

INCH-POUND

MIL-DTL-8788E

24 April 2007

SUPERSEDING

MIL-DTL-8788D

6 April 2001

DETAIL SPECIFICATION

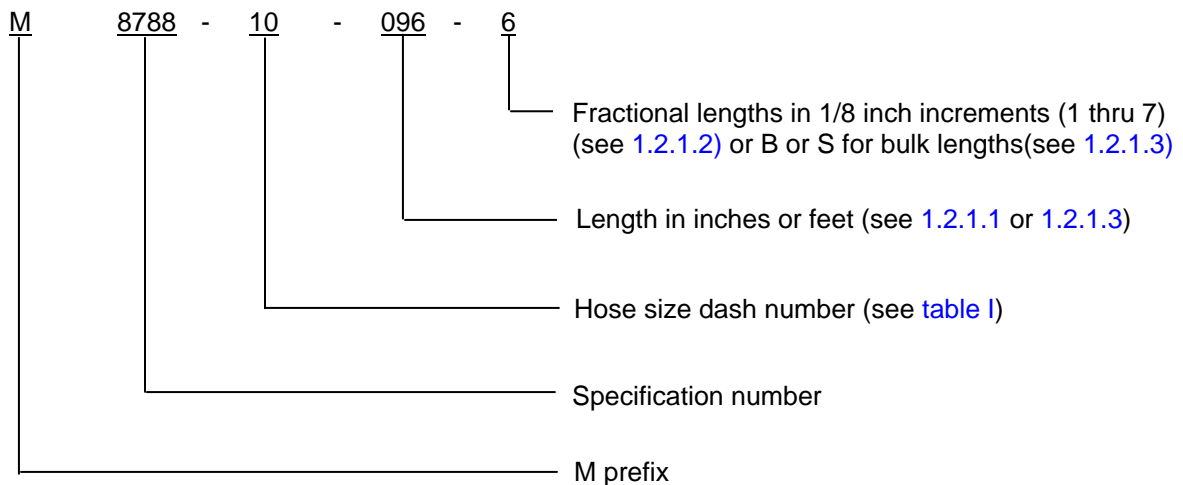
HOSE, RUBBER, HYDRAULIC, HIGH PRESSURE (3,000 PSI),
OPERATING TEMPERATURE RANGE -65°F to +160°F

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

1. SCOPE

1.1 Scope. This specification covers the requirements for hose, rubber, hydraulic, high pressure (3000 psi) operating temperature range -65°F to +160°F (see 6.1).

1.2 Part or Identifying Number (PIN). The PIN consists of the letter M, the basic specification number, a dash, a number for hose size, a dash, three numbers for length a dash, and a number for fractions of an inch or for bulk hose lengths the letter B or S.



Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, Attn: VAI, P.O. Box 3990, Columbus, Ohio, 43218-3990 or emailed to RectangularConnector@dsc.c.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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TABLE I. Hose size designator.

Hose size dash number	Hose ID Nominal fractional inch	Hose ID Nominal decimal inch	Hose ID Nominal mm
-4	1/4	.250	6.35
-5	5/16	.313	7.94
-6	3/8	.375	9.53
-8	1/2	.500	12.70
-10	5/8	.625	15.88
-12	3/4	.750	19.05
-16	1	1.000	25.40

1.2.1 Hose lengths. Lengths of bulk hose are represented by inches and fractions in 1/8 inch increments.

1.2.1.1 Lengths of hose. Lengths of hose are represented by inches unless bulk hose is required (see 1.2.1.3).

1.2.1.2 Fractions. Fractions are expressed in 1/8 inch increments (1 thru 7). Not applicable to bulk hose lengths.

1.2.1.3 Bulk hose lengths. Bulk hose lengths are represented by the letter B or S. Bulk lengths are in increments of 20 feet or more (see 3.4.3.1). The S designator is used to define specific lengths in feet (see 3.4.3.2).

Note: For the inch designator insert the number zero in front of designator for lengths less than 100 inches.

Examples:

When 12 and 7/8 inch length is required the designator is: 012-7

When 96 inches is required the designator is: 096

When 30 feet total length is required the designator is: 030-B

When 30 feet continuous length is required with a 1% tolerance the designator is: 030-S

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, and 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

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FEDERAL STANDARDS

FED-STD-595/13538 - Yellow Gloss

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-8789 - Fitting End, Attachable, Hydraulic High Pressure (3,000 psi),
General Specification for
MIL-DTL-8790 - Hose Assemblies, Rubber, Hydraulic, High Pressure (3,000 psi)
MIL-PRF-5606 - Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
Hydrocarbon Base, Aircraft and Missile
MIL-PRF-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base,
Metric, NATO Code Number H-537
MIL-PRF-87257 - Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic
Hydrocarbon Base, Aircraft and Missile

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-889 - Dissimilar Metals

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AEROSPACE INDUSTRIES ASSOCIATION (AIA)

NAS847 - Caps and Plugs, Protective, Dust and Moisture Seal

(Copies of these documents are available online at <http://www.aia-aerospace.com> or from the Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-390.)

ASTM INTERNATIONAL

ASTM D380 - Standard Test Methods for Rubber Hose

(Copies of these documents are available online at <http://www.astm.org> or from the ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

NCSL Z540-1 - Calibration Laboratories and Measuring and Test Equipment,
General Requirements

(Copies of these documents are available online at <http://www.ncsli.org> or from NCSL International 2995 Wilderness Place, Suite 107 Boulder, Colorado 80301-5404.)

