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Vanquish

Access Column Compartment

Operating Manual

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ThermoFisher SCIENTIFIC

Original Operating Manual

The hardware descriptions in this manual revision refer to devices: VA-C10-A-03.

Trademarks

Disclaimer

Printed manual version only

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Contacting Us

You can find information on all of the different support services of Thermo Fisher Scientific by navigating the following website: https://www.thermofisher.com/us/en/home/technical-resources/contact-us.html

Contents

1 Using this Manual

This chapter provides information about this manual, the conventions used throughout the manual, and the reference documentation that is available in addition to this manual.

1.1 About this Manual

This manual describes the functional features and operating principle of your Vanquish Access device and provides instructions for installation, set up, start up, shut down, operation, maintenance and troubleshooting.

This manual also contains safety messages, precautionary statements, and special notices. Follow these properly to prevent personal injury, damage to the device, or loss of data.

Note the following:

- Illustrations in this manual are provided for basic understanding. No claims can be derived from the illustrations in this manual.
- The column compartment is referred to as *module*, *device* or *column compartment* in this manual.

The descriptions in this manual assume that the device is part of the Vanquish™ Access system.

1.2 Conventions

This section describes the conventions that are used throughout this manual.

1.2.1 Conventions for Safety Messages

The safety messages and precautionary statements in this manual appear as follows:

- Safety messages or precautionary statements that apply to the entire manual and all procedures in this manual are grouped in the Safety chapter.
- Safety messages or precautionary statements that apply to an entire section or to multiple procedures in a section appear at the beginning of the section to which they apply.
- Safety messages that apply to only a particular section or procedure appear in the section or procedure to which they apply. They appear different from the main flow of text.

Safety messages are often preceded by an alert symbol and/or alert word. The alert word appears in uppercase letters and in bold type.

Make sure that you understand and follow all safety messages presented in this manual.

1.2.2 Special Notices

Special notices and informational notes in this manual appear different from the main flow of text. They appear in boxes and a note label identifies them. The label text appears in uppercase letters and in bold type.

NOTICE

Highlights information necessary to prevent damage to the device or invalid test results.

TIP Highlights information of general interest or helpful information that can make a task easier or optimize the performance of the device.

1.2.3 Typographical Conventions

These typographical conventions apply to the descriptions in this manual:

Data Input and Output

The following appears in **bold** type:

- Input that you enter by the keyboard or that you select with the mouse
- Buttons that you click on the screen
- Commands that you enter by the keyboard
- Names of, for example, dialog boxes, properties, and parameters

References and Messages

- References to additional documentation appear *italicized*.
- Messages that appear on the screen are identified by quotation marks.

Viewpoint

If not otherwise stated, the expressions *left* and *right* in this manual always refer to the viewpoint of a person that is facing the device from the front.

Particularly Important Words

Particularly important words in the main flow of text appear *italicized*.

Electronic Manual Version (PDF)

The electronic version (PDF) of the manual contains numerous links that you can click to go to other locations within the manual. These include:

- Table of contents entries
- Index entries
- Cross-references (in blue text)

1.3 Reference Documentation

In addition to this operating manual, other documentation is available for reference.

Hardware Documentation

Additional hardware documentation includes the following:

- *Operating manuals* for the other modules of the Vanquish Access system
- *Vanquish Access System Operating Manual*
- *Instrument Installation Qualification Operating Instructions*

Thermo Fisher Scientific provides up-to-date operating manuals as PDF (Portable Document Format) files that you can access from our customer manuals website. To open and read the PDF files, Adobe™ Reader™ or Adobe™ Acrobat™ is required.

Go to the following website: www.thermofisher.com/HPLCmanuals

Software Documentation

Software documentation for the Thermo Scientific™ Dionex™ Chromeleon™ 7 Chromatography Data System includes the following:

- *Chromeleon™ Help and documents*
  The *Chromeleon Help* provides extensive information and comprehensive reference material for all aspects of the software.
- *Installation Guide*
  For basic information about device installation and configuration, refer to the *Installation Guide*.
- *Instrument Configuration Manager Help*
  For specific information about a certain device, refer to the *Instrument Configuration Manager Help.*
- *Quick Start Guide*
  For information about the main elements of the user interface and step-by-step guidance through the most important workflows, refer to the *Quick Start Guide*.
- *Reference Guide*
  For a concise overview of the most important workflows, refer to the *Reference Guide*.

TIP The *Chromeleon Help* and documents are included in the software shipment.

Third-Party Documentation

Refer also to the user documentation provided by the manufacturers of third-party components and materials, for example, Safety Data Sheets (SDSs).

2 Safety

This chapter provides general and specific safety information and informs about the intended use of the device.

2.1 Safety Symbols and Signal Words

2.1.1 Safety Symbols and Signal Words in this Manual

This manual contains safety messages to prevent injury of the persons using the device.

The safety symbols and signal words in this manual include the following:

Always be aware of the safety information. Do not proceed until you have fully understood the information and consider the consequences of what you are doing.

CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

WARNING

Indicates a hazardous situation that, if not avoided, could result in serious injury.

2.1.2 Observing this Manual

Observe the following:

- Before installing or operating the device, read this manual carefully to be familiar with the device and this manual. The manual contains important information with regard to user safety as well as use and care of the device.
- Always keep the manual near the device for quick reference.
- Save this manual and pass it on to any subsequent user.

Read, understand, and comply with all safety messages and precautionary statements presented in this manual.

2.1.3 Safety Symbols on the Device

The table lists the safety symbols that appear on the device or on labels affixed to the device. Follow the safety notices in this manual to prevent the risk of operator injury or damage to the device.

Symbol	Description
	Indicates a potential hazard. Refer to this manual to avoid the risk of personal injury and/or to prevent damage to the device.
— O	Power supply is on Power supply is off
	Indicates alternating current.
	Indicates that the surface becomes hot during operation. Do not touch these surfaces while they are heated up.

2.1.4 Rating Plate

The rating plate is present on the device near the electrical connections. The rating plate indicates the serial number, part number, module name, revision number (if any), and the line and fuse rating.

2.2 Intended Use

The device is intended to be part of the Vanquish Access system.

The intended use of the Vanquish Access system is to analyze mixtures of compounds in sample solutions.

The device is for use by qualified personnel and in laboratory environment only.

The device and Vanquish Access system are intended to be used as General Laboratory Equipment (GLE).

They are not intended for use in diagnostic procedures.

Laboratory Practice

Thermo Fisher Scientific recommends that the laboratory in which the Vanquish Access system is used follow best practices for LC analyses. This includes among others:

- Using appropriate standards
- Regularly running calibration
- Establishing shelf life limits and following them for all consumables used with the system
- Running the system according to the laboratory's verified and validated 'lab developed test' protocol

2.3 Safety Precautions

2.3.1 General Safety Information

All users must observe the general safety information presented in this section and all specific safety messages and precautionary statements elsewhere in this manual during all phases of installation, operation, troubleshooting, maintenance, shutdown, and transport of the device.

If the device is used in a manner not specified by Thermo Fisher Scientific, the protection provided by the device could be impaired. Observe the following:

- Operate the device only within its technical specifications.
- Use only the replacement parts and additional components, options, and peripherals specifically authorized and qualified for the device by Thermo Fisher Scientific.
- Perform only the procedures that are described in this operating manual and in supporting documents for the device. Follow all instructions step by step and use the tools recommended for the procedure.
- Open the enclosure of the device and other components only if specifically instructed to do so in this manual.
- Thermo Fisher Scientific cannot be held liable for any damage, material or otherwise, resulting from inappropriate or improper use of the device. If there is any question regarding appropriate usage, contact Thermo Fisher Scientific before proceeding.

Safety Standard

This device is a Safety Class I instrument (provided with terminal for protective grounding). The device has been manufactured and tested according to international safety standards.

2.3.2 Qualification of the Personnel

Observe the information below on the proper qualification of the personnel installing and/or operating the device.

Installation

Only skilled personnel are permitted to install the device and to establish the electrical connections according to the appropriate regulations.

- Thermo Fisher Scientific recommends always having service personnel certified by Thermo Fisher Scientific perform the installation (for brevity, referred to as Thermo Fisher Scientific service engineer).
- If a person other than a Thermo Fisher Scientific service engineer installs and sets up the module, the installer is responsible for ensuring the safety of the module and system.

General Operation

The device is designed to be operated only by trained and qualified personnel in a laboratory environment.

All users must know the hazards presented by the device and the substances they are using. All users should observe the related Safety Data Sheets (SDSs).

2.3.3 Personal Protective Equipment

Wear personal protective equipment and follow good laboratory practice to protect you from hazardous substances. The appropriate equipment depends on the hazard. For advice on the hazards and the equipment required for the substances you are using, refer to the material handling and safety data sheet provided by the vendor.

An eyewash facility and a sink should be available nearby. If any substance contacts your skin or eyes, wash the affected area and seek medical attention.

Protective Clothing

To protect you from chemical splashes, harmful liquids, or other contamination, put on appropriate protective clothing, such as a lab coat.

Protective Eyewear

To prevent liquids from striking your eyes, put on appropriate protective eyewear, such as safety glasses with side shields. If there is a risk of splashing liquids, put on goggles.

Gloves

To protect you from harmful liquids and avoid personal injury during maintenance or service, put on appropriate protective gloves.

2.3.4 Electrical Safety Precautions

WARNING—Electric Shock or Damage to the Device

High voltages are present inside the device that could cause an electric shock or damage to the device.

- Do not make any changes to the electrical or grounding connections.
- If you suspect any kind of electrical damage, disconnect the power cord and contact Thermo Fisher Scientific Technical Support for assistance.
- Do not open the housing or remove protective panels unless specifically instructed to do so in this manual.
- Do not place liquid reservoirs directly upon the device. Liquid might leak into the device and get into contact with electronic components causing a short circuit. Instead, place liquid reservoirs in the solvent rack that is available for the Vanquish Access system.

2.3.5 General Residual Hazards

Pay attention to the following general residual hazards when working with the device:

WARNING—Hazardous Substances

Solvents, mobile phases, samples, and reagents might contain toxic, carcinogenic, mutagenic, infectious, or otherwise harmful substances. The handling of these substances can pose health and safety risks.

- Be sure that you know the properties of all substances that you are using. Avoid exposure to harmful substances. If you have any doubt about a substance, handle the substance as if it is potentially harmful.
- Wear personal protective equipment as required by the hazard and follow good laboratory practice.
- Reduce the volume of substances to the minimum volume required for sample analysis.
- Avoid handling of solvent reservoirs above head height.
- Do not operate the device in a potentially flammable environment.
- Avoid accumulation of harmful substances. Make sure that the installation site is well ventilated.
- Dispose of hazardous waste in an environmentally safe manner that is consistent with local regulations. Follow a regulated, approved waste disposal program.

WARNING—Biohazard

Biohazardous material, for example microorganisms, cell cultures, tissues, body fluids, and other biological agents can transmit infectious diseases. To avoid infections with these agents:

- Assume that all biological substances are at least potentially infectious.
- Wear personal protective equipment as required by the hazard and follow good laboratory practice.
- Dispose of biohazardous waste in an environmentally safe manner that is consistent with local regulations. Follow a regulated, approved waste disposal program.

WARNING—Self-Ignition of Solvents

Solvents with a self-ignition temperature below 150 °C might ignite when in contact with a hot surface (for example, due to leakage in the chromatography system).

Avoid the use of these solvents.

WARNING—Hazardous Vapors

Mobile phases and samples might contain volatile or flammable solvents. The handling of these substances can pose health and safety risks.

- Avoid accumulation of these substances. Make sure that the installation site is well ventilated.
- Avoid open flames and sparks.
- Do not operate the device in the presence of flammable gases or fumes.

CAUTION—Escape of Hazardous Substances from PEEK Capillaries

Some capillaries in the system are made of PEEK. Swelling or attack by acids can cause PEEK capillaries to start leaking or to burst. Certain chemicals, for example, trichlormethane ($CHCl_3$), dimethyl sulfoxide (DMSO), or tetrahydrofuran (THF) can cause PEEK to swell. Concentrated acids, such as sulfuric acid and nitric acid, or a mixture of hexane, ethyl acetate, and methanol, can attack PEEK.

- Swelling or attack is not a problem with brief flushing procedures.
- For more information, refer to the technical literature on the chemical resistance of PEEK.

