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ERICAN NATIONAL STANDARD

American National Standard

ANSI C18.3M, Part 1-1999

American National Standard

For Portable Lithium Primary Cells and Batteries General and Specifications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
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ANSI C18.3M, Part 1-1999
Revision of
ANSI C18.3M-1991

American National Standard

For Portable Lithium Primary Cells and Batteries— General and Specifications

Secretariat:

National Electrical Manufacturers Association

Approved February 4, 1999

American National Standards Institute

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Foreword (This Foreword is not part of American National Standard C18.3M, Part 1-1999)

This edition of an American National Standard for Portable Lithium Primary Cells and Batteries is based in part on the previous American National Standard for Lithium Primary Batteries--Specifications, ANSI C18.3M-1991, and recognizes the work of the International Electrotechnical Commission (refer to IEC Publications 60086-1 and 60086-2) in establishing world-wide standard requirements for portable lithium primary batteries. This edition includes three chemistries:

Lithium/carbon monofluoride
Lithium/manganese dioxide
Lithium/iron disulfide

In April 1996, the then ANSI Accredited Standards Committee C18 on Specifications for Dry Cells and Batteries established a new general format for the publication of its standards, dividing this standard into two parts. Part 1 of this American National Standard for Portable Lithium Primary Cells and Batteries contains two basic sections. The first section has general requirements and information, such as the scope, applicable definitions, general descriptions of battery dimensions, terminal requirements, marking requirements, general design conditions, test conditions, etc. Section 2 of Part 1 is comprised of specification sheets for various types of cells and batteries. **Part 2 of the standard, a separate document, contains safety requirements.**

Suggestions for the improvement of this standard are welcome. They should be sent to the National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209, Attention: Secretary ANSI ASC C18.

This standard was processed and approved for submittal to ANSI by the American National Standards Committee C18 on Portable Cells and Batteries. Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time Committee C18 approved this standard, it had the following members:

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Michael H. Babiak, Vice-chairperson
Ronald R. Runkles, Secretary

Organization Represented:	*Name of Representative:*
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Consultant, U.S. Navy	Albert Himy
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Wilson Greatbatch Limited	William D. Clark Paul W. Krehl (Alt.)

The members of Subcommittee C18-3 for Portable Lithium Primary Cells and Batteries who contributed to the development of this standard are:

Michael H. Babiak, Chairperson
James C. DeJager, Vice-chairperson
Ronald R. Runkles, Secretary

James Barnes
William D. Clark
Michael Firshein
James Gucinski
Mel Hammer
Henry Heirigs
Albert Himy
John Inman
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Paul Krehl
David Linden
Terrence Telzrow
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Steven Wicelinski

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For Portable Lithium Primary Cells and Batteries— General and Specifications

1 General

Note—Part 1 does not include safety requirements, which are in Part 2.

1.1 Scope and purpose

1.1.1 Scope

This standard applies to portable lithium primary cells and batteries. This edition includes the following electrochemical systems:

a) Lithium/carbon monofluoride;
b) Lithium/manganese dioxide;
c) Lithium/iron disulfide.

1.1.2 Purpose

The purpose of this publication is:

a) To ensure the electrical and physical interchangeability of products from different manufacturers;
b) To minimize proliferation of cell and battery types;
c) To define a standard of performance and provide guidance for its assessment;
d) To provide guidance to consumers, manufacturers, and designers.

This is achieved by specifying nomenclature, dimensions, polarity, terminals, marking, test conditions, and procedures.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

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ANSI/ASME Y14.5-1994, *Dimensioning and tolerancing*

ANSI C18.3, Part 2-1999, *For portable lithium primary cells and batteries--safety standard*

1.3 Definitions

1.3.1 application test: A test which simulates the actual use of a battery in a specific application.

1.3.2 battery: One or more cells, including case, terminals, and markings.

1.3.3 battery, coin: Small round battery, in which the overall height is less than the diameter.

1.3.4 battery, portable: A battery that is easily carried.

1.3.5 battery, primary lithium: A battery that is not designed to be charged and has metallic lithium or lithium alloy as its anode.

1.3.6 battery, prismatic: A battery with non-round geometry.

1.3.7 battery, round: Cylindrical battery, the overall height of which is greater than or equal to its diameter.

1.3.8 capacity: Quantity of electricity, usually expressed in Ampere-hours (Ah), which a battery can deliver under specified discharge conditions.

1.3.9 cell: Basic functional unit providing a source of electrical energy by direct conversion of chemical energy. The cell consists of an assembly of electrodes, separators, electrolyte, container, and terminals.

1.3.10 cell, primary: A cell that is not designed to be recharged electrically.

1.3.11 discharge: An operation during which a battery delivers power (current and voltage) to an external circuit by the conversion of chemical energy into electrical energy.

1.3.12 leakage: The escape of electrolyte from a cell or battery.

1.3.13 minimum average duration: The required average value of service output under specified test conditions.

1.3.14 polarity: The electrical convention used to describe the direction in which current flows on discharge.

1.3.15 rating test: A discharge test used to measure the service output of a battery.

1.3.16 resistance, internal: Apparent opposition to current flow within a battery that manifests itself as a drop in voltage proportional to the discharge current. Its value depends on battery design, state of charge, temperature, and age.

1.3.17 service output: Capacity or energy output of a cell or battery under specified conditions of discharge. It may be expressed as duration, number of pulses, ampere-hours, or in watt-hours.

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1.3.18 small cell or battery: A cell or battery fitting within the limits of the truncated cylinder as defined in Figure 1.

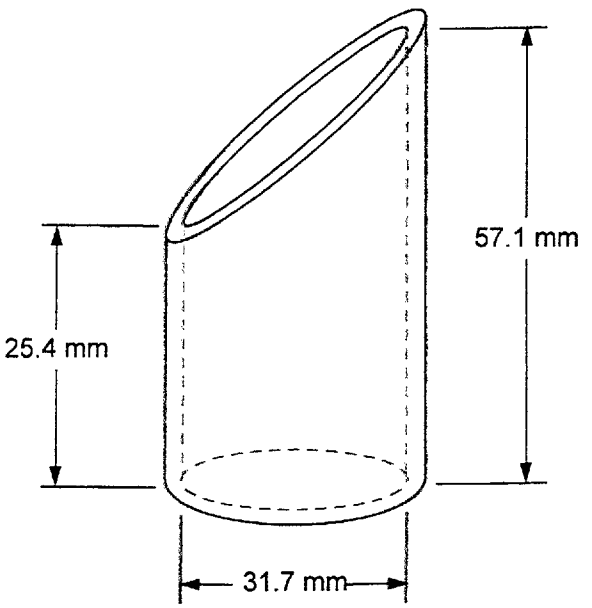


Figure 1 – Small cell or battery gauge (inner dimensions)

1.3.19 terminals: Accessible conductive parts provided for the connection of an external circuit to the positive (+) and negative (-) electrodes of the cell or battery.

