

OPERATING INSTRUCTIONS

Autoclave

38-3900

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<p><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 2018 ©</p>		

Contents

	Section	Page
1	Equipment	3
2	Introduction	3
3	Specification	3
4	Electrical Power Supply	3
5	Description	4
6	General Assembly Drawing	5
7	Operation	6
8	Important Safety Warnings	7
9	Precaution and Maintenance	8
	WEEE Directive	9

1 Equipment

The equipment comprises the following :

- a) Autoclave comprising of main controller contained in the base unit. The pressure vessel is integrally mounted over the base unit, Autoclave top flange which carried the pressure gauge, RTD Thermocouple, Safety valve and release valves.
- b) Pair of gloves.
- c) Bar mould stand with lifting clamp.
- d) Operating Manual with general assembly drawing.

2 Introduction

The Autoclave is used for the determination of Autoclave expansion or accelerated soundness of Portland Cement using a neat cement specimen. The Autoclave's performance has been designed to satisfy ASTM C151.

3 Specification

Working Pressure	:	21 ± 1 kg / cm ² at 215°C
Pressure Vessel	:	Internal diameter 150 mm x 500 mm deep
Weight	:	70 kg
Heater	:	2000 watts
Size	:	480 mm x 580 mm x 1100 mm (w x d x h)
Supply	:	220V, 50 Hz, 1 phase
Panel mounted PID controller with international safety certifications		

4 Electrical Power Supply

Electrical Safety

Danger : Before removing any cover or performing maintenance repair and service, isolate from electrical supply by removing mains plug. Where mains supply is required during these activities, only competent persons should perform the work.

Danger : Installation and servicing must be carried out by a qualified person.

Danger : A good low impedance Protective Earth Ground connection is required for this product.

Danger : It is recommended that this equipment is connected to a mains supply using an RCCB "Residual Current Circuit Breaker" for extra electrical safety protection.

Danger : Check that the power supply is compatible with the requirements stated on the voltage label on the unit and connect in accordance with IEE regulations or to local requirements.

The power cable is coded as follows:-

Brown wire	L	Live or Power
Blue wire	N	Neutral
Green/Yellow wire	E	Earth or Ground

5 Description

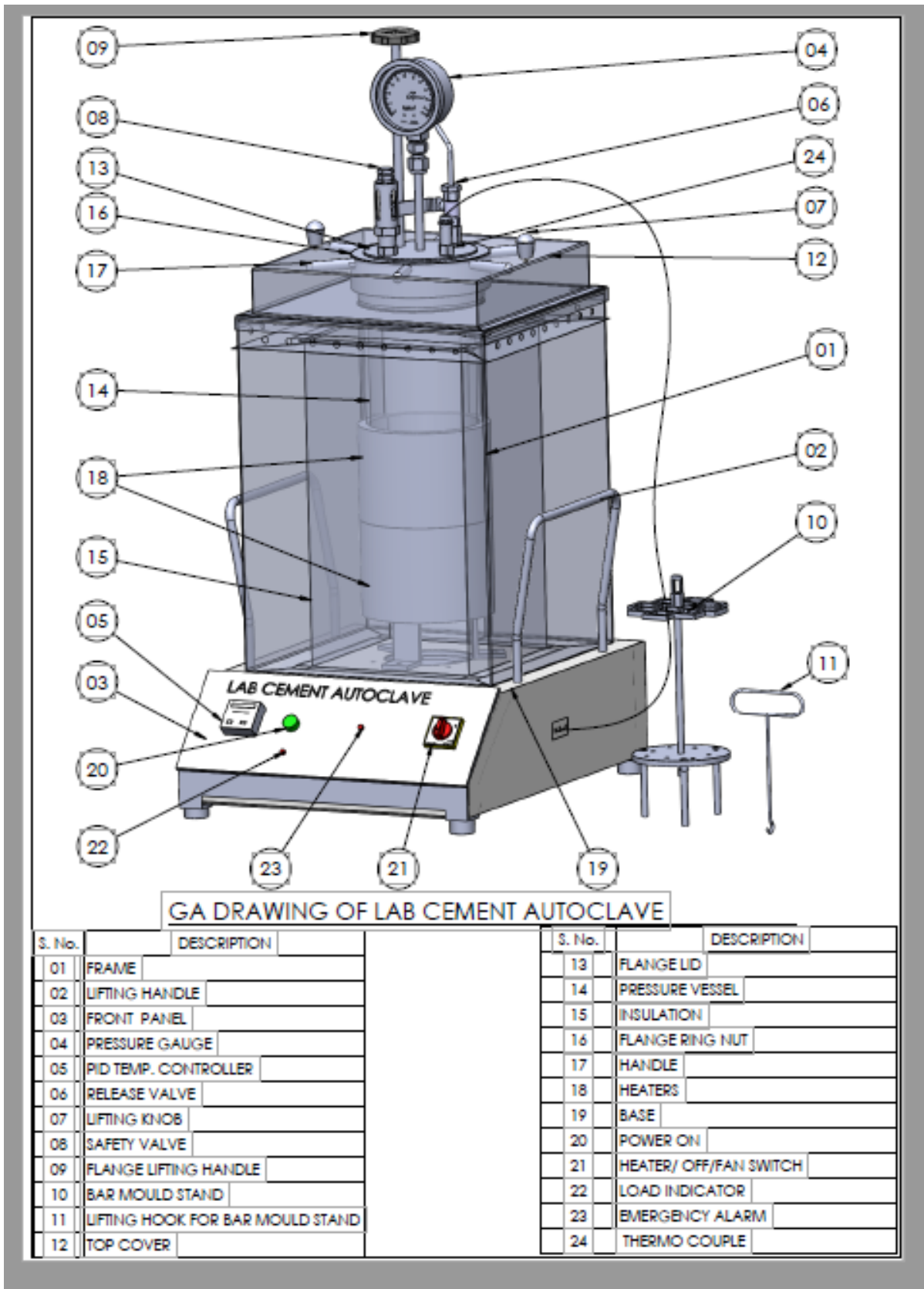
The Autoclave is illustrated in the General Assembly drawing contained in this operating manual. The numbers given against the components of the Autoclave in the description below pertain to this General Assembly drawing.