CAUTION—Sparking due to Electrostatic Discharge

Liquid flowing through capillaries can generate static electricity. This effect is particularly present with insulating capillaries and non-conductive solvents (for example, pure acetonitrile). Discharge of electrostatic energy might lead to sparking, which could constitute a fire hazard.

Prevent the generation of static electricity near the chromatography system.

2.3.6 In Case of Emergency

WARNING—Safety Hazard

In case of emergency, disconnect the device from the power line.

2.4 Solvent and Additive Information

To protect optimal functionality of the Vanquish Access system, observe the following information in the *Vanquish Access System Operating Manual*:

- Compatibility information, for example, regarding allowed pH ranges as well as chloride and buffer concentrations
- General guidelines and recommendations on the use of solvents and additives in the chromatography system

2.5 Compliance Information

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the device is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in this manual.

Changes that you make to the device may void compliance with one or more of these EMC and safety standards. Changes to the device include replacing a part or adding components, options, or peripherals not specifically authorized and qualified for the product by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

The device has been shipped from the manufacturing site in a safe condition.

See also

Compliance Information (▷ page 118)

3 Device Overview

This chapter introduces you to the device and the main components.

3.1 Column Compartment Features

The device includes the following main features:

- Column thermostatting in a temperature range from +5 °C to 85 °C
- Column cooling by a maximum of 18 °C from the ambient temperature, with the lower temperature limit being +5 °C
- Support of still air thermostatting mode
- Column chamber providing room for two columns, with pre-heater and pre-column as required by the application
  Maximum possible length of the entire assembly: 387 mm
- Capillary guides located above and below the column chamber for routing the capillaries
- As an option, the column compartment can also hold:
  - Passive pre-heater for thermostatting of the eluent before it enters the column

For specifications, see Performance Specifications (▸ page 110).

3.2 Operating Principle

The fundamental requirement for a column compartment for liquid chromatography applications is the ability to maintain the preset temperature as precisely as possible. However, for obtaining good measurement results, temperature stability is more important than the temperature accuracy. The advanced electronic circuitry of the column compartment enables the column compartment to maintain the temperature with a precision of ±0.1 °C.

The thermo-optimized design of the column compartment reduces the time required to equilibrate the temperature between the column and the eluent.

Thermoelectric elements heat up or cool down the components in the column chamber. A passive pre-heater can be installed to adapt the eluent to the column temperature, before the eluent enters the column. This avoids temperature gradients in the first part of the column and a loss of separation performance.

Thermostatting Mode

The column compartment supports the following thermostatting mode for column thermostatting:

- Still air mode
  - In still air mode, the column warms up over the total length of the column.
  - The temperature in the interior of the column is the same as in the outer areas.
  - The eluent and sample travel through the interior of the column with the same speed as they travel through the outer areas (no flow concentration).

    In still air mode there is less fronting and tailing of peaks.

The picture shows the thermal distribution inside the column for the still air mode:

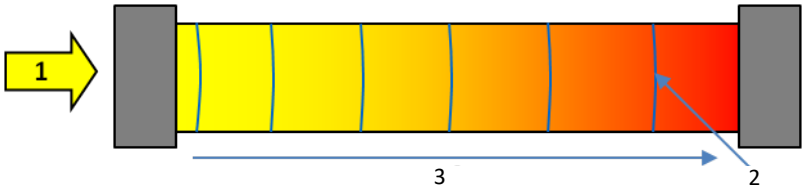

Figure 1: Thermal conditions inside the column in still air mode

No.	Description
1	Direction of flow through the column
2	Flow profile
3	Temperature increase on the column in the direction of flow

3.3 Interior Components

The user-accessible components of the column compartment are located behind the front door:

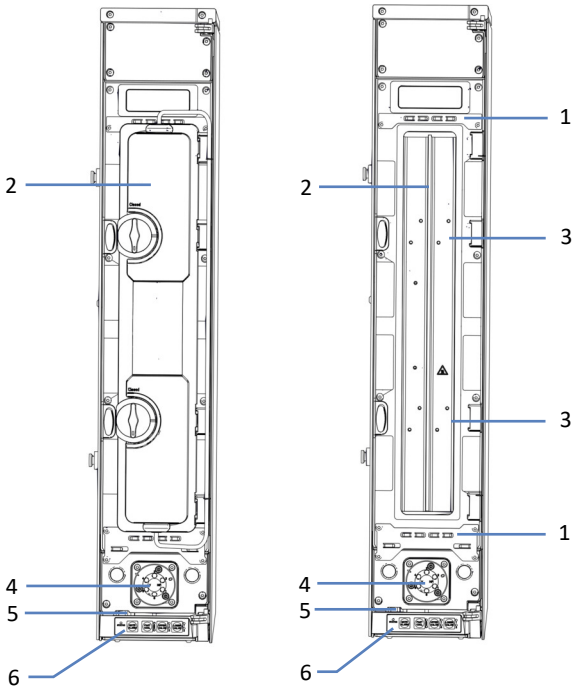

Figure 2: Interior view (left: with chamber cover; right: without chamber cover)

No.	Description
1	Capillary guides
2	Column chamber (with and without chamber cover)
3	Passive pre-heater mounting positions
4	Lower column switching valve (if installed)
5	Leak tray with sensor for liquid leaks
6	Keypad with four buttons for device control

3.4 Leak Detection

Leaks are a potential safety issue.

The leak sensor inside the device monitors the device for liquid leaks from the flow connections. The liquid is collected in the leak tray and guided to the drain port. From the drain port, the liquid is discharged to waste through the drain system of the Vanquish Access system.

When the leak sensor detects leakage, the status indicators change to red and beeping starts to alert you. Follow the instructions in this manual to find and eliminate the source for the leakage.

3.5 Operation

The device is designed to be operated from a computer configured with the Chromeleon Chromatography Data System (CDS). The Chromeleon software provides complete instrument control, data acquisition, and data management.

For a basic description of instrument control and automated sample analysis with the Chromeleon software, refer to the *Vanquish Access System Operating Manual*. Details on control and operation of the device are available in the *Chromeleon Help*.

4 Unpacking

This chapter provides information for unpacking the device and informs you about the scope of delivery.

4.1 Unpacking the Device

Damaged Packaging, Defective on Arrival

Inspect the shipping container for signs of external damage and, after unpacking, inspect the device for any signs of mechanical damage that might have occurred during shipment.

If you suspect that the device may have been damaged during shipment, immediately notify the incoming carrier and Thermo Fisher Scientific about the damage. Shipping insurance will compensate for the damage only if reported immediately.

Unpacking

NOTICE

To lift or move the device, grasp the device by the sides. Do not move or lift the device by the front door. This will damage the door or the device.

TIP Save the shipping container and all packing material. These items will be needed if the device is shipped or moved to a new location.

Follow these steps

1. Place the shipping container on the floor and open it.
2. Grasp the device by the sides.
3. Slowly and carefully, lift the device out of the shipping container.
4. Place the device on a stable surface, on its left side panel, with the bottom side of the device facing toward you.
5. *If applicable*
   Remove any additional packing material. Some surfaces including the door of the device are covered by a protective film during shipment. Leave any protective films attached to the surfaces of the device until it is properly positioned in the system stack.
6. Transport the device to the installation site, if it is not already there.
7. Remove the protective films from all surfaces as applicable.

CAUTION—Tip-Over

This column compartment can tip over.

To avoid personal injury or damage to the device, always attach the column compartment to the Vanquish system housing. For instructions, see Attaching the Column Compartment to the System (▸ page 49).

4.2 Scope of Delivery

The following items are included in the delivery:

- Column compartment
- Operating manual (downloadable from customer manual website)
- Power cord

5 Installation

This chapter specifies the requirements for the installation site and describes how to set up, install, and configure the device in the Vanquish Access system and in the chromatography software.

5.1 Safety Guidelines for Installation

Pay attention to the following safety guidelines:

Observe all warning messages and precautionary statements presented in Safety Precautions (page 19).

CAUTION—Tip-Over

This column compartment can tip over.

To avoid personal injury or damage to the device, always attach the column compartment to the Vanquish system housing. For instructions, see Attaching the Column Compartment to the System (page 49).

CAUTION—Electric Shock or Damage to the Device

After the power to the device is turned off, the device is still energized as long as the power cord is connected. Repair work on the device while the device is connected to power could lead to personal injury.

- Always unplug the power cord before starting repair work inside the device.
- If you were instructed to remove any housing covers or panels, do not connect the power cord to the device while the cover or panels are removed.

NOTICE

To lift or move the device, grasp the device by the sides. Do not move or lift the device by the front door. This will damage the door or the device.

5.2 Installing the Device

A Thermo Fisher Scientific service engineer installs and sets up the Vanquish Access system, including all modules and options or parts shipped with them. The service engineer checks that the installation is correct and that the Vanquish Access system and modules operate as specified. The engineer also demonstrates the basic operation and main features.

If personnel other than a Thermo Fisher Scientific service engineer installs the device, follow the steps below.

NOTICE

The device is part of the Vanquish Access system. Therefore, follow the order for installing the system modules as described in the *Vanquish Access System Operating Manual*.

1. Pay attention to the safety guidelines and observe all site requirements. See Safety Guidelines for Installation (▸ page 40) and Site Requirements (▸ page 43).
2. Set up the device hardware. See Setting Up the Hardware (▸ page 48).
3. Set up the flow connections. See Setting Up the Flow Connections (▸ page 57).
4. Turn on the device. See Turning On the Device (▸ page 62).

TIP

Before turning on the power to a Vanquish Access system module for the first time, verify that the chromatography software is installed on the data system computer. When the power is turned on, the required USB drivers are automatically found and the Windows™ operating system can detect the device.

5. Set up the device in the software. See Setting Up the Device in the Software (▸ page 63).
6. Prepare the system for operation. Refer to the *Vanquish Access System Operating Manual*.

NOTICE

Thermo Fisher Scientific recommends performing Instrument Installation Qualification and Operational Qualification after installation. Some Chromeleon versions support automated qualification for Vanquish Access. Refer to the documentation for the software version that you are using and/or perform the qualification manually.

Moving the Device after Installation

If you have to move the device after it has been set up and installed in the Vanquish Access system, prepare the device for transport and move it to the new location. Follow the instructions in Transporting or Shipping the Device (▸ page 97).

5.3 Site Requirements

An appropriate operating environment is important to ensure optimal performance of the device.

This section provides important requirements for the installation site. Note the following:

- Operate the device only under appropriate laboratory conditions.
- The device is intended to be part of the Vanquish Access system. Observe the site requirements for the Vanquish Access system as stated in the *Vanquish Access System Operating Manual*.
- For specifications, see Specifications (▶ page 109) and the *Specifications* sections in the *Operating Manuals* for the other modules in the Vanquish Access system.
- For general residual hazards, see General Residual Hazards (▶ page 22).

5.3.1 Power Considerations

The power supply of the device has wide-ranging capability, accepting any line voltage in the range specified for the device.

CAUTION—Electric Shock or Damage to the Device

Connecting the device to a line voltage higher or lower than specified could result in personal injury or damage to the device.

Connect the device to the specified line voltage only.

The device can be affected by short voltage interruptions in case the power supply of the equipment is turned off to protect the device against an undetermined behavior. When the supply voltage returns, the power supply automatically restarts the device and reconnection to the chromatography data system is required.

5.3.2 Power Cord

The power cords are designed to match the wall socket requirements of the country in which they are used. The end of the power cords that plugs into the power socket on the device is identical for all power cords. The end of the power cords that plugs into the wall socket is different.

WARNING—Electric Shock or Damage to the Device

- Never use a power cord other than the power cords provided by Thermo Fisher Scientific for the device.
- Only use a power cord that is designed for the country in which you use the device.
- Do not use extension cords.
- Never plug the power cord to a power socket that is shared with other equipment (for example, multiple sockets).
- Operate the device only from a power outlet that has a protective ground connection.
- In case of emergency, it must be possible to reach the power cord easily at any time to disconnect the device from the power line.

WARNING—Electric Shock or Damage to a Product

Misuse of the power cords could cause personal injury or damage the instrument. Use the power cords provided by Thermo Fisher Scientific only for the purpose for which they are intended. Do not use them for any other purpose, for example, for connecting other instruments.

5.3.3 Condensation

NOTICE—Condensation in the device can damage the electronics.

- When using, shipping, or storing the device, avoid or minimize conditions that can lead to a build-up of condensation in the device. For example, avoid significant or fast changes in environmental conditions.
- If you suspect that condensation is present, allow the device to warm up to room temperature. This may take several hours. Wait until the condensation is gone completely before connecting the device to the power line.

