

OPERATING INSTRUCTIONS

Pressure Ageing Vessel (PAV)

46-5010/01

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<i>In the interests of improving and updating its equipment, ELE reserves the right to alter specifications to equipment at any time.</i> ELE International 2017 ©		

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1 Preface

1.1 Unpacking

Retain all cartons and packing materials until the unit is operated and found to be in good condition. If damage has occurred during shipping, notify ELE International and the carrier immediately. If it is necessary to file a damage claim, retain the packing materials for inspection by the carrier.

1.2 Warranty

All new ELE systems are shipped with a warranty. Units have a warranty against defective parts and workmanship for one full year from date of shipment. Please see section 7 of this manual for complete details on the warranty.

NOTE: Please see the warranty information included with the computer (if supplied). It details information that will ensure proper transfer of the computer warranty from ELE International to the appropriate company.

1.3 After-Sale Support

If there are any questions concerning the operation of the unit or software, contact ELE International's Service Department at customerservice@eleint.co.uk.

2 Introduction

ELE International's Pressure Ageing Vessel (PAV) simulates in-service oxidative ageing of asphalt binder according to procedures developed by the Strategic Highway Research Program (SHRP). The PAV system is fully compliant with the most recent versions of ASTM D6521, AASHTO R28 and EN 14769.

This information is related to the function, setup, safe operation, and maintenance of the PAV and its related components.

This manual is intended for anyone who will be setting up and/or operating the PAV.

3 Safety

All ELE International equipment is designed to be operated with the highest level of safety. This manual and ELE International endeavour to educate the operator about safety issues surrounding certain parts of the machinery by using equipment labelling.

For Owners, Operators, and Maintenance Personnel

Read and understand all instructions and safety precautions listed in this manual before installing or operating the unit. If there are any questions regarding operation of the unit or the instructions in this manual, contact ELE International's Service Department at customerservice@eleint.co.uk.

In addition to the safety warnings listed on the equipment, warnings are posted throughout this manual. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, personal injury, or death.

	Read Operator's Manual
	General Danger
	Protective Earth (Ground)
	Burn Hazard (Hot Surface)
	Electrical Shock/Electrocution
	Hand Crush Force from Above
	European Directive CE Mark
	No Access for Unauthorized Persons

3.1 Safety Instructions

Read and follow all warning and caution statements in all related equipment manuals before attempting to operate this machine. If in doubt about any statement or sequence, contact ELE International Customer Support.

- Installation of electrical devices must be accomplished by competent personnel in accordance with any current local and national codes. Equipment grounding is a MUST for both safety and proper operation.
- Before supplying electrical power to the unit, turn all power switches and controls to an OFF or NEUTRAL position.

3.2 Warnings

The following statements are warning statements. Unlike caution statements, warning statements alert the operator to conditions that may injure personnel. Operators must be aware of these conditions to prevent injuries that may occur while operating this equipment.

	WARNING: Obey electrical code requirements. The oven and control system must be wired and grounded in accordance with national and local electrical code requirements.
	WARNING: Be careful when working with equipment at elevated temperatures. In order to prevent burns, wear protective clothing.
	WARNING: Use caution when opening the oven lid. Electrically-heated equipment can cause severe burns.
	WARNING: Allow adequate time to relieve all the pressure from the vessel before opening the oven lid and the pressure vessel lid. Any unrelieved pressure can cause equipment damage and possible personal injury.
	WARNING: Unpack and operate on a stable surface.
	WARNING: Wear safety glasses.

3.3 Cautions

The following statements are caution statements. These statements alert the operator to conditions that may damage equipment. Operators must be aware of these conditions to ensure safe operation of this equipment.

	CAUTION: Installation of electrical devices must be accomplished by competent personnel and done in accordance with any current local and national codes.
	CAUTION: The PAV must be grounded and wired in accordance with national and local electrical code requirements.
	CAUTION: Before energising the electrical power to the Pressure Ageing Vessel, place all controls in an OFF position and ensure the voltage selector switch has been set accordingly.
	CAUTION: Do not exceed the maximum operating temperature.
	CAUTION: All supporting and contacting surfaces must be non-flammable. Do not allow flammable materials to contact the shell.
	CAUTION: If an emergency shutdown needs to be performed, place ON/OFF switch in an OFF position. It is possible to manually exhaust any air within the vessel and pipework system, using the ball valve on the rear of the machine.
	CAUTION: Do not overflow PAV pans. Refer to test specifications for proper amount of material.

