



**GT-3 and GT-4
Gelation Timer
Operator's Manual**

Issue 20

Date of issue:

23rd July 2003.

Techne is the trade mark of

Techne and Techne Inc

© Techne 2002



Barloworld Scientific

CONTENTS**GT-3 and GT-4 Operator's Manual***page***SAFETY and INSTALATION**

CE Declaration of Conformity	3
English	4
Français	6
Deutsch	8
Español	10

INTRODUCTION 12

Packing	12
Description	12
Specification	13
Installation	14

OPERATION 15**TECHNICAL INFORMATION** 16

Operator maintenance	16
Servicing	17
Replacement parts	18





Techne
Duxford
Cambridge
CB2 4PZ



Declaration of Conformity

Techne Units GT-3 and GT-4 have been designed to comply with the following European Standards:

EN 50081-1:1992 Electromagnetic Compatibility; Generic emission standard.

EN 50082-1:1992 Electromagnetic Compatibility; Generic immunity standard (Performance criterion B).

EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control and laboratory use.

I have made all reasonable enquiries regarding the unit stated and its conformance to the following EU directives.

Low Voltage directive, 73/23/EEC and amendment 93/68/EEC, and EMC Directive 89/336/EEC and amendments 91/263/EEC and 92/31/EEC.

To the best of my knowledge and belief these units conforms to these directives.

This Declaration is controlled under an ISO 9001:2000 system certificated by BSI Quality Assurance, certificate number FM13585.

Signature *BCCoombes*
Name B C Coombes
Position Quality Manager
Issue 5 23/07/2003

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

A fused plug when fitted to the mains lead for use in the UK should be fitted with the following value fuse to protect the cable: 3AMP.

Note that units marked 230V on the rating plate work at 220V; units marked 120V work at 110V.

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.

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.

Contact Information

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

Cambridge, CB2 4PZ, United Kingdom.

Telephone: +44(0)1223 832401

Fax: +44(0)1223 836838

Service: +44(0)1223 836950 Out of office hours

e-mail: sales@techne.com

Web site: www.techne.com

or,

Techne Inc, 3 Terri Lane,

Suite 10, Burlington,

New Jersey 08016, USA.

Telephone: 609-589-2560

Toll free: 800-225-9243 ext 306

Fax: 609-589-2571

e-mail: labproducts@techneusa.com

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

Le fusible à l'intérieur de l'appareil est destiné à assurer la protection de l'appareil et de l'opérateur. **Remarque** : les appareils dont la plaque indique 230 V peuvent fonctionner sur 220 V, et ceux dont la plaque indique 120 V peuvent fonctionner sur 110 V. La plaque d'identification se trouve à l'arrière de l'appareil.

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.

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.

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 Geräte 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

Geräte, die für 230 Volt ausgelegt sind, können auch bei 220 Volt arbeiten, Geräte für 120 Volt auch bei 110 Volt. Das Typenschild befindet sich hinten am Gerät.

3. Stellen Sie das Gerät auf eine ebene Arbeitsfläche bzw. (falls erforderlich) unter einen Laborabzug. Beachten Sie, daß die Entlüftungsrillen 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.

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.

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 sobretemperatura. 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

Asegúrese de que los equipos marcados 230V en la placa indicadora funcionan a 220V y de que los equipos marcados 120V funcionan a 110V. La placa indicadora está situada en la parte posterior del equipo.

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.

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.

INTRODUCTION

It is advisable to read the whole of this book before commencing work with the unit.

Principles of Operation

As polymerisation proceeds in a liquid polymer a point will be reached at which on average there will be one cross link per molecule and at this point gelation will be observed. The gel formed may be soft but it will have the property of a solid of elastic recovery from deformation. This change from liquid to a solid is preceded by a considerable rise in viscosity.

An instrument to measure the time of gelation must be able to discriminate between a state of high viscosity and of elasticity. A gelation timer operated primarily by change in viscosity would be wrong in principle and, although it might give useful control tests on a particular product, it could not be expected to give times in accordance with the fundamental theoretical analysis of gelation.

The design of the Techne gelation timer¹ was based on the above considerations. A flat weighted disc, connected by a link with end play in it, to a crank turned by a synchronous motor falls under gravity in the polymer liquid but is pulled up on the upstroke by the synchronous motor. At the gel point the rigidity of the polymer is sufficient to support the weight of the disc, this causes the link to be compressed and to close an electric circuit. This operates a relay which stops the synchronous motor and lights a neon lamp. The gelation time can be read on a digital minutes counter connected to the synchronous motor.

