Thermo Scientific Dionex

Charged Aerosol Detectors
Corona Veo and Corona Veo RS

Operating Instructions
(Original Operating Instructions)

Revision: 1.0

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CE

Declaration of Conformity

(Original Declaration of Conformity)

Product: Thermo Scientific Dionex - Detector

Types: **Corona Veo** and **Corona Veo RS**

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

Responsible for the technical CE documentation is the manufacturer (see further down).

This declaration is issued for the manufacturer

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June 17, 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™ Corona™ Veo™ charged aerosol detector. However, in order to obtain a full understanding of your detector, review the manual thoroughly before beginning operation.

The descriptions in this manual apply to the following charged aerosol detectors:

- Corona Veo
- Corona Veo RS

The following conventions apply to the descriptions throughout this manual:

- The term "the detector" or "the device" is used throughout the manual. If some detail applies to only one detector version, the version is identified by name.
- If not otherwise stated, the descriptions for the Viper™ capillary connections apply also to the nanoViper™ and possible other Viper capillary connections.
- The detector configuration may vary. Therefore, not all descriptions necessarily apply to your particular detector.
- The representation of a component in this manual may be different from the real component. However, this does not influence the descriptions.
- The descriptions in this manual refer to firmware version 1.01.

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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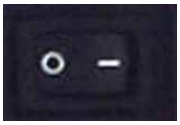
1.2 Safety

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

1.2.1 Symbols on the Detector and in the Manual

The following safety symbols are used on the detector:

Symbol	Description
~	Alternating current—Courant alternatif
	Power supply is on (-)—L'instrument est mis sous tension (-) and Power supply is off (O)—L'instrument est mis hors tension (O)
	Protective grounding—Mise à la terre de protection
	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, messages of particular importance are indicated by certain symbols:

Tip: Indicates general information, as well as information intended to optimize the performance of the device.

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

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

Tip: Before initial operation of the detector, make yourself familiar with the contents of this manual.

For the safety precautions in French, see page 7.

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.

  The exhaust gas may contain hazardous fumes. To avoid an accumulation of the exhaust gasses, make certain that the exhaust gas is absorbed by a fume hood or other ventilating device. Maintain a well-ventilated laboratory. Do not vent directly into the laboratory.

- **Electrostatic discharge**

  Discharge of electrostatic energy may lead to sparking and can constitute a fire hazard. This effect is particularly pronounced in insulating capillaries und 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 trichlormethane ($CHCl_3$), 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.
  - Always wear safety glasses when handling fused silica tubing, for example, during installation or when cutting capillaries to the length.

- Disconnect the detector from all power sources before removing the panels. When the panels are removed, dangerous electrical connections will be exposed.

- Always replace blown fuses with original spare part fuses authorized by Thermo Fisher Scientific.
- 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.
- To prevent damage to the detector when lifting or moving, always lift the unit by the bottom sides or sides. Do not lift the detector by the bottom front or front panel door. This may damage the door.
- 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 HPLC grade water.
- When switching to another solvent, ensure that the new solvent is miscible with the one contained in the HPLC system. If the solvents are not miscible, the system can be damaged, for example, by flocculation.
- If a leak occurs, turn off the detector immediately, stop the pump flow, and remedy the situation.
- Use only standard solvents (HPLC grade) and buffers that are compatible with all parts that may be exposed to solvents.
- Before interrupting operation for several days or more or when preparing the detector for transport, observe the precautions for shutting down the detector (→ page 74).
- Do not use the detector 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.

Veuillez 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 pour éviter une mise en danger de sa personne ou de dommage à l'instrument pendant l'utilisation et des opérations de maintenance 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).

  Débarrassez-vous de tous les déchets de substances de manière écologique, conformément à la règlementation 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.

  Le gaz d'échappement peut contenir des émanations dangereuses. Pour éviter une accumulation des gaz d'échappement, assurez-vous que les gaz d'échappement sont absorbés par une hotte ou autre dispositif d'aération.

- **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 le 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 sulfoxide (DMSO) ou du tetrahydrofuran (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.
  - Portez des lunettes de protection lorsque vous manipulez des capillaires en silice fondue (pendant l'installation, découpe, etc.).

- Quand les capots de protection de l'appareil sont démontés, vous êtes exposés à des connexions électriques sous haute tension deviennent accessibles. Débranchez l'instrument de toute source d'alimentation électrique avant de retirer les capots. Ne démontez les capots de protection que si cela est explicitement demandé au cours de ces instructions.
- Remplacez toujours les fusibles grillés par des fusibles de rechange autorisés par Thermo Fisher Scientific.
- 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 la pompe HPLC. Ceci prévient les dommages résultant de fuites ou de long-terme fonctionnement à sec de la pompe.
- 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.
- 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 la pompe. Dans le cas contraire, la pompe peut être endommagée; par exemple, par des floculations!
- Si une fuite se produit, arrêtez immédiatement l'instrument, stoppez le débit de la pompe et remédiez au problème.
- Utilisez uniquement des solvants (qualité HPLC) et des solutions salines compatibles avec les matériaux exposés phase mobiles.
- De nombreux solvants organiques et solutions salines sont toxiques. Informez-vous des propriétés toxicologiques de toutes les phases mobiles que vous utilisez.
- Avant d'interrompre le fonctionnement pendant plusieurs jours ou plus, observez les précautions figurant en page 74.
- N'utilisez pas l'instrument de manière autre que celles décrites dans ce manuel.
- Conservez ce manuel á proximité de l'instrument pour pouvoir le consulter facilement.

1.3 Intended Use

The device is designed to be operated only be qualified and authorized personnel. All users must know the hazards presented by the device and the used substances.

The detector is designed for laboratory research use only in high-performance liquid chromatography (HPLC) or ultra-high performance liquid chromatography (UHPLC) applications. It is designed as part of the UltiMate 3000 system, but can also be used with other HPLC systems if adequate control inputs and outputs are available. A PC with USB port is required.

The detector can be controlled by the Chromeleon™ Chromatography Management System, but it can also be operated with other data systems, such as

- Xcalibur™.
  To do so, installation of the DCMS^{Link} (Thermo Scientific Dionex Chromatography Mass Spectrometry Link) software is required in addition to the installation of the data system.

- Empower™.
  To do so, installation of the Thermo Scientific Dionex Instrument Integration Software is required in addition to the installation of the data system.

For information about the availability of these and other data systems, contact the Thermo Fisher Scientific sales organization for Dionex HPLC products.

Observe the following when using the detector:

- The detector must be operated only with original accessories and spare parts as recommended by Thermo Fisher Scientific and within the technical specifications (→ page 121).

- Use only standard solvents of at least HPLC grade or better solvent quality that are compatible with all parts of the system that may be exposed to solvents. For information about the wetted parts in the detector, see the 'Technical Information' section (→ section 9, page 121). 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 UltiMate 3000 modules.

- Use only volatile organic buffers. Avoid using inorganic buffer salts as mobile phase modifiers, because they form non-volatile particles upon drying. This may result in loss of performance and damage to the detector.

- Note the special properties of the solvents, such as the viscosity, boiling point, UV absorption (UV/Vis detector), refractive index (refractive index detector), dissolved gas (degasser), as well as pH value.

- In addition, observe the information about the solvent compatibility, buffer concentrations and mobile phase requirements of the other system modules. For more information, refer to the *Operating Instructions* for the respective modules.

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

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'operateur 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.

Reference Documentation

In addition to this manual, it may be necessary to obtain information from other documents for modules that you use in conjunction with the detector. These documents include (but are not limited to):

- Operating Instructions for the other modules of your system
- Chromeleon 6.80 Chromatography Management System Help documents
- *If applicable*
  Operating Instructions for the gas supply (for example, nitrogen generator)

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 detector is a modern high-quality instrument designed for HPLC, UHPLC and microLC analyses, especially as part of the UltiMate 3000 system.

- The detector uses charged aerosol detection (CAD) technology for liquid chromatography. This technique enables detection of all non-volatile and many semi-volatile analytes in the eluent.
- The compound that is analyzed does not need to possess a chromophore as is the case with UV detection. Also, the compound does not need to be ionized as is the case with mass spectrometry.
- The detector provides great sensitivity and a wide dynamic range. Under isocratic conditions, non-volatile analytes produce similar response, independent of chemical structure.
- Fast data sampling ensures full compatibility with HPLC and UHPLC applications.
- The concentric design of the FocusJet™ nebulizer provides an extended flow rate range. In addition, the adjustable evaporation temperature optimizes analyte response.
- Controlling the detector by the Chromeleon Chromatography Management System provides a high degree of system integration, as well as maximum analysis efficiency due to comprehensive data analysis and evaluation features in Chromeleon.
- All parts that may be exposed to solvents are made of materials that provide optimum resistance to the most commonly used solvents and buffer solutions in HPLC.

2.2 Detector Configurations

The detector is available in the following configurations:

Description	**Part no.**
Corona Veo	5081.0010
Corona Veo RS	5081.0020

2.3 Operating Principle

The operating principle of the detector is based on charged aerosol detection. In charged aerosol detection, the detector measures charge that is imparted to dried particles that are formed from an ultra-fine aerosol of the analyte. The measured charged is proportional to the amount of analyte in the sample.

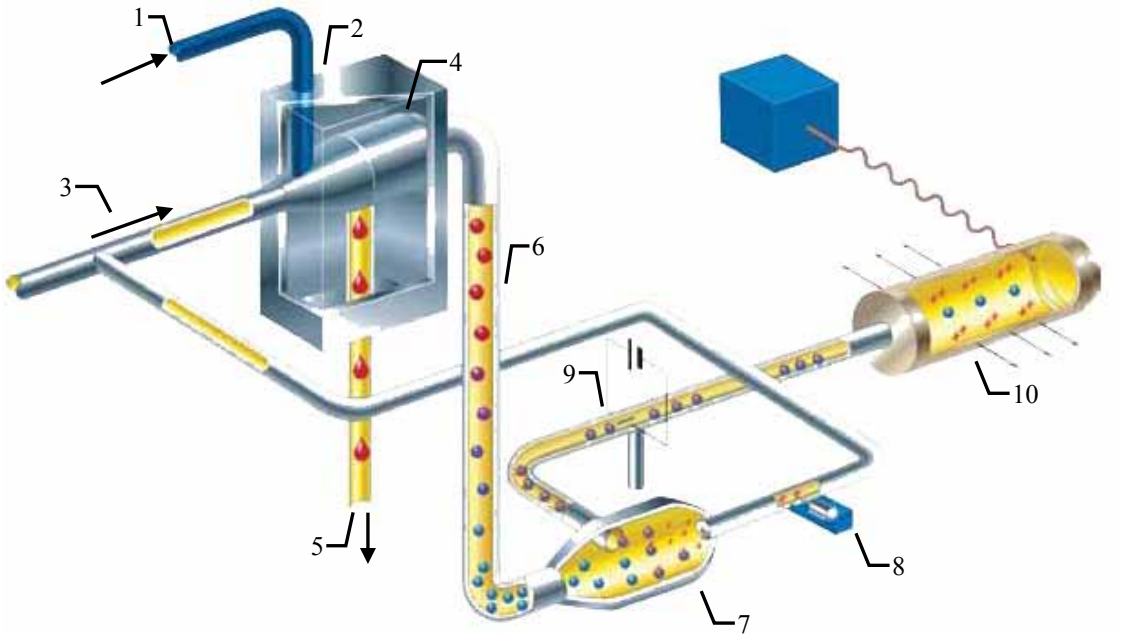


Fig. 1: Schematic drawing of the operating principle

No.	Description	No.	Description
1	Mobile phase and analyte from column	6	Evaporation tube
2	Nebulizer	7	Mixing chamber
3	Gas inlet	8	Ion jet inlet
4	Spray chamber	9	Ion trap
5	Through drain pump to waste	10	Electrometer

The mobile phase with the analyte elutes from the column (no. 1) and is introduced into the nebulizer (no. 2). Pressurized gas (no. 3) is introduced that has been passed through the integrated gas filter. In the spray chamber (no. 4), the mobile phase with the analyte is nebulized into an aerosol with the help of the pressurized gas. Large aerosol droplets are removed from the detector by the drain pump (no. 5).

The resulting fine aerosol droplets pass through the evaporation tube (no. 6) that removes the solvent and more volatile components. The remaining dried particles enter into the mixing chamber (no. 7). The dried particles collide with a stream of ionized gas (no. 8) formed when nitrogen passes over a corona wire. This leads to a diffusional charging of the aerosol particles. The larger the particle, the higher is the level of charge that can be carried. The particles that carry the charged nitrogen pass through an ion trap (no. 9).

In the ion trap excess charge is removed. The charge of the remaining aerosol particles is then measured by the electrometer (no. 10). The greater the amount of analyte that enters the detector and the larger the size of the particles formed, the greater is the charge that they can carry and the larger the response the detector measures.

For a diagram of the gas and aerosol flow paths inside the detector, see section 11.2 (→ page 132).

2.4 Interior Front Panel

The detector is designed to provide easy access to the interior front panel. The white cover is secured by magnets on the right side of the interior front panel and a tab on the left side of the cover that slides into a slot on the black front bezel. Remove the white cover on the right side of the front panel to access the detector inlets and the leak sensor.

Fig. 2: Front view of the detector (here: Corona Veo RS)

No.	Description
1	LED 'Power' The LED is blue when the detector is on.
2	Display with integrated touch screen, showing: - General information - Detector menu and settings
3	Capillary slots
4	FocusJet nebulizer When the detector is shipped, no nebulizer is installed.
5	*Corona Veo RS only* Stream-switching valve
6	Leak sensor

2.5 Rear Panel

Fig. 3: Rear Panel (here: Corona Veo RS)

No.	Description
1	Cooling fan
2	Gas connections
2a	Gas exhaust
2b	Gas inlet
2c	*Corona Veo only* Manual gas regulator knob (For the Corona Veo RS, a plug is installed instead.)
3	Digital I/O consisting of 2 terminals with TTL inputs and relay outputs For connection to external devices.
4	Fuse cartridge Contains two slow-blow fuses rated at 1 A (5 x 20 mm).
5	Main power receptacle
6	Power switch
7	Analog signal output (optional) Installable option to connect a suitable coaxial cable. For installation details, see the *Installation Instructions* in the Analog Signal Output Kit.
8	USB port (USB 1.1 and 2.0 compatible) To connect the detector to the data system computer.
9	Protective grounding Indicates the functional earth terminal.

2.6 Flow Connections

The detector is designed to provide easy access to the capillary and tubing connections. Open the cover on the right front side of the detector to access the liquid inlet. Slots at the top and on the right side of the white front panel cover provide paths for capillary connections to the system.

Tip: The flow path between the column and the detector should be as small a volume as possible (shortest capillary connection possible) to avoid peak broadening effects and the accompanying loss of chromatographic efficiency.

2.7 Nebulizer

The detector is shipped without a nebulizer being installed. Install a nebulizer before operation as described in the *Installation Instructions* for the nebulizer.

The FocusJet concentric nebulizer is the liquid inlet of the detector. Gas supplied by an external gas source is directed to the nebulizer and merged with the incoming liquid from the column to create an aerosol.

2.8 Manual Gas Regulator Knob (Corona Veo only)

The Corona Veo detector is equipped with a manual gas regulator. An adjustment knob on the rear panel of the detector is used to regulate the internal gas pressure.

2.9 Stream-Switching Valve (Corona Veo RS only)

The Corona Veo RS is equipped with a 6-port 2-position stream-switching valve (SSV). The SSV can be used to direct flow to the nebulizer or divert to external devices or waste.

To connect the stream-switching valve, see section 4.4.5 (→ page 40).

For further information about the operation of the stream-switching valve, see section 5.5.2 (→ page 64).

2.10 Leak Sensor

A leak sensor is located within the drip tray on the bottom right side of the front panel of the detector for the automatic sensing of liquid leaks. If liquid collects in the drip tray under the flow connections**,** the leak sensor reports a leak. A warning code appears on the display.

Tip: If you operate the detector from a chromatography data system, a warning code will also be documented in the audit trail of the software.

When the leak sensor reports a leak, eliminate the cause for the leakage and dry the leak sensor (→ page 112). If the sensor is not dry, the display continues to report the leakage with a warning code on the display.

2.11 Detector Display

The detector is equipped with a liquid-crystal color display with integrated touch screen designed for easy menu navigation. To operate the detector using the display, select the soft-keys on the display for menu navigation.

For further information about the display and detector menu, see section 5.3 (→ page 48).

2.12 Self-Test Diagnostics and Preventive Maintenance

The detector supports several performance and reliability features:

- Self-test diagnostics upon power-up (→ page 47)
- Preventive maintenance (→ page 109)
- Leak sensor (→ page 70)
- Internal liquid sensor (→ page 70)

3 Installation

3.1 Facility Requirements

In addition to the facility requirements and safety information below, observe the precautionary statements in section 1.2.2 (→ page 4).

Site Requirements

The installation site must meet the following requirements:

- The main power switch and the main power receptacle are on the rear panel. Make sure that
  - ♦ Free and unrestricted access to the main power switch is ensured at all times.
  - ♦ The 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.
- The installation site must meet the power and environmental specifications listed in the 'Technical Information' section (→ section 9, page 121).
- Install the detector in the laboratory on a stable, flat surface that is free of vibrations.
- The detector should have approximately 65 cm of linear bench space. The bench top should be at least 65 cm deep.
- Make sure that the surface is resistant to solvents.
- Avoid locations with extreme changes in temperature, such as near air conditioning vents or locations with air drafts.
- Avoid locations with direct sunlight and high humidity.
- Allow sufficient clearance behind and to the sides of the detector for easy access to power connections, the main power switch, gas connections and ventilation. Maintain at least a 15 cm clearance behind the detector from any vertical surface.
- Install the detector in a location that provides access to a power outlet, nearby gas supply and ventilation sources. Place the detector in a position such that all appropriate rear panel connections to the system are possible.
- An uninterruptible power supply (UPS) may be necessary for electrical lines that are susceptible to large power fluctuations.

- Connect the detector to an electrical line that shares a common ground with other system modules. If necessary, use a properly functioning multiple socket. A common ground for all system modules will avoid ground loops which can create erratic results (for example, high baseline noise).

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

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

Ventilation Requirements

- Ventilation must be at atmospheric pressure with no vacuum or negative pressure applied.

  Important: A vacuum in the ventilation may cause depressurization inside the detector. This may impair detector operation and lead to decreased performance.

  Important: Un vide dans la ventilation peut conduire à la dépressurisation à l'intérieur du détecteur. Ceci peut nuire au bon fonctionnement du détecteur et contribuer à une diminution des performances.

- Install the HPLC system in a well-ventilated laboratory. Exhaust gases (including carrier gas, vaporized eluents and solute micro particles) exit on the rear panel of the detector through an external vent. The exhaust gas may contain volatile organic compounds in low concentration. Connect the gas exhaust to a fume hood or other ventilation device and the detector is properly vented. Observe the safety precautions on hazardous gases in section 1.2.2 (→ page 4).

Gas Supply Requirements

⚠ **Important:** To prevent damage to the detector, do not exceed the maximum gas pressure of 550 kPa (80 psig) for the gas supply.

⚠ **Important:** Ne pas dépasser une pression de gaz maximaux de 550 kPa (80 psig) pour l'approvisionnement en gaz.

- If you work with combustible solvents, use nitrogen gas. Higher purity nitrogen is not required but recommended and should be dry (not containing water vapor). Medical-grade nitrogen from an in-house liquid nitrogen source is sufficient. However, filter the supplied gases through a submicron particle filter before they enter the detector. Not using a well-filtered operating gas supply may increase the baseline noise.
- Observe the following notes:
  - The inlet gas must be clean and free from micro particles (size ≤ 0,1 µm).
  - The inlet gas supply pressure must be between 480 – 550 kPa (70 – 80 psig).
  - The gas consumption of the detector is approximately 4 L/min.
- Pressure variations in which the gas supply drops below 480 kPa (70 psig) may result in loss of performance. Monitor the gas supply pressure during the installation.

3.2 Unpacking the Detector

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

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 provide excellent protection for the module in case of future transit. Shipping the module in any other packaging automatically voids the product warranty.

1. Open the packaging box of the detector and remove the accessories kit and power cord. Some accessories may be shipped in a separate box.

   The scope of delivery comprises:

   - Detector
   - Accessories kit
   - Nebulizer
   - Power connection cable
   - Operating Instructions

2. Grasp the detector by the sides. Slowly and carefully, pull the detector out of the shipping container and place it on a stable surface.

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

   Important: Afin d'empêcher l'instrument de tomber, saisissez-la par les côtés. Ne soulevez l'instrument e à l’aide du matériau d'emballage ou par les portes des panneaux avants.

3. Remove the foam spacers, and then remove the polythene packaging.

4. Before connecting the detector to the power source, allow the module to come to room temperature and to allow any condensation that might have occurred during shipping to evaporate.

3.3 Positioning the Detector in an UltiMate 3000 System

If the detector is part of an UltiMate 3000 system, for example for analytical HPLC applications, stack the individual modules and interconnect them on the rear panel as shown in the example in Fig. 4.

