

**GENERAL AGREEMENT ON
TARIFFS AND TRADE**

RESTRICTED

TBT/Notif.84.93/Add.1*
28 June 1984

Special Distribution

Committee on Technical Barriers to Trade

Original: Spanish

NOTIFICATION

Addendum

A translation of the Ministerial Order attached to document TBT/Notif.84.93 is reproduced below.

MINISTRY OF INDUSTRY AND ENERGY

4982 ORDER of 10 February 1983 concerning technical standards of fluid-filled types of radiators and heating convectors, and their type-approval by the Ministry of Industry and Energy.¹

Royal Decree 3089/1982, of 15 October, made mandatory, compliance with technical standards for fluid-filled radiators and heating convectors to be determined by the Ministry of Industry and Energy, and laid down that those standards must be observed in the various types of fluid-filled radiators and heating convectors, whose mandatory type-approval shall be effected in accordance with the General Regulations of Procedure of the Ministry of Industry and Energy in the field of standardization and type-approval, which were approved by Royal Decree 2584/1981, of 18 September, and with the standards to be established by the Ministry of Industry and Energy for the system of testing.

With a view to carrying out the mandate assigned by the Royal Decree and upon the recommendation of the Directorate-General for Siderometallurgical and Naval Industries, this Ministry has deemed it appropriate to order as follows:

1. The technical standards concerning tests for the type-approval of fluid-filled radiators and heating convectors, contained in the Annex to this Ministerial Order, are approved.
2. Those standards shall be applicable for radiators and convectors (hereinafter referred to as "emitters"), used for the heating of premises and destined for the domestic market, which operate with a fluid as the heating

*English and French only

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medium and in which the heat is transmitted to the room in which they are situated by means of natural radiation or convection.

3. The object of the standards in the Annex is to define the requirements for type-approval of heat emitters and, in particular, to lay down testing methods and conditions for determining the caloric emission of the emitter i.e. the thermal power of the emitter yielded by radiation or convection to the room in which it is situated.

4. Applications for type-approval, which shall be processed and decided on in accordance with the provisions of Chapter 5 of the General Regulations of Procedure of the Ministry of Industry and Energy in the field of standardization and type-approval, approved by Royal Decree 2584/1981, of 18 September, shall be addressed to the General Directorate for Siderometallurgical and Naval Industries.

5. The application shall indicate:

(a) The identity of the applicant.

If he is a domestic manufacturer, he shall furnish his registration number in the Industrial Register and if he is an importer, his tax identification number, particulars concerning the manufacturer and his representative in Spain.

(b) The annual production volume of the product to be approved and the share of the national market covered, or which is covered by similar products existing on the market.

(c) The percentage of national content of the product and the origin of its technology.

6. Applications for type-approval shall be accompanied by a project in triplicate, signed by a competent licensed technical expert and visaed by the appropriate official association (Colegio Oficial). The project shall include:

1. A descriptive memorandum and specifications indicating:

1.1 The fluids which the emitter can use in its operation;

1.2 Maximum operating pressure;

1.3 Materials of which it is constructed;

1.4 Connections.

2. Construction diagrams in accordance with the UNE standards for industrial drawings.

3. A data sheet, in UNE format A4 in quadruplicate, showing the principal specifications of the emitter and its main dimensions in millimetres, with elevations, cross-sections and external views, the position and size of its connections and its caloric emission.

4. A technical report by one of the laboratories accredited for testing to determine the caloric emission of emitters, showing the results obtained from tests carried out in accordance with the methods and conditions described in the Annex hereto.

5. A verification report (auditoría) on the suitability of the production equipment of the manufacturer, whether domestic or foreign, and of the quality-control system integrated in his manufacturing process. The verification report shall be made by a Co-operating Entity in the field of standardization and type-approval.

It will necessarily include a report on the way in which the manufacturer adheres to the time-tables for calibrating all product elements and measuring instruments.

7. The period referred to in Chapter 6, paragraph 6.1.1, of the General Regulations of Procedure mentioned in Section 4 above, shall be two years. Nevertheless, the Supervision and Certification Commission, responsible for monitoring production, may at any time order the inspections and tests it deems appropriate.

Madrid, 10 February 1983

SOLCHAGA CATALAN

ANNEX

Terminology and Testing Methods

1. BASIC TERMINOLOGY

1.1 Radiators - Radiators consisting of elements, pipes, flat surfaces or finned tubes are heat emitters which yield a considerable amount of heat by radiation.

