

INCH-POUND

MIL-PRF-83536/9A
7 June 2004
SUPERSEDING
MIL-PRF-83536/9
27 March 1992

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT,
LOW LEVEL TO 10 AMPERES, PERMANENT MAGNET DRIVE,
HERMETICALLY SEALED, ALL WELDED, DC COILS

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

The requirements for acquiring the product described herein shall consist
of this specification sheet and the latest issue of MIL-PRF-83536.

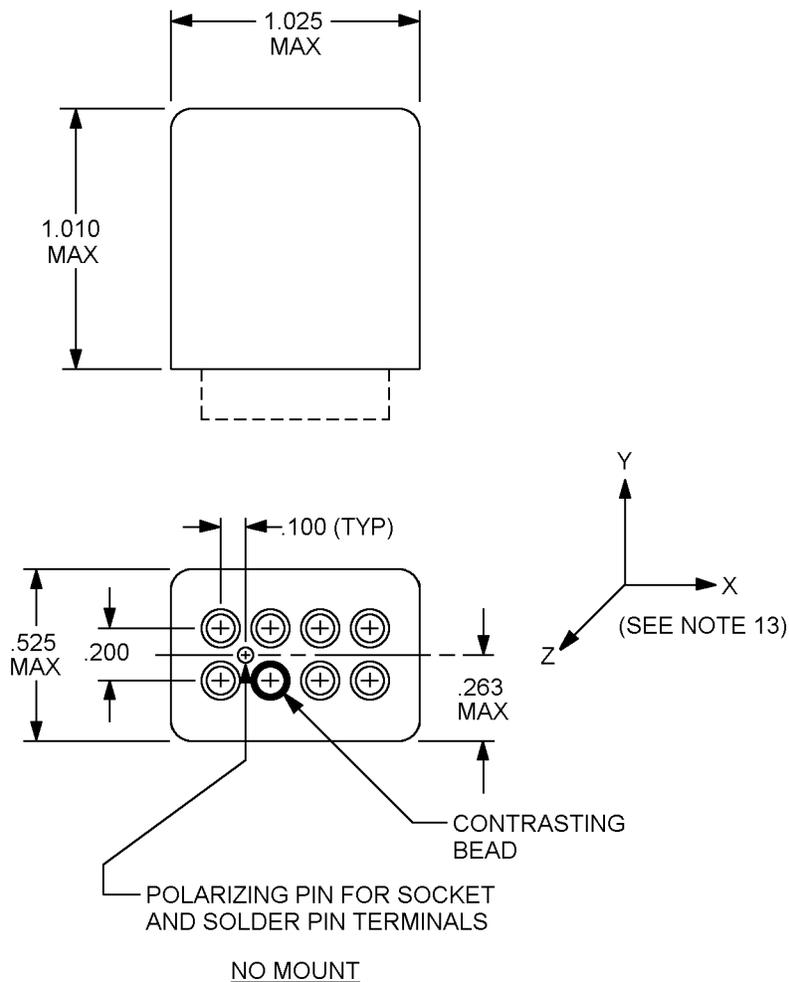


FIGURE 1. Dimensions and configurations.