1.3.20 voltage, closed circuit (CCV): The voltage of a battery when external current is flowing.

1.3.21 voltage, end point: Specified voltage of a battery, when supplying power, at which the discharge is terminated.

1.3.22 voltage, nominal: Suitable approximate value used to designate or identify the voltage of a cell, battery, or electrochemical system.

1.3.23 voltage, open circuit (OCV): The voltage of a battery when no external current is flowing.

1.4 Requirements

1.4.1 Designations, chemical systems, and voltages

1.4.1.1 Designations

Batteries are listed by their ANSI numbers and letter suffixes. Definitions of the letters are:

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LB Lithium/carbon monofluoride [$Li/(CF)_x$]
LC Lithium/manganese dioxide [Li/MnO_2]
LF Lithium/iron disulfide [Li/FeS_2]

1.4.1.2 Chemical systems and voltages

Table 1 – Chemical systems and voltages

Chemical system	Positive electrode	Electrolyte	Negative electrode	Nominal voltage	Max. open circuit voltage
Lithium/ carbon monofluoride	Carbon monofluoride	Organic	Lithium	3.0 volts	3.7 volts
Lithium/ manganese dioxide	Manganese dioxide	Organic	Lithium	3.0 volts	3.7 volts
Lithium/ iron disulfide	Iron disulfide	Organic	Lithium	1.5 volts	1.83 volts

1.4.2 Battery dimensions

In some cases, a battery is adequately defined by two or three linear dimensions. For some batteries, it is necessary to describe the battery in greater detail by specifying additional battery dimensions. Asymmetry of battery shape or terminals enable the compartment to be designed so that batteries can be inserted only with the correct orientation.

1.4.2.1 Dimension symbols

Symbols denoting various dimensions are as follows (note that some of the symbols and terms are defined in 1.4.2.2):

A *maximum overall height of the battery*
B minimum distance between the flats of the positive and negative terminals
C minimum outer diameter of the flat surface of the negative terminal
E maximum recess of the flat surface of the negative terminal
F maximum diameter of the positive terminal within the specified projection height
G minimum projection height of the flat surface of the positive terminal
K minimum projection of the flat surface of the negative terminal
L maximum diameter of the negative terminal within the specified projection height
M minimum diameter of the flat surface of the negative contact
Ⓜ *maximum material condition*
N minimum diameter of the flat surface of the positive terminal
∅ maximum and minimum diameters of the battery
⊕ true position
P datum feature
T positional tolerance of the positive terminal

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1.4.2.2 Dimension definitions

1.4.2.2.1 Datum

A datum is a theoretically exact point, axis, or plane derived from the true geometric counterpart of a specified datum feature. It is the origin from which the location or geometric characteristics of features of a part are established.

1.4.2.2.2 Datum feature

A datum feature is an actual feature of a part that is used to establish a datum.

1.4.2.2.3 Datum feature symbol

A datum feature symbol is used to identify an actual part feature serving as a datum feature. An example of a datum feature symbol would be "[P] ."

1.4.2.2.4 Maximum material condition

The maximum material condition is the condition in which a feature of size contains the maximum amount of material within the stated limits of size (e.g., minimum hole diameter, maximum shaft diameter).

1.4.2.2.5 Positional tolerance

A positional tolerance defines a zone within which the center, axis, or center plane of a feature of given size is permitted to vary from a true position.

1.4.2.2.6 True position

A true position is the theoretically exact location of a feature established by basic dimensions.

1.4.2.3 Positional tolerancing of the positive terminal

The positive terminal shall be located within the allowed tolerance T with respect to the diameter of the cell. The diameter of the cell is specified to be the datum feature. The tolerance is indicated at the maximum material condition, or when the terminal is actually at its largest diameter. Additional tolerance is obtained by making the positive terminal smaller in diameter, subject to passing the N dimension for positive terminal minimum flat diameter.

1.4.2.4 Basic shapes of batteries

Basic battery shapes, including dimension symbols, are illustrated in Figures 2 through 3.

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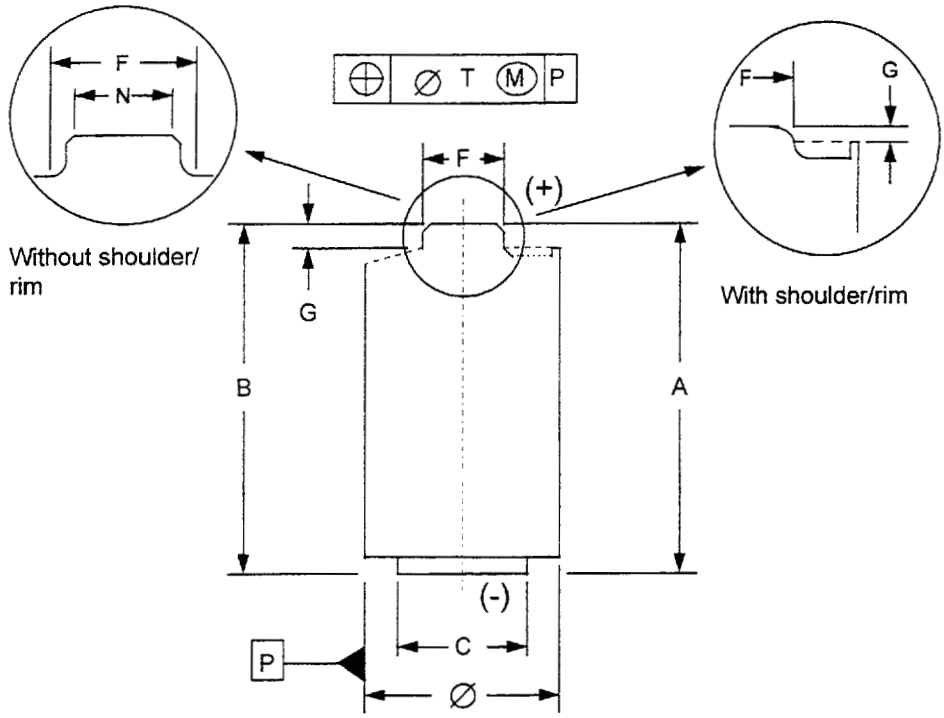


