DIONEX

UltiMate 3000 Series

Flow Managers and Thermostatted Column Compartments

Operating Instructions

Revision: 1.0

Date: May 2006

DIONEX

CE

Declaration of Conformity

Product: Flow Manager and Thermostatted Column Compartment
Types: **FLM-3100**, **FLM-3200**, **FLM-3300**
FLM-3100B, **FLM-3200B**, **FLM-3300B**

Dionex GmbH herewith declares conformity of the above products with the respective requirements of the following regulations:

- Low-Voltage Equipment Directive 73/23/EEC
  changed by 93/68/EEC
- EMC Directive 89/336/EEC
  changed by 91/263/EEC; 92/31/EEC; 93/68/EEC

The electrical safety of the products was evaluated based on the following standard:

- EN 61010-1: 2002
  Safety requirements for electrical equipment for measurement, control and laboratory use
  Part 1: General Requirements

The Electromagnetic Compatibility (EMC) of the products was evaluated based on the following standards:

- EN 61000-6-3-: 2001
  Electromagnetic Compatibility (EMC) - Generic emissions standard
  Part 1: Residential, commercial and light industry
- EN 61000-6-1: 2001
  Electromagnetic Compatibility (EMC) - Generic immunity standard
  Part 1: Residential, commercial and light industry
- EN 61000-3-2: 2001
  Electromagnetic Compatibility (EMC)
  Part 3 / Section 2: Limits for harmonic current emissions
- EN 61000-3-2: 2002
  Electromagnetic Compatibility (EMC)
  Limitation for voltage fluctuations and flicker

This declaration is issued for the manufacturer

Dionex GmbH
Dornierstrasse 4
D-82110 Germering

by the President, Dr. Peter Jochum. August 19, 2005

Certificate

TÜV

Certificate no. CU 72052439 01

License Holder:
Dionex Softron GmbH
Dornierstr. 4

82110 Germering
Germany

Manufacturing Plant:
Dionex Softron GmbH
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Germany

Test report no.: USA-RC 30582114 001 **Client Reference:** Burkhard Seyferth

Tested to: UL 61010-1:2004
CAN/CSA-C22.2 61010-1:2004

Certified Product: Flow Manager **License Fee - Units**

Model Designation: FLM-3100, FLM-3200, FLM-3300 7

Rated Voltage: AC 100/120/220/240V, 50-60Hz
Rated Power: 162VA
Protection Class: I

7

Appendix: 1, 1-2

Licensed Test mark:

TUV Rheinland of North America, Inc. C US

Signatures

Stephan Schmitt
President

Dipl.-Ing. M. Raap
QA Certification Officer

Date of Issue (day/mo/yr)
08/11/2005

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Table of Contents

1 Introduction

1.1 How to Use This Manual

The layout of this manual is designed to provide quick reference to the sections of interest to the user. However, in order to obtain a full understanding the flow manager and thermostatted column compartment, Dionex recommends that you review the manual thoroughly before beginning operation of the module.

Almost all descriptions in the manual apply to all flow managers of the UltiMate 3000 system and cover both the standard (stainless steel) and biocompatible models. Therefore, the terms "the flow manager" and/or "the FLM" are used throughout the manual. If some detail applies to only one model or version, the model (or version) is identified by name.

Note: The device configuration may vary (e.g., one or two column switching valves); therefore, not all descriptions necessarily apply to your particular instrument.

Note: The descriptions in this manual refer to firmware version 2.02 and Chromeleon version 6.70 Service Pack 3.

At various points throughout the manual, messages of particular importance are indicated by certain symbols:

Tip: Indicates general information intended to optimize the performance of the instrument.

Important: Indicates that failure to take note of the accompanying information may result in damage to the instrument.

Important: Indique que ne pas tenir compte de l'information jointe peut endommager l'instrument.

Warning: Indicates that failure to take note of the accompanying information may result in personal injury.

Avertissement: Indique que ne pas tenir compte de l'information jointe peut entraîner des blessures corporelles.

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1.2 General Safety Precautions

When working with analytical instrumentation, you should know the potential hazards of using chemical solvents.

Tip: Before initial operation of the flow manager, make sure that you are familiar with the contents of this manual.

Tip: Observe any warning labels on the device and refer to the related sections in these operating instructions.

Tip: For the general safety precautions in French, refer to Consignes Générales de Sécurité (→ page 4).

Please observe the following general safety precautions when operating the instrument or carrying out any maintenance work:

- Install the HPLC system in a well-ventilated laboratory. If the mobile phase includes volatile or flammable solvents, do not allow them to enter the workspace.
- For minimum interference effects, all components of the analytical system should be connected to the same mains output (same phase).
- The flow manager is primed with a mixture of isopropanol and water (20:80). During initial operation of the flow manager, make sure that the used solvents used are miscible. Otherwise, follow the appropriate intermediate steps.
- To prevent damage to the flow manager when lifting or moving, always lift the unit by the bottom sides or sides. Lifting the flow manager by the bottom front or by the front panel door may damage the door.
- The front panel tilts downward. Do not place any heavy objects on the open front panel door. This may damage the door.
- Do not touch any metal parts inside the column chamber while the temperature set point is > 50 °C (122 °F). Wait for the chamber to cool down, for example, before changing a column or before performing any maintenance procedures.
- When operating the HPLC system, always set a lower pressure limit for the system pump. This prevents damage resulting from leakage or from running the pump dry.
- Use only standard HPLC solvents (HPLC-grade: 0.2 µm filtered) and buffers that are compatible with components in the flow path of the flow manager. Note the special properties of the solvents such as viscosity, boiling point, UV absorption (UV/VIS detector), and refractive index (refractive index detector).
  Buffer concentration: typically up to 1 mol/L.

- When connecting the capillaries, make sure that the connectors are free from contaminants. Even minute particles may cause damage to the flow splitter, flow control valve, and column.
- After operation, rinse out buffers and solutions that form peroxides.
- Before switching from buffer to organic solution, rinse the analytical system thoroughly with deionized or HPLG-grade water.
- When switching to another solvent, ensure that the new solvent is miscible with the one contained in the pump. Otherwise, the analytical system can be damaged; for example, by flocculation.
- If the mobile phase includes volatile or flammable solvents, avoid open flames and sparks.
- If a leak occurs, turn off the flow manager immediately, stop the pump flow, and remedy the situation.
- When the panels are removed, dangerous electrical connections will be exposed. Disconnect the flow manager from all power sources before removing the panels. Open the enclosure only when instructed to do so in these instructions.
- Always replace blown fuses with the original spare fuses from Dionex (→ Replacing the Fuses, page 66).
- Replace faulty power cords and communication cables.
- Many organic solvents and buffers are toxic. Know the toxicological properties of all mobile phases that you are using.
- The toxicological properties of many samples may not be well known. If you have any doubt about a sample, treat it as if it contains a potentially harmful substance.
- Wear goggles when handling mobile phases or operating the instrument. An eye wash facility and a sink should be close to the unit. If any mobile phase splashes on the eyes or skin, wash the affected area and seek medical attention.
- Dispose of all waste mobile phase in an environmentally safe manner that is consistent with all local regulations. Do not allow flammable and/or toxic solvents to accumulate. Follow a regulated, approved waste disposal program. Never dispose of flammable and/or toxic solvents through the municipal sewage system
- In an UltiMate 3000 system, some tubing is made of PEEK. While this polymer has superb chemical resistance to most organic solvents, it tends to swell when it is in contact with trichlormethane ($CHCl_3$), dimethyl sulfoxide (DMSO), or tetrahydrofuran (THF). In addition, it is attacked by concentrated acids such as sulfuric acid and nitric acid (swelling or attack by acid is not a problem with brief flushing procedures).
- Do not use PEEK tubing that is stressed, bent, or kinked.
- Wear goggles when handling fused silica tubing (during, installation, cutting, etc.).
- Before interrupting operation for several days or more, observe the precautions in Shutting Down the Flow Manager (→ page 71).
- Use original Dionex spare parts only. Substituting non-Dionex parts or using non-Dionex accessories may impair the performance of the instrument.
- Do not use the module in ways other than those described in this manual.

1.3 Consignes Générales de Sécurité

Veuillez noter: Avant de commencer à utiliser l'instrument, assurez-vous que vous vous êtes familiarisés avec le contenu de ce manuel.

Veuillez noter: Observez les étiquettes d'avertissement sur l'appareil et référez-vous aux sections correspondantes dans ce mode d'emploi.

Veuillez observer les consignes générales de sécurité suivantes lorsque vous utilisez l'instrument ou que vous procédez à des opérations de maintenance:

- Installez le système HPLC dans un laboratoire bien ventilé. Si la phase mobile contient des solvants volatils ou inflammables, empêchez qu'ils ne pénètrent dans l'espace de travail.
- Afin d'éviter au maximum les interférences, tous les éléments du système analytique doivent être raccordés à la même ligne secteur (même phase).
- L'instrument est stocké sous isopropanol et eau. Au cours démarrage de l'instrument, assurez-vous que les solvants utilisés soient miscibles. Sinon, suivez les étapes intermédiaires appropriées.
- Lorsque vous soulevez ou l'instrument, tenez-le toujours par le dessous ou par les côtés de l'unité. Soulever l'instrument par la partie avant inférieure ou par le panneau avant peut endommager la porte.
- Ne placez aucun objet lourd sur la porte ouverte du panneau avant. Ceci pourrait endommager la porte.
- Ne touchez à aucune partie en métal à l'intérieur du compartiment de colonne tant que le point de réglage de température est > 50 °C (122 °F). Attendez que le four refroidisse, par exemple, avant de changer une colonne ou avant de procéder à tous travaux de maintenance.
- Réglez toujours une limite de pression minimum pour le système HPLC. Ceci prévient les dommages résultant de fuites ou du fonctionnement à sec de la pompe.
- Utilisez uniquement des solvants HPLC (qualité HPLC, filtré à: 0.2 µm) et des sels compatibles avec les composants des circuits hydrauliques de l'instrument. Vérifiez les propriétés spécifiques des solvants tels que la viscosité, le point d'ébullition, l'absorption UV (détecteur UV/VIS),
  Concentration en sels: généralement jusqu'à 1 mol/L.
- Lorsque vous connectez les capillaires, assurez-vous que les raccords sont exempts de tout contaminant. Même d'infimes particules peuvent causer des dommages au système (ex. diviseur de débit, vanne de régulation de débit et colonne).
- Après utilisation, purgez le système des tampons et des susceptibles de former des peroxydes.
- Lorsque vous passez d'une solution saline à un solvant organique, effectuez un rinçage intermédiaire du système HPLC à l'eau dé-ionisée ou qualité HPLC.
- Lorsque vous passez à un autre solvant, assurez-vous que le nouveau solvant soit miscible avec celui qui se trouve dans le système HPLC. Dans le cas contraire, le système HPLC peut être endommagé; par exemple, par des floculations!

- Si la phase mobile contient des solvants volatils ou inflammables, évitez les flammes nues et les sources d'étincelles à proximité.
- Si une fuite se produit, arrêtez immédiatement l'instrument, stoppez le débit de la pompe et remédiez au problème.
- Quand les capots sont démontés, des connexions électriques sous haute tension deviennent accessibles. Débranchez l'instrument de toute source d'alimentation électrique avant de retirer les capots. Les capots de protection devraient être démontés uniquement par le personnel de service habilité.
- Remplacez toujours les fusibles grillés par des fusibles de rechange d'origine Dionex (→ Replacing the Fuses, page 66).
- Remplacez les cordons d'alimentation électrique et les câbles de communication défectueux.
- De nombreux solvants organiques et solutions salines sont toxiques. Informez-vous des propriétés toxicologiques de toutes les phases mobiles que vous utilisez.
- Les propriétés toxicologiques de nombreux échantillons peuvent être mal connues. Au moindre doute concernant un échantillon, traitez-le comme s'il contenait une substance potentiellement dangereuse.
- Portez des lunettes de protection lorsque vous manipulez des phases mobiles ou que vous utilisez l'instrument. Une installation permettant de se laver les yeux ainsi qu'un lavabo doivent se trouver à proximité du système. Si une phase mobile, quelle qu'elle soit, gicle dans les yeux ou sur la peau, lavez la zone affectée et consultez un médecin.
- Débarrassez-vous de tous les déchets de phase mobile de manière écologique, conformément à la règlementation en vigueur au niveau local. Empêchez impérativement l'accumulation de solvants inflammables et/ou toxiques. Suivez un programme d'élimination des déchets règlementé et approuvé. Ne jetez jamais de solvants inflammables et/ou toxiques dans le système municipal d'évacuation des eaux usées.
- Dans un système UltiMate 3000, certains tubes sont en PEEK. Bien que ce polymère présente une excellente résistance chimique à la plupart des solvants organiques, il a tendance à gonfler lorsqu'il est en contact prolongé avec du chloroforme (CHCl3), du diméthyle sulfoxyde (DMSO) ou du tétrahydrofurane (THF). De plus, il est attaqué par des acides concentrés tels que l'acide sulfurique et l'acide nitrique (ces acides peuvent cependant être utilisés dans le cadre de procédures de nettoyage, à condition que l'exposition soit brève).
- N'utilisez pas de tubes PEEK écrasés, pliés ou abîmés.
- Avant d'interrompre le fonctionnement pendant plusieurs jours ou plus, observez les précautions figurant en Shutting Down the Flow Manager(→ page 71).
- Utilisez des pièces de rechange d'origine Dionex. Effectuer des remplacements par des pièces ne provenant pas de Dionex ou utiliser des accessoires ne provenant pas de Dionex peut affecter les performances de l'instrument.
- N'utilisez pas l'instrument de manière autre que celles décrites dans ce manuel.

1.4 Unpacking

All electrical and mechanical components of the flow manager are carefully tested before the instrument is shipped from the factory. After unpacking, please inspect the module for any signs of mechanical damage that may have occurred during transit.

Tip: Immediately report any shipping damage to both the incoming carrier and Dionex. Shipping insurance will compensate for the damage only if reported immediately.

Tip: Keep the original shipping container and packing material. They provide excellent protection for the flow manager in case of future transit. Shipping the instrument in any other packaging automatically voids the product warranty.

Unpack the flow manager as follows:

1. Place the shipping container on the floor. Remove the accessories kit and power cord.
2. Grasp the flow manager by the sides. Slowly and carefully, pull the instrument out of the shipping container and place it on a stable surface.

   Important: To prevent the flow manager from falling, only lift by the bottom sides. Do not lift the unit by the packaging material or the front panel door.

   Important: Afin d'empêcher l'instrument de tomber, saisissez-la par les côtés. Ne soulevez l'instrument à l'aide du matériau d'emballage ou par la porte du panneau avant.

3. Remove the foam inserts.
4. Check off the contents of the accessories kit against the accessories list (→ Standard Accessories (included in the shipment), page 75).

Important: When lifting or moving the flow manager, always hold it by the bottom sides or by the sides of the unit. Lifting the flow manager by the bottom front or by the front panel may damage the door.

Important: Lorsque vous soulevez ou l'instrument, tenez-le toujours par le dessous ou par les côtés de l'unité. Soulever l'instrument par la partie avant inférieure ou par le panneau avant peut endommager la porte.

1.5 Intended Use

The flow manager is designed to perform equally well as a dependable system for routine analyses or as a sophisticated research instrument for use in capillary, nano, and micro HPLC (high performance liquid chromatography) applications, especially as part of the UltiMate 3000 system. However, it can also be used with other HPLC systems if adequate control inputs and outputs are available. A PC with USB port is required.

The flow manager is controlled by the **Chromeleon** Chromatography Management System. Being part of the UltiMate 3000 system, the detector can also be operated with other data systems, such as Analyst® (Applied Biosystems/MDS Sciex), HyStar™ (Bruker Daltonics), or Xcalibur® (Thermo Electron Corporation). To do so, installation of the DCMS^{Link} (Dionex Chromatography Mass Spectrometry Link) software is required in addition to the installion of the data system.

Please note that the flow manager may only be operated with the accessories originally supplied with the instrument (→ page 75) and within its technical specifications (→ page 73).

Use only standard solvents and water of at least HPLC grade (0.2 µm filtered; better: LC-MS grade) and buffers that are compatible with components in the flow path of the flow manager. Note the special properties of the solvents such as viscosity, boiling point, UV absorption (UV/VIS detector), and refractive index (refractive index detector).

Buffer concentration: typically up to 1 mol/L.

If there is a question regarding appropriate usage, contact Dionex before proceeding.

Dionex is not liable for any damage, material or otherwise, resulting from inappropriate or improper use of the instrument.

1.6 Federal Communications Commission (FCC) Note

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 instruction manual, 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.

2 Overview

2.1 Product Overview

The flow manager is a reliable module of the UltiMate 3000 system and performs equally well as a dependable system for routine analyses or as a sophisticated research instrument for capillary, nano, and micro HPLC applications. The design has been optimized for minimum dead volume and maximum efficiency.

- The flow splitter (→ Fig. 1, page 11) delivers the low flow rates required for capillary, micro, and nano HPLC applications. The flow manager is fitted with a flow splitter identification system that allows you to store splitter-specific information on a chip card and read it out whenever you want.

- An electronic splitter identification module (→ Splitter Identification System (Splitter ID), page 58) automatically adapts the system settings to the used splitter cartridge. The module also allows you to store splitter-specific information (spit ratio, flow control settings) on a chip card and read it out whenever you want. In addition, the parameters required for flow splitting are set automatically.

- UltiFlow™ technology with active control of the splitter flow keeps the set flow rates constant, independent of outside influences. Thus, the flow rate is not influenced by the solvent composition, solvent gradients, different viscosities, or analyses at different temperatures. In the same way, effects from column ageing and partial clogging will be compensated.

- Thermoelectric elements heat or actively cool the column chamber and all internal components to the desired temperature. Using a heat exchanger, they allow fast temperature changes and ensure independence from the ambient temperature, even if the temperature set point is below the ambient temperature.

