Heraeus

QuiK-Cup / QuiK-Lab E
Thermal Analysis of Cast Iron

Electro-Nite

QuiK-Cup

Thermal Analysis of Cast Iron

Description

Thermal analysis is a quick, simple, reliable, and low-cost method for shop floor control of molten iron.

Based on the measurement of the temperatures at which the thermal arrests occur in the cooling curve of a solidifying iron sample, it is possible to accurately determine %CEL, %C, and %Si.

Carbon equivalent, expressed by the formula %CEL=%C+%Si/4+%P/2, is directly related to the measured liquidus thermal arrest, which occurs as the molten iron sample begins to freeze.

Carbon content determination requires the knowledge of both liquidus and white eutectic or solidus arrest temperatures. Each pair corresponds to a unique value for carbon.

Silicon content calculation is possible through its relationship with the measured solidus temperature, corrected by a factor depending on the phosphorus content of the iron.

Features

- Solid, thick-walled cup with reliable contact arrangement assuring correct polarity
- Horizontal quartz-protected thermocouple with short response time
- Wide pouring temperature range
- Reproducible and stable cooling curves
- High success rate

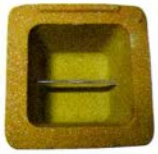
Also possible

- Inoculation control by means of the eutectic undercooling measurement
- Prediction of various mechanical and physical properties, taking into account the measured liquidus temperature possibly combined with the eutectic undercooling

Cups and Applications

Cups without Tellurium (QC4010, QC4000) for CEL determination in hypoeutectic iron and eutectic undercooling measurement. QC4000 has a reduced volume and is used in nodular and vermicular iron production.

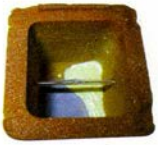
Cups with Tellurium (QC4011, QC4012, QC4014) for %CEL, %C and %Si determination in both hypo- and hypereutectic lamellar iron. QC4012 has additional sulphur for usage in magnesium-treated iron (nodular and vermicular). QC4014 has twice the amount of tellurium for iron grades with an extremely high graphitisation potential.



QC4010

QC4000

QC4011



QC4012

QC4014

ORDERING INFORMATION - Cups

Cups without Tellurium (100 in a pack)

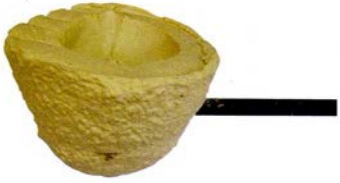
QuiK-Cup without Te	QC4010
QuiK-Cup with reduced volume	QC4000

Cups with Tellurium (100 in a pack)

QuiK-Cup with Te	QC4011
QuiK-Cup with Te + S	QC4012
QuiK-Cup with 2 x Te	QC4014

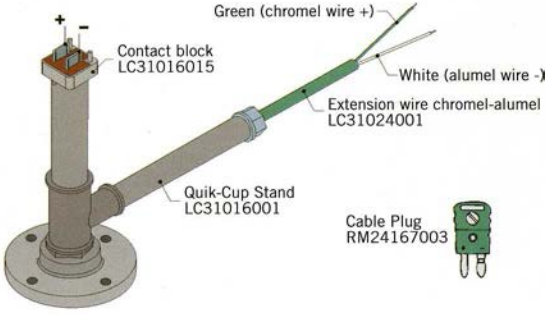
ORDERING INFORMATION - Spoons

Large ceramic fibre pouring spoon	LC31013004
Small ceramic fibre pouring spoon	LC31013005



ORDERING INFORMATION - Hardware

QuiK-Cup Holder (complete with 8m cable) includes:	LC31025208
QuiK-Cup contact block	LC31016015
QuiK-Cup stand	LC31016001
Type K extension wire (per meter)	LC31024001
Type K plug	RM24167003



QuiK-Lab E

Thermal Analysis of Cast Iron

QuiK-Lab E Measuring System - Overview

The QuiK-Lab E system measures temperature and determines carbon equivalent, saturation degree, and carbon and silicon content in cast iron melts. It uses special crucibles (QuiK-Cups), and software-based solutions to measure, calculate, and display measurement values in real time.

The values are shown on bright and easy-to-read 50mm digital displays until the next measurement takes place. QuiK-Lab E uses formulas to evaluate and convert these values to a range of other metallurgical readings:

- Peak temperature (TP)
- Liquidus temperature (TL)
- Carbon equivalent (CEL)
- Saturation degree (SC)
- Tensile strength (RM)
- Brinell hardness (HB)
- Quality index (Z/H)
- Solidus temperature (TS)
- Silicon content (SI)
- Carbon content (C)
- Graphitisation factor (K)
- Amount of eutectic graphite (MEG)
- Undercooling DT (TM)
- Eutectic temperature minimum (-T)
- Eutectic temperature maximum (+T)
- Eutectic temperature minimum/ maximum difference (△T)
- Cold junction (Cj)
- Time end of freeze (EF)
- Algorithm (AI)

QuiK-Lab E Measuring System

QuiK-Cup Holder and QuiK-Cup

Setting Displays

The QuiK-Lab E has an upper and lower display. The upper shows measured values as soon as they are available and the lower shows various calculated values. Scroll through these values using the up and down arrows underneath the lower display. The calculations are fixed in the instrument, but the parameters used to alter the calculations can be set as follows.

