Sonatest

TRANSDUCER CATALOGUE

Simplicity | Capability | Reliability

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Contents

Due to a policy of continual development and process improvement, the data presented within this catalogue is subject to change without notice.

Applications Matrix

The Applications Matrix below is a quick reference guide to selecting the transducer model that may be suitable for your specific application or the material that requires testing.

Model	Aerospace	Bars	Billets	Bond Testing	Castings	Ceramics	Composites	Lamination	Forgings	Glass	Brazed Joints	Machined Parts	Thickness	Tube & Pipe	Critical Welds	General Welds	White Metal	Boiler Tubes
CD	•	•	•	•	•	•	•	•	•			•	•	•				
D	•			•								•	•	•			•	
DEM	•	•	•	•	•	•	•	•	•			•	•	•			•	
FCG		•	•	•	•			•	•			•						
FCR		•	•	•	•			•	•			•						
LMA					•				•			•		•	•	•		
MMA					•				•			•		•	•	•		
MSG						•			•					•	•	•		
MW						•			•					•	•	•		
PDEM	•	•	•	•	•	•	•	•	•			•	•	•			•	
PFC		•	•	•	•			•	•			•						
PMS						•			•					•	•	•		
PQC	•				•	•			•			•			•		•	
PSLF		•	•	•	•			•	•									
PSLM						•	•					•						
PSS															•	•		
QCG	•				•	•			•			•			•		•	
RDT	•			•			•			•	•	•	•	•				
RP	•			•			•											
SLF Inc		•	•	•	•			•	•									
SLM						•	•					•						
SMA					•				•			•		•	•	•		
SSG															•	•		
Starc					•				•			•		•	•	•		
Starc 0		•	•	•	•	•	•		•	•	•	•		•	•	•		
STP	•			•			•											
TSMA					•				•					•	•	•		
TSTARC		•	•	•	•	•	•	•	•	•	•	•		•	•	•		
X0 Series																		
X1 Series												•					•	
X2 Series					•							•			•			
X3 Series					•							•			•			
X4 Series					•							•			•			
X5 Series		•	•		•										•			
X6 Series	•																	
DAAH 1A		•	•		•							•			•			
DAAH 1B																		
DAAH 1Z		•	•		•							•			•			
DAAH 5A	•														•			

This guide can not be absolute or all-inclusive.
If your requirements are not listed below please call Sonatest Ltd on +44 (0)1908 316345 or email sales@sonatest.com; or Sonatest Inc on +1(210) 697-0335 or email sales@sonatestinc.com.

Model	Solder Joints	Rail	Bore Pipes	Sall Diametre Tube Inspection	Fits on most low profile scanners	Scribe Lines	Automotive parts	Flanges	Delaminations	Corrosion, blistering & Thicknes Mapping	Shaft	Structural Components	Pressure Vessels	Alloys	Dsimillar Welds	Attenuative Material
D	•															
LMA		•														
MMA		•														
X0 Series			•	•	•											
X1 Series						•	•									
X2 Series							•	•								
X3 Series							•	•								
X4 Series							•	•								
X5 Series											•	•				
X6 Series									•	•						
DAAH 1A							•	•				•				
DAAH 1B													•	•	•	•
DAAH 1Z							•	•				•				
DAAH 5A									•	•						

Finger Tip Contact Transducers

FCG, FCR & PFC

Transducer Models				
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)	Nearfield Length* (mm) N
FCG2525	2.25MHz ¼" Fingertip	0.25	2.25	0.2
FCG3725	2.25MHz 3/8" Fingertip	0.375	2.25	0.3
FCG5025	2.25MHz ½" Fingertip	0.5	2.25	0.6
FCG1250	5MHz 1/8" Fingertip	0.125	5	0.1
FCG2550	5MHz ¼" Fingertip	0.25	5	0.3
FCG3750	5MHz 3/8" Fingertip	0.375	5	0.8
FCG5050	5MHz ½" Fingertip	0.5	5	1.3
FCG1210	10MHz 1/8" Fingertip	0.125	10	0.2
FCG2510	10MHz ¼" Fingertip	0.25	10	0.7
FCG3710	10MHz 3/8" Fingertip	0.375	10	0.8
FCG5010	10MHz ½" Fingertip	0.5	10	2.7

Features

- Single normal beam compression wave contact probe.
- Circular, lead metaniobate crystal.
- High damped for wide bandwidth (FCR & PFC).
- Medium damped for medium bandwidth (FCG).
- Ceramic wear face and steel wear ring to prolong service life.
- Stainless steel ergonomic case for good grip and ease of use.

Frequent applications

- Castings & Forgings
- Bars & Billets
- Bond Testing
- Laminations
- Machined Parts

Transducer Models				
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)	Nearfield Length* (mm) N
FCR2525	2.25MHz ¼" Fingertip	0.25	2.25	0.2
FCR3725	2.25MHz 3/8" Fingertip	0.375	2.25	0.3
FCR5025	2.25MHz ½" Fingertip	0.5	2.25	0.6
FCR1250	5MHz 1/8" Fingertip	0.125	5	0.1
FCR2550	5MHz ¼" Fingertip	0.25	5	0.3
FCR3750	5MHz 3/8 " Fingertip	0.375	5	0.8
FCR5050	5MHz ½" Fingertip	0.5	5	1.3
FCR1210	10MHz 1/8" Fingertip	0.125	10	0.2
FCR2510	10MHz ¼" Fingertip	0.25	10	0.7
FCR3710	10MHz 3/8 " Fingertip	0.375	10	0.8
FCR5010	10MHz ½" Fingertip	0.5	10	2.7

Transducer Models				
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)	Nearfield Length* (mm) N
PFC501	1MHz ½" Fingertip	0.5	1	0.3
PFC2525	2.25MHz ¼" Fingertip	0.25	2.25	0.2
PFC3725	2.25MHz 3/8" Fingertip	0.375	2.25	0.3
PFC5025	2.25MHz ½" Fingertip	0.5	2.25	0.6
PFC1250	5MHz 1/8" Fingertip	0.125	5	0.1
PFC2550	5MHz ¼" Fingertip	0.25	5	0.3
PFC3750	5MHz 3/8" Fingertip	0.375	5	0.8
PFC5050	5MHz ½" Fingertip	0.5	5	1.3
PFC1210	10MHz 1/8" Fingertip	0.125	10	0.2
PFC2510	10MHz ¼" Fingertip	0.25	10	0.7
PFC3710	10MHz 3/8" Fingertip	0.375	10	0.8
PFC5010	10MHz ½" Fingertip	0.5	10	2.7

Size Options				Connector	
Probe Size (inches)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Microdot (D)	Side
0.25	14	26	10	·	·
0.375	16	25	13	·	·
0.5	19	28	16	·	·
0.125	13	22	7	·	·

Single Compression Transducer

SLM and PSLM

Features

- Single normal beam compression wave contact probe
- Circular, lead metaniobate crystal (SLM)
- Circular composite PZT crystal (PSLM)
- Medium damped for general use (SLM)
- High damped for wide bandwidth (PSLM)
- Ceramic wear face and steel wear ring to prolong service life
- Stainless steel ergonomic case for good grip and ease of use

Frequent Applications

- Ceramics
- Composites
- Machined Parts

Transducer Models				
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)	Nearfield Length* (mm) N
SLM5025B	2.25MHz ½" SC M.Damped	0.5	2.25	0.6
SLM1025B	2.25MHz 1" SC M.Damped	1	2.25	2.4
SLM5050B	5MHz ½" SC M.Damped	0.5	5	1.3
SLM1050B	5MHz 1" SC M.Damped	1	5	5.4
PSLM5025	2.25MHz ½" SC H.Damped	0.5	2.25	0.6
PSLM1025	2.25MHz 1" SC H.Damped	1	2.25	2.4
PSLM5050	5MHz ½" SC H.Damped	0.5	5	1.3
PSLM1050	5MHz 1" SC H.Damped	1	5	5.4

Size Options				Connector		
Probe Size (inches)	Case Dimensions (mm)			Connector Type		Connector Position
Ø	A	B	C	BNC (B)	Lemo 00 (Z)	Side
0.5	26	32	24	·	·	·
1	36	38	34	·	·	·

Single Compression Transducer with Membrane

SLF & PSLF

Frequent Applications

- Castings
- Forgings
- Bars
- Billets
- Bond Testing
- Laminations

Transducer Models				
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)	Nearfield Length* (mm) N
SLF5025	2.25MHz ½" SC Soft Face	0.5	2.25	0.6
SLF1025	2.25MHz 1" SC Soft Face	1	2.25	2.4
SLF5050	5MHz ½" SC Soft Face	0.5	5	1.3
SLF1050	5MHz 1" SC Soft Face	1	5	5.4
PSLF10.5	0.5MHz 1" SC Soft Face	1	0.5	0.5
PSLF101	1MHz 1" SC Soft Face	1	1	1.1
PSLF1025	2.25MHz 1" SC Soft Face	1	2.25	2.4
PSLF5050	5MHz ½" SC Soft Face	0.5	5	1.3
PSLF50.5	0.5MHz ½" SC Soft Face	0.5	0.5	0.1
PSLF501	1MHz ½" SC Soft Face	0.5	1	0.3
PSLF5025	2.25MHz ½" SC Soft Face	0.5	2.25	0.6
PSLF1050	5MHz 1" SC Soft Face	1	5	5.4

Features

- Single normal beam compression wave contact probe.
- Circular, lead metaniobate crystal (SLF).
- Circular, composite PZT crystal (PSLF).
- Medium damped for general use (SLF).
- Polymer membrane protected face facilitates coupling with minimum couplant.
- Stainless steel ergonomic case for good grip and ease of use.
- Delay lines available on request.

Size Options				Connector		
Probe Size (inches)	Case Dimensions (mm)			Connector Type		Connector Position
Ø	A	B	C	BNC (B)	Lemo 00 (Z)	Side
0.5	30	32	24	·	·	·
1	40	38	34	·	·	·

Delay Line Single Compression Transducer

RDT

Features

- Single normal beam compression wave delay line probe.
- Provide excellent near surface resolution.
- Circular lead metaniobate crystal.
- High damped for wide bandwidth.
- Rexolite delayline.

