

Thermo Scientific Dionex UltiMate 3000 Series

SRD-3x00 Solvent Racks

Operating Instructions (Original Operating Instructions)



Revision: 1.8

Date: September 2013



Declaration of Conformity

(Original Declaration of Conformity)

Product: Thermo Scientific Dionex UltiMate 3000 Solvent Rack

Types: SR-3000, SRD-3200, SRD-3400, SRD-3600

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

- Low-Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

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

- DIN EN 61010-1:2010
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 standard:

- DIN EN 61326:2006
Electrical equipment for measurement, control and laboratory use
EMC Requirements

This declaration is issued for the manufacturer

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September 2, 2013

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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 reader when operating the Thermo Scientific™ Dionex™ SRD-3x00 Solvent Rack. However, in order to obtain a full understanding of the Solvent Rack, Thermo Fisher Scientific recommends that you review the manual thoroughly before beginning operation.

Almost all descriptions in the manual apply to all SRD-3x00 Solvent Racks in the UltiMate™ 3000 series. Therefore, the term "the SRD" or "the device" is used throughout the manual. If some detail applies to only one SRD model, the model is identified by name. The same applies to the descriptions of the Viper™ capillary connections throughout this manual. They apply also to nanoViper™ capillary connections if not otherwise stated.

Note: The device configuration may vary; therefore, not all descriptions necessarily apply to your particular instrument.

The representation of a component in this manual may be slightly different from the real component. However, this does not influence the descriptions.

The software descriptions in this manual refer to Chromeleon™ 6.80 Service Release 13

This manual is provided "as is." Every effort has been made to supply complete and accurate information and all technical specifications have been developed with the utmost care. The information contained in this manual should not be construed as a commitment by Thermo Fisher Scientific. Thermo Fisher Scientific assumes no responsibility for any errors that may appear in this document that is believed to be complete and accurate at the time of publication and, in no event, shall Thermo Fisher Scientific be liable for incidental or consequential damages in connection with or arising from the use of this document. We appreciate your help in eliminating any errors that may appear in this document.

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1.2 Safety Information

The CE Mark label and cTUVus Mark safety label on the instrument indicate that the instrument is compliant with the related standards.

1.2.1 Symbols on the Module and in the Manual

The table shows the symbols used on the instrument:

Symbol	Description
	Direct current—Courant continu
	Refer to the Operating Instructions to prevent risk of harm to the operator and to protect the instrument against damage. Référez-vous à ce manuel pour éviter tout risque de blessure à l'opérateur et/ou protéger l'instrument contre tout dommage
	Label according to the "Measures for Administration of the Pollution Control of Electronic Information Products" (China RoHS) guideline Étiquette "Measures for Administration of the Pollution Control of Electronic Information Products" (China RoHS)
	WEEE (Waste Electrical and Electronic Equipment) label—For more information, see the WEEE Information section in the "Installation and Qualification Documents for Chromatography Instruments" binder. Étiquette DEEE (Déchets d'Equipements Electriques et Electroniques) — Pour plus d'informations, référez-vous au chapitre WEEE Information dans le classeur "Installation and Qualification Documents for Chromatography Instruments".

At various points throughout the manual, the following symbols indicate messages of particular importance:






Tip:

Indicates general information, as well as information intended to optimize the performance of the instrument.




Important:

Indicates that failure to take note of the accompanying information could cause wrong results or may result in damage to the module.


-  **Important:** Indique que ne pas tenir compte de l'information jointe peut conduire à de faux résultat ou 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.

1.2.2 Safety Precautions

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

-  **Tip:** Before initial operation of the SRD, make sure that you are familiar with the contents of this manual.

For the safety precautions in French, see section 1.2.3 (→ page 6).

-  **Warning:** All users of the device must observe the following safety precautions and all additional safety precautions in this manual to avoid the possibility of personal injury or damage to the device when operating the device or carrying out any maintenance or service procedures.

Observe any warning labels on the device and see the related sections in these *Operating Instructions*.

- **Protective equipment**

When performing any work on or near the HPLC system, wear personal protective equipment (protective clothing, safety gloves, safety glasses) as required by the hazard of the mobile phase and sample. For information about the proper handling of a particular substance and for advice on specific hazards, refer to the material safety data sheet for the substance you are using. Observe the guidelines of Good Laboratory Practice (GLP).

An eyewash facility and a sink should be close to the device. If any substance splashes on the eyes or skin, wash the affected area and seek medical attention.

- **Hazardous substances**

Many organic solvents, mobile phases, and samples are harmful to health. Be sure that you know the toxic and infectious properties of all substances that you are using. You may not know the toxic or infectious properties of many substances that you are using. If you have any doubt about a substance, treat it as if it contains a potentially harmful substance. For advice on the proper handling of a particular substance, refer to the Safety Data Sheet (SDS) of the manufacturer. Observe the guidelines of Good Laboratory Practice (GLP).

Dispose of waste substance in an environmentally safe manner that is consistent with all local regulations. Do not allow flammable, toxic, and/or infectious substances to accumulate. Follow a regulated, approved waste disposal program. Never dispose of flammable, toxic, and/or infectious substances through the municipal sewage system.

- **Hazardous gases**

Install the HPLC system in a well-ventilated laboratory. If the mobile phase or sample includes volatile or flammable solvents, do not allow them to enter the workspace. If the mobile phase or sample includes volatile or flammable solvents, avoid open flames and sparks.

- **Electrostatic discharge**

Discharge of electrostatic energy may lead to sparking and can constitute a fire hazard. Keep in mind that liquid flowing through capillaries can generate static electricity. This effect is particularly pronounced in insulating capillaries and with non-conductive solvents (for example, pure acetonitrile).

Take appropriate measures to prevent the generation of static electricity near the HPLC system. For example, make sure that the air humidity level in the laboratory is sufficiently high and provide proper ventilation, wear anti-static clothing or shoes, prevent accumulation of air bubbles in waste lines, and use grounded waste containers. Use only non-conductive capillaries to direct solvents into the waste container. With electrically conductive capillaries, make sure that they are properly grounded.

- **Self-ignition of solvents**

Do not use solvents for which the self-ignition temperature is below 150 °C. In case of leakage, these solvents may self-ignite on a hot surface.


- **Capillaries, capillary connections, open connections**


- ◆ Capillaries, especially non-metallic capillaries may burst, slip out of their fittings or may not be screwed in. This may result in substances spraying out of the open connections.
- ◆ In an UltiMate 3000 system, some components are made of PEEK™. This polymer has superb chemical resistance to most organic solvents. However, it tends to swell when in contact with trichloromethane (CHCl₃), dimethyl sulfoxide (DMSO), or tetrahydrofuran (THF). In addition, it is attacked by concentrated acids, such as, sulfuric acid and nitric acid or a mixture of hexane, ethyl acetate, and methanol. In both cases, capillaries may start leaking or they can burst. Swelling or attack by concentrated acids is not a problem with brief flushing procedures.
- ◆ Do not use tubing that is stressed, bent, kinked, or damaged.
- ◆ Capillary connections can be contaminated by harmful substances or harmful substances can escape from open connections.

- ◆ Some capillaries of the RS pumps and some Viper system capillaries are made of MP35N[®], a nickel-cobalt based alloy. Individuals with sensitivity to nickel/cobalt may show an allergic reaction from skin contact.
- ◆ Always wear safety glasses when handling fused silica tubing, for example, during installation or when cutting capillaries to the length.
- For safety reasons, you shall not lift the SRD with one or more solvent reservoirs being in the tray.
- The enclosure must be opened only by Thermo Fisher Scientific service personnel.
- Replace faulty communication cables.
- Replace faulty power cords. Never use a power cord other than the power cords provided for the device.
- Use only the original spare parts and accessories authorized for the device by Thermo Fisher Scientific.
- When operating the HPLC system, always set a lower pressure limit for the pump. This prevents damage resulting from leakage or from running the pump dry over a longer period. Activate solvent reservoir level monitoring (→ *Pump manual*).
- Use only standard HPLC grade solvents (MS grade if the SRD is operated together with an NCS-3500RS or NCP-3200RS) and buffers that are compatible with all parts that may be exposed to solvents (→ page 49).
- The front panel tilts upward. When lifting or moving the SRD, always lift by the bottom or sides of the instrument. This is to avoid damage to the instrument.
- The open front panel door is not designed to carry weight. Therefore, you shall not place any objects on the open front panel door.
- If a leak occurs, turn off the SRD and remedy the situation immediately.
- Before interrupting operation for several days or more, observe the precautions on page 36.
- Do not use the SRD in ways other than those described in these *operating instructions*.
- Keep the operating instructions near the device to be available for quick reference.

1.2.3 Consignes de Sécurité

Si vous utilisez d'instrumentation analytique, vous devez connaître les risques d'utilisation de produit chimiques.

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

 **Avertissement:** Toutes les personnes utilisant l'instrument doivent observer les consignes de sécurité suivantes et dans les autres chapitres de ce manuel pour éviter une mise en danger de sa personne ou de dommage à l'instrument pendant l'utilisation et des opérations de maintenance ou service de l'instrument.

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

- **Equipment de protection**

Pour tous les travaux sur le système HPLC ou à proximité, portez l'équipement de protection personnel (vêtements de protection, gant de sécurité, lunettes de protection) qui correspond aux risque découlant de la phase mobile et/ou de l'échantillon. Pour les informations sur la manipulation correcte des composés et des recommandations pour les situations de risque spécifiques, veuillez consulter la fiche de données de sécurité des substances que vous utilisez. Veuillez respecter des directives des Bonnes Pratiques de Laboratoire (BPL).

Une installation permettant de se laver les yeux ainsi qu'un lavabo doivent se trouver à proximité du système. Si une substance, quelle qu'elle soit, entre en contact avec vos yeux ou votre peau, rincez abondamment la zone affectée à l'eau, puis.

