

INCH-POUND

MIL-PRF-32271/1

30 October 2008

PERFORMANCE SPECIFICATION SHEET

BATTERY, NON-RECHARGEABLE, LITHIUM

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

The requirements for acquiring the product herein shall consist of this specification and MIL-PRF-32271.

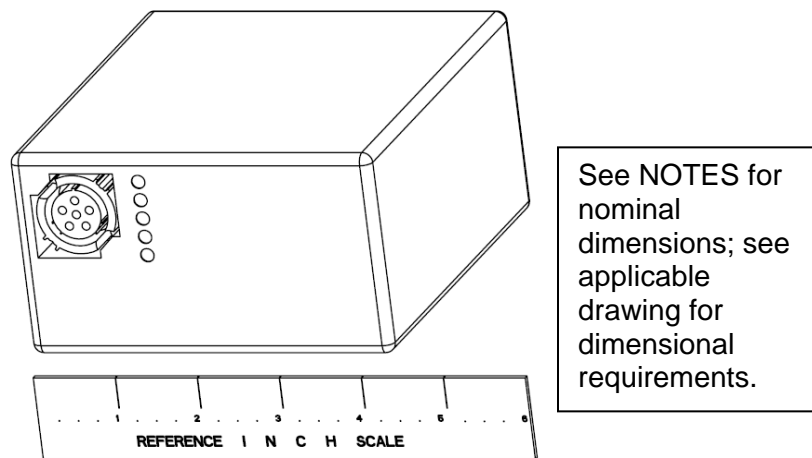


Figure 1 – General View, M32271/1 Battery Shape

REQUIREMENTS (see 1.2 for Type, Class, and Features descriptions):

Type	I			II			III
Class	2			2			2
Features	C	D	E	C	D	E	E
PIN	M32271/1-12C	M32271/1-12D	M32271/1-12E	M32271/1-22C	M32271/1-22D	M32271/1-22E	M32271/1-32E
Approved Chemistry	Lithium Manganese Dioxide			Lithium Sulfur Dioxide			Lithium Manganese Dioxide

Specification requirements: The following requirements of MIL-PRF-32271, identified therein by the phrase “when specified”, are applicable as indicated below:

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Requirement	Specification Reference	Applicability by PIN Suffix (M32271/1-)						
		12C	12D	12E	22C	22D	22E	32E
Parallel cell arrangements ¹	3.4	Yes	Yes	Yes	No	No	No	Yes
Connectors	3.4.5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Battery charger connection	3.4.5.1	No	No	No	No	No	No	No
Connection integrity	3.4.5.2	No	No	No	No	No	No	No
Terminal integrity	3.4.6	No	No	No	No	No	No	No
Complete discharge device	3.4.7	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State of charge device	3.4.8	No	Yes	Yes	No	Yes	Yes	Yes
State of charge data output	3.4.8e	No	No	Yes	No	No	Yes	Yes
Cell charging	3.5.3	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nail penetration	3.5.4	Yes	Yes	Yes	No	No	No	Yes
Cell series short circuit	3.5.6	Yes	Yes	Yes	No	No	No	Yes
Parallel string charge protection ²	3.5.6.1	Yes	Yes	Yes	No	No	No	Yes
Charge protection	3.5.11	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Over-current protection	3.5.13.1	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Over-temperature protection	3.5.14	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Surface temperature	3.6h	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity LR & LRT		No	No	No	Yes	Yes	Yes	No
Immersion	3.7.8	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Watertight integrity	3.7.9	No	No	No	No	No	No	No
DO NOT CHARGE! marking	3.8.1.2b	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Complete discharge device marking/label	3.8.4	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State of charge marking	3.8.5	No	Yes	Yes	No	Yes	Yes	Yes

Dimensions, marking and configuration, all types:

Battery – Drawing A3315878

Battery Connector (3.4.5 & 4.6.1.7) – Drawing SC-C-179492³

Mating Connector (3.4.5 & 4.6.1.7) – Part Number SM-D-687888-1, Drawing SM-D-687888

