

Thermo Scientific

Valve Interface Module (VIM) User Guide

CH-106929 Revision 4 January 2023

Thermo

S C I E N T I F I C

© 2021 Thermo Fisher Scientific Inc. All rights reserved.

TSQ Vantage are trademarks, and Xcalibur, Aria, Transcend, Foundation, TurboFlow, Accucore, and TSQ Quantum are registered trademarks of Thermo Fisher Scientific Inc. in the United States.

Microsoft and Windows are registered trademarks of the Microsoft Corporation

Fluorinert is a trademark of 3M; Freon and Teflon are registered trademarks of E.I. du Pont de Nemours and Company; Fomblin is a registered trademark of Solvay Fluorati Holding S.P.A.; Adobe and Reader are registered trademarks of Adobe Systems Incorporated. PAL is a trademark of CTC Analytics AG; Defraggler and Piriform are registered trademarks of Piriform Limited.

Thermo Fisher Scientific Inc. provides this document to its customers with a product purchase to use in the product operation. This document is copyright protected and any reproduction of the whole or any part of this document is strictly prohibited, except with the written authorization of Thermo Fisher Scientific Inc.

The contents of this document are subject to change without notice. All technical information in this document is for reference purposes only. System configurations and specifications in this document supersede all previous information received by the purchaser.

Thermo Fisher Scientific Inc. makes no representations that this document is complete, accurate or error-free and assumes no responsibility and will not be liable for any errors, omissions, damage or loss that might result from any use of this document, even if the information in the document is followed properly.

This document is not part of any sales contract between Thermo Fisher Scientific Inc. and a purchaser. This document shall in no way govern or modify any Terms and Conditions of Sale, which Terms and Conditions of Sale shall govern all conflicting information between the two documents.

Release history:

Date	Version	Author	Change ID	Changes
MAY 2011	1	Chris Elicone	N/A	Initial release
09-APR-2014	2	Stefan Nadler	ECN*1380	Include Ultimate VIM in the user guide
28-SEP-2021	3	Stefan Nadler	EPIR*547	Include Vanquish VIM in the user guide
18-JAN-2023	4	Phil Ruggles	EPIR*1431	Update of compliance and safety information

For General Lab Equipment, not for Clinical, Patient or Diagnostic Use.

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol:



Thermo Fisher Scientific has contracted with one or more recycling or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. See www.thermoscientific.com/rohswее for further information on Thermo Fisher Scientific's compliance with these Directives and the recyclers in your country.

WEEE Konformität

Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2012/19/EU erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet:




Thermo Fisher Scientific hat Vereinbarungen mit Verwertungs-/Entsorgungsfirmen in allen EU-Mitgliedsstaaten getroffen, damit dieses Produkt durch diese Firmen wiederverwertet oder entsorgt werden kann. Mehr Information über die Einhaltung dieser Anweisungen durch Thermo Fisher Scientific, über die Verwerter, und weitere Hinweise, die nützlich sind, um die Produkte zu identifizieren, die unter diese RoHS Anweisung fallen, finden sie unter www.thermoscientific.com/rohswее.

Conformité DEEE

Ce produit doit être conforme à la directive européenne (2012/19/EU) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant:



Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider la détection des substances sujettes à la directive RoHS sont disponibles sur www.thermoscientific.com/rohsweee.

CAUTION Symbol	CAUTION	VORSICHT	ATTENTION	PRECAUCION	AVVERTENZA
	Electric Shock: This instrument uses high voltages that can cause personal injury. Before servicing, shut down the instrument and disconnect the instrument from line power. Keep the top cover on while operating the instrument. Do not remove protective covers from PCBs.	Elektroschock: In diesem Gerät werden Hochspannungen verwendet, die Verletzungen verursachen können. Vor Wartungsarbeiten muß das Gerät abgeschaltet und vom Netz getrennt werden. Betreiben Sie das Gerät nicht mit abgenommenem Deckel. Nehmen Sie die Schutzabdeckung von Leiterplatten nicht ab.	Choc électrique: L'instrument utilise des tensions capables d'infliger des blessures corporelles. L'instrument doit être arrêté et débranché de la source de courant avant tout intervention. Ne pas utiliser l'instrument sans son couvercle. Ne pas enlever les étuis protecteurs des cartes de circuits imprimés.	Descarga eléctrica: Este instrumento utiliza altas tensiones, capaces de producir lesiones personales. Antes de dar servicio de mantenimiento al instrumento, éste deberá apagarse y desconectarse de la línea de alimentación eléctrica. No opere el instrumento sin sus cubiertas exteriores quitadas. No remueva las cubiertas protectoras de las tarjetas de circuito impreso.	Shock da folgorazione. L'apparecchio è alimentato da corrente ad alta tensione che può provocare lesioni fisiche. Prima di effettuare qualsiasi intervento di manutenzione occorre spegnere ed isolare l'apparecchio dalla linea elettrica. Non attivare lo strumento senza lo schermo superiore. Non togliere i coperchi a protezione dalle schede di circuito stampato (PCB).
	Chemical: This instrument might contain hazardous chemicals. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive or irritant chemicals. Use approved containers and proper procedures to dispose waste oil.	Chemikalien: Dieses Gerät kann gefährliche Chemikalien enthalten. Tragen Sie Schutzhandschuhe beim Umgang mit toxischen, karzinogenen, mutagenen oder ätzenden/reizenden Chemikalien. Entsorgen Sie verbrauchtes Öl entsprechend den Vorschriften in den vorgeschriebenen Behältern.	Produits chimiques: Des produits chimiques dangereux peuvent se trouver dans l'instrument. Portez des gants pour manipuler les produits chimiques toxiques, cancérigènes, mutagènes, ou corrosifs/irritants. Utilisez des récipients et des procédures homologués pour éliminer les huiles usagées.	Química: El instrumento puede contener productos químicos peligrosos. Utilice guantes al manejar productos químicos tóxicos, carcinogénos, mutagénos o corrosivos/irritantes. Utilice recipientes y procedimientos aprobados para deshacerse del aceite usado.	Prodotti chimici. Possibile presenza di sostanze chimiche pericolose nell'apparecchio. Indossare dei guanti per maneggiare prodotti chimici tossici, cancerogeni, mutageni, o corrosivi/irritanti. Utilizzare contenitori aprovo e seguire la procedura indicata per lo smaltimento dei residui di olio.
	Heat: Before servicing the instrument, allow any heated components to cool.	Hitze: Warten Sie erhitzte Komponenten erst nachdem diese sich abgekühlt haben.	Haute Température: Attendre que les composants chauffés soient refroidis avant tout intervention.	Altas temperaturas: Permita que los componentes se enfríen, ante de efectuar servicio de mantenimiento.	Calore. Attendere che i componenti riscaldati si raffreddino prima di effettuare l'intervento di manutenzione.
	Fire: Use care when operating the system in the presence of flammable gases.	Feuer: Beachten Sie die einschlägigen Vorsichtsmaßnahmen, wenn Sie das System in Gegenwart von entzündbaren Gasen betreiben.	Incendie: Agir avec précaution lors de l'utilisation du système en présence de gaz inflammables.	Fuego: Tenga cuidado al operar el sistema en presencia de gases inflamables.	Incendio. Adottare le dovute precauzioni quando si usa il sistema in presenza di gas infiammabili.
	Eye Hazard: Eye damage could occur from splattered chemicals or flying particles. Wear safety glasses when handling chemicals or servicing the instrument.	Verletzungsgefahr der Augen: Verspritzte Chemikalien oder kleine Partikel können Augenverletzungen verursachen. Tragen Sie beim Umgang mit Chemikalien oder bei der Wartung des Gerätes eine Schutzbrille.	Danger pour les yeux: Les projections de produits chimiques ou de particules dans l'air peuvent provoquer des lésions oculaires. Porter des lunettes de protection lors de la manipulation de produits chimiques ou lors de l'entretien de l'instrument.	Peligro par los ojos: Las salicaduras de productos químicos o partículas que saltan bruscamente pueden causar lesiones en los ojos. Utilice anteojos protectores al manipular productos químicos o al darle servicio de mantenimiento al instrumento.	Pericolo per la vista. Gli schizzi di prodotti chimici o delle particelle presenti nell'aria potrebbero causare danni alla vista. Indossare occhiali protettivi quando si maneggiano prodotti chimici o si effettuano interventi di manutenzione sull'apparecchio.
	General Hazard: A hazard is present that is not included in the above categories. Also, this symbol appears on the instrument to refer the user to instructions in this manual.	Allgemeine Gefahr: Es besteht eine weitere Gefahr, die nicht in den vorstehenden Kategorien beschrieben ist. Dieses Symbol wird im Handbuch außerdem dazu verwendet, um den Benutzer auf Anweisungen hinzuweisen.	Danger général: Indique la présence d'un risque n'appartenant pas aux catégories citées plus haut. Ce symbole figure également sur l'instrument pour renvoyer l'utilisateur aux instructions du présent manuel.	Peligro general: Significa que existe un peligro no incluido en las categorías anteriores. Este símbolo también se utiliza en el instrumento par referir al usuario a las instrucciones contenidas en este manual.	Pericolo generico. Pericolo non compreso tra le precedenti categorie. Questo simbolo è utilizzato inoltre sull'apparecchio per segnalare all'utente di consultare le istruzioni descritte nel presente manuale.
	When the safety of a procedure is questionable, contact your local Technical Support organization for Thermo Fisher Scientific San Jose Products.	Wenn Sie sich über die Sicherheit eines Verfahrens im unklaren sind, setzen Sie sich, bevor Sie fortfahren, mit Ihrer lokalen technischen Unterstützungsorganisation für Thermo Fisher Scientific San Jose Produkte in Verbindung.	Si la sûreté d'une procédure est incertaine, avant de continuer, contacter le plus proche Service Clientèle pour les produits de Thermo Fisher Scientific San Jose.	Cuando la certidumbre acerca de un procedimiento sea dudosa, antes de proseguir, pongase en contacto con la Oficina de Asistencia Técnica local para los productos de Thermo Fisher Scientific San Jose.	Quando e in dubbio la misura di sicurezza per una procedura, prima di continuare, si prega di mettersi in contatto con il Servizio di Assistenza Tecnica locale per i prodotti di Thermo Fisher Scientific San Jose.

