



ADVANCED PAVEMENTS TESTING SYSTEMS

**PAV**

Pressure Aging Vessel

**VDO**

Vacuum Degassing Oven

# Long Term Aging Conditioning of Asphalt Binder

**Standards** ASTM D6521 | AASHTO R28 | EN14769





The advanced proprietary technology that characterizes the IPC Global | CONTROLS Group Testing Systems for bituminous mixes has been successfully extended to some of the most important equipment and apparatus for bitumen testing.

The important advantages for Research and Central Laboratories equipped with IPC Global | CONTROLS Group apparatus are the common performing philosophy resulting in a better and easy management of all testing results.

Within these new apparatus, an important role is played by the equipment for Long Term Aging of Asphalt Binders.

## PAV

**81-PV2600 Pressure Aging Vessel,** featuring freely selectable test temperature, Programmable pre-heating functions, User friendly software, Network ready for remote monitoring, etc.

## VDO

**81-PV2610 Vacuum Degassing Oven** which is the essential accessory to perform the tests conforming the Standards.

## PAV Pressure Aging Vessel For long term aging conditioning of asphalt binder



### main features

- > Platinum RTD temperature internal measurement to  $\pm 0.1^{\circ}\text{C}$
- > Freely selectable test temperatures from  $80^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ , PID controlled to  $\pm 0.5^{\circ}\text{C}$
- > Efficient heating system allowing the test temperature to be achieved in one hour, exceeding the Standards' specifications.
- > Programmable pre-heating functions (up to  $60^{\circ}\text{C}$ ) for time optimization
- > Pressure monitored by transducer and controlled to  $2.1 \pm 0.1$  MPa
- > User friendly software allows the operator to view in real time vessel temperature and pressure (set points and actual values) on the 6" colour touch screen display
- > Temperature and pressure calibrations performable by the user
- > Network ready for remote monitoring of the test status from PC, Tablet or Smartphone
- > Reclining display for improved visibility
- > CE and ASME certified pressure vessel

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### Operating Principle

The Pressure Aging Vessel (PAV) has been developed to simulate in-service aging of asphalt binder after 5 to 10 years. The binder is exposed to high pressure and temperature for 20 or 65 hours (selectable up to 99) to simulate the effect of long-term oxidative aging.

The aging of asphalt binders during service is affected by ambient temperature and by mixture-associated variables, such as component proportions in the mix, aggregate properties and many more. This conditioning process is intended to provide an evaluation of the relative resistance of asphalt binders to oxidative aging at selected elevated temperatures and pressures.

It is normally performed after an initial conditioning using a Rolling Thin Film Oven (RTFOT), refer to page 112 of the IPC Global's catalogue.

Residue from this conditioning practice may be used to estimate the physical and chemical properties of asphalt binders after several years of in-service aging in the field, and to compare these properties to pre-conditioning test results of the same binders.

### General Description

The apparatus consists of a stainless steel (AISI 304 with ASME and CE certifications) pressure vessel with encased band heaters and integral pressure and temperature controls. Data logs of both temperature and pressure are saved on USB stick or transferred to PC at the end of the test.

The user friendly software allows the operator to view the vessel temperature and pressure in real time, both as set targets and actual values, with a high rate of refresh. It is also possible to view, in real time, the temperature and pressure graphs.

The instrument features PID temperature control and highly efficient heaters that allow heating rate and temperature control, exceeding the Standards' specifications.

Pre-heating of the instrument can be programmed (maximum  $60^{\circ}\text{C}$  for safety reasons) to allow the operator to find the PAV ready for the next test at any time. An acoustic alarm advises the operator when the test is finished.

To recover the sample after the Pressure Aging (PAV) test and to make it suitable for any following tests (e.g. BBR, DSR, penetration, softening point, ductility etc.), a Vacuum Degassing Oven (VDO) shall be used.

The source of compressed air (at least 2.1 MPa), necessary to perform the test, can be obtained using a compressed air tank or a suitable air compressor, which shall be user provided.



Detail of certified pressure vessel and cover locking switch

**Safety features:**

- Electrically locked top cover, to avoid direct exposure of the pressure vessel during the test
- Forced ventilation cooling system allowing quick cooling of sample rack and to avoid accidental burns
- 60°C pre-heating limit for operator safety during sample rack positioning
- Over temperature limit switch
- Over pressure relief valve



Pressure transducer calibration menu.



