

HIFU Transducer Coupling Cones



Precision Acoustics has designed a range of coupling cones to fit our standard size HIFU transducers. These are intended to allow HIFU or other focused transducers to be coupled to objects without the need for a water bath or immersion setup.

With a wide aperture and thin acoustically transparent membrane, perturbations in the acoustic field are minimized for accurate and reliable delivery of targeted intensities.

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VERSION HISTORY

Version	Date	Description
1.0	27/2/23	Document created
1.1	30/3/23	Images updated

1 OVERVIEW OF SYSTEM

Precision Acoustics coupling cones are designed to be fitted over our standard HIFU transducers as a push-fit accessory. They are attached to the transducer housing with a double O-ring seal which acts to both seal the water chamber and also hold the cone in place on the housing. Transducers can be pushed into the cone until they reach the solid stop at the base of the tapered section of cone.

Coupling cones are supplied with O-rings and membrane. Membrane may need fitting before use. To fit the membrane, stretch the membrane across the aperture at the tip of the coupling cone and fit the O-ring over the membrane and secure around the O-ring barb on the cone.

Coupling cones are supplied with two identical 6mm hose push-fit connectors (inlet/outlet) to allow connection to a water circulation system for cooling. A 6mm hose (OD 6 mm) can simply be pushed into the connector. To remove the hose; press the blue ring on the connector in towards the centre of the cone. With the ring depressed, pull the hose to remove. A 3 m length of transparent hose is provided with the coupling cone to allow connection to a water circulation system.

Solid hose can be used to seal off the 6mm inlet/outlet if not required. This can be fitted in the same way as the hose tube.

It is recommended to fit the hoses and membrane before filling the cone with water.

To fill the cone using a gravity feed or pumped system, turn the cone onto its side with the outlet vertically above the inlet and fill slowly until full. Ensure all air bubbles are expelled during filling.

If a circulating water source is not required, the cone should be filled by first fitting a solid hose blanking plug to the outlet. The inlet should be positioned vertically above the now closed outlet and water can be poured into the cone. When the cone is full and all air bubbles have been expelled a solid hose blanking plug can be fitted to the inlet.

The coupling cone should be used with an appropriate coupling medium on the outside of the membrane. Examples of recommended options include:

- Water
- Glycerol
- Water based gels (Aquasonic 100, Parker Labs)

1.1 CLEANING

Coupling cones should be cleaned with warm soapy water. Solvents should not be used to clean the cone. The acoustic membrane may be cleaned with Isopropyl alcohol (IPA) or acetone if required.

Note:

- **Do NOT tighten the inlet/outlet fittings as this may cause the cone to crack.**
- **Never drive a HIFU transducer with an unfilled coupling cone or with an air bubble in the cone.**
- **Be careful not to drive the HIFU transducer whilst the cone membrane is not in good acoustic contact with adjacent surface. Any energy unable to leave the cone will reflect back to the transducer and may cause damage.**

1.2 SPARES

Spare or replacement membranes, hoses and O-rings can be purchased online through www.acoustics.co.uk or by contacting pa@acosutics.co.uk

2 SPECIFICATION AND PERFORMANCE

Precision Acoustics coupling cones have been designed to ensure minimal disturbance of the acoustic field. Figure 1 below shows the transverse pressure distribution of a 1MHz HIFU transducer at its axial maximum (focus). Hydrophone measurements were unable to detect a difference in either pressure distribution or amplitude attributable to the cone.

