

INSTRUCTIONS

MANUAL

AUTOMATIC MACHINE FOR CBR AND MARSHALL WITH LOAD FRAME (MARSHALL: ASPHALT ANALYSIS METHOD)

Model: TT AUT-MARSHALL-CBR




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	CE Declaration of Conformity	
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WARNING:



This equipment can endanger life by exposure to high voltages.

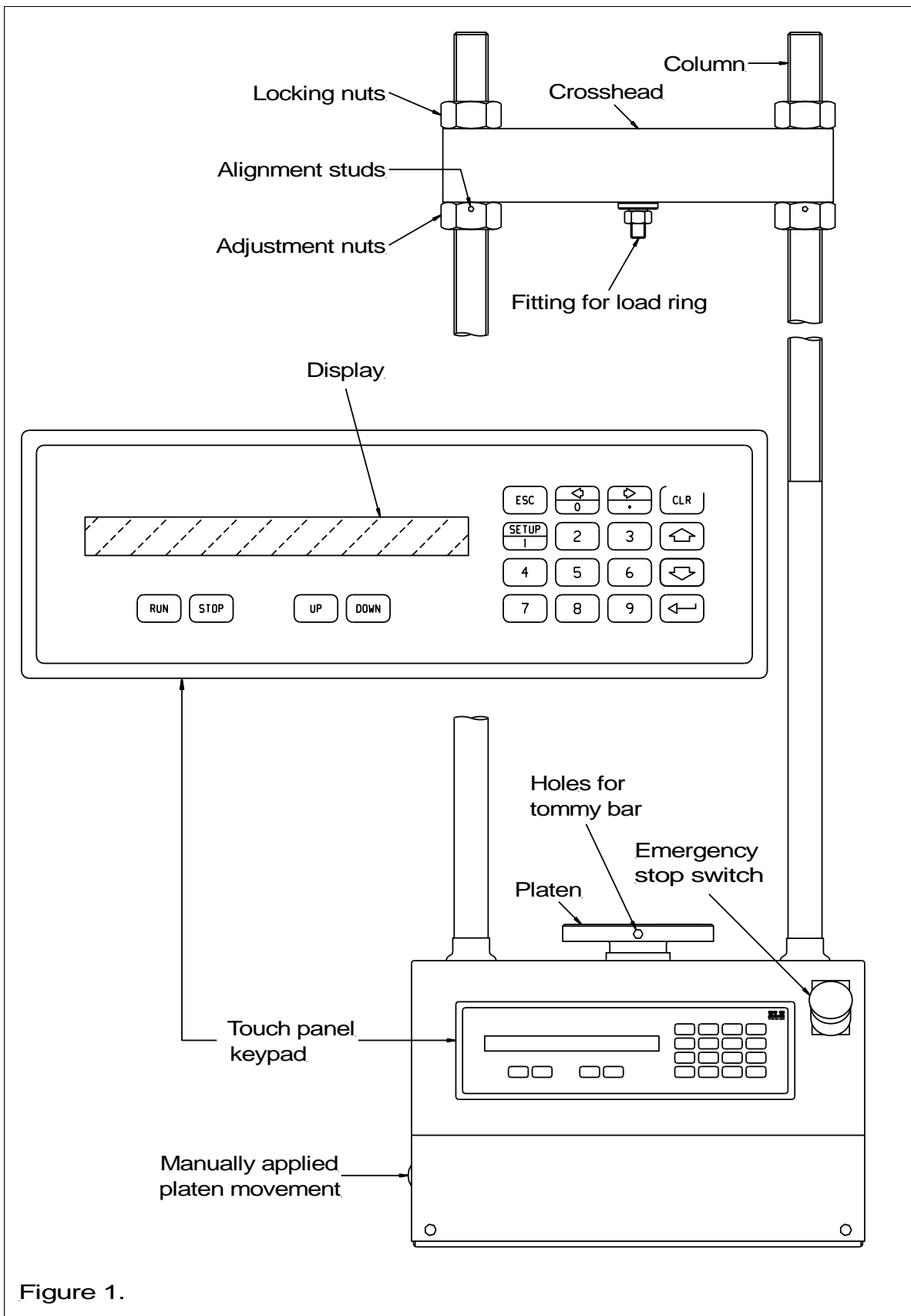
The equipment must be permanently earthed due to the high earth leakage current in the motor and drive. Use the earth lead on the rear of the unit to connect to a permanent safety earth. The AC inlet should not be relied on to provide a safe earth.

Service personnel must ensure all incoming supplies are isolated before working on the equipment.

There may still be dangerous voltages present at power terminals (motor output, supply input phases, DC bus and the brake, where fitted) when the motor is at standstill or is stopped.

For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range. CAT I and CAT II meters must not be used on this product.

