

Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes

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Appendix 1 - PORTABLE FIELD KITS

This appendix was prepared by R. Ballance

Portable field kits are useful for the field testing of samples in a water quality monitoring programme. This appendix contains brief descriptions of portable kits available from some of the major suppliers. The reference to items of equipment by trade name and the inclusion of equipment in the following lists does not imply an endorsement of that equipment.

Telephone and telefax numbers of the various suppliers are provided where this has been possible. The number in square brackets, e.g. [33] is the country code, and the number in round brackets, e.g. (453) is an area code within the country.

BDH Laboratory Supplies

Seldown Road

Poole

Dorset

England

Telephone [44] (1202) 660444

Telex 41186 and 418123 TETRA G

Fax Group 111 [44] (1202) 666856

Cables: Tetradome Poole

This company distributes the Merck line of test strips and kits for water analysis. Merckoquant, Aquamerck and Aquaquant are the trade names of the three available systems.

- *Merckoquant* test strips consist of a strip of paper, impregnated with reagents and bonded to a plastic backing. Colour develops on the strip after it is dipped in water and colour intensity is compared with a colour scale. This system can be used for the semi-quantitative determination of Aluminium, Ammonium, Calcium, Iron, Manganese, Nitrate, Nitrite, pH, Potassium, Sulphate and Total hardness.
- *Aquamerck* kits use either titrimetric or colorimetric methods to obtain semi-quantitative results in the analysis of Aluminium, Ammonium, Calcium, Carbonate hardness, Chloride, Iron, Nitrite, Dissolved oxygen, pH, Phosphate and Total hardness.
- The *Aquaquant* system involves colorimetric methods to obtain quantitative results in the analysis of Ammonium, Chloride, Iron, Manganese, Nitrite and Silicon.

ELE International Ltd

Eastman Way
Hemel Hempstead
Herts
HP2 7HB
England

Telex 825239 ELE LTD G
Fax [44] (1442) 252474 and 219045
Tel [44] (1442) 218355

This company assembles the following three standard systems under the trade name "Paqualab" systems 50, 25 and 25L System 50 has two incubators powered by an internal rechargeable battery permitting simultaneous total and faecal coliform analyses, meters to measure pH, temperature, conductivity and turbidity, and a photometer for measuring chemical variables System 25 is a single compartment incubator (37 °C or 44 °C) with internal rechargeable battery, meters and photometer the same as system 50 System 25L is a single compartment incubator powered from an external source of either 12 V or 24 V DC All systems include a membrane filtration unit and a supply of aluminium Petri dishes Only the system 25 is described below Kits can be assembled to permit analyses for more than 30 physical and chemical variables The company also sells several types of water samplers and two models of current meter Most of the physical and chemical methods of analysis use either a photometer or an electrode and meter Operators' manuals are available in English, French and Spanish The analyses done by the different methods are:

- Photometric methods are used for Alkalinity, Aluminium, Ammonia, Boron, Chloride, Fluoride, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Phosphate, Potassium, Silica and Sulphate
- Electrode methods are applied to the measurement of Dissolved oxygen concentration, pH, Conductivity, Temperature, Total dissolved solids and Turbidity Special purpose units can be provided for " Determination of Biochemical oxygen demand by the Warburg and Sierp method The unit has six stations, thus permitting simultaneous determinations on six samples
- Determination of Chemical oxygen demand with digestion carried out by the bichromatic method The thermal reactor unit can simultaneously test 18 samples plus one blank

Potapak Limited

Toomer's Wharf
Newbury
Berks
RG13 1DY
England
Telex 846114 INTACL G
Fax [44] (1635) 30844
Tel [44] (1635) 30552

The Potolab kit produced and sold by Potapak Limited is designed to serve the needs of physical, chemical and bacteriological analyses in the field and can be purchased with equipment necessary to measure or analyse for Alkalinity, Aluminium, Ammonia nitrogen, Boron, Calcium (hardness), Conductivity, Fluoride, Iron, Magnesium, Manganese, Nitrates, Nitrites, pH, Phosphate, Potassium, Silica, Sulphate and Temperature The Potolab consists of twin incubators so that some samples can be incubated at 37 °C (total coliforms) and

others at 44.5 °C (faecal coliforms) simultaneously. The physico-chemical component of the Potalab contains a pH/Temp/mV meter, a conductivity meter, a turbidity tube and a universal photometer, together with reagents necessary to analyse for more than 25 variables.