4 System Overview

ELE International's Pressure Ageing Vessel (PAV) uses heated, pressurised air to simulate long-term oxidative ageing of asphalt binders.

The PAV consists of: an ASME Boiler and Pressure Vessel Code and CE certified stainless-steel pressure vessel; steel cabinet with encased band heaters; and integral pressure measurement control.

This state of the art system meets ASTM D6521, AASHTO R28, and EN 14769 requirements and includes a platinum RTD device to ensure accurate temperature resolution and uniformity. A pressure relief valve and high-temperature thermal shut-down are included as standard safety features. A USB port located on the front of the unit allows the user to easily store test data and upgrade software if necessary.

The PAV Pressure Ageing Vessel uses a Touch-screen controller with front panel user interface for complete control and monitoring of all test processes. The system has an operating pressure range of 2.1 ± 0.1 MPa and temperature range of $80^{\circ} - 115^{\circ}\text{C}$, with resolution of 0.01°C .

The PAV includes a set of ten TFOT specimen pans, a precision aluminium sample holder with lifting handle, and a specimen handling tool. Additional TFOT pans can be ordered as necessary. Bottled compressed air with a pressure of at least 325 psi (2.24 MPa) and a regulator must be user provided.

4.1 Vessel Certification

ASME Code: Unless otherwise noted, the Pressure Ageing Vessel (PAV) is designed, fabricated, inspected, tested, and stamped in accordance with the *ASME Boiler and Pressure Code*, Section VIII, Division 1, for service at a maximum pressure of 2.45 MPa/350 psig and a maximum temperature of 150°C/300°F. *The ASME Boiler and Pressure Vessel Code* is an Internationally Recognized Standard.

Contact ELE International for the vessel certificate/U-IA Report and CE Declaration of Conformity.

4.2 Specifications

Electrical supply: 230 Volts; 50 or 60 Hz @ 13A
Dimensions: (w x d x h): 750 x 545 x 660 mm
Estimated weight: 120 Kg

Pneumatic connections:

Air Inlet: ¼", Male, BSPP, Flat sealed connection
Air Outlet: ¼", Male, BSPP, Flat sealed connection

Note: ELE International reserves the right to modify any specification without notice.

4.3 Environmental Conditions

Operation of the PAV Pressure Ageing Vessel involves use of high temperatures and contents being contained at high pressure. The location and placement of the PAV should always take these elements into consideration to ensure a safe working environment. The PAV is meant for use in laboratory/factory settings in a dry and clean work environment. The work surface that the PAV is placed on should be a clean and sturdy work surface at a reasonable working height and away from any water, gas, or electrical hazards. The work surface should be able to support more than the weight of the unit itself. The indoor area the PAV is placed in should be well ventilated

5 Unpacking and Installation

5.1 Unpacking

Carefully unpack the equipment and inspect it for damage during shipment. Retain all cartons and packaging materials until the unit is operated and found to be in good condition. If damage has occurred during shipping, notify the carrier and ELE International immediately. If it is necessary to file a damage claim, retain the packing materials for inspection by the carrier.

5.2 Installation

- a) Use an overhead crane or forklift to remove the PAV from the crate and position it in the desired location.



Utilise lifting slings around the unit to take the weight, do not lift from underneath, you will cause damage.

- b) Position the PAV in the testing position, such as on the heavy-duty steel stand or on a workbench or lift cart.



CAUTION: All supporting and contacting surfaces must be non-flammable. Do not allow flammable materials to contact the shell.

- c) Level the PAV by adjusting the height of the four feet.
- d) Inspect the gasket to make sure it is clean. Contact ELE International for replacement gasket.

5.3 Pan Holder Levelling

- a) Once the PAV is in place, verify that the plate located inside the bottom of the pressure vessel is level by placing the parallel bar and a spirit level across the top of the levelling plate.