5.4 Accessing the Interior Components

To access the interior components in the column compartment, open the column compartment door and the column chamber cover.

Opening and Closing the Column Compartment Door

1. To open the door, slightly pull on the door.
2. To close the door, push against the door.

Opening the Column Chamber

CAUTION—Hot Surfaces

Surfaces inside the device may become hot during operation. Touching hot parts might cause burns.

- Do not touch the inner side of the column chamber cover. When opening the column chamber cover, only grasp it by its holder.
- Allow hot surfaces to cool down before starting replacement or maintenance procedures.

1. Open the column compartment door.
2. Turn both rotating locks 180 °counterclockwise until they lock in vertical position.
   A click confirms that the rotating locks are in the correct position to open the column chamber.

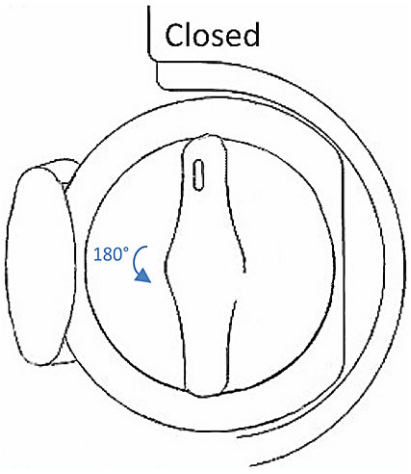

Figure 3: Unlocking the column chamber cover

3. Grasp the column chamber cover by its holder.

4. Slightly pull the column chamber cover towards you and push it to the right with the inner side of the cover pointing towards the inner side of the door.

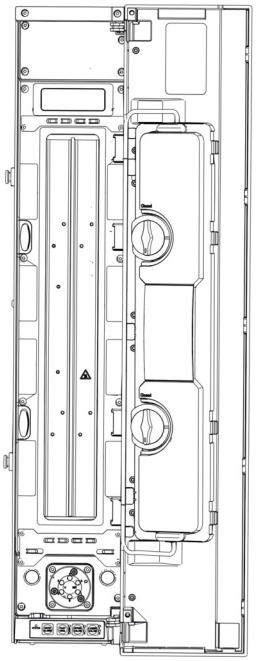

Figure 4: Opening the column chamber cover

Closing the Column Chamber

1. Grasp the column chamber cover by its holder.
2. Slightly pull the column chamber cover towards you and push it to the left with the inner side of the cover pointing towards the column chamber.

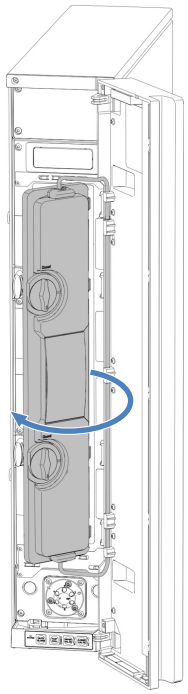

Figure 5: Closing the column chamber cover

3. Before closing the column chamber, properly position the 4 hinges of the column chamber cover to hinge the column chamber cover.

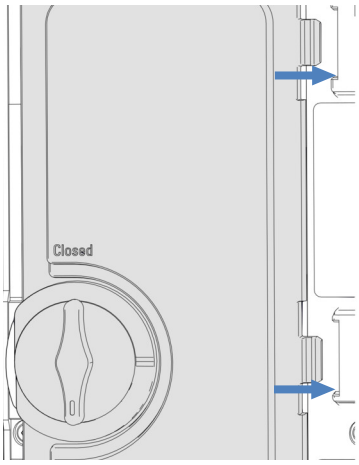

Figure 6: Column chamber cover hinges

4. Turn both rotating locks 180° clockwise until they reach vertical position and lock in.
   Observe the labeling above the rotating locks and make sure that both rotating locks are set to Closed.

TIP Always operate the column compartment with the column chamber cover and the column compartment door closed, otherwise you cannot start the analysis.

5.5 Setting Up the Hardware

This section describes how to set up the hardware and provides information about the device connectors and cables.

5.5.1 System Arrangement

The device is part of the Vanquish Access system. The system modules are typically arranged in a system stack.

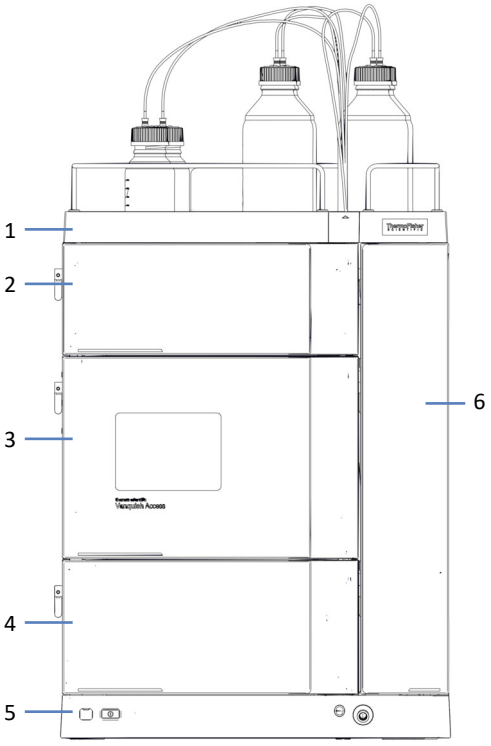

Figure 7: System arrangement

No.	Description
1	Solvent Rack
2	Detector
3	Autosampler
4	Pump
5	System Base
6	Column Compartment

5.5.2 Attaching the Column Compartment to the System

CAUTION—Risk of Tilting Solvent Rack

To prevent the solvent rack from tilting, remove the solvent rack before removing or installing the column compartment.

Preparations

1. Remove the solvent rack.

Follow these steps

NOTICE—Pinch Point Hazard

When placing the column compartment on the system base, be careful not to pinch your hands or fingers between the column compartment and the system base.

1. Grasp the column compartment by its sides.
2. Slightly lift the column compartment up.
3. Insert the holding knobs on the column compartment in the grooves on the mounting bars that are pre-installed on the autosampler and pump.

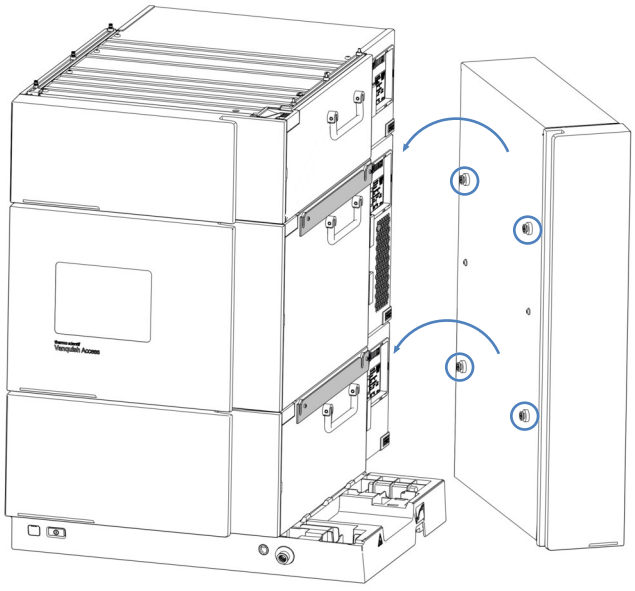

Figure 8: Attaching the column compartment to the system stack

4. Place the column compartment on the system base.

5.5.3 Connecting the Device

Device Connectors

The following connectors are provided on the device:

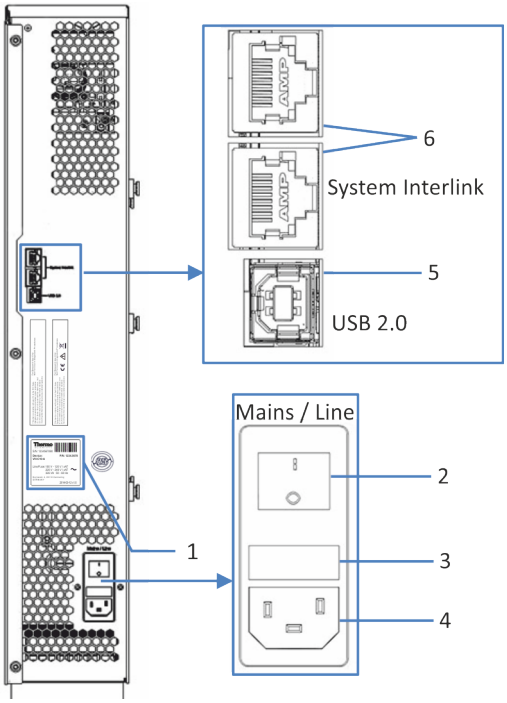

Figure 9: Connectors

No.	Description
1	Rating plate, indicating the serial number, part number, module name, revision number (if any), line and fuse rating
2	Main power switch (on/off control)
3	Fuse holder
4	Power-inlet connector
5	USB (Universal Serial Bus) port ("B" type connector) Allows connection to other modules in the Vanquish Access system or the computer on which the data management system is installed, such as the Chromeleon software
6	System Interlink port Allows power on/off control for the device from the Vanquish Access system base and device communication (e.g. for the Vanquish User Interface).

TIP Thermo Fisher Scientific recommends using the USB ports only as described above. If the USB ports are used for any other purpose, Thermo Fisher Scientific cannot ensure proper functionality.

Follow these steps

NOTICE

- Never use defective communication cables. If you suspect that a cable is defective, replace the cable.
- To ensure trouble-free operation, use only the cables provided by Thermo Fisher Scientific for connecting the device.

1. Place the device in the system as required by the system configuration. For details, refer to the *Vanquish Access System Operating Manual*.
2. Connect the required interface cables to the device. For information about how to connect the device to other modules in the Vanquish Access system or to the chromatography data system computer, refer to the *Vanquish Access System Operating Manual*.
3. Connect the power cord. See Connecting the Power Cord (▸ page 51).

5.5.4 Connecting the Power Cord

NOTICE

Condensation in a device can damage the electronics.

- Before connecting the devices to the power line, be sure that no condensation is present in the devices.
- If you suspect that condensation is present, allow the device to warm up to room temperature slowly. Wait until the condensation is completely gone before proceeding.

1. Verify that the power switch on the device is set to OFF.
2. Connect the power cord to the power inlet connector on the device.
3. Connect the free end of the power cord to an appropriate power source.

5.5.5 Installing the Passive Pre-Heater

Parts required

Passive pre-heater

Tools required

Screwdriver, Torx T10

Follow these steps

1. Place the passive pre-heater in the desired position.
   Inside the column chamber, four different positions are available.

TIP The passive pre-heater can be mounted in any of the four positions that are shown below. It can be orientated as required, with the outlet capillary pointing downwards or upwards, depending on the column inlet position.

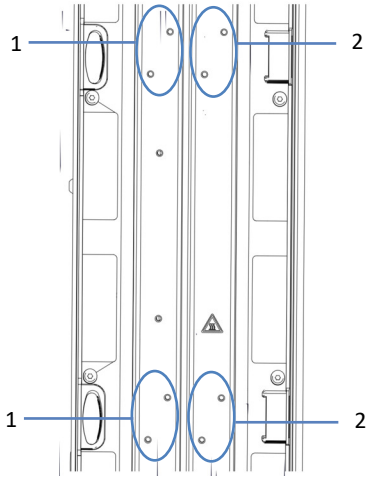

Figure 10: Mounting positions for passive pre-heater

No.	Description
1	Passive pre-heater positions in left column slot
2	Passive pre-heater positions in right column slot

2. Align the screw holes of the passive pre-heater with the screw holes on the pre-heater mounting position.

3. With the screwdriver, tighten the two screws and washers to mount the passive pre-heater inside the column chamber.

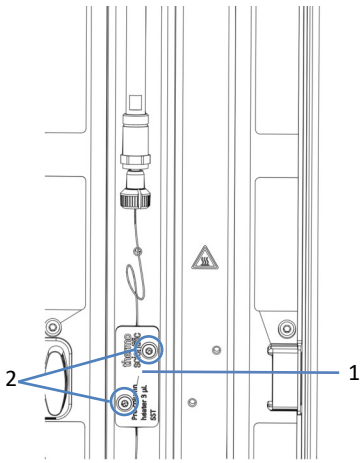

Figure 11: Mounting the passive pre-heater

No.	Description
1	Passive pre-heater (installed)
2	Passive pre-heater washers and screws

4. Connect the outlet capillary of the passive pre-heater to the column inlet.

5. Connect the inlet capillary of the passive pre-heater to the autosampler or a column switching valve.

TIP The passive pre-heater is not controlled by the chromatography data system. Therefore, it is not required to set up the passive pre-heater in the chromatography data system. The passive pre-heater can be used to adapt the eluent to the column temperature, before the eluent enters the column.