Figure 2A – Round battery (protruding negative)

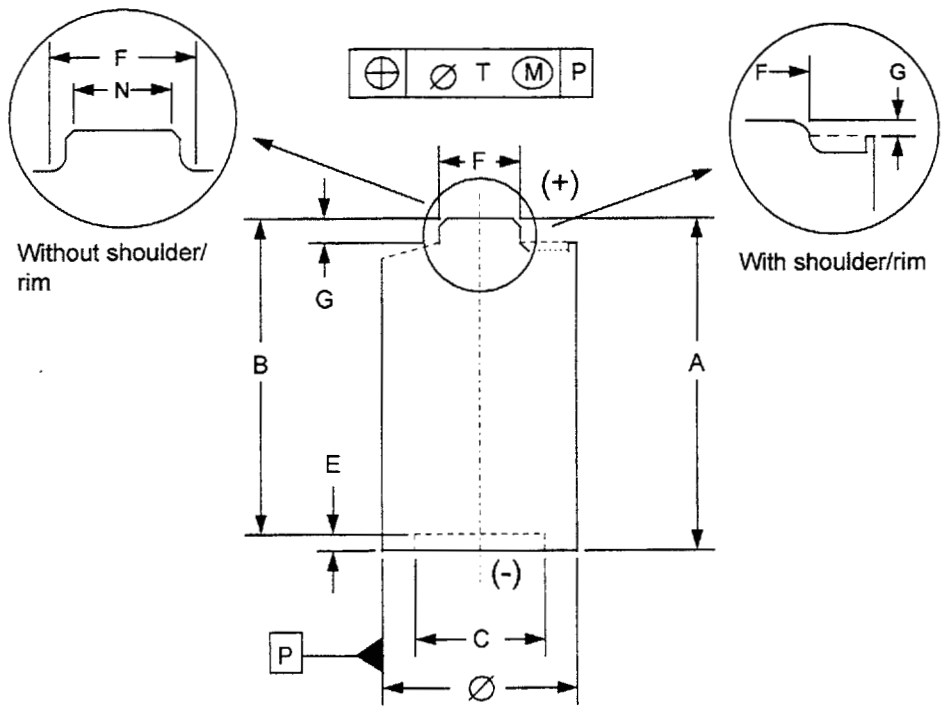


Figure 2B – Round battery (recessed negative)

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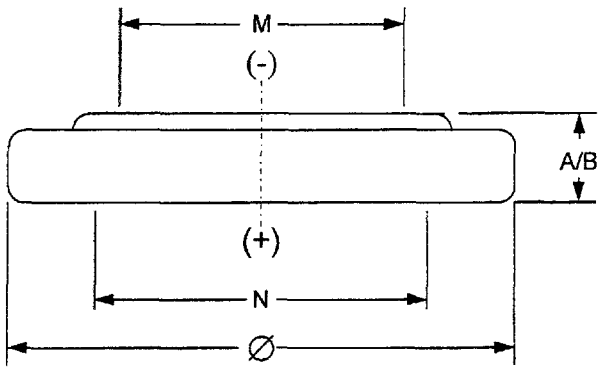


Figure 3 – Coin battery

1.4.3 Terminals

1.4.3.1 General

Each cell or battery shall be supplied with terminals as specified in the appropriate specification sheet and according to the following general comments.

1.4.3.2 Cap and base

This type of terminal is used for batteries that have specified dimensions according to Figure 2 and have the cylindrical side insulated from the terminals. The metal cap on the center electrode and the bottom of the battery serve as the terminals.

1.4.3.2.1 Protruding negative terminal (Figure 2A)

The bottom construction shall ensure good electrical contact when the battery is placed on a flat metal surface.

1.4.3.2.2 Recessed negative terminal (Figure 2B)

The recessed terminal shall be such that when two or more batteries are placed in series, the cap of one battery will not project within the recess in the bottom of the adjacent battery to a degree that will cause the height of the stacked batteries, measured terminal-to-terminal, to be less than the number of batteries multiplied by their B dimension.

1.4.3.3 Cap and case

This type of terminal is used for batteries that have specified dimensions according to Figure 3. The cylindrical side of the battery forms part of the positive terminal.

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1.4.3.4 Snap

This type of terminal consists of a stud for the positive terminal and a socket for the negative terminal. These shall be made from nickel-plated steel or other suitable material. They shall be designed to provide a secure physical and electrical connection, when fitted with similar corresponding parts for connection to an electrical circuit.

1.4.4 General design considerations

1.4.4.1 Dimensional stability

The dimensions of batteries shall remain within specified dimensional tolerances under conditions of storage and discharge, specified herein.

1.4.4.2 Leakage

Batteries shall not leak during discharge when tested under the conditions given in Section 2.2 of Part 1.

1.4.5 Test conditions

1.4.5.1 Environmental conditions

1.4.5.1.1 Standard temperature

The ambient temperature surrounding the battery shall be 21 ± 2°C. During short periods only, the temperature may deviate from these limits without exceeding 21 ± 5°C.

1.4.5.1.2 Standard relative humidity

The relative humidity shall be between 35% and 65%, unless otherwise specified.

1.4.5.2 Discharge conditions

Unless otherwise specified, discharge tests are to be carried out on fresh batteries at standard temperature and standard relative humidity within 30 days after the shipment by the manufacturer.

All minimum average duration values given in this specification refer to batteries discharged under the above stated conditions.

1.4.6 Test requirements

1.4.6.1 Resistive load

The value of the resistive load (which includes all parts of the external circuit) shall be accurate to within 0.5%.

