VARIAN

Varian, Inc.
2700 Mitchell Drive
Walnut Creek, CA 94598-1675/usa

ProStar 410 AutoSampler

Operation Manual

QUALITY SYSTEM
ISO 9001
CERTIFIED

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VARIAN

Quality Systems At Varian, Inc.

The ISO 9000 series standards were created in Geneva in 1987 to cut through a morass of conflicting quality definitions. These standards define a model for quality assurance systems in product design, development, manufacturing, installation, service, and customer support. They are now the worldwide quality assurance benchmark used to gauge the strength of a company's commitment to quality, and the value of its quality systems.

Various organizations around the world, such as the British Standards Institution (BSI), provide certified, objective auditors to scrutinize quality procedures, product development, manufacturing processes, and customer satisfaction programs. No company can claim ISO 9000 series registration unless it receives a stamp of approval from the demanding quality assessors of BSI or similar accredited examining body. ISO 9000 series registration constitutes an objective third-party report to determine the level of a supplier's commitment to quality.

In 1992, Varian, Inc., Analytical Instruments became registered to the most comprehensive of the ISO 9000 series standards — ISO 9001. ISO 9001 registration means that every stage of our quality system, including product development, manufacturing, final test, shipping, and parts and supplies has been rigorously examined against the most exacting set of internationally recognized standards. It means we live up to a standard of quality that you can count on today, and into the future. Our Quality System has received ISO 9001 certification number FM21797.

The quality systems that earned us ISO 9001 registration have direct benefits for our customers:

- We can speed instruments to you faster than ever before. Emergency orders can be processed even faster.
- We fill your orders promptly and completely.
- We have implemented a system of continuous feedback from our customers — we are aware of your needs today and tomorrow.
- We have improved your productivity by cutting systems failure rates in half and speeding service response time.
- We have embedded continuous improvement into the fabric of our organization so that we can achieve even higher levels of quality in the future.
- We are embedding GLP requirements into our products and services to help you meet your regulatory compliance requirements.

ISO 9001 registration is not enough. For us, quality is defined by our customers. We are not satisfied unless you are satisfied. We are striving to understand customer needs, using independent surveys, user groups, customer advisory boards, and our “Hallmark of Quality” response program, in addition to individual face-to-face customer contact. Our products and our processes are configured to meet those needs.

We know that you are seeking more than the most advanced processes and top-notch applications expertise. You want to join forces with a partner committed to delivering world-class quality, reliability, and value — on time, every time.

QUALITY SYSTEM ISO 9001 CERTIFIED

Our overriding aim is to be that partner.

Varian, Inc. Analytical Instrument Warranty

Hardware Products

All analytical instruments sold by Varian, Inc. are warranted to be free from defects in material and workmanship for the periods specified and in accordance with the terms on the face of Varian's quotation or as otherwise agreed upon in writing between Varian and the Customer. The warranty period begins on the date of **shipment** from Varian to the original Customer. However, where installation is paid for by the Customer or included in the purchase price, the warranty period begins upon completion of installation. If the Customer schedules **installation** to start later than 30 days after delivery or if such delay is caused through the Customer's inability to provide adequate facilities or utilities or through failure to comply with Varian's reasonable pre-installation instructions or through other omissions by Customer, then the warranty period starts on the 31st day from date of shipment. Moreover Varian will charge the Customer for labor and other expenses involved in making multiple or follow-up installation service calls.

Software Products

Where software is provided within the frame of a license agreement concluded between the Customer and Varian, any warranty shall be strictly in accordance with the terms of such agreement.

In the absence of a license agreement and unless an alternate warranty period is agreed upon in writing between Varian and the Customer, the warranty period is as specified on the face of Varian's quotation. Varian warrants such software products, if used with and properly installed on Varian hardware or other hardware as specified by Varian to perform as described in the accompanying Operator's Manual and to be substantially free of those defects which cause failure to execute respective programming instructions; however, Varian does not warrant uninterrupted or error-free operation.

Remedies

The sole and exclusive remedy under hardware warranty shall be **repair** of instrument malfunctions which in Varian's opinion are due or traceable to defects in original materials or workmanship or, at Varian's option, **replacement** of the respective defective parts, provided that Varian may as an alternative elect to **refund** an equitable portion of the purchase price of the instrument or accessory.

Repair or replacement under warranty does not extend the original warranty period.

Repair or replacement under warranty claims shall be made in Varian's sole discretion either by sending a Customer Support Representative to the site or by authorizing the Customer to return the defective accessory or instrument to Varian or to send it to a designated service facility. The Customer shall be responsible for loss or damage in transit and shall prepay shipping cost. Varian will return the accessory or instrument to the Customer prepaid and insured. Claims for loss or damage in transit shall be filed by the Customer. To correct software operation anomalies, Varian will issue software revisions where such revisions exist and where, in Varian's opinion, this is the most efficient remedy.

Limitation of Warranty

This **warranty does not cover** software supplied by the Customer, equipment and software warranted by another manufacturer or replacement of expendable items and those of limited life, such as but not limited to: Filters, glassware, instrument status lamps, source lamps, septa, columns, fuses, chart paper and ink, nebulizers, flow cells, pistons, seals, fittings, valves, burners, sample tubes, probe inserts, print heads, glass lined tubing, pipe and tube fittings, variable temperature dewars, transfer lines, flexible discs, magnetic tape cassettes, electron multipliers, filaments, vacuum gaskets, seats and all parts exposed to samples and mobile phases.

This **warranty shall be void** in the event of accident, abuse, alteration, misuse, neglect, breakage, improper operation or maintenance, unauthorized or improper modifications or tampering, use in an unsuitable physical environment, use with a marginal power supply or use with other inadequate facilities or utilities. Reasonable care must be used to avoid hazards.

This warranty is expressly in lieu of and excludes all other express or implied warranties, including but not limited to warranties of merchantability and of fitness for particular purpose, use or application, and all other obligations or liabilities on the part of Varian, unless such other warranties, obligations or liabilities are expressly agreed to in writing by Varian.

Limitation of Remedies and Liability

The remedies provided herein are the sole and exclusive remedies of the Customer. In no case will Varian be liable for incidental or consequential damages, loss of use, loss of production or any other loss incurred.

Safety Information

Operating Instructions

This instruction manual is provided to help you establish operating conditions which will permit safe and efficient use of your equipment. Special considerations and precautions are also described in the manual, which appear in the form of **NOTES**, **CAUTIONS**, and **WARNINGS** as described below. It is important that you operate your equipment in accordance with this instruction manual and any additional information which may be provided by Varian. Address any questions regarding the safe and proper use of your equipment to your local Varian office.

NOTE

Information to aid you in obtaining optimal performance from your instrument.

CAUTION

Alerts you to situations that may cause moderate injury and/or equipment damage, and how to avoid these situations.

WARNING

Alerts you to potentially hazardous situations that could result in serious injury, and how to avoid these situations.

Warning Symbol	Warning Description
 **WARNING: SHOCK HAZARD**	Hazardous voltages are present inside instrument. Disconnect from main power before removing screw-attached panels.
 **WARNING: CHEMICAL HAZARD**	Hazardous chemicals may be present. Avoid contact, especially when replenishing reservoirs. Use proper eye and skin protection.
 **WARNING: BURN HAZARD**	Very hot or cryogenically cold surfaces may be exposed. Use proper skin protection.
 **WARNING: EYE HAZARD**	Eye damage could occur either from flying particles, chemicals, or UV radiation. Use proper eye and face protection.
 **WARNING: FIRE HAZARD**	The potential for fire may be present. Follow manual instructions for safe operation.
 **WARNING: EXPLOSION HAZARD**	The potential for explosion may exist because of type of gas or liquid used.
 **WARNING: RADIATION SOURCE**	Ionizing radiation source is present. Follow manual instructions for safe operation.
 **WARNING: MOVING PARTS**	Keep hands and fingers away.

General Safety Precautions

Follow these safety practices to ensure safe equipment operation.

- Perform periodic leak checks on all supply lines and pneumatic plumbing.
- Do not allow gas lines to become kinked or punctured. Place lines away from foot traffic and extreme heat or cold.
- Store organic solvents in fireproof, vented and clearly labeled cabinets so they are easily identified as toxic and/or flammable materials.
- Do not accumulate waste solvents. Dispose of such materials through a regulated disposal program and not through municipal sewage lines.

NOTICE: This instrument has been tested per applicable requirements of EMC Directive as required to carry the European Union CE Mark. As such, this equipment may be susceptible to radiation/interference levels or frequencies which are not within the tested limits.

WARNING This instrument is designed for chromatographic analysis of appropriately prepared samples. It must be operated using appropriate gases and/or solvents and within specified maximum ranges for pressure, flows, and temperatures as described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING It is the responsibility of the Customer to inform Varian Customer Support Representatives if the instrument has been used for the analysis of hazardous biological, radioactive, or toxic samples, prior to any instrument service being performed or when an instrument is being returned to the Service Center for repair.

Electrical Hazards

- Disconnect the instrument from all power sources before removing protective panels to avoid exposure to potentially dangerous voltages.
- When it is necessary to use a non-original power cord plug, make sure the replacement cord adheres to the color coding and polarity described in the manual and all local building safety codes.
- Replace blown fuses with fuses of the size and rating stipulated on the fuse panel or in the manual.
- Replace faulty or frayed power cords immediately with the same type and rating.
- Make sure that voltage sources and line voltage match the value for which the instrument is wired.

Compressed Gas Cylinders

- Store and handle compressed gases carefully and in strict adherence to safety codes.
- Secure cylinders to an immovable structure or wall.
- Store and move cylinders in an upright, vertical position. Before transport, remove regulators and install cylinder cap.
- Store cylinders in a well-ventilated area away from heat, direct sunshine, freezing temperatures, and ignition sources.
- Mark cylinders clearly so there is no doubt as to their contents.
- Use only approved regulators and connections.
- Use only connector tubing that is chromatographically clean (Varian Part Number 03-918326-00) and has a pressure rating significantly greater than the highest outlet pressure from the regulator.

GC Safety Practices

Exhaust System

No special exhaust ducting is necessary for GC detectors installed in a well-ventilated room except when the detectors are used to test hazardous chemicals. If you do install ducting:

- Use only fireproof ducting.
- Install a blower at the duct outlet.
- Locate duct intakes such that their vibration or air movement does not effect detector operation.
- Check periodically for proper operation of the duct.
- Ensure proper ventilation in lab area.

Radioactive Source Detectors

- Read carefully and comply with all NOTES, CAUTIONS, and WARNINGS in the Ni^{63} ECD manual.
- Perform the tests for removable radioactive contamination described in the Ni^{63} ECD manual.
- Comply with leak test schedules and procedures.

Burn Hazard

Heated or cryogenically cooled zones of gas chromatographs can remain hot or cold for a considerable time after instrument power is turned off. To prevent painful burns, ensure that all heated or cooled areas have returned to room temperature or wear adequate hand protection before you touch potentially hot or cold surfaces.

LC Safety Practices

High Pressure Hazard

- If a line ruptures, a relief device opens, or a valve opens accidentally under pressure, potentially hazardous high liquid pressures can be generated by the pump causing a high velocity stream of volatile and/or toxic liquids.

- Wear face protection when you inject samples or perform routine maintenance.
- Never open a solvent line or valve under pressure. Stop the pump first and let the pressure drop to zero.
- Use shatter-proof reservoirs capable of operating at 50-60 psi.
- Keep the reservoir enclosure closed when the reservoir is under pressure.
- Read and adhere to all NOTES, CAUTIONS, and WARNINGS in the manual.

Flash Chromatography

The operator should be familiar with the physico-chemical properties of the components of the mobile phase.

Keep solvents from direct contact with the polyurethane supply tubing as certain solvents will cause weakening and leaks with possible bursting.

All components of the system should be connected to a common power supply and common ground. This ground must be a true ground rather than a floating ground.

Non-polar solvents can develop a static charge when pumped through the system. All vessels that contain mobile phase (including tubing and collection vessels) must be grounded to dissipate static electricity.

Employ static measuring and static discharge devices (e.g., air ionizers) to safeguard against the buildup of static electricity.

Ultraviolet Radiation

Liquid chromatograph detectors that use an ultraviolet light source have shielding to prevent radiation exposure to personnel.

For continued protection:

- Ensure that protective lamp covers of variable and fixed wavelength detectors are in place during operation.
- Do not look directly into detector fluid cells or at the UV light source. When inspecting the light source or fluid cell, always use protective eye covering such as borosilicate glass or polystyrene.

Spare Parts Availability

It is the policy of Varian to provide operational spare parts for any instrument and major accessory for a period of five (5) years after shipment of the final production run of that instrument. Spare parts will be available after this five (5) year period but on an *as available* basis. Operational spare parts are defined as those individual electrical or mechanical parts that are susceptible to failure during their normal operation. Examples include relays, lamps, temperature probes, detector elements, motors, etc. Sheet metal parts, structural members or assemblies and castings, printed circuit boards, and functional modules are normally capable of being rebuilt to like-new condition throughout their useful life and therefore will be supplied only on an *as available* basis after the final production run of the instrument.

Service Availability

Varian provides a variety of services to support its customers after warranty expiration. Repair service can be provided by attractively priced service contracts or on a time and material basis. Technical support and training can be provided by qualified personnel on both a contractual or as-needed basis.

Varian, Inc. Analytical Instruments Sales Offices

For Sales or Service assistance and to order Parts and Supplies, contact your local Varian office.

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(LC)

VARIAN

www.varianinc.com

03-914603-00:10

Sicherheitsinformationen

Arbeitsanleitungen

Diese Arbeitsanleitung will Ihnen bei der Aufstellung solcher Arbeitsbedingungen helfen, die einen sicheren und wirkungsvollen Gebrauch Ihrer Geräte ermöglichen. Besondere Überlegungen und Vorsichtsmaßnahmen erscheinen in diesem Handbuch in Form von **HINWEIS**, **ACHTUNG** und **WARNUNG,** wie unten beschrieben. Es ist wichtig, daß Sie Ihr Gerät in Übereinstimmung mit dieser Arbeitsanleitung und allen möglichen zusätzlichen Informationen von Varian betreiben. Alle Fragen bezüglich Sicherheit und Handhabung Ihres Gerätes richten Sie an Ihr Varian Büro.

HINWEIS

Eine Information, um einen optimalen Wirkungsgrad Ihres Instruments zu erzielen.

ACHTUNG

Weist auf Situationen, die zu mäßiger Beeinträchtigung und/oder zu Geräteschäden führen und auf die Vermeidung dieser Situationen hin.

WARNUNG

Weist auf mögliche Gefahrensituationen, die zu ernsthaften Verletzungen führen können und auf die Vermeidung dieser Situationen hin.

Warnungssymbol	Warnungsbeschreibung
WARNUNG ELEKTRISCHER SCHLAG	Gefährliche Spannungen bestehen innerhalb des Instruments. Trennen Sie das Gerät vom Netz, bevor Sie abschraubbare Paneele entfernen.
WARNUNG CHEMISCHE GEFAHR	Gefährliche Chemikalien können vorhanden sein. Vermeiden Sie jeden Kontakt, besonders beim Auffüllen der Reservoirs. Benutzen Sie wirksamen Augen und Hautschutz.
WARNUNG VERBRENNUNGSGEFAHR	Sehr heiße oder tiefstgekühlte Oberflächen können freigelegt sein. Benutzen Sie einen wirksamen Hautschutz.
WARNUNG AUGENVERLETZUNG	Herumfliegende Partikel, Chemikalien oder UV-Strahlung können Augenschäden verursachen. Tragen Sie deshalb einen geeigneten Schutz für Augen und Gesicht.
WARNUNG FEUERGEFAHR	Es besteht eine mögliche Feuergefahr. Beachten Sie die Vorschriften im Handbuch für eine gefahrlose Benutzung.
WARNUNG EXPLOSIONSGEFAHR	Eine mögliche Explosionsgefahr besteht infolge der benutzten Gas- oder Flüssigkeitsart.
WARNUNG STRAHLUNGSQUELLE	Es besteht eine ionisierende Strahlungsquelle. Beachten Sie die Vorschriften im Handbuch für eine gefahrlose Benutzung.
WARNUNG BEWEGTE TEILE	Bleiben Sie mit Ihren Händen und Fingern weg.

Allgemeine Sicherheitsmaßnahmen

Befolgen Sie diese Sicherheitspraktiken für eine gefahrlose Gerätebenutzung.

- Prüfen Sie regelmäßig alle Versorgungs und Pneumatikleitungen auf Lecks.
- Gasleitungen dürfen nicht geknickt oder angestochen werden. Verlegen Sie die Leitungen außerhalb von Laufwegen und abseits von extremer Hitze oder Kälte.
- Lagern Sie organische Lösungsmittel in feuerfesten, belüfteten und eindeutig bezeichneten Schränken, damit sie leicht als toxische und/oder brennbare Materialien erkannt werden.
- Sammeln Sie keine Lösungsmittelabfälle. Entsorgen Sie solche Materialien über ein geregeltes Entsorgungsprogramm und nicht über die öffentlichen Abwasserleitungen.

HINWEIS: Dies Instrument wurde nach den zutreffenden Vorschriften der EMC Direktive getestet, die zum Führen des CE Zeichens der Europäischen Union berechtigen. Dieses Gerät kann an sich auf Strahlungs-/Störpegel oder Frequenzen außerhalb der getesteten Grenzen reagieren.

WARNUNG Dies Instrument ist für chromatographische Analysen entsprechend präparierter Proben gedacht. Es muß mit geeigneten Gasen und/oder Lösungsmitteln und innerhalb der im Handbuch spezifizierten maximalen Werte für Druck, Flüsse und Temperaturen betrieben werden.

WARNUNG Der Kunde ist vor der Durchführung irgendeines Geräteservices verpflichtet den Varian Kundendienstvertreter zu informieren, wenn das Instrument für Analysen gefährlicher biologischer, radioaktiver oder toxischer Proben benutzt worden ist.

Elektrische Gefahren

- Lösen Sie das Instrument von allen Stromquellen, bevor Sie Schutzpaneele entfernen, damit Sie nicht mit potentiell gefährlichen Spannungen in Berührung kommen.
- Wenn ein Nicht-Original Netzkabelstecker benutzt werden muß, muß das Austauschkabel die im Handbuch beschriebene Farbcodierung und Polarität beibehalten und alle örtlichen Sicherheitsvorschriften erfüllen.
- Ersetzen Sie durchgebrannte Sicherungen nur mit Sicherungen der Werte, die am Sicherungspaneel oder im Handbuch angegeben sind.
- Ersetzen Sie fehlerhafte oder durchgescheuerte Netzkabel sofort durch Kabel gleicher Art.
- Sorgen Sie dafür, daß Spannungsquellen und die Netzspannung den gleichen Wert haben, für den das Instrument verdrahtet ist.

Gasdruckflaschen

- Lagern und handhaben Sie komprimierte Gase vorsichtig und in strikter Einhaltung der Sicherheitsvorschriften.
- Befestigen Sie die Gasflaschen an feststehenden Aufbauten oder an Wänden.
- Lagern und transportieren Sie Gasflaschen in aufrechter Stellung. Druckregler zuvor abnehmen.
- Lagern Sie Gasflaschen in gut durchlüfteten Räumen, weit genug weg von Heizungen, direktem Sonnenschein, Frosttemperaturen und Entzündungszonen.
- Kennzeichnen Sie die Flaschen so eindeutig, daß kein Zweifel über deren Inhalt bestehen kann.
- Benutzen Sie nur geprüfte Druckminderer und Verbindungsstücke.
- Benutzen Sie nur chromatographisch reines Verbindungsrohr (Varian Part Number 03-918326-00), das wesentlich höheren Druck als den höchsten Ausgangsdruck des Druckminderers aushält.

GC Sicherheitspraktiken

Abgassystem

Für GC Detektoren, die in einem gut durchlüfteten Raum installiert sind, ist keine spezielle Abgasführung erforderlich, außer wenn die Detektoren zum Testen gefährlicher Chemikalien benutzt werden. Wenn Sie eine Abgasführung installieren:

- Benutzen Sie nur feuerfeste Führungen.
- Installieren Sie ein Gebläse am Ausgang.
- Ordnen Sie die Ansaugöffnung so an, daß ihre Erschütterungen oder Luftströmungen nicht die Detektorfunktion beeinträchtigen.
- Prüfen Sie regelmäßig die einwandfreie Arbeitsweise der Abgasführung.
- Sorgen Sie für gute Entlüftung im Laborbereich.

Radioaktive Detektoren

- Lesen Sie sorgfältig und befolgen Sie alle **HINWEISE**, **ACHTUNGEN** und **WARNUNGEN** im Ni^{63} ECD Handbuch.
- Führen Sie die Tests für zu beseitigende radioaktive Kontamination durch, die im Ni^{63} ECD Handbuch beschrieben sind.
- Erfüllen Sie die Zeitpläne und Verfahren zur Dichtigkeitsprüfung.

Verbrennungsgefahr

Beheizte oder tieftemperaturgekühlte Zonen des Gaschromatographen können beträchtlich lange heiß oder kalt bleiben, nachdem das Instrument bereits abgeschaltet ist. Zur Vermeidung schmerzhafter Verbrennungen müssen Sie darauf achten, daß alle beheizten oder gekühlten Zonen auf Raumtemperatur zurückgegangen sind oder Sie müssen ausreichenden Handschutz benutzen, bevor Sie möglicherweise heiße oder kalte Oberflächen berühren.

LC Sicherheitspraktiken

Gefahr durch hohen Druck

Wenn eine Leitung bricht, eine Entlüftungseinheit sich öffnet oder ein Ventil sich unbeabsichtigt unter Druck öffnet, kann durch die Pumpe möglicherweise ein gefährlich hoher Flüssigkeitsdruck entstehen, der einen Strahl flüchtiger und/oder toxischer Flüssigkeiten von hoher Stömungsgeschwindigkeit verursacht.

- Tragen Sie einen Gesichtsschutz, wenn Sie Proben injizieren oder Routinewartungen durchführen.
- Öffnen Sie niemals eine unter Druck stehende Lösungsmittelleitung oder ein Ventil. Halten Sie zuerst die Pumpe an und lassen Sie den Druck auf Null abfallen.
- Benutzen Sie splittersichere Reservoirs, die für einen Druck von 3,4 bis 4,1 bar ausgelegt sind.
- Halten Sie die Reservoirverkleidung geschlossen, wenn die Reservoirs unter Druck stehen.
- Lesen Sie und befolgen Sie alle **HINWEISE**, **ACHTUNGEN** und **WARNUNGEN** im Handbuch.

Blitzlicht-Chromatographie

Der Bediener sollte mit den physikalisch-chemischen Eigenschaften der Komponenten vertraut sein, aus denen sich die mobile Phase zusammensetzt.

