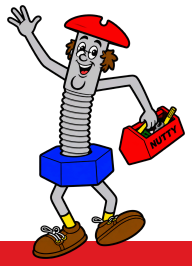
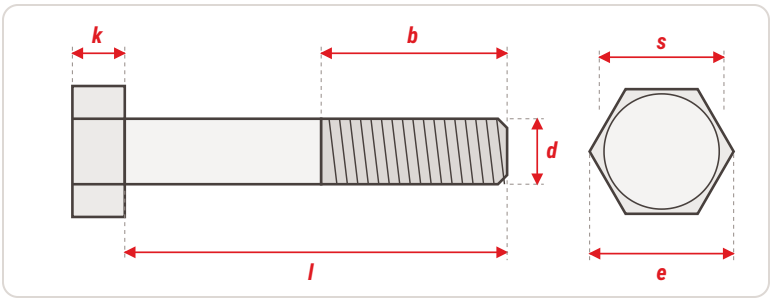
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PRODUCT DATA SHEET

Metric Hex Head Cap Screws – Class 8.8 & 10.9




8.8 ZINC • PARTIAL THREAD


8.8 ZINC • FULL THREAD


10.9 PLAIN • FULL THREAD

- **Metric hex head cap screws** to **DIN 933 / ISO 4017** (full thread) and **DIN 931 / ISO 4014** (partial thread).
- **Strength:** property **Class 8.8** (medium) and **Class 10.9** (high), quenched & tempered steel to **ISO 898-1**.
- **Sizes:** M3 through M30, standard (coarse) pitch; fine pitch shown for reference. Thread tolerance 6g.
- **Finish:** 8.8 zinc plated; 10.9 plain (black). See 5.0 for what we stock.

1.0 Dimensions DIN 931 / 933 & ISO 4014 / 4017, millimeters

Size d	Pitch		s – Across Flats		e – Across Corners min.	k – Head Height		b – Thread Length (DIN 931 / ISO 4014)			Tap Drill	Clearance Hole
	Coarse	Fine	DIN	ISO		Min	Max	l ≤ 125	125 < l ≤ 200	l > 200		
M3	0.5	–	5.5	5.5	6.01	1.88	2.13	12	–	–	2.5	3.4
M4	0.7	–	7	7	7.66	2.68	2.93	14	–	–	3.3	4.5
M5	0.8	–	8	8	8.79	3.35	3.65	16	–	–	4.2	5.5
M6	1.0	–	10	10	11.05	3.85	4.15	18	24	–	5.0	6.6
M8	1.25	1.0	13	13	14.38	5.15	5.45	22	28	41	6.8	9.0
M10	1.5	1.25 / 1.0	**17**	**16**	17.77	6.22	6.58	26	32	45	8.5	11.0
M12	1.75	1.5 / 1.25	**19**	**18**	20.03	7.32	7.68	30	36	49	10.2	13.5
M14	2.0	1.5	**22**	**21**	23.36	8.62	8.98	34	40	53	12.0	15.5
M16	2.0	1.5	24	24	26.75	9.82	10.18	38	44	57	14.0	17.5
M18	2.5	1.5	27	27	30.14	11.28	11.72	42	48	61	15.5	20.0
M20	2.5	1.5	30	30	33.53	12.28	12.72	46	52	65	17.5	22.0
M22	2.5	1.5	**32**	**34**	37.72	13.78	14.22	50	56	69	19.5	24.0
M24	3.0	2.0	36	36	39.98	14.78	15.22	54	60	73	21.0	26.0
M27	3.0	2.0	41	41	45.20	16.65	17.35	60	66	79	24.0	30.0
M30	3.5	2.0	46	46	50.85	18.28	19.12	66	72	85	26.5	33.0

s and k are product grade A (M3–M24) and grade B (M27–M30). **Red** = the four sizes where DIN and ISO wrench sizes differ. b applies to partial-thread (DIN 931) screws; full-thread (DIN 933) screws are threaded to within about 1–3 pitches of the head. Tap drill for coarse thread; clearance hole = ISO 273 medium fit. d = nominal diameter, l = length under head.