The load in ohms shall appear in the individual specification sheets and shall be one of the following, along with their multiples:

1.00	1.10	1.20	1.30	1.50	1.60	1.80	2.00
2.20	2.40	2.70	3.00	3.30	3.60	3.90	4.30
4.70	5.10	5.60	6.20	6.80	7.50	8.20	9.10

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The value of any other non-resistive loads shall be specified in the individual specification sheet and shall be accurate to within 1%.

1.4.6.2 Time periods

The closed circuit and open circuit periods shall be as specified in the individual specification sheets.

1.4.6.3 Determination of service output

To determine the service output, batteries shall be discharged on each test, as specified in the individual specification sheet, until the closed circuit voltage drops for the first time below the specified end point voltage.

When a specification sheet designates more than one service output test, batteries shall meet the requirements of all these tests to be in compliance with this standard.

1.4.6.4 Voltage measurement

The accuracy of voltage measurements shall be within 0.01 V for each 1.5 V. The resistance of the measuring instrument shall be at least 10 times the discharge resistance, but with a minimum of 20,000 ohms per volt of scale.

1.4.6.5 Leakage and deformation determination

After the service output has been determined, using the criteria on the individual specification sheets, the discharge shall be continued in the same way until the closed circuit voltage drops for the first time below 40% of the nominal voltage of the battery. The requirements of 1.4.4.1 and 1.4.4.2 shall be met, except that a decrease in battery height of 0.25 mm below the minimum specified value is allowed for button/coin cells of LB and LC systems.

1.4.6.6 Methods of determining discharge test conditions

The discharge tests in this standard are divided into two categories:

a) Application
b) Rating or capacity

In both categories of test, loads are specified in accordance with 1.4.6.1.

1.4.6.7 Procedures to check conformance to a specified minimum average duration

a) Test nine batteries.
b) Calculate the average without the exclusion of any results.
c) If this average is equal to or greater than the specified value and no more than one battery has a service output of less than 80% of the specified value, the batteries are considered to conform for service output.
d) If this average is less than the specified value and/or more than one battery has a service output of less than 80% of the specified value, repeat the test on another sample of nine batteries and calculate the average as previously.
e) If the average of this second test is equal to or greater than the specified value and no more than one battery has a service output of less than 80% of the specified value, the batteries are considered to conform for service output.

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f) If the average of the second test is less than the specified value and/or more than one battery has a service output of less than 80% of the specified value, the batteries are considered not to conform and no further testing is permitted.

1.4.7 Marking

1.4.7.1 General

At least the following items shall be marked on the battery or package:

a) Battery system (lithium or Li);
b) Designation;
c) Polarity of terminal (when applicable);
d) Nominal voltage;
e) Year and month or week of manufacture, which may be in code, or the expiration date;
f) Name or trade mark of the manufacturer or supplier;
g) Warnings or cautionary notes where applicable;
h) Caution for ingestion (small batteries only).

1.4.7.2 Small size batteries

When this subclause is invoked on the individual specifications sheet, items b) and c) shall be marked on the battery. Items a), d), e), f), g), and h) may be given on the immediate packing instead of on the battery.

NOTE—Batteries that are considered "small" are so noted on the individual battery specification sheets in 2.2, Part 1.

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2 SPECIFICATIONS

2.1 Specification sheet reference

ANSI Designation	IEC Designation	Volts	Chemistry	Page
15LF	–	1.5	Lithium iron disulfide	15
1406LC	2CR11108	6	Lithium manganese dioxide	16
1604LC	–	9	Lithium manganese dioxide	17
5000LB	BR2016	3.0	Lithium carbon monofluoride	18
5000LC	CR2016	3.0	Lithium manganese dioxide	18
5001LB	BR2320	3.0	Lithium carbon monofluoride	19
5002LB	BR2325	3.0	Lithium carbon monfluoride	20
5002LC	–	3.0	Lithium manganese dioxide	20
5003LC	CR2025	3.0	Lithium manganese dioxide	21
5004LC	CR2032	3.0	Lithium manganese dioxide	22
5008LC	CR11108	3.0	Lithium manganese dioxide	23
5009LC	CR1620	3.0	Lithium manganese dioxide	24
5011LC	CR2430	3.0	Lithium manganese dioxide	25
5012LC	CR1220	3.0	Lithium manganese dioxide	26
5018LC	CR17345	3.0	Lithium manganese dioxide	28
5020LB	BR1225	3.0	Lithium carbon monofluoride	30
5024LC	CR-P2	6.0	Lithium manganese dioxide	31
5026LC	–	3.0	Lithium manganese dioxide	32
5028LC	CR14250	3.0	Lithium manganese dioxide	33
5029LC	CR2450	3.0	Lithium manganese dioxide	34
5032LC	2CR5	6.0	Lithium manganese dioxide	35
5043LC	–	3.0	Lithium manganese dioxide	36
5044LC	–	3.0	Lithium manganese dioxide	37
5046LC	CR2	3.0	Lithium manganese dioxide	38

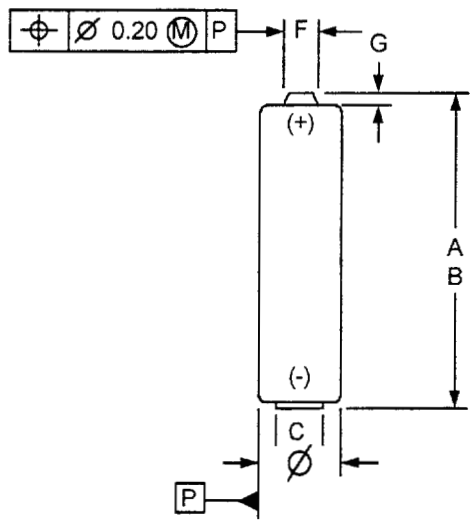
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2.2 Battery specification sheets

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Dimension	Millimeters	Inches
A (Max)	50.5	1.988
B (Min)	49.2	1.937
C (Min)	7.0	0.277
F (Max)	5.5	0.217
G (Min)	1.0	0.039
N (Min)	4.2	0.165
∅ (Max)	14.5	0.571
∅ (Min)	13.5	0.531

NOTES
1 Terminals: Cap and base
2 B (Min): 49.5 mm [1.949 in] is under consideration.
3 G (Min): 1.2 mm [0.047 in] is under consideration.

