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# Accuracy, Traceability and Repeatability Key to Battenberg Haptic System’s Success

## Case Study

### Solution

- RV Series Robot
- CR750 Controller

### Battenberg Product Benefits

- Reduced time to new car launch
- Cost savings for OEMs and suppliers
- OEM acceptance of objective test results

### Mitsubishi Electric Value-added Advantages

- Repeatability for iterative test sequences
- Accurate mimicking of human movements
- Reproducible test results
- Location-independent results comparison



*“With Mitsubishi Electric robots, there are no limitations on the kind of haptic testing data our customers can get.”*

*– Günther Battenberg, Managing Director,  
Battenberg ROBOTIC L.P.*



## BATTENBERG

### BACKGROUND

A car’s design—from exterior styling and colors, to interior comfort—is an integral part of the automotive value chain, since it is a primary basis for consumers’ perceived value. Among the interior elements that affect an automobile’s comfort are the haptic characteristics of control elements. Consumers value these characteristics in their impression of an automobile’s quality, especially for controls on air conditioning, navigation and infotainment systems.

Based on measurement robotics, Battenberg provides complete systems worldwide for functional testing in experimentation, in climate test chambers under extreme climatic conditions, for end-of-line tests in production, and for interior measurements in the interior of vehicles. The system is particularly well suited to measuring haptic features in cars and is sold to automotive OEMs, first-tier suppliers and others in the automotive supply chain.

### CHALLENGE

Battenberg ROBOTIC pioneered measurement robotics, which refers to the simultaneous execution of measuring,

testing and moving functions using robots. Battenberg employs measurement robotics with a combination of robots, sensors and the Battenberg RobFlow® software package for haptic testing—the testing of tactile sensations on a vehicle’s control elements, for example.

Battenberg’s measurement robotics haptic system records, analyzes and evaluates actuation forces and torques in real time. The software allows the definition of movements and measuring, analysis, and evaluation functions, which are then executed by the robot. The robot mimics human movements on a car’s control elements, such as buttons, rotary knobs and shift levers.

The robot must be capable of making complex path curves and force-torque-controlled movements. In order to compare test values of car control elements at various global facilities, Battenberg demands a robot that provides repeatability, traceability and high accuracy, including the capability to measure in milliseconds. The robot must also be capable of measuring components at a temperature

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range from minus 40° F to 185° F to ensure that haptic testing can be executed at every step of the value chain, from the climate chamber to the car's interior.

### SOLUTION

Battenberg identified only two robot manufacturers that might meet its needs, however, one was eliminated because its robots did not provide measurements in milliseconds, and therefore, would not provide the required accuracy.

Consequently, Battenberg's latest measurement robotics haptic system incorporates Mitsubishi Electric's RV-7F vertical, six-axis robot and controller. In addition to millisecond measurements, accuracy is further ensured with exceptional motion control through the use of a rigid arm design and forward feed trajectory. The RV Series robot offers 2kg to 20kg payload capacity, with ranges up to 1.5m.

The multiple-jointed robot is able to imitate complex human movements, allowing the measurement, evaluation and documentation of such characteristics as force displacement, torques and angles. "With Mitsubishi Electric robots, there are no limitations on the kind of haptic testing data our customers can get," says Günther Battenberg, Managing Director, Battenberg ROBOTIC L.P.

Beyond meeting Battenberg's requirements for accuracy, Mitsubishi Electric's robot provides repeatability for iterative test sequences, as well as traceability, allowing comparison of test results from location to location.

The rotating joints and reduction gears on Mitsubishi Electric's RV Series robots are sealed within the motor's hollow structure, allowing them to be used in almost any environmental condition. This capability facilitates the comparison of data at every step of the value chain, including climate chambers.

### RESULTS

Competitive systems for haptic testing require a new machine for each product. Even if the product being tested is a recalled vehicle, the testing machine used for that vehicle when it was new would have to be rebuilt. However, Battenberg offers the flexibility to use a single system for a variety of measurement applications, resulting in considerable cost savings for OEMs and suppliers.

They also realize cost savings due to the robot's traceability and reproducibility. Using competitive haptic systems, first-tier suppliers must travel between multiple plants worldwide



to compare testing quality and conditions from location to location. With Battenberg's haptic system, OEMs and suppliers simply share the program. Battenberg's location-independent, reproducible measurement results also allow standardization of quality features, which overcomes the challenges of global quality evaluations. "We eliminate obstacles and close the loop between suppliers and OEMs," comments Battenberg.

In addition to cost savings, Battenberg's haptic systems result in substantial time savings as well, reducing product launch times. "And, in the automobile market, decreasing time to launch a new vehicle can result in a significant competitive advantage to automobile manufacturers."

"The accuracy, traceability, and repeatability of Mitsubishi Electric robots have helped us gain wide acceptance by European automobile manufacturers for our measurement robotics haptic systems and the objectivity of their results," says Battenberg. "In addition to our own technology innovations, Mitsubishi Electric robots have helped us to retain our market leadership in haptic systems. Based on this success, we are now expanding our operation into the U.S."



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