

petrotest®



BREAKING-POINT & BENDING-STRESS ANALYZERS

BPA 5 (BBS)



MANUFACTURER SINCE 1873

WWW.PETROTEST.COM



Scope of Application

To determine the temperature at which a bitumen tends to break rather than to flow when stressed.

Suitable for any homogeneous road or industrial bitumen.

Summary of Method

A thin flat steel plaque, coated with the sample, is flexed under specified conditions at a descending series of temperatures.

The FRAASS-Breaking-Point is the temperature at which the first cracks appear in the coating.

Determination of the Breaking-Point of Bitumen - Fraass Method - BPA 5 (automatic)

IP 80 - EN 12 593 (former DIN 52 012 - NF T 66-026) - JIS K 2207



Easy to Operate

Due to its principle of construction "measuring the bending force of a steel plaque coated with the material to be examined" and the use of thermoelectric elements for the cooling of the test chamber, the **Automatic Breaking-Point Tester BPA 5** offers a series of outstanding advantages.

The handling of the BPA 5 is very easy, even clamping and adjusting the coated steel plaque is made automatically. The operator only puts the specimen on to the plaque support and the **BPA 5 automatically clamps and adjusts the test-plaque.**

The **large LC-display** provides the operator with additional instructions during a test. When a test is completed, the final result remains on the display until a new measurement is started.

Economical

The BPA 5 is a very economical instrument. It uses **Peltier-elements for the refrigeration** of the test chamber. These solid-state cooling elements require a light auxiliary refrigerant only and thus avoid investing in a bulky and high energy consuming cooler.

Note:

The coolers are designed to be operated at ambient temperatures of approx. +5 to +40 °C.

All mentioned values are basically detected at an ambient temperature of approx. +20 °C.

Cooling Source	Coolant Temperature	Achievable Breaking-Point (at ambient temperature of +20 °C)
Tap Water	+17 °C	approx. -24 °C
Circulation Cooler (25-0382)	-10 °C	approx. -36 °C
Circulation Cooler (12-0495)	-20 °C	approx. -46 °C



Versatility

The scope not only covers the examination of bitumen according to the conventional FRAASS Method but also allows the user to adapt the test procedure to particular conditions (e.g. research of glass transition temperatures) or to perform a permanent bending program.

With the **Standardized-FRAASS-Test-Method** the instrument detects a distinct variation of the bending force or a typical deformation of the force/temperature curve respectively. Just as if the BPA 5-user could look inside the material under test.

These striking force characteristics can even be recognized with difficult materials (such as certain kinds of bitumen), where ruptures of the bitumen coating cannot be observed visually.

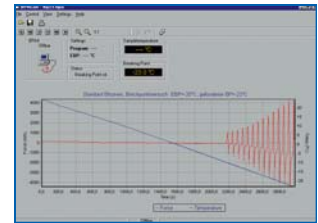
In particular with Polymer-modified Bitumen (PmB), the **Permanent-Bending-Program** is an interesting alternative to the conventional FRAASS method. The sample is cooled to a specified temperature and then the number of bending strokes is counted which are necessary to cause a rupture.

This program, however, requires a PC with **BPACon - Software** to remote-control the BPA 5, for storage and evaluation of the measured data. Thus, test proceedings (e.g. variation of the bending force) can be easily watched via a graphic diagram on the PC screen.

For samples with a very low breaking-point a **Rapid-Test-Program** is included. It cools with an accelerated rate of 2 K/min in the beginning and then changes to the standardized cooling rate during the actual test period.

In order to avoid unnecessary tests, with samples where the breaking-point is not known at all, the **SEARCH-Mode**, which is preset in the USER program, can be used beneficially. The instrument works with a refrigeration rate of 2 K/min and makes a bending test every 2 Kelvin.

The BPA 5 also offers the possibility to change test parameters like bending speed, cooling rate or bending intervals and to store them as a **USER-Defined-Program**.