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ANSI C18.3M, Part 1-1999	Battery Specification	15

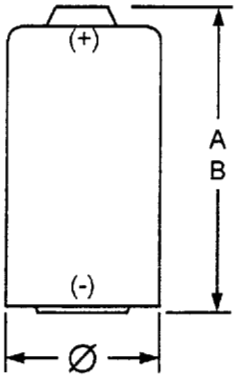
Designation	ANSI	15LF
	IEC	[FR6]
Electrochemical system		Lithium/ iron disulfide
Nominal voltage		1.5
Maximum off-load voltage		1.83

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Photo	1.8	15 sec/min 24 hr/d	0.9	750 pulses
Video Camera	1000 mA	24 hr/d	1.0	90 min

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	1406



Dimension	Millimeters	Inches
A (Max)	25.2	0.992
B (Min)	23.9	0.941
Ø (Max)	13.0	0.512
Ø (Min)	12.0	0.472

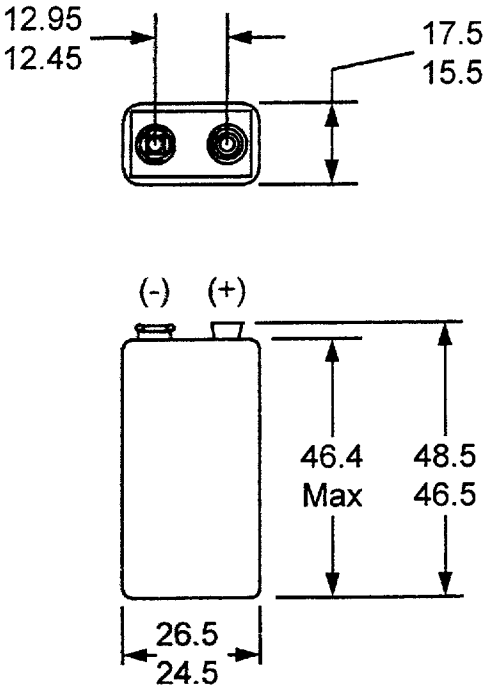
NOTE—Terminals: Cap and base	**Small battery**

Designation	**ANSI**	**1406LC**
	IEC	2CR11108
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		6.0
Maximum off-load voltage		7.4

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	30K	24 hr	3.6	800 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	1604



Millimeters	Inches
12.45	0.490
12.95	0.510
15.5	0.610
17.5	0.689
24.5	0.965
26.5	1.043
46.4	1.827
46.5	1.831
48.5	1.909

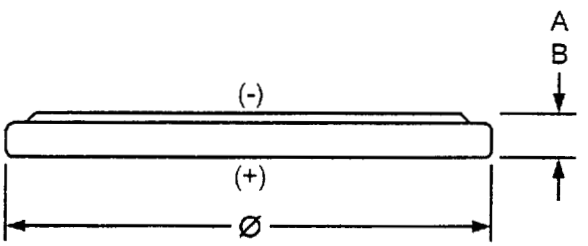
NOTE—Terminals: Snap

Designation	ANSI	1604LC
	IEC	—
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		9.0
Maximum off-load voltage		11.1

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	1800	24 hr	5.4	225 hr
Radio	510	4 hr	5.4	65 hr
Toy	270	1 hr	5.4	33 hr
Smoke Detector	Under consideration			

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5000



Dimension	Millimeters	Inches
A (Max)	1.6	0.063
B (Min)	1.4	0.055
Ø (Max)	20.0	0.787
Ø (Min)	19.7	0.776

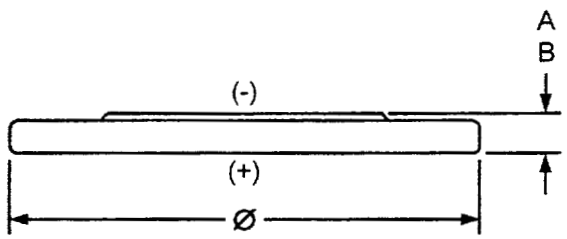
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5000LB**	**5000LC**	
	IEC	BR2016	CR2016	
Electrochemical system		Lithium/ carbon monofluoride	Lithium/ manganese dioxide	
Nominal voltage		3.0	3.0	
Maximum off-load voltage		3.7	3.7	

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**		
Rating	30K	24 hr	2.0	780 hr	780 hr	

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5001



Dimension	Millimeters	Inches
A (Max)	2.0	0.079
B (Min)	1.8	0.071
Ø (Max)	23.0	0.906
Ø (Min)	22.6	0.890

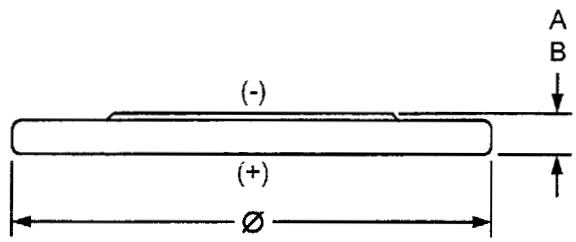
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5001LB**
	IEC	BR2320
Electrochemical system		Lithium/ carbon monofluoride
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	15K	24 hr	2.0	700 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5002



Dimension	Millimeters	Inches
A (Max)	2.5	0.098
B (Min)	2.2	0.087
Ø (Max)	23.0	0.906
Ø (Min)	22.6	0.890

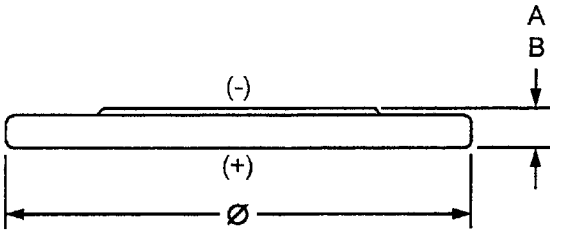
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5002LB**	**5002LC**	
	IEC	BR2325	---	
Electrochemical system		Lithium/ carbon monofluoride	Lithium/ manganese dioxide	
Nominal voltage		3.0	3.0	
Maximum off-load voltage		3.7	3.7	

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**		
Rating	15K	24 hr	2.0	950 hr	950 hr	

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5003



Dimension	Millimeters	Inches
A (Max)	2.5	0.098
B (Min)	2.2	0.087
Ø (Max)	20.0	0.787
Ø (Min)	19.7	0.776