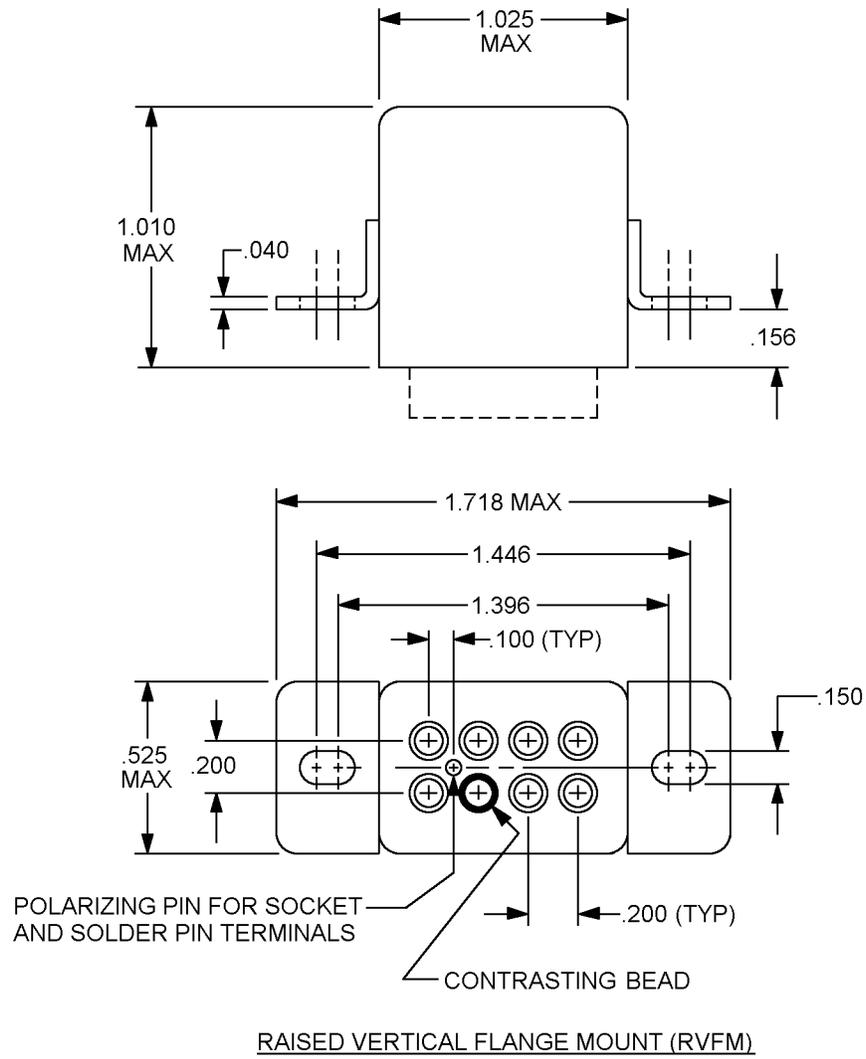


FIGURE 1. Dimensions and configurations - Continued.

