

## GYROTRONIC SUPERPAVE GYRATORY COMPACTOR



STANDARDS: EN 12697-10, EN 12697-31 | ASTM D6925 | AASHTO T312, TP4 | SHRP M-002

This Gyrotory Compactor, entirely developed and manufactured by Matest, is used to simulate and reproduce the real compaction conditions under actual road paving operations, hence determining the compaction properties of the asphalt.



B041-23

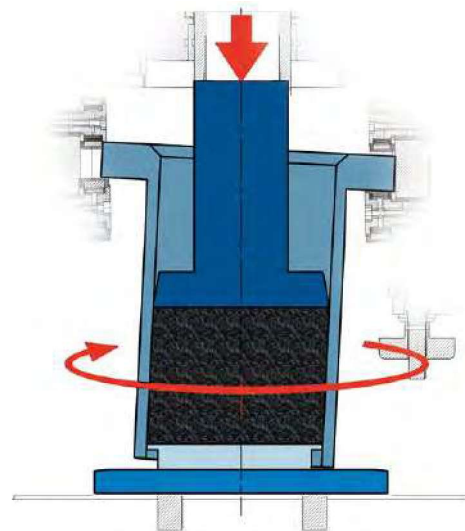
B041-20

**B041** with accessories

### MAIN FEATURES

- Rigid steel frame ensuring excellent angle control.
- Electro-pneumatic action with servo-controlled regulator.
- Full color touch screen control unit, running like a standard PC based on Windows operating system.
- Software for PC control acquisition and data processing.
- Optional shear stress measurement.
- Concept based on American DOT principles.
- Cold mix emulsions which can be compacted.
- Optional integrated balance.
- Optional integrated extruder.
- Gyrotory angle adjustable from 0 to 2.4° (up to 3°).
- Electromechanical version available on request.

Gyrotronic working principle precisely meets the international Standards specifications avoiding any interpretation deviation. Its stable mechanism with gears and bearers a is embedded inside a sturdy frame.



### A SUCCESSFUL PRODUCT

- COST COMPETITIVE
- TRIED AND PROVEN
- OVER 50 UNITS DELIVERED EVERY YEAR

## GYROTRONIC - SUPERPAVE GYRATORY COMPACTOR

Gyrotronic compacts in a fully automatic way, by combining the rotary action and the vertical resultant force applied by a mechanical head. The Compactor comprises a highly rigid steel frame ensuring excellent angle control.

**Load is applied by an electro-pneumatic cylinder, servo-controlled by a precision pressure regulator;** the height is measured by a linear transducer.

Gyrotronic motion is generated by an eccentric high precision system allowing an easy set up with precision and constant angle of gyration.

The rotation speed is controlled by an inverter through on board computer control.

Using the proper perforated mould, the Compactor is able to run tests also on cold emulsified asphalt mix.

The acquired results are also employed in the investigation of volumetric and mechanical characteristics of the asphalt mix.

**The machine is calibrated at Matest factory to the selected internal angle.**

### ADVANTAGES OF AN ELECTRO-PNEUMATIC COMPACTION SYSTEM

The Gyrotronic is equipped with a high performance, value engineered, **electro-pneumatic loading system**. The vertical actuator is low friction pneumatic cylinder and allows to apply constant stress regardless of the response of the specimen. In this way, the compaction is strictly performed in stress control and load/stress spikes are prevented. This concept provides a simple, cost effective solution with **reduced maintenance requirement**.

### ON-BOARD TOUCH SCREEN or PC CONTROL

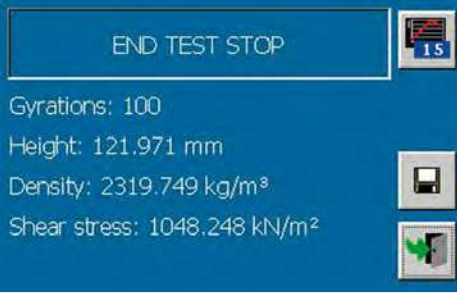
The touch-screen icon interface allows an easy set up of the parameters and an immediate automatic execution of the test, data acquisition and processing, graphics and file. A remote test control is available through a dedicated software, provided in bundle.