WARNING: When placing the level and the parallel bar onto the plate, do not interfere with the RTD located in the bottom of the pressure vessel. The RTD is factory set and should not be moved.

- b) If the level indicates that the plate is not evenly balanced, make the necessary corrections by rotating the three vertical-set screws to lower or raise the plate. Use the supplied 4mm hex wrench to make this adjustment.

5.4 Air and Power Connections

- a) Install the air pressure line to the 1/4" male pipe-threaded fitting provided on the back of the control cabinet.



CAUTION: Use a regulated air supply of 340 to 350 psi (2.34 to 2.41 MPa). Do not exceed 350 psi (2.41 MPa) or the PAV's performance may be impaired by excessive pressure.

- b) A suitable mains lead is supplied with the PAV (without plug).
* Use an electrical plug that is suitable for the available electrical socket.

	CAUTION: The PAV and control system must be grounded according to national and local code requirements.
	CAUTION: Flow adjust valves on the PAV are factory set and should not be adjusted.

5.5 Regulator Connections

Secure the air supply to the PAV using the supplied male connections.

Verify that all connections are tightly sealed by applying soapy water on the connections and turning on the air. If suds appear, apply more compound or tape to seal the leak.

6 Operation

Plug in and turn on at mains.

- 6.1 Power on the PAV by turning the Main Power Switch located on the front of the PAV to the "I" position.



NOTE: Make sure the compressed air is connected and set at 340-350 psi.

- 6.2 Wait for home screen to appear on HMI



6.3 Press Menu Key followed by 'Login'



6.4 Enter Password '0000'



6.5 Setting up a Basic Test

6.5.1 Temperature

- a) Set the chamber set point by pressing the yellow box next to 'SP:'



6.5.2 Enter the set point temperature in the keypad that pops up.

- Temperature ranges are programmable from 0°C - 150°C; however, only temperatures between 80°C - 115°C are calibrated to be within $\pm 0.5^\circ\text{C}$ of the set point.
- Do NOT enter a set point temperature higher than the actual temperature value which will be used for the Ageing Procedure.



NOTE (1): The PAV is designed to operate most efficiently when the Pressure Vessel and Sample Rack are preheated to the temperature at which Ageing will be done.

NOTE (2): Attempting to preheat the Pressure Vessel and/or Sample Rack to a higher temperature than the Ageing procedure temperature may result in either a longer period of time required for the PAV to recover temperature after Pressure is applied and/or a poorer control of the chamber temperature after pressure is applied to the chamber.

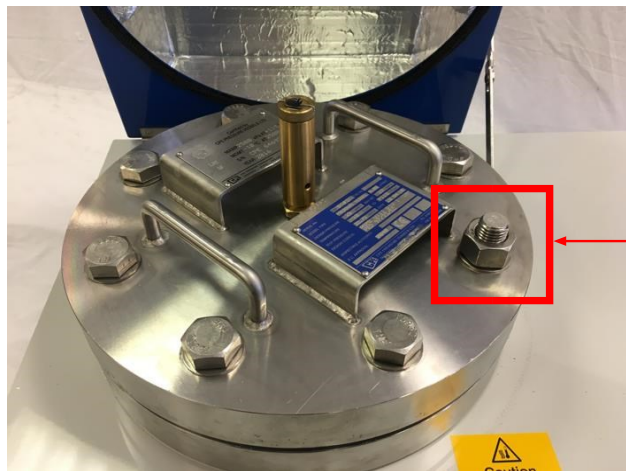
6.6 Ageing Duration

6.6.1 The Ageing duration has been automatically set to meet AASHTO R28, ASTM D6521 and EN 14769 standards (i.e. 20 hours).

