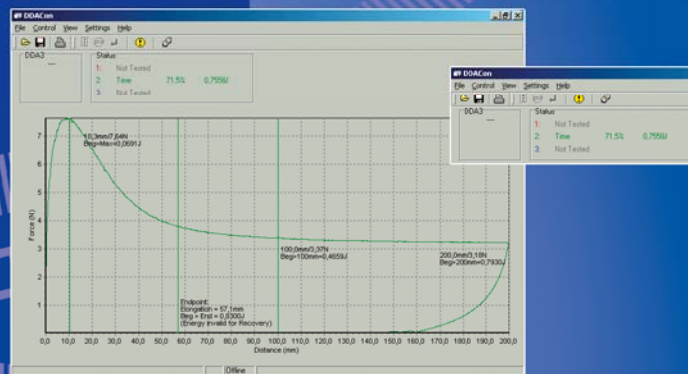
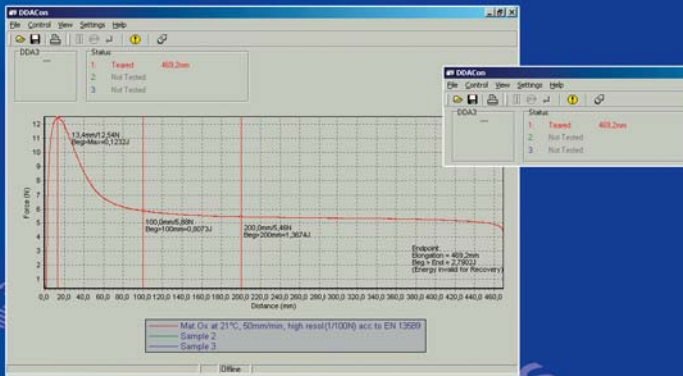




petrotest®

TENSILE PROPERTY TESTER OF BITUMINOUS BINDERS

DUCTILOMETER



MANUFACTURER SINCE 1873

WWW.PETROTEST.COM



Scope of Application

The **Ductility** or **Elongation** is measured by the **distance** to which a sample will elongate before breaking when two ends of a specimen briquette are pulled apart at a specified speed and at a specified temperature. It may be used for quality specifications.

The **Force-Ductility** measures tensile properties on the basis of the **performed force and the specimen strain**.

A specimen briquette is pulled apart at a specified speed and at a specified temperature until the briquette ruptures or a specified strain is achieved.

The **Elastic Recovery** is measured by the **recoverable strain** determined after severing an elongated briquette specimen.

The specimens are pulled to a specified distance at a specified speed and at a specified temperature.

This is useful in confirming that a material has been added to the asphalt to provide a significant elastomeric characteristic.



Molds



Temperature Probes

Tensile Properties - Force-Ductilometer Method - DDA 3 (automatic)

Elongation:

**ASTM D 113 - AASHTO T 51 - JIS K2207
DIN 52 013 (IP 32, NF T 66-006)**

Force-Ductility:

**EN 13589 - IP 520
EN 13703 - IP 515 - AASHTO T 300**

Elastic Recovery:

**ASTM D 6084
EN 13398 (DIN V 52 021-1) - IP 516
(ASTM D 5892 - ASTM P 226)**



With the ductility machines of the DDA 3 series the afore mentioned procedures can be performed automatically. Except for recovery tests, 3 tests can be performed simultaneously.

The drive is microprocessor controlled and uses a stepping motor and a feed rod. Both are located outside the tempering bath and therefore are not affected by corroding influences of the bath liquid. The tempering bath itself is double-walled with an outer water circulation system. The tractor cradle is made of stainless steel as well as the bath walls.

If extremely thin threads are measured, the built-in circulation pump for the inner bath can be switched off.

A very even and exact temperature can be obtained in the bath by the connection of a good coolant circulator and due to several temperature probes plus the transparent bath cover.

Traction speed, elongation and pauses can be pre-set on the control unit. During the whole test run the tensile force on each line is permanently measured. The maximum tensile force may be up to 300 Newton's per line.

With the DDA 3 a minimum tensile force margin can be set. When a bitumen briquette ruptures and the tensile falls below this setting, the pertinent elongation will be stored and the machine will be stopped automatically after all three briquettes have broken.

There is a special program for recovery tests of polymer-modified bitumen.

The bitumen briquette will be expanded to a pre-set elongation, then the tractor (after a pause) returns to a position where no more stress is in the material, equivalent to the cut-up state of the specimen. If due to any recovery of the material a tension should occur, the tractor will move until there is a stress-free condition again.

