

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

ileo Galilei (1564-1642)

Reference Guide

Lovis 2000 M/ME

Instrument Software Version: 2.98

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1 About the Reference Manual

This reference manual is split into two sections and an Appendix:

SECTION I - Lovis Reference Information

This section contains all chapters of the Lovis 2000 M/ME Original Instruction plus additional information to certain chapters of the printed Instruction Manual such as:

- · Checks and adjustments
- Specific measuring settings
- · Editing advanced method settings
- Polymer application settings (for more details refer to the Polymer Measurement Short Instruction, Doc. No. C72IB012EN, supplied on the USB flash drive)
- · Service utilities

It describes also operating Lovis 2000 ME inside a DMA M/DSA M model. Additionally read and adhere to all instructions given in a DMA M/DSA M instruction manual.

SECTION II - Flow-Through Systems

This section informs you about the hardware setup and the operation of measuring assemblies consisting of Lovis 2000 M/ME with several Xsample sample changer models, DMA M/DSA M density/sound velocity meters and other modules.

Appendix

The Appendix with helpful information about

- Measurement under special conditions
- Lovis parameters
- Chemical compatibility of wetted parts
- Troubleshooting
- Full menu structure

and more completes the reference manual.

Pay special attention to the safety instructions and warnings in this manual and on the product. It is a part of the product, included on the USB flash drive supplied with Lovis 2000 M/ME. It is available only as a pdf file in English language.

Keep this documentation 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 reference manual from Anton Paar GmbH, these must be treated as part of the reference manual.

TIP Functions of the instrument software which are not instrument specific find in the "Platform M General Software Functions Instruction Manual" (Document No. XPAIB001EN) on the enclosed USB flash drive

Conventions for safety messages

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



DANGER

Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Hazard

This symbol calls attention to the fact that other hazards can occur, e.g. during sample handling. Follow the instructions.



Wear protective gloves

Wear protective gloves when handling the Lovis 2000 M/ME.



Wear safety goggles

Wear safety goggles when handling the Lovis 2000 M/ME.



Use protective clothing

Use protective clothing when handling the Lovis 2000 M/ME.

NOTICE

Notice indicates a situation which, if not avoided, could result in damage to property.

TIP Tip gives extra information about the situation at hand.

Typographical conventions

The following typographical conventions are used in this instruction manual:

Convention	Description
<key></key>	The names of keys and buttons are written inside angle brackets.
"Menu Level 1 > Menu Level 2"	Menu paths are written in bold, inside straight quotation marks. The menu levels are connected using a closing angle bracket.

2 Safety Instructions

- Read this reference manual before using Lovis 2000 M/ME.
- Follow all hints and instructions contained in this reference manual to ensure the correct use and safe functioning of Lovis 2000 M/ME.

2.1 General Safety Instructions

Liability

- This reference 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 Lovis 2000 M/ME if no adjustments have been made to the mechanics, electronics, module firmware and instrument software.
- Only use Lovis 2000 M/ME for the purpose described in this instruction manual. Anton Paar GmbH is not liable for damages caused by incorrect use of Lovis 2000 M/ME.

Installation and use

- Lovis 2000 M/ME 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 Chapter 4).
- 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
 Lovis 2000 M/ME. Do not operate the instrument under conditions which
 could result in damage to goods and/or injuries and loss of life.
- Check Lovis 2000 M/ME for chemical resistance to the samples and cleaning liquids.

Maintenance and service

- The results delivered by Lovis 2000 M/ME 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.
- Service and repair procedures may only be carried out by authorized personnel or by Anton Paar GmbH.

Disposal

 Concerning the disposal of Lovis 2000 M/ME, observe the legal requirements in your country.

Returns

 For repairs, contact your local Anton Paar representative. Remove sample and solvent liquids and clean the Lovis 2000 M/ME before return and return the instrument with the filled out "Safety Declaration for Instrument Repairs".

Precautions for highly inflammable samples and cleaning agents

- Observe and adhere to your national safety regulations for handling the measured samples and used cleaning liquids (e.g. use of safety goggles, gloves, respiratory protection etc.).
- Keep any sources of ignition, like sparks and open flames, at a safe distance from Lovis 2000 M/ME.
- Place Lovis 2000 M/ME on a laboratory bench with a non-flammable surface, preferably made of bricks, ceramics or stoneware.
- Only store the minimum required amount of sample, cleaning agents and other inflammable materials near the Lovis 2000 M/ME.
- 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 Lovis 2000 M/ME must be kept free of inflammable gases and vapors.
- Connect Lovis 2000 M or the DMA M/DSA M model containing Lovis 2000 ME 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 Lovis 2000 M or the DMA M/DSA M master instrument.
- Supply a fire extinguisher.
- Ensure the sufficient supervision of Lovis 2000 M/ME during operation.

2.2 Special Safety Instructions

- Do not use Lovis 2000 M/ME respectively the measuring assembly with included Lovis 2000 M/ME to measure fluids of the IIC group according to EN 60079-14, such as e.g. carbon disulfide, hydrogen or acetylene.
- Do not use Lovis 2000 M/ME respectively the measuring assembly with included Lovis 2000 M/ME to measure fluids, such as diethyl ether, above temperature class T4 according to ATEX Directive 94/9/EC.
- If liquid was spilled over the instrument, disconnect the instrument from the mains. Clean and dry the housing of the instrument. If you have a suspicion that liquid got into the instrument, have the instrument cleaned and checked for electrical safety by a service technician.
- Ensure that spilled liquids can not get into plug connections or venting slots of electrical equipment.
- If placing a module on top of a master instrument (Lovis 2000 M or DMA M/DSA M) with built-in Xsample model use a Drip Plate (Mat. No. 158100) to protect the master instrument against liquid entry and to ensure electrical safety in case of leakage. If combining a master instrument with several modules, it is recommended to use the Stand Measuring Assembly (Mat. No. 105451) instead of the Drip Plate. See also SECTION II of the Lovis 2000 Reference Manual.

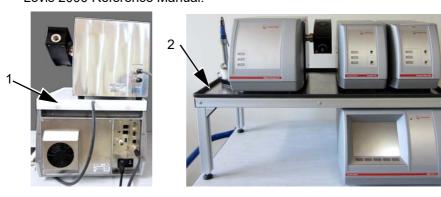


Fig. 2 - 1 Drip Plate (1 - color may vary) and Stand Measuring Assembly (2)

- Make sure that the capillary was removed from the Lovis capillary block before you move or lift Lovis 2000 M/ME.
- To move or lift Lovis 2000 M, place one hand at the back and grip the ledge at the top. Place the other hand at the front, under the display. There is a hollow for your fingers.
- To move or lift Lovis 2000 ME in the Module Housing, place one hand at the back and grip the base plate. Place the other hand at the front and grip the base plate. To move or lift Lovis 2000 ME in a DMA M/DSA M, refer to the safety instructions in the respective instruction manual.

• When carrying the instrument or parts of the measuring assembly, keep them close to your body.

2.2.1 Special Safety Instructions for Low Temperature Application

- Use only water or a mixture of water and glycol for counter cooling. Do not fill flammable liquids or mineral oils into the cooling system.
- Do not exceed a pressure of 1.5 bar in the counter cooling system of the Lovis capillary block. If using tap water, make sure there is a free flow. For closed cooling systems check the pump pressure of your circulation cooler.
- Operate the counter cooling system only in a range from -10 °C to 40 °C circulation temperature.
- Use only the hose type, cooling liquids and settings specified in this
 instruction manual. The system has been tested for this setup. Other hose
 materials or conditions could possibly make the hoses too stiff or brittle; the
 hoses could break under the strain of the moving capillary block.
 Do not use any other cooling setup without contacting Anton Paar GmbH
 first.

2.3 Warning Signs on the Instrument



Hazard

This symbol calls attention to the fact that other hazards can occur, e.g. during sample handling. Follow the instructions.

Warning symbol "Hazard" on the Lovis capillary block:

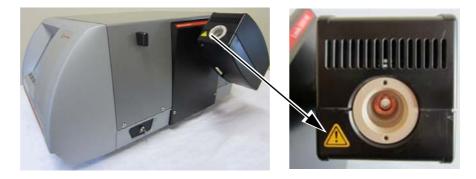


Fig. 2 - 2 Symbol "Hazard" on the Lovis capillary block

 Handling caustic liquids, acids, or biologically hazardous, easily inflammable liquids etc. involves a serious health risk for the operator. Use appropriate protective equipment (protective gloves, safety goggles, protective clothing, fume hood...).

- When switching on the Lovis 2000 M/ME instrument, the Lovis capillary block moves into the physical end position (initialization). The moving block could possibly squeeze your fingers. Touching the moving block might lead to clamping or displacement of the zero position. Do not touch the moving Lovis capillary block or bring parts of your body or objects near it.
- Switch off the instrument before moving the Lovis capillary block by hand!
- Risk of burns at measuring temperatures above 60 °C at the insert openings
 of the Lovis capillary block and on the capillary. Do not remove the hot
 capillary and do not touch the insert openings of the Lovis capillary block
 when hot. Either use adequate protective gloves or cool down the
 Lovis 2000 M/ME to a temperature significantly below 60 °C before touching
 these parts with bare hands.
- Due to thermal expansion of the sample at elevated measuring temperatures, the plugs which seal the capillary after filling manually outside the Lovis capillary block may pop off. Risk of burns or injury caused by hot, toxic or aggressive liquid splashes. Risk of injury caused by the popping off plug. To prevent that, always attach the closed screw cap front side and back side for this filling method.

Refer to the instructions in Chapter 9.

Option Lovis 2000 M/ME Low Temperature

- For Option Lovis 2000 M/ME Low Temperature, the capillary block is equipped with two metal counter cooling connectors. Depending on the counter cooling temperature these connectors can be cold or hot. Risk of injury. Do not touch the cold or hot connectors with bare fingers.
- Connected cooling hoses and an optional hose for dry air move with the turning Lovis capillary block. Make sure the hoses have got sufficient free space to move and do not get bent or entangled with objects or persons.
- In case of accident cooling liquid might leak from the system. Depending on the used cooling liquid and counter cooling temperature liquid flowing out involves a health risk. Use appropriate protective equipment (protective gloves, protective clothing,...) in case of leakage.

SECTION I: Lovis 2000 M/ME Reference

This section contains all chapters of the Lovis 2000 M/ME Original Instruction. Some chapters also give additional information to the Lovis 2000 M/ME Original Instruction.

3 Lovis 2000 M/ME - An Overview

Lovis 2000 M/ME is a microviscometer based on the Rolling Ball Principle explained in Chapter 3.3 of the Lovis 2000 Reference Manual. It is designed for measuring dynamic, kinematic, relative and intrinsic viscosity of liquids especially in the low viscosity range.

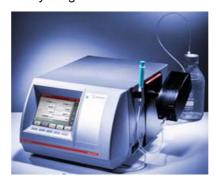


Fig. 3 - 1 Lovis 2000 M with flow-through hose connection

It is a microviscometer due to the small sample volume required (< 1mL). The sample is filled into a capillary which is introduced into a temperature controlled capillary block. This block can be inclined at a variable predefined angle. Varying the inclination angle permits to extend the measuring range of a capillary and to submit a sample to different shear rates.

The Lovis 2000 M is an instrument for stand-alone operation. The Lovis 2000 ME is a modular instrument for inserting into

- DMA 4100/4500/5000 M density meter or
- DSA 5000 M sound velocity meter.

From Software 2.92 on, Lovis ME can also be combined with DMA 4200 M, especially for samples which corrode glass. This combination is set up from case to case. Please contact your Anton Paar representative.

Important information on DMA M / DSA M:

From June 2015 on, adapters for the inlet and outlet of DMA M and DSA M are made of black material. These adapters have new material numbers (please refer to Chapter 16.1.4.1 of the Lovis 2000 M/ME Reference Manual or to the product description list of the DMA M / DSA M) but their functionality and the handling is the same. If white adapters are shown in a figure, simply use the black adapters instead.



Fig. 3 - 2 DMA M with 2 Injection Adapters UNF 1/4" black

Optionally, the Lovis 2000 M/ME can also be connected to an automatic sample changer (Xsample) and to other Anton Paar measuring modules.

For combining Lovis 2000 ME with a DMA M/DSA M plus an Xsample and/or additional modules, refer to the Lovis 2000 Reference Manual, SECTION II: Flow-Through Systems.

3.1 Intended Use of the Machinery

Lovis 2000 M/ME is intended for measuring the rolling times of a ball in liquid samples and calculating the samples' viscosities from the obtained times. It is designed for use under the ambient conditions specified in Appendix A.4.

- Lovis 2000 M/ME is ideally suited for samples in the low viscosity range, e.g. pharmaceutical liquids, polymer solutions, beer and wort or ink for ink-jet printers.
- The variable inclination angle predestines Lovis 2000 M/ME for testing polymer solutions requiring extrapolation to zero shear rate.
- Do not fill a sample if you do not know which cleaning liquid removes this sample. Make sure the wetted parts of Lovis 2000 M/ME are chemically resistant to any tested sample or cleaning liquid. Do not fill and test liquids that attack the instrument's materials, e.g. hydrofluoric acid (attacks glass).

3.1.1 Measurement results without Density Values

The liquid's **relative viscosity** and **intrinsic viscosity** and further polymer solution parameters can be calculated from the rolling times alone. It is not necessary to adjust the capillary plus the ball. The sample density must not be known

These viscosities are relative values. In their equations the density values cancel each other out.

3.1.2 Density Values for Viscosity Calculation

To calculate a **dynamic viscosity** or **kinematic viscosity** value from the measured rolling times the sample's density must be known.

In addition, the capillary plus a ball needs to be adjusted with a substance of known viscosity and density. The density of the ball must also be known.

A ball's density is given on the label of the ball vessel, along with the ID number of the ball batch. There are two possibilities how to obtain the sample density:

Manual Input of Sample Density

The sample density can be entered manually before starting a test with Lovis 2000 M/ME. Either the value is already known or it has been tested beforehand with a density meter.

Simultaneous Density Measurement with DMA M/DSA M

Lovis 2000 ME is combined with a density meter or sound velocity meter of Anton Paar GmbH. Both instruments are connected with hoses and simultaneously filled with the same sample. The density is measured at the same time as the rolling time.

3.2 Available Capillaries and Filling Methods

This chapter gives an overview of the capillaries and the filling methods. Capillaries are available made of borosilicate glass (see the below figures) or of PCTFE (see Fig. 3 - 8). Find detailed information in the Lovis 2000 M/ME Product Description List (provided on the supplied USB storage device).

Standard Capillary for Manual Filling Outside the Capillary Block

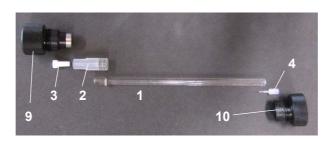




Fig. 3 - 3 Standard glass capillary and accessories for manual filling

Standard Capillary for Flow-Through Filling

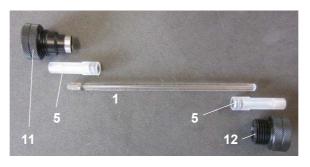




Fig. 3 - 4 Standard glass capillary and accessories for flow-through filling

Short Capillary for Low Sample Volume (Manual Filling Outside the Capillary Block)

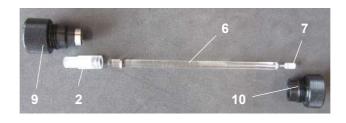




Fig. 3 - 5 Short glass capillary and accessories for low sample volume

- 1 ... Capillary (glass or PCTFE)
- 2 ... Filling Adapter Luer Female
- 3 ... Luer Plug
- 4 ... Capillary Plug (PVDF)
- 5 ... Filling Adapter UNF
- S ... Short Capillary (glass or PCTFE)
- 7 ... Capillary Plug Hollow (PCTFE)
- 8 ... Ball
- 9 ... Screw Cap Front Side Closed
- 10 ... Screw Cap Back Side Closed
- 11 ... Screw Cap Front Side Open
- 12 ... Screw Cap Back Side Open

Twist protection made of PEEK

From the end of 2013 on, a removable twist protection made of PEEK replaces the permanently fixed Hastelloy ring on glass capillaries. Every capillary comes with five PEEK twist protection clips. One is already fixed on the capillary; the spare ones come in a glass bottle (Mat. No. for ordering 5 spare clips: 134755).

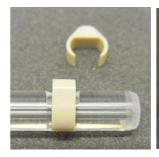




Fig. 3 - 6 Capillary with PEEK twist protection clip and spare clips

The surface of the capillary has got a flat groove (1) where the clip (2) can be fixed by pressing it downwards (see arrow).

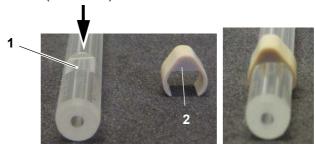


Fig. 3 - 7 Fixing the PEEK twist protection clip

TIP The PEEK twist protection can be removed for cleaning. Other than with the Hastelloy twist protection there is no risk that the cleaning liquid attacks the glue holding the twist protection into place (especially if soaking the capillary in a bath).

Capillaries made of PCTFE

Short and standard capillaries are also available made of PCTFE with 1.62 mm inner diameter. PCTFE capillaries are break-proof. For optimum measurement accuracy it is not recommended to use the PCTFE capillaries at temperatures higher than 60 °C. The twist protection is part of the capillary itself. These capillaries are used with the same adapters and plugs 1.8 as glass capillaries.

- 1 ... Standard capillary
- 2 ... Short capillary
- 3 ... Integrated adapter
- 4 ... Filling Adapter Luer Female
- 5 ... Luer plug
- 6 ... Capillary Plug Hollow 1.8 (PCTFE)

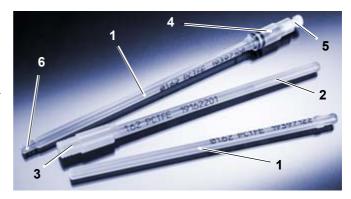


Fig. 3 - 8 PCTFE capillaries and accessories

3.3 Lovis Measuring Principle

The Rolling Ball Principle goes back to the "Falling-Ball Viscometer" designed by Fritz Höppler in 1933 (see also DIN 53015, and later ISO 12058).

A ball rolls through a closed, liquid-filled capillary, which is inclined at a defined angle.

Three inductive sensors determine the ball's rolling time between defined marks. The sample's viscosity is directly proportional to the rolling time (the greater the viscosity the longer the rolling time). The microviscometer registers the rolling time.

The inductive sensors allow the measurement of opaque liquids.

By using these three sensors the total measuring distance of Lovis 2000 M/ME is divided in a short first part and a longer second part. When the instrument starts measuring, the ball first passes the short distance; the obtained time shows whether the sample is highly viscous or not.

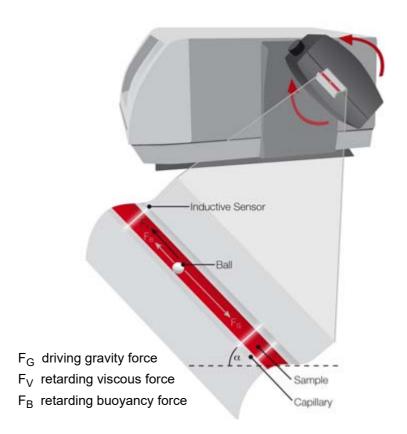


Fig. 3 - 1 Lovis measuring principle

With highly viscous samples, time can be saved by measuring only the rolling time for the short distance. The capillary block is turned around as soon as the ball has passed sensor No. 2. This applies also to short capillaries for low sample volume.

Fig. 3 - 1 shows the three dominating forces: gravity, viscous force, and buoyancy. Other forces than the ones named above are negligible, provided there is laminar flow. A portion of the gravitational force, which depends on the angle, drives the ball downwards. As opposing forces, the buoyancy inside the sample and the viscous forces of the liquid slow the ball down. It follows that for identical inclination angles the rolling time increases with the viscosity of the sample. The ball's rolling time is directly proportional to viscosity. Ideally, this is a linear relation (*Equation 2*). The following legends show SI (International System) units.

 $F_G = m \cdot g = \rho \cdot V \cdot g$ Equation 1: Gravitational force

 $F_G \dots$ gravitational force m ... ball mass [g] ρ ... density [kg/m³] V ... ball volume [m³]

g ... acceleration of gravity [m/s²]

The ball's density plays a vital role in the gravitational force. By replacing the density of the liquid with the ball's density in *Equation 1*, you obtain the buoyancy F_B . Consequently, both density values $(\rho_b, \, \rho_s)$ are required to calculate the viscosity.

 $\eta = K \cdot (\rho_b - \rho_s) \cdot t_r$ Equation 2: Dynamic viscosity

 $\begin{array}{llll} \eta & ... & dynamic \ viscosity \ [Pa\cdot s] \ or \ [mPa\cdot s] & \rho_b \ ... & ball \ density \ [kg/m^3] \\ K & ... & proportionality \ constant \ [1] & \rho_l \ ... & liquid \ density \ [kg/m^3] \\ & t_r \ ... & ball \ rolling \ time \ [s] \end{array}$

The proportionality constant (K) results from an adjustment with a certified reference standard. With the Lovis 2000 M/ME, a configuration consisting of a capillary plus a ball is adjusted with such a reference standard of known viscosity and density. This adjustment links the ball's rolling time to viscosity and corrects influencers of exactly this capillary/ball configuration, such as manufacturing tolerances of the capillary (inner diameter), the ball diameter or the ball density. Additional correction factors take into account temperature-related influences, e.g. thermal expansion coefficients of ball and capillary.