- The flow manager allows compartment cooling by max. 15K from the ambient temperature. The lower temperature limit is +5 °C (+41 °F).

- The columns can be warmed up to max. +85 °C (+185 °F). An increase in temperature from 20 °C to 50 °C (68 °F to 122 °F) is realized in less than 25 minutes. This corresponds to an average performance of 2-4 K per minute.

- Temperature control allows keeping the column temperature constant. If the ambient temperature changes during the analysis, the increased heating or cooling ensures that the column temperature remains constant. The maximum deviation is ± 0.1 °C.

- Several columns of different length (maximum length: 30 cm) can be installed in the column chamber. An electronic column identification module allows GLP-compliant documentation of the column type and all important column parameters (→ Column Identification System (Column ID), page 56).

- Depending on the configuration, the flow manager is equipped with one or two column switching valves (→ Supported Configurations, page 12), e.g., for applications that require different columns at frequent intervals at similar temperatures.

- The flow manager is fully controlled by the Chromeleon Chromatography Management System, providing a high degree of system integration.

- All surfaces in the column chamber are made of materials that provide maximum resistance to the most commonly used HPLC solvents.

- The flow managers of the UltiMate 3000 system are available as biocompatible versions, also. For information about the characteristics of the biocompatible devices, refer to section 2.3.2 (→ page 13).

2.2 Theory of Operation (UltiFlow)

The fundamental requirement on a flow manager for liquid chromatography is the ability to create constant low flow rates for capillary, nano, and micro HPLC applications, as well as to equalize the temperature. The flow managers of the UltiMate 3000 system are fitted with a flow splitter with integrated flow control that ensures constant flow rates, ranging from few micro liters to nano liter flows. The flow rate is influenced neither by varying column backpressures nor by the temperature or solvent viscosity.

The flow splitter is equipped with two fluidic resistors that split the flow from the pump in the reciprocal ratio of the resistance. To ensure identical pressure drop at both resistors, the outputs of the flow splitter are connected via a cross arm with integrated flow meter. A controller zeroes the unbalance flow so that only the flow delivered by the flow splitter passes the column. To ensure this, the waste path includes an adjustable valve for counterbalancing the column pressure (→ Fig. 1).

This innovative method creates constant low flow rates based on the split ratio and the pump flow. Different lowest flow rates are created by different pump flow rates, but they are always split according to the split ratio. This is independent of the solvent composition and the column pressure.

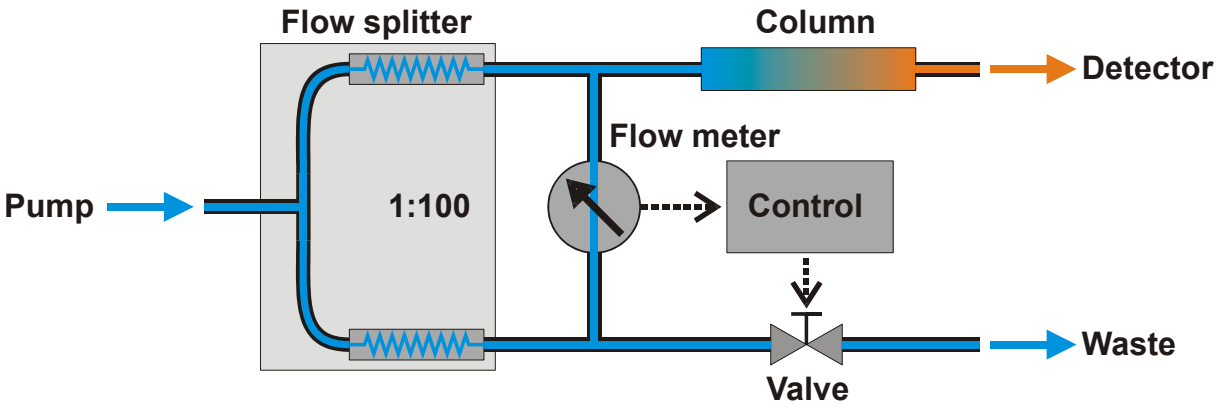

Fig. 1: Operation principle of flow splitting with control

For temperature equalization, temperature stability is more important than the absolute precision of the setting. The flow manager contains advanced electronic circuits that can maintain the selected temperature with a precision of ±0.1 °C.

The thermo-optimized design reduces the time required to equilibrate the temperature between the column and the solvent. The Peltier elements of the flow manager heat up and cool down the columns. The heat exchanger inside the column chamber also helps to bring the air and all components in the chamber to the desired temperature, including the flow splitter and column switching valve(s).

These procedures ensure that

- The temperature of the stationary phase remains constant over the total column length.
- The column and the solvent have the same temperature during the analysis.

In this way, analytical separation is performed at the nominal temperature, thus, minimizing fronting and tailing as well as retention time variations.

2.3 Supported Configurations

2.3.1 General

For an overview of the currently available models, refer to the list below. If you have any questions, do not hesitate to contact your Dionex sales representative or distributor.

Application	Description	Part No.
Nano HPLC	FLM-3100 with two 10-port micro switching valves	5720.0010
	FLM-3100B, same as FLM-3100, but biocompatible version	5721.0010
	FLM-3200 with 10-port micro and 6-port nano switching valves (1 each)	5720.0020
	FLM-3200B, same as FLM-3200, but biocompatible version	5721.0020
	FLM-3300 with one 10-port micro switching valve	5720.0030
	FLM-3300B, same as FLM-3300, but biocompatible version	5721.0030
	Tip: These flow managers are fitted with a splitter cartridge for a split ratio of 1:1000.	
Capillary and/or Monolithic HPLC	FLM-3100 with two 10-port micro switching valves	5720.0015
	FLM-3100B, same as FLM-3100, but biocompatible version	5721.0015
	FLM-3200 with 10-port micro and 6-port nano switching valves (1 each)	5720.0025
	FLM-3200B, same as FLM-3200, but biocompatible version	5721.0025
	FLM-3300 with one 10-port micro switching valve	5720.0035
	FLM-3300B, same as FLM-3300, but biocompatible version	5721.0035
	Tip: These flow managers are fitted with a splitter cartridge for a split ratio of 1:100.	
Micro HPLC	FLM-3100 with two 10-port micro switching valves	5720.0018
	FLM-3100B, same as FLM-3100, but biocompatible version	5721.0018
	FLM-3200 with 10-port micro and 6-port nano switching valves (1 each)	5720.0028
	FLM-3200B, same as FLM-3200, but biocompatible version	5721.0028
	FLM-3300 with one 10-port micro switching valve	5720.0038
	FLM-3300B, same as FLM-3300, but biocompatible version	5721.0038
	Tip: These flow managers are fitted with a splitter cartridge for a split ratio of 1:6.	

Tip: All flow managers are equipped with a flow splitter with flow control. When the flow manager is operated with Chromeleon, systems for column and/or splitter identification are supported (→ sections 5.6, page 56 and 5.7, page 58).

For information about how to replace a cartridge, refer to section 3.8.2 (→ page 37).

For information about the switching valve, refer to section 2.5 (→ page 17).

If you have any questions, do not hesitate to contact your Dionex sales representative or distributor.

2.3.2 Biocompatible Flow Managers

The FLM-3100B, FLM-3200B, and FLM-3300B flow managers extend UltiMate 3000 flow manager series by biocompatible device versions. Except for the flow splitter parts that are exposed to solvent and the injection valve(s) with the connected components, the biocompatible flow managers are identical to the standard devices (stainless steel). Therefore, almost all descriptions of the standard devices apply to the biocompatible versions, also. If some detail applies to only one version, the version will be identified. The differences are as follows:

Switching valve

The biocompatible flow managers are fitted with PAEK switching valves. As PAEK valves have deeper connection ports (→ Fig. 2), preassembled fitting connections (see below) must be used. This is essential for a zero dead volume connection.

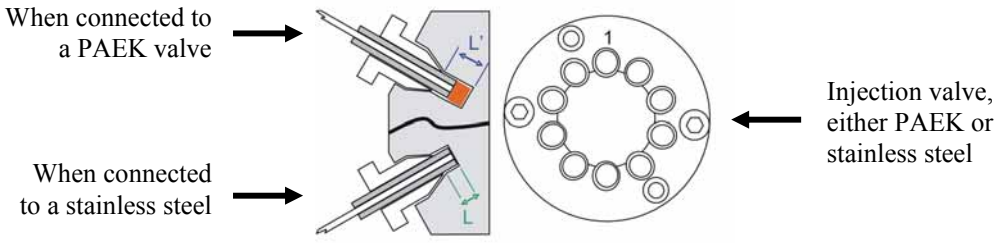

Fig. 2: Capillary connection on the injection valve

⚠ **Important:** Do not use a stainless steel nut and/or ferrule to connect the components to the PAEK valve. To avoid damage to the valve, use only the supplied capillaries and fittings, as well as original Dionex spare parts.

⚠ **Important:** N'utilisez jamais de vis et/ou ferrules métalliques pour les connexions sur une vanne biocompatible en PAEK. Afin d'éviter tout dommage à la vanne, utilisez seulement les capillaires et raccords fournis, ainsi que des pièces d'origine Dionex.

Follow the steps below to connect the components to the biocompatible injection valve. The description refers to the connection of a nano column, but applies to the other components, as well.

1. To establish a zero dead volume fitting connection between the column and the injection valve, a finger-tight nut, ferrule, and sleeve are required. Slide the finger-tight nut and the ferrule onto the sleeve as shown in Fig. 3.

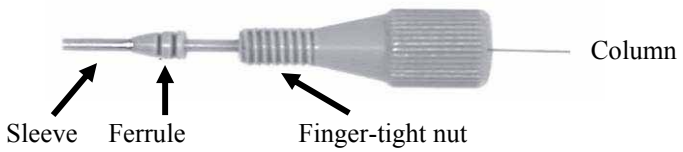

Fig. 3: Fitting connection

2. Insert this assembly in a port on the preassembly tool (part no. 6000.0065) and tighten the nut by two or three manual turns. (The preassembly tool is included in the application kits for the biocompatible UltiMate 3000 system.)

Fig. 4: Preassembly tool

⚠ **Important:** To avoid damage to the biocompatible injection valve, neither preassemble the fitting connection on the injection valve nor use any tool to tighten the finger-tight nut.

⚠ **Important:** Afin d'éviter tout dommage à la vanne d'injection biocompatible, ne l'utilisez jamais pour le pré-sertissage des raccords, et n'utilisez aucun outil pour visser les raccords à serrage manuel.

3. Push the assembly with the column all the way into the port. It is essential for a zero dead volume connection that the assembly seats firmly.

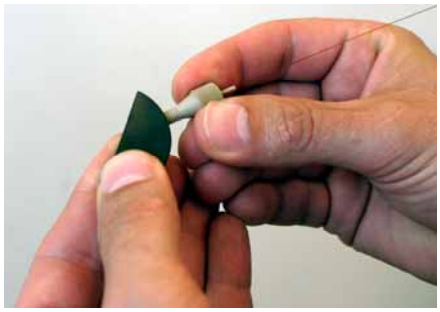

Fig. 5: Preassembling the fitting connection

4. Tighten the nut in the port until it is finger tight.

5. Carefully turn the nut an additional 1/4 turn (90°) past the point at which the ferrule starts to grab the sleeve.

Tip: Dionex cannot provide a torque specification because the force required to tighten the nut can vary due to the friction between nut and the thread, as well as the composition and wall thickness of the component to be connected.

6. Remove the preassembled fitting from the tool and inspect the fitting. When you gently pull the column, you should not be able to move the column in sleeve. If the sleeve moves laterally (→ Fig. 6), re-insert the fitting into the preassembly tool and tighten it an additional 1/8 turn past finger-tight.

Fig. 6: Inspecting the fitting

7. Remove and re-inspect the fitting. Repeat the step if necessary.

8. Connect the preassembled fitting to the appropriate port on the injection valve. Tighten the nut until it is finger-tight.

Tip: If you cannot use finger-tight fittings due to limited space, you may use the long hex style nuts, instead (→ Fig. 7; part no. 6721.0017; the nuts are included in the application kits for the biocompatible UltiMate 3000 system, also). Follow the above steps and then connect the hex nut to the appropriate port on the injection valve. Tighten the nut with a ¼" wrench.

Fig. 7: Long hex style nut

Flow Splitter

On the flow splitter, the parts that are exposed to solvent are made of titanium. For connecting components to the flow splitter it might be necessary to preassemble the fittings as described below.

2.4 General Flow Manager Design

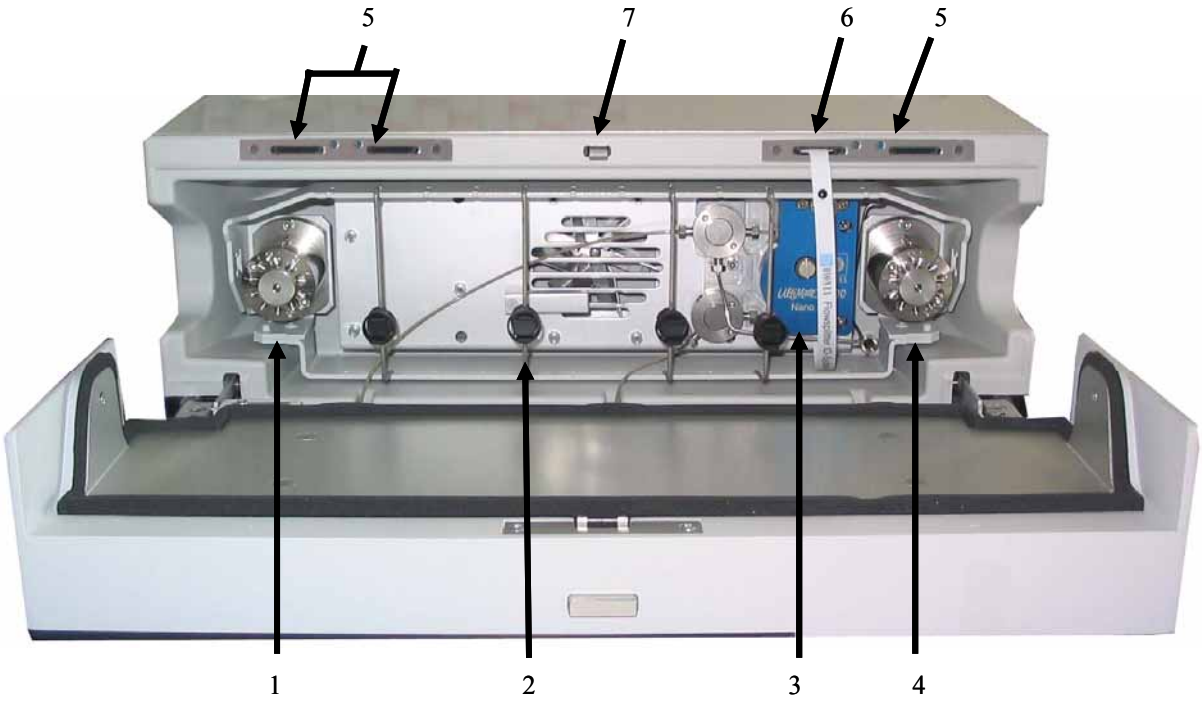

Fig. 8: Open FLM-3100 (here: with two 2-position/10-port switching valves)

No.	Description
1	Switching valve (2-position/10-port micro switching valve) (in Chromeleon: ValveLeft or MsvPosition, depending on the device type)
2	Column bracket with column clip (→ section 3.5, page 29)
3	Flow splitter (→ section 3.8.2, page 37)
4	Switching valve (if installed: 2-position/10-port micro valve or 2-position/6-port nano valve) (in Chromeleon: ValveRight)
5	Slots for the column ID chip cards (→ section 5.6, page 56)
6	Slot for the flow splitter chip card (→ section 5.7, page 58)
7	Locking mechanism for the front panel door (→ section 3.3, page 25)

⚠ **Important:** Use only the capillaries shipped with the flow manager and original spare capillaries from Dionex.

⚠ **Important:** Utilisez uniquement les capillaires fournis avec l'instrument et les capillaires de rechange d'origine Dionex.

⚠ **Important:** Reuse used fittings and ferrules only for the same capillary connection. This is to avoid increased dead volume.

⚠ **Important:** La réutilisation des raccords et ferrules n’est possible que pour la connexion capillaire d’origine, afin d’éviter l’apparition de volumes morts.

⚠ **Important:** Different fitting systems are used in an UltiMate 3000 system. Therefore, install the capillaries and fittings only at the positions for which they are intended.

⚠ **Important:** Différents types de raccords sont utilisés dans le système UltiMate 3000. Par conséquent, installez les capillaires et les raccords uniquement dans les positions pour lesquelles ils sont prévus.

⚠ **Important:** To connect the capillaries to the injection valve, install only the ferrules and fitting screws provided in the accessories kit.

⚠ **Important:** Pour brancher les capillaires à une vanne d'injection, installez uniquement les ferrules et les raccords livrés avec la vanne et respectez les instructions d'installation du fabricant.

2.5 Column Switching Valve

Depending on the instrument configuration, the flow manager is equipped with one or two switching valves (2-position/10-port micro and/or 2-position/6-port nano valves), e.g., for applications that require different columns at frequent intervals at similar temperatures.

The switching valve automatically selects the column to be used. The valve is installed in the column chamber and is brought to the temperature equilibrium as well. The valve positions are programmed and controlled in Chromeleon. (For details, refer to the Chromeleon *online Help*.)

For information about how to connect the capillaries to the valve, refer to Connecting the Capillaries to the Column Switching Valve (→ page 32).

For more information about the valve, refer to the technical appendix (→ page 79).