Direct connection to Intranet (through LAN network) and Internet to establish a remote communication and receive an immediate diagnostic of potential problems from Matest technicians, or for software updates.

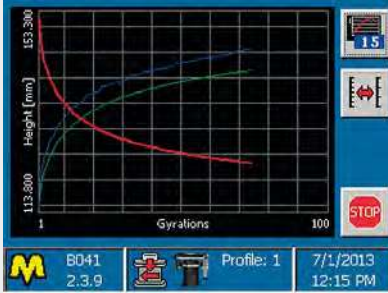
Unlimited memory storage with: 2 USB ports, 1 SD card.

Hardware technical details: see catalogue at p. 19.






End test data (with shear stress value)



Test execution (data plot)



Setting of test parameters

## TECHNICAL SPECIFICATIONS

- Compacted specimen size: Ø 100 and 150 mm; height from 0 to 200 mm for both sizes.
- Mould dimensions: Internal Ø 100 and 150 mm; height 250 mm for both moulds.
- Gyrotory angle: adjustable from 0 to 2.4° (up to 3°)
- Number of cycles (gyrotory): adjustable from 1 to 5000
- Gyration rate: adjustable from 5 to 60 work cycles/min (30 cycles/min requested by Standards)
- Vertical load on Ø 150 mm specimen: adjustable from 10 to 1000 kPa (1000 kPa with 10 bar compressor) (800 kPa with 8 bar compressor) (700 kPa with 7 bar compressor)
- Vertical load on Ø 100 mm specimen: adjustable from 23 to 1500 kPa (with 7 bar compressor)
- The vertical load on the specimen is automatically controlled and adjusted by the electronic system.

Modes of operation:

- Compaction of specimen in accordance to the selected number of rotations.
- Compaction of specimen upon reaching the selected height.
- Compaction of specimen upon reaching the selected density.
- **The machine can also perform a final flattering cycle at “zero” angle to obtain specimens with perpendicular faces.**

Data acquisition: number of rotations, specimen height, applied load (to ensure tolerances requested by the Standards)

Requires pressurized air, minimum 7 bar.

The Matest Gyrotory Compactor is **supplied complete** with lubricant and power cord.

**Optional extra are:** moulds, filter paper, penetration pistons, extruder, bench, air compressor Accredia official vertical load calibration certificate, to be ordered separately (see accessories)

**Power supply:** 230V 1ph 50-60Hz 1000W 12A

**Dimensions:** 640x500x1050 mm

**Weight:** 240 kg approx.

Overview of mechanical “heart”



Compaction phase: simultaneous action of a static compression and of the shearing action



## AVAILABLE MODELS

### B041 GYROTORY COMPACTOR - ASTM

STANDARDS: ASTM D6925 | AASHTO T312 | SHRP M-002  
 The machine is calibrated at Matest factory and supplied with the internal angle set to 1.16° as requested by ASTM, AASHTO Specifications.

 **Note:** Electromechanical Gyrotory Compactor version available on request.

### B041EN GYROTORY COMPACTOR - EN

STANDARDS: EN 12697-10, EN 12697-31  
 The machine is calibrated at Matest factory and supplied with the internal angle set to 0.82° as requested by EN Specifications.

## GYROTRONIC WITH SHEAR STRESS - RESEARCH GYRATORY COMPACTOR

This model is basically structured as mod. B041 and B041EN, but, in addition, **it includes the shear stress measurement device** and therefore it is recommended for both design and research purposes.

The device provides the most important parameters required to determine the main properties of asphalt mixes, and to predict their suitability for practical uses. This integrated measurement allows user to perform tests without any additional operation. The system comes already calibrated from the factory.