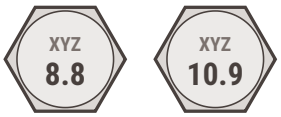
2.0 Chemical Composition ISO 898-1, % by weight (cast analysis)

Class	Material & Treatment	Carbon	Phosphorus max.	Sulfur max.	Boron max.	Min. Tempering Temp.
8.8	Carbon steel with additives (B, Mn or Cr), quenched & tempered	0.15 – 0.40	0.025	0.025	0.003	425°C
	Carbon steel, quenched & tempered	0.25 – 0.55	0.025	0.025	0.003	425°C
	Alloy steel, quenched & tempered	0.20 – 0.55	0.025	0.025	0.003	425°C
10.9	Carbon steel with additives (B, Mn or Cr), quenched & tempered	0.20 – 0.55	0.025	0.025	0.003	425°C
	Carbon steel, quenched & tempered	0.25 – 0.55	0.025	0.025	0.003	425°C
	Alloy steel, quenched & tempered	0.20 – 0.55	0.025	0.025	0.003	425°C

Steel for M20 and larger 10.9 screws may need alloying elements (such as chromium, nickel or molybdenum) for enough hardenability. Typical steels: 8.8 – medium-carbon or boron steel; 10.9 – boron or Cr-Mo alloy steel (such as 41Cr4 / 42CrMo4).

3.0 Mechanical Properties ISO 898-1, at room temperature

Property	Class 8.8 M3 – M16	Class 8.8 M18 – M30	Class 10.9 M3 – M30
Min. tensile strength R_m	800 MPa 116,000 psi	830 MPa 120,400 psi	1,040 MPa 150,800 psi
Min. yield strength $R_{p0.2}$	640 MPa 92,800 psi	660 MPa 95,700 psi	940 MPa 136,300 psi
Proof stress S_p	580 MPa 84,100 psi	600 MPa 87,000 psi	830 MPa 120,400 psi
Min. elongation after fracture A	12%	12%	9%
Min. reduction of area Z	52%	52%	48%
Vickers hardness HV	250 – 320	255 – 335	320 – 380
Rockwell hardness HRC	22 – 32	23 – 34	32 – 39
Brinell hardness HB	238 – 304	242 – 318	304 – 361
Matching nut (ISO 898-2)	Class 8	Class 8	Class 10
Approx. inch equivalent	SAE J429 Grade 5	SAE J429 Grade 5	SAE J429 Grade 8



CLASS 8.8 **CLASS 10.9**

Head marking: property class plus the manufacturer's ID (shown as XYZ). Required on M5 and larger.

1 MPa = 145.04 psi. First number × 100 = minimum tensile strength in MPa; the second number × 10 = yield as a percent of tensile (8.8 → 80%, 10.9 → 90%).

3.1 Installation Notes

- **Match the nut:** use a Class 8 nut on 8.8 screws and a Class 10 nut on 10.9 screws. A weaker nut can strip before the screw reaches its strength.
- **Use hardened washers** under the head and nut on 10.9 screws, and in slotted or oversize holes, so the joint does not sink in and lose clamp load.
- **Full vs. partial thread:** DIN 933 / ISO 4017 screws are threaded to the head. DIN 931 / ISO 4014 have a plain shank – use them where the shank sits in the hole or carries shear.
- **Plating and 10.9:** electroplating high-strength (10.9 and up) screws carries a risk of hydrogen embrittlement. Our 10.9 standard-pitch screws are supplied plain; oil or coat after installation if needed outdoors.
- **Wrench sizes:** DIN and ISO heads differ on M10, M12, M14 and M22 (see 1.0). Check before you buy sockets.