2.6 Front Panel Display and Controls

Fig. 9: Front panel

No.	Front Panel Element	Description
1	Display	Shows information about the flow manager, e.g.: - General information upon power-up (→ section 4.1, page 39) - Status screen (→ section 4.2, page 39) - Various functions and menus that can be accessed via soft keys (→ section 4.3, page 40) - Error messages (→ section 6, page 59)
2	Standby button	Switches the flow manager to Standby mode (the LED is lighted). To cancel Standby mode and resume operation, press the Standby button again (the LED is not lighted).
3	**LEDs**	
	Power	The LED is blue when the flow manager is on.
	Connected	The LED is green when the flow manager is controlled by Chromeleon.
	Status	The LED is green when the flow manager has reached the target temperature and no error has been detected. The LED is orange when the flow manager has not yet reached the target temperature or when the door is open. The LED is red when an error has been detected, e.g., a leak.

2.7 Leak Sensors

The flow manager contains two leak sensors to detect any humidity or gases that may accumulate in the column chamber. When a certain humidity of gas concentration is reached in the chamber (while the door is closed), the corresponding sensor is activated. Eliminate the cause for the leakage, wearing the appropriate protective clothing, and ventilate the inside before closing the door.

In addition, the flow manager contains a fluid leak sensor to detect liquid leaks from the flow control valve in the enclosure. The fluid leak sensor is installed in the rear of the enclosure (in a tray on the right). When liquid is detected in tray, e.g., due to clogging of the waste outlet (→ Fig. 15, page 27), the sensor is activated. Eliminate the cause for the leakage and dry the sensor as described in section 7.4 (→ page 67).

On the **Control > Leak control** menu (→ page 44), set the sensitivity for the sensors and determine whether an acoustic beep shall alert you in case of an alarm. (You can open the **Leak control** menu also via the **Leak** soft key (→ page 40).)

If one of the sensors detects a leak, the **Status** LED on the instrument's front panel is red and the related error message appears on the front panel display.

Tip: The **Status** LED remains red as long as the sensor is exposed to humidity, gas, or moisture. The **Clear** soft key on the navigation bar (→ page 42) allows you to remove the error message from the front panel display.

If a beep alerts you, you can turn off the beep for the current alarm from the **Control > Leak control** menu by setting **All leak alarms** to **silent**. If the humidity or gas sensor was activated, you can turn off the alarm also by opening the front panel door.

Beeping stops in any case when the cause for the leakage has been eliminated. A new beep sounds when one of the sensors is activated again.

Tip: If the flow manager is operated by Chromeleon, you can determine the leak sensor mode in Chromeleon, also. If a sensor is activated, the related error message appears on the front panel display and the error is logged in the Chromeleon audit trail.

Tip: Inspect the flow manager for leaks every day. Tighten or replace leaking capillary connections if necessary.

2.8 System Wellness and Reliability

The flow manager supports several system wellness and reliability features that can help you detect small problems before they turn into big ones:

- Leak detector (→ page 19)
- Door status monitoring
- Column ID features for a GLP-compliant overview of the column status (→ Column Identification System (Column ID), page 56)
- Flow splitter ID for the documentation of the splitter type and characteristics (→ Splitter Identification System (Splitter ID), page 58)

Tip: If the flow manager is operated by Chromeleon, related information is available in Chromeleon, also (→ Operating the Flow Manager with Chromeleon, page 55).

If an error is found, the Status LED on the front panel is red and an error message appears on the front panel display (→ Troubleshooting, page 59). If the flow manager is operated by Chromeleon, the error is logged in the Chromeleon Audit Trail, also.

3 Installation

3.1 Facility Requirements

After unpacking the flow manager, allow the unit to warm up for approximately 4 hours before connecting it to the power supply. This delay allows any condensation that might have occurred during shipping to evaporate. After 4 hours, check the flow manager; if the condensation is still there, allow the instrument to continue to warm up (without connecting it to the mains) until the condensation is completely gone.

Install the instrument in the laboratory on a stable surface that is free of vibration. Make sure that the surface is resistant to solvents. Avoid locations with extreme changes in temperature (such as direct sunlight or drafts) and high humidity. Allow sufficient clearance behind the flow manager for power connections and ventilation.

If the flow manager is part of an UltiMate 3000 system, Dionex recommends that you stack the individual modules, for example, as shown in Fig. 10. However, the arrangement of the system modules depends on the application. The nano/cap system manual provides more application examples and information about how to arrange and/or connect the modules for these applications.

Fig. 10: Example for an UltiMate 3000 system

3.2 Rear Panel Connectors

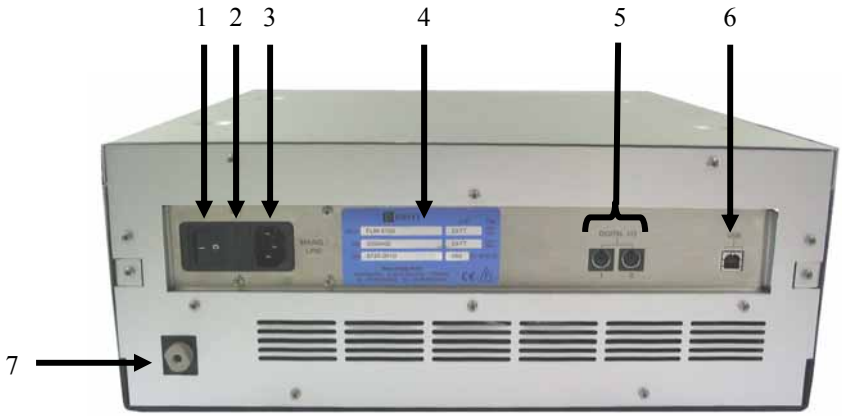

Fig. 11: Rear panel connectors

No.	Description
1	Power switch
2	Fuse holder (→ section 7.3, page 66)
3	Main power receptacle
4	Type label
5	Digital I/O for communication with external devices (→ section 3.2.2.2, page 23)
6	USB (Universal Serial Bus Interface) port for connection to the server PC (→ section 3.2.2.1, page 23)
7	Waste port for directing any liquid from the waste path of the flow splitter to an appropriate waste container (→ section 3.2.2.3, page 24)

3.2.1 Power Connection

Use the power cord provided in the accessories kit to connect the flow manager to the mains. The instrument is equipped with a standard power supply unit with an automatic voltage selector. Thus, no adjustment is required to adapt the line voltage to the local voltage requirements.

3.2.2 Interfaces for Device Control

The Chromeleon Chromatography Management System can use a USB connection to control the flow manager. Data is transferred digitally via the appropriate USB cable (1m USB cable, part no. 6035.9035; 0.5 m USB cable, part no. 6720.8910). The USB port is provided on the rear panel (→ Fig. 11).

⚠ **Important:** To ensure trouble-free operation, all USB cables (see above) should be ordered from Dionex.

⚠ **Important:** Afin de garantir un fonctionnement correct, tous les câbles USB (voir ci-dessus) doivent être commandés auprès de Dionex.

3.2.2.1 USB

Connect the flow manager to the server PC via the USB port (→ Fig. 11, no. 6). To do so, select one of the following alternatives:

- Connect the flow manager directly to the USB port on the server PC.
- Connect the flow manager to the server PC via another UltiMate 3000 instrument that is already connected to the server PC.

Tip: Apart from the solvent rack, all modules of the UltiMate 3000 system can be connected separately to the server PC. However, Dionex recommends interconnecting all modules, and then connecting the system to the Chromeleon server PC via only one connection. To do so, use the USB hub on the pump or autosampler. For more information about how to connect the system modules, refer to the nano/cap system manual.

3.2.2.2 Digital I/O

The 6-pin Mini-DIN (→ Fig. 11, no. 5) ports can be used in Chromeleon to exchange digital signals with external instruments.

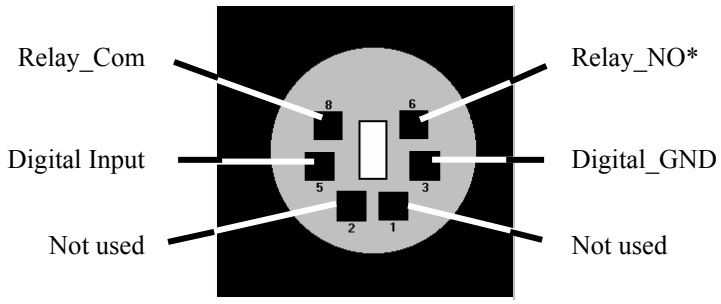

Fig. 12: Digital I/O (view from the rear)

* NO = normally open contact

If the relay is activated, the connection is between Com and NO.

	Description
Digital Input ↔ Digital_GND	0 to +5V
Relay_Com ↔ Relay_NO	Switching voltage: 100 V_{DC}; switching current: 0.25 A Carry current: 1.0 A; Switching capacity: 3 W Contact resistance: max. 150 mΩ

The accessories kit includes a 6-core Mini-DIN signal cable (part no. 6000.1004). For information about the pin assignment, refer to section 10 (→ page 79).

3.2.2.3 Waste Port

During operation, liquid exits the waste path of the flow splitter (→ Fig. 1, page 11) via this port at the rear panel (→ Fig. 11, no.7, page 22). Connect drain tubing to direct the liquid to an appropriate waste container. Dionex recommends connecting, for example, PTFE tubing with an inner diameter of 1 mm (minimum 0.5 mm). Make sure that the tubing is long enough to reach the bottom of the waste container.

⚠ **Important:** Make sure that the waste port is open at all times during operation of the flow manager. Verify that the tubing is not kinked or blocked.

⚠ **Important:** Assurez-vous que la tubulure d'évacuation (Waste) est libre en toutes circonstances. Vérifiez que les tubes ne sont ni pliés, ni bouchés.

⚠ **Important:** For optimum chromatographic results, you should not change the position of the tubing and/or the waste container during the analysis or direct the liquid to a capped waste container because this might impair flow control performance.

⚠ **Important:** Pour des résultats chromatographiques optimaux, vous ne devez ni modifier les positions de la tubulure d'évacuation et du flacon égout pendant l'analyse, ni diriger le liquide dans un récipient hermétiquement clos; ceci risque d'affecter les performances du contrôle du débit.

3.3 Opening the Front Panel Door

The front panel tilts downward to provide easy access to the components in the column chamber. Tilting down the front panel automatically moves the valves and the column carrier approximately 3.5 cm out of the enclosure, thus facilitating capillary connection.

To open the front panel door, press the release button on top of the enclosure. If the door lock is not released immediately, press the front panel against the enclosure.

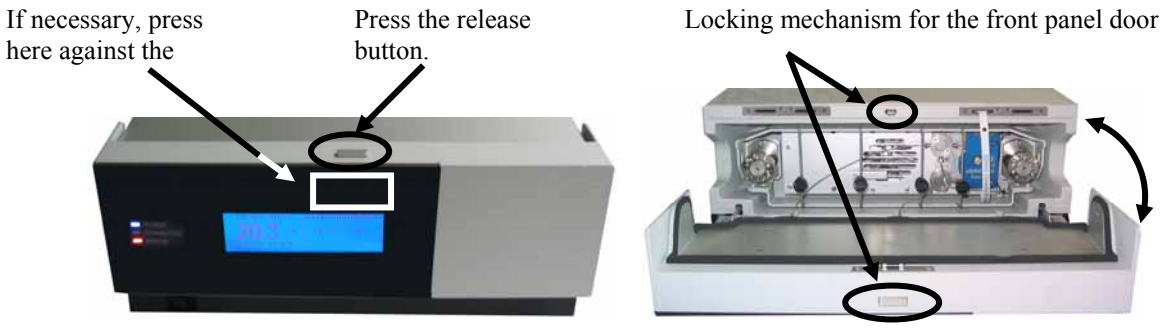

Fig. 13: Tilting the front panel downward

To close the column chamber, tilt the front panel upward until you hear the locking mechanism engage.

⚠ **Important:** When lifting or moving the flow manager, always lift the unit by the bottom sides or the sides. Lifting the flow manager by the bottom front or by the front panel may damage the door.

⚠ **Important:** Lorsque vous soulevez ou l'instrument, tenez-le toujours par le dessous ou par les côtés de l'unité. Soulever l'instrument par la partie avant inférieure ou par le panneau avant peut endommager la porte.

⚠ **Important:** Do not place any heavy objects on the open front panel door. This may damage the door.

⚠ **Important:** Ne placez aucun objet lourd sur la porte ouverte du panneau avant. Ceci pourrait endommager la porte.

3.4 Preparing the Flow Manager

⚠ **Important:** The flow manager is filled with a mixture of isopropanol and water (20:80) when being shipped from the factory. During initial operation, make sure that the solvents used are miscible. Otherwise, use an appropriate intermediate solvent.

⚠ **Important:** L'instrument est stocké sous isopropanol et eau. Au cours démarrage de l'instrument, assurez-vous que les solvants utilisés soient miscibles. Sinon, suivez les étapes intermédiaires appropriées.

⚠ **Important:** When you operate a biocompatible flow manager, observe the instructions for connecting the capillaries to the injection valve and/or flow splitter (→ Biocompatible Flow Managers, page 13).

⚠ **Important**: Afin de raccorder les capillaires à la vanne d'injection ou au diviseur de débit biocompatible, veuillez respecter les instructions d'installation (→ Biocompatible Flow Managers, page 13).

1. Observe the information about the facility requirements when connecting the flow manager to the HPLC system (→ page 21). For information about how to connect the system modules, refer to the nano/cap system manual.

2. Connect drain tubing to the two ports at the bottom right of the instrument (→ Fig. 14) to direct condensing water and/or liquid leaks to an appropriate waste container.

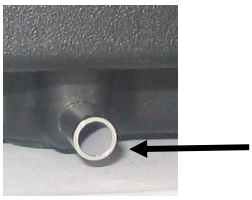

Fig. 14: Drain port

⚠ **Important:** The drain tube must remain below the drain port. If the drain tube is above the drain port, the liquid may flow back into the interior and cause damage to the instrument. Also, be careful not to use tubing that is bent.

⚠ **Important:** Afin d'éviter d'endommager l'instrument, assurez-vous qu'aucune pièce des tubes n'est placée plus haute que le port de raccordement.

3. Connect drain tubing to the waste port on the instrument's rear panel (→ Fig. 15) to direct any liquid from the waste path of the flow splitter to an appropriate waste container.

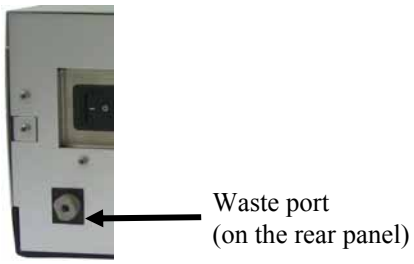

Fig. 15: Waste port

⚠ **Important:** Make sure that this port is open at all times during operation of the flow manager.

⚠ **Important:** Assurez-vous que la tubulure d'évacuation (Waste) est libre en toutes circonstances. Vérifiez que les tubes ne sont ni pliés, ni bouchés.

⚠ **Important:** For optimum chromatographic results, you should not change the position of the tubing and/or the waste container during the analysis or direct the liquid to a capped waste container because this might impair flow control performance.

⚠ **Important:** Pour des résultats chromatographiques optimaux, vous ne devez ni modifier les positions de la tubulure d'évacuation et du flacon egout pendant l'analyse, ni diriger le liquide dans un récipient hermétiquement clos; ceci risque d'affecter les performances du contrôle du débit.

4. Install the column(s) as described in Installing a Separation Column (→ page 29).

5. Establish the fluid connections between the column(s), switching valve(s), and flow splitter according to your application. For information about the connections on the column switching valves, refer to section 3.6 (→ page 32). For information about the connections on the flow splitter, refer to section 3.8 (→ page 34).

6. Connect the flow manager to the other components of your UltiMate 3000 system, as required by your specific application.

Tip: For information about how to connect the UltiMate system modules and for application examples, refer to the nano/cap system manual.

7. Use the power cord shipped with the flow manager to connect the instrument to the mains. Turn on the instrument by pressing the power switch on the rear panel.

   Tip: The noise that sounds when you turn on the flow manager is normal and does not impair the flow manager's performance.

   When the flow manager is powered up, the following information appears on the front panel display: Device type, serial number, and firmware version. After some seconds, the initial screen changes to the status screen (→ page 39).

8. Connect the flow manager to the USB port on the Chromeleon Server PC and install the flow manager in Chromeleon as described in section 5 (→ page 47).

3.5 Installing a Separation Column

Warning: Before carrying out any work in the column chamber, wait for the column chamber to cool down. Do not touch any metal parts inside the column chamber while the temperature set point is > 50 °C (122 °F).

Avertissement: Avant de procéder à toute modification dans le compartiment de colonne, attendez que celui-ci refroidisse. Ne touchez aucune partie en métal à l'intérieur du four, tant que l'affichage de la température est > 50 °C (122 °F).

Before the flow manager is shipped, four brackets and six column clips are pre-installed in the column chamber in the factory (→ Fig. 16).

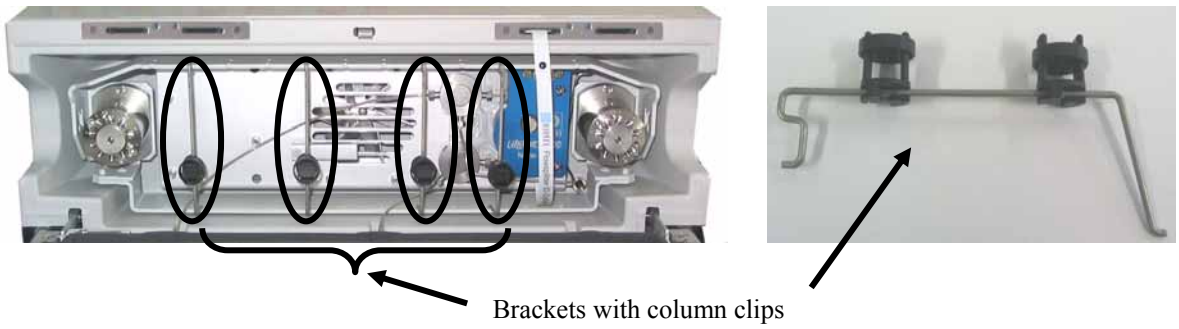

Fig. 16: Brackets with column clips

The column clip consists of two pieces (→ Fig. 17). To remove the ring from the bottom part, slightly press the ring in the direction of the arrows, which are printed on the ring.

