Anton Paar

Instruction Manual and Safety Information

ViscoQC 100 H
ViscoQC 100 L
ViscoQC 100 R

Find out more

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1 Safety instructions

Read the documentation

- Read the documentation before using the product.
- Follow all hints and instructions in the documentation to ensure the correct use and safe functioning of the product.

1.1 General safety instructions

General

- The documentation is a part of the product. Keep it for the complete working life of the product and make it easily accessible to all persons involved with the product. If you receive any additions or revisions from Anton Paar, these must be treated as part of the documentation.

Liability

- This document does not claim to address all safety issues associated with the use of the product and samples. It is your responsibility to establish health and safety practices and to determine the applicability of regulatory limitations.
- Anton Paar only warrants the safe and proper functioning of the product if no modifications are made to mechanics, electronics, or software.
- Use the product only for the purpose described in the documentation. Anton Paar is not liable for damages caused by incorrect use of the product.
- The results delivered by the product depend on the correct function of the product and various other factors. We recommend that you have experts check the results (i.e., perform plausibility testing) before taking consequential actions based on the results.
- The proper function of the instrument's protective devices is only guaranteed when operated correctly within the specified scope of applications.

General precautions

- Observe and adhere to your national safety regulations regarding the handling of all substances associated with your measurements (e.g. use safety goggles, gloves, respiratory protection, etc.).
- Substances used must be labeled. The corresponding material safety data sheets must be observed and made available near the measuring setup.
- Samples and cleaning liquids that have been used in the measuring system are not suited for human consumption after use.
- Check the wetted parts of the product for chemical resistance to all samples and cleaning liquids.
- Take care that samples, cleaning liquids and gases are chemically compatible when they come into contact with each other. They must not react exothermally or produce hazardous substances.

Installation

- Install the product so that you can easily separate it from the electrical supply (pull the power plug) at any time.
- The installation procedure shall only be carried out by authorized personnel who are familiar with the installation instructions.
- Never use the product outside the specified ambient conditions and specifications.
- Use only accessories, consumables, or spare parts supplied or approved by Anton Paar.
- Do not expose the product to direct sunlight for extended periods of time.

Using the product

- Ensure that all operators have been trained beforehand to use the product safely and correctly.
- Ensure that the product is sufficiently supervised during operation.
- In case of damage or malfunction, stop operating the product. Do not operate the product under conditions that could result in damage to goods or injuries or loss of life.
- If you suspect that spilled substances got into the product, disconnect the product from the electrical supply and have it checked for electrical safety by a service technician authorized by Anton Paar.

Operator's skills

- All personnel involved in the operation and/or maintenance of the product must be qualified or properly instructed in its use.
- Operators must be able to read and understand the instructions within the manual.
- It is the owner's responsibility that all operators are sufficiently trained in the correct and safe use of the product.
- Operators must be able to judge dangerous situations and take the right measures to prevent accidents, injury and damage.
- Operators must have knowledge of chemistry and its rules.

Precautions for flammable samples and cleaning agents

- Keep potential sources of ignition, like sparks or open flames, at a safe distance from the product.
- Store only the minimum required amount of sample, cleaning liquids, and other hazardous materials near the product.
- Place the product and all samples in a fume hood of adequate capacity.

- Do not spill sample/cleaning liquids or leave their containers uncovered. Immediately remove spilled sample/cleaning liquids.
- Ensure that the setup location is sufficiently ventilated. The environment of the product must be kept free from flammable gases and vapors.
- Provide fire-extinguishing equipment.

Operation in areas with risk of explosion

- The product is **not** explosion-proof and therefore must not be operated in areas with risk of explosion.

Service and repairs

- Service and repair procedures may be carried out only by authorized persons or by Anton Paar.

Disposal

- Concerning the disposal of the product, observe the legal requirements in your country. Contact your Anton Paar representative for further questions.

1.2 Special safety instructions

- Do not use the product to measure fluids of the IIC group according to EN 60079-14, such as e.g. carbon disulfide or acetylene.
- Move the head up and down using the hand wheel on the head.
- To move or lift the product, grasp the rod of the stand with one hand and the foot of the stand with the other hand. Do not take the product by the measuring head, nor by the spindle guard.
- Carry the product in front of you and keep it close to your body.
- Disconnect spindles or measuring systems by pulling them sideways. This reduces strain on and wear of the internal low-friction bearing.

1.3 Remaining risks

Knocking over the product might cause damage to other lab equipment due to the instrument's weight. If measuring hazardous samples, take care not to knock over the sample vessel. The spillage of hazardous samples represents a serious health risk.

CAUTION

Risk of injury, health risk

Using chemically or biologically hazardous chemicals as samples or cleaning liquids is a health risk. Measuring at high (> 40 °C) or low temperatures (< 0 °C) is a health risk.

The above risks could cause serious injuries unless special precautions are taken.

- Consult the material safety data sheets of the sample substances and cleaning liquids.
- Operate the instrument in a fume hood and make sure to use suitable protective equipment.

Wear safety gloves

Wear protective gloves when handling samples and cleaning liquids.

Wear safety goggles

Wear safety goggles when handling samples and cleaning liquids.

Use protective clothing

Wear protective clothing when handling samples and cleaning liquids.

2 Overview

ViscoQC 100 is a rotational viscometer that determines the dynamic (apparent) viscosity. The instrument serves for quality control of liquid samples such as solvents up to semi-solid substances such as lotions. It returns instant results on a built-in color screen. The instrument has no data memory for storing results. Continuous data output is possible to a printer or via V-Collect Software installed on a PC. Refer to Section 4.2.3 [▶ 11].

The Toolmaster™ system automatically recognizes connected measuring systems (spindles and cylinder systems). A Pt100 temperature sensor allows to monitor the temperature of the measured sample.

A magnetic coupling serves as connection for spindles or measuring systems. This reduces the risk to bend or damage parts.

Fig. 1: *Rotational viscometers: ViscoQC 100*

2.1 Intended use of the instrument

ViscoQC 100 is an instrument for determination of dynamic viscosity. It can measure a wide range of viscous and viscoelastic samples within the specified measuring range. There are three different models available for different viscosity measuring ranges (L – low, R – regular, and H – high). These ranges depend on the torque range of the model. Refer to Appendix A [▸ 27].

NOTICE

Risk of damage to the instrument

- Do not test a sample if you do not know which cleaning liquid removes this sample. Make sure the wetted parts of the instrument are chemically resistant to any tested sample or cleaning liquid.
- Do not test any samples which harden or solidify during the time they are in contact with parts of the instrument.
- Do not test any samples that are specified in Section 1.2 [▸ 6].

2.2 Functional components

Fig. 2: *ViscoQC 100 - front view*

1 Arrow keys – move up or down on the display (through quick access buttons, the menu, or lists)
2 Hand wheel – move the measuring head up or down
3 Measuring head retention
4 Rod of stand
5 Foot of stand
6 Leveling screws – level the ViscoQC
7 Spindle coupling (magnetic)
8 Context keys (three) – perform the functions displayed above each key
9 Start / Stop key – start or stop a measurement
10 Display
11 ViscoQC 100 measuring head

Turn the hand wheel to move the measuring head up or down. If you are in front of ViscoQC, turn the hand wheel towards you to lower the head; turn the hand wheel away from you to lift the head.

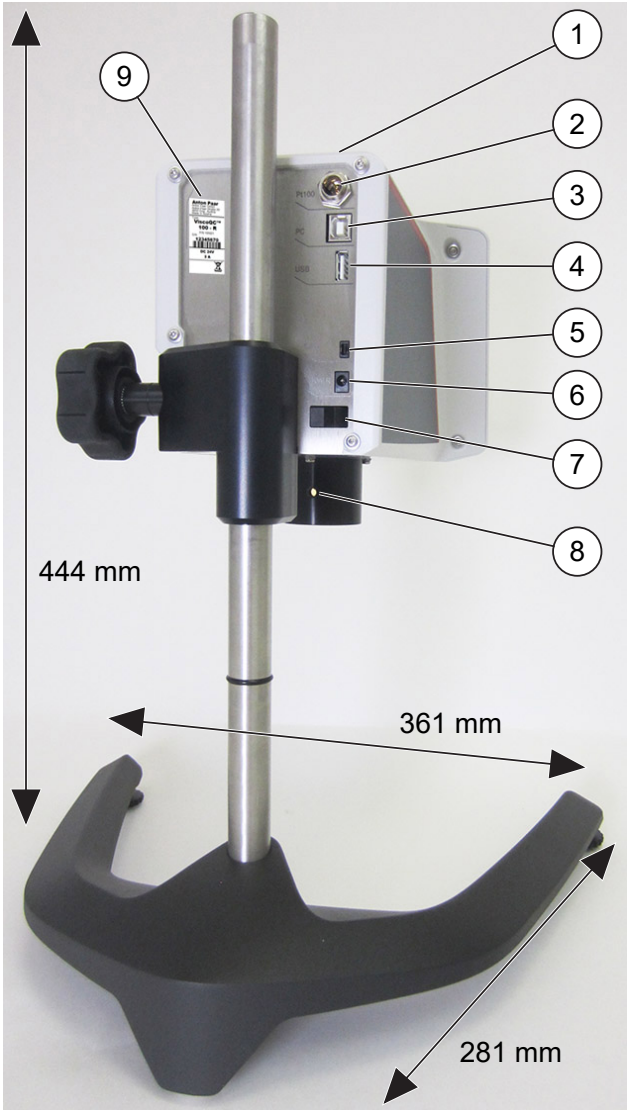


Fig. 3: *ViscoQC 100 - rear view*

1 *ViscoQC 100 measuring head*
2 *Interface for optional Pt100 temperature sensor*
3 *PC interface (for V-Collect Software)*
4 *USB interface – to connect a USB printer, or for firmware update from storage device. No data storage to USB device possible.*
5 *CAN interface for optional accessories*
6 *Power inlet*
7 *Power switch*
8 *Mount for spindle guard or measuring cup on the measuring flange*
9 *Type plate with serial number*

3 Supplied parts

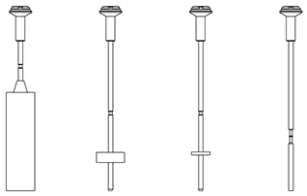
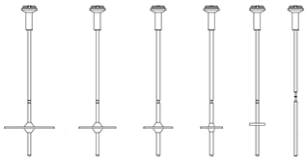
The product was tested and packed carefully before shipment. However, damage may occur during transport.

– Keep the packaging material (box, foam piece, transport protection) for possible returns and further questions from the transport and insurance company.
– Check the delivery for completeness by comparing the supplied parts to those noted in the table(s) below.
– If a part is missing, contact your Anton Paar representative.
– If a part is damaged, contact the transport company and your Anton Paar representative.

Table 1: Supplied parts

	Qty.	Description	Mat. No.
	1	ViscoQC 100 – L [a] or ViscoQC 100 – L [a] or ViscoQC 100 – L [a] *(with transport protection for magnetic coupling – indicated by the arrow)*	105020 105021 105022

[a] *Refer to Appendix A [▸ 27] for specifications of viscosity and torque measuring range.*

	1	Viscometer stand (above picture)	189184
	1	Set of spindles depending on torque model:	
		Set L-spindles – supplied with ViscoQC 100 - L: consisting of 4 spindles L1 to L4 *Order a guard (if required) separately:* *Guard L: Mat. No. 191707*	190845
		Set RH-spindles – supplied with ViscoQC 100 - R / H: consisting of 6 spindles RH2 to RH7 *Order a guard (if required) separately:* *Guard R: Mat. No. 191718*	190846
	1	Set of torque range stickers L / R / H *Find this set on the front page of this instruction manual.*	189804
	1	Power supply unit with connection cable to ViscoQC (comes in a cardboard box – *a reminder to remove the ViscoQC transport protection covers the box*)	186547
	1	one of the following power cords Power cord EUR Power cord USA Power cord GBR Power cord Switzerland Power cord China Power cord Brazil Power cord Thailand Power cord Australia	 52112 52656 61865 93408 27011 130117 79730 173747
	1	USB cable (1.8 m)	94228
	1	Standard Operating Procedure (SOP)	
	1	Instruction Manual and Safety Information	

4 Installation

Find all Technical Data and required ambient conditions in Appendix A [▶ 27].

