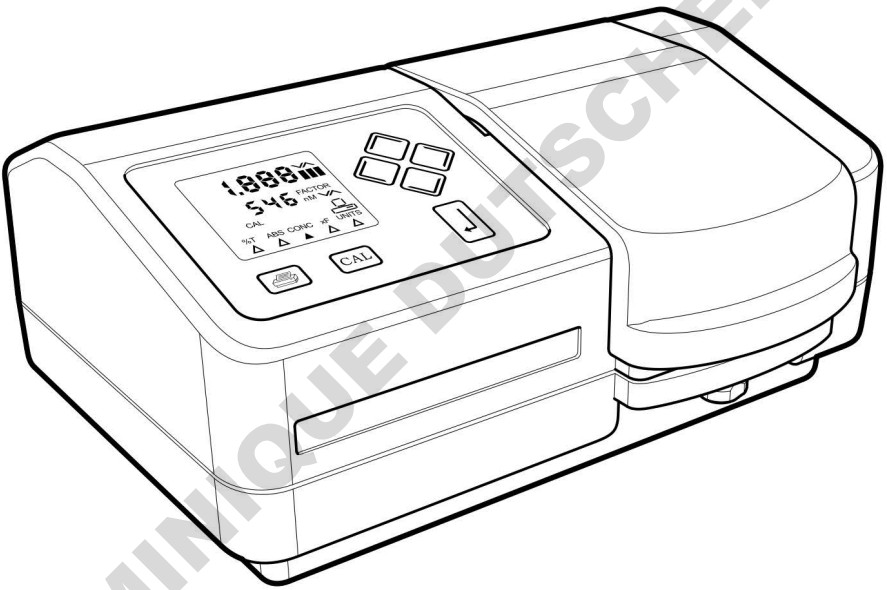
Cole-Parmer®

SP-200-VIS
SP-250-VIS

Visible Spectrophotometer



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Instruction Manual

630 026-CPB REV K

Cole-Parmer®

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Safety

Please read this information carefully prior to installing or using this equipment.

1. The SP-200-VIS and SP-250-VIS Spectrophotometers are designed for operation by **trained personnel** who are aware of the principles and applications involved. For further help and advice please visit www.cole-parmer.com

2. The spectrophotometer is a sensitive electronic and optical instrument designed for use in a laboratory environment. Careful adherence to the installation instructions must be observed. If in doubt contact a **relevant and competent authority** for advice before proceeding.

3. In addition to observing the instructions detailed in the Operating Manual and Service Manual for this instrument all installation, operating and service personnel must be aware of, and employ, **a safe system of work**.

4. Voltage levels hazardous to life are present in this instrument, for personal safety only **trained engineers** aware of the risk and avoidance of electric shock should remove protective covers from the instrument.

5. This instrument is designed for minimal maintenance, which must be carried out carefully following the **procedures detailed in this manual**. All safety instructions in these procedures, as well as those defined locally for the **area or environment** where the work is being carried out must be observed.

6. Other than for those items defined in the maintenance procedures herein there are **no user serviceable** items in this instrument. Removal of covers and attempted adjustment or service by unqualified personnel will invalidate any warranty and incur additional charges for repair.

7. Reference should always be made to the **Health and Safety Data** for any chemicals or reagents used. All available information, advice and warnings on the handling, storage, use and disposal of such must be carefully observed. When not available this data must be requested from the supplier before proceeding in any way.

8. It is important that **good laboratory practice** is observed when handling samples, chemicals, reagents and ancillary equipment in order to carry out measurement and analysis with this instrument. Suitable **safety and personal protective equipment** must be used at all times.

9. If it is suspected that safety protection has been impaired in any way, the spectrophotometer must be made **inoperative and secured** against any intended operation. The fault condition must be reported to the **appropriate servicing authority**. In all such reports the **model number and serial number** of the spectrophotometer must be quoted.

Sécurité

Ces informations sont importantes ; veuillez les lire avec attention avant d'installer ou d'utiliser l'instrument.

1. Les spectrophotomètres SP-200-VIS et SP-250-VIS sont conçus pour être utilisés par du **personnel formé** qui connaît les principes et les applications concernés. Pour obtenir de l'aide et des conseils supplémentaires, merci de consulter le site Internet www.Cole-Parmer.fr

2. Le spectrophotomètre est un instrument électronique et optique sensible conçu pour être utilisé en laboratoire. Les instructions d'installation doivent être scrupuleusement

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respectées. En cas de doute, contactez une **personne compétente** afin d'obtenir des conseils avant de procéder à l'installation.

3. En plus de suivre les instructions détaillées des manuels d'utilisation et d'entretien de cet instrument, tout le personnel impliqué dans l'installation, le fonctionnement et l'entretien doit connaître et utiliser **un système de travail sûr**.

4. Des niveaux de tension à risque sont présents dans cet instrument. Pour la sécurité du personnel, seuls des **ingénieurs formés** conscients du risque et de la nécessité d'éviter les chocs électriques peuvent enlever les capots de protection de l'instrument.

5. Cet instrument est conçu pour une maintenance minimale qui doit être effectuée avec soin en suivant les **procédures détaillées dans ce manuel**. Toutes les instructions de sécurité listées dans ces procédures, ainsi que celles définies localement pour la **zone ou l'environnement** dans lequel le travail doit être réalisé, doivent être respectées.

6. Hormis les éléments définis dans les procédures de maintenance, il n'existe aucun élément dans cet instrument qui peut être **réparé par l'utilisateur**. L'enlèvement des capots et les tentatives de réglage ou d'entretien par du personnel non-qualifié annuleront toute garantie et entraîneront des frais supplémentaires de réparation.

7. Il est nécessaire de toujours consulter **les données relatives à la santé et à la sécurité** de chaque produit chimique ou réactif utilisé. Tous les conseils, informations et avertissements disponibles concernant la manipulation, le stockage, l'utilisation et l'élimination de ces produits chimiques doivent être respectés soigneusement. Lorsqu'elles ne sont pas disponibles, ces données doivent être demandées dans tous les cas au fournisseur avant de poursuivre.