By measuring the viscosity of a second reference standard with different viscosity using the adjusted capillary/ball configuration, it is possible to prove that the viscosity is actually proportional to the ball's rolling time.

Still, there remain several influencers, which contribute to the uncertainty of the measuring result. These Factors are:

- operator skills
- · change of ball
- uncertainty of the reference standard liquids used
- deviations between adjustment temperature and measuring temperature
- · deviations between viscosity of the reference liquid and measured viscosity
- variation of the gravitational constant with change of location

The MS Excel template "Lovis 2000 M/ME Measuring Error Contribution Factors" (provided on the Customer USB storage device) serves to determine the allowed uncertainty (i.e. deviation from reference value) based on the listed influencers.

4 Checking the Supplied Parts

Lovis 2000 M/ME 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.
- 2. Check the delivery for completion by comparing the supplied parts to those listed in the corresponding tables. The capillary/capillaries, balls and filling accessories supplied with Lovis 2000 M/ME depend on which parts were actually ordered. Compare the delivered items to the delivery list. Find detailed information on all capillary accessories and optional equipment in the Lovis 2000 M/ME Product Description List (provided on USB flash drive). For parts supplied with DMA M series, DSA 5000 M and other modules see the respective instruction manuals and delivery lists.
- 3. If a part is missing, contact your Anton Paar representative.
- 4. If a part is damaged, contact the transport company and your Anton Paar representative.

TIP It is recommended to perform an installation/operation qualification (IQ/OQ) for the instrument. An IQ/OQ ensures that your instrument is complete and in good working order before starting work.

4.1 Supplied Parts Lovis 2000 M

This is the list of the standard delivery range of Lovis 2000 M for "stand alone" operation. As the real delivery range depends on your order, see also the IQOQ (installation and operation qualification) document you receive during installation.

For ordering spare parts refer to the Product Description List (PDL) on the USB flash drive supplied with your Lovis.

Table 4.1: Supplied Parts Lovis 2000 M

Symbol	Pcs.	Article Description	Mat. No.
	1	Lovis 2000 M Microviscometer	94075

Symbol	Pcs.	Article Description	Mat. No.
	1	Lovis 2000 M/ME Instruction Manual	
TOTAL STATE OF THE PARTY OF THE	1 Pack	Protection foils for touch-screen (3 pcs.)	81402
	1	Waste Bottle SVM 3000 0.5 L	17822
	1	Power cord (country specific) EUR: GBR: USA: PRC: AUSTRALIA: THAI: BRAZIL: SWITZERLAND:	65146 61865 52656 27011 173747 79730 130117 93408
	1	Accessory Kit Basic-Lovis Accessories other than contained in this kit depend on your orders. Compare all delivered items to the delivery list respectively to the IQOQ document.	100219
Content of Accessory Kit Ba	asic-Lovis		

4.2 Options

Some basic options see Chapter 16.2.

For all available options and for ordering consumables or spare parts, consult the Lovis 2000 M/ME Product Description List (Doc. No. C72IE001EN) provided on the USB flash drive.

5 Functional Components

This chapter contains pictures and short descriptions of all connectors and functional components of Lovis 2000 M/ME.

5.1 Lovis 2000 M

The following pictures shows only Lovis 2000 M - without DMA M or DSA M. For the functional components of these instruments refer to the corresponding instruction manuals.

5.1.1 Lovis 2000 M Front and Left Side View



Fig. 5 - 1 Lovis 2000 M front and left side

- 1 ... Keys
- 2 ... Color TFT touch screen with disposable protection foil (see Lovis 2000 Reference Manual, Appendix E.4)
- 3 ... Power on LED
- 4 ... Lovis capillary block
- 5 ... Blind covers for inlet and outlet of the optional cooling kit applicable for DMA M/DSA M only
- 6 ... USB interfaces (3x)
- 7 ... Protection cover for USB interfaces

5.1.2 Lovis 2000 M Right Side View

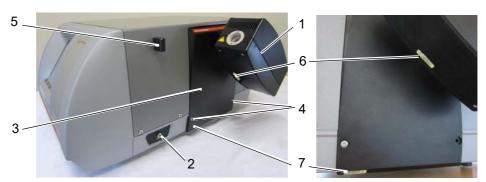


Fig. 5 - 2 Lovis 2000 M right side

Lovis capillary block
 Mir pump outlet
 Lovis 2000 ME
 Lovis 2000 ME fixing screws
 Serial number of Lovis 2000 ME
 Serial number of Lovis 2000 ME

5.1.3 Lovis 2000 M Rear View

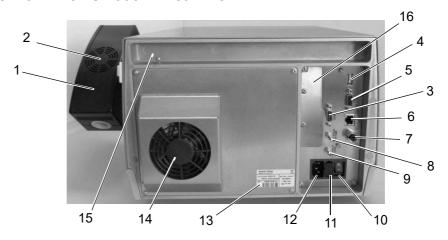


Fig. 5 - 3 Lovis 2000 M rear view

- 1 ... Lovis capillary block
- 2 ... Capillary block fan
- 3 ... RS-232 interface (COM)
- 4 ... USB interface
- 5 ... VGA interface
- 6 ... Ethernet interface
- 7 ... CAN interface
- 8 ... "DRY AIR IN AIR PUMP" connector for optional drying cartridge (see Lovis 2000 Reference Manual, Appendix E.3)
- 9 ... "DRY AIR IN INTERNAL" connector not required for Lovis 2000 M
- 10 ... Power switch
- 11 ... Fuse holder
- 12 ... Power socket
- 13 ... Type plate with serial number
- 14 ... Fan
- 15 ... Carrying ledge
- 16 ... Blind cover for optional installation of a sensor board for pH ME module

5.2 Module Housing Lovis ME

5.2.1 Module Housing Front View



Fig. 5 - 4 Module Housing Lovis ME front view

- 1 ... Power LED (green) lights up when the power is on
- 2 ... Status LED (orange) blinks when booting, lights up when all connections between master instrument and Lovis 2000 ME are correct
- 3 ... Error LED (red) lights up in case of an error. If a supply cable is interrupted, it lights up only for a short time. An error message on the display of the master instrument follows.

5.2.2 Module Housing Right Side View

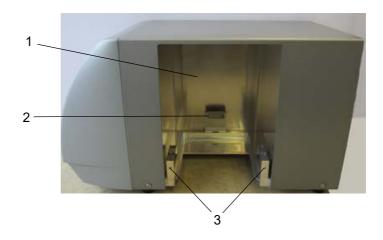


Fig. 5 - 5 Module Housing Lovis ME right side view

- 1 ... Slot for Lovis 2000 ME microviscometer module
- 2 ... Connector
- 3 ... Threads for fixing screws

5.2.3 Module Housing Rear View

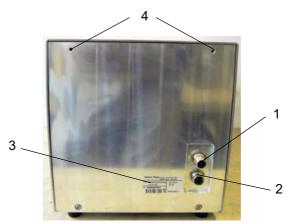


Fig. 5 - 6 Module Housing Lovis ME rear view

- 1 ... Connector for CAN interface cable to master instrument
- Connector for CAN/Devicenet terminating resistor
- 3 ... Type plate with serial number
- 4 ... Unused threads

5.3 Operating Elements of the Main Screen

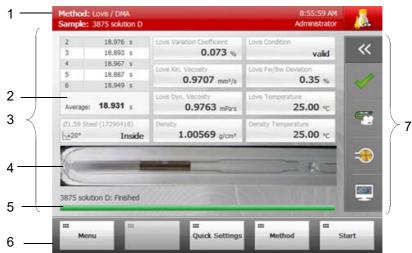


Fig. 5 - 7 Main screen example – Camera view of U-tube only in combination with DMA / DSA M

1 ... Header2 ... Output field5 ... Progress bar6 ... Buttons area

... Content area 7 ... Quick access buttons

4 ... Camera view of U-tube

Header (Fig. 5 - 7: 1)

Left side: Name of the currently active method and sample number.

Right side: Clock and user indicator. The user indicator indicates the type of user that is currently logged on (see Appendix C and General Software Functions Manual).

Content area (Fig. 5 - 7: 3)

In the content area, the measuring values are displayed in small, medium or large output fields (2). The layout of the content area is defined in the settings of the current method and can be adapted according to your needs (see Appendix C). How to adapt the display is described in detail in the General Software Functions Manual.

A progress bar (5) at the bottom of the content area indicates whether the instrument is currently measuring or whether a measurement was finished.

Buttons area (Fig. 5 - 7: 6)

The buttons in this area have the following functions:

<menu></menu>	Open the main menu.
<quick settings=""> /</quick>	Open the quick settings. /
<sample list="">^a</sample>	Open the current sample list.
<method></method>	Open the method list and select a method.
<start></start>	Start a measurement.
<stop></stop>	Stop and abort a measurement.

a. When a sample list is defined, the button <Sample List> replaces the button <Quick Settings>.

Quick access area (Fig. 5 - 7: 7)



Fig. 5 - 8 Expanded quick access area

- To expand the quick access area, tap the icon on the quick access bar in the main screen.
- To collapse the quick access area, tap the >>> icon on the upper right corner of the window.
- To browse items, use the page navigation the window.
- To rearrange, rename or delete the items in the quick access area, tap the button (Settings) in the upper left corner of the window. For details, see the General Software Functions Manual.

Button **Function** To open the message list (see also Appendix F.1). The general instrument status as well as all measuring errors that have occurred during the measurements of the currently active sample list are described in this list. The button changes its appearance depending on the current error status: Green OK sign: The general instrument status and the error status of all measured samples of the current sample list are OK. Yellow warning sign: The instrument (or system) has a minor problem (e.g. there is a printer problem etc.). One or more samples of the currently active sample list had an error (e.g. too great forward/backward deviation of runtimes). Red error sign: The instrument (or system) has a major problem that needs to be fixed before you continue measuring (e.g. no ball detected). One or more samples of the current sample list could not be measured. To reset the message list button to the green check, confirm all error messages by tapping on the <X> button on the right side of the message. To confirm all messages in the list in one step, tap the "Delete all" icon at the end of the list. The message list button will also be reset to the green check symbol if you delete the currently active sample list (see Appendix C). U-ViewTM: To open the live camera view of the measuring cell (DMA M / DSA 5000 M only). For Lovis M alone, this button is inactive and grayed out. To start the air pump (The air pump is off). To stop the air pump (The air pump is on). The screen is unfrozen, shows live measuring values. If you have started a measurement, the continuous measuring values are shown until the measurement is finished. The final values are frozen until the next measurement is started. To unfreeze the screen, tap the below button. To unfreeze the screen after a finished measurement. (The screen is frozen after end of measurement). If you have not started a measurement yet, or if you have terminated a measurement by tapping <Stop>, the instrument is in the monitor mode and shows a continuous reading of the current temperature in the Lovis capillary block. This button is not available if limited visibility of measuring values is enabled. See General Software Functions Manual, "Value Visibility" and Appendix C, "System Security > Value Visibility". To display information on using favorites. Only available if no U-ViewTM -button is available and no favorites have yet been added to the quick access area by the user.

5.4 Operating Elements of the Menu Screen

To access the menu, tap <Menu> in the main screen.

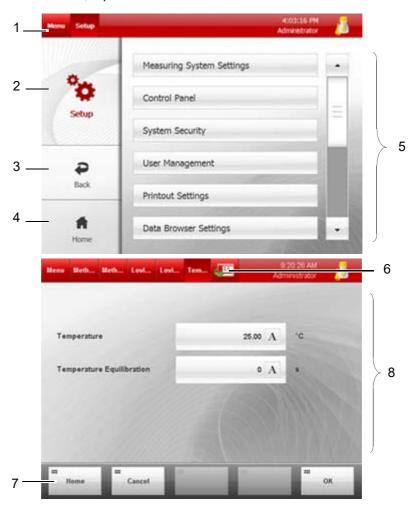


Fig. 5 - 9 Menu screen examples

1 ... Header 5 ... Content area 2 ... Menu level 1 6 ... <Add to Favorites> button 3 ... <Back> button 7 ... Buttons area 4 ... <Home> button 8 ... Content area

On the left side of the header, you find the navigation path (1) to your current position in the menu. You can go back to any menu position in your current path by directly tapping on the respective box of the navigation path.

In the content area (5, 8), you find the menu options of the current menu level and the menu dialogs.

Buttons	Function
<back></back>	Moves to the next higher menu level.
<home></home>	Returns to the main screen.
Buttons at the bottom of screens in deeper menu levels	Different functions depending on the current menu or dialog.

6 Preparing the Instrument

This chapter informs on how to set up the instrument after unpacking it. It does not give instructions how to prepare a measurement (e.g. filling a capillary). It gives specific instructions for Lovis 2000 M/ME. If using Lovis 2000 ME inside a DMA M/DSA M, also read and follow the corresponding instruction manuals.

6.1 Installation Requirements

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

Allow the equipment to reach ambient temperature before installation. This is very important if the equipment has been stored or transported at lower temperatures.

Place the instrument on a stable, flat lab desk which is free of vibrations.

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

- next to a heating facility
- near an air conditioning, ventilation system or an open window
- · in direct sunlight
- · on a vibrating surface or close to vibrating equipment

Keep the instrument away from magnetic fields. Those could possibly influence the inductive sensors or electronics. Read the Safety Instructions in Chapter 2. Find all Technical Data required for installation in Appendix A.4.



WARNING

Using hazardous or flammable chemicals as samples or cleaning liquids could destroy the instrument and cause serious injuries when not taking special precautions into account.

• See the section "Special precautions for flammable chemicals" in Chapter 2 for information on a suitable installation place.

NOTICE

Ensure that the power plug and the power switch are always freely accessible so that the instrument can easily be disconnected from the mains at any time.

A strong built-in cooling fan dissipates heat through the bottom and the rear of Lovis 2000 M. Ensure that the airflow is not blocked and assure a minimum distance of 100 mm (3.9 inches) to walls behind and besides the instrument. A second built-in cooling fan dissipates heat through the top of the Lovis capillary block. Do not cover the venting slots.

6.2 Mounting Lovis 2000 M

Carefully unpack the Lovis 2000 M and place it on the lab desk. Make sure the instrument stands evenly and that the capillary block can turn freely. While the instrument is switched off, turn the capillary block manually in both directions as far as possible and check that is does not touch any obstacles or gets entangled with hoses, cables or other objects.

To connect the silicone hose at the air pump outlet

- 1. Cut a piece of approx. 250 mm (10 in) length from the silicone hose contained in the accessory kit.
- 2. Attach the silicone hose to the air pump outlet.
- 3. Attach an Adapter Luer Cone (from the accessory kit) to the other end of the silicone hose.



Fig. 6 - 1 Lovis 2000 M with air hose plus Luer cone connected

TIP If the ambient air humidity is high and the measuring temperature is lower than the ambient temperature, it is recommended to connect a drying cartridge to the air pump inlet to avoid condensation. See Appendix E.3 of the Lovis 2000 Reference Manual.

6.3 Switching Lovis 2000 M On/Off



WARNING

High voltage at parts of the instrument can cause serious injuries or death.

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

NOTICE

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

- Connect the power socket of the Lovis 2000 M (see Chapter 5.1.3) to the mains using the supplied power cord.
- 2. To switch the instrument on, use the power switch on the rear. The green LED on the front side of the Lovis 2000 M indicates that the power is on. During initialization the Lovis capillary block first moves to -90°, then to 0° and stops in the home position (depends on the selected capillary, see Chapter 7.1.1: Capillary Filling Mode / default: -45°).
- 3. After turning on the power, the instrument waits for temperature equilibration. During this time "temp. equilibration" is displayed.
- 4. To switch the instrument off, use the power switch.

6.4 Mounting Lovis 2000 ME in the Master Instrument or in the Module Housing Lovis ME

If ordering a Lovis 2000 ME module plus Xsample module, a Module Housing Lovis 2000 ME and a master instrument, all items are packed separately.

In the following, Lovis 2000 M and DMA M/DSA M are indicated as "master instrument". Lovis 2000 ME is named "module".

TIP If combining Lovis 2000 with an Xsample module, mount Lovis 2000 ME in the Module Housing, the Xsample module in the master instrument, if applicable.

If mounting Lovis 2000 ME inside a DMA M/DSA M, you first need to update the instrument software of the master instrument to the version on the USB storage device supplied with Lovis 2000 ME. Otherwise Error 13 will occur (see Appendix F.2). To update, refer to the instruction manual of the DMA M/DSA M.

NOTICE

If retrofitting an existing Lovis 2000 M / DMA M / DSA M make sure that the master instrument is switched off before connecting or disconnecting a module.

- **TIP** Keep the packaging material, the cover of the slot and the bottom plate of the master instrument (if any) for possible returns or if removing the module again.
 - 1. Unpack the master instrument or the Module Housing Lovis ME carefully and place it on a flat lab desk.
 - 2. In case of a DMA /DSA M remove the cover (1) of the slot for the module by unscrewing the two fixing screws M4x20 (2; Torx T20 supplied with Lovis accessory kit). See Fig. 6 2.

The Module Housing Lovis ME and the Lovis 2000 M Base Unit come without cover.

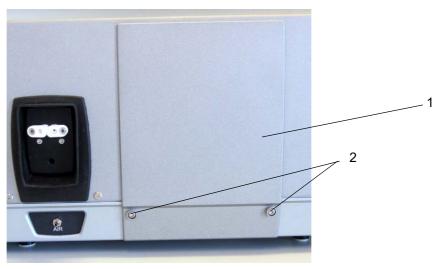


Fig. 6 - 2 Removing the cover of a DMA M/DSA M

3. To remove the bottom plate of a DMA M/DSA M (1; Fig. 6 - 3), pull it out. The Module Housing Lovis ME and the Lovis 2000 M Base Unit come without bottom plate.

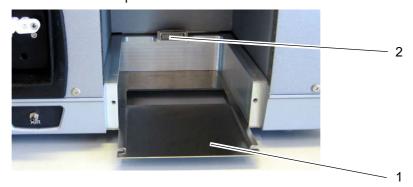


Fig. 6 - 3 Removing the bottom plate of a DMA M/DSA M

Carefully unpack the module (1) and insert it into the slot (2; Fig. 6 - 4) of the
master instrument or of the Module Housing Lovis ME.
 Push the module slowly backwards until it is in place.



Fig. 6 - 4 Inserting the Lovis 2000 ME Microviscometer Module



WARNING

Electrostatic discharge of a module that is not correctly grounded may cause sparking and fire.

- To ground the module according to regulations, only use the supplied screws with the contact washers for fixing the module in the master instrument or in the Module Housing Lovis ME.
- 5. Insert the supplied fixing screws M4x20 (Fig. 6 5: 1; Torx T20 supplied with Lovis accessory kit) for Lovis 2000 ME together with the contact washers (2) into the holes of the module and fix them hand-tight.



Fig. 6 - 5 Mounting the Lovis 2000 ME module

6.5 Connecting the Cables to the Module Housing

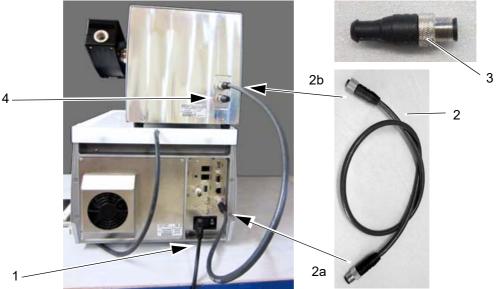


Fig. 6 - 6 Connecting the cables for Module Housing Lovis ME

- 1. Place the Lovis 2000 ME on the master instrument. (The color of the drip plate may be different than shown in Fig. 6 6).
- 2. Connect the power cord (1; Fig. 6 6) to the power socket of the master instrument and to the mains supply.
- 3. Connect the CAN interface cable (2; Fig. 6 6):
 - One end (2a) to the "CAN" interface of the master instrument.
 - The other end (2b) to the male CAN plug of the Module Housing Lovis ME.
 - Secure the connectors against accidental loosening by tightening each sleeve nut finger-tight.
 - Power supply to the Module Housing Lovis ME and data transfer between the master instrument and the module are performed via this CAN cable.
- 4. Plug the supplied CAN/Devicenet terminating resistor (3; Fig. 6 6) to the connector of the Module Housing Lovis ME (4; Fig. 6 6). Tighten the sleeve nut finger tight.

A measuring assembly consists of several instruments connected in series. This terminating resistor should always be connected to the last instrument in the series to avoid signal reflections at an open end of the signal line.

TIP For all measuring assemblies with more instruments than a master instrument, Lovis 2000 ME and sample changer, find a detailed description of the cable connections is in SECTION II of the Lovis 2000 Reference Manual.

6.6 Switching Lovis 2000 ME On/Off

Lovis 2000 ME is switched on or off via the power switch of the master instrument (DMA M/DSA M or Lovis 2000 M). Refer to the corresponding instruction manual. The Lovis 2000 ME is initialized as described in Chapter 6.3.

6.7 Operating Lovis 2000 M/ME with Counter Cooling

A Lovis capillary block with a counter cooling system is available for testing samples at low temperatures down to -20 °C. With special equipment and/or at moderate ambient temperature, -30 °C can be reached.

All temperature values specified in this chapter are guiding values. The actual values depend on the ambient temperature and conditions (high/low air humidity).

- The warmer the ambient temperature is, the more cooling power is required.
- The higher the ambient air humidity is, the more condensation is to be expected. A suitable drying equipment is required.

For measuring temperatures lower 5 °C the counter cooling is not an option but definitely required.

The counter cooling does not influence the Lovis 2000 M/ME heating performance up to measuring temperatures of 60 °C.

For measuring temperatures higher than 60 °C, either deactivate the circulation cooler or use hoses with stop-cocks to close off the cooling circuit.