Vermeiden Sie direkten Kontakt der Lösungsmittel mit den Zuführungsleitungen aus Polyurethan, da einige Lösungsmittel das Material der Leitungen schwächen und damit Undichtigkeiten oder Brüche hervorrufen können.

Alle Systemkomponenten sollten an der gleichen Netzstromquelle und einer gemeinsamen Erdung angeschlossen sein. Dabei muss es sich um eine echte, nicht um eine schwebende Erdung handeln.

Nicht-polare Lösungsmittel können sich beim Pumpen durch das System statisch aufladen. Alle Gefäße, die mobile Phase enthalten (einschließlich Leitungen und Sammelgefäße), müssen zur Ableitung elektrostatischer Aufladungen geerdet sein.

Setzen Sie Geräte zur Messung und Ableitung elektrostatischer Aufladungen (z.B. Geräte zur Luftionisierung) als Maßnahmen gegen den Aufbau statischer Elektrizität ein.

Ultraviolette Strahlung

Detektoren in Liquidchromatographen, die eine ultraviolette Lichtquelle benutzen, besitzen eine Abschirmung, die das Bedienungspersonal gegen Abstrahlungen schützt. Zum ständigen Schutz:

- Achten Sie darauf, daß die schützende Lampenabdeckung der Detektoren mit variablen und festen Wellenlängen während des Betriebs an ihrem Platz ist.
- Schauen Sie nicht direkt in die Flüssigkeitszellen im Detektor oder in die UV Lampe. Zum Inspizieren der Lichtquelle oder der Flüssigkeitszelle benutzen Sie immer einen wirksamen Augenschutz, wie er durch Borsilikatglas oder Polystyrol gewährleistet wird.

Verfügbarkeit von Ersatzteilen

Es ist Varian's Grundsatz, Ersatzteile für alle Instrumente und die wichtigsten Zubehöre für einen Zeitraum von fünf (5) Jahren nach dem Fertigungsauslauf dieser Geräteserie verfügbar zu haben. Nach diesem Zeitraum von fünf (5) Jahren können Ersatzteile auf der Basis *solange vorhanden* bezogen werden. Als Ersatzteil werden hier solche elektrischen und mechanischen Einzelteile verstanden, die unter normalen Bedingungen ausfallen können. Beispiele sind Relais, Lampen, Temperaturfühler, Detektorelemente, Motore usw. Metallbleche, Formteile oder Baugruppen und Gußteile, PC Boards und Funktionsmodule können normalerweise neuwertähnlich für eine brauchbare Lebensdauer instandgesetzt werden und werden deshalb nur auf der Basis *solange vorhanden* nach dem Produktionsauslauf des Instruments geliefert werden.

Serviceverfügbarkeit

Varian bietet seinen Kunden auch nach dem Auslaufen der Garantie eine Vielfalt von Serviceleistungen an. Reparaturservice kann zu attraktiven Preisen über eine Wartungsvereinbarung oder nach Zeit- und Materialaufwand zur Verfügung gestellt werden. Technische Unterstützung und Training bieten wir Ihnen durch qualifizierte Chemiker sowohl auf einer Kontraktbasis als auch nach Ihren Erfordernissen an.

Varian Analytical Instruments Verkaufsbüros

Für Verkaufs oder Servicehilfe und zum Bestellen von Teilen und Zubehören setzen Sie sich bitte mit Ihrem Varian Büro in Verbindung.

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Informations et mesures de sécurité

Instructions de fonctionnement

Ce manuel d'instruction est conçu pour aider l'utilisateur à créer des conditions opératoires lui permettant de faire fonctionner le matériel efficacement et en toute sécurité. Il contient entre autres certaines observations spéciales présentées sous forme de **NOTES, MISES EN GARDE** et **AVERTISSEMENTS.** Il est important de faire fonctionner ce matériel conformément aux instructions du présent manuel et à toute autre information émanant de Varian. S'adresser au bureau régional Varian pour toute question relative à la sécurité ou à l'utilisation correcte du matériel.

NOTE

Information destinée à tirer le meilleur parti du matériel sur le plan des performances

MISE EN GARDE

Attire l'attention sur une situation pouvant occasionner des dommages corporels légers et/ou des dégâts mineurs à l'appareil et indique comment remédier à cette situation

AVERTISSEMENT

Attire l'attention sur une situation potentiellement dangereuse pouvant occasionner des dommages corporels importants et indique comment remédier à cette situation

Symboles d'avertissement	Description
 **ATTENTION RISQUE D'ELECTROCUTION**	Exposition à des tensions dangereuses. Débrancher le matériel du secteur avant de dévisser les panneaux protecteurs.
 **ATTENTION SUBSTANCES CHIMIQUES DANGER**	Présence éventuelle de substances chimiques dangereuses. Eviter tout contact, en particulier lors du remplissage des réservoirs. Prendre les mesures de protection adéquates pour les yeux et la peau.
 **ATTENTION RISQUE DE BRÛLURES**	Exposition à des surfaces chaudes ou traitées cryogéniquement. Prendre les mesures de protection adéquates pour la peau.
 **ATTENTION DANGER POUR LES YEUX**	Les dommages causées aux yeux sont de deux natures différentes : jet de particules et de produits chimiques ou radiations UV. Utiliser des protections du visage et des yeux appropriées.
 **ATTENTION RISQUE D'INCENDIE**	Risque potentiel d'incendie. Se conformer aux instructions du manuel pour faire fonctionner le matériel en toute sécurité.
 **ATTENTION RISQUE D'EXPLOSION**	Risque potentiel d'explosion en raison du type de gaz ou de liquide utilisé.
 **ATTENTION SOURCE DE RADIATION**	Présence d'une source de radiation ionisante. Se conformer aux instructions du manuel pour faire fonctionner le matériel en toute sécurité.
 **ATTENTION PIECES EN MOUVEMENT**	Garder les mains et les doigts hors de portée.

Précautions générales en matière de sécurité

Les pratiques suivantes garantissent une utilisation sans risques du matériel:

- Effectuer régulièrement des essais d'étanchéité de tous les conduits d'alimentation et de tous les tuyaux du système pneumatique.
- Ne pas travailler avec des conduits de gaz déformés ou percés. Installer les conduits de gaz à l'écart des allées et venues et à l'abri du chaud ou du froid.
- Conserver les solvants organiques dans des récipients à l'épreuve du feu, bien ventilés et portant mention de la nature de leur contenu, en particulier lorsque lesdits solvants sont toxiques et/ou inflammables.
- Ne pas accumuler les solvants de rebut. Les éliminer conformément à un programme agréé d'élimination des déchets et non via les égouts municipaux.

NOTE: Ce matériel a été testé conformément aux dispositions de la directive CME afin de pouvoir porter le sigle CE de l'Union européenne. Il en résulte qu'il peut être sensible à des niveaux de radiation/d'interférence ou à des fréquences se situant hors des limites testées.

ATTENTION Ce matériel est conçu pour effectuer des analyses chromatographiques d'échantillons préparés selon des méthodes appropriées. Il convient de le faire fonctionner avec les gaz et/ou les solvants adéquats et dans les limites des pressions, des débits et des températures maximales spécifiées dans le présent manuel.

ATTENTION Le client est tenu d'informer le service Varian d'assistance à la clientèle que son matériel a été utilisé pour l'analyse d'échantillons biologiques dangereux, radioactifs ou toxiques avant que n'en soit effectué la maintenance.

Risques de chocs électriques

- Déconnecter le matériel de toute source d'alimentation avant d'en démonter les panneaux de protection, sous peine de s'exposer à des tensions dangereuses.
- En cas d'utilisation d'un cordon d'alimentation n'étant pas d'origine, s'assurer que celui-ci soit conforme à la polarité et au codage des couleurs décrits dans le manuel d'utilisation ainsi qu'à toutes les normes régionales de sécurité régissant le secteur de la construction.
- Remplacer les fusibles sautés par des fusibles de même type que ceux stipulés sur le panneau des fusibles ou dans le manuel d'utilisation.
- Remplacer les cordons d'alimentation défectueux ou dénudés par des cordons d'alimentation de même type.
- S'assurer que les sources de tension et la tension de secteur correspondent à la tension de fonctionnement du matériel.

Bouteilles à gaz comprimé

- Ranger et manipuler les bouteilles à gaz comprimé avec précaution et conformément aux normes de sécurité.
- Fixer les bouteilles à gaz comprimé à un mur ou à une structure inamovible.
- Ranger et déplacer les bouteilles à gaz comprimé en position verticale. Avant de transporter les bouteilles à gaz comprimé, retirer leur régulateur.
- Ranger les bouteilles dans un endroit bien ventilé et à l'abri de la chaleur, des rayons directs du soleil, du gel ou des sources d'allumage.
- Marquer les bouteilles de manière à n'avoir aucun doute quant à leur contenu.
- N'utiliser que des connexions et régulateurs agréés.
- N'utiliser que des tuyaux de raccordement propres sur le plan chromatographique (Varian P/N 03-918326-00) et pouvant supporter des pressions sensiblement plus élevées que la plus haute pression de sortie du régulateur.

Mesures de sécurité en CPG

Système d'échappement

Les détecteurs CPG installés dans une pièce bien ventilée ne nécessitent pas de conduits spéciaux d'échappement excepté lorsqu'ils sont destinés à analyser des substances chimiques dangereuses. Lors de l'installation de tels conduits:

- N'utiliser que des conduits à l'épreuve du feu
- Installer un ventilateur à la sortie du conduit.
- Placer les orifices d'aspiration de manière à ce que les vibrations ou les mouvements d'air n'affectent pas le fonctionnement du détecteur.
- Vérifier périodiquement l'état du conduit.
- S'assurer que le laboratoire est correctement ventilé.

Détecteurs à source radioactive

- Se conformer au manuel d'utilisation de l'ECD Ni^{63}, en particulier à ses **NOTES**, **MISES EN GARDE ET AVERTISSEMENTS**.
- Effectuer les tests de décontamination radioactive décrits dans le manuel d'utilisation de l'ECD Ni^{63}.
- Se conformer aux procédures et au calendrier des essais d'étanchéité.

Risque de brûlures

Les zones des chromatographes à gaz chauffées ou traitées cryogéniquement peuvent rester très chaudes ou très froides durant une période plus ou moins longue après la mise hors tension du matériel. Pour éviter les brûlures, s'assurer que ces zones sont revenues à température ambiante ou utiliser un dispositif adéquat de protection des mains avant de les toucher.

Mesures de sécurité en CPL

Risques liés aux hautes pressions

En cas de rupture d'un tuyau ou en cas d'ouverture accidentelle d'une vanne alors que le système est sous pression, la pompe peut occasionner des dommages en expulsant à grande vitesse des jets de liquides volatiles et/ou toxiques.

- Mettre un masque de protection lors de l'injection des échantillons ou en effectuant les opérations de maintenance de routine.
- Ne jamais déconnecter un conduit de solvant ou une vanne sous pression. Arrêter préalablement la pompe et laisser la pression descendre à zéro.
- Utiliser des réservoirs incassables à 50-60 psi.
- Laisser l'enceinte du réservoir fermée lorsque le réservoir est sous pression.
- Se conformer aux **NOTES**, **MISES EN GARDE ET AVERTISSEMENTS** du manuel d'utilisation**.**

Chromatographie Flash

L'utilisateur aura la connaissance des propriétés physico-chimiques des constituants de la phase mobile.

Eviter le contact direct des solvants avec les tuyaux en polyuréthane : certains solvants sont susceptibles de provoquer des faiblesses et des fuites avec risques d'explosion.

Tous les constituants du système devront être connectés à une source de courant commune et à une prise de terre commune. Cette prise de terre devra être fixe et non mobile.

Les solvants non-polaires peuvent produire de l'électricité statique lorsqu'ils passent au travers du système. Les bouteilles qui contiennent la phase mobile (incluant les tuyaux et les flacons de collecte de fractions) doivent être mises à la terre pour éliminer l'électricité statique.

Utiliser des appareils de mesure et de décharge d'électricité statique (par exemple des ionisateurs d'air) pour combattre la formation d'électricité statique.

Radiations ultraviolettes

Les détecteurs CPL utilisant une source lumineuse ultraviolette comportent un écran destiné à se prémunir contre les expositions aux rayonnements.

Pour s'assurer une protection permanente:

- Vérifier que le couvercle de protection de la lampe des détecteurs opérant à des longueurs d'onde variables et fixes soit bien en place durant le fonctionnement du matériel.
- Ne pas regarder directement les cellules du détecteur ou la source d'UV. Se protéger systématiquement les yeux lors du contrôle de la source lumineuse ou des cellules, par exemple au moyen de verres borosilicatés ou en polystyrène.

Disponibilité des pièces de rechange

La politique de Varian consiste à fournir des pièces de rechange pour tous les appareils et accessoires majeurs durant une période de cinq (5) ans après livraison de leur production finale. Les pièces de rechange ne sont fournies au terme de cette période de cinq (5) ans que suivant les disponibilités. Il faut entendre par pièces de rechange les pièces individuelles électriques ou mécaniques susceptibles de défaillance au cours de leur utilisation normale. Par exemple, les relais, les lampes, les sondes thermiques, les éléments de détecteur, les moteurs, etc. Les parties en tôles, les éléments ou assemblages structurels et les pièces de fonderie, les cartes à circuits imprimés et les modules fonctionnels sont normalement susceptibles d'être remis à l'état neuf pendant toute la durée de leur vie utile et ne sont dès lors fournies, au terme de la production finale des appareils, que suivant les disponibilités.

Service d'assistance à la clientèle

Varian fournit divers services destinés à aider sa clientèle après expiration de la garantie: service de réparation sur base de contrats de maintenance à prix attractifs ou sur base d'accords à durée limitée portant sur du matériel spécifique; support technique et service de formation assurés par des chimistes qualifiés sur base contractuelle ou en fonction des besoins spécifiques.

Points de vente des instruments analytiques Varian

Contactez votre point de vente régional Varian pour toute question commerciale ou de service d'assistance à la clientèle ou pour passer commande de pièces et de fournitures.

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Informazioni sulla Sicurezza

Instruzioni per l'Uso

Questo manuale ha lo scopo di aiutare l'operatore ad utilizzare lo strumento in modo sicuro ed efficiente. Le considerazioni e le precauzioni speciali vengono presentate in questo manuale sotto forma di avvisi di **NOTA**, **CAUTELA** e **ATTENZIONE**. E' importante che lo strumento venga utilizzato rispettando le istruzioni fornite in questo manuale o che verranno fornite successivamente dalla Varian. Per ogni eventuale chiarimento sull'uso o sulla sicurezza, si prega di contattare la Varian di Leinì (TO).

NOTA

Sono informazioni utili ad ottenere le prestazioni migliori da parte dello strumento.

ATTENZIONE

Allerta l'operatore su situazioni che potrebbero causare ferite leggere e danni limitati allo strumento ed il modo di evitarle.

ATTENZIONE

Allerta l'operatore su situazioni potenzialmente pericolose che possono causare danni molto seri ed il modo di evitarle.

Segnali di ATTENZIONE	Descrizione del Pericolo
 **ATTENZIONE** **Pericolo di folgorazioni**	Nello strumento sono presenti tensioni pericolose. Scollegare il cavo di alimentazione prima di togliere il pannello fissato con le viti.
 **ATTENZIONE** **ESPOSIZIONE A SOSTANZA CHIMICHE**	Possono essere presenti composti chimici pericolosi. Evitare il contatto, specialmente quando si riempiono i contenitori. Usare protezioni opportune per la pelle e per gli occhi.
 **ATTENZIONE** **Pericolo di scottature**	Pericolo di esposizione a superfici molto calde o raffreddate criogenicamente. Usare protezioni opportune per la pelle.
 **ATTENZIONE** **PERICOLO PER GLI OCCHI**	Particelle volanti, agenti chimici o radiazioni UV possono danneggiare gli occhi. Vanno quindi utilizzate le opportune protezioni per gli occhi e per il volto.
 **ATTENZIONE** **Pericolo di incendio**	Pericolo potenziale di incendio. Seguire le istruzioni del manuale per lavorare con una maggiore sicurezza.
 **ATTENZIONE** **Pericolo di esplosioni**	C'è pericolo di esplosioni a causa del tipo di gas o liquido utilizzato.
 **ATTENZIONE** **Pericolo di radiazioni**	E' presente una radiazione ionizzante. Seguire le istruzioni del manuale per lavorare con una maggiore sicurezza.
 **ATTENZIONE** **Parti in movimento**	Non tenere le mani o le dita vicino.

Norme di Sicurezza

Per lavorare in modo sicuro sullo strumento, Vi consigliamo si adottare le seguenti procedure.

- Verificare periodicamente che non ci siano perdite sulle linee e sui raccordi pneumatici.
- Evitare che le linee dei gas vengano piegate o forate. Le linee vanno posizionate in modo tale da non essere calpestate e lontane da sorgenti o troppo calde o troppo fredde.
- I solventi organici vanno conservati in armadi speciali antiincendio, ventilati e con indicazioni chiare sul contenuto di materiali tossici e/o infiammabili.
- Non accumulare i solventi utilizzati. Adottare un programma regolare di smaltimento, ma mai nelle acque di scarico.

AVVERTENZA: Questo strumento è stato testato secondo le Direttive EMC allo scopo di poter utilizzare il Marchio CE della Comunità Europea. Questo strumento può essere suscettibile a radiazioni/interferenze o frequenze che non sono entro i limiti collaudati.

ATTENZIONE Questo strumento è progettato per l'analisi cromatografica di campioni opportunamente preparati. Deve essere utilizzato usando gas e solventi adatti a questo scopo ed entro i limiti massimi di pressione, flusso e temperatura riportati in questo manuale. Se lo strumento non viene utilizzato secondo le modalità specificate dal costruttore, le condizioni di sicurezza previste potranno non essere sufficienti.

ATTENZIONE E' responsabilità del Cliente informare il Servizio Tecnico Varian, prima di qualsiasi intervento di riparazione, se lo strumento è stato utilizzato per l'analisi di campioni biologicamente pericolosi, radioattivi o tossici.

Pericoli Elettrici

- Prima di togliere i pannelli di protezione, scollegare lo strumento da tutte le alimentazioni elettriche in modo da evitare l'esposizione a voltaggi potenzialmente pericolosi.
- Quando si rende necessario sostituire il cavo di alimentazione, assicurarsi che il nuovo cavo rispetti sia le codifiche di colore e di polarità riportate nel manuale di istruzioni che quelle stabilite dalle norme di sicurezza del laboratorio.
- Sostituire i fusibili bruciati solo con fusibili che abbiano le stesse caratteristiche; queste ultime sono riportate sul pannello dei fusibili e/o nel manuale di istruzioni.
- Sostituire immediatamente i cavi di alimentazione difettosi o consumati con cavi dello stesso tipo e con le stesse caratteristiche.
- Assicurarsi che il voltaggio del pannello di alimentazione corrisponda a quello dello strumento da collegare.

Bombole dei Gas

- Occorre prestare molta attenzione quando si spostano bombole di gas compressi. Rispettare tutte le norme di sicurezza.
- Assicurare le bombole ad una parete o ad una struttura fissa.
- Spostare e conservare le bombole sempre in posizione verticale. Togliere i manometri prima di spostare le bombole.
- Conservare le bombole in un'area ben ventilata, non infiammabile, lontana da sorgenti di calore, non esposta a temperature troppo fredde o alla luce diretta del sole.
- Evidenziare in modo chiaro e che non lasci dubbi il contenuto di ogni bombola.
- Usare solo manometri e raccordi di qualità.
- Usare solo tubazioni cromatograficamente pulite (Numero di Parte Varian 03-918326-00) e calibrate per pressioni superiori a quella massima di uscita dal manometro.

Procedure di Sicurezza in GC

Scarico dei Gas

Per i rivelatori GC non è richiesto alcun sistema particolare di scarico dei gas, se lo strumento è installato in una stanza ben ventilata e se non viene utilizzato per l'analisi di sostanze chimiche pericolose. Se si deve installare un sistema di scarico dei gas:

- Usare condutture non infiammabili
- Installare un aspiratore in uscita
- Posizionare la presa d'aria in modo che le vibrazioni e il movimento dell'aria non disturbino il rivelatore.
- Eseguire verifiche periodiche per garantire un funzionamento corretto.
- Garantire una buona ventilazione nel laboratorio.

Rivelatori a Sorgente Radioattiva

- Leggere e rispettare tutte gli avvisi di **NOTA**, **CAUTELA** e **ATTENZIONE** riportati nel manuale del rivelatore ECD al Ni^{63}.
- Eseguire tutti i test di contaminazione radioattiva rimovibile descritti nel manuale dell'ECD al Ni^{63}.
- Rispettare tutte le procedure e le scadenze di verifica per eventuali perdite.

Pericolo di Scottature

Le zone calde o raffreddate criogenicamente del gascromatografo possono mantenere la loro temperatura per parecchio tempo, dopo aver spento lo strumento. Per evitare scottature, assicurarsi che le zone riscaldate o raffreddate siano a temperatura ambiente oppure indossare delle protezioni adeguate prima di toccare tali superfici.

Procedure di Sicurezza in LC

Pericolo di Alte Pressioni

In caso di rottura di una linea o di apertura accidentale di una valvola, quando il sistema è sotto pressione, la pompa può liberare liquidi tossici e/o volatili molto pericolosi.

- E' opportuno adottare un sistema di protezione del viso quando si inietta il campione o si esegue una manutenzione routinaria del sistema.
- Non smontare mai una linea del solvente od una valvola quando il sistema è sotto pressione. Fermare prima la pompa ed aspettare che la pressione scenda a zero.
- Usare dei contenitori per solventi infrangibili ed in grado di lavorare a 50-60 psi.
- Quando i contenitori sono sotto pressione, usare una protezione esterna.
- Leggere e rispettare tutti gli avvisi di **NOTA**, **CAUTELA** e **ATTENZIONE.**

Cromatografia Flash

L'operatore deve conoscere le proprietà fisico-chimiche delle componenti della fase mobile.

I solventi non vanno messi in contatto diretto con il tubo di erogazione in poliuretano, dal momento che alcuni solventi possono causare indebolimento e perdite con possibili scoppi.

Tutte le componenti del sistema vanno collegate ad una fonte di alimentazione e ad una messa a terra comuni. E' meglio che per quest'ultima venga utilizzata una spina con polo di terra.

I solventi non-polari possono sviluppare una carica statica quando vengono pompati attraverso il sistema. Tutti i recipienti che contengono la fase mobile (inclusi i tubi e i recipienti di raccolta) devono avere una messa a terra per disperdere l'elettricità statica.

Vanno utilizzati dispositivi di misurazione e scarico (ad esempio ionizzatori d'aria) per evitare l'aumento di elettricità statica.

