INCH-POUND

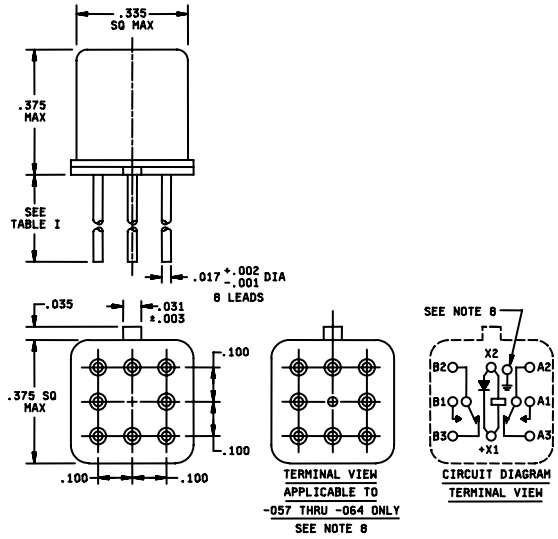
MIL-PRF-39016/42E
15 September 2006
SUPERSEDING
MIL-PRF-39016/42D
20 July 1988

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE WITH INTERNAL DIODE FOR COIL TRANSIENT SUPPRESSION, TERMINALS .100-INCH GRID PATTERN (SENSITIVE 60 MILLIWATTS, COIL OPERATE POWER AT 25°C)

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 MIL-PRF-39016.

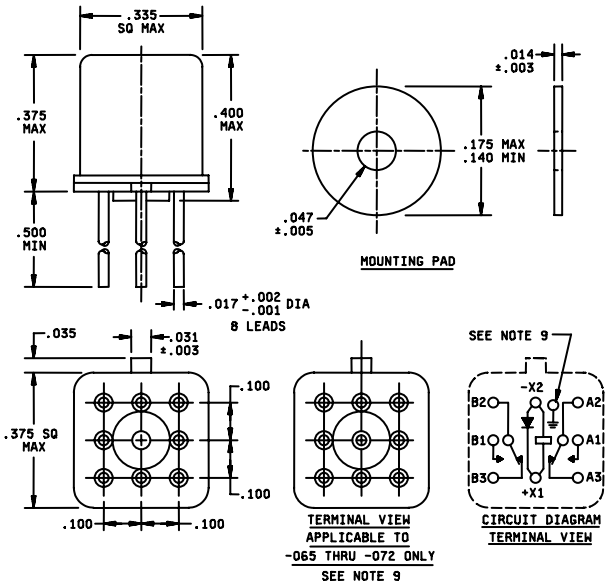


Inches	mm	Inches	mm	Inches	mm
.001	0.03	.031	0.79	.335	8.51
.002	0.05	.035	0.89	.370	9.40
.003	0.08	.200	5.08	.375	9.53
.017	0.43	.275	6.99		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.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. Dash numbers -057 through -064 shall be supplied with a case grounding pin welded to the header as shown.

FIGURE 1. Dimensions and configuration.



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.005	0.13
.014	0.36
.017	0.43
.031	0.79
.047	1.93
.100	2.54
.170	4.32
.275	6.99
.300	7.62
.335	8.51
.370	9.40
.500	12.70

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.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 in accordance with MIL-I-631. Type G, class 1.
9. Dash numbers -065 through -072 shall be supplied with a case grounding pin welded to the header as shown.

FIGURE 2. Dimensions and configuration (relay with 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 Hz and 400 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 μA to 50 μA at 10 mV 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. Not applicable to ac load ratings.

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 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)	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 deenergized positions:- - - - - - -	500	500	
Between case, frame, or enclosure and coil:- - - - - - - -	500	500	
Between all contacts and coil: - - - - - - - - - - - - - - - - -	500	500	125
Between open contacts in the energized and deenergized positions:- - - - - - - - - - - - - - - - - - -	500	375	All terminals to case
Between contact poles in the energized and deenergized positions: - - - - - - - - - - - - - - - - - -	500	500	
Between coils of dual coil relays - - - - - - - - - - - - - - - -	N/A	N/A	

Diode characteristics 2/:

Maximum negative transient: 1.0 V.

Peak inverse voltage: 100 volts minimum.

Coil transient suppression: Applicable.

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 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

1/ Connect coil leads together to avoid damage to the diode.

2/ WARNING: Reverse polarity on coil terminals will destroy diode.

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

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

Physical data:

Terminals:

Terminal strength: One pound pull minimum.

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

Solderability: Applicable.

Dimensions and configuration: See figure 1.

Terminations: See figure 1 and table I.

Weight: 4.3 grams (0.15 ounce) maximum.

