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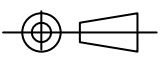
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FORM 09-01

ISSUE DATE: APRIL 1963
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THIRD ANGLE PROJECTION		CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE	REVISION 2
PROCUREMENT SPECIFICATION NONE	TITLE NUMERICALLY CONTROLLED DRAFTING LINE PLOTTER	CLASSIFICATION SPECIFICATION NAS957	SHEET 1 OF 10

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Full document details: AIA NAS957 2012



Documents
SHEET 1 OF 10

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INACTIVE FOR DESIGN AFTER 31 JULY 2012

1. SCOPE

1.1 Purpose: This specification provides a standard for the manufacture, performance, reliability, inspection and procurement of a single head numerically controlled drafting lines plotter. This standard lists minimum requirements and is not intended to limit design advances.

1.2 Classification: These machines shall be of the following types, sizes, and classes.

Type I. Single vertical head with approximate vertical table and gantry type construction.

Type II. Single head with adjustable horizontal to vertical table, gantry construction.

Size A - Small
Size B - Medium
Size C - Large

Class I. Drawing head shall be used to produce drawn or scribed lines in the XY, XZ or YZ axis motion from mathematical data input onto standard drafting papers, chart paper and/or mylar scribe coat.

1.3 Intended Use: The machines described in this specification are intended for use in the Aerospace Industry to provide the following:

- (a) Numerographics construction of engineering lines from mathematical formulae for design purpose.
- (b) Preparation of detail drawings from mathematical data for parts, assemblies, and other components of aerospace vehicles.
- (c) Verification of XY, YZ, or XZ axis coordinates of tapes programmed for use on numerically controlled machine tools. Other axis recognition at customer's option.
- (d) Preparation of tooling layout drawings.
- (e) Verification of various programs established for utilization of numerical data, such as APT III, ADAPT.

2. APPLICABLE 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. In the event of a conflict between the requirements of this specification and the referenced documents the requirements herein shall govern.

- (a) The Joint Industrial Council (JIC) Electrical Standards for General Purpose Machine Tools, EGP.1.1967.
- (b) The Joint Industrial Council (JIC) Hydraulic and Pneumatic Standards for Industrial Equipment.
- (c) The American Society of Mechanical Engineers' (ASME) Boiler and Pressure Vessel Code, Section VIII.
- (d) National Electrical Code (NEC).
- (e) The Electronic Industries Association (EIA) Construction Standards, Numerical Machine Tool Control, No. RS-281 and SP-621 Tape Format.
- (f) National Aerospace Standard (NAS) 938, Machine Axis and Motion Nomenclature.
- (g) National Aerospace Standard 953, Numerical Control System.
- (h) National Aerospace Standard 955, Interchangeable Tape Standards - Variable Block Format, Contouring and Contouring/Positioning Numerically Controlled Equipment.
- (i) National Aerospace Standard 972, Glossary of Manufacturing Equipment Terms.
- (j) National Aerospace Standard 985, Uniform Alignment Tests NAS Series Metal Cutting Equipment Specifications.
- (k) Illinois Institute of Technology Research Institute (IITRI) Standards for APT Programming Language.
- (l) 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.
- (m) State and Local Safety and Electrical Codes.
- (n) Military Standard 2B - Drawing Sizes.

3. REQUIREMENTS

3.1 Design. The dimensions and capacities for respective types, sizes and class of equipment shall be as shown in Section 3.2 Table I. The Manufacturer shall have the choice of configuration and the functional operation of the machine, except when specifically stated in this specification.

3.1.1 The design of the machine should avoid the use of hydraulic equipment so as to prevent contamination of either the work or the machine area.

3.1.2 The machine shall provide sufficient longitudinal travel to permit parking of the drawing tool head and carriage to permit accessibility to the entire working surface without interference.

3.1.3 The entire working surface must be easily accessible to the operator.

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LIST OF CURRENT SHEETS			
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5	1		

CUSTODIAN: MANUFACTURING COMMITTEE

PROCUREMENT SPECIFICATION

TITLE

NUMERICALLY CONTROLLED DRAFTING LINE PLOTTER

CLASSIFICATION SPECIFICATION

NAS Documents
SHEET 1 OF 9

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APPROVAL DATE APRIL 1963 REVISION ① 16 DEC. 1974

REQUIREMENTS (Contd.)

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3.2 Type, Size, Class As Shown in TABLE I

TABLE I

TYPE AND CLASS	SIZE		
	A	B	C
Work Mounting Surface			
Width (Y) Min.	60"	60"	60"
Length (X) Min.	96"	144"	240"
Height from floor (Type II) Approx.	40"	40"	40"
Axes Movement - CLASS I & II			
Transverse (Y)	60"	60"	60"
Longitudinal (X)*	96"	144"	240"
Retraction Stroke	1"	1"	1"
Feed Rates (Numerical Control)			
Transverse (Y) IPM	0-200	0-200	0-200
Longitudinal (X) IPM	0-200	0-200	0-200

*Sufficient movement shall be provided to permit compliance with Section 3.1.2.

