



SINT[®]
Technology

TÜV AUSTRIA Group

CENTRE OF EXCELLENCE IN MEASUREMENT TECHNOLOGY

COMPANY

SINT Technology is a privately owned company, which has been in business since 1990. Having a mechanical engineering background, SINT Technology started supporting R&D departments of small and medium sized enterprises by supplying measurement and testing services.

The experience and competency gained over the years have been leading to a consistent growth of our company, which now delivers a diversified portfolio of services and products also for large enterprises at national and international level.

In 2021 SINT Technology joined TÜV AUSTRIA, becoming a reference within the Group for field measurements & testing.

From Florence (Italy), where the company is located, SINT Technology supports its customers worldwide with expertise and commitment.

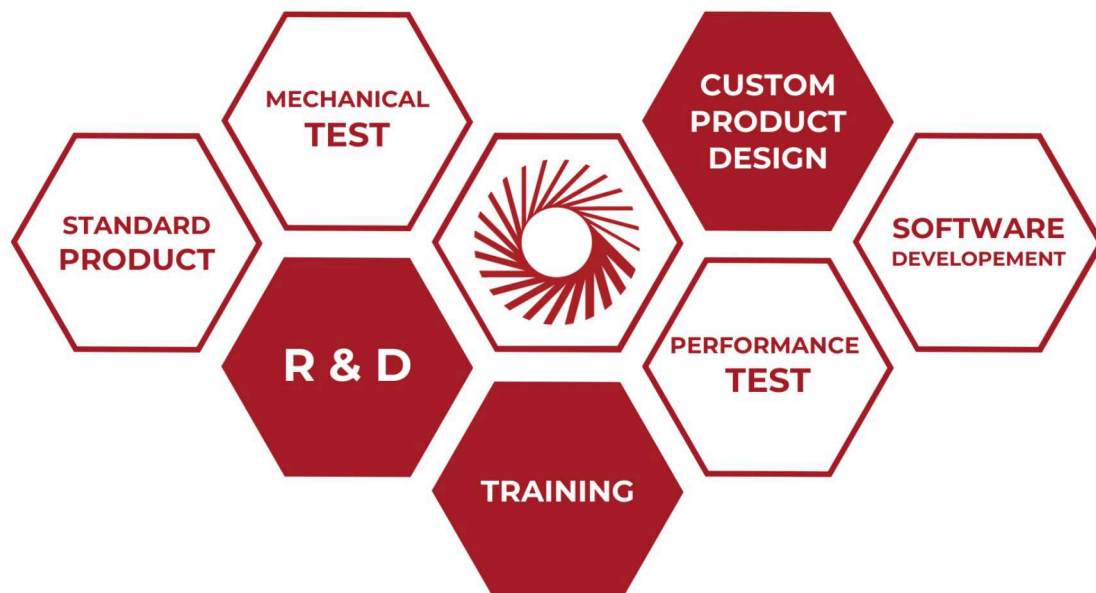


ORGANIZATION

Relying on a staff of about 40 employees, mostly university graduates and qualified technicians, the Company has the experience and the infrastructure to perform activities regarding testing, production of measurement equipment, mechanical and electronic design & software development.

SINT Technology is also a trusted partner and a centre of excellence recognized by the Italian Accreditation Body ACCREDIA.

Continuous improvement in research and innovation makes our solutions the state of the art in experimental testing and in the production of measurement system.



VIBRATION MEASUREMENTS AND ANALYSIS

Vibration measurement and analysis are important instruments for characterization, monitoring and diagnostics of machinery, structures and plants. Analysis of the vibration behaviour of machinery and structures is one of the most important and effective techniques for monitoring the "**health status**" of a machine. At the same time, vibration analysis makes it possible to identify the main causes of **malfunctions**. Here below some of our main services:



- 1 // *Vibration measurement on rotating and reciprocating machinery*
- 2 // *Rotor balancing (trim balance)*
- 3 // *Vibration diagnostic and troubleshooting*
- 4 // *Measurement and analysis of torsional vibration*
- 5 // *Vibration acceptance test*
- 6 // *Vibration Condition Monitoring (CBM)*
- 7 // *NVH testing (Noise, Vibration and Harshness)*

Vibration analysis can be used in Structural Health Monitoring (SHM), including but not limited to:

- Bridges • Highway • Buildings • Pipes

SINT **engineers** and **technicians** have obtained the following **certifications**:

ISO 18436:2 — *Vibration analysis — category II and III — TÜV Austria*

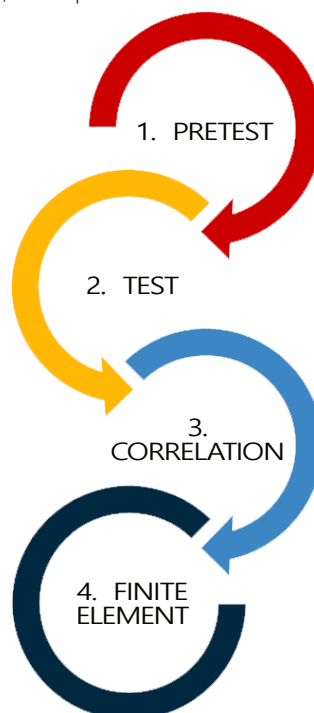
EXPERIMENTAL MODAL ANALYSIS

Experimental Modal Analysis (EMA) is an effective tool for describing, understanding and modelling the dynamic behaviour of a structure. Thanks to EMA, it is possible to reach the following results:

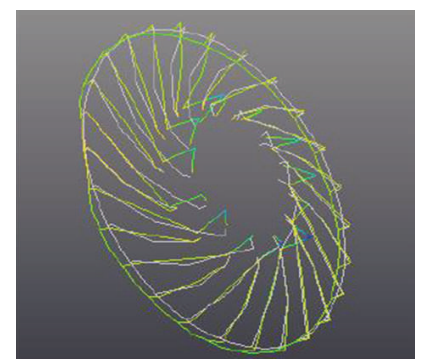
- Determine the main **modal parameters**:
 - Natural frequencies
 - Mode shapes
 - Damping
- Verify accuracy and calibrate a **Finite Element** model (FE).
- Troubleshooting vibration problems (e.g. identify and solve problems of resonance).