Radiazioni Ultraviolette

I rivelatori di cromatografia liquida che usano sorgenti a luce ultravioletta montano degli schermi di protezione per evitare che gli operatori siano esposti a radiazioni pericolose.

Per una protezione sicura:

- Assicurarsi che i coperchi delle lampade dei rivelatori a lunghezza fissa e variabile siano sempre al loro posto, quando si lavora.
- Non guardare mai direttamente dentro le celle o alla sorgente di luce UV. Quando si vuole ispezionare la lampada o le celle, usare sempre delle protezioni adatte per gli occhi, quali vetro in borosilicato e polistirolo.

Disponibilità delle Parti di Ricambio

E' politica della Varian il fornire le parti di ricambio per lo strumento ed i suoi accessori per un periodo di cinque (5) anni a partire dalla data di produzione dell'ultima unità della serie. Le parti di ricambio saranno disponibili anche dopo questo periodo di cinque (5) anni ma solo in base alla disponibilità delle stesse. Per parti di ricambio si intendono i componenti elettrici e meccanici soggetti ad usura durante l'uso, in condizioni normali, dello strumento. Come esempio, citiamo i relay, le lampade, i probe di temperatura , i componenti del rivelatore, i motorini, ecc. Le parti strutturali o da fusione, le schede elettroniche ed i moduli funzionali possono essere ricostruiti e rimessi a nuovo durante tutto il loro periodo di vita e perciò sarà possibile acquistarli, dopo la produzione dell'ultima unità delle serie, solo in base alla loro disponibilità.

Servizi Tecnico

La Varian, alla scadenza del periodo di garanzia, è in grado di fornire ai suoi clienti un'ampia scelta di opzioni. Le riparazioni possono essere effettuate sulla base di contratti di manutenzione particolarmente vantaggiosi od in base ad una tariffa oraria piu' il costo delle parti. A richiesta, si possono avere corsi per operatori sia sotto forma di contratto che a tariffe da concordare.

Uffici Vendite della Divisione Strumenti Analitici della Varian

Per informazioni relative alla Vendita, al Servizio Tecnico o all'acquisto di Parti di ricambio, si prega di contattare l'ufficio Varian piu' vicino.

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Instrucciones de Seguridad

Instrucciones de Operación

Este Manual de Instrucciones está diseñado para ayudarle a establecer las condiciones de operación que le permitan operar su instrumento de forma segura y eficaz. Así mismo, se describen consideraciones especiales ó precauciones, que aparecen en forma de **NOTA**, **PRECAUCION**, y **ATENCION** como se indica más abajo.Es importante que utilice el instrumento de acuerdo con este Manual de Operación y cualquier otra información que le proporcione Varian. Remita a la Oficina Local de Varian cualquier cuestión que tenga respecto al correcto uso de su equipo.

NOTA

Información para ayudarle a obtener unas prestaciones óptimas de su instrumento.

¡PRECAUCION!

Le alerta de situaciónes que pueden causar daños moderados a la salud ó al equipo, y cóm evitar esas situaciones.

ATENCIÓN

Le alerta de potenciales situaciones peligrosas que pueden causar serios daños, y cómo evitar esas situaciones.

Símbolo	Descripción
 **ATENCIÓN PELIGRO DE DESCARGA ELÉCTRICA**	El instrumento utiliza voltages peligrosos. Desconecte el interruptor general antes de retirar los paneles atornillados.
 **ATENCIÓN PELIGRO QUÍMICO**	Peligro de productos químicos. Evite el contacto, especialmente cuando rellene los depósitos. utilice protección de ojos y piel.
 **ATENCIÓN PELIGRO DE QUEMADURAS**	Superficies posiblemente calientes ó frías (criogénico). Utilice protección para la piel.
 **ATENCIÓN PELIGRO PARA LOS OJOS**	Las partículas volátiles, productos químicos o radiación UV pueden causar daños en los ojos. Usar las debidas protecciones para la cara y los ojos.
 **ATENCIÓN PELIGRO DE FUEGO**	Peligro potencial de fuego. Siga las instrucciones del Manual de Operación para su seguro funcionamiento.
 **ATENCIÓN PELIGRO DE EXPLOSIÓN**	Peligro potencial de explosión debido al tipo de gas ó líquido empleado.
 **ATENCIÓN PELIGRO DE RADIACIÓN**	Peligro por Fuente de radiación. Siga las instrucciones del Manual de Operación para su seguro funcionamiento.
 **ATENCIÓN PARTES EN MOVIMIENTO**	Mantenga alejados los dedos y las manos.

Precauciones Generales de Seguridad

Siga estas indicaciones de seguridad para una correcta operación del equipo.

- Realice verificaciones periódicas de fugas en todas las líneas de suministro y tuberías.
- No permita que las líneas de gas se doblen ó pinchen. Manténgalas alejadas de zonas de paso y del calor ó frío excesivo.
- Guarde los disolventes orgánicos en cabinas ventiladas, a prueba de fuego, y etiquetadas para que puedan ser fácilmente identificadas como material tóxico y/ó inflamable.
- No acumule disolventes inservibles. Deseche todo el material inservible a través de un programa especial de desechos y no a través del sistema convencional.

NOTA: Este instrumento ha sido testado bajo las normas de la Directiva EMC según requerimientos de la Marca CE de la Unión Europea. Por lo tanto, este equipo puede ser sensible a niveles de radiaciones / interferencias ó frecuencias que no estén incluidas dentro de los límites testados.

ATENCIÓN Este instrumento está diseñado para análisis cromatográfico de muestras preparadas apropiadamente. Debe ser operado usando gases y/ó disolventes apropiados y con unos niveles máximos de presión, flujos y temperaturas, según se describe en este manual.

ATENCIÓN El Usuario tiene la obligación de informar al Servicio Técnico de Varian cuando el instrumento vaya a ser empleado para análisis de muestras peligrosas de origen biológico, radioactivo ó tóxico, antes de comenzar a realizar cualquier análisis.

Peligros Eléctricos

- Desconecte el instrumento de todos las conexiones eléctricas a la red antes de retirar los paneles para evitar la posible exposición a peligrosos voltages.
- Cuando sea necesario emplear una clavija eléctrica no original, asegurese de colocar los cables de acuerdo con el código de colores y polaridades descritos en el manual y los códigos de seguridad de la red eléctrica.
- Sustituya los fusibles fundidos con fusibles del tipo y tamaño estipulados en el panel de fusibles ó en el manual.
- Sustituya los cables deteriorados inmediatamente con cables del mismo tipo y graduación.
- Asegureses de que los valores de las líneas de electricidad se ajustan a los valores para los que el Instrumento ha sido preparado.

Botellas de Gas Comprimido

- Guarde y maneje las botellas de gas con cuidado y de acuerdo con las normas de seguridad.
- Asegure las botellas a una estructura inmovil ó a la pared.
- Guarde y mueva las botellas en posición vertical. Retire los reguladores antes de transportarlas.
- Guarde las botellas en un área ventilada, lejos de fuentes de calor, de luz solar directa y de temperaturas extremadamente bajas.
- Identifique las botellas claramente para evitar cualquier duda sobre su contenido.
- Utilice sólamente reguladores y conexiones aprobadas.
- Utilice sólo tubos de conexión cromatográficamente límpios (Varian p/n 03-918326-00) y que tengan una graduación de presión significativamente mayor que la mayor presión del regulador.

GC Prácticas de Seguridad

Sistema de Extracción

No se necesita un sistema de extracción para los detectores GC instalados en un laboratorio bien ventilado, excepto cuando se analicen muestras químicas peligrosas. Si instala un sistema de extracción:

- Utilice conductos a prueba de fuego.
- Instale un ventilador al final del sistema.
- Instale entradas de aire cuya vibración no afecte al trabajo del detector.
- Compruebe periódicamente el correcto funcionamiento del sistema.
- Asegurese de una correcta ventilación del laboratorio.

Detectores con fuentes radioctivas

- Lea con cuidado y cumpla todas las **NOTAS**, **PRECAUCION**, y **ATENCION** del Manual del Detector Ni^{63} ECD.
- Realice los test de contaminación radioactiva descritos en el Manual del Detector Ni^{63} ECD.
- Cumpla con los plazos y procedimientos de test de fugas.

Peligro de Quemaduras

Las zonas de calor ó frío (criogénicas) del Cromatógrafo de Gases pueden permanecer calientes ó frías durante bastante tiempo después de apagar el instrumento. Para evitar quemaduras asegureses de que todas las áreas que se calienten ó enfríen han vuelto a la temperatura ambiente, ó protejase adecuadamente las manos, antes de tocar las superficies potencialmente calientes ó frías.

LC Prácticas de Seguridad

Peligro de Alta Presión

Si se rompe una línea de presión, ó se abre una válvula de seguridad accidentalmente bajo presión, la bomba puede generar líquidos a alta presión potencialmente peligrosos, produciendo un chorro a alta velocidad de líquidos volátiles y/ó tóxicos.

- Lleve protección facial cuando inyecte muestras ó realice mantenimiento de rutina.
- Nunca abra una línea ó una válvula bajo presión. Apague la bomba antes y deje que la presión baje a cero.
- Utilice depósitos irrompibles que sean capaces de operar a 50-60 psi.
- Mantenga cerrada la junta del depósito cuando se haye bajo presión.
- Lea y cumpla todas las **NOTA**, **PRECAUCION**, y **ATENCION** del manual.

Cromatografía Flash

El operador debe familiarizarse con las propiedades físico-químicas de los componentes de la fase móvil.

Alejar los disolventes del contacto directo con los tubos de poliuretano ya que ciertos disolventes pueden causar reblandecimiento de los tubos o posibles fugas con riesgo de explosión.

Todos los componentes del sistema deben estar conectados a un enchufe común con toma de tierra común. Esta toma de tierra debe ser una toma de tierra verdadera en lugar de flotante.

Los disolventes no-polares pueden originar carga estática cuando son bombeados por el sistema. Todos los recipientes que contienen fase móvil (incluyendo los tubos y los recipientes de recogida) deben estar conectados a tierra para disipar la electricidad estática.

Utilizar medidores de carga estática y los debidos dispositivos de descarga (por Ej., ionizadores de aire) para salvaguardarse contra la creación de electricidad estática.

Radiación Ultravioleta

Los detectores del Cromatógrafo de Líquidos que utilizan una fuente de luz ultravioleta disponen de protección para prevenir exposiciones radioactivas al personal.

Para una correcta protección:

- Asegurese de que las cubiertas de protección de la lámpara de los detectores está correctamente situada durante su funcionamiento.
- No mire directamente a las celdas del detector ó a la fuente de luz UV. Cuando inspeccione la fuente de luz ó la celda, utilice siempre una protección para los ojos como gafas de borosilicato ó poliestireno.

Disponibilidad de Recambios

Es Política de Varian disponer de Recambios para cualquier instrumento y la mayoría de los accesorios por un periodo de cinco (5) años después del último instrumento fabricado. Los recambios durante esos cinco años estarán disponibles, pero siempre bajo el sistema *"Según disponibilidad"*. Los Recambios están definidos como todas aquellas partes individuales mecánicas ó eléctricas que son susceptibles de fallo durante su normal proceso de operación. Por ejemplo, relés, lámparas, sondas de temperatura, elementos del detector, motores, etc. Las planchas de metal, partes de la estructura, placas de circuitos integrados, y otros módulos funcionales son normalmente susceptibles de reparación y por lo tanto sólo estarán disponibles bajos el sistema *"Según disponibilidad"* después del último instrumento fabricado.

Disponibilidad de Servicio

Varian ofrece una gran variedad de sistemas de Servicio para mantener el soporte a sus usuarios tras el periodo de garantía. El Soporte de Servicio se ofrece a través de atractivos Contratos de Servicio ó bajo un sistema de facturación de mano de obra y materiales. El mantenimiento y el entrenamiento se realiza por ingenieros cualificados bajo Contrato ó petición.

Oficinas de Instrumentación Analítica Varian

Para cualquier consulta sobre Instrumentación Analítica, Servicio Técnico ó Recambios y Accesorios, contacte con su oficina local:

Argentina
Buenos Aires
Tel. +54.11.4.783.5306

Australia
Mulgrave, Victoria
Tel. +61.3.9566.1134

Austria
Vösendorf bei Wien
Tel. +43.1.699.9669

Benelux
Bergen Op Zoom
Tel. +31.164.282.800

Brazil and Latin America (S)
São Paulo
Tel. +55.11.820.0444

Canada
Mississauga, Ontario
Tel. 800.387.2216

China
Beijing
Tel. +86.106209.1727

Europe
Middelburg, The Netherlands
Tel. +31.118.671.000

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Les Ulis Cédex
Tel. +33.1.6986.3838

Germany
Darmstadt
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India
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Tel. +91.22.857.0787/88/89

Italy
Torino
Tel. +39.011.997.9111

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Tokyo
Tel. +81.3.5232.1211

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Tel. +82.2.345.22452

Mexico and Latin America (N)
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Tel. +52.5.523.9465

Russian Federation
Moscow
Tel. +7.095.937.4280

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Tel. +34.91.472.7612

Sweden
Solna
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Switzerland
Varian AG
Tel. +41.848.803.800

Taiwan
Taipei Hsien
Tel. +886.2.698.9555

United Kingdom and Ireland
Walton-on-Thames
Tel. +44.1932.898000

Venezuela
Valencia
Tel. +58.41.257.608

United States
Walnut Creek, California, USA
Tel. +1.800.926.3000
(GC and GC/MS)

Tel. +1.800.367.4752
(LC)

VARIAN

www.varianinc.com

03-914603-84:10

Table of Contents

Installation

Unpacking

Inspect the ProStar 410 for indications of damage. Keep the shipping container as it provides excellent protection for your detector for any future transit or storage.

Any evidence of damage should be reported immediately to the carrier and to:

Varian Chromatography Systems
2700 Mitchell Drive
Walnut Creek, CA 94598-1675
Attention: Customer Service
1-800-FOR HPLC or your local Varian office

Check the contents against the enclosed packing list. Any discrepancies or missing items should be reported to the carrier and to Varian.

CAUTION

Before using the ProStar 410, allow the instrument to warm to room temperature for 1 hour.

Lift the ProStar 410 as shown in Figure 1 with both hands under the instrument or with one hand under the front and the other hand grasping the rear top of the ProStar 410.

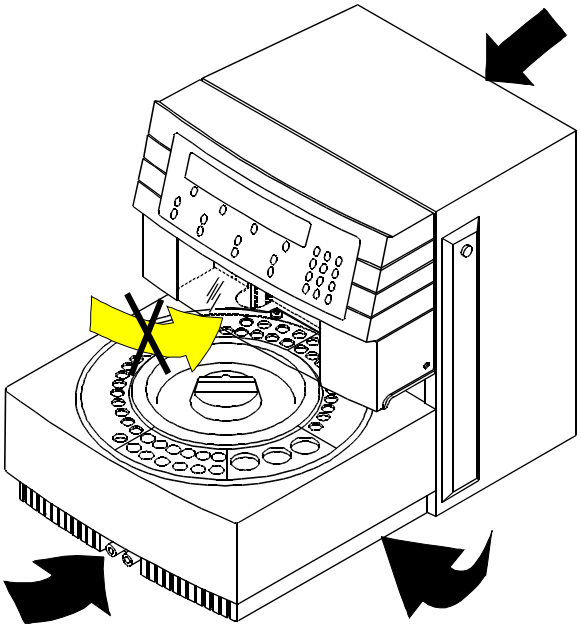


Figure 1 ProStar 410 Lifting Instructions

CAUTION

Do NOT lift the ProStar 410 by the front cover.

Location of the ProStar 410

The ProStar 410 needs approximately 30 cm (12 inches) of bench space and one power supply (230 Vac or 115 Vac, 50/60 Hz).

The best place to install your ProStar 410 is at the top of the module stack. This stack would normally be; solvent delivery module on the bench, detector on top of the SDM, and finally the AutoSampler. From the right-hand side you have the shortest connection to the injection valve of the ProStar 410 to the column.

Be sure that none of the ventilation holes are blocked. Blockage of the ventilation holes can cause overheating of the ProStar 410 AutoSampler and even damage the electronics inside.

Do not install the ProStar 410 in areas subject to excessive dust, direct sunlight or shocks and do not place it near any other source of heat, this will affect the performance of the cooling tray if installed.

Power Connections

Before connecting the power cable to a power source, check the voltage setting of the ProStar 410 at the input socket on the rear-panel. Make sure that the voltage setting is identical with the voltage of your local power supply, use only a supply appliance with protective grounding.

If the indicated voltage is not correct, select the proper voltage by removing, inverting, and then reinserting the voltage selector-cartridge.

Check if the correct fuses are installed; if not replace them with the correct fuses.

CAUTION

For 115 Vac ±15%, use two 5 A T-fuses (slow-blow).
For 230 Vac ±15%, use two 2.5 A T-fuses (slow-blow).

All fuses must be UL listed and CSA certified, or IEC 127 type.

WARNING:
FIRE HAZARD

Risk of fire; replace fuses as marked.

When the voltage selection and fuses are correct for your power source, plug in the power cable.

Fluid Connections

The ProStar 410 is factory installed with a 250 µL syringe, a 100 µL loop, a 500 µL buffer tubing and a stainless steel sample needle.

A schematic presentation of all parts that have contact with any fluid is shown below. This sticker can be found on the inside of the front cover.

To get access to the fluidics, it is necessary to open the front cover of the ProStar 410. To do this, remove the screw on the right-hand side of the ProStar 410 front cover.

See *Table 1* for the dimension of the standard installed tubing.

To obtain optimal performance of the ProStar 410, a correct combination of syringe, loop and buffer tubing should be installed, see also *Needle and Tubing,* page 60.

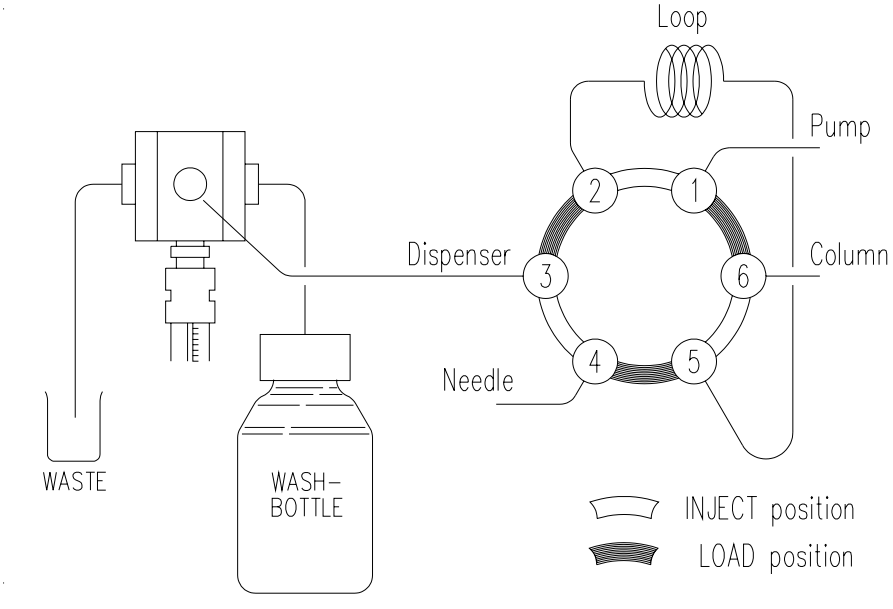


Figure 2 Fluid Connections of the ProStar 410

Table 1 Standard Installed Tubing of the ProStar 410

Tubing	***Material and dimensions***		***Volume***
Standard sample needle and tubing.	SS tubing 0.25 mm ID Tefzel tubing	70 mm x 0.65 mm OD x 155 mm x $^{1}/_{16}$" OD x 0.25 mm ID	11 µL
Buffer tubing from high pressure valve to syringe valve.	PTFE tubing	640 mm x $^{1}/_{16}$" OD x 1.0 mm ID	500 µL
Tubing syringe valve to wash solvent bottle.	PTFE tubing	300 mm x $^{1}/_{16}$" OD x 1.0 mm ID	
Tubing syringe valve to waste.	PTFE tubing	400 mm x $^{1}/_{16}$" OD x 1.6 mm ID	

HPLC Connections

To ensure reproducible injections the following connections to your HPLC system should be made:

- Connect the HPLC pump to port 1 of the injection valve.
- Connect the HPLC column to port 6 of the injection valve.

The instrument has been flushed with Iso–propanol: make sure that the mobile phase of your HPLC system is miscible with Iso–propanol. If your mobile phase is not miscible with Iso-propanol, then start with an intermediate solvent that is and transition to the mobile phase. To avoid possible contamination of the column, it is good practice to not have the column installed during this operation.

NOTE:	It is essential that the contents of the sample loop are injected as a back flush onto the column, ther efore do not exchange column and pump connections at the injection valve.

Waste Tubing

General Waste

Connect the drain tubing (in the Accessory Kit of the ProStar 410) to the right-hand drain hose connector of the ProStar 410 and put it in a bottle which is placed on the floor. All the liquid dispensed while the ProStar 410 is in the wash position is removed through this drain.

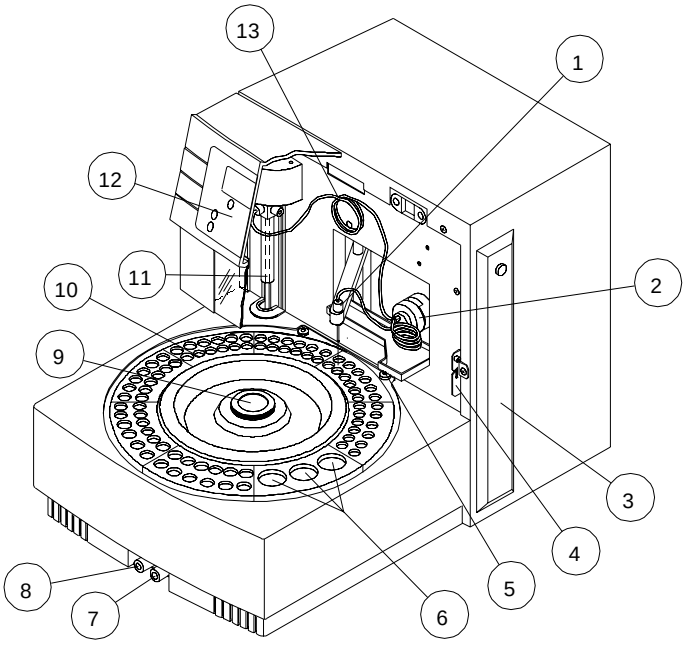


Figure 3 ProStar 410 AutoSampler Exploded View

1. Needle Arm
2. Injection valve
3. Oven compartment
4. Tubing guide
5. Wash position
6. Position for transport solvent and reagent vials
7. Vial wash drain
8. Condensed water and leakage drain
9. Tray fixation knob
10. Sample tray
11. Syringe dispenser
12. Keyboard

Placing the sample tray in the ProStar 410:

- Place the sample tray in the ProStar 410 and rotate it until the tray drops into the slot, only one position is possible.
- Turn the tray fixation knob (9) clock-wise to fixate the tray.
- The ProStar 410 is now ready for use.

