INCH-POUND

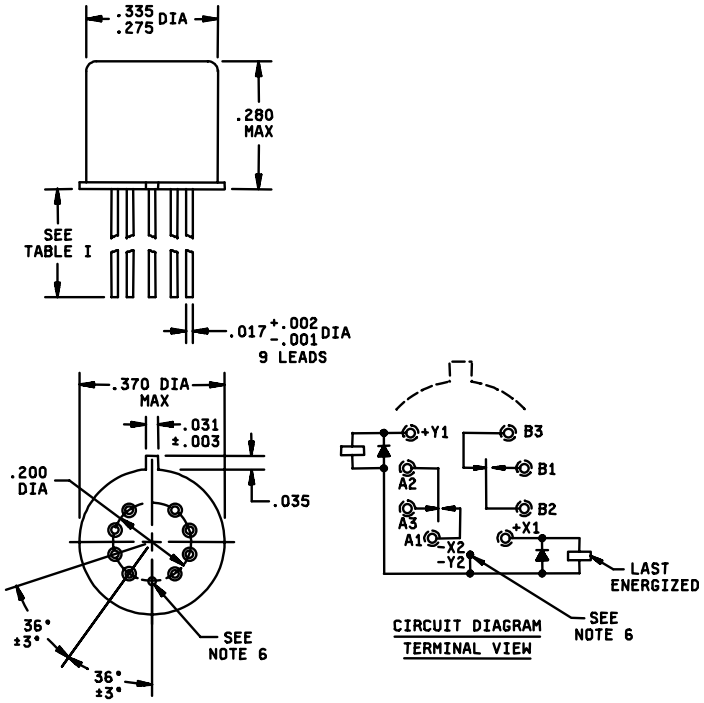
MIL-PRF-39016/29G
w/AMENDMENT 2
28 March 2006
SUPERSEDING
MIL-PRF-39016/29G
w/AMENDMENT 1
18 October 2005

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE (LATCHING) WITH INTERNAL DIODES FOR COIL TRANSIENT SUPPRESSION

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

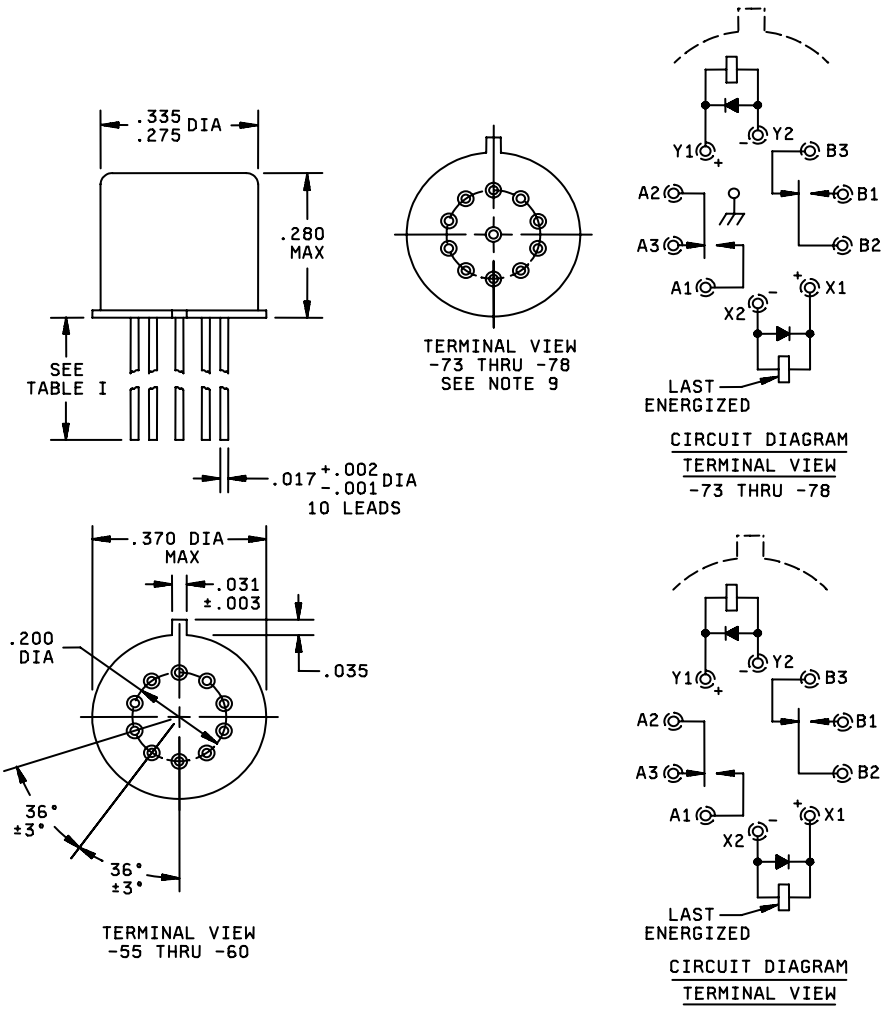
The complete requirements for acquiring the relays described herein shall consist of this specification sheet and the latest issue of MIL-PRF-39016.



