

# Pharmaceutical Balance Systems

## The Torsion Balance, Simple and Sophisticated

### What is a torsion balance?

At its most simplistic, a torsion balance can be defined as *an instrument used to measure small forces*. In the case of a pharmacy balance, materials most commonly weighed include powders, liquids, and solids with medicinal purposes.

Not all balances are used by pharmacists, however. Since torsion balances are also capable of measuring small electric, magnetic, and gravitational forces, scientists in all fields utilize their amazing capabilities.

### What is the secret of their great capabilities?

You can think of a torsion balance as a sophisticated type of scale (thus, the "balance"); yet it is so much more. Consider its minute makeup: A thin wire or thread - let's call it a fiber - is attached by one end only. The free end is subject to a force which, when applied, causes the fiber to twist. This twisting force (called "torque" is key, because the force is measured by the degree of twisting to which the wire or thread is subjected. Simply put, the fiber resists twisting with a force that is proportional to the stress.

### What is a pharmaceutical torsion balance?

For a pharmaceutical torsion balance, the torsional principle is able to be implemented by means of three trusses which have a paper thin stainless steel ribbon approximately 1 (one) millimeter in width, under high tension, traversing the perimeter of the truss. There are two parallel beams that are attached at the top and bottom of the trusses and when weight is applied to one of the pans, the force is transferred to the beam-truss system, causing that side to move downward, with an opposing torque in the steel ribbons which is proportional to the weight applied. The twisting of the metal bands ingeniously replaces the knife edge of a conventional fulcrum type balance, and so there is nothing to wear out, and these balances will retain their accuracy indefinitely.

### What about reliability?

Once you understand the basic workings of the torsion balance, it should come as no surprise that the accuracy of a mechanical torsion balance is superior to other methods of weighing. Unlike the electronic balance, it can always be relied upon during a power failure, or in an environment where power is not readily accessible. Furthermore, when the basic parts of a mechanical torsion balance are maintained as needed, the balance can be relied upon forever.

It should now be evident that the torsion balance is both simple and detailed, delicate and

strong. In short, it is an instrument of admirable, paradox proportions - and of indispensable value.

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