1 **THERMAL CALIBRATION SYSTEM**
2 .By thermal radiation emitting device (e.g., blackbody cavity)
3 .By immersion in liquid having controlled temperature
4 **LEAK OR FLAW DETECTION**
5 .With heating or cooling of specimen for test
6 **DISTANCE OR ANGLE**
7 .Thickness, erosion, or deposition
8 **FLAMMABILITY TESTING**
9 **EMISSIVITY DETERMINATION**
10 **DIFFERENTIAL THERMAL ANALYSIS**
11 .Detail of electrical heating control
12 .Detail of sample holder or support therefor
13 ..Formed by thermoelectric element
14 **THERMAL GRAVIMETRIC ANALYSIS**
15 **BY APPLYING KNOWN THERMAL GRADIENT (E.G., INDICATION OF RESPONSE BY LOCATION)**
16 **TRANSFORMATION POINT DETERMINATION (E.G., DEW POINT, BOILING POINT)**
17 .By change in optical property (e.g., transmission)
18 ..By reflection (e.g., polished surface)
19 ...Sensed by instrument (e.g., photocell)
20 ....Controlling heating or cooling
21 .By electrical condition of specimen
22 .By change in motion of movable element
23 ..Driven element
24 .By change in pressure of flow rate
25 .By thermal arrest (e.g., time-temperature curve)
26 ..Of molten metal (e.g., carbon content)
27 .Between gaseous and liquid states
28 ..Dew point
29 **HEAT FLUX MEASUREMENT**
30 .By differential temperature measurement along undisturbed thermal gradient
31 **CALORIMETRY**
32 .Total radiant energy or power measurement
33 .With control of heat added to or lost from a sample container (e.g., isothermal calorimetry)
34 ..With controlled adiabatic shield
35 .Heat absorbing heigh temperature gas probe (e.g., enthalpy or fluid cooled probe)
36 .Heat value of combustion (e.g., 'calorific value')
37 ..Having specified control of input of mixture
38 ..Having bomb or cartridge ignition chamber
39 .Gain or loss of heat by heat utilizing load in path of heat exchange fluid
40 ..Determined by combining flow rate and temperature signals of heat exchange fluid
41 ...Signals combined electrically
42 .Throttling calorimeter (e.g., steam quality)
43 **DETERMINATION OF INHERENT THERMAL PROPERTY (E.G., HEAT FLOW COEFFICIENT)**
44 .Thermal conductivity
45 **THERMAL TESTING OF A NONTHERMAL QUANTITY**
46 .With loading of specimen (e.g., stress or strain)
47 ..Cyclic
48 ...Torsional
49 ..Tensile
50 ...With detail of heating or cooling structure
51 ..Compressional
52 ..Bending or flexing
53 .Of cure or hardenability
54 .Of fluid volume
55 .Expansion or contraction characteristics (e.g., dilatometry)
56 ..Including electrical sensor
57 .Of susceptibility to thermally induced deteriouration, flaw, or failure

100 **TEMPERATURE MEASUREMENT (E.G., THERMOMETER)**
101 .Composite temperature-related paramenter
102 ..Time-temperature relationship (e.g., integral, deterioration, change)
103 ...Time-temperature integration performed by particular circuit arrangement
104 ...Peak (maximum or minimum) with respect to time
105 ....Indicating tube with sensing material return prevention
106 ....Permanent visual indication (i.e., irreversible)
107 ...Rate of change
108 ...Degree-days
109 ..Climate related (e.g., wind-chill factor, discomfort index)
110 ..Plural spaced temperature function
111 ...Highest or lowest of spaced temperatures
112 ...Difference or gradient
113 ....By thermoelements connected in series opposition
114 ....By current modifying elements in circuit (e.g., bridge)
115 ...Space average
116 ...By single sensor (e.g., elongate or with plural fluid intakes)
117 .By a vibratory effect (e.g., resonant frequency, acoustical)
118 ..Resonant frequency by fluid flow
119 ..Vibration velocity (e.g., echo timing)
120 .In spaced noncontact relationship to specimen
121 ..By thermally emitted radiation
122 ...By microwave arrangement
123 ...Transparent material measurement or compensation (e.g., spectral line, gas, particulate suspension
124 ...With scanning or temperature distribution display
125 ...With fluid flow purging device
126 ...Having emissivity compensating or specified radiating surface
127 ...Having significant frequency limitation or relationship (e.g., peak, ratio)
128 ...Having significant signal handling circuitry (e.g., linearizing, emissivity compensation)
129 ...Comparison with radiation reference standard
130 ...Optical system structure (e.g., lens)
131 ....With radiation conducting element
132 ...Sensor or mounting temperature control
133 ...Ambient temperature compensated (e.g., dummy sensor)
134 ..Extrapolation (e.g., simulation, heat flow)
135 ..By fluid flow within or to sensor (e.g., convection, heat transfer, differential pressure)
136 .Geophysical (e.g., well bore, underwater)
137 .Temperature distribution or profile
138 .With fluid flow deflector
139 .Of molten metal
140 ..Lance (e.g., consumable)
141 .Combined with diverse art device
142 ..With other measuring device
143 ...Pressure
144 ..With combustion engine
145 ...Cooling system
146 ....Radiator cap mounted thermometer
147 ..With fluid carrying conduit (e.g., shower pipe)
148 ...Sensor within conduit
149 ..With cooking compartment or door thereof (e.g., oven)
150 ..With bottle (e.g., nursing)
151 ..With confection or infant pacifier
152 ..With electrical component (e.g., transformer)
153 ..With roll or rotary specimen or support
154 ...With coupling between rotating sensor and stationary electrical circuitry
155 ..With percing element