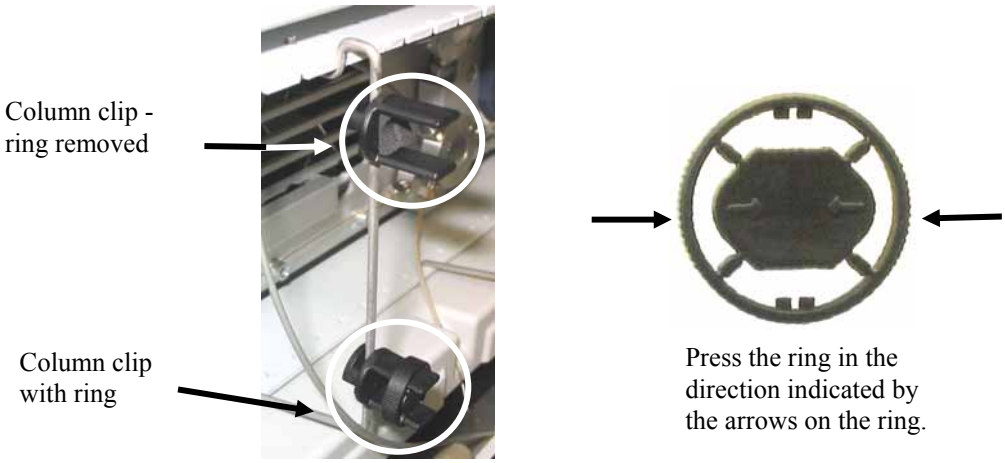

Fig. 17: Two-piece column clip

1. Press the column into the clip and reinstall the ring (→ Fig. 18).

Fig. 18: Column installed in the clip

2. Connect the capillaries to column.

Tip: For information about the connections on the column switching valve(s), refer to section 3.6 (→ page 32). For information about the connections on the flow splitter, refer to section 3.8 (→ page 34).

You can thread the capillaries out of the interior at any position between the enclosure and the front panel door. To thread the capillaries out of the interior on the left or right side of the enclosure, direct them through the respective capillary guide.

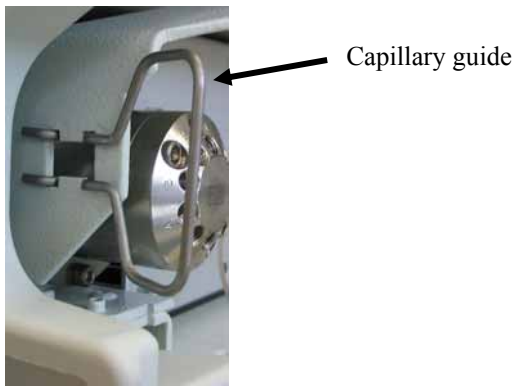

Fig. 19: Capillary guide installed on the carrier

Dionex recommends threading the capillaries out of the interior in such a way that the connections are as short as possible.

Tip: Place the capillaries in such a manner (i.e., preferably 90-degree angle related to the door seal) that they do not open a small path for ambient air into the column chamber. This will prevent a proper seal and thus, impair the heating and cooling performance of the flow manager. When cooling, an improper seal may lead to a considerable amount of condensed water.

Tip: An electronic column identification module allows GLP-compliant documentation of the column type and the most important column parameters. For more information, refer to section 5.6 (→ page 56).

You may move the preinstalled brackets and/or clips as required by your application:

- Column clip
  To remove the column clip from the bracket, turn it 90° counterclockwise. To install the clip at the new position attach it to the bracket and turn it 90° clockwise.
- Bracket
  The bracket for the column clips is installed in the column carrier as shown in Fig. 20. To remove the bracket, slightly push it downward. You can now remove the bracket at the top. Then, remove it at the bottom of the carrier. To install the bracket at the new position, proceed in the reverse order.

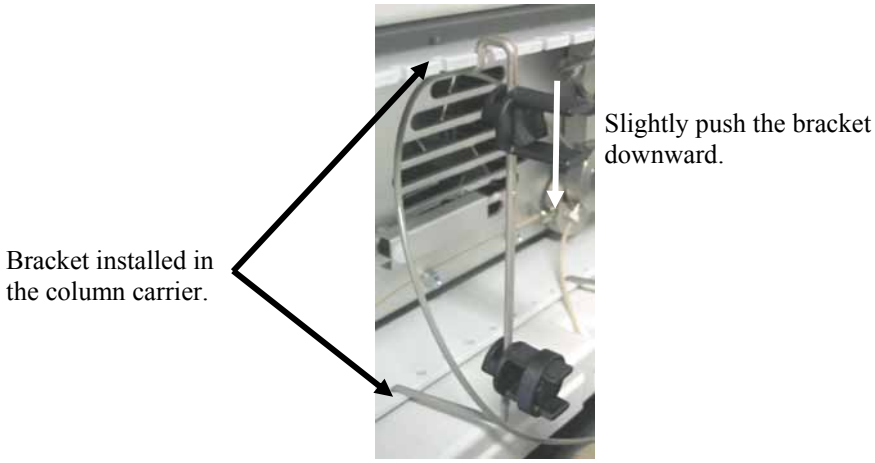

Fig. 20: Bracket installed in the column carrier

3.6 Connecting the Capillaries to the Column Switching Valve

Depending on the instrument configuration, the flow manager is fitted with one or two column switching valves (2-position/10-port or 2-position/6-port). Valve switching is programmed and controlled via Chromeleon. (For more information, refer to the Chromeleon online Help.) Establish the fluid connections:

3. Remove the plastic cap that protects the switching valve during shipment.
4. Connect the capillaries, using an appropriate tool. For an example, refer to Fig. 21.

⚠ **Important:** When you operate a biocompatible flow manager, observe the instructions for connecting the capillaries to the injection valve (→ page 13).

⚠ **Important**: Afin de raccorder les capillaires à la vanne d'injection biocompatible, veuillez respecter les instructions d'installation (→ page 13).

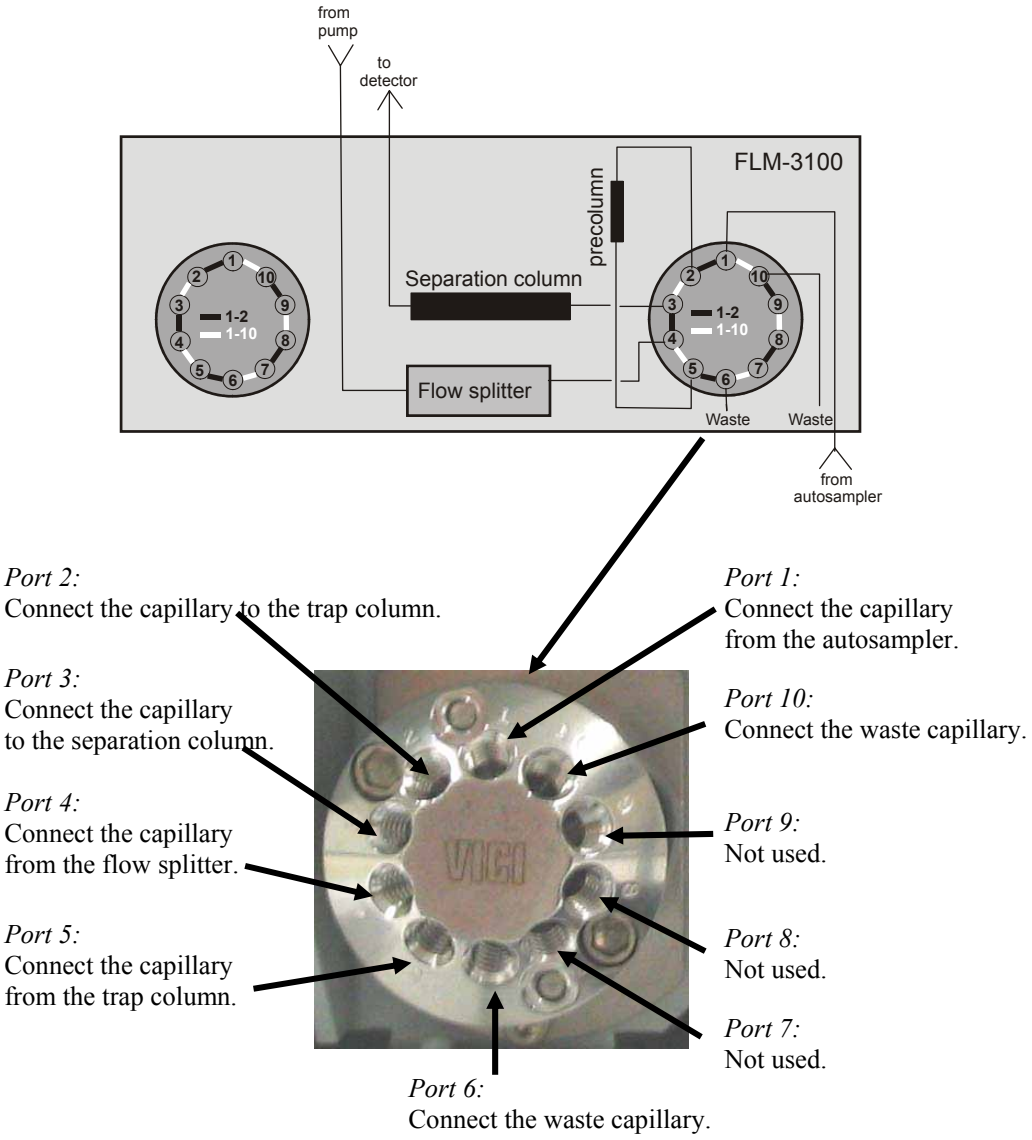

Fig. 21: Example for the connections on a 2-position/10-port column switching valve

⚠ **Important:** To connect the capillaries to the injection valve, install only the ferrules and fitting screws provided in the flow manager's accessories kit.

⚠ **Important:** Pour raccorder les capillaires à la vanne d'injection, installez uniquement les ferrules et les raccords fournis dans le kit d'accessoires.

3.7 Installing a Trap Column

STOP **Warning:** Before carrying out any work in the column chamber, wait for the column chamber to cool down. Do not touch any metal parts inside the column chamber while the temperature set point is > 50 °C (122 °F).

STOP **Avertissement:** Avant de procéder à toute modification dans le compartiment de colonne, attendez que celui-ci refroidisse. Ne touchez aucune partie en métal à l'intérieur du four, tant que l'affichage de la température est > 50 °C (122 °F).

Follow the steps below if your application includes a trap column:

1. To install the trap column a column holder is required.
   The application kits for the UltiMate 3000 nano and cap system include a trap column holder with the appropriate capillaries.
2. Insert the trap column in its holder and connect the capillaries directly to the column switching valve, e.g., to ports 2 and 5 (→ Fig. 21, page 32).

⚠ **Important:** When you operate a biocompatible flow manager, observe the instructions for connecting the capillaries to the injection valve (→ page 13).

⚠ **Important**: Afin de raccorder les capillaires à la vanne d'injection biocompatible, veuillez respecter les instructions d'installation (→ page 13).

3.8 Flow Splitter

3.8.1 Connections on the Flow Splitter

The flow manager is equipped with a flow splitter (→ Fig. 22) that delivers the low flow rates required for capillary, micro, and nano HPLC applications. Splitter cartridges with different split ratios are available for the different applications.

For information about the cartridge types and installation details, refer to section 3.8.2 (→ page 37).

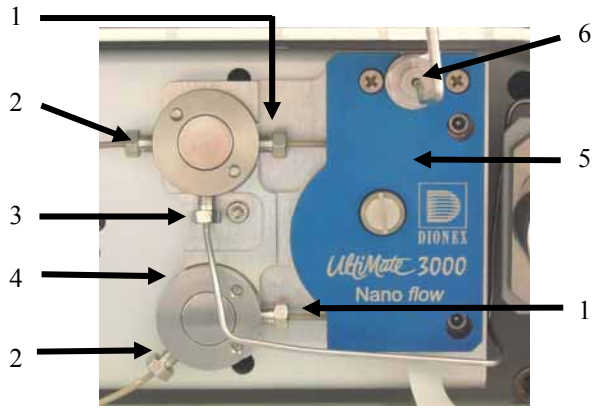

Fig. 22: Flow Splitter

No.	Description
1	Splitter cartridge outlets
2	Flow sensor connectors
3	Flow control valve connector
4	Capillary connector, depending on your application. (The nano (capillary or micro) flow set in Chromeleon is available here.) For the application shown in Fig. 21 (→ page 32), connect the capillary to the flow manager's right switching valve (port 4).
5	Splitter cartridge
6	Pump connector

⚠ **Important:** The flow sensor connectors (→ Fig. 22, no. 2) and the flow control valve connectors (→ Fig. 22, no. 3) are installed in the factory. They should not be opened by the user.

⚠ **Important:** Les raccordements au capteur de débit (→ Fig. 22, no. 2) et à la vanne de régulation de débit (→ Fig. 22, no. 3) sont effectués en usine. Ils ne doivent pas être modifiés par l'utilisateur.

Follow the steps below to connect the capillaries to the flow splitter:

Warning: Before carrying out any work in the column chamber, wait for the column chamber to cool down. Do not touch any metal parts inside the column chamber while the temperature set point is > 50 °C (122 °F).

Avertissement: Avant de procéder à toute modification dans le compartiment de colonne, attendez que celui-ci refroidisse. Ne touchez aucune partie en métal à l'intérieur du four, tant que l'affichage de la température est > 50 °C (122 °F).

Important: When connecting the capillaries, make sure that the connectors are free from contaminants. Even minute particles may cause damage to the flow splitter, flow control valve, and column.

Important: Lorsque vous connectez les capillaires, assurez-vous que les raccords sont exempts de tout contaminant. Même d'infimes particules peuvent causer des dommages au système (ex. diviseur de débit, vanne de régulation de débit et colonne).

Important: When you operate a biocompatible flow manager, observe the instructions for connecting the capillaries (→ page 13).

Important: Afin de raccorder les capillaires à la vanne d'injection biocompatible, veuillez respecter les instructions d'installation (→ page 13).

1. Use the special capillary that is shipped with the flow manager to connect the flow manager to the pump.

Description	Part No.
Long capillary for connecting the pump to the flow splitter (including the appropriate fittings and ferrules) Standard version Biocompatible version Use this capillary, for example, when the system modules are stacked as shown in Fig. 10 (→ page 32).	 6035.2550 6037.2550
Available as an option: Short capillary for connecting the pump to the flow splitter (including the appropriate fittings and ferrules) Standard version Biocompatible version Use this capillary, for example, when the pump is directly on the flow manager.	 6035.2553 6037.2553

Important: Do not substitute the capillaries mentioned in the above table for any other capillary.

- Connect the capillary to the pump.
- Rinse the capillary with isopropanol, via the pump (maximum flow rate, 5 minutes).
- Connect the capillary to the flow splitter (→ pump connector, Fig. 22, no. 6).

Tip: The pump outlet connector is equipped with a filter frit to catch any particles that might have entered the capillary during installation. Usually, it is not necessary to change this frit.

2. Establish the connection to the capillary connector (→ Fig. 22, no. 4) as required by your application. For the system structure shown in Fig. 10, connect the capillary to the flow manager's right switching valve (port 4; → page 32).

3.8.2 Exchanging the Splitter Cartridge

The following splitter cartridges are available from Dionex:

Part No.	Description
Standard Flow Managers:	
6720.3150A	Splitter cartridge for a split ratio of 1:1000
6720.3155A	Splitter-Kassette für ein Splitverhältnis von 1:300
6720.3160A	Splitter cartridge for a split ratio of 1:100
6720.3165A	Splitter-Kassette für ein Splitverhältnis von 1:15
6720.3170A	Splitter cartridge for a split ratio of 1:6
Biocompatible Flow Managers:	
6721.3150A	Splitter cartridge for a split ratio of 1:1000
6721.3155A	Splitter-Kassette für ein Splitverhältnis von 1:300
6721.3160A	Splitter cartridge for a split ratio of 1:100
6721.3165A	Splitter-Kassette für ein Splitverhältnis von 1:15
6721.3170A	Splitter cartridge for a split ratio of 1:6

To change the splitter cartridge:

1. Disconnect the capillary on the flow splitter's pump connector (→ Fig. 22, no. 6).
2. Loosen the fittings on the splitter cartridge outlets (→ Fig. 23).

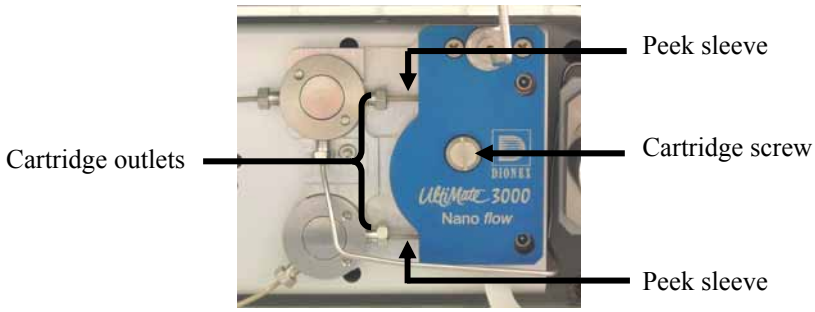

Fig. 23: Splitter cartridge

3. Loosen the cartridge screw (→ Fig. 23).
4. Remove the splitter cartridge. If necessary, carefully remove the peek sleeves from the cartridge outlets.
5. To install the new cartridge, proceed in the reverse order.

