

INCH-POUND

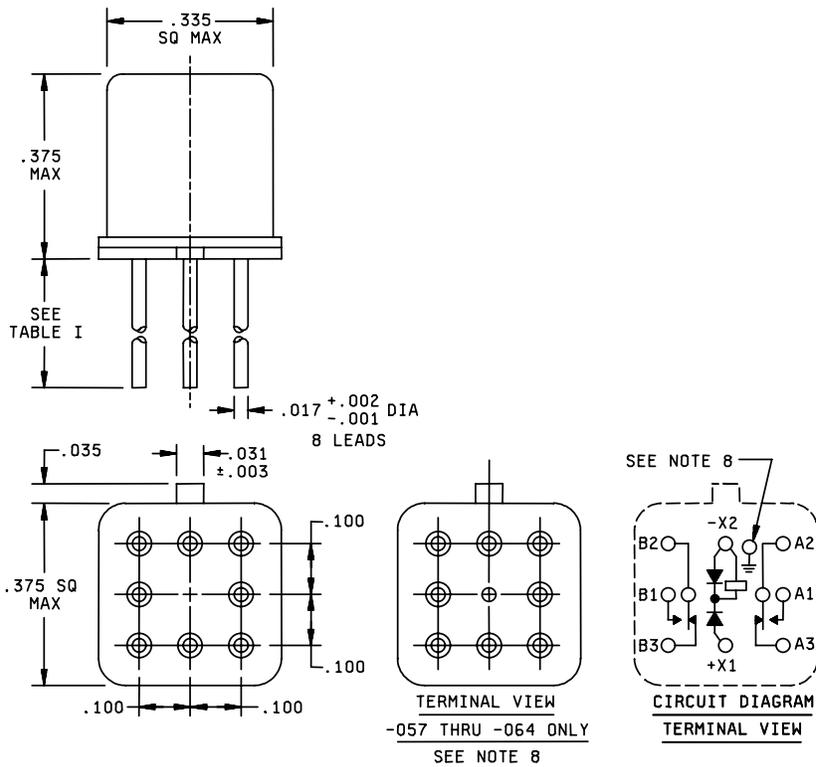
MIL-PRF-39016/43E  
15 June 2005  
SUPERSEDING  
MIL-PRF-39016/43D  
20 July 1988

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE, WITH INTERNAL DIODES FOR COIL TRANSIENT SUPPRESSION, AND POLARITY REVERSAL PROTECTION TERMINALS 0.100-INCH GRID PATTERN (SENSITIVE, 60 MILLIWATTS, COIL OPERATE POWER AT 25°C)

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

The complete requirements for acquiring the relays described herein shall consist of this specification sheet and the latest issue of MIL-PRF-39016.



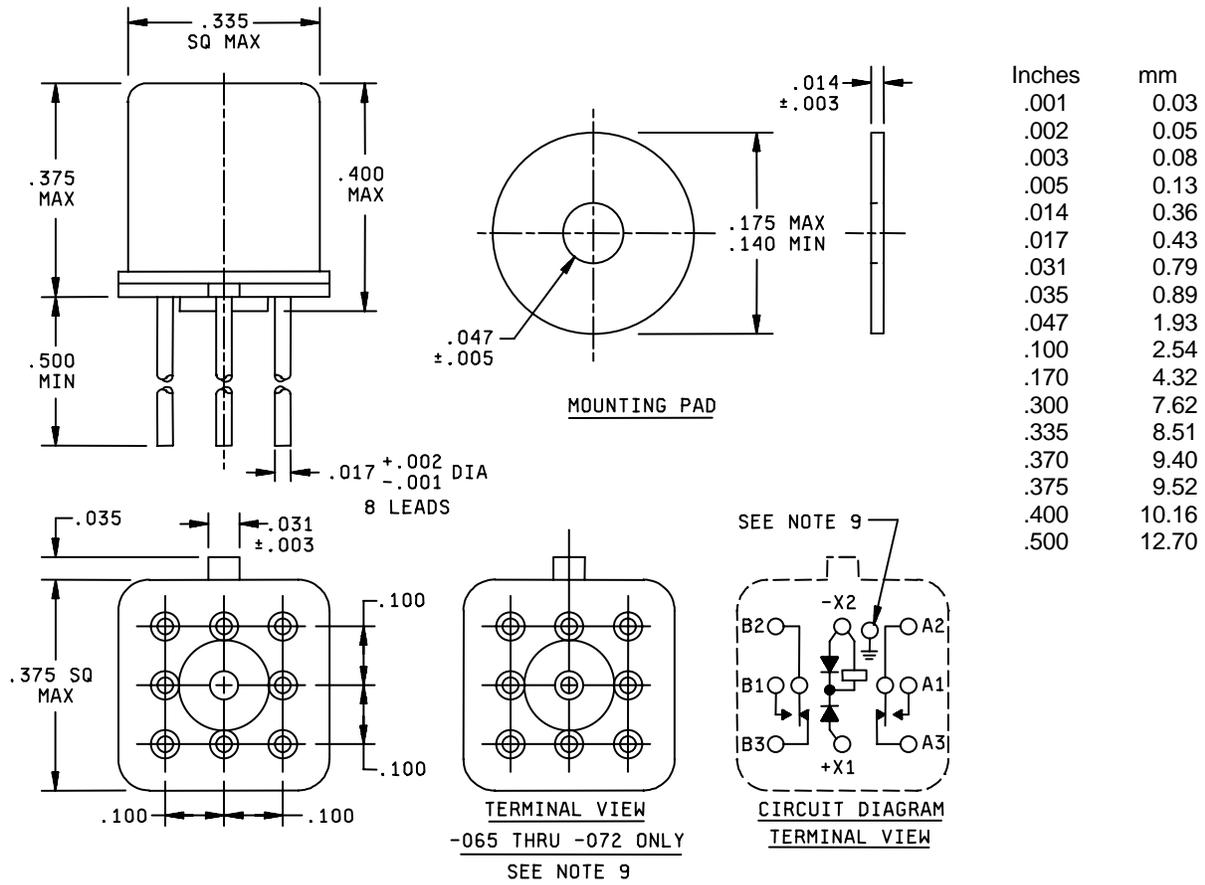
Inches	mm
.001	0.03
.002	0.05
.003	0.08
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.335	8.51
.375	9.53