The motion of the disk is resisted both by elastic and by viscous forces but the size, weight and time have been chosen so that the magnitude of a purely viscous force sufficient to trip the mechanism would be far greater than is observed in practice before gelation has taken place.

The work of B. A. Hills² has shown that gelation times measured by this instrument with suitable choice of disc diameter, are in excellent agreement with predicted values based on the analysis of P. J. Flory³ as shown for example by the following table:-

<i>Molecular weight of Polyamide</i>	<i>'FLORY' time</i>	<i>'TECHNE' time</i>
19800	139 minutes	135 minutes
17200	160 minutes	151 minutes
13500	203 minutes	193 minutes
12200	225 minutes	224 minutes
10000	275 minutes	260minutes

Measurements of gelation time with the Techne Gelation Timer are thus a very simple method of making fundamental control tests on a polymeric product quite apart from their practical significance to the user who must be assured of a known time of use (after addition of catalyst) before gelation takes place.

The Techne Gelation Timer conforms to the requirements of BS 3532 : 1990 and BS 2782 : Part 8 : Method 835C : 1980 for gelation timing of unsaturated polyester resin systems. It is equally useful for epoxies, urea formaldehyde, resorcinol formaldehyde and other cross linking products.

References

- 1 N.A. de Bruyne, modern plastics 27, N°9, May, 1950.
- 2 B.A. Hills, J. Oil & Colour Chemists Assoc. 45, 251-260 (1962).
(We shall be glad to send a reprint of this to anyone interested).
- 3 P.J. Flory, J. American Chemical Soc. (1941) 63, 3083

Gelation Tests at Constant Temperatures

The gelation timer is designed so that tests may be carried out at constant temperature. The sample cup may stand directly in a laboratory water bath and the gelation timer is relatively narrow so that several instruments may, if necessary, stand together over quite a small bath.

An alternative way of keeping sample cups at constant temperatures is to use a Techne Dri-Block® which is held at accurately controlled temperatures and which has a hole drilled in it of a diameter to accept the sample cup.

Techne manufactures a wide range of both water baths and Dri-Block® heaters suitable for gelation tests at constant temperatures. Details of these are available on request.

Operator Safety

All users 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 user may be impaired.

Installation

Before connecting the mains supply, check the voltage against the rating plate. 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>220/240V</i>	<i>110/120V</i>
Live	Brown	Black
Neutral	Blue	White
Earth	Green/yellow	Green

If a fused plug is used it should be fitted with a fuse as shown in the following table:

<i>Unit</i>	<i>Supply Voltage Fuse Rating</i>	
GT-3 or	240 V	1 Amp
GT-4	120 V	1 Amp

Note that units marked 120V work equally well at 110V. The rating plate is on the rear of the unit.

Specification

Maximum time reading

GT-3 9999 minutes in 1 minute increments

GT-4 999.9 minutes in 0.1 minute increments

Amplitude of plunger oscillation

13mm

Frequency of plunger oscillation

GT-3 1 cycle/minute

GT-4 10 cycle/minute

Accuracy of gelation times $\pm 2\%$

Electrical Supply See item 23 in spare parts list

Overall Dimensions, Housing

Height 119mm

Width 69mm

Depth 94mm

Overall Length With Standard

Plunger at bottom of stroke 269mm

Method of Support

Tubular support 132mm long and 13mm diameter extends horizontally from rear of housing for attachment to retort stand.

Nett Weight

4.4Kg

Shipping Weight

7.7Kg

Optional items

Sample Cups

The test requires about 100ml of sample in a container of at least 40mm inside diameter. The top of the plunger stroke should be not less than 32mm below the sample surface and not closer than 13mm to the bottom of the container. Any suitable container which allows the above requirements to be met may be used. However for convenience sample cups are available from Techne as follows:-

Specification

Material	Aluminium
Capacity	100ml
Outside Dimension	
Diameter	46mm
Height	79mm
Net Weight (pack of 240)	3.7Kg

Disposable Plungers

In some applications the gel hardens so quickly that it is impossible to remove the plunger from the gel. In such work the use of Techne disposable plungers are recommended. They are accurately weighed in accordance with Techne specifications, made of glass, and easily slide into an adaptor screwed into the instrument in place of the stainless steel plunger.

Specification

Material	Glass
Disc dimensions	
Diameter	21.8mm
Thickness	2.3mm
Rod dimensions	
Diameter	4.5mm
Length	102mm
Nett Weight (pack of 100)	1.0 Kg

Stainless Steel Plungers

To meet the requirements of those applications where a small sample container is required, two alternative stainless steel plungers are available which are smaller than the standard plunger supplied with each instrument.