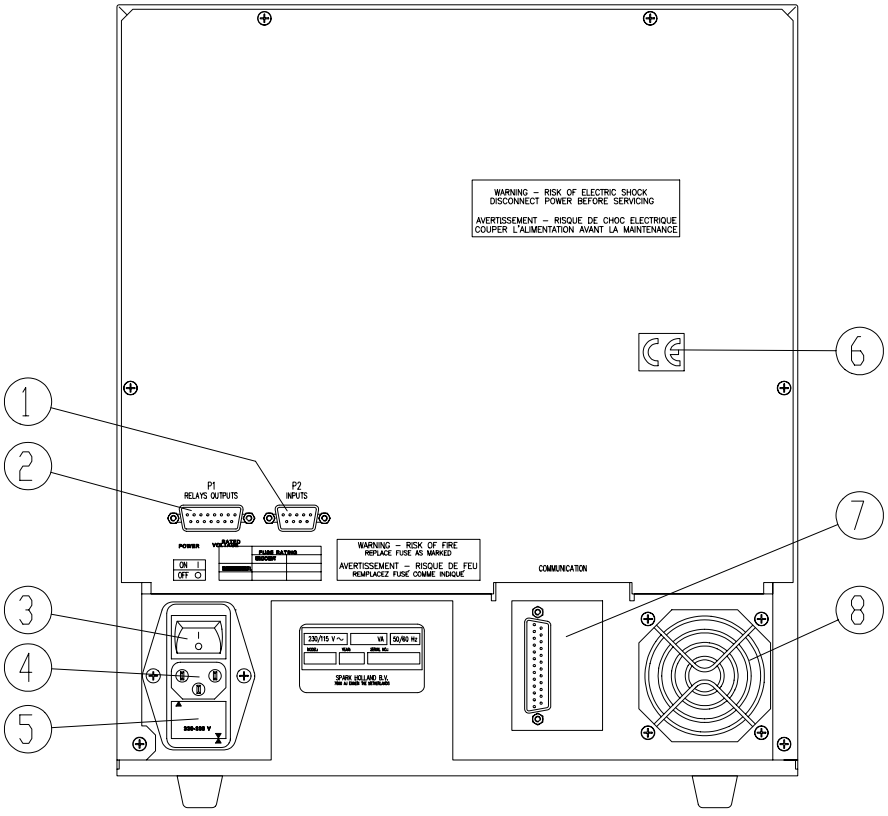


Figure 4 Rear Side of the ProStar 410 AutoSampler.

1. P2- I/O connector; Inputs, see page 15.
2. P1- I/O connector; Relays outputs, see page 15.
3. Main switch.
4. Main input.
5. Fuses and voltage selector.
6. CE-mark.
7. RS-422 communication interface connector.
8. Fan, only when tray cooling option is installed.

NOTE:	Sample which is not injected is also removed through this tubing.

Syringe Waste

Place the syringe waste tubing into a small bottle next to the ProStar 410. If no injection volumes are programmed that are larger than the buffer tubing can contain, the syringe waste will only be wash solvent.

Condensation Water and Leakage Drain

All solvents that result from a leak in the system and condensed water, in case a Peltier cool option is installed, is drained through the left hand hose connector.

If the optional Peltier tray cooling is installed, it is advisable to connect this hose connector (in the Accessory Kit of the ProStar 410) to a waste container on the floor.

CAUTION

Be sure that the drain and waste tubing are not twisted thereby obstructing the flow path.

Wash Solvent and System Rinse

Use a clean bottle for the wash solvent and place it at the left-hand side of the ProStar 410.

NOTE:	It is recommended to use a mixture of distilled water / Iso-propanol (80/20 $^{v}/_{v}$%) or the mobile phase as wash solvent. Before using the wash solvent, degas the solvent with Helium or an ultrasonic bath. Do not use salts or buffer solutions as crystals may block or damage the system.

To fill the wash solvent tubing use the following procedure:

- Put the wash solvent tubing in the filled wash solvent bottle.
- Press **<MAINTENANCE>** to go to the ProStar 410 maintenance functions.
- Fill the tubing using the ProStar 410 soft-function keys **<SYR END>** and **<SYR HOME>**.
- With **<SYR END>** a syringe volume of wash solvent is aspirated from the wash solvent bottle and the wash solvent tubing is filled.
  With **<SYR HOME>** the syringe contents will be dispensed to the syringe waste.
- Repeat this action until the wash solvent tubing and the syringe are completely filled and no air bubbles appear in the syringe.
- Press **[Escape]** to leave the maintenance screen.

After the wash solvent tubing and the syringe are filled, press **<WASH>** to perform a standard wash routine. All tubing connected to the syringe valve will be rinsed with wash solvent.

Syringe

The ProStar 410 is factory equipped with a 250 µL syringe, but can also be equipped with a 1000 µL syringe, see page 66 on how to replace the syringe.

NOTE:	The ProStar 410 will give the best results if all air is removed from the syringe. Use **<WASH>** to remove air from the syringe, if this is not satisfactory, see page 9 for more tips on removing air.

Preparation of Vials

Vial Dimensions

The standard tray for the ProStar 410 contains 84 standard sample and three large volume vials for reagents and transport liquid.

NOTE: Vials used should meet the following dimensions:

Maximum vial height, including cap: 47 mm
Minimum vial height, including cap: 32 mm

Maximum vial diameter:
- Standard sample vial: 12 mm
- Reagent / transport liquid vials: 22 mm
- Large sample volume vials: 22 mm

The following section contains examples of Chromacol vials which can be used in the ProStar 410. See page 86, for the corresponding Varian part numbers for the vials, seals and caps.

Chromacol standard sample vials

The following Chromacol vials can be used in the ProStar 410. For each vial the Chromacol reference number is given.

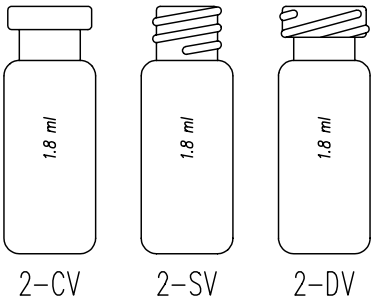


Figure 5 Standard sample vials.

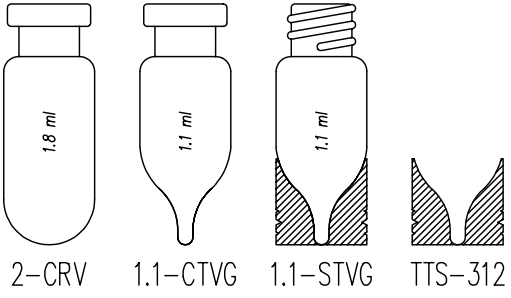


Figure 6 Conical vials with support.

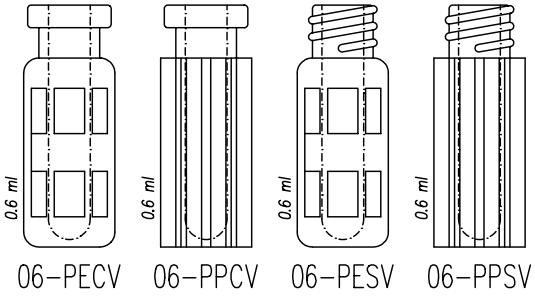


Figure 7 Plastic vials

To reduce the volume of standard vials use a Chromacol insert (02–MTV, 02–MTVWG or 03–MTV) in combination with the appropriate vial and support sleeve or spring.

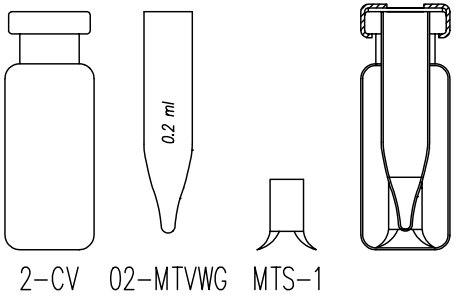


Figure 8 Standard vial with insert.

Chromacol 2.5-CV vials

It is possible to use the Chromacol 2.5-CV vials in the ProStar 410.

When used, this vial type must be programmed in the *System Settings*, see page 40.

NOTE: ProStar 410 uses two aspiration heights to aspirate liquid from the 2.5-CV vials. Therefore the vials need to be full, when ProStar 410 is started.

When a vial is not full the ProStar 410 might aspirate air.

Chromacol reagent and transport liquid vial

The following Chromacol vial can be used for Reagents and transport liquid, this vial can also be used in the optional LSV tray.

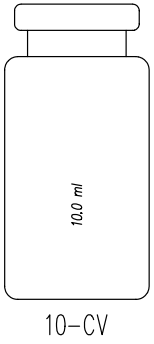


Figure 9 Reagent and transport liquid vial.

CAUTION

Only use the Chromacol seal (P/N 20-ST101) in combination with the 10-CV vials together with one of the following caps:

Chromacol: 20-ACB (Blank aluminum cap)
20-MCB (Blank tinplate cap)

CAUTION

Do not use the 10-CV vials without being capped. Uncapped vials will NOT be detected by the ProStar 410 vial sensor.

NOTE:	ProStar 410 uses two aspiration heights to aspirate liquid from the reagent and transport liquid vials. Therefore the vials need to be full when the ProStar 410 is started. When a vial is not full the ProStar 410 might aspirate air.

Eppendorf micro centrifuge tubes

Eppendorf micro centrifuge tubes may be used instead of the standard vials.

To avoid cross contamination, prevent the air needle from making contact with the sample.

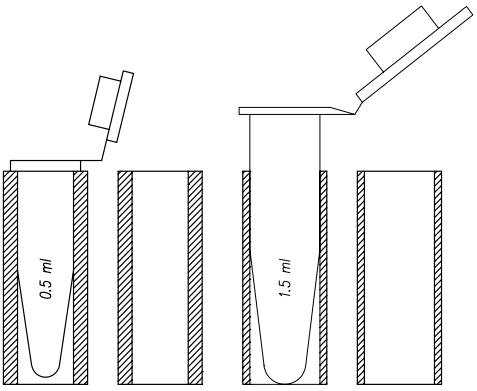


Figure 10 Eppendorf micro centrifuge tubes with support sleeve.

NOTE:	When using Eppendorf micro centrifuge tubes in the ProStar 410 do not leave open spaces on the tray. The vial detection system may not always detect a missing tube because of the shape of the tubes.

Filling and Sealing the Vials

The standard vials, as well as the conical vials, can best be filled by means of a narrow–end pipette to allow air to escape when filling the vial.

Do not fill vials completely to the top. In that case sample will be forced into the air needle, risking cross-contamination of samples and fouling of the needle pair.

It is important that the seal is airtight, to maintain a pressure on the vial for air bubble prevention and to prevent evaporation of volatile samples.

NOTE: When using uncapped vials, the performance of the AutoSampler may not meet the specifications (precision).

Do not re-use a sample vial without replacing its cap or septum.

Check seal after crimping: if the cap can be turned easily, the seal is not airtight (re-adjust hand crimper).

Loading the Sample Tray

Place vial in the tray and link them to methods in the Series, see page 52.

To gain access to all vial positions the tray can be rotated manually when the ProStar 410 is not running.

Control I/O Connections

The ProStar 410 has three standard I/O connectors:

- RS485/4222 connector for serial communication using the Varian Star Workstation Version 5.0 or higher, see also page 35.
- Contact closures output connector (P1)
- TTL input connector (P2)

WARNING

Varian will not accept any liability for damages directly or indirectly caused by connecting this AutoSampler to instruments which do not meet relevant safety standards.

Contact Closure Output Connector (P1)

Table 2 Connector P1: Contact closure outputs.

Pin no:	Description:	Pin no:	Description:
1	Inject marker 1 - Normally open	10	Alarm output - Normally open
2	Inject marker 1 - Common	11	Alarm output - Common
3	Inject marker 1 - Normally closed	12	Alarm output - Normally closed
4	Auxiliary 1 - Normally open	13	Auxiliary 2 - Normally open
5	Auxiliary 1 - Common	14	Auxiliary 2 - Common
6	Auxiliary 1 - Normally closed	15	Auxiliary 2 - Normally closed
7	Inject marker 2 - Normally open		
8	Inject marker 2 - Common		
9	Inject marker 2 - Normally closed		

NOTE: V_{MAX} = 28 V_{DC} / V_{AC} , I_{MAX} = 0.25 A

An **Inject marker output** (1 and 2) will be generated when the injection valve switches from **LOAD** to **INJECT**.

The **Alarm Output** will be activated whenever an error occurs see page 89 for a description of the *Error Codes* of the ProStar 410.

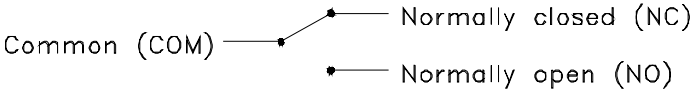


Figure 11 Contact closure output

TTL Input Connector (P2)

This connector is an active high or active low TTL input, user definable in the System Settings. The **Next Injection Input** can be used when the ProStar 410 works in **Remote Control**. The **Freeze Input** and **Stop Input** can be used to control the ProStar 410 from other devices.

Table 3 Connector P2: TTL inputs.

Pin no:	Description:
1	Next Inject Input
2	Signal Ground
3	Freeze Input
4	Stop Input
5-9	Signal Ground

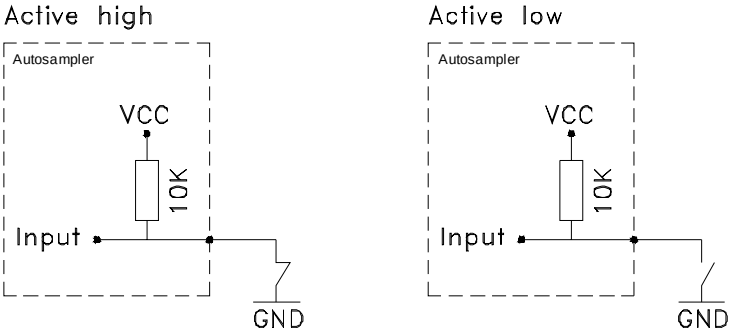


Figure 12 TTL Input

Next Injection Input

This input will start the next injection sequence when the ProStar 410 is started in Remote Control. After finishing the injection sequence the ProStar 410 will wait for the **Next Injection Input.**

From the **Ready** screen a **Next Injection Input** will start the latest programmed Series. In this case the ProStar 410 will not wait for the **Next Injection Input** before continuing with the next injection. The ProStar 410 will execute the complete Run as if it was started with the **[Start/Stop]** key.

Freeze input

The ProStar 410 will freeze the analysis time for the time this input is active. If the **Freeze Input** is activated while the analysis time is not running, the ProStar 410 will perform all programmed pre-injection sample handling (mix method and sample load). But the ProStar 410 will not inject the sample until the **Freeze Input** is no longer active.

Stop Input

With this input the run of the ProStar 410 is immediately aborted and returns to the Ready screen. If the ProStar 410 is in Remote Control, the Run of the ProStar 410 is immediately aborted but the ProStar 410 remains in Remote Control and can not be re-started with a *Next Injection Input,* see also page 56.

About ProStar 410

The ProStar 410 has been designed to meet the needs of the modern analytical laboratory: reliable, cost-effective and easy to use. Column temperature control and sample cooling are available for consistent results. High resolution syringe control guarantees superior precision for injection and reagent addition. For quick service the entire injection valve can be replaced in seconds. The use of these and many more features are described in this manual.

Loop injection with Pressure Assisted Sample Aspiration is a proven concept that combines high precision with simplicity and reliability. Three injection modes can be selected: full loop, partial loop filling and µL Pick-up for maximum precision, maximum flexibility and zero sample loss.

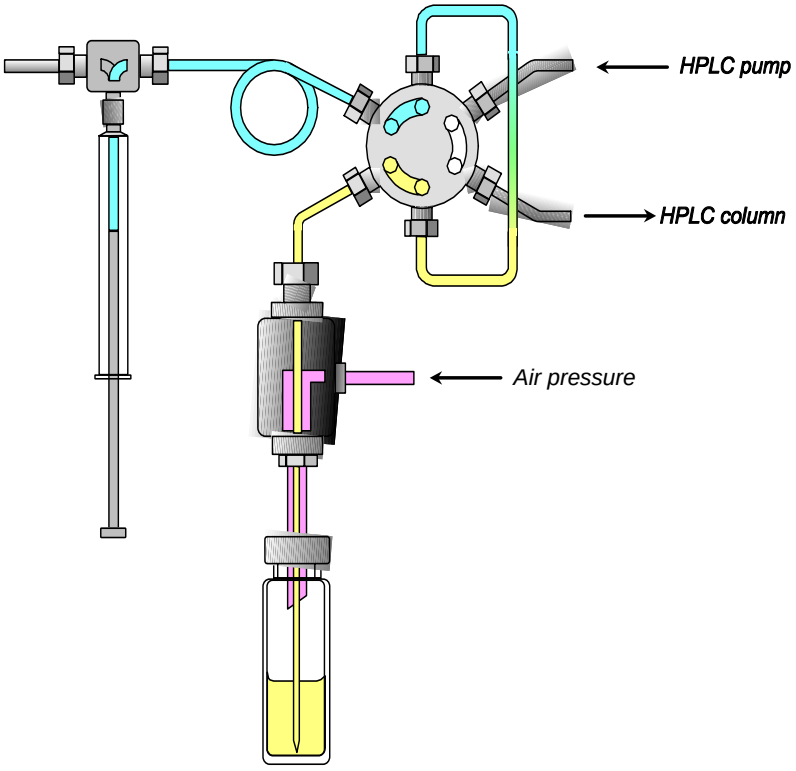


Figure 13 Diagram of Sample Loading Configuration.

Side-Port Needle

The strong side-port needle combines the optimum point style for septa piercing with a minimum risk of blockage by septum particles.

Column Oven for Consistent Results

A column oven is an integral part of the ProStar 410 because constant column temperature is important for long term stability of a chromatographic separation and may be required for GLP compliance.

Integrated Sample Cooling Option

Thermo-electric sample cooling is available as a fully integrated option. No external device is required and the efficient cooling concept does not restrict access to the sample tray during operation.

Reagent Addition Made Simple

Internal Standard addition, sample dilution or derivatization can be programmed in a very simple manner. A single-stage derivatization of a sample in a separate (destination) vial requires no more than 4 program lines. Multi-reagent addition is also possible: two large volume reagent vials are available on the sample tray.

Ease of Service Design

Low instrument down time is accomplished by a high Mean Time Between Failure and quick instrument service. Special attention has been paid to these aspects of the concept, as is illustrated by the injection valve. The ProStar 410 will alert you when the lifetime of the seal is exceeded or if the switching torque becomes too high. This allows preventive maintenance before injection performance degrades. And if necessary, the entire injection valve can be replaced in seconds with the unique Quick-fit valve mounting mechanism.

Injection Principle

A unique sequence of valve switching and syringe dispenser controlled sample withdrawal enables the ProStar 410 to inject sample volumes in a range from a few microliters to milliliters in a simple and reproducible manner.

Therefore three different modes of injection can be selected:

- Full loop: The sample loop is completely (quantitatively) filled with sample resulting in the maximum reproducibility.
- Partial loop: The sample loop is partially filled with sample; low sample loss and programmable injection volumes.
- µL pick-up: After removal from the vial the sample volume is transported into the loop with solvent from another vial resulting in no sample loss.

The ProStar 410 uses a syringe to remove the sample from a vial into the sample loop. To prevent contamination of the syringe the ProStar 410 is equipped with buffer tubing between the syringe and the injection valve.

The wash solvent is used to remove the sample from the buffer tubing and sample needle and rinse the buffer tubing and sample needle.

Full Loop Injections

The switching sequence for a full loop injection is schematically shown in the following figures:

Initially the injection valve is in the **INJECT** position. The sample needle with air needle has entered the vial. The head-space pressure, applied through the outer air needle, ensures that no air or vapor bubbles are formed during sample aspiration.

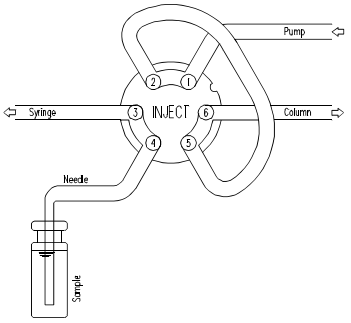


Figure 14 Full loop injection: initial position.

The syringe dispenser aspirates the “flush volume” from the sample vial to fill the sample line with sample and remove wash solvent.

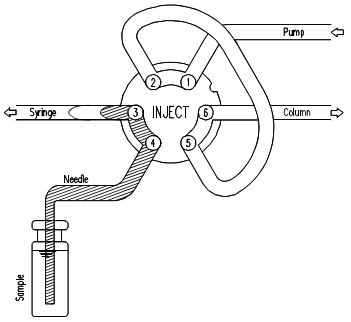


Figure 15 Full loop injection: flushing sample lines and needle.

The injection valve is switched into the **LOAD** position, placing a distinct sample front at the inlet of the sample loop.

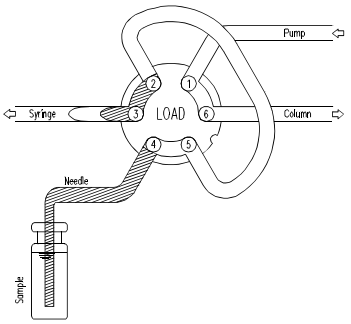


Figure 16 Full loop injection: switch injection valve to LOAD.

The sample loop is quantitatively filled by transporting a number of times the loop volume through the loop, depending on the volume of the loop.

3x loop volumes for loops ≤ 100 µL

2x loop volumes for loops from 100 µL to 500 µL

1½ x loop volumes for loops > 500 µL

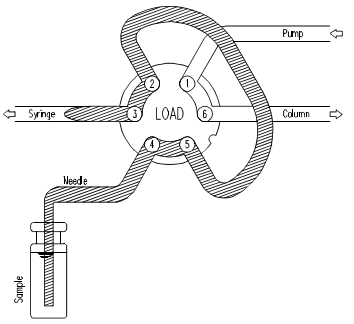


Figure 17 Full loop injection: Filling the sample loop.

The injection valve switches into the **INJECT** position. The sample loop is now part of the HPLC mobile phase flow path: sample is transported to the column. The analysis starts.

