MIL-S-4569C

23 October 1974

SUPERSEDING
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7 July 1971

MILITARY SPECIFICATION

SHAFT ASSEMBLY, FLEXIBLE DRIVE WITH 1/4 INCH CAPACITY CHUCK

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

1. SCOPE.

1.1 Scope. This specification covers one type flexible drive shaft, 30 inch long, with swivel adjustable head and 1/4 inch capacity chuck.

2. APPLICABLE DOCUMENTS

*2.1 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.

SPECIFICATIONS

Federal

QQ-N-290	Nickel Plating (Electrodeposited)
QQ-C-320	Chromium Plating (Electrodeposited)
PPP-T-1150	Tools and Tool Accessories for Power Driven, Metal and Woodworking Machinery, Packaging and Packing of.

Military

MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-C-13924	Coating, Oxide, Black, for Ferrous Metal

STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables of Inspection by Attributes

(Copies of specifications, standards, drawings and publications required by suppliers 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 date of invitation for bids or request for proposal shall apply.

National Bureau of Standards

Handbook H28 Screw Thread Standards for Federal Services

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

American Gear Manufacturer's Association

AGMA 360.01 Manual for Machine Tool Gearing

(Application for copies should be addressed to the American Gear Manufacturers' Association, One Thomas Circle, Washington, D.C. 20005).

3. REQUIREMENTS

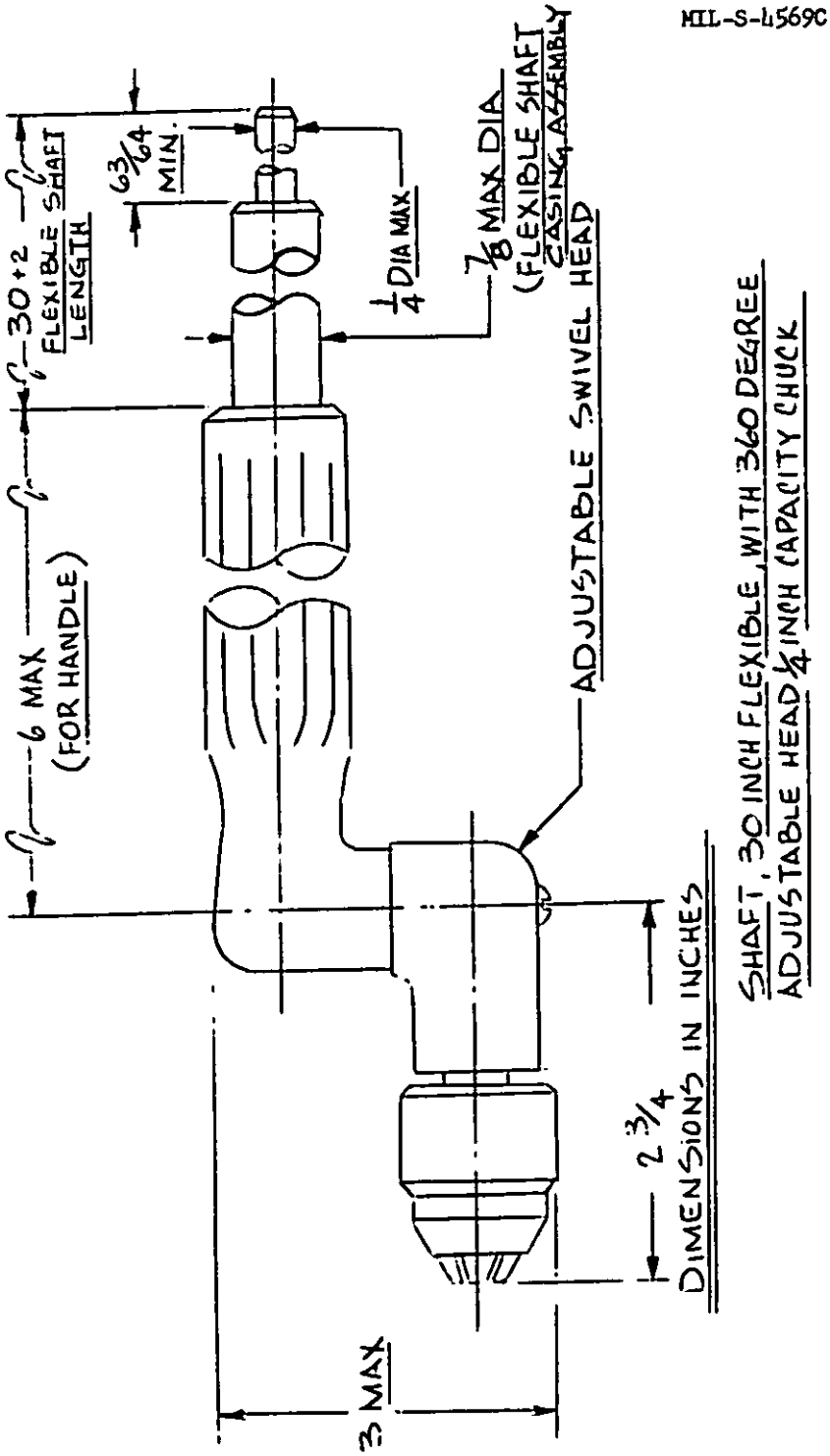
3.1 Preproduction/first article. This specification includes requirements for first article testing. Unless otherwise specified (see 6.2) the supplier shall furnish a complete shaft assembly for inspection and testing in accordance with Section 4. Approval of the first article does not relieve the supplier of responsibility for compliance with all provisions of this specification.