8. Il est important que de **bonnes pratiques de laboratoire** soient respectées lors de la manipulation d'échantillons, de produits chimiques, de réactifs et d'équipements auxiliaires afin de réaliser des mesures et des analyses avec cet instrument. Des **équipements de protection individuels et de sécurité** adaptés doivent être utilisés à tout moment.

9. Si une protection de sécurité est susceptible d'être détériorée, le spectrophotomètre doit être **mis hors service et sécurisé** pour éviter toute utilisation prévue. L'état défectueux doit être signalé à **l'autorité en charge de la maintenance**. Le **numéro du modèle et le numéro de série** du spectrophotomètre doivent être indiqués dans tous les rapports.

Sicherheit

Dies sind wichtige Informationen, bitte lesen Sie sie vor Installation oder Verwendung dieses Geräts sorgfältig durch.

1. Die Spektrophotometer SP-200-VIS und SP-250-VIS sind für den Betrieb durch **geschultes Personal,** das ü ber die entsprechenden Prinzipien und Anwendungen Bescheid weiß, vorgesehen. Weitere Hilfe und Hinweise finden Sie auf www.Cole-Parmer.de

2. Ein Spektrophotometer ist ein empfindliches elektronisches und optisches Instrument, das für die Verwendung in Laboren vorgesehen ist. Die Installationsanweisungen sind genau zu beachten. Wenden Sie sich im Zweifelsfall an die **jeweils zuständige Stelle,** bevor Sie fortfahren.

3. Neben der Befolgung der Anweisungen des Betriebshandbuchs und des Wartungshandbuchs für dieses Gerät muss sämtliches Installations-, Betriebs- und Wartungspersonal über **ein sicheres Arbeitssystem** informiert sein und dieses anwenden.

4. In diesem Gerät herrschen lebensgefährliche Spannungspegel, aus Sicherheitsgründen dürfen nur **geschulte Techniker,** die über die Gefahr und Vermeidung von Stromschlägen informiert sind, Schutzabdeckungen vom Gerät entfernen.

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5. Dieses Gerät ist für minimale Wartungsarbeiten ausgelegt, die unter Einhaltung der **in diesem Handbuch dargelegten Verfahren** sorgfältig durchzuführen sind. Alle Sicherheitsanweisungen dieser Verfahren sowie die örtlich festgelegten Anweisungen für das **Gebiet oder Umfeld,** in dem die Arbeit ausgeführt wird, sind einzuhalten.

6. Außer der in den Wartungsverfahren in diesem Handbuch angegebenen Teile gibt es in diesem Instrument **keine Teile, die vom Benutzer zu warten sind.** Die Entfernung von Abdeckungen sowie der Versuch der Einstellung oder Wartung durch unqualifiziertes Personal führen dazu, dass die Garantie ungültig wird und können zusätzliche Reparaturkosten nach sich ziehen.

7. Die **Angaben zum Gesundheitsschutz und zur Arbeitssicherheit** für die verwendeten Chemikalien bzw. Reagenzien sind jederzeit zu berücksichtigen. Sämtliche verfügbaren Informationen, Hinweise und Warnungen in Bezug auf die Handhabung, Lagerung, Verwendung und Entsorgung dieser Stoffe sind genau zu befolgen. Falls diese Informationen nicht verfügbar sind, müssen sie vom Lieferanten angefordert werden, bevor die Arbeiten fortgesetzt werden.

8. Es ist wichtig, dass bei der Handhabung von Proben, Chemikalien, Reagenzien und Hilfsgeräten zur Durchführung von Messungen und Analysen mit diesem Instrument die **gute Laborpraxis** befolgt wird. Es ist jederzeit eine geeignete **Sicherheitsausrüstung und persönliche Schutzausrüstung** zu verwenden.

9. Falls vermutet wird, dass der Sicherheitsschutz auf irgendeine Weise beeinträchtigt wurde, ist das Spektrophotometer **außer Betrieb zu setzen und gegen den Betrieb zu sichern**. Die Störung ist der **entsprechenden Wartungsstelle** zu melden. In diesen Berichten ist die **Modellnummer und die Seriennummer** des Spektrophotometers anzugeben.

Seguridad

Información importante que debe leer atentamente antes de instalar o utilizar este instrumento.

1. Los espectrómetros SP-200-VIS y SP-250-VIS se han concebido para ser utilizados por **personal con formación** que conozca los principios y las aplicaciones que entrañan. Si necesita más ayuda o indicaciones, diríjase a www.Cole-Parmer.com

2. El espectrómetro es un instrumento electrónico y óptico de gran sensibilidad destinado a entornos de laboratorio. Deben seguirse atentamente las instrucciones de instalación. En caso de duda, consulte a la **autoridad competente y pertinente** antes de continuar.

3. Aparte de cumplir las instrucciones detalladas en el Manual de funcionamiento y el Manual de servicio de este instrumento, todo el personal de instalación, manejo y servicio debe conocer y aplicar **un sistema seguro de trabajo**.

4. Este instrumento presenta niveles de tensión peligrosos; por motivos de seguridad personal, las tapas protectoras del instrumento debe ser retiradas únicamente por **técnicos debidamente cualificados** que conozcan los riesgos y sepan evitar las descargas eléctricas.

5. Este instrumento ha sido diseñado con requisitos mínimos de mantenimiento, que debe realizarse con cuidado de acuerdo con los **procedimientos detallados en este manual**. Deben cumplirse todas las instrucciones de seguridad de estos procedimientos, así como las que se establezcan localmente para la **zona o el entorno** donde se esté realizando el trabajo.

