

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC
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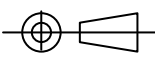
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FORM 09-01

FED. SUPPLY CLASS

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NAS380.

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THIRD ANGLE PROJECTION		CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE	REVISION 2
PROCUREMENT SPECIFICATION NONE	TITLE LATHE, PRECISION – NUMERICALLY CONTROLLED	CLASSIFICATION SPECIFICATION NAS966	SHEET 1 OF 23

ISSUE DATE: July 1964
REVISION DATE: JULY 31, 2012

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON 6, D. C.

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1.0 SCOPE

- 1.1 Purpose: This specification provides a standard for the manufacture, performance, inspection, and procurement of a series of numerically controlled precision, horizontal spindle turning machines.
- 1.2 Classification: The machine shall be of the following type, size, and class of controls as ordered by the procuring agency:
- 1.2.1 Type - Lathe, engine, numerically controlled
- 1.2.2 Size - 10" swing over cross slide, 16" swing over carriage wings.
13" swing over cross slide, 20" swing over carriage wings.
16" swing over cross slide, 25" swing over carriage wings.
20" swing over cross slide, 32" swing over carriage wings.
25" swing over cross slide, 40" swing over carriage wings.
35" swing over cross slide, 50" swing over carriage wings.
- 1.2.3 Class - The control system shall, at the option of the procuring agency, be either:
- Class III (Positioning and straight cut)
Class IV (Contouring)
Class III/Class IV (Combination positioning and contouring)
- 1.3 Intended Use: The machines described by this specification are intended for use in the Aerospace Manufacturing Industry.

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 of this specification shall preclude any contradictory portions of the following specifications, codes and standards.

- 2.1 The National Machine Tool Builders Association's (NMTBA) Electrical Standards.
- 2.2 The Joint Industries Conference (JIC) Hydraulic Standards for Industrial Equipment.

①

LIST OF CURRENT SHEETS							
NO.	REV.	NO.	REV.	NO.	REV.	NO.	REV.
1	1	7		13		19	1
2		8		14		20	
3		9		15		21	
4		10		16		22	
5		11		17			
6		12		18			

INACTIVE DESIGN AFTER 31 JULY 2012

CUSTODIAN:

Manufacturing Equipment Committee

PROCUREMENT
SPECIFICATION

TITLE

LATHE, PRECISION - NUMERICALLY CONTROLLED

CLASSIFICATION
Specification

NAS Documents
SHEET 1 of 22

INACTIVE DESIGN AFTER 31 JULY

- 2.3 The American Standards Association (ASA).
- 2.4 The American Society of Mechanical Engineers' (ASME) Boiler and Pressure Vessel Code, Section VIII.
- 2.5 National Aerospace Standard 938, Machine Axis & Motion Nomenclature.
- 2.6 National Aerospace Standard 943, Interchangeable Perforated Tape Standards - Variable block format for positioning and straight cut numerically controlled equipment.
- 2.7 National Aerospace Standard 953, Numerical Control Systems (standard practice).
- 2.8 National Aerospace Standard 955, Interchangeable Tape Standards - Variable block format, contouring and contouring/positioning, numerically controlled equipment.
- 2.9 Safety Codes - as specified by the customer.
- 2.10 Electronic Industries Association Standard RS-281, Numerical Control Construction Standards -- Numerical Machine Tool

3.0 REQUIREMENTS

The manufacturer's contractual obligations for the design and function of the machine shall be specified in this section.

- 3.1 Responsibilities: An overall responsibility shall be accepted by the manufacturer for the design, manufacture, performance, reliability and packaging of the control system and the controlled equipment as defined in the specification. This responsibility shall provide for technical direction during installation and maintenance during the warranty period.
- 3.1.1 The manufacturer will in turn hold subcontractors responsible for the performance of the control sub-systems and components.
- 3.1.2 The manufacturer will be responsible for the inspection, acceptance and warranty of the control system, controlled equipment and all sub-systems. The warranty period shall be for one (1) year from final machine acceptance during which time the manufacturer is responsible for replacement of all defective materials, workmanship and engineering and in turn will assure compliance of his suppliers and subcontractors to the warranty. Exceptions may be made on low cost perishable components which preventive maintenance procedures may provide for more frequent replacements than one (1) year.

