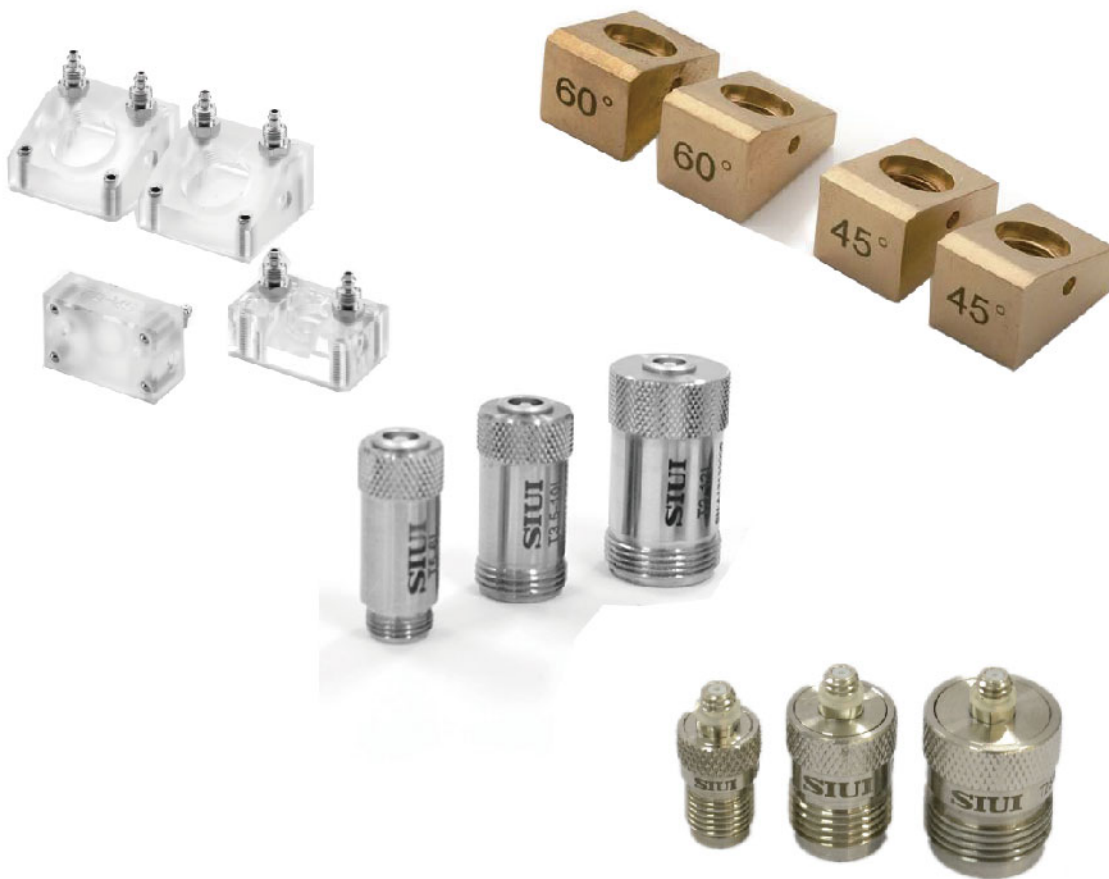


# TOFD Probes & Wedges

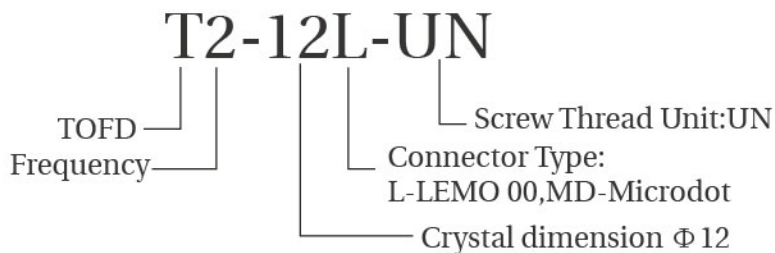


**SIUI**



# TOFD Probes

## Ordering Information:



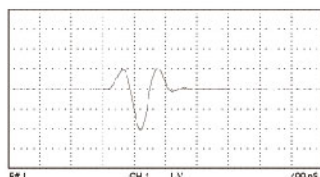
LEMO 00 Connector



Microdot Connector

| Probe         | Frequency | Crystal Diameter D1 | Max. Pulse Voltage | Housing Dimension | Screw Thread Unit   | Compatible Wedge |
|---------------|-----------|---------------------|--------------------|-------------------|---------------------|------------------|
|               | MHz       | mm                  | V                  | mm                |                     |                  |
| T2-12L-UN     | 2         | 12                  | -800               | D2:18<br>H:32     | UN:11/16-24<br>UNEF | TFD-45/60/70-UN  |
| T2-14L-UN     | 2         | 14                  | -800               | D2:18<br>H:32     |                     |                  |
| T2.25-12MD-UN | 2.25      | 12                  | -800               | D2:18<br>H:22.3   |                     |                  |
| T2.25-14MD-UN | 2.25      | 14                  | -800               | D2:18<br>H:22.3   |                     |                  |

### Test Report: T2-14L-UN 9mm plexiglass test block



Serial number: 2M114-27

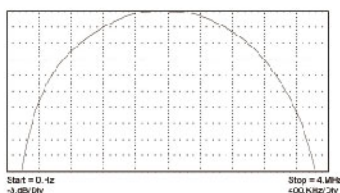
Envelope Peak Lengths:

|       |      |    |
|-------|------|----|
| 0dB   | 490  | +8 |
| -12dB | 660  | +8 |
| -28dB | 756  | +5 |
| -38dB | 1.12 | +5 |

Peak-to-peak Sensitivity: -31.31dB

Pulse Volt (Volts): 120V

Pulse Gain (dB): 0dB

