

WATER ANALYSIS SPECTROPHOTOMETERS AquaQuest



CECIL



Dedicated to Water Analysis

The new AquaQuest Series 4000 spectrophotometers have been specially designed to cover the complete requirements of water analysis spectrophotometers. Both visible range and UV and visible range instruments are offered, each with or without an integral printer for convenient presentation of results without the extra space required by an external printer.

Versatility

Whatever special needs your laboratory may have, the AquaQuest Series 4000 instruments are likely to offer the flexibility, power and performance required. Wavelength scanning, cell programming, batch sampling, wavelength programming, time course plotting and reaction Kinetics are all available.

Performance

Superb performance is the result of the excellent specification of the AquaQuest Series 4000. High stability, low straylight, low noise and high wavelength setting precision ensure that reliable and accurate measurements may be made to 3 Absorbance units.

Programmed Methods

All instruments are completely programmed for approximately 170 water analysis methods based on the proven range of Merck 'Spectroquant' test kits.

Users may in addition develop their own methods and calibrations to be stored in security protected memory for instant recall and use at any time.

Speed of Operation

Choosing a test method complete with the appropriate sample pathlength could not be simpler, taking only about 15 seconds for selection and the instrument to be set up ready for the measurement. Quick change sample holders each accommodating more than one sample pathlength further adds to convenience and speeds up operation.

Software Enhancement by E-SEF

E-SEF - encoded software enhancement facility - allows optional software modules to be enabled by entering encoded numbers. These numbers can be provided by telephone, fax or E-mail. Software requirements may be tailored after instrument purchase without incurring delay.

LARGE SCREEN : COMPACT PRINTING

4000 SERIES

USER BENEFITS

- Pre-programmed Test
- Merck Spectroquant Kits
- User Method Storage
- Wavelength Scanning
- Time Plots
- Curve and Line Fit
- Kinetics
- Large Backlit Screen
- Integral Printer
- E-SEF Software Call-Up
- Only 48cms Wide

PERFORMANCE

- Self Test and Calibration
- Accurate to 3A
- Wavelength Setting 0.1nm
- Stability $\pm 0.001A/H$
- Straylight 0.01%
- Validation Software
- Traceable Standards

Informative Graphic Display

Menus, scans, curves and tabulated results are displayed on the large backlit LCD display with contrast control. Lists may be scrolled vertically and plots, scans and data horizontally to give an effective 430mm screen width. Shown below is a typical wavelength scan which may be fully viewed by scrolling, a printout of the same scan is shown below.

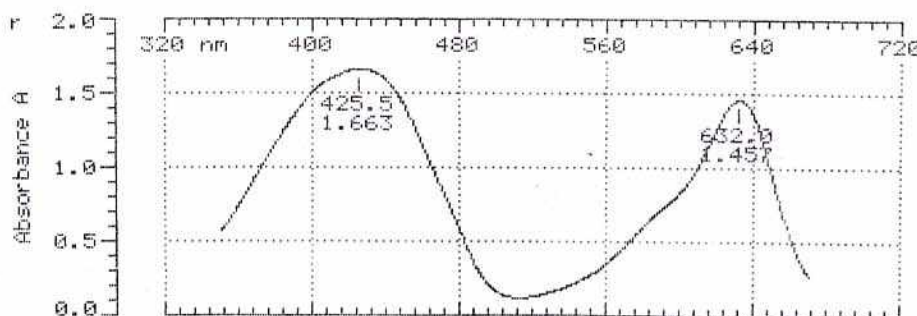
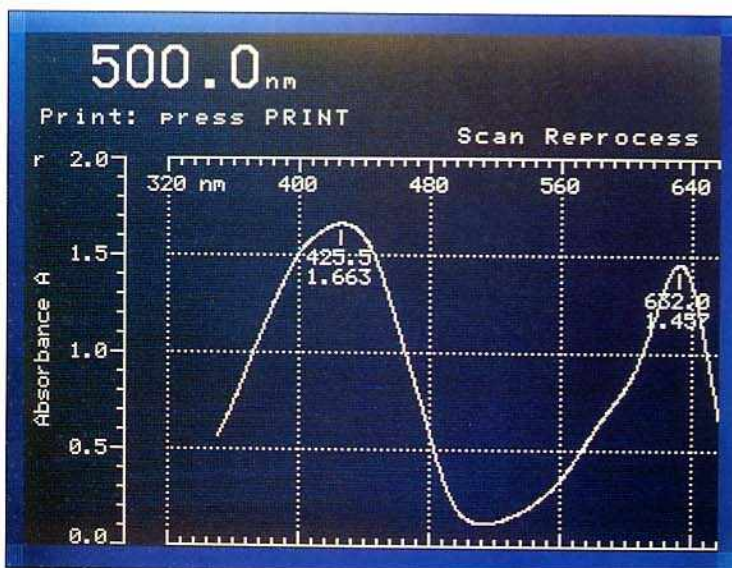
Integral Printer