BPACon Standardized Test

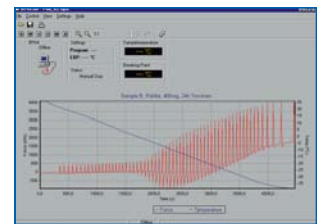
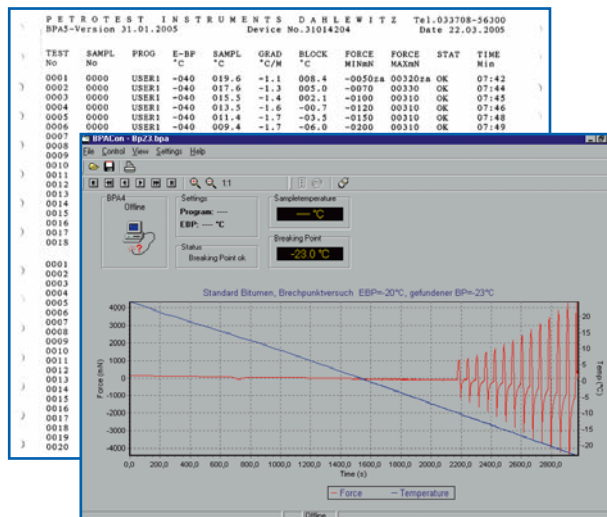


BPACon Permanent Bending

Data Output

Although not required, the connection of a serial printer is recommended.

The user will receive a test result for each flexion or any other interval (time or temperature according to the parameters set by the operator).



BPACon Glass Transition Temperature

BPACon-Software

Most comfortable is the use of the BPA 5 together with a PC and the **BPACon-Software**.

This software package (for Windows®) includes the Permanent-Bending-Program. Further it permits to remote control the BPA 5 by PC, to create additional user-defined test programs and to store or reload them from a PC. The measured data can be easily saved and evaluated on a PC in numerical form and as well as a graphical diagram.

BPACon is, for instance, mandatory to run **Permanent-Bending-Tests** or when **Glass-Transition-Temperatures** are determined, where the trend of the bending force versus the temperature drops and the recovery trend serves as the criteria for the material under test.

TEST No	SAMPL No	PROG	E-BP °C	SAMPL °C	GRAD °C/M	BLOCK °C	FORCE MINs	FORCE MAXs	STAT	TIME Min
0001	0000	USER1	-040	019.6	-1.1	008.4	-0050	00320	OK	07:42
0002	0000	USER1	-040	017.6	-1.3	005.0	-0070	00330	OK	07:44
0003	0000	USER1	-040	015.5	-1.4	002.1	-0100	00310	OK	07:45
0004	0000	USER1	-040	013.5	-1.6	-00.7	-0120	00310	OK	07:46
0005	0000	USER1	-040	011.4	-1.7	-03.5	-0150	00310	OK	07:48
0006	0000	USER1	-040	009.4	-1.7	-06.0	-0200	00310	OK	07:49

Printer Test Chart



Technical Data

Testmaterial:

Bitumen or Polymer-Bitumen

Measuring Range:

- Temperature: approx. -36 to +60°C
- Resolution: 10 mN

Programs:

- Standard-Program
(cooling rate of 1 K/min)
for FRAASS-Breaking-Point
- RAPID-Program
(cooling rate of 2 K/min)
for very low breaking-points
- SEARCH-Mode
to find the approximated
breaking-point
- USER-Definable-Program
for program modifications

In connection with the BPACon-software:

- Permanent-Bending-Program for fatigue tests
- Glass-Transition-Temperature-Test
- Graphic display and evaluation of bending forces
- LIMS ability

Interface:

serial RS232 for printer
serial RS232 for PC
(USB-converter available)

Refrigeration:

Peltier-elements counter-cooled by the circulation cooler

Dimensions (W x D x H):

- BPA-Tester:
23 x 40 x 29/43 cm, 15 kg
- Cooler:
23 x 36 x 38 cm, 23 kg

Available for

special applications:

BPA 5 in combination with circulator 12-0495 for a working range of approx. -46 to +60 °C.