危險警告

CAUTION Symbol

CAUTION



Electric Shock: This instrument uses high voltages that can cause personal injury. Before servicing, shut down the instrument and disconnect the instrument from line power. Keep the top cover on while operating the instrument. Do not remove protective covers from PCBs.



Chemical: This instrument might contain hazardous chemicals. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive or irritant chemicals. Use approved containers and proper procedures to dispose waste oil.



Heat: Before servicing the instrument, allow any heated components to cool.



Fire: Use care when operating the system in the presence of flammable gases.



Eye Hazard: Eye damage could occur from splattered chemicals or flying particles. Wear safety glasses when handling chemicals or servicing the instrument.



General Hazard: A hazard is present that is not included in the above categories. Also, this symbol appears on the instrument to refer the user to instructions in this manual.

When the safety of a procedure is questionable, contact your local Technical Support organization for Thermo Fisher Scientific San Jose Products.

電撃：この計測器は高電圧を使用し、人体に危害を与える可能性があります。保守・修理は、必ず作業を停止し、電源を切ってから実施して下さい。上部カバーを外したままで計測器を使用しないで下さい。プリント配線板の保護カバーは外さないで下さい。

化学物質：危険な化学物質が計測器中に存在している可能性があります。毒性、発がん性、突然変異性、腐食・刺激性などのある薬品を取り扱う際は、手袋を着用して下さい。廃油の処分には、規定の容器と手順を使用して下さい。

熱：熱くなった部品は冷えるのを待ってから保守・修理を行って下さい。

火災：可燃性のガスが存在する場所でシステムを操作する場合は、充分な注意を払って下さい。

眼に対する危険：化学物質や微粒子が飛散して眼を傷つける危険性があります。化学物質の取り扱い、あるいは計測器の保守・修理に際しては防護眼鏡を着用して下さい。

一般的な危険：この標識は上記以外のタイプの危険が存在することを示します。また、計測器にこの標識がついている場合は、本マニュアル中の指示を参照して下さい。

安全を確保する手順がよくわからない時は、作業を一時中止し、お近くのサーモエレクトロンサンローゼプロダクトのテクニカルサポートセンターご連絡ください。

危險警告

電撃：儀器設備使用會造成人身傷害的高伏電壓。在維修之前，必須先開儀器設備並切除電源。務必要在頂蓋蓋上的情況下操作儀器。請勿拆除PCB保護蓋。

化學品：儀器設備中可能存在有危險性的化學物品。接觸毒性致癌、誘變或腐蝕／刺激性化學品時，請配帶手套。處置廢油時，請使用經過許可的容器和程序。

高溫：請先等高溫零件冷卻之後再進行維修。

火災：在有易燃氣體的場地操作該系統時，請務必小心謹慎。

眼睛傷害危險：飛濺的化學品或顆粒可能造成眼睛傷害。處理化學品或維修儀器設備時請佩戴安全眼鏡。

一般性危險：說明未包括在上述類別中的其他危險。此外，儀器設備上使用這個標誌，以指示用戶本使用手冊中的說明。

如對安全程序有疑問，請在操作之前與當地的菲尼根技術服務中心聯繫。

Contents

Preface	9
Related Documentation.....	9
Safety and Special Notices.....	9
Safety Information.....	10
Environmental Conditions.....	12
Good Laboratory Practices	12
Keeping Good Records.....	13
Contacting Us	15
VIM(ValveInterfaceModule)Overview	16
Introduction.....	16
Enclosures	18
Valves.....	20
VIM Configurations.....	21
LeakDetection.....	24
Specifications.....	25
InstallingtheVIM	26
ConnectingtheVIMtotheAppropriateSystem	26
Changing the VIM Plumbing— TLX Systems Only.....	26
Changing the Rotor Seal.....	28
Plumbing the VIM	28
ConnectingtheAppropriateTurboFlowandAnalyticalColumns	31

Maintaining the VIM	32
Replacing the Analytical Column (every 2,000 injections)	32
Replacing the TurboFlow Column (every 300 to 1000 injections).....	32
Cleaning or Replacing the Rotor Seals (every 15,000 Injections).....	33
Preparing the Cleaning Solvent	35
Spare Parts	36
Troubleshooting the VIM.....	37
Checking for Clogged or Damaged Rotor Seals	37
Verifying Valve Positions	38
Compliance Information.....	39
Declarations of Conformity.....	39
WEEE Compliance	40
FCC Compliance	40

Preface

This manual provides a description of the valve interface module (VIM) and information on how to install, maintain, and troubleshoot the VIM. The VIM houses the valves that manage the fluidics in the Thermo Scientific Transcend Systems.

Related Documentation

In addition to this manual, you can find information related to the VIM in the following:

Aria OS User Guide – Provides information on using the VIM when the VIM is installed in an Aria or Transcend system that is operated by Aria OS

Aria MX User Guide – Provides information on using the VIM when the VIM is installed in an Aria™ or Transcend™ system that is operated by Aria MX.

Aria OS Help – Provides information on using the VIM when the VIM is installed in an Aria or Transcend system that is operated by Aria OS

Aria MX Help – Provides information on using the VIM when the VIM is installed in an Aria or Transcend system that is operated by Aria MX.

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

Safety and special notices include the following:



CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

ATTENTION Met en évidence les dangers pour l'homme, les biens ou l'environnement. Chaque avertissement est accompagné d'un symbole ATTENTION approprié.



CAUTION Highlights electric shock hazards to humans. Each electric shock notice is accompanied by the international high voltage symbol.

ATTENTION Met en évidence les risques de chocs électriques pour les humains. Chaque avis de choc électrique est accompagné du symbole international de haute tension.



CAUTION Highlights chemical hazards to humans, property, or the environment. Each chemical notice is accompanied by the chemical caution symbol.