156 ..With float
157 ..With sampling cup
158 .With removable cover for sensor (e.g., disposable sheath)
159 .Nonelectrical, nonmagnetic, or nonmechanical temperature responsive property
160 ..Melting or softening
161 ..Change of optical property
162 ...Color
163 .By electrical or magnetic heat sensor
164 ..With preheated sensing probe
165 ..With heat exchanger or conductor
166 ..At plural zones
167 ...Scanning
168 ..With self-rebalancing arrangement (e.g., servo-potentiometer, thermal link)
169 ..With thermal lag compensation
170 ..Digital output
171 ...With digital linearizing circuitry
172 ..With compensation for sensor nonlinearity or lead impedance
173 ...By feedback in amplifier circuit or with constant current source in circuit
174 ..By conductive fluid or work function within sensor (e.g., ionization)
175 ..Thermal noise generated in conductor
176 ..Including sensor having hysteresis or cryogenic property (e.g., ferromagnetism, superconductivity)
177 ...Ferroelectric
178 ..By barrier layer sensing element (e.g., semiconductor junction)
179 ..By thermoelectric potential generator (e.g., thermocouple)
180 ...Specimen is part of thermoelectric circuit
181 ...Reference junction compensation
182 ...Reference junction temperature control
183 ..By current modifying sensor
184 ...Reactive element (e.g., capacitive)
185 ...Detail of resistive sensor
186 .With specified recording arrangement
187 .Mechanical (e.g., expansion or contraction of materials)
188 ..Having electrical indication
189 ..Plural zones (e.g., indoor-outdoor)
190 ..Indicating tube type
191 ...With optical element (e.g., magnifying)
192 ...With holder for shaking
193 ...Having specified cross section
194 ...With support or housing
195 ..With detail of motion transmitting mechanism
196 ..One sensing element within another
197 ..With compensation
198 ..With adjustment
199 ...Mechanical loading of sensor
200 ...Adjustment of limit stop
201 ..Expanding fluid
202 ...With distinct pressure transmitting fluid
203 ...Bourdon tube or bellows
204 ..Multiple distinct sensing elements
205 ..Compound sensing element (e.g., bimetallic)
206 ...Coil
207 ....Helix
208 **HOUSING, SUPPORT, OR ADJUNCT**
209 .Removable probe cover
210 **MISCELLANEOUS**

E-SUBCLASSES

The following subclasses beginning with the letter E are E-subclasses. Each E-subclass corresponds in scope to a classification in a foreign classification system, for example, the European Classification system (ECLA). The foreign classification equivalent to an E-subclass is identified in the subclass definition. In addition to US documents classified in E-subclasses by US examiners, documents are regularly classified in E-subclasses according to the classification practices of any foreign Offices identified in parentheses at the end of the title. For example, "(EPO)" at the end of a title indicates both Euro-

pean and US patent documents, as classified by the EPO, are regularly added to the subclass. E-subclasses may contain subject matter outside the scope of this class.Consult their definitions, or the documents themselves to clarify or interpret titles.