The control unit is equipped with two RS232 interface. This allows to connect a serial printer and a PC to record all test parameters, the final values on each test line as well as peaks with their pertinent elongation.

Further, the DDA 3 has analog output sockets so that force/elongation curves can be drawn.

The ductility meters are also available as DD 3 in a basic version without force measurement. These models have a digital indication of the elongation only.



DDACon-Software

A program for recording, saving and graphic presentation of DDA values.

Replacing analog line recorder or serial data-printer, allows to control the DDA by PC, the data-transfer to MS EXCEL® or LIMS and simplifies the download of firmware-upgrades.

The sample status of up to 3 samples will be displayed simultaneously, indicating the traction distance or for Recovery-tests the percentage of relief and the total energy.

Significant points like the local minimum, maximum, turn-points of in- & decreasing flanks and tangent-points can be determined automatically and displayed as diagram or chart.

The numerical display of force or distance for a single point on the curve is possible, too.

Caption	Sample	Distance (mm)	Force (N)
W00N 10.0mm/7.48N 80	Emp. Max. Mar. On tested with pr. 10.0		7.44
Endpoint #940elongation = 57.3mm@40kg	Mar. On tested with pr. 57.3		0.02
#91000.0mm/3.37N #940relax=100mm=0.407	Mar. On tested with pr. 100.0		3.37
#92000.0mm/3.18N #940relax=200mm=0.715	Mar. On tested with pr. 200.0		3.18

Located Points

Individual diagram areas can be increased, curves can be hidden or indicated numerically.

Since every sample will be saved under an individual filename, it is possible to compare 3 samples of different tests with each other.

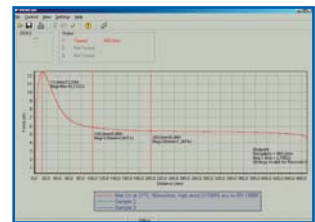
The evaluated data can be exported as ASCII-files. They include information like the sample name, file name, user ID, date & time, duration, program, speed, temperature at start & end, status and distance & force.

Printing of numerical or graphic evaluations, including relevant point like maxima and fracture are possible on a usual printer.

Elongation Test



Printer Chart



Software Diagram "Force"

Main Units

DDA 3 - Automatic Tensile Property Tester, Force-Ductilometer Method

Depending on the accessories suitable for:

Elongation: ASTM D 113 - AASHTO T 51 - JIS K2207 - DIN 52 013

Recovery : ASTM D 6084 - EN 13 398 - IP 516

Force : EN 13 589 - IP 520 - EN 13 703 - IP 515 - AASHTO T 300

(obs.: ASTM D 5892, ASTM P 226, DIN V 52021-1, IP 32, NF T 66-006)

Features:

- 2 elongation & 2 recovery programs
- variable traction speed up to 140 mm/min.
- force detection by high resolution (10 mN) 300 N-sensors
- automatic rupture detection above 20 mN is possible
- constancy of speed and temperature at minor bath motion is better than demanded by the standards
- without cooling coils, therefore easy to clean

Consisting of:

Bath: for 3 simultaneous tests, made of stainless steel, double-walled and full insulated, closed cycle cooling system, circulation pump to be switched off, temperature probe, bath illumination and acrylic bath cover.

Control Unit: with microprocessor, membrane keypad, analog output for 3 force-channel line-recorder, RS232-interfaces for printer & PC.

Digital display (LCD) of: program, traction speed, distance, tensile force and temperature.

- 4 Programs:**
- *Semi-Automatic Elongation* for rupture forces below 20 mN
 - *Automatic Elongation* for rupture forces of 20 mN to 300 N
 - *Semi-Automatic Elastic Recovery* for polymer modified bitumen (in accordance with ASTM D 6084, EN 13 398 and other methods)
 - *Automatic Elastic Recovery* for polymer modified bitumen (similar to ASTM D 6084 and other methods)

Serial Printer: for single sheet & continuous paper (incl. data transmission cable) makes printouts of 3 test points with following parameters: program, traction speed, distance, tensile forces, temperatures, percentage of elastic recovery, energy (the result of integral) (not suitable for DDACon-software printouts)

Note: External cooling device for filling the bath-jacket is required. Windows® PC-Software DDACon is available.

Technical Data:

Working range : approx. -10 to +60 °C (depending on the cooler)

Travel length : 100 cm or 150 cm (maximum)

Test positions : 3 (in a 30 l or 45 l bath)

Traction speed : Standard: 50 mm/min. / Variable: 2.5 to 140 mm/min.

