

OPERATING INSTRUCTIONS

Muffle Furnace

83-4170

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In the interests of improving and updating its equipment, ELE reserves the right to alter specifications to equipment at any time
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Contents

Section		Page
1	Introduction	3
2	Technical Information	3
3	Operation : Version 1	3
4	Operation : Version 2 (post 2016)	6
5	Electrical Supply	8
6	Spares	9
Appendix 1		10
WEEE Directive		

1 Introduction

ELE's muffle furnace is used for determining various properties of construction materials.

Please refer to Operation section before installing machine.

2 Technical Information

- 2.1 Rated power : 5 KW
- 2.2 Rated voltage : 220V
- 2.3 Phase : Single phase
- 2.4 Heating time for empty oven : Less than 60 minutes
- 2.5 Consumable power for empty oven : Less than 1.2 KW
- 2.6 Interior dimensions (l x b x h) : 200 x 120 x 80 mm
- 2.7 Overall dimensions (l x b x h) : 545 x 385 x 400 mm

3 Operation : Version 1

- 3.1 The muffle furnace should be located on a sturdy structure away from heat sources.
- 3.2 The relative humidity of the testing environment should be less than 85% and the area should be free from combustible and explosive materials.
- 3.3 Electrical Safety

This equipment has been tested and is safe to use providing that the proper safety precautions are observed:

Do not use this equipment in any manner, other than as specified in this user manual, misuse may result in serious injury to personnel.

Do not attempt to operate the equipment with electrical covers removed.

Do not operate machine with wet hands.

Important Note : Please read this entire manual before unpacking, setting up or operating this equipment. Pay particular attention to all **DANGER** and **CAUTION** statements. Failure to do so could result in serious injury to the operator, or other personnel, or damage to the equipment.

Key to Hazard Information

DANGER : Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION : Indicates a potentially hazardous situation that may result in minor or moderate injury.

Important Note : Information that requires special emphasis.

Note : Information that supplements points in the main text.

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 requirements.

It is recommended that this machine be connected via a residual current device (not supplied), and it should operate if earth leakage current exceeds 0.03 amps.

The power cable is coded as follows:

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

Portable Appliance Tests (PAT)

All ELE supplied products are tested for electrical safety prior to sale.

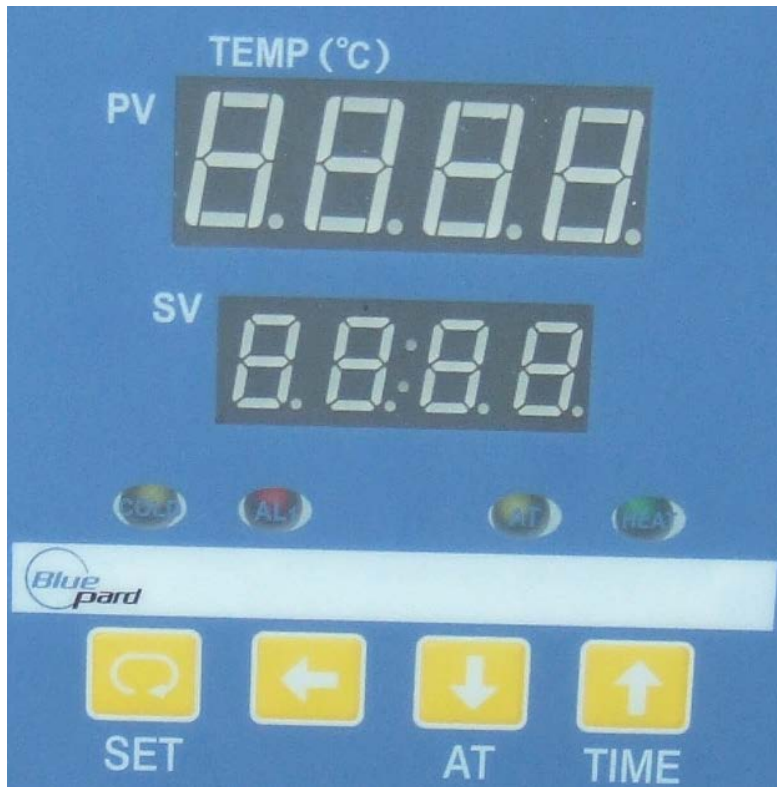
An electrical safety test label is fitted (usually adjacent to the mains input socket).