> **Tip:** An electronic flow splitter identification system allows you to store splitter-specific information, such as, the split ratio and settings for flow control, on a chip card and read it out whenever you want.
> For more information, refer to section 5.7 (→ page 58).

6. Insert the memory chip card for the flow splitter ID in an appropriate slot (→ Splitter Identification System (Splitter ID), page 58).

3.9 Manual Injection Port

A manual injection port (→ Fig. 24) is available from Dionex as an option for the flow manager:

Part No.	Description
6720.9007	Manual Injection Port, standard flow manager
6721.9007	Manual Injection Port, biocompatible flow manager

Dionex Service installs the injection port during the installation of the flow manager if you want to perform the injection manually instead of using an autosampler.

Fig. 24: Flow Manager with manual injection port

4 User Interface

4.1 Power-Up

Use the power cord from the flow manager's accessories kit to connect the instrument to the mains. Turn on the flow manager by pressing the power switch on the rear panel. While the flow manager is powered up, the following information appears on the front panel display: Instrument type, serial number, and firmware version.

Tip: The noise that sounds when you turn on the flow manager is normal and does not impair the flow manager's performance.

Tip: Each time the flow manager power is turned on, the flow manager runs a series of internal tests. During these self-diagnostics, all of the main components are checked. If an error is detected, the flow manager is not yet ready for analysis. The **Status** LED on the front panel is red and an error message appears on the front panel display. If the flow manager is operated by Chromeleon, an error message is logged in the Chromeleon audit trail, also. Turn off the flow manager, take appropriate remedial action (→ Troubleshooting, page 59), and turn on the flow manager again.

4.2 Status Screen

If the self-test was successful, the initial screen changes to the status screen:

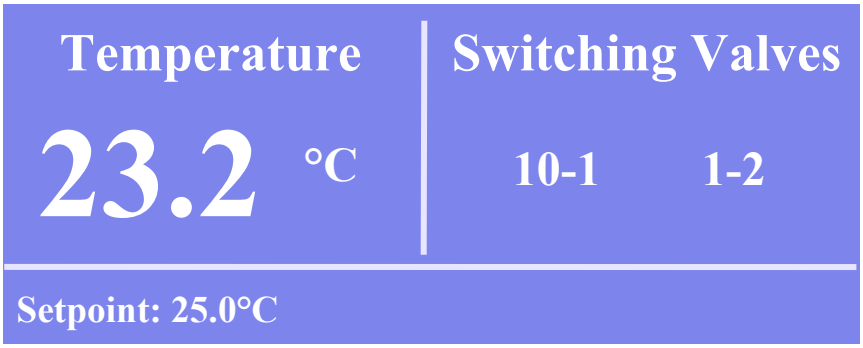

Fig. 25: Front panel display (here: for an FLM with two 2-position/10-port switching valves)

On the left side, the current temperature and the target temperature are displayed (in °C). The information about the column switching valves appears on the right side. The numerical values indicate the fluid connections in the related valve.

Tip: Adjust the screen brightness and/or contrast on the **Configuration** menu (→ page 46).
If the flow manager is operated by Chromeleon, you can adjust the settings also via the **Brightness** and **Contrast** parameters in the **Commands** dialog box.

4.3 Soft Key Menus

Four soft keys under the front panel display provide access to various menus, allowing you to perform specific commands directly from the flow manager's front panel. White dots on the front panel mark the positions of the soft keys. To show the soft key menus, select the position of a white dot on the front panel display with the Dionex menu pen. The menu pen (part no. 6300.0100) is included the in the accessories kit.

Fig. 26: Showing the soft keys

The bottom status screen line changes to show the **Menu**, **Temp**, **Valve**, and **Leak** soft keys:

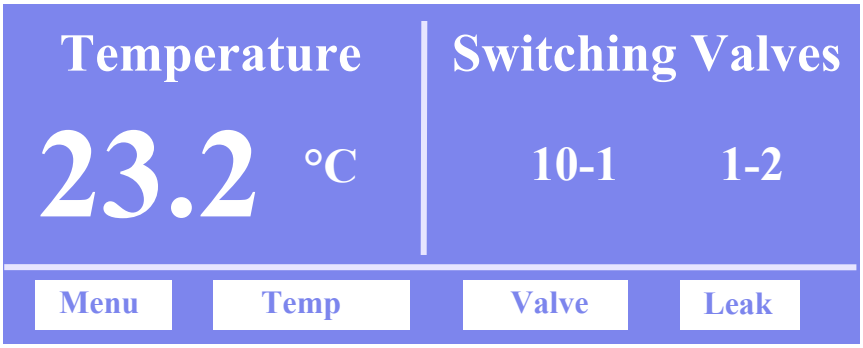

Fig. 27: Soft keys

Select a soft key with the menu pen:

Soft Key	Description
Menu	Opens the **Main** menu (→ page 43)
Temp	Opens the **Temperature control** menu (→ page 44).
Valve	Opens the **Valve control** menu (→ page 44).
Leak	Opens the **Leak control** menu (→ page 44).

Tip: If no option is selected, the original status screen line is restored after about 5 seconds.

Tip: When the flow manager is connected in Chromeleon, front panel input related to the measurement is disabled to prevent changes to the operating parameters. (Operating parameters are set to read-only.)
Parameters that do not interfere with the measurement, such as, the screen brightness or contrast can still be changed.

4.4 Menu Structure and Layout

Fig. 28 shows the menu structure:

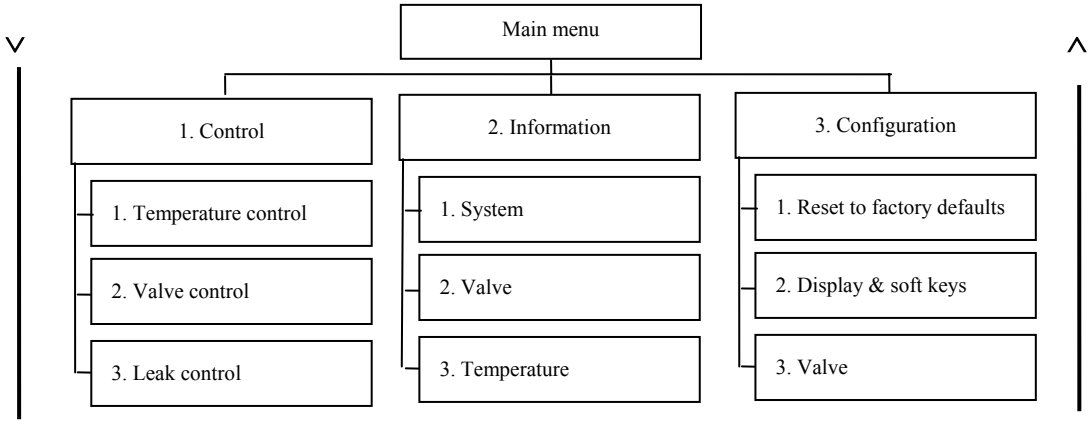

Fig. 28: Menu structure

In general, the menu layout is as follows:

Fig. 29: Menu layout (here: Control menu)

No.	Description
1	Reports the menu name.
2	Reports the number of the current menu on the **Main** menu.
3	The menu items appear on a list and are numbered consecutively. The selected item is underlined.
4	Navigation bar The selected menu item and/or parameter determines which soft keys appear on the navigation bar. These are the general soft keys:

Soft Key	Description
∧	- Returns you to the previous entry on a list. If the list contains 5 or more items, the arrow up key pages forward through the entries on the list (after reaching the first line). - Increments numerical values. - Toogles between operating states e.g., on and off.
∨	Takes you to the next entry on a list. If the list contains 5 or more items, the arrow down key pages backward through the entries on the list (after reaching the fouth line). - Decrements numerical values. - Toogles between operating states, e.g., on and off.
Select	Confirms the selection and activates the input field if applicable. **Note:** If an item is read-only (e.g., because the device is connected in Chromeleon), the **Select** key will not be available.
Back	Returns you to the previous menu level.
OK	Confirms the selection and/or input.
Cancel	Cancels the action and restores the last value.
Note: Depending on the selected option, specific soft keys may replace these general soft keys.	

Tip: If an error is found, one or more error messages appear on the front panel display. In this case, the following soft keys appear on the navigation bar:

Soft Key	Description
Prev	Returns you to the previous error message.
Next	Takes you to the next error message.
Clear	Remove an error message from the display.

4.4.1 Main Menu

Open the **Main** menu from the bottom line of a status screen (→ Fig. 27, page 40). To do so, select the **Menu** soft key. The **Main** menu provides top-level access to the menu structure:

Fig. 30: Main menu

Select an item with the arrow up or down key—the selected item is underlined. Confirm your selection with **Select**. **Back** returns you to the status screen.

For information about the menus, refer to:

- Control menu (→ page 44)
- Information menu (→ page 45)
- Configuration menu (→ page 46)

4.4.2 Control Menu

On the **Control** menu, you can make the temperature and valve settings. In addition, you can determine the behavior for a leak alarm:

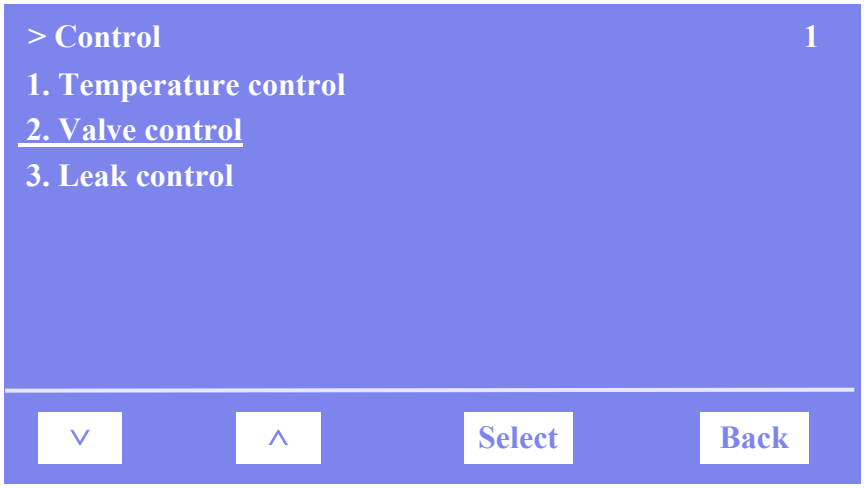

Fig. 31: Control menu

Menu Item	Description
Temperature control	Determine the setpoint temperature and turn temperature control on or off.
Valve control	Determine the fluid connections for the related valve.
Leak control	Make the following settings for the related sensor: —Enable or disable leak detection. —Set the sensitivity with which the sensor responds to gas or humidity (low, standard or high). —Select whether an acoustic beep alerts you in case of an alarm (with "silent", no beep sounds). To turn off the sound for the current alarm, set **All leak alarms** to **silent**.

4.4.3 Information Menu

The **Information** menu provides general information about the flow manager, e.g., for diagnostic purposes:

Fig. 32: Information menu

Menu Item	Description
System	Shows general information about the flow manager, e.g., firmware version, serial number, operating hours, etc.
Valve	Shows general information about the switching valves, e.g., configuration, switching cycle counter, etc.
Temperature	Shows general information about the temperature e.g., working load and cooling load, hours that the flow manager was operated in a certain temperature range, etc.

4.4.4 Configuration Menu

The **Configuration** menu provides information about the instrument configuration and/or allows you to the make the related settings:

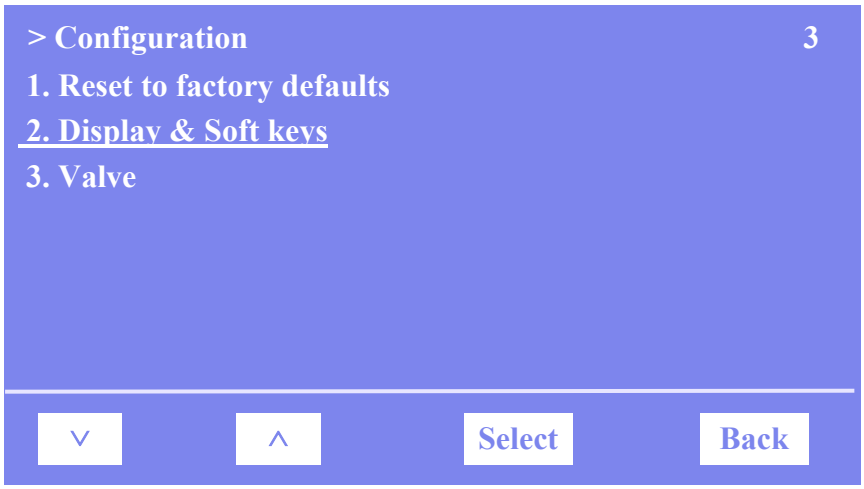

Fig. 33: Configuration menu

Menu Item	Description
Reset to factory defaults	Restores the default Dionex settings.
Display & Soft keys	Sets the display and soft key parameters: **Brightness**— Sets the screen brightness. **Contrast**— Sets the screen contrast. **Key sound**— Sets whether an acoustic beep sounds when you select a soft key.
Valve	Configures the related switching valve and is reserved for Dionex Service.

5 Automated Control by Chromeleon

5.1 General

The flow manager can be controlled by the Chromeleon Chromatography Management System. To control the flow manager, an appropriate Chromeleon version and a **Timebase Class 1** Chromeleon license are required. (If you have any questions, please contact your Dionex sales representative.)

The flow manager is connected to the Chromeleon server PC via the USB port (→ Fig. 11, page 22) on the instrument's rear panel. Follow the installation steps below.

5.2 USB Installation

Tip: **Install Chromeleon software before connecting the flow manager to the USB port on the Chromeleon server PC.**

Connect the flow manager to the mains using the power cord shipped with the instrument. Please observe the information about the facility requirements (→ page 21) and the electrical connection (→ page 22). Turn on the flow manager by pressing the power switch on the rear panel. Use the USB cable from the flow manager's accessories kit (→ page 75) to connect the flow manager to the USB port on the Chromeleon server PC.

Tip: Apart from the solvent rack, all modules of the UltiMate 3000 system can be connected separately to the server PC. However, Dionex recommends interconnecting all modules, and then connecting the system to the Chromeleon server PC via only one connection. To do so, use the USB hub on the pump or autosampler. For more information about how to connect the system modules, refer to the nano/cap system manual.

Tip: The USB connection to the PC or the USB hub must not exceed 5 m.

During the Chromeleon installation, the Windows USB drivers are copied to the appropriate locations. When you connect the flow manager for the first time, the Plug&Play Manager (Hardware Wizard) guides you through the remaining USB installation and installs the drivers as required. Afterward, follow the instructions in section 5.3 (→ page 48) to install and configure the flow manager in the Chromeleon Server Configuration program.

5.3 Installing the Flow Manager in Chromeleon

Install the flow manager in the Chromeleon Server Configuration program:

Tip: The description below refers to Chromeleon 6.70 SP3.

1. Start the Server Monitor program by selecting **Server Monitor** on the **Start → Programs → Chromeleon** menu on the task bar. **Start** the server and **close** the Server Monitor window. The Server Monitor icon appears on the task bar.

   Tip: Clicking the **Quit Monitor** button quits (exits) the Server Monitor program, but it does not stop the server. To stop the server, click the **Stop** button.

2. Start the Server Configuration program by selecting **Server Configuration** on the **Start → Programs → Chromeleon** menu on the taskbar.

3. If necessary, click the "+" sign beside the server name to display the items under the server.

4. Select the timebase to which you want to add the flow manager.

5. Select **Add Device…** on the **Edit** or context menu.

6. Select **Dionex HPLC: UltiMate 3000** from the left list box, and then select **FLM-3x00 Flow Manager** from the right list box. Click **OK** to confirm your selection.

A wizard guides you through the installation:

Clicking **Next>** takes you to the next wizard page.

Clicking **<Back** returns you to the previous wizard page.

General Wizard Page

Define the general instrument parameters.

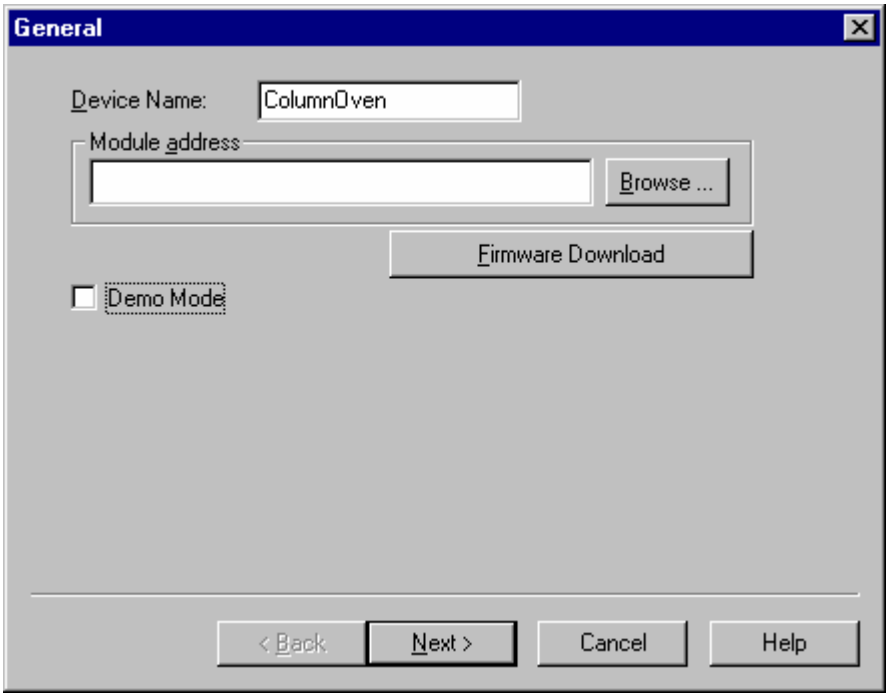

Fig. 34: General wizard page

- The **Device Name** field reports the name under which the flow manager is identified in the installation environment and in the Chromeleon client. Accept the default device name (**ColumnOven**).

