

# APPLICATION NOTE

## Determining mechanical properties of thin CuSn6 foils

Bronze foils/strips are used for a huge variety of industrial applications, ranging from electrical contacts and membranes to spring elements and switches. The processing industry requires CuSn6 foils with more and more specific characteristics, e.g. significantly higher mechanical load-carrying capacity. To guarantee consistent quality, the mechanical characteristics of the foils must be determined.

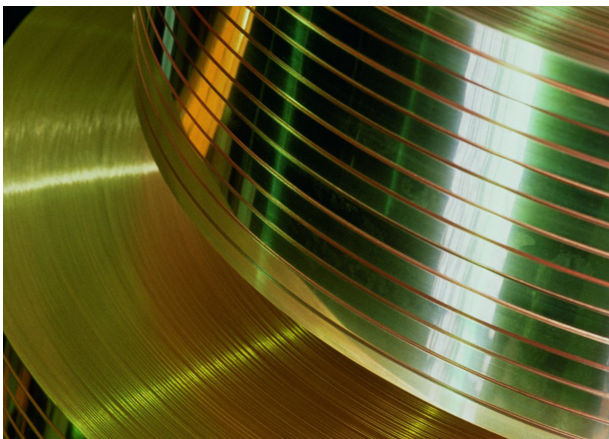


Fig. 1: Metal foil strips for industrial applications

The mechanical characteristics of thin metal foils can be determined using the instrumented indentation test (according to DIN ISO 14577). For this purpose the foils are affixed onto a smooth and stable surface. However, if the foil is applied unevenly or if an air bubble is trapped underneath it, the foil will bend while being measured, causing a false measurement of the indentation depth by adding an additional elastic but inconsistent percentage to the measurement result.

With the special foil clamping device from FISCHER, thin metal foils up to 200  $\mu\text{m}$  in thickness can be easily braced over a cylinder, avoiding any critical fixation.



Fig. 2: Foil clamping device for securely holding thin plastic or metal foils

Measurements on three bronze strips (CuSn6) of different hardnesses were carried out with the aid of the foil clamping device. The thickness of the foils ranged from 75  $\mu\text{m}$  to 170  $\mu\text{m}$ . Table 1 shows the parameters measured for these strips.

		HM (Martens hardness) N/mm <sup>2</sup>	H <sub>IT</sub> (indentation hardness) N/mm <sup>2</sup>	HV (Vickers hardness derived from H <sub>IT</sub> )	E <sub>IT</sub> /(1- $\nu_s^2$ ) (elastic indentation module) GPa	$\eta_{IT}$ (elastic deformation) %
strip 1	X.	1006	1179	111	97	9
	s	19.9	27.6	2.6	10.7	1.0
	V%	1.9	2.3	2.3	11.0	11.2
strip 2	X.	1116	1311	124	105	9
	s	16.8	24.5	2.3	4.0	0.5
	V%	1.5	1.9	1.9	3.8	5.4
strip 3	X.	1573	1916	181	108	12
	s	71.8	88.5	8.4	8.0	0.8
	V%	4.6	4.6	4.6	7.4	6.6

Tab. 1: Exemplary measurement results for the mechanical properties of three CuSn6 strips. Displayed are the mean value, standard deviation and coefficient of variation for each parameter.

The mechanical properties of thin metal foils can be determined precisely and conclusively with the instrumented indentation test. For this purpose FISCHER provides the measuring system FISCHERSCOPE<sup>®</sup> HM2000 and a foil clamping device for optimal sample preparation. For further information please contact your local FISCHER representative.