

OPERATING INSTRUCTIONS

Paqualab Photometer

430-550

<p>ELE International Chartmoor Road, Chartwell Business Park Leighton Buzzard, Bedfordshire, LU7 4WG England phone: +44 (0) 1525 249200 fax: +44 (0) 1525 249249 email: ele@eleint.co.uk http://www.ele.com ELE International, a division of Hach Lange Ltd.</p>	<p>Distributor:</p>	<p>ELE International Soiltest Product Division PO Box 389, Loveland, CO 80539 USA phone: +1 (800) 323 1242 fax: +1 (970) 663 9781 email: soiltest@eleusa.com http://www.eleusa.com</p>
<p><i>In the interests of improving and updating its equipment, ELE reserves the right to alter specifications to equipment at any time ELE International 2005 ©</i></p>		

Contents

	Section	Page
1	Introduction	1
2	Operating Principle	1
3	Specification	4
4	Blank and Sample Tubes	4
5	Operating Instructions	5
6	Use of Calibration Charts	5
7	Other Applications	6
8	Care and Maintenance	6
9	Tablet Reagents	7

WEEE Directive

1 Introduction

- 1.1 The ELE Paqualab Photometer is a precision colorimeter with wide application in colour matching analytical chemistry. Most importantly, the Photometer is integrated with the Palintest system of analysis. It therefore offers an instrumental method of analysis for an extensive range of water and soil tests.

The Photometer features solid state electronics and built-in filters. It is lightweight and portable for field or laboratory use. The instrument has automatic blank setting, automatic power cut-off and operates on a single press of the ON button.

2 Operating Principle

- 2.1 The Photometer is an instrument for measuring colour intensity. Light from an incandescent lamp is passed through a test tube containing the sample solution, and then through a coloured filter onto a photocell. Five built-in filters offer a choice of wavelengths covering the visible spectrum. Light detected by the photocell is displayed as a digital response. The display shows the percentage transmittance (%T) – the proportion of incident light which reaches the photocell.

- 2.2 When the test solution is completely colourless, all of the light passes through the sample and a reading of 100% transmittance is obtained. With coloured solutions light of certain wavelengths is absorbed and the light passing through the sample is proportionately reduced. A lower transmittance is therefore recorded. In this way the instrument gives an accurate measure of the colour intensity of the solution.

- 2.3 In Palintest colour match tests, the Photometer is used to measure the colour produced when reagent tablets are added to the sample solution. The colour intensity is proportional to the concentration of the parameter under test. In order to obtain the test result, the transmittance reading obtained is compared against a calibration chart provided for each test.

- 2.4 Calibrations are normally given at the wavelength at which maximum light absorbency occurs so as to provide the most sensitive test result. In certain cases calibration at two different wavelengths may be given so that different concentration ranges can be covered for the same test. The Photometer can accurately assess very low intensities of colour and will give accurate test results even at very low concentrations of the test parameter.

3 Specification

Wavelength range	390-660 nm
Operational wavelengths	5 built-in filters 410, 490, 520, 570, 640 nm
Filter band pass	± 20 nm
Display	10 mm LCD
Range	0 – 100% transmittance
Resolution	1% transmittance
Power	8 x 1.5V AA size batteries (included). Automatic power cut-off after 6 – 8 seconds.
Dimensions	170 x 130 x 45 mm
Weight	320 g
Test tubes	10 ml glass test tubes, 20 mm OD, 18 mm path length

4 Blank and Sample Tubes

- 4.1 A blank tube is used in the Photometer each time a test reading is taken. This enables the instrument to be set automatically to 100% T and compensates for any inherent colour in the test sample. It is therefore important to understand the meaning of the term 'blank tube'.
- 4.2 The 'blank tube' is a test tube filled with untreated sample (water, soil extract, etc). It is important to use the actual sample as a blank whenever any inherent colour or particulate matter is present. When the instrument is being used only with samples which are completely clear and colourless, then deionised water may be used as a blank if preferred.
- 4.3 The Photometer is provided with a tube holder, adjacent to the test chamber, to keep the blank tube conveniently at hand whilst using the instrument.
- 4.4 The term 'sample tube' is used to describe the tube containing the test sample to which the reagent tablets have been added. This tube is used to take the Photometer reading.

