



HIGH-TEMPERATURE UT FLAW DETECTION TRANSDUCERS

-  Phased Array
-  Time-of-Flight Diffraction
-  Dual-Linear Corrosion Arrays
-  Wedges

Covering Flaw Scanning and Sizing from Standard to Elevated Temperatures all in One Transducer

If you're inspecting or planning to perform on-line, elevated temperature flaw detection using linear phased-array, TOFD or dual-linear arrays for corrosion detection and mapping, SNI has a better solution for you. We have developed and done extensive testing on a family of PAUT arrays, transducers, and wedges that can operate at up to 200°C (392°F) continuous metal-surface temperatures.

Changes in the transducers and the wedge's resultant refracted angle, due to temperature change, is predictable and can be managed and compensated for in the calibration process. The attached data shows the temperature effects on both attenuation, frequency, velocity, and refracted angle. The new transducer designs are engineered with materials capable of transitioning and operating at these higher temperatures associated with on-line Oil & Gas and Power Gen applications thereby enabling the inspection and protecting the user's investment in the various transducers.





Phased-Array Linear: Shear and L Wave

High-Temperature Linear Arrays are versatile arrays that optimize a wide range of high-temp applications including weld inspection, tube and pipe inspection, rails, pressure vessels, and many more. These arrays come standard with 2.5 meter (8.2 ft.) cables with IPEX connectors. Wedges for these arrays are available in two options: Mid Temp [100°C to 150°C (212°F - 302°F)] and High Temp [150°C to 200°C (302°F - 392°F)]. Each wedge type is also available in 30-70° and 0° refracted angle models.



TRANSDUCERS

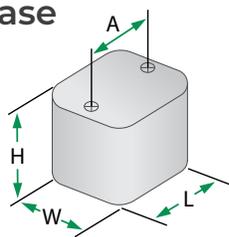
Case Style	Frequency (MHz)	Number of Elements	Element Pitch		Elevation		Part Number
			in	mm	in	mm	
A10	5	16	0.024	0.6	0.39	10	00-015631
A11	5	32	0.024	0.6	0.39	10	00-015632

WEDGES

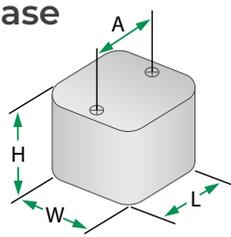
Wedges									
Case Style	Temp Range	Angle*	Part Number	Length		Width		Height	
A10	Mid Temp (100°C to 150°C)	0°	01-013350-IHC	0.98 in.	24.9 mm	1.58 in.	40.1 mm	0.79 in.	20.1 mm
A10	High Temp (150°C to 200°C)	0°	01-013351-IHC	0.98 in.	24.9 mm	1.58 in.	40.1 mm	0.79 in.	20.1 mm
A10	Mid Temp (100°C to 150°C)	N55S (30-70°)	01-013352-IHC	0.91 in.	23.1 mm	1.30 in.	33 mm	0.56 in.	14.2 mm
A10	High Temp (150°C to 200°C)	N55S (30-70°)	01-013353-IHC [^]	1.4 in.	35.6 mm	1.58 in.	40.1 mm	0.7 in.	17.8 mm
A11	Mid Temp (100°C to 150°C)	0°	01-013355-IHC	1.38 in.	35.1 mm	1.58 in.	40.1 mm	0.79 in.	20.1 mm
A11	High Temp (150°C to 200°C)	0°	01-013356-IHC	1.38 in.	35.1 mm	1.58 in.	40.1 mm	0.79 in.	20.1 mm
A11	Mid Temp (100°C to 150°C)	N55S (30-70°)	01-013357-IHC	1.63 in.	41.4 mm	1.30 in.	33 mm	1.13 in.	28.7 mm
A11	High Temp (150°C to 200°C)	N55S (30-70°)	01-013358-IHC [^]	2.25 in.	57.2 mm	1.30 mm	33 mm	1.05 in.	26.7 mm

All wedges come standard with porting, wear pins, and 8mm Ø (0.315 in.) 3mm deep (0.12 in.) gimbal-mounting holes. Wedges can be special ordered without these items if desired.