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.017	0.43
.031	0.79
.035	0.89
.200	5.09
.275	6.99
.280	7.11
.335	8.51
.370	9.40

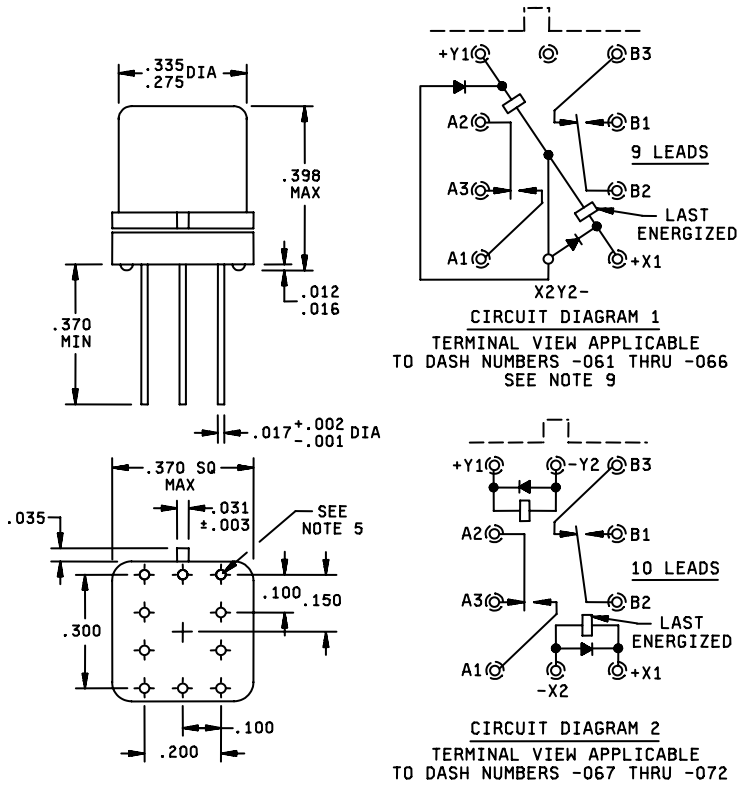
NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above are for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case, except for lead terminal, -X2 -Y2, which is grounded to the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.

FIGURE 1. Dimensions and configuration.



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 for reference only. Numbers do not appear on relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.
9. M39016/29-073 through M39016/29-078 shall be supplied with a case grounding pin welded to the relay header as shown.

FIGURE 2. Dimensions and configuration - 10 leads.



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.012	0.30
.016	0.41
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.150	3.81
.200	5.08
.275	6.99
.300	7.62
.335	8.51
.370	9.40
.398	10.11

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. Spreader mounting pads shall comply with the requirements of A-A-55485, A-55485/05-003 or A-55485/05-013.
5. Dimensions and tolerances shown for the bottom view of the spreader mounting pad are for the center-to-center locations of the holes in the spreader mounting pad.
6. Shape optional within the envelope dimension.
7. Terminal numbers shown above for reference only. Numbers do not appear on the relay.
8. Relays shall have a (+) sign placed on the circuit diagram as shown.
9. All leads shall be electrically insulated from the case, except for lead terminal, -X1 -Y2, which is grounded to the case.
10. Coil symbol optional in accordance with MIL-STD-1285.
11. Circuit diagram shown on part is the terminal view.