1.2 Convectors - Convectors are heat emitters which yield heat almost exclusively by convection.

1.3 Family - Emitters of a given type form a family when they are of one well-defined construction as regards constituent elements, form, materials, method of connection, but are produced in different heights, widths and lengths.

1.4 Gamme - Appliances of one family having the same width.

1.5 Model - Appliances of one gamme having the same height, i.e. they differ only in their length.

1.6 Thermal power or caloric emission Q,q - The quantity of heat yielded by the emitter in unit of time Q.

Thermal power per element or metre of emitter's length q.

1.7 Temperatures of the heating medium - The inlet temperature t_v is the temperature of the heating medium on entering the emitter in °C.

The outlet temperature t_r is the temperature of the heating medium on leaving the emitter in °C.

1.8 Reference ambient temperature t_L - This is the temperature of the air, measured in accordance with Section 9 below, to be used in determining the thermal head, as defined in the next paragraph, in °C.

1.9 Thermal head - The thermal head is defined as the difference between the average temperature of the heating medium and the reference ambient temperature, in accordance with the following formula:

$$\Delta t = \frac{t_v + t_r}{2} - t_L$$

measured in Kelvin(K) degrees.

1.10 Air pressure p - This is the atmospheric pressure in the testing room in mbar.

1.11 Flow rate of heating medium m_H - This is the mass of the heating medium flowing through the emitter per unit of time in Kg/h.

Nominal flow-rate is the flow rate under the nominal conditions indicated in 1.12 below.

1.12 Rated thermal power Q_n - Rated thermal power is the thermal power of the emitter under the following nominal conditions:

Thermal head $\Delta t = 60$ K.

Reference ambient temperature $t_L = 20^\circ$ C.

Air pressure $p_0 = 1013$ mbar.

$t_v - t_r = 20$ K for radiators.

$t_v - t_r = 10$ K for convectors.

1.13 Ratio and nominal ratio - The ratio shows the relationship between the thermal power of the emitter and the average thermal head Δt for a given constant flow-rate m_H of the heating medium.

The nominal ratio is the ratio using the nominal flow-rate.

2. TESTING DIRECTIVES

2.1 Installation - The testing shall be done in a testing room with an open booth as specified in Section 9 below, so as to ensure compliance with the testing conditions laid down in Section 3.

2.2 Position and hookup of the emitter

2.2.1 Position of the emitter - The emitter shall be placed in the centre of the rear wall of the booth. The emitter shall be positioned without a shield at a distance of 50 mm. \pm 5 mm. from the rear wall and of 110 mm. \pm 10 mm. above the floor of the booth on insulated supports of not more than 20 mm. width. If the distances from the wall or the floor of the booth are different from those indicated, that must be expressly mentioned in the test report.

Convectors shall be placed directly against the rear wall of the booth with the shield supplied or prescribed by the manufacturer. The manufacturer's assembly recommendations must be strictly followed. These provisions shall apply also to the testing of shielded radiators.

2.2.2 Hookup of radiator - The inlet and outlet pipes for the heating medium shall be connected diagonally, with the inlet pipe at the top of the emitter, unless the manufacturer indicates otherwise.

2.3 Methods of determining the thermal power - The following two methods may be used for determining the thermal power.

2.3.1 Electrical method - The heating medium to be used is heated electrically and flows into the emitter, whether by natural circulation or by means of a pump.

The thermal power of the emitter is obtained by subtracting the heat losses of the electrical generator and of the pipes, including the power of the pump if any, from the electrical energy supplied.

2.3.2 Method by weighing - The heating medium flows out of the emitter into a recipient for the purpose of being weighed.

The thermal power of the emitter is determined as the product of the flow rate times the difference in the heat content of the heating medium between the inlet and outlet of the emitter.

Section 10 below shows different arrangements that can be adopted for establishing the heat equation in hot-water circuits; other arrangements can be adopted provided the requirements of Section 3 are fulfilled.

3. TESTING CONDITIONS

3.1 Size of the emitter - Radiators composed of elements shall be formed of not less than ten elements. No emitter shall have a length of less than 0.5 m.

The rated power shall, in every case, be higher than 700 W.

3.2 Steady-state condition - The testing shall be done when the emitter reaches its steady-state condition. This shall be deemed to have been reached if, in measurements taken at least every five minutes over a period of thirty minutes, the values obtained do not fluctuate from the average by more than:

± 0.2 K for temperatures of the heating medium and the reference ambient air, ± 2 per cent for the flow rate, ± 1 per cent for the pressure, and ± 1 per cent for the thermal power (electrical method).

