ Customize are also available

TYPE：JFA07
(Round)

TYPE：JFA08
(Square)

TYPE：JFA09
(Compact)





Type：JFA07~JFA09

Material：SS400 - Rolled Steel for general construction
Surface Treatment：Black Oxidized & Electrolyze nickel plating by option

DH7		Inner Thickness (N)	L	D1	H	T	ℓ	M Rough Thread	P	K	W	P1	F	D1	Q	K
8	+0.015 0	3.5	16	15	32	5	10	M3	25	25	15	25	–	3.5	–	–
10		5	20	20	38	5	12		30	30	20	30		4.5		
12	+0.018 0	5	24	22	40	6	15	M4	32	32	25	28	16	4.5	4	32
16		6	32	28	50	6	19		40	39	32	33	22	5.5	5	39
20	+0.021 0	7.5	32	35	63	8	20	M5	50	48	40	42	25	6.6	5	48
25		7.5	38	40	68	8	23		55	53	45	45	30	6.6	6	53
30		7.5	38	45	73	10	24	M6	60	58	50	48	35	6.6	6	58

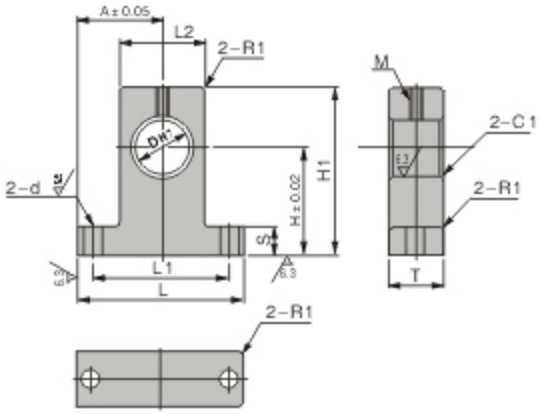
Order Example：

Type	–	D	–	Surface treatment
JFA07	–	8	–	Black Oxidized

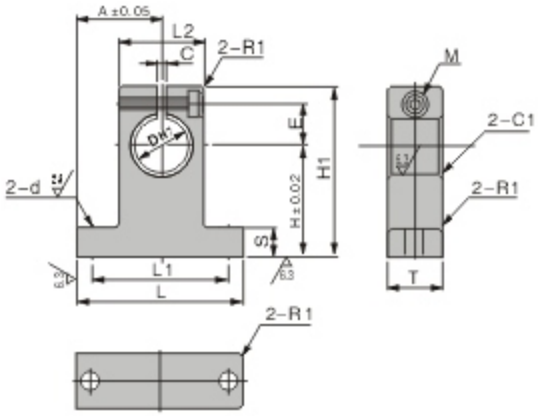
■ Customize are also available

Shaft Holder - T Shaped

TYPE：JFA10
(Regular)



TYPE：JFA11
(Upper Seam)



Type：JFA10 & JFA11

Material：S45C -1.1191 Carbon Steel for machinery structures
Surface Treatment：Black Oxidized & Electrolyze nickel plating by option

Type	D	H	L	H1	T	L1	d	L2	A	S	(Thread) M
JFA10	8	15	42	24	10	32	5.5	18	21	6	M4
	10	20		30							
	12			32				20			
	13										
	16	25	48	40		38		25	24	8	
	20		60	43	16	45	6.6	30	30	10	M6
		30		48							
	25		70	50		56		35	35	12	
	30		84	53	20	64	9	44	42		

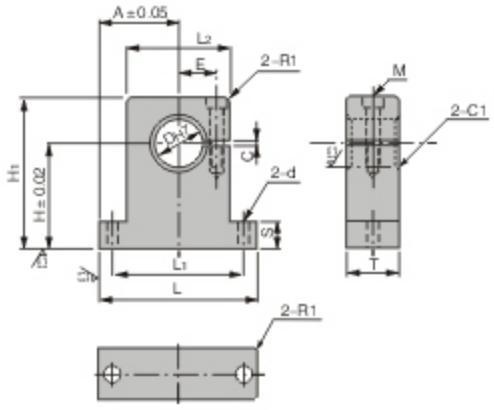
Type	D	H	L	H1	T	L1	d	L2	A	S	E	C	(Thread) M
JFA11	3	20	42	32.8	14	32	5.5	18	21	6	7.8	2	M4
	4												
	5												
	6												
	8												
	10												
	12	23		37.5				20			9.5	2.5	
	13												
	15	27	48	44	16	38		25	24	8	12		
	16												
	18	31	60	51	20	45	6.6	30	30	10	14		M5
	20												
	25	30	70	55	24	56		38	35	12	17		M6
		35		60									
	30	42	84	70	28	64	9	44	42	15	21		M8
	35	50	98	82	32	74	11	50	49		24		
	40	60	114	96	36	90		60	57		27		
	50	70	126	120	40	100	14	74	63	18	38		M12

Order Example: Type - D - Surface treatment
JFA10 - 10 - Black Oxidized

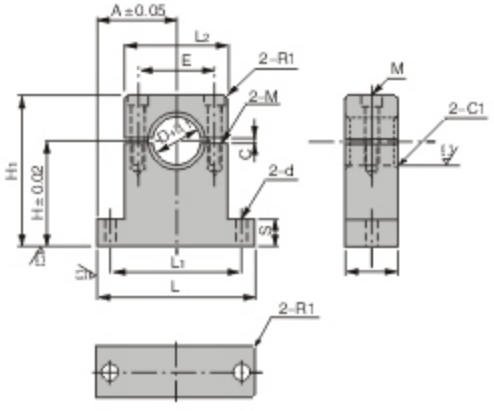
■ Customize are also available

Shaft Holder - T Shaped With Side Seam

TYPE：JFA12
(Single Side Seam)



TYPE：JFA13
(Double Side Seam)



Type：JFA 12 & JFA 13

Material：S45C -1.1191 - Carbon Steel for machinery structures
Surface Treatment：Black Oxidized & Electrolyze nickel plating by option

Type	D	H	L	H1	T	L1	d	L2	A	S	E	C	(Thread) M
JFA12	8	15	52	22	12	40	5.5	28	26	6	9	2	M4
	10	20	54	29		42		30	27		10		
	12		56	31		44		32	28		11		
	13												
	16	25	58	37		46		34	29		12		
	20	30	79	40	16	64	6.5	49	39.5	8	17		M6
				45									
	25			48							18		
	30		102	51	20	82	9	62	51	10	22	3	M8

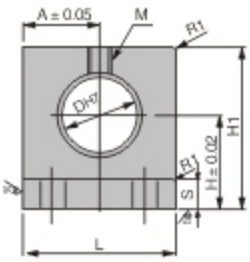
Type	D	H	L	H1	T	L1	d	L2	A	S	E	C	(Thread) M
JFA13	8	15	52	22	12	40	5.5	28	26	6	18	2	M4
	10	20	54	29		42		30	27		20		
	12		56	31		44		32	28		22		
	13												
	16	25	58	37		46		34	29		24		
	20	30	79	40	16	64	6.5	49	39.5	8	34		M6
				45									
	25			48							36		
	30		102	51	20	82	9	62	51	10	44	3	M8

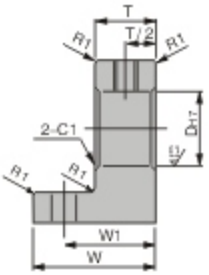
Order Example：[Type] - [D] - [Surface treatment]
[JFA12] - [8] - [Black Oxidized]

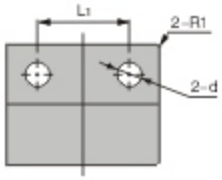
■ Customize are also available

Shaft Holder - L Shaped

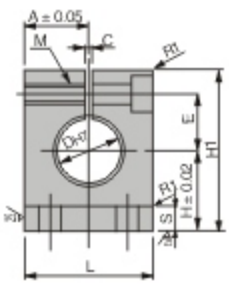
TYPE：JFA14
(Regular)

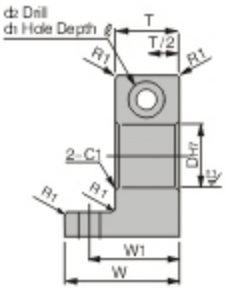


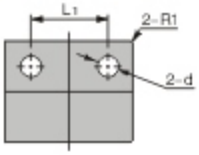




TYPE：JFA15
(Upper Seam)







Type：JFA14 & JFA15

Material：S45C -1.1191 - Carbon Steel for machinery structures
Surface Treatment：Black Oxidized & Electrolyze nickel plating by option

Type	D	H	L	H1	T	S	W	W1	A	L1	d	(Thread) M
JFA14	8	15	25	24	10	6	20	15	12.5	13	5.5	M4
	10	20		30								
	12			31								
	16	25		38								
	20		40	43		8	26	18	20	24	6.5	M6
	25	30		50								
	30		50	53	12	10	30	20	25	30	9	

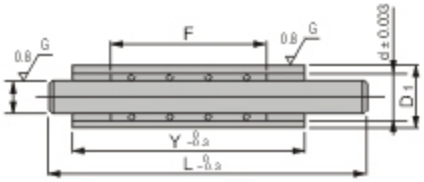
Type	D	H	L	H1	T	S	W	W1	A	L1	d	E	d2	d1	ℓ	C	(Thread) M
JFA15	8	15	25	31	12	6	22	17	12.5	15	5.5	11	4.5	8	4.5	2	M4
	10	20		36													
	12			38								13					
	16	25	30	45					15			15					
	20		40	51	16	8	32	24	20	24	6.5	18	6.5	11	6.5		M6
	25	30		58								21					
	30		50	63	20	10	40	30	25	30	9	24	9	14	9	3	M8

Order Example：

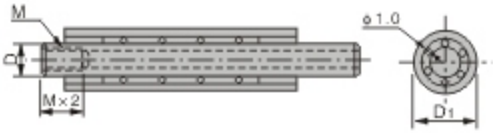
Type	–	D	–	Surface treatment
JFA14	–	8	–	Black Oxidized

■ Customize are also available

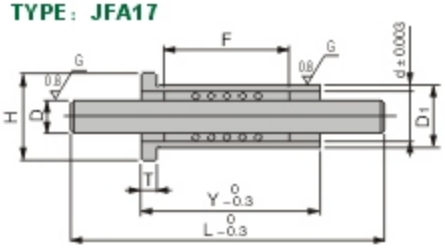
TYPE：JFA16



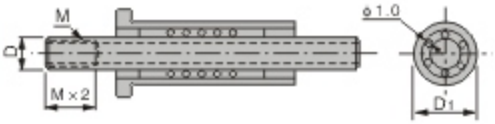
TYPE：JFA18



TYPE：JFA17



TYPE：JFA19



Type：JFA16 ~ JFA19

Material：C3604,Brass

Steel Ball Material：SUJ2 - 1.3505 - High Carbon Chrome Bearing Steel (JIS-Grode10)

Combination Parts：

No.	Description	Quantity	Material
1	Shaft	1	SUJ2 - 1.3505
2	Bushing	1	SUJ2 - 1.3505
3	Ball Cage	1	Brass+Steel Ball

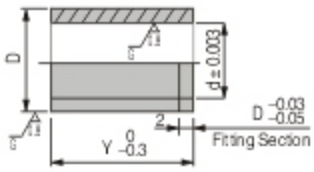
Type	D	Tolerance	L 1mm Increments	Y Selection	F Selection	D1	D1 Tolerance	T	H	d	M (Coarse thread)
JFA16 JFA17	3	0 -0.005	40~70	10	10 15 20	7	0 -0.006	2.5	9	5	-
				20							
				30							
	4			10	10 15 20	8		3	10	6	-
				20							
				30							
JFA18 JFA19	5		40~90	10	10 15 20	10			12	7	M3
				20							
				30							
	6			20	15 20 30	11	0 -0.011	4	13	8	M3
				30							
				40							
	8		40~150	20	15 20 30	12			14	10	M4
				30							
				40							
	10			30	20 30 40	16			18	12	M5
				40							
				50							
	12			30	20 30 40	18			20	14	M6
				40							
				50							

Order Example：

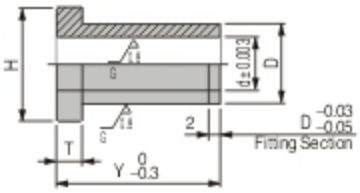
Type	-	D	-	L	-	Y	-	F
JFA16	-	3	-	72	-	20	-	15

■ Customize are also available

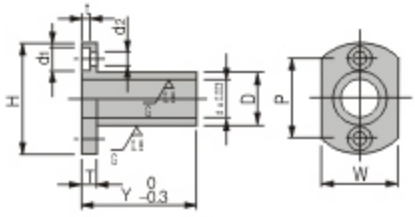
TYPE：JFA20
(Regular)



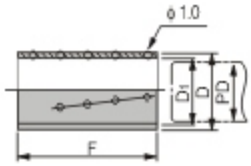
TYPE：JFA21
(With Head)



TYPE：JFA22
(With Bolt Hole)



TYPE：JFA23
(Brass Ball Cage)



Type：JFA20 ~ JFA23

Material：JFA20~JFA22：SUJ2 - 1.3505 - High Carbon Chrome Bearing Steel
JFA23：C3604, Brass + JIS - Grade 10 Steel Ball
Hardness：JFA20~JFA22：HRC58+4 Through High Frequency Quenching

Type	No.	Y Selection	D	Tolerance	T	H	d
JFA20 JFA21	3	10 20 30	7	0 -0.006	2.5	9	5
	4	10 20 30	8		3	10	6
	5	10 20 30	10			12	7
	6	20 30 40	11	0 -0.011	4	13	8
	8	20 30 40	12			14	10
	10	30 40 50	16			18	12
	12	30 40 50	18			20	14

Type	No.	Y Selection	D	Tolerance	H	W	P	T	d	d1	d2	t
JFA22	5	20 30	10	0 -0.006	25	16	17	4	7	6	3.5	2.2
	6	20 30 40	12	0 -0.011	28	18	20		8			
	8	20 30 40	14		29	20	21		10			
	10	30 40 50	16		34	22	25	5	12	7.5	4.5	3
	12	30 40 50	19		40	25	29		14			

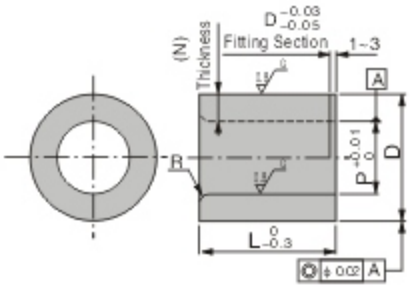
Type	PD	F Selection	D	D1
JFA23	3	10 15 20	4.8	3.2
	4		5.8	4.2
	5		6.8	5.2
	6	15 20 30	7.8	6.2
	8		9.8	8.2
	10	20 30 40	11.8	10.2
	12		13.8	12.2

JFA20 ~ JFA22 Order Example: Type – No. – Y
JFA20 – 3 – 20

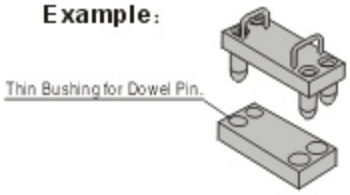
JFA23 Order Example: Type – PD – F
JFA23 – 3 – 15

■ Customize are also available

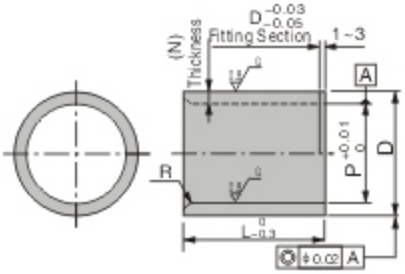
TYPE：JFA24
(Regular)



Example：



TYPE：JFA25
(Thin Thickness)



Type：JFA24 & JFA25

Material：SUJ2 - 1.3505 - High Carbon Chrome Bearing Steel
Surface Treatment：Black Oxidized & Electrolyze nickel plating by option
Hardness：HRC56~60 Through High Frequency Quenching

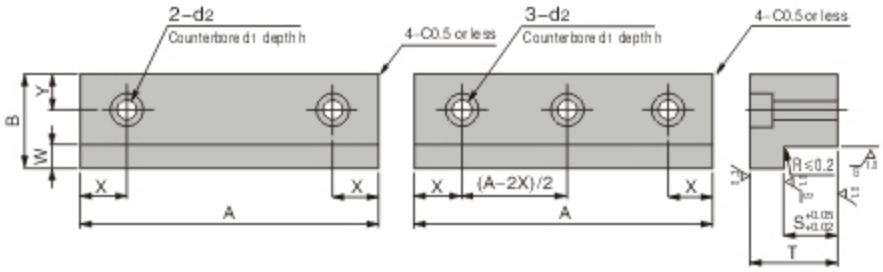
Type	D	D Tolerance p6	P 0.01mm Increments	L 0.1mm Increments	(N) Thickness	R
JFA24	5	+0.020 +0.012	2.00~2.50	5.0~6.0	1.25~1.50	0.8
	7	+0.024 +0.015	2.00~3.50	5.0~8.0	1.75~2.50	
	8		3.00~4.50	5.0~13.0		1.0
	10		4.00~6.50	5.0~20.0	1.75~3.00	
	12	+0.029 +0.018	6.00~8.50			2.0
	15		8.00~10.50	10.0~40.0	2.25~3.50	
	18		10.00~12.50		2.75~4.00	
	20	+0.035 +0.022	12.00~13.50		3.25~4.00	
	22		12.00~13.50		4.25~5.00	
	25		13.00~15.50		4.75~6.00	
	26		15.00~16.50		4.75~5.50	
	30		16.00~20.50	12.0~60.0	4.75~7.00	3.0
	35	+0.042 +0.026	20.00~25.00		5.00~7.50	

Type	D	D Tolerance M8	P 0.01mm Increments	L 0.1mm Increments	(N) Thickness	R
JFA25	7	+0.015 +0.006	3.51~5.00	5.0~8.0	1.00~1.74	0.5
	8		4.51~6.00	5.0~13.0		
	9		4.51~6.50		1.25~2.24	
	10		6.51~8.00	5.0~20.0	1.00~1.74	
	11	+0.018 +0.007	8.00~9.00		1.00~1.50	
	12		8.51~9.00		1.50~1.74	
	13		8.51~9.00		1.50~2.24	
	14		9.00~11.00		1.50~2.50	
	15		10.51~12.00	10.0~40.0	1.50~2.24	
	17		10.51~13.00		2.00~3.24	1.0
	18		12.51~14.00		2.00~2.74	
	20	+0.021 +0.008	13.51~15.00		2.50~3.24	
	22		13.51~17.00		2.50~4.24	
	25		15.51~19.00		3.00~4.74	

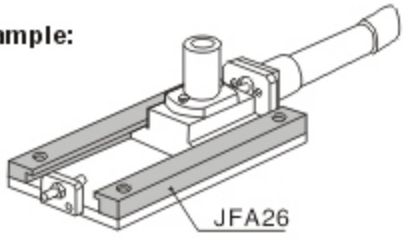
Order Example：

Type	-	D	-	P	-	L	-	Surface treatment
JFA24	-	5	-	2	-	5	-	Black Oxidized

■ Customize are also available



Example:



Type：JFA26

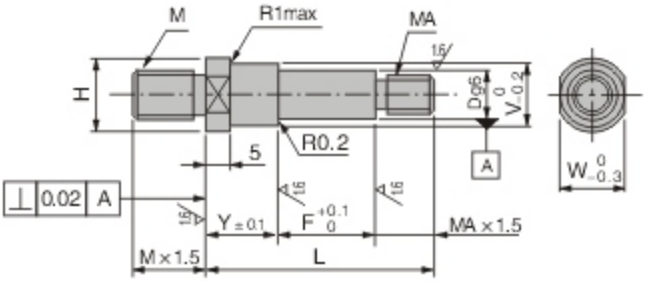
Material：S45C -1.1191 - Carbon Steel for machinery structures
Surface Treatment：Electrolyze nickel plating by option

B	A Selection	S Selection	W	T	X	Y	d1	d2	h
15	40	5	5	10	5	5	8	4.5	4.5
	60								
	80								
	100								
20	60	8 10	5	15	7	7	9.5	5.5	5.5
	80								
	100								
	120								
25	80	10 12 15	5	20	10	10	11	6.5	6.5
	100								
30	80	12 15 20	5	25	10	10	14	9	9
	100								

