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SPMM 5000e

Exceptional Accuracy, Quality and Reliability from Exceptional Design

AB Dynamics supply advanced testing technology to vehicle manufacturers and their suppliers throughout the world.

SPMM 5000e

Exceptional Accuracy by Design

- World class vehicle Kinematics and Compliance (K&C), Moments of Inertia (MIMS) and Centre of Gravity (C of G) measurement capability.
- The most faithful simulation of on-road vehicle behaviour.
- The capability to test the next generation of vehicles, from small city cars, to large SUVs and high performance racing cars.

SPMM 5000e

Exceptional Accuracy by Design

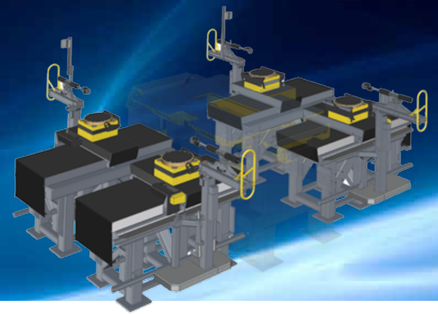
- Faithful simulation of on-road vehicle behaviour
- Unrivalled measurement accuracy
- Exceptional reliability
- Intuitive and safe operation

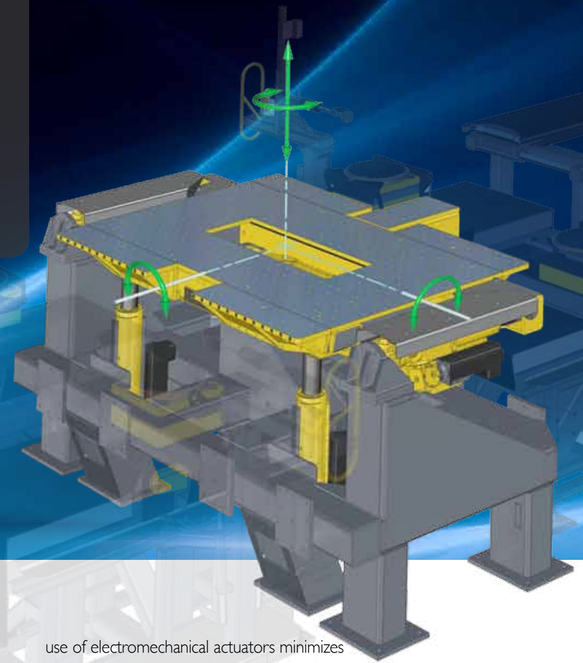
Wheel Stations

The wheel stations serve three functions: automatic adjustment for wheelbase and track during loading, the measurement of wheel forces and displacements, and the application of forces and moments during testing.

Moving Body Platform

At the heart of the SPMM 5000e is the ***moving centre table***. Six precision electromechanical actuators apply a combination of roll, pitch, bounce and yaw motion to the vehicle body. The ground plane remains fixed.





Electrical Actuators

All of the axes on the SPMM 5000e are driven by electromechanical actuators. This provides the operator with ***a safe, clean and quiet environment*** where vehicle behaviour can be closely observed.

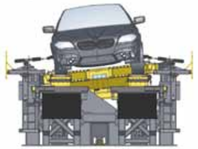
Design Philosophy

Exceptional Accuracy, Quality and Reliability from Exceptional Design

The SPMM 5000e has been designed by suspension engineers for suspension engineers. The vehicle body is moved to simulate braking, accelerating and cornering scenarios. This moving body philosophy provides ***the most faithful possible simulation*** of on-road vehicle behaviour and allows highly accurate wheel position measurement systems to be used. During compliance testing, lateral, longitudinal and steer forces are applied using the X, Y and Delta actuators in the wheel stations.

Braking Simulation

Cornering Simulation



Exceptional reliability and ***unrivalled measurement accuracy*** comes from the philosophy of using only the most suitable and highest quality components. ***Intuitive and safe operation*** results from the application-specific software and user interface of the SPMM 5000e. The use of electromechanical actuators minimizes stored energy making it safe to inspect vehicles during a test. A comprehensive ***post processing package*** presents results in an informative report. Relevant data can automatically be exported and used within today's vehicle modelling packages.

