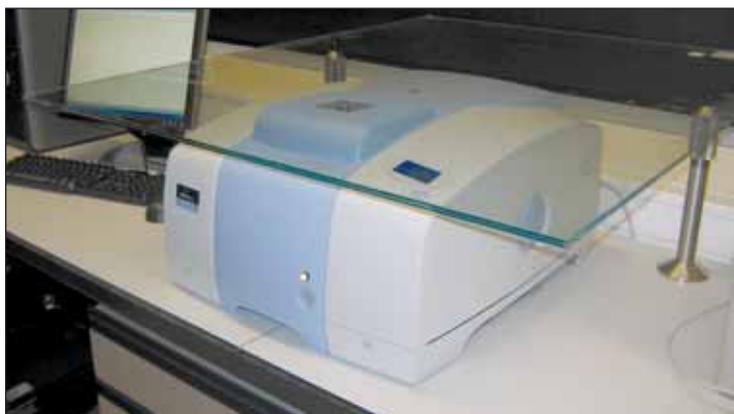


# IR Specular Reflection Set for Measuring Emissivity

## A proven tool for measuring emissivity of coated glass



### Introduction

Emissivity is a key property in determining the energy saving ability of glazing. In the context of European Standardization with the introduction of CE mark and methods for the evaluation of conformity of products there is an urgent need to improve and standardize measurement methods pertaining to emissivity. The THERMES project<sup>1</sup> dealt with these issues and provided the necessary co-normative research.

Based on the findings of the THERMES project, an IR specular reflection accessory set has been developed for the PerkinElmer® Spectrum™ 100 FT-IR Spectrometer. This provides a complete solution for state-of-the-art measurement of the emissivity of coated glazing products according to international standards. A unique feature of the accessory is that it enables measurements on large tempered glass panes. In addition, relatively small samples (as small as 5 mm) that are generally difficult to align, can be measured with this accessory.

### Key Features

- ▶ Measures the emissivity of coated glazing products according to international standards for energy saving
- ▶ Adjustable and stable sample supports enable accurate measurement of large tempered glass panes on Spectrum 100
- ▶ Unique built-in laser alignment system to check and adjust alignment for large glass panels
- ▶ Features 5 gold-coated reference mirrors, including a primary standard for checking and recalibration of 4 working standards

The usable wavelength range of the accessory is that of the Spectrum 100 configuration equipped with a KBr or CsI beamsplitter. The accessory is designed to measure direct reflectance of specular samples at an angle of incidence of 6 degrees.

## Description

The accessory is equipped with a 3-point sample support for maximum stability and accuracy. A laser alignment system is built in to enable checking and adjusting the alignment of large panes. A stable horizontal sample positioning for large panes (>1 square meter size) is obtained with the help of two separate supports, height adjustable, to be positioned on the same table as the instrument.

The accessory is accompanied by a set of five gold coated reference mirrors, of which one mirror is the primary standard that is used only to check and recalibrate the four other mirrors that are the so-called working standards. Initial calibration values for all of these mirrors, traceable to international standards, are provided. The reflectance of the mirrors is close to 0.985 and the total calibration uncertainty is less than 0.005. If required, an optional primary standard mirror can be supplied with an official NPL certificate with a calibration uncertainty of approximately 0.003. Also included is a manual with step-by-step procedures for installation, calibration and measurements and an Excel® workbook in which the procedures are implemented that were validated by the THERMES project (resulting in emissivity values according to EN673).

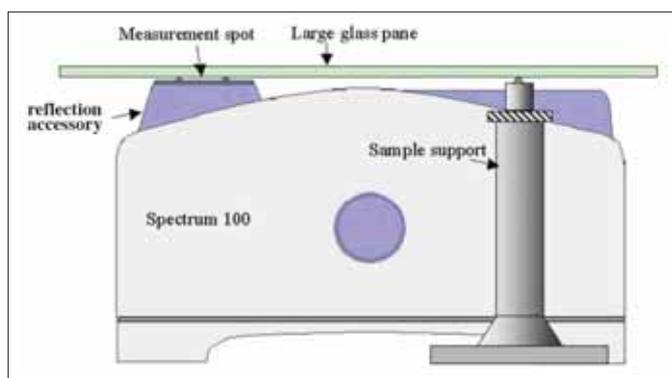


Figure 1. Schematic drawing of the reflection set-up for large panes (side view), showing one of the two large sample supports. Supports are height adjustable to adjust the alignment.

The IR specular reflection set is delivered in a light-weight equipment protector case containing the following items:

- The IR specular reflection accessory.
- Sample port protection cover.
- Set of five calibrated gold mirrors, of which four are to be used as working standards and one is used as primary standard for checking and calibrating the other four.
- Two height adjustable sample support pillars for extreme large samples.
- CD-ROM with an electronic copy of the manual and Excel® workbooks for data analysis.
- Instruction manual with a step-by-step description of the alignment and measurement procedures. This includes a detailed description of the calculation procedures and uncertainty analysis.
- Report containing test results obtained on the accessory prior to shipment.
- The accessory is pre-aligned and fully tested at TNO.



