

[INCH-POUND]
GGG-F-360E
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SUPERSEDING
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FEDERAL SPECIFICATION

FINGER, MECHANICAL, AND RETRIEVER TOOL, MAGNETIC

The General Services Administration has authorized the use of this Federal Specification by all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers mechanical fingers and magnetic retrieving tools used for retrieving such objects as screws, washers, nuts, bolts, pins, and similar objects from hard-to-reach places.

1.1.1 Federal specification coverage. Federal specifications do not cover all varieties of the commodity indicated by the title of the specification, or which are commercially available, but are intended to cover only those generally used by the Federal Government.

1.2 Classification.

1.2.1 Types, classes, and styles. The fingers shall be of the following types, classes, and styles, as specified (see 6.1):

Type I - Fingers, mechanical

Class 1 - Rigid

Class 2 - Flexible

Type II - Retrieving tool, magnetic

Class 1 - Telescoping

Class 2 - Flexible

Style A - Uncovered spring

Style B - Covered spring

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

2.1.1 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

Beneficial comments, recommendations, additions, deletions, clarifications, etc., and any other data which may improve this document should be sent to: General Services Administration, Federal Supply Service, Tools and Appliances Commodity Center (6FETE-CO), Washington, DC 20406.

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American National Standards Institute (ANSI)/American Society of Quality Control (ASQC):

ANSI/ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Application for copies should be addressed to the American Society for Quality Control, P.O. Box 3005, 611 E. Wisconsin Avenue, Milwaukee, WI 53201-4606.)

American Society for Testing and Materials (ASTM):

ASTM D4101 - Plastic Molding Material (Propylene Plastics, Injection and Extrusion)

(Applications for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

3. REQUIREMENTS

3.1 Illustrations. Except for the technical requirements (e.g., design, dimensions), the illustration herein is descriptive and is not intended to preclude the purchase of tools otherwise conforming to the requirements of this specification.

3.2 Materials. The materials used in the manufacture of the fingers and retrieving tools shall be as hereinafter specified. The materials shall be free from any defects and imperfections that may impact the tool's serviceability, durability, safety, or appearance.

3.3 Finish.

3.3.1 Surface roughness. All surfaces shall be free from pits, nodules, burrs, cracks, or other detrimental defects. Areas ground, buffed, or otherwise finished by an equivalent method and provided with a coating finish of chromium shall have a bright finish with a maximum surface roughness of 70 microinches (arithmetical average, using a 0.030 inch cutoff on the surface measuring instrument).

3.3.2 Coatings. The coating shall be adherent, smooth, continuous, and free from pits, blisters, nodules, and other defects which would interfere with their corrosion-protective value and serviceability. For intermating parts, the coating shall not interfere with the ease of operation.

3.3.2.1 Chromium plating. Chromium plating shall be of electro-deposited metal consisting of nickel followed by chromium.

3.3.2.2 Zinc plating. Zinc plating shall be an electro-deposited coating of zinc.

3.4 Identification marking. Each item shall be marked with the manufacturer's name or identifying symbol and the state or country of manufacture. The marking shall be engraved, etched, or stamped in such a manner that it will be permanent to the extent that it will remain clear and legible throughout the life of the item.

3.5 Type I, finger, mechanical. Type I fingers shall consist essentially of a housing, plunger, coil spring, and retracting jaws. The fingers shall be designed to allow free movement of the assembled parts with a minimum of clearance between the working parts and to preclude the possibility of the parts becoming loose when tested as specified in 4.4.1. The retracting jaws shall be capable of being opened to 13/16 inch minimum, measured between the gripping surfaces. The jaws, when retracted to a closed position, shall be capable of gripping a 0.004 inch feeler gauge. The required force to operate the plunger shall not exceed 18 pounds. Components of actuating parts that are permanently attached shall withstand longitudinal forces as specified in 4.4.7.

3.5.1 **Housing.** The housing shall be of either steel or brass tubing. The jaw end of the housing shall be flared to allow smooth expansion and retraction of the jaws. The opposite end of the housing shall be provided with a steel, brass, or plastic flange having a diameter equal to or larger than the diameter of the head of the plunger to afford an adequate grip.

3.5.2 **Plunger.** The plunger shall be of a round steel rod having a head attached to one end and a pair of jaws attached to the opposite end. A means shall be provided to secure the head and jaws to the rod in such a manner as to assure that the head and jaw assembly will not become loose when tested as specified in 4.4.1.

3.5.3 **Coil spring.** The coil spring shall be of steel having sufficient strength to assure the proper grip when tested as specified in 4.4.2.

