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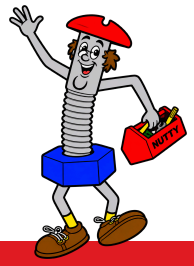
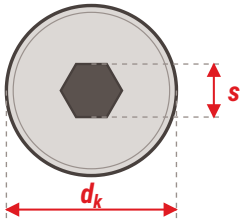
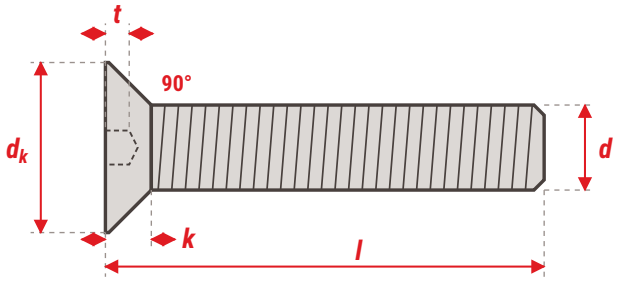


PRODUCT DATA SHEET

Metric Flat Head Socket Cap Screws







- **Metric flat head (countersunk) socket cap screws** to **DIN 7991**: 90° countersunk head with hex socket that sits flush with the surface.
- **Material:** property **Class 12.9** alloy steel, quenched & tempered to **ISO 898-1**.
- **Thread:** standard (coarse) pitch, 6g. Stocked M3 through M24; short lengths fully threaded, longer lengths partially threaded.
- **Finish:** thermal black oxide. See 5.0 for the sizes and lengths we stock.

1.0 Dimensions DIN 7991, millimeters

Size d	Pitch P	d_k Head Dia.	k Head Height	s Hex Key	t Key Depth	b Thread Length	Head Angle	Tap Drill	Clearance Hole
		Max	Max	Nom	Min	Ref			
M3	0.5	6.0	1.7	2	1.1	18	90°	2.5	3.4
M4	0.7	8.0	2.3	2.5	1.5	20	90°	3.3	4.5
M5	0.8	10.0	2.8	3	1.9	22	90°	4.2	5.5
M6	1.0	12.0	3.3	4	2.2	24	90°	5.0	6.6
M8	1.25	16.0	4.4	5	3.0	28	90°	6.8	9.0
M10	1.5	20.0	5.5	6	3.6	32	90°	8.5	11.0
M12	1.75	24.0	6.5	8	4.0	36	90°	10.2	13.5
M14	2.0	27.0	7.0	10	4.5	40	90°	12.0	15.5
M16	2.0	30.0	7.5	10	4.8	44	90°	14.0	17.5
M20	2.5	36.0	8.5	12	5.6	52	90°	17.5	22.0
M24	3.0	39.0	14.0	14	9.0	60	90°	21.0	26.0

l = overall length, including the head. d_k = theoretical sharp-edge head diameter; actual heads are slightly smaller. b applies to partially threaded screws. Tap drill for coarse thread; clearance hole = ISO 273 medium fit.

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

Class	Material & Treatment	Carbon	Phosphorus max.	Sulfur max.	Boron max.	Min. Tempering Temp.
12.9	Alloy steel, quenched & tempered	0.30 – 0.50	0.025	0.025	0.003	425°C

Alloying elements such as chromium, nickel, molybdenum or vanadium are added for hardenability. Typical steels: SCM435 / 4135 / 4140 Cr-Mo.

3.0 Mechanical Properties ISO 898-1 material, at room temperature

Property – Class 12.9	Metric	Inch
Min. tensile strength R_m	1,220 MPa	176,900 psi
Min. yield strength $R_{p0.2}$	1,100 MPa	159,500 psi
Proof stress S_p	970 MPa	140,700 psi
Min. elongation after fracture A	8%	–
Min. reduction of area Z	44%	–
Vickers hardness HV	385 – 435	–
Rockwell hardness HRC	39 – 44	–
Brinell hardness HB	366 – 414	–
Matching nut (ISO 898-2)	Class 12	–
Approx. inch equivalent	ASTM F835 alloy flat head	–



HEAD MARKING

Class 12.9 plus the manufacturer's ID (shown as XYZ), on the head.