3.3 Ambient temperature - The reference ambient temperature shall be stabilized at between 18 and 22° C.

3.4 Temperature of heating medium - The testing shall be done with a flow rate stabilized to produce a reduction of temperature in the appliance of 20 ± 2 K for radiators and 10 ± 2 K for convectors.

4. ACCURACY OF MEASUREMENTS

The accuracy of measurements shall be comprised within the following limits:

Flow rates: ± 0.5 per cent (weighing method).

Temperatures: $\pm 0.1^\circ$ C.

Absolute pressures: ± 1 per cent.

Energy: ± 0.5 per cent.

5. TESTING PROCEDURE

5.1 General - The test is started as soon as the steady-state condition is reached.

During a test at least two separate determinations of thermal-power values shall be made at an interval of not less than ten minutes.

The thermal-power values determined in each one of the measurements must not differ by more than 0.5 per cent of each of the values.

5.2 Determination of the thermal power of the emitter

5.2.1 Rated thermal power: for fluid-filled emitters, the power (electrical method) or the flow rate of the heating medium (weighing method) must be adjusted so as to attain as closely as possible the nominal conditions mentioned in paragraph 1.12. For this purpose two separate tests are recommended, one with $\Delta t = 57$ to 60 K and another with $\Delta t = 60$ to 63 K. The rated thermal power is determined by interpolation to $\Delta t = 60$ K.

5.2.2 Ratios: to indicate the relationship between the thermal power of an emitter and the thermal head (ratio) at least two tests shall be made, one with $\Delta t = 30$ to 35 K and the other with $\Delta t = 45$ to 50 K. To determine the nominal ratio the flow rate of the heating medium must be adjusted to the nominal conditions.

At the request of the manufacturer ratios may be determined for flow rates different from the nominal flow-rate.

5.3 Heat loss in the electrical method - In the electrical method the thermal power lost in the testing installation, in the range of test temperatures, shall be determined by a short-circuit test (installation of an insulated tube whose heat loss is known instead of the emitter).

6. TEST EVALUATION

6.1 When the atmospheric pressure p differs from $p_0 = 1013$ mbar the thermal power must be multiplied by the correction factor:

$$1 + \frac{\beta \Delta p}{p_0}$$

In which:

$\beta = 0.3$ for radiators and 0.5 for convectors.

$\Delta p = p_0 - p$.

p : Average atmospheric pressure during test.

p_0 : Reference atmospheric pressure: 1013 mbar.

Provided this factor is greater than 1.01.

6.2 The values obtained for the various thermal heads (ratio) are shown on a logarithmic diagram. The relationship between thermal powers and thermal head can be expressed sufficiently accurately by an exponential function in the form:

$$q = \beta (\Delta t)^n$$

in which B and n are coefficients obtained by the method of squared minimum values of $\log q$ in a function of $\log \Delta t$.

7. MODELS FOR TESTING

When a set of emitters constitutes a gamme, it is not necessary to test every model individually in order to determine its thermal power. It will suffice to test the largest and the smallest models of the gamme provided the height ratio is less than 1:2. If this is not the case, the intermediate heights must be tested as necessary so that this ratio is not exceeded as between two consecutive emitters. The power of untested models will be determined by linear interpolation.

8. TEST REPORT

8.1 The test report must indicate:

Testing method.

Dimensions of testing booth.

Model, dimensions, type and arrangement of connections, mass and quality of the emitter.

Heating medium.

Numerical table showing values measured and test results.

Diagram showing nominal ratio.

Rated thermal power and corresponding nominal flow-rate for the models tested.

Rated thermal power of all models in the gamme.

Exponent n of ratio.

8.2 The report must include the following documentation which will be duly verified by the laboratory:

- Drawing of the emitter in UNE format A4 in which the form and dimensions of the emitter are clearly indicated.
- Capacity weight, material used and heating medium.
- In cases where deemed necessary, assembly and installation instructions for the emitter.

9. TESTING ROOM

9.1 Testing room - The place in which tests are to be carried out must be such that the heat released by the emitters to be tested, and the corresponding installations, does not appreciably affect the temperature of the ambient air and of the walls of the room.

Its volume must not be less than 200 cubic metres.

The room must be without windows and be protected as far as possible against climatic influences, in particular solar radiation and wind.

