

Metal Washers / Collars

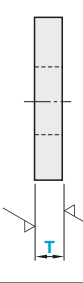
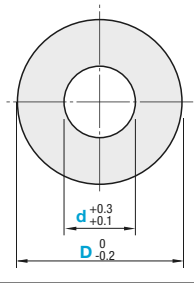
	Shape	Size	Ordering Code	Accuracy	Material		Surface Treatment	Catalog Page
					(Raw Material)	(Hardened Products)		
Washer	Standard	O.D. D 4~60 I.D. V 2~30 Thickness T 1~10	Selectable	Standard Grade Precision Grade	EN 1.1191 Equiv. Standard Grade EN 1.1191 Equiv. EN 1.4301 Equiv. Standard Grade EN 1.4301 Equiv.	EN 1.1191 Equiv. Standard Grade EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.4301 Equiv.	None Black Oxide Electroless Nickel Plating	P.113 P.114 P.119
		O.D. D 4~30 I.D. V 2~25 Thickness T 1~10	Configurable	Standard Grade Precision Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.113 P.114
		O.D. D 4~100 I.D. V 0~90 Thickness T 1~10	Dimension Configurable	Standard Grade Precision Grade Tolerance Selection	EN 1.0038 Equiv. EN 1.1191 Equiv. EN 1.4301 Equiv. EN AW-2017 Equiv. EN AW-2017 Equiv. EN AW-2017 Equiv.	EN 1.1191 Equiv. EN 1.2510 Equiv. EN 1.4301 Equiv. EN 1.4301 Equiv. EN 1.4301 Equiv. EN 1.4301 Equiv.	None Black Oxide Electroless Nickel Plating LTC Plating Anodize (Clear, Black)	P.115 P.120
	Flanged	D Dim. 5~60 H Dim. 7~70 V Dim. 2~58 L Dim. 2~10	Dimension Configurable	Standard Grade Precision Grade	EN 1.0038 Equiv. EN 1.1191 Equiv. EN 1.4301 Equiv.	EN 1.4301 Equiv. EN 1.2510 Equiv.	None Black Oxide Electroless Nickel Plating	P.122
		O.D. D 10~60 I.D. P 3.5~11 Thickness T 6~20	Selectable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.4301 Equiv. EN 1.4301 Equiv.	None Black Oxide Electroless Nickel Plating	P.123
	Counterbored	O.D. D 10~30 I.D. P 3.5~9 Thickness T 3~20	Configurable	Standard Grade Precision Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.123
		O.D. D 10~100 I.D. P 3~88 Thickness T 3~50	Dimension Configurable	Standard Grade Precision Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.0038 Equiv. EN AW-2017 Equiv.	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.2510 Equiv.	None Black Oxide Electroless Nickel Plating Clear Anodize	P.124
		O.D. D 10~60 M Dia. 2~20 Thickness T 3~20	Selectable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.125
	Tapped	O.D. D 6~30 M Dia. 2~12 Thickness T 3~20	Configurable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.125
		Thickness T 3~50	Dimension Configurable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN AW-2017 Equiv.	-	None Black Oxide Electroless Nickel Plating Clear Anodize	P.125
Collar	Countersunk	O.D. D 14~30 Applicable Countersunk M Dia. 4~10 Thickness T 2.5~3	Selectable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.126
		O.D. D 10~60 Applicable Countersunk M Dia. 2~30 Thickness T 2~10	Dimension Configurable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN AW-2017 Equiv.	-	None Black Oxide Electroless Nickel Plating Clear Anodize	P.126
	With Screw Holes	O.D. D 20~40 Applicable Countersunk M Dia. 3~28 Thickness T 1~10	Dimension Configurable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN AW-2017 Equiv.	-	None Black Oxide Electroless Nickel Plating Clear Anodize	P.126
		O.D. D 10~50 I.D. V 3~30 Thickness T 3~10	Dimension Configurable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.127
	Standard	I.D. V 3~25 O.D. D 5~30 Thickness L 10~35	Selectable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv.	-	None Black Oxide Electroless Nickel Plating	P.131
		O.D. D 4~60 I.D. V 2~30 Thickness L 10~100	Configurable	Standard Grade Precision Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN AW-2017 Equiv.	-	None Black Oxide Electroless Nickel Plating Clear Anodize	P.132 P.137
		I.D. V 2~90 O.D. D 4~100 Thickness L 10~100	Dimension Configurable	Standard Grade Precision Grade Tolerance Selection	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.0038 Equiv. EN AW-2017 Equiv. EN AW-2017 Equiv. EN AW-2017 Equiv.	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.2510 Equiv.	None Black Oxide Electroless Nickel Plating LTC Plating Anodize (Clear, Black)	P.133
	Flanged	I.D. V 2~30 O.D. D 5~60 Length L 10~100	Selectable	Standard Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN AW-2017 Equiv.	-	None Black Oxide Electroless Nickel Plating Clear Anodize	P.139
		V Dim. 2~55 D Dim. 4~60 H Dim. 6~70 T Dim. 1~20 L Dim. 10~100	Dimension Configurable	Standard Grade Precision Grade	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.0038 Equiv. EN AW-2017 Equiv. EN AW-2017 Equiv. EN AW-2017 Equiv.	EN 1.1191 Equiv. EN 1.4301 Equiv. EN 1.2510 Equiv.	None Black Oxide Electroless Nickel Plating Anodize (Clear, Black)	P.140
	Thin-Walled Metal Collar	O.D. D 2~7 I.D. V 1~5 Length L 3~20	Selectable	Standard Grade	EN 1.4301 Equiv.	-	None	P.128
	Hollow Collar	O.D. D 10.5~48.6 I.D. d 5.7~41.6 Length L 6~200	-	Standard Grade	EN 1.0035 Equiv. EN 1.0254 Equiv. (Sch40/80)	-	None Black Oxide	P.128

Metal Washers Washers (Bulk Packages)

Have larger O.D. and are thicker compared to standard washers. As these washers are press finished, they are cheaper than the washers made by cutting.



Type	Material	Surface Treatment
PACK-PWTB	EN 1.0330	Black Oxide
PACK-PWTM	Equiv.	Electroless Nickel Plating



T Dimension	Tolerance
1	±0.08
2	±0.13
3	±0.15

Part Number		D	T	Unit Price								Pieces in 1 pack
Type	d			PACK-PWTB				PACK-PWTM				
				1~4		5~10		1~4		5~10		
				Price per 1 pc.	1 Pack	Price per 1 pc.	1 Pack	Price per 1 pc.	1 Pack	Price per 1 pc.	1 Pack	
PACK-PWTB PACK-PWTM	3	10	1 2									100 pcs.
	4	10 12	2 3									100 pcs.
	5	12	2 3									100 pcs.
		15	2 3									100 pcs.
	6	20	3									50 pcs.
	8	20	3									50 pcs.
	10	20	3									50 pcs.

Sold by the package only

 Ordering Example

Part Number - D - T
PACK-PWTB3 - 10 - 1

 Example

Use when screw holes are large.

O.D. is larger as compared to standard washers, and grapping area is larger and hence can be fixed firmly.

Using Standard Washers

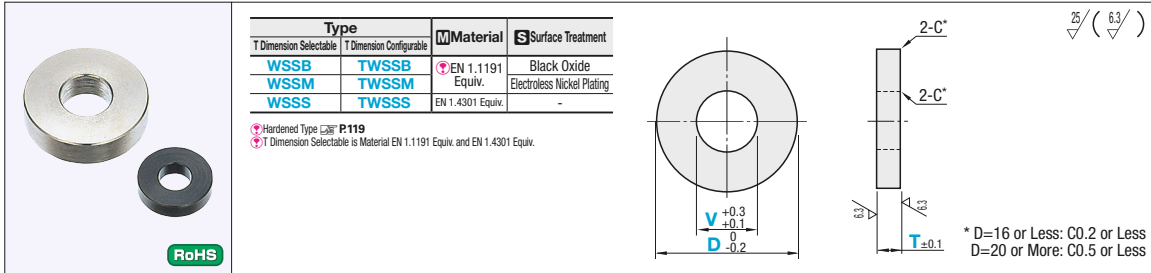


Using Metal Washers



Metal Washer

Standard Grade, T Dimension Selectable / Configurable



T Dimension Selectable (Standard Grade)

Part Number	Type	D	V Selection	T Selection	Unit Price		
					WSSB	WSSM	WSSS
WSSB WSSM WSSS	4	2		1 2			
				1.5 2.5			
	5	2 3		1 2			
		3		1.5 2.5 3			
	6	2 3 4		1 2			
		3 4		1.5 2.5 3 4 5 6			
	8	2 3 4 5 6		1 2 3 5			
		3 4 5 6		1.5 2.5 4 6 8			
	10	2 3 4 5 6 8		1 2 3 5			
		3 4 5 6 8		1.5 2.5 4 6 8			
	12	3 4 5 6 8 10		1 2 3 5			
		4 5 6 8 10		1.5 2.5 4 6 8			
	13	4 5 6 8 10		1 2 3 5			
		5 6 8 10		1.5 2.5			
	14	6 8 10		4 6 8			
		4 5 6 8 10		1 2 3 5			
	15	5 6 8 10		1.5 2.5			
		6 8 10		4 6 8			
	16	4 5 6 8 10 12		1 2 3 5			
		5 6 8 10 12		1.5 2.5 4 6 8			
	20	6 8 10 12		1 2 3 5			
		4 5 6 8 10 12 15 16		1.5 2.5 4 6 8			
	25	6 8 10 12 15		2 3 5			
		6 8 10 12 15 16 20		1 4 6 8			
	30	8 10 12 15 16 20 25		2 3 5			
				1 4 6 8			
	35	10 12 15 16 20 25		3 5 10			
	40	10 12 15 16 20 25 30		3 5 10			
	50	10 12 15 16 20 25 30		3 5 10			
	60	15 16 20 25 30		3 5 10			

Ordering Example: Part Number - V - T
WSSS14 - 10 - 5

T Dimension Configurable (Standard Grade)

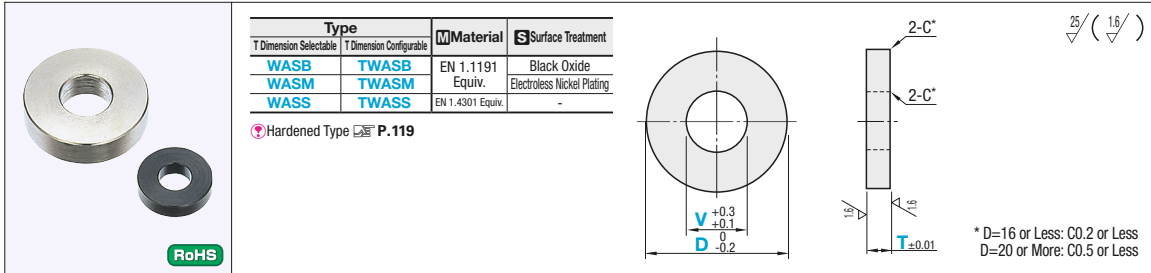
Part Number	Type	D	V Selection	T 0.5mm Increment
4		2		
5		2 3		
6		2 3 4		
8		2 3 4 5 6		
10		2 3 4 5 6 8		
12		3 4 5 6 8 10		
13		4 5 6 8 10		
14		4 5 6 8 10		
15		4 5 6 8 10 12		
16		4 5 6 8 10 12		
20		4 5 6 8 10 12 15 16		
25		6 8 10 12 15 16 20		
30		8 10 12 15 16 20 25		

Ordering Example: Part Number - V - T
TWSSB30 - 8 - 5.5

D	T	Unit Price		
		TWSSB	TWSSM	TWSSS
4~10	1.0~ 2.0			
	2.5~ 5.0			
	5.5~10.0			
12~20	1.0~ 2.0			
	2.5~ 5.0			
	5.5~10.0			
25, 30	1.0~ 2.0			
	2.5~ 5.0			
	5.5~10.0			

Metal Washer

Precision Grade, T Dimension Selectable / Configurable



T Dimension Selectable (Precision Grade)

Part Number	Type	D	V Selection	T Selection	Unit Price		
					WASB	WASM	WASS
WASB WASM WASS	4	2		1 2			
	5	2 3		1 2			
	6	2 3 4		1 2			
		3 4		1.5			
	8	2 3 4 5 6		1 2 3 5			
		3 4 5 6		1.5			
	10	2 3 4 5 6 8		1 2 3 5			
		4 5 6 8		1.5 2.5			
	12	3 4 5 6 8 10		1 2 3 5			
		5 6 8 10		1.5 2.5			
	13	4 5 6 8 10		1 2 3 5			
		6 8		1.5 2.5			
	14	4 5 6 8 10		1 2 3 5			
		6 8 10		1.5			
	15	4 5 6 8 10 12		1 2 3 5			
		6 8 10 12		1.5			
	16	4 5 6 8 10 12		1 2 3 5			
		6 8 10 12		1.5			
	20	4 5 6 8 10 12 15 16		2 3 5			
		6 10 15		1.5 2.5			
	25	6 8 10 12 15 16 20		2 3 5			
	30	8 10 12 15 16 20 25		2 3 5			
	35	10 12 15 16 20 25		3 5 10			
	40	10 12 15 16 20 25 30		3 5 10			
	50	10 12 15 16 20 25 30		3 5 10			
	60	15 16 20 25 30		3 5 10			

Ordering Example: Part Number - V - T
WASB14 - 10 - 5

T Dimension Configurable (Precision Grade)

Part Number	Type	D	V Selection	T 0.5mm Increment
4		2		
5		2 3		
6		2 3 4		
8		2 3 4 5 6		
10		2 3 4 5 6 8		
12		3 4 5 6 8 10		
13		4 5 6 8 10		
14		4 5 6 8 10		
15		4 5 6 8 10 12		
16		4 5 6 8 10 12		
20		4 5 6 8 10 12 15 16		
25		6 8 10 12 15 16 20		
30		8 10 12 15 16 20 25		

Ordering Example: Part Number - V - T
TWASB30 - 8 - 5.5

D	T	Unit Price		
		TWASB	TWASM	TWASS
4~10	1.0~ 2.0			
	2.5~ 5.0			
	5.5~10.0			
12~20	1.0~ 2.0			
	2.5~ 5.0			
	5.5~10.0			
25, 30	1.0~ 2.0			
	2.5~ 5.0			
	5.5~10.0			