E19.001 **TESTING OR CALIBRATING CALORIMETERS (EPO)**
E17.001 **MEASURING QUANTITY OF HEAT (EPO)**
E17.002 .For measuring the power of light beams, e.g., laser beams, etc. (EPO)
E17.003 .Microcalorimeters, e.g., using silicon microstructures, etc. (EPO)
E17.004 .Calorimeters using transport of an indicating substances, e.g., evaporation calorimeters, etc. (EPO)
E17.005 ..Where evaporation, sublimation or condensation caused by heating or cooling, is measured (EPO)
E17.006 .Calorimeters using compensation methods (EPO)
E17.007 .Measuring quantity of heat conveyed by flowing mediums, e.g., in heating systems, etc. (EPO)
E17.008 ..Based upon measurement of temperature difference (EPO)
E17.009 ...Between an inlet and an outlet point, combined with measurement of rate of flow of the medium if such, by integration during a certain time-interval (EPO)
E17.01 ....Indicating product of flow and temperature difference directly (EPO)
E17.011 .....Using mechanical means for both measurements (EPO)
E17.012 .....Using electrical or magnetic means for both measurements (EPO)
E17.013 .....Using electrical or magnetic means for one measurement and mechanical means for the other (EPO)
E17.014 ......Where the indicating-instrument is driven electrically or magnetically by the temperature-measurement device and mechanically by the flow-measurement device (EPO)
E17.015 ...Across a radiating surface, combined with ascertainment of the heat transmission coefficient (EPO)
E15.001 **TESTING OR CALIBRATING OF THERMOMETERS (EPO)**
E15.002 .Calibrated temperature sources, temperature standards therefor (EPO)
E7.001 **MEASURING TEMPERATURE BASED ON THE USE OF ELECTRIC OR MAGNETIC ELEMENTS DIRECTLY SENSITIVE TO HEAT (EPO)**
E7.002 .Using pyroelectric elements (EPO)
E7.003 .Using superconductive elements (EPO)
E7.004 .Using thermoelectric elements, e.g., thermocouples, etc. (EPO)
E7.005 ..Provided with specially adapted connectors (EPO)
E7.006 ..Expendable thermocouples (EPO)
E7.007 ..Arrangements for signaling rupture or disconnection of the thermocouple (EPO)
E7.008 ..Using microstructures, e.g., made of silicon, etc. (EPO)
E7.009 ..The object to be measured not forming one of the thermo-electric materials (EPO)
E7.01 ...The thermo-electric materials being arranged one within the other with the junction at one end exposed to the object, e.g., sheathed type, etc. (EPO)
E7.011 ..The object to be measured forming one of the thermo-electric materials, e.g. pointed type, etc. (EPO)
E7.012 ..Arrangements for compensating for auxiliary variables, e.g., length of lead, etc. (EPO)
E7.013 ...Arrangements with respect to the cold junction, e.g., preventing influence of temperature of surrounding air, etc. (EPO)

E7.014 ....Circuits for cold-junction compensation (EPO)
E7.015 ..Arrangements for modifying the output characteristic, e.g., linearizing, etc. (EPO)
E7.016 ..Particular circuit arrangements (EPO)
E7.018 .Using resistive elements (EPO)
E7.019 ..The element being an electrolyte (EPO)
E7.02 ...In a specially-adapted circuit, e.g., bridge circuit, etc. (EPO)
E7.021 ..The element being a linear resistance, e.g., platinum resistance thermometer, etc. (EPO)
E7.022 ...Characterized by the use of the resistive element (EPO)
E7.023 ...Using microstructures (EPO)
E7.024 ...In a specially-adapted circuit, e.g., bridge circuit, etc. (EPO)
E7.025 ....In an oscillator circuit (EPO)
E7.026 ....In a potentiometer circuit (EPO)
E7.027 ....For modifying the output characteristic, e.g., linearizing, etc. (EPO)
E7.028 ..The element being a non-linear resistance, e.g., thermistor, etc. (EPO)
E7.029 ...Characterized by the shape of the resistive element (EPO)
E7.03 ...Using microstructures, e.g., silicon spreading resistance, etc. (EPO)
E7.031 ...In a specially-adapted circuit, e.g., bridge circuit, etc. (EPO)
E7.032 ....In an oscillator circuit (EPO)
E7.033 ....For modifying the output characteristic, e.g., linearizing, etc. (EPO)
E7.034 .Using thermal noise of resistances or conductors (EPO)
E7.035 .Using semiconducting elements having PN junctions (EPO)
E7.036 ..Using microstructures, e.g., made of silicon, etc. (EPO)
E7.037 .Using capacitative elements (EPO)
E7.038 ..The dielectric constant of which is temperature dependant (EPO)
E7.039 .Using magnetic elements, e.g., magnets, coils, etc. (EPO)
E7.04 ..The variations of temperature influencing the magnetic permeability (EPO)
E7.041 .Using ionization of gases (EPO)
E7.042 .Circuits for reducing thermal inertia; Circuits for predicting the stationary value of temperature (EPO)
E7.043 ..Thermal management of integrated systems (EPO)
E3.001 **THERMOMETERS GIVING RESULTS OTHER THAN MOMENTARY VALUE OF TEMPERATURE (EPO)**
E3.002 .Circuits arrangements for indicating a predetermined temperature (EPO)
E3.003 .Giving means values; giving integrated values (EPO)
E3.004 ..In respect of time (EPO)
E3.005 ..In respect of space (EPO)
E3.006 .Giving differences of values; giving differentiated values (EPO)
E3.007 ..In respect of time, e.g., reacting only to a quick change of temperature etc. (EPO)
E3.008 ...Based upon expansion or contraction of materials (EPO)
E3.009 ..In respect of space (EPO)
E9.001 **MEASURING TEMPERATURE BASED ON MOVEMENTS CAUSED BY REDISTRIBUTION OF WEIGHT, E.G., TILTING THERMOMETER, ETC. (EPO)**
E5.001 **MEASURING TEMPERATURE BASED ON THE EXPANSION OR CONTRACTION OF A MATERIAL (EPO)**
E5.002 .The material being a liquid (EPO)
E5.003 ..Manufacturing of this particular type of thermometer (EPO)
E5.004 ..Details (EPO)
E5.005 ...Arrangements for driving back the liquid column (EPO)
E5.006 ...Capillary tubes (EPO)
E5.007 ...Containers for the liquid (EPO)