Battery Charger Connector (3.4.5.1 & 4.6.1.7.1) – Not Applicable

Battery voltages (3.4.4 & 4.6.1.5), all types:

Battery open-circuit voltage (3.4.4.1 & 4.6.1.5.1):

<i>Type:</i>	Types I & III		Type II	
<i>Connection Mode:</i>	Series	Parallel	Series	Parallel
<i>Maximum:</i>	33.00V	16.50V	30.50V	15.25V
<i>Minimum:</i>	29.80V	14.90V	28.80V	14.40V

¹ Parallel cell arrangements are permitted for Types I and III batteries described by this specification sheet but are not required.

² Only required if parallel cell arrangements are used for Type I or III batteries

³ Certifications for physical properties of connector material required by SC-C-179492

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Battery closed circuit voltage (3.4.4.2, 3.6, 4.6.1.5.2, & 4.6.4.1):

For capacity & initial voltage delay –
 10.0 volts minimum for parallel connection
 20.0 volts minimum for series connection

For closed circuit voltage test -
 10.0 volts per battery section

Cell closed circuit voltage (3.4.4.3 & 4.6.1.3):

Minimum – 2.0 volts per cell

Maximum weight (3.1 & 4.6.1.6): Type I - 3.10 lbs. (1,406 g); Type II – 2.33 lbs. (1,057 g);
 Type III – 3.20 lbs. (1,451 g)

State of charge (3.4.8 & 4.6.1.10): Batteries described by this specification sheet have two independent sections. State of charge circuitry, when required, shall be located in the section connected to sockets 1 and 4. See applicable drawing for additional requirements pertaining to batteries with state of charge data output requirements.

Capacity test requirements (3.6 & 4.6.4), Type I:

Test	Initial voltage delay		Minimum Capacity	Storage Period		Cut-off Volts
	Time (MAX) to	Volts		1-Week	4-Week	
I	1 second	20.00	5.0 hours		20.00	
IP	1 second	10.00	5.0 hours		10.00	
L	1 second	20.00	3.3 hours		20.00	
LP	1 second	10.00	3.3 hours		10.00	
H	1 second	20.00	8.3 hours		20.00	
HP	1 second	10.00	8.3 hours		10.00	
IT	1 second	20.00	4.7 hours	4.5 hours	20.00	
ITP	1 second	10.00	4.7 hours	4.5 hours	10.00	
LT	1 second	20.00	3.1 hours	3.0 hours	20.00	
LTP	1 second	10.00	3.1 hours	3.0 hours	10.00	
HT	1 second	20.00	7.7 hours	7.5 hours	20.00	
HTP	1 second	10.00	7.7 hours	7.5 hours	10.00	

Capacity test requirements (3.6 & 4.6.4), Type II:

Test	Initial voltage delay		Minimum Capacity	Cut-off Volts
	Time (MAX) to	Volts		
I	5 seconds	20.00	3.4 hours	20.00
IP	5 seconds	10.00	3.4 hours	10.00
L	60 seconds	20.00	2.2 hours	20.00
LP	60 seconds	10.00	2.2 hours	10.00
H	5 seconds	20.00	6.2 hours	20.00
HP	5 seconds	10.00	6.2 hours	10.00
LR	5 seconds	20.00	50.0 hours	3.00

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Test	Initial voltage delay		Minimum Capacity		Cut-off Volts
	Time (MAX) to Volts		Storage Period		
			1-Week	4-Week	
IT	5 seconds	20.00	3.1 hours	3.0 hours	20.00
ITP	5 seconds	10.00	3.1 hours	3.0 hours	10.00
LT	60 seconds	20.00	2.0 hours	1.9 hours	20.00
LTP	60 seconds	10.00	2.0 hours	1.9 hours	10.00
HT	5 seconds	20.00	5.8 hours	5.6 hours	20.00
HTP	5 seconds	10.00	5.8 hours	5.6 hours	10.00
LRT	5 seconds	20.00	46.5 hours	45.0 hours	3.00

