Anton Paar

Measure
what is measurable
and make measurable
that which is not.

Galileo Galilei (1564-1642)

Instruction Manual and Safety Information

RheolabQC

Rotational Rheometer

Instrument Firmware Version: 1.33

(Original Instruction)

Instructions and Safety Information

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Further information

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1 Safety Instructions

- Read this instruction manual before installing and using RheolabQC.
- Follow all hints and instructions contained in this instruction manual to ensure the correct use and safe functioning of RheolabQC.
- The manual is a part of the product. Keep this manual for the complete working life of the product and make sure it is easily accessible to all people involved with the product. If you receive any additions or revisions to this manual from Anton Paar GmbH, these must be treated as part of the manual.

1.1 General Safety Instructions

Liability

- This instruction manual does not claim to address all safety issues associated with the use of the instrument and samples. It is your responsibility to establish health and safety practices and determine the applicability of regulatory limitations.
- Anton Paar GmbH only warrants the proper functioning of RheolabQC if no adjustments have been made to the mechanics, electronics, and firmware.
- Only use RheolabQC for the purpose described in this instruction manual. Anton Paar GmbH is not liable for damages caused by incorrect use of the RheolabQC.

Installation and use

- RheolabQC is not an explosion-proof instrument and therefore must not be operated in areas with risk of explosion.
- The installation procedure should only be carried out by authorized personnel who are familiar with the installation instructions.
- Do not use any accessories or spare parts other than those supplied or approved by Anton Paar GmbH (see section 3).
- Make sure all operators are trained to use the instrument safely and correctly before starting any applicable operations.
- In case of damage or malfunction, do not continue operating RheolabQC. Do not operate the instrument under conditions which could result in damage to goods and/or injuries and loss of life.
- Check RheolabQC for chemical resistance to the samples and cleaning agents.
- Install RheolabQC only in a corrosion-free atmosphere.
- Allow the equipment to reach ambient temperature before installation and use.
- Place the instrument in a clean, dry and vibration-free environment.
- Do not operate the instrument in strong electric or magnetic fields.
- Switch off the equipment before you connect or disconnect cables.
- Make sure that the voltage supply meets the instrument specifications and only use the power supply the equipment has been delivered with.
- When operating, the equipment must be supervised at all times.
- The results delivered by RheolabQC not only depend on the correct functioning of the instrument, but also on various other factors. We therefore recommend you have the results checked (e.g. plausibility tested) by skilled personnel before consequential actions are taken based on the results.

Maintenance and service

- Service and repair procedures may only be carried out by authorized personnel or by Anton Paar GmbH.
- Maintenance of the RheolabQC should be carried out at least once a year or as agreed upon in your service contract. Certain equipment may require more frequent checks.

Disposal

- Concerning the disposal of RheolabQC, observe the legal requirements in your country.

Returns

- For repairs send the cleaned RheolabQC to your Anton Paar representative. Only return the instrument together with the filled out RMA (Return Material Authorization) and the form "Safety Declaration for Instrument Repairs". Please download the Safety Declaration form from our website www.anton-paar.com.
- Do not return instruments which are contaminated by radioactive materials, infectious agents or other harmful substances that cause health hazards.

Precautions for highly inflammable samples and cleaning agents

- Observe and adhere to your national safety regulations for handling the measured samples (e.g. use of safety goggles, gloves, respiratory

protection etc.).
- Only store the minimum required amount of sample, cleaning agents and other inflammable materials near the RheolabQC
- Do not spill sample/cleaning agents or leave their containers uncovered. Immediately remove spilled sample/cleaning agents.
- Make sure that the setup location is sufficiently ventilated. The environment of RheolabQC must be kept free of inflammable gases and vapors.
- Connect RheolabQC to the mains via a safety switch located at a safe distance from the instrument. In an emergency, turn off the power using this switch instead of the power switch on RheolabQC.
- Supply a fire extinguisher.

1.2 Special Safety Instructions

- Read and observe the instructions given in the "*Instruction Manual - RheolabQC Temperature Devices (Doc. No. C04IB012)*" when operating the RheolabQC with a temperature device.
- Do not use RheolabQC to measure fluids of the IIC group according to EN 60079-14, such as e.g. carbon disulfide or acetylene.
- Do not use the RheolabQC to measure samples above temperature class T3 according to ATEX Directive 94/9/EC.

⚠ **WARNING**

Risk of injury, risk of hazardous gases
Some materials may evaporate during measurement especially at high temperatures. Ensure adequate protection from hazardous gases. The measuring temperature should be selected so that no explosive substances can develop.

⚠ **CAUTION**

Risk injury, risk of burning
The equipment or parts of it, as well as the sample, can reach temperatures far above or below room temperature. Touching these areas may cause severe burns. Make sure you are adequately protected when operating the equipment at these temperatures.
Heated or cooled areas may take considerable time to reach room temperature. Allow these areas to cool down / warm up to room temperature before touching them or wear adequate protection.

🖐	***Wear protective gloves*** Wear protective gloves when handling RheolabQC at high or low temperatures.
👓	***Wear safety goggles*** Wear safety goggles when handling RheolabQC (depending on the sample type).
🧍	***Use protective clothing*** Use protective clothing when handling RheolabQC (depending on the sample type).

1.3 Safety Signs on the Instrument

⚠ **CAUTION**

Hot surface
This symbol calls attention to the fact that the respective **surface can get very hot** if RheolabQC is operated with a temperature device. Do not touch this surface without adequate protective measures.
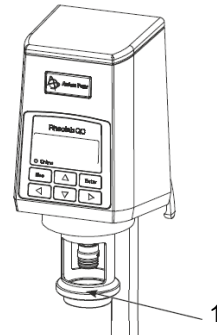
1   CAUTION - Hot surface

Fig. 1: Position of warning signs on the instrument

NOTICE
Take care that the warning symbols remain clearly legible.

1.4 Conventions for Safety Messages

The following conventions for safety messages are used in this manual:

⚠️ **WARNING**	⚠️ **CAUTION**
Description of risk. Warning indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.	***Description of risk.*** Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

2 RheolabQC - An Overview

RheolabQC is a rotational rheometer used for a **wide range of applications**, like paints, coatings, food, pharmaceuticals, cosmetics, petrochemicals and asphalts. **Different test types** can be performed like viscosity tests, flow curves, yield point measurements, thixotropy or temperature tests. RheolabQC can either be used stand-alone or with the PC-software RheoCompass™.

Fig. 2: RheolabQC with different accessories

RheolabQC is a **ball-bearing rotational rheometer** which works according to the Searle principle: the measuring cup remains static, the measuring bob rotates. A sample is put in between a fixed "holding" part (usually the lower cup) and a moving part "measuring system" (usually a cylinder) that is fixed to the rheometer motor.
This moving part touches the sample and so the sample's "influence" on the movement of the rheometer motor can be measured.
The RheolabQC can either preset a certain **torque** and measure the resulting **speed**, or preset a certain **speed** and measure the resulting **torque**. The torque multiplied with the **CSS factor** gives the **shear stress**, and the speed multiplied with the **CSR factor** gives the **shear rate**. If these two parameters are known, the rheometer can calculate the viscosity. The dynamic viscosity is defined as shear stress divided through shear rate.
The rheometer thus translates the physical properties torque and speed into the rheological properties shear stress and shear rate and then calculates

the sample's viscosity.
In order to measure the **speed** and the **torque** the RheolabQC features a high resolution optical encoder and the unique synchronous EC motor enabling very fast shear rate changes.
Additionally, the RheolabQC also measures ambient conditions like the **temperature** if a temperature device or a Pt100 sensor is connected.
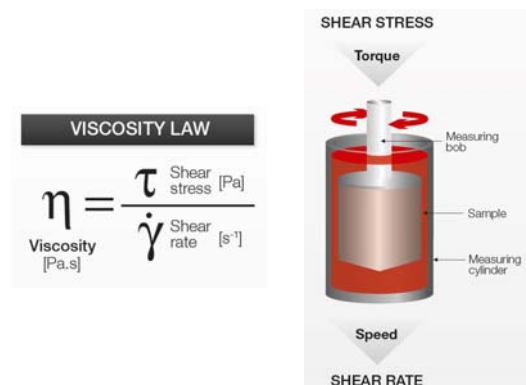
Fig. 3: Principle of viscosity measurement with a rotational rheometer

The physical properties torque and speed depend on the **measuring geometries**. Each measuring geometry has its own **CSS factor** and **CSR factor**. With those factors the rheological properties are calculated. A sample's viscosity is independent of the measuring geometries. A sample will always show the same viscosity value, no matter, if measured with a CC17 or the bigger CC27 cylinder, because the rheometer "translates" the influence of the measuring system using the Toolmaster™ system on the measuring bob. The Toolmaster™ stores the measuring system's CSS and CSR factor (among other data).

The most important **measuring geometries** for the RheolabQC are the concentric cylinders (CC), double gap (DG) and stirrer (ST) systems.
Concentric cylinder systems when used with the

corresponding cup are so called "**absolute**" measuring systems. This means that they have a defined shear gap and they measure the viscosity according to **ISO 3219**. This norm describes the measurement of viscosity with rotational rheometers and defines how to calculate the CSS and CSR factors of the "absolute" measuring systems. Stirrers, cylinders in large containers, or ball measuring systems are relative systems because the shear gap is not defined. Therefore these systems are called "**relative systems**". They also measure the viscosity, but the measurement is only comparable if repeated on the same instrument with the same setup (except if a calibration is performed for the "relative" system).

2.1 The Instrument

Export software.
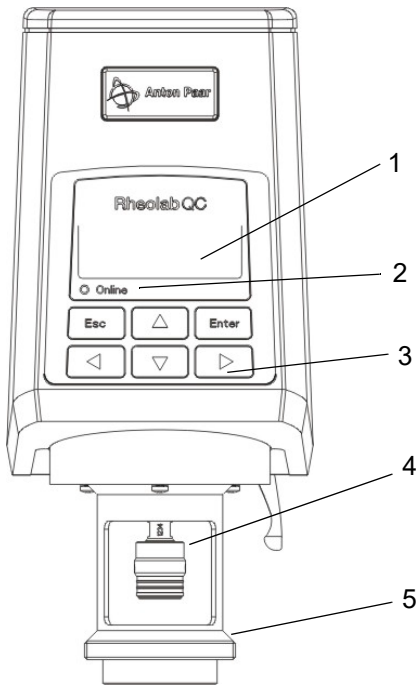
1 Display
2 "Online" LED
3 Keypad for stand-alone operation
4 Coupling for connecting measuring systems
5 Flange for mounting immersion measuring cup or temperature device

Fig. 4: Front view of the RheolabQC

 The "Online" LED shows whether the instrument is connected to the Rheometer software or to the Data

1 Main switch
2 Connector for power supply
3 RS232 connector for PC or printer
4 RS232 connector for accessories (e.g. circulator)
5 Ethernet connector
6 PS2 connector for keyboard and/or bar code reader
7 Pt100 connector
8 Release handle

Fig. 5: Rear view of the RheolabQC

The Keypad

Esc	Press this key to go up one level in the instrument menu or to cancel an entry.
Enter	Use this key to confirm a selection or an entry.
△	Press this key to scroll through items in a menu. The selected menu is marked with a ">". In an entry field, use this key to increase the value, e.g. when entering measuring parameters.
▽	As above. Use this key to decrease the current value in an entry field.
◁	Press this key to move the cursor to the left in an entry field.
▷	Press this key to move the cursor to the right in an entry field.

3 Checking the Supplied Parts

The RheolabQC 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 tables 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.

