Specification for

Thermographs (Bimetallic type) —

For air temperatures within the range 0 °F to 140 °F (– 20 °C to 60 °C)

Co-operating organizations

The Instrument Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Association of Scientific Workers
British Ceramic Research Association
British Clock and Watch Manufacturers' Association
British Electrical and Allied Industries Research Association
British Electrical and Allied Manufacturers' Association*
British Industrial Measuring and Control Apparatus Manufacturers' Association*
British Iron and Steel Federation*
British Nautical Instrument Trade Association
British Railways, The British Transport Commission
British Scientific Instrument Research Association*
Council of British Manufacturers of Petroleum Equipment
Electricity Council, the Generating Board and the Area Boards in England and Wales*
Engineering Equipment Users' Association*
Gauge and Tool Makers' Association
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Water-tube Boilermakers' Association

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the Committee entrusted with the preparation of this British Standard:

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Air ministry
British Coal Utilization Research Association
Gas Council
Ministry of Power
Ministry of Works
Physical Society
Refrigerated Cargo Research Council
Society of Chemical Industry
War Office
Individual manufacturers and users

This British Standard, having been approved by the Instrument Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 17 March 1960

The following BSI references relate to the work on this standard:
Committee references INE/4 and INE/4/7
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Contents

Foreword

This standard makes reference to the following British Standards:

BS 1133, *Packaging code*.

BS 1986, *Dimensional features of measuring and control instruments and panels for industrial purposes*.

BS 2548, *Wood wool for general packaging purposes*.

BS 2770, *Recommendations for the pictorial marking of handling instructions for non-dangerous goods*.

This British Standard is one of a series prepared under the authority of the Instrument Industry Standards Committee at the request of the Temperature Measuring Instruments Sub-Committee of the Joint Equipment Standardization Committee. It is intended to cover Service requirements for a thermograph to record air temperatures, as well as the requirements for certain industrial and marine uses.

NOTE Where metric equivalents are stated, the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in BS 350, *"Conversion factors and tables"*.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 3 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard relates to thermographs of the bimetallic type, for general and marine use in obtaining a continuous record of air temperatures within the range 0 °F to 140 °F (– 20 °C to 60 °C).

Such an instrument comprises a bimetallic element, the response of which to temperature changes controls the movement of a pen, and a clock-driven drum carrying a chart on which the pen movement records against a temperature scale. A louvred screen may be used to protect the instrument during exposure, but the screen is not included in this British Standard.

If the instrument is to be used in conditions where vibration or violent movement is likely, shock absorbers or some other suitable device may be required to ensure that the specified accuracy is maintained.

2 Materials

Wherever possible, the materials of construction shall be selected to avoid the possibility of electrolytic or atmospheric corrosion.

The bimetallic element shall have received an appropriate stress-relieving treatment to ensure freedom from hysteresis. It shall also receive a suitable surface treatment to resist corrosion.

3 Design and construction

The thermograph shall preferably use one of the types of drum and chart described in BS 1986[1)].

The recorder shall be provided with a suitable cover, with windows on at least the three sides which embrace the drum, or alternatively with a single window on the side on which the record is being traced, so arranged as to provide free access for removal and replacement of charts. These windows shall be of permanently transparent, non-flammable material. A mechanism for withdrawing the pen from the chart shall also be fitted, operated from outside the cover.

The bimetallic element may be of any convenient form, such as a helix, a spiral or a cantilever, arranged to record low temperatures at the bottom of the chart. The position of the fixed end shall be adjustable, e.g. by a fine-adjustment screw and spring. The element shall be protected from damage by a guard of minimum heat capacity, so constructed as to allow free passage of air. A clip shall be provided on the guard to carry a thermometer for air temperature measurement.

If ink is used, provision shall be made for the safe storage of a container within the instrument.

4 Temperature range

The nominal range of the instrument shall be either 80 degF or 100 degF, within the extremes of 0 °F and 140 °F. When specially ordered, provision may be made for recording down to – 40 °F.

