



## Electric Servo Column Development

**PRONELLO**  
COMPETITION RESEARCH



### Apply as post rig equipment or as an electric servo commanded shock Dyno.:

The servo commanded shock absorber Dyno tests the shock under any type of curve (for example a classic sine test or a shock bump). It also allows tests to be performed with different speeds for compression and expansion, as needed in the simulation of real world situations. Particularly Rally shock absorbers where the bump and rebound speeds vary significantly.



### Motor & Driver:

BOSCH/REXROTH servo motor and driver. Max torque 198Nm. Max RPM 2800. The servo motor has a blower cooling system and a brake resistor unit to allow it to work under extreme load conditions.



### Position & Speed Sensing:

Digital high precision encoder system directly reads the crosshead position and works in a closed loop with the servo motor encoder. Several analog or digital sensors can also be applied to the system, measuring the relative chassis and wheel movement for example.



### Positioning:

Position resolution: 0.0002" (0.005mm)  
Position accuracy: 0.0004" (0.01mm)  
Crosshead positioning precision: 0.0008" (0.02mm)  
Stroke limit Crosshead MAX movement: 8" (203mm)



### Speed Control:

A Pronello device performs an active control over the Servo Drive, adjusting and maintaining the test position and speed.  
Crosshead Speed Accuracy with zero or constant load:  $\pm 0.3\%$  of set speed  
Speed limit Crosshead MAX speed: 79"/sec (2000mm/sec)



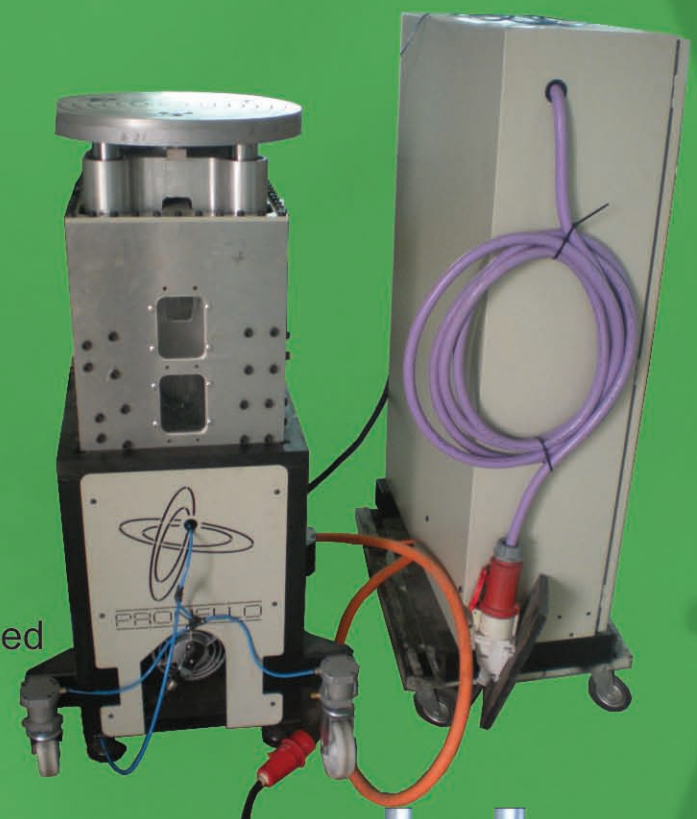
### Force Sensing:

For Shock Testing: S-Block type load cell.  
For wheel Testing (Post-Rig): 3 interconnected twin bending beam type load cells, to have a regular force measurement in the entire wheel plate surface.  
Load Measurement Accuracy:  
 $\pm 0.05\%$  of reading down to 5% & 100% of load cell capacity.  
 $\pm 0.1\%$  of reading down to 1% & 100% of load cell capacity.  
Force limit 3.300 lbs (1.500kg)



### Transmission:

The servo motor connects directly to a hub & ball screw assembly (zero power consumption compared to having a reduction mechanism). A special hub design gives the system zero backlash for angular (servo rotation) and axial (ball screw axis) direction. To achieve this, the hub assembly has:  
a-A zero Backlash coupling device to connect the servo motor and the ball screw assembly.  
b- SKF high-precision preloaded angular contact ball bearings of high axial rigidity that allow the hub to resist the axial loads of the system with minimum deformation. This combined with the use of linear ball bearings for guidance of the crosshead, reduces all friction and system losses, ensuring a super-efficient delivery of power.