NOTICE

Consult the instruction manual of your circulation cooler about deactivating or shutting it off.

Do not switch off a cooler when it is below 5 °C. The cooling unit will ice over. Let the cooler reach ambient temperature before deactivating it.

The recommended Julabo circulation coolers can be shut off with stop cocks without damaging them.

You can use commercially available stop cocks (lab equipment). Depending on the type of stop cock you may need additional nozzles. Order additional hose clamps for securing the hoses to the stop cocks.

6.7.1 Cooling Equipment

The Lovis 2000 M/ME Product Description List explains all required and optional items in detail.

Standard cooling equipment

- Lovis 2000 M/ME with capillary block with cooling option; comes with 2 pcs. hose connectors (Mat. No. 71436) plus 2 pcs. seal rings (Mat. No. 69536).
- Circulation cooler F250 (Mat. No. 98610 or 98611, depending on local mains); comes with 4 m hose (Mat. No. 50811) and 4 pcs. hose clamps (Mat. No. 51109).

Optional cooling equipment

- Quick coupling set for counter cooling (Mat. No. 14952), incl. flat hose clamps (Mat. No. 19851) that fit under the insulation hose
- Stop cocks for closing off the cooling hoses (not supplied by Anton Paar GmbH), additional hose clamps (Mat. No. 51109 or Mat. No. 19851)
- Insulation hose Armaflex D12/25 (Mat. No. 50812 specify required length)
 insulation layer for cooling hoses
- Circulation thermostat FL601 (Mat. No. 174353 or 174354, depending on local mains); comes without hoses (order in addition: Hose Mat. No. 50811 – specify required length, and hose clamps, Mat, No. 51109) – model for high ambient temperatures and/or measuring temperatures lower -20 °C
- Silicone cooling hose 8x12 (Mat. No. 51802 specify required length) for counter cooling temperatures of 0 °C or lower
- Drying cartridge (Mat. No. 65085); comes with connection hose 2.5x4 PUR transparent (Mat. No. 15272) and hose 4x6 PUR black plus hose connector 6 mm/4 mm for drying capillaries at measuring temperatures below the dew point
- Air preparation set dew point -40 °C (Mat. No. 21902) for drying the capillary block at counter cooling temperatures below +5 °C

Required additional equipment not supplied by Anton Paar GmbH

- Open wrench size 14 mm or 9/16 "
- Cooling liquid for counter cooling:

Cooling temperature range	Cooling liquid
+5 °C to +40 °	Tap water (plus algicide and corrosion inhibitor suitable for aluminum)
0 °C to +5 °C	mixture of 80 % de-ionized water and 20 % inhibited glycol (suitable for aluminum)
+0 °C to -10 °C	mixture of 70 % de-ionized water and 30 % inhibited glycol (suitable for aluminum)

The below link can help you find suitable cooling liquids:

http://www.houghton.com/heat-transfer-fluids/inhibited-propylene-glycol-fluids/safe-t-therm-al/

For the required liquid volume consult the instruction manual of the cooler.

6.7.2 Installing the Counter Cooling

This chapter describes how to install the cooling equipment.

NOTICE

Switch off the Lovis 2000 M/ME before installing the cooling equipment. Otherwise you will damage the motor when manually turning the capillary block.

The cooling hoses will move due to the turning Lovis capillary block. Make sure that the hoses can move freely and do not get entangled or caught with other objects.

Put one seal ring (2) on the threaded side of each hose connector (1). Screw
the hose connectors into the threaded openings of the Lovis capillary block.
Use an open wrench with size 14 mm or 9/16 ". Fasten the hose connectors
hand-tight.

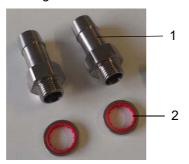




Fig. 6 - 7 Hose connectors and seal rings

- 2. Place the circulation cooler next to your measuring system. See Fig. 6 11. Make sure there is enough room for the cooling hoses.
- 3. Take the piece of supplied cooling hose. Cut off two hoses of suitable length for connecting the cooler to the Lovis capillary block (min. length each: 1 m).
 - If required, install a stop-cock for each hose. The stop-cock should be located close to the cooler. Cut off the required hoses accordingly.
- 4. Open the supplied hose clamps wide enough to slide them on the hoses (one clamp at each hose end). Use the supplied face wrench or a suitable screwdriver.
- 5. Push one hose each onto the hose connectors. Slide the hose clamps over the connectors and tighten them with the face wrench or a screwdriver.

Tighten the hose clamps just so much that you cannot push them along the hose. The clamps should not cut into the hose material and damage it.



Fig. 6 - 8 Standard cooling hoses and hose clamps on Lovis capillary block

- 6. Push the free ends of the hoses over the hose connectors of the circulation cooler and secure them with hose clamps as described above.
- 7. Fill the circulation cooler with cooling liquid and set it into operation. For the exact procedure, refer to the instruction manual of the cooler.

NOTICE

The allowable maximum pressure inside the cooling system is 1.5 bar. Check the pump pressure of your circulation cooler. If using tap water for cooling, ensure free flow through the system (open end).

The allowable standard range for the cooling temperature is from 0 °C to 40 °C. Special equipment allows for operation at cooling temperatures down to -10 °C.

Use only such hoses as recommended in this instruction manual. These hoses are suitable for the specified pressure and temperature range.

Optional cooling hoses

For cooling temperatures of 0 °C or lower use silicone hoses as cooling hoses (see "Optional cooling equipment", p. 44). The supplied Perbunan hoses become stiff at low temperatures. Due to the moving capillary block they can become brittle and leaky.

Optional insulation hoses

For cooling temperatures <+5°C or if required due to high ambient temperatures, additional insulation hoses can be used. Order the required length of insulation hose and flat hose clamps (see "Optional cooling equipment", p. 44). Slide the insulation hose over the cooling hose before connecting it.

Optional quick coupling set

Instead of the supplied hose connectors you use the quick coupling set for fast (dis)connection of the cooling hoses at the capillary block. Order the set separately (see "Optional cooling equipment", p. 44).

TIP For optimum cooling performance the quick-coupling should not be used in combination with water/glycol mixtures. The small diameter of the quick-coupling reduces the flow of viscous liquids significantly.

These connectors are self-locking when disconnected.

 Instead of the supplied hose connectors screw the in-outlet fittings (1) into the threaded openings of the Lovis capillary block. Use the seal rings as for the open connectors.

- 2. Push the cooling hoses (3) onto the self-locking couplings (2) and secure them with the flat hose clamps (4).
- 3. Connect the hoses with the quick couplings and pull the insulation (5) over the connectors (see arrow).
- 1 ... In-Outlet fitting
 2 ... Self-locking coupling
 2 ... Cooling hose
 4 ... Flat hose clamp
 5 ... Insulation

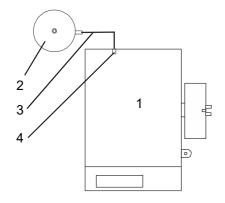
Fig. 6 - 9 Insulated cooling hoses and flat hose clamp, dry air supply

Optional drying cartridge

If measuring and cleaning at temperatures below the dew point, use dry air for drying the capillaries. Connect a drying cartridge to the Lovis air pump (see "Optional cooling equipment", p. 44).

- 1 ... Lovis 2000 M
- 2 ... Drying cartridge
- 3 ... Supplied connection hoses and connector 6 mm/4 mm
- 4 ... Nozzle DRY AIR IN AIR PUMP

Fig. 6 - 10 Drying cartridge connection



Optional air preparation unit

If constantly measuring and cleaning at low temperatures, use clean dry air or technical nitrogen for drying the capillaries and for drying the capillary block. Condensation in capillaries occurs if the measuring temperature is below the dew point – depends on ambient temperature and air humidity. The capillary block requires drying if the counter cooling temperature is below +5 °C.

For suitable dry air, use the air preparation set (see "Optional cooling equipment", p. 44). How to set up the air preparation set is described in detail in the Lovis 2000 Reference Manual SECTION II: Flow-Through Systems, Chapter 23. Fig. 6 - 11 shows how to connect the air hoses if using the air preparation set dew point -40°C.

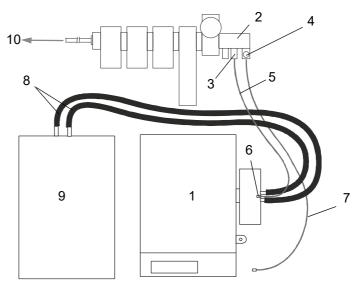


Fig. 6 - 11 Hose connection for optional air preparation set dew point -40 °C

- 1 ... Lovis 2000 M
- 2 ... Air preparation set dew point -40°C
- 3 ... Adjustable dry air outlet
- 4 ... Dry air outlet with stop cock
- 5 ... Air hose to capillary block
- 6 ... Opening Luer cone
- 7 ... Air hose for drying capillaries
- 8 ... Thermostat hoses
- 9 ... Cooling thermostat
- 10 ... to compressed air supply
- 1. Cut two pieces from the supplied hose. Each hose length should suit your local setup:
 - A transparent PU hose 2.5x4 (10 m) is supplied with the air preparation set.
 - Otherwise, use silicone hose 3x5 (Mat. No. 50814 specify the required length when ordering; 1.2 m supplied with Lovis).
- 2. Plug an Adapter Luer cone onto one end of each hose. Connect the other ends of the hoses to the dry air or technical nitrogen supply:
 - Use one hose (5) to dry the Lovis capillary block. Connect it to the opening Luer cone (6) on the Lovis capillary block.
 - Use the other hose (7) to dry the capillaries and other accessories.
- 3. Set up a slow-flow of dry air or nitrogen at the supply.

6.7.3 Counter Cooling Settings and Handling

Temperature ranges

- For measuring temperatures between -20 °C and +60 °C, set a cooling temperature of +5 °C. This is suitable for ambient temperatures up to 35 °C max.
- For temperature scans from 0 °C to 100 °C, a cooling temperature of +25 °C is recommended.

If constantly measuring at low temperatures, a flow-through system should be used. Additionally, dry air is required for drying the capillary at the low temperatures and to prevent condensation in the Lovis capillary block.

NOTICE

Do not remove the capillary from the Lovis capillary block at temperatures below ambient (20 °C). That causes condensation or ice formation on the capillary and inside the capillary block and might even lead to breakage of glass capillaries.



Fig. 6 - 12 Standard cooling hoses and dry air supply on the Lovis capillary block

TIP Lovis 2000 M/ME provides the literature viscosity and density values for pure water in a range from +2 °C to +85 °C. Adjust capillaries with water at +5 °C for measuring in the low temperature range. Alternatively, use viscosity standard oil AP S3, which provides reference values at -20 °C.

Correct procedure

The set counter cooling temperature should have been reached before you start measurement. During measurement, it is possible to deactivate the counter cooling (e.g. by closing the stop-cocks, if installed).

Do not suddenly flood the cooling system of the capillary block with cool water during a measurement (e.g. by opening the stop-cocks, if installed). That will cause a warning error message if exceeding the allowable maximum temperature difference between measuring cell and cooling system. Further error messages can occur if the system's heating or cooling rate is too low. In such a case the Lovis 2000 M/ME aborts the heating or cooling. Error message and warnings see Appendix F.2.

Assemblies with DMA M / DSA M and low measuring temperatures:

DMA M / DSA M is not specified for measurement below 0 °C.

- In this case, first measure the density at two different temperatures (close to the low temperature range).
- Use these values to extrapolate the density to the measuring temperature.
- In order to enter the extrapolated density value, select manual input for the density source: Tap <Menu > and "Method Settings > "Method Name" > Lovis Module > Density Settings".

7 Settings and Methods

7.1 Measuring System Settings

In the Measuring System Settings for the Lovis Module you can create, edit or delete capillary configurations, (de)activate the capillary detection and the ball detection audio signal and set the filling position.

A capillary configuration is a capillary with one type of ball.

You can also enter or import data of solvents for polymer applications (see Lovis 2000 M/ME Reference Manual, Chapter 7.1.4).

TIP You can access the measuring systems settings only with administrator or manager rights.

7.1.1 Capillary Administration

Tap "Menu > Setup > Measuring System Settings > Lovis Module > Capillary Administration".

The list of available capillaries is displayed. Upon delivery this list is empty. You need to install at least one capillary to perform a measurement.

To add a new capillary

- 1. Tap <Add>. There are two possibilities:
 - Select "Create New Capillary" and tap <OK>. See point 2.
 - Select "Import Capillary Configuration" and tap <OK>. See point 3.
- 2. Create New Capillary: Enter the following data for a new capillary:
 - Ball type, capillary diameter in [mm] and length, capillary serial number (engraved on the outer surface) and the name of the capillary configuration.
 - An internal checksum verifies that the capillary serial no. is valid.
 - Tap <Next> .
 - Define whether the capillary requires an adjustment.
- TIP If measuring runtimes and relative viscosity values only, it is not necessary to adjust the capillary. Find more information in Chapter 3.1.1 and Chapter 3.1.2.
 - Define the Capillary Filling Mode for this capillary.

Capillary Filling Mode

This option is visible only if no automatic sample changer is active. In combination with an Xsample, flow-through filling is automatically assigned.

Choose between manual capillary filling outside the Lovis capillary block and flow-through capillary filling by syringe (or with an Xsample – refer to Lovis 2000 M/ME Reference Manual, SECTION II: Flow-Through Systems).

- Manually (outside the block):
 By default, Lovis 2000 M/ME is set to manual filling. In this position the angle of the Lovis capillary block is -45°.
- Flow-through (hoses connected):
 The position for flow-through filling is +20°. The front end of the Lovis capillary block is lower than the back end. During filling, potential air bubbles can rise with the liquid flow and can easily leave the capillary again.

When a capillary is selected, the Lovis capillary block assumes the position assigned to the Capillary Filling Mode as home position. The block moves to this position after activating the instrument and after every measurement.

- Tap <OK> to save the settings.
- **TIP** You can store one capillary with different ball types, for different adjustments (see Chapter 8.4), or for different filling modes by using different names.
 - Import Capillary Configuration: To import a capillary configuration you need a data file on a USB storage device. If you have ordered a factory capillary adjustment this file is supplied with the capillary. You can also use data already stored in another Lovis 2000 M/ME (see below "To export a capillary from the list").
 - Select the "Drive" (USB HD) and the "Target" (capillary data).
 - If data of more than one capillary is stored on the storage device, select the capillary/capillaries to be imported from the drop down list.
 - Tap <Next>. You can assign a new name to the capillary, define whether
 the capillary requires an adjustment (see the above "TIP"), and assign the
 Capillary Filling Mode to be used (see p. 50).
 - Tap <OK>. The capillary/ball configuration is added to the capillary list.

To delete a capillary from the list

- 1. Tap the capillary to highlight it.
- 2. Tap <Delete> and <OK>.

To edit a capillary from the list

- 1. Tap the capillary to highlight it and tap <Edit>.
- 2. The input window for editing a capillary comes up. You can change the capillary name, set whether an adjustment is required, and assign the Capillary Filling Mode to be used (see p. 50).
- 3. Tap <OK> to save your settings.

To export a capillary from the list

- 1. Tap the capillary to highlight it and tap <Edit>.
- 2. The input window for editing a capillary comes up. You can change the capillary name and set whether an adjustment is required.
- 3. Connect a USB storage device to the master instrument.
- 4. Tap <Export>. Select the "Drive" (USB HD) and tap <OK>. The capillary data is exported. A message confirms the successful export. Confirm with <OK>.

7.1.2 Capillary Settings

In this sub menu you can (de)activate the automatic capillary detection and the ball detection audio signal.

- Tap "Menu > Setup > Measuring System Settings > Lovis Module > Capillary Settings".
- 2. (De)activate the respective check boxes. Refer to the below explanations.
- 3. Tap <OK> to save the new settings.

Automatic Capillary Detection

Lovis 2000 M/ME ensures that a Screw Cap Front Side (open or closed) is mounted. If an inductive sensor in the Lovis capillary block does not detect a metal ring on the Screw Cap Front Side, you get the message "Cannot start measurement because no capillary is in the capillary block."

Lovis 2000 M/ME registers whenever the Screw Cap Front Side has been removed and fastened again. When the capillary detection is active, Lovis 2000 M/ME asks whether the currently selected capillary is really the one inside the Lovis capillary block. If only one capillary/ball configuration is stored in the instrument, it always uses this one for measurement.

TIP You can always select any installed capillary in the Quick Settings (see Chapter 10.1).

By default, the capillary detection is activated. It is recommended to leave it on.

• Tap on the check box to activate or deactivate the function.

Ball Detection Audio Signal

By default, the ball detection audio signal is deactivated.

 Tap on the check box "Emit an audio beep every time the ball passes one of the coils" to activate this signal.

7.1.3 Viscosity Standards Management

TIP You need administrator rights to have access to the Viscosity Standards Management.

In the Viscosity Standards Management you can store the data of reference standard liquids you plan to use. These data are then available for adjustments of capillaries. Existing standards can be edited or deleted.

7.1.3.1 Entering a New Reference Standard

TIP The easiest way to enter the reference standard's data is via bar code reader from a certificate with QR code. Anton Paar viscosity standards come with QR code. Instead, you can use an external keyboard or the instrument's touch screen.

Optional equipment

- 2D Bar code reader with USB cable (Mat. No. 189615 or 92160)
- Keyboard USA USB (Mat. No. 80807) or German USB (Mat. No. 80809)

Procedure

- Tap <Menu> and select Setup > Measuring System Settings > Lovis Module > Viscosity Standards Management.
 The instrument displays a list of all stored standards.
- 2. Tap <New>.

If you use a bar code reader

- 1. Plug the bar code reader to one of the instrument's USB interfaces.
- Tap <Scan QR code>. The screen displays a drop-down list of suitable bar code readers. Select your model and use the displayed QR code to configure your bar code reader if necessary. If the code from the screen does not work, use your model's code from below:

Zebra DS2208



Zebra DS6707



Zebra DS8108



1D reader models



3. Remove the transparent envelope (if any) and place the reference standard's certificate on the table and hold the bar code reader above the QR code. Focus the reader on the code. If reading does not work at once, vary the distance of the bar code reader. Fig. 7 - 1 shows an example from an Anton Paar standard's certificate.

tandard type:	APS3	Lot No:	311411		Expiration Date: 04-Jun-
Tempera	dure	Viso	osity	Density	300 September 2000
(°C)	(°F)	(mm²/s) Kinematic	(mPars) Dynamic	(g/mL)	
20.00	68.00	4.627	3.916	0.8247	200 C C C C C C C C C C C C C C C C C C
25.00	77.00	4,079	3.350	0.8213	
40.00	104.00	2.926	2.373	0.8111	
60.00	140.00	2.039	1.626	0.7974	
80.00	176.00	1.520	1.191	0.7835	
100.00	212.00	1.188	0.9142	0.7695	
on Scientific Ltd c	erifies that the kin	ematic viscosity measur	rements have been mo	ade in accordance w	th ASTM D 2162 using long capillary 2. The viscosity data reported is based

Fig. 7 - 1 QR code on reference standard certificate

You read all reference values, lot number, the standard type, certificate number and expiry date automatically into the instrument.

This can take up to 60 seconds. The instrument prompts you to wait.

- **TIP** Do not unplug the bar code reader until the instrument has finished scanning, or the data will be incomplete.
 - 4. Once the scan was completed, the instrument prompts you to review the imported data. Tap <OK>.
 - 5. Tap <Next> to check that all reference values and all temperatures are correctly listed.
 - 6. Tap <OK> to save the data.

If you use a keyboard or the touch screen

1. Enter the standard type, the lot number, the certificate number and the expiry date.

- 2. Tap <Next>.
- 3. Enter the following data from the certificate:
 - Temperature (at least one value)
 - Dynamic viscosity and density at the entered temperature(s).
- 4. Tap <OK> to save the data.

7.1.3.2 Editing a Reference Standard

Edit the data of a reference standard if you need to correct your original manual input.

For example, a typing error might have happened. You might also want to add another temperature value for adjustment. Therefore it is also possible to edit reference values after an adjustment has been performed with the affected standard liquid.

NOTICE

If you have to correct the reference values of a standard after having used it for adjustment, you must re-adjust the capillary.

- 1. Tap <Menu> and select Setup > Measuring System Settings > Lovis Module > Viscosity Standards Management.
 - The instrument displays a list of all stored standards.
- 2. Select the reference standard you want to edit. Tap <Edit>.
- 3. If necessary, correct the standard type, the lot number, the certificate number or the expiry date.
- 4. Tap <Next>. Edit or correct the reference value(s) for viscosity and/or density according to the standard's certificate.
- 5. Tap <OK> to save your changes.

7.1.3.3 Deleting a Reference Standard

- Tap <Menu> and select Setup > Measuring System Settings > Lovis Module
 Viscosity Standards Management.
 - The instrument displays a list of all stored standards.
- 2. Select the reference standard you want to delete. Tap <Delete>.
 - The instrument asks you whether you really want to delete the selected reference standard. If you confirm, the data are deleted.
- 3. Tap <Home> to return to the main screen.

7.1.4 Polymer Solvents Administration

In this submenu you can enter all solvent data required for testing polymer solutions. The data are stored for future measurements.

For additional information on testing polymers with the Lovis 2000 M/ME, consult the Short Instruction on Polymer Measurements (Doc. No. C72IB012EN)

 Tap "Menu > Setup > Measuring System Settings > Lovis Module > Polymer Solvents Administration".

A list of all stored solvents comes up. By default, this list is empty.

- 2. Tap on the respective parameter fields to enter or change a solvent's name, its batch number and the measuring temperature.
- 3. Tap the button "...." for this solvent. A list of different measuring angles for this solvent and temperature comes up.