6. A excepción de los elementos indicados en los procedimientos de mantenimiento de este manual, este instrumento no contiene piezas que necesiten **ningún tipo de mantenimiento por el usuario**. La retirada de las tapas y cualquier intento de ajuste o

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mantenimiento por parte de personal no cualificado dará lugar a la invalidación de la garantía y podría causar gastos adicionales de reparación.

7. Deben consultarse siempre los **datos sobre salud y seguridad** de los productos químicos o reactivos empleados. Debe leerse atentamente toda la información, los consejos y las advertencias existentes sobre la manipulación, el almacenamiento, el uso y la eliminación de los mismos. Si no se dispone de información, deberá solicitarse al proveedor antes de continuar.

8. Es importante adoptar **buenas prácticas de laboratorio** cuando se manipulen muestras, productos químicos, reactivos y equipos auxiliares para realizar medidas y análisis con este instrumento. Se deben utilizar siempre **equipos de seguridad y protección personal**.

9. Ante la sospecha de que alguna medida de seguridad se haya visto de algún modo comprometida, el espectrómetro deberá dejarse **inutilizado, así como garantizarse** que nadie pueda utilizarlo. Debe informarse de cualquier fallo al **responsable de servicio pertinente**. En todos los informes, deben indicarse el **número de modelo y el número de serie**.

Sicurezza

Queste informazioni sono importanti; si prega di leggerle attentamente prima di installare o utilizzare lo strumento.

1. Gli spettrofotometri SP-200-VIS e SP-250-VIS sono progettati per essere utilizzati da **personale qualificato** che conosce i principi e le applicazioni ad essi collegati. Per ulteriori informazioni e per assistenza visitare il sito internet www.Cole-Parmer.com

2. Lo spettrofotometro è uno strumento ottico elettronico sensibile progettato per l'uso in laboratorio. Seguire minuziosamente le istruzioni di installazione. In caso di dubbi rivolgersi all'**autorità competente appropriata** per una consulenza prima di procedere.

3. Oltre ad osservare le istruzioni indicate nel Manuale di funzionamento e manutenzione del presente strumento, tutto il personale addetto all'installazione, funzionamento e manutenzione deve conoscere e implementare **un sistema di lavoro sicuro**.

4. Questo strumento utilizza livelli di tensione pericolosi, pertanto per la sicurezza personale solo **i tecnici qualificati** che conoscono i rischi e come evitare le scosse elettriche possono rimuovere le coperture protettive dallo strumento.

5. Questo strumento è progettato per necessitare di una manutenzione minima, che però deve essere eseguita con cura seguendo **le procedure indicate in questo manuale**. Rispettare tutte le istruzioni per la sicurezza presenti in queste procedure, nonché quelle definite a livello locale per **l'area o l'ambiente** in cui viene eseguito il lavoro.

6. Ad esclusione delle parti indicate nelle procedure di manutenzione contenute in questo manuale, l'apparecchiatura non contiene **componenti che possano essere riparati dall'utente**. La rimozione di coperture ed eventuali tentativi di regolazione o riparazione da parte di personale non qualificato renderanno nulla qualsiasi garanzia e genereranno dei costi aggiuntivi per la riparazione.

7. Fare sempre riferimento ai **dati sulla salute e la sicurezza** per tutte le sostanze chimiche o reagenti utilizzati. Osservare attentamente tutte le informazioni, i consigli e le avvertenze disponibili sulla loro manipolazione, conservazione, utilizzo e smaltimento. Qualora tali dati non siano disponibili, richiederli al fornitore prima di procedere in qualsiasi modo.

8. È importante che vengano osservate le **buone pratiche di laboratorio** quando si manipolano campioni, sostanze chimiche, reagenti e apparecchiature accessorie per

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eseguire misurazioni e analisi con questo strumento. Attrezzature idonee **per la protezione personale e la sicurezza** vanno utilizzate in ogni circostanza.

9. Se si sospetta che la protezione della sicurezza sia stata compromessa in qualsiasi modo, **disattivare e rendere inutilizzabile** lo spettrofotometro. La condizione di guasto deve essere comunicata al **responsabile della manutenzione appropriato**. Tale comunicazione deve sempre comprendere il **numero di modello e il numero di serie** dello spettrofotometro.

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SECTION 1 - Introduction

1.1 INSTRUMENT DESCRIPTION

The SP-200-VIS and SP-250-VIS spectrophotometers are suited to a wide range of applications in education, quality control, environmental and clinical analysis. Both models are visible spectrophotometers covering a wavelength range from 320nm to 1000nm, with measurement modes for absorbance, % transmittance and concentration. These models have full interfacing capability for Analogue output and serial (RS232) interfacing. The optical system is independently housed and isolated with lenses to give maximum protection from environmental contamination. Combined with a mechanically rigid structure, these models provide a system with fast warm-up, low drift and high reliability.

1.2 INSTRUMENT SPECIFICATION

	SP-200-VIS and SP-250-VIS
Wavelength	
Range	320 to 1000nm
Resolution	1nm
Accuracy	± 2nm
Spectral bandwidth	8nm
Photometrics	
Transmittance	0 to 199.9%
Absorbance	-0.300 to 1.999A
Accuracy	±1%T @10%T, ±0.04Abs at 1.000 Absorbance
Resolution	0.1%T, 0.001A
Stability	1%/hr after 15 minute warm up
Concentration	
Range	-300 to 1999
Resolution	1/0.1
Calibration	Blank with a single standard or factor
Units	no units, %, ppm, M, g/l, mg/l
Factor	0.1 to 9999
Standard	0.1 to 1999
Other	
Beam height	15mm
Light source	Tungsten halogen lamp
Outputs	Analogue, RS232
Power	<50W
Size (w x d x h)	365 x 272 x 160mm
Weight	6kg

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SECTION 2 – Installation

2.1 UNPACKING

Remove the SP-200-VIS or SP-250-VIS from the packaging and ensure the following items are included:

1. Model SP-200-VIS spectrophotometer, or Model SP-250-VIS spectrophotometer
2. Required power cable either UK mains lead moulded plug (HH179(S)), EU mains lead moulded plug (HH180(S)), or US mains lead moulded plug (FCABLEUS)
3. Pack of 100 disposable plastic visible wavelength cuvettes (060 084), model SP-200-VIS only
4. Cole-Parmer 63-zero PC software (635 100) and interface cable (013 210) model SP-200-VIS only
5. Instruction manual (630 026-CPB)
6. Optional accessories (as ordered)

2.2 INSTALLATION

Models SP-200-VIS and SP-250-VIS are supplied ready to use.