4.0 Proof & Minimum Tensile Loads ISO 898-1, calculated

Size – Coarse	Stress Area A_s (mm²)	Class 8.8				Class 10.9			
		Proof (N)	Proof (lbf)	Min. Tensile (N)	Min. Tensile (lbf)	Proof (N)	Proof (lbf)	Min. Tensile (N)	Min. Tensile (lbf)
M3 x 0.5	5.03	2,920	656	4,020	904	4,170	937	5,230	1,180
M4 x 0.7	8.78	5,090	1,140	7,020	1,580	7,290	1,640	9,130	2,050
M5 x 0.8	14.2	8,240	1,850	11,400	2,560	11,800	2,650	14,800	3,330
M6 x 1.0	20.1	11,700	2,630	16,100	3,620	16,700	3,750	20,900	4,700
M8 x 1.25	36.6	21,200	4,770	29,300	6,590	30,400	6,830	38,100	8,570
M10 x 1.5	58.0	33,600	7,550	46,400	10,400	48,100	10,800	60,300	13,600
M12 x 1.75	84.3	48,900	11,000	67,400	15,200	70,000	15,700	87,700	19,700
M14 x 2.0	115	66,700	15,000	92,000	20,700	95,400	21,400	120,000	27,000
M16 x 2.0	157	91,100	20,500	126,000	28,300	130,000	29,200	163,000	36,600
M18 x 2.5	192	115,000	25,900	159,000	35,700	159,000	35,700	200,000	45,000
M20 x 2.5	245	147,000	33,000	203,000	45,600	203,000	45,600	255,000	57,300
M22 x 2.5	303	182,000	40,900	251,000	56,400	251,000	56,400	315,000	70,800
M24 x 3.0	353	212,000	47,700	293,000	65,900	293,000	65,900	367,000	82,500
M27 x 3.0	459	275,000	61,800	381,000	85,700	381,000	85,700	477,000	107,000
M30 x 3.5	561	337,000	75,800	466,000	105,000	466,000	105,000	583,000	131,000

FINE PITCH SIZES WE STOCK

Size – Fine	Stress Area A_s (mm²)	Class 8.8				Class 10.9			
		Proof (N)	Proof (lbf)	Min. Tensile (N)	Min. Tensile (lbf)	Proof (N)	Proof (lbf)	Min. Tensile (N)	Min. Tensile (lbf)
M10 x 1.0	64.5	37,400	8,410	51,600	11,600	53,500	12,000	67,100	15,100
M10 x 1.25	61.2	35,500	7,980	49,000	11,000	50,800	11,400	63,600	14,300
M12 x 1.25	92.1	53,400	12,000	73,700	16,600	76,400	17,200	95,800	21,500
M12 x 1.5	88.1	51,100	11,500	70,500	15,800	73,100	16,400	91,600	20,600
M14 x 1.5	125	72,500	16,300	100,000	22,500	104,000	23,400	130,000	29,200
M16 x 1.5	167	96,900	21,800	134,000	30,100	139,000	31,200	174,000	39,100
M20 x 1.5	272	163,000	36,600	226,000	50,800	226,000	50,800	283,000	63,600

Load = A_s × proof stress or minimum tensile strength from 3.0, rounded to 3 significant figures; lbf = N × 0.2248. Reference minimums, not working loads.

4.1 Class 8.8 vs. 10.9 at a Glance

	Class 8.8	Class 10.9
Strength	Medium strength – 800 MPa (116 ksi) tensile	High strength – 1,040 MPa (150 ksi) tensile, about 30% stronger
Inch equivalent	Close to SAE Grade 5	Close to SAE Grade 8
Typical uses	Cars and motorcycles, machinery, brackets, general metric assembly	Heavy machinery, presses, truck and equipment frames, high-load joints
Finish we stock	Zinc plated (standard pitch); zinc plated or plain (fine pitch)	Plain (black); zinc plated in some fine-pitch sizes
Head marking	8.8 + manufacturer's ID	10.9 + manufacturer's ID

Disclaimer: The above is a compilation of DIN 931, DIN 933, ISO 4014, ISO 4017, ISO 273 and ISO 898-1 data. Loads in 4.0 are calculated minimums for reference, not working loads. The Nutty Company, Inc. has made every effort to present the data accurately. However, The Nutty Company, Inc. cannot be held liable for any claim traceable to any errors, typographical or otherwise, contained herein.