- **Substances dangereuses**

De nombreux solvants organiques, phases mobiles et échantillons sont nuisibles à la santé. Informez-vous de propriétés toxicologiques et infectieuses de toutes les substances que vous utilisez. Les propriétés toxicologiques et infectieuses de nombreuses substances peuvent être mal connues. Au moindre doute concernant une substance, traitez-la comme s'il contenait une substance potentiellement dangereuse. Pour des instructions comment utiliser correctement des composés particuliers, veuillez consulter à la fiche de données des sécurités du fabricant respectif. Veuillez respecter des directives des Bonnes Pratiques de Laboratoire (BPL).

Débarassez-vous de tous les déchets de substances de manière écologique, conformément à la réglementation en vigueur au niveau local. Empêchez impérativement l'accumulation de solvants inflammables, toxiques et/ou infectieux. Suivez un programme d'élimination des déchets règlementé et approuvé. Ne jetez jamais de solvants inflammables, toxiques et/ou infectieux dans le système municipal d'évacuation des eaux usées.

- **Gaz dangereux**

Installez le système HPLC dans un laboratoire bien ventilé. Si la phase mobile ou l'échantillon contient des solvants volatils ou inflammables, vous devez assurer qu'ils ne pénètrent dans l'espace de travail. Si la phase mobile ou l'échantillon contient des solvants volatils ou inflammables, évitez les flammes nues et les sources d'étincelles à proximité.

- **Décharge électrostatique**

Décharge électrostatique peut provoquer la formation d'étincelles et peut présenter un risque d'incendie. Veuillez noter que des solvants fluides dans les capillaires peuvent se charger automatiquement. Cet effet se peut produire particulièrement forte dans les capillaires isolants et avec des solvants non-conducteurs (par exemple, l'acetonitrile pur).

Prenez des mesures appropriées pour éviter les charges électrostatiques à proximité du système HPLC. Par exemple, s'assurez qu'il y a une humidité de l'air suffisante et une ventilation adéquate dans la laboratoire, portez des vêtements ou équipement de protection antistatique, évitez l'accumulation de bulles d'air dans les lignes de déchets et utilisez des réservoirs à déchets mis à la terre.

Utilisez uniquement des capillaires non-conducteurs pour diriger solvants au réservoir de déchets. Capillaires électriquement conducteur devrait être mis à la terre.

- **Inflammation spontanée des solvants**

N'utilisez aucun solvants avec une température d'auto-inflammabilité inférieure à 150° C. Si une fuite se produit, ces solvants peuvent s'auto-enflammer au contact d'une surface chaude.

- **Capillaires, connecteur capillaires, connexions ouvertes**

- ◆ Des capillaires, en particulier les capillaires non-métalliques, pourraient fendre ou glisser des connecteurs ou ne peuvent pas être vissés. Ceci peut en résulter aussi que des substances pourraient jaillir des connexions ouvertes.
- ◆ Dans un système UltiMate 3000, certaines composantes 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 ou d'un composé du hexane, éthyle acétate et méthanol. Ceci peut causer des capillaires de fuite ou risquer des capillaires d'éclater. Ces acides peuvent cependant être utilisés dans le cadre de procédures de nettoyage, à condition que l'exposition soit brève.
- ◆ N'utilisez pas de capillaires écrasés, pliés, abimés ou endommagés.
- ◆ Les connecteurs capillaires pour pourrait être contaminé par des substances dangereuses ou des substances dangereuses pourrait sortir des connexions ouvertes.

- ◆ Certains capillaires des pompes RS, ainsi que des capillaires du système Viper, sont faits d'alliage de nickel-cobalt MP35N. Contact avec la peau peut provoquer une réaction chez les personnes qui sont sensibles au nickel/cobalt.
- ◆ Portez des lunettes de protection lorsque vous manipulez des capillaires en silice fondue (pendant l'installation, découpe, etc.).
- Seul un personnel de service de Thermo Fisher Scientific doit démonter les capots de l'instrument.
- Remplacez les câbles de communication défectueux.
- Remplacez les cordons d'alimentation électrique défectueux. Utilisez uniquement les cordons d'alimentation électrique spécifique à l'instrument.
- Utilisez seulement des pièces de rechange originales et des accessoires autorisés par Thermo Fisher Scientific.
- Réglez toujours une limite de pression minimum pour le système HPLC. Ceci prévient les dommages résultant de fuites ou de long-terme fonctionnement à sec de la pompe. Activez la surveillance de niveau liquide pour des réservoirs (→ *manuel de pompe*).
- Utilisez uniquement des solvants (qualité HPLC; qualité MS si vous utilisez l'instrument avec un NCS-3500RS ou NCP-3200RS) et des solutions salines compatibles avec les matériaux exposés phase mobiles (→ page 49).
- Pour raison de sécurité, ne soulevez pas l'instrument avec des réservoirs.
- 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.
- Si une fuite se produit, arrêtez immédiatement l'instrument et remédiez au problème.
- Avant d'interrompre le fonctionnement pendant plusieurs jours ou plus, observez les précautions figurant sur la page 36.
- N'utilisez pas l'instrument de manière autre que celles décrites dans ce manuel.
- Conservez ce manuel à proximité de l'instrument pour pouvoir le consulter facilement.

1.3 Intended Use

For Research Use Only. Not for use in diagnostic procedures. The device is designed to be operated only by qualified and authorized personnel. All users must know the hazards presented by the device and the used substances.

The SRD has been developed as part of the UltiMate 3000 system and is a reliable module for the secure and functional positioning of the solvent reservoirs and for automatic degassing of typical HPLC (high performance liquid chromatography) solvents. The SRD is controlled by the Chromeleon Chromatography Management System from the HPLC pump of the UltiMate 3000 system. However, the SRD can be used with other HPLC systems if adequate control inputs and outputs are available.

Being part of the UltiMate 3000 system, the SRD (and the pump) can also be operated with other data systems, such as

- Xcalibur™, Compass™/HyStar™, or Analyst®
To do so, installation of the DCMSLink (Dionex Chromatography Mass Spectrometry Link) software is required in addition to the installation of the data system.
- Empower™
Installation of the Dionex Instrument Integration Software is required in addition to the installation of the data system.

For more information, contact the Thermo Fisher Scientific sales organization for Dionex HPLC Products.

Operation in stand-alone mode is possible as well.

Note that the SRD may be operated only with accessories and spare parts recommended by Thermo Fisher Scientific (→ page 51) and within its technical specifications (→ page 49).

If there is any question regarding appropriate usage, contact Thermo Fisher Scientific before proceeding.

Thermo Fisher Scientific cannot be held liable for any damage, material or otherwise, resulting from inappropriate or improper use of the instrument.



Warning:

If the device is used in a manner not specified by Thermo Fisher Scientific, the protection provided by the device could be impaired. Thermo Fisher Scientific assumes no responsibility and will not be liable for operator injury and/or instrument damage. Whenever it is likely that the protection is impaired, the instrument must be disconnected from all power sources and be secured against any intended operation.



Avertissement: Si l'instrument est utilisé de façon non spécifiée par Thermo Fisher Scientific, la protection prévue par l'instrument pourrait être altérée. Thermo Fisher Scientific n'assume aucune responsabilité et ne sera pas responsable des blessures de l'opérateur et/ou des dommages de l'instrument. Si la protection de l'instrument n'est pas garanti à tout moment, débranchez l'instrument de toutes les sources d'alimentation électrique et assurez-vous que l'instrument n'est pas utilisé involontairement.

1.4 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 Unit Description

The SRD is a modern high-quality instrument designed for HPLC analysis, especially as part of the UltiMate 3000 system. The SRD provides a secure location for installation of the solvent reservoirs and, when mounted on top of the UltiMate 3000 system, saves valuable bench space.

The SRD includes a reservoir tray, solvent reservoirs, and appropriate tubing. The integrated analytical vacuum degasser continuously degasses solvents through special polymer membranes that are permeable to gas, but not to liquids. Degassing solvents guarantees reproducibility and reduces pulsation in the connected pump.


All parts in the flow path are made of amorphous fluoropolymer (AF), PEEK, FEP, and ETFE/ECTFE (filter frit in the solvent supply line filter: stainless steel, PEEK, or titanium, depending on the pump type) to provide optimum resistance to the most commonly used HPLC solvents and buffer solutions.

2.2 SRD Configurations

The SRD is available in the following configurations:

SRD	Description	Part No.
SRD-3600	SRD with analytical 6-channel vacuum degasser typically for use with the following pumps: <ul style="list-style-type: none"> - one DGP-3600 - two HPG-3200 (SD or RS) pumps in a two-stack system - one HPG-3200 (SD or RS) and one HPG-3400 in a two-stack system - one HPG-3400 if you want to degas the solvents and the wash solution of an UltiMate 3000 series autosampler 	5035.9230
SRD-3400	SRD with analytical 4-channel vacuum degasser typically for use with the following pumps: <ul style="list-style-type: none"> - one HPG-3400 - two HPG-3200 (SD or RS) pumps in a two-stack system - one HPG-3200 (SD or RS) or ISO-3100 if you want to degas the solvents and the solution of an UltiMate 3000 series autosampler - one NCS-3500RS 	5035.9245
SRD-3200	SRD with analytical 2-channel vacuum degasser typically for use with the following pumps: <ul style="list-style-type: none"> - one HPG-3200 (SD or RS) - one ISO-3100 	5035.9250

In addition, a solvent rack *without* degasser channels is available (SR-3000, part no. 5035.9200). The SR-3000 is intended only for use as a solvent organizer, for example, together with a LPG-3400 pump. For this pump type, the degasser is incorporated in the pump.