'exceptionally reliable.'

'. . . the SPMM has proven to be an excellent product; efficient and flexible in use, accurate and exceptionally reliable.'

Ian Willows
Consultant Engineer - MIRA

SPMM 5000e

Exceptional Accuracy by Design

With the capacity to test a broad range of vehicles from small city cars to large SUVs and high performance racing cars, the SPMM 5000e provides a platform for developing the next generation of vehicles.

Dynamic Testing

Whilst the majority of K&C tests are quasi-static, advanced users also undertake dynamic K&C tests. The SPMM 5000e actuators, measurement systems and algorithms are specifically designed for high accuracy testing up to 5Hz.

Capabilities That Meet Your Needs

Capacity

	Minimum	Maximum
Wheelbase	1960 mm	4540 mm
Track	1100 mm	2082 mm
Vehicle Mass		5000 Kg*
Rear Wheelpan ∅	400 mm	600 mm†

**6800 Kg if centrally loaded † With adaptor fitted*

Body Motions

	Range	Accuracy	Max Velocity*
Bounce	±215 mm	±0.15 mm	140 mm/s
Roll	±10°	±0.02°	7°/s
Pitch	±8°	±0.02°	6°/s

**Maximum Velocity available with dynamic option*

Wheel Motions

	Range	Acuracy	Max Velocity*
Fore & aft (X)	±150 mm	±0.15 mm	100 mm/s
Lateral (Y)	±150 mm	±0.15 mm	100 mm/s
Powered Rotational (δ)	±80° nominal	±0.02°	6°/s

**Maximum Velocity available with dynamic option*

Evolving Capabilities.

The SPMM 5000e is supplied as a two or four wheel station machine. Both machines have the same footprint, allowing the two wheel version to be upgraded to a four wheel version simply by adding additional hardware. The initial investment in the two wheel station machine is preserved.

SPMM 5000e

Exceptional Accuracy by Design

The SPMM 5000e delivers unrivalled and proven measurement accuracy. A class-leading calibration approach provides the reassurance that today's industry demands.

Wheel Position Measurement

The Dynamic Arm gives exceptionally accurate measurement of wheel centre motion. A fully traceable calibration process proves all stated accuracies and cross-talk performances, at frequencies up to 5Hz.

Wheel Force Measurement

High quality Kistler piezo-electric, multi component load cells accurately measure the forces and moments applied to each wheel.

Accuracy Like No Other

Dynamic Arm - Accuracy

	Sub range*	Accuracy (0 - 5 Hz)	Resolution
Fore/aft (X) & Lateral (Y)	±10 mm	±0.02 mm	0.005 mm
Vertical (Z)	±10 mm	±0.02 mm	0.005 mm
Steer	±1°	±0.004°	0.001°
Camber	±1°	±0.005°	0.001°
Wheel Spin	±30°	±0.01°	0.003°

**Contact AB Dynamics for full range accuracy.*

Cross-talk

	Maximum Cross-talk
Linear to linear	0.003 mm/mm
Linear to rotation	0.0004 mm/°
Rotation to linear	0.015 °/mm
Rotation to rotation	0.003 °/°

Wheel Force Measurement Accuracy

	Calibrated Range	Accuracy
Fore/aft (F_X) or Lateral (F_Y)	±1750 N	±5 N
	±15000 N	±30 N
Vertical (F_Z)	0 - > 5000 N	±5 N
	0 - > 30000 N	±30 N
Steer Moment (M_Z)	±500 Nm	±1 Nm
	±750 Nm	±2 Nm

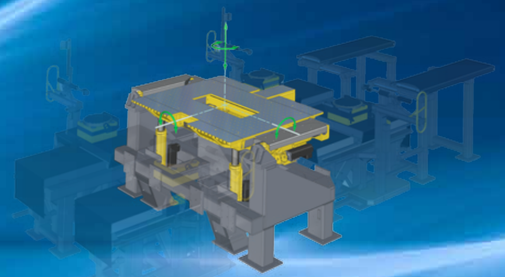
Cross-talk

	Maximum Cross-talk
Load to load	< ±0.1%
F_X or F_Y to M_Z	< ±0.0004 Nm/N
F_Z to M_Z	< ±0.0001 Nm/N

