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Surface Temperature Measurement Device for Ultrasound Diagnostic Instrument

(Surface temperature measurement device for diagnostic equipment probe (KS205TW-1 type), Surface temperature measurement device for diagnostic equipment probe in the cavity (KS205TW-2 type))

In order to comply with the implementation of GB 9706.237-2020 and GB 9706.205-2020, we strictly followed the specific provisions and principles of the standards, comprehensively absorbed the experience obtained by the drafting unit during the verification experiments, and developed the KS205TW series of dedicated temperature measurement body molds. The temperature measurement body mold series includes the KS205TW-1 type for external probes for diagnosis and monitoring, the KS205TW-2 type for internal probes, and the KS205TW-3 type for ultrasonic therapy equipment. All of them can be used under two conditions: air-ambient temperature and water bath-temperature rise. There are various ready-made products for water baths and thermometers, and they can be flexibly selected according to the user's wishes.

The structure and performance of the KS205TW-1 type are as follows:

1. Purpose

It is specifically designed for surface temperature detection of extracorporeal (non-invasive) type probes and can be used in both water bath - heating and non-water bath - room temperature conditions.

2. Basic Structure

(1) Shape and Dimensions

The overall shape is approximately hexagonal, with a width of 200mm, a thickness (front and back direction) of 70mm, and a height of 210mm.

(2) Shell Construction

(a) Front and Back Walls: The central part is a 1mm thick stainless steel plate, and the edge-matched part is a 10mm thick acrylic plate;

(b) Non-sound Window Sides: A 10mm thick acrylic plate;

(c) Top and Side Sound Windows: A 1.5mm thick room-temperature vulcanized rubber.

(3) Sound Windows

(a) Top: One flat and one R20mm curved sound window, the former for flat linear array and R76 convex array probes, the latter for R20, R15 and R10 convex array probes;

(b) Sides: One R40mm and one R60mm curved sound window, the former for R40 and R30 convex array probes, the latter for R60 and R50 convex array probes.

(4) Tissue-like Material: Water-based polymer gel composite material.

(5) Supporting Base Plate: 10mm thick acrylic.

3. Characteristics Parameters of Tissue-like Material

(1) Sound Velocity: (1540 ± 10) m/s

(2) Sound Attenuation Coefficient Slope: (0.5 ± 0.1) dB/(cm • MHz)

(3) Specific Heat Capacity: (3500 ± 500) J/(kg • K)

(4) Thermal Conductivity: (0.5 ± 0.1) W/(m • K)

The structure and performance of the KS205TW-2 type are as follows:

1. Purpose

The surface temperature detection specifically for the in vivo (interventional) type ultrasound diagnostic probe can be used in both water bath - heating and non-water bath - room temperature conditions.

2. Basic Structure

(1) Shape and dimensions

Overall cylindrical shape, outer diameter approximately 94mm, height approximately 190mm.

(2) Shell composition

(a) Side wall: approximately 5mm thick stainless steel, corresponding to the red arrow indication direction on the top membrane, the stainless steel side wall has sound-absorbing material inside;

(b) Top surface: transparent acrylic with a round hole in the center;

(c) Bottom surface: transparent acrylic with a central opening sealed by rubber.

(3) Cavity shape and material

(a) Shape: cylindrical;

(b) Upper section: ABS plastic;

(c) Lower section: rubber layer;

(d) Cavity bottom: rubber layer;

(e) Cavity aperture diameter: approximately 30mm (inner diameter);

(f) Cavity depth: approximately 120mm (opening depth)

(4) Tissue-like material type: water-based polymer gel composite material.

(5) Supporting base plate: 10mm thick acrylic.

3. Characteristics parameters of tissue-like material

(1) Sound velocity: (1540 ± 10) m/s;

(2) Sound attenuation coefficient slope: (0.5 ± 0.1) dB/(cm • MHz);

(3) Specific heat: (3500 ± 500) J/(kg • K);

(4) Heat conductivity: (0.5 ± 0.1) W/(m • K).

Figure 1: In-vivo temperature measurement body model KS205TW-2 and out-vivo temperature measurement body model KS205TW-1