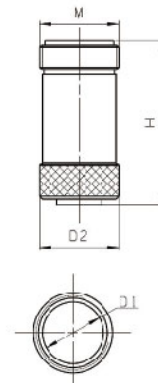


Specified Parameters for CH 1

- 6dB Low band edge
- 6dB High band edge
- 6dB Center frequency
- 6dB bandwidth

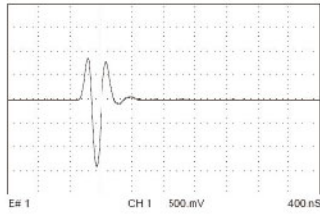
9/8.95  
2.99  
1.96  
100/105

K12  
MHz  
MHz  
%



| Probe         | Frequency | Crystal Diameter D1 | Max. Pulse Voltage | Housing Dimension | Screw Thread Unit   | Compatible Wedge |
|---------------|-----------|---------------------|--------------------|-------------------|---------------------|------------------|
|               | MHz       | mm                  | V                  | mm                |                     |                  |
| T2-10L-UN     | 2         | 10                  | -800               | D2:18<br>H:32     | UN:11/16-24<br>UNEF | TFD-45/60/70-UN  |
| T2.5-10L-UN   | 2.5       | 10                  | -700               | D2:18<br>H:32     |                     |                  |
| T3.5-10L-UN   | 3.5       | 10                  | -700               | D2:18<br>H:32     |                     |                  |
| T5-10L-UN     | 5         | 10                  | -500               | D2:18<br>H:32     |                     |                  |
| T2.25-10MD-UN | 2.25      | 10                  | -800               | D2:18<br>H:22.3   |                     |                  |
| T3.5-10MD-UN  | 3.5       | 10                  | -700               | D2:18<br>H:22.3   |                     |                  |
| T5-10MD-UN    | 5         | 10                  | -500               | D2:18<br>H:22.3   |                     |                  |