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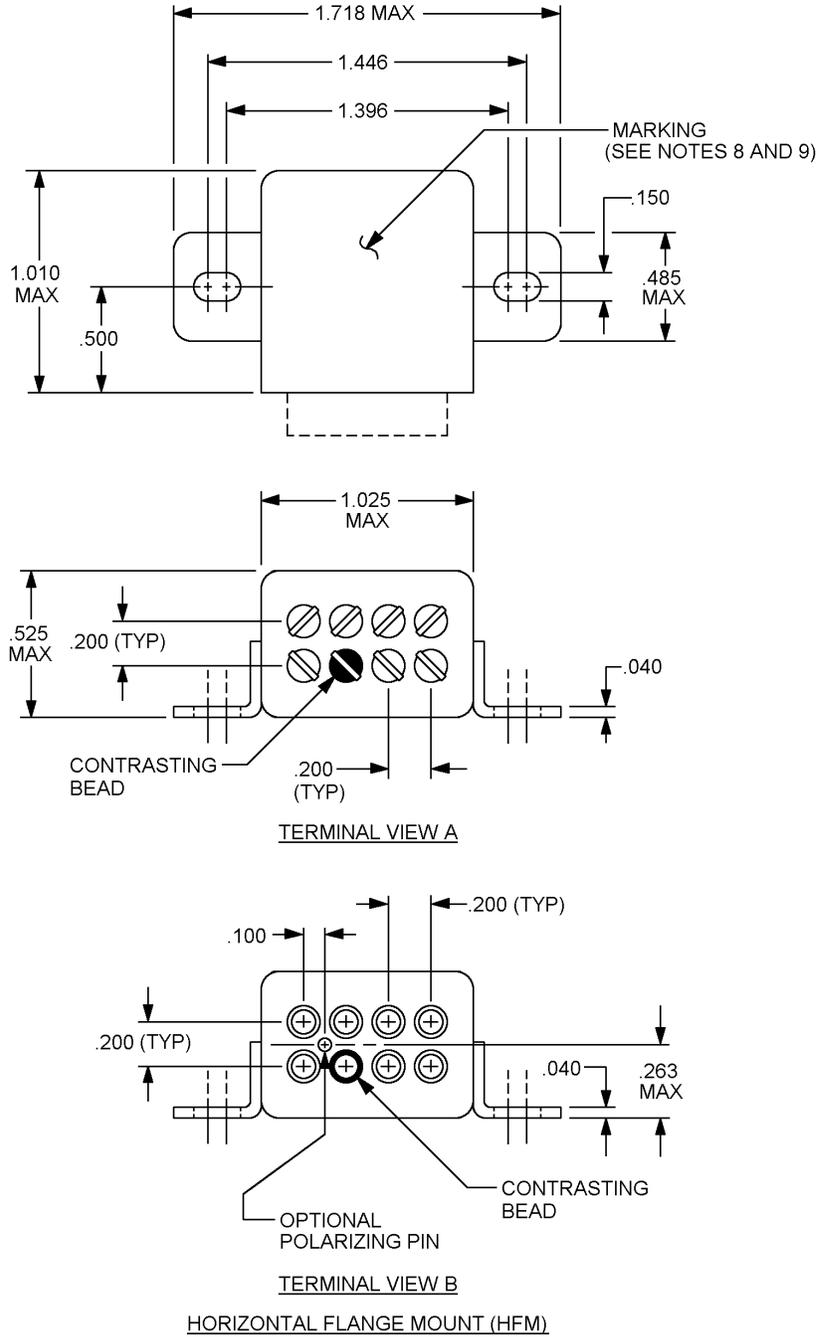
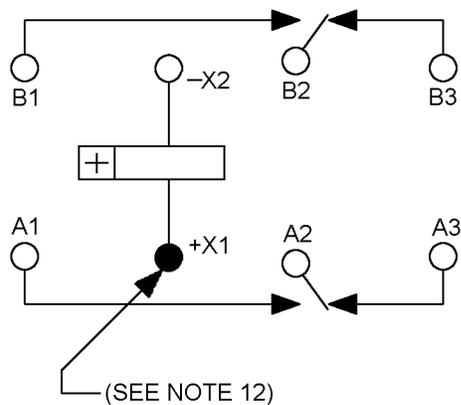
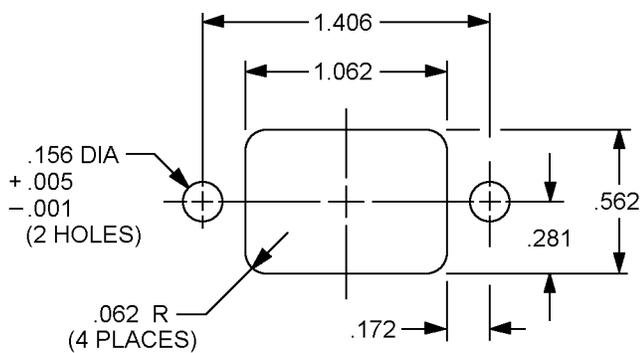


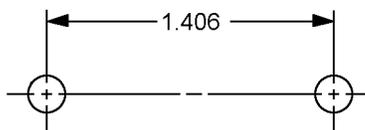
FIGURE 1. Dimensions and configurations - Continued.



CIRCUIT DIAGRAM



MOUNTING HOLE LAYOUT (RVFM)
(SOLDER HOOK TERMINALS)



MOUNTING HOLE LAYOUT (HFM)

FIGURE 1. Dimensions and configurations - Continued.