The unit should be placed on a clean flat surface which is free from drafts and vibrations. The units are designed for operation on 115V to 230V AC input at 50 to 60Hz. The standard 2 metre cable supplied with the units is fitted with an IEC type connector which can be plugged directly into the POWER IN socket on the rear panel. The unit should be positioned within 1.5 metres of an earthed mains supply.

The mains fuse is housed within the POWER IN socket. When replacing the fuse the unit must be disconnected from the mains supply. The fuse rating is 2A 'F' (fast blow type). In the event of the fuse failing after replacement it is advisable to consult with Cole-Parmer Service or your distributor before proceeding further.

It is possible to switch the voltage between 230V and 115V. When changing the voltage please ensure the fuse rating is correct. Before attempting to change the voltage disconnect the instrument from the mains supply. Withdraw the fuse holder from the power input socket and remove the fuse. Extract the grey fuse retainer and rotate so that the correct voltage is visible through the aperture in the fuse holder. Replace the fuse retainer in its holder, fit the correct fuse and push assembly back into the power input socket. For further information please refer to the service manual.

Connect the power supply unit to the power inlet socket on the rear panel of the instrument and connect to the mains socket. Turn the power on at the mains and switch the instrument on using the power switch on the rear of the instrument. DO NOT open the sample chamber door during initialisation.

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The instrument will automatically re-align the monochromator at zero order wavelength. During this initialisation, the instrument displays CAL on the primary display before displaying the main measurement screen. Please note that the instrument will go to the last wavelength and measurement mode used.

2.3 DISPLAY

These spectrophotometers have an LCD display:

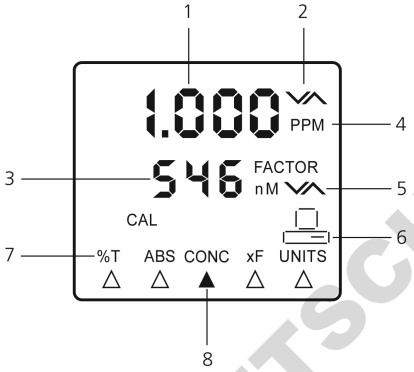


Fig. 2.3.1 – Display

1. Primary display area – Transmission, Absorbance, Concentration
2. Primary display adjust annunciator
3. Secondary display area – Wavelength, Factor
4. Primary display units
5. Secondary display annunciator
6. Operation with PC
7. Menu options - %T, ABS, CONC, FACTOR, UNITS
8. Menu pointers (for above)

2.4 CONTROLS

The keypad used for these models enables an easy and effective way of navigating the different measurement modes. The arrow keys can be used to move between modes and to adjust wavelengths, factors, concentration and units. The main menu screen and surrounding keypad is displayed below:

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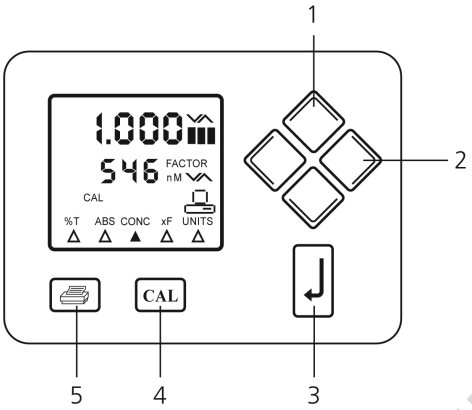


Fig. 2.4.1 – Controls

1. Arrow Keys: Used to adjust values on the selected display
2. Arrow Keys: Used to move the cursor horizontally between menu options
3. Return Key: Used to select the display menu option
4. CAL Key: Initiates a calibration routine
5. Print Key. Provides a printout of the current reading with an incremental sample number. When pressed for the first time after a calibration the print out will give calibration information. The incremental sample number will be reset after a calibration.

2.5 REAR PANEL

The image below shows the rear panel on the instrument:

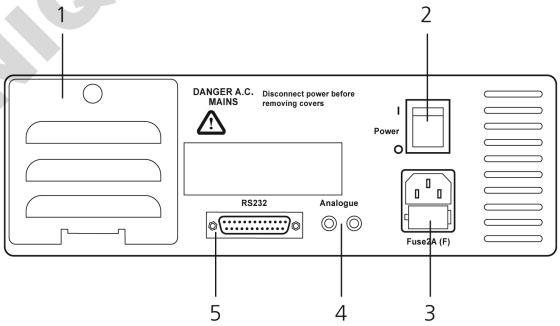


Fig. 2.5.1 – Rear Panel

1. Lamp access panel Allows access to lamp when replacement is necessary.

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NOTE: The lamp access panel and all ventilation slots must NOT be covered or obstructed at any time.

2. Power switch — On/off switch for the unit
3. Power in socket — IEC type connection socket for mains cable
4. Output sockets — Analogue output
5. RS232 serial port — Connection to a PC

2.6 SAMPLING

Model SP-200-VIS is supplied with a 10mm cuvette holder. Other accessories can be fitted (refer to section 7).

Model SP-250-VIS is supplied with a dual 10mm cuvette holder with a 12.7mm test tube holder. The domed lid on this model enables tall test tubes (up to 100mm in height) to be used.

WARNING: The optical characteristics and light path of the cuvettes and test tubes used in the dual purpose sample holder vary so cannot be interchanged. Calibrate on one and use only the same type of sample holder for each analysis batch.

