

NI DAY 2011

Innovation is the essence
Dedication makes the difference

Test the curing of enamelled copper wire using
LabView.

This case story will give you a guided tour through the challenges of making a mechatronics instrument to be used world wide, and why it is important to test enamelled copper wire to secure the lifetime of transformers, generator and electrical motors.

Presentation of DSE Test Solutions A/S

- ♦ More than 15 years in T&M business
- ♦ Location – Horsens DK
- ♦ App. 25 employees
 - Knowledge based organization
 - Approx. 60% with long educations (B.Sc, M.Sc)
- ♦ 3 Business areas
 - Testers for the electronic industry
 - Wire testers
 - Biomass moisture testers



Mission:

Applying our in-depth experience and knowledge of test and measurement, we design unique system solutions and products that create value for our customers, our partners and ourselves.

Platform based FT solutions



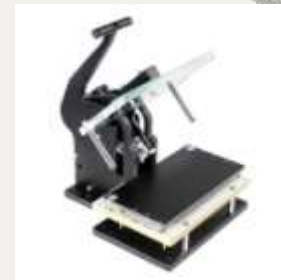
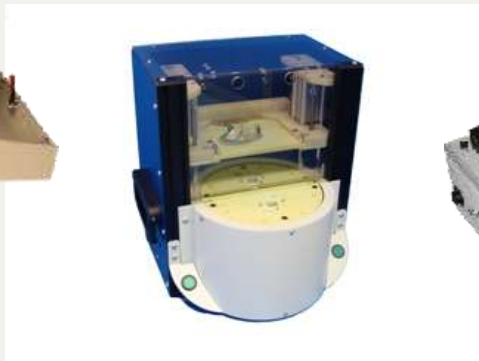
Cassette based In-Line Handling – standard or custom



Fixtures standard and custom



- From simple mechanic to full automatic
- RF shielded
- Turntable
- Safety cover
- Manual or pneumatic operated



Burn-in solution - Based on NI TestStand



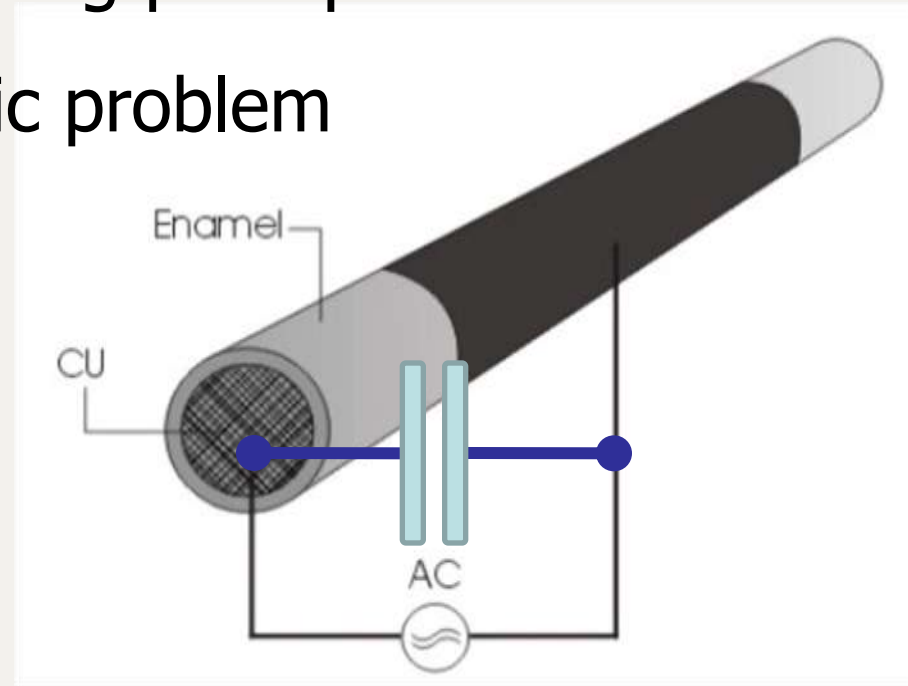
- ♦ Test of curing on:
 - Copper wire
 - Aluminium wire
 - Diameters 0.020mm – 8.0mm
 - Flat wire 1x1 mm – 8x20 mm