| Inches | mm | Inches | mm | Inches | mm | Inches | mm |
|--------|------|--------|------|--------|-------|--------|-------|
| .001 | 0.03 | .078 | 1.98 | .281 | 7.14 | 1.010 | 25.65 |
| .002 | 0.05 | .079 | 2.01 | .300 | 7.62 | 1.025 | 26.04 |
| .005 | 0.13 | .094 | 2.39 | .310 | 7.87 | 1.062 | 26.97 |
| .010 | 0.25 | .140 | 3.56 | .318 | 8.08 | 1.250 | 31.75 |
| .020 | 0.51 | .150 | 3.81 | .330 | 8.38 | 1.396 | 35.46 |
| .027 | 0.69 | .156 | 3.96 | .400 | 10.16 | 1.406 | 35.71 |
| .031 | 0.79 | .172 | 4.37 | .485 | 12.32 | 1.413 | 35.89 |
| .040 | 1.02 | .200 | 5.08 | .500 | 12.70 | 1.446 | 36.73 |
| .050 | 1.27 | .263 | 6.68 | .525 | 13.34 | 1.718 | 43.64 |
| .062 | 1.57 | .270 | 6.86 | .550 | 13.97 | 2.010 | 51.05 |

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is $\pm .010$ (0.25 mm).
4. There shall be affixed to the relay a suitable legible circuit diagram that identifies each terminal location specified.
5. These relays are polarized monstable.
6. This relay shall not operate or be damaged by reverse polarity.
7. Permanent magnet drive consists of a permanent magnet with its flux path switched and combined with the electro-magnet flux.
8. Applicable to horizontal flange mount only. The circuit diagram, manufacturer's PIN, and the military PIN shall be marked on the near side. The remaining portion of the nameplate data shall be marked on the far side.
9. Applicable to horizontal flange mount only. Relays shall be marked with the manufacturer's name or CAGE code and date code. Marking shall be with the bottom of the print adjacent to the near side.
10. Socket pin terminals shall provide the operational, environmental, and interface characteristics to provide a reliable interconnect to gold-plated contacts. Terminals, except the polarizing pin, shall be gold plated. One system for gold plating that may be used is ASTM B488, type 3, class 1.25 with a nickel underplate of 50 to 150 microinches thick. The gold plating system shall enable the product to meet the performance requirements of this specification and shall be approved by the qualifying activity.
11. Gasket shall provide a reliable seal between the relay and mating socket that will meet the environmental, operational, and interface requirements of the relay with the mating socket. The gasket shall have shore hardness 15 to 35, thickness $.050 \pm .005$. Gasket material according to SAE-AMS3332 has been considered acceptable.
12. Indicated terminals shall be identified by a contrasting bead.
13. Plane of critical motion for vibration and shock is Y-axis.

FIGURE 1. Dimensions and configurations - Continued.

REQUIREMENTS:

Contact data:

Load ratings: See table I.

Low level: 10 to 50 μ A at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Mixed loads: Applicable.

TABLE I. Rated contact load and cycles (amperes per pole).

| Type of load (high level) | Cycles x 10 ³ | 28 V dc | 115 V ac 1 phase 400 Hz | 115 V ac 1 phase 50/60 Hz <u>1/</u> | 115/200 V ac 3 phase 400 Hz | 115/200 V ac 3 phase 50/60 Hz <u>1/</u> |
|------------------------------|--------------------------|---------|-------------------------------|-------------------------------------------|-----------------------------------|-----------------------------------------------|
| Resistive | 100 | 10 | 10 | 2.5 | 10 | 2.5 |
| Inductive | 20 | 8 | 8 | N/A | 8 | N/A |
| Inductive | 10 | N/A | N/A | 2.5 | N/A | 2.5 |
| Motor | 100 | 4 | 4 | 2 | 4 | 2 |
| Lamp | 100 | 2 | 2 | 1 | N/A | N/A |

1/ For 50/60 Hz rating, rupture and overload are not applicable and life for each load shall be 10,000 cycles.

Life: 100,000 cycles, unless otherwise specified (see table I).

Contact voltage drop or resistance:

Initial contact voltage drop: 0.100 volt maximum. Rated resistive current at 6 V dc or peak ac.
Relays shall not make or break this load.

Initial contact resistance: 0.010 ohm maximum. 50 mA max at 6 V dc or peak ac.

High level life (contact voltage drop):

During life: 10 percent open circuit voltage maximum.

After life: 0.125 volt maximum.

