

# Contents

	Page
Abstract -----	II
Foreword -----	III
Preface -- -----	IV
Editor's Note -----	V

## 1. Acoustics

### Papers

- |      |  |    |
|------|--|----|
| 1.1. | Acoustical impedance of a right circular cylinder enclosure.<br>F. Biagi and R. K. Cook, <i>J. Acoust. Soc. Am.</i> , 26, No. 4,<br>506-509 (July 1954).<br>Key words: Acoustic impedance; cylindrical enclosure;<br>microphone calibration; series solution -----   | 5  |
| 1.2. | Pressure calibration of condenser microphones above 10,000<br>cps.<br>B. D. Simmons and F. Biagi, <i>J. Acoust. Soc. Am.</i> , 26, No.<br>5, 693-695 (Sept. 1954).<br>Key words: Acoustic coupler; acoustic impedance; mi-<br>crophone; pressure calibration -----   | 9  |
| 1.3. | Method of measurement of $E'/I'$ in the reciprocity calibra-<br>tion of condenser microphones.<br>W. Koidan, <i>J. Acoust. Soc. Am.</i> , 32, No. 5, 611 (May<br>1960).<br>Key words: Calibration of microphones; driving cur-<br>rent; microphone; open-circuit voltage; reciprocity ----                                   | 12 |
| 1.4. | Hydrogen retention for pressure calibration of microphones<br>in small couplers.<br>W. Koidan, <i>J. Acoust. Soc. Am.</i> , 35, No. 4, 614 (Apr.<br>1963).<br>Key words: Acoustic coupler; hydrogen retention; mi-<br>crophone; pressure calibration .....   | 13 |
| 1.5. | Free-field correction for condenser microphones.<br>W. Koidan and D. S. Siegel, <i>J. Acoust. Soc. Am.</i> , 36,<br>No. 11, 2233-34 (Nov. 1964).<br>Key words: Calibration of microphones; condenser<br>microphones; free-field correction; radiation impedance—   | 14 |
| 1.6. | Calibration of standard condenser microphones: coupler<br>versus electrostatic actuator.<br>W. Koidan, <i>J. Acoust. Soc. Am.</i> , 44, No. 5, 1451-1453<br>(Nov. 1968).<br>Key words: Calibration; condenser microphone; free-<br>field correction; microphone; radiation impedance;<br>standard condenser microphone ----- | 15 |

1. Acoustics — Continued

Papers	Page
1.7. USA Standard for the calibration of microphones, S1.10—1966, background and summary. W. Koidan, a condensed version of "A new standard for the calibration of microphones", Magazine of Standards, 37, No. 5, 141-144 (May 1966). Key words: Microphone calibration; acoustic coupler, anechoic chamber, standard -----	17
1.8. Calibration of audiometers. E. L. R. Corliss and W. F. Snyder, J. Acoust. Soc. Am., 22, No. 6, 837-842 (Nov. 1950). Key words: Audiometer; calibration; earphone; threshold of hearing .....	21
1.9. A probe tube method for the transfer of threshold standards between audiometer earphones. E. L. R. Corliss and M. D. Burkhard, J. Acoust. Soc. Am., 25, No. 5, 990-993 (Sept. 1953). Key words: Audiometer earphones; "loudness balancing"; probe tube transfer of threshold; threshold standard -----	27
1.10. The response of earphones and ears in couplers. M. D. Burkhard and E. L. R. Corliss, J. Acoust. Soc. Am., 26, No. 5, 679-685 (Sept. 1954). Key words: Artificial ears; auditory threshold; calibration of earphones; coupler; earphone; microphone -----	31
1.11. International standard reference zero for audiometers. P. G. Weissler, J. Acoust. Soc. Am., 44, No. 1, 264-275 (Jan. 1968). Key words: Audiometer; calibration; earphones; standard reference zero for audiometers; threshold of hearing, threshold standard -----	38
1.12. Determination of reverberant sound absorption coefficients from acoustic impedance measurements. A. London, J. Acoust. Soc. Am., 22, No. 2, 263-269 (Mar. 1950). Key words: Absorption coefficients; acoustic impedance; acoustical material; measurement; normal incidence; random incidence; sound absorption -----	50
1.13. Laboratory measurement of airborne sound transmission loss of building partitions. ASTM E 90—66 T, Philadelphia, Pa. Key words: Airborne sound; building partitions; diffuse sound field; insulating properties; measurement; noise; transmission loss -----	57
1.14. Output of a sound source in a reverberation chamber and other reflecting environments. R. V. Waterhouse, J. Acoust. Soc. Am., 30, No. 1, 4-13 (Jan. 1958). Key words: Enclosure; interference patterns; reverberation chamber; sound power; sound source -----	69