Frequent Applications

- Aerospace
- Bond Testing
- Composites
- Glass
- Brazed Joints
- Machined Parts
- Thickness
- Tube & Pipe

Transducer Models				
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)	Nearfield Length* (mm) N
RDT2525	2.25Mhz ¼" DelayLine	0.25	2.25	0
RDT5025	2.25Mhz ½"DelayLine	0.5	2.25	0
RDT2550	5Mhz ¼" DelayLine	0.25	5	0
RDT5050	5Mhz ½" DelayLine	0.5	5	0
RDT2510	10Mhz ¼" DelayLine	0.25	10	0
RDT5010	10Mhz ½" DelayLine	0.5	10	0
RDT1215	15Mhz 1/8" DelayLine	0.125	15	0
RDT2515	15Mhz ¼" DelayLine	0.25	15	0
RDT1220	20Mhz 1/8" DelayLine	0.125	20	0
RDT2520	20Mhz ¼" DelayLine	0.25	20	0

Size Options				Connector	
Probe Size (inches)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Microdot (D)	Top (T)
0.25	13	20	12	·	·
0.5	19	26	18	·	·
0.125	13	20	12	·	·

Twin Compression Transducer

DEM & PDEM

Features

- Duel normal beam compression wave contact probe.
- Lead metaniobate crystal (DEM).
- Composite PZT (PDEM).
- Medium damped for medium bandwidth.
- Acrylic face.
- Available with High Temperature

Frequent applications

- Aerospace
- Bars and Billets
- Bond Testing
- Castings
- Ceramics
- Composites
- Lamination
- Forging
- Machined Parts
- Thickness
- Tube and Pipe
- White Metals

Transducer Models			
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)
DEM2525	2.25MHz ¼" DualElement	0.25	2.25
DEM3725	2.25MHz 3/8" DualElement	0.375	2.25
DEM5025	2.25MHz ½" DualElement	0.5	2.25
DEM7525	2.25MHz ¾" DualElement MDOT	0.75	2.25
DEM2550	5MHz ¼" DualElement	0.25	5
DEM3750	5MHz 3/8" DualElement	0.375	5
DEM5050	5MHz ½" DualElement	0.5	5
DEM7550	5MHz ¾" DualElement	0.75	5
DEM2510	10MHz ¼" DualElement	0.25	10
DEM3710	10MHz 3/8" DualElement	0.375	10
DEM5010	10MHz ½" DualElement	0.5	10

Transducer Models			
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)
PDEM2525	2.25MHz ¼" DualElement	0.25	2.25
PDEM3725	2.25MHz 3/8" DualElement	0.375	2.25
PDEM5025	2.25MHz ½" DualElement	0.5	2.25
PDEM7525	2.25MHz ¾" DualElement	0.75	2.25
PDEM2550	5MHz ¼" DualElement	0.25	5
PDEM3750	5MHz 3/8" DualElement	0.375	5
PDEM5050	5MHz ½" DualElement	0.5	5
PDEM2510	10MHz ¼" DualElement	0.25	10

Size Options				Connector		
Probe Size (inches)	Case Dimensions (mm)			Connector Type	Connector Position	
Ø	A	B	C	Microdot (D)	Top (T)	Side
0.25	15	28	11	·	·	·
0.375	16	28	13	·	·	·
0.5	19	28	16	·	·	·
0.75	30	41	25	·	·	·

Twin Compression Transducer
Combined Double

CD

Transducer Models				
Product code	Description	Crystal Diameter (mm)	Frequency (MHz)	Nearfield Length* (mm) N
CD2-15	2MHz TC Combined Dble	15	2	16
CD2-20	2MHz TC Combined Dble	20	2	19
CD2-25	2MHz TC Combined Dble	25	2	38
CD5-15	5MHz TC Combined Dble	15	5	16
CD5-20	5MHz TC Combined Dble	20	5	25
CD5-25	5MHz TC Combined Dble	25	5	38

Features

- Dual normal beam compression wave contact probe.
- Semi-circular/rectangular, lead zirconate titanate crystal.
- Medium damped for medium bandwidth.
- Available with high temperature (HT) and short focus (F) shoes.
- Tubular, knurled stainless steel case for easier mechanical integration.

Frequent Applications

- Aerospace
- Bars & Billets
- Bond Testing
- Castings & Forgings
- Ceramics
- Lamination
- Machined parts
- Thickness
- Tube & Pipe
- Composites

Size Options						
Probe Size (mm)	Case Dimensions (mm)			Connector Type		Connector Position
Ø	A	B	C	Lemo 00 (Z)	Microdot (D)	Top (T)
15	22	48	-	·	·	·
20	27	56	-	·	·	·
25	35	67	-	·	·	·

Twin Compression

DL

Frequent Applications

- Aerospace
- Bond Testing
- Solder Joints
- Machined Parts
- Thickness
- Tube & Pipe
- White Metal

Transducer Models				
Product code	Description	Crystal Diameter (mm)	Frequency (MHz)	Nearfield Length* (mm) N
D2-10Z	2MHz TC Medium Damped	10	2	7
D5-5Z	5MHz TC Medium Damped	5	5	6
D5-10Z	5MHZ TC Medium Damped	10	5	7

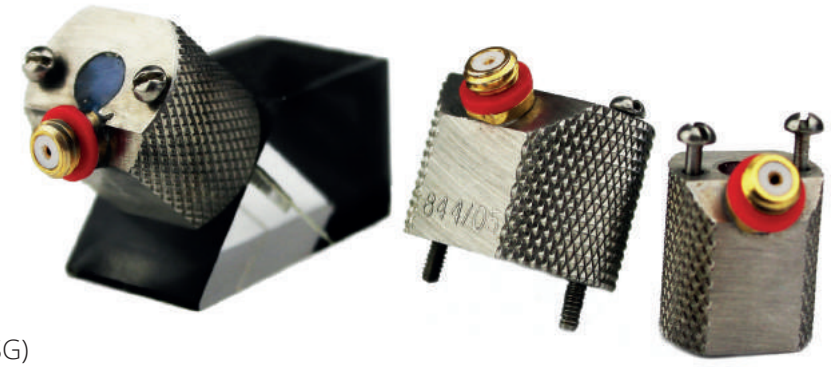
Features

- Dual normal beam compression wave contact probe.
- Semi-circular/rectangular, lead metaniobate crystal.
- Medium damped for medium bandwidth.
- Acrylic shoe facilities profiling to curved parts; * High Temp Vespel.
- Button probe case with side entry cable to facilitate inspection access.
- Integral 2m cable.

Size Options				Connector	
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 00 (Z)	Cable
2	18.0	16.0	12.5	·	·
5	13.0	18.0	7.5	·	·

Miniature Single Angle Shear wave transducer with Replaceable Wedges

MSG, PMS & MW Wedge
(Wedges can be contoured)



Transducer Features

- Transducer Features
- Single angle beam shear wave contact probe
- Rectangular, lead metaniobate crystal
- High damped for wide bandwith (PMS)
- Medium damped for medium bandwidth (MSG)
- Attached by screws to MW wedges

Wedge Features

- Wedge beam shear wave contact probe
- Attached by screws to MSR, MSG and PMS transducers. 1-64 threded holes.
- Axial and circumferential ID or OD profiling available

Frequent applications

- Ceramics
- Forgings
- Tube & Pipe
- Critical Welds
- General Welds

MW Wedge		Θ (°)	a x b (inches)
MW2545	45° wedge for ¼" Probe	45	1/4
MW2560	60° wedge for ¼" Probe	60	1/4
MW2570	70° wedge for ¼" Probe	70	1/4
MW3745	45° wedge for 3/8" Probe	45	3/8
MW3760	60° wedge for 3/8" Probe	60	3/8
MW3770	70° wedge for 3/8" Probe	70	3/8
MW5045	45° wedge for ½" Probe	45	1/2
MW5060	60° wedge for ½" Probe	60	1/2
MW5070	70° wedge for ½" Probe	70	1/2

Transducer Models			
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)
MSG2525	2.25MHz ¼" Mini SW MICRODOT	0.25	2.25
MSG3725	2.25MHz 3/8" Mini SW MICRODOT	0.375	2.25
MSG5025	2.25MHz ½" Mini SW MICRODOT	0.5	2.25
MSG2550	5MHz ¼" Mini SW MICRODOT	0.25	5
MSG3750	5MHz 3/8" Mini SW MICRODOT	0.375	5
MSG5050	5MHz ½" Mini SW MICRODOT	0.5	5
MSG2510	10MHz ¼" Mini SW MICRODOT	0.25	10
MSG3710	10MHz 3/8" Mini SW MICRODOT	0.375	10
MSG5010	10MHz ½" Mini SW MICRODOT	0.5	10
PMS2525	2.25MHz ¼" Mini SW MICRODOT	0.25	2.25
PMS3725	2.25MHz 3/8" Mini SW MICRODOT	0.375	2.25
PMS5025	2.25MHz ½" Mini SW MICRODOT	0.5	2.25
PMS2550	5MHz ¼" Mini SW MICRODOT	0.25	5
PMS3750	5MHz 3/8" Min SW MICRODOT	0.375	5
PMS5050	5MHz ½" Mini SW MICRODOT	0.5	5
PMS2510	10MHz ¼" Mini SW MICRODOT	0.25	10
PMS3710	10MHz 3/8" Mini SW MICRODOT	0.375	10
PMS5010	10MHz ½" Mini SW MICRODOT	0.5	10

Size Options				Connector	
Probe Size (inches)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Microdot (D)	Top (T)
0.25	13	14	10	·	·
0.375	16	14	13	·	·
0.5	19	14	16	·	·

Single Angle Shear Wave Transducer
General Weld Probes

Starc

Transducer Models				
Product code	Description	Crystal Diameter (mm) (°)	Frequency (MHz)	Nearfield Length* (mm) N
STARC2-10	Single Crystal Ø10mm 2Mz	10	2	8.5
STARC2-20	Single Crystal Ø20mm 2Mz	20	2	34
STARC2-45	Single Shear 2Mhz 45°	10	2	5
STARC2-60	Single Shear 2Mhz 60°	10	2	7
STARC2-70	Single Shear 2Mhz 70°	10	2	6
STARC4-10	Single Crystal Ø10mm 4Mz	10	4	17
STARC4-20	Single Crystal Ø20mm 4Mz	20	4	67
STARC4-45	Single Shear 4Mhz 45°	10	4	24
STARC4-60	Single Shear 4Mhz 60°	10	4	23
STARC4-70	Single Shear 4Mhz 70°	10	4	21

Features

- Single (Ceramic hand Faced).
- 2 MHz and 4 MHz - 10, 20 mm diameter versions.
- LEMO 00.
- Stainless steel enclosure.

Frequent Applications

- General Welds
- Critical Welds
- Machine Parts
- Tube & Pipe
- Casting & Forging
- Composites
- Bars & Billets
- Bond Testing
- Glass
- Brazed Joints
- Ceramics

Size Options				Connector		
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position	
Ø	A	B	C	Lemo 00 (Z)	Top (T)	Side
10	30	31	31	•	-	•
20	30	31	31	•	-	•
10	21	15	29	•	•	-
10	30	20	20	•	-	•
20	30	20	20	•	-	•

Single Angle Shear Wave Transducer
Small Single Angle Beam Shearwave (Sirius)

SMA

Features

- Single angle beam composite shear wave contact probe.
- Rectangular, PZT crystal.
- Medium damped for medium bandwidth.
- European Standard transducer.

Frequent Applications

- General Welds
- Critical Welds
- Machined Parts
- Tube and Pipe
- Casting and Forging

Transducer Models					
Product code	Description	Crystal Diameter (mm)	Frequency (MHz)	Beam Angle (°)	Nearfield Length* (mm) N
SMA2-45	Single Shear 2Mhz 45°	8 x 9	2	45	15
SMA2-60	Single Shear 2Mhz 60°	8 x 9	2	60	15
SMA2-70	Single Shear 2Mhz 70°	8 x 9	2	70	17
SMA4-45	Single Shear 4Mhz 45°	8 x 9	4	45	30
SMA4-60	Single Shear 4Mhz 60°	8 x 9	4	60	30
SMA4-70	Single Shear 4Mhz 70°	8 x 9	4	70	30

Size Options				Connector	
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 00 (Z)	Rear (R)
8 x 9	24	15	22	·	·

Single Angle Shear Wave Transducer
Medium Angle Beam Shearwave

MMA

Features

- Single angle beam composite shearwave contact probe
- Rectangular, PZT crystal
- Medium damped for medium bandwidth
- European Standard transducer

Frequent Applications

- General Welds
- Critical Welds
- Machined Parts
- Tube and Pipe
- Casting and Forging
- Rail

Transducer Models					
Product code		Crystal Diameter (mm)	Frequency (MHz)	(°)	Nearfield Length* (mm) N
MMA2-45	Single Shear 2Mhz 45°	14x16	2	45	39
MMA2-60	Single Shear 2Mhz 60°	14x16	2	60	39
MMA2-70	Single Shear 2Mhz 70°	14x16	2	70	39
MMA4-45	Single Shear 4Mhz 45°	14x16	4	45	78
MMA4-60	Single Shear 4Mhz 60°	14x16	4	60	78
MMA4-70	Single Shear 4Mhz 70°	14x16	4	75	78

Size Options				Connector	
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 00 (Z)	Rear (R)
14x16	41.0	21.0	29.0	·	·

Single Angle Shear Wave Transducer
Large Angle Beam Shearwave

LMA

Features

- Single angle beam composite shearwave contact probe.
- Rectangular, lead PZT crystal.
- Medium damped for medium bandwidth.
- European Standard transducer.