3.1 Thread Loads reference only – calculated

Size	Stress Area A_s (mm²)	Thread Proof Load		Thread Min. Tensile Load	
		N	lbf	N	lbf
M3 x 0.5	5.03	4,880	1,100	6,140	1,380
M4 x 0.7	8.78	8,520	1,920	10,700	2,410
M5 x 0.8	14.2	13,800	3,100	17,300	3,890
M6 x 1.0	20.1	19,500	4,380	24,500	5,510
M8 x 1.25	36.6	35,500	7,980	44,700	10,000
M10 x 1.5	58.0	56,300	12,700	70,800	15,900
M12 x 1.75	84.3	81,800	18,400	103,000	23,200
M14 x 2.0	115	112,000	25,200	140,000	31,500
M16 x 2.0	157	152,000	34,200	192,000	43,200
M20 x 2.5	245	238,000	53,500	299,000	67,200
M24 x 3.0	353	342,000	76,900	431,000	96,900

Load = A_s × 970 MPa (proof) or 1,220 MPa (min. tensile), 3 significant figures; lbf = N × 0.2248. Because of the countersunk head, flat head screws may not reach these loads – the head can fail first. Not working loads.

4.0 Installation Notes

- **Length is overall:** a flat head screw is measured from the top of the head to the end of the thread, not from under the head.
- **Countersink:** machine a 90° countersink slightly larger than d_k so the head sits flush or just below the surface. An 82° (inch) countersink will not seat a metric 90° head properly.
- **Not for full-strength joints:** the countersunk head and shallow socket cannot carry the full Class 12.9 load. Where full strength is needed, use a DIN 912 socket head cap screw in a counterbore.
- **Use the exact hex key** and seat it fully – flat head sockets are shallow and round out if over-torqued or driven with a worn key.
- **Thread engagement:** in a tapped hole allow about 1–1.5 × d in steel, more in aluminum or cast iron. Use a Class 12 nut for through-bolting.
- **Black oxide** gives only light rust protection. For wet or outdoor use, choose stainless flat head socket screws.

5.0 Stocked Sizes stock # MFSC...

Size	Lengths in stock, mm overall (Class 12.9 • DIN 7991 • black oxide)
M3 x 0.5	5, 6, 8, 10, 12, 16, 20, *25**, *30**, *35**, *40**
M4 x 0.7	6, 8, 10, 12, 16, 20, 25, *30**, *35**, *40**, *45**, *50**, *60**
M5 x 0.8	8, 10, 12, 16, 20, 25, 30, *35**, *40**, *45**, *50**, *60**, *70**
M6 x 1.0	8, 10, 12, 16, 20, 25, 30, 35, *40**, *45**, *50**, *60**, *70**, *80**
M8 x 1.25	10, 12, 16, 20, 25, 30, 35, 40, 45, *50**, *60**, *70**, *80**, *90**, *100**
M10 x 1.5	16, 20, 25, 30, 35, 40, 45, *50**, *60**, *70**, *80**, *90**, *100**
M12 x 1.75	20, 25, 30, 35, 40, 45, 50, *60**, *70**, *80**, *90**, *100**
M14 x 2.0	30, 35, 40, 50, *60**, *70**, *80**, *100**
M16 x 2.0	30, 35, 40, 45, 50, 60, *70**, *80**, *90**, *100**
M20 x 2.5	30, 35, 40, 45, 50, 60, 70, *80**, *90**, *100**
M24 x 3.0	50, 60, 70, 80, 90, *100**

* Partially threaded (thread length about b); other lengths fully threaded.

Disclaimer: The above is a compilation of DIN 7991, ISO 273 and ISO 898-1 data. Loads in 3.1 are calculated thread values for reference, not ratings or working loads for the screw. 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.



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