MIL-W-80043C
28 January 1981
SUPERSEDING
MIL-W-80043B
6 June 1974

MILITARY SPECIFICATION

WELDING MACHINE, ARC, DC, TRANSFORMER-RECTIFIER, CONSTANT CURRENT

This Specification is approved for use by all Departments and Agencies of the Department of Defense,

1. SCOPE

1.1 Scope. This specification covers Arc Welding Machines of the industrial type, rated at 60 percent duty cycle, producing direct current, (DC) constant current output characteristics from a transformer-rectifier power supply for single operator shielded metal Arc Welding (SMAW) processes.

1.2 Classification. The welding machines shall be of the following sizes. The size required shall be as specified (see 6.2.1).

Size 200 - 200 amperes
Size 300 - 300 amperes
Size 400 - 400 amperes
Size 500 - 500 amperes
Size 600 - 600 amperes

2. APPLICABLE DOCUMENTS

* 2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

STANDARDS

FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Industrial Plant Equipment Center, Memphis, Tennessee 38114, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

☆ US GOVERNMENT PRINTING OFFICE 1981—703-023/949 FSC 3431

MILITARY

MIL-STD-1188 - Commercial Packaging of Supplies and Equipment

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

* 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

U. S. DEPARTMENT OF LABOR

OSHA 2206 - General Industry, OSHA Safety and Health Standards (29 CFR 1910)

Title 29 Code of Federal Regulations, Chapter XVII, Part 1910 and Amendments	Occupational Safety and Health Administration Standards

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Z210-1 Metric Practice (ASTM-E-380)

(Application for copies should be addressed to the American National Standards Institute, Dept. 969, 1430 Broadway, New York, NY 10018.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

EW-1 - Electric Arc-Welding Apparatus
WC-3 - Rubber-insulated wire and cable for the transmission of electrical energy

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street, N,W., Washington, DC 20037.)

3. REQUIREMENTS

3.1 First article. When specified (see 6.2.1 and 6.3), the supplier shall furnish one complete welding machine of each size specified in the contract or order for first article inspection in accordance with Section 4.

* 3.2 Design. The welding machines shall be of the manufacturer's standard commercial product and shall include any additional features necessary to comply with the requirements specified herein. Additional features which are not specified herein that are a part of the manufacturer's standard product shall be included in the equipment furnished. A standard commercial product is a product which has been sold on the commercial market through advertisements, manufacturer's catalogs or brochures, and represents the manufacturer's latest production models. The welding machines shall have all the necessary controls and indicating devices to meet the performance requirements specified herein. The machine shall be rated at not less than 60% duty cycle at the ampere output specified for the size machine. The machines shall be of the DC, Constant Current, Transformer-Rectifier design and shall be a NEMA Class I as defined in NEMA Standard EW-1, for Constant Current Machines.

3.2.1 Parallel operation. The machine shall be designed to permit parallel operation of two or more similar machines of the same manufacturer. When operated in parallel and with the same control settings, the welding machine shall divide the load so that no individual machine will draw in excess of ten percent more of the load than any other individual machine in the system.

3.2.2 Safety and health requirements. All parts presenting safety hazards shall be insulated, fully enclosed or guarded. The safety devices shall not interfere with operation of the machine. The safety devices shall prevent unintentional contact with the guarded part and shall be removable to facilitate inspection, maintenance and repair of the parts. All machine parts, components, mechanisms and assemblies furnished on the machine, whether or not specifically required herein, shall comply with the applicable portions of 29 CFR 1910.252b. All physical hazards on the machine shall be safety color coded in accordance with 29 CFR 1910.144. Additional safety and health requirements shall be as specified (see 6.2.1 and 6.4).

3.2.3 Interchangeability. All parts shall be manufactured to definite dimensions and tolerances which will permit installation of replacement parts without modification of parts or machine,

3.2.4 Materials. Materials not specified herein shall be selected by the manufacturer to meet the requirement of this specification, Contact between dissimilar metals especially brass, copper or steel in contact with aluminum or magnesium shall be avoided whenever possible. Materials shall be free from all defects and imperfections that might affect the serviceability and appearance of the finished product.