The principles of TgD

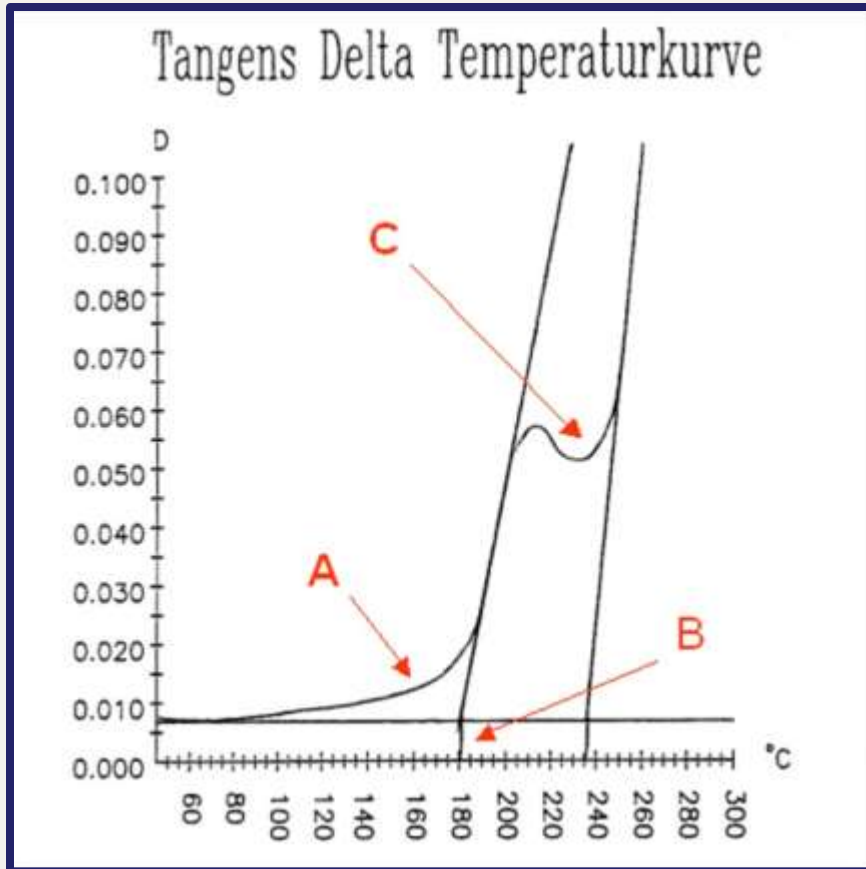
- DSE use inactive measuring principle

- No oxidation and toxic problem







- The enamel as isolator between the CU and the graphite makes and measureable capacitance.

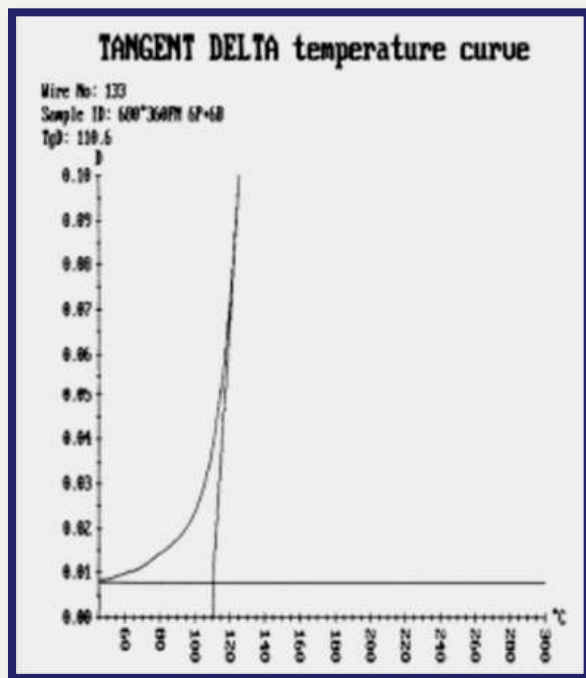
The Tangent Delta curve



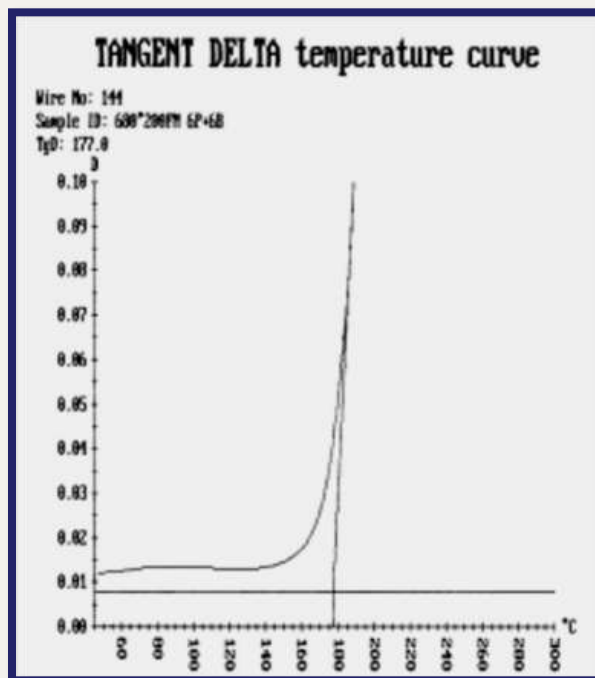
IMPORTANT FACTORS

-  Solvents (A)
-  Tangent Delta Temperature value (B)
-  Swing (C)
-  General shape of the curve