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SECTION 3 – Theory and Practice of Spectroscopy Measurements

3.1 THEORY OF SPECTROSCOPY MEASUREMENT

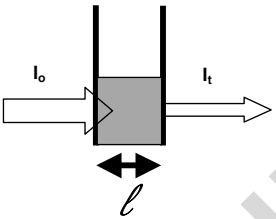
UV-visible spectroscopy is the measurement of the absorbance of light at a specific wavelength in a sample. This is used to identify the presence and concentration of molecular entities within the sample. The Beer-Lambert law is used to relate the absorption of light to the properties of the sample through which the light is travelling through. The Beer-Lambert law states that:

$$A = \varepsilon l c$$

- **A** is the absorbance
- **ε** is the molar absorption coefficient (l $mol^{-1}cm^{-1}$)
- **c** is the concentration (mol l^{-1})
- **l** is the path length (cm)

This law shows that absorbance is linear to concentration but this is only true for low concentrations. For absorbance levels above 3 the concentration starts to move away from the linear relationship.

Transmittance is the proportion of the light which passes through the sample:



Where:

- I_o is the incident light
- I_t is the transmitted light
- ℓ is the path length

Therefore:

$$T = \frac{I_t}{I_o}$$

Absorbance is inversely related to transmittance:

$$A = \frac{\log 1}{T}$$

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3.2 SPECTROSCOPY MEASUREMENT

There are four main components of a spectrophotometer. These are a light source to emit a high and constant amount of energy over the full wavelength range; a method for separating the light into discreet wavelengths; a sample holder and a light detector.

The optical layout of the SP-200-VIS and SP-250-VIS spectrophotometers is shown below:

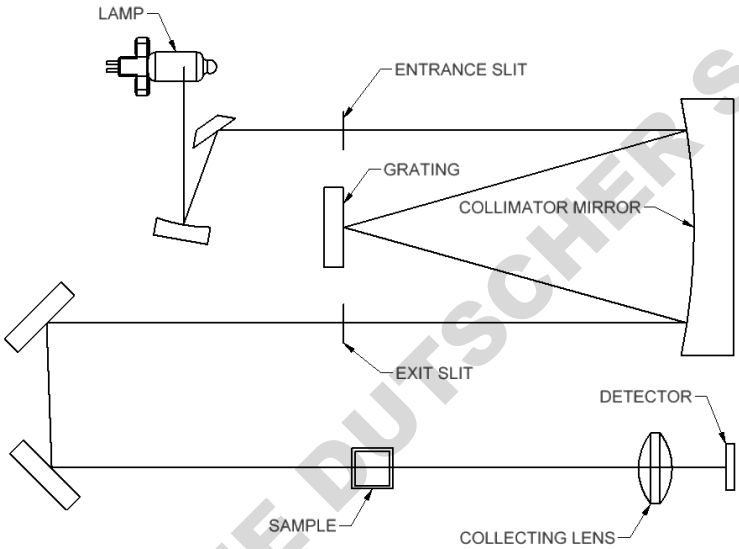


***Figure 3.2.1* – Diagram of light path**

The light from the pre-focused tungsten halogen lamp is focused onto the grating, with 1200 lines per millimeter, which separates the light into discreet wavelengths. The diffracted spectrum of light then passes through a further slit and lens arrangement before passing through the sample in the sample chamber from left to right. The light which is not absorbed by the sample is transmitted through a collecting lens and onto the signal detector. The photo-diode detector used is mounted directly onto the detector PCB and is used to calculate the % transmittance. The result is displayed either as % transmittance or absorbance on the instrument display.

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3.3 GOOD PRACTICE GUIDELINES

1. For optimum performance all spectrophotometers should be sited in a clean, dry, dust free atmosphere. When in use ambient temperature and light levels should remain as constant as possible.
2. If required adherence to Standard Operating Procedures (SOP) and Good Laboratory Practice (GLP) should be monitored with regular calibration checks and a suitable Quality Control (QC) programme.
3. The sample chamber lid must be fully closed during measurement and before any readings are recorded or printed.
4. The correct selection of sample containers is imperative for accurate and reproducible results:
    a) Check that the material of the sample container is compatible with the wavelengths to be used for measurement. In general glass can only be used down to 360nm or 320nm depending on quality. Standard plastic cuvettes can be used down to 320nm. Special UV versions can be used down to 260nm. Below this level quartz cuvettes must be used.
    b) Plastic disposable cuvettes should only be used ONCE.
    c) Glass cuvettes should be thoroughly cleaned after use. Discard when scratches become evident on optical surfaces.
    d) Care should be taken when selecting semi-micro or micro cuvettes. The cuvette window on the inner chamber (the area filled with sample) must be wider than the aperture in the sample holder or light will reach the detector without passing through the sample. In this case, semi-micro or micro cuvettes with self-screening black surrounds must be used or, alternative holders for these cuvettes should be used.
    e) Glass test tubes and other sample tubes should be used with care. Where possible, matched tubes should be used and any index mark set to the correct position before measurements are made.
    f) Ensure any sample containers used are compatible with the constituents of both the samples and standards they are to hold. Plastic cuvettes are not compatible with organic solvents.
    g) All sample containers must be handled with care; by the top, bottom and non-optical surfaces only. Any finger marks evident must be removed by a suitable cleaning process.

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h) Flow-through cuvettes must be selected with care and consideration for the sample type, sample volume, pumping system, rinse, sample and waste handling to be used.

5. Samples and standards should not be stored in open cuvettes or sample containers as evaporation will change the value and lead to staining of the walls which may be irreversible. If stored in stoppered and sealed cuvettes, they should be filled with little or no air space and the values regularly checked against a reference standard or quality control material.

6. Samples should be allowed to equilibrate to ambient temperature before measurement (unless a suitable temperature controlled sample holder is in use). Temperature change during measurement may cause air bubbles to form on the walls of the sample holder. This is a common cause of drift during measurement.