For newly entered solvents, this list is empty.

- 4. Enter a measuring angle, the solvent's dynamic and/or kinematic viscosity and/or the runtime (for short/long measuring distance) at this angle.
- TIP If you have already measured a polymer solvent with the Lovis 2000 M/ME beforehand, tap <Import> to transfer the solvent's measurement data from the instrument's data memory to the list of polymer solvents. In that case, just enter the solvent name, the batch number and the measuring temperature.
 - Lovis 2000 M/ME displays all measurement results available for the selected measuring temperature (see point 2.). If you do not enter a temperature value before tapping <Import>, the instrument prompts you to do so.
 - If the list for data import is empty, there are no data available for the set temperature.
 - Scroll through the list, tap on the one you want to select and confirm with <OK>.

Data import into the Polymer Solvents Administration is not possible if the Non Storage Mode is active.

- To enter data for more than one measuring angle, tap a parameter field of the empty row or tap <Import> again.
- · Enter or import values as described above.
- To delete an angle, tap on the respective row to select it and tap <Delete>.
- 5. Tap <OK> to save your settings.

If testing polymer solutions prepared with this solvent, select the stored data in the Quick Settings before starting measurement. It is not necessary to measure the solvent again for every new Single Concentration or Multi Concentration test.

7.2 Lovis Measuring Methods Settings

To save the user's time, parameters which need to be set before starting measurement are defined in measuring methods. Once a method has been defined, any user with operator rights can select it for a test.

TIP Only users with administrator or manager rights can create and edit methods.

7.2.1 Factory Predefined Methods

Lovis 2000 M/ME is delivered with the following factory predefined measuring methods, which are suitable for the most common applications.

By default, the method names are in English. You can rename them in the "Method Management". See the General Software Functions Manual.

TIP If testing polymer solutions use method "Lovis Polymer (Single Conc.)" or "Lovis Polymer (Multi Conc.)". Please consult the Short Instruction on Polymer Measurements (Doc. No. C72IB012EN, supplied on the USB storage device).

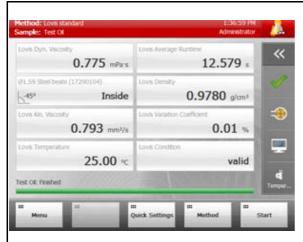


Fig. 7 - 2 Example Method Lovis standard

Lovis standard

- Lovis Dynamic Viscosity, Lovis Kinematic Viscosity, Lovis Average Runtime, Lovis Variation Coefficient, Lovis Capillary State, Lovis Temperature, Lovis Density, Lovis Condition
- Var. Coeff. set by default: 0.10 %
- Default measurement mode: S (Standard)
- For use without DMA M / DSA M.
- If viscosity results are required, the sample density must be entered manually in the sample list.
- · General purpose method.

| Method: Lovis detailed | 233/32 AM | Administrator | Administrator | Administrator | Administrator | Administrator | 2748 s | 10 | 2.788 s | Lovis Temporature | Lovis Set Temporature | 25.00 nc | 2.745 s | Lovis Condition | Valid | Lovis Shear Auto | 873.8 1/s | Lovis Condition | Valid | Lovis Shear Auto | 24.98 mm | Lovis Lovis Lovis Lovis Lovis Mesis. Detained | Lovis Lovis Mesis. Detained | Lovis Lov

Fig. 7 - 3 Example Method Lovis detailed

Lovis detailed

- Lovis Runtime Details (runtimes of every forward and backward run), Lovis Density, Lovis Capillary State, Lovis Temperature, Lovis Set Temperature, Lovis Condition, Lovis Shear Rate. Lovis Variation Coefficient. Lovis Forward/Backward Deviation, Lovis Measuring Length, Lovis Dynamic Viscosity, Lovis Kinematic Viscosity.
- Var. Coeff. set by default: 0.10 %
- Default measurement mode: S (Standard)
- For use without DMA M / DSA M
- To get viscosity results, the sample density must be entered manually in the sample list.
- Provides detailed measuring data.



Fig. 7 - 4 Example Method Lovis / DMA

Lovis / DMA – available only in combination with DMA M/DSA M

- Lovis Runtime Details (runtimes of every forward and backward run), Lovis Dynamic Viscosity, Lovis Kinematic Viscosity, Lovis Temperature, Lovis Capillary State, Lovis Variation Coefficient, Lovis Shear Rate, Master Condition, Density, Density Temperature, U-View™
- Var. Coeff. set by default: 0.10 %
- Default measurement mode: S (Standard)
- For use with DMA M/DSA M, the measured density is used automatically to calculate viscosity results.
- For use with DSAM display sound velocity in one output field (e.g. instead of the shear rate). See the General Software Functions Manual.
- General purpose method.

42.968 8 << 25.00 % 42.950 B 42.977 0.0617 % valid 1.675 115.239 135 0638 ---103 2007 ---0.0263 * 111.1665 ml/g 0.6753 E. Finished

Fig. 7 - 5 Example Method Lovis Polymer (Single Conc.)

Lovis Polymer (Single Conc.) – especially for polymer applications

- Lovis Runtime Details (runtimes of every forward and backward run), Lovis Variation Coefficient, Lovis Temperature, Lovis Capillary State, Lovis Condition, Polymer Concentration (m/v), Relative Viscosity, K-Value, Reduced Viscosity, Inherent Viscosity, Intrinsic Viscosity (Billmeyer), Specific Viscosity
- Var. Coeff. set by default: 0.35 %
- Default measurement mode: P (Polymer)
- For use with/without DMA M. If available, measured density is used automatically to calculate viscosity results.

Method: Lows Polymer (Mutt Conc.)

Sample: Polymer 1

1 16 603 8 2 2 17 119 8 25.00 10 46 Inside
3 16 582 8 4 17 125 8 Valid Foresterior V

Fig. 7 - 6 Example Method Lovis Polymer (Multi Conc.)

Lovis Polymer (Multi Conc.) – especially for polymer applications

- Lovis Runtime Details (runtimes of every forward and backward run), Lovis Variation Coefficient, Lovis Temperature, Capillary State, Lovis Condition, Polymer Concentration (m/v), Relative Viscosity, Reduced Viscosity, Specific Viscosity, Inherent Viscosity, Intrinsic Viscosity (Kraemer), Molar Mass (Kraemer)
- Var. Coeff. set by default: 0.20 %
- Default measurement mode: P (Polymer)
- For use with/without DMA M. If available, measured density is used automatically to calculate viscosity results.

The following Lovis specific values are set for the predefined methods. The meaning of the parameters is explained in detail in Chapter 7.2.5 of the Lovis 2000 Reference Manual:

Temperature Settings	Temperature	20 °C
	Temperature Equilibration	0 s
Measuring settings	Measurement Cycles	2
	Use manual angle check box	deactivated
	Use variation coefficient check box	activated; variation coefficient: for the value see the above methods
	Measuring distance	Automatic
Advanced settings	Max. Measurement Cycles	6
	Auto-distance threshold	60 s
	Auto-angle threshold	20 s
	Measuring Timeout	250 s

If you need other method settings to suit your application:

- Edit an existing method or
- · Create a new method

7.2.2 Creating, Editing and Deleting Measuring Methods

- Tap "Menu > Methods > Method Management". Select a method from the list.
 - Tap <Copy> to copy a method. Enter a new name for this method. Edit the new method as described in Chapter 7.2.3 and the Lovis 2000 Reference Manual (Chapter 7.2.4 and Chapter 7.2.5).
 - Tap <Rename> to assign a new name to a method.
 - Tap <Delete> to delete a method.

You cannot rename or delete the currently used method.

To change method parameters that do not only affect Lovis 2000 M/ME, refer to the General Software Functions Manual or to the instruction manual(s) of the other instruments/modules of the assembly.

7.2.3 Measurement Mode Settings

This chapter explains the measurement modes which define what kind of test is performed.

- Tap "Menu > Methods > Method Settings". Select a method ("Method Name") from the list.
- 2. Select a "Measurement Mode (XX)".

Lovis Measurement Modes

Meas. Mode	Description
S (Standard)	To perform a single temperature / single angle test.
C (Check)	To perform one of the predefined checks. It is only possible to select a check which has been defined for the selected method before. Checks are single temperature / single angle tests. Refer to Chapter 8.2 of the Lovis 2000 M/ME Reference Manual for details.
MM (Multiple Measurement)	To perform a single temperature / single angle test repeatedly (2 to 10 times, as defined).
RM (Repeated Mode)	To perform up to 5 repeated measurements with refilling liquid from the same syringe or sample vial (if using an Xsample model) without cleaning in-between. The repeat deviation between determinations can be calculated (see "Repeated Mode Settings").
MF (Multi Fill)	If using an Xsample model: To perform up to 5 repeated measurements refilling liquid from the same syringe or sample vial with automatic cleaning in-between. If not using an Xsample model: To perform up to 5 repeated measurements refilling liquid from the same syringe.
TS (Temperature Scan)	To measure from start to end temperature at set intervals (single angle). The minimum step size is 0.01 °C. ^a
TTS (Temperature Table Scan)	To measure at user-defined temperatures (single angle). It is not necessary to enter the temperatures in a certain order. Two consecutive temperatures must not differ at all (minimum step size = 0 °C).
TiS (Time Scan)	To measure for a defined duration at set intervals (single temperature / single angle).
FAS (Fixed Angle Scan)	To measure from start to stop angle at set intervals (single temperature). The minimum step size in angle scans is 1°.
P (Polymer) ^b	 To measure relative viscosity either from a polymer solvent and one single concentration solution or from a polymer solvent and at least two solutions of different concentration (multi conc.). Maximum number of solutions: 10. The measurement is performed at one angle or at several angles for extrapolating the viscosity at zero shear rate. Maximum number of angles: 10.

- a. The specified minimum step size is valid for Lovis as master instrument. If performing a TS /TTS with DMA M or additional modules (e.g. Abbemat refractometer), the minimum step size also depends on the technical specifications and settings of these instruments. Refer to the respective instruction manuals.
- b. For details on the Polymer mode see Chapter 7.2.5.6 and Chapter 7.2.5.7 of the Lovis 2000 M/ME Reference Manual and consult the Short Instruction on Polymer Measurements (Doc. No. C72IB012EN, supplied on the USB storage device).

Meas. Mode	Description
ZSS (Zero Shear Scan)	To measure a shear-dependent sample at different automatically selected angles. The viscosity at zero shear rate is extrapolated. To display the Zero Shear Viscosity select it as quantity (from parameter group "Lovis Polymer") for one of the output fields (see General Software Functions Manual). By default, the sample is tested at three different angles. To change the number of angles (max. 10) see Chapter 7.2.5.6 of the Lovis 2000 M/ME Reference Manual. This mode is not suitable for polymer solutions for which the concentration is a relevant parameter!

TIP If defining a TS or FAS, make sure to set the step interval so that the instrument can reach the end value by a whole number of steps (divide the interval between start and end value by whole numbers only to find appropriate step settings). If you enter a unsuitable end value, the instrument suggests a different input.

Repeated Mode Settings

These settings only apply to measurement mode "(RM) Repeated Mode".

Tap "Menu > Methods > Method Settings > "Method Name" > Repeated Mode Settings".

Max. Number Of	The max. number of determinations which shall be	
Determinations	performed to get a valid repeat deviation.	
Save Mode	Defines which determinations shall be saved (all, valid	
	two only, or final one only).	
"Active" check box	If activated, the deviation of the average values of two	
(Lovis Averages	consecutive measurements (determinations) is	
Runtime)	calculated and compared to the "Max. Repeat Value".	
	The measurement is valid, if this value is not	
	exceeded. If the max. allowable deviation is exceeded,	
	the instrument can do another determination	
	(depending on the set max. no. of determinations).	
"Use Default "	If activated, the default "Max. Repeat Value" is set.	
check box		
Max. Repeat Value	This value is the maximum allowable deviation	
[%]	between two determinations. Default: 0.50 %.	

7.2.4 Formula Parameters

The Formula Parameters can be used if you operate with manual input of the density.

If you enter the density as Formula Parameters the instrument calculates the dynamic and kinematic viscosity with this/these density value(s) for this method.

TIP The instrument does no longer ask for the input of a density value when starting measurement.

Mind to enter the correct value(s) if testing samples of different density!

You can always change the value(s) in the "Quick Settings" just before starting measurement.

To set the Lovis Formula Parameters

- Tap "Menu > Methods > Method Settings > "Method Name" > Formula Parameters".
- 2. Enter the "Lovis Density" (value at measuring temperature) for single temperature tests.
- 3. Enter two reference density values at two independent temperatures via field "Lovis Density TS/TTS". These values serve to extrapolate density values for temperature or temp. table scans.

If you do no longer need the values in the Formula Parameters, delete them. The field "Parameter Select" must be completely empty.

7.2.5 Lovis Module Settings

This submenu contains the following measuring parameters that affect only Lovis 2000 M/ME:

- Temperature Settings
- Measuring Settings
- Advanced Settings
- Density Settings only for Lovis 2000 ME combined with DMA M/DSA M
- · Beer/Wort Settings
- Polymer Settings
- Molar Mass Calculation Settings

7.2.5.1 Temperature Settings

Set the measuring temperature and the temperature equilibration time.

- Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Temperature Settings".
- 2. Enter the "Measuring Temperature" in the selected unit [°C / °F / K].

3. Define the "Temperature Equilibration" time in [s]. This is the time the instrument waits for the sample to reach the measuring temperature after starting measurement and after the Lovis capillary block has reached the set temperature.

TIP You can set the temperature equilibration time to 0 s and use the variation coefficient (Chapter 7.2.5.2) for temperature equilibration of the sample. Using the var. coeff. for temperature equilibrium is not recommended for highly viscous samples. Due to the long runtimes the procedure would consume too much time.

4. Tap <OK> to save your settings.

7.2.5.2 **Measuring Settings**

- 1. Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Measuring Settings".
- 2. Set the following parameters:

Measurement Cycles:

One measuring cycle represents one forward and one backward run. Set here the number of cycles for calculating the variation coefficient.

Use Manual Angle:

If selected, you can define the measuring angle to be used for a test. If you deactivate the check box, the first measurement will be done using a 70° angle and then the angle is automatically chosen depending on the values in the Advanced Settings (Chapter 7.2.5.3).

Use Variation Coefficient:

If using the variation coefficient, Lovis 2000 M/ME compares the set value to the runtime variation coefficient calculated from the set number of measurement cycles. If the calculated var. coeff. exceeds the set value, Lovis 2000 M/ME discards the first cycle and performs another cycle. The maximum number of cycles within which the set value should be achieved is set in the Advanced Settings (Chapter 7.2.5.3). The var. coeff. provides a way to ensure temperature equilibrium of the sample. As long as the sample temperature is not stable, the runtimes vary between measurement cycles.

- TIP The variation coefficient is always calculated by the instrument, but the set limit value is only applied to a measurement if activated in these settings!
 - For highly viscous samples (long runtimes) it is recommended to set a fixed temperature equilibrium time (Chapter 7.2.5.1).

Measuring Distance:

Use the drop-down box to select one of the options:

- · Long: corresponds to 100 mm measuring distance
- · Short: corresponds to 25 mm measuring distance
- Automatic: Lovis 2000 M/ME switches to "Short" if the runtime exceeds the Auto-distance threshold in the Advanced Settings (Chapter 7.2.5.3).

The long measuring distance is recommended for low viscous media to get a long enough runtime for optimum precision. Use the short measuring distance for more viscous samples to save time.

3. Tap <OK> to save your settings.

7.2.5.3 Advanced Settings

- Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Advanced Settings".
- 2. Set the following parameters:

Max. Measurement Cycles:

The maximum number of measuring cycles within which the set variation coefficient (see Chapter 7.2.5.2) should be achieved.

· Auto-distance threshold:

The auto-distance threshold is that runtime value at which the instrument switches from the long measuring distance to the short measuring distance. It is applied only if the option "Automatic" is selected for the measuring distance (see Chapter 7.2.5.2).

· Auto-angle threshold

The auto-angle threshold is that runtime value at which the instrument switches to flatter measuring angles (start angle = 70°. It is applied only if the option "Use Manual Angle" is **not** activated (see Chapter 7.2.5.2).

Measuring Timeout (for long distance)

The timeout limit is that time in seconds after which a Lovis measurement is aborted if not all coils for the long measuring distance have been passed by the ball for one measuring run. Set a value between 60 s or 1700 s.

In case an application always yields short runtimes, setting this timeout to a value slightly longer than the expected runtime for the long measuring distance avoids unnecessary waiting times in case of an error (e.g. ball blocked by an air bubble).

For testing samples of higher viscosity, the limit must be raised accordingly. The maximum values can be calculated from the capillary measuring ranges (Appendix A.2).

The following example shows how to find a suitable timeout for a sample:

The default measuring timeout of 250 s permits to measure viscosities of approx. 1500 mPa.s with the 2.5 mm capillary at an 80° angle.

- Extended range of 2.5 mm capillary: max. viscosity = 10 000 mPa.s
- This corresponds to 1700 s runtime.
- (10 000 mPa.s / 1700 s) * 250 s = 1470.58 mPa.s => approx. 1500 mPa.s
- TIP For capillary adjustments and the Level Adjustment always the maximum timeout of 1700 s is applied, independent of the value set for the current measuring method.
 - 3. Tap <OK> to save your settings.

7.2.5.4 Density Settings

 Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Density Settings".

This menu item is available only for Lovis 2000 ME combined with DMA M/DSA M.

- 2. Set the following parameters:
 - Density Source:

Select the density value for calculating dynamic or kinematic viscosity:

- DMA Density (default setting) use the measured density value
- API Density use this to extrapolate measured density to a different Lovis temperature using API tables or a custom coefficient. (API = American Petroleum Institute).
- User Function use calculated density values (see below)
- Lovis Density (Manual Input) enter the density manually
- TIP If selecting "Lovis Density (Manual Input)", you get an additional input option in the "Quick Settings" (see Chapter 10). For Temperature and Temperature Table Scans, you can enter two different density values independent of the scan start and end temperature. The density values for the scan's temperatures are extrapolated from the two input values.

User Function:

Active only if selected as "Density Source". The instrument calculates special density values from the density measured by the DMA M/DSA M:

- Apparent Density Steel
 Apparent density referring to scales adjusted with brass weights.
- Apparent Density Brass
 Apparent density referring to scales adjusted with steel weights.
- 3. Tap <OK> to save your settings.

7.2.5.5 Beer/Wort Settings

Here you can enter a specific parameter – the Extract – for testing beer and wort.

- Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Beer/Wort Settings".
- 2. Open the drop down list. Select an option:
 - Approximate Apparent Extract

The instrument uses a MEBAK polynomial (see MEBAK Handbook 4th edition, chapter 2.10.) to calculate the Approximate Apparent Extract from the density value. It does not matter whether the density was entered manually or taken from a DMA M/DSA M. (MEBAK is an established Middle-European association for brewing techniques).

- **TIP** The Approximate Apparent Extract applies only to wort. Do not use it if testing beer. Test results would be faulty.
 - Manual Input to enter an Extract value manually.
 - 3. Tap <OK> to save your settings.

7.2.5.6 Polymer Settings

Here you can enter specific parameters for testing polymer solutions. Consult the "Polymer Measurement Short Instruction" (Doc. No. C72IB012EN, supplied on the USB storage device) for details.

- Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Polymer Settings".
- 2. Enter the following parameters:
 - · Calculation Method

All polymer-related calculations are based on the relative viscosity. Define here how to calculate the relative viscosity:

- · by Runtime ratio
- by Dynamic viscosity ratio
- · by Kinematic viscosity ratio
- Angle Count (for Zero Shear Scan)

Enter the number of measuring angles at which the polymer solution shall be tested. This input serves for Zero Shear Scans to extrapolate the zero shear viscosity. If testing a polymer solution at one angle only, this input does not affect the measurement. For a scan, a minimum of two angles is required. The maximum number of angles is 10. The default setting is 3.

- By default, the instrument automatically chooses the angles that are used for measurement.
- If using data from the "Polymer Solvents Administration", Chapter 7.1.4, the instruments selects angles that are available for the specified solvent.
- TIP The "Angle Count" setting also defines the number of angles when performing a measurement with mode "ZSS (Zero Shear Scan)". For this mode the measuring angles are always automatically selected.

Mind that the measurement mode ZSS is NOT suitable for testing polymer solutions, use the mode P (Polymer) instead!

Use Zero Shear Scan (for each solution)

Check this box to perform a Zero Shear Scan for polymer solutions. If you do a Multi Concentration measurement (testing a polymer in solutions with different concentrations), each solution is tested at each angle.

If the box is not active, each polymer solution is tested at one single angle only.

Enable Redo/Skip Prompt (for failed measurements)

Check this box to allow for doing failed measurements again, or for skipping them. If one sub-measurement of a series (e.g. Multi Concentration or Zero Shear Scan) fails, you are prompted to redo it. This is especially useful in combination with a sample changer with a magazine. The system stops directly at the failed sample (i.e. vial) and you can redo the sub measurement.

If the box is not active, measurement continues without prompt. In the worst case, the failed sub-measurement is a vital one for your test and you do not get any results out of the series.

- 3. Tap <Next> to continue your input.
- 4. Select a Concentration Input Mode:
 - Manual input

Enter the concentration(s) of your polymer solution(s) manually in the Quick Settings before starting measurement.

· Calculated by user function

Select a "User Function for concentration" that calculates the concentration(s) of your polymer solution(s). You can only select user functions that you have programmed beforehand in the "Setup > Expert Settings > User Function Management". Refer to the Instrument Software Manual for entering user functions.