5 Operating Instructions

- 5.1 Select required wavelength by moving the slide control left or right. The required wavelength is stated in the instructions for each test and on calibration charts.
- 5.2 Place BLANK tube containing water only in the test chamber (refer to 4.2).
- 5.3 Press the ON button. Keep depressed until display reads 100 (100% T).
- 5.4 Release button. Remove 'blank' tube and place in tube holder.
- 5.5 Place SAMPLE tube in the test chamber. Note displayed reading when steady. Instrument turns off automatically after 6-8 seconds.
- 5.6 Compare displayed reading (%T) against appropriate calibration chart to obtain test result.

NOTE: The instrument must always be set up using a 'blank' prior to each reading. If further test readings are to be taken, repeat steps 5.2 to 5.6. This procedure ensures that the Photometer is always correctly set for each wavelength.

- 5.7 To obtain the most accurate and consistent results, make sure the test tubes are kept clean and dry, and always place plastic cap on tube before taking Photometer reading. Palintest tablet reagents are designed to give a completely clear test solution. In practice always allow to stand for a few seconds for any undissolved particles to settle before taking the test reading.

6 Use of Calibration Charts

- 6.1 The ELE Paqualab Photometer is a universal instrument with application for many different analytical tests. This versatility is achieved by the use of calibration charts for each different test. The use of easy-to-read calibration charts enables the user to use the Photometer for all test requirements without further modification, and to set up user originated calibrations if required.
- 6.2 Full calibration charts for Palintest methods are given in the appropriate test instructions. In addition, durable plastic calibration charts are supplied for certain tests. These are designed to fit in the recessed area on the front of the instrument for easy reference.

- 6.3 The use of calibration charts is demonstrated by the Chlorine calibration chart. For example, if a Photometer reading of 43% transmittance is obtained at a wavelength of 520 nm, then the Chlorine concentration in the sample is 0.96 mg/l.

CHLORINE (DPD)	Chlorine mg/l										520 nm
%T	9	8	7	6	5	4	3	2	1	0	
90	0.01	0.02	0.04	0.05	0.06	0.07	0.08	-	-	0	
80	0.14	0.15	0.16	0.18	0.19	0.21	0.21	0.22	0.24	0.25	
70	0.26	0.27	0.29	0.30	0.32	0.33	0.35	0.35	0.36	0.38	
60	0.42	0.44	0.46	0.48	0.50	0.51	0.53	0.55	0.57	0.59	
50	0.61	0.63	0.65	0.68	0.70	0.72	0.74	0.76	0.78	0.80	
40	0.82	0.85	0.87	0.89	0.91	0.93	0.96	0.98	1.00	1.03	
30	1.06	1.09	1.13	1.17	1.20	1.24	1.28	1.31	1.35	1.38	
20	1.42	1.46	1.51	1.56	1.64	1.70	1.77	1.84	1.92	2.00	
10	2.08	2.16	2.24	2.32	2.40	2.50	2.60	2.72	2.84	3.00	
0	3.20	3.40	3.70	4.00	4.50	5.00	-	-	-	-	

7 Other Applications

- 7.1 The ELE Paqualab Photometer is ideally suited for general analytical applications. The instrument can be used with user-generated calibration graphs for standard or new colorimetric methods; or for matching or comparison of coloured solutions for research, development or quality control purposes. The instrument should be used in accordance with the general operating procedures given earlier.

8 Care and Maintenance

- 8.1 The ELE Paqualab Photometer is designed to give long and trouble-free operation. The instrument is suitable for both laboratory and field use. Care should be taken however to avoid test solutions being spilt over the instrument, and to prevent excessive amounts of moisture entering the instrument under outdoor conditions. Spillages or moisture should be wiped off immediately with a dry cloth. On no account should solvents or abrasive materials be used to clean the instrument.

