

Selecting the right couplant

Get the most accurate measurements with the right ultrasonic couplant

Why couplant matters at high temperatures

Couplant is used to transfer ultrasound from the transducer to the test piece by removing the air gap between them. Even a thin air gap will prevent ultrasound transmission through to the test piece due to the large mismatch in acoustic impedance between the transducer face and air. Couplants are typically water or glycerine-based gels and come in a range of viscosities and acoustic impedances.

Thickness gauging and corrosion mapping is often conducted in-service at temperatures exceeding 250 °C where not only can the couplant degrade, evaporate, or vaporize, but also reach the temperature at which auto-ignition can occur.

Selecting the right couplant for your UT inspection is critical to get the best measurement data and prevent unnecessary risks.

High temperature couplant selection

It is not unusual to see users try commonplace greases, oils, and lubricants as couplants. This should be avoided as the degradation products are often harmful to both the user, in terms of toxicity and flammability, or can contribute to hydrogen embrittlement of the test piece if not cleared properly.

Ionix recommend a range of couplants for temperatures above 150 °C which offer high temperature stability, low corrosion characteristics, low toxicity, and smoke, and have clear indication of their auto-ignition temperatures.

For the best results, ultrasonic transducers should be in contact with the test piece such that:

- The test piece surface is free of loose corrosion, paint or other coatings that can obstruct the sound path, and that the surface has been prepared to a standard that is acceptable for UT measurements.
- The transducer should be perpendicular to the test piece to make sure the reflected sound is directed back in the shortest path and with the highest amplitude.
- Position your transducer so that the internal insulation barrier between the two elements is perpendicular to the axis of the pipe.



Apply couplant to the transducer face

- A thin layer of couplant is between the transducer face and the test piece. The couplant should be appropriate to the temperature and type of test piece being inspected.
- Once the appropriate couplant is selected, the couplant should be preferentially applied to the transducer face and then pressed with firm, even pressure on to the test piece.
- Avoid scraping or dragging the transducer across the surface of the test piece to reduce degradation of the transducer surface. Damage to the front face, through either dragging along an unprepared surface or pressing too hard during measurements can lead to a poor signal return.

Ionix provides a range of high temperature ultrasonic couplants for use with HS582i and other transducers. To select appropriate couplants, see the selection chart below.

Couplant	Benefits	Viscosity	Temperature range	Corrosion Characteristics
VeraSonic®	<ul style="list-style-type: none"> • Broad operating temperature • Fast response • Low smoke & toxicity 	Gel / paste	-23 to 371 °C -10 to 700 °F	Long term corrosion protection. Meets ASTM F519
HiTempco	<ul style="list-style-type: none"> • Lowest smoke • No residue or varnish • Fast response • Non toxic 	Paste	-45 to 412 °C -50 to 775 °F	Excellent corrosion inhibition
EchoTherm™	<ul style="list-style-type: none"> • Most economical – leaves residue 	Paste	93 to 538 °C 200 to 1000 °F	-
EchoTherm Extreme™	<ul style="list-style-type: none"> • Highest performance at high temperature • Fast response • No residue • Low smoke 	Paste	-40 to 675 °C -40 to 1250 °F	Meets ASTM F519

Remember, a lack of ultrasonic signals may indicate a thickness that is outside of the range of the UT setup being used or could indicate a heavily corroded or degraded wall which may require further investigation.

For further guidance, see

ISO 16809 Non-destructive testing – Ultrasonic thickness measurement