Metal Washer

Standard / Precision Grade, Dimension Configurable

Part Number	Standard Grade	Precision Grade	Material	Surface Treatment	
FW	FW	FW	EN 1.0038 Equiv.	-	
FWSSC	FWASC	FWASC		-	
FWSSB	FWASB	FWASB	EN 1.1191 Equiv.	Black Oxide	
FWSSM	FWASM	FWASM		Electroless Nickel Plating	
FWSSR	FWASR	FWASR		LTBC Plating	
FWSSA	FWASA	FWASA	Aluminum Alloy 2000 series	Clear Anodize	
FWSSAB	-	-		Black Anodize	
FWSSBB	-	-	Brass (JIS EN CW614N Equiv.)	-	
FWSSS	FWASS	FWASS	EN 1.4301 Equiv.	-	
FWSSSR	FWASSR	FWASSR		LTBC Plating	
FWSSUS	FWASU	FWASU	EN 1.4401 Equiv.	-	

⚙ Hardened Type P120

RoHS

25 / (6.3 / 1.6)

* D=16 or Less: C0.2 or Less
D=16.5 or More: C0.5 or Less

Standard Grade Precision Grade

2-C* 2-C* 2-C*

V +0.3
0
D -0.2

T ±0.1

T ±0.01

Standard Grade

Part Number	D	V 0.5mm Increment (V3 or More)	T 0.1mm Increment	Unit Price										
				FWS	FWSSC	FWSSB	FWSSM	FWSSR	FWSSA	FWSSAB	FWSBB	FWSSS	FWSSSR	FWSUS
FWS FWSSC FWSSB FWSSM FWSSR FWSSA FWSSAB FWSBB FWSSS FWSSSR FWSUS	4.0~10.0 0.5mm Increment	0 (No Hole Machining) (Selection) 2.0 2.6 (0.5mm Increment) 3.0 90.0	1.0~ 2.0											
			2.1~ 5.0											
			5.1~ 10.0											
	10.5~20.0 0.5mm Increment		1.0~ 2.0											
			2.1~ 5.0											
			5.1~ 10.0											
	21~30 1mm Increment		1.0~ 2.0											
			2.1~ 5.0											
			5.1~ 10.0											
	31~40 1mm Increment		1.0~ 2.0											-
			2.1~ 5.0											-
			5.1~ 10.0											-
41~50 1mm Increment	1.0~ 2.0											-		
	2.1~ 5.0											-		
	5.1~ 10.0											-		
51~60 1mm Increment	1.0~ 2.0											-		
	2.1~ 5.0											-		
	5.1~ 10.0											-		
61~80 1mm Increment	5.0~ 10.0												-	
81~100 1mm Increment	5.0~ 10.0												-	

Material: EN AW-2017 Equiv., EN 1.4401 Equiv., Brass→
T≥2
No specification available for sizes without declaration of value.

D / V Machining Conditions
D≤60→ V≤D-2
D≥61→ V≤D-4

D / V Machining Conditions of Material EN AW-2017 Equiv.
4≤D≤ 10 → V≤D- 2
10.5≤D≤ 30 → V≤D- 4
31≤D≤ 60 → V≤D- 6
61≤D≤ 80 → V≤D- 8
81≤D≤100 → V≤D-10

Ordering Example Part Number - D - V - T
FWSSC - D71 - V50.0 - T10.0

Precision Grade

Part Number	D	V 0.5mm Increment (V3 or More)	T 0.1mm Increment	Unit Price								
				FWAS	FWASC	FWASB	FWASM	FWASR	FWASA	FWASS	FWASSR	FWASU
FWAS FWASC FWASB FWASM FWASR FWASA FWASS FWASSR FWASU	4.0~10.0 0.5mm Increment	0 (No Hole Machining) (Selection) 2.0 2.6 (0.5mm Increment) 3.0 90.0	1.0~ 2.0									
			2.1~ 5.0									
			5.1~ 10.0									
	10.5~20.0 0.5mm Increment		1.0~ 2.0									
			2.1~ 5.0									
			5.1~ 10.0									
	21~30 1mm Increment		1.0~ 2.0									
			2.1~ 5.0									
			5.1~ 10.0									
	31~40 1mm Increment		1.0~ 2.0									-
			2.1~ 5.0									-
			5.1~ 10.0									-
41~50 1mm Increment	1.0~ 2.0									-		
	2.1~ 5.0									-		
	5.1~ 10.0									-		
51~60 1mm Increment	1.0~ 2.0									-		
	2.1~ 5.0									-		
	5.1~ 10.0									-		
61~80 1mm Increment	5.0~ 10.0							-	-	-	-	
81~100 1mm Increment	5.0~ 10.0							-	-	-	-	
⚙ Material: EN AW-2017 Equiv., EN 1.4401 Equiv.→ T≥2 ⚙ No specification available for sizes without declaration of value.				⚙ D / V Machining Conditions D≤60→ V≤D-2 D≥61→ V≤D-4			⚙ D / V Machining Conditions of Material EN AW-2017 Equiv. 4≤D≤ 10 → V≤D- 2 61≤D≤ 80 → V≤D- 8 10.5≤D≤ 30 → V≤D- 4 81≤D≤100 → V≤D-10 31≤D≤ 60 → V≤D- 6					

Ordering Example Part Number - D - V - T
FWASB - D15.5 - V5.5 - T2.6

Alterations Order Example Part Number - D - V - T - (KC, SC, WSC, VKC, DKC, HKC)
FWASS - D20 - V10 - T5 - VKC

⚙ When both I.D. / O.D. tolerance changes are specified, the concentricity is 0.02.

Alterations	Code	Spec.
Keyway Relief	KC	Adds an keyway relief. Ordering Code KC Machining Conditions ⚙ V≥8 ⚙ Not available for D61 ~ 100.
One Flat	SC	Adds a flat. Ordering Code SC10 SC=1mm Increment SC≥V/2+2 ⚙ Not available for D4 ~ 8.
Two Flats	WSC	Adds two flats. Ordering Code WSC10 WSC=1mm Increment WSC≥V+4 ⚙ Not available for D4 ~ 8.

Alterations	Code	Spec.
I.D. Tolerance	VKC	Changes the I.D. Tolerance to H7. Ordering Code VKC Machining Conditions ⚙ D≥6 V≥3 ⚙ Not applicable for FWSSAB.
O.D. Tolerance	DKC (g6) HKC (h7)	Changes the O.D. Tolerance to g6 or h7. Ordering Code DKC, HKC Machining Conditions ⚙ When D≥43, T≥1.5. ⚙ D≥6 ⚙ Not applicable for FWSSAB.

Standard / Precision Grade I.D. / O.D. Tolerance Selectable / Dimension Configurable



RoHS

Part Number		M Material	S Surface Treatment
Standard Grade	Precision Grade		
SWSC	SWMC	EN 1.1191 Equiv.	-
SWSB	SWMB		Black Oxide
SWSM			Electroless Nickel Plating
SWSS	SWMS		
		EN 1.4301 Equiv.	-

D	TD Tolerance Selection			
	G	H	N	X
	g6	h7	-	-
5.0-8.5	-	-	-0.1 -0.3	0 -0.2
9.0-10.0	-0.005	0		
	-0.014	-0.015		
10.5-18.0	-0.006	0		
	-0.017	-0.018		
18.5-30	-0.007	0		
	-0.020	-0.021		
31-50	-0.009	0		
	-0.025	-0.025		
51-60	-0.010	0		
	-0.029	-0.030		

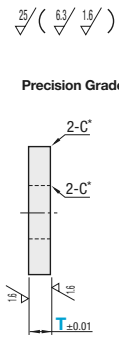
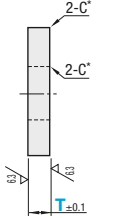
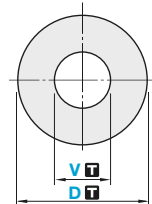
V	V Tolerance Selection		
	H	N	X
	H7	-	-
3.0	+0.010 0	+0.3 +0.1	+0.2 0
3.5-6.0	+0.012 0		
6.5-10.0	+0.015 0		
10.5-18.0	+0.018 0		
18.5-30.0	+0.021 0		
30.5-50.0	+0.025 0		
50.5-58.0	+0.030 0		

*D=16 or Less: C0.2 or Less
D=16.5 or More: C0.5 or Less

I.D./O.D. Tolerance Price Number List		
D (O.D.)	V (I.D.)	Price No.
G	H	②
	N	①
	X	①
H	H	②
	N	①
	X	①
N	H	①
	N	③
	X	③
X	H	①
	N	③
	X	③

• Guide to Price List
<Ex.> When ordering Material EN 1.1191
Equiv., O.D. g6, I.D. H7 and L Tolerance When
ordering Material EN 1.1191 Equiv., O.D. g6,
I.D. H7 and L Tolerance ± 0.01
Product Number:
SWMC-GH-D10.0-V4.0-T1.0

1. Check the I.D. / O.D. Tolerance Price Number List. (GH is Price Number ②)
2. In the price list of precision grade, find the column of I.D. / O.D. tolerance price ② shown in the price list of precision grade.

**Standard Grade**[illegible]

 T≥3 for SWSS
 No specification available for sizes without declaration of value.

 D≥9 is applicable when G or H is selected as the tolerance values of D and V. The dimension ranges of V and T are shown in the table below.

D	V	T
9~30	$D-V \geq 6$	1~10
31~60	$D-V \geq 12$	2~10



Ordering Example

Part Number - Tolerance Selection - **D** - **V** - **T**

SWSC - G H - D10.0 - V4.0 - T1.0

■ Precision Grade

[illegible]

! $T \geq 3$ for SWMS

⚠ No specification available for sizes without declaration of value.

⚠ D_{≥9} is applicable when G or H is selected as the tolerance values of D and V. The dimension ranges of e. V and T are shown in the table below.

D	V	T
9~30	$D-V \geq 6$	1~10
31~60	$D-V \geq 12$	2~10



Ordering Example

Part Number - D - V - T

D	V
---	---

SWMC - G H - D10.0 - V4.0 - T1.0

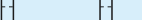


Alterations

 Part Number - **Tolerance Selection** - **D** - **V** - **T** - (TSB, TSC, TSD, TSE)

D V

SWMC - G H - D10.0 - V4.0 - T1.0 - TSB

Standard Grade Tolerance	Alterations	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
	Code	TCB	TCC	TCD	TCE
	 Applicable to Standard Grade.	Changes thickness tolerance (T). T -0.1 T -0.3 <u>Ordering Code</u> TCB	Changes thickness tolerance (T). T +0.3 T +0.1 <u>Ordering Code</u> TCC	Changes thickness tolerance (T). 0 T -0.2 <u>Ordering Code</u> TCD	Changes thickness tolerance (T). T +0.2 0 <u>Ordering Code</u> TCE

Alterations	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
	Code	TSB	TSC	TSD
</				

Metal Washer

Hardened Type, Standard Grade / Precision Grade, T Dimension Selectable



RoHS

Part Number		Material	Surface Treatment	Hardness
Standard Grade	Precision Grade			
WSSBH	WASBH	EN 1.1191 Equiv.	Black Oxide	45~50HRC
WSSMH	WASMH		Electroless Nickel Plating	
WSSSH	WASSH	EN 1.4031 Equiv.	-	

Standard Grade is EN 1.1191 Equiv.
Depending on thickness and length, EN 1.1191 Equiv. Hardened Type may be less than 45HRC.
Stainless Steel Hardened Type (WSSSH, WASSH) may be discolored by hardening.

* D=16 or Less: C0.2 or Less
D=20 or More: C0.5 or Less

25 / (6.3 / 1.6)

Standard Grade
2-C*
2-C*
6.3 / 3
T ±0.1
V +0.3
0
D -0.2

Precision Grade
2-C*
2-C*
1.6 / 0.8
T ±0.01
V +0.3
0
D -0.2

Part Number		V Selection				T Selection		Unit Price							
Type	D							Standard Grade			Precision Grade				
								WSSBH	WSSMH	WSSSH	WASBH	WASMH	WASSH		
Standard Grade WSSBH WSSMH WSSSH	4	2					1	2							
	5	2	3				1	2							
	6	2	3	4			1	2							
	8	2	3	4	5	6		1	2	3	5				
	10	2	3	4	5	6	8		1	2	3	5			
	12		3	4	5	6	8	10		1	2	3	5		
	13			4	5	6	8	10		1	2	3	5		
	14			4	5	6	8	10		1	2	3	5		
Precision Grade WASBH WASMH WASSH	15		4	5	6	8	10	12		1	2	3	5		
	16		4	5	6	8	10	12		1	2	3	5		
	20		4	5	6	8	10	12	15	16		2	3	5	
	25			6	8	10	12	15	16	20		2	3	5	
	30				8	10	12	15	16	20	25		2	3	5
	35					10	12	15	16	20	25		3	5	10
	40						10	12	15	16	20	25	30		
	50							10	12	15	16	20	25	30	
60								15	16	20	25	30			



Ordering Example

Part Number

-

V

-

T

WASBH14

-

10

-

5

Metal Washer

Hardened Type, Standard Grade / Precision Grade, Dimension Configurable



RoHS

Part Number		Material	Surface Treatment	Hardness
Standard Grade	Precision Grade			
FWSSCH	FWASCH	EN 1.1191 Equiv.	Black Oxide	45~50HRC
FWSSBH	FWASBH		Electroless Nickel Plating	
FWSSMH	FWASMH	EN 1.2510 Equiv.	Black Oxide	55HRC~
FWSSK	FWASK		Electroless Nickel Plating	
FWSSKB	FWASKB	EN 1.4031 Equiv.	-	45~50HRC
FWSSKM	FWASKM		LTBC Plating	
FWSSSH	FWASSH			
FWSSSHR				

Depending on thickness and length, EN 1.1191 Equiv. Hardened Type may be less than 45HRC.
Stainless Steel Hardened Type (FWSSSH, FWASSH) may be discolored by hardening.