- 5. Select a Concentration Unit from the drop down list. This option is only active for manual input mode.
- 6. Tap <Next> to continue your input.

- 7. Select one of the calculations for the intrinsic viscosity.

 If required, enter the correct k (slope) constant. Only select such a calculation if the k (slope) constant is known.
- 8. Tap <OK> to save your settings.

7.2.5.7 Molar Mass Calculation Settings

If known, you can enter the coefficients for the Mark-Houwink equation here. This equation calculates the molar mass of your polymer.

- 1. Tap "Menu > Methods > Method Settings > "Method Name" > Lovis Module > Molar Mass Calculation Settings".
- 2. Enter the Mark-Houwink coefficients:
 - Mark-Houwink Factor (K) [mL/g] allowable range: 0 mL/g to 10 mL/g
 - Mark-Houwink Exponent (a) allowable range: 0 to 2
- 3. Tap <OK> to save your settings.

8 Checks and Adjustments for Lovis 2000 M/ME

8.1 Definitions

Checking

Checking the correct state of operation of an instrument by measuring a sample of exactly known measurement properties and comparing the result with the expected values.

Lovis 2000 M/ME allows you to perform tests in the measuring mode "Check". For details, refer to Chapter 8.2.

Adjusting

Enabling correct measurements in the future by measuring a sample of exactly known measurement properties (standard) and adjusting the instrument constants in a way that the known correct results are found by the instrument.

Lovis 2000 M/ME requires the following adjustments:

- Level Adjustment (Chapter 8.3)
- Adjustments of capillary configurations (Chapter 8.4)
- Temperature Adjustment (Chapter 8.5). The instrument is temperature adjusted before delivery and users need not do this adjustment as a rule.

Calibrating

Calibrations are checking procedures which are carried out using certified standards. By comparing the measured result with the standard reference value, you can validate the quality of your measurements.

8.2 Checks

8.2.1 Editing the Check Settings for Lovis 2000 M/ME

You can edit the factory predefined water check (name, time interval and allowable tolerance) or create an entirely new custom check.

NOTICE

Reference values and limits of custom checks are valid only for one temperature. Make sure that the currently set measuring temperature of the Lovis capillary block agrees with the reference value.

If using water as check standard, Lovis 2000 M/ME automatically calculates the correct reference value for the currently set Lovis temperature. This is not possible with customer reference fluids.

Factory default tolerance values of the Water Check

- Reference value: Kinematic viscosity [mm²/s] and dynamic viscosity [mPa.s] of water at the currently set temperature of the Lovis capillary block default water reference values are from IAPWS 2008
- Lower deviation: 0.01000 mm²/s; 0.01000 mPa.s
- Upper deviation: 0.01000 mm²/s; 0.01000 mPa.s

To edit the settings of the Water Check

- Tap on the <Menu> button and select "Setup > Expert Settings > Check Management" to open the check management list.
- 2. Highlight the **"Water Check"** and tap <Edit> to open the three-step "Check Edit" wizard.
- 3. Enter a name for the check. Tap <Next>.
- 4. Use the check boxes...
 - to set that the check is "GxP relevant"
 - to activate a reminder for regular check execution. Enter a time interval for the check execution reminder: "Remind every" xx day(s). Tap <Next>.
- Define for which modules the check should be active. There are different fields for dynamic and kinematic viscosity. The reference values for water are pre-programmed. Set the maximum allowed lower and upper deviation (absolute values).
- 6. Tap <OK>.

To create a custom check

- Tap on the <Menu> button and select "Setup > Expert Settings > Check Management" to open the check management list.
- 2. Tap <New> to open the three-step "Check Administration" wizard.
- 3. Perform the following settings:
 - · Enter a name for the check.
 - Select the method with which you want to perform the check. You can choose any pre-defined or customized method. Tap <Next>.
- 4. Select a quantity for the check.
 - Select the quantity from Group "Lovis".
 - If there are several unit applicable to this quantity, select one. Tap <OK>.
- 5. Enter the absolute lower and upper limit of the allowable range for the check result.
- 6. If required, repeat the two above steps to add more quantities to the check.
- 7. Tap <OK>.

To edit a custom check

- Tap on the <Menu> button and select "Setup > Expert Settings > Checks
 Management" to open the check administration list.
- 2. Highlight a custom check and tap <Edit> to open the three-step "Check Administration" wizard.
- 3. Change the settings as required. See "To create a custom check".

8.2.2 Performing Checks

With water or custom checks, carried out in regular intervals, you can ensure a high and stable accuracy of your viscosity measurements.

For a check, you fill your capillary with a reference standard of known viscosity and compare the measured viscosity with the reference value.

The Lovis performs the check automatically at the measuring temperature of the method that is currently active. The viscosity of water at the measuring temperature is calculated and compared with the reference value.

When to do checks

Use the check to verify that the instrument is measuring with satisfactory accuracy. We recommend performing a check every day before starting the measurements. Perform additional checks on demand depending on your judgment, e.g. when you get unexpected results.

To perform a check

- **TIP** If the Non Storage Mode is active, results are not saved. Make sure to print or export data before closing the Check Result Data window. See General Software Functions Instruction Manual for detailed information.
 - Tap <Menu>. Select "Checks/Adjustments > Checks".
 - 2. Highlight a list item and tap <Start>.
 - 3. Follow the instructions on the screen.

For a water check use freshly degassed ultra pure (bi-distilled or deionized) water. For a custom check use a reference standard of known viscosity.

TIP If NOT using water make sure that the currently set Lovis temperature agrees with the reference value and limit value predefined for the check!

When the check is finished, the following information is displayed:

- Check type
- Date and time
- · Used method
- User name
- Reference value for all quantities of the check
- Allowable range (lower and upper value) for all quantities of the check
- Measured value for all quantities of the check
- Check result ("Passed" or "Not passed") for all quantities of the check
- 4. Tap <Print or Export> if you want to print or export the check results.
- 5. Tap <OK> or <Home> to exit the density check.

If the check failed, take corrective actions until the check is valid again:

- · Check the quality of the water/reference standard.
- Clean the capillary efficiently (see Chapter 11.2 or Chapter 11.3).
- If the above mentioned actions do not help, perform a new adjustment of the capillary (see Chapter 8.4).

8.2.3 Viewing, Printing or Exporting Current Check Data

TIP Check data are not available if the Non Storage Mode is active.

The total number of entries in the check history is limited to 100.

- 1. Tap <Menu> and select "Data Memory > Check Data".
- 2. Highlight a list item and tap <Detail>.
- To perform a printout on paper or to a PDF file or to export the data as an MS Excel or Text file tap <Print or Export>. Follow the instructions on the screen.

8.3 Performing a Level Adjustment

Ideally, the ball's runtimes of a forth and back run at the same angle should be identical when the Lovis 2000 M/ME stands levelly on a flat surface. As the instruments cannot be leveled mechanically by adjustable feet, possible unevenness of the location of installation should be compensated by performing a Level Adjustment.

TIP Perform a Level Adjustment

Perform a Level Adjustment

- when initially installing Lovis 2000 M/ME
- whenever the instrument has been moved (even if only a bit)
- before adjusting a capillary. In this case, ideally perform the Level Adjustment with the capillary you plan to adjust.

For a correct adjustment a correctly filled capillary with a ball is required. The capillary can be filled outside the capillary block or by the flow-through method (see Chapter 9). The capillary need not be adjusted for a Level Adjustment!

Select a capillary/ball configuration and fill it with a suitable liquid (see Appendix A.2).

NOTICE

It is not possible to perform a Level Adjustment with air, as the minimum run time must not fall below 10 seconds. Further the ball's friction in an empty capillary does not represent the conditions in a liquid filled capillary.

To perform a Level Adjustment

- Tap <Menu> and select "Checks / Adjustments > Other Adjustments >
 Lovis Module > Level Adjustment".
- Select an angle (Auto Angle or Manual Angle and define it) for the Level Adjustment and define the allowable Variation Coefficient (Chapter 7.2.5.2).
 Tap <OK>.
- 3. Follow the instructions on the display. If more than one capillary/ball configuration is installed (see Chapter 7.1.1), Lovis 2000 M/ME prompts you to select a capillary from the list.

During the Level Adjustment Lovis 2000 M/ME displays the current temperature and the progress.

When finished, the instrument shows the results for short and long measuring distance:

- Required angle correction to achieve near identical runtimes
- Average forward and backward runtimes
- Forward/Backward Deviation and Variation Coefficient

- 4. An arrow suggests the suitable action:
 - If the correction is greater than 0.5°, a message on the lower left-hand side of the instrument screen reads "Check Result. Improve". The Level Adjustment should be repeated with the same filling of the capillary. Tap <Improve>. The first correction is applied and a new adjustment is started to fine tune the angle correction.
 - For corrections smaller than 0.5°, Lovis 2000 M/ME suggests to <Apply> the Level Adjustment.
 - Tap <Reject> to discard the displayed correction and end the adjustment.
- TIP The result can be improved several times (even if Lovis 2000 M/ME suggests <Apply>). It is possible to achieve angle corrections < 0.1°.
 - 5. If after improving several times Lovis does not prompt you to <Apply>, check the filling of the capillary for bubbles and check that the Lovis stands in a stable position. Refill the capillary and tap <Improve>.
 - 6. The Level Adjustment is valid and stored after tapping <Apply>.

8.4 Adjusting Lovis 2000 M/ME Capillaries

Lovis 2000 M/ME calculates dynamic and kinematic viscosity from the adjustment data of the capillary/ball configuration and from the measured runtimes.

TIP If you have ordered a factory adjustment, import the adjustment from the USB storage device delivered with the capillary. See Chapter 7.1.1!

Do not lose the original adjustment ball (see below)!

Adjustment Ball

Due to manufacturing the diameters of the supplied balls vary within a defined tolerance.

- The variation is greater for gold balls because of the additional layers (undercoating + gold layer) on the steel balls.
- The smaller the inner diameter of a capillary is, the narrower is the gap inside the capillary and the more the ball diameter affects the adjustment results.

The below table shows the maximum measurement deviation if changing balls from the same batch.

Capillary	Steel Ball	Gold Ball
1.59 glass	0.7 %	6.0 %
1.8 glass	0.2 %	1.6 %
2.5 glass	<0.1 %	0.2 %
1.62 PCTFE	0.6 %	5 %

Use only the adjustment ball for measurement.

Do not change the ball unless the expected deviation is acceptable for you. The deviation does not influence relative viscosity results (It is cancelled out when calculating these values).

If you need to change the ball and the expected deviation exceeds your precision requirements, perform a measurement with the new ball and a viscosity standard liquid to check the real deviation. Use measurement mode "Standard" or "Check" (for details on mode "Check" see Chapter 8.2 of the Lovis 2000 M/ME Reference Manual).

If the deviation of the check measurement exceeds your limits, the capillary has to be re-adjusted with the new ball.

TIP If you plan to dispose of the balls after each measurement do not use gold balls.

Adjustment types

Single Point Adjustment

for one user-defined angle

A single point adjustment does not allow for performing angle or shear rate scans. It is faster than range adjustments and provides maximum accuracy.

Standard Adjustment

for a fixed range of 20° to 70° angle

A Standard Adjustment is a versatile adjustment for wide range angle/shear rate scans. It is time consuming because the 20°, 30°, 40°, 50°, 60° and 70° angle are adjusted; for measuring angles in-between the Lovis provides a mathematical fit.

Extended Adjustment

for a user defined range that lies within 15° to 75° angle range

The Extended Adjustment permits customers to define specific adjustment ranges which optimally suit their applications. Select angles from the range you actually need. Angle/shear rate scans can then be performed in this range.

- The more angles you select within your range, the better your measuring accuracy will be, but the longer the procedure will take.
- Select at least three angles. It is not recommended to select too few angles that are more than 20° apart from each other.

You can store the same capillary by different names in the Capillary Administration and adjust it for different angle ranges or single angles.

TIP It is **not** recommended to adjust the capillary over an angle range including the 80° angle. This causes a significant loss in accuracy for the entire adjustment range, because the ball's rolling behavior at 80° does not give an optimum fit for the applied mathematical model. If the 80° angle is required due to customer regulations, a Single Point Adjustment should be performed.

To adjust a capillary

To adjust a capillary, you need a reference standard with certified values of dynamic viscosity and density at the respective temperature. The viscosity of the reference standard must be in the core range of the capillary (see Appendix A.2).

A table in Appendix A.3 lists suitable standard liquids.

- 1. Perform a Level Adjustment. See Chapter 8.3.
- Tap <Menu> and select "Checks / Adjustments > Other Adjustments > Lovis Module". Select an adjustment type.
- 3. Follow the instructions on the display. Select the capillary (from the list of stored capillary configurations, see Chapter 7.1.1). Enter the ball batch no., the ball density (see label of the ball vessel) and the adjustment temperature.
- **TIP** You get the most precise measuring results if adjusting a capillary at or near that temperature you wish to measure at. To adjust the same capillary at different temperatures you can store it by different names in the Capillary Administration.
 - 4. Fill the capillary with your standard liquid. You can fill outside the block or with the flow-through method.
 - 5. Select the standard liquid ("Reference Medium Type"), enter its batch (if applicable) and its dynamic viscosity and density at the adjustment temperature. If you select a reference standard liquid from the Viscosity Standards Management (see Chapter 7.1.3), the instrument uses the values that are defined for this standard.
 - By default Lovis 2000 M/ME uses the pre-programmed values according to IAPWS 2008 for water. If using AP $\rm H_2O$ enter the values from the supplied certificate.
 - 6. Define a Variation Coefficient (see Chapter 7.2.5.2 of the Lovis 2000 M/ME Reference Manual.) that suits your precision requirements (value between 0.05 and 2.00 %).
 - 7. If you tap the button <Predict duration> before starting a Standard Adjustment, the Lovis will perform a run at 70° angle and displays a list of angles that are available for the selected capillary/ball configuration, reference standard and adjustment temperature.

For an Extended Adjustment the Lovis always calculates the available angles and displays check boxes to select the angles at which the capillary shall actually be adjusted.

If no angles are available at all, a too high FW/BW deviation or variation coefficient of the runtimes might be the cause. Check the filling of your capillary or perform a Level Adjustment.

8. Start the adjustment with <OK>.

For an Extended Adjustment or if <Predict duration> was selected for a Standard Adjustment, the instrument displays the predicted end of the adjustment. This is an estimated time when the adjustment will be finished, if the set variation coefficient is always reached with the minimum number of determinations.

When finished, Lovis 2000 M/ME displays the ball runtimes at the adjusted angle(s) and the maximal variation coefficient that occurred during the adjustment. If one or more angles are invalid, the respective angles are not stored. The instrument displays a message.

- If the maximal variation coefficient or the FW/BW deviation exceeds the allowed value for one or more angles, the Lovis 2000 M/ME prompts you to tap <Reject>.
- If you apply the adjustment and there are invalid angles within the angle range, these will be interpolated from the existing values if at least three valid angles are available. The interpolation of an angle results in a less accurate adjustment.
- If you apply the adjustment and an invalid angle is on either end of the adjustment range, this angle is canceled and the adjusted range of the capillary is only between the valid angles.
- If you reject the adjustment, fill the capillary again and repeat the adjustment.
- If still exceeding the allowed variation coefficient after the second adjustment, clean and brush the capillary (see Chapter 11.2 or Chapter 11.3), refill it, repeat the level adjustment and start a new adjustment.
- 9. For adjustment results within the specifications Lovis 2000 M/ME prompts you to tap <Apply>.
 - To print or export an adjustment report, tap <Print> before applying the results.
 - Tap <Apply> to store the adjustment data for this capillary configuration.

8.5 Temperature Calibration and Adjustment

Perform temperature calibrations regularly to verify that the Lovis temperature control works correctly. For example, temperature calibration is performed during annual maintenance if you have a service agreement. Calibration can be performed at freely selectable temperatures within the instrument's measuring range. Authorized service personnel or any user with operator rights is allowed to calibrate the temperature measurement.

A temperature adjustment is required if the temperature calibration measurements are repeatedly outside the limit values. The new adjustment can be carried out by authorized service personnel or a user with administrator rights.

Adjustment is performed at 20 $^{\circ}$ C, 40 $^{\circ}$ C, 60 $^{\circ}$ C, 80 $^{\circ}$ C and 100 $^{\circ}$ C. For a manual adjustment, the values are measured by an external thermometer and have to be entered manually. If doing an adjustment with MKT 10 or MKT 50, the values are entered automatically.

8.5.1 Performing a Calibration or Manual Temperature Adjustment

Required thermometer specification: For temperature calibration and/or adjustment we recommend the MKT 10 or MKT 50 high-precision thermometer or a similar device with Pt-100 temperature probe and an uncertainty of measurement of max. 0.01 °C.

TIP Check the precision and the calibration of the thermometer and the temperature probes before starting the temperature adjustment.

Required parts for Lovis:

- Pt100 Adapter Lovis (Mat. No. 98604)
- Screw Cap Front Side Open (Mat. No. 98166)
- Screw Cap Back Side Closed (Mat. No. 98175)

To insert the temperature probe

- 1. Lead the Pt-100 temperature probe through the hole of the Screw Cap Front Side Open.
- 2. Take the Pt100 Adapter Lovis and unscrew it.
- 3. First lead the Pt-100 temperature probe through the hole of the PEEK part of the Pt100 Adapter Lovis.
- 4. Then carefully insert the Pt-100 temperature probe into the metal part of the Pt100 Adapter Lovis.

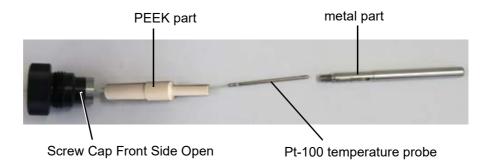


Fig. 8 - 7 Inserting the Pt-100 temperature probe

5. Take care that the recess of the Pt-100 temperature probe fits into the corresponding clip of the Pt100 Adapter Lovis.

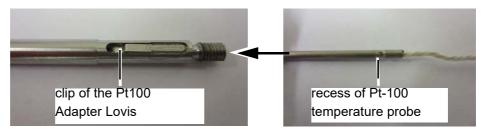


Fig. 8 - 8 Temperature probe and adapter - recess fitting into the clip

- 6. Screw the two parts (PEEK and metal) of the Pt100 Adapter Lovis together.
- 7. Insert the Pt100 Adapter Lovis with the inserted Pt-100 temperature probe into the Lovis capillary block and close the capillary block with the Screw Cap Front Side Open.
- 8. On the back side close the capillary block with the Screw Cap Back Side Closed (Mat. No. 98175).
- 9. Connect the cable of the Pt-100 temperature probe with your thermometer.
- 10. To use the thermometer refer to the corresponding instruction manual. (Continue on p. 80 for adjusting the temperature).

To perform a temperature calibration

- 1. Set any desired temperature on the Lovis 2000 M/ME.
- 2. Wait for approx. 10 minutes for temperature equilibration. The temperatures of the Lovis and the external thermometer need to be stable. The capillary block remains in its home position.
- 3. Compare the temperature displayed on the thermometer with the value displayed by Lovis.

Allowable temperature deviation for valid calibration:

±0.02 °C + thermometer uncertainty (max. ±0.01 °C)

In case the calibration exceeds the allowable deviation, repeat the procedure. If the deviation is still too high, adjust the instrument.

- 4. You can perform additional calibration measurements at different temperatures.
- To document a calibration, take a picture that shows the temperature values both on the Lovis screen and on the thermometer. Print or store this picture if required.
- 6. At the end of calibration, set the Lovis to 25 °C. Wait until Lovis reaches the set temperature before you remove the temperature probe.



CAUTION

The temperature probe and adapter could be hot after the calibration, which could lead to burns to your skin.

To prevent injury, allow the instrument to cool down to room temperature before removing these items.

To perform a temperature adjustment

Tap <Menu> and select "Checks/Adjustments > Other Adjustments > Lovis Module > Temperature Adjustment".

An ongoing adjustment can always be aborted by pressing <Cancel>.

- 1. The instrument prompts you to fix the external temperature sensor to the capillary block and to tap <OK>. The capillary block moves to the 0° position.
- 2. Wait until the temperatures of the Lovis and the external thermometer are stable.
- 3. When ready, the screen displays the current "Set Temperature". Enter the value displayed by the external thermometer (field "Reference Temperature").
- 4. The instrument heats to the second temperature value.
- 5. Repeat this procedure until the last temperature value (100°C) is reached.
- 6. After entering the last temperature value, the instrument displays all temperatures that were successfully measured and prompts you to <Apply> the results.
 - To save the temperature adjustment results tap <Apply>.
 - To discard the temperature adjustment results tap <Reject>.
 - To print the temperature adjustment results press <Print>.
- 7. After the adjustment was finished, the instrument automatically cools down.



CAUTION

The temperature probe and adapter could be hot after the adjustment, which could lead to burns to your skin.

To prevent injury, allow the instrument to cool down to room temperature before removing these items.

8.5.2 Performing a Temperature Adjustment with MKT 10/50

The adjustment is performed at 20 °C, 40 °C, 60 °C, 80 °C and 100 °C, the temperature values, measured by the MKT 10/50, are entered automatically.

Required parts:

- PT 100 Adapter Lovis (Mat. No. 98604)
- Screw Cap Front Side Open (Mat. No. 98166)
- MKT 10 Millikelvin Thermometer (Mat. No. 172072) or MKT 50 Millikelvin Thermometer (Mat. No. 26878)
- Sensor for temperature calibration DMA/SVM Pt 100 (Mat. No. 74557)
- Cross-over Ethernet cable for PC connection (Mat. No. 18597)

To insert the temperature probe into the Lovis capillary block

Refer to Chapter 8.5.1 "Performing a Calibration or Manual Temperature Adjustment".

