



QuiK-Cup[®] QuiK-Lab[®] E

Thermal Analysis of Cast Iron

QuiK-Lab® E



QuiK-Lab® E Measuring System - Overview

The QuiK-Lab® E system measures the temperature of a cooling cup. Based on the cooling trace it can determine carbon equivalent, 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 45mm digital displays. Depending on the used QuiK-Cup® the QuiK-Lab® E provides the foundry operator with the following (calculated) metallurgical readings:

- **Peak temperature (TP)**
- **Liquidus temperature (TL) which provides calculation of:**
 - o Carbon equivalent (CEL)
 - o Saturation degree (SC)
- **Solidus temperature (TS) which provides calculation of:**
 - o Silicon content (%Si)
 - o Carbon content (%C)
- **Eutectic temperature minimum (TEmin)**
- **Eutectic temperature maximum (TEmax)**
- **Recalescence (DTM)**
- **Undercooling (DT)**
- **End of freezing (TF)**

Setting Displays

The QuiK-Lab® E has an upper and lower display. The upper display shows measured values continuously and the lower one displays the various calculated values. One can scroll through these values using the up and down arrows underneath the lower display or let the display scroll automatically.



Measurement system for thermal analysis

Parameter settings

You can set instrument parameters and select data telegrams using an LCD interface inside the instrument.

Parameters can be set for:

- **evaluation tolerances;**
- **thermocouple calibration type;**
- **measurement times;**
- **communication interfaces;**
- **start conditions;**
- **formulas for thermal analysis;**
- **calibration offset;**
- **algorithm selection;**
- **connection with MeltControl2020**

The device configuration programmed by internal LCD and buttons is protected by a user set password.

An integrated and removable memory dongle provides the backup and the restore of the instrument parameters.

Analysing Results

Although the QuiK-Lab® E can operate as a standalone measuring instrument for thermal analysis, it can also work as part of the MeltControl 2020 system, which stores measured and calculated values on a PC for visualisation and further analysis.



Meltcontrol 2020 interface

The MeltControl software runs on a central logging PC and captures all measurements from all measurement instruments (eg. DigiTemp-E, QuiK-Lab® E, ...) in the same network. The cooling traces are visualised in a user friendly way and can be analysed in detail.

MeltControl2020 in combination with the QuiK-Lab® E can run in three operating modes:

- **Instrument Control: QuiK-Lab® E is master and handles the entire thermal analysis.**
- **Half Control: QuiK-Lab® E handles the temperature evaluations for big cups, while it gets its calculated values from MeltControl2020.**
- **Full Control (only for cups with a reduced volume): QuiK-Lab® E collects the measurement data and acts then as a display while MeltControl 2020 calculates the evaluations making use of a custom calculation algorithm.**

MeltControl 2020 is a server application and can be used with Windows®7 or higher.

QuiK-Cup®



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 types of QuiK-Cups® 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.



QuiK-Cup® family

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

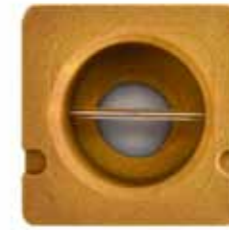
- Solid, thick-walled cup with reliable contact arrangement assuring correct polarity
- Horizontal quartz-protected thermocouple with short response time
- Wide pouring temperature range
- Reproducible and stable cooling curves
- High success rate
- Optimized volume resulting in fast cooling rate and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

Also possible

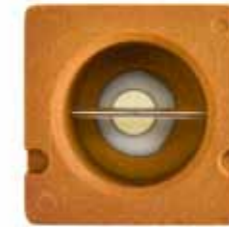
- Inoculation control by means of the eutectic undercooling measurement. This can be achieved by making use of the QCTCov cups.
- Evaluation algorithm for QCTCov cups for thermal analysis using MeltControl2020

Cups and Applications

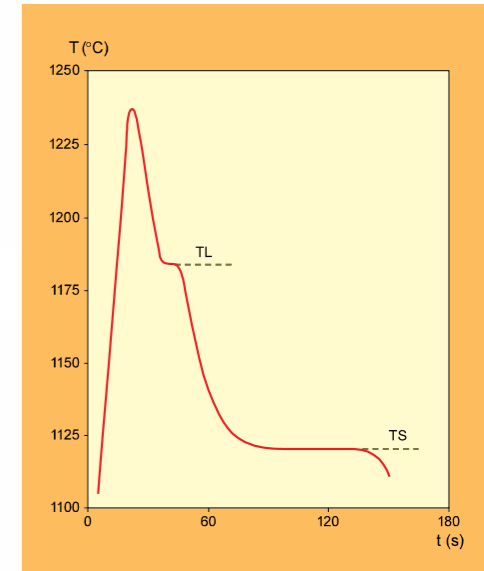
Cups with Tellurium (QCTe, QCTeS):
 White solidification for %CEL, %C and %Si determination in both hypo- and slightly hypereutectic lamellar iron. QCTeS has additional sulphur for usage in magnesium-treated cast iron (nodular and vermicular).