Symbol	Pcs.	Article Description	Mat. No.
	1 OR	RheolabQC with Standard Stand Rotational Rheometer The RheolabQC with Standard Stand may be combined with many different accessories and measuring geometries. The instrument head can be moved up and down with a release handle. The RheolabQC with Standard Stand includes the Standard Stand RheolabQC (Mat. No. 18850) (The RheolabQC with Standard Stand does not include a temperature device nor other accessories or measuring geometries.)	18318
	1 OR	RheolabQC with Immersion Stand Rotational Rheometer The RheolabQC with Immersion Stand features a hand-wheel so that the instrument head can be moved up and down very easily. The stand allows to put containers directly under the instrument. It includes the RheolabQC - Immersion Stand (Mat. No. 23520). The RheolabQC with Immersion Stand does not include a temperature device nor other accessories or measuring geometries and may not be used in combination with the flexible cup holder or ball measuring system	13000
	1	RheolabQC without Stand Rotational Rheometer that can be mounted on a customized setup. The RheolabQC without Stand does not include a temperature device nor other accessories or measuring geometries.	27401
	1	Instruction Manual	

Symbol	Pcs.	Article Description	Mat. No.
	1	Power supply RheolabQC[a]	19215
	1	one of the following power cables[a] Power cable EUR Power cable USA Power cable GBR Power cable Switzerland Power cable China Power cable Brazil Power cable Thailand Power cable Australia	52112 52656 61865 93408 27011 130117 79730 173747
	1	Ethernet cable LAN (RJ45 Cat5e Ethernet Patch Cable; Note: comes usually with white cable end) Standard, if the instrument should be connected over a LAN network.	18470
	1	Ethernet peer to peer (RJ45 Cat5e Crossover Cable; Note: comes usually with green cable end) Crossed, if the instrument should be connected directly to a PC via LAN.	18597
	1	RS232 Connection cable 9PIN If the instrument should be connected to a PC via RS 232.	70429
	1	Customer USB storage device including: Adjustment data of the instrument, Anton Paar software: e.g. data export software Documents: e.g. manuals, application reports	

a Note: In 2013 the power supply for the RheolabQC was redesigned from a 2-pole plug to a 3-pole plug. If spare parts (e.g a cable) for the power supply are required please mention if the instrument's power supply dates from before 2013 and has the 2-pole plug. Then different cables are required. For more information refer to the product description list (included in customer USB storage device).

3.1 Optional Accessories

Fig. 6: RheolabQC equipped with different accessories

In order to adapt to very different applications, many combinations with different accessories and measurement geometries are available for the RheolabQC.

A Basic Configuration consists of

- The measuring **device** (e.g. RheolabQC with Standard Stand)

- A **temperature device** for setting the measuring temperature (e.g. C-PTD 180/AIR/QC)

Tip: The Instruction Manual "RheolabQC - Temperature Devices" gives more information.

- A **measuring system** that consists of a **cup** and a **bob** and covers a certain viscosity range (e.g. CC27/QC-LTD).

Additional Options are

- **Software** (e.g. RheoCompass™ Light). A software allows remote control of the instrument. It especially has advantages for more complex measurements (e.g. flow curve, yield point measurement, temperature tests, etc.). One-point viscosity measurements can be performed well also without the software. Every instrument (also when purchased without an additional software) is delivered with a data export software that allows to export the measurement data from the instrument to a computer.

- **Further measuring systems** that work with the same temperature accessory but cover another viscosity range (e.g. CC39/QC-LTD)

- **Disposable measuring systems** (e.g. CC27/D/QC-LTD)

- **Further accessories** (e.g. flexible cup holder or cover)

Tip: *The best overview over all available accessories for the RheolabQC is given in the product description list that is included in the customer USB storage device.*

Optional Accessories - Selected Examples

Symbol	Pcs.	Article Description	Mat. No.
	1	Software e.g. RheoCompass™ Light **Tip**: *The Instruction Manual "RheoCompass™ Software - Getting Started with RheolabQC" gives more information.*	104632
	1	Temperature device e.g. C-PTD 180/AIR/QC **Tip**: *The Instruction Manual "RheolabQC - Temperature Devices" gives more information.*	108642
	1	Concentric cylinder measuring system for the temperature device [a] e.g. CC27/QC-LTD including cup and bob	20645
	1	Concentric cylinder measuring system - immersion (for use without temperature device) [a] e.g. CC27/QC-IM includes cup and bob, does not include a temperature sensor	20652
	1	Concentric cylinder disposable measuring system for the temperature device [a] e.g. CC27/D/QC-LTD including cup holder, disposable cups (100 pcs), measuring system bob and ejector	20655
	1	Stirrers [a] e.g. ST24-2D/2V/2V-30/109 used for well dispersing particles in a sample	9428
	1	Viscosity Standards [a] e.g: Viscosity Standard AP N415 100ml (viscosity at 20 °C approximately 1100 mPa.s)	100048

a   The best overview over all available accessories, measuring systems and calibration fluids for the RheolabQC is given in the product description list that is included in the customer USB storage device.

4 Installing the RheolabQC

This chapter describes the installation of the RheolabQC. Please read the whole chapter before installing the instrument. Observe the safety instructions and make sure that all installation requirements are met.

Tip: *The installation of the temperature devices is described in the Instruction Manual "RheolabQC Temperature Devices (Doc. No. C04IB012)"*

4.1 Installation Requirements

- Allow the equipment to reach ambient temperature before installation and use.
- Place the instrument in a clean, dry and vibration-free environment.
- Do not operate the instrument in strong electric or magnetic fields.
- Switch off the equipment before you connect or disconnect cables.
- Make sure that the voltage supply meets the instrument specifications and only use the power supply the equipment has been delivered with.
- Make sure you allow sufficient space for the instrument and any peripheral equipment.
- The environmental conditions mentioned in section 8 must be met.

4.2 Installation

Place the instrument on a table in an environment that meets the installation requirements.
If you are going to use the ball measuring system or flexible cup holder install it before you continue with the installation. Information on mounting these systems can be found in section 7.

NOTICE

Do not expose the instrument and peripheral equipment to direct sunlight, strong magnetic or electric fields, moisture or an explosive environment. The equipment is not drip-proof. Keep the instrument dry at all times.

4.3 Power Supply

- Connect the cable from the power supply unit to the connector marked "POWER" on the rear panel of the instrument.

- Connect the power cable to the power supply unit and to a suitable main supply (see section 8.3).

⚠ **WARNING**

Danger of electric shock

The power supply unit of the RheolabQC must only be connected to an approved standard socket with protective conductor.
Before connecting the mains cable make sure that the local mains supply and frequency correspond to the values specified on the power supply unit.
Only use the supplied mains cable and the supplied power supply unit for safe operation.
Place the equipment in a way that the mains plug can easily be reached.

4.4 RheolabQC with Standard Stand Height Adjust

The instrument head can be moved up and down with the release handle. Hold the instrument head with one hand and open the release handle with the other by moving the handle upwards and when moving it downwards pushing the red button at the same time. Then release the red button and push upwards again and continue until the instrument head can be moved easily. For most standard applications the handling is easiest when the instrument head is in the highest position. Lock the instrument head in the preferred position by moving the release handle downwards and when moving it upwards pushing the red button at the same time.
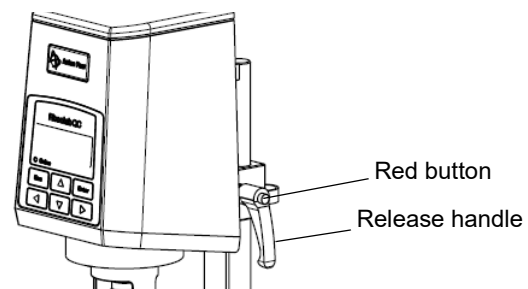

Fig. 7: RheolabQC release handle for height adjust

4.5 RheolabQC with Immersion Stand Height Adjust

The RheolabQC with Immersion Stand can be easily moved up and down with the hand-wheel.

5 Operating the RheolabQC

Before switching on the RheolabQC make sure that the instrument has been installed correctly as described in the previous chapter.

This chapter describes how to fill the sample and mount the measuring system for the RheolabQC with temperature device and for the immersion type. Stand-alone operation of the instrument is described as well.

Tip: The installation of the temperature device is described in the Instruction Manual "RheolabQC Temperature Devices (Doc. No. C04IB012)".

Tip: How to connect and operate the instrument with the Rheometer software RheoCompass™ is described in the instruction manual "RheoCompass™ Software - Getting started with RheolabQC (Doc. No. C04IB014)".

Tip: How to connect and operate the instrument with the Rheometer software Rheoplus is described in the instruction manual "Rheometer Software - Rhe-*oplus Version 3.x - Volume 4 - Device Driver Rheo-labQC"*.

Tip: A list of Warnings, Errors and Error Numbers on the RheolabQC display is available upon request.

⚠️ **CAUTION**

Risk of injury
The measuring system coupling and the measuring system may turn at high speed during measurement.
- Do not touch the coupling and the measuring system during a measurement.
- Before working on the mounted measuring systems ensure that the measurement is finished.

5.1 Switching On the Instrument

Switch on the RheolabQC with the main switch ('POWER') on the rear panel of the instrument and wait for the instrument to boot.

For switching on the instrument the temperature device should stay mounted on the RheolabQC but the measuring system bob should be removed. The instrument is initialized during the boot procedure. This means that the measuring system coupling turns for initialization of the optical encoder which is used for measuring the speed of the instrument's motor. This initialization works when the instrument coupling can turn freely. If it is hindered, e.g. when a measuring system that is immersed into a high viscous sample is connected, the instru-ment cannot initialize and an error message appears. In this case switch off the instrument, open the instrument coupling and remove the measuring system and switch the instrument on again.

⚠️ **CAUTION**

Risk of injury
The measuring system coupling turns at high speed during initialization. Do not touch the coupling until the instrument has finished booting.

5.2 User Adjust and Adjustment Warning

If no user adjust has been performed during the last 90 days (default settings) or if no valid user adjust is available (e.g. if the adjust has been deleted) a warning appears after switching on the instrument. If these warnings appear it is recommended to perform a user adjust. The user adjust is an "internal zero-adjust" in air (it compensates all torque influences caused by the ball bearing of the instrument). It is performed without measuring system and with a closed coupling. This means that the mantle of the coupling (see Fig. 13) has to be pushed down without measuring system. The temperature device should stay mounted on the RheolabQC. The user adjust can be performed in stand-alone mode and software-controlled.

User Adjust - Stand-alone mode

1. Go to "Menu > Setup > Adjust > Start Adjust" to start a user adjust.

2. Do not touch the instrument during the adjust.
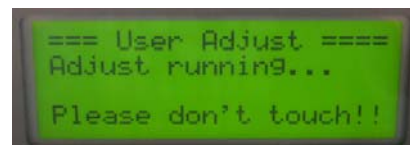
Fig. 8: User Adjust screen

3. The adjust takes approximately 10 minutes.

4. After the adjust press <Enter> to continue.

The adjustment warning can be switched off or the interval for the warning changed in "Menu > Setup > Options > Adjust Warning"

User Adjust - Software-controlled

A user adjust can be also performed with the Rheo-Compass™ Software. Therefor a software version greater or equal 1.21 is needed.

1. Go to the ribbon tab "Measuring Set" > Start service function > User adjust
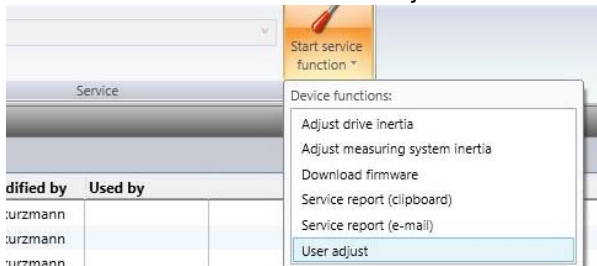
Fig. 9: User Adjust - RheoCompass™ 1.21

2. Read the instructions and confirm.
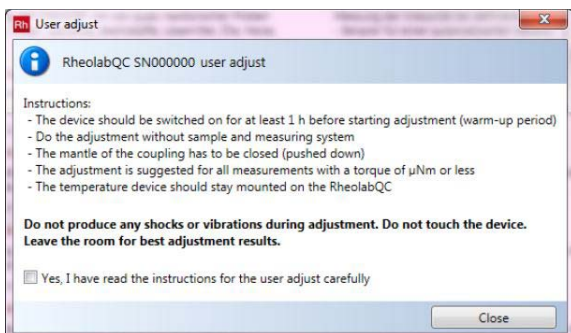
Fig. 10: User Adjust - Instructions

3. Click on "Start adjustment" to start the user adjust.
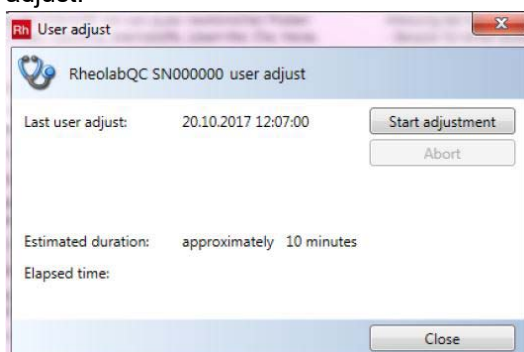
Fig. 11: User Adjust - Start adjustment

The adjustment warning can be switched off or the interval for the warning can be changed in the navigation pane "Setup". Go to "Measuring set components > Device" and select your device. Open the "Device details" and switch to the tab "Adjustments" to configure the adjustment warning

Tip: *Ideally, the user adjust is performed when the instrument has been switched on for approximately*

one hour so that the instrument is in "standard measuring conditions/temperature". More information about the user adjust can be found in the application report "Calibration and Adjustment (Doc. No. C04IA022)" that is included in the customer USB storage device.