The analysis can be performed with the **impulsive** (instrumented hammer) or **continuous** type (shaker) of the **excitation**. SINT Technology uses the following techniques:

- Experimental Modal Analysis (EMA)
- Operational Modal Analysis (OMA)
- Operation Deflection Shape (ODS)



SINT Technology can carry out the **PRE-TEST** analysis (in order to choose the best set-up measurement) and the **CORRELATION** analysis (for the comparison of the Finite Element Model with the experimental model).

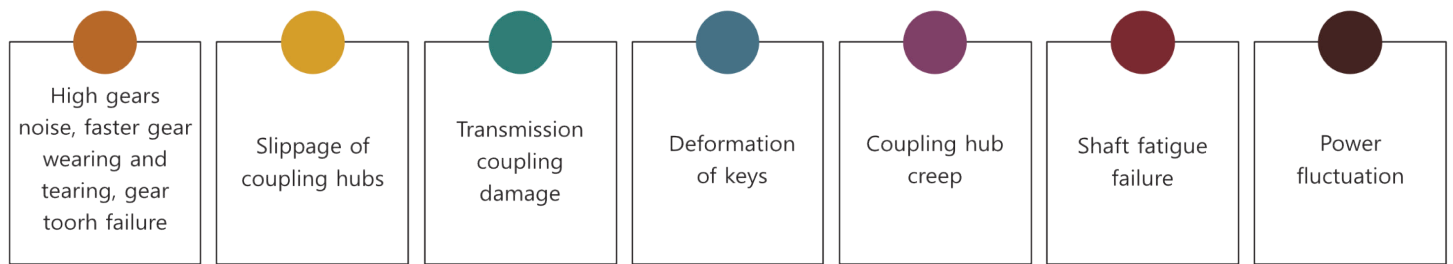


TORQUE AND TORSIONAL VIBRATION MEASUREMENTS AND ANALYSIS

Torque measurement is used to evaluate transmitted mechanical power. It is very useful to know the power delivered by a machine or the power used for its operation.

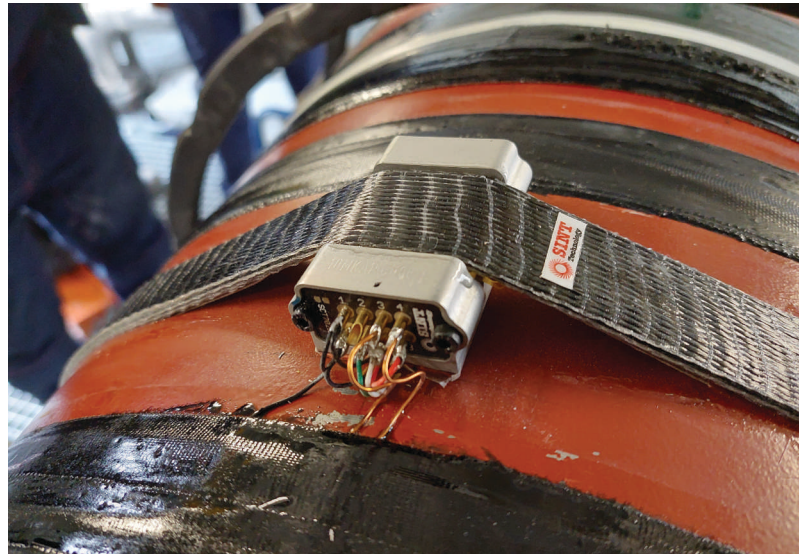
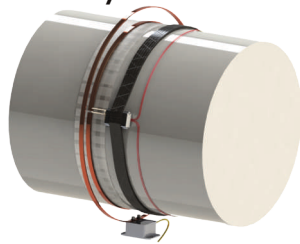
Torsional vibration measurement is an important diagnostic instrument to identify irregularities during operation of a machine that can lead to damage of the rotating parts. Torsional vibrations may increase the stresses caused by normal rotational motion.

Main problems that can be found with torsional measurements are:



SINT Technology can supply the **complete telemetry systems** and the services of measurements and analysis of torque and torsional vibrations with following methods:

- **ZEBRA-TAPE** (with **optical probe**)
- **GEAR WHEEL** (with **non-contact probe**)
- **STRAIN GAGE** (with **battery** and **inductive telemetry**)



NOISE AND SOUND INTENSITY MEASUREMENTS AND ANALYSIS

Reliable and accurate sound measurement is essential to check the compliance with design specifications and legal requirements and for the identification and mitigation of noise sources.

