Thermo Scientific

HAAKE Viscotester iQ

Instruction Manual

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ThermoFisher SCIENTIFIC

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Release history:

For Research Use Only. Not for use in diagnostic procedures.

Contents

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Konformitätserklärung
Declaration of Conformity
Déclaration de conformité

075-5041

Produktbezeichnung **Product name** **Nom du produit**	**Identifikation** **Identification** **Identification**
HAAKE Viscotester iQ / Viscotester iQ Air in combination with: TM-LI-C32, TM-LI-C48, TM-PE-C, TM-PE-P, TM-LI-P HAAKE Viscotester iQ / Air Laboratory Stand	262-0001 / 262-0100 222-2256, 222-2255, 222-2431, 222-2430, 222-1909 262-0050 / 262-0053

Hersteller **Manufacturer** **Fabricant**	**Thermo Electron (Karlsruhe) GmbH** **Dieselstraße 4** **D – 76227 Karlsruhe** **Germany**
Dokumentationsbevollmächtigte Person **Authorised person for technical file** **Personne autorisée à constituer le dossier technique**	**Henry Eisenlohr** **Thermo Electron (Karlsruhe) GmbH**

CE

Richtlinie
Directive
Directive

2006/42/EG	**Maschinenrichtlinie** **Machinery directive** **Directive des machines**

Konform zu weiteren Richtlinien
Conform to other directives
Conforme aux autres directives

2014/30/EU	**Richtlinie für elektromagnetische Verträglichkeit** **Electromagnetic Compatibility Directive** **Directive relative à la compatibilité électromagnétique**
2011/65/EU	**RoHS**

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Folgende harmonisierte Normen wurden angewandt:
Following harmonized standards are used:
On a appliqué les normes harmonisées suivantes:

EN ISO 12100:2010	Sicherheit von Maschinen - Grundbegriffe, allgemeine Gestaltungsleitsätze Safety of machinery – basic concepts, general principles for design Sécurité des machines – Termes de base, principes généraux de conception
EN 61010-1: 2010	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel-, und Laborgeräte - allgemeine Anforderungen Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire – Partie 1: Prescriptions generals
EN 61010-2-010: 2014	Besondere Anforderungen an Laborgeräte für das Erhitzen von Stoffen Particular requirements for laboratory equipment for the heating of materials Exigences particulières pour appareils de laboratoire utilisés pour l'échauffement des matières
EN 61326-1: 2013	Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV Anforderungen Electrical equipment for measurement, control and laboratory use – EMC requirements Matériel électrique de mesure, de commande et de laboratoire – Exigences CEM

Wir erklären in unserer ausschließlichen Verantwortung, dass das Produkt, auf das sich diese Erklärung bezieht, mit den oben genannten Normen, normativen Dokumenten und den Bestimmungen der genannten Richtlinien übereinstimmt. Die Prüfprotokolle werden bei Thermo Electron (Karlsruhe) 10 Jahre aufbewahrt.

We declare under our sole responsibility, that this product to which this declaration relates is in conformity with the a.m. standards or other normative documents and is following the provisions of the a.m. directives.
All test certificates will be kept by Thermo Electron (Karlsruhe) for 10 years.

Nous déclarons, sous notre seule responsabilité, que le produit auquel cette déclaration fait référence est conforme aux normes susmentionnées, aux autres documents normatifs et aux dispositions des directives citées.
Les procès-verbaux de vérification sont conservés pendant 10 ans chez Thermo Electron (Karlsruhe).

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Unterschrift Signature Signature Geschäftsleitung/ Business Management Direction commerciale	Datum Date Date	Hersteller Manufacturer Fabricant

UK Declaration of conformity

We, Thermo Electron (Karlsruhe) GmbH, part of Thermo Fisher Scientific
Dieselstraße 4
76227 Karlsruhe
Germany

an ISO9001 certified company

declare under our sole responsibility that the

Product Name:	HAAKE Viscotester iQ / Viscotester iQ Air in combination with: TM-LI-C32, TM-LI-C48, TM-PE-C, TM-PE-P, TM-LI-P HAAKE Viscotester iQ / Air Laboratory Stand
Model:	262-0001 / 262-0100 222-2256, 222-2255, 222-2431, 222-2430, 222-1909 262-0050 / 262-0053
Declaration ID:	**075-5041**

Meets the provisions of the regulations:

Supply of Machinery (Safety) Regulations 2008

Electromagnetic Compatibility Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

using to the following standards and normative documents:

EN ISO 12100:2010	Safety of machinery – basic concepts, general principles for design
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use – general requirements
EN 61010-2-010:2014	Particular requirements for laboratory equipment for the heating of materials
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use EMC-requirements, Part 1 general requirements

Place and Date of issue: Karlsruhe, 26-07-2022

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Signature

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China RoHS Declaration

Identification 标识	Product name 产品名称	Declaration ID
262-0001 / 262-0100 222-2256, 222-2255, 222-2431, 222-2430, 222-1909 262-0050 / 262-0053	HAAKE Viscotester iQ / Viscotester iQ Air in combination with: TM-LI-C32, TM-LI-C48, TM-PE-C, TM-PE-P, TM-LI-P HAAKE Viscotester iQ / Air Laboratory Stand	**075-5041**

Part name 零件号	Toxic or Hazardous substances and elements 有毒或危险物质或元素					
	Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 镉 (Cd)	Hexavalent Chromium 六价铬 (Cr^{6+})	Polybrominated biphenyls 多溴联苯 (PBB)	Polybrominated diphenyl ethers 多溴联苯醚 (PBDE)
Mechanics 机械类	x	o	o	o	o	o
Electronics 电子类	o	o	o	o	o	o

o: Indicates that this toxic or hazardous substance contained in all of the homogenous materials for this part is below the limit requirement in SJ/T 11363-2006

o: 表明该产品中，无任何一种有毒或危险物含量高于限量标准 SJ/T 11363-2006

x: Indicates that this toxic or hazardous substance contained in at least one of the homogenous materials for this part is above the limit requirement in SJ/T 11363-2006

x: 表明该产品中，至少有一种有毒或危险物含量高于限量标准 SJ/T 11363-2006

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Preface

This manual describes how to install and operate the HAAKE Viscotester iQ and how to mount and dismount the various temperature modules and other accessories.

For a detailed description of how to operate the touch screen user interface, the optional RheoApp software and the specific parts of the RheoWin software, see the HAAKE Viscotester iQ Reference Manual, which also gives an overview over the properties of the standard measuring geometries.

Note In this manual the name HAAKE Viscotester iQ is used to describe both the HAAKE Viscotester iQ (with ball-bearing drive motor) and the HAAKE Viscotester iQ Air (with air-bearing drive motor) unless stated differently.

Related documentation

In addition to this manual, Thermo Fisher Scientific provides the following documents for use with the HAAKE Viscotester iQ:

- HAAKE Viscotester iQ Instruction Manual, Addendum for Lab Stand.
- HAAKE Viscotester iQ Instruction Manual, Addendum for Pressure Cell Stand.
- HAAKE Viscotester iQ Instruction Manual, Addendum for Instrument Head Only.
- HAAKE Viscotester iQ Reference Manual.
- HAAKE RheoWin Installation and 21 CFR Part 11 Configuration User Guide.
- HAAKE RheoWin Instruction Manual.

All manuals are available (in PDF format) on the HAAKE Viscotester iQ RheoApp USB flash drive, which is part of the delivery of any HAAKE Viscotester iQ and Viscotester iQ Air rheometer.

Safety and special notices

Make sure that you follow the cautions and special notices presented in this manual. Cautions and special notices appear in boxes; those concerning safety or possible damage also have corresponding caution symbols.

This manual uses the following types of cautions and special notices.

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

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or may contain information that is critical for optimal performance of the system.

Note Highlights information of general interest.

The HAAKE Viscotester iQ instruction manual contains the following caution-specific symbols (Table 1).

Table 1. Caution-specific symbols and their meanings

Symbol	Meaning
	**Hot surface:** Before touching any TM-xx-x module allow heated components to cool.
	**Pinch point:** Keep hands away from the specified areas.
	**Risk of eye injury:** Eye injury could occur from splattered chemicals or airborne particles. Wear safety glasses when handling chemicals or servicing the instrument.
	**Risk of hand injury:** Wear protecting gloves when handling chemicals, when handling hot substances and when handling hot instrument parts.

Safety Notes and Warnings

The HAAKE Viscotester iQ corresponds to the relevant safety regulations. However you are solely responsible for the correct handling and proper usage of the instrument.

CAUTION

- The instrument must be operated in such a way that it will not endanger anyone.
- The instrument may not be operated if there are any doubts regarding safe operation because of its outer appearance (e.g. damages).
- In case of unforeseen occurrence or an accident the instrument must be put out of service immediately by switching it off using the operation switch *and* pulling the mains plug of the power supply.
- A safe operation of the instrument cannot be guaranteed if the user does not comply with this instruction manual.
- Ensure that this instruction manual is made readily available to every operator.
- This instrument is registered for one-man operation.
- The operator must have an uninterrupted view of the instrument and its surroundings.
- The rheometer must be fully visible from the PC control stand.
- This unit and all of its accessories must only be used for the applications it was designed for.

CAUTION The HAAKE Viscotester iQ is designed for use with a rotor. All existing safety devices are based on the correct installation of the rotor. In case the lift is used without a rotor installed, injuries may occur when reaching in the lift area.

CAUTION

- Make sure that the instrument has been switched off before you connect or disconnect the cables. This is to avoid electrostatic charging resulting in a defect of the electronic circuit boards.
- To disconnect the instrument from the mains, first switch the instrument off, then unplug the power supplies mains cable from the wall socket.
- Do not operate the instrument with wet or oily hands.
- Do not immerse the instrument in water or expose it to spray water.
- Do not bend connection and/or mains cable, do not subject cables to stress or high temperatures (higher than 70 °C).
- Check all cables visually at regular intervals.
- Do not operate the instrument with damaged cables.
- Only operate the instrument using the power supply which was part of the original delivery (power supply type GS220A24-R7B or GST220A24-R7B).

CAUTION

- Repairs, alterations or any work involving opening up the instrument should only be carried out by specialized personnel. Considerable damage can be caused by incorrect repair work. The Thermo Fisher Scientific-service department is at your disposal for any repairs you may require.
- After a repair the instruments safety must be inspected thoroughly by qualified personnel.
- Have the instrument serviced by specialists at regular intervals.
- The pressure of the air supply for the HAAKE Viscotester iQ Air must not exceed 3 bar. A higher pressure will damage the air bearing permanently.

CAUTION

- Depending on the temperature module used, temperatures from -20 °C up to 180 °C may be reached. This can result in parts of the Viscotester iQ cooling down to or heating up to such an extent, that even when taking the cooling and insulation into account, serious burns can result if they come into contact with the skin.
- Thermo Fisher Scientific recommends shielding the HAAKE Viscotester iQ when operating at very low or high temperatures and handling it only with high or low temperature proof gloves and safety glasses.

CAUTION

- Do not clean the instrument using solvents (fire danger!), a damp cloth applied with a household cleaning substance is often sufficient.
- Consult Thermo Fisher Scientific or your local if there is any doubt about the compatibility of decontamination or cleaning agents.

CAUTION

- The HAAKE Viscotester iQ is designed for the determination of the rheological behavior of fluid and semi-solid materials. These materials must *not* be measured with the HAAKE Viscotester iQ in case the operator (or other people) can be injured or the device can be damaged. Especially explosive, combustible and toxic materials must *not* be measured with the HAAKE Viscostester iQ.
- Suitable personal protective gear, consisting of lab coat, protective eye wear and safety gloves, must be worn at all times when working with the instrument.
- At higher angular velocities of the rotor sample material may be thrown out of the gap due to centrifugal forces. Wearing personal protective gear, see above, is recommended.

Contacting us

Please always first address any questions to the local Thermo Fisher Scientific office or the general agent or partner company who delivered your instrument.

International Helpdesk

You can also contact our international helpdesk directly. In that case we kindly ask you to use the contact form to which a link is provided below.

❖ **To contact the international helpdesk**

Contact form https://tfs-3.secure.force.com/materialcharacterization/

Technical and Sales Support

❖ **To contact Technical Support or Sales, Germany and International**

Company	Thermo Electron (Karlsruhe) GmbH Part of Thermo Fisher Scientific
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	76227 Karlsruhe, Germany
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E-mail	support.mc.de@thermofisher.com
Internet	https://www.thermofisher.com/materialcharacterization

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Company	Thermo Fisher Scientific
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	XinJinqiao Rd., Shanghai 201206
Phone	+86(21) 68654588
Fax	+86(21) 64457830
E-mail	info.mc.china@thermofisher.com

❖ **To contact Technical Support or Sales, Japan**

Company	Thermo Fisher Scientific
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	Yokohama, 221-022
Phone	+81 45 453 9170
Fax	+81 45 453 9082
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❖ **To contact Technical Support or Sales, India**

Company	Thermo Fisher Scientific
Adress	403-404, Delphi-B Wing, Hiranandani Business Park
	Powai, Andheri (E), Mumbai - 400076
Phone	+91 22 6680 3000
Fax	+91 22 6680 3001
E-mail	info.mc.in@thermofisher.com

Application Support

For questions regarding your rheological application please use the following e-mail address to contact our application specialists. Do not use this e-mail address for any other questions.

❖ **To contact Application Support, Germany and International**

E-mail	support.rheology@thermofisher.com

Software and Firmware downloads

The latest HAAKE RheoWin software version and firmware versions for all HAAKE rheometers and viscometers are available as downloads from our dedicated web-site.

❖ **To download software and firmware**

Internet www.rheowin.com

Quality assurance

Dear customer, Thermo Fisher Scientific Karlsruhe has implemented a Quality Management System certified according to ISO 9001 ff. This guarantees the presence of organizational structures which are necessary to ensure that our products are developed, manufactured and managed according to our customers expectations. Internal and external audits are carried out on a regular basis to ensure that our QMS is fully functional. We also check our products during the manufacturing process to certify that they are produced according to the specifications as well as to monitor correct functioning and to confirm that they are safe. The results are recorded for future reference.

The “Final Test” label on the product is a sign that this instrument has fulfilled all requirements at the time of final manufacturing.

Please inform us if, despite our precautionary measures, you should find any product defects. You can thus help us to avoid such faults in future.

Warranty and service

For the warranty and any potential additional warranty, the user must ensure that the device is serviced by a Thermo Fisher Scientific approved service engineer at the following intervals:

The maintenance is required after approx. 2000 operating hours, at the latest, however, twelve months after the initial operation or the last maintenance, respectively.

Two thousand operating hours are achieved:

- At an operating period of eight hours daily (five days a week) about once a year.
- At an operating period of more than eight to sixteen hours daily about every six months.
- At an operating period of more than sixteen hours daily about every three months.

We recommend to have the maintenance carried out by Thermo Fisher Scientific or by staff authorised by Thermo Fisher Scientific as special knowledge and tools are required.

The maintenance and calibration work carried out has to be recorded by certificates in conformity with ISO 9001 ff.

Instrument Description

The development of the HAAKE Viscotester iQ rheometer was driven by customer demands from the quality control (QC) area. In the HAAKE Viscotester iQ we have combined our decades of experience in rheology and rheometry with new technical solutions, which are especially designed for highly dynamic working environments.

Our goal was to enable fast, reliable and precise rheological measurements with a maximum ease of operation. As an operator, please feel encouraged to challenge the HAAKE Viscotester iQ performance.

The HAAKE Viscotester iQ is the instrument of choice for measuring single viscosity values or for investigating the more complex rheological properties of materials ranging from low viscous liquids to highly viscous pastes.

Figure 1. The HAAKE Viscotester iQ in four different configurations

Coaxial cylinder geometry

Parallel plate and cone and plate geometries

Vane geometry and universal container holder

Lab stand

The following list sums up the main features of the HAAKE Viscotester iQ and its optional accessories.

- Highly dynamic, powerful, synchronous, EC, direct drive motor with optical angle encoder and high precision ball-bearings or an unique, robust and patented air-bearing.
- Standard CR- and CS-mode for rotational rheometry as well as optional CD- and CS-mode for oscillatory rheometry (OSC mode is standard for Viscotester iQ Air).
- Integrated high precision “Connect Assist” quick-coupling connector for measuring geometries, with automatic recognition of measuring geometries including automatic transfer of the relevant geometry parameters.
- Easy and quick change between coaxial cylinder geometries, parallel plates geometries and vane geometries.
- Easy and quick mounting and removal of coaxial cylinder cups as well as lower plates.

- Easy and quick exchange as well as automatic recognition of temperature modules and external temperature sensors.
- Five different temperature modules for a wide temperature range from -20 °C to +180 °C and a wide range of measuring geometries.
- Easy to use, highly adaptable, holder for original sample containers or beaker glasses, for use with vane geometries or ISO 2555 spindle type geometries, with optional external temperature sensor.
- Integrated, easy to use manual lift mechanism for (semi-) automatic, accurate and reproducible axial positioning of the measuring geometries (gap setting).
- Two modes of operation:
  - Stand-alone mode using a touchscreen panel user interface with, manual control and integrated, editable measuring and data evaluation routines (Jobs).
  - Remote control with the HAAKE RheoWin PC software for,
    - complex measuring and data evaluation routines (Jobs) and interactive data analysis,
    - automatic report export (PDF) and report printout,
    - 21 CFR part 11 compatibility.
- Colour touchscreen control panel with an intuitive, easy to use, clearly structured graphical user interface including;
  - a multilingual user interface with the following 19 languages: Chinese, Czech, Dutch, English, Finnish, French, German, Hungarian, Indonesian, Italian, Japanese, Korean, Polish, Portuguese, Russian, Slovak, Spanish, Thai, Turkish.
  - numerical and graphical display of measurement results,
  - direct manual control of shear rate, shear stress, rotational speed, torque, temperature using (editable) rows of set-values or manually entered set-values.
  - automatic on-screen editable measurement routines (Jobs) with integrated data evaluation
  - integrated user management for up to 10 user with 3 different user levels,
  - on-screen alphanumerical keyboard for entering sample information and parameters,
  - Easy Job and data transfer using the USB flash drive based HAAKE Viscotester iQ RheoApp PC software.
- Two USB ports for data exchange with the USB flash drive based HAAKE Viscotester iQ RheoApp PC software as well as an external keyboard and external barcode reader.
- Ethernet TCP/IP interface for point-to-point communication with a PC on which HAAKE RheoWin is running or for integration in a company network.
- Small footprint for optimal use of lab space (width 270 mm, depth 340 mm to 500 mm).
- Trolley transport case for transporting a complete (i.e. including measuring geometries, temperature control, etc.) HAAKE Viscotester iQ measuring station.

For a more detailed description of the functionality, installation, operation and specifications, etc. of the HAAKE Viscotester iQ and it accessories, see the following chapters of this manual and the HAAKE Viscotester iQ Reference Manual.

Functional Elements

The HAAKE Viscotester iQ consists of the instrument head and the instrument base. The instrument head contains the touchscreen panel, the rheometer drive motor and the control electronics. The instrument base contains the lift mechanics and functions as the holder for the temperature modules and the heat exchanger iQ which is used with the TM-PE-x Peltier temperature modules.

Figure 2. HAAKE Viscotester iQ (frontview)

Instrument base

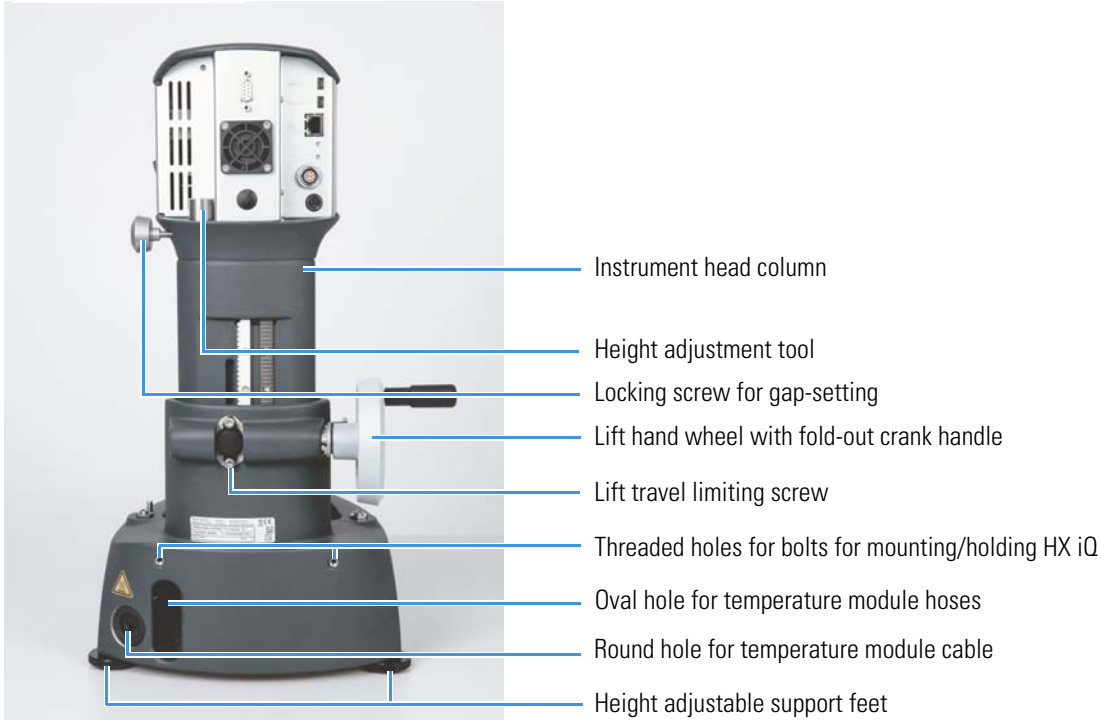
The instrument base contains the lift mechanics and functions as the holder for the temperature modules and the heat exchanger iQ which is used with the TM-PE-C and TM-PE-P Peltier temperature modules.