The integral printer may be used to provide a hard copy of all experimental results. Time course plots, wavelength scans and calibration curves may also be plotted with full documentation, timed and dated for GLP. The printer is of the dot matrix type and does not require expensive heat sensitive paper. A typical printout of results is shown on the left.

FORMALDEHYDE
CECIL CE 4003

Serial No: 000000
S/W version: T0948
Time: 12:42 29/04/97
Bandwidth: 4.0 nm
Wavelength: 585.0 nm
Conc factor: 3.300
Range: 0.1-10.0
Path length: 16 mm
Operator:
Reference:
Sample:

Sample	Concentration mg/L HCHO
1	3.294
2	2.568
3	3.450

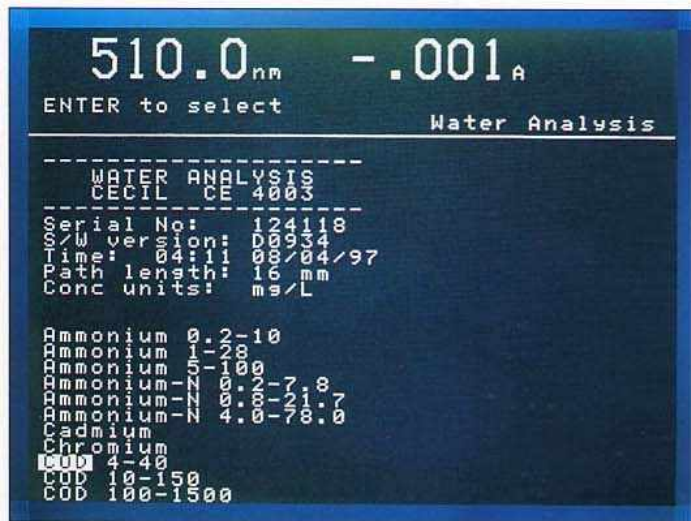


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          SCAN 1
          CECIL CE 4003
-----
Serial No: 124118
Time: 10:03 07/04/97
Speed: 600 nm/min
Averaging: 2.5 nm
Bandwidth: 4.0 nm
Path length:
Operator:
Reference:
Sample:

Peak      Abs
425.5 nm 1.663 A
632.0 nm 1.457
    
```

SUPERB OPERATIONAL SIMPLICITY



Rapid Operation

Simply enter the quantitative mode and follow the menus displayed on the screen, selecting pathlength and the required analysis each at the touch of a key. The instrument is then set ready for the analysis selected.

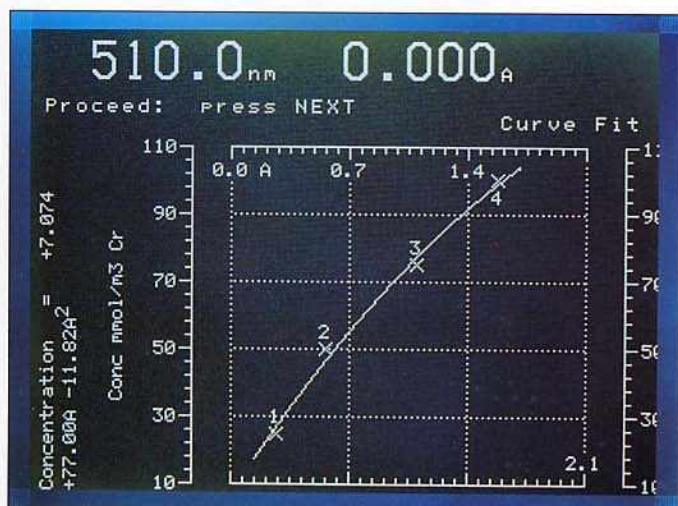
Convenient Sampling

Insert the 16mm tube or 10mm cell in the dual sample holder, press the 'Run' key and the result is displayed and printed as required. Other holders and sampling techniques may be used as required.

APPLICATIONS

- Waste Water
- Boiler Water
- Cooling Water
- Drinking Water
- River Water
- Beverages
- Foodstuffs
- Chemicals
- Surface Finishing
- Agriculture
- Paint
- Paper
- Pharmaceuticals
- Hydroponics





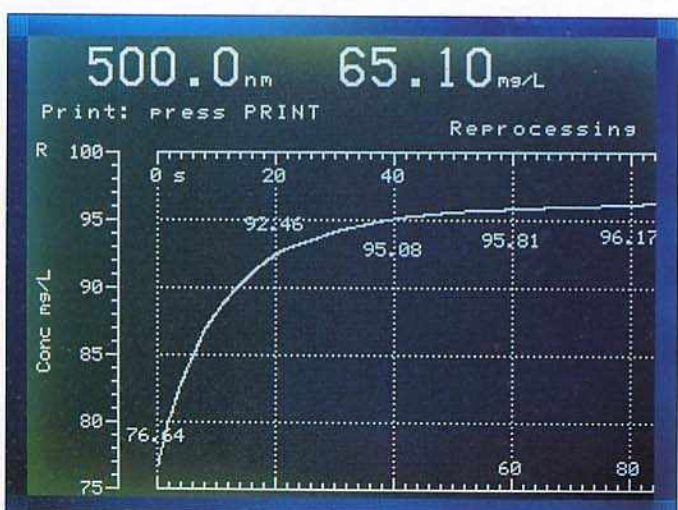
Curve and Line Fitting

A straight line, quadratic or cubic curve may be automatically fitted to a set of up to 30 standards. Fits are possible either with an intercept or forced through zero. All entries are prompted for simplicity of operation. With the possibility of using such a large number of standards, duplicate or multiple standards may be used for any given concentration. A quadratic curve is shown here.

Editing and Storage

Any suspect standards observed by inspection of the screen display may be deleted or replaced and a new fit produced.

Up to 30 curves may be stored, security protected, for future recall and processing.



Time Course Plotting

The course of any reaction with time may be followed by simply entering the mode, selecting the wavelength and entering the duration of the plot, scale and absorbance range as prompted.

The data is displayed on screen or plotted and may be reprocessed and stored security protected for future use.

A time plot on the screen is shown on the left. A printout is by pressing the RUN key, or may be made in real time.

Reaction Kinetics

Reaction Kinetics is available with reaction plots to screen and printer. Data may be reprocessed as required. Regression analysis is applied to the user selected portion of the reaction plot and results are reported in Units/Litre.

Sampling Flexibility

Some of the complete range of sampling accessories are shown. All instruments are fitted as standard with a special dual sample holder designed to accommodate both 10mm rectangular cuvettes and 16mm reaction tubes as supplied with many of the Merck test kits; time is saved as no change of holder is required when changing between the two.