* D=16 or Less: C0.2 or Less
D=20 or More: C0.5 or Less

25 / (6.3 / 1.6)

Standard Grade
2-C*
2-C*
6.3 / 3
T ±0.1
V +0.3
0
D -0.2

Precision Grade
2-C*
2-C*
1.6 / 0.8
T ±0.01
V +0.3
0
D -0.2

Part Number	D	V 0.5mm Increment (V3 or More)	T 0.1mm Increment	Unit Price														
				Standard Grade					Precision Grade									
				FWSSCH	FWSSBH FWSSMH	FWSSK	FWSSKB FWSSKM	FWSSSH	FWSSSHR	FWASCH	FWASBH FWASMH	FWASK	FWASKB FWASKM	FWASSH				
Standard Grade FWSSCH FWSSBH FWSSMH FWSSK FWSSKB FWSSKM FWSSSH FWSSSHR	4.0~10.0 0.5mm Increment	0 (No Hole Machining) (Selection) 2.0 2.6	1.0~ 2.0 2.1~ 5.0 5.1~10.0															
	10.5~20.0 0.5mm Increment		1.0~ 2.0 2.1~ 5.0 5.1~10.0															
	21~30 1mm Increment		1.0~ 2.0 2.1~ 5.0 5.1~10.0															
	31~40 1mm Increment		1.0~ 2.0 2.1~ 5.0 5.1~10.0															
	41~50 1mm Increment		1.0~ 2.0 2.1~ 5.0 5.1~10.0															
Precision Grade FWASCH FWASBH FWASMH FWASK FWASKB FWASKM FWASSH	51~60 1mm Increment	(0.5mm Increment) 3.0 90.0	1.0~ 2.0 2.1~ 5.0 5.1~10.0															
	61~80 1mm Increment		1.0~ 2.0 2.1~ 5.0 5.1~10.0															
	81~100 1mm Increment		5.0~10.0									-	-	-				
D / V Machining Conditions				D / V Machining Conditions of Material EN 1.2510 Equiv.										No specification available for sizes without declaration of value.				
D≤60→V≤D-2 D≥61→V≤D-4				4≤D≤10→V≤D-2 10.5≤D≤30→V≤D-4 31≤D≤60→V≤D-6														
				61≤D≤80→V≤D-8 81≤D≤100→V≤D-10														



Ordering Example

Part Number

-

D

-

V

-

T

FWSSKB

-

D71

-

V50.0

-

T10.0



Alterations

Part Number

-

D

-

V

-

T

FWSSBH

-

D20

-

V10

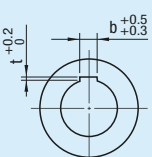
-

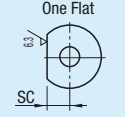
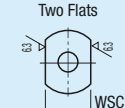
T5

-

KC

(KC, SC, WSC)

Alterations	Code	Spec.																																				
Keyway Relief	KC	Adds an keyway relief.																																				
		Ordering Code KC Machining Conditions ⚙️ V≥8 ⊗ Not available for D61 ~ 100.																																				
		<table><tr><th>V</th><th>b</th><th>t</th><th>D-V</th></tr><tr><td>8 ~10.5</td><td>3</td><td>2.0</td><td>7 or More</td></tr><tr><td>11~12.5</td><td>4</td><td>2.5</td><td>8 or More</td></tr><tr><td>13~17.5</td><td>5</td><td>3.0</td><td>10 or More</td></tr><tr><td>18~22.5</td><td>6</td><td>3.5</td><td>12 or More</td></tr><tr><td>23~30.5</td><td>8</td><td>4.0</td><td>14 or More</td></tr><tr><td>31~38.5</td><td>10</td><td>4.0</td><td>14 or More</td></tr><tr><td>39~42.5</td><td>12</td><td>4.0</td><td>14 or More</td></tr><tr><td>43~44.0</td><td>14</td><td>4.5</td><td>16 or More</td></tr></table>	V	b	t	D-V	8 ~10.5	3	2.0	7 or More	11~12.5	4	2.5	8 or More	13~17.5	5	3.0	10 or More	18~22.5	6	3.5	12 or More	23~30.5	8	4.0	14 or More	31~38.5	10	4.0	14 or More	39~42.5	12	4.0	14 or More	43~44.0	14	4.5	16 or More
V	b	t	D-V																																			
8 ~10.5	3	2.0	7 or More																																			
11~12.5	4	2.5	8 or More																																			
13~17.5	5	3.0	10 or More																																			
18~22.5	6	3.5	12 or More																																			
23~30.5	8	4.0	14 or More																																			
31~38.5	10	4.0	14 or More																																			
39~42.5	12	4.0	14 or More																																			
43~44.0	14	4.5	16 or More																																			

Alterations	Code	Spec.
One Flat 	SC	Adds a flat. Ordering Code SC10 SC=1mm Increment SC≥V/2+2 Not available for D4 ~ 8.
Two Flats 	WSC	Adds two flats. Ordering Code WSC10 WSC=1mm Increment WSC≥V+4 Not available for D4 ~ 8.

Metal Washer

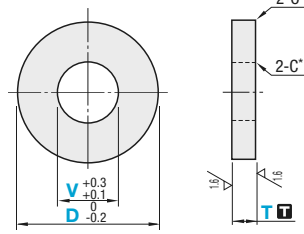
Standard Grade / Precision Grade / High Precision Grade I.D. / O.D. Tolerance Selectable / Dimension Configurable



RoHS

Part Number	M Material	S Surface Treatment	H Hardness
AWSC	EN 1.1191 Equiv.	-	-
AWSB		Black Oxide	
AWSM		Electroless Nickel Plating	
AWSS	EN 1.4301 Equiv.	-	45~50HRC
AWSH	EN 1.4031 Equiv.	-	

Stainless Steel Hardened Type (AWSH) may be discolored due to hardening.



2-C*
2-C*
1/16
V +0.3
D -0.2
T

T Dimension Tolerance Selection Table			
A	±0.005	-	-
B	-0.1 -0.3	SB	-0.01 -0.03
C	+0.3 +0.1	SC	+0.03 +0.01
D	0 -0.2	SD	0 -0.02
E	+0.2 0	SE	+0.02 0

2/ (1/)
*D=16 or Less: C0.2 or Less
D=16.5 or More: C0.5 or Less

I.D./O.D. Tolerance Selectable, Dimension Configurable

Part Number	Tolerance Selection	D	V 0.5mm Increment	T 0.1mm Increment	Unit Price													
					High Precision Grade - Tolerance A				Standard Grade - Tolerance B-E				Precision Grade - Tolerance SB-SE					
					AWSC	AWSB	AWSM	AWSH	AWSC	AWSB	AWSM	AWSS	AWSH	AWSC	AWSB	AWSM	AWSS	AWSH
AWSC AWSB AWSM AWSS AWSH	High Precision Grade A Standard Grade B C D E Precision Grade SB SC SD SE	5.0~10.0 0.5mm Increment	3.0~58.0	1.0~ 2.9														
				3.0~ 5.0														
				5.1~10.0														
		10.5~20.0 0.5mm Increment		1.0~ 2.9														
				3.0~ 5.0														
				5.1~10.0														
		21~30 1mm Increment		1.0~ 2.9														
				3.0~ 5.0														
				5.1~10.0														
		31~40 1mm Increment		1.0~ 2.9														
				3.0~ 5.0														
				5.1~10.0														
		41~50 1mm Increment		1.0~ 2.9														
				3.0~ 5.0														
				5.1~10.0														
		51~60 1mm Increment		1.0~ 2.9														
				3.0~ 5.0														
				5.1~10.0														

D≤60...V≤D-2 D≥61...V≤D-4 High Precision Grade (Tolerance A) is not available for AWSS.

Ordering Example

Part Number - T Tolerance Selection - D - V - T

AWSB - B - D20.0 - V8.0 - T5.0

AWSS - SB - D20.0 - V8.0 - T5.0

Metal Washer

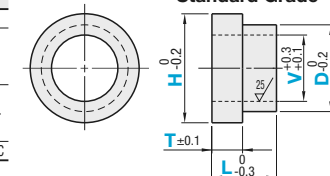
Flanged



RoHS

Part Number	M Material	S Surface Treatment	H Hardness
FTCSS	EN 1.0038 Equiv.	-	-
FTCC		-	-
FTCB		Black Oxide	-
FTCM	EN 1.1191 Equiv.	Electroless Nickel Plating	-
FTCSK		-	-
FTCSKB	EN 1.2510 Equiv.	Black Oxide	55HRC~
FTCSKM		Electroless Nickel Plating	-
FTCS	EN 1.4031 Equiv.	-	45~50HRC

Stainless Steel Hardened Type (FTCS, FTCSM) may be discolored by hardening.



6.3 / (1.5 / 2.5)
Standard Grade
Precision Grade
H 0~0.2
T ±0.1
L 0
Circumference C0.5 or Less

Standard Grade / Precision Grade

Part Number	D	H	V 0.5mm Increment (V3 or More)	T 0.1mm Increment	L 0.1mm Increment	Unit Price									
						Standard Grade					Precision Grade				
FTCSS	FTCC	FTCB	FTCM	FTCSK	FTCSKB	FTCSKM	FTCS	FTCMC	FTCMB	FTCMM	FTCMS				
Standard Grade	Precision Grade	5.0~9.0 (0.5mm Increment)	7.0~12.0 (0.5mm Increment)	(Selection) 2.0 2.6	1.0~8.0	2.0~10.0									
FTCSS	FTCC	9.5~20.0 (0.5mm Increment)	11.5~25.0 (0.5mm Increment)												
FTCB	FTCM	21~30 (1mm Increment)	23~40 (1mm Increment)												
FTCSK	FTCSKB	31~40 (1mm Increment)	33~50 (1mm Increment)												
FTCSKM	FTCS	41~50 (1mm Increment)	43~60 (1mm Increment)												
		51~60 (1mm Increment)	53~70 (1mm Increment)												
Machining Conditions					Machining Conditions of Material EN 1.2510 Equiv. (FTCSK, FTCSKB, FTCSKM)					2≤T≤L-2					
D	H	V	D	H	V										
For 5 ~ 20	D+2±HsDx1.5	V≤D-2	For 5 ~ 10	D+2±HsDx1.4	V≤D-2										
For 21 ~ 40	D+2±HsDx1.4	V≤D-4	For 10.5 ~ 30		V≤D-4										
For 41 ~ 60	D+2±HsDx1.2	V≤D-6	For 31 ~ 60	D+2±HsDx1.2	V≤D-6										

Ordering Example

Part Number - D - H - V - T - L

FTCMS - D25 - H30 - V8.0 - T2.0 - L5.0

Alterations

Part Number - D - H - V - T - L

FTCMM - D25 - H30 - V8.0 - T2.0 - L5.0

(TCB, TCC, TCD, TCE, TSA, TSB, TSC, TSD, TSE, VKC, DKC, HKC)

TSC - VKC

When both I.D./O.D. tolerance changes are specified, the concentricity is 00.02. Not applicable to the Hardened Products.

Alterations	Code	Spec.	Alterations	Code	Spec.
I.D. Tolerance		Changes the I.D. Tolerance to H7. Ordering Code VKC Machining Conditions D≥6 V≥3	O.D. Tolerance		Changes the O.D. Tolerance to g6 or h7. Ordering Code DKC, HKC Machining Conditions When D≥43, T≥1.5. D≥6
	VKC			DKC (g6) HKC (h7)	
		D D-V			D D-V
		6~10 D-V≥2			6~10 D-V≥2
		10.5~20 D-V≥3			10.5~20 D-V≥3
		21~30 D-V≥6			21~30 D-V≥6
		31~40 D-V≥8			31~40 D-V≥8
		41~50 D-V≥10			41~50 D-V≥10
		51~60 D-V≥12			51~60 D-V≥12

Not applicable to the Hardened Products (FTCSK, FTCSKB, FTCSKM, FTCS, FTCMS).

Alterations	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
Code	TCB	TCC	TCD	TCE
Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).
T -0.1 -0.3	T +0.3 +0.1	T 0 -0.2	T +0.2 0	
Ordering Code TCB	Ordering Code TCC	Ordering Code TCD	Ordering Code TCE	
Applicable to Standard Grade.				

Alterations	Shoulder Thickness Tolerance	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
Code	TSA	TSB	TSC	TSD	TSE
Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).	Changes shoulder thickness tolerance (T).
T ±0.025	T -0.01 -0.06	T +0.06 +0.01	T 0 -0.05	T +0.05 0	
Ordering Code TSA	Ordering Code TSB	Ordering Code TSC	Ordering Code TSD	Ordering Code TSE	
Applicable to Precision Grade.					

