

# Datasheet

## Definitions

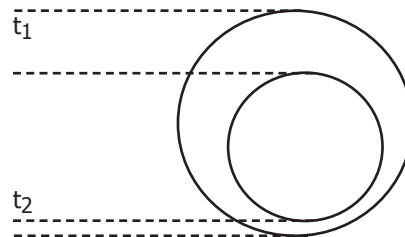
### Eccentricity

An eccentric tube is one which has the centre of the circle formed by the OD which is at a different point from the centre of the circle formed by the ID, i.e. the two circles are not concentric. Eccentricity can be checked by determining the wall thickness around the tube at any cross section to establish maximum and minimum. The tube's eccentricity (in mm) at that cross section would be one half the difference between the minimum wall thickness (t2) and the maximum wall thickness (t1).

$$\text{Eccentricity} = \frac{t_1 - t_2}{2} \quad \text{or}$$

$$\% \text{ Eccentricity} = \frac{t_1 - t_2 \times 100}{t_1 + t_2}$$

$$= \frac{\text{Total displacement}}{\text{Total wall area}}$$



### Wall Run-Out

Is derived from eccentricity. It is that variation in wall thickness compared to the specified nominal wall (total  $\Delta$  wall).

$$\text{i.e. wall run-out} = \frac{\text{maximum } t_1 \text{ wall thickness} - \text{minimum } t_2 \text{ wall thickness}}{\text{nominal wall thickness}}$$

Wall run-out can be related to eccentricity:

$$\text{wall run-out} = 2 \times \text{eccentricity}$$

Wall run-out is also known as TIR (Total Indicated Reading).

### Light Wall

Any wall dimension which is less than 3% of the theoretical average OD.

### Normal Wall

Any wall dimension which is 3% or more of the theoretical average wall.

### As-Drawn Tube

A tube in any temper other than annealed or heat treated.

### Heat Treated

A tube which has been quenched and tempered or precipitation hardened.

### Ovality

Out-of-roundness or difference between maximum and minimum dimensions of OD, obtained by careful measurement for high and low points at any one section around the tube. The ovality tolerance is considered to be a total spread, inside which both the maximum OD dimension and minimum OD dimension must fall. (For example on a 1" OD tubing with light wall, annealed temper, the total ovality tolerance is a spread of 0.030". At any one section around the tube, the difference between the minimum OD reading and the maximum OD reading may not exceed 0.030").

### Average OD

The average of a minimum of four micrometer readings, including the high and low points, equally spaced around the full circumference of the tube.

# Datasheet

## Tolerances

Standard commercial tolerances, as applicable to all round Stainless, Nickel and Titanium alloy tubing are as follows: Tolerances may be specified by OD/ID or OD/wall thickness definition. Closer tolerances are achievable subject to discussion.

| OD Range |        | Commercial OD / ID |         | Wall<br>% ± | FT OD achievable |        |
|----------|--------|--------------------|---------|-------------|------------------|--------|
| mm       | inches | mm                 | inches  |             | mm               | inches |
|          |        | ± 0.05             | ± 0.002 | 10          | ± 0.01           | 0.0004 |
| 2.38     | 0.094  | ± 0.08             | ± 0.003 | 10          | ± 0.01           | 0.0004 |
| 4.76     | 0.19   | ± 0.10             | ± 0.004 | 10          | ± 0.03           | 0.0012 |
| 12.7     | 0.500  | ± 0.13             | ± 0.005 | 10          | ± 0.05           | 0.002  |
| 25.4     | (1.00) | ± 0.15             | ± 0.006 | 10          | ± 0.05           | 0.002  |

## Straightness Table

| OD   |          | Wall                   | Straightness<br>Commercial | FT achievable<br>mm |
|------|----------|------------------------|----------------------------|---------------------|
| mm ≤ | inches ≤ |                        |                            |                     |
| 15.9 | 0.625    | All sizes              | 1 in 600                   | 1 in 2000           |
| 25.4 | 1.00     | 2% of OD<br>or heavier | 1 in 600                   | 1 in 1500           |
| 25.4 | 1.00     | Less than 2% of OD     | 1 in 400                   | 1 in 1000           |

## Worked Examples

|                                                                                                           |                                                                                                             |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Tube size 1 6.35 mm OD x 0.71 mm wall<br>$\frac{1}{4}$ " OD x 0.035 (21G)<br>$t_1 = 0.79$<br>$t_2 = 0.64$ | Tube size 2 38.1 mm OD x 1.65 mm wall<br>$\frac{1}{2}$ " OD x 0.065 (16G)<br>$t_1 = 1.815$<br>$t_2 = 1.485$ |
| Eccentricity = $\frac{0.79 - 0.64}{2} = \frac{0.15}{2} = 0.078$ mm                                        | Eccentricity = $\frac{1.815 - 1.485}{2} = 0.165$ mm                                                         |
| % Eccentricity = $\frac{0.79 - 0.64}{0.79 + 0.64} \times 100 = 10.5$ %                                    | % Eccentricity = $\frac{1.815 - 1.485}{1.815 + 1.485} \times 100 = 10.0$ %                                  |
| Wall run-out = $t_1 - t_2 = 0.79 - 0.64 = 0.15$ mm<br>or TIR                                              | Wall run-out<br>or TIR = $t_1 - t_2 = 1.815 - 1.485 = 0.33$ mm                                              |

Fine Tubes Ltd.  
 Plymbridge Road, Estover  
 Plymouth  
 Devon, PL6 7LG  
 UK

Sales Tel: +44 (0)1752 697216  
 General Tel: +44 (0)1752 735851  
 Fax: +44 (0)1752 733301  
 Email: sales@finetubes.co.uk

Fine Tubes  
 Sales Office Europe  
 Zeppelinstr. 73  
 D-81669 Munich  
 GERMANY

Tel: +49 (0) 89 458355-43  
 Fax: +49 (0) 89 458355-53  
 Email: sales@finetubes.de

Fine Tubes  
 Sales Office Western Europe  
 23, Rue Antigna  
 F-45000 Orléans  
 FRANCE

Tel: +33 (0) 238775-702  
 Fax: +33 (0) 238812-407  
 Email: sales@finetubes.fr

Fine Tubes  
 Sale Office India  
 Eros Corporate Towers  
 Level 15, Nehru Place  
 New Delhi - 110019  
 INDIA

Tel: +91 (0) 114223 5118  
 Fax: +91 (0) 114223 5222  
 E-mail: sales@finetubes.in

