

INCH-POUND

MIL-PRF-39016/21H
22 April 2013
SUPERSEDING
MIL-PRF-39016/21G
28 March 2007

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO
1.0 AMPERE (SENSITIVE, 60 MILLIWATTS) WITH INTERNAL DIODES FOR COIL
TRANSIENT SUPPRESSION AND POLARITY REVERSAL 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 sheet and [MIL-PRF-39016](#).

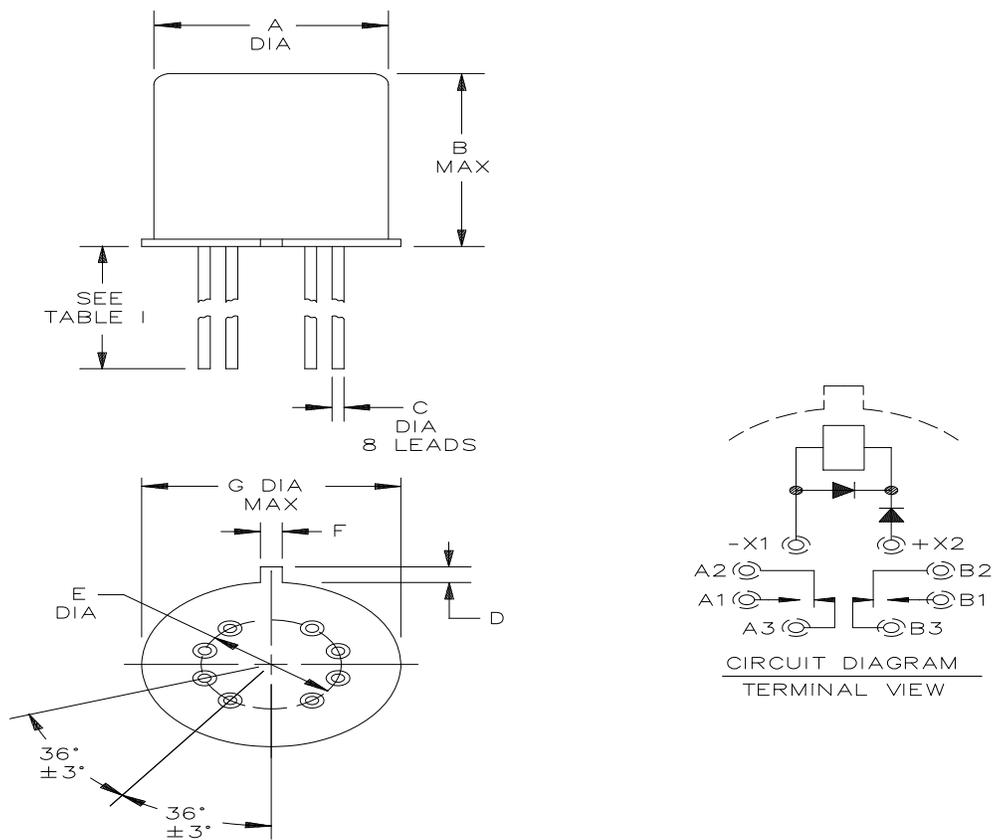


FIGURE 1. Dimensions and configuration.