A holder for 10, 20 and 50mm cells is also available as are holders for rectangular or cylindrical cells, up to 100mm in length.

Rapid Change Sample Holders

Sample holders take only seconds to change without the use of any tool. They are retained by two pillar thumb screws, and require no adjustment after fitting saving valuable time.



4000 SERIES

Dedicated with speed and convenience for Water Analysis.

Designed also for use in a very wide range of UV/Visible applications.



WATER ANALYSIS
AquaQuest



Sipette System

The sipette system shown in the photograph below may be used to advantage when a number of samples have to be measured in sequence. All measurements are made in the same cell improving accuracy while cell handling and breakage are avoided. The Sipette pump mounts inside the sample compartment and operates under control of the spectrophotometer microprocessor system. Samples after measurement may be returned and saved, or pumped to waste.

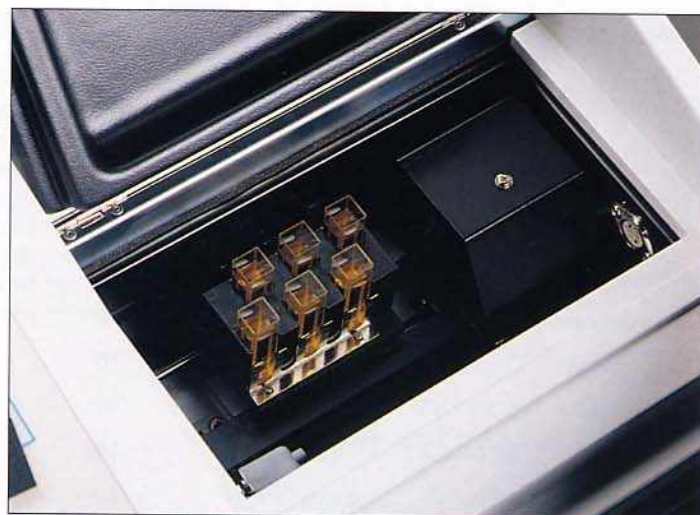
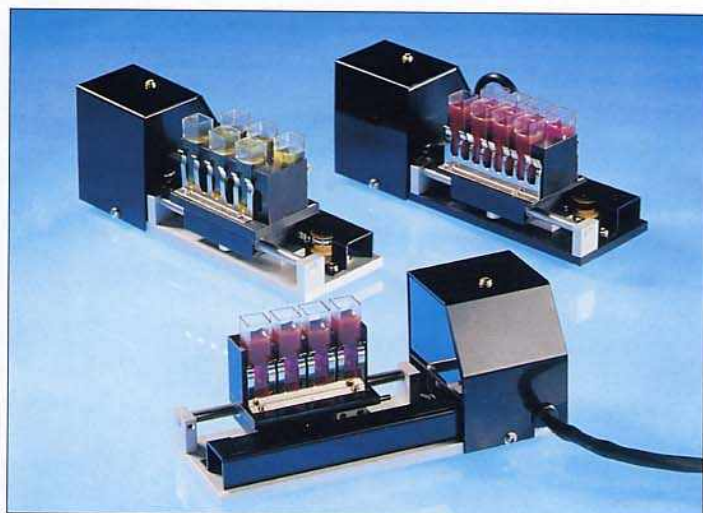
Multi-Cell Sipette System

A cell changer designed to accommodate three cells, of 10mm, 20mm and 50mm pathlengths, connected in series, speeds up the change between cells of different pathlengths when using a sipette system. This avoids cell handling and breakage.

Batch Sampling

Where large numbers of similar samples are to be measured, a batch sampler is available for up to 100 samples. The pump for the system is sample compartment mounted and under the instruments internal system control.





Automatic Cell Changers

For automatic measurements cell changers are available for 4, 6 or 8 cells and may be fully programmed for measurements.

A wavelength programme for up to 10 wavelengths is also available and may be used with a single cell or combined with a cell changer for a cell and wavelength program.

The sample changers are shown above together with a photograph of the 6 cell changer fitted to a spectrophotometer.

Ordering Accessories

SAMPLE HOLDERS

	Part No.
Single cell holder	1010 31 00
Dual holder for 10mm cells and 16mm tubes	4002 32 00
Holder for 10, 20 and 50mm cells	2010 38 00
Universal cell holder, 10mm cells upwards	1010 38 00
Long pathlength cylindrical cell holder	1010 39 00

CELL CHANGERS AND HOLDERS

4 cell automatic changer (no holder)	2021 34 00
6 cell automatic changer and holder	2021 36 00
8 cell auto changer and holder	4000 37 00
3 x (1-50mm) cell changer for water analysis	2020 35 00