 **Tip:** An SRD with an *analytical* degasser cannot be used with a *semipreparative* pump.

2.3 Front Panel Elements



Fig. 1: Front panel view

No.	Element	Description
1	Status LEDs	
	Power	The LED is blue when the SRD power is on.
	Vacuum	The LED is green if the degasser is working properly. The Vacuum and Status LEDs are red if the degasser vacuum is insufficient for proper degassing.
	Status	The LED is green if the degasser is working properly and no leaks have been detected. The LED is red if the leak sensor reports a leak. The Status and Vacuum LEDs are red if the degasser vacuum is insufficient for proper degassing.
2	Standby button	Switches the SRD to standby mode. The LED of the standby button is red when the SRD is in standby mode. To resume operation, press the standby button again (the LED is not lighted). Note: To allow the SRD to change the mode, press and hold the Standby button for at least one second.

⚠ Important: If you switch a pump to which a SRD-3x00 Solvent Rack is connected to the Standby mode, the Solvent Rack, too, will be set to Standby mode.

⚠ Important: Si vous commutez une pompe à laquelle est raccordé un dégazeur SRD, en mode Veille, le dégazeur passera également en mode Veille.

2.4 Rear Panel

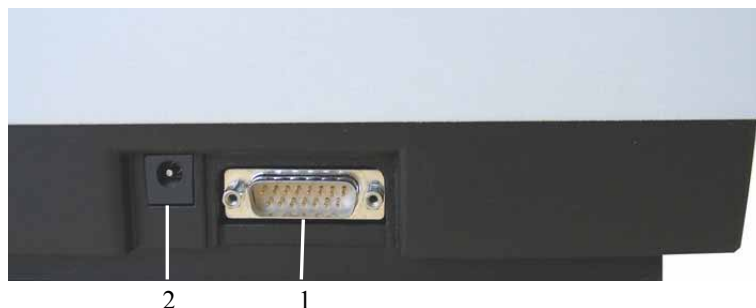


Fig. 2: Rear panel view

No.	Description
1	15-pin D-Sub port: Connects the SRD to the pump (→ page 21)
2	DC Input (Power) Only to be used if the SRD is <i>not</i> controlled by the UltiMate 3000 system pump. In this case, connect an external power supply unit (part no. 6510.0004) from here to the main power supply (→ page 21).

2.5 Fluid Connections

The SRD is designed to provide easy access to the fluid degasser connections. Tilt the front cover upward. The open door locks in its topmost position.



Fig. 3: SRD with open front panel door (here SRD-3600)

No.	Description
1	Exhaust air outlet Optional: Connect tubing to vent vapors exiting the degassing chambers.
2	Tubing guides for the solvent supply lines
3	Leak sensor (→ page 16)

STOP Warning: For safety reasons, you shall not lift the SRD with one or more solvent reservoirs being in the tray.

STOP Avertissement: Pour raison de sécurité, ne soulevez pas l'instrument avec des réservoirs.

⚠ Important: Do not lift the SRD by the front panel door. When lifting or moving the SRD, always lift by the bottom or sides of the instrument. Lifting the SRD by the front panel may damage the front panel door. The open front panel door is not designed to carry weight. Therefore, you shall not place any objects on the open front panel 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. Ne lacez aucun objet sur la porte ouverte du panneau avant. Ceci peut endommager la porte.

2.6 Leak Sensor

A leak sensor is installed inside the SRD. If liquid collects in the drip tray under the fluid connections, the leak sensor reports a leak, and the **Status** LED on the front panel door changes to red.

If the SRD is operated from a pump of the UltiMate 3000 system and if the leak sensor is exposed to liquid for at least 30 seconds, a message (Solvent Rack leak detected) appears on the front panel display of the pump and a beep sounds. If the pump is operated from Chromeleon, a message is also displayed in the Chromeleon Audit Trail.

When the leak sensor reports a leak, eliminate the cause for the leakage and dry the leak sensor (→ page 47).

2.7 Wellness

System Wellness monitors the health of the SRD. Therefore, the SRD supports several performance and reliability features that can help you detect small problems before they turn into big ones:

- Leak detection—**Status** LED on the front panel door
- Degasser vacuum level monitoring—**Status** and **Vacuum** LEDs on the front panel door

When an error is detected, the **Status** LED or the **Status** and **Vacuum** LEDs on the front panel door change to red. If the SRD is operated from the pump of the UltiMate 3000 system, one or more messages appear on the pump display and in the Chromeleon Audit Trail (→ page 39).

3 Installation

3.1 Facility Requirements

The installation site must meet the following requirements:

- The power connection is on the rear panel. Make sure that
 - ◆ Free and unrestricted access to the power connection is ensured at all times.
 - ◆ The connection cable/power cord of the device can be easily reached and disconnected from the power line at all times. Provide sufficient space behind the device to unplug the cable.
- Make sure that the installation site meets the power and environmental specifications listed in the Technical Information section (→ page 49).
- Install the SRD in the laboratory on a stable surface that is free of vibrations. Typically, the SRD is placed on top of the pump.
- Make sure that the surface is resistant to solvents.
- The ambient temperature should be kept as constant as possible.
- Avoid locations with extreme changes in temperature (such as direct sunlight or drafts) and high humidity.
- Allow sufficient clearance behind and to the sides of the SRD for ventilation.


3.2 Unpacking


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

i **Tips:** Immediately report any shipping damage to both, the incoming carrier and Thermo Fisher Scientific. Shipping insurance will compensate for the damage only if reported immediately.

Keep the original shipping container and packing material. They will provide excellent protection for the module in case of future transit. Shipping the unit in any other packaging automatically voids the product warranty.

1. Place the shipping container on the floor and remove the accessories kit and solvent reservoirs.
2. Grasp the module by the sides. Slowly and carefully, pull the SRD out of the shipping container and place it on a stable surface.

 **Important:** To prevent the device from falling, grasp the device by the sides, and then lift the unit together with the foam spacers out of the shipping container. Do not lift the device by the foam spacers or the front panel.

 **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 spacers, and then remove the polythene packaging.
4. Before connecting the SRD to the power source, wait approximately four hours to allow the instrument to come to room temperature and to allow any condensation that might have occurred during shipping to evaporate. After four hours, check the SRD; if condensation still exists, allow the instrument to continue to warm up (without connecting it to the power source) until the condensation is completely gone.

3.3 Positioning the SRD in the UltiMate 3000 System

If the SRD is part of an UltiMate 3000 system, for example, for analytical HPLC applications, you should stack the individual modules, for example, as shown in Fig. 4 and interconnect them on the rear panel as shown in Fig. 5. The arrangement of the system modules depends on the application.

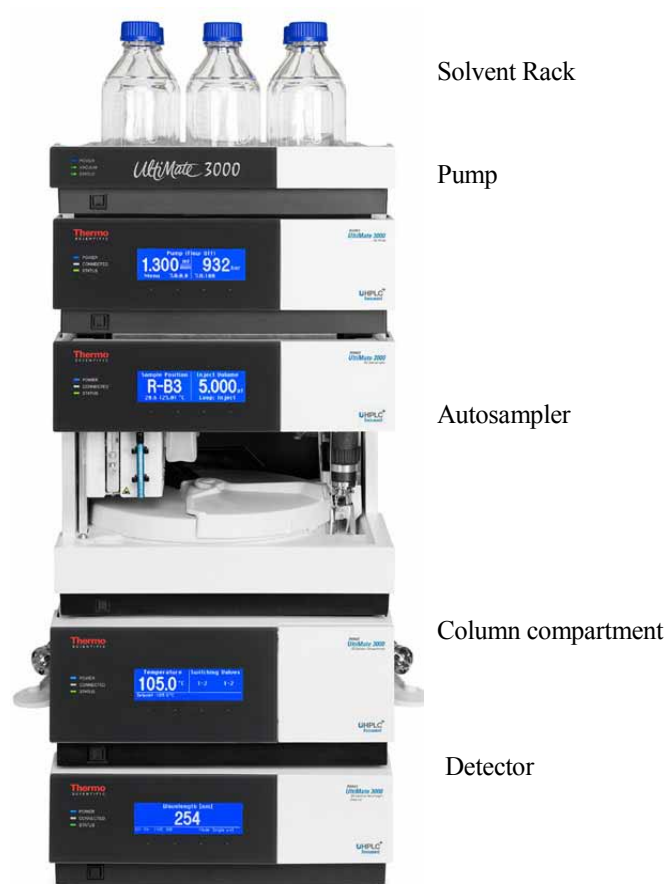


Fig. 4: Module arrangement for an UltiMate 3000 system (example)

If the solvent rack is part of an UltiMate 3000 RSLCnano system or Proteomics MDLC system, the related system manual ('UltiMate RSLCnano - Standard Applications' or 'UltiMate 3000 Proteomics MDLC - System Installation and Application') provides information about how to arrange the modules and set up the system for these applications.

