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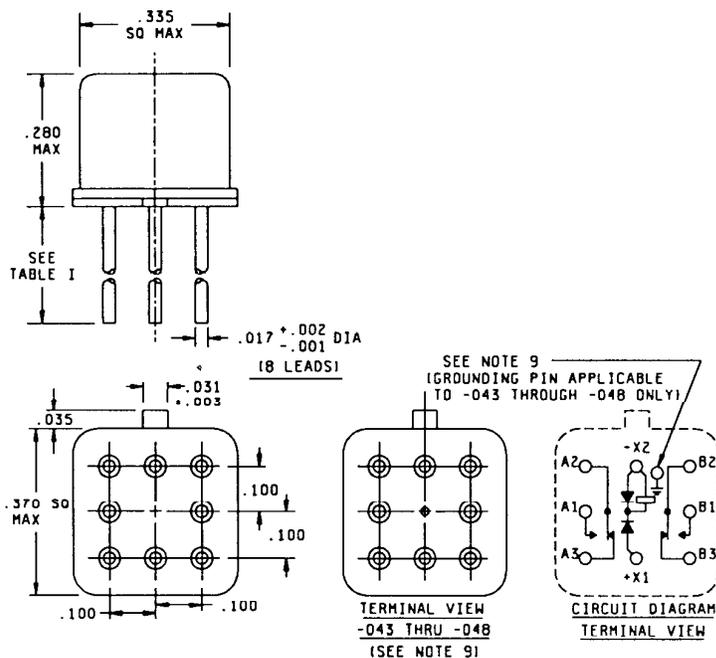
MIL-PRF-39016/19G
20 JULY 1988
 SUPERSEDING
 MIL-R-39016/19F
 10 February 1984

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE WITH INTERNAL DIODE FOR COIL TRANSIENT SUPPRESSION AND POLARITY REVERSAL PROTECTION. TERMINALS 0.100-INCH GRID PATTERN

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-R-39016.



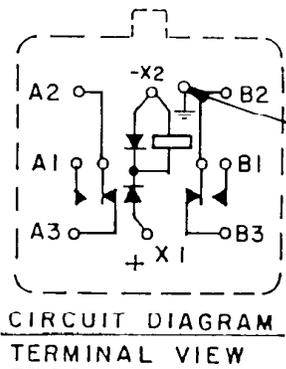
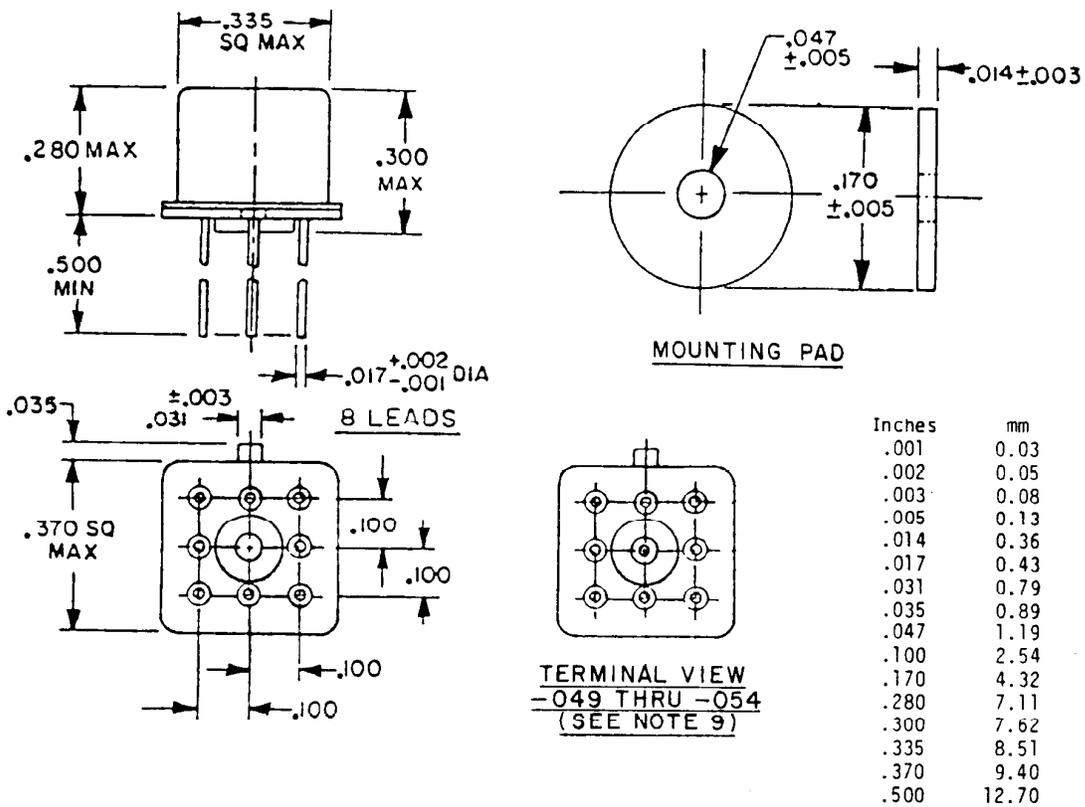
Inches	mm	Inches	mm	Inches	mm
.001	0.03	.031	0.79	.335	8.51
.002	0.05	.035	0.89	.370	9.40
.003	0.08	.100	2.54		
.017	0.43	.280	7.11		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.010 (0.25 mm).
4. Terminal numbers shown above are for reference only. Numbers do not appear on 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. See table I for lead lengths.
9. M39016/19-043 through M39016/17-048 shall be supplied with a case grounding pin welded to the relay header as shown.