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SAE INTERNATIONAL

- | | | |
|------------|---|---|
| SAE ARP603 | - | Impulse Testing of Hydraulic Hose, Tubing, and Fitting Assemblies |
| SAE AS1933 | - | Age Controls for Hose Containing Age-Sensitive Elastomeric Material |
| SAE J1966 | - | Lubricating Oil, Aircraft Piston Engine (Nondispersant Mineral Oil) |

(Copies of these documents are available online at <http://www.sae.org> or from the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The hose furnished under this specification shall be a product that is authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.4 and 6.3).

3.1.1 Hose assemblies. Hoses qualified to this specification are intended for use with fittings in accordance with MIL-DTL-8789 and the subsequent hose assemblies are to be qualified in accordance with MIL-DTL-8790.

3.2 Materials.

3.2.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials shall be used to the maximum extent possible provided that the material meets operational and maintenance requirements, and promotes economically advantageous life cycle costs.

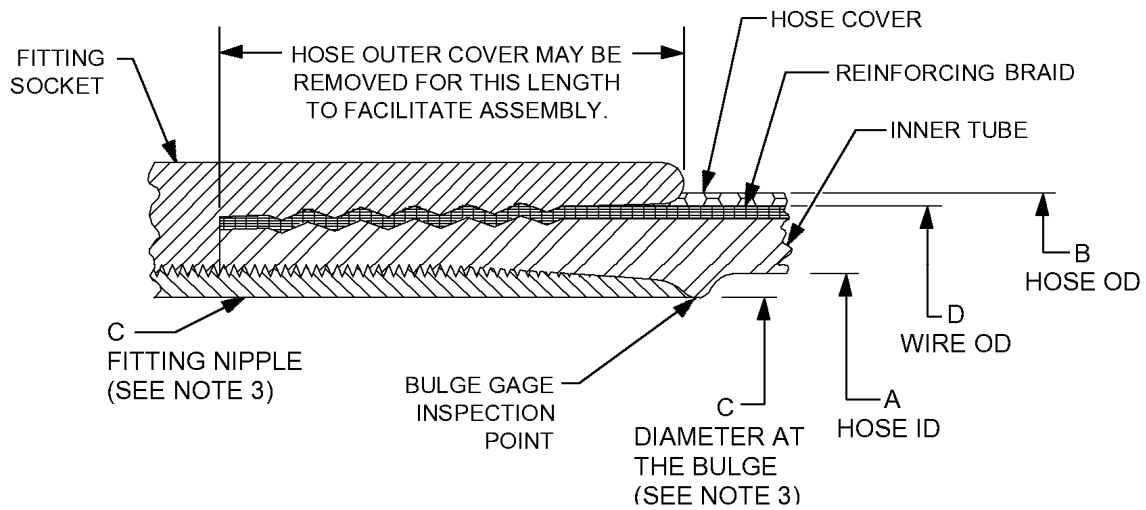
3.2.2 Hazardous substances. The use of hazardous substances, toxic chemicals, or ozone depleting chemicals (ODCs) shall be avoided whenever possible.

3.2.3 Metals. Metals selected for constructing the reinforcement of the hose shall be corrosion resistant or treated to resist corrosion caused by exposure to atmospheric and environmental conditions encountered during storage or normal service. Dissimilar metals, as defined by MIL-STD-889, shall not be used in intimate contact with each other unless protected against electrolytic corrosion.

3.3 Hose construction. The hose construction shall be specified on [figure 1](#) and shall consist of the following:

- a. A seamless compounded inner tube (see [3.3.1](#)).
- b. Braided steel wire reinforcement (see [3.3.2](#)).
- c. An abrasion resistant cover (see [3.3.3](#)).

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Hose size dash number	A Hose ID		B Hose OD inch (mm)	C Inner tube diameter at the bulge inch (mm)	Hose ID Nominal inch (mm)
	Inch	mm			
-4	.219 $\begin{matrix} +.031 \\ -.007 \end{matrix}$	5.56 $\begin{matrix} +0.79 \\ -0.18 \end{matrix}$	.625 $\pm .031$ (15.88 ± 0.79)	.146 (3.71)	.250 (6.35)
-5	.281 $\begin{matrix} +.025 \\ -.007 \end{matrix}$	7.14 $\begin{matrix} +0.64 \\ -0.18 \end{matrix}$	.703 $\pm .031$ (17.86 ± 0.79)	.177 (4.50)	.313 (7.95)
-6	.344 $\begin{matrix} +.025 \\ -.007 \end{matrix}$	8.74 $\begin{matrix} +0.64 \\ -0.18 \end{matrix}$	.766 $\pm .031$ (19.46 ± 0.79)	.271 (6.88)	.375 (9.53)
-8	.438 $\begin{matrix} +.025 \\ -.007 \end{matrix}$	11.13 $\begin{matrix} +0.64 \\ -0.18 \end{matrix}$	.859 $\pm .031$ (21.82 ± 0.79)	.365 (9.27)	.500 (12.70)
-10	.563 $\begin{matrix} +.025 \\ -.007 \end{matrix}$	14.30 $\begin{matrix} +0.64 \\ -0.18 \end{matrix}$	1.031 $\pm .031$ (26.19 ± 0.79)	.455 (11.56)	.625 (15.88)
-12	.688 $\begin{matrix} +.031 \\ -.010 \end{matrix}$	17.48 $\begin{matrix} +0.79 \\ -0.25 \end{matrix}$	1.219 $\pm .031$ (30.96 ± 0.79)	.568 (14.43)	.750 (19.05)
-16	.875 $\begin{matrix} +.031 \\ -.010 \end{matrix}$	22.23 $\begin{matrix} +0.79 \\ -0.25 \end{matrix}$	1.500 $\begin{matrix} +.047 \\ -.031 \end{matrix}$ (38.10 $\begin{matrix} +1.19 \\ -0.79 \end{matrix}$)	.778 (19.76)	1.000 (25.40)

FIGURE 1. Construction of hose.

