

## Ball Joint Test Systems

### The World of Ball Joint Testing

Steering systems are expected to last the lifetime of the vehicle, well in excess of 100,000 miles. In addition to the rack, which can be evaluated on Servotest steering test rigs, it is important to test the ball joints, which mount at the end of the tie rods and often used as wishbone-tohub interfaces. These ball joints undergo continuous loading from vehicle acceleration, braking, and cornering, whilst enduring bump steer and shock loads due to the road surface.

Supplementing the Servotest Steering Test Machine range, the ball joint Sn and Mn machines adds considerable advantage to customer test facility to accurately test the durability of ball joints for passenger cars, trucks, and SUVs using block cycle testing. Through years of knowledge and industry experience Servotest have developed in conjunction with large automotive companies test rigs to introduce all these loads and motions onto steering ball joints whilst the joint is in an environment to represent the extreme temperatures which can be expected from their position in the vehicle.



### A World of Experience...

Servotest is a World Class Test and Motion Simulation Company, with experience of operating around the globe, for multi national corporations, smaller specialist companies and Government Departments.

Since the 1940's our engineers and equipment have been at the forefront of our industry. Product and Service quality is maintained by a program of



continuous training and development of our people and equipment. We operate in all of the key industry sectors for our marketplace, including Automotive, Marine, Civil Engineering, Aviation, Defence, Aerospace and Traction. The company holds both ISO14001 and 9001 Quality accreditation marks and is a member of many national & international trade organizations.

## Sn3.2 – Three Axis 2 Ball Joints

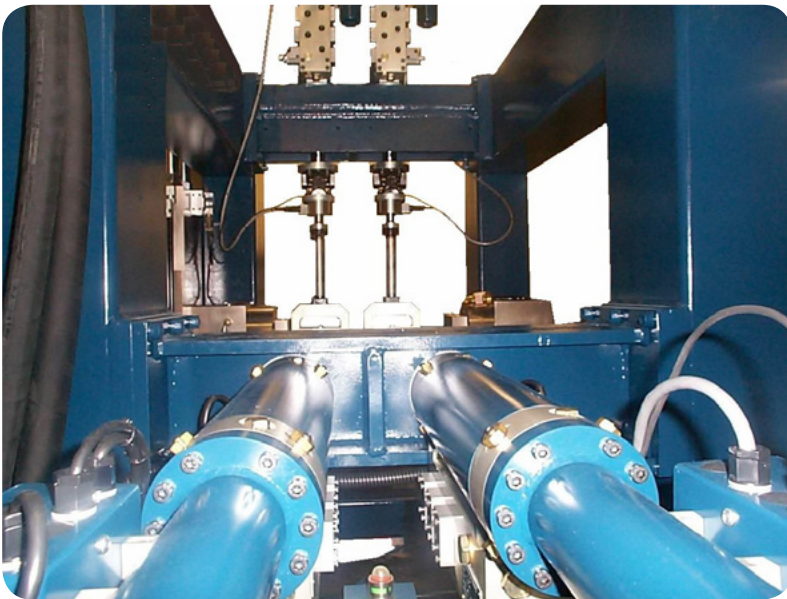
The rig consists of a two-station test frame, which enable two joints to be tested simultaneously. Each joint is loaded axially and radially with two 15 kN Servotest hydrostatic bearing actuators which can apply block programmed or real time loads. The rocking and twist motions up to a maximum of  $\pm 45^\circ$  are applied to both ball joints via a rocking cradle mechanism.

The two joints are surrounded by an environmental chamber which has a temperature range of  $-40^\circ\text{C}$  to  $+100^\circ\text{C}$  to represent the conditions from a cold overnight soak to the high temperatures from the sun, engine heat and brakes.

Long term life tests are conducted on the ball joints to ensure they will have a long reliable life in the vehicle.

The test machine is controlled and monitored by a Servotest PULSAR Digital controller with Multi System software so that the two test stations can be run independently. The tests including the chamber temperature, are sequenced using the Pulsar EzFlow programmer which can include real time history signals, with the drive signals being prepared using ICS Analysis.