Temperature and pressure target values vs actual values.



Real time temperature vs pressure graph.



Detail of inclinable touch screen display



## PAV Pressure Aging Vessel For long term aging conditioning of asphalt binder

### Ordering information

#### **81-PV2600**

Pressure Aging Vessel (PAV) conforming to ASTM D6521, AASHTO R28, EN 14769. 110–230 V, 50–60 Hz, 1 ph

### Accessories and spares

#### **81-PV2610**

Vacuum Degassing Oven (VDO). 110–230 V, 50–60 Hz, 1 ph (see complete description next page)

#### **81-PV2600/1**

Spare sample container (TFOT pan) for PAV

#### **81-PV2600/2**

Spare sample rack for PAV

### Specifications

- Working temperature range: ambient to 200°C
- Temperature measurement: Platinum RTD with  $\pm 0.1^\circ\text{C}$  resolution
- Pressure measurement: pressure transducer with  $\pm 1$  kPa resolution
- Power: 600 W
- Dimensions (L x W x H): 430 x 440 x 480 mm
- Weight approximately: 90kg



*Precision assembled supporting rack with ten TFOT pans (included with the instrument)*



*Pressure Aging Vessel (PAV) & Vacuum Degassing Oven (VDO) and related accessories*

## VDO Vacuum Degassing Oven



### main features

- > Platinum RTD temperature internal measurement to  $\pm 0.1^{\circ}\text{C}$
- > Selectable test temperature (from ambient to  $200^{\circ}\text{C}$ ) controlled to  $\pm 4.0^{\circ}\text{C}$
- > Integrated vacuum pump
- > Vacuum monitored by transducer and controlled to  $15 \pm 1.0$  kPa absolute pressure
- > Digital touch screen 6" display for temperature, vacuum, set points and actual values
- > Reclining display allowing view from any angle
- > Over temperature limit switch
- > Network ready for remote monitoring of the test status from PC, Tablet or Smartphone

**Standards** ASTM D6521 | AASHTO R28 | EN 14769

Most Standards make a degassing oven of the PAV-aged asphalt samples mandatory. The **Vacuum Degassing Oven (VDO)** is designed to remove air bubbles created during accelerated oxidative aging of asphalt binder by the PAV. This final conditioning makes the aged binder suitable for further tests such as BBR, DSR, penetration, ductility, softening point and many more.

The apparatus consists of a stainless steel vacuum vessel with encased band heaters and integral vacuum and temperature controls. A platinum RTD measures internal test temperature to  $\pm 0.1^{\circ}\text{C}$ . Selectable test temperatures (from ambient to  $200^{\circ}\text{C}$ ) are controlled to  $\pm 4.0^{\circ}\text{C}$ .

Vacuum is provided by an integrated vacuum system monitored by a pressure transducer and controlled to achieve 15 kPa absolute pressure. Temperature and vacuum are indicated both as set points and as actual values on the 6" digital color touch screen display. Temperature and vacuum calibration can be site executed. Data logs of both temperature and vacuum are saved on USB stick or transferred to PC at the end of the test.

The vacuum chamber can accept either eight 55x35 mm or four 70x45 mm (available as accessories) sample containers.

The instrument is supplied complete with temperature traceable calibration certificate, 8 aluminium 55x35 mm sample containers, a double face sample holder and operator's manual.

### Specifications

- **Working temperature range:** ambient to  $200^{\circ}\text{C}$
- **Temperature measurement:** Platinum RTD with  $\pm 0.1^{\circ}\text{C}$  resolution
- **Pressure measurement:** pressure transducer with  $\pm 1$  kPa resolution
- **Power:** 600 W
- **Dimensions (L x W x H):** 430 x 440 x 480 mm
- **Weight approx.:** 30kg

### Ordering information

#### 81-PV2610

Vacuum Degassing Oven conforming to ASTM D6521, AASHTO R28, EN 14769. 110-230V, 50-60 Hz, 1 ph

### Accessories and spares

#### 81-PV2610/1

Set of eight 55x35 mm sample containers for VDO

#### 81-PV2610/2

Set of four 70x45 mm sample containers for VDO



Double face sample rack positioning



Double face sample holder for eight 55x35 mm or four 70x45 mm sample containers

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