SPMM 5000e

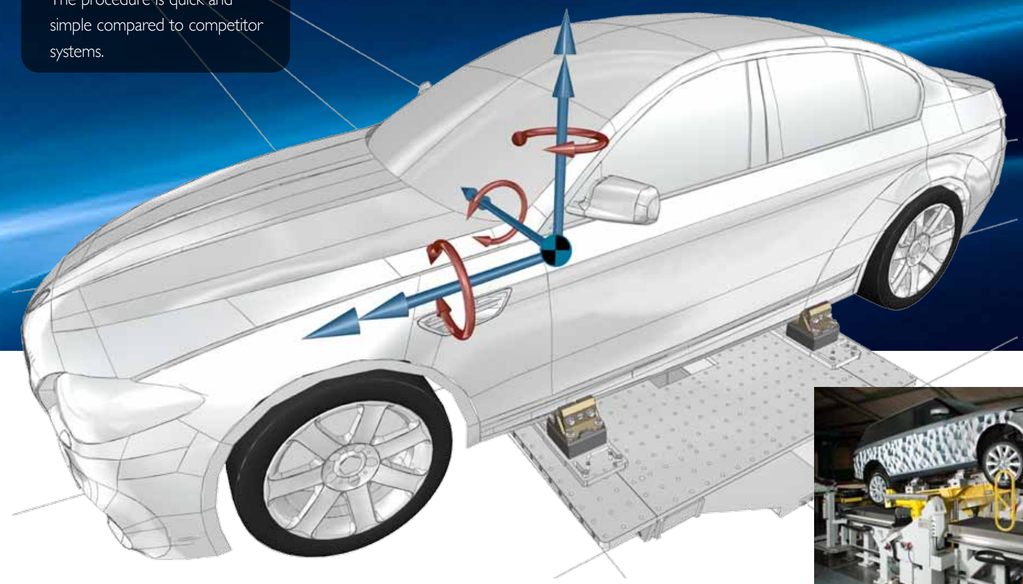
Exceptional Accuracy by Design

The Moment of Inertia Measurement System (MIMS) quickly and accurately determines the vehicle's Centre of Gravity and Moments of Inertia.



30 Minute Change Over

Switching from K&C to MIMS test mode takes less than 30 minutes. The moving body platform allows mode change with the vehicle loaded. The procedure is quick and simple compared to competitor systems.



Moments of Inertia Measurement

Unrivalled Accuracy

The MIMS design maximises signal to noise ratio by using the moving body platform to apply large motions. The significant forces generated are accurately measured close to the vehicle using specially selected load cells within the clamp assembly.

Measurement System

The vehicle, or an assembly, is fixed to the SPMM 5000e centre table by four special MIMS clamps. The forces and moments generated in the clamps are accurately measured and then used to calculate the vehicle C of G and Moments of Inertia.

MIMS clamp assembly with multi axis piezo-electric load cell.

MIMS Accuracy

	Accuracy
Centre of gravity height	± 2 mm*
Centre of gravity horizontal position	± 0.5 % of the clamp separation
Roll and Pitch inertias	± 1 %
Yaw inertia	±1.5 %

**± 2mm or 0.5% of measured value to table face (whichever is the greater).*

SPMM 5000e

Exceptional Accuracy by Design

The SPMM 5000e can be configured according to budget and requirements. A comprehensive range of upgrades and options to enhance capacity and test capabilities are available.

Options and Upgrades

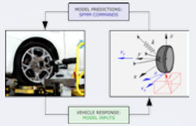
Flexible Configuration

The SPMM 5000e design philosophy makes upgrading after initial installation straightforward. Measures taken include: making the footprint of the two wheel station machine the same as the four wheel station machine, ensuring sufficient capacity in the control cabinets, the inclusion of electrical components required by future upgrades, and the supply of wide loading ramps as standard. The available options are designed to enhance the capacity, productivity or testing capabilities of the SPMM 5000e. Capacity may be increased by the provision of Large Table Extenders, Centre Table Spine Extenders and Large Diameter Rear Turntable Adaptors. Productivity is increased by the addition of Rear Wheel Stations. Testing capability is enhanced by options such as MIMS, Wheel Substitutes, Dynamic Testing, Hardware in the Loop, and the Body Displacement Measurement System.

