



Metal Washers

Standard / Precision / High Precision Grade with Configurable Dimensions and Tolerances

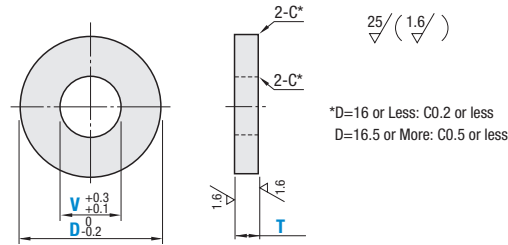
Metal Washers – Standard / Precision / High Precision Grade with Configurable Dimensions and Tolerances



RoHS10

Part Number	Material	Surface Treatment	Hardness
AWSC	1045 Carbon Steel or Equivalent	—	—
AWSB		Black Oxide	
AWSM		Electroless Nickel Plating	
AWSH	304 Stainless Steel	—	45–50 HRC min.
AWSS	440C or 420 Stainless Steel	—	

Ⓢ Stainless Steel Hardened Type (AWSH) may be discolored by hardening.



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

T Dimension Tolerance Selectable 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

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

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



Part Number Example
 Part Number - T Tolerance - D - V - T
 AWSB - B - D20.0 - V8.0 - T5.0
 AWSS - SB - D20.0 - V8.0 - T5.0

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

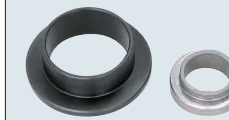
Alterations	Code	Spec.
Outer diameter and inner diameter C chamfering additional machining (One location on each side)	CC WCC (OD) CV WCV (ID)	The C surface is added to the outer and inner diameters. Ordering Code: CC1.5/WCC2.5, CV1.5/WCV2.5 0.5mm Increments Ⓢ T-CC · 2WCC, CV · 2WCV≥5 Ⓢ D≤20 Ⓢ D≤16: (D-V)/2-0.7>CV · WCV, CC · WCC Ⓢ D≥16.5: (D-V)/2-1>CV · WCV, CC · WCC Ⓢ CC/WCC and CV/WCV cannot be used together.
Inner diameter change (0.1mm unit Designation)	WVE	Ordering Code: WVE15.2 0.1mm Increments Ⓢ WVE>13 Ⓢ T≥(5 AWSH only) Ⓢ Cannot be used with VKC.



Metal Washers

Flanged

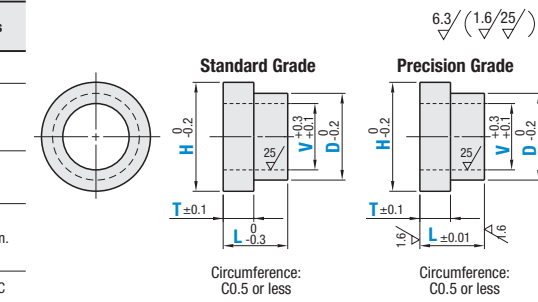
Metal Washers – Flanged



RoHS10

Part Number		Material	Surface Treatment	Hardness
Standard Grade	Precision Grade			
FTCSS	—	1018 Carbon Steel or Equivalent	—	—
FTCC	FTCMC			
FTCB	FTCMB			
FTCM	FTCMM	1045 Carbon Steel or Equivalent	Black Oxide Electroless Nickel Plating	—
FTCAA	—			
FTCAB	—	2000 Series Aluminum Alloy	Clear Anodize Black Anodize	—
FTCSU	—			
FTCSK	—	304 Stainless Steel	—	—
FTCSKB	—			
FTCSKM	—			
FTCS	FTCMS	440C or 420 Stainless Steel	Black Oxide Electroless Nickel Plating	55 HRC Min.
—	—			
—	—	—	—	45-50 HRC

Ⓢ Stainless Steel Hardened Type (FTCS / FTCMS) may be discolored by hardening.