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Hose size dash number	D Wire braiding OD		Reinforcing braid Number of wire layers
	Inch	mm	
-4	.484 ± 0.016	12.29 ±0.41	2
-5	.547 ± 0.016	13.89 ±0.41	2
-6	.640 ± 0.023	16.26 ±0.58	2
-8	.734 ± 0.023	18.64 ±0.58	2
-10	.859 ± 0.031	21.82 ±0.79	2
-12	1.047 ± 0.031	26.59 ±0.79	2
-16	1.328 ± 0.031	33.71 ±0.79	3

NOTES

1. Dimensions are in inches.
2. Metric equivalents are for information only.
3. Dimension C indicates both the minimum allowable inner tube diameter at the bulge and the minimum nipple ID of the fitting when assembled with the hose. When elbow fittings are used, the minimum ID through the elbow bend area may be .031 inch (0.79 mm) less than the values shown in this column.

FIGURE 1. Construction of hose - Continued.

3.3.1 Inner tube. The inner tube shall be a seamless fabrication of an oil-resistant elastomer and shall have a uniform thickness. The bore of the tube shall be smooth, free from pitting, cuttings, borings, or cements.

3.3.2 Reinforcement. The hose shall be reinforced with uniformly braided steel wires.

3.3.3 Cover. The cover shall be of a compounded polymerized chloroprene that is both abrasion and oil resistant. A friction ply or a braided layer may be used over the wire reinforcement.

3.4 Dimensions.

3.4.1 Outer surface concentricity. The outer surface shall be concentric, with the inside bore of the tube, to within .035 inch (0.89 mm) full indicator movement (FIM) for sizes 6 and smaller, .040 inch (1.02 mm) FIM for sizes 8 and 10, and .050 inch (1.27 mm) FIM for sizes 12 and 16.

3.4.2 Inside bore concentricity. The reinforcement shall be concentric, with the inside bore of the tube, to within .030 inch (0.76 mm) FIM for hose size 8 and smaller. Hoses size 8 and larger shall be within .035 inch (0.89 mm) FIM.

3.4.3 Length of bulk hose.

3.4.3.1 B designator of bulk hose lengths. Bulk hose shall be furnished in lengths greater than 20 feet (6.10 m). However, up to 10% of the order may be furnished in random lengths between 10 and 20 feet (3.05 to 6.10 m). No more than 10% of the order shall be furnished in random lengths between 3 and 10 feet (0.91 to 3.05 m).

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3.4.3.2 S designator for specific bulk hose lengths. When the order is for a specific length in feet, a tolerance of $\pm 1\%$ of the required length shall be used.

3.5 Performance. The hose shall meet the following performance requirements. When necessary for testing, the hose shall be assembled with end fittings in accordance with MIL-DTL-8789.

3.5.1 Proof pressure. The hose shall not leak or fail during or at the completion of the test, when tested as specified in 4.7.3, with the applicable proof pressure specified in table II. There shall be no visual evidence of damage or permanent deformation.

TABLE II. Performance characteristics.

Hose size dash number	Operating pressure psig (bar)	Operating pressure for impulse testing psig (bar)	Proof pressure, min psig (bar)	Burst pressure, min psig (bar)	Bend radius inside, min inch (mm)	Assembly length of test samples inch (cm) ^{1/}
-4	3,000 (206.84)	3,000 (206.84)	16,000 (1103.2)	64,000 (4412.6)	3.00 (76.20)	16 (40.64)
-5	3,000 (206.84)	3,000 (206.84)	14,000 (965.25)	56,000 (3861)	3.38 (85.85)	18 (45.72)
-6	3,000 (206.84)	3,000 (206.84)	14,000 (965.25)	56,000 (3861)	5.00 (127.00)	21 (53.34)
-8	3,000 (206.84)	3,000 (206.84)	14,000 (965.25)	56,000 (3861)	5.75 (146.05)	24 (60.96)
-10	3,000 (206.84)	3,000 (206.84)	12,000 (413.69)	48,000 (3309.5)	6.50 (165.10)	30 (76.20)
-12	3,000 (206.84)	3,000 (206.84)	12,000 (413.69)	48,000 (3309.5)	7.75 (196.85)	33 (83.82)
-16	3,000 (206.84)	3,000 (206.84)	10,000 (689.5)	40,000 (2757.9)	9.63 (244.60)	24 (60.96)

^{1/} Length specified includes fittings at both ends (see 3.5).

3.5.2 Diameter reduction. The ID of the hose shall not be less than 90% of the applicable diameter specified on figure 1, when tested as specified in 4.7.4.

3.5.3 Elongation and contraction. The length change for hose sizes 4 and 5 shall not be more than +0.50 or -2.50%, when tested as specified in 4.7.5. Length change for hose sizes 6 and larger shall not be more than $\pm 2.00\%$.

3.5.4 Leakage. The hose and end fittings shall not show any evidence of leakage during or at the completion of the test, when tested as specified in 4.7.6.