ATTENTION Met en évidence les risques chimiques pour les humains, les biens ou l'environnement. Chaque avis de danger chimique est accompagné du symbole de mise en garde contre les produits chimiques.

Note Highlights information of general interest.

Note Met en évidence les informations d'intérêt général.

Safety Information

Observe the precautions listed in this section to ensure the safe operation and longevity of the instrument.

CAUTION When you use the VIM, follow the generally accepted procedures for quality control and method development. If you observe a change in retention time of a particular compound, in the resolution between two compounds, or in peak shape, immediately determine the reason for the changes. Until you determine the cause of the change, do not rely on separation results.



ATTENTION Lorsque vous utilisez le VIM, suivez les procédures généralement acceptées pour le contrôle de la qualité et l'élaboration des méthodes. Si vous observez une modification du temps de rétention d'un composé particulier, de la résolution entre deux composés ou de la forme du pic, déterminez immédiatement la raison de ces modifications. Tant que vous n'avez pas déterminé la cause du changement, ne vous fiez pas aux résultats de la séparation.

CAUTION Use equipment only in the manner specified by its manufacturer, or risk impairing the protection provided by the equipment.



ATTENTION Utilisez l'équipement uniquement de la manière indiquée par son fabricant, sous peine de compromettre la protection fournie par l'équipement.



CAUTION Do not service any part when operating the instrument. Do not remove any panel when the instrument is running. Do not run the instrument without all panels in place.

ATTENTION N'entretenez aucune pièce lorsque vous utilisez l'appareil. Ne retirez aucun panneau lorsque l'instrument est en marche. Ne faites pas fonctionner l'instrument sans que tous les panneaux soient en place.



CAUTION The instrument contains voltage lines. Switch off the power and disconnect the power cable prior to servicing the instrument. There is no need to open the VIM enclosure, as all user serviceable components are outside of the instrument.

ATTENTION L'instrument contient des lignes de tension. Coupez le courant et débranchez le câble d'alimentation avant d'effectuer l'entretien de l'instrument. Il n'est pas nécessaire d'ouvrir le boîtier du VIM, car tous les composants réparables par l'utilisateur se trouvent à l'extérieur de l'instrument.



CAUTION Follow the maintenance procedures in this manual when replacing or repairing the VIM' serviceable components. Never try to repair or replace components not described in this manual without the assistance of a Thermo Fisher Scientific representative.

ATTENTION Suivez les procédures d'entretien de ce manuel lorsque vous remplacez ou réparez les composants du VIM. N'essayez jamais de réparer ou de remplacer des composants non décrits dans ce manuel sans l'aide d'un représentant de Thermo Fisher Scientific.



CAUTION To prevent personal injury, observe good laboratory practice when handling solvents, changing tube lines, or both. Consult the pertinent material safety data sheets (MSDSs) for the solvents used for HPLC analysis.

ATTENTION Pour éviter les blessures, respectez les bonnes pratiques de laboratoire lors de la manipulation de solvants, du changement de tubes ou des deux. Consultez les fiches de données de sécurité (FDS) des solvants utilisés pour l'analyse HPLC.

“Use the power cable provided with the VIM. Do not use the power cable if it has been damaged.”

“Caution Heavy Instruments – the instrument weighs up to 35 – 48 lbs. Can cause muscle strain. Multi-person lift required.”

“Do not block rear ventilation openings”

“Do not position the equipment so that it is difficult to operate the electrical disconnect device”

“If the equipment is used in a manner not specified by Thermo Fisher Scientific, the protection provided by the equipment may be impaired.”

Preface
Environmental Conditions

Environmental Conditions

The installation category (over voltage category) for this instrument is Category 2, which pertains to equipment that receives its electrical power from the local level, such as an electrical wall outlet.

The pollution degree for this instrument is Pollution Category 2 (Laboratory): Normally, only nonconductive pollution occurs. Expect temporary conductivity caused by condensation.

Observe the following environmental specifications.



CAUTION Only use the VIM according to the conditions stated, or risk personal injury or damage to the device.

ATTENTION N'utilisez le VIM que dans les conditions indiquées, sinon vous risquez de vous blesser ou d'endommager l'appareil.

Table 1. Environmental specifications

Environmental condition	Recommendation
Location	Indoor use only TYPE 1 according to UL50E
Allowable Temperature Change	5 °F (2.8 °C)/hr Operating
Temperature	40 – 104 °F (4 – 40 °C)
Non-operating altitude	Up to 4600 m (14950 ft) storage conditions
Operating altitude	Up to 2000 m (6500 ft)
Humidity	20 – 80%
Main Supply Voltage Fluctuation	+/- 10% Vac, 50/60 Hz

Good Laboratory Practices

To obtain optimal performance from your LC system and to prevent personal injury or injury to the environment, do the following:

- Keep good records.
- Read the manufacturers' MSDSs for the chemicals you use in your laboratory.
- Remove particulate matter from your samples before injecting them into the liquid chromatograph.
- Use LC-MS-grade solvents or better.
- Connect the drainage tubes from the pump, autosampler, VIM, and detector to an appropriate waste receptacle. Dispose of solvents as specified by local regulations.

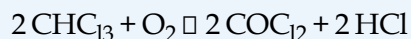
Keeping Good Records

To help identify and isolate problems with either your equipment or your methodology, keep good records of all system conditions (for example, %RSDs on retention times and peak areas, peak shape, and resolution). At a minimum, keep a chromatogram of a typical sample and

CAUTION Do not use the following solvents:

Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).

- High concentrations of inorganic acids like sulfuric acid and nitric acid, especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:



This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solvents containing strong complexing agents (e.g. EDTA).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

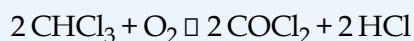




ATTENTION N'utilisez pas les solvants suivants :

Solutions d'halogénures alcalins et de leurs acides respectifs (par exemple, iodure de lithium, chlorure de potassium, etc.).

- Des concentrations élevées d'acides inorganiques comme l'acide sulfurique et l'acide nitrique, surtout à des températures élevées (à remplacer, si votre méthode de chromatographie le permet, par de l'acide phosphorique ou un tampon de phosphate qui sont moins corrosifs pour l'acier inoxydable).
- Solvants ou mélanges halogénés qui forment des radicaux et des acides, par exemple :



Cette réaction, dans laquelle l'acier inoxydable agit probablement comme un catalyseur, se produit rapidement avec du chloroforme séché si le processus de séchage élimine l'alcool stabilisateur.

- Les éthers de qualité chromatographique, qui peuvent contenir des peroxydes (par exemple, THF, dioxane, di-isopropyléther), ces éthers doivent être filtrés par de l'oxyde d'aluminium sec qui adsorbe les peroxydes.
- Les solvants contenant des agents complexants forts (par exemple, l'EDTA).
- Mélanges de tétrachlorure de carbone avec du 2-propanol ou du THF.

Solvent Disposal

Make sure you have a solvent waste container or other kind of drain system available at or below the benchtop level. Most solvents have special disposal requirements prohibiting disposal directly down a drain. Follow all governmental regulations when disposing of any chemical.

High-Pressure Systems and Leaks

LC systems operate at high pressures. There is little immediate danger from the high pressures in an LC system. However, if a leak occurs, correct it as soon as possible. Always wear eye and skin protection when operating or maintaining an LC system. Always shut down the system and return it to atmospheric pressure before attempting any maintenance.

Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need.

❖ **To contact Technical Support**

Phone	800-532-4752
Fax	561-688-8736
E-mail	us.techsupport.analyze@thermofisher.com
Knowledge base	www.thermokb.com

Find software updates and utilities to download at mssupport.thermo.com.

❖ **To contact Customer Service for ordering information**

Phone	800-532-4752
Fax	561-688-8731
E-mail	us.customer-support.analyze@thermofisher.com
Web site	www.thermo.com/ms

❖ **To get local contact information for sales or service**

Go to www.thermoscientific.com/wps/portal/ts/contactus.

VIM (Valve Interface Module) Overview

This chapter provides information on the VIM's valves and their possible configurations.

Introduction

The valve interface module (VIM) houses the Thermo Scientific Aria and Transcend TLX and LX system valves.

