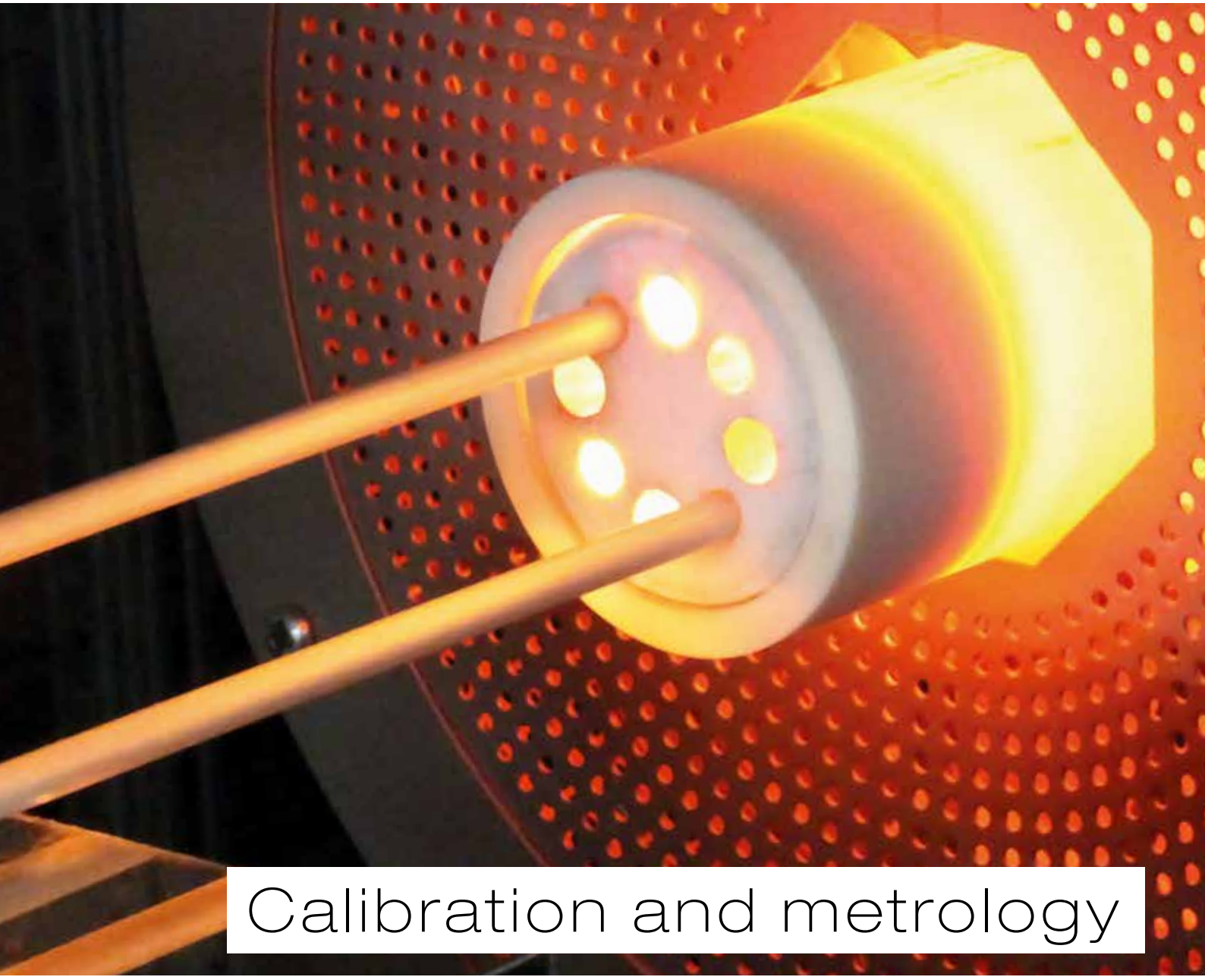
GÜNTHER



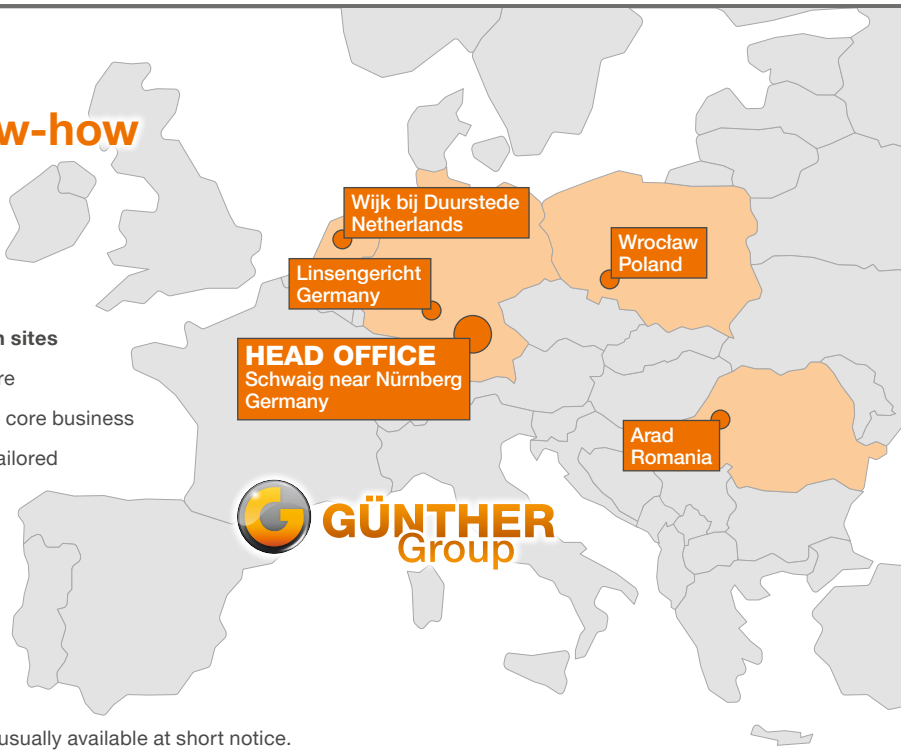
Calibration and metrology

Calibration, consulting, on-site measurement, training

Temperature Measurement Technology
Reliable . Precise . Certified

Calibration and measurement systems

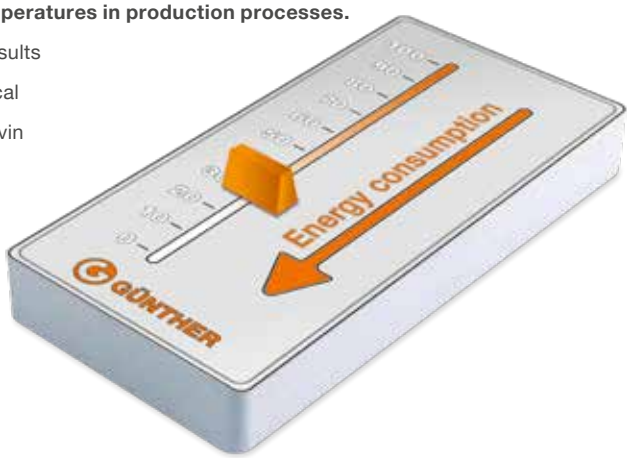
More than 50 years of know-how



Founded in 1968, GÜNTHER is one of the most renowned companies in industrial temperature measurement technology. High-quality thermocouples and resistance thermometers are developed and manufactured at **five international production sites** in order to provide our customers with the optimum temperature measurement technology for their respective applications. The core business is the development and production of small series, which are tailored to the customer's requirements and needs. Our temperature sensors are used in a wide variety of industries around the world – wherever precise measurement results are essential, sometimes under the most extreme conditions. Extensive material warehouses and various independent suppliers for raw materials and components usually enable short production times. This also ensures that spare parts are usually available at short notice. A long-established QM system and our own calibration laboratories ensure the highest quality standards.

Maximum measuring accuracy – many advantages

GÜNTHER Calibration and Measurement is a central business segment of the GÜNTHER Group and essentially comprises the three areas: **Calibration laboratory, on-site service and training.** The aim is to ensure the **highest possible accuracy of the GÜNTHER temperature sensors** and to maintain this permanently. **This is the only way to precisely control temperatures in production processes.** On the one hand, this is important in order to achieve the best possible quality results for the products produced and, on the other hand, it is essential for the economical operation of the system. Sometimes temperature deviations of a few degrees Kelvin – caused by inaccurate measurements – can lead to much higher energy consumption than necessary and thus cause unnecessary additional costs as well as significantly worsens the CO_2 balance of a system.