## 1. Acoustics — Continued

Papers	Page
1.15. Impedance and absorption of acoustical materials by the tube method. ASTM C 384—58, Philadelphia, Pa. Key words: Absorption; acoustic impedance; acoustical material; frequency; sound absorption coefficients; “tube method” -----	79
1.16. A portable impedance tube. R. D. Berendt and H. A. Schmidt, Jr., <i>J. of Acoust. Soc. Am.</i> , 35, No. 7, 1049-1052 (July 1963). Key words: Absorptivity; acoustic impedance; acoustical material; frequency; sound absorption coefficients--	92
1.17. Sound absorption of acoustical materials in reverberation rooms. ASTM C 423—66, Philadelphia, Pa. Key words: Acoustical material; diffuse sound field; measurement; reverberation; sound absorption -----	96
1.18. Measurement of airborne sound insulation in buildings. ASTM E 336—67 T, Philadelphia, Pa. Key words: Acoustical insulation; field measurements; free field; insertion loss; noise reduction; reverberant field; sound transmission -----	103

### Abstracts

1.19. ISO Recommendation R-140—1960, Field and laboratory measurements of airborne and impact sound transmission. American National Standards Institute, Inc., New York, N.Y., (Abstract by R. L. Bloss). Key words: Airborne sound; impact sound; measurement; sound insulation; sound transmission -----	126
1.20. American Standard Method for the physical measurement of sound, ANS S1.2—1962, (Abstract by R. D. Berendt). American National Standards Institute, Inc., New York, N.Y. Key words: Acoustic center; sound source; random sound field; reverberation time; semireverberant field; sound power level; sound pressure level -----	127

## 2. Fluid Mechanics

2.1. Effect of humidity in hot-wire anemometry. G. B. Schubauer, <i>J. of Res., Nat. Bur. Stand. (U.S.)</i> , 15, 575-578 (Dec. 1935). Key words: Anemometer; calibration; heat loss; hot-wire anemometry; humidity -----	131
2.2. Effect of yaw on vane anemometers. R. H. Heald and P. S. Ballif, <i>J. Res. Nat. Bur. Stand. (U.S.)</i> 19, 685-690 (Dec. 1937). Key words: Anemometers; performance; vane; yaw ---	135

## 2. Fluid Mechanics — Continued

Papers	Page
<p>2.3. Effect of support on the performance of vane anemometers.                      G. B. Schubauer and G. H. Adams, J. Res. Nat. Bur. Stand. (U.S.) 40, 275-280 (Apr. 1948).                      Key words: Anemometers; calibration; interference; support; vane -----</p>	142
<p>2.4. Liquid-flowmeter calibration techniques.                      M. R. Shafer and F. W. Ruegg, Transactions of <b>ASME</b>, 1369-1379 (<b>Oct.</b> 1958).                      Key words: Accuracy; calibration; flow measurement; fluid meter; liquid flow; weigh-time procedure -----</p>	148
<p>2.5. Calibration of bell provers by dimensional analysis and by cubic foot standards. Comparison of "strapping" and "bottling".                      C. T. Collett, Presented at Appalachian Gas Measurement Short Course, Morgantown, W. Virginia, August 26, 1964, and American Gas Association Operating Section Distribution Conference, Minneapolis, Minn., May 4, 1965.                      Key words: Bell-type provers; "bottling"; calibration; cubic-foot bottle; cubic foot standards; gas flow meter; gas volume standards; standard method; "<b>strapping</b>" ---</p>	159
<p>2.6. An examination of the effects of heat transfer and compressible flow on the performance of laminar flowmeters.                      F. W. Ruegg and H. H. <b>Allion</b>, presented at: Fluid Meters Golden Anniversary; Flow Measurement Conference, Pittsburgh, Pa. (Sept. 26-28, 1966).                      Key words: Calibration; effect, heat transfer; flow measurement; flowmeters; fluid meters; gas flow meters; laminar flowmeters; meter .....</p>	169