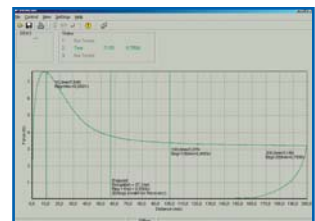
Tension force : 300 N (maximum)

Connections for : line-recorder, serial printer, PC (RS232), cooler as tempering & filling device (Ø 8 mm)

Recovery Test



Printer Chart "Recovery"



Software Diagram "Recovery"



Main Units



10-0360 & 10-0364

DDA 3/100 - for test length up to 100 cm

Supplied with:

3 molds (acc. **ASTM D 113**, if not ordered otherwise), 3 mold-holders, 2 corrosion protection specimen, 2 contrast inlays and distance pieces

Technical Data:

Travel length : 100 cm (maximum)

Dimensions of

- Bath : 170 x 40 x 50 cm (WxDxH), weight: 70 kg
- Controller : 35 x 25 x 15 cm (WxDxH), weight: 6 kg
- Printer : 37 x 28 x 16 cm (WxDxH), weight: 5 kg

- 10-0360 Power supply : 220/240 V, 50/60 Hz, EU-plug
- 10-0361 Power supply : 115 V, 60 Hz, US-plug



10-0335 & 10-1333

DDA 3/150 - for test length up to 150 cm

Supplied with:

3 molds (acc. **ASTM D 113**, if not ordered otherwise), 3 mold-holders, 2 corrosion protection specimen, 3 contrast inlays and distance pieces

Technical Data:

Travel length : 150 cm (maximum)

Dimensions of

- Bath : 220 x 40 x 50 cm (WxDxH), weight: 92 kg
- Controller : 35 x 25 x 15 cm (WxDxH), weight: 6 kg
- Printer : 37 x 28 x 16 cm (WxDxH), weight: 5 kg

- 10-0364 Power supply : 220/240 V, 50/60 Hz, EU-plug
- 10-0365 Power supply : 115 V, 60 Hz, US-plug



Printer Chart



10-0380

Circulator (for external & internal cooling & heating)

Necessary **as tempering & filling device** for the DD/DDA bath jacket and for reaching a bath-temperature of approx. -10 to +60 °C (at +20 °C ambient temperature).

Consisting of:

Cooler with stainless steel **bath**. Thermostat with digital display, splash-proof keypad, **heater**, **pump**, RS232/RS485-**interface**, Pt-100-socket, **programmer**, over/under-temperature & low-level protection, adjustable pump-pressure, proportional cooling control.

Supplied with: 1 bath cover, 1 drain tap, 1 junction line for temperature probe

Note: Insulated hose matter is not included but recommended.

Dimensions / Weight : 37 x 46 x 71 cm (WxDxH), 49 kg

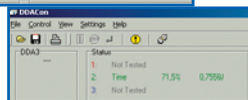
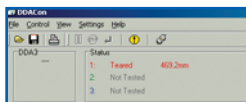
- 10-0380 Power supply : 230 V, 50 Hz, EU-plug
- 10-0381 Power supply : 230 V, 60 Hz



25-0228

25-0228 **Hose-Set**, insulated (Ø 8 mm, 2x 2 m, incl. fittings)

Data Evaluation



10-0404

10-0404 **PC Software - DDACon** (Windows®)

A program for recording, saving and graphic presentation of DDA values.

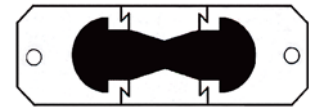
Replacing analog line recorder or serial printer, allows to control the DDA by PC, the data-transfer to MS EXCEL® or LIMS and simplifies the download of firmware-upgrades.

Supplied with: 1 PC-data-cable, 1 USB/RS232-converter



Options and Accessories

- Mold (4-piece)**, brass, for the preparation of bitumen briquettes
 Note: the (year of issue) refers to latest changes in molds only!
- 10-0332** ... according to **EN 13 398 (2003) - IP 516 - DIN 52 013 (2007)**
- 10-0335** ... according **ASTM D 113 (2007) - AASHTO T 51**
- 10-1336** ... according to **EN 13 589 (2003) - IP 520 - DIN EN 13 589 (2008)**
EN 13 703 (2003) - IP 515
- 10-1337** ... according to **ASTM D 6084 (2006) - AASHTO T 300**
- 10-1333** **Mold Holder** (fits all petrotest ductility molds)
-
- 10-0379** **Calibration Set - DDA/DD**
Consisting of:
 1 set of precision resistor plugs ,
 1 certified thermometer DIN 12 775 (0 to +50 :0.1°C),
 1 thermometer holder,
 1 digital stop watch,
 1 tape-measure with mm-division
 3 weights with steel-rope & 1 pulley (for DDA only)
- Thermometer**, for DDA/DD-calibration set
10-0383 ... DIN 12 775, range 0 to +50 :0.1°C, precision made
10-0384 ... DIN 12 775, range 0 to +50 :0.1°C, officially certified (incl. in calibration set)
-
- 10-0403** **Rack** 80 x 25 x 42 cm (L x W x H) to place controller and printer behind the ductilometer
-
- Circulator-Bath** (for external & internal heating)
 Used **for pre-tempering of samples** (e.g. DD/DDA-molds)
Note: It requires counter-cooling by a circulation cooler or thermostatic circulator for applications near ambient temperatures. Hose matter is not included.
 Dimensions / Weight : 37.5 x 45 x 47.5 cm (WxDxH), 3.4 kg
- 18-0403** Power supply : 230 V, 50 Hz, EU-plug
18-0402 Power supply : 115 V, 60 Hz, US-plug
- 11-0181** **Hose**, silicon (Ø 8 mm, 8 m)