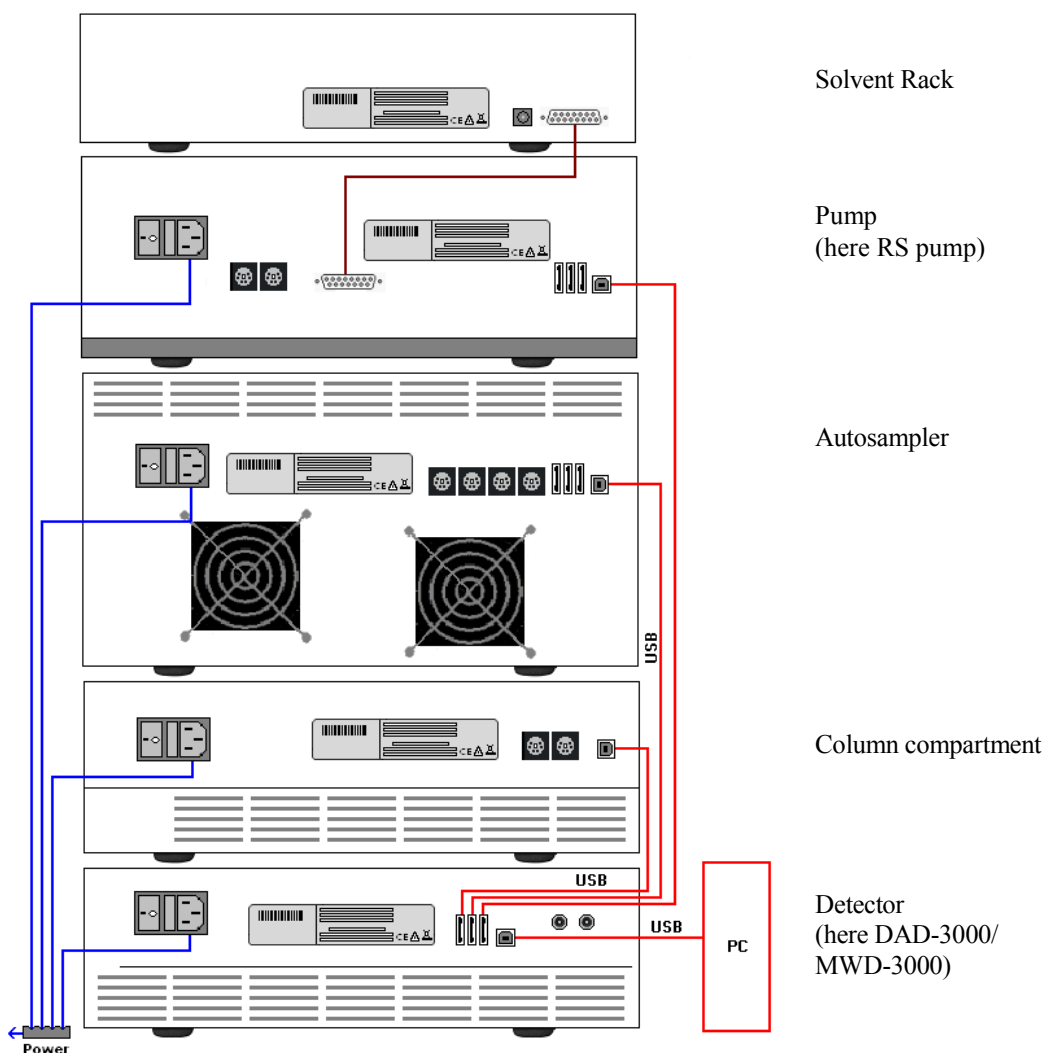




Fig. 5: Example for the rear panel connections on an UltiMate 3000 system

Apart from the Solvent Rack, all modules of the UltiMate 3000 system can be connected separately to the Chromeleon computer by using the USB port on the rear panel of the instrument. However, Thermo Fisher Scientific recommends interconnecting all modules, and then connecting the system to the Chromeleon computer with only one connection. For systems with a DAD-3000(RS) or MWD-3000(RS), you can use *only* the hub on the detector for the connection. For systems with a VWD-3x00(RS), use only the hub on the pump.

3.4 Connecting the SRD

 **Warning:** Never use a connection cord or external power supply provided for the device.

 **Avertissement:** Utilisez uniquement le câble de raccordement ou l'alimentation électrique externe spécifique à l'instrument.

3.4.1 Connecting the SRD to an UltiMate 3000 System Pump

Locate the connection cable in the accessories kit of the SRD and connect the 15-pin D-Sub port on the rear panel with the Solvent Rack port on the rear panel of the pump. To ensure trouble-free operation, use only the cable shipped with the instrument.


When the SRD is connected to the pump, the solvent rack is powered from the pump. The SRD need *not* be connected directly to the main power supply.


For information about the pin assignment for the 15-pin D-Sub connector, see page 55.


3.4.2 Connecting the SRD to the Main Power Supply (Optional)


The SRD needs to be connected to the main power supply only if it is not operated from an UltiMate 3000 system pump. For this scenario, an external power supply (part no. 6510.0004) is available as an option for the SRD.

Use the external power supply unit to connect the DC input on the rear panel to a power source that is connected to a true ground. No manual adjustment is required to adapt the line voltage to local voltage requirements.

 **Warning:** Do not use multiple sockets or extension cords. Using defective multiple sockets or extension cords may cause personal injury or damage to the device.

 **Avertissement:** N'utilisez pas des blocs multiprise ou des câbles prolongateurs. Cela pourrait entraîner des blessures corporelles ou endommager l'instrument.

 **Important:** Do *not* connect the external power supply unit when the SRD is connected to an UltiMate 3000 system pump (→ section 3.4.1).

 **Important:** N'utilisez pas d'alimentation électrique externe si l'instrument est raccordé un pompe du système UltiMate 3000 (→ chapitre 3.4.1).

4 Preparation for Operation (Startup)

4.1 Overview

After you have unpacked, positioned, and connected the SRD described in sections 3.1 through 3.4 (→ page 17 and following pages), prepare the SRD for operation:

1. Connect drain tubing (→ section 4.2).
2. Connect the solvent reservoirs, and then connect the solvent supply lines to the degassing channels (→ page 24).
3. Select one of the following alternatives:
 - *To operate the SRD with the pump of the UltiMate 3000 System*
Connect the pump to the degassing channels (→ page 27).
 - *Standalone Operation*
Connect the degassing channels as required by your application.

4.2 Connecting Drain Tubing

To discharge liquid leaks that might have accumulated in the interior, the SRD has a drain port at the bottom right of the instrument.



Fig. 6: Drain port

Direct liquid leaks to waste through the drain system of the UltiMate 3000 system. The required components are shipped with the UltiMate 3000 pumps, NCS-3500RS and NCP-3200RS, but can be ordered also separately. The drain kit (part no. 6040.0005) includes all required components and detailed installation instructions.

4.3 Solvent Reservoirs

All Solvent Racks are shipped with solvent reservoirs and appropriate tubing, including frit holders with filter frits.

4.3.1 General Notes

When connecting the solvent reservoirs, observe the following general precautions:

- Observe the precautions for solvent selection (→ page 29).
- Before using the solvent reservoirs for the first time, rinse them thoroughly by using high-purity solvents.
- Always install filter frits on the solvent supply line filters. This prevents contaminants from reaching the HPLC system that may increase wear and cause damage to the system.
- Regularly check the filter frits for permeability. This is especially important when using aqueous solvents. Aqueous solvents may contaminate the filters with algae and other microorganisms that deposit on the filter frits. Therefore, use fresh solvents at regular intervals. Clean the reservoirs thoroughly before refilling them and replace the filter frits as necessary.
- As a standard, filter holders with stainless steel frits are provided in the accessories kit of the Solvent Rack. Do *not* use these frits if the system includes a biocompatible pump, and NCS-3500RS or an NCP-3200RS. In this case, replace the stainless steel frits with the frits from the accessories kit of the module.

Open the filter holder and remove the filter frit. When placing the new filter frit into the bottom part, make sure that the frit is in a level position (avoid tilting the frit).

- Make sure that the tubing connecting the pump to the degasser is as short as possible and locate the solvent reservoirs as close as possible to the pump. To avoid formation of air bubbles in the reservoirs and reformation of air bubbles in the solvent, make sure that the reservoirs are on the same level or higher as the pump. Therefore, stack the rack onto the pump as shown in Fig. 4 (→ page 19).
- Normal phase eluents usually show only a low concentration of dissolved gases. Therefore, it is normally not required to use a degasser with these eluents.
- Before connecting the solvent supply lines, make sure that the connectors are free of contaminants. Even minute particles can allow air to enter the degasser, and thus reduce the degassing effectiveness.

- When replacing solvents, make sure that the solvents are miscible. Mix immiscible solvents with an intermediate solvent (for example, isopropanol) to replace them step-by-step.

i **Tip:** If the UltiMate 3000 system includes an UltiMate 3000 series autosampler, Thermo Fisher Scientific recommends degassing the wash solution on a continuous basis, for example, by using the degasser of an appropriate SRD. The procedure how to prepare and install the liquid lines for the wash solution is similar to connecting the solvent supply lines. For details, see the *Autosampler manual*.

4.3.2 Connecting the Solvent Reservoirs

1. Feed the solvent supply line through the retaining guide, which holds the tubing in place in the reservoir, and then into the open hole in the reservoir cap.
2. Verify that an appropriate frit is installed in the filter holder.

Pump	Filter frit (material, porosity)	Part No.
SD(N) pumps	Stainless steel, 10 µm	6268.0110
BM pumps NCS-3500RS, NCP-3200RS	PEEK, 10 µm	6268.0117
RS pumps AB pumps	Titanium, 10 µm	6268.0111

3. Slide the filter holder with filter frit onto the end of the solvent supply line.
4. *If required*
Cut the tubing straight if necessary. The end of the solvent supply line should be cut straight and not deformed. Use only the original Dionex solvent supply lines.
5. Place the entire unit in the reservoir.
6. Tighten the reservoir cap hand-tight. Press the retaining guide into the hole in the reservoir cap to hold the solvent supply line in place inside the reservoir.

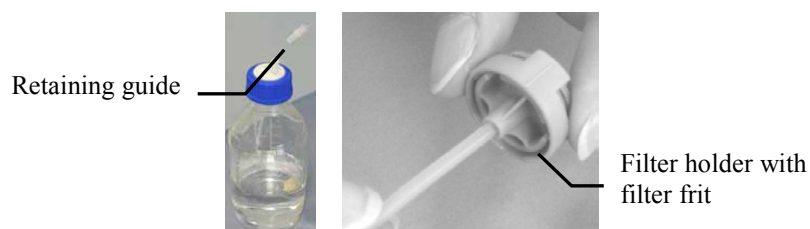


Fig. 7: Connecting the solvent supply lines to the reservoirs

When replacing a solvent supply line, remove the filter holder, then the retaining guide, and then the solvent supply line.

