



NATIONAL AEROSPACE STANDARD

© COPYRIGHT 2012 AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC. ALL RIGHTS RESERVED



FED. SUPPLY CLASS

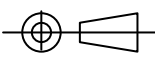
INACTIVE FOR DESIGN AFTER 31 AUGUST 2012. NO SUPERSEDING STANDARD. FOR DESCRIPTION OF STATUS NOTES SEE NAS380.

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.
1000 WILSON BLVD.
ARLINGTON, VA 22209

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME
PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST
REVISION DATE.

FORM 09-01

ISSUE DATE: MARCH 1976 REVISION DATE: AUGUST 31, 2012

THIRD ANGLE PROJECTION		CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE	REVISION 1
PROCUREMENT SPECIFICATION NONE	TITLE MACHINE PLASMA ARC WELDING EQUIPMENT	CLASSIFICATION SPECIFICATION NAS997	SHEET 1 OF 20



1.0 SCOPE

1.1 Purpose

This specification provides a standard for performance, inspection, and procurement of transferred arc plasma welding systems exclusive of weld positioners, weld manipulators, and other mechanical tooling devices. This standard lists minimum requirements and is not to limit design advances.

1.2 Classification

The plasma welding systems shall consist of the following types, sizes, and class.

1.2.1 Type

- I. DC Constant Current
- II. DC Pulsed Power (Optional)

1.2.2 Size

- A. 15 A (Low)
- B. 125 A (Medium)
- C. 400 A (High)

1.2.3 Class

Transferred plasma arc

1.3 Intended Use

The welding systems described by this specification are intended for use within the aerospace manufacturing industry to provide plasma arc welding of titanium, superalloys, and ferrous alloys.

LIST OF CURRENT SHEETS

NO.	REV.	NO.	REV.	NO.	REV.	NO.	REV.	NO.	REV.
1	NEW	5	NEW	9	NEW	13	NEW	17	NEW
2	NEW	6	NEW	10	NEW	14	NEW	18	NEW
3	NEW	7	NEW	11	NEW	15	NEW	19	NEW
4	NEW	8	NEW	12	NEW	16	NEW		NEW

CUSTODIAN: MANUFACTURING COMMITTEE

PROCUREMENT
SPECIFICATION
NONE

TITLE
MACHINE PLASMA ARC WELDING
EQUIPMENT

CLASSIFICATION
SPECIFICATION

NA 887
SHEET 1 OF 19

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON, D. C. 20036

2.0 APPLICABLE SPECIFICATIONS, CODES, AND STANDARDS

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

- 2.1 American Welding Society Standard A3.0-69
- 2.2 The Joint Industrial Council (JIC) Electrical Standards for General Purpose Machine Tools, EGP.1.1967, when requirements are not specifically noted in Sections 2.6 and 2.7.
- 2.3 The Joint Industrial Council (JIC) Hydraulic and Pneumatic Standards for Industrial Equipment.
- 2.4 The American National Standards Institute (ANSI).
- 2.5 National Electrical Manufacturers Association (NEMA) EW1-1970.
- 2.6 The Electronic Industries Association (EIA) Construction Standards for Electronic Wiring and Components, RS 281.
- 2.7 FCC regulations pertaining to radio interference.
- 2.8 National Aerospace Standard 972, Glossary of Manufacturing Equipment Terms.
- 2.9 Occupational Safety and Health Standards, Part 1910 of Chapter XVII of Title 29 of the Code of Federal Regulations. Ref: Occupational Safety and Health Act (OSHA) - 1970.
- 2.10 State and Local Safety and Electrical Codes.
- 2.11 Military Specification C-4566A2 - Calibration Systems Requirements.

3.0 REQUIREMENTS3.1 Design

The manufacturer has the choice of configuration and functional operation of the equipment except where specifically stated in this specification.

3.2 Types, Sizes, and Class

See TABLE I.

TABLE I

Type I - DC Constant Current

	Size		
	A	B	C
Maximum Rated Current Output at 100% duty cycle, A	15	125	400
Output Current Range	10% to 120% of rated output, continuously		
Maximum Rated Load Voltage, V	40	40	40
Output Current Load Regulation	$\pm 2\%$ over entire current range for a $\pm 30\%$ variation in output voltage		
Output Voltage Range, V	15 to 60	15 to 60	15 to 60
Output Current Line Regulation	1% for a 10% variation in primary line voltage		
Open Circuit Voltage, V	75 minimum	75 minimum	75 minimum
Input Voltage Requirements	110 V, 1 ϕ , 60 Hz	230/460 V, 3 ϕ , 60 Hz	230/460 V, 3 ϕ , 60 Hz
Input Current Requirements	Maximum noted by manufacturer		
Power Factor	Not less than 75% at maximum rated output		
Response to Program Change, sec	0.120 or less	0.120 or less	0.120 or less
Resolution and Accuracy of Current Control, A	± 0.5 or 1% of indicated reading, whichever is greater	± 0.5 or 1% of indicated reading, whichever is greater	± 0.5 or 1% of indicated reading, whichever is greater
Polarity Switch	Provided	Provided	Provided
Auxiliary Power (110 VDC receptacle energized with main power switch)	Optional	None	None
Thermal Overload Protection	Provided	Provided	Provided
Current Slope Control, Machine Welding	Linear and/or exponential and/or stepped, as specified by the customer. Time deviation to be defined by the user.		