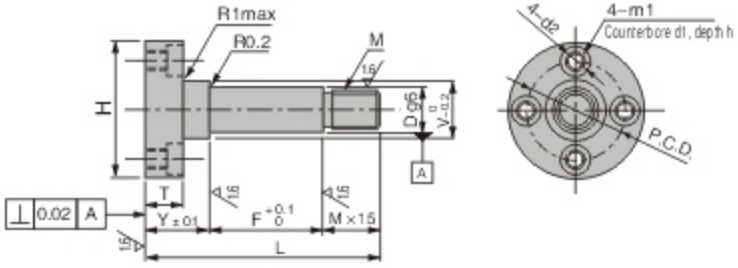
Order Example：

Type	–	B	–	A	–	S	–	Surface treatment
JFA26	–	15	–	40	–	5	–	ENP

■ Customize are also available

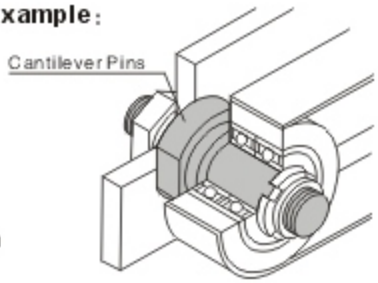


TYPE：JFA27
(Regular)



TYPE：JFA28
(With Head Counterbore)

Example：



Type：JFA27 & JFA28

Material：S45C - 1.1191 - Carbon Steel for machinery structures
Surface Treatment：Black oxidized & Electrolyze nickel plating by option

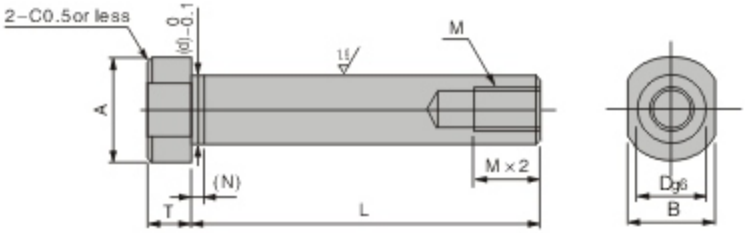
Type	Dg6	1mm Increments Y	1mm Increments F		L	V	H	W	M (Coarse thread)
JFA27	3	7~30	3~35	3	L=Y+F+MA×1.5	5	7	5	M3
	4			3 4		6	8	6	M4
	5			3 4 5		7	9	7	M5
	6	7~60	5~100	4 5 6		8	10	8	M6
	8			5 6 8		10	12	10	M8
	10			6 8 10		13	154	13	M10
	12		10~150	6 8 10 12		15	17	14	M12
	15			8 10 12 (15)		18	20	17	
	20	7~75		10 12 (15) 16 20		24	23	24	M20
	25			10 12 (15) 16 20 24 (25)		29	31	27	
	30			12 (15) 16 20 24 (25) 30		34	36	32	

Type	Dg6	1mm Increments Y	1mm Increments F		L	V	H	T	m1	d1	d2	h	PCD
JFA28	6	12~60	5~100	4 5 6	L=Y+F+MA×1.5	8	26	10	M4	6.5	3.5	5.3	17
	8			5 6 8		10	28						19
	10			6 8 10		12	32						23
	12		10~150	6 8 10 12		15	36		M5	8	4.3	4.4	26
	15			8 10 12 (15)		18	40						30
	20	17~75		10 12 (15) 16 20		24	48	15	M6	9.5	5.2	5.4	36
	25			10 12 (15) 16 20 24 (25)		29	54						42
	30			12 (15) 16 20 24 (25) 30		34	62		M8	11	6.8	6.5	49

Order Example：

Type	D	Y	F	MA	Surface treatment
JFA27	3	7	3	3	Black Oxidized

■ Customize are also available



Type: JFA29

Material: S45C -1.1191 - Carbon Steel for machinery structures

Surface Treatment: Black oxidized & Electrolyze nickel plating by option

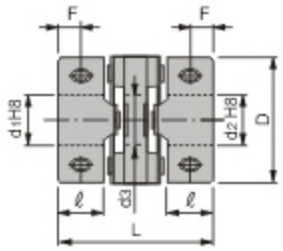
Dg6		L 0.1mm Increments	A	B	(d)	T	(N)	M (Coarse Thread)
6	-0.004 -0.012	15.0~100.0	10	8	5.8	5	1.5	M3
8	-0.005 -0.014	20.0~100.0	13	10	7.8			M5
10		25.0~100.0	16	13	9.8			M6
12	-0.006 -0.017	25.0~200.0	18	14	11.8			
13		30.0~200.0	24	21	12.8			M8
15					14.8			
16		35.0~200.0			15.8			M10
20	-0.007 -0.020	40.0~200.0	27	23	19.8			M12

Order Example: Type - D - L - Surface treatment

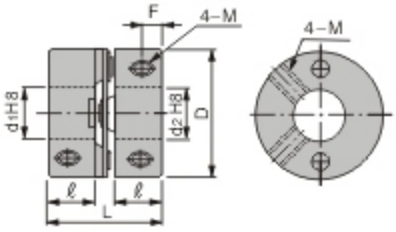
JFA29 - 6 - 15 - Black Oxidized

■ Customize are also available

TYPE：JFA30
(Standard Torque)



TYPE：JFA31
(Standard Torque-Short)



Type：JFA30 & JFA31

Material for body：Aluminum Alloy - HD 3With Electrolyze nickel plating
Material for plate：Polyimid

Type	Dg6	d1,d2 selection with d1≤d2	d3	L	ℓ	F	Set Screw M	Set Screw Tightening Torque (N·m)
JFA30	10	2 3 4	4.1	15	4.2	2	2	0.3
	13	3 4 5 6	5.5	19	5.5	2.5		
	16	4 5 6 6.35 7 8	6.8	23.2	7	3	3	0.7
	20	4 5 6 6.35 7 8 10	8.1	26	7.5	3.7		
	25	5 6 6.35 7 8 9.53 10 11 12	10.4	30.2	9	4	4	1.7
	32	6 6.35 7 8 9.53 10 11 12 14 16	15	41	12.4	6		
	40	8 9.53 10 11 12 14 16 18 20	19.5	47	15.5	7.8	5	4
	50	14 16 18 20 22 24 25	25	53	18	9	6	7

Type	Dg6	d1,d2 selection with d1≤d2	L	ℓ	F	Set Screw M	Set Screw Tightening Torque (N·m)
JFA31	10	2 3 4	10.5	4.2	2	2	0.3
	13	3 4 5 6	13.5	5.5	3		
	16	4 5 6 6.35 7 8	16.5	7	3	3	0.7
	20	4 5 6 6.35 7 8 10	18.4	7.5	4		
	25	5 6 6.35 7 8 9.53 10 11 12	21.6	9	4	4	1.7
	32	6 6.35 7 8 9.53 10 11 12 14 16	29	12.4	6		
	40	8 9.53 10 11 12 14 16 18 20	35	15.5	7.8	5	4
	50	14 16 18 20 22 24 25	41	18	9	6	7

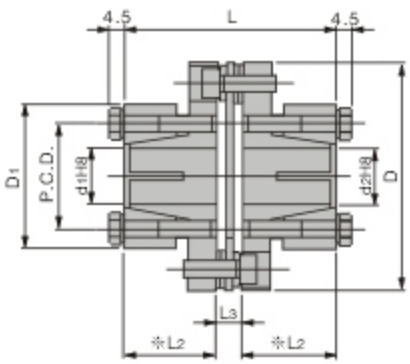
DATA INFORMATION：

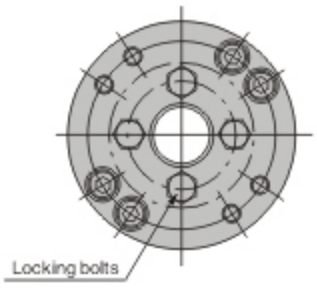
Catalog No. Type	D	Normal Torque (N·m)	Max Torque (N·m)	Allowable Declination (°)	Allowable Eccentricity (mm)	Static Torsional Spring Constant (N·m/rad)	Max. Revolutions (min^{-1})	Moment of Inertia ($kg \cdot m^2$)	Permissible End Play	Mass (g)
JFA30	10	0.15	0.3	3.5	0.3	21	26000	4.6×10^{-8}	±0.2	3
	13	0.25	0.5			44	20000	8.0×10^{-8}		5
	16	0.4	0.8			70	19000	2.4×10^{-7}	±0.3	9
	20	0.6	1.2			130	18000	7.2×10^{-7}	±0.4	14
	25	1.4	2.8			240	16000	2.2×10^{-6}	±0.5	27
	32	2.6	5.2			560	12000	6.0×10^{-6}		60
	40	4.4	8.8		0.4	980	8000	1.7×10^{-5}	±0.6	104
	50	7.0	14.0			1100	6000	4.6×10^{-5}		210

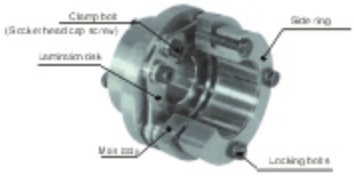
Catalog No. Type	D	Normal Torque (N·m)	Max Torque (N·m)	Allowable Declination (°)	Allowable Eccentricity (mm)	Static Torsional Spring Constant (N·m/rad)	Max. Revolutions (min^{-1})	Moment of Inertia ($kg \cdot m^2$)	Permissible End Play	Mass (g)
JFA31	10	0.15	0.3	2	0.1	27	26000	4.0×10^{-8}	±0.1	2
	13	0.25	0.5			60	20000	7.0×10^{-8}		4
	16	0.4	0.8			90	19000	2.0×10^{-7}		7
	20	0.6	1.2			170	18000	6.0×10^{-7}	±0.2	11
	25	1.4	2.8			300	16000	1.8×10^{-6}		22
	32	2.6	5.2			700	12000	5.2×10^{-6}	±0.3	50
	40	4.4	8.8		0.15	1200	8000	1.3×10^{-5}		85
	50	7.0	14.0			1450	6000	3.6×10^{-5}		170

Order Example： Type - D - d1 - d2
JFA30 - 10 - 2 - 4

■ Customize are also available







Type: JFA32

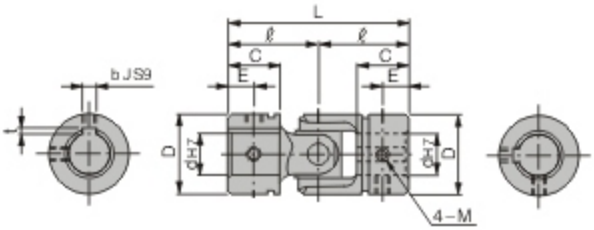
Material for body: S45C - 1.1191 - Carbon steel for machinery structures
Material for plate: SUS301 - 1.6900 - Stainless steel

D	d1	d2	L3	D1	P.C.D	Locking Bolts		Clamp Bolts	
						Size	Tightening Torque (N • m)	Size	Tightening Torque (N • m)
65	15	15 16 18 20 22 24 25	7.5 (7.0)	41	29	M5×25	5.8	M5×16	7.8 (6.0)
	16				30				
	18			44	35				
	20			48	37	M5×22			
	22								
	24			53	42				
	25								

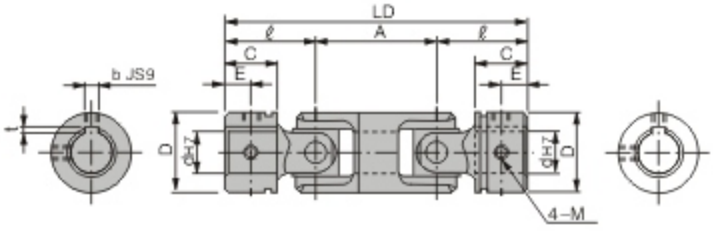
Order Example: Type - d1 - d2
JFA32 - 15 - 18

■ Customize are also available

TYPE：JFA33
(Standard)



TYPE：JFA34
(Increasing Length)



Type：JFA33 & JFA34

Material：SCM415 - 1.7262 - Chrome Molybdenum Steel (Through Carburizing)

Motion Data:

① Condition variables (formula)

Calculation condition variable = (Revolutions (min⁻¹)) × (Angle (°)) × (Torque (N·m))

② Number of Rotations (min⁻¹)

No. of revolutions × Angle coefficient < Allowable condition variable

= Angle Coefficient Table=

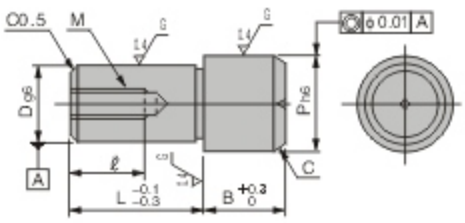
Angle	5° or less	10°	15°	20°	25°	30°
Angle Coefficient	1.00	1.05	1.18	1.43	1.82	2.50

Type	D	d1	Standard	Increasing length		ℓ	C	E	b	t	M (Rough Bolt)
			L	LD	A						
JFA33 JFA34	19	10	42	67.5	25.5	21	12	6	3	1.4	M5
	23	12	52	83	31	26	15	7.5	4	1.8	M5
	26	14	59	94.5	35.5	29.5	17	8.5	5	2.3	M6
	30	16	74	117.5	43.5	37	22	11	5	2.3	M6
	36	20	87	139	52	43.5	25	12.5	6	2.8	M6

Order Example: Type – d

JFA33 – 10

■ Customize are also available



※Tolerance for "P"

P	h6
6.50~10.00	0 -0.009
10.01~18.00	0 -0.011
18.01~30.00	0 -0.013

Type: JFA35

Material: SKS3 - 1.2419 - Alloy Tool Steel
Hardness: HRC 60~63 Through hardening

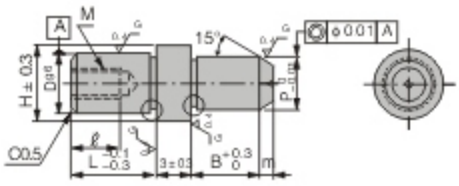
D	Tolerance g6	P 0.1 mm Increments	L	B	M (Corase Thread)	ℓ	C
6	-0.004 -0.012	6.50~10.00	10	5	M3	5	1.0
8	-0.005 -0.014	9.00~13.00	12	6	M5	8	1.5
10		11.00~15.00	16	10			2
12	-0.006 -0.017	13.00~16.00	20	20			
13		14.00~18.00	22	22	M8	12	3
16		17.00~25.00	24	25			
20	-0.007 -0.020	22.00~30.00	32	30			

Order Example: Type - D - P
JFA35 - 6 - 9

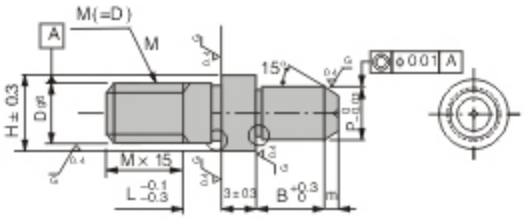
■ Customize are also available

Locating Pins - Shoulder Head -

TYPE：JFA36
(Inner Thread)



TYPE：JFA37
(Outside Thread)



Type：JFA36 & JFA37

Material：SKS3 - 1.2419 - Alloy Tool Steel
Hardness：HRC60~63 Through hardening

※Tolerance for JFA36 & JFA37

D	g6	m	h	(W)	ℓ	M (Thread)	
						JFA36	JFA37
3	-0.002 -0.008	1	6	1	–	–	M3
4	-0.004 -0.012			1.2		–	M4
5		2	8	1.5		–	M5
6				1.8	5	M3	M6
8	-0.005 -0.014	3	11	2.2	10	M5	M8
10			13	3			M10
12	-0.006 -0.017		15	3.2			M12
13		4	16	3.5	12	M8	-
16			19	4			M16
20	-0.007 -0.020	5	23	5.5			M20

Type	D	P 0.01mm Increments	L	B
JFA36	6	4.00~7.00	10	5
	8	5.00~9.00	15	6
	10	7.00~11.00		8
	12	7.00~12.00		
	13	8.00~13.00	22	
	16	13.00~16.00		10
	20	16.00~20.00	30	

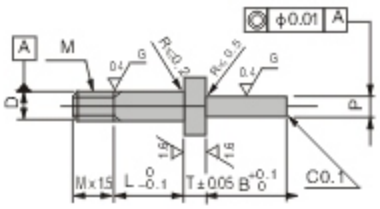
Type	D	P 0.01mm Increments	L	B
JFA37	3	2.00~4.00	2	5
	4	2.00~5.00		6
	5	3.00~6.00	3	
	6	4.00~7.00		8
	8	5.00~9.00	5	
	10	7.00~11.00		10
	12	7.00~12.00	8	
	16	13.00~16.00		
	20	16.00~20.00	10	15

Order Example：

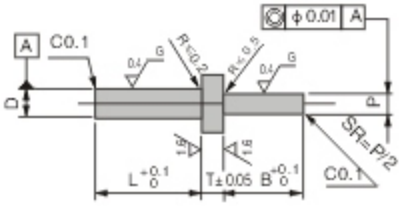
Type	-	D	-	P
JFA36	-	6	-	5

■ Customize are also available

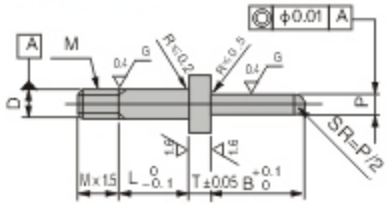
TYPE：JFA38



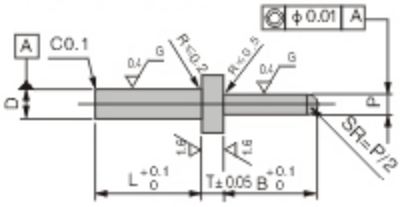
TYPE：JFA39



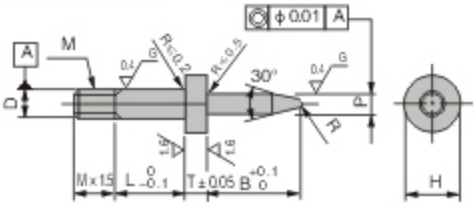
TYPE：JFA40



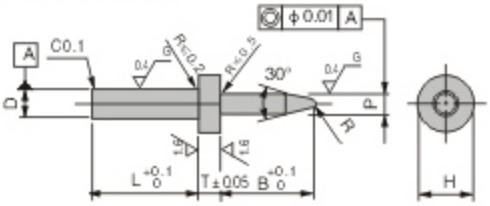
TYPE：JFA41



TYPE：JFA42



TYPE：JFA43



Type：JFA38 ~ JFA43

Material：SUS304 - 1.4301 - Stainless Steel

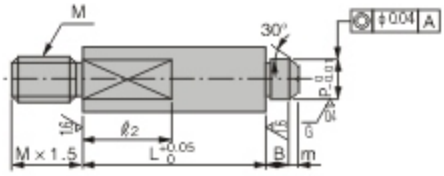
D	D Tolerance		L	P	P	B	H	T	R	M
	JFA38 JFA40 JFA42	JFA39 JFA41 JFA43 (m6)	Increments 0.5mm	Increments 0.1mm	Tolerance	Increments 0.5mm	Increments 0.1mm	Increments 0.5mm		
1	0 -0.005	+0.008 +0.002	2.0~5.0	1.0~3.0	0 -0.01	1.0~10.0	1.1~3.0	1.0~10.0	0.2	-
2			0.0~10.0	1.0~4.0		1.0~30.0	2.1~7.0	1.0~30.0		M2
3				1.5~6.0			3.1~8.0		0.3	M3
4		+0.012 +0.004		2.0~7.0			4.1~9.0		0.4	M4

Order Example: Type - D - L - P - B - H - T

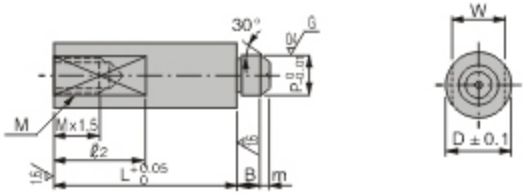
JFA38 - 2 - 5 - 3 - 10 - 4 - 7

■ Customize are also available

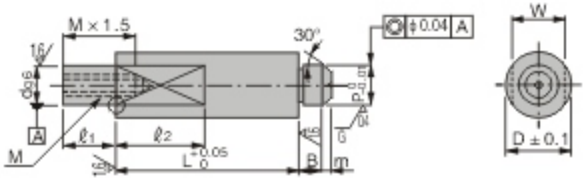
TYPE：JFA44
(Male Thread Type)



TYPE：JFA45
(Female Thread Type)



TYPE：JFA46
(Inlay Type)



Type：JFA44 ~ JFA46

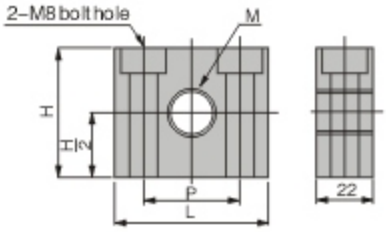
Material：S45C -1.1191 - Carbon Steel for machinery structures
Surface Treatment：Black oxidized & Hard chrome plating by option