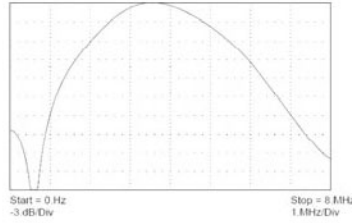
# Test Report: T3.5-10L-UN 9mm plexiglass test block



Serial number: u4

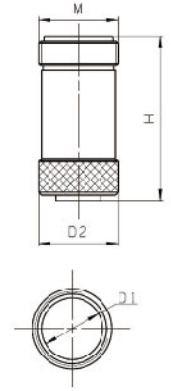
Envelope Pulse Lengths:

|                       |          |
|-----------------------|----------|
| Search in -           |          |
| -6 dB                 | 273.6 ns |
| -12 dB                | 272 ns   |
| -20 dB                | 469.6 ns |
| -30 dB                | 627.2 ns |
| Peak peak sensitivity | -34.5 dB |
| Pulse Volt (Volts)    | 120V     |
| Pulse Gain (dB)       | 0dB      |



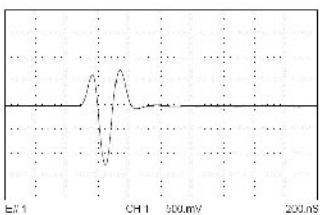
Spectral Parameters for CH 1

|                        |          |
|------------------------|----------|
| -6 dB Low bandedge     | 2.02 MHz |
| -6 dB High bandedge    | 5.45 MHz |
| -6 dB Center frequency | 3.74 MHz |
| -6 dB bandwidth        | 92.05 %  |



| Probe        | Frequency | Crystal Diameter D1 | Max. Pulse Voltage | Housing Dimension | Screw Thread Unit | Compatible Wedge |
|--------------|-----------|---------------------|--------------------|-------------------|-------------------|------------------|
|              | MHz       | mm                  | V                  | mm                |                   |                  |
| T4-6L-UN     | 4         | 6                   | -500               | D2:11.5<br>H:28.7 | UN:3/8-32UNEF     | TFB-45/60/70-UN  |
| T5-3L-UN     | 5         | 3                   | -500               | D2:11.5<br>H:28.7 |                   |                  |
| T5-6L-UN     | 5         | 6                   | -500               | D2:11.5<br>H:28.7 |                   |                  |
| T7.5-3L-UN   | 7.5       | 3                   | -300               | D2:11.5<br>H:28.7 |                   |                  |
| T7.5-6L-UN   | 7.5       | 6                   | -300               | D2:11.5<br>H:28.7 |                   |                  |
| T2.25-6MD-UN | 2.5       | 6                   | -800               | D2:11.2<br>H:19.7 |                   |                  |
| T3.5-6MD-UN  | 3.5       | 6                   | -700               | D2:11.2<br>H:19.7 |                   |                  |
| T5-3MD-UN    | 5         | 3                   | -500               | D2:11.2<br>H:19.7 |                   |                  |
| T5-6MD-UN    | 5         | 6                   | -500               | D2:11.2<br>H:19.7 |                   |                  |
| T7.5-3MD-UN  | 7.5       | 3                   | -300               | D2:11.2<br>H:19.7 |                   |                  |
| T7.5-6MD-UN  | 7.5       | 6                   | -300               | D2:11.2<br>H:19.7 |                   |                  |

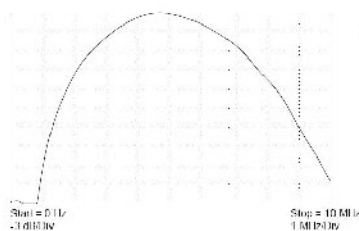
# Test Report: T5-6L-UN 9mm plexiglass test block



Serial number: 312 (1)