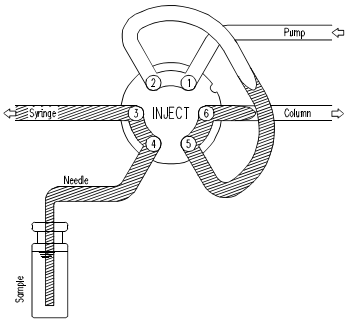


Figure 18 Full loop injection: Injecting sample.

If one injection is to be made out of each vial or a wash routine has to be performed after every injection: the needle withdraws from the vial immediately after the injection and, if programmed, immediately performs a wash. After the analysis time elapses a new sequence is started.

If more than one injection is to be made out of the same sample vial without performing a wash routine, after the analysis time has elapsed the ProStar 410 withdraws a flush volume to compensate for diffusion of mobile phase from the rotor groove into the front of the sample line during the analysis time. This flush volume between injections is not programmable and is always 50% of the programmed flush volume. If the total amount of sample withdrawn with the next injection from the vial will exceed the total volume of the buffer tubing, the buffer tubing is

rinsed before the next injection. The next injection sequence will then start with a full flush volume.

Air segment

An air segment can be used to reduce the amount of flush volume. This air segment is at the front of the flush volume and will not be injected and therefore will not influence the injection. The air segment may be selected in the *System Settings* (ON/OFF, see page 40).

With a standard needle the flush volume must be at least 30 µL for injections with air segment and 35 µL for injections without air segment. If the samples are highly viscous it may be necessary to program larger flush volumes and reduce the syringe speed for better performance.

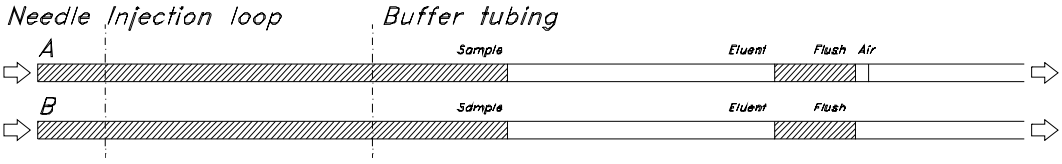


Figure 19 Situation after filling the loop in the case of Full loop injections with (A) or without air segment (B)

Partial Loop Injections

The switching sequence for a partial loop injection is schematically shown in the following figures.

Initially the injection valve is in the **INJECT** position. The sample needle with air needle has entered the vial. The head-space pressure, applied through the outer air needle, ensures that no air or vapor bubbles are formed during sample aspiration.

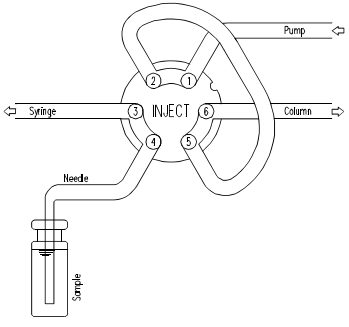


Figure 20 Partial loop injection: initial situation.

The syringe dispenser aspirates the “flush volume” from the sample vial to fill the sample line with sample and remove wash solvent.

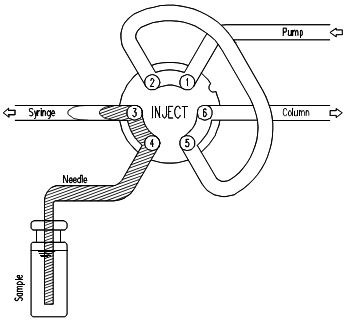


Figure 21 Partial loop injection: flushing sample lines and needle.

The injection valve is switched into the **LOAD** position, placing a distinct sample front at the inlet of the sample loop.

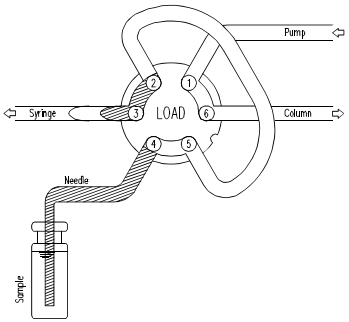


Figure 22 Partial loop injection: switch injection valve to LOAD.

The programmed injection volume is now aspirated into the sample loop.

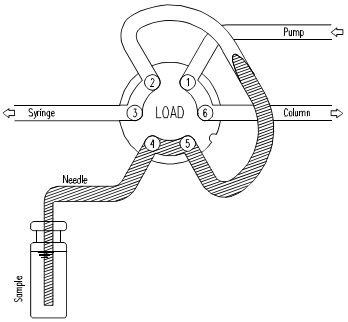


Figure 23 Partial loop injection: filling the sample loop.

The injection valve switches into the **INJECT** position. The sample loop is now part of the HPLC mobile phase flow path: sample is transported to the column. The analysis starts.

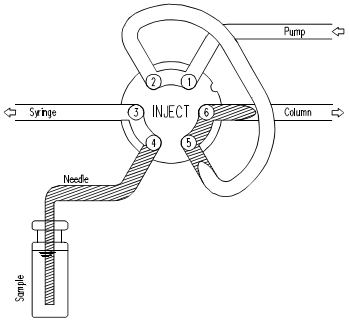


Figure 24 Partial loop injection: injecting sample.

The next injection sequence will start with a flush of 50% of the programmed flush volume, if more than one injection is to be made from the same vial and no wash routine is programmed. Otherwise it will start with a flush of the programmed flush volume. If the withdrawal of sample for the next injection will exceed the total volume of the sample buffer tubing, the buffer tubing is rinsed before the next injection. The next injection will start with the programmed flush, also see the *Full Loop Injections* section, page 22.

Air segment

An air segment can be used to reduce the amount of flush volume. This air segment is at the front of the flush volume and will not be injected. The air segment can be selected in *System Settings* (ON/OFF, see page 40).

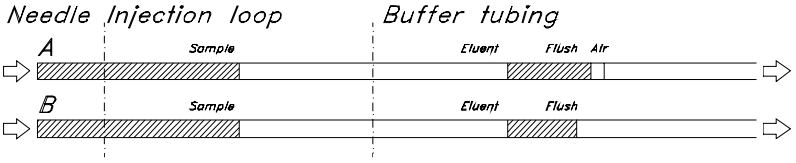


Figure 25 Situation after filling the loop in the case of partial loop injections with (A) or without air segment (B)

µL Pick-up Injections

The switching sequence for a µL pick-up injection is schematically shown in the following figures:

Initially the injection valve is in the **INJECT** position. The sample needle has entered the vial of mobile phase. This to avoid disturbance of the chromatogram with an additional peak that could come from solvent that is different from the mobile phase.

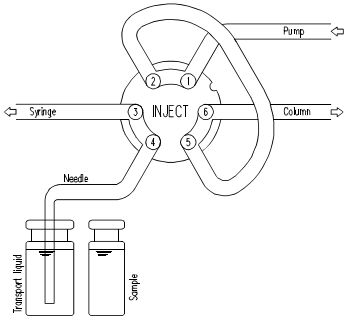


Figure 26 µL pick-up injection: initial position

For the first injection after a wash or after emptying of the buffer tubing. The syringe dispenser aspirates mobile phase from the mobile phase vial to fill the sample line with mobile phase and remove wash solvents.

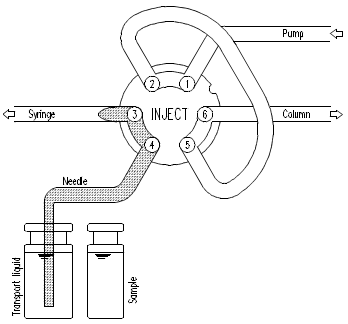


Figure 27 µL pick-up injection: filling sample lines with mobile phase.

The needle moves from the mobile phase vial to the sample vial. The injection valve is switched into the **LOAD** position.

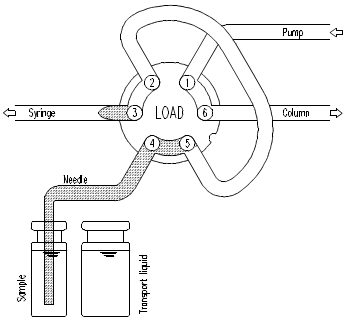


Figure 28 µL pick-up injection: go to sample vial and switch injection valve to LOAD.

The programmed injection volume is aspirated from the sample vial.

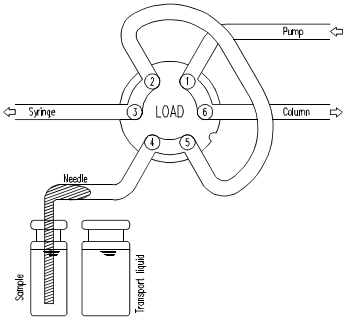


Figure 29 µL pick-up injection: filling the sample loop.

The sample needle moves back to the mobile phase vial. The sample is quantitatively transported into the loop, with mobile phase.

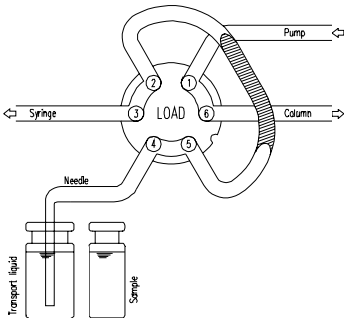


Figure 30 µL pick-up injection: transporting sample into the sample loop.

The injection valve switches into the **INJECT** position. The sample loop is now part of the HPLC mobile phase flow path: sample is transported to the column. The analysis starts.

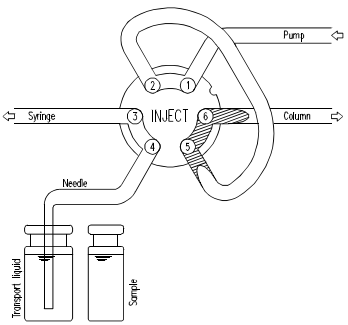


Figure 31 µL pick-up injection: injecting sample.

For the next sequence the first withdrawal of mobile phase is omitted unless a wash routine is performed or the ProStar 410 has emptied the buffer tubing into the waste. In these cases the sequence is completely repeated.

Air segment

If an air segment has been programmed, it appears at the front of the first plug of mobile phase at the front of every sample plug. An air segment can be programmed in the *System Settings* (see page 40).

NOTE: In the µL pick-up mode, the air segment at the front of the sample plug is injected into the HPLC system

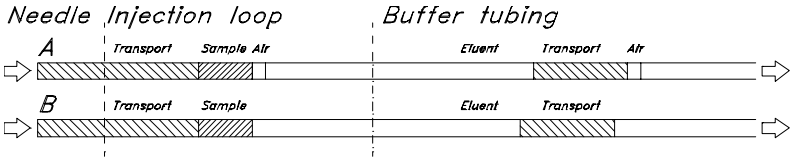


Figure 32 Situation after filling the loop in case of µL pick-up injections with (A) or without air segment (B)

NOTE: In case of µL pick-up injections, there will be no air pressure (head-space pressure) on the sample vial, to avoid sample errors due to air expansion during vial exchange from the sample vial to the mobile phase vial.

Operation

Typographic Convention

Keyboard Keys

Hard function keys: Function keys are printed in the text between square brackets.
[Start/Stop], **[Hold/Cont.]**, **[Priority]**, **[Series]**, **[Methods]**, **[System]**, **[Escape]**, **[Menu]**, **[Clear]** and **[Enter]**.

Soft function keys: Soft function keys are printed in the text between pointed brackets. Example: **<WASH>**, **<SYR END>**.

Display

In the text a display is represented as follows:

```
                                        [MENU]
              READY (X.XX)            OVEN:30°C
                                      TRAY:10°C
 <WASH>  <MAINTENANCE>  <SERIAL>  <TEMP>
```

How to Use the Keyboard

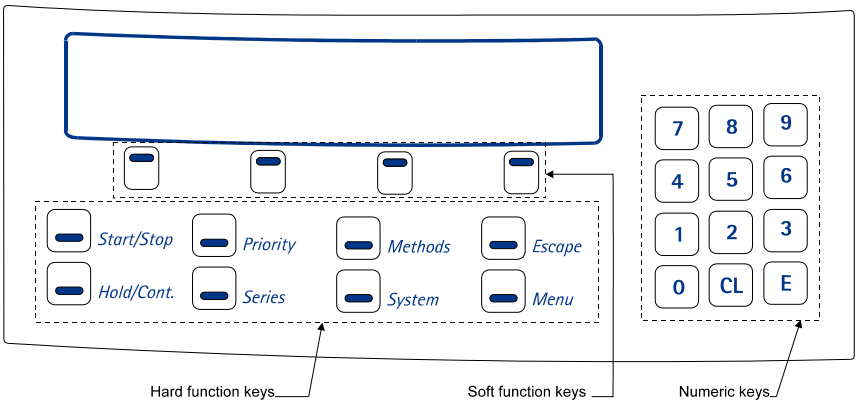


Figure 33 Keyboard of the ProStar 410.

The keyboard comprises 24 keys, which can be divided into three major groups:

1. **Numeric keys**: 0 to 9, the **[Clear]** key (CL) to erase a value and the **[Enter]** key (E) to enter a value.

2. **Hard function keys:** Three keys to start and control the ProStar 410 during the run; **[Start/Stop]**, **[Hold/Cont**.], **[Priority]**. Four keys to program the ProStar 410; **[Series]**, **[Methods]**, **[Menu]**, **[System]**. And the **[Escape]** key to leave programming or to go to a previous level or return to the Ready screen (“Main” screen).

3. **Soft function keys**: Keys which have different functions, depending on the status of the ProStar 410 as indicated on the lower display line.

Hard Function Keys

Keyboard function	Description
[Start/Stop]	Start and stop automatic processing.
[Hold/Cont.]	Hold or continue the countdown of the analysis time. The analysis time is extended with the time that **Hold** is active.
[Priority]	Interrupt a sample run to process an emergency sample prior to the next sample of the programmed sample Series. After the priority sample the sample run is continued.
[Series]	Enter the **Series** programming mode. In the Series, vials are linked to methods.
[Methods]	Enter the **Methods** programming mode.
[Menu]	The **[Menu]** key is only active when "**[Menu]**" appears in the right top corner of the display. In that case there are more than four soft function keys available. With the **[Menu]** key it is possible to toggle between the soft function keys.
[System]	Enter the **System Settings** programming mode. In the system settings the configuration of the ProStar 410 is defined.
[Escape]	Return to the previous programming level when you are in programming mode, the programmed parameters are checked and stored in battery backup memory.
[CL]	**Clear**; Removes the actual value of the active programmable parameter. In some cases the value **NONE** will be displayed.
[E]	**Enter**; Store and check all values in a screen. If all values are valid the next programming screen will be displayed.
0 - 9	Numeric keys; used to enter values for programming parameters. The values are stored when going to the next parameter with **[Enter]** or when leaving a programming mode with **[Escape]**.

Direct Functions

After power up, the ProStar 410 will run an initiation routine in which it performs a self-test and everything is set to default positions.

After that the ProStar 410 will return with the **Ready** screen:

```
                                    [MENU]
              READY (X.XX)      OVEN:--°C
                                TRAY:--°C
 <WASH> <MAINTENANCE> <SERIAL>    <TEMP>
```

[Menu]:

```
                                    [MENU]
              READY (X.XX)      OVEN:--°C
                                TRAY:--°C
                        <UTILS>  <SERVICE>
```

In the **Ready** screen the ProStar 410 will display on the bottom line the soft functions which can be used from this screen. With the **[Menu]** key it is possible to toggle between the screens.

At the right-hand side of the screen one or two temperatures are shown, the oven temperature and the tray temperature, when this option is installed.

Direct Control Functions

<WASH>

Activates a manual wash of the ProStar 410. All tubing, the needle and the syringe will be rinsed.

<MAINTENANCE>

The maintenance screens will provide three functions to control the needle arm, the syringe, and the injection valve.

<NDL HOR>

This function is to facilitate the replacement of the sample needle, air needle and valve. See also page 64, for detailed information.

Press **<NDL HOR>** to move the needle arm horizontally above the inner sample ring. When the needle arm reaches the front position, it will be returned to its home position by pressing **<NDL HOME>**.

<SYR END>

This function facilitates the exchange of syringes and filling of the wash solvent tubing. See also page 66, for detailed information.

Press **<SYR END>** to move the syringe to its end position, thereby aspirating wash solvent into the tubing and syringe. It will return to its home position by pressing **<SYR HOME>**, thereby dispensing the wash solvent to waste.

After changing a syringe all tubing can be rinsed using **<WASH>** as described above.

<VLV LOAD>

With this function the injection valve can be switched.
Press **<VLV LOAD>** to switch the valve from **INJECT** to **LOAD.** When the valve is in the **LOAD** position it can be switched back to INJECT by pressing **<VLV INJ>.**
It is not possible to leave this function when the valve is in the **LOAD** position, first switch back by pressing **<VLV INJ>** and then press **[Escape]**.

To leave the maintenance screen and return to the **Ready** screen press **[Escape]**.

<SERIAL>

After pressing **<SERIAL>** the ProStar 410 enters the serial communication mode. From this mode the ProStar 410 is controlled by the Varian Star workstation software.

```
SERIAL MODE

     <PANIC STOP>   <EXIT>
```

After entering the serial mode only the following two soft function keys are available on the ProStar 410 (the other keys are

disabled).

<PANIC STOP> The ProStar 410 will immediately stop the run and leave the serial communication mode and initialize.

<EXIT> The ProStar 410 will leave the serial communication mode and return to the **Ready** screen. The ProStar 410 can be operated from the keyboard again.

This soft-function key is **NOT** active when the ProStar 410 is **Running** in the serial communication mode

NOTE: After pressing the **<PANIC STOP>** soft function key, perform a wash routine to ensure that all tubing is rinsed.

<TEMP>

After pressing **<TEMP>** the ProStar 410 enters the temperature control screen for the column thermostat and the sample tray cooling (optional).

```
PROGRAMMING TEMPERATURE SETTINGS


   <OVEN>  <TRAY-COOLING>
```

To program the column oven temperature press **<OVEN>**:

```
PROGRAMMING OVEN SETTINGS
OVEN: OFF  SETPOINT: 20°C

   <ON>    <OFF>
```

Turn the column oven on by pressing **<ON>** and program the new setpoint. After pressing **[Enter]** the new oven setpoint will be activated and the ProStar 410 returns to the first temperature programming screen.

NOTE: Temperature range column thermostat: ($T_{ambient}$ +5°C) - 60°C

If the optional tray cooling is installed, it can be programmed by pressing **<TRAY-COOLING>**:

```
PROGRAMMING COOL SETTINGS
COOLING: OFF  SETPOINT: 04°C

   <ON>     <OFF>
```

Turn the tray cooling on by pressing **<ON>** and program the new setpoint. After pressing **[Enter]** the new tray cooling setpoint will be activated and the ProStar 410 returns to the first temperature programming screen.

NOTE: Temperature range for sample tray cooling: 4°C - 15°C
Maximum cooling capacity: 20°C below ambient temperature

After all values are programmed press **[Escape]** to return to the **Ready** screen.

<UTILS>

After pressing **<UTILS>** the ProStar 410 offers three Utility soft functions:

<COPY> Copy a method.

<ERASE> Erase a method.

<LOG> ProStar 410 logbook, containing information on the number of times the injection valve and the syringe valve have switched and on the number of movements of the syringe dispenser.

<SERVICE>

The service mode of the ProStar 410 can be entered after pressing **<SERVICE>** and entering the service entry-code. This code is only known to authorized service personnel.

System Settings

After pressing **[System]** the ProStar 410 enters the **System Settings**, where all system variables of the ProStar 410 can be set.

```
SYSTEM SETTINGS                      [MENU]
SELECT SETTINGS TO DEFINE

<GENERAL>  <METHOD>   <TRAY>     <IO>
```

[Menu]

```
SYSTEM SETTINGS                      [MENU]
SELECT SETTINGS TO DEFINE

 <SERIAL>
```

The System Settings are divided in five sub-sections: to enter a sub-section press the corresponding soft function key. To step through a sub-section press the **[Enter]** key.

After all values are defined correctly within a sub-section, return to the menu screen of the System Settings by pressing **[Escape]**. Return to the **Ready** screen by pressing **[Escape]** one more time. The values are stored in battery back up memory.

The following sections show the programmable system settings, with their ranges.

General System Settings

Press <GENERAL>

General System Settings	Range	Comment
Volume of installed loop:	0-5000 µL	The volume of the installed loop. The ProStar 410 uses this value for calculating injection volumes.
Volume of tubing needle ↔ valve	0-999 µL	The volume of the tubing and needle connected to the injection valve. The ProStar 410 uses this value for calculations of flush and transport volumes.
Syringe volume	<250> <1000>	The volume of the installed syringe.
Syringe speed	<LOW> <NORMAL> <HIGH>	The aspirating and dispensing speed are programmable in three steps: **NORMAL** for samples with a viscosity almost equal to the viscosity of water. **LOW** for samples with a higher viscosity and **HIGH** for samples with a lower viscosity when compared to that of water. (See Table 4*).*

Table 4 Syringe speed.

	250 µL syringe		***1000 µL syringe***	
Syringe speed	*Aspirate*	*Dispense*	*Aspirate*	*Dispense*
LOW	0.31 mL/min	3.4 mL/min	1.25 mL/min	5.5 mL/min
NORMAL	0.62 mL/min	3.4 mL/min	2.50 mL/min	5.5 mL/min
HIGH	0.94 mL/min	3.4 mL/min	3.75 mL/min	5.5 mL/min
Wash syringe speed:	3.4 mL/min		13.7 mL/min	

	Range	Comment
Skip missing vials:	<YES> <NO>	Define if the ProStar 410 has to stop if a vial is not found or continue with the next programmed vial. Program **<NO>** to stop the ProStar 410 in case a vial is not found.

Air segment:	<YES> <NO>	Inject a sample with or with out an air segment between the sample and the wash solvent. If the air segment is **ON** (YES) the ProStar 410 will draw an air segment of 5 µL before the flush volume prior to an injection. The air segment will not be injected into the analytical system. In the case of µL pick-up the sample will be preceded by an air segment, which will be injected into the analytical system. (see also page 28).
Headspace pressure:	<YES> <NO>	The ProStar 410 normally uses headspace pressure in combination with the syringe to introduce sample into the loop. If, for some reason, no headspace pressure is desired, it can be switched **OFF** (NO). The compressor will always be used in the wash position of the ProStar 410. The accuracy and reproducibility of the ProStar 410 can decrease when NO headspace pressure is used.

Method System Settings

Press <METHOD>

Method System Settings	Range	Comment
Use calibration vials	<ENABLED> <DISABLED>	Determine if calibration vials will be used in Series.