D	L 0.01mm Increments	P 0.01mm Increments	B Selection	m	d	M Coarse thread	ℓ1	W	ℓ2
6	10.00~50.00	3.00~4.00	2 3 4 5	1	–	M3	–	5	8
8		3.00~6.00						7	
10	20.00~80.00			2	6		6	8	
12		4.00~8.00			8	M5		10	10
15		4.00~10.00		3	10		9	13	
20		5.00~10.00			12	M8		17	

Order Example：

Type	D	L	P	B	Surface treatment
JFA44	6	10	3	2	Black Oxidized

■ Customize are also available



Type: JFA47

Material: SS400 - Rolled Steel for general construction

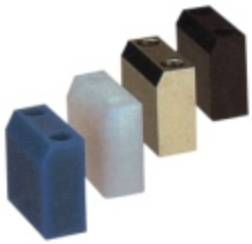
Surface Treatment: Zinc galvanizing

M	H Selection	M (Coarse Thread)	L	P
6	30	6×1.0	45	24
8		8×1.25		
10	50	10×1.5	50	28
12		12×1.75		

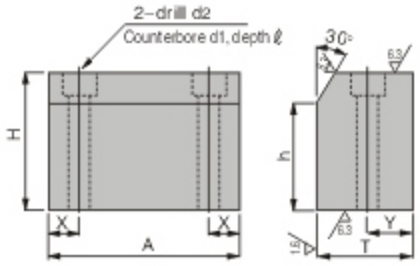
Order Example: Type – M – H

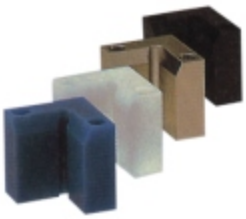
JFA47 – 6 – 30

■ Customize are also available

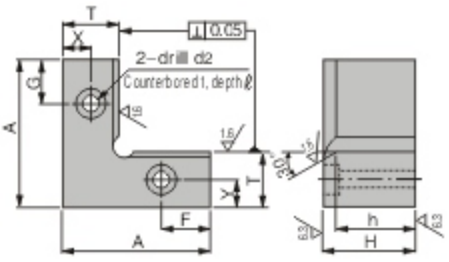


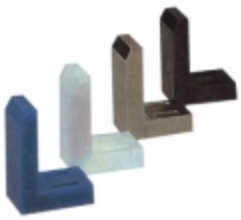
TYPE：JFA48
(Straight Shape)



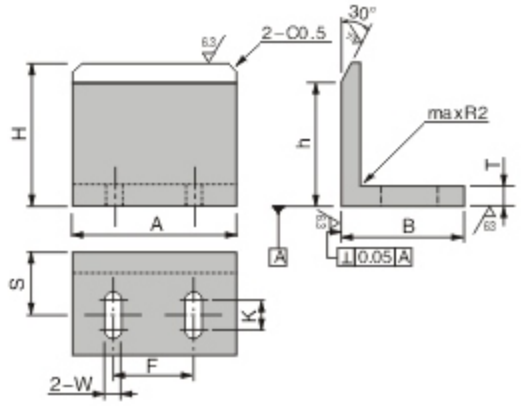


TYPE：JFA49
(L Shape)





TYPE：JFA50
(Angle Shape)



Type：JFA48 ~ JFA50

Material：S45C -1.1191 - Carbon Steel for machinery structures
Surface Treatment：Black oxidized & Electrolyze nickel plating by option

Type	A Selection	H 5mm Increments	T	h	X	Y	d1	d2	ℓ
JFA48	20 30 40 50	10 ~ 30	12	H-5	5	5	6.5	3.5	3.5
	20 30 40 50		15		5	6	8	4.5	4.5
	30 40 50 60		20		7	9	9.5	5.5	5.5
	30 40 50 60	15~30	25		8	11	11	6.5	6.5
	40 50 60		30		11	14	14	9	9

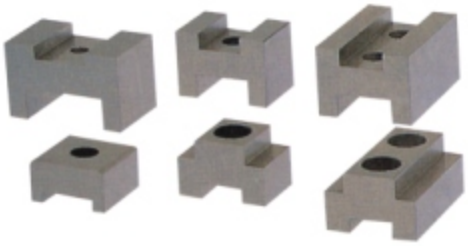
Type	A Selection	H 5mm Increments	T	h	F	G	X	Y	d1	d2	ℓ
JFA49	20 30 40 50	10 ~ 30	12	H-5	5	5	5	5	6.5	3.5	3.5
	20 30 40 50		15		5	5	6	6	8	4.5	4.5
	30 40 50 60		20		7	7	9	9	9.5	5.5	5.5
	30 40 50 60	15~30	25		8	8	11	11	11	6.5	6.5
	40 50 60		30		11	11	14	14	14	9	9

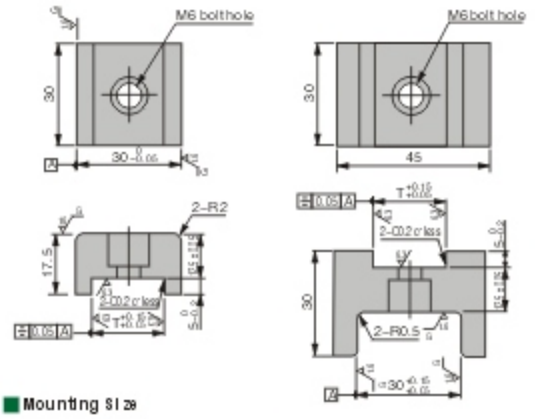
Type	A Selection	H 10mm Increments	T	h	F	B	S	W	K
JFA50	20	20 ~ 60	8	H-5	11	30	19	3.5	8
	30		10		16	40	25	4.5	10
	40		10		26	40	25	4.5	10
	50		12		32	50	31	5.5	15
	60		12		42	50	31	5.5	15

Order Example：

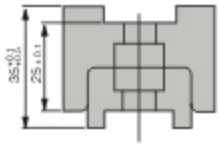
Type	-	A	-	H	-	Surface treatment
JFA48	-	20	-	15	-	Black Oxidized

■ Customize are also available

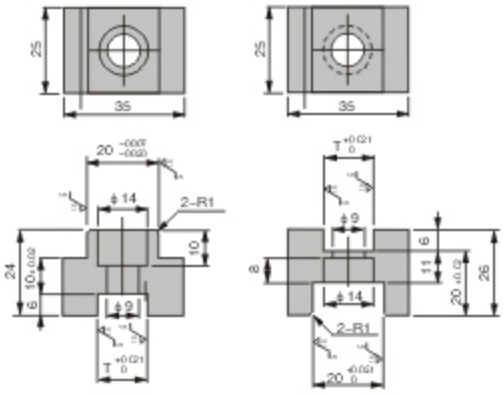




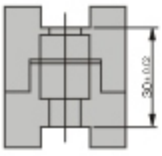
■ Mounting Size



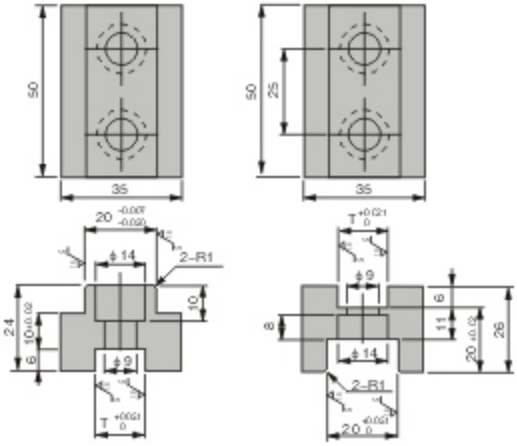
TYPE：JFA51



■ Mounting Size



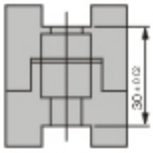
TYPE：JFA52



Type：JFA51 ~ JFA53

Material：S45C -1.1191 - Carbon Steel for machinery structures
Hardness：HRC42~45 Through hardening

■ Mounting Size

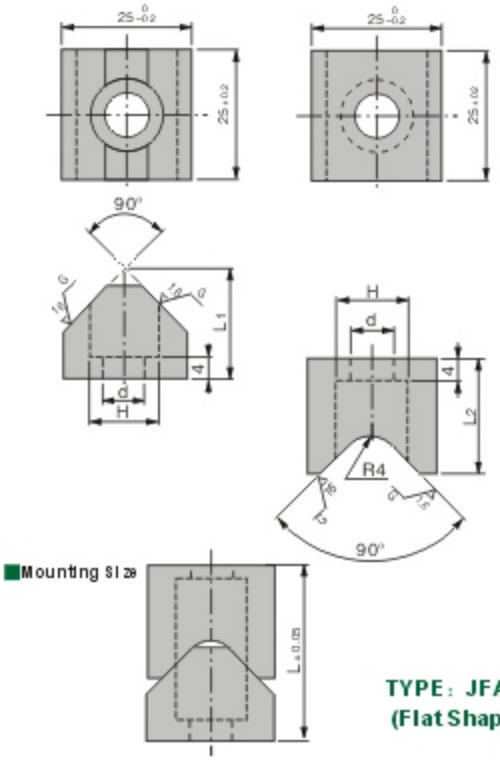


TYPE：JFA53

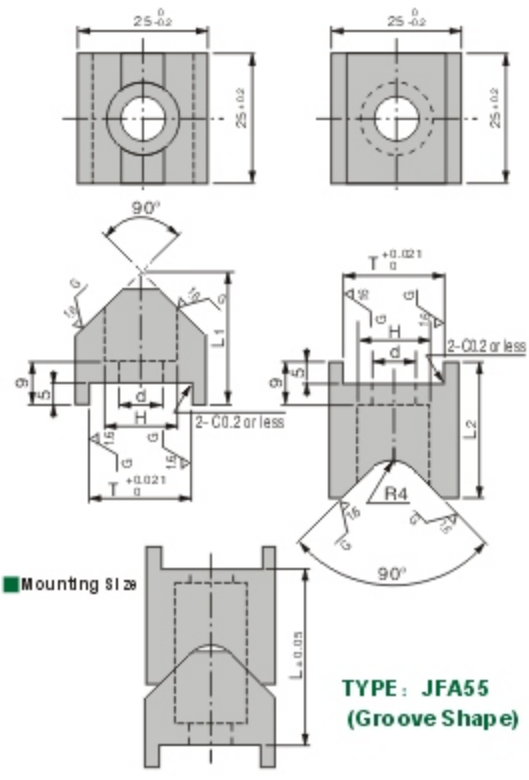
Type	T	d1	d2
JFA 51	14	11	6.5
	16	11	6.5
	20	11	6.5
JFA 52	12	9.5	5.5
	16	14	9
	19	14	9
JFA 53	12	9.5	5.5
	16	14	9
	19	14	9

Order Example: Type – T
JFA51 – 16

■ Customize are also available



TYPE：JFA54
(Flat Shape)



TYPE：JFA55
(Groove Shape)

Type：JFA54 & JFA55

Material：S45C - 1.1191 - Carbon Steel for machinery structures

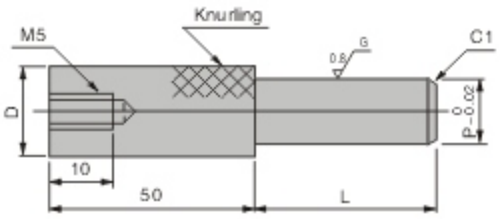
Hardness：HRC42~45 Through hardening

Type	T	L	L1	L2	H	d
JFA54	-	35	22	23	14	9
	-	25	16	19	11	7
JFA55	16	35	27	28	14	9
	19					

Order Example: Type – T – L

JFA55 – 16 – 35

■ Customize are also available



Type：JFA56

Material：S45C -1.1191 - Carbon Steel for machinery structures

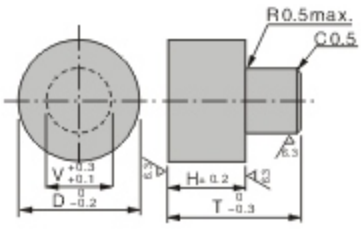
D	P 0.01mm Increments	L 1mm Increments
10	2.00~8.00	5~40
12	4.00~10.00	
16	8.00~14.00	
20	10.00~18.00	
25	15.00~23.00	

Order Example: Type - D - P - L

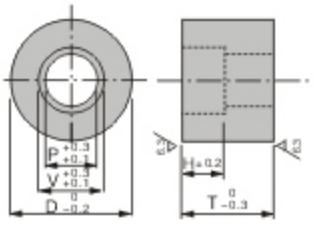
JFA56 - 10 - 3 - 30

■ Customize are also available

TYPE：JFA57 & JFA58
(Nosefreetype)



TYPE：JFA59 & JFA60
(Counterboreholefreetype)



Type：JFA57 ~ JFA60

Material：JFA57 & JFA59 - Polyacetal
JFA58 & JFA60 - MC Nylon (Standard grade - Blue)

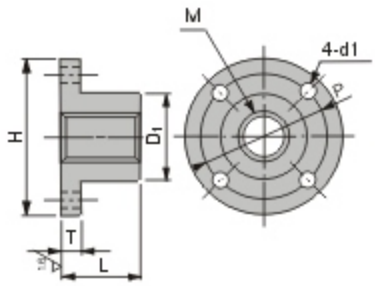
Type	D	V (0.5mm increments)	H (0.5mm increments)	T (0.5mm increments)
JFA57 JFA58	6~10 (0.5mm increments)	2~28	2~28	3~10
				10.5~20
				20.5~30
	10.5~20 (0.5mm increments)	4~18		3~10
				10.5~20
				20.5~30
	21~30 (1mm increments)	10~28		3~10
				10.5~20
				20.5~30
	31~40 (1mm increments)	15~38	2~38	5~10
				10.5~20
				20.5~30
				30.5~40
	41~50 (1mm increments)	20~48	2~48	10~20
				20.5~30
				30.5~40
				40.5~50
	51~60 (1mm increments)	30~58		10~20
				20.5~30
				30.5~40
				40.5~50

Type	D	V (0.5mm Increments)	P (0.5mm Increments)	H (0.5mm Increments)	T (0.5mm Increments)
JFA59 JFA60	10~20 (0.5mm Increments)	5~55	3~53	1~48	3~10
					10.5~20
					20.5~30
					30.5~40
					40.5~50
	21~30 (0.5mm Increments)				3~10
					10.5~20
					20.5~30
					30.4~40
					40.5~50
	31~40 (1mm Increments)				3~10
					10.5~20
					20.5~30
					30.5~40
					40.5~50
	41~50 (1mm Increments)				3~10
					10.5~20
					20.5~30
					30.5~40
					40.5~50
	51~60 (1mm Increments)				3~10
					10.5~20
					20.5~30
					30.5~40
					40.5~50

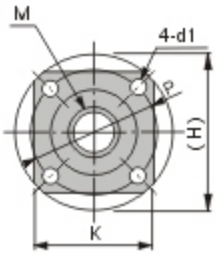
Order Example: Type - D - V - P - H - T
JFA59 - 10 - 5 - 3 - 2 - 5

■ Customize are also available

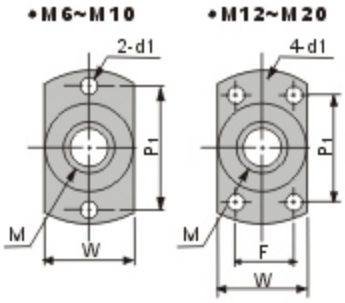
TYPE：JFA61
(Round)



TYPE：JFA62
(Square)



TYPE：JFA63
(Compact)



Type：JFA61 ~ JFA63

Material：SS400 - Rolled Steel for general construction

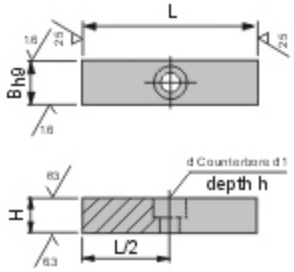
Surface Treatment：Black oxidized & Electrolyze nickel plating by option

M	M×Pitch	L	D1	H	T	P	K	W	P1	F	d1
6	6×1.0	12	12	28	4	20	22	12	20	–	3.5
8	8×1.25	14	15	32	5	25	25	15	25		
10	10×1.5	18	20	38		30	30	20	30		4.5
10A	10×1.25										
12	12×1.75	20	22	40	6	32	32	25	28	16	
14A	14×1.5	22	26	50		40	39	32	33	22	5.5
16	16×2.0	26	28								
18A	18×1.5	30	32	53	8	50	48	40	42	25	6.6
20	20×2.5	32	35								

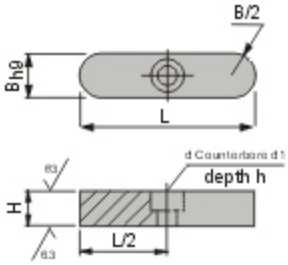
Order Example: Type – M – Surface treatment

JFA61 – 6 – Black Oxidized

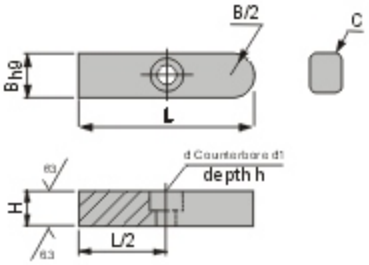
■ Customize are also available



TYPE：JFA64& JFA65



TYPE：JFA66 & JFA67



TYPE：JFA68 & JFA69

Type：JFA64 ~ JFA69

Material：JFA64, JFA66, JFA68：S45C - 1.1191 - Carbon Steel for machinery structures
JFA65, JFA67, JFA69：SUS316 - 1.4401 - Stainless Steel

Bh9		L 5mm Increments	H Tolerance		d	d1	h	C
8	0 -0.036	15~80	7	0 -0.090	3.4	6	3.5	0.25~0.40
10		15~80	8		4.5	7.5	4.5	0.40~0.60
12	0 -0.043	20~80			5.5	9.5	5.5	
14		30~90	9					
15		30~90	10					
16		40~100						
18		40~110	11	0 -0.110	6.6	11	6.5	

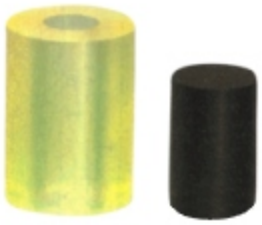
Length Tolerance：

L	Tolerance
15	0 -0.18
20 25 30	0 -0.21
35 40 45 50	0 -0.25
55 60 65 70 75 80	0 -0.30
85 90 95 100 105 110	0 -0.35

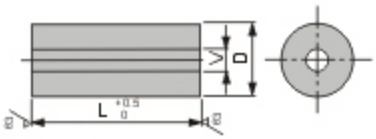
Order Example: Type - B - L
JFA64 - 8 - 20

■ Customize are also available

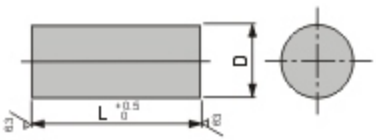
Urethane Round Bar



TYPE：JFA70
(With Hole)



TYPE：JFA71
(Without Hole)



D Tolerance

D	Tolerance
6~40	±0.2
41~60	±0.3
61~100	±0.4

V Tolerance

V	Tolerance
Below 30	±0.2
31~86	±0.5

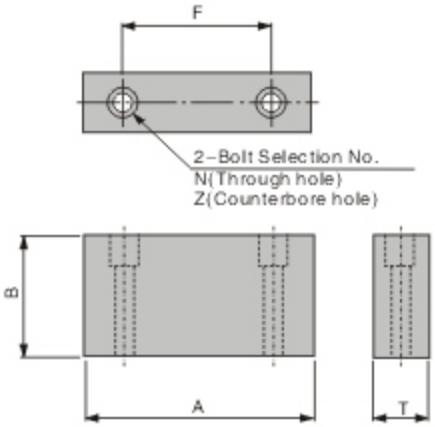
Type：JFA70 & JFA71

Material：Polyurethane
Hardness：Shore A95

1mm Increments			C
D	L	V (Hole)	Color Selection
6~15	10~300	2~11	N (Natural Color) B (Black)
16~30		4~26	
31~45		6~41	
46~60		6~56	
61~80		6~76	
81~100		6~86	

Order Example: Type - D - L - V - C
JFA70 - 15 - 50 - 6 - N

■ Customize are also available



Tolerance Table		
T Tolerance	6~9	Below 10
	±0.3	±0.5

Type：JFA72

Material：Polyurethane

Hardness：Shore A95

1mm Increments				Bolt Selection No.
A	B	T	F	N(Through)・Z(Counterbore bolt)
25~150	25~100	6~30	9~141	0 3 4 5 6 8 10 12 (B<30) 0 5 6 8 10 12 (30≤B<50) 0 10 12 (50≤B) (When without hole) N=0