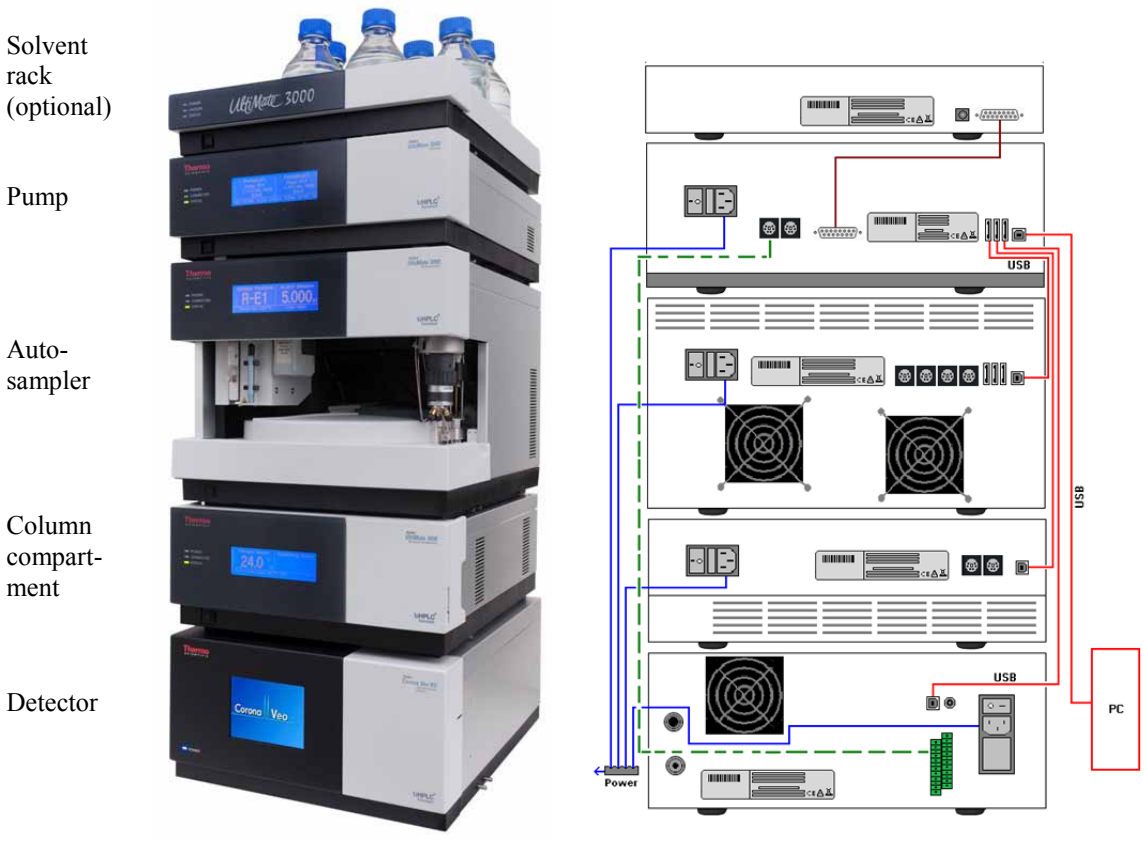


Fig. 4: Example for stack arrangement and rear panel connections in an UltiMate 3000 system with the Corona Veo RS detector

Observe the following when positioning the detector:

- The arrangement of the system modules depends on the application and may vary if an optical detector is used additionally.
- Place the detector in a position so that the connections between the output of the column and the inlet of the detector are minimized. This will reduce post-column band broadening effects and optimize chromatographic resolution.
- In an UltiMate 30000 system, apart from the Solvent Rack, all system modules can be connected separately to the computer via the USB port on the rear panel of the module, respectively. However, Thermo Fisher Scientific recommends interconnecting all modules, and then connecting the system to the computer with only one connection.

Systems with Series and Parallel Detector Configuration

The detector can be used in series or parallel configuration with other detectors (for example, a UV detector or mass spectrometer).

Series Configuration

In series configuration, one flow path from the pump is used for each type of detector installed on the system. Consider the following:

- In general, charged-aerosol detectors such as the Corona Veo detector must be placed last in the flow path within the system.
- The addition of other detectors may contribute to band broadening, and have an adverse effect on peak shape measured by the detector.

Parallel Configuration

In parallel configuration with another detector or a mass spectrometer, consider the following:

- Use a flow splitter to ensure balanced distribution of liquid flows to each detector in the system.

  Tip: Thermo Fisher Scientific recommends using an adjustable analytical flow splitter (part no. 70-6377, adjustable from 1:1 to 20:1) for flexible, accurate and precise liquid flow.

- When you use a passive flow-splitting device and thus adjust (balance) the liquid flows, consider the backpressure from the detector. Observe the flow rate specifications in the 'Technical Information' section (→ section 9, page 121).

3.4 Connecting the Detector Rear Panel

3.4.1 Overview of Connections

The rear panel connections depend on the system configuration. The following overview is to assist you with the required connections:

- **USB connection**
  Connect the USB port to
  - ♦ Use the detector with other system modules, such as UltiMate 3000 modules.

  – and/or –
  - ♦ Connect the detector to a data system computer via USB port and operate it from chromatography software, such as Chromeleon.

- **Digital I/O connection**
  Connect the Digital I/O port to
  - ♦ Connect a pump to the detector within an HPLC system, such as the UltiMate 3000 system, and establish the 'Pump Off' connection.

  – and/or –
  - ♦ Connect the detector to other external devices.

- **Analog signal output connection**
  Use and install the analog signal output to use the detector with a data system computer if no USB port is available on the computer.

3.4.2 Connecting the Power Cord

Use the power cord shipped with the device to connect the detector to the main power source. Connect the power cord from the main power receptacle on the rear panel. No manual adjustment is required to adapt the line voltage to local voltage requirements.


Warning: Never use a power cord other than the power cords provided for the device.

Do not use defective multiple sockets or extension cords, as they may cause personal injury or damage to the device.


Avertissement: Utilisez uniquement les cordons d’alimentation électrique spécifique à l’instrument.

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

3.4.3 Connecting the USB Cable

Connect the detector to the data system computer via the USB port on the rear panel. To ensure trouble-free operation, use only the cables shipped with the detector. The PC must be equipped with a USB 1.1 or USB 2.0 port.

The following cable is available (provided in the accessories kit for the detector):

USB Cable	Part no.
USB cable, type A to type B, high speed, USB 2.0 compatible (cable length: 3 m)	70-5713

Tip: The USB standard limits the USB cable length to 3 meters. Each USB device can be separated from the PC or next USB hub by no more than 3 meters

The following connection options are available:

- Connect the detector directly to the USB port on the computer.
- *If you use the detector in an UltiMate 3000 system*

  Connect the detector to an internal USB hub on the pump of the UltiMate 3000 series (except LPG-3400XRS pump*). Thermo Fisher Scientific recommends connecting all modules to the pump, and then connecting the system to the computer via only one connection. If the system includes a UV detector in addition to the detector, connect the UV detector directly to the computer.

  * The LPG-3400XRS pump is not equipped with a USB hub.

  Tips: It is not possible to use the USB hub on the UltiMate 3000 autosampler for connection of the detector to the computer.

  The detector has no USB hub on its rear panel. Thus, it can only be connected to USB hubs of other modules in the UltiMate 3000 system or directly to the computer.
- *If you want to operate the detector from Chromeleon chromatography software*

  Verify that Chromeleon is installed on the computer and that the license code is entered *before* you connect the detector to the USB port on the Chromeleon computer and turn on the detector power. Only if you install Chromeleon first, the USB driver for the detector is automatically loaded and the Windows® operating system can detect the detector upon power-up.

  For further information about operation from Chromeleon, see section 6 (→ page 77).

3.4.4 Connecting the Digital I/O

General Information

The detector is equipped with two Digital I/O terminals for connection to external devices (such as an autosampler, a data station, pumps, valves, etc.) which can synchronize their operation. The terminals include 7 connection ports (4 TTL inputs and 3 relay outputs).

Digital I/O terminal A comprises 2 relay outputs and 1 TTL input, and Digital I/O terminal B comprises 3 TTL inputs and 1 relay output.

To connect an external device to the Digital I/O terminal ports on the rear panel, use a suitable cable, such as the I/O 2-conductor cable (part no. 70-4850) from the accessories kit for the detector. Check the Digital I/O capabilities of the device that you want to the detector.

To connect wires to the terminal ports:

1. Locate the screwdriver (size 3/32" x 2") from the accessories kit for the detector.
2. Open the screw of the pin to which you want to connect a wire with the screwdriver.
3. Insert the loose wire into the pin.
4. Close the screw of the pin.

For information about the functions of the connector pins and pin assignment of the detector, see section 11 on page 129.

'Pump Off' Output Connection

The Digital I/O port on the rear panel of the detector comprises a dedicated 'Pump Off' output for connection to a pump within an HPLC system, such as the UltiMate 3000 system. If a pump is connected to the 'Pump Off' output on the detector, a safety feature is established. In the event that the gas supply to the detector is interrupted, this connection will be activated. A signal will be sent from the detector to the pump to stop mobile phase flow and avoid flooding of the detector.

Note the following:

- To use this safety feature, the support relay on the pump must be designed to stop liquid flow. Check the Digital I/O capabilities of the pump before you connect the pump to the detector. Refer to the manufacturer's documentation for information on how to connect the Digital I/O of the pump.
- *Corona Veo RS only*
  The stream-switching valve of the Corona Veo RS detector has an integrated safety feature. In the event of a gas supply failure, the stream-switching valve will automatically divert liquid flow away from the detector.

Thermo Fisher Scientific recommends that you always connect the 'Pump Off' output to the pump within an HPLC system.

For further information about connecting an UltiMate 3000 pump (except for the LPG-3400XRS pump) to the 'Pump Off' output, refer to *Chromeleon Help*. For information about connecting an LPG-3400XRS pump to the 'Pump Off' output, refer to the *Operating Instructions* for the LPG-3400XRS pump.

3.4.5 Connecting the Analog Signal Output

The analog signal output carries a signal from 0-1 V that is proportional to the current that is being measured. The analog signal output is available as an installation option when digitalized data output over the USB port to a compatible chromatography software is not available. The analog signal output uses a BNC connector (Bayonet Neill-Concelman).

For information about installation and connection of the analog signal output, see the *Installation Instructions* in the Analog Signal Output Kit.

4 Preparation for Operation (Startup)

4.1 Overview of Actions

After you have unpacked, positioned and connected the detector as described in sections 3.1 through 3.4 (→ page 23 and following), prepare the detector for operation. Follow the sequence of steps below:

1. Connect the drain tubing as described in section 4.2 (→ page 34).
2. Connect the gas tubings to the gas inlet and the gas exhaust as described in section 4.3 (→ page 35).
3. Install the nebulizer as described in the *Installation Instructions* for the nebulizer.
4. Make the flow connections from the detector to the other modules of your system, as required by your application. For information about the flow connections, see section 4.4 (→ page 36).
5. Turn on the detector. Observe the notes and precautions in section 5.2 (→ page 47). Allow the detector to perform the self test before proceeding.
6. *Chromeleon installation (optional)*
   When the display shows the Main Menu after the self test, set up the detector in Chromeleon as described in section 6.1 (→ page 78).
7. *If required*
   Adjust the brightness of the detector display (→ section 5.3.2, page 49).
8. *If required*
   Set date and time on the detector display (→ section 5.3.4.2, page 57).
9. Set the gas pressure for the nebulizer as described in section 5.4.1 (→ page 59).
10. Before using the detector for sample analysis, prepare the LC system and the detector as described in sections 5.4.2 and 5.4.3 (→ starting from page 62).

4.2 Connecting the Drainage

The detector has two drain ports at the bottom right of the enclosure to collect liquid leaks or waste from the detector. Use the drain tubing shipped with the detector to direct liquid from the two drain ports to waste.

Fig. 5: Drain ports

No.	Description
1	Leak port For liquid leaks from the drip tray.
2	Waste port For liquid from the drain pump during operation.

When connecting the drain ports of the detector, observe the following:

- Connect the ports separately with a drain line for each port. Do *not* use a connection tube to connect both ports with each other.
- Both drain ports may be directed to the same waste.
- Use the elbow and tee pieces from the accessories kit for the detector to connect the drain ports.
- Make sure that the tubing and waste bottle are below the height of the detector.

Drainage in an UltiMate 3000 system

In an UltiMate 3000 system, you can use the components from the drain kit for UltiMate 3000 systems to direct liquid leaks to waste via the drain system. The kit is shipped with the UltiMate 3000 pumps and can be ordered separately (part no. 6040.0005). The kit includes all required components and detailed installation instructions.

If there is more than one UltiMate 3000 detector in your system and you need an additional tee piece, you can find one in the accessories kit of the UltiMate 3000 fluorescence, multiple wavelength, or diode array detector.

4.3 Connecting the Gas Supply and Exhaust Tubing

Connect the gas and exhaust tubing from the accessories kit to the gas inlet and exhaust outlet at the rear of the detector. Observe the gas requirements and precautionary statements in section 3.1 (→ page 23) and the gas supply and ventilation guidelines in section 4.5.3 and 4.5.4 (→ starting from page 42).

If required, use the tubing cutter from the accessories kit to cut the tubing to appropriate length.

Tips: Make straight cuts perpendicular to the length of the gas inlet tubing for a good connection to the push-in fitting on the gas inlet. Slanted or angular cuts can lead to gas leaks.

If you wish to use a different gas inlet tubing with metric dimensions, you can use the inch-to-metric adapter from the detector accessories kit to connect the tubing to the gas inlet of the detector.

1. Locate the gas inlet tubing (part no. 6081.1070) and the exhaust tubing (part no. 70-6261) from the accessories kit for the detector.
2. Connect one end of the gas inlet tubing to the push-in fitting on the gas inlet of the detector. Connect the other end of the gas inlet tubing to the outlet of the gas supply.
3. Connect the exhaust outlet:
   a) Connect one end of the exhaust tubing to the push-in fitting of the exhaust output of the detector.
   b) Connect the other end of the exhaust tubing to a fume hood or other ventilating device source.

Warning: The exhaust gas may contain hazardous fumes. To avoid an accumulation of the exhaust gasses, make certain that the exhaust gas is absorbed by a fume hood or other ventilating device.

Avertissement: Le gaz d'échappement peut contenir des émanations dangereuses. Pour éviter une accumulation des gaz d'échappement, assurez-vous que les gaz d'échappement sont absorbés par une hotte ou autre dispositif d'aération.

4.4 Making Flow Connections

The following section provides information about how to connect capillaries to your detector.

4.4.1 General Guidelines

When connecting capillaries to the detector, observe the following general precautions:

- Observe the precautionary statements for capillaries and capillary connections in section 1.2.2 (→ page 4).
- When you connect capillaries, make sure that the connectors are free from contaminants. Even minute particles may cause damage to the system.
- Use only the capillaries shipped with the detector or original spare capillaries.
- Always make sure that the ID of the replacement capillary corresponds to the ID of the capillary shipped with the system.
- Make sure that the connectors and capillary ends are free from contaminants and not damaged. Even minute particles may cause damage to the system, for example, to the nebulizer and, with the Corona Veo RS, the stream-switching valve.
- The connection between the column and the detector should be as short as possible to prevent band-broadening.

For more information about the available capillaries, see section 10.2 (→ page 126).

4.4.2 Capillary Connections in an UltiMate 3000 System

Note the following:

- 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.
- *Viper and nanoViper fitting connections*

  Loosen or tighten the Viper connection only using the black knurled screw and only with your hand (do not use tools). The knurled screw can be easily removed and reattached to the capillary at any time. If you observe leakage on the connection, tighten the screw a little further. If leakage continues, remove the capillary, clean the capillary ends carefully by using a cloth or tissue wetted with isopropanol, and reinstall the capillary. If the connection continues to leak, replace the Viper capillary.

  When connecting the Viper capillary to the detector inlet, observe the guidelines in the Installation Instructions shipped with the capillary.

  Capillaries with Viper fitting connections can be reused also for a different connection.
- *Conventional fitting connections (non-Viper)*

  Do not over-tighten these fitting connections. If you observe leakage on the connection, tighten a little further.

  If leakage still exists, first consider cleaning the connection port with a cleaning swab (part no. 6040.0006). Replace the capillary and/or fitting if this does not eliminate the problem.

  Reuse used fittings and ferrules only for the same capillary connection. This is to avoid increased dead volume or damage to the system and leakage.

4.4.3 Installing the In-Line Filter (optional)

An in-line filter is included in the accessories kit for the detector. The in-line filter can be used in the flow path before the detector to prevent particulate matter from entering into the nebulizer.

To install the in-line filter:

1. Locate and unpack the in-line filter. The in-line filter is shipped with a filter frit.
2. Open the two end nuts of the filter assembly.
3. Rinse the filter housing with deionized water.
4. Install and close one end nut.
5. Insert the filter frit into the filter housing. Ensure that the filter frit is properly centered and seated against the surface of the end nut. Be careful not to scratch the filter.
6. Install the second end nut and tighten it carefully until contact between the cap and filter is felt. The filter is properly installed if both end nuts are approximately an equal distance from the center of the filter housing. The connection should be fingertight. Do not use a wrench or pliers to close the end nuts. Do not overtighten the end nuts, as this can crush the filter.
7. Connect the in-line filter to the system flow path as described in section 4.4.4 (→ page 39). Ensure that the in-line filter is installed in the direction of flow as indicated on the filter.

4.4.4 Connecting Capillaries to the Detector

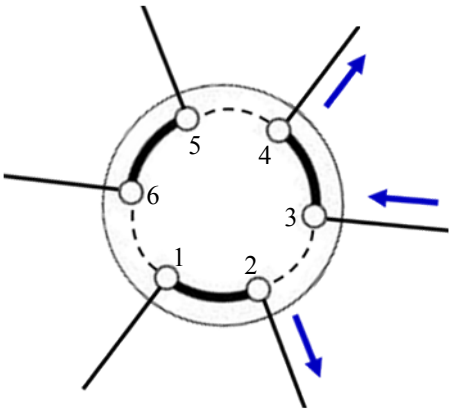
To connect the detector to the system flow path:

1. Locate the red capillary and the RheFlex fittings from the accessories kit for the detector.
2. Connect one end of the red capillary to the column outlet using a fitting.
3. *If you use the in-line filter*
   a) Connect the capillary from the column outlet to the upstream end of the in-line filter. Ensure that the direction of flow is as indicated on the filter housing.
   b) Flush the in-line filter with mobile phase at a flow rate of about 5 mL to waste.
   c) Connect a capillary to the downstream end of the in-line filter.
4. Remove the white cover on the right front side of the detector.
5. Connect the other end of the red capillary to the fluid inlet of the detector using a fitting. This step depends on the detector model:
   - *Corona Veo:*
     Connect the capillary to the nebulizer.
   - *Corona Veo RS:*
     If you use the stream-switching valve: Connect the capillary to the Inlet port (Port 3) of the stream-switching valve. Connect the other capillaries to the ports on the stream-switching valve as described in section 4.4.5.
     If you do not use the stream-switching valve: Connect the capillary to the nebulizer.

After you have made the capillary connections to the detector, you can re-install the white cover on the front panel.

4.4.5 Connecting the Stream-Switching Valve (Corona Veo RS only)

To connect the stream-switching valve, connect ports 2, 3 and 4 of the valve. The ports of the stream-switching valve are assigned as follows:



No.	Ports
2	Divert/Waste (away from the detector)
3	Inlet (capillary from column)
4	Nebulizer (to nebulizer inlet)

Fig. 6: Ports on the stream-switching valve

1. Make sure that you have connected the detector to the flow path as described in section 4.4.4 before you proceed.

2. Locate the Viper capillary, the gray capillary and the RheFlex fittings from the accessories kit for the detector.

3. Connect the Viper capillary from the Nebulizer port (Port 4) on the stream-switching valve to the nebulizer inlet using the RheFlex fittings.

4. Connect the gray capillary to the Divert/Waste port (Port 2) using a RheFlex fitting and direct it to the waste.

4.5 General Guidelines for Detector Operation

The following sections offer general guidelines for detector operation.

4.5.1 Mobile Phase

Mobile phase quality significantly affects detection limits and detector performance. A careful consideration in the selection of the components of the mobile phase will be extremely useful in minimizing baseline noise and optimizing the performance during analysis. This section describes general guidelines for the use of the mobile phase with the detector.

To ensure optimal performance of the detector, observe the following guidelines:

- Prepare all mobile phases with HPLC-grade (or better) solvents- and reagent-grade chemicals.

  Tip: It is recommended to use water from an ultra-pure deionized source, which typically has low conductivity and high resistivity.

- Use only mobile phases that contain water, solvents and modifying reagents of the highest purity available.

- The stability of the mobile phase may decrease over a period of time. Use freshly prepared mobile phase on a daily basis.

  Tip: It is recommended to use online degassers for HPLC systems with the detector. In some cases, it may be necessary to use helium sparging and/or sonication during mobile phase preparation in order to achieve optimum results.

- Take care to minimize non-volatile particulates and/or additives from the mobile phase. The detector will produce a response to non-volatile particulate matter contained in the mobile phase.

- Use solvents with minimal residue after evaporation. If a particular solvent causes problems due to particulates, try a different grade or a different vendor. Be aware that some solvents contain stabilizing agents that may cause elevated baseline noise.

- When you change from a buffer to a different operating mobile phase, be sure the solvents are miscible and will not induce precipitation of the buffers.

- Only use volatile mobile phase additives (buffers, solvents, etc.). Buffers such as acetic or formic acid and their ammonium salts are typical. Use additives (e.g. trifluoroacetic acid (TFA, HFBA)) at concentrations below 0.3 %. Avoid using carbonates, bicarbonates, sulfates, phosphates or other non-volatile buffers.

The following table is to assist you with typical additives and buffers.

Additive/Buffer	pKa	Buffer Range
Trifluoroacetic Acid (TFA)	0.3	
Formic Acid	3.75	2.8 – 4.8
Ammonium Formate	3.75	2.8 – 4.8
Acetic Acid	4.76	3.8 – 5.8
Ammonium Acetate	4.76	3.8 – 5.8

- Exposure of the detector to non-volatile salts will lead to increased background currents and noise. It may also adversely affect the nebulizer performance. If the detector is inadvertently exposed to non-volatile salts, use HPLC-grade water as mobile phase to remove the salts from the detector. Avoid using inorganic buffer salts.
- Use nitrogen with highly combustible mobile phases such as tetrahydrofuran (THF) and other ethers or ketones.

4.5.2 Mobile Phase Delivery System

The pump should deliver continuous flow and at the same time ensure the intermixing of the mobile phase (if gradient elution is used). Fluctuations in pump backpressure can cause baseline noise. If the noise is synchronized with the pump stroke, check your HPLC pump.

The mobile phase reservoir should be glass. In some applications, however, it may be necessary to use plastic solvent reservoirs. In carbohydrate applications, for example, PTFE solvent reservoirs should be used to prevent carbon dioxide build up in the mobile phase.

4.5.3 Gas Supply

- The gas supplied to the detector must be either air or nitrogen. Always use nitrogen with tetrahydrofuran (THF) or other highly combustible solvents. Do not use helium, as it does not charge the aerosol particles properly.
- If nitrogen gas is used, it must be pure (typically ≥ 95 %), free from particulates, and must not contain volatile hydrocarbons or solvent vapors (e.g. compressor oils).

  Tip: If necessary, use a sub-micron filter in combination with a water condensation trap located close to the nitrogen gas source.

- The supplied gas is filtered through a charcoal filter and a high-efficiency particulate air (HEPA) filter within the detector. Make sure that the filters are maintained properly to ensure optimal gas quality.
- If you use a nitrogen generator, observe the manufacturer's user documentation on recommended service intervals for the generator to provide optimum performance of the detector.

4.5.4 Ventilation

⚠ **Important:** Volatile hydrocarbons such as compressor oils in the external gas supply to the detector may cause permanent damage to the detector.

⚠ **Important:** Hydrocarbures volatils tels que les huiles pour compresseur dans d'approvisionnement en gaz extérieurs peuvent causer des dommages permanents au détecteur.

- Maintain a well-ventilated laboratory. Exhaust gases must be vented to an appropriate hood or gas ventilating device. Do not vent directly into the laboratory.
- Operate the detector only when the exhaust vent is connected properly. Exhaust gas venting should be at atmospheric pressure. A vacuum or restriction may result in pressure changes within the detector which may lead to baseline instability and/or other problems.
- The use of bottled or liquid nitrogen cylinder gas may be a quick and easy source of nitrogen during the installation. However, for uninterrupted use, a nitrogen generator is recommended.