The measurement of sound intensity makes it more straightforward to determine the Sound Power (Lw) of a source, particularly as it dispenses with the costly and complicated tests in anechoic or reverberant rooms. SINT Technology offers this service in accordance with the standard **ISO 9614-2 - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning.**

1. *Sound power level measurements*
2. *Noise mitigation interventions*
3. *Noise source identification*
4. *Noise mapping*
5. *Noise troubleshooting*

MEASUREMENT OF MACHINE AND PLANT PERFORMANCE

SINT Technology is a valuable supplier for both the **Oil&Gas** and the **Power Generation** sectors, having a wide expertise in the thermodynamic performance assessment of:



- 1 // *Gas and steam turbines*
- 2 // *Centrifugal and reciprocating compressors*
- 3 // *Centrifugal and reciprocating pumps*
- 4 // *Heat recovery steam generators and fired boilers*
- 5 // *Simple-cycle and combined-cycle power plants*
- 6 // *Waste-to-energy power plants*
- 7 // *Biomass power plants*

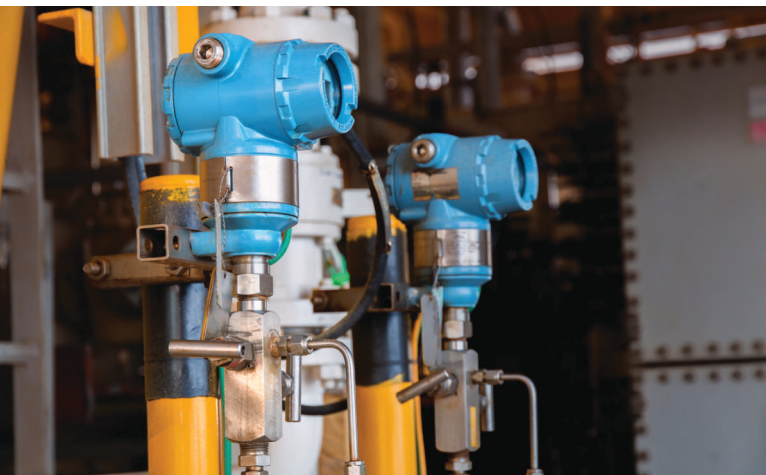
Whether a **guarantee acceptance test** is requested on a new unit for contractual fulfilment, or there is the need to verify the performance improvement after a major overhaul/maintenance on an existing unit, our Performance Testing Department delivers **complete solutions** for machinery and plant performance testing, including:

Design and execution
of the test

Supply of calibrated
measurement
instrumentation

Data acquisition
and analysis

Experienced test
engineers



Moreover, it provides customers with consultancy on **measurement best practices** and testing codes requirements for **contract compliance**.

The recognition from the Italian Body of Accreditation ACCREDIA for thermodynamic performance testing makes SINT Technology a Reliable Third-Party for an **independent evaluation** of the condition of any asset.

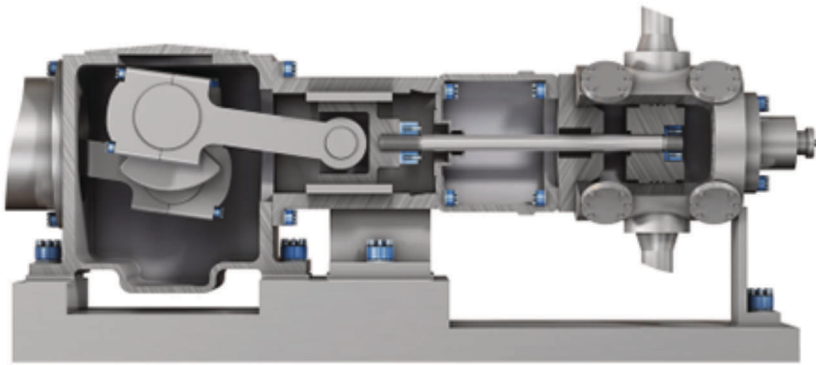


Gas emissions monitoring is also fundamental for industrial machinery and plants.

SINT Technology has in-depth experience in measurement of the main exhaust components, such as nitric oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO₂), oxygen (O₂) and sulphur oxides (SO_x).

RECIPROCATING COMPRESSOR DIAGNOSTICS

Reciprocating compressor diagnostics is important for checking the machine conditions in order to detect behaviour changes and preventing machine faults.

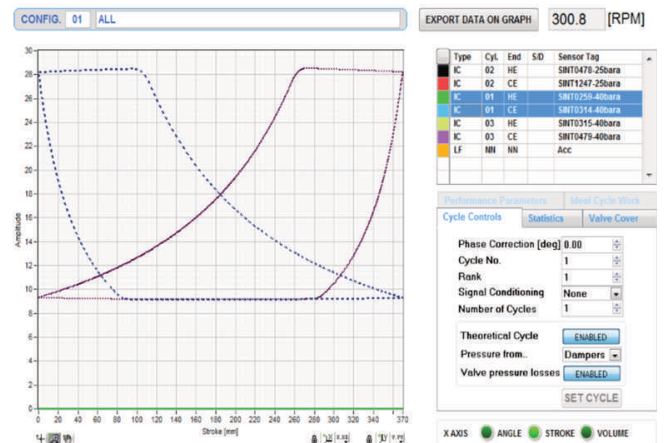


- 1 // PV Cycle
- 2 // Vibration
- 3 // Pressure pulsation
- 4 // Cover valve temperature
- 5 // Ultrasound & acoustic emission
- 6 // Rod-drop & run-out
- 7 // Performance analysis



Moreover, SINT Technology has developed data acquisition and diagnostics system (RCX) specially designed for reciprocating compressors.

RCX is an acquisition and diagnostic system suitable for **hazardous area** which can be operated also in standalone mode for the **long-term monitoring** and **troubleshooting**.