Capacity test requirements (3.6 & 4.6.4), Type III:

Test	Initial voltage delay		Minimum Capacity		Cut-off Volts
	Time (MAX) to Volts		Storage Period		
			1-Week	4-Week	
I	1 second	20.00	5.8 hours		20.00
IP	1 second	10.00	5.8 hours		10.00
L	1 second	20.00	3.2 hours		20.00
LP	1 second	10.00	3.2 hours		10.00
H	1 second	20.00	9.7 hours		20.00
HP	1 second	10.00	9.7 hours		10.00
IT	1 second	20.00	5.4 hours	5.2 hours	20.00
ITP	1 second	10.00	5.4 hours	5.2 hours	10.00
LT	1 second	20.00	3.0 hours	2.9 hours	20.00
LTP	1 second	10.00	3.0 hours	2.9 hours	10.00
HT	1 second	20.00	9.0 hours	8.7 hours	20.00
HTP	1 second	10.00	9.0 hours	8.7 hours	10.00

Abuse test pulse discharge capacity requirement, all types (3.5.12 & 4.6.2.12i): Type I – 9.4 ampere-hours; Type II – 6.2 ampere-hours; Type III – 10.8 ampere-hours.

METHODS OF EXAMINATION AND TEST:

Verification requirements. The following verification requirements of MIL-PRF-32271, identified therein by the phrase “when specified,” are applicable to each battery type as indicated below:

Test Requirement	Specification Reference	Applicability by PIN Suffix (M32271/1-)						
		12C	12D	12E	22C	22D	22E	32E
Parallel discharges	Tables III, IV, IX, & XI	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Connectors	4.6.1.7	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Battery charger connection	4.6.1.7.1	No	No	No	No	No	No	No
Static connection integrity	4.6.1.7.2	No	No	No	No	No	No	No
Dynamic connection integrity	4.6.1.7.3	No	No	No	No	No	No	No
Terminal integrity	4.6.1.8	No	No	No	No	No	No	No

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Test Requirement (continued)	Specification Reference	Applicability by PIN Suffix (M32271/1-)						
		12C	12D	12E	22C	22D	22E	32E
Complete discharge device	4.6.1.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State of charge device	4.6.1.10	No	Yes	Yes	No	Yes	Yes	Yes
State of charge data output	4.6.1.10	No	No	Yes	No	No	Yes	Yes
Cell charging	4.6.2.3	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nail penetration	4.6.2.4	Yes	Yes	Yes	No	No	No	Yes
Cell series string short	4.6.2.6	Yes	Yes	Yes	No	No	No	Yes
Parallel string charge protection ⁴	4.6.2.6.1	Yes	Yes	Yes	No	No	No	Yes
Charge protection	4.6.2.11	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Battery over-current protection	4.6.2.13	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Battery over-temperature protection	4.6.2.14	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Surface temperature	4.6.4.1	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity LR	4.6.4.1.5	No	No	No	Yes	Yes	Yes	No
Capacity LRT	4.6.4.1.9	No	No	No	Yes	Yes	Yes	No
Immersion	4.6.5.8	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Watertight integrity	4.6.5.9	No	No	No	No	No	No	No

Cell closed-circuit voltage test: When cells are tested as specified in 4.6.1.3, load each cell to be used in a single series cell string design with 2 amperes constant current, 1 ohm constant resistance, or 4 watts constant power. In the event that parallel cell arrangements are used (Types I and III only), use a load that produces a current equivalent to 2 amperes divided by the number of parallel cell strings to be used, as a minimum.

Battery closed-circuit voltage test: When tested as specified in 4.6.1.5.2, load each independent section of the battery with 2 amperes constant current, 5 ohms constant resistance, or 20 watts constant power.