- 8.2 The only routine maintenance required is replacement of the batteries. Replace the batteries when the 'B' symbol appears on the display. Access to the batteries is in the base of the instrument and is secured by two screws. Replace all batteries with new alkaline 1.5V AA type cells. To avoid corrosion damage through battery leakage, remove the batteries from the instrument if it is to be stored or left unused for a period of time.
- 8.3 The Photometer is fitted with a long-life bulb and contains no user-serviceable components. If the instrument requires servicing or repair this can be arranged through our Technical Services Department.
- 8.4 To ensure accurate test results, it is important that the test tubes are kept in a clean condition. Test tubes should be washed and dried carefully after use. Dirty tubes may be soaked in weak detergent solution if necessary. Tubes which become stained or scratched in use should be replaced. A spare set of six glass tubes is available, to order quote 430-550/10.
- 8.5 With average use the Photometer will need re-calibration every two years. We recommend the Photometer is returned to our Service Department for calibration and a minor service every two years, please contact ELE for a quotation for this work. Alternatively, calibration standards may be purchased from ELE to check the instrument.

9 Tablet Reagents

- 9.1 A wide range of tablet reagents are available to test different chemicals, as listed overleaf. Each is supplied in a pack of 50 tablets for 50 tests, complete with calibration chart (or 30 as marked).

Please quote the reference number when ordering.

Refill packs have sufficient tablets for 250 tests (or 200, 30 as marked).

Table of Photometer Reagents

	Measurement range	50 test Reagent System (30 as marked**)	250 test Reagent Refill Pack (200 as marked*)	Details
Alkalinity	0-500 mg/l CaCO ₃	EE433-098	EE433-098/10	Natural and treated waters contain a variety of dissolved alkaline substances (eg bicarbonates).
Alkalinity M	0-500 mg/l CaCO ₃	EE433-094	EE433-094/10	Alkalinity measured to the Methyl orange end point (pH 4.5).
Alkalinity P	0-500 mg/l CaCO ₃	EE433-096	EE433-096/10	Alkalinity measured to the phenolphthalein end point (pH 8.2). This test should be used for waters whose pH is 8.3 or above and may be used with the methyl orange test to determine the type of alkalinity present.
Aluminium	0-0.5 mg/l	EE433-100	EE433-100/10	Aluminium salts are found in natural waters. High levels can be toxic to fish. Aluminium Sulphate is used in drinking water treatment.
Ammonia	0-1.0 mg/l N	EE433-102	EE433-102/10	Occurs when nitrogenous products break down in water. Ammonia is harmful to aquatic life, particularly fish.

Boron	0-2.5 mg/l	EE433-103	EE433-103/10*	Normally found as calcium or sodium borate. Some crops are very sensitive to Boron. Widely used in industrial processes so may be present in effluent discharges.
Bromine	0-6.0 mg/l	EE433-105	EE433-105/10	A powerful disinfectant used for water treatment and swimming pool management.
Calcium Hardness	0-500 mg/l CaCO ₃	EE433-108	EE433-108/10	Calcium salts contribute to water hardness. Hard waters cause scaling in boilers and pipes.
Chloride	0-50 mg/l	EE433-110	EE433-110/10	Chloride contributes to the salinity of water and can affect nutrient uptake in plants.
Chlorine (DPD)	0-5.0 mg/l	EE433-115	EE433-115/10	Free, total and combined Chlorine test. Chlorine is used for the disinfection of drinking water and swimming pools.
Chlorine	0-250 mg/l	EE433-118	EE433-118/10	Total Chlorine test. High levels of Chlorine are used to disinfect or sterilise water distribution systems.
Chromium VI	0-1 mg/l	EE433-120	EE433-120/10	Chromium salts are used in many industrial processes and may enter a water supply through discharge of waste. The hexavalent (VI) state is more common in potable water.


Chromium III	0-1 mg/l	EE433-122	(no refill pack)	The trivalent form of chromium is more likely to be present in industrial waters and rarely occurs in potable water.
Copper	0-5.0 mg/l	EE433-130	EE433-130/10	Occurs naturally in water, may cause discoloration and a severe taste. Sometimes used as an algicide.
Cyanuric acid	0-200 mg/l	EE433-134	EE433-134/10	Used as a Chlorine stabiliser in swimming pool water treatment.
Dissolved Oxygen	0-2 mg/l	EE433-136**	EE433-136/10**	Dissolved oxygen levels affect the taste of potable water. Levels found in natural water depend on temperature and organic pollution.
Fluoride	0-1.5 mg/l	EE433-138	EE433-138/10*	Found naturally in some waters, but more usually introduced into drinking water to prevent tooth decay.
Total Hardness	0-500 mg/l CaCO ₃	EE433-139	EE433-139/10	The sum of Calcium, Magnesium and other salts which cause scale in boilers and pipes.
Hydrazine	0-0.5 mg/l	EE433-141	EE433-141/10	Oxygen scavenger used in high pressure boilers.
Hydrogen Peroxide	0-2.0 mg/l	EE433-142	EE433-142/10	Used in water treatment processes.