The instrument base is equipped with three mountings points for the temperature modules and the universal container holder. The triangular plate of the temperature modules and the universal container holder are mounted (see "Mounting/dismounting a TM-LI-Cxx or TM-LI-P temperature module" on page 25) on the mounting point using three thumb screws (see Figure 2).

Note The three mountings points in the instrument base are individually adjusted as part of the instrument assembly and should never be touched.

The heat exchanger iQ is mounted (see "Installing the heat exchanger iQ" on page 20) to the Viscotester iQ instrument base using two bolts on the back of the instrument base (see Figure 3).

Figure 3. HAAKE Viscotester iQ (rear view)



The hand wheel with its fold-out crank handle and release lever allows for a quick up and down movement of the instrument head relative to the instrument base using the built in lift mechanics (see "Lift control" on page 32).

The instrument base is equipped with three height adjustable support feet for leveling the instrument (see "Mounting/dismounting a TM-LI-Cxx or TM-LI-P temperature module" on page 25).

Instrument head

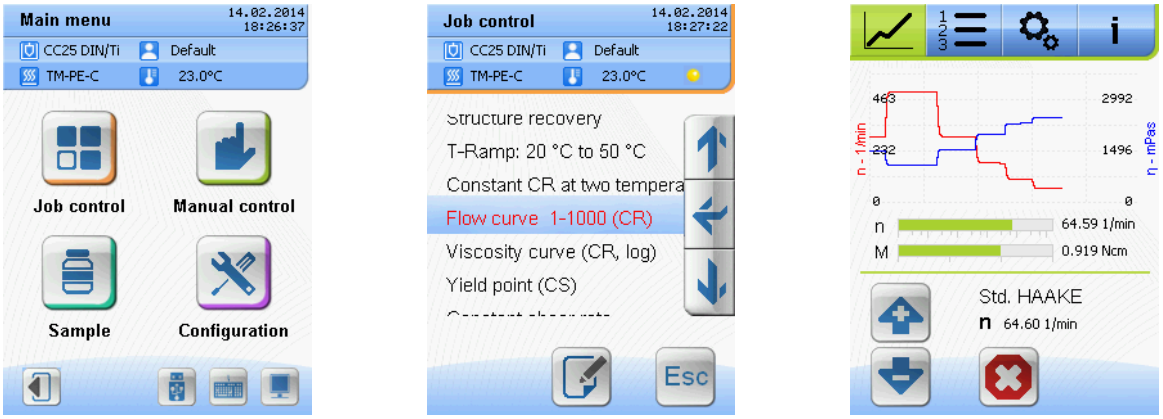
The instrument head includes the touchscreen panel and the rheometer drive motor. The instrument head column, that is the moving part of the lift mechanism, is an integral part of the instrument head. All the instruments connector sockets are placed on the left and back side of the instrument head (see Figure 6 and Figure 7).

The instrument head is also available as a separate unit, that is without the instrument head column (and the instrument base) for use on a standard lab stand or for special measuring setups.

Touchscreen panel

The HAAKE Viscotester iQ is equipped with a touchscreen panel which allows full control over all instrument functions as well as the configuration of the instrument.

Figure 4. Touchscreen panel main menu screen, job control screen and manual control screen



From the **Main menu** (see Figure 4) the operator has direct access to the **Job control** menu, the **Manual control** menu, the **Sample** menu and the **Configuration** menu.

The operation of the user interface is described in Chapter 5, "Operation," and in detail in the HAAKE Viscotester iQ Reference Manual.

Drive motor

The HAAKE Viscotester iQ is equipped with a completely newly designed, direct drive, low inertia, synchronous EC motor with high precision ball bearings.

The HAAKE Viscotester iQ Air is equipped with the same motor but comes with a completely new designed, very robust, air-bearing with a very low air-consumption.

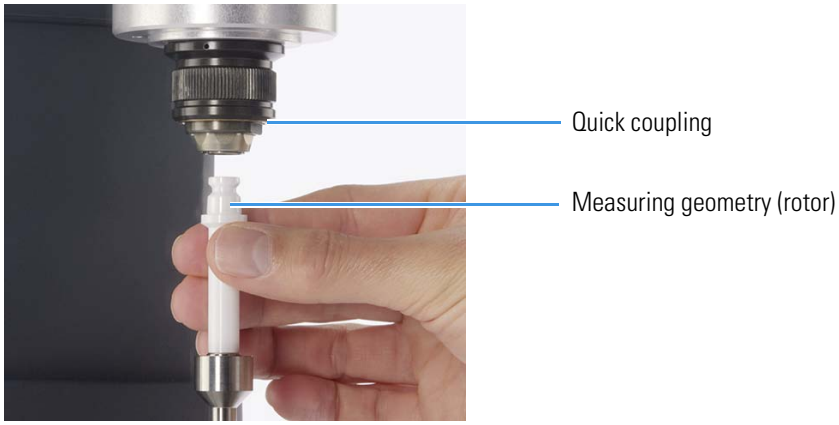
The rotor of the EC (Electronically Commutated) motor of the Viscotester iQ is equipped with permanent magnets. The stator of the motor consist of coils in which an alternating, microprocessor controlled current, produces a magnetic field. The combination of the permanent magnets in the rotor and the changing magnetic field of the stator make the rotor rotate.

Due to the special design of the motor, the relation between the current applied to the motor stator coils and the torque generated by the EC motor is strictly linear. This allows for a precise torque control (in CS-mode) and torque measurement (in CR-mode). The rotational speed of the drive motor is measured by means of a high resolution angular encoder which is mounted on the drive motor shaft. Advanced control loop algorithms allow for a precise control (in CR-mode) and measurement (CS-Mode) of the angular speed.

Measuring geometry quick coupling

The HAAKE Viscotester iQ drive motor shaft is equipped with the newly designed Connect Assist quick coupling for the upper part of the measuring geometry (the rotor). This new quick coupling offers one-handed operation for both the mounting and the dismounting of the rotor from the drive motor shaft as well as an automatic recognition of each individual rotor including an automatic transfer of the relevant geometry parameters to the instrument.

Figure 5. Connect Assist quick coupling



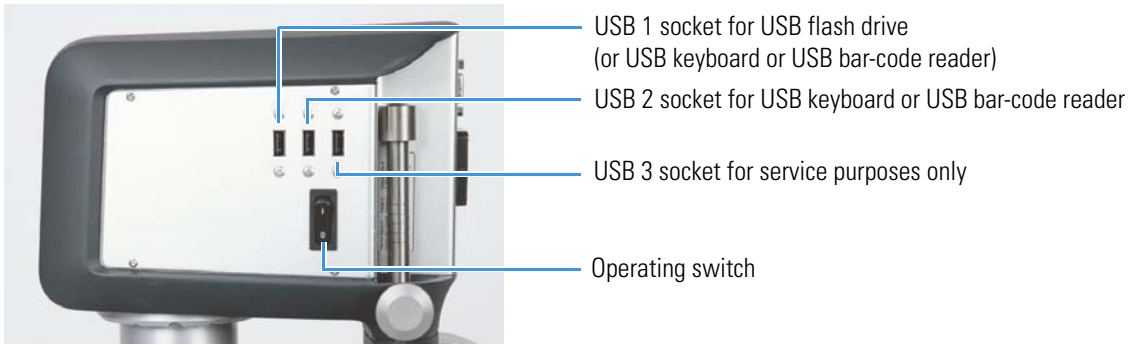
Connector sockets and controls

The HAAKE Viscotester iQ is equipped with the following connector sockets and controls on the right hand side of the instrument head (see Figure 6):

1. A USB socket for connecting an USB flash drive or an USB keyboard or an USB bar-code reader.
2. A second USB socket for connecting an USB keyboard or an USB bar-code reader. Wireless keyboards and bar-code readers can be used when the USB adapter provides a standard HDI interface.
3. The operating switch for switching the Viscotester iQ on and off, the external power supply does not have an on/off switch.

Note An USB flash drive can only be connected to the front USB 1 socket. An USB keyboard or USB bar-code reader can be connected to either the USB 1 or the USB 2 socket. An USB keyboard and an USB bar-code reader can be connected at the same time.

Figure 6. HAAKE Viscotester iQ instrument head right side view

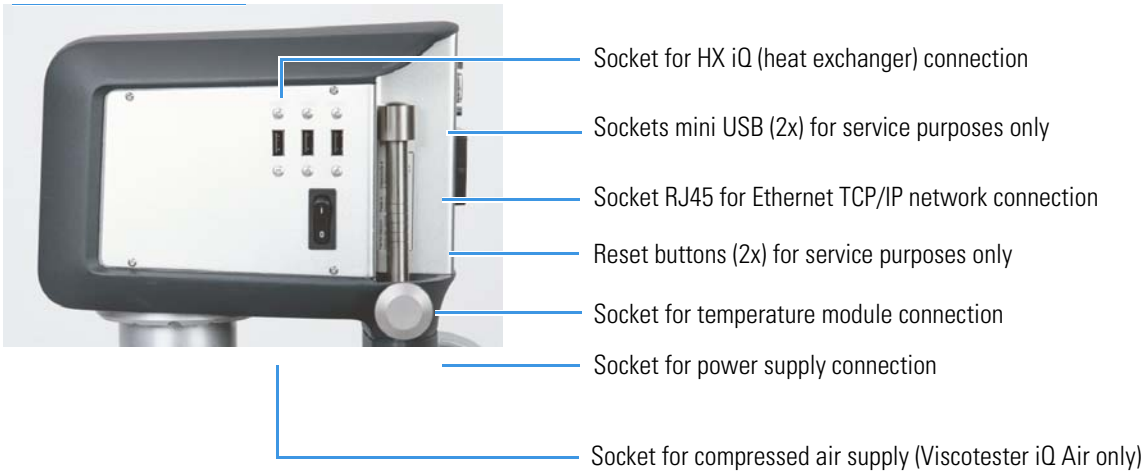


The HAAKE Viscotester iQ is equipped with the following connector sockets and controls on the back of the instrument head (see Figure 7):

1. A RJ45 socket for the Ethernet TCP/IP connection between the instrument and a PC on which HAAKE RheoWin is running.
2. A mini-USB socket for service purposes only. The Viscotester iQ can not be controlled via USB.
3. A pin hole reset switch, which is for service purposes only.

4. A socket for connecting either the TM-PE-C (Peltier Cylinder), TM-PE-P (Peltier Plate), TM-LI-C32 and TM-LI-C48 (Liquid Cylinders) or TM-LI-P (Liquid Plate) temperature module or the external Pt100 temperature sensor.
5. A socket for connecting the HX iQ heat exchanger.
6. A socket for connecting the external power supply.
7. A socket for connecting a compressed air supply (Viscotester iQ Air only).

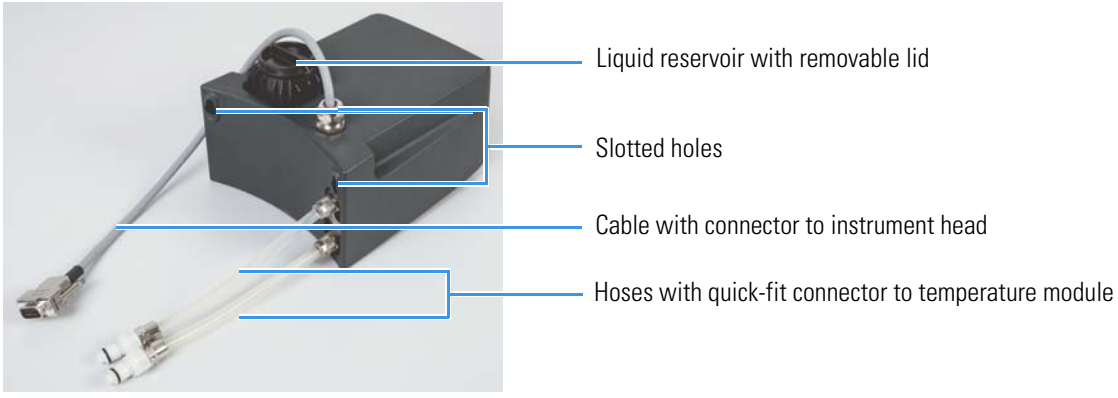
Figure 7. HAAKE Viscotester iQ instrument head rear view



Heat exchanger iQ

The optional Peltier cylinder temperature modules (TM-PE-C or TM-PE-P) are designed to be used with the heat exchanger iQ (HX iQ) only. The HX iQ is part of the TM-PE-C and TM-PE-P delivery. The HX iQ is designed to be mounted to the rear of the instrument base and is controlled by the HAAKE Viscotester iQ electronics.

Figure 8. Heat exchanger iQ (HX iQ)



The HX iQ consists of a liquid reservoir, a radiator and a pump for pumping the cooling liquid through the system.

Installation Requirements / Ambient Conditions

This chapter lists the requirements to the laboratory environment and other ambient conditions that must be fulfilled for operating the HAAKE Viscotester iQ instrument.

IMPORTANT Do not begin with the installation of the instrument until the instrument has reached the ambient temperature. This is particularly important when the unit was stored or transported at a low temperature until shortly before the installation.

Space Requirements

For good working conditions an area with a width of 0.5 m and a depth of 0.6 m on a (laboratory) bench is needed, when using the Viscotester iQ in stand-alone mode (that is without a PC). When a PC is used to control the Viscotester iQ, the width should be 1.0 m. The (laboratory) bench must be sufficiently stable to support the instrument weight (up to 20 kg for a standard Viscotester iQ) and must be level.

The bench surface must be easy to clean. When a circulator is used for temperature control it must be placed on the floor (under the bench) or on a separate bench to avoid mechanical interference when running sensitive experiments.

Mains supply

IMPORTANT The external power supply of the HAAKE Viscotester iQ to the mains supply *must* be connected to a mains socket with a proper grounded earth.

The external power supply of the Viscotester iQ automatically adapts to the applied AC voltage supply. The applied voltage must be in the range of 100 V to 240 V, frequency in the range of 50 Hz to 60 Hz).

Table 2 lists the power consumption of the Viscotester iQ in various configurations.

Table 2. Viscotester iQ power consumption

Device(s)	Power consumption
HAAKE Viscotester iQ rheometer, without any TM-xx-x	≤ 120 W
HAAKE Viscotester iQ rheometer, with TM-PE-C or TM-PE-P	≤ 190 W
HAAKE Viscotester iQ rheometer, idling[a] /standby[b]	≤ 9 W / ≤ 0.5W

[a] Instrument switched on with no measurement running and with no temperature control running

[b]Instrument switched off with power supply connected to mains

For the power consumption of devices like an external circulator see the manuals of those devices.

Compressed air supply

Note A supply of pressurized air is only needed for the HAAKE Viscotester iQ Air (with air-bearing), that is not for the HAAKE Viscotester iQ (with ball-bearings).

The air-bearing of the HAAKE Viscotester iQ Air needs a continuous supply of compressed air to work.

The compressed air supply *must* fulfill the requirement listed in Table 3.

Table 3. Compressed air supply requirements for HAAKE Viscotester iQ Air

Specification	Value
Air quality according to ISO8573-1:2010	class 1.3.1
Air pressure	2.0 bar
Air consumption	approximately 4.0 l/min

Note The air supply can be discontinued when the instrument is not running.

Note To prevent damage to the air bearing, it is recommended to connect the compressed air supply before performing any other work on the instrument.

IMPORTANT Not fulfilling the air quality requirements according to Table 3 will damage the air-bearing.

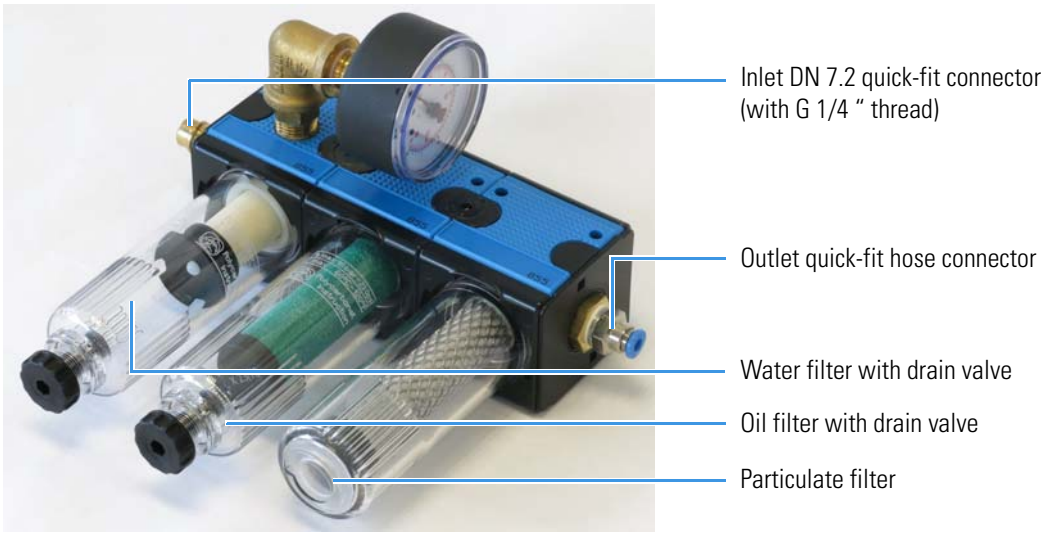
IMPORTANT It is strongly recommended to use the optional filter unit (order no. 222-1211) between the compressed air supply and the instrument.

Air filter

To guarantee that the quality of the compressed air complies with the specifications listed in Table 3, the use of an appropriate air-filter, for cleaning the air from water, oil and particulates, is obligatory.

The air-filter unit (see Figure 9) is configured especially for use with the HAAKE Viscotester iQ Air air-bearing. This filter is equipped with a DN 7.2 quick-fit connector on the inlet side and quick-fit connector for the compressed air-hose delivered with the HAAKE Viscotester iQ Air on the outlet side.

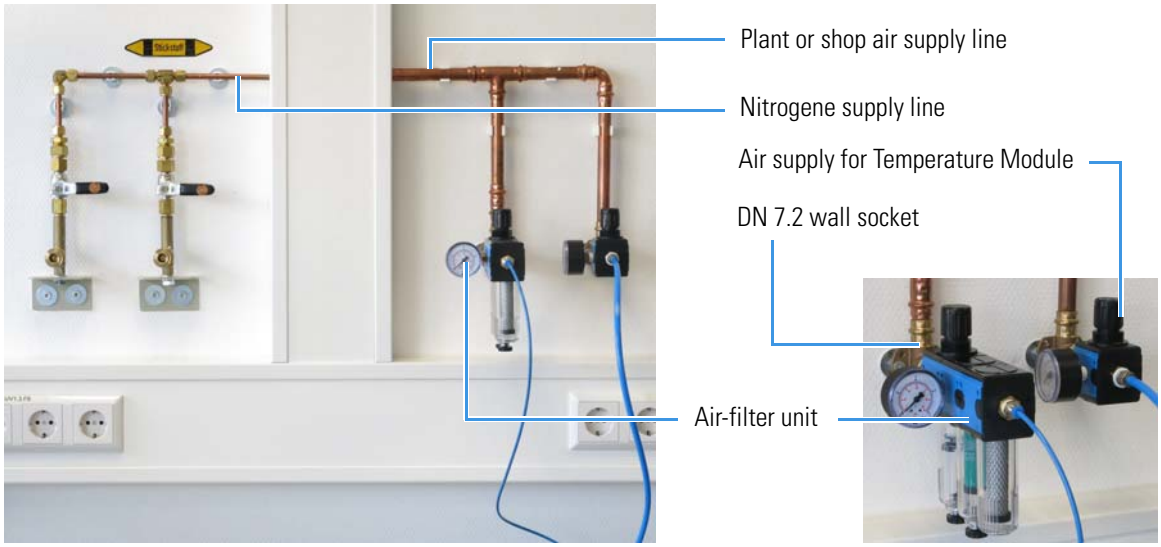
Figure 9. Air filter unit for HAAKE Viscotester iQ Air (order no. 222-1211)



IMPORTANT The optional filter unit (order no. 222-1211), or a comparable filter unit with the same specifications, *must* be used between *any* compressed air supply and the instrument.