  Tip: If you change the default device name, you have to re-link the corresponding controls of the related control panel(s).

- Verify that the **Demo Mode** check box is cleared. If the **Demo Mode** is enabled the **Module address** input field and the **Firmware Download** button are disabled. (In Demo Mode, Chromeleon simulates the functions of the flow manager (→ note on page 53).)

  Tip: If you leave this page and no module address was entered, Demo Mode is enabled automatically.

- Select the **Module address** of the flow manager. Click **Browse** to open a window listing the address and serial number of all flow managers that are connected via a USB connection. Double-click to select the flow manager that you want to use. The module address is automatically entered in the **Module address** field.

- Click **Firmware Download** to download the current firmware version from Chromeleon to the flow manager. The current firmware version is displayed here, as well as the version of the file that is available in the **\Bin** directory of your Chromeleon installation (UM3_FLM.HEX).

  Tip: The flow manager is shipped with the most recent firmware version installed. Therefore, you do not need to download the firmware from Chromeleon when you install the flow manager.

  Click **OK** to start the firmware download. Please note that the Chromeleon server needs to be in **running idle** mode before the download can be started. The download takes several minutes. To make sure that the firmware is downloaded correctly, do not perform further actions while the download is running. The download is complete when **Download finished successfully** appears in the **Messages Server** window in the Chromeleon Server Configuration program or in the Chromeleon audit trail.

  Important: During the download, make sure that communication between the flow manager and Chromeleon is not interrupted and do not turn off the instrument. Otherwise, the entire firmware may be lost. If the download is not successful, contact Dionex Service.

  Important: Au cours du téléchargement, assurez-vous que la communication entre l'instrument et Chromeleon n'est pas interrompue et n'arrêtez pas l'instrument. Dans le cas contraire, l'ensemble des progiciels pourrait être perdu. Si le téléchargement échoue, contactez le service après-vente Dionex.

Clicking **Next>** takes you to the next wizard page.

Components Wizard Page

Specify which other components are installed:

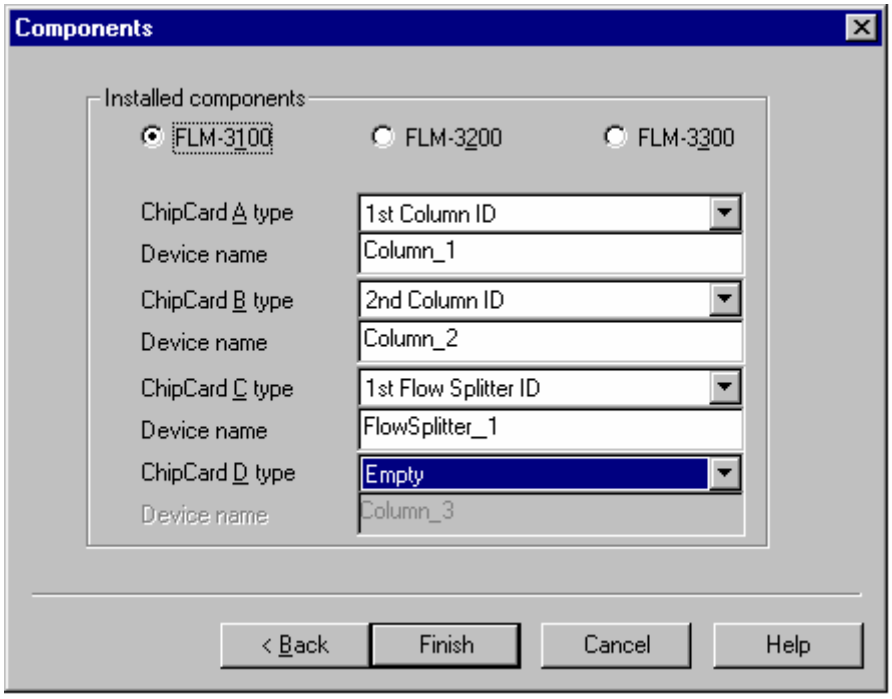

Fig. 35: Components wizard page

Option	Description
FLM-3100 **FLM-3200** **FLM-3300**	Indicate which flow manager is part of your system.
ChipCard A type (B, C, D type, resp.)	The flow manager is fitted with a column identification system (→ section 5.6, page 56) and a flow splitter identification system (→ section 5.7, page 58). Specify in which slot the chip cards for column and/or splitter identification are installed. As standard, the two slots on the left (ChipCard A type and ChipCard B type) and the rightmost slot (ChipCard D type) are for the column ID memory cards. The second slot from the right (ChipCard C type) is for the splitter ID memory card. Nevertheless, you can install the memory chip cards in any other slot, instead, if necessary. Click the arrow next to the corresponding input field and select an entry from the list. If no chip card is installed, select **Empty**. In this case, the associated **Device name** field is disabled.
Device name	Indicates the name under which the column or flow splitter is identified in the installation environment and in the Chromeleon client. **Tip**: Accept the default device name. If you change the default name, you have to re-link the corresponding controls of the related control panel(s).

Click **Finish** to complete the basic configuration of the flow manager.

Tip: To change the basic settings you may as well reopen these configuration pages after the installation. Select **FLM-3x00 Flow Manager** in the Chromeleon Server Configuration program, and then select **Properties** on the context menu.

In addition, you may make advanced settings (temperature signal, column pressure, pressure unit) in the Server Configuration program and determine which relays and/or digital inputs shall be available in Chromeleon. Select **FLM-3x00 Flow Manager** in the Server Configuration program, and then select **Properties** on the context menu. The following tab dialog pages will be available:

Configuration Tab Page

Use this tab page to determine whether Chromeleon shall record the temperature and/or column pressure as a separate channel:

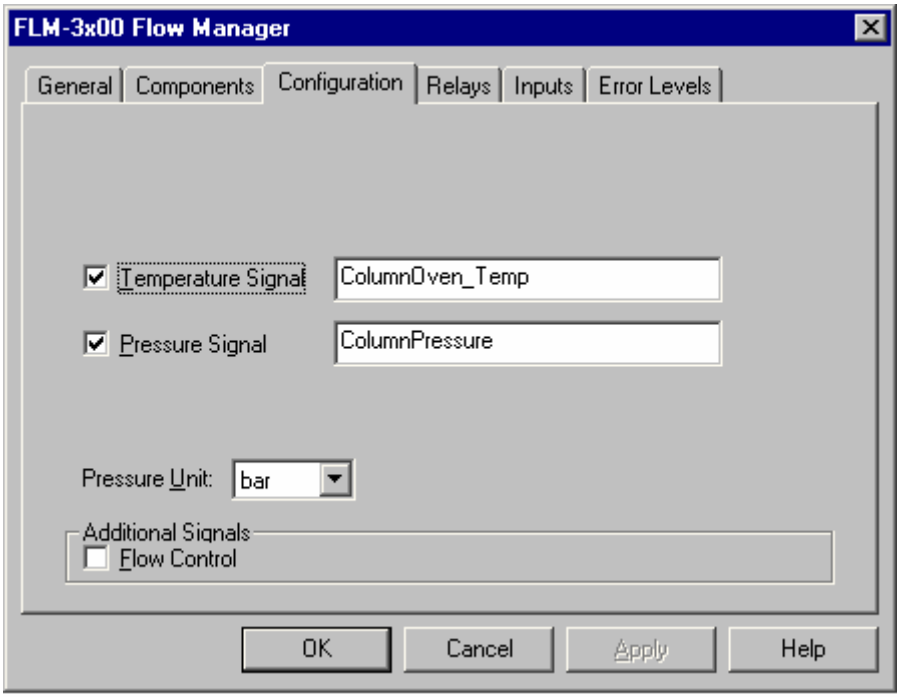

Fig. 36: Configuration tab page

Option	Description
Temperature Signal	The **Temperature Signal** check box is selected by default. Accept this setting if you want to record the temperature as a separate channel. Accept the default name (**ColumnOven_Temp**) under which the temperature signal is identified in the installation environment and in the Chromeleon client or enter a new name. If you change the default device name, you have to re-link the corresponding controls of the corresponding control panels.
Pressure Signal	The **Pressure Signal** check box is selected by default. Accept this setting if you want to record the column pressure as a separate channel. Accept the default name (**ColumnPressure**) under which the column pressure signal is identified in the installation environment and in the Chromeleon client or enter a new name. If you change the default device name, you have to re-link the corresponding controls of the corresponding control panels.

Option	Description
Pressure Unit	Select the pressure unit to be used. The following options are available: bar, MPa, and psi.
Flow Control	The check box is cleared by default. Accept this setting. Select the check box only if you want to perform Operational Qualification for the flow manager. When the check box is selected, additional channels are recorded and displayed under Column/Splitter Details on the UltiMate_3000_ColumnComp control panel. The values for Bridge Flow, Filtered Bridge Flow, Stepper, and Pressure provide valuable information to Dionex Service for troubleshooting in case the flow manager does not pass Operational Qualification successfully.

Relays Tab Page

The **Relays** tab page lists all available relays (FLM3x00_RELAY_1 and FLM3x00_RELAY_2). Select a check box to enable or disable the corresponding relay. Make sure that the required relays are selected; if they are not, they will not be available in Chromeleon.

Inputs Tab Page

The **Inputs** tab page lists all available remote inputs (FLM3x00_INPUT_1 and FLM3x00_INPUT_2). Select a check box to enable or disable the corresponding remote input. Make sure that the required inputs are selected; if they are not, they will not be available in Chromeleon.

Error Levels Tab Page

The **Error Levels** tab page classifies the severity of any errors that occur. It is generally not necessary to change the default settings.

Finally, save and close the Server Configuration. For more information about how to configure the flow manager, refer to the Chromeleon *online Help*.

Tip: Before turning off the flow manager by the power switch, always "**disconnect**" the module in Chromeleon. Disconnecting the module in Chromeleon is not required to set the flow manager to the Standby mode.

Tip: You may simulate the functions of the flow manager, also. On the **General** tab page, select the **Demo Mode** check box, and then and configure the flow manager in the installation wizard as described above.

5.4 Assigning the Flow Splitter

If the UltiMate 3000 system includes a flow manager and a micro pump (DGP-3600M or LPG-3400M), use the **Devices** tab page of the pump's properties to indicate which pump is fluidically connected with the flow splitter:

1. In the Chromeleon **Server Configuration** program, select the pump and click **Properties** on the pump's context menu.
2. On the **Devices** tab page, specify which pump is connected with the flow splitter:

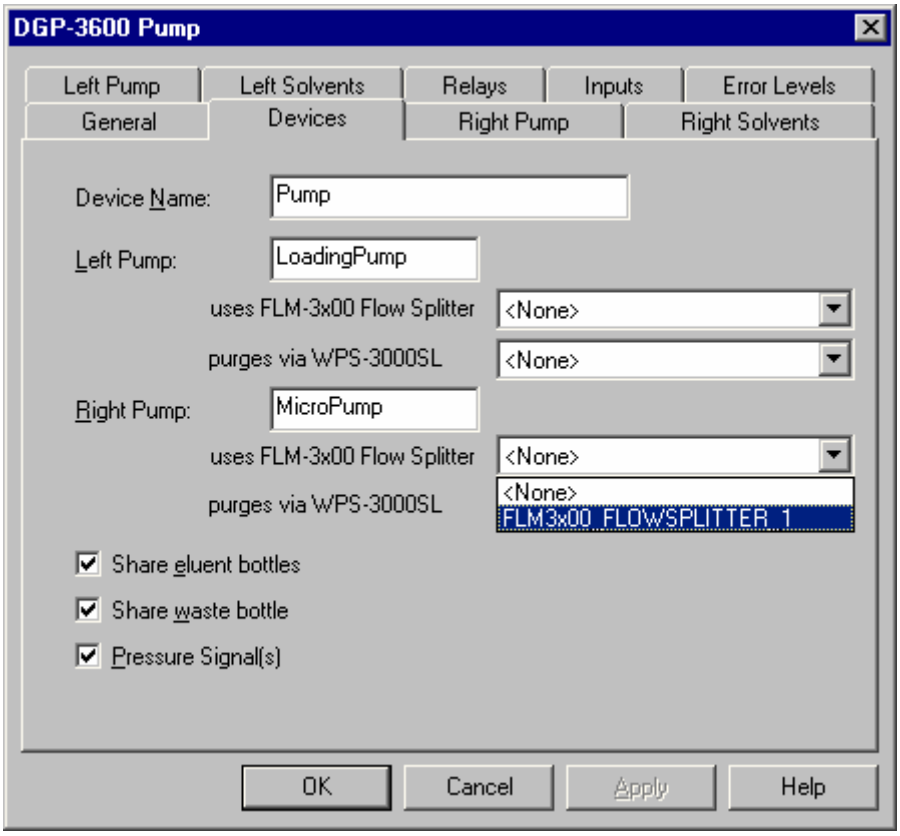

Fig. 37: Devices tab page (here: DGP-3600)

The default entry in the **uses FLM-3x00 Flow Splitter** field is **<None>** (no splitter). To change the setting, click the arrow next to the input field and select a flow splitter from the drop-down list.

Tip: When you assign a flow splitter to the pump, the pump flow settings apply directly to the flow on the splitter outlet, i.e., the split ratio is considered automatically.

Tip: In the standard configuration of the UltiMate 3000 system with a DGP-3600M, Dionex recommends assigning the flow splitter to the right pump (MicroPump).

5.5 Operating the Flow Manager with Chromeleon

Chromeleon can control the flow manager in two ways:

- Directly, via the toolbar icons and menu commands or via the controls on an appropriate control panel (e.g., Ultimate_3000_ColumnComp.pan)
- Via time-based programs (PGM-File or programmable buttons)

For a list of the commands and properties supported for the instrument, refer to the *Chromeleon online Help* and/or *User Manual*.

The Chromeleon version determines which commands and properties are supported. The display filter level (**Normal**, **Advanced**, or **Expert**) determines which commands and properties are displayed. (For information about how to set the display filter level, refer to the *Chromeleon online Help*.) Besides, some commands and properties are displayed only if the corresponding check boxes have been selected in the Server Configuration program.

For information about individual commands and parameters, as well as the command syntax, open a Chromeleon control panel. Select **Command** on the **Control** menu to open the **Commands** dialog box. You can also open this box by pressing the F8 key. In the left list box, click the "+" sign beside **ColumnOven** to display the items underneath.

When the flow manager is correctly connected to Chromeleon:

- The **Connected** LED on the instrument's front panel is green.
- Front panel input related to the measurement is disabled to prevent changes to the operating parameters. (Operating parameters are set to read-only.) Parameters that do not interfere with the measurement, such as, the screen brightness and/or contrast can still be changed.
- Information about the system performance and reliability is available via the related properties in the **Commands** dialog box.

Tip: The **Standby** button on the instrument's front panel remains active when the flow manager is operated by Chromeleon.

Tip: If the flow manager is controlled by Chromeleon as part of the HPLC system, the program file (PGM File) can include a command that automatically restarts operation as desired after a power failure. (For details, refer to the *Chromeleon online Help*.)

Tip: Operational and/or Performance Qualification allows you to check and document the quality of your HPLC system. All required materials and detailed instructions are available from Dionex on request.

5.6 Column Identification System (Column ID)

The flow manager is fitted with a column identification system (column ID) that allows you to store column-specific information on a chip card and read it out whenever you want.

Fig. 38: Column Identification System (Column ID)

1. Clip the column-ID chip card (part no. 6710.1505 = 5 chip cards) onto the column. (To do so, open the expanding rivet by removing the rivet head from the body.) Open the expanding rivet by pulling the rivet head partly out of the body (→ Fig. 39 a), clip the chip card onto the column as shown in Fig. 39 b, and push the rivet head back into the body (→ Fig. 39 c).

a b c

Fig. 39: Clipping the column ID chip card onto a column

2. Insert the chip card (with the Dionex logo facing up) in one of the four memory card slots (→ Fig. 40).

Fig. 40: Inserting a memory chip card in a memory card slot

Tip: Column identification is supported for more than one column simultaneously. When the chip card is installed correctly in the slot, the slot LED is green.

Tip: As standard, the second slot from the right is intended for the splitter ID chip card (→ Splitter Identification System (Splitter ID), page 58). Nevertheless, you may use this slot also for the column ID chip card if you have specified this on the **Components** page (→ page 51) in the Server Configuration program.

3. To store and read out the column-specific information, use the related **Column** commands and properties in the Chromeleon **Commands** dialog box. These entries are available only if you have made the relevant settings in the flow manager's properties (on the **Components** tab page in the Server Configuration program; → page 51). The stored information can then provide a GLP-compliant overview of the column status.

   Tip: To open the **Commands** dialog box, open a Chromeleon control panel and select **Command** on the **Control** menu or press the F8 key. In the left list box, click the "+" sign beside **ColumnOven** to display the items underneath.

For more information about the column identification system, refer to the *Chromeleon online Help*.

5.7 Splitter Identification System (Splitter ID)

The flow manager is fitted with a flow splitter identification system (splitter ID) that allows you to store splitter-specific information on a chip card (similar to the column ID system in Fig. 38, page 56) and read it out whenever you want. The memory chip card is fitted to the splitter cartridge in the factory.

1. Insert the chip card (with the Dionex logo facing up; → Fig. 40, page 56) in the second memory card slot from the right. As standard, this slot is for the splitter ID chip card. Nevertheless, you may use any other slot instead if you have specified this on the **Components** page (→ page 51) in the Server Configuration program.