### MAIN FEATURES

- Integrated shear stress measurement.
- A dedicated group of load cells measures all the involved forces acting on the specimen and through our software the effective shear stress value is calculated.
- Real time display of the instant shear stress value along with the entire compaction process.
- Calculation of the resultant load eccentricity and consequently the effective tilting moment.
- Results exportable into an Excel data report, which can be easily edited by the user.



Time:	148 sec	
Gyrations:	71	
Angle:	1.190 °	
Load:	599.291 kPa	
Height:	123.512 mm	
Density:	2290.807 kg/m <sup>3</sup>	
Shear stress:	1024.357 kN/m <sup>2</sup>	
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Test execution with shear stress measurement

### GYROTRONIC EXCEEDS THE STANDARDS

The R&D department is continuously committed to improve the performance of SGC compactors. Matest aims to meet any type of need and purpose, from academics to researchers and routine testing laboratories, through a constant attention to quality.

The annual revisions have led to the development of a high performance electro-compaction system that exceeds the standard indications.

- Applies constant stress regardless the specimen response
- No rigid reaction to specimen behaviour
- Easy to control
- Inherently good stress/load control
- Cost competitive with low maintenance
- Reliable and precise

The following table clearly shows the reasons why Gyrotronic goes beyond the acknowledge figures.

				SHRP	
CONSOLIDATION PRESSURE	600 kPa	600 kPa	600 kPa	600 kPa	10...1000 kPa (150 mm samples) 23...1500 kPa (100 mm samples)
ANGLE	0.82°	1.16°	1.16°	1.25°	Adjustable 0...2.4° (up to 3°)
GYRATIONS/MIN	30	30	30	30	Adjustable 5...60

### GYROTRONIC AND ACCURACY

**Gyrotronic strictly maintains the compaction angle, exceeding the EN and ASTMs standards.** In fact, the angle IEA<sub>240</sub> is precisely defined within an accuracy of  $\pm 0.003^\circ$ .

Also, all specifications defined in the EN 12697-31 Annex C are complied and exceeded. The maximum difference between the four individual measurements, that gives an idea about the **planarity of top and bottom faces**, is completely under the standards limit.

Another aspect is the parallelism between top and bottom faces: the difference between the Internal Top Angle, **ITA**, and the Internal Bottom Angle, **IBA**, also indicated as  $\delta_{TB}$  meets and exceeds the standard.

The compacted specimens will be perfect for mechanical analysis: parallelism between top and bottom plane, associated with right planarity, and perpendicularity between vertical walls and each plane are the fully guaranteed.

	ASTM D6925 ASTM D7115 AASHTO T312	EN 12697-31	MATEST
PRESSURE	600±18 kPa	600±18 kPa	
ANGLE, IEA <sub>240</sub>	1.16°±0.02°	0.82°±0.02°	1.16° ± 0.003° 0.82°± 0.003°
$\delta_{TB} = ITA - IBA$		<0.10°	<0.02°
Max difference between individual measurements		<0.05°	<0.02°
$\delta_{LH} = IEA_{240} - IEA_{425}$		<0.10°	<0.07

## AVAILABLE MODELS

### B041-01 RESEARCH GYRATORY COMPACTOR - ASTM

STANDARDS: ASTM D6925 | AASHTO T312 7 SHRP M-002  
The machine is calibrated at Matest factory and supplied with the internal angle set to 1.16° as requested by ASTM, AASHTO Specifications.

### B041-01 EN RESEARCH GYRATORY COMPACTOR - EN

STANDARDS: EN 12697-10, EN 12697-31  
The machine is calibrated at Matest factory and supplied with the internal angle set to 0.82° as requested by EN Specifications.

