SONY

Digiruler®

Technical Information . . .

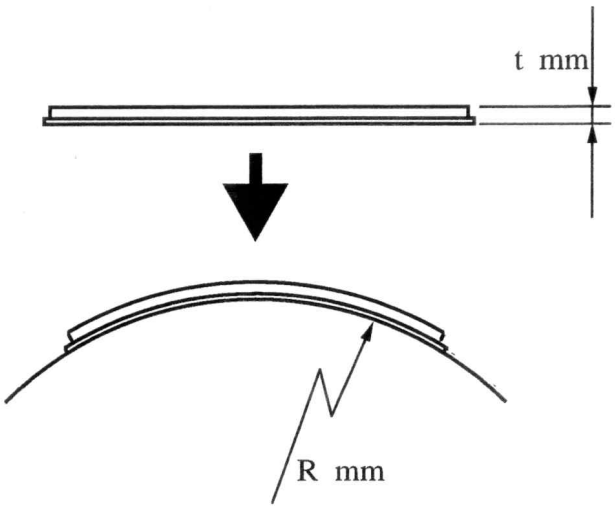
No. 8

== TITLE ==

ERRORS THAT CAN OCCUR WHEN SCALE IS ATTACHED TO A ROUND SURFACE

When a DIGIRULER scale SL130 or SL331 is mounted on a circumference, the scale surface is stretched, which causes cumulative error to occur.

Calculation is made below to find the cumulative error.



When scale's thickness = t mm and the radius of the circumference = R mm, the resulting cumulative error is

$$\Delta L=\{ 2\pi (R + t) - 2\pi R\}L/ (2\pi R) \quad [mm]$$

== E.g. ==

Scale thickness : t = 1 [mm]
Radius of circumference : R = 500 [mm]
Measuring length : L = 100 [mm]

$$\Delta L = \{2\times \pi \times(500+1) - 2\times \pi \times500\}\times100 / (2\times \pi \times500)$$
$$= 0.2 \quad [mm]$$
$$= 200 \quad [\mu m]$$

This means that when the SL130 or SL331 is mounted on a circumference with a radius of 500 mm, a cumulative error of 200 μm will occur for a measuring length of 100 mm.

This error value is the value on the scale surface. Because of the head-scale clearance through which the sensor detects the signal, the ultimate error value is greater and can be obtained by replacing (t) with (t + clearance in mm + 0.8 mm). The above applies when the scale signal is processed as length data.

When the scale signal is processed as angular data, error as stated above will not occur: the uppermost surface of the scale (length = L) mounted on a circumference is stretched by ΔL as shown but angle θ remains the same.