5 Operation

5.1 Safety Guidelines for Operation

English Safety Guidelines

For the safety guidelines in French, see page 46.

⚠ **Important:** When operating the detector, observe the following safety guidelines:

- Always turn on the gas supply *before* starting the flow of mobile phase.
- When you stop the gas flow, always turn off the mobile phase flow and allow the detector to remain pressurized for 5 minutes before your turn off the gas flow.
- Turn on the gas flow *only* when a nebulizer is installed.
- Observe the pressure range for the gas supply (→ section 9, page 121) and the internal gas pressure setting as stated in the *Installation Instructions* for the nebulizer.
- Operate the detector only when it is connected to appropriate ventilation. Exhaust gas ventilation should be at atmospheric pressure.
- If a leak occurs, turn off the detector immediately, stop the pump flow, and remedy the situation.
- If the pressure relief valve is open and leaking gas, immediately shut down the detector. For details, see section 5.7.3 (→ page 71).
- *After operation of the detector*
  If you operated the detector with organic solvents in high concentration that may form peroxides upon evaporation (un-stabilized THF, 2-propanol, etc.), flush the flow paths completely with HPLC-grade water prior to shut down.

French Safety Guidelines

⚠ **Important:** Lors de l'exploitation et l'entretien du détecteur, respectez les consignes de sécurité suivantes:

- Toujours couper l'alimentation en gaz avant de commencer le débit de la phase mobile.
- Lorsque vous arrêtez le flux de gaz, toujours désactiver le flux de la phase mobile et permettre le détecteur de rester sous pression pendant 5 minutes avant votre arrêt le débit de gaz.
- Activez le débit de gaz uniquement lorsqu'un nébuliseur est installé.
- Respecter la gamme de pression de l'alimentation en gaz (→ section 9, page 121) et la réglage de la pression interne de gaz selon les instructions de montage pour le nébuliseur.
- Utilisez le détecteur uniquement lorsqu'il est connecté à une ventilation appropriée. Évacuation des gaz doit être à la pression atmosphérique.
- Si une fuite se produit, arrêtez immédiatement l'instrument, stoppez le débit de la pompe et remédiez au problème.
- Si la soupape de décharge est ouverte et fuit de gaz, immédiatement l'arrêt du détecteur. Pour les détails voir section 5.7.3 (→ page 71).
- *Après l'utilisation du détecteur*
  Si vous utiliser le détecteur avec des solvants organiques en haute concentration qui peuvent former des peroxydes au cours de l'évaporation (THF non stabilisée, isopropanol), rincez les chemins d'écoulement complètement avec l'eau de qualité CLHP avant de vous arrêter le détecteur.

5.2 Turning on the Power to the Detector

Before powering up the detector, be sure that all preparations for startup have been carried out (→ section 4, page 33).

To start the detector for the first time, turn on the main power switch on the rear panel of the detector.

The following sequence of events occurs when the detector is powered up:

- **Self-test diagnostics**
  The detector runs a series of internal tests. During these self-diagnostics, all of the main components are checked. When testing is complete and has been successful, the display will show the start up screen with the current detector firmware version, followed by the warm-up screen.

- **Warm-up phase**
  In the warm-up state, the detector monitors the internal temperature of the components. The warm-up time may be longer if the ambient temperature is cool or cold. When the detector has properly warmed up, the display will show the Main Menu.

- **Self-test error**
  If an error is detected during the self test, the detector is not ready for analysis. The status of the test and an error code appear on the display. Take appropriate remedial action as described in the 'Troubleshooting' section (→ section 7, page 91).
  If the detector continues to fail the self test, write down the error code and contact the Thermo Fisher Scientific Service for Dionex HPLC products.

For routine operation, leave the main power switch on. Turn the main power switch off when instructed to do so, for example, before performing a maintenance procedure or when interrupting operation for longer periods (one week or more). In this case, also observe the precautions in section 5.8 (→ page 74).

5.3 Operating the Detector from the Touch Screen

5.3.1 Overview

The display with the integrated touch screen provides keys immediately below the screen for control and navigation. The role of the keys depends on the screen that is presented. These keys are termed *soft keys*, as the definition of these keys is context sensitive.

The following table provides an overview and brief functional description of the available menus and screens:

See...	To...	On page…
Main Menu	- Turn on/off gas flow - Adjust display brightness - Advance to the Run Mode and System Setup Menus	49
Run Mode Menu	Adjust parameters for sample analysis	50
Diagnostics Screen	Monitor internally calibrated parameters	51
Graph Screen	Monitor and adjust the detector signal during data acquisition	53
Evaporation Temperature Screen	Set and monitor the temperature of the evaporation tube	54
System Setup Menu	Edit default parameters	55
Drain Screen	Enable or disable the drain pump	--
Analog Output Screen	Install the analog output PC board in the detector firmware and adjust signal settings	--
SSV Screen	Obtain the position of the stream-switching valve	--
Gas Regulator Screen	Set and monitor internal gas pressure and pressure unit	56
Date & Time Setup Screen	Set date and time, and reset next filter change and PM date	57
Contacts & Inputs Screen	Activate outputs and monitor inputs	58

For all menus and screens, if a parameter is highlighted, this indicates that the user must select the **Continue** soft key located at the bottom right corner of the display in order to choose the available options. If a parameter is displayed in parenthesis, this indicates a touch-sensitive, user-selectable entry. When you select an entry within the parenthesis, additional options will become available.

5.3.2 Main Menu

The Main Menu provides the serial number of the detector, the firmware version.

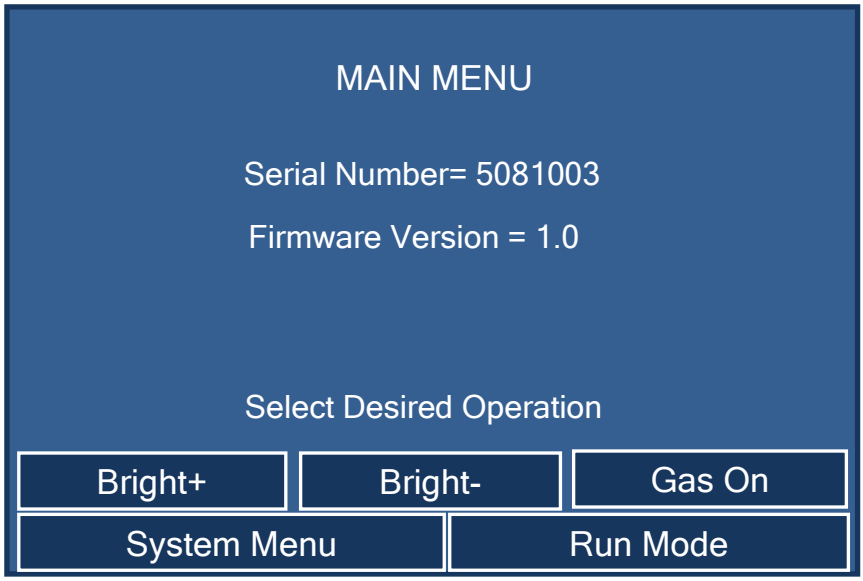


Fig. 7: Main Menu screen (here: Corona Veo RS)

Parameter	**Description**
Serial Number	Indicates the serial number of your detector.
Firmware Version	Indicates the installed firmware version.

The following options are available:

Soft key…	**Select to…**
Bright+ Bright-	Adjust the brightness of the display Press Bright+ to increase, Bright- to decrease the display brightness.
Gas On Gas Off	Turn on and off the gas flow to pressurize the detector. If the internal gas flow is disabled, 'Gas On' appears. If internal gas flow is enabled, 'Gas Off' is displayed as soft key.
System	Access the screens that are used to select a variety of general operating parameters, such as defining default values, setting time/date, etc. Some of these settings can be saved as default settings while the detector is powered on. For details, see section 5.3.4 (→ page 55).
Run Mode	Start a sample analysis. For details, see section 5.3.3 (→ page 50).

5.3.3 Run Mode Menu

From the Main Menu, press the **Run Mode** soft key to open the Run Mode Menu with the available functions and parameters. Use the Run Mode Menu to make real-time adjustments to instrument settings. Changes made on the Run Mode Menu screens will not alter the internal memory of the detector.

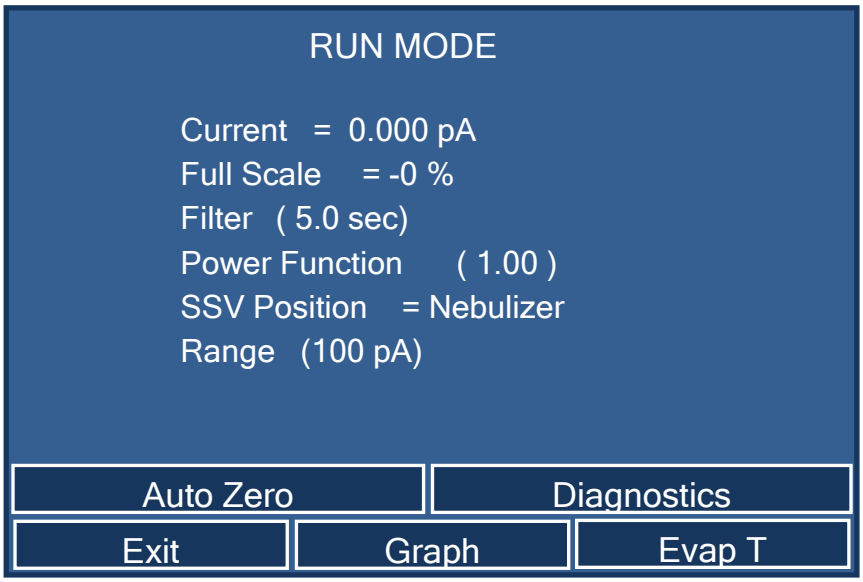


Fig. 8: Run screen (here: Corona Veo RS)

If the gas is not turned on yet, the detector will automatically start the gas flow when you press the **Run Mode** soft key in the Main Menu.

The following functions and parameters are available in the menu. Select the desired parameter and adjust as required.

Parameter	Description	Options	Default Setting
Current	Detector signal during data acquisition	read-only	---
Full Scale	Percent offset added to the analog output of the detector	-50 % to +50 %	0 %
Filter	Digital filter constant that is applied to output current.	Filter time constants: 0.1, 0.2, 0.5, 1.0, 2.0, 3.6, 5.0, 10.0 seconds	5.0 sec.
Power Function	Data linearization function	0.67 – 2.00	1.00
SSV Position	Position of the stream-switching valve	Nebulizer, Diverted	Nebulizer
Range	Set the signal current range for the analog output of the detector	1 pA to 500 pA (in steps of 1, 2, and 5)	100 pA

Corona Veo RS only

If the stream-switching valve is not set to **Nebulizer**, the detector will automatically actuate the valve.

The following action keys are available:

Soft key	**Select to…**
Autozero	Adjust the output signal to zero at the current range in use. This function can be turned off.
Diagnostics	Open the Diagnostics screen (→ page 51).
Graph	Open the Graph screen (→ page 53).
Evap T	Open the Evaporation Temperature screen (→ page 54).

To stop the run mode, press the **Exit** soft key and, on the next screen, press the **Continue to Exit** soft key.

5.3.3.1 Diagnostics Screen

The Diagnostics screen displays information with regards to factory-set and internally calibrated parameters. Real-time values are displayed.

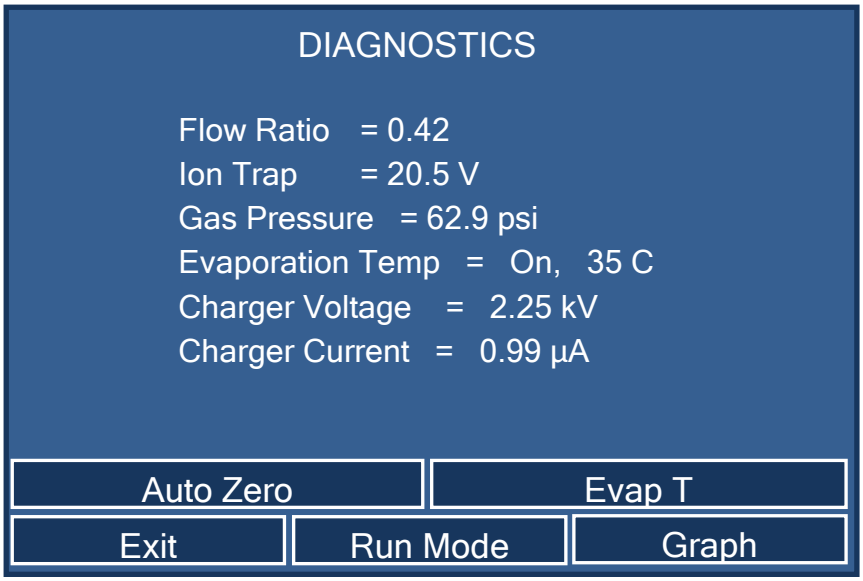


Fig. 9: Diagnostics screen (here: Corona Veo RS)

The following functions and parameters are available on the screen:

Parameter	Description	Typical Values
Flow Ratio	Indicates the ratio of nebulizer gas pressure to the charging gas pressure calibrated at factory.	Normal
Ion Trap	Removes highly mobile gas ions.	18 V – 20.9 V
Gas Pressure	Indicates inlet pressure from gas source.	276 – 448 kPa (40-65.0 psig ± 0.1 psig)
Evaporation Temp	Displays if the evaporation tube is operating and the actual evaporation temperature.	35 C
Charger Voltage	Indicates the applied voltage to the corona wire to charge the (secondary) ion gas stream.	1.8 kV – 3.0 kV
Charger Current	Indicates the current required to charge the (secondary) ion gas stream.	0.99 – 1.01 µA

To return to the Run Mode Menu, press the **Settings** soft key.

5.3.3.2 Graph Screen

The Graph screen displays the online detector signal during data acquisition.

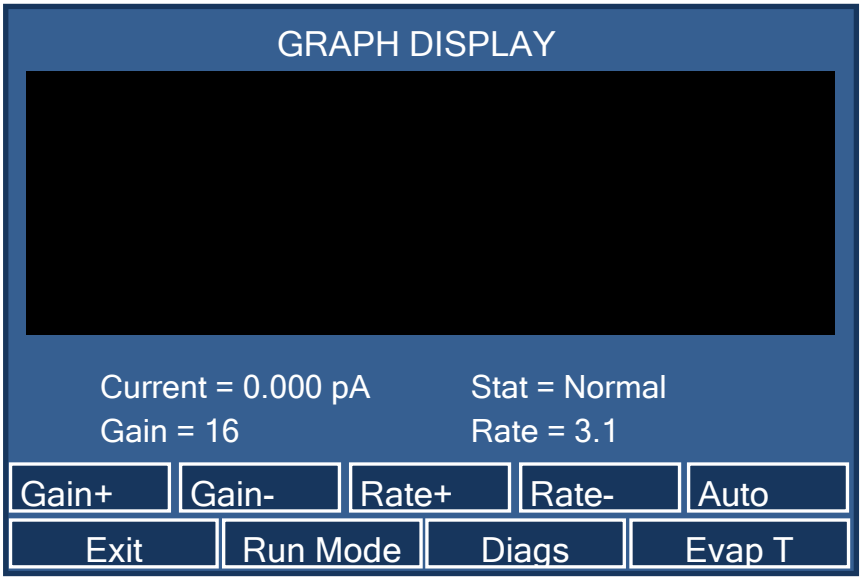


Fig. 10: Graph screen (here: Corona Veo RS)

The following functions and parameters are available on the screen:

Soft key	**Select to…**
Gain ±	Change the default signal range. This function refers to the online plot range as is displayed.
Rate ±	Update the display rate. Rate is displayed in seconds per division. A rate of 4.7 indicates each horizontal division is 4.7 seconds and the entire chromatogram is 47 seconds. With this function you can change the default time constant window of the online plot.
Auto	Adjust the auto-rate/gain setting. The online plot will scale the signal automatically to the peak with the largest magnitude on the online plot.
Exit	Exit out of the Graph screen.

5.3.3.3 Evaporation Temperature Screen

The Evaporation Temperature screen provides the means to set and monitor the temperature of the evaporation tube.

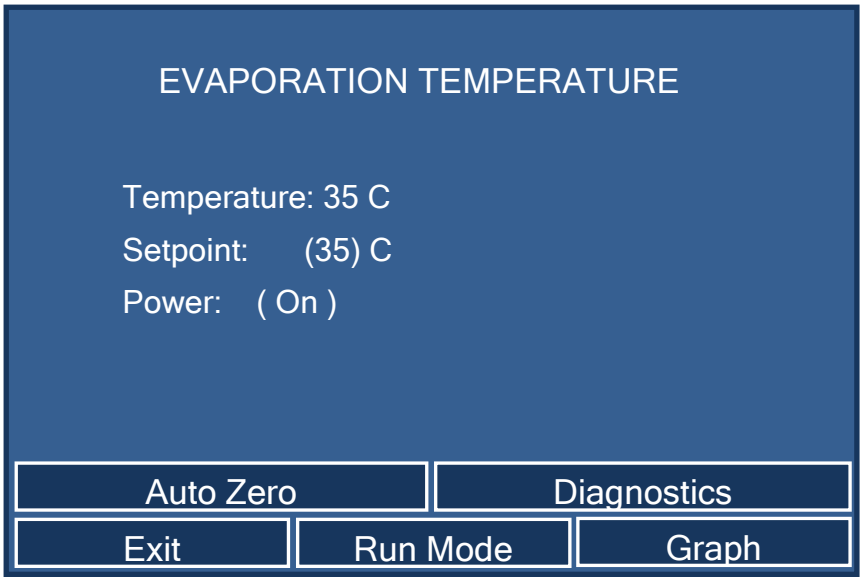


Fig. 11: Evaporation Temperature screen (here: Corona Veo RS)

The following functions and parameters are available on the screen:

Parameter	Description
Temperature	Displays the actual evaporation temperature.
Power	Turns on and off temperature control of the evaporation tube.
Setpoint	Sets the target temperature for the evaporation tube; default temperature is 35 °C. *Corona Veo:* Two temperature settings are available: 35 °C and 50 °C. *Corona Veo RS:* The temperature can be set from ambient +5°C to +100°C in 0.1°C increments.

Tips: The actual temperature reached depends on several factors, including mobile phase composition, liquid flow rate, mobile phase temperature, gas temperature, and ambient temperature.

To ensure that the evaporation tube comes to equilibrium for the set temperature, wait approximately 30 minutes after the temperature is changed before you start sample analysis.

5.3.4 System Setup Menu

The System Setup Menu is used to edit a variety of default parameters that relate to the overall operation of the detector.

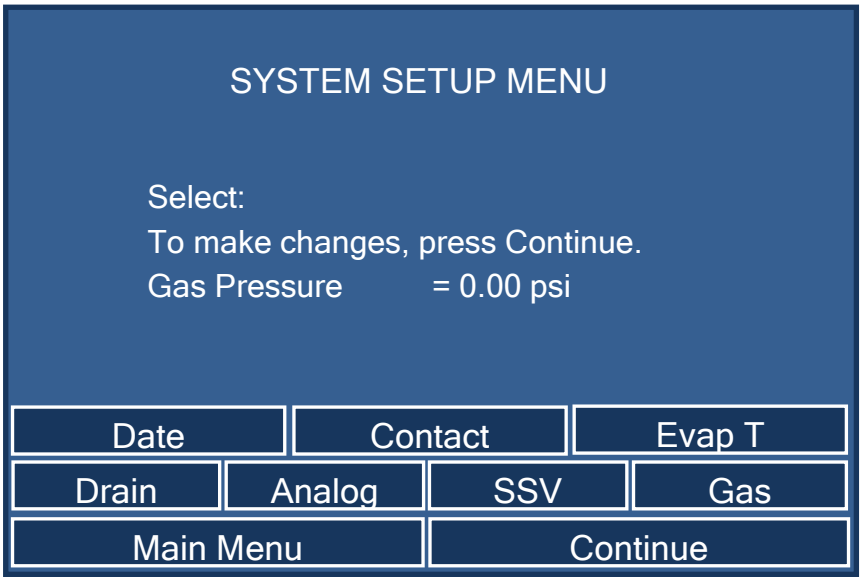


Fig. 12: System setup menu (here: Corona Veo RS)

The following parameters and functions are available in the menu:

Soft key	**Select to…**
Date	Set the system date and time and also provides the ability to reset the filter change and next preventive maintenance (PM) date.
Contact	Manually set the states of the digital output contact as well as activate the system response when a signal change to the digital input contact occurs.
Evap T	Open the Evaporation Temperature screen and set the evaporation temperature (→ page 54).
Drain	Enable or disable the drain pump.
Analog	Install the analog output PC board in the detector firmware.
SSV (Corona Veo RS only)	Use the SSV Position Status screen to obtain the position of the stream-switching valve.
Gas	Set and monitor the internal gas pressure for the nebulizer (→ page 56).

To change one of the detector system parameters, select the desired soft key to display its function on the screen. Select **Continue** to enter the parameters setup display. If you changed a parameter, select the **Save** soft key to save the setting as the new default setting for the detector.

5.3.4.1 Gas Regulator Screen

The Gas Regulator screen provides the functions to set the gas pressure and pressure unit on the gas screen, and monitor the pressure.

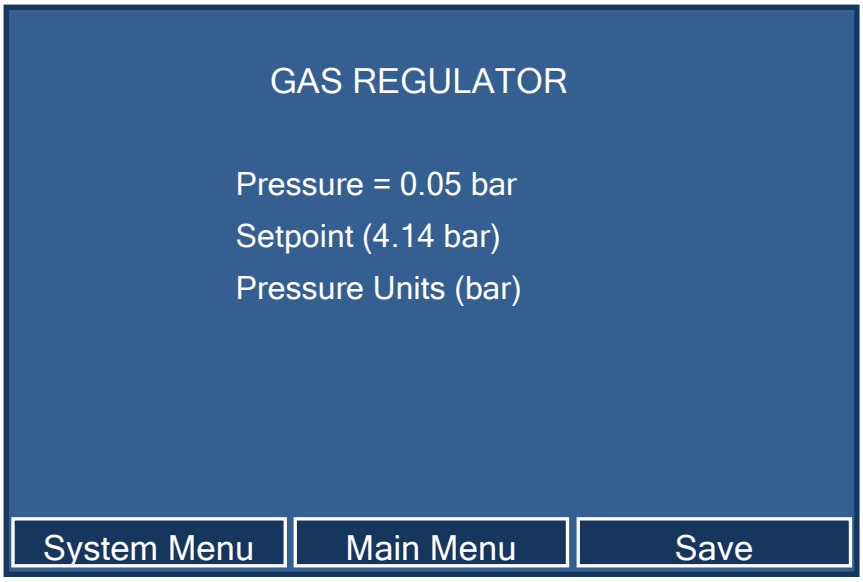


Fig. 13: Gas Regulator screen (here: Corona Veo RS)

To set a pressure unit or the internal gas pressure, select the desired soft key on the display. The available parameters or pressure values are displayed. Select the desired parameter and press the **Save** soft key to save your changes.