3.5.4 **Retracting jaws.** The retracting jaws shall be of tempered spring steel having sufficient strength to withstand the test requirements of 4.4.1. The jaws shall flex open when the plunger is fully depressed and shall retract smoothly, closing the gripping surfaces when the plunger is fully released.

3.5.5 **Class 1, rigid.** The fingers shall be provided with a rigid housing of either steel or brass tubing. Class 1 fingers shall conform to Table I, and be similar to Figure 1.

TABLE I. Type 1, class 1, finger, mechanical, rigid

Plunger head diameter A $\pm 1/8$ inch (Inches)	Overall length B $\pm 1/4$ inch (Inches)	Reach C $\pm 1/2$ inch (Inches)
1-1/4	6-1/2	3-3/4
1-1/4	8-1/2	5-3/4
1-1/4	10-1/2	8
1-1/4	14-1/2	11-3/4

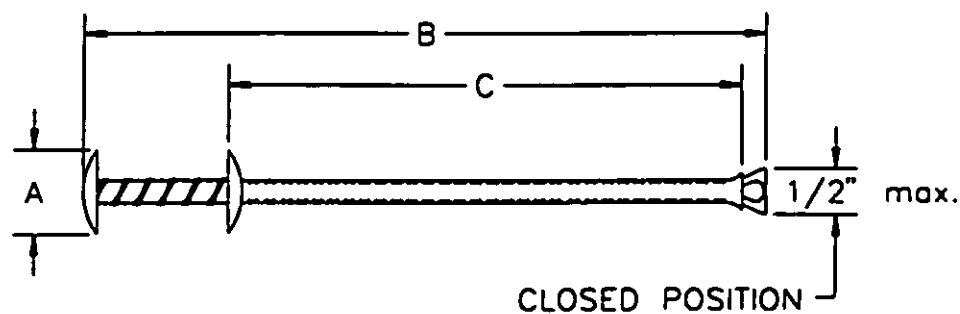


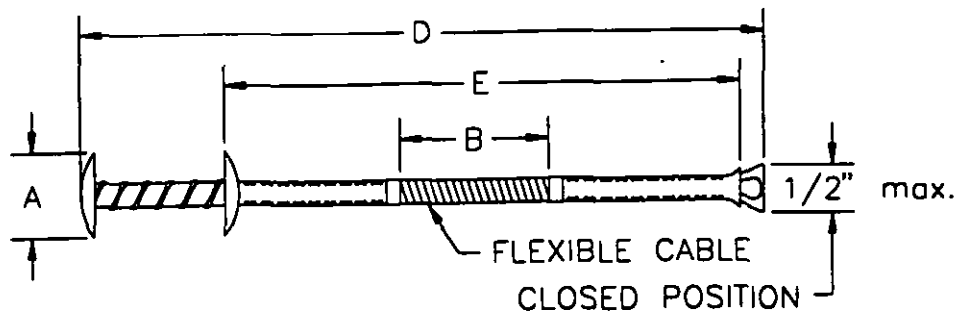
Figure 1. Type 1, class 1, finger, mechanical, rigid.

3.5.6 **Class 2, flexible.** The fingers shall be provided with a housing of either steel or brass tubing and a flexible midsection. The flexible midsection shall be of spirally-wound armored cable capable of being bent into various directions and shall meet the test requirements of 4.4.3. The flexible section may be coated with a lacquer or enamel that will not flake or chip, or it may be encased in plastic, vinyl, or neoprene. The fingers shall conform to Table II and be similar to Figure 2.

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TABLE II. Type I, class 2, finger, mechanical, flexible

Plunger head diameter A $\pm 1/8$ inch (Inches)	Flexible cable length B Minimum (Inches)	Overall length D $\pm 1/4$ inch (Inches)	Reach E $\pm 1/4$ inch (Inches)
1-7/32	8	17-1/2	14-7/8
1-7/32	7	26-1/2	23-3/4

Figure 2. Type I, class 2, finger, mechanical, flexible.

3.6 Type II, magnetic retrieving tools. The retrieving tools shall consist essentially of a handle or handgrip section, a midsection(s), magnet case, and magnet. The midsection(s) shall be either telescopic (class 1), or flexible (class 2).

3.6.1 Magnet case. The magnet case shall be of metal, nylon, or high impact strength plastic in accordance with ASTM D4101 and shall securely hold a magnetic element.

3.6.1.1 Magnetic element. The magnetic element shall be composed of commercially available material, having long life, permanent magnetic qualities, and shall meet the applicable test requirements specified in 4.4.