10-0332



10-0335



10-1336 & 10-1337



10-0379



10-0403 & DDA

Spare Parts

- 10-0377** **Contrast Inlay**
 (6 x 170 x 550 mm) pack of 1
- 10-0406** **Corrosion Protection Specimen**
 (200 x 100 mm) pack of 2
- 11-0599** **USB/RS232-Converter** with 2 m cable
 (verified for Petrotest®-units)
 connecting 1 serial port with the
 USB-port of a PC or Hub.
- 25-0262** **PC-Data-Cable** (0-modem), serial,
 RS232 (9 & 25-pin)



18-0403



Scope of Application

The **Ductility** or **Elongation** is measured by the **distance** to which a sample will elongate before breaking when two ends of a specimen briquette are pulled apart at a specified speed and at a specified temperature. It may be used for quality specifications.

The **Elastic Recovery** is measured by the **recoverable strain** determined after severing an elongated briquette specimen. The specimens are pulled to a specified distance at a specified speed and at a specified temperature. This is useful in confirming that a material has been added to the asphalt to provide a significant elastomeric characteristic.

Our ductilometers are also available as **automatic versions with force measurement - DDA 3**.



Molds in Bath



Thermometer in Bath

Tensile Properties - Ductilometer Method - DD 3 (semi-automatic)

Elongation:

**ASTM D 113 - AASHTO T 51 - JIS K2207
DIN 52 013 (IP 32, NF T 66-006)**

Elastic Recovery:

**ASTM D 6084
EN 13398 (DIN V 52 021-1) - IP 516
(ASTM D 5892 - ASTM P 226)**



Ductility gives an indication of the suitability of **bituminous materials** for specific applications such as road construction etc.

In order to determine the particular properties of **polymer modified bitumen**, the method of **elastic recovery** has turned out to be more expedient.

Main Units

DD 3 - Semi-Automatic Tensile Property Tester, Ductilometer Method

Depending on accessories suitable for:

Elongation: ASTM D 113 - AASHTO T 51 - JIS K2207 - DIN 52 013

Recovery : ASTM D 6084 - EN 13 398 - IP 516

(obs.: ASTM P 226, ASTM D 5892, DIN V 52021-1, IP 32, NF T 66-006)

Features:

- 1 elongation & 1 recovery program
- variable traction speed up to 140 mm/min.
- constancy of speed and temperature at minor bath motion is better than demanded by the standards
- without cooling coils, therefore easy to clean

Consisting of:

Bath: for 3 simultaneous tests, made of stainless steel, double-walled and full insulated, closed cycle cooling system, circulation pump to be switched off, bath illumination and acrylic bath cover.

Control Unit: with microprocessor, membrane keypad, RS232-interface for printer Digital display (LCD) of: program, traction speed, distance

2 Programs: - *Semi-Automatic Elongation*

- *Semi-Automatic Elastic Recovery* for polymer modified bitumen

Serial Printer: for single sheet & continuous paper (incl. data transmission cable) makes printouts of 3 test points with following parameters: program, traction speed, distance

Note: External cooling device for filling the bath-jacket is required.

Technical Data :

Working range : approx. -10 to +60 °C (depending on the cooler)

Travel length : 100 cm or 150 cm (maximum)

Test positions : 3 (in a 30 l or 45 l bath)

Traction speed : Standard: 50 mm/min. / Variable: 2.5 to 140 mm/min.

