



Your Source for Process Measurement & Control



Aerospace and Aviation Solutions



omega.co.uk



Letter from the President

In the dynamic and demanding environment of the Aerospace and Aviation industry, lives depend on the quality of your equipment. At OMEGA Engineering we take great pride in our process measurement and control products, used everywhere from testing programs to launch operations. You can rely on our sensors to test turbine blade integrity, verify airframe and engine component integrity, and monitor high-value assets.

Yours is a highly specialized industry, and our depth of expertise allows us to deliver the solutions and technical support you require. Whether it's an off-the-shelf product or a specially designed and configured solution, we will work closely with you to understand your application needs.

For over fifty years OMEGA Engineering has been a pioneer in the design, manufacture, and distribution of sensors and instrumentation, including leading-edge wireless and IIoT-ready offerings. Today we offer 100,000 products, available through 24 country-specific websites and 11 global offices.



Our commitment to customers like you has been the building block of our success over the last five decades—and will remain our top priority in the years to come.

— Joe Vorih, President

Aerospace and Aviation Engineers Trust OMEGA for our

- Quality process measurement and control products
- Selection of off-the-shelf sensors and instrumentation
- Ability to design and manufacture custom solutions
- Excellence in calibration and maintenance services
- Accessibility and expertise of our tech support engineers
- Quality standards: ISO 9001, ANSI/ASQC-Q90 series

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New Products for Aerospace and Aviation



Universal Input Touch Screen Data Loggers : OM-DAQXL

Eight or sixteen channel input portable data loggers. Fast sampling rate, large data storage, advanced capabilities.

For use in recording turbine blade fatigue test temperature data.

omega.com/om-daql



Portable Benchtop Oxygen Analyzers : GAB-1700 Series

Fast, accurate and reliable analysis of common gas mixtures. Non-depleting, component specific measurement for long life and minimal running costs.

For use in a calibration lab with oxygen testing.

omega.com/gab-1700



Wheatstone Bridge In-Line Signal Conditioners : IN-UVI Series

Supplies a highly regulated bridge excitation voltage for the transducer.

For use in clamping force control to avoid damaging carbon fiber parts.

omega.com/in-uvi



High Performance Pressure Transducers : PX5000-MV Series

Advanced sputtered thin-film sensor technology. High operating temperature and long-term stability.

For use in tough applications requiring high shock and vibration resistance.

omega.com/px5000-mv



Temperature, Process and Strain Controllers : CNPT Series

PLATINUM™ Series high performance, high accuracy PID controllers. Flexible functionality with the ability to program multiple outputs for all modes.

For use in temperature cycle control for the manufacturing of components.

omega.com/cnpt_series



Self-Adhesive Thermocouples : SA3 Series

Fast response in a thin flexible mounting pad. Outstanding heat and chemical resistance.

For use in humid and outdoor locations such as ground support equipment.

omega.com/sa3

OMEGA® Sensors Play a Vital Role in Commercial Space Mission Success

Recently an aerospace customer came to OMEGA with a problem. They were buying off-the-shelf RTDs and assembling them into a mechanical housing they'd designed for the job. After assembly, a high percentage of their RTDs failed to work as expected, and they couldn't determine the cause. They needed a solution—preferably one that let them continue to use standard products.

YIELD INCREASED TO 100%

Technical specialists from OMEGA determined that the high failure rate of probe assemblies arose from the way in which they were tested and assembled at the client facility. We recommended a fully assembled solution incorporating off-the-shelf OMEGA sensors. Working from drawings and samples of the client's components, we now manufacture the custom housing ourselves, assembling and shipping it with an OMEGA standard probe. As with all OMEGA products, testing and inspection are undertaken prior to shipment to make sure that the customer receives the best products for their applications. In this case, yield at the customer site jumped to 100 percent. Now our customer has the confidence to install OMEGA's turnkey solution without further testing.

STANDARD AND CUSTOM SENSORS FROM OMEGA

Sensors and accessories are the central nervous system of launch vehicles, payloads, and support systems. Besides supplying critical information to computers and controllers during preparation and flight, they enable real-time vehicle monitoring and control. They're also key to the extensive testing that every system and subsystem must undergo, helping to maintain consistent, stable component manufacturing processes.

In the past, many of the sensors used in space and aerospace were specially designed and tested for each application. In today's commercial space market, the emphasis is on lower cost products with shorter timelines. Off-the-shelf sensors and accessories meet those needs wherever possible. Specially configured or custom sensors are used only in select locations, and only when absolutely necessary.

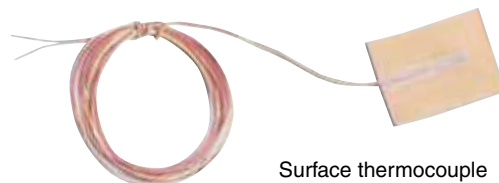
SENSORS FOR USE IN MULTIPLE ENVIRONMENTS

Propulsion systems, avionics, manufacturing, testing, and R&D are among the major use areas of sensors.

The **propulsion system** includes the engines, fuel tanks, and everything in between that provides thrust to the launch vehicle. Parameters such as temperature, pressure, load, flow, and vibration are measured throughout the system to assure health, safety, and efficiency.