Mounting the air-filter to a DN 7.2 quick-fit wall connector socket behind the instrument, as shown in Figure 10, is recommended.

Figure 10. Air-filter mounted to a DN 7.2 quick-fit connector wall socket



IMPORTANT The air-filter unit needs to be checked and serviced on a regular basis, see "Servicing the air filter (VT iQ Air only)" on page 68 in Appendix C, "Maintenance" .

Plant or shop air supply

Plant (or shop) air systems generally apply small amounts of oil to the compressed air to prevent rust in the piping. Compressed air from such installations can not be used directly for air-bearing of the HAAKE Viscotester iQ Air, the use of special oil filters that reduce the amount of oil to the above specification is obligatory.

WARNING Not using a suitable air filter will cause severe and irreversible damage to the air-bearing of the HAAKE Viscotester iQ Air.

Air compressors

In general two types of air compressors exist; “oil-free” compressors and ”lubricated” compressors.

Only so-called “oil-free” compressors are admissible for supplying compressed air for the Viscotester iQ Air air bearing.

Thermo Fisher Scientific offers a suitable small compressor, see “Miscellaneous accessories” on page 65 in Appendix B, “Accessories” , for order information. When using this compressor the optional filter unit (order no. 222-1211) is *not* needed.

Ambient conditions according to EN 61010

The ambient conditions under which the HAAKE Viscotester iQ is operated must fulfill the following requirements:

- Indoors, at a maximum altitude of 2000 meters above sea level.
- Ambient temperature 15 °C < $T_{ambient}$< 40 °C.
- Relative humidity < 80% at 31 °C (< 50% at 40 °C).
- Excess voltage category II, contamination level 2.
- Radiant emissions Class A. This equipment may cause harmful interference to radio communications in residential areas.

IMPORTANT The laboratory in which the HAAKE Viscotester iQ is operated must be:

- Free of smoke and dust.
- Free of highly corrosive gases and vapors.

IMPORTANT The HAAKE Viscotester iQ must not be placed:

- Next to a heating system, air conditioning, ventilation system or an open window.
- Directly in the sunlight.
- Near any device that generates a magnetic field.

IMPORTANT Protect the device from vibrations (for example caused by other devices on the same laboratory bench).

It is recommended to operate the HAAKE Viscotester iQ in an air-conditioned laboratory, with the temperature set to approximately 23 °C.

Computer system (PC) requirements

When the HAAKE Viscotester iQ is to be operated using the HAAKE RheoApp and/or the HAAKE RheoWin a computer is needed.

Any computer running Windows 7, Windows 8(.1), Windows 10 or Windows 11 that fulfills the requirements (as defined by the manufacturer of the operating system) to run the operating system in question is, in principle, suitable for running the HAAKE RheoApp and the HAAKE RheoWin software.
A monitor with a resolution of 1920x1080 (Full HD) or higher is recommend, a resolution of at least 1152x864 is mandatory (for all HAAKE RheoWin software menus to fit on the screen). Some specific requirements are listed below.

For a more detailed description of the computer requirement see the **HAAKE RheoWin Installation and 21 CFR Part 11 Configuration User Guide** document.

For HAAKE RheoApp software

The HAAKE Viscotester iQ RheoApp software runs directly from a (special) USB flash drive. To be able to use the USB flash drive the computer must have at least one free USB port.

For HAAKE RheoWin software

The HAAKE RheoWin software must be installed on a computer before it can be used.

IMPORTANT Windows administrator privileges and *full* access to certain directories are needed to be able to install the HAAKE RheoWin software.

The communication between the HAAKE Viscotester iQ instrument and the HAAKE RheoWin software uses an Ethernet network connection. To be able to use the HAAKE Viscotester iQ with the computer must have at least one free Ethernet network connection port (a standard RJ45, 8P8C port).

In case the computer does not have such a free network connection port, but at least one free USB port, a standard USB to Ethernet adapter can be used to setup a network connection port. A suitable USB to Ethernet adapter is available from Thermo Scientific under the order number 222-1760.

IMPORTANT Windows administrator privileges may be needed to be able to install drivers for a network card or a USB to Ethernet adapter.

4

Installation

This chapter describes how to unpack the instrument and setup the instrument for the first time. It also describes how to mount and dismount temperature modules. the universal container holder, the immersion tube and the external temperature sensor. Detailed information and how to set up a network connection for the communication between the HAAKE Viscotester iQ and a computer can be found in the HAAKE Viscotester iQ, Instruction Manual Reference Manual.

IMPORTANT Read this chapter completely before starting the installation.

Unpacking

Before unpacking the instrument always carefully check the outside of the packaging for damage. In case of any visible damage make a photo of the damaged area and take a note. Damage to the packaging may, but must not, indicate damage to the instrument.

Transportation damage

When the instrument is damaged as described below:

- Compile a damage report.
- Notify the carrier (i.e. forwarding merchant, railroad company, post office, etc.).

  Before returning the delivery in case of problems:

- Always first inform the dealer or the manufacturer (Small problems can often be dealt with locally.)

Contents of the delivery

This section describes the contents of delivery of the different versions of the HAAKE Viscotester iQ.

HAAKE Viscotester iQ

Check the contents of the delivery carefully. The standard content of the delivery of the HAAKE Viscotester iQ (without any accessories) is shown in Figure 11 and Table 4.

Figure 11. Standard HAAKE Viscotester iQ rheometer delivery

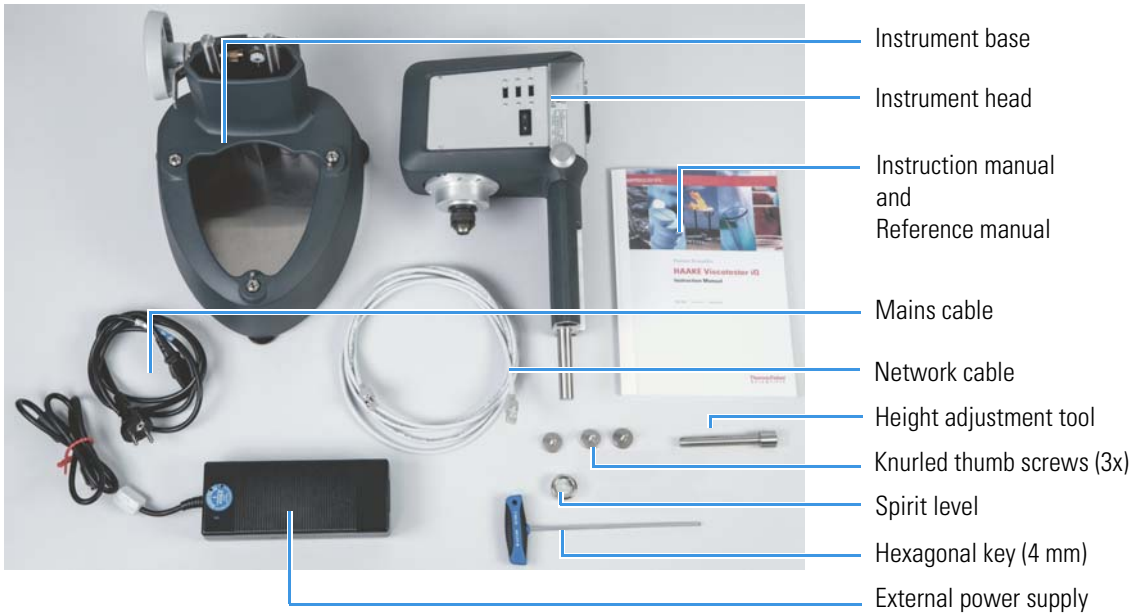


Table 4. Standard HAAKE Viscotester iQ, HAAKE Viscotester iQ Air contents of delivery

Item	Part number
HAAKE Viscotester iQ (instrument head + instrument base)	006-4000[a]
HAAKE Viscostester iQ Air (instrument head + instrument base)	006-4001[a]
Power supply, 220 W, 24 V	006-1545
Mains cable, 230 V (EU) or Mains cable, 115 V (US) or Mains cable, 230 V (UK) or Mains cable, 250 V (CN)	000-0724 000-0725 082-2548 082-2546
Ethernet TCP/IP network cable	082-2526
HAAKE Viscotester iQ, Instruction Manual (English) HAAKE Viscotester iQ, Reference Manual (English)	006-2021 006-2452
Knurled thumb screws (3 pieces)	006-1490
Spirit level	002-4696
Screen protector film (1 piece + 1 piece applied to the screen)	006-2373
Hexagonal key (4 mm)	006-2388
Compressed air hose (only with HAAKE Viscotester iQ Air)	082-2451
HAAKE Viscotester iQ RheoApp flash drive (not shown in Figure 11)	098-5065

[a] This part number can be found on the type plate on the back of the instrument.

Setting up the rheometer

This section describes how to setup the different versions of the HAAKE Viscotester iQ.

HAAKE Viscotester iQ

❖ **To setup the HAAKE Viscotester iQ rheometer**

1. Place the instrument base on a suitable (laboratory) bench, see Chapter 3, "Installation Requirements / Ambient Conditions."

   IMPORTANT The instrument must be positioned such that the operating switch on the right side of the instrument head can be reached for at any moment.

2. Unscrew the lift travel limiting screw on the back of the instrument base (see Figure 3 on page 4), as far as possible but without removing it completely.
3. Mount the instrument head on the instrument base by inserting the instrument head column onto the two guide bars and into the instrument base.

   The instrument head column can only be inserted into the instrument stand for about 2 cm, then it will come to a stop.
4. Release the lift release lever by pressing it to the right in the direction of the lift hand wheel and keep it in that position to allow the instrument head column to move further downward.

   The lift wheel will start to rotate since the lift gears will engage.
5. Let the instrument head move downward into its lowest position.
6. Screw the lift travel limiting screw on the back of the instrument base (see Figure 3 on page 4), back in.
7. Place the power supply on the bench.

   IMPORTANT The power supply must be positioned such that it

   - can be reached for at any moment, to be able to separate it from the mains wall socket (by pulling the mains plug from the mains socket).
   - is protected for coming into contact with liquids, this includes the pouring of fluid onto it.
8. Make sure that the operating switch on the right side of the instrument head is in the *off* position.
9. Connect the power supply cable plug to the power supply socket on the back of the instrument head.
10. Connect one end of the power supply mains cable to the power supply.
11. Connect the other end of the power supply cable into a wall socket.

    IMPORTANT Only use a mains cable that is suitable for the required voltage and the power consumption of the instrument. The mains cable supplied with the instrument fulfills these requirements.

Note The following two steps (12 and 13) are only needed when installing a HAAKE Viscotester iQ air.

12. Using the supplied compressed air hose (082-2451), connect the socket on the rear panel of the measuring device to the supply of compressed air, for example a shop-air wall outlet, or a compressor.

    It is strongly recommended to use the optional filter unit (order no. 222-1211) between the compressed air supply and the instrument.

IMPORTANT The compressed air supply must fulfill the requirements listed in chapter "Compressed air supply" on page 10.

IMPORTANT Make sure to flush the compressed air supply (shop-air or compressor) for at least half an hour before connecting it to the instrument.

13. Apply compressed air with a pressure of 2.0 bar to the instrument.

Moving the rheometer

The HAAKE Viscotester iQ is a compact and relatively light instrument (see Table 13 in Appendix A, "Technical Specifications.") and can easily be moved from one lab bench to another. For moving the instrument over longer distances a special, trolley like, transport case is available, see the HAAKE Viscotester iQ Reference Manual.

❖ **To move the rheometer from one lab bench to another**

1. Let the instrument, that is the temperature module, cool down to ambient temperature.
2. Remove any sample from the instrument.
3. Remove the rotor from the instrument head drive motor shaft.
4. Switch the instrument off.
5. Unplug the power supply from the mains socket.
6. Unplug the power supply from the instrument head.

   The following two steps 7 and 8 are only necessary when a TM-LI-C32, TM-LI-C48 or TM-LI-P is used. When the TM-PE-C or TM-PE-P is used, the heat exchanger iQ (HX iQ) can be left attached to the instrument base.

7. Switch the circulator off.
8. Disconnect the hoses that connect the temperature module with a circulator.
9. Lift the instrument by holding the instrument base only.

IMPORTANT Do not lift the instrument by holding the instrument head or the heat exchanger iQ.

Installing a temperature module

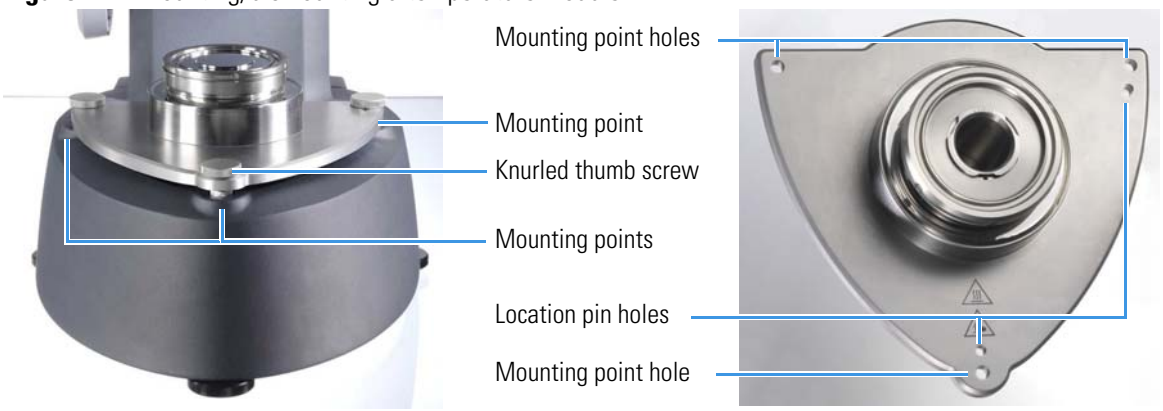
The HAAKE Viscotester iQ can be used with several different TM-xx-x temperature modules. The following sections describe how to install, mount/dismount and connect these modules.

Depending on which temperature module is used, the hoses and the electrical cable of the temperature module must be connected to the HAAKE Viscotester iQ and the heat exchanger iQ or a circulator before the module can be used.

CAUTION Severe skin burns can be caused by touching a hot area of a temperature module.

IMPORTANT Make sure that the HAAKE Viscotester iQ has been switched off before you connect or disconnect the cables.

Figure 12. Mounting/dismounting a temperature module



Installing a TM-PE-C or TM-PE-P temperature module

The Peltier cylinder TM-PE-C temperature module and the Peltier plate TM-PE-P temperature module consist of the TM-PE-x module itself and the separate heat exchanger iQ. See Figure 13 for the contents of delivery of a TM-PE-C module plus that of the HX iQ, the contents of delivery of the TM-PE-P is basically the same, but both the module itself and the bayonet clamping ring are different.

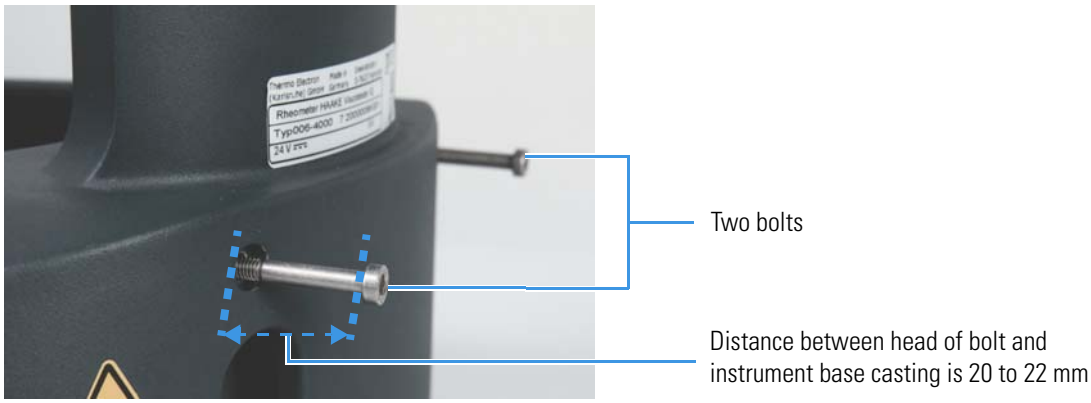
Note In the remainder of this chapter the term TM-PE-x is used to denote both the TM-PE-C and the TM-PE-P.

Figure 13. TM-PE-C contents of delivery

Installing the heat exchanger iQ

Before the HX iQ can be mounted to the Viscotester iQ base unit for the first time, the two bolts (part number 085-1105) holding HX iQ must be mounted to the Viscotester iQ instrument base.

Figure 14. Mounting of the bolts for the heat-exchanger iQ



❖ **To mount the bolts for the heat-exchanger iQ**

1. Screw the bolt in the instrument base casting using a 4 mm hexagonal key until the distance between the head of the bolt and casting is in the range of 20 to 22 mm, see Figure 14.

The HX iQ is delivered empty, that is without cooling liquid in the liquid reservoir. Before the HX iQ and therefore the TM-PE-x can be used, the HX iQ must be filled with cooling liquid.

Note As a cooling liquid only distilled water with a special additive (innovatekProtect IP), which is part of the TM-PE-x delivery, must be used.

For more information on the innovatekProtect IP cooling liquid additive, see "Cooling liquid additive" on page 66 in Appendix B, "Accessories."

❖ **To fill the HX iQ with cooling liquid**

1. Mount both the TM-PE-x and the HX iQ to the HAAKE Viscotester iQ, see "To mount the heat exchanger iQ" on page 22 and "To mount a TM-PE-x temperature module" on page 22.
2. Switch the HAAKE Viscotester iQ on and wait for it to be initialized.

The pump inside the HX iQ, which is responsible for circulating the liquid through the system, is now running.

3. Remove the lid of the HX iQ liquid reservoir by rotating the lid counterclockwise (for about 30 degrees) until a stop, then pull the lid upwards from the reservoir.
4. Pour approximately 50 ml of the special additive (innovatekProtect IP) that is part TM-PE-x delivery into the reservoir.
5. Pour approximately 140 ml of distilled water into the reservoir.

   The pump inside the HX iQ will now pump the cooling liquid through the radiator (in the HX iQ) and the TM-PE-x, as a result the fluid level in the reservoir will drop and air bubbles may appear in the cooling liquid.
6. Wait until there are no air bubbles in the cooling liquid anymore, if necessary pour more water into the reservoir until the liquid level is about 1,5 cm below the rim of the filling opening.
7. Push the lid of the HX iQ liquid reservoir back on the reservoir, then rotate the lid clockwise (for about 30 degrees) until a stop.

Mounting/dismounting a TM-PE-C or TM-PE-P temperature module

The Peltier temperature modules (TM-PE-x) are designed to be used with the heat exchanger iQ (HX iQ) only. Before a TM-PE-x can be mounted on the Viscotester iQ instruments base, the HX iQ must be mounted to the rear of the instruments base first.