A sample of the available options is shown opposite.

Hardware In the Loop (HiL)

HiL testing capability allows vehicle behaviour measured on the SPMM 5000e to be used as feedback in vehicle handling models.

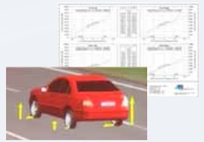


WPMS Options

Depending on required measurement accuracy, either the Draw Wire or the higher specification Dynamic Arm Wheel Position Measurement System (WPMS) is supplied.

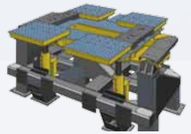
Model Generators

The model generators export data directly into CarSim or CarMaker models. These options are used with AB Dynamics' MATLAB based Post Processing.



Large Table Extenders

With the large table extenders fitted, the maximum vehicle wheelbase is increased to 4540mm.



Calibration Tools

Devices include: the Force calibrator, the Aligning Torque (Mz) Calibrator, the Wheel Position Measurement System Checker, the Steering Robot calibration device and the MIMS calibration mass.

The RMMD

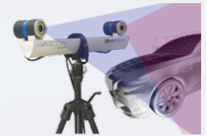
The Rigidity Matrix Measurement Device (RMMD) enables forces and moments to be applied at the wheel centre in order to determine the vehicle's stiffness matrix.

The Wheel Substitute

The Wheel Substitute enables key wheel centre compliance parameters to be determined.

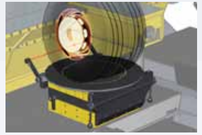
Castor and Body Measurements

During tests servo inclinometers are available for castor angle measurement. Camera systems can be used to measure vehicle body, chassis and suspension system displacements.



Rear Turntable Adaptors

The diameter of the rear turntable is increased to 600mm by adaptors that enable vehicles with twin wheels on the rear axle to be tested.



Spare Input and Output Channels

Additional encoder inputs, as well as CAN and analogue input and output channels, can be supplied. Powerful digital signal conditioning of input channels is available allowing a large range of transducers to be used.

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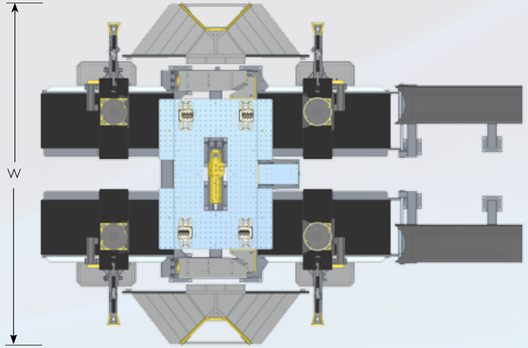

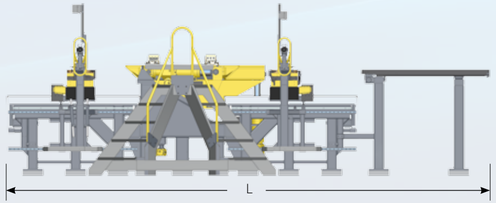

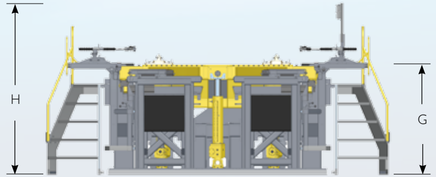

SPMM 5000e - Dynamic Arm Variant*	
Length (L)	7415 mm*
Width (W)	4570 mm*
Height (H)	2460 mm
Ground Plane Height (G)	1530 mm
Electrical Power	3 phase | 30 kVA peak | 15 kVA continuous
Compressed Air	7 Bar | 1.6 litres/second peak | 0.005 litres/second average

**Other variants available*

AB Dynamics

The SPMM 4000 and SPMM 5000 are in service at many leading manufacturers and their suppliers worldwide. With the SPMM 5000e, AB Dynamics has combined the knowledge gained during 20+ years of K&C testing, with a modern EtherCAT control system that has the power, flexibility and speed needed for the next generation of vehicle K&C testing.