resonic

Compare our solutions for full mass property measurements
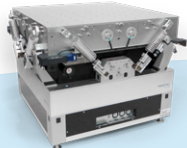
resonic **G**   resonic **F**   resonic **S**   resonic **K**   resonic **P**

The following table compares the four resonic product lines which are capable of full mass property measurements (MPM). Resonic T is excluded because it can measure only a single MOI.

Mass properties:	mass	center of gravity (COG)	moments of inertia (MOIs)	products of inertia (POIs)
Mass, inertia tensor and center of gravity (center of mass). Mass properties make it possible to predict or simulate the dynamic behavior of objects in 3D space.	m	x, y, z	I_{xx}, I_{yy}, I_{zz}	I_{xy}, I_{xz}, I_{yz}

General characteristics

	resonic G	resonic F	resonic S	resonic K/P
Full MPM	√	√ [1]	√	√ [1]
Unlimited work space	√	√	X [2] ●	√
Horizontal platform	√	√	√	X ●
Low–cost solution	X ●	–	√ ●	–
Instrument much smaller than largest test object	–	√ ●	X	– [3]
Full automation	√	√ [4]	X	X
Integrated calibration device	√ ●	X	X	√ [4]
High accuracy	√	√	– ●	√

[1] Mass from weighing on optional scales.
[2] Option for one direction (for oblong objects).
[3] Of little importance because the test objects are not too large.
[4] Option.

√   Yes
–   To some extent
X   No
●   Key advantage compared to the other three product lines
●   Key disadvantage compared to the other three product lines

MPM   Mass property measurement
COG   Center of gravity
MOI   Moment of inertia
POI   Product of inertia

Suitable applications

	resonic G	resonic F	resonic S	resonic K/P
Suitable for soft test objects	√ ●	– [5]	X	√
Suitable for very tall objects with large enclosed air volumes	√ ●	–	–	–
Suitable for long, narrow objects [6]	– [7]	√ ●	√	–
Suitable for tiny objects	X	X	X	√ ● (K)
Suitable for > 20 kg objects that cannot be easily lifted by hand	√	√	√	√ (P)
Cost-effective for very large objects (> 20 tons)	–	√ ●	√ ●	X
Measurement range between smallest and largest MOIs	500x	1000x [8]	50x [9] ●	1000x [10]
Examples	Large satellites, helicopters	Cars, motorcycles, truck cabins, engines, rockets, drones, ship models, boats, ultra-heavy vehicles	Engines, gear units, car wheels	Components, helmets, crashtest equipment, optics modules, power tools, small engines, nano/micro satellites, drones

[5]   Good for soft objects with low COGs, poor for soft objects with very high COGs.
[6]   Even if, for example, Ixx is 100x smaller than Iyy and Izz, percentage errors are still similar for all three MOIs.
[7]   Only if standing upright (similar to conventional 45° positioning adapters).
[8]   For example, a 2000F system can measure a full passenger car and the engine of the same car with the same percentage accuracy.
[9]   Limited by work space. Range can be extended by additional smaller measurement platform.
[10] Requires interchangeable carrier platforms in different sizes. Available as options.

Test facility

	resonic G	resonic F	resonic S	resonic K/P
No infrastructure needed beyond rigid floor, crane and power outlet	√	√ [11]	√	√ [12]
Device can be quickly moved into storage between measurements	√	√	√	√

[11] For some vehicle adapters, it is possible to drive onto the machine and work without a crane.
[12] Resonic K: No crane is needed because the test objects are light enough to be lifted by hand.

Time requirements

	resonic G	resonic F	resonic S	resonic K/P
Time per measurement [13]	90 min	30 min	20 min	40 min
Time with operator interaction	5 min	5 min [14] or 30 min [15]	20 min	40 min
Machine setup time when taken out of storage	< 2.0 h	< 1.5 h	< 1.5 h	< 30 h
Calibration	1 h after each measurement (can run without supervision) ●	2-4 d at Resonic facility (or, optionally, as a service on site) ●	1-2 d at Resonic facility (only the detachable springs are calibrated)	5-10 min, ideally before each measurement ●
Time for moving the system into storage	< 1.5 h	< 1.0 h	< 1.0 h	< 30 h

[13] Not including the installation of the test object on the platform and not including 3D measurements for coordinate transformation.
      Please note also that the time requirement is about the same for an additional empty measurement which is often needed for subtracting the fixture inertia.
[14] In automated version.
[15] In non-automated version.

√	Yes		
–	To some extent	MPM	Mass property measurement
X	No	COG	Center of gravity
●	Key advantage compared to the other three product lines	MOI	Moment of inertia
●	Key disadvantage compared to the other three product lines	POI	Product of inertia