The increase in the ambient temperature and wall temperature must not exceed 0.3 K/h for the maximum test power envisaged. Otherwise there must be a cooling system to maintain the room at a constant temperature.

Figure 1 shows the minimum dimensions of the testing room.

9.2 Testing booth - The emitter to be tested must be placed in an open-fronted testing booth in order to avoid any radiation exchange with the walls of the room, and likewise undesirable drafts.

The positioning of the booth in the testing room and its possible internal dimensions are shown in Figure 1.

The joints between the wall and floor of the booth must be airtight.

Given that the heat transmission coefficient and the emissivity of the walls of the booth have a considerable influence on the fraction of thermal power corresponding to radiation, this is particularly important for the rear wall of the booth. For these reasons, the walls of the booth must comply with the following specifications:

(a) Rear wall of the booth:

$$\text{Resistance to heat transmission: } \frac{1}{\Lambda} = 0.13 \pm 0.03 \frac{\text{m}^2\text{K}}{\text{W}}$$

$$\text{Emissivity: } \varepsilon > 0.92$$

(b) Other walls:

$$\text{Resistance to heat transmission: } \frac{1}{\Lambda} < 0.13 \frac{\text{m}^2\text{K}}{\text{W}}$$

$$\text{Emissivity: } \varepsilon > 0.9$$

In the event of significant differences between the ambient temperature and that of the wall of the room facing the open side of the booth, a radiation screen must be set up at a distance of 2 metres from the booth (see Figure 1).

In testing emitters more than 2 metres high the booth need not have a roof, and the side and rear walls must then be extended, as well as the radiation screen, so as to be not less than 0.5 m. higher than the radiator.

9.3 Climatic requirements in testing booth - In order to avoid the effects of vertical temperature variations or drafts in the testing booth, in measuring thermal power the following conditions must be fulfilled in the booth when there are no emitters in operation:

9.3.1 At the middle vertical axis of the front of the booth, the difference in temperature between a point 0.05 m. above the floor of the booth and the level corresponding to the upper part of the emitter must not exceed 0.2 K/m.

9.3.2 The wind speed, measured at a point 0.5 m. in front of the middle of the radiator, must not exceed 0.03 m/s with a tolerance of $\pm \frac{20}{100}$ per cent. The measurement must be made with sufficiently sensitive low-inertia apparatus.

10. MEASUREMENT OPERATIONS, DIAGRAMS
 FOR TESTING INSTALLATIONS

The diagrams below illustrate, by way of example, various arrangements that can be adopted for achieving thermal balance.

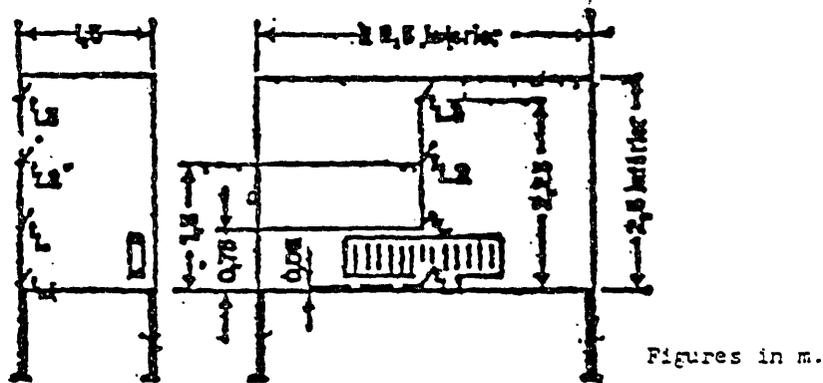


Figure 2. Positioning of booth temperature measurement points.

