



**SBL-1, SBL-2,
SBL-2D**
Operator's Manual



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The complex block contains the Tequipment.NET logo on the left, which includes a large red 'T', a blue 'equipment' with a small USA flag above the 'i', and '.NET' in red. To the right of the logo is contact information for Tequipment.NET, including the address, phone number, fax number, and email address, all in bold black text.

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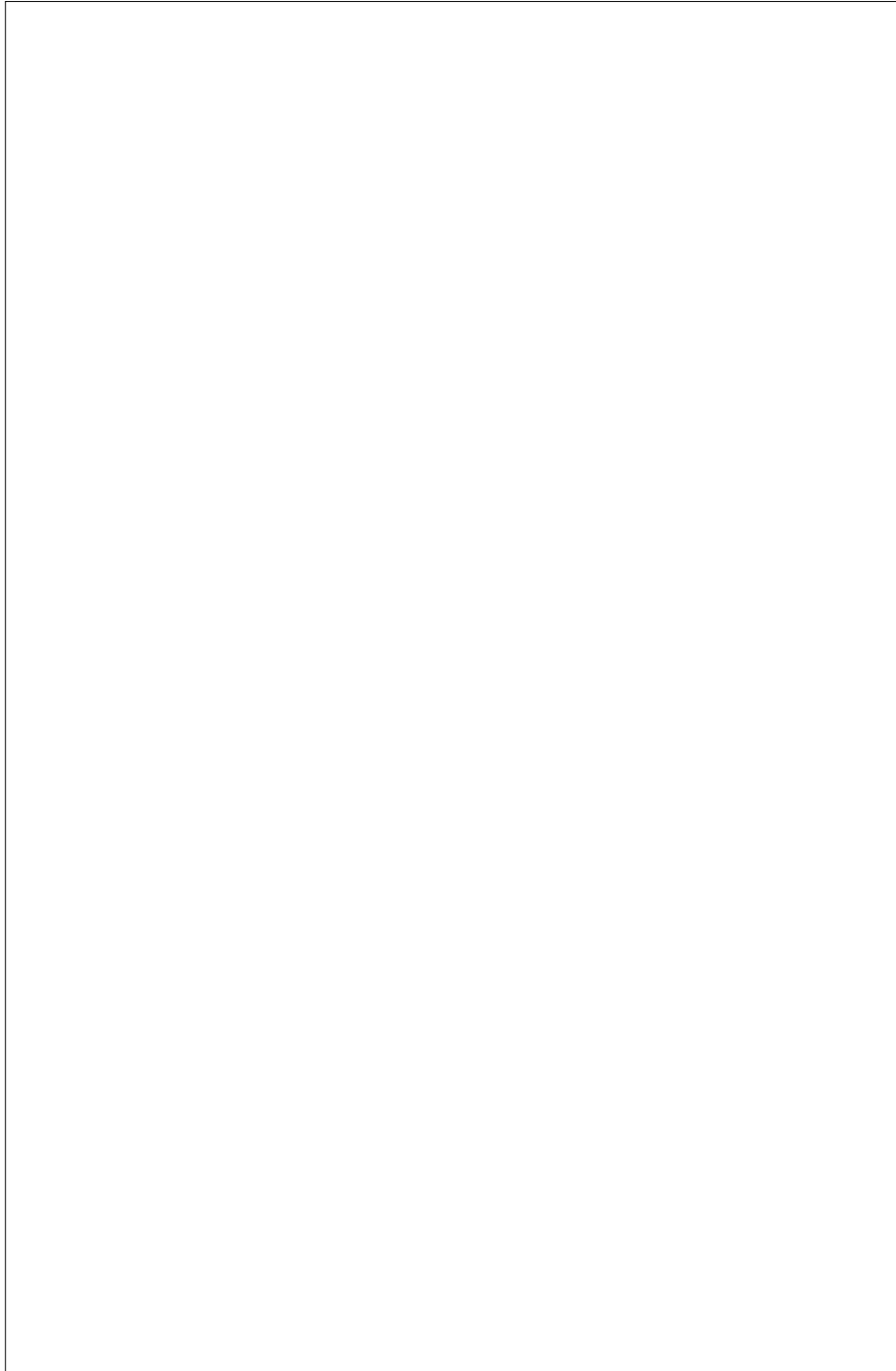
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NOTES

Introduction

Please read all the information in this booklet before using the unit.

Warning

HIGH TEMPERATURES ARE DANGEROUS: they can cause serious burns to operators and ignite combustible material.

Techne have taken great care in the design of these units to protect operators from hazards, but Operators should pay attention to the following points:

- USE CARE AND WEAR PROTECTIVE GLOVES TO PROTECT HANDS;
- DO NOT put hot objects on or near combustible objects;
- DO NOT operate the unit close to inflammable liquids or gases;
- DO NOT place any liquid directly in your unit;
- At all times USE COMMON SENSE.

Operator Safety

All Operators of Techne equipment must have available the relevant literature needed to ensure their safety.

It is important that only suitably trained personnel operate this equipment, in accordance with the instructions contained in this manual and with general safety standards and procedures. If the equipment is used in a manner not specified by Techne the protection provided by the equipment to the Operator may be impaired.

All Techne units have been designed to conform to international safety requirements and are fitted with an overtemperature cutout. On some models, the cutout is adjustable and should be set to suit the application. On all other models the cutout is preset to protect the unit. If a safety problem should be encountered, switch off at the mains socket and remove the plug from the supply.

Installation

1. All Techne units are supplied with a power cable. This may be integral or plug-in.
2. Before connecting the mains supply, check the voltage against the rating plate. The rating plate is on the rear of the unit. Connect the mains cable to a suitable plug according to the table below.

Note that the unit must be earthed to ensure proper electrical safety.

<i>Connections</i>	<i>220V-240V</i>	<i>110V-120V</i>
Live	Brown	Black
Neutral	Blue	White
Earth	Green/yellow	Green

The fused plug supplied with the mains lead for the SBL1 and SBL-2 for use in the UK is fitted with the following value fuse to protect the cable: 13 AMP.

3. Place the unit on a suitable bench or flat workspace, or in a fume cupboard if required, ensuring that the air inlet vents on the underside are free from obstruction.

