



Cooper & Turner Ltd

STRUCTURAL

**ASTM A325M
HEAVY HEX STRUCTURAL
BOLTING ASSEMBLIES (METRIC)
(A325M BOLT, A563M NUT & F436M WASHER)**

A325M BOLT DIMENSIONS

Thread d	M16	M20	M22	M24	M27	M30	M36	
P pitch of thread	2	2.5	2.5	3	3	3.5	4	
b	Bolt ≤100	31	36	38	41	44	49	56
	Bolt >100	38	43	45	48	51	56	63
ds	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
s	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
e	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
dw ¹⁾	min.	24.9	31.4	33.3	38.0	42.8	46.5	55.9
k'	min.	6.5	8.1	9.2	9.9	11.3	12.4	15.0
k	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
c	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
da	max.	18.2	22.4	24.4	26.4	30.4	33.4	39.4
r	min.	0.6	0.8	0.8	1.0	1.2	1.2	1.5

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

MATERIALS

Medium carbon, carbon boron, medium carbon ally or alloy boron steel in accordance with ASTM A325M.

CHARACTERISTIC

STANDARD

Materials & Manufacture	ASTM A325M	
Finish / Coatings	Self Colour/Black	ASTM A325M
	Hot Dip Galvanized	ASTM A153 / A153M Class C
Mechanical Properties	ASTM A325M	
Dimensions & Tolerances	ASME B18.2.3.7M	
Threads	ASME B1.13M tolerance class 6g	
Workmanship	ASTM F788 / F788M	
Product Marking	ASTM A325M	

A325M BOLT LENGTH TOLERANCES for BOLT DIAMETERS M16-M36 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

A325M MAXIMUM GRIP GAUGING LENGTH and MINIMUM BODY LENGTHS

Nom. 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	
	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.	ls min.	lg max.
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