Weight 25 kg (incubator, photometer and miscellaneous equipment and supplies for chemical, physical and bacteriological analyses)

Dimensions (cm) 56 × 26 × 34

Portability Carrying handles

Power 220 V AC, internal 12 V battery with built-in charger. One charge will serve up to two incubation periods.

Variables Bacteriology - Total and faecal coliforms, Physico-chemical - Alkalinity, Aluminium, Ammonia, Boron, Fluoride, Iron, Manganese, Nitrate, Nitrite, pH, Phosphate, Potassium, Silica, Sulphate

Consumables Sufficient for 200 bacteriological analyses supplied with kit. Additional consumables approximately UK £3.00 per test.

Manual language English, but the company can supply copies in French, Spanish or Portuguese on request.

Manual contents A complete description of all tests and how to get the best performance from the kit. Individual components in the kit can be returned to the supplier for major repair.

Cost: complete portable lab UK £3,950 bacteriological unit UK £2,550 (1993 prices)

Hach Company **Hach Europe, S.A./N.V.**

International Marketing Dept BP 229

PO Box 389 B 5000 Namur 1
Loveland, Colorado 80539 Belgium
USA

Telex 160840 Telex 846-59027
Fax [1] (303) 669 2932 Fax [32] (81) 44 13 00
Tel [1] (303) 669 3050 Tel [32] (81) 44 53 81

The company makes field kits and equipment that can be used to analyse for most of the chemical and physical variables listed in Chapters 6 and 7. The manual describing procedures for use of the kits is available in English, French and Spanish. Colorimetric, photometric, titrimetric, gravimetric or electrode methods are provided for the various analyses as follows:

- Colorimetric method for analysis of Calcium and Magnesium (hardness)
- Photometric methods for analysis of Aluminium, Boron, Chloride, Fluoride, Iron, Manganese, Nitrate, Nitrite, Ammonia nitrogen, Kjeldahl nitrogen, Dissolved oxygen, Phosphorus, Potassium, Selenium, Silica and Sulphate

- Titrimetric methods for analysis of Alkalinity, Chloride, Iron and Dissolved oxygen
- Gravimetric method for analysis of Total suspended solids
- Electrode method for analysis of Calcium, Fluonde, Nitrate, Dissolved oxygen, Potassium and Sodium and for the measurement of Temperature, Conductivity and pH

Macherey-Nagel GmbH & Co KG

PO Box 10 13 52
D-52313 Duren
Germany

Telex 8 33 893 mana d
Fax [49] (2421) 62054
Tel [49] (2421) 6980

The company makes a broad range of kits and equipment that can be used to analyse for many of the chemical and physical variables listed in Chapters 6 and 7 Customised kits can be assembled on request Colorimetric, titrimetric, photometric or electrode procedures are available for the various determinations and analyses as follows

- Colorimetric methods for the analysis of Ammonia, Iron, Manganese, Nitrate, Nitrite, pH, Phosphate, Potassium, Silica and Sulphate
- Titrimetric methods for the analysis of Alkalinity, Calcium, Chloride, Hardness and Dissolved oxygen
- Photometric methods for the analysis of Aluminium, Ammonia, Chemical oxygen demand, Chloride, Fluonde, Iron, Manganese, Nitrate, Nitrite, Orthophosphate, Total phosphate, Potassium, Silica and Sulphate
- Electrode methods for the determination of pH, Conductivity and Dissolved oxygen

The Tintometer Ltd

Waterloo Road
Salisbury
Wilts
SP1 2JY
England

Telex 47372 TINTCO G
Fax [44] (1722) 412322
Tel [44] (1722) 327242

Although this company's speciality is equipment for colorimetric analyses, some of its equipment uses photometric or electrode methods The colorimetric analyses are of two types, one is colour comparison with standard colour discs while the other depends on counting the numbers of reagent tablets required to produce a colour change in a measured volume of water Users' manuals are available in English, French, Spanish and German Application of the analytical systems is as follows