Tray Settings

Press <TRAY>

TRAY SETTINGS	Range	Comment
Tray type	<84+3>	Standard tray with 84 1.5 mL vials and 3 10 mL vials for special use. Vials 85-87, will be used for transport solvent for the µL pick-up injections. When the use of mix is enabled in the System Setting the three 10 mL vials will be used as follows: vial 85: transport solvent vial 86: Reagent A vial 87: Reagent B
	<96>	Tray with 96 vials of 1.5 mL.
	<24>	Tray with 24 vials of 10 mL.
Vial type	<STANDARD>	Standard vials are used.
(only when <84+3> or <96> is selected)	<2.5mL>	Only 2.5 mL vials are used. (Chromacol 2.5-CV, 12 X 40 mm)

NOTES: Only with the standard <84+3> tray is it possible to perform a mix and to use the µL pick-up injection mode.
With the other two trays both, the mix and the µL pick-up injection mode, will automatically be disabled.

If 2.5 mL vials are used be sure to fill the vials completely before starting a RUN.

I/O Configuration

Press <IO>

I/O Configuration	Range	Comment (See also page 11)
Injection marker pulse length	0.0 - 2.0 sec.	Define the length of the inject marker pulse. Normally 1.0 sec.
Input edge next injection	<FALLING> <RISING>	Define the edge sensitivity of the next injection input.
Freeze input active	<LOW> <HIGH>	Define the level to activate the freeze function.

NOTE: If the freeze input is set **HIGH**, the timebase will freeze if the input is not connected to another device; consequently, the ProStar 410 will not start.

Reset outputs after last Series	<YES> <NO>	Define if the outputs should be reset to the default settings after finishing the last Series.

Serial Communication

Press <SERIAL>

Serial Communication	Range	Comment
Device identifier	60-63	Device identifier used by Varian Star Workstation software

Method Programming

The ProStar 410 offers nine programmable methods.
Depending on your needs a method may be comprised of:

- Injection program — Containing information on the type of the injection with the flush volume, injection volume, number of injections per vial and the analysis time.
- Wash program — Containing information on the needle wash of the ProStar 410.
- Mix program — Containing information on the sample handling of the sample prior to the injection.
- Timed events program — Containing information on the auxiliaries and the temperature of the column oven during the analysis of the sample.

A method is any combination of the above and is saved as this combination under its method number.

To enter the method programming mode press **[Method]**.

After entering the method number the ProStar 410 will return with the main screen of method programming:

```
PROGRAMMING METHOD NUMBER: 1   (I W M T)
SELECT SECTION TO PROGRAM

<INJECTION>  <WASH>    <MIX> <TIMED EV.>
```

From this screen the different sections can be programmed by pressing the corresponding soft function key.
Existing programs in this method are displayed between brackets on the first line; I for the injection program, W for the wash program, M for the mix program and T for the timed events program.

After programming the method press **[Escape]** to leave the method programming.
The methods are stored in battery backup memory.

Injection Program

After pressing **<INJECTION>** the ProStar 410 returns with the main screen of injection programming.

```
METHOD NUMBER: 1   SECTION: INJECTION
INJECTION MODE: PARTIAL LOOPFILL

  <FULL>   <PARTIAL>  <PICK-UP>  <NONE>
```

Select the mode of injection to be used or select **<NONE>** if no injection is required in this method, see page 21, for an explanation of the different injection principles.

<FULL>	Full loop injection mode, see page 22
<PARTIAL>	Partial loopfill injection mode, see page 25
<PICK-UP>	µL Pick-up injection mode, see page 28.
<NONE>	No injection program in this method.

Depending on the injection mode selected the ProStar 410 will ask for a Series of parameters:

Parameter:	**Range:**	
Flush volume:	0-9999 µL	The amount of sample used to fill the needle plus tubing connection to the injection valve (**not** the loop-fill volume). Only used for full loop and partial loopfill injections.
Number of injections per vial:	1-9	Number of injections taken from the same vial.
Injection volume:	0-2500 µL	Only used for partial loopfill and µL pick-up injections
Analysis time:	Max. 9:59:59	Analysis time starting at the moment of switching the injection valve from **LOAD** to **INJECT**. Format is Hours: Minutes: Seconds

NOTE: Flush volumes smaller than twice the volume of the needle plus tubing between needle and injection valve may result in a decrease of performance.

The **maximum** programmable injection volumes are:

Full loop:	Not programmable, is equal to the loop volume but requires more sample to fill the loop completely:
	3 x loop volume for loops <= 100 µL
	2 x loop volume for loops from 100 µL to 500 µL
	1½ x loop volume for loops > 500 µL
Partial loopfill:	50% of the programmed loop volumes.
µL pick-up:	Max. injection volume = ½ x loop volume - 1½ x needle tubing

After all parameters are programmed, return to the main screen of method programming by pressing **[Escape]**.

Wash Program

After pressing **<WASH>** the ProStar 410 returns with the main screen of the wash program.

```
METHOD NUMBER: 1   SECTION: WASH
WASH BETWEEN: INJECTION

<INJECTION> <VIALS>  <SERIES>  <NONE>
```

A wash comprises two parameters:

Parameter:	**Range:**	
Wash between:	<INJECTION>	Wash the needle and tubing immediately after every injection.
	<VIALS>	Wash the needle and tubing immediately after every vial.
	<SERIES>	Wash the needle and tubing immediately after every series.
	<NONE>	Remove the wash command from the method.
Number of syringe volumes:	0-9	Wash volume in number of syringe volumes.

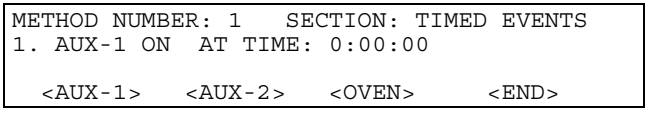
NOTE: If the wash program is the only program used in a method, program a **wash between Series**, otherwise the Series with this method will not be executed.

After all parameters are programmed, return to the main screen of method programming by pressing **[Escape]**.

Timed Events Program

After pressing **<TIMED EV.>** the ProStar 410 will ask if the timed events program are to be used in this method if **<YES>** is pressed ProStar 410 returns with the first screen of timed events programming.

NOTE: If **<NO>** is pressed the timed events program is not used in this method and the ProStar 410 returns to the previous screen. The contents of the timed events programmed is **NOT** removed and will be available the next time **<YES>** is pressed.



The timed events program is a list of 20 programmable events to control other devices via the two auxiliaries (contact closures) or to activate a new oven setpoint. Each event can be programmed on a time base, which starts at the moment of injection.
Press **[Clear]** to remove the programmed time, the display will show the value: **NONE**.

A complete list is shown in Table 5, to step through the list use the **[ENTER]** key or one of the soft function keys to step directly to the first line of another section.

Table 5 Timed events programming lines as they appear on screen.

<AUX-1>	1. AUX-1 ON AT TIME: 0:00:00
	1. AUX-1 OFF AT TIME: 0:00:00
	2. AUX-1 ON AT TIME: 0:00:00
	2. AUX-1 OFF AT TIME: 0:00:00
	3. AUX-1 ON AT TIME: 0:00:00
	3. AUX-1 OFF AT TIME: 0:00:00
	4. AUX-1 ON AT TIME: 0:00:00
	4. AUX-1 OFF AT TIME: 0:00:00
<AUX-2>	1. AUX-2 ON AT TIME: 0:00:00
	1. AUX-2 OFF AT TIME: 0:00:00
	2. AUX-2 ON AT TIME: 0:00:00
	2. AUX-2 OFF AT TIME: 0:00:00
	3. AUX-2 ON AT TIME: 0:00:00
	3. AUX-2 OFF AT TIME: 0:00:00
	4. AUX-2 ON AT TIME: 0:00:00
	4. AUX-2 OFF AT TIME: 0:00:00
<OVEN>	INITIAL OVEN SETPOINT: 00°C
	1. OVEN SETPOINT: 00°C AT TIME: 0:00:00
	2. OVEN SETPOINT: 00°C AT TIME: 0:00:00
<END>	END OF TIMED EVENTS AT: 0:00:00

Although it is possible to program setpoints from 0°C to 60, the ProStar 410 oven can only control the temperature down to ambient temperature + 5°C.

If the oven is set **ON** from the Ready screen (see page 36), the oven will be switched **OFF** if **NO** initial oven setpoint is programmed.

If the oven is **OFF** and an initial setpoint is programmed, the oven will be activated. ProStar 410 will wait before continuing with the Series until the initial setpoint ± 2 °C is reached. After the Series the oven will be turned **OFF** again if the end of the last Series is encountered or the next Series does not contain an initial setpoint.

If **NO** initial setpoint is programmed the lines with additional setpoint changes will not be displayed.

If the END time exceeds the programmed analysis time, this END time overrules the analysis time. The next injection will be started as soon as the timed events program has finished.

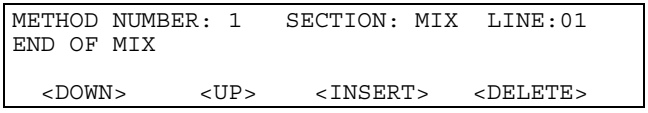
It is possible to program events after the END time, but these events are not executed during the RUN.

After all parameters are programmed, return to the main screen of method programming by pressing **[Escape]**.

Mix Program

After pressing **<MIX>** the ProStar 410 will ask if the mix program must be used in this method. If **<YES>** is pressed the ProStar 410 returns with the first screen of the mixing program.

NOTE: If **<NO>** is pressed the mix program is not used in this method and the ProStar 410 returns to the previous screen. The contents of the mix programmed is **NOT** removed and will be available the next time **<YES>** is pressed.



The mix method can contain a maximum of 15 programmable lines (including the **END OF MIX**).

To scroll through the program steps use the **<DOWN>** and **<UP>** soft function keys.

Press **<DELETE>** to delete the displayed step.

Press **[Enter]** to edit the displayed step.

Press **<INSERT>** to insert a step **before** the displayed step.

```
METHOD NUMBER: 1   SECTION: MIX  STEP:01
SELECT ACTION:

   <ADD>     <MIX>     <WAIT>
```

Three types of actions can be programmed **<ADD>**, **<MIX>** and **<WAIT>**:

<ADD>: **xxx** µl from **<SAMPLE>** **<REAG-A>** **<REAG-B>** **<WASH>** to **<SAMPLE>** **<DESTINATION>**

Aspirate a programmed amount of xxx µL (max.= the syringe volume) from the sample vial, **<SAMPLE>**, a reagent vial, **<REAG-A>** or **<REAG-B>** or from the wash solvent bottle, **<WASH>**, and dispense it into the sample vial, **<SAMPLE>**, or the destination vial, **<DESTINATION>**.

NOTE: To prevent cross contamination the ProStar 410 will aspirate an additional volume of 25% of the programmed volume; to flush the tubing and needle. The aspirate and dispense speed depends on the selected syringe and syringe speeds; programmed in the System Settings, see page 40.

Example: ADD 200 µL from Reagent A to Destination.

This will result in the following actions:

- Aspirate an air segment of 5 µL, to separate the wash solvent in the buffer tubing from Reagent A.
- Aspirate 50 µL Reagent A to flush the tubing and needle.
- Unload the syringe to the syringe-waste position.
- Aspirate 200 µL Reagent A and dispense it to the destination vial.
- Rinse buffer tubing and needle with wash solvent.

<MIX>: **x times with xxx µL**

Program a mix step: aspirate and dispense a number (x) of times a programmed amount (xxx µL) from the destination vial. If no destination vial is used the mix is performed in the sample vial.

Example: MIX 3 times with 250 µL.

This will result in the following actions:

- Aspirate an air segment of 50 µL, to separate the wash solvent in the buffer tubing from solvent to be mixed.
- Unload the syringe to the syringe-waste position.
- Aspirate 250 µL the solvent and dispense it back into the vial.
- Repeat the last action two times.
- Rinse buffer tubing and needle with wash solvent.

<WAIT>: **x:xx:xx**

Wait a programmed period of time before continuing with the next step (reaction time).

After all parameters are programmed, return to the main screen of method programming by pressing **[Escape]**.

Programming the Run Sequence; Series

In a Series or Run sequence, methods are linked to vials.

To enter Series programming press **[Series]**.

```
PROGRAMMING SERIES
SERIES NUMBER: 1
```

Key in a number (1-9) and press **[Enter]**.

The first parameter of a Series is a method number. Depending on the contents of this method and the System Settings the ProStar 410 will return with a number of questions. Press **[Enter]** to step through the questions.

Each time a value has to be entered key in a number (1-9) or press **[Clear]** or 0 to select **NONE** and press **[Enter]** to go to the next screen.

- Method number: 1-9 or **NONE**

NOTE: The value **<NONE>** can be used for empty Series, when programmed the Series will be skipped during the Run of the ProStar 410. This is an easy way to remove a Series or leave the possibility of adding a Series during the Run, see page 57. Should a method consist of only the wash and/or a timed events program, no more questions will be asked.

When the use of calibration vials is enabled in the System Settings (see page 40) and the method does not contain a mix, the ProStar 410 will ask the following questions:

- Use calibration vials (see Figure 34.) **<YES>** **<NO>**

  <YES>:
  - First calibration vial
  - Last calibration vial
  - Number of samples between calibrations

The range of sample vials:
- First sample vial
- Last sample vial

When the method contains a mix routine in which destination vials are used, the ProStar 410 will ask for the first position of the destination vials. The last destination vial is calculated based on the sample vial range.

- First destination vial:

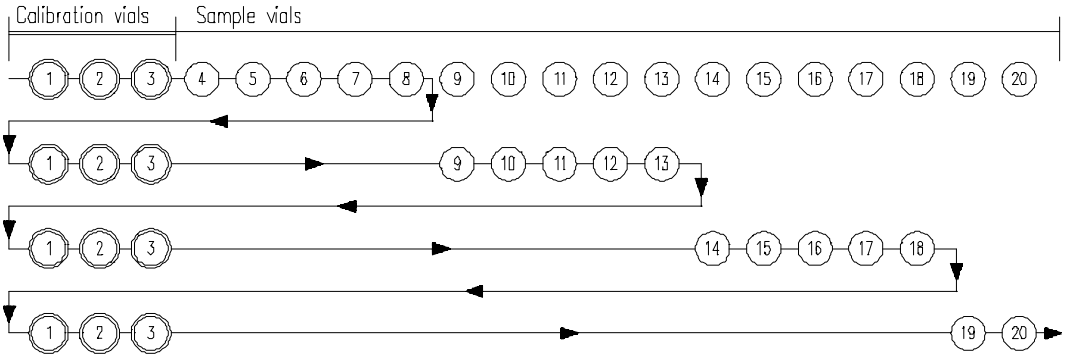


Figure 34 Run sequence with 3 calibration vials between every 5 vials (First calibration vial: 1, last calibration vial: 3 and number of samples between calibrations: 5).

NOTE:	Sample vials and destination vials must be placed sequentially. Sample vial and destination vial ranges must not overlap.

After all parameters are programmed return to the Series programming screen by pressing **[Escape]**, where another Series can be programmed. If all Series are programmed return to the **Ready** screen by pressing **[Escape]**.

NOTE:	Series are not stored in battery backup memory. After switching **ON** the Series are empty (method: **<NONE>**).

Running

Start and Stop

To start a Run of the ProStar 410 press **[Start/Stop]** at the **Ready** screen.

The ProStar 410 will ask for the Series number to start with and the last Series number.

Enter each number and press **[Enter]** to step to the next screen.

```
EXECUTE SERIES 1


  <START>   <REMOTE>
```

ProStar 410 can be started directly by pressing **<START>** or in Remote Control by pressing **<REMOTE>**, see page 56.

NOTE: If a Mix or µL Pick-up injection method is used in any Series be sure the transport liquid vials and/or reagent vials are filled completely.
If not the ProStar 410 might aspirate air into the loop (see also page 11).

To return to the **Ready** screen without starting the ProStar 410, press **[Escape]**.

During the Run the ProStar 410 shows the following information:

```
STATUS: RUNNING            TIME: 0:00:00
SERIES:01  SAMPLE:01  INJ: 1/1 OVEN:--°C
METHOD:01                    TRAY:--°C
   AUX:12
```

The first line shows the status and the elapsed analysis time.

The second line shows the Series number, the sample vial number, the current injection number, the total number of injections and the actual oven temperature; “- -“ indicates the oven is OFF.

The third line shows the method number of the current used method, this will also be the method used when a priority sample is programmed, see page 57. When the tray cooling is installed the actual tray cooling temperature is displayed; “- -“ indicates the tray cooling is OFF.

The fourth line shows information on the auxiliaries when timed events are programmed in a method. When the number is displayed behind “AUX:”, this indicates that the auxiliary is active.

NOTE: Series are always executed in numerical order!
Empty Series will be skipped!

The Run can be stopped by pressing **[Start/Stop]**. The ProStar 410 will execute a shutdown sequence by removing all the sample from the buffer tubing and performing a standard wash routine.

Remote Control

After programming the range of Series to be Run, as described in the previous section. Press **<REMOTE>** to start the ProStar 410 in Remote Control mode,

The ProStar 410 will now operate as the slave of another device and can be controlled with the **Next Injection Input**.

With the **Next Injection Input** ProStar 410 will start the next injection in the Series. If the Series was completed, it starts the next injection from the next Series, until all Series have been completed.

During the Run, ProStar 410 shows the following information:

```
STATUS: RUNNING             TIME: 0:00:00
SERIES:01  SAMPLE:01  INJ: 1/1 OVEN:--°C
METHOD:01                    TRAY:--°C
 r  AUX: 12
```

A blinking “r” in the lower left corner of the Run screen, indicates the ProStar 410 is running in Remote Control mode.

After completion of all Series the ProStar 410 will display the following screen:

```
SERIES COMPLETED VIA REMOTE CONTROL
```

To return to the Ready screen press **[Escape]**. From the Ready screen the ProStar 410 can be re-started by pressing the **[Start/Stop]** key.

NOTE: As long as the previous screen is displayed, it is not possible to re-start the ProStar 410 with a **Next Injection Input**.

Priority Sample

For an emergency sample, the ProStar 410 offers the possibility to analyze it immediately without stopping the current Run.

Press **[Priority]**, to enter the priority programming mode.

Enter the position of the priority sample.

```
PROGRAMMING PRIORITY
PRIORITY SAMPLE: 12
```

Return to the Run screen by pressing **[Escape]**, the priority sample will be processed after the current sample has finished, with the **method** that is running at the moment when the vial number is entered.

```
STATUS: RUNNING            TIME: 0:00:00
SERIES:01  SAMPLE:01  INJ: 1/1 OVEN:--°C
METHOD:01                    TRAY:--°C
 p  AUX: 12
```

To indicate the priority sample has been activated, a blinking "**p**" is displayed in the Run screen.

NOTE: As long as the "**p**" is blinking it is possible to change or remove the priority sample. The priority mode is only available during the execution of a Series with a method that does **NOT** contain a Mix routine. If calibration vials are used in the current Series, the priority sample is included in the calibration interval.

Programming during a Run

During a Run of the ProStar 410 it is possible to program Series and Methods:
Press **[Series]** or **[Methods]**.
The programming possibilities are the same as described on page 45 and page 54.

NOTE: If a Series or Method is changed, the new values are active for Series after the current Series.
The current Series is **NOT** affected by changes.

It is not possible to add Series to the Run, but you can program empty Series between the first and last Series in a Run. As long as the empty Series have not been executed, they can be (re-)programmed. In this way Series with vials can be added later to the Run.

Maintenance

Injection Valve

The ProStar 410 is equipped with a stainless steel or a biocompatible Valco valve with quick connect mounting. The next section describes how to replace the valve assembly.

Replacing the Injection Valve

The ProStar 410 is equipped with quick connect mounting to simplify the exchange of valves.

To remove the valve proceed as follows (see Figure 35).

- Disconnect all tubing from the valve. Only the loop can stay in place.
- Place the needle arm in the front position, press **<MAINTENANCE> <NDL HRZ>**, see page 36.
- Push tabs “A” in Figure Figure 35 to release the valve.
- Pull the valve out of the instrument while turning the valve counter-clockwise.

To re-insert the valve proceed as follows (see Figure 36).

- Hold the valve for the mounting with the port 1 position facing to the top.
- Push the valve into the mounting and turn the valve clockwise till it clicks into the fitting.
- Re-connect all tubing to the valve.

- Insure that the valve is in the INJECT position. This can be done by switching the ProStar 410 OFF and ON, all Series will be reset.

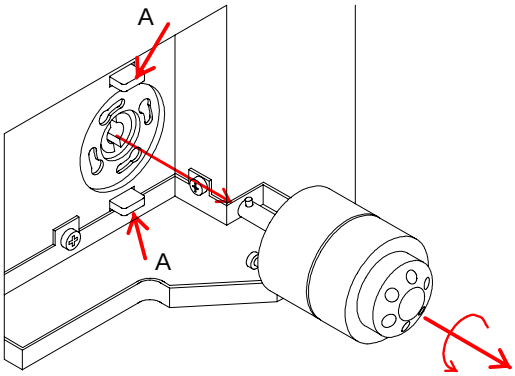


Figure 35 Valve removal procedure

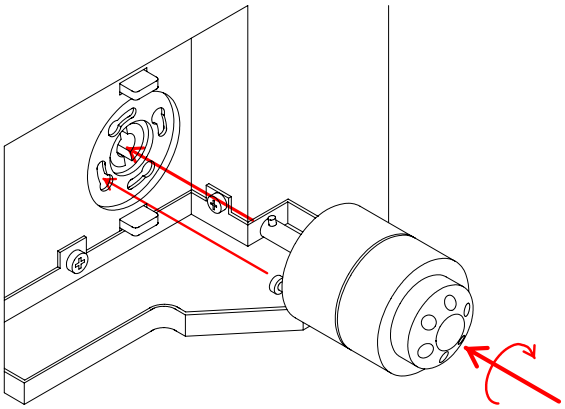


Figure 36 Re-inserting the valve

Needle and Tubing

Three sizes of syringes are available for the dispenser: 250, 1000, and 2500 µL

The 250 µL syringe is the standard syringe; combined with the standard 500 µL buffer and the standard 100 µL sample loop, the following injection volume range is available for the various injection modes:

- Full Loop : 100 µL
- Partial loopfill : 1 - 50 µL
- µl pick-up : 1 - 27 µL

The maximum injection volumes are calculated with the following formulas:

- Full loop : injection volume = loop volume
- Partial loopfill : max. inj. volume = ½ x of loop volume
- µL pick- up : max. inj. volume = ½ x loop volume - 1½ × needle volume

Note that:

Full loop gives **maximum possible reproducibility**, but not maximum accuracy, since loop volume is specified with an accuracy of ± 10%.
Minimum sample loss = 230 µL (2 x loop overfill + flush volume for needle).