3.5.5 Burst pressure. There shall be no leakage in the hose or at the end fittings, when tested as specified in 4.7.7, below and including the minimum burst pressure specified in table II. The hose shall not burst or develop a permanent blister. The fittings shall not loosen or disconnect from the hose.

3.5.6 Impulse. The hose and end fittings shall not show any evidence of leakage, burst, or fitting loosening or blow-off, when tested as specified in 4.7.8.

3.5.7 Bulge resistance. The ball gage, used to determine the inner tube diameter at the bulge of the hose, shall fall freely under its own weight through the section of the end-fitting insert in the hose, when tested as specified in 4.7.9.

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3.5.8 Low temperature flexibility. The hose shall not leak or fail during or at the completion of the test, when tested as specified in 4.7.10. There shall be no visual evidence of damage or permanent deformation.

3.6 Interchangeability. Hoses bearing the same manufacturer's PIN for hose size (see 1.2) shall be both functionally and dimensionally interchangeable.

3.7 Cleanliness. The interior surface of the hose shall be free from oil, grease, dirt, moisture, cleaning solvents and foreign materials.

3.7.1 Sealing of hose ends. The cut hose ends shall be sealed with caps or plugs conforming to NAS847 to prevent the entrance of foreign contaminants. The caps or plugs shall be securely attached and shall withstand normal strains, jarring and vibrations encountered during shipping, storage and handling. Hose lengths with uncovered ends shall be rejected and considered as failure.

3.8 Age. The bulk hose that is covered by this specification shall not exceed the age limits in accordance with SAE AS1933.

3.9 Workmanship. Hose shall be manufactured and processed in such a manner as to be uniform in quality and shall be free from foreign material and other defects that will affect life, serviceability, strength, assembly or durability (see table III). Workmanship shall be such as to enable the hose to meet the applicable performance requirements of this specification.

TABLE III. Workmanship defects.

Defect	Inspection	Reference
Dimensions affecting interchangeability not within tolerance	Standard inspection equipment	3.4.1 and 3.4.2
Ridge on tube - Severe	Standard inspection equipment	3.3.1
Bunching of tube - Severe	Standard inspection equipment	N/A
Loose tube	Standard inspection equipment	N/A
Off center -under gage cover	Standard inspection equipment	N/A
Hole in tube	Standard inspection equipment	N/A
Nad lap or delamination of tube	Standard inspection equipment	N/A
Reinforcement through tube	Standard inspection equipment	N/A
Reinforcement through cover	Visual	N/A
Poorly patched cover	Visual	N/A
Blistered or loose, patch on cover	Visual	N/A
Under gage cover area	Visual	N/A
Poor overlap, opening or lack of adhesion	Visual	N/A
Cover missing	Visual	N/A
Loose cover (wrinkles when bent)	Visual	N/A
Exposed reinforcement braid	Visual	N/A
Split, slit or break in cover	Visual	N/A
Blister under cover	Visual	N/A
Misbranding	Visual	3.10

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3.10 Marking. The outer cover of bulk hose or hose in hose assemblies shall be marked with, continuous yellow stripe. As a minimum, the hose cover material shall be marked with the following information at intervals of not more than 12 inches (305 mm).

- a. PIN (see 1.2), length designator may be omitted.
- b. Cure date in quarter and year such as 4Q06 for fourth quarter 2006.
- c. CAGE code.
- d. Manufacturer's name or trademark.

3.10.1 Marking color. The marking color shall be yellow in accordance with FED-STD-595/13538. The marking shall be a water resistant, gasoline resistant, and oil-resistant.

3.10.2 Anti-counterfeiting protection. All qualified manufacturers shall establish proprietary measures to authenticate their products when necessary see 6.2. If required, this proprietary information shall be released only to the quality assurance department of the final procuring activity.

4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be used. The establishment and the maintenance of a calibration system to control the accuracy of all test and measuring equipment shall be in accordance with NCSL Z540-1 or equivalent.

4.3 Inspection conditions. Unless otherwise specified, all required inspection shall be performed in accordance with the test conditions specified in 4.6.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government qualifying activity (see 6.3) on sample units produced with equipment and procedures used in production.

4.4.1 Samples for qualification. Qualification samples shall be representative of the products proposed to be furnished to this specification. Sample sizes are specified in the applicable test methods and table III. Except for visual and mechanical inspection and proof pressure, at the discretion of the manufacture, hose or hose assembly samples may be subjected to multiple tests.

4.4.1.1 Hose assembly. When a hose assembly is required for a qualification inspection each hose assembly shall consist of a hose as specified herein assembled with fittings from two different manufacturers qualified to MIL-DTL-8789.

4.4.2 Qualification inspection routine. Samples shall be subjected to qualification inspection specified in table IV.

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TABLE IV. Qualification and verification of qualification inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of samples 1/
Examination of product	3.3, 3.4, 3.6, 3.8, 3.9, and 3.10	4.7.1	All
Cleanliness	3.7	4.7.2	1 hose
Proof pressure	3.5.1	4.7.3	All
Diameter reduction	3.5.2	4.7.4	2 hose
Elongation and contraction	3.5.3	4.7.5	3 hose assemblies
Leakage	3.5.4	4.7.6	2 hose
Burst pressure	3.5.5	4.7.7	2 hose
Impulse	3.5.6	4.7.8	4 hose
Bulge resistance	3.5.7	4.7.9	Impulse test samples
Low temperature flexibility	3.5.8	4.7.10	2 hose/ or hose assemblies

1/ Reference the inspection paragraph for specimen sizes and hose or hose assembly sample lengths.

