# MENSOR

## Electronic scales - manufacturer since 1977 - www.mensor.pl

## Information about MENSOR company

MENSOR is a research and production company in the field of mass and force measurements, it has new construction and technological solutions in the field of electronic scales based on research carried out within 5 research projects financed by the European Commission. The main research topic is mass measuring transducers based on the new principle of operation reserved in the European Union. The above research works have been conducted for about 20 years and the company was founded in 1977.

**The organization of the MENSOR company is based on parallel scientific research, www.mensor.pl/nauka and the production www.mensor.pl of electronic scales equipped with new measuring transducers. These scales are used in Poland, Germany and Lithuania in thousands of pieces and confirm the adopted design and scientific assumptions. Thus, the descriptions presented below have**

**the character of certain technical and scientific information, not theoretical considerations typical of scientific works.**

**. At present, extensometer transducers - the extensometer beam Fig 1 dominate in the production of electronic scales with a capacity of 2 kg and more.**

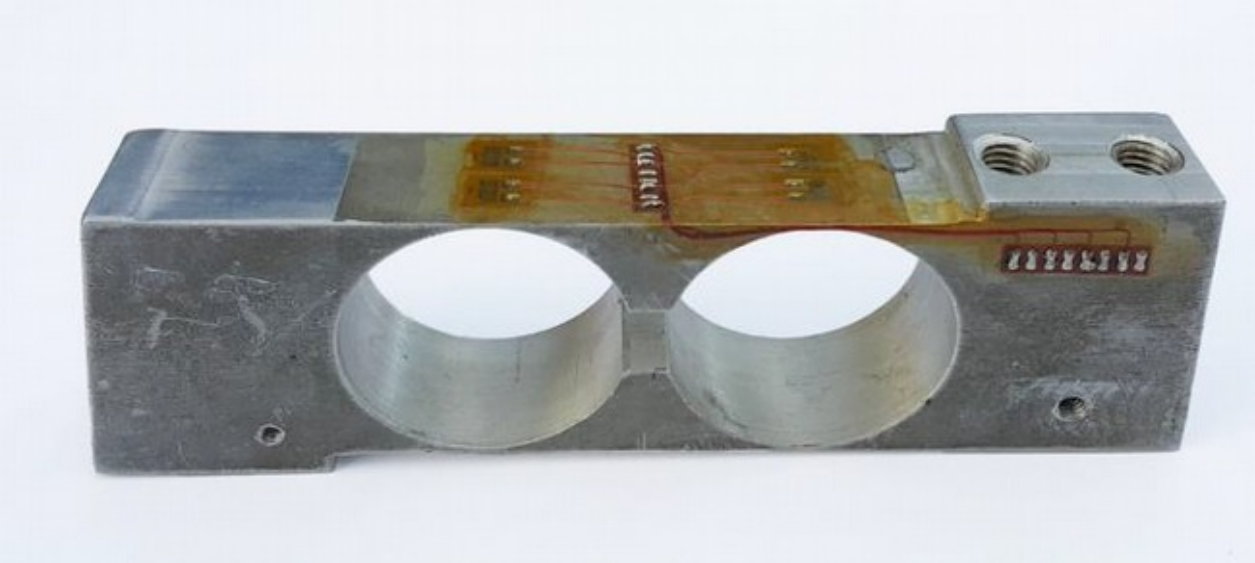

Fig. 1 The extensometer beam

**Disadvantages**

**• measurement of stresses by means of strain gauges glued in place where the beam is necking where there are highest stresses.**

**• the accumulation of stresses under the strain gauge worsens the elastic properties of the beam: hysteresis, material creep under constant load and poorer linearity of the static beam characteristics**

**• the strain gauge is not very resistant to mechanical overloads applied to the beam (typical and widespread damage to the tensometry scales is damage to the glued place)**

**• for smaller measuring ranges, the clear effect of the stiffness of the strain gauge on static characteristics of the beam eliminates small measuring ranges**

**• measuring ranges from 20g to 500g practically impossible to perform with the use of a strain gauge**

The principle of measuring the deformation of a strain gauge beam in specially made constrictions causes a faulty use of its elastic properties. The stresses in these constrictions are dangerously close to the permissible stresses for a given material. This has a significant impact on the elastic properties of the beam, i.e. a higher hysteresis effect and a greater share of the creep phenomenon under constant load.

Mathematical analysis of these phenomena has been carried out in academic work posted on the website www.mensor.pl/nauka. These works were the basis for many construction and technological works as well as the launch of series production of electronic scales, www.mensor.pl.

The tensometric method of mass measurement owes its success to the simple and cheap technology of gluing the extensometers and the simple structure of the electronic measurement system based on the Wheatstone bridge. However, this method is bad and leads to the construction of cheap but unreliable electronic scales.

## Measuring beams protected in the European Union EUJPO

All MENSOR production scales are based on the measuring beam Fig. 2 based on a different measuring principle than the extensometer beam Fig. 1. The main difference is the measurement by means of the sensor of the total deflection of the beam loaded with the measured mass. There are no necking places with accumulated stress that carry out the entire beam.


Fig. 2 The new construction of the measuring beam

**Advantages**

- **- non-contact measurement of beam deflection using an inductive sensor**
- **- stresses inside the measuring springs significantly lower than the permissible stresses for a given material**
- **- less hysteresis and creep of material under constant load**
- **- good linearity of static characteristics**
- **- high resistance to mechanical overloads**

In the case of the use of CNC spark erosion technology using a CNC machine, it is possible to make measurement springs with a variable cross-section Fig. 3. The cross-sectional area of the measuring springs can be designed so that the stresses along this cross-section are the same..