A zero adjustment of at least ± 25 per cent of the nominal range shall be provided, of such construction that a screwdriver or other tool can be used for fine control.

5 Accuracy

When the temperature is changed by 50 degF over any interval between 0 °F and 140 °F, the indicated difference in temperature shall not be in error by more than ± 1 degF when tested in accordance with Clause **7** *a*).

6 Lag (response)

When any change in ambient temperature takes place, the instrument shall record at least two-thirds of such change within 30 seconds when tested in accordance with Clause **7** *b*).

7 Testing

a) *Accuracy*. The clock shall be removed to avoid damage and a metal strip bearing the appropriate scale substituted, the pen arm pressure on the strip being adjusted to simulate pen/paper friction. The instrument shall then be tilted at an angle of 10 degrees and the element immersed alternately in recirculating water baths differing in temperature by 50 degF. The difference in temperature shall be indicated to the accuracy specified in Clause **5**.

b) *Response*[2)]. The instrument shall be raised about 40 degF above ambient temperature by inserting it in a suitably heated recirculating air oven for at least 30 minutes. The instrument shall then be withdrawn from the oven and placed in a current of air moving towards the element at not less than 15 ft/sec (5 m/sec). At least two-thirds of the difference in temperature shall be recorded within 30 seconds (Note), as required by Clause **6**.

[1)] BS 1986, "*Dimensional features of measuring and control instruments and panels for industrial processes*".

[2)] Instruments of identical design may be expected to have the same response time and it will generally only be necessary for a type test to be carried out.

c) *Certification.* Certification of thermographs shall normally be carried out by a recognized testing station, but periodic checks on performance and examination for general compliance with this specification may be conducted in the manner described above.

NOTE An instrument complying with Clause **6** is likely to have a response of about 3 seconds if the test described above is carried out using two water baths in place of an air oven and a current of air.

8 Marking

The following information shall be permanently marked on the instrument in a convenient position for ready reference, preferably on the cover:

a) The manufacturer's name or trade mark.

b) A serial number.

c) The number of this British Standard, i.e. "BS 3231".

d) The nominal range of the instrument.

NOTE The mark "BS 3231" on a product is an indication by the manufacturer that it purports to comply with the requirements of this British Standard.

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9 Packaging

The instrument shall be packed for transit in such a manner as to minimize the possibility of accidental damage[3)]. Detailed recommendations are given in Appendix A.

[3)] General guidance on methods of packaging and packaging materials is given in BS 1133, "*Packaging Code*".

Appendix A General recommendations for despatch by manufacturer and subsequent movement by customer from site to site

a) **Packaging.**

1) Allow clock to run down.

2) Remove ink from pen-nib (absorb by blotting paper).

3) If reserve ink is contained within the recorder remove the container and pack separately.

4) Operate pen lifter and fix by tying with thread or by using a rubber band, so that the pen-nib cannot hammer the chart drum while in transit.

5) Lock lid, or failing locking arrangement tie with broad tape, so as to prevent the instrument opening if the package is inverted.

6) Cover windows with plywood, fibreboard or very stout paperboard fixed with adhesive tape, thus transferring padding pressure strain to the instrument case.

7) Enclose the instrument in a stout container with suitable cushioning, sufficient to withstand normal transit risks, to prevent movement of the instrument within the container.

b) **Transport.**

1) For local delivery by vehicle or for postal or air transport the container is sufficient.

2) For rail transport put container(s) inside a larger container with wood wool[4)] cushioning.

3) For sea transport enclose container(s) in strong cases with wood wool[4)] cushioning.

4) Provide usual warnings of fragility in English for internal transportation but use the appropriate international "Fragile" sign for export[5)].

[4)] See BS 2548, *"Wood wool for general packaging purposes"*.
[5)] Attention is drawn to BS 2770, *"Recommendations for the pictorial marking of handling instructions for non-dangerous goods"*.

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