# Product Data – Quasi-static Mechanical Analyzer (QMA)

## PRODUCT OFFER

QMA standard solution is a plug-and-play system. It integrates both acquisition system and measurement bench and only requires electrical and USB connections. It comes with QMA-X software and useful accessories for samples installations. QMA system allows to measure circular sample materials of diameters[1] 29 mm, 44.44mm and 100 mm and get the following parameters based on the specified standard:

| | **Parameters** |
|---|---|
| ***E* – Young modulus (Pa)** | ✓ |
| ***k* – Stiffness (N/m)** | ✓ |
| **ν – Poisson's Ratio** | ✓ |
| **η – Structural Loss Factor (damping)** | ✓ |
| **Based on ISO 18437-5 standard** | ✓ |

[1] Custom accessories can be made for other diameters at the request of the customer

**Standard Measurement Range**

| | **QMA** |
|---|---|
| **Frequency** | **20 Hz to 60 Hz** |
| ***E* – Young modulus** | **300 Pa to 34 MPa[2]** |
| **ν – Poisson's Ratio** | **0 to 0.499** |
| **η – Structural loss factor (damping)** | **0 to 0.999** |

[2] depends on the diameter of the material

**Hardware Specification**

**Specimen Specifications**

| | |
|---|---|
| Max. sample thickness | 50 mm |
| Min. sample thickness | 5 mm |
| Max. sample diameter | 100 mm |
| Min. sample diameter | 29 mm |

**Vibration Source**

| | |
|---|---|
| Vibration source | piezoelectric actuator |
| Open-loop Travel | 2 mm |
| Stiffness in motion direction | 0.15 N/µm |
| Blocking Force | 300 N |
| Material | 17-4PH Stainless Steel |

**Force sensor**

| | |
|---|---|
| Nominal Sensitivity | 112.4 mV/kN |
| Measurement range | 44.48 N |
| Non-Linearity | ≤ 1 % full scale |

**Accelerometer**

| | |
|---|---|
| Nominal Sensitivity | 10.2 mV/(m.s$^{-2}$) |
| Measurement range | ± 490 m.s$^{-2}$ peak |
| Non-Linearity | ≤ 1 % |

**Thickness measurement**

| | |
|---|---|
| Type | lazer |
| Resolution | 20 µm |
| Linearity | 0.1 % |
| Laser Class (EN 60825-1) | 2 |

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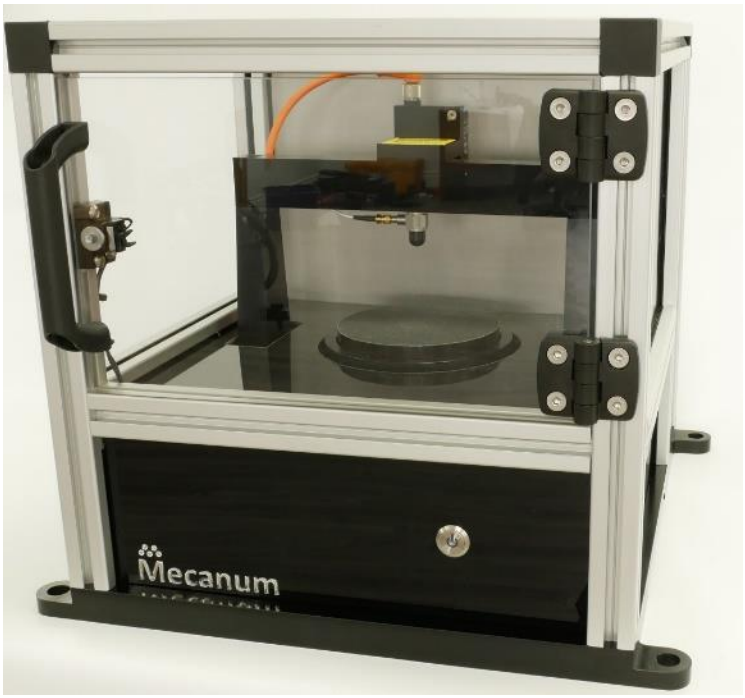
**DAQ**

| | |
|---|---|
| Acquisition card Brand | National Instrument |
| Input sampling rate | 102.4 kS/s/channel |
| Output update rate | 96 KS/s |
| Resolution | 24 bits |
| Integrated piezo amplifier maximum voltage | 150 V |

| | |
|---|---|
| Communication | USB 2.0 Type A |
| Temperature range | 10 to + 40 °C |
| Power | 100-240 Vac 50/60 Hz |
| Dimensions | (457 x 485 x 398) mm |
| Weight | 35 kg |

