



STEEL BALLS, CHROME ALLOY, VACUUM PROCESSED

ESW-M1A130-B

1. SCOPE

The materials defined by this specification are purchased finished, vacuum processed, chrome alloy steel balls.

2. APPLICATION

This specification was released originally for material used in automotive ball bearings.

3. REQUIREMENTS

3.0 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.1 MELTING PRACTICE

The vacuum processed material shall be of uniform composition and uniform grain structure, free from physical defects, clean, and of the highest quality in every respect as described and defined in the sections which follow.

3.2 CHEMICAL COMPOSITION

52100

Carbon	0.95 - 1.10
Manganese	0.25 - 0.45
Phosphorus	0.025 max
Sulfur	0.025 max
Silicon	0.20 - 0.35
Chromium	1.30 - 1.60
Nickel	0.35 max
Copper	0.25 max
Molybdenum	0.08 max

Analysis made by purchaser on samples taken at random from each lot or sample thereof shall fall within the specified limits. The standard permissible variation in analysis from the values specified shall be as follows:

PERMISSIBLE VARIATION +/- %

Carbon	0.03
Manganese	0.03
Phosphorus	0.005
Sulfur	0.005
Silicon	0.02
Chromium	0.05

Date	Action	Revisions
2006 03 17	Revised	Inserted 3.0; Deleted 3.12 & 4; Revised 5.
1978 10 04	Metricated & Retyped	CW10H-RD-824168
1974 01 11	Released	CW10B-PR-702789



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3.3 SEAM DEPTH

Each coil of wire for balls must be inspected for seams. The maximum allowable seam or surface defect is as follows:

	<u>Size - O.D.</u>	<u>Max. Depth of Seam</u>
Cold Finished Wire & Rod	Up to 0.250 in (6.4 mm)	0.003 in (0.08 mm)
	0.251-0.500 in (6.4-12.70 mm)	0.004 in (0.10 mm)
	0.501-0.750 in (12.70-19.05 mm)	0.006 in (0.15 mm)
	0.751 in-over (19.08 mm-over)	0.008 in (0.20 mm)
Hot Rolled Annealed	0.222-0.500 in (5.64-12.70 mm)	0.005 in (0.13 mm)
	0.501-0.700 in (12.70-17.78 mm)	0.007 in (0.18 mm)
Annealed & Skin Passed	Up to 0.250 in (6.4 mm)	0.005 in (0.13 mm)
	0.251-0.500 in (6.4-12.70 mm)	0.006 in (0.15 mm)
	0.501-0.750 in (12.70-19.05 mm)	0.008 in (0.20 mm)

3.4 HARDNESS

The ball shall be uniformly through hardened to an as-quenched hardness of Rockwell C 64 minimum followed by a temper at 150 °C minimum to obtain a Rockwell "C" (or equivalent) hardness of 61 to 64 as measured on parallel flats. Balls in any lot and unit container shall have a uniform hardness within two points Rockwell "C" as measured on parallel flats. For convenience sake, hardness may be measured on the curved ball surface, taking into account the necessary correction factor. In case of controversy, however, readings shall be made on parallel flats, ground carefully to avoid grinding damage on the balls.

Note: Case hardened balls will not be acceptable at any time.

3.5 FRACTURE GRAIN SIZE

The fracture grain size shall be No. 8 or finer as determined on fractured balls. Compare with Shepherd fracture grain size standards.

3.6 SURFACE DEFECTS

Balls etched in a 50% HCl solution for 30 minutes at 80 °C, brushed off with soft brush, and examined under a well diffused light shall be free from surface defects (seams, laps, scratches, decarburization, rush and pipe). No cracks, pits, or excessive porosity shall be present.

3.7 SURFACE TEMPER INSPECTION

Balls shall be etched per manufacturing process standard MS 6-2.

3.8 NON-METALLIC INCLUSION AND SEGREGATION

Cleanliness of the steel will be judged by the size and distribution of non-metallic inclusions observed in the hardened fracture and confirmed by metallographic examination at 100X magnification of polished specimens.

The examination of a polished specimen shall be on a plane through "poles" of the balls as determined by hot etching.