

INCH-POUND

MIL-PRF-39016/38C  
5 August 2003  
SUPERSEDING  
MIL-PRF-39016/38B  
20 July 1988

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT,  
LOW LEVEL TO 2 AMPERES (0.150-INCH TERMINAL SPACING),  
WITH INTERNAL DIODES FOR COIL TRANSIENT SUPPRESSION AND  
REVERSE POLARITY PROTECTION

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 and the latest issue of MIL-PRF-39016.

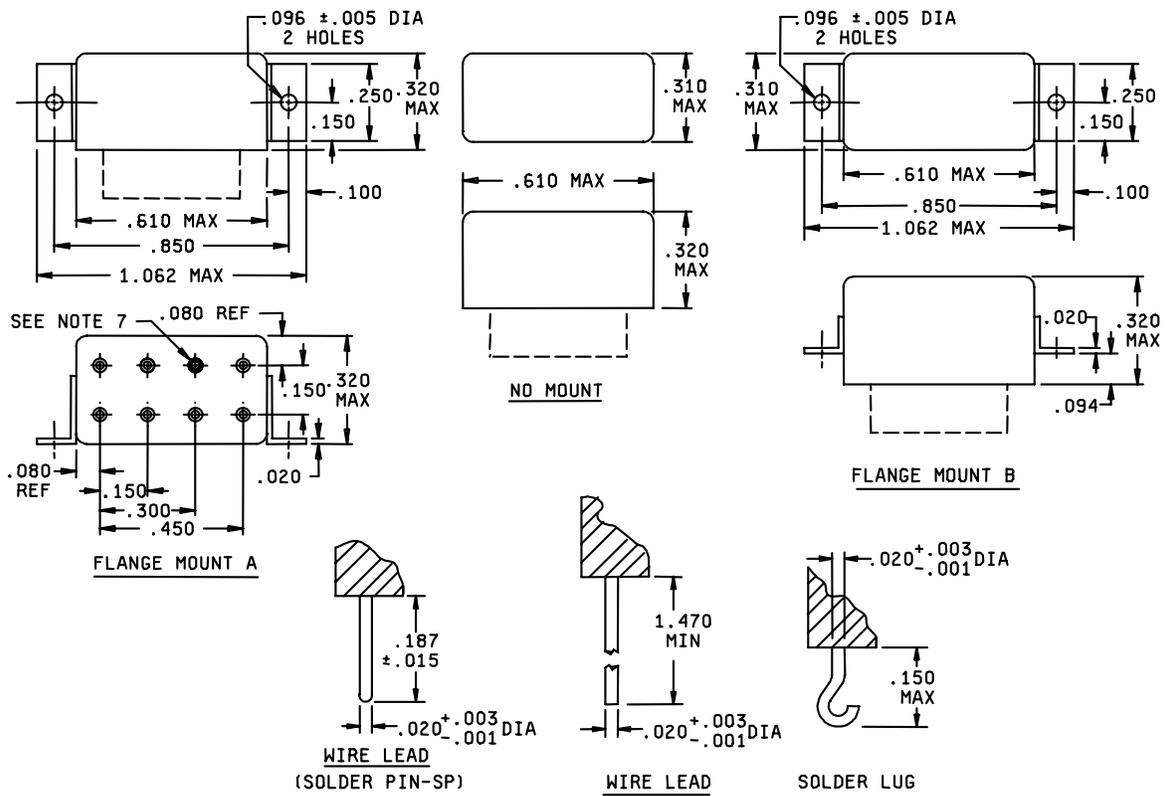
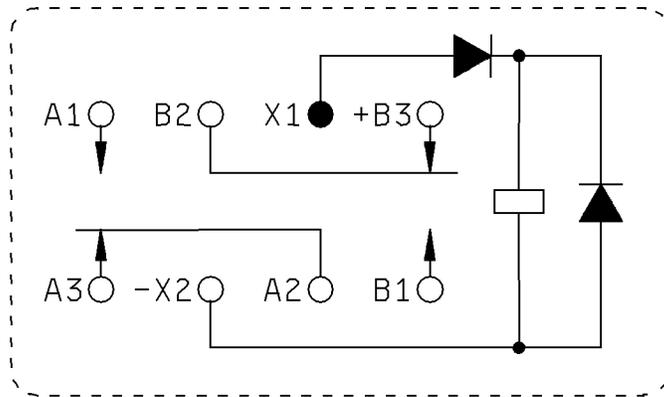


FIGURE 1. Dimensions and configuration.