5.3.4.2 Date & Time Setup Screen

Access the Date & Time setup screen from the System Setup Menu. The screen is used to set the current date and time. It also provides the option to reset the filter change and next preventive maintenance (PM) date, respectively.

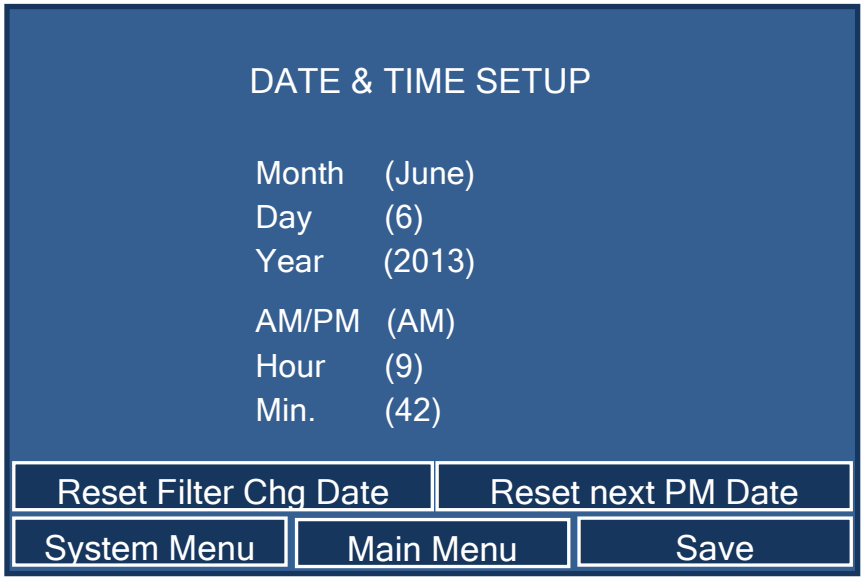


Fig. 14: Date & Time Setup screen (here: Corona Veo RS)

The following parameters and functions are available on the screen:

Soft key	**Select to…**
Reset Filter Chg Date	Shows the next date for gas filter replacement. If the date is expired, it will be indicated in red. The replacement interval is automatically set for 12 months after replacement and can be reset manually.
Reset next PM Date	Shows the next date for preventive maintenance. If the date is expired, it will be indicated in red. The replacement interval is automatically set for 12 months after preventive maintenance and can be reset manually.

5.3.4.3 Contacts & Inputs Screen

The Contacts & Inputs screen is used to activate the individual outputs and view the state of the inputs related to the Digital I/O terminals on the rear panel of the detector.

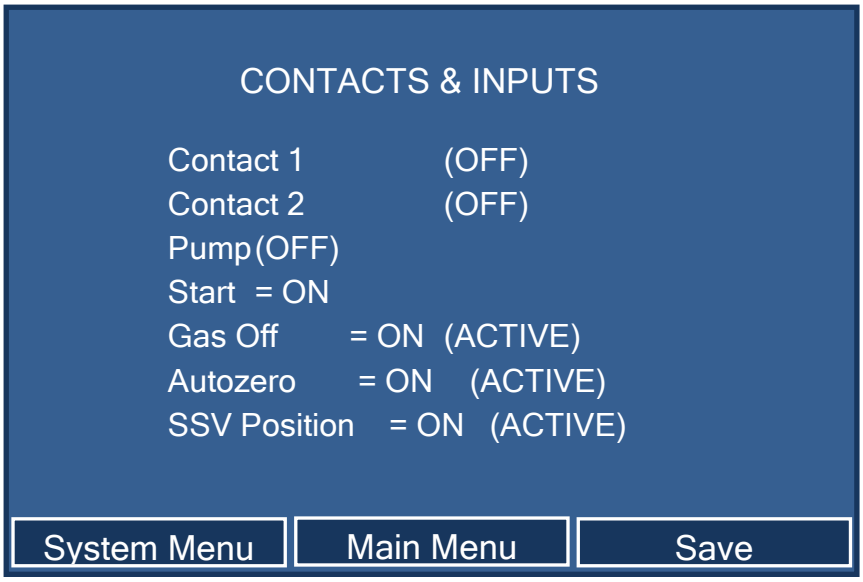


Fig. 15: Contacts & Inputs screen (here: Corona Veo RS)

The following parameters and functions are available on the screen:

Parameter	Description
Contact 1 & 2	For use with compatible chromatography data systems to interact with external devices.
Pump	Dedicated output for connection to external pump. During an alarm condition, a signal will be sent to shut down the pump and stop liquid flow to the detector. Requires a compatible LC pump with dedicated outputs.
Start	For use with compatible chromatography data systems to initiate data collection. For more information, refer to the user documentation of the chromatography software.
Gas Off	Dedicated input to shut down the gas flow to the detector. Requires a compatible LC system and chromatography software to program this parameter.
Autozero	Adjusts the output signal to zero at the current range in use. This function can be turned off.
SSV Position	For external control of the stream-switching valve.

For further information about the digital inputs and outputs, see section 11.1 (→ page 129).

5.4 Before Operating the Detector

5.4.1 Setting the Gas Pressure

The internal gas regulation provides the gas pressure to the nebulizer to create the aerosol. Make sure that you set the gas pressure for the nebulizer *before* you perform an equilibration of the detector.

Setting the gas pressure is required in the following cases:

- After you have installed or replaced the nebulizer.
- If the gas pressure has fallen outside of the specified setting of the nebulizer.
- *Corona Veo only*
  The gas regulator knob will sometimes drift so that the gas pressure needs to be re-adjusted.
- *Corona Veo RS only*
  If you operate the detector from a chromatography data system and use the analytical or microLC gas flow mode.

The gas pressure must match the recommended gas pressure setting as indicated on the certificate that is shipped with the FocusJet nebulizer. For more information about the nebulizer installation, refer to the *Installation Instructions* for the nebulizer.

⚠ **Important:** Always turn on the gas supply *before* starting the flow of mobile phase. Wait at least 5 minutes before turning on mobile phase flow.

⚠ **Important:** Toujours couper l'alimentation en gaz avant de commencer le débit de la phase mobile. Attendez au moins 5 minutes avant de se tourner sur le débit de la phase mobile.

Tip: If the gas pressure is outside of the recommended gas pressure setting for the respective nebulizer, the detector may experience a loss in performance.

Setting the Gas Pressure for the Corona Veo

Set the gas pressure manually with the manual gas regulator knob on the rear panel of the detector. The knob will change the pressure by approximately 138 kPa (20 psi) per revolution.

Tip: Write down the gas pressure reading as indicated on the display before you set the gas pressure.

1. *If applicable*
   Stop the mobile phase flow from the pump and wait several minutes for the detector pressure to stabilize.

2. *If applicable*
   In the Run Mode Menu, select the **Exit** soft key to return to the Main Menu.

   Tip: If you operate the detector from a chromatography data system, you may need to disconnect the detector in the system in order to access the Main Menu.

3. In the Main Menu, select the **System Menu** soft key.
4. Select the **Gas** soft key to display the current gas pressure value.
5. Before adjusting the pressure, loosen the lock nut of the gas regulator knob on the rear panel of the detector.
6. Adjust the gas pressure:
   - To increase the gas pressure, turn the regulator knob slowly clockwise.
   - To decrease the gas pressure, turn the regulator knob slowly counterclockwise.
7. While turning the knob, monitor the increase or decrease of the gas pressure on the detector display.
8. Re-tighten the lock nut of the regulator knob. Ensure that the indicated pressure reading on the display does not change. Hold the regulator knob while tightening the lock nut. This will ensure that the pressure does not change while you tighten the lock nut.
9. Wait until the gas pressure has stabilized and reached the set point. Monitor the gas pressure (→ see further down in this section).

Setting the Gas Pressure for the Corona Veo RS

Regulate the internal gas pressure from the display to provide a consistent nebulizer pressure for a stable aerosol.

1. *If applicable*
   Stop the mobile phase flow from the pump and wait several minutes for the detector pressure to stabilize.
2. *If applicable*
   In the Run Mode Menu, select the **Exit** soft key to return to the Main Menu.

   Tip: If you operate the detector from a chromatography data system, you may need to disconnect the detector in the system in order to access the Main Menu.

3. In the Main Menu, select the **System Menu** soft key.
4. Select the **Gas** soft key to display the current gas pressure value.

5. Select **Setpoint** and set the pressure set point to the desired value.
6. Select the **Save** soft key and then the **Exit** soft key to return to the Main Menu.
7. Wait until the gas pressure has stabilized and reached the set point. Monitor the gas pressure (→ see below).

Monitoring the Gas Pressure

To monitor the gas pressure on the detector display:

1. From the Main Menu, select the **Run Mode** soft key.
2. In the Run Mode Menu, select the **Diagnostics** soft key.
3. On the Diagnostics screen, monitor the Gas Pressure reading.

5.4.2 Preparing the System

Before using the detector, flush the LC system thoroughly prior to sample analysis.

1. Remove any analytical column from the system.
2. Flush the system with a starting solution of 80 % water and 20 % methanol without the detector until the system is free of any other liquid composition.

   Tip: When you use an online degasser in your system, make sure that you flush each channel of the online degasser before you use them for sample analysis with the detector.

3. Pre-program all temperature-controlled devices, such as the column oven, to the temperature required for the application.
4. Switch the solvent to the mobile phase required for your application
5. Flush the system without the detector with the mobile phase for your application until the system is free of the starting solution (80 % water/20 % methanol).
6. Re-install the analytical column.
7. Flush the system without the detector until the internal column volume has been replaced with fresh mobile phase.
8. Monitor the pump pressure. Verify that the reading is correct for the application and is stable.

5.4.3 Equilibrating the Detector

After you have prepared the system, perform an equilibration for the detector. Make sure that you set the gas pressure for the nebulizer *before* you perform an equilibration of the detector.

1. Start the gas supply. Observe the gas supply requirements in section 3.1 and gas supply guidelines in section 4.5.3.

   ⚠ **Important:** To prevent damage to the detector, do not exceed the maximum gas pressure of 550 kPa (80 psig) for the gas supply.

   Always turn on the gas supply *before* starting the flow of mobile phase. Wait at least 5 minutes before turning on mobile phase flow.

   Turn on the gas flow *only* when a nebulizer is installed

   ⚠ **Important:** Ne pas dépasser une pression de gaz maximaux de 550 kPa (80 psig) pour l'approvisionnement en gaz.

   Toujours couper l'alimentation en gaz avant de commencer le débit de la phase mobile. Attendez au moins 5 minutes avant de se tourner sur le débit de la phase mobile.

   Activez le débit de gaz uniquement lorsqu'un nébuliseur est installé.

2. On the detector display, from the Main Menu, select the **Run Mode** soft key. The Run Mode Menu is displayed.

   The gas flow will automatically start. Alternatively, you can establish the gas flow before you start the acquisition in the Main Menu (→ page 49).

   Adjust the settings and parameters as required for your analysis.

3. On the evaporation temperature screen, set the evaporation temperature. To optimize the evaporation temperature for your application, observe the guidelines in section 5.6.3 (→ page 66).

4. Start the delivery of the mobile phase. Monitor the fittings and tighten as appropriate.

   Observe the guidelines for mobile phases and the flow rate specifications for the detector.

   ℹ **Tip:** Make sure that you keep the flow rate within the specified range for the detector (→ page 121). Operating the detector outside of these flow rates may result in a loss of performance.

The following table is to assist you with typical flow rates for certain column diameters:

Column Diameter	Typical Flow Rate
4.6 mm	1.0 mL/min
3.0 mm	0.5 mL/min
2.0 mm	0.2 mL/min
1.0 mm	0.05 mL/min

Fig. 16: Typical flow rates for various columns

5. Allow the detector to equilibrate until you observe a steady baseline.
   Monitor the background signal of the detector. It will increase initially and then start to fall. Over a short period of time the signal will fall to a low level and then stabilize.
6. The detector is ready for data acquisition when the baseline is stable. The time required to obtain a stable baseline depends on the application.
7. Autozero the detector: From the Run Mode Menu, press the **Autozero** soft key.
8. The detector is now ready for sample analysis.

5.5 Performing Sample Analysis

This section provides information for performing sample analysis with the detector. Before you perform an analysis, set the operating parameters from the detector display (→ section 5.3, page 48).

5.5.1 Starting and Stopping Data Acquisition

Before you start data acquisition, make sure that you have set the required parameters, and that the system and the detector have equilibrated. You can start and stop data acquisition and watch the progress of data acquisition on the display.

To monitor data acquisition on the detector display, see page 53.

To start data acquisition from the detector display

1. In the Main Menu, select the **Run Mode** soft key.
2. Equilibrate the detector as described in section 5.4.3 (→ page 62).
3. To monitor the progress of data acquisition on the display, see the **Current** parameter on the Run Mode Menu that displays the online data signal in real-time (→ page 50).
4. To stop data acquisition, press the **Exit** soft key in the Run Mode Menu and on the next screen, select **Continue to Exit**.

5.5.2 Operating the Stream-Switching Valve (Corona Veo RS only)

The stream-switching valve can be used to direct flow to the nebulizer or divert to external devices or waste. In addition, the stream-switching valve will divert liquid away from the detector in the event of an alarm condition.

When the detector is controlled from chromatography software, such as Chromeleon, the valve can be actuated as part of the chromatographic method. This way, it can be used to divert flow away from the detector as a timed function to eliminate unwanted peaks from detection, thus simplifying the chromatogram.

Tip: If you operate the detector with another detector from chromatography software, the valve can divert the liquid flow to the other detector or liquid handling and/or collector device.

5.6 Optimizing the Detector Performance

The performance of the detector can be optimized by careful selection of key operating parameters. The table summarizes these parameters, indicates the performance characteristics affected, and offers guidelines for selecting the parameters.

Operating Parameter	Performance characteristics affected	Selection guidelines
Filter Constant	Sensitivity, baseline noise	see page 66
Evaporation Temperature	Baseline noise, background current	see page 66
Gas Flow Modes		see page 67
Power Function Value	Linear range	see page 68
Baseline Noise	Sensitivity, reproducibility	see page 68
Data Collection Rate	Peak resolution, disk space, possibly baseline noise	see page 69

5.6.1 General Guidelines

- Make sure that the HPLC column is stable (in flow and temperature) and at the pH of your mobile phase. Use ‘low-bleed’ columns. Do not use a column that has been used with non-volatile mobile phases.
- When the mobile phase is stored over a period of time, high background current may be observed. Replace old mobile phase with freshly prepared mobile phase.
- When you use the detector for the analysis of complex biological samples, proper sample preparation is especially important.
- Flush new analytical columns to waste for several hours before you connect them to the system. Use a dedicated column for each specific analysis to avoid cross-contamination of the column.
- To fully utilize the capabilities of the flow connections within a UHPLC system, particularly when you use columns with smaller internal diameters, minimize dead volumes before the detector. This is a commonly overlooked but important cause of band broadening. Use capillaries with a small internal diameter of the shortest length possible.

Tip: When you perform a gradient, it is recommended to perform blank injections with the desired LC method gradient profile prior to analysis. This column "pre-conditioning" will improve the performance of both the analytical HPLC column and the detector.

5.6.2 Setting a Filter Constant

The filter time constant is used to electronically reduce the noise of the baseline within the chromatographic run. A small filter value (e.g., 0.2 sec) removes little noise, while a large filter value (e.g., 10 sec) will smooth the baseline significantly.

For details how to set the filter constant from the display, see section 5.3.3 (→ page 50).

5.6.3 Selecting the Evaporation Temperature

General Notes

The temperature-controlled evaporation tube dries the aerosol that comes from the nebulizer. Thus, the evaporation tube removes the mobile phase components and leaves an aerosol with dried analyte. The efficiency of this drying procedure depends upon the chosen temperature and additional factors, such as the mobile phase composition, liquid flow rate and sample composition. Use performance metrics such as the detector precision and sensitivity as guidelines to receive the optimal evaporation temperature. After you have set the evaporation temperature, wait approximately 30 minutes to ensure that the evaporation tube comes to equilibrium before you start sample analysis.

Tips: A change in the evaporation temperature can have a dramatic effect to the response of the detector. Try different temperature settings before you finalize an analytical method.

Corona Veo RS only

When you decide to use an optimized evaporation temperature, perform three or more injections of a reference standard for the analytical method. For these reference injections, use different evaporation temperature settings that range from low to high temperature. Select the most appropriate starting point temperature, based upon the performance criteria as mentioned before.

For a starting point for selecting an evaporation temperature, refer to the table below:

<table>
<tr><th colspan="2" rowspan="2">Factor</th><th colspan="2">Evap. Temp. Guidelines</th><th rowspan="2">Effect</th></tr>
<tr><th>Corona Veo</th><th>Corona Veo RS</th></tr>
<tr><td rowspan="4">Mobile phase composition</td><td>100 % aqueous</td><td>50 °C</td><td rowspan="4">Use lower or higher temperature settings</td><td rowspan="3">Baseline noise, background current</td></tr>
<tr><td>100 % organic (e.g. normal phase HPLC)</td><td>50 °C</td></tr>
<tr><td>water/acetonitrile or methanol gradient (e.g. reversed-phase or HILIC HPLC)</td><td>35 °C</td></tr>
<tr><td>water/THF gradient</td><td>35 °C</td><td>Baseline noise</td></tr>
</table>

Factor		Evap. Temp. Guidelines		Effect
		Corona Veo	**Corona Veo RS**	
Mobile phase composition	volatile modifiers (e.g. TFA, formic acid, ammonium formate)	35 °C or 50 °C		
	non-volatile modifiers (e.g. sodium phosphate)	Do not use		---
Mobile phase flow rate		35 °C		minimal
Analyte	Non-volatile	50 °C	35 °C or 50 °C	minimal
	Semi-volatile	35 °C	Use lower or higher temperature settings	Detector response, baseline noise

5.6.4 Using Gas Flow Modes (Corona Veo RS only)

The Corona Veo RS detector is capable of two separate gas pressure modes: analytical gas flow mode and microLC gas flow mode.

Each of these modes sets a specific pressure, based upon the default gas pressure of the nebulizer. They are designed as a simple way to optimize the nebulizer efficiency when you use very high (analytical) or very low (microLC) flow rates that range from 0.01 mL/min – 2.00 mL/min. These modes of operation are only available when you use compatible chromatography software.

- Analytical gas flow mode:
  The gas pressure set point corresponds to the default gas pressure setting as described in the certificate that is shipped with the nebulizer.

- MicroLC gas flow mode:
  The gas pressure value is calculated by multiplying the analytical gas flow mode value by a factor in order to optimize the gas pressure for certain types of liquid flow rates and mobile phase compositions.

5.6.5 Applying a Power Function Value

The signal of the detector has a wide dynamic range with over four orders of magnitude. The nature of the response is inherently nonlinear. The Power Function Value (PFV) applies a power transformation to the data output of the detector. Power transformations may result in extending the linear range of the detector. As a result, a simple linear correlation can be applied in place of a polynomial regression that is fit to the detector's raw data response curve after a PFV has been applied. The transformation is applied real time to the data stream. The data is raised to the selected power; it is scaled and sent out.

The choice of an optimal Power Function Value will result in an increase in the linear dynamic range of the detector as compared to the default setting. The appropriate or best value for the Power Function depends on the individual analyte and analysis conditions.

Tips: Changes to the PFV do not result in improvements to the detector's limit of detection (LoD) performance.

The default PFV setting of 1.0 provides a good universal setting for most applications and compounds.

The detector accepts any value between 0.67 and 2.00 in increments of 0.01.

To set the power function value from the detector display:

1. On the detector display, in the Main Menu, select the **Run Mode** soft key.
2. Set the operating parameters as required by your application.
3. For the **Power Function** parameter, enter the three digits of the desired PFV without decimal point.
4. Press **Enter**. The data stream will now be raised to the selected power.

5.6.6 Minimizing Baseline Noise

Minimizing the baseline noise that is generated for a given LC method depends on many factors. Consider the following recommendations to optimize the detector performance and reduce baseline noise:

- Use only mobile phases of the highest quality available and keep impurities and contaminants to a minimum. Observe all guidelines as described in the 'Mobile Phase' section (→ section 4.5.1, page 41).
- Flush the LC system periodically in order to remove any non-volatile mobile-phase residues if applicable.
- Observe the recommended maintenance schedule for the detector and the LC system as per the manufacturer's guidelines.
- The gas supply should be filtered and free from moisture and hydrocarbons. Observe the gas requirements in section 3.1 (→ page 23) and the guidelines for gas supply in section 4.5.3 (→ page 42).

5.6.7 Digital Data Collection Rate Guidelines

When you operate the detector from a chromatography data system, you can select the digital data collection rate in order to optimize the detector's performance. The data collection rate is defined as the number of data points per second (Hz) that chromatography software collects from the detector and stores as raw data.

Note the following guidelines:

- In general, define each peak by at least 20 data points. For chromatograms with co-eluting peaks or low signal-to-noise ratios, 40 data points per peak is recommended.
- If all peaks are relatively wide, select a lower data collection rate (for example, 1.0 Hz). This saves disk space and typically provides a faster display rate of data.
- If any peaks of interest are less than a few seconds, select a higher data collection rate (20.0 Hz, for example). If the collection rate is too high, data files may need more disk space and post-run analyses may require more processing time.

Tip: If you use the Chromeleon chromatography data system, data can be generated with the Corona Veo with a maximum collection rate of 100 Hz. With the Corona Veo RS data can be generated with a maximum collection rate of 100 Hz in Chromeleon 6.80 or 200 Hz in Chromeleon 7.

5.7 Internal Safety Features

5.7.1 Leak Detection

When a leak occurs that originates from the capillary connections to the nebulizer or stream-switching valve (Corona Veo RS only) and the leak sensor reports a leak, a warning code appears on the detector display.

When the leak sensor reports a leak, eliminate the cause for the leakage and dry the leak sensor (→ page 112).

Tip: If you operate the detector from a chromatography data system, a warning code will also be documented in the audit trail of the software.

5.7.2 Internal Liquid Detection

A liquid sensor is installed inside the detector to detect excess liquid build-up in the event of a flood within the detector.

When excess liquid is present inside the detector;

- A critical error code appears on the detector display.
- The detector will exit the Run mode. If you operate the detector from chromatography software, the running batch is aborted.
- If the Pump Off relay has been connected, the pump will stop mobile phase flow.
- *Corona Veo RS:* The stream-switching valve will actuate and divert the liquid flow away from the detector.
- The drain pump will turn on automatically.

