■ Standard Specifications of Synthetic Quartz Crystal

● Handedness of Crystal

Right-handed quartz crystal, unless otherwise specified.

● Quality

Twins

Electric and optical twins are not included.

External appearance

No cracks or bubbles that affect electric characteristics are found in the effective length.

Inclusions

The following grades are set for the maximum number of inclusions contained in the Z zone according to IEC60758.

Grade	Size of an inclusion and maximum number of inclusions in 1 cm^3				Application
	10 to 30μm	30 to 70μm	70 to 100μm	100μm to	
Ⅰa	2 max.	1 max.	0 max.	0 max.	For photolithographic processing
Ⅰb	3 max.	2 max.	1 max.	1 max.	
Ⅰ	6 max.	4 max.	2 max.	2 max.	
Ⅱ	9 max.	5 max.	4 max.	3 max.	For high-frequency and high-quality oscillators and SAW
Ⅲ	12 max.	8 max.	6 max.	4 max.	For industrial crystal oscillators

Infrared absorption coefficient α

The following grades are set for the infrared absorption coefficient α (the wave number 3585 cm–1 is used) according to IEC60758.

Grade	Infrared absorption coefficient α_{3585}	Reference infrared Q value	Application
Aa	0.015 max.	3.8 million min.	For high-quality crystal oscillators
A	0.024 max.	3 million min.	
B	0.050 max.	2.4 million min.	
C	0.069 max.	1.8 million min.	For high-frequency industrial crystal oscillators that require a temperature characteristic equivalent to a low α value
D	0.100 max.	1.4 million min.	For a low-price l ow-frequency crystal oscillator
E	0.160 max.	1 million min.	

Etch channel density ρ

The following grades are set for etch channel density ρ according to IEC60758.

Grade	Maximum ρ (per cm^2)	Application
1	10	For high-frequency fundamental waves and crystal oscillators manufactured in special processing (photolithographic processing, etc.), such as chemical etching.
2	30	For high-frequency fundamental waves, crystal oscillators manufactured in special processing (photolithographic processing, etc.), and SAW
3	100	For industrial crystal oscillators
4	300	
5	600	For conventional low-price large-size crystal oscillators

● Direction and Dimensions of Seed Crystal

Direction

There are four directions according to applications as follows:

0°00'±30', 1°00'±30'

1°30'±30', 2°00'±30'

Dimensions Unit : mm

	Z plate			
Direction	0°00'		1°30'	
X-axis dimension	41.0±1.0	89.0±1.0	43.0±1.0	68.0±1.0
Z-axis dimension	2.5 max.			

● Standard Specifications of Lumbered Synthetic Quartz Crystal

Angle of a processed surface

Angle of the Z surface in the Y' -axis direction :

0°00'±30', 1°00'±30'

1°30'±30', 2°00'±30'

Angle of the Z surface in the X-axis direction :

0°00'±15'

Angle of the X surface in the Z' -axis direction :

0°00'±15'

Angle of the X surface in the Y' -axis direction :

0°00'±15'

Dimensional tolerance

X-axis direction : ±0.1mm

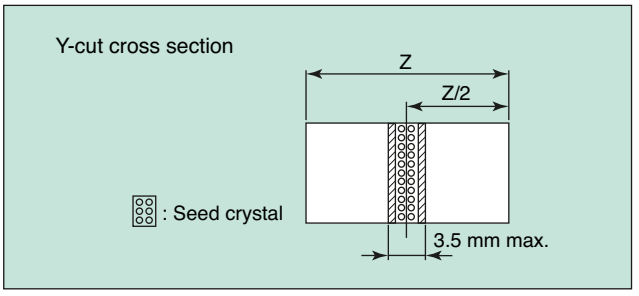
Z' -axis direction : ±0.2mm

Surface finishing

With a diamond wheel of #80 or larger

Seed crystal location

The location of the seed crystal is included in the shaded part (oblique line) in the figure below.



● Display

- The following are displayed on the X surface:

Direction of a seed crystal

Handedness of a crystal (RH or LH)

Manufacturing lot number

Manufacturer name (NDK)