Intermediate current (contact resistance):

During intermediate current: 3 ohms maximum.

After intermediate current: 0.150 ohm maximum.

Low level (contact resistance):

During low level: 100 ohms maximum.

After low level: 0.150 ohm maximum at 100 mA and 28 V dc.

Contact bounce: 1.0 millisecond maximum.

Contact stabilization time: 2.5 milliseconds maximum.

Overload current: 40 amperes dc, 60 amperes ac.

Rupture current: 50 amperes dc, 80 amperes ac.

Time current relay characteristics: See table II.

TABLE II. Time current relay characteristics. 1/

| Successive application | Amperes | Time |
|------------------------|---------|-------------|
| 1 | 15 | 1 hour |
| 2 | 50 | 5 seconds |
| 3 | 100 | 1.2 seconds |
| 4 | 250 | 0.2 second |
| 5 | 350 | 0.1 second |

1/ All relays shall withstand overload and fault currents. Relays must be able to sustain five applications (make and carry only) of power concurrently on adjacent poles at each of five different current levels in the sequence listed in table II. Separate relays shall be tested at 28 V dc and 115/200 V ac, 400 Hz 3-phase. Cooling time between successive applications shall be 30 minutes. Tests shall be performed on both normally open and normally closed contacts. There shall be no failures or evidence of welding or sticking and relays shall pass contact voltage drop at the conclusion.

Coil data 1/: See table III.

Operate time: 10 milliseconds maximum with rated coil voltage over the temperature range.

Release time: 10 milliseconds maximum from rated coil voltage over the temperature range.

Duty rating: Continuous.

Coil transient suppression: Not applicable.

Neutral screen: Not applicable.

Electrical data:

Insulation resistance:

Initial: 100 megohms at 500 V dc.

After life or environmental tests: 50 megohms at 500 V dc.

1/ CAUTION: Due to possible interaction of relay magnetic fields, the following spacing requirements, as a minimum, shall be considered in dense packaging situations:

- a. Row to row assisting fields: .125 (3.18 mm).
- b. Row to row opposing fields: .1875 (4.763 mm).
- c. Side to side alternating fields: .0625 (1.588 mm).
- d. Side to side like fields: .125 (3.18 mm).