Should no label be found, please contact the ELE service department quoting the serial number of the equipment.

DANGER : Organisations have an obligation to ensure equipment is maintained and safe for use. Regular PAT testing is one means of ensuring equipment continues to be electrically safe.

NOTE : DO NOT FLASH TEST ELECTRONIC EQUIPMENT.

3.4 Set the working temperature and time as follows:-



To set temperature:

Press "SET" once and SP will highlight.

Press up arrow to set the tens and units.

Press the side arrow key and then press the up arrow to set the hundreds and thousands.

Press "SET" twice to exit.

To set time:

Press "SET" twice.

Press up arrow to set the time required.

Press "SET" to exit.

3.4.1 Before using for the first time, and following periods of rest, the furnace should be pre-heated prior to use. Suggested pre-heating times are:-

2 hours : 100°C

3 hours : 400°C

3 hours : 600°C

1 hour : 900°C

Disconnect power and allow to cool at room temperature.

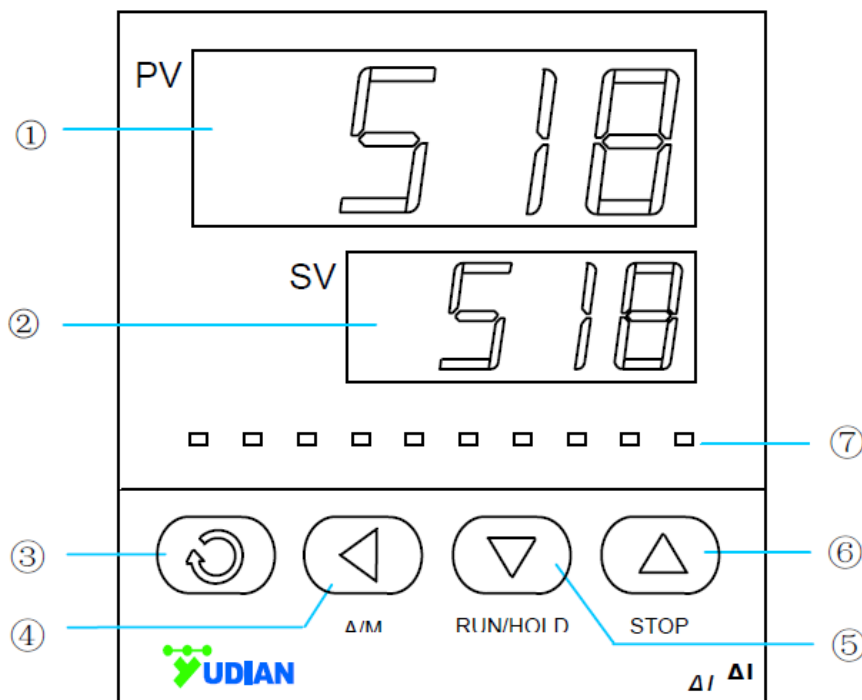
3.4.2 The working temperature of the furnace must be less than 1,200°C to avoid damage to parts of the furnace. Do not add liquid and melt metal in furnace.

3.4.3 The circuit system of the furnace and controller should be checked at regular intervals.

4 Operation : Version 2 (post 2016)



4.1 Front Panel and Operation



- ① Upper display window, displays PV, or code of a parameter.
- ② Lower display window, displays SV, alarming code, or value of a parameter.
- ③ Set-up key, for accessing parameter table and confirming change.
- ④ Data shift key, also for activating auto-tuning.
- ⑤ Data decrease key.
- ⑥ Data increase key.
- ⑦ Indicator lamps (MIO, OP1, OP2, AL1, AL2, AU1, AU2 indicate the I/O actions of the corresponding modules. MAN and PRG are non-applicable for AI-508).

Basal display status : When the power is on, the upper display window of the instrument shows the process value (PV), and the lower window shows the setpoint (SV). This status is called the basal display status. When the input signal is out of the measurable range (for example, the thermocouple or RTD circuit is activated (broken), or the input specification is set incorrectly), the upper display window will alternately display “orAL” and the high limit or the low limit of PV, and the instrument will automatically stop output.

4.2 Operation Description

4.2.1 Set value setting:

In basal display status, if the parameter lock “Loc” isn’t locked, setpoint (SV) can be set by pressing ,  or . Press  to decrease the value,  to increase the value, and  to move to the digit expected to modify. Keep pressing  or , the speed of decreasing or increasing value quickens. The maximum value of the setpoint is HIAL.