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### **Movement Transformation & Crosshead Guidance :**

BOSCH/REXROTH precision preloaded Ball Screw Assembly.  
For crosshead guidance, the actuator has 4 columns with linear ball bearings of the same brand.



### **Data Acquisition System:**

Of exclusive development, works combined with BOSCH/REXROTH drives.  
The system is totally commanded by software.



### **Software :**

Developed in C++ with all the usual windows functions (file, edition...) resulting in powerful and friendly software.  
It can handle several tests with a practical show/no show command and different curves, colors & traces making comparing results easy.

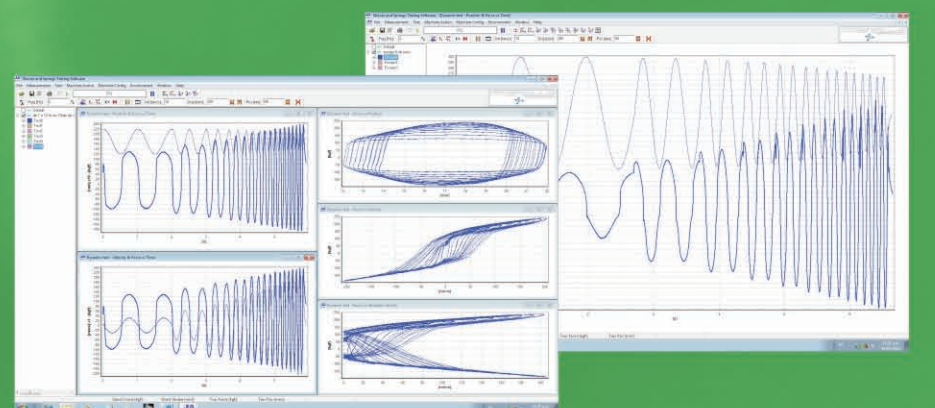
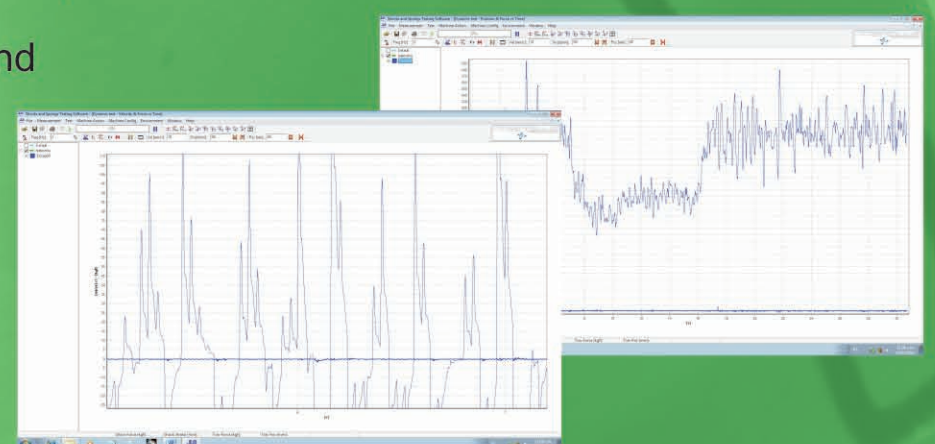


### **Modular Configuration of the Electrical Servo Column :**

The user can interconnect up to 4 electric servo columns to implement a 4 Post Rig, but also any one independently to measure a single shock absorber.

To test shock absorbers with the electrical servo column, the user must:

- a-Remove the wheel plate (post-rig)
- b-Install the crosshead & bar kit



### **Additional Sensors:**

Analog or digital sensors can be added, for example to measure the relative wheel – chassis movement.