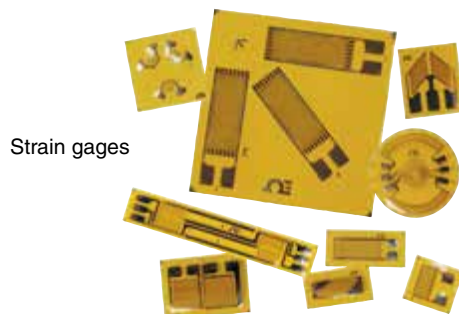
Commercial space manufacturers rely on OMEGA mineral-insulated thermocouples during pre-launch certification to determine if the systems are capable of providing sufficient thrust for launch and are ready for the rigors of flight. Surface sensors provide high accuracy and thermal response for engine performance evaluation.



Avionics are the electrical systems used in aircraft, rockets, and satellites and include communication, navigation, and all of the other functions of the vehicle. They receive important in-flight information and provide feedback to the computers and systems that control rocket and payload operations. OMEGA's thermocouples and temperature labels are used extensively in the lab to ensure electronic systems will function properly when exposed to flight conditions.

Manufacturing, Test, and R&D facilities test the durability of components subjected to rigorous stresses and environments. At launch and during flight, satellites, engines, system electronics, and related components are subjected to stresses and environments far in excess of those encountered in most industrial processes. Manufacturing must therefore meet stringent process-control requirements, followed by extensive testing. Components, subsystems, and systems are exposed to extremes of heat, vibration, and mechanical loads to verify that they will perform as expected. For example, fuel tanks must withstand the high pressures associated with the storage of cryogenic liquids.

OMEGA offers components such as load cells, strain gages, and thermocouples to test durability.



Temperature Sensors for Preflight



High Temperature Standard Size Thermocouple Connectors : HGST-K-M/F

High-performance with quick connection capability. The liquid crystal polymer shell is highly resistant to fire.

For use in reducing electrical noise from pumps and motors.

omega.com/hgst

Thermocouple Probes with Mini Transition : KMTXL-125U-6

For use in harsh, high-vibration, high-pressure, high-temperature applications that require extended life and accuracy.

omega.com/kmtxl_nmtxl

RTD Sensors : RTD-2-F3105

Fast response sensors used with custom housings or assemblies.

For use in aerospace applications where high-accuracy and repeatability are critical to the process performance.

omega.com/rtd-2-f3105

Surface Mount RTD Sensors : SA1-RTD

Class A accuracy self-adhesive sensors designed to provide convenient temperature measurements.

For use in critical temperature monitoring on surfaces and structures.

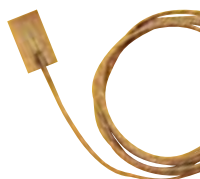
omega.com/sa1-rtd

Fine Diameter RTD (Pt100) Probes : PR-11

Precision measurement with Class A accuracy.

For use in applications that require a fast thermal response due to rapid temperature changes.

omega.com/fine_diameter_rtd_probes



Cement-On Thermocouples : CO1

Surface measurement thermocouples that are permanently mounted in high temperature applications.

For use in measuring the temperature of flat and curved metal surfaces found in turbine blade testing.

omega.com/co-k



Load Cell Washers : LCWD-10K

Compression force load cell that is installed between the bolt head and the nut, where it can measure the load as torque is applied.

For use in clamping forces, die loads, bolt stresses, weighing systems, and structural loads.

omega.com/lcwd



Thermocouple Terminal Blocks : DRTB-2

A polyamide construction with a UL 94 V0 rating. Provides excellent vibration and maintenance free corrosion resistant connection.

For use in automation, controls and calibration/auditing.

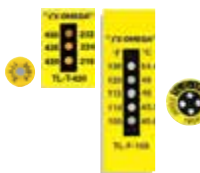
omega.com/drtb-2



Miniature Thermocouple Connectors : SMPW Series

For use in testing where chemical and flame resistance material is needed.

omega.com/smpw_smp_hmp_hmpw



Non-Reversible Temperature Labels : TL Series

Maximum temperature indicators.

For use in hard-to-measure areas such as airfoil surfaces.

omega.com/non-reversible-temperature-label

Calibrated Temperature Devices Maintain Rigid Quality Standards

Every device used for process-critical temperature measurements should be checked periodically to verify that it continues to deliver the required measurement accuracy. Equipment properties can change with time and use, become damaged in service (mechanically or by corrosion) resulting in rapid deterioration. Whenever possible, a device measuring outside of expected limits should be brought back to an acceptable performance level. The process of adjusting an instrument to meet those specifications is referred to as calibration.

An area of increasing importance is the production of carbon fiber components for automotive and aerospace use. As with other curing processes, temperature and pressure requires tight thermal processing and must be precisely controlled. Even in situations where temperature control is not essential for product performance, repeatability is needed for product consistency.

CALIBRATING TEMPERATURE SENSORS

The goal during any calibration is to expose the sensor to a known condition, to then measure its output and compare the two values. There are a number of ways to do this, but each will have a different level of uncertainty due to the differences in measurement accuracy, temperature stability, and heat transfer conditions between the sensor and the known condition among others.

Helpful information for calibration procedures can be found in standards such as the following from ASTM International:

- E563: Practices for the Preparation and Use of an Ice-Point® Bath as a Reference Temperature
- E2488: Practices for the Preparation and Evaluation of Liquid Baths Used for Temperature Calibration by Comparison
- E1502: Practices for the Use of Freezing Point Cells for Reference Temperatures
- E1750: Practices for the Use of Triple Point of Water Cells
- E644: Test Method for Testing Industrial Resistance Thermometers
- E220: Test Methods for Calibration of Thermocouples by Comparison Techniques



Calibration bath

CALIBRATION IN-HOUSE OR USE A CALIBRATION LAB?

For most organizations the determining factors are the volume of calibration work to be performed and the availability of in-house resources. Temperature calibration requires specific equipment, as well as training, knowledge of all the factors that affect the results, and in many cases infrastructure investments especially if certifications are needed.

