

**NICKEL, CHROMIUM, MANGANESE AND SILICON
ALLOYED ELECTRODE****WSD-M6A105-A****NICKEL, CHROMIUM, MANGANESE AND SILICON
ALLOYED ELECTRODE, GRAIN STABILIZED****WSD-M6A105-A2****NICKEL, MANGANESE AND SILICON ALLOYED
ELECTRODE****WSD-M6A105-A3****NICKEL, CHROMIUM AND IRON ALLOYED ELECTRODE****WSD-M6A105-A4****1. SCOPE**

The materials defined by these specifications are nickel, chromium manganese silicon alloys.

2. APPLICATION

These materials were originally released for side electrodes in spark plug applications.

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).

3.2 CHEMICAL COMPOSITION, weight, %

	A	A2	A3	A4
Nickel	95 min	94.5 min	94.0 - 96.0	76.0 - 78.0
Chromium	2 max	2 max	0.20 max	14.0 - 15.5
Manganese	1.2 - 2.5	1.2 - 2.5	3.75 - 4.25	0.2 - 0.5
Silicon	0.6 max	0.6 max	0.75 - 1.25	0.2 - 0.5
Copper	0.5 max	0.5 max	0.10 max	0.5 max
Iron	1.0 max	2.0 max	0.50 max	7.0 - 8.0
Carbon	0.1 max	0.1 max	0.05 max	0.05 max
Titanium	---	0.2 - 0.4	0.15 max	0.35 max
Zirconium	---	0.1 - 0.2	---	---
Aluminum	---	---	0.10 max	0.25 max

Chemical composition, including permitted impurity levels, will form part of the agreed control plan.

Date	Action	Revisions
2003 10 09	Revised	Para 3.0 inserted; para 3.1, 3.5 and 4 deleted
1993 06 10	C10309021	Released A4 J.C. Webster NAAO, R. Cooper EAO
1988 02 25	SM/ER 2761TC	Final Release N.P. Riley, EAO

**3.3 MECHANICAL PROPERTIES****3.3.1 Tensile Properties**
(ISO 6892/ASTM E 8M)

	A/A2	A3	A4
Ultimate Tensile Strength, MPa	430 - 500	N/A	570 - 620
0.2 Proof Stress, MPa, min	180	N/A	250 - 300
Elongation, %	35 min	30 - 42 in 250 mm	---
Round Material, % (Solid Centre Electrode)	---	---	8 - 25
Rectangular Material, %	---	---	34 - 42
Round Material, % (Copper-cored Centre Electrode, Gauge Length: 200 mm)	---	---	46 - 72

3.3.2 Hardness, HV
(ISO 6507/2; ASTM E 384)

	A/A2	A3	A4
	100 - 150	N/A	---
Round Material (Solid Centre Electrode)	---	---	220 - 250
Rectangular Material	---	---	140 - 170
Round Material (Copper-cored Centre Electrode)	---	---	120 - 160

The processing route and optimum mechanical properties for fabrication, welding and service performance shall form part of the agreed control plan.