The Autoclave pressure vessel has been designed, manufactured and inspected at a static hydraulic pressure of 60 kg/cm² and conforms to ASTM C151. The pressure vessel (14) is made of seamless stainless steel tube with a welded base and is closed with a top flange lid (13) which houses the lid lifting handle (09), pressure gauge (04), release valve (06), safety valve (08), and the platinum resistance thermocouple fitted in a thermocouple (24) pocket (inside the unit and not shown in the general assembly drawing). The complete flange lid assembly (13) is mated to the pressure vessel (14) with a high temperature seal and can be held leak-proof using the top flange ring nut (16) with integral handles (17) by means of which the ring nut can be tightened.

The pressure vessel complete assembly is mounted on a base (19). The front panel (03) houses the power ON / OFF switch (20), the temperature controller (05), and heater/off/fan switch (21) controls. The pressure vessel is heated by means of a set of heaters (18) wrapped around the pressure vessel and the insulation (15) between the external stainless steel case and the top cover keeps the temperature stable and uniform inside the autoclave during the operational period. The outlet of the steam release valve is positioned in such a way that the steam is vented away from the direction of the operator.

The cylindrical autoclave or pressure vessel (14) is surrounded by insulation and this insulated pressure vessel hinged inside the frame (01). The Autoclave can be moved around with the help of the lifting handle (02).

6 General Assembly Drawing



7 Operation

- 1) Before attempting to operate the Autoclave, read this manual in full.
- 2) Ensure initially that the power to the Autoclave is completely isolated.
- 3) Remove the top cover (12) by lifting the same vertically and leave it in a suitable place.
- 4) Rotate the flange ring nut (16) counter clockwise using the handle (17) and completely remove the flange ring nut (16) by lifting the ring nut vertically and place it suitably near the autoclave.
- 5) The flange lid assembly (13) with its release valve (06), safety valve (08), pressure gauge (04) etc can now be removed using the flange lifting handle (09). This will give complete access to the inside of the autoclave chamber.
- 6) Using a beaked mug pour the suitable quantity of distilled water to a height of approximately 155 mm into the autoclave chamber such that the water level is just below the mould holder bottom plate.
- 7) Assemble the bar mould stand (10) with cement bar moulds and, using the lifting hook (11) provided with the autoclave, place the mould stand with moulds into the autoclave chamber, then remove the lifting hook and keep it secure for the next use.
- 8) Ensure that the “O” ring is properly located in its groove at the top of the pressure vessel (14).
- 9) Place the flange lid assembly on top of the autoclave chamber. Slide the ring nut (16) from the top and tighten the same onto the threading on the autoclave body using the handles (17). Also place the top cover (12) in its place before operating the autoclave.
- 10) The autoclave is now mechanically ready for operation.
- 11) After this initial assembly, keep the release valve (06) in the open position to allow the steam to escape when the autoclave is heating. This is done to ensure that the initial air inside the autoclave is flushed by the steam generated while heating.
- 12) Connect the power to the autoclave and switch on the power from the wall socket.
- 13) Select the heater/off/fan switch (21) to ‘heater position’.
- 14) Switch on the “mains” (20) located at the front switch panel (03).
- 15) You will now be able to see that the display in the temperature controller (05) starts and the heating control program of the autoclave is initiated.
- 16) As the autoclave is heated, the steam gets released through the release valve.
- 17) When you physically see the steam starting to escape from the release valve (06) outlet, close the release valve (06). The steam pressure starts building up and the pressure inside the chamber is measured on the pressure gauge (04).
- 18) As the temperature is increased from ambient to set point 215°C, the pressure starts building up in the autoclave and is constantly monitored in the pressure gauge. The temperature controller will control the autoclave maximum temperature at 215 +/- 1°C.
- 19) You will observe that the pressure is constantly held at 2.1 MPa.
- 20) Allow the autoclaving to take place for a period of up to 3 hours, and at the end of the 3 hour period switch off the supply to the heater and switch the operational mode to FAN from heater mode by means of the toggle switch.