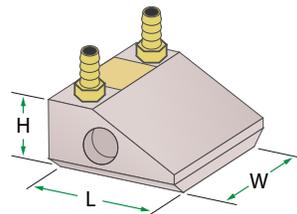
A10 Case



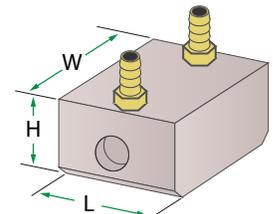
A11 Case



30-70° Wedges



0° Wedges



Case	Dimensions							
	Length		Width		Height		A (Screw Mounts)	
A10	0.91 in.	23.1 mm	0.63 in.	16 mm	0.79 in.	20.1 mm	0.67 in.	17 mm
A11	0.91 in.	23.1 mm	0.98 in.	24.9 mm	0.79 in.	20.1 mm	0.67 in.	17 mm

* Standard and custom refracted angles available
[^] Dimensions for these wedges are subject to change





TOFD

Time-of-Flight Diffraction

The High-Temperature TOFD transducer acts like a conventional TOFD transducer but designed for temperatures up to 200°C (392°F). Time-of-flight diffraction is a method used to determine the size of mid-wall and I.D. cracks in metallic welds. It requires highly-damped, broadband transducers and wedges that generate refracted longitudinal (L) waves. The high-temp TOFD transducers come standard with a straight-mounted Microdot connector. The TOFD wedge is also designed for use up to 200°C (392°F) and includes two couplant irrigation ports and gimbal-mounting holes.

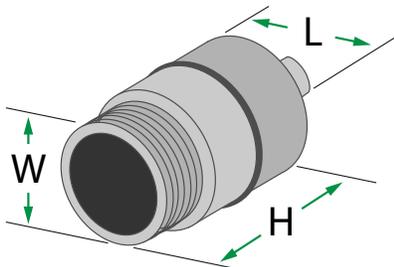


TRANSDUCERS

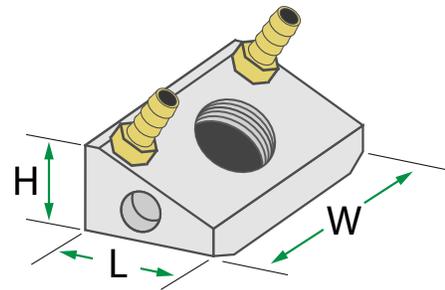
Case Style	Frequency (MHz)	Element Diameter		Part Number
		in	mm	
3/8 - 32	2.25	0.25	6.4	00-015636
3/8 - 32	5	0.25	6.4	00-015635

WEDGES

Case Style	Temp Range	Angle*	Part Number
3/8 - 32	Up to 200°C	45°L	01-013467
3/8 - 32	Up to 200°C	60°L	01-013468
3/8 - 32	Up to 200°C	70°L	01-013469



Case	Dimensions					
	Length		Width		Height	
3/8 - 32	0.41 in.	10.4 mm	0.37 in.	9.5 mm	0.72 in.	18.3 mm



Wedge	Dimensions					
	Length		Width		Height	
3/8 - 32	0.67 in.	17 mm	1.25 in.	31.75 mm	0.53 in.	13.5 mm

Gimbal-mounting holes: 5mm Ø (0.2 in.) and 3mm deep (0.12 in.)





Dual-Linear Corrosion Arrays

The High-Temp Dual-Linear Corrosion Array is optimized for corrosion and erosion inspection at elevated temperatures. The transducer and its replaceable delay line is designed to withstand temperatures up to 200°C (392°F). This dual array features 32 transmit and 32 receive elements to provide larger beam coverage than conventional dual-element transducers. The transmit and receive element sets have an included angle to provide a pseudo-focusing effect in the inspected material.



TRANSDUCERS

Case Style	Frequency (MHz)	Number of Elements	Element Pitch		Elevation		Part Number
			in	mm	in	mm	
CL	5	64 (32 x 2)	0.058	1.5	0.20	5	00-015634