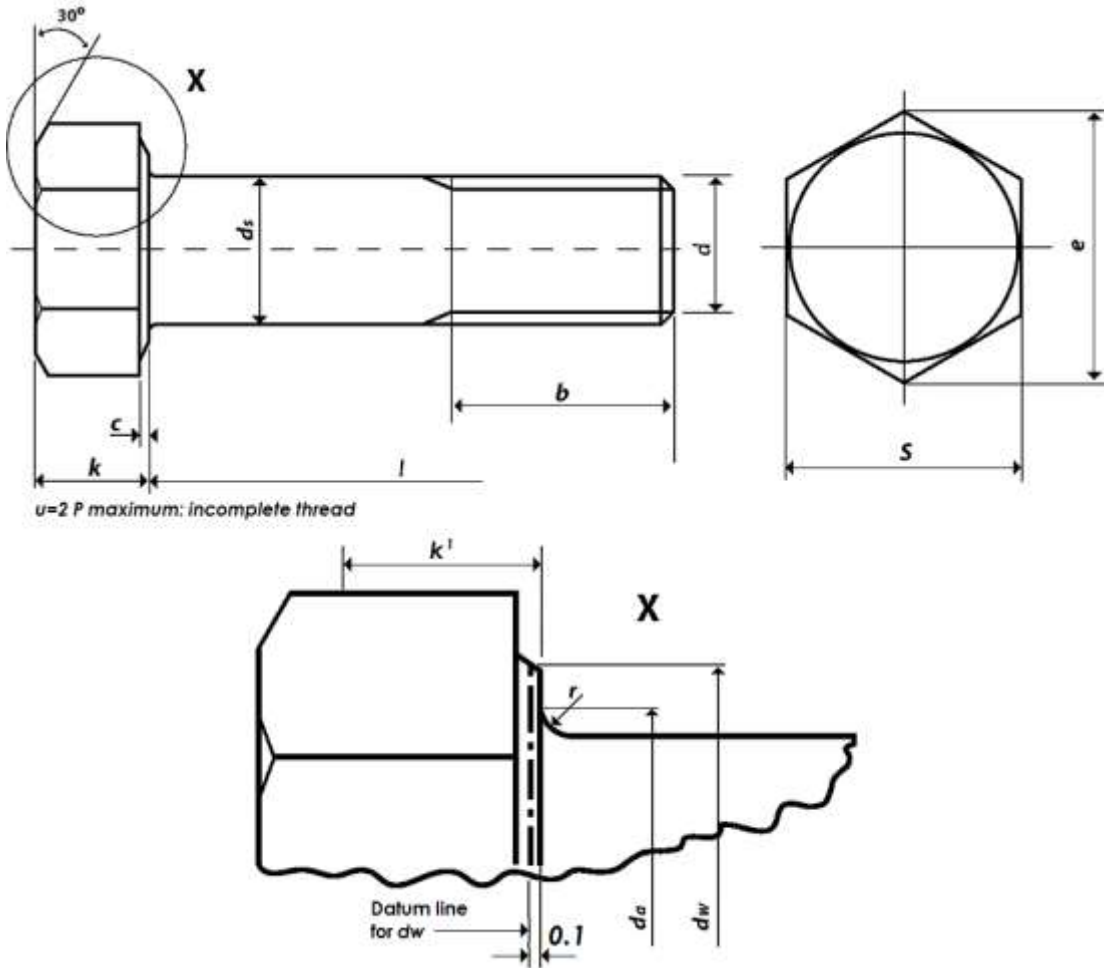
A325M HEAD MARKING



A325M BEARING SURFACE RUNOUT and STRAIGHTNESS

Nominal Bolt Diameter	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



A325M TENSILE LOAD and PROFF LOAD REQUIREMENTS for FULL SIZE BOLTS

Nominal Dia. & Thread Pitch	Stress Area mm ²	Tensile Load min kN	Proof Load# kN	Alterative Proof Load* kN	Hardness Rockwell HRC	
					min	max
M16 X 2	157	130	94.2	104	25	34
M20 X 2.5	245	203	147	162	25	34
M22 X 2.5	303	251	182	200	25	34
M24 X 3	353	293	212	233	25	34
M37 X 3	459	381	275	303	19	30
M30 X 3.5	561	466	337	370	19	30
M36 X 4	817	678	490	539	19	30

Proof load determined by length method

*Alternative Proof Load determined by yield strength method

A325M TENSILE STRENGTH REQUIREMENTS for SPECIMENS MACHINED from BOLTS

Nominal Dia	Tensile Strength min	Yield Strength min	Elongation in 4D min	Reduction of Area min
	mm ²	kN	kN	%
M16 to M36 inc	830	660	14	35

All dimensions are in millimetres

ASTM A325M

HEAVY HEX STRUCTURAL BOLTS (METRIC)

A325M BOLT FINISH WEIGHT – KILO's/100

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

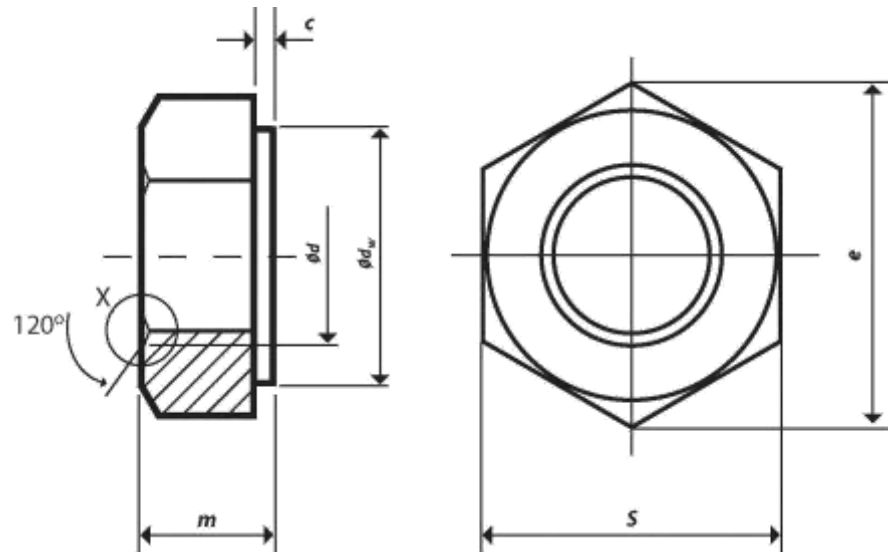
ASTM A325M HEAVY HEX NUTS (Metric)

for use with ASTM A325M BOLTS

A563M NUT DIMENSION CLASSES 8S & 10S

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

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



MATERIALS

Carbon, carbon alloy steel in accordance with ASTM A563M classes 8s & 10s

CHARACTERISTIC

STANDARD

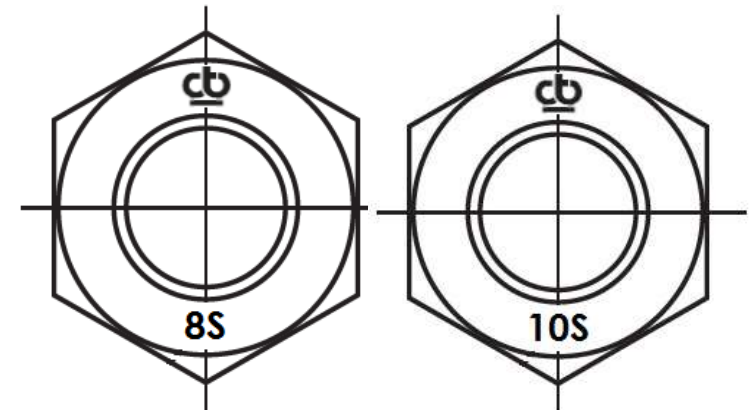
Materials & Manufacture	ASTM A563M Classes 8S & 10S	
Finish / Coatings	Self Colour / Black	ASTM A563M
	Hot Dip Galvanized	ASTM A153 / A153M CLASS C
Mechanical Properties	Self Colour/Black	ASTM A563M CLASS 8S
	Hot Dip Galvanized	ASTM A563M CLASS 10S
Dimensions & Tolerances	ANSI B18.2.4.6M	
Threads	Self Colour/Black	ASME B1.13M tolerance class 6H
	Hot Dip Galvanized	ASTM A563M Clause 7.8
Workmanship	ASTM F812 / F812M	
Product Marking	ASTM A563M C;ASSES 8S & 10S	

