

ivf smart Quench

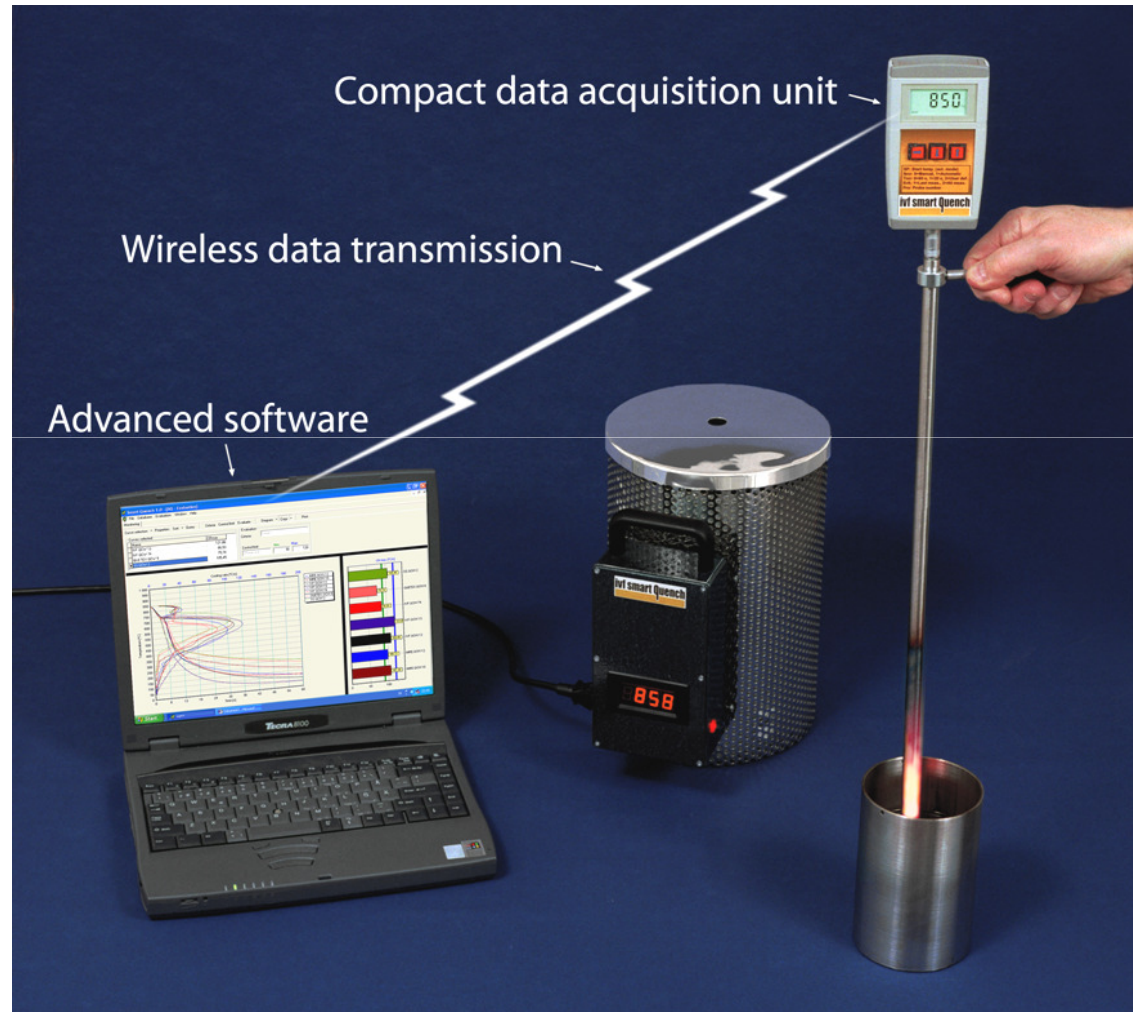
The logo for 'ivf smart Quench' features the text in a bold, sans-serif font. The word 'ivf' is in lowercase, 'smart' is in lowercase, and 'Quench' is in title case. The text is black, and there is a thick orange horizontal bar behind the word 'Quench'.