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 numbers shown above are for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. Coil symbol optional in accordance with MIL-STD-1285.
7. Circuit diagram shown on part is the terminal view.
8. The grounding pin shown is a non-insulated case grounding pin applicable to -057 through -064 only.

FIGURE 1. Dimensions and configuration,

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5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. Coil symbol optional in accordance with MIL-STD-1285.
7. Circuit diagram shown on part is the terminal view.
8. Spacer mounting pad shall be a polyester film per MIL-I-631, type G, class I.
9. The grounding pin shown is a non-insulated case grounding pin applicable to -065 through -072 only.

FIGURE 2. Dimensions and configuration (relay with spacer mounting pad).

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive:

1.0 ampere at 28 V dc.

250 milliamperes at 115 V ac 60 and 400 Hz case not grounded.

100 milliamperes at 115 V ac 60 and 400 Hz case grounded.

Inductive: 0.2 ampere at 28 V dc with 0.32 henry inductance.

Lamp: 0.10 ampere at 28 V dc.

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: 0.10 ohm maximum (0.110 ohm maximum with spacer mounting pad).

High level:

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

After life: 0.20 ohm maximum (0.210 ohm maximum with spacer mounting pad).

Low level:

During life: 100 ohms maximum.

After life: 0.15 ohm maximum (0.160 ohm maximum with spacer mounting pad).

Intermediate current:

During: 3 ohms maximum.

After: 0.20 ohm maximum (0.210 ohm maximum with spacer mounting pad).

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

Contact stabilization time: 2.5 milliseconds maximum (applicable to failure rate levels "M", "P", and "R").

Overload (high level only): Two times rated current. Not applicable to ac load ratings.

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COIL DATA: (See table I).

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

Release time: 7.5 ms maximum over temperature range from rated coil voltage.

ELECTRICAL DATA:

Insulation resistance: 10,000 megohms minimum at 500 V dc, except the resistance between coil and case at high temperature shall be 1,000 megohms minimum.

Dielectric withstanding voltage:	Sea level V rms (60 Hz)	Post intermediate current life test 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.	500	500	125 All terminals to case
Between case, frame, or enclosure and coils.	500	500	
Between all contacts and coils.	500	500	
Between open contacts in the energized and de-energized positions.	500	375	
Between contact poles.	500	500	
Between coils of dual coil relays.	N/A	N/A	

DIODE CHARACTERISTICS:

Coil transient suppression: Applicable.

Diode block integrity (perform this test after coil transient suppression test in all inspection tables of MIL-PRF-39016): With applicable voltage applied to the relay coil circuit in the reverse direction, monitor leakage current with dc microammeter, oscilloscope, or qualifying activity approved test equipment. Leakage current shall not exceed the specified value.

Block integrity maximum leakage current: 1  $\mu$ A at 50 V dc.

Maximum negative transient: 1.0 volt.