5.5.6 Installing the Column Switching Valve

For quickly changing between columns, the column compartment can hold one column switching valve. The valve can be installed at the position shown in Interior Components (▷ page 31).

Parts required

Column switching valve

Tools required

Screwdriver, Torx T10

Preparations

1. Turn off the power to the column compartment. If the power is on, the switching valve can be damaged during installation.
2. Do not yet remove the fitting plugs that cover the valve ports.

Removing the Column Switching Valve Cover

1. Open the column compartment door.
2. With the screwdriver, loosen the 4 screws on the switching valve cover.

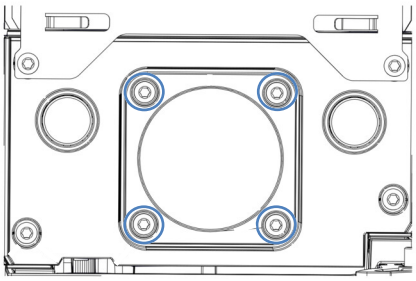

Figure 12: Switching valve cover screws

3. Remove the screws and keep them for further installation.

4. Remove the switching valve cover and gasket.

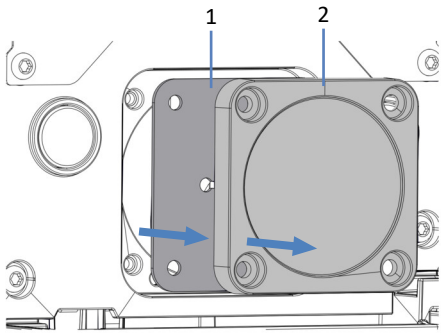

Figure 13: Removing the switching valve cover and gasket

No.	Description
1	Gasket
2	Cover

5. Carefully detach the cable from the rear of the switching valve gasket.

TIP Keep the switching valve cover and gasket to cover the switching valve opening if the valve is removed again.

Installing the Column Switching Valve

1. Check the orientation of the cable. The alignment pin in the middle of the connector on the cable should point downward.
2. Connect the cable to the connector on the rear of the column switching valve.
3. Push the cable into the housing.
4. Carefully push the column switching valve into the housing.

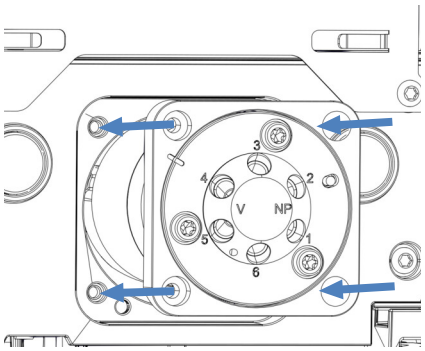

Figure 14: Installing the column switching valve

5. With the screwdriver, tighten the 4 screws of the column switching valve.
6. Remove the fitting plugs that cover the valve ports.
7. Connect the liquid lines as required by the application.
8. Turn on the power to the column compartment.
9. Configure the column switching valve in the chromatography data system:
   - ♦ In the Instrument Configuration Manager dialog box, select the valve model.
10. Switch the valve into the different positions and test the flow connections.

5.6 Setting Up the Flow Connections

This section describes how to set up the flow connections to and from the device and additional flow connections, if required.

Follow these steps

To set up the flow connections and complete the installation of the column compartment, follow these steps:

1. Connect and place the columns (see Connecting and Placing the Column (▸ page 60)).
2. Connect the components to the column switching valve.

For rules and recommendations on flow connections, see General Information and Guidelines (▸ page 57).

5.6.1 General Information and Guidelines

When setting up flow connections, follow these rules and recommendations:

Flow connections can be filled with hazardous substances. Observe the warning messages and precautionary statements presented in Safety Precautions (▸ page 19).

- Dirty components can contaminate the chromatography system. Contamination leads to poor performance of the modules and entire system or can even cause damage to the modules and system. Therefore:
  - Always wear appropriate gloves.
  - Place the components only on a clean, lint-free surface.
  - Keep your tools clean.
  - Use only lint-free cloth for cleaning.
- For installation instructions and guidelines and for handling recommendations, see Connecting Fittings, Capillaries, and Tubing (▸ page 58).

NOTICE

When you install devices or components to the system, always flush them to waste before connecting them in the system flow path. To flush Vanquish Access modules, follow the instructions in the *Vanquish Access System Operating Manual*.

5.6.2 Connecting Fittings, Capillaries, and Tubing

This section provides information about how to connect and handle capillaries, fittings, and tubing.

5.6.2.1 General Guidelines

When connecting capillaries and tubing, follow these general recommendations:

- Use only the capillaries and tubing (for example, solvent lines or waste tubing) that are shipped with the product or additional or spare capillaries and tubing as recommended by Thermo Fisher Scientific.
- The connectors must be free from contaminants. Even minute particles may cause damage to the system or lead to invalid test results.
- Do not install capillaries or tubes that are stressed, nicked, kinked, or otherwise damaged.
- Install capillaries and fittings only at the positions for which they are intended.

5.6.2.2 Connecting Viper Capillaries

This section describes how to connect Viper™ capillaries. All Viper flow connections in the Vanquish Access system are designed to be finger-tight.

To connect Viper capillaries with knurls, follow these steps:

NOTICE

- Tighten or loosen Viper capillaries *only* with your fingers. Do not use tools other than the knurl that comes with the capillary.
- To avoid damage to the capillary or connection, tighten and loosen the Viper capillaries *only* when the system pressure is down to zero.

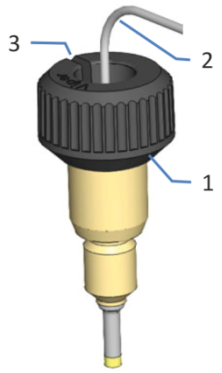

Figure 15: Viper fitting with knurl

No.	Description
1	Knurl
2	Capillary
3	Slot

1. Insert the Viper capillary into the connection port.
2. Tighten the connection by the knurl.

TIP Note the slot in the knurl. You can easily remove the knurl from the capillary through this slot if space is limited.

3. Check whether the connection leaks. If leakage exists, follow the steps further down.

Resolving Leakage of Viper Fittings with Knurls

1. Tighten the connection a little more.
2. If leakage continues, remove the capillary.
3. Clean the capillary ends carefully by using a lint-free tissue wetted with isopropanol.
4. Reinstall the capillary.
5. If the connection continues to leak, install a new Viper capillary.

5.6.3 Connecting and Placing the Column

Inside the column chamber, a central wall separates the left column position from the right one. Use a column holder to fix the columns on the central wall inside the column chamber.

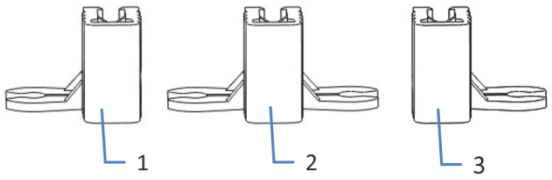

Figure 16: Column holders

No.	Description
1	Column holder for left-side positioning of the column
2	Column holder for placing two columns at the same height
3	Column holder for right-side positioning of the column

Follow these steps

1. Connect the capillaries to the column inlet and column outlet.

NOTICE

To avoid any leakage, check that all fittings are properly connected to the column inlet and outlet, when installing or exchanging capillaries.

2. Attach the column holder to the column fitting.

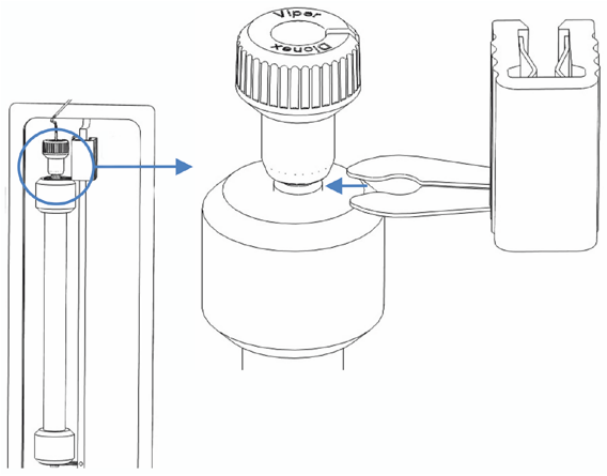

Figure 17: Attaching column holder to column fitting

3. Fix the column holder on the central wall inside the column chamber.
   The column holder can be fixed at any position on the central wall.

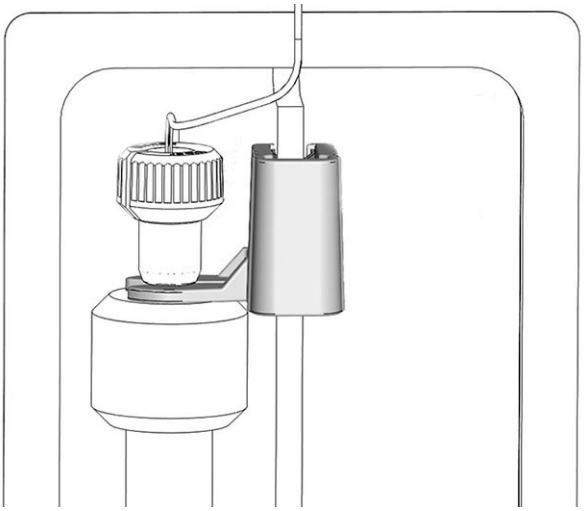

Figure 18: Positioning the column inside the column chamber

NOTICE

To avoid any damage to the central wall, do not slide the holders along the wall. If you need to change their position, pull off the holder and fix it again at the desired position.

4. Route the capillaries through the capillary guides. The capillary guides are located above and below the column chamber.

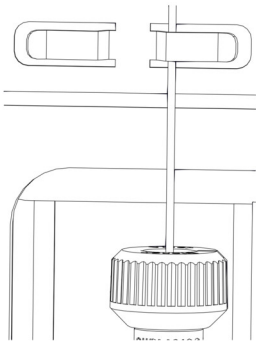

Figure 19: Routing the capillary through the capillary guide

5.7 Turning On the Device

TIP

Before turning on the power to a Vanquish Access system module for the first time, verify that the chromatography software is installed on the data system computer. When the power is turned on, the required USB drivers are automatically found and the Windows™ operating system can detect the device.

To turn on the power to the device, follow these steps:

1. Check that the power button on the front left of the Vanquish Access system base (system power button) is pressed in. If the power button stands out, press the power button to turn on the power on the system base.
2. Turn on the device with its main power switch.

Turn off the device with the main power switch, when instructed to do so, for example, during maintenance. Pressing the system power button will not be sufficient to turn off the power to the device completely.

See also

Power On/Off Control (▶ page 71)

5.8 Setting Up the Device in the Software

This manual assumes that the chromatography software is already installed on the data system computer and a valid license is available.

For more information about setting up the Vanquish Access system in the software, refer to the *Vanquish Access System Operating Manual*.

The Help for the software that you are using provides detailed information about the settings on each property page.

6 Operation

This chapter describes the elements for device control, provides information for routine operation and for shutdown.

6.1 Introduction to this Chapter

The information in this chapter assumes that the initial setup of the device has already been completed. If this is not the case, see the instructions in Installation (page 39).

For a basic description of instrument control and automated sample analysis with the Chromeleon software, refer to the *Vanquish Access System Operating Manual*. Details on control and operation of the device are available in the *Chromeleon Help*.

Software descriptions in this manual refer to Chromeleon 7. Terminology may be different to that of other software versions.

6.2 Safety Guidelines for Operation

When operating the device, pay attention to the following safety guidelines:

Observe all warning messages and precautionary statements presented in Safety Precautions (▸ page 19).

CAUTION—Hot Surfaces

Surfaces inside the device may become hot during operation. Touching hot parts might cause burns.

- Allow hot surfaces to cool down before you touch them.
- To cool down hot surfaces inside the column compartment quickly, press FAST COOL on the keypad. For details, see Keypad (▸ page 68).

NOTICE

Pay attention also to the following guidelines:

- To prevent damage resulting from leakage or from running the pump dry, always set the lower pressure limit for the pump.
- If there is evidence of leakage in the device, turn off the pump flow and remedy the situation immediately.

