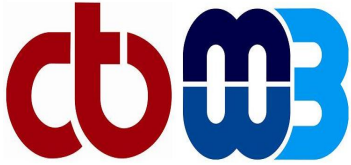


STRUCTURAL

## ASTM A490M

Heavy Hex Structural Bolting Assemblies (Metric)  
(ASTM A490M Bolt, A563M Nut & ASTM F436M)





# ASTM A490M

# Heavy Hex Structural Bolts (Metric)

Issue: 3  
 Date: 12/03/10  
 Approved: M.R. Tiddy  
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## A490M Bolt Dimensions

Thread size <i>d</i>	M16	M20	M22	M24	M27	M30	M36	
<i>P</i> pitch of thread	2	2.5	2.5	3	3	3.5	4	
<i>b</i>	Bolt ≤ 100	31	36	38	41	44	49	56
	Bolt > 100	38	43	45	48	51	56	63
<i>ds</i>	min.	15.30	19.16	21.16	23.16	26.16	29.16	35.00
	max.	16.70	20.84	22.84	24.84	27.84	30.84	37.00
<i>s</i>	min.	26.16	33.00	35.00	40.00	45.00	49.00	58.80
	max.	27.00	34.00	36.00	41.00	46.00	50.00	60.00
<i>e</i>	min.	29.56	37.29	39.55	45.20	50.85	55.37	66.44
	max.	31.18	39.26	41.57	47.34	53.12	57.74	69.28
<i>k</i>	min.	9.25	11.60	13.10	14.10	16.10	17.65	21.45
	max.	10.75	13.40	14.90	15.90	17.90	19.75	23.55
<i>k</i> <sup>1</sup>	min.	6.5	8.1	9.2	9.9	11.3	12.4	15.0
<i>dw</i> <sup>1</sup>	min.	24.9	31.4	33.3	38.0	42.8	46.5	55.9
<i>c</i>	min.	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	max.	0.8	0.8	0.8	0.8	0.8	0.8	0.8
<i>da</i>	max.	18.2	22.4	24.4	26.4	30.4	33.4	39.4
<i>r</i>	min.	0.6	0.8	0.8	1.0	1.2	1.2	1.5

<sup>1</sup>) The maximum value of *dw* shall not exceed the actual width across flats

## Materials

Medium carbon alloy steel in accordance with ASTM A490M

## Characteristic

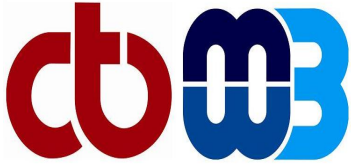
## Standard

Materials & Manufacture	ASTM A490M
Finish	Self Colour / Black
Mechanical Properties	ASTM A490M
Dimensions & Tolerances	ASME B18.2.3.7M
Threads	ASME B1.13M tolerance class 6g
Workmanship	ASTM F788 / F788M
Magnetic Particle Inspection	ASTM A490M
Product Marking	ASTM A490M

## A490M Bolt Length Tolerances for Bolt Diameters M16-M35 inc.

Nominal Length	Length Tolerance
Up to and including 50	± 1.2
Over 50 up to and including 80	± 1.5
Over 80 up to and including 120	± 1.8
Over 120 up to and including 150	± 2.0
Over 150	± 4.0

All dimensions are in millimetres



# ASTM A490M

# Heavy Hex Structural Bolts (Metric)

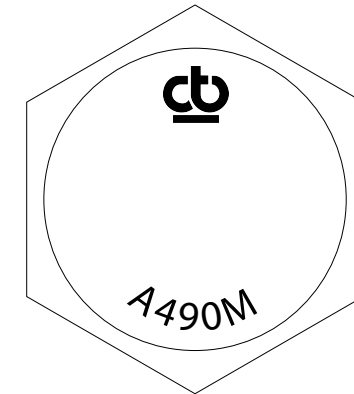
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## A490M Maximum Grip Gauging Length and Minimum Body Lengths