FIGURE 3. Dimensions and configuration relay with spreader mounting pad attached.

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 to 50 μA at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

Initial: 0.125 ohm maximum (0.150 ohm maximum with spreader mounting pad attached).

High level:

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

After life: 0.225 ohm maximum (0.250 ohm maximum with spreader mounting pad attached).

Low level:

During life: 33 ohms maximum.

After life: 0.175 ohm maximum (0.200 ohm maximum with spreader mounting pad attached).

Intermediate current:

During: 1 ohm maximum.

After: 0.225 ohm maximum (0.250 ohm maximum with spreader mounting pad attached).

Contact bounce: 2.0 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.

Neutral screen: Applicable.

COIL DATA: See table I.

Operate time: 2.0 ms maximum over temperature range with rated coil voltage.
Release time: Not applicable.

ELECTRICAL DATA: 1/

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	
Between case, frame, or enclosure and coils.	500	500	125
Between all contacts and coils.	500	500	All terminals to case
Between open contacts in the energized and de-energized positions.	500	375	
Between contact poles.	500	500	
Between coils of dual coil relays.	500	500	

DIODE CHARACTERISTICS: 2/

Maximum transient voltage: 1.0 volt.

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).

1/ Dielectric withstanding voltage and insulation resistance are not applicable between coils and case or from coil to coil on figure 1 relays.
2/ WARNING: Reverse polarity on coil terminals will destroy diode.

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.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

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

PHYSICAL DATA:

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

Pull test: Test condition A, 1 pound pull.

Bend test: Test condition C, ½ pound load.

Twist test: As specified in MIL-PRF-39016.

Solderability: Applicable.

Dimensions and configuration: See figure 1, 2, and 3.

Weight: 2.84 grams (0.10 ounce) maximum, 3.09 grams (0.109 ounce) maximum with spreader mounting pad attached).

Seal: Hermetic.

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): M39016/29- (dash number from table I and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/ 2/

Dash numbers 3/				.500 Min leads with ground 6/	Number of leads	Coil voltage V dc 7/		At 25°C		Over temperature range
Lead length 1.500 min 4/	Lead length .187 ±.010	Lead length .500 min	Spreader mounting pad (figure 3) 5/			Rated	Max	Coil resist-ance ohms ±10%	Speci-fied pickup (latch/ reset) value (voltage) (V dc)	Speci-fied pickup (latch/ reset) value (voltage) (V dc)
025	037	049	061		9	6.0	8.0	120	3.5	4.5
026	038	050	062		9	9.0	12	280	5.3	6.8
027	039	051	063		9	12	16	500	7.0	9.0
028	040	052	064		9	18	24	1,130	10.5	13.5
029	041	053	065		9	26.5	32	2,000	14.2	18
030	042	054	066		9	5.0	6.0	61	2.8	3.7
031	043	055	067		10	5.0	6.0	61	2.8	3.7
032	044	056	068		10	6.0	8.0	120	3.5	4.5
033	045	057	069		10	9.0	12	280	5.3	6.8
034	046	058	070		10	12	16	500	7.0	9.0
035	047	059	071		10	18	24	1,130	10.5	13.5
036	048	060	072		10	26.5	32	2,000	14.2	18
				073	11	12	16	500	7.0	9.0
				074	11	5.0	6.0	61	2.8	3.7
				075	11	6.0	8.0	120	3.5	4.5
				076	11	9.0	12	280	5.3	6.8
				077	11	18	24	1,130	10.5	13.5
				078	11	26.5	32	2,000	14.2	18

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/ WARNING: When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less then the nominal coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed, it is possible for the relay to be in the magnetically neutral position.

3/ 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, 025L - - - - - -072R.

4/ 1.500 leads are inactive for new design.

5/ Relays supplied with spreader mounting pads (-061 through -072) shall have the spreader mounting pad rigidly attached.

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

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

8/ Delete “Coil resistance” and substitute “Coil current” test in all inspection tables of MIL-PRF-39016.