**New, advanced system
for safeguarding performance
of quenching media
and quenching systems**

**Based on 18 years' experience of *ivf quenchotest*
with more than 300 units sold to 36 countries worldwide**

**IVF Industrial Research and Development Corporation
Mölndal, Sweden**

Overview of the system *ivf SmartQuench™*



Main characteristics

ivf SmartQuench™

- **Small and robust data acquisition unit**
 - Light
 - Easy to use, extremely fast
 - On-site monitoring facilitated
- **Wireless data transmission**
 - High flexibility and accessibility
 - Results immediately available in your PC
 - PC can be placed where convenient
(up to 10-30 m away)
- **Advanced software**
 - Fast and accurate, quantitative evaluation
 - Formula editor for customized, numerical evaluation
 - Optimized selection of quenchants from database

Applications

ivf SmartQuench™

Main uses:

- Incoming inspection of quenchants
- Periodic monitoring of quenching characteristics
- Trouble-shooting in case of inconsistent hardening performance
- Comparison between alternative quenchants

Measurements can be made:

- On-site in quench tanks
- In the laboratory to ISO and ASTM standards

Different types of quenchants can be tested:

- Oils, polymers, water-based media, salts and gases

Reliability

ivf SmartQuench™

- **Each test probe is supplied with a test certificate**
→ Traceability, guarantee of performance
- **Reference oil is supplied with a test certificate**
→ Traceability, guarantee of performance
- **18 years' experience of manufacturing test probes to ISO and ASTM standards (more than 1800 units made)**
→ Long and stable life
- **More than 20 years' experience of R&D of quenching and quenchants**
→ Help available from IVF's experts to assist in planning and evaluating measurements

- **Cost saving**
 - Minimizing quality costs
 - Maximizing life of quenching media
 - Optimized selection of quenching media
- **Quality assurance**
 - Minimizing variation in results
 - Minimizing rework and rejects
 - Minimizing production downtime
- **Easy to use**
 - Time-saving
 - Suitable for use by a wide range of personnel
- **Access to IVF's quenching knowledge and experience**

Hardware

ivf SmartQuench™

- **Hand-held data acquisition unit**
Powered by rechargeable batteries
- **Test probe – to ISO 9950 and ASTM specs.**
Inconel 600, 12.5 mm dia., 400 mm length.
With handle
- **Portable furnace**
Lightweight thermal insulation for rapid heating
- **Equipment to facilitate testing in laboratory**
2-litre beaker with holder for test probe
- **Portable computer (optional)**
 - Pentium processor, min. 1.7 GHz
 - Min. 20 GB hard disk
 - Min. 256 MB memory
 - Windows® XP Professional (English version)
 - Min. 2 years warranty

Easy to carry

ivf SmartQuench™

The data acquisition unit with accessories, the test probe with handle, a CD with the computer software and the manual are all contained in a lightweight carrying case



Wireless communication *ivf SmartQuench™*

Wireless data transmission facilitates on-site testing



Wireless communication *ivf SmartQuench™*

- Data is transferred wirelessly between hand unit and PC
 - Parameter settings in hand unit can also be downloaded from PC
 - Recorded data downloaded to PC
 - Current probe temperature displayed on PC

A screenshot of the SmartQuench software window. The window has a blue title bar with the text 'SmartQuench'. Inside, there's a large red box at the top displaying '850'. Below this are various settings: Unit (1), Setpoint (850 °C), Time Mode (20sec), Start Mode (No Start), Time Mode (60sec), Start Mode (Start Manual), Probe Number (1835), Erase (No Erase), Temp °C / °F (°C), Sampling Rate (10 Samples/sec), MeasuringTime (60 sec), Calibration Zero (0), and Calibration Factor (1). There are buttons for 'Load from Unit' and 'Store in Unit'. At the bottom, there's a section for 'Measurement #' (2) with a 'Load data from hand unit' button, a 'Comment' field with 'New test', and 'Start Measurement' and 'Exit' buttons.

Software characteristics *ivf SmartQuench™*

- **Standard database format**
→ User-friendly
- **High-performance smoothing algorithm**
→ Efficient noise reduction
- **Built-in and user-defined numerical parameters**
(CR_{max} , $t[T]$, HP, etc.) calculated automatically
→ Quantitative evaluation of quenchant
- **Control limits can be set for all characteristics**
→ Evaluation enhanced
- **Database filtering of selected characteristics**
→ Optimized selection of quenchant
- **Flexible report configuration**
→ To suit to the application

