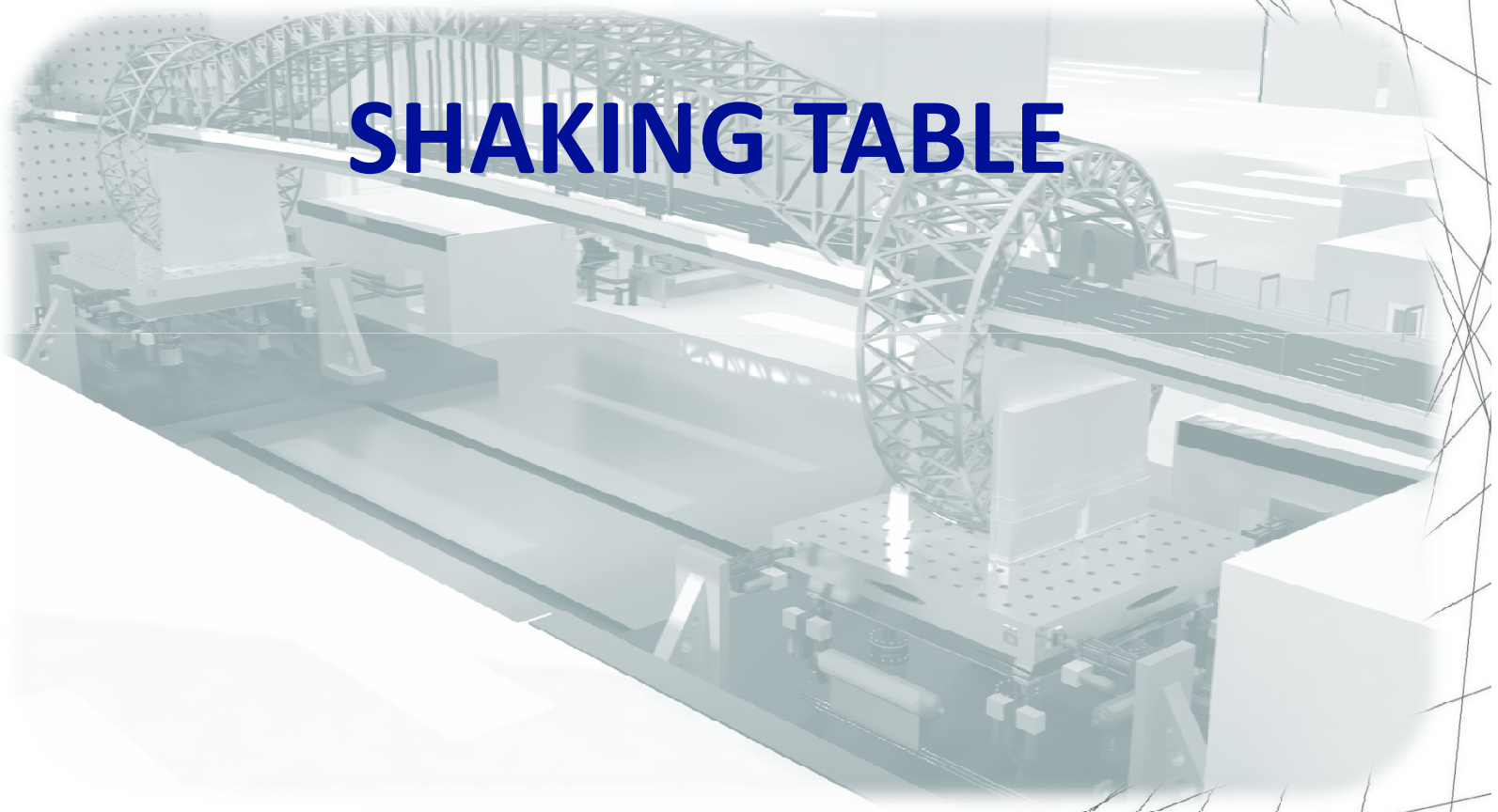
ARIES
INGENIERIA Y SISTEMAS S.A.

