

[INCH-POUND]
FF-L-2937
January 31, 2005

FEDERAL SPECIFICATION

COMBINATION LOCK, MECHANICAL

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 commercially available combination locks. The lock shall be a dial operated, mechanical, bolt type lock that uses a three number combination with standard-left-right left dialing sequence.

1.2 Classification. Combination locks shall be manipulation, force, and thermal resistant. The locks shall be of the following styles, as specified.

K – Key changeable combination lock
H – Hand changeable combination lock

2. APPLICABLE DOCUMENTS

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

Federal Standards:

FED-STD-123 – Marking for Shipment (Civil Agencies)

(Activities outside the Federal Government may obtain copies of federal specification, standards, and commercial item descriptions as specified in the General Information section of the Index of Federal Specifications, Standards and Commercial Item Descriptions from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

Beneficial comments, recommendations, additions, deletions, clarifications, etc., and any other data which may improve this document should be sent to: General Services Administration, National Furniture Center, Engineering Division (3FNE-CO), 1901 South Bell Street, Room 403, Arlington, VA 22202.

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(Single copies of this specification and other federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle.

(Federal government activities may obtain copies of federal standardization documents and Handbooks and the Index of Federal Specifications, Standards and Commercial Item Descriptions from the established distribution points in their agencies.)

Military Standards:

MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-889 - Dissimilar Metals

(Copies of Military Specifications and Standards required by contractors 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 a specific issue is identified, the issue in effect on the date of invitation for bids or request for proposals shall apply.

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association, Inc., Traffic Department, 1616 P Street, NW, Washington, DC 20036)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

Underwriters Laboratories, Inc. (UL) Publications:

ANSI/UL 768 - Standard for Combination Locks.

(Application for copies should be addressed to Underwriters Laboratory, 12 Laboratory Drive, Research Triangle Park, NC 27709-3995.)

American National Standards Institute (ANSI)/American Society for Quality (ASQ):

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

(Application for copies should be addressed to ANSI, 11 West 42nd Street, New York, NY 10036.)

American Society for Testing and Materials (ASTM):

ASTM B117-97 – Standard for Salt Spray (fog) Testing

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption is obtained.

3. REQUIREMENTS

3.1 Qualification. The combination locks furnished under this specification shall be products which have been tested, and have passed the qualification tests specified in section 4, and have been listed on or approved for listing on the applicable qualified products list (QPL).

3.1.1 Qualification suspension.

3.1.1.1 Development of entry techniques. The combination locks qualified under this specification will be continually tested by the Government during the term of qualification to determine whether the security protection afforded by the locks should or can be improved. If, at any time, entry techniques are developed within the framework of the specification which affect a combination lock's security integrity, it shall be removed from the QPL and the manufacturer will be required to modify the product to the extent necessary to defeat the techniques, and have the lock requalified.

3.1.1.2 Change in specification requirements. This specification will be continually reviewed by the Government to determine whether specification requirements should or can be changed to improve product quality. If, at any time, requirements are changed, and such changes affect the qualification status of a qualified combination lock, it shall be removed from the QPL and the manufacturer will be required to modify the product to the extent necessary to comply with specification changes and have the lock requalified.

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3.2 Design. The lock dial and ring shall be of top reading, spy resistant design with dial and dial ring protected by a snap-on dust cover. The case and cover dimensions shall be as shown in Figure 1. At the option of the purchaser, the lock shall be hand or key change style (see 6.2).

3.3 UL requirements. The lock shall conform to the Group 1 requirements of UL 768. The lock shall have passed the UL testing and be listed by UL. The government reserves the right to perform any testing or inspections in UL 768.

3.4 Combinations. The lock shall have a minimum of 800,000 usable combinations. The dial shall be marked with 100 graduation divisions, each 5th division distinctively identified to facilitate easy reading. Each 10th division from 0 to 90 shall be marked with a number.

3.5 Dialing tolerance. A three wheel lock shall not open when the dial is turned more than ½ graduation on either side of the proper graduation for each wheel. The lock shall be tested in accordance with paragraph 4.7.1.

3.6 Thermal lockout. The lock shall have a thermal lockout feature which will restrict unaided retraction of the bolt when the temperature reaches 170 degrees Fahrenheit. The lock shall be tested in accordance with paragraph 4.7.2.