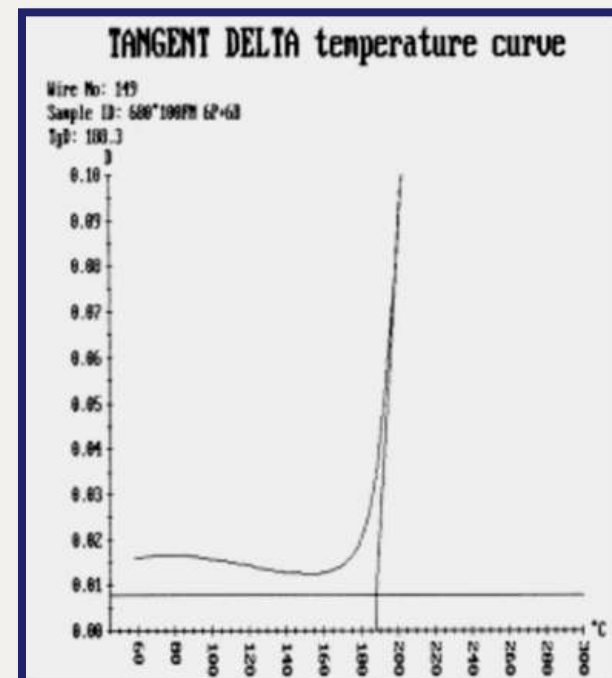
Polyurethane



Under Cured

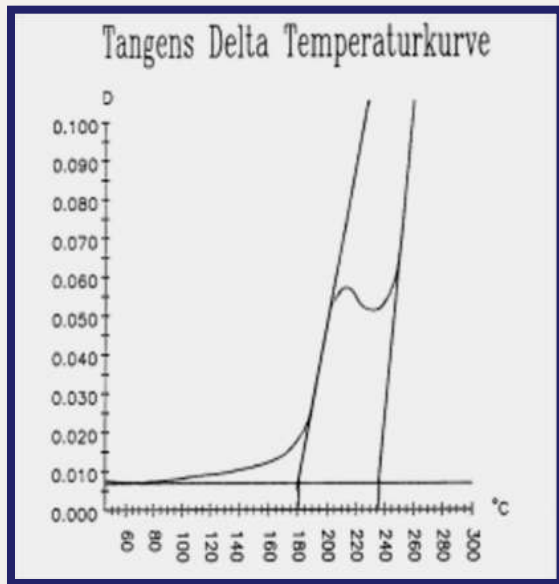


Well Cured

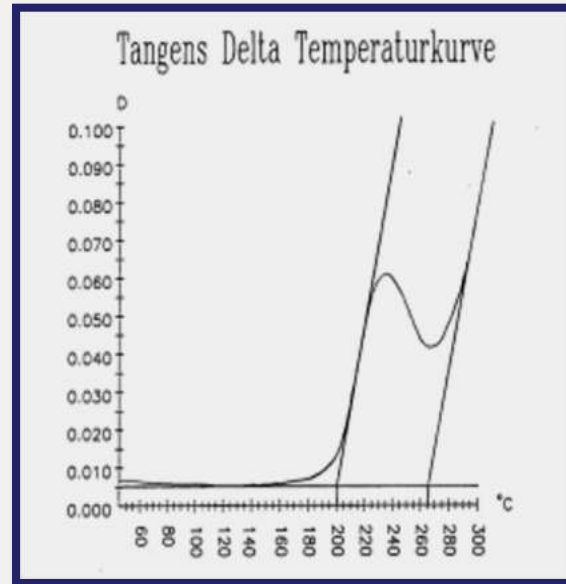


Over Cured

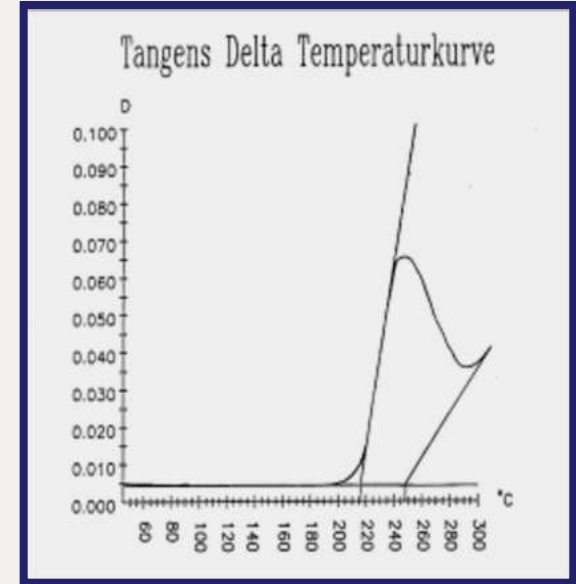
Polyesterimide



Under Cured



Well Cured



Over Cured

The temperature shown is the typical for the enamel types

- ♦ PE – PolyEster 160°
- ♦ PEI - PolyEsterImide, THEIC 185-220°
- ♦ AI – PolyAmideImide - >250°
- ♦ PI – PolyImide >250°
- ♦ PU – PolyUrethane 130°, 155°, >180°
- ♦ PA – PolyAmide – Nylon, 90°
- ♦ Bond, XWE – Amide based, temp not relevant
- ♦ Formvar – Polyvinyle