Figure 15. The HX iQ heat exchanger

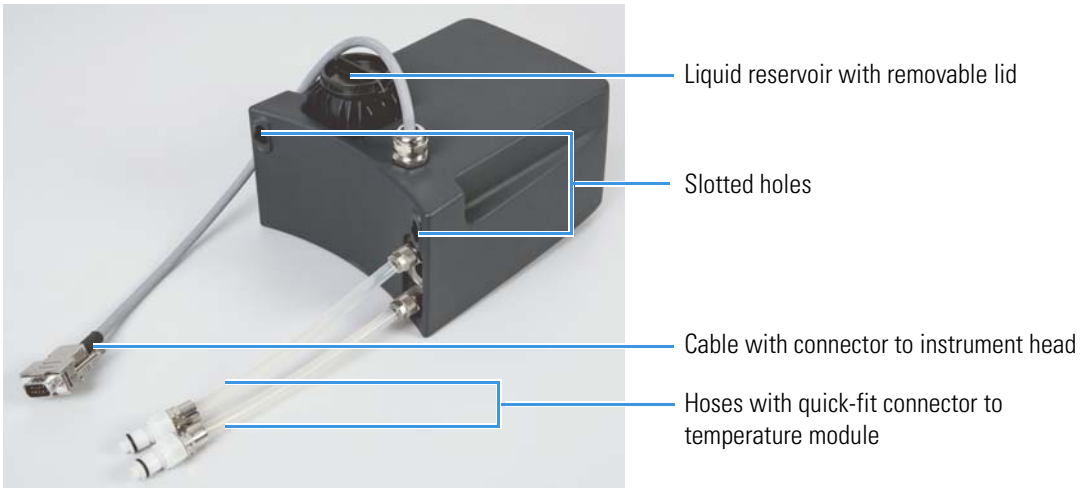


Figure 16. Mounting the HX iQ - guiding the hoses and cables into the instrument base

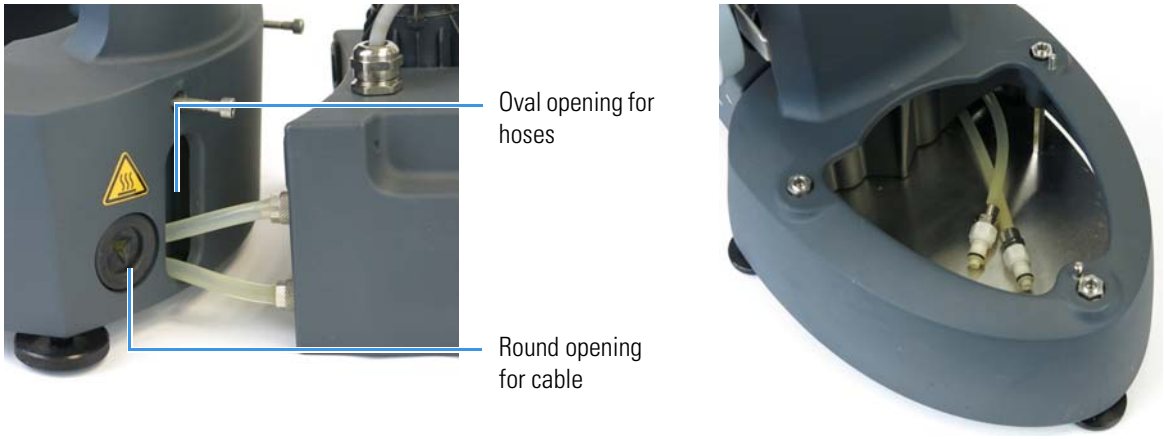
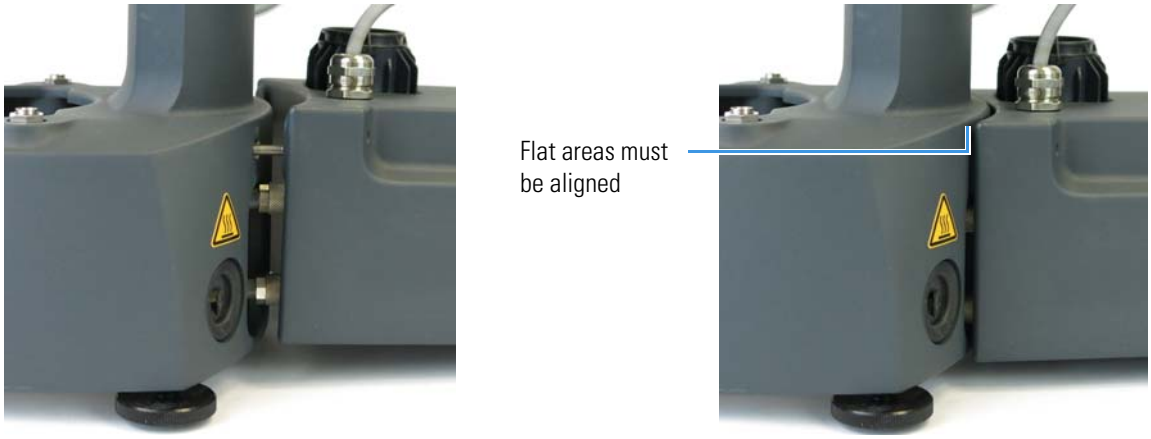


Figure 17. Mounting the HX iQ - mounting and aligning



❖ To mount the heat exchanger iQ

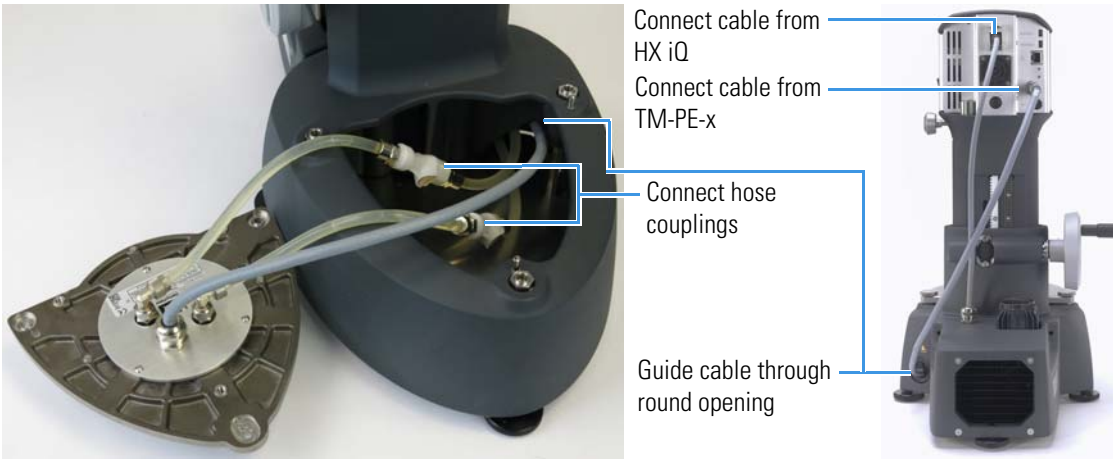
1. Place the HX iQ behind the instrument on the bench, see Figure 16 (left image).
2. Guide the two fluid hoses through the larger oval opening at the rear of the Viscotester iQ instruments base, so that they end up in the instruments base temperature module compartment, see Figure 16 (right image).
3. Mount the HX iQ to the Viscotester iQ, by sliding it with the two slotted holes (on the front of the HX iQ) on the two bolts at the back of the Viscotester iQ instruments base, see Figure 17 (left image) and then lowering it a few millimeters, see Figure 17 (right image). The flat area of the HXiQ and the flat area of the VTiQ must be aligned.
4. Plug the connector at the end of the cable to the socket for the HX iQ heat exchanger on the back of the instrument head, see Figure 18 (right image).

The TM-PE-x can now be mounted on the instruments base and connected with the HX iQ.

❖ To mount a TM-PE-x temperature module

1. Make sure that no rotor is fitted to the instrument head drive shaft.
2. Make sure that the instrument head is in its highest position.
3. Place the TM-PE-x upside down at the left side of the instrument base and connect the fluid hoses with those of the HX iQ, see Figure 18 (left image).

Figure 18. Connecting the HX iQ and TM-PE-x fluid hoses and cables



4. Guide the cable of the TM-PE-x through the round opening at the back of the Viscotester iQ instruments base, see Figure 16 (left image) and Figure 18 (left image).
5. Place the temperature module on the instrument base while placing the two hoses in a loop on the base plate in the instrument temperature compartment, such that the hoses leave enough space for the TM-PE-x, at the same time gently grab the cable behind the instrument base and pull it through the round opening.
6. Make sure that the module is correctly placed on its three mounting points at the three corners of the triangular shaped plate and that the two location pins fit into the corresponding location holes of the plate. The location pins are situated close to the front and right mounting point.
7. Bolt the module down to the instrument base by tightening the three knurled thumb crews (see Figure 12).
8. Plug the connector at the end of the TM-PE-X cable to the socket for the temperature module on the back of the instrument head, see Figure 18 (right image).
9. Check the horizontal orientation of the module using the spirit level.
10. Switch the instrument on.
11. Check the level of the cooling liquid in the HX iQ fluid reservoir, see "To fill the HX iQ with cooling liquid" on page 20.

❖ To dismount a TM-PE-x temperature module

1. Check that no rotor is fitted to the instrument head drive shaft.
2. Check that the instrument head is in its highest position.
3. Unscrew the three knurled thumb screws (see Figure 12).
4. Lift the temperature module from the instrument base and place it upside down aside from the instrument.
5. Disconnect the cable from the socket at the back of the instrument head.
6. Guide the cable out of the opening in the base of the instrument
7. Disconnect the two fluid hoses from the hoses of the HX iQ.

WARNING A small amount of fluid may drain from the hoses.

❖ **To dismount the HX iQ**

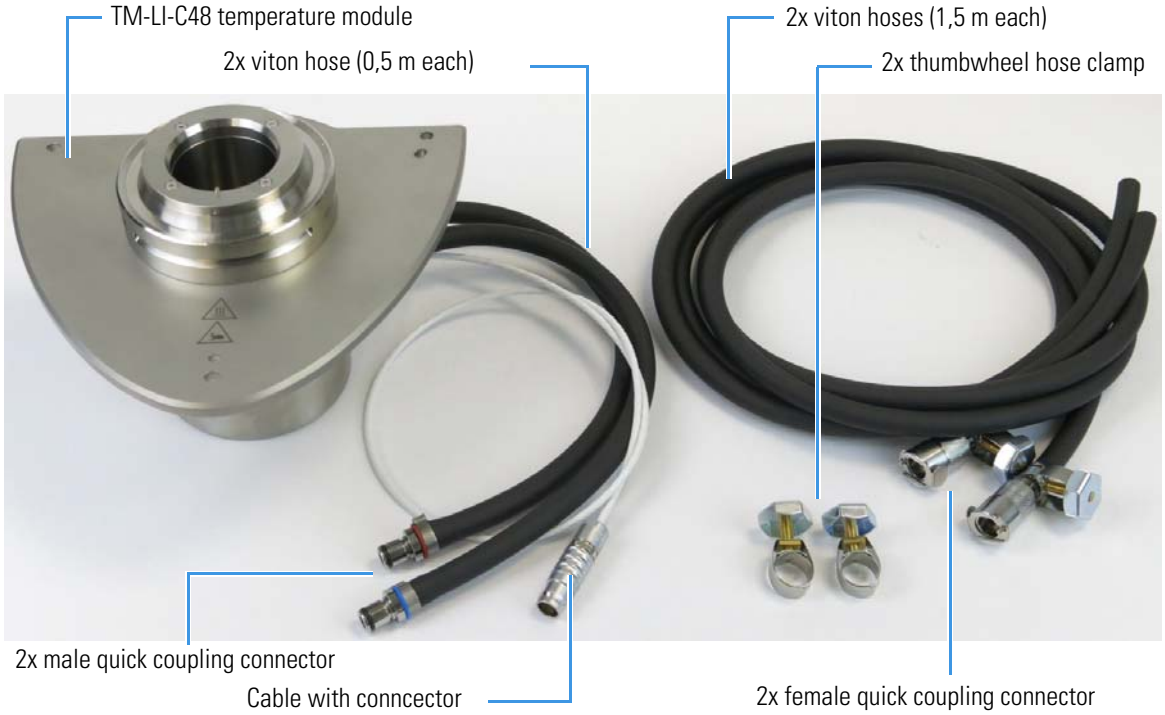
1. Lift the HX iQ slightly upward and then backward to remove it from the back of the instrument.
2. Place the HX iQ on the bench behind the instrument.
3. Disconnect the cable from the socket at the back of the instrument head.
4. Guide the two fluid hoses out of the opening in the base of the instrument to remove the HX iQ from the instrument completely.

It is not necessary to remove the cooling liquid from the HX iQ when the HX iQ is dismounted from the HAAKE Viscotester iQ.

Installing a TM-LI-Cxx or TM-LI-P temperature module

The TM-LI-C32, TM-LI-C48 and TM-LI-P are delivered with two short (L = 0.5 m) viton hoses with male quick coupling connectors readily mounted to the module, plus a set (006-4377) of two longer (L = 1.5 m) viton hoses with female quick coupling connectors readily mounted to the hoses, see Figure 19.

Figure 19. TM-LI-C48 with hoses



The longer hoses and the two separate thumbwheel hose clamps with are for connecting the TM-LI-xx with a circulator.

Mounting/dismounting a TM-LI-Cxx or TM-LI-P temperature module

❖ **To mount a TM-LI-Cxx or TM-LI-P temperature module:**

1. Check that no rotor is fitted to the drive motor shaft.
2. Check that the instrument head is in its highest position.
3. Place the temperature module in/on the instrument base while guiding the two hoses with quick connectors through the oval hole and the electrical cable with the connector through the round hole in the back of the instrument base.
4. Make sure that the module is correctly placed on its three mounting points at the three corners of the triangular shaped plate and that the two location pins fit into the corresponding location pin holes (see Figure 12) of the plate. The location pins are situated close to the front and right mounting point.
5. Bolt the module down to the instrument base by inserting the three knurled thumb crews in the mounting point (holes) and tightening them (see Figure 12).
6. Connect the connector of the electrical cable to the socket for temperature module connections on the back of the instrument head.
7. Connect the TM-LI-x hoses to the hoses coming from a circulator using the quick connect couplings.
8. Check the horizontal orientation of the module using the spirit level.

❖ **To dismount a TM-LI-Cxx or TM-LI-P temperature module**

1. Check that no rotor is fitted to the drive motor shaft.
2. Check that the instrument head is in its highest position.
3. Disconnect the electrical cable from the socket for temperature module connections on the back of the instrument head.
4. Disconnect the TM-LI-x hoses from the hoses coming from the circulator.

   WARNING A small amount of fluid may drain from the hoses.

5. Unscrew the three knurled thumb screws (see Figure 12).
6. Remove the temperature module from the instrument base.

HAAKE Viscotester iQ RheoApp software

The HAAKE Viscotester iQ RheoApp software is delivered on an USB flash drive with a specific file and data structure and does not need be installed on a PC. The HAAKE Viscotester iQ RheoApp software runs directly from the USB flash drive and can thus be used on any PC running Windows 7, Windows 8(.1), Windows 10 or Windows 11 with at least one USB port.

On the first use of the HAAKE Viscotester iQ RheoApp software a software installation key must be entered. By entering the key, the USB flash drive will be “coupled” to the serial number of the HAAKE Viscotester iQ. This means that the USB flash drive can only be used with one specific HAAKE Viscotester iQ instrument. It is possible to create (multiple) copies of the USB flash drive, so that each user of the instrument can have its own USB flash drive.

HAAKE RheoWin software installation

The HAAKE RheoWin software is delivered on a CD-ROM and must be installed on a PC before it can be used. See the separate HAAKE RheoWin Installation and CFR Part 11 Configuration User Guide for detailed instructions on the installation of the HAAKE RheoWin software.

Operation

This chapter describes how to operate the instrument. That is, how to mount a measuring geometry, how to use the lift, how to adjust the universal container holder, how to start a measurement etc.

The operation of the touchscreen control panel user interface is described in detail in the HAAKE Viscotester iQ Reference Manual. The operation of the and RheoWin PC software is also described in detail in the HAAKE Viscotester iQ Reference Manual.

Information on how to setup the instrument and on how to install temperature modules can be found in Chapter 4, “Installation.”

IMPORTANT Read the relevant parts of this chapter before operating the instrument for the first time.

Switching on

When all connections, see “Installation” on page 15 have been made, switch the instrument on using the operating switch (see Figure 6 on page 6) on the right hand side of the instruments head.

The complete initialization process takes around 2 min 40 s for a standard Viscotester iQ without oscillation option, around 2 min 40 s (4 min 30 s the first time every day) for a Viscotester iQ with oscillation option and around 3 min 40 s for a Viscotester iQ Air.

During the subsequent phases of the initialization process of the instrument, several text messages, see Figure 20, will appear on the display indicating the current status of the instrument:

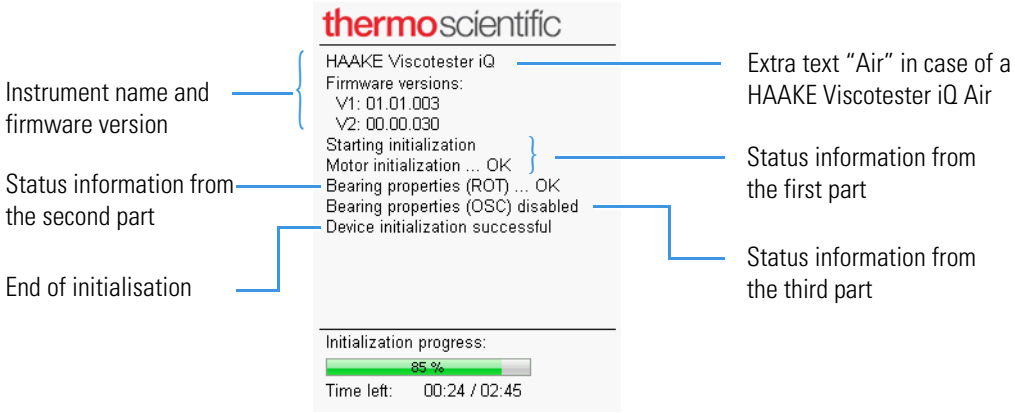
- During part 1 of the initialization process the drive motor shaft will rotate slowly for a few revolutions.

  Note When a measuring geometry mounted to the rheometer drive shaft is detected at this point, the instrument will give an acoustic signal and the text `Please remove geometry to continue` will be displayed on the display. In this case the measuring geometry must be removed in order for the initialization process to be continued.

- During part 2 of the initialization process (Bearing properties ROT) the drive motor shaft will first rotate fast and then decelerate. For the corresponding text messages see Figure 20.
- During part 3 of the initialization process for the VT iQ Air (Torque mapping) the drive motor shaft will continuously rotate slowly. For the corresponding text messages see Figure 20.
- During part 3 of the initialization process for the VT iQ with ball bearings (Bearing properties OSC) the drive motor shaft will continuously rotate slowly. This is only performed on a Viscotester iQ (with ball bearings) with oscillation option, and only one time each day.

When the initialization process is finished the touchscreen will show the main menu (default setting) or another menu that was selected as the start screen.

Figure 20. Initialization screen



IMPORTANT The drive motor shaft must be able to rotate freely during the initialization process. This means:

- There must not be a rotor, attached to the drive shaft and immersed in a sample.
- Do not touch the measuring drive shaft during the initialization process.

Note During the initialization process the instrument will make a clicking noise several times, this is normal.

IMPORTANT After the initialization process is finished allow the instrument to warm up for 5 minutes before running the first measurement.

Automatic temperature module detection

The Viscotester iQ will automatically detect whether and which temperature module is connected to the corresponding socket at the back of the Viscotester iQ instrument head and show the name of that module in the status bar (see Figure 36 on page 40) on the display. The HX iQ is detected independently of a TM-PE-x.

Note When the HX iQ is not detected, that is not connected to the Viscotester iQ instrument head, the icon left of the text TM-PE-x will be displayed in red colour (instead of blue) and will blink. In this case temperature control will not work.

Table 5 lists the status bar texts for the automatically detected temperature modules and their meaning

Table 5. Status bar text for detected TM-xx-x modules and their meaning (Sheet 1 of 2)

Text on display	Detected module	Description
TM-PE-C	TM-PE-C	Peltier cylinder
TM-PE-P	TM-PE-P	Peltier plate
TM-LI-C32	TM-LI-C32	Liquid cylinder for 32 mm diameter cups

Table 5. Status bar text for detected TM-xx-x modules and their meaning (Sheet 2 of 2)

Text on display	Detected module	Description
TM-LI-C48	TM-LI-C48	Liquid cylinder for 48 mm diameter cups
TM-LI-P	TM-LI-P	Liquid plate
Pt100	none, Pt100 sensor	External Pt100 temperature sensor
---	none	No temperature value available in data

The same information is also displayed on the Information page, of the Job control menu and the Information page, of the Manual control menu.

Mounting/dismounting a measuring geometry

The Viscotester iQ can be used with a wide range of coaxial cylinder, parallel plate, cone and plate and vane measuring geometries. See the HAAKE Viscotester iQ Reference Manual for more detailed information on the available measuring geometries. The following sections describe how to mount and dismount the upper part (the rotor) and the lower part (the cup or plate) of the measuring geometry to the drive motor shaft and the TM-xx-x temperature modules respectively.

CAUTION The rotor, cup, lower plate, TMP adapter and the TM-xx-C module can be hot after a measurement at elevated temperatures. Use appropriate tools, for example heat protecting gloves, to prevent skin burn.

Mounting/dismounting a rotor

The Viscotester iQ is equipped with a completely new designed Connect Assist quick coupling for the upper part of the measuring geometry (the rotor). This new Connect Assist quick coupling offers one-hand operation for both the mounting and the dismounting of the rotor from the drive motor shaft as well as an automatic recognition of each individual rotor, including an automatic transfer of the relevant geometry parameters to the instrument electronics and firmware.

