



ALSP

highline

Two measuring methods

DENSITY INDEX &
THERMAL ANALYSIS



- PROMPT
- FLEXIBLE
- TRANSPARENT



AL-SCHMELZE-MESSTECHNIK
MELT MEASURING TECHNOLOGY



MOBILE TEST UNIT ALSP *highline*

The Mobile Test Unit ALSP highline combines two measuring procedures. The purity and thus the quality of the melt is determined by the density index measurements. The integrated Thermal Analysis TA 12.13 determines the grain refinement and modification to evaluate the mechanical properties of the casting. The goal of reducing rejects, thereby saving resources, is made possible by continuous melt monitoring using ALSP highline.

The hardware and design of ALSP highline allows the operator to take very accurate measurements while working comfortably. It has been designed for daily use in the harsh foundry environment. The balance stands on a raised, vibration-damped steel plate. A cooling water vessel for the density samples and a storage facility for the casting ladle supplied with enable an efficient workflow. The thermo stand for thermal analysis is fixed on the robust aluminium work plate. The base of the unit offers two large storage compartments, one of which has a lockable door. Due to the smooth-running and heat-resistant castors, ALSP highline can be used flexibly at different stations or furnaces.

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.

DENSITY INDEX

Application

Metallic and non-metallic impurities, as well as hydrogen and oxides, may negatively affect the quality of an aluminium melt. By measuring the density index, it is possible to define, control and optimise the process of cleaning the melt, thereby improving the quality. In this way, the consistently high quality of the melt is assured and the reject rate effectively reduced.

Alloy AlSi7Mg0,3
Transfer ladle 400 kg



before impeller treatment
vacuum sample 80 mbar, density index 13,64 %



after impeller treatment 12 min.
vacuum sample 80 mbar, density index 0,55 %

The Mobile Test Unit ALSP highline is used to cast two melt samples to compare the densities: one sample solidifies in a defined vacuum of 80 mbar and the other sample at atmospheric pressure. The Electronic Density Index Balance MK 3000 **automatically** determines the specific density of the two samples according to the Archimedean principle and then the density index. The density index represents the percentage difference in density of the produced samples. The lower the density index, the cleaner the melt.

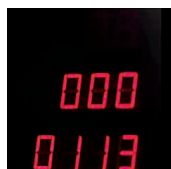
Crucible pre-heating chamber

ALSP highline includes a crucible pre-heating chamber that allows density index samples to be always prepared under the same conditions:

- The sample crucibles are always heated to 200°C, to prevent the accumulation of humidity in the crucible coating, which could have a negative effect on the sample.
- The pre-heated crucible allows the atomically dissolved hydrogen in the melt to develop its full pore potential.



Leakage indicator



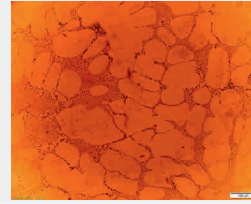
Cycle counter



ALSP highline

Basis

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 integrated TA 12.13 anticipates the time-consuming procedure of a polished specimen preparation and enables a standardised comparison of specimens.



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 the integrated 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



Sensor stand

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.



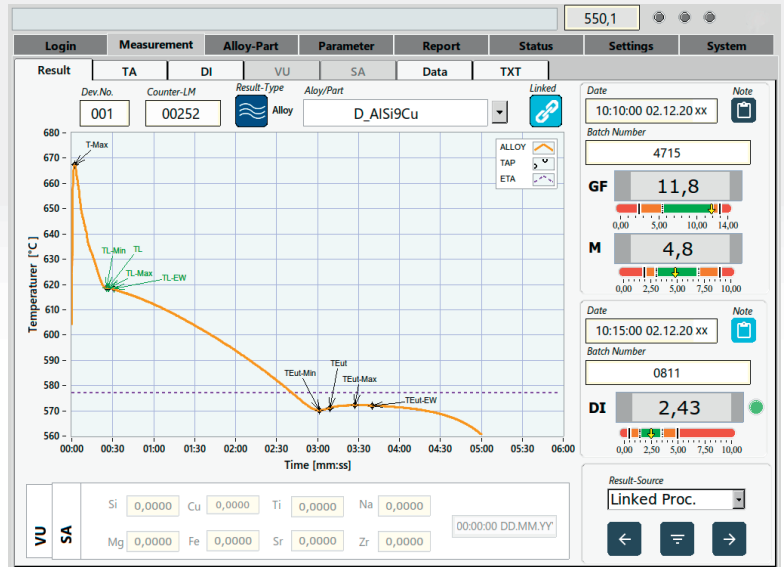
Differentiation to analytical micrograph & spectral analysis

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.