OMEGA is accredited to ISO 9001 and offers calibration services to help satisfy our customers' needs for instrument certification.

CALIBRATION FREQUENCY

Quality Management Systems universally require calibration of all measuring equipment that can affect final product quality. Quality standards generally leave it to the user to decide how often a device should be calibrated. However, an auditor will expect a sound justification for whatever frequency is given. When establishing a calibration frequency, consideration should be given to the type of use the device sees, the risk of damage, and the rate of drift (which can be determined from historical calibration records). These procedures can define the actions needed if calibration shows a device is operating outside of acceptable limits.

Calibration is an important factor:

- Ensures that the proper conditions have been met in a process
- Verifies the accuracy of the temperature measurements and can provide the level of uncertainty for a calibration to those measurements
- Assures that the equipment has not changed since the last calibration
- Formal accreditation means a customer can be confident that the appropriate procedures were followed
- Provides the documentation that can be required and can help prove a part was treated correctly

Periodic checks are advised and specific calibration frequencies should be established to verify both accuracy and measurement uncertainty. We offer hundreds of calibration products, technical support and dedicated calibration services from our website, state-of-the-art labs, and facilities.

Remote Connectivity for Sensing and Centralized Monitoring

In today's networked environment, businesses rely more than ever on remote connectivity and data collection. For interactive control sensing and centralized monitoring specifically, aerospace and aviation technicians are increasingly implementing remote data solutions to drive informational displays or to support control and alarm functions.



OMEGA's connectivity products are the solution preferred by organizations serious about 24/7 monitoring, often under harsh conditions and in remote areas.

WIRELESS VERSUS WIRED SOLUTIONS

There are two categories of device connectivity products: wireless and wired.

Wireless Connectivity Solutions

OMEGA wireless solutions include the ZW (long range) and the UW family of transmitters. Both are based on IEEE 802.15.4 2.4 GHz transceivers and the wSeries of WiFi transmitters.

ZW and UW products exchange data with a ZW-REC receiver that accumulates data from all remote transmitters. They support an Ethernet connection, which you can configure and control via a web server and a direct command interface. The WiFi transmitters exchange data with the local WiFi wireless router. They also provide a direct command interface.

Wired Connectivity Solutions

When a wireless solution won't suffice, you can still rely on hardwired connections to get the job done.

- **Meters and Controllers :** OMEGA's wired solutions include the PLATINUM™ family of meters and controllers and the iTH family of iServer products. They provide internal Ethernet connections using a web server and direct command interface.
- **OMEGA Web Server :** The OMEGA Web Server provides convenient on-screen display of data from remote devices. Its capabilities include charting, alarming, and email.

REMOTE DATA ACQUISITION

All OMEGA Ethernet-capable devices allow you to access the device directly using TCP/IP transactions. You can also run commands to verify system status as well as access data for use in custom applications.

The OMEGA® Dashboard Software

A dashboard server configured for your organization allows you to see, at a glance, the status of the system and the nature of data running through the network. The Dashboard Server application runs in the background on a network server computer and collects data from multiple OMEGA devices. Setup your dashboard to personalize the display, generate charts, control alarms, and handle email. Supports both standard and secure (SSL) OMEGA connected devices.

The OMEGA® OPC Software

Collects data from Ethernet-connected devices and presents it in an industry-standard format. It works well with such third-party tools as DASYLab®, LabVIEW®, Intellution, Wonderware® and Rockwell Automation®.

Monitor and Protect High-Value Assets During Storage and Transport

To address the limitations of conventional solutions to protect high-value assets, OMEGA has developed an automated data collection system with wireless sensors. The continuous and proactive monitoring that we provide allows preventative action before damage occurs in sensitive assets, minimizing the impact of any deviations from the specified environment.

As aerospace engineers are well aware, high-value assets such as control panel assemblies, propellant tanks, and propellant fuel must be maintained in controlled environments during all phases of production, storage, and transportation. Exposure to extreme humidity or temperature during storage, for example, can cause irreparable damage to sensitive components and result in millions of dollars of losses. Even worse, an undetected defect could cause catastrophic failure during operation.

The traditional approach to asset monitoring has been to attach passive temperature/humidity monitors to inventoried items. These require a periodic manual survey of all inventoried items, which is both labor intensive and prone to human error. This is also not a continuous monitoring solution, since it simply reacts to problems that have already occurred. What the industry needs is a proactive, preventative strategy.

RELIABLE PROTECTION WITH THE OMEGA® ZW WIRELESS MONITORING SYSTEM

You can confidently rely on our ZW wireless monitoring system to provide the data assurance and security critical to the protection of high-value aerospace assets such as rocket engines.

OMEGA's robust solution consists of installing individual sensor nodes that regularly sample the environment and transmit the information to a receiver that maintains a complete database of all sampled data. In addition to providing in-situ monitoring, the probe units are capable of continuous monitoring even when removed from the wireless environment during transportation. The result is a full audit trail through the entire life cycle of the assets.

Data Assurance

Data losses can occur at many levels: radio loss, receiver loss, Ethernet connectivity loss. Although these types of failures are usually quickly corrected, the loss of information during down time can put millions of dollars of valuable materials at risk. OMEGA® ZW Series wireless receivers provide confirmation to the transmitter that the data has been correctly received, with automatic retransmission as needed. Data logging at every potential failure point allows recovery of information once the system is restored. Additionally, the power conservation feature lets the user unplug



Wireless monitoring system

the temperature/humidity sensor while continuing to log environmental data during transport of valuable material—thus providing continuous coverage.