TRAINING

SINT Technology is a **training** and **examination** Centre for the Certification of level I and II personnel in **strain gauge testing** according to **EN ISO 9712 standard - Non-destructive testing – Qualification and certification of NDT personnel**.



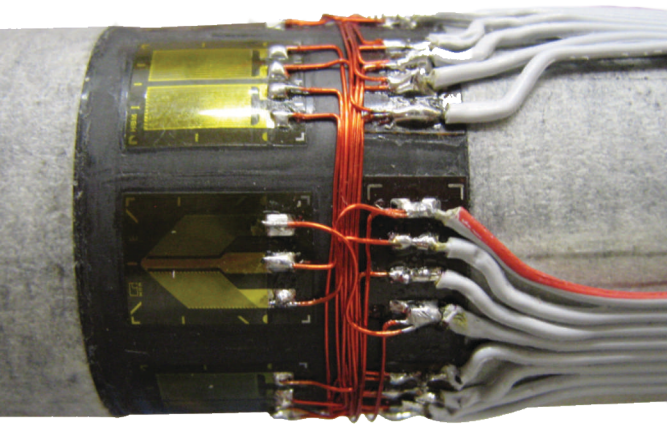
SINT Technology is also a **training** and **examination** Centre for the Certification of level I, II and III personnel, assigned to monitoring and diagnostics of operating machines such as steam turbines, gas turbines, hydraulic turbines, pumps, compressors, etc. **in accordance with EN ISO 18436-2 — Monitoring and diagnostics of vibrations**.

STRAIN GAUGE MEASUREMENTS AND ANALYSIS

SINT Technology has a long track record in strain gauge measurement and over the years has developed various measurement techniques also in collaboration with research centres and universities.

The service of the experimental stress analysis consists in the installation, measurement and data analysis both on site and in our laboratory.

SINT Technology has experience in the following special applications:



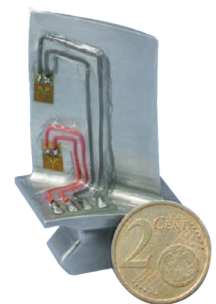
- 1 // High temperature applications with ceramic cements (up to 650°C)
- 2 // High temperature applications with weldable strain gages (up to 950°C)
- 3 // High sensitivity strain gages – semi-conductors
- 4 // High centrifugal forces - Installations on rotating
- 5 // High pressure application (up to 1400 barg)
- 6 // Submerged/Underwater application
- 7 // Special materials (composite materials, stones, etc.), Miniaturized application, electronic boards (PCB)

Strain is measured to determine the level of stress on the material and/or validate the FE analysis. The absolute value and direction of the mechanical stress are determined from the measured strain and known properties of the material (Modulus of elasticity and Poisson's ratio).



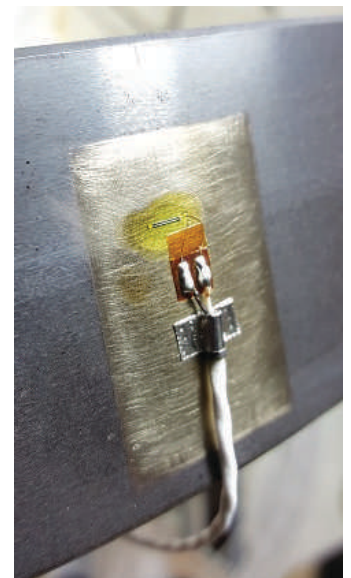
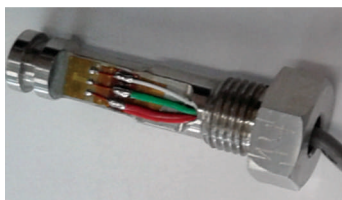
SINT Technology offers **services** for many different applications on **field** and in **laboratory**, for instance:

- Measurement of static and dynamic strains
- Experimental stress analysis
- Measurement of torque and torsional vibration on rotating shafts
- Strain gauge measurements on pressure vessels
- Residual stress analysis
- Experimental modal analysis
- Installation of strain gauges
- Design and construction of transducers (eg. load cells)



SINT **engineers** and **technicians** have obtained the levels II and III **certifications** for:

ISO 9712 – Non-destructive testing – Qualification and certification of NDT personnel.



RESIDUAL STRESS MEASUREMENTS BY STRAIN GAUGE METHODS

All the stresses that exist in materials, also without the application of any external loads, are termed **residual stresses**. Residual stresses can originally exist in a component and naturally add to stresses induced by applied loads.

Residual stresses influence the behaviour of mechanical components and can impair the structural and dimensional stability, as well as the fatigue and fracture resistance of components. Residual stresses limit the loading capacity and safety of mechanical components during operation and in certain circumstances it becomes necessary to quantify those stresses.

The typical **fields of application** of residual stress are:

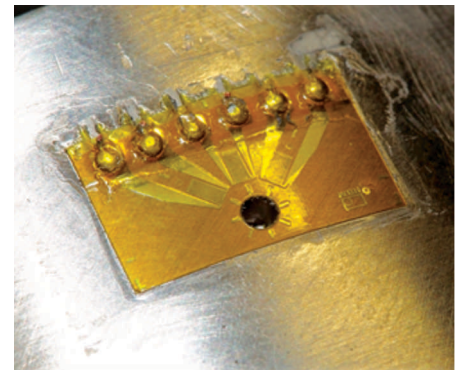


Residual stresses can be measured on many different components, including **standard** (metals, alloys, unfilled polymers) and **not standard materials** (Inconel, Ti alloys, composites).