3.7 Bolt lockout. The lock shall have a mechanical relock mechanism that will prevent the retraction of the bolt if the lock cover plate is moved more than 0.10 inch (2.54 mm) at any point from its normal operating position. The lock shall be tested in accordance with paragraph 4.7.3.

3.8 Endurance test. After completion of the 10,000 cycles the lock shall undergo 50 combination changes including three open and close verifications after each change. The lock shall be tested in accordance with paragraph 4.7.4.

3.9 Salt spray corrosion requirement. The lock shall pass the test of 4.7.5.

3.10 Dissimilar metals. Dissimilar metals, as defined in MIL-STD-889, must either be plated or compatible to prevent operationally destructive corrosion.

3.11 Resistance to unauthorized opening. The lock shall pass the test of 4.7.7.

3.12 Torque requirement. The lock shall meet the torque requirements below when tested in accordance with 4.7.8.

3.12.1 Wheel-pack assembly. The wheel centers shall resist slippage when torqued to 5 inch-pound-force (lbf.in) (0.575 Newton meter (N.m)) in either direction.

3.12.2 Wheel to wheel center slippage. Mount each wheel so that it remains stationary. Apply a torque of 5 lbf.in (0.575 N.m) to the wheel center (or insert) in a clockwise rotation and then a counterclockwise rotation. Any evidence of slippage at less than the required torque between the wheel center and the outer wheel shall constitute failure of this test.

3.12.3 Wheel-pack assembly torque. The locks shall maintain a wheel-pack assembly torque in the range of not less than 16 inch-ounce-force (ozf.in) (0.1136 N.m) and not more than 24 ozf.in (0.1704 N.m).

3.12.4 Security. After the break-in period, the ending torque shall be checked to determine that the lock torque is less than twice the starting value.

3.13 Case and bolt strength. The lock shall pass the test required in paragraph 4.7.6.

3.14 Workmanship. The workmanship shall be of a quality to produce a serviceable and well-finished end item able to withstand hard daily usage. The edges of all exposed parts shall be protected by folding, beading, flanging, or grinding to eliminate burrs, roughness, and sharp edges. Welding and brazing shall produce rigid and secure connections. Lock washers, cotter pins, clips, retainers, or built-in features shall be used to prevent loosening of screws, bolts, and nuts, which may cause disengagement of parts and possible lockout. The locking mechanism shall operate smoothly without binding or jamming of parts. The lock shall be free of any defect or feature which may affect its appearance and serviceability, or which may cause personal injury.

3.15 Assembly drawing and parts list. A parts list of all lock parts which may be subject to subsequent replacement because of wear or damage shall be furnished with each lock delivered under contract. The parts list shall clearly identify the parts by description, location and part number. When necessary, assembly drawings shall be provided to show the location of the parts. The parts list shall be printed on heavy paper or other suitable material and provided with each lock.

4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection responsibility. Except that testing for qualification shall be performed by an agency designated by General Services Administration, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facility or service acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order. 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 the prescribed requirements.

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4.2 Component and material inspection. The supplier is responsible for insuring that components and materials used are manufactured, tested and inspected in accordance with the requirements of referenced subsidiary specifications and standards to the extent specified, or, if none, in accordance with this specification.

4.3 Examination of preparation for delivery. An examination shall be made to determine that the packaging, packing and marking comply with the requirements in Section 5 of this specification. Defects shall be scored in accordance with Table I. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with ASQ Z1.4. The lot size shall be the number of containers in the inspection lot. The inspection level shall be Level I and the AQL shall be 4.0 defects per hundred units.

Table I. Classification of preparation for delivery defects

Examine	Defects
Markings (exterior)	Omitted; incorrect; illegible; improper size, location, sequence or method of application.
Materials	Any component missing or damaged.
Workmanship	Inadequate application of components such as incomplete closure of container flaps or shroud.

4.4 Testing procedures and tests.

4.4.1 Testing agency. Qualification tests accomplished on locks submitted for approval for inclusion on the applicable Qualified Products List (QPL) and any retesting that may be required shall be performed by a testing agency specifically designated by the General Services Administration.

4.4.2 Test costs. All testing costs entailed in determining the qualification of the supplier's product, including costs of retesting of a qualified product if subsequently disqualified under 3.1.1, shall be borne by the supplier, and shall be payable to the General Services Administration. All costs associated with changes made by the suppliers product that require evaluation or testing shall be borne by the supplier.