5.3 Sample Filling and Mounting the Measuring System

This chapter describes how to correctly fill the measuring system.

⚠️ **CAUTION**

Risk of injury, risk of burning

The temperature device, the flange, the measuring system and the sample may reach very high or cold temperatures from -20 to +180 °C. Make sure you are protected adequately (suitable gloves) when touching these parts.

The measuring system coupling and the measuring system may turn at high speeds during measurements.

- Do not touch the coupling and the measuring system during a measurement.
- Before working on the mounted measuring systems ensure that the measurement is finished.

NOTICE

- Do not bend or drop the measuring systems. Any damage, however small, can lead to large measurement errors.

- The coupling cone on the measuring system and the coupling on the instrument must be completely clean. The coupling must not be oiled or lubricated.

- Do not use force when removing the sample from the measuring system and do not scratch the measuring system when cleaning.

- Do not immerse the Toolmaster™ chip on the upper end of the measuring system into solvent and do not dry it in an oven above 70 °C

- Do not try to bend the instrument coupling. The instrument coupling is vertically aligned and if it is moved sidewards with force it may be damaged.

Tip: *In order to avoid sample evaporation it is possible to use a cover. Another possibility is to cover the sample with a thin layer of low viscous oil. This prevents sample evaporation and can be done when the sample does not mix with the oil.*

Tip: *When filling highly viscous samples like asphalt the measuring system and the sample can be put in an oven or heated in the RheolabQC temperature device for easier filling. Notice: The measurement system bob should not be heated to above 70 °C in an oven to avoid damage to the Toolmaster™ chip.*

5.3.1 Cylinder Measuring Systems

5.3.1.1 Correct Filling of the Cylinder System

The cylinder measuring system has to be completely filled so that the whole cylinder itself is immersed in the sample when the system is mounted on the RheolabQC. The most important influence to the viscosity measurement comes from the region with the narrow gap of approximately 1 mm. In the region of the cylinder's shaft the influence is not so high on the measurement due to the big gap distance.

1   Toolmaster™ Chip
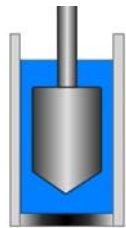
Fig. 12: Cylinder measuring system

We recommend to always fill the same amount of sample for good repeatability (most cylinder measuring cups feature a scratched marker ring). The following table gives an overview over the standard cylinder measuring systems and their calculated filling volume.

Cylinder System	Filling Volume
CC10/QC-LTD	1 ml
CC17/QC-LTD	4.8 ml
CC27/QC-LTD	19 ml
CC39/QC-LTD	56 ml

Tip: *The filling volume for each measuring system can be found in the "Measuring System Data Sheet" (available on request and included in the product description list that can be found on the customer USB storage device).*

5.3.1.2 Mounting the Cylinder Measuring System

1. Fill the measuring cup up to the marker ring.

2. Carefully insert the measuring system bob into the cup. Do not apply large forces to the system, even with highly viscous materials. This might already influence the sample's structure and therefore the measurement results.

3. Push up the mantle of the measuring system coupling.

4. Remove the lower closure of the temperature device by turning it.

5. Place the filled measuring system (cup and bob) into the lower closure of the temperature device and insert it into the temperature device from below.

6. If necessary, use your free hand to center the measuring system to prevent it touching the outer rim of the coupling.

7. Secure the cup by turning the lower closure. The ring has to "click" into place.

8. Carefully pull up the measuring system until it is fully inserted into the coupling and fasten it by pulling down the mantle.
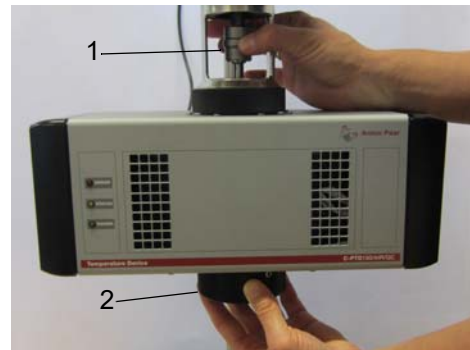
1   Mantle of the coupling
2   Lower closure

Fig. 13: Mounting the measuring system

9. When working with an immersion measuring system the measuring system is screwed directly on the RheolabQC instrument flange.

Fig. 14: Mounting the immersion measuring system

5.3.1.3 Mounting Disposable Cylinder Measuring Systems

1. When working with the marker tool (Mat. No. 18474) mark the correct filling volume.

2. Fill the measuring cup up to the marker ring or fill the correct amount of sample volume.

3. Insert the cup into the cup holder.

4. Carefully insert the measuring system bob into the cup and mount the measuring system as described in section 5.3.1.2.

Fig. 15: Cylinder, disposable cups, cup holder and ejector

5.3.2 Double Gap Measuring System

1. Insert the measuring system bob into the cup

2. Fill the system completely so that the holes in the measuring system bob are immersed in sample.

3. The calculated filling volume of the double gap system is 12 ml, but it is recommended to over-fill the system a little bit and then remove what is too much as described in step 5.

4. Mount the filled measuring system on the Rheo-labQC as described in section 5.3.1.2.

5. After mounting the measuring system use a syringe or pipette to remove what is too much of the sample through the holes of the measuring system bob. Ideally, only the double gap is filled.

Fig. 16: Double gap measuring system

5.3.3 Vanes and Stirrers

1. Fill the measuring cup.

2. The amount of sample that has to be filled depends on the cup and bob that are used.

3. For good reproducibility, we recommend to always use the same cup size and same amount of sample if measurements with a vane or stirrer should be compared. It is important that the whole stirrer is immersed in the sample.

4. Carefully insert the measuring system bob into the cup and mount the measuring system as described in section 5.3.1.2.

Tip*: In comparison to concentric cylinders, vanes and stirrers are "relative" measuring systems. This means that the CSR and CSS factor may be adapted / calibrated if requested. Find more information in the application report "Calibration and Adjustment" that is included in the customer USB storage device.*

5.3.4 Information about Toolmaster™

All standard measuring geometries for the Rheo-labQC are equipped with Toolmaster™. Toolmas-ter™ offers automatic measuring system recognition. A chip is included in the measuring system shaft and on this chip all data needed for rheo-logical calculations (e.g. CSS and CSR factor) are stored and transferred to the RheolabQC.

When working with RheolabQC in stand-alone mode, the first time a measurement is started with a new measuring system on the RheolabQC, the in-strument display shows the following message: "New MS detected .... Append to UserList? Press ENTER or ESC". It is recommended to tab <Enter> to append the system to the user list. For special purposes (not recommended as standard opera-tion) it is possible to edit the CSS and CSR data of the measuring system in "Menu > Setup > Meas.Systems > Edit User List". If a measuring sys-tem without Toolmaster™ chip is used or if different settings than the standard settings should be used it is possible to work without MS-Detection (see section 5.7) and define a user defined measuring system (see section 5.8.8.1).

When working with the software it is also possible to work with or without measuring system detection and to edit the CSS and CSR factors for special pur-poses (not recommended for standard operations). See software manual "*Rheoplus Software Volume 4 - Device Driver RheolabQC*" and "*Instruction Manu-al RheoCompass™ - Getting started with Rheo-labQC*".

Tip: *All Toolmaster™ data for each measuring sys-tem can be found in the "Measuring System Data Sheet" (available on request and included in the product description list that can be found on the cus-tomer USB storage device).*

5.4 Mounting Additional Accessories (Optional)

5.4.1 Pt100 Sensor

It is possible to mount an external Pt100 sensor.

For mounting the Pt100 sensor with holder (Mat. No. 20521) mount the holder on the flange and attach the sensor to the connector marked "PT100" on the rear panel of the instrument.

The bent Pt100 sensor (Mat. No. 133997) can be inserted directly into the measurement system cup in the Pt100 opening (available for CC17 and CC27).

If the RheolabQC is used with the C-LTD70/SM/QC, C-LTD80/QC or C-LTD180/QC no external Pt100 can be connected if the Pt100 sensor from the temperature device is connected.

5.4.2 Keyboard and Bar Code Reader

Connect the keyboard or bar code reader to the connector marked "PS2" on the rear panel of the instrument. If a suitable bar code reader is used, both devices can be connected to the instrument at the same time. Connect the PS2 connector as described above and attach the keyboard to the second connector of the bar code reader.

5.4.3 Printer

For a direct printout of the measurement data you can connect a serial printer to the RheolabQC. The following communication parameters are programmed:

- baud rate 9600
- data bits 7
- parity even
- stop bits 1
- For the data transfer you can select either no protocol or hardware protocol. This setting can be selected in the instrument menu. Depending on the printer you can select a width of 40 or 80 characters.

Information: The printer (Mat. No. 79168) has 40 characters and no protocol.

The printer has to be connected to the "**PC**" RS232 connector at the back of the RheolabQC.

The printer settings can be found in "Menu > Setup > Options > Printer Type" and "Menu > Setup > Options > Printer Protocol".

In "Menu > Setup > Options > Print" you can choose the default settings for printing measurement data. Measurement results are not printed if "Off" is selected and all data are printed if "All" is selected. With "Single" you can limit the printout to a specific point. Enter the value using the up/down buttons and confirm with <Enter>. With "Range" define the start and end of a data point range and confirm with <Enter>.
This setting is used for all programs unless changed for the particular program (see section 5.7).

The printout performed with the printer (Mat. No. 79168) contains the following header information:

- Date and time of print
- Firmware version of the RheolabQC
- Serial number of the RheolabQC
- Measurement date and time
- Sample
- Program name
- Measurement duration
- Number of measurement points
- Used measuring system and its CSS and CSR factor
- Program type (e.g. "CSS_CONST")
- Set variable (e.g. "M" for torque or "D" for shear rate)

For each interval the list of measurement points contains 5 columns with the measured values (e.g. point number "No."; shear rate "D"; shear stress "tau"; viscosity "eta"; temperature "T").

5.5 Performing a Measurement in Stand-Alone Operation

Tip*: If the measurement temperature is far above or below room temperature it is recommended to wait for 10 to 15 min after the instrument reached the measurement temperature before the measurement to ensure thermal equilibrium in the sample.*

Tip*: How to perform measurements with software control is explained in the manual "RheoCompass™ Software - Getting started with RheolabQC" and "RheoCompass™ Software - Software Manual".*

After switching on the instrument display shows the main menu ("== Menu ===") by default.

Tip*: If the list of programs ("== Program Start ===") should be shown after switching on the instrument, go to "Setup > Options > Select Startmenu" and there choose "Program Start" by pressing <Enter>.*

Tip: *If no Pt100 sensor or temperature device is connected to the instrument, it is recommended to switch off the Pt100 warning ("Setup > Options > PT100 Warning") in the instrument menu. Otherwise, the warning will be shown at every start of a*

measurement in stand-alone operation.

In stand-alone operation, select one of the measuring programs saved in the instrument and start it as described below. The instrument is delivered with a number of default programs. These can be edited. The editing and creating of measuring programs is described in section 5.7.