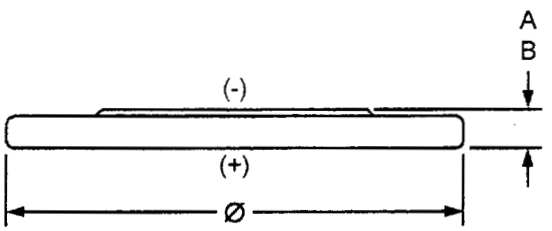
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5003LC**
	IEC	CR2025
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	15K	24 hr	2.0	675 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5004



Dimension	Millimeters	Inches
A (Max)	3.2	0.126
B (Min)	2.9	0.114
Ø (Max)	20.0	0.787
Ø (Min)	19.7	0.776

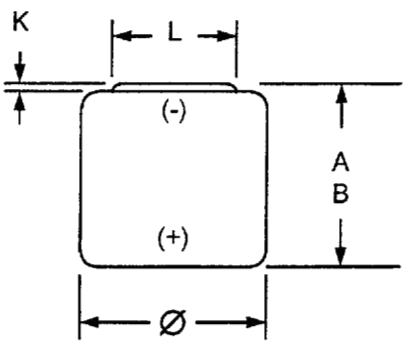
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5004LC**
	IEC	CR2032
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	15K	24 hr	2.0	1000 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5008



Dimension	Millimeters	Inches
A (Max)	10.8	0.425
B (Min)	10.4	0.409
K (Min)	0.2	0.008
L (Max)	9.0	0.354
Ø (Max)	11.6	0.457
Ø (Min)	11.4	0.449

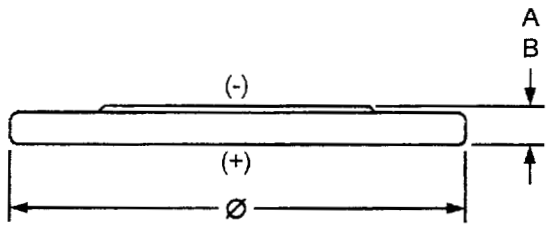
NOTE—Terminals: Cap and case	Small Battery

Designation	ANSI	5008LC
	IEC	CR11108
Electrochemical system		Lithium manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration	
Rating	15K	24 hr	2.0	900 hr	

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5009



Dimension	Millimeters	Inches
A (Max)	2.0	0.079
B (Min)	1.8	0.071
∅ (Max)	16.0	0.630
∅ (Min)	15.7	0.618

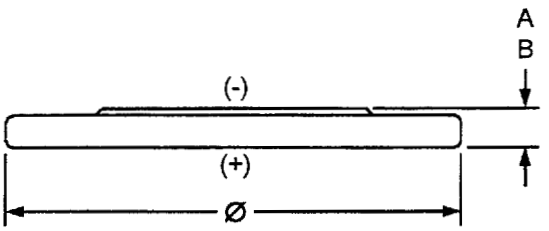
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5009LC**
	IEC	CR1620
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	47K	24 hr	2.0	1150 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5011



Dimension	Millimeters	Inches
A (Max)	3.0	0.118
B (Min)	2.7	0.106
Ø (Max)	24.5	0.965
Ø (Min)	24.2	0.953

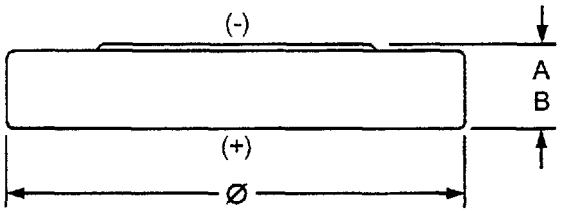
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5011LC**
	IEC	CR2430
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	15K	24 hr	2.0	1350 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5012



Dimension	Millimeters	Inches
A (Max)	2.0	0.079
B (Min)	1.8	0.071
Ø (Max)	12.5	0.492
Ø (Min)	12.2	0.480

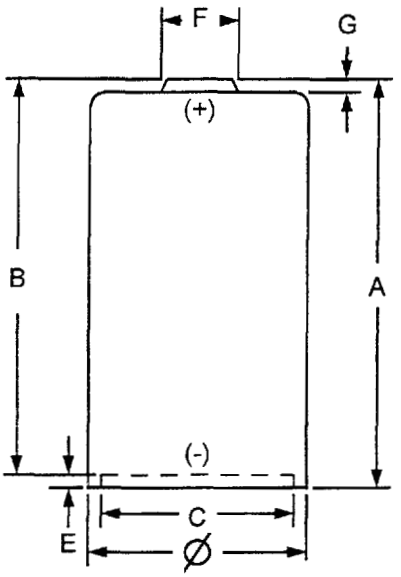
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5012LC**
	IEC	CR1220
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	62K	24 hr	2.0	750 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5018



Dimension	Millimeters	Inches
A (Max)	34.5	1.358
B (Min)	33.5	1.319
C (Min)	11.0	0.433
E (Max)	0.9	0.035
E (Min)	0.5	0.020
F (Max)	9.6	0.378
G (Min)	1.0	0.039
Ø (Max)	17.0	0.669
Ø (Min)	16.0	0.630

NOTE—Terminals: Cap and recessed base	**Small battery**

Designation	**ANSI**	**5018LC**
	IEC	CR17345
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

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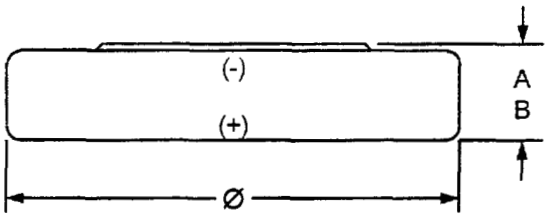
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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5018

ANSI Designation				5018LC	
Typical use	Load	Daily period	End point V	Minimum average duration	
Rating	100Ω	24 hr	2.0	45 hr	
Photo	900 mA	3 sec on 27 sec off 24 hr	1.55	1400 pulses	

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5020



Dimension	Millimeters	Inches
A (Max)	2.5	0.098
B (Min)	2.2	0.087
∅ (Max)	12.5	0.492
∅ (Min)	12.2	0.480