Frequent Applications

- General Welds
- Critical Welds
- Machined Parts
- Tube and Pipe
- Casting and Forging
- Rail

Transducer Models				
Product code	Description	Crystal Diameter (mm)	Frequency (MHz)	Nearfield Length* (mm) N
LMA2-45	Single Shear 2Mhz 45°	20 x 22	2	90
LMA2-60	Single Shear 2Mhz 60°	20 x 22	2	90
LMA2-70	Single Shear 2Mhz 70°	20 x 22	2	90
LMA4-45	Single Shear 4Mhz 45°	20 x 22	4	180
LMA4-60	Single Shear 4Mhz 60°	20 x 22	4	180
LMA4-70	Single Shear 4Mhz 70°	20 x 22	4	180

Size Options				Connector	
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 00 (Z)	Rear (R)
20 x 22	53.5	29.0	44.0	·	·

Quick Change Shear Wave Transducers

QCG & PQC & Wedges
(wedges can be contoured)

Features

- Single angle beam shear wave contact probe
- Circular, lead metaniobate crystal
- High damped for bandwidth (PQC)
- Medium damped for medium bandwidth (QCG)
- Screw thread for quick change, use with threaded QW wedges
- Circular composite crystal (PQC)

Frequent applications

- Aerospace
- Castings
- Forgings
- Machined parts
- Critical welds
- White metal

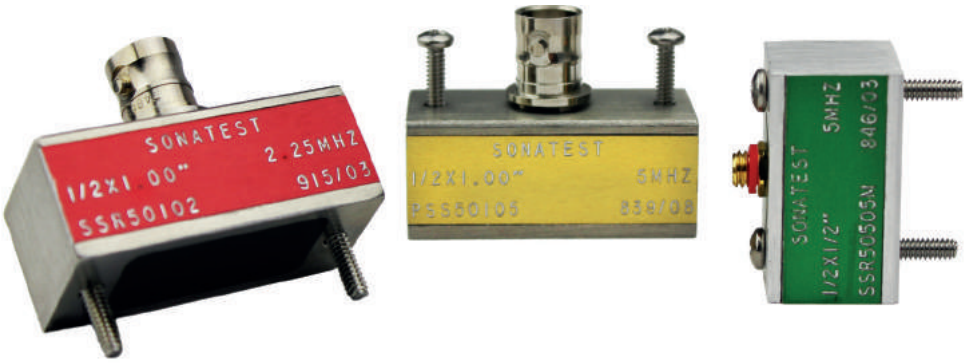
Transducer Models			
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)
QCG2525	2.25MHz ¼" QuickChange	0.25	2.25
QCG3725	2.25MHz 3/8"QuickChge	0.375	2.25
QCG5025	2.25MHz ½" QuickChange	0.5	2.25
QCG2550	5MHz ¼" QuickChange	0.25	5
QCG3750	5MHz 3/8" QuickChange	0.375	5
QCG5050	5MHz ½" QuickChange	0.5	5
QCG2510	10MHz ¼" QuickChange	0.25	10
QCG3710	10MHz 3/8" QuickChange	0.375	10
QCG5010	10MHz ½" QuickChange	0.5	10
PQC2525	2.25MHz ¼" QuickChange	0.25	2.25
PQC3725	2.25MHz 3/8"QuickChge	0.375	2.25
PQC5025	2.25MHz ½" QuickChange	0.5	2.25
PQC2550	5MHz ¼" QuickChange	0.25	5
PQC3750	5MHz 3/8" QuickChange	0.375	5
PQC5050	5MHz ½" QuickChange	0.5	5
PQC2510	10MHz ¼" QuickChange	0.25	10
PQC3710	10MHz 3/8" QuickChange	0.375	10
PQC5010	10MHz ½" QuickChange	0.5	10

Size Options					
Probe Size (inches)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Microdot (D)	Top (T)
0.25	13	19	-	•	•
0.375	14	19	-	•	•
0.5	17	19	-	•	•

QC Wedge			Θ (°)	a x b (inches)
QW2545	QW2545RL	45° wedge for ¼" QC probe	45	1/4
QW2560	QW2560RL	60° wedge for ¼" QC probe	60	1/4
QW2570	QW2570RL	70° wedge for ¼" QC probe	70	1/4
QW3745	QW3745RL	45° wedge for 3/8" QC probe	45	3/8
QW3760	QW3760RL	60° wedge for 3/8" QC probe	60	3/8
QW3770	QW3770RL	70° wedge for 3/8" QC probe	70	3/8
QW5045	QW5045RL	45° wedge for ½" QC probe	45	1/2
QW5060	QW5060RL	60° wedge for ½" QC probe	60	1/2
QW5070	QW5070R	70° wedge for ½" QC probe	70	1/2

Single Angle Shear wave transducer with removeable wedge

SSG, PSS & WEDGES



SSG & PSS Features

- Single angle beam shear wave contact probe
- Rectangular, lead metaniobate crystal
- Low damped for narrow bandwidth (SSG)
- Composite PZT crystal for wide bandwidth (PSS)
- Attached by screws to SW or SNW wedges
- AWS structural weld code style

Frequent applications

- Critical welds
- General Welds

Transducer Models			
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)
SSG50502	2.25MHz ½" x ½" Shearwave BNC	1/2x1/2	2.25
SSG50505	5MHz ½" x ½" Shearwave BNC	1/2x1/2	5
SSG50102	2.25MHz ½" x 1" Shearwave BNC	1/2x1	2.25
SSG50105	5MHz ½""x 1" Shearwave BNC	1/2x1	5
SSG62622	2.25MHz 5/8"x5/8" Shearwave BNC	5/8x5/8	2.25
SSG62625	5MHz 5/8"x 5/8" Shearwave BNC	5/8x5/8	5
SSG62752	2.25MHz ¾"x5/8" Shearwave BNC	5/8x3/4	2.25
SSG62755	5MHz ¾" x 5/8" Shearwave BNC	5/8x3/4	5
SSG75752	2.25MHz ¾" x ¾" Shearwave BNC	3/4x3/4	2.25
SSG75755	5MHz ¾" x ¾" Shearwave BNC	3/4x3/4	5

Transducer Models			
Product code	Description	Crystal Diameter (inches)	Frequency (MHz)
PSS50502	2.25MHz ½" x ½" Shearwave BNC	1/2x1/2	2.25
PSS50505	5MHz ½" x ½" Shearwave BNC	1/2x1/2	5
PSS50102	2.25MHz ½" x ½" Shearwave BNC	1/2x1	2.25
PSS50105	5MHz ½""x 1" Shearwave BNC	1/2x1	5
PSS62622	2.25MHz 5/8"x5/8" Shearwave BNC	5/8x5/8	2.25
PSS62625	5MHz 5/8"x5/8" Shearwave BNC	5/8x5/8	5
PSS62752	2.25MHz 5/8"x¾" Shearwave BNC	5/8x3/4	2.25
PSS62755	5MHz 5/8"x¾" Shearwave BNC	3/4x5/8	5
PSS75752	2.25MHz ¾" x ¾" Shearwave BNC	3/4x3/4	2.25
PSS75755	5MHz 5/8"x¾"Shearwave BNC	5/8x3/4	5

Size Options				Connector	
Probe Size (inches)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	BNC (B)	Top (T)
1/2x1/2	17	19	17	·	·
1/2x1	17	19	17	·	·
5/8x5/8	17	22	17	·	·
3/4x3/4	17	25	17	·	·
3/4x5/8	17	22	17	·	·

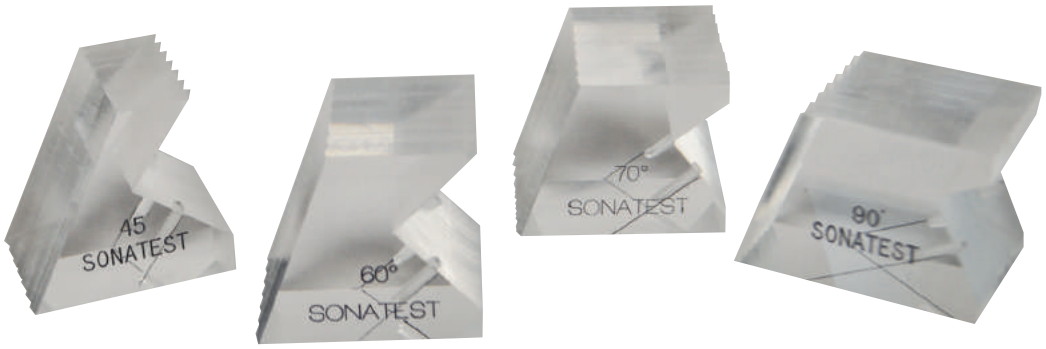
Standard Wedges - SW

SW - Standard Wedges		Θ (°)	a x b (“)
SW5045	45° wedge for ½” x ½” Probe	45	1/2 x 1/2
SW5060	60° wedge for ½” x ½” Probe	60	1/2 x 1/2
SW5070	70° wedge for ½” x ½” Probe	70	1/2 x 1/2
SW5090	90° wedge for ½” x ½” Probe	90	1/2 x 1/2
SW5145	45° wedge for ½” x 1” Probe	45	1/2 x 1
SW5160	60° wedge for ½” x 1” Probe	60	1/2 x 1

SW - Standard Wedges		Θ (°)	a x b (“)
SW5170	70° wedge for ½” x 1” Probe	70	1/2 x 1
SW5190	90° wedge for ½” x 1” Probe	90	1/2 x 1
SW6245	45° wedge for 5/8”x 5/8” Probe	45	5/8 x 5/8
SW6260	60° wedge for 5/8”x 5/8” Probe	60	5/8 x 5/8
SW6270	70° wedge for 5/8”x 5/8” Probe	70	5/8 x 5/8
SW6290	90° wedge for 5/8”x 5/8” Probe	90	5/8 x 5/8

Features

- Attached by screws to SSG or PSS transducers. 4-40 threaded holes
- Axial and circumferential ID or OD profiling available



Snail Wedge - SNW

SNW - Snail Wedges		Θ (°)	a x b (“)
SNW6245	45° Snail Wedge	45	5/8 x 5/8
SNW6260	60° Snail Wedge	60	5/8 x 5/8
SNW6270	70° Snail Wedge	70	5/8 x 5/8

Features

- Attached by screws to SSG or PSS transducers. 4-40 threaded holes
- Axial and circumferential ID or OD profiling available
- AWS structural weld code style

NB: 5/8 x 5/8 SW, SW-HT and SNW wedges are also compatible with X5 (X Series) phased array probes. 4-40 screws are required for this.

