



INACTIVE DESIGN AFTER 31 JULY 2012
NATIONAL AEROSPACE STANDARD

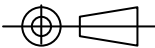
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FORM 09-01	THIRD ANGLE PROJECTION 	CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE	REVISION 2
	PROCUREMENT SPECIFICATION NONE	TITLE TOOL AND CUTTER GRINDING MACHINE	CLASSIFICATION SPECIFICATION NAS973 SHEET 1 OF 35

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:

ISSUE DATE: Nov. 1964 REVISION DATE: JULY 31, 2012



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1.0 SCOPE

1.1 Purpose: This specification provides a standard for the manufacture, performance, inspection and procurement of machines designed to sharpen all types of metal cutting tools, and to perform internal and external surface grinding.

1.2 Classification:

1.2.1 Machines covered by this specification shall be the following types as described in Table I (Page 14):

1.2.1.1 Type I - Tool and Cutter Grinder

1.2.1.2 Type II - Tool and Cutter Grinder with optional power or hand table feed, extended table and extended table travel.

1.2.1.3 Type III - Universal Tool and Cutter Grinder

1.3 Intended Use: The machine(s) described by this specification are intended for use in the aerospace manufacturing industry and provides flexibility in grinding milling cutters, reamers, saws, lathe tools, grinder work blades, taps, styli; cylindrical, flat internal and external surfaces; and gear cutting tools.

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LIST OF CURRENT SHEETS

NO.	REV.	NO.	REV.	NO.	REV.	NO.	REV.
1	1	10	1	19	1	28	1
2	1	11	1	20	1	29	1
3	1	12	1	21	1	30	1
4	1	13	1	22	1	31	NEW
5	1	14	1	23	1	32	NEW
6	1	15	1	24	1	33	NEW
7	1	16	1	25	1	34	NEW
8	1	17	1	26	1		
9	1	18	1	27	1		

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CUSTODIAN: MANUFACTURING EQUIPMENT COMMITTEE

PROCUREMENT SPECIFICATION

TITLE

TOOL AND CUTTER GRINDING MACHINE

CLASSIFICATION

Specification

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SHEET 1 OF 34

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 listed in this specification shall override any contradictory portions of the following specifications, codes and standards.

- 2.1 The Joint Industrial Council (JIC) Electrical Standards (state whether for General Purpose Machine Tools, EGP.1.1967.)
- 2.2 The Joint Industrial Council (JIC) Hydraulic and Pneumatic Standards for Industrial Equipment.
- 2.3 The Joint Industrial Council (JIC) Electronic Standards for Mass Production Equipment and General Purpose Machine Tools EL-1-71.
- 2.4 The American Standards Association (ASA) B.5.1.
- 2.5 The American Society of Mechanical Engineers' (ASME) Boiler and Pressure Vessel Code, Section VIII.
- 2.6 National Electrical Code (NEC).
- 2.7 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.
- 2.8 State and Local Safety and Electrical Codes.

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3.0 REQUIREMENTS

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

- 3.1 Responsibilities: An overall responsibility shall be accepted by the manufacturer for the design, manufacture, performance, reliability and shipping of machine controls and all controlled equipment as defined in this 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 subsystems and components.

- 3.1.2 The manufacturers will be responsible for the inspection, acceptance and warranty of the control system, controlled equipment and all subsystems. 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 preventative maintenance procedures may provide for more frequent replacements than one (1) year.

- 3.1.3 Component and System Reliability

The manufacturer shall provide the customer, at time of quotation, his guaranteed component and system reliability factors as expressed in minimum machine run hours between failures.

- 3.1.3.1 The manufacturer shall provide, in the format indicated, reliability factors for the following systems and components. The reliability factors may be predicated on the assumption that the customer will comply with the manufacturer's recommended preventative maintenance schedule.

MANUFACTURER'S SYSTEM AND RELIABILITY FACTORS		
System or Component	Minimum Run Hours	Conditions

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APPROVAL DATE Nov. 1964 REVISION ① 31 Jan. 1973

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- 3.2 Design: The dimensions and capacities for the respective types and sizes shall be as shown in 3.3. The manufacturer has the choice of configuration and the functional operation of the machine, except where specifically stated in this specification.
- 3.2.1 All parts subject to wear shall be easily and readily accessible for adjustment, repair and/or replacement.
- 3.3 Types, Sizes and Classification: The minimum requirements for type, size and classification are to be as shown in Table I (page 14).
- 3.4 Construction: The machine shall be constructed to comply with the requirements of this specification.
- 3.4.1 Machine shall have hardened, anti-friction, readily replaceable ways between saddle and table.
- 3.4.1.1 Protective covering shall be provided for all ways which otherwise would be subjected to exposure and deterioration from grinding grit, dust and coolant.
- 3.4.1.2 All bearing surfaces to be provided with adequate protection to prevent the entry of grinding grit, dust and coolant.
- 3.4.2 Machine shall have built-in taper setting device to position swivel table with precision accuracy and convenience.
- 3.4.3 Machine shall have 180° offset swivel on table to increase cross range capacity and add rigidity to set-up by centering heavy loads over sliding table.