4.2.2 Parameter setting:

In basal display status, press  and hold for approximately 2 seconds to access Field Parameter Table. Pressing  can go to the next parameter; pressing ,  or  can modify a parameter. Press and hold  to return to the preceding parameter.

Press  (don’t release) and then press  simultaneously to escape from the parameter table. The instrument will escape automatically from the parameter table if no key is pressed within 30 seconds.

4.2.3 Artificial intelligence control and auto-tuning

When AI control method is chosen, the control parameters can be obtained by running auto-tuning. At the first time of running auto-tuning, in basic display status press  for 2 seconds. “At” will flash at lower display window and the instrument executes on-off control. After 2 to 3 cycles of on-off action, the instrument will obtain the values of PID control parameters. If you want to escape from auto-tuning status, press and hold  for approximately 2 seconds until the “At” flash stops.

Depending on the system, the time of auto-tuning can be several seconds to several hours. After the auto-tuning finishes, the parameter "Ctrl" automatically changes to 3 (the initial value is 1) or 4, and then you are unable to activate auto-tuning by pressing  for 2 seconds. If you want to run auto-tuning again, set parameter "Ctrl" to 2 (refer to the description of parameter "Ctrl").

Note 1 : Before running auto-tuning, the setpoint should be set to an often-used value or middle value first, and then start auto-tuning. Generally, for application with 10% - 80% heating time, the auto-tuning results should be satisfactory. If the heating time is not in the range of 10% - 80%, the auto-tuning will run for a long time and a satisfactory result cannot be obtained. Raising the setpoint for heating time less than 10%, or decreasing setpoint for heating time greater than 80%, can improve the auto-tuning result.

Note 2 : Do not modify the setpoint during auto-tuning as it may affect the precision of the auto-tuning.

Note 3 : The temperature fluctuation caused by interference may affect the precision of auto-tuning. Besides checking the wiring, increasing the parameter dL (input digital filter) can also reduce interference.

Note 4 : After auto-tuning finishes, generally the rising temperature has a little over-shoot (approximately 1 - 3°C). This is because the transducer is often placed between the heater and heated material, and a little over-shoot can shorten the time of rising to setpoint and save power. (Generally the temperature of the transducer can be raised faster than that of the heated material.)

5 Electrical Supply

5.1 **For Version 1 :** The controller should be connected as per figure 1 below:

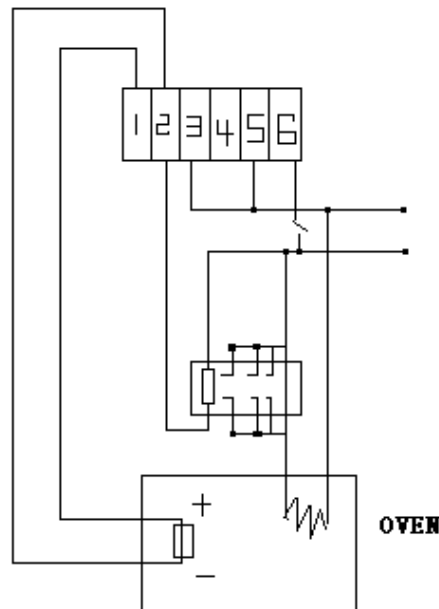


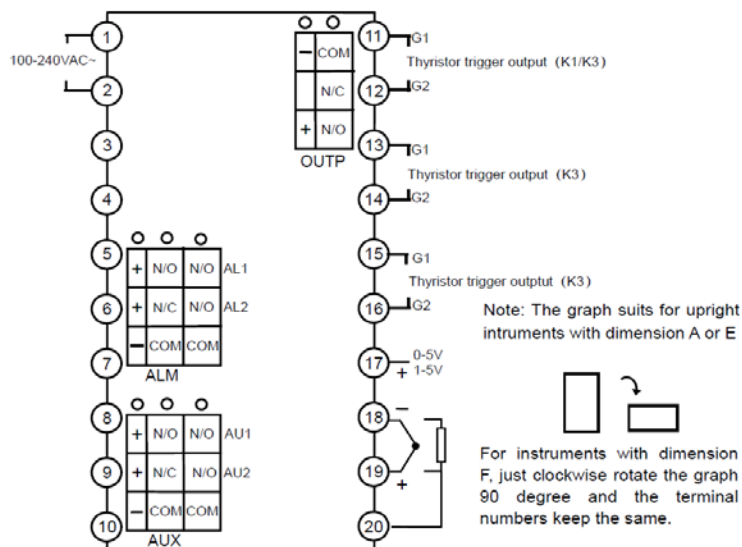
figure 1

5.2 For Version 2 :

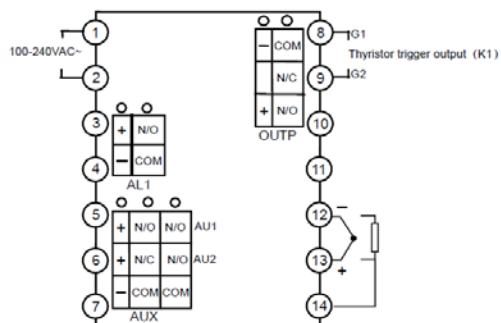
INSTRUMENT INSTALLATION AND WIRING

Wiring graph for instruments with dimension A, E or F

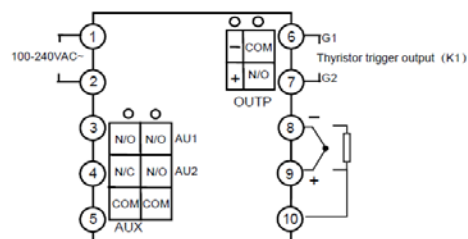
Note: The compensation wires for different kinds of thermocouple are different, and should be directly connect to the terminals. Connecting the common wire between the compensation wire and the terminals will cause measurement error.



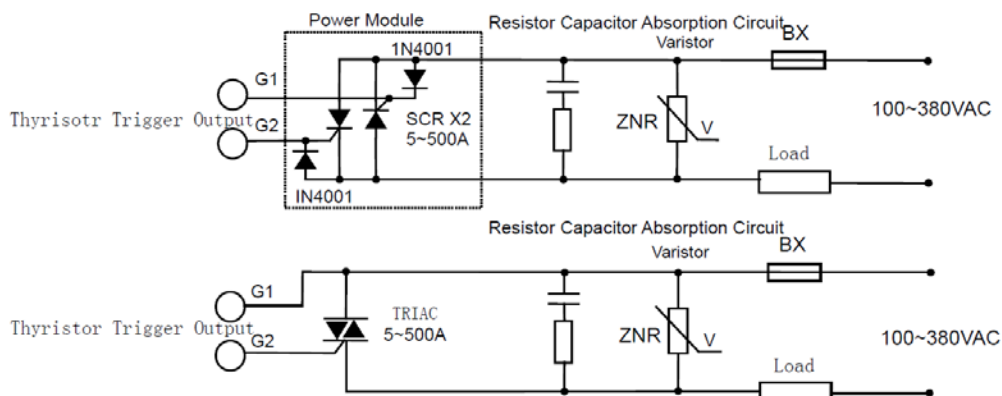
Wiring graph for D dimension (72mmX72mm) instruments



Wiring graph for D2 dimension (48X48mm) instruments



Wiring Graph for Thyristor Trigger Output



Note: It is recommended to use the power module, which includes 2 pair of SCRs and diodes. Compared to TRIAC, it is more reliable and consumes less trigger current.

6 Spares

Please contact ELE's service department.