Twin Angle Shear Wave Transducer
General Weld Probes

TStarc

Transducer Models				
Product code	Description	Crystal Diameter (mm) (°)	Frequency (MHz)	Nearfield Length* (mm) N
TSTARC2-10	Twin Crystal Ø10mm 2Mz	10	2	8.5
TSTARC2-20	Twin Crystal Ø20mm 2Mz	20	2	33
TSTARC2-45	Twin Shear 2Mhz 45°	2x(8x5)	2	4
TSTARC2-60	Twin Shear 2Mhz 60°	2x(8x5)	2	4
TSTARC2-70	Twin Shear 2Mhz 70°	2x(8x5)	2	4
TSTARC4-10	Twin Crystal Ø10mm 4Mz	10	4	17
TSTARC4-20	Twin Crystal Ø20mm 4Mz	20	4	68
TSTARC4-45	Twin Shear 4Mhz 45°	2x(8x5)	4	7.5
TSTARC4-60	Twin Shear 4Mhz 60°	2x(8x5)	4	7.5
TSTARC4-70	Twin Shear 4Mhz 70°	2x(8x5)	4	7.5

Features

- Twin (Perspex Delay) versions
- 2 MHz and 4 MHz - 10, 20 mm diameter versions
- Stainless steel enclosure

Frequent Applications

- General Welds
- Critical Welds
- Machined Parts
- Tube and Pipe
- Casting and Forging
- Laminations
- Composites
- Bars
- Billets
- Bond Testing
- Glass
- Brazed Joints
- Ceramics

Size Options				Connector	
Probe Size (MM)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 00 (Z)	Top (T)
10	34	33	33	·	·
20	34	33	33	·	·
2x(8x5)	21	15	29	·	·
10	37	25	25	·	·
20	37	25	25	·	·

Twin Angle Shear Wave Transducer

TSMA

Features

- Dual angle beam composite shearwave contact probe
- Rectangular, lead PZT crystal
- Medium damped for medium bandwidth
- European Standard transducer

Frequent Applications

- General Welds
- Tube and Pipe
- Casting and Forging
- Critical Welds

Transducer Models				
Product code	Crystal Diameter (mm)	Frequency (MHz)	Beam Angle (°)	Nearfield Length* (mm) N
TSMA4-45	Twin Shear 4Mhz 45°	3.5 x 10	4	11
TSMA4-60	Twin Shear 4Mhz 60°	3.5 x 10	4	11
TSMA4-70	Twin Shear 4Mhz 70°	3.5 x10	4	11

Size Options				Connector Options	
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 1 (L)	Rear (R)
3.5x10	24	15	22	-	•

Through Transmission Transducers
Soft Tip Probe

STP

Features

- Pair of normal beam compression wave soft tip probe.
- Circular, lead netaniobate crystal.
- Low damped for narrow bandwidth.
- Polymer face.
- Use with Dryscan Flaw Detector.

Frequent Applications

- Aerospace
- Bond Testing
- Composites

Transducer Models			
Product code	Crystal Diameter (mm)	Frequency (MHz)	Nearfield Length* (mm) N
STP5-1Z	5	1.25	5
STP5-2Z	5	0.5	5
STP10-1Z	10	1.25	10
STP10-2Z	10	0.5	10
STP20-1Z	20	1.25	20

Size Options				Connector		
Probe Size (mm)	Case Dimensions (mm)			Connector Type		Connector Position
Ø	A	B	C	Lemo 00 (Z)	Subvis (S)	Top (T)
5	9.8	30	-	·	·	·
10	20	36	-	-	·	·
20	30	36	-	-	·	·

Through Transmission Transducers
Roller Probe

RP

Features

- Pair normal beam compression wave roller probe.
- Circular, lead metaniobate crystal.
- High Sensitivity
- Polymer face.
- Use with Dryscan Flaw Detector.
- Stub axle
- Version available RP25HS-3.

Frequent Applications

- Aerospace
- Bond Testing
- Composites

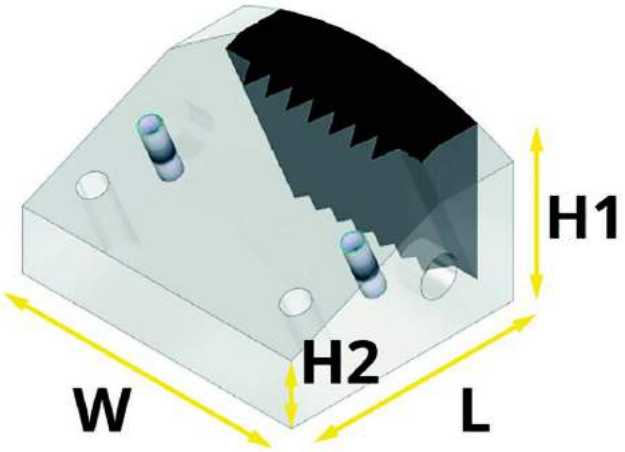
Transducer Models			
Product code	Description	Crystal Diameter (mm)	Frequency (MHz)
RP25HS-1	1.25 roller probe	10	1.25
RP25HS-2	0.5 roller probe	10	0.5
RP25HS-3C	1.25 Special Design (GE)	10	1.25

Size Options				Connector	
Probe Size (mm)	Case Dimensions (mm)			Connector Type	Connector Position
Ø	A	B	C	Lemo 00 (Z)	Top (T)
10	36	113	25	·	·

Phased Array Probes
X0 Series

Features
- Quick I-PEX Connector (QX)
- Quick I-PEX Bracket
- 5m Cable
- Other cable lengths upon request

Frequent Applications
- Bore Pipe
- Small diameter tube inspection
- Fits on most low profile scanners



Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
							A	B	C
X0A-001	X0A-2.25M16EFC35-0.5x10-SQX5	2.25	16	10	0.5	8	26	22	9.7
X0A-002	X0A-5M16EFC35-0.5x10-SQX5	5	16	10	0.5	8	26	22	9.7
X0A-003	X0A-7.5M16EFC35-0.5x10-SQX5	7.5	16	10	0.5	8	26	22	9.7
X0A-004	X0A-10M16EFC35-0.5x10-SQX5	10	16	10	0.5	8	26	22	9.7
X0A-005	X0A-10M32EFC35-0.25x10-SQX5	10	32	10	0.25	8	26	22	9.7

Wedge	Wedge Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
X0AW-001	X0AW-N60S-IH	S	60	39	0	18	21	13.2	2.4
X0AW-002	X0AW-N55S-IH	S	55	36	0	18	21	13.2	2.4
X0AW-003	X0AW-N45S-IH	S	45	31	0	18	21	13.2	2.4
X0AW-004	X0AW-N60L-IH	L	60	20	0	18	21	9	2.4

Phased Array Probes

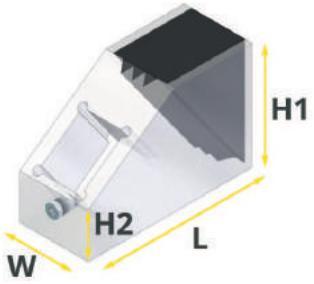
X1 Series

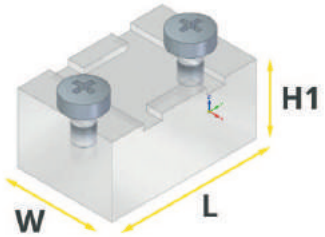
Features

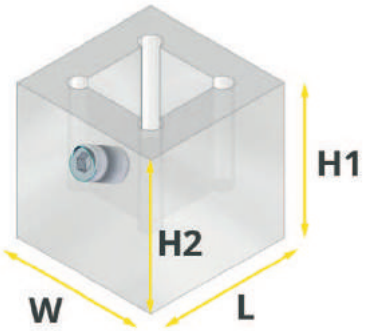
- Quick I-PEX Connector (QX)
- Quick I-PEX Bracket
- 2.5m/5m Cable
- Other cable lengths upon request

Frequent Applications

- Scribe Lines
- Automotive parts
- Machined Parts
- White Metal Sheets



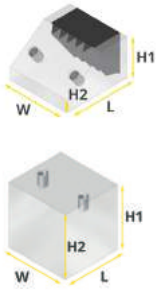




Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
2.5 Metre Cable							**A**	**B**	**C**
X1A-001	X1A-5M10E-0.6x5-SQX2.5	5	10	5	0.6	6	13	10	23
X1A-002	X1A-10M10E-0.6x5-SQX2.5	10	10	5	0.6	6	13	10	23
X1B-001	X1B-10M16E-0.3x5-SQX2.5	10	16	5	0.3	4.8	8	8	23
5 Metre Cable							**A**	**B**	**C**
X1A-003	X1A-5M10E-0.6x5-SQX5	5	10	5	0.6	6	13	10	23
X1A-002	X1A-10M10E-0.6x5-SQX5	10	10	5	0.6	6	13	10	23
X1B-001	X1B-10M16E-0.3x5-SQX5	10	16	5	0.3	4.8	8	8	23

Wedge	Wedge Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
X1AW-001	X1AW-0L10	L	0	0	10	23	15	11	11
X1AW-002	X1AW-0L20	S	55	0	20	23	15	21	21
X1AW-003	X1AW-N55S	S	55	36	0	35.5	16	24.93	12.3
X1AW-004	X1AW-N60L	L	60	20	0	29.1	16	22.6	15
X1BW-001	X1BW-0L5	L	0	0	5	15	15	15	15
X1BW-002	X1BW-0L20	L	0	0	20	15	15	30	30
X1BW-003	X1BW-N45S	S	45	31	0	23	16	16.03	8
X1BW-004	X1BW-N55S	S	55	36	0	23	16	15.39	6.8
X1BW-005	X1BW-N60S	S	60	39	0	23	16	15.36	6.8
X1BW-006	X1BW-N60L	L	60	20	0	23	16	21.43	15.9

X2 Series



Features

- Quick I-PEX Connector (QX)
- Quick I-PEX Bracket
- 2.5m/5m Cable
- Other cable lengths upon request

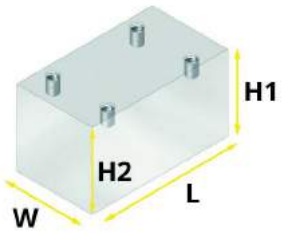
Frequent Applications

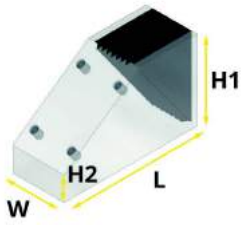
- General critical welds (butt, T and corner joints)
- Castings
- Automotive parts
- Flanges
- Machined parts

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
2.5 Metre Cables							**A**	**B**	**C**
X2A-002	X2A-5M16E-0.6x10-SQX2.5	5	16	10	0.6	9.6	16	23	20
X2A-003	X2A-7.5M16E-0.6x10-SQX2.5	7.5	16	10	0.6	9.6	16	23	20
X2A-004	X2A-10M16E-0.6x10-SQX2.5	10	16	10	0.6	9.6	16	23	20
X2A-005	X2A-10M32E-0.3x10-SQX2.5	10	32	10	0.3	9.6	16	23	20
X2B-001	X2B-5M32E-0.6x10-SQX2.5	5	32	10	0.6	19.2	32	23	20
X2B-002	X2B-7.5M32E-0.6x10-SQX2.5	7.5	32	10	0.6	19.2	32	23	20
X2B-004	X2B-7.5M32E-0.6x10-SQX2.5	7.5	32	10	0.6	19.2	32	23	20
5 Metre Cables							**A**	**B**	**C**
X2A-006	X2A-5M16E-0.6x10-SQX5	5	16	10	0.6	9.6	16	23	20
X2A-007	X2A-7.5M16E-0.6x10-SQX5	7.5	16	10	0.6	9.6	16	23	20
X2A-008	X2A-10M16E-0.6x10-SQX5	10	16	10	0.6	9.6	16	23	20
X2A-009	X2A-10M32E-0.3x10-SQX5	10	32	10	0.6	9.6	32	23	20
X2B-003	X2B-5M32E-0.6x10-SQX5	5	32	10	0.6	19.2	32	23	20