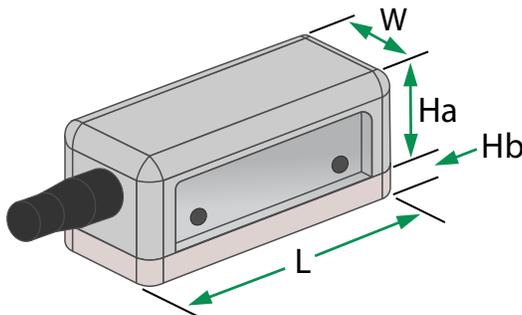
Replaceable Delay

Celazole	01-014525
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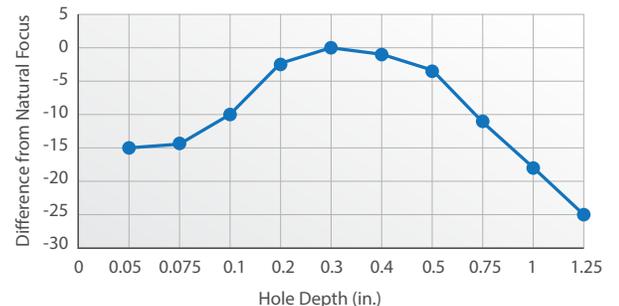
DIMENSIONS

Case	Dimensions							
	Length		Width		Height A		Height B	
CL	2.58 in.	65.5 mm	1.25 in.	31.8 mm	0.98 in.	24.9 mm	0.22 in.	5.6 mm

Mounting holes: Spaced 1.4 in. (35.6 mm) apart



DAC for #5 Flat Bottom Hole





Temperature & Testing Data

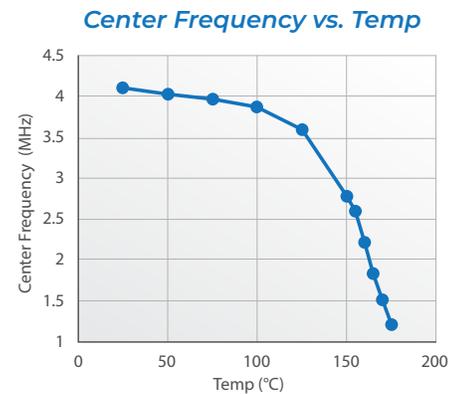
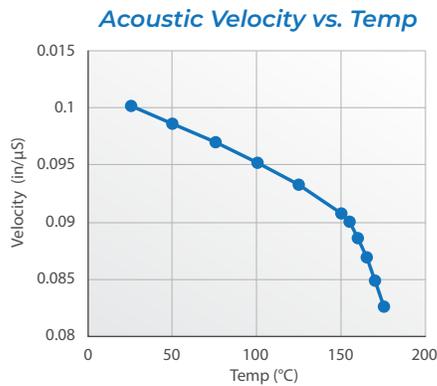
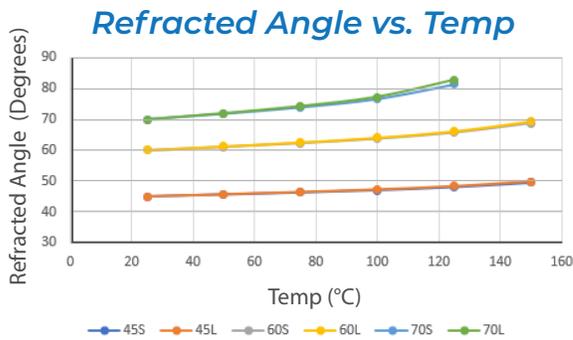
Mid-Temp Wedges

Peek (Natural)*

100°C - 150°C (212°F - 302°F)

- A10 & A11 Wedges
- TOFD Wedges
- Dual-Linear Integral Delay Line

PEEK							
Temp (°C)	1st BW Gain (dB) Low/Low	Velocity (in./μs)	% Dif V from 25 (°C)	Gain @ 80% FSH	% Dif BW from 25 (°C)	Fc (MHz)	% Dif Fc from 25 (°C)
25	14	0.100	0.00	21.5	0.00	4.1	0.00
50	14.2	0.099	1.60	22	2.33	4.03	1.71
75	14.6	0.097	3.19	22.5	4.65	3.96	3.41
100	15.2	0.095	4.89	23	6.98	3.86	5.85
125	16.4	0.093	6.89	24	11.63	3.59	12.44
150	22.4	0.091	9.38	29.5	37.21	2.76	32.68
175	52.4	0.083	17.56			1.22	70.24