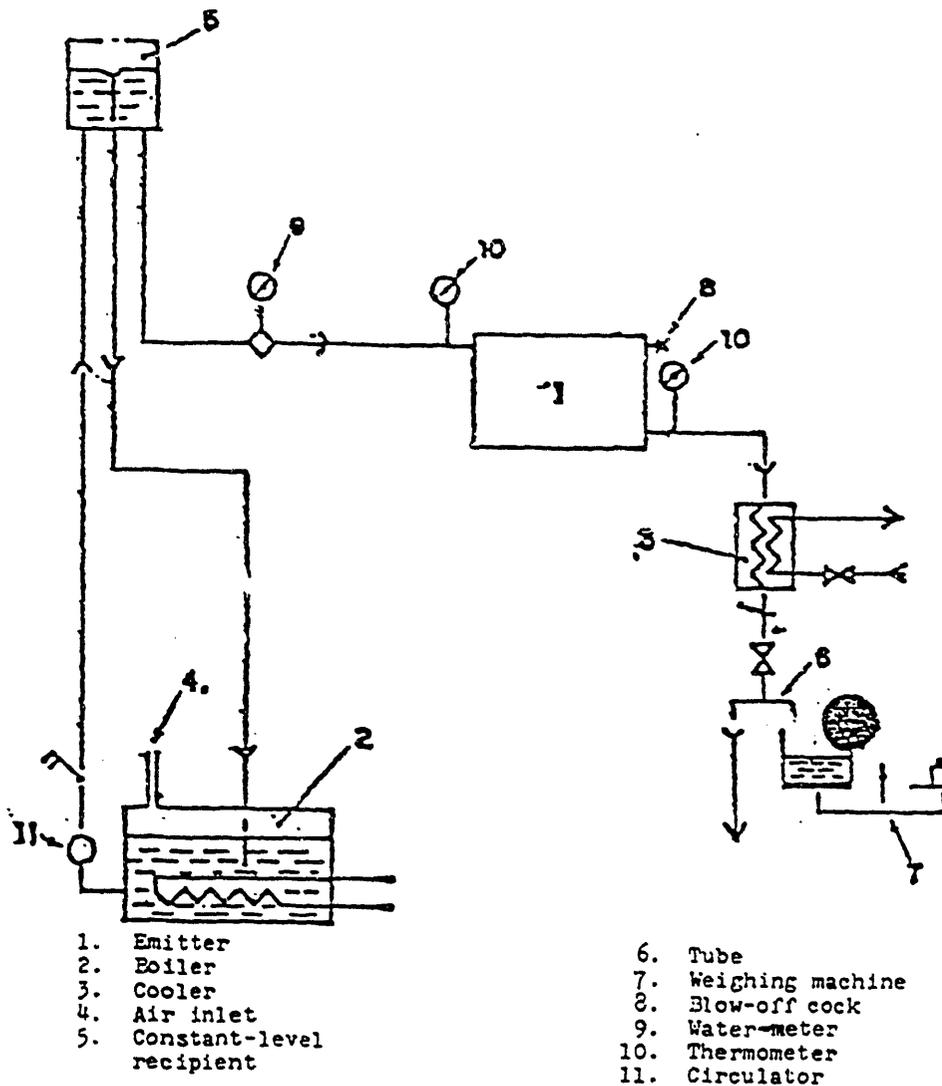
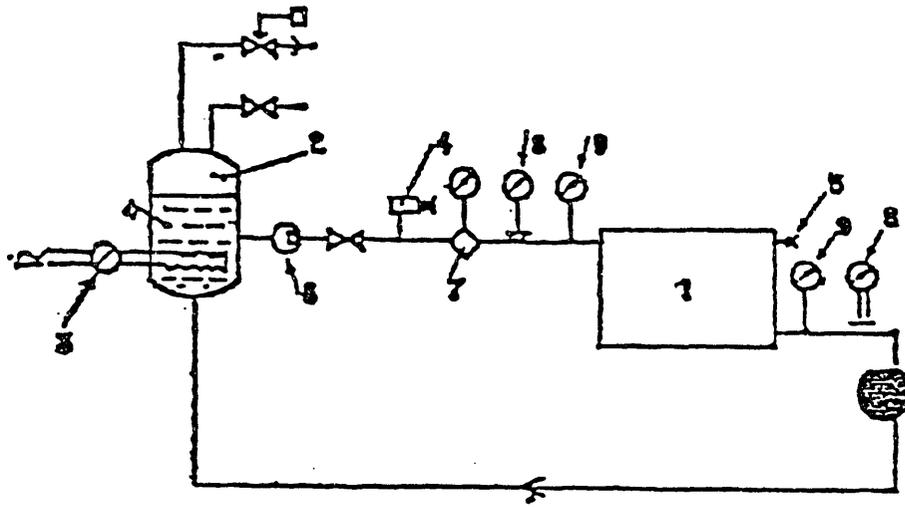


Figure 3. Installation of hot-water test, weighing method.



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|------------------|----------------|
| 1. Emitter | 6. Circulator |
| 2. Boiler | 7. Water-meter |
| 3. Watt-meter | 8. Monometer |
| 4. Air separator | 9. Thermometer |
| 5. Slow-off cock | |

Figure 4. Installation of hot-water or overheated test.
Electrical method.