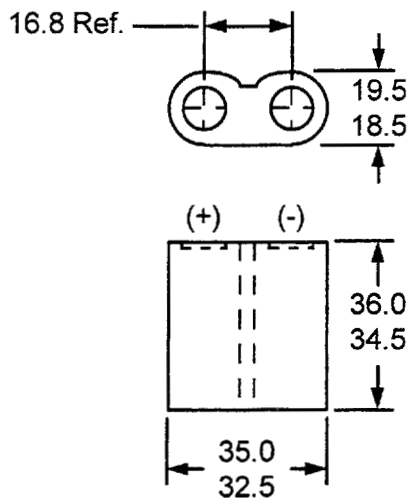
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5020LB**
	IEC	BR1225
Electrochemical system		Lithium/ carbon monofluoride
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	30K	24 hr	2.0	395 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5024



Millimeters	Inches
16.8	0.661
18.5	0.728
19.5	0.768
32.5	1.280
34.5	1.358
35.0	1.378
36.0	1.417

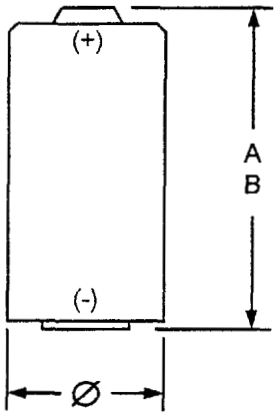
NOTE—Terminals: Flat recessed contacts	

Designation	ANSI	5024LC
	IEC	CR-P2
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		6.0
Maximum off-load voltage		7.4

ANSI Designation				5024LC
Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	200	24 hr	4.0	40 hr
Photo	900 mA	3 sec on 27 sec off 24 hr	3.1	1400 pulses

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5026



Dimension	Millimeters	Inches
A (Max)	33.5	1.319
B (Min)	32.0	1.260
Ø (Max)	17.0	0.669
Ø (Min)	16.0	0.630

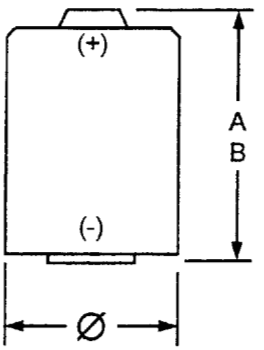
NOTE—Terminals: Cap and base	**Small battery**

Designation	**ANSI**	**5026LC**
	IEC	---
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	2K	24 hr	2.0	1020 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5028



Dimension	Millimeters	Inches
A (Max)	25.0	0.981
B (Min)	23.5	0.925
Ø (Max)	14.5	0.571
Ø (Min)	13.5	0.531

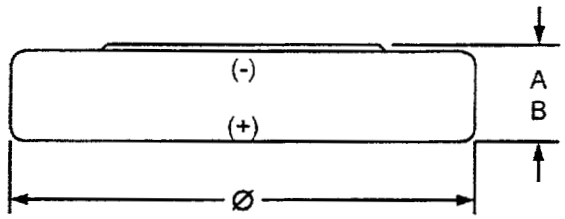
NOTE—Terminals: Cap and base	**Small battery**

Designation	**ANSI**	**5028LC**
	IEC	CR14250
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	3K	24 hr	2.0	750 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5029



Dimension	Millimeters	Inches
A (Max)	5.0	0.197
B (Min)	4.6	0.181
Ø (Max)	24.5	0.965
Ø (Min)	24.2	0.953

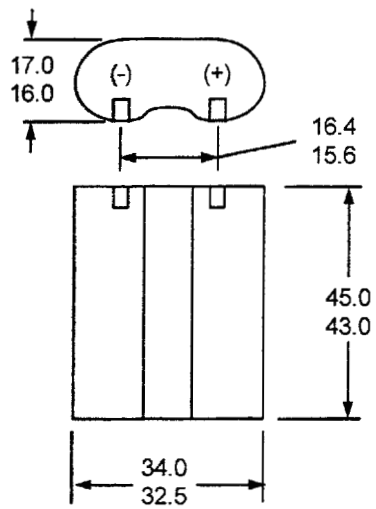
NOTE—Terminals: Cap and case	**Small battery**

Designation	**ANSI**	**5029LC**
	IEC	CR2450
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	7.5K	24 hr	2.0	1325 hr

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ANSI C18.3M, Part 1-1999	Battery Specification	5032



Millimeters	Inches	Millimeters	Inches
15.6	0.614	32.5	1.280
16.0	0.630	34.0	1.339
16.4	0.646	43.0	1.693
17.0	0.669	45.0	1.772

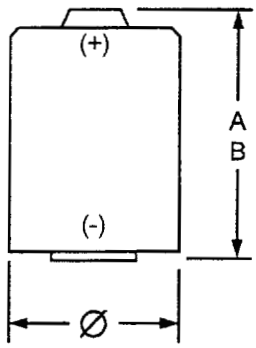
NOTE—Terminals: Flat contact

Designation	ANSI	5032LC
	IEC	2CR5
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		6.0
Maximum off-load voltage		7.4

Typical use	Load (ohms)	Daily period	End point V	Minimum average duration
Rating	200	24 hr/d	4.0	40 hr
Photo	900 mA	3 sec on 27 sec off 24 hr	3.1	1400 pulses

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5043



Dimension	Millimeters	Inches
A (Max)	23.0	0.906
B (Min)	22.0	0.866
Ø (Max)	17.0	0.670
Ø (Min)	16.0	0.630

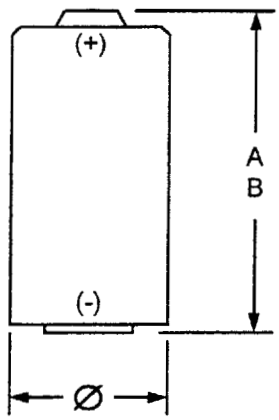
NOTE—Terminals: Cap and base	**Small battery**

Designation	**ANSI**	**5043LC**
	IEC	---
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	3K	24 hr	2.0	825 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5044



Dimension	Millimeters	Inches
A (Max)	33.5	1.319
B (Min)	32.0	1.260
Ø (Max)	14.5	0.571
Ø (Min)	13.5	0.531