CIRCUIT DIAGRAM  
 TERMINAL VIEW  
 DEENERGIZED POSITION  
 SEE NOTES 6,7,8 AND 9

Inches	mm	Inches	mm
.001	0.03	.250	6.35
.003	0.08	.300	7.62
.005	0.13	.310	7.87
.020	0.51	.320	8.13
.080	2.08	.450	11.43
.094	2.39	.610	15.49
.096	2.44	.850	21.59
.100	2.54	1.062	26.97
.150	3.81	1.470	37.34
.187	4.75		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is  $\pm 0.010$  (0.25 mm).
4. Terminal locating dimensions shown are applicable to all type mounts.
5. The shape of lug terminals is optional.
6. Coil symbol is optional per MIL-STD-1285.
7. X1 terminal shall be identified with contrasting bead.
8. Terminal markings A1 and A3 shall appear on the circuit diagram; other terminal markings are for reference only.
9. Relays shall have a plus sign marked on the circuit diagram as shown.

FIGURE 1. Dimensions and configuration - Continued.

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REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive: 2 amperes at 28 V dc (50,000 cycles). 1 ampere at 28 V dc;  
0.125 ampere at 115 V ac, (60 and 400 Hz).  
0.5 ampere at 115 V ac (60 and 400 Hz) with case not grounded.

Inductive: 0.3 ampere at 200 mH inductive at 28 V dc.

Lamp: 0.10 ampere at 28 V dc - Life test not required.

Low level: 10 to 50  $\mu$ A at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

Initial: 0.050 ohm maximum.

High level:

During life: Not more than 5 percent of open circuit voltage.

After life: 0.150 ohm maximum.

Low level:

During life: 33 ohms maximum.

After life: 0.150 ohm maximum.

Intermediate current:

During intermediate current: 1 ohm maximum.

After intermediate current: 0.300 ohm maximum.

Contact bounce: 1.5 milliseconds (ms) maximum. (Applicable to failure rate level "L").

Contact stabilization time: 2.0 milliseconds (ms) maximum. (Applicable to failure rate levels "M", "P", and "R").

Overload (high level only): 4 amperes resistive at 28 V dc. 0.6 ampere inductive at 28 V dc (ac not applicable).  
Post overload life test shall be 25,000 cycles.

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COIL DATA: (See table I).

Operate time: 4.0 ms maximum over temperature range with rated coil voltage.

Release time: 6.0 ms maximum over temperature range from rated coil voltage.

ELECTRICAL DATA:

Insulation resistance: 1/ 10,000 megohms minimum, except the resistance between coil and case at high temperature shall be 1,000 megohms minimum.

Dielectric withstanding voltage: 1/

	Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame, or enclosure, and all contacts in the energized and de-energized positions: -----	750	
Between case, frame, or enclosure and coil: -----	500	350
Between all contacts and coil: -----	750	All terminals to case
Between open contacts in the energized and deenergized positions: -----	500	
Between contact poles: -----	750	

DIODE CHARACTERISTICS: 2/

Maximum negative transient: 1.0 volt.

Breakdown voltage: 100 V dc, at 10 microamperes ( $\mu$ A).

Maximum leakage current: 1  $\mu$ A at 50 V dc.

Coil transient suppression: Applicable.

Semiconductor in-process screening: Applicable, visual inspection of semiconductors shall be in accordance with MIL-STD-750, method 2074.