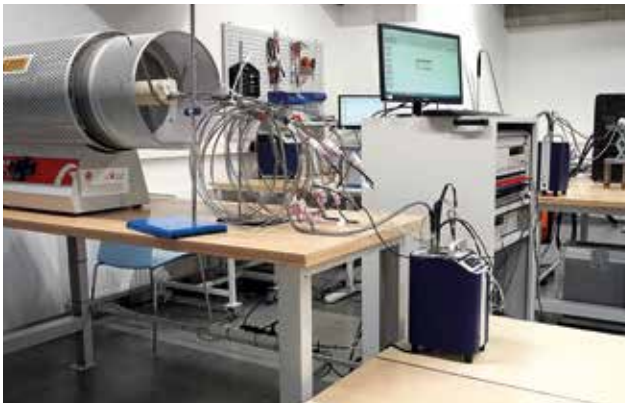
The three basic requirements for accurate measurement results

- Accurate temperature measurements are based on the delivery of precisely calibrated elements.
- In continuous operation, regular inspection of the temperature sensors used by trained service technicians is essential - and a mandatory requirement for compliance with international standards and guidelines such as CQI-9 and AMS 2750.
- Professional handling of the temperature sensors used is another important component. We impart the necessary specialist and background knowledge in our training courses, tailored to the respective needs of our customers.

The GÜNTHER calibration laboratories

The GÜNTHER Group currently operates **two accredited laboratories** for the calibration of temperature sensors as well as temperature display devices and simulators. As a result, we not only create redundancy for your calibration services, but can also always provide you with reliable results thanks to a quality policy supported by internal laboratory comparisons. In our laboratories, we test and calibrate sensors from our in-house production as well as measuring equipment provided by our customers.

The laboratory at the company headquarters in Schwaig, Germany was put into operation back in 1995 and has since been continuously expanded and equipped with the latest technology.



In operation since 2021 – the accredited calibration laboratory at the company site in Wrocław, Poland.

Scope of laboratory activities

- Calibrations in the accredited area
  (calibration certificates with accreditation symbol)
- Calibrations outside the accredited area
  (factory calibration certificates)
- Functional tests and investigations of temperature sensors
- Advice on the calibratability and optimization of temperature sensors
  and troubleshooting in temperature measurement chains
- Recommendations on the type and scope of required calibrations
  (e.g. for various heat treatment guidelines)
- Inspections of the laboratory premises
  (e.g. as part of our customer training courses)
- Research projects together with our customers

Calibration and measurement systems

Calibrations in the accredited area (calibration certificates with accreditation symbol)

For many industrial sectors, calibration certificates are required in the accredited area. These are identified by the symbol of the respective national accreditation body. Such calibration certificates guarantee metrological traceability to national standards and are also accepted in other countries due to international agreements on the mutual recognition of calibration certificates. For calibrations in the accredited area, we only use calibration procedures that have been defined in standardized documents.

Further information and documents for download can be found on our website:

GÜNTHER calibration laboratory at the company headquarters in Schwaig, Germany

- Accreditation certificate and accredited area
- List of calibration procedures
- Sample documents Batch certificate, DAkkS calibration certificate and factory calibration certificate

▸ www.guenther.eu/en/downloads

GUENTHER Polska Calibration Laboratory in Wrocław, Poland

- Accreditation certificate of the calibration laboratory no. AP 201
- Scope of accreditation for the calibration laboratory no. AP 201_PL

▸ www.guenther.com.pl/en/laboratory

If your requirements do not match our range of services, in many cases we can pass on the calibration to an external, accredited laboratory. You can conveniently have the corresponding processing carried out by our company.

Calibrations outside the accredited area (factory calibration certificates)

Upon request, we also carry out calibrations outside the accredited range.
This allows us to cover a wider temperature range, as well as to use alternative calibration methods.
These essentially include:

- Comparison calibrations up to +1600°C
- On-site calibrations for temperature sensors from +50°C to +1210°C

Advice on the calibratability of temperature sensors and troubleshooting in temperature measurement chains

In order to meet the growing requirements of all industrial sectors, today's temperature sensors are characterised by a sometimes very complex design. **In particular, the type and design of the protective fittings play a major role here.** This must be taken into account to ensure accurate measurements.
Experience gained over decades enables us to provide our customers with expert and competent advice on whether and in which procedures the temperature sensors designed for their processes can be calibrated.
Furthermore, our trained specialists can help prevent, detect and, if necessary, eliminate possible sources of error in your measurement chain by asking specific questions and carrying out on-site inspections.