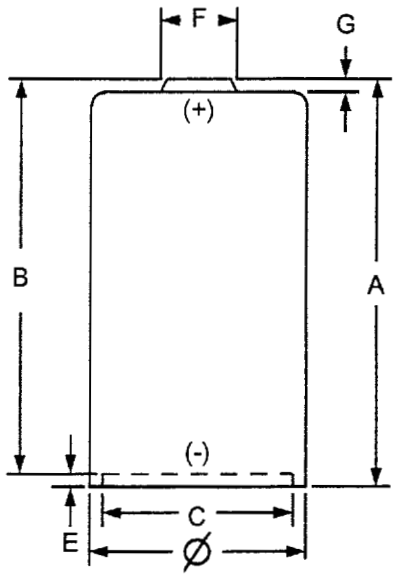
NOTE—Terminals: Cap and base	**Small battery**

Designation	**ANSI**	**5044LC**
	IEC	---
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

Typical use	**Load (ohms)**	**Daily period**	**End point V**	**Minimum average duration**
Rating	2K	24 hr	2.0	600 hr

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5046



Dimension	Millimeters	Inches
A (Max)	27.0	1.063
B (Min)	25.8	1.015
C (Min)	8.5	0.335
E (Max)	0.5	0.020
E (Min)	0.05	0.002
F (Max)	6.5	0.256
G (Min)	0.7	0.027
∅ (Max)	15.6	0.614
∅ (Min)	15.1	0.594

NOTE—Terminals: Cap and recessed base	**Small battery**

Designation	**ANSI**	**5046LC**
	IEC	CR2
Electrochemical system		Lithium/ manganese dioxide
Nominal voltage		3.0
Maximum off-load voltage		3.7

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ANSI C18.3M, Part 1-1999	BATTERY SPECIFICATION	5046

ANSI Designation				5046LC	
Typical use	Load	Daily period	End point V	Minimum average duration	
Photo	900 mA	3 sec on 27 sec off 24 hr	1.55	900 pulses	
Photo	1200 mA	3 sec on 7 sec off 24 hr	1.30	600 pulses	
Rating	100Ω	24 hr	2.0	25 hr	

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Annex A
(informative)

Methods of determining load and test conditions

A.1 Application tests

a) The discharge load is calculated from the average current and average operating voltage of the most popular representative equipment.

b) The functional end-point voltage and the discharge load value are obtained from the data on all the equipment measured.

c) The median class defines the discharge load value and the end-point voltage to be used for the discharge test.

d) If the data are concentrated in two or more widely separated groups, more than one test may be required.

e) The daily discharge period should reflect typical consumer use.

f) In order to minimize the proliferation of application tests, the tests specified should be those accounting for 80% of the market by battery size with a limited number of tests.

g) Application tests should be used unless they require an excessive amount of time to run.

A.2 Capacity or rating tests

For capacity/rating tests, the value of the discharge load shall be selected such that the service output approximates 30 days.

When full capacity is not realized within the required time period, the service output may be extended to the shortest suitable duration thereafter by selecting a more appropriate discharge load.

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Annex B
(informative)

Guidance for packaging, handling, storage, and transportation

B.1 Introduction

The greatest satisfaction to the user of primary batteries results from a combination of good practices during manufacture, distribution, and use. The purpose of this annex is to describe these good practices in general terms and, more specifically, to warn against procedures known from experience to be undesirable. It takes the form of advice to battery manufacturers, distributors, equipment designers, and users.

NOTE—Certain Department of Transportation regulations apply to the packaging and transportation of lithium batteries.

B.2 Packing

The packing should be adequate to avoid mechanical damage during transport, handling, and stacking. The materials and pack design should be chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals, and ingress of moisture.

B.3 Transport and handling

Shock and vibration should be kept to a minimum. For instance, boxes should not be thrown off trucks, slammed into position, or piled so high as to overload battery containers below. Protection from inclement weather should be provided.

B.4 Storage and stock rotation

B.4.1 For normal storage, the temperature should be between +10°C and +25°C and never exceed +30°C. Batteries should therefore not be stored next to radiators or boilers, nor in direct sunlight. Extremes of humidity (below 35% and above 95% relative humidity) for sustained periods should be avoided since they are detrimental to both batteries and packing.

B.4.2 Although the storage life of batteries at room temperature is good, storage is improved at lower temperatures provided special precautions are taken. The batteries should be enclosed in special protective packing (such as sealed plastic bags or variants) which should be retained to protect them from condensation during the time they are warming to ambient temperature. Also, accelerated warming is harmful.

B.4.3 Batteries may be stored while fitted in equipment or packages if determined suitable by the battery manufacturer.

B.4.4 Batteries should be shipped promptly after manufacture. In order that stock rotation (first-in, first-out) can be practiced, storage areas and displays should be properly designed and packs adequately marked.

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B.5 Display and sales points

B.5.1 When batteries are unpacked, care should be taken to avoid physical damage and accidental discharge.

B.5.2 The battery manufacturer should provide some information to assist the retailer to select the correct battery for the user's application.

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Annex C
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Reliability guidelines

C.1 Consumer/user

In order to assure that batteries and appliance operate reliably, the following should be taken into consideration:

a) Since batteries are sensitive to high temperature, when storing them, keep them in a cool dry place.
b) Battery contacts need to be clean, both on the battery and in the appliance.
c) Batteries should be removed from the appliance when not being used for long periods of time (months).
d) Choose the proper battery for the intended application. Follow the recommendations supplied with the appliance.
e) Never charge a battery unless the battery label specifically states that it is a rechargeable battery.
f) Always use the cord supplied with the appliance, since other cords may result in the batteries in the appliance being charged.

C.2 The designer

The following are considerations for the designer:

a) Choose the proper battery for the intended application.
b) Never solder or weld to a battery without first contacting the manufacturer for advice.
c) The choice of contact material and the type of contact mechanism will affect the reliability of the appliance/device being designed.
    a) Pressure contacts require a special knowledge of contact materials, corrosion couples, connection force, point connections, corrosion inhibitors, etc.
    b) Once sample units are developed, high temperature and humidity tests should be performed to test for contact integrity.
d) Care should be taken to avoid battery damage during ultrasonic sealing.
e) Battery compartment contacts should be designed to prevent reverse battery installation.

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Annex D
(informative)

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