ASTM A325M HEAVY HEX NUTs (Metric) for use with ASTM A325M BOLTS

A563M NUT PROOF LOADS & NUT HARDNESS

Nominal size and thread pitch	PROOF LOADS		HARDNESS			
	8S	10S	8S		10S	
	Self Colour / Black (6H fit)	Hot Dip Galvanized Overtapped	Self Colour / Black (6H fit)		Hot Dip Galvanized Overtapped	
	kN	kN	min HRB	max HRC	min HRC	max HRC
M16 x 2	169	183	89	38	26	38
M20 x 2.5	263	285	89	38	26	38
M22 x 2.5	326	353	89	38	26	38
M24 x 3	379	411	89	38	26	38
M27 x 3	493	535	89	38	26	38
M30 x 3.5	603	654	89	38	26	38
M36 x 4	878	952	89	38	26	38

A563M NUT MARKING



ASTM A563M NUT FINISH WEIGHT – KILOs / 100

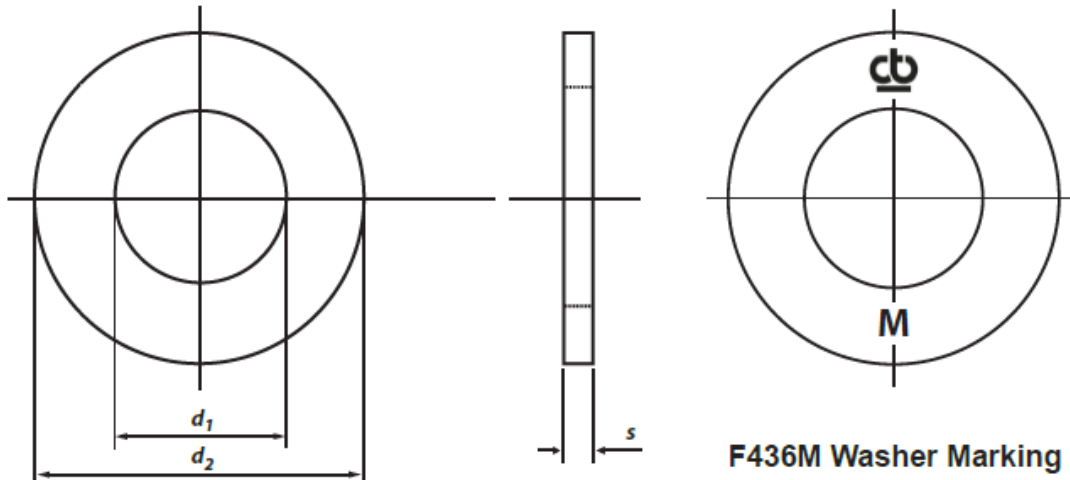
M12	M16	M20	M22	M24	M27	M30	M36
2.80	5.20	7.99	10.64	17.65	22.90	29.39	49.90

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

All dimensions are in millimetres

BS EN 14399-6 CHAMFERED WASHER DIMENSIONS

Nominal washer size		M16	M20	M22	M24	M27	M30	M36
d₁	min.	18.4	22.5	24.5	26.5	30.5	33.6	39.6
	max.	18.0	22.0	24.0	26.0	30.0	33.0	39.0
d₂	min.	34.0	42.0	44.0	50.0	56.0	60.0	72.0
	max.	32.4	40.4	42.4	48.4	54.1	58.1	70.1
h	min.	4.6	4.6	4.6	4.6	4.6	4.6	4.6
	max.	3.1	3.1	3.4	3.4	3.4	3.4	3.4



MATERIALS

Carbon steel in accordance with ASTM A436M

CHARACTERISTIC

STANDARD

Materials & Manufacture	ASTM F436M	
Finish / Coatings	Self Colour / Black	ASTM A436M
	Hot Dip Galvanized	ASTM A153 / A153M CLASS C
Mechanical Properties	ASTM F436M	
Dimensions & Tolerances	ASTM F436M	
Workmanship	ASTM F436M	
Product Marking	ASTM F436M	

ASTM A563M NUT 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		Hot Dip Galvanized	
	min.	max.	min.	max.
M16 to M36 inclusive	38	45	26	45

All dimensions are in millimetres