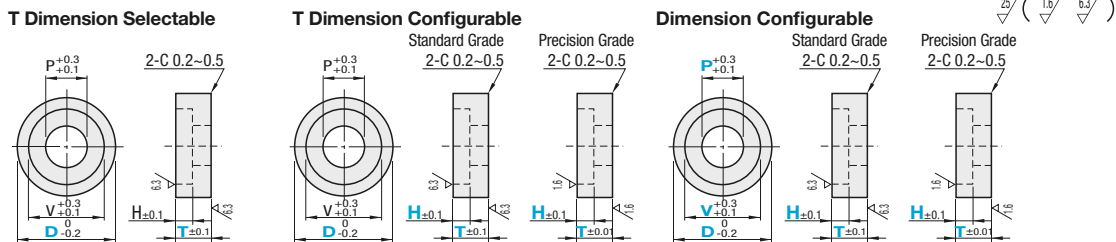
Metal Washer Counterbored



RoHS

Standard Grade T T Tolerance±0.1			Precision Grade T T Tolerance±0.01		M Material	S Surface Treatment	H Hardness
T Dimension Selectable	T Dimension Configurable	Dimension Configurable	T Dimension Configurable	Dimension Configurable			
-	-	FWAZSS	-	-	EN 1.0038 Equiv.	-	-
-	-	FWZAC	-	FWZSC	EN 1.1191 Equiv.	Black Oxide	45~50HRC
WZAB	TWZAB	FWZAB	TWZSB	FWZSB		Electroless Nickel Plating	
WZAM	TWZAM	FWZAM	TWZSM	FWZSM		Clear Anodize	
-	-	FWZAA	-	-	Aluminum Alloy 2000 series	Black Anodize	-
WZAS	TWZAS	FWZAS	TWZSS	FWZSS	EN 1.4301 Equiv.	-	-
-	-	FWZACH	-	-	EN 1.1191 Equiv.	Black Oxide	45~50HRC
WZABH	-	FWZABH	-	-		Electroless Nickel Plating	
WZAMH	-	FWZAMH	-	-		-	
-	-	FWZASK	-	-	EN 1.2510 Equiv.	Black Oxide	55HRC~
-	-	FWZASKB	-	-	EN 1.4031 Equiv.	Electroless Nickel Plating	45~50HRC
WZASH	-	FWZASKM	-	-		-	
-	-	FWZASH	-	-	EN 1.4031 Equiv.	-	-

⚠ Depending on thickness and length, EN 1.1191 Equiv. Hardened Type may be less than 45HRC. ⚠ Stainless Steel Hardened Type (WZASH, FWZASH) may be discolored by hardening



■ **T Dimension Selectable**

Part Number		H	T Selection			V	P	Unit Price					
Type	D							WZAB	WZAM	WZAS	WZABH	WZAMH	WZASH
WZAB WZAM WZAS WZABH WZAMH WZASH	10	4	6	8	10	6	3.5						
	12	5		8	10	8	4.5						
	14	6		8	10	10	5.5						
	15	8			10	12							
	20	8			10	12	15	11	6.5				
	30	10				12	15	14	9				
	40	12					15	20					
	50	12					15	20	18	11			
	60	12					15	20					

■T Dimension Configurable

Part Number		H 0.5mm Increment	T 0.5mm Increment	V	P	Unit Price					
Type	D					Standard Grade			Precision Grade		
						TWZAB	TWZAM	TWZAS	TWZSB	TWZSM	TWZSS
Standard Grade	10	1.0~18.0	3.0~10.0	6	3.5						
			10.5~20.0								
12	3.0~10.0		8	4.5							
	10.5~20.0										
14	3.0~10.0		10	5.5							
	10.5~20.0										
Precision Grade	15		3.0~10.0	11	6.5						
			10.5~20.0								
TWZSB	20		3.0~10.0	14	9						
			10.5~20.0								
TWZSM	30	3.0~10.0									
		10.5~20.0									
TWZSS											

⚙️ Machining Conditions: $H+2 \leq T \leq P \times 8$



Ordering • T Dimension Selectable

Ordering Example	Part Number	-	T
------------------	-------------	---	---

WZAS15 - 10

- T Dimension Configurable

Part Number - H - T

TWZAB10 - 3.5 - 10.0

■ Dimension Configurable

[illegible]

 **Machining Conditions**

D	V	P
For 10 ~ 60	$V \leq D - 2$	$P \leq V - 2$
For 61 ~ 100	$V \leq D - 4$	$P \leq V - 4$

② $2 \leq (T-H) \leq P \times 8$ The shaft diameter is 2mm or more and $P \times 8$ or less.

Ⓜ Machining Conditions of Material EN 1.2510 Equiv. (FWZASK, FWZASKB and FWZASKM)

D	V	P
For 10	$V \leq D-2$	$P \leq V-2$
For 10.5 ~ 30	$V \leq D-4$	
For 31 ~ 60	$V \leq D-6$	
For 61 ~ 80	$V \leq D-8$	$P \leq V-4$
For 81 ~ 100	$V \leq D-10$	

📍 No specification available for sizes without declaration of value.



Ordering Example

Part Number - D - V - P - H - T

FWZASS - D25 - V12.0 - P6.0 - H5.5 - T10.5

FWZSC - D20 - V10.0 - P5.0 - H5.5 - T15.0



Alterations

Part Number - D - V - P - H - T - (TKC)

FWZASH - D15.0 - V10.5 - P6.5 - H12.5 - T18.5 - TKC

Alteration	Code	Spec.
$T \pm 0.01$	TKC	Changes T dimension tolerance. <u>Ordering Code</u> TKC $T \pm 0.1 \Rightarrow \pm 0.01$ ⓧ FWZAA, FWZAS and FWZASH are not available for D=61 ~ 100. ⓧ Applicable to Dimension Configurable Type, Standard Grade (except FWZAB) only.

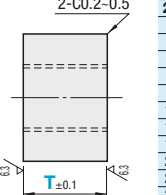
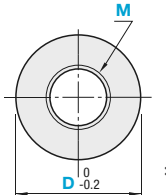
Metal Washer

Tapped



RoHS

T Dimension Selectable	T Dimension Configurable	Dimension Configurable	Material	Surface Treatment
Coarse Thread	Coarse Thread	Coarse Thread		
-	-	FWTAC	EN 1.1191 Equiv.	Black Oxide
WTAB	TWTAB	FWTAB		
WTAM	TWTAM	FWTAM		Electroless Nickel Plating
-	-	FWTAA	Aluminum Alloy 2000 series	Clear Anodize
WTAS	TWTAS	FWTAS	EN 1.4301 Equiv.	Black Anodize



25° ($\frac{6.3}{\sqrt{3}}$)
 $2-C0.2-0.5$
 $D \begin{smallmatrix} 0 \\ -0.2 \end{smallmatrix}$
 $T \pm 0.1$

M	Pitch
2	0.4
2.6	0.45
3	0.5
4	0.7
5	0.8
6	1.0
8	1.25
10	1.5
12	1.75
16	2.0
20	2.5
24	3.0
30	3.5

T Dimension Selectable

Part Number	Type	D	M Selection					T Selection				Unit Price		
			2	3	4	5		3	5	8	10	WTAB	WTAM	WTAS
WTAB WTAM WTAS		10												
		12												
		16												
		20												
		30												
		40												
		50												
		60												

T Dimension Configurable

Part Number		M Selection					T	
Type	D						0.5mm Increment	
TWTAB TWTAM TWTAS	6	2	3	4		3.0~20.0		
	8	2	3	4				
	10	2	3	4	5			
	12		4	5	6	3.5~20.0		
	16			5	6		8	
	20				6		8	10
	30						8	10
Ⓜ2 ≤Mx8 Ⓜ2 → T ≤Mx5								

Part Number		T	Unit Price		
Type	D	0.5mm Increment	TWTAB	TWTAM	TWTAS
TWTAB TWTAM TWTAS	6~10	3.0~ 5.0			
		5.5~10.0			
		10.5~20.0			
	12, 16	3.5~ 5.0			
		5.5~10.0			
		10.5~20.0			
	20, 30	3.5~ 5.0			
		5.5~10.0			
		10.5~20.0			

Dimension Configurable

Part Number	D	M Selection	T	Unit Price							
			0.5mm Increment	FWTAC	FWTAB	FWTAM	FWTAA	FWTAAB FWTAS			
FWTAC FWTAB FWTAM FWTAA FWTAAB FWTAS	6~10 (0.5mm Increment)	2 (3≤T≤10) 2.6 (3≤T≤13) 3 (3≤T≤24) 4 (3≤T≤32) 5 (3≤T≤40) 6 (3≤T≤48) 8 (4≤T≤50) 10 (5≤T≤50) 12 (6≤T≤50) 16 (6≤T≤50) 20 (8≤T≤50) 24 (10≤T≤50) 30 (12≤T≤50)	3.0~ 5.0								
			5.5~10.0								
			10.5~20.0								
			20.5~30.0								
			30.5~40.0								
	10.5~20.0 (0.5mm Increment)		40.5~50.0								
			3.0~ 5.0								
			5.5~10.0								
			10.5~20.0								
			20.5~30.0								
	21~30 (1mm Increment)		30.5~40.0								
			40.5~50.0								
			3.0~ 5.0								
			5.5~10.0								
			10.5~20.0								
	31~40 (1mm Increment)		20.5~30.0								
			30.5~40.0								
			40.5~50.0								
			3.0~ 5.0								
			5.5~10.0								
	41~50 (1mm Increment)		10.5~20.0								
			20.5~30.0								
			30.5~40.0								
			40.5~50.0								
			3.0~ 5.0								
	51~60 (1mm Increment)		5.5~10.0								
			10.5~20.0								
			20.5~30.0								
			30.5~40.0								
			40.5~50.0								
	61~80 (1mm Increment)		5.0~10.0								
			10.5~20.0								
			20.5~30.0								
			30.5~40.0								
			40.5~50.0								
	81~100 (1mm Increment)		5.0~10.0								
			10.5~20.0								
			20.5~30.0								
			30.5~40.0								
			40.5~50.0								
				(D-M) / 2≥2					T≤Mx8		M2, M2.6→ T≤Mx5



Ordering Example

Part Number - D - M - T

WTAB12 - D20 - M6 - T5

TWTAB12 - D20 - M6 - T5.5

FWTAM - D20 - M5 - T4.5



Alterations

Part Number - D - M - T - (WSC)

FWTAS - D15 - M6 - T15 - WSC10

Alteration	Code	Spec.
	WSC	Adds two flats. Ordering Code WSC10 WSC=1mm Increment WSC≥M+4 ⊗ Not available for D6 ~ D8. ⊗ Not available for T Dimension Selectable/Configurable Type.

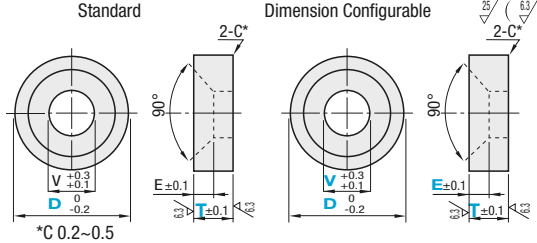
Metal Washer

Countersunk / With Screw Holes



RoHS

Standard	Dimension Configurable	Material	Surface Treatment
-	FWSRC	EN 1.1191 Equiv.	-
WSRB	FWSRB		Black Oxide
WSRM	FWSRM		Electroless Nickel Plating
-	FWSRA	EN AW-2017 Equiv.	Clear Anodize
WSRS	FWSRS	EN 1.4301 Equiv.	-



25° ($\frac{6.3}{\sqrt{3}}$)
 $2-C^*$
 $V \begin{smallmatrix} +0.3 \\ -0.1 \end{smallmatrix}$
 $D \begin{smallmatrix} 0 \\ -0.2 \end{smallmatrix}$
 $E \pm 0.1$
 $T \pm 0.1$
 $*C 0.2-0.5$

Countersunk, Standard

Part Number	Type	D	T Selection	E	V	Unit Price		
						WSRB	WSRM	WSRS
WSRB WSRM WSRS	14		2.5	2.5	4.5			
			4					
			5					
	16		3	3	5.5			
			4					
			5					
	20		3.5	3.5	6.6			
			4					
			5					
	25		5	5	9			
			6					
	30		6	6	11			
			8					

Countersunk, Dimension Configurable

Part Number	D	V	E	T	Unit Price					
		0.5mm Increment (V3 or More)	0.5mm Increment	0.5mm Increment	FWSRC	FWSRB	FWSRM	FWSRA	FWSRS	
FWSRC FWSRB FWSRM FWSRA FWSRS	10.0~20.0 (0.5mm Increment)	2.0	2.0~10.0	E≤T	2.0~ 5.0					
	21~30 (1mm Increment)				5.5~10.0					
	31~40 (1mm Increment)				2.0~ 5.0					
	41~50 (1mm Increment)	5.5~10.0								
		51~60 (1mm Increment)			2.0~ 5.0					
					5.5~10.0					
	2.0~ 5.0									
	5.5~10.0									
	2.0~ 5.0									
	5.5~10.0									
	2.0~ 5.0									
	5.5~10.0									
	2.0~ 5.0									
	5.5~10.0									

⚠ (D-V)/2-E≥1...1mm or more is required for the min. thickness.

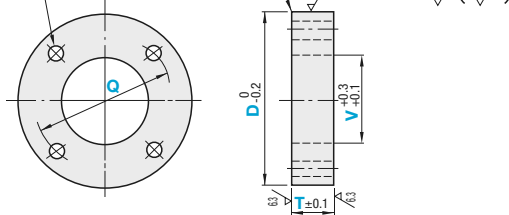
⚠ Circularity cannot be guaranteed because the thickness V becomes 0 when E=T.

With Screw Holes



RoHS

Type	Material	Surface Treatment
WBAC	EN 1.1191 Equiv.	-
WBAB		Black Oxide
WBAM		Electroless Nickel Plating
WBAA	EN AW-2017 Equiv.	Clear Anodize
WBAS	EN 1.4301 Equiv.	-



25° ($\frac{6.3}{\sqrt{3}}$)
 $2-C0.2-0.5$
 $4-d$
 Q
 $D \begin{smallmatrix} 0 \\ -0.2 \end{smallmatrix}$
 $V \begin{smallmatrix} +0.3 \\ -0.1 \end{smallmatrix}$
 $T \pm 0.1$

Part Number		V	Q	T	d	Applicable Screw	Unit Price																
		0.5mm	0.5mm	1mm			WBAC			WBAB			WBAM			WBAA			WBAS				
Type	D	Increment	Increment	Increment			T1-2	T3-5	T6-10	T1-2	T3-5	T6-10	T1-2	T3-5	T6-10	T2	T3-5	T6-10	T1-2	T3-5	T6-10		
WBAC WBAB WBAM WBAA WBAS	20	3.0~ 5.0	10.5-13.5	1~10	3.5	M3																	
	25	3.0~ 9.5	10.5-17		3.5	M3																	
	30	3.0~10.0	12 ~20		4.5	M4																	
	35	3.0~16.0	12 ~25		4.5	M4																	
	40	3.0~20.0	12 ~30		4.5	M4																	
	50	3.0~22.0	14 ~35		5.5	M5																	
	60	3.0~28.0	14 ~40		5.5	M5																	
🌀Q≥V+d+4 🌀T≥2 for WBAA.																							