Setting Parameters

The QuiK-Lab E can be interfaced to other instruments in many ways, resulting in different parameter settings. All parameters are stored in memory, and they remain there even when power is switched off. Parameters are accessed using a keypad and LCD inside the instrument or with a web browser through the Ethernet interface.

QuiK-Cup Types

A QuiK-Cup is a disposable measurement test cup that is securely attached to the contact block of the QuiK-Cup holder. The system measures the cooling attributes of the molten iron poured into the QuiK-Cup. Various type of QuiK-Cup are available depending on measurement type and iron grade. They all play their part in the accurate, consistent, and quick measurement results that characterise the QuiK-Lab E system.

Analysing Results

Measured and calculated values can be sent to and stored on a PC for further analysis and manipulation if the appropriate software is installed, for example, MeltControl 2000 or Remote Viewer.

Using MeltControl 2000

Although the QuiK-Lab E can operate as a standalone measuring instrument for thermal analysis, it can also work as part of the MeltControl 2000 system. This system consists of the local measuring device, for example, QuiK-Lab E, and a PC on which the MeltControl 2000 software is installed. The advantage of using MeltControl is that data can be stored and processed and cooling traces can be visualised.

Up to three cooling traces can be displayed for comparison. Optional software can alternatively be installed for charge calculation, weighing data, active oxygen measurement, spectrographic analysis, melting reports, casting reports, and SPC. MeltControl 2000 can also calculate parameters based on formulas other than those in the QuiK-Lab E. Those recalculated parameters can be sent back to the instrument, which then operates as a display.

Summary

Application	Data	Additional Data	Notes
Analysis program for white and grey solidification of cast iron melts	Determination of C%, CEL/SC, Si%	Undercooling and recalescence	
Additional program for unalloyed grey cast iron melts	Calculation of tensile strength (RM), Brinell hardness (HB)	Tensile strength hardness factor (Z/H), graphite factor (K)	Quantity of eutectic graphite (MEG)
Temperature measuring range	Arithmetically linerarised according to IEC 584, IPTS 68	Type K (NiCr-Ni) 400°C – 1370°C	Compensated connector type K
Displays	Bright displays with LED signals on front door	Two seven-segment displays with four-digit matrix and four external keys. There is an LCD with four keys at the back of one of those displays to set instrument parameters.	Several display setups are possible for hardware and software
Reference temperature	0°C with cold-junction adjustment	Cold junction inside the instrument	
Accuracy	+18°C to +28°C ambient temperature ±1°C accuracy	0°C to +50°C ambient temperature ±2°C accuracy	
Multifunctional display	Peak temperature (TP), Liquidus temperature (TL), Carbon equivalent (CEL), Saturation degree (SC), Tensile strength (RM), Brinell hardness (HB), Quality index (Z/H),	Solidus temperature (TS), Silicon content (SI), Carbon content (C), Graphitisation factor (K), Amount of eutectic graphite (MEG), Undercooling DT (TM), Eutectic temperature minimum (-T),	Eutectic temperature maximum (+T), Eutectic temperature minimum/ maximum difference (△T), Cold junction (Cj), Time end of freeze (EF), Algorithm (Al) Error measurement
Three solid state outputs 220V AC	Outputs for external signals (Ready: green, Measure: yellow, Complete: red)	An external horn can be connected to the red lamp if a snubber network is mounted to avoid EMC problems	
Operation	Individual measurement result selection using external arrow keys	Si% and C% adjustment using external keys	Heat number adjustment using external keys if correct display board fitted
Data output	Measurement results (with floating point) and measurement station number through one serial output TTY 20mA or using Ethernet interface	One input and one output set by jumper to active or passive	Output is always TXD while input can be selected with jumper to Busy Ready signal or RXD. RRXD is for protocols like 3964
Housing, dimensions, and weight	Metal housing for wall mounting. protection IP 55	H=230mm, W=260mm, D=130mm	Weight 7.5kg
Operating data	Auto-range power supply 90 to 230V, 50 to 60Hz	Power consumption 24VA – 30VA	Ambient temperature 0°C to +50°C
Interface	Standard Ethernet module		
Optional second serial port	For Profibus, Modbus, wireless, TTY, or 4-20mA analog output module	With the 4-20mA analog output module, fault indication can be set by jumpers on the board to 0% full scale (FS) or 100% FS.	