3.3 Sub-Assemblies

3.3.1 Vacuum System: The entire drawing surface shall be provided with vacuum chucking system to hold the paper or other drawing material in a smooth drawing condition. The vacuum chuck and system must meet all applicable specifications and must be capable of holding all of the various drawing materials over the entire drawing area and must be provided with a means of holding all standard drawing sizes as shown in Military Standard 2B.

3.3.1.1 The vacuum chuck for the Type I equipment must be divided into sections with proper valves to hold any standard size drawing or to hold a drawing over the complete surface. Sections shall be jointly and severally controllable.

3.3.1.2 The manufacturer must furnish the complete vacuum system, including pumps, motors, valves, piping, chucking components complete, including a surface that will not interfere with the smooth movement of the drawing tool or scribes.

3.3.1.3 All vacuum system control items, gages, instruments, valves, etc. shall be mounted readily accessible to the operator while mounting drawing material. In case of vacuum failure, the entire equipment and control system shall immediately cease all operations without loss of synchronization or tape to stylus drawing accuracy.

3.3.1.4 The vacuum system must be capable of holding in proper position drawing paper, vellum, scribe coat, mylar, glass cloth, and coated metal sheets normally used for drawing of loft lines in the Aerospace Industry.

3.3.1.5 The equipment must be capable of correctly holding the drawing material before chucking and a means shall be provided to relocate the drawing material for corrections or drawing changes.

3.3.1.6 The vacuum drawing surface must meet the flatness and alignment requirements in Section 4.

3.3.2 Drawing Head: The drawing head assembly shall be mounted onto machine gantry in such a manner as to assure full coverage of the X & Y axis motions in an accurate and smooth movement that will meet the tests and tolerances of Section 4 of this specification.

3.3.2.1 The turret of the drawing head shall contain six stations. The indexing shall be accomplished manually or automatically through a precision mechanism capable of indexing the turret one position at a time for each input command. Each turret station shall accommodate a standard stylus-holder which shall be equipped either with an inking device or a scribing device. Each device shall be pressure or spring loaded to maintain light but positive pressure on the drawing surface, in order to produce a clear distinct uniform line. The inking or scribing device shall be precision ground with negligible lost motion through the use of linear circulating ball bushings. This turret shall be a highly precise mechanism, but must have low inertia so that system performance will not be degraded.

3.3.2.2 Drawing tools furnished with the plotter shall consist of at least two diamond-point styli and four pens. The pens shall be capable of drawing lines of correct width and weight, so that when reproduced on microfilm it will be a clear distinct line. They shall have precision diameter with replaceable tips, or nips, so that the pens can be removed and cleaned. Each pen shall have a slip cap that can be taken off. The pens shall be designed so as to permit smooth flow of commercially available ink without clogging, blotting, or running.

3.3.3 Machine Controls: The machine shall be equipped with an AIA Class IV numerical control system for controlling all movements specified in Section 3.2, Table I.

3.3.3.1 The control unit shall be a digital input system of the latest improved type and shall be provided with all equipment necessary for the simultaneous continuous path control of two (2) axes. The tool motions, drawing tool engaged and drawing tool disengaged, must be controlled by the system. Control of all axis motions shall be provided during setup from the operator's panel.

3.3.3.2 Functions shall be provided for acceleration and deceleration, drawing speed rate, dwell, dash lines, tape rewind, optional stops, and sequence number display. Provisions shall be included to permit the generation of dash lines (phantom line). This function shall be controlled by an auxiliary command programmed on the tape as well as by manual controls located on the control panel. In addition, manual override shall be provided to adjust length of dash lines and length of spaces between dash lines from data on tape.

3.3.3.3 Circular or parabolic interpolation shall be provided at the customer's option.

3.3.3.4 Scale selection shall be provided. The system shall be capable of making scaled drawings of one-quarter, one-half, and two times size.

3.3.3.5 Symmetry switching (mirror image) of plus or minus X, plus or minus Y quadrant switching shall be provided to permit right or left hand drawings from one tape.

3.3.3.6 The numerical control system shall accept a control input media which conforms to NAS 955 specification for "Interchangeable Perforated Tape Standards, Variable Block Format, Contouring and Contouring/Positioning Numerical Controlled Equipment." At customer's option, magnetic tape compatible with NAS Specifications may be used as an input media. Switchable capabilities from EIA to present available input control format shall be provided at the customer's option.

3.3.3.7 Program position on control media shall be indicated at all times by means of a sequence number display or similar device.

3.3.3.8 Position indicator for X and Y axes shall be furnished on control system panel. A minimum of three decimal places shall be indicated.

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