Ford Motor Company

ENGINEERING MATERIAL SPECIFICATION

Material Name	Specification Number
STEEL, AUSTENITIC VALVE WROUGHT	**WSD-M1A313-A1** **WSD-M1A313-A2** **WSD-M1A313-A3** **WSD-M1A313-A4** **WSD-M1A313-A5**

1. SCOPE

The materials defined by this specification are a series of wrought chromium-manganese austenitic steels which develop optimum physical properties by appropriate solution and aging treatments. Controlled forging and/or stress relieving processing may also be applicable in limited instances.

2. APPLICATION

These specifications were released originally for material used for the heads of two piece exhaust valves for reciprocating engines. These materials may also be employed in one piece valve designs where appropriate consideration is given to tip, stem and seat wear properties. Under normal conditions and with appropriate approval (para 3.7) a lower graded material may be substituted by an alternative (see 4.2).

3. REQUIREMENTS

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

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

Date	Action	Revisions
2002 09 23	Revised	Updated and renumbered
1992 11 25	C10261076	Released w. Jones EAO J.C. Webster NAAO

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3.2 CHEMICAL COMPOSITION (WEIGHT %)

	A1	A2	A3
Carbon *	0.65 - 0.75	0.50 - 0.60	0.47 - 0.58
Manganese	5.5 - 6.9	7.0 - 10.00	7.00 - 10.00
Phosphorus	0.04 max	0.05 max	0.05 max
Sulphur	0.04 max	0.09 max	0.09 max
Silicon	0.45 - 0.85	0.25 max	0.25 max
Chromium	20.50 - 22.00	19.50 - 21.50	20.00 - 22.00
Nickel	1.4 - 1.9	1.50 - 2.80	3.25 - 4.50
Nitrogen *	0.18 - 0.28	0.20 - 0.40	0.38 - 0.50
Tungsten	---	---	---
Niobium+Tantalum	---	---	---
Molybdenum	---	---	---
*Carbon + Nitrogen	---	---	0.90 min
Iron	Remainder	Remainder	Remainder

	A4	A5
Carbon *	0.48 - 0.58	0.45 - 0.56
Manganese	8.00 - 10.00	8.00 - 10.00
Phosphorus	0.04 max	0.05 max
Sulphur	0.035 max	0.03 max
Silicon	0.45 max	0.45 max
Chromium	20.00 - 22.00	20.00 - 22.00
Nickel	3.25 - 4.50	3.5 - 5.0
Nitrogen *	0.38 - 0.50	0.40 - 0.60
Tungsten	---	0.8 - 1.5
Niobium+Tantalum	2.00 - 3.00	1.8 - 2.5
Molybdenum	---	---
*Carbon+Nitrogen	0.90 min	0.90 min
Iron	Remainder	Remainder

Minor variations to the above composition will be permitted providing all other specification and performance criteria are met and the composition is approved at control plan stage. See Para 4.1 for alternative national specifications, where available.

3.3 HEAT TREATMENT

High temperature strength, fatigue and corrosion properties are dependent on heat treatment temperatures and process duration. The supplier must select the best heat treatment compromise for particular component performance.

NOTE: Actual times and temperature may be adjusted to meet hardness and microstructural requirements and will be agreed at inception of the control plan.

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