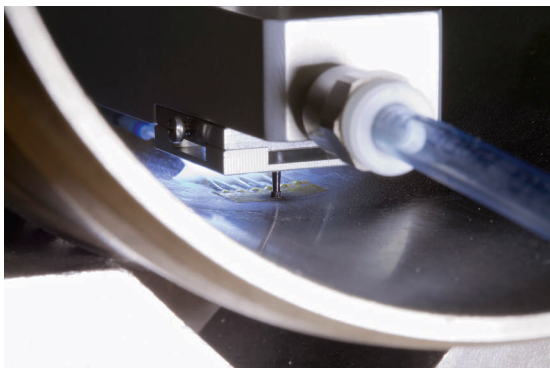
The residual stresses measurements can be carried out using different techniques. Residual stress techniques are based on indirect type of measurements. This means that thanks to the observation of the variation of different mechanical quantities (strain or diffraction) it is possible to evaluate the original stress that has caused this effect.

SINT Technology is able to offer different techniques for measuring the residual stresses. The available methods can generally be divided into 3 different groups, depending on the damage level that they cause in the specimens under investigation:

- non-destructive techniques (**X-ray Diffraction**)
- semi destructive techniques (**Hole Drilling, Ring Coring**)
- destructive techniques (**Sectioning, Slitting, Layering** and **Contour**)



Among these techniques, one of the most versatile and reliable non-destructive methods which allows the realization of low-cost tests with a high measurement accuracy, is the **hole drilling method**.



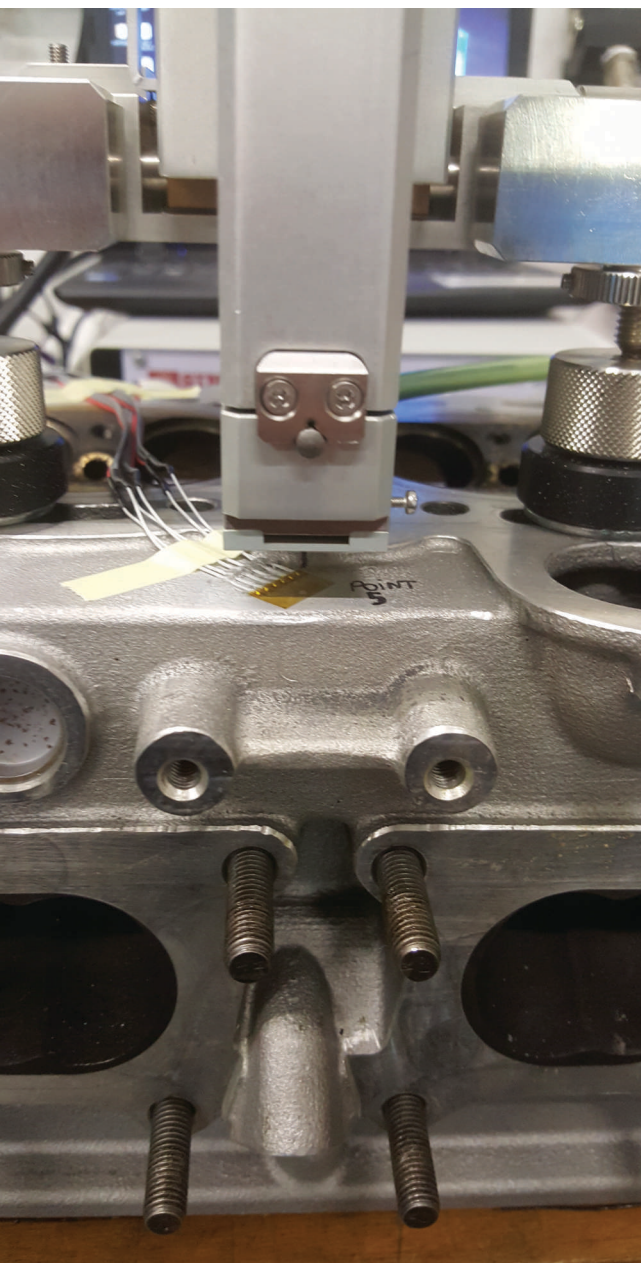
The hole-drilling method consists in drilling a small hole (typically 1.8 - 2.0 mm) in the centre of a special three-grid strain gage rosette installed on the specimens under test: the machining of the Hole modifies the mechanical equilibrium of the workpiece allowing a redistribution of the strains (measured by the strain gage).

The hole-drilling strain-gage method has been standardized by the **ASTM E837** for both uniform and not-uniform residual stress along the depth. In particular, the ASTM E837 standard is the only complete standard in the field of residual stress measurements.

MTS3000 - RESTAN

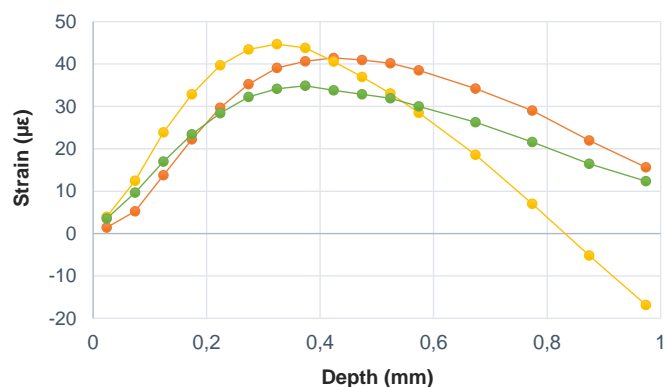
The automatic system for the measurement of residual stresses **MTS3000-Restan** (acronym of Residual Stress Analyzer), patented, produced and developed by SINT Technology, allows full but simple residual stress testing by the hole-drilling strain gauge method. The tests can be carried out in accordance with the **ASTM E837 standard for uniform and non-uniform** stress distributions. With a suitable acquisition strategy (fine hole-drilling) and an appropriate analysis method (Integral, Incremental or Influence Functions), it is also possible to back-calculate the residual stress variation with depth even very close to the surface on both metallic and non-metallic materials (polymers, composites).

