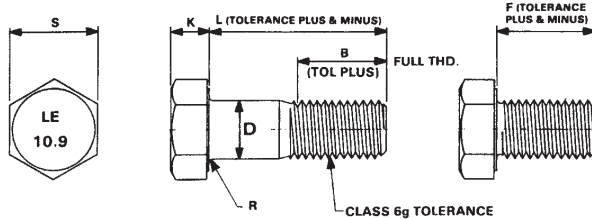




## Specifications Dimensions

### ANSI/ISO Metric Hex Cap Screws

**See Page 415  
For  
Torque Values**



#### All Dimensions To ANSI B18.2.3.1M

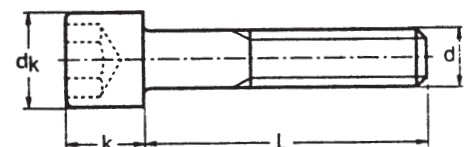
Nominal Screw Diameter & Thread Pitch	D		S		K		R	B Thread Length			F Longest Stand. Bolt Length Thd. to Head	
	Body Diameter		Width Across Flats		Head Height			Fillet Radius Min.	For L ≤ 125	For L > 125 ≤ 200		For L > 200
	Min.	Max.	Min.	Max.	Min.	Max.						
M6 x 1	5.82	6.00	9.78	10.00	3.85	4.15	0.3	18	24	37	25	
M8 x 1.25	7.78	8.00	12.73	13.00	5.10	5.50	0.4	22	28	41	30	
M10 x 1.5	9.78	10.00	15.73	16.00	6.17	6.63	0.4	26	32	45	35	
M12 x 1.75	11.73	12.00	17.73	18.00	7.24	7.76	0.6	30	36	49	40	
M14 x 2	13.73	14.00	20.67	21.00	8.51	9.09	0.6	34	40	53	45	
M16 x 2	15.73	16.00	23.67	24.00	9.68	10.32	0.6	38	44	57	50	
M20 x 2.5	19.67	20.00	29.16	30.00	12.12	12.88	0.8	46	52	65	60	
M24 x 3	23.67	24.00	35.00	36.00	14.56	15.44	0.8	54	60	73	75	
M30 x 3.5	29.67	30.00	45.00	46.00	17.92	19.48	1.0	66	72	85	90	

#### Material & Mechanical Properties To SAE J1199

Property	Class 8.8	Class 10.9
Hardness	Rc23-34	Rc33-39
Proof Load	600 MPa (87,000 PSI)	830 MPa (120,350 PSI)
Yield Strength	660 MPa (95,700 PSI)	940 MPa (136,300 PSI)
Min. Tensile Strength	830 Maa (120,350 PSI)	1040 Mpa (150,800 PSI)
Headmark	8.8-Bolt Sizes M16 Thru M30	10.9-Bolt Sizes M6 Thru M30

### Metric Class 12.9 Socket Head Cap Screws

Diameter	d <sub>k</sub> Head Diameter	k Head Height	s Hex Key Size
M2	3.62	1.86	1.5
M2.5	4.32	2.36	2.0
M3	5.32	2.86	2.5
M4	6.78	3.82	3.0
M5	8.28	4.82	4.0
M6	9.78	5.70	5.0
M8	12.73	7.64	6.0
M10	15.73	9.64	8.0
M12	17.73	11.57	10.0
M16	23.67	15.57	14.0
M20	29.67	19.48	17.0
M24	35.61	23.48	19.0

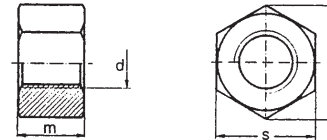




### Metric Socket Set Screws

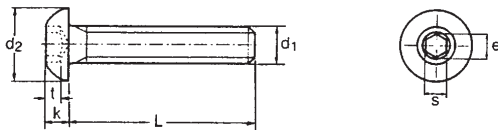
Bolt Size	$d_v$	$t$	
	Point Diameter	Key Engagement	
M2	0.75	1.7	
M2.5	0.95	2.0	
M3	1.15	2.0	
M4	1.75	2.5	
M5	2.25	3.0	
M6	2.75	3.5	
M8	4.70	5.0	
M10	5.70	6.0	
M12	7.64	8.0	
M16	9.64	10.0	
M20	13.57	12.0	