TIP For details how to use the MKT 10/50, refer to the MKT 10 or MKT 50 Instruction Manual, respectively.

To perform a temperature adjustment with an MKT 10/50

- 1. Connect the MKT 10/50 via Ethernet cable to the Lovis.
- 2. Connect the cable of the Pt-100 temperature probe to Channel (CH1) of the MKT 50 and switch the MKT 50 on. For MKT 10, the Pt-100 probe is permanently fixed to the device.

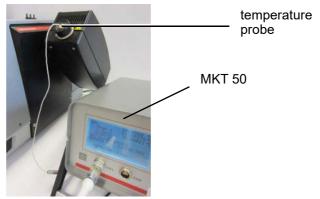


Fig. 8 - 9 Connecting the temperature probe with the MKT 50

- 3. To start the adjustment tap "Menu > Checks/Adjustments > Other Adjustments > Lovis Module > Temperature Adjustment with MKT".
- 4. The instrument prompts you to fix the external temperature sensor to the capillary block and to tap <OK>. Instructions come up on the screen.

You have already connected the MKT (see above). Set the required IP address on the MKT. The **webserver** must be "**ON**", enter "**IP 010.000.000.002**".

MKT 50:

• Tap <M> (main menu) and "2 Edit Configuration > 5 Ethernet".

MKT 10:

• Tap the list symbol (main menu) and "Setup > Network Configuration".

Select the following settings for the MKT: Mean value determined from 50 values.

MKT 50:

• "1 Select Display > 4 Temperature Statistics N: 50".

MKT 10:

• "Display Mode > Temperature statistics N: 50".

If temperature statistics is already displayed but not set to "50", change the number of values by tapping "UP" or "DOWN".

5. Wait till the mean value is displayed on the MKT:

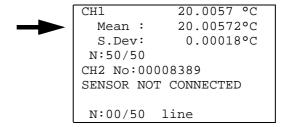


Fig. 8 - 10 Mean value on MKT 50 display (Channel 1) - Example

6. Tap <OK>. The temperature adjustment is performed automatically.

After measuring the last value, the instrument displays all successfully measured temperatures and prompts you to <Apply> the results.

- To save the temperature adjustment results tap <Apply>.
- To discard the temperature adjustment results tap <Reject>.
- To print the temperature adjustment results press <Print>.
- 7. After the adjustment was finished the instrument automatically cools down.



CAUTION

The temperature probe and adapter could be hot after the adjustment which could lead to burns to your skin. To prevent injury, allow the instrument to cool down to room temperature before removing these items.

8.5.3 Resetting the Temperature Factory Adjustment Data

You can re-activate the factory temperature adjustment.

- Tap <Menu> and select "Checks/Adjustments > Other Adjustments > Lovis Module > Reset To Temp. Factory Adjustment".
- 2. Activate the check box "Lovis" and tap <OK>.

8.6 Viewing, Printing or Exporting Adjustment Data

TIP Data of adjustments are not available if the Non Storage Mode is active.

View, print and export the detailed data of the last 50 adjustments.

Tap <Menu> and select "Data Memory > Adjustment Data > Lovis Module" and select "Capillary Adjustment", "Temperature Adjustment", "Level Adjustment" or "Distance Adjustment" to open the respective adjustment data.

TIP The Distance Adjustment is done at works before delivery and need not be done by the user. The valid results can be viewed.

- 1. Highlight a list item (if applicable) and tap <Details> to see the detailed adjustment data.
- 2. To perform a printout on paper or to a PDF file or to export the data as an MS Excel or Text file tap <Print or Export>. Follow the instructions on the screen.

9 Filling the Lovis 2000 M/ME

This chapter describes the possible methods for manually filling a capillary for Lovis 2000 M/ME. How to fill a Lovis 2000 M/ME automatically with an Xsample sample changer and how to fill Lovis measuring assemblies with other modules is described in the Lovis 2000 Reference Manual, SECTION II: Flow-Through Systems.

Fill a capillary outside the capillary block or use a flow-through filling system.

TIP Short capillaries (low sample volume) can only be filled outside the capillary block.

9.1 Selecting a Capillary and a Ball

Select a capillary with a suitable diameter, a suitable ball the suitable material and the desired length (standard or short). Refer to Appendix A.2.

The capillary and the ball should be clean and dry (capillary: inside and outside).

NOTICE

All capillaries are factory cleaned before shipping them. Still, efficient cleaning before the first filling and measurement is essential to condition the inner surface! For cleaning instructions, see Chapter 11.



WARNING

Capillaries that are made of glass will break if treated with excessive force. Sharp pieces can cut your hands and fingers. In case of hazardous sample liquids (acid, caustic, infectious, easily inflammable...) spills and fumes are an additional health risk. Handle the capillaries with care! Refer to the Safety Instructions, Chapter 2, for the necessary precautions and for correct handling of hazardous substances.

9.2 Filling a Standard Capillary Outside the Capillary Block

The filling procedure is the same for all standard capillaries, independent of the material they are made of (glass or PCTFE). Before you fill a capillary, make sure it is clean and dry. See Chapter 11.6.

TIP Appendix E gives additional hints for filling highly viscous or volatile sample liquids.

1. Take a clean new syringe. Recommended volume: 1 mL or 2 mL

NOTICE

Do not use syringes that contain lubricants or rubber sealings. These materials can dissolve into your sample and lead to a systematic measurement error.

2. Take the capillary and put a Filling Adapter Luer Female on its top end (near the twist protection). Press the adapter onto the capillary and turn the capillary till the adapter clicks into place.



Fig. 9 - 1 Mounting the Filling Adapter Luer Female on a glass capillary

- 3. Hold the free end of the capillary upwards and place the funnel (part of standard supply) or the ball dispenser on top of the capillary.
- 4. Take the clean ball with the plastic tweezers and drop it into the funnel. Do not touch the ball with bare fingers.
- 5. If using the ball dispenser, press the release button once to drop a ball into the capillary.





Fig. 9 - 2 Inserting a ball with tweezers and funnel (A) or ball dispenser (B)

TIP If using a factory adjustment ball (see Chapter 8.4), tip it directly from its container into the funnel.

6. Put a Filling and Cleaning Adapter Luer Male onto the free capillary end. Proceed as described for the first adapter. The ball can no longer drop from the capillary now.

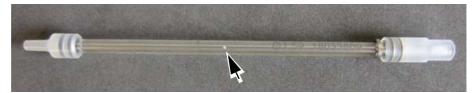


Fig. 9 - 3 Empty capillary with two adapters and ball (see arrow)

There are two possibilities how to fill the capillary: Either you draw in sample with the syringe directly from a vessel or you fill the syringe first and then fill the capillary from below, pressing the sample upwards. Consider that the latter method involves sample flowing out at the capillary end.

Drawing in sample from a vessel

- Plug the tip of the syringe firmly into the Filling Adapter Luer Female.
- 2. Plunge the inlet of the Filling And Cleaning Adapter Luer Male directly into the sample liquid.
 - Alternatively, you can fix a hollow needle to this adapter. This way you can fill samples directly from sealed vessels (by piercing the cover) or from narrow vials.
- Place the inlet or the needle well below the liquid's surface in order to avoid drawing in too many air bubbles. Slowly draw in sample by moving the plunger upwards.

Draw in sample until the liquid reaches the syringe and no air bubbles are inside the capillary.



Fig. 9 - 4 Drawing in sample from a vessel

4. Leave the syringe on the adapter and remove the capillary from the liquid. Turn the capillary upside down. Closely check the entire capillary for air bubbles.

Filling the capillary from the syringe

- Fill the syringe with sample. Wipe the tip of the syringe with a soft tissue to remove sample residues.
- 2. Plug the tip of the syringe firmly into the Filling Adapter Luer Female.
- Turn the capillary upside down so that the syringe is below it and fill it from bottom to top. Slowly fill the sample by pushing the plunger upwards.

Fill sample until the liquid reaches the tip of the Filling And Cleaning Adapter Luer Male and any air bubbles have left the capillary.



Fig. 9 - 5 Filling the capillary from below

Checking for air bubbles

No matter how you fill the capillary, always check it for air bubbles.

- 1. Hold the capillary upside down (syringe beneath the capillary).
- 2. Turn the capillary by 360° around its longitudinal axis and look it closely up and down. Tilt it a bit if necessary.
- If detecting a bubble, wait till it rises to the top (lightly knock a finger against the capillary wall if a bubble gets attached) and push the plunger upwards a bit to remove it.
- 4. In case an air bubble is attached to the ball, also loosen it by lightly knocking against the capillary wall. If the bubble is below the ball, turn the capillary around and let the bubble rise towards the Filling Adapter Luer Female. Wait long enough for the bubble to leave the capillary.



Fig. 9 - 6 Removing air bubbles by knocking with a finger

Closing the capillary

- Hold the capillary upside down (syringe beneath the capillary). Remove the Filling And Cleaning Adapter Luer Male (plus hollow needle if applicable).
- Select a suitable clean plug for the capillary and close it. Press the plug firmly into the capillary. Make sure not to insert air bubbles with the plug (tilt the plug slightly when first inserting it). Turn the plug to insert it deeper into the capillary.



Fig. 9 - 7 Inserting the plug

- 3. Turn the capillary (twist protection up) and remove the syringe from the adapter.
- 4. Firmly press a Luer plug (with or without bore) into the Filling Adapter's opening.



Fig. 9 - 8 Fastening the Luer plug

The capillary should now be filled air-bubble free and closed tightly. Carefully check it for air bubbles again – they possibly stick to the ball or the tip of the plug. Check that the ball rolls freely in both directions. Air bubbles will slow down the ball and cause faulty measurement results.



Fig. 9 - 9 Filled Capillary with ball (see arrow)

TIP Note down the serial number of the capillary. You need it when starting an adjustment or measurement.

9.3 Filling a Short Capillary

You can fill short capillaries outside the capillary block only. The filling procedure is the same for all short capillaries, independent of the material they are made of (glass or PCTFE). Before you fill a capillary, make sure it is clean and dry. See Chapter 11.6.

TIP Appendix E gives additional hints for filling highly viscous or volatile sample liquids.

Syringes and hollow needles are supplied with the low volume filling sets. Select a suitable syringe and needle diameter depending on the sample viscosity and volume.

- · Plastic syringes are disposable items.
- For precise dosage and minimum loss of sample volume use the microliter glass syringe and the hollow needle 0.7 (gauge 22).
- Pull the plunger of the micro-liter syringe only as far out as the µL-scale.

TIP The supplied hollow plugs for closing short capillaries are factory-cleaned before delivery, but there may still be particles inside that would influence the measurement.

To remove particles, hollow plugs should always be cleaned with a suitable cleaning liquid before using them for the first time (see Chapter 11.1 and p. 114).

1. Take a clean syringe and a clean hollow needle.

Low viscous samples:

Use a microliter glass syringe and a hollow needle 0.7 (gauge 22) with Luer fitting. Fix the hollow needle to the syringe tip.

Highly viscous samples: Use a 1 mL plastic syringe and a hollow needle 1.2 (gauge 18) with Luer fitting.

NOTICE

Do not use syringes that contain lubricants or rubber sealings. These materials can dissolve into your sample and lead to a systematic measurement error.

- TIP Clean the micro-liter glass syringe with a suitable cleaning liquid for your sample before using it for the first time. See Chapter 11.1 and Chapter 11.3. If the glass syringe is not dry after cleaning it, remove traces of the cleaning liquid by drawing in approx. 10 µL of sample and ejecting it into the waste vessel.
 - 2. Take the capillary.
 - If using a glass capillary, put a Filling Adapter Luer Female on its top end (near the twist protection). Press the adapter onto the capillary and turn the capillary till the adapter clicks into place.



Fig. 9 - 10 Mounting the Filling Adapter Luer Female on a glass capillary

This adapter is required to have a hold on the capillary when inserting it into or removing it from the capillary block.

 If using a PCTFE capillary with integrated adapter, you can proceed directly to filling it.



Fig. 9 - 11 Short PCTFE capillary with integrated adapter

3. Fill the syringe with sample.

· Low viscous samples:

Slowly draw in the sample through the hollow needle.

Highly viscous samples:

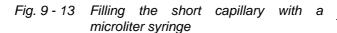
Proceed slowly in order not to generate air bubbles. Draw the sample into the syringe without attaching a hollow needle (the narrow channel might also generate air bubbles). Try to remove air bubbles from the syringe (turning it upside down). Wipe the tip of the syringe with tissue paper to remove sample residues.

Fix the hollow needle and remove the air from it. See also Appendix E.1.



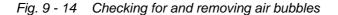
Fig. 9 - 12 Filling a microliter syringe with sample

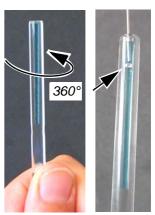
- 4. Hold the open end of the capillary upwards.
- 5. Insert the hollow needle into the capillary as far as possible. It should touch the closed end.
- 6. Slowly fill the sample by pushing the plunger downwards.
- 7. While the liquid rises, draw the hollow needle upwards. Make sure it remains below the liquid level and below any air bubbles.
- 8. Fill sample until the liquid reaches the tip of the capillary.





- 9. Check the entire filling. The capillary must be filled without any bubbles or particles.
 - Turn the capillary by 360° around its longitudinal axis and look it closely up and down. Tilt it a bit if necessary.
 - If detecting a bubble (see arrow), wait till it rises to the top or remove it with the hollow needle.





· Highly viscous substances:

Place the capillary into a stable, high vessel and wait till air bubbles rise to the top and leave the capillary. Depending on the viscosity this may take up to 15 minutes or more. If required, fill some more sample and wait again until there are no bubbles left. See also Appendix E.1.

- 10. Place a clean ball in the capillary. Do not touch the ball with bare fingers.
 - Possibility A: Place the funnel (part of the standard supply) on top of the capillary and drop the ball into the funnel. If using the ball dispenser, press the release button once to drop a ball into the funnel.
 - Possibility B: Use the plastic tweezers to place the ball directly in the capillary.

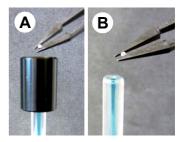


Fig. 9 - 15 Inserting a ball with funnel (A) or directly (B)

TIP If using a factory adjustment ball (see Chapter 8.4), tip it directly from its container into the funnel.

If the sample has got a high surface tension the ball may rest on the liquid surface.

- Knock the funnel with your finger to make the ball drop into the sample.
- Slowly remove the funnel in case the ball sticks to it.
- If not using the funnel, push the ball into the capillary with the tip of the hollow needle.



Fig. 9 - 16 Pushing the ball into the capillary

- If small air bubbles are attached to the ball remove them with the hollow needle.
- 11. Check the filling again. The capillary must be filled without any bubbles or particles.

12. Select a suitable clean hollow plug for the capillary and close it. Press the hollow plug firmly into the capillary. Make sure not to insert air bubbles with the plug (tilt the plug slightly when first inserting it).

Turn the hollow plug to insert it deeper into the capillary. If necessary, remove a little sample with the hollow needle to insert the plug properly.

The sample liquid should rise into the hollow plug, but a small air reservoir inside the plug is necessary for pressure equilibrium. See Fig. 9 - 18.





13. Wipe the capillary and plug on the outside to remove surplus sample. Clean the funnel (see Chapter 11.3).

The capillary should now be filled air bubble free and closed tightly. Carefully check it for air bubbles again – they possibly stick to the ball or the plug. Check that the ball rolls freely in both directions. Air bubbles will slow down the ball and cause faulty measurement results.



Fig. 9 - 18 Filled short capillary with ball (see arrow) and hollow plug

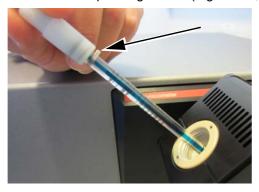
TIP Note down the serial number of the capillary. You need it when starting an adjustment or measurement.

9.4 Inserting a Filled Capillary

The procedure is the same for all capillaries filled outside the block, independent of the material they are made of (glass or PCTFE) and independent of the type of twist protection (metal, PEEK clip or integrated PCTFE).

- 1. The Lovis capillary block should be in the manual-filling position (-45°). See Chapter 7.1.2.
- 2. Screw the Screw Cap Back Side Closed (Fig. 9 21, 1) into the back end of the Lovis capillary block.
- **TIP** If the capillary has got a PEEK twist protection, make sure the twist protection clip is placed correctly on the flat groove of the capillary.

3. Insert the filled capillary into the Lovis capillary block from the front end. The twist protection (Fig. 9 - 19, arrow) should point upwards. Fit it into the corresponding recess (Fig. 9 - 20, arrow) by slightly rotating the capillary.



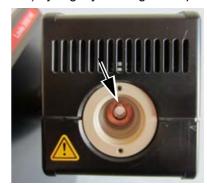


Fig. 9 - 19 Capillary twist protection

Fig. 9 - 20 Recess for twist protection

Due to the twist protection the capillary cannot turn sideways. The capillary is not held in place by any O-rings, it sits loosely inside the Lovis capillary block.

NOTICE

- If the twist protection is not properly fitted into its recess, a glass capillary may possibly break when fastening the Screw Cap Front Side Closed.
 Make sure the capillary is properly placed inside the Lovis capillary block.
- The capillary is fixed inside the capillary block by the Screw Cap Front Side Closed. It will fall out if turning the block and this cap is not mounted.
- 4. Mount the Screw Cap Front Side Closed (2) on the Lovis capillary block.

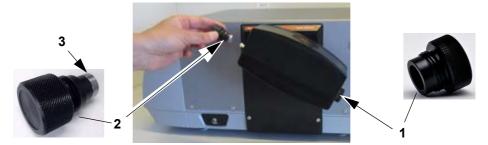


Fig. 9 - 21 Mounting the screw caps closed

- 1 ... Screw Cap Back Side Closed
- 2 ... Screw Cap Front Side Closed
- 3 ... Metal ring of Screw Cap Front Side Closed

The Lovis 2000 M/ME is now ready for measurement.

9.5 Mounting a Capillary for Flow-Through Filling

This chapter describes how to assemble the capillary for flow-through filling. The procedure is the same for all standard capillaries, independent of the material they are made of (glass or PCTFE) and independent of the type of twist protection (metal, PEEK clip or integrated PCTFE).

The required flow-through system consists of the capillary with the ball, two UNF adapters for connecting hoses and two open screw caps.

Preparing and inserting the capillary

Select a capillary (see Chapter 9.1). Make sure it is clean and dry. See Chapter 11.6.

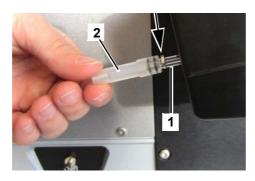
- 1. The Lovis capillary block should be in the Flow-through filling position (+20°). See Chapter 7.1.2. In this position the front end is lower than its rear end.
- 2. Take the capillary and the Filling Adapter UNF. Plug the Filling Adapter UNF onto the end with the twist protection. Press the adapter onto the capillary and turn the capillary till the adapter clicks into place



Fig. 9 - 22 Mounting the Filling Adapter UNF on the front side of a glass capillary

- **TIP** Note down the serial number of the capillary. You will need it later when entering the capillary data in the instrument's "Capillary Administration".
 - 3. Hold the free end of the capillary upwards and place the funnel (part of standard delivery) on top of the capillary. Take a ball with the plastic tweezers and drop it into the funnel.
 - Alternatively, place the ball dispenser on top of the capillary. Press the release button once to drop a ball into the capillary. See Fig. 9 2, p. 85.
- **TIP** If having ordered a factory adjustment, tip the adjustment ball directly from its container into the funnel.
 - If the capillary has got a PEEK twist protection, make sure the twist protection clip is placed correctly on the flat groove of the capillary.

4. Insert the empty capillary plus the ball (1) into the Lovis capillary block from the front end. The twist protection (Fig. 9 - 23, arrow) should point upwards. Fit it into the corresponding recess (Fig. 9 - 24, arrow) by slightly rotating the capillary. Hold the capillary by the Filling Adapter UNF (2) on the front side.



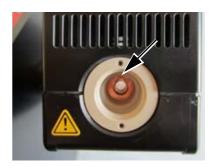


Fig. 9 - 23 Capillary twist protection

Fig. 9 - 24 Recess for twist protect.

NOTICE

If the twist protection is not properly fitted into its recess in the block, the capillary may be damaged. Make sure the capillary is properly inserted into the Lovis capillary block. Keep holding the capillary until it is fixed with the Screw Cap Front Side - Open, or it will fall out of the capillary block and break if made of glass!

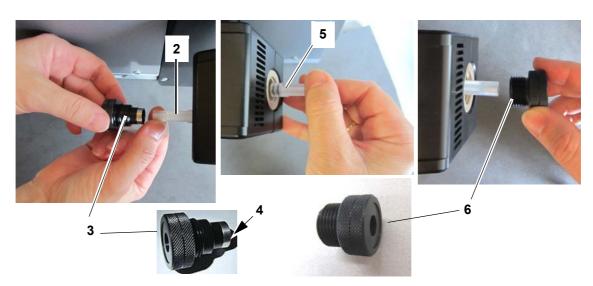


Fig. 9 - 25 Installing the flow-through system

- 1 ... Capillary plus ball
- 2 ... Filling Adapter UNF on the front side
- 3 ... Screw Cap Front Side Open
- 4 ... Metal ring of Screw Cap Front Side Open
- 5 ... Filling Adapter UNF on the back side
- 6 ... Screw Cap Back Side Open
- 5. Mount the Screw Cap Front Side Open (3) on the Lovis capillary block.
- 6. Plug a second Filling Adapter UNF (5) onto the back end of the capillary.