Wedge	Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
X2AW-001	X2AW-0L25	L	0	0	25	23	25	25	25
X2AW-002	X2AW-N45S	S	45	31	0	26.5	25	14.6	4
X2AW-003	X2AW-N55S	S	55	36	0	26.5	25	15.7	4.8
X2AW-004	X2AW-N60S	S	60	39	0	26.5	25	15.4	4
X2AW-005	X2AW-N60L	L	60	20	0	26.5	25	24	17.5
X2AW-006	X2AW-0L25-IHC	L	0	0	25	23	25	25	25
X2AW-007	X2AW-N45S-IHC	S	45	31	0	26.5	25	14.6	4
X2AW-008	X2AW-N55S-IHC	S	55	36	0	26.5	25	15.7	4.8
X2AW-009	X2AW-N60S-IHC	S	60	39	0	26.5	25	15.4	4
X2AW-010	X2AW-N60L-IHC	L	60	20	0	26.5	25	24	17.5
X2AW-101	X2AW-N60S-114COD-IHC	S	60	39	0	26.5	36.2	20	8
X2AW-102	X2AW-N60S-141COD-IHC	S	60	39	0	26.5	36.2	20	8
X2AW-103	X2AW-N60S-273COD-IHC	S	60	39	0	26.5	36.2	20	7.5
X2AW-104	X2AW-N60S-324COD-IHC	S	60	39	0	26.5	36.2	20	7.5
X2AW-105	X2AW-N60S-508COD-IHC	S	60	39	0	26.5	36.2	20	7.5
X2AW-106	X2AW-N60S-1067COD-IHC	S	60	39	0	26.5	36.2	20	7
X2BW-001	X2BW-0L25	L	0	0	25	33	25	25	25
X2BW-002	X2BW-N45S	S	45	31	0	43	25	26.8	10.6
X2BW-003	X2BW-N60S	S	60	39	0	43	25	27.4	10.6
X2BW-004	X2BW-N60L	L	60	20	0	43	25	29.2	17.4
X2BW-005	X2BW-0L25-IHC	L	0	0	25	33	36	25	25
X2BW-006	X2BW-N45S-IHC	S	45	31	0	43	36	26.8	10.6
X2BW-007	X2BW-N60S-IHC	S	60	39	0	43	36	27.4	10.6
X2BW-008	X2BW-N60L-IHC	L	60	20	0	43	36	29.2	17.4

X3 Series





Features

- Quick I-PEX Connector (QX) Quick I-PEX Bracket
- 2.5m/5m Cable
- Other cable lengths upon request
- Immersion available on demand

Frequent Applications

- General critical welds (butt, T and corner joints)
- Castings
- Flanges
- Automotive parts
- Machined parts

Product code	Crystal Diameter (mm)	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)
2.5 Metre Cable						
X3A-001	X3A-2.25M48E-0.8x10-SQX2.5	2.25	48	10	0.8	38.4
X3A-002	X3A-3.5M64E-0.6x10-SQX2.5	3.5	64	10	0.6	38.4
X3A-003	X3A-5M64E-0.6x10-SQX2.5	5	64	10	0.6	38.4
X3A-004	X3A-10M64E-0.6x7-SQX2.5	10	64	7	0.6	38.4
5 Metre Cable						
X3A-005	X3A-2.25M48E-0.8x10-SQX5	2.25	48	10	0.8	38.4
X3A-006	X3A-3.5M64E-0.6x10-SQX2.5	3.5	64	10	0.6	38.4
X3A-007	X3A-5M64E-0.6x10-SQX2.5	5	64	10	0.6	38.4
X3A-008	X3A-10M64E-0.6x7-SQX2.5	10	64	7	0.6	38.4

Case Dimensions (mm)		
A	**B**	**C**
45	23	20

Wedge	Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
X3AW-001	X3AW-0L25	L	0	0	25	45	25	25	25
X3AW-002	X3AW-N45S	S	45	31	0	65	25	41	16.7
X3AW-003	X3AW-N55S	S	55	36	0	65	25	38.6	11.7
X3AW-004	X3AW-N60S	S	60	39	0	65	25	36.3	7.5
X3AW-005	X3AW-N45L	L	45	16	0	65	25	34.4	21
X3AW-006	X3AW-N60L	L	60	20	0	65	25	43	25
X3AW-007	X3AW-0L25-IHC Wedge	L	0	0	25	45	38	25	25
X3AW-008	X3AW-N45S-IHC Wedge	S	45	31	0	65	38	41	16.7
X3AW-009	X3AW-N55S-IHC Wedge	S	55	36	0	65	38	38.6	11.7
X3AW-010	X3AW-N60S-IHC Wedge	S	60	39	0	65	38	36.3	7.5
X3AW-011	X3AW-N45L-IHC Wedge	L	45	16	0	65	38	34.4	2.1
X3AW-012	X3AW-N60L-IHC Wedge	L	60	20	0	65	38	43	25
X3AG-001	X3AG-0LW25	L	0	0	25	66	34.1	25	25
X3AG-002	X3AG-0LW6.35	L	0	0	6.35	*	*	*	*

*Dimensions available upon request

X4 Series

Features

- Quick I-PEX Connector (QX).
- Quick I-PEX Bracket.
- 2.5m/5m Cable.
- Other cable lengths upon request.

Frequent Applications

- General critical welds (butt, T and corner joints)
- Castings
- Flanges
- Automotive parts
- Machined parts

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
2.5 Metre Cable							**A**	**B**	**C**
X4Z-001	X4Z-2M8E-N50S-1x9-SQX2.5	2	8	9	1	8	27	16.5	22
X4Z-002	X4Z-4M16E-N50S-0.5x9-SQX2.5	4	16	9	0.5	8	27	16.5	22
5 Metre Cable							**A**	**B**	**C**
X4Z-003	X4Z-2M8E-N50S-1x9-SQX5	2	8	9	1	8	27	16.5	22
X4Z-004	X4Z-4M16E-N50S-0.5x9-SQX5	4	16	9	0.5	8	27	16.5	22

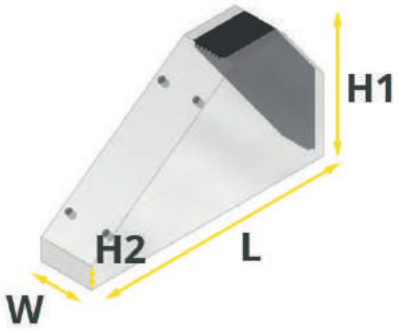
X6 Series

Features

- Quick I-PEX Connector (QX).
- Quick I-PEX Bracket.
- 2.5m/5m Cable.
- Other cable lengths upon request.

Frequent Applications

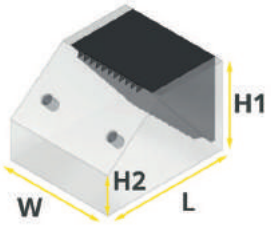
- Aerospace parts
- Large Aluminium plates (delaminations)
- Corrosion, blistering and thickness mapping

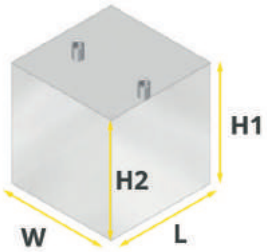


Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
2.5 Metre Cables							**A**	**B**	**C**
X6A-001	X6A-3.5M128E-0.75x10-SQX2.5	3.5	128	10	0.75	96	56	28	27.5
X6A-002	X6A-5M128E-0.75x10-SQX2.5	5	128	10	0.75	96	60	28	27.5
5 Metre Cable							**A**	**B**	**C**
X6A-003	X6A-3.5M128E-0.75x10-SQX5	3.5	128	10	0.75	96	56	28	27.5
X6A-004	X6A-5M128E-0.75x10-SQX5	5	128	10	0.75	96	60	28	27.5

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
2.5 Metre Cables							**A**	**B**	**C**
X6A-001	X6A-3.5M128E-0.75x10-SQX2.5	3.5	128	10	0.75	96	56	28	27.5
X6A-002	X6A-5M128E-0.75x10-SQX2.5	5	128	10	0.75	96	60	28	27.5
5 Metre Cable							**A**	**B**	**C**
X6A-003	X6A-3.5M128E-0.75x10-SQX5	3.5	128	10	0.75	96	56	28	27.5
X6A-004	X6A-5M128E-0.75x10-SQX5	5	128	10	0.75	96	60	28	27.5

Phased Array Probes
X5 Series





Features

- Quick I-PEX Connector (QX)
- Quick I-PEX Bracket
- 2.5m/5m Cable
- Other cable lengths upon request

Frequent Applications

- Structural component (large pins)
- Shaft
- Casting, bars and billets
- Critical large weld inspection

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
2.5 Metre Cable							**A**	**B**	**C**
X5A-001	X5A-2.25M16E-1x16-SQX2.5	2.25	16	16	1	16	23	45	20
X5A-002	X5A-5M16E-1x16-SQX2.5	5	16	16	1	16	23	45	20
X5A-003	X5A-2.25M16EHF-1x16-SQX2.5	2.25	16 (Hard-Face)	16	1	16	23	45	20
X5A-004	X5A-5M16EHF-1x16-SQX2.5	5	16 (Hard-Face)	16	1	16	23	45	20
5 Metre Cable							**A**	**B**	**C**
X5A-005	X5A-2.25M16E-1x16-SQX5	2.25	16	16	1	16	23	45	20
X5A-006	X5A-5M16E-1x16-SQX5	5	16	16	1	16	23	45	20
X5A-007	X5A-2.25M16EHF-1x16-SQX5	2.25	16 (Hard-Face)	16	1	16	23	45	20
X5A-008	X5A-5M16EHF-1x16-SQX5	5	16 (Hard-Face)	16	1	16	23	45	20

Wedge	Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
X5AW-001	X5AW-0L40 L	L	0	0	40	38	38	40	40
X5AW-002	X5AW-N60S	S	60	39	0	45	38	30.2	13.6
X5AW-003	X5AW-N60L	L	60	20	0	45	38	33	21
X5AW-004	X5AW-0L40 L-IHC	L	0	0	40	38	49	40	40
X5AW-005	X5AW-N60S-IHC	S	60	39	0	45	49	30.2	13.6
X5AW-006	X5AW-N60L-IHC	L	60	20	0	45	49	33	21

Phased Array Probes
DAAH 1A

Features
- DAAH 1 Cable Connection.
- 2m Cable.
- Other cable lengths upon request

Frequent Applications
- General and critical welds (butt, T and corner joints)
- Casting, bars and billets
- Structural component (large pins)
- Shaft, casting, bars and billets
- Flanges
- Automotive parts
- Machined parts

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)
DA1-001	D1A-2.25M20E-1.2x12	2.25	20	12	1.2	24
D1A-002	D1A-5M32E-0.8x12	5	32	12	0.8	25.6
D1A-003	D1A-7.5M44E-0.6x12	7.5	44	12	0.6	26.4
D1A-004	D1A-2.25M20EHF-1.2x12	2.25	20 (Hardface)	12	1.2	24
D1A-005	D1A-5M32EHF-0.8x12	5	32 (Hardface)	12	0.8	25.6
D1A-006	D1A-7.5M44EHF-0.6x12	7.5	44 (Hardface)	12	0.6	26.4