### Metric Class 8 Finished Hex Nuts



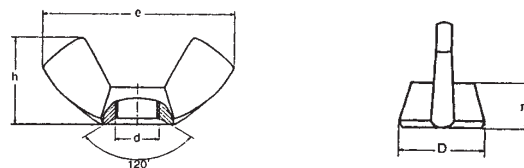
Pitches		Diameters	$s$	$o$	$m$
Coarse	Fine		Width Across Flats	Width Across Corners	Thickness
			min.	min.	min.
.4	-	M1.6	3.2	3.41	1.05
.4	-	M2	4.0	4.32	1.35
.45	-	M2.5	5.0	5.45	1.75
.5	-	M3	5.5	6.01	2.15
.6	-	M3.5	6.0	6.58	2.55
.7	-	M4	7.0	7.66	2.90
.8	-	M5	8.0	8.79	3.70
1.0	-	M6	10.0	11.05	4.70
1.0	-	M7	11.0	12.12	5.20
1.25	1.0	M8	13.0	14.38	6.14
1.5	1.25	M10	17.0	18.90	7.64
1.75	1.50	M12	19.0	21.10	9.64
2.0	1.5	M14	22.0	24.49	10.30
2.0	1.5	M16	24.0	26.75	12.30
2.5	1.5	M18	27.0	29.56	14.30
2.5	1.5	M20	30.0	32.95	14.90
2.5	1.5	M22	32.0	35.03	16.90
3.0	2.0	M24	36.0	39.55	17.70
3.0	2.0	M27	41.0	45.20	20.70
3.5	2.0	M30	46.0	50.85	22.70
3.5	2.0	M33	50.0	55.37	24.70
4.0	3.0	M36	55.0	60.79	27.40
4.0	-	M39	60.0	66.44	29.40
4.5	-	M42	65.0	71.30	32.40
4.5	-	M45	70.0	76.95	34.40
5.0	-	M48	75.0	82.60	36.40
		M52	80.0	88.25	40.40

### Metric Class 10.9 Button Head Socket Cap Screws



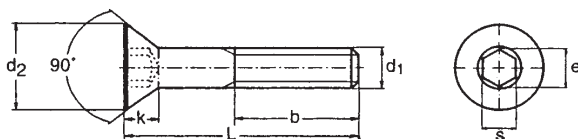
Bolt Size	$d_2$	$k$	$s$	$t$
	Head Diameter	Head Height	Hex Key Size	Key Engagement
M3	5.7	1.65	2.0	1.04
M4	7.6	2.20	2.5	1.30
M5	9.5	2.75	3.0	1.56
M6	10.5	3.30	4.0	2.08
M8	14.0	4.40	5.0	2.60
M10	17.5	5.50	6.0	3.12
M12	21.0	6.60	8.0	4.16

### Metric Class 5 Wing Nuts Cold Forged



Diameter	$d$	$e$	$h$	$m$
	Boss Diameter	Wing Spread	Wing Height	Boss Height
M3	8.0	17.6	8.6	2.9
M4	8.0	17.6	8.6	2.9
M5	10.3	22.5	11.0	4.1
M6	12.7	27.8	13.6	5.1
M8	13.8	30.3	14.8	5.6
M10	16.5	36.2	17.7	6.8
M12	22.5	49.4	24.1	9.0
M14	26.6	58.3	28.5	10.7
M16	26.6	58.3	28.5	10.7
M18	29.5	68.5	33.8	13.5
M20	29.5	68.5	33.8	13.5

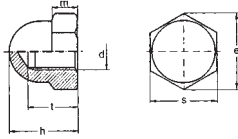
### Metric Class 10.9 Flat Head Socket Cap Screws



