

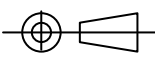
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FED. SUPPLY CLASS

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THIRD ANGLE PROJECTION	
PROCUREMENT SPECIFICATION	NONE

CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE
TITLE DRILLING MACHINES, NUMERICALLY CONTROLLED

REVISION 3
CLASSIFICATION SPECIFICATION DAS960
SHEET 1 OF 17

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.
1000 WILSON BLVD.
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FORM 12-01

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FIGURES

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1. SCOPE

1.1 Purpose

This specification provides a standard for the design, performance requirements, reliability, testing, inspection and procurement for numerically controlled (CNC at customer's option) drilling machines with manual, turret and automatic tool changer capabilities.

1.2 Classification

The machine shall be of the following type and class of numerically controlled size and group as ordered by the procuring agency.

1.2.1 Types

- Type I – Three axis single spindle machine (X,Y,Z) with manual tool change and Class III point-to-point positioning control.
- Type II – Three axis single spindle machine (X,Y,Z) with turret type tool change and Class III point-to-point positioning control.
- Type III – Three axis single spindle machine (X,Y,Z) with automatic tool changer and Class III point-to-point positioning control.

1.2.2 Sizes

- Group I – As listed in Table I
- Group II – As listed in Table I
- Group III – As listed in Table I

1.3 Intended Use

The machine described by this specification is intended for use in the aerospace manufacturing industry for point-to-point drilling, reaming, counterboring, countersinking and tapping.

2. APPLICABLE DOCUMENTS

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

State and Local Safety and Electrical Codes

Government Standards

29 CFR 1910 Occupational Safety and Health Standards (OSHA Act 1970)

TechAmerica

EIA-RS-281-B Electrical and Construction Standards for Numerical Machine Control

Copies can be obtained from TechAmerica, 601 Pennsylvania Avenue NW, North Building, Suite 600, Washington, D.C. 20004. www.techamerica.org

Aerospace Industries Association

- NAS938 Machine Axis and Motion Nomenclature
- NAS943 Interchangeable Perforated Tape Standards, Variable Block Format for Positioning and Straight Cut Numerically Controlled Equipment
- NAS953 Numerical Control System

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- NAS955 Interchangeable Tape Standards, Variable Block Format, Contouring and Contouring/Positioning Numerically Controlled Equipment
- NAS968 Interchangeable Digital Magnetic Tape Standards, Variable Block, Word Address Format, Contouring and Contouring/Positioning Equipment
- NAS969 Interchangeable Digital Magnetic Tape Cartridge for Numerically Controlled Machines
- NAS972 Glossary of Manufacturing Equipment Terms

Copies can be obtained from the Aerospace Industries Association, 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209. www.aia-aerospace.org

ASME

- ASME B5.1M T-Slots, Their Bolts, Nuts, and Tongues
- ASME B5.18 Spindle Noses and Tool Shanks for Milling Machines
- ASME BPVC Boiler and Pressure Vessel Code, Section VIII

Copies can be obtained from ASME, Three Park Ave., New York, NY 10016-5990. www.asme.org

National Fire Protection Association

- NFPA 70 National Electrical Code
- NFPA 79 Electrical Standard for Industrial Machinery

Copies can be obtained from NFPA, 1 Batterymarch Park, Quincy, MA 02169. www.nfpa.org

International Organization for Standardization

- ISO 4413 Hydraulic fluid power — General rules and safety requirements for systems and their components
- ISO 4414 Pneumatic fluid power — General rules and safety requirements for systems and their components

Copies can be obtained from ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56 - CH-1211 Geneva 20, Switzerland. www.iso.org

3. REQUIREMENTS

3.1 Design

The dimensions and capacities for the respective types and sizes shall be shown in Section 3.2. The manufacturer has the choice of configuration and the functional operation of the machine, except where specifically stated in the specification.

3.2 Machine Specifications

3.2.1 Sizes as defined in Section 1.2. Table or column travel as follows:

TABLE I – SIZES

GROUP	"X"	"Y"
I	10"	18"
II	15"	20"
III	18"	30"

3.2.1.1 Table size shall not be less than table travel. Throat depth to be compatible with table travel in Table I.

3.2.1.2 Table and/or head adjustment – 20" minimum. Quill travel – 8" minimum.

3.2.1.3 Types as defined in Section 1.2. The specifications of Table II are minimum requirements, and may be exceeded.

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TABLE II – MINIMUM REQUIREMENTS