4.1 Installation requirements

Read the Safety Instructions in Section 1 [▶ 5].

NOTICE

Risk of damage to the instrument

Before switching the instrument on, make sure that the correct line voltage and line frequency are available (AC 100 V to 240 V, 50/60 Hz). If large voltage fluctuations are to be expected, we recommend using a constant voltage source (UPS).

4.1.1 Environmental requirements

The setup location and surroundings should meet the requirements of a typical laboratory.

Place the product on a stable, flat lab desk that is free of vibrations.

To ensure temperature stability and trouble-free measurement never locate your product:

- next to a heating facility
- near an air conditioning, ventilation system or an open window
- in direct sunlight

Keep the product away from magnetic fields.

4.2 Installation

1. Carefully unpack the instrument. Lift it out of the box by the rod of the stand and place it on the lab desk.
2. Unscrew the transport protection from the magnetic coupling by turning it clockwise.

   Keep the transport protection for later use.
3. If required, place the correct torque range sticker (L, R, or H) clearly visible on the ViscoQC measuring head (e.g. on top or on the side).

Fig. 4: *Removing the transport protection*

1 Transport protection

4. Connect optional equipment (e.g. printer) to the corresponding interfaces.
5. Allow the equipment to reach ambient temperature before installation. This is very important if the equipment has been stored or transported at lower temperatures.

4.2.1 Connecting and switching on the instrument

WARNING

High voltage. Risk of injury or death

- Connect the power supply unit of the instrument to the mains via protective earthing only.
- Never connect the power supply unit to the mains via protective separation or protective insulation.
- Make sure that the non-fused earth conductor of the power cord is connected to earth.

1. Connect the power supply unit of ViscoQC to the mains using the supplied power cord.
2. Connect the power supply unit and the power inlet of ViscoQC.
3. Switch the instrument on using the power switch on the rear of the measuring head. ViscoQC boots.

4.2.2 Language settings, level/zero adjust

1. After start-up, choose your operating language:
   - **By default, ViscoQC is set to English.** Tap *Edit* to open the drop-down list containing available languages.
   - Move through the list using the arrow keys.
   - Tap *Apply* to choose a language.
   - Tap *Apply* to confirm your setting.
2. Level ViscoQC by turning the two leveling screws on the foot of the stand. An adjusted, built-in leveling chip serves as reference. Center the colored dot in the small inner circle. The colored dot shrinks when approaching the level position

   A: RED – Adjust the two leveling screws.

   B: YELLOW – Wait; the instrument stabilizes.

   C: GREEN – ViscoQC is correctly leveled.
3. Tap *Apply* to continue.

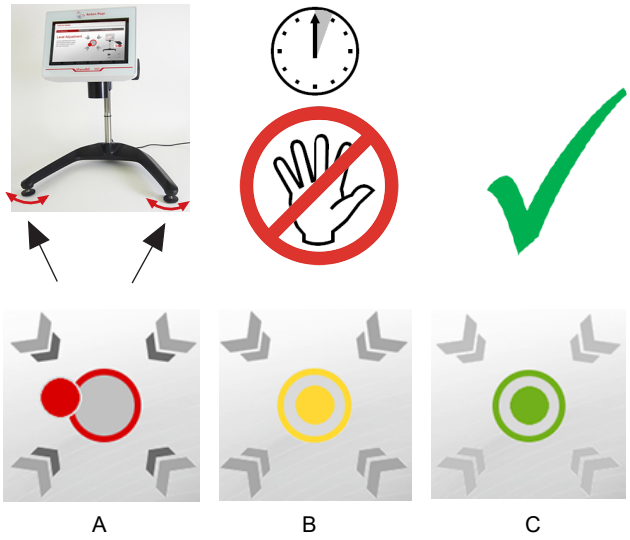


Fig. 5: *Levelling ViscoQC*

If you skip the level adjust, you directly jump to the main screen. It is not possible to measure, you can only open the menu and quick access functions.

Zero adjust

For correct function of ViscoQC the instrument determines the start position for zero torque without load (i.e. spindle or measuring system).

1. ViscoQC prompts you to remove the spindle. Tap *Next* to continue.
2. ViscoQC performs a Zero Adjust. Do not touch the instrument. Once the Zero Adjust is finished, tap *Apply*.
   In case you abort the Zero Adjust by tapping *Abort* and then *Cancel*, you can access main screen and menu, but cannot perform measurements.
3. ViscoQC is now ready for operation. Connect a spindle or measuring system.

You can start a Level/Zero Adjust any time from the menu. Tap *Menu* and select *Adjusts* > *Level/Zero Adjust*.

TIP: *Perform these adjustments every time you moved ViscoQC. Every time ViscoQC boots, the Level Adjust screen comes up.*

4.2.3 Mounting additional components

In case you use additional or optional equipment, connect and/or install it as follows.

4.2.3.1 Pt100 sensor

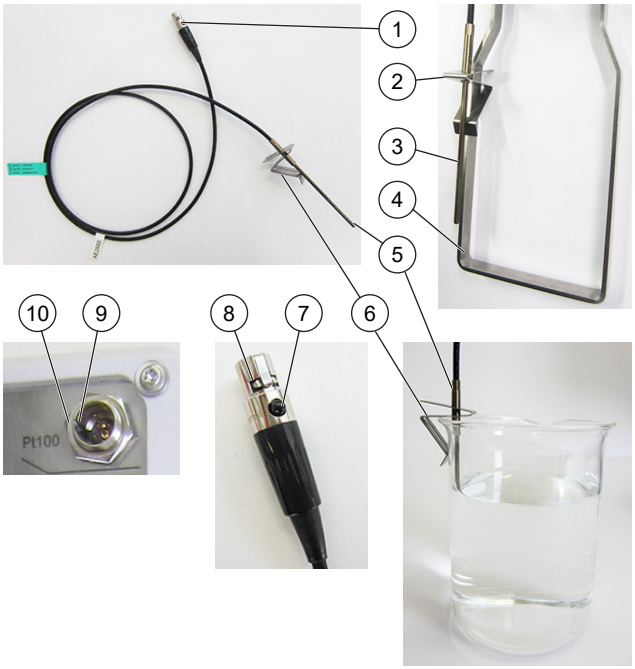


Fig. 6: *Setting up the Pt100 sensor*

1 Pt100 plug
2 Clip for fixing Pt100 sensor
3 Pt100 sensor
4 Spindle guard
5 Pt100 sensor
6 Clip for fixing Pt100 sensor
7 Release knob
8 Pt100 guide
9 Recess for Pt100 guide
10 Pt100 socket

Plug the optional Pt100 sensor into the connector on the rear of ViscoQC. Fit the guide on the Pt100 plug into the recess of the socket. Immerse the Pt100 sensor in the sample vessel. Fix the Pt100 sensor on the rim of the sample vessel or on the guard with the metal clip.

The sensor must not touch the spindle. If required, perform a temperature calibration and set a temperature offset (Section 6.2.1 [▶ 16]).

To disconnect the Pt100 cable, press the release knob on the plug and pull out the plug.

The Pt100 sensor is also suitable for use with a DIN Adapter (Section 8.1.2 [▶ 21]).

4.2.3.2 Printer

For printout of measurement results, Anton Paar offers a USB label printer.

– Recommended label size: 90 mm x 29 mm

First, connect the printer cable to the printer. Then plug the printer cable into the USB interface of ViscoQC. Connect the printer to the mains. Follow the safety and operating instructions of the printer's documentation.

TIP: *If "Automatic Printout" is active, ViscoQC automatically prints when a measurement is finished. The instrument has no data memory from which data can be retrieved.*

4.2.3.3 V-Collect software

You can connect ViscoQC to a PC with USB interface and export the measurement results directly to MS Excel via V-Collect Software.

Plug the supplied USB cable into the PC interface and to ViscoQC. Install V-Collect software (macro-based MS Excel Add-in). You need administrator rights on the PC in question.

TIP: *Always use the latest version of V-Collect.*

Download V-Collect software here:

www.anton-paar.com/viscoqc-webpack

Fig. 7: *QR code for download of V-Collect package*

PC software requirements

- Windows 7 or newer
- Microsoft Excel 2010 or newer

Find instructions how to install and operate V-Collect software in the download package.

4.2.3.4 Temperature device or bath thermostat

For accurate temperature control use a Peltier Temperature Device:

- PTD 80 (+15 °C to +80 °C),
- ETD 300 (+25 °C to +300 °C), or
- PTD 100 Cone-Plate (0 °C to +100 °C).

Refer to Appendix B [▸ 27] to learn which measuring system is suitable for the used device.

For basic temperature control of samples in 600 mL beakers, use a bath thermostat.

Recommended:

- Julabo CORIO™ C-BT5 bath thermostat +
- Stainless bath cover for 600 mL beaker +
- Stand for Bath Thermostat CORIO™ C-BT5

Refer to the ViscoQC Temperature Devices Instruction Manual or the ViscoQC Product Description List.

5 Operation

5.1 The display

Main screen

The **header** shows the connected spindle/measuring system and the maximum viscosity that is measurable with this spindle and speed. On the right the connected spindle guard is shown (if used).

The **content area** shows measuring parameters and data. It is constantly updated during measurement. The data are frozen after measurement until you tap *Home* (middle context key). The number and appearance of displayed fields depends on the current measurement mode.

The **progress bar** displays the selected measurement mode. It shows information on the status of a measurement, while a counter on the right shows the measuring time.

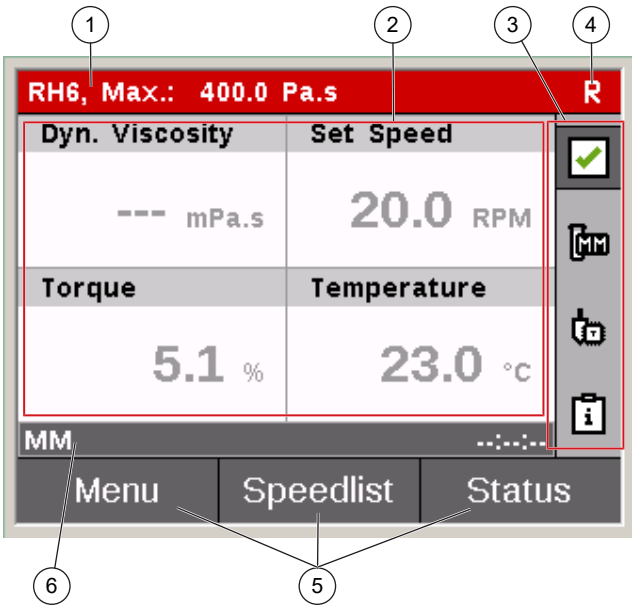


Fig. 8: *Main screen - example: ViscoQC 100 - R*

1 Header
2 Content area
3 Quick access area
4 Type of guard/DIN adapter
5 Functions of context keys
6 Footer/progress bar

The ideal torque range is between 10 - 100 %.