Partial loopfill gives **maximum accuracy** (dependent on syringe accuracy) plus reproducibility better than 0.5% RSD for injection volumes > 10 µL
Minimum sample loss (Flush volume) = 30 µL
30 µL is the recommended minimum flush volume, smaller flush volumes can be programmed, but will result in decreasing performance.

µL Pick-up offers **zero sample loss**, maximum accuracy (same as partial loop fill), but slightly less reproducibility: RSD better than 1% for injection volumes > 10 µL.
5 µL of **AIR** is injected together with the sample, in case an air segment is selected in the System Settings.

Sometimes other combinations of syringe, loop and/or buffer are advised:

Injection volumes smaller than 5 µL:

Partial loopfill:

Preferably install a 20 µL sample loop to avoid loss of accuracy due to expansion of the loop content when

switching from inject to load position prior to sample loading, especially when working with high pressure (200 bar), this loss may be in the order of 0.1 - 0.5 µL for a 100 µL loop. Note that the minimum sample loss in partial loop fill mode is 30 µL (recommended minimum flush volume) for the first injection and an additional 15 (always half the programmed flush volume) for additional injections from the same vial. If a wash between injections has been programmed, sample loss is 30 µL for every injection. For zero sample loss injections, use the µL-pick injection mode.

µL Pick-up:
Do not install a smaller sample loop!
The sample plug is transported into the loop, preceded by a programmable air segment of 5 µL, with a plug of transport liquid which equals 2.5 times the programmed needle tubing volume. The 20 µL loop is too small to guarantee quantitative injection.

Injection volumes up to twice the standard

With the standard 250 µL syringe, standard needle with tubing (15 µL) and standard 500 µL buffer, but with a 200 µL sample loop, the maximum injection volumes are:

Full loop:	200 µL	Sample loss remains 230 µL since loops > 100 µL need only one loop volume overfill
Partial loopfill:	100 µL	
µL Pick-up:	77 µL	

NOTE: Smaller volumes than 10 µL may be injected, but reproducibility and accuracy may not be < 0.5% for partial loop fill or < 1% for µL pick-up!

For volumes larger than 200 µL

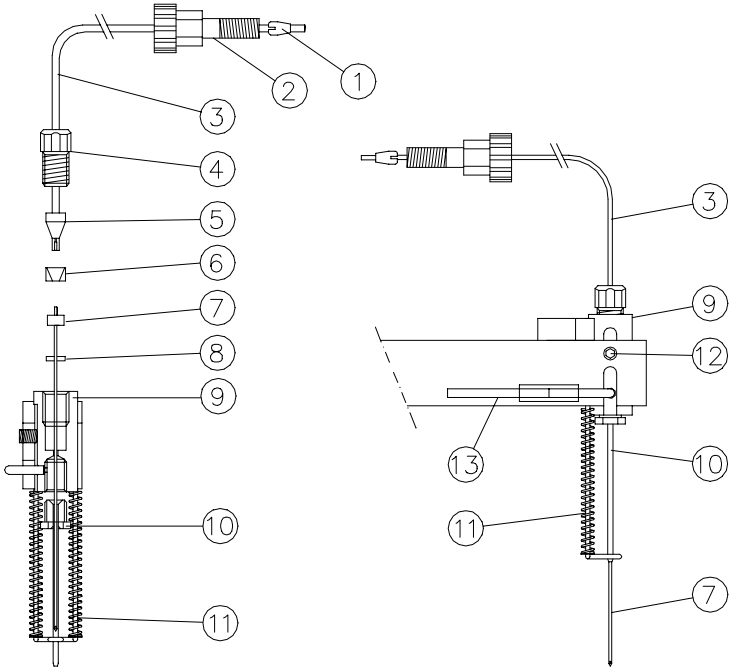
Install the 2000 µL buffer tubing, install the appropriate sample loop size and the appropriate syringe: Syringe volume > 2 x injection volume. Injection volumes larger than 500 µL are possible, but the sample may contaminate the syringe. Program sufficient wash after use.

Buffer Tubing

Table 6 Syringe and buffer tubing.

Syringe	Buffer tubing
250 µL	500 µL buffer tubing
1000 µL	2000 µL buffer tubing

Sample Needle



1. PEEK ferrule
2. PEEK nut
3. Tefzel tubing
4. Needle connection nut
5. Ferrule (PTFE)
6. Conical ring
7. Sample needle
8. Silicon air seal
9. Needle holder
10. Air needle

Figure 37 Sample Needle

Sample Needle Replacement

To replace the sample needle proceed as follows (see Figure 37).

- Open keyboard cover.
- Place the sample needle in the front position, press **<MAINTENANCE>**, **<NDL-HOR>**.
- Loosen needle connection nut (4) that fixates the sample needle (7).
- Loosen PEEK nut (1) that connects the PTFE tubing (3) to the injection valve.
- Remove sample needle by pulling it out of its fitting with the PTFE tubing that usually sticks to the needle.
- Put in a new needle assembly. Be sure the air seal (6) is around the needle.
- Connect tubing to needle with PTFE ferrule (5) and needle connection nut (4),
- Connect loose end of needle connection tubing to port 4 of injection valve (use a Valco ferrule).

NOTE: Do not tighten excessively; it may block the tubing.

- Place the sample needle back in the home position and leave the maintenance mode, press <NDL HOME> and [Escape].
- Check the needle penetration depth, see page 65 and adjust if necessary.
- Perform a wash routine to clean the new needle by pressing <WASH>

Air Needle Replacement

To replace the air needle proceed as follows (see Figure 37).

- Remove sample needle as described on page 64.
- Remove air needle (10) and install new air needle.
- Reinstall sample needle as described on page 64.

Sample Needle Penetration Depth

To keep lost volume small, the sample needle should stop close to the bottom of the sample vial. If the needle penetration depth needs adjustment, proceed as follows (see Figure 37).

- Open keyboard cover.
- Place an uncapped sample vial in position 2 of the tray.
- Lower the sample needle in the vial, by:
  - ♦ Program a method with a full loop injection and an analysis time of at least 10 seconds.
  - ♦ Program a Series with the programmed method and vial 2 as first and last vial.

    Start the Series.

    As soon as the sample needle has entered the vial switch off the power supply.
- Loosen adjustment screw one turn (counterclockwise).
- Use the needle connection nut (4) as a grip, adjust needle penetration depth.
  - ♦ Needle should stop not less than 1 mm above the bottom of a standard vial and not less than 2 mm above the bottom of a conical vial.
- Fasten adjustment screw (clockwise).
- Re-apply the power, the ProStar 410 will initialize and is ready for use.

Syringe

The ProStar 410 is factory equipped with a 250 µL syringe, but can also be equipped with a 1000 or 2500 µL syringe.

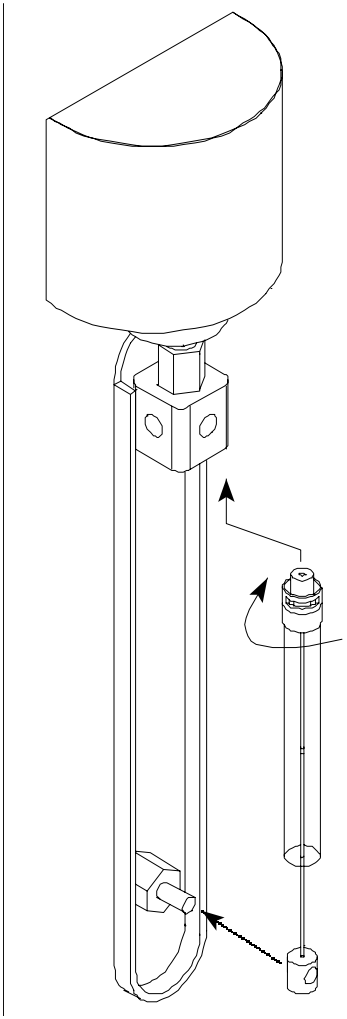


Figure 38 Changing the Syringe

To install another syringe proceed as follows:

NOTE:	Do not disconnect the power supply of the ProStar 410, it is needed to move the syringe.

Press **<MAINTENANCE>** to get access to the maintenance function for moving the syringe

Move the syringe to the end position by pressing **<SYR END>.**

Unscrew the syringe from syringe valve, be sure that the Luer connector in the valve remains in place.

Disconnect the plunger from the syringe drive.

Fill the new syringe with wash solvent, be sure most air bubbles are removed from the syringe.

Connect the plunger of the filled syringe to the syringe drive and connect the syringe with the Luer connector at the syringe valve.

Screw the syringe firmly into the Luer connector.

Remove the air from the syringe by pressing **<SYR HOME>.** The syringe will move to its HOME position and dispense its contents to the syringe waste.

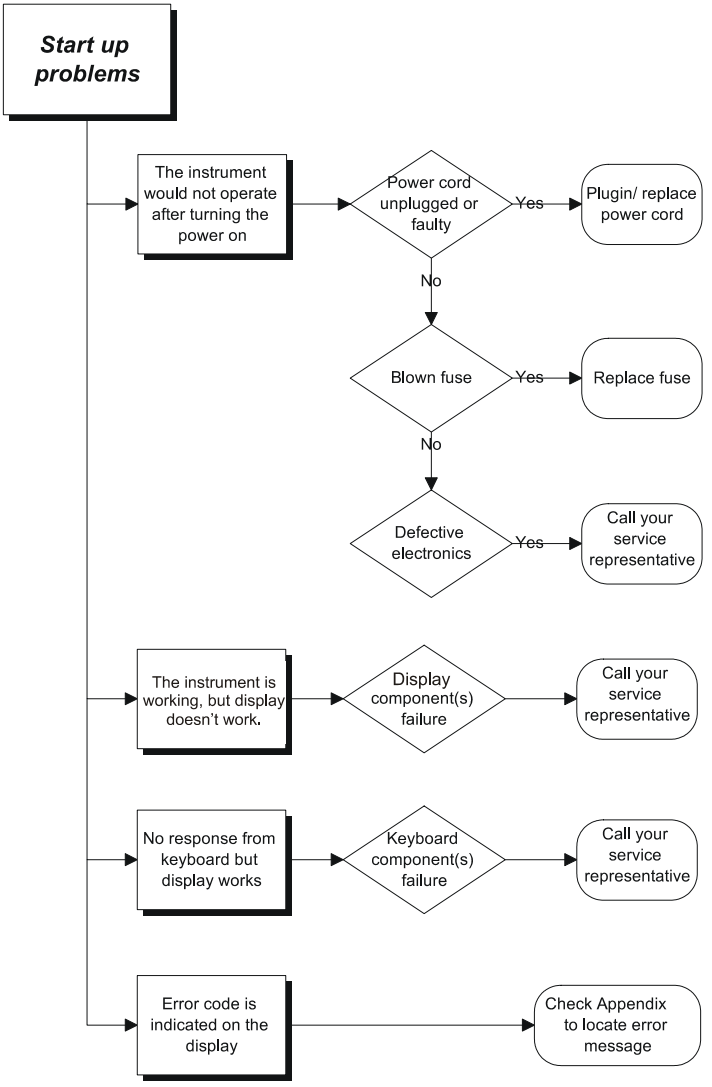
If some air remains in the syringe press <SYR END> again. The syringe is filled with wash solvent.

Press <SYR HOME> to dispense the wash solvent to waste. If there is still air in the syringe, repeat the previous action and tick softly against the syringe as the wash solvent is dispensed to the syringe waste.

Leave the maintenance screen by pressing **[Escape]** and press **<WASH>** to perform a standard wash routine. All tubing connected to the syringe valve will be refilled and flushed.

The ProStar 410 is now ready for use.

Start up Problems



Analytical Problems

In cases of analytical problems the best thing to start with is to determine, if the cause for the problem is in the AutoSampler, or in the rest of the system.

Quick Check

Replace the valve by a manual injection valve to discriminate between valve problems and other problems.

Perform some manual Full loop injections. If the results are fine the fault has to be found in the AutoSampler, if not the HPLC system should be checked.

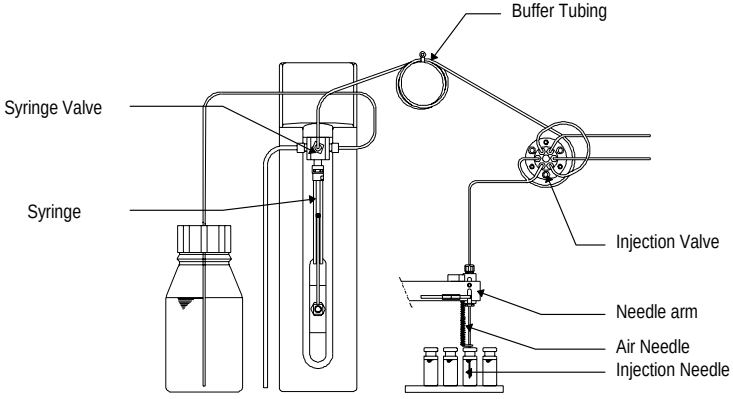
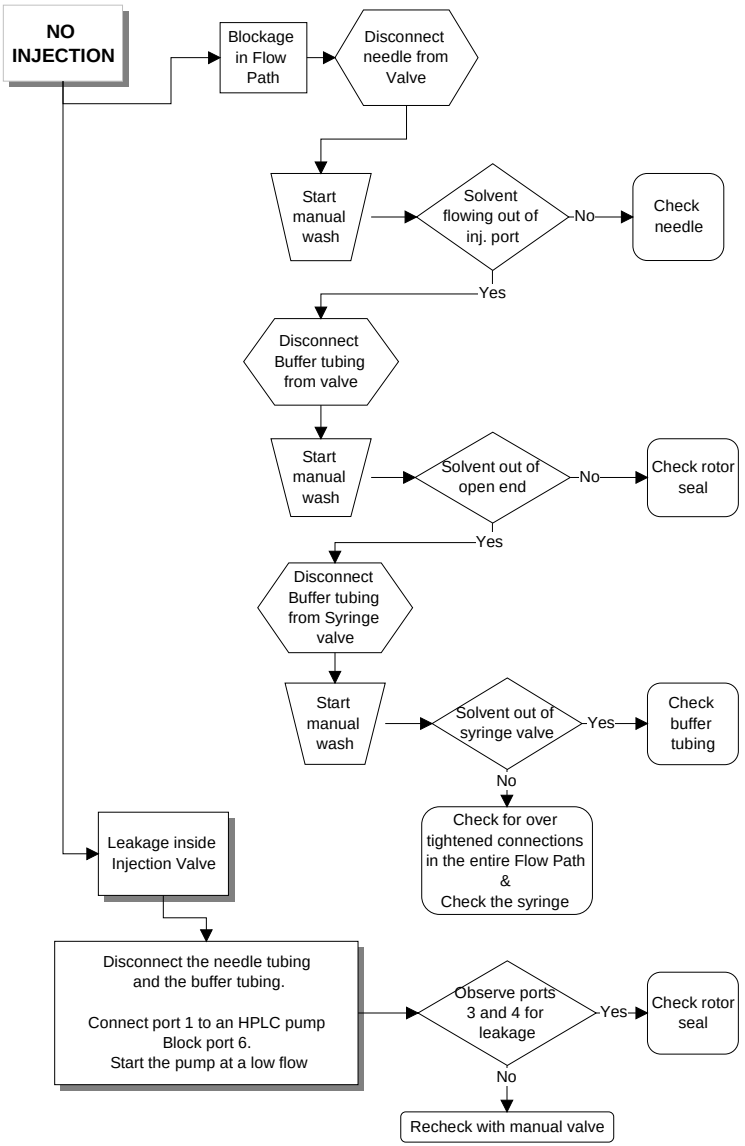


Figure 39 Troubleshooting: ProStar 410 Flowpath.

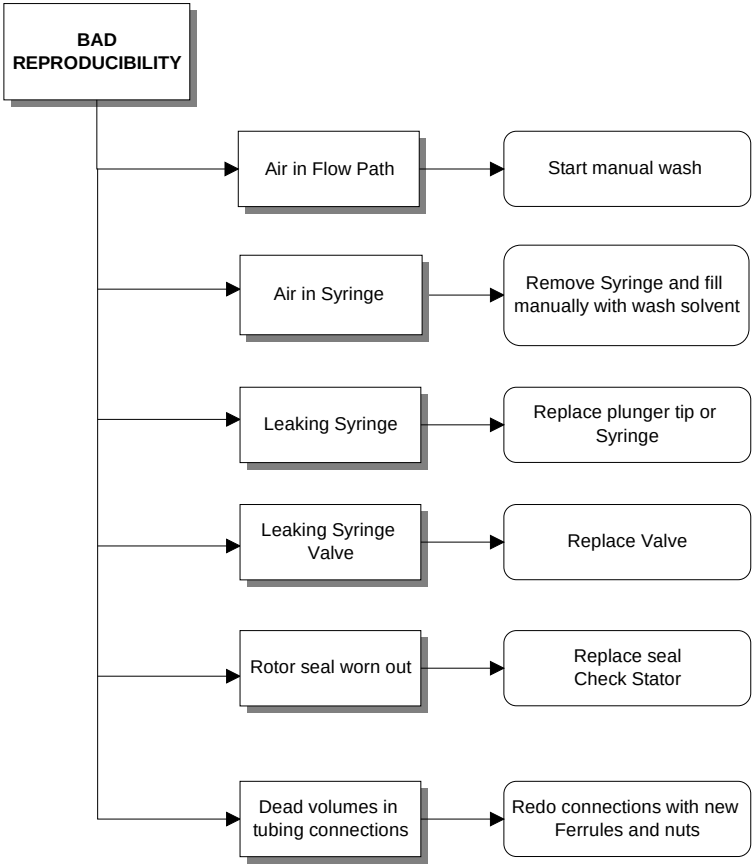
In the diagrams on the next pages it is assumed that the unit is working without Errors.

Please keep in mind that analytical results also might be caused by external influences, like temperature and or light sensitive samples. For this reason it is important to be sure the application was running without problems before and nothing is changed.

No Injection



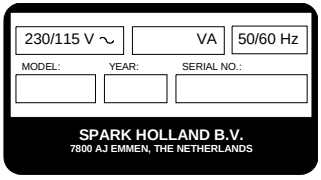
Bad Reproducibility



Appendix

Specifications

CE



General

Working temperature	10 - 40°C
Safety and EMC compatibility	According to EC-directives.

Sampling

Sample capacity:	Standard tray: 84 vials of 1.5 mL (Std) and 3 vials of 10 mL (LSV)
Vial dimensions (cap included):	Maximum vial height: 47 mm Minimum vial height: 32 mm
Loop volume	1 - 5000 µL
Dispenser syringe	250 µL (standard) or 1000 or 2500 µL syringe
Vial detection	Missing vial detection by vial sensor.
Headspace pressure	Built-in compressor
Switching time injection valve	Electrically <100 msec
Piercing precision needle	± 0.6 mm
Wash solvent	External wash solvent bottle
Wetted parts in flow path	SS316, PTFE, TEFZEL®, VESPEL®, Glass, Teflon. Optional: PEEK

Analytical performance

Reproducibility	RSD <= 0.3% for full loop injections
	RSD <= 0.5% for partial loopfill injections, injection volumes >10 µL
	RSD <= 1.0% for µL pick-up injections, injection volumes >10 µL
Memory effect	< 0.05% with programmable needle wash
Column oven	Built-in column thermostat
	Range: $(T_{ambient}$ +5) - 60°C
	Accuracy ± 1°C (measured in the center)
	Dimensions: (W x D x L) 25 mm x 25 mm x 300 mm 1" x 1" x 11.8"

Programming

Methods	9 programmable methods
Injection method	Injection mode: Full loop injection Partial loopfill injection µL pick-up injection
Injection volume	1 µL - 5000 µL, with 1 µL increment
	Full loop injection: max. 5000 µL Partial loopfill injection: max. 2500 µL µL pick-up injection: max. 2477 µL
Injections per vial	max. 9 injections
Analysis time	max. 9 hr 59 min 59 sec
Wash	Programmable: Wash between injections Wash between vials Wash between Series
Mix	max. 15 programmable steps

Timed events	Programmable: 4 x AUX-1 ON/OFF 4 x AUX-2 ON/OFF Initial oven setpoint 2 x new oven setpoint	
Series	9 programmable Series	
Priority sample	Programmable	
Communication		
Outputs	Inject marker	(Relay & TTL)
	2 Auxiliary outputs	(Relay)
	Alarm output	(Relay)
Inputs	Next injection input	(TTL)
	Freeze input	(TTL)
	Stop input	(TTL)
Serial communication port	RS422	
Physical		
Dimensions (W x D x H)	300 mm x 500 mm x 340 mm 11.8". x 19.7" x 13.4"	
Weight	19 kg (42 lb.) 21 kg (46 lb.) with cool option	
Electrical		
Power requirements	115/230 Vac ±15%; 50 Hz / 60 Hz; 200 VA	
Fuses	For 115 Vac	two 5.0 A T-fuses (slow, ¼"x 1¼", UL/CSA)
	For 230 Vac	two 2.5 A T-fuses (slow, 5 x 20 mm, IEC 127)

Options	***(User installable)***
Large capacity tray:	96 vials of 1.5 mL (STD, 12 mm OD)
Large volume tray:	24 vials of 10 mL (LSV, 22 mm OD)
PC Control:	Varian Star Workstation Version 5.0 or higher.

Options	***(Factory installed)***
Sample tray cooling	Built-in Peltier cooling Range: 4°C - 15°C Accuracy: ± 2°C (at temperature sensor) (Temperature at relative humidity of 80% and ambient temperature of 30°C) Cooling capacity: 20°C below ambient.
Bio-compatible valve	PEEK Valco injection valve, quick connect mounting.

Quick Start

This section will help you get started quickly with your ProStar 410 AutoSampler. It is a step by step guide from installation through running a complete analysis.

Installation

Allow the ProStar 410 to reach ambient temperature for at least one hour

Check the ProStar 410 for visual damage due to shipping. If this is the case, please contact your sales representative immediately.

Remove the safety screw on the right-hand side of the front cover.

NOTE: Keep the keyboard front cover closed during operation.

Check fuses and voltage settings on the rear of the instrument.

Connect the power cable

After turning "ON" the power, the Ready screen appears displaying the firmware revision number.

Connect the drain tubing to the wash outlet on the lower front side of the instrument.

Fill the wash solvent bottle with distilled water/iso-propanol (80/20 v/v%) or mobile phase. Only water/organic solvents should be used. Do not use any crystalline or buffer solutions; these may block the system and cause severe damages. To avoid air bubbles in the syringe degas the wash solvent.

Fill the wash solvent tubing, syringe and buffer tubing by washing the system 2 or 3 times. This is done by pressing the <WASH> function key displayed on the Ready screen. Check if

there are some air bubbles trapped in the syringe, they can be removed by gently tapping on the syringe.