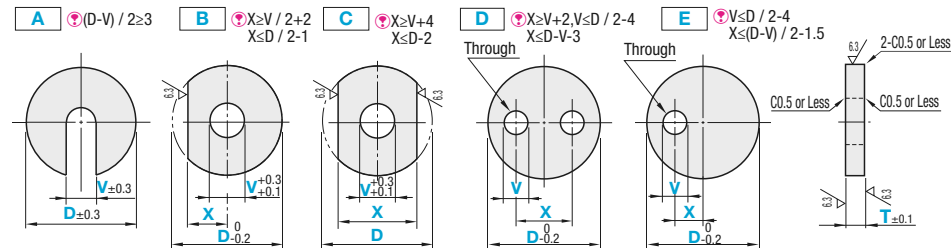
Shape Selectable Flat / Pilot

Thin-Walled Metal Collars / Hollow Collars / Spacers

■ Metal Washers



Part Number	Material	Surface Treatment
KWSC	EN 1.1191 Equiv.	-
KWSB		Black Oxide
KWSM		Electroless Nickel Plating
KWSS	EN 1.4301 Equiv.	-

[illegible]

 Ordering Example **Part Number** - **Shape** - **D** - **V** - **X** - **T**
KWSB - B - D12.0 - V5 - X5.0 - T3.0

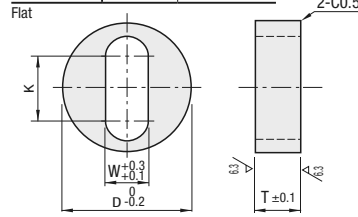
Alterations  Part Number - Shape - D - V - T - (HH)
KWSB - A - D20 - V10 - T3 - HH

Alteration	Code	Spec.
	HH	Hardens the washer in the shape of A.  Hardness: 45 ~ 50HRC Ordering Code: HH  Applicable to KWSB and KWSC only.  Deformation may occur in some cases due to heat treatment.

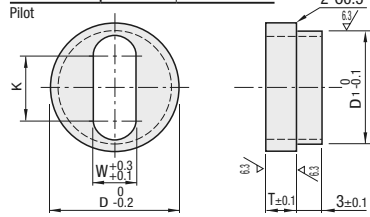
■ Slotted Hole Washers



Type	Material	Surface Treatment
WLM	EN 1.1191 Equiv.	Electroless Nickel Plating
WLS	EN 1.4301 Equiv.	-



Type	Material	Surface Treatment
WLHM	EN 1.1191 Equiv.	Electroless Nickel Plating
WLHS	EN 1.4301 Equiv.	-



■ Flat

Part Number		D	T	K	W	Applicable Screw	Unit Price	
Type	No.						WLM	WLS
WLM WLS	3	18	3	5	3.5	M3		
	4	20		6	4.5	M4		
	5	22		7	5.5	M5		
	6	26		8	6.6	M6		
	8	30		10	9	M8		
	10	38	4	12	11	M10		
	12	46	5	16	14	M12		

 Ordering Example
WLM5
WLHS4

Pilot

Part Number		D	D1	T	K	W	Applicable Screw	Unit Price	
Type	No.							WLHM	WLHS
WLHM WLHS	4	20	14	3	6	4.5	M4		
	5	22	16		7	5.5	M5		
	6	26	18		8	6.6	M6		
	8	30	22		10	9	M8		
	10	38	28	4	12	11	M10		
	12	46	36	5	16	14	M12		

Example

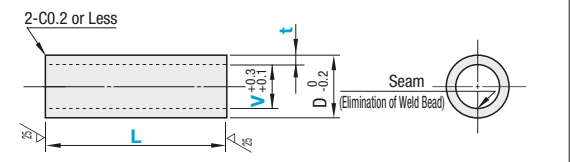
For Pilot Type (VLHM, VLHS), drill a hole on Angle Plate or Base Plate, etc. to insert the pilot part (with D1) prior to use (see the right figure). The slotted hole allows fine-adjustment of K dimension.

■ Thin-Walled Metal Collars



Type	Material
TASC	EN 1.4301 Equiv.

L Dimension	Tolerance
3.0~10.0	±0.05
10.5~20.0	±0.1



Part Number		t	L	D		Unit Price			
Type	V			t0.5	t1	L3.0-5.0	L5.5-10.0	L10.5-15.0	L15.5-20.0
TASC	1	0.5	3.0 20.0	2	3				
	1.5			2.5	3.5				
	2			3	4				
	2.5			3.5	4.5				
	3			4	5				
	3.5			4.5	5.5				
	4			5	6				
	5				6	7			

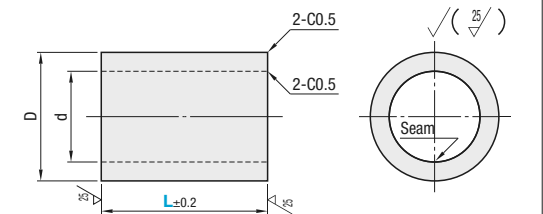
 Ordering Example **Part Number** - **t** - **L**
TASC1 - 0.5 - 3.0

■ Hollow Collars



Type	Material	Surface Treatment
SGP	EN 1.0035 Equiv.	-
SGPBB		Black Oxide
STPG	EN 1.0254 Equiv. (Sch40)	-
STPGB		Black Oxide
STPGH	EN 1.0254 Equiv. (Sch80)	-
STPGHB		Black Oxide

⚠ This tube has a welding seam on the I.D. surface.
 ⚠ Only EN 1.0035 Equiv. and SGPBB have 0.5 ~ 1mm weld seam rise inside.

[illegible]

 Ordering Example

Part Number
SGP6A

 -

L
45.0

Alterations  Part Number - L - (LKC)
STPG15A - 80 - LKC

Alteration	Code	Spec.
L Dimension Tolerance 	LKC	Changes L dimension tolerance from ± 0.2 to ± 0.05 . <u>Ordering Code</u> LKC

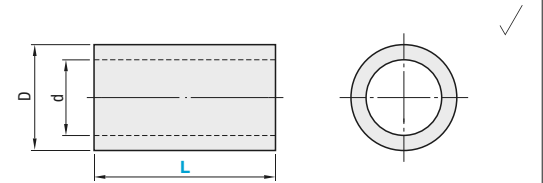
■ Spacers



Type	M Material	S Surface Treatment
SMKB	EN 1.0330 Equiv.	Trivalent Chromate (Black)

L Dimension	Tolerance
3, 4, 5, 8, 10	± 0.05
12, 15, 20	± 0.1
30	± 0.15

⚠ The circularity may be slightly deformed due to manufacturing process.



Part Number	L										D	d	Unit Price			
Type	No.	Selection												L3~10	L12~20	L30
SMKB	2	3	4	5	8	10					3	2		-	-	
	2.6	3	4	5	8	10					3.65	2.65		-	-	
	3	3	4	5	8	10	12	15	20		4	3		-	-	
	4	3	4	5	8	10	12	15	20	30	5.3	4.1				
	5	3	4	5	8	10	12	15	20	30	6.3	5.1				
	6	3	4	5	8	10	12	15	20	30	7.8	6.2				
	8		4	5	8	10	12	15	20	30	10	8.2				
	10			5	8	10	12	15	20	30	12.2	10.2				

 Ordering Example

Part Number
SMKB2.6

 -

L
10

The diagram shows two cross-sectional views of a bonding process. On the left, a component is bonded to a substrate using 'TASC SGP etc.'. On the right, a component is bonded using 'TASC SMKB etc.', with a layer of 'Resin, Rubber' applied to the bonding surface.

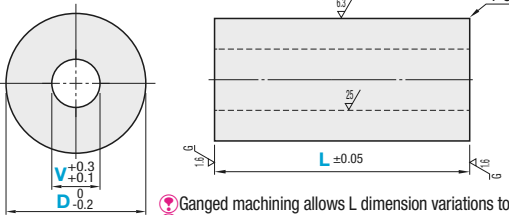
Simultaneous Grinding Spacers



RoHS

Type	Material	Surface Treatment	Hardness
DWSSB	EN 1.1191 Equiv.	Black Oxide	-
DWSSM	EN 1.1191 Equiv.	Electroless Nickel Plating	-
DWSSS	EN 1.4301 Equiv.	-	-
DWSSKB	EN 1.2510 Equiv.	Black Oxide	55HRC~
DWSSKM	EN 1.2510 Equiv.	Electroless Nickel Plating	55HRC~

* D=16 or Less: C0.1 ~ 0.2
D=20 or More: C0.5 or Less



⚠ Ganged machining allows L dimension variations to be within ±5 micro meters per order.
⚠ Please order 2 or more pieces.

Part Number	D 0.5mm Increment	V 0.5mm Increment (V3 or More)	L		Simultaneous Grinding Maximum Quantity	Unit Price						
			Machining Conditions	0.1mm Increment		DWSSB	DWSSM	DWSSS	DWSSKB	DWSSKM		
DWSSB DWSSM DWSSS DWSSKB DWSSKM	4.0~10.0	0 2 2.6 3.0~8.0	L≤40 ⇒D-V≥2 40.1≤L≤50 ⇒D-V≥4	1.0~ 5.0	100 pcs.							
				5.1~ 10.0								
				10.1~ 25.0								
				25.1~ 40.0								
				40.1~ 50.0								
	10.5~15.5	0 2 2.6 3.0~13.5	L≤40 ⇒D-V≥2 40.1≤L≤80 ⇒D-V≥4 80.1≤L≤100 ⇒D-V≥6	1.0~ 5.0								
				5.1~ 10.0								
				10.1~ 25.0								
				25.1~ 40.0								
				40.1~ 55.0								
	16.0~20.0	0 2 2.6 3.0~18.0	L≤40 ⇒D-V≥2 40.1≤L≤80 ⇒D-V≥4 80.1≤L≤100 ⇒D-V≥6	55.1~ 70.0								
				70.1~ 85.0								
				85.1~ 100.0								
				1.0~ 20.0		50 pcs.						
				20.1~ 30.0								
	30.1~ 40.0											
	40.1~ 50.0											
	50.1~ 60.0											
	20.5~30.0	0 2 2.6 3.0~28.0	L≤50 ⇒D-V≥2 50.1≤L≤100 ⇒D-V≥6	60.1~ 70.0								
				70.1~ 80.0								
				80.1~ 90.0								
				90.1~ 100.0								
				1.0~ 20.0	20 pcs.							
	30.5~39.5	0 2 2.6 3.0~37.5	L≤50 ⇒D-V≥2 50.1≤L≤100 ⇒D-V≥6	20.1~ 30.0								
				30.1~ 40.0								
				40.1~ 50.0								
				50.1~ 60.0								
				60.1~ 70.0								
	40.0~50.0	0 2 2.6 3.0~48.0		L≤50 ⇒D-V≥2 50.1≤L≤100 ⇒D-V≥6		70.1~ 80.0						
						80.1~ 90.0						
						90.1~ 100.0						
						1.0~ 20.0						
						20.1~ 30.0						

⚠ Common Machining Conditions: ① L≤Vx8 ② DWSSS[EN 1.4301 Equiv.]⇒L≥2 ⚠ Please order 2 or more pieces. ⚠ No specification available for sizes without declaration of value.

Ordering Example

Part Number

-

D

-

V

-

L

DWSSS

-

D35.5

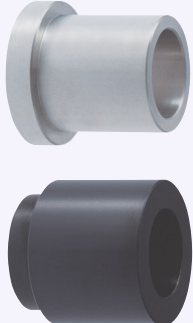
-

V12.5

-

L58.4

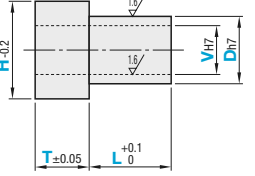
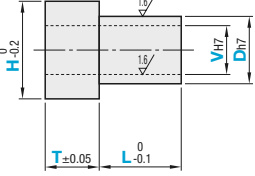
Stepped Spacers



RoHS

Type	L Tolerance	Material	Surface Treatment
DCLB	0 -0.1	EN 1.1191 Equiv.	Black Oxide
DCLM		EN 1.1191 Equiv.	Electroless Nickel Plating
DCLS		EN 1.4301 Equiv.	-
MCLB	+0.1 0	EN 1.1191 Equiv.	Black Oxide
MCLM		EN 1.1191 Equiv.	Electroless Nickel Plating
MCLS		EN 1.4301 Equiv.	-

⚠ L Tolerance 0 -0.1 ⚠ L Tolerance +0.1 0



⚠ L Tolerance 0 -0.1 ⚠ L Tolerance +0.1 0

Circumference C0.5 or Less

Part Number	D _{h7} 0.5mm Increment	V _{H7} 0.5mm Increment	H 0.5mm Increment	T 0.1mm Increment	L 0.1mm Increment	Unit Price	L Tolerance	-0.1~0	Unit Price	L Tolerance	0~-+0.1
						DCLB	DCLM	DCLS	MCLB	MCLM	MCLS
L Tolerance 0~-0.1 DCLB DCLM DCLS L Tolerance +0.1~0 MCLB MCLM MCLS	5.0~10.0	2.0~8.0 (V≤D-2)	7.0~16.0 (D+2≤H≤D+6)	1.0~20.0	1.0~ 5.0						
					5.1~10.0						
					10.1~25.0						
					25.1~40.0						
					40.1~50.0						
	10.5~20.0	2.0~18.0 (V≤D-2)	12.5~26.0 (D+2≤H≤D+6)		1.0~ 5.0						
					5.1~10.0						
					10.1~25.0						
					25.1~40.0						
					40.1~50.0						
	20.5~30.0	2.0~28.0 (V≤D-2)	22.5~40.0 (D+2≤H≤D+10)		1.0~20.0						
					20.1~30.0						
					30.1~40.0						
					40.1~50.0						
					50.1~100.0						
	30.5~40.0	6.0~36.0 (V≤D-4)	32.5~50.0 (D+2≤H≤D+10)		1.0~20.0						
					20.1~30.0						
					30.1~40.0						
					40.1~50.0						
					50.1~100.0						
40.5~50.0	10.0~44.0 (V≤D-6)	42.5~60.0 (D+2≤H≤D+10)	1.0~20.0								
			20.1~30.0								
			30.1~40.0								
			40.1~50.0								
			50.1~100.0								

⚠ Common Machining Conditions: ① L+T≤Vx8 ② When V≥8 and L+T≥Vx4, intermediate clearance is added.