Allow at least 5 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V DC and AC RMS to confirm that less than 50V is present between all power terminals and earth.





1 Introduction

These instructions are for machines with a serial number beginning 1895, i.e. of the format 1895-X-XXXX.

This machine has been designed to perform compressive strength tests on soil and asphalt samples. The following test types are built into the machine: California Bearing Ratio (CBR), Marshall and Quick Undrained Triaxial (UU) tests. User-defined test speeds are also allowed.

The apparatus consists of a load frame with an adjustable top crosshead mounted on columns attached to a sturdy base casting. Loading forces of up to 50kN are applied to the sample by means of a motor-driven platen and the speed is accurately maintained by the control electronics and speed feedback system. The motor, gear unit and microprocessor-controlled electronics are housed in the machine base.

Limit switches are fitted to prevent over travel on the up and down stroke of the platen.

A ball seated screw fitting located on the crosshead accepts load rings and load transducers up to and including 50 kN.

The user controls the machine via the front panel display screen and keypad. A simple menu system provides speed control and all set-up operations

As well as the limit switches, the operator is protected by a stall detection system, large emergency stop button and electrical fuses. All electrical design complies with the relevant CE safety and interference directives.

Please note that the motor in this machine is capable of generating loads greater than 50kN, so the operator must always be aware of the current loading being applied in order to prevent overload. (Note that connecting the DSU readout device provides automatic overload protection – see below)

Two sockets at the rear of the machine provide connections for the Electronic Control and read-out Unit (DSU). These are for use with electronic load and displacement transducers (see section 9).

2 Specification

Dimensions	(l x w x h) 550 mm x 400 mm x 1230 mm
Weight	71 kg
Max. vertical clearance (platen down crosshead up)	795 mm
Min. vertical clearance (platen up crosshead down)	210 mm
Horizontal clearance	265 mm
Platen diameter	133.3 mm
Platen adaptor diameter	158.5
Platen travel	100 mm (nominal)
Platen speed	Variable 0.5 to 50.8 mm/min (0.020 – 2 in/min)

2.1 Items supplied with the machine

- Tommy bar for removing the platen
- Platen adapter - fits on the platen to locate moulds when conducting CBR tests.
- Stabilising bar - used to ensure stability and location of the penetration piston during CBR tests and the stability piston during Marshall tests.
- Stability piston - used in conjunction with the stabilising bar to provide very stable loading conditions during Marshall tests.
- Extended ball nipple - for mounting the axial strain transducer when using a 100mm triaxial cell and load ring.
- Power lead with moulded socket for connecting to the mains supply.
- Communications cable (RS232) for connecting the machine to a DSU readout device.

3 Installation

3.1 The machine must be installed on a bench that is both level and designed to support the gross weight of the machine, samples and ancillary equipment.

3.2 This equipment must be earthed via its mains input cable. A separate earth terminal screw is provided on the rear of the unit as an optional extra safety earth and for PAT testing connection point.

3.3 The machine contains a dc motor drive unit and the manufacturer of this drive unit gives the following service and safety advice:

- *Never perform high voltage resistance checks on the wiring without first disconnecting the drive from the circuit being tested.*
- *When replacing a drive in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.*
- *This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.*

This is a non isolated product. The signal plus control connections are not isolated from the AC supply. [Note that the unit is isolated design of the machine].

3.4 Power Supply

Electrical safety

Warning: Do not operate the unit without a permanent earth connection. Use the cable provided at the rear of the unit.

Warning: Before removing any covers 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. Check that the power supply is compatible with the requirements stated on the label and connect in accordance with IEE regulations or to local electrical installation regulations.

The power cable is coded as follows: -

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

Note: Do not use the machine with wet hands. Dry hands before operating.

Portable Appliance Tests (PAT)

All designed products are tested for electrical safety prior to sale.

An electrical safety test label is fitted, (usually adjacent to the mains input socket). Should no label be found, please contact Service Department quoting the serial number of the equipment.

Organisations have an obligation to ensure equipment is maintained and is safe for use. Regular Portable Appliance Testing (PAT) is one means of ensuring equipment continues to be electrically safe. **For operator safety, regular earth bonding checks are recommended.**

If in doubt as to the most suitable connection point (which will usually be an earth stud or an external earth connection) contact Service Department for assistance.

Do not flash test this electronic equipment.

4 Controls (refer to figures 1 & 2)

4.1 Mains ON/OFF switch (at the rear of the machine).

This will switch on the power to the machine. The display will briefly indicate "Multiplex 50" before indicating the selected platen speed.

The LCD display has a back light which is illuminated when the machine is switched on.