TABLE III. Dash numbers and characteristics. 1/

| Dash number 2/ | | | | Mount | Coil data | | | | | | | | | | |
|----------------|-------------------|-------------------|----------------|----------|------------------------|------------------|----------------------------------|------------------------------------|----------------------------------|-------------------------------------|------------------------------------|----------------------------------|-------------------------------------|-----------------------|-------------------------|
| | | | | | At 25°C | | | | | Over temperature range | | | Maximum pickup voltage | | |
| Solder pin | Solder hook | Socket pin | 90° solder pin | | Coil voltage (V dc) 3/ | | Coil resistance (ohms) (minimum) | Specified pickup voltage (V dc) 4/ | Specified hold voltage (V dc) 4/ | Specified dropout voltage (V dc) 4/ | Specified pickup voltage (V dc) 4/ | Specified hold voltage (V dc) 4/ | Specified dropout voltage (V dc) 4/ | High temperature test | Continuous current test |
| | | | | Rated | Max | | | | | | | | | | |
| 001 | 002 | 003 | --- | No mount | 6 | 7.3 | 18 | 3.2 | 1.6 | 0.4 | 4.5 | 2.3 | 0.25 | 5.0 | 5.7 |
| 004 | 005 | 006 | --- | RVFM | 6 | 7.3 | 18 | 3.2 | 1.6 | 0.4 | 4.5 | 2.3 | 0.25 | 5.0 | 5.7 |
| 007 | 008 | --- | 009 | HFM | 6 | 7.3 | 18 | 3.2 | 1.6 | 0.4 | 4.5 | 2.3 | 0.25 | 5.0 | 5.7 |
| 010 | 011 | 012 | --- | No mount | 12 | 14.5 | 72 | 6.5 | 3.3 | 0.75 | 9.0 | 4.5 | 0.5 | 9.9 | 11.25 |
| 013 | 014 | 015 | --- | RVFM | 12 | 14.5 | 72 | 6.5 | 3.3 | 0.75 | 9.0 | 4.5 | 0.5 | 9.9 | 11.25 |
| 016 | 017 | --- | 018 | HFM | 12 | 14.5 | 72 | 6.5 | 3.3 | 0.75 | 9.0 | 4.5 | 0.5 | 9.9 | 11.25 |
| 019 | 020 | 021 | --- | No mount | 28 | ^{5/} 29 | 280 | 13.5 | 5.5 | 2.3 | 18.0 | 7.0 | 1.5 | 19.8 | 22.5 |
| 022 | 023 | 024 | --- | RVFM | 28 | ^{5/} 29 | 280 | 13.5 | 5.5 | 2.3 | 18.0 | 7.0 | 1.5 | 19.8 | 22.5 |
| 025 | 026 | --- | 027 | HFM | 28 | ^{5/} 29 | 280 | 13.5 | 5.5 | 2.3 | 18.0 | 7.0 | 1.5 | 19.8 | 22.5 |
| --- | ^{6/} 028 | ^{6/} 029 | --- | RVFM | 28 | ^{5/} 29 | 280 | 13.5 | 5.5 | 2.3 | 18.0 | 7.0 | 1.5 | 19.8 | 22.5 |
| 030 | 031 | 032 | --- | No mount | 48 | 50 | 850 | 24.0 | 12.0 | 3.0 | 36.0 | 14.0 | 2.0 | 38.0 | 42.0 |
| 033 | 034 | 035 | --- | RVFM | 48 | 50 | 850 | 24.0 | 12.0 | 3.0 | 36.0 | 14.0 | 2.0 | 38.0 | 42.0 |
| 036 | 037 | --- | 038 | HFM | 48 | 50 | 850 | 24.0 | 12.0 | 3.0 | 36.0 | 14.0 | 2.0 | 38.0 | 42.0 |

1/ Each relay possesses high level and low level capabilities. However, relays previously tested or used above 10 mA resistive at 6 V dc maximum or peak ac open circuits are not recommended for subsequent use in low level applications.

2/ The suffix letter L, M, P, or R to designate the applicable failure rate level shall be added to the applicable listed dash number. Failure rate level (percent per 10,000 cycles): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example: 001L, 002R.

3/ CAUTION: The use of any coil voltages less than the rated coil voltage will compromise the operation of the relay.

4/ Pickup, hold, and dropout voltages as shown are for test purposes only and are not to be used for design criteria.

5/ When maximum ambient temperature does not exceed +85°C, the maximum coil voltage shall be 32 V dc.

6/ Dash numbers -028 and -029 are rated for high shock and high vibration (see environmental characteristics for ratings).

Dielectric withstanding voltage 2/:

| | Coil to case | All other points |
|------------------|--------------|------------------|
| Sea level: | | |
| Initial: | 1,000 | 1,250 |
| After life: | 1,000 | 1,000 |
| Altitude: | | |
| At 80,000 feet: | 350 | 350 |
| At 300,000 feet: | 500 | 500 |

Environmental characteristics:

Temperature range: -70°C to +125°C.

Maximum altitude rating: 300,000 feet.

Shock (specified pulse): Applicable, MIL-STD-202, method 213, test condition C except peak value shall be 200 g's for 6 ± 1 ms. (For dash numbers -028 and -029 peak value shall be 500 g's.) Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

Vibration (sinusoidal): Applicable, MIL-STD-202, method 204, 30 g's, except frequency range shall be 10 to 3,000 Hz. (For -028 and -029, 50g's.) Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

Vibration (random): Applicable to qualification and group C inspection. Test in accordance with MIL-STD-202, method 214, test condition IG ($0.4 \text{ g}^2/\text{Hz}$, 50 to 2,000 Hz). Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts. For -028 and -029, use test condition IH, except that power spectral density shall be $0.65 \text{ g}^2/\text{Hz}$.

Acceleration: Applicable, except 15 g's.