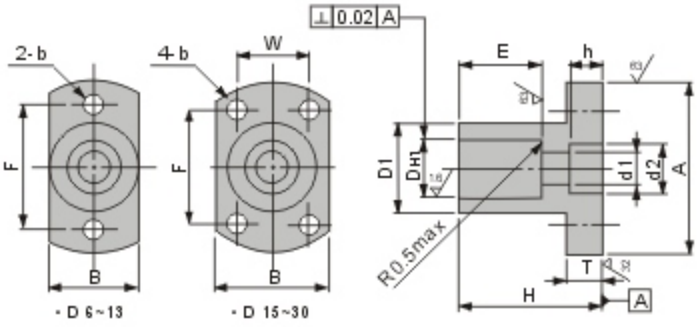
Hole matching detail							
N (Through) Z (Counterbore bolt)							
No.	3	4	5	6	8	10	12
d	3.5	4.5	5.5	6.5	9	12	14
d1	6.5	8	9.5	11	14	17.5	20.5
h	3.5	4.5	5.5	6.5	9	11	14

Order Example：

Type	A	B	T	F	Bolt Selection No.
JFA72	30	30	10	20	N5

■ Customize are also available

Holders For Fixing Shaft And Post



Type：JFA73

Material：S45C - 1.1191 - Carbon Steel for machinery structures

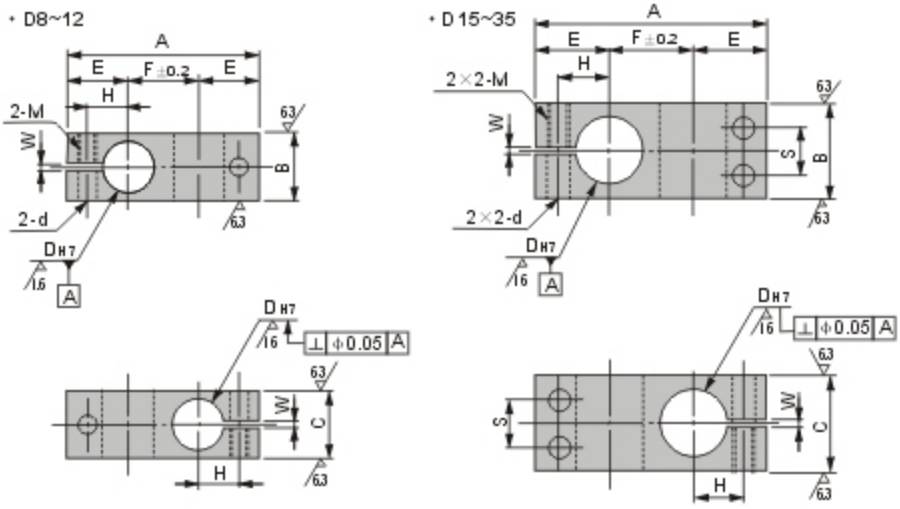
Surface Treatment：Black oxidized & Electrolyze nickel plating by option

DH7	A	B	H	D1	T	E	d1	d2	h	F	W	b	Bolts for Shaft • Post
6	28	12	16	12	5	9	3.5	6.5	3.5	20	–	3.5	M3
8	32	15	22	15		12	4.5	8	4.5	24	–	4.5	M4
10	38	18	26	18	8	15	5.5	9.5	5.5	30	–		M5
12	42	20	32	20		18	6.6	11	6.5	32	–	5.5	M6
13													
15	48	32	40	25	10	23	9	14	9	32	20		M8
16													
20	55	38	50	30		31	11	18	11	35	25	6.6	M10
25	75	50	62	38	15	38	14	20	14	45	35	9	M12
30	80	55	75	45		45	18	26	18	40	40		M16

Order Example: Type – D – Surface treatment

JFA73 – 6 – Black Oxidized

■ Customize are also available



Type: JFA74 & JFA75

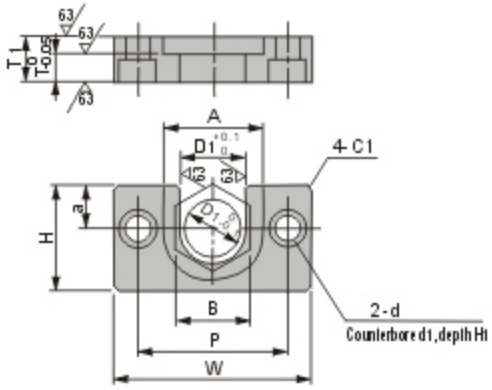
Material: JFA74 - SS400 - Rolled Steel for general construction
JFA75 - A6063 - Aluminum Alloy

Surface Treatment: JFA74 - Black Oxidized
JFA75 - White anodic anodized

DH7		A	B	C	E	F	H	S	M (Coarse Thread)	d	W
8	+0.015 0	41	12	12	14	13	8	–	M5	5.5	2
10		45	16	16	15	15	9	–			
12	+0.018 0	49			16	17	10	–			
15		57	22	22	18	21	12	11			
20	+0.021 0	69	28	28	22	25	15	14	M6	6.6	
25		83	32	32	25	33	18	16			
30		95	40	40	29	37	21	20	M8	9	
35	+0.025 0	107	45	45	32	43	24	24			

Order Example: Type – D
JFA74 – 8

■ Customize are also available



Type: JFA76

Material: S45C - 1.1191 - Carbon Steel for machinery structures

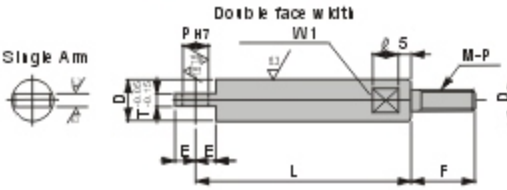
D	B	D1	A	T	T1	W	H	a	P	d	d1	H1
4	6	4.5	9	4	8	30	10	4	20	4.5	8	4.4
6	8	6.5	12			34	13	5	24			
7	10	8	14			36	15	6	26			
8	12	9	17	6	10	42	18	7	30	5.5	9.5	5.4
10	14	11	19		11	44	20	8	32			
13	17	14	23	8	13	52	24	10	38	6.6	11	6.5
16	21	18	28			56	30	12	42			
18	23	20	31	12	17	66	34	14	48	9	14	8.6
21	26	23	34			70	36	15	52			
25	30	27	38	15	21	84	43	19	62	11	17	10.5

Order Example: Type - D

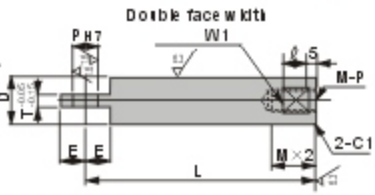
JFA76 - 6

■ Customize are also available

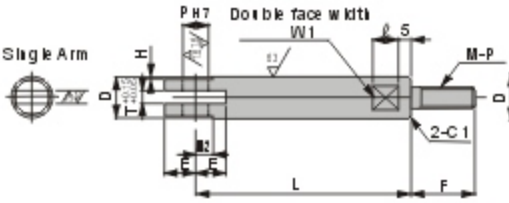
TYPE：JFA77 (Male Thread)



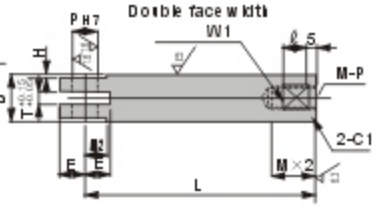
TYPE：JFA79 (Female Thread)



TYPE：JFA78 (Male Thread)



TYPE：JFA80 (Female Thread)



Type：JFA77 ~ JFA80

Material：JFA77 ~ JFA80 - S45C - 1.1191 - Carbon Steel for machinery structures
SUS304 - 1.4301 - Stainless Steel by option

Surface Treatment：JFA77 & JFA79 - Black Oxidized

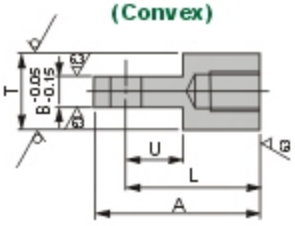
Type	M-Pitch	1mm Increments				T Selection	D	ℓ	W1	H	W2
		L	F	E	*P						
JFA77 JFA78	4-0.7	20~50	10~15	3~12	3~6	5	10	8	8	0.5	6
	5-0.8										
	6-1.0		10~20		3~8	5 6	12	10	10	1	7
	8-1.25	20~90	10~25	5~20	3~8	5 6 9 *10 *12	16	10	13	1.5	9
					*3~10						
	10-1.5		10~30		3~8	5 6 9 10 *12	20	10	17		
					*3~12						
	16-2.0		10~50		3~16	5 6 9 10 12 *16	25	10	17		

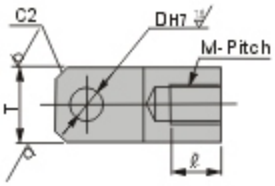
Type	M-Pitch	1mm Increments			T Selection	D	ℓ	W1	H	W2
		L	F	E						
JFA79 JFA80	5-0.8	30~60	3~12	3~5	5 *6	10	8	8	0.5	6
				*3~6						
	6-8.0			3~6	5 6	12	10	10	1	7
				*3~8						
	8-1.25	30~100	5~20	3~8	5 6 9 *10 *12	16	10	13	1.5	9
				*3~10						
	10-1.25			3~8	5 6 9 10 12	18	10	14		
	10-1.5			*3~12						

Order Example: Type - M-Pitch - L - F - E - P - T
JFA77 - 4-0.7 - 20 - 10 - 3 - 3 - 5

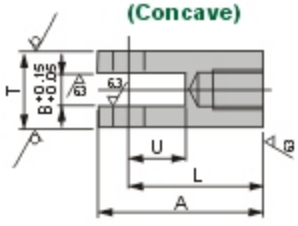
■ Customize are also available

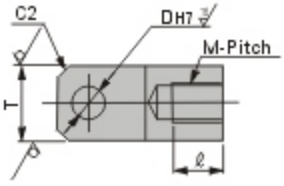
TYPE：JFA81
(Convex)





TYPE：JFA82
(Concave)





Type：JFA81 & JFA82

Material：S45C - 1.1191 - Carbon Steel for machinery structures

Surface Treatment：Black oxidized & Electrolyze nickel plating by option

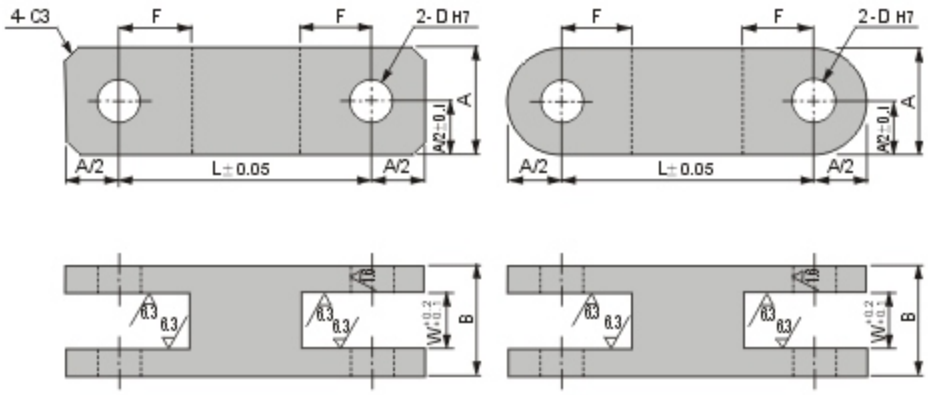
M-Pitch	B Selection	DH7	U	A	L	T
3-0.5	4 • 5	4	10	26	20	10
4-0.7	5 • 6	5		31	25	
5-0.8	5 • 6					12
6-1.0	4 • 6					
8-1.0	5 • 8	8	15	43	34	16
8-1.25	5 • 8					
10-1.25	6 • 10	10				20
10-1.5	6 • 10					
12-1.25	8 • 10	12		50	40	22
12-1.5	8 • 10					
14-1.5	10 • 12		20	62	50	25
16-1.5	10 • 12			67	55	
18-1.5	12 • 14			69		28

Order Example：

Type	–	M-Pitch	–	B	–	Surface treatment
JFA81	–	3-0.5	–	4	–	Black Oxidized

■ Customize are also available

Link - Regular



TYPE：JFA83
(Tetragon)

TYPE：JFA84
(Round)

Type：JFA83 & JFA84

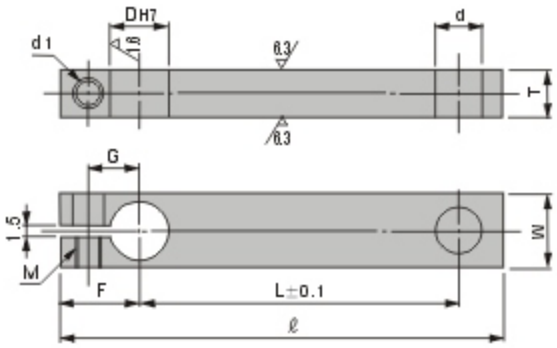
Material：SS400 - Rolled Steel for general construction
Surface Treatment：Black oxidized & Electrolyze nickel plating by option

DH7		L 5mm Increments	W Selection	A	B	F
10	+0.015 0	50~120	12 16 19	28	28	20
12	+0.018 0	60~120		32	32	
16				38	38	25

Order Example:

Type	D	L	W	Surface treatment
JFA83	10	50	16	Black Oxidized

■ Customize are also available



Type: JFA85 & JFA86

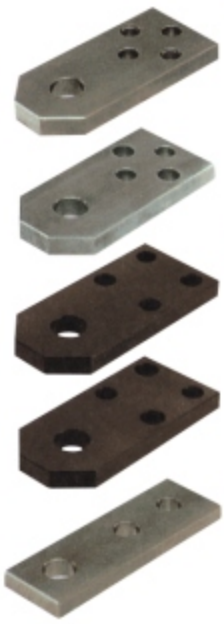
Material: JFA85 - S45C - 1.1191 - Carbon Steel for machinery structures
JFA86 - SUS304 - 1.4301 - Stainless Steel

Surface Treatment: JFA85 - Black oxidized

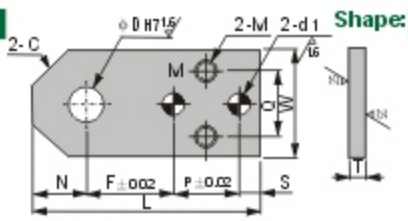
DH7	d Selection	L 1mm Increments	ℓ	W	F	G	Applicable Bolts M	d1	T
8	5	30~150	L+21	12	14	8	M6-12	6.6	10
	6		L+22						
	8		L+24						
10	5		L+23	16	15	9	M6-15		
	6		L+24						
	8		L+25						
	10		L+27						
12	5		L+23	18	16	10			12
	6		L+24						
	8		L+25						
	10		L+27						
	12		L+30						
15	6		L+27	22	18	12	M6-20		
	8		L+28						
	10		L+30						
	12		L+32						
	14		L+34						
20	8	50~150	L+32	28	22	15	M8-25	9	15
	10		L+34						
	12		L+35						
	14		L+36						
	16		L+38						
25	10		L+36	32	25	18	M8-30		
	12		L+37						
	14		L+38						
	16		L+40						
	18		L+42						

Order Example: Type - D - d - L
JFA85 - 8 - 5 - 100

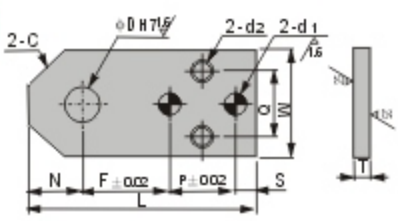
■ Customize are also available



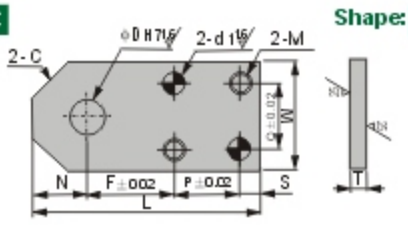
Shape: A



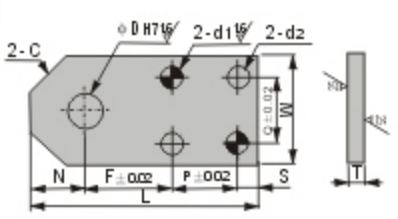
Shape: B



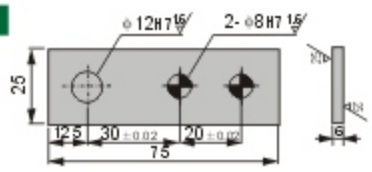
Shape: C



Shape: D



Shape: E



Type: JFA87 & JFA88

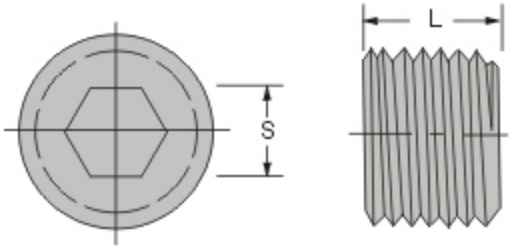
Material: JFA87 - S45C - 1.1191 - Carbon Steel for machinery structures
JFA86 - SUS304 - 1.4301 - Stainless Steel
Surface Treatment: Black oxidized & Electrolyze nickel plating by option

Shape	DH7	T Selection	1mm Increments P	1mm Increments Q	N	F	W	L	C	S	d1	d2	M
A	10	9 12 16	15~30	12~20	12	F=L-N-P-S	32	65	10	8	6	6.5	6
B	12		20~35	20~25	16		38	75		10	8	9	8
C	16		25~55	20~35	20		50	105	15	10	10	11	10
D	20												

Order Example:

Type	Shape	D	T	Q	P	Surface treatment
JFA87	A	10	9	12	15	Black Oxidized

■ Customize are also available



Type：JFA89

Material：SCM435 - 1.7220 - Chrome Molybdenum Steel
Surface Treatment：Black oxidized
Hardness：HRC32~42 Through hardening

Standard	S	L	HEX SIZE	THREADS
U.S	1/8NPT	0.250	3/16	27
	1/4NPT	0.406	1/4	18
	3/8NPT	0.406	5/16	18
	1/2NPT	0.531	3/8	14
	3/4NPT	0.531	9/16	14
	1NPT	0.656	5/8	11 1/2

Standard	S	L	HEX SIZE	THREADS
British	1/8PT	7.0	5.0	28.0
	1/4PT	8.9	6.0	19.0
	3/8PT	10.0	8.0	19.0
	1/2PT	12.0	10.0	14.0
	3/4PT	14.0	14.0	14.0
	1PT	17.0	17.0	11.0

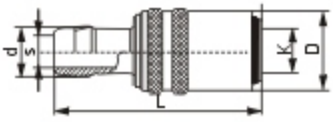
Standard	S	L(LENGTH)	HEX SIZE
German	M8*0.75	8.0	4.0
	M10*1	8.0	5.0
	M12/1.5	8.0	6.0
	M14*1.5	10.0	7.0

Order Example:

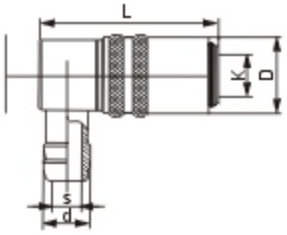
Type	–	Standard	–	S	–	L
JFA89	–	U.S	–	1/8NPT	–	0.25

■ Customize are also available

TYPE：JFA90



TYPE：JFA91



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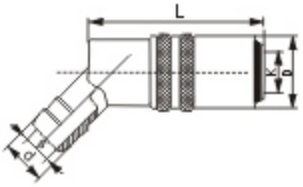

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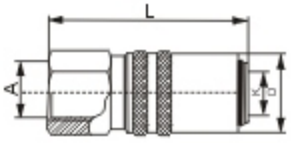


Type：JFA90 ~ JFA93

Material：C3604, Brass

TYPE	D	L	d	K	S
JFA90	17.2	52.5	10.0	9.0	6.0
			11.0		
			14.0		9.0
	23.0	58.5	11.0	13.5	6.0
			14.0		9.0
	31.0	90.0	20.5	19.0	13.0

TYPE	D	L	d	K	S
JFA91	17.2	46.5	10.0	9.0	6.0
			11.0		
			14.0		9.0
	23.0	48.0	11.0	13.5	6.0
			14.0		9.0
	31.0	75.0	20.5	19.0	13.0

TYPE	D	L	d	K	S
JFA92	17.2	46.5	10.0	9.0	6.0
			11.0		
			14.0		9.0
	23.0	48.0	11.0	13.5	6.0
			14.0		9.0
	31.0	75.0	20.5	19.0	13.0