3.6.2 Class 1, telescoping. The class 1 magnetic retrieving tool shall be provided with a telescoping body consisting of an inner shaft and outer tube. The tool shall be designed to allow free movement of the assembled parts of the handle with a minimum of clearance between the working parts and to preclude the possibility of the parts becoming loose under normal service conditions. The tool shall be of either single or compound hinge construction.

3.6.2.1 Inner shaft. The inner shaft shall be of steel with a means provided for assembly to the magnet case. The handle end of the inner shaft shall be provided with a positive stop to prevent the outer shaft from being disengaged when fully extending the outer shaft.

3.6.2.2 Outer tubing. The outer tubing shall be swaged approximately 1 inch at the end opposite of the handle to properly engage the inner shaft so that when the inner shaft is fully extended and the magnet is held at an angle to the shaft, no swiveling of the inner shaft can take place. The design of the outer tubing shall provide for suitable assembly to the inner shaft with the outer end properly sealed. A vinyl or plastic grip which completely encases the handle for at least 3 inches from the end of the handle may be provided. When a vinyl or plastic grip is not furnished, the outside diameter of the tubing shall be knurled at the handle end of the grip.

3.6.2.3 Retrieving tool. The retrieving tool shall conform to Table III and be similar to Figure 3a or 3b.

TABLE III. Type II, class 1, retrieving tool, magnetic, telescoping

Closed length		Extended Length		Lifting power	Magnet case diameter	Knurled length
Minimum (Inches)	Maximum (Inches)	Minimum (Inches)	Maximum (Inches)			
15-1/4	18	26	27-1/2	18	5/8	2-7/8

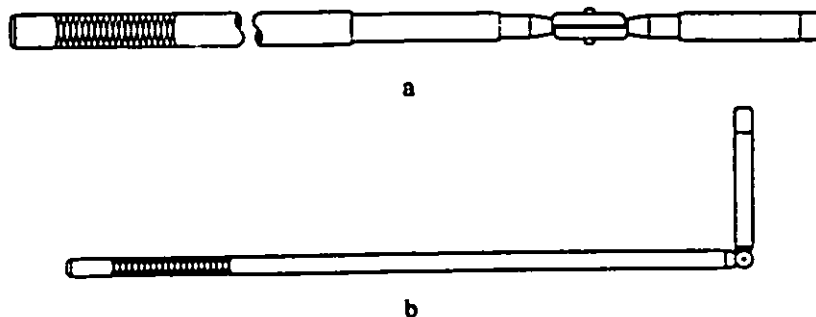


Figure 3. Type II, class 1, retrieving tool, magnetic, telescoping.

3.6.3 Class 2, style A, uncovered spring. Class 2, style A retriever shall be of flexible, spirally-wound wire. It shall have a magnet case (see 3.6.1) and magnet (see 3.6.1.1) on one end and a handle on the other end. The handle shall be designed so parts will not become accidentally detached. The tool shall be constructed of spirally-wound wire of not less than 0.054 inch hard drawing wire coiled to meet the diameter requirements of Table IV. The wire tensile strength shall be a range of 240,000 to 280,000 pounds per square inch (psi). The retrieving tool shall conform to Table IV and be similar to Figure 4.

TABLE IV. Type II, class 2, styles A and B retrieving tools

Overall length + 4 (Inches)	Flexible section F		Magnet case M		Lifting power style A	Lifting power, style B
	Diameter		Length	Diameter		
	Minimum (Inch)	Maximum (Inch)	Maximum (Inches)	Maximum (Inch)	Minimum (Ounces)	Minimum (Ounces)
21	0.215	0.375	3	17/32	12	5
33	0.215	0.375	3	17/32	12	5

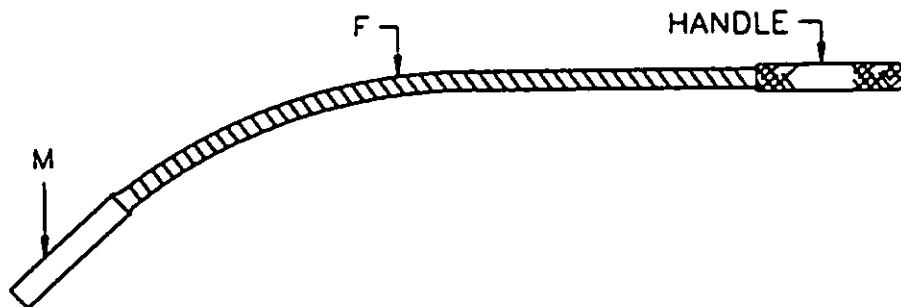


Figure 4. Type II, class 2, style A retrieving tool, magnetic, flexible, uncovered.