E5.008 ...Selection of liquid compositions (EPO)
E5.009 ..The liquid displacing a further liquid column or a solid body (EPO)
E5.01 ..With electric contacts (EPO)
E5.011 ..With electric conversion means for final indication (EPO)
E5.012 ..With provision for expansion indicating over not more than a few degrees, e.g., clinical thermometer, etc. (EPO)
E5.013 ...With means for indicating a maximum, e.g., a constriction in the capillary tube, etc. (EPO)
E5.014 ..With means for indicating a maximum or a minimum or both (EPO)
E5.015 ..With provision for measuring the difference between two temperatures (EPO)
E5.016 ..With provision for adjusting zero point of scale, e.g., Beckmann thermometer, etc. (EPO)
E5.017 .The material being a gas (EPO)
E5.018 ..The gas displacing a liquid column (EPO)
E5.019 .The material being a fluid contained in a hollow body having parts which are deformable or displaceable under the pressure developed by the material (EPO)
E5.02 ..Selection of fluid compositions (EPO)
E5.021 ..Using a fluid container connected to the deformable body by means of a capillary tube (EPO)
E5.022 ..The body being a tubular spring, e.g., Bourdon tube, etc. (EPO)
E5.023 ...Of spiral formation (EPO)
E5.024 ...Of helical formation (EPO)
E5.025 ..The body being a bellows (EPO)
E5.026 ..The body being a capsule (EPO)
E5.027 ..The body being a cylinder and piston (EPO)
E5.028 ..With electric conversion means for final indication (EPO)
E5.029 ...Using electrical contact making or breaking devices (EPO)
E5.03 .The material being a solid (EPO)
E5.031 ..Using materials with a configuration memory e.g., Ni-Ti alloys, etc. (EPO)
E5.032 ..Using microstructures, e.g., made of silicon, etc. (EPO)
E5.033 ..Arranged for free expansion or contraction (EPO)
E5.034 ...With electrical conversion means for final indication (EPO)
E5.035 ..Consisting of pivotally-connected elements (EPO)
E5.036 ..Constrained so that expansion or contraction causes a deformation of the solid (EPO)
E5.037 ...The solid body being formed of compounded strips or plates, e.g., bimetallic strip, etc. (EPO)
E5.038 ....Details of the compounds system (EPO)
E5.039 .....Selection of composition of the components of the system (EPO)
E5.04 .....Shape of the system (EPO)
E5.041 ....Specially adapted for indicating or recording (EPO)
E5.042 .....With electric transmission means for final indication (EPO)
E5.043 ...The solid body being constrained at more than one point, e.g., rod, plate, diaphragm, etc. (EPO)
E5.044 ....The body being a flexible wire or ribbon (EPO)
E11.001 **MEASURING TEMPERATURE BASED UPON PHYSICAL OR CHEMICAL CHANGES NOT COVERED BY ANY OF THE PRECEDING SUBCLASSES (EPO)**
E11.002 .Using absorption or generation of gas, e.g., hydrogen, etc. (EPO)
E11.003 .Using measurement of the effect of a material on microwaves or longer electromagnetic waves, e.g., measuring temperature via microwaves emitted by the object, etc. (EPO)
E11.004 .Using evaporation or sublimation, e.g., by observing boiling, etc. (EPO)

