



TA 12.13

Thermal Analysis

DETERMINATION OF
GRAIN REFINEMENT
AND MODIFICATION
FOR THE EVALUATION
OF MECHANICAL
PROPERTIES



- PROMPT
- FLEXIBLE
- TRANSPARENT

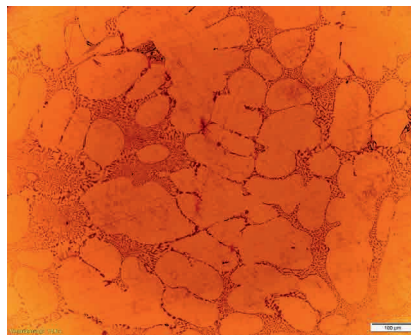
THERMAL ANALYSIS TA 12.13

BASIS TA 12.13

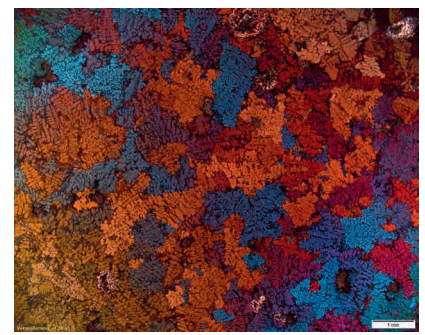
The new hardware specially developed for the Thermal Analysis TA 12.13 enables very accurate measurements and was designed for daily use in the rough foundry environment. Various laboratory and field tests of different Al alloys were microscopically evaluated by means of specially prepared polished sections and chemical treatment of the polished surfaces for grain boundary determination. The grain size was determined by measuring approx. 100 grains per section in two axes and then calculating the average value. The dimensionless grain refinement number is based on the grain size table of the American ASTM standard. Thus, the TA 12.13 anticipates the time-consuming procedure of a polished specimen preparation and enables a standardised comparison of specimens.



mk laboratory equipment



Modification AlSi7Mg0,3



Grain refinement AlSi7Mg0,3

APPLICATION

In order to achieve specific mechanical properties (e.g. strength and ductility) on the casting or to optimise the casting properties, the control of the melt by means of thermal analysis is essential. In this way, conclusions can be drawn easily and quickly about the expected mechanical properties and allow timely intervention, such as the controlled addition of grain refining and modification preparations to the melt.

The Thermal Analysis TA 12.13, consisting of a monitoring system and a sensor stand with thermocouple, is used to monitor the quality of typical Al cast alloys with a silicon content between approx. 5% and 13%, as well as various established special alloys*, such as AlZn10Si8Mg, AlMg5 and AlCu4Ti.

*customised alloys on request

Various factors have an influence on the course of the temperature and thus on the quality of the melt. These include:

- Ratio of the addition of ingot material to recycled material and scrap
- Tolerance ranges of the chemical elements per Al alloy
- Burn-off of alloying elements, such as Mg and Na
- Addition and quantity of modifying agents, such as Sr or Na
- Addition and quantity of grain refining agents, such as TiB
- Duration of the standing time after the melt treatment

APPLICATION

During the solidification of an Al melt sample in a durable stainless steel crucible, the cooling curve is recorded using a permanent thermocouple and visually displayed in real time with all holding and turning points. A stainless steel protection tube protects the permanent thermocouple (NiCr-Ni - class 1) from freezing in the sample.

The grain refinement (GR) and the modification (M) are decisive key figures for the microstructure and the mechanical properties to be expected. While the grain refinement describes the grain size, the modification represents the homogeneous distribution of the silicon in the microstructure. The reusability of the measuring components (crucible and thermocouple) allows objective comparability of the samples. Furthermore, the addition of TiB, Sr and Na can actively influence the quality properties of the melt. The goal of reducing rejects, and thus saving resources, is made possible by continuous melt monitoring with the TA 12.13. The associated MeltBoard PC software allows the tabular and graphic display of individual measurements and measurement series. The standardised comparability, evaluation and archiving of all measurement results are ensured, as is the use for internal and external reporting. The pre-configured standard report can be customised and extended with your own functionality.

