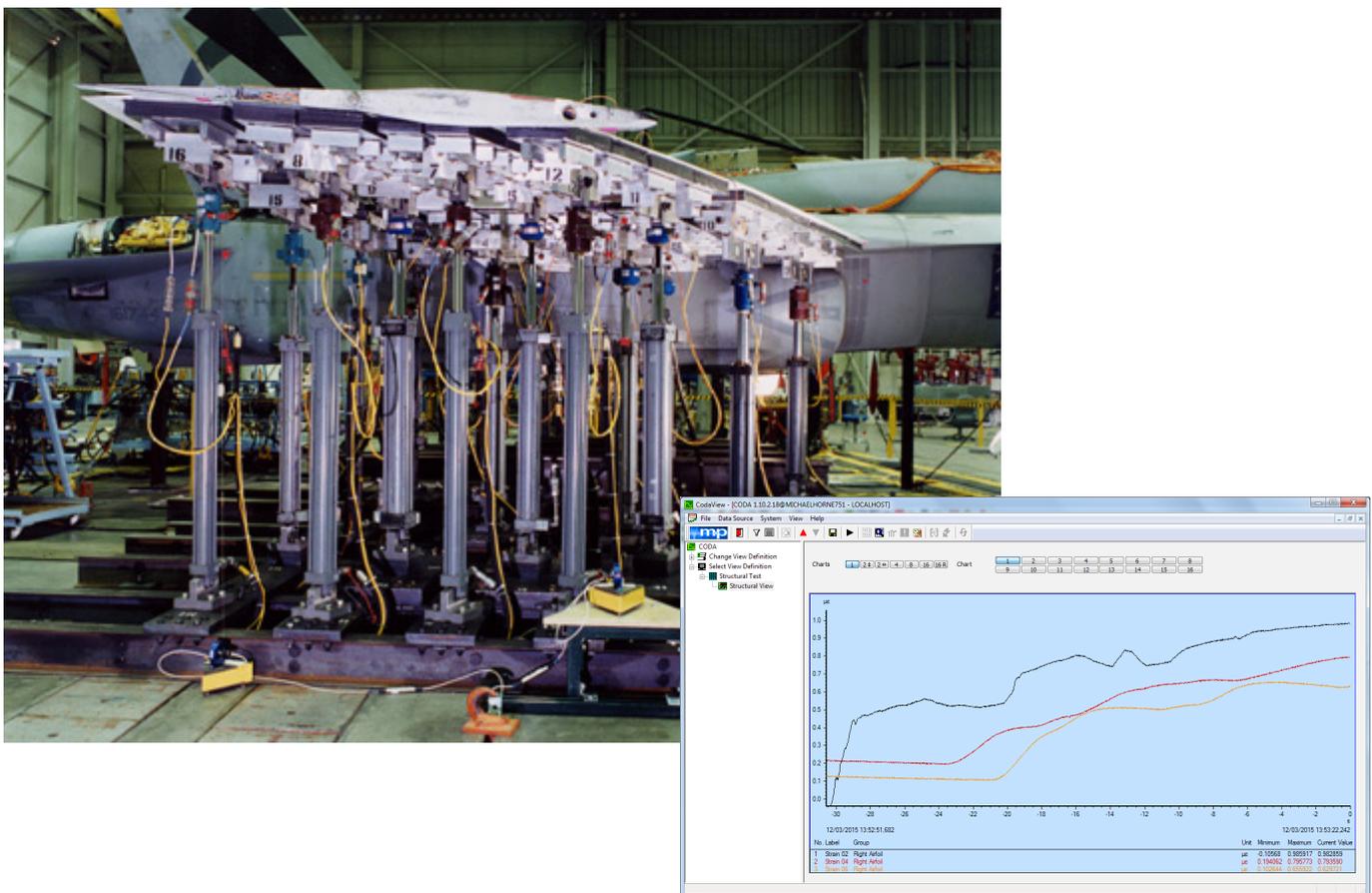


# Application Note

## Structural Testing with m+p Coda

Experimental structural testing is necessary in a wide range of applications from airframes and sub-assemblies down to individual components such as turbine blades and many others. These tests enable the engineers to compare the acquired data with the predicted results from the design calculations.

Structural tests typically need a lot of time and resources and they are often expensive to perform, however it can be much more expensive not to do it. Taking this into consideration, it is vital to have a precise, easy to use and reliable instrumentation and software system for these critical test and measurement applications.



A typical application would require the engineers to operate a load control system to apply a continuously varying force to the test structure and determine the behaviour of the structure by analysing the acquired response data.