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

SPECIAL FEATURES TA 12.13

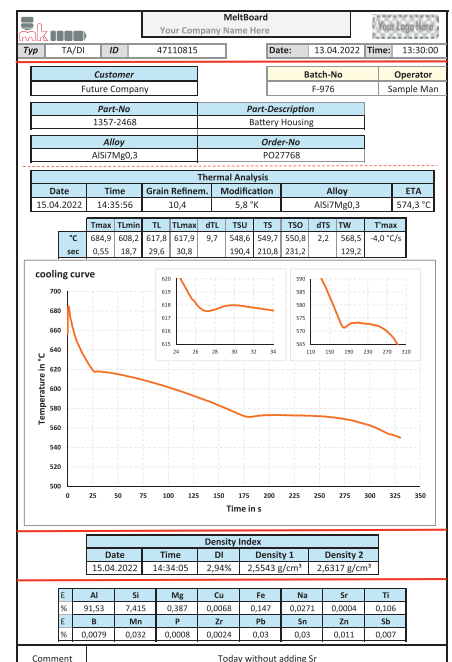
- Simple operation
- Long lifespan due to sturdy design
- Flexible use at different casting stations or furnaces
- Process reliability through fully electronic control
 - Fully automatic control of vacuum to 80 mbar
 - Leakage indicator
 - Cycle counter
- Crucible pre-heating chamber: greater accuracy of measurement
- Exact calculation of density to four decimal places (0,0000 g/cm³)
- Vessel for cooling density samples provided and shelf and storage space
- Detailed display on a 12" touch screen
- User authorisation via RFID chip
- 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
- Interface / data transmission for spectral analysis results, on request
- 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

- Saving of density index measurements
- 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 GSV 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

DROSS TEST



- Additional process for visual assessment of Al samples
- Pressure step 80 mbar (density index)
- Pressure step 30 mbar (Straube-Pfeiffer test for the assessment of the sample interior regarding hydrogen pores and oxides)
- Pressure step final 6 ± 3 mbar (dross test to assess the sample surface regarding oxides and other impurities)

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

DROSS TEST R&D



As Dross Test, but in total of 6 pressure steps:

- Pressure step 80/30/final mbar and
- 3 additional pressure steps in the range 140 - final mbar (to be defined by the customer when placing the order)
- Key switch for interlocking the pressure steps

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

DUST PROTECTION CASE

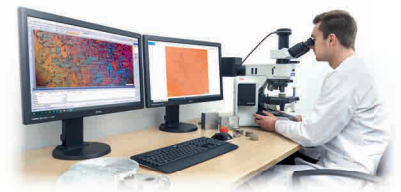
- Protection of the balance from contamination in the foundry
- Sturdy powder-coated construction of steel sheet with cable lead-through
- Cover with gas-pressure damping
- Large impact-proof plexiglas window
- Aluminium handle



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



PRODUKTFAMILIEN



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



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



Thermal Analysis TA 12.13 for determination of grain refinement and modification for the evaluation of mechanical properties

TECHNICAL DATA

Design:

Mobile Test Unit of powder-coated hot galvanised steel sheet with two storage compartments, two fixed and two guiding wheels with brake

Dimensions: W 1.400 x H 700 x D 1.360 mm

Weight: approx. 150 kg

Power connection:

Power cable with plug, 230 VAC, 1400 VA, 50-60 Hz, (115 VAC available on request)

Power consumption: 1400 VA

Vacuum pump:

Oil-lubricated vacuum pump

Timer:

Electric short-period timer (1-99 min. or endless = 00) integrated in display

Vacuum chamber upper part:

Incl. safety inspection glass

Heater: Fixed temperature $200^{\circ}\text{C} \pm 10^{\circ}\text{C}$

OS: Linux measuring system, Windows PC software

Display:

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

Interfaces:

2x USB 3.0, 1x thermal input (stand TYPE K), network RJ45, XLR signal

Weighing range: 3.000 g

Resolution: 0,01 g

Stabilising time: 3 sec.

Ambient temperature: 10-50°C

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

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