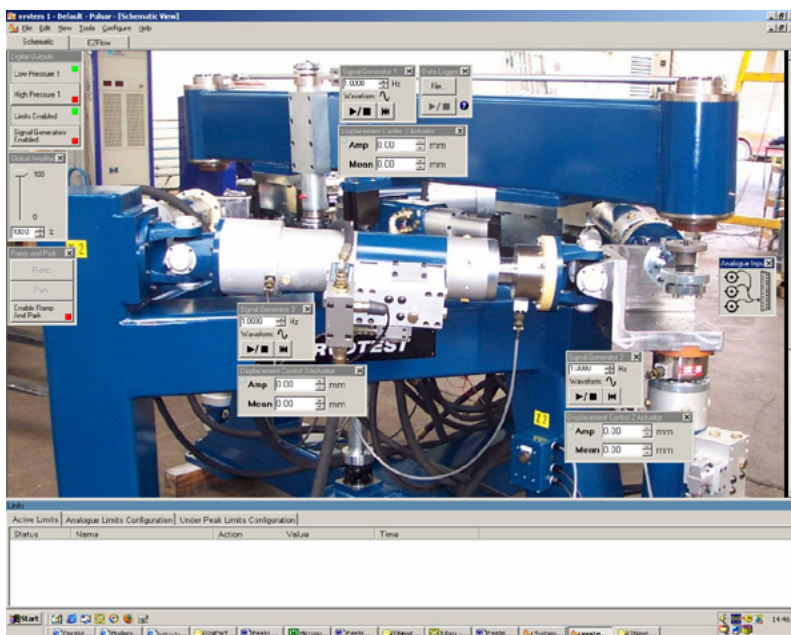
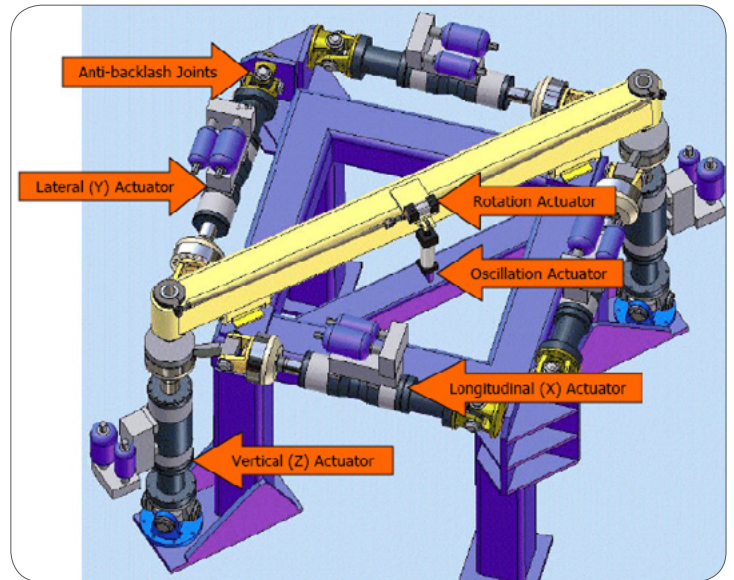
The software also includes the latest features of, Pulsar Auto PID, Random signal generation from peaks and troughs values, a Remote Status display via the network, a Test Data Screen saver and a Test Library Manager. This enables test to be easily set up, run and monitored.



## Sn5.2 – Five Axis 2 Ball Joints

The Heavy-duty 5-axis Dual-station Ball Joint Test System is designed to simulate the vertical, lateral, longitudinal, rotational, and oscillatory forces on two ball-joints simultaneously. These forces may be based on block-cycle testing or developed from time history/real roadload profiles using PULSAR EzFlow and ICS Analysis.