4.4.3 Test procedures. The following procedures shall govern the testing of all locks submitted for qualification under this specification:

(a) Samples shall be submitted for qualification only after the supplier has obtained written authorization from the General Services Administration.

(b) A qualification test may be discontinued at the Government's testing facility at any time the product fails to meet any one or more of the requirements set forth in this specification. The manufacturer may be permitted to make modifications on the sample during the testing phase where such modifications, in the judgment of the General Services Administration and the testing facility, are clearly in the interest of the Government.

(c) In case of failure of the sample, consideration will be given to the request of the manufacturer for resubmission for retest only after it has been clearly shown that changes have been made in the product which the Government considers sufficient to warrant retest.

(d) The manufacturer or his representative will not be permitted to observe the actual tamper resistance tests conducted on his product at the testing facility. However, when samples tested fail to comply with the requirements of this specification, the sample may be examined by the manufacturer or his representatives and full details of the failure may be made known to them in a manner which, for reasons of security, will be in the best interest of the Government.

4.4.3.1 Test samples. Eight qualification test samples shall be forwarded to a place designated by the General Services Administration. In the event the samples are destroyed or damaged to such an extent during testing that testing cannot be completed, the Government reserves the right to require the manufacturer to furnish additional samples to complete the testing. Samples delivered to the test facility shall have a tag attached which shall reference this specification.

4.4.3.2 Drawings and material specifications. The manufacturer shall furnish two complete sets of construction and assembly drawings and material specifications with the sample submitted for qualification. When samples have been tested and the product is approved for inclusion on the applicable QPL, the manufacturer shall furnish three additional complete sets of the assembly and construction drawings and material specifications lists to the General Services Administration for the Government's use in inspection and acceptance of the product after award of contract. All material so furnished by the manufacturer will be held in proprietary confidence.

4.4.3.3 Changes in construction or construction drawings. No changes shall be made in the construction or construction drawings of the lock after it has become qualified and is furnished under contract or order unless prior written authorization to make changes is obtained from the GSA contracting officer.

4.5 Qualification testing. Qualification testing shall consist of the tests in 4.7. Failure of the sample to withstand one or more of these tests shall provide reason to consider the product as having failed to meet qualification requirements.

4.6 Acceptance after award of contract. The Government reserves the right to inspect and test each lock, including all component parts thereof, delivered for acceptance under this specification after award of contract.

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4.7 Test methods.

4.7.1 Dialing tolerance test. The test shall be conducted by changing the combination $\frac{1}{2}$ number at a time in the following manner:

- a) Dial the combination with the first number $\frac{1}{2}$ graduation lower than set, and the second and third numbers as they are set;
- b) Then dial the combination with the first number $\frac{1}{2}$ graduation higher than set, and the second and third numbers as they are set;
- c) Then dial the combination with the second number $\frac{1}{2}$ graduation lower than set, and the first and third numbers as they are set;
- d) Then dial the combination with the second number $\frac{1}{2}$ graduation higher than set, and the first and third numbers as they are set;
- e) Then dial the combination with the third number $\frac{1}{2}$ graduation lower than set, and the first and second numbers as they are set;
- f) Then dial the combination with the third number $\frac{1}{2}$ graduation higher than set, and the first and second numbers as they are set.

If the lock opens as a result of any of these attempts, the trial is to be repeated with the number dialed $\frac{1}{4}$ of a graduation more. If the lock opens on that trial, that shall constitute failure of the test.

This test shall be conducted before and after the lock has been through the endurance test in paragraph 4.7.4.

4.7.2 Thermal relock test. The lock shall be placed in a chamber maintained at a temperature of 155 degrees Fahrenheit for a period of three hours. At the end of that period, the lock shall be removed from the chamber, and without allowing time for the lock to cool, the lock shall be opened five times using normal dialing procedures. The lock shall then be placed back in the chamber and the temperature increased to 170 degrees. After one hour, the lock shall be removed from the chamber and an attempt shall be made to open it. Retraction of the lock bolt shall constitute a failure.

4.7.3 Bolt Lockout test. The sample lock shall be tested to determine compliance with the requirement of paragraph 3.7.

4.7.4 Endurance test. The sample lock shall be cycled through 50 combination changes including three open and close verifications after each change. The combination set process shall operate as designed. Once the combination has been set, there shall be no fluctuations.