Abuse test, pre-discharge: When tested as specified in 4.6.2.12a, discharge in the series mode with a load of either 2 amperes or 50 watts for: 2.5 hours for Type I batteries; 1.7 hours for Type II batteries; and 2.9 hours for Type III batteries.

Abuse test, pulse discharge: When tested as specified in 4.6.2.12i, discharge in the series mode with a load of 2.5 amperes for 1 minute followed by 1.8 amperes for 4 minutes, cycled continuously to 20.00 volts.

Battery over-current protection: When tested as specified in 4.6.2.13, apply a load to the batteries with the battery sections connected in the series mode and subject to a load of either 4 amperes or 96 watts.

Immersion: When tested as specified in 4.6.5.8, apply a load, with the battery connected in the series mode, of either 0.4 amperes or 4.6 watts during the storage and immersion time periods specified.

⁴ This test only required if parallel cell arrangements are used for Type I or III batteries

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Capacity tests (4.6.4):

Test ⁵	Discharge Rate	Duty Cycle
I	2 amperes	Continuous discharge to zero volts, followed by 2-ampere forced discharge for 10 minutes.
IP	4 amperes	Continuous discharge to zero volts, followed by 4-ampere forced discharge for 10 minutes
L	2 amperes	Continuous discharge to cut-off voltage
LP	4 amperes	Continuous discharge to cut-off voltage
H	2 amperes	Discharge for 5 minutes at 2 amperes, followed by 5 minutes on open circuit; repeat cycle continuously to cut-off voltage
HP	4 amperes	Discharge for 5 minutes at 4 amperes, followed by 5 minutes on open circuit; repeat cycle continuously to cut-off voltage
LR	145 mA/5.5W	Discharge in series mode at 145 milliamperes to 20.5 volts, then Discharge at 5.5 watts to cut-off voltage
IT	2 amperes	Continuous discharge to cut-off voltage
ITP	4 amperes	Continuous discharge to cut-off voltage
LT	2 amperes	Continuous discharge to cut-off voltage
LTP	4 amperes	Continuous discharge to cut-off voltage
HT	2 amperes	Discharge for 5 minutes at 2 amperes, followed by 5 minutes on open circuit; repeat cycle continuously to cut-off voltage
HTP	4 amperes	Discharge for 5 minutes at 4 amperes, followed by 5 minutes on open circuit; repeat cycle continuously to cut-off voltage
LRT	145 mA/5.5W	Discharge in series mode at 145 milliamperes to 20.5 volts, then Discharge at 5.5 watts to cut-off voltage

NOTES:

(This section contains information of a general nature which may be helpful, but is not mandatory)

Intended use: This battery is intended to operate portable military communications electronics equipment. It is used mainly in tactical radios, but is also used in sensors, chemical agent alarms, night vision equipment, and many other types of electronic equipment. Some applications use the battery for powering electric motors.

⁶Nominal ratings: The following are the nominal ratings for each battery type described by this specification sheet. They are provided for information purposes.

⁵ Discharge tests including the letter P require discharge with the two sections of the battery connected in parallel; all other capacity tests require discharge with the two sections connected in series.

⁶ Capacity and energy delivered by a battery are significantly affected by usage conditions, such as temperature and loads applied. If you have any questions about use of this battery in a particular device or circumstance, please visit the following web site (contact info is posted): <http://www.cerdec.army.mil/c2d/armypower>.

