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DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Letter
Circular
LC672
(Superseding
LC554, LC364
and LC233)

November 22, 1941

ELECTRICAL MEASURING INSTRUMENTS, METERS AND THEIR ACCESSORIES

Publications by the staff of the National Bureau of Standards and others.

GENERAL INFORMATION

This letter circular gives a selected list of publications originating for the most part at the National Bureau of Standards which deal with design, testing, or performance of electrical measuring instruments and meters and of the accessory equipment used to extend their range. In making up the list, a number of the older publications of the Bureau were omitted because they have been virtually superseded by later papers, or because the particular devices treated in them are no longer in general use.

Many requests for information in this field, received by the Bureau, can best be answered by reference to a recognized standard prepared by some organization of national scope or in other cases by reference to some standard textbook or handbook. Accordingly there are listed below a few such standards and books which contain in convenient form the information which is most frequently requested.

The Bureau makes no tests on motors, generators, or transformers used for power or lighting service, and has no current publications* on their design or performance. It can not undertake to answer questions concerning the design, construction, repair, or rewinding of such apparatus in cases where the matter is not one of general interest.

*Exception, Circular 408; see p.4 of this Circular.

Some of the publications in this list have appeared in the regular series of publications of the Bureau and others in various scientific and technical journals. Unless specifically stated, papers are not obtainable from the National Bureau of Standards.

Where the price is stated, the publication can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. The prices quoted are for delivery to addresses in the United States and its territories and possessions and in certain foreign countries which extend the franking privilege. In the case of all other countries, one-third the cost of the publication should be added to cover postage. Remittances should be made either by coupons (obtainable from the Superintendent of Documents in sets of 20 for $1.00 and good until used), or by check or money order payable to the "Superintendent of Documents, Government Printing Office," and sent to him with order.

Publications marked "OP" are no longer available as separates. However, certain of the earlier Scientific Papers may still be secured by purchasing, at a price of 25 cents, the quarterly number of the Bulletin in which they appeared. In such cases the number of the Quarterly is indicated with the date and the symbol q appears in the last column.

The publications may be consulted in technical libraries and in particular at the "Government Depository Libraries" a list of which will be found in the "List of Publications of the Department of Commerce" (obtainable from the Department or the National Bureau of Standards without charge), or in the supplements to Circular C24 mentioned below.

For papers in other scientific or technical journals, the name of the journal or of the organization publishing the article is given in abbreviated form, with the volume number (underscored), page, and year of publication, in the order named. The Bureau can not supply copies of these journals, or reprints from them, and it is unable to furnish information as to their availability or price. They, too, can usually be consulted at technical libraries.

Series letters with serial numbers are used to designate Bureau publications:

S = "Scientific Paper". S1 to S329 are "Reprints" from the "Bulletin of the Bureau of Standards". S330 to S572 were published as "Scientific Papers of the Bureau of Standards". This series was superseded by the "Bureau of Standards Journal of Research" in 1928.

RP = "Research Paper". These are reprints of articles appearing in the "Bureau of Standards Journal of Research" and the "Journal of Research of the National Bureau of Standards", the latter being the title of this periodical since July 1934 (volume 13, number 1).

C = "Circular".

H = "Handbook".

M = "Miscellaneous Publication".

Circular C24 and supplements, the complete list of the Bureau's publications (1901-1936), is sold by the Superintendent of Documents for 55 cents. Announcement of new publications is made each month in the Technical News Bulletin which is obtainable by subscription at 5O cents per year.