There are two types of VIMs available: Legacy VIMs, which support Aria and Transcend systems, and Transcend II VIMs, which support Transcend II systems. Each VIM type offers several model options to accommodate a variety of system types. [Table 2](#), [Table 3](#) and [Table 4](#) list the VIM part numbers and system types.

Table 2. Legacy VIM part numbers

VIM Description	Part Number (Transcend > 600 bar)	Model Number	System
3 valve TX	CH-953199	2303TX	TLX-1
3 valve LX	CH-953225	2303LX	LX-2
6 valve TX	CH-953227	2306TX	TLX-2
6 valve LX	CH-953228	2306LX	LX-4
6 valve TX for Twin	CH-953321	2306TX-TWIN	TLX-2 TWIN
10 valve TX	CH-953229	2310TX	TLX-4

“Legacy VIMs - Rated 120/240 VAC, 50/60 Hz, 80 Watts. When replacing fuses on the power inlet, use only a fuse rated 10 A / 250 VAC”.

Table 3. Transcend II Ultimate VIM part numbers

VIM Description	Part Number	System
2 valve LX-4	60500-60001	LX-4
3 valve TX	60500-60003	TLX, and LX-2
6 valve TX	60500-60004	TLX-2
10 valve TX	60500-60005	TLX-4

1 VIM (Valve Interface Module) Overview

Enclosures

Table 3. Transcend II Ultimate VIM part numbers

VIM Description	Part Number	System
2 valve LX-4	60500-60001	LX-4
3 valve TX	60500-60003	TLX, and LX-2
6 valve TX	60500-60004	TLX-2
10 valve TX	60500-60005	TLX-4

“Transcend II Ultimate VIMs – Rated 120/230 VAC, 50/60 Hz, 4.0 A Max. When replacing fuses on the power inlet, use only a fuse rated 8 A / 250 VAC”.

Table 4. Transcend Vanquish VIM part numbers

VIM Description	Part Number	System
2 valve LX-4	VF-V08-A	LX-4
2 valve LX-2	VF-V07-A	LX-2
3 valve TLX	VF-V01-A	TLX, and LX-2
6 valve TLX	VF-V02-A	TLX-2
10 valve TLX	VF-V03-A	TLX-4

“Transcend Vanquish VIMs - Rated 120/230 VAC, 50/60 Hz, 4.0 A Max. When replacing fuses on the power inlet, use only a fuse rated 8 A / 250 VAC”.

Enclosures

Legacy VIMs are enclosed in one of three types of enclosures: a modular enclosure, a chassis installed into a system table, (not shown), or an Agilent enclosure. See [Figure 1](#) and [Figure 2](#). See [Figure 3](#) and [Figure 5](#) for the Transcend II VIM enclosure.

Figure 1. Legacy VIM in Thermo Scientific modular enclosure showing front panels closed and open



Figure 2. Legacy VIM in Agilent modular enclosure showing front panels closed



1 VIM (Valve Interface Module) Overview
Enclosures

Figure 3. Transcend II VIM enclosure showing front panel closed



Figure 4. Transcend II VIM enclosure showing front panel open



Figure 5. Transcend Vanquish VIM enclosure showing front panel closed



Figure 6. Transcend Vanquish VIM enclosure showing front panel open



Valves

A VIM can contain the following valves:

Valve	Description
6 port/2 position valves	Every VIM contains three or more six-port valves for controlling the flow of fluids through the TurboFlow or analytical columns. On VIMs installed on LX systems, this valve is labeled Valve A. On VIMs installed in TLX systems, these are labeled A and B. The number of six-port valves in the VIM depend on the number of multiplexed TLX systems. The valve positions are determined in the LC method.
Divert valve (6 port/2 position valve)	Some of the VIMs contain a divert valve rather than a bypass valve. A divert valve controls whether fluid flows to the detector or to waste. The position of the divert valve is determined in the LC method. This valve is also referred to as the C valve.
Selector Valve (6 port/2 position valve or 9 port/eight position valve)	The VIM on a multiplexed system, which is two or four TLX or LX systems connected to one mass spectrometer, contains a selector valve. The selector valve controls which system is inline with the bypass valve. The position of this valve depends on the LC system assignment.
Bypass Valve (6 port/2 position valve)	Most VIMs contain a bypass valves for switching the flow to waste or to the detector. If the VIM does not contain a bypass valve, it contains a divert valve. The position of the bypass valve is determined by the data window of the method that is currently running, or the state of the mass spectrometer.

The system software controls the valve positions for the TLX and LX systems.

VIM Configurations

The placement of the valves on the valve interface modules depends on the system model. The following diagrams show the number of valves and their locations on the valve interface module for each system model.

Legacy VIM Configurations

Figure 7. Valve interface module for LX-2 system models (2303LX)

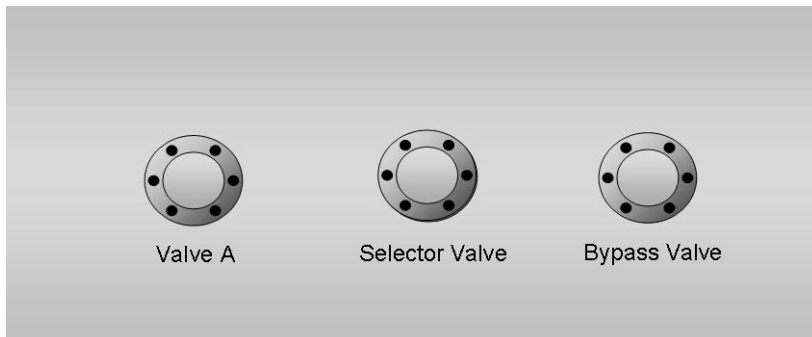


Figure 8. Valve interface module for LX-4 system models (2306LX)

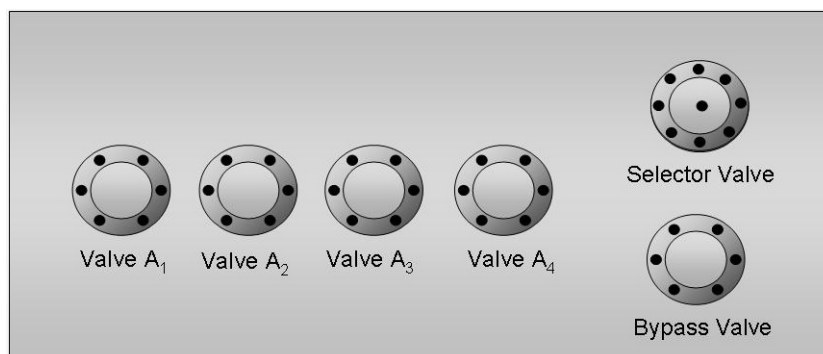


Figure 9. Valve interface module for TLX-1 system models (2303TX)

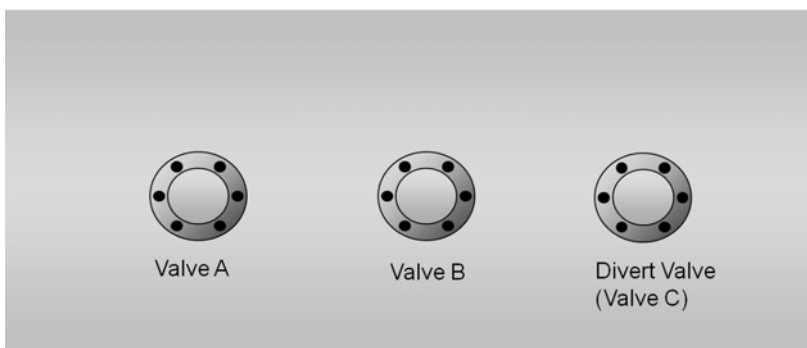


Figure 10. Valve interface module for TLX-2 system models (2306TX)