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Battery PIN:	M32271/1-12C, 12D or 12E (Li/MnO₂)		M32271/1-22C, 22D or 22E (Li/SO₂)		M32271/1-32E (Li/MnO₂)	
<i>Overall Dimensions:</i>	5 in H x 4.4 in W x 2.45 in D					
<i>MAX Weight:</i>	3.1 lbs (1.41 Kg)		2.33 lbs (1.06 Kg)		3.2 lbs (1.45 Kg)	
<i>Connection Type:</i>	<u>Series</u>	<u>Parallel</u>	<u>Series</u>	<u>Parallel</u>	<u>Series</u>	<u>Parallel</u>
<i>Voltage Range:</i>	20-33	10-16.5	20-30.5	10-15.25	20-33	10-16.5
<i>Nominal Capacity (Ampere-hours):</i>	10-11 Amp-hours	20-22 Amp-hours	6.8-7.2 Amp-hours	13.6-14.4 Amp-hours	11.6-13 Amp-hours	23.2-26 Amp-hours
<i>Nominal Energy (Watt-hours):</i>	208-260 Watt-hours		160-200 Watt-hours		220-305 Watt-hours	
<i>MAX Rated Power Output:</i>	50 watts		50 watts		50 watts	
<i>MAX Continuous load Rating:</i>	2 Amps	4 Amps	2 Amps	4 Amps	2 Amps	4 Amps
<i>MAX Pulse Rating:</i>	2.5 Amps	5 Amps	2.5 Amps	5 Amps	2.5 Amps	5 Amps
<i>Instantaneous Trip Rating:</i>	4 Amps	8 Amps	4 Amps	8 Amps	4 Amps	8 Amps
<i>Operating Temperature Range:</i>	-20 to 130°F (-29 to 55°C)				-4 to 130°F (-20 to 55°C)	
<i>Storage Temperature Range:</i>	-40 to 160°F (-40 to 71°C)					
<i>MAX Abusive Temperature (non-operating):</i>	195°F (91°C)				172°F (78°C)	

Other data:

Military Type Designations. The military type designations that relate to the PINs covered by this specification sheet are as follows: The BA-5390()/U designation has been used for the Type I PINs; the BA-5590()/U designation has been used for the Type II PINs; and the BA-7590()/U designation was used once for prototypes of the Type III PIN.

All battery types described by this specification sheet have two independent sections with each section designed to provide a nominal 12 volts in use. Sockets 1 and 4 on the connector are for one section; sockets 2 and 5 are the other. Using equipment can connect for either 12-volt or 24-volt operation by connecting these two sections in parallel or series respectively. When required, the state of charge device is located in section 1-4. For batteries with State of Charge data output (PINs ending with "E"), the ground connection for the SOC device is located on the battery connector at pin 1. See table above for differences in performance among the three types.

All battery types are subject to the transportation requirements of 49 CFR 173.185. M32271/1-12C, -12D, 12E and -32E batteries (solid cathode) contain more than 1 gram of lithium per cell and more than 2 grams per battery; M32271/1-22C, -22D and -22E (liquid cathode) batteries contain more than 0.5 grams per cell and 1 gram per battery. Check the appropriate Material Safety Data Sheet for actual lithium content. It should be noted that all non-rechargeable lithium batteries are restricted from shipment as cargo aboard passenger aircraft within, entering, or leaving the US.

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All battery types described by this specification sheet include a complete discharge device in order to render the battery non-reactive after use. If the battery is damaged, or if the device does not operate as indicated by an amber or yellow light, the battery is considered reactive waste. Any type, whether completely discharged or not, may be recycled after use. Universal waste rules, where applicable, apply only when recycling is the chosen disposal method.

The US Army CECOM Life Cycle Management Command (LCMC) publishes guidelines for the design of battery compartments for devices using both battery types I and II covered by this specification sheet: Technical Bulletin CECOM-TB-7. Please contact the CECOM LCMC Directorate for Safety at monm-amselsfsec@conus.army.mil for further information.

Navy safety tests of NAVSEA S9310-AQ-SAF-010 are required for this battery during first article testing. The test data provided from the testing will be used to evaluate applications for specific using devices and Navy platforms. Devices using any battery described by this specification sheet will require US Navy Safety Approval prior to use by Department of Navy users unless such approval has already been granted. Please consult with NAVSEA Instruction 9310.1 for further information.

Custodians:

Army – CR
Navy – NW
Air Force – 99
DLA – GS

Preparing activity:

Army – CR
(Project Number 6135-2006-004)

Review activities:

Navy – SH, AS, MC
Air Force – 71

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