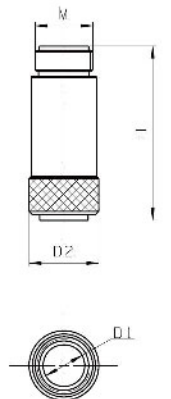
Envelope Pulse Lengths:

|                       |          |
|-----------------------|----------|
| Search in             |          |
| 0 dB                  | 222 ns   |
| -12 dB                | 290 ns   |
| -20 dB                | 550.4 ns |
| -30 dB                | 620.6 ns |
| Peak peak sensitivity | 30.26 dB |
| Pulse Volt (Volts)    | 120V     |
| Pulse Gain (dB)       | 0 dB     |



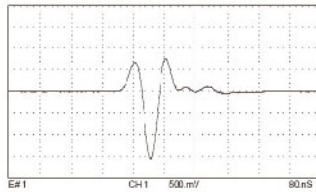
Spectral Parameters for CH 1

|                         |           |
|-------------------------|-----------|
| 0 dB Low bandedge       | 2.62 MHz  |
| 0 dB High bandedge      | 7.22 MHz  |
| -30 dB Center frequency | 4.917 MHz |
| -6 dB bandwidth         | 36.49 %   |



| Probe         | Frequency | Crystal Diameter D1 | Max. Pulse Voltage | Housing Dimension | Screw Thread Unit   | Compatible Wedge |
|---------------|-----------|---------------------|--------------------|-------------------|---------------------|------------------|
|               | MHz       | mm                  | V                  | mm                |                     |                  |
| T2-10L-UN     | 2         | 10                  | -800               | D2:18<br>H:32     | UN:11/16-24<br>UNEF | TFD-45/60/70-UN  |
| T2.5-10L-UN   | 2.5       | 10                  | -700               | D2:18<br>H:32     |                     |                  |
| T3.5-10L-UN   | 3.5       | 10                  | -700               | D2:18<br>H:32     |                     |                  |
| T5-10L-UN     | 5         | 10                  | -500               | D2:18<br>H:32     |                     |                  |
| T2.25-10MD-UN | 2.25      | 10                  | -800               | D2:18<br>H:22.3   |                     |                  |
| T3.5-10MD-UN  | 3.5       | 10                  | -700               | D2:18<br>H:22.3   |                     |                  |
| T5-10MD-UN    | 5         | 10                  | -500               | D2:18<br>H:22.3   |                     |                  |

Test Report: T10-3L-UN 9mm polystyrene test block

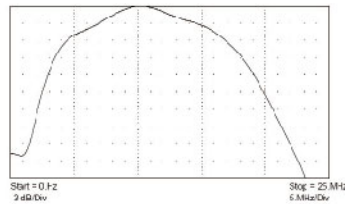


Serial number: 10V3-177

Envelope Pulse Lengths:

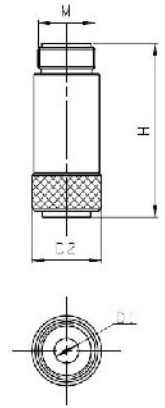
|            |       |    |
|------------|-------|----|
| Start in - | 00.   | nS |
| -4dB       | 11C.4 | nS |
| -12 dB     | 13C.0 | nS |
| -20 dB     | 28E   | nS |
| -30 dB     |       |    |

Peak-peak sensitivity -34.2/ dB  
Pulse Volt (Volts) 120V  
Pulse (amplitude) 0 dB



Spectral Parameters for Oil 1

|                       |       |
|-----------------------|-------|
| -6dB Lowbandedge      | 443   |
| -6dB Highbandedge     | 10.05 |
| -6dB Center frequency | 10.64 |
| -6dB Bandwidth        | 19.6  |



**SIUI can Provide**

A series of TOFD probes compatible with different TOFD flaw detectors;  
Customization of TOFD probes and wedges with different specifications.