7. Fasten the Screw Cap Back Side - Open (6) on the back side of the Lovis capillary block. Tighten both screw caps with your fingers.





Fig. 9 - 26 Flow-through system ready for hose connection, front and back side

8. Next, connect the hoses. For filling with a syringe, see Chapter 9.6. For filling with an Xsample sample changer or for combinations with other measuring modules, see SECTION II of the Lovis 2000 Reference Manual.

9.6 Hose Connections Flow-through Filling

This chapter separately describes how to connect the different hoses:

- Lovis 2000 M Filling Support to Lovis capillary block (p. 96)
- Lovis 2000 ME + DMA M/DSA M Cell outlet to Lovis capillary block (p. 97)
- Lovis 2000 M/ME Lovis capillary block to waste bottle (p. 99)

Lovis 2000 M - Filling Support to Lovis capillary block

- Take an Adapter Luer 1/4" UNF (1 Mat. No. 64792, part of the Accessory Kit Basic) and fasten it to the upper side of the Filling Support (2). Tighten it with a 8 mm wrench (part of the Accessory Kit - Basic) to avoid accidental loosening.
- 2. Take the hose 350x3x2 FEP (3). Fasten one end to the Filling Support (2) from below. Bend the hose into a loop:

TIP Avoid sharp bends or kinks!

- Take the free end of the hose and bend it sideways towards the capillary block. Guide it counter-clockwise into a wide loop.
- Fasten the free end to the Filling Adapter UNF (4) which projects from the Lovis capillary block.
- 1 ... Adapter Luer 1/4" UNF
- 2 ... Filling Support
- 3 ... Hose 350x3x2 FEP
- 4 ... Filling Adapter UNF (on front side)

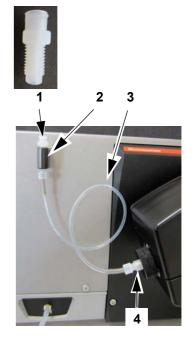


Fig. 9 - 27 Lovis 2000 M flow-through filling – Hose 350x3x2 FEP

Lovis 2000 ME + DMA M/DSA M - Cell outlet to Lovis capillary block

1. Mount an Injection Adapter UNF 1/4" DMA or DSA (Fig. 9 - 29: 1a) to the outlet of the DMA M/DSA M. Refer to the DMA M/DSA M instruction manual for the correct procedure.

TIP If your DMA M/DSA M has also got a Filling Support, you can fill the system with a syringe in vertical position. Connect the hoses as follows:

- Fasten an Adapter Luer 1/4" UNF (1 Mat. No. 64792, part of the Accessory Kit Basic) and fasten it to the upper side of the Filling Support (2). Tighten it with a 8 mm wrench (part of the Accessory Kit Basic) to avoid accidental loosening.
- Fasten an Injection Adapter UNF 1/4" DMA or DSA to the DMA M/DSA M cell inlet (8) instead of the Injection Adapter Luer (see the respective instruction manual).

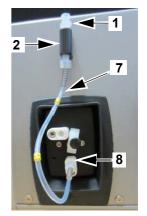


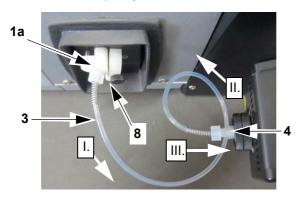
Fig. 9 - 28 Hose for Filling Support - DSA 5000 M

• Select a connection hose (7):

DMA M	DSA 5000 M
Hose 120x3x2 PTFE – Mat. No. 90305, supplied with the Filling support (Mat. No. 106019 or 106021)	Hose 220x3x2 FEP "CC" – Mat. No. 25540 (part of the Lovis Accessory Kit - Complete)

• Fasten one end of the hose (7) to the Filling Support from below and fasten the other end to the Injection Adapter UNF 1/4".

- 2. Take the hose 350x3x2 FEP (3). Fasten one end to the Injection Adapter UNF 1/4" DMA/DSA of the DMA M/DSA M (1a). To avoid that this hose gets entangled with the syringe, bend it into a loop:
 - Take the free end of the hose and bend it sideways towards the capillary block. Guide it counter-clockwise into a wide loop (steps I. to III.).
 - Fasten the free end to the Filling Adapter UNF (4) which projects from the Lovis capillary block.



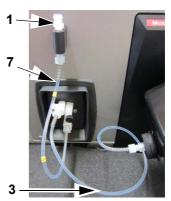


Fig. 9 - 29 Hose DSA 5000 M to capillary block without / with Filling Support

Fig. 9 - 28 and Fig. 9 - 29 show the hose connections for a DSA 5000 M. Connect and bend the hoses (3, 7) in the same way for a DMA M.

- 1 ... Adapter Luer 1/4" UNF
- 1a ...Injection Adapter UNF 1/4" DMA or DSA
- 2 ... Filling Support
- 3 ... Hose 350x3x2 FEP
- 4 ... Filling Adapter UNF (on front side)
- 5 ... Filling Adapter UNF (on back side)
- 6 ... Waste hose 530x3x2 FEP
- 7 ... Optional connection hose:
 - Filling Support DMA M/DSA M inlet
- 8 ... DMA M/DSA M inlet
- TIP Fasten the Adapter Luer 1/4" UNF and the hose properly inside the Filling Support to make sure the connection is leak tight. The end of the hose must press against the adapter (see arrows). There is no additional sealing inside the Filling Support.

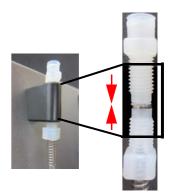


Fig. 9 - 30 Connection inside the Filling Support

Lovis 2000 M/ME - Lovis capillary block to waste bottle

The hose 530x3x2 FEP serves as connection to the waste bottle.



CAUTION

A light-weight waste vessel (like the plastic vessel of the standard delivery) will move around at the end of the waste hose when the Lovis capillary block turns. It could easily tilt and waste liquid would spill out.

Use the waste bottle glass 1 L which is massive enough to prevent undesirable movement and comes with a break protection.

3. Fasten one end of the waste hose (6) to the Filling Adapter UNF (5) on the back side of the Lovis capillary block.

Fasten the other end to the screw cap (9) of the waste bottle (10).

- 5 ... Filling Adapter UNF (on back side)
- 6 ... Waste hose 530x3x2 FEP
- 9 ... Screw cap of waste bottle
- 10 ... Waste bottle

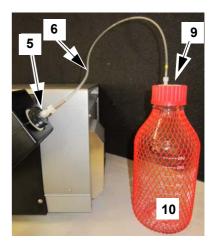


Fig. 9 - 31 Hose Lovis capillary block to waste bottle

- 4. Make sure all hose connectors are properly tightened (finger tight).
 - Switch off the instrument and slowly turn the capillary block from -90° to +90° angle by hand.
 - · Check that the hoses do not get entangled or sharply bent.
 - Check that the hose connectors (especially the one at the DMA M/DSA M outlet) do not become loose.

The assembly is now ready for filling (see Chapter 9.7).

9.7 Filling the Flow-Through Assembly Manually with a Syringe

This chapter describes how to fill a Lovis flow-through system with a syringe. It applies to

- Lovis 2000 M
- Lovis 2000 ME in combination with DMA M/DSA M.

For filling with an Xsample sample changer or for combinations with other measuring modules, see Lovis 2000 Reference Manual, SECTION II: Flow-Through Systems.

TIP Make sure all parameters have been set according to your requirements before you fill the capillary (see Chapter 10.1).

Once filled, measurement should be started immediately, otherwise the ball will roll back to the lower end (see "Explanation", p. 101)!

NOTICE

Do not use syringes that contain lubricants or rubber sealings. These materials can dissolve into your sample and lead to a systematic measurement error.

- Take a clean syringe (filling volume 10 or 20 mL) and draw in sample liquid.
 Proceed slowly and continuously to avoid the formation of air bubbles. Turn
 the syringe upside down and remove remaining air bubbles by pressing the
 plunger upwards a bit (until a drop of liquid emerges from the tip).
- 2. Connect the syringe to the instrument.

Lovis 2000 M

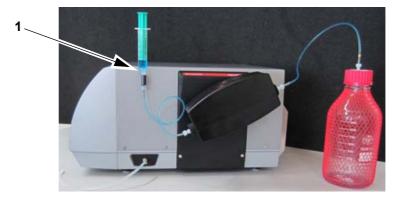
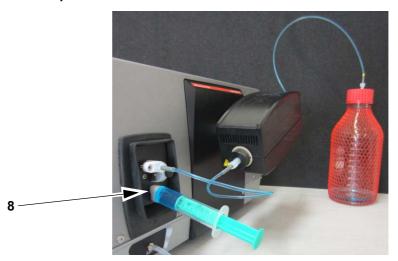


Fig. 9 - 32 Lovis 2000 M - Flow-through filling with a syringe

Plug the syringe firmly into the Adapter Luer (1) in the Filling Support.



Lovis 2000 ME plus DMA M/DSA M

Fig. 9 - 33 Lovis 2000 ME with DMA M – Flow-through filling with a syringe

Plug the syringe firmly into the Injection adapter Luer of the DMA M/DSA M (8; see also Fig. 9 - 29).

If using a Filling Support, plug the syringe firmly into the fixed Adapter Luer (1 – see Fig. 9 - 28 and Fig. 9 - 29).

Filling

- Push the plunger of the syringe slowly and continuously until liquid flows from the end of the waste hose into the waste bottle. If using a DMA or DSA 5000 M, the filling of the density measuring cell can be observed via U-ViewTM (refer to the corresponding instruction manual).
- 4. Start a measurement as soon as the measuring assembly is correctly filled!

Explanation: If waiting to start measurement for longer than approx. 10 s with the Lovis capillary block in the Flow-through filling position, the ball will roll to the front end of the capillary. Depending on the sample's viscosity the ball might possibly not roll to the back end (starting position for correct ball detection) fast enough, when the measurement is finally started. In that case the ball could not be detected.

5. Leave the syringe in the filling position during the measurement.

NOTICE

The waste hose is usually higher than the DMA M/DSA M inlet or the Filling Support. The pressure of the liquid column in the hose will cause the liquid to flow out at the DMA M/DSA M inlet or at the Filling Support as soon as the syringe is disconnected. Draw the sample liquid from the system back into the syringe before removing the syringe!

10 Performing a Measurement

This chapter describes all necessary steps to obtain valid measurement results.

Before starting a measurement a filled capillary must be placed inside the Lovis capillary block and all parameters should be set according to your requirements.

10.1 Preparing a Measurement

Select a capillary/ball configuration

Capillary/ball configurations can be defined by an administrator or manager user (see Chapter 7.1.1). Persons with operator rights do not have access to the Measuring System Settings!

Any user can select a capillary/ball configuration from the existing list when starting measurement. See Chapter 10.2.

Select a method

Any user can select an existing method (see Chapter 7.2) for measurement.

- 1. Tap "Method". Select a measuring method from the list on the screen.
- 2. Tap on the selected method and confirm with "OK".
- 3. The instrument returns to the main screen and shows the display layout assigned to the selected method.

Enter the quick settings values

The values of all parameters stored in the quick settings of a method can be changed by any operator.

If a sample list has been defined, the Quick Settings button is replaced by the <Sample List> button.

- 1. Tap "Quick Settings".
- 2. Tap on a parameter to highlight it. Tap on the field in the "Parameter Select" column to alter the value or to select a different input from the drop-down list.
- 3. Enter a value or make a selection and tap <OK>.
- 4. Perform these steps for each quick settings parameter.
- 5. Tap <OK>.

The quick settings parameters set by default are:

- Sample name
- Measurement Mode (see Chapter 7.2.3)
- Lovis Density (for manual density input)
- Lovis Density TS/TTS
 (for manual density input for Temperature/Temperature Table Scans)
- Lovis Capillary

Mandatory input parameters are marked as: •

Once the user has altered the value of a quick settings parameter (the value differs from the one preset for this method), it is marked with a: *

- **TIP** If using the density values of a DMA M/DSA M you need not enter any density values.
 - You can also enter the density value(s) as "Formula Parameters" in the "Method Settings". See Chapter 7.2.4.

Manual density input for Temperature/Temperature Table Scans

Use field "Lovis Density TS/TTS" to enter two reference density values at two different temperatures. These values serve to calculate the density values for a Temperature/Temperature Table Scan which is performed by the Lovis.

Special notes for Temperature Scans with water

- Due to the anomaly of water, the density values of water show non-linear behavior.
- If measuring dynamic viscosity, the deviation of the density values does not significantly influence the viscosity values (a deviation of up to 0.05 g/cm³ is acceptable).
- If measuring kinematic viscosity, the density deviation should be no more than 0.001 g/cm³. In this case use the density calculation only over limited temperature ranges. The linear density calculation fits best if the reference temperatures are no more than 20 °C apart. To cover a wide range, perform several Temperature Scans, each over a 20 °C range.

Before starting a measurement, check whether:

- the hoses are connected correctly (if applicable)
- the hose connections are tight (if applicable)
- the waste hose leads into the waste container (if applicable)
- the waste container is not full (if applicable)
- the correct sample names are entered
- the method settings are set correctly
- · suitable cleaning liquids are available.

Fill the capillary or the measuring assembly (see Chapter 9).

10.2 Start Measuring

- 1. Tap <Start>.
 - The instrument displays all available capillary/ball configurations and prompts you to select the one actually used.
 - If the automatic capillary detection (see Chapter 7.1.2) is deactivated, no message or prompt is displayed.
 - In case only one capillary/ball configuration is stored in the instrument, it automatically uses this one; no message or prompt is displayed.
 - In case you have not entered mandatory parameters (e.g. Lovis density or sample name) the instrument prompts you to do so.
- 2. The instrument starts measuring. Wait till the measurement is finished.



Fig. 10 - 1 Method Lovis /DMA – Example: Measurement in progress

TIP Depending on the Value Visibility settings (see Appendix C, System Security), Lovis 2000 M/ME may show no measuring values or only temperature values.

- A red bar (1) shows the progress.
- A message gives the sample name (2) and the measurement status (3): "Sample name: Measuring". If no sample name has been entered, the message gives just the measurement status (3): "Measuring".
- Depending on the selected method different data fields are displayed.
- Available definite values (4) are displayed black.
- · Precalculated values (5) are gray.
- Black dashes (6) the instrument waits for a value or there is no value available for this quantity (e.g. when doing Multi Concentration measurements for polymer solutions, see Fig. 7 6, p. 58).



3. At the end of measurement an acoustic signal is given.

Fig. 10 - 2 Method Lovis detailed – Example: Measurement finished

- The progress bar (1) turns green.
- The message gives the sample name (2) and the measurement status (3): "Sample name: Finished". If no sample name has been entered, the message gives just the measurement status (3): "Finished".
- The measuring values are displayed.
- The "Lovis Condition" output field shows the message "valid".
- The quick access button to the diagnosis list (8) shows a green check for correct measurement.
- The result values are frozen.
 The display can be unfrozen by tapping the button.
- The result values are saved in the data memory. Tap the button <Measured Data> to view, print or export the data.
- TIP If the Non Storage Mode is active, results are not saved. In order to print or export data (in PDF format) in the Non Storage Mode, activate "Automatic Printout" (Menu > Setup > Printout Settings). See General Software Functions Instruction Manual for detailed information.
 - 4. Measure the next sample or clean and dry the capillary and the density measuring cell if applicable.

Related topics

Safety Instructions: Chapter 2

Density Values for Viscosity Calculation: Chapter 3.1.2

Measuring System Settings: Chapter 7.1

Lovis Measuring Methods Settings: Chapter 7.2

Filling the Lovis 2000 M/ME: Chapter 9

Cleaning and Storing the Instrument: Chapter 11

10.3 Filling and Measurement Errors

10.3.1 Status Messages

Lovis condition

The "Lovis Condition" output field gives information on the current status of measurement or instrument and may show the following messages:

temp. equilibration	Appears during temperature equilibration. In this stage no precalculated result can be determined by the instrument.
moving / inclining / turning back /starting	Appears when the Lovis capillary block moves during measurement or waits for a run of the ball to start.
Coil x forward/ backward passed	Appears when the ball has passed the indicated coil (1 / 2 / 3) in the specified direction.
homing	Appears when the Lovis capillary block moves to the initial position (manual filling or flow-through) at the end of measurement.
valid	Appears when the measuring temperature has been reached and the measurement has been taken.

Sample status icons

In the first column of the sample list, you find an icon for each sample that has already been measured. The icon indicates the status of the sample:

	The sample was successfully measured.	
!	Reduced precision due to e.g. exceeding the set variation coefficient, FW/BW-deviation, short runtime or a filling error.	
1	No result due to a malfunction (e.g. no ball detected).	
×	The measurement was aborted.	

10.4 Measurement Results - Graph View

TIP The graph view is not available if the Non Storage Mode is active.

All measurement results are stored in the instrument's data memory. How to filter, view or export them is described in the General Software Functions Instruction Manual. A functions that is specific for Lovis 2000 M/ME is the result graph. The results of the following test modes (scans) can be shown on the display as graph:

- Temperature Scan (TS)
- Temperature Table Scan (TTS)
- Fixed Angle Scan (FAS)
- Time Scan (TiS)
- Zero Shear Scan (ZSS)

- 1. Tap <Menu> and select "Data Memory > Measured Data" to open the multiple sample view.
- 2. In the multiple sample view, highlight the row that is assigned to the master data of the scan.

In the parameter field that specifies the used "Mode" a scan's master data are specified by the abbreviation of the mode plus "AVG". For example, the master data row of a temperature scan is listed as "TS AVG".

3. Tap <Details> to view the graph. It is automatically displayed. The quantity for which the scan was performed is assigned to the x-axis (e.g. "temperature" for a TS).



Fig. 10 - 3 Example graph of temperature scan TS - all data

Use the button to see the next result (single sample view – this is the first sub data point of the graph).

4. Tap directly on the graph to view single data points.

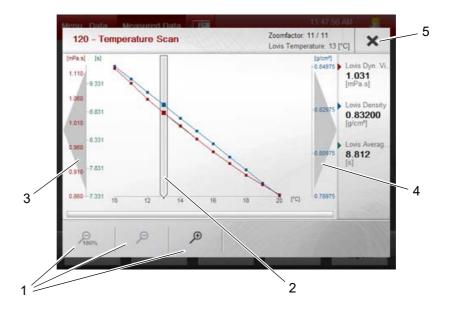


Fig. 10 - 4 Example graph of temperature scan TS – single data points

- 1 ... Zoom in and out of the graph to view data points separately the function of these buttons is important especially if the entire graph contains more data point than can be shown on the screen
- 2 ... Data point bar if the bar rests on a point, the measurement values for this point are displayed on the right of the graph
- 3 ... Move from one data point to the previous within the graph
- 4 ... Move from one data point to the next within the graph
- 5 ... Close the single data point view, return to the view of the entire graph

All single determinations of the test (sub data) can be viewed separately in the single sample view (see General Software Functions Instruction Manual).

11 Cleaning and Storing the Instrument

To assure constant and high accuracy of your measurements, use regular and effective cleaning routines. Store the instrument as described in Chapter 11.8.

Wipe sample spills on the instrument immediately with a soft tissue or dry cloth. Remove sample residues inside the Lovis capillary block or on the screw caps also at once. Clean all these parts as described in Chapter 11.7.

Capillaries should be cleaned and dried immediately after measurement.

TIP If measuring similar, fully miscible samples, one sample can be replaced by the next. This requires more sample liquid, as the first sample batch must be flushed completely from the capillary by the following one. In this case always clean capillaries at the end of a work shift, but at least once every 24 hours.

Capillaries can be cleaned outside the Lovis capillary block or – if applying the flow-through method – assembled inside the Lovis capillary block.

11.1 Selecting Cleaning Liquids

The choice of the cleaning liquid(s) depends on the tested samples. All wetted parts of Lovis 2000 M/ME must be chemically resistant to the cleaning liquid(s). Refer to Appendix B for an overview of concerned parts and materials. Find additional information on their chemical resistance against selected liquids in the Lovis 2000 Reference Manual.



CAUTION

Cleaning liquids may involve health risks. Read Chapter 2.3 for your safety.

A suitable cleaning liquid must completely dissolve and remove the sample. It has to be a good solvent for all sample components. If this first cleaning liquid does not dry up fast and/or without leaving residues, a second cleaning liquid is required.

Cleaning liquid 2 must completely dissolve and remove cleaning liquid 1 and is easily evaporated by a stream of dry air.

- Recommended for aqueous samples and beverages: water (cleaning liquid 1) and ethanol (cleaning liquid 2)
- Recommended for polymer solutions:
 the polymer solvent which is contained in the solution (cleaning liquid 1)
- Recommended for petrochemical samples: solvent naphtha (only one cleaning liquid)

If you are not sure if a cleaning liquid is suitable for your sample, perform a preliminary test in a test vessel to see if any phase separation, precipitate or opalescence can be observed.

11.2 Cleaning Standard Capillaries Outside the Capillary Block / Conditioning

This cleaning method is applicable if:

- cleaning a standard capillary that was filled outside the capillary block.
- conditioning a new capillary or conditioning it after a special cleaning.
- rinsing of flow-through systems does not give satisfactory results.

How to rinse flow-through systems is described in Chapter 11.5.



CAUTION

Risk of burns if the Lovis 2000 M/ME is set to temperatures higher than 60 $^{\circ}$ C. Refer to the Safety Instructions, Chapter 2.

First, remove the capillary form the Lovis capillary block.