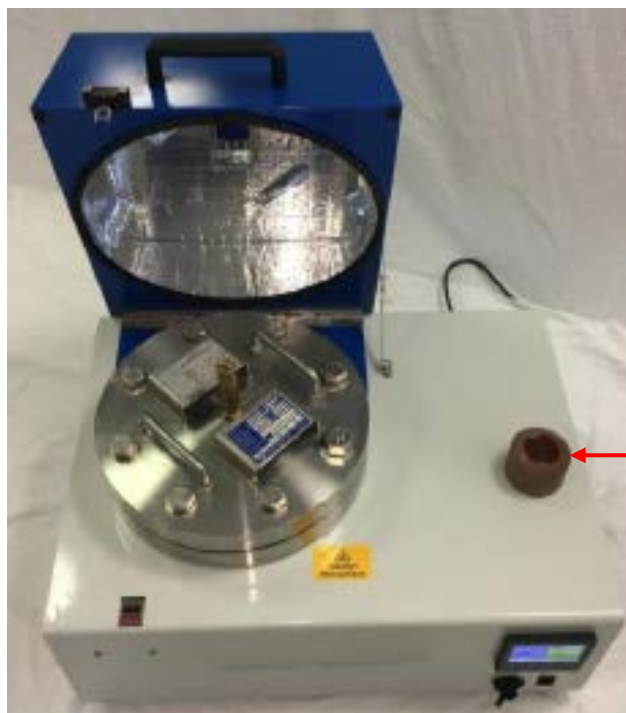
6.6.2 The equipment is set to automatically achieve 'set point' temperature.

NOTE: Condition samples at this point.

6.7 Remove bolts (not pivot nut) and rotate lid onto the lid rest. Insert sample holder.



**DO NOT REMOVE
NUT FROM PIVOT BOLT**

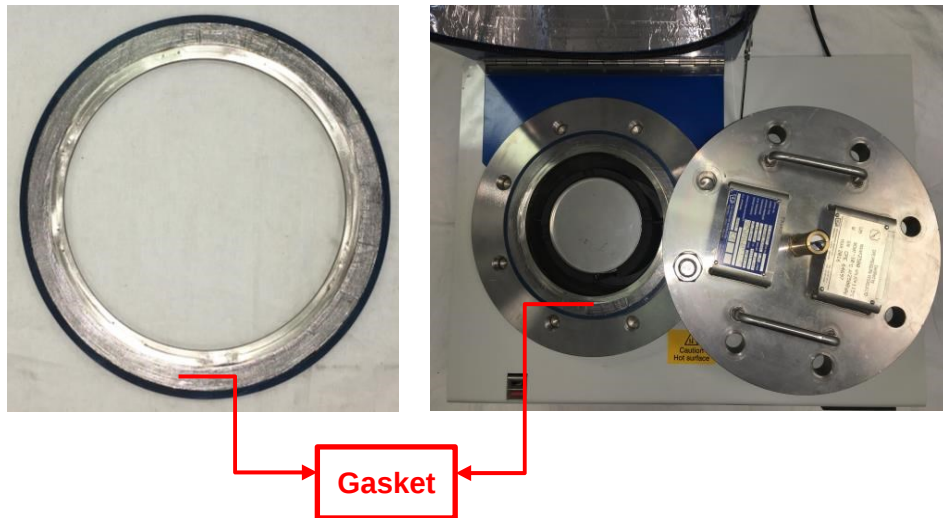


Lid rest

6.8 Slide the vessel lid closed and insert bolts. The bolts only need to be engaged a turn or two. It is not necessary at this time to completely tighten the bolts. Close the oven lid.



Be sure to fit gasket.



6.9 Wait until set point is achieved as shown on screen as PV.



Once the PAV has reached the set point, wait for 20 minutes to condition the pan holder.

6.10 Now open the lid, insert specimens. Close lid and press 'start ageing'.



Do this process as quickly as possible.

6.11 The test will start and the machine will apply the required parameters and temperature following the pre-determined test standard requirements.

Note: If pressure or temperature fall outside the set parameters, the test will stop. This may be because you have run out of air or there has been an electric failure.

NOTE: Details of why the test may have stopped will be shown in the dropdown menu at the top of the screen.

6.12 Ensure Alarm is 'ON' for audible buzzer.

- * If alarm is preferred choice to notify you that the test has completed.
- * The screen will flash as standard if you prefer not to have the alarm switched on.

7 Warranty

ELE International undertake to repair or replace any goods manufactured or supplied by us and in the reasonable judgement of ELE International to be defective in material or workmanship.

- a) ELE International shall be required to comply with this warranty where such defective material or workmanship is found within 12 months from the date of delivery.
- b) If required by ELE International, the buyer shall return or procure the return of the goods alleged to be defective to ELE International who may carry out repairs.