Connections for : serial printer, cooler as tempering & filling device (Ø 8 mm)

Dimensions: Bath (100 cm travel length) : 170 x 40 x 50 cm (WxDxH), weight: 70 kg

Bath (150 cm travel length) : 220 x 40 x 50 cm (WxDxH), weight: 92 kg

Controller : 35 x 25 x 15 cm (WxDxH), weight: 6 kg

Printer : 37 x 28 x 16 cm (WxDxH), weight: 5 kg

DD 3/100 - for test length up to 100 cm

Supplied with:

3 molds (acc. **ASTM D 113**, if not ordered otherwise), 3 mold-holders, 2 corrosion protection specimen, 2 contrast inlays, 2 distance pieces, 3 thermometers ASTM 63C, 3 thermometer-holders

Travel length : 100 cm (maximum)

10-0350 Power supply : 220/240 V, 50/60 Hz, EU-plug

10-0351 Power supply : 115 V, 60 Hz, US-plug

DD 3/150 - for test length up to 150 cm

Supplied with:

3 molds (acc. **ASTM D 113**, if not ordered otherwise), 3 mold-holders, 2 corrosion protection specimen, 3 contrast inlays, 3 distance pieces, 3 thermometers ASTM 63C, 3 thermometer-holders

Travel length : 150 cm (maximum)

10-0354 Power supply : 220/240 V, 50/60 Hz, EU-plug

10-0355 Power supply : 115 V, 60 Hz, US-plug



Circulator (for external & internal cooling & heating)

Necessary as **tempering & filling device** for the DD/DDA-bath jacket and for reaching a bath-temperature of approx. -10 to +60°C (at +20°C ambient temperature).

Note: Insulated hose matter is not included but recommended.

Dimensions / Weight : 37 x 46 x 71 cm (W x D x H), 49 kg

10-0380 Power supply : 230 V, 50 Hz, EU-plug

10-0381 Power supply : 230 V, 60 Hz

25-0228 **Hose-Set**, insulated (Ø 8 mm, 2x 2 m, incl. fittings)

21-0697 **Digital Stop Watch**



10-0380

Options & Accessories

Mold (4-piece), brass, for the preparation of bitumen briquettes

Note: the *(year of issue)* refers to latest changes in molds only!

10-0332 ... according to **EN 13 398 (2003) - IP 516 - DIN 52 013 (2007)**

10-0335 ... according **ASTM D 113 (2007) - AASHTO T 51**

10-1336 ... according to **EN 13 589 (2003) - IP 520 - DIN EN 13 589 (2008)**
EN 13 703 (2003) - IP 515

10-1337 ... according to **ASTM D 6084 (2006) - AASHTO T 300**

10-1333 **Mold Holder** (fits all petrotest ductility molds)



10-0332 & 10-1333

10-0379 **Calibration Set - DDA/DD**

Consisting of:

- 1 set of precision resistor plugs ,
- 1 certified thermometer DIN 12 775 (0 to +50 :0.1°C),
- 1 thermometer holder,
- 1 digital stop watch,
- 1 tape-measure with mm-division
- 3 weights with steel-rope & 1 pulley (for DDA only)



10-0335 & 10-1333

10-0403 **Rack** 80 x 25 x 42 cm (L x W x H) to place controller and printer behind the ductilometer

Circulator-Bath (for external & internal heating)

Used for **pre-tempering of samples** (e.g. DD/DDA-molds).

Note: It requires counter-cooling by a circulation cooler or thermostatic circulator for applications near ambient temperatures. Hose matter is not included.

Dimensions / Weight : 37.5 x 45 x 47.5 cm (WxDxH), 3.4 kg

18-0403 Power supply: 230 V, 50 Hz, EU-plug

18-0402 Power supply: 115 V, 60 Hz, US-plug

11-0181 **Hose**, silicon (Ø 8 mm, 8 m)



10-1336 & 10-1333

Thermometers

 (for DDA/DD-calibration set & DD-bath)

Precision Made	Officially Certified	Type		Range
		ASTM	DIN	
10-0383	10-0384	-	12 775	0 to +50 : 0.1 °C
10-0385	10-0386	63C	-	+8 to +32 : 0.1 °C



10-0403 & Ductilometer

Spare Parts

10-0377 **Contrast Inlay**
(6 x 170 x 550 mm) pack of 1

10-0406 **Corrosion Protection Specimen**
(200 x 100 mm) pack of 2



Thermometer & Holder

MANUFACTURER OF PETROLEUM TEST EQUIPMENT SINCE 1873



PETROTEST BUILDING



PRODUCTION



DEVELOPMENT

ISO 9001
CERTIFIED
PROCESSES...

...ALL UNDER
ONE ROOF!



QUALITY CONTROL



TRAINING



STORAGE

Presented by:

We reserve the right of changes without prior notice.

petrotest®

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