3,2.5 Reclaimed materials. The welding machine may contain reclaimed materials provided such materials will not jeopardize the machine's intended use and performance. The reclaimed materials shall have been reprocessed, remanufactured or recycled in a manner which will restore them to the same chemical composition and physical properties as the materials originally selected for use on the machine,

3.2.6 Measurement systems. Unless otherwise specified, either the U.S. Customary System of Units (US) or the International System of Units (SI) may be used in the design and construction of the machine, When only one system of measurements is acceptable, the particular system required shall be as specified (see 6.2.1). In this specification, all measurements, dimensions, sizes and capacities are given in the U.S. Customary System of Units (US). These measurements may be converted to the International System of Units (SI) through the use of the conversion factors and methods specified in ANSI Z210.

3.2.7 Portability. Each machine shall be portable, and shall be base mounted. Running gear, if required shall be as specified (see 6.2.1). The machine shall be provided with a lifting device capable of supporting 2 1/2 times the weight of the machine for handling by crane or hoist. Each machine shall be designed for handling by forklift truck.

3.2.8 Power supply. Each welding machine shall be designed to operate from a nominal 230/460 volts, 60 hz three phase power supply.

3.2.8.1 Voltage compensation, Each machine shall compensate for line voltage fluctuation of + 10% and maintain virtually constant welding current output.

3.2.9 Temperature rise. The maximum allowable temperature rise of insulated parts of the machine shall not exceed the temperature limits of NEMA EW-1 for the class of insulation system used.

3.2.10 Fungus and moisture resistance. When specified (see 6.2.1), the equipment shall be treated to resist fungus and moisture as specified below:

a. Electrical components such as switches, fuses and contacts shall not be treated. Other materials and components inherently fungus resistant or protected by hermetic sealing shall not be treated.

b. Circuit elements not covered above which have a temperature rise of not more than 75°F when operated at full load shall be coated with a moisture and fungus-resistant varnish. Circuit elements include but are not limited to, cable, wire, terminal and junction blocks, junction boxes and condensers.

c. Circuit elements such as motor coils, transformer windings, and similar electrical components which have a temperature rise exceeding 75°F when operated at full load shall not be coated with a fungi-toxic compound. Instead, such components shall be given two coats of electrical impregnating varnish. The coat shall be applied by the vacuum-pressure, immersion, centrifugal, pulsating pressure or built-up method so as to fill all interstices in the coils and preclude the entrapment of air or moisture. The sealer coat may also be applied by brushing or spraying.

3.3 Construction. The welding machine shall be constructed and assembled so that when installed and connected to the specified power supply, it can be used for any operation required herein. Construction and design shall be free from any characteristic or defect that will prevent the machine from meeting any of the requirements of this specification.

3.3.1 Fastening devices. All screws, pins, bolts and similar fasteners shall be of a type that resist loss of tightness or installed with means for preventing loss of tightness. Such fasteners subject to removal or adjustment shall not be swaged, peened, staked or otherwise permanently deformed.

* 3.3.2 Painting. The machine shall be cleaned and painted in accordance with the manufacturer's standard commercial practice.

3.3.3 Accessibility. The welding machine shall be provided with removable panels or doors for access to terminal boards and other parts which may require replacement or adjustment. Components within the cabinet shall be arranged so that they may be removed or replaced without undue interference from, or removal of, or injury to, other components and wiring.

3.3.4 Threads. All threaded parts shall be in accordance with FED-STD-H28.

3.3.5 Surfaces. All surfaces of castings, forgings, molded parts, stampings and welded parts shall be cleaned and free from sand, dirt, fins, sprues, scale, flux and other harmful or extraneous materials. External surfaces shall be smooth and there shall be no sharp edges.

3.3.6 Welding, brazing or soldering. Welding, brazing or soldering shall be employed only where these operations are required in the original design. These operations shall not be employed as repair measures for defective parts.