PUBLICATIONS OF THE NATIONAL BUREAU OF STANDARDS

Title	Series	Price
Instruments		
Electrical measuring instruments, 2nd ed. May 28, 1915, 57 pp. ----------	C20	OP
Radio instruments and measurements, edition of March 10, 1924, reprinted Jan. 1, 1937, with certain type corrections and omissions (2nd ed. rev.) ----------	C74	60¢
A comparison of American direct-current switchboard voltmeters and ammeters. T.T.Fitch and C.J.Huber. Bul. BS 7, 407 (1911) -----	S163	OP
A suppressed-zero electrodynamic voltmeter. F.K.Harris. BS J. Research 3, 445 (1929) -	RP105	5¢
Standard electrodynamic wattmeter and ac-dc transfer instruments. J.H.Park and A.B.Lewis. J. Research NBS 25, 545 (1940)	RP1344	10¢
Composite-coil electrodynamic instruments. F.B.Silsbee. BS J. Research 8, 217 (1932)	RP411	10¢
Temperature compensation of millivoltmeters. H.B.Brooks. J. Research NBS 17, 497 (1936)	RP926	10¢
A device for measuring the torque of electrical instruments. P.G.Agnew, Bul. BS 7, 45 (No. 1, 1911) ----------	S145	OPq
Meters		
A comparative study of American direct-current watthour meters. T.T.Fitch and C.J.Huber. Bul.BS 10, 161 (No.2, 1914) ----------	S207	OPq
Standards for electric service. 2nd ed. 1923. 344 pp. ----------	C56	OP

Title	Series	Price
Potentiometers		
Deflection potentiometers for current and voltage measurements, H.B.Brooks. Bul.BS 8, 395 (No. 2, 1912)	S172	OPq
Outline of design of deflection potentiometers, with notes on the design of moving-coil galvanometers. H.B.Brooks. Bul.BS 8, 419 (No.2, 1912).	S173	OPq
A multi-range potentiometer and its application to the measurement of small temperature differences. H.B.Brooks and A.W.Spinks. BS J. Research 9, 781 (1932)	RP506	OP
The standard-cell comparator, a specialized potentiometer. H.B.Brooks. BS J. Research 11, 211 (1933)	RP586	5¢
The Waidner-Wolff and other adjustable electrical-resistance elements. E.F.Mueller and F. Wenner. J. Research NBS 15, 477 (1935)	RP842	5¢
Transformers		
Information for the amateur designer of transformers for 25- to 60-cycle circuits. H.B.Brooks. June 14, 1935, 25 pp.	C408	5¢
Accuracy of the formulas for the ratio, regulation, and phase angle of transformers. P.G. Agnew and F.B.Silsbee. Bul.BS 10, 279 (No.2,1914).	S211	OPq
The determination of the constants of instrument transformers. P.G.Agnew and T.T.Fitch. Bul. BS 6, 281 (No.2, 1909)	S130	OPq
A watthour meter method of testing instrument transformers. P.G.Agnew. Bul. BS 11, 347 (No.3, 1915)	S233	OPq
A study of the current transformer with particular reference to iron loss. P.G.Agnew. Bul. BS 7, 423 (1911)	S164	OP
A method for testing current transformers. F.B. Silsbee. Bul. BS 14, 317 (No.2, 1918-19)	S309	OPq

Title	Series	Price
Transformers (continued)		
Equipment for testing current transformers. F.B.Silsbee, R.L.Smith, N.L.Forman, and J.H.Park. BS J. Research 11, 93 (1933)----	RP580	5¢
Accuracy of high-range current transformers. J.H.Park. NBS J. Research 14, 367 (1935) --	RP775	5¢
Effect of wave form upon the performance of current transformers. J.H.Park. NBS J. Research 19, 517 (1937). ----------	RP1041	5¢
Testing potential transformers. H.B.Brooks. Bul. BS 10, 419 (No.3, 1914) ----------	S217	OPq
A shielded resistor for voltage transformer testing. F.B.Silsbee. Sci.Pap. BS 20, 489 (1924-26) ----------	S516	15¢
High-Voltage Measurement		
A transformer method for measuring high alternating voltages and its comparison with an absolute electrometer. F.B.Silsbee and F.M. Defandorf. J.Research NBS 20, 317 (1938). -	RP1079	10¢
An absolute electrometer for the measurement of high alternating voltages. H.B.Brooks, F.M.Defandorf, and F.B.Silsbee. J. Research NBS 20, 253 (1938) ----------	RP1078	15¢
An experimental study of the corona voltmeter. H.B.Brooks and F.M.Defandorf. BS J. Research 1, 589 (1928) ----------	RP21	20¢
Standard Resistors		
The four-terminal conductor and the Thomson bridge. F. Wenner. Bul. BS 8, 559 (No. 3, 1912) ----------	S181	OPq
Adjustments of the Thomson bridge in the measurement of very low resistances. F. Wenner and E. Weibel. Bul. BS 11, 65 (1915) ----------	S225	5¢
Methods of measuring the inductance of low-resistance standards. F.Wenner, E.Weibel, and F.B.Silsbee. Bul.BS 12, 11 (No.1,1915-16)	S246	OPq

