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Mask for Acoustic Power Measurement of Ultrasonic Diagnostic Equipment (YM-1)

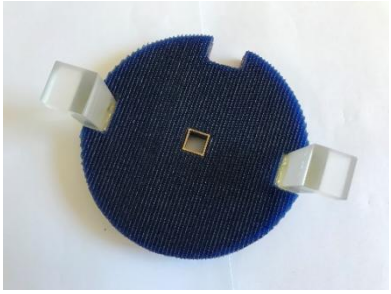
In the field of medical ultrasound, radiation force balances are widely employed to measure the acoustic output power of diagnostic and therapeutic devices. The application of this method is contingent upon two prerequisites: first, the acoustic beam must be parallel, with its acoustic axis (direction of propagation) perpendicular to the cross-section of the reflecting target or the plane of the absorbing target; and second, the target's cross-section must be sufficiently large to intercept the entire acoustic beam. While these requirements are easily met for single-element probes and linear arrays of limited length, they prove difficult to satisfy for convex arrays and phased arrays —probe types that constitute the mainstay of modern clinical practice. To address this challenge, the IEC 60601-2-37 standard—along with its national equivalent, GB 9706.9–2008—proposes three distinct methods for measuring the "bounded acoustic power" emitted from a 1 cm section of a probe's radiating surface. These methods include:

(1) Placing a component known as a "mask" between the probe and the target to intercept the majority of the acoustic beam—particularly when the probe is in scanning mode—without generating reflections; this allows only the quasi-parallel central portion of the beam to pass through a 1 cm wide aperture and impinge upon the target;

(2) Modifying the target of the radiation force balance to a width of 1 cm, orienting its longitudinal axis perpendicularly to the longitudinal axis of the probe's radiating surface, and ensuring that no reflected waves impinge upon the target;

(3) For specific probe types—such as phased arrays—employing electronic control techniques to restrict ultrasonic emission solely to the central 1 cm section of the radiating surface.

Of these three methods, the second requires physical modification of the power meter, while the third necessitates the development of specialized acoustic beam scanning software; both present significant practical difficulties for both the manufacturers and the end-users of power meters. Consequently, the first method—owing to its superior operational feasibility—has emerged as the preferred approach within the industry. To facilitate the implementation of the GB 9706.9–2008 standard, we have specifically developed and manufactured the Model YM-1 1 cm Aperture Mask, a device designed to comply fully with the requirements stipulated in this standard.



The technical characteristics of the mask 1. Absorption layer for reducing reverberation: >30dB (f > 2.5 MHz)

2. Overall insertion loss of three layers: >50dB (f > 2.5 MHz)

3. Reflection coefficient of window wall material: >90%