*3.2 Safety. Covers or other safety devices shall be provided for all parts of the equipment presenting safety hazards which can be guarded without interference to operation. Exceptions and additional safety requirements shall be as specified (see 6.2).

*3.3 Illustration. Detailed dimensional requirements shown on Figure 1 shall be complied with. Construction details not specified on Figure 1 is for convenience of identification and is not intended to exclude shaft assemblied which otherwise comply with the requirements of this specification.

*3.4 Design. The shaft assembly shall be designed for dynamic application, 1,800 revolutions per minute (RPM), intermittent duty, clockwise torque delivery.

*3.4.1 Construction. The shaft assembly shall be complete so that it shall be ready for operation. Construction shall be free from any characteristics or defects that will prevent the shaft assembly from passing any examination or test specified in Section 4.



SHAFT, 30 INCH FLEXIBLE, WITH 360 DEGREE ADJUSTABLE HEAD 1/4 INCH CAPACITY CHUCK

FIGURE 1

3.4.2 Interchangeability. All parts shall be manufactured to tolerance standards that will allow replacement of worn or damaged parts without modification of the shaft assembly or the parts.

3.4.3 Welding, brazing or soldering. Welding, brazing or soldering shall be employed only where those operations are included in fabrication of the original design. These operations shall not be employed as repair measures for defective parts.

3.4.4 Fastening devices. All screws, pins, bolts, and similar parts shall be installed with means for preventing loss of tightness. All such parts when subject to removal or adjustment shall not be swaged, peened, staked or otherwise permanently deformed.

3.4.5 Surfaces. All surfaces of all castings, forgings, molded parts, stampings, and welded parts shall be cleaned and free from sand, dirt, fins, sprues, scale, flux or other harmful or extraneous materials. External surfaces shall be smooth and all edges shall be either rounded or beveled. All external surfaces which are susceptible to corrosion shall be treated to resist corrosion. Zinc or cadmium plating is not acceptable.

3.4.5.1 Finish and coatings. Unless otherwise specified (see 6.2) all external surfaces, except inherently corrosion resistant parts, shall be protected with one or a combination of coatings, as applicable, in accordance with the following specifications:

a. Chrominum plating - QQ-C-320, Type II, Class 2.
b. Nickel plating - QQ-N-290, Class 1, Grade D.
c. Anodic Coating for Aluminum - MIL-A-8625.
d. Black Oxide Coating - MIL-C-13924.

3.4.6 Threads. All threaded parts shall be in the inch system and shall conform to Handbook H28.

3.5 Components. The shaft assembly shall consist of a flexible core with end fittings, casing assembly with end ferrules and external casing reinforcements and a holder with an adjustable swivel head including a 1/4 inch capacity drill chuck (see Figure 1).

*3.5.1 Core assembly. The core assembly consist of the basic flexible drive element with securely attached end fittings. The core shall be made up of layers of wire wrapped around a single flexible wire with each successive layer wound in alternate directions and the final outer layer wound for right-hand torque application. The end fittings shall be adaptable for transmitting rotating motion from the power source to the drill chuck.

*3.5.2 Casing assembly. The casing assembly shall consist of a tempered steel liner with a wire braid overlay, an oil and abrasion resistant rubber, neoprene or polyvinyl chloride outer cover with terminal ferrules and external reinforcements at both ends of the casing. The casing assembly shall withstand the flexibility and resilence tests in Section 4. This casing assembly shall cover all rotatable shaft components except the tang of minimum length of 63/64 inches on the input end and the chuck on the output end.

3.5.3 Holder and head assembly. The assembly shall be similar to Figure 1 and shall not exceed the dimensions specified. The head shall swivel full 360° and shall have a locking device for securing the head at any position within the swivel range. Revolving parts including shafts and the chuck mounting spindle shall be mounted on anti-friction bearings. Lubricating fittings and grease retaining seals shall be provided where applicable. The chuck shall be infinitely adjustable for chucking all size drills within a range of 1/16 to 1/4 inch inclusive. The total weight of the assembly shall not exceed three pounds.

3.6 Gears. All gears shall conform to the applicable requirements of AGMA Standard 360.01.

3.7 Special tools. All special tools required for adjustment and maintenance of the shaft assembly shall be furnished by the supplier.

*3.8 Lubrication. The shaft assembly shall have provisions for lubrication between moving surfaces. Gear enclosures shall have provisions for retaining grease.

*3.9 Identification marking. Identification marking shall be permanent and legible and shall include the manufacturer's name or code and the chucking capacity.

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 inspection. Inspection and testing shall be classified as follows:

a. First article inspection and tests.
b. Quality conformance inspection.

NOTE: Testing shall be conducted in ambient temperature ranging from 60°F to 80°F.