Title	Series	Price
Standard Resistors (continued)		
A study of the inductance of four-terminal resistance standards. F.B.Silsbee. Bul. BS 13, 375 (No. 3, 1916-17) ----------	S281	OPq
Notes on the design of 4-terminal resistance standards for alternating currents. F.B. Silsbee. BS J. Research 4, 73 (1930) ------	RP133	15¢
A method of adjusting the temperature coefficient and resistance of low-valued resistance standards. F.Wenner and J.L.Thomas. BS J. Research 12, 147 (1934) ----------	RP639	5¢
Methods, apparatus, and procedures for the comparison of precision standard resistors. F. Wenner. J. Research NBS 25, 229 (1940) -	RP1323	15¢
Volt Boxes		
Testing and performance of volt boxes. F.B.Silsbee, and F.J. Gross, J. Research NBS 27, 269 (1941)	RP1419	10¢
Galvanometers		
General design of critically damped galvanometers. F. Wenner. Bul. BS 13, 211 (No.2, 1916-17)	S273	OPq
A study of electromagnet moving coil galvanometers for use in alternating-current measurements. E. Weibel. Bul. BS 14, 23 (No.1, 1918-1919) --	S297	OPq
Sensitivity of a galvanometer as a function of its resistance. H.B.Brooks. BS J. Research 4, 297 (1930) ----------	RP150	5¢
A theoretical and experimental study of the vibration galvanometer. F. Wenner. Bul. BS 6, 347 (No. 3, 1909-1910) ----------	S134	OPq
A new form of vibration galvanometer. P.G. Agnew. Sci.Pap. BS 16, 37 (1920) ----------	S370	OP

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Title	Series	Price
Standard Cells		
Effect of service conditions on the electromotive force of unsaturated portable standard cells. J.H.Park. BS J. Research 10, 89 (1933) ----	RP518	5¢
A temperature-control box for saturated standard cells. E.F.Mueller and H.F.Stimson. J. Research NBS 13, 699 (1934) ----------	RP739	5¢
Inductors		
A variable self and mutual inductor. H.B.Brooks and F.C.Weaver. Bul. BS 13, 569 (No. 4, 1916-17) ----------	S290	OPq
Improved continuously variable self and mutual inductor. H.B.Brooks and A.B.Lewis. J. Research NBS 19, 493 (1937) ----------	RP1040	10¢
Design of standards of inductance and the proposed use of models in the design of air-core and iron-core reactors. H.B.Brooks. BS J. Research 7, 289 (1931) ----------	RP342	15¢
Miscellaneous		
A system of remote control for an electric testing laboratory. P.G.Agnew, A.H.Stannard, and J.L.Fearing. Bul. BS 13, 581 (No.4, 1916-17)	S291	OPq
A clock-controlled constant-frequency generator. A.B.Lewis. BS J. Research 8, 141 (Jan.1932)	RP406	10¢
A new cathode-ray oscillograph and its application to the study of power loss in dielectric materials. F.H.Harris. BS J. Research 12, 87 (1934) ----------	RP636	5¢
Calculations of electrical surge-generator circuits. A.B.Lewis. J. Research NBS 17, 585 (1936) ----------	RP929	5¢
Copper. 2nd ed. (1922) 108 pp. ----------	C73	OP
Copper wire tables. 3rd ed. (1914). 76 pp.--.	C31	20¢
Copper wire tables (English and Metric) (1914)	M17	OP

Test Fee Schedules (sent without charge by the National Bureau of Standards and listing the fees charged for the usual tests).

131, Resistance standards for current measurements.
132, Direct-current ammeters.
133, Direct-current voltmeters and millivoltmeters.
134, Alternating-current ammeters.
135, Alternating-current voltmeters.
136, Wattmeters
137, Direct-current watthour meters.
138, Alternating-current watthour meters.
139, Frequency meters for power and lighting frequencies.
1310, Current transformers.
1311, Voltage (potential) transformers.
1312, Volt boxes
191, Standard cells.