The 5-axis Ball Joint Test System utilises the latest Servotest PULSAR controller for optimum performance and reliability. The front panel displays information relevant to each actuator in a straightforward format. The 900Mflop DSP and optical-fibre node cables provide fast and accurate processing of data, with further graphical analysis available via PULSAR sDAP. Furthermore, PULSAR Multisys allows independent control of each actuator, thus making it possible to simultaneously run separate tests in the X, Y, and Z direction for each ball joint.



**This “two machines in one” philosophy is more cost effective, and space efficient, than producing two separate test frames.**

For more information, see our separate PULSAR brochure.



## Mn5.2 – Two Axis 6 Ball Joints

This Multi Station machine is used for environmental testing and proof of ball joints against water, and mud. This mechanical system is designed to rock and rotate 6 ball joints in an environmental chamber with hot cold and slurry spray for wear testing steering ball joints.

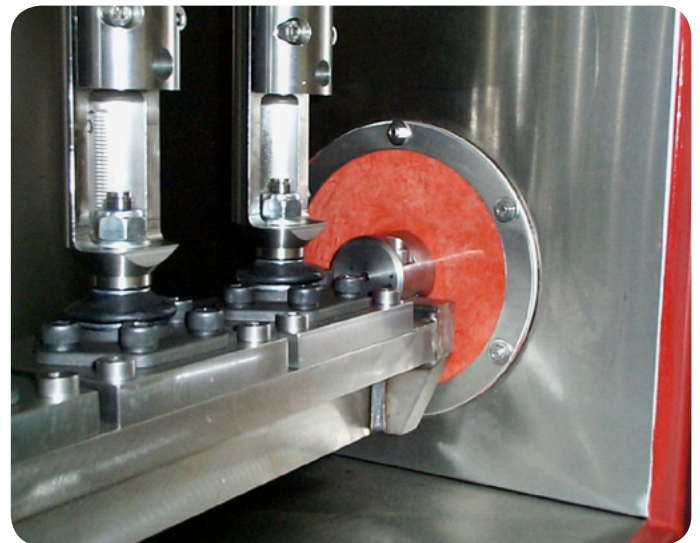
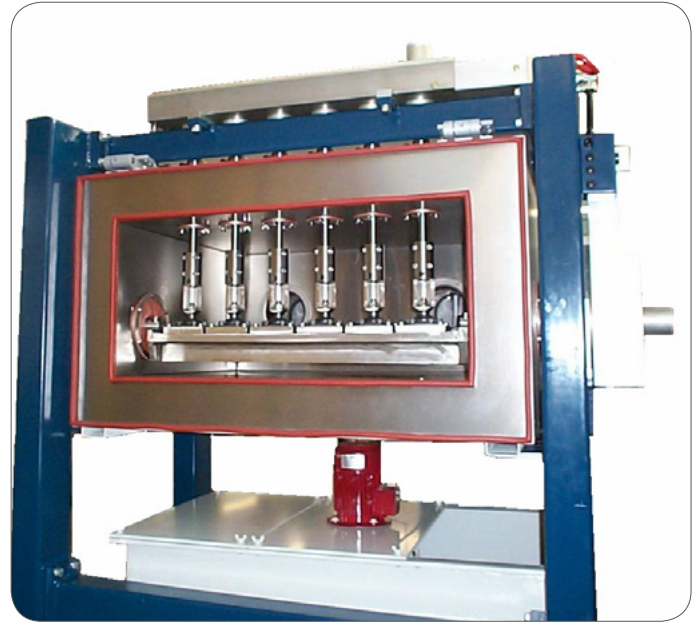
The mechanism is driven using 2 off Rack actuators controlled Servotest's PULSAR Digital Control System.

This system provides a maximum turning angle  $\pm 45$  degrees and maximum swing angle of  $\pm 45$  degrees at frequencies up to 3 Hz. The system also provides over 360 Nm to overcome the 60 Nm braking torque for each ball joint.

The environmental chamber is 0.5m x 1m x 0.5m in size with access holes for the loading system.