After use

When you have finished heating samples, remember that parts of the unit – the tubes, blocks and associated accessories – may be very hot. Take the precautions listed earlier.

Guarantee

The unit is guaranteed against any defect in material or workmanship for the period specified on the enclosed guarantee card. This period is from the date of purchase, and within this period all defective parts will be replaced free of charge provided that the defect is not the result of misuse, accident or negligence. Servicing under this guarantee should be obtained from the supplier.

Notwithstanding the description and specification(s) of the units contained in the Operator's Manual, Techne hereby reserves the right to make such changes as it sees fit to the units or to any component of the units.

This Manual has been prepared solely for the convenience of Techne customers and nothing in this Instruction Book shall be taken as a warranty, condition or representation concerning the description, merchantability, fitness for purpose or otherwise of the units or components.

Operator maintenance

NOTE: THAT THIS EQUIPMENT SHOULD ONLY BE DISMANTLED BY PROPERLY TRAINED PERSONNEL. REMOVING THE SIDE, FRONT OR REAR PANELS EXPOSES POTENTIALLY LETHAL MAINS VOLTAGES. THERE ARE NO OPERATOR MAINTAINABLE PARTS WITHIN THE EQUIPMENT.

In the unlikely event that you experience any problems with your unit which cannot easily be remedied, you should contact your supplier and return the unit if necessary. Please include any details of the fault observed and remember to return the unit in its original packing. Techne accept no responsibility for damage to units which are not properly packed for shipping: if in doubt, contact your supplier. See the Decontamination Certificate supplied with your unit.

1. Cleaning

Before cleaning your unit ALWAYS disconnect it from the power supply and allow it to cool below 50° C.

Your unit can be cleaned by wiping with a damp soapy cloth. Care should be exercised to prevent water from running inside the unit. Do not use abrasive cleaners.

2. Fuses

Your unit is protected by one or two fuses. These should only be changed by suitably qualified personnel.

If the fuses blow persistently, a serious fault is indicated and you may need to return the unit to your supplier for repair.

Contact Information

For technical, sales or servicing information, contact your local Techne dealer or,

Barloworld Scientific Ltd
Beacon Road, Stone
Staffordshire
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e-mail: equipment@barloworld-scientific.com

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Web site: www.techneusa.com

Introduction

Veillez lire attentivement toutes les instructions de ce document avant d'utiliser l'appareil.

Avertissement

DANGER DE TEMPERATURES ELEVEES : les opérateurs peuvent subir de graves brûlures et les matériaux combustibles risquent de prendre feu.

Techne a apporté un soin tout particulier à la conception de ces appareils de façon à assurer une protection maximale des opérateurs, mais il est recommandé aux utilisateurs de porter une attention spéciale aux points suivants :

- PROCEDER AVEC SOIN ET PORTER DES GANTS POUR SE PROTEGER LES MAINS.
- NE PAS poser d'objets chauds sur ou près de matériaux combustibles.
- NE PAS utiliser l'appareil à proximité de liquides ou de gaz inflammables.
- NE PAS verser de liquide directement dans l'appareil.
- FAIRE TOUJOURS PREUVE DE BON SENS.

Sécurité de l'opérateur

Tous les utilisateurs de produits Techne doivent avoir pris connaissance des manuels et instructions nécessaires à la garantie de leur sécurité.

Important : cet appareil doit impérativement être manipulé par un personnel qualifié et utilisé selon les instructions données dans ce document, en accord avec les normes et procédures de sécurité générales. Dans le cas où cet appareil ne serait pas utilisé selon les consignes précisées par Techne, la protection pour l'utilisateur ne serait alors plus garantie.

Tous les appareils Techne sont conçus pour répondre aux normes de sécurité internationales et sont dotés d'un coupe-circuit en cas d'excès de température. Sur certains modèles, ce coupe-circuit est réglable pour s'adapter à l'application désirée. Sur d'autres modèles, il est pré-réglé en usine pour assurer la protection de l'appareil.

Dans le cas d'un problème de sécurité, coupez l'alimentation électrique au niveau de la prise murale et enlevez la prise connectée à l'appareil.

Installation

1. Tous les appareils Techne sont livrés avec un câble d'alimentation qui peut être intégré à l'appareil ou à raccorder.
2. Avant de brancher l'appareil, vérifiez la tension requise indiquée sur la plaque d'identification. Raccordez le câble électrique à la prise appropriée en vous reportant au tableau ci-dessous. **Il est important que l'appareil soit relié à la terre pour assurer la protection électrique requise.**

<i>Connexions</i>	220V-240 V	110V-120 V
Phase	marron	noir
Neutre	bleu	blanc
Terre	vert/jaune	vert

3. Placez l'appareil sur un plan de travail ou surface plane, ou le cas échéant, dans une hotte d'aspiration, en s'assurant que les trous d'aération situés sous l'appareil ne soient pas obstrués.

Après utilisation

Lorsque vous avez fini de chauffer les échantillons, n'oubliez pas que certaines parties de l'appareil - les éprouvettes, leurs supports et autres accessoires - risquent d'être très chaudes. Il est donc recommandé de toujours prendre les précautions citées plus haut.

Garantie

L'appareil est garanti contre tout défaut ou visde fabrication pour la durée figurant sur la carte de garantie, à compter de la date d'achat de l'appareil. Au cours de cette période, toutes les pièces défectueuses seront remplacées gratuitement, dans la mesure où la défaillance n'est pas due à une mauvaise utilisation, un accident ou une négligence. Toute réparation sous garantie sera effectuée par le fournisseur.

Malgré la description et les spécifications de l'appareil données dans le manuel de l'utilisateur, Techne se réserve le droit d'effectuer les changements nécessaires à l'appareil ou à tout élément qui entre dans sa composition.

Ce manuel a été exclusivement rédigé à l'attention des clients de Techne, et aucun élément de ce guide d'instructions ne peut être utilisé comme garantie, condition ou représentation concernant la description, commercialisation, adaptation aux conditions d'utilisation ou autre des appareils ou leurs composants.

Entretien utilisateur

IMPORTANT : CET APPAREIL NE PEUT ETRE DEMONTE QUE PAR DU PERSONNEL QUALIFIE.