TYPE	D	L	A	K
JFA93	17.2	46.5	1/4'BSPT	9.0
			3/8'BSPT	
	23.0	48.0	1/4'BSPT	13.5
			3/8'BSPT	

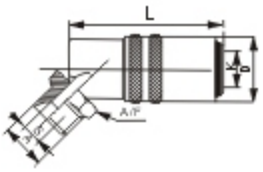
Order Example： Type - D - L - d

JFA90 - 17.2 - 52.5 - 10

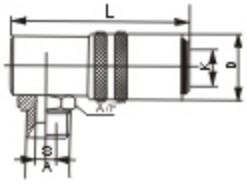
■ Customize are also available

Coupling - European Standard - With Thread

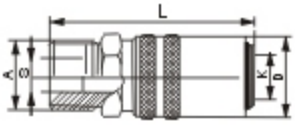
TYPE: JFA94



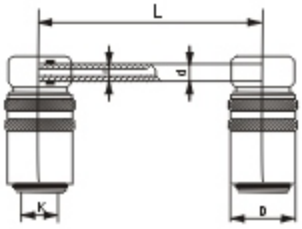
TYPE: JFA95



TYPE: JFA96



TYPE: JFA97



Type: JFA94 ~ JFA97

Material: C3604, Brass

TYPE	D	L	d	K	S	A/F
JFA94	17.2	46.5	M14*1.5	9.0	6.0	14.0
			R1/4"			
			R3/8"			17.0

TYPE	D	L	A	K	S	A/F
JFA95	17.2	46.5	M14*1.5	9.0	6.0	14.0
			R1/4"			
			R3/8"			17.0

TYPE	D	L	d	K	S
JFA96	17.2	46.5	M10*1	9.0	6.0
			M14*1.5		
			1/4"BSPT		
			3/8"BSPT		
	23.0	48.0	1/4"BSPT	13.5	9.0
			3/8"BSPT		
			1/2"BSPT		
	31.0	75.0	1/2"BSPT	19.0	14.0
			3/4BSPT		
			M24*1.5		

TYPE	D	L	K
JFA97	17.2	125.0	9.0
		250.0	
		500.0	
		125.0	
	23.0	250.0	13.5
		500.0	
		160.0	
	31.0	315.0	19.0
		500.0	

Order Example: Type - D - L - A

JFA94 - 17.2 - 46.5 - M14x1.5

■ Customize are also available

Technical Data

Greek Symbols

Uppercase	Lowercase	Pronunciation	Conventional Usage
A	α	alpha	Angle, coefficient
B	β	beta	Angle, coefficient
Γ	γ	gamma	Angle, weight per unit area, Relation (uppercase)
Δ	δ	delta	Fine difference, density displacement
E	ε	epsilon	Fine quantity, distortion
Z	ζ	zeta	Variable
H	η	eta	Variable
Θ	θ	theta	Angle, temperature, time
I	ι	iota	
K	κ	kappa	Rotational radius
Λ	λ	lambda	Wavelength, characteristic value
M	μ	mu	Friction coefficient 10⁻⁶ (Micro)
N	ν	nu	Frequency
Ξ	ξ	xi	Variable
O	ο	omicron	
Π	π	pi	Number π (3.14159…). Angle
P	ρ	rho	volume (uppercase) Radius, density
Σ	σ	sigma	Stress, standard deviation, summation (uppercase)
T	τ	tau	Time constant, time, torque
Υ	υ	upsilon	
Φ	φ, ϕ	phi	Angle, function, diameter
X	χ	chi	
Ψ	ψ	psi	Angle, function
Ω	ω	omega	Angular velocity: 2πf Ohm: Unit of electric resistivity (uppercase)

Note: Unless otherwise specified, lowercase letters are the norm.

Atomic Symbols

Atomic Number	Name	Symbol	Atomic Number	Name	Symbol
1	Hydrogen	H	53	Iodine	I
2	Helium	He	54	Xenon	Xe
3	Lithium	Li	55	Cesium	Cs
4	Beryllium	Be	56	Barium	Ba
5	Boron	B	57	Lanthanum	La
6	Carbon	C	58	Cerium	Ce
7	Nitrogen	N	59	Praseodymium	Pr
8	Oxygen	O	60	Neodymium	Nd
9	Fluorine	F	61	Promethium	Pm
10	Neon	Ne	62	Samarium	Sm
11	Sodium	Na	63	Europium	Eu
12	Magnesium	Mg	64	Gadolinium	Gd
13	Aluminum	Al	65	Terbium	Tb
14	Silicon	Si	66	Dysprosium	Dy
15	Phosphorous	P	67	Holmium	Ho
16	Sulfur	S	68	Erbium	Er
17	Chlorine	Cl	69	Thulium	Tm
18	Argon	Ar	70	Ytterbium	Yb
19	Potassium	K	71	Lutetium	Lu
20	Calcium	Ca	72	Hafnium	Hf
21	Scandium	Sc	73	Tantalum	Ta
22	Titanium	Ti	74	Tungsten	W
23	Vanadium	V	75	Rhenium	Re
24	Chromium	Cr	76	Osmium	Os
25	Manganese	Mn	77	Iridium	Ir
26	Iron	Fe	78	Platinum	Pt
27	Cobalt	Co	79	Gold	Au
28	Nickel	Ni	80	Mercury	Hg
29	Brass	Cu	81	Thallium	Tl
30	Zinc	Zn	82	Lead	Pb
31	Gallium	Ga	83	Bismuth	Bi
32	Germanium	Ge	84	Polonium	Po
33	Arsenic	As	85	Astatine	At
34	Selenium	Se	86	Radon	Rn
35	Bromine	Br	87	Francium	Fr
36	Krypton	Kr	88	Radium	Ra
37	Rubidium	Rb	89	Actinium	Ac
38	Strontium	Sr	90	Thorium	Th
39	Yttrium	Y	91	Protactinium	Pa
40	Zirconium	Zr	92	Uranium	U
41	Niobium	Nb	93	Neptunium	Np
42	Molybdenum	Mo	94	Plutonium	Pu
43	Technetium	Tc	95	Americium	Am
44	Ruthenium	R	96	Curium	Cm
45	Rhodium	Rh	97	Berkelium	Bk
46	Palladium	Pd	98	Californium	Cf
47	Silver	Ag	99	Einsteinium	Es
48	Cadmium	Cd	100	Fermium	Fm
49	Indium	In	101	Mendelevium	Md
50	Tin	Sn	102	Nobelium	No
51	Antimony	Sb	103	Lawrencium	Lr
52	Tellurium	T			

Note: This table was excerpt from Appendix A (Symbols and Atomic Numbers for Chemical Elements) of ISO 31/8-1980 (Quantities and Units of Physical Chemistry and Molecular Physics) and Appendix C (Names and Symbols for Radionuclide) of ISO 31/9-1980 (Quantities and Units of Atomic Physics and Nuclear Physics).

Characteristics of Metals

Materials	Specific Gravity	Thermal Expansion Coefficient	Young's Modulus	
		X10⁻⁶/℃	G Pa	Kgf/mm²
Mild steel	7.85	11.7	214	21000
MAB80	7.8	12.5	209	20500
SKD11	7.85	11.7	214	21000
SKD61	7.75	10.8	214	21000
SKH51	8.2	10.1	227	22300
Carbide V30	14.1	6.0	571	56000
Carbide V40	13.9	6.0	551	54000
Cast Iron	7.3	9.2-11.8	76-107	7500-10500
SUS304	8.0	17.3	201	19700
SUS440C	7.78	10.2	208	20400
Oxygen free copper C1020	8.9	17.6	119	11700
6/4 Brass C2801	8.4	20.8	105	10300
Beryllium Copper C1720	8.3	17.1	133	13000
Aluminum A1100	2.7	23.6	70	6900
Duraluminum A7075	2.8	23.6	73	7200
Titanium	4.5	8.4	108	10600

How to Calculate the Volume

Solid	Volume V	Solid	Volume V	Three-dimensional object	Volume V	Solid	Volume V
Truncated cylinder	$V=\frac{\pi}{4}d^2h$ $=\frac{\pi}{4}d^2\left(\frac{h_1+h_2}{2}\right)$	Ovaling	$V=\frac{\pi}{4}d^2\frac{\sqrt{a^2+b^2}}{2}$	Spherical segment	$V=\frac{2}{3}\pi r^2h$ $=2.0944r^2h$	Spherical belt	$V=\frac{\pi h}{6}(3a^2+3b^2+h^2)$
Pyramid	$V=\frac{1}{3}Ah=\frac{1}{6}anh$ A= Area of base r= Radius of inscribed circle a= Length of one side of inscribed polygon n= Number of the sides of inscribed polygon	Cross cylinder	$V=\frac{\pi}{4}d^2(\ell+d-\frac{d}{3})$	Torus	$V=2\pi^2Rr^2$ $=19.739Rr^2$ $=\frac{\pi^2}{3}Dd^2$ $=2.4674Dd^2$	Barrel	When circumference makes a curve equal to the circular arc. $V=\frac{\pi h}{12}(2D^2+d^2)$ When circumference makes a curve equal to a parabolic line, $V=0.2094(2D^2+Dd+\frac{3}{4}d^2)$
Spherical crown	$V=\frac{\pi h^2}{3}(3r-h)$ $=\frac{\pi h}{6}(3a^2+h^2)$ a is the radius.	Hollow cylinder	$V=\frac{\pi}{4}h(D^2-d^2)$ $=\pi th(D-t)$ $=\pi th(d+t)$	Circular cone	$V=\frac{\pi}{3}r^2h$ $=1.0472r^2h$ $V=\frac{1}{3}\pi r^2h=4.1888r^3$ $=\frac{\pi}{6}d^3=0.5236d^3$		
Ellipsoid	$V=\frac{4}{3}\pi abc$ In case of a spheroid (b=c) $V=\frac{4}{3}\pi ab^2$	Truncated pyramid	$V=\frac{1}{3}(A+a+\sqrt{Aa})$ Aa=area of both ends	Sphere			

How to Calculate the Weight

Weight W [g] = Volume [cm³] × Specific gravity

Ex.: Mild steel

◇D=16 and L=50mm, he weight is:

$W=\frac{\pi}{4}D^2\times L\times$ Specific gravity

$=\frac{\pi}{4}\times1.6^2\times5\times7.85$

$=79$ [g]

1. General Steel Materials

Class	Symbol	Application or Use	Type	JIS	Steel Flat	Square Bar	Hexagonal Bars	Round Bar	Steel Sheet	Section
Rolled steel for general construction	SS400	General machine parts	Good workability and weld ability	JIS G 3101	○	○		○	○	○
Cold finished steel bar (Cold-drawn)	SS400D	General machine parts	Good precision and surface grain. Can be used as it is or cut into smaller parts.	—	○	○	○	○		
Carbon steel for machine construction	S45C	General machine parts	Quenchable 58kgf/mm² tensile strength	JIS G 4051	○	○	○	○	○	
	S50C		Quenchable 68kgf/mm² tensile strength							
Carbon tool steel	SKS93	Shafts, pins, etc.	Drill rods (Pole) SK4 is cold-drawn then machine-surfaced. Available in Class 7 (–DG7) = h7 Class 8 (–DG8) = h8 Class 9 (–DG9) = h9	JIS G 4401	○	○		○		
	SK4				○			○		
	SK5				○			○	○	
Alloy tool steel	SKS3	Quench-hardened parts	Deformation in quench-hardening differs little from SK materials.	JIS G 4404	○	○		○		
Chromium-molybdenum steel	SCM435	General machine parts requiring strength	SCM435 70kgf/mm² tensile strength Tensile strength of 95kgf/mm² or stronger by quenching and tempering Hardness of HB270 or harder HRC50 or more by surface quenching	JIS G 4105	○	○	○	○	○	
	SCM415									
	SCM420									
Sulfuric and sulfuric compound free cutting steel products	SUM21	General machine parts (Free-cutting steel)	Sulfur is added to improve machinability of carbon steel.	JIS G 4804		○	○	○		
	SUM22L		Free cutting steel added with lead as well as sulfur							
	SUM24L									
High-carbon high-chromium bearing steel	SUJ2	Roller bearings, etc,	Bearing steel	JIS G 4805				○		
Cool rolled steel products	SPCC	Covers, cases, etc,	Rolled at almost normal temperatures. High dimensional precision and beautiful texture Good workability in bending, squeezing, and cutting, Good weldability, too.	JIS G 3141					○	
Hot-rolled steel plates sheet and strip in coil length	SPHC	General machine structural parts	General use plate thickness is max. 6mm.	JIS G 3131					○	

2. Stainless Steel Materials

Type	Symbol	Application or Use	Type	Magnetism	JIS	Steel Flat	Square Bar	Hexagonal Bars	Round Bar	Steel Sheet	Section
Austenite	SUS303	Machine parts requiring rust-proofing	18-8 non-magnetic, free-cutting SUS. Machines better than SUS304.	None*	JIS G 4303 ~	○			○		
Austenite	SUS304	Machine parts requiring rust-proofing	Generally used as erosion-resistant, heat-resistant steel Most popular general-use steel material.	None*		○	○	○	○	○	○
Austenite	SUS316	Machine parts requiring rust-proofing	More water-proof than SUS304. Used with seawater and all kinds of mediums.	None*		○			○	○	
Martensite	SUS440C	Machine parts requiring rust-proofing (Less corrosion resistant than austenite)	Quenchable.	Available					○		
Martensite	SUS410	Machine parts requiring rust-proofing (Less corrosion resistant than austenite)	Quenchable. Good workability.	Available					○		

*①Martensite exhibits magnetic properties. Machining of Austenite may cause magnetic properties.

3. Copper Alloy Materials

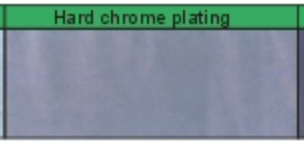
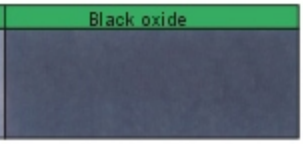
Class	Symbol	Application or Use	Type	JIS	Square Bar	Hexagonal Bars	Round Bar	Steel Sheet
Brass sheet	C2801P	For general metal sheets machining Name plates, instrument plates	High strength. Ductile. Used in sliding parts. Brass	JIS H 3100				○
Free-cutting brass (Extruded bar)	C3604BD	General turning bolts screws, nuts, etc.	Good machinability	JIS H 3250	○	○	○	

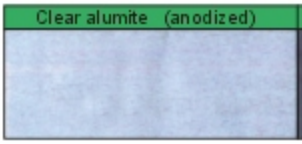
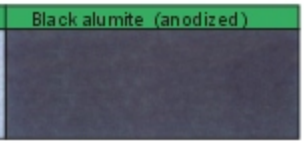
Types and Apparent Colors of Surface Treatments

Machine Surfacing

Name		Vickers Hardness (HV)	Film thickness (μm)	Applicable Materials	Example	Purpose・Features	Reference
Zinc galvanizing		–	3~20	Steel	Thin plate Wite	・Rust-proof,low priced. ・Merely fair outer appearance.	–
Chromate plating		–	1~2	Steel	Metal sheet Bolts and nuts	・Rust-proof, low priced. ・Applicable to mass-produced parts. ・Substitute for nickel plating which quickly looses outer appearance.	–
Bright chromate		–	1~2	Steel	–		
Nickel-plated		–	–	Steel Brass Copper	–	・Improved corrosion resistance and decorative. ・Chromate plating has more corrosion resistant in atmosphere.	・Use a copper substrate when necessary. ・Not applicable to deep indentations.
	Class 1 plating	500	5~20			・Better outer appearance than Class 3 plating.	・Material→Buff→Plate→Buff
	Class 3 plating						・Material→Plate
	Crepe plating	–	–			・Fatigue resistance. ・Minor scratches remain inconspicuous.	・Material→Dull finish→Plate
Electroless nickel plating		500	Specifable	Steel Stainless Brass Copper alloy Aluminum alloy Glass Plastecs	Parts not applicable with nickel plating	・Approx. 10 times more expensive than nickel plating. ・Easy film thickness control ・High corrosion resistance, wear resistance. ・Applicable for making conductors of non-metals.	–
Kanigen		Up to 1000			Parts hardened after plating	・Same as electroless nickel plating. ・Hardening is possible by heat-treatment after plating.	
Chrome plating		–	–	Steel Brass Copper	–	・Luster appearance. ・Good corrosion resistance ・Sliding with chromium-plated surfaces bum easiiy.	・Use a nickel plate base coat when necessary. ・Not applicable to deep indentations.
	Class 1 plating	500	5~20			・Better outer appearance than Class 3 plating.	・Material→Buff→Plate→Buff
	Class 3 plating						・Material→Plate
	Crepe plating	–	–			・Fatigue resistance. ・Minor scratches remain inconspicuous.	・Material→Dull finish→Plate
	Hard chrome plating	1000	10~30		Cylinder liners	・Excellent wear resistarce ・More expensive than other chromium plating	・Material→Plate (Class 3 plating)
Black oxide		–	–	Steel	Bolts Nut Instruments	・Base coat for paints. ・Luster appearance. ・Rusts more easily than parkerized materials.	・Forms striron tetraoxide (Black color).
Parkerizing		–	–	Steel	Parts easily rusted after black oxide	・Excellent base coat for paints ・Rust-proof ・No luster	・Forms crystal phosphorous film on steel surfaces by non-electric method.
Raydent©		–	1~2	Steel Brass Stainless	Applications requiring precision or corrosion resistance higher than black oxide.	・Long term lust proof performance ・Good corrosion resistance ・Ultra thin coating	・Undergone a low temperature post-curative treatment that does not exert the malefic effects on the base material, this material enables processing as is even on a junction part with plastic rubber, etc.
Alumite (Anodized)	Clear	–	3~5	Aluminum alloy	–	・Corrosion and werar resistance ・No electrical conductivity ・Heat resistance	・There are colored alumite coatings that utilize porosity on a hard oxidation coating generated on their surface for coloring.
	Black	–	5~10				

Apparent Color of Surface Treatment

Bright chromate	Electroless nickel plating	Hard chrome plating	Black oxide
			

Clear alumite (anodized)	Black alumite (anodized)
	

Heat-Treatment for Steel Materials

Name	Vickers Hardness (HV)	Quenching Depth (mm)	Strain	Applicable Materials	Tpical Materials	Reference
Through hardening	750 or less	Full depth	Varies according to material.	High carbon steel C>0.45%	SKS3 SKS21 SUJ2 SKH51 SKS93 SK4 S45C	• Operation of heating copper to an appropriate temperature over transformation point and quickly cooling it in an appropriate medium in order to increase hardness or improve strength. • Not applicable with long or precision parts, such as spindles, etc.
Carburizing	750 or less	Standard 0.5 Max. 2	Moderate	Low carbon steel C<0.3%	SCM415 SNCM220	• Quenchable parts. • Quenching depth specified on drawings. • Applicable to precision parts.
High frequency quenching	500 or less	1 ~ 2	High	Medium carbon steel C0.3~ 0.5%	S45C	• A surface hardening method that uses high frequency induction current to quickly heat and cool the steel surface. • Quenchable parts. • Expensive in small volume lot. • Good strain resistance.
Nitriding	900 ~ 1000	0.1 ~ 0.2	Low	Nitriding steel	SACM645	• A surface hardening method that uses high frequency induction current to quickly heat and cool the steel surface. • Obtains highest hardness of all quenching techniques. • Applicable to precision parts. • Applicable to spindles for radial bearing.
Tufftricing	Carbon steel 500 Stainless Steel 1000	0.01~0.02	Low	Steel materials	S45C SCM415 SK3 Stainless Steel	• Tuftriding is one of the soft nitriding methods. • Good fatigue resistance and wear resistance. • Same corrosion resistance as zinc plating. • Not applicable to presision parts because it cannot be polished after heat-treatment • Applicable to dry bearings.
Bluing	–	–	–	Wire rod	SWP-B	• LOW-temperature annealing • Removes internal stress informing to enhance elasticity.