4.7.5 Salt spray corrosion test. A combination lock shall operate as intended following a 72 hour exposure to salt spray (fog) as described in the Standard for Salt Spray (fog) testing, ASTM B117-97.

4.7.6 Case and bolt strength test. Mount the lock extension on a test stand so that the bolt extends beyond the edge of the stand, as shown in Figure 2. Apply a force of 600 pounds to the face of the bolt as shown in the figure. Examine the extension and bolt for damage. Apply a force of 600 pounds to the end of the bolt as shown in Figure 3. Any fracture or bending of the bolt or case shall be a failure.

4.7.7 Resistance to unauthorized opening test. The lock design shall be such that the lock cannot be opened by mechanical manipulation or autodialers for a period of 20 hours. The lock design shall not allow autodialers to dial 75 percent of usable combinations within 20 hours.

4.7.8 Torque test. The lock shall be tested to determine conformance with the torque requirements of paragraph 3.12.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Installation and combination changing instructions and combination change key (when applicable) shall be placed in an envelope. Each lock and envelope shall be packaged in a close fitting fiberboard box. The box shall be sealed with reinforced tape.

5.2 Packing. Locks, packaged as specified in 5.1, shall be packed to ensure carrier acceptance in accordance with National Motor Freight Classification and Uniform Freight Classification.

5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with FED-STD-123.

5.3.2 Military requirements. In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Combination locks covered by this specification are intended for use on field safes, armory vault doors, weapons containers and similar items.

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) Style required (see 1.2).
- (c) Levels of packaging, and packing required.

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6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion on the applicable Federal Qualified Products List, whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification so that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the National Furniture Commodity Center, Federal Supply Service, General Services Administration, 1901 South Bell Street, Arlington, VA 22202. Information pertaining to qualification may be obtained from that activity.

6.4 Definitions of terms used in this specification.

6.4.1 Entry. For the purpose of this specification, entry means retracting the bolt.

6.4.2 Normal use. For the purpose of this specification, normal use means dialing the combination, retracting the bolt, and extending the bolt.

6.5 Samples. All samples required for test purposes shall be furnished at no expense to the Government and the manufacturer shall pay all transportation charges to and from the point where the tests are performed. All tested samples shall become the property of the Government but may be released to the manufacturer at the option of the Government. Upon request, the manufacturer shall furnish to the Government testing facility, a lock equal in every respect to that of the qualified sample for use, of inspection and test during the term of qualification. The lock shall be furnished at no expense to the Government and will be returned to the manufacturer upon removal of his product from the qualified products list.

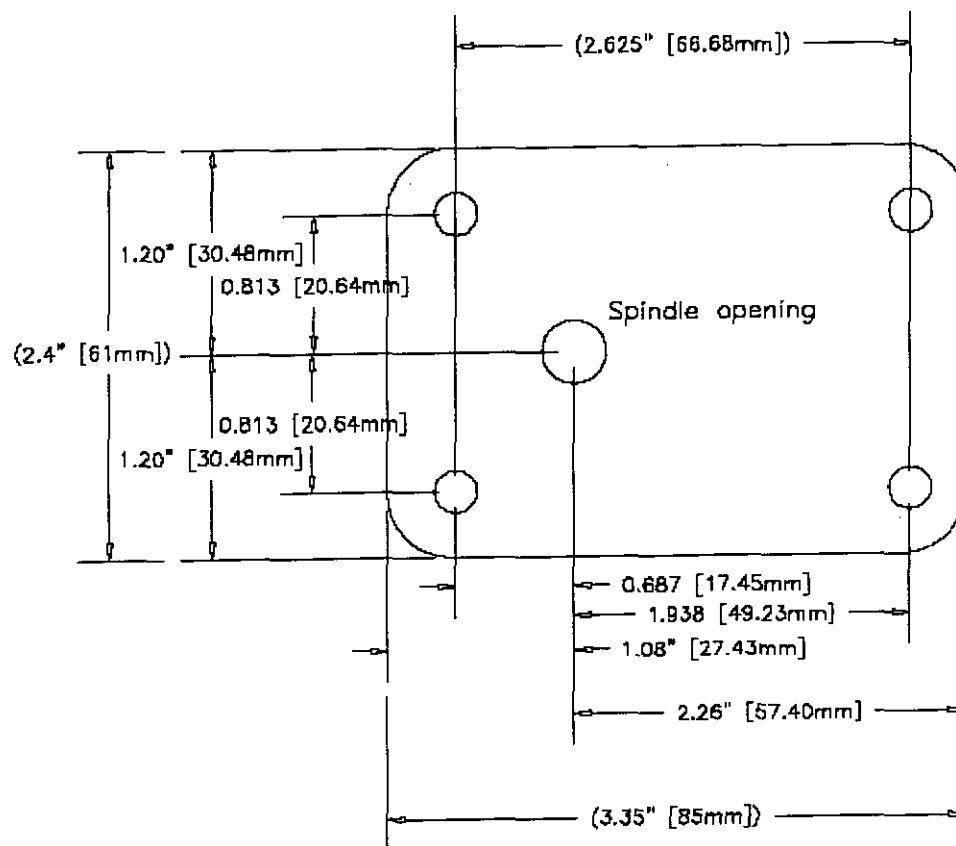
6.6 Special techniques. Information relating to special techniques will be disclosed to qualified suppliers and personnel of the Federal agencies on a need-to-know basis.

