

SPRING MATERIALS

CARBON STEEL SPRING STRIP

GM181M GM182M GM184M

1 SCOPE. This standard covers three types of steel spring strip, sometimes referred to as low (0.6) carbon, regular (0.7) carbon, and high (1.0) carbon materials.

1.1 COMPARABLE SPECIFICATIONS. ASTM A680, ASTM A682, ASTM A682M and ASTM A684.

2 CHEMICAL COMPOSITION. Steel shall conform to the following composition limits (% by mass).

GM Numbers	GM181M		GM182M	GM184M
SAE Numbers	1070*	1074*	1060*	1095*
Carbon	0.65–0.76	0.69–0.80	0.55–0.66	0.90–1.76
Manganese	0.60–0.90	0.50–0.80	0.60–0.90	0.30–0.50
Phosphorus	0.040 max	0.040 max	0.040 max	0.040 max
Sulfur	0.050 max	0.050 max	0.050 max	0.050 max
Silicon	0.15–0.30	0.15–0.30	0.15–0.30	0.15–0.30

*Supplier's option.

3 MECHANICAL PROPERTIES.

3.1 CONDITION. Unless otherwise specified, strip shall be furnished in the annealed condition.

3.2 For all grades, purchaser may also specify, spheroidized, hard rolled or various intermediate hardnesses.

3.3 In the cases of GM181M and GM184M, purchaser may also specify T1 Temper, T2 Temper and T3 Temper. T1 indicates full spring temper; T2 medium temper; and T3 low or blanking temper.

3.4 HARDNESS. Rockwell hardness for spheroidized, annealed and hard rolled shall conform to the limits shown in Table 1 for the number and condition of material specified by the purchaser. Intermediate hardness grades vary with application and ranges may be established as outlined in ASTM A684. Hardness values for tempered grades T1, T2, and T3 are shown in the appendix.

3.4.1 The applicable hardness scale for each thickness of hardened and tempered stock specified by the purchaser is shown below:

Thickness (mm)		Scale
Over	Thru	
—	0.20	*
0.20	0.35	HR15N
0.35	0.85	HR30N
0.85	—	HRC

*Tensile test is recommended.

TABLE 1 – ROCKWELL HARDNESS

Thickness (mm)		GM181M	GM182M	GM184M
Over	Thru	Annealed Hardness, Max		
—	0.60	HR15T89	HR15T88	HR15T90
0.60	1.00	HR30T77	HR30T76	HR30T78
1.00	—	HRB90	HRB88	HRB92
		Spheroidized Hardness, Max		
—	0.60	HR15T89	HR15T88	HR15T90
0.60	1.00	HR30T74	HR30T73	HR30T75
1.00	—	HRB86	HRB83	HRB88
		Hard Rolled (Untempered) Hardness, Min for all GM Numbers		
—	0.35	HR15T92.5		
0.35	0.60	HR30T81		
0.60	0.85	HR45T70		
0.85	—	HRB98		

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3.5 TENSILE STRENGTH. In the cases of GM181M and GM184M (Temper T1, T2, and T3), tensile strength for specific thickness of strip shall conform to charts in Appendix A, within a tolerance of ± 100 MPa. Forming properties for Temper T2 and T3 are also shown on these charts.

3.5.1 Tensile strength shall be determined according to ASTM E8.

4 FORM, SIZE AND QUALITY. Strip furnished to these specifications shall not be wavy or crooked. The surface shall be free from scale and rust. There shall be no objectionable surface defects such as seams or deep scratches revealed by etching in a solution of equal parts of chemically pure hydrochloric acid and water at a temperature of 75 to 80 C for a sufficient length of time to remove approximately 1% of the stock thickness, but not less than 0.006 mm.

4.1 Annealed or hard rolled strip shall have the regular bright mill finish customary with such material. Strip in the tempered conditions shall be "bright polished," "blued," "scaleless," "straw colored," or "black finish" specified by purchaser. Black finish is the surface obtained direct from the hardening and tempering operation.

4.2 Material shall conform to one of the following edges, as specified.

1. (Round) a perfect round, smooth edge. (Square) a perfect square, smooth edge.
2. Natural round mill edge; for blanking where any edge will serve.
3. Square as produced by slitting, not filing.
4. Round edge rolled.
5. Square edge, as produced by rolling or filing, after slitting to remove burr.
6. Square edge rolled.

4.3 Unless otherwise specified, strip shall conform to the width specified by the purchaser within the tolerances shown for the corresponding designated edge type shown in Tables 2, 3 and 4.

4.4 Unless otherwise specified, strip shall conform to the thickness specified by the purchaser within the tolerances shown in Table 5.

4.4.1 Certain applications may require more restrictive tolerances. Consult the supplier for the exact limits.

TABLE 2 - WIDTH TOLERANCES, NUMBER 2 MILL EDGE

Specified Width, mm		Width Tolerance, mm
Over	Thru	Plus & Minus
-	50	0.8
50	100	1.2
100	200	1.6
200	400	2.5
400	500	3.0
500	600	4.0

TABLE 3 - WIDTH TOLERANCES, NUMBER 3 SLIT EDGE

Specified Width, mm		Width Tolerance, mm, Plus And Minus For Specified Nominal Thickness, mm			
Over	Thru	Thru 1.5	Over 1.5 Thru 2.5	Over 2.5 Thru 4.5	Over 4.5 Thru 6.0
-	100	0.13	0.20	0.25	0.40
100	200	0.13	0.25	0.40	0.50
200	300	0.25	0.25	0.40	0.50
300	450	0.40	0.40	0.50	0.80
450	600	0.50	0.50	0.50	0.80

TABLE 4 - WIDTH TOLERANCES, NUMBERS 1, 4, 5 AND 6 EDGES

Edge No.	Specified Width, mm		Specified Thickness, mm		Width Tolerance, mm
	Over	Thru	Min	Max	Plus & Minus
1	-	200	-	3.0	0.13
4	-	25	0.6	5.0	0.38
4	25	50	0.6	6.0	0.65
4	50	150	1.0	6.0	1.20
5	12	100	-	3.0	0.13
5	100	500	0.4	3.0	0.25
5	500	600	0.6	2.0	0.38
6	12	25	0.6	5.0	0.38
6	25	50	0.6	6.0	0.65
6	50	150	1.0	6.0	1.20

4.5 SIZE SELECTION. See GM6160M for preferred metric wire sizes.