5.0 Stocked Sizes stock # MHC..., lengths in mm

Size	Full Thread (FT) – lengths, mm	Partial Thread (PT) – lengths, mm
CLASS 8.8 • PLAIN • STANDARD PITCH (DIN 933 / 931)		
M8 x 1.25	–	90
CLASS 8.8 • ZINC PLATED • STANDARD PITCH (DIN 933 / 931)		
M4 x 0.7	10, 12, 16, 20, 25, 30, 35, 40, 45, 50	–
M5 x 0.8	6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50	40
M6 x 1	10, 12, 16, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 90	35
M8 x 1.25	12, 16, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 90, 100, 110, 120, 130	70, 80, 100, 120
M10 x 1.5	16, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 200	–
M12 x 1.75	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100	40, 45, 50, 70, 80, 90, 100
CLASS 10.9 • PLAIN • STANDARD PITCH (DIN 933 / 931)		
M10 x 1.5	20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 90, 100, 110, 120	35, 40, 45, 50, 55, 60, 65, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220
M12 x 1.75	20, 25, 30, 35, 40, 45, 50, 60, 80, 90, 100, 110, 120, 130, 140	60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 180, 190, 200, 210, 220, 230, 240
M14 x 2	25, 30, 35, 40, 45, 50, 55, 70, 80, 90, 100	50, 55, 60, 65, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160
M16 x 2	25, 30, 35, 40, 45, 50, 60, 65, 70, 80, 90, 100, 110, 120, 130, 150, 160	60, 65, 70, 75, 80, 90, 100, 120, 130, 140, 150, 160, 180, 200, 250, 260, 280, 300
M18 x 2.5	40, 50, 60, 70, 80, 100	60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 180
M20 x 2.5	30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150	60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 220, 240, 260, 280, 300, 320, 360, 380, 400
M24 x 3	40, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 140, 150	70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400
M30 x 3.5	50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 180	80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 280, 300, 320, 340, 360, 380
CLASS 8.8 • PLAIN • FINE PITCH (DIN 961 / 960)		
M10 x 1	25, 30, 40, 50	–
M10 x 1.25	20, 25, 30, 35, 40, 45, 50	45, 50, 60, 70, 80, 90, 100, 120, 140
M12 x 1.25	20, 25, 30, 35, 40, 45, 50	45, 50, 60, 70, 80, 100, 120
M12 x 1.5	20, 25, 30, 35, 40, 45, 50	60, 70, 80, 100, 120
M14 x 1.5	25, 30, 35, 40, 50	50, 60, 70, 80, 100, 120
M16 x 1.5	30, 35, 40, 45, 50, 60	60, 70, 80, 90, 100, 120
M20 x 1.5	40, 45, 50, 60	80, 100
CLASS 8.8 • ZINC PLATED • FINE PITCH (DIN 961 / 960)		
M10 x 1	25, 30, 35, 40	60
M10 x 1.25	20, 25, 30, 35, 40, 50	40, 45, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150
M12 x 1.25	20, 25, 30, 35, 40, 45, 50	40, 45, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150
M12 x 1.5	20, 25, 30, 35, 40, 45, 50	60, 70, 80, 90, 100, 110, 120, 130, 140, 150
CLASS 10.9 • PLAIN • FINE PITCH (DIN 961 / 960)		
M14 x 1.5	30	90, 100
M16 x 1.5	–	60, 100, 120
CLASS 10.9 • ZINC PLATED • FINE PITCH (DIN 961 / 960)		
M14 x 1.5	35, 60	120
M16 x 1.5	–	70



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