QCG and QW

Single Crystal transducers, threaded for use with "Quick Change" shear wave wedges

Features

- Single crystal angle beam shear wave quick change transducer and wedges
- Circular lead metaniobate crystal
- Max operating temperature 50°C / 120°F
- High temperature options available up to 285°C / 545°F on request
- Medium damped for medium bandwidth
- Highly damped option for wide bandwidth available see PQC transducer list
- Wedges available in refracted longitudinal angles on request

Common Applications

- General Welds / Tube & Pipe
- Forgings

Transducer Models

Product Code	Description	Frequency (MHz)	Crystal Diameter (mm / Inches)	Nearfield Length in Steel (mm / Inches)
QCG2525	2.25MHz ¼" QuickChange	2.25	6.4mm / 0.252"	7.1mm / 0.28"
QCG3725	2.25MHz ⅜" QuickChange	2.25	9.5mm / 0.374"	15.7mm / 0.618"
QCG5025	2.25MHz ½" QuickChange	2.25	12.7mm / 0.5"	28.1mm / 1.106"
QCG2550	5MHz ¼" QuickChange	5	6.4mm / 0.252"	15.9mm / 0.626"
QCG3750	5MHz ⅜" QuickChange	5	9.5mm / 0.374"	34.9mm / 1.374"
QCG5050	5MHz ½" QuickChange	5	12.7mm / 0.5"	62.4mm / 2.457"
QCG2510	10MHz ¼" QuickChange	10	6.4mm / 0.252"	31.7mm / 1.248"
QCG3710	10MHz ⅜" QuickChange	10	9.5mm / 0.374"	69.9mm / 2.752"
QCG5010	10MHz ½" QuickChange	10	12.7mm / 0.5"	124.8mm / 4.913"

Case Dimensions and Details

Transducer Size	Width/Diameter (mm)	Height (mm)	Connector Options	Position Options
6.4mm / 0.252"	12.7mm / 0.5"	19.05mm / 0.75"	D S	Top
9.5mm / 0.374"	14.5mm / 0.571"	19.05mm / 0.75"	D S	Top
12.7mm / 0.5"	17.2mm / 0.677"	19.05mm / 0.75"	D S	Top

Wedge Details

Product Code	Description	Θ wedge Angle in Steel (°)	Applicable Probe Diameter	Width (mm / Inches)	Height (mm / Inches)	Length (mm / Inches)
QW2545	45° wedge for ¼" QCG probe	45	6.4mm / 0.252"	12.7mm / 0.5"	11.5mm / 0.453"	20.3mm / 0.799"
QW2560	60° wedge for ¼" QCG probe	60	6.4mm / 0.252"	12.7mm / 0.5"	12.6mm / 0.496"	23.5mm / 0.925"
QW2570	70° wedge for ¼" QCG probe	70	6.4mm / 0.252"	12.7mm / 0.5"	12.7mm / 0.5"	26mm / 1.024"
QW3745	45° wedge for ⅜" QCG probe	45	9.5mm / 0.374"	16mm / 0.63"	12.7mm / 0.5"	25.2mm / 0.992"
QW3760	60° wedge for ⅜" QCG probe	60	9.5mm / 0.374"	16mm / 0.63"	15mm / 0.591"	28.5mm / 1.122"
QW3770	70° wedge for ⅜" QCG probe	70	9.5mm / 0.374"	16mm / 0.63"	15.5mm / 0.61"	30.5mm / 1.201"
QW5045	45° wedge for ½" QCG probe	45	12.7mm / 0.5"	22.2mm / 0.874"	15.3mm / 0.602"	28.6mm / 1.126"
QW5060	60° wedge for ½" QCG probe	60	12.7mm / 0.5"	22.2mm / 0.874"	18.1mm / 0.713"	34.4mm / 1.354"
QW5070	70° wedge for ½" QCG probe	70	12.7mm / 0.5"	22.2mm / 0.874"	18.6mm / 0.732"	36.8mm / 1.449"

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PQC and QW

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ANGLE BEAMS

Features

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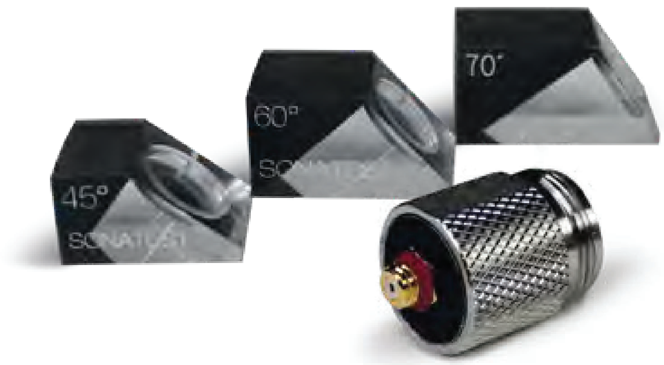
- Circular lead metaniobate crystal
- Max operating temperature 50°C / 120°F
- High temperature options available up to 285°C / 545°F see QCG transducer list
- Highly damped for wide bandwidth
- Medium damped for medium bandwidth option see QCG transducer list
- Wedges available in refracted longitudinal angles on request