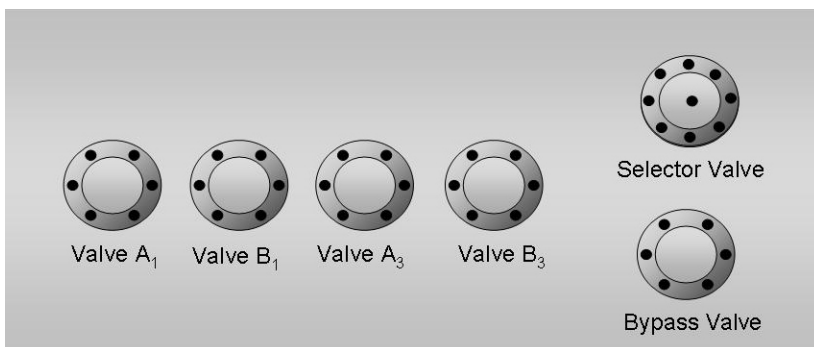


Figure 11. Valve interface module for TLX-2 TWIN system models (2306TX-TWIN)

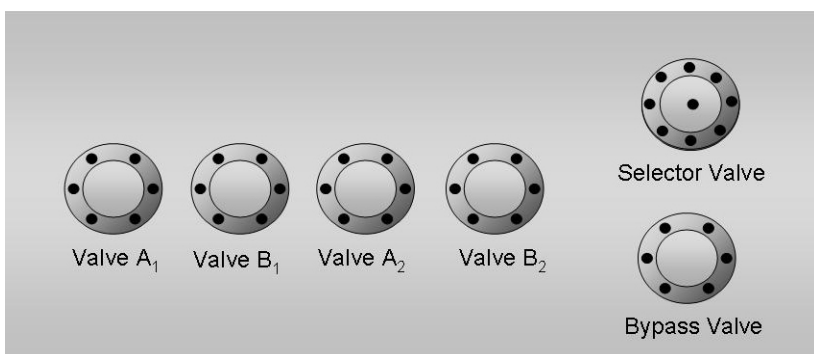
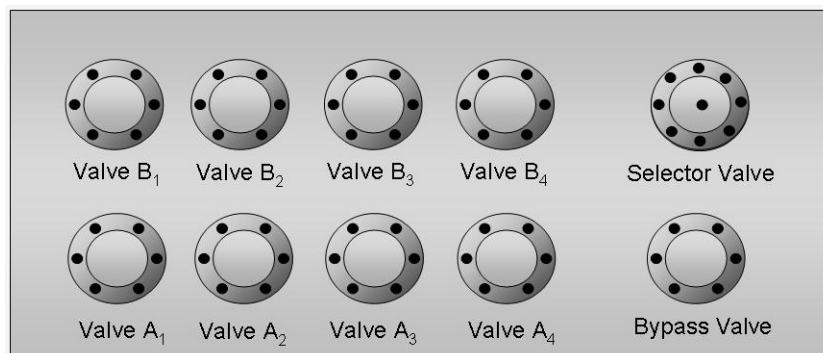


Figure 12. Valve interface module for TLX-4 system models (2310TX)



Transcend II VIM Configurations

Figure 13. Valve interface module for Transcend II system LX-2 (PN 60500-60002)

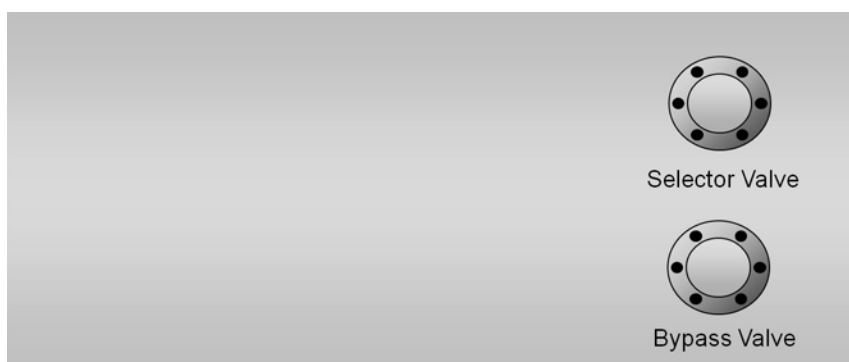


Figure 14. Valve interface module for the Transcend II system LX-4 (PN 60500-60001)



Figure 15. Valve interface module for the Transcend II systems TLX (PN 60500-60003)

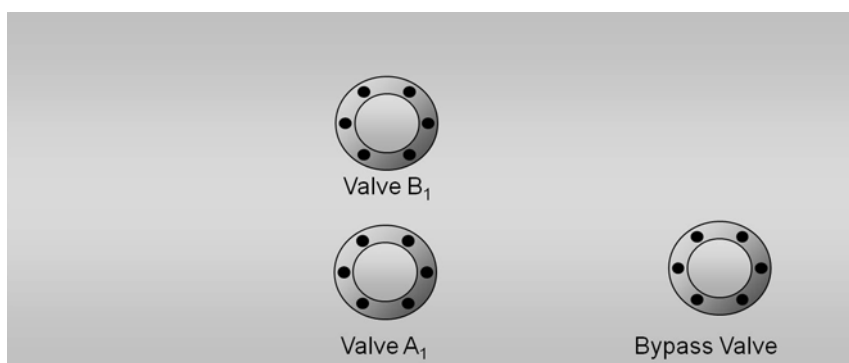


Figure 16. Valve interface module for the Transcend II system TLX-2 (PN 60500-60004)

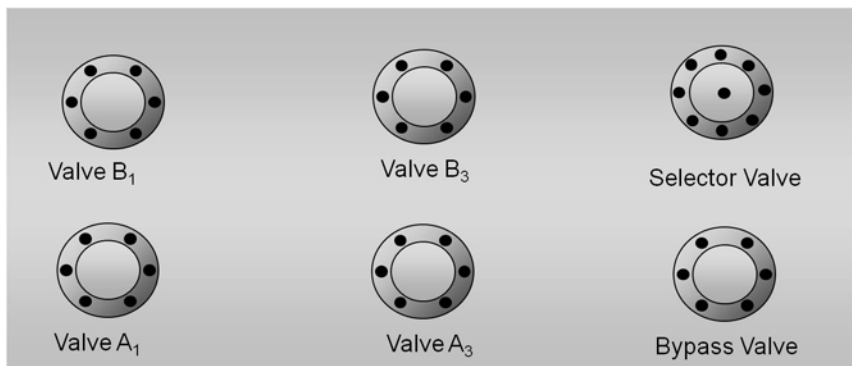
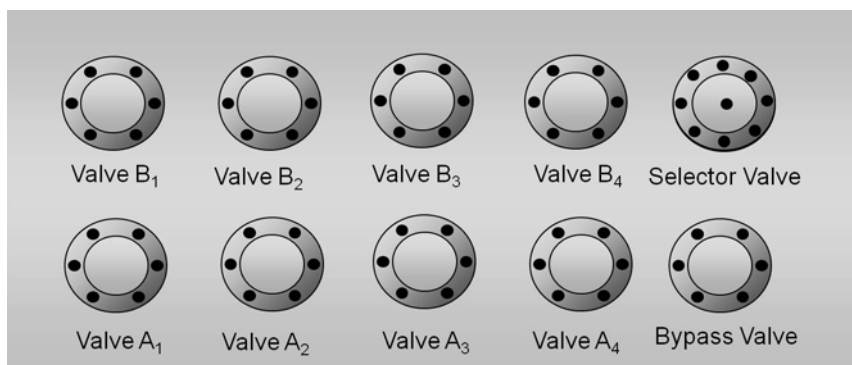


Figure 17. Valve interface module for the Transcend II system TLX-4 (PN 60500-60005)



Leak Detection

The Transcend II VIMs contain a leak detection system that alerts you if liquid had been detected on the floor of the VIM housing. If a leak is detected, the status light at the front of the VIM appears red. The detected leak is not communicated to the Transcend system operating software.

The leak detection system is not available for Vanquish VIM.