MIL-PRF-39016/21H

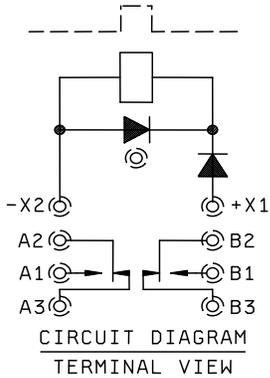
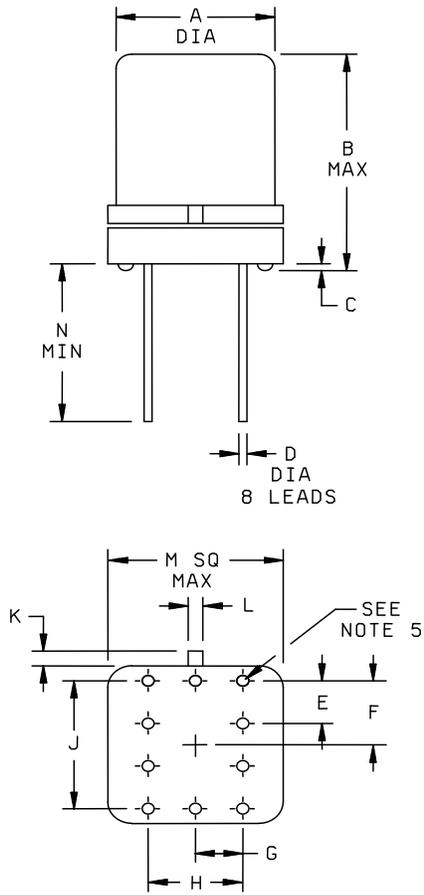
Ltr	Inches		mm	
	Min	Max	Min	Max
A	.275	.335	6.99	8.51
B	---	.375	---	9.53
C	.016	.019	0.41	0.48
D	.025	.045	0.64	1.14
E	.190	.210	4.83	5.33
F	.028	.034	0.71	0.86
G	---	.370	---	9.40

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.

FIGURE 1. Dimensions and configuration - Continued.

MIL-PRF-39016/21H



Ltr.	Inches		mm	
	Min	Max	Min	Max
A	.275	.335	6.99	8.51
B	---	.493	---	12.52
C	.012	.016	0.30	0.41
D	.016	.019	0.41	0.48
E	.090	.110	2.29	2.79
F	.140	.160	3.56	4.06
G	.090	.110	2.29	2.79
H	.190	.210	4.83	5.33
J	.290	.310	7.37	7.87
K	.025	.045	0.64	1.14
L	.028	.033	0.71	0.84
M	---	.370 SQ	---	9.40 SQ
N	.370	---	9.40	---

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. Spreader pads shall comply with the requirements of [A-A-55485](#), A-A-55485/5-003, in accordance with [A-A-55485/5](#).
5. Dimensions and tolerances shown for the bottom view of the spreader pad are for the center to center locations of the holes in the spreader pad.
6. Shape optional within the envelope dimension.
7. Terminal numbers shown above for reference only. Numbers do not appear on relay.
8. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
9. Coil symbol optional in accordance with [MIL-STD-1285](#).
10. Circuit diagram shown on part is the terminal view.

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

Lamp: 0.10 ampere at 28 V dc.

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

Intermediate current: Applicable.

Contact resistance or voltage drop:

Initial: 0.100 ohm maximum, 0.125 ohm maximum with spreader pad attached.

High level:

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

After life: 0.200 ohm maximum (0.225 ohm maximum with spreader pad attached.)

Low level:

During life: 33 ohms maximum.

After life: 0.150 ohm maximum (0.175 ohm maximum with spreader pad attached.)

Intermediate current:

During life: 1 ohm maximum.

After life: 0.200 ohm maximum (0.225 ohm maximum with spreader pad attached.)

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

Contact stabilization time: 2.0 ms 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.

MIL-PRF-39016/21H

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 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 coils	500	500	125
Between all contacts and coil	500	500	All
Between open contacts in the energized and deenergized positions	500	375	terminals
Between contact poles	500	500	to case
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 μ A at 50 V dc.

Maximum negative transient: 1.0 volt.

Breakdown voltage: 100 V dc minimum at 10 microamperes (μ 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, methods 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.

Magnetic interference: Applicable.

MIL-PRF-39016/21H

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

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

PHYSICAL DATA:

Terminal strength: ([MIL-STD-202](#), method 211).

Pull test: Test condition A, 1 pound pull.

Bend test: Test condition C, 0.5 pound load.

Twist test: As specified in [MIL-PRF-39016](#).

Dimensions and configurations: See [figure 1](#) and [figure 2](#).