1. Select "Program Start" using the up/down arrow buttons and press <Enter>.

2. A list of the available programs is shown. Select the required program using the arrow buttons and press <Enter>.

3. If the measuring system you are using has not been used with the instrument before, you are asked to select whether its data should be saved on the instrument or not. Press <Enter> twice to store the measurement system data.

4. Enter the sample name. If an external keyboard is used you can enter the name with the keyboard; if a bar code reader is used, read the sample code now, it is then displayed automatically.
   To enter the name with the keypad, use the right/left arrow buttons to move the cursor in the display and the up/down arrow buttons to select the signs.

5. Confirm the sample name with <Enter>.

   - If no Pt100 sensor is connected, the warning "No Pt100 connected! Ignore with ENTER" is shown. The measurement can be started by pressing <Enter>. To disable this warning go to "Menu > Setup > Options > PT100 Warning".
   - If the measuring program has been set up to use a certain measuring system and a different measuring system is connected, an error message is shown ("Valid. check failed. Detected MS not in Prog").
     Confirm the message with <Enter> and select a different program or connect the correct measuring system. Then repeat the pro-

cedure starting with step 2.

6. The measurement is started. The measurement data depend on the program settings.

7. After the program has been finished the display shows the data of the last measuring point. "STOP" is shown on the right-hand side of the display. If a printer has been selected, the data are now printed out.

Fig. 17: RheolabQC after a measurement was finished

With the immersion type of the RheolabQC the measurement is always performed at ambient temperature, unless the measuring cup is immersed in a temperature bath. The measurement is always carried out at room temperature. The current temperature can be measured using the Pt100 sensor with holder (option, Mat. No. 20521) and stored with the measurement data.

NOTICE

The measurement data can be transferred to a PC (refer to section 6.5). If this is required, we strongly recommend to do so on a regular basis (e.g. once a week, after 50 measurements or similar) and delete the stored measurements from the memory afterwards. The maximum number of measurements that can be transferred to a PC is 160 measurements. If more than 160 measurements are in the data memory, the data transfer to the PC might not work. When working in stand-alone mode, we recommend to delete the data memory on a regular basis (e.g. once a week, after 50 measurements or similar). The stored measurement data can be deleted in "Menu > Setup > Options > Delete all results". A password is required if the passwords are active.

5.6 Cleaning the Measuring System

⚠️ **CAUTION**

Risk of injury, risk of burning

The temperature device, the flange, the measuring system and the sample may reach very high or cold temperatures from -20 °C to +180 °C. Make sure to use adequate protection (suitable gloves) when touching these parts.

The measuring system coupling and the measuring system may turn at high speed during measurements.

- Do not touch the coupling and the measuring system during a measurement.
- Before working on the mounted measuring systems ensure that the measurement is finished.

1. After the measurement, push up the mantle of the coupling to release the measuring system. If you are using a temperature device, turn the lower closure and remove the whole measuring system. With the immersion type, remove the coupling ring and pull down the measuring system (see Fig. 13 and Fig. 14).

2. Clean and dry the measuring cup and cylinder. The bottom of the cup can be unscrewed for easier cleaning. Conventional detergents like dish-washing agent mixed with warm water and organic solvents like acetone, ethanol or petroleum benzine can be used for cleaning. If solvents are used, first remove the sealing in the cup bottom. When remounting the cup bottom after cleaning make sure that the sealing is in the correct position (the wider side must be on the bottom).

Fig. 18: Sealing (measuring cup bottom)

Tip: *A list of wetted parts can be found in section 8.1.*

NOTICE
- Do not bend or drop the measuring systems. Any damage, however small, can lead to large measurement errors.
- The coupling cone on the measuring system and the coupling on the instrument must be completely clean. The coupling must not be oiled or lubricated.
- Do not use force when removing the sample from the measuring system and do not scratch the measuring system when cleaning.
- Do not immerse the Toolmaster™ chip on the upper end of the measuring system into solvent and do not dry it in an oven above 70 °C.
- Do not try to bend the instrument coupling. The instrument coupling is vertically aligned and if it is moved sidewards with force it may be damaged.

5.6.1 Cleaning the Coupling

Keep the coupling of the RheolabQC clean. Do not oil or grease the coupling.

In case you can not move the coupling up and down smoothly, clean the coupling by following steps:

1. Use cotton buds and Ethanol to clean the inner surface of the coupling. Take care not to damage the transponder contact in the center of the coupling.

2. Drip some Ethanol between the sleeve and the inner part of the coupling (see Fig. 19). Don't use any other solvents, such as Acetone or Cleaners naphtha; some models of the coupling have an NBR O-ring inside that might get damaged. Then move the sleeve up and down until it runs smoothly. You may repeat this procedure a few times.

IMPORTANT: Do not use any lubrication such as WD40 or similar.

Fig. 19: Dripping solvent into the coupling.

5.7 Creating and Editing Programs in Stand-alone Operation

The RheolabQC is delivered with a number of default measuring programs (Default1...). You can edit these programs or create new ones. All programs are shown in the program list of the instrument (under "Program Start") and can be selected for measurements there. Up to 100 programs can be stored on the instrument.

The programming procedure is described in Fig. 20. Explanations for the steps marked with a number can be found below the figure.

To select a menu entry use the up/down buttons on the keypad or on the external keyboard. The selected entry is marked with ">".

All settings for editing programs, e.g. the sample name or values, can be made on the instrument's keypad or on an external keyboard. If you are using the keypad, the values are changed with the up/down buttons. The cursor is moved using the left/right buttons. With an external keyboard, use the right/left arrow buttons to move the cursor and enter the values and letters directly.
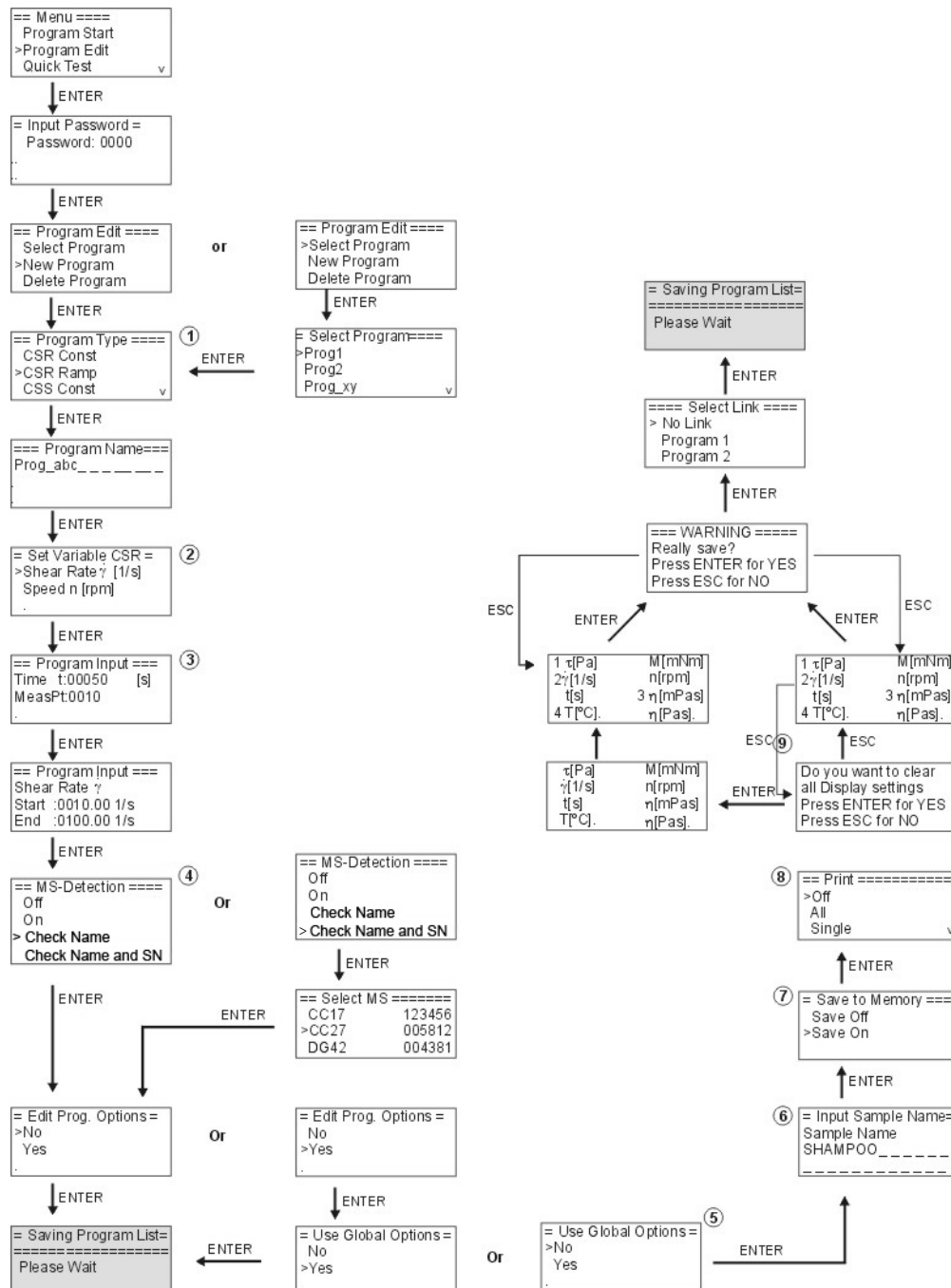

Fig. 20: Editing / creating measurement programs

1. The RheolabQC can carry out measurements with controlled shear rate (CSR) or controlled shear stress (CSS). Shear rate control is more frequently used because the shear rate is often known from the application. For each type of measurement you can select to measure a range ("Ramp") or a constant value ("Const"). Select the required measurement type from the list. The ramp is always made in a linear scale.

2. In this menu you select the required set value. The available values depend on the selection made in step 1. For CSR measurements you can select between shear rate and rotational speed; for CSS measurements you can select between shear stress and torque. Speed and torque are raw values from the instrument, the range is given in the technical data. Shear rate and shear stress are calculated from speed and torque using the measuring system factors.

3. The input of measurement parameters ("Program Input") is done in one step for a single value measurement and in two steps for a ramp. The time value given under "Time" is the complete measurement duration.
Enter the number of measuring points ("MeasPt") and the constant value or the start and end value for the set variable. Please note that the duration of one measuring point needs to be at least 0.5 s. The measurement point duration for one point is the "Time" divided through the "MeasPt".

4. For each program you can select whether to use the automatic recognition of the measuring system (Toolmaster™).

   - "On": Recommended settings. The measuring system data are checked and stored with the measurement result. If no measuring system or a measuring system without Toolmaster™ is connected, an error message is shown at the start of a measurement ("No MS detected").

   - "Off": The measuring system is not checked. This setting should only be chosen if measuring systems without Toolmaster™ will be used.

   - "Check Name": A measuring system is defined for the program. The measurement can only be carried out with this type of system. If another system is detected by the instrument, an error message is shown at the start of the measurement ("Valid. check failed. Detected MS not in Prog").

   - "Check Name and SN": A measuring system is defined for the program. The measurement can only be carried out with exactly this

system (type and serial number). If another system is detected by the instrument, an error message is shown at the start of the measurement ("Valid. check failed. Detected MS not in Prog").

5. Certain settings, e.g. the display of measuring data during a measurement or the saving / printing of data, are selected in the instrument menu and used for all programs. To use different settings for a program, choose "Yes" under "Edit Program Options" and "No" for "Use Global Options". You can find the available settings on the right-hand side of the figure (Fig. 20).

6. If you frequently measure samples with similar names it may be useful to preset the beginning of the sample name to make sample name entry easier.

7. Under "Save to Memory" you select whether the measurement results should be stored to the instrument's memory ("Save On") or not ("Save Off"). The instrument can store up to approximately 160 measurements - depending of the amount of data points per measurement. The stored measurements can be transferred to a computer using the Rheometer software or the RheolabQC data export software. If the storage of the RheolabQC is full an error message appears and the storage has to be emptied before continuing "Menu > Setup > Options > Delete all results".

8. Measurement results are not printed if "Off" is selected; all data are printed if "All" is selected. With "Single" you can limit the printout to every x point; with "Range" you can define start and end of a data point range that should be printed.