Minimum marking: Military part number, "J" with the date code (example J8530), circuit diagram, manufacturers' 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): M39016/42- (dash number from table I and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/

Dash number 2/					Coil voltage 5/ (V dc)		At 25°C				Over temperature range		
Lead strength .500 Min	Lead length .187 ±.010	Mounting pads (fig. 2) 3/	Lead length .500 min with ground pin 4/	Mounting pads (fig. 2) with ground pin 3/ 4/	Rated	Max	Coil resistance ohms ±10%	Specified pickup value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified drop-out value (voltage) (V dc)	Specified pickup value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified drop-out value (voltage) (V dc)
033	041	049	057	065	5.0	7.5	100	2.6	1.4	0.23	3.5	2.5	0.12
034	042	050	058	066	6.0	10.0	200	3.4	2.0	0.28	4.5	3.2	0.18
035	043	051	059	067	12.0	20.0	800	7.0	4.0	0.64	9.0	6.5	0.41
036	044	052	060	068	26.5	40.0	3,200	14.0	8.0	1.4	18.0	13.0	0.89
037	045	053	061	069	36.0	57.0	6,500	20.0	10.0	1.8	27.0	19.0	1.25
038	046	054	062	070	48.0	75.0	11,000	25.8	13.0	2.4	36.0	26.0	1.60
039	047	055	063	071	9.0	15.0	400	4.85	3.0	0.55	6.8	4.9	0.35
040	048	056	064	072	18.0	30.0	1,600	9.8	6.0	0.92	13.5	10.0	0.59

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 operations): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example, 033L - - - - - 056P.

3/ Relays supplied with mounting pads (-049 through -056 and -065-through-072) shall have the pad rigidly attached.

4/ Dash numbers -057 through -072 shall be supplied with a case grounding pin welded to the relay header (see figures 1 and 2).

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

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/ 33 units plus 1 open unit for level M at C = 0 2/ Qualification inspection as applicable.	M39016/42-036	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/ Qualification inspection as applicable.
	M39016/42-033 M39016/42-034 M39016/42-035 M39016/42-037 M39016/42-038 M39016/42-039 M39016/42-040	2 units each PIN, qualification inspection table, Q1.
	M39016/42-060	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-PRF-39016/43 may be used in addition to MIL-PRF-39016/42 data. Prior to performance of qualification or extension 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, 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 sampling plan.

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

If the relays produced for MIL-PRF-39016/42 are similar in construction and design except for the steering diode to the relays produced for MIL-PRF-39016/43, then reduced testing for qualification of MIL-PRF-39016/42 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-39016/43 relays. For reduced testing see table III.

TABLE III. Qualification inspection (reduced testing).

Inspection
2 units each coil voltage Q1 of qualification inspection table. 1 unsealed sample unit for internal inspection

Initial qualification of relays supplied with 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 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-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, solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with 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 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) test duration shall be 10 minutes, vibration (random), particle impact noise detection (PIND, when specified), screening.

After installation of 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, dropout values (voltages), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, and visual and mechanical inspection (external).

Group A testing for relays supplied with 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 mounting pad removed before the seal test. After the seal test, the 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: See table IV.

TABLE IV. Supersession data. 1/

Superseded PIN M39016/42-	New PIN M39016/42-	Superseded PIN M39016/42-	New PIN M39016/42-
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	039
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 V.

TABLE V. Cross reference for Government logistical support.

Superseded PIN M39016/42-	New PIN M39016/42-	Support with PIN M39016/	Superseded PIN M39016/42-	New PIN M39016/42-	Support with PIN M39016/	New PIN M39016/42-	Support with PIN M39016/
001	033	42-033	029	045	43-039	057	42-057
002	034	42-034	030	046	42-040	058	42-058
003	035	43-036	031	047	43-035	059	43-060
004	036	43-038	032	048	43-037	060	43-062
005	037	43-039		033	42-033	061	43-063
006	038	43-040		034	42-034	062	43-064
007	039	43-035		035	43-036	063	43-060
008	040	43-037		036	43-038	064	43-061
009	041	42-033		037	43-039	065	42-065
010	042	42-034		038	43-040	066	42-066
011	043	43-036		039	43-035	067	43-068
012	044	43-038		040	43-037	068	43-070
013	045	43-039		041	43-033	069	43-071
014	046	43-040		042	43-034	070	43-072
015	047	43-035		043	43-036	071	43-067
016	048	43-037		044	43-038	072	43-069
017	033	42-033		045	43-039		
018	034	42-034		046	43-040		
019	035	43-036		047	43-035		
020	036	43-038		048	43-037		
021	037	43-039		049	42-049		
022	038	43-040		050	42-050		
023	039	43-035		051	43-052		
024	040	43-037		052	43-054		
025	041	42-033		053	43-055		
026	042	42-034		054	43-056		
027	043	43-036		055	43-051		
028	044	43-038		056	43-053		

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

MIL-I-631	MIL-STD-750	MIL-STD-202
MIL-PRF-39016/43	MIL-STD-1285	

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.

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

Preparing activity:
DLA - CC

(Project 5945-1293-000)

Review activities:
Army - AR
Navy - MC, OS, SH
Air Force - 19, 99

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