2. To store and read out splitter-specific information, use the related flow splitter commands and properties in the Chromeleon **Commands** dialog box. This entry is available only if you have made the relevant settings in the flow manager's properties (on the **Components** tab page in the Server Configuration program; (→ page 51).

   The correct configuration of the flow splitter is important to ensure correct operation of the nano pump in an UltiMate 3000 system. Also, refer to the notes in Assigning the Flow Splitter (→ page 54).

Tip: To open the **Commands** dialog box, open a Chromeleon control panel and select **Command** on the **Control** menu or press the F8 key. In the left list box, click the "+" sign beside **ColumnOven** to display the items underneath.

For more information about the flow splitter identification system, refer to the *Chromeleon online Help*.

6 Troubleshooting

Each time a fault or mechanical failure occurs during the operation of the flow manager, the **Status** LED on the instrument's front panel is red and an error message appears on the front panel.

Tip: Select **Clear** to remove a error message from the display. If several error messages appear, select **Prev** to view the previous message. **Next** takes you to the next message.

Tip: For information about common operating problems that might occur with the UltiMate system, probable causes, and remedial actions, refer to the nano/cap system manual.

The following table summarizes the error messages that may appear on the front panel display, lists possible causes, and suggests appropriate remedial actions:

Message	Probable Cause	Remedial Action
Chip card communication error!	The chip card is not installed properly or defective.	Verify that the chip card is installed properly. Contact Dionex Service if the message appears again.
Column pressure too high!	The column pressure is too high. The column might be blocked.	Regenerate the column or use a new column. If the problem still exists, contact Dionex Service.
Compartment temperature sensor communication error!	The temperature sensor in the column compartment may not be connected properly or is defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Error while programming flash!	An error occured while the flash memory was programmed.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Flash object error!	An error occured in the object administration.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Flow control valve failure!	The flow control valve is dirty or defective.	Perform an automatic cleaning cycle from the control panel for the flow manager. Contact Dionex Service if the message appears again.
Flow control valve limit!	The flow from the pump is insufficient. The pump might not be ready for operation. Leakage occurs in the system. The flow control valve is dirty or defective.	Check the pump and/or the master flow from the pump. Eliminate the cause for the leakage. Tighten leaking connections. Perform an automatic cleaning cycle from the control panel for the flow manager. Contact Dionex Service if the message appears again.

Message	Probable Cause	Remedial Action
Flow sensor fail!	The flow sensor may be defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Gas leak alarm!	The gas sensor detected an increased concentration of gas in the column chamber.	Eliminate the cause. Tighten leaking connection and vent the column chamber (→ section 2.7, page 19).
Gas leak sensor error!	The gas leak sensor may be defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Humidity leak alarm!	The humidity sensor detected an increased concentration of humidity in the column chamber.	Eliminate the cause. Tighten leaking connection and vent the column chamber (→ section 2.7, page 19).
Humidity leak sensor error!	The humidity leak sensor may be defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
I2C bus error!	The I2C bus may be blocked.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Leak temperature sensor communication error!	The temperature sensor for the leak sensor may not be connected properly or defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Left chip card communication error!	The left chip card (slot A or B) is not inserted properly or defective.	Verify that the chip card is installed properly. Contact Dionex Service if the message appears again.
Left MSV communication error!	The left switching may not be connected properly or is defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Left MSV controller error!	The left switching valve is installed but cannot be accessed.	Retry. Contact Dionex Service if the message appears repeatedly.
Left MSV error!	An error has been reported for the left switching valve.	Contact Dionex Service if the messages appears reapeatedly.
Left MSV error! Retrying… and/or Left MSV position error!	The left switching valve cannot be switched to the desired position.	Switching is repeated automatically. If this is not successful, the **Left MSV position error!** message appears. Contact Dionex Service if the message appears repeatedly.
MSV communication error!	The swichting valve may not be installed properly or is defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Rear temperature sensor communication error!	The temperature sensor for the heat exchanger may not be installed properly or is defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.
Right chip card communication error!	The left chip card (slot C or D) is not inserted properly or defective.	Verify that the chip card is installed properly. Contact Dionex Service if the message appears again.
Right MSV communication error!	The right switching valve may not be connected properly or is defective.	Turn the flow manager off and on again. Contact Dionex Service if the message appears again.

Message	Probable Cause	Remedial Action
Right MSV controller error!	The right switching valve is installed but cannot be accessed.	Retry. Contact Dionex Service if the message appears repeatedly.
Right MSV error!	An error has been reported for the right switching valve.	Contact Dionex Service if the messages appears reapeatedly.
Right MSV error! Retrying…. and/or Right MSV position error	The right switching valve cannot be switched to the desired position.	Switching is repeated automatically. If this is not successful, the **Right MSV position error!** message appears. Contact Dionex Service if the message appears repeatedly.

Tip: If the flow manager is operated by Chromeleon, a more detailed error message appears in the Chromeleon audit trail, also.

Tip: In addition to the error messages mentioned above, other messages may appear. In this case, please note the exact wording of the message and contact Dionex Service.

If communication between Chromeleon and the flow manager cannot be established, related error messages may appear in the Chromeleon audit trail, also.
Refer to the table below for the most important error messages, along with possible causes and the corresponding remedial actions.

Message	Probable Cause	Remedial Action
FLM-3x00@USB-1610103 - Device not found on the USB.	The USB connection between the flow manager and the Chromeleon server is interrupted.	Check the USB connection.
	The power supply to the flow manager is interrupted.	Check the mains connection of the flow manager.
Error opening FLM-3x00@USB-1610103 – The System cannot find the file specified	The USB connection between the flow manager and the Chromeleon server is interrupted.	Check the USB connection.
	The power supply to the flow manager is interrupted.	Check the mains connection of the flow manager.
Error issuing control request to FLM-3x00@USB-1610103	The Chromeleon server cannot connect to the specified flow manager.	Check the USB connection. Check the mains connection of the flow manager. Remove the flow manager specified in the message from the server configuration. Or else, select a different flow manager from the list of available flow managers in the server configuration (via Properties/ Browse).

Message	Probable Cause	Remedial Action
Error reading from FLM-3x00@ USB-1610103 Data error (cyclic redundancy check)	There is a transmission error between the flow manager and the Chromeleon server.	Check the USB connection. The connection to the next hub must not exceed 5 m. The overall connection length, including the hub connections must not exceed 30 m (→ page 47). Replace any defective USB cable or hub.
Error reading from FLM-3x00@ USB-1610103	The connection between the flow manager and the Chromeleon server is interrupted. The power supply to the flow manager is interrupted.	Check the USB connection. Check the mains connection of the flow manager.

Tip: In addition to the error messages mentioned above, other messages may appear. In this case, please note the exact wording of the message and contact Dionex Service.

7 Routine Maintenance

7.1 General Notes

The flow manager is made of high-quality components and materials to minimize maintenance requirements. The painted surfaces, as well as the display, are relatively resistant to weak acids, alkali, and organic solvents. Nevertheless, immediately wipe up all liquids spilled onto the flow manager's surface, using lint-free cloth or paper. If surfaces are exposed for longer periods, these liquids can cause damage.

The following sections describe all maintenance procedures that can be carried out by the user. Dionex personnel should perform any additional servicing, as well as annual inspections to detect contamination, wear, etc. If unexpected problems occur, please contact Dionex Service.

Warning: Strictly observe all warning notes when carrying out maintenance or repair work.

Avertissement: Observez strictement toutes les notes d'avertissement lorsque vous procédez à des opérations de maintenance ou de réparation.

Warning: Do not touch any metal parts inside the column chamber while the temperature set point is > 50 °C (122 °F). Wait for the chamber to cool down, for example, before changing a column or before performing any maintenance procedures.

Avertissement: Ne touchez à aucune partie en métal à l'intérieur du compartiment de colonne tant que le point de réglage de température est > 50 °C (122 °F). Attendez que le four refroidisse, par exemple, avant de changer une colonne ou avant de procéder à tous travaux de maintenance.

Warning: Do not operate the flow manager when the enclosure is open.

Avertissement: Ne faites pas fonctionner l'instrument lorsque le capot de protection est enlevé, sauf instruction dans ce sens. Observez toutes les notes d'avertissement.

Warning: Keep in mind that the fluid components of the flow manager may be filled with toxic solvents. Therefore, purge the flow manager with an appropriate solvent and put on protective clothing before starting maintenance work.

Avertissement: Gardez à l'esprit que les circuits hydrauliques de l'instrument peuvent être remplis de solvants toxiques. Par conséquent, purgez l'instrument avec un solvant approprié et portez des vêtements de protection avant de commencer les opérations de maintenance ou de réparation.

⚠ **Important:** Use original Dionex spare parts only. Substituting non-Dionex parts may impair flow manager performance, thereby voiding the product warranty. Refer to the warranty statement in the terms of sale for more information.

⚠ **Important:** Utilisez les pièces de rechange d'origine Dionex. Effectuer des remplacements avec des pièces ne provenant pas de Dionex ou utiliser des accessoires ne provenant pas de Dionex peut affecter les performances de l'instrument, rendant ainsi caduque la garantie de produit. Référez-vous à la déclaration de garantie dans les conditions générales de vente pour plus d'information.

⚠ **Important:** Before you return any instrument to Dionex for repair, contact Dionex Service or your local distributor. An RMA number (Return Material Authorization number) is required in order to track your instrument. Always use the original packaging when shipping the flow manager. Shipping the instrument in anything other than the original packaging will void the warranty. Refer to the warranty statement in the terms of sale for more information.

⚠ **Important:** Avant de retourner tout instrument à Dionex en vue de réparations, contactez le service après-vente Dionex ou votre distributeur local. Un numéro RMA (Return Material Authorization ou autorisation de retour de matériel) est nécessaire afin d'assurer la traçabilité de votre instrument. Utilisez toujours l'emballage d'origine lorsque vous expédiez l'instrument. Expédier l'instrument dans tout autre contenant que l'emballage d'origine rend caduque la garantie. Référez-vous à la déclaration de garantie dans les conditions générales de vente pour plus d'information.

For instructions on shutting down the flow manager, refer to page 71.

7.2 Maintenance Intervals

Perform the maintenance procedures listed below at regular intervals to ensure optimum performance and maximum uptime of the flow manager. The exact maintenance schedule for the flow manager will depend on a number of factors.

Frequency	What you should do...
Daily	Inspect the flow manager for signs of leakage. Tighten leaking capillary connections. If necessary, replace the fittings and/or ferrules.
Periodically	Clean the column chamber, using a lint-free cloth. Use paper to absorb any humidity in the column chamber. The cleaner the column chamber is, the better the leak sensor is at detecting leaks.
	Empty the waste container for the liquid from the waste outlet (→ Fig. 15, page 27).
	Inspect the seal installed in the front panel door. A defective door seal impairs the performance of the instrument. If the seal is defective, please contact your Dionex service representative.
	When you use saliferous buffers, rinse the flow manager with de-ionized water.

Tip: For information about maintenance procedures for the column switching valve, refer to section 10 (→ page 79).

All other maintenance procedures must be performed by Dionex Service personnel. Have a Dionex service representative check the flow manager once a year to prevent contamination, excessive wear, etc. If unexpected problems occur, please contact your Dionex service representative.

7.3 Replacing the Fuses

Warning: Before replacing the fuses, turn off the flow manager. Be sure to disconnect the power cord from its source.

Avertissement: Avant de remplacer les fusibles, arrêtez l'instrument. Assurez-vous de bien débrancher le cordon d'alimentation de la source secteur.

To replace the fuses:

1. Remove the fuse holder, using a small screwdriver.

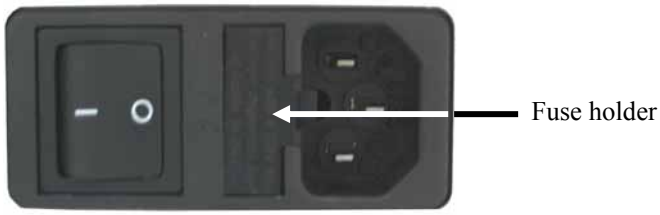

Fig. 41: Fuse holder

2. Replace the fuses with fuses of the appropriate rating.

Important: Always install two new fuses.

Important: Installez toujours deux nouveaux fusibles. Ne faites pas fonctionner l'instrument avec seulement un fusible.

Important: Use only the fuses indicated below or those listed in the Accessories/Spare Parts List (→ page 75).

Important: Utilisez uniquement les fusibles indiqués ci-dessous ou ceux qui sont répertoriés dans la liste des accessoires/pièces de rechange (→ page 75).

Description	Part No.
2A Fuse, slow-blow, 5 x 20 mm	Included in Fuses Kit, part no. 6710.9001 For information about which fuses are included in the kit, refer to section 9.2 (→ page 76).

3. Reinstall the fuse holder.
4. Reconnect the power cord to its source and turn on the flow manager.

7.4 Drying the Fluid Leak Sensor

Tip: Inspect the connections for signs of leakage every day and tighten leaking connections. **Important:** Also, inspect the tubing connected on the waste port for indications of blockage and verify that the port is open.

Tip: The cleaner the columns and capillaries are, the more reliable is the operation of the leak sensors. If columns and capillaries are wetted with solvent during installation, reliable leak detection is possible only with restrictions.

The fluid leak sensor is activated when it is exposed to moisture. When the sensor detects a liquid leak, the **Status** LED on the instrument's front panel is red and the error message appears on the front panel display. If the flow manager is operated by Chromeleon, the error is logged in the Chromeleon audit trail, also.

Put on appropriate clothing and eliminate the cause of the leakage. Follow the steps below to dry the leak sensor and remove any liquid in the drip tray. (The sensor and drip tray are situated on the right in the rear of the enclosure.)

Warning: Turn off the flow manager and disconnect the power cord from its source.

Avertissement: Arrêtez l'instrument. Assurez-vous de bien débrancher le cordon d'alimentation de la source secteur.

1. On the rear panel, remove the screw for the right-side panel (→ Fig. 42).

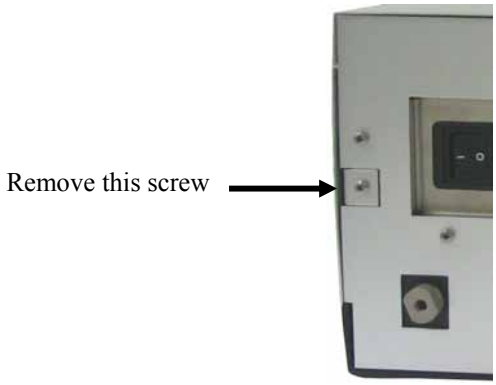

Fig. 42: Screw for the right-side panel

2. Push and remove the side panel backward, toward the rear panel (→ Fig. 43).

Fig. 43: Removing the side panel towards the rear panel

3. Dispose of any liquid in the tray and dry the sensor (→ Fig. 44), using lint-free cloth or paper.

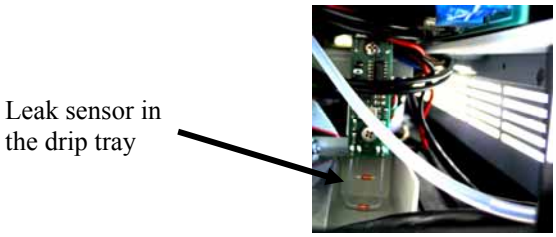

Fig. 44: Leak sensor

⚠ **Important:** Make sure that you do not bend or damage the sensor.

⚠ **Important:** Assurez-vous que vous ne tordez, ni n'endommagez le capteur.

4. Install the side panel in the reverse order.

Tip: The **Status** LED on the front panel remains red and the error message is flashing on the front panel display as long as the leak sensor is exposed to moisture.

7.5 Column Switching Valve

Maintenance requirements are kept to a minimum. In most instances, it will be sufficient to clean the valve by flushing all lines with an appropriate solvent. The nature of the solvent to be used depends on the sample(s) and the mobile phase(s) that are used. Use a common solvent such as methanol or acetonitrile or an 80/20 mixture of methanol or acetonitrile and water.

Tip: A detailed discussion on the installation, use and maintenance of the valve is presented in Technical Note 801 from Valco Instruments, Co. Inc. and can be obtained at the Valco website (www.Valco.com).

Two parts of the valve, the rotor and the stator, are subject to wear. The degree of wear depends on the application. Both parts can be replaced independently from each other.

Description	Part No.
Rotor seal for 2-position/10-port C2 switching valve (standard valve)	754.C2-00R0H
Stator for 2-position/10-port C2 switching valve (standard valve)	754.C-0C00H
Rotor seal for 2-position/10-port C2 switching valve (biocompatible valve)	6720.0092
Stator for 2-position/10-port C2 switching valve (biocompatible valve)	6720.0091
Rotor seal for 2-position/6-port CN2 switching valve (biocompatible valve)	754.CN2-43R6
Stator for 2-position/6-port CN2 switching valve (biocompatible valve)	754.CN2-4C46I

To dissemble the valve:

1. Use a 9/16" hex driver to remove the socket head screws that secure the stator to the valve.

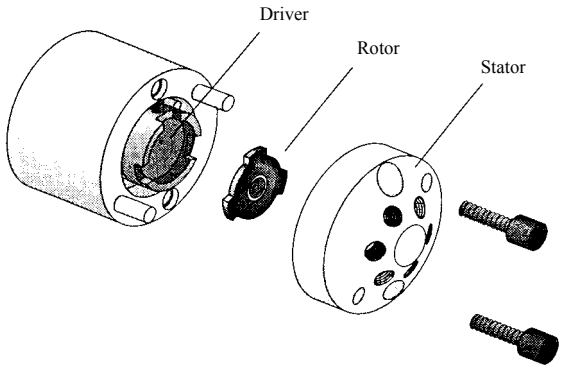

Fig. 45: Exploded view of the Valco model C2 valve

2. To ensure that the sealing surface of the cap is not damaged, rest it on its outer face. If the tubing is still attached, leave it suspended by the tubing.