Standard & Precision Grade

Part Number		D	H	V	T	L
		0.5 mm Increment	0.5 mm Increment	0.5 mm Increment (V 3 or more)	0.1 mm Increment	0.1 mm Increment
Standard Grade FTCSS FTCC FTCB FTCM FTCAA FTCAB FTCSU FTCSK FTCSKB FTCSKM FTCS	Precision Grade FTCMC FTCMB FTCMM FTCMS	5.0–9.0	7.0–12.0	Selection 2 2.6 0.5 mm Increment 3.0–58.0	1.0–8.0	2.0–10.0
		9.5–20.0	11.5–25.0			
		21–30	23–40			
		31–40	33–50			
		41–50	43–60			
51–60	53–70					

Ⓢ Machining Conditions Ⓢ T≤L-1

D	H	V
When 5–20	D+2±H±Dx1.5	V≤D-2
When 21–40	D+2±H±Dx1.4	V≤D-4
When 41–60	D+2±H±Dx1.2	V≤D-6

Ⓢ Machining Conditions of Material 01 Tool Steel (FTCSK / FTCSKB / FTCSKM) Ⓢ 2±T≤L-2

D	H	V
When 5–10	D+2±H±Dx1.4	V≤D-2
When 10.5–30	D+2±H±Dx1.4	V≤D-4
When 31–60	D+2±H±Dx1.2	V≤D-6



Part Number Example
 Part Number - D - H - V - T - L
 FTCMS - D25 - H30 - V8.0 - T2.0 - L5.0



Part Number Alterations
 Part Number - D - H - V - T - L - (TCB / TCC / TCD / TCE / TSA / TSB / TSC / TSD / TSE / VKC / DKC / HKC)
 FTCSM - D25 - H30 - V8.0 - T2.0 - L5.0 - TSC - VKC

Ⓢ When both Inner and Outer Diameter Tolerance Changes are specified, the concentricity is Ⓢ0.02. Ⓢ Not available for the Hardened Products.

Alterations	Code	Spec.														
I.D. Tolerance	VKC	Changes the I.D. Tolerance to H7. Ordering Code: VKC Machining Conditions Ⓢ D≥6 V≥3														
		<table border="1"> <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≥6</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> </tbody> </table>	D	D-V	6–10	D-V≥2	10.5–20	D-V≥3	21–30	D-V≥6	31–40	D-V≥8	41–50	D-V≥10	51–60	D-V≥12
D	D-V															
6–10	D-V≥2															
10.5–20	D-V≥3															
21–30	D-V≥6															
31–40	D-V≥8															
41–50	D-V≥10															
51–60	D-V≥12															

Alterations	Code	Spec.														
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														
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51–60	D-V≥12															

Ⓢ Not available for the Hardened Products (FTCSK / FTCSKB / FTCSKM / FTCS / FTCMS).

Alterations	Code	Negative Tolerance	Positive Tolerance	Zero Negative Tolerance	Zero Positive Tolerance
		TCB	TCC	TCD	TCE
Standard Class T Tolerance		Changes Shoulder Thickness Tolerance (T). T -0.1 -0.3 Ordering Code: TCB	Changes Shoulder Thickness Tolerance (T). T +0.3 +0.1 Ordering Code: TCC	Changes Shoulder Thickness Tolerance (T). T 0 -0.2 Ordering Code: TCD	Changes Shoulder Thickness Tolerance (T). T +0.2 0 Ordering Code: TCE
Ⓢ Available for Standard Grade					

Alterations	Code	Shoulder Thickness Tolerance	Negative Tolerance	Positive Tolerance	Zero Negative Tolerance	Zero Positive Tolerance
		TSA	TSB	TSC	TSD	TSE
Precision Class T Tolerance		Changes Shoulder Thickness Tolerance (T). T ±0.025 Ordering Code: TSA	Changes Shoulder Thickness Tolerance (T). T -0.01 -0.06 Ordering Code: TSB	Changes Shoulder Thickness Tolerance (T). T +0.06 +0.01 Ordering Code: TSC	Changes Shoulder Thickness Tolerance (T). T 0 -0.05 Ordering Code: TSD	Changes Shoulder Thickness Tolerance (T). T +0.05 0 Ordering Code: TSE
Ⓢ Available for Precision Grade						