Software details

ivf SmartQuench™

Data INPUT

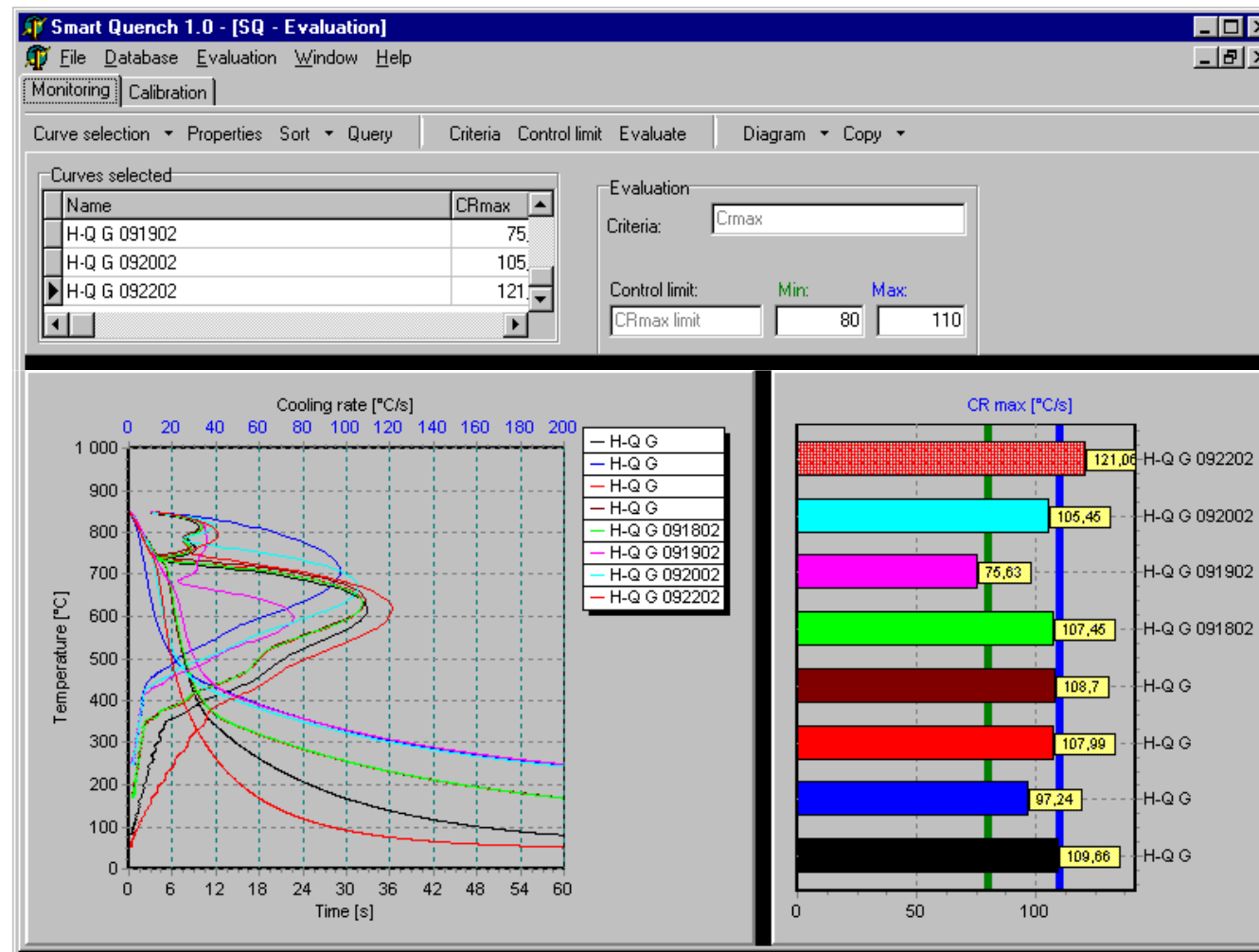
The screenshot displays the 'Smart Quench 1.0 - [SQ - Database]' window. The interface includes a menu bar (File, Database, Evaluation, Window, Help) and a tabbed interface with 'Curve data', 'Control limit data', 'Probe data', and 'Formula data'. The 'Curve data' tab is active, showing a 'New' button and a 'Formula' dropdown. On the left, there are two tree views: 'Folders' (containing INBOX, Oils, Polimers, Ucon, and two 'New folder' entries) and 'Curves' (listing various .qcw files, with 'probe01.qcw 101' selected). The main area is divided into 'General data' and 'Calculated data' tabs. The 'General data' tab contains input fields for curve name, date, and various temperature and time parameters. The 'Calculated data' tab is currently empty. Below these tabs is a table with columns 'Formula_id', 'Result', and 'Comment'.