**Also provided with the equipment:**

- **Compression plates:** a set of three compression plates for samples of 29 mm, 44.44 mm and 100 mm diameter.
- **Centering tools :** a set of three Centers for samples of 29 mm, 44.44 mm and 100 mm diameter.
- **Verification sample:** A verification sample with its verification certificate.
- **Gages:** Three gages of 10 mm, 25 mm and 50 mm thick for the calibration of the QMA's laser.



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## SOFTWARE DESCRIPTION

QMA- X software fully controls the measurement procedure from the calibration to the measurement itself. Every steps of the measurement process are detailed by illustrated instructions. The tested sample's diameter is the only parameter that the user must enter. Sample's thickness is automatically measured just before the dynamic measurement sequence. Measurements data are automatically processed at the end of the procedure. A post-processing interface allows the computation of the Young's modulus, Poisson's ratio, and structural loss factor. A color code gives indications on the quality of the results obtained.

### Measured Parameters

(1) Young modulus, (2) Poisson's Ratio, (3) structural loss factor, (4) stiffness, (5) Thickness

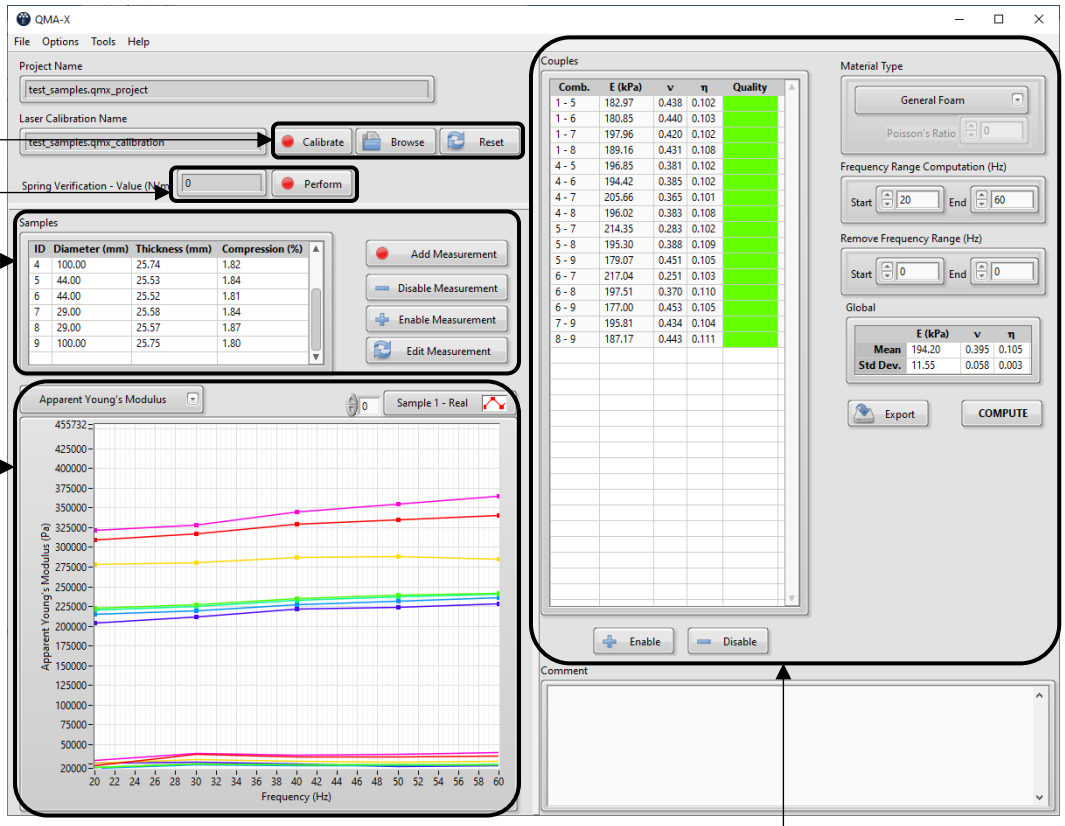
### Measurement steps

**STEP 1 :** Laser calibration

**STEP 2 :** Spring verification

**STEP 3 :** Add, edit or name as many measurements as required.

**STEP 4 :** Direct graphical results following frequencies before post processing: Stiffness, Apparent Young modulus, Force and displacement.




**STEP 5 :** Post processing. QMA-X automatically identifies all couples of samples with different shape factors, and calculate all the elastic properties: Young's modulus, Poisson's ratio, and structural loss factor

# Product Data – Quasi-static Mechanical Analyzer (QMA)

**Additional features**

- **Stiffness vs. Compression**
  This module measures the stiffness of the material on a range of compression rate in order to define the value to apply on the material for optimal results.

- **Data export**
  All data for each couple of samples exported in *.txt file easily readable by Excel:
  - Young modulus
  - Poisson's ratio
  - Structural loss factor

**QMA-X specifications**

| | |
|---|---|
| Compatibilities | Windows 8 and 10<br>32 or 64 bits |
| Result file type | .txt |
| Export graph file type | .txt |

## RELATED ACCESSORIES AND OPTIONS

**Circular cutter**

| | |
|---|---|
| Available diameters (mm)* | 29, 44.44, 100 |
| Maximum sample thickness (mm) | 75 |
| Material | Stainless steel |

* Custom diameter available on demand.

**Sample slicer**

| | |
|---|---|
| Available diameters (mm) | 29, 44.44, 100 |
| Maximum sample thickness (mm) | 100 |
| Also include | Acoustic material knife |