Case Dimensions (mm)		
A	B	C
32	29.3	14.7

Wedge	Wedge Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
D1AW-001	D1AW-0L12.7	L	0	0	12.7	42	31.8	12.7	12.7
D1AW-002	D1AW-0L25.4	L	0	0	25.4	42	31.8	25.4	25.4
D1AW-004	D1AW-N57S	S	57	37	0	48.6	31.8	27.2	6.1
D1AW-005	D1AW-N48L	L	48	17	0	40.2	31.8	4.5	14.7
D1AW-006	D1AW-0L12.7 - IHC Wedge	L	0	0	12.7	46	31.8	12.7	12.7
D1AW-007	D1AW-0L25.4 - IHC Wedge	L	0	0	25.4	46	31.8	25.4	25.4
D1AW-009	D1AW-N57S - IHC Wedge	S	57	37	0	48.6	31.8	27.2	6.1
D1AW-010	D1AW-N48L - IHC Wedge	L	48	17	0	40	31.8	25.3	15.4
D1AW-011	D1AW-N45S - IHC Wedge	S	45	31	0	56	31.8	33.56	12
D1AW-101	D1AW-N57S-114COD-IHC	S	57	37	0	42	31.8	33	13.4
D1AW-102	D1AW-N57S-141COD-IHC	S	57	37	0	42	31.8	33	13.4
D1AW-103	D1AW-N57S-273COD-IHC	S	57	37	0	42	31.8	30.5	10.5
D1AW-105	D1AW-N57S-324COD-IHC	S	57	37	0	42	31.8	30.5	10.5
D1AW-105	D1AW-N57S-508COD-IHC	S	57	37	0	42	31.8	28.8	8.5
D1AW-106	D1AW-N57S-1067COD-IHC	S	57	37	0	42	31.8	28.8	8.5

DAAH 1B

Features

- DAAH 1 Cable Connection.
- 2m Cable.
- Other cable lengths upon request

Frequent Applications

- Pressure vessels
- Austentic stainless steel alloys
- Dissimilar welds
- Very attenuative material

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)
D1B-001	D1B-2.25M20E-1.2x12	2.25	20	12	1.2	24
D1B-002	D1B-5M32E-0.8x12	5	32	12	0.8	25.6
D1B-003	D1B-7.5M44E-0.6x12	7.5	44	12	0.6	26.4

Case Dimensions (mm)		
A	B	C
44	17.6	14.7

Wedge	Wedge Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
D1BW-006	D1BW-2N45L-FD25-IHC	L	45	17	7.6	50	45	20.5	4
D1BW-007	D1BW-2N45L-FD50-IHC	L	45	17	4.1	50	45	17.6	4
D1BW-008	D1BW-2N45L-FD75-IHC	L	45	17	3	50	45	18.8	4
D1BW-004	D1BW-2N45L-FD15-IHC	L	45	17	-	50	45	22.6	4
D1BW-005	D1BW-2N45L-FC20-IHC	L	45	17	-	50	45	22.1	4

DAAH 1Z

Features

- DAAH 1 Cable Connection.
- 2m Cable.
- Other cable lengths upon request.

Frequent Applications

- General and critical welds (butt, T and corner joints)
- Casting, bars and billets
- Structural component (large pins)
- Shaft, casting, bars and billets
- Flanges
- Automotive parts
- Machined parts

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
							A	B	C
D1Z-001	D1Z-2.25M19E-N48L-1.2x12	2.25	19	12	1.2	22.8	33.8	17.6	22.6
D1z-002	D1Z-2.25M14E-N53S-1.2x12	2.25	14	12	1.2	16.8	34.1	17.6	27.5
D1Z-003	D1Z-5M26E-N48L-0.8x12	5	26	12	0.8	20.8	33.8	17.6	22.6
D1Z-004	D1Z-5M22E-N53S-0.8x12	5	22	12	0.8	17.6	34.1	17.6	27.5
D1Z-005	D1Z-7.5M40E-N48L-0.6x12	7.5	40	12	0.6	24	33.8	17.6	22.6
D1Z-006	D1Z-7.5M30E-N53S-0.6x12	7.5	30	12	0.6	18	34.1	17.6	27.5

DAAH 5A

Features

- DAAH 5 Cable Connection.
- 2m Cable.
- Other cable lengths upon request.

Frequent Applications

- Aerospace parts (large composite)
- Large aluminium plates (delaminations)
- Corrosion, blistering & thickness mapping
- Critical Welds of thick material

Product code	Probe Description	Frequency (MHz)	Number Elements (QTY)	Elevation E (mm)	Element Pitch P (mm)	Aperture L (mm)	Case Dimensions (mm)		
							A	B	C
D5A-001	D5A-5M64E-0.8x12	5	64	12	0.8	51.2	60	29.2	20.6

Wedge	Wedge Description	Wave Type (LW/SW)	Angle Steel	Cut Angle	Delay Line (mm)	Length (L)	Width (W)	Front Height (H1)	Back Height (H2)
			(°)	(°)	(mm)	(mm)	(mm)	(mm)	(mm)
D5AW-001	D5AW-0L12.7	L	0	0	12.7	80	30	12.7	12.7
D5AW-002	D5AW-0L25.4	L	0	0	25.4	80	30	25.4	25.4
D5AW-003	D5AW-0L12.7-IHC	L	0	0	12.7	80	30	12.7	12.7
D5AW-004	D5AW-0L25.4-IHC	L	0	0	25.4	80	30	25.4	25.4
D5AW-005	D5AW-N53S	S	57	37	0	109	32.2	59	16
D5AW-006	D5AW-N53S-IHC	S	57	37	0	*	*	*	*

* Dimensions on demand

PA Adapters

Part Number	Description
D1 Phased Array Cables	
D1-CABLE-001	D1-CABLE-S-QX2
D1-CABLE-002	D1-CABLE-S-QX5
D1-CABLE-003	D1-CABLE-D-QX2
D1-CABLE-004	D1-CABLE-D-QX5
D1-CABLE-005	D1-CABLE-QX2-AR
D1-CABLE-006	D1-CABLE-S-QX5-AR
D1-CABLE-007	D1-CABLE-D-QX2-AR
D1-CABLE-008	D1-CABLE-D-QX5-AR
D1-CABLE-151	D1-CABLE-CUSTOM
D5 Phased Array Cables	
D5-CABLE-001	D5-CABLE-S-QX2
D5-CABLE-002	D5-CABLE-S-QX5
D5-CABLE-003	D5-CABLE-S-QX2-AR
D5-CABLE-004	D5-CABLE-S-QX5-AR
D5-CABLE-151	D5-CABLE-CUSTOM
Phased Array Extension Cables	
PA-CABLE-001	PA-CABLE-S-64E-QX5
PA-CABLE-002	PA-CABLE-S-63E-QX10
PA-CABLE-151	PA-CABLE-CUSTOM

Adapters (F) Female (M) Male	**Order Code**
UHF (M) to BNC (F)	136166
UHF (F) to UHF (F)	136167
BNC (M) to BNC (F)	136168
BNC (F) to LEMO1 (M)	136169
BNC (M) to LEMO1 (F)	152018
BNC (M) to UHF(F)	136178

Couplants

The **Sonagel** range is designed for use on all types of metallic surface and is especially suited to solving the problems of rough, pitted, uneven surfaces allowing smooth probe movement during testing. The thixotropic properties of this couplant give excellent wetting and acoustic transmission and do not allow the product to flow all over the test area. This makes it very economical to use as you only cover the working area and not the whole piece, and is especially suitable for vertical and overhead surfaces.

Sonagel incorporates chemicals, which allow very slow drying even at elevated temperatures, whilst being free of VOC's and other hazardous materials. However, it does contain a special tracer dye to enable areas to be checked for coverage but the couplant is still very easily removed with gentle water washing or solvent wipes.

Sonagel W Sonagel W is a stable clear yellow water based couplant gel specifically designed for ultrasonic inspection. It is non-toxic and safe for the environment and is available in easy to use 125ml applicator bottles, 250ml bottles, as well as in plastic 1 litre, 5 litre and 25 litre bulk containers (with suitable carrying handles).

***NB:** this product operates within a temperature range of -10°C - 60°C and has a flash point of 160°C (PM) when used for long periods at elevated temperatures.

T-09	125 ml Bottle
Sonagel W1	1 Litre Tub
Sonagel W1/T	1 Litre Bottle
Sonagel W5	5 Litre Tub
Sonagel W25	25 Litre Tub

Sonagel D1 is a bright yellow fine powder that when mixed with water, forms a stable clear yellow gel specifically designed for ultrasonic inspection. 1 kilo of D1 powder makes 20 litres of couplant when mixed with water. This product is specifically designed for 'on site' spot tests where it is impractical to carry or deliver ready to use couplant in bulk.

Sonagel D1	I KG - mixes to 20 litres

Sonagel O is a stable pink/orange oil based couplant gel intended for use as a replacement for mineral oils and greases, within NDT environment. Hydrocarbon based, and retains a gel state without causing corrosion or drying on the test surface. The gel has a flash point of 175° (PM) and operates within the temperature range of -10°C - 75°C.

Sonagel O is available in easy to use 125ml applicator bottles as well as in plastic 1 litre, 5 litre and 25 litre bulk containers (with suitable carrying handles).

T-08	125 ml Bottle
Sonagel 01	1 Litre Tub
Sonagel 05	5 Litre
Sonagel 025	25 Litre

Sonagel LTHT is a thick translucent couplant paste specifically designed for ultrasonic inspection at temperatures up to 250°C and is non-toxic and safe for the environment and is easily removed with solvents such as Alcohol, Acetone or Hydrocarbon distillates.

Hazardous decomposition does not occur at elevated temperatures, the product will start to liquify as temperatures increase up to 300°C.

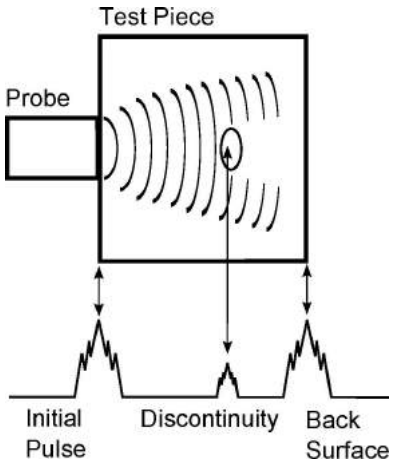
Sonagel-LTHT	1 Litre Tub

All products meet the sulphur and halogen requirements of nuclear and industrial specifications.

Please contact **nic@sonatest.com** for further details

Fundamentals of Ultrasonic NDT

In ultrasonic non-destructive testing (NDT) short pulses of sound at ultrasonic frequencies are introduced into the test item by a transducer. Any changes in the material property of the test material or boundaries will produce reflections to varying degrees. If these reflections eventually return to the transducer, then the time delay between their introduction and return may indicate how far into the test item they originated from. This time delay or path length may permit the identification of the position of the reflector. Similarly the amplitude of the echo may indicate the size or nature of the reflector. In cases when the reflector introduces a significant change in the material acoustic impedance (which is the product of material density and sound speed in the material) the reflection is strong, for instance at metal-air boundary.



The generation of ultrasonic pulses for NDT generally relies on the piezoelectric effect, whereby an electrical voltage pulse of between 50 and 500 V is applied across a piezo-ceramic crystal. This causes the crystal to deform. The motion of the crystal is transmitted to the test item via a coupling layer, thus introducing the ultrasound to the test item. The detection of echoes works in the same fashion but in reverse. The attenuated echo causes the crystal to vibrate disturbing the internal charge distribution in the crystal and thus creating a very small voltage which is measured. Thus the electronics in ultrasonic inspection equipment must be able to generate a precise, short high voltage pulse as well as amplify and accurately measure a short, very low voltage pulse.

Transducer Characteristics

Ultrasonic transducers for non-destructive testing come in a wide variety of configurations in order to facilitate numerous inspections possibilities. Despite this, there are a small number of physical characteristics which are commonly used to describe the performance of ultrasonic transducers and therefore identify them in inspection procedures and manufacturers' documentation.

Frequency

Transducers are classified by the nominal frequency of the ultrasound that they emit or are most sensitive to. This is the number of cycles per second of the pressure fluctuations in the material. Because ultrasound is high frequency it is usually measured in megahertz (MHz), which are million multiples of a hertz. So 1 MHz is 1 million cycles per second. Occasionally kilohertz (kHz) are used where the frequencies are thousand multiples of a hertz. It is the high frequency range that classifies this branch of acoustics as ultrasonics. The frequency is important because in conjunction with the speed of sound in the material it determines the wavelength of the sound, which is one of the factors that determine whether a reflection or echo is generated by a target object or defect.