For more information, have a look at our website: www.mk-gmbh.de



TA 12.13



Lockable holder for individual table or wall mounting for ergonomic working



Sensor stand

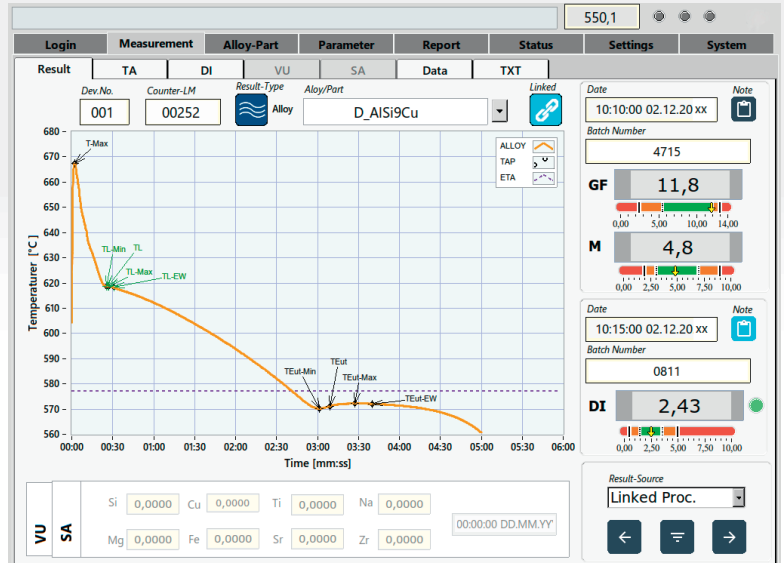


Differentiation to analytical micrograph & spectral analysis

The evaluation of a melt by means of the Thermal Analysis TA 12.13 with regard to grain refinement and modification, which determines the effectiveness of the elements present as well as those added (TiB and Sr/Na), can only be confirmed by a microsection sample. Compared to thermal analysis, the performance of a microsection test is very time-consuming. This makes the microsection sample almost impossible to use as a quick decision criterion on the further procedure in the daily production process. Therefore, the microsection is only a retrospective comparison to the TA. The spectral analysis is a quantitative observation of the elements present and provides only little information about their influence and effectiveness in terms of grain refinement and modification.

SPECIAL FEATURES TA 12.13

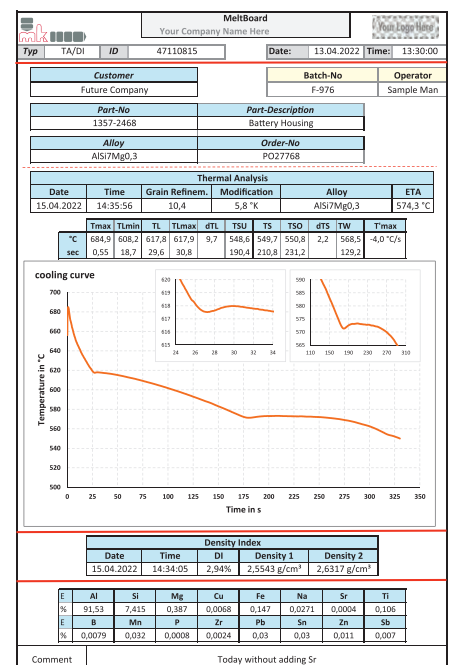
- Simple operation
- Closed, dust-proof housing; passively cooled
- Detailed display on a 12" touch screen
- User authorisation via RFID chip
- Power over Ethernet (PoE) for the sensor stand
- Precise measurement, high sampling rate and digital data transmission
- Dynamic measuring frequencies between 10/40 Hz for memory optimisation
- Automatic marking of relevant curve points
- Reproducible calculation of grain refinement and modification
- Calculation and display of the 1st and 2nd derivation
- Grain size determination in accordance with the American standard ASTM E112-10
- Automatic indication of potential faulty measurements
- Ageing and breakage control of thermocouple
- Automatic assignment of a batch number
- Quality traffic light: visualisation of warning and blocking limits according to customer specifications; tolerance indication red / green
- Storage of results in a relational database
- Low costs per measurement due to permanent thermocouple
- The swivel base allows lockable table or wall mounting
- Interface / data transmission for spectral analysis results, on request
- Interface to Electronic Density Index Balance MK 3000 and previous models
- Firmware update via USB or network file transfer
- Remote maintenance by mk possible via network or GSM modem



TA 12.13 screen

MELTBOARD PC SOFTWARE

- Central database in the network for several TA stations
- Overview of operating status of the connected TA station
- Central administration of operation-specific limit values of the TA stations
- Transfer of measurement results to a local database via USB stick possible
- Extensive curve discussion
- Clear presentation of all measured variables and results
- Tabular listing and individual presentation of measurement results
- Graphical overlay of two or more measurement curves for comparison
- Individual analysis and evaluation of data through filter options, Excel database-supported
- Storage of a customised reference curve for visual comparison
- Basic statistics with trend diagram and histogram
- Reporting in HTML format, as CSV file or PDF
- Provision of quality assurance data for component certificate and traceability
- Software update via data transfer
- Remote maintenance possible by mk



