



ADVANCED PAVEMENTS TESTING SYSTEMS

DUCTIMETER

Determination of Ductility



CUSTOMER'S VALUE
DRIVES THE INNOVATION

Determination of ductility

81-PV10A02
Standard version

81-PV10B02
High performance version

81-PV10C12
Research version

The ductility test is performed for determining the ductility of bituminous materials by measuring the elongation before breaking when two ends of briquette specimens are pulled apart at a specified speed and temperature.

81-PV10A02 Standard version complies and exceeds the ASTM D113, D6084, AASHTO T51 and EN 13398 Standards which require the test to be performed in water at a temperature of $25^{\circ} \pm 0.5^{\circ}\text{C}$ (ASTM/AASHTO) or $25^{\circ} \pm 0.2^{\circ}\text{C}$ (EN) at a constant speed of 50 mm/min.

81-PV10B02 High performance version also satisfies EN 13589 and EN 13703 which require the test to be performed from 4° to 30°C $\pm 0.2^{\circ}\text{C}$ at a testing speed adjustable up to 100 mm/min, and the determination of the tensile properties of modified bitumen.

81-PV10C12 Research version exceeds all the above mentioned Standards requirements, and it is fully dedicated to research.

81-PV10A02

Standard version



main features

- > 4 tension lines (briquette capacity) x 1500 mm
- > Easy and free access to the large testing space
- > Closed-loop PID temperature control system
- > Stainless steel insulated water bath
- > Exclusive in-built thermoregulation system compensating the exchange of heat and cooling, resulting in very strict temperature control, optimized by the connection to chiller (optional)
- > Adjustable speed range from 5 to 100 mm/min
- > High carriage return speed of 500 mm/min for greater productivity
- > Elongation measurement by encoder read on display

Standards ASTM D113 | ASTM D6084 | AASHTO T51 | EN 13398 | EN 13589 | EN 13703

81-PV10A02

Standard version

This model fully satisfies and exceeds ASTM D113, ASTM D6084, AASTHO T51 and EN 13398 requirements. To obtain the required 25°C with ±0.2°C tolerance, circulation of cold water is necessary. A water chiller (see accessory 81-PV1002) is ideal for this and may already be available in the laboratory but mains water can also be used. If the ambient temperature goes over 25°C, as in tropical areas, and cold mains water is not available, the use of a water chiller is mandatory.



Detail of the stainless steel water bath with the protection for the lateral driving screw rods, by stainless steel too.

Water bath

Insulated stainless steel water bath with a heating system located over the entire base surface and a cooling coil (for connection to water mains or chiller) distributed over the three side walls assuring temperature uniformity without water turbulence inside the bath. All parts in contact with water are made of stainless steel.

Carriage displacement

Double-screw rods and mobile carriage enable test speeds from 5 to 100 mm/min. The system also permits the fast return of the carriage at the end of the test (500 mm/min) to reduce down time and increase productivity. The carriage return is automatic so manual intervention is not required.

Temperature control

- A closed-loop PID system assures constant temperature within ±0.2°C.
- Plate-type base heaters give better temperature uniformity.
- The thermoregulation system is based on controlling the heater (which increases the temperature of the bath) and the flow rate of the cooling coil (which decreases the temperature). This important feature assures control of the temperature within strict limits and permits the use of suitable standard water chillers.

Machine control and elongation measurement

Control panel with digital display to set the testing speed: 5 to 100 mm/min, with the carriage return function. Elongation measurement by encoder.

Optional transparent cover

The machine can be completed with a transparent cover.

Ordering information

81-PV10A02

DUCTIMETER
Ductility testing machine.
4-briquette capacity, 1500 mm carriage travel, 5 to 100 mm/min adjustable testing speed. 230V, 50-60 Hz, 1 ph.

81-PV10A04

As above but 110V, 60 Hz, 1 ph.

Upgrading option

81-PV10030

Transparent machine cover
For technical specifications, refer to page 7.

81-PV10B02

High performance version



main features

- > 4 tension lines (briquette capacity) x 1500 mm
- > Easy and free access to the large testing space
- > Double drive screw rod
- > Closed-loop PID temperature control system
- > Stainless steel insulated water bath
- > Exclusive in-built thermoregulation system compensating the control, optimized by the connection to chiller (optional)
- > High carriage return speed of 500 mm/min for greater productivity
- > Adjustable speed range from 5 to 100 mm/min
- > PC-controlled using dedicated software
- > Includes a system for measuring forces up to 4x300 N with load cells (see accessories)
- > Temperature range at 25±0.2°C and from 4 to 30 ± 0.2°C
- > Elongation measurement system by encoder
- > Real-time load and displacement graphics via PC

Standards EN 13589 | EN 13703

81-PV10B02

**Force-ductility
High performance version**

Machine control
By PC (not included).