Element Size

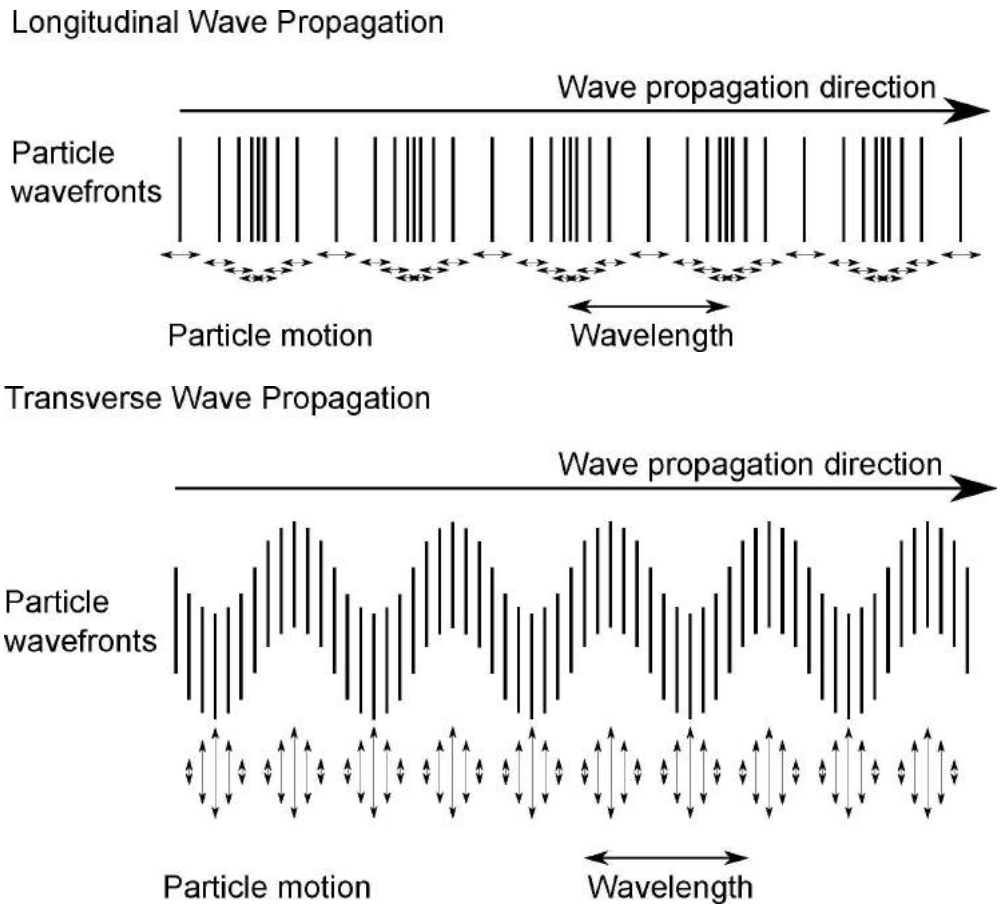
Transducers are also classified according to the size of their active sensor elements. The size of the element in conjunction with the frequency determines the shape of the beam emitted by the element. The size of the element determines the size of the transducer enclosure and so also affects how the transducer couples to the test item.

Element Type

Transducer elements are commonly made from the piezo-ceramic materials lead zirconate titanate (PZT) or lead metaniobate (PMN). They can be single crystals, composite crystals or phased arrays. Single crystals are a block of piezo-ceramic with one electrode on either side. Composite crystals comprise an array of vertical fingers of piezo-ceramic embedded in a resin matrix. The fingers are electrically connected by two electrodes in the same way as single crystals. The resin matrix permits both the acoustic impedance and mechanical resonances of the crystal to be manipulated, typically resulting higher bandwidth and sensitivity. In phased arrays the individual elements are similarly embedded in a resin matrix, but are electronically independent, i.e. individual electrodes for each element.

Bandwidth and Damping

An ultrasonic transducer emits a burst or pulse of ultrasonic energy which will contain a discrete number of pressure cycles at the transducer's nominal frequency. In practice this pulse contains cycles that start with small amplitude grow to large amplitude and reduce to small amplitude at the end of the pulse. This in fact means that the pulse contains a spread of frequencies of which the transducer's nominal frequency is the most prevalent. The shorter and sharper the pulse, the fewer cycles and the broader the spread of frequencies involved. The longer the pulse, the more cycles and the narrower the spread of frequencies involved. The breadth of the frequency content is measured by the quantity called the bandwidth. The bandwidth has a significant impact on the ability of a transducer to resolve defects and penetrate into the material. The bandwidth is controlled by the application of acoustic damping to the sensor crystal. An undamped crystal will oscillate for a longer time generating a pulse with many cycles thus containing much acoustic energy and having a narrow bandwidth, good penetration but poor resolution. A highly damped crystal will oscillate for a short time generating a pulse with few cycles thus containing less acoustic energy and having a broad bandwidth, poor penetration but good resolution.



Wave Type

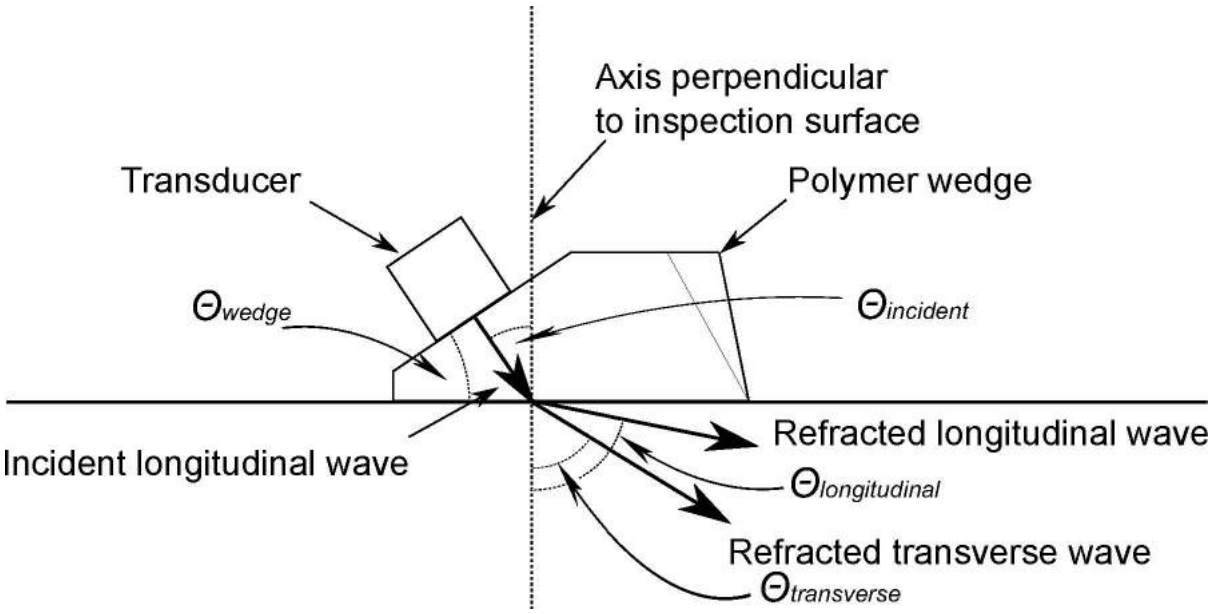
There are several different types, or modes, of ultrasonic wave propagation, not all are possible in all materials. Compression waves, also known as longitudinal waves, oscillate along the direction of propagation. Shear waves, also known as transverse waves, oscillate perpendicular to the direction of propagation. Less common are various types of surface and body waves. Solid materials support both compression and shear waves and the wave speed, or sound velocity, for the compression wave is always greater or faster than the shear wave. Liquids do not support shear waves and so immersion tests use compression waves. A wave of one type may generate a wave of another type when it passes from on material into another. This process is called mode conversion. Some transducers types rely on this phenomenon in order to generate the required ultrasonic sound beam. Some materials, e.g. austenitic steels, propagate shear waves very poorly and practical inspection requires compression waves.

Beam Angle

In order to detect certain defects it is sometimes necessary to produce beams of ultrasound at different angles. The beam angle is always measured with respect to an axis perpendicular, or normal, to the inspection surface. Therefore a transducer with a beam looking directly into the material is referred to as 0° or normal beam probe. A 90° probe has a beam looking along the inspection surface and may well propagate a surface wave. The beam angles that are possible are determined by Snell's Law which relates the beam in the transducer to the relative sound velocities in the transducer and the test material. Snell's Law is given by the formula

$$\frac{\sin\Theta_{incident}}{c_{incident}} = \frac{\sin\Theta_{transverse}}{c_{transverse}} = \frac{\sin\Theta_{longitudinal}}{c_{longitudinal}}$$

The incident longitudinal wave in the wedge is mode converted into two refracted beams in the material, one longitudinal and one transverse. The angles Θ and sound speeds c are the corresponding beam angle and sound speeds for a given wave type in the two materials. Snell's Law is used to calculate the necessary wedge (or cut) angle in order to achieve a specified beam angle for a specified combination of wedge material and test material. If either the wedge material or the test material is changed a different beam angle will result. As the speed of sound for compression waves is always greater than for shear waves, then the compression wave beam angle will always be greater than that of shear waves in the same material. Above a certain angle the longitudinal beam will be reflected back into the wedge.



Coupling and Lens Configuration

In a similar way to which the beam angle is determined, it is possible to influence the geometry of the beam of ultrasound by the application of lenses or delay-lines between the crystal and the test material. This may change the focal length of a flat faced transducer or may focus the beam to line or spot in the case of probes to which curved faces are introduced. The selection of lens or interface layer may also provide benefits for coupling to the test item by providing a compliant face that fills gaps or by providing improved matching of the acoustic impedances. A delay-line may also help to minimise wear to the transducer face thus prolonging the operational life of the transducer. Delay-lines are also useful in the protection of transducers when testing items at high temperatures.

The difference in the acoustic impedances of two adjoining materials determines the proportion of the incident sound is reflected at the interface and what proportion is transmitted. The acoustic impedance, Z, is the product of the material's density, ρ, and its velocity, c. Knowledge of the density and speed of sound for each wave type allows the reflection and transmission coefficients, R and T, to be calculated. Hence a near-perfect reflection occurs at the surface of a metal calibration block on account of the large differences in the densities and speeds of sound in steel and air and also the acoustic impedances. (See the table of acoustic properties of materials.)