Nominal bolt dia. & thread pitch	M16 x 2		M20 x 2.5		M22 x 2.5		M24 x 3		M27 x 3		M30 x 3.5		M36 x 4		
	<i>l</i> Nominal length	<i>lg</i> max	<i>ls</i> min	<i>lg</i> max	<i>ls</i> min	<i>lg</i> max	<i>ls</i> min	<i>lg</i> max	<i>ls</i> min	<i>lg</i> max	<i>ls</i> min	<i>lg</i> max	<i>ls</i> min	<i>lg</i> max	<i>ls</i> min
45	14	8													
50	19	13	14	6.5											
55	24	18	19	11.5	17	9.5									
60	29	23	24	16.5	22	14.5	19	10							
65	34	28	29	21.5	27	19.5	24	15	21	12					
70	39	33	34	26.5	32	24.5	29	20	26	17	21	10.5			
75	44	38	39	31.5	37	29.5	34	25	31	22	26	15.5			
80	49	43	44	36.5	42	34.5	39	30	36	27	31	20.5	24	12	
85	54	48	49	41.5	47	39.5	44	35	41	32	36	25.5	29	17	
90	59	53	54	46.5	52	44.5	49	40	46	37	41	30.5	34	22	
95	64	58	59	51.5	57	49.5	54	45	51	42	46	35.5	39	27	
100	69	63	64	56.5	62	54.5	59	50	56	47	51	40.5	44	32	
110	72	66	67	59.5	65	57.5	62	53	59	50	54	43.5	47	35	
120	82	76	77	69.5	75	67.5	72	63	69	60	64	53.5	57	45	
130	92	86	87	79.5	85	77.5	82	73	79	70	74	63.5	67	55	
140	102	96	97	89.5	95	87.5	92	83	89	80	84	73.5	77	65	
150	112	106	107	99.5	105	97.5	102	93	99	90	94	83.5	87	75	
160	122	116	117	109.5	115	107.5	112	103	109	100	104	93.5	97	85	
170	132	126	127	119.5	125	117.5	122	113	119	110	114	103.5	107	95	
180	142	136	137	129.5	135	127.5	132	123	129	120	124	113.5	117	105	
190	152	146	147	139.5	145	137.5	142	133	139	130	134	123.5	127	115	
200	162	156	157	149.5	155	147.5	152	143	149	140	144	133.5	137	125	
210	172	166	167	159.5	165	157.5	162	153	159	150	154	143.5	147	135	
220	182	176	177	169.5	175	167.5	172	163	169	160	164	153.5	157	145	
230	192	186	187	179.5	185	177.5	182	173	179	170	174	163.5	167	155	
240	202	196	197	189.5	195	187.5	192	183	189	180	184	173.5	177	165	
250	212	206	207	199.5	205	197.5	202	193	199	190	194	183.5	187	175	
260	222	216	217	209.5	215	207.5	212	203	209	200	204	193.5	197	185	
270	232	226	227	219.5	225	217.5	222	213	219	210	214	203.5	207	195	
280	242	236	237	229.5	235	227.5	232	223	229	220	224	213.5	217	205	
290	252	246	247	239.5	245	237.5	242	233	239	230	234	223.5	227	215	
300	262	256	257	249.5	255	247.5	252	243	249	240	244	233.5	237	225	

*lg* is grip gauging length; *ls* is body length

## A490M Head Marking

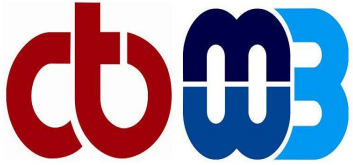


## A490M Bearing Surface Runout and Straightness

Nominal bolt dia	Runout Bearing Surface max (mm)	Straightness max (mm/mm)
M16	0.48	0.006
M20	0.59	0.006
M22	0.63	0.006
M24	0.70	0.006
M27	0.77	0.006
M30	0.77	0.006
M36	1.01	0.006

All dimensions are in millimetres





# ASTM A490M

# Heavy Hex Structural Bolts (Metric)

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Approved: M.R. Tiddy

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## A490M Tensile Load and Proof Load Requirements for Full-Size Bolts