Examples of different set-ups of protective fittings around the actual measuring point

Recommendations on the type and scope of calibrations required (e.g. for various heat treatment guidelines).

Depending on the field of activity of our customers, the requirements for the calibration of the temperature sensors can vary. Calibration tailored to specific customer requirements not only saves costs, but also avoids unnecessary deviations during audits.
Decades of experience, as well as an extensive in-house standards library compiled over many years, enable us to provide our customers with expert advice in this regard. The goal is a precise analysis of the respective customer-specific requirements. After clarification of all necessary points, a calibration in accordance with the specifications is carried out.

Frequently asked questions regarding calibration requirements

- What kind of calibration is necessary / prescribed for a special field of application? (with accreditation symbol, without accreditation symbol)
- How many calibration points must the calibration of the sensors include? (Is one temperature sufficient or does a certain temperature range have to be covered?)
- Which permissible tolerance / measurement uncertainty is required with regard to the deviation of the temperature sensors?
- How many sensors must be calibrated for a delivery comprising several sensors? (If calibration of one sensor is sufficient, is it necessary to calibrate at least two sensors, or do all sensors need to be calibrated?)

The GÜNTHER on-site service

In order to achieve a **constantly accurate temperature inside the furnace,** error-free temperature measurement is essential.
This in turn requires a properly functioning temperature sensor system.
The same applies when a **homogeneous temperature distribution** must be achieved across the entire furnace chamber – here, too, accurate and error-free measurement results are the basis for a consistently high quality of the heat-treated products.
Another important factor for the accuracy of the temperature measurement (and thus the quality of the heat treatment) is ultimately also the **correct output of the measurement result on the display device** – even a calibrated temperature sensor is only as accurate as the display of the measurement result on the output device.
In order to ensure these three essential factors in heat treatment in the best possible way and to exclude sources of error, we offer our customers the GÜNTHER on-site service.

The scope of this service

- SAT measurements (System Accuracy Test)
- TUS measurements (Temperature Uniformity Surveys)
- Instrument calibration,
  also possible as calibration within the accredited range

In all types of system reviews, all internationally applicable standards and specifications are complied with, if so required.
Some examples are: AMS 2750 and CQI-9 (Aerospace and automotive industry), DIN 17052-1, API 20H, etc.

Operation of the GÜNTHER services

Query of various data by means of questionnaire
Questionnaire in PDF format, can be completed on screen
Convenient return by e-mail