Torque < 10 %	Dynamic viscosity and torque appear gray
Torque < 0 %	"---" no dynamic visc. shown
Torque < -10 %	"<<<" shown as torque value
Torque > 100 %	">>>" shown as torque value

Quick access area

Access to four functions. Select a function using the arrow keys (up/down). Tap on the right context key to open the function.

	**Status information on instrument** Context key: *Status* A green check signals *No error*
	A yellow warning sign signals a minor problem. If you ignore the warning message, measurement is still possible. Examples for warnings: – ViscoQC is not leveled. – The wrong guard is connected (TruGuard™ is enabled but NOT mandatory).
	A red error sign signals a serious problem that prevents measurement. Examples for errors: – No valid Zero Adjust. – The wrong guard is connected *(TruGuard™ is mandatory)*.
	**Measurement mode / current mode** Context key: *Mode* Set a measurement mode (Section 7.2 [▶ 17]).
  	**Spindle information** Context key: *Spindle* Shows connected spindle/measuring system type plus details (factors, guard) If the Toolmaster™ (Section 7.4.4 [▶ 19]) is disabled: Selection of spindle/measuring system. Refer to Section 7.4 [▶ 18]. A red "x" signals that no spindle is connected or selected.
	**Information / summary** Context key: *Summary* Shows information on used measurement mode, spindle/measuring system and accessories (if in use).

Menu screen

The functions of the context keys change when you enter a sub-menu or a function of the quick access area. Navigation is similar for functions and menus.

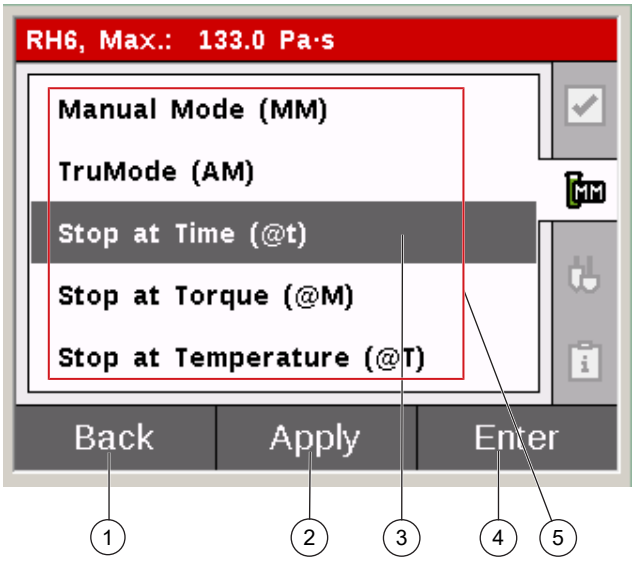


Fig. 9: *Example of a ViscoQC 100 selection list*

1 Context key "Back": go one menu level back
2 Context key "Apply": confirm your settings
3 Marker bar
4 Context key "Enter": select the marked item
5 List of available items

Menu navigation

Arrow up/down keys	Move up and down in the menu, in sub-menus or lists
Context keys	
Back (left context key)	Return to the previous menu level (i.e. go one level up)
Cancel	Discard your input, abort a procedure
Ignore	Quit a warning and continue
Enter	Access the selected sub-menu or function, confirm a selection or enter an input (e.g. number)
Edit	Open the input dialog of a function, access settings
Enable/ Disable	Switch functions on or off
Done	Confirm an input.
Apply	Apply settings
Home	Go to the main screen, unfreeze the main screen

Selecting an item

Place the gray marker bar on the item using the arrow keys. Tap *Enter* or *Edit* depending on the context.

Entering numbers

In all input dialogs, ViscoQC displays a scroll bar with available signs on the right-hand side. The bar contains only allowed signs. It adapts to your selection.

1. Mark the desired sign using the arrow keys.
2. Tap *Enter* to select the marked sign.
3. To delete a sign, mark the "arrow left" sign in the scroll bar and tap *Delete*.
4. Tap *Done* to save the input.

If only a limited number of signs is available, the same sign may be visible more than once in the scroll bar. When you have reached the maximum number of allowed digits for the current input, the scroll bar contains only "arrow left" signs which serve to delete signs.

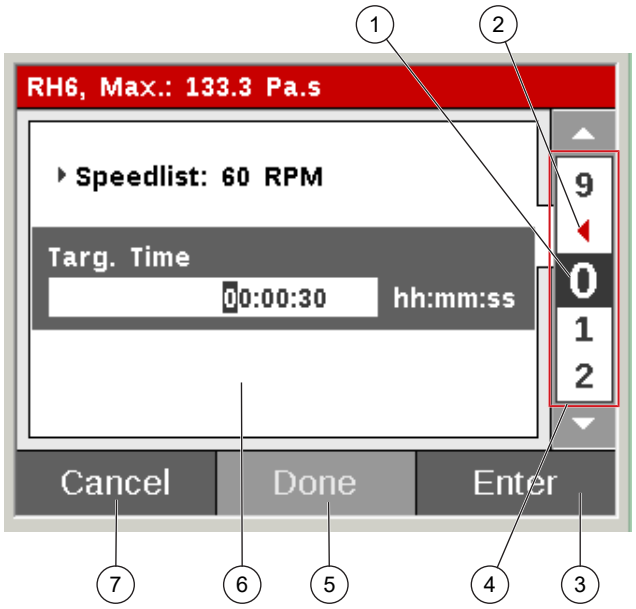


Fig. 10: *Example for a ViscoQC 100 input dialog*

1 Marked sign
2 Delete sign (arrow left)
3 Context key "Enter" to select the marked sign / if you mark "arrow left", this key switches to "Delete"
4 Scroll bar containing allowed signs
5 Context key "Done" to save the input
6 Input field
7 Context key "Cancel" to discard the input

5.2 Spindle, guard, DIN adapter

5.2.1 Connecting and removing a spindle

ViscoQC features a magnetic coupling. To connect a spindle, take the spindle shaft beneath the coupling and approach the coupling on the measuring head from below. Rotate the spindle slightly and wait until it clicks into place.

To remove a spindle, take the spindle shaft beneath the coupling and incline the spindle sideways. Then pull the spindle downwards.

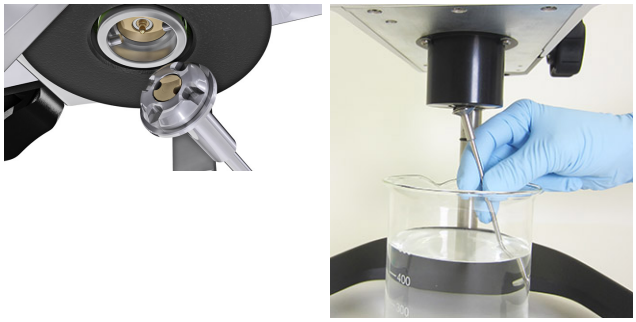


Fig. 11: *Connecting/removing spindles*

5.2.2 Connecting and removing a spindle guard or DIN adapter

The spindle guard is fixed to the rear of the measuring flange with an encoded screw showing the identification of the guard (**L** or **R**).

If using DIN measuring systems (concentric cylinders CC or double-gap DG) a DIN Adapter is fixed to the same thread. The fixing screw of a DIN Adapter is marked **D**.

ViscoQC can automatically detect the type of fixing screw (Section 7.4.3 [▸ 19]).

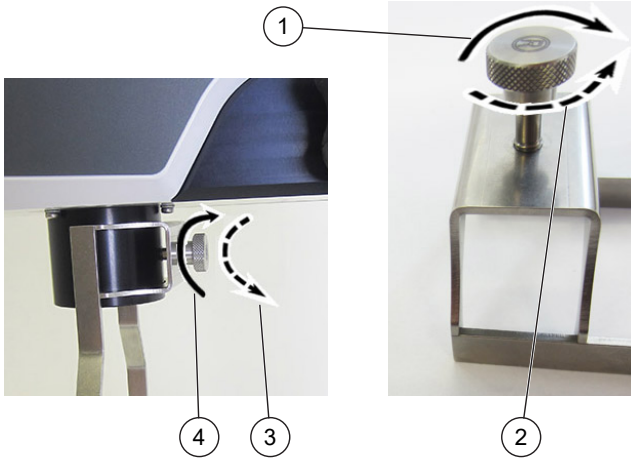


Fig. 12: *Fixing screw for spindle guard/DIN adapter*

1 Inserting the fixing screw into the holder
2 Removing the fixing screw from the holder
3 Removing a spindle guard/DIN adapter
4 Mounting a spindle guard/DIN adapter

The fixing screw is positioned in a threaded hole on the holder of the guard/DIN adapter. The screw cannot drop out accidentally due to the hole's thread. To remove the fixing screw from the holder you unscrew it.

Align the holder of the guard or DIN adapter with the rear of the measuring flange and fasten the screw (right thread). If you loosen the screw, hold the spindle guard/DIN adapter, so that it does not drop.

TIP: *If using a temperature device, no DIN adapter is needed. Refer to the instruction manual of temperature device.*

6 Adjustment and calibration

Adjusting means changing some hardware or software factors on the instrument that will have an influence on future measurement results. Calibrating means verifying that the instrument measures according to certain specifications: You perform a check measurement with a certified reference material (CRM).

Apart from Level Adjust and Zero Adjust, you can calibrate and adjust:

- Spindles (Section 6.1 [▸ 15])
- Temperature measurement (Section 6.2 [▸ 16])

6.1 Calibrating and adjusting spindles

TIP: *Verify that ViscoQC measures correctly at least once a month.*

Measure a certified reference material. Determine how much the measuring result may deviate from the reference value. Check the actual deviation.

Equipment and consumables

- Certified reference material. Use only reference materials which were stored in their closed original containers in cool and dark places. Check the expiry date.
- For standard spindles:
  600 mL lab (low Griffin) beaker
- Pt100 temperature sensor, calibrated (Section 6.2.1 [▸ 16]), plus fixing clip and thermostat bath (stability ±0.1 °C) or calibrated PTD 80, ETD 300 or PTD 100 Cone-Plate
- Spindle, guard (if required)/measuring system

Silicone standards are recommended for 600 mL beaker due to their lower temperature sensitivity compared to petroleum-based standards.

TIP: *Due to the small surface of the following spindles, they are not recommended for calibration: L4, RH7. Their small surface does not allow for the required accuracy.*

Preparation

1. Set the thermostat bath or the temperature device to the desired temperature.
2. Fill the certified reference material into the sample vessel.
3. Immerse the spindle (if in use: also the spindle guard) in the sample.
4. Place the Pt100 sensor in the sample vessel if applicable.
5. Mount the parts as described in Section 4.2.3.1 [▸ 11] and Section 5.2 [▸ 14].
6. Place the sample vessel in the thermostat bath or temperature device.
   Wait for temperature equilibrium. The displayed temperature must be stable (±0.1 °C) before you start measuring. Let the spindle rotate at slow speed for better temperature distribution.

TIP: *If using a standard spindle that requires 500 mL of reference material, wait for at least one hour (from the moment the bath thermostat has reached the set temperature). Spindle L1 requires more than 500 mL filling volume or place the beaker in a higher position (e.g. on a lab boy).*

Determining the allowed deviation

The allowed deviation is the total of the accuracy of the ViscoQC model (1 % of full scale range, refer to Appendix A [▸ 27]) plus the uncertainty of the certified reference material (refer to the material's certificate).