4.4.3 Acceptance of qualification inspection data. Required qualification tests at the hose assembly level that were already performed at the bulk hose level may be eliminated if documented approval has been obtained from the qualifying activity.

4.4.4 Alternate qualification inspection criteria. Hose shall meet the requirements of 4.4.2. Alternatively, when the identical fittings are manufactured and tested in accordance with MIL-DTL-8789, and identical hose assemblies are manufactured and tested in accordance with MIL-DTL-8790, using identical hose in accordance with MIL-DTL-8788, it is not necessary to test the hose to meet the qualification requirements of this specification. This applies when substantially identical test requirements and test procedures are required for the assembly and the individual components and upon documented approval by the qualifying activity.

4.4.5 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.4.6 Summary of test. If the summary of test results indicates nonconformance with the requirements specified herein but the corrective measures acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the QPL.

4.5 Conformance inspection.

4.5.1 Individual tests. Inspection of the product, for delivery, shall consist of subjecting each hose length to the individual tests specified in table V. Any item failing to meet the requirements of the individual tests shall be immediately removed from the lot.

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TABLE V. Individual inspection.

Inspection	Requirement paragraph	Test method paragraph
Examination of product	3.3, 3.4, 3.6, 3.8, 3.9, and 3.10	4.7.1
Proof pressure	3.5.1	4.7.3

TABLE VI. Sampling inspection and periodic inspection.

Inspection	Requirement paragraph	Test method paragraph	Sampling inspection	Periodic inspection
Elongation and contraction	3.5.3	4.7.5	X	
Leakage	3.5.4	4.7.6	X	
Burst pressure	3.5.5	4.7.7	X	
Impulse ^{1/}	3.5.6	4.7.8		X

^{1/} Aging is not required for periodic inspection.

4.5.2 Sampling inspections sample plan. Hose length, randomly selected from a production lot shall be subjected to the sampling inspections specified in table VI.

4.5.2.1 Production lot. A production lot shall consist of 750 foot of hose of one size manufactured essentially the same time with the same material, process, and control during the continuous production run.

4.5.2.2 Sampling for inspection (bulk hose). Sampling for bulk hose shall be selected at a rate of 1 sample for each full or partial increment of 750 feet (228.60 m) of hose produced in the continuous run, up to a maximum of 2 samples. For continuous runs greater than 1500 feet (2286 m), 2 samples, representative of the entire production run, shall be selected.

4.5.3 Periodic inspections sampling plan. Hose length, randomly selected from a production lot shall be subjected to the periodic inspections specified in table VI.

4.5.3.1 Periodic quality conformance inspection (QCI) . Periodic QCI will be 4 samples tested to each required periodic inspection for every 20,000 feet (6096 m) of bulk hose (large lot option). At the option of the manufacturer, 1 sample may be tested to the required periodic inspection for every 5,000 feet (1524 m) as applicable (small lot option).

4.5.3.2 Reduced production bulk hose. If there has been some production, but the footage of bulk hose produced has not reached 5,000 feet (1524 m) for a specific size within three years, the manufacturer shall perform periodic control tests on one sample of that size, the required periodic test, unless documented approval to not perform the test has been obtained from the qualifying activity.

4.5.3.3 Disposition of test specimens. Test specimens that have been subjected to sampling and periodic inspection, see [table IV](#), shall not be delivered on the contract or purchase order.

4.5.4 Acceptance of conformance inspection data. Required conformance tests at the hose assembly level that were already performed at the bulk hose level may be eliminated if documented approval has been obtained from the qualifying activity.

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4.5.4.1 Alternate conformance inspection criteria. Hose assemblies, consisting of hose and end fittings, shall meet the requirements of this specification. Alternatively, when the identical hose is manufactured and tested in accordance with MIL-DTL-8788, and the identical hose fittings are manufactured and tested in accordance with MIL-DTL-8789, and these items are later mated into a hose assembly in accordance with MIL-DTL-8790, it is not necessary to test the hose assembly to meet the conformance inspection requirements of this specification. This applies when substantially identical test requirements and test procedures are required for the assembly and the individual components and upon documented approval by the qualifying activity. When conformance inspection data is to be accepted for the hose in accordance with MIL-DTL-8788, the hose shall be tested at least once every 36 months, or once every 20,000 feet of hose produced, whichever occurs first. For the purpose of this specification, 10,000 hose assemblies is equivalent to 20,000 feet of bulk hose.

4.5.5 Nonconformance.

4.5.5.1 Failures. If a sample fails to pass any sampling and periodic inspection, see [table IV](#), the manufacturer shall immediately notify the qualifying activity and cognizant inspection activity of such failure. The manufacturer shall take corrective action on the materials or processes or both as warranted, on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure.

4.5.5.2 Acceptance and shipment. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity, has been taken. After the corrective action has been taken sampling and periodic inspection, see [table IV](#), shall be repeated on additional samples. At the discretion of the qualifying activity this may include all inspections, or the inspection which the original sample failed. Individual and sampling and periodic inspections, if applicable, may be reinstated. However final acceptance of the hose or hose assemblies shall be withheld until the sampling and periodic inspection has shown that the corrective action was successful.