MILITARY INTERESTS:

Preparing Activity:
GSA-FSS

Military Coordinating Activity:
DLA-IS

Custodians:
DLA-IS
AF-99
Army-AR



Tolerances:
 XX.XX ± 0.01 [± 0.25 mm]
 XX.XXX ± 0.005 [± 0.13 mm]

FIGURE 1
 Schematic arrangement of lock case holes.

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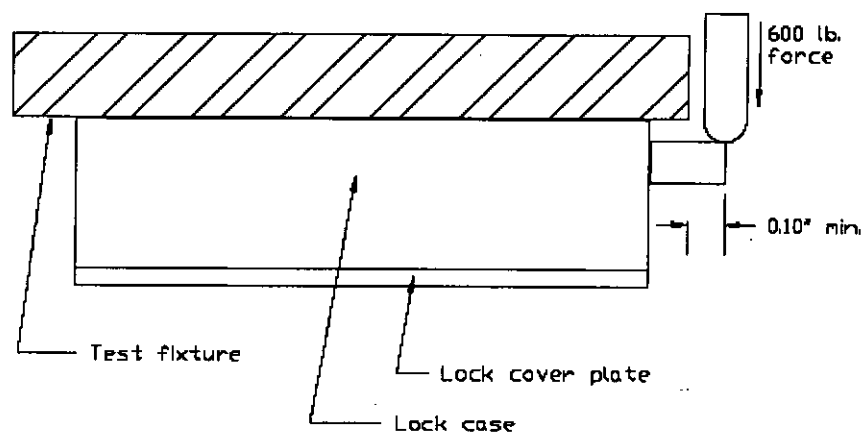


FIGURE 2
Case and bolt strength test

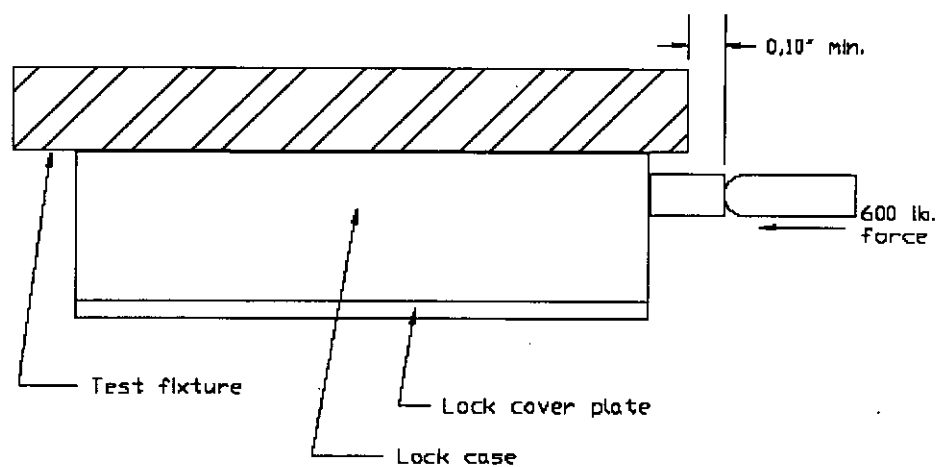


FIGURE 3
Bolt end pressure test