LORSQUE LES PANNEAUX AVANT, ARRIERE ET LATERAUX SONT DEMONTES, L'OPERATEUR EST EXPOSE A DES TENSIONS QUI PEUVENT ETRE MORTELLES. CET APPAREIL NE CONTIENT AUCUN ELEMENT QUI DEMANDE UN ENTRETIEN DE LA PART DE L'UTILISATEUR.

Dans le cas peu probable où votre appareil présente un défaut de fonctionnement auquel il est difficile de remédier, il est alors préférable de contacter votre fournisseur et, le cas échéant, de renvoyer le matériel. Veuillez inclure une description détaillée du problème constaté et retourner l'appareil dans son emballage d'origine. Techne ne sera pas tenu responsable des dommages subis par tout appareil dont l'emballage est inadéquat pour le transport. Pour plus de sûreté, contactez votre fournisseur. Voir le certificat de décontamination livré avec le produit.

1. Nettoyage

Avant de nettoyer l'appareil, assurez-vous TOUJOURS que le câble d'alimentation est déconnecté et laissez la température redescendre en dessous de 50 °C.

Utilisez un chiffon imprégné d'eau savonneuse pour nettoyer l'appareil. Veillez à ne pas introduire d'eau dans l'appareil. N'utilisez pas de produits abrasifs.

2. Fusibles

La protection de l'appareil est assurée par un ou deux fusibles dont le remplacement ne peut être effectué que par un personnel qualifié.

Si les fusibles sautent sans arrêt, il s'agit d'un problème sérieux. Nous vous conseillons dans ce cas de prendre contact avec votre fournisseur pour réparation.

Einleitung

Bitte lesen Sie diese Bedienungsanleitung komplett bevor Sie dieses Gerät benutzen.

Warnung

HOHE TEMPERATUREN SIND GEFÄHRLICH: sie können dem Bediener ernsthafte Verletzungen zufügen und brennbare Materialien können sich leicht entzünden. Techne hat bei der Konstruktion dieses Gerätes sehr darauf geachtet, daß der Bediener vor Gefahren geschützt ist. Dennoch sollten Sie auf die folgenden Punkte achten:

- SEIEN SIE VORSICHTIG UND TRAGEN SIE SCHUTZHANDSCHUHE
- Legen Sie heiße Gegenstände NICHT auf oder in die Nähe von leicht brennbaren Materialien; vermeiden Sie Arbeiten in der Nähe von leicht entzündbaren Flüssigkeiten oder Gasen.
- Bringen sie KEINE Flüssigkeiten direkt in Ihr Gerät.
- Benutzen Sie immer den normalen Menschenverstand

Sicherheit des Anwenders

Alle Benutzer von Techne Geräten müssen Zugang zu der entsprechenden Literatur haben, um ihre Sicherheit zu gewähren.

Es ist wichtig, daß diese Geräte nur von entsprechend geschultem Personal betrieben werden, das die in dieser Gebrauchsanweisung enthaltenen Maßnahmen und allgemeine Sicherheitsbestimmungen und -vorkehrungen beachtet. Wenn das Gerät anders eingesetzt wird als vom Hersteller empfohlen, kann dies die persönliche Sicherheit des Anwenders beeinträchtigen. Die Geräte von Techne entsprechen den internationalen Sicherheitsbestimmungen und sind mit einem automatischen Übertemperaturabschalter ausgestattet. Bei einigen Modellen ist der Übertemperaturabschalter verstellbar und sollte je nach Anwendung entsprechend eingestellt werden. Bei allen anderen Modellen ist der Temperaturschutz voreingestellt um Schäden am Gerät zu vermeiden. Wenn ein Sicherheitsproblem auftreten sollte, muß das Gerät ausgeschaltet und vom Stromnetz getrennt werden.

Installation

1. Alle Techne Geräte werden mit einem Stromanschlußkabel geliefert. Dieses ist entweder fest mit dem Gerät verbunden oder zum Einstecken.
2. Vergleichen Sie, ob die Spannung Ihrer Stromversorgung mit den Angaben auf dem Typenschild des Gerätes übereinstimmen. Verbinden Sie das Stromanschlußkabel mit einer geeigneten Stromversorgung gemäß der nächstehenden Tabelle. **Achtung:** Das Gerät muß geerdet sein, um die elektrische Sicherheit zu gewährleisten!

<i>Verbindungen</i>	<i>220V-240V</i>	<i>110V-120V</i>
Stromführend	Braun	Schwarz
Neutral	Blau	Weiß
Erde	Grün/Gelb	Grün
3. Stellen Sie das Gerät auf eine ebene Arbeitsfläche bzw. (falls erforderlich) unter einen Laborabzug. Beachten Sie, daß die Entlüftungsrippen an der Geräteunterseite immer frei zugänglich sind.

Nach dem Gebrauch

Vergessen Sie nicht, daß Teile des Gerätes (die Gefäße, die Blöcke und andere Zubehörteile) nach dem Erhitzen von Proben noch sehr heiß sein können. Bitte beachten Sie die oben genannten Vorsichtsmaßnahmen.

Garantie

Die Garantiedauer des Gerätes ist auf der beiliegenden Garantiekarte angegeben und schließt Fehler im Material oder der Verarbeitung ein. Die Garantiedauer beginnt am Tag des Einkaufs. Sämtliche defekte Teile werden innerhalb dieses Zeitraumes kostenlos ersetzt unter der Voraussetzung, daß dem Defekt keine unsachgemäße Handhabung, Fahrlässigkeit oder ein Unfall zugrundeliegt. Der unter diese Garantie fallende Service wird vom Lieferanten geleistet. Ungeachtet der in dieser Gebrauchsanweisung enthaltenen Beschreibungen und Spezifikationen, behält sich Techne hiermit das Recht vor, Änderungen an den Geräten bzw. an einzelnen Geräteteilen durchzuführen.

Diese Gebrauchsanleitung wurde ausschließlich dazu erstellt, um Kunden die Handhabung der Techne-Geräte zu erleichtern. Nichts in dieser Gebrauchsanleitung darf als Garantie, Bedingung oder Voraussetzung verstanden werden, sei es die Beschreibung, Marktgängigkeit, Zweckdienlichkeit oder sonstiges bezüglich der Geräte oder deren Bestandteile.

