

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.
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FORM 09-01

THIRD ANGLE PROJECTION		CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE	REVISION 3
PROCUREMENT SPECIFICATION NONE	TITLE GAS TUNGSTEN ARC (GTA) SPOT WELDING EQUIPMENT		CLASSIFICATION SPECIFICATION NAS981 SHEET 1 OF 18

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1.0 SCOPE

1.1 Purpose

This specification provides a standard for the manufacture, performance, inspection, reliability, and procurement of an inert gas tungsten arc spot welding system. This standard lists minimum requirements and is not limited to design advances.

1.2 Classification

This machine shall be of the following type, size and class.

1.2.1 Type

I Constant Current (DCSP)

1.2.2 Size

The maximum rated output shall be not less than 300 amperes at 100% duty cycle.

1.2.3 Class

General Purpose - Manual and Mechanized (GTA)

LIST OF CURRENT SHEETS

NO.	REV.	NO.	REV.	NO.	REV.	NO.	REV.
1	2	5	1	9	1	13	1
2	1	6	1	10	1	14	1
3	1	7	1	11	1	15	1
4	1	8	1	12	1	16	1
						17	NEW

②

CUSTODIAN: MANUFACTURING COMMITTEE

PROCUREMENT
SPECIFICATION

NONE

TITLE

GAS TUNGSTEN ARC (GTA)
SPOT WELDING EQUIPMENT

CLASSIFICATION
SPECIFICATION

NAS 981

SHEET 1 OF 17

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1.3 Intended Use

The welding system described by this specification is intended for use primarily in the aerospace manufacturing industry. It provides performance criteria for inert-gas tungsten arc spot welding of materials including, but not limited to, titanium and titanium alloys, nickel and cobalt alloys, and ferrous alloys.

2.0 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

The latest revision of the following specifications, codes and standards are included as a portion of this specification. Detail requirements listed in this specification shall override any contradicting portions of the following specifications, codes and standards.

- 2.1 MIL-W-27664 - Inert Gas Shielded Arc Spot Welding.
- 2.2 The Joint Industrial Council (JIC) Electrical Standards for General Purpose Machine Tools, EGP, 1, 1967.
- 2.3 National Electrical Code (NEC).
- 2.4 Federal, state and local regulations pertaining to radio interference.
- 2.5 National Aerospace Standard 972, Glossary of Manufacturing Equipment Terms.
- 2.6 American Welding Society's Standard A3.0-69.
- 2.7 State and local safety and electrical codes.
- 2.8 Occupational Safety & Health Standard Part 1910 of Chapter XVII of Title 29 of the Code of Federal Regulations (Occupational Safety & Health Act [OSHA] - 1970).
- 2.9 National Aerospace Standard (NAS) 938, Machine Axis and Motion Nomenclature.
- 2.10 National Aerospace Standard (NAS) 955, Interchangeable Tape Standards - Variable Block Format, Numerically Controlled Equipment.
- 2.11 National Aerospace Standard (NAS) 953, Numerical Control System (Reference Only).

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3.0 REQUIREMENTS

3.1 Design

The manufacturer has the choice of configuration and the functional operation of the machine, except where specifically stated in this specification or customer direction.

3.2 Type, Size, Class (GTA)

3.2.1 Welding Power Supply

3.2.1.1 The welding power supply shall be a constant current type with nominal 240/480 volt, 3 phase 60 Hertz input power, designed to provide exact and reproducible current, the magnitude of which will be pre-set by a dial calibrated directly in amperes.

3.2.1.2 The welding power supply rated output shall be not less than 300 amperes at 100% duty cycle.

3.2.1.3 The equipment shall be capable of welding from ten (10) amperes to at least 400 amperes at an operating arc voltage which will be set by direct reading dials graduated in hundreds, tens, and units, to enable the operator to set absolute values. The equipment shall be capable of down slope to one (1) ampere when welding below one hundred amperes.

3.2.1.4 Open circuit voltage shall be a minimum of 75 volts and an arc operating voltage range of from 6 to 40 volts.

3.2.1.5 The power supply shall be capable of changing the secondary current from maximum to minimum or minimum to maximum at the rate of 2 cycles per 100 amperes (based on AC line frequency of 60 Hertz per second).

3.2.1.6 The starting welding current shall be infinitely adjustable within the power source range and shall not exceed operating current by more than 15%; and must be uniform for each start. The starting current shall be stabilized within 3 cycles of time at a rate of not less than 50 amperes per cycle of line frequency.