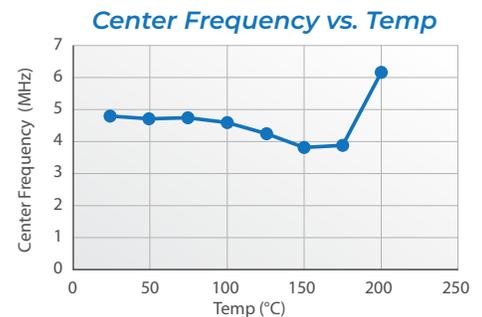
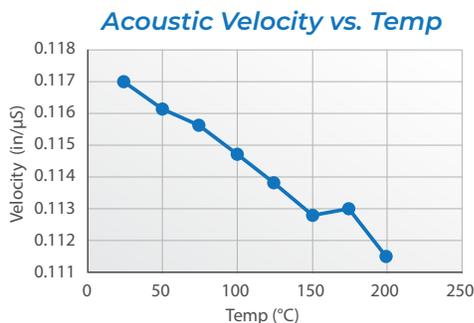
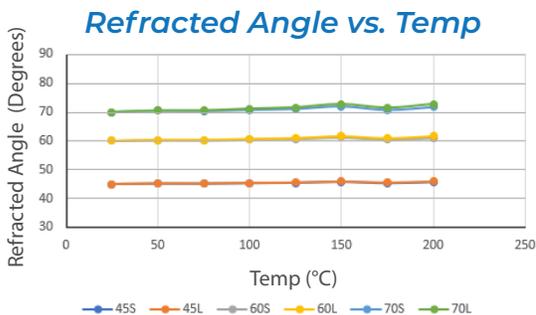
High-Temp Wedges

Celazole U-60*

150°C - 200°C (302°F - 392°F)

- A10 & A11 Wedges
- TOFD Wedges
- Dual-Linear Integral Delay Line

Celazole U-60							
Temp (°C)	1st BW Gain (dB) Low/Low	Velocity (in./μs)	% Dif V from 25 (°C)	Gain @ 80% FSH	% Dif BW from 25 (°C)	Fc (MHz)	% Dif Fc from 25 (°C)
25	10	0.117	0.00	16	0.00	4.88	0.00
50	10	0.116	0.77	16	0.00	4.8	1.64
75	10	0.116	1.20	16.5	3.13	4.76	2.46
100	12.5	0.115	1.97	17.5	9.38	4.66	4.51
125	15	0.114	2.65	19.5	21.88	4.27	12.50
150	20	0.113	3.68	23.5	46.88	3.86	20.90
175	26	0.113	3.42	29.5	84.38	3.91	19.88
200	39	0.112	4.53	39	143.75	6.05	-23.98



* This data is calculated with the transducer, wedge, and asset all at 150°C (peek data) or 200°C (celazole data). During actual inspections, there will be a temperature gradient from the asset up to the transducer.



Actual weld defect in a 10 inch (254mm) diameter by 3/8" (9.7mm) thick carbon steel pipe performed at 200°C (392°F).