4.5.6 Additional QPL test and reporting requirements.

4.5.6.1 Retention of qualification. To retain qualification, the contractor shall submit a test report to the qualifying activity at 12 month intervals. The qualifying activity shall establish the initial reporting date. Each test report shall consist of a summary of test and inspection results required by this specification that were performed during the 12 month reporting interval. As a minimum, the test report shall include the following:

- a. Number of lots produced and tested, including lot and sample sizes for each lot.
- b. Identify which tests were performed.
- c. Quantities passed.
- d. Quantities failed.
- e. All reworked sampling lots shall be accounted for and identified. A summary of corrective action taken shall be included.

4.5.6.2 Loss of product qualification.

4.5.6.3 Failure to meet test requirements. The manufacturer shall immediately notify the qualifying activity at any time during the 12-month reporting period when the qualified product fails to meet the sampling and periodic inspections requirements of this specification. The manufacturer shall identify and indicate what corrective action will be taken to correct the problem. Failure to take corrective action acceptable to the qualifying activity may result in removal of the product from the QPL.

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4.5.6.4 Failure to submit summary test data report. Failure to submit a test report within 30 days after the end of the 12 month reporting period may result in loss of qualification for the product.

4.5.6.5 Change to manufacturing process, materials or equipment. The manufacturer shall notify the qualifying activity, in writing, of any changes in the manufacturing process, materials, or equipment used to manufacture a QPL product. Subsequently, the qualifying activity will notify the manufacturer, in writing, if a full re-qualification, partial re-qualification, or no additional testing is required as a result of these changes.

4.5.6.6 No production during reporting period (12 months). When no production occurs during the reporting period, a report shall be submitted to the qualifying activity certifying that the manufacturer still has the capability and facilities necessary to produce the QPL product.

4.5.6.6.1 Discontinuation and resumption of production of bulk hose (three years or more). If there has been no production of a specific size hose for a period of three years or more, six (6) samples of that particular size hose shall be subjected to sampling and periodic inspections. Two hoses shall be subjected to sampling inspection and four hoses shall be subjected to the periodic inspection (see [table IV](#)).

4.6 Test conditions.

4.6.1 Preparation of specimens. Test samples shall be assembled with samples of fittings of applicable size conforming to MIL-DTL-8789. Assembly lengths shall be as shown in [table II](#).

4.6.2 Temperature. Unless otherwise specified, room temperature shall be defined as +60°F to +90°F (15.56°C to 32.22°C).

4.6.3 Test fluids. Unless otherwise specified, the test fluid shall be lubricating oil conforming to grade 50 of SAE J1966 or hydraulic fluid conforming to MIL-PRF-5606, MIL-PRF-87257, MIL-PRF-83282, or water.

4.6.4 Aging of samples. When specified, specimens shall be either air aged (see [4.6.4.1](#)) or oil aged (see [4.6.4.2](#)) prior to testing.

4.6.4.1 Air aging. Samples shall be exposed to air at a temperature of +158°F ±2°F (70 ±0.16°C) for a minimum of 168 continuous hours.

4.6.4.2 Oil aging. Samples shall be completely immersed in fluid in accordance with MIL-PRF-5606, MIL-PRF-87257, or MIL-PRF-83282 at a temperature of +158°F ±2°F (70° ±0.16°C) for a minimum of 168 continuous hours. The following details shall apply:

- a. Air shall not be trapped in the bore of the tube during this aging period.
- b. The volume of fluid used shall be sufficient to completely fill and cover the samples.
- c. Both the samples and the fluid shall be placed in a non-pressurized closed type container or in a reflux type condenser to prevent distillation of the volatile matter in the fluid.
- d. For qualification tests, a new batch of oil shall be used for each group of test samples.
- e. For quality conformance tests, a new batch of oil shall be used for each 10 or fewer tests.

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4.7 Test methods.

4.7.1 Examination of product. Each hose length shall be visually examined for conformance to the following requirements:

- a. Design and construction (see 3.3).
- b. Dimensions (see 3.4).
- c. Interchangeability (see 3.6).
- d. Age limitations (see 3.8).
- e. Workmanship (see 3.9).
- f. Marking (see 3.10).

4.7.2 Cleanliness inspection. Both ends of the hose length shall be visually inspected to determine if caps or plugs are installed (see 3.7). The caps or plugs shall then be removed and a light source shall be placed at one end. The interior of the hose shall be visually examined, without magnification, from the opposite end of the light source. Conformance shall be as specified in 3.7.

4.7.3 Proof pressure test (see 3.5.1). Hoses when subjected to proof pressure testing in accordance with ASTM D380 shall meet the requirements of 3.5.1. The following details shall apply:

- a. Proof pressure shall be in accordance with table II.
- b. Test fluid shall be water or fluid conforming to MIL-PRF-5606, MIL-PRF-87257, or MIL-PRF-83282.

4.7.4 Diameter reduction (see 3.5.2). Hoses when subjected to oil aging shall meet the diameter reduction requirements of 3.5.2. The following details shall apply:

- a. Prior to testing, two hose lengths shall be oil aged as specified in 4.6.4.2.
- b. Following the aging process, the ID of the hose shall be measured at a distance of at least 1/2 inch (.500 inch) (12.7 mm) from each end of the hose.

4.7.5 Elongation and contraction (see 3.5.3). Hoses when subjected to the elongation and contraction test in accordance with ASTM D380 shall meet the requirements of 3.5.3. Test pressure shall be 3,000 psi (206.84 bar) minimum and held for 5 minutes.