ELE International shall not be responsible under this warranty if:

- a) The buyer shall not have paid all the invoices for goods and services supplied by ELE International within the agreed time.
- b) The goods have been improperly maintained, installed or operated.
- c) The goods have been altered or modified so as to adversely affect the operation or use or durability or so as to change their intended use.
- d) ELE International's liability under warranty contained in this clause is limited to the repair or replacement of defective goods and making good defective workmanship.

8 Copyright

The contents of all ELE International catalogues and other literature published by us are protected by copyright and may not be reproduced or used without written consent.

9 Force Majeure

All contracts are subject to ELE International's right to cancel the same in whole or in part in case of war, rebellion, hostilities or any local or national emergency, government action, strikes, lock-outs or any other causes which are unforeseen or beyond the immediate control of ELE International which affects or interferes with production, shipment, transit, delivery or installation of the goods subject to contract.

10 Jurisdiction

All contracts shall be deemed to have been made in England, unless otherwise agreed by ELE International Limited in writing and the construction, performance and validity thereof shall be governed by English law.

In relation to sales where the buyer has his place of business outside the United Kingdom or its residences outside the United Kingdom all disputes with regard to the contract shall be settled by arbitration in London in accordance with the rules for the time being of the International Chamber of Commerce.

DIRECTIVE ON WASTE ELECTRICAL & ELECTRONIC EQUIPMENT (WEEE)

	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user. Note: <i>For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment for proper disposal.</i> Important document. Retain with product records.
GERMAN	Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben. Hinweis: <i>Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.</i> Wichtige Informationen. Bitte zusammen mit den Produktinformationen aufbewahren.
FRENCH	A partir du 12 août 2005, il est interdit de mettre au rebut le matériel électrique marqué de ce symbole par les voies habituelles de déchetterie publique. Conformément à la réglementation européenne (directive UE 2002/96/EC), les utilisateurs de matériel électrique en Europe doivent désormais retourner le matériel usé ou périmé au fabricant pour élimination, sans frais pour l'utilisateur. Remarque : <i>Veillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.</i> Ce document est important. Conservez-le dans le dossier du produit.
ITALIAN	Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore. Nota: <i>Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.</i> Documento importante. Conservare con la documentazione del prodotto.
DANISH	Elektriske apparater, der er mærket med dette symbol, må ikke bortskaffes i europæiske offentlige affaldssystemer efter den 12. august 2005. I henhold til europæiske lokale og nationale regler (EU-direktiv 2002/96/EF) skal europæiske brugere af elektriske apparater nu returnere gamle eller udtjente apparater til producenten med henblik på bortskaffelse uden omkostninger for brugeren. Bemærk: <i>I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.</i> Vigtigt dokument. Opbevares sammen med produktdokumenterne.

SWEDISH

Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller uttrangerad utrustning till tillverkaren för kassering utan kostnad för användaren.

Obs! Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.

Viktigt dokument. Spara tillsammans med dina produktbeskrivningar.

SPANISH

A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario.

Nota: *Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.*

Documento importante. Guardar junto con los registros de los equipos.

DUTCH

Elektrische apparatuur die is voorzien van dit symbool mag na 12 augustus 2005 niet meer worden afgevoerd naar Europese openbare afvalsystemen. Conform Europese lokale en nationale wetgeving (EU-richtlijn 2002/96/EC) dienen gebruikers van elektrische apparaten voortaan hun oude of afgedankte apparatuur kosteloos voor recycling of vernietiging naar de producent terug te brengen.

Nota: *Als u apparatuur voor recycling terugbrengt, moet u contact opnemen met de producent of leverancier voor instructies voor het terugbrengen van de afgedankte apparatuur voor een juiste verwerking.*

Belangrijk document. Bewaar het bij de productpapieren.

POLISH

Sprzęt elektryczny oznaczony takim symbolem nie może być likwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecnie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji.

Uwaga: *Aby przekazać sprzęt do recyklingu, należy zwrócić się do producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkowania.*

Ważny dokument. Zachować z dokumentacją produktu.

PORTUGUESE

Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador.

Nota: *No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.*

Documento importante. Mantenha junto dos registos do produto.