E11.005 ..From material contained in a hollow body having parts which are deformable or displaceable under the pressure developed by the vapor (EPO)
E11.006 .Using melting, freezing, or softening (EPO)
E11.007 ..Of disposable test bodies, e.g., cone, etc. (EPO)
E11.008 .Using sintering (EPO)
E11.009 .Using measurement of acoustic effects (EPO)
E11.01 ..Of the velocity of propagation of sound (EPO)
E11.011 ..Of resonant frequencies (EPO)
E11.012 ...Using surface acoustic wave (SAW) (EPO)
E11.013 .Using measurements of density (EPO)
E11.014 .Using measurement of the effect of a material on X-radiation, gamma radiation or particle radiation (EPO)
E11.015 .Using changes in transmission, scattering or fluorescence in optical fibers (EPO)
E11.016 ..At discrete locations in the fiber, e.g., by means of Bragg gratings, etc. (EPO)
E11.017 ...Using changes in fluorescence, e.g., at the distal end of the fiber, etc. (EPO)
E11.018 .Using change of color or translucency (EPO)
E11.019 ..Using change in reflectance (EPO)
E11.02 ..Of inorganic materials (EPO)
E11.021 ..Of organic materials (EPO)
E11.022 ...liquid crystals (EPO)
E11.023 ..Of materials which change translucency (EPO)
E11.024 .Using thermo-luminescent materials (EPO)
E13.001 **ADAPTATIONS OF THERMOMETERS FOR SPECIFIC PURPOSES (EPO)**
E13.002 .For measuring body temperature (EPO)
E13.003 ..Infrared clinical thermometers, e.g., tympanic, etc. (EPO)
E13.004 .For cryogenic purposes (EPO)
E13.005 ..Using microstructures, e.g., made of silicon, etc. (EPO)
E13.006 .For measuring temperature of moving fluids or granular materials capable of flow (EPO)
E13.007 ..Suction thermometers (EPO)
E13.008 .For measuring temperature of moving solid bodies (EPO)
E13.009 ..In linear movement (EPO)
E13.01 ..In rotary movement (EPO)
E13.011 .For measuring temperature within piled or stacked materials (EPO)
E13.012 .Combined with sampling devices for measuring temperatures of samples of materials (EPO)
E13.013 ..For siderurgical purposes (EPO)
E1.001 **DETAILS OF THERMOMETERS NOT SPECIALLY ADAPTED FOR PARTICULAR TYPES OF THERMOMETER (EPO)**
E1.002 .Special applications of indicating or recording means, e.g., for remote indications, etc. (EPO)
E1.003 ..Recording (EPO)
E1.004 ..For remote (EPO)
E1.005 ..Arrangements for monitoring a plurality of temperatures, e.g., by multiplexing, etc. (EPO)
E1.006 ..Arrangements for numerical indication (EPO)
E1.007 ..Scales (EPO)
E1.008 ...Temperature indication combined with the indication of another variable (EPO)
E1.009 ...Arrangements for facilitating reading, e.g., illumination, magnifying glass, etc. (EPO)
E1.01 ....Of liquid column thermometers (EPO)
E1.011 .Protective devices, e.g., casings, etc. (EPO)
E1.012 ..For clinical thermometers, e.g., contamination preventing sleeves, etc. (EPO)
E1.013 ...For tympanic thermometers (EPO)
E1.014 ..For preventing chemical attack (EPO)
E1.015 ...For siderurgical use (EPO)
E1.016 ..For preventing damage due to heat overloading (EPO)
E1.017 ...For siderurgical use (EPO)

E1.018 .Supports; Fastening devices; mounting thermometers in particular locations (EPO)
E1.019 ..For measuring surface temperatures, e.g., of pipe walls, etc. (EPO)
E1.02 ..Arrangements for moving thermometers to or from a measuring position (EPO)
E1.021 .Special arrangements for conducting heat from the object to the sensitive element (EPO)
E1.022 ..For reducing thermal inertia (EPO)
E1.023 .Compensating for effects of temperature changes other than those to be measured, e.g., changes in ambient temperature, etc. (EPO)
E1.024 ..By means of fluid contained in a hollow body having parts which are deformable or displaceable under the pressure developed by the fluid (EPO)
E1.025 ..By means of compounded strips or plates, e.g., by bimetallic strips, etc. (EPO)
E1.026 .Compensating for effects of pressure changes (EPO)

FOREIGN ART COLLECTIONS

FOR 000 **CLASS-RELATED FOREIGN DOCUMENTS**