MIL-STD-1424

1 NOVEMBER 1979

MILITARY STANDARD

HYDROGEN ION METERS

FSC 6630

DEPARTMENT OF DEFENSE
Washington, DC 20301

Hydrogen Ion Meters

MIL-STD-1424

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of any use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn: DRDAR-TSC-S, Aberdeen Proving Ground, MD 21010, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This is the first book format standard generated on hydrogen ion meters. This standard is mandatory for use by all departments and agencies of the Department of Defense in the selection of items for application. It is intended to prevent the entry of unnecessary items (sizes, types and varieties) into the Department of Defense logistics system. This is not a procurement document.

CONTENTS

1. SCOPE

1.1 Coverage. This standard is a presentation of nomenclature, symbols, physical and chemical properties and requirements, military and typical commercial uses, directions for use, packaging data, toxicity data and shelf life of all military standard hydrogen ion meters. This standard does not necessarily include all classifications of the items represented by the title or those which are commercially available. It does contain items preferred for use in the selection of hydrogen ion meters for application by the Department of Defense. This standard covers the following 54 items:

NAME	NO. OF ITEMS
GENERAL PURPOSE pH METERS	37
pH METERS FOR RESEARCH	17

1.2 Application. Items listed herein accomodate essential requirements of the military and defense agencies, and will effect continued economies in all logistics functions when properly employed in new applications.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The issue of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

Federal Specification

PPP-B-636 Box, Shipping, Fiberboard

Military Specification

MIL-M-36755 Meters, Hydrogen Ion Test

Military Standard

MIL-STD-129 Marking for Shipment and Storage

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

ANSI Standards

C39.5 Electrical and Electronic Measuring and Controlling Instrumentation, Safety Requirements for

(Applications for copies should be addressed to the American Standards Institute, Incorporated, 1430 Broadway, New York, NY 10018.)

Clinical Laboratory Standards

PSI-5 Power Requirements for Clinical Laboratory Instruments and Laboratory Power Lines

ASI-1 Preparation of Manual for Installation, Operation and Repair of Laboratory Instruments

(Applications for copies should be addressed to the National Committee for Clinical Laboratory Standards, 771 East Lancaster Avenue, Villanova, PA 19085.)

Underwriters Laboratories

UL1262 Laboratory Equipment

(Applications for copies should be addressed to Underwriters Laboratories, Incorporated, 207 East Ohio Street, Chicago, IL 60611.)

3. GENERAL REQUIREMENTS

3.1 Chemical and physical requirements. All values given in tables of chemical and physical requirements are in percent by weight unless otherwise indicated.

3.2 Nomenclature. The Department of Defense item names, as used throughout this standard, are in capital letters. Other names that are sometimes used commercially are in small letters immediately beneath.

3.3 Packaging data and labeling. All meters in this standard shall be packaged in accordance with Federal Specification PPP-B-636 and all applicable documents mentioned in this military standard.

3.4 Safety. All general purpose hydrogen ion meters should be designed to comply with ANSI C39.5, UL1262, and clinical standards PSI-5 and ASI-1 standards for safety and laboratory instruments. In using these meters normal laboratory safety precautions should be followed.

3.5 Temperature. If the temperature at which a property was determined is not specified, it is to be room temperature (20 to 25°C or 68 to 77°F).

3.6 Use data. Typical commercial uses are given. In general hydrogen ion meters are designed for use in pH determinations and potentiometric titrations.

4. DETAIL REQUIREMENTS

4.1 Name. GENERAL PURPOSE HYDROGEN ION METERS
General Purpose pH Meters

4.1.1 Specifications. MIL-M-36755, Meters, Hydrogen Ion Test.

4.1.2 Technical description. Table I cites the physical requirements of general purpose pH meters. General purpose hydrogen ion meters are designed to meet the requirements of industrial and educational laboratories. In addition to doing routine pH measurements, general purpose pH meters usually have a millivolt scale so that they can be used for potentiometric titrations. General purpose pH meters, having a millivolt scale can be used for Karl Fisher titrations, specific ion determinations and other dead stop titrations. Many of these meters can be operated both on line and/or by batteries, offering the portability necessary for field operations.

TABLE I. General Purpose Hydrogen Ion Meters

Meter	1	2	3	4	5
Ranges	0-14 pH[a] ± 700 mV ± 1400 mV	0-14pH[a] ± 1999 mV	0-14 pH ---	0-14 pH ± 1800 mV	2-12 pH ---
Smallest graduation nominal	0.10 pH[b] 10.0 mV	0.01 pH 1.0 mV	0.10 pH ---	---	0.20 pH ---
Temperature compensator	included manual or automatic	included manual or automatic	optional	included manual or automatic	optional
Temperature range	0-100°C	0-100°C	0-100°C	0-100°C	0-100°C
Installation	optional	optional	optional	optional	portable
Repeatability nominal	0.02 pH[c] 2.0 mV	0.01 pH 1.0 mV	0.02 pH ---	0.01 pH 1.0 mV	0.1 pH ---
Accuracy nominal	0.05 pH[d] 5.0 mV	0.01 pH ---	0.05 pH ---	0.02 pH 1.0 mV	---
Power	120/240 V 50/60 Hz	120/220 V 50/60 Hz	220/240 V 95/125 V 50/60 Hz	115 V 50/60 Hz	rechargeable battery pack

[a] Also available in digital models
[b] Also available in graduations of 0.05 pH and 5 mV
[c] Also available with repeatability of 0.01 pH and 0.6 mV
[d] Also available with an accuracy of 0.1 pH and 15 mV and 1.0 mV

4.1.3 Use data. General purpose hydrogen ion meters are intended for use in the routine determination of pH of solutions. If the pH meter is equipped with a millivolt scale, it can be used for potentiometric titrations, Karl Fisher titrations and other routine determinations.

