endurance

CONCAVITY & CONVEXITY

DEFINITION

Concavity or convexity refers to the curvature of the side surfaces of square and rectangular tubes inwards or outwards:

» **Concavity**   ≙ **Inward curvature of the side surface**
» **Convexity**   ≙ **Curvature of the side surfaces outwards**

According to current standards, the curvature of the side surfaces is defined as follows:

	EN10219 Cold-formed, welded hollow sections for steel construction	endurance
Concavity x_1 / Convexity x_2 [1]	Maximum 0.8% of the side length but minimum 0.5mm	Within the dimensional tolerance

[1] The tolerance values for concavity and convexity apply independently of the tolerance for the external dimensions

## GRAPHICAL REPRESENTATION USING THE EXAMPLE 100/100

An example shows the difference between the valid EN10219 standard and endurance tubes from voestalpine Krems GmbH:

» Square tube nominal dimension (NB) width: 100mm, nominal dimension (NH) height: 100mm
» Dimensional tolerance of the side lengths B_{TOL}/H_{TOL} for endurance tubes: 0.7mm
» Tolerance concavity x_1/ convexity x_2: 0.8% of the side length, mindestens 0.5mm = 2 * (0.8% * 100mm) = 1.6mm
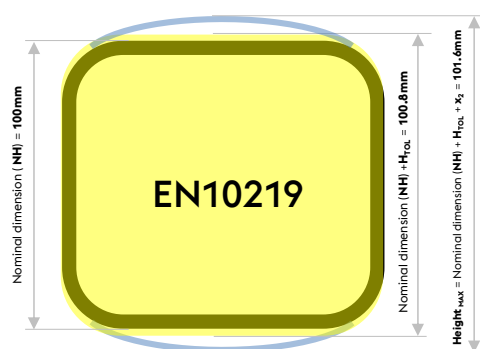
EN10219 allows addition of dimensional tolerance and curvature tolerance

$Height_{MAX}$ = Nom. dim. (NH) + H_{TOL} + 2 * x_2 = 100mm + 0.8mm + 2 * 0.8mm = 102.4mm
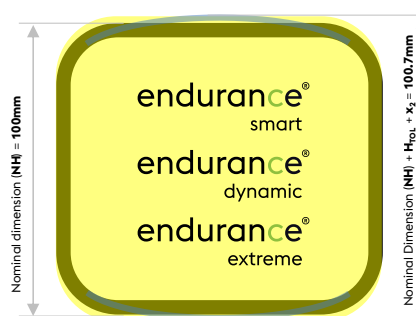
endurance tubes include the curvature tolerance in the dimensional tolerance

$Height_{MAX}$ = Nom.dim. (NH) + H_{TOL} + x_2 = 100mm + 0.7mm = 100.7mm

The tube height must not exceed or fall below the dimensional tolerance over the entire tube width

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ONE STEP AHEAD.