



Thermal Oxidation Stability of Aviation Turbines Fuels  
ASTM D3241 - Annex 2

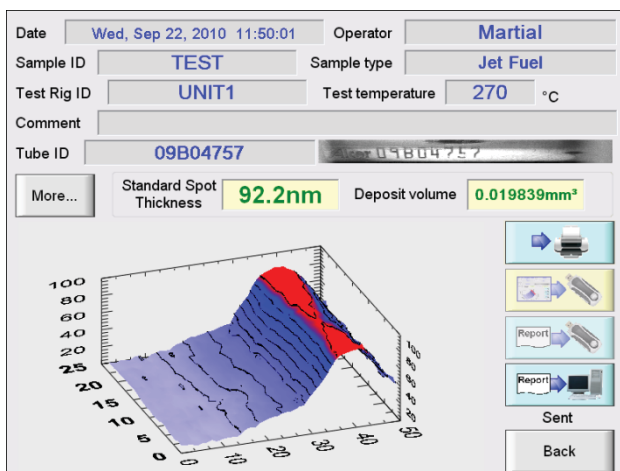
# DR10 – ITR Heater Tube Deposit Rater



- ▶ Referee instrument for measurement of deposit thickness on heater tubes
- ▶ Quick, easy, very compact design
- ▶ Ideal tool for QC and research
- ▶ Rigid construction, no optical adjustment required

Until late 2014, only the visual rating method was used for specification purposes but it was suffering

from the drawback of operator subjectivity. ASTM decided to use SI unit to report the result of the jet fuel thermal oxidation deposit. To do so, ASTM voted to make the DR10-ITR a referee method.



The DR10 measures the deposit thickness around the surface of the tube. At the end of the test, it displays in SI units a 3D mapping of the deposit formed along and around the whole length of heater tube. In addition the instrument reports average and maximum thicknesses and total volume deposit.

## Applications

The DR10 - ITR is designed for all types of applications related to thermal oxidation testing of jet fuels including research, refining, pipeline, terminals, and mobile laboratory applications - every location where thermal oxidation of jet fuel is evaluated.

Methods:  
ASTM D3241  
IP 323, ISO 6249  
ASTM D1655,  
D7566  
DEF STAN 91-91

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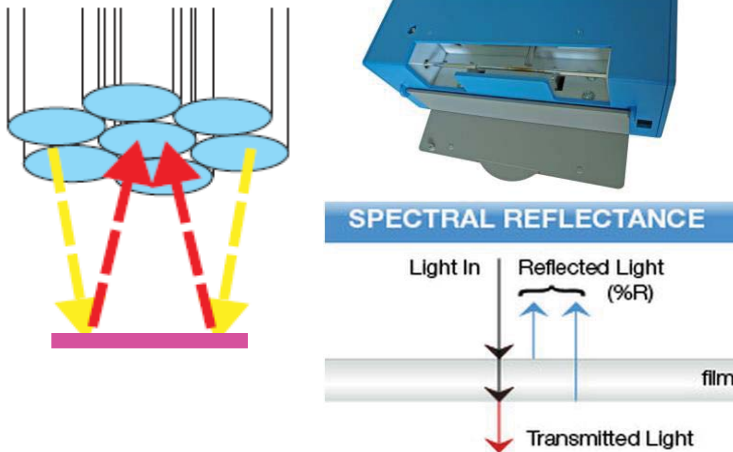


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## Principle

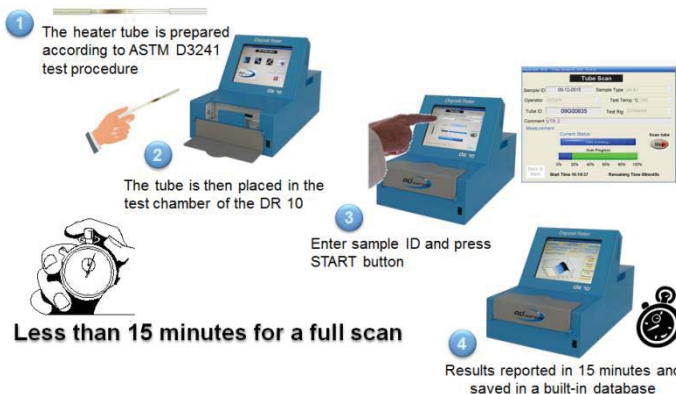
The DR10 uses an interferometry technique (Spectral Reflectance) based on a powerful light source, a fiber optic probe, and a spectrometer. Specific light is emitted on the surface of the tube.



The reflected light is collected and the light interference created by the deposit is processed by a spectrometer. The software analyzes the interference fringes and calculates the deposit thickness.

## Operation

The heater tube is prepared according to ASTM D 3241 procedure and is placed in the test chamber of the DR 10.

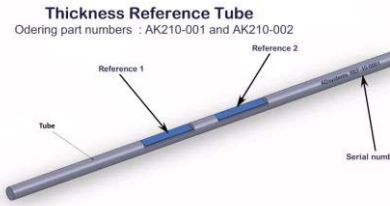


The DR10 is equipped with a touch screen. A virtual alphanumeric keypad is used to program the test. The sample types, the operator names and test temperatures are pre-programmed. Only the sample ID and the tube serial number have to be entered. The tube serial number is displayed by a camera and the technician simply enters the displayed serial number at the beginning of the test. With this minimal data entry, the 1,200 points tube scanning is initiated. The full tube scan is completed **in 12 minutes**. With the fast mode operation the full scan is performed in **4 minutes**.

The DR10 displays a 3D image of the deposit and the average and the maximum thickness deposit values. The mean deposit thickness of the thickest 2.5 mm<sup>2</sup> area defined in the ASTM D3241 is reported in addition to the calculated total deposit volume.

When the deposit thickness over the 2.5 mm<sup>2</sup> area exceeds the 85 nm limit specified in ASTM D1655 and Def Stan 91-91, the result is displayed in red color to warn the laboratory technician.

AD Systems thin film thickness reference tubes can be used for the verification of the accuracy of the DR10



Deposit Rater – ITR instrument. The thin film thickness reference tubes are traceable to Spectroscopic Ellipsometer (SE)

measurements performed by a National Laboratory for Metrology. It meets the requirements for calibration and testing laboratories as defined in the EN ISO/IEC 17025.

### Reported results

Average thickness	0 to 1200 nm
Maximum thickness	0 to 1200 nm
Maximum thickness on 2,5mm <sup>2</sup> area	0 to 1200 nm
Deposit volume	0 to 0.5 mm <sup>3</sup>

### Measurement limits

### Technical specifications

Test duration	12 minutes for 1 200 pts scan 4 minutes in fast mode
Number of measurement points	Configurable By default: 1,200 points
Results storage	Limited only to capacity of external device
LAN connectivity	Ethernet port RJ45
Printer output	USB (printer is optional)
Data output	USB (2), Ethernet
Dimensions (mm)	250 x 410 x 290 (10" x 16" x 12")
Weight	10 kg (22 lb)
Electrical	115 to 230V - 2 A - 50/60 Hz

### Description

We reserve the right to alter specifications without notification.

Your local distributor:

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