Connect your HPLC pump to port 1 of the injection valve and the column to port 6 of the injection valve. Check for leakage and let the system equilibrate for at least 5 minutes.

System Settings

(see page 40 of this manual)

Normally these settings are correctly installed, to check and set these (standard) settings, proceed as follows:

Press keys:	***Description:***
[System]	*Enter the System Settings*
<GENERAL>	*Enter the General Settings*
[0100] [Enter]	*Volume of installed loop: 100 µL.*
[015] [Enter]	*Volume of tubing needle ↔ valve:015 µL*
<250> [Enter]	*Syringe volume: 250 µL*
<NORMAL> [Enter]	*Set Syringe speed to Normal.*
<YES> [Enter]	*Skip missing vials.*
<YES> [Enter]	*Air segment: use air segment*
<YES> [Enter]	*Headspace pressure: On*

Press **[Escape]** twice to go back to the Ready screen

Example 1: Performing a 10 µL partial loopfill injection from vial number 1.

Performing an injection routine is easy with the ProStar 410. First you define a method such as the injection, mix or wash method. These methods are stored in memory. Subsequently a Run sequence or Series can be programmed in which those methods are linked to the Series of vials. Those Series will be executed by the ProStar 410.

Programming the method (see page 45 of this manual).

Injection Program:

Press keys:	*Description:*
[Methods] [1] [Enter]	*Enter Method number 1.*
<INJECTION> <PARTIAL> [Enter]	*Selecting partial loopfill injection program*
[30] [Enter]	*Flush volume: e.g. 30 µL*
[1] [Enter]	*Number of injections per vial: 1*
[10] [Enter]	*Injection volume: 10 µL*
[100] [Enter]	*Enter the analysis time e.g. 1 minute*

Press **[Escape]** once to go up one level.

Wash Program:

Press keys:	*Description:*
<WASH>	*Selecting wash program*
<NONE>	*Disable the wash*

Press [Escape] three times to go back to the Ready screen.

Programming the Series (see page 52 of this manual).

Press keys:	*Description:*
[Series] [1] [Enter]	*Enter Series number 1.*
[1] [Enter]	*Enter Method number:1*
[1] [Enter]	*Enter First sample vial: 01*
[1] [Enter]	*Enter Last sample vial: 01*

Press [Escape] (twice) to go back to the Ready screen

Put a sample vial in position 1. (If you can't reach position 1, turn the tray manually).

Press keys:	*Description:*
[Start/Stop]	
[1] [Enter]	*Start at Series number:1*
[1] [Enter]	*Stop after Series number: 01*

If you press **<START>** the ProStar 410 will start searching for vial 1 and perform a 10 µL injection.

Example 2: Performing three 10 µL injections from one vial without sample loss using the µL Pick-up injection routine, followed by a wash routine between each injection.

NOTE: If the Air segment is set ON in System Settings, a small air segment will also be injected into your HPLC system. (For more detailed information, see page 40 of this manual.) To switch OFF the air segment enter the System Settings and change the setting for the air segment: from **YES** to **NO**.
This is done by pressing ***[System] <GENERAL> [Enter] [Enter] [Enter] [Enter] [Enter] <NO> [Escape] [Escape]***

Programming the method (see page 45 of this manual)

Injection program:

Press keys:	*Description:*
[Methods] [1] [Enter]	*Enter Method number 1.*
<INJECTION> <PICK UP> [Enter]	*Selecting µL pick-up injection program*
[3] [Enter]	*Number of injections per vial: 3*
[10] [Enter]	*Injection volume: 10 µL*
[100] [Enter]	*Enter the analysis time e.g. 1 minute*

Press [Escape] once to go up one level.

Wash Program:

Press keys:	*Description:*
<WASH>	*Selecting wash program*
<INJECTION> [ENTER}	Perform a wash after each injection
[1] [Enter]	*Enter the number of syringe volumes to be used for washing, e.g. 1 syringe volume.*

Press [Escape] three times to go back to the Ready screen.

Programming the Series (see page 52 of this manual)

Press keys:	*Description:*
[Series] [1] [Enter]	*Enter Series number 1.*
[1] [Enter]	*Enter Method number:1*
[1] [Enter]	*Enter First sample vial: 01*
[1] [Enter]	*Enter Last sample vial: 01*

Press [Escape] (twice) to go back to the Ready screen

Running the Series (see page 54 of this manual)

Put a sample vial in position 1 and a vial filled with mobile phase in position 85.

Be sure the vial in position 85 is filled correctly before starting a new Series.

Press keys:	*Description:*
[Start/Stop]	
[1] [Enter]	*Start at Series number:1*
[1] [Enter]	*Stop after Series number: 1*

If you press **<START>** the ProStar 410 will start searching for the sample vial and perform 3 injections of 10 µL. After every injection the needle system will be washed with 1 syringe volume.

EXAMPLE 3: Performing a 1:10 dilution followed by a 10 µL partial loopfill injection

The mix method will perform the following:

Transfer 360 µL from Reagent A to the destination vial, add 40 µL sample, mix 3 times with 250 µL and subsequently inject 10 µL.

From the Ready screen:

Programming the method (see page 45 of this manual)

Injection Program:

Press keys:	***Description:***
[Methods] [1] [Enter]	*Enter Method number 1.*
<INJECTION> <PARTIAL> [Enter]	*Selecting partial loopfill injection program*
[30] [Enter]	*Flush volume: e.g. 30 µL*
[1] [Enter]	*Number of injections per vial: 1*
[10] [Enter]	*Injection volume: 10 µL*
[100] [Enter]	*Enter the analysis time e.g. 1 minute*

Press [Escape] once to go up one level.

Wash Program:

Press keys:	***Description:***
<WASH>	*Selecting Wash program*
<NONE>	*Disable the wash*

Press [Escape] once to go up one level.

Mix Program: (see page 50 of this manual)

Press keys:	***Description:***
<MIX>	*Selecting Mix program*
<YES>	*Confirm the use of the Mix program*

Press keys:	*Description:*
<INSERT> **<ADD> [180] [Enter]** **<REAG-A> [Enter]** **<DESTINATION> [Enter]**	*Insert the first Mix step: Add 180 µL Reagent-A to the Destination vial.*
<INSERT> **<ADD> [180] [Enter]** **<REAG-A> [Enter]** **<DESTINATION> [Enter]**	*Insert the second Mix step: Add another 180 µL Reagent-A to the Destination vial.*
<INSERT> **<ADD> [40] [Enter]** **<SAMPLE>[Enter]** **<DESTINATION> [Enter]**	*Insert the third Mix step: Add 40 µL from the Sample vial to the Destination vial.*
<INSERT> **<MIX> [3] [Enter]** **[250] [Enter]**	*Insert the fourth Mix step: Mix the contents of the Destination vial 3 times with a volume of 250 µL*

Press [Escape] three times to go back to the Ready screen

Programming the Series (see page 52 of this manual)

Press keys:	*Description:*
[Series] [1] [Enter]	*Enter Series number 1.*
[1] [Enter]	*Enter Method number:1*
[1] [Enter]	*Enter First sample vial: 01*
[1] [Enter]	*Enter Last sample vial: 01*
[2] [Enter]	*Enter First destination vial: 02*

Press [Escape] (twice) to go back to the Ready screen

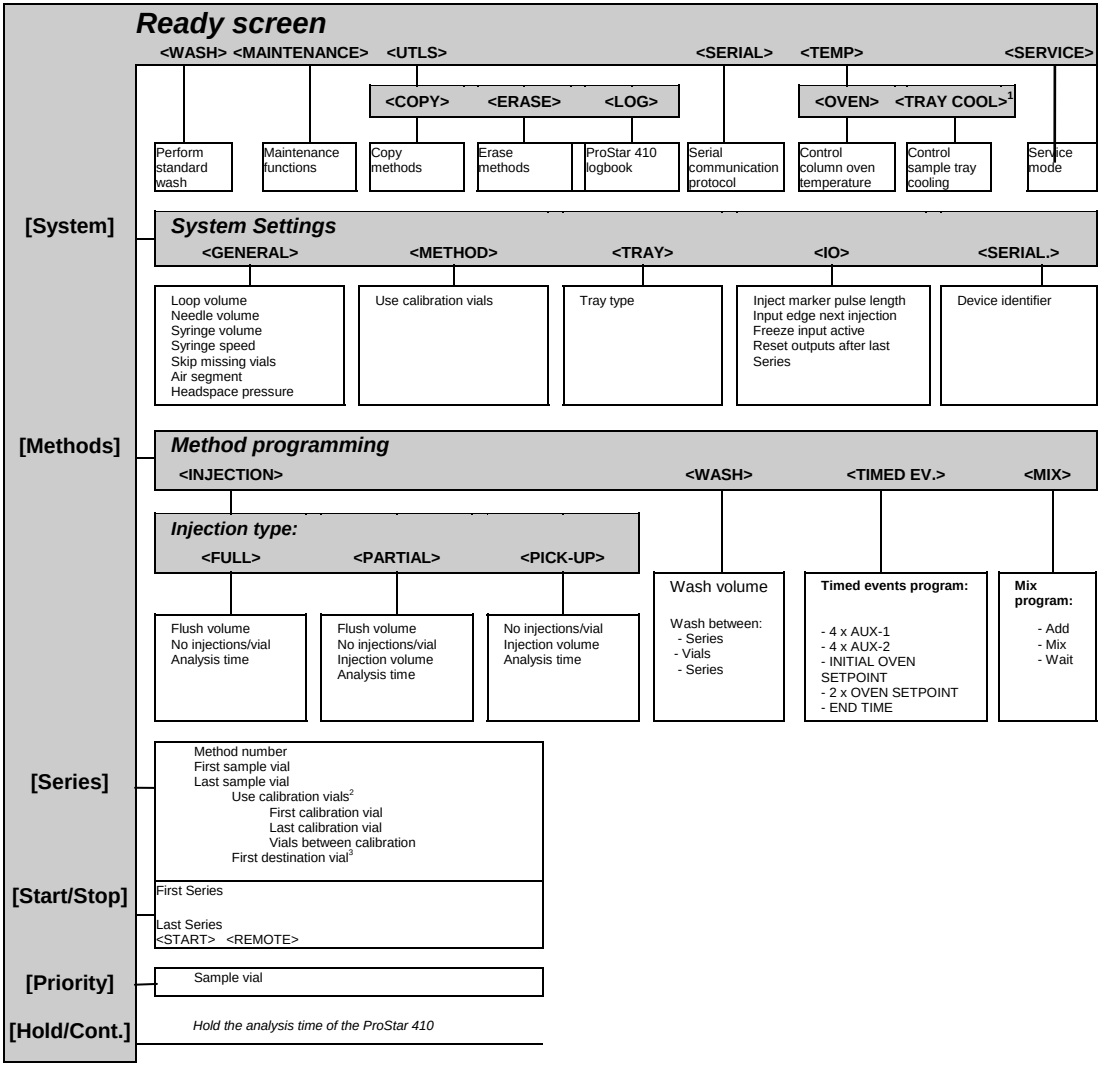
Running the Series (see page 54 of this manual)

Put a sample vial in position 1, an empty sealed destination vial in position 2 and a filled reagent vial in position 86. Be sure the reagent vial is filled correctly before starting a new Series. (If you can't reach one of the tray positions, turn the tray manually.)

Press keys:	***Description:***
[Start/Stop]	
[1] [Enter]	*Start at Series number:1*
[1] [Enter]	*Stop after Series number: 1*

If you press **<START>** the ProStar 410 will start searching for vial 86 and transfer 180 µL to the destination vial twice, subsequently 40 µL of sample will be added and after mixing 3 times a 10 µL injection will be performed.

Programming Chart



[1] Available when the optional tray cooling is installed.
[2] Depends on the System Settings.
[3] In case Destination vials are used in the mix of the method.

Accessories

Part Number	Description
R000088210	Large capacity tray option, 96 position for 1.5 mL vials (12 mm OD)
R000088211	Large volume tray option, 24 position for 10 mL vials (22 mm OD), with 1 mL syringe and LSV needle
0393590791	Prep Upgrade Option, Includes Needle, Syringe, Injection Valve and Large Volume Sample Tray
0392607952	Standard Tray (84+3)
0392607967	Flanged-tube fitting 1/8" (pck/5)
0392607968	Flanged-tube fitting 1/16" (pck/5)
0392607901	Air needle (incl. seal)
0392611025	Preparative Air Needle
0392607974	Sample needle (pck/3)
0392611026	Preparative Sample Needle
0392607804	Buffer tubing 500 µL
0392607805	Buffer tubing 2000 µL
0392607973	Tefzel buffer tubing 2000 µl
0392607971	Syringe waste tubing
0392607972	Syringe wash tubing
0392607908	Syringe valve
0392607922	Luer lock connector syringe valve
0190018200	Valco loop 5 µL with fittings
0190018202	Valco loop 20 µL with fittings
0190018204	Valco loop 100 µL with fittings
0190018207	Valco loop 200 µL with fittings
0190018205	Valco loop 500 µL with fittings
0392611013	Valco loop 1000 µL with fittings

Part Number	Description
0392611014	Valco loop 2000 µL with fittings
0392611015	Valco loop 5000 µL with fittings
0392611016	Valco loop 10 mL with fittings
0392611017	Valco PEEK loop 20 µL with fittings
0392611018	Valco PEEK loop 50 µL with fittings
0190018208	Valco PEEK loop 100 µL with fittings
0392611019	Valco PEEK 250 µl with fittings
0392611020	Valco PEEK loop 500 µL with fittings
0392611021	Valco PEEK loop 1000 µL with fittings
0392611022	Valco PEEK loop 5000 µL with fittings
2869450201	Package of 10 Valco Ferrules
2869450101	Package of 10 Valco Nuts
0392607983	Valco fingertight PEEK Nut
0392607984	Valco fingertight PEEK Ferrule
0392607979	Valco SS Injection Valve
0392607980	Valco PEEK Injection Valve
0392611027	Valco Preparative Injection Valve
0190017500	Rotor Seal for SS Injection Valve
0392607981	Rotor Seal for PEEK Injection Valve
0392607982	Stator for PEEK Injection Valve
0392607810	250 µL syringe
0392607962	1000 µL syringe
0392611028	2500 µL syringe
0392607963	Plunger replacement tip for 250 µL syringe (pck/10)
0392607964	Plunger replacement kit for 1000 µL syringe (pck/10)
Vials, seals and caps	
R0000542CV	Standard clear crimptop 2-CV vial (pck/100)

Part Number	Description
R005411AC6	Crimpcap for standard 2-CV and 1.1-CTVG vials. (pck/100)
R05411CTVG	Chromacol 1.1-CTVG conical vial with crimptop. (pck/100)
R054TTS312	Chromacol TTS-312 support for 1.1-CTVG vial. (pck/100)
R0000542SV	Standard screwtop 2-SV vial. (pck/100)
R0000548SC	Screwcap for standard 2-SV vial. (pck/100)
R005486RTI	Septum for standard 2-SV vial. (pck/100)
R05406PPCV	Polypropylene crimptop vial 0.6 mL (pck/100)
R000541201	Polypropylene septum caps for polypropylene vials (pck/100)
R005402MTV	0.2 mL Insert to fit inside standard 2 mL crimptop vial, requires support sleeve R00054MTSA
R00054MTSA	Support sleeve for 0.2 mL insert
RK60827510	Chromacol 10-CV, 10 mL vial. (pck/100)
R0K7382420	Chromacol 20-ACB crimpcap and seal for 10-CV vial. (pck/100)
R0K6990111	Handcrimper 11 mm OD vials (standard).
R0K6990120	Handcrimper 20 mm OD vials.

Error Codes

ERROR CODE	*CAUSE*
Injection valve	
ERROR 211	Injection valve is not in a valid position.
ERROR 212	The injection valve did not switch within 1.5 seconds.
ERROR 213	The switching time of the injection valve exceeds 500 msec
Syringe dispenser unit	
ERROR 221	The syringe valve did not switch.
ERROR 222	The syringe did not reach the home position within time.
ERROR 223	The syringe spindle did not make the correct number of rotations.
ERROR 224	The spindle does not rotate.
ERROR 225	The syringe valve did not find a valid position.
Injection needle unit	
ERROR 230	The sample needle arm did not reach or leave the home position (vertical).
ERROR 231	The sample needle arm is in an invalid horizontal position while moving down.
ERROR 232	The sample needle arm did not reach its destination within a certain time (horizontal).
ERROR 233	Too many or not enough steps needed to reach destination of horizontal needle movement.
ERROR 234	Sample needle arm not in vertical home position while moving horizontally.
ERROR 235	The sample needle arm is at an invalid horizontal position
ERROR 237	The sample tray is not at a valid position while moving the sample needle arm down.
ERROR 239	Vial sensor sticks.

ERROR CODE	*CAUSE*	
Tray unit		
ERROR 251	Incorrect tray rotation	
ERROR 252	No sample tray positioned in the ProStar 410.	
ERROR 253	The sample needle arm is not in the home position while rotating the tray.	
Vials		
ERROR 260	Missing vial.	*Only available when Skip Missing Vial is set to **NO** in the System Settings (see page 40) and during the execution of the Mix of a method.*
ERROR 262	Missing transport vial.	*Only available when Skip Missing Vial is set to **NO** in the System Settings (see page 40).*
ERROR 264	Missing vial for reagent A	
ERROR 265	Missing vial for reagent B	
ERROR 268	Missing destination vial.	
ERROR 269	Not enough transport liquid available due to missing transport vials.	
ERROR 270	Not enough reagent A available.	
ERROR 271	Not enough reagent B available.	
Electronics		
ERROR 275	Error occurred during initialization, the ProStar 410 can not start.	

ProStar 410 Prep Option

By just choosing PREP in your system settings, you can use the ProStar 410 to inject all of your sample into a Preparative LC system or in other areas where large injection volumes are required.

The combination of large sample vials (10 mL) a large sample volume needle and a 2.5 mL syringe enable you to inject large volumes very reproducible with high speeds and only 45 µL of sample loss. The installed large bore valve (0.75 mm) with 10 mL sample loop enables you to inject from microliters to milliliters with the same AutoSampler. Flow rates up to 200 mL per minute are possible when in the Prep mode.

If the Prep option is factory installed the following installation instructions can be skipped.

If the Prep option is bought as a kit, carry out the installation instructions.

Installation of 410 Prep Option

To install the Prep option on the standard Midas perform the following installation steps:

- When the Firmware revision is lower than V2.00, then first replace the EPROM with the one supplied in the shipkit before you continue with the next steps (see the section on Firmware replacement).
- Replace the standard injection valve with the special 410 Prep valve.
- Replace standard sample needle, air needle and buffer tubing with the ones supplied in the Prep Upgrade kit.

- Re-connect all tubing to the injection valve.
- Replace standard Syringe with the 2500 µL syringe.
- Install the 24 vials (LSV) tray.
- Choose Prep Mode in system.

Table 7 Tubing of the ProStar 410 Prep option.

Tubing	***Material and dimensions***	
LSV sample needle and tubing.	SS tubing: 70 mm x 0.81 mm OD x 0.51 mm ID Tefzel tubing: 155 mm x $^{1}/_{16}$" OD x 0.50 mm ID	45 µL
Buffer tubing from high-pressure valve to syringe valve.	PTFE tubing: 2550 mm x $^{1}/_{16}$" OD x 1.0 mm ID	2000 µL

Injecting with the ProStar 410 Prep AutoSampler

The injection routine differs from the standard routine. The 410 Prep has only the Partial loopfill injection routine, which differs from the partial loopfill injection routine of the standard AutoSampler.

The following explains the difference in injection protocol between the standard and prep configurations.

NOTE: Ensure that the programmed injection volume does not exceed the 50% of the loop volume, otherwise the reproducibility and accuracy of the injection can not be guaranteed.

The software does not check the injection volume with the installed loop volume. It is therefore possible to program injection volumes larger than 50% of the loop volume.

The preflush is no longer executed, expansion of the liquid in the sample loop will remove sample from the sample tubing and needle when switching from INJECT to LOAD. To compensate for the volume of the needle and tubing, an additional amount of the sample, equal to the programmed sample needle – tubing volume (default 45 µL) is aspirated in the sample loop together with the programmed sample volume.

Firmware Replacement

The firmware of the ProStar 410 is stored in an EPROM, which is located on the CPU Board.

CAUTION

The EPROM is highly sensitive for Electro Static Discharges.
Observe precautions for handling Electro Static Discharge sensitive devices.

For replacement of this EPROM proceed as follows:

1. Make a note of all the programmed Methods, Series and System Settings
2. Turn main power OFF
3. Remove the 4 screws marked (A).
4. Open the rear panel
5. Remove the old EPROM and place the new EPROM on the CPU Board

Check all System Settings after placing the new EPROM

Make sure all pins of the EPROM are placed in the IC-socket.

NOTE: The little notch on the top of the EPROM should be facing the same way.

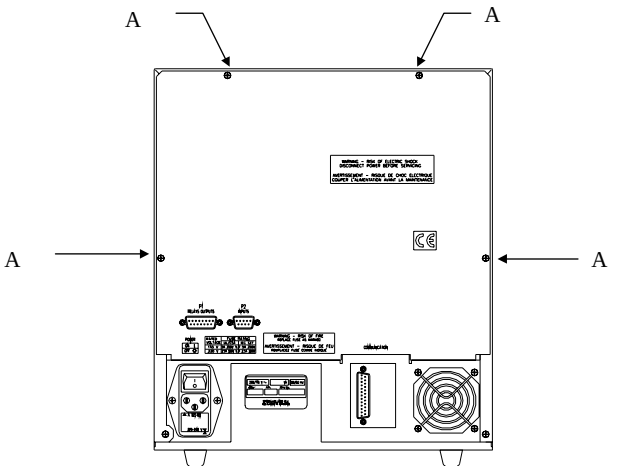


Figure 40

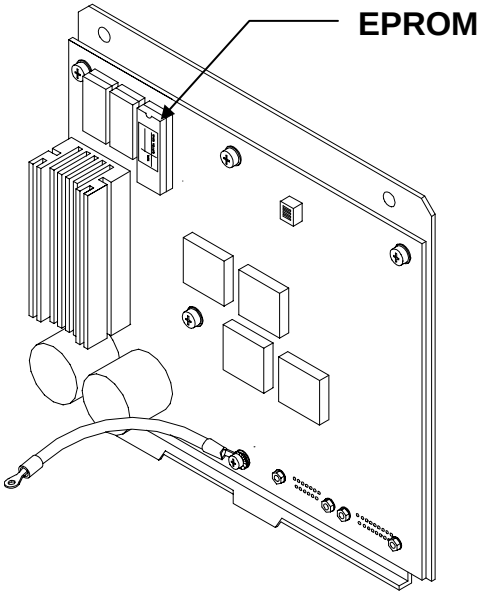


Figure 41

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