9. During measurement up to four values can be shown on the instrument display. The order of these values is defined by numbers. To move the cursor in the list, use the right/left arrows. To change the value use the up/down buttons. The following variables are available:

τ [Pa]	Shear stress in Pascal
$\dot{\gamma}$ [1/s]	Shear rate in 1/second
t [s]	Time in seconds
T [ºC]	Temperature in ºC
M [mNm]	Torque in milliNewtonmeter
n [rpm]	Speed in revolutions per minute
η [mPas]	Viscosity in milliPascal seconds
η [Pas]	Viscosity in pascal seconds

Under "Select Link" choose the program you want to be run directly after the current one or "No Link" to save the program as a single program. A link to a second program is usually chosen if a program should consist of 2 different intervals (e.g. high shear rate - low shear rate).

10. Save the program with <Enter>.

5.8 Instrument Menu

The main menu ("== Menu ===") is shown when the instrument is switched on (default setting). In this menu you can access:

- "Program Start"
- "Program Edit"
- "Quick Test"
- "Krebs Test"
- "Memory"
- "Temperature ON"
- "Temperature OFF"
- "Setup"

Tip: *Some settings can be password-protected by setting the passwords to active. Once the password has been entered for such a protected setting, there will be no further password checks even for protected settings until the instrument has been switched off and restarted.*

5.8.1 "Program Start"

This shows the list of programs that are stored in the instrument. To use one of these programs select it and press <Enter>.

By default, the list contains both the default programs and the user-defined programs. To hide the default programs go to "Menu > Setup > Options > Def. Progs in List" and choose the appropriate option.

5.8.2 "Program Edit"

Choose "Select Program" to edit a previously stored program or "New Program" to create a new one (for detailed information see section 5.7).

To delete a program, select "Delete Program", select the program in the list and tab <Enter>. Only user-defined programs can be deleted. Default programs cannot be edited (they have to be stored under a new name if they should be edited) and cannot be deleted.

5.8.3 "Quick Test"

Enter the set value for the shear rate at which you want to carry out the quick test and press <Enter>. Enter the sample name and press <Enter> again. In a quick test, the instrument measures at the selected shear rate until the test is stopped by pressing <Esc>.

If the test is not stopped manually, it stops after ap-

proximately 30 minutes. Quick tests can only be performed with measuring systems with Toolmaster™.

5.8.4 "Krebs Test"

This test - according to ASTM standard D562 - is a test at a rotational speed of 200 rpm and the viscosity is shown in Krebs units (KU) on the display. For this measurement, one of the Krebs spindles has to be used. Available spindles are:

Mat.No.	Description	Symbol
22146	ST54-1V/1V (KU1-10)	
22147	ST43-1V/1V (KU1-75Y)	

5.8.5 "Memory"

The memory stores all measurement data which are performed in stand alone mode using a measuring program from "Program Start" except programs where "Save to Memory" is set to "Save Off". Approximately 160 measurements - depending on the amount of data points per measurement can be stored. If the memory is full an error message appears.

"Show Measurement":
Shows a stored measurement and its measuring points. Use the up/down arrow buttons to scroll through the measurements in single steps. Use the right/left button to scroll through your measurements in increments of 10. For each stored measurement the instrument shows during scrolling through the memory:

- consecutive number in the memory
- sample name
- date and time
- program name
- measurement type (e.g. $\dot{\gamma}$ Ramp)
- number of measuring points

To show the measuring points of a measurement, you need to scroll to the required measurement and press <Enter>. To scroll between the points use the up/down arrow buttons. For each point the following parameters are shown:
- time (in seconds)
- shear stress (in Pascal)
- shear rate (in s^{-1})

-   viscosity (in Pa.s)

•   "Print Measurement":
    To print a stored measurement select the required measurement using the up/down buttons and tab "Enter". More information can be found in section 5.4.3.

•   "Last Measurement":
    Select "Show Measurement" to display the most recent measurement; to display the data points press "Enter" and use the up/down buttons to scroll. With "Print Last Measurement" you can print out the most recent measurement.

NOTICE

The measurement data can be transferred to a PC (refer to section 6.5). If this is required, we strongly recommend to do so on a regular basis (e.g. once a week, after 50 measurements or similar) and delete the stored measurements from the memory afterwards. The maximum number of measurements that can be transferred to a PC is 160 measurements. If more than 160 measurements are in the data memory, the data transfer to the PC might not work. When working in stand-alone mode, we recommend to delete the data memory on a regular basis (e.g. once a week, after 50 measurements or similar). The stored measurement data can be deleted in "Menu > Setup > Options > Delete all results". A password is required if the passwords are active.

5.8.6 "Temperature ON"

Use this button to send a temperature to the temperature device C-PTD180/AIR/QC (optional). Find more information in the Instruction Manual "RheolabQC - Temperature Devices".
In stand-alone mode you can choose if you want to switch off or leave on the temperature control after the measurement which will be described in section 5.8.8.3.
The temperature which is set will be saved when the device is switched off.

5.8.7 "Temperature OFF"

Use this button to switch off the temperature control of the temperature device C-PTD180/AIR/QC (optional).

5.8.8 "Setup"

5.8.8.1 "Meas. Systems"

In this menu you can edit and create measuring systems. This is only needed when working in stand-alone mode without Toolmaster™ or when CSS and CSR factors should be changed in stand-alone mode. A password input is required if the passwords are active.

Tip: *Make sure to enter the correct values for the CSS and CSR factor as these values influence all measurements. Incorrect measuring system data will cause incorrect measurement results.*

•   "Edit User List": Select "Edit User List" to edit, create or delete measuring system data.

    -   "Edit List"
        Select the measuring system in the list and press "Enter". Name, type[1], serial number, CSS and CSR factor are shown. The entries can be changed using the up/down buttons. To confirm an entry press "Enter". If the last line is confirmed with "Enter", the instrument stores the data.
    -   "Define New MS"
        Enter name, type, serial number (No), CSS and CSR factor. Confirm each line with <Enter>; the data are stored when the last line is confirmed.
    -   "Delete MS"
        Select the measuring system from the list and press "Enter". There will be no further confirmation before the measuring system is deleted permanently.

•   "Copy from default":
    Here you find a list of measuring systems stored in the instrument before delivery. These can be copied to the user list by selecting them in the default list and pressing <Enter>. List of avail-

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1   *The type defines the kind of measuring system. The RheolabQC (with firmware 1.26 or higher) allows to define types from 00 to 21, but only the types 02, 03, 06 and 12 are measuring systems suitable for RheolabQC. (Note: Older firmware versions only support measurement with measuring systems suitable for RheolabQC.)*
    List of measuring system types for the RheolabQC:
    02...cylinder, standard; 03...cylinder, Mooney-Ewart; 06...ball; 12...cylinder, relative (e.g. stirrer); (Note: The DG system is also defined as type 12)
    List of selected other measuring system types (not in use for the RheolabQC):
    00...cone-plate; 01...plate-plate; 04...solid (rectangular section); 05...solid (circular section); 07...cylinder, magnetic; 08...extensional fixture (fiber); 09...fiber fixture (film); 17...Cylinder, CL=1.0

able standard geometries: CC10, CC17, CC27, CC39 and DG42. The geometries CC27-39 (meaning a CC27 bob used in a CC39 cup), CC17-27 (meaning a CC17 bob used in a CC27cup) and DG26.7 are also included in the list. Note: The geometries CC27-39 and CC17-27 show slightly different default CSS factors than the same systems calculated in the software.

5.8.8.2 "Adjust"

- "Start Adjust": Here you can start a new user adjust. (see section 5.2)

- "Delete Adjust":
Deletes the current adjust. To delete the adjust data permanently confirm the prompt with <Enter>. To cancel press <Esc>. Before the next measurement you have to carry out an adjust.

- "Date Last Adjust":
Shows the date of the last adjust.

The user adjust is performed without measuring system and with a closed coupling. The temperature device should stay mounted on the RheolabQC.

Tip: *Ideally, the user adjust is performed when the instrument has been switched on for approximately one hour so that the instrument is in "standard measuring conditions/temperature". More information about the user adjust can be found in the application report "Calibration and Adjustment" that is included in the customer USB storage device.*

5.8.8.3 "Options"

- "Select Connection"
Here you can choose if the instrument should be connected via RS232 or Ethernet to a PC. Choose RS232 or Ethernet and tab <Enter>. When you select "Ethernet", the MAC address of the Ethernet interface of the instrument is shown.

- "Select Startmenu"
Select if "Menu" or "Program Start" should be shown by default when the instrument is switched on and confirm with <Enter>.

- "Temperature Unit"
Select the required temperature unit ("ºC" or "ºF") and press <Enter> to confirm.

- "Temperature Control"
Select whether the temperature control should be switched off after the measurement ("Off after test") or not ("On after test") in stand-alone mode.

- "Printer Type"

Choose the character width (80 or 40 characters) depending on the properties of the available printer and confirm with <Enter>.

- "Printer Protocol"
Select the type of data transfer depending on the properties of the printer connected to the instrument and press <Enter>. Data transfer is possible using the hardware protocol ("RTS/CTS") or without protocol ("No Protocol").

- "Save Results"
Select whether measurement results should be saved ("Save On") or discarded ("Save Off") in stand-alone operation. This setting is used for all programs unless changed for the particular program (see section 5.7).

- "Display"
If the display settings should be changed a question appears if all settings should be cleared. Press <Enter> to completely clear all settings and <Esc> for editing the current settings.
Select which four variables should be shown during measurement. In the list of available variables you can move the cursor using the right/left buttons; the selection is made using the up/down buttons. For each selected variable a number is chosen; the variables are sorted by these numbers during the measurement. Confirm your selection with <Enter>. These settings are used for all programs unless changed for the particular program (see section 5.7).

τ [Pa]	Shear stress in Pascal
$\dot{\gamma}$ [1/s]	Shear rate in 1/second
t [s]	Time in seconds
T [ºC]	Temperature in ºC
M [mNm]	Torque in milliNewtonmeter
n [rpm]	Speed in revolutions per minute
η [mPas]	Viscosity in milliPascal seconds
η [Pas]	Viscosity in pascal seconds

- "Print"
Measurement results are not printed if "Off" is selected and all data are printed if "All" is selected. With "Single" you can limit the printout to every x point. Enter the value using the up/down buttons and confirm with <Enter>. With "Range" define the start and end of a data point range and confirm with <Enter>.
This setting is used for all programs unless changed for the particular program (see

section 5.7).

- "Sample Input Query"
Select whether the user should be prompted to enter the sample name at the start of a measurement ("On") or not ("Off"). This setting is used for all programs and for the quick test.

- "Def. Progs in List"
Select "On" to show the default programs (see section 5.9) in the program list under "Program Start" or "Off" to show only the user-defined programs.

- "Adjust Warning"
If "On" is selected the instrument shows a warning when the last adjust is older than the maximum allowed time (see section 5.2). To set the time value go to "Set Interval" (a password input is required if the passwords are active) and enter a time period between 1 and 90 days. If "Off" is selected, no warning is shown.

- "Pt100 Warning"
Select "On" to display a warning at the start of a measurement if no Pt100 sensor is connected (the measurement can be started anyway after confirming with "Enter"). To suppress this warning select "Off".

- "Delete all results"
Deletes all stored measurement results. A password input is required if the passwords are active. Press <Enter> to confirm or <Esc> to cancel. There will be no further query, if <Enter> is pressed.

- "Passwords Active"
The instrument setup is protected with a password by default ("On"). To remove this protection select "Off". A password input is required if the passwords are active. The default password is "0000".

Tip: *If the passwords are active, once the password has been entered there will be no further password checks even for protected settings until the instrument has been switched off and restarted.*

- "Change Password"
To change the current password, enter the current password using the up/down buttons and enter the new password twice. Confirm each line by tabbing <Enter>. The default password is "0000". If you have forgotten the current password, select "Reset Password".

5.9 Default Measuring Programs

The RheolabQC is delivered with a set of default measuring programs. The default programs can be modified and saved under a new name.

- "Reset Password"
Enter the master password to reset the password to the default value of "0000". If the master password is required contact your local Anton Paar representative for support.