Common Applications

- General Welds / Tube & Pipe / Forgings

Transducer Models

Product Code	Description	Frequency (MHz)	Crystal Diameter (mm / Inches)	Nearfield Length in Steel (mm / Inches)
PQC501	1MHz ½"QuickChange MICRODOT	1	12.7mm / 0.5"	12.5mm / 0.492"
PQC2525	2.25MHz ¼" QuickChange	2.25	6.4mm / 0.252"	7.1mm / 0.28"
PQC3725	2.25MHz ⅜" QuickChange	2.25	9.5mm / 0.374"	15.7mm / 0.618"
PQC5025	2.25MHz ½" QuickChange	2.25	12.7mm / 0.5"	28.1mm / 1.106"
PQC2550	5MHz ¼" QuickChange	5	6.4mm / 0.252"	15.9mm / 0.626"
PQC3750	5MHz ⅜" QuickChange	5	9.5mm / 0.374"	34.9mm / 1.374"
PQC5050	5MHz ½" QuickChange	5	12.7mm / 0.5"	62.4mm / 2.457"
PQC2510	10MHz ¼" QuickChange	10	6.4mm / 0.252"	31.7mm / 1.248"

Case Dimensions and Details

Probe size	Width/Diameter (mm / Inches)	Height (mm / Inches)	Connector Options	Position Options
6.4mm / 0.252"	13mm / 0.512"	19.05mm / 0.75"	D S	Top
9.5mm / 0.374"	14.5mm / 0.571"	19.05mm / 0.75"	D S	Top
12.7mm / 0.5"	17.2mm / 0.677"	19.05mm / 0.75"	D S	Top

Wedge Details

Product Code	Description	Θ wedge Angle in Steel (°)	Applicable Transducer Ø (mm / Inches)	Width (mm)	Height (mm / Inches)	Length (mm)
QW2545	45° wedge for ¼" QCG probe	45	6.4mm / 0.252"	12.7mm / 0.5"	11.5mm / 0.453"	20.3mm / 0.799"
QW2560	60° wedge for ¼" QCG probe	60	6.4mm / 0.252"	12.7mm / 0.5"	12.6mm / 0.496"	23.5mm / 0.925"
QW2570	70° wedge for ¼" QCG probe	70	6.4mm / 0.252"	12.7mm / 0.5"	12.7mm / 0.5"	26mm / 1.024"
QW3745	45° wedge for ⅜" QCG probe	45	9.5mm / 0.374"	16mm / 0.63"	12.7mm / 0.5"	25.2mm / 0.992"
QW3760	60° wedge for ⅜" QCG probe	60	9.5mm / 0.374"	16mm / 0.63"	15mm / 0.591"	28.5mm / 1.122"
QW3770	70° wedge for ⅜" QCG probe	70	9.5mm / 0.374"	16mm / 0.63"	15.5mm / 0.61"	30.5mm / 1.201"
QW5045	45° wedge for ½" QCG probe	45	12.7mm / 0.5"	22.2mm / 0.874"	15.3mm / 0.602"	28.6mm / 1.126"
QW5060	60° wedge for ½" QCG probe	60	12.7mm / 0.5"	22.2mm / 0.874"	18.1mm / 0.713"	34.4mm / 1.354"
QW5070	70° wedge for ½" QCG probe	70	12.7mm / 0.5"	22.2mm / 0.874"	18.6mm / 0.732"	36.8mm / 1.449"

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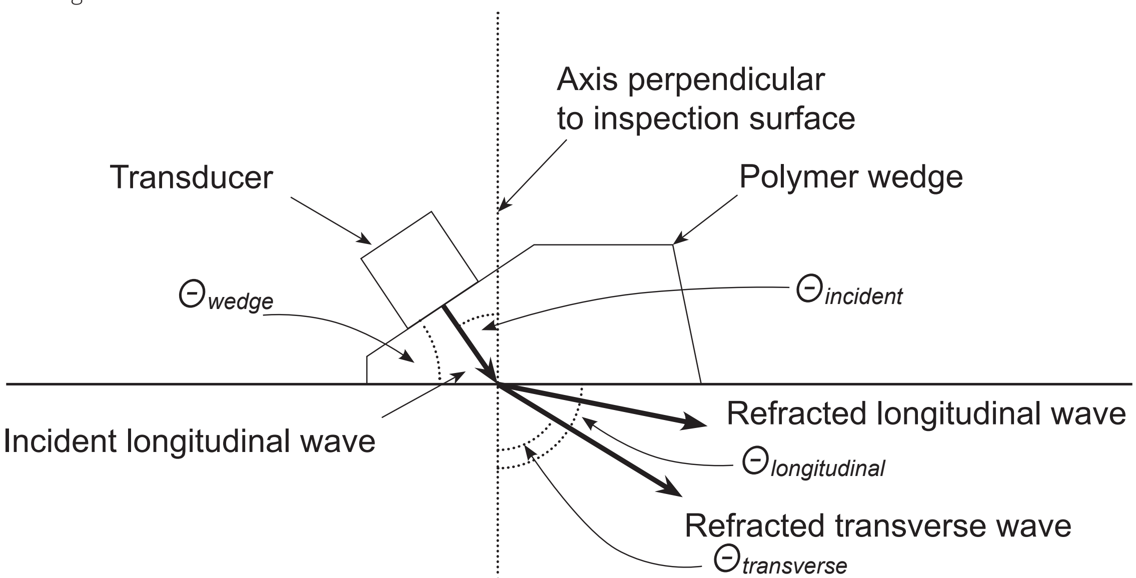
Beam Angle

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 Transducer. A 90° Transducer 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 Transducers 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.)

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