Tip: If you operate the detector from a chromatography data system, an error message will also be documented in the audit trail of the software.

When the sensor reports excess liquid in the interior of the detector, stop the mobile phase flow, if not already done, and leave the gas flow turned on. If there is only a small amount of liquid present inside the detector, the liquid may evaporate. If the error code continues to appear on the display, note the error code and contact the Thermo Fisher Scientific Service for Dionex HPLC products.

5.7.3 Gas Supply Pressure Relief Valve

A pressure relief valve is installed at the gas supply inlet to prevent damage to the detector in the event of a gas overpressure. If the gas inlet pressure exceeds 620 kPa (90 psi), the valve will open to relieve the pressure and create a loud hissing sound. If the detector is in Run mode, the detector will fail to pressurize and an error code will appear on the detector display.

Warning: If during operation the pressure relief valve is leaking or releasing gas, immediately shut down the detector.

Avertissement: Si lors du fonctionnement, la soupape de décharge est une fuite où libérant des gaz, arrêtez le détecteur immédiatement.

To remedy the situation:

1. Turn off gas flow.
2. Clear the error code on the detector display and return to the Main Menu.
3. Shut down the gas supply to the detector.
4. Check the gas pressure that is supplied to the detector display. Adjust the gas pressure so that the inlet gas supply pressure is in the range of 480 – 550 kPa (70 – 80 psig).
5. Turn on the gas supply.
6. If the gas pressure has fallen within the specified range, the gas pressure relief valve will remain closed.
7. On the Main Menu, select the **Gas** soft key to pressurize the detector.
8. On the Main Menu, select the **System Menu** soft key.
9. In the System Setup Menu, select the **Gas** soft key to display the current gas pressure value from the gas regulator.
10. Verify that the gas pressure has returned to the default setting.
11. On the display, return to the Main Menu.

5.7.4 Flow Ratio Alarm

The detector continuously monitors the internal pressure. On the Diagnostics screen, the flow ratio diagnostic provides detailed pressure information for internal components. If a "low" or "high" flow ratio alarm is triggered, the following actions occur:

- An error code appears on the detector display.
- The detector will exit the Run mode. If you operate the detector from chromatography software, the running batch is aborted.
- If the Pump Off relay has been connected, the pump will stop mobile phase flow.
- *Corona Veo RS:* The stream-switching valve will actuate and divert the liquid flow away from the detector.
- The drain pump will turn on automatically.

Tip: When you operate the detector from a chromatography data system, an error message will also be documented in the audit trail of the software.

For more information on how to resolve a flow ratio alarm state, see the 'Troubleshooting' section (→ section 7, page 91).

5.7.5 Detector Flooding Alarm

If the detector is properly connected to a pump in a LC system as described in section 3.4.4 (→ page 31), the system can receive a contact closure from the detector in the event of a critical error.

Tip: Most LC pumps are programmed to send out a general contact closure in the event of a low pump pressure alarm as determined in the configuration. Be sure that this setting is compatible with the analytical method.

When the gas pressure falls outside of the specified range of 241 – 480 kPa (35 – 70 psi), the following actions occur:

- An error code appears on the detector display.
- The detector will exit the Run mode. If you operate the detector from chromatography software, the running batch is aborted.
- If the Pump Off relay has been connected, the pump will stop mobile phase flow.

- *Corona Veo RS:* The stream-switching valve will actuate and divert the liquid flow away from the detector.
- The drain pump will turn on automatically.

Tip: When you operate the detector from a chromatography data system, an error message will also be documented in the audit trail of the software.

To remedy the problem:

- Check the gas supply for leaks (if appropriate) and make sure that the gas supply is properly connected.
- Set the gas pressure to the setting specified for your nebulizer (→ page 59).
- Reset the pump and re-start the analysis.

5.8 Shutting Down the Detector

5.8.1 Short-term Shutdown

If the detector is not used for a few days, allow the detector to remain connected to the system, and the detector and system to be turned on. If possible, continue the gas flow. This is to prevent any build-up of residue from solvents or analyte.

- Keep the detector connected to the system flow path.
- *If applicable*
  Keep the detector connected to the chromatography data system.
- Turn off the mobile phase flow.
- If sufficient gas supply is available, continue to flow gas through the detector with a low gas flow rate. This is to prevent any build-up of reside from solvents or analytes.

5.8.2 Long-term Shutdown

If the detector is not going to be used for a prolonged period of time, or shipped, observe the following steps before interrupting operation:

1. Rinse out any solvents from the detector. Flush the detector with a neutral solvent that does not contain any salts. For information about recommended wash procedures, see section 8.3.2 (→ page 111). The solvent must be compatible with the mobile phase to remove all buffers, acidic modifiers, etc. from the detector. Do not leave the detector exposed for long periods to highly acidic or basic mobile phases.
2. Turn off the mobile phase flow.
3. Allow gas to flow for at least 5 minutes.
4. Turn off the gas flow.
5. Wait several minutes for the detector to de-pressurize.
6. Turn off the gas supply to the detector.
7. Press the power switch on the detector rear panel to turn the detector off.
8. Disconnect the gas tubings from the detector rear panel. With the multi-tool from the accessories kit for the detector, push in the locking ring on the push-in fittings of the gas inlet and gas exhaust.
9. Disconnect the power cord from the main power receptacle and all other cables as well as capillaries from the detector.

10. *If you prepare the detector for shipment*

    a) Remove the nebulizer from the detector as described in section 8.6 (→ page 115).

    b) Store and ship the nebulizer in its original shipping box.

Shipping the detector

Use the original shipping container and observe the *Packing Instructions*. Shipping the unit in any other packaging automatically voids the warranty. If the original shipping container is not available, you can order appropriate shipping containers and packing material 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 also available on request.

6 Chromeleon Software

The detector can be controlled by the Chromeleon Chromatography Management System Service Release 13 or higher. To control the detector, an appropriate Chromeleon version and a Timebase Class 1 Chromeleon license are required.

Tip: All software details in this section refer to *Chromeleon 6.80*.
If you want to operate the detector from *Chromeleon 7,* refer to the following documents for information about how to perform the related processes in Chromeleon 7 (all documents are included in the Chromeleon 7 shipment):

- Chromeleon 7 Help—provides extensive information and comprehensive reference material for all aspects of the software.
- Quick Start Guide—describes the main elements of the user interface and guides you step-by-step through the most important workflows.
- Reference Card—provides a concise overview of the most important workflows.
- Installation Guide—provides basic information about module installation and configuration. For specific information about a certain module, refer to the Chromeleon 7 Instrument Configuration Manager Help.

Please also note the following:

- Chromeleon 7 terminology is different from the terminology used in Chromeleon 6.80. For details, refer to the 'Glossary -Chromeleon 7.0,' which is available in the Documents folder of your Chromeleon 7 installation.
- Chromeleon 7 may not yet support all functions supported in Chromeleon 6.80.

Two modes of software control are available:

- **Direct Control**
  With direct control, you select operating parameters and commands in the **Commands** (F8) dialog box. Direct commands are executed as soon as they are entered. For routine operation, most parameters and commands are available also on a control panel. For more information about direct control, see page 86.
- **Automated Control**
  With automated control, you create a program (or PGM File). This is a list of control commands, executed in chronological order, for automated operation of the detector. Programs can be created automatically with the help of a software wizard or manually by editing an existing program. For more information about automatic control, see page 88.

For information about the available functions and parameters for the detector in Chromeleon, refer to the *Chromeleon Help*.

6.1 Setting Up the Detector in Chromeleon

This section provides brief instructions for setting up Chromeleon. For details, also see the *Chromeleon Help*.

Tip: When the detector is connected to the Chromeleon computer, verify that the Chromeleon software is installed before turning on the detector power for the first time. Only then, the USB driver for the detector is automatically loaded and the Windows operating system detects the detector when the power is turned on.

6.1.1 Loading the USB Driver for the Detector

1. Turn on the computer power, if it is not already on.
2. Under Windows Vista® (Windows® XP, Windows® 7, or Windows® Server 2008) log on as a
   - Local administrator if the computer is a local computer.
   - User with local computer administrator privileges if the computer is a network computer.
3. Open the **Chromeleon Server Monitor** program by double-clicking the Chromeleon Server Monitor icon  on the Windows taskbar.

   If the Server Monitor icon is not on the taskbar, click **Start** on the taskbar, point to **Programs** (or **All Programs**, depending on the operating system), point to **Chromeleon,** and then click **Server Monitor**.
4. Click **Start** to start the server.
5. Click **Close** to close the Server Monitor window. The Server Monitor icon  appears on the taskbar.

   Tip: Clicking the **Quit Monitor** button quits (exits) the **Server Monitor** program, but does not stop the server. To stop the server, click **Stop**.
6. Turn on the main power switch on the rear panel of the detector.
7. *Windows Vista, Windows 7, and Windows Server 2008* will automatically detect the new detector and perform the USB installation.

   If Windows fails to detect the detector and launches a wizard instead, this indicates that you connected the detector to the computer and turned on the power for the first time before you installed Chromeleon. To resolve the problem:

   a) Click **Cancel** to exit the wizard.

   b) Turn off the detector.

   c) Install Chromeleon.

d) Turn on the detector power. Windows will now detect the detector and install the USB software for the detector automatically.

Windows XP
will automatically detect the new detector and launch the Found **New Hardware Wizard**, which guides you through the USB installation. Select the following options:

a) If asked whether Windows can connect to Windows Update to search for software, select **No, not this time**.

b) Accept the default option (**Install the software automatically**) and click **Next>**.

c) Click **Finish** when the wizard reports that the software for the detector has been installed.

If Windows XP fails to detect the detector and a message box asks for a USB configuration file (cmwdmusb.inf), this indicates that you connected the detector to the computer and turned on the power for the first time before you installed Chromeleon. To resolve the problem:

a) Click **Cancel** in the Windows message box.

b) Turn off the detector.

c) Install Chromeleon.

d) Turn on the detector power. Windows will now automatically detect the detector and launch the **Found New Hardware Wizard**.

6.1.2 Installing the Detector

The detector should complete the self-test prior to connecting the detector to the computer to prevent possible installation errors. When the display shows the Main Menu, the self-test is complete, and that the detector is ready for connection.

After the USB software for the detector has been installed (→ page 78), install and configure the detector in Chromeleon:

1. Start the Chromeleon **Server Monitor** (→ page 78) and the Chromeleon server if they are not yet running.
2. Start the Chromeleon **Server Configuration** program by clicking **Start** on the taskbar. Point to **Programs** (or **All Programs**, depending on the operating system), point to **Chromeleon**, and then click **Server Configuration**.
3. If necessary, click the plus sign beside the server icon  to display the items underneath.
4. Select the timebase to which the detector will be assigned, or create a new timebase (on the **Edit** menu, click **Add Timebase**).
5. Open the **Add device to timebase** dialog box. To do so, click **Add Device** on the **Edit** menu or right-click the timebase and click **Add Device** on the menu.
6. On the **Manufacturers** list, click **Dionex** and on the **Devices** list, click **Corona Veo Charged Aerosol Detector**.
7. The configuration pages are opened. On each page, verify that the settings are correct and select additional settings if needed. For a description of the pages, see section 6.1.3.1 (→ page 81).
8. Click **OK** to complete the configuration of the detector.
9. On the **File** menu, click **Save Installation** and then close the **Server Configuration** program.

6.1.3 Configuring the Detector

6.1.3.1 Initial Installation

During the installation, Chromeleon connects to the detector and transfers the settings from the instrument to Chromeleon, setting the options on the pages accordingly. Verify that the settings are correct and make additional settings if needed. You may reopen the configuration pages later again to change the settings (→ page 84).

Tip: Changing the settings for a specific application in the **Commands** (F8) dialog box, in a program file (PGM), or on a control panel will not change the default settings on the configuration pages.

For additional information about a page, click **Help**.

General Page

Shows the general detector parameters.

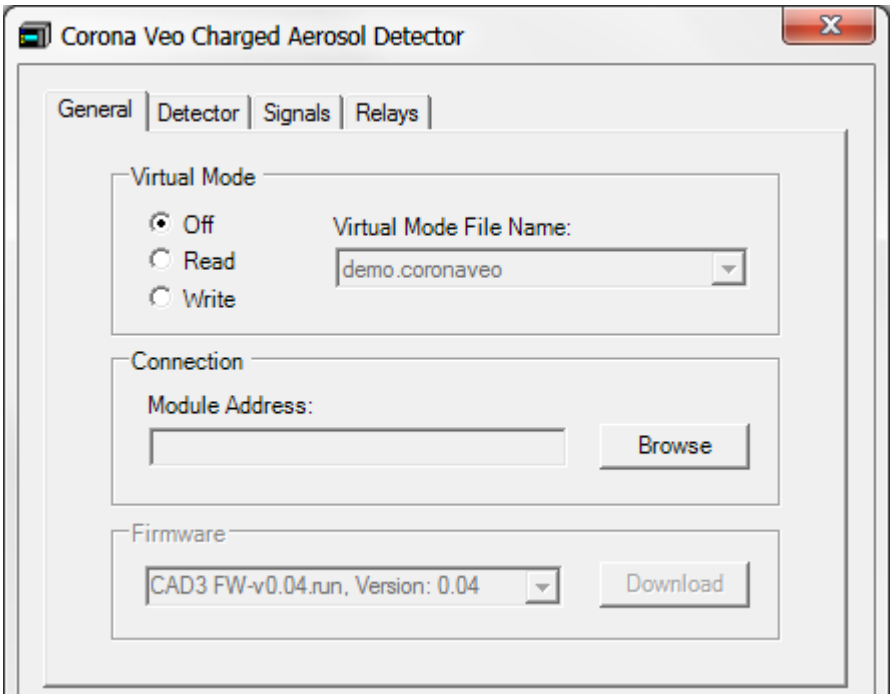


Fig. 17: General page

- **Virtual Mode**
  Verify that the virtual mode is set to off. If the virtual mode is enabled, the **Module Address** box will be unavailable. If you exit this page without having entered a module address, the virtual mode will be enabled automatically.

In the virtual mode, Chromeleon simulates detector control and data acquisition.

- Click **Read** to read and display data from an existing demo file instead of real data. Select the file from the **Virtual Mode File Name** list.
- Click **Write** to save the data currently delivered by the detector as a demo file. Enter the file name in the **Virtual Mode File Name** field or select a name from the list.

- **Module Address**
  Select the module address of the detector if necessary. The module address states the USB port and the serial number of the detector. Click **Browse** and then double-click the detector that you want to use on the **Device List**. The address is automatically entered in the **Module Address** field. Chromeleon connects to the detector and transfers the settings from the detector firmware to Chromeleon, setting the options on the pages accordingly.
- **Download**
  Click this button to transfer the current firmware version to the detector. (The button appears dimmed if the virtual mode is enabled.) The detector is shipped with the most recent firmware version. If a firmware update is ever required, follow the steps in section 8.9 (→ page 119).

Detector Page

Shows the detector configuration.

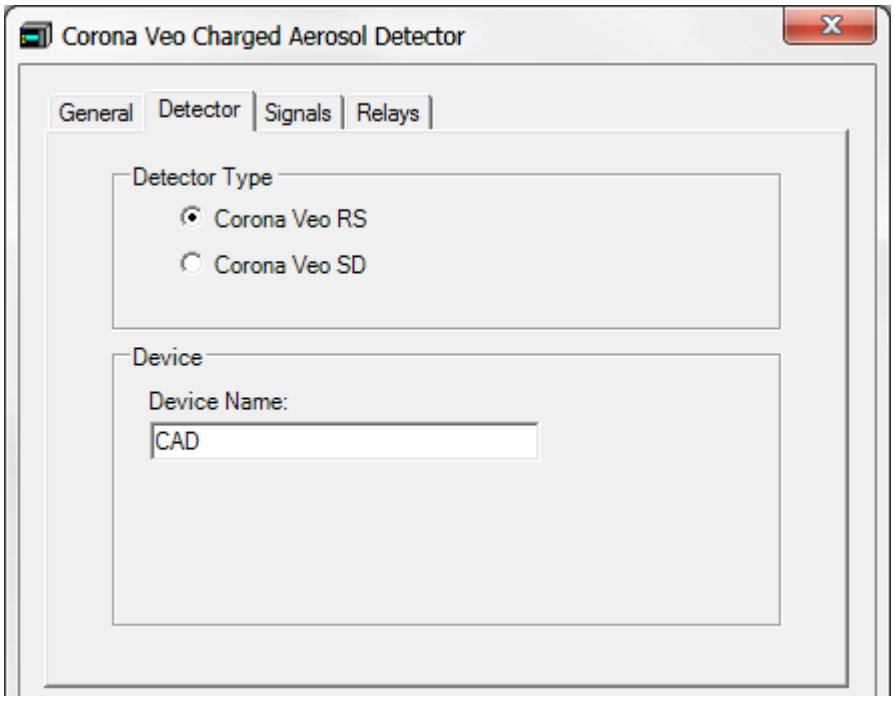


Fig. 18: Detector page

- **Detector Type**
  Select the detector type. Make sure that the selected option corresponds to the actually installed detector type.

- **Device Name**
  Displays the name used to identify the detector the installation environment and in the Chromeleon client program. To control the detector with the existing control panels, accept the default name. If you enter a different name, you may have to re-link the controls on the control panels and edit the device name in the program files.

Signals Page

The page lists all signal channels that Chromeleon can record for the detector. The signal type and name of each signal is displayed. To allow raw data collection for a signal, select the **Enabled** check box next to the signal name. If the check box is cleared, the detector cannot collect raw data for the signal. To change a signal name, overwrite the existing name directly in the **Name** line.

If the signals are renamed during the configuration, it is also necessary to update the panel tabset.

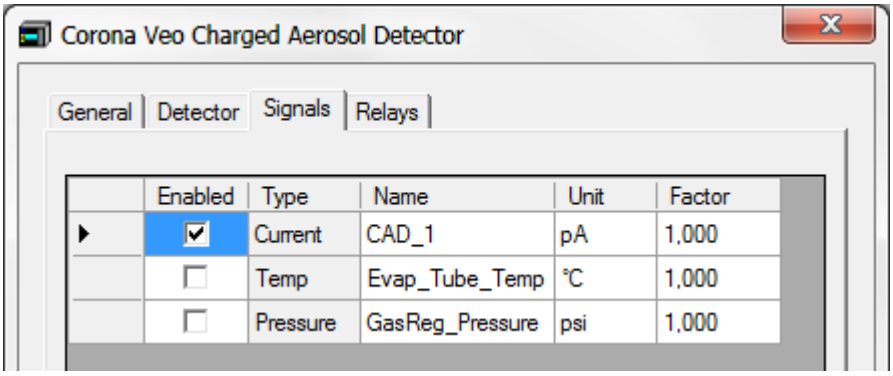


Fig. 19: Signals page (here: Corona Veo RS)

Relays Page

The **Relays** page lists all available relays. They refer to the relay outputs CC1 and CC2 on the rear panel of the detector.

The 'Pump Off' output is not available in Chromeleon.

To have the relays available for control on the detector tabset panel in Chromeleon, select a check box. If a check box is cleared, the relay will not be available on the detector tabset panel. To change a relay name, overwrite the existing name directly in the corresponding line.

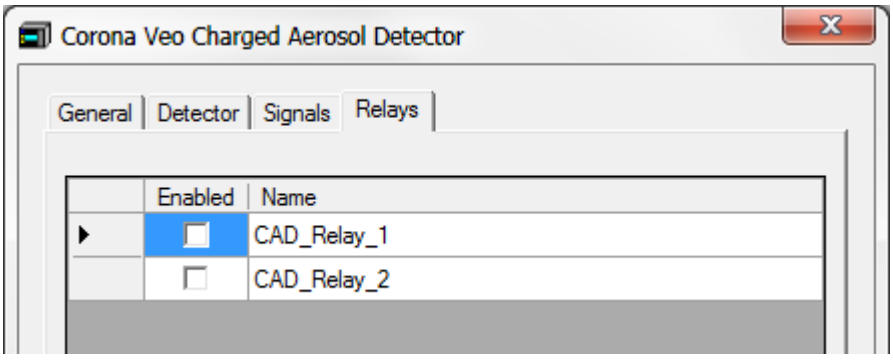


Fig. 20: Relays page

6.1.3.2 Changing the Configuration Properties

You may reopen the configuration pages later again to change the settings.

1. Start the **Server Configuration** program (→ page 80).
2. Right-click the **Corona Veo Charged Aerosol Detector** in the timebase and click **Properties** on the menu.
3. Change the settings as needed. For a description of the pages, see section 6.1.3.1 (→ page 81).
4. To save the changed configuration, click **Save** on the **File** menu and then close the **Server Configuration** program.

6.2 Setting Up the Detector in DCMSLink

To set up the detector in DCMSLink, refer to *DCMSLink Installation Guide*, which is provided on the DCMSLink DVD in the *Additional Documents\DCMSLink User Documents* folder.

1. Install and configure the DCMSLink software (→ *DCMSLink Installation Guide*).
2. Open the Chromeleon **Server Configuration** program (→ *DCMSLink Installation Guide*).
3. In the **Server Configuration** program, add the detector to the timebase. Follow the appropriate steps in section 6.1.2 (→ page 80).
4. Configure the detector as described in section 6.1.3 (→ page 81).

For more information about DCMSLink, refer to the *DCMSLink Quick Start Guide*, which is also provided on the DCMSLink DVD and to *DCMSLink Help*.

6.3 Operating the Detector from Chromeleon

Before you begin, verify that

1. The Chromeleon software is installed on the computer and the license code is entered. The computer meets the system requirements (→ page 11).
2. The detector is connected to the Chromeleon computer via a USB connection.

   Tip: Verify that Chromeleon is installed on the computer and that the license code is entered *before* you connect the detector to the USB port on the Chromeleon computer and turn on the detector power. Only then, the USB driver for the detector is automatically loaded and the Windows operating system can detect the detector when the power is turned on.
3. The detector is set up in Chromeleon, as described in section 6.1 (→ page 78).

Before you can operate the detector from Chromeleon, you have to connect the timebase in which the detector is installed to the Chromeleon client program (→ page 85).

Two modes of software control are available:

- **Direct control** with the parameters and commands from the **Commands** (F8) dialog box (→ page 86) or from a control panel (→ page 87).
- **Automated control** with a control program (PGM) (→ page 88).