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/ 33 units plus 1 open unit for level M at C = 0 2/ Qualification inspection as applicable	M39016/29-053	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
	M39016/29-049 M39016/29-050 M39016/29-051 M39016/29-052 M39016/29-054 M39016/29-055 M39016/29-056 M39016/29-057 M39016/29-058 M39016/29-059 M39016/29-060	2 units each PIN Qualification inspection, Q1.
	M39016/29-073	1 unit terminal strength and terminal solderability

1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-PRF-39016/30 may be used in addition to MIL-PRF-39016/29 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, 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.

Initial qualification of relays supplied with spreader mounting pads (-061 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 spreader 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 spreader 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 (latch/reset) value (voltage), hold, coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderatiliby, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader mounting pads (-061 through -072), two (2) units of the 26.5 volt rated coil voltage (-065) shall be tested as specified below:

Before installation of spreader 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.
(Failure rate level "L" is inactive for new design).

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

After installation of spreader 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 (latch/reset) value (voltage), 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 spreader mounting pads (-061 through -072), shall be tested as specified below:

Perform seal test immediately, preceding the subgroup A2 electrical tests. Relay leads shall be formed and the spreader mounting pad removed before the seal test. After the seal test, the spreader mounting pad shall be rigidly attached to the relay and the remaining group A tests performed.

Qualification inspection (reduced testing) and sample size: See table III.

If the relays produced for MIL-PRF-39016/29 are similar in construction and design except for diodes and coils, to the relays produced for MIL-PRF-39016/30, then reduced testing for qualification of MIL-PRF-39016/29 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-39016/30 relays. For reduced testing see table III.

TABLE III. Qualification inspection (reduced testing).

Examination or test
2 units each coil voltage – Q1 of qualification inspection table 1 unsealed sample unit for internal examination.

SUPERSESSION DATA:

Supersession data: See table IV.

TABLE IV. Supersession data. 1/

Superseded part no. M39016/29-	New part no. M39016/29-		Superseded part no. M39016/29-	New part no. M39016/29-		Superseded part no. M39016/29-	New part no. M39016/29-
001	025		009	040		017	035
002	026		010	041		018	036
003	027		011	030		019	043
004	028		012	042		020	044
005	029		013	031		021	045
006	037		014	032		022	046
007	038		015	033		023	047
008	039		016	034		024	048

1/ Dash numbers M39016/29-025 through M39016/29-036 are inactive for new design and are for support of existing equipment design only.

Cross reference for Government logistical support. See table V.

TABLE V. Cross reference for Government logistical support.

Superseded part no. M39016/29-	New part number M39016/29-	Support with part number M39016/		New part number M39016/29-	Support with part number M39016/		New part number M39016/29-	Support with part number M39016/
001	025	29-025 1/		049	29-049		073	30-073
002	026	30-026		050	30-050		074	29-074
003	027	30-027		051	30-051		075	29-075
004	028	30-028		052	30-052		076	29-076
005	029	30-029		053	30-053		077	29-077
006	037	29-049		054	29-054		078	29-078
007	038	30-050		055	29-055			
008	039	30-051		056	29-056			
009	040	30-052		057	30-057			
010	041	30-053		058	30-058			
011	030	29-030 1/		059	30-059			
012	042	29-054		060	30-060			
013	031	29-031 1/		061	29-061			
014	032	29-032 1/		062	30-062			
015	033	30-033		063	30-063			
016	034	30-034		064	30-064			
017	035	30-035		065	30-065			
018	036	30-036		066	30-066			
019	043	29-055		067	29-067			
020	044	29-056		068	29-068			
021	045	30-057		069	30-069			
022	046	30-058		070	30-070			
023	047	30-059		071	30-071			
024	048	30-060		072	30-072			

1/ Dash numbers -025, -030, 031, and -032 are inactive for new design and for support existing equipment designs only.

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

A-A-55485, /5
MIL-PRF-39016/30
MIL-STD-202
MIL-STD-750
MIL-STD-1285

Changes from previous issue: Marginal notations are mark 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

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

(Project 5945-2006-016)

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.