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

Vibration (sinusoidal): MIL-STD-202, method 204. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts.

1/ Insulation resistance and dielectric withstanding voltage tests must always precede all other specified measurements. Connect all coil terminals together to avoid damage to the diodes.

2/ In all tables relating to qualification testing and group A testing, delete coil resistance and substitute the following test: Diode breakdown and block integrity with applicable voltage applied to the relay coil circuit in the reverse direction, monitor leakage current with dc microammeter or oscilloscope. Leakage current shall not exceed the specified value.

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Vibration (random): MIL-STD-202, method 214, test condition IG. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts (applicable to qualification and group C testing only).

Shock (specified pulse): MIL-STD-202, method 213, test condition C (100 g's). Contact chatter shall not exceed 10  $\mu$ s maximum for closed contacts, and 1  $\mu$ s maximum closure for open contacts.

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: 100 g.

PHYSICAL DATA:

Terminals: See figure 1 and table I.

Terminal strength: 1.5  $\pm$ 0.2 lbs. (pull).

Solderability: Applicable.

Terminal twist test: Applicable to wire leads.

Dimensions and configuration: See figure 1 and table I.

Weight: 4.82 grams (0.17 ounce) maximum.

Identification marking (full): Applicable (see figure 1, note 8).

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles.

Low level: 100,000 cycles plus 900,000 cycles mechanical life.

PART NUMBER: M39016/38 - (dash number from table I and suffix letter designation failure rate level).

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TABLE I. Dash number and characteristics. 1/

Dash number 2/			Mount	Coil voltage 3/ V dc		At 25°C				Over temp range			
Wire lead (SP)	Solder lug	Wire lead		Rated	Max	Coil resistance ohms ±10%	Specified pickup voltage (V dc)	Specified hold voltage (V dc)	Specified dropout voltage (V dc)	Specified pickup voltage (V dc)	Specified hold voltage (V dc)	Specified dropout voltage (V dc)	
001	---	002	No mount	5	7	44	3.4	2.0	0.37	4.3	2.8	0.28	
003	---	004		A	6	8	56	3.7	2.2	0.4	4.8	3.0	0.3
---	005	006											
007	008	009											
010	---	011	No Mount	9	12	140	5.4	3.2	0.6	7.0	4.4	0.38	
012	---	013		A	12	16	210	6.4	3.8	0.7	8.4	5.3	0.5
---	014	015											
016	017	018	B										
019	---	020	No mount	18	24	650	10.5	6.2	1.1	13.8	8.5	0.85	
021	---	022		A	26.5	35	1350	14.5	8.7	1.6	19.0	11.6	1.1
---	023	024											
025	026	027											

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 circuit 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 - - - -027R.

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

TABLE II. Qualification inspection and sample size.

Single submission	Group submission	
24 units plus 1 open unit for level L at C = 0 <sup>1/</sup> 33 units plus 1 open unit for level M at C = 0 <sup>1/</sup> Qualification inspection as Applicable.	M39016/38-023  M39016/38-001 M39016/38-006 M39016/38-010 M39016/38-019	24 units plus 1 open unit for level L at C = 0 <sup>1/</sup> 33 units plus 1 open unit for level M at C = 0 <sup>1/</sup> Qualification inspection as Applicable.  2 units, each part number, qualification inspection table, group II.  2 units, qualification inspection table, group II, and shock, vibration, acceleration, terminal strength, and seal.

<sup>1/</sup> The number of units required for qualification testing shall be increased as required in group V, table II, MIL-PRF-39016, if the relay manufacturer elects to test the number of units permitting one or more failures. Prior to performance of qualification inspection testing the relay manufacturer shall preselect the sample size.

Custodians:

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

Preparing activity:

DLA - CC

Review activities:

- Army - AR
- Navy - AS, MC, OS, SH
- Air Force - 19, 99

(Project 5945-1190-02)