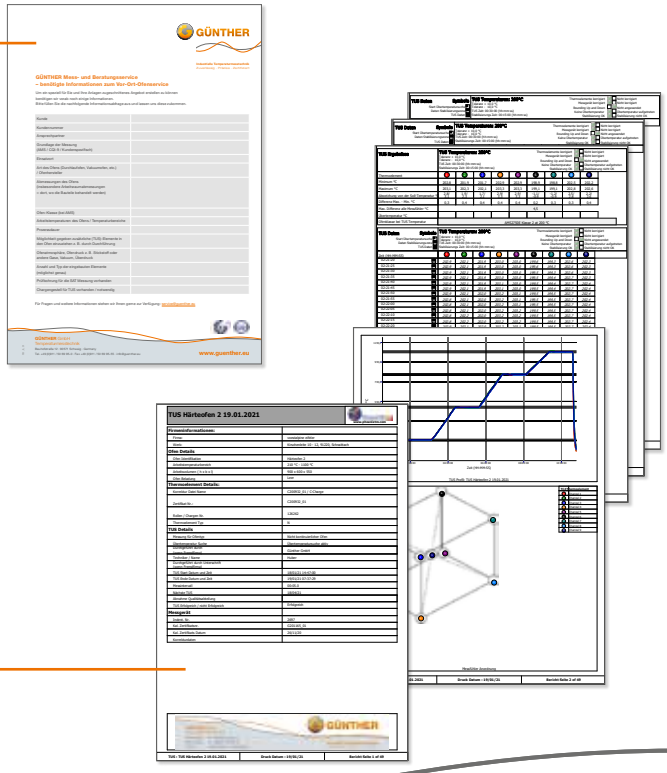
Quotation preparation by GÜNTHER

Making an appointment

Carrying out the measurement(s) on the furnace by GÜNTHER service technicians

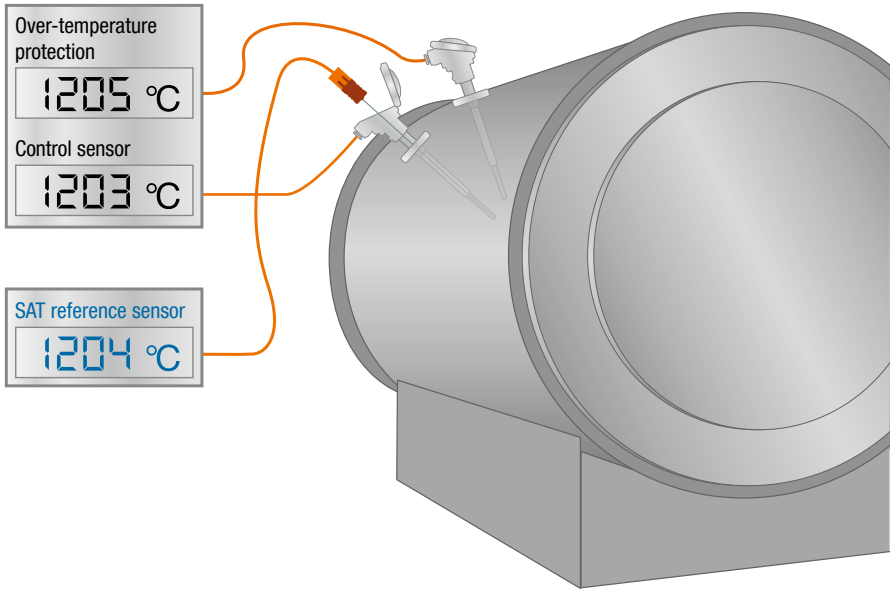
Reading out / processing the measurement data

Transmission of a detailed test report



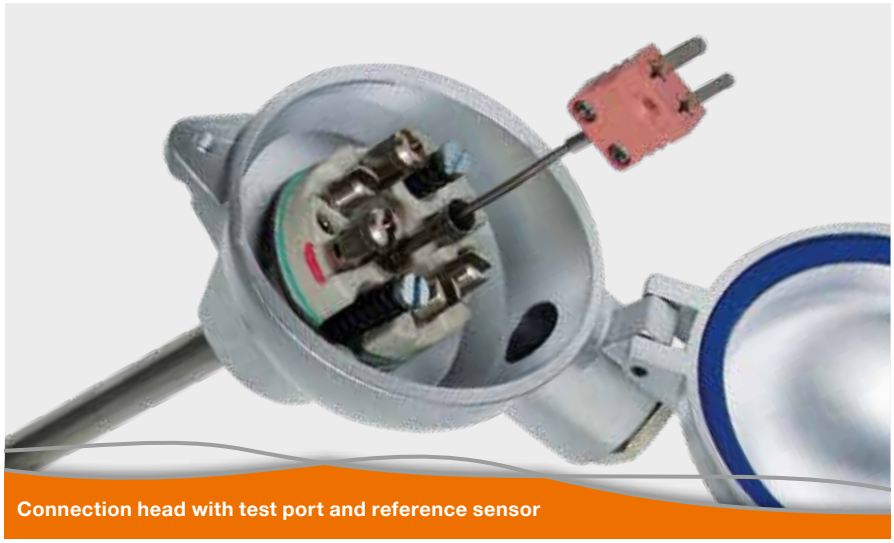
System accuracy measurement (SAT measurement)

The SAT measurement (System Accuracy Test) is a comparative measurement that takes place in the heated oven.
The installed thermocouple (e.g. control sensor) or the entire measuring chain is checked for deviations during operation with a **calibrated reference sensor**.



The SAT measurement must be carried out at the smallest possible spatial distance from the sensor to be tested. Ideally, this is done through a test hole inside the connection head, through which the reference sensor can be pushed to the measuring point of the control sensor. This way, the comparison measurement takes place precisely at the measuring point of the control sensor and guarantees accurate values for an exact evaluation.