SHAKING TABLE



1. GENERAL

2. PERFORMANCE

3. SYSTEM SIZING

4. CONTROL SYSTEM

5. CONCLUSION

6. CONTACT

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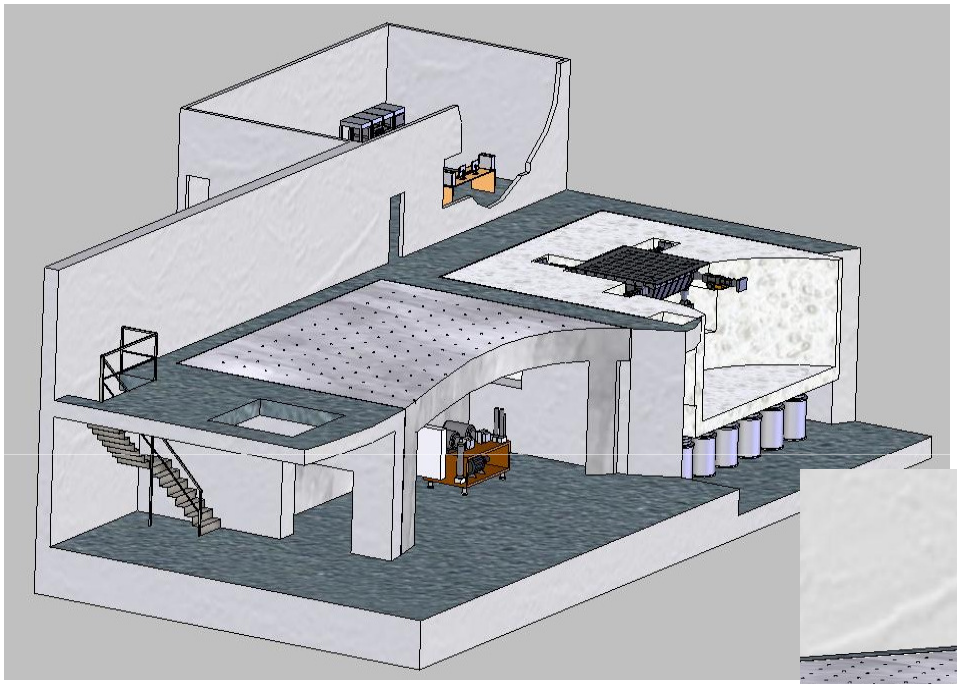
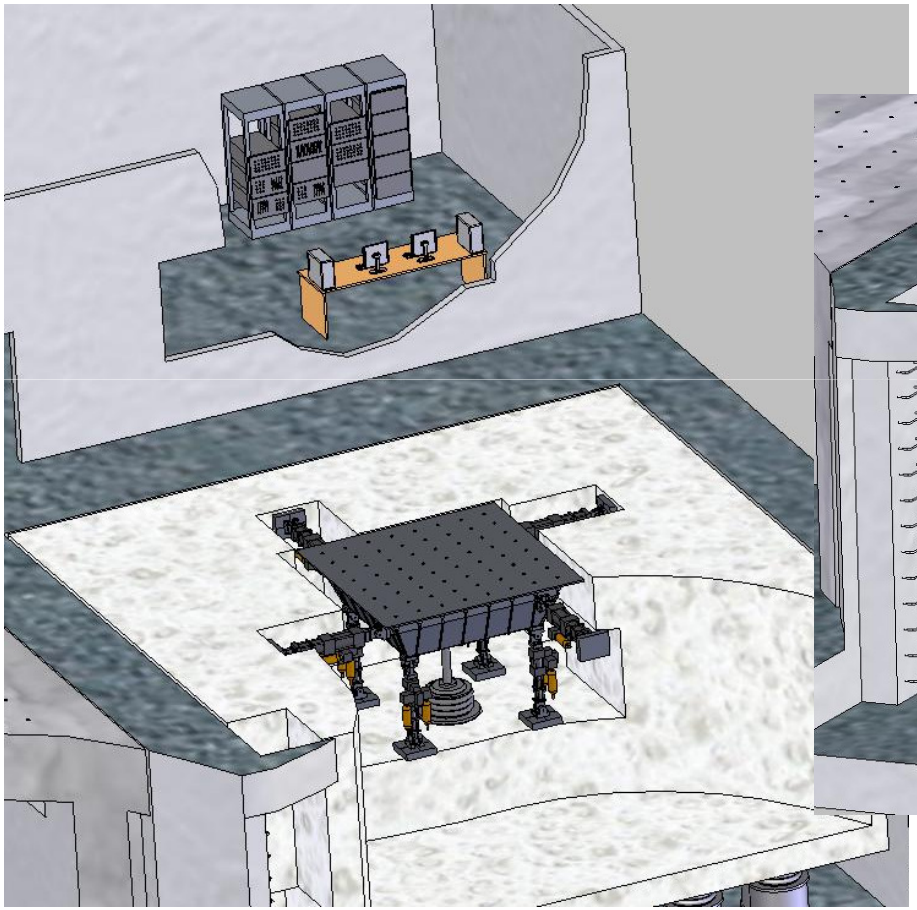
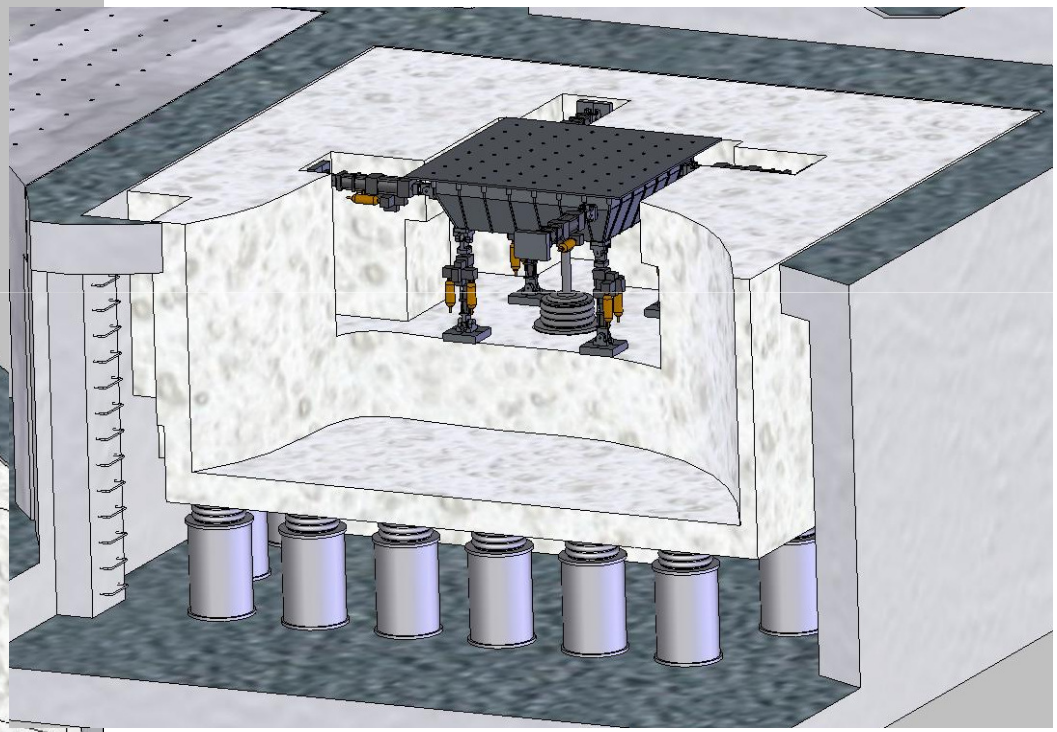
1. GENERAL