7. In the preparation of samples and standards high grade borosilicate glass and AR grade chemicals and reagents must be used. Good quality deionised water or other suitable solvents must be used for dissolving or diluting samples, chemicals and reagents.

8. All measurements require calibration to a blank, for maximum accuracy this should be prepared with care using the same deionised water or solvent used for dissolving or diluting the sample. Where reagents are added to the sample to produce a colour proportional to its concentration a 'sample based' blank should be used. In this case the blank should consist of all reagents or chemicals to be used, **except** the sample which will produce the colour to be measured.

9. Deviations from the Beer-Lambert Law may occur at high and low concentrations giving non-linear response during sample concentration measurements. For all new methods a linear range should be defined by the preparation of a calibration curve.

10. Cuvettes and sample holders must be filled to a minimum level which covers the light path. All Cole-Parmer spectrophotometers have a beam height of 15mm.

11. The instrument must be calibrated to zero absorbance/100% transmittance prior to taking readings.

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SECTION 4 – PHOTOMETRICS MEASUREMENTS

The SP-200-VIS/SP-250-VIS can perform simple measurements of % transmittance or absorbance. The sample is measured at one wavelength and at one point in time.

4.1 TRANSMISSION MEASUREMENT MODE

To select % Transmittance use the LEFT or RIGHT arrow keys to move the cursor to the %T indicator on the menu bar (refer to figure 2.3.1). The primary display will show the transmittance with %T units. To adjust the wavelength use the UP and DOWN arrow keys.

The calibration must be performed at the same wavelength at which the sample will be measured. Insert a cuvette containing the blank (clear) solution into the sample chamber and close the instrument lid. Press the CAL key. The instrument will perform a zero % transmission calibration followed by a 100% transmission calibration. An internal shutter is automatically activated to perform the zero % setting and this part of the routine is therefore independent of the solution in the light path).

Once the calibration has been performed a sample can be measured. Remove the cuvette containing the blank solution and place a cuvette containing the sample to be measured in the sample holder. Close the instrument lid and the % transmittance result will be shown on the screen.

Subsequent samples can be measured in the same way. If the wavelength is adjusted between sample measurements then the instrument must be calibrated again before more samples can be measured.

4.2 ABSORBANCE MEASUREMENT MODE

To select absorbance use the LEFT or RIGHT arrow keys to move the cursor to the ABS indicator on the menu bar (refer to figure 2.3.1). The primary display will show the absorbance with ABS units. To adjust the wavelength use the UP and DOWN arrow keys.

The calibration must be performed at the same wavelength at which the sample will be measured. Insert a cuvette containing the blank (clear) solution into the sample chamber and close the instrument lid. Press the CAL key. The instrument will perform a zero % transmission calibration followed by a 0.000 Absorbance calibration. An internal shutter is automatically activated to perform the zero % setting and this part of the routine is therefore independent of the solution in the light path.

Once the calibration has been performed a sample can be measured. Remove the cuvette containing the blank solution and place a cuvette containing the sample to be measured in the sample holder. Close the instrument lid and the absorbance result will be shown on the screen.

Subsequent samples can be measured in the same way. If the wavelength is adjusted between sample measurements then the instrument must be calibrated again before more samples can be measured.

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SECTION 5 – CONCENTRATION MEASUREMENTS

The concentration measurement mode enables simple measurements of concentration to be performed. In this measurement mode it is possible to calibrate against a standard of a known concentration or use a known factor. The sample is measured at one wavelength at one point in time.

To select concentration use the LEFT or RIGHT arrow keys to move the cursor to the CONC indicator on the menu bar (refer to figure 2.3.1). The primary display will show the concentration with the selected units. To adjust the wavelength use the UP and DOWN arrow keys.

To select the units use the LEFT or RIGHT arrow keys to move the cursor to the UNITS indicator on the menu bar (refer to figure 2.3.1). Use the UP and DOWN arrow keys to select ppm, mg/l, g/l, M, % or blank units. Once the required units have been selected press the RETURN or CAL key to store the units and return to the concentration measurement mode.

5.1 USING A KNOWN STANDARD

The calibration must be performed at the same wavelength at which the sample will be measured. Insert a cuvette containing the known concentration standard into the sample chamber and close the instrument lid. Press the CAL key; the CAL annunciator will flash continuously. Use the arrow keys to change the concentration to the required value for the standard. Press the CAL or RETURN key to calibrate the instrument to the standard concentration. The instrument will calculate the factor for subsequent measurements. If the factor calculated is out of range, then the instrument will display Err 3 for 2 seconds after the calibration. To view the factor use the LEFT or RIGHT arrow keys to move the cursor to the xF indicator on the menu bar (refer to figure 2.3.1).

Once the calibration has been performed a sample of unknown concentration can be measured. Remove the cuvette containing the standard solution and place a cuvette containing the sample to be measured in the sample holder. Close the instrument lid and the concentration result will be shown on the screen.

Subsequent samples can be measured in the same way. If the wavelength is adjusted between sample measurements then the instrument must be calibrated again before more samples can be measured.

5.2 USING A KNOWN FACTOR

If the factor is known there is no need to calibrate against a known standard. To enter the factor use the LEFT or RIGHT arrow keys to move the cursor to the xF indicator on the menu bar (refer to figure 2.3.1). Use the UP and DOWN arrow keys to enter the required factor. Once the required factor has been entered press the RETURN or CAL key to store the factor and return to the concentration measurement mode.

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SECTION 6 – CONNECTING TO A PC

Connect the interface cable to the RS232 serial port on the rear of the instrument and connect to the serial port on the rear of the PC. Turn the PC on and load the PC software by inserting the PC software disc into the CD drive. If the PC software does not auto run open My Computer and double click on the 63-Zero software icon. Follow the instructions to install the PC software to the required location. Once the software is installed, turn the mains power on to the instrument.