7. Connect the lines to the appropriate connection ports on the degassing module. Route the solvent supply lines through the opening between the housing and the front panel door.

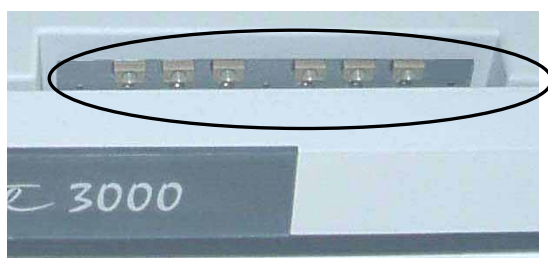


Fig. 8: Opening for the solvent supply lines

8. Remove the fitting plugs from the degasser inlet if necessary and connect the solvent supply line with the associated line label.

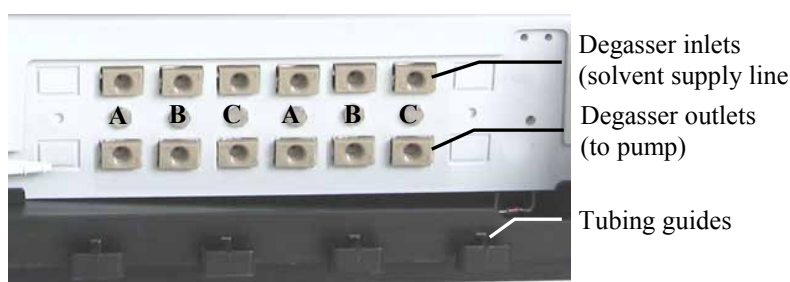


Fig. 9: Example for degasser connections (here SRD-3600)

i Tip: The degasser ports in the upper row are combined in pairs with the related ports in the lower row.

Before connecting the solvent supply lines, make sure that the connectors are free of contaminants. Even minute particles can allow air to enter the degasser, and thus reduce the degassing effectiveness.

9. Connect the solvent supply lines from the pump to the degasser (→ page 27).

4.3.3 Connecting the Solvent Supply Lines to the Degasser

With all UltiMate 3000 system pumps, the solvent supply lines are connected to the pump at the factory.

1. If necessary, route the solvent supply lines through the opening between the front panel door and top cover (→ Fig. 10).

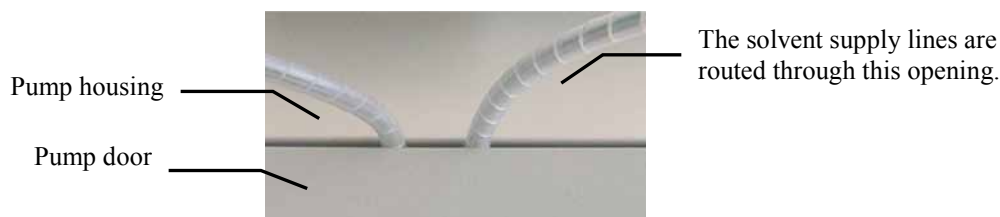


Fig. 10: Preconnected solvent supply lines (here on a DGP-3600)

2. Tubing guides in the SRD facilitate the connection of the solvent supply lines (→ Fig. 9, page 26). Place the solvent supply line in a tubing guide, remove the blind fitting from the associated degasser outlet if necessary (→ Fig. 9), and connect the solvent supply line with the associated line label.
3. Locate the solvent reservoirs as close as possible to the pump. To avoid formation of air bubbles in the reservoirs and reformation of air bubbles in the solvent, make sure that the reservoirs are on the same level or higher as the pump. Therefore, stack the SRD onto the pump as shown in Fig. 4 (→ page 19). The tubing connecting the pump to the degasser should be as short as possible to avoid reformation of air bubbles in the solvent.

Tip: If a degasser is connected to the pump but is not used (degasser turned off), change the flow path and connect the solvent reservoirs directly to the pump, instead.


5 Operation and Maintenance


5.1 Choosing the Solvents

Observe the following precautions for solvent selection:

- Use only HPLC grade water or better LC-MS grade (0.2 µm, filtered).
If water from water purification systems is used that are not properly maintained, polymeric contamination may seriously damage the column, rapidly block solvent frits, and result in early piston seal wear.
- Use only standard solvents and buffers that are compatible with all parts of the UltiMate 3000 system that may be exposed to solvents.
For information about the wetted parts in the Solvent Rack, see the Technical Information section (→ page 49). For information about the wetted parts in the other UltiMate 3000 system modules, refer to the 'Technical Information' section in the operating instructions for the modules.
- Observe also the information about the pH range and buffer concentration in the Operating Instructions for the other UltiMate 3000 system modules.
- Make sure to use special (highly pure) solvents. They are usually labeled accordingly by the vendor.
- Mind the special properties of the solvents, such as viscosity, boiling point, UV absorption (UV/VIS detector), refractive index (refractive index detector), and dissolved gas (degasser).
- Observe the solvent compatibility of the degasser.
Whenever possible, avoid using the following solvents: hexafluoroisopropanol, solvents containing hydrofluoric acid, perfluorinated solvents, and freons. For modules with a serial number < 8014538, you should avoid also hexanes (60% n-Hexane).
- Except for the SDN pumps, the UltiMate 3000 system pumps are shipped with reversed phase (RP) seals as main piston seals.
Keep in mind that using chloroform, trichlorobenzene, methylene chloride, tetrahydrofuran, or toluene as solvents chemically damages the UHMW-PE seals. Chemical reactions may also occur when using tetrachloromethane, diethyl ether, diisopropyl ether, ketones, toluene, methylcyclohexane, and monochlorobenzene. If you use these solvents, contact the Thermo Fisher Scientific sales organization for Dionex HPLC Products.

- In an UltiMate 3000 system, some components are made of PEEK. This polymer has superb chemical resistance to most organic solvents. However, it tends to swell when in contact with trichloromethane (CHCl₃), dimethyl sulfoxide (DMSO), or tetrahydrofuran (THF). In addition, it is attacked by concentrated acids, such as, sulfuric acid and nitric acid or a mixture of hexane, ethyl acetate, and methanol. In both cases, capillaries may start leaking or they can burst. Swelling or attack by concentrated acids is not a problem with brief flushing procedures.
- Before switching from buffer to organic solution, rinse the system thoroughly with deionized water.
- When switching to another solvent, ensure that the new solvent is miscible with the one contained in the system. Otherwise, for example, the pump can be damaged by flocculation.
- After operation, rinse out buffers and solutions that form peroxides.

 **Important:** *Neither* recycle the solvent *nor* use methanol from aluminum reservoirs. This may impair the performance of the seals.

 **Important:** Thermo Fisher Scientific déconseille de recycler les solvants. Ceci peut nuire aux performances des joints.

5.2 General Notes for Degasser Operation

In normal operation, the degasser is quiet. Even if the vacuum pump is running, the operating noise is very low. With higher load, the operating noise may slightly increase. However, this does not impair the degassing performance.

In addition, observe the following to ensure optimum degassing performance:

- Thermo Fisher Scientific recommends filling *all* channels with eluent and degassing *all* channels (even if they are not used for the application). This will reduce the speed of the vacuum pump and reduce the degasser noise.
- To avoid contamination of the degasser, you should prepare fresh solvents, clean the solvent supply lines, and rinse the degassing channels at regular intervals (→ page 46).
- Thermo Fisher Scientific advises *against* recycling the solvents. This may impair the degassing performance.
- Before connecting the solvent supply lines, make sure that the connectors are free of contaminants. Even minute particles can allow air to enter the degasser, and thus reduce the degassing effectiveness.
- When replacing solvents, make sure that the solvents are miscible. Mix immiscible solvents with an intermediate solvent to replace them step-by-step.
- Thoroughly rinse the degasser with methanol or isopropanol after operation. The alcohol does not need to be removed afterward.
- For longer periods of inactivity and when using saliferous buffers (which may result in salt crystallization in the gas separation membrane, thereby impairing the degassing performance), rinse with de-ionized water followed by either methanol or isopropanol.
- Also, observe the information about the solvent compatibility of the degasser (→ page 29).

5.3 Operational Settings

5.3.1 Turning the Degasser on or off (from the UltiMate 3000 System Pump)

When the SRD is connected to the pump, NCS-3500RS, or NCP-3200RS of an UltiMate 3000 system and when the module is powered up, the SRD is powered from the module. The degasser is ready for operation.

You can turn the degasser on or off:

- From the front panel display of the pump
- From Chromeleon if the module is operated from Chromeleon
- By the standby button on the front panel display (→ page 13). Press and hold the button for one second to allow the SRD to change the mode.

Observe the following:

- Turning off the module to which the SRD is connected, also turns off the SRD. The same applies to Standby mode.
- Thermo Fisher Scientific recommends always leaving the degasser on.

5.3.1.1 Turning the Degasser on and off from the Pump Display

1. On the front panel display of the pump, show the function keys and select **Menu**. (For details, see the *Pump* and/or *NCS/NCP manuals*.)
2. On the **Main** menu, select **Preferences**, and then select **Degasser**.
3. Select **On** (or **Off**) to turn on (or off) the degasser.


5.3.1.2 Turning the Degasser on and off in Chromeleon

If the pump is operated from Chromeleon, select one of the following alternatives to turn the degasser on and off:

- Directly from the Panel Tabset (→ page 33)
- Directly from the **Commands** dialog box for the pump (→ page 34)
- Automatically with a program file (PGM) for the pump (→ page 34)

If the Solvent Rack is connected to an SD(N), RS, or BM pump or to an NCS-3500RS or NCP-3200RS, verify in the Properties dialog for the device that Degasser Control is set to External (with SD(N), RS, and BM pumps on the Devices page; with an NCS/NCP on the Pumps page).