Specifications

Table 5. Specifications for legacy VIMs

Specification	Description: Thermo Scientific Legacy Enclosure	Description: Agilent Enclosure
Width	35.5 cm (14 in.)	34.5 cm (13.5 in.)
Depth	45.7 cm (18 in.)	43.5 cm (17 in.)
Height	18.0 cm (7 in.)	18.0 cm (7 in.)
Weight	3 valve: 18 pounds 6 valve: 25 pounds 10 valve: 35 pounds	3 valve: 18 pounds 6 valve: 25 pounds 10 valve: 35 pounds

Table 6. Specifications for Transcend II VIMs

Specifications	Description: Thermo Scientific Ultimate Enclosure
Width	41.5 cm (16.3 in.)
Depth	50 cm (19.7 in.)
Height	19.5 cm (7.7 in.)
Weight	3 valve: 18 pounds 6 valve: 25 pounds 10 valve: 35 pounds

Table 7. Specifications for Vanquish VIMs

Specifications	Description: Thermo Scientific Vanquish Enclosure
Width	42.0 cm (16.5 in.)
Depth	62.0 cm (24.4 in.)
Height	19.2 cm (7.6 in.)
Weight	2 valve: 31 pounds 3 valve: 33 pounds 6 valve: 40.3 pounds 10 valve: 48.2 pounds

Installing the VIM

Installing the VIM involves the following procedures:

- Connecting the VIM to the appropriate system components
- Plumbing the VIM
- Connecting the appropriate TurboFlow and analytical columns

There are occasions when you might want to change the VIM plumbing. See “Connecting the VIM to the Appropriate System” below. You will need to replace the columns at regular intervals. See the column product insert for information on replacing the column.

Connecting the VIM to the Appropriate System

The VIM installation procedures are performed by a qualified Thermo Fisher Service representative. Contact Technical Support if you need information on the VIM connections to other components.

Changing the VIM Plumbing—TLX Systems Only

At the time the system is installed, the service engineer plumbs the TLX VIM for either Quick Elute Mode or Focus Mode. This section describes how to change the plumbing mode.

You can configure a TLX system to run in either Quick Elute Mode or Focus Mode. The following table summarizes the changes required to convert the system configuration from Quick Elute Mode to Focus Mode and from Focus Mode to Quick Elute Mode.

Table 8. Required changes when changing the mode (Sheet 1 of 2)

Converting from Focus Mode to Quick Elute Mode	Converting from Quick Elute Mode to Focus Mode
Change the rotor seal on Valve B to a standard rotor seal. See “Changing the Rotor Seal” on page 27 .	Change the rotor seal on Valve B to a Hi Res rotor seal.
Disconnect the transfer loop.	Install a transfer loop onto ports 4 and 5 of Valve A.

Table 8. Required changes when changing the mode (Sheet 2 of 2)

Converting from Focus Mode to Quick Elute Mode	Converting from Quick Elute Mode to Focus Mode
Change the plumbing of the VIM to Quick Elute Mode. See “ Plumbing the VIM ” on page 27 .	Change the plumbing of the VIM to Focus Mode. See “ Plumbing the VIM ” on page 27 .
Change the LC Method Editor configuration in Aria OS or Aria x1. See the <i>Aria OS User Guide</i> or the <i>Aria x1 User Guide</i> .	Change the LC Method Editor configuration in Aria OS or Aria x1. See the <i>Aria OS User Guide</i> or the <i>Aria x1 User Guide</i> .
Develop new methods in Quick Elute Mode. See the <i>TurboFlow Method Development Guide</i> or the <i>Aria x1 User Guide</i> .	Develop new methods in Focus Mode. See the <i>TurboFlow Method Development Guide</i> or the <i>Aria x1 User Guide</i> .



CAUTION Follow all safety guidelines listed in “[Safety Information](#)” on [page 10](#).

ATTENTION Suivez toutes les consignes de sécurité énumérées dans la section “[Informations sur la sécurité](#)” à la [page 10](#).



CAUTION The instrument contains voltage lines. Switch off the power and disconnect the power cable prior to servicing the instrument. There is no need to open the VIM enclosure, as all user serviceable components are outside of the instrument.

ATTENTION L'instrument contient des lignes de tension. Coupez le courant et débranchez le câble d'alimentation avant d'effectuer l'entretien de l'instrument. Il n'est pas nécessaire d'ouvrir le boîtier du VIM, car tous les composants réparables par l'utilisateur se trouvent à l'extérieur de l'instrument.

Changing the Rotor Seal

Valve B on TLX systems uses a rotor seal that is specific for the operation mode.

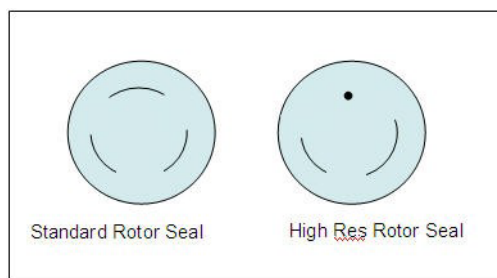
❖ To install the rotor seal

1. Determine which rotor seal is appropriate for your system.

Table 9. Which rotor seal to use

If you run...	Then...
Quick Elute Mode methods	Install the standard rotor seal onto Valve B.
Focus Mode methods	Install the HiRes rotor seal onto Valve B.

Figure 18. Quick Elute Mode and Focus Mode rotor seal differences



2. Remove the rotor seal on valve B, install the appropriate rotor seal, and reinstall the valve face. See [“Cleaning or Replacing the Rotor Seals \(every 15,000 Injections\)”](#) on page 33.

Plumbing the VIM

This section describes the plumbing changes required if you change operation modes on your system.

Changing to Quick Elute Mode Operation

❖ To set up the system plumbing for Quick Elute Mode methods

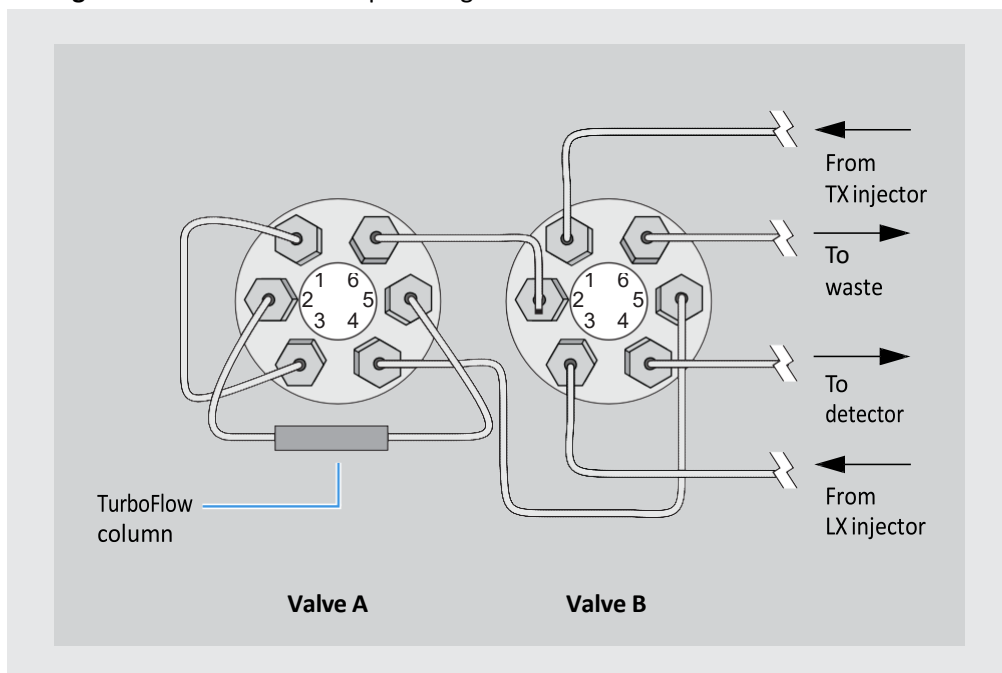
1. Disconnect the transfer loop from ports 3 and 4 on Valve A. See [“Disconnecting and Installing the Transfer Loop”](#) on page 30.
2. Plumb the system according to the following figure.

Note Valve locations on the valve interface module depend on your system model. Port numbers remain the same as they appear in the diagram. See [“Valve Interface Module Configurations”](#) on page 20.