3.4 Components.

3.4.1 Enclosure. The sheet metal enclosure shall be dripproof, so designed and constructed that liquid or solid particles falling on the enclosure from above, at angles up to 15 degrees from the vertical, shall not interfere with the satisfactory operation of the equipment. Inlet and outlet electrical connections shall be clearly and permanently marked. The output welding terminals shall be of the stud and hex nut type. Studs shall be not less than 1/2 inch diameter. Receptacles of equivalent capacity shall be acceptable provided that a pair of matching plugs suitable for attachment to the welding leads are included. The welding power terminals shall be recessed or otherwise protected against accidental contact by personnel. All intake or exhaust openings shall be screened or of a size to prevent entrance of trash or rodents.

3.4.2 Transformer. The transformer shall be of the laminated core or shell type, designed to draw a balanced load from a three phase power supply. Insulation of primary and secondary transformer coils shall be Class B, F or H material in accordance with the definition in NEMA EW-1. The transformer(s) shall be rigidly mounted within the enclosure. All terminals shall be permanently marked.

* 3.4.2.1 Overtemperature protection. Transformer coil windings shall be protected by a suitable thermal device or devices. The device shall reduce the load or de-energize the machine to prevent transformer damage due to excessive temperature. The device shall protect the welding machine from overloads of the electrical circuitry. A combination over-temperature and overload device may be used in lieu of separate controls for overtemperature and overload.

* 3.4.3 Rectifier. The rectifier shall be of the full wave type. Rectification shall be accomplished by means of silicon controlled rectifiers (SCR), silicon diodes or silicon diodes and thrysistors or a combination of these devices of suitable size and design for the

intended service. The assembly employed shall be of a type which has had a satisfactory history of field service in the type machines covered by this specification. The operating temperature of the rectifier under maximum load conditions at rated duty cycle shall not exceed a value which will result in damage to the rectifier system or adversely affect performance of the power supply,

* 3.4.4 Controls. The control panel shall be located on the front of the machine enclosure, The panel shall be recessed and contain the machine outlets and control devices. The welding current shall be controlled from not more than 20 percent of rated output to maximum output in one or more steps, with stepless adjustment within each range. Power on/off switch shall be provided and all controls shall be clearly marked as to their functions. Operation of the controls shall be free from binding and controls shall be of such materials and design that a fixed setting will remain unchanged after extended exposure to adverse atmospheric conditions. A remote current control receptacle and switch on the front panel for remote operations shall be furnished. When specified (see 6.2.1), the machine shall have a switch for selecting positive or negative current at the electrode.

3.4.4,1 Welding current adjustment. Welding current shall be provided by a stepless, adjustable control. Adjacent ranges shall have sufficient overlap to provide for any current setting within the range of the machine.

* 3.4.4.2 Voltmeter and ammeter. When specified (see 6.2.1), the machine shall be provided with a voltmeter to register the voltage at the welding output terminal and an ammeter to register the current during welding operations. A combination volt-ammeter may be used. The meters shall be flush mounted in a panel and have an accuracy within 3 percent of full scale reading.

* 3.4.4.3 Gas, water, high frequency control systems. When required the machine shall be equipped with gas shielding control, a water cooling system and high frequency arc starting system as specified (see 6.2.1). Unless otherwise specified (see 6.2.1), these devices may be either built-in or provided as an added external unit.

3.4.5 Ventilation system. Adequate ventilation and cooling of all components, to meet the duty cycle specified herein, shall be provided by forced air. The cooling fan or fans shall have totally enclosed permanent lubricated ball bearing motors. The fan assembly shall be

securely fastened to a rigid mount in such a manner to withstand the vibrations encountered in this type of equipment. Fan blades shall be of material and design to prevent fatigue failure.

3.5 Performance. Each welding machine shall meet the applicable performance requirements of NEMA Standard EW-1. When operated by a skilled welder, the machine shall be a satisfactory power supply for direct current welding, both straight and reverse polarity, using a drooping volt-ampere characteristic.

