

ENGINEERING MATERIAL SPECIFICATION

Material Name

Specification Number

STEEL, MARTENSITIC, VALVE, WROUGHT

WSD-M1A314-A1/A2

1. SCOPE

The materials defined by this specification are a range of wrought martensitic alloy steels, including a chromium-silicon alloy steel.

2. APPLICATION

This specification was released originally for material used for one piece intake valves, and stems of two piece valves for reciprocating engines. WSD-M1A314-A2 is a more appropriate selection for stem applications of two piece valves.

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).

3.2 CHEMICAL COMPOSITION (WEIGHT %)

	A1	A2
Carbon	0.40 - 0.50	0.37 - 0.50*
Manganese	0.80 max	0.50 - 1.0*
Silicon	2.70 - 3.50	0.40 max
Phosphorus	0.040 max	0.040 max
Sulphur	0.030 max	0.040 max
Chromium	8.00 - 10.00	1.25*
Nickel	0.50 max	1.10 max *
Molybdenum	---	0.25 max*
Iron	Remainder	Remainder

*Particular overall composition selected will be dependant on required weldability, hardenability and performance requirements.

Minor variation to the above composition will be permitted providing all other specification/performance requirements are met and that the composition is approved at control plan stage. See para 4.1 for alternative proven specifications where available.

Date	Action	
2002 07 31	Revised	Updated and renumbered
1992 11 25	C10261077	Released W.Jones EAO C.J.Webster NAAO

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3.3 PART HARDNESS (ASTM E 18) Unless otherwise specified on the Engineering drawing

3.3.1 General

One piece/stem of two piece valves 30 - 40 HRC*

* Areas remote from weld and induction hardened heat affected zones, cold work, chromium plating and other finishes and curved surface correction to be applied where applicable.

3.3.2 Induction Hardened Surfaces

Collet Groove, min	50 HRC
Tip, min	53 HRC
Valve Seat, min	42 HRC

Curved surface correction to be applied where appropriate.

3.4 HEAT TREATMENT

The material shall be heated uniformly within the austenite phase field and quenched by a suitable medium to produce optimum hardness. Hardening shall be followed by reheating and tempering at a temperature shown below:

WSD-M1A314-A1	Austenitising	1020 - 1050 °C
	Tempering	590 - 750 °C
WSD-M1A314-A2	Austenitising	825 - 880 °C
	Tempering	500 - 650 °C

All heat treatment process parameters including any local hardening will form part of control plan.

3.5 MICROSTRUCTURE

General microstructure (para 3.3.1), shall be uniform tempered martensite. In the areas of process rehardened heat affected zones up to 5 and 10 %, by area, of ferrite and retained austenite, respectively, shall be permitted. A uniform distribution of carbides no larger than 0.025 mm maximum dimension shall be present.

Induction hardened surfaces (para 3.3.2) which are ground or machined shall be free from total decarburization, overheating and scale.

3.6 GRAIN SIZE (ASTM E 112)

The prior austenite grain size shall be ASTM Number 5 or finer.