## 3. Force

<p>3.1. Temperature coefficients for proving rings.                      B. L. Wilson, D. R. Tate, and G. Borkowski, J. Res. Nat. Bur. Stand. (U.S.) 37, 1-7 (July 1946).                      Key words: Corrections; errors; force measurement; proving ring; testing machine; temperature effects ----</p>	207
<p>3.2. Proving rings for calibrating testing machines.                      B. L. Wilson, D. R. Tate, and G. <b>Borkowski</b>, Nat. Bur. Stand. (U.S.) Circ. C454 (Aug. 1946), 23 pages.                      Key words: Calibration; errors; force measurement; proving ring; testing machine; temperature effect ----</p>	216
<p>3.3. Uncertainties associated with proving ring calibration.                      T. E. Hockersmith and H. H. Ku, Preprint <b>#12.3-2-64</b>, ISA Conference (Oct. 12-15, 1964).                      Key words: Calibration, confidence interval; error analysis; force measurement; proving ring; uncertainty ----</p>	239

- 4.1. Absolute value of  $g$  at the National Bureau of Standards.  
D. R. Tate, Nat. Bur. Stand. (U.S.) Monogr. 107 (June 1968). 24 pages.  
Key words: Absolute gravity; acceleration; free-fall;  $g$ ; geodesy; gravity; **Potsdam** system ----- 249
- 4.2. Gravity measurements and the standards laboratory.  
D. R. Tate, Nat. Bur. Stand. (U.S.) Tech. Note 491 (Aug. 1969), 10 pages.  
Key words: Absolute gravity; deadweight; force; geodetic pendulum; gravity; gravity meter; **Potsdam** system; standard gravity; units of force ----- 250

## 5. Humidity

- 5.1. Methods of measuring humidity and testing hygrometers.  
A. Wexler and W. G. Brombacher, Nat. Bur. Stand. (U.S.) Circ. 512 (Sept. 1951).  
Key words: **Dewpoint**; electrical hygrometer; gravimetric hygrometer; humidity calibration; hygrometer; mechanical hygrometer; psychrometer ----- 261
- 5.2. Pressure-humidity apparatus.  
A. Wexler and R. D. Daniels, Jr., J. of Res., Nat. Bur. Stand. (U.S.) 48, No. 4, 269-274 (Apr. 1952).  
Key words: Apparatus, pressure-humidity; humidity calibration; pressure-humidity ----- 281
- 5.3. Relative humidity-temperature relationships of some saturated salt solutions in the temperature range  $0^{\circ}$  to  $50^{\circ}$  C.  
A. Wexler and S. Hasegawa, J. of Res., Nat. Bur. Stand. (U.S.) 53, No. 1, 19-26 (July 1954).  
Key words: **Dewpoint** method; hygrometer calibration; relative humidity; saturated salt solution ----- 287
- 5.4. A pneumatic bridge hygrometer for use as a working humidity standard.  
L. Greenspan, Humidity and Moisture, **Reinhold Pub. Corp.**, New York (1965).  
Key words: Humidity working standard; hygrometer; pneumatic bridge hygrometer; standard ----- 296
- 5.5. A comparison between the National Bureau of Standards two-pressure humidity generator and the National Bureau of Standards standard hygrometer.  
S. Hasegawa, R. W. Hyland, and S. W. Rhodes, Humidity and Moisture, **Reinhold Pub. Corp.**, New York (1965).  
Key words: Gravimetric hygrometer; hygrometer calibration; standard hygrometer; two-pressure humidity generator ----- 306

## 5. Humidity — Continued

### Papers

Pane

- 5.6. An adiabatic saturation psychrometer.  
 L. Greenspan, *J. Res., Nat. Bur. Standard. (U.S.)* **72C**,  
 No. 1, 33-47 (Jan.-Mar. 1968).  
 Key words: Adiabatic saturation gas mixtures; humid-  
 ity; hygrometer mixing ratio; moist gas psychrometer;  
 psychrometric factor; saturation; thermodynamic wet-  
 bulb temperature; vapor content; wet-bulb tempera-  
 ture ----- 311
- 5.7. Calibration of humidity measuring instruments at the Na-  
 tional Bureau of Standards.  
 A. Wexler, *ISA Transactions*, 7, No. 4, 356-392 (1968).  
 Key words: Calibration accuracies; gravimetric hy-  
 grometer; humidity calibration; humidity generator;  
 hygrometry ----- 326