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- 3.4.3.1 Swivel table shall have one (size 9/16") T-Slot running full length on the centerline of table; T-Slot shall conform to ASA B.5.1.
- 3.4.3.2 Machine shall have combination positive and spring cushioning table dogs. This spring cushion to eliminate shock at table instant reversal.
- 3.4.3.3 Provide table with a slow table traverse handle for cylindrical and shoulder grinding.
- 3.4.4 Workhead: The workhead spindle support bracket and base shall be graduated so that accurate swivel adjustments can be obtained in both horizontal and vertical planes.
 - 3.4.4.1 The workhead shall be provided with a cutter clearance setting dial for obtaining angles. The dial shall be graduated in degrees, direct reading and independent of tooth-rest setting.
 - 3.4.4.2 Workhead shall be provided with removable unit mounted drive motor that shall drive spindle through belt, with horsepower and speed as shown in Table I (Sheet 14).
 - 3.4.4.3 The workhead spindle shall be mounted on anti-friction bearings and shall have a No. 50 MM taper in one end and either 12 B&S or No. 5 Morse taper in the other end as specified by customer with the following accessories:
 - 3.4.4.3.1 Center for workhead.
 - 3.4.4.3.2 2 - #12 B&S to #9 B&S taper collet or #5 Morse to #3 Morse taper collet.

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- 3.4.4.3.3 #12 B&S to #7 B&S taper collet or #5 Morse to #2 Morse taper collet.
- 3.4.4.3.4 #12 B&S to #10 B&S taper collet or #5 to #4 Morse taper collet.
- 3.4.4.3.5 Ejector Rod.
- 3.4.4.3.6 Draw-in-Bolt and Washer.
- 3.4.4.3.7 2 Table T-Bolts for workhead.
- 3.4.5 Tailstocks: Right hand and left hand shall be supplied.
- 3.4.5.1 Right hand tailstock shall have a retractable center and tensioning device.
- 3.4.5.2 Left Hand tailstock shall have a clearance setting dial, calibrated in degrees.
- 3.4.5.3 Tailstock shall be equipped with two table T-bolts and provision for accurate alignment to front of table T-slot.
- 3.4.6 Grinding Wheel Head: Grinding wheel head shall have either self-contained or unit mounted reversible motor providing minimum of two speeds.
- 3.4.6.1 The grinding wheel head shall be adjusted vertically in a housing fixed to the bed or wheel slide.
- 3.4.6.2 Wheel head housing shall be provided with a flexible bellows, or equal means, entirely around the column to prevent the entry of grit, dust, coolant and in no way restrict the movement of wheel head.
- 3.4.6.3 Wheel head spindle shall be of high grade steel, hardened, ground and mounted on precision, pre-loaded anti-friction bearings with sealed in life time lubrication of cartridge type mounting.
- 3.4.6.4 Wheel head spindle shall be a double end type providing for use of grinding wheels on either end without dis-assembly of the bearings and shall swivel a minimum of 180° in a horizontal plane.
- 3.4.6.5 Wheel head spindle shall be dynamically balanced for vibrationless operation up to the maximum RPM of the machine.

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- 3.4.7 Standard Equipment Items: The following items shall be considered standard equipment items, and shall be furnished with either Type I, Type II, or Type III machines.
- 3.4.7.1 Extension plate, eye bolt and ring
- 3.4.7.2 Blade holder extension
- 3.4.7.3 Micrometer tooth rest support with round top blade
- 3.4.7.4 Offset blade
- 3.4.7.5 Plain tooth rest holder
- 3.4.7.6 Plain tooth rest plate
- 3.4.7.7 Means for attaching plain tooth rest plate to Universal tooth rest plate
- 3.4.7.8 Wheel spindle extension - two (2) inches long, for one and one-fourth (1-1/4) inch diameter hold wheels
- 3.4.7.9 Clearance angle setting dog
- 3.4.7.10 T-wrench for grinding wheel collets
- 3.4.7.11 2 - Pin wrenches
- 3.4.7.12 Collet wrench
- 3.4.7.13 Diamond bracket
- 3.4.7.14 Diamond holder with diamond
- 3.4.7.15 Suitable wheel guards for full range of wheels machine will accomodate
- 3.4.7.16 Centering gage bracket
- 3.4.7.17 Necessary end wrench
- 3.4.8 Cylindrical Grinding: Provide for cylindrical grinding, straight as well as tapered. Equipment shall include a 4 inch, 3-jaw chuck with two (2) sets of jaws, adapter, and chuck wrench; Universal grinding dog, minimum 1/4 HP, reversible motor and control.