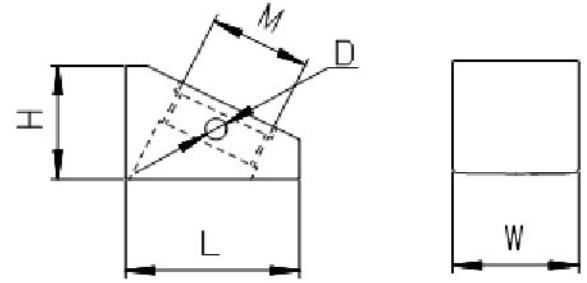
Wedge for TOFD Probe

Ordering Information:



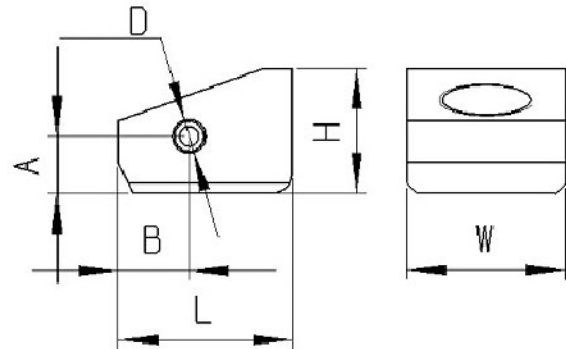


## Non-irrigation Wedge



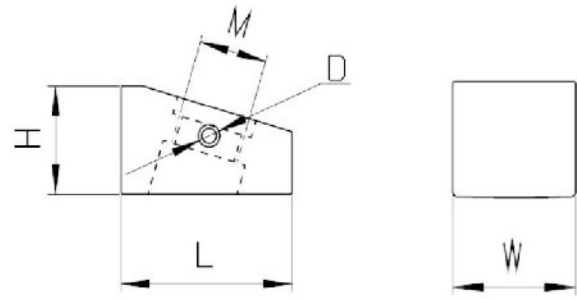
| Wedge Model | Type                                | Velocity | Refracted Angle in Steel | L  | W  | H    | D  | Screw Thread Unit |
|-------------|-------------------------------------|----------|--------------------------|----|----|------|----|-------------------|
|             |                                     | m/s      |                          | mm | mm | mm   | mm |                   |
| TFB-45-UN   | Brass<br>Longitudinal<br>Wave Wedge | 2730     | 45                       | 24 | 16 | 16   | 3  | UN:3/8-32UNEF     |
| TFB-60-UN   |                                     | 2730     | 60                       | 24 | 16 | 16   | 3  |                   |
| TFB-70-UN   |                                     | 2730     | 70                       | 24 | 16 | 16   | 3  |                   |
| TFC-45-UN   |                                     | 2360     | 45                       | 24 | 16 | 14.6 | 3  |                   |
| TFC-60-UN   |                                     | 2360     | 60                       | 24 | 16 | 14.6 | 3  |                   |
| TFC-70-UN   |                                     | 2360     | 70                       | 24 | 16 | 14.6 | 3  |                   |
| TFD-45-UN   |                                     | 2730     | 45                       | 31 | 24 | 21.5 | 3  | UN:11/16-24UNEF   |
| TFD-60-UN   |                                     | 2730     | 60                       | 31 | 24 | 21.5 | 3  |                   |
| TFD-70-UN   |                                     | 2730     | 70                       | 31 | 24 | 21.5 | 3  |                   |