Ideally, the possibility of a (reference) SAT measurement is already considered when designing the control element. **For this purpose, test ports for this type of measurement can be integrated into many GÜNTHER temperature sensors on request.**



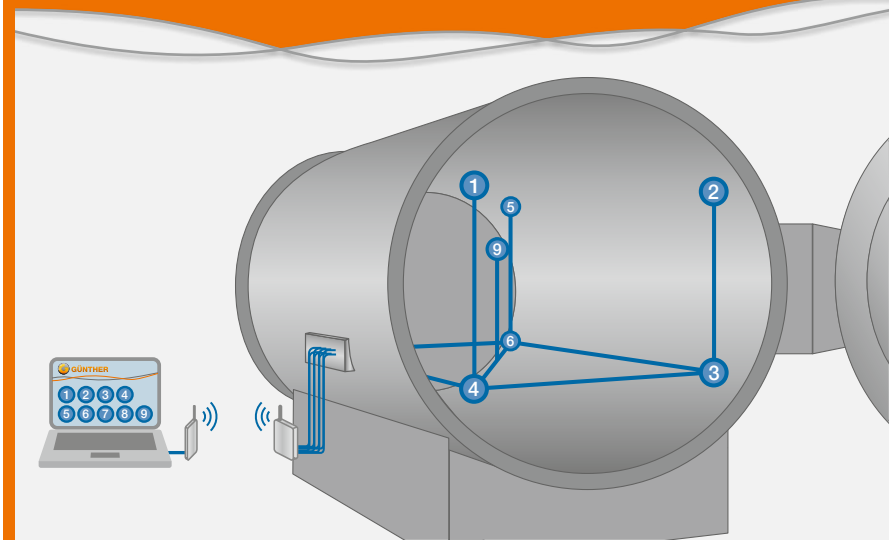
Connection head with test port and reference sensor

Calibrated test sensors for performing SAT measurements

Temperature uniformity check (TUS measurement)

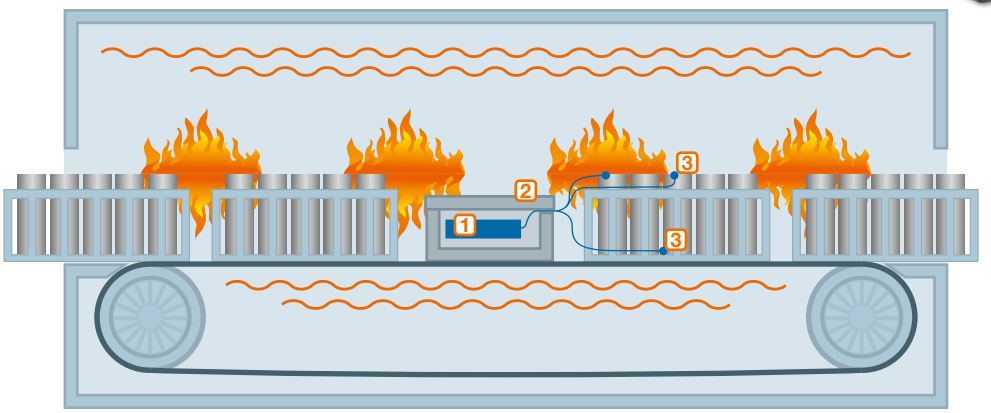
In the heat treatment of components for the automotive and aerospace industries, the proof of a uniform temperature distribution in the furnace is of utmost importance. This is ensured by regularly carrying out TUS (Temperature Uniformity Surveys) measurements.
Separate thermocouples are placed in the furnace to monitor temperature uniformity. The number, installation position and type of installation of the temperature sensors are determined by the dimensions of the furnace and the design of the furnace.

Vacuum furnace with TUS elements in the qualified working zone (Area in which the products are placed during heat treatment).



If it is not possible to insert thermocouples into the oven from the outside, special heat protection containers with integrated data loggers are available that can remain in the oven for a certain time. In these cases, it is also possible to measure the temperature uniformity in the oven and to store it in a forgery-proof manner for later evaluation.
In the case of tunnel furnaces, drag measurements are usually carried out with thermocouples or sheath thermocouples attached to the heat-treated product or the batch passing through the furnace and connected to the data logger located outside the furnace.

Measurement by means of a data logger in the heat protection container.