4.7.6 Leakage test (see 3.5.4). Hoses when subjected to the leaking test shall meet the requirements of 3.5.4. Leakage shall be tested in accordance with ASTM D380. The following details shall apply:

- a. Two unaged samples shall be tested.
- b. The samples shall be a minimum of 12 inches (30.48 cm) in length.
- c. Test fluid shall be water or hydraulic fluid conforming to MIL-PRF-5606, MIL-PRF-87257 or MIL-PRF-83282.
- d. Samples shall be subjected to 70% of the burst pressure specified in table II and held for 5 minutes.
- e. After 5 minutes, the pressure shall be released and reduced to zero.
- f. Then the pressure shall be raised again to 70% of the burst pressure and held for another 5 minutes.
- g. The adjacent outer cover shall be carefully inspected during this period for any wicking or leakage of the test fluid.

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4.7.7 Burst pressure test (see 3.5.5). Hoses when subjected to the burst pressure test shall meet the requirements of 3.5.5. Burst shall be tested in accordance with ASTM D380. The following details shall apply:

- a. Two unaged hose assembly samples shall be subjected to the burst pressure specified in [table II](#).
- b. Length: In accordance with ASTM D380.
- c. Test fluid shall be water or fluid conforming to MIL-PRF-5606, MIL-PRF-87257, or MIL-PRF-83282.
- d. The rate of pressure rise shall be 25,000 psi \pm 10,000 psi (1723.69 bar \pm 689.48 bar) per minute.
- e. During this test, the hose shall be fastened at one end fitting to the pressure source while the other end shall be extended straight, and the free end shall not be restrained or fastened in anyway.
- f. The actual pressure at which the samples burst or otherwise fail shall be recorded.

4.7.8 Impulse test (see 3.5.6). Hose samples shall be subjected to impulse testing in accordance with SAE ARP603 and shall meet the requirements of 3.5.6. The following details shall apply.

- a. Four samples of the length specified in [table II](#), shall be subjected to the proof pressure test (see 4.7.3), prior to impulse cycling.
- b. Two of the four samples shall be air aged (see 4.6.4.1) and the other two shall be oil aged (see 4.6.4.2).
- c. Operating pressure for impulse testing shall be specified in [table II](#) and impulse cycles shall be specified in table VII.
- d. Only size 16 hose shall be tested without surge peaks and in a straight position with one end free.
- e. Test fluid shall be in accordance with MIL-PRF-5606, MIL-PRF-87257, or MIL-PRF-83282 except that up to 25% of the total volume may be fluid conforming to SAE J1966, grade 50.
- f. The fluid temperature, measured at the manifold, shall be held at $+120^{\circ}\text{F} \pm 20^{\circ}\text{F}$ ($48.89^{\circ}\text{C} \pm 11.11^{\circ}\text{C}$).

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TABLE VII. Impulse cycles.

Hose size dash number	Minimum impulse cycles per hose	Minimum average impulse cycles <u>1/</u>	Maximum impulse cycles that can be used to compute average <u>2/</u>
-4	100,000	---	---
-5	100,000	---	---
-6	100,000	---	---
-8	75,000	100,000	150,000
-10	50,000	75,000	100,000
-12	35,000	50,000	70,000
-16	45,000	55,000	75,000

1/ The average of the test samples shall not be below the values listed in this column.

2/ When test samples impulse cycles are averaged, the maximum cycles that may be used to compute the average shall not exceed the figures given in this column. This column is giving a limit to the number of impulse cycles that are allowed to calculate the average. While testing is in progress the test operator will take a reading of the impulse cycles completed. If it's higher than the value in column 4 the test operator would use the value specified in the table not the higher (true) value from the reading.

4.7.9 Bulge resistance test (see 3.5.7). Hoses when subjected to the bulge resistance test shall meet the requirements of 3.5.7. The four samples prepared for the impulse test (see 4.7.8) shall be checked for bulging of the inner tube and reduction of fitting nipple inner diameter caused by the attachment of end fittings. The following details shall apply:

- a. Ball gages shall be specified in table VIII for the applicable hose size.
- b. Without using force or lubrication, the ball shall be placed inside the samples at the bulge gage inspection point shown on [figure 1](#).
- c. Holding the hose in a vertical orientation, the gage is inserted into the end of the hose assembly at the bulge inspection point C shown on [figure 1](#).
- d. The ball gage shall fall through the section at the end of the adapter in the hose under its own weight without lubrication and without forcing the ball gage through the adapter-to-hose interfacing section.

TABLE VIII. Ball gages. 1/

Hose size dash number	Ball Diameter inches (mm)	Volume (in ³)	Weight (grams)	Weight (ounces)
-4	0.132 (3.35)	0.001204259	0.153543075	0.005416078
-5	0.2 (5.08)	0.004188787	0.5340703	0.018838796
-6	0.26 (6.60)	0.009202764	1.173352449	0.041388834
-8	0.35 (8.89)	0.022449279	2.862283014	0.100964171
-10	0.45 (11.43)	0.047712898	6.083394511	0.214585658
-12	0.575 (14.61)	0.099540952	12.69147137	0.447678961
-16	0.781 (19.84)	0.249431534	31.80252055	1.12180211

1/ Steel balls are used to ensure that hoses are free of debris and bulging rubber.