AIA AND ITS COMMITTEES WILL NOT INVESTIGATE THE APPLICABILITY OF PATENTS TO THE SUBJECT MATTER OF NAS STANDARDS AND IN RESPECT THEREOF DO NOT ASSUME ANY LIABILITY TO PATENT OWNERS OR TO PROSPECTIVE USERS.

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST DATE OF APPROVAL SHOWN HEREON.

APPROVAL DATE March 1976 REVISION

TABLE I (Continued)

Type II - DC Pulsed Power

Response to Program Change	Must be coordinated with pulsation requirements plus the following:
Maximum Rated Output	Average current output obtained at maximum pulse and background level settings.
Output Current Range	Peak current 10% to 120% of rated output, continuous. Background current 10% to 100% of peak current. Open circuit voltage shall be 75 V minimum.
Output Current Resolution and Accuracy	Same as Type I and applicable to both peak and background level settings.
Pulse Repetition Rate	Low frequency peak power pulses shall be available at such rates (frequency) as 1 to 60, 1 to 120, or 1 to 250 pulses per second. The rate is to be fixed or preset by a convenient front panel control. High frequency (e.g., 25,000) shall be a procurement option.

3.3 Welder Sub-Assemblies

3.3.1 Welding Head

3.3.1.1 Capacity — At 100% duty cycle of applicable power source (Low, Medium, High — as detailed in 1.2.2).

3.3.1.2 Inert gas lines shall be flexible and of a type to prevent contamination by osmotic aspirations of oxygen or water vapor or gas line outgassing according to customer's specification, so that plasma arc performance is not reduced.

3.3.1.3 The welding torch shall be adequately cooled to maintain current capacity specified.

3.3.1.4 Gas inlet fitting, water inlet fitting, water out, and power cable fitting shall be per NAS specification.

3.3.1.5 Permanent leak proof partitions shall be used between water and gas passages.

AIA AND ITS COMMITTEES WILL NOT INVESTIGATE THE APPLICABILITY OF PATENTS TO THE SUBJECT MATTER OF NAS STANDARDS AND IN RESPECT THEREOF DO NOT ASSUME ANY LIABILITY TO PATENT OWNERS OR TO PROSPECTIVE USERS.

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS OF THE SAME TITLE AND SHALL BE OBSOLETE SIX MONTHS FROM THE DATE OF APPROVAL SHOWN HEREON.

APPROVAL DATE March 1976 REVISION

NAS 997
SHEET 4

AIA AND ITS COMMITTEES WILL NOT INVESTIGATE THE APPLICABILITY OF PATENTS TO THE SUBJECT MATTER OF NAS STANDARDS AND IN RESPECT THEREOF DO NOT ASSUME ANY LIABILITY TO PATENT OWNERS OR TO PROSPECTIVE USERS.

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST DATE OF APPROVAL SHOWN HEREON.

- 3.3.1.6 The electrode shall be readily and accurately positioned concentrically within the orifice and with the proper setback. An optional micrometer adjusting device can be used to center the electrode and adjust the distance between the electrode and the orifice. A voltmeter shall be provided in the pilot circuit to check electrode positioning.
- 3.3.1.7 Orifices shall be available for two severities of performance, one for copper and one for conditions exceeding the endurance of copper, e.g., molybdenum or tungsten orifices. Orifices shall be free of burrs and nicks, shall be flat for proper seating, and ovality shall be no greater than 1% of the diameter.
- 3.3.1.8 An optional orifice gas purifier (scrubber) to be located as close to the torch as practical, can maintain the gas purity level at 5 ppm maximum.
- 3.3.1.9 Electrode and orifice sizes shall be consistent with torch capacity.
- 3.3.1.10 Torch start may be either hi-frequency, impulse, pilot arc, or momentary contact. Initial current spike (overshoot) shall not exceed 10% of effective current setting.
- 3.3.1.11 The water supply shall be isolated so that no torch components will be exposed to water when orifices and electrodes are being changed.
- 3.3.1.12 Normal Adjustment - Combined manual and mechanized adjustment shall include at least 8 inches automatic adjustment in the vertical position.
- 3.3.1.13 Backlash Requirement - "Zero" backlash.
- 3.3.1.14 Torch mounting assembly design shall provide for manual adjustment of electrode tip within a conical angle of 15° measuring from electrode center line. Entire head assembly shall be adjustable to ± 3 inches in a transverse direction to the weld point.
- 3.3.2 Filler Wire Feeder
- 3.3.2.1 Filler wire feed rate - infinitely variable within a single range from 3 to 300 ipm.
- 3.3.2.2 Filler wire feed rate accuracy - $\pm 1\%$ of preset rate, regardless of $\pm 10\%$ line voltage fluctuation.
- 3.3.2.3 Filler wire size range - 0.020 to 0.093-inch-diameter hard wire.
- 3.3.2.4 The filler wire feed rate indicator shall read within $\pm 3\%$ of the actual rate regardless of $\pm 10\%$ line voltage fluctuation.

APPROVAL DATE March 1976 REVISION