Wartung durch den Bediener

BEACHTEN SIE, DASS DIESES GERÄT NUR VON TECHNISCHEN FACHKRÄFTEN GEÖFFNET UND DEMONTIERT WERDEN DARF.

DURCH ENTFERNEN DES GERÄUSES ODER GEHÄUSETEILEN SIND BAUTEILE MIT LEBENGEFÄHRLICHEN SPANNUNGEN FREI ZUGÄNGLICH.

IM INNERN DES GERÄTES BEFINDEN SICH KEINE TEILE, DIE VOM ANWENDER GEWARTET WERDEN MÜSSEN.

Falls Ihr Gerät nicht ordnungsgemäß arbeitet, wenden Sie sich an Ihren Lieferanten oder senden Sie das Gerät wenn nötig zurück. Fügen Sie eine genaue Beschreibung des Defektes bei. Verpacken Sie das Gerät möglichst im Originalkarton. Bitte beachten Sie, daß Techne keine Haftung bei Transportschäden aufgrund unzureichender Verpackung übernehmen. Setzen Sie sich im Zweifelsfall mit Ihrem Lieferanten in Verbindung. Bitte beachten Sie die Entgiftungsbescheinigung, die Sie mit dem Gerät erhalten haben.

1. Reinigen

Bevor Sie Ihr Gerät reinigen, sollten Sie

- zuerst den Netzstecker ziehen
- das Gerät unter 50°C abkühlen lassen.

Ein feuchtes Tuch mit Seifenlösung reinigt Ihr Gerät am besten. Achten Sie darauf, daß kein Wasser in das Gerät gelangt. Verwenden Sie keine Scheuermittel.

2. Sicherungen

Die Stromzuleitung ist durch ein oder zwei Sicherungen geschützt. Diese sollten nur durch qualifiziertes Fachpersonal ausgetauscht werden. Wenn die Sicherung wiederholt durchbrennt, liegt ein größerer Defekt vor. Das Gerät muß zur Reparatur an Ihren Lieferanten eingesandt werden.

Introducción

Le rogamos lea cuidadosamente la información contenida en este folleto antes de manipular el aparato.

Aviso

LAS TEMPERATURAS ELEVADAS SON PELIGROSAS: pueden causarle graves quemaduras y provocar fuego en materiales combustibles.

Techne ha puesto gran cuidado en el diseño de estos aparatos para proteger al usuario de cualquier peligro; aún así se deberá prestar atención a los siguientes puntos:

- EXTREME LAS PRECAUCIONES Y UTILICE GUANTES PARA PROTEGERSE LAS MANOS;
- NO coloque objetos calientes encima o cerca de objetos combustibles;
- NO maneje el aparato cerca de líquidos inflamables o gases;
- NO introduzca ningún líquido directamente en el aparato;
- UTILICE EL SENTIDO COMUN en todo momento.

Seguridad del usuario

Todos los usuarios de equipos Techne deben disponer de la información necesaria para asegurar su seguridad.

De acuerdo con las instrucciones contenidas en este manual y con las normas y procedimientos generales de seguridad, es muy importante que sólo personal debidamente capacitado opere estos aparatos. De no ser así, la protección que el equipo le proporciona al usuario puede verse reducida.

Todos los equipos Techne han sido diseñados para cumplir con los requisitos internacionales de seguridad y traen incorporados un sistema de desconexión en caso de sobretensión. En algunos modelos el sistema de desconexión es variable, lo que le permite elegir la temperatura según sus necesidades. En otros, el sistema de desconexión viene ya ajustado para evitar daños en el equipo.

En caso de que surgiera un problema de seguridad, desconecte el equipo de la red.

Instalación

1. Todos los aparatos Techne se suministran con un cable de alimentación. Puede ser fijo o independiente del aparato.
2. Antes de conectarlo, compruebe que el voltaje corresponde al de la placa indicadora. Conecte el cable de alimentación a un enchufe adecuado según la tabla expuesta a continuación. El equipo debe estar conectado a tierra para garantizar la seguridad eléctrica.

<i>Conexiones</i>	220V-240V	110V-120V
Línea	Marrón	Negro
Neutro	Azul	Blanco
Tierra	Verde/amarillo	Verde

3. Sitúe el aparato en un lugar apropiado tal como una superficie de trabajo plana, o si fuera necesario incluso en una campana con extractor de humos, asegurándose de que las entradas de aire en la parte inferior no queden obstruidas.

Después de su uso

Cuando haya finalizado el calentamiento de muestras, recuerde que las piezas del equipo, tales como tubos, bloques y demás accesorios, pueden estar muy calientes. Tome las precauciones mencionadas anteriormente.

Garantía

Este aparato está garantizado contra cualquier defecto material o de fabricación durante el periodo especificado en la tarjeta de garantía adjunta. Este plazo inicia a partir de la fecha de compra, y dentro de este periodo todas las piezas defectuosas serán reemplazadas gratuitamente siempre que el defecto no sea resultado de un uso incorrecto, accidente o negligencia. Mientras se encuentre bajo garantía las revisiones las debe llevar a cabo el proveedor.

A pesar de la descripción y las especificaciones de los aparatos contenidas en el Manual del Usuario, Techne se reserva por medio de este documento el derecho a efectuar los cambios que estime oportunos tanto en los aparatos como en cualquier componente de los mismos. Este manual ha sido preparado exclusivamente para los clientes de Techne y nada de lo especificado en este folleto de instrucciones se tomará como una garantía, condición o aseveración de la descripción, comerciabilidad o adecuación para cualquier fin específico de los aparatos o sus componentes.

Mantenimiento

ESTE APARATO DEBE SER DESMONTADO SOLO Y EXCLUSIVAMENTE POR PERSONAL DEBIDAMENTE CAPACITADO.

EL RETIRAR LOS PANELES LATERALES, FRONTALES O TRASEROS SUPONE DEJAR AL DESCUBIERTO TENSION DE LA RED PELIGROSA.

EL EQUIPO NO CONSTA DE NINGUNA PIEZA DE CUYO MANTENIMIENTO SE PUEDA ENCARGAR EL USUARIO.