Water bath
Insulated stainless steel water bath with a heating system located over the entire base surface and a stainless steel cooling coil (for connection to water mains or chiller) distributed over the three side walls assuring temperature uniformity without water turbulence inside the bath. All parts in contact with water are made of stainless steel.

Carriage displacement
Double-screw rods and mobile carriage enable test speeds from 5 to 100 mm/min. The system also permits the fast return of the carriage at the end of the test (500 mm/min) to reduce down time and increase productivity. The carriage return is automatic, manual intervention is not required.

Temperature control
- A closed-loop PID system assures constant temperature of 25±0.2°C.

- Temperature range from 4 to 30°C ±0,2°C with a water chiller (see accessories p7)
- Stainless steel cooling coil
- Plate-type base heaters give better temperature uniformity.
- The thermoregulation system is based on control of the heater (which increases the temperature of the bath) and the control of the flow rate of the cooling coil by an electro-valve. This important feature assures control of the temperature within strict limits and permits the use of suitable standard water chillers.

Load and elongation measurement
Automatic measurement of the elongation by an encoder and of the test load of the four testing lines with load cells (not included).

Testing software

- Selection of test parameters (speed, temperature etc.) by PC. The test temperature, however, can be set in advance using the control panel of the machine.
- Test control by PC: Start-Stop-Carriage return
- Specimen failure recognition
- Real-time display of load/elongation graph with advanced visualization options (single or multi-graph).

- Data acquisition and processing conforming to Standards
- Function for multiple test data comparison
- Storage of test data

Water cooling
This model is proposed without a chiller (81-PV1002-04) for use with a suitable cooling system that could be available in the laboratory. It is important however, that this unit is capable of delivering a flow rate of 6 litres/min, 1 bar, at the minimum temperature of 2°C.

See-through cover
Essential for better temperature control of the bath.

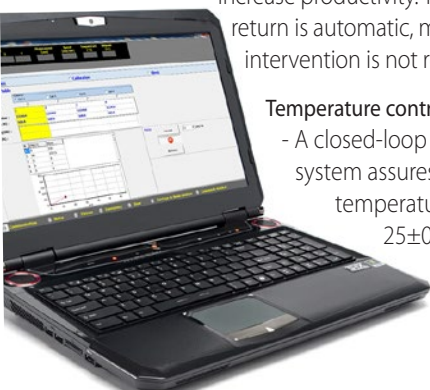
Ordering information

81-PV10B02

DUCTIMETER
High Performance Ductility testing machine. PC controlled, 4-briquette capacity, 1500 mm carriage travel, adjustable testing speed from 5 to 100 mm/min, thermostatically controlled water bath at 25°C ±0,2°C and from 4° to 30°±0.2°C, force measurement facility up to 300 N per line. 230 V, 50-60 Hz, 1 ph.

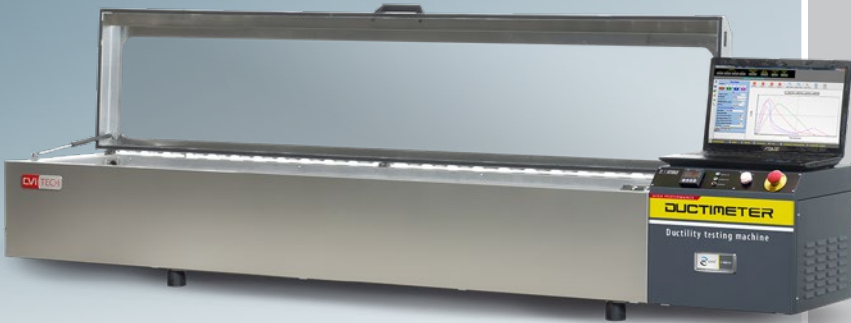
81-PV10B04

As above but 110 V, 60 Hz, 1 ph.
For technical specifications please refer to page 7.



Typical screenshot of the machine software

81-PV10C12
Research version



Additional main features

- > Includes a system for measuring forces up to 2000 N (4x500 N) with load cells (refer to accessories p 7)
 - > Temperature range from -10 to 60 ±0.2°C
 - > Speed range adjustable from 1 to 200 mm/min
 - > Extensive use of stainless steel for frame, cover and tank

Standards EN 13589 | EN 13703

81-PV10C12

Force-ductility

Research version

This research version further increases the high performance of the 81-PV10B02 model by more advanced specifications concerning temperature control, speed range and max. tension force, together with an extended use of stainless steel: frame, tank, cooling coil and cover. These features make this version ideal for research purposes. See specifications on page 536 of the IPC Global's catalogue.