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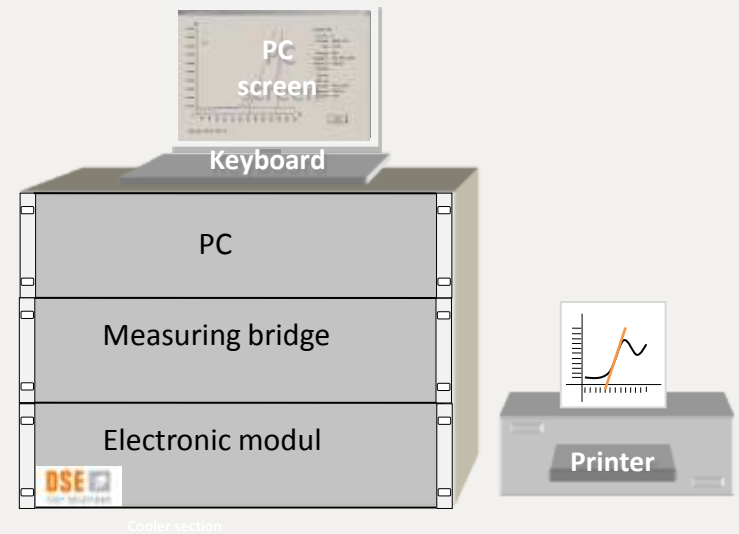
IVA PRODUCTS

Chemical Family		Thermal Class	Application
Polyvinyl Acetoformal (PVF)	B	120°C	Transformer
	B	120°C	Radio-TV-Auto
Polyurethane (PU)	F	155°C	Household
	H	180°C	Appliances
			Connector
Polyester Theic modified	H	180°C	Automotive
			Class H Motors
			Ballast
Polyesterimide Theic modified		200°C	Automotive
			Household
			Appliances
			Overcoat
Polyamideimide (PAI)		220°C	Nuclear and high
Self lubricating AI			temperature
			Industry
Nylon	B	120°C	Overcoat
			Sliding, chemical
			behavior
			Pump-Motor
Self Bonding Varnishes	H	180°C	TV
			Motor without
			carcass
Polyimide	C	240°C	Arming, aerospace
			Fight against fire

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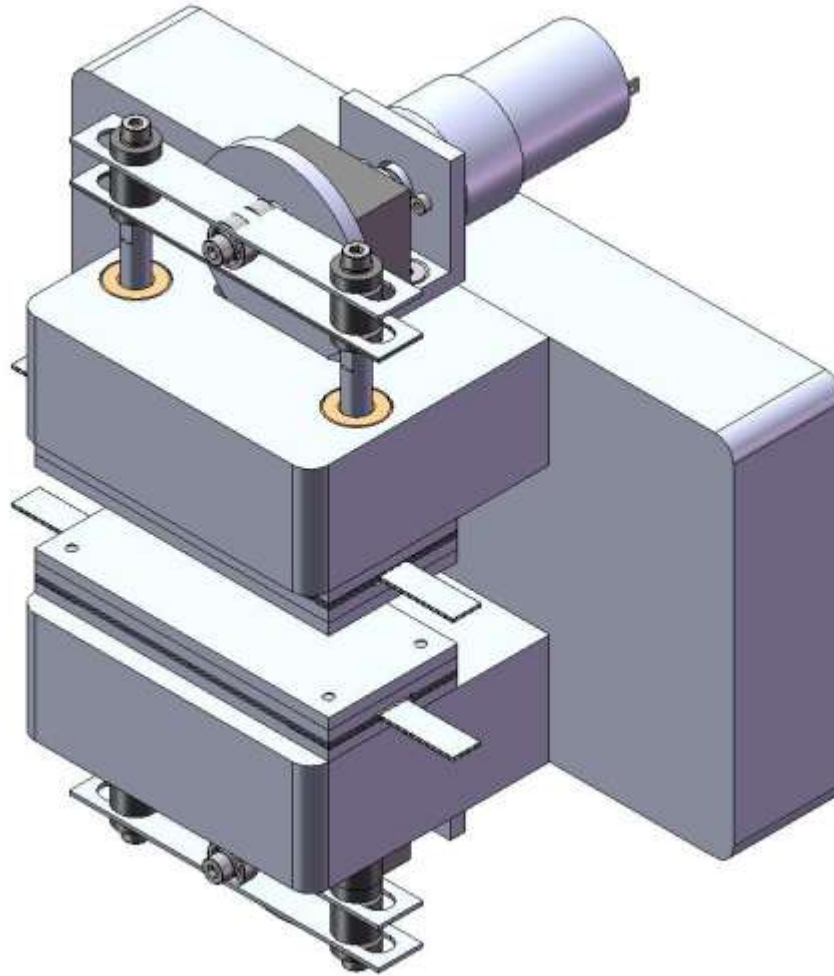
Old instruments