The MTS3000-Restan system is an **automatic measurement chain** for hole-drilling residual stress measurements: the full control of the device during the drilling and the acquisition process guarantees high accuracy of the results and reduction of the measurement uncertainty connected with the measurements.



The main **key-features** of the MTS3000-Restan system are:

- High-speed drilling technology with compressed air turbine or electric motor
- Straightforward, automatic and fast to use
- Test, strain acquisition and control of the drilling process automatically executed through a dedicated software
- Automatic determination of the initial drilling point by electric contact
- Suitable for both laboratory and on field applications
- Evaluation of residual stresses in depth
- Possibility to choose among different data processing and analysis methods (ASTM E837, Integral, Differential and HDM).
- Measurement of the actual hole diameter and eccentricity by manual and automatic process
- Possibility to measure near corners and walls
- Choice among a wide database of strain gauge rosettes, accessories and spare parts

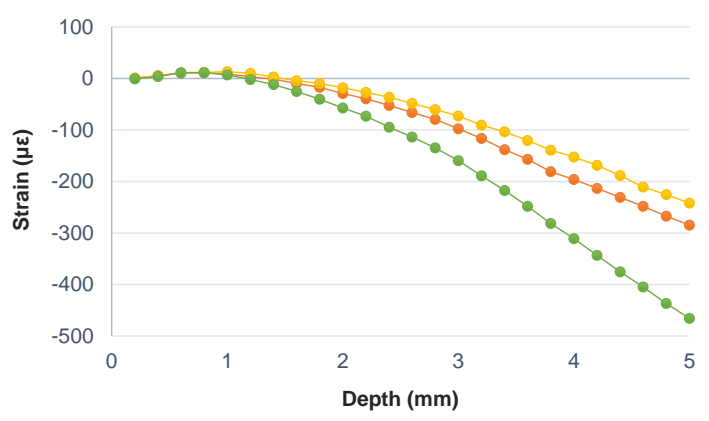
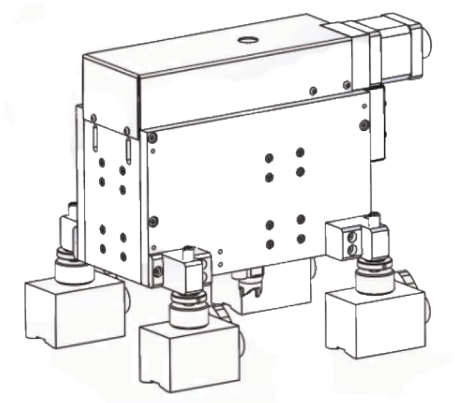


MTS3000 - RINGCORE

In addition to the hole drilling method, the automatic system for the measurement of residual stresses **MTS3000-RingCore** allows testing by the **ring-coring** strain gauge method.

The MTS3000-Ringore system is a complete solution for any ring coring residual stress measurements: it can be used in different testing configurations and conditions (laboratory or field tests) as well as on different materials.

This kind of measurement is based on the specifications reported in the KWU method; in particular, the measurement process requires to drill a blind core, with an internal diameter of 14 mm and an external diameter of 18 mm, around a strain gage rosette with 3 overlapped grids. The coring is performed step-by-step up to a maximum total **depth of 5 mm**. An evaluation software, dedicated to such analysis, allows to select different calculation strategies depending on the type of analysis that is required.



DRMS CORDLESS



The Drilling Resistance Measurement System (DRMS Cordless) is a useful portable tool that continuously measures the force required to drill a hole in the investigated material during all the testing process. This parameter is called **Drilling Resistance** and it can be measured by drilling a hole with a suitable drill bit (usually with a diamond tip) on many different materials, mainly **natural stones, rocks, mortars and bricks**.

The most important features of the DRMS Cordless are the following:

- The speed of rotation is established by the operator before drilling; the range is from 20 to 1000 rpm
- The penetration rate is set by the operator before starting the test; the range is from 1 to 80 mm/min
- Both rotational and penetration speeds are kept constant during drilling
- Travel span (and consequently depth of analysis) from 0 to 50 mm
- Diamond type drill bits: size range from 3 to 10 mm in diameter

