

# CoreReader™

## Model 3660

The Bulk Specific Gravity (Gmb) determinations of compacted asphalt specimens have been relying on the water displacement method of volumetric approximation for many years. The coarser and more open graded mixtures resulting from Superpave™ mix designs have created a challenge for the industry to look for alternatives to raise precision in specific gravity determinations. Troxler Electronic Laboratories, a leader in test and measurement equipment for highway construction industry, has developed and patented an automatic device to directly determine Bulk Specific Gravity of laboratory compacted or field core specimens.



The Model 3660 CoreReader™ uses advanced gamma ray technology to determine Bulk Specific Gravity and density of test specimens. The automatic process eliminates operator errors associated with current labor-intensive test methods. Furthermore, the user can perform other laboratory tasks at the same time since monitoring the test progress is not necessary. Bulk Specific Gravity determinations are no longer estimations or approximations, but actual measurements based on the material properties of the test specimen.

The operator inputs the height of the specimen and the CoreReader automatically measures and displays Bulk Specific Gravity (Gmb) and density of the test sample. If the operator enters a Maximum Specific Gravity value, the air void content is also calculated and displayed.

This non-destructive Gmb test method allows the re-use of the specimen for further laboratory testing such as Superpave™ performance test, TSR, rutting and modulus. The operator does not have to prepare as many sample replicates from the Gyrotory Compactor thus saving time and money.



[www.troxlerlabs.com](http://www.troxlerlabs.com)

1.877.TROXLER

Outside the USA— +1.919.549.8661

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# Features & Benefits

- Automatic device to determine Bulk Specific Gravity of asphalt specimens**  
 No weighing, no wrapping, no sealing, no polymer bag, no vacuum device, no submerging, no drying, and no manual calculations required. The Model 3660 also eliminates the need to maintain a clean, temperature regulated water bath.
- No radioactive materials license required (in the US)**  
 Small, low level gamma sources used in the CoreReader have radiation levels so low that the Nuclear Regulatory Commission (NRC) has determined that licensing, special training, radiation monitoring badges and leak testing are not required.
- Non-destructive test**  
 The non-destructive density determination of laboratory prepared and cored pavement specimens allows for further performance tests to be conducted on the same specimens. Eliminates need to prepare as many sample replicates.
- No sample cooling required**  
 Samples can be tested when they are hot, straight out of the Gyratory Compactor or Marshall Hammer. This will provide instant feedback on asphalt quality without having to wait hours for samples to cool, as required with other current test methods.
- Inexpensive to operate**  
 The average daily electricity cost to operate the CoreReader is around 5 cents. Compared to the costs of other methods requiring higher power, poly bags and operator intervention, the CoreReader saves you real money.
- On site calibration**  
 The CoreReader has its own menu-driven automatic calibration and confirmation utilities, which eliminates the need to have the unit shipped back to the manufacturer for calibration.
- Minimal operator training required**
- Easy to use**  
 Eliminates operator errors and inconsistencies associated with current test methods.
- Software upgradeable**  
 "Flash" latest software version to the CoreReader for current updates.

## CoreReader provides much improved precision compared to existing test methods:

	Repeatability (Single-operator) (1-std dev)	Reproducibility (Multilaboratory) (1-std dev)
<b>Old Methods</b>		
ASTM D 2726-SSD	0.0124	0.0269
ASTM D 1188-Parafilm	0.028	0.034
AASHTO T-269-Dimensional	unknown	unknown
<b>New Methods</b>		
ASTM D 6752-Vacuum Seal	0.0124	0.0135
3660 CoreReader	0.006	0.009

**USA Patent Number: 6,492,641 B1**  
(International Patents Pending)

## SPECIFICATIONS

### Measurement

Sample Geometry	Cylindrical samples with parallel flat faces. Samples produced using a Gyratory Compactor or Marshall Hammer method meets this geometry. For field samples obtained from coring, saw-cut the bottom to form a flat face that is parallel to the top face.
Sample Diameter	100 mm (4 in.) and 150 mm (6 in.)
Sample Height	22.0 to 175.0 mm (0.87 to 6.89 in.)
Tolerance of Cylinder Height	For a field sample, the height should be determined from the average of six evenly spaced height measurements with a precision of 0.1 mm at sigma level.

### Standard Equipment

- AC adapter, 12 V dc
- Calibration standard cylinders
- Cable assembly, serial, 8 ft.
- Operator's manual

### Electrical

#### Power Requirements:

Power supply	100–240 V ac, 47–63 Hz,
(AC adapter)	Single phase, 0.4 A
CoreReader	12 V dc, 500 mA

#### Serial Port:

Connector	9-pin male D-subminiature connector RS-232 standard
Data format	8 data bits, 1 stop bit, no parity
Baud rate	9600
Cable type	RS-232 null modem 9-pin female – 9 (25) pin female

### Mechanical

Size	30.8 W x 41.2 D x 73.8 H cm (12.2 W x 16.2 D x 29.0 H in)
Weight	35 kg (77 lb)
Shipping weight w/accessories	44.5 kg (98 lb)
Shipping weight w/calibration cylinders	11.3 kg (25 lb)
Ambient Operating Temperature	5 to 40 °C (41 to 104 °F)



### Troxler Electronic Laboratories, Inc.

3008 Cornwallis Rd. • PO Box 12057 • Research Triangle Park, NC 27709

Phone: 1.877.TROXLER • Outside the USA +1.919.549.8661

Fax: +1.919.549.0761 • www.troxlerlabs.com