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4.7.10 Low temperature flexibility test (see 3.5.8). Hoses when subjected to the low temperature flexibility test shall meet the requirements of 3.5.8. The following details shall apply:

- a. Testing shall consist of two samples of the lengths specified in [table II](#).
- b. One sample shall be unaged while the other shall be oil aged prior to testing.
- c. Samples shall be filled with fluid conforming to MIL-PRF-5606, MIL-PRF-87257, or MIL-PRF-83282 and then exposed for 24 hours in a chamber at a temperature of $-65^{\circ} \pm 2^{\circ}\text{F}$ ($-53.89^{\circ}\text{C} \pm 1.11^{\circ}\text{C}$).
- d. Size 16 hose may be exposed to a temperature of $-40^{\circ} \pm 2^{\circ}\text{F}$ ($-40^{\circ}\text{C} \pm 1.11^{\circ}\text{C}$).
- e. After the 24 hour exposure and while still at the specified temperature, the samples shall be flexed through 180° at each extreme travel, considered as one cycle, to the applicable inside bend radius specified in [table II](#).
- f. Each sample shall be subjected to one cycle only, the duration of which shall be no greater than four seconds.
- g. After the flexing cycle (see figure 2), samples shall be removed from the cold chamber and subjected to the proof pressure test (see 4.7.3).

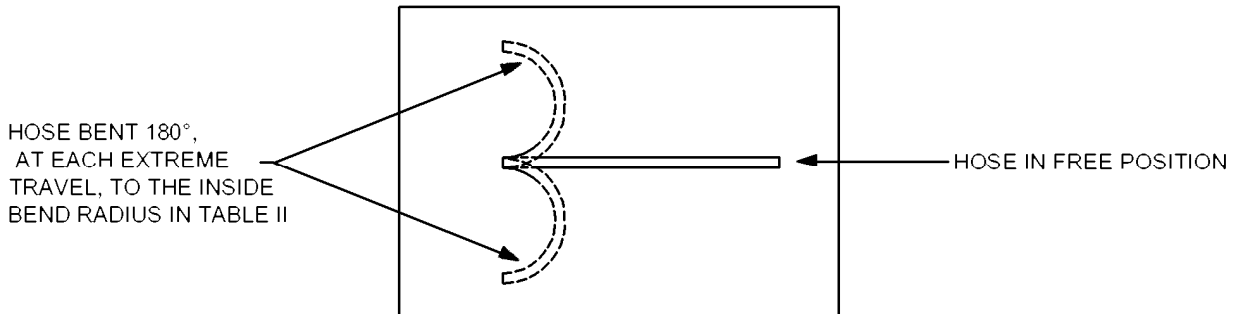


FIGURE 2. Flexibility test set up.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the Military Service's System Commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The hose covered by this specification is military unique hose that mates with fittings conforming to MIL-DTL-8789, to form hose assemblies, conforming to MIL-DTL-8790. The military unique hose assemblies are intended to be used in high pressure hydraulic systems requiring interoperability and compatibility with associated components and equipment. The hose assemblies are required to withstand an operating pressure of 3000 psi (206.84 bar).

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6.1.1 Interoperability and compatibility. The interoperability and compatibility to new and existing systems has been assured through strict adherence to the military detail specification requirements. Manufacturers of these items and users place great reliance on the detailed technical requirements to ensure the products meet the interoperability and compatibility requirements while encountering rapid ambient temperature fluctuations.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Required PIN (see 1.2.1).
- c. Quantity or lengths of bulk hose required (see 3.4.3).
- d. Anti-counterfeiting protection if required (see 3.10.2).
- e. Packaging (see 5).
- f. Shelf life requirements (see 6.2.1).

6.2.1 Shelf life. This specification covers items where shelf life is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order. The shelf-life codes are contained in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M, Shelf- life Management Manual, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points (ICPs), and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <http://www.shelflife.hq.dla.mil/>.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 8788 whether or not such products have actually been so listed by that date. The attention of contractors is called to these requirements, manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, P.O. Box 3990, ATTN: DSCC-VQ, Columbus, Ohio 43218-3990 or emailed to vqp.chief@dlamail.

6.3.1 Provisions governing qualification (SD-6). Copies of "Provisions Governing Qualification" are available online at <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

6.4 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs. Table IX lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. If any of these hazardous materials are required, it is recommended that it be used only when other materials cannot meet performance requirements.

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TABLE IX. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and compounds	Lead and compounds	Toluene
Carbon Tetrachloride	Mercury and compounds	1,1,1 - Trichloroethane
Chloroform	Methyl Ethyl compounds	Trichloroethylene
Chromium and compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and compounds	Nickel and compounds	

6.5 Subject term (key word) listing.

Abrasion resistant
 Aircraft systems
 Bulge resistance
 Delivery fluids
 Fluid systems
 Ship systems
 Support equipment
 Wire reinforcement

6.6 Supersession data. Table X provides supersession data for the "B" designator that was previously used to represent bulk hose lengths.

TABLE X. Supersession data.

Old PIN	New PIN
B8788-4	M8788-4-XXX-B
B8788-5	M8788-5-XXX-B
B8788-6	M8788-6-XXX-B
B8788-8	M8788-8-XXX-B
B8788-10	M878810-XXX-B
B8788-12	M8788-12-XXX-B
B8788-16	M8788-16-XXX-B

6.7 Changes from previous issue. Marginal notations are not used to identify changes with respect to the previous issue due to the extent of the changes.

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CONCLUDING MATERIAL

Custodians:

Army - AT
Navy - AS
Air Force - 99
DLA - CC

Preparing activity
DLA - CC

(Project 4720-2005-005)

Review activities:

Army - AV, MI
Navy - SA, MC
Air Force - 71

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.