HARDWARE AND SOFTWARE PLATFORM FOR MONITORING, DIAGNOSTICS AND PROGNOSTICS

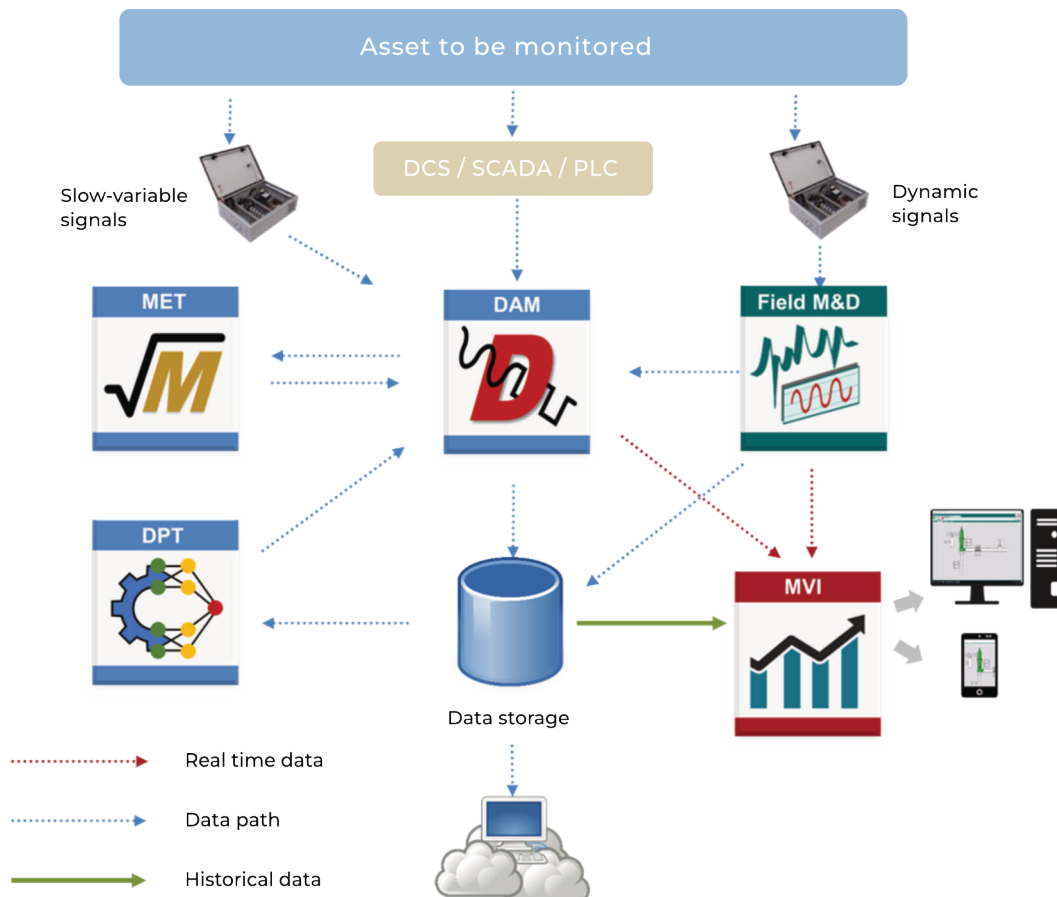
Prognosis is a hardware and software platform, which allows the monitoring, diagnostics and prognostics of machines, industrial plants and general assets, with the aim of predicting and therefore preventing possible failures or degradation of the individual performance of components.



This platform is able to retrieve data from SCADA/PLC already available on the asset, via the most common industrial protocols (**ModBus, OPC UA/DA**, etc.). Moreover, it is possible to acquire signals from additional instrumentation installed for the task, such as vibration sensors.

Prognosis is **fully customizable**, thus its features and calculations can be set according to either technical standards or upon customer's specifications.

Prognosis is composed of five main applications that can communicate each other:



Through the Prognosis platform, SINT Technology delivers decades of experience in Oil & Gas and Power Generation business to its Customers.

Continuous Monitoring of Analog/Digital signals

Customized Data Viewers

Mathematical Operators and Thermodynamic Proprieties

Dynamic signals analysis (Fft. torsional vibrations)