## Short Flank Non-irrigation



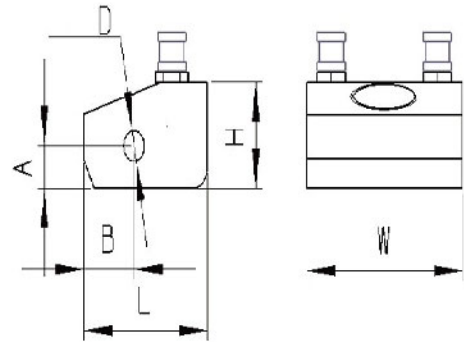
| Wedge Model | Type                                 | Velocity | Refracted Angle in Steel | L    | W  | H    | D  | Screw Thread Unit |
|-------------|--------------------------------------|----------|--------------------------|------|----|------|----|-------------------|
|             |                                      | m/s      |                          | mm   | mm | mm   | mm |                   |
| TFG-45-UN   | Resins<br>Longitudinal<br>Wave Wedge | 2730     | 45                       | 17.5 | 16 | 12.3 | 3  | UN:3/8-32UNEF     |
| TFG-60-UN   |                                      | 2730     | 60                       | 17.5 | 16 | 12.3 | 3  |                   |
| TFG-70-UN   |                                      | 2730     | 70                       | 17.5 | 16 | 12.3 | 3  |                   |
| TFH-45-UN   |                                      | 2360     | 45                       | 17.5 | 16 | 12.3 | 3  |                   |
| TFH-60-UN   |                                      | 2360     | 60                       | 17.5 | 16 | 12.3 | 3  |                   |
| TFH-70-UN   |                                      | 2360     | 70                       | 17.5 | 16 | 12.3 | 3  |                   |

## Irrigation Wedge



| Wedge Model | Type                                 | Velocity | Refracted Angle in Steel | L    | W  | H    | Outer Aperture D | Inner Aperture D | Screw Thread Unit |
|-------------|--------------------------------------|----------|--------------------------|------|----|------|------------------|------------------|-------------------|
|             |                                      | m/s      |                          | mm   | mm | mm   | mm               | mm               |                   |
| TFB-45-UN-I | Resins<br>Longitudinal<br>Wave Wedge | 2730     | 45                       | 20   | 32 | 13   | 6                | 3                | UN:3/8-32UNEF     |
| TFB-60-UN-I |                                      | 2730     | 60                       | 20   | 32 | 13   | 6                | 3                |                   |
| TFB-70-UN-I |                                      | 2730     | 70                       | 20   | 32 | 13   | 6                | 3                |                   |
| TFC-45-UN-I |                                      | 2360     | 45                       | 20   | 32 | 12.5 | 6                | 3                |                   |
| TFC-60-UN-I |                                      | 2360     | 60                       | 20   | 32 | 12.5 | 6                | 3                |                   |
| TFC-70-UN-I |                                      | 2360     | 70                       | 20   | 32 | 12.5 | 6                | 3                |                   |
| TFD-45-UN-I |                                      | 2730     | 45                       | 30.5 | 32 | 18   | 6                | 3                | UN:11/16-24UNEF   |
| TFD-60-UN-I |                                      | 2730     | 60                       | 30.5 | 32 | 18   | 6                | 3                |                   |
| TFD-70-UN-I |                                      | 2730     | 70                       | 30.5 | 32 | 18   | 6                | 3                |                   |