3.5.1 Arc stabilization. Output of the machines shall be inherently stable to the extent that arc outage on critical welding application is not a problem. The operator shall have no difficulty in striking or maintaining an arc with any type and size electrode within the capacity of the machine without losing the arc more than once per minute. The welding machine shall not produce excessive spatter.

3.6 Diagram of connections. A diagram of electrical connections shall be attached to the welding machine, and shall be coated with a transparent varnish or transparent plastic covering.

* 3.7 Cables. When specified (see 6.2.1), the following cables shall be furnished with each unit:

a. Fifty feet of grounding cable and fifty feet of electrode cable conforming to NEMA WC-3, with electrode holder and ground clamp attached. Procuring activity shall specify the wire size.

b. Remote hand or foot control with cable as specified,

c. Power supply cable as specified by the procuring activity.

3.8 Nameplate. A corrosion-resistant metal nameplate shall be securely attached to each machine. The nameplate shall contain the information listed below. If the machine is a special model, the model designation shall include the model of the basic standard machine and a suffix keyed to the manufacturer's permanent records.

Nomenclature
Manufacturer's name
Manufacturer's model designation
Manufacturer's serial number

Power input characteristics and ratings
Power output characteristics and ratings
Date of manufacture
Contract or order number
National Stock Number or Plant Equipment Code

3.9 Technical data. Technical data shall be furnished as specified (see 6.2.2).

3.10 Workmanship. Workmanship of the machine and accessories shall be of the quality prevailing among manufacturers normally producing equipment of type specified herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

4.3 First article inspection, First article inspection shall be applied to the first article submitted in accordance with 3.1. Unless otherwise specified (see 6.2.1), first article inspection shall consist of the examination in 4.5 and all tests in 4.6. Failure of the first article to pass the examination or one or more preproduction tests shall be cause for rejection.

4.4 Quality conformance inspection. Quality conformance inspection shall be applied to each item prior to being offered for acceptance under the contract. Unless otherwise specified, quality conformance

inspection shall consist of the examination in 4.5, the test in 4.6.1 and the inspection in 4.7. When additional quality conformance tests are required, they shall be as specified (see 6.2.1), and shall be selected from the tests prescribed by paragraphs 4.6.3 through 4.6.9 of this specification. Failure of the item to pass the examination or any test shall be cause for rejection.

4.5 Examination. The welding machine shall be examined for design, construction, materials, components, electrical equipment and workmanship to determine compliance with the requirements of this specification.

4.6 Tests. All tests shall follow the procedures as specified herein.

4.6.1 High potential tests. Each welding machine shall be subjected to high potential tests described in “Testing Standards” of NEMA EW-1.

4.6.2 Open circuit voltage test. The welding machine shall be connected to the appropriate primary power supply and the open circuit voltage shall conform to the requirements of NEMA EW-1.

4.6.3 Temperature rise test. With machine at room temperature, the maximum temperatures of the primary and secondary windings of the transformer shall be recorded. The welding machine shall be operated at rated load and rated duty cycle until stable temperatures are obtained. Temperatures of the windings shall be recorded at 10 minute intervals until stable temperatures are obtained on three successive readings. The load tests are to be run with resistance loading. Temperature rise of the rectifier assemblies, transformer and related parts shall not exceed the temperature limits for these items specified in NEMA EW-1.

* 4.6.4 Capacity test. The welding machine shall be operated on 230 or 460 volt taps. The output current shall be measured when using the resistance or stick electrode methods. The current range at rated load volts shall conform to the requirements of NEMA EW-1.

4.6.5 Welding performance test. To demonstrate the capability of the machine to weld within its specified range, a welder shall deposit six inch long weld beads using DC with both polarities. Welding shall be done with 1/8 and 1/4 inch diameter, AWS-E-6011 electrodes as specified in the AWS Handbook, Section One and applicable for the processes. There shall be no evidence of difficulty in striking or maintaining the arc.

4.6.6 Overtemperature protection test. The welding machine shall be subjected to a short circuit condition specified in 4.6.7. The overtemperature device shall de-energize the machine or reduce the load before any damage occurs to the transformer or any other component.

