



Figure 1: The Test device **SubCASE HT*** can measure the pot life and the curing of reactive plastics. It is designed for high reaction temperatures. The core temperature is measured by a reusable thermocouple inserted vertically into the center of the plastic sample.

Pot Life Monitor

SubCASE is a laboratory device for measuring the pot life and the curing behaviour of **Coatings**, **Adhesives**, **Sealants** and **Elastomers** (C.A.S.E.). The measurement device is especially designed for testing polyurethane, epoxy and polyester formulations. The compact mechanical design of SubCASE combines dielectric polarization measurement by using a CMD-sensor (Curing Monitor Device) and temperature measurement by a thermocouple and a PT transducer.

CMD-Sensor

The dielectric polarization is the key value in measuring chain formation and cross-linking of reactive plastics. It reveals the reaction profile of the entire chemical process starting off with the reactive mixture and finally ending with a cured compound. The CMD-sensor consists of two comb-shaped electrodes forming a plane capacitor. It is mounted onto the heated base plate of SubCASE and is protected by a foil, which avoids any direct contact between the reactive material and the sensor. The dielectric polarization and surface temperature data is obtained from the very beginning of the chemical reaction. Additionally the core temperature in the center of the test sample is measured by means of a vertically inserted thermocouple (TC, Figs. 1, 2). Testing under production near conditions is accomplished by heating the CMD-sensor to any production relevant temperature. Two SubCASE versions are available, the SubCASE 110°C (Fig. 4) with a maximum heater temperature of 110°C and the SubCASE HT with a maximum heater

SubCASE®

Pot Life and Curing Monitor for Reactive

- **C**oatings
- **A**dhesives
- **S**ealants
- **E**lastomers

based on

- **P**U formulations
- **EP, UP, and MMA** resins

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temperature of up to 150°C. The core temperature of the chemistry can reach much higher temperature values than the maximum heater temperature. The user-friendly software SUBCASE controls the measurement cycle. It acquires, displays and evaluates the measurement data (Figs. 3, 5, 6).

Test Cycle

Before starting a new test cycle a protection foil is rubbed onto the CMD-sensor using an adhesion promoting agent. A new cardboard cylinder, which forms the test container is fixated with the clamp mechanism. The mixing time, the test time, and the heater temperature are free selectable parameters in the software SUBCASE. The formulation data and additional comments can be inserted into an extra spread sheet.

The reactive mixture can automatically trigger the data acquisition when poured into the test container. After completion of a test, physical values like pot life and curing are evaluated from the measured curves and are listed together with other input data in a parameter list. The pot life is defined as a percentage value of the maximum dielectric polarization. The curing is determined from the dielectric polarization gradient.

Up to ten tests can be displayed and printed superimposed using the curve comparison function of the software SUBCASE. When a test is finished, the cardboard cylinder containing the cured sample is pulled off the CMD-sensor. The protection foil sticking to the sample is also removed. The thermocouple can be pulled out of the disposable glass tube and can therefore be reused for further tests.

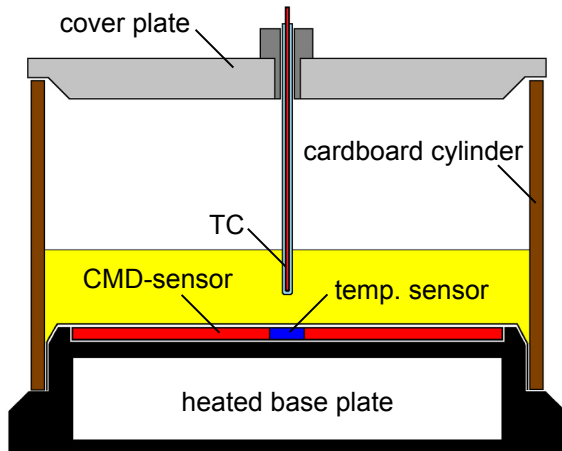


Figure 2: Cross section of the **SubCASE** test container. The CMD-sensor is mounted onto the temperature controlled base plate and is covered with a protection foil. The core temperature is measured by a thermocouple, which is inserted vertically through the cover plate.