Use the ViscoQC Calibration Certificate from the ViscoQC webpack to determine the allowed deviation and the actual deviation.

Spindle calibration and correction

It is recommended to use the "TruMode", target time 60 s. Start measuring. Note down the result and determine the deviation from the reference value. If the calibration result exceeds the allowed deviation, calculate a new spindle correction factor (Section 6.1.1 [▸ 15]).

TIP: *Shear warming effects or turbulences might occur at high shear rates. For calibration, a maximum shear rate of 1,000 s^{-1} is recommended to avoid shear warming.*

Turbulences result in falsely high viscosity values and can occur at high speeds with relative systems (L or RH spindles). Examples for critical setups are:

- *L1 spindle: 15 mPa·s at 60 rpm*
- *L2 spindle: 100 mPa·s at 200 rpm*
- *RH1 spindle: 100 mPa·s at 50 rpm*
- *RH2 spindle: 500 mPa·s at 60 rpm*

The torque should be higher than 80 % to achieve the desired accuracy.

If you set a new SCF, it is recommended to repeat the calibration to verify the SCF.

6.1.1 Setting spindle correction factors

The *Spindle Correction Factor* (SCF) serves to adjust the results you obtain with a certain ViscoQC setup to a (certified) reference value. This is necessary if a calibration yields a deviation that is greater than allowed (Section 6.1 [▸ 15]) even if all preconditions for a good measurement are fulfilled.

The ViscoQC setup includes test speed, test temperature, spindle, sample vessel, and (if applicable) spindle guard.

TIP: *You can also adjust the SCF if you do not use the spindle guard for a spindle that requires it, or if the size of your vessel is other than recommended.*

The SCF is stored directly on the Toolmaster™ chip of the spindle. It is a spindle-specific parameter, not an instrument-specific one. Therefore, you can edit the SCF only if the Toolmaster™ is enabled (Section 7.4.4 [▶ 19]).

Determining the SCF

NOTICE

Risk of erroneous measuring results

Work with great care to eliminate disturbing influences such as change of temperature, big air bubbles (especially with disc spindles), different immersion depth of the spindle, and different position of the sample vessel (centricity). Depending on the setup, the effect of these influences may even exceed the effect of the SCF!

1. In order to determine the SCF, measure a certified reference material with the desired setup. Proceed according to the instructions for calibrating (Section 6.1 [▶ 15]).
2. Note down the measured viscosity.
3. Calculate the new SCF:

$$SCF_1 = SCF_0 \cdot \frac{\eta_R}{\eta_M}$$

SCF_1 … *new spindle correction factor*
SCF_0 … *old SCF (= current SCF)*
η_R … *reference viscosity*
η_M … *measured viscosity*

4. Enter the new SCF in the ViscoQC and repeat the measurement. The measuring results should now match the reference data.
   Default SCF settings: SCF = 1.000

Setting a spindle correction factor (SCF)

1. Tap *Menu* and select *Adjustments* > *Edit Spindle Correction*. Tap *Enter*.
2. ViscoQC shows the old (currently valid) SCF and *Enter new SCF*. Enter your input.
3. Tap *Apply* to save the SCF. ViscoQC prompts you to wait and displays a message when the data have been saved.

6.2 Temperature calibration

TIP: *With optional Pt100 sensor or a temperature device only. Refer to the instruction manual of the temperature device.*

The Pt100 sensor comes ready for use. If required, calibrate the sensor.

Required equipment

– Reference thermometer and sensor of better accuracy than the optional Pt100 sensor (Appendix A [▶ 27]), e.g. Anton Paar MKT 10.
– Water or sample substance, provided the latter is not highly viscous.

Temperature calibration

1. Fill a vessel with the above medium and let it reach a stable temperature. Ideally, calibrate the Pt100 sensor at or close to the usual measuring temperature.
2. Place the reference sensor and the Pt100 sensor side by side in the sample vessel. The sensor tips should be on the same level.
3. Wait for temperature equilibrium (approx. 10 minutes). The values should be stable.
4. Compare the temperatures displayed by ViscoQC and by the external thermometer. If required, set a temperature offset.

6.2.1 Setting a temperature offset manually

This applies to an optional Pt100 sensor only.

Default offset value: 0 °C. Allowed offset range:

±5.0 °C (±5.0 K) in steps of 1/10 °C (1/10 K) /

±9.0 °F in steps of 1/10 °F

1. Tap *Menu* and select *Adjustments* > *Edit Temp. Offset*. Tap *Enter*.
2. ViscoQC shows the current offset and *Enter new offset*. Enter your input.
3. Tap *Apply* to save the offset.

7 Measuring settings and modes

7.1 Measuring speeds - Speedlist

The instrument covers a speed range from 0.1 rpm to 200 rpm. It comes with 19 preset measuring speeds. You can select them from the *Speedlist*. The list ranges from minimum to maximum preset speed. Additionally, ViscoQC provides the possibility to define up to six custom speeds. It always shows custom speeds at the end of the list.

Table 2: Speedlist Example (ViscoQC 100 - L, spindle L2)

Speed	Info	Max. Viscosity
0.3 rpm	L	1.067 kPa·s
0.5 rpm	R/H	640.0 Pa·s
:	:	:
200 rpm	C0	1.600 Pa·s
150 rpm	C1	2.133 Pa·s
--- rpm	C2 ... C6	---

– The *Speedlist* is available on the main screen (middle context key) when editing measurement modes (exception: TruMode™).

– To select a speed, place the gray marker on this speed and tap *Select*.
– **Speed**: Measuring speed
– **Info**: Shows the ViscoQC model(s) for which this speed is standardized. This is only for information; you can also measure with a model other than the displayed one(s).

  200 rpm is not specified in any standard for rotational viscometers. For custom speeds there is no information on standards available, either, these speeds are identified as C1 to C6.
– **Max. Viscosity**: Maximum viscosity that is measurable with this speed and the connected spindle. Units adapt automatically to the measuring range (e.g. switch from kPa·s to Pa·s).

How to set custom speeds

1. Select a custom speed (C1 to C6) in the *Speedlist*.
2. Tap *Edit*. Enter the desired speed.
3. Tap *Done* to save the new speed. It is displayed in the *Speedlist*.

The set speed is used in all measurement modes.

7.2 Measurement modes

ViscoQC 100 provides five measurement modes:

– Manual Mode (MM)
– TruMode (AM) – automatic speed search
– Stop at Time (@t)
– Stop at Torque (@M) – "M" = Latin "momentum"
– Stop at Temperature (@T) – with Pt100 sensor only

To select a mode, mark the mode icon in the quick access area and tap *Mode*.

In the mode parameter view you can also set:

– the measuring speed (Section 7.1 [▶ 16]). The currently used speed is displayed.
– TruMode (AM): speed setting is not available.
– if the Toolmaster™ (Section 7.4.4 [▶ 19]) is disabled: the spindle/measuring system (Section 7.4 [▶ 18]). The currently used spindle/measuring system is displayed.
– specific mode details (refer to modes)

To set a speed or spindle, place the marker bar on the *Speedlist/Spindlelist*. Tap *Enter* to open a list.

When all settings are ready, tap *Apply* to save them and to return to the main screen.

Manual Mode (MM)

Start measurement manually with the *Start/Stop* key. The set speed changes to speed after starting the measurement. ViscoQC measures at the set speed until you tap the *Start/Stop* key again. There are no further mode parameters.

Default settings: set speed = 20 rpm

Table 3: Main screen – displayed parameters

Dynamic viscosity	(Set) Speed
Torque	Temperature

TIP: *You can change the speed while the measurement is running: Open the Speedlist directly from the main screen and set a new speed.*

TruMode™ (AM)

TIP: *Option Heli-Plus only: when the Helix Mode is enabled, the TruMode™ is not available.*

The *TruMode™* adjusts the speed so that ViscoQC reaches a torque of approximately 80 %. Enter a target time (duration). Refer to *Stop at Time* for target time specifications.

– Speed range: 1 rpm to 200 rpm

Start the test with the *Start/Stop* key. ViscoQC starts measuring. When it has reached the torque and the values have been stable for at least 10 s, ViscoQC starts taking the time. The test stops when the target time has passed. The main screen layout is the same as for *Stop at Time*.

NOTE: *Once the desired torque and stability have been reached with a certain speed, ViscoQC uses this measuring speed for the entire test duration. If the torque changes later during the test due to e.g. shear thinning/thickening or temperature influences, the measuring speed is not adjusted.*

If the required torque cannot be reached or the torque range is exceeded, ViscoQC displays a message and recommends the use of a bigger or smaller spindle. The message also tells if the viscosity range of the sample does not fit into the torque range of the ViscoQC model.

Stop at time (@t)

Enter a *target time* (duration).

Default settings: speed = 20 rpm, target time = 30 s

Table 4: Main screen – displayed parameters

Dynamic viscosity	Target Time
Torque	(Set) Speed
	Temperature

Start the test with the *Start/Stop* key. The set speed changes to speed after starting the measurement. When the instrument has reached the set speed, it starts taking the time. The test stops when the target time has passed.

TIP: *The target time shall be long enough for stable reading. A minimum of 5 full revolutions is recommended. Rule of thumb: for > 5 rpm at least 20 s, for < 5 rpm at least 60 s.*

Stop at Torque (@M)

Enter a *target torque*.

Start the test with the *Start/Stop* key. ViscoQC starts measuring. The set speed changes to speed after starting the measurement. Within the first 5 seconds of the runtime, ViscoQC does not react if the target torque is exceeded. This eliminates false results due to transient effects. The test stops when the target torque is reached. The only other way to end the test is to abort it by tapping the *Start/Stop* key. The instrument shows the runtime (duration) of the test.

Stop at Torque serves to check hardening or solidification processes. You expect that the sample's viscosity will increase. It is relevant to know how long it takes until a certain torque is reached.

Default settings:

set speed = 20 rpm, target torque = 80 %

Table 5: Main screen – displayed parameters

Dynamic viscosity	Target Torque
Torque	(Set) Speed
	Temperature

Stop at Temperature (@T)

TIP: *With optional Pt100 sensor only.*

Enter a *target temperature*.

Start the test with the *Start/Stop* key. The set speed changes to speed after starting the measurement. When the instrument has reached the set speed, it starts taking the time. The test stops when the target temperature is reached. The only other way to end the test is to abort it by tapping the *Start/Stop* key. The instrument shows the runtime (duration) of the test.

Stop at Temperature serves to observe the influence of temperature on a substance's viscosity. You require an optional Pt100 sensor.

Default settings:

set speed = 20 rpm, target temperature = 20 °C

Table 6: Main screen – displayed parameters

Dynamic viscosity	Target Temperature
Temperature	(Set) Speed
	Torque

7.3 Spindles and measuring systems

Spindlelist

TIP: *The list is only available if the Toolmaster™ is disabled.*

- There are two ways to access the Spindlelist:
  - Mark the spindle icon in the quick access area and tap *Spindle*. The spindle information is displayed. Tap *Spindlelist*.
    or:
  - Open the *Spindlelist* when editing a measurement mode.
- To select a spindle or measuring system, place the gray marker on this spindle and tap *Select*.

The list contains all spindles and measuring systems, which you can use with ViscoQC. (Find an overview in Appendix B [▸ 27]).

TIP: *All spindles are available independent of the ViscoQC torque range (e.g. RH-spindles can also be used with ViscoQC - L). In addition to all predefined spindles/measuring systems you can select custom spindles (Section 7.5.2 [▸ 20]).*

Table 7: Spindlelist example (ViscoQC 100 - L, speed 20 rpm)

Name	Guard	Max. Viscosity
L1	L	300.0 mPa·s
L2	L	1.500 Pa·s
L3		6.000 Pa·s
:	:	:
Custom		x.xxx Pa·s

- **Name**: Spindle identification
- **Guard**: Shows which spindle guard is recommended. If no guard is specified, the spindle does not require one.