- Colorimetric methods for analysis of Alkalinity, Aluminium, Boron, Chloride, Fluonde, Iron, Magnesium, Manganese, Ammonia nitrogen, Nitrate, Nitrite, Phosphorus, Silica, Sulphate,

Dissolved oxygen and for the measurement of pH Tablet count method for Alkalinity, Calcium, Chloride, Nitrite and Sulphate

- Photometric methods for Aluminium, Fluoride, Iron, Ammonia nitrogen, Nitrate, Nitrite, Phosphate and pH
- Electrode methods for Dissolved oxygen, pH, Conductivity, Temperature and Total dissolved solids

Robens Institute

University of Surrey
Guildford
Surrey
GU2 5XH
England

Telex 859 331 UNIVSY G
Fax [44] (1483) 503 517
Tel [44] (1483) 259 209

The Oxfam DelAgua field kit for bacteriological analysis was developed by the Robens Institute with the main objective of providing a quality product at low cost

Weight: 10 kg

Dimensions: (cm) 37 × 14 × 26

Portability: Carrying handles

Power: 220 V and 110 V AC, internal 12 V battery with built-in charger, 72 hours between charges

Variables: Faecal coliforms, pH, Free and total chlorine, Turbidity Some optional extras can be supplied on request

Consumables: Sufficient for 200 bacteriological analyses supplied with kit Additional consumables approximately UK £0 24 per test

Manual language: English, French, Chinese and Spanish

Contents: Analytical methods, kit maintenance, troubleshooting, basic kit repair, circuit diagram Repair kit provided Return to supplier for major repair

Cost: UK £1,050 (1996 price)

Water and Environmental Engineering Group

Department of Civil Engineering
University of Leeds
Leeds
Yorks
LS2 9JT
England

Fax [44] (1132) 33 23 08

Tel [44] (1132) 33 22 76

The Leeds portable incubator was developed to fill the need for sturdy, low-cost equipment for carrying out bacteriological analyses in the field.

Weight: 4.5 kg

Dimensions: (cm) 35 × 21 × 26

Portability: Carrying handles

Power: 220 VAC, 12 V DC

Variables: Aerobic bacteria, Total and faecal coliforms

Consumables: Sufficient for 200 bacteriological analyses supplied with kit Additional consumables approximately UK £0.30 per test

Manual language: English

Manual contents: Kit maintenance, troubleshooting, basic kit repair, circuit diagram *Repair*
Return to supplier for major repair

Cost: UK £600 (1993 prices)

CQ-3 Portable Kit

7 Pan Jia Yuan Nan Li
Chao Yang District
Beijing 100021
China

Weight 7 kg

Dimensions: (cm) 41 × 18 × 38

Portability: Carrying handles and shoulder strap

Power supply: 220 VAC, 12 V DC, built-in charger, 10 hours between charges

Variables: Total bacteria, Total and faecal coliforms Optional extras - *Shigella*, *Salmonella*, *Vibrio cholera*

Consumables: Sufficient for 100 bacteriological analyses supplied with kit Additional consumables approximately US \$0 50 per test

Manual language: Chinese and English

Manual contents: Analytical methods, kit maintenance, troubleshooting, circuit diagram

Repair: Repair kit provided Return to supplier for major repair

Cost: US\$500 (1991 prices)

Millipore Intertech	Millipore Intertech
BP 307	PO Box 255
78054 St Quentin Yvelines	Bedford, MA 01730
CEDEX	USA
France	

Tel [33] (1) 30 12 70 00	Tel [1] (617) (275-9200)
Fax [33] (1) 30 12 71 81	Fax [1] (617) (275-3726)
Telex 698371	Telex 4430066 MILIPR UI

This company manufactures literally thousands of articles that are associated with membrane filtration Two of the kits and two optional incubators that may be used are described below