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3.6.4 Class 2, style B, covered. The class 2, style B retriever shall be of flexible, spirally-wound wire encased in plastic, vinyl, or neoprene. At the option of the contractor, the encased portion may be considered a handgrip section. If a specific handle is furnished, it shall be designed so that parts will not become accidentally detached. The tool shall be constructed of spirally-wound wire as specified in 3.6.3. At the option of the manufacturer, an eye or loop may be provided for hanging the tool when not in use (see Figure 5a). The retrieving tool shall conform to Table IV and be similar to Figure 5.

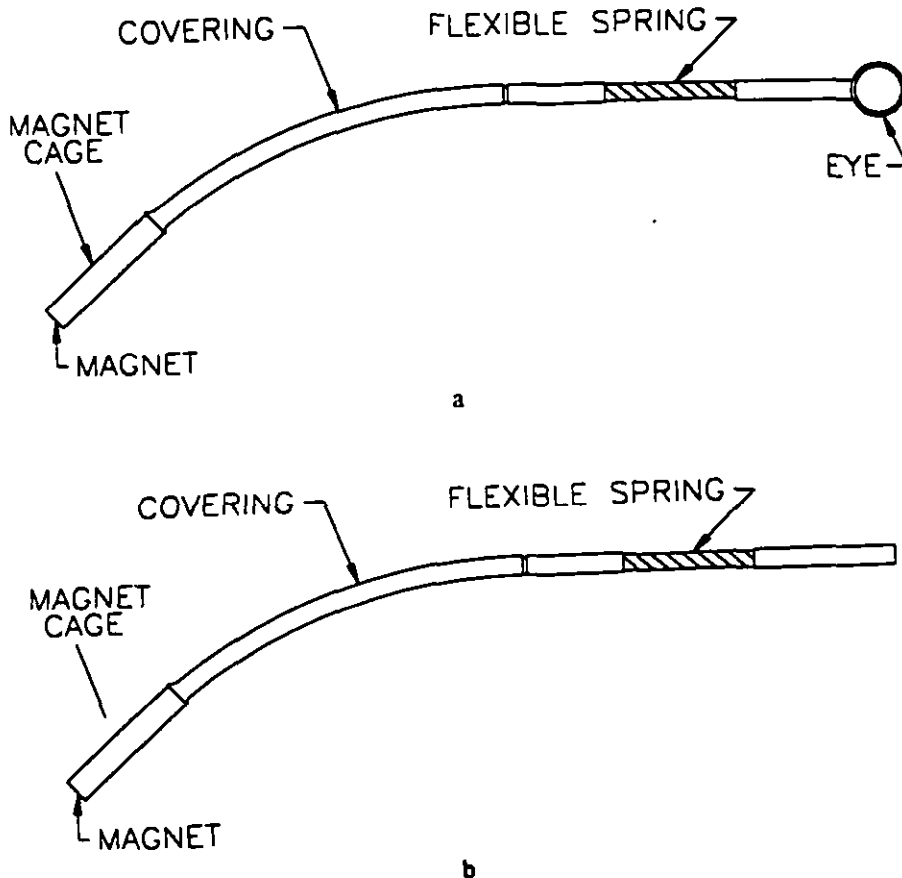


Figure 5. Type II, class 2, style B, retrieving tool, magnetic, flexible, covered (5a and 5b illustrate optional styles).

3.7 Metric products. Products manufactured to metric dimensions will be considered on an equal basis with those manufactured using inch-pound units, provided they fall within the tolerances specified and all other requirements of this document are met. If a product is manufactured to metric dimensions and those dimensions exceed the tolerances specified in the inch-pound units, a request should be made to the specification preparing activity for change to this document.

3.8 Workmanship: Details of workmanship shall be in accordance with the best commercial standards and practices. Paints, coatings, platings, and finishes shall be smooth, dry, adherent, continuous, and not stained or discolored. External and bearing surfaces shall be free of tool and gouge marks, nicks, or other surface imperfections. The item shall be clean and free of corrosion and debris (e.g., chips, shavings, slivers) or other foreign material. The item shall be free from manufacturing workmanship defects (e.g., loose, missing, binding or misaligned parts, sharp or rough external edges, corners, or surfaces) and material workmanship defects (e.g., pits, rips, fins, burrs, tears, nodules, cracks, blisters) which may adversely impact the item's serviceability, durability, safety, or appearance.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor 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 that supplies and services conform to prescribed requirements.