1. GENERAL





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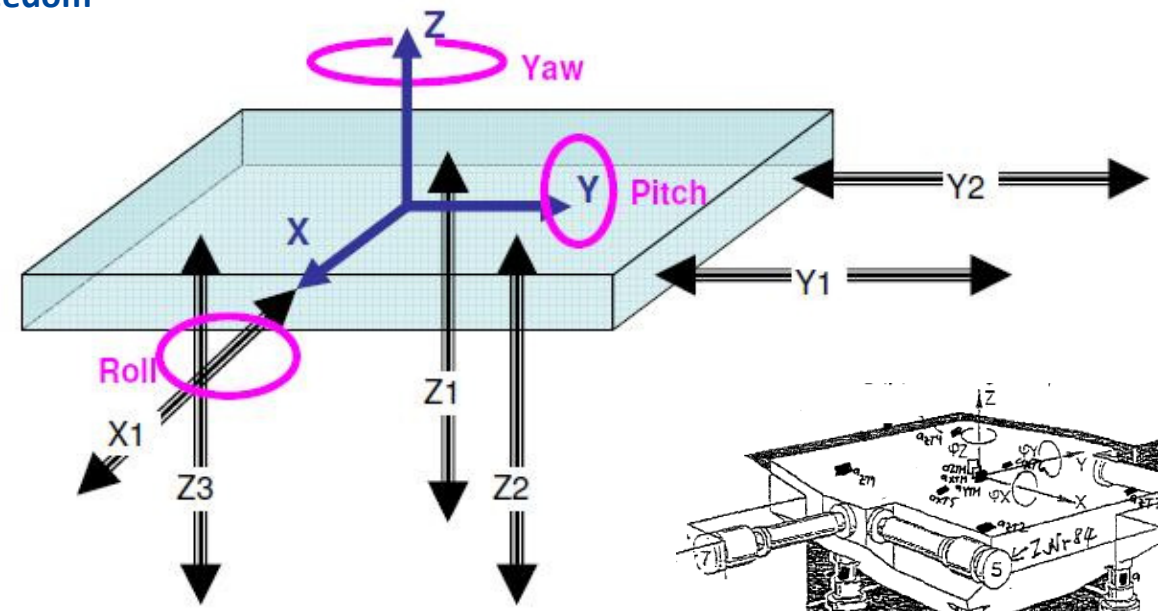
2. PERFORMANCE

- **Payload:** Weight, dimensions
- **System Performance:** Displacement, Velocity, Acceleration
- **Degrees of Freedom**