6.3.1 Connecting to Chromeleon

1. Start the Chromeleon **Server Monitor** and the Chromeleon server if they are not yet running (→ page 78).
2. Start the Chromeleon client by clicking the Chromeleon icon  on the desktop. If the Chromeleon icon is not on the desktop, click **Start** on the taskbar, point to **Programs** (or **All Programs**, depending on the operating system), point to **Chromeleon**, and then click **Chromeleon**.
3. Connect the Chromeleon client program to the timebase in which the detector is installed. For details about how to do this from the **Commands** (F8) dialog box, see page 86. For details about how to do this on a control panel, see page 87.

Before turning off the detector by the main power switch, always **disconnect** the detector in Chromeleon.

6.3.2 Direct Control

With direct control, you select operating parameters and commands in the **Commands** (F8) dialog box. Direct commands are executed as soon as they are entered. For routine operation, most parameters and commands are available also on a control panel.

To open the Commands dialog box for the detector

1. Open a control panel (any panel is possible). To open a control panel, open the Chromeleon Browser and double-click a control panel in the **Dionex Templates/Panels** folder.
2. Connect the control panel to the timebase in which the detector is installed. On the **Control** menu, select **Connect to Timebase**, and then select the timebase on the **Timebase** tab. (The Control menu is visible only when a control panel is open.) For information about the **Timebase** dialog, click **Help**.
3. Press the F8 key or select **Command** on the **Control** menu.
4. To see the parameters and commands that are available for the detector, click the plus sign next to **CAD**.

   The commands and parameters available in the dialog box vary, depending on the
   - Chromeleon version
   - Options selected for the detector in the Properties dialog (→ page 81).
   - Display filter level (**Normal**, **Advanced**, or **Expert**)
5. Change the display filter level if necessary. Right-click in the commands list and select the filter level on the menu.

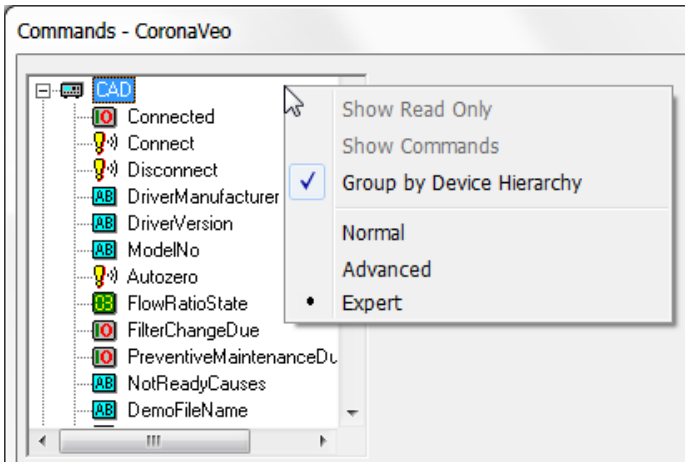


Fig. 21: Commands dialog box

6. Verify that the detector is connected to Chromeleon. If it is not, select **Connect** to connect the detector.

For a list of the commands and properties that are supported for the detector, see the Chromeleon Help. In addition to the detector commands and parameters, the **Commands** (F8) dialog box provides access to all of the commands and parameters available for all devices that are installed in the selected timebase.

To open a control panel

1. On the **View** menu, click **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 modules 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 page for the detector.

3. Verify that the detector is connected to Chromeleon (the Connect button is green). If it is not, click **Connect**.

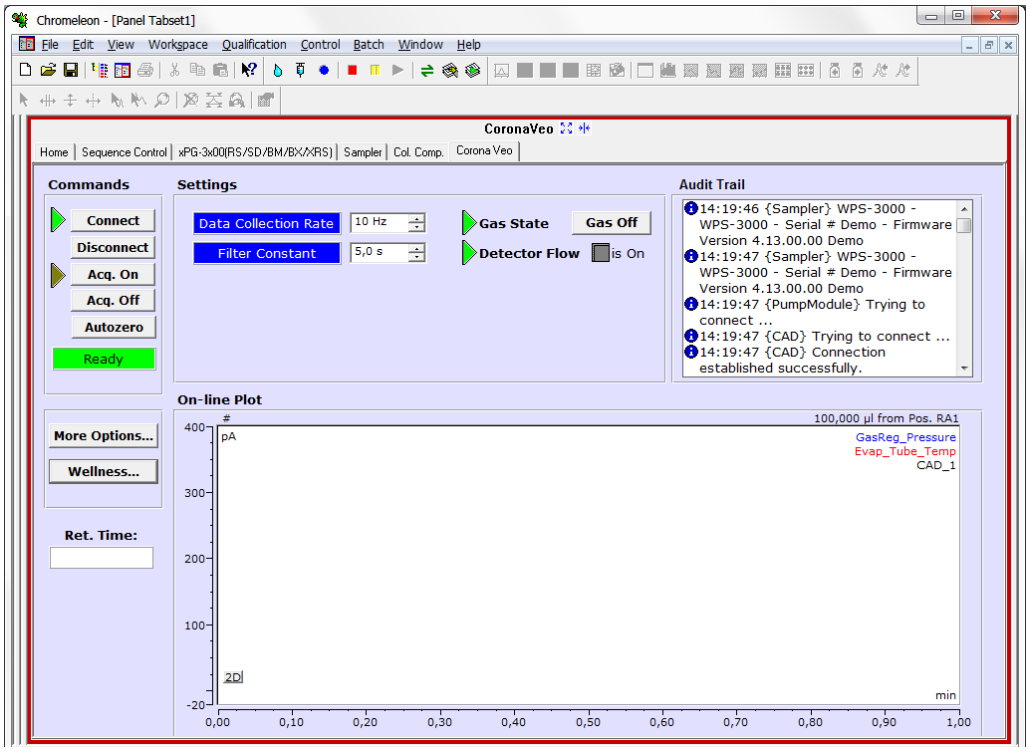


Fig. 22: Detector control panel

The control panel provides access to the operating parameters and commands required for routine operation of the detector. Additional functions are available in the **Commands** (F8) dialog box. To open the **Commands** box from the panel tabset, select **Command** on the **Control** menu.

6.3.3 Automated Control

With automated control, you create a program file (PGM) for automated operation of the detector. Programs can be created automatically with the help of a software wizard or manually by editing an existing program.

In addition to programs for sample analysis, you can also create programs for special purposes, for example, to automate system shutdown (→ page 111) or to ensure that the system automatically restarts operation as desired after a power failure. For details, see the Chromeleon Help.

You can create a program:

- Manually (→ see below).
- With the Program Wizard (→ page 89).

For information how to start a program, see page 89.

To create a program manually

1. Open an existing program.

   Select and double-click the program you want to open.
   - or -
   On the **File** menu, select **Open**. In the dialog box, select **Program** on the **Object of Type** list and select the program.

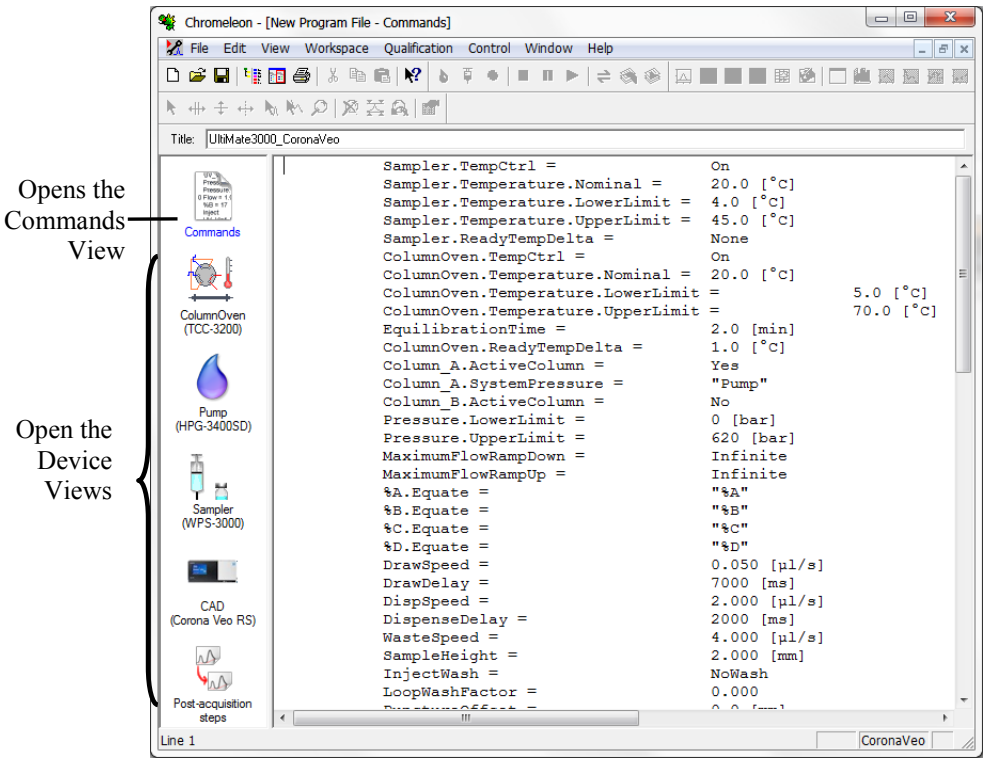


Fig. 23: Chromeleon program file (here program shown in the Commands view for Corona Veo RS)

2. Change the settings in the program as desired.

   The easiest way to edit a program is to do this in the Device Views (→ Fig. 23). Click a device icon and change the settings on the device pages. Editing the program in the Device Views ensures correct command syntax.

   If you cannot edit a certain parameter in the Device View, click **Commands** to open the Commands View. The **Commands** view shows the entire program, listing the control commands in chronological order. For more information, see the Chromeleon Help.

3. To start the program, follow the steps below.

To create a program with the Program Wizard

1. Open the Program Wizard. On the **File** menu, select **New**, and then select **Program File**.
2. The wizard guides you through program creation. On each wizard page, make the desired settings or accept the default values. For additional information about a page, click **Help**.
3. After you finish the wizard, Chromeleon automatically creates the corresponding program.
4. To start the program, follow the steps below.

To start a program

Program for sample analysis

1. Create a sample list (sequence). A sequence must include the program and a method for evaluating the sample data (for example, for peak identification, area determination, and amount determination).
2. Assign the program and method to each sample on the list.
3. Add the sequence to the batch and start the batch.

For information about each of the above steps, see the *Chromeleon Help*.

Other programs

Add the program to the batch and start the batch.

7 Troubleshooting

7.1 Overview

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

- Status screen on the detector display
  The display on the front panel provides a quick visual check of the operational status of the detector.
- Troubleshooting check to isolate the cause of a problem (→ page 92).
- Self-test diagnostics and error codes
  If errors are detected during the self-test diagnostics upon power-up, an error code is shown on the detector display. For information about the self-test error codes, see the 'Self-Test Error Codes' section (→ section 7.2, page 93).
- Error and warning codes
  If a fault or error is detected during the operation of the detector, a code appears on the detector display. Check the 'Warning and Error Codes' section for recommended courses of action (→ section 7.3, page 95). If you operate the detector from a chromatography data system, a message will also be documented in the audit trail of the software.
- Operating problems
  For information about operating problems that might occur during the operation of an UltiMate 3000 system, see the 'Operating Problems' section (→ section 7.4, page 99).

Quick Troubleshooting Check

The following guidelines can be used to quickly isolate the cause of a problem. Subsequent troubleshooting sections cover the problems in greater detail.

1. Turn on the detector and wait for the result of the self test. If the test fails, note the error code and check the 'Self-Test Error Codes' section (→ section 7.2, page 93).
2. If the detector does not power up:
   a) Check the power cord and make sure that it is properly connected.
   b) Check the fuses on the rear panel of the detector.
3. Check that
   - all gas connections are properly made, there are no signs of leakage, and the gas is flowing.
   - the external gas supply pressure is 480 – 550 kPa (70 and 80 psig). If not, adjust the pressure as required.
   - the exhaust tubing located at the rear of the detector is free of kinks, blockages or loops and that the ventilation is free from blockages.
   - all connections in the flow path of the LC system, including the detector, are correct and that there are no visible signs of leakage.
   - the gas filter assembly (located in the interior on the right-hand side of the detector) is properly attached.
   - the other system components are connected and operating properly, according to the instructions for each system components.
   - all synchronizing Digital I/O connections are properly made and functioning correctly.
4. Verify that any recent maintenance procedures were properly executed as described in section 8.3 (→ page 109).

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

7.2 Self-Test Error Codes

Internal self-test diagnostics are performed when the detector is powered up. If the diagnostics determined that there is an internal problem, the detector is not ready for analysis and an error code will appear on the display.

If the self test fails during start-up, the detector will display a sum of the affected self-test error codes.

1. Select the **Review** soft key. The first entry for the self test review will be displayed on-screen.
2. Select the **Test Name** in parenthesis to review the results of the entry. Navigate through the self test review with the **Next** and **Last** soft keys.
3. Note any failed self tests and their respective values for your records.
4. To exit the self test review at any time, select the **Continue** soft key.

> **Tip:** Selecting the **Continue** soft key at any time during the self test review will bypass the results and default to the Main Menu.

If an error code appears on the display, turn the detector off, wait several minutes and turn the detector on again to repeat the self test diagnostics. If the error code still appears, contact the Thermo Fisher Scientific Service for Dionex HPLC products for further assistance. Have the serial number of the detector, the error code or the exact wording of the message and the firmware version number available.

Error Code	Description
1	The detector failed to reach the maximum voltage.
2	An error occurred with the high voltage output when the voltage of the corona charger was turned off.
4	An error occurred with the high voltage current at maximum voltage.
8	An error occurred with the charger current when the voltage of the corona charger was turned off.
10	An error occurred with the reading of the flow ratio transducer at zero pressure
20	An error occurred with the reading of the pressure transducer at zero pressure.
40	An error occurred with the reading of the total flow transducer at zero pressure.
80	An error occurred with the ion trap supply upon power up. Liquid is present in the ion trap, indicating detector flooding. Turn off the pump flow. Check that the drain assembly is free from loops, kinks or blockages. Flow only gas through the detector for 24 hours. Re-run the self test.
100	An error occurred with the ion trap supply when the ion trap voltage was turned off. Liquid is present in the ion trap, indicating detector flooding. Turn off the pump flow. Check that the drain assembly is free from loops, kinks or blockages. Flow only gas through the detector for 24 hours. Re-run the self test.

Error Code	Description
200	The detector failed to reach a steady-state internal temperature. The detector requires additional warm-up time before the self test. Allow the detector to reach room temperature. Re-run the self test.
400	The clock is not set.
800	The clock is not running.
1000	The clock battery is low.

7.3 Warning and Error Codes

Each time a fault or error occurs during the operation of the detector, a warning code or error code appears on the detector display. In this case, the **Continue** soft key appears on the display for navigation

If you operate the detector from a chromatography data system, a message will also be documented in the audit trail of the software.

Warning Codes

The following table lists the detector-related warning codes and messages along with recommended remedial actions. Warning codes will neither interrupt data acquisition from the detector nor interfere with automated sequences or batch runs when you operate the detector from a chromatography data system.

Note the warning code or the exact wording of the message and contact the Thermo Fisher Scientific Service for Dionex HPLC products if you are unable to eliminate the problem.

Warning Code	Warning Message	Description and Remedial Action
15000	Charger voltage failed	The voltage of the charger approaches the maximum level. Turn the detector off and on. If the voltage still fails, contact Service.
15010	Leak sensor fault detected	The leak sensor has reported a leak. Check the nebulizer and/or stream-switching valve for signs of leakage. Dry the leak sensor (→ section 8.4, page 112).
15008	Stream-switching valve (SSV) failure	*Corona Veo RS only* The SSV has failed to rotate. From the System Setup Menu, manually actuate the valve. If the valve still fails to rotate, disassemble and inspect the SSV (→ section 8.7.1, page 116). If the error persists, replace the rotor and stator (→ section 8.7 , page 116).
15011	High engine temperature	The internal temperature of the detector is too high. Turn the detector off and on. Test the evaporation heater by the self test. Allow the detector to come to thermal stabilization. If the heater still fails, contact Service.
15012	Low engine temperature	The internal temperature of the detector is too low. Turn the detector off and on. Test the evaporation heater by the self test. Allow the detector to come to thermal stabilization. If the heater still fails, contact Service.
15013	High evaporation temperature	The temperature of the evaporation tube is too high. Set a lower temperature in the specified range (→ section 5.6.3, page 66).

Warning Code	Warning Message	Description and Remedial Action
15014	Evaporation heater fault	The evaporation heater has failed to apply the selected temperature. Turn the detector off and on. Test the evaporation heater by the self test. Allow the detector to come to thermal stabilization. If the heater still fails, contact Service.

Error Codes

The following table lists the detector-related error codes and messages along with recommended remedial actions. Error codes immediately result in the interruption of data acquisition from the detector and will terminate any automates sequences or batch runs when you operate the detector from a chromatography data system.

If left unattended, error codes may result in permanent physical damage to the detector.

Note the error code or the exact wording of the message and contact the Thermo Fisher Scientific Service for Dionex HPLC products if you are unable to eliminate the problem.

Error Code	Error Message	Description and Remedial Action
29006	Low gas pressure	The gas pressure has dropped below 241 kPa (35 psig). This can be caused by an incorrect gas pressure setting: a gas leak (internal or external), or an incorrect gas supply pressure. The contact closure was sent to the Digital I/O terminal of the detector. If a pump is connected to the Digital I/O, the pump flow will be stopped. On the detector display, press any soft key to continue. *Corona Veo RS only:* The stream-switching valve will divert liquid flow away from the nebulizer to prevent detector flooding. Check that • gas supply pressure is in the range of 480 kPa – 550 kPa (70 – 80 psig) and that gas is still being delivered to the detector. • gas pressure reading on the detector display is the range of 276 kPa – 448 kPa (40 – 65 psig). • gas supply tubing is correctly installed at the rear of the detector and that there are no signs of a gas leak. • gas filters are correctly installed and that there is no sign of gas leakage. Turn the detector off and on and allow the self test to test the pressure sensors. If the error persists, contact Service.

Error Code	Error Message	Description and Remedial Action
29004	High gas pressure	The gas pressure has risen above 448 kPa (65 psig). This can be caused by an incorrect gas pressure setting or a failing gas regulator. The contact closure was sent to the Digital I/O terminal of the detector. If a pump is connected to the Digital I/O, the pump flow will be stopped. On the detector display, press any soft key to continue. *Corona Veo RS only:* The stream-switching valve will divert liquid flow away from the nebulizer to prevent detector flooding. Check that • gas supply pressure is in the range of 480 kPa – 550 kPa (70 – 80 psig) and that gas is still being delivered to the detector. • gas pressure reading on the detector display is the range of 379 kPa – 448 kPa (55 – 65 psig). • gas supply tubing is correctly installed at the rear of the detector. • gas filters are correctly installed. The pressure relief valve will open if the gas supply pressure exceeds 550 kPa (80 psig). The purpose of the valve is to protect the detector from damage in the event that the gas supply pressure exceeds the recommended range. If this occurs, adjust the gas pressure within the specified range (480 kPa – 550 kPa (70 – 80 psig)). The gas pressure relief valve should immediately close once the gas pressure is maintained in the range of 480 kPa – 550 kPa (70 – 80 psig). Turn the detector off and on and allow the self test to test the pressure sensors. If the error persists, contact Service.
29002	Low flow ratio	The gas flow ratio (charging gas to gas pressure) is outside of specification for more than 60 seconds. The contact closure was sent to the Digital I/O terminal of the detector. If a pump is connected to the Digital I/O, the pump flow will be stopped. On the detector display, press any soft key to continue. *Corona Veo RS only:* The stream-switching valve will divert liquid flow away from the nebulizer to prevent detector flooding. Check that • gas supply pressure is in the range of 480 kPa – 550 kPa (70 – 80 psig) and that gas is still being delivered to the detector. • gas pressure reading on the detector display is the range of 379 kPa – 448 kPa (55 – 65 psig). Turn the detector off and on and allow the self test to test the pressure sensors. If the error persists, then there may be an internal leak or possible gas blockage due to internal liquid flooding within the detector. Contact Service.

Error Code	Error Message	Description and Remedial Action
29003	High flow ratio	The gas flow ratio is outside of specification for more than 60 seconds. The contact closure was sent to the Digital I/O terminal of the detector. If a pump is connected to the Digital I/O, the pump flow will be stopped. On the detector display, press any soft key to continue. *Corona Veo RS only:* The stream-switching valve will divert liquid flow away from the nebulizer to prevent detector flooding. Check that • gas supply pressure is in the range of 480 kPa – 550 kPa (70 – 80 psig) and that gas is still being delivered to the detector. • gas pressure reading on the detector display is the range of 379 kPa – 448 kPa (55 – 65 psig). Turn the detector off and on and allow the self test to test the pressure sensors. If the error persists, then there may be a possible gas blockage within the detector. Contact Service.
29009	Liquid sensor fault detected	Liquid is present the mixing chamber of the detector (→ Fig. 29). The contact closure was sent to the Digital I/O terminal of the detector. If a pump is connected to the Digital I/O, the pump flow will be stopped. On the detector display, press any soft key to continue. *Corona Veo RS only:* The stream-switching valve will divert liquid flow away from the nebulizer to prevent detector flooding. Turn the detector off and on and allow the self test to test the pressure sensors. In the Main Menu, set the gas pressure to **On** and attempt to dry the liquid present inside the detector for 24 hours. If the error persists, contact Service.
29000	Low ion trap voltage	The ion trap voltage is too low. Liquid may be present in the ion trap. The voltage may have been shorted due the detector flooding. The contact closure was sent to the Digital I/O terminal of the detector. If a pump is connected to the Digital I/O, the pump flow will be stopped. On the detector display, press any soft key to continue. *Corona Veo RS only:* The stream-switching valve will divert liquid flow away from the nebulizer to prevent detector flooding. Turn the detector off and on and allow the self test to test the pressure sensors. In the Main Menu, set the gas pressure to **On** and attempt to dry the liquid present inside the detector for 24 hours. If the error persists, contact Service.

For more information about the internal safety features of the detector, see section 5.7 (→ page 70).

7.4 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, also see the manuals for the other modules of the UltiMate 3000 system.

Problem	Probable Cause	Remedial Action
No information appears on the detector display.	The detector is not connected to the main power supply.	Connect the power cord.
	The power is turned off.	Turn on the detector power.
	The screen brightness is not adjusted correctly.	Adjust the brightness (→ page 49).
	The fuses have blown.	Replace the fuses (→ page 118). If the replacement fuse(s) fail, there is a fault with the power supply. Contact Service.
	An error occurred with the electronics.	Contact Service.
Problems during control under Chromeleon	There is no connection between the detector and the Chromeleon computer.	Check the USB cable and connection to the computer.
	The USB port on the computer is not ready for operation.	Check the USB port on the computer. It must comply with the USB 1.1 or 2.0 standards.
	The Chromeleon PC is very slow.	Verify that the system requirements are met (→ page 77).
No liquid flow	The system is leaking.	Find and eliminate the leak.
	There is a gas bubble in the autosampler flow path.	Perform a wash cycle (→ *Autosampler Manual*). Non-degassed wash solution is used. Degas the wash solution (→ *Autosampler Manual*).
	For further causes, refer to the Operating Instructions of your pump.	
The system has very high backpressure.	Flow-path components in the system (capillaries, filter, and column) are blocked by precipitate, or capillaries are damaged by bending.	Check the capillaries in the system step by step from the detector to the pump, remove the blockage, or replace the capillaries.