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- 3.4.9 Gear Cutter Sharpening Attachment: Provide for sharpening straight or hobbled gear tooth cutters uniformly and radially up to eight and one-half (8-1/2) inch diameter.
- 3.4.9.1 Attachment shall provide for swiveling the cutter in a vertical plane on its fixture and a scale graduated in degrees shall indicate the angular setting.
- 3.4.9.2 A spring pawl shall be provided to control tooth indexing.
- 3.4.9.3 Standard equipment shall be as follows:
 - 3.4.9.3.1 Gage
 - 3.4.9.3.2 Pawl
 - 3.4.9.3.3 5 Adapter bushings for 1", 1-1/4", 1-1/2", 1-3/4" and 2" diameter hole cutters.
- 3.4.10 Internal Grinding Attachment: Provide for removable quill type spindle which shall mount to and be driven by belt from grinding wheel head.
- 3.4.10.1 Spindle shall rotate on precision ball bearings, grease packed and lubricated for life, at a speed of not less than 21,000 RPM.
- 3.4.10.2 The following accessories shall be furnished:
 - 3.4.10.2.1 2 - Removable quills
 - 3.4.10.2.2 Bracket
 - 3.4.10.2.3 Pulleys
 - 3.4.10.2.4 Belt
 - 3.4.10.2.5 Belt Guard
- 3.4.11 Surface Grinding Attachment: Consists of Universal vise with means of attachment and indexing to table T-slots, and being capable of tilting through 90° and rotating 360°.
- 3.4.11.1 Vise shall have minimum capacity of four (4) inch wide jaws with two and one-half (2-1/2) inch opening.

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- 3.5 Spindle Head Assemblies: Spindle head assemblies shall consist of spindle nose, spindle, drive motor, provisions for altering the stipulated range of speeds, integral housing, and such saddle, slide and swiveling mechanisms as necessary to satisfy the requirements of Table I, Page 10.
- 3.6 Control System: All control is manual.
- 3.7 Operator's Controls: All operating control switches or levers shall be located convenient to the operator when he is in the normal established operating positions.
- 3.8 Electrical Equipment: All electrical equipment and its installation shall conform to the latest revision of the NMTBA, "Machine Tool Electrical Standards". All machines shall be equipped to operate on 220/440 volts, 3 phase, 60 cycle alternating current, unless otherwise specified.
- 3.9 Hydraulic Equipment:
 - 3.9.1 All hydraulic equipment and its installation shall conform to the latest Joint Industries Conference Standards (JIC), where they apply.
 - 3.9.2 Suitable over-temperature thermal switches and signaling devices shall be provided to alert the operator to an over-temperature condition and to shut off electric motors at the end of cycle in the event hydraulic fluid temperature exceeds the top limit specified by the supplier.
 - 3.9.3 The use of fire resistant fluids shall be the customer's option, in which case all hydraulic system components shall be compatible with these fluids.
- 3.10 Lubrication:
 - 3.10.1 Automatic and adequate lubrication of all sliding and rotating parts, except the motor or pump with non-additive pack seal bearings, shall be provided.
 - 3.10.2 All points of adjustment shall have provisions for periodic lubrication.
 - 3.10.3 The lubrication system shall be equipped with a low-level and system-failure alarm.

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- 3.10.4 All lubrication reservoirs shall be equipped with visual lubrication level gages and all filler and/or lubrication points shall be properly identified with type of lubricant and instructions.
- 3.10.5 All systems shall have easily changed oil filtering equipment.
- 3.10.6 Machine shall be capable of operating safely for a minimum of 100 hours without replenishing the lubricant supply.
- 3.11 Safety: Each machine shall be furnished with adequate safety devices of the latest approved type. Moving parts, which are hazardous to personnel, shall be suitably protected.
- 3.11.1 All equipment and components shall comply with Applicable Occupational Safety and Health Standards, Part 1910 of Chapter XVII of Title 29 of the Code of Federal Regulations and to the state and local safety codes where equipment is to be installed.
- 3.11.2 Ample protection against electrical shock shall be provided.
- 3.12 Interchangeability: All replaceable parts shall be manufactured to definite standards for tolerance, clearance and finish in order that any such part may be field installed without further machining. All parts shall be permanently and legibly marked with the manufacturer's part number.
- 3.13 Color and/or Finish: Standard(s) as used by manufacturer or as specified by customer.
- 3.14 Pressure Vessel: All receivers, hydraulic accumulators and other pressure tanks shall meet the requirements of the ASME Boiler and Pressure Code, Section VIII for non-fired pressure vessels and vessel shall have the required label attached.

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