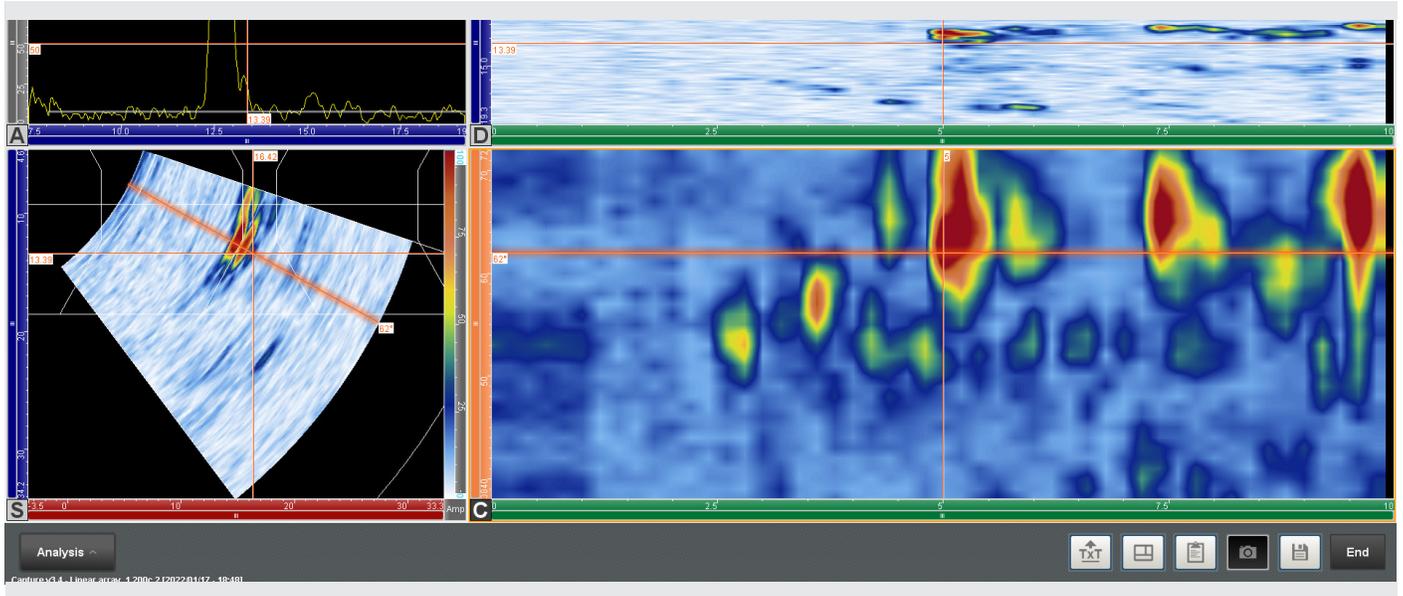


Image courtesy of Eddyfi

Current offering of the High-Temp family of transducers and wedges.

	Part Number	Description
Linear Arrays	00-015631	16-element High Temperature 200°C, 5MHz, 16EL, 0.6mmP x 10mm, 2.5M Cable, A10 Case, IPEX
	00-015632	16-element High Temperature, 200°C, 5MHz, 32EL, 0.6mmP X 10mm, 2.5M Cable, A11 Case, IPEX
Corrosion Array	00-015634	64-element High Temperature, 200°C, 5MHz, Corrosion, 1.5mmP, 2.5M Cable, IPEX, Removeable Delay
TOFD	00-015635	Single-element, High Temperature, 200°C, TOFD, .25" Ø, 5MHz, Microdot, 3/8-32 Thread Case
	00-015636	Single-element, High Temperature, 200°C, TOFD, .25" Ø, 2.25MHz, Microdot, 3/8-32 Thread Case
Wedges*	01-013350-IHC	PA A10 Delay, 0°, 20mm Delay Path, Peek (100°C to 150°C), Porting, Wear Pins, 8mm Gimbal
	01-013351-IHC	PA A10 Delay, 0°, 20mm Delay Path, Celazole (150°C to 200°C), Porting, Wear Pins, 8mm Gimbal
	01-013352-IHC	PA A10 Wedge, N55S (30-70S), Peek (100°C to 150°C), Flat, Porting, Wear Pins, 8mm Gimbal
	01-013353-IHC	PA A10 Wedge, N55S (30-70S), Celazole (150°C to 200°C), Flat, Porting, Wear Pins, 8mm Gimbal
	01-013355-IHC	PA A11 Delay, 0°, 20mm Delay Path, Peek (100°C to 150°C), Porting, Wear Pins, 8mm Gimbal
	01-013356-IHC	PA A11 Delay, 0°, 20mm Delay Path, Celazole (150°C to 200°C), Porting, Wear Pins, 8mm Gimbal
	01-013357-IHC	PA A11 Wedge, N55S (30-70S), Peek (100°C to 150°C), Flat, Porting, Wear Pins, 8mm Gimbal
	01-013358-IHC	PA A11 Wedge, N55S (30-70S), Celazole (150°C to 200°C), Flat, Porting, Wear Pins, 8mm Gimbal
	01-013467	Wedge, TOFD, 45°L CS, 3/8-32 Thread, SST Housing, Dual Ported for Couplant, 200°C
	01-013468	Wedge, TOFD, 60°L CS, 3/8-32 Thread, SST Housing, Dual Ported for Couplant, 200°C
	01-013469	Wedge, TOFD, 70°L CS, 3/8-32 Thread, SST Housing, Dual Ported for Couplant, 200°C
	01-014525	Replaceable delay for corrosion array, Celazole, High temp

*All wedges can be customized for refracted angle and radiused for curved surfaces.

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