En el caso improbable de que experimentara algún problema con su aparato que no pudiera resolver con facilidad, debería ponerse en contacto con su proveedor y devolverlo si fuera necesario. Indique de forma detallada todos los defectos que haya notado y devuelva el equipo en su embalaje original. Techne no aceptará responsabilidad alguna por daños causados en equipos que no estuvieran debidamente embalados para su envío; si tuviera alguna duda, póngase en contacto con su proveedor. Sírvase consultar el Certificado de Descontaminación suministrado con su aparato.

1. Limpieza

Antes de limpiar su aparato, desconéctelo SIEMPRE de la fuente de alimentación y permita que se enfríe por debajo de los 50°C.

Este aparato se puede limpiar pasándole un paño húmedo enjabonado. Hágalo con cuidado para evitar que caiga agua dentro del mismo. No utilice limpiadores abrasivos.

2. Fusibles

Su aparato está protegido por uno o dos fusibles. Sólo deben cambiarlos personal debidamente capacitado.

Si los fusibles se fundieran repetidamente, esto indicaría una avería grave y puede que tuviera que devolverle el aparato a su proveedor para su reparación.

THE FLUIDISED BATH

Read the whole of this book before commencing work with the unit.

The SBL-1 bath inner is a cylindrical solid drawn stainless steel vessel of inside diameter 230 mm (9"). SBL-2 and the SBL-2D bath inner is a cylindrical stainless steel vessel of welded construction and inside diameter 230 mm (9"). This vessel is suspended in, but thermally insulated from, an outer mild steel cylindrical container. The porous plate in the SBL-1 is mounted in a resilient gas tight seal at the bottom of the bath. The porous plate in the SBL-2/SBL-2D is made of either sintered or woven mesh stainless steel and is mounted across the vessel between compression flanges. Bath insulation is provided by fibreglass but some circulation of air is provided to prevent the outer container from getting too hot.

Each of these fluidised baths have 1kW Inconel sheathed electric heating elements mounted just above the porous plate. The SBL-1 has two, the SBL-2 has three and the SBL-2D has four heaters. The air control valve is mounted at the right hand side of the bath. A pneumatically operated safety switch is fitted which switches off the heating current in the event of failure of the air supply.

Temperature control is achieved by a manually operated energy regulator. This may be by-passed by setting it to maximum and fitting an externally connected controller, the Techne TC-8 or TC-8D for example. On the SBL-1 a switch is fitted for the selection of either 1kW or 2kW heat input. On the SBL-2 and SBL-2D switches are fitted for the selection of either 1kW or 2kW or 3kW heat input but only the initial 1kW is controlled by the energy regulator. On the SBL-2D a switch is fitted for the selection of the fourth boost heater, this heater is not controlled by the energy regulator.

Each heater has its own neon light indicator to show when it is working.

The air supply must be from a filtered and regulated air line or alternatively a Techne air pump, F119D for 240V or F119P for 120V, may be used. The air pump includes a safety valve and special filters and is driven by 1/4 HP electric motor.

Operator Safety

It is important that only suitably instructed personnel operate this equipment. It must also be used in accordance with the instructions contained in this manual and with proper safety standards and procedures.

It is imperative that all personnel who may come into contact with our equipment have available such of our literature as they require to ensure their safety.

Principles of operation

Small solid particles can be readily 'fluidised' by means of a suitable gas (air) stream. Clean dry air at a constant pressure of about 21kN/m² (3 lb/in²) from a pump, or from an air line, is supplied via a control valve to a chamber beneath the diffuser (porous plate). This diffuser ensures a uniform flow of air across the full section of the container and acts also as a support plate for the sand.

As the control valve is slowly opened the solid sand bed remains undisturbed and the air finds its way between the particles; under such conditions the pressure drop is proportional to the rate of flow of air. As the valve is opened further the air drag on the particles will cause them to separate and the whole mass of the bed can be seen to have expanded. The bed now behaves as a fluid and is said to be 'fluidised'. Further opening of the valve is not accompanied by an increase in pressure drop, which remains constant at a value corresponding to the head of the column of particles, but the bed becomes more turbulent and will have the appearance of boiling liquid. The heat transfer and most uniform temperatures are obtained when the bath is in this 'boiling' state.

Characteristic of a fluidised bath

A bath of fluidised solid particles behaves as a bath filled with an insulating non-volatile liquid and it shares with liquid baths the desirable characteristics of accessibility, uniformity of temperature and good heat transference. It is not, however, possible to obtain such a close temperature control as in a true liquid as the effective specific heat of a fluidised solid is much less than that of a liquid. On the other hand this small thermal capacity gives a rapid heat up from room temperature.

A typical heat transfer figure is $600 \text{ W/m}^2/\text{°C}$. Mr H. Sutcliffe* has pointed out the advantages of a fluidised bath for testing electrical components. The only electrical leakage that takes place is by physical transfer of charged particles so that the leakage currents are very small, being of the order of 10^{-9} amperes for a potential difference of 200 volts between electrodes 10 mm square at a spacing of 5 mm.

A fluidised bath is, of course, much cleaner than an oil bath and objects do not have to be cleansed on removal from the bath. A light dusting of the object with a brush is enough to return particles to the bath. It is necessary to clamp vessels as the fluidised bath produces appreciable buoyancy.

* Electronic Engineering, February 1961. pp. 94-95.

Cleaning your unit

Before cleaning your unit ALWAYS disconnect from the power supply and allow to cool below 50°C .

The outside of your fluidised bath can be cleaned by wiping with a damp soapy cloth. Care should be exercised to prevent water from running inside the unit. Do not use abrasive cleaners.

Before using any cleaning or decontamination method, except those recommended here, the customer should check with Techne that the proposed method will not damage the fluidised bath.