### Abstracts

- 5.8. Electric hygrometers.  
 A. Wexler, *Nat. Bur. Stand. (U.S.) Circ.* 586 (Sept.  
**1957**), 21 pages.  
 Key words: Electric hygrometers; humidity; hygrom-  
 etry ----- 333
- 5.9. The NBS standard hygrometer.  
 A. Wexler and R. W. Hyland, *Nat. Bur. Stand. (U.S.)*  
*Monogr.* 73 (May **1964**), 35 pages.  
 Key words: Gravimetric **hygrometer**; humidity stand-  
 ard; hygrometry; mixing ratio; moisture standard;  
 standard hygrometer ----- 334
- 5.10. Humidity and moisture.  
 A. Wexler, editor-in-chief, *Humidity and Moisture*, **Rein-**  
**hold Pub. Corp.**, New York (**1965**), (Abstract by M. J.  
 Orloski).  
 Key words: Coulometric hygrometry; dew point; elec-  
 tric hygrometer; environmental chambers; equation of  
 state of moist gases; humidity; humidity generator;  
 humidity measurement, application of; humidity stand-  
 ards; hygrometry; interaction of moisture and ma-  
 terials; moisture measurement, capacitance method;  
 moisture measurement, chemical method; moisture  
 measurement, dielectric method; moisture measure-  
 ment, nuclear method; moisture measurement, physical  
 method; moisture measurement, resistance method;  
 pneumatic bridge hygrometer; psychrometry; satu-  
 rated salt solution; spectroscopic hygrometry ----- 335

## 6. Pressure

- 6.1. The piston gage as a precise pressure-measuring instrument.  
 D. P. Johnson and D. H. **Newhall**, *Transaction of the*  
**ASME**, 301-310 (1953):  
 Key words: Apparatus; pressure standards; fixed point;  
 high pressure; mercury melting point; precise pressure  
 measurements; standard ----- **339**

- 6.2. Elastic distortion error in the dead-weight piston gage.  
D. P. Johnson, J. L. Cross, J. D. Hill, and H. A. Bowman,  
Industrial and Engineering Chemistry, 49, 2046 (Dec.  
1957).  
Key words: Dead-weight piston gage; elastic distortion;  
equation of state; error, elastic distortion; high  
pressure; PVT measurements ----- 349
- 6.3. A tilting air-lubricated piston gage for pressure below **one-**  
half inch of mercury.  
U. O. **Hutton**, J. of Res., Nat. Bur. Stand. (U.S.) **63C**,  
No. 1, 47-57 (July-Sep. 1959).  
Key words: Dead-weight piston gage; low pressure;  
piston gage, air lubricated; pressure regulator ----- **355**
- 6.4. Mercury barometers and manometers.  
J. L. Cross, Nat. Bur. Stand. (U.S.) Monogr. 8 (May 20,  
**1960**), 59 pages.  
Key words: Barometer; instruments; low pressure;  
manometer; mercury barometer; mercury manometer-- 366
- 6.5. Reduction of data for piston gage pressure measurements.  
J. L. Cross, Nat. Bur. Stand. (U.S.) Monogr. 65 (June  
17, **1963**), 9 pages.  
Key words: Data reduction; piston gage; reduction of  
data ----- 429
- 6.6. The Bi I-II transition pressure measured with a dead-  
weight piston gage.  
P. L. M. Heydemann, J. Appl. Physics, 38, No. 6, 2640-44  
(May 1967).  
Key words: Bi I-II transition; fixed point; high pressure;  
polymorphic phase transition; scale, pressure;  
transition ----- 440
- 6.7. Measurements in the high pressure environment (Excerpt).  
C. W. Beckett, E. C. Boyd, and E. C. Lloyd, Science 164,  
3881,860-861 (May 16, 1969).  
Key words: Ba I-II transition; Bi I-II and **III-V** tran-  
sition; equation of state; fixed points; high pressure;  
mercury freezing point; phase transformations as fixed  
points; pressure coefficients of thermocouples; pressure  
scale; sodium chloride pressure scale; Thallium I-II  
transition ----- 446
- Abstract**
- 6.8. A survey of micromanometers.  
W. G. Brombacher, Nat. Bur. Stand. (U.S.) Monogr. 114  
(**1970**), 62 pages.  
Key words: Calibration techniques; capacitance **pres-**  
**sure** gages; gas column manometers; manometers;  
meteorographs; micromanometers; piston gages; pres-  
sure measurement; vane gages; vapor pressure meas-  
urement ----- 449