Problem	Probable Cause	Remedial Action
The system has very high backpressure *(Cont'd)*	Particulates from the mobile phase, the column, or injected samples have accumulated.	Ensure that the mobile phase and/or samples are filtered sufficiently before use (e.g. with an in-line filter). Use a mobile phase with a substantial fraction of an organic solvent to prevent growth of microorganisms. Observe the guidelines for mobiles phases (→ page 41). Use freshly prepared mobile phase. Growth of microorganisms in the mobile phase may lead to clogging of the filter.
	The solubility of the analyte (standard or sample) in the mobile phase exceeded.	Start the autosampler and isolate the pressure spike up to the detector. Replace the in-line filter elements. Flush the system using an appropriate solvent. Make sure standard and/or sample are soluble in the mobile phase. Use diluted sample/standard if necessary.
	The nebulizer nozzle of the detector is clogged.	Poor solubility of analyte during nebulization/analyte build-up. Check the backpressure of the nebulizer. From the Main Menu, of the detector, turn off the gas flow. Remove the nebulizer from the detector. Carefully flow liquid through the nebulizer capillary from the pump. Backpressure of the nebulizer is typically below 10 bars. Liquid should exit the capillary in drops. If the backpressure rises in the pump, then there is a blockage in the nebulizer capillary. Install a new nebulizer (→ *Nebulizer Installation Instructions*). Flush the detector with an appropriate mobile-phase composition to solubilize analyte build-up.

Problem	Probable Cause	Remedial Action
High baseline drift	The column is contaminated.	Clean or replace the column.
	The system is not sufficiently equilibrated.	Flush the system until equilibration.
	The eluents are dirty or not homogeneous.	Before you start an analysis, homogenize eluents already in their reservoir. Use fresh solvent and check the eluent filter frits. In aqueous solvents, growth of microorganisms is possible.
	The environmental conditions are unstable.	Make sure that the temperature and the humidity are constant. Avoid draft.
	The mobile phase is contaminated.	Use fresh solvent. Use HPLC-grade eluents only.
High noise, non-periodic baseline fluctuation	There are pressure fluctuations from the pump.	Purge the pump; check general function (→ *Pump Manual*).
	There are air bubbles in the system.	Purge the system (→ *Pump Manual*).
	The eluent is dirty or their purity is insufficient.	Use fresh solvent. Use HPLC-grade eluents only.
	The gas content of the eluent is too high.	Degas the eluent.
	The system is not grounded.	Verify that all system components are grounded.
	The mobile phase is contaminated.	Use fresh solvent. Use HPLC-grade eluents only.
	Connections in the system are leaking.	Check the system for leaks and tighten all fitting connections if necessary.
	The mobile phase is not properly mixed.	Check the mixing function of the pump (→ *Pump Manual*).
	Contaminants are eluting from the column.	Trace levels of organic compounds may be tightly retained by the column. Remove the column and see if problems persist. Clean the column. If problems continue to exist, replace the column (→ *TCC Manual)*.
	The column temperature is not held constant.	Check the thermostatted column compartment (→ *TCC Manual)*.

Problem	Probable Cause	Remedial Action
High noise, non-periodic baseline fluctuation *(Cont'd)*	There are temperature fluctuations in the laboratory.	Check the thermostat in the laboratory. If possible, note the temperature fluctuations/values in the system log.
Periodic baseline fluctuation, pulsation	There are pressure fluctuations from the pump.	Purge the pump; check general function (→ *Pump Manual*).
	There are air bubbles in the system.	Purge the system (→ *Pump Manual*).
Peak Tailing	Too large extra column volume	Use short capillary connections with a suitable inner diameter.
	There are bad capillary connections.	Use different capillaries, for example, Viper capillaries.
Peak Broadening, increased dead time	The inner diameter of the capillary to the detector is too large.	Change the capillary.
	The filter frits on the solvent lines are clogged.	Check the filter for permeability. Replace the filter frit if necessary (→ *Pump Manual*).
	The capillaries are clogged or capillary connections bad.	Replace the capillaries. Use different capillaries, for example, Viper capillaries.
	The sample loop is clogged.	Replace the needle (→ *Autosampler Manual*).
	The proportioning valve is defective.	Contact Service.
	The column is overloaded or contaminated.	Clean or replace the column.
	The eluent has changed.	Use fresh solvent.
Reproducible ghost peaks in the chromatogram.	The degassing channels are contaminated.	Rinse the degassing channels *(→ Solvent Rack or Pump Manual).*
	The solvents are degraded or dirty or their purity is insufficient.	Use fresh and appropriate solvents.
	Contamination occurs in the autosampler or somewhere in the system.	Flush the autosampler or the entire system using an appropriate solvent.
Some broad ghost peaks in the chromatogram.	Late eluting peak from previous analysis.	Extend the run time. Increase the elution strength of the gradient (higher organic content). At the end of the run, flush column with strong eluent.

Problem	Probable Cause	Remedial Action
Spikes	Electrical interferences from other modules.	Isolate the electrical circuit from strong current consumers. Consider using an UPS (Uninterruptible Power Supply) to filter current fluctuations. Ground the detector using heavy gauge wire from the thumbscrew ground terminal that is located on the power supply module to the main power ground.
	The column temperature is significantly above boiling point of the mobile phase.	Use a post-column cooler or reduce the column temperature.
Negative Peaks	Sample solvent and mobile phase differ in composition.	Dissolve the sample in the mobile phase.
	Wrong polarization of the analog output interface.	Check the analog output polarization.
Loss of response	Analytes of interest are not sufficiently stable.	Some compounds will decompose as a function of time. Check the stability regularly, and prepare fresh standards. If necessary, change conditions.
	The pH of the solvent or the mobile phase composition has been changed.	Check the mobile phase. Mobile phases should be freshly prepared. Use a fresh mobile phase.
	A parameter has accidentally been changed.	Check the settings and verify that the detector is turned on and data acquisition is started.
	Autosampler components may be partially or fully clogged.	Make sure that the sample and mobile phase are clean. Flush the autosampler (→ *Autosampler Manual*).
	The stream-switching valve (SSV) is in the divert position (Corona Veo RS only).	Make sure that the SSV is directing liquid to the nebulizer.
	The drain pump of the detector has failed.	In the System Setup menu, make sure that the drain pump is turned on. If there is excessive gas venting from the Waste port, contact Service.

Problem	Probable Cause	Remedial Action
Loss of response *(Cont'd)*	The retention times changed.	Maintain the column at constant temperature.
		Air is present in the pump or an incorrect flow rate is set. Purge the pump (→ *Pump Manual*). Check the flow rate. Consider the mobile phase.
	The gas flow is turned off.	No gas flow is present to induce nebulization.
		Make sure that the gas is flowing into the detector.
	The gas flow is reduced.	Reduced gas flow can lead to low response.
		Make sure that the gas is flowing into the detector. Check gas filters and replace them if necessary (→ page 113).
	Gas is leaking.	Gas leaks interrupt the nebulization. The gas flow value is too low on the display. Check the gas inlet, exhaust and tubing. Remedy the gas leak and/or replace gas tubings.
	Liquid is leaking at the detector inlet.	Check the capillary connections. Check the tubing connected to the waste port of the detector for liquid.
		If internal liquid leak is observed, contact Service.
Poor peak area precision	The autosampler draws air from the vial.	There is not enough amount of sample in the vial, the needle height setting is incorrect (→ *Autosampler Manual*), or there are too many replicates.
	There are air bubbles in the syringe or the autosampler flow connection parts.	Flush the syringe (→ *Autosampler Manual*).
		Non-degassed wash solution is used. Degas the wash solution (→ *Autosampler Manual*).
	There is a gas bubble in the flow path.	Perform a wash cycle (→ *Autosampler Manual*).
	The draw speed is too high.	Reduce the draw speed (→ *Autosampler Manual*).
	The gas content of the sample is too high or saturated.	Reduce the draw speed (→ *Autosampler Manual*). Degas the sample if possible.
	The needle is clogged or the needle tip is deformed.	Replace the needle (→ *Autosampler Manual*).

Problem	Probable Cause	Remedial Action
Poor peak area precision *(Cont'd)*	The autosampler, the injection valve, or the syringe valve is not tight.	→ *Autosampler Manual*
	Carry-over occurs in the system.	Flush the needle using an appropriate solvent *(→ Autosampler Manual)*.
	The capillary connections are not installed properly or they are not tight.	Check and tighten the capillary connections. Exchange the needle seat if necessary (→ *Autosampler Manual*). Exchange the needle if necessary (→ *Autosampler Manual*).
	There are dead volumes in the capillary connections.	Replace the fittings. Make sure that the capillaries are installed correctly. Thermo Fisher Scientific recommends using Viper capillary connections whenever possible.
	The piston seals are not tight.	Replace the seals (→ *Pump Manual*).
	There is air in the working head.	Purge the pump; check general function (→ *Pump Manual*).
	There is pump pulsation.	Use degassed solvents.
	The gradient is irreproducible.	Change the gradient. Check the pump function and degassing. Check the filter frits in the solvent line filters for contamination. Replace the frits if necessary.
	The sample is unstable and decomposes.	Use new sample or change the conditions. Cool the sample in the autosampler if possible.
	Baseline fluctuations	see "Baseline Fluctuations"
	The environmental conditions are unstable.	Make sure that the temperature and air humidity are constant. Use column thermostatting. Avoid draft.
	Contamination occurs somewhere in the system.	Flush the system using an appropriate solvent.

Problem	Probable Cause	Remedial Action
Noisy baseline, high background current	The mobile phase is contaminated.	Use fresh solvent. Use HPLC-grade eluents only.
	Highly retained compounds are being eluted from the column.	This may occur when a new mobile phase or column is used. Allow the system to equilibrate for an hour with the new mobile phase or until the baseline is stable and check the signal again. Remove the column and re-establish flow. If the signal drops, clean or replace the column (→ *TCC manual)*.
	Fittings are leaking.	Check the flow path connections. Tighten fitting connections if necessary.
	Contamination occurs somewhere in the system.	Flush the system using an appropriate solvent.
	The detector is flooded with solvent (pump flow is turned on while no gas flow is present).	This may occur if the detector is turned off. Clean and dry all aspects of the flow path. Operate the detector without liquid flow (pump flow is turned off) or with liquid flow being diverted with gas flowing for 24 hours.
Inability to autozero the signal	High background signal on a very sensitive current range (background >10 x gain)	Use a mobile phase that provides a lower background (lower concentration of impurities). Increase the current range.
	The autozero occurs on a peak or the void signal.	Autozero on a relatively flat section of the chromatogram.
	Autozero on a very noisy signal.	Reduce the noise or increase the current range.
Liquid in the gas exhaust	The detector is flooded with solvent (pump flow is turned on while no gas flow is present).	This may occur if the detector is turned off when liquid is still flowing into the detector. Clean and dry all aspects of the flow path. Operate the detector without liquid flow (pump flow is turned off) or with liquid flow being diverted with gas flowing for 24 hours.

8 Maintenance

8.1 Safety Guidelines for Maintenance

The following sections describe all maintenance procedures for the detector that the user may perform. All other maintenance and service procedures must be performed 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).

Before starting maintenance or service procedures, observe the following precautions:

- 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.

For instructions on shutting down the detector, see page 74.

8.2 Returning the Detector for Repair

Before returning the detector for repair, contact the Thermo Fisher Scientific Service for Dionex HPLC products. An RMA (Return Material Authorization) number is required to track your device. Always use the original packaging and observe the packing instructions (Service Return Form section in the manual binder) when shipping the detector. Shipping the detector in anything other than the original packaging will void the warranty.

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 also available on request.

8.3 Routine and Preventive Maintenance

8.3.1 Inspection and Service Plan

The preventive maintenance features of the detector provide information about internal parameters and service intervals.

Gas Filter Change Date

The Gas Filter Change Date can be set manually. After you have replaced the gas filters, set the date annually. To set the gas filter change date:

1. In the Main Menu, select the **System Menu** soft key.
2. In the System Setup Menu, select the **Date/Time** soft key.
3. Select the **Reset Filter Chg Date** soft key. The detector will reset a countdown of 12 months.

Preventive Maintenance Date

The Preventive Maintenance (PM) Date provides information about the next preventive maintenance procedure that is to be performed and can be reset manually. The due date is shown on the detector display and is one year from the manufacturing date of the detector.

Tip: Have a service representative perform preventive maintenance annually for the detector. For further information, contact the Thermo Fisher Scientific Service for Dionex HPLC products.

To set the PM date from the detector display:

1. In the Main Menu, select the **System Menu** soft key.
2. In the System Setup Menu, select the **Date/Time** soft key.
3. Select the **Reset next PM Date** soft key. The detector will reset a countdown of 12 months.

General Routine Maintenance in an LC System

Perform the maintenance procedures listed in the table at regular intervals to ensure optimum performance and maximum uptime of the detector. The exact maintenance schedule for the detector will depend on a number of factors, such as sample type, mobile phase composition, sample cleanliness, etc.

Frequency	What you should do...
Daily	Inspect the flow connections for indications of leakage or restrictions.
	When using buffer solutions, flush the system thoroughly after use. Use a solvent that does not contain buffers or salts.
	Check that the solvent bottle(s) contain sufficient mobile phase for the expected analysis.
Regularly	Check the drain tubes connected to the drain ports on the bottom right of the detector (→ page 34). Verify that the tubings are unclogged and are routed below the drain port. Check the volume of the liquid in the waste container and empty as needed.
	Inspect the tubing for possible damage, such as cracks, nicks, cuts, or blockage.
	Check all electrical connections to ensure that they are properly seated.
Annually	Have a service representative check the detector and perform preventive maintenance once a year to prevent contamination and excessive wear.

The detector is just one component of a chromatographic system. The performance of the detector will reflect the performance of the overall HPLC system. To maintain optimal analytical performance, perform routine maintenance on each of the various HPLC system components (e.g., pump, autosampler, etc.).

8.3.2 Maintaining the Detector between Analyses

Prevent build-up or accumulation of residue from mobile phase/analytes within the detector between the analyses. To do so, periodically flush the detector. This helps maintain consistent response, optimum performance and reduced detector downtime. In general, make sure that you use the solvent with the best solubility characteristics for the analyte(s) of the analytical method in question.

Remove the analytical column before you perform any of the following wash procedures. Without column, a typical flow rate will be 2.0 mL/min.

Mobile phase and sample composition	**Recommended wash procedure**
Reverse phase (small molecules)	• A mixture of isopropyl alcohol (IPA) and HPLC-grade water. The required amount depends on the gradient method used. • High aqueous mixtures when using buffers over 100 Mm in strength.
Reverse phase (large molecules and polymers)	100 % tetrahydrofuran (THF) or other appropriate organic solvent as determined by the HPLC method used.
Reverse phase (proteins)	A mixture of alcohol (IPA/methanol) and HPLC-grade water (50:50).
Normal phase	A mixture of tetrahydrofuran and methanol (50:50).

8.3.3 Cleaning the Surface of the Detector

Observe the following when cleaning the surface of the enclosure:

- Clean the surface of the detector with a soft towel moistened with a mild detergent. This should be suitable for removing dust and fingerprints.
- Prevent any liquids from entering the inside the detector, as this could damage the detector. Clean the display with a soft tissue.

If it becomes necessary to disinfect the enclosure surface, use a mild 10 % bleach solution. However, do not allow the bleach solution to remain on the detector for more than a few minutes. Wipe the solution off with a damp towel. After cleaning, dry the detector with a soft towel.

8.3.4 Operational Qualification and Performance Qualification

Operational Qualification and Performance Qualification allow you to check and document the performance of the HPLC system. All materials required for performing qualification and detailed instructions are available on request.

8.4 Eliminating Leakage

The leak sensor is installed on the interior front panel of the detector (→ Fig. 2, page 19). The sensor reports a leak when liquid collects in the drip tray under the flow connections. Eliminate the cause for the leakage and dry the leak sensor.

1. Stop the pump flow. If you operate the detector from a chromatography data system, disconnect the detector from the software.
2. Turn off the detector.
3. Inspect the capillary connections on the detector for signs of leakage:
   - Nebulizer
     Check the capillary connection to the nebulizer for signs of leakage.
   - *Corona Veo RS only*
     Check the stream-switching valve for signs of leaks on the capillary connections from the column, to the nebulizer, and to "Divert" (waste).
4. With a cloth or tissue, absorb all liquid that has collected in the tray.

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

   ⚠ **Important:** Assurez-vous que vous ne tordez, ni n'endommagez le capteur.
5. Allow the sensor to adjust to the ambient temperature for a few minutes.
6. Turn on the detector and, if applicable, reconnect it with the chromatography software.
7. If no error is reported after you turned on the detector, you can resume operation.

   Tip: If the sensor is not dry, the display continues to show a warning code.

8.5 Replacing the Gas Filters

The detector filters incoming gas through two gas filters: a charcoal filter and a high-efficiency particulate air (HEPA) filter. The gas filters are located on the right front side of the detector (view from the front).

In the System Setup Menu, under the **Date** soft key, the detector indicates when the filters should be replaced and alerts if the date has expired. Expired dates will be indicated by a color change to red test. The gas filters are replaced as a single unit.

To replace the gas filters:

1. Stop the detector operation:
   a) Turn off the mobile phase flow. Allow gas to flow for at least 5 minutes.
   b) Turn off the gas flow. Wait several minutes for the detector to de-pressurize.
   c) Turn off the gas supply to the detector.
   d) Press the power switch on the detector rear panel to turn the detector off.
   e) Disconnect the power cord from the main power receptacle of the detector.

   Warning: Disconnect the detector from all power sources before removing any panels. When the panels are removed, dangerous electrical connections will be exposed.

   Avertissement: Débranchez le détecteur de toutes les sources d'alimentation électrique avant de retirer les panneaux. Quand les capots de protection de l'appareil sont démontés, vous êtes exposés à des connexions électriques sous haute tension deviennent accessibles.

2. On the right side of the detector, loosen and remove the three screws that attach the cover plate to the detector enclosure with the Torx® TX 10 screwdriver. The Torx screwdriver is included in the accessories kit for the detector.

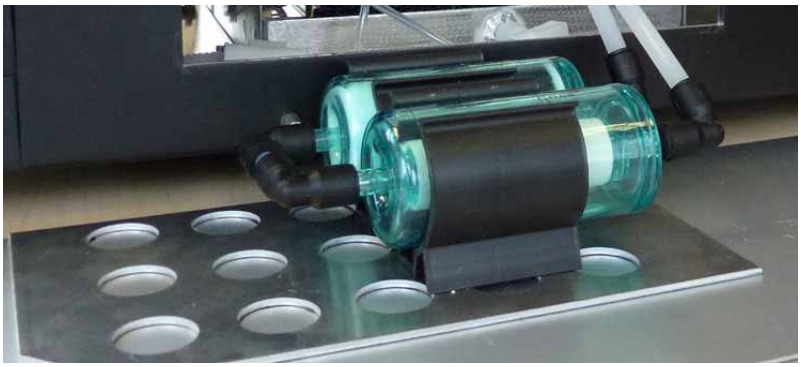


Fig. 24: Replacing the gas filters

3. Carefully move the cover plate away from the detector enclosure and place it close to the detector.
4. With the multi-tool from the accessories kit for the detector, push in the locking ring on the push-in fitting and pull carefully on the gas tubing.
5. Carefully pull the filters from out of the clamps on the cover plate.
6. To install the new filters, follow the above steps in reverse order. Install the gas filters in the direction of the gas flow through the filters. Flow direction signs are indicated on the filter housings.
7. Re-connect the power cord to the main power receptacle.
8. Turn on the detector. Observe the notes and precautions in section 5.2 (→ page 47). Allow the detector to perform the self test before proceeding.
9. On the detector display, reset the gas filter replacement date from the System Setup Menu.
   a) Select **Date** to get to the Date & Time Setup Screen.
   b) Select **Reset Filter Chg Date**. The replacement interval is automatically set for 12 months after replacement and can be reset manually.

8.6 Removing the Nebulizer

⚠ **Important:** Even minute particles may cause contamination to the nebulizer and can result in poor detector performance. Always wear clean-room gloves when you install or remove the nebulizer to prevent contamination of the detector parts.

⚠ **Important:** Même minuscules particules peuvent entraîner la contamination sur le nébuliseur et peuvent conduire à une performance de détecteur mauvaise. Toujours porter des gants de salle blanche lorsque vous installez ou supprimez le nébuliseur pour prévenir la contamination de pièces de détecteur.

To remove the nebulizer from the detector:

1. Stop the detector operation:
   a) Rinse out any harmful solvents from the detector. For information about recommended wash procedures, see section 8.3.2 (→ page 111).
   b) Turn off the mobile phase flow. Allow gas to flow for at least 5 minutes.
   c) Turn off the gas flow. Wait several minutes for the detector to de-pressurize.
   d) Turn off the gas supply to the detector.
   e) Press the power switch on the detector rear panel to turn the detector off.
2. Remove the white cover on the right side of the front panel to access the interior front panel.
3. Turn the nebulizer in the opening 90 degrees counter-clockwise to unlock it.
4. Pull the nebulizer out of the opening in the interior front panel.

   STOP **Warning:** The fused-silica capillary inside the nebulizer protrudes from the nebulizer tip. The capillary is fragile and sharp. To avoid personal injury or damage to the nebulizer capillary, handle the nebulizer carefully and do not touch the nebulizer tip.

   STOP **Avertissement:** Le capillaire de silice fondue à l'intérieur du nébuliseur émerge de l'extrémité de nébuliseur. Le capillaire est fragile et pointu. Pour éviter des blessures corporelles ou endommager le nébuliseur capillaire, manipulez le nébuliseur avec précautions et ne pas toucher la pointe du nébuliseur.

5. *If you do not replace the nebulizer*
   Install the dust cover on the nebulizer opening on the interior front panel.

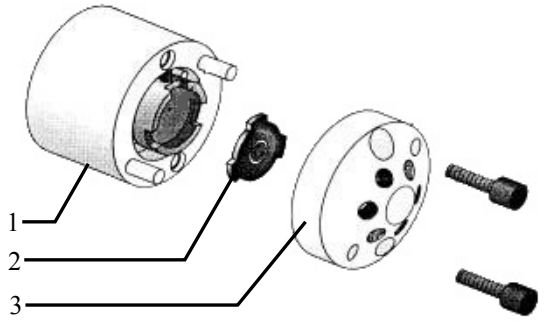
To install a new nebulizer, refer to the *Installation Instructions* for the nebulizer.