SPECIFICATION**SBL-1**

Temperature range	Minimum	50°C
	Maximum	350°C
Short Term Stability	at 50°C	±1°C
	at 350°C	±2°C
Heater power		2 x 1 KW
Heat up time 20°C to 350°C		1 h
Cool down time to 200°C		2 h 30 min
Electrical supply		240 V 50/60 Hz 120 V 50/60 Hz
Air supply	Pressure	21 kN/m ² (3 psi)
	Max Flow	57 l/min
Overall Dimensions } excluding tap }	Diameter	315 mm
	Height	470 mm
Internal Dimensions	Diameter	228 mm
	Usable Depth	120 mm
Weight	Net	26 kg
Alundum		16 kg

SBL-2

Temperature range	Minimum	50°C
	Maximum	600°C
Short Term Stability	at 50°C	±1°C
	at 600°C	±3°C
Heater power		3 x 1 KW
Heat up time 20°C to 600°C		1 h 45 min
Cool down time to 200°C		5 h
Electrical supply		240 V 50/60 Hz
Air supply	Pressure	21 kN/m ² (3 psi)
	Max Flow	57 l/min
Overall Dimensions } excluding tap }	Diameter	385 mm
	Height	470 mm
Internal Dimensions	Diameter	228 mm
	Usable Depth	140 mm
Weight	Net	30 kg
Alundum		16 kg

SBL-2D

Temperature Range	Minimum	50°C
	Maximum	600°C
Short Term Stability	at 50°C	±1°C
	at 600°C	±3°C
Heater power		4 x 1 KW
	Note at 230V this is 17 amp	
Heat up time 20°C to 600°C		1 h 45 min
Cool down time to 200°C		5 h 30 min
Electrical supply		240 V 50/60 Hz
Air supply	Pressure	21 kN/m ² (3 psi)
	Max Flow	57 l/min
Overall Dimensions excluding tap	Diameter	385 mm
	Height	695 mm
Internal Dimensions	Diameter	228 mm
	Usable Depth	350 mm
Weight	Net	49 kg
	Alundum	32 kg

INSTALLATION

- 1 Before connecting the mains supply check the voltage with that marked on the rating plate. Connect the mains cable to a suitable supply as follows:

CONNECTIONS	220/240V	110/120V
Live	Brown	Black
Neutral	Blue	White
Earth	Green/yellow	Green

The SBL-1 needs at least a 9 amp supply and the SBL-2 needs at least a 13 amp supply at a nominal 230V. The SBL-2D will use 17 amps and needs its own separate supply capable of taking this current.

- 2 Ensure that the air control valve is closed, then connect the air inlet to the correct supply. 21 kN/m² (3 l/in²) and up to 57 l/min (2 ft³/min) is required. It is most important that clean, dry air is used. For permanent set-ups the use of standard hose clips is recommended at the connections.

NOTE: If the pump unit supplied by Techne is used, no adjustments are necessary and the unit can be connected directly to the bath.

- 3 Set both the energy regulator and heater control switches to the OFF position before connecting to the correct electrical supply.
- 4 IF THIS PRODUCT IS USED FOR PROCESSING ITEMS WHICH MAY EMIT TOXIC FUMES, IT IS ESSENTIAL THAT AN ADEQUATE FUME EXTRACTION SYSTEM BE INSTALLED.
- 5 **ALUNDUM**

Should the fluidised bath be stored for long periods of time under damp or humid conditions, moisture may be absorbed by the alundum which is hygroscopic. To avoid violent fluidisation which occurs when damp alundum is heated above 100°C, operate the bath for a period of approximately 8 hours at 90°C prior to operation at elevated temperatures.

NEVER ADD COLD OR DAMP ALUNDUM TO A HOT BATH AS THIS WILL ALSO CAUSE VIOLENT FLUIDISATION WHICH CAN BE DANGEROUS. Allow the bath to cool then add the fresh alundum. If this fresh alundum is a large proportion of the charge then dry the whole charge as above.

OPERATION

- 1 Fill the SBL-1 to within about 40 mm (1.5" to 2") or the SBL-2 and SBL-2D to within 76 mm (3") from the top with the alundum. Make sure it is dry.
- 2 Slowly open the air control valve until the bed gives the appearance of continuous boiling.
The bath is now ready for use and temperature setting.
- 3 If a rapid heat-up of the bath is required, set the heater switches to 'high' (SBL-1 2kW, SBL-2 3kW, SBL-2D 4kW) and set the energy regulator knob to a high value (say 8 or 9 on the scale), then as the desired temperature is approached the knob should be slowly turned anti-clockwise to a lower reading until control about the desired mean temperature is achieved. At this stage it may be necessary to switch out some of the heaters.

NOTE: The energy regulator has an arbitrary scale which is not a temperature scale.

At a setting of 10 the heater will be continuously on. A little practice will soon enable rapid temperature selection.

A Techne TC-8 or TC-8D temperature controller may be connected externally into the circuit provided the energy regulator remains set at 10.

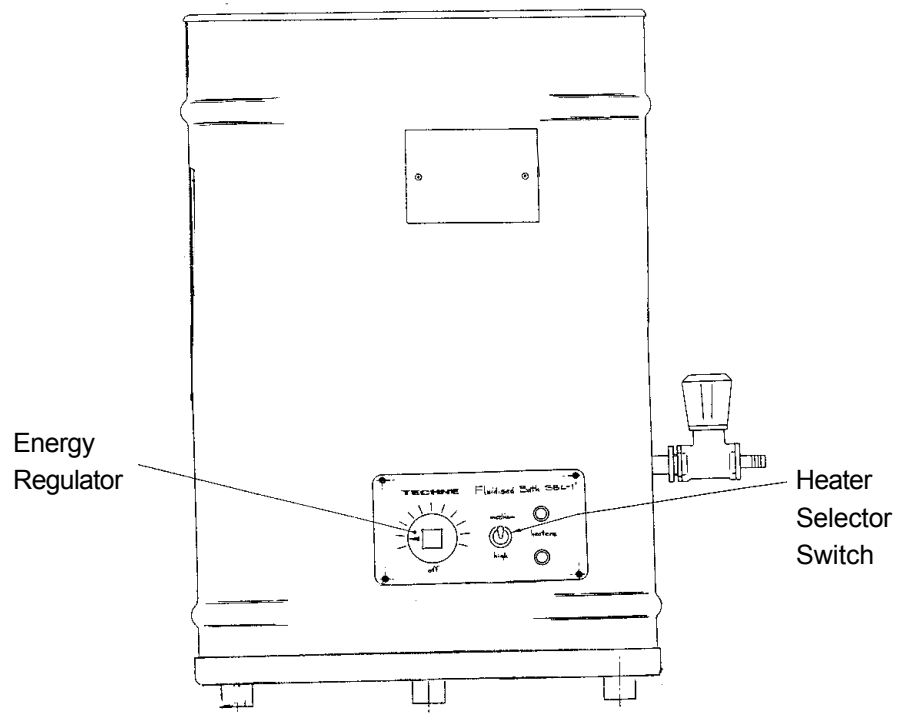
- 4 With increase in temperature, or when objects are placed into or taken from the bath, adjustment of the air control valve may be necessary, but the bed must be kept vigorously boiling.
- 5 AS THIS UNIT DOES NOT CONVEY THE EFFECTS SUCH AS VAPOUR OR SMELL NORMALLY ASSOCIATED WITH HIGH TEMPERATURE BATHS, WE ADVISE THAT ONLY TRAINED OPERATORS BE ALLOWED TO USE IT.

