

**2013-  
2014**

# Generic product specifications



## Introduction

In our continues effort to supply our customers with the best possible materials and information we hereby supply you with our material specification. The listed specification are our standard specification. If agreed upon between Customer and Squall International BV. tubes may have other tolerances.

## Index

Introduction.....	1
Index .....	2
1 Visual Characteristics .....	3
2 Dimensional Tolerances .....	4

# 1 Visual Characteristics

## Standard Inspection Lighting:

The term “visible” is used for flaws (typically > 0.25 mm) that can be seen under general overhead inspection illumination. The light source is typically 0.75 – 1.25 m above the piece, with the tubing viewed at a distance of 0.3 – 0.6 m from the inspector, with a white/black background. All inspections are performed with conditioned lighting but without magnification. Defects that are too small to discriminate with the unaided eye, are not considered to be a defect. Identified defects can be measured with a magnifier, ruler, vernier caliper, and polariscope.

Below the types of deviations are listed including the guidelines and methods of checking the tolerances.

### Cracks

*Definition:* A thin break line in the wall which is readily visible and extends through part or all of the wall is not allowed. The line may also be circular as from impact damage.

### Chip

*Definition:* A void with a sharp edge with a diameter > 1.0 mm caused by a mechanical impact knocking out part of the quartz material is not allowed.

### Airline (enclosed)

*Definition:* A void, completely within the tube wall including those bumping up the surface.

*Limits:* Airlines with a length of  $\geq 50$ mm

### Airlines (open)

*Definition:* A void, open to the ID or OD surface, which has sharp, knifelike edges is not allowed.

### Scratch

*Definition:* A narrow line abrasion of the surface (over 0.3 mm wide).

*Limits:*

- No scratches adding up to half the tube length in the longitudinal direction;
- No single scratch exceeding 150 mm;
- No scratches on the inside surface;
- No scratches around the tube adding up to twice the tube circumference.
- Density: Total length of scratches maximum 25% of tube length.

### Scuff

*Definition:* A broad abrasion visible under general lighting.

*Limits:*

- Scuffmarks wider than 15mm and/or longer than 100 mm are not allowed.
- Density: Total area may not exceed 5% of the tube surface.

### Dirt

*Definition:* Removable foreign material adhering to the tube surfaces.

*Limits:*

- None permitted on the ID;
- No obvious fingerprints;
- Readily apparent, non-uniform graphite on the OD is not permitted.
- No spot larger than 2.0 mm in diameter or smaller spots adding to 2.0 mm diameter within any 300 mm of length.

### Vapor

*Definition:* A haze of silica deposited on the tube surface seen when viewed with the unaided eye.

*Limits:*

- Reject any degree having a color other than white;
- Reject if more than 10 % of either the ID or OD surface contains the haze.

### Inclusions

*Definition:* Foreign matter, with a diameter  $\geq 0.5$ mm of any color baked to surface (exposed) or fully enclosed (not exposed) in the quartz material.

*Limits:*

- Individual inclusion (spot):  $\geq 0.5$  mm diameter;
- Long length (> 300 mm): Colored or black line – Max length of 25 mm;

- Short length: ( $\leq 300$  mm): Colored or black line – Max length of 1.0 mm;
- Cluster: Long length ( $> 300$  mm): Max of 2 clusters in any 300 mm of tubing length;  
Short length: ( $\leq 300$  mm): Max of 1 cluster per tube.

Note on inclusion clusters:

Consider a cluster to be 3 or more individual inclusions with each inclusion within a millimeter of the next inclusion, with each inclusion visible to an unaided eye, and with each individual inclusion passing the max size specification for an individual inclusion.

**Devitrification**

*Definition:* A white crystallization spot due to alkaline contamination.

*Limits:* Spots with a diameter  $> 1.0$  mm are not allowed.

**Striations**

*Definition:* Circumferential surface variations resulting in optical distortions, over the full length of the tube.

*Limits:*

- Accept light striations uniformly distributed around either a portion or the full circumference of the tube.

## 2 Dimensional Tolerances

Standard Tubing – Tolerance guidelines

Outer diameter	[mm]	$>5 \leq 40$	$>40 \leq 50$	$>50 \leq 60$
Diameter tolerance	$\pm \%$	2	3	4
Wall thickness tolerance	$\pm \%$	10	10	10
Ovality	$\leq \%$	2	2	2
Wall siding	$\leq \%$	12	12	12
Bow	$\leq$ mm/m	2	2	2

**Outside Diameter (OD)**

*Definition:* All diameters in all cross-sectional planes along length (“all points in”).

**Inside Diameter (ID)**

*Definition:* Minor axis diameter at the tube ends (as measured by plug gages). ID is not a criteria unless specifically given in print, order or standard.

**Wall Thickness (WT)**

*Definition:*  
All wall thicknesses on the circumference of both ends.

**Ovality**

*Definition:* Out of Round Diameter (circular run-out tolerance).  
Expressed as a percent =  $(\text{Max OD} - \text{Min OD}) / \text{Specified Nominal OD} \times 100 \%$   
Expressed as an amount =  $\text{Max OD} - \text{Min OD}$

**Siding (Eccentric wall)**

*Definition:* Difference between greatest and least wall thickness, at either tube end.  
Expressed as a percent =  $(\text{Max Wall} - \text{Min Wall}) / \text{Specified Nominal Wall} \times 100 \%$   
Expressed as an amount =  $\text{Max Wall} - \text{Min Wall}$

**Bow**

*Definition:* Amount of deviation to a straight edge, usually a curve.

Measurement =  $\text{Max Gap to a Straight Surface} / \text{Length of Tube}$

Note: Bow is often specified as a maximum amount over a given length (such as per 1000 mm). The maximum deviation per tube is prorated for the actual length of the tube.