Range Capacity	Type I	Type II	Type III
Drill Capacity	1" mild steel	1" mild steel	1" mild steel
Spindle			
Speed – RPM	25 to 5,000	25 to 5,000	25 to 5,000
Steps 24	24	24	24
Feed Rate – Min	.0005"/rev	.0005"/rev	.0005"/rev
– Max	.130"/rev	.130"/rev	.130"/rev
Feedrate Control	Infinitely variable	Infinitely variable	Infinitely variable
Horsepower	5	5	5
Spindle nose to table surface – Min	4"	4"	4"
Positioning Feedrate			
Rapid Traverse – IPM Min	140"/min	140"/min	140"/min
Tool Changer Capacity	–	6 tools min.	tools (optional)
Positioning Accuracy			
Resolution per Axis	.0005"	.0005"	.0005"
Positioning Accuracy	.001"	.001"	.001"

3.2.2 Type III machine only (customer option)

3.2.2.1 Tool changer shall be a numerically controlled tool pocket magazine (or position), which requires operator to place correct pre-set tool in proper position.

3.2.2.2 The action of the tool changer is to be initiated by tape command and shall be fully automatic.

3.3 Construction

3.3.1 The machine shall be constructed to comply with requirements of Section 3 and inspection and acceptance tests of Section 4.

3.3.2 Tables shall move on replaceable mating surfaces.

3.3.3 Tee-slots shall be provided, one on center, per ASME B5.1M and ASME B5.18.

3.3.4 Coolant collector troughs shall be built into the table with provisions for returning the coolant to a central coolant system or collector.

3.3.5 Structure to withstand a thrust of 5,500 lbs. without undue deformation.

3.3.6 Spindle growth due to temperature rise under normal variety of operating conditions is to not change the relative position of the registration surface for tool holders greater than $\pm .001$ ".

3.3.7 All moving parts and mating ways shall be provided with wipers and/or covers to eliminate entrance of chips and other foreign matter.

3.3.8 Locking provisions are required on all motions. Automatic clamping shall be interlocked to prevent "X" and "Y" axis movement prior to spindle movement and spindle movement shall be prevented during movement of "X" and/or "Y" axis movements. Maximum displacement of any slides during lockout shall not exceed $\pm .0005$ ". A balanced hydraulic system may be considered as an automatic clamp. An unbalanced hydraulic system shall have provisions for a positive leak-proof lockout device (such as a pilot operated check valve).

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3.4 Spindle Head Assembly

- 3.4.1 Spindle head assembly shall consist of spindle nose, spindle, drive motor, provisions for altering the stipulated range of speed, reversing, integral housing, and such saddle and slides as necessary to satisfy the requirements of Section 3.2.
- 3.4.2 Spindle shall be of high quality, hardened and ground alloy steel. The spindle bearing shall be of adequate size and design to provide accurate support and rigidity for all machining operations within the limits of the capacity of the machine.
- 3.4.3 All moving parts and mating ways shall be provided with wipers and/or covers to eliminate entrance of chips and other foreign matter.
- 3.4.4 Locking provisions are required on all linear motions. Automatic clamping devices shall be interlocked to prevent slide movements prior to slide release. Maximum displacement of any slide during lock shall not exceed .0005". If a balanced hydraulic system is used, this may constitute the automatic clamp.
- 3.4.5 Selection of feed and speeds shall be by quick change method.

3.5 Control System

- 3.5.1 The machine shall be equipped with numerical control system for controlling all movements of the table and spindle, as applicable.
 - 3.5.1.1 The numerical control system shall be AIA Class III control for discrete positioning.
 - 3.5.1.2 The AIA Class III numerical control system shall be available in either 2-axis of movement or 3-axis of movement.
 - 3.5.1.3 When the Class III, 2-axis control is ordered, the positioning table longitudinal movement (X) and the positioning table cross movement (Y) shall be controlled.
 - 3.5.1.4 When the Class III, 3-axis control is ordered, the positioning table longitudinal movement (X), the positioning table cross movement (Y) and the spindle movement (Z) shall be controlled.
 - 3.5.1.5 The system shall be capable of controlling the longitudinal movement (X) and the cross movement (Y) simultaneously.
 - 3.5.1.6 Zero Offset – The system shall be such that the zero or reference point can be offset the full range of any axis and proceed without a back reference to a fixed point.
 - 3.5.1.7 The control system shall be designed and constructed to operate in normal factory environment defined as follows:

Room ambient temperature, 50 °F to 125 °F
Room ambient relative humidity, 10% to 95%
Line voltage fluctuation, ±10% of rated voltage

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