To turn the degasser on or off from the Panel Tabset

1. In Chromeleon, click the **View** menu and **Default Panel Tabset** or click the corresponding icon on the toolbar , and then connect to the Chromeleon server. Chromeleon creates centralized control panels, called panel tabsets, for all timebases available on the Chromeleon server. A panel tabset provides control panels for the individual instruments in a timebase and, in addition, one or more panels for performing system-wide functions, for example, creating and running sequences. For more information about panel tabsets, see the Chromeleon Help.
2. On the **panel tabset** for your timebase, click the pump page (→ Fig. 11) or NCS/NCP page.

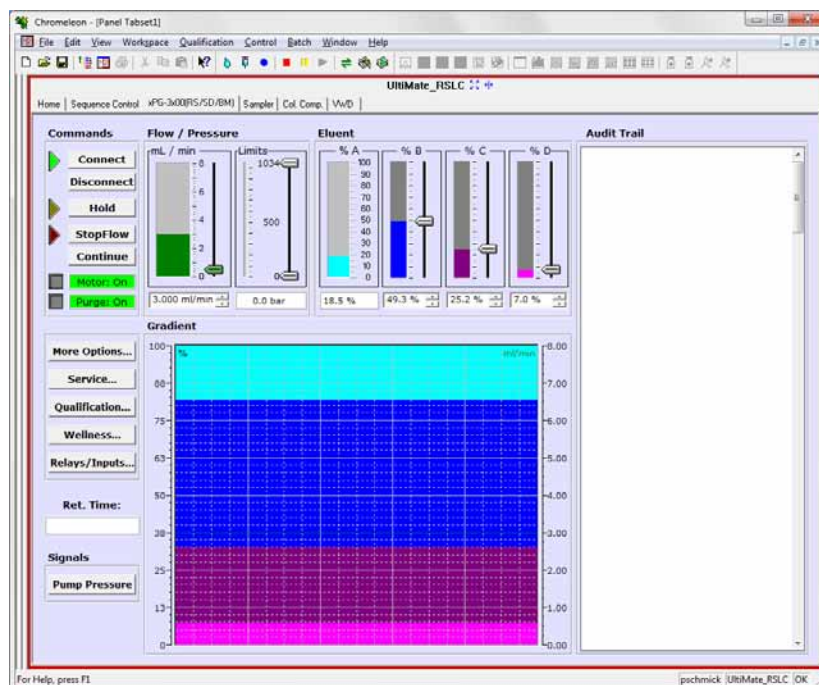


Fig. 11: Pump control panel on the panel tabset

3. Verify that the module (pump, NCS, or NCP) is connected to Chromeleon (the LED next to the Connect button is green). If it is not, click Connect.
4. Click **More Options** and select **On** or **Off** under **Degasser Mode**.

To turn the degasser on or off from the Commands dialog box

1. In Chromeleon, open a control panel for the pump (or the pump module of the NCS or NCP, respectively) and connect to the timebase in which the pump is installed. (For details, see the *Pump* and/or *NCS/NCP manuals* and the *Chromeleon Help*.)
2. On the **Control** menu, select **Command**.
3. Depending on the pump type, click the plus sign next to **PumpModule** or **Pump** to display the items underneath.
4. Set **Degasser** to **On** (or **Off**) to turn on (or off) the degasser.

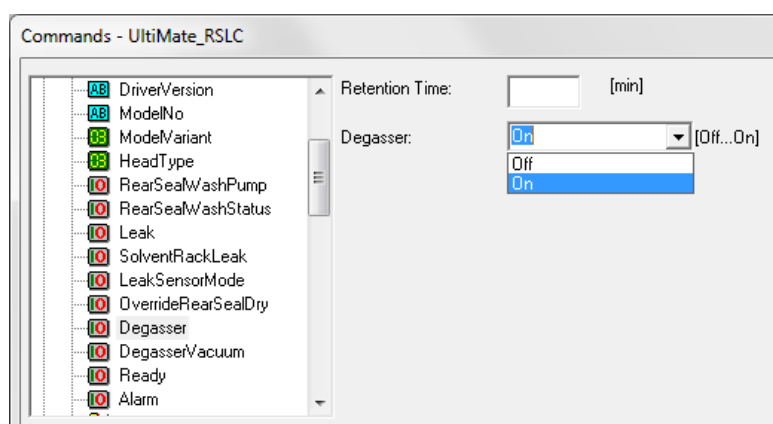


Fig. 12: Commands dialog box

To turn the degasser on or off automatically

It is also possible to include the command for turning the degasser on or off in a program file (PGM) for automated operation of the pump. (For details about program creation, see the *Pump* and/or *NCS/NCP manuals* and the *Chromeleon Help*.)

5.3.2 Turning the Degasser On or Off (Stand-alone Operation)

If the SRD is directly connected to the power source by using the external power supply unit (→ page 21), the degasser reaches the appropriate operating vacuum after a short time. When the front panel LEDs are blue/green/green, the degasser is ready for operation.

5.4 Special Chromeleon Functions

This section provides a short overview of some special functions that Chromeleon supports for the SRD. These functions are available in the **Commands** dialog box for the pump or on the control panel for the pump. For more information, see the *Chromeleon Help*.

5.4.1 Leak and Vacuum Monitoring

The following SRD-related parameters appear in the **Commands** dialog box under **PumpModule** (or **Pump**, depending on the pump type):

Chromeleon	Description
DegasserVacuum	Reports whether the degasser in the SRD has reached the operating vacuum.
SolventRackLeak	Reports whether the leak sensor in the SRD detected a leak.

If the SRD is controlled by Chromeleon together with the pump 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, see the *Chromeleon Help*.)

5.4.2 SRD Diagnostics

Chromeleon 6.80 supports Diagnostics functions for the pumps of the UltiMate 3000 system, also allowing you to check the performance of the solvent rack degasser. (For more information, see the *Pump* and/or *NCS/NCP manuals* and the *Chromeleon Help*.)

You can run the test for a SRD for which the last four digits of the serial number end in 0701 or higher or for which the serial number starts with is 8 or 9. The serial number is provided on the type label on the rear of the SRD.

1. On the **Control** menu, select **Diagnostics**. (The **Control** menu is visible only when a control panel is open.)
2. The Diagnostics dialog box lists all tests that are available for the devices in the current timebase. Select the **Degasser Vacuum Test**.
3. A wizard guides you through the test. Enter the serial number of the SRD and follow the steps of the wizard. For more information about the test, see the *Chromeleon Help*.

If the test fails, see page 40 for a short description of possible causes along with recommended courses of action.

5.5 Shut Down

Observe the following precautions before interrupting the operation or before shipping the SRD:

- Thoroughly rinse the degasser with methanol or isopropanol after operation.
- For longer periods of inactivity and when using saliferous buffers (which may result in salt crystallization in the gas separation membrane, thereby impairing the degassing performance), rinse with de-ionized water followed by either methanol or isopropanol.
- Ship the SRD only in the original shipping container and observe the packing instructions.

If the original shipping container is not available, appropriate shipping containers and packing material can be ordered from Thermo Fisher Scientific sales organization for Dionex HPLC products. The packing instructions are included in the "Installation and Qualification Documents for Chromatography Instruments" binder and are available on request.

Shipping the module in any other packaging automatically voids the warranty. For more information, see the warranty statement in the terms of sale.

When the SRD is connected to the pump of the UltiMate 3000 system and when you are running Chromeleon, you can set the pump with the SRD and HPLC system into the standby mode or automate system shutdown. (For more information, see the *Pump* and/or *NCS/NCP manuals* and the *Chromeleon Help*.)

5.6 Routine and Preventive Maintenance

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

Perform the maintenance procedures listed in the table at regular intervals to ensure optimum performance and maximum uptime of the SRD. The exact maintenance schedule for the module will depend on a number of factors.

Frequency	What you should do...
Regularly	To avoid contamination of the degasser: <ul style="list-style-type: none"> • Prepare fresh solvents. • Clean the solvent supply lines. • Rinse the degassing channels (→ section 7.2).
	Check the fluid lines for any signs of leakage and/or salt deposits.
	Check the drain tube connected to the drain port at the bottom right of the SRD. Verify that the tubing is unclogged and is routed below the drain port. Check the volume of the liquid in the waste container and empty as needed.
Annually	Have authorized Service personnel perform preventive maintenance once a year.

i **Tip:** If the SRD is operated with the pump of an UltiMate 3000 system and if the pump is operated by Chromeleon, you can check the performance of the SRD degasser (→ page 35).

6 Troubleshooting

6.1 Overview

The following features help you to identify and eliminate the source for problems that may occur during the operation of the SRD or UltiMate 3000 system.

Status LEDs

The status LEDs (light emitting diodes) on the front panel display provide a quick visual check of the operational status of the SRD. They indicate whether the SRD is turned on and operating properly (→ page 13).

Messages

If the SRD is operated from a pump of the UltiMate 3000 system and if a fault or error is detected during the operation of the SRD, a message appears on the front panel display of the pump. Check the Messages on the Pump Display section for recommended courses of action (→ page 40). If the pump is operated from Chromeleon, a message is also displayed in the Chromeleon Audit Trail.

i **Tip:** For information about operating problems that might occur during the operation of an UltiMate 3000 system, see Operating Problems (→ page 41).

Diagnostics Test

When the SRD is operated with the pump of an UltiMate 3000 system and when the pump is operated by Chromeleon, you can check the performance of the SRD degasser from Chromeleon (→ page 35). If the test fails, check the Chromeleon Diagnostics Message section for a short description of possible causes along with recommended courses of action (→ page 40).


If you are unable to eliminate a problem following the instructions given here, contact Thermo Fisher Scientific Service for Dionex HPLC Products.