As the high performance version 81-PV10B02, this research model is PC controlled using dedicated software.



Typical screenshot of the machine software



Detail of 81-PV10B02 and PV10C12 with four 81-PV10020 load cells and briquette molds

Detail of water bath.
 Easy and free access to the large testing space, common to all versions



Ordering information

81-PV10C12

DUCTI-METER
 Research Ductility testing machine.
 PC controlled, 4-briquette capacity, 1500 mm carriage travel, adjustable testing speed from 1 to 200 mm/min, thermostatically controlled water bath from -10° to 60° ±0.2°C, force measurement facility up to 500 N per line. 230 V, 50-60 Hz, 1 ph.

81-PV10C14

As 81-PV10C14 but 110 V, 60 Hz, 1 ph.

Note: Briquette molds, Load cells and Water cooling system are not included and should be ordered separately. See accessories.

Technical Specifications

| Models | 81-PV10A02 81-PV10A04 | 81-PV10B02 81-PV10B04 | 81-PV10C12 81-PV10C14 |
|---|---|---|--|
| Conforms to Standards | EN 13398 ASTM D113 ASTM D6084 AASHTO T51 | EN 13398 EN 13589 EN 13703 ASTM D113, ASTM D6084, AASHTO T51, AASHTO T300 | EN 13398 EN 13589 EN 13703 ASTM D113, ASTM D6084, AASHTO T51, AASHTO T300 |
| Machine control by | Digital display panel | PC with dedicated Software (PC not included) | PC with dedicated Software (PC not included) |
| Thermostatically controlled water bath temperature: | at 25±0.2°C | at 25±0.2°C and from 4 to 30±0.2°C with water chiller (see accessories below) | from -10 to 60 ±0.2°C with water chiller (see accessories below). PID closed-loop control. |
| Temperature control system | Heater and cooling coil for connection to cold water or water chiller | Heater and cooling coil for connection to cold water or water chiller | Heater and cooling coil for connection to cold water or water chiller |
| Structure | Stainless steel tank | Stainless steel tank | Extensive use of stainless steel for frame, tank, cooling coil and cover |
| Briquette capacity | 4 | | |
| Max carriage travel | 1,500 mm | | |
| Testing speed | Adjustable from 5 to 100 mm/min | Adjustable from 5 to 100 mm/min | Adjustable from 1 to 200 mm/min |
| Elongation measurement by | Encoder (Linear scale) | Encoder (Optical system) | Optical system |
| Max. load and tension load measurement | -- | 1,200 N (4 x 300 N) by load cells (500N capacity.) (Cells not included, see accessories) | 4 x 500 N by load cells (2,000 N in total). (Cells not included, see accessories) |
| Tension load/elongation graph | -- | Real-time graphs by PC | Real-time graphs by PC |
| Carriage return speed | 500 mm/min | | |
| Power rating (approx.) | 1200 W | | |
| Transparent cover | not included | included | included |
| Overall dimensions | (L x D x H) 2,434 x 412 x 385 mm | | |
| Weight (approx.) | 100 kg | | |

Accessories
Ductility briquette molds
81-B0141

Briquette mold conforming to EN 13389



Briquette molds

81-B0141/A

Briquette mold conforming to ASTM D6084 and EN 13589

81-B0141/B

Briquette mold conforming to ASTM D113 and AASHTO T51

81-B0142

Ductility mold plate

Water chillers

Specifications
Pump water flow (maximum): 6 liters/min
Dimensions: 450 x 450 x 825 mm (W x D x H)
Weight: approx. 35 kg

81-PV1002

(for 81-PV10B02 + 81-PV10A02)
Water chiller, flow rate 6 litres/min, 2°C minimum temperature. 1200 W, 230 V, 50-60 Hz, 1 ph.

81-PV1004

(for 81-PV10B04 + 81-PV10A04) Water chiller, same as above but 110 V, 60 Hz, 1 ph.



81-PV1002

81-PV1012

(for 81-PV10C12)
Fluid chiller, flow rate 6 litres/min, -20°C minimum temperature. 1200 W, 230 V, 50-60 Hz, 1 ph.

81-PV1014

(for 81-PV10C14)
Same as above but 1200 W, 110 V, 60 Hz, 1 ph.

Load cells

(for use with 81-PV10B02, 81-PV10B04, 81-PV10C12 and 81-PV10C14 versions only)

81-PV10020

High precision strain gauge load cell
0-500 N capacity

Machine base
81-PV10010

Support base for ductility machine, stainless steel table
Dimensions (L x D x H): 2,370 x 600 x 670 mm
Weight: approx. 50 kg

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