4.6.7 Short circuit test. When set for maximum welding current, the welding machine shall be capable of sustaining, without indication of damage, a short circuit connected for one minute through an external resistance of approximately 0.002 ohms.

4.6.8 Current adjustment. The welding machine shall be checked to verify compliance with the current adjustment requirements of 3.4.4.1.

4.6.9 Parallel operation test, The First article and a similar welding machine shall be connected in parallel. The load current shall be adjusted from no-load to combined full load ratings in five equal steps and returned to no-load. The line voltage and output current for each welding machine for each load adjustment shall be recorded. Neither machine shall indicate a load greater than 10 percent of the load of the other machine at any setting.

4.7 Packaging inspection. Packaging shall be inspected to determine compliance with the requirements of Section 5.

5. PACKAGING

5.1 Preservation, packing and marking. Unless otherwise specified (see 6.2,1), preservation, packing and marking shall conform to the requirements of MIL-STD-1188.

6. Notes.

6.1 Intended use, The welding machines covered by this specification are intended for shielded metal arc welding processes.

6.2.1 Procurement requirements,

a. Title, Number and Date of this specification

b. Size machine required (see 1.2).

c. First article, when required (see 3.1).

d. Additional safety and health requirements (see 3.2.2),

e. Measurement system, if different (see 3.2.6).

f, Running gear, if required (see 3.2.7).

g. Fungus and moisture treatment, if required (see 3.2.10).

h. Reverse polarity switch, if required (see 3.4.4).

i. Voltmeter and ammeter, if required (see 3.4.4.2).

j. Shielding gas, high frequency arc starting and water cooling system, if required. Specify each system and specify if these systems are required to be built-in the machine (see 3.4.4.3).

k. Cables and remote control device, if required specify each cable and remote control device (see 3.7).

l. First article inspection, if different (see 4.2).

m. Quality conformance inspection, if different (see 4.3).

n. Preservation and marking, if different (see 5.1).

6.2.2 Contract data requirements. Required technical data, such as operators manuals, parts lists, wiring diagrams and other instructions for operation and maintenance as identified on a numbered DD Form 1664 should be specified on a DD Form 1423 incorporated into the contract.

6.3 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of 7-104.55 of the Defense Acquisition Regulation. The first article should be a preproduction sample, or a standard production item from the contractor's current inventory. The contracting officer should include specific instructions in all procurement instruments regarding arrangements for examination, test and approval of the first article.

6.4 Safety and health requirements. Paragraph 3.2.2 requires compliance only with those OSHA requirements that concern the machine itself. It does not require compliance with those OSHA requirements

that concern "the machine in its operating environment" such as noise levels, radiation levels, electromagnetic emissions, noxious vapors or air contaminants in the environment. This does not limit the hazard level of individual machines in the environment. The procuring agency is advised to analyze the existing hazards levels in the proposed operating environment and specify additional machine requirements that will integrate the new machine into its future operating environment. If specific point-of-operation guarding is required, the procuring agency should specify the exact configuration of the guard required. The above, and any other additional safety and health requirements should be specified in detail under 6.2.l(d).

Custodians:
Army - AL
Navy - YD
Air Force - 99

Review Activities:
Army - ME
Navy - YD, CG
Air Force - 99
DLA - GS

User Activities:
Navy - MC, AS

Preparing Activity:
DLA- IP

Project Number:
3431-0140

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE. This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

DOCUMENT IDENTIFIER *(Number)* AND TITLE

MIL-W-80043C, Welding Machine, Arc, DC, Transformer-Rectifier, Constant Current

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1 ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY *(Printed or typed name and address — Optional)*

TELEPHONE NO.

DATE

DD FORM 1426 1 OCT 76

EDITION OF 1 JAN 72 MAY BE USED UNTIL EXHAUSTED

FOLD

DEFENSE LOGISTICS AGENCY

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO 4966 WASHINGTON D C

POSTAGE WILL BE PAID BY THE DEFENSE LOGISTICS AGENCY

Commander
Defense Industrial Plant Equipment Center
ATTN: DIPEC-TF
Memphis, Tennessee 38114

FOLD