

DETA SCOPETM

Industrial Dielectric Analysis and Spectroscopic Evaluation of Polymer Processing

General description

DETA SCOPE is a novel industrial monitoring system to follow the material changes during polymer processing involving reactions or state transformations. Measurements of electrical conductivity changes on dielectric sensors during the processing are analysed to provide actual estimation of material properties, such as viscosity and degree of polymerisation. The DETA SCOPE makes use of modern architecture data acquisition

hardware built in a rugged housing while it provides the operator with a simple, robust and user friendly soft-ware. The ability to supply interdigital sensors for on-line and in situ application to any process environment

makes DETA SCOPE a unique tool in monitoring advanced methods of manufacturing in a wide range of industrial sectors.

Product key features:

- Intelligent signal processing
- Adaptable monitoring strategy to the process and material characteristics

Components

DETA SCOPE comprises of the hardware unit, the control software and the dielectric sensors.

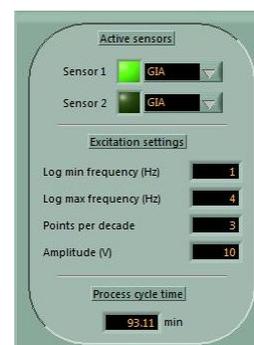


The **hardware unit** of DETA SCOPE performs the measurement function on dielectric sensors (capacitive elements). The main features are:

- Fast and accurate interrogation of dielectric sensors over a wide frequency range (10^{-3} - 10^5 Hz)
- Parallel interrogation of thermocouples (supported types J, K, T, S and N)
- Individual modules for 2 dielectric sensors and 4 thermocouples replicated to the desired level of expansion
- Connection to PC/laptop through USB port
- Rugged and modular industrial housing of the data acquisition system with separate terminal panels to connect sensors (BNC sockets) and thermocouples (mini sockets)
- Connectivity to industrial control equipment via analog signal of the measured properties

The design philosophy within the **DETA SCOPE software** creates an open, integrated environment for controlling, monitoring and post processing dielectric data. The main features of the software are:

- Simple output of continuous measurements (conductivity and temperature vs. time)
- Full support of hardware capabilities for multi-frequency sweeps (point-to-point or all-in-one mode) across a wide frequency and amplitude range
- Simple calibration of sensors and cables (practically any cable length can be compensated)
- Real-time plotting of electrical and material properties (see below)
- Data storage and automated post-processing for custom report generation
- Password protected area for in depth configuration and control of dielectric signal

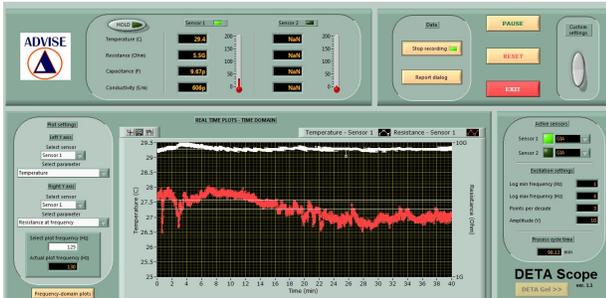




ADVISE

Where materials' intelligence creates the advantage

- Intelligent integration of generic and material specific models for real-time estimation of:
 - Degree of cure (chemical kinetics)
 - Resin viscosity (rheology)
 - T_g evolution (chemical structure)



DETA SCOPE software has unlimited license.

The capacitive interdigital **dielectric sensors** are the key element of the DETA SCOPE system. The system is configured to operate with a range of industrial dielectric sensors of variable geometry and material configurations. ADVISE supplies disposable sensors on a thin film substrate or durable sensors on a ceramic material (see picture on the left) with interdigital distance



(ID) ranging from 50 μm to 500 μm and covering a wide range of operating temperature (up to 300°C) and compatibility with materials processing environment.

These sensors can be adapted to various types of tooling (embedded, bag backed, middle-ply inserts), moulds, dies as well as in resin tanks/pots for the monitoring of all stages of the polymer processing.

The **instrumentation of ovens or autoclaves** for the use of DETA SCOPE system is made by special feedthroughs fitted on the vacuum ports for passing special high temperature (up to 220°C) coaxial cables in the vessel. A dedicated connection panel is installed in the oven/autoclave where the dielectric sensors are plugged on.

The DETA SCOPE system can be optionally linked to the supervisory control of the process equipment (oven, autoclave, RTM or injection device) through the supply of analog signal calibrated for a number of properties, including conductivity, viscosity, degree of

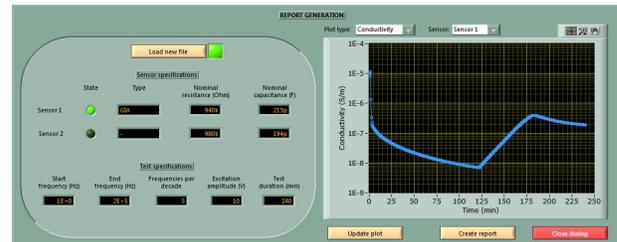
cure and T_g. For this purpose a separate module is provided.

Current Applications

The DETA SCOPE system can be used on the following types of reactive materials:

- Thermoset resins (epoxy/polyester/vinylester/BMI)s
- Polyurethane resins
- Polymer blends (thermoset/thermoplastic)
- CNT doped reactive polymers
- Liquid reactive thermoplastics (CBT)

The use of the system can be extended to any material or process where conductivity changes reflect changes of material state.



DETA SCOPE reporting function

Key Benefits

The adoption of DETA SCOPE system in the manufacturing practice makes the following proven advantages:

- shorter cure cycles (up to 20% reduction for common aerospace resin matrices)
- reduction of scrap (up to 35%) due to *in situ* measurement of viscosity, reaction rates and end-of-process conditions
- reduction of post-process inspection tests given the quality signature from the in-process sensors
- faster process development time due to the real-time measurement of main process parameters and material properties, such as resin viscosity and glass transition temperature

DETA SCOPE

For further information check our site www.advise-deta.com or contact us at info@advise-deta.com