  The spindle guard is a metal frame. It influences the flow conditions in the sample substance. The guard is a common item with rotational viscometers of similar type as ViscoQC. For low-viscosity samples the guard's influence needs to be considered. Otherwise measuring results are not comparable to results measured with a similar viscometer, spindle, and guard. Consequently, certain ViscoQC spindles and torque ranges require a spindle guard:
  - ViscoQC - L, spindles L1, L2: Guard L
  - ViscoQC - R, spindles RH1, RH2: Guard R
- **Max. Viscosity**: Maximum viscosity that is measurable with this spindle at the set speed (e.g. 20 rpm). Units adapt automatically to the measuring range (e.g. switch from mPa·s to Pa·s).

The selected spindle is used in all measurement modes.

7.4 Device setup

Tap *Menu* and select *Device Setup*. Edit the following instrument settings:

- PIN Settings (Section 7.4.1 [▸ 19])
- Language (Section 7.4.2 [▸ 19])
- TruGuard (guard detection) (Section 7.4.3 [▸ 19])
- Toolmaster (Section 7.4.4 [▸ 19])
- Automatic Printout (Section 7.4.5 [▸ 19])
- Sound (Section 7.4.6 [▸ 19])

Mark the desired item to edit it.

7.4.1 PIN protection (PIN settings)

If PIN protection is enabled, users need a PIN code to access the menu and mode settings.

Access rights without PIN code

– Perform measurements in the predefined mode.
– Manual Mode: change the measuring speed.

How to set a PIN code

1. Enable the PIN protection.
2. Enter a PIN code (4 to 8 characters).
3. Confirm the PIN code. Tap *OK*.

Option *Change PIN*:

Change an existing code and confirm the new code.

7.4.2 Language

Select the operating language for ViscoQC from the drop-down list and confirm your selection.

The language selection comes up automatically when initially starting ViscoQC or after restoring the factory settings on ViscoQC.

NOTE: *This setting only affects the language but not the data format. ViscoQC always uses a dot "." as decimal point.*

7.4.3 TruGuard™ (Guard detection)

TruGuard™ is relevant for spindles and DIN/SSA/UL/ASTM systems. Refer to Section 5.2.2 [▸ 14] and Appendix B [▸ 27].

– Default: *TruGuard*™ is enabled.
– ViscoQC detects whether a guard/DIN adapter is mounted and the type of guard. If no or the wrong item is connected, you get a warning.
– You can ignore the warning and perform measurements. The summary shows a warning sign for the guard.
– If you disable *TruGuard*™, the instrument no longer monitors if and which guard/DIN adapter is connected.
– If you set *TruGuard*™ as mandatory, you cannot start measuring if a wrong or no guard is connected (for spindles with recommended guard). The summary shows an error sign for the guard.

7.4.4 Toolmaster™

All ViscoQC spindles and measuring systems have a chip inside their magnetic coupling. This chip carries the following information:

– Spindle/system identification (name + UID)
– Spindle/system factors – if editing the SCF (Section 6.1.1 [▸ 15]), it is stored on this chip

When a spindle/measuring system is connected, the Toolmaster™ board in the upper part of the magnetic coupling reads the data and ViscoQC uses them for measurement.

– Toolmaster™ enabled (default): You do not need to select a spindle or measuring system.
– Toolmaster™ disabled: You have to select spindles/measuring systems manually from the Spindlelist (Section 7.3 [▸ 18]). There is no communication between ViscoQC and spindle. It is not possible to edit the spindle correction factor (Section 6.1.1 [▸ 15]). Unique identifier is not available.

7.4.5 Automatic printout

Enable or disable automatic printout of measurement data to a USB printer or to PC (via V-Collect Software).

NOTE: *ViscoQC 100 has no data memory. Data are lost if you do not print them directly after a measurement is finished or read them from the display and note them down manually.*

7.4.6 Sound

Enable or disable sound. If enabled, ViscoQC beeps when:

– a measurement is finished
– connecting a spindle
– connecting a spindle guard or DIN adapter
– connecting a Pt100 sensor

7.5 Measuring settings

7.5.1 Setting units

ViscoQC allows to customize the displayed units for physical quantities.

1. Tap *Menu* and select *Meas. Settings* > *Set Units*.

Table 8: Available quantities and units

Quantity	Units (bold print = default unit)
Torque	– **% (percent** of full-scale range) – mNm / µNm (Newton-meter) – dyn.cm (dyne-centimeter)[a] – – BU (Brabender units)
Temperature	– **°C** (degree Celsius) – K (Kelvin) – °F (degree Fahrenheit)
Dynamic viscosity	– **Pa·s / mPa·s** (Pascal-second) – P / cP (Poise)

[a] *Due to limited space the unit "dyn.cm" is displayed as "d.cm" on the main screen*

2. Select a quantity.
3. Tap *Edit*. Select the desired unit.
   You select the type of unit, ViscoQC automatically assigns unit prefixes and displays the number (decimal point) accordingly.
   For example: Selected unit *Pa·s / mPa·s* => ViscoQC may show *Pa·s, mPa·s*, or *kPa·s*.
4. Tap *Apply* to save the selected unit.

7.5.2 Custom spindles

Custom spindles equipped with Toolmaster™ are automatically recognized by the instrument. If a custom spindle is without Toolmaster™, data for one custom spindle can be stored in the instrument.

Manually setting a custom spindle

1. Tap *Menu* and select *Meas. Settings* > *Custom Spindle*.

   Set the spindle factors SMC (Spindle Multiplier Constant), and SRC (Shear Rate Constant). If the shear rate is not defined for this spindle, enter SRC "0". DIN/SSA/UL systems with defined geometry have shear rate constants.
2. Mark a factor and tap *Edit*. Enter your input.
3. Tap *Done* to save your input.

   Default settings:
   - Spindle Multiplier Constant SMC = 1.000
   - Shear Rate Constant SRC = 0.0000

The factors of a custom spindle without Toolmaster™ are stored inside ViscoQC. You can change them if required. It is not possible to edit the SCF of a spindle without Toolmaster™.

TIP: *If working with two Toolmaster™ custom spindles, ViscoQC identifies each spindle by its name plus the unique identifier (UID) of the Toolmaster™ chip. The spindle name shows in the header on the main screen together with the maximum measurable viscosity. The UID appears in the spindle information. If not connected, you can identify a custom spindle by an engraved number below the magnetic coupling.*

8 Performing a measurement

8.1 Preparation and sample filling

If available, prepare your sample according to a suitable standard test method, guide or practice.

The equipment employed for measurement must be clean and free of residues.

WARNING

Risk of injury, health risk

- Using chemically or biologically hazardous chemicals as samples or cleaning liquids is a health risk.
- Measuring hot (> 40 °C/104 °F) or very cold (< 0 °C/32 °F) substances is a health risk.

The above risks could cause serious injuries unless special precautions are taken.

Consult the material safety data sheets of the sample substances and cleaning liquids.

Operate the ViscoQC in a fume hood and make sure to use suitable protective equipment.

Adhere to the instructions in Section 1 [▸ 5].

NOTICE

Risk of damage to instrument parts

- Make sure that all wetted parts are resistant to the sample substance and cleaning liquids (Section 9.2 [▸ 23]).
- Make sure that sample temperature is between -60 °C and +100 °C (-76 °F to +212 °F).
- Make sure that the sample will not solidify or harden inside the sample vessel. Otherwise, you may have to dispose of the spindle/measuring system and/or spindle guard.

8.1.1 Measuring with spindles

1. Use a sample vessel of at least 500 mL filling volume (e.g. typical 600 mL lab beaker with approx. 83 mm inner diameter). Fill the sample into the test vessel.

   A sufficient sample filling height is important, because the tip of the spindle should be at least 10 mm above the vessel's bottom and the spindle should be immersed as far as the mark on its shaft.
2. Slowly dip the spindle into the sample vessel. Incline disc spindles so that you do not trap air bubbles on the bottom side of the spindle.

   If using a spindle guard, immerse that first (then the spindle).
3. Put the sample vessel beneath the measuring head. Move the ViscoQC measuring head slowly downwards until it nearly touches the spindle. Pull the spindle upwards and fix it on the measuring head. If applicable, mount the guard on the measuring flange (Section 5.2 [▸ 14]).
4. If applicable, place the Pt100 sensor in the sample vessel (Section 4.2.3.1 [▸ 11]).
5. Adjust the height of the measuring head: immerse the spindle until the sample level reaches the mark (small recess) on the spindle shaft. Adjust the position of the sample vessel: the spindle must be centered.

TIP: *The beaker can be positioned exactly centrally to the spindle by using the flexible cup holder.*

NOTE: *Vane spindles V71 to V73 and GT6 have two immersion marks (full and half). SMC of full immersion is used for calculation of viscosity. The recommended speed range for vane spindles is up to 10 rpm. Above 10 rpm turbulences (Eddy currents) might cause higher viscosity readings.*

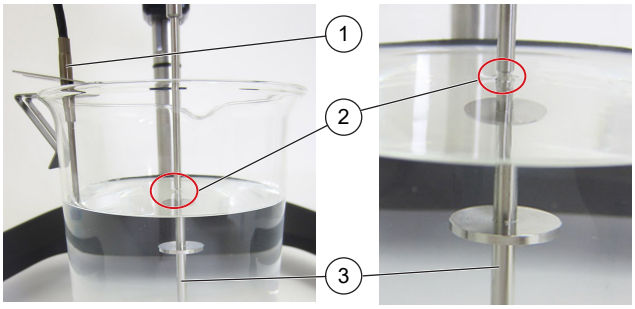


Fig. 13: *Positioning a spindle in the sample vessel*

1 *Pt100 sensor*
2 *Immersion mark*
3 *Spindle*

8.1.2 Measuring with systems with cup

If using a temperature device, refer to the instruction manual of the temperature device.

NOTICE

Risk of erroneous measuring results

If you calibrate a DIN/SSA/UL system, the calibration includes all following parts: spindle (bob), cup, hook, coupling and the DIN Adapter.

When exchanging any of these parts (disposable parts: for each batch) or the Peltier temperature device (if applicable), perform a new calibration to verify the measured values!

1. For DIN/SSA/UL measuring systems, mount the DIN Adapter on the measuring head (Section 5.2.2 [▶ 14]).

TIP: *If using a Pt100 sensor, insert this sensor in the DIN Adapter before mounting the DIN Adapter.*

2. Fill the sample into the provided cup up to the mark or use the recommended sample filling volume. Proceed slowly to avoid air bubbles.
3. Dip the selected measuring bob into the sample.
4. Insert the cup into the DIN adapter from below until it clicks. The upper rim of the cup is now level with the rim of the DIN adapter.
5. Rotate the cup until the notch on its rim clicks into place.
6. Pull the measuring bob upwards and fix it on the measuring head (Section 5.2 [▶ 14]). Place the optional cover on the cup (if applicable).