The PC software is pre-configured to run using the following settings:

1200 baud
7 data bits
Odd parity
1 stop bit

The 25 way D connector allows a standard one-to-one interconnection lead to be used, as supplied with the 40 column printer/interface cable kit.

A printout is initiated by pressing the PRINT key. If the sample number is unity, then the printout will include a header block. The sample number is incremented every time the PRINT key is pressed.

The following commands can also be sent to the SP-200-VIS and SP-250-VIS via the serial interface
(using Windows HyperTerminal, for example):

ASCII **D** or **d** Same as pressing the PRINT key

ASCII **T<CR>** Outputs transmission and wavelength separated by an ASCII TAB character, regardless of the instrument operating mode. For example: 100.0 540

ASCII **A<CR>** Outputs absorbance and wavelength separated by an ASCII TAB character, regardless of the instrument operating mode. For example: 0.001 540

ASCII **C<CR>** Outputs concentration and wavelength separated by an ASCII TAB character, regardless of the instrument operating mode. For example: 123.4 540

ASCII **V<CR>** Outputs a voltage proportional to the monochromatic light level passing the sample and wavelength separated by an ASCII TAB character. For example: 1234.5 540

ASCII **Z<CR>** Calibrates a zero absorbance if the dark shutter is open (SO<CR>command), or zero transmittance if the dark shutter is closed (SC<CR>command).

ASCII **SC<CR>** Closes the dark shutter which blocks monochromatic light entering the sample chamber. This allows 0% transmittance to be calibrated.

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ASCII **SO<CR>** Opens the dark shutter which allows monochromatic light to enter the sample chamber. This allows 100% transmittance (zero absorbance) to be calibrated. The shutter must be open for normal measurements.

ASCII **Gnnn<CR>** Commands the instrument to go to wavelength **nnm**. For example: G540<CR> will set the wavelength to 540nm.

ASCII **Fxxxx.x<CR>** Sets the concentration factor to xxxx.x. For example: F1000<CR> will set the factor to 1000.

Note **<CR>** is an ASCII carriage return character. The last three commands provide an output which can be readily incorporated into most spreadsheet software packages.

6.1 RS232 Output

The bi-directional RS232 interface is available on the rear panel 25 way D type connector. The connections are as follows:

TDX 2 – INPUT TO SP-200-VIS/SP-250-VIS

RXD 3 – OUTPUT FROM SP-200-VIS/SP-250-VIS

RTS 4 – LINKED TO CTS

CTS 5 – LINKED TO RTS

DSR 6 – OUTPUT FROM SP-200-VIS/SP-250-VIS

DCD 8 – OUTPUT FROM SP-200-VIS/SP-250-VIS

DTR 20 – INPUT TO SP-200-VIS/SP-250-VIS (must be active)

GND 7

Suggested interconnections are detailed below:

SP-200-VIS/SP-250-VIS		IBM PC XT (25 way "D")
TDX 2	———	2 TXD (From PC)
RXD 3	———	3 RXD (To PC)
RTS 4	———	4 RTS (From PC)
CTS 5	———	5 CTS (To PC)
DSR 6	———	6 DSR (To PC)
DCD 8	———	8 DCD (To PC)
DTR 20	———	20 DTR (From PC)
GND 7	———	7 GND

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SP-200-VIS/SP-250-VIS		IBM PC XT (9 way “D”)
TDX 2	————	3 TXD (From PC)
RXD 3	————	2 RXD (To PC)
RTS 4	————	7 RTS (From PC)
CTS 5	————	8 CTS (To PC)
DSR 6	————	6 DSR (To PC)
DCD 8	————	1 DCD (To PC)
DTR 20	————	4 DTR (From PC)
GND 7	————	5 GND

Note the interface cable kit (542 009) can be used to implement the above interconnections.

6.2 Recorder Output

This is available via the 4mm rear panel sockets. The level is proportional to the displayed reading, depending on the measurement mode:

Transmission	1mV per 0.1%T
Absorbance	1mV per 0.001ABS
Concentration	1mV per concentration unit

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SECTION 7 – Accessories and Spare Parts

7.1 OPTIONAL ACCESSORIES

Part Code	Description of Accessory
634 001	4 position manual cuvette holder
632 001	Sipper pump, supplied with inlet and outlet tubing (230V/50Hz)
632 031	Sipper pump, supplied with inlet and outlet tubing (110V/60Hz)
630 204	10x10mm path length cuvette holder
637 071	10mm cuvette and 16/24mm test tube holder
630 005	10 to 100mm adjustable path length cuvette holder
630 304	Micro-cuvette holder
648 001	Water heated 10x10mm single cuvette holder
632 511	Dual cell holder for 10mm cuvettes and 12.7mm diameter tubes (SP-250-VIS ONLY)
033 290	Storage/carry case (not for use with SP-250-VIS)
630 028	Dust cover
037 551	RS232 to USB converter for use with computer without a serial port
543 001	40 Column printer supplied with interface cable, paper roll and ribbon and universal power supply
060 287	Paper roll for printer (quantity 1)
060 288	Printer ribbon (quantity 1)
542 009	Interface cable kit

7.2 SPARES

Part Code	Description of Spare Part
012 075	Tungsten halogen lamp (SP-200-VIS & SP-250-VIS)
630 204	10x10mm path length cuvette holder
632 511	Dual cell holder for 10mm cuvettes and 12.7mm diameter tubes (SP-250-VIS ONLY)
060 084	Pack of 100 disposable plastic visible wavelength 10x10 cuvettes
HH179(S)	UK mains lead moulded plug
HH180(S)	EU mains lead moulded plug
FCABLEUS	US mains lead moulded plug
635 100	PC software on CD ROM
013 210	Serial Lead to connect to PC
016 021	Replacement fuse 2A
016 025	Replacement fuse 1A

To order spares please contact your local distributor or Antylia Scientific

E-mail: cpspares@antylia.com

Tel: +44 (0) 1785 810234

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SECTION 8 – Maintenance and Service

8.1 ROUTINE MAINTENANCE

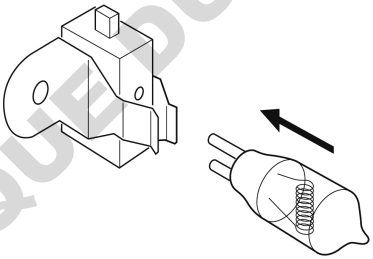
Ensure the external surfaces of the unit are clean and free from dust. The sample area should always be kept clean and any accidental spillage should be wiped away immediately. To give added protection when not in use, the unit should be disconnected from the mains supply and covered with the optional dust cover.