The name of the automatically detected rotor will be displayed in the status bar (see Figure 36 on page 40) on the display. In addition to the rotor name, the Information page of the Job control menu and the Information page of the Manual control menu will also display the geometry factors (A- and M-factor) of the measuring geometry (see the HAAKE Viscotester iQ Reference Manual).

IMPORTANT When mounting an adapter rotor (Adapter P1, P2, U1, U2, ISO) to the drive motor shaft for the first time, the Edit geometry dialog will appear on the touchscreen. Read the "Geometries menu," in Chapter 2, "Touchscreen User Interface," in the HAAKE Viscotester iQ Reference Manual before using this dialog.

Both mounting and dismounting the rotor to the drive motor shaft is very easy and comfortable as shown in Figure 21 and Figure 22 respectively.

Figure 21. Mounting a rotor to the drive motor shaft

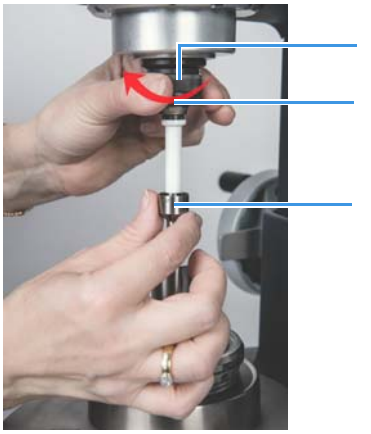
❖ **To mount a rotor to the drive motor shaft**

1. Insert the rotor into the quick coupling on the drive motor shaft from below. The coupling will engage automatically. There is no significant force needed to insert the rotor in the quick coupling.

❖ **To dismount a rotor from the drive motor shaft**

1. Grab and rotate the sleeve of the quick coupling clockwise (to the left) for about 30 degrees with one hand and at the same time be prepared to catch the rotor with the other hand to prevent the rotor from falling in the cup or on the lower plate.

Figure 22. Dismounting a rotor from the drive motor shaft



IMPORTANT Do *not* exert a downward pulling force on the rotor while dismounting the rotor.

IMPORTANT Do not dismount an adapter rotor (Adapter Ux, Adapter Px) directly after editing the properties of that rotor using the touchscreen, but wait at least 3 seconds after tapping the Save button.
See the "Geometries menu," in Chapter 2, "Touchscreen User Interface," in the HAAKE Viscotester iQ Reference Manual for more information.

Mounting/dismounting a cup

❖ **To mount a cup in a TM-PE-C or TM-LI-Cxx temperature module**

1. Make sure the bayonet clamping ring is not mounted on the TM-xx-C.

2. Insert the cup in the TM-xx-C and push it downward as far as possible while aligning the small slot in the upper rim of the cup with the corresponding pin on the TM-xx-C.
3. Place the slotted bayonet clamping ring on the TM-xx-C.
4. Tighten the bayonet clamping ring by rotating it firmly clockwise (about one third of a revolution) until a stop.

Figure 23. Dismounting a cup

❖ **To dismount a cup from a TM-PE-C or TM-LI-Cxx temperature module**

1. Loosen the bayonet clamping ring by rotating it counterclockwise (about one third of a revolution) until a stop.
2. Pull the bayonet clamping ring upwards, thereby pulling the cup out of the TM-xx-C.
3. Remove the cup from the bayonet clamping ring.

Mounting/dismounting a lower plate

The TMPxx lower plates can be mounted on TM-xx-P(late) temperature modules as well as on TM-xx-C(ylinder) temperature modules.

Lower plate on a TM-xx-C temperature module

To be able to use a parallel plate or cone and plate geometry with a TM-xx-C(ylinder) temperature module the TMP adapter is needed and must be mounted in the TM-xx-C first.

❖ **To mount the TMP adapter in a TM-PE-C or TM-LI-Cxx temperature module**

1. Make sure the bayonet clamping ring is not mounted on the TM-xx-C.
2. Insert the TMP adapter in the TM-xx-C and push it downward as far as possible while aligning the small hole in the TMP adapter top plate with the corresponding pin on the TM-xx-C.

When the TMP adapter is mounted in the TM-xx-C a TMPxx lower plate can be mounted on the TMP adapter.

❖ **To mount a lower plate on the TMP adapter**

1. Place the lower plate on the TMP adapter while aligning the small slot on bottom side of the plate with the pin on the TMP adapter.

2. Place the bayonet clamping ring on the TMP adapter.
3. Tighten the bayonet clamping ring by rotating it firmly clockwise (about one third of a revolution) until a stop.

❖ **To dismount a lower plate from the TMP adapter**

1. Loosen the bayonet clamping ring by rotating it counterclockwise (about one third of a revolution) until it can be lifted from the TMP adapter.
2. Remove the bayonet clamping ring.
3. Remove the lower plate from the TMP adapter.

The TMP adapter only needs to be removed from the TM-xx-C when switching to using a coaxial cylinder geometry.

❖ **To dismount a TMP adapter from a TM-PE-C or TM-LI-Cxx temperature module**

1. Grip the TMP adapter at the top plate's rim and lift it upward out of TM-xx-C.

Lower plate on a TM-xx-P temperature module

A TMPxx lower plate can be mounted directly on to a TM-xx-P(late) temperature module.

❖ **To mount a lower plate**

1. Place the lower plate on the TM-xx-P temperature module while aligning the small slot on bottom side of the plate with the pin on the TM-xx-P temperature module.
2. Place the bayonet clamping ring on the TM-xx-P temperature module.
3. Tighten the bayonet clamping ring by rotating it firmly clockwise (about one third of a revolution) until a stop.

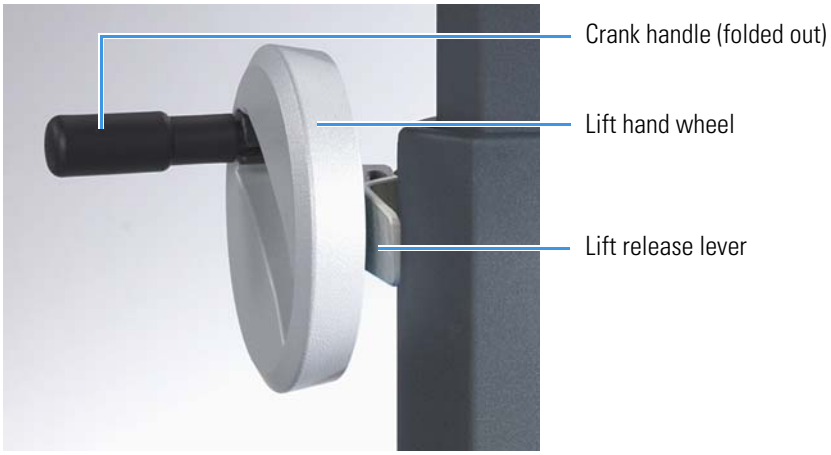
❖ **To dismount a lower plate**

1. Loosen the bayonet clamping ring by rotating it counterclockwise (about one third of a revolution) until it can be lifted from the TM-xx-P temperature module.
2. Remove the bayonet clamping ring.
3. Remove the lower plate from the TM-xx-P temperature module.

Lift control

The HAAKE Viscotester iQ is equipped with a simple but effective and easy to operate lift mechanism for the axial positioning of the rotor relative to the cup or the lower plate. The lift is operated with the large hand wheel with fold-out crank handle at the left side of the instrument base. For easier operation of the lift mechanism it is recommend to have the crank handle folded-out at any time.

Figure 24. Lift hand wheel with lift release lever



❖ **To raise the instrument head**

1. Turn the hand wheel counterclockwise to move the instrument head all the way up.
2. In its upper position the lift mechanism will automatically engage in a fixed position.

❖ **To lower the instrument head**

1. To release the lift from its upper fixed position press the lift release lever (see Figure 24) to the right (in the direction of the hand wheel).

   The instrument head will now move downward, the lift movement is slowed down by the damper on the back of the instrument base.
2. Control the lift speed by braking the rotational motion of the hand wheel.
3. Check whether the lift attained its lowest possible position by turn the hand wheel clockwise until a stop.

Note Step 3 of the above procedure is mainly needed in the case of high viscous samples.

Coaxial cylinder geometries

All coaxial cylinder geometries are designed in a such way that the lowest possible position of the instrument head will automatically result in the correct axial position of the attached cylinder rotor. There is no need to make any adjustments whatsoever.

❖ **To setup the measuring geometry for a measurement**

1. Fill the correct sample volume in the cup.

   For the correct sample volume see the HAAKE Viscotester iQ Reference Manual.
2. Mount the cup in the temperature module, see “Mounting/dismounting a cup.”
3. Mount the rotor to the drive motor shaft, see “Mounting/dismounting a rotor.”
4. Lower the instrument head to the measurement position, see “Lift control.”
5. Make sure that the lowest position of the lift is reached.

In case the viscosity of the sample is (very) high it may be necessary to force the lift into the lowest position by manually rotating the lift wheel clockwise using a small force.

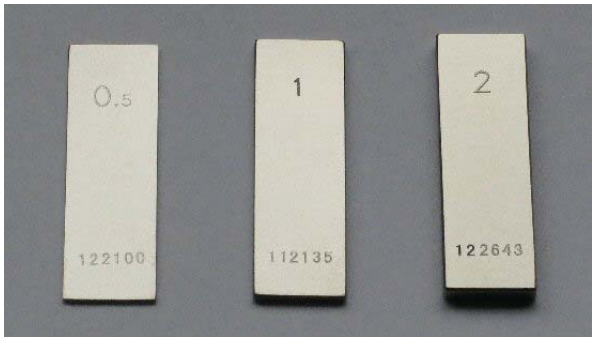
Parallel plate and cone and plate geometries

For a parallel plate geometry the gap between the upper plate (rotor) and the lower plate is not a fixed value and can be adjusted individually. For a cone and plate geometry the gap must be set according to the cone truncation. In case of the Viscotester iQ the gap is set by using high precision calipers of different thicknesses as a spacer between the upper plate or cone and the lower plate (see Figure 29) and then adjusting the lowest lift position (measuring position) by turning the adjusting screw knob or the adjusting lever of the gap setting tool (part number 222-2190) at the back of the instrument head (see Figure 27 and Figure 29).

Calipers for parallel plate geometries

For parallel plate geometries four calipers with thicknesses of 0.5 mm, 1.0 mm, 1.5 mm and 2.0 mm, see Figure 25, are available.

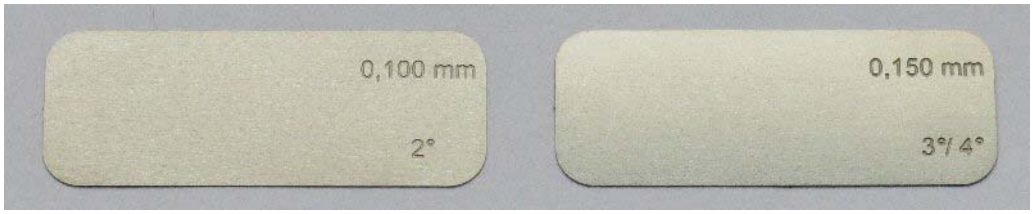
Figure 25. Calipers for parallel plate geometries



Calipers for cone and plate geometries

For cone and plate geometries there are two different calipers, one with a thickness of 0.1 mm for use with all 2° cones and one with a thickness of 0.150 mm for use with all 3° and 4° cone, see Figure 26.

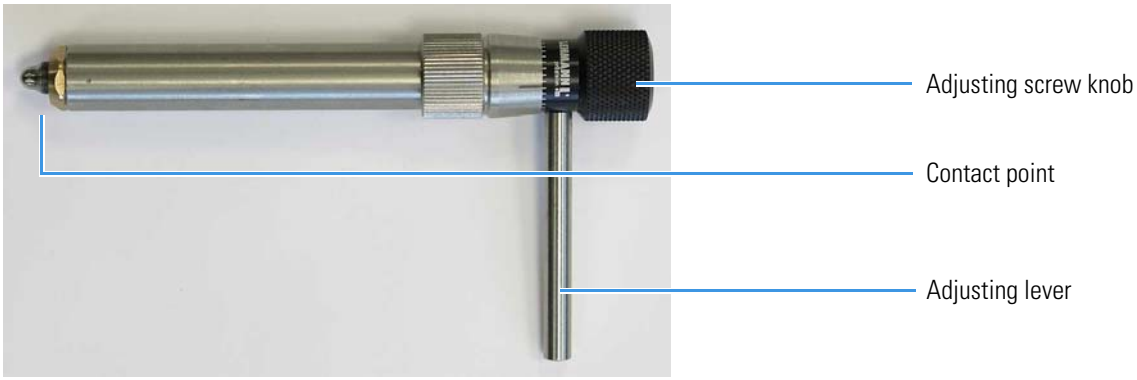
Figure 26. Calipers for cone and plate geometries



Gap setting tool

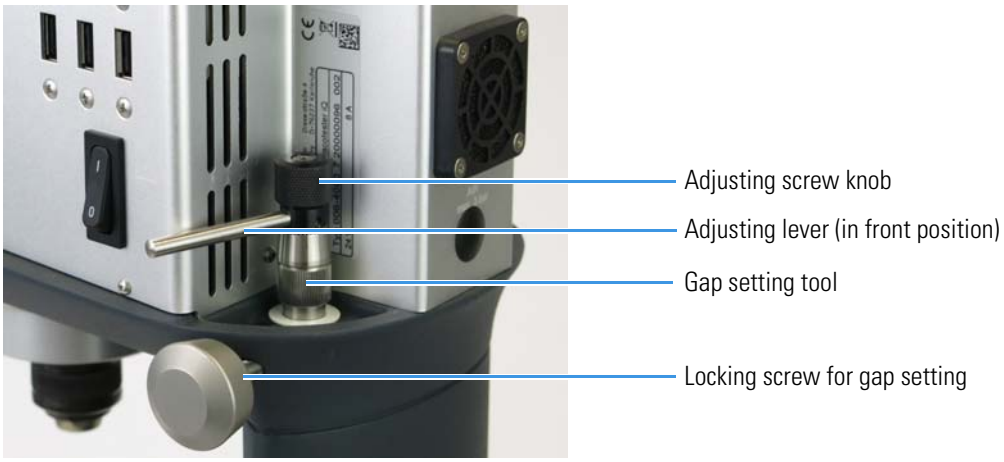
The gap setting tool is basically a hollow bolt which effective length can be changed by means of a fine pitch adjusting screw inside the bolt, see Figure 27. Turning the screw knob or moving the lever moves the contact point in and out of the hollow bolt. One revolution of the adjusting screw knob results in a movement of 0.360 mm of the contact point (1 degree $\hat{=}$ 1 µm).

Figure 27. Gap setting tool



The gap setting tool must be mounted on the back of the instrument head in place of the standard height adjustment tool, see Figure 29 (compare with Figure 34).

Figure 28. Back of instrument head with gap setting tool



Setting the gap

The procedure below describes how set the gap for parallel plate and cone and plate measuring geometries.

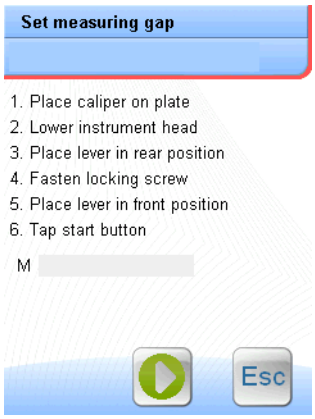
Figure 29. Using a caliper to set the gap

❖ To set the measuring gap

1. Mount the lower plate on the temperature module, see "Mounting/dismounting a lower plate."
2. Mount the rotor to the drive motor shaft, see "Mounting/dismounting a rotor."
3. Loosen the locking screw for the gap setting, see Figure 29.
4. Choose **Configuration > Set measuring gap** from the touchscreen panel user interface, to open the Set measuring gap menu, see Figure 32.

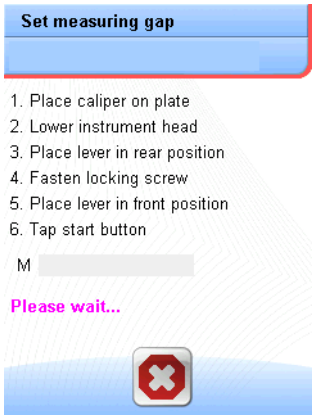
   Now follow the on-screen instructions, see Figure 32, Figure 31 and Figure 32, which are explained in more detail below.

Figure 30. Set measuring gap menu



5. Place the caliper with the thickness that corresponds to the desired gap on the lower plate, see Figure 29.
6. Lower the instrument head (slowly) until the upper plate or cone (rotor) is resting on the caliper, see "Lift control."
7. Place the adjusting lever of the gap setting tool in the *rear* position.
8. Fasten the locking screw for the gap setting, see the right image in Figure 29.
9. Place the adjusting lever of the gap setting tool in the *front* position. (This lifts the upper plate or cone from the precision caliper by around 90 µm.)
10. Tap the **Start** button in the Set measuring gap menu of the touchscreen panel user interface (see Figure 30) and wait for the (purple coloured) message **Please wait** (see Figure 31) to disappear.

Figure 31. Set measuring gap menu



The upper plate or cone will now rotate slowly.

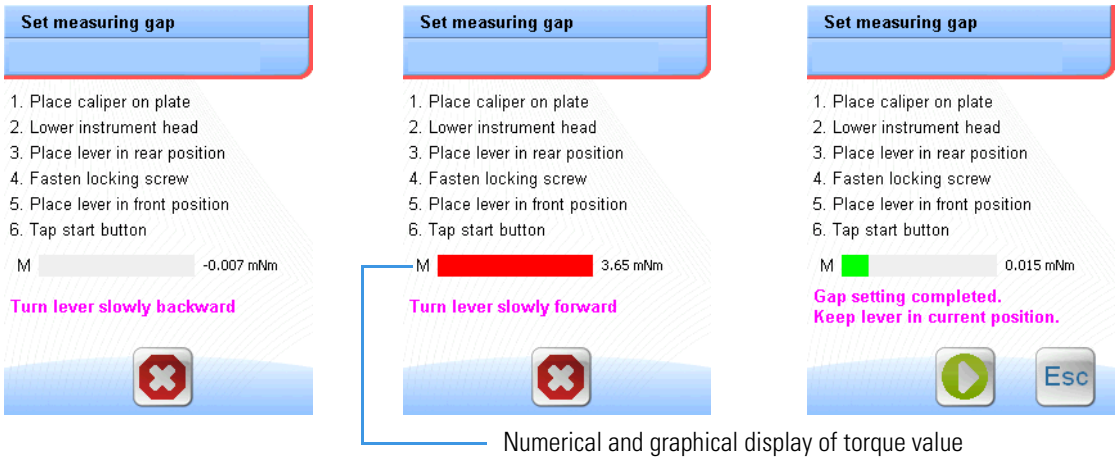
11. Slowly turn the adjusting lever backward (counterclockwise) to lower the instrument head until the rotating upper plate or cone just touches the precision caliper.

    The torque needed to overcome the friction between the upper plate and the precision caliper is displayed on the screen both graphically and numerically. The torque reading is used to adjust the gap setting.

    By turning the adjusting lever forward (clockwise) and/or backward (counterclockwise), adjust the torque reading until it is in the range of 0.03 mNm < torque < 0.1 mNm. In this range the graphical torque display is green, outside this range it is red (see Figure 32).

    Watch the (purple coloured) messages for which direction to turn the adjusting lever (see Figure 32).

Figure 32. Set measuring gap menu



Note This setting is very sensitive. Try *not* to exert any vertical force on the instrument head while adjusting the lever.

When the torque is within the correct range the (purple coloured) message **Gap setting completed** will appear.

The gap is now set to the thickness of the caliper with an accuracy of ± 10 µm.

IMPORTANT After finishing this procedure do not move the adjusting lever anymore.

12. Raise the instrument head to the upper position, see "Lift control."
13. Remove the caliper from the lower plate.

CAUTION The lower plate can have a temperature up to 160 °C. Use protective gloves and/or a suitable tool (order number 006-2389) to remove the caliper from the lower plate.

After the gap setting is adjusted to the desired value the sample can be placed on the lower plate and the instrument head lowered into the measuring position.

❖ **To setup the measuring geometry for a measurement**

1. Place the correct sample volume on the lower plate.

   For the correct sample volume see the HAAKE Viscotester iQ Reference Manual.

2. Lower the instrument head to the measurement position, see "Lift control."

3. Make sure that the lowest position of the lift is reached.

In case the viscosity of the sample is (very) high it may be necessary to force the lift into the measurement gap position by manually rotating the lift wheel clockwise using a small force.

IMPORTANT For parallel plate geometries the physical gap (set using a precision caliper) *must* match the gap value defined in the internal Job, the RheoWin Job or the manual measurement setup, see the HAAKE Viscotester iQ Reference Manual.