Bolt Size	$d_2$	$b$	$k$	$s$
	Head Diameter	Thread Length	Head Height	Hex Key Size
M3	6	12	1.7	2.0
M4	8	14	2.3	2.5
M5	10	16	2.8	3.0
M6	12	18	3.3	4.0
M8	16	22	4.4	5.0
M10	20	26	5.5	6.0
M12	24	30	6.5	8.0
M16	30	38	7.5	10.0
M20	36	46	8.5	12.0



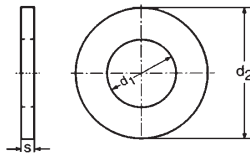
### Metric Class 6 Acorn (Cap) Nuts



Diameter	m Hex Height	h Thickness	t Depth of Threads	s Width Across Flats	e Width Across Corners
M3	3.2	8	5.5	7	5.50
M4	3.2	8	5.5	7	7.66
M5	4.0	10	7.5	8	8.79
M6	5.0	12	8.0	10	11.05
M8	6.5	15	11.0	13	14.38
M10	8.0	18	13.0	17	18.90
M12	10.0	22	16.0	19	21.10
M14	11.0	25	18.0	22	23.35
M16	13.0	28	21.0	24	26.75
M18	15.0	32	25.0	27	30.14
M20	16.0	34	26.0	30	33.53
M22	18.0	39	29.0	32	35.72
M24	19.0	42	31.0	36	39.98

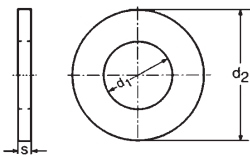
### Metric Flat Washers

Bolt Size	d <sub>1</sub> Inside Diameter	d <sub>2</sub> Outside Diameter	s Thickness
M1.6	1.7	4	0.3
M2	2.2	5	0.3
M2.5	2.7	6	0.5
M3	3.2	7	0.5
M3.5	3.7	8	0.5
M4	4.3	9	0.8
M5	5.3	10	1.0
M6	6.4	12	1.6
M7	7.4	14	1.6
M8	8.4	16	1.6
M10	10.5	20	2.0
M12	13.0	24	2.5
M14	15.0	28	2.5
M16	17.0	30	3.0
M18	19.0	34	3.0
M20	21.0	37	3.0
M22	23.0	39	3.0
M24	25.0	44	4.0
M27	28.0	50	4.0
M30	31.0	56	4.0

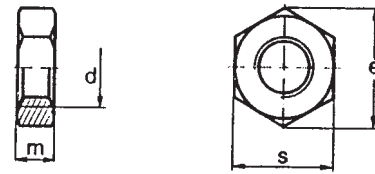


### Metric Fender Washers

Bolt Size	d <sub>1</sub> Inside Diameter	d <sub>2</sub> Outside Diameter	s Thickness
M2.5	2.7	8	0.8
M3	3.2	9	0.8
M3.5	3.7	11	0.8
M4	4.3	12	1.0
M5	5.3	15	1.2
M6	6.4	18	1.6
M7	7.4	22	2.0
M8	8.4	24	2.0
M10	10.5	30	2.5
M12	13.0	37	3.0
M14	15.0	44	3.0
M16	17.0	50	3.0
M18	20.0	56	4.0
M20	22.0	60	4.0

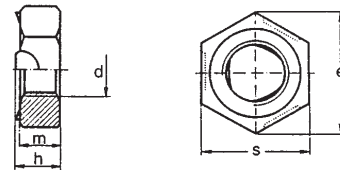


### Metric Class 4 Hex Jam Nuts



Diameter	e Width Across Corners	m Thickness min.	s Width Across Flats
M2	4.32	0.95	4
M2.5	5.45	1.35	5
M3	6.01	1.55	5.5
M4	7.66	1.95	7
M5	8.79	2.45	8
M6	11.05	2.90	10
M8	14.38	3.70	13
M10	18.90	4.70	17
M12	21.10	5.70	19
M14	24.49	6.42	22
M16	26.75	7.42	24
M18	29.56	8.42	27
M20	32.95	9.10	30
M22	35.03	9.90	32
M24	39.55	10.90	36
M27	45.20	12.40	41
M30	50.85	13.90	46
M33	55.37	15.40	50
M36	60.79	16.90	55