Main Unit

BPA 5 Set - Fraass Method

Automatic Breaking-Point Tester & Circulation Cooler

Bitumen: IP 80

Bitumen & Bituminous Binders: EN 12 593 (former: DIN 52 012 - NF T 66-026) - JIS K2207

Consisting of:

Measuring and Control Unit:

high-grade stainless steel housing with two-color powder coating, measuring head with bending mechanism, automatic fixture and adjustment of test plaques; test chamber cooled by solid-state components (Peltier-elements), chamber ventilator, touch-key panel with large LC-display visible up to 10 m distance for measured values and user guidance for temperature pre-selection and test-plaque clamping

Programs:

- Standardized- FRAASS-Test
- RAPID-Test for very low breaking-points
- USER-Definable-Program
- SEARCH-Mode for samples with unknown breaking-point

In combination with a PC and BPACon-software:

- Permanent-Bending-Program
- further the graphic display and evaluation of the bending forces

Circulation Cooler:

as auxiliary refrigeration of the Peltier-elements

Supplied with:

- 10 test-plaques (41 x 20 x 0.15 mm)
- 1 insulated hose-set (Ø 8 mm, 2 x 2 m)

Note: serial printer or PC-software BPACon are recommended

10-0460 Power supply: 230 V, 50/60 Hz, 450 W, 2 A, EU-plug

10-0461 Power supply: 115 V, 60 Hz, 450 W, 4 A, US-plug



Options & Accessories

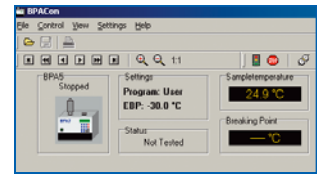
10-0473 PC Software - BPACon (Windows®)

The Program includes the Permanent-Bending-Test software and is used to store / modify and display curves of force for
 - Breakpoint-Tests
 - Permanent-Bending-Tests
 - Glass-Transition-Temperature-Tests

It replaces the serial printer and makes it possible to start/stop the BPA/BBS by PC, as well as to load self-defined test-programs.

The progression in elasticity, plasticity and of course cracking will be displayed numerically or graphically in different scales. With special created curves of trends for bending or recovery force even very small, nearly not visible, breaks of the material can be found in an unknown high precision.

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



10-0473

10-0474 Calibration Set - BPA 5

Consisting of:

- 1 set of precision resistor plugs,
- 2 weights,
- 1 thermometer IP42C, calibrated



10-0474

10-0475 Laboratory Stand for calibration set

Serial Impact Printer for single sheet & continuous paper, with USB-interface to record data like test results, duration of test, etc. (instead of a PC)

Supplied with: 1 data transmission cable, 1 ink ribbon (black)

Technical Data:

- Line spacing : 80 characters per line (10 cpi)
- Page size (W x H) : 257 x 364 mm (sheet), 254 x 558.8 mm (roll)
- Ports : serial, USB (1.1) & parallel
- Dimensions : 37 x 28 x 16 cm (WxDxH), weight 5 kg

25-0282 Power supply: 220/240 V, 50/60 Hz

25-0283 Power supply: 110/130 V, 50/60 Hz



25-0282

10-0007 Melting Apparatus

for bitumen samples having a ring & ball softening-point <100 °C.

Consisting of:

heater plate (steplessly regulated) with thermometer socket and cooling plate with hose connections; magnetic test-plaque holder (40 x 60 x 8 mm) with cover

Supplied with: 1 thermometer (0 to +200 : 1 °C)

Note: circulation cooler is recommended

Technical Data:

- Dimensions / Weight : 23 x 35 x 13 cm (W x D x H), 5 kg
- Power supply: 230 V, 50 Hz, 150 W, EU-plug



10-0007

10-0233 Tongs to handle test-plaques

12-1763 Storage Box for spare parts and tools

Spare Parts

10-0006 **Test-Plaques**, 10 pieces (41 x 20 x 0.15 mm), steel

10-0016 **Test-Plaques**, 10 pieces (41 x 20 x 0.15 mm), steel (with works certificate)

25-0228 **Hose-Set**, insulated (Ø 8 mm, 2 x 2 m, incl. fittings) (Photo: page 7)