Technical Data SubCASE HT

Pot Life Monitor	
measurement rate	10 Hz
serial interface	RS 232 C, USB
dimensions	270x205x180 mm
test cup diameter	100 mm
mass	3.7 kg
CMD-Sensor	
diameter	90 mm
polarization frequency	10 ... 1000 Hz
Heater Temperature	
SubCASE 110°C	20 ... 110 +/- 0.5°C
SubCASE HT	20 ... 150 +/- 0.5°C
Temperature Probe	
thermocouple	Type K (NiCr/Ni)
range	0 ... 300°C
External Power Supply	
SubCASE 110°C	12 VDC, 5.5 A
SubCASE HT	24 VDC, 5.5 A
Order No.	
SubCASE 110°C	300120
SubCASE HT	300130

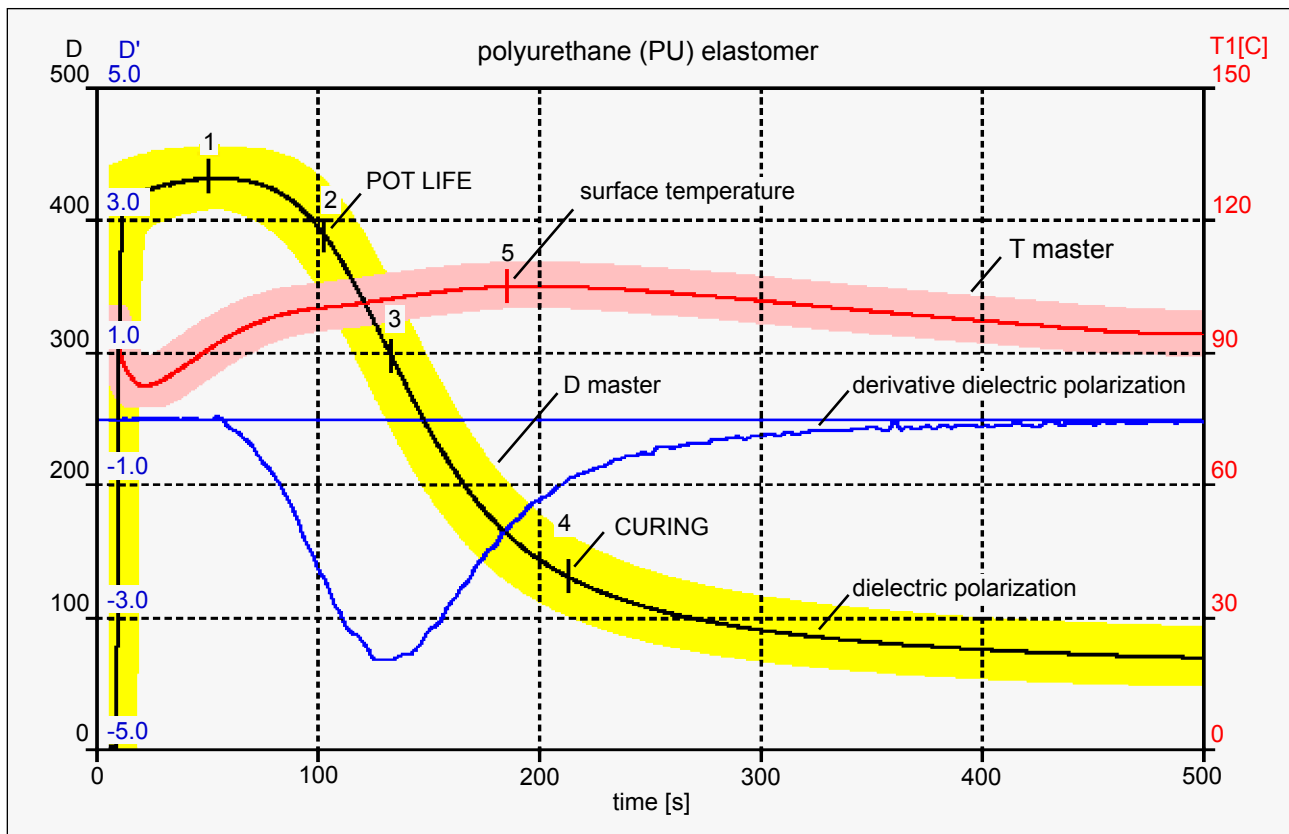


Figure 3: The curves show the dielectric polarization D and the surface temperature T_1 of a polyurethane (PU) elastomer. The D master and the T master are margins for QC purpose. The pot life and the curing are evaluated from the dielectric polarization curve and its derivative.

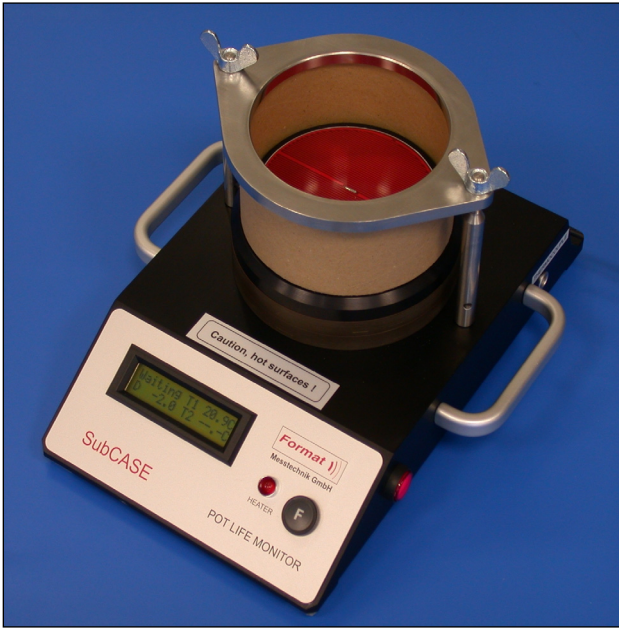


Figure 4: The Test device **SubCASE 110°C** is designed for measuring the pot life and the curing of Coatings, Adhesives, Sealants and Elastomers (C.A.S.E.). The reaction profile is determined by a dielectric polarization and a temperature measurement.