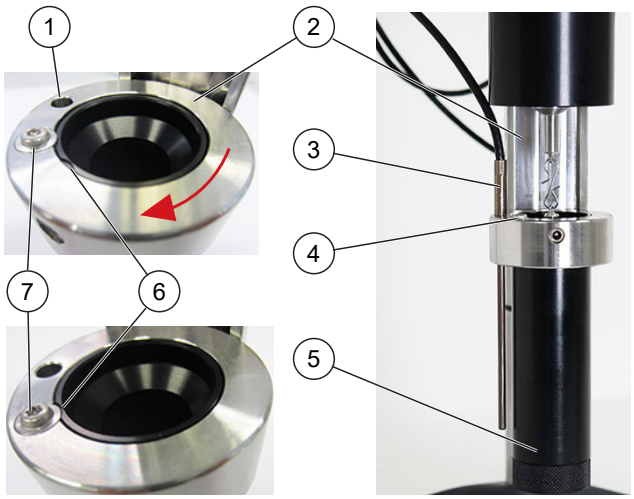


Fig. 14: *Mounting a DIN measuring system*

1 *Bore for optional Pt100 sensor*
2 *DIN adapter*
3 *Pt100 sensor (optional)*
4 *Cup positioning screw*
5 *Cup*
6 *Notch on cup rim*
7 *Cup positioning screw*

8.2 Measurement procedure

Set the measuring parameters (Section 7 [▶ 16]). Tap the *Start/Stop* key to start measuring. The display depends on the selected measurement mode.

When you start measuring, ViscoQC starts the motor. Until it reaches the set speed (for TruMode™, this is the speed that gives the target torque) the progress bar is gray and says *Preparing*. The counter is not yet active. Viscosity and torque values are gray until the measured torque is at least 10 % of the full-scale range, then they turn black.

TIP: *In order to get reliable measuring values, the spindle should have completed at least five revolutions before a value is accepted. In case you do not manually stop the test, your settings should agree with this rule (especially if the measuring speed is low).*

Recommendation: > 5 rpm: 20 s / < 5 rpm: 60 s

If no Pt100 sensor is connected, the temperature reading is " --- ".

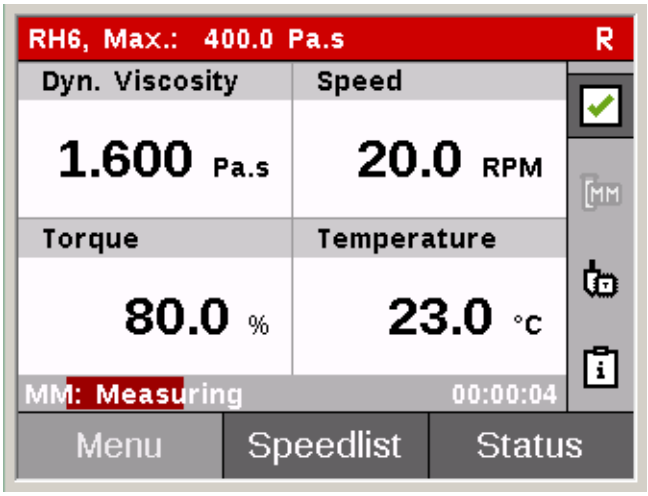


Fig. 15: *Measuring – example Manual Mode*

When the spindle turns at set speed, ViscoQC starts taking the time. The progress bar is red and in motion. It says *Measuring*.

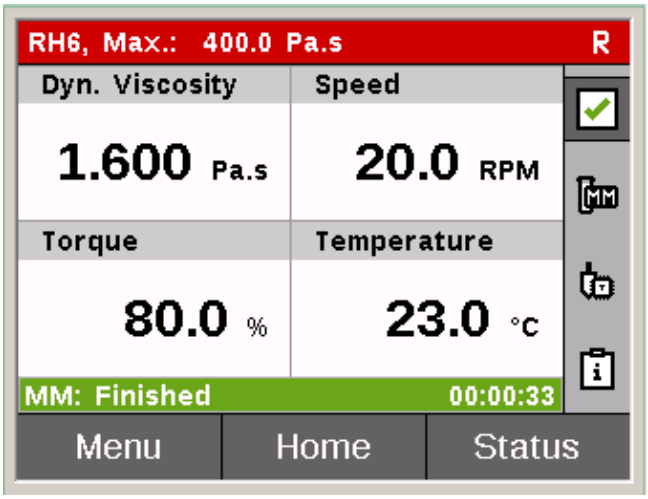


Fig. 16: *Measurement finished – example Manual Mode*

When the measurement is ready, the progress bar turns green and says "Finished". The counter shows the duration of the measurement. All measured values are frozen on the screen.

TIP: *Do not unfreeze the screen unless you noted down the values or printed them! ViscoQC 100 has no data memory!*

To unfreeze the screen tap *Home*.

If you stop a measurement before ViscoQC has finished *Preparing* or before it has reached a target value, the progress bar is red and reads *Aborted*. Data are not exported to V-Collect Software nor sent to the USB printer. Target values depend on the set measurement mode.

When you have finished, remove all parts:

WARNING

Risk of injury, health risk

If you measured at very high or low temperatures, wait until the sample reaches a temperature between 15 °C and 40 °C before you handle the hot or cold parts or make sure to use suitable protective equipment.

Adhere to the instructions in Section 1 [▶ 5].

1. Unscrew the spindle guard (if used) and disconnect the spindle. For DIN/SSA/UL systems, first disconnect the measuring bob, then turn the cup to unlock it from the DIN adapter and pull the cup downwards.
2. Put the sample vessel aside and lift the parts out of the sample substance for cleaning.

TIP: *Do not let the sample dry on the wetted parts. Clean all wetted parts immediately.*

9 Upkeep and cleaning

Calibrate the ViscoQC regularly. Refer to Section 6.1 [▶ 15].

Clean the measuring system and instrument after each measurement.

WARNING

Risk of injury, health risk

Using chemically or biologically hazardous chemicals as cleaning liquids is a health risk.

The above risks could cause serious injuries unless special precautions are taken.

Clean parts in a fume hood and make sure to use suitable protective equipment.

Adhere to the instructions in Section 1 [▶ 5].

The selection of the cleaning liquid(s) depends on the samples. All wetted parts must be chemically resistant to the cleaning liquid(s). Section “Wetted parts” lists all wetted parts and materials.

Cleaning liquid 1 must dissolve and remove sample residues in the measuring system.

The chemical quality must be high enough so that the cleaning liquid evaporates without leaving residues (e.g. particles). If cleaning liquid 1 does not dissolve the sample completely or does not dry up fast and/or without leaving residues, a second cleaning liquid is required.

Cleaning liquid 2 removes cleaning liquid 1 and evaporates easily with a stream of dry air.

9.1 Standard cleaning

Required equipment

– Cleaning liquid(s), above section

– Optional: vessels for immersing parts
– Lint-free tissue or lab paper
– Soft cleaning cloth or soft brush
– Protective equipment for user
– Procedure

NOTICE

Risk of damage to instrument parts and faulty measuring results

– Do not bend or drop spindles or measuring systems, nor the spindle guard. Spindles are vertically aligned and may be damaged if moved sideways with force. Any damage, however small, can cause large measurement errors.
– The spindle coupling and the instrument side of the coupling must be completely clean. The coupling must not be oiled or lubricated.
– Do not use force when removing sample substances from a spindle or measuring system. Do not use abrasive substances or tools for cleaning. Those would scratch the surface of the spindle/cup.
– Do not immerse the Toolmaster™ chip on the top of a spindle coupling into liquids. Do not place the Toolmaster™ chip in an oven at 70 °C (158 °F) or higher.
– Do not immerse the Pt100 sensor deeper than the end of the sensor sleeve. The sensor cable must not be immersed.

1. Take all parts (spindle, if applicable: spindle guard and Pt100 sensor) out of the sample substance and clean them.
2. First, wipe the part with dry paper. Wet a fresh sheet of paper with cleaning liquid and wipe the part again. If the sample is hard to remove, immerse the part except for the Toolmaster™ chip in cleaning liquid. Let the part soak for some time before wiping it.
3. You can also clean the parts with a soft sponge or soft brush.
4. If necessary, clean the parts again with a second cleaning liquid.
5. Empty the sample vessel and clean it. Proceed as described above. For cups with plug, pull this off (DG: unscrew the bottom, then pull) and clean the parts separately.
6. Dispose of sample substance and contaminated paper according to the regulations of your country. Consult the material safety data sheets of the sample substances and cleaning liquids.
7. If you need to clean the Toolmaster™ chip, use a soft tissue and wet it with e.g. ethanol, isopropyl alcohol or petroleum benzine. Wipe the chip.
8. If necessary, wipe housing and display: Use a soft cloth dipped in ethanol or warm water (optionally plus a mild solvent, pH < 10).

9.2 Wetted parts

The following materials are in contact with samples and the cleaning liquids:

Table 9: Sample wetted parts

Material	Part
Stainless steel 1.4404/1.4435/ 1.4545 (AISI 316L)	Spindles, spindle guard (optional), DIN system bobs, DIN system cup of DG26/SS, C-CC18/SS SSA systems (bob + cup), UL26 bob, 4B2 spindle, HT-DIN-81, PTD 100 Cone-Plate measuring cup and bobs
Anodized aluminum 3.2315 (6082)	DIN system cups of CC12, CC18, CC26, DG26; UL26 bob
1.4310 (AISI 301)	DIN/SSA/UL26/L1D22 system spindle hook, clip Pt100 sensor (optional)
Titanium 3.7165/64	L1D22 spindle
PEEK	Sample cover (optional)
PEEK black	DIN/SSA/UL26 cup plug, insulation 4B2 spindle, sample cover (optional)
FKM	O-ring of DIN cup bottom in CC12, CC18, CC26, DG26, UL26, SSA systems
EPDM 70	O-ring of DIN cup bottom plug in DG26/SS
Aluminium (Al 99.7/99.5)	Disposable cup of system CC12/D18, 4B2, L1D22, and of ETD 300, disposable spindle SC4-27
Stainless steel 1.4571 (SS316Ti)	Pt100 sensor (optional)

NOTICE

Risk of damage to measuring system

Anodized aluminum measuring cups are resistant to samples with **pH values between 5.0 and 8.5**.

a) For samples that are more chemically aggressive or outside this pH range, stainless steel cups made of AISI 316L are recommended. However, strong acids especially at high temperatures can also corrode this high-quality steel.
b) It is the responsibility of the user to ensure that the tested samples are suitable and do not damage the surface of the cup.

9.3 Software administration

Find all software upkeep functions in the Service menu. Tap *Menu* and select *Service*:

– TruSine (Bearing check) (Section 9.3.1 [▶ 24])

- Software Update (Section 9.3.2 [▸ 24])
- System information: shows ViscoQC model and serial no., current software and firmware version, serial numbers of motor/sensor unit and main board, if in use: data of optional temperature device, result of current Zero Adjustment (Section 4.2.2 [▸ 10]) and current TruSine™/bearing check (Section 9.3.1 [▸ 24])
- Help information: displays where to find help
- Restore Factory Settings (Section 9.4 [▸ 24])

9.3.1 TruSine™ (Bearing check)

The *TruSine™* (Bearing check) checks whether the measuring apparatus of ViscoQC is in good working order. It proves that sensitive parts such as the spring and the point jewel (bearing) are not damaged or worn.

The *System Information* window shows the latest (current) value *x.x %*.

Perform a new bearing check: *Menu* > *Service* > *TruSine (Bearing check)*. Remove the spindle and tap *Next*. Do not touch the instrument until the check is finished. A successful bearing check shows a very smooth decrease of torque.

The final torque value should be between 0.0 % and 0.5 % to be valid. Message: *Finished*. Tap *Apply*.

If the bearing check fails, calibrate with a reference standard liquid (refer to Section 6.1 [▸ 15]). If calibrating also fails, contact your local Anton Paar representative.