11-0599 **USB/RS232-Converter** (verified for petrotest®-units) with 2 m cable connecting 1 serial port with the USB-port of a PC or Hub

25-0262 **PC-Data-Cable** (0-modem), serial, RS232 (9 & 25-pole) (Photo: page 7)

25-0274 **Printer-Data-Cable** (2 m) serial, RS232 (25-pole)



12-1763



11-0599



Technical Data

Testmaterial:

varnishes, paintings, adhesives or other coatings

Measuring Range:

- **Temperature:**
approx. -36 to + 60 °C
approx. -46 to + 60 °C
approx. -46 to +100 °C
- **Resolution:** 1 mN

Programs:

- **Standard-Program**
(cooling rate of 1 K/min)
- **RAPID-Program**
(cooling rate of 2 K/min)
- **SEARCH-Mode**
to find the approximated breaking-point
- **USER-Definable-Program**
for program modifications

In connection with the BPACon-software:

- Permanent-Bending-Program for fatigue tests
- Glass-Transition-Temperature-Test
- Graphic display and evaluation of bending forces
- LIMS ability

Interface:

serial RS232 for printer
serial RS232 for PC
(USB-converter available)

Refrigeration:

- Peltier-elements counter-cooled by the circulation cooler
- Climatic chamber and switched-off Peltier-elements

Dimensions (W x D x H):

- BBS-Tester:
23 x 40 x 29/43 cm, 15 kg
- Cooler:
23 x 36 x 38 cm, 23 kg

Determination of the Bending Behavior of Coatings - BBS 5 (automatic)



Standard Model

In addition to the bitumen application analyzer BPA 5, we now offer a **new scientific analyzer** to determine the behavior of coating materials by using specimens coated with layers of paint, varnishes, hair spray etc. - the **BBS 5**.

The BBS 5 will determine **glass-transition-temperature, elasticity behavior, drying behavior of varnishes, painting materials, adhesive materials and other coatings** with dynamic loading and force/temperature documentation.

Therefore it is equipped with a **high resolution 1 mN-sensor** for thin-coated samples

Main Unit

BBS 5 - Automatic Bending & Breaking Stress Tester, Standard Model

Designed to determine the fatigue behavior of coating materials against temperature by force measurements under periodical bends.

The test chamber is cooled by Peltier-elements in combination with an additional circulation cooler for counter-cooling. Depending on the attached cooler a sample test temperature within the range of -46 to +60°C is possible. A chamber ventilator can be switched on to decrease the chamber temperature by a few degrees.

Consisting of:

Measuring and Control Unit:

measuring head with bending mechanism, automatic fixture and adjustment of test-plaques; test chamber cooled by solid-state components (Peltier-elements), chamber ventilator, large LC-display for measured values and user guidance

Programs:

- Standard-Program (cooling rate 1 K/min)
- RAPID-Program (cooling rate 2 K/min)
- SEARCH-Mode to find the approximated breaking-point
- USER-Definable-Program to set up program modifications

In combination with a PC and BPACon-software:

- Permanent-Bending-Program for fatigue tests
- Glass-Transition-Temperature-Test
- Graphic display and evaluation of bending forces
- LIMS ability

10-0466 Power supply: 230 V, 50/60 Hz, 450 W, 2 A, EU-plug

10-0467 Power supply: 115 V, 60 Hz, 450 W, 4 A, US-plug

BBS 5 C - Automatic Bending & Breaking Stress Tester, Climatic Chamber Model

Designed for the use in a climatic chamber to determine the fatigue behavior of coating materials under the influence of temperature and humidity.

This instrument is build to allow measurements in a Climatic Chamber or alternatively in the BBS 5-basic unit itself. The sample test temperature is depending on the customers climatic chamber. The Peltier-cooling will be switched off.

For alternativ measurements in the basic unit the Peltier-cooling will be switched on after connecting a cooling circulator for counter-cooling. (Details see BBS 5 - Standard)

Consisting of:

like BBS 5 - Standard but with an external clamping device & test-rack and an elongated cable (2 m) for measuring head to allow tests in a closed chamber.