Specification

	<i>Standard Plunger F0985</i>	<i>Optional Plungers F0982</i>	
F0979			
Disc dimensions (mm)			
Diameter	22.4	16.0	19.1
Thickness	2.3	2.5	2.3
Rod dimensions (mm)			
Diameter	3.3	4.1	4.1
Length	105.0	92.7	80.0
Net weight (g)	11.4	11.4	11.4

OPERATION

- 1 Mount the Gelation Timer in a vertical position by clamping it in a retort stand or similar apparatus.
- 2 Remove the protective sleeve from the slide contact assembly.
- 3 Screw the appropriate disc (F0985 standard) into the slide contact assembly (6001003) and ensure that it hangs vertically and freely in the centre of the contact housing.
- 4 Set the Holding switch to the 'Hold' position.
- 5 Press the start switch and observe that the disc plunger assembly reciprocates. It should not be possible to 'trip' the mechanism with the switch set as in 3 above.
- 6 Place a sample in a beaker of at least 40mm internal diameter.
- 7 Insert the beaker below the disc plunger assembly and adjust the position such that the plunger will reciprocate between 1 1/4" below the surface of sample at the top of its stroke and not less than 1/2" from bottom of the beaker at the bottom of its strike (length of stroke 1/2").
- 8 Set the counter to zero; re-position the holding switch to 'Operate'.
- 9 The unit can now be left unattended.
- 10 When the neon lamp lights up (indicating that the sample has gelled) the time (minutes) taken from the sample to set will be indicated on the counter.
- 11 Remove the disc from the timer unit by unscrewing, clean and replace ready for next test.

For setting times of less than 30 minutes, we recommend the use of our Gelation Timer, GT-4, with a periodic time of 6 seconds. This instrument is of the same design as the GT-3 but the counter registers in 1/10 minutes.

should be disconnected from the power. In all cases MAINTENANCE and repair work should be undertaken by a skilled technician. Untrained personnel should not attempt to dismantle the unit.

- Always thoroughly clean the disc and plunger immediately after each test using a suitable solvent.
- Periodically remove cover and inspect all wiring and mechanical moving parts.

The following guide has been prepared to give the user a simple and systematic series of checks for fault correction.

With the unit connected to the correct electrical supply, press the starter switch. The disc plunger should reciprocate. With the holding switch at 'OPERATE' it should be possible to trip the switch manually with the holding switch at 'HOLD' the switch should not trip.

1) **FAULT**

Plunger does not reciprocate.

ACTION REQUIRED

- A Remove the side cover plate taking care not to touch any electrical wiring or components. Check that the connecting link (6002501) is reciprocating freely
- B Carry out motor tests as described in section 7.

2) **FAULT**

Neon lamp does not light (this should operate when mechanism has been tripped).

ACTION REQUIRED

Disconnect the electrical supply, replace neon lamp. Reconnect supply and recheck. **NOTE:** the operation of the neon lamp is not essential for the effective performance of the instrument.

6) **FAULT**

Starter switch damaged

FAULT

If neon still does not function.

ACTION REQUIRED

Check all wires are undamaged and properly connected, in accordance with the circuit diagram (fig 1)

3) **FAULT**

Vibration not occurring. (Vibration will stop in any case when gelation is completed).

ACTION REQUIRED

Check the vibration relay (6004483 or 6004484) for continuity (relay without cover). If satisfactory, adjustment should be made to the fixed outer contact so as to give a low vibration. No adjustment is needed to the amateur contact.

4) **FAULT**

Slide contact does not operate. (ie pushing disc plunger by hand does not trip the relay and stop the motor).

ACTION REQUIRED

Disconnect the unit from the electrical supply, put the hold switch to 'HOLD'. With an Avro Meter set to 1 'Meg' DC, place the prods on the exposed contacts of the starter and the holding switches. When the slide contact is pressed upwards by hand, a deflection should be observed. If not replace the complete slide contact. Remove the slide contact by unscrewing the three retaining screws holding the housing to the base of the connecting link, withdraw the slide contact assembly (6001003) through the base of the case after disconnecting wires. Replace with new slide contact.

5) **FAULT**

Relay does not operate

ACTION REQUIRED

Remove and replace.

ACTION REQUIRED

Put the holding switch to 'HOLD' and test across the exposed contact of the starter switch and exposed contact of the holding switch (6003529) with an Avo Meter set at 1 'Meg' DC. A deflection should be obtained when the slide contact is pressed up (as in section 4), but this deflection should change when the starter switch is pressed and held down. If this change does not occur remove the starter switch (6006044) and replace.