- 21) The FAN mode helps return the temperature of the autoclave slowly in about one hour. You will also observe that the pressure is lowered and by the end of one hour the pressure will be around 0.1 MPa. Any residual pressure inside the Autoclave may be released by opening the release valve. This completes the autoclaving cycle of the test sample and now you can remove the sample and process the same as required in the standard. However, before you remove the test samples ensure the electrical power to the autoclave is isolated. At this point the autoclave body and parts may be very hot. Do not attempt to open the autoclave with bare hands. Use the gloves supplied to ensure personal safety.
- 22) Remove the thermocouple from its well and ensure that the flange assembly is clear of all removable parts.
- 23) Open the flange ring nut (16) completely and slide it vertically over the flange assembly and keep to one side.
- 24) Lift the flange assembly by the lifting knob (07) and keep it in a safe place.
- 25) Now the inside of the autoclave is accessible and, using the lifting hook (11), take out the complete bar mould stand along with the processed bar moulds.
- 26) The temperature of the bar moulds is expected to be around 90°C at this point. Place the moulds in water such that the temperature of the water reaches around 27 +/- 2°C in about 15 minutes. Remove the moulds and ensure that the surface of the moulds are dried. After drying, the mould length is measured again.
- 27) The difference in lengths of the test specimens before and after autoclaving will be calculated to the nearest 0.01% of the effective gauge length, which is the length between the innermost points of the metal inserts used as reference points, and shall be reported as the Autoclave expansion of the cement. A contraction (negative expansion) will be indicated by prefixing a minus sign to the percentage expansion reported.
- 28) In the event of cement failing to meet the test for soundness, a retest may be made after aeration. For this purpose, spread out the sample in a layer 75 mm thick and store it for 7 days in an atmosphere maintained at 27 +/- 2°C and RH of 50-80%. Repeat the test cycle again.
- 29) The flange assembly, ring nut and top cover should now be returned to their original place, leaving the Autoclave completely assembled.
- 30) Return the thermocouple to its well on the flange.
- 31) Re-start the procedure from point 1) for the next set of samples.

8 Important Safety Warnings

The Autoclave must be operated precisely as described in this manual. There are no user serviceable parts. Please contact ELE International for all service requirements. The settings of the PID temperature controller (05) are programmed during manufacture. These settings should not be tampered with.

The Autoclave chamber should be cleaned after every use.


Use the high temperature gloves whilst loading, unloading and undertaking opening and closing of the Autoclave.

Ensure the power is isolated when the sample is changed.

9 Precaution and Maintenance

- a) Do not turn the heater on when the vessel has no water in it.
- b) Whilst in operation the pressure should not go beyond 25 kg/cm².
- c) The Autoclave must be positioned so that air can enter at the base of the machine.
- d) Ensure that the heat insulating glove is available for operating the release valve.
- e) We recommend having the pressure vessel re-certified periodically by your local authority.
- f) We recommend testing of the safety valve setting twice a year.
- g) After testing switch the heaters off and the fan on for cooling.
- h) The gloves supplied with the equipment must be worn to prevent hands being burnt when removing the top of the Autoclave at the end of the test. The outlet of the vent valve must be directed away from the operator. When removing the Autoclave lid it must be tilted so that any escaping steam is discharged away from the operator.
- i) The Autoclave must be electrically grounded for operator safety.
- j) The internal surface of the pressure vessel must be de-scaled at least once every six months to ensure the temperature rise is not adversely affected.
- k) The Autoclave is provided with two safety features:-
 - The temperature controller is factory set at 215°C maximum. When this temperature is reached, the supply to the heater is cut off.
 - If the temperature controller fails, the safety valve (08), which is set to release at approximately 25 kg/cm², blows to release trapped steam.

DIRECTIVE ON WASTE ELECTRICAL & ELECTRONIC EQUIPMENT (WEEE)

	<p>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.</p> <p>Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment for proper disposal.</p> <p>Important document. Retain with product records.</p>
<p>GERMAN</p> <p>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.</p> <p>Hinweis: 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.</p> <p>Wichtige Informationen. Bitte zusammen mit den Produktinformationen aufbewahren.</p>	
<p>FRENCH</p> <p>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.</p> <p>Remarque : Veuillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.</p> <p>Ce document est important. Conservez-le dans le dossier du produit.</p>	
<p>ITALIAN</p> <p>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.</p> <p>Nota: 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.</p> <p>Documento importante. Conservare con la documentazione del prodotto.</p>	
<p>DANISH</p> <p>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.</p> <p>Bemærk: I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.</p> <p>Vigtigt dokument. Opbevares sammen med produktdokumenterne.</p>	

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.