Predictive models for Prognostics

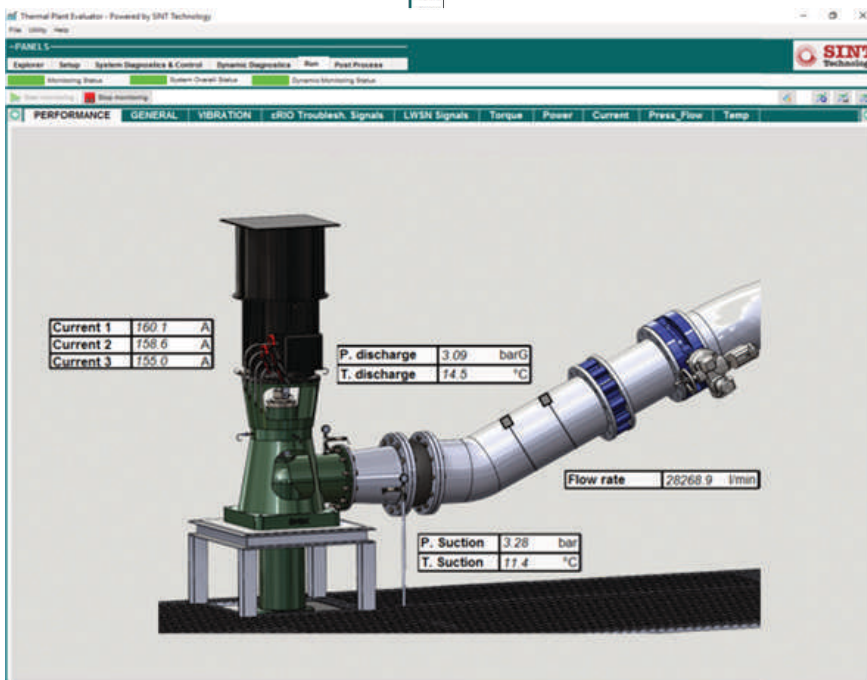
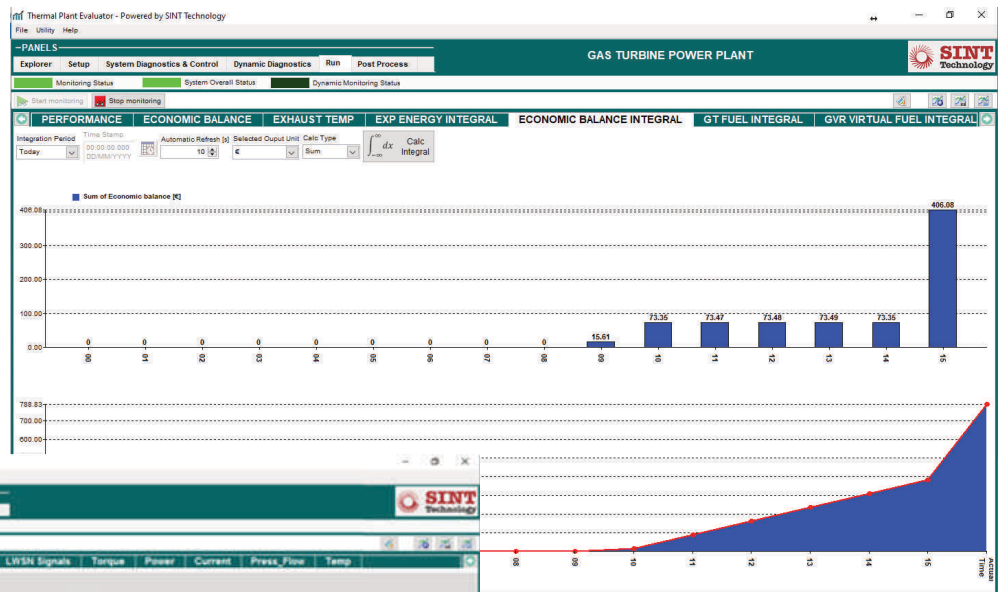
Amazon Aws Cloud compatible

Prognosis is configured with the **performance calculations** prescribed by the main technical standards (ASME PTC, ISO) and results are immediately available to the user, allowing a **continuous evaluation** of the operation of plants and machines.

With the integration function, it is possible to precisely control not only the energy flows (production/consumption of electricity, steam), but also the generated **economic revenues**, helping managers in the strategic evaluation of asset operation.

Optimum operation point of the plant can thus be set, improving its capacity factor and reducing the payback time.

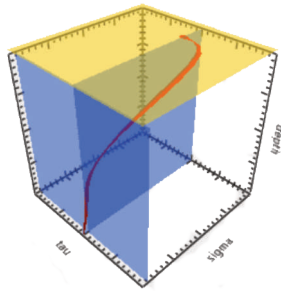
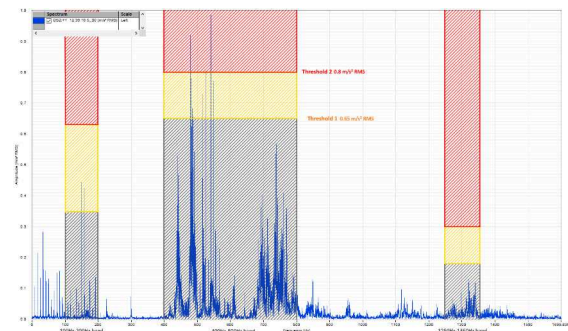
The software platform is able to generate and send by email, **automatic scheduled report** also in a customizable excel format.



SOFTWARE DEVELOPMENT

SINT Technology has been providing software design and development services for over 20 years through its qualified engineers.

Thanks to consolidated partnerships with leading companies operating in various industrial sectors, SINT Technology can offer software services and **custom software** solutions related to **testing, measurements and calibration**.



Software for data acquisition, elaboration, logging and presentation

Software for test bench control

Systems integration (database, web server, cloud services, DDL, .NET, cameras)

Drivers for the communication with electronic measuring instruments

Automation of industrial processes

Automation of sensors calibration

Post processing and advanced data analysis

SINT Technology can also provide cutting-edge software solutions based on customer's needs or proficiently manage the life cycle of an existing software platform.

In its software department, SINT Technology includes all engineers and technicians certified by **National Instruments** for the development of applications in **LabVIEW** environment.

INTEGRATED SOLUTIONS

SINT technology has experience in the development and realization of prototypes and HW & SW solutions, performing all the project phases:

Mechanical
design

Electronic
design

Software
design

We supply standard or **custom products** and systems for a wide variety of industrial applications for measurement, inspection, testing and automation.

The main fields of application of the solutions developed by SINT Technology are:

- High-precision acquisition of slow-variable signals
- High sampling frequency signals acquisition
- Long-term remote monitoring & diagnostics
- Stand-alone system for Industry 4.0
- Test bench management and data analysis
- Structural monitoring
- Test and calibration automation



Contact us

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Certifications

Certification of conformity of the Management System to standards **ISO 9001 and OHSAS 18001**



CIC-PND approval as an examination centre for certification of strain gauge testing engineers **according to ISO 9712**



Recognition by the Ministry of Education, Universities and Research

SINT Technology's test laboratory is accredited to standard ISO/IEC 17025:2017 by the Italian accreditation body **ACCREDIA with certificate no. 0910L**



LAB N° 0910 L

TÜV Austria approval as an examination Centre for Certification of strain gauge testing and monitoring and diagnostics of vibrations personnel **according to ISO 9712 and ISO 1843**