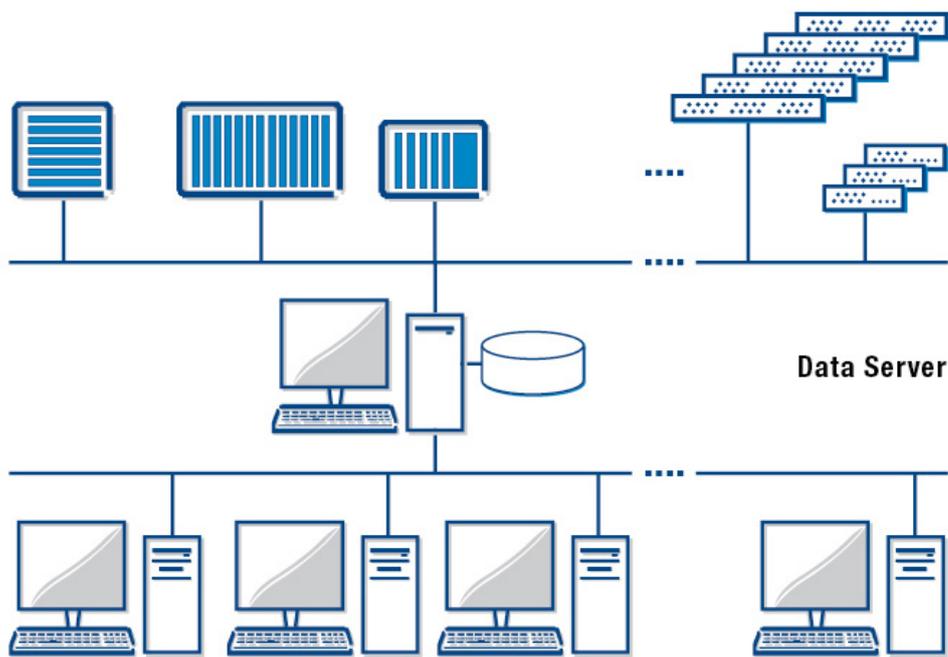
m+p Coda is a full-featured software platform for data acquisition and signal analysis. The complete off-the-shelf turnkey operation provides quicker time to test and results in reduced costs associated with the data acquisition process. The extensive built-in features and tools offer functionality that was previously only available in custom packages. The intuitive GUI facilitates set-up, operation, analysis and report generation, thus leading quickly to precise repeatable results.

Thanks to its modular structure and easy parameterization, m+p Coda is the perfect solution for experimental structural testing and multi-axis strain and stress analysis. Features include measurements with single- and multichannel strain gauges, real-time strain and stress calculations, limit checking and communication with the load control system.

The client/server architecture allows several test engineers to have concurrent online access to the acquired data for display and analysis operations. The online server approach also ensures reliable data archival and retrieval with integrated error diagnostics to guard against connection and data access issues.

For highest system flexibility m+p Coda supports a range of powerful USB, Ethernet, LXIbus and VXIbus-based instruments from m+p international and other manufactures. These instruments are known for their high performance, measurement accuracy and reliability. Users can select their preferred acquisition hardware for any test size.

### Data Acquisition Units USB/Ethernet/VXI/LXI



### PC Clients: Engineers' Workstations

The scalable architecture makes the package ideal for any test size, from tens to thousands of channels. High-channel count systems can be easily configured and are ready to test within a very short time.

Configuration data are stored in a central SQL database for maximum flexibility and repeatability. m+p Coda stores and processes the acquired data in its uniform data model. Even different sampling rates for data groups or data acquired asynchronously are permitted. As a rule, the raw measured data are always stored to ensure access to the original data at any time.

Using a simple mouse-click, the connected measurement hardware is listed and the characteristics of connected channels are automatically identified. A channel configuration wizard with user-definable default values is also available for rapid setup of large numbers of channels.

m+p Coda supports ¼, ½, full-bridge configurations and rosette type sensors, also thermocouples and RTDs for temperature compensation are supported. The results of a strain measurement can be shown in correlation strains compared with the input force or input pressure.

The m+p Coda software provides full-featured limit checking and alarm monitoring capability for all active channels. Out-of-limit data is displayed in a separate window and logged.



Alarm window: Full-featured alarm monitoring allowing the user to see the current status at a glance

Acquired data and computed channels can be freely combined in user-definable groups for subsequent analyses. Powerful storage functions allow for comprehensive data management and temporary or permanent, pre-programmed or event-controlled data storage for all or selected channel groups.