Appendix 1

PARAMETER AND SETTING

● Press  and hold for 2 seconds to access

Code	Name	Description	Setting Range	Default																								
HIAL	High limit alarm	Alarm on when PV (Process Value) >HIAL; alarm off when PV<HIAL-dF Setting HIAL=9999 can disable high limit alarm.	-1999~ 3000℃	9999																								
HdAL	Deviation high alarm	Alarm on when PV-SV>HdAL; alarm off when PV-SV<HdAL-dF Setting dHAL=999.9℃ can disable deviation high alarm.	0~ 999.9℃	999.9																								
dF	deadband (hysteresis)	Avoid frequent on-off action of alarm or control output because of the fluctuation of PV. "dF" can affect alarm. For example, provided upper alarm parameter "HIAL" is set as 800℃, dF parameter is set as 2.0℃, then: ● Instrument is in normal status at the beginning, when process value is greater than 800℃ (HIAL), the upper limit alarm can be triggered. ● Instrument is in upper alarm status at the beginning, when process value is less than 798℃ (HIAL-dF), then alarm can be cleared. "dF" also affect on-off control and auto tuning. For example, provided SV is set as 700℃, dF parameter is set to 2℃, control is reverse action (heat control). ● when process value is greater than 700℃ (SV), then output turn off. ● when process value is less than 698℃ (SV-dF), output turn on again to start heating. As for on-off control, the larger for dF parameter value, the longer for Ctl (output period time) and the worse for control accuracy. Conversely, the smaller for dF parameter, the shorter for Ctl, then the better for control accuracy, but error action will occur easily due to input fluctuation and shorten the service life of mechanical contactors of relay.	0~ 200.0℃	20℃																								
Ctrl	Control mode	0: on-off control. For situation not requiring high precision; 1: AI control. Allowed to active auto-tuning in basic display status. 2: Run auto-tuning. After auto-tuning finishes, it will automatically change to 3 or 4. 3: AI control, this configuration is automatically set after auto tuning is done. At this setting, starting auto tuning at basic display status is inhibited and it can prevent from running auto tuning by mistake. 4: Similar to Ctrl=3, but parameter P is defined as 10 times as its original value, suitable for rapidly changed temperature (changes by more than 100℃/second). Auto tuning function can automatically set Ctrl to 3 or 4.	0~4	1																								
Ctl	Control period	Small value can improve control accuracy. For SSR or TRIAC output, generally 0.5 to 3 seconds. For Relay output, generally 15 to 45 seconds, because small value will cause the frequent On-Off of mechanical switch and shorten its service life. Ctl is recommended to be 1/4 – 1/10 of derivative time. (It should be integer times of 0.5 second.)	0.5~ 125 seconds	2 seconds																								
Sn	Input specification	<table><tr><th>Sn</th><th>Input spec.</th><th>Sn</th><th>Input spec.</th></tr><tr><td>0</td><td>K</td><td>1</td><td>S</td></tr><tr><td>2</td><td>R</td><td>3</td><td>Spare</td></tr><tr><td>4</td><td>E</td><td>5</td><td>J</td></tr><tr><td>6</td><td>Spare</td><td>7</td><td>N</td></tr><tr><td>8-20</td><td>Spare</td><td>21</td><td>Pt100</td></tr></table>	Sn	Input spec.	Sn	Input spec.	0	K	1	S	2	R	3	Spare	4	E	5	J	6	Spare	7	N	8-20	Spare	21	Pt100	0~21	0
Sn	Input spec.	Sn	Input spec.																									
0	K	1	S																									
2	R	3	Spare																									
4	E	5	J																									
6	Spare	7	N																									
8-20	Spare	21	Pt100																									
Sc	Input offset	Sc is used to shift input to compensate the error caused by transducer, input signal, or auto cold junction compensation of thermocouple. PV _{after compensation} =PV _{before compensation} + Scb	-199.9~ +400.0 ℃	0.0																								
dL	input digital filter	If measurement input fluctuates due to noise, then digital filter can be used to smooth the input. Parameter "dL" may be configured in the range of 0 to 20, among which, 0 means no filter, 1 means intermediate-value filter, and 2—20 means that intermediate-value filter and second order integral filter working simultaneously. The bigger dL, the more stable the measurement input but the slower the response. Generally if great interference exist, then you can increase parameter "dL" gradually to make momentary fluctuation of measurement input less than 2 to 5 values. If the instrument is being tested at laboratory, then parameter "dL" should be set to 0 or 1 to improve response speed.	0~40	1																								
Loc	Parameter Lock	Loc=0, allowed to modify parameters and setpoint. Loc=1, allowed to view parameters, but can't modify them. And allowed to set setpoint. Loc=2, allowed to view parameters, but not allowed to modify parameters or setpoint (except parameter Loc itself).	0~9999	111																								

Note : Generally, before shipping, the HIAL (high limit alarm) is set to output to AL1, and dHAL (deviation high limit alarm) outputs to AU1 (ALP=5533). However, D2 dimension instruments only have AUX slot. If single relay output module L1 or L2 is installed, HIAL and dHAL should be set to share an alarm output AU1 (ALP=5555); if dual relay output module L5 is installed, HIAL and dHAL should separately output to AU2 and AU1 (ALP=5566). Expert users can change alarm outputs, add low limit or deviation low limit alarm, or hide some parameters by setting internal ALP and EP parameters. You can call your provider for details.

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: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment for proper disposal. 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: 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. 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 : 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. 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: 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. 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 forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt. 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.