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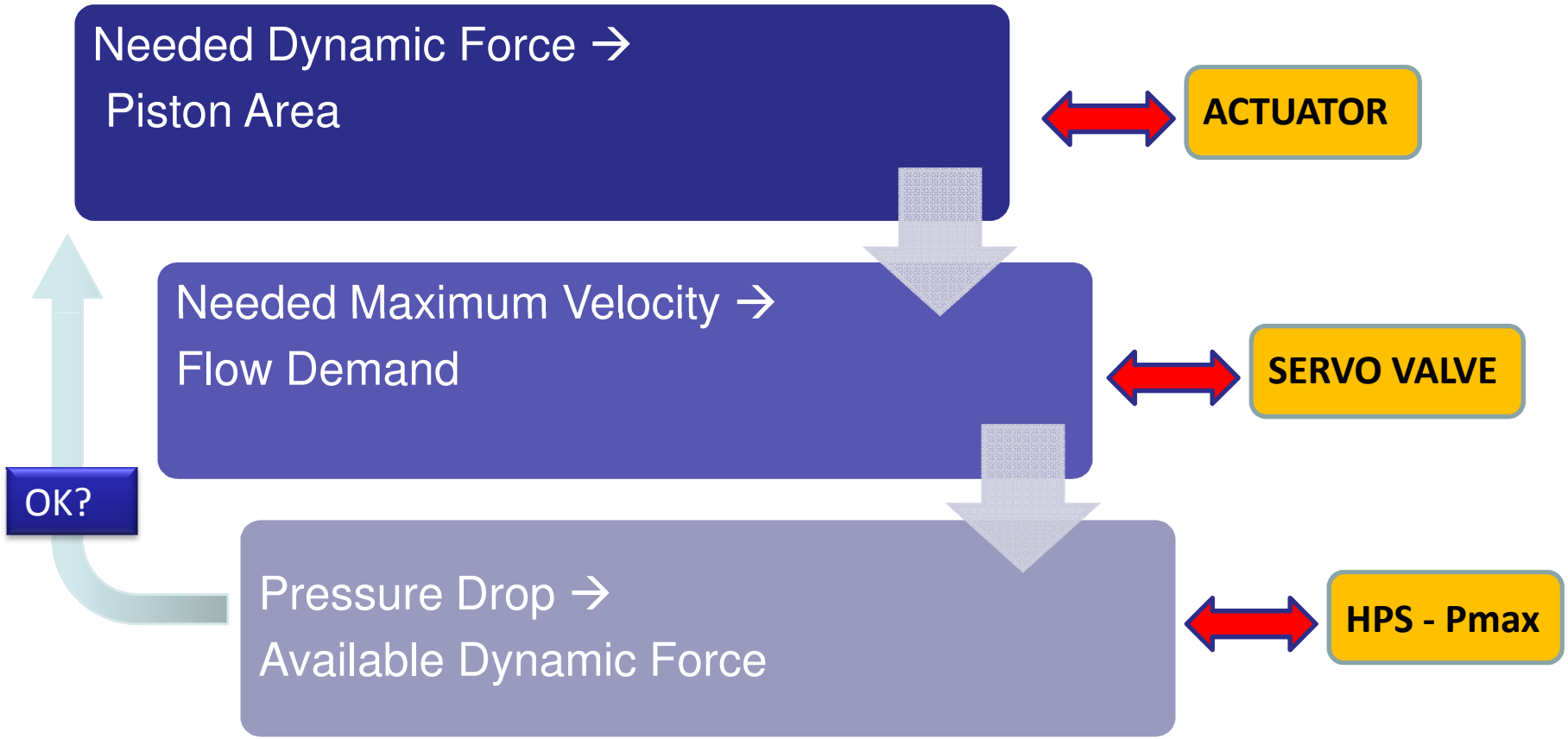
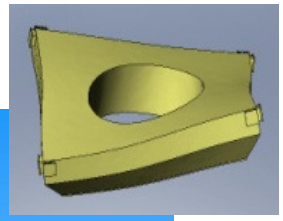
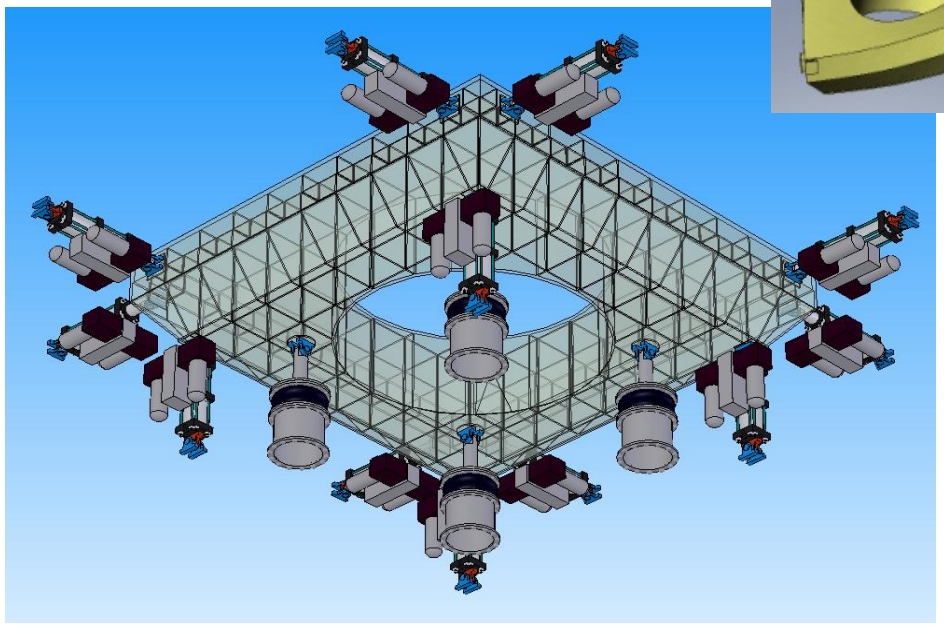
3.1 HYDRAULIC