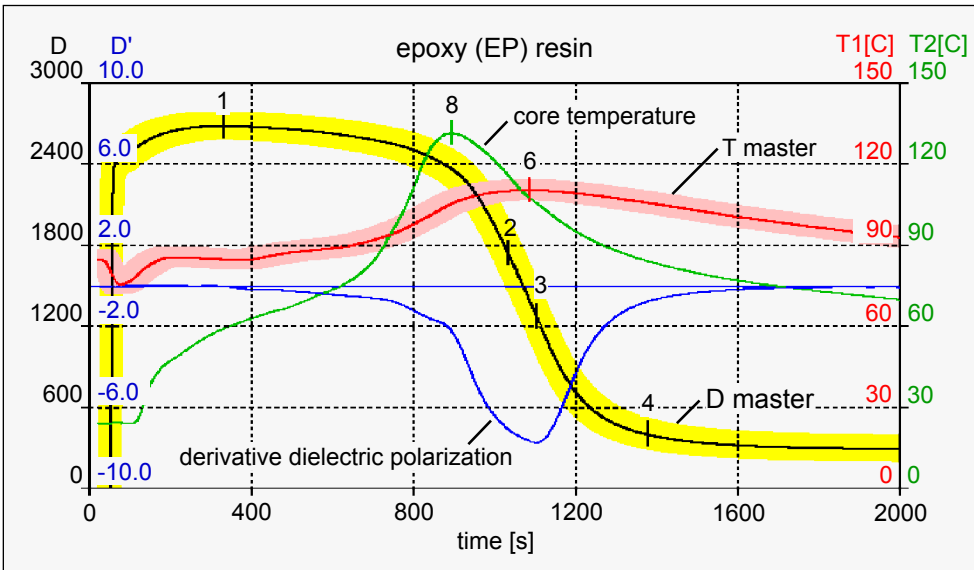


Figure 5: Reaction profile of an epoxy (EP) resin measured with SubCASE HT. The core temperature **T2** is detected by a thermocouple centered in the test sample. The curves are examples and they may differ for other formulations.

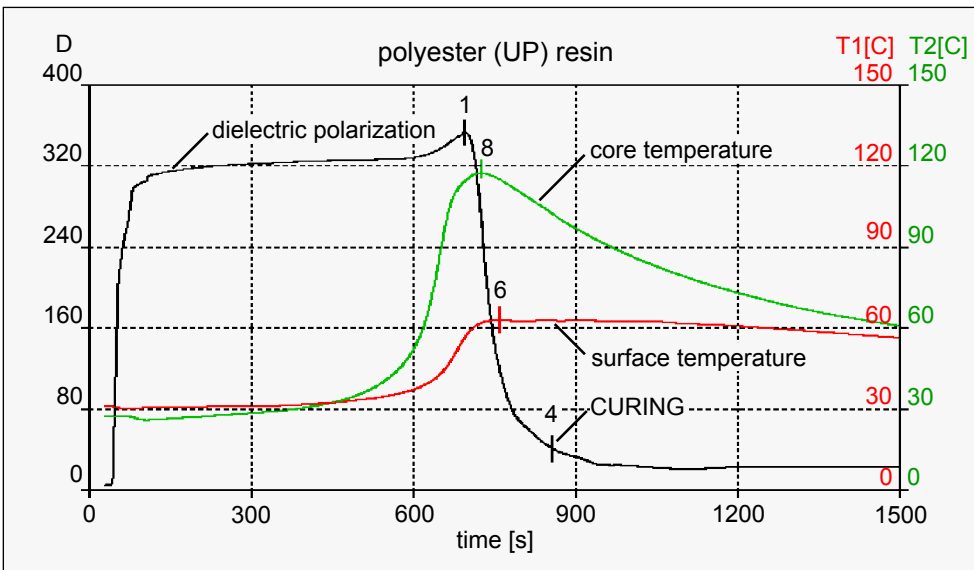


Figure 6: The dielectric polarization **D**, the surface temperature **T1**, and the core temperature **T2** of an unsaturated polyester (UP) resin measured with SubCASE HT.