QCTe



QCTeS



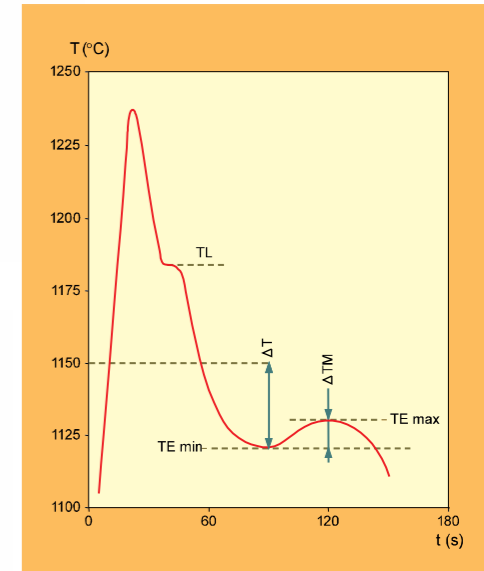
Cups without Tellurium (QC, QCTCov):
 Grey solidification for CEL determination in hypoeutectic iron and eutectic undercooling measurement. QCTCov has a reduced volume for a more pronounced undercooling. Due to the cover, the effect of the specific inoculation on the cast iron melt can be evaluated.



QC



QCTCov



ORDERING INFORMATION - Cups

Cups with Tellurium (50 in a pack)

QuiK-Cup® with Te	QCTe
QuiK-Cup® with Te + S	QCTeS

Cups without Tellurium (50 in a pack)

QuiK-Cup® without Te	QC
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Cups with Thin Volume (30 in a pack)

QuiK-Cup® with thin volume and Cover	QCTCov
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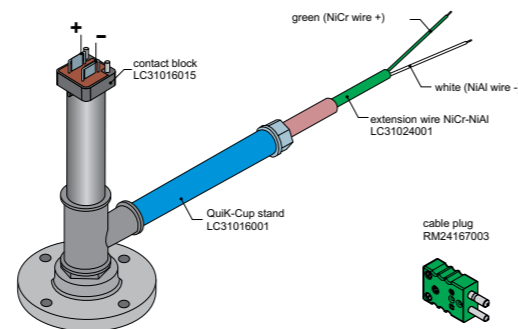
▲ AES pouring spoons

ORDERING INFORMATION - Spoons

Large pouring spoon AES (400cc)	LC31013004
Small pouring spoon AES (150cc)	LC31013005

ORDERING INFORMATION - Hardware

QuiK-Cup® Holder (complete)	LC31025208
QuiK-Cup® contact block	LC31016015
QuiK-Cup® stand	LC31016001
Type K extension wire (per meter)	LC31024001
Type K plug	RM24167003



▲ Quik-Cup® holder

ORDERING INFORMATION – QuiK-Lab E

QuiK-Lab® E instrument	31015001
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TECHNICAL DETAILS

Temperature measuring range

- Type K (NiCr-Ni) 400°C – 1370°C
- Arithmetically linearised according to IEC 584, IPTS 68
- Compensated connector type K

Displays

- 2 bright displays with LED signals on front door (height 45mm)
- Two seven-segment displays with four-digit matrix and four external keys.
- LCD display with four keys inside the instrument to set instrument parameters.

Reference temperature

- 0°C with electronic cold-junction adjustment

Accuracy

- Temperature +/- 1°C at 0°C to 50°C ambient temperature in measurement range > 400°C

Four solid state outputs 220V AC

- Outputs for external signals (Ready: green, Measure: yellow, Complete: red, Horn)
- An external horn can be connected if a snubber network is mounted to avoid EMC problems

Operation

- %Si and %C adjustment using external keys on second display

Power supply

- Power supply 90 to 230V AC, 50 to 60Hz
- Power consumption: Maximum 34 VA at ambient temperature 0°C to +50°C

Standard Data output

- Ethernet: TCP/IP Client Server
- Serial TTY 20mA or V24 interface
- mA output 0/4-20mA

Housing, dimensions, and weight

- Steel housing for wall mounting.
- Protection IP 55
- H=230mm, W=260mm, D=150mm
- Weight approx. 7.5kg

Additional interfaces/options (max 1 option)

- Second serial TTY 20mA or V24 interface;
- or Profibus DP;
- or PROFINET IO;
- or Modbus RTU;
- or Modbus TCP;
- or Ethernet IP;
- or mA output

Parameter storage

- USB 2.0 Storage Dongle

Variants

- Instrument with three displays: Third display shows heat number which is adjustable by using the external keys.
- Wireless cup holder (under development)



Heraeus Electro-Nite GmbH & Co. KG

Unter dem Hofe 10

D-58099 Hagen, Germany

Tel: +49 6181 35-2722

Fax: +49 6181 35-2801

Email: info.electro-nite.be@heraeus.com

www.heraeus-electro-nite.com

Heraeus Electro-Nite International NV

Centrum Zuid 1105

3530 Houthalen, Belgium

Tel: +32 11 / 60 02 11

Fax: +32 11 / 60 04 00

Email: info.electro-nite.be@heraeus.com

www.heraeus-electro-nite.com



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