Portable Water Laboratory includes incubator, filter holder assembly, sampling cup, vacuum syringe, adapter tube, forceps, alcohol bottle and a supply of consumables This kit is used in accordance with the directions contained in the sections of Chapters 6 and 10 that refer to membrane filtration

Weight: 7.9 kg (incubator only, 5 4 kg)

Dimensions: (cm) 39.4 × 26.7 × 29.2

Portability: One carrying handle - no shoulder strap

Capacity: 18 plastic Petri dishes (47 mm diameter)

Power supply: Operates on 12 or 24 V DC and 115 or 220 VAC Power cord with adapters for battery terminals, car cigarette lighter or mains outlet

Test variables: Total coliforms is standard Media for detection of other organisms can be provided Temperature or incubation chamber adjustable between 27 °C and 60 °C, thermostatically controlled Incubating temperature can vary ± 1 °C in stable ambients from-40 °C

Consumables: Kit includes the following sterile consumables 100 plastic Petri dishes, 25 plastic pipettes, 100 ampoules MF-Endo medium, 100 filters of 0.45 µm pore diameter with absorbent pads (47 mm diameter) Cost of additional consumables approximately US \$3 00 per coliform test

Manual language: English, French, Spanish

Manual contents: Instructions for use of equipment. Gives no information concerning maintenance or repair of kit. Return equipment to supplier for major repairs.

Warranty: All products are warranted against defects in materials and workmanship when used in accordance with instructions, for one year from the date of shipment.

Cost: US \$4,377 for complete kit The cost of the incubator without the filter assembly and consumables is US \$1,573 (1994 prices)

Portable Water Analysis Kit

This kit is designed for the field determination of total coliform bacteria in water by filtering samples through sterile 0.45 µm Millipore, 37 mm diameter, bacteriological analysis "monitors" The test sample is collected in the stainless steel cup and is drawn through a monitor by a valved syringe used as a vacuum pump After sample filtration, ampouled culture medium is introduced into the monitor which is then incubated in the portable incubator (the incubator is the same as the one described above under Portable Water Laboratory).

Weight: 20.9 kg (kit complete with supplies), 5.4 kg (incubator only)

Dimensions: (cm) 39.4 × 26.7 × 29.2

Portability: Carrying handle - no shoulder strap

Capacity: 30 monitors

Power supply: 12 or 24 V DC, or 115 or 220 V AC

Consumables: Sufficient for 100 total coliform tests supplied with kit Replacement consumables cost US \$4.81 per test

Manual: Same as for Portable Water Laboratory (above)

Warranty: Same as for Portable Water Laboratory (above)

Cost: US\$2,339 (1994 prices)

Battery Powered Incubator (Rechargeable)

Weight: 7.4 kg (with battery)

Dimensions: (cm) 32.7 × 37.1 × 29.6

Portability: Carrying handle and bag with shoulder strap

Capacity: 48 Petri dishes or 75 monitors

Power supply: 12 V DC supplied by rechargeable Ni/Cd battery, 12 V car battery (cigarette lighter or direct connection) or AC (115 or 220 V) power adapter Battery charger and AC adapter included Battery duration about 24 hours in 25 °C ambient when operating at 44.5 °C

Temperatures: Fixed temperature settings 30 °C, 35 °C, 37 °C, 41 °C (± 0.5 °C) and 44.5 °C (± 0.2 °C)

Cost: US \$2,446, Charger and AC adapter included (1994 prices)

Dual Chamber Battery Powered Incubator (Rechargeable)

Weight: Approx 12 kg with battery

Dimensions: (cm) 54 × 37.1 × 29.6

Portability: Carrying handle and bag with shoulder strap

Capacity: 48 Petri dishes in each chamber

Power supply: As above

Temperatures: Lower chamber 30 °C, 35 °C, 37 °C, 41 °C

Upper chamber 41.5 °C (± 0.5 °C), 44.5 °C (± 0.2 °C)

The two chambers may be operated simultaneously at different temperatures

Cost: US\$4,184, Charger and AC adapter included (1994 prices)