(G) FIGURE 1. Dimensions and configuration.

(G) denotes changes



SEE NOTE 9 (GROUND PIN APPLICABLE TO -049 THROUGH -054 ONLY)

CIRCUIT DIAGRAM
TERMINAL VIEW

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. Terminal numbers shown above are for reference only. Numbers do not appear on 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. Mounting pad shall be a polyester film per MIL-I-631, Type G, Class I.
9. M39016/19-049 through -054 shall be supplied with a case grounding pin welded to the relay header as shown.

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

MIL-R-39016/19G

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive:

1.0 ampere at 28 V dc.

500 milliamperes at 115 V ac 400 Hz case not grounded.

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

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

Inductive load: 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 μ 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 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 pad).

Low level:

During life: 100 ohms maximum.

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

Intermediate current:

During: 3 ohms maximum.

Ⓔ After: 0.20 ohm maximum (0.210 ohm maximum with spacer 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.

COIL DATA: See table I.

Operate time: 2.0 ms maximum over temperature range with rated coil voltage.

Release time: 4.0 ms maximum over temperature range from rated coil voltage.

ELECTRICAL DATA:

Insulation resistance ^{1/}: 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: ^{1/}

	Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame, or enclosure and all contacts both in the energized and deenergized positions - -	500	} 125 All terminals to case
Between case, frame, or enclosure and coil - - - - -	500	
Between all contacts and coil - - - - -	500	
Between open contacts in the energized and deenergized positions - - - - -	500	
Between contact poles - - - - -	500	
Between coils of dual coil relays - - - - -	---	

DIODE CHARACTERISTICS:

ⓐ Coil transient suppression: Applicable.

Diode breakdown and block integrity (delete coil resistance and substitute this test in all testing tables of MIL-R-39016):

ⓐ With applicable voltage applied to the relay coil circuit in the reverse direction, monitor leakage current with dc microammeter or oscilloscope or qualifying activity approved test equipment. Leakage current shall not exceed the specified value.

Maximum negative transient: 1.0 volt.

ⓐ Breakdown voltage: 100 V dc minimum at 10 microamperes (μA).

Maximum leakage current: 1 μA at 50 V dc.

Peak inverse voltage: 100 volts minimum.

ⓐ 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.

ⓐ Shock (specified pulse): MIL-STD-202, method 213, test condition B (75 g's). Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

ⓐ 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 testing only).

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

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

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

PHYSICAL DATA:

Terminal strength (method 211, MIL-STD-202):

Pull test: Test condition A, 1 pound pull.

Bend test: Test condition C, 1/2 pound load.

ⓐ Twist test: As specified in MIL-R-39016.

Solderability: Applicable.

Dimensions and configuration: See figure 1.

Weight: 2.25 grams (0.09 ounce) maximum.

Seal: Hermetic.

ⓐ Minimum marking: Military part number, "J" with the date code (example J8530), circuit diagram, and 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 NUMBER: M39016/19- (dash number from table I and suffix letter designating failure rate level).

ⓐ TABLE I. Dash numbers and characteristics. 1/

Dash number 2/			At +25°C							Over temperature range			
Lead length .187 ±.010	Lead length .500 Min	Mounting pads (fig. 2) 3/	Coil voltages (V dc)		Coil resistance (ref. only) Ohms	Coil circuit current 5/ (mA)		Speci- fied pickup value (volt- age) (V dc)	Speci- fied hold value (volt- age) (V dc)	Speci- fied drop- out value (volt- age) (V dc)	Speci- fied pickup value (volt- age) (V dc)	Speci- fied hold value (volt- age) (V dc)	Speci- fied dropout value (volt- age) (V dc)
			Rated	Max		Max	Mfn						
025	031	037	5.0	5.8	39	128.2	93.2	3.2	2.3	0.6	4.0	2.8	0.6
026	032	038	6.0	8.0	78	78.3	58.3	4.0	2.8	0.7	5.0	3.4	0.7
027	033	039	9.0	12.0	220	42.9	33.0	6.3	4.2	0.9	7.8	5.3	0.8
028	034	040	12.0	16.0	390	32.8	25.6	8.0	5.2	1.1	10.0	6.5	0.9
029	035	041	18.0	24.0	880	22.1	17.5	11.5	7.3	1.4	14.5	10.0	1.1
030	036	042	26.5	32.0	1,560	18.5	14.8	15.2	9.5	1.8	19.0	13.0	1.4
---	043 6/	049 6/	5.0	5.8	39	128.2	93.2	3.2	2.3	0.6	4.0	2.8	0.6
---	044 6/	050 6/	6.0	8.0	78	78.3	58.3	4.0	2.8	0.7	5.0	3.4	0.7
---	045 6/	051 6/	9.0	12.0	220	42.9	33.0	6.3	4.2	0.9	7.8	5.3	0.8
---	046 6/	052 6/	12.0	16.0	390	32.8	25.6	8.0	5.2	1.1	10.0	6.5	0.9
---	047 6/	053 6/	18.0	24.0	880	22.1	17.5	11.5	7.3	1.4	14.5	10.0	1.1
---	048 6/	054 6/	26.5	32.0	1,560	18.5	14.8	15.2	9.5	1.8	19.0	13.0	1.4

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, 031L - - - - 042R.