4.2 Emergency stop switch

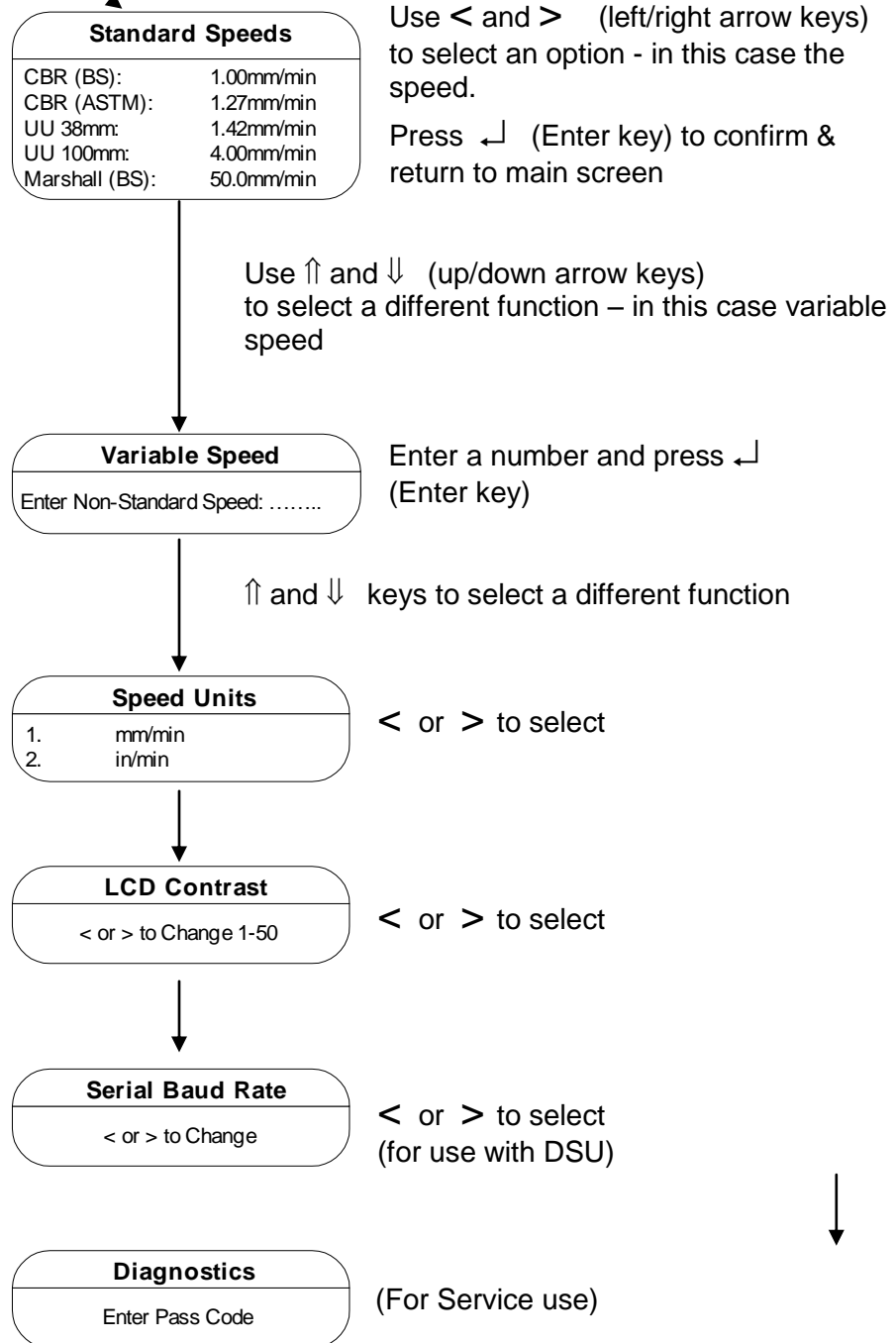
This is the large red knob on the front panel. Pressing this switch stops the platen from travelling in either direction. When this switch is pressed, the display will read "EMERGENCY STOP BUTTON PRESSED Release button to proceed". As a safety feature, once this switch has been depressed, it latches in the off position and must be physically pulled out to the on position before any other functions will operate.

4.3 Set-up Menu

Press the SETUP key to enter set the basic machine parameters. Press the left and right arrow keys (< and >) to scroll through the options for any particular setting. Press the up and down arrow keys to select a different function to set. The diagram below illustrates the use of the set-up menus:

Press the SETUP key to edit operational settings

In all cases press Enter key (↵) to confirm your selection, or ESC to return to the main screen without making



4.4 **RUN** key

Pressing this key causes the platen to rise. The speed indicated on the display will be preceded by "RUN". The platen will continue to rise until the STOP key (or the Emergency stop switch) is pressed. If the platen reaches the end of its travel before these buttons are pressed, the limit switch will actuate preventing further upward travel of the platen and the display will indicate "UP LIMIT!"