INACTIVE DESIGN AFTER 31 JULY 2012

CUSTODIAN:			Manufacturing Equipment Committee	
PROCUREMENT SPECIFICATION	TITLE		CLASSIFICATION	
			Specification	
	LATHE, PRECISION - NUMERICALLY CONTROLLED		 AS 966 SHEET 2	

INACTIVE DESIGN AFTER 31 JULY

- 3.1.3 At the customer's option the manufacturer will be responsible for instructions and indoctrination of the customer's personnel. The period and extent of training may vary according to the complexity of the system, and the prior training of the customer's employees. Basic and advance training in system trouble shooting and diagnostic procedures are to be available by the manufacturer prior to and/or during the installation and checkout of the equipment.
- 3.2 Design: The dimensions and capacities for the respective types and sizes shall be as shown in Section 3.3. The manufacturer has the choice of configuration and the functional operation of the machine, except where specifically stated in this specification.
- 3.3 Size: See Table I

TABLE I

<u>Part Capacity</u> (in inches)	10	13	16	20	25	35
Diameter over cross slide-nominal	10	13	16	20	25	35
Diameter over carriage wings - nominal	16	20	25	32	40	50
Diameter, round bar through spindle-min.	2	2	$2\frac{3}{4}$	$2\frac{3}{4}$	3	3
Length between centers - nominal*	30	48	48	48	60	72
<u>Movements - Numerically Controlled</u> (in inches)						
Longitudinal - Z Axis (minimum)*	32	50	50	50	62	74
Transverse - X Axis (minimum)	12	16	20	20	25	35
Travel - Centerline of Tool Turret beyond centerline of spindle (minimum)	1	1	1	1	1	1
<u>Feed Rates</u> Inches per minute (infinitely variable)						
Longitudinal - Z Axis (nominal)	.010-20	.010-20	.010-20	.010-20	.010-20	.005-20
Transverse - X Axis (nominal)	.010-20	.010-20	.010-20	.010-20	.010-20	.005-20
Rapid Traverse - (minimum)	140	140	140	140	140	140

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PROCUREMENT SPECIFICATION

TITLE

CLASSIFICATION
Specification

LATHE, PRECISION - NUMERICALLY CONTROLLED

NAS Documents
AVASHEET 3

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON 6, D. C.

INACTIVE DESIGN AFTER 31 JULY

Spindle Data

Horsepower (minimum)	10	20	30	30	40	50
RPM's (minimum)	15-2000	10-1800	10-1800	8-1000	4-600	2-400
Number of changes - non-overlapping (minimum)	35	35	35	35	35	35
Spindle nose-camlock 6"D-1	6"D-1	8"D-1	8"D-1	11"D-1	11"D-1	
Spindle nose- taper key	L-1	L-1	L-2	L-2	L-3	L-3

*See Customer Option 6.1.13

- 3.4 Construction: The machine shall be constructed to comply with the requirements of this specification.
- 3.4.1 The machines shall be provided with hardened ways for all power driven machine member motions.
- 3.4.2 All moving parts and mating ways shall be protected to eliminate the entrance of chips and other foreign matter.
- 3.4.3 Servo lock or other locking provisions are required for all linear motions. Mechanical clamping devices shall be interlocked preventing slide movements prior to slide release.
- 3.4.4 Anti-backlash provisions shall be included in the servo loop.
- 3.4.5 Tailstock shall have a built-in revolving anti-friction spindle.
- 3.4.5.1 Provisions for drilling with the tailstock shall be included.
- 3.4.5.2 Provisions for moving the tailstock along the bed either by hand crank or from the carriage shall be included.
- 3.4.6 Carriage cross slide shall have a built-in precision indexing device for tool turret mounting. Tool turrets must interchange quickly and accurately, be referenced keyed for locating, accommodate a minimum of four (4) tools and accurately index to at least eight (8) positions. Tool turrets must accommodate pre-set type tooling.
- 3.4.7 Machine shall be equipped with an adequate capacity chip pan, splash guards, coolant drainage sump and reservoir.