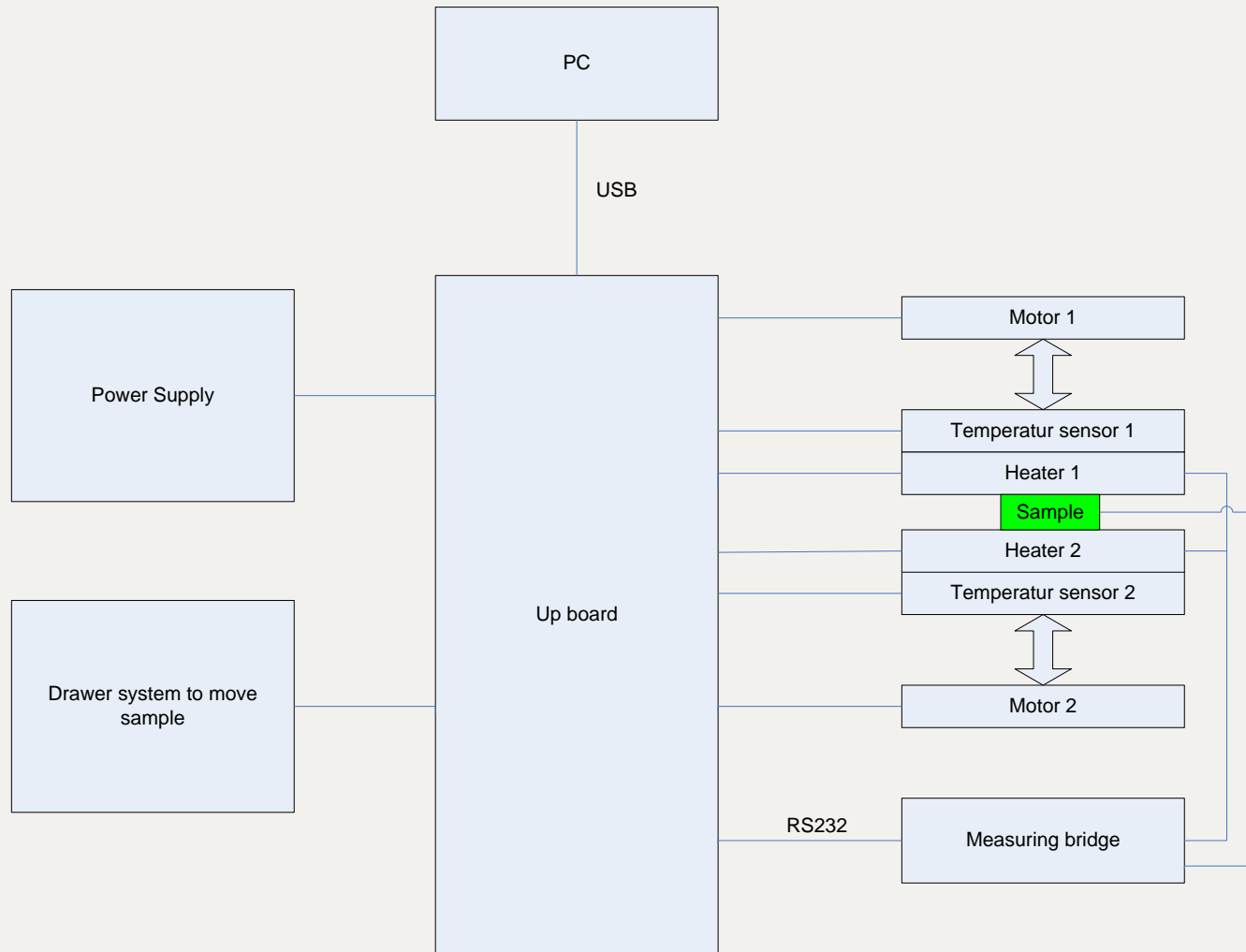
New requirements

- ♦ Modern design “Danish design”
- ♦ Higher measuring temperature $>400^{\circ}\text{C}$
- ♦ All wire types and diameters in one system
- ♦ Multi language user interface
- ♦ Use standard USB interface measuring unit to PC
- ♦ MS SQL database for data storage
- ♦ Simple to use
- ♦ Compare curves