Data Security

Cybersecurity is a key concern in all industries, but is especially critical to aerospace and military suppliers. Although the environmental data itself may not be of interest to adversaries, the inferred information regarding quantities, dates, and material movement may be extremely sensitive. The ZW Series provides full 128-bit SSL encryption to guard against any intrusions.

Power Management

Wireless product power management is always a concern, especially for extension of battery life. The ZW Series uses adaptive transmission rates based on the measured data exceeding specified thresholds, as well as local data logging that allows burst transmission to maximize battery life.

Asset Monitoring



Wireless Transmitters and Receivers : ZW-ED / zTHP-P / ZW-REC

Communicate with various wireless equipment to display data.

For use in continuous and proactive monitoring of temperature, humidity and barometric pressure measurements in testing rocket engines.

omega.com/zw-ed

omega.com/zed-p_series

omega.com/zw-rec



iServer Transmitter : iBTX-W

For use in monitoring control room temperature and barometric pressure with an Ethernet connection.

omega.com/ibtx_ibthx



Self-Adhesive Thermocouple : SA3-K

Robust temporary or permanent thermocouple.

For use in rocket skin temperature sensing during launch.

omega.com/sa3



Digital Panel Meter : DP32PT

Versatile measurement with universal inputs and very high accuracy.

For use in control room monitoring of launch sensors.

omega.com/dp32pt_series



Differential Pressure Gauge :

DPG409-001DWU

Very high precision in a rugged NEMA 4X (IP65) enclosure.

For use in reliable pressure measurement in storage facilities to maintain positive conditions.

omega.com/dpg409_diff



Low Profile Load Cell : LCHD-50KC2IS

FM approved intrinsically safe load cells.

For use in monitoring tower frame forces and other hazardous locations.

omega.com/lchd-is

Unique Solutions to Challenging Automation Applications

How do you hold a brittle workpiece without crushing it? That was the problem a builder of precision CNC machines for the aerospace manufacturing industry brought to OMEGA Engineering. They needed a way to measure clamping forces quickly enough to stop the clamping motion from damaging the part.

SPECIAL DEMANDS OF AEROSPACE MANUFACTURING

In pursuit of weight savings, aerospace companies are moving towards more exotic materials. While stronger and lighter, these materials are also challenging to machines. They may chip, fracture, or burn if handled and machined incorrectly. As many are composite structures, it's possible for damage to occur internally where it can only be detected with expensive inspection techniques.

Carbon fiber is a good example. Usually combined into a composite with a very high strength-to-weight ratio, it is exceptionally rigid and strong—but also brittle. Holding it in place for secondary machining operations requires very careful control over clamping forces to avoid damaging or even crushing the parts.

MEASURING CLAMPING FORCES

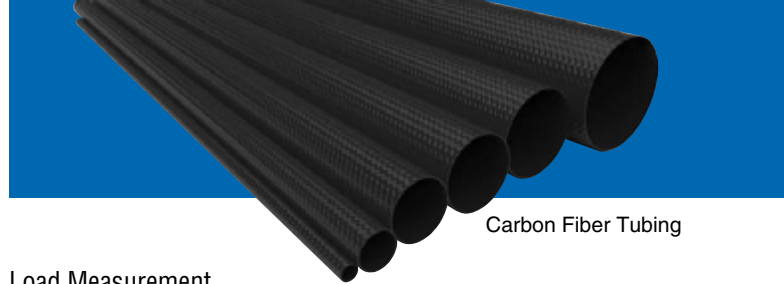
This was the problem OMEGA's customer faced. They were designing special-purpose CNC machines for drilling holes in long, thin carbon-fiber-composite components. The nature of the part meant it needed clamping it at each end, to be achieved by servomotors.

Rather than drive the clamps to a fixed position, the machine designers wanted to maneuver them in to achieve a predetermined load. This approach was preferred primarily because there will always be some variation in part length; thus, some parts would be clamped too tight and others not tight enough. Clamping to a load would avoid damaging or dropping the workpiece.

To minimize automation cycle time, these motors would move the clamps in rapidly before slowing to $\frac{1}{16}$ th of an inch per second. Servomotors are capable of providing 200-300 pounds of force, so the machine needed to sense the onset of clamping and stop the servomotors before forces became too high.

THE OMEGA SOLUTION

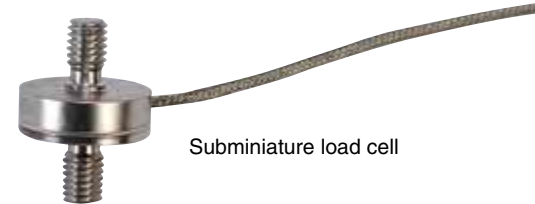
The problem posed three challenges for OMEGA. First was the need to incorporate a compression load cell into the servo-clamping system of the automated machine. Second, as the machine controller would be remote from the load cell, the millivolt output signals needed amplification and conditioning to avoid any degradation affecting accuracy. And third, all this had to happen fast enough to meet the speed and cycle time requirements of the automation controller.



Carbon Fiber Tubing

Load Measurement

To measure the clamping force, OMEGA proposed using the LC201 series subminiature load cells. Just 19 mm (0.75") in diameter and 6.4 mm ($\frac{1}{4}$ ") thick, these cells come with dual mounting studs for easy installation, and measure both compressive and tensile forces up to 500 N (metric models) or 300 pounds. Stainless steel construction protects against damage, and a four-conductor shielded cable handles both the 10 Vdc excitation and millivolt output signals.