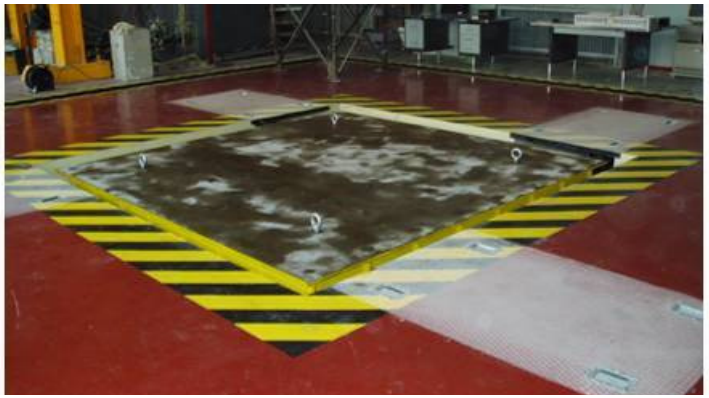


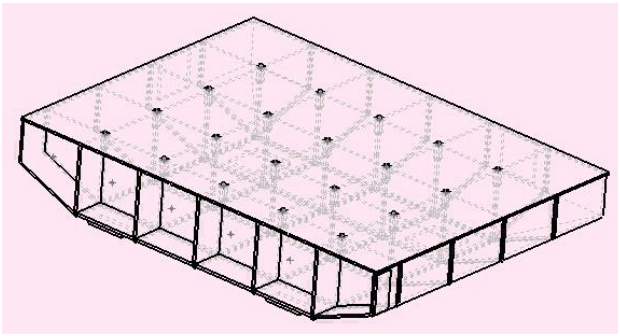
3.2 TABLE

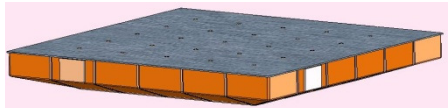




- Designed using sophisticated FEA analysis
- Maximized bending and torsional stiffness to weight ratio