Meltboard Single Report

PRODUCT EXTENSIONS

SIGNAL LAMP

- Immediate colour evaluation of the measured value tolerances defined by the customer regarding grain refinement and modification
- Short reaction times of the staff - even at a distance
- Increase in process reliability
- Signal colours red and green
- For wall mounting



SIGNAL LAMP WITH SIGNAL HORN

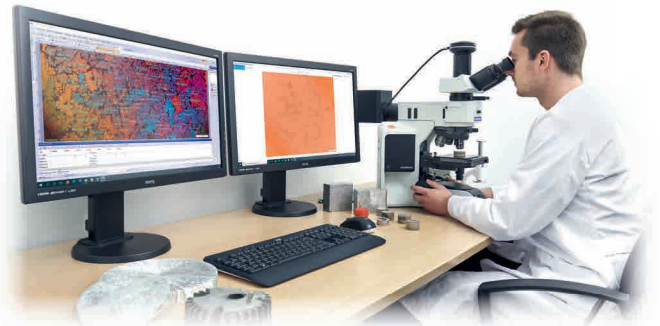
- Like signal lamp
- Additional acoustic signal (0 - 90 dB) in case of deviation from tolerances defined by the customer with regard to grain refinement and modification of the aluminium melt
- For unit or wall mounting



MICROSCOPIC SECTIONS AND SHORT REPORT

Service

- Al cast sample cutting, grinding, polishing and chemical treatment
- Microscopic evaluation with illustration for grain refinement and modification
- Preparation of a short report for internal/external casting documentation



PRODUCT LINE



ALSP highline incl. crucible pre-heating chamber for determination of grain refinement and modification for the evaluation of mechanical properties



ALSP plus incl. crucible pre-heating chamber for determination of the density index



Combi Package plus consists of 3VT plus incl. crucible pre-heating chamber and MK 3000 for determination of the density index

TECHNICAL DATA

Design:

Mobile measuring device made of powder-coated sheet steel for table or wall mounting

Size: approx. W 520 x H 500 x D 230 mm

Weight: approx. 17 kg

OS: Linux measuring system, Windows PC software

Display:

12" touch monitor, TFT LCD industrial version, GFG (glass-film-glass), resolution: 1024 x 768

Interfaces:

1x USB 2.0, 2x USB 3.0, 1x Ethernet, 1x Ethernet PoE

Mains connection:

100-230 V, 50/60 Hz

Ambient temperature:

15-65°C

Sensor stand:

Design:

Sturdy steel housing with movable sleeve for thermocouple guidance, nickel-plated and powder-coated

Size: approx. W 150 x H x 410 x D 320 mm

Weight: approx. 11 kg

ABOUT US

We are a medium-sized, privately owned company established in 1984. We are located in the Westerwald region of Germany, about 100 km from Frankfurt, and design and build a range of high-quality aluminium melt test equipment for the foundry industry. Our products are the result of expertise and experience acquired over many years of close association with the aluminium industry. Besides manufacturing our equipment, we also provide customer services such as commissioning, maintenance and calibration of our test equipment, supported by our comprehensive spare parts inventory.

Our customers all over the world are served by us personally as well as by a team of representatives operating worldwide.

SERVICES

- Device demonstration
- Provision of rental units
- Commissioning and device instructions
- Staff training
- Maintenance and calibration service
- Microscopic sections and short report
- Spare and wear parts
- IT support



CERTIFIED ACCORDING TO
DIN EN ISO 9001 | DIN EN ISO 14001



MANAGING DIRECTOR Nicolas Knoche

"Our vision is to become the worldwide leader in the design and manufacture of aluminium melt testing technology and in service to our customers."

Are you interested in technical consultancy and a demonstration on your premises?
We look forward to your inquiry. Please check our website if a local representative is available in your country.
Otherwise, please contact us directly for further support.

For more information, have a look at our website: www.mk-gmbh.de

CONTACT DATA

 **mk Industrievertretungen GmbH**
Melt Measuring Technology
Rödernhahn 1b
56459 Stahlhofen a.W., Germany

 +49 2663 82 10
 +49 2663 34 31
 information@mk-gmbh.de
 www.mk-gmbh.de