9.3.2 Software update

TIP: *A software update does not delete customized settings (language, PIN code, mode setting, ...).*

To update the instrument, you need a USB storage device with an update file in the root directory. The current software/firmware package is available from Anton Paar.

Download it with the following link:

www.anton-paar.com/viscoqc-webpack

Make sure to extract all files correctly.

1. Plug the USB storage device into the USB interface on the rear of ViscoQC.
2. Restart the instrument. ViscoQC updates the instrument software and internal firmware. Follow the procedure via messages on the display.
3. When the update is finished, select your operating language and enter all customized settings (mode settings, custom speeds, temp. offset...).

TIP: *Disconnect the USB memory device immediately after updating the software and remove the software file from the device. Explanation: If a USB memory device with update package in the root directory is connected and the instrument is switched off and on again, update starts automatically.*

9.4 Restore factory settings

This function restores the instrument to factory settings. You reset ViscoQC to the state of delivery.

NOTICE

Risk of data loss

Restoring the factory settings deletes the following customized settings:

- selected operating language
- PIN protection / PIN code
- mode settings and measuring settings (selected speed/spindle, target values, customized speeds in Speedlist)
- temperature offset
- factors of custom spindle without Toolmaster™

Note down all relevant factors and settings you want to keep, before you reset ViscoQC. Otherwise these data are irretrievably lost!

1. If you select *Restore Factory Settings*, ViscoQC warns you that you will delete settings.
2. If you tap *OK*, factory (default) settings are restored. The instrument prompts you to restart.
3. Switch ViscoQC off and on again. The instrument boots and prompts you to select an operating language. Refer to Section 4.2.1 [▸ 10]. If applicable, enter customized settings.

TIP: *Fast reset: While switching on ViscoQC, press the keys <Start/Stop> + <Context Left> till "Anton Paar ViscoQC 100" is displayed.*

ViscoQC 100 boots in English.

9.5 Adjusting the head retention

The head retention holds the measuring head on the rod of the stand. It defines how easily the head moves when you turn the hand wheel.

To adjust the head retention, insert a large slotted screw driver or small coin into one of the slits on the head retention.

- To tighten the hold, turn clockwise.
- To loosen the head retention, turn counter-clockwise.

CAUTION

Danger of hand injuries, squeezing

The head can drop uncontrollably if you open the head retention. Do not open or close the head retention unless the head is in the lowest position on the rod.

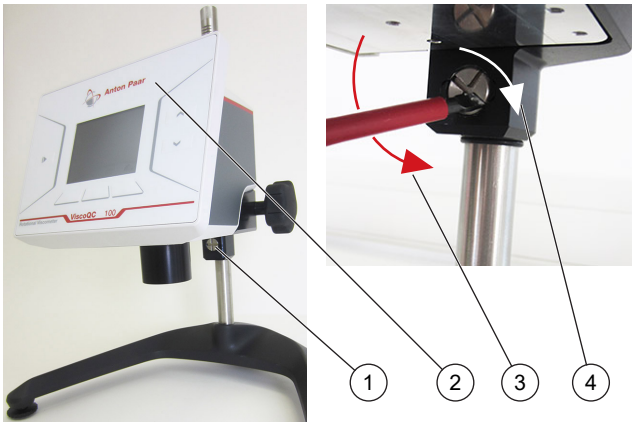


Fig. 17: *Adjusting the head retention*

1 *Head retention*
2 *Measuring head*
3 *Loosen the head retention*
4 *Tighten the head retention*

Tighten the head retention just enough so that the measuring head does not move down by itself, even if you place a weight of approx. 700 g on the head.

NOTE: *Tightening the head retention too much will cause premature wear of the retention block and hand wheel.*

If the hand wheel slips, the head slides down uncontrollably and you cannot fasten the head retention, replace the hand wheel and head retention block. Order the Hand Wheel Set, mat. no. 267644.

9.6 Storing and transporting the instrument

Clean all parts of the instrument before storing it. Clean these parts as described in Section 9.1 [▶ 22]. Make sure no sample residues or spills remain on the instrument. Disconnect the instrument from the mains supply.

Screw the transport protection onto the magnetic coupling by turning it to the right.

Put all parts into the original packing box or cover the instrument with a dust protection hood.

Store the instrument in a dry, clean place.

9.7 Packing the instrument for returns

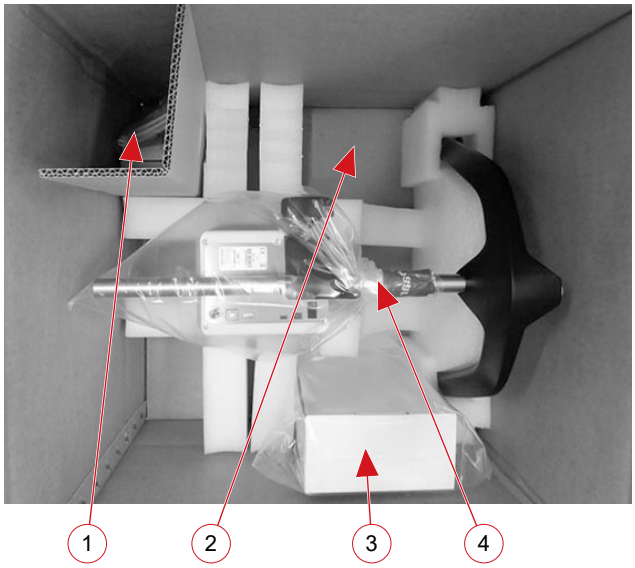


Fig. 18: *Placing ViscoQC in the original box*

1 *Power supply and cables*
2 *Bottom foam fillller*
3 *Spindle box*
4 *ViscoQC*

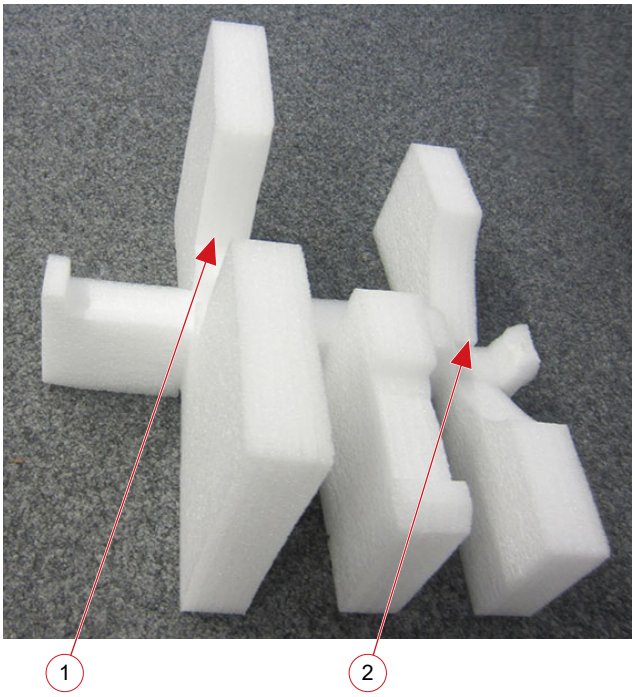


Fig. 19: *Top foam filler*

1 *Space for ViscoQC measuring head*
2 *Space for ViscoQC foot*

Use the original cardboard box and foam fillers to pack the ViscoQC. Cover the ViscoQC and parts with the top foam filler.

10 Maintenance and repair

10.1 Maintenance performed by an authorized Anton Paar representative

The product does not require a periodic maintenance by an authorized Anton Paar representative to retain warranty coverage.

If the product is no longer performing optimally (e.g., sensor performance), consider ordering product maintenance.

Please contact your local Anton Paar representative for more information about service options (e.g., service, possible warranty extension).

To fulfill requirements of regulatory authorities e.g. FDA 21 CFR 211.67, PIC/S 023-2 (5.5), Anton Paar offers services for compliant preventive maintenance and requalification for qualified Anton Paar products in case of software update, repair, and location change.[1]

Table 10: Maintenance and repair

Component	Action	Interval	Classification
ViscoQC	Check and calibrate	1 year	Recommended
Hand wheel of ViscoQC	Replace	after 7,500 up/down-cycles	Recommended
Head retention block	Replace	if worn down to less than 13.3 mm	Recommended

Following parts are generally excluded from the warranty (wear and tear parts)

- Fuses
- Measuring systems – except in case of malfunction of the Toolmaster™ chip in spite of correct handling (refer to Section 7.4.4 [▶ 19])
- O-Rings
- Hand wheel
- Head retention block

10.2 Repair performed by an authorized Anton Paar representative

In case your product needs repair, contact your local Anton Paar representative, who will take care of the necessary steps. If your product needs to be returned, request an RMA (Return Material Authorization Number). It must not be sent without the RMA and the filled “Safety Declaration for Instrument Repairs”. Please make sure it is cleaned before return.
Do not return products that are contaminated by radioactive materials, infectious agents or other substances that cause health hazards.

TIP: *Find the contact data of your local Anton Paar representative on the Anton Paar website (https://www.anton-paar.com) under “Contact”.*

[1] For detailed information, please refer to general terms of delivery (GTD) on the Anton Paar website (https://www.anton-paar.com).

Appendix A Technical data

Table 11: Torque specifications

Torque range (10 % to 100 %)	
- L	0.00673 mNm to 0.0673 mNm
- R	0.07187 mNm to 0.7187 mNm
- H	0.57496 mNm to 5.7496 mNm
Accuracy (±1 % of FSR [a])	
- L	0.673 µNm
- R	7.187 µNm
- H	57.496 µNm
Resolution (±0.1 % of FSR [a])	
- L	0.0673 µNm
- R	0.7187 µNm
- H	5.7496 µNm
Repeatability	±0.2 % of FSR [a]

[a] *FSR = Full Scale Range = 100 % torque*

Table 12: Speed specifications

Speed range	0.1 rpm to 200 rpm
Number of speeds	– Speedlist with 18 standard speeds – 1 fixed custom speed C0 (200 rpm) – Up to 6 custom speeds can be added to the Speedlist
Resolution	0.1 rpm to 59.9 rpm: 0.1 rpm > 60 rpm: 1 rpm – 740 increments

Table 13: Pt100 temperature sensor

Measuring range	Accuracy (non-calibrated)
+15 °C to +30 °C (+59 °F to 86 °F)	±0.5 °C (±1.0 °F)
-60 °C to +149 °C (-76 °F to +300 °F)	±1.0 °C (±2.0 °F)
+150 °C to +300 °C (+302 °F to +572 °F)	±2.0 °C (±4.0 °F)
Resolution	0.1 °C (0.2 °F)
Max. measuring temperature ViscoQC: 100 °C	

Table 14: Ambient conditions

Ambient temperature	0 °C to 40 °C (32 °F to 104 °F)
Air humidity, relative	≤ 80 % up to 31 °C (88 °F), linearly decreasing down to 50 % at 40 °C (104 °F), non-condensing
Absolute altitude	maximum 4000 m
Pollution degree	2 (EN 61010 [a])
Environment	laboratory and industry, in-door use only
Environmental standards	EN 61326 EN 61010 [a]
Airborne noise emitted	< 70 dB/A

[a] *EN 61010:2010 +A1:2019 +A1:2019/AC:2019*

Table 15: General specification

Dimensions WxDxH	361 mm x 281 mm x 444 mm (14.2 in x 11.1 in x 17.5 in)
Net weight	6.2 kg (13.7 lbs) ViscoQC + stand
Shipping weight	9.6 kg (21.2 lbs) Box + supplied parts
Power supply:	
At Instrument	DC 24 V / 3 A
AC Adapter	90 VAC to 264 VAC; 47 Hz to 63 Hz
Power	70 W max.
ViscoQC housing material	
Housing	PC (Polycarbonate) + ABS (Acrylonitrile Butadiene Styrene)
Stand rod	Stainless steel 1.4301 (SS304)
Stand leg	Zamak 5 Z410 ($ZnAl_4Cu_1$)
Interface specifications	
USB-A, USB-B, CAN, Pt100 sensor	

Appendix B Spindle overview

Find spindle factors inside ViscoQC, refer to Spindle information, Section 5.1 [▶ 12].