Weight: 4.25 grams (0.15 ounce) maximum, 4.50 grams (0.159 ounce) maximum with spreader pad attached.

Seal: Hermetic.

Minimum marking: As specified in [MIL-PRF-39016](#).

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles per relay.

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

Intermediate current: 50,000 cycles.

Mechanical life: 1,000,000 cycles.

Part or Identifying Number (PIN): M39016/21- (dash number from [table I](#) and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/ 5/

Dash number <u>2/</u>				Coil voltage (V dc) <u>3/</u>		At 25°C						Over temperature range		
Lead length 1.500 min <u>4/</u>	Lead length .187 ±.010	Lead length .500 min	Spreader pads (fig. 2) <u>6/</u>			Coil resistance (ref. only) Ohms	Coil circuit current <u>7/</u> (mA)		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)
				Rated	Max		Max	Min						
007	019	033	041	5.0	7.0	64	78.1	56.8	2.9	2.2	0.8	3.7	2.6	0.7
008	020	034	042	6.0	10.0	125	48.9	36.3	4.0	2.5	0.9	4.8	3.0	0.8
009	021	035	043	9.0	15.0	400	23.6	18.1	6.1	3.6	1.1	8.0	4.5	0.9
010	022	036	044	12.0	20.0	850	15.0	11.7	7.8	4.6	1.3	11.0	5.8	1.0
011	023	037	045	18.0	30.0	1,600	12.2	9.6	11.3	7.0	1.5	14.5	9.0	1.1
012	024	038	046	26.5	40.0	3,300	8.8	7.0	15.2	10.8	1.7	19.0	13.0	1.3
029	031	039	047	36.0	57.0	6,500	6.1	4.9	21.7	14.7	2.3	27.2	19.0	1.7
030	032	040	048	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 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 013L - - - - 036R.
- 3/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise relay operation.
- 4/ 1.500 leads are inactive for new design.
- 5/ OTR = over the temperature range, PU = pickup, and DO = dropout.
- 6/ Relays supplied with spreader pads (-041 through -048) shall have the pad rigidly attached.
- 7/ 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.

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 1/ 33 units plus 1 open unit for level M at C = 0 1/ Qualification inspection as applicable.	M39016/21-038	18 units plus 1 open unit for level L at C=0 1/ 33 units plus 1 open unit for level M at C = 0 1/ Qualification inspection as applicable.
	M39016/21-033	2 units each part number Qualification inspection, Q I.
	M39016/21-034	
	M39016/21-035	
	M39016/21-036	
	M39016/21-037	
	M39016/21-039	
	M39016/21-040	

[1/](#) The number of units required for qualification testing will be increased as required in group Q5 of [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, the relay manufacturer shall preselect the sampling plan.

Initial qualification of relays supplied with spreader pads (-041 through -048), shall be tested as specified below:

Qualifications inspections (reduced testing for previously qualified relays) for relays supplied with spreader pads (-041 through -048), (2) two units of the 26.5 volt rated coil voltage (-046) shall be tested as specified below:

Qualification inspection testing for relays supplied with spreader pads (-041 through -048), two (2) units of the 26.5 volt rated coil voltage (-046) shall be tested as follows:

Relay leads shall be formed and the mounting pad removed. Perform A4 tests of group A inspection. Rigidly attach mounting pad to relay. Perform A1 and A2 tests of group A inspection.

Group A inspection testing for relays supplied with spreader pads (-041 through -048) shall be tested as follows:

Perform seal test immediately, preceding 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.

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.

Referenced documents. In addition to [MIL-PRF-39016](#), this document references the following:

[A-A-55485](#) [A-A-55485/5](#) [MIL-STD-750](#) [MIL-STD-1285](#) [MIL-STD-202](#)

Custodians:
Army – CR
Navy – EC
Air Force – 85
DLA-CC

Preparing activity:
DLA-CC

(Project 5945-2013-021)

Review activities:
Army - AR
Navy - AS, 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 <https://assist.dla.mil/>.