Breakdown voltage: 100 V dc minimum at 10 microamperes ( $\mu$ A). (This test may be performed in process or as final assembly).

Semiconductor in process screening: Applicable, visual inspection of semiconductors shall be in accordance with MIL-STD-750, method 2073, or 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.

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 B (75 g's). Contact chatter shall not exceed 10  $\mu$ s maximum for closed contacts, and 1  $\mu$ s maximum closure for open contacts.

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Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

Salt atmosphere (corrosion): In accordance with MIL-STD-750, method 1041.

PHYSICAL DATA:

Terminals:

Termination strength: 1 pound pull minimum.

Terminal twist test: As specified in MIL-PRF-39016.

Dimensions and configuration: See figures 1 and 2.

Terminations: See figure 1 and table I.

Weight: 4.3 grams (0.15 ounce) maximum.

Solderability: Applicable.

Minimum marking: Military part number "J" with the date code (example J0430), circuit diagram, manufacturer's name or source code.

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles per relay.

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

Part or Identifying Number (PIN): M39016/43 - (dash number from table I and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/

Dash number 2/			Coil voltages (v dc) 4/		At +25°C						Over temperature range		
Lead length .500 min	Lead length .187 ±.010	Spacer mounting pads (fig.2) 3/	Rated	Max	Coil resistance (ref. only) ohms 5/	Coil circuit current (mA) 5/ 7/		Specified pickup value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified dropout value (voltage) (V dc)	Specified pickup value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified dropout value (V dc)
						Max	Min						
033	041	049	5.0	7.0	64	78.1	56.8	2.9	2.2	0.8	3.7	2.6	0.7
034	042	050	6.0	10.0	125	48.9	36.3	4.0	2.5	0.9	4.8	3.0	0.8
035	043	051	9.0	15.0	400	23.6	18.1	6.1	3.6	1.1	8.0	4.5	0.9
036	044	052	12.0	20.0	800	16.0	12.5	7.8	4.6	1.3	11.0	5.8	1.0
037	045	053	18.0	30.0	1,600	12.2	9.6	11.3	7.0	1.5	14.5	9.0	1.1
038	046	054	26.5	40.0	3,200	9.0	7.2	15.2	10.8	1.7	19.0	13.0	1.3
039	047	055	36.0	57.0	6,500	6.1	4.9	21.7	14.7	2.3	27.2	19.0	1.7
040	048	056	48.0	75.0	11,000	4.8	3.9	27.8	19.8	2.8	34.8	26.0	2.0
057 6/	---	065 6/	5.0	7.0	64	78.1	56.8	2.9	2.2	0.8	3.7	2.6	0.7
058 6/	---	066 6/	6.0	10.0	125	48.9	36.3	4.0	2.5	0.9	4.8	3.0	0.8
059 6/	---	067 6/	9.0	15.0	400	23.6	18.1	6.1	3.6	1.1	8.0	4.5	0.9
060 6/	---	068 6/	12.0	20.0	800	16.0	12.5	7.8	4.6	1.3	11.0	5.8	1.0
061 6/	---	069 6/	18.0	30.0	1,600	12.2	9.6	11.3	7.0	1.5	14.5	9.0	1.1
062 6/	---	070 6/	26.5	40.0	3,200	9.0	7.2	15.2	10.8	1.7	19.0	13.0	1.3
063 6/	---	071 6/	36.0	57.0	6,500	6.1	4.9	21.7	14.7	2.3	27.2	19.0	1.7
064 6/	---	072 6/	48.0	75.0	11,000	4.8	3.9	27.8	19.8	2.8	34.8	26.0	2.0

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 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, 033L - - - - -56R.

3/ Relays supplied with spacer mounting pads (-049 through -056 and -65 through -072) shall have the spacer mounting pad rigidly attached.

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

5/ Coil resistance not directly measurable at relay terminals. When rated voltage is applied to the coil terminals, the coil circuit current must be within the limits shown. Measure at 25°C at nominal voltage for 5 seconds, maximum.

6/ Relays are supplied with a case grounding pin welded to the header (see figures 1 and 2).

7/ Delete "Coil resistance" and substitute "Coil current" test in all inspection tables of MIL-PRF-39016.

QUALIFICATION INSPECTION AND SAMPLE SIZE: See table II.

TABLE II. Qualification inspection and sample size.