7) **FAULT**

Motor burned out.

ACTION REQUIRED

Unsolder the two wires from the relay and test with Avo Meter set at 1 'Meg' DC, across motor terminals. If no deflection occurs replace motor.

8) **FAULT**

Holding switch damaged.

ACTION REQUIRED

If checks in sections 4, 5, 7, fail to find the faults, the holding switch must be damaged. Remove and replace.

9) **FAULT**

Plunger reciprocates but counter does not rotate.

ACTION REQUIRED

Check counter crank grub screw is tight on shaft, if the counter still does not rotate, remove and replace.

19	6005219	240V NEON	1
19	6005741	117V NEON	1

DISMANTLING

Access is gained by unscrewing the single screw, item 17, on the right hand side of the unit when looking at the front face. When this side is removed all the internal components can be checked or removed.

Spare parts

When ordering spare or replacement parts, reference should be made to fig 2 to obtain the correct part numbers and to the accompanying list for the part titles. Always quote the instrument serial number, the part number and part title.

<i>Item</i>	<i>Part</i>	<i>Description</i>	<i>Qty</i>	<i>Notes</i>
1	F0985	PLUNGER, STANDARD 22mm	1	
2	6001003	SLIDE CONTACT ASSEMBLY	1	
3	6002489	230/250V RELAY M/C	1	
3	6002490	110/125V RELAY M/C	1	
4	6002495	CLAMPING POST	1	
5	6002496	COVER CLAMPING POST	1	
6	6002501	CONNECTING LINK	1	
7	6002502	SLIDE PLATE R/H 1 HOLE	1	
8	6002503	SLIDE PLATE L/H 2 HOLES	1	
9	6002507	MAINS CABLE ASSEMBLY	1	
10	6002539	CRANK SCREW	1	
11	6004483	VIBRATING RELAY M/C 240V	1	
11	6004484	VIBRATING RELAY M/C 117V	1	
12	6005509	COUNTER M/C ASSY	1	
13	6005508	COUNTER CRANK	1	
14	6005861	BRACKET	1	
15	6005862	WRAPPER	1	
16	6005864	MOTOR CRANK ASSEMBLY	1	
17	6000957	4BA x 3/8" LING INSTR HD SCREW3		
18	6003529	ROCKER SWITCH (HOLD)	1	

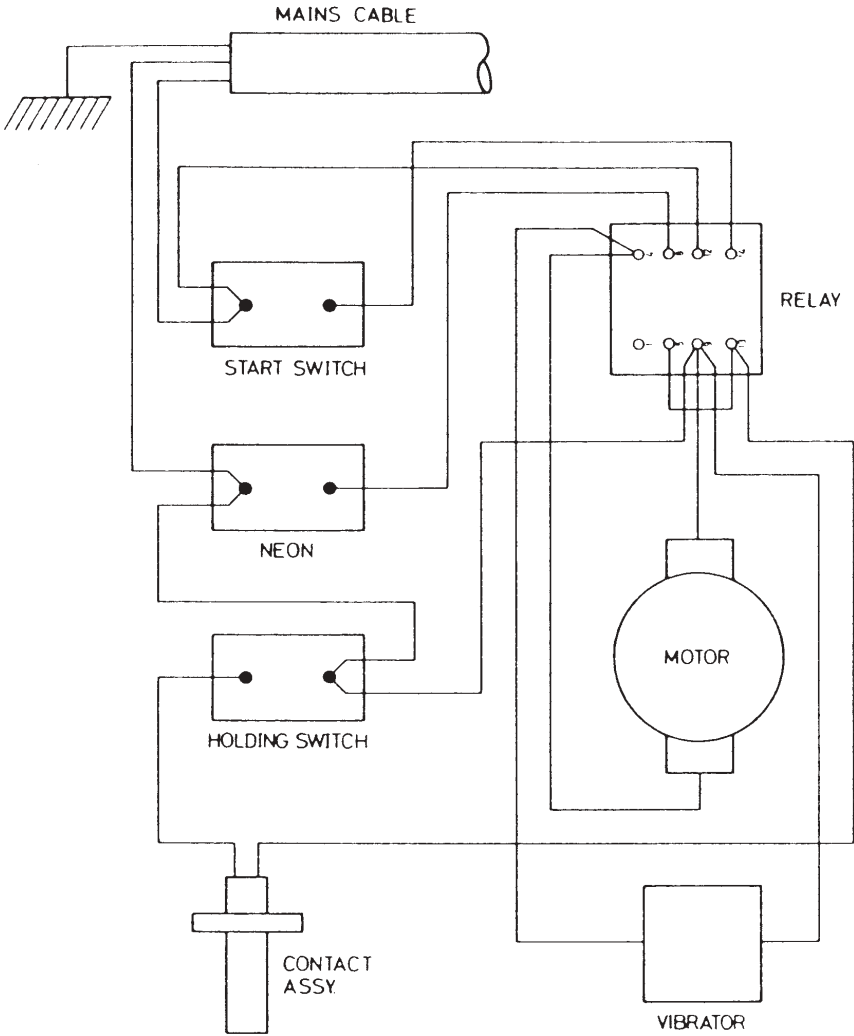
20	6006044	ROCKER SWITCH (START)	1	
21	6006956	GT-3/4 FRONT LABEL	1	
22	6008530	M3 x 5mm SOCKET SET SCREW	2	
23	6005865	MOTOR 240V 50Hz 1RPM	1	GT-3
23	6005866	MOTOR 240V 60Hz 1RPM	1	GT-3
23	6005867	MOTOR 117V 50Hz 1RPM	1	GT-3
23	6005868	MOTOR 117V 60Hz 1RPM	1	GT-3
23	6005869	MOTOR 240V 50Hz 10RPM	1	GT-4
23	6005866	MOTOR 240V 60Hz 10RPM	1	GT-4
23	6104624	MOTOR 117V 60Hz 10RPM	1	GT-4
23	6005742	MOTOR 117V 50Hz 10RPM	1	GT-4