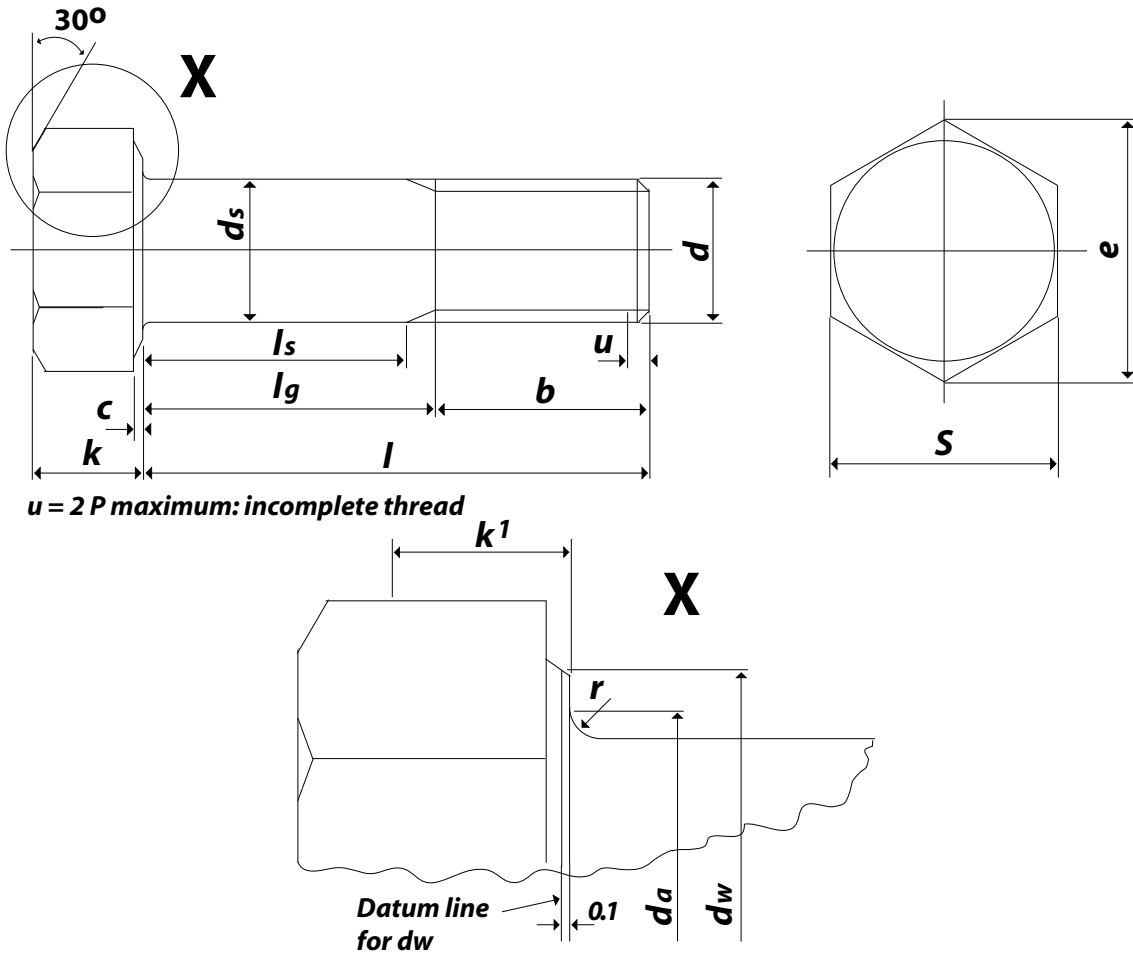
Nominal Dia, & Thread Pitch	Stress Area mm <sup>2</sup>	Tensile Load min		Proof Load # kN	Alternative Proof Load* kN	Hardness Rockwell HRC	
		Min (kN)	Max (kN)			min	max
M16 x 2	157	163	190	130	148	33	39
M20 x 2.5	245	255	296	203	230	33	39
M22 x 2.5	303	315	366	251	285	33	39
M24 x 3	353	367	427	293	332	33	39
M27 x 3	459	477	555	381	431	33	39
M30 x 3.5	561	583	679	466	527	33	39
M36 x 4	817	850	989	678	768	33	39

# Proof load determined by length measurement method

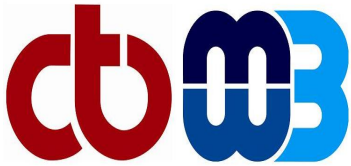
\* Alternative Proof load determined by yield strength method