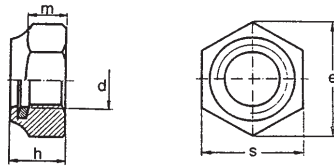
### Metric Class 10 All Metal Hex Locknuts



Diameter	e Width Across Corners min.	h Thickness max.	m Hex Height	s Width Across Flats
M2.5	-	-	-	-
M3	6.01	3.7	1.65	5.5
M4	7.66	4.2	2.20	7.0
M5	8.79	5.1	2.75	8.0
M6	11.05	6.0	3.30	10.0
M8	14.38	8.0	4.40	13.0
M10	18.90	10.0	5.50	17.0
M12	21.10	12.0	6.60	19.0
M16	26.75	16.0	8.80	24.0
M20	32.95	20.0	11.00	30.0
M24	39.55	24.0	13.20	36.0

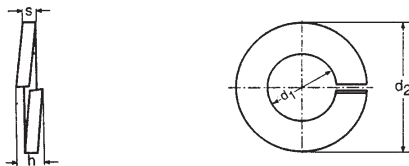


### Metric Class 6 & 8 Nylon Insert Hex Locknuts



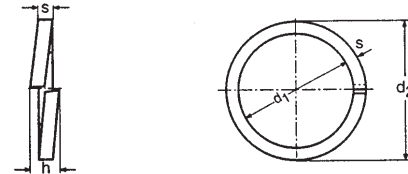
Diameter	e Width Across Corners	h Thickness	m Hex Height	s Width Across Flats
	min.	max.		
M3	6.01	4.0	2.4	5.5
M4	7.66	5.0	2.9	7.0
M5	8.79	5.0	3.2	8.0
M6	11.05	6.0	4.0	10.0
M8	14.38	8.0	5.5	13.0
M10	18.90	10.0	6.5	17.0
M12	21.10	12.0	8.0	19.0
M14	24.49	14.0	9.5	22.0
M16	26.75	16.0	10.5	24.0
M18	29.56	18.5	13.0	27.0
M20	32.95	20.0	14.0	30.0
M22	35.03	22.0	15.0	32.0
M24	39.55	24.0	15.0	36.0
M27	45.20	27.0	17.0	41.0
M30	50.85	30.0	19.0	46.0

### Metric Medium Split Lock Washers



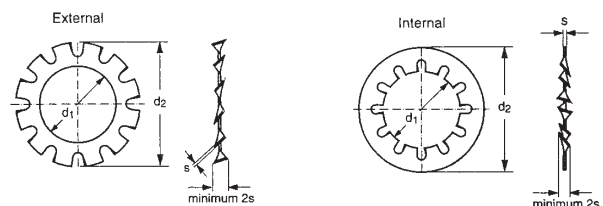
Bolt Size	d <sub>1</sub> Inside Diameter	d <sub>2</sub> Outside Diameter	s Thickness
M2	2.1	4.4	0.5
M2.5	2.6	5.1	0.6
M3	3.1	6.2	0.8
M3.5	3.6	6.7	0.8
M4	4.1	7.6	0.9
M5	5.1	9.2	1.2
M6	6.1	11.8	1.6
M7	7.1	12.8	1.6
M8	8.1	14.8	2.0
M10	10.2	18.1	2.2
M12	12.2	21.1	2.5
M14	14.2	24.1	3.0
M16	16.2	27.4	3.5
M18	18.2	29.4	3.5
M20	20.2	33.6	4.0
M22	22.5	35.9	4.0
M24	24.5	40.0	5.0
M27	27.5	43.0	5.0