Subminiature load cell

Signal Conditioning

Conventional DIN-mounted signal conditioners were unable to deliver the speed needed for precise motion control. That led OMEGA to recommend the new IN-UVI high speed signal conditioner. With a response time of 200 μ S, the conditioner would ensure that the controller stopped the clamping motion before damaging the workpiece.



In-line signal conditioner

The IN-UVI is an in-line Wheatstone bridge signal conditioner packaged in a compact IP65 stainless steel enclosure. Ideal when space is limited, it improves the signal-to-noise ratio, allowing millivolt signals from the load cell to be sent over longer distances. A supply voltage of 22 to 32 Vdc provides the load cell with one of two user-selectable excitation voltages and amplifies the millivolt output signal to suit the controller requirements.

OUTCOME: REDUCED PART DAMAGE

OMEGA's customer has outfitted more than 20 machines with load cell control of clamping forces. Each system uses two LC201-300 pound load cells (for redundancy) and two IN-UVI signal conditioners. Operating at high speed, they deliver the signals needed for precise clamping force control. This has resulted in faster response, higher reliability, and—most important of all—reduced workpiece damage.

Automated Manufacturing



Pressure Transducers : PX409 Series
High accuracy, high performance, stainless steel.
For use in scale-model and full-scale flight tests.
omega.com/px409_series



Low Profile Load Cell : LC412-IS
Tension and compression measurements.
FM rated, intrinsically safe.
For use in hazardous locations including fuel and engine testing.
omega.com/lc412-is



Triaxial Accelerometer : ACC301A
Titanium construction makes it very rugged.
For use in lightweight single-point monitoring vibration in three (X-Y-Z) planes.
omega.com/acc301



High Temperature Strain Gages :
OMEGA®/HBM-M Series
Foil strain gages for stress analysis of materials with high fatigue strength.
For use in high temperature fiber composites and resistance to alternating loads.
omega.com/hbm-m-series



Digital Pressure Gauge with Analog Output : DPG409
Wireless transmitter option allows for remote monitoring, chart recording and data logging.
For use in storage facilities requiring high precision to maintain positive conditions.
omega.com/dpg409



Bridge/Strain Gage Signal Conditioner : DMD4059
Filters, amplifies, and converts the millivolt signal into the selected DC voltage or current output that is linearly related to the input.
For use in applications with load cell weighing and scales, strain gage pressure transducers, tanks and melt pressure.
omega.com/dmd4059



Portable, High Accuracy Multifunction Calibrator : PCL1200
Laboratory grade instrument that displays the measurement of volts, current, pressure, RTDs, thermocouples, frequency, and more.
For use in the lab or field for equipment calibration.
omega.com/pcl1200

Products for Aerospace and Aviation



Thermistor Thermometer : HH42A

Ultra-high accuracy and high resolution. Record, chart, and store data with the included software.

For use in a precision laboratory, or critical process control and testing functions.

omega.com/hh42a



TEMPERATURE

Thermocouple and RTD Calibrator : CL543B

High accuracy automated temperature calibration.

For use in calibrating meters and controllers that monitor and control laboratory tests.

omega.com/cl543b



Pipe Clamp Thermocouple : 8800PC-K

Secure clamping for fast response.

For use in temperature measurements of pipes for laboratory and industrial use.

omega.com/8800pc-k



Transition Junction Thermocouple Probes : TJ36 Series

Super accurate and stable at high temperatures.

For use in applications that require excellent resistance to oxidation, carburization and chlorination.

omega.com/tj36caxl_nnxl



TEMPERATURE

Self-Adhesive or Cement-On Surface Thermocouple : SA1XL Series

Quick response time for high or low temperatures.

For use in measuring piping and component temperatures conveniently.

omega.com/sa1xl



Vacuum Thermocouple Sensors : TCV-CB Series

Probe assemblies with M12 connector and mounting flange with special probe lengths available.

For use in vacuum systems during heat treating and curing processes.

omega.com/tcv-cb

Products for Aerospace and Aviation



Temperature Transmitters : TX400 Series

Miniature head mount provides temperature readings improving signal accuracy for remote measurements.

For use in RFID communications ensuring high precision on the reading scale.

omega.com/tx400-series



DIN Rail Mount Transmitters : TXDIN400 Series

Temperature transmitter that accepts Pt100, Ni100 RTD and thermocouples.

For use in transforming a temperature or process signal into a linearized 2-wire loop-powered 4 to 20 mA output.

omega.com/txdin400



Heat Tape with Thermostatic Control : PH1 Series

Ready-to-use pipe heater.

For use in indoor and outdoor environments requiring freeze protection.

omega.com/ph1



Universal Benchtop Digital Controller : CS8DPT

Controller with embedded Internet options and remote capability.

For use in laboratories, controlling experiments, and process monitoring.

omega.com/cs8dpt



Thin Film Pressure Transducers : PX5500/PXM5500 Series

High performance solid state reliability in a sputtered strain gage design.

For use in demanding industrial and research applications where accuracy and stability are critical.

omega.com/px5500



Industrial Pressure Transmitters : PX51/PXM51 Series

High-accuracy, low-cost, and heavy-duty all stainless steel construction.

For use in the harshest environments.

omega.com/px51-pxm51-series

PRESSURE

Products for Aerospace and Aviation



In-Line Field Calibratable Signal Conditioner : IN-USBH

Adds digital USB output to mV/V pressure or load transducers.

For use in remote areas converting your laptop or tablet into a virtual meter, chart recorder, and data logger.
omega.com/in-usbh



Linear Variable Inductive Transducers : LDI-127 Series

Heavy-duty position sensing contactless device.