## 7. Strain

Papers	Page
7.1. Characteristics of the Tuckerman strain gage. B. L. Wilson, Proceedings of ASTM, 44, Philadelphia, Pa. (1944). Key words: Autocollimator; calibration; extensometer; mounting force; optical strain gage; strain gage; temperature effects; Tuckerman strain gage -----	453
7.2. A method for measuring the instability of resistance strain gages at elevated temperatures. R. L. Bloss and J. T. Trumbo, ISA Transactions 2, No. 2, 112-116 (Apr. 1963). Key words: Drift; high temperature; resistance instability; resistance strain gage; temperature effects; test methods -----	463 ✓
7.3. Four methods of determining temperature sensitivity of strain gages at high temperatures. C. H. Melton and R. L. Bloss, ISA Journal, 12, No. 10, 69-74 (Oct. 1965). Key words: Drift; heating rate; high temperature; resistance strain gages; strain gages; temperature effects; temperature sensitivity; test methods -----	468

## 8. Vacuum

8.1. Micrometer U-tube manometers for medium-vacuum measurements. A. M. Thomas and J. L. Cross, J. of <b>Vac.</b> Sci. and Tech. 4, No. 1, 1-5 (Jan./Feb. 1967). Key words: Low pressure, medium vacuum range; manometry; micromanometer; U-tube manometer; vacuum measurements -----	477
8.2. Calibration to high precision in the medium vacuum range with stable environments and micromanometer. S. Ruthberg, J. of <b>Vac.</b> Sci. and Tech. 6, No. 3, 401-412 (May-June 1969). Key words: Calibration; medium vacuum range; micromanometer; precision servo control; vacuum measurements; vacuum systems -----	482

## 9. Vibration

9.1. Calibration of vibration pickups by the reciprocity method. S. Levy and R. R. Bouche, J. of Res., Nat. Bur. Stand. 57, No. 4, 227-243 (Oct. 1956). Key words: Vibration; acceleration; velocity; calibration; reciprocity; standard -----	497
--	-----

Papers	Page
9.2. Modulated photoelectric measurement of vibration. V. A. Schmidt, S. Edelman, E. R. Smith, and E. T. Pierce, J. Acoust. Soc. Am., 34, No. 4, 455-458 (Apr. 1962). Key words: Fringe disappearance; interferometer; modulation; photoelectric; vibration; vibration ampli- tude .....	514
9.3. Calibration of vibration pickups at large amplitudes. E. Jones, S. Edelman, K. S. Sizemore, J. Acoust. Soc. Am, 33, No. 11, 1462-66 (Nov. 1961). Key words: Acceleration; calibration; high accelera- tions; interferometric measurement; phase angle; reso- nance; stroboscopic measurement .....	518
9.4. A dual centrifuge for generating low frequency sinusoidal accelerations. R. O. Smith, E. A. Willis, and J. S. Hilten, J. of Res., Nat. Bur. Stand., 66D, No. 4, (Oct.-Dec. 1962). Key words: Acceleration, calibration, dual centrifuge; low frequency vibration .....	523
9.5. Electrodynamic vibration standard with a ceramic moving element. T. Dimoff, J. Acoust. Soc. Am., 40, No. 3, 671-676 (Sept. 1966). Key words: Acceleration; calibration; ceramic element; electrodynamic vibration generator; distortion; shaker; standard; vibration .....	529
9.6. Improved transfer standard for vibration pickups. E. Jones, D. Lee and S. Edelman, J. Acoust. Soc. Am., 41, No. 2, 354-357 (Feb. 1967). Key words: Acceleration, calibration, ceramic, compari- son, piezoelectric; transfer standard .....	535
9.7. Absolute calibration of vibration generators with time- sharing computer as integral part of system. B. F. Payne, Shock & Vibration Bulletin, Bull. 36, Part 6, Naval Res. Lab., Washington, D. C. (Feb. 1967). Key words: <b>Calibration</b> ; computer; electromagnetic vi- bration generators; distortion; phase angle; reciproc- ity; vibration generators .....	539
9.8. Optical FM system for measuring mechanical shock. L. D. Ballard, W. S. Epstein, E. R. Smith, and S. Edel- man, J. of Res., Nat. Bur. Stand. (U.S.) 73C, No. 3-4, 75-78 (July-Dec. 1969). Key words: Accelerometers; calibration; vibration; Doppler; high acceleration; interferometric measure- ment of shock; interferometric measurement of vibra- tion; laser; shock; mechanical; single sideband tech- nique; velocity; vibration .....	551

## 10. Viscosity

Papers

Page

10.1. Calibration of viscometers.

R. S. Marvin, Nat. Bur. Stand. (U.S.) SP300, Vol. 8, Mechanics, (Nov. 1971), 690 pages.

Key words: Measurement of viscosity; relative measurements; systematic errors; viscometer calibrating liquids (materials standards of viscosity); viscosity ----

557

Author index ----- 663

Subject index ----- 564

SI physical units (inside the back cover).