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™**

![Diagram showing components of the system: Compact data acquisition unit, Wireless data transmission, Advanced software.](image)
Main characteristics

- **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

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

- 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
Customer values

ivf SmartQuench™

• **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

• **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

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

Wireless data transmission facilitates on-site testing
Wireless communication

- 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
Software characteristics

• Standard database format
  → User-friendly

• High-performance smoothing algorithm
  → Efficient noise reduction

• Built-in and user-defined numerical parameters
  \((CR_{\text{max}}, t[T], \text{HP}, \text{etc.})\) calculated automatically
  → Quantitative evaluation of quenchants

• Control limits can be set for all characteristics
  → Evaluation enhanced

• Database filtering of selected characteristics
  → Optimized selection of quenchants

• Flexible report configuration
  → To suit to the application
Software details

Data INPUT

![Image of the ivf SmartQuench™ software interface]

The image shows the ivf SmartQuench™ software interface with a focus on the data input section. The interface includes fields for curve data, control limits, probe data, and formula data. Specific parameters such as Curve name, Data, CTime (°C), TIP (μl), etc., are displayed in a tabular format. The interface is designed to manage and analyze data input for various experiments, likely in a laboratory setting.
Software details

ivf SmartQuench™

Evaluation
User-defined formula:

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

where VARIABLE\(_N\) can be e.g.:

- CR\(_\text{max}\) [°C/s]
- CR(T) [°C/s]
- CR(t) [°C/s]
- T\(_\text{Cmax}\) [°C]
- Tvp [°C]
- Tcp [°C]
- T(t) [°C]
- Agitation rate [m/s]
- Concentration [%]
- ...
Software details

F₁ = 3.54CR(550°C) + 12.3CR(325°C) - 168

Formula editor
Software details

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

![Diagram](image)

**Quenchant DB**

**Query:**
- \( CR_{max} \{60,80\} \)
- \( HP(IVF) \{800,1000\} \)
- \( UserForm \{75,100\} \)

**List of conforming quenchants**
Selecting quenchants by data filtering
Consumables

• **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

- **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 quencho test
Items for calibration

- **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

• 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

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

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