Physical data:

Dimensions and configurations: See figure 1.

Weight: 0.10 pound (46 grams).

Terminal strength:

Solder hook terminals:

Pull force: 10 pounds ± 1.0 pound.

Bend: Not applicable to leads .047 (1.19 mm) and larger.

Twist: Not applicable.

Solder pin terminals:

Pull force:

For .062 diameter terminals: 10 pounds ± 1.0 pound.

2/ Dielectric may be improved by suitable insulation of terminals and wiring after installation.

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Bend: Not applicable to leads .047 (1.19 mm) and larger.

Twist: Not applicable.

Socket pin terminals:

Pull force:

For .062 diameter terminals: 5 pounds ±0.5 pound.

Bend: Not applicable to leads .047 (1.19 mm) and larger.

Twist: Not applicable.

Terminal solderability: Applicable to solder pin and solder hook terminals only.

Seal: Hermetic.

Marking: Applicable.

Part or Identifying Number (PIN): M83536/9 (dash number from table III and suffix letter designating failure rate level).

Qualification inspection:

Qualification inspection and sample size: See table IV.

TABLE IV. Qualification inspection and sample size. ^{1/}

| Single submission | Group submission | |
|--------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------|
| 18 units plus 1 open unit for level L at C = 0 ^{2/} | M83536/9-024 | 18 units plus 1 open unit for level L at C = 0 ^{2/} |
| 33 units plus 1 open unit for level M at C = 0 ^{2/} | M83536/9-024 | 33 units plus 1 open unit for level M at C = 0 ^{2/} |
| Qualification inspection as applicable | M83536/9-024 | Qualification inspection as applicable |
| | M83536/9-020 | 2 units, qualification inspection table, group II, shock, vibration, acceleration, terminal strength, and seal |
| | M83536/9-025 | |
| | M38536/9-027 | |
| | M83536/9-002 | 2 units, qualification inspection table, group II |
| | M83536/9-015 | |
| | M83536/9-038 | |

^{1/} For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-PRF-83536/10 may be used in addition to MIL-PRF-83536/9 data. Prior to performance of retention of qualification testing, the relay manufacturer shall preselect the sampling plan.

^{2/} The number of units required for qualification testing shall be increased as required in Q5, table II of MIL-PRF-83536, if the contractor elects to test the number of units permitting one or more failures. Prior to performance of qualification testing, the relay manufacturer shall preselect the sampling plan.

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Qualification inspection (reduced testing) (sample size - 2 units each coil voltage and 1 unsealed unit). See table V.

If the relays produced for MIL-PRF-83536/9 are similar in construction and design except for the suppression network to the relays produced for MIL-PRF-83536/10, then reduced testing for qualification of MIL-PRF-83536/9 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-83536/10 relays. For reduced testing, see table V.

TABLE V. Qualification inspection (reduced testing).

| |
|---------------------------------------------------------------------------------------------------------------------------|
| Inspection |
| 2 units each coil voltage Group II of qualification inspection table 1 unsealed sample unit for internal inspection |

Supersession data: See table VI.

TABLE VI. Supersession data.

| Superseded PIN MS27401- | Replacement PIN M83536/9- |
|----------------------------|------------------------------|
| 5 | 023 |
| 6 | 024 |
| 9 | 028 |
| 10 | 029 |
| 13 | 023 |
| 14 | 024 |
| 21 | 026 |
| 23 | 026 |
| 37 | 025 |
| 38 | 025 |
| 41 | 022 |
| 42 | 022 |
| 46 | 020 |
| 47 | 019 |
| 50 | 020 |
| 51 | 019 |
| 58 | 027 |

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Referenced documents. In addition to MIL-PRF-83536, this document references the following:

MIL-PRF-83536/10 MIL-STD-202 SAE-AMS3332 ASTM B488

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes 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 content irrespective of the marginal notations and relationship to the last previous issue.

Custodian:

Army - CR
Navy - EC
Air Force - 11
DLA - CC

Preparing activity:

DLA - CC

(Project 5945-1230)

Review activities:

Air Force - 99

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