Front opening door with window enable easy access to the fixtures. Waterproof lighting is fitted in the chamber, along with a dust /water spray facility with 6 nozzles at 30° 500 mm from the specimen. With mixing unit Pressure for dust/water mixture to be variable from 1 –10 bar.

Separate environmental loading unit to provide; Temperature range  $-50^{\circ}\text{C}$  to  $+180^{\circ}\text{C}$  temperature control point  $\pm 1.5^{\circ}\text{C}$ . This requires a two stage compressor with power 25HP to achieve  $-54^{\circ}\text{C}$ .



# Specifications

## Sn3.2 Specification

Number of joints: 2

2 off Vertical linear actuator:

- Displacement: +/-100 mm
- Force: +/- 15 kN
- Performance: 20Hz +/- 1mm

2 off Horizontal linear actuator:

- Displacement: +/-150 mm
- Force: +/- 50 kN
- Performance: 20Hz +/- 1mm

Rotary, in horizontal plane:

- Displacement: +/- 45° max (+/- 30° nominal)
- Force: +/- 40 Nm Each Joint (i.e. 80 Nm in Cradle)
- Motion: Sine wave
- Performance: +/-20° at 5 Hz (typically 3Hz)

Cradle rocking:

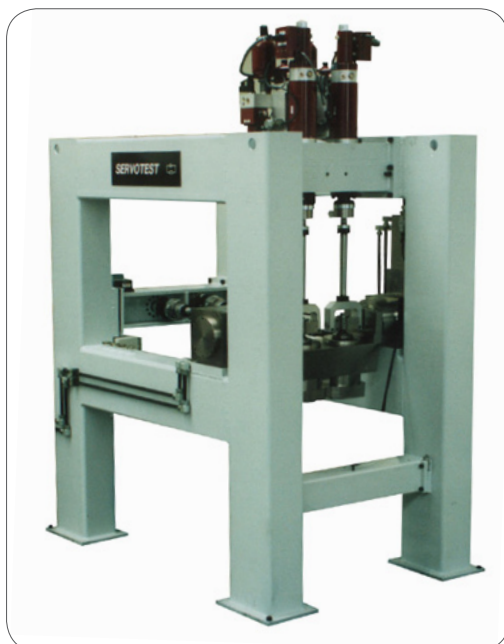
- Displacement: +/- 60° max (+/- 45° nominal)
- Force: +/- 40 Nm (i.e. 80 Nm in Cradle)
- Motion: Sine wave
- Performance: +/-20° at 5 Hz (typically 3Hz)

Options:

- Environmental Chamber: + 100 to -40 °C (+80 °C on ball joint)

Frame construction:

- Welded steel tubing
- Size: 3m high (inc. actuators) 1.2m wide, 1.5m deep



## Sn5.2 Specification

Number of joints: 2

Longitudinal and lateral:

- Force: ±35kN (±50kN static)
- Displacement: 50mm
- Frequency: <60Hz
- Load cell included

Vertical:

- Force: ±35kN (±50kN static)
- Displacement: 50mm
- Frequency: <60Hz
- Load cell included

Rotation:

- Dynamic Torque: ±440Nm max
- Angle: ±38°
- Frequency: <5Hz

Oscillation:

- Dynamic Torque: ±1310Nm max
- Angle: ±30°
- Frequency: <5Hz



## Specifications (cont.)

### Mn5.2 Specification

Number of joints: 6

Rotation:

- Angle:  $\pm 45^\circ$
- Frequency: 3Hz

Oscillation:

- Dynamic Torque: 360Nm max
- Angle:  $\pm 45^\circ$
- Frequency: 3Hz



# ***SERVOTEST***

## **SERVOTEST Testing Systems Ltd**

Unit 1, Beta Way  
Thorpe Industrial Estate  
Egham, Surrey  
TW20 8RE  
UNITED KINGDOM

**Tel** +44 (0)1784 274410  
**Fax** +44 (0)1784 274438  
**Email** [info@servotestsystems.com](mailto:info@servotestsystems.com)

[www.servotestsystems.com](http://www.servotestsystems.com)