Vane geometries

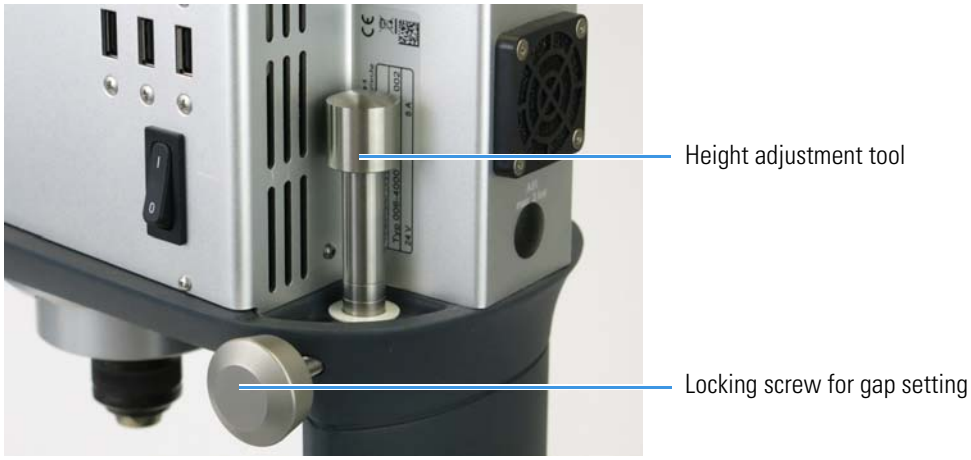
For a vane geometry the axial position of the instrument head is determined by the position of the surface of the sample, the height of the vane blades and how far the vane should be immersed into the sample. That means that the measuring position mus be adjusted individually for each setup. The axial position is set by fixing the height adjustment tool (see Figure 33) with the locking screw, see Figure 34.

Figure 33. Height adjustment tool

The height adjustment tool must be mounted on the back of the instrument head, see Figure 34.

Note The gap setting tool (see Figure 27) can be used instead of the height adjustment tool.

Figure 34. Back of instrument head with height adjustment tool



❖ **To setup the measuring geometry for a measurement**

1. Place the container with the sample on the universal container holder.
2. Loosen the locking screw for the gap setting, see the right image in Figure 29 and Figure 34.
3. Lower the instrument head (very slowly) until the vane is (completely) immersed in the sample, see "Lift control."
4. Fasten the locking screw for the gap setting.

When repeating the measurement with the same vane and the same sample container filled to the same level, the measuring position must not be set again.

Touchscreen

The touchscreen used in the Viscotester iQ is a standard modern capacitive touchscreen panel. The lightest touch of a finger tip is enough for executing a command. The touchscreen can be operated while wearing standard nitrile (laboratory) gloves without limitations.

Figure 35. Working with the touchscreen

Touchscreen user interface

All functions of the HAAKE Viscotester iQ can be completely controlled using the build-in graphical user interface which is described in detail in the HAAKE Viscotester iQ Reference Manual. For the configuration of some of the more enhanced functions the HAAKE Viscotester iQ RheoApp PC software is needed, see the HAAKE Viscotester iQ Reference Manual.

The user interface is operated by tapping on the touchscreen. For entering alphanumerical information (that is numbers or text) an external USB keyboard, connected to the instrument head, can be used also.

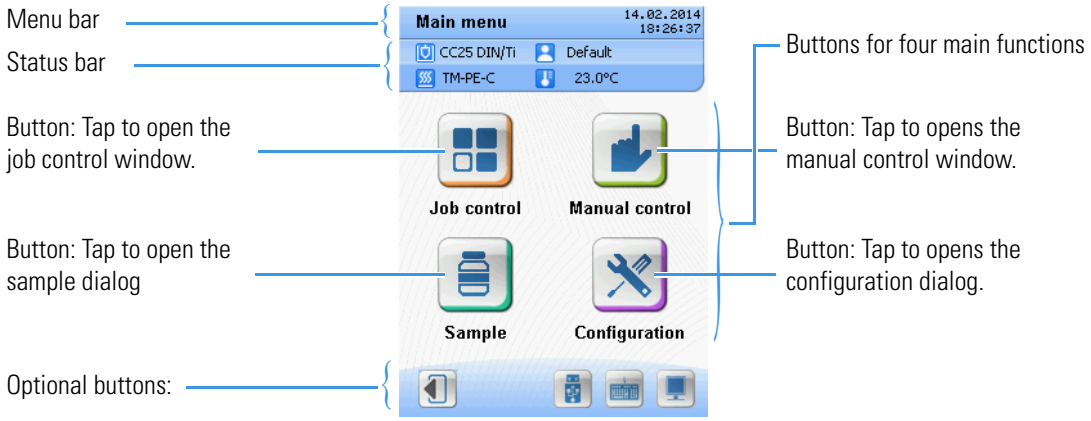
Main menu

The touchscreen user interface main menu, see Figure 36, consist of the following functional elements:

- The menu bar.
- The status bar.
- The buttons for the four main functions.
- The optional buttons at the bottom of the screen.

These functional elements are described in detail in the HAAKE Viscotester iQ Reference Manual.

Figure 36. The Main menu



The four main functions of the user interface, that is Job control, Manual control, Sample information and Configuration are accessed by tapping on one of the four large buttons.

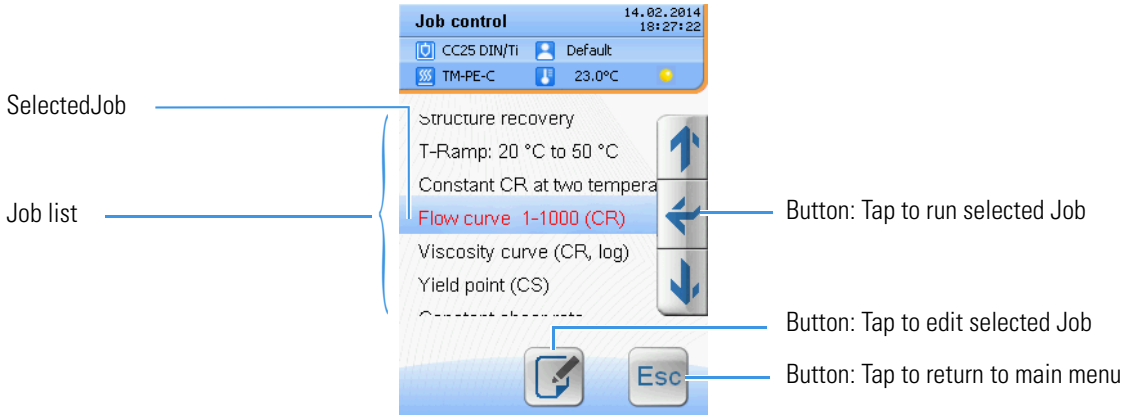
The functionality of the Menu bar, Status bar, and the optional buttons at the bottom of the screen, is explained in detail in the HAAKE Viscotester iQ Reference Manual.

Job control menu

The starting point for any Job related action is the Job control list menu (see Figure 37). From this list menu a Job can selected for either editing or viewing the Job or for running the Job.

For a detailed description on how to run a job measurement and how to edit the job parameters see the HAAKE Viscotester iQ Reference Manual.

Figure 37. Job control list menu



Running a Job measurement

To run a job measurement, starting from the Main menu, proceed as described below. When the touchscreen control is setup to show the Job control menu as the starting menu, the first step is not needed.

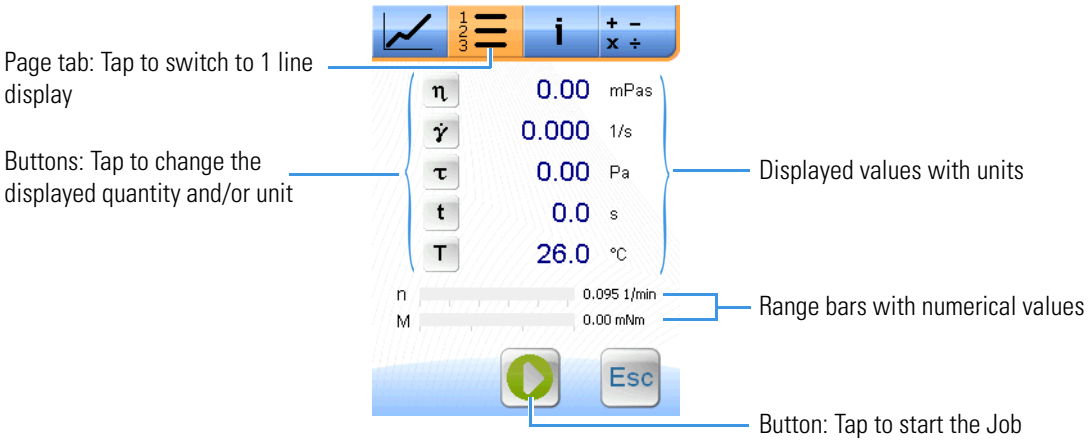
❖ To run a job measurement

1. In the Main menu tap the **Job control** button.
2. In the Job control menu (see Figure 37) select a Job from the list.
3. Tap the **Enter** button in the list to open the selected Job in the Job run menu (see Figure 38).

   The Job run menu consist of four pages: The Graph page, the Numeric page, the Information page and the Result page. The operator can switch forth and back between the four different pages at any time during a Job run.

   The functionality of these pages is described in the HAAKE Viscotester iQ Reference Manual.
4. Tap the **Graph page** tab or the **Numeric page** tab to switch to the Graph or Numeric page, see Figure 38 and Figure 41.

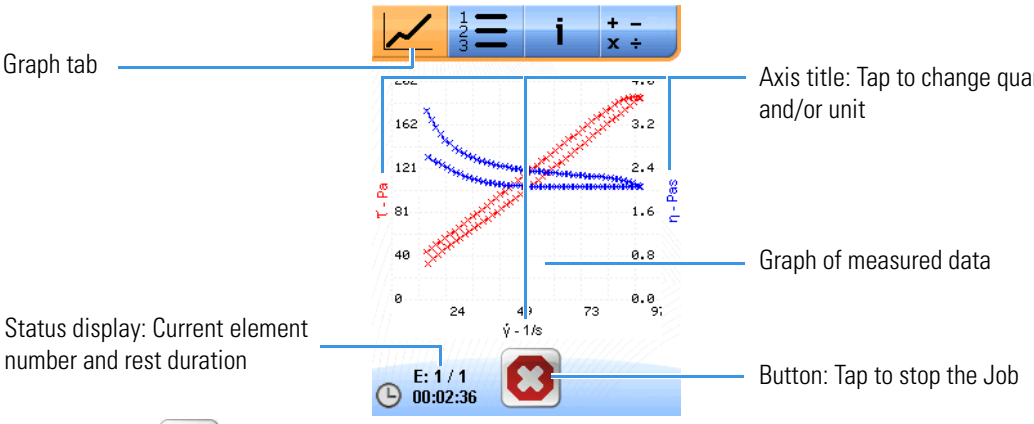
   Figure 38. Numeric page of job run menu, 5 line display



   Note When the Show sample menu option is active, the Sample menu (see "Sample menu" on page 43) will be opened first. After the closing the Sample menu the Job run menu will be opened.
5. Tap the **Start** button to actually start the job.

❖ **To stop a job measurement**

Figure 39. Graph page of job run menu



1. Tap the **Stop** button to stop the measurement immediately at any time.

Manual control menu

The manual control menu consists of four pages: The Graph page, the Numeric page, the Settings page and the Information page. The operator can switch forth and back between the different pages at any time, that is also during a measurement.

The functionality of these pages is described in detail in the HAAKE Viscotester iQ Reference Manual.

Figure 40. Manual control menu (with 1 line display on Numeric page)

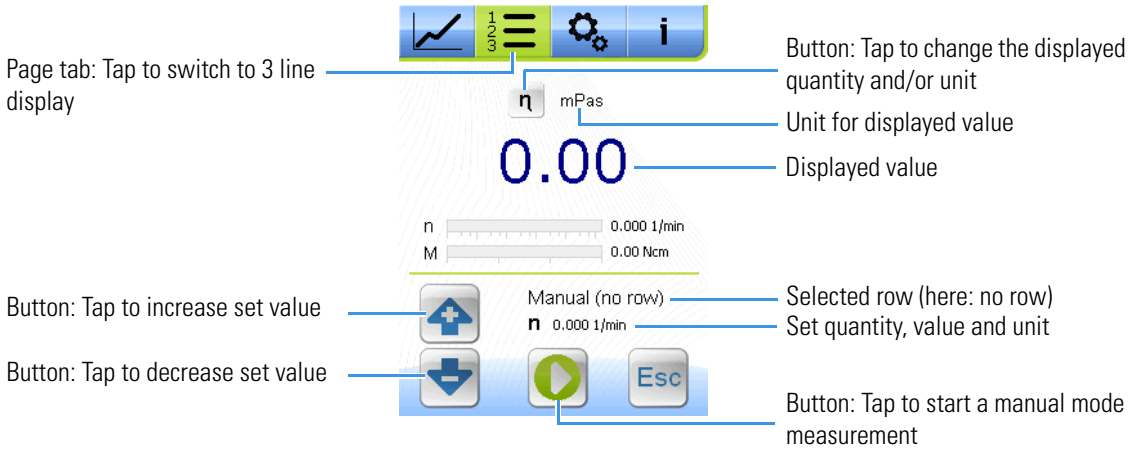
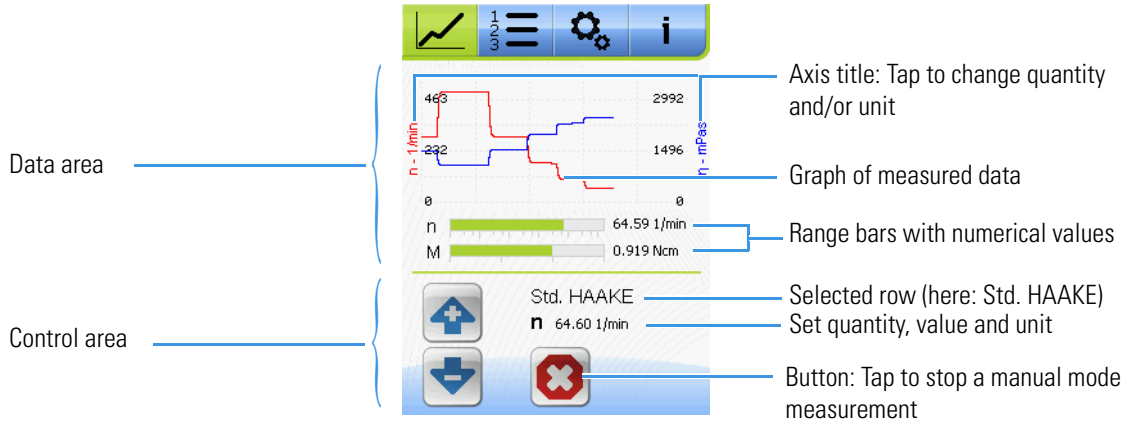


Figure 41. Manual control menu (with Graph page)



Running a manual control measurement

❖ **To run a manual control measurement**

1. On the Settings page select a row or manually enter a set value, see the HAAKE Viscotester iQ Reference Manual for detailed information on how to do that.
2. Tap the **Graph page** tab or the **Numeric page** tab to switch to the Graph or Numeric page, see Figure 40 and Figure 41.
3. Tap the **Up(+)** or the **Down(-)** arrow button to increase or decrease the set value.

> **Note** The set value can also be changed using the Up(+) or the Down(-) arrow button when the measurement is already running, both when a Row or Manual (no row) is selected. In the last case the set value will be increased/decreased with increasing size steps the longer Up(+) or the Down(-) arrow button is tapped.

4. Tap the **Start** button to start the measurement.

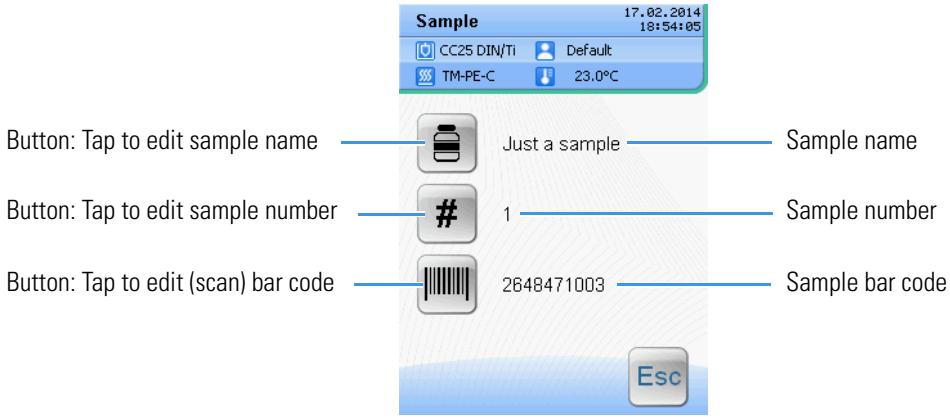
❖ **To stop a manual control measurement**

1. Tap the **Stop** button to stop the measurement immediately at any time.

Sample menu

From the Sample menu the operator can enter the sample name and the sample number of the sample that is to be measured. Using a USB bar code scanner a bar code related to the sample can be scanned. All sample information is saved together with the other measurement data in a data file.

Figure 42. Sample menu



See the HAAKE Viscotester iQ Reference Manual for detailed information on the Sample menu.

Configuration menu

From the Configuration menu several settings for the HAAKE Viscotester iQ, Instruction Manual touchscreen user interface can be made. Certain configuration settings can also be made using the HAAKE Viscotester iQ RheoApp software.

Figure 43. Configuration menu

See the HAAKE Viscotester iQ Reference Manual for detailed information on the Configuration menu.

Temperature Modules

This chapter describes the TM-xx-x temperature modules that are available for the HAAKE Viscotester iQ.

Overview of the TM-xx-x modules

Criteria for selecting a temperature module for a certain application are parameters like; temperature range, maximum heating and cooling rate, maximum temperature ramp rate, temperature constancy, maximum permissible temperature gradient in the sample, sample volume, type of measuring geometry, sample properties, etc.

The TM-xx-x modules available for the HAAKE Viscotester iQ can be classified according to the three different technical solutions that are used in these modules:

- Temperature control using the Peltier effect.
- Temperature control using an external circulator.

Each technical solution has its advantages regarding the parameters mentioned above: Temperature control using the Peltier effect offers high heating and cooling rates in the low and medium temperature range from around -5 °C to 160 °C. Temperature control using an external circulator offers a very good temperature constancy in a limited temperature range and with limited heating and cooling ranges only. Table 6 gives an overview over the basic properties of the different TM-xx-x models.

Table 6. Overview over the temperature modules

Name	Type	Fluid flow (for cooling)	Measuring geometries	T-min (in °C)	T-max (in °C)
TM-PE-C	Peltier	Liquid	Coaxial cylinder Parallel-plate,cone and plate[a]	-5 0	160 140
TM-PE-P	Peltier	Liquid	Parallel-plate, cone and plate	0	160
TM-LI-C32	Liquid	Liquid	Coaxial cylinder Parallel-plate, cone and plate[a]	-20 -20	200 200
TM-LI-C48	Liquid	Liquid	Coaxial cylinder Parallel-plate, cone and plate[a]	-20 ---	200 ---
TM-LI-P	Liquid	Liquid	Parallel-plate, cone and plate	-20	200

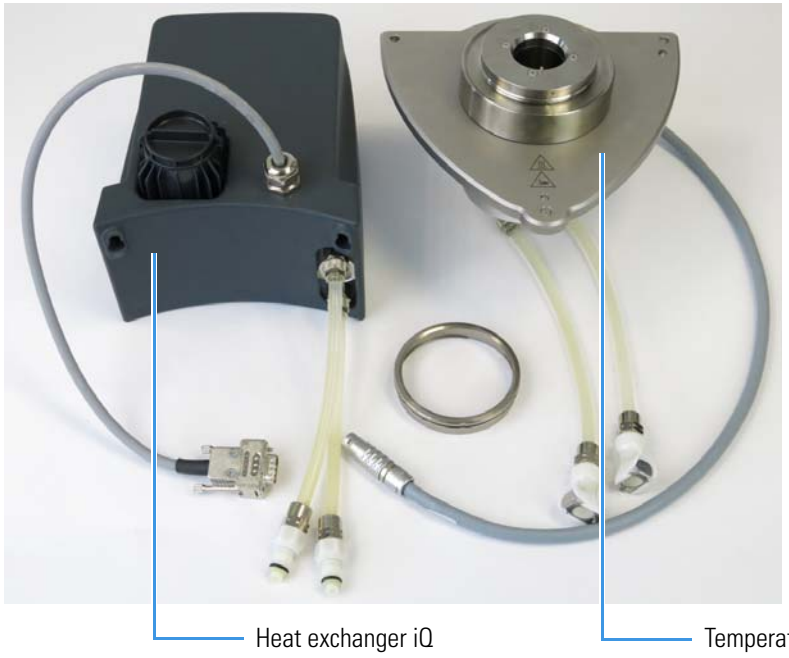
[a] With the TMP-adapter.