Figure 2. Kit includes Spectrum 100 sample pod, reflectance standards, supports for large panes and protective case.

## Ordering information

IR Specular Reflection Set for measuring emissivity  
Part No. L1250600

For further ordering information, please contact your nearest PerkinElmer representative.

## References

1. P.A. van Nijnatten, M.G. Hutchins, N.B. Kilbey, A. Roos, K. Gelin, F. Geotti-Bianchini, P. Polato, C. Anderson, F. Olive, M. Köhl, R. Spragg and P. Turner, Uncertainties in the accurate determination of thermal emissivity by measurement of reflectance using Fourier Transform Spectrophotometers, *Thin Solid Films*. 502 (2006) p. 164-169.

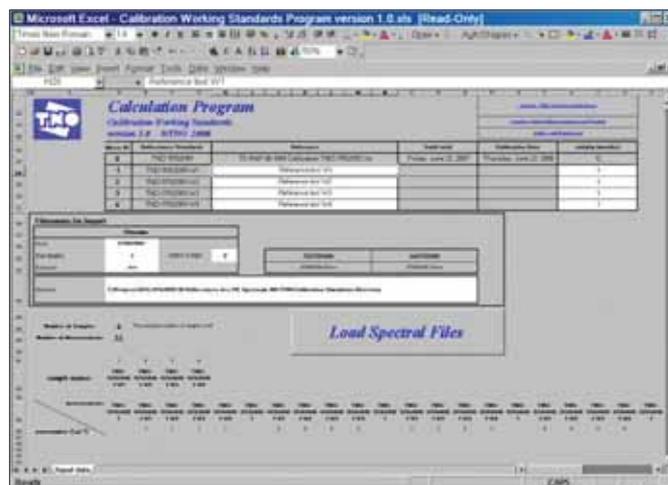


Figure 4. Worksheet for calculation of emissivity values.

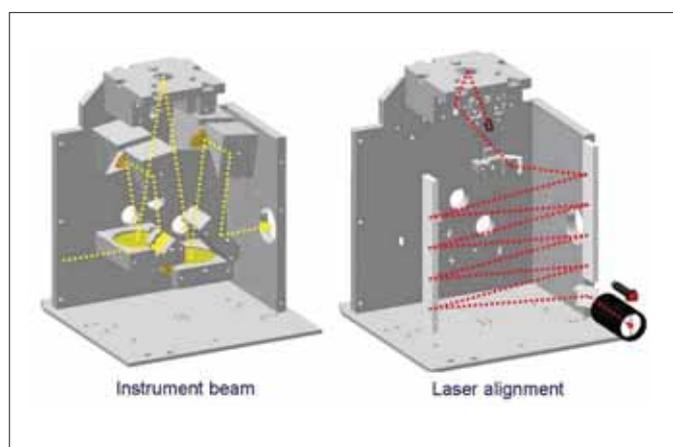


Figure 3. Schematics showing light paths in IR and alignment modes.

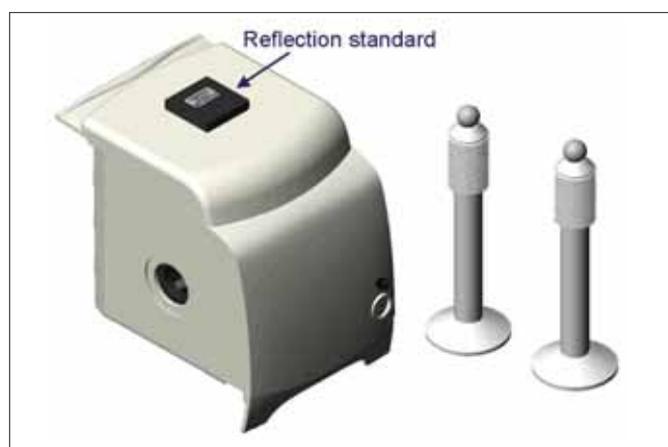


Figure 5. Spectrum 100 sampling pod and supports.

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For more information about IR emissivity measurements contact TNO Science and Industry:  
POB 595 • 5600 AN Eindhoven • The Netherlands

**Accessory Development:** Peter A. van Nijnatten (PhD), Ivo Schoofs (BSc), Jurgen de Wolf (BSc)  
Website: [www.tno.nl/omt](http://www.tno.nl/omt) • Telephone: +31 40 265 01 00 • Telefax: +31 40 265 08 50 • E-mail: [OMT@tpd.tno.nl](mailto:OMT@tpd.tno.nl)

PerkinElmer, Inc.  
940 Winter Street  
Waltham, MA 02451 USA  
Phone: (800) 762-4000 or  
(+1) 203-925-4602  
[www.perkinelmer.com](http://www.perkinelmer.com)



For a complete listing of our global offices, visit [www.perkinelmer.com/lasoffices](http://www.perkinelmer.com/lasoffices)

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