3/ Relays supplied with mounting pads (-037 through -042 and -049 through -054) shall have the 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 ground pin welded to the header (see figures 1 and 2).

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

Ⓒ TABLE II. Qualification inspection and sample size. 1/

Single submission		Group submission
18 units plus 1 open unit for level L at C = 0 2/	M39016/19-036	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/		33 units plus 1 open unit for level M at C = 0 2/
Qualification inspection as applicable		Qualification inspection as applicable
	M39016/19-031	2 units each part number
	M39016/19-032	qualification inspection
	M39016/19-033	table, group II
	M39016/19-034	
	M39016/19-035	
	M39016/19-048	1 unit terminal strength and solderability

- 1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/43 may be used in addition to MIL-R-39016/19 data. Prior to retention of qualification, the relay manufacturer shall preselect the sampling plan.
- 2/ The number of units required for qualification testing will be increased required in group V, table II, MIL-R-39016, if the relay manufacturer elects to test the number of units permitting one or more failures. Prior to performance of qualification inspection, the relay manufacturer shall preselect the sampling plan.

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

If the relays produced for MIL-R-39016/19 are similar in construction and design except for the coils to the relays produced for MIL-R-39016/43, then reduced testing for qualification of MIL-R-39016/19 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/43. For reduced testing see table III.

Ⓒ TABLE III. Qualification inspection (reduced testing).

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

- Ⓒ Initial qualification of relays supplied with mounting pads (-037 through -042 and -049 through -054) shall be tested as specified below:

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

Before installation of 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 pad, perform the following tests as specified in the qualification inspection table of MIL-R-39016, in the following order:

- Ⓒ 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 mounting pads (-037 through -042 and -049 through -054) two units of the 26.5 volt rated coil voltage (-042) shall be tested as specified below:

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

For failure rate level L only: Screening.

- Ⓒ For failure rate levels M, P, and R: Vibration (sinusoidal) test duration shall be 10 minutes, vibration (random), particle impact noise detection (P.I.N.D., when specified), screening.

After installation of pad, perform the following tests as specified in the qualification inspection table of MIL-R-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 mounting pads (-037 through -042) shall be tested as specified below:

- Ⓒ Before installation of pad, perform subgroup 2 of group A tests.
- Ⓒ After installation of pad, perform subgroups 3 and 4 of group A tests.

SUPERSESSION DATA:

Supersession data: See table IV.

Ⓒ TABLE IV. Supersession data. 1/

Superseded part no. M39016/19-	New part no. M39016/19-	Superseded part no. M39016/19-	New part no. M39016/19-
001	031	013	031
002	032	014	032
003	033	015	033
004	034	016	034
005	035	017	035
006	036	018	036
007	025	019	025
008	026	020	026
009	027	021	027
010	028	022	028
011	029	023	029
012	030	024	030

1/ Dash numbers -001 through -024, .225 inch high cans have been canceled and are superseded by dash numbers -025 through -036, .280 inch high cans. The .225 inch cans are no longer manufactured.

For Government logistical support: See table V.

③ TABLE V. Cross reference for Government logistical support.

Superseded part no. M39016/19-	New part no. M39016/19-	Support with part no. M39016/19-	Superseded part no. M39016/19-	New part no. M39016/19-	Support with part no. M39016/19-	New part no. M39016/19-	Support with part no. M39016/19-
001	031	031	022	028	034	043	043
002	032	032	023	029	035	044	044
003	033	033	024	030	036	045	045
004	034	034		025	031	046	046
005	035	035		026	032	047	047
006	036	036		027	033	048	048
007	025	031		028	034	049	049
008	026	032		029	035	050	050
009	027	033		030	036	051	051
010	028	034		031	031	052	052
011	029	035		032	032	053	053
012	030	036		033	033	054	054
013	031	031		034	034		
014	032	032		035	035		
015	033	033		036	036		
016	034	034		037	037		
017	035	035		038	038		
018	036	036		039	039		
019	025	031		040	040		
020	026	032		041	041		
021	027	033		042	042		

CONCLUDING MATERIAL

Custodians:

- Army - ER
- Navy - EC
- ③ Air Force - 85

Review activities:

- Army - AR
- Navy - AS, OS, SH
- ③ Air Force - 99
- DLA - ES

User activities:

- Navy - MC
- ③ Air Force - 11

Preparing activity:

Navy - EC

Agent:

DLA - ES

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