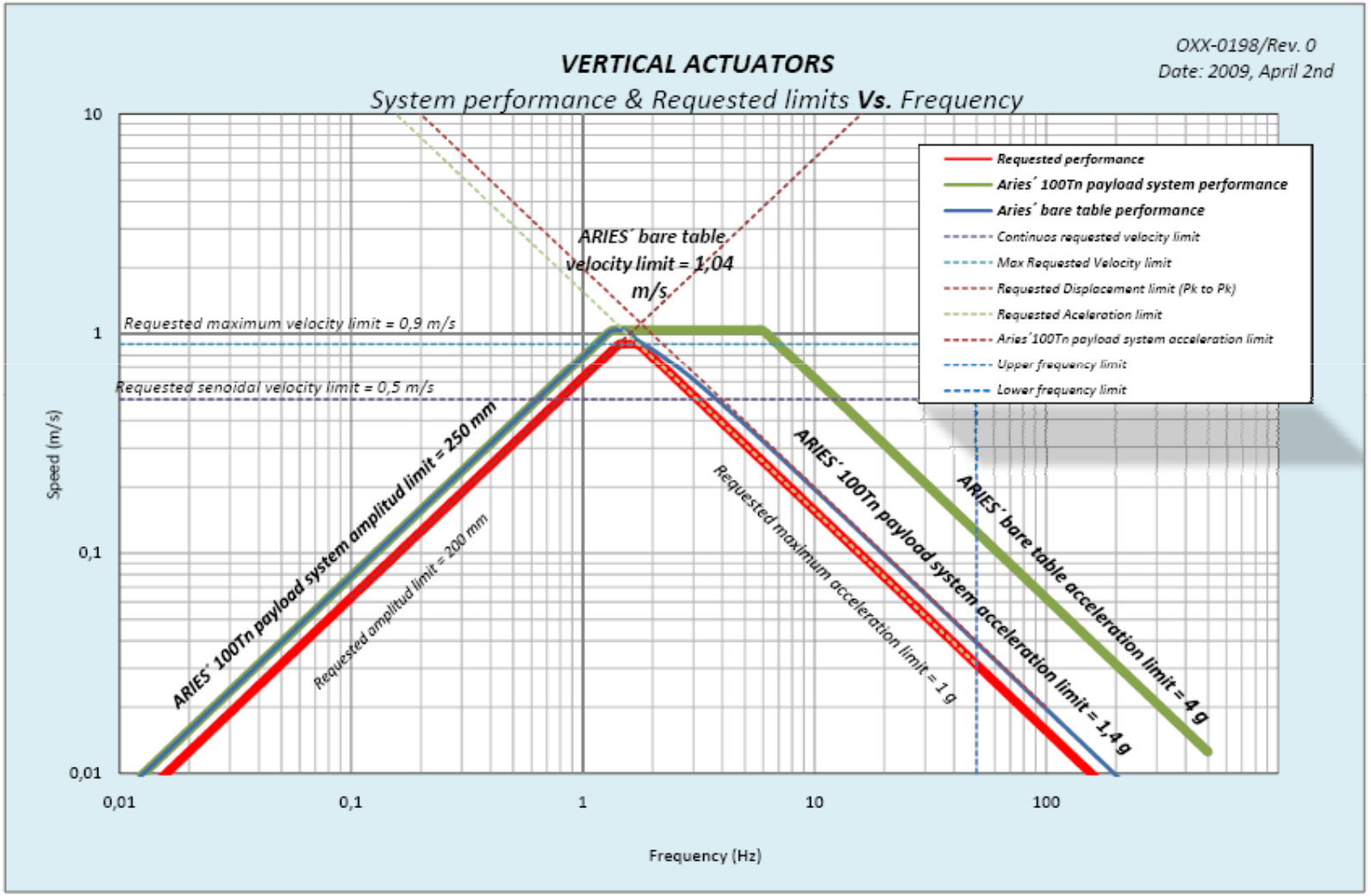




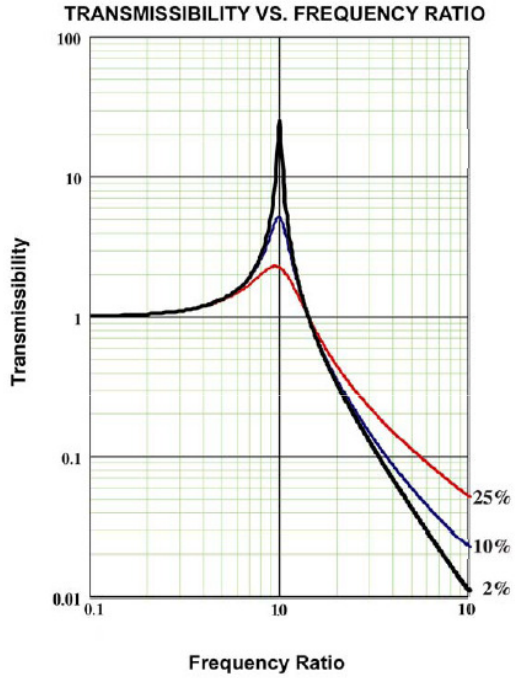


- Aluminum or steel
- Grid of threaded inserts on upper surface
- Natural Frequency: 1st vibration mode well over the desired operating frequency

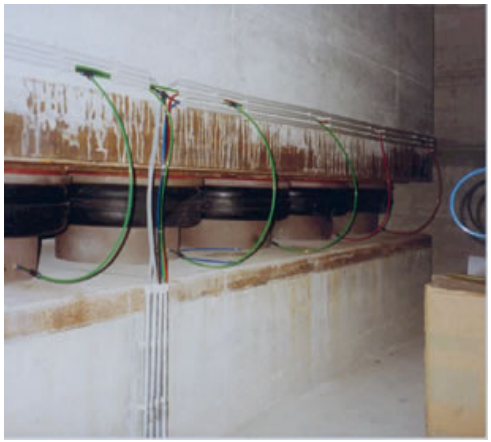
3.3 ACTUATOR PERFORMANCE

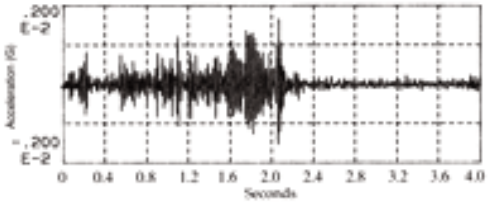


3.4 VIBRATION ISOLATION

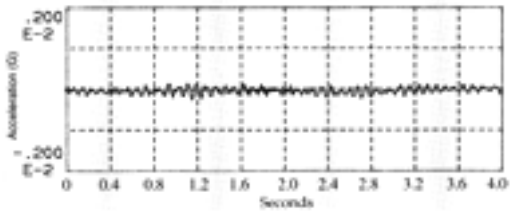


$$Fn = \frac{1}{2p}\sqrt{\frac{k}{M}}$$





Transmitted before isolation



Transmitted after isolation

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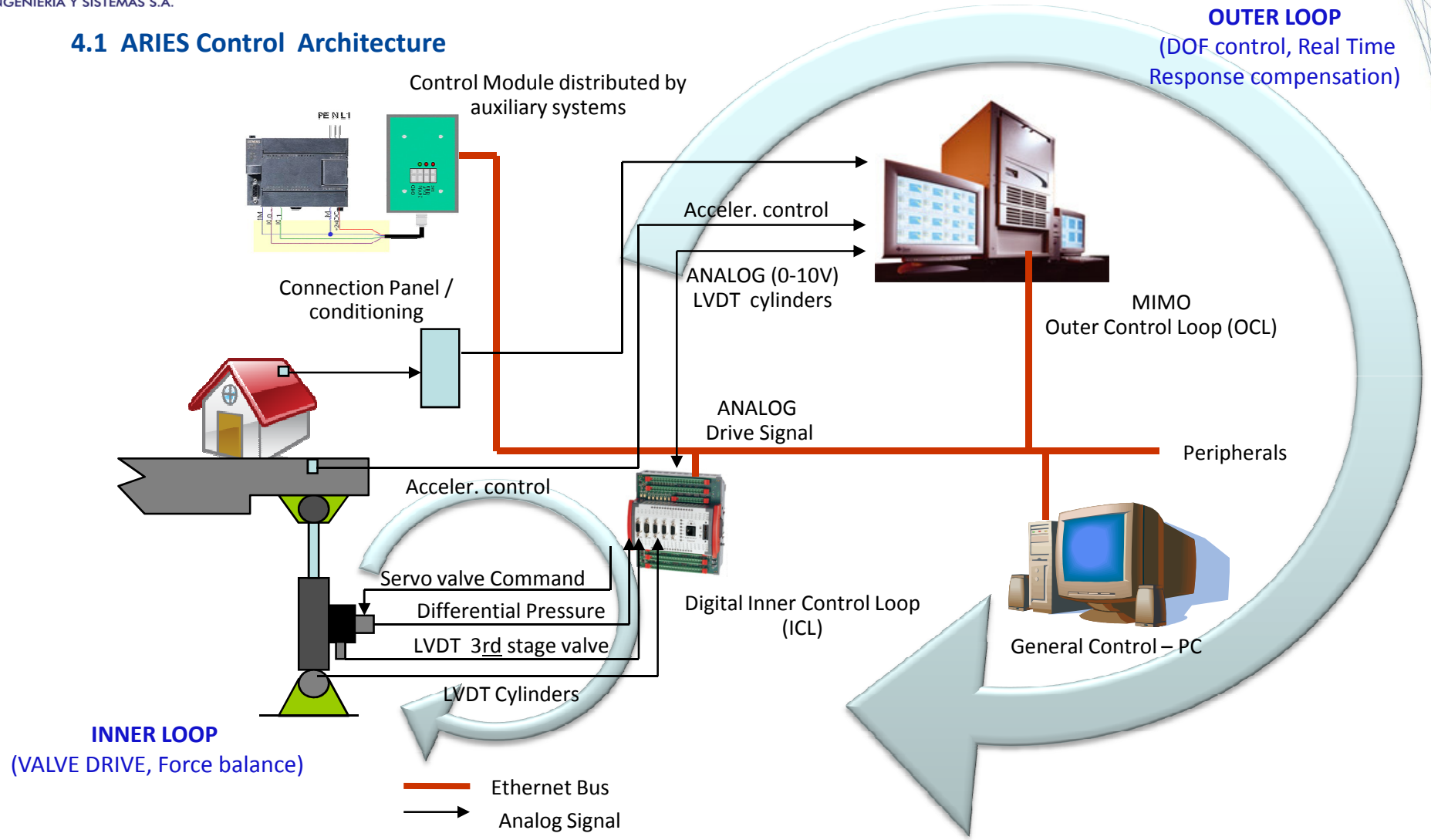
4.1 ARIES Control Architecture