10-0464 Power supply: 230 V, 50/60 Hz, 450 W, 2 A, EU-plug

10-0465 Power supply: 115 V, 60 Hz, 450 W, 4 A, US-plug



Climatic Chamber Model



Main Unit

BBS 5 H - Automatic Bending & Breaking Stress Tester, High-Temperature Model

The test chamber is cooled by Peltier-elements in combination with an additional circulation cooler for counter-cooling, regulated by a cooling circuit controller. Depending on the attached cooler a sample test temperature within the range of -46 to +100 °C is possible. A chamber ventilator can be switched on to decrease the chamber temperature by a few degrees.

Consisting of:

like BBS 5 - Standard Model but with an additional Cooling-Circuit-Controller for an extended temperature range without a cooling-circuit change

- 10-0462 Power supply: 230 V, 50/60 Hz, 450 W, 2 A, EU-plug
- 10-0463 Power supply: 115 V, 60 Hz, 450 W, 4 A, US-plug



High-Temperature Model

Options & Accessories

Circulation Cooler (for external cooling)

Necessary to counter-cool the BPA/BBS 5 to reach a test-temperature of approx. -36 °C (at +20 °C ambient temperature)

Consisting of:

Cooler with tank, digital display, **pump** and liquid level indication.

Supplied with: 1 insulated hose-set (Ø 8 mm, 2 x 2 m)

Technical Data:

Working range : -20 °C to ambient
Volume : 1.4 l

Cooling capacity : 300 W at +15 °C
Pump capacity : 12 l/min, 200 mbar (Pressure)
: 12 l/min, 100 mbar (Suction)

Dimensions : 23 x 36 x 38 cm (W x D x H), weight: 23 kg

- 25-0382 Power supply : 230 V, 50/60 Hz, 3.5 A, EU-plug
- 25-0383 Power supply : 115 V, 60 Hz



25-0382

Circulator (for external & internal cooling or heating)

Necessary to counter-cool the BPA/BBS 5 to reach a test-temperature of approx. -46 °C (at +20 °C ambient temperature)

Consisting of:

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

Supplied with: 1 bath cover, 1 insulated hose-set (Ø 8 mm, 2 x 2 m)

Technical Data:

Working range : -40 to +200 °C
Interface : RS232 (LIMS ability)
Volume : 16 l

Cooler capacity : 680 W at +20 °C
Heater capacity : 2000 W
Pump capacity : 11-16 l/min, 450 mbar (Pressure)

Dimensions : 37 x 46 x 69 cm (W x D x H), weight: 48 kg

- 12-0495 Power supply : 230 V, 50 Hz, EU-plug
- 12-0496 Power supply : 230 V, 60 Hz



12-0495

- 10-0473 **PC Software - BPACon (Windows®)** (Details: page 3 & 4) instead of a serial printer

10-0494 Calibration Set - BBS 5

Consisting of:

1 set of precision resistor plugs,
2 weights,
1 calibrated thermometer IP42C



10-0494

- 10-0475 **Laboratory Stand** for calibration set

- 10-0233 **Tongs** to hold handle test-plaques

- 12-1763 **Storage Box** for spare parts and tools (Photo: page 5)

Serial Printer (Details: page 5)

- 25-0282 Power supply: 220/240 V, 50/60 Hz
- 25-0283 Power supply: 110/130 V, 50/60 Hz



10-0015

Spare Parts

- 11-0599 **USB/RS232-Converter** (verified for petrotest®-units) with 2 m cable connecting 1 serial port with the USB-port of a PC or Hub

- 10-0015 **Test-Plaques**, 10 pieces (41 x 20 x 0.1 mm), steel

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

- 25-0262 **PC-Data-Cable** (0-modem), serial, RS232 (9 & 25-pole)

- 25-0274 **Printer-Data-Cable** (2 m) serial, RS232 (25-pole)



25-0228



25-0262

MANUFACTURER OF PETROLEUM TEST EQUIPMENT SINCE 1873



PETROTEST BUILDING



DEVELOPMENT

ISO 9001
CERTIFIED
PROCESSES...



PRODUCTION

...CONSOLIDATED
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