6.3 Control Elements

The device is designed to be operated mainly from a computer running with the chromatography software.

In addition, the following elements are available on the device:

- Keypad
  The keypad buttons allow you to perform certain functions directly from the device.
- Status indicators
  The LEDs (Light Emitting Diodes) on the status indicator LED bar on the front side of the device and the **STATUS** LED on the keypad provide a quick visual check of the operational status of the device.

6.3.1 Keypad

The keypad inside the device allows you to perform certain functions directly from the device. When you press a button, a short beep confirms that the function is performed.

When the device is connected in the chromatography data system, some functions may not be available from the keypad (see further down in this section).

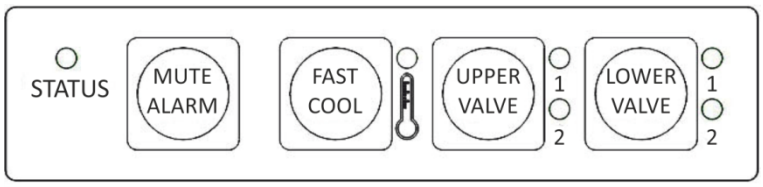

Figure 20: Keypad

STATUS

The **STATUS** LED provides a quick visual check of the operational status of the device.

When the door is closed, the LED bar on the front side indicates the operational status.

For status details, see Status Indicators (▷ page 70).

MUTE ALARM

Beeping alerts you when the device detects a problem, for example, leakage. To turn off the beep for the current alarm, press this button. Eliminate the source for the alarm within 10 minutes. Otherwise, beeping starts again. If the device detects a different problem, beeping alerts you again immediately.

FAST COOL

Pressing this button cools down hot surfaces in the column compartment quickly, for example, to allow fast and safe access to the components for replacement or maintenance procedures. For details, see Important Operating Parameters (▷ page 72).

The button LED is red while cooling is in progress. When the cool down temperature has been reached, the LED is green, indicating that you can safely access the components.

To cancel the Fast Cool mode, press the button again. The button LED is off and the components are heated up to the latest setpoint temperature. The Fast Cool mode can also be cancelled via the Chromeleon software.

UPPER VALVE

The button is disabled.

LOWER VALVE

Pressing this button switches the lower column switching valve (if installed).

With 2-position 6-port valves, the LEDs next to the button indicate the current valve position. The upper LED is green when the valve is in position 1. The lower LED is green when the valve is in position 2. The LEDs are off during valve switching.

When the Device is Connected in the Chromatography Data System

The button functionality is as follows when the device is connected in the chromatography data system:

- No injection or sequence is running:
  All functions are available from the keypad.
- An injection or sequence is running:
  The **MUTE ALARM** function remains available from the keypad, allowing you to turn off the beep for the current alarm.

6.3.2 Status Indicators

The status LED bar on the front side of the device and the **STATUS** LED on the inside keypad provide information about the device status.

LED Bar

The LED bar colors provide the following information:

LED Bar	Description
Off (dark)	The power to the device is turned off.
Dimmed	The door of the device is open.
Yellow, flashing slowly	The power to the device is turned on, but the device is not connected in the chromatography data system.
Yellow	The device is connected in the chromatography data system.
Green, flashing	The device is equilibrating.
Green	The device is equilibrated.
Blue	An injection or sequence is running, including data acquisition.
Red	A problem or error has occurred. For the related message, check the Instrument Audit Trail. For remedial action, see Troubleshooting (▸ page 101).

STATUS LED

The **STATUS** LED on the keypad inside the device provides the following information:

STATUS LED	Description
Off (dark)	The power to the device is turned off.
Green	The device is functioning properly.
Red	A problem or error has occurred. For the related message, check the Instrument Audit Trail. For remedial action, see Troubleshooting (▸ page 101).

6.4 Power On/Off Control

The power switch on the device is the main switch for power on/off control. The main power switch is turned on during initial installation of the device.

For easier handling, you can use the power button on the front left of the Vanquish Access system base (system power button) for power on/off.

Observe the following:

- *All* modules in the Vanquish Access system that are connected to the system base via system interlink cables are turned on or off simultaneously when the system power button is pressed.
- When the power is on, the system power button is pressed in. When the power is off, the system power button stands out.
- If the main power switch on a device is off, you cannot turn on the device with the system power button.
- To turn off a device completely, you *have to* turn it off with the main power switch on the device. Pressing the system power button will not be sufficient to turn off the power to the device completely.

6.5 Important Operating Parameters

The parameters described in this section should be considered for routine operation of the device. You can usually access them from the Chromeleon user interface.

If a parameter listed below is not available in the Chromeleon software, consider updating the firmware and Chromeleon version.

For more information, refer to *Chromeleon Help and documents*.

TIP The Instrument Method Wizard provides different parameter view modes. Depending on the parameters to be set, you can select the desired view mode (for example, **Easy** or **Advanced**).

Parameter	Description
Column Selection	For a column compartment with one column switching valve, column selection is performed in Chromeleon. The valve model and the application determine which commands and properties are used.
Equilibration Time	**Equilibration Time** can be set for the column compartment. For details, see Ready Temp Delta and Equilibration Time (▷ page 74) or refer to the *Chromeleon Help*.
Fast Cool	The Fast Cool mode is disabled as a standard. To cool down hot surfaces in the column compartment quickly, turn on the Fast Cool mode in Chromeleon or press the **FAST COOL** button on the keypad, see Keypad (▷ page 68). To cancel the Fast Cool mode in Chromeleon: • Set a new nominal temperature for the column compartment. The component is heated up to the new setpoint temperature. Note that temperature control remains turned off if no new nominal temperature is set. • Set temperature control to **ON** for the column compartment. Note that temperature control remains turned off if the temperature control is not enabled.
Leak Sensor Settings	The leak sensor is enabled as a standard.
Ready Temp Delta	**Ready Temp Delta** can be set for the column compartment. For details, see Ready Temp Delta and Equilibration Time (▷ page 74) or refer to the *Chromeleon Help*.
Column Thermostatting	In the **Command** window, select the column compartment, named **CC** by default and set **TempCtrl** to **ON**, to turn on column thermostatting. To change the thermostatting temperature, enter a value for the **Temperature.Nominal**.

Parameter	Description
Temperature Signals	In the Instrument Configuration Manager dialog box of the column compartment the temperature check boxes are selected as a standard, when the column compartment is set up in Chromeleon. The Chromeleon software uses this setting to generate the channels for recording the temperature signals. If a problem occurs, the temperature signals can provide helpful information to identify and eliminate the source for the problem. Therefore, always record the temperature signals.

6.6 Ready Temp Delta and Equilibration Time

The **Ready** property indicates whether the column compartment is ready for operation. When the column compartment is in the status **NotReady**, you cannot start the analysis. Keep in mind that the settings for **Ready Temp Delta** and **Equilibration Time** influence the time that the column compartment needs to enter the **Ready** state.

By default, the Chromeleon software pre-defines the **Equilibration Time**. If required, this setting can be adjusted.

Ready Temp Delta

Ready Temp Delta indicates for how many degrees the current temperature may be above or below the temperature setpoint. If the current temperature deviates from the temperature setpoint by more degrees than the value entered here, the column compartment enters the **NotReady** state and is not ready for operation.

Example: Temperature setpoint: 45 °C, **Ready Temp Delta**: 1 °C

The column compartment is ready for operation when the current temperature is between 44 °C and 46 °C for the **Equilibration Time**. If the current temperature is outside this range, the column compartment enters the **NotReady** state.

Equilibration Time

Indicates for how long the preferred temperature must be in the range specified by the temperature setpoint and the setting for **Ready Temp Delta** before the column compartment is ready for operation and the analysis can be started.

Example: Temperature setpoint: 45 °C, **Ready Temp Delta**: 1 °C, **Equilibration Time**: 0.5 min

The column compartment is ready for operation when the current temperature is between 44 °C and 46 °C and has remained in this range for 0.5 minutes.

Observe the following:

- The smaller the value is for **Ready Temp Delta** and the higher the value is for **Equilibration Time**, the longer it takes until the column compartment is ready for operation and you can start the data acquisition and/or the analysis.
- Environmental conditions, such as draft or air conditioning, may also extend the waiting period or even prevent the column compartment from entering the **Ready** state.
- However, keep in mind that the better the system is equilibrated, the better the chromatographic results are.

6.7 Optimizing the Performance of the Device

This section provides information for best performance of the device and gives hints on what you can do to optimize the performance further.

6.7.1 General Guidelines

To optimize the column compartment performance, consider the following general guidelines:

- Use short connection capillaries.
- Monitor the usage of specific column compartment components, for example, column switching valves that are subject to wear and stress and schedule appropriate maintenance intervals (see Predictive Performance (▷ page 86)).
- Always close the column chamber cover and the column compartment door during operation.
- Observe the general guidelines and recommendations on the use of solvents and additives in the chromatography system. Refer to *Use of Solvents and Additives* in the *Vanquish Access System Operating Manual*.

6.8 Shutting Down the Device

If the device will not be operated for some time, follow the instructions in this section to shut down the device.

TIP The Chromeleon software provides procedures for automatically preparing the chromatography system for shutdown. The procedures include, for example, operations for reducing the flow rate, reducing the temperature in temperature-controlled devices, and turning off the detector lamps. For information about **Smart Shutdown** and **Smart Standby**, refer to the *Chromeleon Help*.

6.8.1 Short-Term Shutdown (Interruption of Operation)

To interrupt operation of the device for a short period (short-term shutdown), for example, overnight, observe these guidelines for the Vanquish Access system modules, as required by your system arrangement:

- For your UV/VIS detector, note the following:
  - The lamp(s) in the detector can remain turned on.
  - The shutter can be moved to a closed position for protection of the flow cell.
- Apply a flow of 0.05 mL/min and have the pump deliver an appropriate solvent.
  Check the lower pressure limit for the pump and adapt the value if necessary. If the pressure falls below the lower limit, the pump stops the flow.
- Set the injection valve in the autosampler to the Inject position.
- Make sure that the temperature of the column does not exceed 40 °C.
- When resuming operation, let the flow equilibrate and verify that the operating parameters for the other system modules are set as required before proceeding.

6.8.2 Long-Term Shutdown

To interrupt operation for a longer period, follow the instructions below.

TIP Shutting down the device affects the operation of the system. When shutting down the device, also observe the shutting down instructions for the other Vanquish Access system modules and take appropriate action (refer to the *Operating Manuals* for the modules).

1. Remove the column.
2. Flush the system with an appropriate solvent (minimum HPLC-grade). Observe the following:

Situation after Shutdown	If no additive is used	If an additive is used
If using **reversed-phase (RP)** compatible solvents and additives:		
Device remains in the laboratory after shutdown	Flush the system, for example with methanol. 100% acetonitrile should not be used.	Flush the system with several volumes of methanol and water (50:50) (for example, 1.0 mL/min for 10 minutes with the standard system) to prevent salt buildup in the fluidics. If the solvents in the device are not miscible with water, use an appropriate intermediate solvent.
Device shall be transported or shipped after shutdown	Flush the system with isopropanol.	Flush the system first with several volumes of methanol and water (50:50) (for example, 1.0 mL/min for 10 minutes with the standard system) to prevent salt buildup in the fluidics. If the solvents in the device are not miscible with water, use an appropriate intermediate solvent. Afterward, flush the system with isopropanol.

Situation after Shutdown	If no additive is used	If an additive is used
If using **normal-phase (NP)** compatible solvents and additives:		
Device remains in the laboratory or shall be transported or shipped	Flush the system, for example with isopropanol. 100% acetonitrile should not be used.	Flushing liquids should be minimum HPLC-grade. 1. Flush the system with several volumes of an appropriate pure solvent with a flow rate of 1.0 mL/min for 10 minutes. 2. Flush the system with isopropanol.

3. Turn off the pump flow. Wait until the system pressure is down to zero before you continue the shutdown of the device.

4. The step depends as follows:

Situation	Steps
Device and all other system modules remain in the system stack and are to be turned off	Turn off the system with the system power button on the system base.
Device shall be transported or shipped after shutdown	If one of the modules shall be removed from the system stack, turn off *all* system modules with their main power switch. Pressing the system power button will not be sufficient to turn off the power to the devices completely. Follow the instructions in Transporting or Shipping the Device (▶ page 97).

6.8.3 Restart after Long-Term Shutdown

To restart the device after a long-term shutdown, follow these steps:

1. Turn on the device. Observe the following:

Situation	Action
If the device remained in the system stack and all system modules were turned off.	Turn on the system with the system power button on the system base.
If the device is restarted after transport.	Turn on the device with the main power switch.