For use in heavy-duty factory automation, industrial and commercial applications.
omega.com/ldi-127



Load Cells for Hazardous Locations : LCHD/LCMHD-IS Series

FM Approved intrinsically safe, low profile load cells with 5 different electrical terminations.

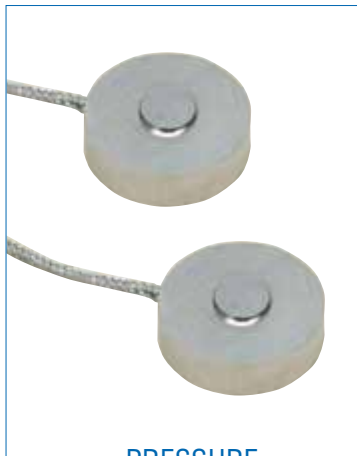
For use in structural testing of rockets and rocket engine thrust stands.
omega.com/lchd-is



Pressure Transmitters : PX509/PXM509-IS Series

FM Approved intrinsically safe, rugged all stainless steel.

For use in hazardous locations, all classes and zones.
omega.com/px509-is



Subminiature Low Profile Load Cell : LCKD Series

Delivering high performance and rugged all stainless steel construction.

For use in industrial load measurement, assuring superior linearity and stability.
omega.com/lckd



High-Capacity Tension Link Load Cells : LC702/LC712 Series

Heavy-duty all stainless steel construction for high capacity loads.

For use in measuring the load on cables for cranes, engine test beds, and industrial weighing.
omega.com/lc702

PRESSURE

Products for Aerospace and Aviation



DAS / WIRELESS

Long Range Wireless Transmitter : ZW-ED

Transmit data over long distances with our reliable sensor/transmitter system.

For use in web-based monitoring of temperature, humidity, and barometric pressure with no special software required.

omega.com/zw-ed

Long Range Wireless Receiver : ZW-REC

Receive data assurance and data security in one system. Connect directly to an Ethernet network.

For use in collecting data during all phases of production, storage, and transportation.

omega.com/zw-rec

Thermocouple Input Data Acquisition System :

OMB-DAQ-TC-RACK

32-channel USB/Ethernet system with exceptional performance and accuracy.

For use in collecting and storing process information with USB and Ethernet communications capability.

omega.com/omb-daq-tc-rack



FLOW

Velocity and Temperature Measurement System :

TVS-1000

The sensor is a flexible, robust base-and-stem design sensor that measures both temperature and air velocity.

For use in measuring cabin air flow.

omega.com/tvs-1000

Coriolis Flow Meters :

FMC-5000 Series

Accurate measurement of liquids, gases and slurries.

For use in deionized water flow. The aerospace industry requires ultrapure water for high-precision fabrication of components.

omega.com/fmc-5000

Portable Handheld Particle Counter :

HHPT-51

Holds 500 samples in memory and records the data of each sample. The data can be easily downloaded using the USB interface cable.

For use in measuring and reporting cabin air quality.

omega.com/hhpt-51

OMEGA Assures Aircraft Engine Turbine-Blade Integrity

The integrity of the turbine blades in an aircraft engine is essential for its safe operation. These blades are subject to a variety of stresses during the engine's operation cycle, including rapid heating, sustained high temperature, and cooling. It is therefore vital to ensure that this repetitive cycle does not affect the structural integrity of any turbine blade since the failure of a single blade can affect other blades and cause the total engine failure.

THE OMEGA SOLUTION

The primary challenge of testing turbine blades is their repetitive thermal cycling. The CS8DPT PLATINUM™ Series Universal Digital Benchtop Controller from OMEGA Engineering is an ideal solution in quality lab environments. It combines enhanced ramp/soak programmability, complete portability, and remote monitoring via the Internet. These controllers make data collection, reporting, and analysis just as easy to accomplish outside of the office as they are in a quality lab.

A heat-controlled chamber is the standard method of testing designs for turbine blades. This procedure allows technicians to test different geometries and materials for optimal performance. Heat-controlled testing also provides the data needed for failure analysis and life expectancy of the proposed design.

Technicians can place the blade under a thermal load known as the ramp/soak period to simulate its operation in an engine. This procedure generally involves heating the test chamber at a specified rate to test various heat profiles. A constant temperature is then maintained for a designated period of time and allowed to cool. The blade may then be inspected for stress cracks, which could cause the blade to fail.

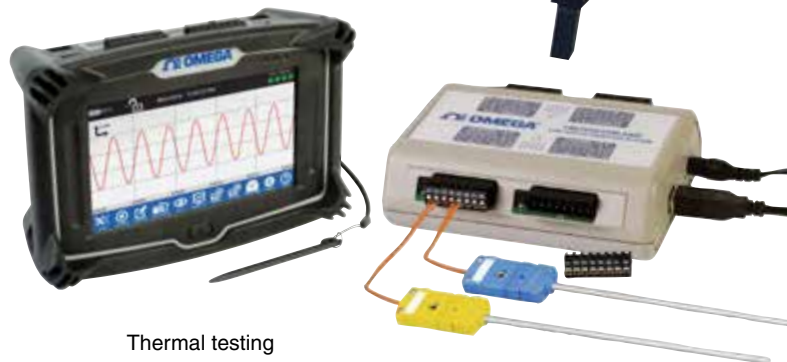
REPETITIVE THERMAL CYCLING

Proper testing of a turbine blade requires it to be subjected to repetitive thermal cycling; otherwise the experimental requirement for a thorough simulation of the turbine blade damage factors under stress conditions will not be satisfied.

