

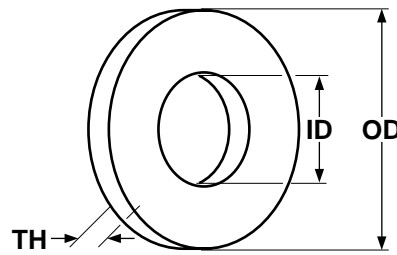
METRIC - STANDARD FLAT WASHERS (NORMAL SERIES, GRADE A)							ISO 7089
Nominal Size	ID		OD		T		
	Internal Diameter		Outside Diameter		Thickness		
	Max	Min	Max	Min	Max	Min	
1.6	1.84	1.7	4	3.7	0.35	0.25	
2	2.34	2.2	5	4.7	0.35	0.25	
2.5	2.84	2.7	6	5.7	0.55	0.45	
3	3.38	3.2	7	6.64	0.55	0.45	
3.5	3.88	3.7	8	7.64	0.55	0.45	
4	4.48	4.3	9	8.64	0.9	0.7	
5	5.48	5.3	10	9.64	1.1	0.9	
6	6.62	6.4	12	11.57	1.8	1.4	
8	8.62	8.4	16	15.57	1.8	1.4	
10	10.77	10.5	20	19.48	2.2	1.8	
12	13.27	13	24	23.48	2.7	2.3	
14	15.27	15	28	27.48	2.7	2.3	
16	17.27	17	30	29.48	3.3	2.7	
20	21.33	21	37	36.38	3.3	2.7	
24	25.33	25	44	43.38	4.3	3.7	
30	31.39	31	56	55.26	4.3	3.7	
36	37.62	37	66	64.8	5.6	4.4	

	Steel	Stainless
<b>Description</b>	A thin, flat circular part with a centrally located hole. Class 300 HV washers are also hardened and tempered.	
<b>Applications/ Advantages</b>	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. <u>Class 140 HV &amp; Class 200 HV</u> metric washers meet the majority of industrial applications in manufacturing, maintenance and repair. <u>Class 300 HV</u> metric washers are best suited for use with through-hardened cap-screws, bolts and nuts.	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. <u>Stainless</u> washers are for use with austenitic stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
<b>Material</b>	Low or medium carbon steel	Austenitic stainless steel
<b>Hardness</b>	<u>Class 140 HV</u> : HV 140 minimum (Rockwell B 75 minimum) <u>Class 200 HV</u> : HV 200-300 (Rockwell B 91.5 - C 29.8) <u>Class 300 HV</u> : HV 300-400 (Rockwell C 29.8 - 40.8)	<u>Class A 140</u> : HV 140 minimum (Rockwell B 75 minimum) <u>Class A 200</u> : HV 200-300 (Rockwell B 91.5 - C 29.8) <u>Class A 350</u> : HV 350-400 (Rockwell C 35.5 - 40.8)
<b>Plating</b>	See Appendix-A for information about the plating of flat washers.	

**Flat Washers -  
Wider I.D.**

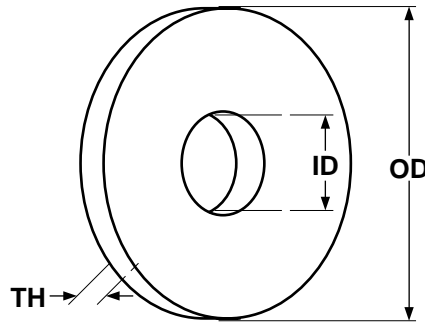
**METRIC**

**Washers**



<b>METRIC - FLAT WASHERS, WIDER I.D. (NORMAL SERIES, GRADE C)</b>						ISO 7091
Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
5	5.8	5.5	10	9.1	1.2	0.8
6	6.96	6.6	12	10.9	1.9	1.3
8	9.36	9	16	14.9	1.9	1.3
10	11.43	11	20	18.7	2.3	1.7
12	13.93	13.5	24	22.7	2.8	2.2
14	15.93	15.5	28	26.7	2.8	2.2
16	17.93	17.5	30	28.7	3.6	2.4
20	22.52	22	37	35.4	3.6	2.4
24	26.52	26	44	42.4	4.6	3.4
30	33.62	33	56	54.1	4.6	3.4
36	40	39	66	64.1	6	4

<b>Description</b>	A thin, flat circular part with a centrally located hole which is approximately 6% wider than the hole of a like-sized standard metric flat washer.
<b>Applications/ Advantages</b>	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. The wider-ID style is ideal for use with bolts which have over-sized shoulder or body diameters.
<b>Material</b>	Low or medium carbon steel
<b>Hardness</b>	HV 100 minimum (Rockwell B 56.2 minimum)
<b>Plating</b>	See Appendix-A for information about the plating of flat washers.