Ordering Example

Part Number

-

D

-

V

-

H

-

T

-

L

DCLS

-

D25.5

-

V12.5

-

H33.5

-

T10.7

-

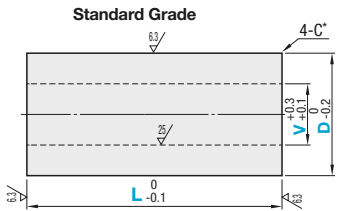
L40.2

Metal Collar

Standard Grade, L Dimension Selectable



Type	Material	Surface Treatment
Standard Grade		
KNCLB	EN 1.1191 Equiv.	Black Oxide
KNCLM		Electroless Nickel Plating
KNCLSS	EN 1.4301 Equiv.	-



* D=16 or Less: C0.1 ~ 0.2
D=20 or More: C0.5 or Less

Standard Grade

Part Number		D Selection										L Selection	
Type	V	5	6	8	10	12							
KNCLB KNCLM KNCLSS	3												
	4		6	8	10	12	13	14	15	16	20		
	5			8	10	12	13	14	15	16	20		
	6			8	10	12	13	14	15	16	20	25	
	8				10	12	13	14	15	16	20	25	30
	10					12	13	14	15	16	20	25	30
	12						15	16	20	25	30		
	15								20	25	30		
	16								20	25	30		
	20									25	30		
	25										30		
													10 12 15 20 25 30 35



Ordering Example

Part Number - D - L
KNCLB3 - 5 - 10

Part Number		Unit Price						
Type	D	L10	L12	L15	L20	L25	L30	L35
KNCLB	5							
	6							
	8							
	10							
	12							
	13							
	14							
	15							
	16							
	20							
	25							
	30							

Part Number		Unit Price						
Type	D	L10	L12	L15	L20	L25	L30	L35
KNCLM	5							
	6							
	8							
	10							
	12							
	13							
	14							
	15							
	16							
	20							
	25							
	30							

Part Number		Unit Price						
Type	D	L10	L12	L15	L20	L25	L30	L35
KNCLSS	5							
	6							
	8							
	10							
	12							
	13							
	14							
	15							
	16							
	20							
	25							
	30							

The prices are based on the O.D. (D).

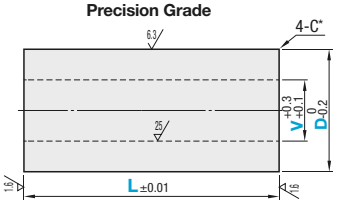
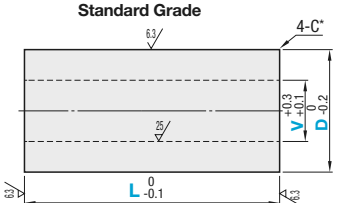
Metal Collar

Standard Grade / Precision Grade, L Dimension Configurable



Type	Material	Surface Treatment
L Dimension Configurable		
Standard Grade		
NCLC	ACSC	-
NCLB	ABSC	Black Oxide
NCLM	AMSC	Electroless Nickel Plating
NCLA	AASC	Clear Anodize
NCLSS	SASC	-

Hardened Type P.137



* D=16 or Less: C0.1 ~ 0.2
D=20 or More: C0.5 or Less

Standard Grade / Precision Grade

Part Number		D Selection		L Selection		Unit Price									
Type	V			0.1mm Increment		Standard Grade					Precision Grade				
Standard Grade NCLC NCLB NCLM NCLA NCLSS	2	4	5	6	8	10									
	3	5	6	8	10	12									
	4	5	6												
	5														
	6														
	8	10	12												
	10	12													
	12														
	15	16	20												
	25														
Precision Grade ACSC ABSC AMSC AASC SASC	2	4	5	6	8	10									
	3	5	6	8	10	12									
	4	5	6												
	5														
	6														
	8	10	12												
	10	12													
	12														
	15	16	20												
	25														
	30														



Ordering Example

Part Number - D - L
NCLB3 - 5 - 10.5

Metal Collar

Standard Grade / Precision Grade, Dimension Configurable



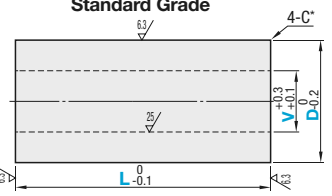
RoHS

Part Number		Material	Surface Treatment
Standard Grade	Precision Grade		
FNCL	FAC	EN 1.0038 Equiv.	-
FNCLC	FACS	EN 1.1191 Equiv.	-
FNCLB	FABSC		Black Oxide
FNCLM	FAMSC		Electroless Nickel Plating
FNCLR	FARSC		LTBC Plating
FNCLBB	-	Brass (JIS EN 0861-4H Equiv.)	-
FNCLA	FAASC	Aluminum Alloy 2000 series	Clear Anodize
FNCLAB	-	EN 1.4301 Equiv.	Black Anodize
FNCLSS	FSASC	-	-
FNCLSSR	FSASCR	-	LTBC Plating

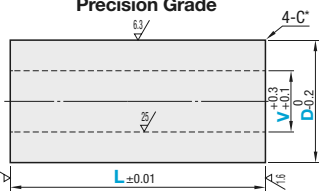
*D=16 or Less: C0.1 ~ 0.2
D=16.5 or More: C0.5 or Less

Hardened Type P137

Standard Grade



Precision Grade



Standard Grade

Part Number	V 0.5mm Increment (V3 or More)	D	L 0.1mm Increment	Unit Price								
				FNCL	FNCLC	FNCLB	FNCLM	FNCLR	FNCLBB	FNCLA FNCLAB	FNCLSS	FNCLSSR
FNCL FNCLC FNCLB FNCLM FNCLR FNCLBB FNCLA FNCLAB FNCLSS FNCLSSR	(Selection) 2.0 2.6 (0.5mm Increment) 3.0~90.0	4.0~10.0 (0.5mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		10.5~20.0 (0.5mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		21~30 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		31~40 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		41~50 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		51~60 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		61~75 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0									
		76~80 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0						-			
		81~100 (1mm Increment)	10.0~ 25.0									
			25.1~ 50.0									
			50.1~ 75.0									
			75.1~ 100.0						-			

*Machining Conditions *1, *2, *3 Foreign Exchange and Foreign Trade Act restricts the export of collars whose O.D. is more than 75mm and over length exceed O.D. Size D>75/L75 is discontinued.

Ordering Example

Part Number - V - D - L

FNCLB - V10.5 - D19.5 - L50.5

Precision Grade

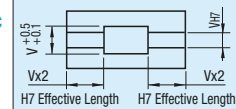
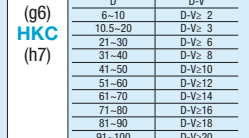
Part Number	V	D	L	Unit Price							
	0.5mm Increment (V3 or More)			0.1mm Increment	FAC	FACS	FABSC	FAMSC	FARSC	FAASC	FSASC
FAC FACS FABSC FAMSC FARSC FAASC FSASC FSASCR	(Selection) 2.0 2.6 <										

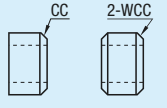
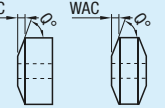
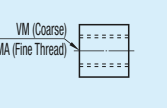
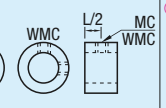
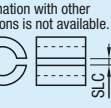
Alterations

Part Number - V - D - L - (VKC, DKC, HKC)

FNCLB - V10.5 - D45 - L70.5 - VKC

When both I.D./O.D. tolerance changes are specified, the concentricity is $\varnothing 0.02$.

Alteration	Code	Spec.	Alteration	Code	Spec.																																												
I.D. Tolerance			O.D. Tolerance																																														
	VKC	Changes the I.D. Tolerance to H7. <u>Ordering Code</u> Not applicable for FNCLAB. Machining Conditions When V>8 and L>=Vx5, adds a central relief shown on the right.		DKC (g6) HKC (h7)	Changes the O.D. Tolerance to g6 or h7. <u>Ordering Code</u> DKC, HKC Machining Conditions D>=6																																												
																																																	
		<table><tr><td>D</td><td>D-V</td></tr><tr><td>6~10</td><td>D-V2 2</td></tr><tr><td>10.5~20</td><td>D-V2 3</td></tr><tr><td>21~30</td><td>D-V2 6</td></tr><tr><td>31~40</td><td>D-V2 8</td></tr><tr><td>41~50</td><td>D-V2 10</td></tr><tr><td>51~60</td><td>D-V2 12</td></tr><tr><td>61~70</td><td>D-V2 14</td></tr><tr><td>71~80</td><td>D-V2 16</td></tr><tr><td>81~90</td><td>D-V2 18</td></tr><tr><td>91~100</td><td>D-V2 20</td></tr></table>	D	D-V	6~10	D-V2 2	10.5~20	D-V2 3	21~30	D-V2 6	31~40	D-V2 8	41~50	D-V2 10	51~60	D-V2 12	61~70	D-V2 14	71~80	D-V2 16	81~90	D-V2 18	91~100	D-V2 20			<table><tr><td>D</td><td>D-V</td></tr><tr><td>6~10</td><td>D-V2 2</td></tr><tr><td>10.5~20</td><td>D-V2 3</td></tr><tr><td>21~30</td><td>D-V2 6</td></tr><tr><td>31~40</td><td>D-V2 8</td></tr><tr><td>41~50</td><td>D-V2 10</td></tr><tr><td>51~60</td><td>D-V2 12</td></tr><tr><td>61~70</td><td>D-V2 14</td></tr><tr><td>71~80</td><td>D-V2 16</td></tr><tr><td>81~90</td><td>D-V2 18</td></tr><tr><td>91~100</td><td>D-V2 20</td></tr></table>	D	D-V	6~10	D-V2 2	10.5~20	D-V2 3	21~30	D-V2 6	31~40	D-V2 8	41~50	D-V2 10	51~60	D-V2 12	61~70	D-V2 14	71~80	D-V2 16	81~90	D-V2 18	91~100	D-V2 20
D	D-V																																																
6~10	D-V2 2																																																
10.5~20	D-V2 3																																																
21~30	D-V2 6																																																
31~40	D-V2 8																																																
41~50	D-V2 10																																																
51~60	D-V2 12																																																
61~70	D-V2 14																																																
71~80	D-V2 16																																																
81~90	D-V2 18																																																
91~100	D-V2 20																																																
D	D-V																																																
6~10	D-V2 2																																																
10.5~20	D-V2 3																																																
21~30	D-V2 6																																																
31~40	D-V2 8																																																
41~50	D-V2 10																																																
51~60	D-V2 12																																																
61~70	D-V2 14																																																
71~80	D-V2 16																																																
81~90	D-V2 18																																																
91~100	D-V2 20																																																

Alterations	C Chamfering (One Side - Both Sides)	Taper (One Side - Both Sides)	Tapping	Set Screw Hole (1-set 2-set)	Slitting																																																											
																																																																
Code	CC, WCC	AC, WAC	VM (Coarse Thread) VMA (Fine Thread)	MC, WMC	SLC																																																											
Spec.	Chamfers C plane. [Ordering Code] CC1.5 WCC2.5	Adds a taper. [Ordering Code] AC3.5-Q60 WAC5.0-Q30	Adds a tapped hole (through). [Ordering Code] VM-V should be specified as VM or VMA. Ex.) FNCL-VM4-D10-L18 For the machining limits of tap dia. and overall length (L), see the table below. Tap dia. $\leq D/2$	Adds a tapped hole (coarse thread) at D part. [Ordering Code] MC3 WMC5	Adds a slit. [Ordering Code] SLC																																																											
	- CC, WCC=0.5mm Increment - CC, WCC≤ 10 - CC, WCC$< (D-V)/2$ - L-CC≥ 5 - L-(WCC$\times 2$)≥ 5	- AC, WAC=0.5mm Increment - Q=Selection from 15, 20, 30 and 60 - AC$\leq L-5$ $(D-V)/2 \geq \tan Q \times AC(WAC) + 0.5$	<table><thead><tr><th>Tapped Hole Dia. VM, VMA</th><th>VM Pitch (Coarse)</th><th>VMA Pitch (Fine)</th><th>L max</th></tr></thead><tbody><tr><td>4</td><td>0.7</td><td>0.5</td><td>20</td></tr><tr><td>5</td><td>0.8</td><td></td><td>30</td></tr><tr><td>6</td><td>1.0</td><td>0.75</td><td>35</td></tr><tr><td>8</td><td>1.25</td><td></td><td>40</td></tr><tr><td>10</td><td>1.5</td><td>1.0</td><td>50</td></tr><tr><td>12</td><td>1.75</td><td></td><td>55</td></tr><tr><td>16</td><td>2.0</td><td></td><td>90</td></tr><tr><td>18</td><td>-</td><td>1.5</td><td></td></tr><tr><td>20</td><td>2.5</td><td></td><td>100</td></tr></tbody></table>	Tapped Hole Dia. VM, VMA	VM Pitch (Coarse)	VMA Pitch (Fine)	L max	4	0.7	0.5	20	5	0.8		30	6	1.0	0.75	35	8	1.25		40	10	1.5	1.0	50	12	1.75		55	16	2.0		90	18	-	1.5		20	2.5		100	- For the condition of thickness $(D-V)/2$, see table below. $L \geq MC, WMC \times 3$ - MC, WMC-Select from table below. <table><thead><tr><th>MC, WMC</th><th>(D-V)/2</th></tr></thead><tbody><tr><td>3, 4</td><td>3 or More</td></tr><tr><td>5, 6, 8</td><td>5 or More</td></tr><tr><td>10, 12</td><td>8 or More</td></tr></tbody></table>	MC, WMC	(D-V)/2	3, 4	3 or More	5, 6, 8	5 or More	10, 12	8 or More	- For the condition of thickness $(D-V)/2$, see table below. - Slit width is fixed. <table><thead><tr><th>O.D. D</th><th>SLC</th><th>(D-V)/2</th></tr></thead><tbody><tr><td>10.0~20.0</td><td>1</td><td>5 or Less</td></tr><tr><td>20.5~40</td><td>2</td><td>10 or Less</td></tr><tr><td>41~</td><td>3</td><td>20 or Less</td></tr></tbody></table> - D, V and L dimension tolerances are the values before alteration. They may change after alteration depending on materials.	O.D. D	SLC	(D-V)/2	10.0~20.0	1	5 or Less	20.5~40	2	10 or Less	41~	3
Tapped Hole Dia. VM, VMA	VM Pitch (Coarse)	VMA Pitch (Fine)	L max																																																													
4	0.7	0.5	20																																																													
5	0.8		30																																																													
6	1.0	0.75	35																																																													
8	1.25		40																																																													
10	1.5	1.0	50																																																													
12	1.75		55																																																													
16	2.0		90																																																													
18	-	1.5																																																														
20	2.5		100																																																													
MC, WMC	(D-V)/2																																																															
3, 4	3 or More																																																															
5, 6, 8	5 or More																																																															
10, 12	8 or More																																																															
O.D. D	SLC	(D-V)/2																																																														
10.0~20.0	1	5 or Less																																																														
20.5~40	2	10 or Less																																																														
41~	3	20 or Less																																																														