4 x 10mm cell holder for auto changer	2010 24 00
4 x 50mm holder for auto changer	2010 36 00

SIPETTE, BATCH AND SIP SAMPLING

Holder for 10mm sipette cell	1010 32 00
Holder for sipette cells up to 50mm	2020 37 00
Batch sampler for 40 samples with pump	2020 82 00
Batch sampler for 100 samples with pump	2020 82 02
Return sipette system no cell or holder	2020 21 00

LAMPS

Deuterium lamp with hours indicator	2202 01 42
Tungsten halide lamp - in pairs	2303 01 40

THERMOSTATTING

Water flow holder for auto 4 cell changer	2020 36 15
Water flow holder for single, sipette cell	1010 33 00
Peltier controller and 10mm cell holder	2020 31 00
Peltier controller and 4 cell auto changer	2020 32 00
Cell compartment lid and pipe port for water thermostating	1010 05 00

PRINTERS, CABLES AND COMPUTERS

RS232c cable for PC with 25 pin outlet and protocol manual	2020 26 00
RS232c cable for PC with 9 pin outlet and protocol manual	2020 83 00
Printer connection cable	8000 71 00
Dot matrix printer	8000 70 01
Ink jet printer	8001 70 01
Print rolls and ribbon for integral printer	2020 03 20

CALIBRATION FILTERS

Holmium filter in holder	202 01 44
Didymium filter in holder	303 01 30
Set of 4 certified absorbance filters in holders	594 44 00
Set of 6 certified absorbance filters in holders	594 66 00
Set of 2 certified wavelength filters in holders	303 40 00

ANALYTE	RANGE	UNIT	pl (mm)
Aluminium	0.05-0.35	mg/L Al	50
Aluminium	0.20-1.50	mg/L Al	10
Aluminium	2.0-13.0	mmol/m ³ Al	50
Aluminium	7.4-55.6	mmol/m ³ Al	10
Ammonium	0.010-0.620	mg/L NH ₄ -N	50
Ammonium	0.010-0.800	mg/L NH ₄	50
Ammonium	0.10-2.70	mg/L NH ₄ -N	10
Ammonium	0.10-3.50	mg/L NH ₄	10
Ammonium	0.20-10.00	mg/L NH ₄	16
Ammonium	0.20-7.80	mg/L NH ₄ -N	16
Ammonium	0.6-44.4	mmol/m ³ NH ₄	50
Ammonium	0.8-21.7	mg/L NH ₄ -N	16
Ammonium	1.0-28.0	mg/L NH ₄	16
Ammonium	4.0-78.0	mg/L NH ₄ -N	16
Ammonium	5-100	mg/L NH ₄	16
Ammonium	6-195	mmol/m ³ NH ₄	10
Ammonium	60-1550	mmol/m ³ NH ₄	16
Boron	0.050-0.800	mg/L B	10
Cadmium	0.005-0.300	mg/L Cd	50
Cadmium	0.025-1.000	mg/L Cd	16
Calcium	1.0-15.0	mg/L Ca	20
Calcium	5-160	mg/L Ca	20
Calcium	7-224	mg/L CaO	20
Calcium	13-4000	mmol/m ³ CaCO ₃	20
Chloride	0.28-4.23	mol/m ³ Cl	10
Chloride	1.0-20.0	mg/L Cl	20
Chloride	10.0-150	mg/L Cl	10
Chloride	28-564	mmol/m ³ Cl	20
Chloride	5-125	mg/L Cl	16
Chlorine	0.05-1.50	mg/L Cl ₂	50
Chlorine	0.1-10.0	mg/L Cl ₂	10
Chlorine	0.50-5.00	mg/L Cl ₂	10
Chlorine	0.05-1.50	mg/L Cl ₂	50
Cl dioxide	0.02-1.00	mg/L ClO ₂	50
Cl dioxide	0.05-1.50	mg/L ClO ₂	50