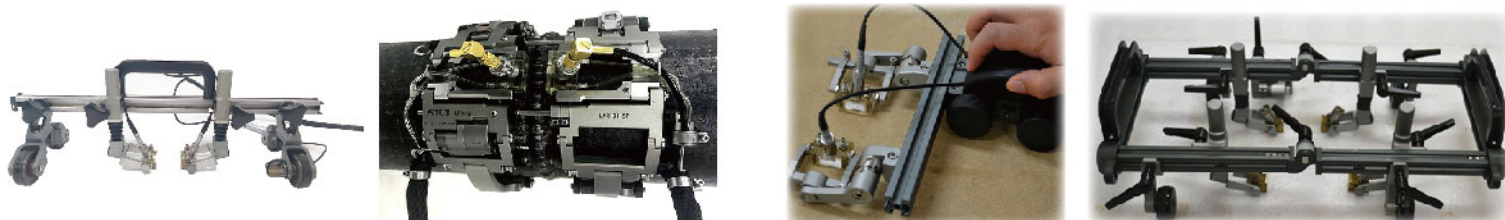
## Short Flank Irrigation Wedge



| Wedge Model | Type                                 | Velocity | Refracted Angle in Steel | L    | W  | H    | Outer Aperture D | Inner Aperture D | Screw Thread Unit |
|-------------|--------------------------------------|----------|--------------------------|------|----|------|------------------|------------------|-------------------|
|             |                                      | m/s      |                          | mm   | mm | mm   | mm               | mm               |                   |
| TFG-45-UN-I | Resins<br>Longitudinal<br>Wave Wedge | 2730     | 45                       | 17.5 | 22 | 11.2 | 3                | 2                | UN:3/8-32UNEF     |
| TFG-60-UN-I |                                      | 2730     | 60                       | 17.5 | 22 | 11.2 | 3                | 2                |                   |
| TFG-70-UN-I |                                      | 2730     | 70                       | 17.5 | 22 | 11.2 | 3                | 2                |                   |
| TFH-45-UN-I |                                      | 2360     | 45                       | 17.5 | 22 | 10.6 | 3                | 2                |                   |
| TFH-60-UN-I |                                      | 2360     | 60                       | 17.5 | 22 | 10.9 | 3                | 2                |                   |
| TFH-70-UN-I |                                      | 2360     | 70                       | 17.5 | 22 | 10.9 | 3                | 2                |                   |

## Crawler for TOFD

Different crawlers compatible with TOFD probes can be provided by SIUI.



## TOFD Probe Selection

(Based on ASTM E2373-04)

Probe selection shall be based on the application requirements. The following tables provide initial recommended probe parameters for specified thickness ranges in ferritic steels.

For austenitic or other attenuative materials, nominal frequencies normally need to be reduced and element sizes increased.



Table 1 For Steel Thickness Ranges up to 75 mm (3 in.)

| Nominal Wall Thickness | Nominal Frequency | Element Size          | Recommended Angle |
|------------------------|-------------------|-----------------------|-------------------|
| mm(in.)                | MHz               | Mm(in.)               |                   |
| <12(0.375)             | 10 to 15          | 2 to 6 (0.08 to 0.25) | 60 to 70          |
| 12 to <35(3.75 to 14)  | 5 to 10           | 2 to 6 (0.08 to 0.25) | 50 to 70          |
| 35 to <75 (1.4 to 3)   | 2 to 5            | 6 to 12 (0.25 to 0.5) | 45 to 65          |

For thickness ranges in steel 75 to 300 mm, the beam divergence from a single element is not likely to provide sufficient intensity for good detection over the entire thickness. For thickness 75 mm (3 in.) and greater (in steel) the examination piece shall be divided into multiple zones. For thickness 75 mm (3 in.) and greater (in steel) and when required in smaller thickness, sensitivity targets shall be placed in a reference block at least at 25% and 75% through thickness in each zone to verify that there is adequate beam coverage for the multiple zone technique used.

Table 2 For Steel Thickness Range 75 mm (3 in.) to 300 mm (12 in.)

| Wall Thickness Zone   | Nominal Frequency | Element Size          | Nominal Angle |
|-----------------------|-------------------|-----------------------|---------------|
| mm(in.)               | MHz               | mm(in.)               |               |
| <35 (0 to 1.4)        | 5 to 10           | 2 to 6 (0.08 to 0.25) | 50 to 70      |
| 35 to <100 (1.4 to 4) | 2 to 7.5          | 6 to 12 (0.25 to 0.5) | 45 to 65      |
| 100 to <300 (4 to 12) | 2 to 7.5          | 6 to 12 (0.25 to 0.5) | 45 to 65      |

On thick sections requiring more than one TOFD pair the lateral wave or back-wall signal may not always be visible. Therefore, provision in the linearizing algorithms must be made to permit inputs of other parameters instead of the lateral and back-wall signal positions. For wall thickness less than 75 mm (3 in.), technique qualifications may require they too be divided into smaller ranges with each range addressed by a dedicated TOFD pair.

# SIUI

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