4.1.4 Packaging data and labeling. For military use general purpose hydrogen ion meters shall be packed in accordance with PPP-B-636. Each unit package shall be marked in accordance with MIL-STD-129.

4.1.5 Safety. All general purpose hydrogen ion meters should be designed to comply with UL1262 and ANSI C39.5 standards for safety in laboratory instruments.

4.1.6 Storage. General purpose hydrogen ion meters should be stored in a cool, dry area.

4.2 Name. HYDROGEN ION METERS FOR RESEARCH
Ph Meters for Research

4.2.1 Specifications. None

4.2.2 Technical description. Table II cites the physical requirements of pH meters for research. pH meters for research are designed to give the precision necessary for research work. In addition many pH meters for research can perform potentiometric and amperometric titrations and specific ion concentration determinations. Many of these meters can be operated both on line and/or by batteries, offering the portability necessary for field operations.

TABLE II. Hydrogen Ion Meters for Research

Meter	1		2	
Ranges	*Normal* 0-14 pH ± 700 mV	*Expanded* any 2.8 pH units	*Normal* 0-14 pH ± 1400 mV ± 700 mV	*Expanded* any 1.4 pH units any 140 mV
Smallest graduation	0.1 pH 10 mV	0.02 pH	0.1 pH 10 mV	0.01 pH 1.0 mV
Repeatability	± 0.02 pH ± 2 mV	0.002 pH ---	± 0.03 pH ± 3 mV	± 0.003 pH ± 0.3 mV
Accuracy	± 0.02 pH ± 4 mV	0.004 pH ---	± 0.07 pH ± 7 mV	± 0.007 pH ± 0.7 mV
Temperature compensator	optional		included manual or automatic	
Temperature range	0 - 100°C		0 - 100°C	
Installation	portable		optional	
Power	batteries or 90/250 VAC 50/60 Hz		120/240 V 50/60 Hz	
Differentiating meter characteristics	1. Built in battery charger 2. rugged splash proof case		1. has a log scale 2. provides test button for proper meter operation	

TABLE II. (Continued)

Meter	3 Expanded Value	4 Normal	4 Expanded
Ranges	0-14 pH ± 1400 mV	0-14 pH ± 1400 mV	any 2 pH ± 200 mV
Smallest graduation	0.002 pH 0.2 mV	0.1 pH 10 mV	0.01 pH 1 mV
Repeatability	± 0.002 pH ± 0.2 mV	± 0.02 pH ± 2 mV	± 0.002 pH ± 0.2 mV
Accuracy	± 0.002 pH when standardized within 3 pH units 1/4 full mV scale	± 0.05 pH within 3 pH units ± 7 mV	± 0.007 pH ± 0.7 mV
Temperature compensator	included manual or automatic	included manual or automatic	
Temperature range	0 - 100°C	0 - 100°C	
Installation	fixed	fixed	
Power	90/130 V 50/60 Hz	120/240 V 50/60 Hz	
Differentiating meter characteristics	1. pH range expands without manual switching 2. all solid state circuitry 3. housing is compact, rugged metal case with chemical resistant epoxy finish	1. has two and four decade log scales 2. can be used to measure monovalent and divalent ions	

TABLE III. Digital Hydrogen Ion Meters for Research

Model	1	2	3
Ranges	Continuously Expanded 0-14 pH ± 1400 mV	0-14 pH ± 1999.9 mV	0-13.999 pH ± 1999.9 mV
Repeatability	± 0.001 pH ± 0.1 mV	± 0.001 pH ± 0.1 mV	N.A.*
Accuracy	± 0.002 pH ± 0.2 mV	± 0.001 pH N.A.	± 0.002 pH ± 0.1 mV or 0.05% of reading, whichever is greater
Temperature compensator	included automatic or manual	included automatic or manual	included automatic or manual
Temperature range	0 - 100°C	0 - 100°C	0 - 100°C
Installation	optional	optional	optional
Power	120/240 V 50/60 Hz.	120/240 V 50/60 Hz	100/115/220/240 V ± 10% 50/60 Hz
Differentiating meter characteristics	1. automatically indicates changes in polarity 2. has self-test circuit which indicates instrument malfunction 3. has analog and binary coded digital output for computer or printer	1. has electronic test switch to check for proper operation 2. has a blank switch that eliminates 3rd decimal place when not needed 3. has a multiple electrode selectrode capability	1. has an out of range indicator 2. has a binary coded digital output for digital printer or computer

*Not available

4.2.3 Use data. Expanded range hydrogen ion meters are intended for use in pH determinations where very precise determinations are necessary. Also these meters are used in potentiometric and redox titrations and in specific ion concentration determinations.

4.2.4 Packaging data and labeling. For military use expanded range hydrogen ion meters shall be packed in accordance with PPP-B-636. Each unit package shall be marked in accordance with MIL-STD-129.

4.2.5 Safety. All general purpose hydrogen ion meters should be designed to comply with ANSI C39.5 and UL1262 standards for safety in laboratory instruments.

4.2.6 Storage. Expanded range hydrogen ion meters should be stored in a cool, dry area.

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Navy - MS
Air Force - 03
Other - DLA-DM

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