The only routine maintenance which maybe required is the replacement of the light source. The replacement lamp is available from your local distributor or Cole-Parmer (refer to section 7.2 for spare part codes). Only genuine replacement lamps should be used. Similar lamps may have different filament configurations or be wavelength restricted for domestic or commercial use and will give rise to errors if used.

8.2 LAMP REPLACEMENT

8.2.1 Tungsten Halogen Lamp Replacement

Before replacing the lamp disconnect the unit from the mains supply and ensure the lamp is cool before handling. Care should be taken when removing the lamp from the holder. Access to the tungsten halogen lamp can be gained via the lamp access panel located on the rear of the instrument (refer to section 2.5).



1. Slacken off the thumbscrew from the lamp access panel located at the rear of the unit.
2. Remove the old lamp from the holder. The lamp is a plug-in fit and should be removed by gently easing it from the holder.
3. Carefully remove the replacement lamp from the packaging. Ensure that the glass portion of the lamp is not touched as finger marks will damage the lamp resulting in a reduced performance. If accidental damage occurs the surface of the lamp may be cleaned using propan-2-ol.
4. Insert the lamp into the holder, ensuring it is fully pushed in.
5. Replace the lamp access panel and re-tighten the thumbscrew.
6. Reconnect the power supply, turn on the unit and ensure that the lamp is illuminated after a few seconds.

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For further instructions refer to the service manual.

8.3 SERVICE

Our dedicated service staff are on hand to help in the unlikely event that your Cole-Parmer equipment develops a fault. Please contact them by one of the following means with a clear description of the problem:

E-mail: cpservice@antylia.com

Tel: +44 (0) 1785 810475

Fax: +44 (0) 1785 810471

On occasion it may be necessary for your equipment to be sent back to our Service Department for repair. In this case please contact the Service Department for a reference number which you should include with your faulty equipment. Please also ensure you include a clear description of the fault and a completed copy of our Decontamination Certificate. This is available as a downloadable pdf file at www.Cole-Parmer.com, or contact us and we will be happy to send you a copy. Please clearly mark the package for the attention of the Service Department and post to the following address:

Antylia Scientific Ltd
Beacon Road
Stone
Staffordshire
ST15 0SA
United Kingdom

All replacement parts are guaranteed for 1 year and where ever possible, returned equipment is turned around in 10 working days.

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SECTION 9 – Troubleshooting

9.1 ERROR CODES

Refer to the table below to diagnose error codes. If you require further assistance contact Cole-Parmer Help (refer to section 9.2).

Error Code	Error Name	Issue
Err 1	**Dark cal error**	This error occurs when the SP-200-VIS/SP-250-VIS closes the shutter to block light entering the sample chamber. If the detector output does not fall to a level normally associated with a dark cal then this error is indicated. The most likely cause is that the sample chamber lid is not closed.
Err 2	**Light cal error**	This error indicates that there is insufficient light to calibrate to 100%. The most likely cause is that the light at the selected wavelength is being absorbed by a sample in the sample chamber. This error can also be caused if the lamp has failed.
Err 3	**Concentration calibration error**	The calculated factor is outside the instrument range. Recalibrate the instrument using a standard of lower concentration.
Err 4	**Lamp Failure**	The lamp failed after initially finding 0nm peak. If the lamp has failed, it should be replaced.
Err 5	**No light detected**	The instrument has failed to find a zero order peak. Possible causes of this error are that the lamp has failed or that a sample has been left in the unit which is absorbing the zero order light.
Err 6	**No dark level detected**	The instrument checks the region below 320nm which should have no optical throughput. If this region cannot be found the most likely cause is that the sample chamber lid is not closed.

9.2 TECHNICAL SUPPORT

Cole-Parmer have a dedicated Technical Support team made up of experienced scientists who are on hand to help with any applications advice and questions you may have about our products and how to use them. If you require any technical or application assistance please contact the team at:

E-mail: cptechsupport@antylia.com

Phone: +44 (0)1785 810433

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This product meets the applicable CE Directives and UKCA Legislation for radio frequency interference and may be expected not to interfere with, or be affected by, other equipment with similar qualifications. We cannot be sure that other equipment used in its vicinity will meet these standards and so we cannot guarantee that interference will not occur in practise. Where there is a possibility that injury, damage or loss might occur if equipment malfunctions due to radio frequency interference, or for general advise before use, contact the manufacturer.

Declaration of Conformity is available to view online at www.coleparmer.com

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9 Orion Court
Ambuscade Road Colmworth Business Park St. Neots PE19 8YX
United Kingdom
Tel: +44 (0) 1480 277339 Email: enquiries@antylia.com

Ordering Information

Order No.	Cole-Parmer Series	Cole-Parmer Model	Jenway Model	Jenway Part No.
-	SP-200	SP-200-VIS-115	6300 Visible Spectrophotometer 115V	630531
83054-05	SP-200	SP-200-VIS	6300 Visible Spectrophotometer 230V	630501
83054-00	SP-200	SP-250-VIS-115	6320D Visible Spectrophotometer 115V	632621
83054-07	SP-200	SP-250-VIS	6320D Visible Spectrophotometer 230V	632601

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Warranty Registration

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