4.2 INNER LOOP CONTROL (CLI)

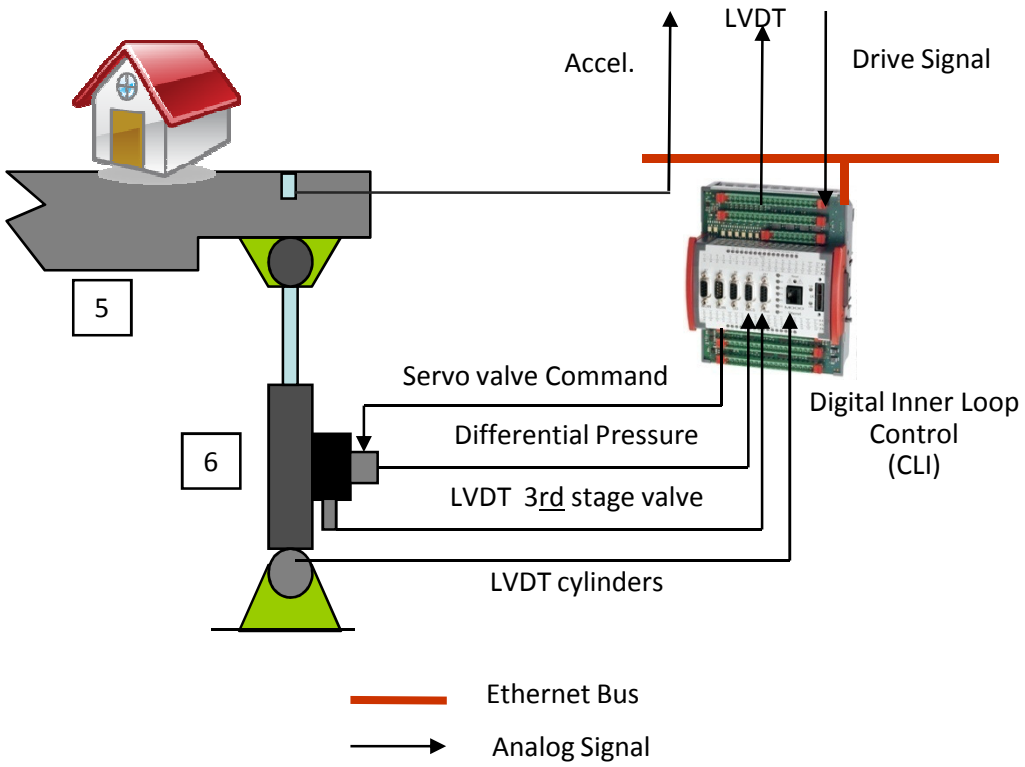
4.3 OUTER LOOP CONTROL (CLE)