- "Sound"
Several actions of the RheolabQC are indicated by acoustic signals if the option "On" is selected. To suppress these signals select "All Off". If you want to keep only the signals for Warnings and Keystrokes then choose "Warnings and keys on".

5.8.8.4 "Language"

Select the required language (English or German are available) using the up/down arrow buttons and tab <Enter> to confirm.

5.8.8.5 Display Contrast

With the up/buttons you can edit the display contrast. Confirm with <Enter>.

5.8.8.6 "Date/Time"

Here you can set the date and time and set the date format using the up/down buttons. Tab <Enter> to confirm. The following date formats are available:

- YYYY-MM-DD
- DD.MM.YYYY
- MM/DD/YYYY

5.8.8.7 Config. LAN

A password is required to continue if the passwords are active. This settings can be edited if the instrument should be connected to a computer via Ethernet. Note: With the Rheometer software the settings can be edited also via the software. You can choose the port number, if DHCP protocol should be used ("0" or "1"), the instrument's network name and edit the IP settings. Find more information in section 6.2)

5.8.8.8 Set Sys Password

If the system password is active ("On"), RheolabQC requires the input of a password after switching on the instrument. With active system password operating the instrument in stand-alone mode is only possible after typing in the system password once. Before activating the system password for the first time it has to be changed from 00000000.

5.8.8.9 Chan. Sys Password

Select or change the system password using the up/down arrow buttons and tab <Enter> to confirm.

5.9.1 Calibration Oil Program

This is a special program for measuring calibration oils in the range from 1 Pa s to 20 Pa s. This pro-

gram may not be modified. The required test temperature has to be sent to the instrument before starting the test. The test consists of 2 parts, the first part is a "waiting interval" for temperature equilibration. The RheolabQC turns at a speed of 1 rpm for 10 min. No measurement data are shown for this first interval. In the second interval 30 measurement points with a duration of 10 s per point are made at a speed of 50 rpm. The viscosity in mPa.s, the temperature (if an external Pt100 or the C-LTD70/SM/QC, C-LTD80/QC or C-LTD180/QC are connected, not with the C-PTD180/AIR/QC), the shear rate and the measurement point number are shown on the RheolabQC display. MS-Detection is on.

5.9.2 DEFAULT1 Program
-   Mode: CSR ramp
-   Measuring time = 580 s
-   Measuring points = 29 (measuring point duration 20 s)
-   Shear rate = 2 - 100 1/s linear ramp
-   MS-Detection: On

5.9.3 DEFAULT2 Program
-   Mode: CSS ramp
-   Measuring time = 170 s
-   Measuring points = 34 (measuring point duration 5 s)
-   Shear stress = 1 Pa to 100 Pa linear ramp
-   MS-Detection: On

5.9.4 DEFAULT3 Program
-   Mode: CSR constant
-   Measuring time = 120 s

-   Measuring points = 20 (measuring point duration 6 s)
-   Shear rate = 1000 1/s
-   MS-Detection: On

5.9.5 DEFAULT4 Program
-   Mode: CSR constant
-   Measuring time = 1000 s
-   Measuring points = 200 (measuring point duration 5 s)
-   Shear rate = 50 1/s
-   MS-Detection: On

5.9.6 Yield-maxTorque Program

This program runs at a constant shear rate and does an analysis of the highest shear stress value. This is a very simple quality control test and can be used especially for measuring slurry. It is not recommended as a standard yield point test. The measuring parameters may be modified. Default settings:
-   Mode: CSR ramp
-   Measuring time = 300 s
-   Measuring points = 300 (measuring point duration 1 s)
-   Shear rate = 0.5 1/s
-   MS-Detection: On

Analysis result:
-   Max. Torque: PM: xxx (at which measuring point the max. shear stress occurred)
-   mNm: xxx (at which torque value the max. shear stress occurred)
-   Pa: xxx (the value of the max. shear stress)

6 Operation with PC Software

6.1 Requirements for the Computer

A computer is required if one of the following programs should be operated together with the RheolabQC:

-   Rheometer software RheoCompass™
-   Rheometer software Rheoplus
-   Data Export software
-   Flash Update software for firmware update

Connection to a PC is only possible to one of the mentioned programs at a time and requires one of the following interfaces on the PC:

-   a free serial port (RS232)
-   an Ethernet connection peer to peer
-   an Ethernet connection over a network
-   a USB port with USB-RS232 converter (Mat. No. "15446 USB to RS232" is recommended and tested)

6.1.1 Requirements for RheoCompass™

For the RheolabQC firmware 1.26 or higher is recommended. Only firmware 1.26 and higher have been tested and are supported with RheoCompass™. The steady state function of the RheoCompass™ software works with firmware 1.31 or higher.

For further information on steady-state sensing refer to the *RheoCompass™ Software Manual (Doc. No. C01IB003)*.

For information on the installation requirements of the RheoCompass™ software, please refer to the software manual "*RheoCompass™ Software - Getting started with RheolabQC (Doc. No. C04IB014)*".

6.1.2 Requirements for Rheoplus

For information on the installation requirements of

the Rheoplus software, please refer to the software manual on the installation CD.

6.1.3 Requirements for RheolabQC Data Export Software

Information on installing the Data Export software can be found on the customer USB storage device in the directory "Anton Paar Software > RheolabQC Data Export Software > V1.50" in document "*Rheo-* *labQC Data Export Readme (Doc. No. C04IB016)*"

6.1.4 Requirements for Flash Update Software for Firmware Update

See section 6.1.3 for the system requirements and refer to "*Short Instruction Firmware Update Rheo- labQC (Doc. No. C04IB013)*" for information about the firmware update.

6.2 Connecting the RheolabQC to a PC

There are 3 possibilities to connect the RheolabQC to a PC. These possibilities are valid for the following programs:

- RheolabQC Data Export Software
- RheolabQC Flash Update for Firmware
- Rheometer Software RheoCompass™
- Rheometer Software Rheoplus

To disconnect the RheolabQC from the computer remove the LAN or RS232 cable and switch the RheolabQC off and on. Now it will operate in stand-alone mode again.

Tip: *It is only possible to connect the RheolabQC to one program and one PC at the same time. So if e.g. the RheolabQC is connected to the RheoCompass™ it is not possible to connect to the Data Export Software at the same time. One program has to be disconnected or closed to successfully connect to another program.*

6.2.1 Ethernet (LAN) Cable Connection

Tip: *This instruction shows how to set up the connection using DHCP protocol. It is also possible to assign fixed IP addresses instead.*

If the RheolabQC should be connected to a PC via a LAN network, use the standard LAN cable (RJ45 Cat5e Ethernet Patch Cable; delivered with the instrument).

- Switch off the RheolabQC.
- Connect the LAN cable (with white cable end) to the instrument and to the network.
- Switch on the RheolabQC.
- Go to "Setup" using the buttons on the instrument and tap <Enter>.
- Go to "Options" and tap <Enter>.
- Go to "Select connection". If Ethernet is already selected (the ">" sign is shown for "Ethernet"), leave this menu by tapping <Esc> three times.
- If this is not the case, use the up and down but-

tons on the instrument to select "Ethernet" and tap <Enter> two times. Then leave this menu by tapping <Esc> three times.
Switch the instrument off and on if you changed the settings.
- Go to "Setup" using the buttons on the instrument and tap <Enter>.
- Go to "Config. LAN" and tap <Enter>.
- If no password is set on the RheolabQC leave the display on "Password: 0000" and tap <Enter>. If another password has been set on the instrument before, type it in and tap <Enter>.
- Now you see "Config. LAN" "Port: 1025" and tap <Enter>.
- Select "DHCP: 1" with the buttons on the instrument and tap <Enter> two times.
- The instrument display shows "Config. LAN - Changes saved!"
- On your PC go to the network settings and check the properties of the TCP/IP protocol. Verify that the LAN settings for internet protocol version 4 (TCP/IPv4) are set to automatic. Usually, this is already the case.
- Deactivate the wireless LAN on your PC. It needs to be deactivated every time you establish the connection. If required – e.g. during a long measurement – the wireless LAN can be switched on again.
- Open the program on the PC that you will use.
- In the Data Export and Flash Update Software select "TCP: RheolabQC" and click "...". After a short time, the RheolabQC should appear. Select it and click "OK". More instructions are given in chapter 6.5 .
- In the RheoCompass™ and Rheoplus software select the "Net" and "Ethernet" connection in the software. For further information refer to the "*Instruction Manual RheoCompass™ - Getting started with RheolabQC*" or "*Instruction Manual Rheoplus Software Volume 4 - Device Driver RheolabQC*".

6.2.2 Peer to Peer Ethernet Connection

If the RheolabQC should be connected to a PC directly with a LAN cable, use the crossed LAN cable (RJ45 CAT5E Crossover Cable; delivered with the instrument). Please note that it is not possible to connect the computer to another network during establishing the connection to the RheolabQC.

• Switch off the RheolabQC.

• Connect the LAN cable (with green cable end) to the instrument and to the PC.

• Switch on the RheolabQC.

• Go to the network settings of your computer and check the properties of the TCP/IP protocol. Verify that the LAN settings for internet protocol version 4 (TCP/IPv4) are not set to automatic but to a fixed IP address.

• Note down the IP number, the subnet mask and the IP number of the standard gateway. If these are not set, you may use the following settings:

    - IP number: 192.168.21.5

    - Subnet mask: 255.255.255.0

    - Standard gateway: 192.168.21.10

• Deactivate the wireless LAN on your PC. It needs to be deactivated every time you establish the connection. If required – e.g. during a long measurement – the wireless LAN can be switched on again.

• On the RheolabQC go to "Setup" using the buttons on the instrument and tap <Enter>.

• Go to "Options" and tap <Enter>.

• Go to "Select connection". If Ethernet is already selected (the ">" sign is shown for "Ethernet"), leave this menu by tapping <Esc> three times.

• If this is not the case, use the up and down buttons on the instrument to select "Ethernet" and tap <Enter> two times. Then leave this menu by tapping <Esc> three times. Switch the instrument off and on if you changed the settings.

• On the RheolabQC go to "Setup" using the buttons on the instrument and tap <Enter>.

• If no password is set on the RheolabQC, leave the display on "Password: 0000" and tap <Enter>. If another password has been set on the instrument before, type it in and tap <Enter>.

• Go to "Config. LAN" and tap <Enter>.

• Now you see "Port: 1025" and tap <Enter>.

• Select "DHCP: 0" with the buttons on the instrument and tap <Enter> two times.

• Now configure the LAN settings so that they correspond to the LAN settings on your PC, e.g.:

    - IP number: 192.168.21.6

    - Subnet mask: 255.255.255.0

    - Standard gateway: 192.168.21.10

• For the IP number, use the same numbers as on the computer for the first three groups of digits. **The last group needs to be different**. You can use any numbers for the last group as long as it is different from the setting on the computer. Note: the numbers 0 and 255 should not be used.

• The instrument display shows "Config. LAN - Changes saved!"

• Now open the Program on the PC that you want to use.

• In the Data Export and Flash Update select "TCP:RheolabQC" and click "...". After a short time the RheolabQC should appear. Select it and click "OK". More instructions are given in chapter 6.5 .

• In the RheoCompass™ and Rheoplus software select the "Net" and "Ethernet" connection in the software. For further information refer to the "*Instruction Manual RheoCompass™ - Getting started with RheolabQC*" or "*Instruction Manual Rheoplus Software Volume 4 - Device Driver RheolabQC*".

6.2.3 Serial (RS232) Connection

If the RheolabQC should be connected to a PC with the RS232 port, use the RS232 connection cable.

Tip: *In case that the computer does not have an RS232 port, it is possible to use a USB-RS232 adapter cable. Anton Paar only tests and supports this setup with a tested adapter cable USB-RS232. It can be ordered from Anton Paar with the part number 15446. Other converters might work as well and especially for the Data Export Software no problems are expected. However, for controlling the instrument with a rheometer software, only the adapter with part number 15446 is tested and supported by Anton Paar.*

• Switch off the RheolabQC.

• Connect the RS232 cable to the instrument (to "PC") and to the computer.