Hardness Tests and Applicable Parts

Testing Method	Principle	Applicable Heat-Treated Parts	Features	Reference
Brinell hardness	• A (steel or superhard alloy) ball indenter is used to indent the test surface. Hardness is given as a quotient minus the surface area of the indent, computed from the diameter.	• Annealed parts • Normalized parts • Anchored materials	• Applicable to uneven materials and forged products because indent is large. • Not applicable to small or thin specimens.	JIS Z2243
Rockwell hardness	• This standard or test load is applied via a diamond or ball indenter. Hardness is read on a tester.	• Quenched-tempered parts • Carburized surfaces • Nitrided parts • Thin sheets like copper, brass, bronze, etc.	• Hardness value obtained quickly. • Applicable as intermediate test to actual products. • 30 types caution required.	JIS Z2245
Shore hardness	• The specimen is set on a table. A hammer is dropped from a uniform height. Hardness is based on how height the hammer bounces.	• Quenched-tempered parts • Nitrided parts • Large carburized parts, etc.	• Extremely easy to operate. Data obtained quickly. • Applicable to large parts. • Indent is kept shallow, therefore is applicable to actual products. • Compact and light-weight. Portable.	JIS Z2246
Vickers hardness	• Uses a diamond 136° square pyramid indenter. Hardness value is obtained as the surface area of the indent, computed from the length of the diagonal lines of the indent.	• Thin parts hardened by high frequency quenching carborizing, nitriding electrolytic plating, ceramic coating etc • Hardened layer depth in carburized and nitrided parts.	• Applicable to small and thin specimens. • Applicable to all materials because of diamond indenter.	JISZ 2244

CONVERSION TABLE OF HARDNESS
Excerpt From SAE J417

Conversion table approximate values for steel according to Rockwell hardness C scale[1]

Rockwell hardness C scale (HRC)	Vickers hardness (HV)	Brinell hardness (HB) Ball:10mm diameter/ Load:3,000kgf		Rockwell hardness[2]			Rockwell superficial hardness Diamond conical penetrator			Shore hardness (HS)	Tensile strength (Approximate value) Mpa (kgf/mm²) (2)	Rockwell hardness c scale[2] (HRC)
		Standard ball	Tungsten carbide ball	A scale (HRA) Load:60kgf Diamond conical penetrator	B scale (HRB) Load:100kgf Ball of 1.6mm (1/16") dia.	D scale (HRD) Load:100kgf Diamond conical penetrator	15-N Scale Load:15kgf	30-N Scale Load:30kgf	45-N Scale Load:45kgf			
68	940	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	68
67	900	—	—	85.0	—	76.1	92.9	83.6	74.2	95	—	67
66	865	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	66
65	832	—	(739)	83.9	—	74.5	92.2	81.9	72.0	91	—	65
64	800	—	(722)	83.4	—	73.8	91.8	81.1	71.0	88	—	64
63	772	—	(705)	82.8	—	73.0	91.4	80.1	69.9	87	—	63
62	746	—	(688)	82.3	—	72.2	91.1	79.3	68.8	85	—	62
61	720	—	(670)	81.8	—	71.5	90.7	78.4	67.7	83	—	61
60	697	—	(654)	81.2	—	70.7	90.2	77.5	66.6	81	—	60
59	674	—	(634)	80.7	—	69.9	89.8	76.6	65.5	80	—	59
58	653	—	615	80.1	—	69.2	89.3	75.7	64.3	78	—	58
57	633	—	595	79.6	—	68.5	88.9	74.8	63.2	76	—	57
56	613	—	577	79.0	—	67.7	88.3	73.9	62.0	75	—	56
55	595	—	560	78.5	—	66.9	87.9	73.0	60.9	74	2075(212)	55
54	577	—	543	78.0	—	66.1	87.4	72.0	59.8	72	2015(205)	54
53	560	—	525	77.4	—	65.4	86.9	71.2	58.5	71	1950(199)	53
52	544	(500)	512	76.8	—	64.6	86.4	70.2	57.4	69	1880(192)	52
51	528	(487)	496	76.3	—	63.8	85.9	69.4	56.1	68	1820(186)	51
50	513	(475)	481	75.9	—	63.1	85.5	68.5	55.0	67	1760(179)	50
49	498	(464)	469	75.2	—	62.1	85.0	67.6	53.8	66	1695(173)	49
48	484	451	455	74.7	—	61.4	84.5	66.7	52.5	64	1635(167)	48
47	471	442	443	74.1	—	60.8	83.9	65.8	51.4	63	1580(151)	47
46	458	432	432	73.6	—	60.0	83.5	64.8	50.3	62	1530(156)	46
45	446	421	421	73.1	—	59.2	83.0	64.0	49.0	60	1480(151)	45
44	434	409	409	72.5	—	58.5	82.5	63.1	47.0	58	1435(146)	44
43	423	400	400	72.0	—	57.7	82.0	62.2	46.7	57	1385(141)	43
42	412	390	390	71.5	—	56.9	81.5	61.3	45.5	56	1340(136)	42
41	402	381	381	70.9	—	56.2	80.9	60.4	44.3	55	1295(132)	41
40	392	371	371	70.4	—	55.4	80.4	59.5	43.1	54	1250(127)	40
39	382	362	362	69.9	—	54.6	79.9	58.6	41.9	52	1215(124)	39
38	372	353	353	69.4	—	53.8	79.4	57.7	40.8	51	1180(120)	38
37	363	344	344	68.9	—	53.1	78.8	56.8	39.6	50	1160(118)	37
36	354	336	336	68.4	(109.0)	52.3	78.3	55.9	38.4	49	1115(114)	36
35	345	327	327	67.9	(108.5)	51.5	77.7	55.0	37.2	48	1080(110)	35
34	336	319	319	67.4	(108.0)	50.8	77.2	54.2	36.1	47	1055(108)	34
33	327	311	311	66.8	(107.5)	50.0	76.6	53.3	34.9	46	1025(105)	33
32	318	301	301	66.3	(107.0)	49.2	76.1	52.1	33.7	44	1000(102)	32
31	310	294	294	65.8	(106.0)	48.4	75.6	51.3	32.7	43	980(100)	31
30	302	286	286	65.3	(105.5)	47.7	75.0	50.4	31.3	42	950(97)	30
29	294	279	279	64.7	(104.5)	47.0	74.5	49.5	30.1	41	930(95)	29
28	286	271	271	64.3	(104.0)	46.1	73.9	48.6	28.9	41	910(93)	28
27	279	264	264	63.8	(103.0)	45.2	73.3	47.7	27.8	40	880(90)	27
26	272	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	860(88)	26
25	266	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	840(86)	25
24	260	247	247	62.4	(101.0)	43.1	71.6	45.0	24.3	37	825(84)	24
23	254	243	243	62.0	100.0	42.1	71.0	44.0	23.1	36	805(82)	23
22	248	237	237	61.5	99.0	41.6	70.5	43.2	22.0	35	785(80)	22
21	243	231	231	61.0	98.5	40.9	69.9	42.3	20.7	35	770(79)	21
20	238	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	760(77)	20
(18)	230	219	219	—	96.7	—	—	—	—	33	730(75)	(18)
(16)	222	212	212	—	95.5	—	—	—	—	32	705(72)	(16)
(14)	213	203	203	—	93.8	—	—	—	—	31	675(69)	(14)
(12)	204	194	194	—	92.3	—	—	—	—	29	650(66)	(12)
(10)	196	187	187	—	90.7	—	—	—	—	28	620(63)	(10)
(8)	188	179	179	—	89.5	—	—	—	—	27	600(61)	(8)
(6)	180	171	171	—	87.1	—	—	—	—	26	580(59)	(6)
(4)	173	165	165	—	85.5	—	—	—	—	25	550(56)	(4)
(2)	166	158	158	—	83.5	—	—	—	—	24	530(54)	(2)
(0)	160	152	152	—	81.7	—	—	—	—	24	515(53)	(0)

※Notes (1) The figures in bite are based on Table 1 of ASTM E 140 (adjusted by SEA, ASM and ASTM in collaboration)

(2) The values and units parentheses have have been converted from psi based on conversion tables of JIS Z 8413 and Z 8438. 1Mpa=1N/mm²

(3) The figures in parentheses are less frequently used values and are for reference only.

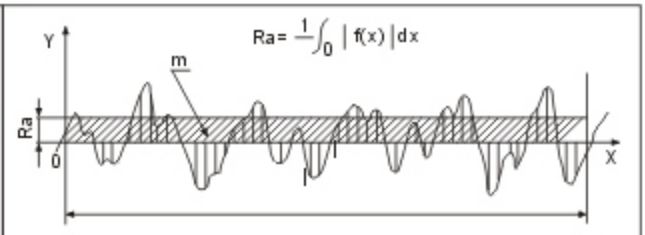
1. Categories of surface roughness

Definitions and indications for surface roughness parameters(for industrial products)are specified.The yare arithmetical mean roughness (Ra),maximum height(Ry),ten-point mean roughness(Rz), mean spacing of profile irregularities(Sm),mean spacing of local peaks of the profile(S)and profile bearing length ratio(tp).Surface roughness is given as the arithmetical mean value for a randomly sampled area. [Mean center line roughness(Ra75)is defined in the annexes of JIS B0031 and JIS B(0061)] .

Table 1 Typical ways for obtaining surface roughness

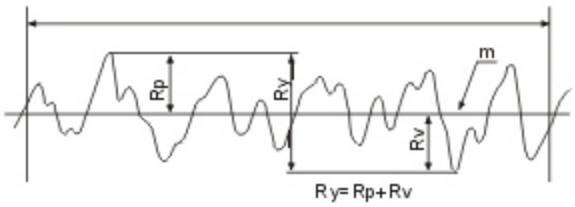
Arithmetical mean roughness (Ra)

A section of standard length is sampled from the mean line on the roughness chart.The mean line is laid on a Cartesian coordinate system wherein the mean line runs in the direction of the x-axis and magnification is the Y-axis.The value obtained with the formula on the right is expressed in micrometer(μm) when y=1(X)



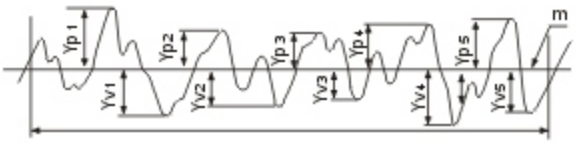
Maximum peak(Ry)

A section of standard length is sampled from the mean line on the roughness chart.The distance between the peaks and valleys of the sampled line is measured in the y direction .The value is expressed in micrometer(μm).
Notes: To obtain Ry,sample only the standard length .The part, where peaks and valleys are wide enough to be interpreted as scratches,should be avoided.



Ten-point mean roughness (Rz)

A section of standard length is sampled from the mean line on the routhness chart,The distance between the peaks and valleys of the sampled line is measured in the y direction. Then , the average peak is obtained among 5 tallest peaks (Yp), as is the average valley between 5 lowest valleys (Yv), The sum of these two values is expressed in micrometer(μm).



$$Rz = \frac{|Yp1+Yp2+Yp3+Yp4+Yp5| + |Yv1+Yv2+Yv3+Yv4+Yv5|}{5}$$

Yp1、Yp2、Yp3、Yp4、Yp5: Tallest 5 peaks within sample

Yv1、Yv2、Yv3、Yv4、Yv5: Lowest 5 peaks within sample

Reference:Relationship between arithmetical mean roughness(Ra)and conventional symbols

Arithmetical mean roughness Ra			Max.Height Ry	Ten-point mean roughness Rz	Standard length of Ry · Rz ℓ(mm)	Triangular indication
Preferred number series	Cut-off value C(mm)	Indication of surface texture on drawings	Preferred number series			
0.012 a	0.08	0.012 ~ 0.2	0.05s	0.05 z	0.08	▽▽▽▽
0.025a	0.25		0.1 s	0.1 z		
0.05 a			0.2 s	0.2 z	0.25	
0.1 a			0.4 s	0.4 z		
0.2 a			0.8 s	0.8 z		
0.4 a	0.8	0.4 ~ 1.6	1.6 s	1.6 z	0.8	▽▽▽
0.8 a			3.2 s	3.2 z		
1.6 a			6.3 s	6.3 z		
3.2 a	0.25	3.2 ~ 6.3	12.5s	12.5 z	0.25	▽▽
6.3 a			25 s	25 z		
12.5 a	8	12.5 ~ 25	50 s	50 z	8	▽
25 a			100s	100 z		
50 a	–	50 ~ 100	200s	200 z	–	–
100 a			400	400 z		

※The interdependence for 3 classes is not strictly enforced.
※The evaluation eengths of Ra,Ry and Rz:Five times the cut-off value and standard length respectively.

Kinds and symbols of geometrical tolerances

Kinds of tolerance		Symbol	Definition of tolerance zone	Examples of diagrammatical indication and its interpretation
Form tolerance	Straightness tolerance	—	Where symbol ϕ is attached before the numerical value indicating a tolerance zone, this tolerance zone is a zone in a cylinder of diameter t.	ϕ 0.08 — Where a tolerance frame is connected to the dimension showing the diameter of a cylinder, the axis of the cylinder shall be contained a cylinder of 0.08mm diameter.
	Flatness tolerance	▱	The tolerance zone is a zone held between two parallel planes a distance t apart.	0.08 — This surface shall be contained between two parallel planes 0.08mm apart.
	Circularity tolerance	○	The tolerance zone in the considered plane is a zone between two concentric circles a distance t apart.	0.1 — The circumerence in any section normal to the axis shall be contained between two concentric circles 0.1mm apart on the same plane.
	Cylindricity tolerance	⌭	The tolerance zone is a zone contained between two coaxial cylinder surfaces a distance t apart.	0.1 — The considered surface shall be contained between two coaxial cylinder surfaces 0.1mm apart.
	Profile tolerance of line	⌒	The tolerance zone is a zone held between two lines enveloping circles of diameter t, the centers of which are situated on a theoretically exact profile line	0.04 — In any cross section parallel to the projection plane the considered profile shall be contained between two lines enveloping circles of 0.04mm in diameter, the centers of which are situated on a line having the theoretically exact profile.
	Profile tolerance of surface	⌓	The tolerance zone is a zone held between the two surfaces enveloping the spheres of diameter t, the centers of which are situated on a theoretically exact profile surface.	0.02 — The considered surface shall be contained between two surfaces enveloping the spheres of diameter 0.02mm, the centers of which are situated on a surface having the theoretically exact profile.
Orientation tolerance	Parallelism tolerance	//	The tolerance zone is a zone held between two parallel planes parallel to the datum plane and a distance t apart from each other.	0.01 A — The surface shown by the arrow of the leader line shall be contained between two planes parallel to the datum plane A and 0.01mm apart from each other in the direction of the arrow of the leader line.
	Perpendicularity tolerance	⊥	Where symbol is attached before the numerical value indicating the tolerance, the tolerance zone is a zone within a cylinder of diameter t perpendicular to the datum plane.	ϕ ⊥ ϕ 0.01 A — The axis of the cylinder shown by the arrow of the leader line shall be contained within a cylinder of diameter 0.01mm perpendicular to the datum plane A.
	Angularity tolerance	∠	The tolerance zone is a zone held between two parallel planes inclined at the specified angle to the datum plane and distance t apart from each other.	0.08 A — 40° — The surface shown by the arrow of the leader line shall be contained between two parallel planes which are inclined at 40° with the oretical exactness to the datum plane A and which are 0.08mm apart from each other in the direction of the arrow of the leader line.
Location tolerance	Positional tolerance	⌖	True location — The tolerance zone is a zone within a circle or sphere of diameter t having its center at the theoretically exact location, hereinafter referred to as the true location.	B — ϕ 0.03 A B — 60 — 100 — A — The point shown by the arrow of the leader line shall be contained within a circle of 0.03mm diameter having its center at the true location 60mm and 100mm apart respectively, from the datum straighline A and from the datum straighline B.
	Coaxiality tolerance of concentricity tolerance	◎	Where symbol ϕ is attached before the numerical value indicating the tolerance, the tolerance zone is a zone within a cylinder of diameter t whose axis agrees with the datum axis straighline.	A — ϕ 0.01 A — The axis shown by the arrow of the leader line shall be contained within a cylinder of 0.01mm diameter whose axis agrees with the datum axis straighline A.
	Symmetry tolerance	⌯	The tolerance zone is a zone held between two parallel planes a distance t apart from each other and arranged symmetrically about the datum median plane.	A — 0.08 A — The median surface shown by the arrow of the leader line shall be contained between two parallel planes 0.08mm apart from each other and arranged symmetrically about the datum median plane A.
Run-out tolerance	Circular run-out tolerance	↗	measuring plane — Toleranced surface — The tolerance is a zone between two concentric circles whose centers agree with the datum axial straighline on any measuring plane normal to the datum axial straighline and which are a distance t apart from each other in the radial direction.	0.1 A-B — A — B — The run-out in the radial direction of the cylinder surface shown by the arrow of the leader line shall not exceed 0.1mm on any measuring plane normal to the datum axial straight line when the cylinder is rotated by one rotation about the datum axial straight line A-B.
	Total run-out tolerance	⌰	The tolerance zone is a zone between two coaxial cylinders having axes agreeing with the datum axial straighline and a distance t apart from each other in the radial direction.	0.1 A-B — A — B — The total radial run-out of the cylinder surface shown by the arrow of the leader line shall not exceed 0.1mm at any point on the cylinder surface when the cylinder part is rotated about the datum axial straight line A-B with a relative movement in the axial direction.

Lines used in the drawing in the column of "defintion of tolerance zone" indicate the following meanings:

Thick solid line or broken line: Feature
Thick alternate long and short dash line: Datum
Thin solid line or broken line: Tolerance zone
Thin alternate long and short dash line: Center line
Thin alternate long and two short dashes line: Supplementary projection plane or sectional plane
Thin alternate long and two short dashes line: Projection of a feature to Supplementary Projection plane or sectional plane

Stainless steels・Heat resisting steels and related materials

Japan Industrial Standards		Steel Type Related to Foreign Standards					
Standard Number Name	Code	ISO 683/1, 10, 11*)	AISI SAE	BS 970 Part1,3 BS EN 10083—1,2	DIN EN 10084 DIN EN 10083—1,2	NF A3—6551 NF EN 10083—1,2	「OCT 4543
JIS G 4051 Carbon steel for machine structral use	S10C	C10	1010	040A10 045A10 045M10	C10E C10R	XC10	–
	S12C	–	1012	040A12	–	XC12	–
	S15C	C15E4 C15M2	1015	055M15	C15E C15R	–	–
	S17C	–	1017	–	–	XC18	–
	S20C	–	1020	070M20 C22 C22E C22R	C22 C22E C22R	C22 C22E C22R	–
	S22C	–	1023	–	–	–	–
	S25C	C25 C25E4 C25M2	1025	C25 C25E C25R	C25 C25E C25R	C25 C25E C25R	–
	S28C	–	1029	–	–	–	25「
	S30C	C30 C30E4 C30M2	1030	080A30 080M30 C30 C30E C30R	C30 C30E C30R	C30 C30E C30R	30「
	S33C	–	–	–	–	–	30「
	S35C	C35 C35E4 C35M2	1035	C35 C35E C35R	C35 C35E C35R	C35 C35E C35R	35「
	S38C	–	1038	–	–	–	35「
	S40C	C40 C40E4 C40M2	1039 1040	080M40 C40 C40E C40R	C40 C40E C40R	C40 C40E C40R	40「
	S43C	–	1042 1043	080A42	–	–	40「
	S45C	C45 C45E4 C45M2	1045 1046	C45 C45E C45R	C45 C45E C45R	C45 C45E C45R	45「
	S48C	–	–	080A47	–	–	45「
	S50C	C50 C50E4 C50M2	1049	080M50 C50 C50E C50R	C50 C50E C50R	C50 C50E C50R	50「
	S53C	–	1050 1053	–	–	–	50「
	S55C	C55 C55E4 C55M2	1055	070M55 C55 C55E C55R	C55 C55E C55R	C55 C55E C55R	–
	S58C	C60 C60E4 C60M2	1059 1060	C60 C60E C60R	C60 C60E C60R	C60 C60E C60R	60「
	S09CK	–	–	045A10 045M10	C10E	XC10	–
	S15CK	–	–	–	C15E	XC12	–
	S20CK	–	–	–	–	XC18	–

ISO: International Organization for Standazation
AISI: Amencan Iron Steel Lnstitute
SAE: Society of Automotive Engineers
BS: British Standards