4.5 **STOP** key

Pressing this key will stop the platen rising when in RUN or DOWN modes. (In UP mode the machine stops when the UP key is released)

4.6 **UP** key

Pressing and holding down this key will cause the platen to rise slowly to allow initial adjustment of the platen position before a test. Press twice and hold for a rapid approach upwards. Release the key to stop.

If the platen reaches the end of its travel before this button is released, the limit switch will actuate preventing further upward travel of the platen and the display will indicate "Ram Stopped at Upper Limit".

*Ram Stopped at Upper Limit
Press DOWN, RUN or SETUP to Continue*

4.7 **DOWN** key

Pressing this key will cause the platen to lower at maximum speed until the STOP key is pressed or until the platen reaches the end of its travel, in which case the limit switch will actuate preventing further downward travel and the display will indicate:

*Ram Stopped at Lower Limit
Press UP, RUN or SETUP to Continue*

4.8 **Manual Movement of the Platen**

Note: Always disconnect the machine from the power supply when manually moving the platen

The platen may be moved manually by means of a 6 mm AF hexagon wrench inserted into the gearbox pulley via the hole provided in the machine case.

The wrench is turned clockwise to apply load to the sample and anticlockwise to unload.

5 Setting up for CBR tests

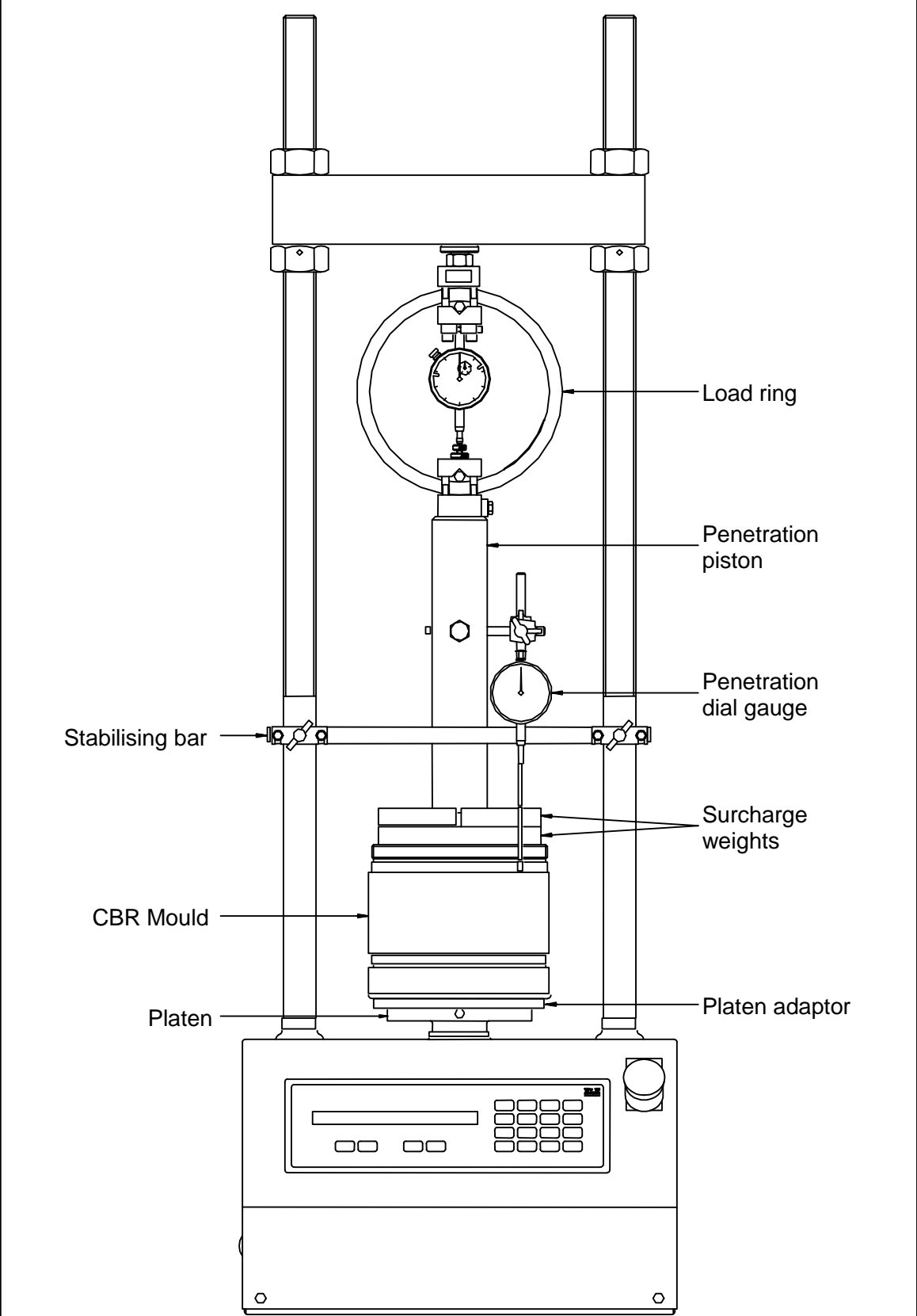


Figure 3. Typical CBR test set up

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- 5.1 Refer to the relevant standard for full details of the CBR test procedure.
 - 5.2 A typical set up for carrying out a CBR penetration test is shown in figure 3.
 - 5.3 The correct location of the CBR mould is achieved by interposing the platen adaptor (supplied with the Multiplex 50) between the machine platen and the mould.
 - 5.4 It is suggested that the test should be started with the platen set approximately 10 mm up from its lowest position.
 - 5.5 Position the crosshead at the height required by firstly slackening the nuts on either side of the crosshead and then adjust the crosshead to the required height by using the adjustment nuts below the crosshead. To ensure that the crosshead is level, the alignment studs on the lower nuts should be located centrally and at the front of the machine. Tighten the locking nuts using a spanner.
 - 5.6 To ensure stability and central location of the penetration piston, the stabilising bar must always be used. When using the maximum number of surcharge weights, it may be necessary to clamp the stabilising bar to the threaded part of the columns. In this case it is recommended that packing pieces (i.e. aluminium strips) be placed between the stabilising bar clamp screws and the column threads.
 - 5.7 With all the equipment correctly located and secured in the machine, press the UP key to close most of the daylight. See 4.6
 - 5.8 Set the speed according to the standard specified. Press the RUN key to commence the test.
 - 5.9 At the completion of the test, press the STOP key.
 - 5.10 Press the DOWN key to return the platen to its lowest position or until the STOP key has been pressed when the platen has descended the required distance.