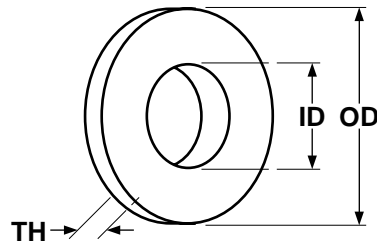
METRIC - FLAT WASHERS, LARGE O.D. (LARGE SERIES, GRADES A & C)						ISO 7093
Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
3	3.38	3.2	9	8.64	0.9	0.7
3.5	3.88	3.7	11	10.57	0.9	0.7
4	4.48	4.3	12	11.57	1.1	0.9
5	5.48	5.3	15	14.57	1.4	1
6	6.62	6.4	18	17.57	1.8	1.4
8	8.62	8.4	24	23.48	2.2	1.8
10	10.77	10.5	30	29.48	2.7	2.3
12	13.27	13	37	36.38	3.3	2.7
14	15.27	15	44	43.38	3.3	2.7
16	17.27	17	50	49.38	3.3	2.7
20	22.52	22	60	58.1	4.6	3.4
24	26.84	26	72	70.1	6	4
30	34	33	92	89.8	7	5
36	40	39	110	107.8	9.2	6.8

	Steel	Stainless
<b>Description</b>	A thin, flat circular part with a centrally located hole with outside diameter three times the nominal thread diameter of the bolt to be used with it. Class 300 HV washers are also hardened and tempered.	
<b>Applications/ Advantages</b>	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. This style washer is most similar to inch-sized fender washers.	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. This style washer is most similar to inch-sized fender washers. <u>Stainless</u> washers are for use with austenitic stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
<b>Material</b>	Low or medium carbon steel	Austenitic stainless steel
<b>Hardness</b>	Grade A: HV 140 minimum (Rockwell B75 minimum) Grade C: HV 100 minimum (Rockwell B56.2 minimum)	HV 140 minimum (Rockwell B75 minimum)
<b>Plating</b>	See Appendix-A for information about the plating of flat washers.	

# Flat Washers - Small O.D.

# METRIC

# Washers



METRIC - FLAT WASHERS, SMALL O.D. (SMALL SERIES, GRADE A)						ISO 7092
Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
1.6	1.84	1.7	3.5	3.2	0.35	0.25
2	2.34	2.2	4.5	4.2	0.35	0.25
2.5	2.84	2.7	5	4.7	0.55	0.45
3	3.38	3.2	6	5.7	0.55	0.45
3.5	3.88	3.7	7	6.64	0.55	0.45
4	4.48	4.3	8	7.64	0.55	0.45
5	5.48	5.3	9	8.64	1.1	0.9
6	6.62	6.4	11	10.57	1.8	1.4
8	8.62	8.4	15	14.57	1.8	1.4
10	10.77	10.5	18	17.57	1.8	1.4
12	13.27	13	20	19.48	2.7	2.3
14	15.27	15	24	23.48	2.7	2.3
16	17.27	17	28	27.48	2.7	2.3
20	21.33	21	34	33.38	3.3	2.7
24	25.33	25	39	38.38	4.3	3.7
30	31.33	31	50	49.38	4.3	3.7
36	37.62	37	60	58.8	5.6	4.4

	Steel	Stainless
<b>Description</b>	A thin, flat circular part with a centrally located hole. The outside diameter of this variety washer is approximately 7-12% smaller than that of a like-sized standard flat washer. Class 300 HV washers are also hardened and tempered.	A thin, flat circular part with a centrally located hole. The outside diameter of this variety washer is approximately 7-12% smaller than that of a like-sized standard flat washer.
<b>Applications/ Advantages</b>	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. The small outside diameter variety is used in applications with limited clearance areas on the bearing surface. <u>Class 140 HV</u> & <u>Class 200 HV</u> metric washers meet the majority of industrial applications in manufacturing, maintenance and repair. <u>Class 300 HV</u> metric washers are best suited for use with through-hardened cap-screws, bolts and nuts.	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. The small outside diameter variety is used in applications with limited clearance areas on the bearing surface. <u>Stainless</u> washers are for use with austenitic stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
<b>Material</b>	Low or medium carbon steel	Austenitic stainless steel
<b>Hardness</b>	<u>Class 140 HV</u> : HV 140 minimum (Rockwell B 75 minimum) <u>Class 200 HV</u> : HV 200-300 (Rockwell B 91.5 - C 29.8) <u>Class 300 HV</u> : HV 300-400 (Rockwell C 29.8 - 40.8)	<u>Class A 140</u> : HV 140 minimum (Rockwell B 75 minimum) <u>Class A 200</u> : HV 200-300 (Rockwell B 91.5 - C 29.8) <u>Class A 350</u> : HV 350-400 (Rockwell C 35.5 - 40.8)
<b>Plating</b>	See Appendix-A for information about the plating of flat washers.	