All diameters in one system



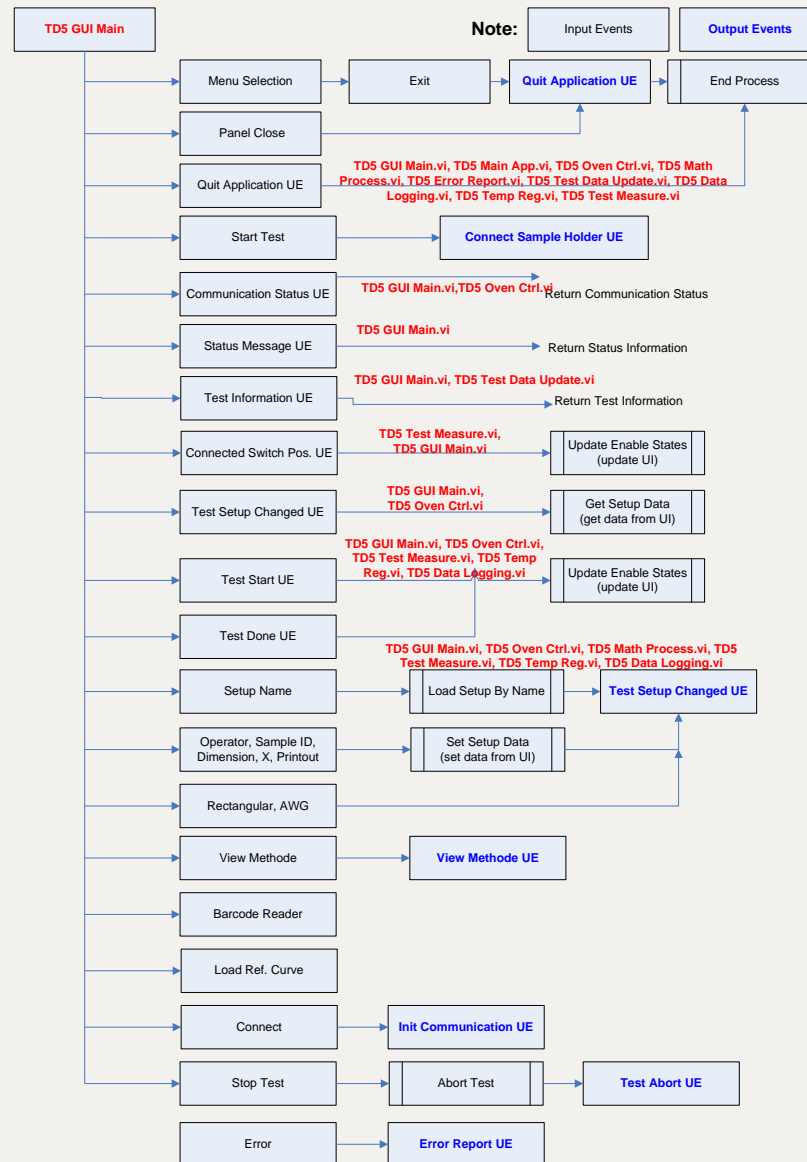
Block Design



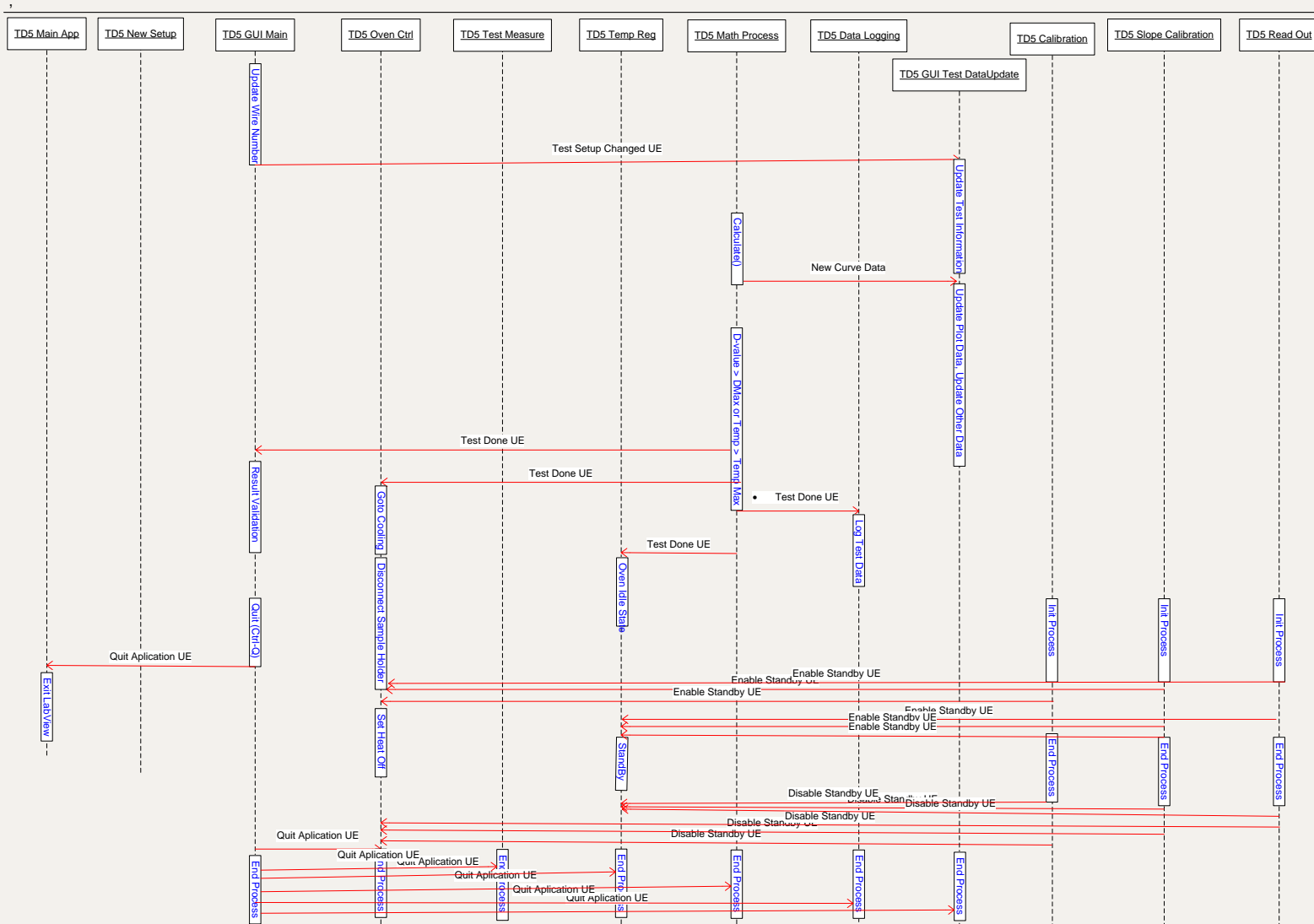
Software development

- ♦ TD300 and TD9000 developed in C++
- ♦ Graphical functions hard to program in C++
- ♦ C++ not core competence
- ♦ Why not use LabView for PC application?

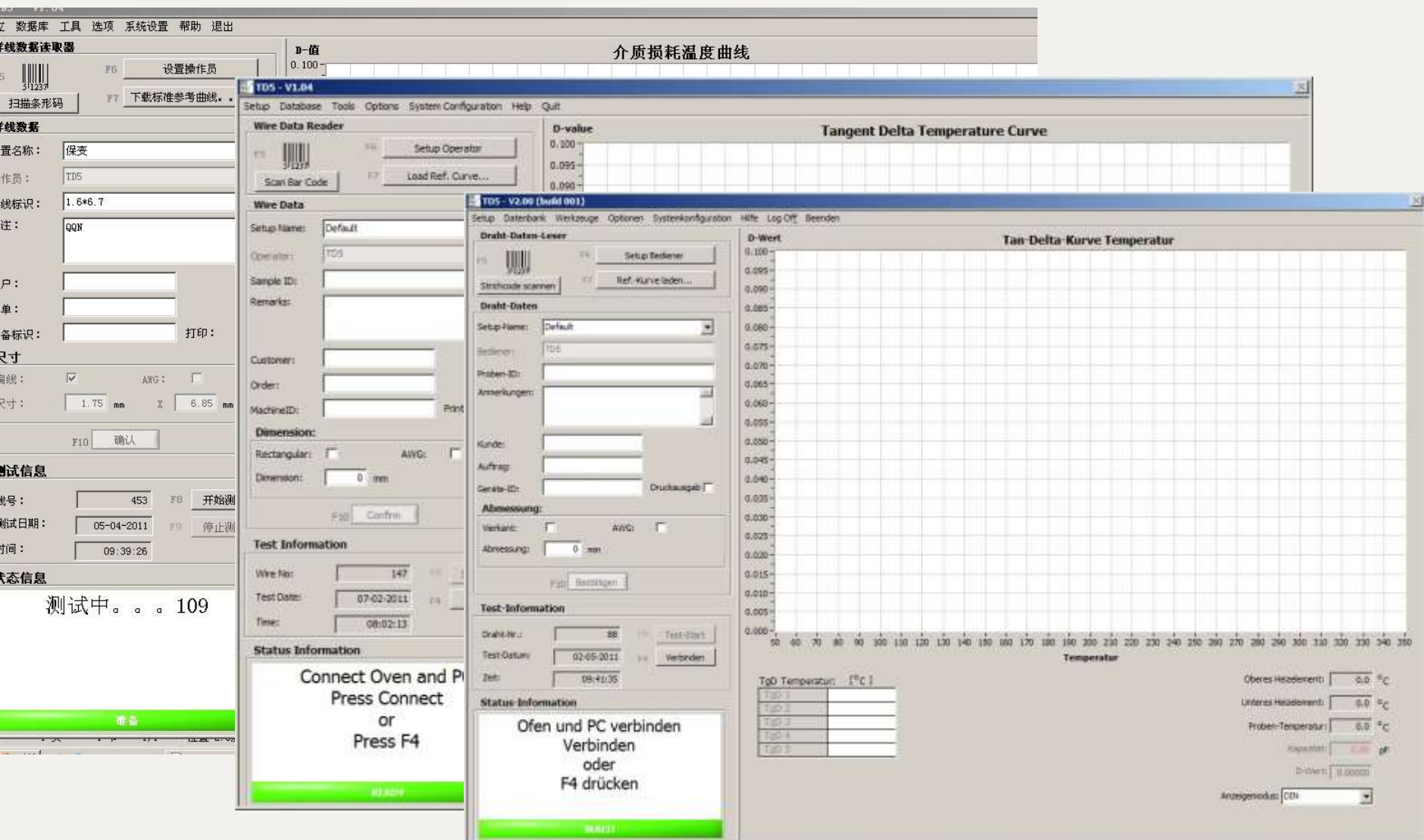
Design event handling



Design test sequence



Multi language



The screenshot displays the DSE software interface, which is designed for multi-language support. The main window, titled "Tangent Delta Temperature Curve", shows a graph of the D-value (D-Wert) versus Temperature (Temperatur). The D-value ranges from 0.000 to 0.100, and the Temperature ranges from 50 to 350 °C. The graph is currently empty, with a grid overlay.