• Switch on the RheolabQC.

• Go to "Setup" using the buttons on the instrument and tap <Enter>.

• Go to "Options" and tap <Enter>.

• Go to "Select connection". If RS232 is already selected (the ">" sign is shown for "RS232"), leave this menu by tapping <Esc> three times. If this is not the case, use the up and down buttons on the instrument to select RS232 and tap

<Enter> two times. Then leave this menu by tapping <Esc> three times.

- The default settings for the serial port are listed below. Select this default settings for the serial port on the PC that is used for the connection to the RheolabQC.
    - baud rate 38400
    - data bits 8
    - parity none
    - stop bits 1
    - handshake: Xon/Xoff

- Now open the program on the PC that you want to use.

- In the Data Export and Flash Update Software select "COM X" (X is the number of the COM port that is used on the PC. The correct COM port is usually already shown automatically). More instructions are given in chapter 6.5 .

- In the RheoCompass™ and Rheoplus software select the "COM" connection in the software. For further information refer to the Instruction Manual "*RheoCompass™ - Getting started with RheolabQC*" or "*Instruction Manual Rheoplus Software Volume 4 Device Driver RheolabQC*".

6.3 RheoCompass™ Software

The RheoCompass™ software allows remote - control of the instrument for software-controlled measurements. Find more information in the Instruction Manual "*RheoCompass™ - Getting started with RheolabQC (Doc. No. C04IB014)*" and on the RheoCompass™ customer USB storage device.

6.4 Rheoplus Software

The Rheoplus software allows remote - control of the instrument for software-controlled measurements. Find more information in "*Instruction Manual Rheoplus Software Volume 4 - Device Driver RheolabQC*".

With the Rheoplus software it is also possible to export measuring profiles to the RheolabQC "Device > Export Measuring Profile". These measuring profiles can then be run in stand-alone mode on the RheolabQC.
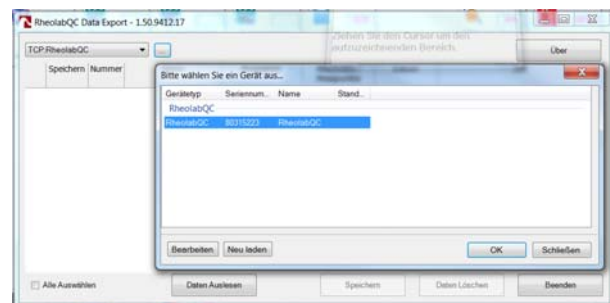
6.5 RheolabQC Data Export Software

The RheolabQC data export software is included in the customer USB storage device. Data export is a software that allows for exporting measurement data from the instrument to a PC.

- To install the software open the customer USB storage device.

- In the folder "Anton Paar Software", open the folder "RheolabQC_Data_Export_Software". Extract the .zip file and store it on your PC.

- Click on "RheolabQCDataExport.exe" and follow the instructions.

- Follow the instructions in section 6.2 to establish a connection between RheolabQC and Data Export Software.

- Then open the data export software.

- Depending on the connection that was established according to section 6.2 choose "COM" or "TCP:RheolabQC" and when working with "TCP:RheolabQC" click on the button <...>. After a short time the RheolabQC appears. Choose it and click on OK.

Fig. 21: RheolabQC Data Export Software connection to the instrument via LAN

- Click on "Read Data"

- Choose all data and click on "Save".
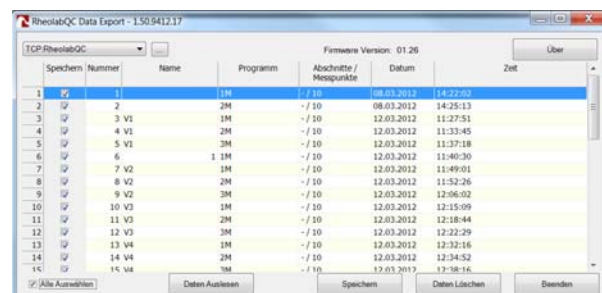

Fig. 22: RheolabQC Data Export Software save data

- The data can now be stored locally on the PC as an Excel or text file.
- Open the file to see and work with the measurement data from the RheolabQC.

Fig. 23: Excel file of exported measurement data

- After exporting and storing all data it is possible to delete all data from the RheolabQC with the

Data Export Software by clicking on "Delete Data", if this is wished.

- Close the data export software.

NOTICE

The measurement data can be transferred to a PC (refer to section 6.5). If this is required, we strongly recommend to do so on a regular basis (e.g. once a week, after 50 measurements or similar) and delete the stored measurements from the memory afterwards. The maximum number of measurements that can be transferred to a PC is 160 measurements. If more than 160 measurements are in the data memory, the data transfer to the PC might not work.

6.6 Firmware Update

All information regarding a firmware update can be found in "*Short Instruction Firmware Update Rheo-labQC (Doc. No. C04IB013)*" that is included in the customer USB storage device.

7 Ball Measuring System and Flexible Cup Holder

7.1 Ball Measuring System (Optional)

The ball measuring system allows you to measure the samples containing large particles like building materials or food like sauces and jam.

Tip: *Additional information can be found in the application report "Viscosity Measurement of Food with the Ball Measuring System for the RheolabQC" that is included in the customer USB storage device.*

### 7.1.1 Checking the Supplied Parts

Symbol	Pcs.	Article Description	Mat. No.
	1	BMS/QC Ball measuring system cup includes a Pt100 sensor requires additionally a measuring bob, e.g. 26896 filling volume approximately 480 mL Can only be mounted on the standard stand for the RheolabQC and not on the RheolabQC with Immersion Stand includes Allen screw for lifting the stopper	26893

7.1.2 Optional Parts

Symbol	Pcs.	Article Description	Mat. No.
	1	Ball measuring system BM08/104/QC (recommended ball measuring system) Ball measuring system BM12/106/QC Ball measuring system BM15/107.5/QC	26896 26895 26894

7.1.3 Ball Measuring System - An Overview
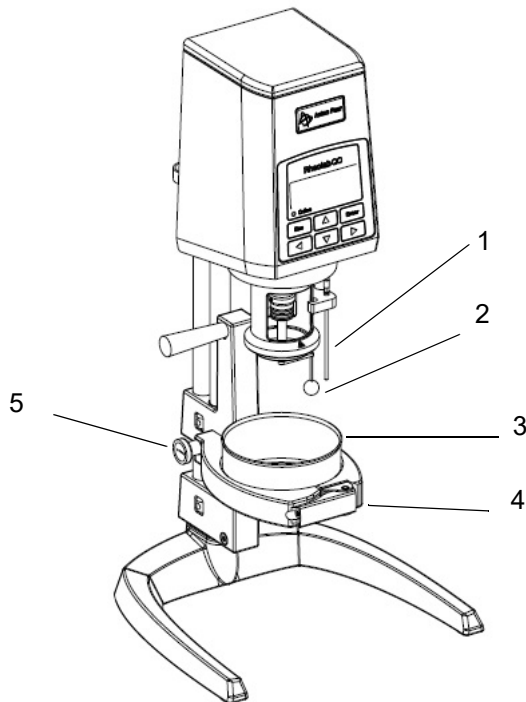
1   PT100
2   Measuring system
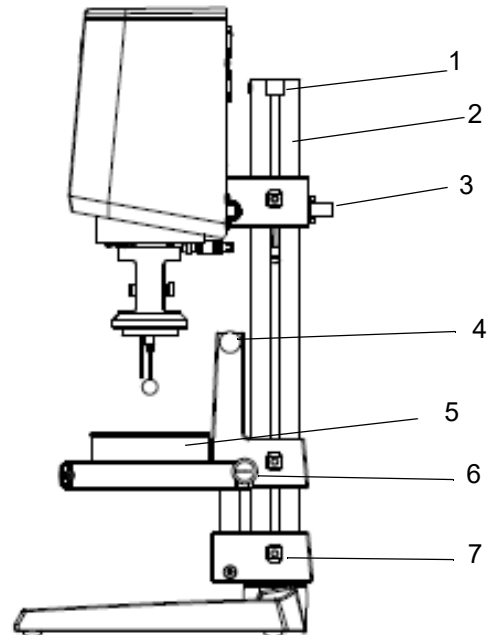3   Sample cup
4   Clamp
5   End stop

Fig. 24: Ball measuring system mounted on the Rheo-labQC

7.1.4 Installation

1. To mount the cup holder it is necessary to disconnect any cables, measuring systems and temperature devices.

2. Lower the instrument head (if applicable, instruction see point 3 or section 4.4) and remove the Allen screw of the stopper and remove the stopper.

3. Hold the instrument with one hand and open the release handle with the other by moving the handle upwards and when moving it downwards pushing the red button at the same time. Then release the red button and push upwards again and continue until the instrument head can be moved easily.

4. Carefully pull off the instrument and put it to one side.

5. Hold the ball measuring system so that the handle bar points upwards and the fixing screw points to the right.

6. Insert the two stand rods into the end stop then into the guiding rail of the ball measuring system. Push down the ball measuring system until the end stop touches the base plate.

7. Remount the RheolabQC and lock it in the highest possible position by moving the handle downwards and when moving it upwards pushing the red button at the same time.

8. Remount the stopper and tighten the Allen screw.

9. Mount the Pt100 holder on the flange and attach the sensor to the connector marked "PT100" on the rear panel of the instrument.

10. With the clamp you can insert and remove the sample cup for easy filling and cleaning.

11. When opening the locking screw you can move up and down the sample cup for easy handling.

Tip: *If you plan to work with a RheolabQC temperature device or an immersion system cup while the ball measuring system is mounted, just remove the sample cup holder by unscrewing the screw on the left-hand side of the flexible cup holder rod and removing the cup to the front.*

1   Stopper (fixed with one Allen screw)
2   Stand rods
3   Release handle
4   Handle bar
5   Sample cup
6   Locking device for the ball measuring system (in guide rail)
7   Fixing screw for the end stop of the cup holder

Fig. 25: RheolabQC with ball measuring system

7.1.5 Operating the RheolabQC with the Ball Measuring System

With the ball measuring system the measurement is carried out at ambient temperature without active temperature control. The current temperature is measured if the temperature sensor is connected. The temperature can then be seen and stored together with the measurement data.

Measurements with the ball measuring system are recommended with software control. The aim is to make a controlled shear rate ramp within only one complete 360° turn of the ball measuring system so that the sample is measured in not - pre-sheared condition. These settings are already pre-programmed in the software templates for the ball measuring system.

1. Fill approximately 480 ml of sample in the sample cup and mount it on the RheolabQC

2. Push up the mantle of the coupling.

3. Insert the measuring system into the coupling and pull down the mantle to fasten it.

4. The ball of the measuring system should be in the middle of the sample filling height. It should not touch the sample cup bottom and should be fully covered by sample.

5. Start the measurement with the software.

6. After the measurement clean and dry the measuring cup and ball measuring system. The sample cup can be removed by opening the clamp for easier cleaning. The bob can be removed via the quick coupling. Conventional detergents like dish-washing agent mixed with warm water and organic solvents like acetone, ethanol or petroleum benzine can be used for cleaning. The sample cup and the ball measuring system are made out of stainless steel.

NOTICE
- Do not bend or drop the measuring systems. Any damage, however small, can lead to large measurement errors.
- The coupling cone on the measuring system and the coupling on the instrument must be completely clean. The coupling must not be oiled or lubricated.
- Do not use force when removing the sample from the measuring system and do not scratch the measuring system when cleaning.
- Do not immerse the Toolmaster™ chip on the upper end of the measuring system into solvent and do not dry it in an oven above 70 °C
- The maximum allowed speed for the RheolabQC equipped with the ball measuring system is 270 1/min

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7.2 Flexible Cup Holder (Optional)

The flexible cup holder allows you to measure the sample directly in a variety of containers. The holder can be preset to different cup diameters from 5 to 10 cm.

Tip: The flexible cup holder can be mounted on the RheolabQC with Standard Stand (part number 18318) and not on the RheolabQC with Immersion Stand. It does not include a measuring system nor Pt100 sensor.