3.2.1.7 The welding arc initiation time is defined as the period necessary to establish stable arc power. This time shall be equal to or less than 3 cycles after open circuit voltage is applied to the electrode. It shall be completely reliable over the entire welding current range. The arc initiation shall be provided by an auxiliary device such as high frequency, capacitor discharge or equivalent. The arc starting method shall not have detrimental effects on the performance of the weld and adjacent area. The weld

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NATIONAL AEROSPACE STANDARD

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3.2.1.7 (Continued)

timing or cycling shall not commence until the welding arc is stabilized at the starting current level, so that a complete cycle will take place.

3.2.1.8 Automatic thermal overload protection shall be supplied.

3.3 Machine Sub-Assemblies

3.3.1 GTA Spot Gun

3.3.1.1 The gun shall be so designed as to permit quick change, without disassembly for .040, 1/16, 3/32 and 1/8 inch diameter electrodes. Tools or gauges shall be supplied to accurately center and adjust the length of the electrode.

3.3.1.2 The welding current range of the gun shall be from a minimum of one (1) ampere to a maximum of 300 amperes continuous, DC Straight Polarity.

3.3.1.3 The gun shall be basically designed for mechanized use. It shall be made adaptable to manual use in one or more of the modes noted:

- (a) Fixed Electrode
- (b) Constant Arc Voltage
- (c) Programmed Arc Voltage
- (d) Programmed Arc Length

3.3.1.4 Provisions shall be made for a manual gun and convenient ready attachment thereof. This gun to be provided with cables of 25 ft. lengths, unless otherwise specified.

3.3.1.5 Mechanized equipment shall provide infinitely adjustable gun pressure from 1 through 60 lbs. force.

3.3.1.6 When used in the manual mode, the gun shall be provided with start-stop, and emergency stop switches and an adjustable "under pressure limit switch". It shall also be provided with wire jog controls.

3.3.1.7 The gun shall be provided with accessories (collets, shielding cups, etc.) and all miscellaneous interchangeable items necessary to GTA spot weld the typical materials called out in paragraph 1.3. The shielding gas cups shall be furnished with inside diameters from 1/4" through 1/2". Cup material shall be copper unless otherwise specified.

3.3.1.8 Permanent leak-proof partitions shall be used between water and gas passages in the gun. 'O' rings shall not be used to separate the gas and water passages.

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- 3.3.1.9 Inert gas lines shall be flexible and of a type to prevent contamination by osmotic aspiration.
- 3.3.1.10 The line fittings provided shall be so designed as to preclude the switching of lines to the wrong inlet/outlet.
- 3.3.2 Filler Wire Feed System
- 3.3.2.1 A dust free, precision filler wire feed drive system shall be provided to feed a predetermined increment of wire into the molten weld puddle, at a pre-established time in the weld cycle, at a precise and predetermined rate of feed, and with a precise, adjustable wire retraction.
- 3.3.2.2 It shall be possible to introduce the wire into the puddle at adjustable and reproducible angles from 5 degrees through 45 degrees using a calibrated scale or equivalent.
- 3.3.2.3 The filler wire feed rate shall be infinitely variable over a range of 10 to 100 inches per minute.
- 3.3.2.4 Filler wire feed rate accuracy shall be plus or minus 1% of preset rate, regardless of plus or minus 10% line voltage variation.
- 3.3.2.5 Filler wire size range - .020 to .093 (hardwire)
- .030 to .093 (softwire)
- 3.3.2.6 Two (2) liners, wire guide tips, etc., shall be furnished for each of the wire diameters.
- 3.3.2.7 Filler wire feed design shall incorporate straightening, non-knurling, and non-galling features.
- 3.3.2.8 Filler wire feed design shall provide for pressure adjustment on feed rolls.
- 3.3.2.9 Provisions to prevent excessive unspooling of the filler wire shall be provided.
- 3.3.2.10 A wire jog capability (Forward & Reverse) shall be provided.
- 3.3.3 Machine Controls
- 3.3.3.1 All controls shall be mounted with activating switches, dials, knobs, etc., on the front side, and arranged in a logical and convenient pattern for making the setup in an orderly manner. Means shall be provided for easily recalibrating all controls where required. Construction shall be such that all equipment is readily accessible for maintenance.
- 3.3.4 Control Console

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