Hydrogen Peroxide	0-100 mg/l	EE433-146	EE433-146/10	High levels of hydrogen are used in many industrial processes such as textile bleaching and paper making.
Iron	0-5 mg/l	EE433-151	EE433-151/10	Widely found in natural water. Affects the taste of water and causes staining. Insoluble iron deposits can cause small pipes to block.
Magnesium	0-100 mg/l	EE433-154	EE433-154/10	Magnesium salts contribute to the hardness of water.
Manganese	0-0.03 mg/l	EE433-156	EE433-156/10	Commonly found in many natural waters. Causes staining to laundry and plumbing fittings.
Molybdate	0-100 mg/l MoO ₄	EE433-160	EE433-160/10	Used as a corrosion inhibitor in industrial water treatment and so may be present in effluent discharges.
Nickel	0-10 mg/l	EE433-164	EE433-164/10	A metal which would usually indicate industrial pollution of water. Used in the metal plating industry.
Nitrate	0-20 mg/l N	EE433-166	EE433-166/10*	Nitrates are found in many natural and waste waters. They originate from chemical fertilisers, break-down of vegetation and the oxidation of nitrogen compounds in effluents.

Nitrite	0-0.5 mg/l N	EE433- 168	EE433- 168/10	Nitrites are an intermediate product in the nitrogen cycle. Nitrites are harmful to fish and aquatic organisms.
Organo-phosphonate	0-20 mg/l	EE433- 170	EE433- 170/10	Organic phosphates are formed primarily by biological process. Phosphorus is an important nutrient and high levels may encourage algal growth in natural waters.
Ozone	0-2.0 mg/l	EE433- 172	EE433- 172/10	Ozone is used in water treatment and swimming pool water disinfection.
pH	6.8 – 8.4	EE433- 180	EE433- 180/10	Uses the phenol red method to determine hydrogen ion activity.
Phenol	0-5 mg/l	EE433- 182	EE433- 182/10	Phenols may occur in many waters. Chlorination of water containing phenol produces chlorophenols which are odorous and objectionable.
Phosphate	0-4.0 mg/l	EE433- 186	EE433- 186/10*	Used extensively in food processing. Also present in many detergents and fertilisers. Not directly toxic, but Phosphates are associated with the eutrophication of rivers and lakes.
Phosphate	0-100 mg/l	EE433- 188	EE433- 188/10	High levels of phosphates are used to treat water in industrial boilers so may be present in effluents.

Potassium	0-12 mg/l	EE433-189	EE433-189/10	An abundant natural element. High levels can be an indication of brackish waters.
Silica	0-4.0 mg/l SiO ₂	EE433-190	EE433-190/10*	Colloidal silica and soluble silicates are abundant in many natural waters. Causes scale problems in many industrial processes.
Sulphate	0-200 mg/l	EE433-192	EE433-192/10	Occurs naturally in water, but often introduced during water treatment. High levels can cause corrosion to metalwork by sulphate reducing bacteria. Damage to cement can also take place.
Sulphide	0-0.5 mg/l	EE433-194	EE433-194/10*	Found in many natural waters, particularly hot springs. Present in many industrial effluents, especially tanneries. Toxic to fish and aquatic organisms.
Sulphite	0-500 mg/l	EE433-196	EE433-196/10	Sulphite ions may occur in boiler water treated with sulphite for D.O. Control. It may be present in industrial waste waters and in waters dechlorinated with sulphur dioxide.
Zinc	0-4.0 mg/l	EE433-198	EE433-198/10	Used as a corrosion inhibitor in industrial cooling water so may be present in effluent discharges.

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 bortscaffas 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.