INACTIVE DESIGN AFTER 31 JULY 2012

CUSTODIAN:

Manufacturing Equipment Committee

PROCUREMENT
SPECIFICATION

TITLE

LATHE, PRECISION - NUMERICALLY CONTROLLED

CLASSIFICATION

Specification

AVAS 966
SHEET 4
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- 3.4.8 Machine shall be provided with a 110 volt single phase, 60 cycle work light and one 10 amp service outlet supplied by an individual transformer.
- 3.5 Headstock Assembly:
- 3.5.1 The headstock assembly shall be adequate to meet the requirements of axial and radial loads resulting from the horsepower at RPM's and feed rates specified in Section 3.3.
- 3.5.2 The headstock assembly shall be constructed so as to provide a minimum of 40% of the rated horsepower at the low spindle speed up to the maximum horsepower specified.
- 3.5.3 The headstock area shall include provisions for mounting chuck guards.
- 3.5.4 The spindle nose shall be hardened steel and comply with all applicable ASA Specification requirements.
- 3.5.5 Spindle rotation shall be reversible.
- 3.5.6 Spindle braking, arranged with a safety interlock to prevent starting of spindle while brake is on, shall be provided. Provisions shall also be included for free rotation of spindle.
- 3.5.7 Manually operated spindle jog shall be provided.
- 3.6 Numerical Control System: The machine shall be equipped with a numerical control system for controlling all movements specified and shall be arranged for operation in the following modes: manual data input, semi-automatic, and full numerical control.
- 3.6.1 The control system shall, at the option of the procuring agency, be: AIA Class III, AIA Class III/Class IV combination, or AIA Class IV.
- 3.6.2 The machine shall be complete with machine control system, including tape transport mechanism and necessary control circuitry, each properly installed within the control cabinet.
- 3.6.2.1 The reading speed of the tape transport shall be such that the machine is not input limited.
- | | | |
|----------------|-----------|-----------------------------------|
| Reading Speed: | Class III | 100 Characters per second minimum |
| | Class IV | 300 Characters per second minimum |

INACTIVE DESIGN AFTER 31 JULY 2012

CUSTODIAN:		
Manufacturing Equipment Committee		
PROCUREMENT SPECIFICATION	TITLE	CLASSIFICATION
	LATHE, PRECISION - NUMERICALLY CONTROLLED	Specification

NAS 986
 Documents
 SHEET 5
 Document Sharing Hub

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NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON 6, D. C.

INACTIVE DESIGN AFTER 31 JULY

- 3.6.3 The system shall be capable of controlling the movements individually, simultaneously, or in any combination.
- 3.6.4 The system shall be such that "stops" can be programmed as desired for cutter change, cutter and part inspection, changing tool turrets, program checks, etc. Resumption of automatic operation shall not cause any loss of accuracy on the work piece.
- 3.6.5 The system shall be such that control of miscellaneous functions such as coolant flow, spindle on-off, spindle speed selection and direction of rotation, indexing of cross slide tool turret to any one of its respective positions, dwell, and other functions as specified or required can be programmed as desired.
- 3.6.6 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 any back reference to a certain point - Class III optional.
- 3.6.7 Tool offset - The system shall include at least ± 0.099 zero tool offset for each axis on each tool - minimum of eight offsets in each axis.
- 3.6.8 Feed rate override - The system shall include provisions to permit variation of programmed feed rate from 10-100% in increments of no more than 10% or continuously variable. (See customer options).
- 3.6.9 Readouts - The system shall provide sequence number readout and individual axes position readouts. (See customer options)
- 3.6.10 Manual input - The system shall include provisions for manual data input.
- 3.6.11 Interpolation - The system shall include linear interpolation as standard equipment. (See customer options)
- 3.6.12 The system shall provide automatic program or monitoring checks equivalent to a parity check at the machine.
- 3.6.13 The system shall be designed to operate in a normal factory environment at ambient temperatures from 60° F to 115° F, relative humidity from 10% to 95% and line voltage fluctuation of $\pm 10\%$ of rated voltage.
- 3.6.14 The system shall be equipped with self-contained protection against dust, dirt, oil and other contaminants present in the average factory environment.
- 3.6.15 The control system shall be modular constructed and shall be maintenance oriented with adequate maintenance checkout devices.

INACTIVE DESIGN AFTER 31 JULY 2012

CUSTODIAN:

Manufacturing Equipment Committee

PROCUREMENT
SPECIFICATION

TITLE

LATHE, PRECISION - NUMERICALLY CONTROLLED

CLASSIFICATION
Specification

NAS Documents
SHEET 6

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