In this way, we have optimal use of the metrological properties of the metal from which the beam is made - we have the optimal beam construction. In addition, the EDM technology using a CNC machine ensures high accuracy and repeatability of the geometrical dimensions of the beam, which is of great importance for mass production.


Fig.3 Measuring beam with variable cross-section of measuring springs

All scales class III and II producing by MENSOR company are based on the next describe measuring beams.

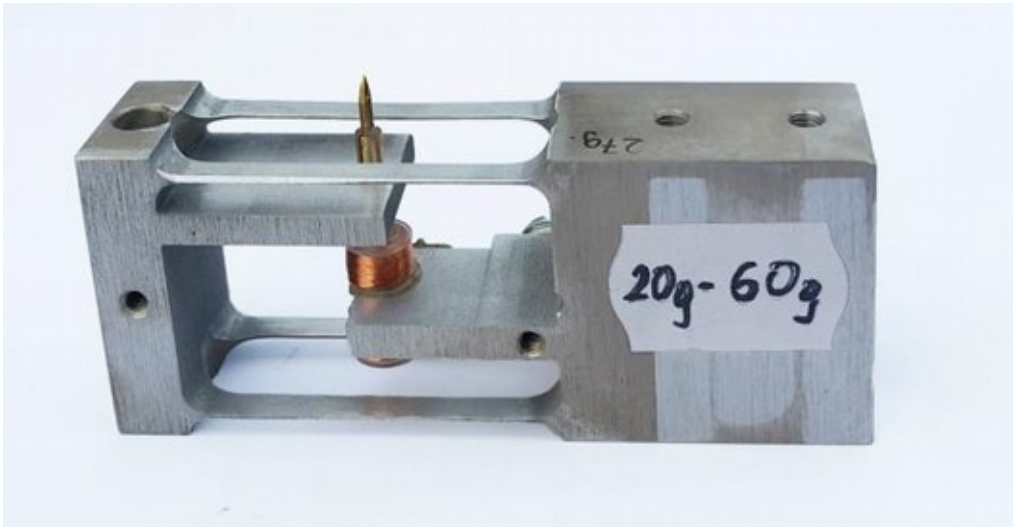


Fig. 4 Measuring range 20g to 60g


Fig. 5  Measuring range 100g to 3kg

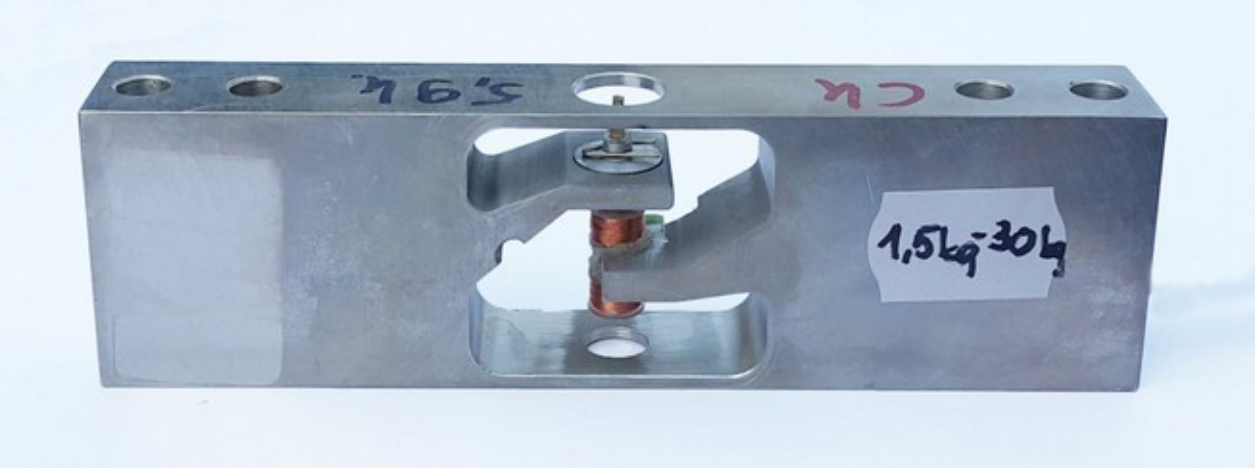

Fig. 6  Measuring range 1.5kg to 30kg


Rys. 7  Measuring range 30kg to 200kg


Fig. 8  Measuring range 300kg to 400kg

Fig. 9 Special measuring beam for II class scales with a measuring range of 5kg to 300kg

A special measuring beam equipped with an additional system of measuring springs for automatic calibration with a low weight of about 400g of the second class with large range of capacities. In this way, the second class scales can be calibrated automatically with a mass of 400 g. The main measurement springs Fig. 9 have a clearly variable cross-section, thanks to which, with a relatively small beam thickness, weights of up to 300 kg and even higher can be measured. Such solutions are completely impossible with the extensometer measurement method.

The above-mentioned measurement ranges of individual beams determine the possible scope of their work. However, the detailed, required measuring range can be precisely selected by the thickness of the springs. Thanks to the better properties of the MENSOR metrological measuring beams, all III class scales have an additional function of increased resolution in the entire working area.