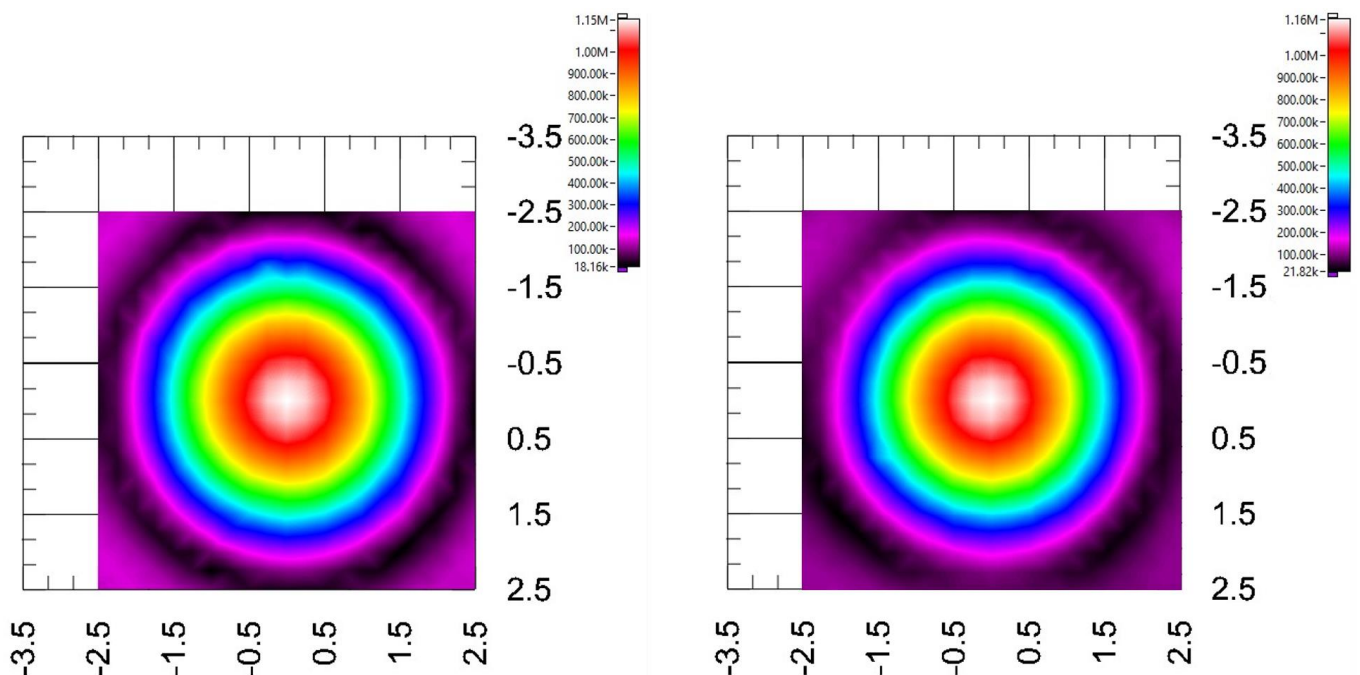


Figure 1. XY (transverse) scans of the focal point of a 1MHz HIFU transducer (TXH-1-75) without a coupling cone (left) and with a coupling cone and membrane fitted (right). Axes scales showing distance (mm), colour scales showing pk positive pressure (Pa).

2.1 MATERIALS SPECIFICATION

Item	Material
Cone	Acrylic, uncoloured
Membrane	Silicone (clear)
O-rings	NBR (Nitrile)
6 mm hose connectors	Body: Brass (Nickel plated), with POM push ring and NBR seal. Tubing clamp: Stainless steel.
6 mm blanking rods	Silicone (translucent)
6 mm hose	Polyurethane (clear)

