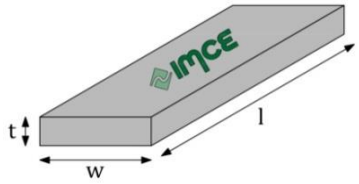
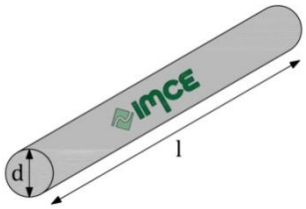
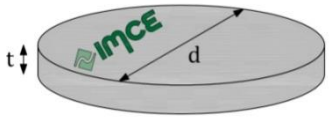
Sample dimensions for room temperature measurements

Below you can find a reference document, which gives some guidelines to prepare a sample, which can be measured using the impulse excitation technique (IET) at room temperature. In general, rectangular bars are preferred.

Shape		Measurable Properties	Advised length	Minimum length	Width & Thickness (advised by IMCE)	Width & Thickness (advised by ASTM E1876-15)
RECTANGULAR		Young's modulus	$l \geq 50\ mm$	$l \geq 20\ mm$	$\frac{l}{t} \geq 20$ $\frac{w}{t} \geq 1.1$ $\frac{l}{w} \geq 6$	$\frac{l}{t} \geq 5$
		Young's modulus Shear modulus Poisson's ratio	$l \geq 50\ mm$	$l \geq 30\ mm$	$\frac{l}{t} \geq 10$ $\frac{w}{t} \geq 5$ $3 \leq \frac{l}{w} \leq 4$	$\frac{l}{t} \geq 5$ $\frac{w}{t} \geq 5$
CYLINDRICAL		Young's modulus	$l \geq 30\ mm$	$l \geq 20\ mm$	$\frac{l}{d} \geq 20$	$\frac{l}{d} \geq 5$
DISC	 (1)	Young's modulus Shear modulus Poisson's ratio	$d \geq 30\ mm$	$d \geq 20\ mm$	$\frac{d}{t} \geq 8$	$\frac{d}{t} \geq 4$

Typical sample dimensions for rectangular bars (l x w x t) in mm

For Young's modulus only:	20 x 3 x 1	40 x 6 x 2	60 x 10 x 3	80 x 12 x 4	100 x 15 x 5
For Young's and shear modulus:	30 x 10 x 1,5	40 x 12 x 2	60 x 20 x 3	80 x 25 x 5	100 x 30 x 6

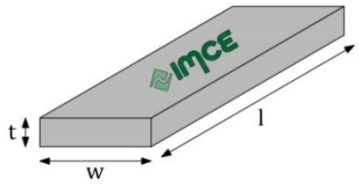
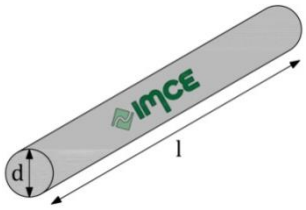
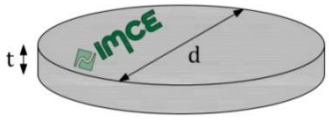
Important remarks

- According to ASTM E 1876-15, the material needs to be homogeneous and isotropic. For anisotropic samples, the Young's modulus can be calculated along the length direction.
- No special surface treatment needed. All surfaces on rectangular samples need to be flat. Opposite surfaces across the length, width and thickness must be parallel to within 0.01 mm or 0.1% whichever is greater.
- Cylindrical samples need to be round and constant in diameter to within 0,1%.
- A minimal thickness of 2 mm is advised. The calculations are most sensitive to errors in thickness measurements.
- Refractory materials: the smallest dimension of the sample should be at least 4 times the largest grain or particle size according to the ISO 12680-1 standard.

(1) Depending on the disc's material properties, it is possible that specific vibration modes can't be excited which makes it impossible to calculate the elastic properties. This can only be verified experimentally.

Sample dimensions for elevated temperature measurements

Below you can find a reference document, which gives some guidelines to prepare a sample, which can be measured using the impulse excitation technique (IET) at elevated temperature. In general, rectangular bars are preferred.

Shape		Measurable Properties	Advised length dependent on furnace Type 1: HT650, HTVP1600 and HTVP1700C Type 2: HT1600 and HT1700	Minimum length	Width & Thickness (advised by IMCE)	Width & Thickness (advised by ASTM E1876-15)
RECTANGULAR		Young's modulus	Type 1: $50 \leq l \leq 120\ mm$ Type 2: $50 \leq l \leq 160\ mm$	$l \geq 30\ mm$	$\frac{l}{t} \geq 20$ $\frac{w}{t} \geq 1.1$ $\frac{l}{w} \geq 6$	$\frac{l}{t} \geq 5$
		Young's modulus Shear modulus Poisson's ratio	Type 1: $50 \leq l \leq 120\ mm$ Type 2: $50 \leq l \leq 160\ mm$	$l \geq 40\ mm$	$\frac{l}{t} \geq 10$ $\frac{w}{t} \geq 5$ $3 \leq \frac{l}{w} \leq 4$	$\frac{l}{t} \geq 5$ $\frac{w}{t} \geq 5$
CYLINDRICAL		Young's modulus	Type 1: $40 \leq l \leq 120\ mm$ Type 2: $40 \leq l \leq 160\ mm$	$l \geq 30\ mm$	$\frac{l}{d} \geq 20$	$\frac{l}{d} \geq 5$
DISC	 (1)	Young's modulus Shear modulus Poisson's ratio	Type 1 and 2: $40 \leq d \leq 100\ mm$	$d \geq 30\ mm$	$\frac{d}{t} \geq 8$	$\frac{d}{t} \geq 4$

Typical sample dimensions for rectangular bars (l x w x t) in mm

For Young's modulus only:	30 x 5 x 1,5	40 x 6 x 2	60 x 10 x 3	80 x 12 x 4	100 x 15 x 5
For Young's and shear modulus:	40 x 12 x 2	60 x 20 x 3	80 x 25 x 5	100 x 30 x 6	120 x 40 x 8

Important remarks

- According to ASTM E 1876-15, the material needs to be homogeneous and isotropic. For anisotropic samples, the Young's modulus can be calculated along the length direction.
- No special surface treatment needed. All surfaces on rectangular samples need to be flat. Opposite surfaces across the length, width and thickness must be parallel to within 0.01 mm or 0.1% whichever is greater.
- Cylindrical samples need to be round and constant in diameter to within 0,1%.
- A minimal thickness of 2 mm is advised. The calculations are most sensitive to errors in thickness measurements.
- Refractory materials: the smallest dimension of the sample should be at least 4 times the largest grain or particle size according to the ISO 12680-1 standard.

(1) Depending on the disc's material properties, it is possible that specific vibration modes can't be excited which makes it impossible to calculate the elastic properties. This can only be verified experimentally.