6 Setting up for Marshall tests

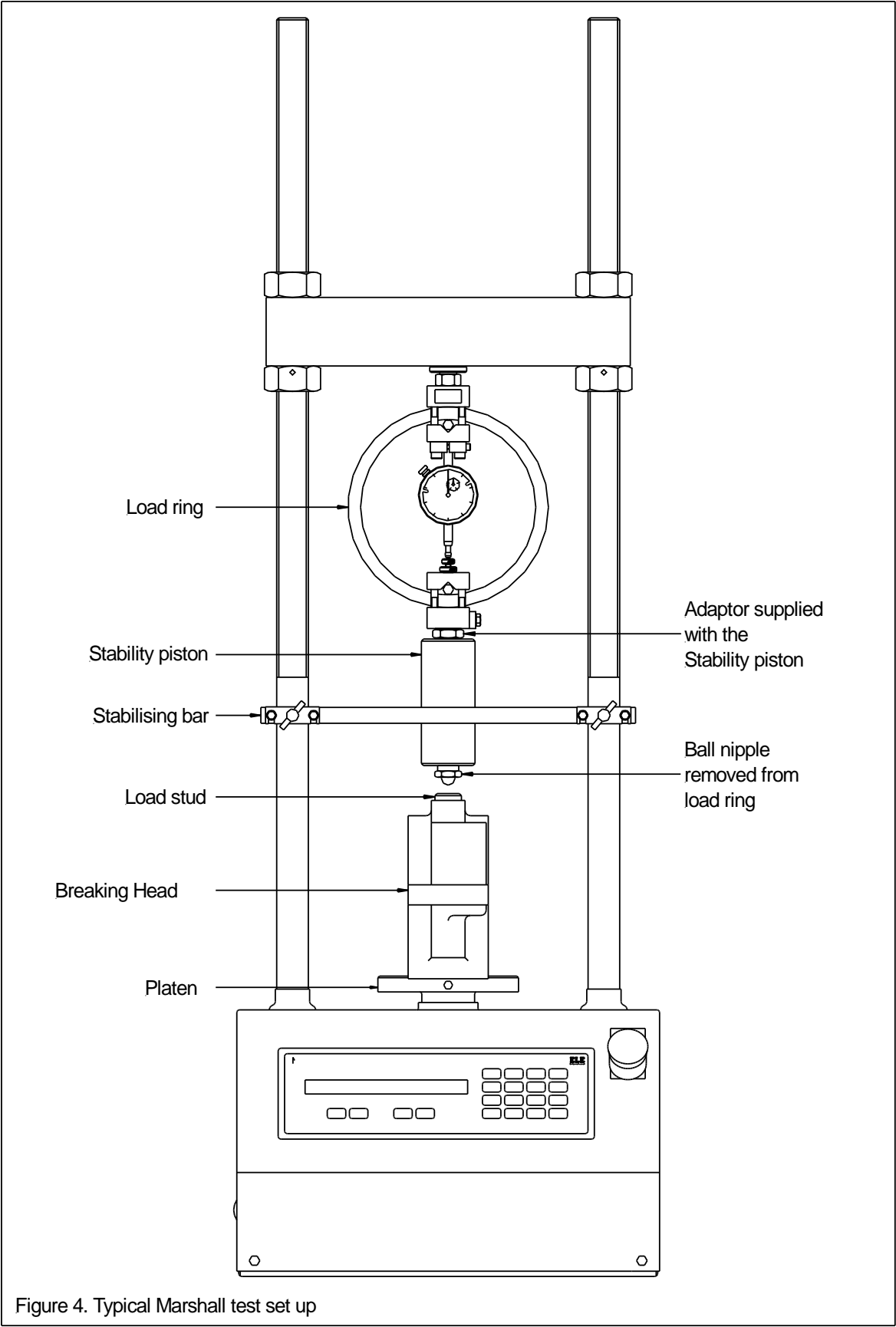