The formatted data of selected or all channels can be easily exported into Excel, ASCII, MATLAB, m+p Analyzer or other popular analysis packages.

### Example:

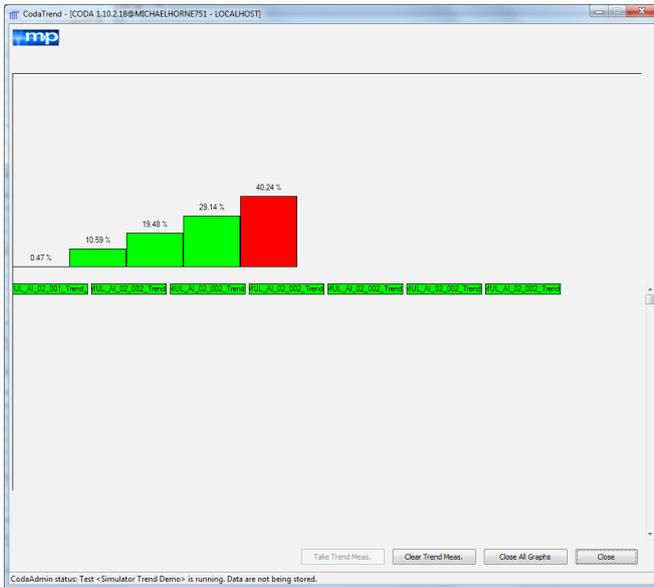
Our customer PIAGGIO AERO INDUSTRIES S.p.A. (PIAGGIO AERO) selected m+p Coda for structural testing of their pioneering aeroplanes.

PIAGGIO AERO has instruments to measure up to 1,248 channels with m+p Coda and for structural testing they use mainly quarter bridges and rosettes configurations.

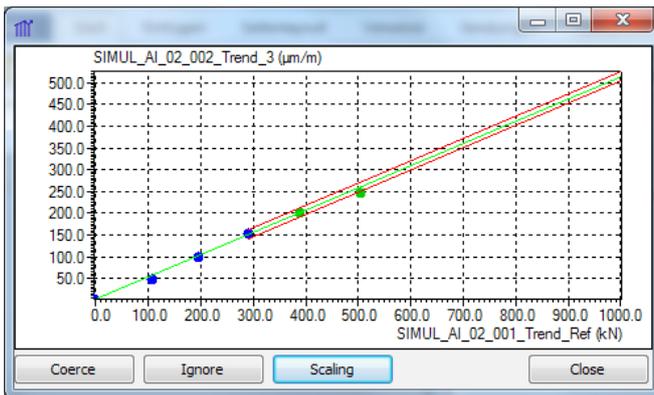
To handle the up to 1,248 strain gauge channels, PIAGGIO AERO created their own SQL database for the storage of the strain gauge parameters. From each package of strain gauges the parameters are scanned by a barcode reader and automatically stored in the database. Each sensor gets a unique number and can be identified also on the aeroplanes.

Because the configuration of m+p Coda is also stored in a SQL database, PIAGGIO AERO easily created some SQL statements to enter the strain gauge parameters according to the m+p Coda needs for data acquisition.

Based on the specific customer requirement a linear trend detection was added to m+p Coda. With this function, m+p Coda is able to track the linear trend of strain gauge signals with respect to the reference channel (mainly force).



In the case where the expected value is outside of a configured tolerance band, a diagram pops up for each out-of-tolerance channel so that the signal can be analysed in more detail.



The user can accept or ignore the out-of-tolerance value and continue his measurement.

**Germany**  
**m+p international Mess- und Rechnertechnik GmbH**  
 Phone: (+49) (0)511 856030  
 Fax: (+49) (0)511 8560310  
 sales.de@mpihome.com

**USA**  
**m+p international, inc.**  
 Phone: (+1) 973 239 3005  
 Fax: (+1) 973 239 2858  
 sales.na@mpihome.com

**United Kingdom**  
**m+p international (UK) Ltd**  
 Phone: (+44) (0)1420 521222  
 Fax: (+44) (0)1420 521223  
 sales.uk@mpihome.com

**France**  
**m+p international Sarl**  
 Phone: (+33) (0)130 157874  
 Fax: (+33) (0)139 769627  
 sales.fr@mpihome.com

**China**  
**Beijing Representative Office of m+p international**  
 Phone: (+86) 10 8283 8698  
 Fax: (+86) 10 8283 8998  
 sales.cn@mpihome.com

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

**ISO 9001  
 CERTIFIED**



*listens to customers ...*

43975/09-15