2. Prepare and restart the system, following the instructions in the *Vanquish Access System Operating Manual*. Pay special attention to the *Preparing the System for Operation* section.

7 Maintenance and Service

This chapter describes the routine maintenance and the service procedures that the user may perform.

7.1 Introduction to Maintenance and Service

This chapter describes the routine maintenance and service and repair procedures that the user may perform.

Additional maintenance or service procedures must be performed only by service personnel certified by Thermo Fisher Scientific (for brevity, referred to as Thermo Fisher Scientific service personnel).

The device is designed for easy maintenance and service. The user-serviceable parts of the device can be accessed from the front. If not stated otherwise, the maintenance procedures do not require that you remove the device from the system.

7.2 Safety Guidelines for Maintenance and Service

When performing maintenance or service procedures, pay attention to the following safety guidelines:

Observe all warning messages and precautionary statements presented in Safety Precautions (page 19).

WARNING—High Voltage

High voltages are present inside the device that could cause an electric shock.

Do not open the housing or remove protective panels unless specifically instructed to do so in this manual.

WARNING—Escape of Hazardous Substances from Flow Connections

Flow and capillary connections can be filled with substances that can pose health risks. Solvent can spray when capillaries burst, slip out of their fittings, or are not properly tightened or when capillary connections are otherwise open.

- Wear appropriate protective equipment and follow good laboratory practice.
- Before starting maintenance or repair procedures, flush out harmful substances with an appropriate solvent.

WARNING—Tilting Liquid Reservoirs

Liquids in the reservoirs on the solvent rack might contain harmful substances. Spilling of these substances can pose health and safety risks.

To prevent the reservoirs from tilting, be careful not to pull on the liquid lines when performing maintenance.

CAUTION—Spraying Solvent

Solvents can spray when under high pressure.

- Stop the pump flow prior to opening the flow path.
- Wait until the system pressure is down to zero.
- When opening the flow path, wear appropriate protective equipment.

CAUTION—Hot Surfaces

Surfaces inside the device may become hot during operation. Touching hot parts might cause burns.

- Do not touch the inner side of the column chamber cover. When opening the column chamber cover, only grasp it by its holder.
- Allow hot surfaces to cool down before starting replacement or maintenance procedures.

CAUTION—Hydrostatic Pressure

Solvent may spill when you open the flow path. This is due to hydrostatic pressure in the system when the solvent reservoirs are located above the pump outlet. Before you loosen a connection in the flow path:

- Turn off the pump flow and wait until the system pressure is down to zero.
- Unscrew the caps of the solvent reservoirs and remove the solvent lines together with the caps from the reservoirs.
- Empty the solvent lines. Refer to the *Operating Manual* for the pump.
- Retighten the reservoir caps.

CAUTION—Electric Shock or Damage to the Device

After the power to the device is turned off, the device is still energized as long as the power cord is connected. Repair work on the device while the device is connected to power could lead to personal injury.

- Always unplug the power cord before starting repair work inside the device.
- If you were instructed to remove any housing covers or panels, do not connect the power cord to the device while the cover or panels are removed.

CAUTION—System Stack Stability

The Vanquish Access system configuration follows a defined stack arrangement. Modifying the system stack arrangement may impair the system stability or damage the system.

Do not change the system configuration or the height of the system stack.

7.3 General Rules for Maintenance and Service

For successful maintenance and service procedures, follow the rules and recommendations below.

General Rules

- Before starting maintenance or service procedures, shut down the device when instructed to do so.
- Use only the replacement parts specifically authorized and qualified for the device by Thermo Fisher Scientific.
- Follow all instructions step by step and use the tools recommended for the procedure.

Using Fast Cool Mode for Maintenance Procedures

To cool down hot surfaces inside the column compartment quickly, use the Fast Cool mode:

- Press the **FAST COOL** button on the keypad. When the LED next to the button is green, you can access the column compartment.
- Cancel the Fast Cool mode when the procedure has been completed by pressing the **FAST COOL** button again. The Fast Cool mode can also be cancelled via the Chromeleon software (see Important Operating Parameters (▷ page 72)).

Opening Flow Path Connections

- Before opening the flow path to replace capillaries in the system, turn off the pump flow and wait until the system pressure is down to zero.
- Dirty components can contaminate the chromatography system. Contamination leads to poor performance of the modules and entire system or can even cause damage to the modules and system. Therefore:
  - Always wear appropriate gloves.
  - Place the components only on a clean, lint-free surface.
  - Keep your tools clean.
  - Use only lint-free cloth for cleaning.

Depot Repair

- If you need to return the device for depot repair, follow the instructions in Transporting or Shipping the Device (▷ page 97).

7.4 Routine and Preventive Maintenance

Optimum device performance, maximum uptime of the device, and accurate results can be obtained only if the device is in good condition and properly maintained.

7.4.1 Maintenance Plan

Perform the maintenance procedures in the table on a regular basis. The frequency given in the table is a suggestion. The optimum frequency for maintenance depends on several factors, such as the types and amounts of samples and solvents used with the device.

Frequency	What you should do...
Daily	• Inspect the flow connections for signs of leakage or blockage. Tighten leaking connections. • When you use buffers or salt solutions, flush the device thoroughly after use with an appropriate solvent that does not contain buffers or salts.
Regularly	• Inspect the flow connections for damage, such as cracks, nicks, cuts, or blockage. • Empty the waste container as needed. • Check that all warning labels are still present on the device and clearly legible. If they are not, contact Thermo Fisher Scientific for replacement.
Annually	Have Thermo Fisher Scientific service personnel perform preventive maintenance once a year.

TIP The Chromeleon software supports functions for estimating the lifetime of consumables. See Predictive Performance (▶ page 86).

7.4.2 Cleaning or Decontaminating the Device

Cleaning and decontamination must be performed by qualified personnel wearing suitable personal protective equipment. Always observe national and local regulations.

NOTICE

Wipe up all liquids spilled onto the system immediately. If surfaces are exposed for longer periods, these liquids can cause damage.

Decontamination

Decontamination is required, for example, when leakage or spillage has occurred, or before service or transport of the device. Use a suitable cleaning detergent or disinfectant to ensure that the treatment renders the device safe to handle.

Parts required

- Suitable cleaning detergent (or disinfectant)
- Purified water
- Lint-free cloths or wipes

CAUTION—Explosive Gas Mixtures from Alcoholic Cleaning Detergents

Alcohol-containing cleaning detergents may form flammable and explosive gas mixtures with air.

- Use such cleaning detergents only when required and only in adequately ventilated rooms.
- Avoid open flames or exposure to excessive heat during the cleaning process.
- Wipe the cleaned components thoroughly dry after cleaning. Do not operate the device before it is completely dry.

NOTICE

Observe the following:

- Only use cleaning detergents that will not damage the surfaces of the system.
- Never use sharp tools or brushes for cleaning any surfaces.
- Do not use sprays for cleaning.
- Prevent cleaning detergent from entering the flow path.
- Do not use excessively wetted cloth or wipes for cleaning. Prevent any liquids from entering the functional components of the device. Liquids can cause a short circuit when getting in contact with the electronic components.

Preparations

1. Turn off the power to the device and disconnect the power cord from the power source.

Follow these steps

1. Wipe the surfaces clean with a clean, dry, soft, lint-free cloth or wipe. If necessary, slightly dampen the cloth or wipe with a solution of lukewarm water and a suitable cleaning detergent.
2. Allow the cleaning detergent to react as recommended by the manufacturer.
3. Wipe the cleaned surfaces with purified water to ensure that all cleaning detergent residues have been removed.
4. Wipe the surfaces dry using a soft, lint-free cloth or wipe.

7.4.3 Predictive Performance

The Chromeleon software supports functions for monitoring and recording service and qualification information about the device.

Monitoring service and qualification intervals

On special service and qualification panels, you can define intervals for service procedures or qualification procedures. These functions, which are called Predictive Performance, allow you to schedule these procedures based on the actual operating and usage conditions of the device. In addition, you can set limits to alert you before and when the service or qualification is due.

Color-coded bars provide visual feedback, allowing you to easily check and monitor the status. If a warning limit was set, a message in the Chromeleon Audit Trail alerts you when the action is due.

Service and qualification counters can be reset to zero after the required action was performed. To keep the Predictive Performance information up-to-date, consider resetting the counter when a service, or qualification procedure has been performed.

For more information, refer to the *Chromeleon Help*.

7.5 Column Switching Valve

The column compartment can hold one column switching valve. To ensure optimum operation of the column switching valve, observe the following guidelines:

- Operating, storing, or shipping the valve below 0 °C with water in the fluid passages may cause failure of the sealing surfaces.
- Install Viper fitting connections to connect the capillaries to the valve.
- Clean the valve by flushing all lines with an appropriate solvent. The nature of the solvent to be used depends on the samples and the mobile phases that are used.

7.5.1 Inspecting the Column Switching Valve for Leakage

When

- Liquid droplets appear at a valve port
- Liquid has collected in the leak tray
- Liquid droplets appear at the drain hole

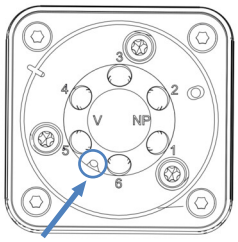

Figure 21: Drain hole on column switching valve

Follow these steps

1. As leakage usually occurs at a connection, visually inspect all connections in the flow path.
2. This step depends:

Situation	Action
Liquid droplets appear at a valve port	1. Retighten the affected capillary. 2. If liquid droplets still appear at the valve port, replace the capillary.
Liquid has collected in the leak tray	1. Retighten all capillaries. 2. If liquid still collects in the leak tray, replace the capillaries.

Situation	Action
Liquid droplets appear at the drain hole	1. If liquid is present, absorb the liquid with a tissue. 2. If liquid droplets still appear at the drain hole, replace the column switching valve. See Replacing the Column Switching Valve (▶ page 88).

7.5.2 Replacing the Column Switching Valve

When

- Column switching valve is leaking
- To change between different valve types

Parts required

Column switching valve as required by the application

Tools required

- Screwdriver, Torx T10

Preparations

WARNING—Escape of Hazardous Substances from Flow Connections

Flow and capillary connections can be filled with substances that can pose health risks. Solvent can spray when capillaries burst, slip out of their fittings, or are not properly tightened or when capillary connections are otherwise open.

- Wear appropriate protective equipment and follow good laboratory practice.
- Before starting maintenance or repair procedures, flush out harmful substances with an appropriate solvent.

1. Turn off the pump flow.
2. Disconnect all liquid lines connected to the column switching valve.
3. Disable the valve in the Instrument Configuration Manager dialog box.
4. Turn off the power to the column compartment. If the power is on, the switching valve can be damaged during replacement.
5. Do not yet remove the fitting plugs that cover the valve ports on the replacement column switching valve.

Removing the Column Switching Valve

1. Loosen the 4 screws on the column switching valve.
2. Keep the screws for installation of the replacement column switching valve.

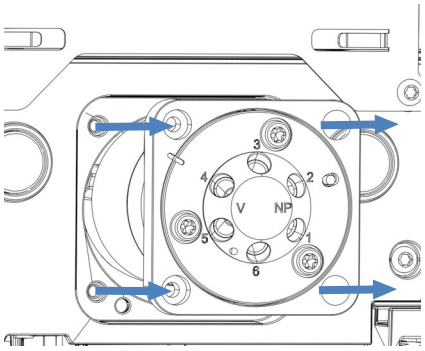

Figure 22: Removing the column switching valve

3. Carefully pull the column switching valve out of the housing.
4. Disconnect the cable from the valve drive on the rear of the column switching valve.
5. If no column switching valve is to be installed afterward, install the column switching valve cover to the column switching valve opening: See Replacing the Column Switching Valve Cover (▸ page 90).

Installing the Column Switching Valve

1. Check the orientation of the cable. The alignment pin in the middle of the connector on the cable should point downward.
2. Connect the cable to the connector on the rear of the column switching valve.
3. Push the cable into the housing.