2 Installing the VIM

Changing the VIM Plumbing—TLX Systems Only

Figure 19. Quick Elute Mode plumbing



Note The LC Method Editor Configuration window must match the system hardware configuration. If you change the system plumbing, change the settings in the LC Method Editor Configuration window. See the system or software documentation for information.

Note Depending on the VIM configuration, valves A and B may be situated vertically, but the plumbing of the ports is the same as in this diagram. See [“VIM Configurations”](#) on [page 20](#).

Changing to Focus Mode Operation

❖ **To set up the system plumbing for Focus Mode methods**

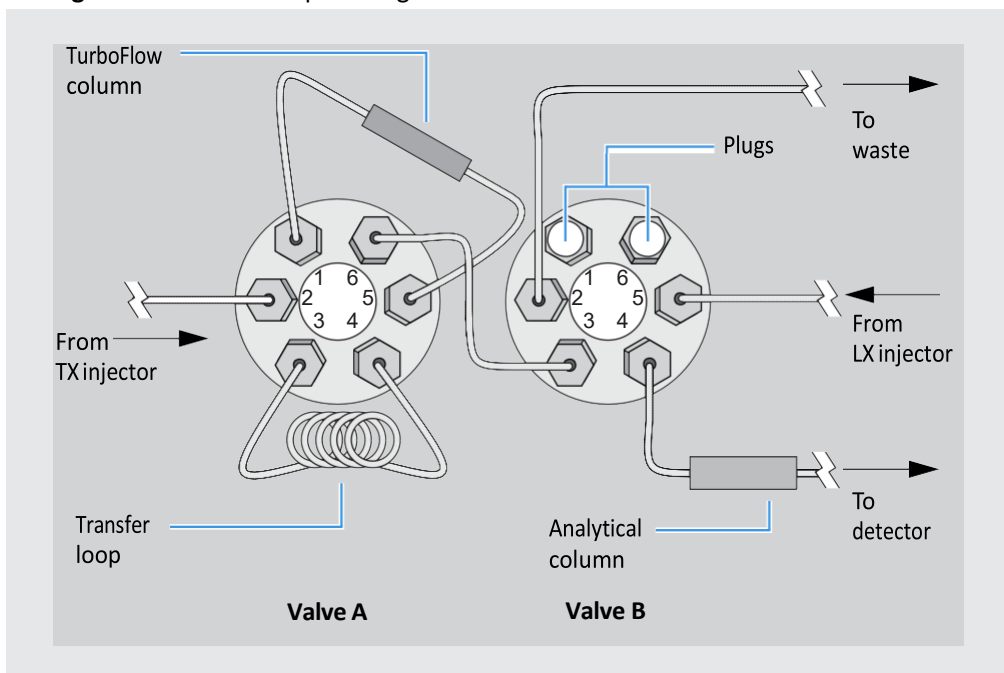
1. Install a transfer loop onto ports 3 and 4 on Valve A. See [“Disconnecting and Installing the Transfer Loop”](#) on [page 30](#).
2. Plumb the system according to the following figure.

Note Valve locations on the valve interface module depend on your system model. Port numbers remain the same as they appear in the diagram.

2 Installing the VIM

Changing the VIM Plumbing—TLX Systems Only

Figure 20. Focus Mode plumbing



Note The LC Method Editor Configuration window must match the system hardware configuration. If you change the system plumbing, change the settings in the LC Method Editor Configuration window. See the system or software documentation for information.

Note Depending on the VIM configuration, valves A and B may be situated vertically, but the plumbing of the ports is the same as in this diagram. See “VIM Configurations” on [page 20](#).

Disconnecting and Installing the Transfer Loop



CAUTION To prevent personal injury, wear protective gloves and observe good laboratory practice when handling solvents, changing tube lines, or both. Consult the pertinent material safety data sheets (MSDSs) for the solvents used for HPLC analysis.

ATTENTION Pour éviter les blessures, portez des gants de protection et observez les bonnes pratiques de laboratoire lorsque vous manipulez des solvants, lorsque vous changez de tube, ou les deux. Consultez les fiches de données de sécurité (FDS) des solvants utilisés pour l'analyse HPLC.

2 Installing the VIM

Changing the VIM Plumbing—TLX Systems Only

❖ To disconnect or install the transfer loop

1. Loosen the fittings that connect the transfer loop to the valve. See [Figure 20](#).
2. Remove the transfer loop and install a new one.
3. Alternately tighten the fittings.

Connecting the Appropriate TurboFlow and Analytical Columns

See [Figure 19](#) and [Figure 20](#) for the column location. See the column product insert for information on handling and connecting the columns.

Maintaining the VIM

Perform the following procedures when the recommended frequency has elapsed, when instructed to do by a Thermo Scientific service engineer, or as part of a troubleshooting process.



CAUTION Follow all safety guidelines listed in “[Safety Information](#)” on [page 10](#).

ATTENTION Respectez toutes les consignes de sécurité énumérées dans la section “[Informations sur la sécurité](#)” à la [page 10](#).



CAUTION The instrument contains voltage lines. Switch off the power and disconnect the power cable prior to servicing the instrument. There is no need to open the VIM enclosure, as all user serviceable components are outside of the instrument enclosure.

ATTENTION L'instrument contient des lignes de tension. Coupez le courant et débranchez le câble d'alimentation avant d'effectuer l'entretien de l'instrument. Il n'est pas nécessaire d'ouvrir le boîtier du VIM, car tous les composants réparables par l'utilisateur se trouvent à l'extérieur du boîtier de l'instrument.

Replacing the Analytical Column (every 2,000 injections)

Follow the recommended installation procedure on the column product insert.

Replacing the TurboFlow Column (every 300 to 1000 injections)

Follow the recommended installation procedure on the TurboFlow™ column product insert.

3 Maintaining the VIM

Cleaning or Replacing the Rotor Seals (every 15,000 Injections)

Cleaning or Replacing the Rotor Seals (every 15,000 Injections)

CAUTION To prevent personal injury, wear protective gloves and observe good laboratory practice when handling solvents, changing tube lines, or both. Consult the pertinent material safety data sheets (MSDSs) for the solvents used for HPLC analysis.



ATTENTION Pour éviter les blessures, portez des gants de protection et observez les bonnes pratiques de laboratoire lorsque vous manipulez des solvants, lorsque vous changez de tube, ou les deux. Consultez les fiches de données de sécurité (FDS) des solvants utilisés pour l'analyse HPLC.

Replace the rotor seal every 15,000 injections per channel. If the pressure of the LC pumps is too high, check the valve rotor seals for clogs or damage.

❖ To remove and check the rotor seals

1. Use a 9/64 Allen wrench to loosen the two screws on the face of the valve. Loosen the screws evenly.

Figure 21. Valve Face Screws



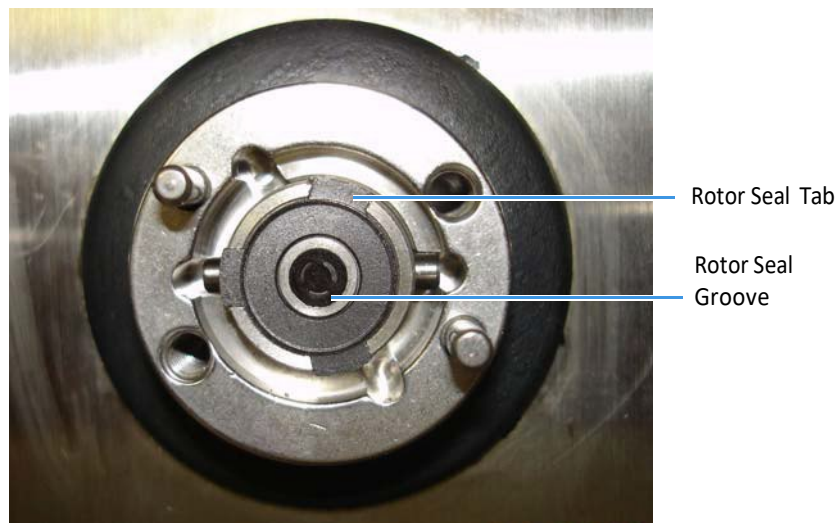
Loosen
these
screws

2. Remove the screws and set them aside.
3. Grasp the valve face and pull it toward you to remove it.
4. Lift and remove the rotor seal by lifting one of the tabs.