3 DESIGN

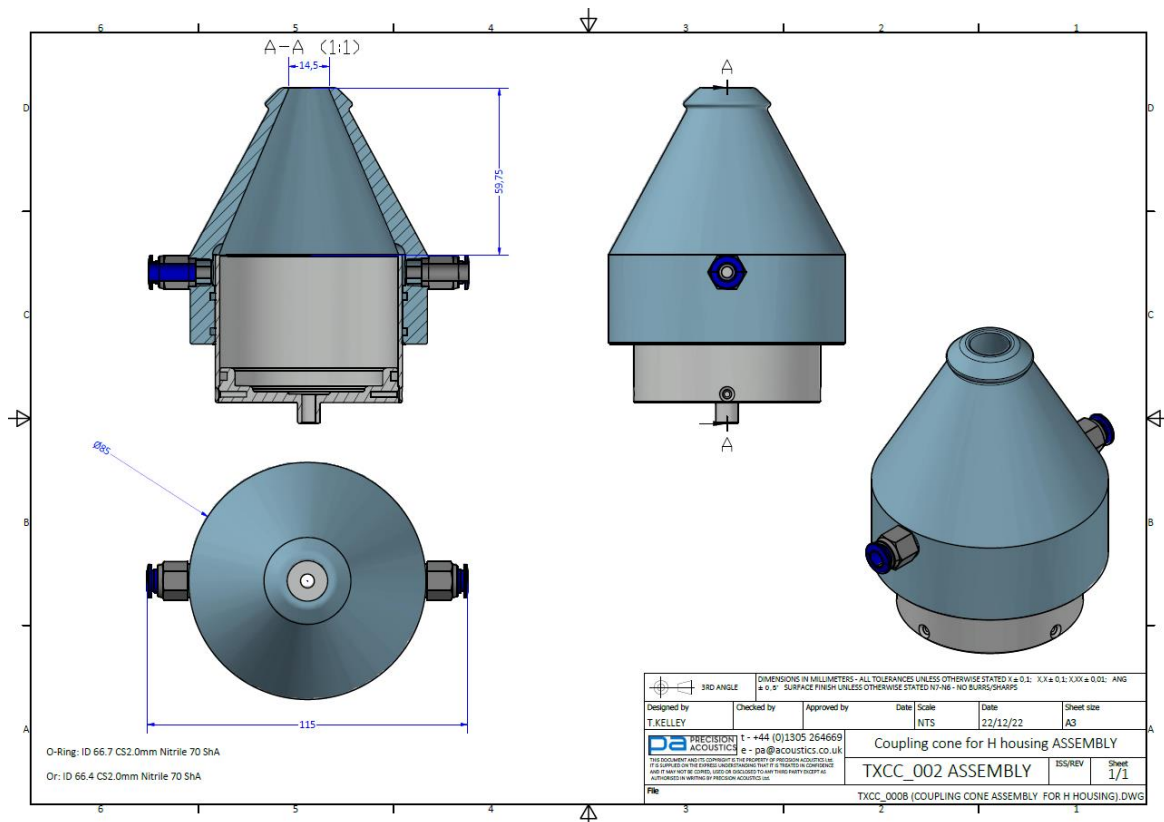


Figure 2. Coupling cone assembly (incl. transducer) for TXH-1-75 and TXH-0.67-75

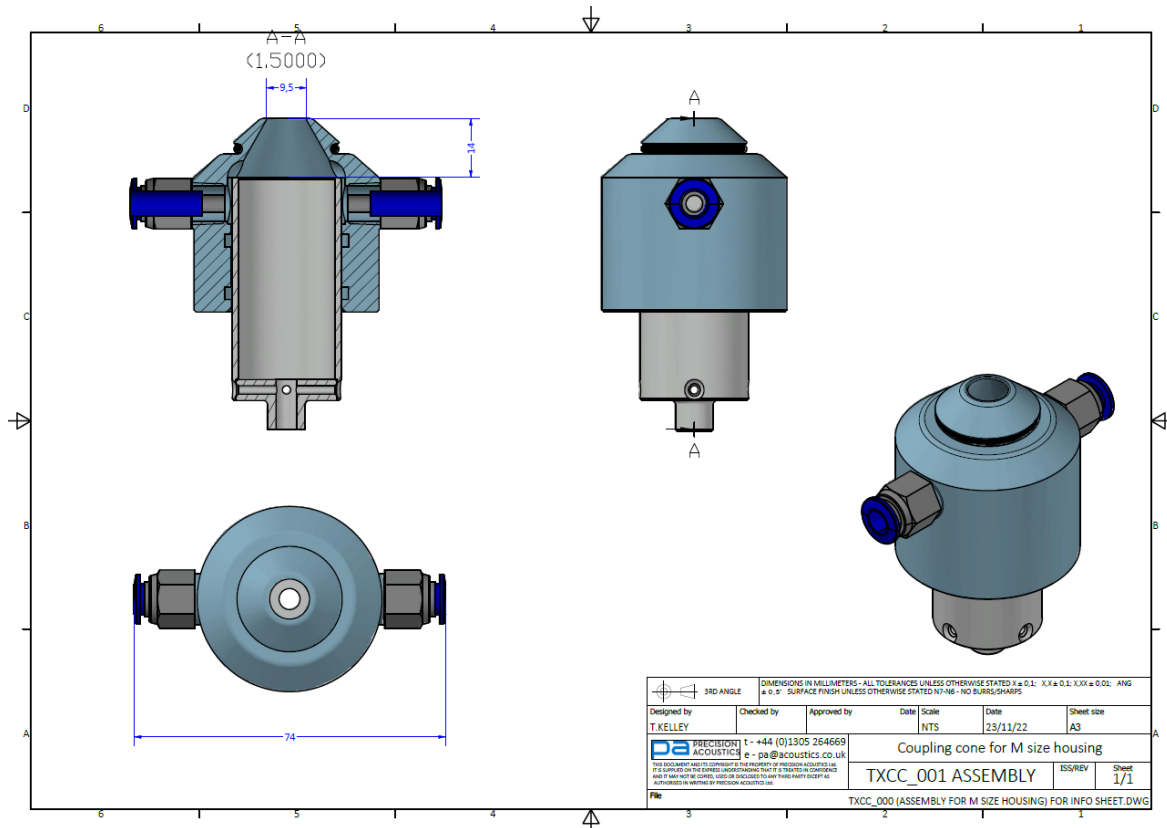


Figure 3. Coupling cone assembly (incl. transducer) for TXH-1-19 and TXH-5-19

4 PRODUCT SUPPORT

4.1 DISCLAIMER

All information is based on results gained from experience and tests and is believed to be accurate but is given without acceptance of liability for loss or damage attributable to reliance thereon as conditions of use lie outside the control of Precision Acoustics Ltd.

4.2 WARRANTY

Warranty will be for 12 months against defect of hardware component or manufacture only.

5 CONTACT DETAILS

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