4. Carefully push the column switching valve into the housing.

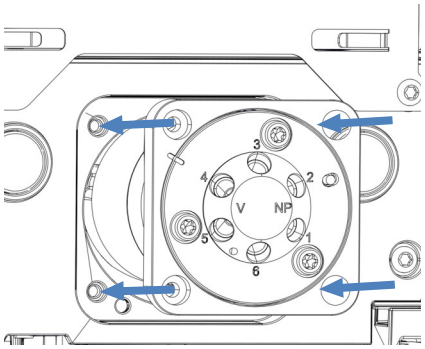

Figure 23: Installing the column switching valve

5. With the screwdriver, tighten the 4 screws of the column switching valve.
6. Remove the fitting plugs that cover the valve ports.
7. Connect the liquid lines as required by the application.
8. Turn on the power to the column compartment.
9. Configure the column switching valve in the chromatography data system:
   - In the Instrument Configuration Manager dialog box, select the valve model.
10. Switch the valve into the different positions and test the flow connections.

7.5.3 Replacing the Column Switching Valve Cover

Parts required

Column switching valve cover

Tools required

Screwdriver, Torx T10

Removing the Column Switching Valve Cover

1. Open the column compartment door.

2. With the screwdriver, loosen the 4 screws on the switching valve cover.

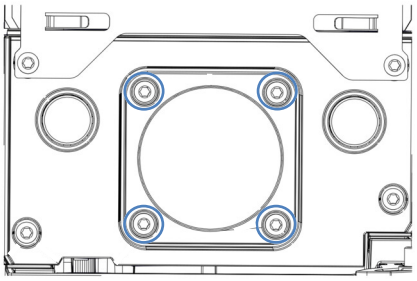

Figure 24: Switching valve cover screws

3. Remove the screws and keep them for further installation.

4. Remove the switching valve cover and gasket.

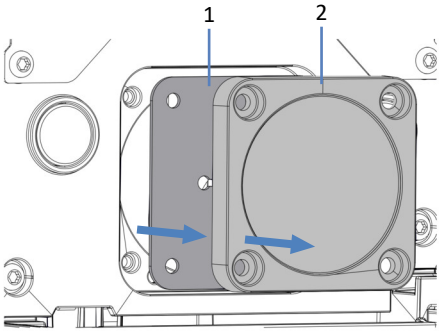

Figure 25: Removing the switching valve cover and gasket

No.	Description
1	Gasket
2	Cover

5. Carefully detach the cable from the rear of the switching valve gasket.

Installing the Column Switching Valve Cover

1. Attach the cable to the rear of the new column switching valve gasket/cover.

2. Position the gasket and the switching valve cover onto the column switching valve opening.

3. With the screwdriver, tighten the 4 screws on the column switching valve cover.

7.6 Replacing the Passive Pre-Heater

When

Defective passive pre-heater

Parts required

Passive pre-heater

Tools required

Screwdriver, Torx T10

Follow these steps

CAUTION—Hot surfaces

The column compartment and pre-heater may be hot. Touching hot parts might cause burns. Allow the column compartment and the pre-heater to cool down before starting the service procedure.

1. Disconnect the outlet capillary of the passive pre-heater from the column inlet.
2. Disconnect the inlet capillary of the passive pre-heater from the autosampler or a column switching valve.
3. With the screwdriver, loosen the two screws and washers on the passive pre-heater and remove the passive pre-heater.
4. Mount the new passive pre-heater in the column chamber. See Installing the Passive Pre-Heater (▸ page 52).

7.7 Replacing the Main Power Fuses

When

Blown fuses

Parts required

Fuses (2 fuses, 4 AT, 250 V AC, slow-blow, 5 x 20 mm) from Fuses Kit

Tools required

Slotted screwdriver, any size between 3.3 mm and 5.5 mm is appropriate

Preparations

WARNING—Electric Shock

High voltages are present inside the device that could cause an electric shock or damage to the device.

- Turn off the device with its main power switch. Disconnect the power cord from both the power source and the device.
- Use only the fuses of the type and current rating specified for the device by Thermo Fisher Scientific.
- Do not use repaired fuses and do not short-circuit the fuse holders.

Follow these steps

The fuse holder is located next to the main power switch.

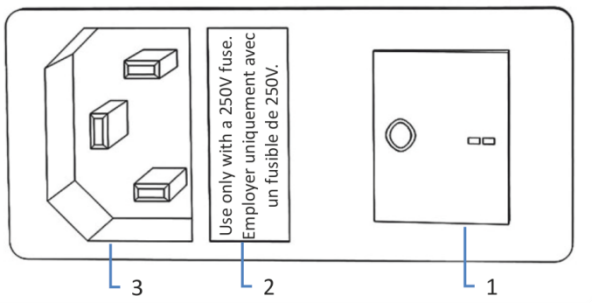

Figure 26: Fuse holder

No.	Description
1	Main power switch (on/off control)
2	Fuse holder
3	Power-inlet connector

1. Use the screwdriver to remove the fuse holder.
2. Replace the two fuses with new fuses of the specified type and current rating. Always replace *both* fuses.
3. Reinstall the fuse holder.
4. Reconnect the power cord to the power source and to the device.
5. Turn on the device with the main power switch.

7.8 Updating the Device Firmware

The description in this section refers to the Chromeleon 7 Chromatography Data System.

When

Updating the device firmware might be required, for example, when a new firmware version is released that adds functionality or solves problems of a previous version.

Items required

Firmware version/Chromeleon version as appropriate

TIP When a new firmware version is released, the new version will be included in the next available Vanquish Access driver package update. Refer to the *Release Notes* for the driver package.

Preparations

1. Read the release notes provided with the firmware and/or Chromeleon version.
2. Connect the device in the Chromeleon software.
3. Stop all operations on the Instrument that includes the device.
4. Wait until the Instrument is idle.

Follow these steps

1. Start the Instrument Configuration Manager program.
2. Perform a firmware update from the **General** tab page in the configuration dialog box for the device. For details, refer to the *Chromeleon Help*.
   The firmware update may take several minutes.

NOTICE

A firmware downgrade or incomplete firmware update may result in loss of functionality or malfunctioning of the device.

- Do not interrupt communication between the Chromeleon software and the device at any time during the procedure.
- At the beginning of the update process, a message appears showing the firmware version currently installed in the device and the version that will be transferred from the Chromeleon software. If the firmware installed in the device is a later version than the version in the Chromeleon software, cancel the download.

3. Monitor the Audit Trail of the Instrument Configuration Manager program to see whether the firmware update was successful or failed.

4. Depends on the situation:

Situation	Action
Firmware update successful	Requalification of the device may be required. Refer to the release notes.
Firmware update failed	Turn the device off and on again. Repeat the firmware update.
Firmware update fails repeatedly	Contact Thermo Fisher Scientific Technical Support.

7.9 Transporting or Shipping the Device

If you want to transport the device to a new location or if you need to ship the device, first prepare the device for transport, and then move or ship the device as required. Follow the instructions in this section.

Observe the following safety guidelines:

CAUTION—Risk of Tilting Solvent Rack

To prevent the solvent rack from tilting, remove the solvent rack before removing or installing the column compartment.

NOTICE

To lift or move the device, grasp the device by the sides. Do not move or lift the device by the front door. This will damage the door or the device.

Follow these steps

1. Prepare the device for transport. See Preparing the Device for Transport (▷ page 97).
2. The step depends as follows:
   - To transport the device to a new location, follow the instructions in Transporting the Device to a New Location (▷ page 98).
   - To ship the device, follow the instructions in Shipping the Device (▷ page 99).

7.9.1 Preparing the Device for Transport

To prepare the device for transport, follow these steps:

1. Perform a long-term shut down of the device. See Long-Term Shutdown (▷ page 77).
2. Turn off the device with its main power switch and disconnect the power cord.
3. Remove all cables and flow connections to other devices.
4. Cover up the valve ports with the fitting plugs.
5. Remove the passive pre-heater, if installed (see Replacing the Passive Pre-Heater (▷ page 92)).

6. Remove the column:
   a) Disconnect the capillaries from the column inlet and outlet.
   b) Detach the column holder from the central wall inside the column chamber.
   c) Detach the column holder from the column fitting.
7. Remove the solvent rack.
8. Remove the column compartment from the Vanquish Access system:
   Grasp the column compartment by its sides and slightly lift the column compartment up and out of the grooves on the mounting bars.

7.9.2 Transporting the Device to a New Location

Preparations

Prepare the device for transport. See Preparing the Device for Transport (▸ page 97).

Follow these steps

1. Observe the notes for handling and lifting the device safely.
2. Transport the device to the new location.
3. Install and set up the device in the system stack. Follow the instructions on mounting the system stack in the *Vanquish Access System Operating Manual*.
4. Set up the device:
   a) Connect the device and set up flow connections. See Installation (▸ page 39).
   b) Prepare the system for operation. For details, refer to the *Vanquish Access System Operating Manual*.
5. Before starting an analysis, let the device equilibrate and be sure that it is ready for operation.

7.9.3 Shipping the Device

Preparations

Prepare the device for transport. See Preparing the Device for Transport (▷ page 97).

CAUTION—Possible Contamination

Hazardous substances may have contaminated the device during operation and may cause personal injury to service personnel.

- Decontaminate all parts of the device that you want to return for repair.
- Fill in and sign the Health and Safety Form. Thermo Fisher Scientific refuses to accept devices for repair if the Health and Safety Form is missing, incompletely filled in, or unsigned.

Follow these steps

1. Follow the unpacking instructions in this manual in the reverse order.
   Use only the original packing material and shipping container. If the original shipping container is not available, appropriate containers and packing material can be ordered from the Thermo Fisher Scientific sales organization.
2. If you need to return the device to Thermo Fisher Scientific for depot repair, contact your local Thermo Fisher Scientific support organization for the appropriate procedure.

Restarting the Device after Shipping

To install the device after shipping, follow the instructions on mounting the system stack in the *Vanquish Access System Operating Manual*.

8 Troubleshooting

This chapter is a guide to troubleshooting issues that may arise during operation of the device.

8.1 General Information about Troubleshooting

The following features help you to identify and eliminate the source for problems that may arise during operation of the device.

TIP For information about operating issues that might occur during the operation of a Vanquish Access system, refer to the *Vanquish Access System Operating Manual*.

If you are unable to resolve a problem following the instructions given here or if you experience problems that are not covered in this section, contact Thermo Fisher Scientific Technical Support for assistance. See the contact information at the beginning of this manual.

To facilitate device identification, have the serial number and technical name available when communicating with Thermo Fisher Scientific.

Status Indicators

The status indicator LED bar on the front side of the device and the **STATUS** LED on the keypad inside provide quick visual feedback on the operational status of the device. If the device firmware detects a problem, the status indicators are red.

Alarms

Leaks are a potential safety issue. Therefore, if a leak sensor detects leakage, beeping starts to alert you in addition to the message in the Instrument Audit Trail and the status indicators changing to red. Follow the instructions in this manual to find and eliminate the source for the leakage.

Instrument Audit Trail Messages

If the device firmware detects a problem, the problem is reported to the chromatography data system.

The chromatography data system logs information about all events related to instrument operation for the current day in an Instrument Audit Trail. The Instrument Audit Trail is named with the current date, using the format yyyymmdd. For example, the Instrument Audit Trail for May 15, 2023, is named 20230515.

The Instrument Audit Trails can be found on the ePanel Set (Audit ePanel). In addition, Audit Trails for each instrument are available in the Chromeleon 7 Console Data view, in the folder of the instrument.

Messages in the Instrument Audit Trail may be preceded by an icon. The icon identifies the seriousness of the problem. For possible causes and remedial actions, see Messages (▶ page 104).

Firmware Failure

If a firmware failure occurred during operation of the module, an exception log has been created about the processes during the firmware failure. The firmware sends the exception log to the Instrument Audit Trail when the module is connected in the chromatography data system.

In this case, observe the following:

- Send the Instrument Audit Trail as **.cmbx** file to the Technical Support before you clear the log.
- To clear the exception log and continue operation of the module, perform the command **ExceptionLogClear**.

For more information, refer to the *Chromeleon Help*.

8.2 Messages

The table lists the most frequently observed messages for the device and provides troubleshooting assistance.

Each message consists of a code number and a text. The code number is the unique identifier for the problem while the wording may change. Note the following:

- To facilitate finding a message, the table lists the messages sorted by code.
- If you cannot find the code you are looking for, check the message text. The two messages "Unexpected module behavior" and "Module malfunction detected" can be assigned to different codes. See the beginning of the table for more information.

TIP If you are unable to resolve the problem following the instructions in this manual, or if you encounter a message not listed in the table, write down the code and wording of the message and contact us. For details, see the *Contacting Us* section at the beginning of this manual.