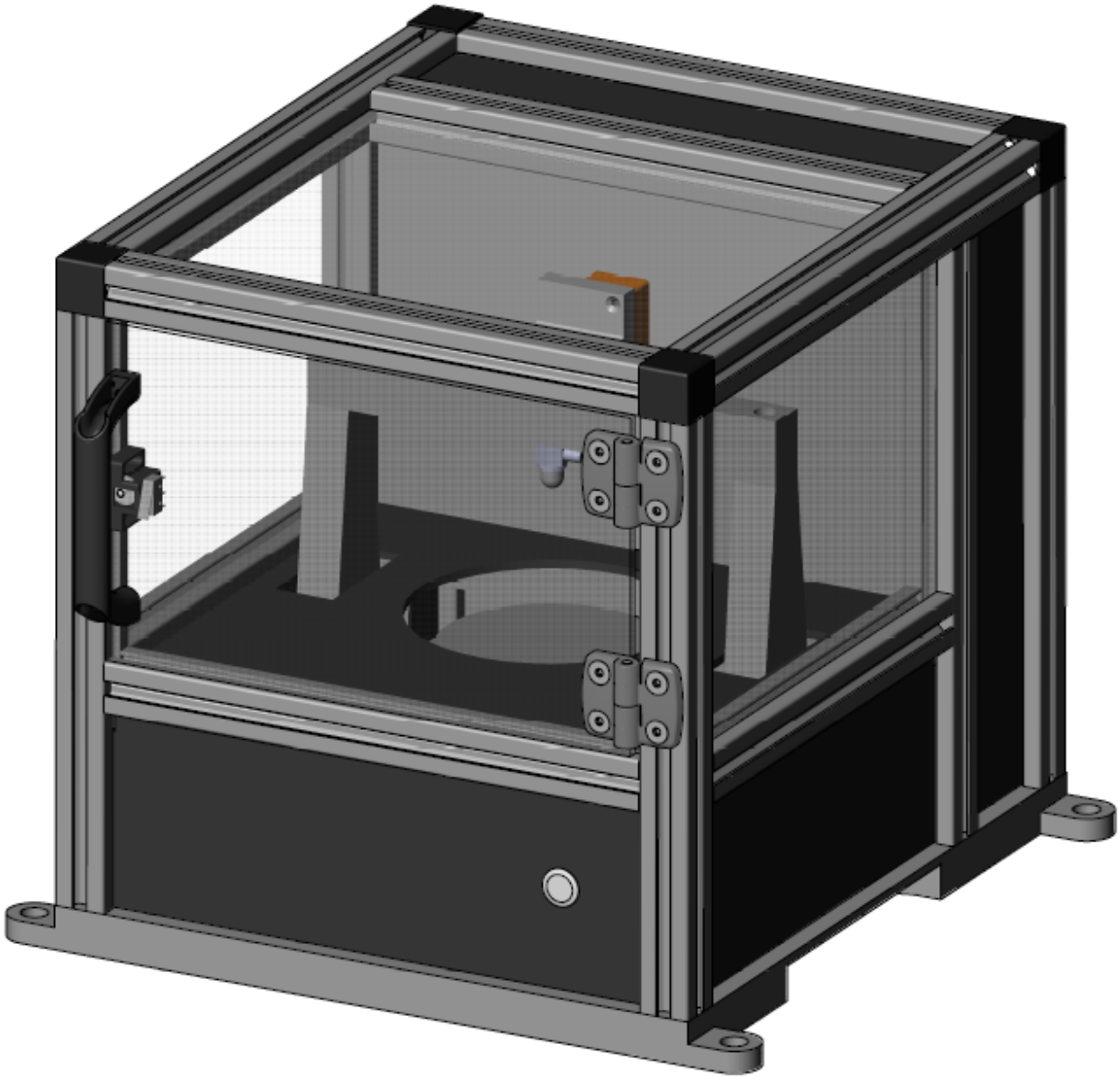
**Foam-X software**

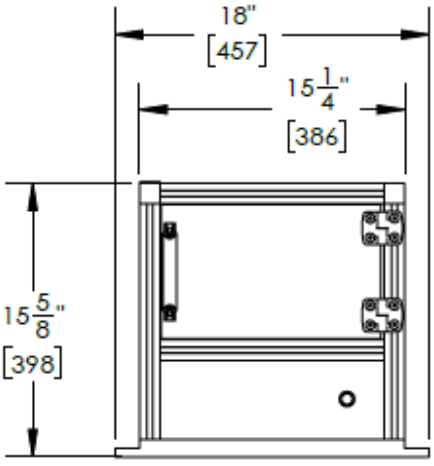
Based on the sound absorption coefficient measured in impedance tube (ASTM E1050, ISO 10534-2), Foam-X computes all the acoustic parameters (e.g. poroelastic Biot exclusively) you need to model a single or an equivalent acoustic material.

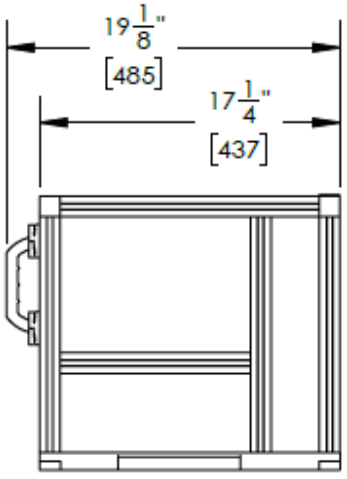
**Nova software**

Nova predicts sound absorption and transmission loss (and more) of single or multilayer materials. Simulation is based on the acoustic parameters you determined with Foam–X or direct characterisation apparatuses such as a airflow resistance meter (SIGMA), a porosity meter (PHI), a tortuosity meter (TOR), and a mechanical analyzer (QMA) or using directly the measured transfer matrix obtain using our transmission tube.

# ANNEX 1 – QMA SYSTEM





## ANNEX 2 – QMA INCLUDED PARTS