## A490M Tensile Strength Requirements for Specimens Machined from Bolts

Nominal Dia,	Tensile Strength		Yield Strength min MPa	Elongation in 4D min %	Reduction of Area min %
	Min MPa	Max MPa			
	M16 to M36 inc	1040	1210	940	14



All dimensions are in millimetres



**ASTM A490M Bolt Finish Weight - Kilos/100**

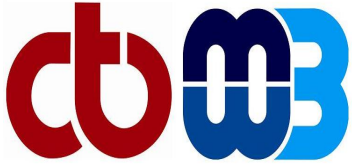
**ASTM A490M**  
**Heavy Hex**  
**Structural Bolts**  
**(Metric)**

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Bolt Dia \ Bolt Length		M16	M20	M22	M24	M27	M30	M36
45		10.71						
50		11.38	18.85					
55		12.04	20.10	25.58				
60		12.70	21.40	26.85	33.76			
65		13.36	22.60	28.12	35.21	48.40		
70		14.02	23.87	29.39	36.66	50.64	60.66	
75		14.68	25.13	30.44	38.11	52.88	63.43	
80		15.34	26.40	31.93	39.56	55.12	66.21	124.50
85		16.00	27.69	33.20	41.01	57.36	68.98	128.50
90		16.66	28.90	34.47	42.46	59.60	71.76	132.50
95		17.32	30.15	35.74	43.91	61.84	74.53	135.40
100		17.98	31.50	37.01	45.36	64.08	77.30	141.30
110		19.55	34.00	39.99	48.91	68.57	82.84	149.29
120		21.13	36.44	42.97	52.46	73.06	88.39	157.28
130		22.71	38.95	45.96	56.01	77.56	93.94	165.27
140		24.29	41.50	48.94	59.56	82.05	99.49	173.26
150		25.87	44.00	51.93	63.11	86.55	105.04	181.25
160		27.44	46.50	54.91	66.66	91.04	110.59	189.24
170		29.02	49.02	57.89	70.21	95.54	116.15	197.23
180		30.60	51.53	60.88	73.77	100.03	121.69	205.22
190		32.18	54.40	63.86	77.32	104.53	127.23	213.21
200		33.76	56.60	66.85	80.87	109.02	132.78	221.20
210		35.34	59.10	69.83	84.42	113.52	138.32	229.19
220		36.91	61.70	72.81	87.97	118.01	143.87	237.18
230		38.49	64.11	75.80	91.52	122.50	149.42	245.17
240		40.07	66.65	78.78	95.07	127.00	154.97	253.16
250		41.65	69.20	81.77	98.62	131.49	160.52	261.15
260		43.23	71.70	84.75	102.18	135.99	166.07	269.14
270		44.81	74.20	87.73	105.73	140.48	171.62	277.13
280		46.38	76.70	90.72	109.28	144.98	177.17	285.12
290		47.96	79.25	93.70	112.83	149.47	182.71	293.11
300		49.54	81.90	96.69	116.38	153.97	188.26	301.10

Weights are for guidance only and may vary in line with product tolerances

All dimensions are in millimetres



# ASTM A563M

## Heavy Hex Nuts (Metric) for use with ASTM A490M Bolts

Issue: 3  
Date: 12/03/10  
Approved: M.R. Tiddy  
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### A563M Nut Dimension

### Materials

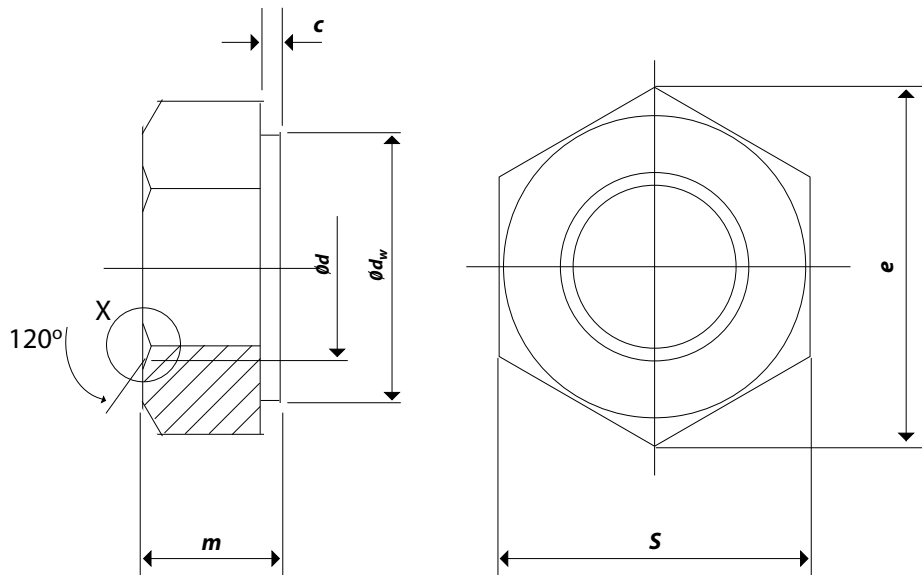
Carbon and carbon alloy steel in accordance with ASTM A563M class 10S