LC475, (free from NBS), Testing of electrical instruments, meters and instrument transformers (Sept. 5, 1936). (Explaining the test fee schedules listed above).

LC460, (free from NBS), Tests of resistance apparatus (Jan.1, 1936). (Explaining the test fee schedules listed above).

ARTICLES PUBLISHED IN OUTSIDE JOURNALS BY MEMBERS OF THE BUREAU STAFF.

Accuracy of commercial electrical measurements. H. B. Brooks. Trans. Am. Inst. Elec. Engrs. (33 W. 39th St., New York City) 39, 495 (1920).

The standardization of electrical measuring instruments. H.B. Brooks. Trans. Am. Inst. Elec. Engrs., 42, 894 (1923).

Accuracy tests for meggers. H.B.Brooks. Elect. World (McGraw-Hill Publishing Co., New York City), 85, 973 (1925).

The two-stage current transformer. H.B.Brooks and F.D.Holtz. Trans. Am. Inst. Elec. Engrs. 41, 382 (1922).

Methods for testing current transformers. F.B.Silsbee. Trans. Am. Inst. Elec. Engrs., 43, 282 (1924).

Lead resistance for current transformers. F.B.Silsbee. Elect. World 81, 1082 (May 12, 1923).

Precautions against stray magnetic fields in measurements with large alternating currents. F.B.Silsbee. Trans. Am. Inst. Elec. Engrs., 48, 1301 (Oct. 1929).

The unit of electrical resistance, past history and impending change. H.B.Brooks. Trans. Am. Inst. Elec. Engrs., 50, 1318 (1931).

Standards of electromotive force. G.W.Vinal, D.N.Craig and L.H.Brickwedde. Trans. Am. Electrochem. Soc. (address of Secretary - Columbia University, New York City) 68, 139 (1935).

PUBLICATIONS BY OUTSIDE ORGANIZATIONS

American Standard for Electrical Indicating Instruments. Am. Standards Assoc. (29 W. 39th St., New York City). C39.1-1938. (Supersedes AIEE Standard No. 33). (40¢).

Report on Standards for Electrical Recording Instruments, Am. Inst. Elec. Engr. 33 W. 39th St., New York City, No. 40 (1933) (free).

Standards for instrument transformers-Section 4 of American Standards for Transformers, Regulators and Reactors. ASA No. C57, Am. Standards Assoc. (29 W. 39th St., New York City) (75¢).

Standards for the measurement of test voltage in dielectric tests. Am. Inst. Elec. Engrs. No. 4 (June 1940) (40¢).

Code for Electricity Meters (4th ed. 1941). Edison Elect. Institute, 420 Lexington Ave., New York City. ($2.00).

BOOKS

Electrical Metermen's Handbook (Edison Electric Institute, 420 Lexington Ave., New York City, 5th ed. 1940).

Electrical measuring instruments; Part 1, Commercial and indicating instruments; Part 2, Induction instruments, supply meters and auxiliary apparatus. C.V.Drysdale and A.C.Jolley. Ernest Benn Ltd., London 1924).

Industrial Electrical Measuring Instruments. K. Edgecumbe and F.E.J.Ockenden. (Pitman Publishing Corp., 2 West 45th St., New York City, 3rd ed. 1933).

Standard Handbook for Electrical Engineers (McGraw-Hill Book Co. 7th ed. 1941).

Electrical Measurements and Measuring Instruments. E.W.Golding. (Pitman, 2nd ed. 1935).

Electric Power Metering. A.E.Knowlton (McGraw-Hill Book Co. 1934).

Instrument Transformers, their Theory, Characteristics, and Testing. B. Hague (Pitman 1936).

Pender-Del Mar Electrical Engineer's Handbook. (John Wiley & Sons Inc., New York City, 3rd ed., 1936).

Electrical Measurements. F. A. Laws (McGraw-Hill Book Co., New York City, 2nd ed. 1938).

Vacuum-tube Voltmeters (John F. Rider Publisher, Inc., 404 Fourth Avenue, New York City 1941).