General data		Calculated data	
Curve name:	probe01.qcw 101	Date:	
CRmax [°C/s]:	103.69	CR300 [°C/s]:	5.81
T(CRmax) [°C]:	584.93	CR400 [°C/s]:	27.88
t(CRMax) [s]:	7.38	CR500 [°C/s]:	72.85
HP - IVF (oils):	785.59	CR550 [°C/s]:	97.18
HP - IVF (polimers):	256.9	CR600 [°C/s]:	103.14
HP - Castrol (oils):	47.61	CR700 [°C/s]:	17.43
		CR800 [°C/s]:	32.01
Tvp [°C]:	697.16	Time600 [s]:	7.29
Tcp [°C]:	336.99	Time400 [s]:	10.36
CrI [°C/s]:	97.18	Time200 [s]:	43.99
Crm [°C/s]:	6.58	Time600-400 [s]:	3.07

Formula_id	Result	Comment

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Evaluation



CALCULATION FORMULA editor

User-defined formula:

$$F_1 = c_1(\text{VARIABLE}_1)^{\text{exp1}} + c_2(\text{VARIABLE}_2)^{\text{exp2}} + \dots \\ \dots + c_N(\text{VARIABLE}_N)^{\text{expN}}$$

where VARIABLE_N can be e.g.:

- CRmax [°C/s]
- CR(T) [°C/s]
- CR(t) [°C/s]
- T_{CRmax} [°C]
- T_{vp} [°C]
- T_{cp} [°C]
- T(t) [°C]
- Agitation rate [m/s]
- Concentration [%]
- ...

Software details

ivf SmartQuench™

$$F_1 = 3.54CR(550^\circ\text{C}) + 12.3CR(325^\circ\text{C}) - 168$$

Formula editor

Smart Quench 1.0 - [SQ - Database]

File Database Evaluation Window Help

Curve data Control limit data Probe data Formula data

New Copy Paste Delete

Folders:

- Name
- IVF equations
- Misc

User formulae:

- Name
- ivf HP
- new

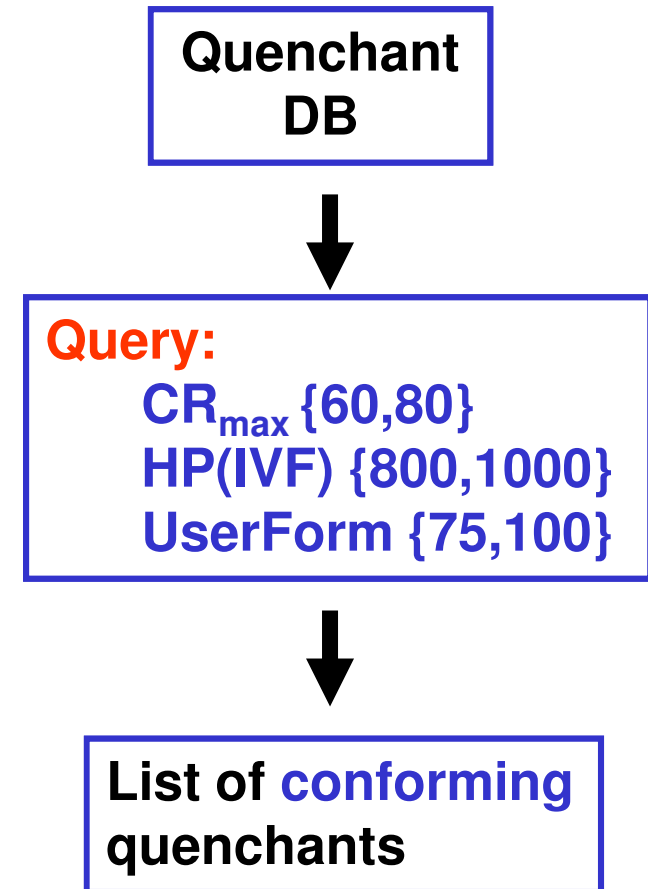
	Coefficient	Variable	Input A.	Input B.	Exponent
1.	91.5	Agitation rate [m/s]	0	0	0
2.	1.34	Temp. vapour->boiling [°]	0	0	1
3.	10.88	CR at * temperature [°/s]	550	0	1
4.	-3.85	Temp. boiling->convection [°]	0	0	1
5.	0	Agitation rate [m/s]	0	0	1
6.	0	Agitation rate [m/s]	0	0	1
7.	0	Concentration [%]	0	0	1
8.	0	CR at * temperature [°/s]	0	0	1
9.	0	CR at * time [°/s]	0	0	1
10.	0	CR Average between temperature ran	0	0	1
	0	CR max [°/s]	0	0	1
	0	Quench. Temperature [°]	0	0	1
	0	Temp. boiling->convection [°]	0	0	1
	0	Agitation rate [m/s]	0	0	1

Software details

ivf SmartQuench™

Selecting quenchants by data filtering

- **General** and **Calculated data** of cooling curves stored in DB
- **Optimum quenchant(s)** can be selected by using data filtering