Metal Collar

Standard Grade / Precision Grade I.D. / O.D. Tolerance Selectable / Dimension Configurable



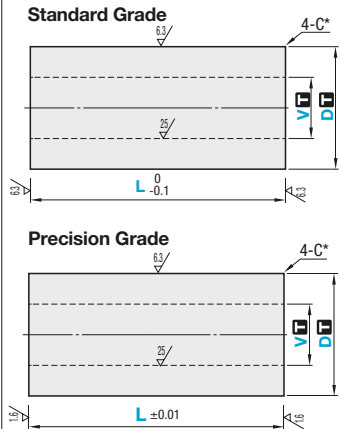
Part Number	M Material	S Surface Treatment
Standard Grade	Precision Grade	
SNCC SNMC	EN 1.1191 Equiv.	-
SNCB SNMB	EN 1.1191 Equiv.	Black Oxide
SNCM SNMM	EN 1.4301 Equiv.	Electroless Nickel Plating
SNCS SNMS	EN 1.4301 Equiv.	-

D	I.D. Tolerance Selection			
	G	H	N	X
	g6	h7	-	-
5.0~8.5	-	-		
9.0~10.0	-0.005 -0.014	0 -0.015		
10.5~18.0	-0.006 -0.017	0 -0.018		
18.5~30	-0.007 -0.020	0 -0.021	-0.1 -0.3	0 -0.2
31~50	-0.009 -0.025	0 -0.025		
51~60	-0.010 -0.029	0 -0.030		

I.D./O.D. Tolerance Price Number List		
D (O.D.)	V (I.D.)	Price No.
G	H	(2)
	N	(1)
	X	(1)
H	H	(2)
	N	(1)
	X	(1)
N	H	(1)
	N	(3)
	X	(3)
X	H	(1)
	N	(3)
	X	(3)

• Guide to Price List
Ex.> When ordering Material EN 1.1191 Equiv.,
O.D. g6, I.D. H7 and L Tolerance ± 0.01
Part Number: SNMC-GH-V4.0-D10.0-L10.0
1. Check the I.D./O.D. Tolerance Price Number List.
(GH is Price Number 2)
2. In the price list of precision grade, find the column of I.D./O.D. tolerance price (2) shown in the price list of precision grade.

V	V Tolerance Selection			
	H	N	X	
	H7	-	-	-
3.0	+0.010 0			
3.5~6.0	+0.012 0			
6.5~10.0	+0.015 0			
10.5~18.0	+0.018 0	+0.3 +0.1	+0.2 0	
18.5~30.0	+0.021 0			
30.5~50.0	+0.025 0			
50.5~58.0	+0.030 0			



* D=16 or Less: C0.1 ~ 0.2
D=16.5 or More: C0.5 or Less

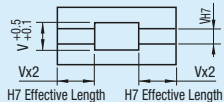
Standard Grade

Part Number	D Tolerance Selection	V Tolerance Selection	V 0.5mm Increment	D	L 0.1mm Increment	Unit Price												
						SNCC			SNCB			SNCM			SNCS			
						Tolerance (1)	Tolerance (2)	Tolerance (3)	Tolerance (1)	Tolerance (2)	Tolerance (3)	Tolerance (1)	Tolerance (2)	Tolerance (3)	Tolerance (1)	Tolerance (2)	Tolerance (3)	
SNCC SNCB SNCM SNCS	G H N X	H N X	3.0~58.0 (V≤D-2) 📍Refer to the following.	5.0~10.0 0.5mm Increment	10.0~ 25.0													
					25.1~ 50.0													
					50.1~ 64.0													
				10.5~20.0 0.5mm Increment	10.0~ 25.0													
					25.1~ 50.0													
					50.1~ 75.0													
				21~30 1mm Increment	75.1~100.0													
					10.0~ 25.0													
					25.1~ 50.0													
				31~40 1mm Increment	50.1~ 75.0													
					75.1~100.0													
					10.0~ 25.0													
				41~50 1mm Increment	25.1~ 50.0													
					50.1~ 75.0													
					75.1~100.0													
				51~60 1mm Increment	10.0~ 25.0													
					25.1~ 50.0													
					50.1~ 75.0													
					75.1~100.0													
					10.0~ 25.0													
					25.1~ 50.0													
					50.1~ 75.0													
					75.1~100.0													
					10.0~ 25.0													
	25.1~ 50.0																	
	50.1~ 75.0																	
	75.1~100.0																	

• D≥9 is applicable when G or H is selected as the tolerance values of D and V.
The dimension range of V is shown in the table below.

D	V
9~30	D-V≥6
31~60	D-V≥12

• Machining Limits of V and Overall Length
L≤Vx8



Ordering Example
Part Number - Tolerance Selection - V - D - L
SNCS - G H - V10.0 - D25 - L50.5

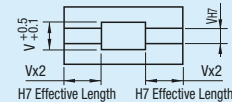
Precision Grade

Part Number	D	V	V 0.5mm Increment	D	L 0.1mm Increment	Unit Price														
	Tolerance Selection	Tolerance Selection				SNMC			SNMB			SNMM			SNMS					
						Tolerance ①	Tolerance ②	Tolerance ③	Tolerance ①	Tolerance ②	Tolerance ③	Tolerance ①	Tolerance ②	Tolerance ③	Tolerance ①	Tolerance ②	Tolerance ③			
SNMC SNMB SNMM SNMS	G H N X	H N X	3.0~58.0 (V≤D-2) Refer to the following.	5.0~10.0 0.5mm Increment	10.0~ 25.0															
					25.1~ 50.0															
					50.1~ 64.0															
				10.5~20.0 0.5mm Increment	10.0~ 25.0															
					25.1~ 50.0															
					50.1~ 75.0															
				21~30 1mm Increment	75.1~100.0															
					10.0~ 25.0															
					25.1~ 50.0															
				31~40 1mm Increment	50.1~ 75.0															
					75.1~100.0															
					10.0~ 25.0															
				41~50 1mm Increment	25.1~ 50.0															
					50.1~ 75.0															
					75.1~100.0															
				51~60 1mm Increment	10.0~ 25.0															
					25.1~ 50.0															
					50.1~ 75.0															
					75.1~100.0															

• D≥9 is applicable when G or H is selected as the tolerance values of D and V.
The dimension range of V is shown in the table below.

D	V
9~30	D-V≥6
31~60	D-V≥12

• Machining Limits of V and Overall Length
L≤Vx8



Ordering Example
Part Number - Tolerance Selection - V - D - L
SNMS - G H - V10.0 - D25 - L50.5

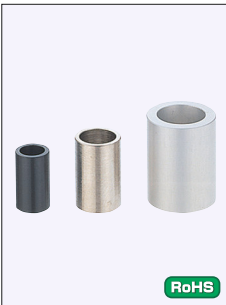
Alterations
Part Number - Tolerance Selection - V - D - L -
SNCS - G H - V10.0 - D25 - L50.0 - LCB

Alterations	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
Code	LCB	LCC	LCD	LCE
Standard Grade L Tolerance Change	Changes L Tolerance (L) L -0.1 -0.2 ORDERING CODE LCB	Changes L Tolerance (L) L +0.3 +0.1 ORDERING CODE LCC	Changes L Tolerance (L) L 0 -0.2 ORDERING CODE LCD	Changes L Tolerance (L) L +0.2 0 ORDERING CODE LCE
Applicable to Standard Grade				

Alterations	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
Code	LSB	LSC	LSD	LSE
Precision Grade L Tolerance Change	Changes L Tolerance (L) L -0.01 -0.03 ORDERING CODE LSB	Changes L Tolerance (L) L +0.03 +0.01 ORDERING CODE LSC	Changes L Tolerance (L) L 0 -0.02 ORDERING CODE LSD	Changes L Tolerance (L) L +0.02 0 ORDERING CODE LSE
Applicable to Precision Grade				

Metal Collar

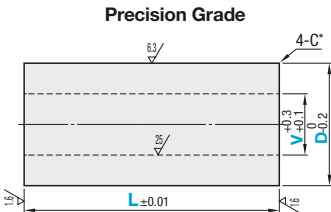
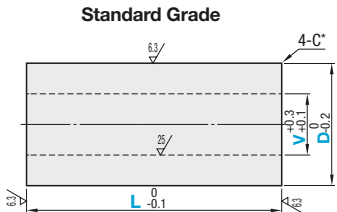
Hardened Type - Standard Grade / Precision Grade, L Dimension Configurable / Dimension Configurable



Part Number				Material	Surface Treatment	Hardness
L Dimension Configurable		Dimension Configurable				
Standard Grade	Precision Grade	Standard Grade	Precision Grade	EN 1.1191 Equiv.	-	45~50HRC
NCLCH	ASH	FNCLCH	FAS			
NCLBH	ASC	FNCLBH	FASC			
NCLMH	PASC	FNCLMH	FPASC			
-	-	FNCSK	FASK	EN 1.2510 Equiv.	-	55HRC~
		FNCSKB	FASKB			
		FNCSKM	FASKM			
NCLSSH	SASCH	FNCLSH	FSASCH	EN 1.4031 Equiv.	-	45~50HRC

Depending on thickness and length, EN 1.1191 Equiv. Hardened Type may be less than 45HRC.
Stainless Steel Hardened Type may be discolored due to hardening.

* D=16 or Less: C0.1 ~ 0.2
D=16.5 or More: C0.5 or Less



L Dimension Configurable, Standard Grade / Precision Grade

Part Number		D Selection	L 0.1mm Increment	Unit Price							
Type	V			Standard Grade				Precision Grade			
Standard Grade NCLCH NCLBH NCLMH NCLSSH	2	4 5 6 8 10	10.0~ 16.0								
	3	5 6 8 10 12	10.0~ 25.0 25.1~ 50.0								
	4 5 6	(6) 8 10 12 13 14 15 16	10.0~ 25.0								
		(6)(6)→Applicable to V4.	25.1~ 50.0								
		20 25	10.0~ 25.0 25.1~ 50.0								
	8 10 12	(10) (12) (13) (14) 15 16	10.0~ 25.0								
		(10)(10)→Applicable to V8. (12 13 14)→Applicable to V8, 10.	25.1~ 50.0 50.1~ 75.0 75.1~ 100.0								
			10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0								
	8 10 12 15 16 20	(20) 25	10.0~ 25.0								
		(20)(20)→Not applicable to V20.	25.1~ 50.0 50.1~ 75.0 75.1~ 100.0								
Precision Grade ASH ASC PASC SASCH	8 10 12 15 16 20 25	30 35	10.0~ 25.0								
			25.1~ 50.0								
			50.1~ 75.0 75.1~ 100.0								
	10 12 15 16 20 25 30	40 50 60	10.0~ 25.0								
			25.1~ 50.0								
			50.1~ 75.0 75.1~ 100.0								
			10.0~ 25.0								
			25.1~ 50.0								
			50.1~ 75.0 75.1~ 100.0								
			10.0~ 25.0								

Ordering Example
Part Number - D - L
NCLCH10 - 20 - 50.5

Dimension Configurable, Standard Grade / Precision Grade

Part Number	V 0.5mm Increment (V3 or More)	D	L 0.1mm Increment	Unit Price													
				Standard Grade								Precision Grade					
FNCLCH FNCLBH FNCLMH FNCSK FNCSKB FNCSKM FNCLSH	(Selection) 2.0 2.6	4.0~10.0 (0.5mm Increment)	10.0~20.0 (0.5mm Increment)	21~30 (1mm Increment)	31~40 (1mm Increment)	41~50 (1mm Increment)	51~60 (1mm Increment)	61~80 (1mm Increment)	81~100 (1mm Increment)	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0	10.0~ 25.0 25.1~ 50.0 50.1~ 75.0 75.1~ 100.0

Machining Limits of Collar Thickness and Overall Length
Length
10.0≤L≤50.0 → (D-V)/2≥1
50.1≤L≤100.0 → (D-V)/2≥3
Machining Limits of Collar Thickness and Overall Length (Material: EN 1.2510 Equiv.)
4≤D≤10 → V≤D-2
10.5≤D≤30 → V≤D-4
31≤D≤60 → V≤D-6
61≤D≤80 → V≤D-8
81≤D≤100 → V≤D-10
Machining Limits of V and Overall Length
L≤Vx8

Ordering Example
Part Number - V - D - L
FNCLCH - V10.5 - D19.5 - L50.5

Alterations
Part Number - V - D - L - (VKC)
FNCLBH - V10.5 - D30 - L30.5 - VKC

Not applicable to L Dimension Configurable Type.

Alteration	Code	Spec.
I.D. Tolerance 	VKC	Changes the I.D. Tolerance to H7. Ordering Code: VKC Machining Conditions (6)≤D≤40 V≥3 L≤40 (6)When V<5, L≤Vx4 (6)When V≥5, L≤Vx3 Thickness Conditions D D-V 6~15 D-V≥3 15.5~18 D-V≥4 18.5~20 D-V≥5 21~40 D-V≥6

Metal Collar

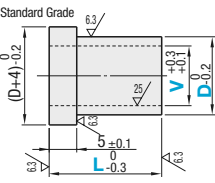
Flanged, Standard Grade / Precision Grade



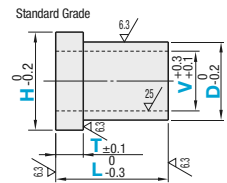
Type		Material	Surface Treatment	Hardness
Standard Grade	Configurable			
-	FTCLS	EN 1.0038 Equiv.	-	-
-	FTCLC FTCLMC	EN 1.1191 Equiv.	Black Oxide	-
TCLB	FTCLB FTCLMB		Electroless Nickel Plating	
TCLM	FTCLM FTCLMM	Brass (58Ni40Cu) Equiv.	-	-
-	FTCLBB	Aluminum Alloy 2000 series	Clear Anodize	-
TCLA	FTCLA		Black Anodize	
-	FTCLAB	EN 1.4301 Equiv.	-	-
TCLSS	FTCLSS		-	
-	FTCLCH FTCLBH	EN 1.1191 Equiv.	Black Oxide	45~50HRC
-	FTCLMH	EN 1.2510 Equiv.	Electroless Nickel Plating	55HRC~
-	FTCLSK		-	
-	FTCLSH FTCMSH	EN 1.4021 Equiv.	-	45~50HRC

Depending on thickness and length, EN 1.1191 Equiv. Hardened Type may be less than 45HRC.
Stainless Steel Hardened Type may be discolored due to hardening.