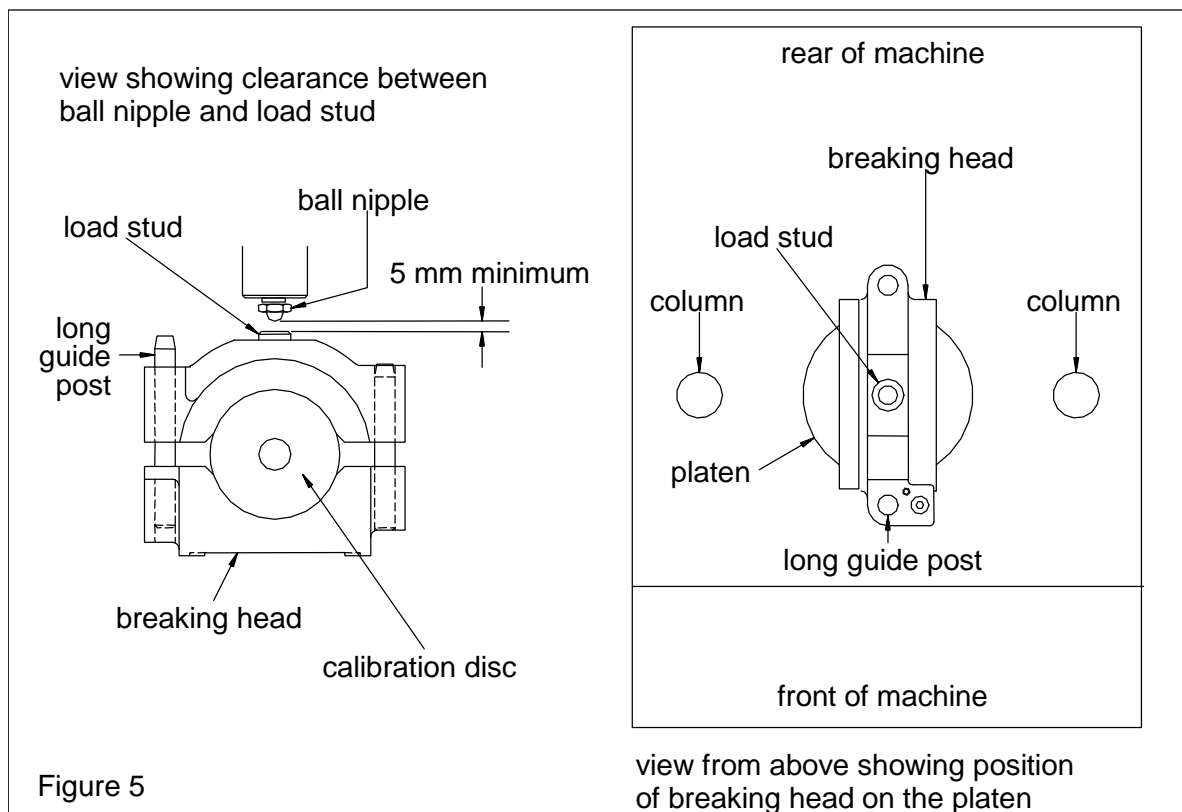