## ACCESSORIES to perform the test: (for all Gyrotronic models)

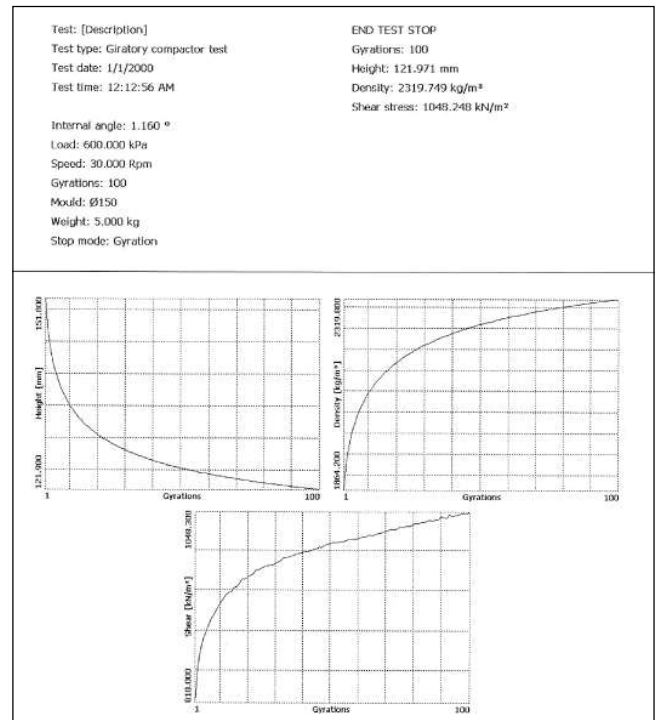
- B041-05** HARDENED SPECIMEN CYLINDER Ø 100 mm complete with bottom plate
- B041-06** HARDENED SPECIMEN CYLINDER Ø 150 mm complete with bottom plate
- B041-08** HARDENED SPECIMEN CYLINDER Ø 100 mm with holes for cold mix compaction, complete with bottom plate
- B041-09** HARDENED SPECIMEN CYLINDER Ø 150 mm with holes for cold mix compaction, complete with bottom plate
- B041-11** TOP PENETRATION PISTON Ø 100 mm
- B041-12** TOP PENETRATION PISTON Ø 150 mm

Metallic discs, to make easier the handling of specimens after the test, strongly recommended accessory for low-cohesion mixtures, such as draining asphalts:

- B041-13** METALLIC DISC for Ø 100 mm moulds. Pack of 2
- B041-14** METALLIC DISC for Ø 150 mm moulds. Pack of 2

Paper discs, to prevent asphalt from sticking to the piston and the mould's base plate, and to absorb bitumen in excess:

- B041-15** FILTER PAPER for Ø 100 mm moulds. Pack of 100
- B041-16** FILTER PAPER for Ø 150 mm moulds. Pack of 100



Final report

Hollow Punches for Gyrotory Compactor:

Used to maintain the core in the right shape and store cohesive asphalt samples after compaction.

Some asphalt mixes can be very unstable due to their high void ratio and large particle size. Wrapping the sample around the hollow punch will prevent it from crumbling down or receiving physical deformations once it is ejected from the mould.

The material will then settle down and assume its stiff properties once it cools down after compaction:

#### B041-17

HOLLOW PUNCH to stabilize and to mature the sample Ø 100 mm

#### B041-18

HOLLOW PUNCH to stabilize and to mature the sample Ø 150 mm



**ACCESSORIES for the Gyratory Compactor:**

**B041-20** WORKTOP for B041 and B041EN, it can also accept the pneumatic specimen extruder (B041-23) and the integrated balance (B041-26)

or:

**B041-19** WORKTOP for B041-01 and B041-01 EN, it can also accept the pneumatic specimen extruder (B041-23) and the integrated balance (B041-26)

**B041-23** PNEUMATIC AUTOMATIC SPECIMEN EXTRUDER, it can be fixed to the worktop B041-19, B041-20, or to any bench.

**V207** AIR COMPRESSOR, pressure 10 bar.  
 Technical details: see p. 598

**B041-35** FILTER GROUP for condensed water removal from the compressed air. (needed accessory).

**B041-21** WHEELS (kit of 4) with brake, for an easy displacement of the Compactor in the laboratory.

**B041-30** VERTICAL FORCE TESTING DEVICE with load ring.

As alternative:

**B041-31** VERTICAL FORCE TESTING DEVICE with digital dynamometer.

**B041-33** KIT OF 2 DISTANCE PIECES of 105 and 115 mm high for the control of the height values measured by the linear transducer.