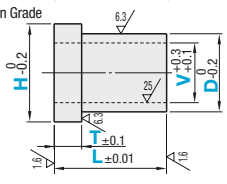
Standard



Dimension Configurable



Circumference C0.5 or Less



Standard Type, Standard Grade

Part Number	V	D Selection	L
Type			0.1mm Increment
2	5 6 8 10		10.0~16.0
3	5 6 8 10 12		
4	6 8 10 12 13 14 15 16 20		10.0~50.0
5	8 10 12 13 14 15 16 20		
6	8 10 12 13 14 15 16 20 25		
8	10 12 13 14 15 16 20 25 30		
10	12 13 14 15 16 20 25 30 35 40 50		
12	15 16 20 25 30 35 40 50		10.0~100.0
15	20 25 30 35 40 50 60		
16	20 25 30 35 40 50 60		
20	25 30 35 40 50 60		
25	30 35 40 50 60		
30	40 50 60		

Part Number	V	Unit Price
Type		L10.0-25.0 25.1-50.0 50.1-75.0 75.1-100.0
2		- - - -
3 4 5		- - - -
6		- - - -
8 10		- - - -
12		- - - -
15		- - - -
16		- - - -
20		- - - -
25		- - - -
30		- - - -

Part Number	V	Unit Price
Type		L10.0-25.0 25.1-50.0 50.1-75.0 75.1-100.0
2		- - - -
3 4 5		- - - -
6		- - - -
8 10		- - - -
12		- - - -
15		- - - -
16		- - - -
20		- - - -
25		- - - -
30		- - - -

Ordering Example
Part Number - D - L
TCLB10 - 20 - 60.0

Standard Grade, Dimension Configurable

Part Number	V	D	H	T	L	Unit Price							
	0.5mm Increment (V3 or More)			1mm Increment	0.1mm Increment	FTCLS	FTCLC	FTCLB	FTCLM	FTCLBB	FTCLA	FTCLAB	FTCLSS
FTCLS FTCLC FTCLB FTCLM FTCLBB FTCLA FTCLAB FTCLSS	(Selection)	4.0~10.0 (0.5mm Increment)	6.0~20.0 (0.5mm Increment)	1~20 (T≤L-1)	10.0~ 25.0								
					25.1~ 50.0								
					50.1~ 75.0								
					75.1~ 100.0								
		10.0~ 25.0	12.5~30 (0.5mm Increment)		10.0~ 25.0								
					25.1~ 50.0								
					50.1~ 75.0								
					75.1~ 100.0								
		21~30 (1mm Increment)	23~40 (1mm Increment)		10.0~ 25.0								
					25.1~ 50.0								
					50.1~ 75.0								
					75.1~ 100.0								
FTCLCH FTCLBH FTCLMH FTCLSK FTCLSH	(0.5mm Increment)	31~40 (1mm Increment)	33~50 (1mm Increment)	FTCLBB (2≤T≤L-2)	10.0~ 25.0								
					25.1~ 50.0								
					50.1~ 75.0								
					75.1~ 100.0								
	(1mm Increment)	41~50 (1mm Increment)	43~60 (1mm Increment)		10.0~ 25.0								
					25.1~ 50.0								
					50.1~ 75.0								
					75.1~ 100.0								
	(1mm Increment)	51~60 (1mm Increment)	53~70 (1mm Increment)		10.0~ 25.0								
					25.1~ 50.0								
					50.1~ 75.0								
					75.1~ 100.0								

⚠ D-V Machining Conditions
10.0≤L≤50.0 → (D-V)/2≥1
50.1≤L≤100.0 → (D-V)/2≥3

⚠ D-V Machining Conditions
(FTCLSK, FTCLBB)
4≤D≤10 → V≤D-2
10.5≤D≤30 → V≤D-4
31≤D≤60 → V≤D-6

⚠ H-D≥2

⚠ D/10≤L≤Vx8

Ordering Example
Part Number - V - D - H - T - L
FTCLB - V10.5 - D20 - H30 - T4 - L23.8

Precision Grade, Dimension Configurable

Part Number	V	D	H	T	L	Unit Price			
	0.5mm Increment (V3 or More)			0.5mm Increment	0.1mm Increment	FTCLMC	FTCLMB	FTCLMM	FTCMSH
FTCLMC FTCLMB FTCLMM FTCMSH	(Selection)	4.0~10.0 (0.5mm Increment)	6.0~20.0 (0.5mm Increment)	1.0~20.0	10.0~ 25.0				
					25.1~ 50.0				
					50.1~ 75.0				
					75.1~100.0				
		10.5~20 (0.5mm Increment)	12.5~30 (0.5mm Increment)	2.0~20.0	10.0~ 25.0				
					25.1~ 50.0				
					50.1~ 75.0				
					75.1~100.0				
		21~30 (1mm Increment)	23~40 (1mm Increment)		10.0~ 25.0				
					25.1~ 50.0				
					50.1~ 75.0				
					75.1~100.0				
	(0.5mm Increment)	31~40 (1mm Increment)	33~50 (1mm Increment)		10.0~ 25.0				
					25.1~ 50.0				
					50.1~ 75.0				
					75.1~100.0				
	(1mm Increment)	41~50 (1mm Increment)	43~60 (1mm Increment)	3.0~20.0	10.0~ 25.0				
					25.1~ 50.0				
					50.1~ 75.0				
					75.1~100.0				
	(1mm Increment)	51~60 (1mm Increment)	53~70 (1mm Increment)		10.0~ 25.0				
					25.1~ 50.0				
	(1mm Increment)				50.1~ 75.0				
					75.1~100.0				

⚠ D-V Machining Conditions ⚠ H-D≥2 ⚠ T≤L-1 ⚠ D/10≤L≤Vx8
4≤D≤10 → V≤D-2
10.5≤D≤30 → V≤D-4
31≤D≤60 → V≤D-6



• Standard Grade
Part Number - V - D - H - T - L - (TCB, TCC, TCD, TCE, CC, VM, (VMA), MC, (WMC), SLC, VKC)
FTCLB - V10.5 - D20 - H30 - T4 - L23.8 - TCB
• Precision Grade
Part Number - V - D - H - T - L - (TSA, TSB, TSC, TSD, TSE, CC, VM, (VMA), MC, (WMC), SLC, VKC)
FTCLMB - V10.5 - D20 - H30 - T4 - L23.8 - TSB

⊗ Not applicable to Standard Type. ⊗ Not applicable to Anodized Products. ⊗ Not applicable to Hardened Type (products with hardness indications H).

Alterations	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
Code	TCB	TCC	TCD	TCE
	Changes shoulder thickness tolerance (T). T -0.1 T -0.3 Ordering Code TCB	Changes shoulder thickness tolerance (T). T +0.3 T +0.1 Ordering Code TCC	Changes shoulder thickness tolerance (T). T 0 T -0.2 Ordering Code TCD	Changes shoulder thickness tolerance (T). T +0.2 T 0 Ordering Code TCE
⚠ Applicable to Standard Grade.				

Alterations	Shoulder Thickness Tolerance	Negative Tolerance	Positive Tolerance	Zero, Negative Tolerance	Zero, Positive Tolerance
Code	TSA	TSB	TSC	TSD	TSE
	Changes shoulder thickness tolerance (T). T ±0.025 Ordering Code TSA	Changes shoulder thickness tolerance (T). T -0.01 T -0.06 Ordering Code TSB	Changes shoulder thickness tolerance (T). T +0.06 T +0.01 Ordering Code TSC	Changes shoulder thickness tolerance (T). T 0 T -0.05 Ordering Code TSD	Changes shoulder thickness tolerance (T). T +0.05 T 0 Ordering Code TSE
⚠ Applicable to Precision Grade.					

	C Chamfering (One Side - Both Sides)	Tapping	Set Screw Hole (1-set 2-set)	Slitting	I.D. Tolerance																																																																																		
Alterations		⚠ Applicable to Dimension Configurable Type only.		⚠ Combination with other alterations is not available.																																																																																			
Code	CC	VM (Coarse Thread) VMA (Fine Thread)	MC, WMC	SLC	VKC																																																																																		
Spec.	Chamfers C plane. Ordering Code CC1.5 ⚠ CC=0.5mm Increment ⚠ CC<(D-V) / 2	Adds a tapped hole (through). Ordering Code VM: V should be specified as VM or VMA. Ex.) FTCLS-VMA4-D10-H13-T18 ⚠ L≤Mx8 <table><thead><tr><th>Tapped Hole Dia</th><th>VM Pitch (Coarse)</th><th>VMA Pitch (Fine)</th><th>L max</th></tr></thead><tbody><tr><td>4</td><td>0.7</td><td>0.5</td><td>20</td></tr><tr><td>5</td><td>0.8</td><td>0.5</td><td>30</td></tr><tr><td>6</td><td>1.0</td><td>0.75</td><td>35</td></tr><tr><td>8</td><td>1.25</td><td>0.75</td><td>40</td></tr><tr><td>10</td><td>1.5</td><td>1.0</td><td>50</td></tr><tr><td>12</td><td>1.75</td><td>1.0</td><td>55</td></tr><tr><td>16</td><td>2.0</td><td>1.5</td><td>90</td></tr><tr><td>18</td><td>-</td><td>1.5</td><td>100</td></tr><tr><td>20</td><td>2.5</td><td>-</td><td>100</td></tr></tbody></table>	Tapped Hole Dia	VM Pitch (Coarse)	VMA Pitch (Fine)	L max	4	0.7	0.5	20	5	0.8	0.5	30	6	1.0	0.75	35	8	1.25	0.75	40	10	1.5	1.0	50	12	1.75	1.0	55	16	2.0	1.5	90	18	-	1.5	100	20	2.5	-	100	Adds a tapped hole (coarse thread) at D part. Ordering Code MC3 WMC5 ⚠ For the condition of thickness (D-V) / 2, see table below. ⚠ L≥MC, WMCx3 ⚠ MC, WMC=Select from table below. <table><thead><tr><th>MC, WMC</th><th>(D-V)/2</th></tr></thead><tbody><tr><td>3, 4</td><td>3 or More</td></tr><tr><td>5.6, 8</td><td>5 or More</td></tr><tr><td>10, 12</td><td>8 or More</td></tr></tbody></table>	MC, WMC	(D-V)/2	3, 4	3 or More	5.6, 8	5 or More	10, 12	8 or More	Adds a slit. Ordering Code SLC ⚠ For the condition of thickness (D-V) / 2, see table below. ⚠ Slit width is fixed. <table><thead><tr><th>O.D. D</th><th>SLC</th><th>(D-V)/2</th></tr></thead><tbody><tr><td>10.0~20.0</td><td>1</td><td>5 or Less</td></tr><tr><td>20.5~40</td><td>2</td><td>10 or Less</td></tr><tr><td>41~</td><td>3</td><td>20 or Less</td></tr></tbody></table> ⚠ D, V and L dimension tolerances are the values before alteration. ⚠ They may change after alteration depending on materials.	O.D. D	SLC	(D-V)/2	10.0~20.0	1	5 or Less	20.5~40	2	10 or Less	41~	3	20 or Less	Changes the I.D. Tolerance to H7. Ordering Code VKC Machining Conditions ⚠ D≥6 V≥3 L≤Vx5 <table><thead><tr><th>D</th><th>D-V</th></tr></thead><tbody><tr><td>6~10</td><td>D-V/2</td></tr><tr><td>10.5~20</td><td>D-V/3</td></tr><tr><td>21~30</td><td>D-V/4</td></tr><tr><td>31~40</td><td>D-V/8</td></tr><tr><td>41~50</td><td>D-V/10</td></tr><tr><td>51~60</td><td>D-V/12</td></tr><tr><td>61~70</td><td>D-V/14</td></tr><tr><td>71~80</td><td>D-V/16</td></tr><tr><td>81~90</td><td>D-V/18</td></tr><tr><td>91~100</td><td>D-V/20</td></tr></tbody></table>	D	D-V	6~10	D-V/2	10.5~20	D-V/3	21~30	D-V/4	31~40	D-V/8	41~50	D-V/10	51~60	D-V/12	61~70	D-V/14	71~80	D-V/16	81~90	D-V/18	91~100	D-V/20
Tapped Hole Dia	VM Pitch (Coarse)	VMA Pitch (Fine)	L max																																																																																				
4	0.7	0.5	20																																																																																				
5	0.8	0.5	30																																																																																				
6	1.0	0.75	35																																																																																				
8	1.25	0.75	40																																																																																				
10	1.5	1.0	50																																																																																				
12	1.75	1.0	55																																																																																				
16	2.0	1.5	90																																																																																				
18	-	1.5	100																																																																																				
20	2.5	-	100																																																																																				
MC, WMC	(D-V)/2																																																																																						
3, 4	3 or More																																																																																						
5.6, 8	5 or More																																																																																						
10, 12	8 or More																																																																																						
O.D. D	SLC	(D-V)/2																																																																																					
10.0~20.0	1	5 or Less																																																																																					
20.5~40	2	10 or Less																																																																																					
41~	3	20 or Less																																																																																					
D	D-V																																																																																						
6~10	D-V/2																																																																																						
10.5~20	D-V/3																																																																																						
21~30	D-V/4																																																																																						
31~40	D-V/8																																																																																						
41~50	D-V/10																																																																																						
51~60	D-V/12																																																																																						
61~70	D-V/14																																																																																						
71~80	D-V/16																																																																																						
81~90	D-V/18																																																																																						
91~100	D-V/20																																																																																						