### Characteristic Standard

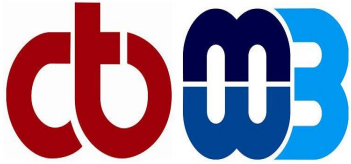
Materials & Manufacture	ASTM A563M Class 10S
Finish	Self Colour / Black
Mechanical Properties	ASTM A563M Class 10S
Dimensions & Tolerances	ANSI B18.2.4.6M
Threads	ASME B1.13M tolerance class 6H
Workmanship	ASTM F812 / F812M
Product Marking	ASTM A563M Class 10S

Nominal size and thread pitch <i>d</i>	<i>s</i>		<i>e</i>		<i>m</i>		<i>dw</i> <sup>1)</sup>	<i>c</i>		Total runout of bearing surface
	Width across flats		Width across corners		Thickness		Bearing face diameter	Washer face thickness		
	max	min	max	min	max	min	min	max	min	
<b>M16 x 2</b>	27.00	26.16	31.18	29.56	17.1	16.4	24.9	0.8	0.4	0.47
<b>M20 x 2.5</b>	34.00	33.00	39.26	37.29	20.7	19.4	31.4	0.8	0.4	0.58
<b>M22 x 2.5</b>	36.00	35.00	41.57	39.55	23.6	22.3	33.3	0.8	0.4	0.63
<b>M24 x 3</b>	41.00	40.00	47.34	45.20	24.2	22.9	38.0	0.8	0.4	0.72
<b>M27 x 3</b>	46.00	45.00	53.12	50.85	27.6	26.3	42.8	0.8	0.4	0.80
<b>M30 x 3.5</b>	50.00	49.00	57.74	55.37	30.7	29.1	46.6	0.8	0.4	0.87
<b>M36 x 4</b>	60.00	58.80	69.28	66.44	36.6	35.0	55.9	0.8	0.4	1.05

<sup>1)</sup> The maximum *dw* shall not exceed the actual width across flats



All dimensions are in millimetres



# ASTM A563M

## Heavy Hex Nuts (Metric) for use with ASTM A490M Bolts

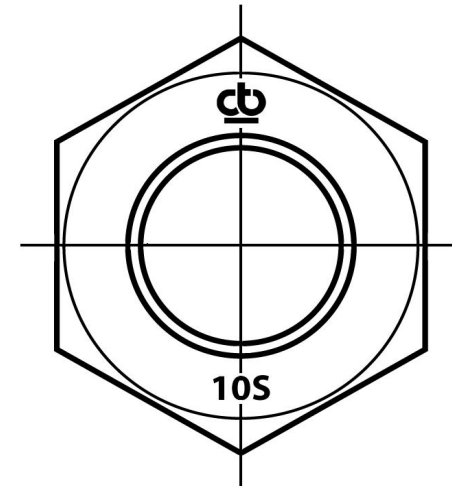
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Approved: M.R. Tiddy  
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### A563M Nut Proof Loads & Nut Hardness

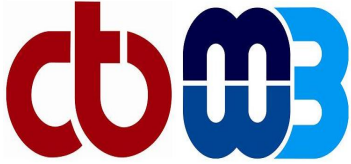
Nominal size and thread pitch	Proof Loads		Hardness	
	10S		10S	
	Self Colour / Black (6H fit)		Self Colour / Black (6H fit)	
	kN	min	max	
HRC		HRC	HRC	
M16 x 2	195	26	38	
M20 x 2.5	305	26	38	
M22 x 2.5	377	26	38	
M24 x 3	439	26	38	
M27 x 3	571	26	38	
M30 x 3.5	698	26	38	
M36 x 4	1020	26	38	