6.2 Messages on the Pump Display

Each time a fault or error occurs during the operation of the SRD, the Status LED or the Status and Vacuum LEDs on the front panel door change to red. If the SRD is operated from the pump of the UltiMate 3000 system, one or more messages appear on the pump display. When the pump is operated from Chromeleon, the message also appears in the Chromeleon Audit Trail.

The table lists SRD-related messages along with recommended remedial actions. In addition to the messages in the table, other messages may appear. In this case, write down the exact wording of the message and contact Thermo Fisher Scientific Service for Dionex HPLC Products if you are unable to eliminate the problem.

Message	Remedial Action
Degasser malfunction.	The vacuum level monitoring function of the degasser in the SRD was activated. Turn the SRD off and on again by pressing the standby button on the front panel. Contact Service if the message appears again.
Solvent Rack leak detected.	The leak sensor in the SRD has reported a leak. There is a leak in the system or a fluid connection is loose. Locate the source for the leak, eliminate the cause, and dry the leak sensor (→ page 47).

 **Tip:** For information about the messages related to the pump, see the *Pump* and/or *NCS/NCP manual*.

6.3 Chromeleon Diagnostics Message

When the degasser in the SRD fails the **Degasser Vacuum Test**, the degassing module most probably did not reach the appropriate operating vacuum.

Check the tubing of the vacuum system and the degassing module and repeat the test. If the test fails again, the degassing module may be defective and should be replaced.

6.4 Operating Problems

The following table provides information about common operating problems that might occur with an UltiMate 3000 system and lists probable causes, as well as remedial actions.

For more information and remedial actions, see the manuals for the other modules of the UltiMate 3000 system.

Problem	Probable Cause	Remedial Action
No function	<p>The instrument is not connected to the mains.</p> <p>The degasser is turned off.</p> <p>The instrument is in standby mode.</p> <p>An error occurred in the electronic system.</p>	<p>Check the connection to the module (pump, NCS, or NCP) of the UltiMate 3000 system or the connection of the external power supply unit (→ page 20).</p> <p>Verify that the degasser is turned on: If the SRD is operated from a module of the UltiMate 3000 system, see page 32. If the SRD is operated in standalone mode, see page 34.</p> <p>Press the Standby button on the front panel.</p> <p>Contact Service.</p>
The module does not work correctly when the pump is controlled by Chromeleon.	<p>The SRD is not connected to the Chromeleon computer by means of a USB connection (through a module of the UltiMate 3000 system).</p> <p>The USB port on the computer is not ready for operation.</p> <p>The degasser is not connected correctly to the pump or NCS/NCP.</p>	<p>Check the USB cable and connection to the computer.</p> <p>Check the USB port on the computer.</p> <p>Check the connection to the UltiMate 3000 system module (→ page 21).</p>
High baseline drift	<p>The column is contaminated.</p> <p>The system is not sufficiently equilibrated.</p>	<p>Clean or replace the column.</p> <p>Flush the system until equilibration. Usually, a volume of 5–10 times the column volume will be sufficient.</p>

Problem	Probable Cause	Remedial Action
High baseline drift (Cont'd)	<p>The eluents are degraded or inhomogeneous.</p> <p>The environmental conditions are unstable.</p> <p>The mobile phase is delivered in circles.</p> <p>For additional causes, refer to the operating instructions for the detector.</p>	<p>Before you start an analysis, be sure that the eluents are already homogenized in the reservoirs. Use fresh solvent and check the eluent filter frits. In aqueous solvents, growth of microorganisms is possible.</p> <p>Make sure that the temperature and the humidity are constant. Avoid draft. Verify on the detector that the lamp and flow cell covers are in proper position and that the front panel door is closed.</p> <p>Direct the mobile phase to waste.</p> <p>→ <i>Detector manual</i></p>
High noise level, non-periodic baseline fluctuation	<p>The eluent is degraded or of poor quality/purity.</p> <p>For additional causes, refer to the operating instructions for the detector.</p>	<p>Use fresh solvents. Use HPLC grade solvents (MS grade if the SRD is operated together with an NCS-3500RS or NCP-3200RS).</p> <p>→ <i>Detector manual</i></p>
Periodic baseline fluctuation, pulsation	<p>There are pressure fluctuations from the pump.</p> <p>There are air bubbles in the system.</p>	<p>Purge the pump (→ <i>Pump manual</i>).</p> <p>Purge the pump (→ <i>Pump manual</i>).</p>
Reproducible ghost peaks in the chromatogram.	<p>The degassing channels are contaminated.</p> <p>The eluents are degraded, dirty or of poor purity/quality.</p> <p>Contamination occurs somewhere in the system.</p>	<p>Rinse the degassing channels (→ page 46).</p> <p>Use fresh eluent. Use HPLC grade solvents (MS grade if the SRD is operated together with an NCS-3500RS or NCP-3200RS).</p> <p>Flush the system using an appropriate solvent.</p>
Additional peaks appear in the injection peak.	<p>With gradients, the equilibration time after the flush cycle is too short.</p> <p>There is excessive dead volume.</p>	<p>Extend the equilibration time.</p> <p>Eliminate possibly existing dead volume.</p>


Problem	Probable Cause	Remedial Action
Spikes	<p>There is electrical interference from other modules.</p> <p>For additional causes, refer to the operating instructions for the detector and for the column compartment.</p>	<p>Isolate the electrical circuit from strong current consumers. Consider installing an uninterruptible power supply (UPS).</p> <p>→ <i>Detector manual</i> → <i>TCC manual</i></p>
Negative peaks	<p>Sample solvent and mobile phase differ in composition.</p> <p>The absorption of the solute is lower than the absorption of mobile phase.</p>	<p>Dissolve the sample in the mobile phase.</p> <p>Select a different wavelength. Use a mobile phase with less UV background absorption.</p>
Poor peak area precision	<p>The capillary connections are not installed properly or they are not tight.</p> <p>There are dead volumes in the capillary connections.</p> <p>The sample is unstable and decomposes.</p> <p>Baseline fluctuations</p>	<p>Check and tighten the capillary connections. Consider using Viper capillaries. Exchange the needle seat if necessary (→ <i>Autosampler Manual</i>). Exchange the needle if necessary (→ <i>Autosampler manual</i>).</p> <p>Replace the fittings. Make sure that the capillaries are installed correctly. Consider using Viper capillaries.</p> <p>Use new sample or change the conditions. Cool the sample in the autosampler if possible.</p> <p>See the remedial actions provided in the related baseline sections further up in this table.</p>

Problem	Probable Cause	Remedial Action
<p>Poor peak area precision (Cont'd)</p>	<p>The gradient is irreproducible.</p> <p>The environmental conditions are unstable.</p> <p>Contamination occurs somewhere in the system.</p> <p>For additional causes, refer to the operating instructions for the autosampler and for the pump.</p>	<p><i>RS, SD(N), and BM pumps:</i></p> <ul style="list-style-type: none"> - Change the gradient. - Check the pump function and degassing. - Check the filter frits in the solvent supply line filters for contamination. Replace the frits as necessary. <p><i>NCS-3500RS, NCP-3200RS:</i> The pressure transducer offset may not be correct. Check the offset and calibrate the pressure transducers if required (→ <i>NCS/NCP manual</i>).</p> <p>Make sure that the temperature and the humidity are constant. Consider using a thermostatted column compartment. Avoid draft.</p> <p>Flush the system using an appropriate solvent. Check the filter frits in the solvent supply line filters for contamination. Replace the frits as necessary.</p> <p>→ <i>Autosampler manual</i> → <i>Pump manual</i> → <i>NCS/NCP manual</i></p>
<p>Poor degassing</p>	<p>There is a leak in the capillaries or solvent supply lines.</p> <p>The flow rate is too high.</p>	<p>Inspect the capillaries and solvent supply lines for leakage; tighten loose fitting connections.</p> <p>Reduce the flow rate.</p>
<p>Degasser noise</p>	<p>The vacuum pump of the degasser is running at high speed.</p>	<p>Fill and degas all channels (even if they are not used for the application).</p>


7 Service

7.1 General Notes and Safety Precautions

The following sections describe all service and repair procedures that the user may perform. All other maintenance and service procedures must be performed only by Thermo Fisher Scientific service personnel.

 **Warning:** The fluid components of the device may be filled with solvents that are harmful to health. Wear appropriate personal protective equipment. Rinse the fluid components with an appropriate solvent to remove harmful substances.

For information about the proper handling of a particular substance and for advice on specific hazards, refer to the material safety data sheet for the substance you are using. Observe the guidelines of Good Laboratory Practice (GLP).

 **Avertissement:** Les composants fluidiques de l'instrument peuvent être remplis de solvants nocifs. Portez l'équipement de protection personnel approprié. Rincez les composants fluidiques avec un solvant approprié afin d'éliminer les substances nocives.

Pour les informations sur la manipulation correcte des composés et des recommandations pour les situations de risque spécifiques, veuillez consulter la fiche de données de sécurité des substances que vous utilisez. Veuillez respecter des directives des Bonnes Pratiques de Laboratoire (BPL).

Observe the following:

- For all service and repair procedures, observe all precautionary statements provided in these operating instructions.
- Use only the original spare parts authorized for the device by Thermo Fisher Scientific.
- Before returning the SRD for repair, contact Thermo Fisher Scientific Service for Dionex HPLC Products. An RMA (Return Material Authorization) number is required in order to track your instrument. Always use the original packaging and observe the packing instructions when shipping the SRD. Shipping the SRD in anything other than the original packaging will void the warranty. For more information, see the warranty statement in the terms of sale.

If the original shipping container is not available, appropriate shipping containers and packing material can be ordered from Thermo Fisher Scientific sales organization for Dionex HPLC products. The packing instructions are included in the "Installation and Qualification Documents for Chromatography Instruments" binder and are available on request.

For instructions on shutting down the SRD, see page 36.