Software details

ivf SmartQuench™

Selecting quenchant by data filtering

Optimization query [X]

GroupBox1

	Variable	Minimum	Maximum	Sort by
AND	HP - IVF (oils)	800	1100	<input checked="" type="checkbox"/>
AND	T(CR max) [°C]	450	550	<input checked="" type="checkbox"/>
AND	Tcp [°C]	300	250	<input checked="" type="checkbox"/>
AND	CR 550 [°C/s]	80	100	<input checked="" type="checkbox"/>
OR	Time 400 [s]	20	25	<input checked="" type="checkbox"/>

Formulae

	Formula	Minimum	Maximum	Sort by
AND	Furnace 2	700	900	<input type="checkbox"/>
AND		0	0	<input type="checkbox"/>
AND		0	0	<input type="checkbox"/>
AND		0	0	<input type="checkbox"/>
AND		0	0	<input type="checkbox"/>

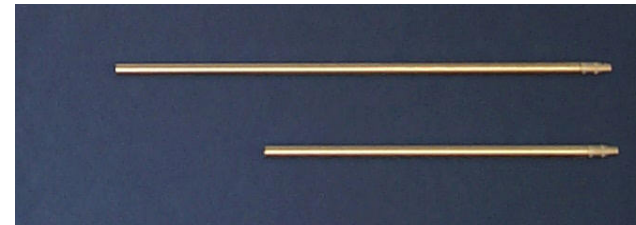
OK Cancel

Consumables

ivf SmartQuench™

- **Test probes**

Inconel 600, 12.5 mm dia.
L= 400 mm, standard
L= 600 mm, optional



Made to meet ISO 9950, ASTM D 6200
and ASTM D 6482 standards

Optional items

ivf SmartQuench™

- **Agitation device**

For testing polymers to
ASTM D 6482 standard

- **Test probes in non-standard dimensions and materials**

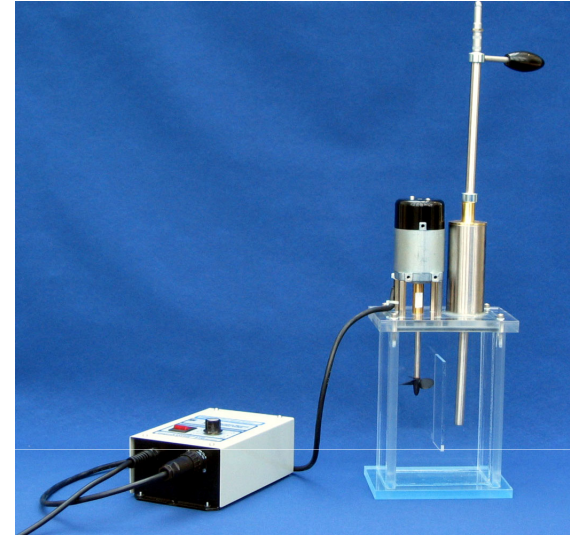
- Inconel, stainless steel, steel, silver, aluminium.
- L=400–1,500 mm.
- Single or multiple thermocouples.

- **Thermocouples**

For testing with real components

- **Adapter for test probes**

To allow the use of test probes
made for *ivf quenchotest*



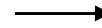
Items for calibration

ivf SmartQuench™

- **Reference test probe**

With certificate

L=400 mm



- **Reference oil**

With certificate

NB. IVF's ref. oil



- **Hand-held, digital temperature measuring instrument with calibrated thermocouple**

For calibration of the measurement system and the furnace



- **Optical tachometer with reflecting tape**

For checking the impeller speed of the agitation device



Markets

ivf SmartQuench™

- Quenchant suppliers
- Commercial heat treaters
- Manufacturers of cars, trucks, automotive components, construction equipment, aircraft, railroad equipment, furnaces, gears, bearings, fasteners, springs, hand tools, forgings, tubes and other semi-finished steel products with own heat treatment facilities
- Research institutes, laboratories, technical schools

Representation

ivf SmartQuench™

- Representation in some 40 countries worldwide
- Please inquire about your nearest representative

Further information

ivf SmartQuench™

For further information, please contact:



IVF Industrial Research and Development Corp.
Argongatan 30, SE-431 53 Mölndal, Sweden
Tel.: +46-31-706 60 00. Fax: +46-31-27 61 30
E-mail: ivfsmartquench@ivf.se
Internet: www.ivfsmartquench.com

From the leader in quenchant testing



IVF Industrial Research and Development Corporation
Mölnadal, Sweden

www.ivfsmartquench.com