Transducer Size, Frequency and Beam Profile

On leaving a transducer ultrasound forms a sound field, or spatial distribution, described by the beam profile, which is determined by the size, geometry and frequency of the transducer. Close to the transducer, in a region called the Near Field or Fresnel Zone, the sound field varies in a complicated manner and so the detection of defects within this region is more difficult. A flat-faced transducer will have a natural focal zone that occurs at the end of the Near Field and beyond which the sound field becomes more easily predictable in a region called the Far Field or Fraunhofer Zone. In this zone the detection of defects is more straightforward, however, as one moves further from the focal point the beam diverges and gets weaker. The combination of frequency and aperture size determines the rate, or angle of beam divergence. Large aperture, low frequency probes have wide beams, but smaller angles of divergence, whereas, small aperture, high frequency probes have narrow beams with larger angles of divergence. The combination of probe aperture and frequency therefore affects the ability of a probe to detect defects.

$$Z = \rho c \qquad R = \frac{Z_2 - Z_1}{Z_2 + Z_1} \qquad T = \frac{2Z_2}{Z_2 + Z_1}$$

N = Nearfield length (mm)
c = Speed of sound (m/s)
f = Frequency (MHz)
D = Crystal diameter (mm)
γ_6 = Divergence angle for -6 dB beam edge (º)

$$\sin\gamma_6 = \frac{0.51c}{Df} \qquad N = \frac{D^2 f}{4c}$$

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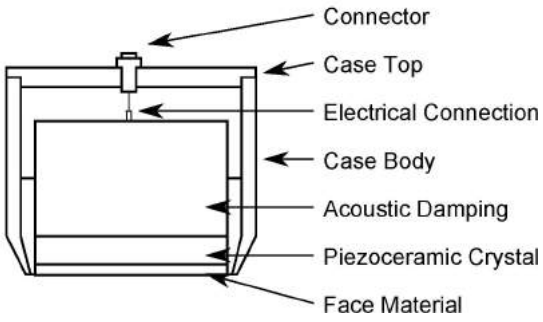
Transducer Types

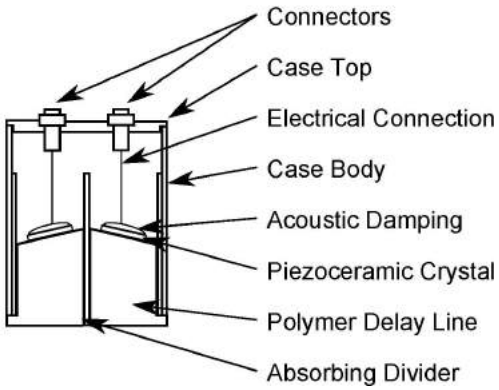
Single Element Transducers

Single element transducers have one active element which is used for both the transmission and reception of ultrasound. Single element transducers can generate compression or shear waves, normal or angled beams, be contact or immersion and can have variety of coupling/lens configurations. These transducers can be used on thickness gauges, flaw detectors and phased array instruments.



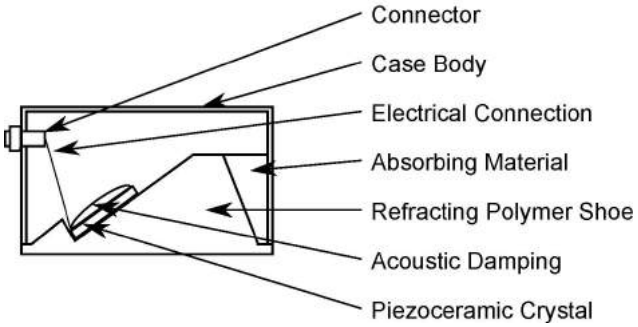
Dual Element Transducers

Dual element transducers have two active elements, one is used for the transmission and one for the reception of ultrasound. Dual element transducers typically are contact transducers and use an integral delay-line or shoe, they can generate compression or shear waves, normal or angled beams. These transducers can be used on thickness gauges, flaw detectors and phased array instruments.



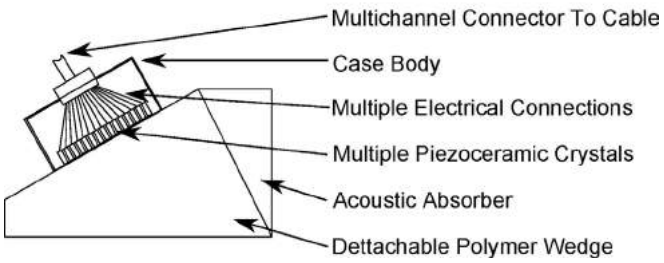
Angle Beam Transducers

Angle beam transducers create a beam of ultrasound at the specified angle to the normal to the inspection surface. Most angle beam transducers generate shear waves in the inspection material by refraction and mode conversion of a compression wave, however some refracted longitudinal angle beams are possible. Angle beam shoes or wedges, onto which the compression transducer is mounted are typically made of polymer such as acrylic or polystyrene. The shoe or wedge can be integral to the transducer or detachable and may be profiled and damped to minimise internal reflections. Dual element angle beam probes are also common, bringing the benefits of a dual probe to an angle beam.



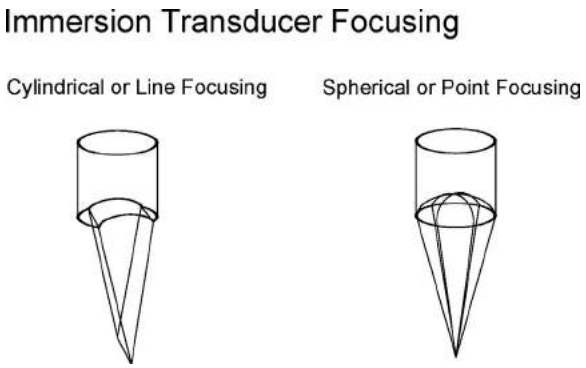
Phased Array Transducers

Phased array transducers have multiple elements, typically ranging in number from 8 to 128. The elements may transmit simultaneously or individually in a timed sequence. This facilitates a variety of composite beam profiles to be synthesised significantly increasing the flexibility of the transducer's application. Phased array transducers can be used with delay-lines, angled wedges and water delay-lines. These can only be used with phased array instruments.



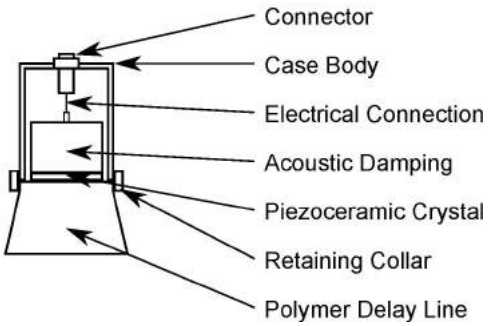
Immersion Transducers

Immersion transducers are design to operate submerged in water which provides the coupling and delay between the transducer and the test item. These transducers are commonly used in automated inspection systems which scan the probe over the test object and handle the ultrasonic inspection. These transducers can be flat faced and unfocused, or have profiled faces to focus them to a point or a line, referred to respectively as spherical and cylindrical focusing.



Delay Line Transducers

Delay line transducers transmit and receive sound waves with one element coupled to the surface, as with compression transducers. The crystal is held off from the surface of the test piece by a delay block. This permits inspection very close to the test piece surface.



Wheel Transducers

Wheel transducers combine aspects of immersion and delay-line transducers to create a probe where the contact with the test item is a rolling tyre. This facilitates the inspection of large areas or continuous feeds of material. The transducer is mounted in the hub of the wheel and the tyre is filled with water allowing the ultrasound to pass from the transducer, through the water, through the tyre and into the test item. The compliant rubber tyre material is carefully chosen to have an acoustic impedance that allows for good coupling to the test item with the minimum, or no couplant. Thus wheel probes are good for inspecting materials which are sensitive to conventional ultrasonic couplants.

Time-Of-Flight-Diffraction (TOFD) Transducers

TOFD transducers are especially high damped single element transducers that are used in conjunction with special wedges in a pitch-catch pair format. They are typically attached to the wedge by a quick change screw thread. The high damping produces the short pulse width and broadband response required by the TOFD technique, which assesses the different wave transit times between the transducers and in particular looks for transit time commensurate with a path involving diffraction from defects located midway between the pair of transducers.

Custom and Application Specific Transducers

Custom designed transducers are often required for the inspection of specialist parts. These often contain a number of elements facilitating the simultaneous inspection at specific locations and angles and often have integral or specialised couplant delivery systems. Some bespoke inspection tools contain several different types of transducer, such as phased array, time of flight diffraction and conventional ultrasonic probes. These systems are designed and optimised for customers' specific needs.

Material Acoustic Properties

Material	Longitudinal Velocity in/µs	Transverse Velocity in/µs	Longitudinal Velocity m/s	Transverse Velocity m/s	Density kg/m³	Acoustic Impedance MRayl
Acrylic Resin (Perspex)	0.107	0.056	2730	1430	2252	3.22
Air	0.013	-	331	-	0.121	0.00
Alcohol (Ethanol)	0.045	-	1144	-	785	0.90
Alumina	0.427	-	10846	-	3974	43.10
Aluminium	0.249	0.123	6320	3100	2690	17.00
Beryllium	0.508	0.350	12900	8900	1822	23.50
Boron Epoxy	0.131	0.072	3327	1829	1918	6.38
Brass	0.168	0.790	3830	2100	8094	31.00
Bronze (Phospher 5%)	0.139	0.088	3531	2235	8864	31.30
Carbon Fibre Epoxy Resin	0.121	0.056	3070	1415	1760	5.40
Castor Oil	0.058	-	1474	-	956	1.41
Concrete	0.167	0.135	4242	3429	2923	12.40
Graphite Epoxy	0.117	0.077	2972	1956	1760	5.40
Copper	0.183	0.089	4660	2300	8927	41.60
Ethylene Glycol	0.064	-	1626	-	1107	1.80
Fibreglass	0.131	0.072	3327	1829	1815	6.04
Glycerin	0.078	-	1920	-	1281	2.46
Glass	0.233	0.135	6800	3940	1676	11.40
Gold	0.128	0.047	3240	1200	19321	62.60
Granite	0.156	0.076	3962	1930	2751	10.90
Inconel	0.290	0.119	5820	3020	8500	49.47
Iron	0.232	0.127	5900	3230	7700	45.43
Iron (cast)	0.189	0.094	4800	2600	6917	33.20
Kerosene	0.052	-	1324	-	820	1.09
Lead	0.085	0.028	2160	700	11338	24.49
Magnesium	0.248	0.130	6310	3000	1585	10.00
Manganese	0.183	0.093	4660	2350	7391	34.44
Mercury	0.057	-	1450	-	13559	19.66
Molybdenum	0.248	0.132	6290	3400	10032	63.10
Monel	0.237	0.107	6020	2700	7907	47.60
Motor Oil (SAE 20 or 30)	0.069	-	1740	-	868	1.51
Nickle	0.222	0.117	5630	2960	8879	49.99

Material Acoustic Properties

Material	Longitudinal Velocity in/µs	Transverse Velocity in/µs	Longitudinal Velocity m/s	Transverse Velocity m/s	Density kg/m³	Acoustic Impedance MRayl
Octane	0.046	-	1171	-	690	0.81
Platinum	0.156	0.066	3960	1670	21399	84.74
Polycarbonate	0.090	-	2286	-	1185	2.71
Polyethane	0.069	0.020	2670	500	637	1.70
Polystyrene (Rexolite)	0.093	-	2362	-	1058	2.50
Polyurethane	0.070	-	1900	-	1000	1.90
Polyviynlchloride (hard)	0.094	0.042	2395	1060	1399	3.35
Quartz (fused)	0.232	0.148	5900	3750	2200	12.98
Rubber (natural)	0.061	-	1549	-	1123	1.74
Rubber (silicone)	0.037	-	940	-	1489	1.40
Silver	0.142	0.063	3600	1600	10489	37.76
Mild Steel	0.232	0.128	5920	3230	7770	46.00
Stainless Steel	0.226	0.122	6070	3100	4498	27.30
Teflon	0.054	0.017	1372	440	2187	3.00
Titanium	0.239	0.122	6070	3100	4498	27.30
Tungsten	0.204	0.113	5180	2870	19251	99.72
Tungsten Carbide	0.262	0.245	6655	6223	10158	67.60
Uranium	0.133	0.066	3370	2000	18694	63.00
Water (20°)	0.058	-	1480	-	1000	1.48
Zinc	0.164	0.095	4170	2410	7101	44.20
Zircaloy	0.186	0.093	4724	2362	9356	44.20
Zirconium	0.183	0.089	4650	2250	6480	30.13