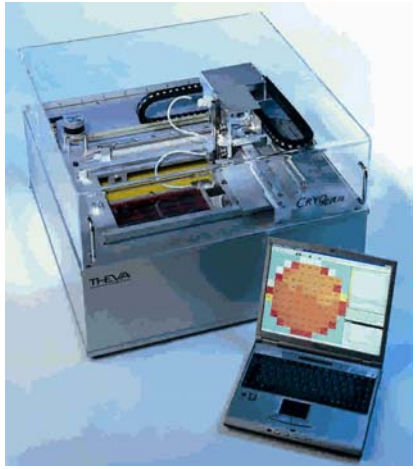
CRYOscan



Fast HTS - film quality assessment

For fast routine characterization of even large film samples, THEVA has developed the Cryoscan™. The instrument performs non-destructive mapping of the critical current density on HTS wafers using an inductive technique. It offers accurate measurements of the overall film quality as well as two-dimensional, high-resolution maps of the critical current distribution. Combined with an optional accessory, the instrument also allows determination of the transition temperature of single and double sided films.

Operating Cryoscan™ is extremely easy and the entire characterization process is automated and keyboard controlled. The desktop instrument operates with liquid nitrogen as coolant and is very versatile with respect to sample size and shape, and practically accommodates any number of wafers or substrates that fit into the 10” x 8” scanning area.

The spatial resolution of this technique can be adjusted into the millimeter range. Custom designed wafer holder plates are available to match your standard sample size.

Technical features

General features

The Cryoscan™ is a stand-alone instrument containing all necessary cryogenics and electronics (CE-certified). A convenient software running on a notebook is used to set scanning parameters and to display data.

All that’s needed is liquid nitrogen easily filled through a pipe connector.

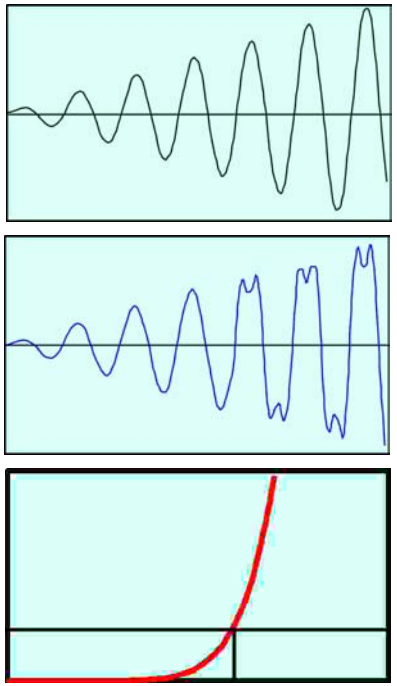
Each Cryoscan™ comes with a calibration standard allowing resistive as well as inductive measurements on the same chip.

Technical data

Size:	72 x 76 x 49 cm^3 (W,D,H)
Weight:	70 kg
Electrical requirements:	110V, 60 Hz, 6.3A, 500W
	230V, 50 Hz, 3.1 A, 500 W
Scanning area:	20 x 25 cm^2
Minimum sample size:	10 x 10 mm^2
Spatial resolution in the mm-range	
Data acquisition speed:	5 sec/point
Operating temperature:	77 K
Pressure:	ambient pressure
Temperature range for Tc:	> 77 K - ambient
Accessible critical current range:	
min	0.05 MA/cm^2 x 500 nm = 2.5 A/cm
max	3 MA/cm^2 x 1100 nm = 330 A/cm

Measurement principle

J_C - measurement



Third harmonic critical current measurement

The underlying contactless, inductive measurement principle is illustrated in the three schematic graphs.

The amplitude of the AC - driving current is increased.

The superconducting film screens the magnetic field as long as the current does not exceed its critical value. When the critical current is exceeded in the peaks of the sine the response signal gets distorted.

This non - linearity can be detected sensitively by checking higher harmonics. Once calibrated by transport measurements the harmonic response relates directly to the critical current density.

T_C - measurement

Tc - measurement

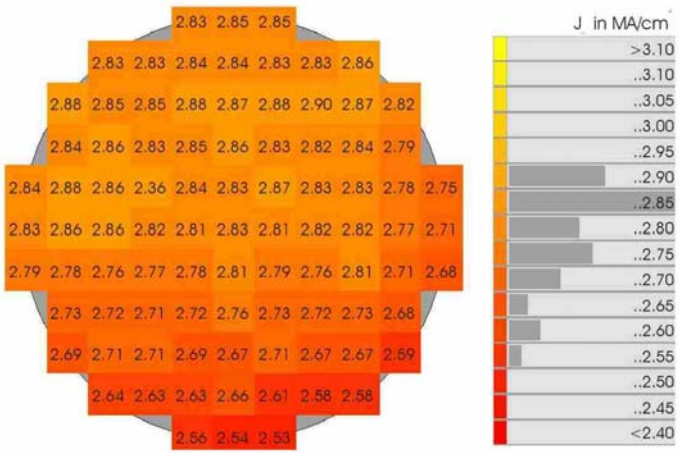
With the same ease as the critical current density the transition temperature of samples up to 4” diameter can be determined with an optional inset. No need for big cryostats – no cutting or monitor samples any more.

Film samples are mounted in a closed metal case to guarantee thermal equilibrium around the probe coil. Hence, the measurement allows only spot checks of the sample.

The measurement principle is the same as for the jc - scan, but the amplitude of the driving current is very low, so that the non – linear response is restricted to the immediate vicinity of the superconducting transition, when the sample is warming up.

Certification

Scan certificate



Current density map of 4” HTS film on sapphire

CRYOscan

Quality certificate

Quality inspection with Cryoscan™ is to a large extend automated. This allows routine checks of a large number of wafers.

After the scans the instrument automatically generates quality inspection sheets which can be filed or printed to keep track of each individual sample. Thus is helps to recognize rejects in an early stage prior to expensive processing or device testing and is an essential ingredient for the continuous documentation of the device fabrication process.