Single submission	Group submission	
18 units plus 1 open unit for level L at C = 0 <u>2</u> / 33 units plus 1 open unit for level M at C = 0 <u>2</u> / Qualification inspection as applicable	M39016/43-038	18 units plus 1 open unit for level L at C = 0 <u>2</u> / 33 units plus 1 open unit for level M at C = 0 <u>2</u> / Qualification inspection as applicable
	M39016/43-033	2 units each part number Qualification inspection Q1.
	M39016/43-034	
	M39016/43-035	
	M39016/43-036	
	M39016/43-037	
	M39016/43-039	
	M39016/43-040	
	M39016/43-062	1 unit terminal strength and solderability

1/ The number of units required for qualification testing shall be increased as required in Q5, MIL-PRF-39016, 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.

Initial qualification of relays supplied with spacer mounting pads (-049 through -056 and -065 through -072), shall be tested as specified below:

Perform the following tests as specified in the qualification inspection table of MIL-PRF-39016, in the order shown below.

Before installation of spacer mounting pad; screening, visual and mechanical inspection (internal), thermal shock, resistance to solvents, vibration (sinusoidal), vibration (random), shock (specified pulse), acceleration, terminal strength, magnetic interference (when specified), capacitance (when specified), coil life (applicable to continuous duty relays only), resistance to soldering heat, salt spray (corrosion), overload (applicable to high level relays only), life, terminal strength, and intermediate current.

After installation of spacer mounting pad perform the following tests as specified in the qualification inspection table of MIL-PRF-39016, in the order shown below:

Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup, hold, and dropout values (voltages), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spacer mounting pads (-049 through -056 and 065 through -072) two units of the 26.5 volt rated coil voltage (-052) shall be tested as specified below:

Before installation of spacer mounting pad, perform the following tests as specified in the qualification inspection table of MIL-PRF-39016 in the order shown below:

For failure rate level L only: Screening.

For failure rate levels M, P, and R: Vibration (sinusoidal), vibration (random), test duration shall be 10 minutes, and screening.

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After installation of spacer mounting pad, perform the following tests as specified in the qualification inspection table of MIL-PRF-39016, in the order shown below:

Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup, hold, and dropout values (voltages), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Group A testing for relays supplied with spacer mounting pads (-049 through -056 and -065 through -072 shall be tested as specified below:

Perform seal test immediately preceding the A2 electrical tests. Relay leads shall be formed and the spacer mounting pad removed before the seal test. After the seal test, the spacer mounting pad shall be rigidly attached to the relay and the remaining group A tests performed (The seal test is not performed with group A4.)

SUPERSESSION DATA:

Supersession data: See table III.

TABLE III. Supersession data. 1/

Superseded part no. M39016/43-	New part no. M39016/43-	Superseded part no. M39016/43-	New part no. M39016/43-
001	033	017	033
002	034	018	034
003	035	019	035
004	036	020	036
005	037	021	037
006	038	022	038
007	039	023	036
008	040	024	040
009	041	025	041
010	042	026	042
011	043	027	043
012	044	028	044
013	045	029	045
014	046	030	046
015	047	031	047
016	048	032	048

1/ Dash numbers -001 through -032, .350 inch high cans have been canceled and superseded by -033 through -048, .375 inch high cans. The .350 inch high cans are no longer manufactured.

FOR GOVERNMENT LOGISTICAL SUPPORT: See table IV.

TABLE V. Cross reference for Government logistical support.

Superseded part number M39016/43-	New part number M39016/43-	Support with part number M39016/43-	Superseded part number M39016/43-	New part no. M39016/43-	Support with part number M39016/43-	New part number M39016/43-	Support with part no. M39016/43-
001	033	033	029	045	037	057	057
002	034	034	030	046	038	058	058
003	035	035	031	047	039	059	059
004	036	036	032	048	040	060	060
005	037	037		033	033	061	061
006	038	038		034	034	062	062
007	039	039		035	035	063	063
008	040	040		036	036	064	064
009	041	033		037	037	065	065
010	042	034		038	038	066	066
011	043	035		039	039	067	067
012	044	036		040	040	068	068
013	045	037		041	033	069	069
014	046	038		042	034	070	070
015	047	039		043	035	071	071
016	048	040		044	036	072	072
017	033	033		045	037		
018	034	034		046	038		
019	035	035		047	039		
020	036	036		048	040		
021	037	037		049	049		
022	038	038		050	050		
023	039	039		051	051		
024	040	040		052	052		
025	041	033		053	053		
026	042	034		054	054		
027	043	035		055	055		
028	044	036		056	056		

Referenced documents. In addition to MIL-PRF-39016, this document references the following:

MIL-I-631  
MIL-STD-202  
MIL-STD-750  
MIL-STD-1285

Changes from previous issue: Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

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

Preparing activity:  
DLA - CC  
(Project 5945-1267)

Review activities:

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

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>.