### Metric High Collar Split Lock Washers



Bolt Size	d <sub>1</sub> Inside Diameter	d <sub>2</sub> Outside Diameter max.	s Thickness
M3	3.1	5.6	1.0
M3.5	3.6	6.1	1.0
M4	4.1	7.0	1.2
M5	5.1	8.8	1.6
M6	6.1	9.9	1.6
M8	8.1	12.7	2.0
M10	10.2	16.0	2.5
M12	12.2	18.0	2.5
M14	14.2	21.1	3.0
M16	16.2	24.4	3.5
M18	18.2	26.4	3.5
M20	20.2	30.6	4.5
M22	22.5	32.9	4.5
M24	24.5	35.9	5.0
M27	27.5	38.9	5.0

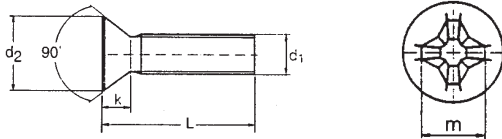
### Metric External And Internal Tooth Lock Washers



Bolt Size	d <sub>1</sub> Inside Diameter	d <sub>2</sub> Outside Diameter	s Thickness
M2	2.2	4.5	0.3
M2.3	2.5	5.0	0.4
M2.5	2.7	5.5	0.4
M3	3.2	6.0	0.4
M4	4.3	8.0	0.5
M5	5.3	10.0	0.6
M6	6.4	11.0	0.7
M7	7.4	12.5	0.8
M8	8.4	15.0	0.8
M10	10.5	18.0	0.9
M12	12.5	20.5	1.0
M14	14.5	24.0	1.0
M16	16.5	26.0	1.2
M18	19.0	30.0	1.4
M20	21.0	33.0	1.4
M22	23.0	36.0	1.5
M24	25.0	38.0	1.5
M27	28.0	44.0	1.6
M30	31.0	48.0	1.6

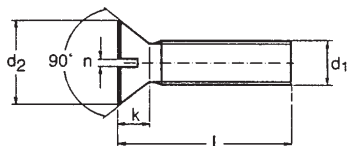


### Metric Flat Head Phillips Machine Screws



Diameter	d <sub>2</sub> Head Diameter	k Head Height	m Recess Diameter
M2	3.8	1.20	2.35
M2.5	4.7	1.50	2.70
M3	5.6	1.65	2.90
M4	7.5	2.20	4.40
M5	9.2	2.50	4.60
M6	11.0	3.00	6.60
M8	14.5	4.00	8.70
M10	18.0	5.00	9.60

### Metric Flat Head Slotted Machine Screws



Diameter	d <sub>2</sub> Head Diameter	k Head Height	n Slot Width
M1.6	3.0	0.96	0.4
M2	3.8	1.20	0.5
M2.5	4.7	1.50	0.6
M3	5.6	1.65	0.8
M3.5	6.5	1.93	0.8
M4	7.5	2.20	1.0
M5	9.2	2.50	1.2
M6	11.0	3.00	1.6
M8	14.5	4.00	2.0
M10	18.0	5.00	2.5
M12	22.0	6.0	3.0

### Pipe Wall Thickness

Nom. Size & (O.D.) IN.	Schedule Number	Wall Thickness (inches)
1/8	40	.068
(.045)	80	.095
1/4	40	.088
(.540)	80	.119
3/8	40	.091
(.675)	80	.126
1/2	40	.109
(.840)	80	.147
3/4	40	.113
(1.050)	80	.154
1	40	.133
(1.315)	80	.179
1-1/4	40	.140
(1.660)	80	.191
1-1/2	40	.145
(1.900)	80	.200
2	40	.154
(2.375)	80	.218
2-1/2	40	.203
(2.875)	80	.276
3	40	.216
(3.500)	80	.300
3-1/2	40	.226
(4.000)	80	.318
4	40	.237
(4.500)	80	.337
5	40	.258
(5.563)	80	.375
6	40	.280
(6.625)	80	.432
8	40	.322
(8.625)	80	.500
10	40	.365
(10.750)	80	.594
12	40	.406
(12.750)	80	.688