Japan Industrial Standards		Steel Type Related to Foreign Standards					
Standard Number Name	Code	ISO 683/1, 10, 11*)	AISI SAE	BS 970 Part1,3 BS EN 10083—1,2	DIN EN 10084 DIN EN 10083—1,2	NF A3—6551 NF EN 10083—1,2	「OCT 4543
JIS G 4102 Nickel-chrome steel	SNC236	–	–	–	–	–	40XH
	SNC415	–	–	–	–	–	–
	SNC631	–	–	–	–	–	30XH3A
	SNC815	15NiCr13	–	655M13	15NiCr13	–	–
	SNC836	–	–	–	–	–	–
JIS G 4103 Nickel-chrome molybdenum steel	SNCM220	20NiCrMo2 20NiCrMoS2	8615 8617 8620 8622	805A20 805M20 805A22 805M22	20NiCrMo2 20NiCrMoS2	20NCD2	–
	SNCM240	41CiNiMo2 41CiNiMoS2	8637 8640	–	–	–	–
	SNCM415	–	–	–	–	–	20XГМ(20XМ)
	SNCM420	–	4320	–	–	–	–
	SNCM431	–	–	–	–	–	–
	SNCM439	–	4340	–	–	–	–
	SNCM447	–	–	–	–	–	–
	SNCM616	–	–	–	–	–	–
	SNCM625	–	–	–	–	–	–
	SNCM630	–	–	–	–	–	–
	SNCM815	–	–	–	–	–	–
JIS G 4104 Chrome steel	SCr415	–	–	–	17Cr3 17CrS3	–	15X 15XA
	SCr420	20Cr4 20CrS4	5120	–	–	–	20X
	SCr430	34Cr4 34CrS4	5130 5132	34Cr4 34CrS4	34Cr4 34CrS4	34Cr4 34CrS4	30X
	SCr435	34Cr4 34CrS4 37Cr4 37CrS4	5132	37Cr4 37CrS4	37Cr4 37CrS4	37Cr4 37CrS4	35X
	SCr440	37Cr4 37CrS4 41Cr4 41CrS4	5140	530M40 41Cr4 41CrS4	41Cr4 41CrS4	41Cr4 41CrS4	40X
	SCr445	–	–	–	–	–	45X
JIS G 4105 Chrome molybdenum steel	SCM415	–	–	–	–	–	–
	SCM418	18CrMo4 18CrMoS4	–	–	18CrMo4 18CrMoS4	–	20XM
	SCM420	–	–	708M20	–	–	20XM
	SCM421	–	–	–	–	–	–
	SCM430	–	4131	–	–	–	30XM 30XMA
	SCM432	–	–	–	–	–	–
	SCM435	34CrMo4 34CrMoS4	4137	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	35XM
	SCM440	42CrMo4 42CrMoS4	4140 4142	708M40 709M40 42CrMo4 42CrMos4	42CrMo4 42CrMos4	42CrMo4 42CrMos4	–
	SCM445	–	4145 4147	–	–	–	–
	SCM822	–	–	–	–	–	–

DIN:Deutsches Institut für Nörmumg
EN:European Standards
NF:Norme Francaise
「OCT:National standard of the former USSR

Japan Industrial Standards		Steel Type Related to Foreign Standards					
Standard Number Name	Code	ISO 683/1, 10, 11[1])	AISI SAE	BS 970 Part1,3 BS EN 10083—1,2	DIN EN 10084 DIN EN 10083—1,2	NFA35—551 NF EN 10083—1,2	GOST 4543
JIS G 4106 Structural manganese steel for machine Structural use and manganese chrome steel	SMn420	22Mn6	1522	150M19	–	–	–
	SMn433	–	1534	150M36	–	–	30 ⌈2 35 ⌈2
	SMn438	36Mn6	1541	150M36	–	–	35 ⌈2 40 ⌈2
	SMn443	42Mn6	1541	–	–	–	40 ⌈2 45 ⌈2
	SMnC420	–	–	–	–	–	–
	SMnC443	–	–	–	–	–	–
JIS G 4202 Aluminum chrome molybdenum steel	SACM645	41CrAlMo74	–	–	–	–	– – –
JIS G 4052 Structual steel with guaranteed hardenability (H steel)	SMn420H	22Mn6	1522H	–	–	–	–
	SMn433H	–	–	–	–	–	–
	SMn438H	36Mn6	1541H	–	–	–	–
	SMn443H	42Mn6	1541H	–	–	–	–
	SMnC420H	–	–	–	–	–	–
	SMnC443H	–	–	–	–	–	–
	SCr415H	–	–	–	17Cr3 17CrS3	–	15X
	SCr420H	20Cr4 20CrS4	5120H	–	–	–	20X
	SCr430H	34Cr4 34CrS4	5130H 5132H	34Cr4 34CrS4	34Cr4 34CrS4	34Cr4 34CrS4	30X
	SCr435H	34Cr4 34CrS4 37Cr4 37CrS4	5135H	37Cr4 37CrS4	37Cr4 37CrS4	37Cr4 37CrS4	35X
	SCr440H	37Cr4 37CrS4 41Cr4 41CrS4	5140H	41Cr4 41CrS4	41Cr4 41CrS4	41Cr4 41CrS4	40X
	SCM415H	–	–	–	–	–	–
	SCM418H	18CrMo4 18CrMoS4	–	–	18CrMo4 18CrMoS4	–	–
	SCM420H	–	–	708H20	–	–	–
	SCM435H	34CrMo4 34CrMoS4	4135H 4137H	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	–
	SCM440H	42CrMo4 42CrMoS4	4140H 4142H	42CrMo4 42CrMoS4	42CrMo4 42CrMoS4	42CrMo4 42CrMoS4	–
	SCM445H	–	4145H 4147H	–	–	–	–
	SCM822H	–	–	–	–	–	–
	SNC415H	–	–	–	–	–	–
	SNC631H	–	–	–	–	–	–
	SNC815H	15NiCr13	–	655H13	15NiCr13	–	–
	SNCM220H	20NiCrMo2 20NiCrMoS2	8617H 8620H 8622H	805H17 805H20 805H22	–	20NCD2	–
	SNCM420H	–	4320H	–	–	–	–

Japan Industrial Standards		Steel Type Related to Foreign Standards					
Standard Number Name	Code	ISO 683/1, 10, 11[1])	AISI SAE	BS 970 Part1,3 BS EN 10083—1,2	DIN EN 10084 DIN EN 10083—1,2	NFA35—551 NF EN 10083—1,2	GOST 4543
JIS G 4107 High-temperature alloy steel for bolts	SNB5	–	501	–	–	–	–
	SNB7	42CrMo4 42CrMoS4	4140 4142 4145	708M40 709M40 42CrMo4[1])	42CrMo4[2])	42CrMo4[4])	–
	SNB16	–	–	40CrMoV4-6[1])	40CrMoV47[2])	40CrMoV4-6[4])	–
JIS G 4108 Steel bar for special-purpose alloy steel bolts	SNB21-1 ~ 5	–	–	40CrMoV4-6[1])	40CrMoV47[2])	40CrMoV4-6[4])	–
	SNB22-1 ~ 5	42CrMo4 42CrMoS4	4142H	–	42CrMo4[2])	–	–
	SNB23-1 ~ 5	–	E4340H	–	–	–	–
	SNB24-1 ~ 5	–	4340	–	–	–	–

Note : 1) BS EN 10259
2) DIN 1654 Part 4
3) NF EN 10259
4) ISO683-1,10,11 have been issued as JIS G 7051,G7052,G7053 by Translation JIS.

Names of tool steel

Rolled steel for general structures	SS400 ····· Steel - Structure - 400N/mm²
Carbon steel for machinery structures	S45C ····· Steel - 0.45%C
Chrome molybdenum steel	SCM435 ··· Steel - Cr - Mo435
Nickel chrome molybdenum steel	SNCM220··· Steel - Ni - Cr - Mo220
Carbon tool steel	SK105 ····· Steel - Kagu(Tool) - 105 types (Old SK3)
Alloy tool steel	SKS3 ····· Steel - Kagu(Tool) - Special - 3 types
	SKD11 ····· Steel - Kagu(Tool) - Dies - 11 types
High speed tool steel	SKD51 ····· Steel - Kagu(Tool) - High Speed - 51 types
High carbon chrome bearing steel	SUJ2 ····· Steel - Use - Jikuuke(Bearing) - 2 types
Stainless steel	SUS304·····Steel - Use - Stainless - 304 types
Gray iron	FC250 ····· Ferrum(Iron) - Cast - 250N/mm²

Carbon steels for machine structural use · Alloy steel and related materials

Japan Industrial Standards		Industrial standards	Foreign Standards							European Standards EN	
			United States		United Kingdom	Germany	France	Russia (Former USSR)			
Standard Number/Name [stainless steel abbreviation]	JIS	ISO TR 16510 L-No.	UNS	AISI	BS	DIN	NF	GOST		Type	Number
JIS G 4303 – 4306	SUS201	12	S20100	201			Z12CMN17-07Az	12Kh17G9AN4		X12CrMnNiN17-7-5	1.4372
	SUS202		S20200	202	284S16					X12CrMnNiN18-9-5	1.4373
Rods	SUS301	5	S30100	301	301S21	X12CrNi17 7	Z11CN17-08	07Kh16N6		X5CrNi17-7	1.4319
Hot-rolled steel strip and plate Cold-rolled steel strip	SUS301L	4				X2CrNi18-7				X5CrNiN18-7	1.4318
	SUS301J1					X12CrNi17 7					
JIS G 4308 – 4309	SUS302		S30200	302	302S25		Z12CN18-09	12Kh18N9			
	SUS302B		S30215	302B							
Wire Cable	SUS303	13	S30300	303	303S21	X10CrNi18 10	Z8CNF18-09			X8CrNiS18-9	1.4305
	SUS303Se		S30323	303Se	303S41			12Kh18E			
	SUS303Cu										
JIS G 4313 – 4315	SUS304	6	S30400	304	304S31	X5CrNi18 10	Z6CN18-09	08Kh18N9		X5CrNi18-10	1.4301
	SUS304L	1	S30403	304L	304S11	X2CrNi19 11	Z2CN18-11	03Kh18N11		X2CrNi19-11	1.4307
		2									1.4307
Spring strips	SUS304N1	10	S30451	304N			Z6CN18-09Az			X2CrNiN18-9	1.4306
Spring wire	SUS304N2		S30452								
Cold pressed wire	SUS304LN	3	S30453	304LN		X2CrNi18 10	Z2CN18-10Az			X2CrNiN18-10	1.4311
JIS G 4317 – 4320	SUS304J1										
	SUS304J2										
	SUS304J3		S30431	S30431							
Hot-rolled equal angle steel	SUS305	8	S30500	305	305S19	X5CrNi18 12	Z8CN18-12	06Kh18N11		X5CrNi18-12	1.4303
	SUS305J1										
Cold-rolled rods	SUS308	ISO 683/14	S30908	308S			Z10CN20-13				
Steel fragments of cast objects	SUS309S	ISO 683/15	S30908	309S							
	SUS310S		S31008	310S	310S31		Z8CN25-20	10Kh23N18		X6CrNi25-20	
	SUS310S1										
	SUS310S2										
Cold-rolled equal angle steel	SUS316	26	S31600	316	316S31	X5CrNiMo1712	Z6CND17-12-02			X5CrNiMo1712-2	1.4401
	SUS316F	27				X5CrNiMo1733	Z6CND18-12-03			X5CrNiMo1713-3	1.4436
	SUS316L	19	S31603	316L	316S11	X2CrNiMo1732	Z2CND17-12-02			X2CrNiMo1712-2	1.4404
		20				X2CrNiMo1713	Z2CND17-12-03	03Kh17N13M2		X2CrNiMo1713-3	1.4432
										X2CrNiMoN1713	1.4435
	SUS316N		S31651	316N							
	SUS316LN	22	S31653	316LN		X2CrNiMoN1712	Z2CND17-12Az			X2CrNiMoN1712	1.4406
		23				X2CrNiMoN1733	Z2CND17-12Az			X2CrNiMoN1713-3	1.4429
	SUS316Ti	28	S31635			X6CrNiMoTi1712	Z6CNDTi17-12	08Kh17N13M2T		X2CrNiMoTi1712-2	1.4571
	SUS316J1										
	SUS316J1L										
	SUS317		S31700	317	317S16						
	SUS317L	21	S31709	317L	317S12	X2CrNiMo1816	Z3CND19-5-03			X2CrNiMo1845	1.4438
	SUS317LN	24	S31753				Z3CND19-11Az			X2CrNiMoN1812	1.4434
	SUS317J1									X2CrNiMoN1713-5	1.4439
	SUS317J2										
	SUS317J3L										
	SUS836L		N08367								
	SUS890L	31	N08904	N08904	904S14		Z2NCDU25-20			X1CrNiMoCuN25-25-5	1.4539
	SUS321	15	S32100	321	321S31	X6CrNiTi1810	Z6CNT18-10	08Kh18N10T		X6CrNiTi18-10	1.4541
	SUS347	17	S34700	347	347S31	X6CrNiNb1810	Z6CNNb18-10	08Kh18B2b		X6CrNiNb18-10	1.4550
	SUS384	9	S38400	384			Z6CNU18-16				
	SUSXM7	D26(1)	S30430	304Cu	394S17		Z6CNU18-10			X3CrNiCu18-9-4	1.4567
	SUSXM15J1		S38100				Z15CNS20-12			X1CrNiSi18-15-4	1.4361
	SUS329J1		S32900	329							
	SUS329J3L	33	S39240	S31803			Z3CNDU22-05Az			X2CrNiMoN22-5-3	1.4462
	SUS329J4L	34	S39275	S31260			Z3CNDU22-07Az			X2CrNiMoCuN25-6-3	1.4507

Japan Industrial Standards		Industrial standards	Foreign Standards							European Standards EN	
			United States		United Kingdom	Germany	France	Russia (Former USSR)			
Standard Number/Name [stainless steel abbreviation]	JIS	ISO TR 16510 L-No.	UNS	AISI	BS	DIN	NF	GOST		Type	Number
	SUS405	40	S40500	405	405S17	X6CrAl13	Z8CAl12			X6CrAl13	1.4002
	SUS410L						Z3C13				
	SUS429		S42900	429							
	SUS430	41	S43000	430	430S17	X6Cr17	Z8C17	12Kh17		X6Cr17	1.4016
	SUS430F	42	S43020	430F		X12CrMoS18	Z8CF17			X6CrMoS17	1.4105
	SUS430LX	44	S43035			X6CrTi17	Z4CTi17			X3CrTi17	1.4510
						X6CrTiNb17				X2CrTi17	1.4520
	SUS430J1L									X3CrNb17	1.4511
	SUS431	43	S43100	431	431S11	X6CrNiS17 1	Z8CD17-01			X6CrNi17-1	1.4113
	SUS436L		S43600	436						X1CrMoTi16-1	1.4513
	SUS436J1L										
	SUS444	46	S44400	444			Z3CDY18-02			X1CrMoTi18-2	1.4521
	SUS445J1										
	SUS445J2										
	SUS447J1		S44700								
	SUSXM27		S44627				Z1CD26-01				
	SUS403		S40300	403							
	SUS410	48	S41000	410	410S21	X20Cr13	Z13C13			X12Cr13	1.4006
	SUS410S	39	S41008	410S	403S17	Z8C12	Z8C12	08Kh13		X6Cr13	1.4000
	SUS410F2										
	SUS410J1		S41025								
	SUS416	49	S41600	416	416S21		Z11CF13			X12CrS13	1.4005
	SUS420J1	50	S42000	420	420S29	X20Cr13	Z20C13	20Kh13		X20Cr13	1.4021
	SUS420J2	51	S42000	420	420S37	X30Cr13	Z33C13	30Kh13		X30Cr13	1.4028
	SUS420F		S42020	420F			Z30CF13			X29CrS13	1.4029
	SUS420F2										
	SUS429J1										
	SUS431	57	S43100	431	431S29	X20CrNi17 2	Z15CN16-02	20Kh17N2		X19CrNi17 2	1.4057
	SUS440A		S44002	440A			Z10C15			X70CrMo15	1.4109
	SUS440B		S44003	440B							
	SUS440C		S44004	440C			Z10CD17	95Kh18		X105CrMo17	1.4125
	SUS440F		S44020	440F							
	SUS630	58	S17400	S17400			Z6CNU17-04			X5CrNiCuNb16-4	1.4542
	SUS631	59	S17700	S17700		X7CrNiAl17 7	Z9CNA17-01	09Kh17N7Yu		X7CrNiAl17-7	1.4568
	SUS632J1										
JIS G 4311 – 4316	SUH31				331S42		Z35CNAS18-14	45Kh14N14V2M			
	SUH35	ISO 683/13 (2)			349S52		Z52CMNC-09Az				
Heat resisting steel bar	SUH36		S63008		349S54	X53CrMnNi219	Z55CMNC-09Az	55Kh20G9AN4			
	SUH37		S63017		381S34						
Heat resisting steel plate	SUH38										
	SUH309		S30900	309	309S24		Z15CN24-13				
	SUH310		S31000	310	310S24	CrNi2520	Z15CN25-20	20Kh25N20S2			
	SUH330		N08330	N08330			Z12NCS35-16				
	SUH660		S66286				Z6NCTV25-20				
	SUH661		R30155								
	SUH21					CrAl1205					
	SUH409	37	S40900	409	409S19	X6CrTi12	Z6CTi12				
	SUH409L	36					Z3CTi12			X2CrTi12	1.4512
	SUH446	JIS G 4902 (3)	S44600	446			Z12C25	15Kh28			
	SUH1	JIS G 4902 (3)	S65007		401S45	X15CrSi93	Z15CS09				
	SUH3						Z10CSD10	40Kh10S2M			
	SUH35				349S52		Z8CNDNb20-02				
	SUH11	JIS G 4902 (3)						20Kh13N4G9			
	SUH660										
	SUH616		S42200								

Notes : 1. ISO is according to ISO TR 15510:1997. The revision is the same as for the English. However, (1) is based on ISO 4954 and (2) is based on ISO 683 - 15
2. We refer to the UNS registration numbers and AISI material manual for American standards.
3. European standards are based upon EN 10088-1:1995.
4. We refer to standards of the individual countries in Europe (JIS DIN and NF) but the standards will be abolished due to the EN regulations.
5. GOST is based on 5632.

Tool steels and related materials

Japan Industrial Standard		Steel Types Related to Foreign Standards					
Standard Number Name	Code	ISO	AISI SATM	BS	DIN VDEh	NF	ΓOCT
JIS G 4401 Carbon tool steel	SK140 (Old SK1)	TC140	–	–	–	C140E3U	Y13
	SK120 (Old SK2)	TC120	W1–11½	–	–	C120E3U	Y12
	SK105 (Old SK3)	TC105	W1–10	–	C105W1	C105E2U	Y11
	SK95 (Old SK4)	TC 90	W1–9	–	–	C 90E2U	Y10
	SK85 (Old SK5)	TC 90 TC 80	W1–8	–	C 80W1	C 90E2U C 80E2U	Y8 Γ Y9
	SK75 (Old SK6)	TC 80 TC 70	–	–	C 80W1	C 80E2U C 70E2U	Y8 Y7
	SK65 (Old SK7)	–	–	–	C 70W2	C 70E2U	P18
JIS G 4403 High-speed tool steel	SKH 2	HS18-0-1	T1	BT 1	–	HS 18-0-1	–
	SKH 3	HS18-1-1-5	T4	BT 4	S18-1-2-5	HS18-1-1-5	–
	SKH 4	HS18-0-1-10	T5	BT 5	–	HS18-0-2-9	–
	SKH10	HS12-1-5-5	T15	BT15	S12-1-4-5	HS12-1-5-5	–
	SKH51	HS 6-5-2	M2	BM 2	S 6-5-2	HS 6-5-2	–
	SKH52	–	M3-1	–	–	–	–
	SKH53	HS 6-5-2-3	M3-2	–	S 6-5-3	HS 6-5-3	–
	SKH54	–	M4	BM 4	–	HS 6-5-4	–
	SKH55	HS 6-5-2-5	–	BM35	S 6-5-2-5	HS 6-5-2-5HC	P6M5K5
	SKH56	–	M36	–	–	–	–
	SKH57	HS10-4-3-10	–	BT42	S10-4-3-10	HS10 -4-3-10	–
	SKH58	HS 2-9-2	M47	–	–	HS 2-9-2	–
	SKH59	HS 2-9-1-8	M42	BM42	S2-10-1-8	HS 2-9-1-8	–
JIS G 4404 Alloy tool steel	SKS11	–	F2	–	–	–	XB4
	SKS 2	105WCr1	–	–	105WCr6	105Wcr5	XB Γ
	SKS21	–	–	–	–	–	–
	SKS 5	–	–	–	–	–	–
	SKS51	–	L6	–	–	–	–
	SKS 7	–	–	–	–	–	–
	SKS 8	–	–	–	–	C140W3UCr4	13X
	SKS 4	–	–	–	–	–	–
	SKS41	–	–	–	–	–	–
	SKS43	TCV105	W2-9½	BW2	–	100V2	–
	SKS44	–	W2-8	–	–	–	–
	SKS 3	–	–	–	–	–	9XB Γ
	SKS31	105WCr1	–	–	105WCr6	105WCr5	XB Γ
	SKS93	–	–	–	–	–	–
	SKS94	–	–	–	–	–	–
	SKS95	–	–	–	–	–	–
	SKD 1	210Cr12	D3	BD3	X210Cr12	X200Cr12	X12
	SKD11	–	D2	BD2	–	X160CrMoV12	–
	SKD12	100CrMoV5	A2	BA2	–	X100CrmoV5	–
	SKD 4	30WCrV5	–	–	–	X32WCrV3	–
	SKD 5	30WCrV9	H21	BH21	–	X30WCrV9	–
	SKD 6	–	H11	BH11	X38CrMoV51	X38CrMoV5	4X5MΦC
	SKD61	40CrMoV5	H13	BH13	X40CrMoV51	X40CrMoV5	4X5MΦ1C
	SKD62	–	H12	BH12	–	X35CrWMoV5	3X3M3Φ