- 6 For the SBL-1 it has been found that under most conditions, only one heater (1kW) is required to maintain temperatures in the bath up to the maximum of 350°C, the second heater only being used as a 'boost' heater.

Heater switch positions: HIGH = 2kW

MEDIUM = 1kW

Maximum temperature for this bath: 350°C (662°F).

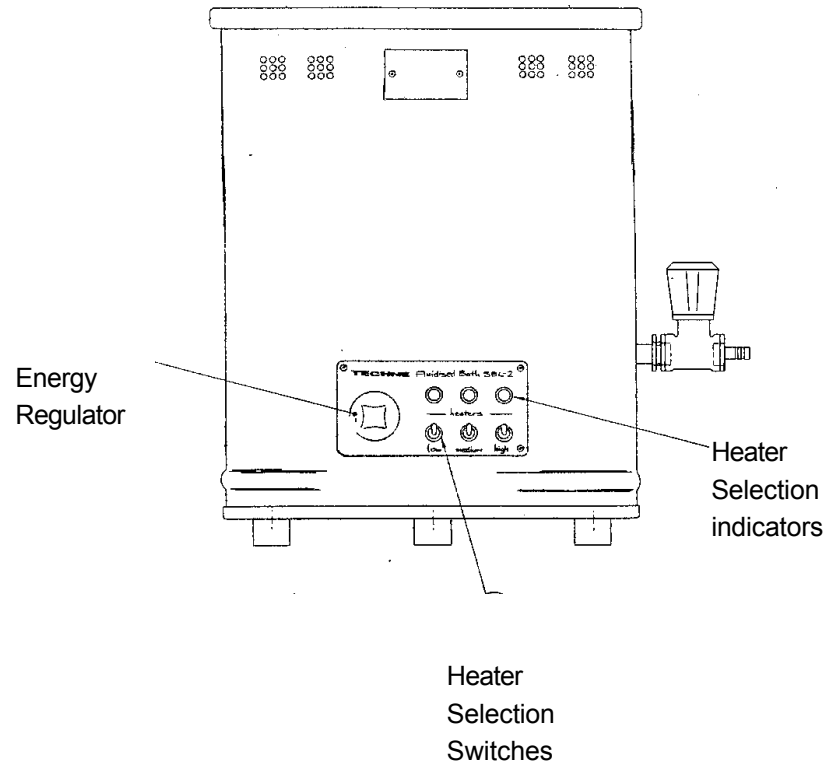


- 7 For the SBL-2 the following table indicates the heat input required to maintain a range of temperatures, with the energy regulator control:

Bath Temperature	Heater Switches	Energy Reg Setting
200°C (392°F)	LOW	7 to 8
300°C (572°F)	LOW	9 to 10
400°C (752°F)	MEDIUM	2 to 3
500°C (932°F)	MEDIUM	8 to 9
600°C (1112°F)	HIGH	4 to 5

The third heater is only used as a 'boost' heater.

Maximum temperature for this bath: 600°C (1112°F).



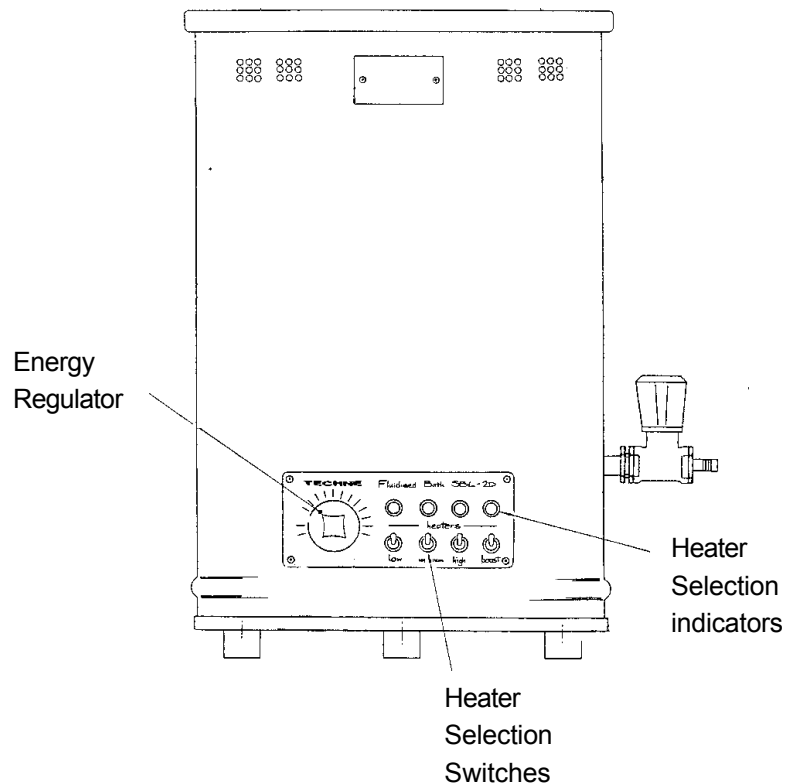
- 8 For the SBL-2D the following table indicates the heat input required to maintain a range of temperatures, with the energy regulator control:

Bath Temperature Setting	Heater Switches	Energy Reg
200°C (392°F)	LOW	7 to 8
300°C (572°F)	LOW	9 to 10
400°C (752°F)	MEDIUM	2 to 3
500°C (932°F)	MEDIUM	8 to 9
600°C (1112°F)	HIGH	4 to 5

The fourth heater is only used as a 'boost' heater.