4.4 Control Compensation Strategies

4.1 ARIES Control Architecture



4.2 INNER LOOP CONTROL (CLI)



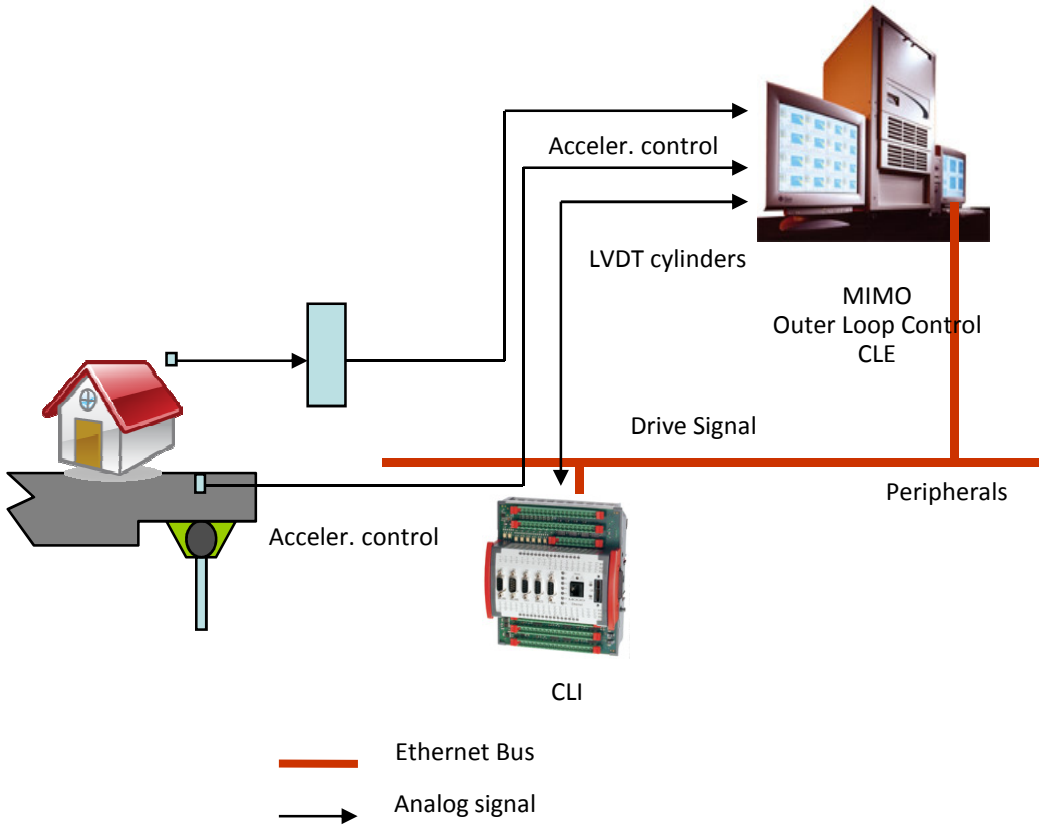
- Main Tasks by cylinder:

  - Cylinders Individual Movement Control
  - Signals conditioning
  - ΔP Stabilization
  - Force balance compensation
  - Dither Generation
  - PIDF loop with LVDT 3rd. stage if necessary
  - Command Signal generation to the servo

- Characteristics:

  - Complete digital Control loop and software programmable.
  - Dedicated Real TIME controllers
  - Ethernet communication with Desktop PC control.

4.3 OUTER LOOP CONTROL (CLE)



- Main Tasks:

➢ **MIMO** (rectangular)

➢ Multivariable Control

➢ Control in degrees of freedom

➢ Geometrical Compensations

➢ System response based compensation

➢ Updates the system's Impedance Matrix in each loop

➢ Spectral Analyzer

4.4 Control Compensation Strategies

• **Multi Variable Control** (Displacement , pseudo-velocity, acceleration):

To improve system response measurement depending on frequency

• **Cross coupling Compensations** (System Impedance Matrix)

To take into account the influence on 1 DOF over non direct affected cylinders

• **Force Balance** (Through individual Delta P measurement)

To take care about internal table tensions caused by hyperstatic conditions of the system.

• **Feed Forward advanced close loop algorithm**

To improved frequency response and system stability

• **Overturning Moments Compensation** through system impedance matrix

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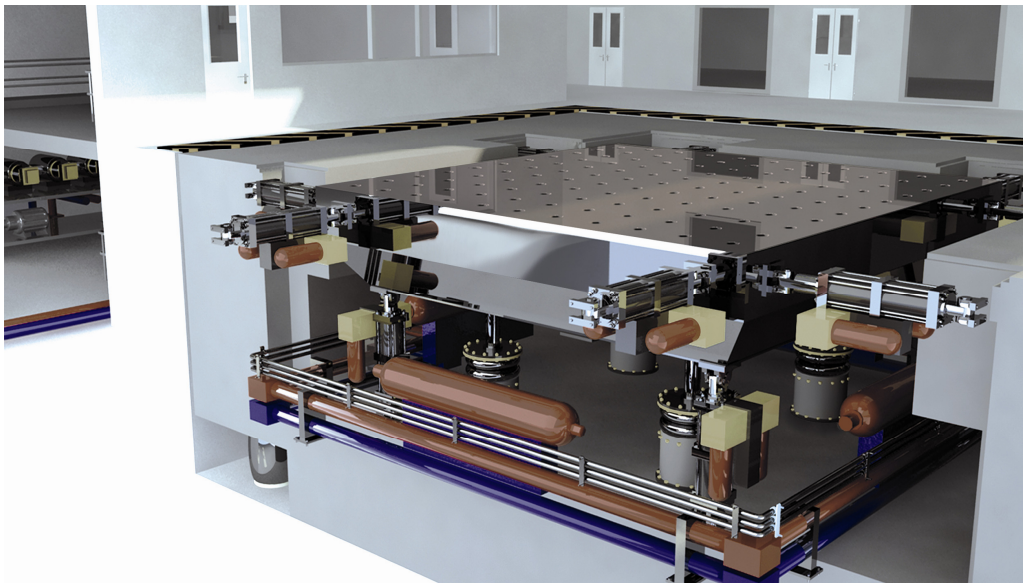
5. CONCLUSIÓN

- ARIES tailors engineering solutions
- ARIES has broad experience in advanced test systems, as well as software development and hardware integration for control applications
- The systems are designed to be easy to expand by adding devices as needed
- ARIES can design and supply any required vibration test system



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For more information:

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