Japan Industrial Standard		Steel Types Related to Foreign Standards					
Standard Number Name	Code	ISO	AISI SATM	BS	DIN VDEh	NF	ΓOCT
JIS G 4404 (Continued)	SKD 7	30CrMoV3	H10	BH10	X32CrMoV33	32CrMoV12-18	–
	SKD 8	–	H19	BH19	–	–	–
	SKT 3	–	–	–	–	55CrNiMoV4	–
	SKT 4	55NicrMov2	–	BH224/5	55NiCrMoV6	55NiCrMoV7	5XHM

Special purpose steels

Japan Industrial Standard		Steel Types Related to Foreign Standards					
Standard Number Name	Code	ISO	AISI SAE	BS	DIN	NF	ΓOCT
JIS G 4801 Spring steel	SUP 3	–	1075 1078	–	–	–	75 85 80
	SUP 6	59Si7	–	–	–	60Si7	60C2
	SUP 7	59Si7	9260	–	–	60Si7	60C2 Γ
	SUP 9	55Cr3	5155	–	55Cr3	55Cr3	–
	SUP 9A	–	5160	–	–	60Cr3	–
	SUP10	51CrV4	6150	–	50CrV4	51CrV4	XΦA50X Γ ΦA
	SUP11A	60CrB3	51B60	735A51,735H51	–	–	50X Γ P
	SUP12	55SiCr63	9254	–	54SiCr6	54SiCr6	–
	SUP13	60CrMo33	4161	685A57, 685H57	–	60CrMo4	–
JIS G 4804 Sulfur and sulfur combined free cutting steel	SUM11	–	1110	705A60, 705H60	–	–	–
	SUM12	–	1108	–	–	–	–
	SUM21	9S20	1212	–	–	–	–
	SUM22	11SMn28	1213	–	9 SMn28	9 SMn28	–
	SUM22L	11SMnPb28	12L13	(230M07)	9 SMnPb28	9 SMnPb28	–
	SUM23	–	1215	–	–	–	–
	SUM23L	–	–	–	–	–	–
	SUM24L	11SMnPb28	12L14	–	9 SMnPb28	9 SMnPb28	–
	SUM25	12SMn35	–	–	9 SMn36	9 SMn36	–
	SUM31	–	1117	–	15S10	15S10	–
	SUM31L	–	–	–	–	–	–
	SUM32	–	–	–	–	–	–
	SUM41	–	1137	210M15,210A15	–	–	–
	SUM42	–	1141	–	–	–	–
	SUM43	44SMn8	1144	–	–	–	–
JIS G 4805 High carbon-chrome bearings steel	SUJ1	–	51100	(226M44)	–	–	–
	SUJ2	B1 or 100Cr6	52100	–	100Cr6	100Cr6	ШX15
	SUJ3	B2 or 100 CrMnsi4-4		–	–	–	–
	SUJ4	–	–	–	–	–	–
	SUJ5	–	–	–	–	–	–

(Unit: μm)

Tolerance zone for shaft

Tolerance \ zone	1 up to 3	over 3 up to 6	over 6 up to 10	over 10 up to 18	over 18 up to 30	over 30 up to 50
h3	0 −2	0 −2.5	0 −2.5	0 −3	0 −4	0 −4
h4	0 −3	0 −4	0 −4	0 −5	0 −6	0 −7
h10	0 −40	0 −48	0 −58	0 −70	0 −84	0 −100
h11	0 −60	0 −75	0 −90	0 −110	0 −130	0 −160
j6	+4 −2	+6 −2	+7 −2	+8 −3	+9 −4	+11 −5
js8	±7	±9	±11	±13.5	±16.5	±19.5
js9	±12.5	±15	±18	±21.5	±26	±31
js13	±70	±90	±110	±135	±165	±195
js14	±125	±150	±180	±215	±260	±310
k7	+10 0	+13 +1	+16 +1	+19 +1	+23 +2	+27 +2
m4	+5 +2	+8 +4	+10 +6	+12 +6	+14 +8	+16 +9

(Unit: μm)

Tolerance zone for hole

Tolerance \ zone	1 up to 3	over 3 up to 6	over 6 up to 10	over 10 up to 18	over 18 up to 30	over 30 up to 50
H5	+4 0	+5 0	+6 0	+8 0	+9 0	+11 0
H11	+60 0	+75 0	+90 0	+106 0	+130 0	+160 0
H12	+100 0	+120 0	+150 0	+180 0	+210 0	+250 0
J6	+2 −4	+5 −3	+5 −4	+6 −5	+8 −5	+10 −6
J7	+4 −6	+6 −6	+8 −7	+10 −8	+12 −9	+14 −11
J55	±2	±2.5	±3	±4	±4.5	±5.5
K8	0 −14	+5 −13	+6 −16	+8 −19	+10 −23	+12 −27
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–

Deviations of Hole to be used in commonly used fits

Basic size step (mm)		Tolerance zone class of Hole																													Unit: μm
Over	or less	B10	C9	C10	D8	D9	D10	E7	E8	E9	F6	F7	F8	G6	G7	H6	H7	H8	H9	H10	JS6	JS7	K6	K7	M6	M7	N6	N7	P6	P7	R7	S7	T7	U7	X7
-	3	+180 +140	+85 +60	+100 +60	+34 +20	+45 +20	+60 +20	+24 +14	+28 +14	+39 +14	+12 +6	+16 +6	+20 +6	+8 +2	+12 +2	+6 0	+10 0	+14 0	+25 0	+40 0	±3	±5	0 -6	0 -10	-2 -8	-2 -12	-4 -10	-4 -14	-6 -12	-6 -16	-10 -20	-14 -24	-	-18 -28	-20 -30
3	6	+188 +140	+100 +70	+118 +70	+48 +30	+60 +30	+78 +30	+32 +20	+38 +20	+50 +20	+18 +20	+22 +10	+28 +10	+12 +4	+16 +4	+8 0	+12 0	+18 0	+30 0	+48 0	±4	±6	+2 -6	+3 -9	-1 -9	0 -12	-5 -13	-4 -16	-9 -17	-8 -20	-11 -23	-15 -27	-	-19 -31	-24 -36
6	10	+208 +150	+116 +80	+138 +80	+62 +40	+76 +40	+98 +40	+40 +25	+47 +25	+61 +25	+22 +13	+28 +13	+35 +13	+14 +5	+20 +6	+9 0	+15 0	+22 0	+36 0	+58 0	±4.5	±7	+2 -7	+5 -10	-3 -12	0 -15	-7 -16	-4 -19	-12 -21	-9 -24	-13 -28	-17 -32	-	-22 -37	-28 -43
10	14	+220	+138	+165	+77	+93	+120	+50	+59	+75	+27	+34	+43	+17	+24	+11	+18	+27	+43	+70	±5.5	±9	+2	+6	-4	0	-9	-5	-15	-11	-16	-21	-	-26	-33 -51
14	18	+150	+95	+95	+50	+50	+50	+32	+32	+32	+16	+16	+16	+6	+6	0	0	0	0	0			-9	-12	-15	-18	-20	-23	-26	-29	-34	-39		-44	-38 -56
18	24	+244	+162	+194	+98	+117	+149	+61	+73	+92	+33	+41	+53	+20	+28	+13	+21	+33	+52	+84	±6.5	±10	+2	+6	-4	0	-11	-7	-18	-14	-20	-27	-	-33	-46
24	30	+160	+110	+110	+65	+65	+65	+40	+40	+40	+20	+20	+20	+7	+7	0	0	0	0	0			-11	-15	-17	-21	-24	-28	-31	-35	-41	-48	-33 -54	-40 -61	-56 -77
30	40	+270 +170	+182 +120	+220 +120	+119	+142	+180	+75	+89	+112	+41	+50	+64	+25	+34	+16	+25	+39	+62	+100	±8	±12	+3 -13	+7 -18	-4 -20	0 -25	-12 -28	-8 -33	-21 -37	-17 -42	-25 -50	-34 -59	-39 -64	-51 -76	-
40	50	+280 +180	+192 +130	+230 +130	+80	+80	+80	+50	+50	+50	+25	+25	+25	+9	+9	0	0	0	0	0													-45 -70	-61 -86	
50	65	+310 +190	+214 +140	+260 +140	+146	+174	+220	+90	+106	+134	+49	+60	+76	+29	+40	+19	+30	+46	+74	+120	±9.5	±15	+4 -15	+9 -21	-5 -24	0 -30	-14 -33	-9 -39	-26 -45	-21 -51	-30 -60	-42 -72	-55 -85	-76 -106	-
65	80	+320 +200	+224 +150	+270 +150	+100	+100	+100	+60	+60	+60	+30	+30	+30	+10	+10	0	0	0	0	0											-32 -62	-48 -78	-64 -94	-91 -121	
80	100	+360 +220	+257 +170	+310 +170	+174	+207	+260	+107	+126	+159	+58	+71	+90	+34	+47	+22	+35	+54	+87	+140	±11	±17	+4 -18	+10 -25	-6 -28	0 -35	-16 -38	-10 -45	-30 -52	-24 -59	-38 -73	-58 -93	-78 -113	-111 -146	-
100	120	+380 +240	+267 +180	+320 +180	+120	+120	+120	+72	+72	+72	+36	+36	+36	+12	+12	0	0	0	0	0											-41 -76	-66 -101	-91 -126	-131 -166	
120	140	+420 +260	+300 +200	+360 +200																											-48 -88	-77 -117	-107 -147		
140	160	+440 +280	+310 +210	+370 +210	+208 +145	+245 +145	+305 +145	+125 +85	+148 +85	+185 +85	+68 43	+83 +43	+106 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	±12.5	±20	+4 -21	+12 -28	-8 -33	0 -40	-20 -45	-12 -52	-36 -61	-28 -68	-50 -90	-85 -125	-119 -159	-	-
160	180	+470 +310	+330 +230	+390 +230																											-53 -93	-93 -133	-131 -171		
180	200	+625 +340	+355 +240	+425 +240																											-60 -106	-105 -151			
200	225	+665 +380	+375 +260	+445 +260	+242 +170	+285 +170	+355 +170	+146 +100	+172 +100	+215 +100	+79 +50	+96 +60	+122 +60	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	±14.5	±23	+5 -24	+13 -33	-8 -37	0 -46	-22 -51	-14 -60	-41 -70	-33 -79	-63 -109	-113 -159	-	-	-
225	250	+605 +420	+395 +280	+465 +280																											-67 -113	-123 -169			
250	280	+690 +480	+430 +300	+510 +300	+271	+320	+400	+162	+191	+240	+88	+108	+137	+49	+69	+32	+52	+81	+130	+210	±16	±26	+5 -27	+16 -36	-9 -41	0 -52	-25 -57	-14 -66	-47 -79	-36 -88	-74 -126	-	-	-	-
280	315	+750 +540	+460 +330	+540 +330	+190	+190	+190	+110	110	+110	+56	+66	+66	+17	+17	0	0	0	0	0											-78 -130				
315	355	+830 +600	+500 +360	+590 +360	+299	+350	+440	+182	+214	+265	+98	+119	+151	+54	+75	+36	+57	+89	+140	+230	±18	±28	+7 -29	+17 -40	-10 -46	0 -57	-26 -62	-16 -73	-51 -87	-41 -98	-87 -144	-	-	-	-
355	400	+910 +680	+540 +400	+630 +400	+210	+210	+210	+125	+125	+125	+62	+62	+62	+18	+18	0	0	0	0	0											-93 -150				
400	450	+1010 +760	+595 +440	+690 +440	+327	+385	+480	+198	+232	+290	+108	+131	+165	+60	+83	+40	+63	+97	+155	+250	±20	±31	+8 -32	+18 -45	-10 -50	0 -63	-27 -67	-17 -80	-65 -95	-45 -108	-103 -166	-	-	-	-
450	500	+1090 +840	+635 +480	+730 +480	+230	+230	+230	+135	+135	+135	+68	+68	+68	+20	+20	0	0	0	0	0											-109 -172				

Note :This table shows that the upper figures are the upper deviation and the lower figures are the lower deviation.

Deviations of shafts to be used in commonly used fits

Unit: μm

Basic size step (mm)		Tolerance zone class of shaft																												
Over	or less	b9	c9	d8	d9	e7	e8	e9	f6	f7	f8	g5	g6	h5	h6	h7	h8	h9	js5	js6	js7	k5	k6	m5	m6	n5*	n6	p6	r6	s6	t6	u6	x6
-	3	-140 -165	-60 -85	-20 -34	-20 -45	-14 -24	-14 -28	-14 -39	-6 -12	-6 -16	-6 -20	-2 -6	-2 -8	0 -4	0 -6	0 -10	0 -14	0 -25	±2	±3	±5	+4 0	+6 0	+6 +2	+8 +2	+8 +4	+10 +4	+12 +6	+16 +10	+20 +14	-	+24 +18	+26 +20
3	6	-140 -170	-70 -100	-30 -48	-30 -60	-20 -32	-20 -38	-20 -60	-10 -18	-10 -22	-10 -28	-6 -4	-4 -12	0 -6	0 -8	0 -12	0 -18	0 -30	±25	±4	±6	+6 +1	+9 +1	+9 +4	+12 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +19	-	+31 +23	+36 +28
6	10	-150 -186	-80 -116	-40 -62	-40 -76	-25 -40	-25 -47	-25 -61	-13 -22	-13 -28	-13 -35	-5 -11	-5 -14	0 -6	0 -9	0 -15	0 -22	0 -36	±3	±4.5	±7	+7 +1	+10 +1	+12 +6	+15 +6	+16 +10	+19 +10	+24 +15	+28 +19	+32 +23	-	+37 +28	+43 +34
10	14	-150	-95	-50	-50	-32	-32	-32	-16	-16	-16	-6	-6	0	0	0	0	0	±4	±5.5	±9	+9	+12	+15	+18	+20	+23	+29	+34	+39		+44	+51 +40
14	18	-193	-138	-77	-93	-60	-89	-75	-27	-34	-43	-14	-17	-8	-11	-18	-27	-43				+1	+1	+7	+7	+12	+12	+18	+23	+28	-	+33	+56 +45
18	24	-160	-110	-65	-65	-40	-40	-40	-20	-20	-20	-7	-7	0	0	0	0	0	±4.5	±6.5	±10	+11	+15	+17	+21	+24	+28	+35	+41	+48	-	+54 +41	+67 +54
24	30	-212	-162	-98	-117	-61	-73	-92	-33	-41	-53	-16	-20	-9	-13	-21	-33	-52				+2	+2	+8	+8	+15	+15	+22	+28	+35	+54 +41	+61 +48	+77 +64
30	40	-170 -232	-120 -182	-80	-80	-50	-50	-50	-25	-25	-25	-9	-9	0	0	0	0	0	±5.5	±8	±12	+13	+18	+20	+25	+28	+33	+42	+60	+59	+64 +48	+76 +60	-
40	50	-180 -242	-130 -192	-119	-142	-75	-89	-112	-41	-50	-64	-20	-25	-11	-16	-25	-39	-62				+2	+2	+9	+9	+17	+17	+26	+34	+43	+70 +54	+86 +70	
50	65	-190 -264	-140 -214	-100	-100	-60	-60	-60	-30	-30	-30	-10	-10	0	0	0	0	0	±6.5	±9.5	±15	+15	+21	+24	+30	+33	+39	+51	+60 +41	+72 +53	+85 +66	+106 +87	-
65	80	-200 -274	-150 -224	-146	-174	-90	-106	-134	-49	-60	-76	-23	-29	-13	-19	-30	-46	-74	±6.5		±15	+2	+2	+11	+11	+20	+20	+32	+62 +43	+78 +59	+94 +75	+121 +102	
80	100	-220 -307	-170 -257	-120	-120	-72	-72	-72	-36	-36	-36	-12	-12	0	0	0	0	0	±7.5	±11	±17	+18	+25	+28	+35	+38	+45	+59	+73 +51	+93 +71	+113 +91	+146 +124	-
100	120	-240 -327	-180 -267	-174	-207	-107	-126	-159	-58	-71	-90	-27	-34	-15	-22	-35	-54	-87				+3	+3	+13	+13	+23	+23	+37	+76 +54	+101 +79	+126 +104	+166 +144	
120	140	-260 -360	-200 -300																										+88 +63	+117 +92	+147 +122		
140	160	-280 -380	-210 -310	-145 -208	-145 -245	-85 -125	-85 -148	-85 -185	-43 -68	-43 -83	-43 -106	-14 -32	-14 -39	0 -18	0 -25	0 -40	0 -63	0 -100	±9	±12.5	±20	+21 +3	+28 +3	+33 +15	+40 +15	-	+52 +27	+68 +43	+90 +65	+125 +100	+159 +134	-	-
160	180	-310 -410	-230 -330																										+93 +68	+133 +108	+171 +146		
180	200	-340 -455	-240 -355																										+106 +77	+151 +122			
200	225	-380 -495	-260 -375	-170 -242	-170 -285	-100 -146	-100 -172	-100 -215	-50 -79	-50 -96	-50 -122	-15 -35	-15 -44	0 -20	0 -29	0 -46	0 -72	0 -115	±10	±14.5	±23	+24 +4	+33 +4	+37 +17	+46 +17	-	+60 +31	+79 +50	+109 +80	+159 +130	-	-	-
225	250	-420 -535	-280 -395																										+113 +84	+169 +140			
250	280	-480 -610	-300 -430	-190	-190	-110	-110	-110	-56	-56	-56	-17	-17	0	0	0	0	0	±11.5	±16	±26	+27	+36	+43	+52	-	+66	+88	+126 +94	-	-	-	-
280	315	-540 -670	-330 -460	-271	-320	-162	-191	-240	-88	-108	-137	-40	-49	-23	-32	-52	-81	-130				+4	+4	+20	+20		+34	+56	+130 +98				
315	355	-600 -740	-360 -500	-210	-210	-125	-125	-125	-62	-62	-62	-18	-18	0	0	0	0	0	±12.5	±18	±28	+29	+40	+46	+57	-	+73	+98	+144 +108	-	-	-	-
355	400	-680 -820	-400 -540	-299	-350	-182	-214	-265	-98	-119	-151	-43	-54	-25	-36	-57	-89	-140				+4	+4	+21	+21		+37	+62	+150 +114				
400	450	-760 -915	-440 -595	-230	-230	-135	-135	-135	-68	-68	-68	-20	-20	0	0	0	0	0	±13.5	±20	±31	+32	+45	+50	+63	-	+80	+108	+166 +126	-	-	-	-
450	500	-840 -995	-480 -635	-327	-385	-198	-232	-290	-108	-131	-165	-47	-60	-27	-40	-63	-97	-155				+5	+5	+23	+23		+40	+68	+172 +132				

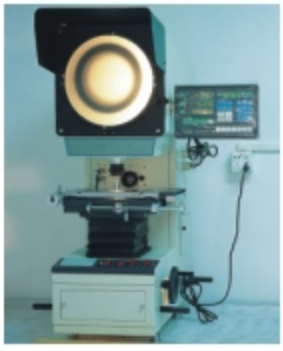
Note : This table shows that the upper figures are the upper deviation and the lower figures are the lower deviation.

PRODUCTION MACHINERY EQUIPMENT & QC MEASURING EQUIPMENT

MACHINERY EQUIPMENT			MEASURING EQUIPMENT		
List of equipment	Q'ty	Origin	List of Machine	Q'ty	Origin
CNC Lathe	10	Taiwan	3D Check Master Coordinate Measuring Machine	1	Taiwan
CNC Lathe	1	Taiwan	2D Trimos Coordinate Measuring Machine	1	Germany
CNC Milling Machine	5	Japan	Rockwell hardness tester	1	Taiwan
CNC Internal Grinder Double axle	3	Taiwan	Vickers hardness tester	1	Japan
CNC Surface Grinder	1	Taiwan	Trimos length tester	1	Germany
CNC External Grinder	4	Japan	Surface rougluess tester	1	Swiss
Internal Honing Machine	2	USA	SUNNEN Internal micrometer	1	USA
Cutting Machine	2	Taiwan	Profile projector	1	Japan



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