8.7 Stream-Switching Valve (Corona Veo RS only)

Tip: When you perform maintenance procedures on the stream-switching valve, put on a pair of clean room gloves to prevent contamination of detector parts.

8.7.1 Disassembling the Valve

1. Stop the detector operation:
   a) Rinse out any harmful solvents from the detector. For information about recommended wash procedures, see section 8.3.2 (→ page 111).
   b) Turn off the mobile phase flow. Allow gas to flow for at least 5 minutes.
   c) Turn off the gas flow. Wait several minutes for the detector to de-pressurize.
   d) Turn off the gas supply to the detector.
   e) Press the power switch on the detector rear panel to turn the detector off.
   f) Disconnect the capillaries from the stream-switching valve.
2. Remove the socket head screws that secure the stator to the valve with a hexagon wrench (9/64"). Loosen the screws alternately: Loosen each screw by only half a turn at a time to avoid that the stator gets jammed.
3. Remove the stator from the valve body. To ensure that the sealing surface of the stator cap is not damaged, place it on its outer face.



No.	Description
1	Valve
2	Rotor
3	Stator

Fig. 25: Exploded view of the valve

4. Carefully remove the rotor seal with your hand or a small screwdriver.
5. Inspect the rotor and stator surfaces for scratches:
   - If scratches are visible, the rotor and/or stator must be replaced.
   - If no scratches are visible, clean all parts thoroughly with deionized water and a microfiber cloth. Take care that no surfaces are scratched while you are cleaning the components. After cleaning, it is not necessary to dry the rotor.

8.7.2 Assembling the Valve

1. Insert the rotor in the valve. Make sure that the rotor sealing surface with its engraved flow passages faces away from the valve. The smooth side of the rotor must show to the valve. The pattern of the rotor is asymmetrical to prevent improper placement.
2. Install the stator on the valve. Make sure that the stator is in correct orientation.
3. Insert the two socket head screws in the stator and valve. Tighten them gently until both are tightened. Do not overtighten the screws. They only 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.
4. Re-connect the capillaries to the stream-switching valve (→ page 40).
5. Turn on the detector. Observe the notes and precautions in section 5.2 (→ page 47). Allow the detector to perform the self test before proceeding.

8.8 Replacing the Main Power Fuses

Warning: Turn off the main power switch. Disconnect the power cord from its source.

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

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

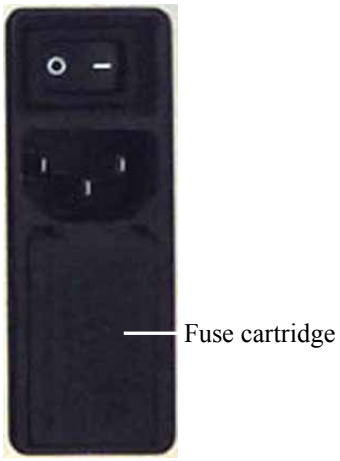


Fig. 26: Fuse cartridge

2. Replace the two fuses.

Warning: Always install two fuses. Use only the fuses indicated in the following table.

Avertissement: Installez toujours deux nouveaux fusibles. Utilisez uniquement les fusibles indiqués ci-dessous.

Description	Part no.
Fuse, 1A, slow-blow (5 x 20 mm)	Included in Fuses Kit (part no. 70-6666) For information about the kit, see section 10.3 (→ page 127).

3. Reinstall the fuse cartridge.
4. Reconnect the power cord to its source. Turn on the power to the detector.

8.9 Updating the Detector Firmware

The detector is shipped with the most recent firmware version. The firmware version is displayed on the Main Menu screen.

To update the detector firmware, the Chromeleon Chromatography Management System is required. The following update description refers to the Chromeleon 6.80 Service Release 13.

To check which firmware version is installed in the detector and which version is included in Chromeleon:

- In the Chromeleon **Server Configuration** program, open the configuration pages for the detector (→ page 81). On the **General** page, the firmware version is displayed.
- In the Windows Explorer, locate the **IQReport.log** file in the **IQ** folder of your Chromeleon installation. In the file, search for CAD3 FW (.run file).

Tip: When you update the firmware via Chromeleon, this information will also be provided during the download (→ below).

Whenever a new firmware version is released for the detector, the new version will be provided with the next Chromeleon Service Release and described in the related release notes.

The new firmware will *not* be downloaded automatically to the detector when you install a Chromeleon Service Release. To update the detector firmware, follow these steps:

Important: To ensure that the download is successful, make sure that the communication between the detector and Chromeleon is *not* interrupted during the download, and do *not* turn off the detector.

Important: Au cours du téléchargement, assurez-vous que la communication entre la pompe et Chromeleon n'est pas interrompue et n'arrêtez pas l'instrument. Ceci peut entraîner des dysfonctionnements de l'instrument.

1. Before you begin, verify that
   - The detector is connected in Chromeleon.
   - The Chromeleon server is in *running idle* mode. This means that all processes on the Chromeleon server PC and in Chromeleon have been stopped.
2. Start the **Server Configuration** program (→ page 80).
3. Right-click the detector in the timebase and select **Properties** on the menu.

4. On the **General** page (→ page 81), the firmware version provided by Chromeleon for the detector is displayed in the **Firmware** field. If more than one firmware version is available for the detector in Chromeleon, select the version from the **Firmware** list.
5. Click **Download**. A message displays the firmware version that is currently installed in the detector and the version that will be downloaded from Chromeleon.

   Tip: If the detector comes with a newer firmware than the version included in Chromeleon, do *not* downgrade the firmware. Older firmware may be incompatible with new hardware revisions.

6. Click **Yes** to start the download. (Click **No** to cancel the action.)

The download may take several minutes. The download is complete when **Download finished successfully** appears in the **Messages Server** window in the Chromeleon Server Configuration program. The message appears also in the Chromeleon Audit Trail.

If the download is not successful, the related messages appear in the Audit Trail. In this case, turn off the detector. Turn on the detector again and repeat the download as described above. If the download fails again, contact Service.

9 Technical Information

Specification	Corona Veo	Corona Veo RS
Detection Type	Charged Aerosol Detection	
Nebulization	FocusJet™ concentric flow design	
Mobile Phase Flow Rate	0.2 – 2.0 mL/min	0.01 – 2.0 mL/min
Filter Time Constants	0.1, 0.2, 0.5, 1.0, 2.0, 3.6, 5.0, 10.0 seconds	
Evaporation Temperature	Selectable values: 35 °C or 50 °C	Settable range: ambient +5 °C to +100 °C
Temperature Accuracy	< ± 5 °C	
Equilibration Time	< 30 minutes to 35.0 °C evaporation temperature	
Integrated Stream-Switching valve	N. a.	6-port 2-position valve (controllable via TTL input)
Digital Noise Filtering	4th order low-pass Bessel filter	
Gas Requirements	Compressed air or nitrogen	
Gas Pressure Control	Manual	Electronical
Gas Supply Pressure	480 – 550 kPa (70 – 80 psig)	
Data Collection Rate	max. 100 Hz (Chromeleon 6.80)	max. 100 Hz (Chromeleon 6.80) or 200 Hz (Chromeleon 7)
User Input/Display	Integrated liquid crystal color display with touch screen with menu functions	
Software Control	Available detector functions are software controllable via USB (USB 1.1 or 2.0 compatible).	
Analog Signal Output (optional)	BNC analog signal output	
Analog Output	0 – 1 V DC	
Full-Scale Analog Output Range	1 pA to 500 pA in 1-2-5 sequence	
Rear Interface	AC connector, power switch, USB port, Digital I/O terminals (4 TTL inputs, 3 relay outputs)	
I/O Interfaces	4 TTL inputs (Gas Off, Autozero, Start, Stream-Switching Valve), 3 relay outputs (one fixed labeled 'Pump Off')	
Safety features	Leak sensor, liquid sensor, gas pressure relief valve	
Power requirements	100-240 V AC, 50/60 Hz, 100 VA	

Specification	Corona Veo	Corona Veo RS
Emission sound pressure level	< 70 dB(A), typically 54 db(A)	
Environmental conditions	Range of use: Indoor use Temperature: 15 °C to 35 °C (59 to 95°F) Air humidity: 80% relative humidity, non-condensing Overvoltage category: II Pollution degree: 2	
Wetted Parts	Stainless steel (type 316), Nitronic® 60 stainless steel, PEEK, Simriz®, aluminum, fused silica *Corona Veo RS only:* PTFE (Valcon H, Valcon E)	
Dimensions (h × w × d)	22.9 × 44.5 × 55.9 cm (9 × 17.5 × 22 in.)	
Weight:	Approx. 14.3 kg (approx. 31.5 lbs)	

Technical information: July 2013
All technical specifications are subject to change without notice.

10 Accessories, Consumables, and Spare Parts

Accessories, spare parts, and consumables for the detector 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.

For more information about accessories, consumables and spare parts, contact the Thermo Fisher Scientific sales organization for Dionex HPLC products.

10.1 Standard Accessories

The following standard accessories are shipped with the detector. The part number always refers to the packing unit. Unless otherwise stated, the packing unit is 1 unit.

10.1.1 Corona Veo

Description	Part no.	Quantity in the accessories kit
Accessories for the Corona Veo detector		
Fuses Kit (2 fuses, 1A, slow-blow, 5 x 20 mm)	70-6666	1
Parts for connecting the detector drain: Tee piece for drainage system L piece for drainage system Flexible hose (11.4 mm O.D. x 8.4 mm I.D.)	 Included in 6040.0005 Included in 6040.0005 Included in 6040.0005	 2 4 2 m
Tool kit, including: 1 multi-tool 1 offset screwdriver Torx size TX10 1 offset screwdriver Torx size TX20 1 screwdriver (3/32" x 2") 1 hexagon socket wrench (1/2" x 9/16")	6081.9190	1
RheFlex fittings (PEEK, 1/16", finger-tight)	Included in 6000.0012	4
Inch-to-metric adapter (1/4" O.D. to 6 mm O.D.)	---	1
Exhaust Hose Assembly, including Gas exhaust hose (1/2" x 11/16" I.D. x O.D., L 2.5 m) Fitting (1/2" x 3/8")	70-6261	1
Gas inlet tubing (1/8" x 1/4" I.D. x O.D., L 2.5 m)	6081.1070	1
In-line filter (SST) with filter frit included	70-4538	1
Filter frits (SST, porosity 0.5 µm) for replacement	70-4539	10
Tubing cutter	70-7112	1

Description	Part no.	Quantity in the accessories kit
Cable I/O, 2-conductor	70-4850	1
USB cable type A to type B, 3 m	70-5713	1
Capillary (I.D. x O.D. 0.005” x 1/16”, L 2 m, PEEK), red	6081.1410	1
Nut and Ferrule Set, SST (1/4")	---	1
Signal synchronization cable from LPG-3400XRS pump to Corona detector	6043.0003	1
Signal cable (6-pin mini DIN)	6000.1004	1

10.1.2 Corona Veo RS

Description	Part no.	Quantity in the accessories kit
Accessories for the Corona Veo RS detector		
Fuses Kit (2 fuses, 1A, slow-blow, 5 x 20 mm)	70-6666	1
Parts for connecting the detector drain: Tee piece for drainage system L piece for drainage system Flexible hose (11.4 mm O.D. x 8.4 mm I.D.), 2 m	 Included in 6040.0005 Included in 6040.0005 Included in 6040.0005	 2 4 1
Tool kit, including: 1 multi-tool 1 offset screwdriver Torx size TX10 1 offset screwdriver Torx size TX20 1 screwdriver (3/32" x 2") 1 hexagon socket wrench (1/2" x 9/16")	6081.9190	1
RheFlex fittings (PEEK, 1/16", finger-tight)	Included in 6000.0012	4
Inch-to-metric adapter (1/4" O.D. to 6 mm O.D.)	---	1
Exhaust Hose Assembly, including Gas exhaust hose (1/2" I.D. x 11/16" O.D., L 2.5 m) Fitting (1/2" x 3/8")	70-6261	1
Gas inlet tubing (1/8" x 1/4" I.D. x O.D., L 2.5 m)	6081.1070	1
In-line filter (SST) with filter frit included	70-4538	1
Filter frits (SST, porosity 0.5 µm) for replacement	70-4539	10
Tubing cutter	70-7112	1

Description	**Part no.**	**Quantity in the accessories kit**
Nut and Ferrule Set, SST (1/4")	---	1
Capillary (I.D. x O.D. 0.005” x 1/16”, L 2 m, PEEK), red	6081.1410	1
Capillary (0.015” x 1/16“ (I.D. x O.D.), L 1.5 m, PEEK), gray	6081.1420	1
Capillary (0.13 x 100 mm (I.D. x L), stainless steel, Viper) For connection between stream-switching valve and nebulizer. For details, see page 40.	6040.2322	1
Cable I/O, 2-conductor	70-4850	1
USB cable type A to type B, 3 m	70-5713	1
Signal synchronization cable from LPG-3400XRS pump to Corona detector	6043.0003	1
Signal cable (6-pin mini DIN)	6000.1004	1

10.2 Optional Accessories

Accessories	Description	Part no.
Analog Signal Output Kit	The kit includes all necessary parts to install the analog output board with a BNC-type connector as well as installation instructions.	6081.0010
Viper inverse gradient capillary kit for UltiMate 3000 SD system	The kit includes all necessary parts for connections in an HPLC SD system as well as instructions.	6040.2819
Viper inverse gradient capillary kit for UltiMate 3000 RS system	The kit includes all necessary parts for connections in an HPLC RS system as well as instructions.	6040.2820
Flow splitter	To adjust liquid flow; adjustable from 1:1 to 20:1.	70-6337

10.3 Consumables and Spare Parts

The part number always refers to the packing unit. Unless otherwise stated, the packing unit is 1 unit.

Cables

Description	Part no.
USB cable type A to type B, 3 m	70-5713
Cable I/O, 2-conductor	70-4850
Signal synchronization cable from LPG-3400XRS pump to Corona detector	6043.0003
Signal cable (6-pin mini DIN), 5 m	6000.1004

Capillaries

Description	Part no.
Capillary (I.D. x O.D. 0.005” x 1/16”, L 2 m, PEEK), red	6081.1410
Capillary (0.015” x 1/16“ (I.D. x O.D.), L 1.5 m, PEEK), gray	6081.1420
Capillary, Viper (0.13 x 100 mm (I.D. x L), stainless steel)	6040.2322

Gas Components

Description	Part no.
Gas filter assembly, including 1 gas filter, charcoal 1 gas filter, HEPA	6081.7062
Gas inlet tubing, L 2.5 m	6081.1070
Gas exhaust hose, L 2.5 m	70-6261

General Spare Parts

Description	Part no.
Fuses kit (2 fuses, 1A, slow-blow, 5 x 20mm)	70-6666
Filter frits (SST, porosity 0.5 µm) for use in the in-line filter, 10 frits	70-4539
Tubing cutter (1/8" x 3/4")	70-7112
Tool kit, including: 1 multi-tool 1 offset screwdriver Torx size TX10 1 offset screwdriver Torx size TX20 1 screwdriver (3/32" x 2") 1 hexagon socket wrench (1/2" x 9/16")	6081.9190

Nebulizer

Description	Part no.
Nebulizer, FocusJet, for Corona Veo and Corona Veo RS	6081.1287

Power Cords

Description	Part no.
Power cord, EU	6000.1000
Power cord, US	6000.1001
Power cord, UK	6000.1020
Power cord, Switzerland	6000.1030
Power cord, Italy	6000.1040
Power cord, Japan	6000.1050
Power cord, Australia, China	6000.1060
Power cord, Denmark	6000.1070
Power cord, India/SA	6000.1090

Stream-Switching Valve Parts (Corona Veo RS only)

Description	Part no.
Rotor for stream-switching valve	6820.0014
Stator for stream-switching valve	6820.0012

11 Appendix

11.1 Digital I/O Pin Assignment

The four TTL inputs and three relay outputs on the rear panel of the detector provide the connection terminals for external devices.

For details about the TTL inputs, see page 130.

For details about the relay outputs, see page 131.

Digital I/O Terminal A

Pin	Signal Name	Signal Level	Remark
1	CC1+	Relay output	Positive polarity
2	CC1-	Relay output	Negative polarity
3	GND	Ground	
4	CC2+	Relay output	Positive polarity
5	CC2-	Relay output	Negative polarity
6	GND	Ground	
7	Divert+	TTL input	Positive polarity
8	Divert-	TTL input	Negative polarity
9	GND	Ground	

Fig. 27: Pin assignment Digital I/O terminal A

Digital I/O Terminal B

Pin	Signal Name	Signal Level	Remark
1	Pump Off+	Relay output	Positive polarity
2	Pump Off-	Relay output	Negative polarity
3	GND	Ground	
4	Gas Off+	TTL input	Positive polarity
5	Gas Off-	TTL input	Negative polarity
6	GND	Ground	
7	Autozero+	TTL input	Positive polarity
8	Autozero-	TTL input	Negative polarity
9	GND	Ground	
10	Start+	TTL input	Positive polarity
11	Start-	TTL input	Negative polarity
12	GND	Ground	

Fig. 28: Pin assignment Digital I/O terminal B

⚠ **Important:** When you connect the TTL inputs, ensure that the potential across the pins is set to 5 V DC ±0.25 V. When you connect relays outputs, the potential across the pins must be less than 30 V DC and the current must be less than 0.5 A.

⚠ **Important:** Lors de la connexion des entrées TTL, assurez-vous que le potentiel aux broches est défini à 5 V CC ±0,25 V. Lors de la connexion des sorties, le potentiel aux broches doit être inférieure à 30 V CC et le courant doit être inférieure à 0,5 A.

TTL Inputs

The inputs are TTL compatible and are assigned "Gas Off", "Autozero", "Start" and "Divert". Use a true contact closure or relay output for the inputs on the Digital I/O terminals. If a TTL level change is used, the voltage must be between 0 and 5 V, and the polarity sense of the device must match that of the detector (i.e. the "+" and the "-" of the external device must be connected to the "+" and the "-" of the detector, respectively). The "+" port is the top one in each group and the "-" port is immediately below it, followed by ground (GND).

- **Start**

  The "Start" input is available for use with a chromatography data system that requires triggering event synchronization for data collection from an external device, such as an autosampler. The detector requires a contact closure or shorting of the terminals (a signal of at least 0.5 seconds) from the external device.

- **Gas Off**

  The "Gas Off" input can be used to turn off the internal gas inlet valve and stop the gas supply to the nebulizer. It is recommended to use this input only when the gas supply is limited.

  If the" Gas Off" input is activated, the detector will shut down internal gas supply. This will result in an alarm condition. Stop the alarm condition using the detector display or the chromatography data system.

- **Autozero**

  The "Autozero" input can be used to set the signal of a channel to a "zero point" regardless of the current that is being measured.

  Allow sufficient time after you performed the Autozero and before injection to ensure that the autozero command is completed. Alternatively, an autozero may be performed during a run. In this case, make sure that autozero occurs at a point in the chromatogram where the response curve is expected to be reasonably flat (i.e., 15 seconds prior to the elution of a peak).

- **Divert**

  The "Divert" input can be used to control the stream-switching valve with a third-party driver.

Relay Outputs

The "Pump Off" output contact is used to send a signal to the pump (or other external device) to stop the flow of mobile phase and turn off the pump. This signal may be used to turn off the pump to prevent detector from being flooded with mobile phase if the gas pressure falls below 50 % of the required gas volume for more than 60 seconds.

To use the "Pump Off" contact closure, the HPLC system must be able to accept an input from the detector that can be programmed to turn off liquid flow. In some cases, a special cable is required.

The pins labeled "CC1'" and "CC2" provide contact closures that can be used to start an external device (for example, an autosampler) or to change a valve position. The two ports act in a similar fashion to the "Pump Off" output. When the output contact closures are used, connect the outputs according to their polarity ("+" or "-"). Connect the third wire on the Digital I/O cable (part no. 70-4850) to the ground of the pin.

11.2 Internal Gas and Aerosol Flow Path Diagram

The following diagram shows the gas and aerosol flow paths inside the detector.

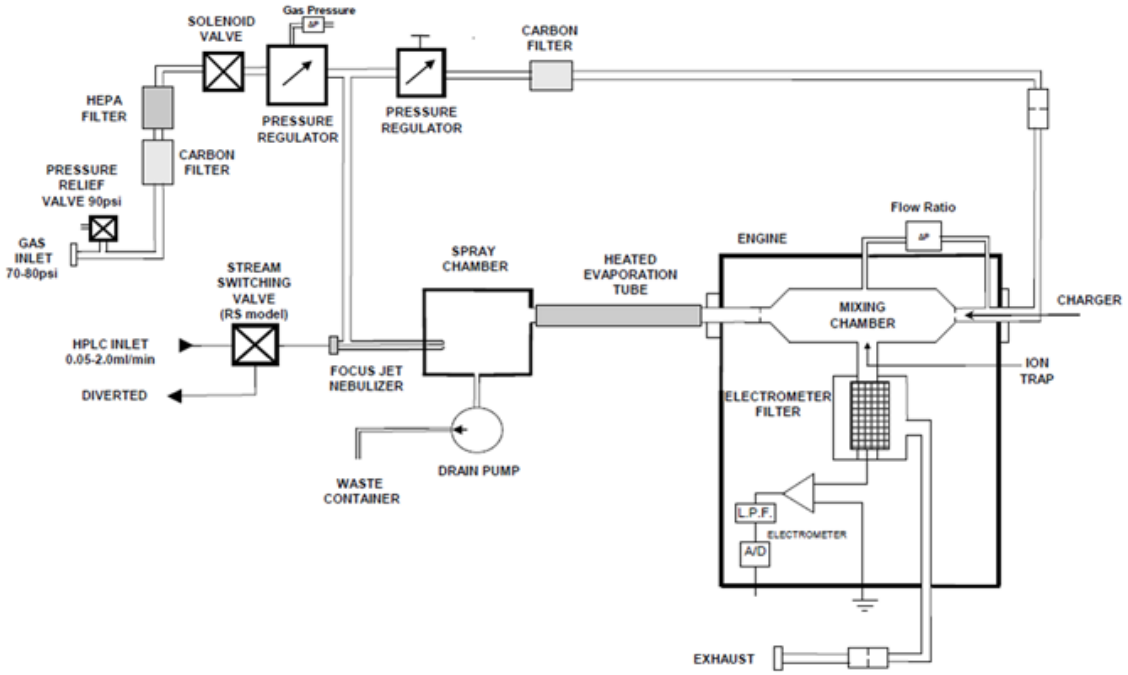


Fig. 29: Gas and aerosol flow paths inside the detector

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