Figure 4. Typical Marshall test set up

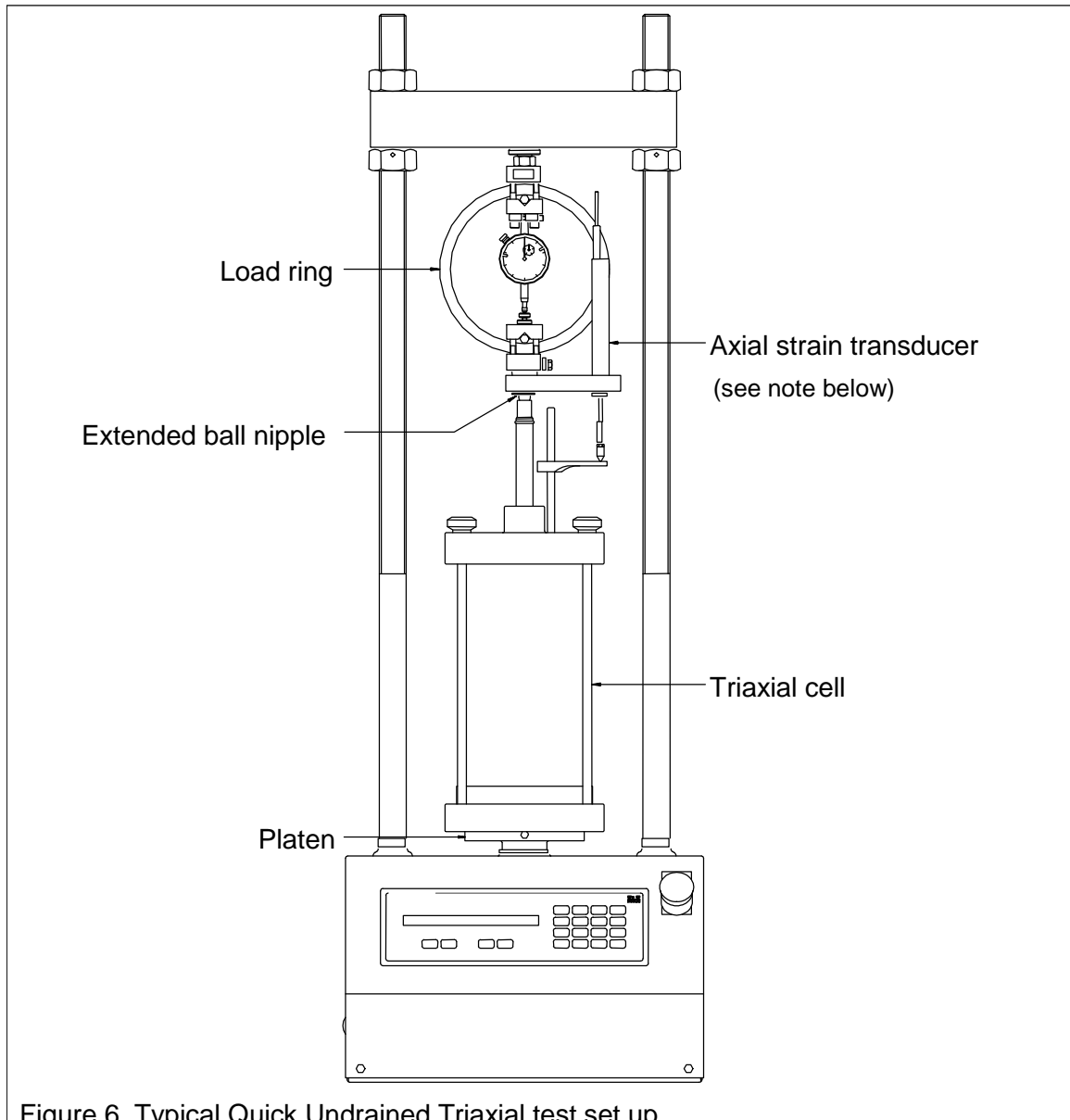
- 6.1 Refer to the relevant standard for full details of the Marshall test procedure.
- 6.2 A typical set up for carrying out a Marshall test is shown in figure 4.
- Important: the Stability piston and Stabilising bar should be used as shown in figure 4 and the breaking head must be placed in the machine with the long guide post facing the operator as shown in figure 5 to ensure very safe loading conditions.**
- 6.3 To fit the Stability piston, remove the ball nipple from the load ring (or load transducer) and replace it with the adaptor supplied with the Stability piston. Fit the ball nipple removed from the load ring (or load transducer) onto the Stability piston and then screw the Stability piston onto the adaptor on the load ring (or load transducer). Ensure that all connections are fully tightened.
- 6.4 Before commencing tests it is necessary to set the height of the crosshead to obtain the optimum clearance between the ball nipple and the load stud on the Breaking head. See figure 5.



- 6.5 Ensure that the Stabilising bar is in position before commencing the test. It is important to set the Stabilising bar at a height that will not impede the raising of the platen and Breaking head.
- 6.6 Operate the machine so that the platen travels to its lowest position.
- With the Breaking head on the platen, fit the calibration disc. See figure 5
- Important: do not under any circumstances load the machine with the calibration disc in position.**
- 6.7 Position the crosshead to give the clearance shown in figure 5. To ensure that the crosshead is level, the alignment studs on the lower nuts should be located centrally and at the front of the machine. Tighten the locking nuts using a spanner.