4.1.1 Component and material inspection. In accordance with 4.1 above, the supplier is responsible for insuring that components and materials used were manufactured, tested, and inspected in accordance with the requirements of referenced subsidiary specification and standards to the extent specified, or, if none, in accordance with this specification.

4.2 Sampling procedures. Unless otherwise specified, sampling for inspection shall be performed in accordance with ANSI/ASQC Z1.4. Data for sampling shall be as specified in Table V.

TABLE V. Sampling data

Category	Sample unit (Each)	Inspection level	Acceptable quality level (AQL)	AQL expressed in terms of	Reference
Visual examination	One	II	4.0	Defects per hundred units	4.3.1
Dimensional examination	One	S-3	2.5	Defects per hundred units	4.3.2
Testing	One	S-3	2.5	Percent defective	4.4.1 through 4.4.7

4.3 Examination.

4.3.1 Visual examination. Each sample unit shall be examined for any nonconformance in design, material, finish, coating, construction, workmanship, and marking.

4.3.2 Dimensional examination. Each sample unit shall be examined for any nonconformance with dimensional requirements.

4.4 Testing. Each sample unit shall be tested in accordance with 4.4.1 through 4.4.7.

4.4.1 Fatigue test for type 1, class 1, mechanical fingers. Each sample mechanical finger shall be operated by hand, or by similar method, to its complete opening and closing limit (see 3.4), a minimum of 500 times, and then subjected to the test specified in 4.4.2. The force required to operate the plunger shall be as specified in 3.4.

4.4.2 Lifting test for type 1, class 1. A No. 0-80 flat or round head machine screw inserted in a 24-ounce block of metal shall be used for the test. The screw head shall extend from the block at a sufficient length as to permit the fingers to grip the head. The sample fingers, after completion of the fatigue test, shall be capable of gripping the No. 0-80 screw, lifting the block of metal, with the axis of the fingers in a vertical position, and holding it suspended for one minute.

4.4.3 Fatigue test for type 1, class 2, mechanical fingers. The sample fingers shall be clamped or otherwise secured with the plunger end on a horizontal plane. The gripping end shall be raised until the nonflexible portion adjacent to the finger is at an angle of 70° to the horizontal plane. The flexible portion shall be curved its full length. The plunger mechanism shall be actuated 10 times to its complete opening and closing limit. The 70° angle shall be sustained within a tolerance of $\pm 5^\circ$.

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4.4.4 Type II, retrieving tool, magnetic lift test. Each sample of type II retrieving tools shall be subjected to a lift test to determine compliance with the requirements of Tables III and IV, as applicable.

4.4.4.1 Test weights. The test weights shall be made from a piece of plain steel of the weight necessary to obtain the minimum ounces specified in Tables II and IV.

4.4.6 Telescopic body and joint tightness test. Type II, class 1 retrieving tools shall be capable of being positioned in, and holding any preset angle of the magnet or length of the tubing. When the telescoping-type tubing is fully extended and the magnet is set at 90° to the longitudinal axis of the body, the outer tubing shall be rotated (manually) through at least 360° without evidence of the one or more inner shaft sections slipping or sliding in the outer tubing section. This test shall be conducted at least once with the longitudinal axis of the body horizontal to the floor and once vertical (the magnet shall be positioned above the body).

4.4.7 Type I actuating components. Permanently installed components of actuating parts of type I finger assemblies shall withstand longitudinal forces of not less than 5 pounds applied between attachment parts without failure of permanently installed connection.

4.5 Inspection of preparation for delivery requirements. An inspection shall be made to determine that the preservation, packaging, packing, and marking comply with the requirements in section 5 of this specification. Defects shall be scored in accordance with Table VI. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

TABLE VI. Classification of preparation for delivery defects

Examine	Defect
Marking (exterior and interior)	Omitted; incorrect; illegible; improper size, location, sequence, or method of application
Materials	Any component missing, damaged, or not as specified
Workmanship	Inadequate application of components such as incomplete closure of container flaps, loose strapping, inadequate stapling Distortion of container
Contents	Number per container is more or less than required Net weight exceeds requirements

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing, and marking shall be as specified in the contract or purchase order.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory.)

6.1 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type and class required (see 1.2).
- c. Size required (see Tables I, II, and IV).

MILITARY INTEREST:



Military Coordinating Activity
Army - GL

Preparing Activity:

GSA - FSS