### ASTM A563M Nut finish weight - Kilos/100

M12	M16	M20	M22	M24	M27	M30	M36
2.80	5.20	7.99	10.64	17.65	22.90	29.39	49.90
Weights are for guidance only and may vary in line with product tolerances							



All dimensions are in millimetres



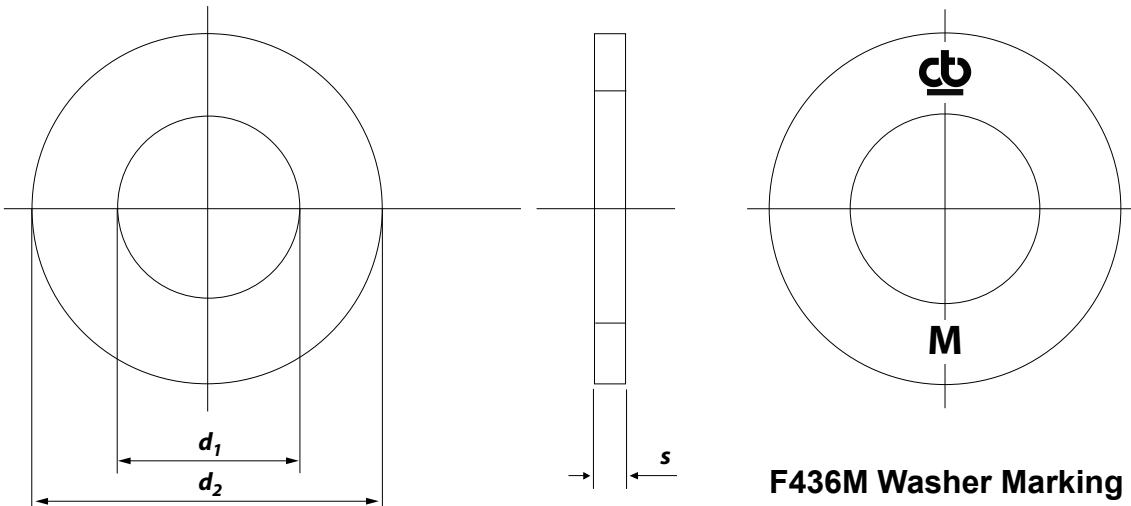
# ASTM F436M

## Hardened Steel Washers (Metric) for use with ASTM A490M Bolts

Issue: 3  
Date: 12/03/10  
Approved: M.R. Tiddy  
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### F436M Washer Dimensions

Nominal Washer Size		M16	M20	M22	M24	M27	M30	M36
$d_1$	max	18.4	22.5	24.5	26.5	30.5	33.6	39.6
	min	18.0	22.0	24.0	26.0	30.0	33.0	39.0
$d_2$	max	34.0	42.0	44.0	50.0	56.0	60.0	72.0
	min	32.4	40.4	42.4	48.4	54.1	58.1	70.1
$h$	max	4.6	4.6	4.6	4.6	4.6	4.6	4.6
	min	3.1	3.1	3.4	3.4	3.4	3.4	3.4



### Materials

Carbon steel in accordance with ASTM F436M

### Characteristic Standard

Materials & Manufacture	ASTM F436M
Finish / Coatings	Self Colour / Black ASTM F436M
Mechanical Properties	ASTM F436M
Dimensions & Tolerances	ASTM F436M
Workmanship	ASTM F436M
Product Marking	ASTM F436M

### ASTM F436M Washer finish weight - Kilos/100

M12	M16	M20	M22	M24	M27	M30	M36
1.20	2.15	3.20	4.55	5.90	6.60	7.55	13.30

Weights are for guidance only and may vary in line with product tolerances

### F436M Washer Mechanical Properties

Nominal Washer Size	Hardness (HRC)	
	Self Colour / Black	
	min	max
M16 to M36 inclusive	38	45

All dimensions are in millimetres

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