Cl dioxide	0.50-5.00	mg/L ClO ₂	10
Chromium	0.010-0.600	mg/L Cr	50
Chromium	0.05-2.00	mg/L Cr	16
Chromium	0.10-3.00	mg/L Cr	10
Chromium	0.2-11.5	mmol/m ³ Cr	50
Chromium	2.0-58.0	mmol/m ³ Cr	10
COD	4.0-40.0	mg/L COD	16

ANALYTE	RANGE	UNIT	pl (mm)
COD	10-150	mg/L COD	16
COD	100-1500	mg/L COD	16
COD	500-10000	mg/L COD	16
COD	50-500	mg/L COD	16
COD	300-3500	mg/L COD	16
Copper	0.05-2.00	mg/L Cu	50
Copper	0.10-8.00	mg/L Cu	16
Copper	0.20-6.00	mg/L Cu	10
Copper	0.8-31.5	mmol/m ³ Cu	50
Copper	3-126	mmol/m ³ Cu	10
Cyanide	0.002-0.100	mg/L CN	50
Cyanide	0.025-0.500	mg/L CN	10
Cyanide	0.025-0.500	mg/L CN	16
Fluoride	0.025-0.500	mg/L F	50
Fluoride	0.10-1.50	mg/L F	16
Formaldehyde	0.025-2.250	mg/L HCHO	50
Formaldehyde	0.1-10.0	mg/L HCHO	16
Formaldehyde	0.02-1.80	mg/L HCHO	50
Formaldehyde	1.00-9.00	mg/L HCHO	10
Gold	0.5-12.0	mg/L Au	10
Hardness Res	0.50-5.00	mg/L Ca	16
Hardness Res	0.075-0.750	deg. Hardness	16
Hardness Tot.	0.7-22.0	deg. Hardness	16
Hardness Tot.	5-140	mg/L Ca	16
Hydrazine	0.02-1.00	mg/L N ₂ H ₄	50
Hydrazine	0.20-5.00	mg/L N ₂ H ₄	10
Hydrazine	0.6-31.2	mmol/m ³ N ₂ H ₄	50
Hydrazine	6-156	mmol/m ³ N ₂ H ₄	10
H peroxide	2.0-20.0	mg/L H ₂ O ₂	16
Iron	0.01-1.00	mg/L Fe	50
Iron	0.10-4.00	mg/L Fe	16
Iron	0.20-2.50	mg/L Fe	20
Iron	0.2-18.0	mmol/m ³ Fe	50
Iron	3.6-45.0	mmol/m ³ Fe	20
Iron II/III	0.2-20.0	mg/L Fe	10
Lead	0.02-1.50	mg/L Pb	50
Lead	0.10-5.00	mg/L Pb	16
Magnesium	5.0-50.0	mg/L Hg	16
Manganese	0.01-2.50	mg/L Mn	50
Manganese	0.2-46.0	mmol/m ³ Mn	50
Manganese	0.5-10.0	mg/L Mn	10
Manganese	9-182	mmol/m ³ Mn	10

ANALYTE	RANGE	UNIT	pl (mm)
Nickel	0.05-2.00	mg/L Ni	50
Nickel	0.10-6.00	mg/L Ni	16
Nickel	0.20-5.00	mg/L Ni	20
Nickel	0.4-34.0	mmol/m ³ Ni	50
Nickel	3.0-85.0	mmol/m ³ Ni	20
Nitrate	0.11-3.40	mg/L NO ₃ -N	16
Nitrate	0.20-5.60	mg/L NO ₃ -N	50
Nitrate	0.25-4.50	mg/L NO ₃ -N	50
Nitrate	0.5-15.0	mg/L NO ₃	16
Nitrate	0.5-18.0	mg/L NO ₃ -N	16
Nitrate	1.0-25.0	mg/L NO ₃	50
Nitrate	1.1-20.3	mg/L NO ₃ -N	10
Nitrate	1.1-22.6	mg/L NO ₃ -N	16
Nitrate	2.0-80.0	mg/L NO ₃	16
Nitrate	5.0-90.0	mg/L NO ₃	10
Nitrate	5-100	mg/L NO ₃	16
Nitrate	8-242	mmol/m ³ NO ₃	16
Nitrate	16-403	mmol/m ³ NO ₃	50
Nitrate	32-1290	mmol/m ³ NO ₃	16
Nitrate	80-1450	mmol/m ³ NO ₃	10
Nitrite	0.010-0.180	mg/L NO ₂ -N	50
Nitrite	0.02-1.00	mg/L NO ₂ -N	10
Nitrite	0.020-0.600	mg/L NO ₂	50
Nitrite	0.020-0.610	mg/L NO ₂ -N	16
Nitrite	0.05-2.00	mg/L NO ₂	16
Nitrite	0.05-3.00	mg/L NO ₂	10
Nitrite	0.4-13.0	mmol/m ³ NO ₂	50
Nitrite	1.0-65.0	mmol/m ³ NO ₂	10
Nitrite	1.1-43.5	mmol/m ³ NO ₂	16
Nitrogen	0.5-18.0	mg/L N	16