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- 6.8 It should be possible to remove and replace the Breaking head complete with its sample without disturbing the ball nipple.
 - 6.9 Set the speed according to the standard specified. Press the RUN key to commence the test.
 - 6.10 At the completion of the test, press the STOP key and return the platen to its lowest position.

7 Setting up for Quick Undrained Triaxial tests



PLEASE NOTE: The displacement transducer shown in the diagram can only be connected to a DSU readout unit.

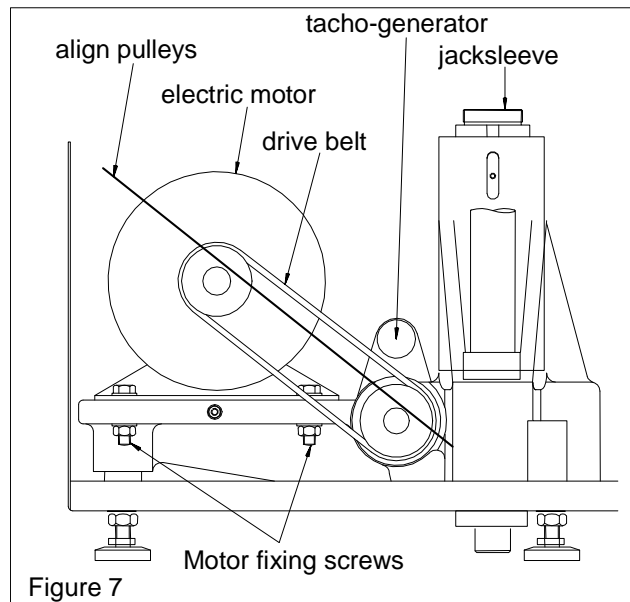
- 7.1 Refer to the relevant standard for full details of the Quick Undrained Triaxial test procedure.

8 Maintenance

- 8.1 After each series of tests raise the platen to its maximum height and clean the platen and case removing all debris, spots of binder etc., particularly from under the platen.
- 8.2 Apply a smear of medium grease to the shaft under the platen where it runs into the base casting. This is particularly important where a solvent is used for cleaning in this area.
- 8.3 After a prolonged period of use, or at least annually, the following internal maintenance should be carried out.
- 8.4 Remove the load measuring device from the crosshead. Raise the platen to its maximum height.

Warning: always disconnect the machine from the power supply before carrying out maintenance work or making any adjustment.

- 8.5 Using the tommy bar provided, unscrew the platen from the jacksleeve (anticlockwise).
- 8.6 Remove the two screws at the front and the six screws at the rear of the machine. Lift the case evenly up the columns. A smear of grease on the columns will assist the grommets to slide smoothly. **Caution:** Take care as the case can be raised only a limited amount before being restrained by connecting cables. Support or suspend the case as convenient or totally remove the crosshead and case. If the case is to be removed, then firstly disconnect the ribbon type cables from the keypad & display from the microprocessor PCB, the cable from the Emergency Stop switch from the dc drive PCB and the earthing lead. It is crucial that all connectors are replaced in the correct orientation – make a note of their position before disconnecting them.
- 8.7 Check for any undue play in the drive belt. If there is, slacken the four screws holding the motor to the main casting. Slide the whole motor assembly until the belt is just taut.
- 8.8 Check the alignment of the pulleys by laying a steel rule across their faces. Retighten the fixing screws. (see figure 7)
- 8.9 If the belt shows any signs of cracking, fretting or other signs of wear, it must be replaced immediately.
- 8.10 Inspect the tacho-generator drive belt for signs of wear and replace if necessary. (see figure 7).
- 8.11 Refit the case ensuring that any disconnected wires have been reconnected and do not foul on the drive mechanism. Replace the case fixing screws. Lift the front panel back into position and replace the fixing screws.
- 8.12 Screw the platen back onto the jacksleeve and tighten with the tommy bar.




9 Connecting a DSU Readout device

- 9.1 Multiplex 50 machines fitted with transducers (instead of manual gauges) may be connected to a transducer readout device called a **DSU**. This device allows real-time display of transducer readings and storage of test data, which can then be downloaded to a PC. The DSU also provides several other features such as automatic overload shut-off, automatic logging start, automatic checking of speed selection and peak force / displacement display.

There are 2 DSU connections on the rear – one provides a serial link (9 way RS232 connector) and the other provides machine identification and remote shut-off functions (round connector). The default serial port speed is 19200 baud. Please see DSU manual.

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: <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></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: <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></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 : <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></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: <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></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>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></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.