Gantner instruments

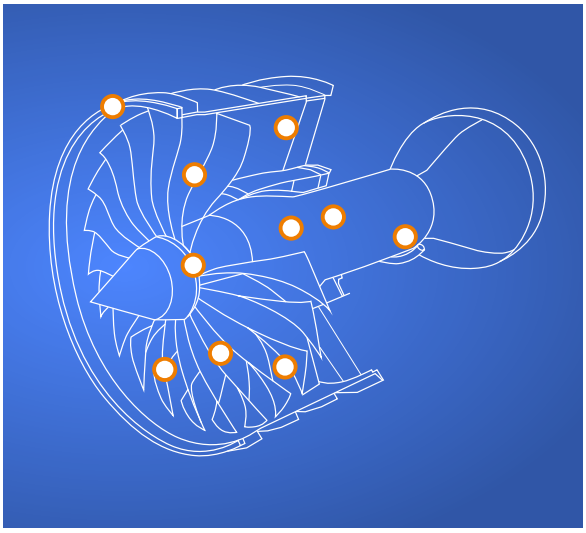
Aerospace Test Automation

Development, Production and Overhaul Testing of Aero Engines

For Turbine Engines, Rocket Engines, Ramjets and APUs

Data Acquisition System for Engine Test Cells

An aero engine is a very complex machine. Many physical parameters are measured at relatively high speeds to accurately characterize engine performance. Gantner Instruments' Q.series data acquisition system is designed for a wide range of engine testing, from APUs to large rocket engines.



To meet the growing requirements of engine test cells, data acquisition systems must be able to record, display and process up to 2000 different parameters, varying from pressures, flow rates, vibrations and temperatures. Real-time sample rates may vary form 10 Hz to several kHz. Continuous testing around-the-clock is putting stringent uptime requirements on the data acquisition system. The Q.series' accuracy, flexibility and reliability makes it the data acquisition system of choice for world's leading engine manufacturers.

Benefits

- **Easy to Adapt**

The flexibility to mix and distribute modules, and a wide variety of available I/O modules allows for using a common measurement platform for development, production and overhaul testing. The system architecture is fully scalable from a few channels to 2000+ channels, supporting both light instrumented endurance testing and heavy instrumented development testing.

- **No Downtime**

The Q.series' HOT SWAP feature allows for simple expansion, modification and service without the need to shut down or re-configure the system, ensuring high system uptime.

- **Minimize Data Overhead**

Engine testing generates a lot of data, especially when engine transient responses must be recorded. Scan rates can range from 10 Hz to several kHz depending on the parameter or type of test. The Q.series allows for creating up to 20 fully configurable data loggers each with its own channel set and sample rate, avoiding excessive data storage.

- **Flexible Integration**

The open standard support makes it simple and easy to integrate the Q.series into a smart networked system, either via REST API or fieldbus protocols like EtherCAT, PROFIBUS, Modbus TCP or CANopen.

Temperature

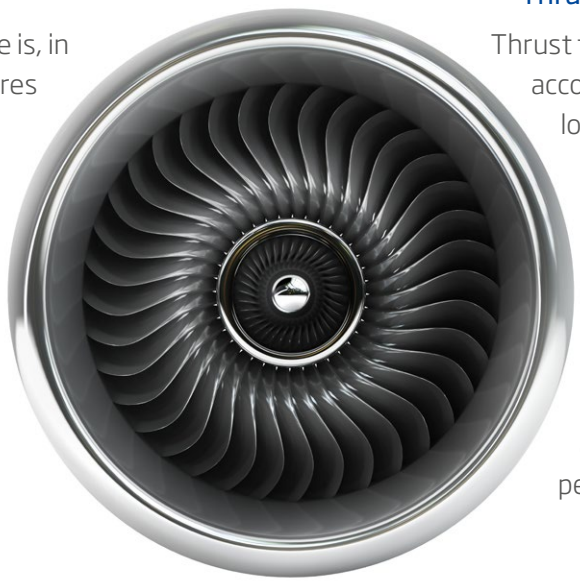
Temperature is the single most important measurement to determine engine performance. The Q.series system features built-in disturbance depression and adaptive linearization for precise temperature measurement. Triple galvanic isolation up to 1200 V, Intrinsic Safety barrier compatibility and stable cold-junction compensation ensure high-accuracy even in the harshest environments.

Vibration

At high speeds, small vibrations can cause an engine to self-destruct. Typically, IEPE sensors are used to measure the vibration signature of rotating parts. The Q.series features per-channel adjustable measurement ranges and filters for accurate vibration analysis. Real-time FFTs allow for instantly detecting the vibration signatures produced by the engine while under test.

Pressure

The efficiency of the jet engine is, in part, determined by air pressures at various stages inside the engine. Engine pressure ratio is a parameter used in engine efficiency thrust calculations. The Q.series comes with a galvanically isolated universal measure-ment module that can be configured for pressure transmitters with bridge or conditioned 4-20 mA output.



Thrust

Thrust force measurement is typically accomplished using a moment/side load compensated strain gage beam or load cell. The Q.series strain measurement with low signal drift minimizes measurement uncertainty and ensures repeatable test results for reliable thrust measurement and accurate propulsion system performance assessment.

Speed

The data acquisition system must be able to accurately measure the full engine speed range. Typically, a counter is used to measure the engine's rotational frequency. The Q.series features accurate frequency measurement for both low and high frequencies using the Chronos method. This method combines the advantage of time measurement and pulse counting, so speed measurement from a few rpm up to 30,000 rpm are easily handled.

Fuel Flow

Engine manufacturers have a common goal: increase fuel and energy efficiency of the engine and reduce environmental impact. The engine's fuel efficiency is determined by measuring fuel flow. The data acquisition system must be capable of high-speed measurement to capture rapid transients in fuel flow. The Q.series allows for fast and accurate frequency measurement for both analog and digital flow meters.

" With the Q.series we have found a modular solution for our measurement technology needs. The Q.series allows us to deploy a common measurement platform for development, production and overhaul testing. The wide range of available modules and the different packaging options allow us to exactly adapt the data acquisition system to our testing requirements. "

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