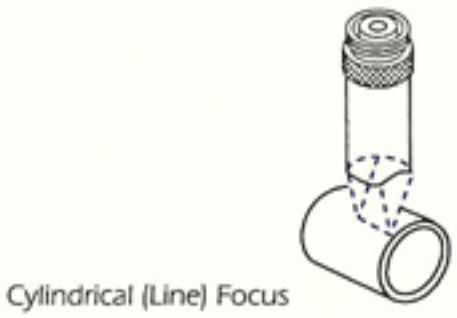
Useful Information

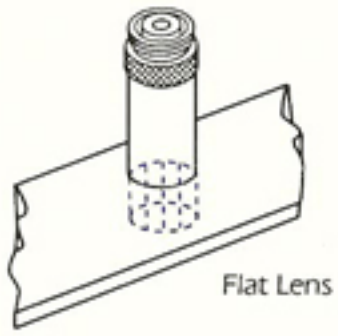
Immersion Testing

Focusing Options



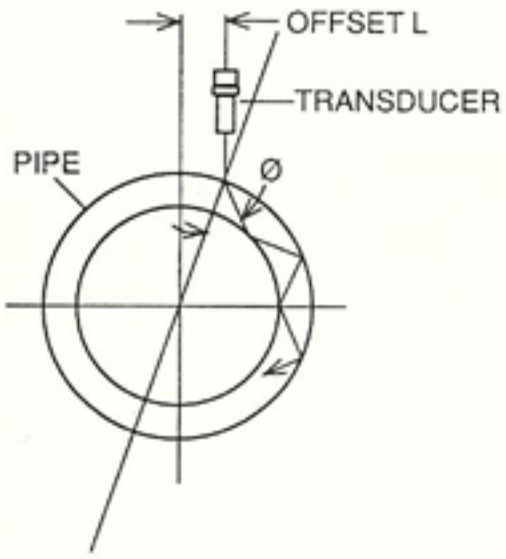
Cylindrical (Line) Focus

Spherical (Spot) Focus



Flat Lens

Tube Testing



Where: L = Transducer offset from tube center line
D = Diameter of tube
Ø = Desired refracted angle of sound beam (usually shear wave)
V_W = Velocity of coupling medium (usually water)
V_M = Velocity of tube (shear or longitudinal)

$$\text{Offset } L = \left(\frac{D}{2}\right)\left(\frac{V_W}{V_M}\right) \sin Ø$$

Beam Spread

$$Ø = 2 \sin^{-1} \frac{(.5\lambda)}{D}$$

Where: λ = Velocity (in. / µs) ÷ Frequency (MHz)
D = Element diameter (in.)

Immersion Nearfield & Practical Focus

Freq. (MHz)	Element Dia. in.	N	Min. Focus	Max Focus
0.5	0.75	1.20	—	1.00
	1.00	2.14	1.50	
	1.125	2.74	1.50	2.00
1.0	.50	1.07	—	0.75
	0.75	2.41	1.00	1.75
	1.00	4.28	1.50	3.00
	1.125	5.41	1.50	4.00
2.25	0.25	0.60	—	0.50
	0.375	1.35	—	1.00
	0.50	2.40	1.00	1.75
	0.75	5.41	1.50	4.00
	1.00	9.63	2.00	7.00
	1.125	12.19	2.00	9.00
3.5	0.25	0.94	—	0.75
	0.375	2.11	0.75	1.50
	0.50	3.75	1.00	3.00
	0.75	8.43	1.50	6.00
	1.00	14.98	2.00	11.00
	1.125	18.96	4.00	14.00
5.0	0.25	1.34	0.50	1.00
	0.375	3.01	0.75	2.00
	0.50	5.35	1.00	4.00
	0.75	12.04	1.50	9.00
	1.00	21.40	4.00	15.00
	1.125	27.09	2.50	21.00
10.0	0.125	0.67	—	0.50
	0.25	2.68	0.50	2.00
	0.375	6.02	0.75	4.50
	0.50	10.70	1.00	8.00
	0.75	24.08	1.50	10.00
15.0	0.125	1.00	0.50	0.75
	0.25	4.01	0.50	3.00
	0.375	9.02	0.75	5.00
20.0	0.125	1.34	0.50	1.00
	0.25	5.35	0.50	3.00
25.0	0.125	1.67	0.50	1.25
	0.25	6.99	0.50	3.00

$$N = \frac{D^2 F}{4V}$$

Where: N = Nearfield Distance
D = Element Diameter
F = Frequency
V = Material Velocity

dB vs. Amplitude Ratios

dB	Ratio
0	1.00:1
.5	1.06:1
1	1.12:1
2	1.26:1
3	1.41:1
4	1.58:1
5	1.78:1
6	2.00:1
7	2.24:1
8	2.51:1
9	2.82:1
10	3.16:1
11	3.55:1
12	3.98:1
13	4.47:1
14	5.01:1
15	5.62:1
16	6.31:1
17	7.08:1
18	7.94:1
19	8.91:1
20	10.00:1
40	100.00:1
60	1000.00:1