TIP: *In order to view factors of spindles that are not actually at hand, deactivate the Toolmaster™ (Section 7.4.4 [▶ 19]) before you open the Spindle information. Via Spindlelist you can then view all available spindles and measuring systems.*

Table 16: ViscoQC spindles

Spindle name	Guard required	Filling volume
Standard spindles		
L1	L	500 mL (600 mL beaker)
L2	L	
L3	L can be used, its influence does not significantly affect measuring results	
L4		
L5		
RH1	R (**only for ViscoQC - R**)	
RH2	R (**only for ViscoQC - R**)	
RH3	R can be used, its influence does not significantly affect measuring results	
RH4		
RH5		
RH6		
RH7		
Concentric cylinder measuring systems (according to ISO 3219) [a]		
CC12	D (DIN adapter or PTD 80	2 mL
CC18 and CC18/SS	D (DIN adapter or PTD 80)	6.4 mL
CC26	D (DIN adapter or PTD 80)	18.5 mL
Concentric cylinder measuring system with wider gap and disposable cup [a]		
CC12/D18	D (DIN adapter or PTD 80)	11.8 mL
Double-gap cylinder measuring system [a]		
DG26 and DG26/SS	D (DIN adapter or PTD 80)	7.5 mL [b – Note!]
Small Sample Adapter (SSA) measuring systems for low sample volume [a]		
SC4-18	D (DIN adapter, PTD 80, or ETD 300)	6.7 mL / ETD 300: 7.0 mL
SC4-21	D (DIN adapter, PTD 80, or ETD 300)	7.1 mL / ETD 300: 7.0 mL
SC4-25	D (DIN adapter or PTD 80)	16.1 mL
SC4-27	D (DIN adapter, PTD 80, or ETD 300)	10.4 mL / ETD 300: 10.5 mL
SC4-28	D (DIN adapter, PTD 80, or ETD 300)	11.0 mL / ETD 300: 11.0 mL
SC4-29	D (DIN adapter, PTD 80, or ETD 300)	13.5 mL / ETD 300: 13.5 mL
SC4-31	D (DIN adapter, PTD 80, or ETD 300)	9.0 mL / ETD 300: 9.0 mL
SC4-34	D (DIN adapter, PTD 80, or ETD 300)	9.4 mL / ETD 300: 9.5 mL
SC4-14/6R	D (DIN adapter or PTD 80)	2.1 mL
SC4-15/7R	D (DIN adapter or PTD 80)	3.8 mL
SC4-16/8R	D (DIN adapter or PTD 80)	4.2 mL
Ultra-low viscosity measuring system [a]		
UL26	D (DIN adapter)	16 mL
Vane spindles (for gel or paste like substances / for shear sensitive substances) – max. 10 rpm		
V71	no spindle guard	500 mL / 300 mL[c] (600 mL beaker)
V72	no spindle guard	350 mL / 250 mL[c] (400 mL beaker)

Spindle name	Guard required	Filling volume
V73	no spindle guard	200 mL / 160 mL[c] (250 mL beaker)
V74	no spindle guard	20 mL (25 mL beaker)
V75	no spindle guard	60 mL (100 mL beaker)
Glass rod GT6 for gel time determination		
GT6	no spindle guard or D (PTD 80 or ETD 300)	wide beaker or test tubes (~25 mL): 20 mL / 11.5 mL[c] (25 mL tube)
ASTM D5133/7110 measuring system [a, d]		
L1D22	D (PTD 175)	16.1 mL
ASTM D2983/8210 measuring system [a, d] – also suitable for DIN 51398		
4B2	D (PTD 175)	20 mL
T-bar measuring systems for paste-like substances and gels		
T-A to T-F (6 pcs.)	no spindle guard	500 mL (600 mL beaker)
Cone-plate measuring bobs for PTD 100 Cone-Plate only [e]		
CP-40	PTD 100 (the required measuring cup is supplied with PTD 100)	0.5 mL
CP-41		2.0 mL
CP-42		1.0 mL
CP-51		0.5 mL
CP-52		0.5 mL
For ETD 300: HT-DIN-81	ETD 300 (the required measuring cup is supplied with ETD 300)	6.5 mL
Spiral adapter		
Spiral spindle	no spindle guard	no defined volume, spiral chamber immersed in sample
Custom spindle: Set in *Menu* > *Measuring Settings* (Section 7.5.2 [▶ 20]).		
Custom	depends on spindle	

[a] *Define a Spindle Correction Factor (Section 6.1.1 [▶ 15]) in order to achieve measuring accuracy better ±3 % of the FSR.*

[b] *NOTE: It is essential to fill the exact sample volume precisely between measuring bob and cup wall. Use a syringe! No sample shall be on top of the measuring bob. DG26 is a very sensitive measuring system. Therefore, you may have to wait for at least 5 minutes for stable results, even if the speed is higher than 5 rpm.*

[c] *Immersion depth: Full / Half*

[d] *Intended for use with PTD 175, and thus not recommended for ViscoQC 100.*

[e] *For CP bobs, is mandatory to define a Spindle Correction Factor (Section 6.1.1 [▶ 15]) in order to achieve measuring accuracy of at least ±1 % of the FSR.*

Appendix C Menu tree

Device Setup	PIN Settings	– PIN protection: Enable/ Disable – Change PIN	Section 7.4.1 [▶ 19]
	Language	English, Deutsch, Français, Español, Italiano, Português, Chinese, Japanese, Korean, Russian [a]	Section 4.2.2 [▶ 10]
	TruGuard	Enabled / Disabled / Mandatory	Section 7.4.3 [▶ 19] (guard detection)
	Toolmaster	Enabled / Disabled	Section 7.4.4 [▶ 19]
	Automatic Printout	Enabled / Disabled	Section 7.4.5 [▶ 19]
	Sound	Enabled / Disabled	Section 7.4.6 [▶ 19]
Meas. Settings (Measuring Settings)	Set Units Section 7.5.1 [▶ 19]	Torque	% mNm µNm dyn.cm (displayed on main screen as "d.cm") BU (Brabender Units)
		Dyn. Viscosity	Pa·s mPa·s P cP
		Temperature	°C, °F, K
	Custom Spindle	SMC	Section 7.5.2 [▶ 20]
		SRC	
PTD 80 / ETD 300 Settings	– Set Temperature – Temperature criterion: *Sensor-Ready*, *T-Ready*, or *None*	Only with PTD 80 or ETD 300, refer to instruction manual of temperature device	
PTD 100 Settings	– Set gap – Cup temperature – Sensor-Ready: Enable/Disable – Initialize	Only with PTD 100 Cone-Plate, refer to instruction manual of temperature device	
Heli-Plus	Initialize	Find reference position	Only with Heli-Plus, refer to Heli-Plus Short Instruction
	Helix Mode	Enabled / Disabled [b]	
	Set Points	Set points for Helix Mode	
Adjustments	Level / Zero Adjust	Section 4.2.2 [▶ 10]	
	Edit Spindle Correction	Section 6.1.1 [▶ 15]	
	Edit Temp. Offset	Section 6.2.1 [▶ 16] – not with temperature device PTD 80/100	
	PTD 80 / ETD 300 Adjustment	Only with temperature device PTD 80 or ETD 300: set off-set and gain, refer to instruction manual of temperature device	

[a] *Language names are shown in their own language, i. e. Chinese, Japanese, Korean, and Russian are displayed in signs/letters of these languages.*

[b] *When Helix Mode is enabled, the TruMode is not available. Downward movement is used for all other measurement modes.*

Service	TruSine	Bearing check – Section 9.3.1 [▶ 24]
	Software Update	Section 9.3.2 [▶ 24]
	System information	ViscoQC model and serial no., software and firmware version, current Zero Adjust, current TruSine™ (bearing check), serial number of main board and of sensor [a, b]
	Help information	Where to find useful information
	Restore Factory Settings	Section 9.4 [▶ 24]
	Enter service level	For service persons only – authorization PIN required

[a] *If connected: PTD 80/ETD 300 FW version, serial no., offset, gain or PTD 100 FW version and serial no.*

[b] *If connected: Heli-Plus serial no. and FW version.*

Appendix D Trouble shooting

Errors and warnings which might occur during operating ViscoQC.

Number	Type	Description
01	Error	Maximum torque exceeded. Use smaller spindle.
02	Error	Severe firmware error during booting. Restart ViscoQC. If the error persists, contact support.
03, 04, 07, 08	Error	Error in Motor-Sensor unit. Contact support!
05, 06	Error	No adjustment found. Contact support!
09	Warning	Motor will soon turn off. Stop test! (Motor is getting too hot)
10	Error	Motor overheat. Wait for cooling down.
11	Error	Restart ViscoQC! If the error persists contact support!
12	Error	Toolmaster™ error: severe firmware error. Restart ViscoQC. If the error persists, contact support.
13	Error	Change spindle! If error persists contact support!
14	Error	SCF saving failed. Attach spindle and repeat!
15	Error	Restart ViscoQC. If the error persists, contact support!
16, 17, 18, 19	Error	Pt100 error. Disconnect/reconnect Pt100 sensor. Restart ViscoQC. If the error persists, contact support!
20	Error	Unknown guard. Clean guard screw!
21	Error	Guard short circuit. Clean guard screw!
22	Error	Retry Level Adjust. Contact support!
23	Warning	Not leveled.
24 / 25	Warning / Error	For spindle [YZ] {X} Guard/DIN adapter/No Guard is recommended / required.
26 / 27	Error / Warning	Perform Level and Zero Adjust.
28	Warning	Torque too high for TruMode AM. Use smaller spindle.
29	Warning	Torque too low for TruMode AM. Use bigger spindle.
30	Error	Pt100 is required for @T. Attach Pt100 sensor.
31	Error	Attach a spindle or choose from list.
32	Warning	Measurement with ViscoQC aborted by user.

TIP: *Errors and warnings concerning PTD/ETD: refer to the Instruction Manual of the temperature device.*

Appendix E Declarations of conformity

EU Declaration of Conformity

(original)

Anton Paar

The Manufacturer **Anton Paar GmbH,** Anton-Paar-Str. 20, A-8054 Graz, Austria – Europe hereby declares that the product listed below

Product designation:	**ViscoQC 100 – L** **ViscoQC 100 – R** **ViscoQC 100 – H** **ViscoQC 100 – L CN** **ViscoQC 100 – R CN**
Model:	**ViscoQC 100 – L** **ViscoQC 100 – R** **ViscoQC 100 – H** **ViscoQC 100 – L CN** **ViscoQC 100 – R CN**
Material number:	105020, 105021, 105022, 286452, 286453

is in conformity with the relevant European Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)

Applied standards:

- EN 61326-1:2013 — Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Low Voltage Directive (2014/35/EU, OJ L 96/357 of 29.3.2014)

Applied standards:

- EN 61010-1:2010 +A1:2019 +A1:2019/AC:2019 — Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011)

Place and date of issue: Graz, 2024-01-19

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