Temperature module TM-PE-C

The temperature module TM-PE-C is designed for the temperature control of coaxial cylinder measuring geometries in the temperature range of -5 °C to 160 °C. With an adapter the TM-PE-C can also be used for the temperature control of parallel-plate and cone-plate measuring geometries in the temperature range of 0 °C to 140 °C.

The TM-PE-C is designed to be used with the special heat exchanger iQ (HX iQ), which is mounted to the back of the HAAKE Viscotester iQ instrument base, only.

Figure 44. TM-PE-C with cable and hoses and heat exchanger iQ



The mounting and dismounting of a coaxial cylinder measuring cup in the TM-PE-C is described in "Mounting/dismounting a cup" on page 30.

The mounting and dismounting of the TMPxx adapter and the mounting and dismounting of a lower measuring plate in the TM-PE-C is described in "Mounting/dismounting a lower plate" on page 31.

WARNING Make sure that all hose connections are properly tightened.

Note There is no preferred flow direction of the liquid through the TM-PE-C.

WARNING Make sure the flow through the hoses is not obstructed due to sharp bends in the hoses or squeezing of the hoses.

WARNING Check the hoses for possible damage on a regular basis.

WARNING Replace the hoses once a year. Use original spare parts only (1.0 meter of silicone hose, order number 082-2467).

Working principle

The TM-PE-C working principle is based on the Peltier effect. A Peltier element is a solid-state heat pump which transfers heat from one side of the device to the other side. By changing the direction of the electrical current through the device the direction of the heat flow can be changed. As a consequence a Peltier element can be used for both heating and cooling. The maximum temperature difference between the hot and the cold side of a Peltier element is around 70 K. The bottom side of the Peltier element (in the TM-PE-C) is mounted on a heat sink so that the heat which is "pumped" away from the sample side (upper side in the TM-PE-C) of the Peltier element can be removed from the Peltier element. Without a heat sink the Peltier element will heat itself up. The heats sink consist of a metallic block through which a constant flow of liquid is passing. The minimum temperature that can be achieved with a Peltier element is mainly determined by the temperature of the liquid flowing through the heat sink and the available electrical power. The maximum achievable temperature is dictated by the properties of the Peltier element itself and the available electrical power. The maximum attainable temperature for the TM-PE-C is 160 °C.

Although the maximum temperature difference between the hot and the cold side of the Peltier element can not be higher than around 70 K, any temperature in the complete temperature range from -5 °C to 160 °C can be reached without modifying the setup.

The TM-PE-C and the heat exchanger iQ are directly connected to HAAKE Viscotester iQ and are controlled by the HAAKE Viscotester iQ, both in manual-control mode and in job-control mode. When the HAAKE Viscotester iQ is controlled by the HAAKE RheoWin software, HAAKE RheoWin also controls the TM-PE-C.

Performance

The performance of the TM-PE-C regarding the lowest attainable temperature depends on the temperature of the "cooling" liquid, that is on the performance of the heat exchanger iQ which is supplying the cooling liquid. Since the HX iQ uses a build-in radiator to cool the liquid, the performance of the HX iQ depends on the ambient temperature. For ambient temperatures ≤ 23 °C, the lowest attainable temperature is -5 °C. For every 1 °C increase in ambient temperature, the lowest attainable temperature will be 1 °C higher.
For example: For an ambient temperature of 28 °C the lowest attainable temperature will be 0 °C.

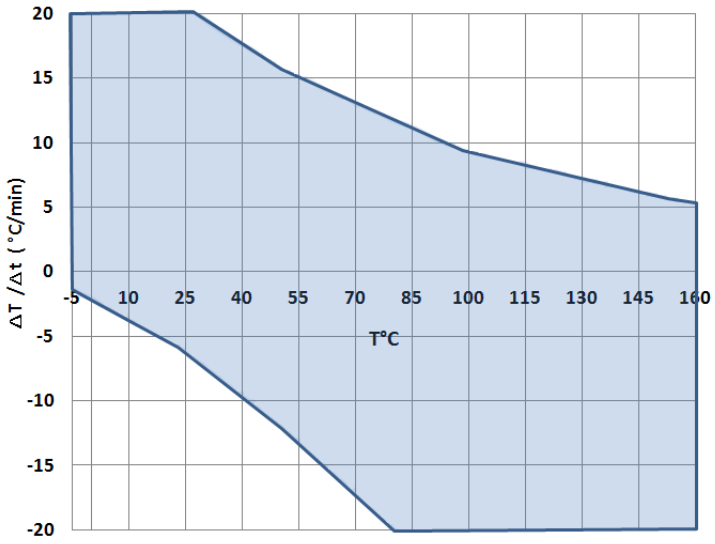
Table 7. Attainable temperature range of the TM-PE-C with coaxial cylinder geometries

Temperature range	Accessories needed	Accessory usage
-5 °C[a] to 160 °C	Sample hood	PEEK hood
	Fluid	pure de-ionized water with additive innovatekProtect IP (3:1 mixture)
	Circulating fluid temperature	around 35 °C
	"Circulator" model	HX iQ
	Hoses	Viton hoses, part of contents of delivery

[a] At an ambient temperature ≤ 23 °C

Figure 45 shows the maximum heating (upper curve) and cooling (lower curve) rates (value on the Y-axis) of the TM-PE-C as a function of the actual (set) temperature (value on the X-axis). The higher the set temperature is, the lower the max. heating rate and the higher the max. cooling rate are. The lower the set temperature is, the higher the max. heating rate and the lower the max. cooling rate are.

Figure 45. Maximum heating and cooling rates of the TM-PE-C as a function of the actual (set) temperature



When using the TM-PE-C with the adapter for TMPxx measuring geometry lower plates the maximum temperature is 140 °C instead of 160 °C, and the lowest attainable temperature is 0 °C instead of -5 °C, see Table 8. The lowest attainable temperature depends on the ambient temperature. For every 1 °C increase in ambient temperature, the lowest attainable temperature will be 1 °C higher.

Table 8. Attainable temperature range of the TM-PE-C with parallel plate and cone and plate geometries

Temperature range	Accessories needed	Accessory usage
0 °C[a] to 140 °C	Sample hood	PEEK hood
	Fluid	pure de-ionized water with additive innovatekProtect IP (3:1 mixture)
	Circulating fluid temperature	around 35 °C
	“Circulator” model	HX iQ
	Hoses	Silicone hoses, part of contents of delivery

[a] At an ambient temperature ≤ 23 °C

When the TM-PE-C is used with the adapter for TMPxx the temperature offset values should be determined for the individual combination of lower plate, upper cone or plate and hood and saved in the HAAKE RheoWin software. This because the offset values for the individual combinations can be different in the range of several Kelvin at the lower and upper end of the temperature range.

Temperature module TM-PE-P

The temperature module TM-PE-P is designed for the temperature control of parallel plate and cone and plate measuring geometries in the temperature range of 0 °C to 160 °C.

The TM-PE-P is designed to be used with the special heat exchanger iQ (HX iQ), which is mounted to the back of the HAAKE Viscotester iQ instrument base, only.

Figure 46. TM-PE-P with cable and hoses and heat exchanger iQ

The mounting and dismounting of a lower measuring plate on the TM-PE-P is described in "Mounting/dismounting a lower plate" on page 31.

WARNING Make sure that all hose connections are properly tightened.

Note There is no preferred flow direction of the liquid through the TM-PE-P.

WARNING Make sure the flow through the hoses is not obstructed due to sharp bends in the hoses or squeezing of the hoses.

WARNING Check the hoses for possible damage on a regular basis.

WARNING Replace the hoses once a year. Use original spare parts only (1.0 meter of silicone hose, order number 082-2467).

Working principle

The TM-PE-P working principle is based on the Peltier effect. A Peltier element is a solid-state heat pump which transfers heat from one side of the device to the other side. By changing the direction of the electrical current through the device the direction of the heat flow can be changed. As a consequence a Peltier element can be used for both heating and cooling. The maximum temperature

difference between the hot and the cold side of a Peltier element is around 70 K. The bottom side of the Peltier element (in the TM-PE-P) is mounted on a heat sink so that the heat which is "pumped" away from the sample side (upper side in the TM-PE-P) of the Peltier element can be removed from the Peltier element. Without a heat sink the Peltier element will heat itself up. The heats sink consist of a metallic block through which a constant flow of liquid is passing. The minimum temperature that can be achieved with a Peltier element is mainly determined by the temperature of the liquid flowing through the heat sink and the available electrical power. The maximum achievable temperature is dictated by the properties of the Peltier element itself and the available electrical power. The maximum attainable temperature for the TM-PE-P is 160 °C.

Although the maximum temperature difference between the hot and the cold side of the Peltier element can not be higher than around 70 K, any temperature in the complete temperature range from -0 °C to 160 °C can be reached without modifying the setup.

The TM-PE-P and the heat exchanger iQ are directly connected to HAAKE Viscotester iQ and are controlled by the HAAKE Viscotester iQ, both in manual-control mode and in job-control mode. When the HAAKE Viscotester iQ is controlled by the HAAKE RheoWin software, HAAKE RheoWin also controls the TM-PE-P.

Performance

The performance of the TM-PE-P regarding the lowest attainable temperature depends on the temperature of the "cooling" liquid, that is on the performance of the heat exchanger iQ which is supplying the cooling liquid. Since the HX iQ uses a build-in radiator to cool the liquid, the performance of the HX iQ depends on the ambient temperature. For ambient temperatures ≤ 23 °C, the lowest attainable temperature is 0 °C. For every 1 °C increase in ambient temperature, the lowest attainable temperature will be 1 °C higher.
For example: For an ambient temperature of 28 °C the lowest attainable temperature will be 5 °C.

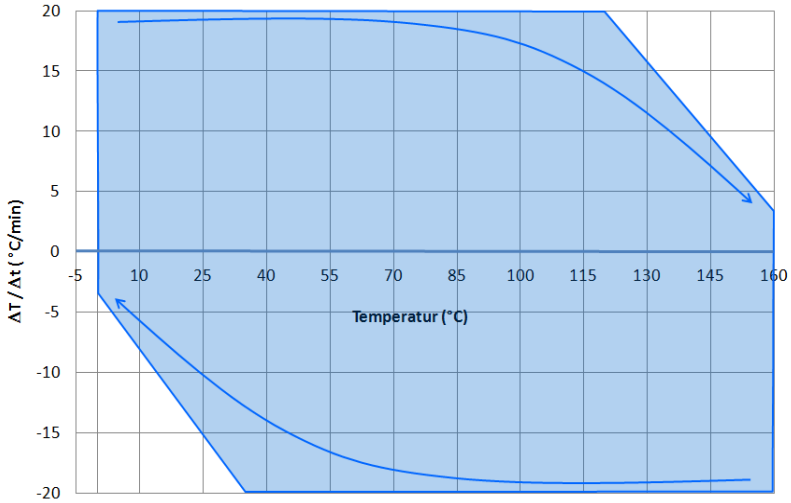
Table 9. Attainable temperature range of the TM-PE-P

Temperature range	Accessories needed	Accessory usage
-0 °C[a] to 160 °C	Sample hood	PEEK hood
	Fluid	pure de-ionized water with additive innovatekProtect IP (3:1 mixture)
	Circulating fluid temperature	around 35 °C
	"Circulator" model	HX iQ
	Hoses	silicone hoses, part of contents of delivery

[a] At an ambient temperature ≤ 23 °C

Figure 47 shows the maximum heating (upper curve) and cooling (lower curve) rates (value on the Y-axis) of the TM-PE-P as a function of the actual (set) temperature (value on the X-axis). The higher the set temperature is, the lower the max. heating rate and the higher the max. cooling rate are. The lower the set temperature is, the higher the max. heating rate and the lower the max. cooling rate are.

Figure 47. Maximum heating and cooling rates of the TM-PE-P as a function of the actual (set) temperature



Temperature modules TM-LI-C32, TM-LI-C48, TM-LI-P

The temperature modules TM-LI-C32 and TM-LI-C48 are designed for the temperature control of coaxial cylinder measuring geometries in the temperature range of -20 °C to 200 °C.

The temperature module TM-LI-P is designed for the temperature control of parallel plate and cone and plate measuring geometries in the temperature range of -20 °C to 200 °C.

Before these temperature modules can be used for the first time, the hoses and quick coupling connectors that are part of the delivery must be mounted first, see "Installing a TM-LI-Cxx or TM-LI-P temperature module" on page 24.

The TM-LI-C32, TM-LI-C48 and TM-LI-P are designed to be used with a separate circulator.

Figure 48. TM-LI-C32 (left) and TM-LI-P (right) with cable

The mounting and dismounting of a coaxial cylinder measuring cup in the TM-LI-C32 or TM-LI-C48 is described in "Mounting/dismounting a cup" on page 30.

Figure 49. TM-LI-C48 with cable

The mounting and dismounting of the TMPxx adapter and the mounting and dismounting of a lower measuring plate in the TM-LI-C32 is described in "Mounting/dismounting a lower plate" on page 31.

The mounting and dismounting of a lower measuring plate on the TM-LI-P is described in "Lower plate on a TM-xx-P temperature module" on page 32.

IMPORTANT When using anti-freeze in the TM-LI-C32, TM-LI-C48 and TM-LI-P make sure that only *silicate free* anti-freeze is used. When using anti-freeze that is not silicate free, the temperature module may get clogged up.

WARNING Secure all hose connections with the proper hose clamps (order number 000-2711 or 006-2387, depending on the maximum temperature).

Note There is no preferred flow direction of the liquid through the TM-LI-C32, TM-LI-C48 and TM-LI-P.

WARNING Make sure the flow through the hoses is not obstructed due to sharp bends in the hoses or squeezing of the hoses.

WARNING The maximum allowable liquid pressure is 0.5 bar.
Only use circulators with a nominal liquid pressure ≤ 0.5 bar.
Do not connect the TM-LI-C32, TM-LI-C48 and TM-LI-P to a mains water conduit.

WARNING Check the hoses for possible damage on a regular basis.

WARNING Replace the hoses once a year. Use original spare parts only (2x 0,5 + 2x 1,5 meter of viton hose, order number 082-1214).

Working principle

In the TM-LI-C32, TM-LI-C48 and TM-LI-P the temperature is controlled by a constant flow of temperature controlled liquid supplied by a circulator.

When the HAAKE Viscotester iQ is used in stand-alone mode, the circulator must be controlled manually from its front panel, since the HAAKE Viscotester iQ can not directly control any circulator.

When the HAAKE RheoWin software is used to control the HAAKE Viscotester iQ, the circulator can also be controlled by the software in case a HAAKE RheoWin device driver is available for the circulator. This is the case for many ThermoScientific circulators .

Performance

The performance of the TM-LI-C32, TM-LI-C48 and TM-LI-P regarding the temperature range and the heating and cooling rates is completely dependent on the performance of the circulator which is supplying the temperature controlled liquid, see Table 10 for examples.

Table 10. Attainable temperature range of a TM-LI-C32, TM-LI-C48 or TM-LI-P with different circulators

Temperature range	Accessories needed	Accessory usage
+5 °C to 90 °C	Sample hood	PEEK hood
	Fluid	pure de-ionized water
	Circulating fluid temperature	+5 °C to 90 °C
	Circulator model	HAAKE SC150-A25
	Hoses	silicon hoses, part of contents of delivery
-20 °C to 90 °C	Sample hood	PEEK hood
	Fluid	water with anti-freeze, 1:1 mixture
	Circulator fluid temperature	-20 °C to 90 °C
	Circulator model	HAAKE AC200-G50
	Hoses	viton hoses with insulation, order number 006-2393
-20 °C to 200 °C	Sample hood	PEEK hood
	Fluid	silicone oil
	Circulator fluid temperature	-20 °C to 200 °C
	Circulator model	HAAKE AC200-G50
	Hoses	viton hoses with insulation, order number 006-2393

Hoods

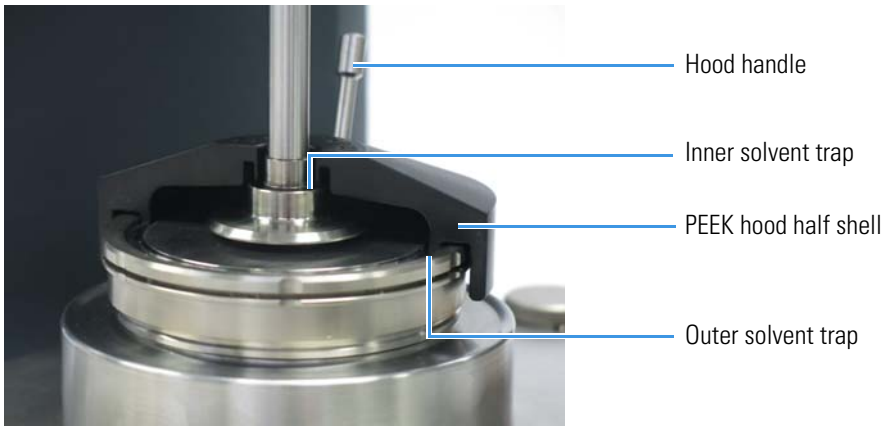
To improve the temperature control of the sample and to reduce the temperature gradient in the sample all TM-xx-x temperature modules can be used with a hood to cover the upper part of the measuring geometry.

For the HAAKE Viscotester iQ two hoods with identical design, but made from different materials, are available. Both hoods can be used with all coaxial cylinder geometries and all parallel plates and cone and plate geometries, see Figure 50, Figure 51 and Figure 52.

A third hood, which is especially designed for the TMP80 EasyClean lower plate, is available in a version made from POM only, see Figure 53.

Each hood consists of two identical half shells which are easily placed on top of the TM-xx-x temperature modules and automatically centered.

Figure 50. PEEK hood on TM-xx-x with parallel plate measuring geometry



The hoods are designed in a such a way that they also function as an almost hermetically closed chamber which can be used in two different ways:

1. By filling the inner and outer solvent trap rings with a solvent, a saturated environment can be created around the sample, to prevent evaporation of the sample.
2. The closed chamber can be flushed by a (very) small but continuous flow of inert gas, to prevent sample oxidation.

CAUTION When flushing the hood with inert gas, make sure that the flow-rate for the inert gas is below 0.1 l/min and that the laboratory is properly ventilated.

