

## 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 <sup>3</sup>				Application
	10 to 30μm	30 to 70μm	70 to 100μm	100μm to	
Ia	Max. 2	Max. 1	Max. 0	Max. 0	For photolithographic processing
Ib	Max. 3	Max. 2	Max. 1	Max. 1	
I	Max. 6	Max. 4	Max. 2	Max. 2	For high-frequency and high-quality oscillators and SAW
II	Max. 9	Max. 5	Max. 4	Max. 3	
III	Max. 12	Max. 8	Max. 6	Max. 4	

#### Infrared absorption coefficient α

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

Grade	Infrared absorption coefficient α <sub>3585</sub>	Reference infrared Q value	Application
Aa	Max. 0.015	Min. 3.8 million	For high-quality crystal oscillators
A	Max. 0.024	Min. 3 million	
B	Max. 0.050	Min. 2.4 million	
C	Max. 0.069	Min. 1.8 million	For high-frequency industrial crystal oscillators that require a temperature characteristic equivalent to a low α value
D	Max. 0.100	Min. 1.4 million	For a low-price low-frequency crystal oscillator
E	Max. 0.160	Min. 1 million	

#### Etch channel density ρ

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

Grade	Maximum ρ (per cm <sup>2</sup> )	Application
1aa	2	A sensor using thick crystal to be required long periods of chemical etching.
1a	50	
1	10	High frequency fundamental crystal units Chemical Etching, SAW Device
2	30	
3	100	For industrial Crystal Units
4	300	Conventional Crystal Units

### ● 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

Direction	Z plate			
	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	Max. 2.5			

### ● 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

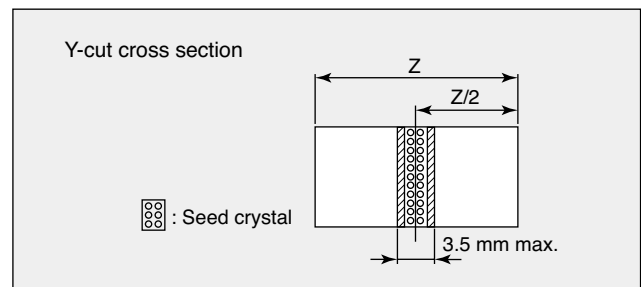
Z'-axis direction : ±0.2mm

#### 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.



### ● Marking

- 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)