4.2.1 First article inspection and tests. Unless otherwise specified (see 6.2) the first article shall be inspected for defects in Table I and subjected to all tests in 4.4. One or more major defect or failure to pass all tests in 4.4 shall be cause for rejection.

TABLE I

Classification of Defects

Category	Defects
Major:	
101	Assembly incomplete, components not as specified, loose connections.
102	Damaged parts, deformed or broken.
103	Inoperative head, will not swivel 360°.
104	Head position locking device inadequate.
105	Defective core or fittings, will not rotate in casing.
Minor:	
201	Burrs, pits, nodules, sharp edges.
202	Identification marking not as specified, illegible.
203	Corrosion or rust.
204	Not properly lubricated.

4.2.2 Quality conformance inspection. Unless otherwise specified (see 6.2) each sample taken from the inspection lot shall be examined for compliance with 4.5, inspected for defects in Table I and subjected to the test in 4.4.2. Sampling shall be in accordance with MIL-STD-105, based on single sampling plan for normal inspection at level II. The acceptable quality level (AQL) shall be 2.5 percent. Defects in excess of the acceptance number shall be cause for rejecting the representative lot. Adequate corrective action is imperative for a rejected lot before a reinspection or retesting is to be made on any part of that lot.

4.3 Inspection lot. All shaft assemblies which have been packaged, marked for shipment and offered for delivery at one time shall be considered a lot for purposes of quality conformance inspection.

4.4 Test method.

4.4.1 Visual and dimensional inspection. Each sample shall be visually and dimensionally inspected for compliance with Section 3. Classification of defects shall be in accordance with Table I. The AQL shall be 2.5 percent for major defects and 6.5 percent for total defects.

*4.4.2 Functional test. Place each sample on a horizontal surface in a fully extended position and test for core friction and resistance to rotation. Torque required for righthand core rotations shall not be more than 8 ounce inch. Each sample shall be bent around an 8 inch radius, to 180° arc, and the core rotated at 1,500 revolutions per minute (RPM), continuous operation for not less than 30 minutes. Shaft assembly temperature, immediately following the test, shall not be more than ambient plus 30°F. After the above test, each sample shall drill twelve (12) successive holes, 1/4 inch diameter, through 1/4 inch thick aluminum alloy, 2024 condition T-4, in not more than five minutes.

4.4.3 Endurance test. The shaft temperature should be normal to the test environment before commencing this test. Bend the shaft around an 8 inch radius to 180° arc and apply a brake load of not less than 8 inch pound to the chuck. (Brake load may be applied after the shaft has reached operating rpm). Rotate the shaft at 1,200 to 1,500 rpm, constant operation, for not less than one hour after the brake load has been applied. Failure resulting from wear, separation of parts or temperature increase exceeding ambient plus 50°F shall be cause for rejection.

4.4.4 Component parts testing. After completing the endurance test the core and casing shall be disassembled from the head and subjected to the following tests. The individual subassembly which fail the tests shall be rejected.

4.4.4.1 Core assembly deflection. Angular deflection of the coreassembly shall not be more than 10 degrees per foot of length with 4 inch pound torque applied in the righthand (winding) direction.

*4.4.4.2 Casing assembly.

a. The casing shall not flatten, crack or show permanent deformation after bending around a 4 inch radius to 180° arc.

b. A static load of 50 pounds, applied in line with the axis of the casing, shall not break the casing or cause separation of the ferrules from the casing.

4.5 Inspection of preparation for delivery. Preservation, packaging, packing and marking for shipment and storage shall be inspected for compliance with Section 5.

5. PREPARATION FOR DELIVERY

*5.1 Preservation, packaging, packing and marking. The shaft assembly shall be cleaned, preserved, packaged, packed and marked for shipment in accordance with PPP-T-1150, for angle attachments-drill chucks. Level of preservation, packaging and packing shall be as specified (see 6.2).

6. NOTES

6.1 Intended use. The shaft assembly covered by this specification is intended for use in conjunction with electric or pneumatic powered portable hand tools for drilling reaming, deburring, sanding or polishing applications in areas unaccessible to conventional powered hand tools.

*6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents.

a. Title, number and date of this specification.
b. Preproduction or first article if different (see 3.1).
c. Exceptions and additional safety requirements if applicable (see 3.2).
d. Finish coating requirements if different (see 3.4.5.1).
e. First article inspection and test requirements if different (see 4.2.1).
f. Quality conformance inspection if different (see 4.2.2).
g. Selection of applicable levels of preservation, packaging and packing (see 5.1).

*6.3 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire contents irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - WC
Navy - SH
Air Force - 84

Review Activities:
Army - GL
Navy - SH

User Activities:
Navy - MC
Air Force - 84

Preparing Activity:
Air Force - 84

Project Number
5130-0241

Civil Agency Interest:
GSA - FSS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval No. 22-R255

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DOCUMENT IDENTIFIER AND TITLE

MIL-S-4569C;Shaft Assembly,Flex Drive with ¼" Capacity Chuck

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?

☐ YES ☐ NO *(If "Yes", in what way?)*

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