THE FOURTH HEATER IS NOT CONTROLLED BY THE ENERGY REGULATOR AND SHOULD BE SWITCHED OFF WHEN CONTROL TEMPERATURE IS REACHED.

Maximum temperature for this bath: 600°C (1112°F).



MAINTENANCE

This unit is designed for continuous operation and requires very little routine maintenance.

- 1 The bath level should be maintained regularly and periodically the bath should be emptied and the alundum screened (or replaced).

Should the fluidised bath be stored for long periods of time under damp or humid conditions, moisture may be absorbed by the alundum which is hygroscopic. To avoid violent fluidisation which occurs when damp alundum is heated above 100°C, operate the bath for a period of approximately 8 hours at 90°C prior to operation at elevated temperatures.

NEVER ADD COLD OR DAMP ALUNDUM TO A HOT BATH AS THIS WILL ALSO CAUSE VIOLENT FLUIDISATION WHICH CAN BE DANGEROUS. Allow the bath to cool then add the fresh alundum. If this fresh alundum is a large proportion of the charge then dry the whole charge as above.

- 2 Always ensure that clean, dry air is used and that the correct electrical supply is properly connected.
- 3 Periodically check the following components for damage or malfunctioning:
 - a) Porous Plate. Check for cracks, or leakage of air through the rubber seal around the periphery
 - b) Heaters. Check for bad 'scaling' or signs of local deterioration.
 - c) Energy Regulator. When switched on the contacts can be heard to 'click' on and off periodically except when set at 10 position.
 - d) Safety Switch. When the sand bed is solid, the heater circuit should be automatically broken. With the bed just 'fluidised' the heater circuit should be completed. (Both tests should be made with the energy regulator set at 10).

FAULT FINDING

The following guide has been prepared to help you get your fluidised bath back into service as soon as possible, should a fault develop. If in doubt, please return the unit to the manufacturers for servicing. Please refer to the next section for dismantling procedure.

Fault	Action required
1 Sand Bed will not fluidise	
a Air lines blocked	Check all air lines and connections for leaks or restrictions.
b Incorrect air supply	Check air supply for correct pressure 21 kN/m ² (3 lb/in ²) and adequate flow (up to 57 l/min) (2 ft ³ /min).
c Filters blocked or leaking	Check all filters for leaks or restrictions.
d Control valves not working correctly	Check functioning of all regulators or control valves in the air line.
e Bed material damp	If the bed material has become damp due to spillage of liquid, etc., then empty the bath immediately. Blow air through the porous plate to remove all moisture and dry the bath material by other means before replacing it in the bath. DO NOT ATTEMPT TO DRY OUT REALLY DAMP MATERIAL IN THE BATH ITSELF.
2 Bed 'boiling' erratically in one spot	
a Porous plate cracked	Check porous plate or its seal for cracks or leaks. Replace porous plate if damaged.
3 Bath not heating	
a Incorrect electrical supply	Check supply (220/250 volts, 50/60Hz or 110/125 volts, 50/60Hz) and all external connections.

- | | | |
|---|------------------------------------|--|
| b | Energy regulator not functioning | Connect an ammeter (range up to 15 amps a.c.) into the mains lead:- adjust the heater switch to the LOW position. Fluidise the bed and by switching the energy regulator to a reading of 5, observe that current flow alternates from 0 to approx. 4.3 amps. If no current flows at all then check items c to f and then if necessary replace the regulator. |
| c | Fail safe switch not functioning | Connect an ammeter (range up to 15 amps a.c.) into the mains lead:- Adjust the heater switch to the LOW position and set the energy regulator at 10. Fluidise the bed (continuous boiling action) and observe that the ammeter registers approx. 4.3 amps. Position the heater switches on the SBL-1 to the HIGH position or on the SBL-2 and the SBL-2D to the MEDIUM position and observe that a current of approx. 13 amps flows. On the SBL-2D a similar check should be made for the fail safe switch on the boost heater. If this current is not registered then check all other items; if necessary replace the fail safe switch. |
| d | Internal electrical wiring damaged | With the electrical supply disconnected:- remove the baseplate of the unit and carefully check all internal wiring. Insulation meter or resistance meter would be useful for third check. A practical wiring layout is shown in the diagram |

- | | | |
|---------------------------|---|---|
| e | Heater switch not functioning or heaters burnt out | Connect an ammeter (range up to 15 amps a.c.) into the mains lead:-
Adjust the heater switches to the LOW position and set the energy regulator at 10. Fluidise the bed and if both switch and heater function correctly a current of approx. 4.3 amps will flow. The top neon should also light. With the heaters switched to HIGH on the SBL-1 or MEDIUM on the SBL-2 or SBL-2D, a current of 8.7 amps should flow. SBL-2 or SBL-2D: Switch set to HIGH 13 amps should flow. Replace either heater or switch as necessary. |
| f | Failure of pneumatic safety switch (situated within outer case) | Check connecting pipe from the control valve through to the switch. Disconnect the rubber tube at a convenient point and check operation of the switch by blowing into the tube, a definite click should be heard from the switch. |
| 4 Bath overheating | | |
| a | Energy regulator damaged | Repeat checks as in 3 b above. |
| b | Heater switch damaged | Repeat checks as in 3 e above. |

Alternatively, all checks in sections 3 and 4 can be carried out with the power disconnected and by using an appropriate resistance or insulation meter.

ACCESSORIES

F5915	FILTER/REGULATORSET
F119D	AIR PUMP 240V
F119J	AIR PUMP 200V 50HZ
F119A	AIR PUMP 200V 60HZ
F937C	TC-8D TEMP CONT 120/240V USA °C
F937F	TC-8D TEMP CONT 120/240V USA °F
F937H	TC-8DTEMP CONT 120/240V
F7807	SBL-1 BASKET
F7804	SBL-2 BASKET
F7805	SBL-2D BASKET
F0885	ALUMDUM 16kg



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