3 Maintaining the VIM

Cleaning or Replacing the Rotor Seals (every 15,000 Injections)

Figure 22. Rotor Seal



5. If the system has performed less than 1500 injections since the rotor seal was installed, visually inspect the rotor seal. Do one of the following:
 - If a clog is suspected, sonicate the rotor seal in cleaning solvent. See [“Preparing the Cleaning Solvent”](#) on [page 35](#). Do not scrub the rotor to avoid damaging it.
 - If damage is suspected, install a new rotor seal.
6. If the system has performed more than 1500 injections since the rotor seal was installed, replace the rotor seal.

❖ **To replace the rotor seal or install a new one**

1. Determine the appropriate rotor seal to install.

The following table lists the appropriate rotor seal type for each valve type. Part numbers vary by system type. See [“Spare Parts”](#) on [page 36](#) for part numbers.

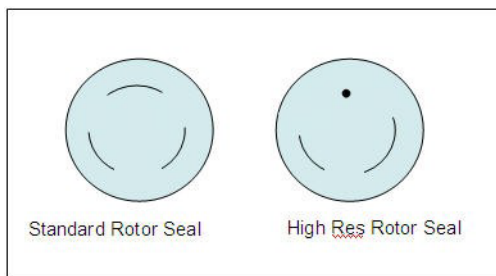
Table 10. Rotor Seal Types

Valve	Rotor Seal Type
VIM Valve A	Standard rotor seal
VIM Valve B on systems that are plumbed for Quick Elute Mode	Standard
VIM Valve B on systems that are plumbed for Focus Mode	Hi-Res rotor seal

3 Maintaining the VIM

Cleaning or Replacing the Rotor Seals (every 15,000 Injections)

Figure 23. Quick Elute Mode and Focus Mode rotor seal differences



2. Line up the new rotor seal tabs to the slots on the valve and with the rotor seal grooves facing toward you. The slots are aligned so that the seal can only be installed at the proper orientation.
3. Press the rotor seal into place.
4. Reinstall the valve face so that ports 6 and 1 appear at the top.
5. Partially tighten one screw, then the other. Alternately tighten the screws until both are fully tightened.

Preparing the Cleaning Solvent

Use a 40:40:20 (v/v/v) solution of acetonitrile/isopropanol/acetone to clean the rotor seal.

❖ To prepare the cleaning solution

1. To a 2-liter bottle, add the following:
 - 800 ml of acetonitrile
 - 800 ml of isopropanol
 - 400 ml of acetone
2. Mix thoroughly. The solution is stable for 30 days at room temperature.

Spare Parts

Thermo Fisher Scientific recommends keeping the following parts available for use in your laboratory. See the Description for the appropriate type for your system.

Table 11. Spare parts

Component	Description	Part number
Rotor seals for Aria system VIM valves	(Standard) ROTORSEAL STANDARD DESIGN FOR STANDARD PRESSURE VALCO CHEMINERT VALVE, VALCON-H	CH-952356
See “Cleaning or Replacing the Rotor Seals (every 15,000 Injections)” on page 33 for a description of High res and standard rotor seals	(High Res) ROTOR SEAL HI-RES DESIGN FOR STANDARD PRESSURE VALCO CHEMINERT VALVE, VALCON-H	CH-952357
Rotor seals for Transcend system VIM valves	(Standard) ROTORSEAL STANDARD DESIGN FOR HIGH PRESSURE VALCO CHEMINERT VALVE, TECAPEK	CH-953197
	(High Res) ROTOR SEAL HI-RES DESIGN FOR HIGH PRESSURE VALCO CHEMINERT VALVE, TECAPEK	CH-953198
Rotor seals for 9-port selector valves on VIMs that have a serial number of F5252AX493 or higher or for valves or stators that have been replaced	ROTORSEAL FOR 9-PORT SELECTOR VALVE ON VIM, H-STYLE, VALCON-H	CH-953396

Troubleshooting the VIM

This chapter provides information on how to troubleshoot the VIM.



CAUTION Follow all safety guidelines listed in [“Safety Information”](#) on [page 10](#)

ATTENTION Respectez toutes les consignes de sécurité énumérées dans la section [“Informations sur la sécurité”](#) à la [page 10](#).



CAUTION The instrument contains voltage lines. Switch off the power and disconnect the power cable prior to servicing the instrument. There is no need to open the VIM enclosure, as all user serviceable components are outside of the instrument.

ATTENTION L'instrument contient des lignes de tension. Coupez le courant et débranchez le câble d'alimentation avant d'effectuer l'entretien de l'instrument. Il n'est pas nécessaire d'ouvrir le boîtier du VIM, car tous les composants réparables par l'utilisateur se trouvent à l'extérieur du boîtier de l'instrument.

Checking for Clogged or Damaged Rotor Seals

If the pressure of the LC pumps is too high, check the valve rotor seals for clogs or damage. See [“Cleaning or Replacing the Rotor Seals \(every 15,000 Injections\)”](#) on [page 33](#).

Verifying Valve Positions

If the pump pressure trace or your chromatography results are not what you expected, verify that the valves rotate properly.

❖ **To verify the valves rotate properly**

1. Access the valve controls for the appropriate system by doing one of the following:
 - If you use Aria OS, open the System State tab, click on the pump status for the appropriate system, and then click on the V. The valve options appear.
 - If you use Aria MX, open the Direct Control window, and click on the appropriate channel. The valve options appear.
2. Click on the Valve A radial button in the software while observing Valve A on the VIM. Verify that the illuminated light above the valve on the VIM turns off and the light that was off turns on, and you hear a clicking noise. You can also remove the stator and observe the seal turn. See [“Cleaning or Replacing the Rotor Seals \(every 15,000 Injections\)”](#) on [page 33](#) for instructions.
3. Repeat [step 2](#) for the remaining valves in the system.
4. Contact Technical support if the valves do not rotate properly.

Compliance Information

Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable North American and European regulations. Your system meets the applicable requirements described in this section.

Unauthorized changes that you make to your system will void regulatory compliance and may defeat the built-in protections for your instrument. Some examples of unauthorized changes include using replacement parts or adding components, options, or peripherals that Thermo Fisher Scientific has not qualified and authorized. Unauthorized changes can also result in bodily injury and/or damage to your system and laboratory. Ensure continued compliance with regulatory standards:

- Follow all installation instructions provided in the documentation that comes with your system.
- Order replacement parts (as specified in the instrument manual) and additional components, options, and peripherals directly from Thermo Fisher Scientific or an authorized representative.

Declarations of Conformity

CE Declaration of Conformity

The device has satisfied the requirements for the CE mark and is compliant with the applicable requirements.

cTUVus Compliance



The cTUVus label on the device indicates that the device has satisfied the requirements for the cTUVus mark. Compliance with the applicable standards has been evaluated by TÜV Rheinland of North America Inc.

RoHS Compliance

This product complies with the RoHS (Restrictions of Hazardous Substances) directives:

- *European RoHS Directive*
Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment
The CE mark on the device indicates that the product is compliant with the directive.
- *China RoHS regulations*
Measures for Administration of the Pollution Control of Electronic Information Products

One of the following logos may be present on the device if applicable:

Logo	Description
	The green logo marks items that do not contain the hazardous substances identified by the regulations.
	The orange logo including a one-digit or two-digit number mark items that contain hazardous substances identified by the regulations. The number indicates the environment-friendly use period (EFUP) of the item. During this period, the item (when used as intended) will not cause serious damage to human health or environment. For more information, go to http://www.thermofisher.com/us/en/home/technical-resources/rohs-certificates.html

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive. It is marked with the following symbol:

Figure 21: WEEE symbol



Thermo Fisher Scientific has contracted with one or more recycling or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. For further information, contact Thermo Fisher Scientific.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the U.S. FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his expense.