Message and Code	Description and Remedial Action
Unexpected module behavior. Code xx	xx = Two-digit to four-digit code number. When the message appears, write down the message code and turn off the module. Wait for 5 seconds and turn on the module again.
Module malfunction detected. Code xx	xx = two-digit to four-digit code number When the message appears, write down the message code. Turn off the module and contact Technical Support.
Code 36 Download failed.	The firmware download has not been successful. Repeat the download.
Code 37 Download firmware mismatch.	The firmware download has not been successful. Verify that the correct firmware file was selected. Repeat the download.
Code 52 Module software incomplete. Download firmware (again).	The firmware is incomplete, for example, because the communication between the chromatography data system and the module was interrupted during the firmware download. Repeat the download.
Code 84 Could not move X to its destination position. Code 85 Could not move X to its destination position.	(with X = bottom valve) The switching valve may be defective. Replace the switching valve, see Replacing the Column Switching Valve (▶ page 88). If the error message persists, contact Technical Support.
Code 86 Unexpected X behavior. Code 87 Unexpected X behavior.	(with X = bottom valve) The switching valve may be defective. Replace the switching valve, see Replacing the Column Switching Valve (▶ page 88). If the error message persists, contact Technical Support.

Message and Code	Description and Remedial Action
Code 89 Liquid leak sensor missing.	Contact Thermo Fisher Scientific Technical Support for assistance. Note that the module can be operated nevertheless, even if the leak sensor is defective or not present, if leak detection is disabled.
Code 90 Download firmware mismatch – invalid version.	You tried to download an incompatible firmware with an earlier version number than the firmware that is currently installed in the module. Downgrading the firmware may result in loss of functionality or malfunctioning of the module. If required, repeat the download with a firmware version later than the version currently installed in the module.
Code 91 Data changed during read.	• This may be a temporary error. Turn off the module. Wait for 5 seconds and turn on the module again. • The firmware may be defective. Update the firmware.
Code 118 USB Buffer Overflow.	This is a software problem. The module produces data faster than the computer on which the chromatography data system is running can process the data. 1. In the chromatography data system, disconnect and reconnect the module. 2. If this does not solve the problem, update the firmware or the chromatography data system version. 3. If the problem persists: Also, third-party software on the computer, for example, virus scanners or poor computer performance can cause the problem. Contact the onsite IT department.
Code 120 System interlink request timed out.	Communication with the module failed. The module did not respond in time. For the module for which the message appears: 1. Turn on the module if it is not yet turned on. 2. Check the system interlink connections to the module. Verify that all system interlink cables are connected at both ends. 3. If the message persists, replace the system interlink cables.
Code 126 Device lost system interlink connection.	All other modules on the system interlink bus are turned off or a firmware download is performed on all other modules. 1. Check whether all other modules have been turned off or a firmware download is performed on all other modules on the bus. 2. Wait until one of the modules on the bus is turned on or the firmware download is complete. 3. A system interlink cable may be disconnected from the module or is defective. Check the system interlink connections to the module. Verify that all system interlink cables are connected at both ends. 4. If the message persists, replace the system interlink cables.
Code 128 System interlink data errors.	A system interlink cable may be disconnected from the module or defective. 1. Check the system interlink connections to the module. Verify that all system interlink cables are connected at both ends. 2. If the message persists, replace the system interlink cables.

Message and Code	Description and Remedial Action
Code 129 Device X not found on system interlink.	X = serial number The module with the given serial number may be disconnected, turned off or a firmware update is running. 1. Check the system interlink connections to the module. 2. If the message persists, check the module operational status.
Code 131 System interlink bus not operable.	A system interlink cable may be disconnected from the module or defective. 1. Check the system interlink connections to the module. Verify that all system interlink cables are connected at both ends. 2. If the message persists, replace the system interlink cables.
Code 136 Lock request rejected – already locked by X.	X = lock holder ID, with keypad button ID, USB address referring to the chromatography data system or system interlink address referring to the system controller or a module The module is already locked by another software (system controller or chromatography data system) or a keypad button. Wait until the module is released from the locked state.
Code 137 Lock by X expired.	X = lock holder ID, with keypad button ID, USB address referring to the chromatography data system or system interlink address referring to the system controller or a module Inform Thermo Fisher Scientific about the occurrence. No further action required.
Code 145 Lock holder X lost.	X = lock holder ID, with keypad button ID, USB address referring to the chromatography data system or system interlink address referring to the system controller or a module The lock was released automatically since its holder disappeared from system interlink. 1. Check if the module holding the lock was turned off. 2. Check the system interlink connections to the module.
Code 152 Assignment or command rejected – device locked.	Module is not ready to accept command or property assignment since locked by another software (system controller or chromatography data system). Wait until module is released by the current software (system controller or chromatography data system).
Code 155 Incomplete system configuration - restricted module operation.	The system configuration is not complete, one or more modules are missing. Check that all required modules are powered on and connected via system interlink.
Code 156 Command rejected - missing module in system configuration.	Command cannot be executed since a module is missing in the system setup. Check that all required modules are powered on and connected via system interlink.
Code 2048 X leak detected - eliminate within approx. xxx seconds.	(with X = liquid) The leak sensor detected excessive liquid in the column chamber. Eliminate the cause within the time indicated in the message. For details, see Resolving Liquid Leaks (▷ page 108).
Code 2049 X leak detected.	(with X = liquid) The leak sensor detected excessive liquid in the column chamber. Eliminate the cause. For details, see Resolving Liquid Leaks (▷ page 108).

Message and Code	Description and Remedial Action
Code 2088 Module malfunction detected (X).	(with X = "Upper Compartment" or "Lower Compartment" or "Main Power") When the message appears, write down the message code and turn off the module. Contact Technical Support.

8.3 Resolving Liquid Leaks

When

The leak sensor is wet. The leak sensor reports leakage.

Parts and additional items required

- Replacement part as required
- Cloth or tissue

Preparations

When resolving leakage, observe the safety guidelines and general rules for maintenance and service as presented in Maintenance and Service (▷ page 79).

Follow these steps

1. Locate the source of the leak.
   As leakage usually occurs at a connection, visually inspect all components and connections in the flow path.
2. Tighten or replace the connection or component as required.
3. With a cloth or tissue, thoroughly absorb all liquid that has collected in the leak tray and under the leak sensor. Be careful not to bend the sensor.
4. Allow the sensor to adjust to the ambient temperature for a few minutes.
5. If leakage is no longer reported, you can resume operation.

9 Specifications

This chapter provides the physical and performance specifications, including information about the materials used in the flow path of the device.

9.1 Performance Specifications

The device performance is specified as follows:

Type	Specification
Capacity	2 column slots
Pressure range	2 – 50 MPa (20 – 500 bar, 290 – 7250 psi)
Temperature range (column chamber)	5 °C – 85 °C, max. 18 °C below ambient
Temperature accuracy (column chamber)	±0.5 °C (up to 80 °C)
Temperature stability (column chamber)	±0.05 °C
Temperature precision (column chamber)	±0.1 °C
Heat up time (column chamber)	from 20 °C to 50 °C in less than 15 minutes ±1 °C from 25 °C to 40 °C in 5 minutes (typically) ±1 °C
Cool down time (column chamber)	from 50 °C to 20 °C in less than 15 minutes ±1 °C
Column switching valves	2-position-6-port valve 6-position-7-port multi-position valve
Communication	1 USB port (USB 2.0, "B" type connector)
System Interlink	2 system interlink ports (RJ45-8 connectors)
Control	Chromeleon 7 The column compartment can only be controlled as part of a Vanquish Access system. Keypad with 4 buttons for performing certain functions directly from the device.
Materials in the flow path	Valve: ceramic/titanium; capillaries: stainless steel (for details, see the pre-heater specifications) **NOTICE** For information about the chemical resistance of materials refer to the technical literature.
Solvent and additive information	For recommendations on the use of solvents and additives, refer to the *Vanquish Access System Operating Manual*.
Safety features	Liquid leak sensor
Good Laboratory Practice (GLP) features	Predictive Performance functions for scheduling maintenance procedures based on the actual operating and usage conditions of the device. All system parameters logged in the Chromeleon Audit Trail.

Passive pre-heaters

Type	0.18 x 530 mm, stainless steel	0.25 x 580 mm, stainless steel
Temperature range	Same as column chamber	Same as column chamber
Biocompatible	No	No
Heated volume	3 µL	5 µL
Total volume	15 µL	32 µL

9.2 Physical Specifications

The physical conditions of the device are specified as follows:

Type	Specification
Range of use	Indoor use only
Ambient operating temperature	5 °C - 35 °C
Ambient storage temperature	-20 °C - 45 °C
Ambient operating humidity	20% - 80% relative humidity (non-condensing)
Ambient storage humidity	Maximum 60% relative humidity (non-condensing)
Operating altitude	Maximum 2000 m above sea level
Pollution degree	2
Power requirements	100 – 240 V AC, ± 10 %; 50/60 Hz; max. 310 W / 330 VA
Overvoltage category	II
Emission sound pressure level	The module can only be operated as part of the Vanquish Access system. For the system specification, refer to the Vanquish Access System Operating Manual.
Dimensions (height x width x depth)	64 x 12 x 45 cm
Weight	10.5 kg without valves, 11 kg with one valve

10 Accessories, Consumables and Replacement Parts

This chapter describes the standard accessories that are shipped with the device and the accessories that are available as an option. This chapter also provides information for reordering consumables and replacement parts.

10.1 General Information

The device must be operated only with the replacement parts and additional components, options, and peripherals specifically authorized and qualified by Thermo Fisher Scientific.

Accessories, consumables, and replacement parts are always maintained at the latest technical standard. Therefore, part numbers are subject to change. If not otherwise stated, updated parts will be compatible with the parts they replace.

10.2 Optional Accessories

Item	Part No.
Passive pre-heater, 0.18 mm x 530 mm, stainless steel	6732.0170
Passive pre-heater, 0.25 mm x 580 mm, stainless steel	6732.0180
Valve 2-p 6-p 70 MPa NP VA-C	6230.2520
Valve 6-p 7-p 70 MPa NP VA-C	6230.2530

10.3 Consumables and Replacement Parts

Cables and fuses

Description	Part No.
Fuses kit The kit includes the appropriate fuses for the Vanquish Access system modules. For the column compartment, use only 4 AT (5 x 20 mm), 250 V AC slow-blow fuses.	6036.0002
System interlink cable (RJ45), 0.5 m	6036.0004
USB cable, type A to type B, high-speed, USB 2.0 Cable length: 1 m	6035.9035A

Miscellaneous

Description	Part No.
Column compartment doors	6190.6350
Column holder kit	6732.1904
Column switching valve cover	6732.1843
Immersion sensor PT100 For column compartment OQ/PQ	6705.0060
Packing material	6190.6390
PQ Kit For column compartment OQ/PQ, including a P700 thermometer and immersion sensor PT100. **Note:** To continue to use an already available PQ Kit 5705.0050A, it is required to order the temperature sensor clip.	6732.0010
Rotor 2-p 6-p 70 MPa NP VA-C	6230.2527
Rotor 6-p 7-p 70 MPa NP VA-C	6230.2537
Stator 2-p 6-p 70 MPa NP VA-C	6230.2525
Stator 6-p 7-p 70 MPa NP VA-C	6230.2535
Temperature sensor clip For column compartment OQ/PQ	6732.0009
Viper inline filter To retain particles (larger than 0.5 µm) from the mobile phase	6036.1045
Viper union	6040.2304
For passive pre-heaters, see Optional Accessories (▶ page 115).	

Power cords

Description	Part No.
Power cord, China	6000.1080
Power cord, India	6000.1090

11 Appendix

This chapter provides additional information about compliance.

11.1 Compliance Information

11.1.1 Declarations of Conformity

CE Declaration of Conformity

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

RoHS Compliance

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

- *European RoHS Directive*
  Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

  The CE mark on the device indicates that the product is compliant with the directive.

- *China RoHS regulations*
  Measures for Administration of the Pollution Control of Electronic Information Products

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

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

UKCA Declaration of Conformity

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

UL/CSA 61010-1 Compliance

The label of the NRTL Lab on the device (for example, cTUVus or CSA mark) indicates that the device has satisfied the requirements of the applicable standards.

11.1.2 WEEE Compliance

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

Figure 27: WEEE symbol

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

11.1.3 FCC Compliance

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

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

11.1.4 Manual Release History

Revision	Covering
1.0	Vanquish Access Column Compartment

The instructions were prepared in English (original instructions). Other language versions are translations based on the English original instructions.

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