1 Data logger
2 Heat protection container
3 Measuring points attached to the product

Instrument calibration

Instrument calibration is the calibration of a display device or a simulator for temperature sensor technology. Such devices convert the signals of the temperature sensors into a temperature or simulate these signals in order to check other measuring devices. There are different types of instruments in the field of temperature measurement technology, which can be found, for example, in the control system of an industrial furnace or in the form of compact hand-held measuring devices. Our accreditation allows us to perform this calibration for all common thermocouple and resistance thermometer types. This is possible both at the customers‘ premises or in one of our permanent laboratories.

Further services of the GÜNTHER service

- Assessment of the existing measurement and control technology
- Removal of thermocouples and resistance thermometers and testing in the block calibrator
- Calibration of the evaluation electronics
- Transmitter check (mV input, mA output and short circuit test)
- Function test of overtemperature devices
- Repair and replacement of defective temperature sensors and individual components
- Advice on possible optimisations

Wide range of services - the GÜNTHER service portfolio

In addition to the classic sectors such as hardening shops in the automotive and aircraft industries, in which processes are carried out in accordance with AMS 2750 and CQI-9 standards, a large number of other sectors are part of the permanent field of activity of GÜNTHER Service. This includes for example

- Aluminium and steel industry foundries
- Rolling mills and hot forming plants
- Welding shops (preheating furnaces)
- Ceramic industry (kilns)
- Companies from the medical technology sector
- Coating company (enamelling)
- Biomass power plants, combined heat and power plants
- Limestone works and brickyards
- Drying plants

Among other things, measurements are taken in high-temperature protective gas furnaces, vacuum curing systems, drying furnaces, heating systems and other complex installations.

GÜNTHER seminars and lectures

For our customers‘ employees, we offer various training courses in the field of temperature measurement technology in addition to instruction in the use of our temperature sensors.
Our training courses are always geared to the needs and know-how requirements of the company from which the employees to be trained come to us. The training location is either at the GÜNTHER premises or directly at the customer‘s premises.

Modern, air-conditioned training rooms are available both at the company headquarters in Schwaig and in the newly built production and administration building in Wrocław. Extensive illustrative material, practical examples accompanying the seminar and in-depth exercises are just as much part of the training package as a comprehensive handout for each participant.

Of course, there is always enough time to answer individual questions – if necessary, these are dealt with after the end of the training. During the training courses at GÜNTHER, there are always plenty of hot and cold drinks available for the participants. The physical well-being is also taken care of – with a warm lunch for all-day training courses.

Illustrative material for training

GÜNTHER training modules

Currently, the GÜNTHER training portfolio consists of five core modules*.
These are closely oriented to the needs of our customers or to the respective tasks
and the questions that arise in daily practice.

Thermocouple basics

- Seebeck effect
- important standards
- Types of thermocouples
- Toxication and ageing of thermocouples
- Structure and basic components of a thermocouple

Resistance thermometers basics

- Resistance thermometers basics
- Lead resistors
- Platinum resistance thermometer according to DIN EN 60751
- Circuit types
- Structure and basic components of a resistance thermometers

Calibration

- Calibration basics
- Various calibration certificates
- Accreditation

CQI-9 – Continuous Quality Improvement 9**

- History and structure of the Directive
- HTSA (Heat Treatment Systems Assessment)
- Thermocouples in the CQI-9
- Instrumentation
- System accuracy measurements (SAT measurements)
- Temperature uniformity measurements (TUS measurements)
- Process tables

AMS 2750 – Aerospace Material Specification**

- History and structure of the Directive
- Thermocouples in the AMS 2750
- Instrumentation
- Heat treatment equipment
- System accuracy measurements (SAT measurements)
- Temperature uniformity measurements (TUS measurements)

* Subject to change ** Version applicable at the time

GÜNTHER online training courses

If desired, all trainings can also be conducted online via Microsoft Teams.
For this, each participant needs a PC/laptop with internet connection as well as a camera, microphone
or headset. The individual slides of the PowerPoint presentation accompanying the training are then displayed
directly on the participants‘ screens. By means of virtual „raising of hands“, intermediate questions
can also be asked in this type of training and interactive communication can take place between
the trainer and the participants. As with the on-site training courses, participants receive
a comprehensive hand-out on the respective topic in advance.

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