3. Gently pry the rotor away from the driver with your fingers or a small screwdriver.

4. Examine the rotor sealing surface for scratches:
   - If scratches are visible to the naked eye, the rotor must be replaced.
   - If no scratches are visible, clean all parts thoroughly with an appropriate solvent. Take care that no surfaces are scratched while you are cleaning the components. (The most common problem in the use of the valve with HPLC is the formation of buffer crystals, which are usually water soluble.) After cleaning, it is not necessary to dry the rotor.

To reassemble the valve:

1. Insert the rotor in the driver, making sure that the rotor sealing surface with its engraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.
2. Reinstall the stator. Insert the two socket head screws and tighten them gently until both are snug. Do not overtighten the screws. They simply hold the assembly together and do not affect the sealing force, which is automatically set as the screws close the cap against the valve body.
3. Test the valve by pressurizing the system. If the valve does not hold pressure, it should be returned for repair.

⚠ **Important:** To connect the capillaries to the injection valve, install only the ferrules and fitting screws recommended by the valve manufacturer, observing the manufacturer's installation instructions.

⚠ **Important:** Afin de raccorder les capillaires à la vanne d'injection, installez uniquement les ferrules et les raccords recommandés par le fabricant de la vanne, en respectant les instructions d'installation du fabricant.

7.6 Shutting Down the Flow Manager

Please observe the following precautions before interrupting operation for more than one week or before shipping the flow manager:

Tip: For longer periods of inactivity and when using saliferous buffers (which may result in salt crystallization, thereby impairing the instrument's performance), rinse with de-ionized water.

8 Technical Information

Temperature range:	5–85 °C (max. 15 °C below ambient)
Temperature accuracy:	±0.5 °C
Temperature stability:	±0.1 °C
Temperature precision:	±0.1 °C
Column capacity:	Up to 3 columns, max. 30-cm length
Heatup time:	Less than 25 min from 20–50 °C (at 23 °C ambient temperature, ±0.5 °C)
Cooldown time:	Less than 35 min from 50–20 °C (at 23 °C ambient temperature, ±0.5 °C)
Control:	All functions software controlled via USB 1.1
I/O interfaces:	2 digital inputs, 2 programmable relay outputs
Column recognition:	Electronic identification system for 3 columns
Switching valves:	1 or 2 low-dispersion thermostatted micro valves (10 ports or 6 ports)
Flow splitter:	Nano, capillary, or micro thermostatted splitter with splitter identification system
Flow control:	Electronically controlled and actively balanced flow splitter, independent from solvent composition and backpressure
Column flow range:	50 /min to 2.5 ml/min using predefined splitter and active flow control
Flow range selection:	50 nl/min to 1000nl/min (with a nano HPLC splitter) 0.5 µl/min to 10 µl/min (with a capillary HPLC splitter) 10 µl/min to 160 µl/min (with a micro HPLC splitter)
Gradient delay time:	Typically < 1.5 min at 200 nl/min to splitter outlet
Max. column pressure:	35 MPa (4900 psi)
Wetted parts:	Fused Silica, stainless steel (1.4571, 316L), PEEK; Waste line: PTFE, aluminum oxide (Al_2O_3)
Safety features:	Humidity sensor, gas sensor, and leak sensor for the flow control valve
User input/display:	LCD indicating system parameters Standby button 3 LEDs for status monitoring (Power, Connected, Status) 4 soft keys for operation during initial installation and maintenance
GLP features:	In Chromeleon: Full support of automatic equipment qualification (AutoQ) and System Wellness monitoring All system parameters are recorded in the Chromeleon audit trail.
Power requirements:	162 VA Automatic voltage selection

Environmental conditions:	Range of use: Indoor use Temperature: 10 to 35 °C (50 °F to 95 °F) Air humidity: 80% relative humidity, non-condensing Overvoltage category: II Polution degree: 2
Dimensions (h × w × d)	17 x 42 x 51 cm (6.7 x 16.5x 20 in)
Weight	FLM-3100: 17 kg (37.4 lbs) FLM-3200: 16.3 kg (35.8 lbs) FLM-3300: 16.3 kg (35.8 lbs)

Technical information: August 2005.
All technical specifications are subject to change without notice.

9 Accessories and Spare Parts

Accessories and spare parts for the flow manager are always maintained at the latest technical standard. Therefore, part numbers are subject to alteration. However, updated parts will always be compatible with the parts they replace. The part numbers always refer to the packing unit. Unless stated otherwise, the packing unit is one unit. For more information, please contact your Dionex sales representative.

9.1 Standard Accessories (included in the shipment)

The following accessories are shipped with the flow manager. (Note: The list is subject to change without notice.) Some parts listed below are included in one of the spare part kits. For information about these kits, refer to section 9.2 (→ page 76).

Description	Part No.*	Quantity in the accessories kit
FLM-3x00 accessory kit (all versions), including:	**5720.8910**	
Power cord (220 V), 2m *or* Power cord (125 V), 2m (depending on the destination country)	6000.1000 *or* 6000.1001	1
2A fuse, slow-blow, 5x20 mm	Included in 6710.9001	2
6.3A fuse, slow-blow, 5x20 mm	Included in 6710.9001	1
Open-end wrench (1/4" x 5/16")	6000.0051	1
Wrench (size 3.0 mm	6000.0050	1
Tubing and Tee-piece for waste fluidics	Included in 6000.5001	1 each
WEEE label	----	1
Analytical tubing	6030.2548	1
PEEK tubing (130 µm I.D. x 75 cm) including appropriate fittings	6720.3220	2
Universal finger-tight fitting (1/16")	Included in 6720.0015	2 fittings
Capillary cutting tool	6720.0016	1
Teflon tubing (250 µm ID., TF-250, 5 pcs.)	6720.0030	1
Micro flow waste container	6720.0011	1
6-pin Mini-DIN signal cable (5 m)	6000.1004	1
USB cable (1m, type A to type B)	6035.9035	2
USB cable (0,5 m, type A to type B)	6720.8910	1
Column clips kit (6 clips)	6720.9002	1
Column brackets	Included in 6720.0293	2 brackets
Column ID	Included in 6710.1505	2
Dionex menu pen	6300.0100	1
Chromeleon 6 Service Pack-CD *or* Chromeleon Driver Update CD	4580.0316 *or* 5950.0092	1
Operating instructions for UltiMate 3000 Series - Flow Managers and Thermostatted Column Compartments	4827.2051	1
Assortment box for accessories	6000.0043	1

* The part number always refers to the packing unit. For more information, please contact your Dionex sales representative.

9.2 Spare Parts and Optional Accessories

Description	Part No.*
Adaptor from capillary column to flow manager switching valve (standard valve) (PeekSil, 50 µm ID, 10 cm long, 1/16")	6720.0040
Adaptor from capillary column to flow manager switching valve (biocompatible valve) (PeekSil, 50 µm ID, 10 cm long, 1/16")	6721.0040
Capillary (long) from pump to flow manager (standard devices), including the appropriate fittings and ferrules	6035.2550
Capillary (long) from pump to flow manager (biocompatible devices), including the appropriate fittings and ferrules	6037.2550
Capillary (long) from pump to flow manager (standard devices), for LC Comprehensive applications, including the appropriate fittings and ferrules	6035.2556
Capillary (long) from pump to flow manager (biocompatible devices), for LC Comprehensive applications, including the appropriate fittings and ferrules	6037.2556
Capillary (short) from pump to flow manager (standard devices), including the appropriate fittings and ferrules	6035.2553
Capillary (short) from pump to flow manager (biocompatible devices), including the appropriate fittings and ferrules	6037.2553
Capillary (short) from pump to flow manager (standard devices) for LC Comprehensive applications, including the appropriate fittings and ferrules	6035.2554
Capillary (short) from pump to flow manager (biocompatible devices) for LC Comprehensive applications, including the appropriate fittings and ferrules	6037.2554
Capillary from autosampler switching valve to flow manager switching valve (20 µm ID x 50 cm, PeekSil) for nano HPLC applications, standard devices,	6720.0036
Capillary from autosampler switching valve to flow manager switching valve (20 µm ID x 50 cm, PeekSil) for nano HPLC applications, biocompatible devices	6721.0036
Capillary from autosampler switching valve to flow manager switching valve (50 µm ID x 50 cm, PeekSil) for capillary HPLC applications, standard devices	6720.0037
Capillary from autosampler switching valve to flow manager switching valve (50 µm ID x 50 cm, PeekSil) for capillary HPLC applications, biocompatible devices	6721.0037
Capillary from autosampler switching valve to flow manager switching valve (75 µm ID x 50 cm, PeekSil) for micro HPLC applications, standard devices	6720.0038
Capillary from autosampler switching valve to flow manager switching valve (75 µm ID x 50 cm, PeekSil) for micro HPLC applications, biocompatible devices	6721.0038
Capillary from autosampler to capillary column in flow manager (50 µm ID, 70 cm long), including zero dead volume union (1/16"), standard devices	6720.0058
Capillary from autosampler to capillary column in flow manager (50 µm ID, 70 cm long), including PEEK union (1/16"), biocompatible devices	6721.0058
Capillary from capillary column to (standard) autosampler (50 µm ID x 50 cm, PeekSil)	6720.0025
Capillary from capillary column to (biocompatible) autosampler (50 µm ID x 50 cm, PeekSil)	6721.0025
Capillary from flow splitter and flow manager switching valve (20 µm ID x 30 cm, PeekSil) for nano HPLC applications, standard device	6720.0033
Capillary from flow splitter and flow manager switching valve (20 µm ID x 30 cm, PeekSil) for nano HPLC applications, biocompatible device	6721.0033
Capillary from flow splitter and flow manager switching valve (50 µm ID x 30 cm, PeekSil) for capillary HPLC applications, standard device	6720.0034
Capillary from flow splitter and flow manager switching valve (50 µm ID x 30 cm, PeekSil) for capillary HPLC applications, biocompatible device	6721.0034

Description	Part No.*
Capillary from flow splitter to autosampler for capillary applications (50 µm ID x 50 cm, PeekSil), standard devices	6720.0028
Capillary from flow splitter to autosampler for capillary applications (50 µm ID x 50 cm, PeekSil), biocompatible devices	6721.0028
Capillary from flow splitter to autosampler for micro HPLC applications (75 µm ID x 50 cm, PeekSil), standard devices	6720.0029
Capillary from flow splitter to autosampler for micro HPLC applications (75 µm ID x 50 cm, PeekSil), biocompatible devices	6721.0029
Capillary from flow splitter to autosampler for nano HPLC applications (20 µm ID x 50 cm, PeekSil), standard devices	6720.0027
Capillary from flow splitter to autosampler for nano HPLC applications (20 µm ID x 50 cm, PeekSil), biocompatible devices	6721.0027
Capillary from flow splitter to flow manager switching valve (75 µm ID x 30 cm, PeekSil) for micro HPLC applications, standard devices	6720.0035
Capillary from flow splitter to flow manager switching valve (75 µm ID x 30 cm, PeekSil) for micro HPLC applications, biocompatible devices	6721.0035
Capillary from loading pump to flow manager switching valve (PEEK, 130 µm ID, 45 cm long), including appropriate fitting connections	6720.0057
Capillary from micro column to (standard) autosampler (75 µm ID x 50 cm, PeekSil)	6720.0026
Capillary from micro column to (biocompatible) autosampler (75 µm ID x 50 cm, PeekSil)	6721.0026
Capillary from nano column to (standard) autosampler (20 µm ID x 50 cm, PeekSil)	6720.0024
Capillary from nano column to (biocompatible) autosampler (20 µm ID x 50 cm, PeekSil)	6721.0024
Capillary union (1/16", zero dead volume)	6720.0039
Column bracket, set of 4	6720.0293
Column for capillary HPLC applications (PepMap C18, 300 µm ID x 15 cm)	160295
Column for micro HPLC applications (PepMap C18, 1.0 mm ID x 15 cm)	160282
Column for nano HPLC applications (PepMap C18, 75 µm ID x 15 cm)	160321
Column ID, set of 5	6710.1505
Ferrule (1/16") for 2-position/10-port or 2-position/6-port switching valve, standard (set of 10)	6720.0017
Ferrule and nut (1/16", PEEK, long HEX nut and ferrule) for 2 position/10-port or 2-position/6-port switching valve, biocompatible (3 sets with 2 pieces each)	6721.0017
Fitting (1/32") for nano switching valve (set of 6)	6720.0080
Fitting, universal finger-tight fitting (1/16"), set of 4	6720.0015
Fitting, universal fitting (1/16", finger-tight, extra long body; set of 2)	6720.0072
Fuses (EU/US), kit including: 10 2A fuses, slow-blow, 5 x 20 mm 5 6.3A fuses, slow-blow, 5 x 20 mm	6710.9001
Ion exchange column (Poros 10 S, ID 1mm x 10 cm), including appropriate connections	163030
Ion exchange column (300 µm ID x 10 cm) packed with Poros 10 S with connections, 130 µm ID PEEK inlet (30cm) and outlet (10 cm)	162152
Ion exchange column (Poros 10S, 300 µm ID, 15 cm long)	162122
Manual injection port, standard FLM	6720.9007
Manual injection port, biocompatible FLM	6721.9007
Nut (1/16", 19 mm long, SS) (set of 10)	6720.0019
Nut (1/16", L=5", SS) (set of 10; recommended by Dionex)	6720.0020
Nut (1/16", standard, SS) (set of 10)	6720.0018

Description	Part No.*
PEEK sleeve (1/32", 300 µm ID, 3 cm; set of 6)	6720.0079
PEEK sleeve (1/32", ID 400 µm, 3 cm; set of 6)	6720.0041
PEEK sleeves for connection with fused silica capillaries (280 µm O.D., set of 5)	6720.0064
PEEK sleeves for connections with fused silica capillaries (360 µm OD, set of 5)	6720.0078
PEEK sleeves for connections with micro-tight union (280 µm OD; set of 10)	6720.0075
PEEK sleeves for connections with micro-tight union (380 µm OD; set of 10)	6720.0076
PEEKsil bridge (standard) between left and right flow manager switching valves (75 µm ID, 50 cm long), including appropriate fittings	6720.0060
PEEKsil bridge (biocompatible) between left and right flow manager switching valves (75 µm ID, 50 cm long), including appropriate fittings	6721.0060
PEEKsil bridge (standard) between left and right switching valves in flow manager (30 µm ID, 15 cm long), including appropriate fitting connection	6720.0061
PEEKsil bridge (biocompatible) between left and right switching valves in flow manager (30 µm ID, 15 cm long), including appropriate fitting connection	6721.0061
PEEKsil bridge (standard) between left and right switching valves in flow manager (30 µm ID, 30 cm long), including appropriate fitting connection	6720.0062
PEEKsil bridge (biocompatible) between left and right switching valves in flow manager (30 µm ID, 30 cm long), including appropriate fitting connection	6721.0062
PEEKsil bridge (standard) from flow manager to flow manager (75 µm ID, 30 cm long), including appropriate fitting connections	6720.0059
PEEKsil bridge (biocompatible) from flow manager to flow manager (75 µm ID, 30 cm long), including appropriate fitting connections	6721.0059
Rotor seal for 2-position/10-port C2 switching valve, biocompatible valve	6720.0092
Rotor seal for 2-position/10-port C2 switching valve, standard valve	754.C2-00R0H
Rotor seal for 2-position/6-port CN2 switching valve, biocompatible valve	754.CN2-43R6
Splitter cartridge, standard, for a split ratio of 1:1000	6720.3150A
Splitter cartridge, biocompatible, for a split ratio of 1:1000	6721.3150A
Splitter cartridge, standard, for a split ratio of 1:300	6720.3155A
Splitter cartridge, biocompatible, for a split ratio of 1:300	6721.3155A
Splitter cartridge, standard, for a split ratio of 1:100	6720.3160A
Splitter cartridge, biocompatible, for a split ratio of 1:100	6721.3160A
Splitter-Kassette, Standard, für ein Splitverhältnis von 1:15	6720.3165A
Splitter cartridge, standard, for a split ratio of 1:15	6721.3165A
Splitter cartridge, standard, for a split ratio of 1:6	6720.3170A
Splitter cartridge, biocompatible, for a split ratio of 1:6	6721.3170A
Stator for 2-position/10-port C2 switching valve, biocompatible valve	6720.0091
Stator for 2-position/10-port C2 switching valve, standard valve	754.C-0C00H
Stator for 2-position/6-port CN2 switching valve, biocompatible valve	754.CN2-4C46I
Tool for preassembly of biocompatible fittings	6000.0065
Trap column holder (5 mm, including appropriate capillaries (30µm I.D.))	6720.0012
Trap column holder (15 mm, including appropriate capillaries (60µm I.D.))	6720.0013
Tubing, fused silica, 5m (75 µm ID ± 3 µm; 280 µm OD ± 10 µm)	6720.0081
Tubing, Teflon® (500 µm ID, 100 cm long) for use as waste tubing	6720.0077
Union (micro-tight), including 2 fittings and 1 gauge plug	6720.0074
Waste fluidics kit, including 2 m tubing and 5 Tee pieces	6000.5001
Wrench, box wrench (slotted head, size 1/4")	6000.0052

* The part number always refers to the packing unit. For more information, please contact your Dionex sales representative.

10 Technical Appendix - Pin Assignment

Pin	Signal Name	Signal Level	Core Color	Core Label
1	Not occupied		Pink	Analog High
2	Not occupied		Gray	Analog Low
3	Digital_GND	0V	Green	Digital GND
5	Digital Input	0 to +5V	Yellow	Digital Input
6	Relay_NO	$100V_{DC}$/0.25A/3W	Brown	Digital Output
8	Relay_Com		White	Dig./Out (GND)
			Black	Shield

Fig. 46: 6-pin Mini DIN (Digital I/O) port and cable

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