Oxygen	0.5-12.0	mg/L O ₂	16
Ozone	0.05-1.00	mg/L O ₃	50
Ozone	0.05-1.50	mg/L O ₃	50
Ozone	0.50-5.00	mg/L O ₃	10
Phenol	0.025-1.500	mg/L PHE	50
Phenol	0.10-2.50	mg/L PHE	16
Phos(PMB)	0.01-11.5	mg/L P ₂ O ₅	16
Phos(PMB)	0.02-1.00	mg/L PO ₄ -P	50
Phos(PMB)	0.05-2.30	mg/L P ₂ O ₅	50
Phos(PMB)	0.05-5.00	mg/L PO ₄ -P	16
Phos(PMB)	0.06-3.00	mg/L PO ₄	50
Phos(PMB)	0.10-5.00	mg/L PO ₄ -P	10

ANALYTE	RANGE	UNIT	pl (mm)
Phos(PMB)	0.2-11.5	mg/L P ₂ O ₅	10
Phos(PMB)	0.2-15.3	mg/L PO ₄	16
Phos(PMB)	0.3-15.3	mg/L PO ₄	10
Phos(PMB)	0.6-32.3	mmol/m ³ PO ₄	50
Phos(PMB)	1.0-25.0	mg/L PO ₄ -P	16
Phos(PMB)	2-160	mmol/m ³ PO ₄	16
Phos(PMB)	3-161	mmol/m ³ PO ₄	10
Phos(PMB)	3.1-76.8	mg/L PO ₄	16
Phos(VM)	0.5-25.0	mg/L PO ₄ -P	16
Phos(VM)	1.0-30.0	mg/L PO ₄ -P	10
Phos(VM)	1.1-57.0	mg/L P ₂ O ₅	16
Phos(VM)	1.5-77.0	mg/L PO ₄	16
Phos(VM)	2.0-69.0	mg/L P ₂ O ₅	10
Phos(VM)	3.0-92.0	mg/L PO ₄	10
Phos(VM)	16-807	mmol/m ³ PO ₄	16
Phos(VM)	32-970	mmol/m ³ PO ₄	10
Potassium	5.0-50.0	mg/L K	16
Silicon	0.010-0.800	mg/L Si	50
Silicon	0.02-1.70	mg/L SiO ₂	50
Silicon	0.10-5.00	mg/L Si	20
Silicon	0.2-10.7	mg/L SiO ₂	20
Silicon	0.3-28.5	mmol/m ³ SiO ₂	50
Silicon	3-178	mmol/m ³ SiO ₂	20
Silver	0.10-1.00	mg/L Ag	50
Silver	0.50-5.00	mg/L Ag	10
Sulphate	0.21-2.50	mol/m ³ SO ₄	16
Sulphate	20-240	mg/L SO ₄	16
Sulphate	25-300	mg/L SO ₄	20
Sulphate	100-1000	mg/L SO ₄	16
Sulphide	0.020-0.500	mg/L S	50
Sulphide	0.25-4.0	mg/L S	10
Sulphide	0.6-15.1	mmol/m ³ S	50
Sulphide	7.6-121.0	mmol/m ³ S	10
Sulphite	0.05-3.00	mg/L SO ₃	50
Sulphite	1.0-25.0	mg/L SO ₃	16
Surfactants	0.05-2.00	mg/L a-Ten	16
Tin	0.10-2.50	mg/L Sn	16
Zinc	0.05-2.50	mg/L Zn	10
Zinc	0.050-0.500	mg/L Zn	50
Zinc	0.20-5.00	mg/L Zn	16
Zinc	0.8-38.2	mmol/m ³ Zn	10

SPECIFICATION

Optical System	Littrow monochromator using 1200L/mm holographic grating; coated optics. Accommodates 100mm cells
Optical Bandwidth	4nm, all versions
Wavelength Range	190-1000nm; 325-1000nm visible versions
Wavelength Reproducibility	Better than 0.1nm
Wavelength Accuracy	Within 1nm
Straylight	Typically 0.01% at 220nm and 340nm - UV versions
Photometric Ranges	-0.3 to 3.0A, 0-200%T, 0-9999C
Photometric Noise	Less than $\pm 0.0002A$ at 500nm
Photometric Accuracy	1% or 0.005A whichever is greater
Absorbance Zero Stability	Better than $\pm 0.001A/Hr.$ at 500nm
Absorbance Zero Setting	0A and 100%T automatic by press button
Self Test and Calibration	Automatic at switch on
Filter and Lamp Selection	Automatic - coupled to wavelength