F0979 MEDIUM PLUNGER ASSEMBLY 19mm (3/4" DIAMETER)

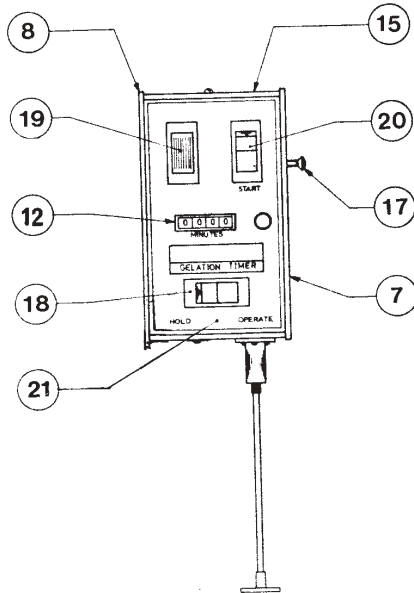
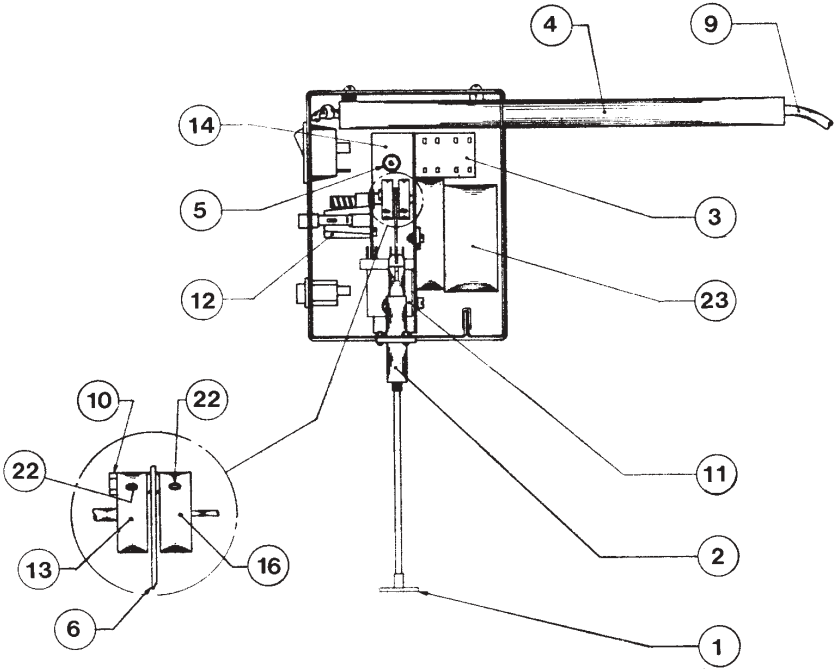
F1794 GLASS PLUNGER ASSEMBLY 22mm (7/8" DIAMETER)

F1795 PLUNGER ATTACHMENT ASSY (USED ONLY WITH 1794)

F7846 ALUMINIUM CUPS PACK 240



Wiring Diagram



Assembly