Figure 51. PEEK hood on TM-xx-x with concentric cylinder measuring geometry

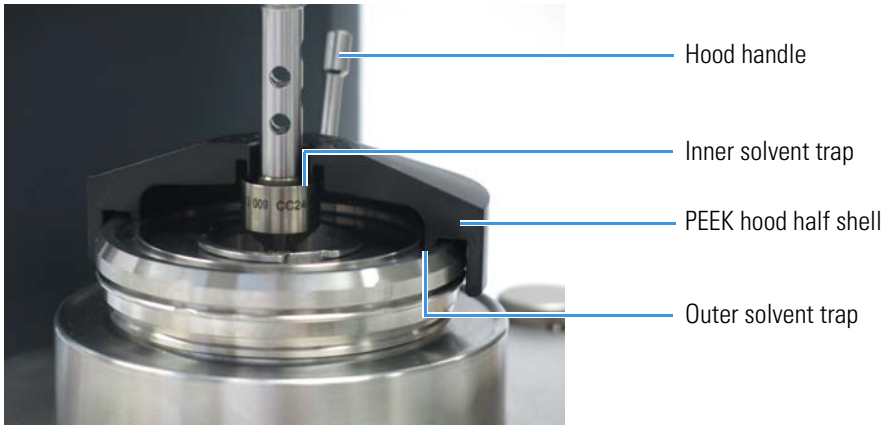


Figure 52. PEEK hood on TM-xx-x closed

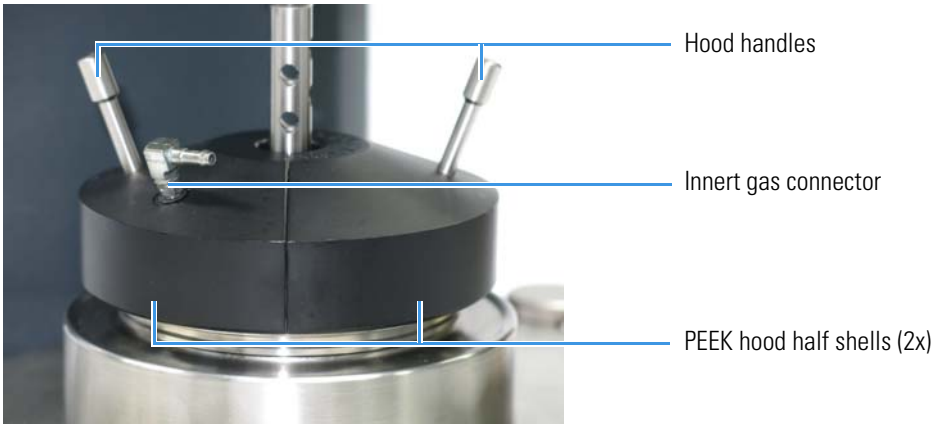
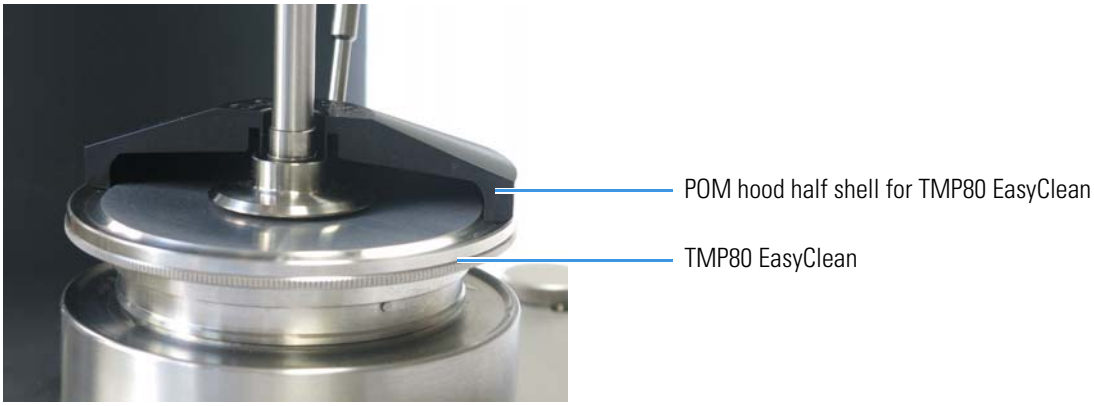


Figure 53. POM hood for TMP80 EasyClean



POM hood for TMP80 EasyClean

The POM hood for TMP80 EasyClean is made from Polyoxymethylene (POM). Due the relative low melting point of POM it can be used for temperatures up to 120 °C only.

PEEK hood

The PEEK hood is made from Polyether ether ketone (PEEK). Due to the high melting point of PEEK it can be used for temperatures up to 250 °C.

A

Technical Specifications

This appendix contains the technical specifications of the HAAKE Viscotester iQ, Instruction Manual rheometer and the optionally available temperature modules. For more detailed information contact your local sales representative or Thermo Scientific directly.

HAAKE Viscotester iQ rheometer

This section contains the technical specifications for the HAAKE Viscotester iQ rheometer.

Drive motor

Table 11 list the specifications of the HAAKE Viscotester iQ drive motor.

Table 11. HAAKE Viscotester iQ drive motor specifications

Property	Value		
Maximum torque	0.10 N m	100 mN m	10^5 µN m
Minimum torque	2 10^{-4} N m	0.2 mN m	200 µN m
Torque resolution	5 10^{-6} N m	0.005 mN m	5 µN m
Maximum angular velocity	1500 1/min	157 rad/s	
Minimum angular velocity	0.01 1/min	0.001 rad/s	
Angle resolution	1.25 µrad		
Maximum oscillation frequency	20.0 Hz	125.7 rad/s	
Minimum oscillation frequency	0.1 Hz	0.628 rad/s	
Motor inertia	32.5 10^{-6} kg/m^2		
Motor type	EC-motor[a]		
Bearing type	Ball-bearing 2x		

[a] EC-motor: Electronically Commutated motor

Table 12 list the specifications of the HAAKE Viscotester iQ Air drive motor.

Table 12. HAAKE Viscotester iQ Air drive motor specifications

Property	Value		
Maximum torque	0.10 N m	100 mN m	10^5 µN m
Minimum torque	1 10^{-5} N m	0.01 mN m	10 µN m
Torque resolution	1 10^{-6} N m	0.001 mN m	1 µN m
Maximum angular velocity	1500 1/min	157 rad/s	
Minimum angular velocity	0.01 1/min	0.001 rad/s	
Angle resolution	1.25 µrad		
Maximum oscillation frequency	50.0 Hz	314.2 rad/s	
Minimum oscillation frequency	0.1 Hz	0.628 rad/s	
Motor inertia	45 10^{-6} kg/m^2		
Motor type	EC-motor[a]		
Bearing type	Air-bearing		

[a] EC-motor: Electronically Commutated motor

Dimensions, power consumption

This section contains information on the dimensions and the power consumption of the HAAKE Viscotester iQ instrument and the power supply unit.

Main instrument

Table 13 lists the mechanical properties of the HAAKE Viscotester iQ with and without the optional heat exchanger for the TM-PE-x. The electrical properties of the instrument are defined by those of the power supply unit, see Table 15 below.

Table 13. HAAKE Viscotester iQ mechanical properties

Property	Value	
Height, maximal/in measuring position	500 mm / 430 mm	19.7 inch / 17 inch
Width	270 mm	10.6 inch
Depth, without/with heat exchanger	340 mm / 500 mm	13.9 inch / 19.7 inch
Weight of instrument head (with column)	5 kg	11 lbs
Weight of instrument head (without column)	3.6 kg	8 lbs
Weight[a] (complete, ready for measurement)	18 kg	40 lbs

[a] The table list the max. weight, i.e. the weight of VTiQ, TM-PE-x, HXiQ, measuring geometry, power supply. Other configurations will weigh less.

Table 14. HAAKE Viscotester iQ electrical properties

Property	Value
Input voltage	24 Volt DC ±10%
Input current, max.	8 A
Power consumption, max.	192 W
Sound level, max.[a]	67 dB(A)

[a] Value valid for Viscotest iQ plus HX iQ, according to IEC 61010-1 at 1 m distance aside of the instrument

Power supply unit

The power supply supplies the electrical power for both the Viscotester iQ instrument head and the (optional) heat exchanger iQ.

Table 15 lists the mechanical and electrical properties of the power supply unit and thus that of the Viscotester iQ.

Table 15. Power supply unit mechanical and electrical properties

Property	Value
Height	45 mm (1.8 inch)
Width	85 mm (3.4 inch)
Depth	210 mm (8.3 inch)
Weight (incl. cables)	1.3 kg (2.9 lbs)
Mains voltage	100 V - 240 V AC ±10%
Mains frequency	50 Hz - 60 Hz
Power consumption, max./ idling[a] / standby[b]	220 W / ≤ 9 W / ≤ 0.5 W
Input current	4.0 $A_{eff.}$
Protective class	1
Mains connection	EN 60950
Output voltage	24 V
Output current	9.2 A
Type of protection (EN 60529)	IP 20

[a] Instrument switched on with no measurement running and with no temperature control running

[b] Instrument switched off with power supply connected to mains

Temperature modules

Table 16 lists the minimum and maximum temperature values that can be achieved with the different temperature modules. For more detailed information on the performance (heating/cooling rate etc.) of the modules see Chapter 6, “Temperature Modules,” starting from page 45.

Table 16. Overview over the temperature modules

Name	Type	Fluid flow (for cooling)	Measuring geometries	T-min (in °C)	T-max (in °C)
TM-PE-C	Peltier	Liquid [a]	Coaxial cylinder Parallel plate and cone and plate[a]	-5 0	160 140
TM-PE-P	Peltier	Liquid	Parallel plate and cone and plate	0	160
TM-LI-C32	Liquid [c]	Liquid	Coaxial cylinder Parallel plate and cone and plate[a]	-20 -20	200 200
TM-LI-C48	Liquid	Liquid	Coaxial cylinder Parallel plate and cone and plate[a]	-20 ---	200 ---
TM-LI-P	Liquid	Liquid	Parallel plate and cone and plate	-20	200

[a] With TMP-adapter.

With the external Pt100 temperature sensor (see"HAAKE Viscotester iQ RheoApp software" on page 25) the HAAKE Viscotester iQ can measure temperatures in the range from -50 °C to +390 °C.

B

Accessories

This appendix contains information on the optional accessories and their contents of delivery as well as spare parts (where applicable) that are available for the HAAKE Viscotester iQ, Instruction Manual.

Temperature modules and hoods

This section contains information on the contents of delivery of and spare parts for the temperature modules as well as information on the hoods.

TM-PE-C temperature module

See Table 17 for the order number and part numbers for the TM-PE-C temperature module.

Table 17. Temperature module TM-PE-C

Accessory	Order number
Temperature module TM-PE-C (complete)	222-2431

Contents of delivery	Part number
Temperature module TM-PE-C, incl. silicone hoses and quick-couplings	006-4033
Bayonet clamping ring	006-1595
Heat exchanger iQ (HX iQ), incl. silicone hoses and quick-couplings	222-2438
Bolts for mounting heat exchanger iQ to instrument base (2 pieces)	085-1105
Cooling liquid additive for TM-PE-x / HX iQ, 250 ml bottle, innovatekProtect IP	082-5474

See Figure 13 on page 20 for a photo of the contents of delivery of the TM-PE-C. See the chapter "Temperature module TM-PE-C" on page 46 for more information on this module.
See "Cooling liquid additive" on page 66 for more information on the additive.

TM-PE-P temperature module

See Table 18 for the order number and part numbers for the TM-PE-P temperature module.

Table 18. Temperature module TM-PE-P

Accessory	Order number
Temperature module TM-PE-P (complete)	222-2430

Contents of delivery	Part number
Temperature module TM-PE-P, incl. silicone hoses and quick-couplings	006-4035
Bayonet clamping ring	006-1182
Heat exchanger iQ (HX iQ), incl. silicone hoses and quick-couplings	222-2438
Bolts for mounting heat exchanger iQ to instrument base (2 pieces)	085-1105
Cooling liquid additive for TM-PE-x / HX iQ, 250 ml bottle, innovatekProtect IP	082-5474

See Figure 13 on page 20 for a photo of the contents of delivery of the TM-PE-P. See the chapter "Temperature module TM-PE-P" on page 49 for more information on this module.
See "Cooling liquid additive" on page 66 for more information on the additive.

TM-LI-Cxx and TM-LI-P temperature modules

See Table 19 for the order number and part numbers for the TM-LI-C32 temperature module.
See Table 20 for the order number and part numbers for the TM-LI-C48 temperature module.
See Table 21 for the order number and part numbers for the TM-LI-P temperature module.

Table 19. Temperature module TM-LI-C32

Accessory	Order number
Temperature module TM-LI-C32	222-2256

Contents of delivery	Part number
Temperature module TM-LI-C32, including viton hoses Ø8x2, 2 pieces of 0,5 m length each with male quick coupling connectors	006-3248
Bayonet clamping ring	006-1595
Hose set for connecting with a circulator (see Table 22)	006-4377

See Figure 19 on page 24 for a photo of the contents of delivery of the TM-LI-C32. See chapter "Temperature modules TM-LI-C32, TM-LI-C48, TM-LI-P" on page 51 for more information on TM-LI-C32 module.

Table 20. Temperature module TM-LI-C48 (Sheet 1 of 2)

Accessory	Order number
Temperature module TM-LI-C48	222-2255

Contents of delivery	Part number
Temperature module TM-LI-C48, including viton hoses Ø8x2, 2 pieces of 0,5 m length each with male quick coupling connectors	006-2944

Table 20. Temperature module TM-LI-C48 (Sheet 2 of 2)

Accessory	Order number
Bayonet clamping ring	006-2389
Hose set for connecting with a circulator (see Table 22)	006-4377

See Figure 19 on page 24 for a photo of the contents of delivery of the TM-LI-C32 which is similar to that of the TM-LI-C48.

Table 21. Temperature module TM-LI-P

Accessory	Order number
Temperature module TM-LI-P (	222-1909

Contents of delivery	Part number
Temperature module TM-LI-P, including viton hoses Ø8x2, 2 pieces of 0,5 m length each with male quick coupling connectors	006-1517
Bayonet clamping ring	006-1182
Stellfüße (3x)	006-4336
Hose set for connecting with a circulator (see Table 22)	006-4377

All TM-LI-x are delivered with a hose set for connecting the module with a circulator, see Table 22.

Table 22. Hose set for TM-LI-C32, TM-LI-C48 and TM-LI-P temperature modules

Accessory	Order number
Hose set for TM-LI-C32, TM-LI-C48 and TM-LI-P temperature modules for connecting with a circulator	006-4377

Contents of delivery	Part number
Viton hoses Ø8x2, 2 pieces of 1,5 m length each	082-1214
Female quick coupling connector (2 pieces)	006-1577
Hose clamps (4 pieces)	006-2387
1 red and 1 blue o-ring (006-4328 and 006-4329)	

Temperature offset calibration tool

A special fully automatic temperature offset calibration tool which consist of a PC software program and a digital temperature sensor plus other hardware is available under order number 222-2206.

Hoods

See Table 23 for the order number and part numbers for the optional hoods which can are compatible with all TM-PE-C and TM-LI-Cxx and all measuring geometries.

Table 23. Hoods

Accessory	Part number
PEEK hood (max. temperature 250 °C)	222-2163
POM hood for TMP80 “EasyClean” lower plate (max. temperature 120 °C)	222-2077

See the “Hoods” on page 53 for more information on the hoods.

Measuring geometries and measuring accessories

For a list of the measuring geometries and adapters that are available for the HAAKE Viscotester iQ see Appendix A, “Properties of Measuring Geometries.” in the HAAKE Viscotester iQ, Instruction Manual Reference Manual.

Table 24. Measuring accessories

Accessory	Part number
Immersion tube 32 mm	222-2340
Immersion tube 48 mm	222-2341
Original container holder with triangular plate	222-2049
Holder with temperature sensor Pt 100, for temperature range -20 °C to 180 °C	222-2458
Temperature sensor Pt100, for temperature range -20 °C to 180 °C	222-2457
Protective cap set (10 pieces) for Connect Assist coupling	222-2332
Fill Assist tool for coaxial cylinder geometries	222-2194
Adapter TMP (for using a lower measuring plate) for temperature module TM-PE-C and TM-LI-C32	222-2010
Adapter TMP (for using a lower measuring plate) for temperature module TM-LI-C48	222-2212
Gap setting tool, including 0.1 mm and 0.15 mm calipers (3 each) for cone and plate geometry setting	222-2190
0.1 mm precision calipers (3 pieces) for all 2° cone and plate geometries	006-2458
0.15 mm precision calipers (3 pieces) for all 3° and 4° cone and plate geometries	006-2467
0.5 mm precision caliper (for parallel plate geometry gap setting)	222-2159
1.0 mm precision caliper (for parallel plate geometry gap setting)	222-2160
1.5 mm precision caliper (for parallel plate geometry gap setting)	222-2161
2.0 mm precision caliper (for parallel plate geometry gap setting)	222-2162

See the separate short instructions 006-4486, Immersion tube for more information on the immersion tube.
See the separate short instructions 006-4072, Universal container holder for more information on the original container holder.
See the separate short instructions 006-4485, External temperature sensor for more information on the external temperature sensor.

Software and network connection

This section contains information on software and network connection accessories.

Table 25. Software and network connection accessories

Accessory	Part number
Option Oscillation (CS, CD) for Viscotester iQ	222-2207
Software HAAKE RheoWin for HAAKE Viscotester iQ (delivered on a DVD)	098-5062
Software HAAKE RheoWin for HAAKE Viscotester iQ-Air (delivered on a DVD)	098-5075
CFR Part 11 tool for HAAKE RheoWin (for VT 6, 7(plus), D, E, 550, iQ, iQ-Air)	098-5039
USB to Ethernet adapter	222-1760

Miscellaneous accessories

This section contains information on miscellaneous accessories.

Table 26. Miscellaneous accessories

Accessory	Part number
Set of screen protector films (10 pieces)	222-2148
Mini keyboard (USA layout only) with USB cable	222-2164
Bar code reader with USB cable	222-2165
Dust protection cover with Thermo logo (Material: cloth)	603-1010
Transport case, also see the HAAKE Viscotester iQ Reference Manual.	222-2136
Compressor Silent Air System SAS-038 230 Volt (WxDxH = 40x34x32 cm, 17 kg)	222-2288
Compressor Silent Air System SAS-038 115 Volt (WxDxH = 40x34x32 cm, 17 kg)	222-2289

Cooling liquid additive

The innovatekProtect IP cooling liquid additive (see Figure 54) is part of the standard TM-PE-C delivery and must be used in the HX iQ heat exchanger.

The innovatekProtect IP additive is to be used in a 1:3 mixture with distilled water. Since the total volume needed is approximately 190 ml, 50 ml of the additive is to be used (mixed) with 140 ml of distilled water.

A copy of the original EEC-Safety Data Sheet of the innovatekProtect IP additive is available on the HAAKE Viscotester iQ RheoApp USB flash drive, which is part of the delivery of any HAAKE Viscotester iQ and Viscotester iQ Air rheometer.

Figure 54. innovatekProtect IP in 250 ml plastic bottle

Maintenance

This chapter describes basic maintenance which can be performed by the operator.

Cleaning the instrument

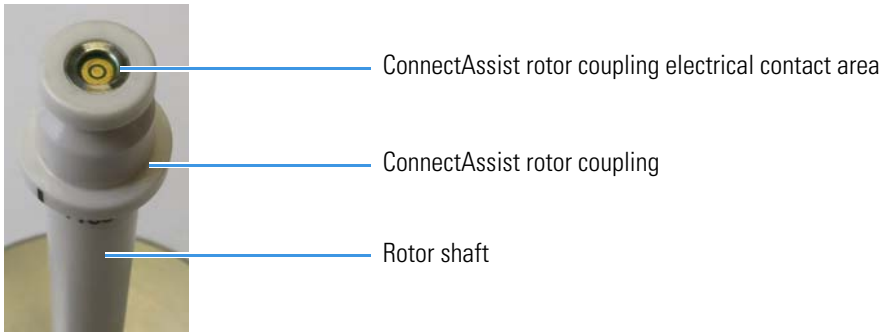
Clean the instrument base and the instrument head on a regular basis, using a suitable cleaning agent.

CAUTION Do not use aceton as a cleaning agent on any surface other than stainless steel.

Cleaning a rotor

The surface of the rotor that comes in contact with the sample can be cleaned with any suitable standard laboratory solvent (for example alcohol, aceton, etc.).

Figure 55. ConnectAssist rotor coupling



IMPORTANT When cleaning a rotor, the ConnectAssist coupling side of a rotor must *not* be immersed in or cleaned with a solvent (apart from isopropyl alcohol). When not attached to the rheometer the rotor must *not* be exposed to temperatures above 65 °C.
Failure to comply with the above may damage the rotor ID-tag (in the rotor shaft).

IMPORTANT In case a rotor must be cleaned in a laboratory dishwasher or a similar device, the ConnectAssist coupling side of the rotor must be equipped with a protective cap to prevent it from coming into contact with the washing agent. A set of 10 protective caps is available as part number 222-2332.

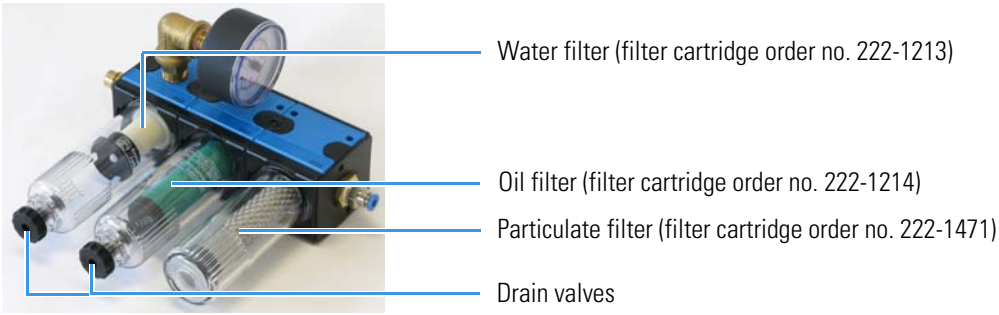
IMPORTANT For cleaning the electrical contact area of the ConnectAssist coupling side of any rotor *only* 99.9% pure isopropyl alcohol (2-propanol) should be used. Any other substance may damage the electrical contact area.

Servicing the air filter (VT iQ Air only)

Check the cups of the water and oil filter daily, drain excessive water and oil from the cups using the drain valves, see Figure 56.

Exchange the three removable filter cartridges at least once a year.

Figure 56. Air-filter unit for HAAKE VTiQ Air (order no. 222-1211)



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