Other visible windows include:

- Wire Data Reader (TD5 - V1.04):** Contains fields for Setup Name (Default), Operator (TD5), Sample ID, Remarks, Customers, Order, Machine ID, and Dimension (0 mm). It also has buttons for "Scan Bar Code", "Setup Operator", and "Load Ref. Curve...".
- Draht-Daten-Leser (TD5 - V2.05 (build 001)):** Similar to the Wire Data Reader, it includes fields for Setup Name, Operator, Sample ID, Remarks, Customers, Order, Machine ID, and Dimension (0 mm). It also has buttons for "Streichcode scannen", "Setup Bediener", and "Ref.-Kurve laden...".
- Test Information:** Displays Wire No. (147), Test Date (07-02-2011), and Time (08:02:13).
- Status Information:** Shows a message: "Connect Oven and PC Press Connect or Press F4" (German: "Ofen und PC verbinden Verbinden oder F4 drücken").

The interface is bilingual, with Chinese text on the left and German text on the right. The status bar at the bottom indicates "测试中。。。109" (Testing in progress... 109).

Language file

The name after the star is the name in the title bar in every window.

```
*TD5
Scan Bar Code\Enable / disable use of Bar Code reader.
Load Ref. Curve...\Load reference curve from a list in the database.
Wire Data
Setup Name:\Chose a Set up from a List.
Choose Setup\Open the list for choosing an existing Set up
Operator:\Type in or select an Operator from the list.
Sample ID:\Type in identification for the current wire sample.
Remarks:\Type in additional information (max.255 char).
Printout:\Click this field to enable automatic print out after completing a
test.
Dimension:\The dimension of the wire must be lager than 0.
Rectangular:\Wire shape. (Round / Rectangular)
AWG:\Wire dimension unit. (mm / AWG)
Dimension:\Wire dimension for round wire, and dimension A for rectangular wire.
X:\Dimension B for rectangular wire.
Update DB\Approve Data [Enter]
Stop Test\Stop current test[F9]
Confirm Help\You can press Confirm button whenever after you have typed:
Customer, Order and MachineID.
Test Information
Wire No:\Current wire number.
Test Date:
Time:
Status Information
OPERATING\Communication Status
READY\Communication Status
View Method:\Select DIN for Linear scale or Danfoss for Logarithmic y-scale (D-
Value).
Tangent Delta Temperature Curve
TgD Temperature:
Sample Temperature:
Capacitance:
Start Test\Start new Test or press[F8]
°C
pF
Customer:\Customers identification
Order:\Order number indification
```

The name after the star is the name in the title bar in every window.

```
*TD5
扫描条形码\启动/中止使用条形码阅读器.
下载标准参考曲线。。。\从数据库下载标准参考曲线
样线数据
设置名称:\数据库里的设置名称列表
选择设置\你可以通过点击组合框箭头从列表中选择设置
操作员:\键入或从列表里选择一个操作员
样线标识:\输入当前样线信息
备注:\最多 255 个字符)
打印:\复选这项在完成测试后进行打印输出
尺寸
扁线:\样线类型 (圆线/扁线)
AWG:\样线尺寸单位 (mm / AWG)
尺寸:\圆线线规, 扁样线线规 A 边
X:\扁样线线规 B 边
更新数据库\通过数据[Enter]
停止测试\停止当前测试[F9]
确认帮助\你可以在你输入: 客户, 订单和设备标识后, 按确认按钮。
测试信息
线号:\当前线号
测试日期:
时间:
状态信息
运行中\通讯状态
准备\通讯状态
查看方式:\选择查看方式(DIN 或 Danfoss)
介质损耗温度曲线
介质损耗温度值:
    样线温度:
    电容值:
开始测试\开始新测试[F8]
°C
pF
客户:\客户标识
订单:\订单号
```

Multi language

- ♦ Ascii = 8 bit, Chinese 16 bit
- ♦ WIN XP not possible to buy in Chinese version in Europe? – Now WIN 7 ultimate solved this problem.
- ♦ Different size of text makes dialog boxes and input filed difficult to fixe sizes

TD5



Evaluation

- ♦ Instrument well received on the market
- ♦ Design state of art within this business
- ♦ 40% of sale in China
- ♦ Language file difficult to align
- ♦ Not possible to scale / maximize user screens efficient in LV8.5
- ♦ Difficult to test software in languages you don't understand
- ♦ Difficult to support system where you don't understand user language
- ♦ Next time keep system design more simple