The CS8DPT Benchtop Controller has an enhanced ramp/soak capability that consists of up to 99 programs with 16 bidirectional ramps, including ramp/soak events and remote start. This unit also allows an aerospace technician to link individual ramp/soak profiles together to create a continuous cycling profile. These features allow easy configuration of optimal test parameters, ensuring the turbine blade is exposed to the required thermal cycling.

PORTABILITY

The test chambers used in the aerospace industry are often customized for the specific size and configuration of the turbine blade being tested. This practice makes portability an essential feature of test equipment.



Thermal testing

The OMEGA® CS8DPT temperature controller is highly portable, giving it a flexibility that saves time and money. Technicians can easily move the unit to a different position in the test lab or to a different test chamber. The CS8DPT's programmable dual three-color displays indicate both setpoint and real-time temperatures, easily read from anywhere in the test lab. Additional connections are directly accessible from the rear panel of the CS8DPT, including an internal 5A solid-state relay control output; power, fuse, and input connections; and an optional Ethernet port.

REMOTE MONITORING

Aerospace engineers and technicians also need to monitor the controller units remotely. This capability allows engineers to adapt to changing test conditions in a highly cost-effective manner from any location. The ability to configure and adjust controller units remotely also saves time.

The CS8DPT comes with the OMEGA® Dashboard Software, which is embedded firmware that can serve web pages over the Internet or an Ethernet LAN. This web server allows technicians to monitor and control a test through a web browser and make modifications, such as changing setpoints or alarm points and turning the heater on and off during testing.

COMPLETE LINE OF THERMAL TESTING PRODUCTS

OMEGA's KMTXL thermocouple probes can accurately measure the test chamber's temperature to ensure the integrity of the testing. Other OMEGA solutions can then record temperature versus time data, such as the OM-DAQXL Touch Screen Data Logger, OM-DAQ-USB-2401 USB Data Acquisition Module, and OMEGA's UWBT Series of Wireless Bluetooth® Transmitters.

Quality/Test Laboratory



Wireless and Wired Monitors :

ZW-ED / UWBT / iTHX-SD

For use in monitoring test lab environmental conditions.

omega.com/zw-ed

omega.com/uwbt

omega.com/ithx-sd



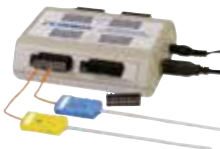
Universal Input Touch Screen

Data Loggers : OM-DAQXL

Eight or sixteen channel input portable data logger with advanced programming capabilities.

For use in recording turbine blade fatigue test temperature data.

omega.com/om-daql



USB Data Acquisition Module :

OM-DAQ-USB-2401

Eight differential/sixteen single-ended thermocouple/voltage input.

For use in recording aerospace composites curing temperature data.

omega.com/om-daql-usb-2400



Laboratory Grade Benchtop Wind-Tunnel with Instrumentation : WT4401

Precise motor control for adjusting flow rates.

For use in calibrating flow meters that measure test chamber air flows.

omega.com/wt4401



Load Cells and Pressure Transducers :

LCMFD / PX409

For use in measuring turbine blade test stand frame forces and chamber pressures.

omega.com/lcmfd

omega.com/px409_series



PLATINUM™ Benchtop Controller :

CS8DPT

Enhanced ramp/soak programmability, complete portability, and remote monitoring via the Internet.

For use in controlling experiments and process monitoring in a test lab or test chamber.

omega.com/cs8dpt

OMEGA Has a Starring Role in the LSST Telescope Mirror

The Large Synoptic Survey Telescope (LSST) is a new kind of optical telescope. Once complete, the LSST will view a wider area of the night sky than any of its predecessors. Images will be captured by a 3.2 billion pixel camera, the largest ever built, revealing the universe in unprecedented detail. OMEGA Engineering is proud to play a defining role in its success.

Key to the success of the LSST camera is its complex three-mirror design that minimizes optical aberrations and allows detection of faint objects with exposures of only fifteen seconds—twenty times faster than other telescopes. Short exposure times and a very wide field of view will let the LSST survey the entire sky twice each week.

One use of the LSST will be detection and tracking of near-earth objects that might pose collision threats. Another is the capture of short-lived cosmic events conventional telescopes miss. Ultimately, the LSST will be used to create a detailed 3D map of the universe. This will support the search for dark matter and help astronomers understand dark energy, both of which, for now, remain theoretical.

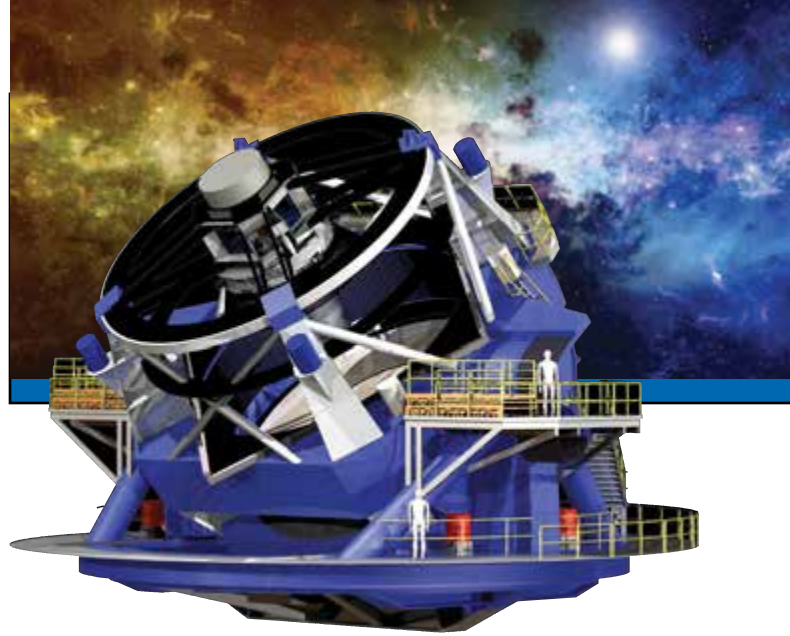
LSST construction began in 2011 and is scheduled for “Engineering First Light” (when the telescope takes its first look at the stars) in mid-2020.