**B041-34** ACCREDIA official vertical load calibration certificate.


**WEIGHTING SOLUTIONS**

**B041-26**  
**BALANCE, INTEGRATED** into the worktop, to facilitate the sample and the mould weightings, by avoiding the stress of lifting them.

The weighting reading values are directly and automatically displayed on the control panel of the Compactor.

Capacity: 30 kg

Accuracy:  $\pm 6$  g



OR **B041-27**  
**BENCH** for lateral bearing of a weighting balance.

Suggested balance:  
 V075-13 Capacity 30 kg div. 0.5 g

or:

**B041-24** Capacity 30 kg div. 0.1g as requested by EN  
 (or a balance of the customer)



## B041-28 GAM GYRATORY INTERNAL ANGLE MEASURER

STANDARDS: EN 12697-31 | ASTM D7115 | AASHTO T344

This Gyratory Angle Measurer has been designed by MATEST to provide an angle validating device. In less than 30 minutes the operator may perform the calibration of the Gyratory Compactor.

The device perfectly simulates a HMA specimen as it generates an equivalent tilting moment and shear forces.

GAM can cover a wide range of angles, including the ones specified by EN and ASTM Standards.

The device allows to perform TOP and BOTTOM angle measurements as specified by the Standards; the average of the obtained values is then considered as the **internal angle of the machine**.

An excel spreadsheet, which is supplied along with the device, is used for data acquisition and processing, and provides the precise value of the internal angle according to the calculation procedure specified by EN 12697-31 (Annex-C) and AASHTO T344.

The spreadsheet allows to plot several graphs showing the measured data and it also provides some important indexes about the quality of the data.

### MAIN FEATURES

- High accuracy of the measured data.
- Connection to PC through RS232 cable.
- Three modes of data acquisition: Single, Partial or Complete.
- Accuracy: more than  $0.01^\circ$ , as requested by the Standards.
- Data processing is carried out by a specific spreadsheet, which also allows to create the final calibration certificate.
- No need for power supply since the device is battery operated. Also it has an energy saving feature which automatically switch off the device if it is not being used for a while.
- Final calibration certificate.
- Stand-alone device (battery operated).
- Energy saving with integrated automatic switch off function.

### TECHNICAL SPECIFICATIONS

- The device is supplied complete with:
  - Two different rings to perform tests either with  $M=240\text{Nm}$  or  $M=425\text{Nm}$
  - Upper and lower base plate
  - RS232 cable
  - Strong practical suitcase
  - Calibration certificate
- Data are read by GAM and then downloaded (via RS232 cable) all together at the end of the measurements, with no need to connect the device to the PC after each measurement
- Possibility to repeat even just one of the measurement, and lately include it in the calculation spreadsheet

**Power supply:** n°2 batteries 1.5V type AA

**Dimensions:** Diameter 150 mm, Height 115 mm

**Weight:** 5.6 kg



**B041-28**

### ACCESSORIES

- B041-50** GAM CALIBRATION-CHECKING set to ASTM ( $1.16^\circ$  angle). The set is composed by two square rules. Supplied complete with factory certificate.
- B041-51** GAM CALIBRATION-CHECKING set to EN ( $0.82^\circ$  angle). The set is composed by two square rules. Supplied complete with factory certificate.
- B041-55** ACCREDIA Official Calibration Certificate of the angle, for the square rules (ASTM and EN).



**B041-50**



Calibration certificate