Display Screen - LCD	High resolution backlit screen with contrast control, displays menus, curves, scans and all data etc.
Display Screen Scrolling	Effective viewing width of 430mm
Wavelength Selection	Keyboard entry with GO TO key
Reaction Kinetics	Tabulation of results; reaction plots, reprocessing
Cell and Wavelength Programming	Up to 8 cells and 10 wavelengths in any combination
Peak Seek	Automatic with baseline flattening
Curve and Line Fitting	Linear, quadratic or cubic, with or without intercept, for up to 30 standards with curve editing
Wavelength Scanning	Scan speeds up to 4000nm/min with the scan software
Method Storage	Up to 100 methods and 30 curves, security coded
Real Time Clock	Timed and dated reports
Sipette Sampling	Under internal control with screen display
Batch Sampling	For up to 100 samples under internal control
Sample Temperature	Displayed and set from Keyboard
Computer Interface	Bi-directional serial RS232C and parallel ports
Sample compartment size	196 x 105 x 107mm (l x d x h)
Power Requirements	110-250V, 50/60Hz, 170W/120W UV/Visible versions
Weight	16.8Kg CE 4001, 18.6Kg CE 4002 17.7Kg CE 4003, 19.5Kg CE 4004
Size	480 x 340 x 205mm (l x d x h)

Cecil Instruments policy is one of continuous development. We therefore reserve the right to change specification without notice.

CECIL INSTRUMENTS LIMITED MILTON TECHNICAL CENTRE CAMBRIDGE CB4 6AZ ENGLAND
TEL: 01223 420821 FAX: 01223 420475 E-MAIL: cecil@dial.pipex.com

ORDERING

Spectrophotometers are supplied with dual cell holder, power cable and instruction manual

VISIBLE RANGE

CE 4001 Spectrophotometer
325-1000nm Wavelength range 4nm Bandpass

CE 4003 Spectrophotometer
325-1000nm Wavelength range 4nm Bandpass. With Integral Printer

UV/VISIBLE RANGE

CE 4002 Spectrophotometer
190-1000nm Wavelength range 4nm Bandpass

CE 4004 Spectrophotometer
190-1000nm Wavelength range 4nm Bandpass. With Integral Printer

SYSTEM 1

Spectrophotometer, spare lamp(s) spare fuses, 2 cells and dust cover. Example: CE4001 System 1 is a CE4001 with spare tungsten halide lamp, spare fuses, 2 glass cells and dust cover.

SOFTWARE MODULES

Program C

Cell program for up to 4, 6 or 8 cells

Program W

Wavelength program for up to 10 wavelengths and timed interval measurements at a fixed wavelength

Kinetics

Kinetic measurements with or without plots, reprocessing of data

Scan

Wavelength scans with peak labelling and peak tables. Time course plots

Validation

Absorbance, wavelength and bandwidth validation using certified standards.

ISO 9000
CERTIFIED COMPANY