7.2.1 Checking the Supplied Parts

Symbol	Pcs.	Article Description	Mat. No.
	1	Flexible cup holder for fast and easy mounting of cups and cans from 5 to 10 cm diameter includes Allen screw for lifting the stopper	18950

7.2.2 Optional Parts

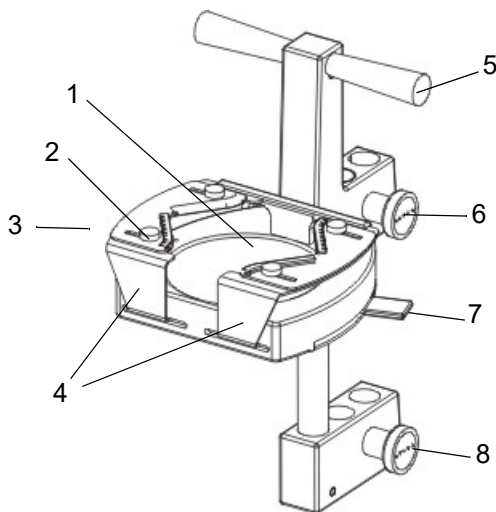| Symbol	Pcs.	Article Description	Mat. No.
	1	Temperature Sensor includes a Pt100 sensor and holder to attach the sensor to the instrument flange	20521
	1	Standard Stand RheolabQC (is included in the RheolabQC with Standard Stand) can be ordered separately if required.	18850

7.2.3 Flexible Cup Holder - An Overview

> ⚠ **CAUTION**
>
> ***Risk of injury.***
> Operate the Flexible Cup Holder carefully and slowly to avoid pinching fingers or entangling hair.

1 Base plate
2 Adjustment screws (4x)
3 Screw for adjusting the initial tension (not visible here)
4 Adjustable brackets
5 Handle bar
6 Locking screw
7 Lever for the sample container
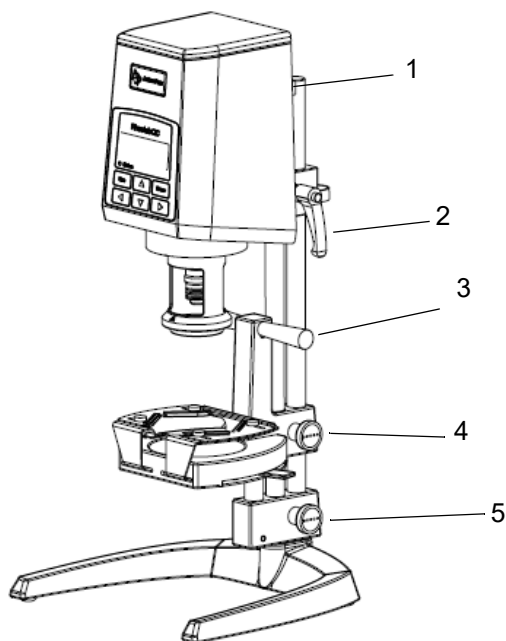8 End stop
Fig. 26: Flexible cup holder

7.2.4 Installation

1. To mount the cup holder it is necessary to disconnect any cables, measuring systems and temperature devices.

2. Lower the instrument head (if applicable, instruction see point 3 or section 4.4) and remove the Allen screw of the stopper and remove the stopper.

3. Hold the instrument with one hand and open the release handle with the other by moving the handle upwards and when moving it downwards pushing the red button at the same time. Then release the red button and push upwards again and continue until the instrument head can be moved easily.

4. Carefully pull off the instrument and put it to one side.

5. Hold the cup holder so that the handle bar points upwards and the fixing screw points to the right.

6. Insert the two stand rods into the end stop then into the guiding rail of the cup holder. Push down the cup holder until the end stop touches the base plate.

7. Remount the RheolabQC and lock it in the highest possible position by moving the handle downwards and when moving it upwards pushing the red button at the same time.

8. Remount the stopper and tighten the Allen screw.

9. Pull the lever towards you to fully open the brackets.

10. Loosen the four adjustment screws on the brackets so that the plates on the brackets can be moved.

11. Put a sample container on the base plate of the cup holder.

12. Push back the lever to a medium position and hold it there.

13. With the other hand move the plates until they touch the sample container. Make sure that the container is in the center.

14. Tighten all four adjustment screws. Push back the lever and check the screws again.

15. The clamping force can be adjusted using the screw on the left-hand side of the cup holder ("+" for a higher clamping force, "-" for a lower clamping force).

The settings described above will have to be repeated if a container diameter differs considerably from the container used for the first adjustment.

Tip: *To work with a RheolabQC temperature device or an immersion system cup while the flexible cup holder is mounted, it is possible to just remove the sample cup holder by unscrewing the screw on the left-hand side of the flexible cup holder rod and removing the cup to the front.*

1 Stopper
2 Release handle
3 Handle bar
4 Locking device for the cup holder (in guide rail)
5 Fixing screw for the end stop of the cup holder

Fig. 27: RheolabQC with flexible cup holder

7.2.5 Operating the RheolabQC with the Flexible Cup Holder

With the flexible cup holder the measurement is carried out at ambient temperature without active temperature control. The current temperature can be measured together with the measurement if the temperature sensor (see chapter 7.2.2) is connected. The temperature can then be seen and stored together with the measurement data.

TIP: *If no Pt100 sensor is connected to the instrument, it is recommended to switch off the Pt100 warning in the instrument menu. Otherwise, the warning will be shown at every start of a measurement in stand-alone operation.*

1. Push up the mantle of the coupling.

2. Insert the measuring system into the coupling and pull down the mantle to fasten it.

3. Pull the lever of the flexible cup holder (see Fig. 26) towards you and place the sample container on the base plate.

4. Push the lever backwards.

5. Open the locking screw (upper screw) on the right-hand side of the cup holder. The holder moves up automatically.

6. If necessary, loosen the screw fixing the end stop (lower screw) and push up the cup holder until the measuring system is fully immersed in the sample. Tighten the end stop screw securely. This adjustment has to be repeated if the size of the sample container changes.

7. For performing a measurement refer to section 5.5.

8. For removing the sample, open the locking nut (upper screw) and push down the holder to the end stop using the handle. Tighten the locking screw. To remove the sample container pull the lever towards you.

NOTICE

- Do not bend or drop the measuring systems. Any damage, however small, can lead to large measurement errors.
- The coupling cone on the measuring system and the coupling on the instrument must be completely clean. The coupling must not be oiled or lubricated.
- Do not use force when removing the sample from the measuring system and do not scratch the measuring system when cleaning.

8 Technical Data

8.1 Wetted Parts

Part	Material
concentric cylinder and double gap measuring system bob	stainless steel 1.4404
concentric cylinder measuring system cup (standard cup)	hard anodized aluminum 3.2315 AlSi1MgMn (AlMgSi1)
concentric cylinder and double gap measuring system cup (stainless steel cup)	stainless steel 1.4404
measuring system cup sealing	PTFE

Part	Material
Measuring system cover (Mat. No 20382)	PTFE GF25
disposable measuring cup	aluminum
vanes, stirrers, ball measuring system bob and cup and similar parts	stainless steel
concentric cylinder PTFE coated	PTFE

8.2 Technical Data

- Motor type: EC-motor, brush-less DC
- Speed: 0.01 to 1200[1]) 1/min
- Internal angular resolution: 2 µrad
- Torque: 0.2 to 75 mNm, permanent
- Torque resolution: < 0.1 µNm
- Shear stress range[2]: 0.5 to 30000 Pa
- Shear rate range[2]: 10^{-2} to 4000 1/s
- Viscosity measuring range[2]: 1 to 10^9 mPas
- Shear step change data rate: < 10 ms per measuring point

1...max. speed with torque derating
2...depends on the measuring system used

- Temperature range[3]: -20 to 180 °C
- Bearing: mechanical ball bearing
- Airborne noise emitted: < 60 dB/A
- Krebs unit output: 40 - 150 KU
- LAN-Ethernet interface PC
- Serial interface RS232 PC, printer
- PS/2 interface keyboard, bar code reader
- Dimensions[4]: W x H x D 300 x 720 x 350 mm
- Weight[4]: 14 kg

3...depends on the temperature device used
4...with standard stand without temperature device or thermostat

8.3 Power Supply

AC Input:
100-240 V~
0.46 - 0.25 A
60/50 Hz

DC Output:
15 V - 1.6 A
max. 24 W

8.4 Environmental Conditions

- Temperature range: +15 °C to +35 °C, recommended 23 °C ± 3 °C
- Humidity: 10 % to 80 % relative humidity,

non-condensing
- Overvoltage category: II
- Degree of pollution: 2

Appendix A: Menu Tree

Menu

- **Program Start**
  - Input Sample Name
    - Measurement
- **Program Edit[a]**
  - Select Program[b]
    - Program Name
      - Set Variable
      - Program Input
      - MS-Detection
        - On
          - Check Name + SN
          - Check Name
        - Off
          - Select MS
      - Edit Program Options
        - Yes
        - No
      - Use Global Options?
        - Yes
        - No
          - Input Sample Name
            - No
            - Input Sample Name
          - Save to Memory
          - Print
            - Off
            - All
            - Single → Print Single
            - Range → Print Range
          - Display settings
          - Select Link
    - Program Type
  - New Program
  - Delete Program
- **Quick Test**
  - Quick Test
    - Input Sample Name
      - Measurement
- **Krebs Test**
  - Input Sample Name
    - Measurement
- **Memory**
  - Memory
    - Show Measurement
    - Print Measurement
    - Last Measurement
      - Show Last Meas.
      - Print Last Meas.
- **Temperature ON**
  - Temp. On
- **Temperature OFF**
- **Setup**
  - Meas. Systems[a]
    - Edit User List
      - Edit List
        - Define New MS
        - Delete MS
        - MS Default List
    - Copy from Default
  - Adjust
    - Start Adjust
    - Delete Adjust
    - Date Last Adjust
  - Options
    - Select Connection
    - Select Startmenu

a   Password required to continue
b   100 different programs may be stored

Temperature Unit		
Temperature Control		
Printer Type		
Printer Protocol		
Save Results		
Display		
Print	Off	
	All	
	Single	
	Range	
Sample Input Query		
Def. Progs. in List		
Adjust Warning	Off	
	On	
	Set Interval[a]	
PT100 Warning		
Delete all results[a]		
Passwords Active[a]		
Change Password[a]		
Reset Password		
Sound		

Language	
Display Contrast	
Date/Time	Set Date/Time
	Set Date Format

Config. LAN[a]
Set Sys Password
Chan. Sys Password

a Password required to continue
b 100 different programs may be stored

Appendix B: CE Declaration

EU Declaration of Conformity   (original)   Anton Paar
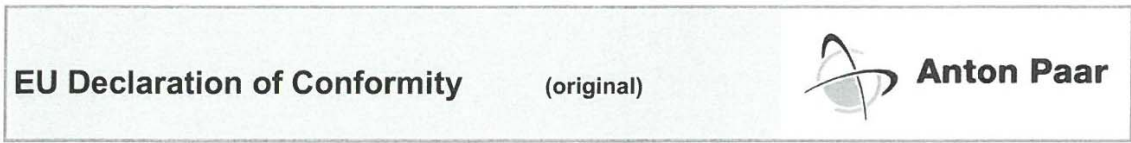
The Manufacturer **Anton Paar GmbH,** Anton-Paar-Str. 20, A-8054 Graz, Austria – Europe hereby declares that the product listed below

Product designation:	**RheolabQC with Standard Stand**
	RheolabQC with Immersion Stand
	RheolabQC without Stand
Model:	**RheolabQC**
Material number:	**18318, 13000, 27401**

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

    The product is classified as a class B equipment and is not intended for the use in industrial area.

- **Low Voltage Directive (2014/35/EU, OJ L 96/357 of 29.3.2014)**
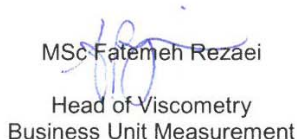
    Applied standards:

    EN 61010-1:2010   Safety requirements for electrical equipment for measurement, control and laboratory use Part 1: General requirements

    EN 61010-2-010:2014   Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-010: Particular requirements for laboratory equipment for the heating of materials

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Business Unit Measurement   Business Unit Measurement