AMONG ONE OF THE LARGEST MIRRORS ON EARTH

Probably the most physically impressive element of the LSST is its huge 8.4 m (27') mirror. This unique structure incorporates both the primary (M1) and tertiary (M3) mirrors of the telescope in a single piece of glass.

Cast in 2008, this “M1M3 monolith” underwent years of grinding and polishing to achieve the nanometer precision needed. After removing over 11,000 pounds of material the mirror was formally accepted on February 13, 2015.

With such a massive mirror, expansion and contraction from temperature differentials could have a seriously detrimental effect on both the precision of the grinding and polishing operations, and in-service performance. OMEGA was able to help overcome this thermal challenge and contribute towards a successful outcome.



To eliminate temperature differentials the LSST design team came up with a custom thermal control system mounted on the back surface of the mirror. The design called for precision thermocouples to be bonded to the mirror front, back and mid-plane at 146 locations. Upon detecting a temperature difference between any of these locations the control system would apply a correction.

THE OMEGA SOLUTION

The specification required differential temperature measurements to be repeatable and accurate to 0.1°C. The best way of achieving such high performance is by using high quality thermocouples made with wire from the same lot. Unlike other suppliers, OMEGA was ready and willing to meet this and other demanding requirements. With our large insulation extrusion operation, we had significant quantities of same-lot thermocouple wire readily available. After a review of our production capability and quality assurance procedures, we got the go-ahead to proceed with the manufacture.



The thermocouples supplied were OMEGA's standard 5TC Series models, but made from a single lot of Special Limits of Error thermocouple wire. In addition, they were handled and packaged as mandated by the LSST team. The leads were all terminated with OMEGA's strain relief connectors. Coiling in large rolls allowed for very high uniformity between the numerous thermocouples, greatly improving temperature measurement and tracking at the large number of locations involved.

TEMPERATURE MONITORING TO EXACT SPECIFICATIONS

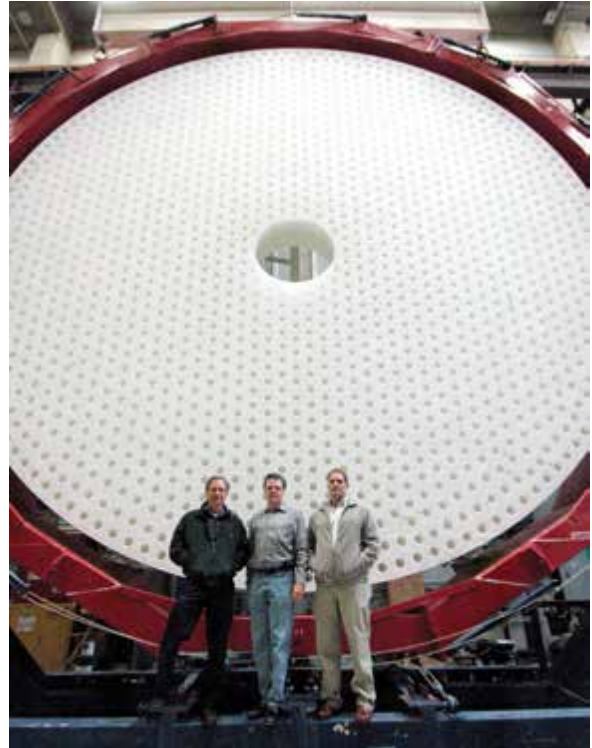
The end result: The LSST team reported that by using the OMEGA 5TC thermocouples, the temperature monitoring system performed to the 0.1°C system requirements.

When the telescope is finally completed, these same thermocouples will be used for ongoing thermal monitoring of the mirror. A digital processing package will use this data to compensate for distortion caused by mirror expansion and contraction.

Following the success of this project, OMEGA was asked to supply additional same-lot thermocouples for test and measurement applications on other phases of the project.

WHY CHOOSE OMEGA

The LSST telescope mirror application is a good example of our commitment to do what it takes to meet our customers' needs. With our extensive custom-engineering capability and experience fulfilling special customer requirements, OMEGA is the go-to choice for test and measurement applications.



Quality is Our Driving Force

At OMEGA, we recognize that commitment to quality is the key to customer satisfaction. This is why our policy is to provide reliable products at a fair price that exceed our customers' expectations.

OMEGA has been certified as being in compliance with the requirements of ISO 9001, ANSI/ASQC-Q90 series for the design, manufacture and distribution of temperature, flow, pH, heating, data acquisition, pressure, environmental instruments and related process equipment, accessories, and custom assemblies, plus provision of calibration services and technical and scientific literature.

We strive to maintain the worldwide quality standards set forth by ISO (International Organization for Standardization) through employee training, rigorous internal auditing, structured and controlled documents, and all required elements as approved by BSI Management Systems, our international accredited registrar.

OMEGA complies with worldwide safety and EMC/EMI regulations that apply. We are consistently pursuing certification of our products to the European New Approach Directives, and add the CE mark to every appropriate device upon certification.

View ISO 9001 Certificate of Registration here: omega.com/iso9001/iso9000cert.pdf

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