7.2 Rinsing the Degassing Channels

To avoid contamination of the degasser, you should prepare fresh solvents, clean the solvent supply lines, and rinse the degassing channels at regular intervals.

Rinsing the degassing channels is especially important for the channel that degasses aqueous solvents (for reverse-phase chromatography).

Usually, it is sufficient to rinse all channels with organic solvent. Use a fresh bottle. When you use water and acetonitrile or methanol, it is usually sufficient to rinse the degassing channels once per week.

However, adapt the rinsing intervals to the solvents in use. In persistent cases, for example, reproducible ghost peaks in the chromatogram, follow these steps:

1. Install a backpressure capillary on the pump outlet. The capillary should be appropriate for generating a backpressure of 20 to 30 MPa.
2. Rinse the degassing channels for 1 hour with 20% nitric acid at the flow rate normally used for your application.
3. Rinse the degassing channels with fresh HPLC grade water (MS grade if the SRD is operated together with an NCS-3500RS or NCP-3200RS) until the pH value is neutral.
4. Rinse the degassing channels for two hours with fresh HPLC grade acetonitrile (MS grade, respectively) at the flow rate normally used for your application.
5. Prepare fresh solvents for your application (using new bottles) and connect them to the degassing channels.
6. Install new filter frits in the solvent supply line filters.
7. Uninstall the backpressure capillary and reconnect the system as required by your application.
8. Equilibrate the system.

7.3 Eliminating Leakage in the Solvent Rack

The leak sensor is installed inside the SRD and reports a leak when liquid collects in the drip tray under the fluid connections. Locate the source for the leak, eliminate the cause, and dry the leak sensor.

1. Inspect the degasser inlets and degasser outlets, and the connected solvent supply lines for signs of leaks. Tighten or replace leaking connections if necessary.
2. Dry the components.
3. With a cloth or tissue, absorb all liquid that has collected in the tray. Make sure that you do not bend or damage the sensor.



Fig. 13: Drying the leak sensor

If the SRD is operated from the pump of the UltiMate 3000 system, the message remains on the pump display for information purposes even after the source for the leak has been eliminated. Select **Clear** on the navigation bar on the pump display to remove the message.

4. Allow the sensor to adjust to the ambient temperature for a few minutes.
5. If no errors are reported, operation can be resumed.

i **Tip:** If the sensor is not dry, the Status LED remains red.

8 Technical Information

Bottle capacity:	Eight 1-L reservoirs <i>or</i> four 2.5-L reservoirs <i>or</i> two 5-L reservoirs <i>or</i> five 1-L reservoirs and one 5-L reservoir <i>or</i> three 2.5-L reservoirs and two 1-L reservoirs <i>or</i> three 1-L reservoirs and two 2.5-L reservoirs <i>or</i> sixteen 0.5-L reservoirs
Degassing channels:	SRD-3600: 6 vacuum channels (analytical) SRD-3400: 4 vacuum channels (analytical) SRD-3200: 2 vacuum channels (analytical)
Degasser membranes:	Amorphous fluoropolymer (AF)
Channel volume	670 µL
Max. flow rate per channel:	12 mL/min
Control:	Controlled by the UltiMate 3000 system pump (from Chromeleon) or standalone operation
Communication:	15-pin D-Sub connector (through the pump of the UltiMate 3000 system)
Power supply:	15-pin D-Sub connector (through the pump of the UltiMate 3000 system) or external power supply unit (optional)
User input/display:	3 LEDs (Power, Vacuum, and Status) Standby button
Wetted parts:	Amorphous fluoropolymer (AF), PEEK, FEP, and EFTC/ECTFE Solvent supply line filter frit: SST, PEEK, or titanium
Safety features:	Leak monitoring, vacuum monitoring
Environmental conditions:	Range of use: Indoor use Temperature: 10 °C to 35 °C (50 to 95 °F) Air humidity: max. 80% relative humidity, non-condensing Pollution degree: 2
Power requirements:	Max. 30 VA
Emission sound pressure level:	< 60 B(A) in 1-m distance
Dimensions (H x W x D):	10 x 42 x 51 cm
Weight:	4.8 kg (without bottles)

Technical information: October 2012.

All technical specifications are subject to change without notice.

9 Accessories, Consumables, and Spare Parts

Accessories, consumables, and spare parts 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.

9.1 Standard Accessories

The following accessories are shipped with the instrument (subject to change without notice). The part number always refers to the packing unit. Unless otherwise stated, the packing unit is 1 unit. For more information, contact the Thermo Fisher Scientific sales organization for Dionex HPLC Products.

Description	Quantity in the kit	Part No.	
SRD-3600 accessories, including:			
Cable connecting the SRD and the UltiMate 3000 system module (pump, NCS-3500RS, or NCP-3200RS)	1	6000.1006	
Cap (to close the holes in the solvent bottle caps)	40	Included in	6000.0047
Bottle cap for solvent reservoirs (including caps to close the holes in the bottle cap)	6	Included in	6270.0013
Solvent filter, including: Filter holder (top and bottom parts) and filter frit (stainless steel, porosity: 10 µm)	6	Included in Included in	6268.0115 6268.0110
Retaining guide (solvent bottle)	6	Included in	6000.0042
1-liter solvent reservoir	6	2270.0012	
Solvent supply line (analytical)	6	6030.2548	
Tubing labels, white (A, B, C, D)	4 each	-----	

Description	Quantity in the kit	Part No.	
SRD-3400 accessories, including:			
Cable connecting the SRD and the UltiMate 3000 system module (pump, NCS-3500RS, or NCP-3200RS)	1	6000.1006	
Cap (to close the holes in the solvent bottle caps)	20	Included in	6000.0047
Bottle cap for solvent reservoirs (including caps to close the holes in the bottle cap)	4	Included in	6270.0013
Solvent filter, including: Filter holder (top and bottom parts) and filter frit (stainless steel, porosity: 10 µm)	4	Included in Included in	6268.0115 6268.0110
Retaining guide (solvent bottle)	4	Included in	6000.0042
1-liter solvent reservoir	4	2270.0012	
Solvent supply line (analytical)	4	6030.2548	
Tubing labels, white (A, B, C, D)	2 each	-----	

Description	Quantity in the kit	Part No.	
SRD-3200 accessories, including:			
Cable connecting the SRD and the UltiMate 3000 system module (pump, NCS-3500RS, or NCP-3200RS)	1	6000.1006	
Cap (to close the holes in the solvent bottle caps)	20	Included in	6000.0047
Bottle cap for solvent reservoirs (including caps to close the holes in the bottle cap)	2	Included in	6270.0013
Solvent filter, including: Filter holder (top and bottom parts) and filter frit (stainless steel, porosity: 10 µm)	2	Included in Included in	6268.0115 6268.0110
Retaining guide (solvent bottle)	2	Included in	6000.0042
1-liter solvent reservoir	2	2270.0012	
Solvent supply line (analytical)	2	6030.2548	
Tubing labels, white (A, B, C, D)	2 each	-----	

9.2 Optional Accessories

Description	Part No.	Remarks
Drain kit for UltiMate 3000 systems	6040.0005	The drain kit includes all required components and detailed installation instructions.
External power supply unit	6510.0004	To connect the SRD to the power source if the SRD is <i>not</i> operated together with the pump of the UltiMate 3000 system.

9.3 Consumables and Spare Parts

Description	Part No.
Solvent supply line (analytical)	6030.2548
Fitting plug degasser	6000.0048
Solvent filter, filter holder (top and bottom parts), pack of 6 filters	6268.0115
<i>Filter frits in the solvent filter</i>	
Filter frit, stainless steel, porosity: 10 µm (pack of 10 frits) for SD(N) pumps	6268.0110
Filter frit, PEEK, porosity: 10 µm (pack of 10 frits) for BM pumps, NCS-3500RS, and NCP-3200RS	6828.0117
Filter frit, titanium, porosity: 10 µm (pack of 10 frits) for RS and AB pumps	6828.0111
Solvent reservoir (1-L; with cap)	2270.0012
External power supply unit	6510.0004
Bottle cap for solvent reservoirs (including caps to close the holes in the bottle cap) 4 caps	6270.0013
Retaining guide (for solvent bottle), pack of 5 guides	6000.0042
Cable connecting the SRD and the UltiMate 3000 system module (pump, NCS-3500RS, or NCP-3200RS)	6000.1006
Cap (to close the holes in the solvent bottle caps), pack of 20 caps	6000.0047
Caps and retaining guides for solvent bottles, kit of 10 caps (to close the holes in the solvent bottle caps) and 5 retaining guides (for solvent bottle)	6030.9101

10 Pin Assignment

10.1 15-pin D-Sub Port

Pin	Signal Name	Signal Level	Remarks
1			Reserved
2	Solvent Rack Error		TTL_high with SRD errors
3			Jumper to pin 9
4	Solvent Rack Leak		TTL high with SRD leaks
5			Reserved
6	V_Degas	+24V_supply	Supply for the SRD
7	GND_Degas	Ground_supply	Reference potential for V_Degas
8	VCC		Voltage for logic devices
9			Jumper to pin 3
10	GND		Reference potential for VCC
11	GND		Reference potential for VCC
12	GND		Reference potential for VCC
13			Reserved
14	V_Degas	+24V_supply	Supply for the SRD
15	GND_Degas	Ground_supply	Reference potential for V_Degas

Fig. 14: 15-pin D-Sub port (male)

10.2 DC Input

The DC input is used to connect the SRD to the main power supply. This is required only if the SRD is not operated from an UltiMate 3000 system pump.

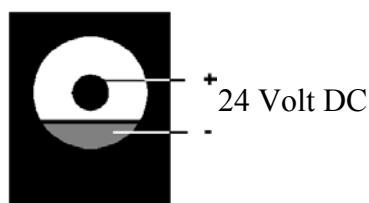


Fig. 15: DC input

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