Taking apart - Capillary filled outside the Lovis capillary block

- 1. Unscrew the Screw Cap Front Side Closed from the Lovis capillary block.
- 2. Pull out the capillary by the Filling Adapter Luer Female.
- 3. Hold the capillary with the tip upwards and remove the plug from the tip.
- 4. Turn the capillary around and hold it over a waste vessel.
- **TIP** To reuse the ball, carefully empty the sample plus ball into a clean vessel first. To clean the ball, see Chapter 11.4.
 - 5. Remove the Luer plug from the Filling Adapter Luer Female.
 - 6. Plug a syringe filled with air into the Luer opening of the Filling Adapter Luer Female and press down the plunger to remove the sample. Observe all safety instructions applicable to this sample.

Taking the system apart – Flow-through filling method

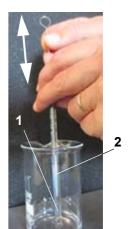
- 1. Make sure any remaining liquid has been evacuated from the system (draw the liquid back into the syringe) and the system has been rinsed (see Chapter 11.5).
- The Lovis capillary block should be in position "Flow-through (hoses connected)" (+20°). See Chapter 7.1.2.
 In this position the front end of the Lovis capillary block is lower than its back end and the ball will not fall out of the capillary when removing it.
- 3. Unscrew both hoses from the capillary directly at the Lovis capillary block.
- 4. Unscrew both screw caps from the Lovis capillary block and remove them.

- 5. Hold the capillary at the Filling Adapter UNF on the front side. Pull the second Filling Adapter UNF off the back side of the capillary.
- Carefully pull the capillary from the Lovis capillary block by the Filling Adapter UNF. Take care that the capillary does not slip out and that the ball does not drop out at the open end.
- 7. Tip the ball into a small vessel. For cleaning the ball, see Chapter 11.4.
- 8. Pull the Filling Adapter UNF off the front side of the capillary.
- 9. Proceed as described below (step 3).

Cleaning the capillary and filling accessories

- 1. Plug a syringe filled with cleaning liquid into the Filling Adapter Luer Female and rinse the capillary. Move the plunger up and down to improve the cleaning effect. Rinse until no traces of sample are left.
- 2. Remove the Filling Adapter Luer Female.
- TIP Do not use the same cleaning equipment (brush, syringe) for different chemicals, e.g. do not use the same brush for water-based and oil-based samples.
 - For hard-to-remove samples, soak all items in some cleaning liquid first. For capillaries with PEEK twist protection, the clip can be removed for cleaning.
 - Rinse the inside of the capillary (1) with some cleaning liquid and brush it with the supplied brush (2). Move the brush repeatedly through the entire capillary (see Fig. 11 5). Rinse the capillary again.
 - 4. Wipe the capillary on the outside with some cleaning liquid and tissue paper.
 - Clean the adapters with some cleaning liquid and cotton buds (Q-tips) and make sure that the inner surfaces are absolutely clean and dry.





- 6. Rinse the brush and wipe it with a lint-free cloth or tissue paper.
- 7. Clean the plug and Luer plug, if required also the funnel or ball dispenser with some cleaning liquid and tissue paper. Wipe them dry.
- **TIP** If cleaning the ball dispenser, do not take it apart! The built-in spring might get lost.
 - How to clean and dry a hollow plug 1.8 (if used with capillary 1.62 PCTFE) see "Cleaning the hollow plug", p. 114.

8. If necessary, repeat these steps with a second cleaning liquid.

TIP If brushing does not yield satisfactory results, perform a special cleaning of the capillary. See Chapter 12.1.

9. Blow the capillary and the adapters dry with clean compressed air or with the built-in air pump (see below instructions).

Using the air pump

 Fix the Filling Adapter Luer Female (1) to the top of the capillary (2). Plug the Adapter Luer cone (3) of the silicone air hose into the adapter's inlet.

Start the pump with the button on the touch screen.

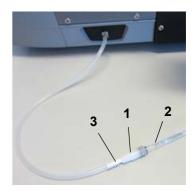


Fig. 11 - 1 Drying a capillary with the air pump

- The drying time depends on the cleaning liquid, on the temperature and on the ambient air humidity. The suitable drying time has to be determined empirically. Tap to switch off the air pump.
- TIP For better drying performance use a drying cartridge (see Lovis 2000 M/ME Reference Manual, Appendix E.3).

11.3 Cleaning Short Capillaries / Conditioning

This cleaning method is applicable if:

- cleaning a short capillary
- · condition a new capillary or conditioning it after a special cleaning



CAUTION

Risk of burns if the Lovis 2000 M/ME is set to temperatures higher than 60 °C. Refer to the Safety Instructions, Chapter 2.

First, remove the capillary form the Lovis capillary block.

Taking apart

- 1. Unscrew the Screw Cap Front Side Closed from the Lovis capillary block.
- 2. Pull out the capillary by the Filling Adapter Luer Female.

3. Hold the capillary with the tip upwards and remove the hollow plug from the tip.

Rinsing the short capillary

- Do not use the same cleaning equipment (brush, syringe, hollow needle) for different chemicals, e.g. do not use the same brush for water-based and oilbased samples.
 - For hard-to-remove samples, soak all items in some cleaning liquid first. For capillaries with PEEK twist protection, the clip can be removed for cleaning.
 - 1. Empty the capillary. Observe all safety instructions applicable to this sample.
 - Low viscous samples:

 Turn the capillary around and hold it over a waste vessel.
 - Highly viscous samples:
 Draw the sample from the capillary with a syringe with a hollow needle. The ball remains inside the capillary and can only be removed later with the cleaning liquid.
- **TIP** To reuse the ball, carefully empty the sample residues plus ball into a clean vessel first. To clean the ball, see Chapter 11.4.
 - Fill a clean syringe with a hollow needle with cleaning liquid. Insert the hollow needle into the capillary as far as possible. Fill the capillary with cleaning liquid. It should not overflow.
 If necessary wait a bit for the cleaning liquid to mix with the sample.
 - Move the plunger up and down rapidly to improve the cleaning effect. Draw the cleaning liquid back into the syringe. Empty the syringe into a waste vessel.
 - 4. Repeat the two above steps two to three times until no traces of sample are left in the capillary. If the ball is still inside, let it roll out into a clean vessel.
 - 5. Fill some cleaning liquid into the capillary with a syringe with a hollow needle.
 - 6. Push a supplied brush as far as possible into the capillary and rotate it. Move it up and down repeatedly.
 - 7. Pull the brush out again and rinse it with cleaning liquid. Rinse the capillary as described above.
 - 8. Wipe the capillary on the outside with some cleaning liquid and tissue paper.
 - 9. Rinse the brush and wipe it with tissue paper.
 - 10. If necessary, repeat the cleaning procedure with a second cleaning liquid.

TIP If brushing with the supplied brush leaves residues inside the dead end of the capillary, perform a special brushing (Chapter 12.2) or perform a special cleaning of the capillary (see Chapter 12.1).

Drying the short capillary

1. Plug a clean hollow needle 1.2 (gauge 18) onto the Adapter Luer cone of the air hose.



Fig. 11 - 2 Fixing a hollow needle to the Adapter Luer cone of the air hose

- 2. Insert the hollow needle into the capillary as far as possible. Blow the capillary dry with the built-in air pump:
 - Start the air pump with the button on the touch screen.



Fig. 11 - 3 Drying a short capillary with the air pump

 The drying time depends on the cleaning liquid, on the temperature and on the ambient air humidity. The suitable drying time has to be determined empirically.

Tap to switch off the air pump.

TIP For drying capillaries always use hollow needles 1.2 (gauge 18).

The wider diameter speeds up the drying. For better drying performance use a drying cartridge (see Lovis 2000 M/ME Reference Manual, Appendix E.3).

Cleaning the hollow plug

- 1. Put the hollow plug into some cleaning liquid.
- 2. Fill a clean syringe with a hollow needle with cleaning liquid. Insert the hollow needle into the plug and rinse the inside of the hollow plug.

Suitable	Hollow Plug	1.59 / 1.8	2.5	
diameters	Hollow Needle	0.7 (gauge 22)	1.2 (gauge 18)	

- 3. If necessary, repeat the above step with a second cleaning liquid.
- 4. Take the hollow plug and wipe it with tissue paper.
- 5. Blow the inside dry using a hollow needle and the built-in air pump (see "Drying the short capillary", p. 114).

Cleaning the microliter glass syringe and hollow needle

Always clean the syringe and needles to avoid contaminating one sample with another one.

TIP Handle the micro-liter syringe with care to avoid damaging this precision tool. Pull the plunger only as far out as the μL-scale. Do not use strongly alkaline cleaning liquids that will corrode the glass.

- 1. Empty the syringe into a waste vessel.
- 2. Draw in some cleaning liquid through the hollow needle and move the plunger up and down repeatedly. If necessary wait a bit for the cleaning liquid to mix with the sample. Empty the syringe into a waste vessel.
- 3. Repeat the above step two to three times until no traces of sample are left. Wipe the hollow needle with tissue paper.
- 4. If necessary, repeat the cleaning procedure with a second cleaning liquid.
- 5. Remove the hollow needle.
- 6. Pull the plunger up a bit and let the syringe air-dry.
- 7. Dry the hollow needle with tissue paper. Blow it dry with the built-in air pump (see "Drying the short capillary", p. 114).

Cleaning the funnel

- 1. Wipe the funnel with some cleaning liquid and tissue paper.
- 2. For hard to remove samples, soak it in some cleaning liquid and brush it. Give it a final rinse and dry it with tissue paper.

11.4 Cleaning Balls

- **TIP** Do not handle balls with bare fingers! Finger prints influence the measurement results. If using the plastic tweezers also clean them to avoid contaminating a clean ball with sample residues.
 - 1. Put the ball into some cleaning liquid.
 - 2. Put the ball onto a piece of tissue paper using the plastic tweezers.
 - Fold a bit of tissue paper over the ball. Wet it with some cleaning liquid. Rub the ball with the tissue paper and one finger.
 Wear protective gloves if required.



Fig. 11 - 4 Rubbing the ball with tissue paper

4. Rinse the ball with some more cleaning liquid and let it dry on tissue paper.

11.5 Manually Cleaning Capillaries with the Flow-Through Method

This is a method for cleaning capillaries filled with the flow-through method (also in combination with DMA M/DSA M). It is not applicable to condition new capillaries. For a more thorough cleaning take the assembly apart and clean all parts separately (see Chapter 11.2 – also for conditioning new capillaries).



CAUTION

Risk of burns if the Lovis 2000 M/ME is set to temperatures higher than 60 °C. Refer to the Safety Instructions, Chapter 2.

NOTICE

Make sure any remaining liquid has been evacuated from the system. Draw the liquid back into the syringe or the pressure from liquid column in the waste hose will lead to sample spilling out of the Filling Support (Lovis 2000 M) or the DMA M/DSA M sample inlet.

- 1. Select a suitable cleaning liquid as explained in Chapter 11.1.
- Fill a new 10 mL or 20 mL syringe with cleaning liquid and connect it to the Adapter Luer in the Filling Support or to the DMA M/DSA M inlet. Press the plunger into the syringe until the cleaning liquid flows into the waste bottle.
- 3. Move the plunger backwards and forwards a few times to intensify the cleaning effect. Empty the syringe completely.

NOTICE

Before disconnecting the syringe, draw the liquid remaining in the system back into the syringe.

- 4. Check the hoses for sample residues. They must be completely clean (no visible traces). If necessary, repeat the above cleaning steps.
- 5. If required, rinse the entire system again with a second cleaning liquid (see Chapter 11.1). Proceed as described above.
- 6. To dry the system, plug the Adapter Luer cone of the air hose into the Adapter Luer in the Filling Support or into the DMA M/DSA M inlet. Switch on the air pump with the button on the touch screen.

7. Select a drying time which is long enough to dry the entire system. The drying time depends on the cleaning liquid, on the temperature and on the ambient air humidity. The suitable drying time has to be determined empirically. Tap to switch off the air pump.

11.6 Capillary Cleaning Check

This chapter describes a simple check which shows whether a capillary is sufficiently clean and dry.

- 1. Fix a Filling Adapter Luer Female or a Filling Adapter UNF to the top end of a standard capillary.
- 2. Put a clean and dry ball into the capillary using the funnel and plastic tweezers or the ball dispenser. This step is the same for standard and short capillaries.
- 3. Close the open end of the capillary:
 - Standard capillary: Use the Filling and Cleaning Adapter Luer Male or another Filling Adapter UNF.
 - · Short capillary: Use a suitable hollow plug.
- 4. Take a 1 mL syringe and place the capillary carefully on the syringe. The ball must start rolling without further help (knocking against the capillary or shaking it). The ball must roll from the top to the bottom without stop. Repeat the test to check that the ball also rolls from the bottom end to the top.



Fig. 11 - 5 Capillary Cleaning Check - Standard Capillary

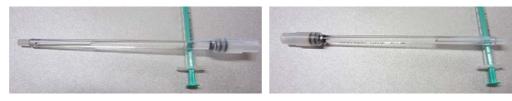


Fig. 11 - 6 Capillary Cleaning Check - Short Capillary, both directions

5. If the ball does not start rolling or stops in-between, please dry the capillary again or repeat the entire cleaning (or conditioning) procedure. If there is still a problem, change also the cleaning liquid or use a second more volatile cleaning liquid and/or a drying cartridge (see Lovis 2000 M/ME Reference Manual, Appendix E.3) for better drying.

11.7 Cleaning Outer Instrument Parts

11.7.1 Housing and Touch Screen

To clean the instrument housing, the outside of the Lovis capillary block or the touch screen, use a soft tissue that can be wetted with ethanol or warm water, if necessary with some mild cleaning agent (pH < 10) added.



WARNING

Ethanol is a highly flammable liquid.

 Make sure that all safety instructions regarding the use of flammable liquids (see Chapter 2) are strictly followed.

NOTICE

Never use:

- highly nonpolar solvents (e.g. toluene, hexane, solvent naphtha)
- strong acids or bases (e.g. nitric acid, sulfuric acid, hydrochloric acid, caustic soda)
- abrasive cleaning agents (containing particles) or strong mechanical action (steel brush).

To replace the protection foil of the display, refer to the Lovis 2000 Reference Manual, Appendix E.4 or to the instruction manual of your DMA M/DSA M.

11.7.2 Capillary Block and Screw Caps

Clean the cover of the Lovis capillary block as the housing (see Chapter 11.7.1).

If there are sample residues inside the Lovis capillary block or on the screw caps, remove them at once.

Clean the inside of the Lovis capillary block and the screw caps with cotton buds. For hard to remove residues use a supplied nylon brush. Select a cleaning liquid that removes the sample and does not attack the material of the parts. Refer to Chapter 11.1 "Selecting Cleaning Liquids" and Appendix B.2 "Parts Possibly in Contact with Sample Liquid".

11.8 Storing the Instrument

Remove the capillary from the Lovis 2000 M/ME. Empty and clean all capillaries. See Chapter 11.2, Chapter 11.3 and Chapter 11.5. Store all capillaries, filling equipment and hoses in the case of the supplied Accessory Kit.

Make sure no sample residues or spills remain on the instrument or inside the Lovis capillary block. Clean these parts as described in Chapter 11.7.

12 Customer Maintenance

To keep your Lovis 2000 M/ME working smoothly and reliably, regularly perform the following checks and maintenance tasks. The required steps depend on the configuration of your measuring instrument.

Filling outside the capillary block - Lovis 2000 M:

What to do:	When:
Visual inspection of capillary and adapters.	Daily; before starting measurements.After changing the capillary.
Special cleaning of the capillary.	 Once a year. If cleaning outside the capillary block does not give satisfactory results. See Chapter 12.1.
Replacing the O-rings of the capillary adapters.	 If the capillary adapters are leaking or do no longer hold tightly on the capillary. If fixing Kalrez[®] O-rings for better chemical resistance. See Chapter 12.5.

Flow-through filling – Lovis 2000 M or Lovis 2000 ME inside DMA M/DSA M:

What to do:	When:		
Visual inspection of capillaries and adapters.	If residues inside the capillary are suspected that cannot be removed by standard flow-through cleaning. See Chapter 11.2 and Chapter 12.1.		
Visual inspection of hoses and hose connections.	Daily; before starting measurements.After changing the capillary.		
Tighten all hose connections.	Monthly.After changing the capillary.		
Leak test of all connected hoses.	 Monthly. After hoses were dis- and reconnected. If leakage is suspected. See Chapter 12.4. 		
Special cleaning of the capillary.	 Once a year. If standard cleaning outside the capillary block does not give satisfactory results. See Chapter 12.1. 		
Regularly perform all maintenance steps according to the schedule given for DMA M/DSA M, if any.	Consult the instruction manual of your DMA M/ DSA M model.		
Replacing the O-rings of the capillary adapters.	 If the capillary adapters are leaking or do no longer hold tightly on the capillary. If fixing Kalrez[®] O-rings for better chemical resistance. See Chapter 12.5. 		

12.1 Special Cleaning of Capillaries

Besides cleaning the capillary after each measurement or measurement cycle, a special cleaning should be performed regularly – at least once a year. The special cleaning procedure removes deposits, which have built up over time. For glass, use e.g. hydrochloric acid 15 % or a suitable commercially available glassware cleaner. For PCTFE, use a solvent suitable for your application and for PCTFE (refer to Appendix B.5 of the Lovis 2000 Reference Manual).

Take care when using strong alkaline cleaning agents as they damage the glass. Changes of the inner surface will influence the capillary adjustment. If you really need to use a strong (alkaline) cleaning agent, verify the capillary adjustment with a substance of known viscosity before starting your next measurements.



CAUTION

Aggressive cleaning agents are a potential risk of injury. Skin contact may cause injury to bare hands. Splashes may cause injuries to the eyes.

To avoid hurts, use appropriate means of personal protection like safety goggles, gloves and apron.

Prepare, use and dispose of the cleaners as indicated by the manufacturer. Follow all safety instructions given in the safety data sheet of the product.

Cleaning procedure

- Place the capillary into the cleaning liquid to soak it. For capillaries with PEEK twist protection remove this clip. The duration depends on the cleaning liquid, the cleaning temperature and on the deposits on the capillary. Brush the capillary with the supplied brush to achieve a better cleaning of the inside of the capillary. For short capillaries perform an additional special brushing (see Chapter 12.2).
- 2. Rinse the capillary efficiently. Either use deionized water (especially for glass capillaries) or a suitable solvent, depending on the used cleaning agent. Then rinse with a volatile solvent for quick drying. Dry the capillary by blowing through with clean compressed air or with the built-in air pump.
- 3. After using a cleaning agent other than your usual cleaning liquid, brush and rinse the capillary with a cleaning liquid suitable for your application to condition the inner surface (see Chapter 11.2 or Chapter 11.3). This yields better measurement results due to better wetting of the inner surface.
- **TIP** Instead of manual cleaning and brushing you can use an ultrasonic bath. Make sure the cleaning agent is suitable for use in an ultrasonic bath.

Examples for commercially available cleaning agents

 Neodisher® cleaning agents. E.g. type LM3 is recommended from Schott also for viscometer cleaning. See the Duran-Group web site for further suitable cleaners.

- Chromium-free cleaning agents like Nochromix[®]. This is a substitute for chromic acid. See the Godax web site.
- Deconex[®] lab glass cleaners. For a suitable cleaner see the Borer web site.

12.2 Special Brushing of Short Capillaries

The brushes supplied with the Lovis 2000 M/ME serve to clean the inner walls of a short capillary but have no effect on the dead end (no bristles on the wire tip).

Remove sample residues inside the dead end of a short capillary as follows:

1. Take a commercial interdental brush and insert it (wire end first) into the tip of a hollow needle 1.2.

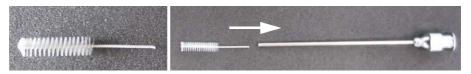


Fig. 12 - 1 Interdental brush / inserting it into the hollow needle 1.2

2. Push the brush into the hollow needle 1.2 until it is no longer visible. (You can use the hollow needle 0.7).



Fig. 12 - 2 Pushing the interdental brush into the hollow needle 1.2

- 3. Fill some cleaning liquid into the short capillary.
- 4. Insert the hollow needle 1.2 containing the brush into the short capillary as far as possible.
- 5. Insert a hollow needle 0.7 into the Luer end of the hollow needle 1.2 and push the brush out of the needle for about 4 mm.

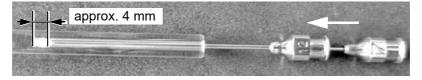


Fig. 12 - 3 Pushing the interdental brush into the dead end of the capillary

6. Remove the hollow needle 0.7.

Now the bristles of the interdental brush are bent into the dead end of the capillary.

- 7. Clean the dead end. Turn the hollow needle 1.2 with the brush around inside the capillary, move it up and down a bit.
- 8. Remove the hollow needle 1.2 (plus brush) from the short capillary.

- 9. Rinse the capillary with fresh cleaning liquid. If necessary repeat the procedure until all sample residues in the dead end are removed.
- 10. Dry the capillary as described in Chapter 11.3, "Drying the short capillary", p. 114.

12.3 Inspection of Hoses and Hose Connectors

To meet safety requirements and for proper function of the system, a regular inspection is required.

- 1. Check all hoses and hose connectors of the measuring assembly at least monthly if they are connected properly. If required, tighten the connectors.
- 2. Check the color of the FEP hoses. Replace very dark or turbid hoses.
- 3. Check all hoses for mechanical damage (e.g. kinks). Replace damaged hoses immediately.

12.4 Leak Test of all Connected Hoses

The leak test works by feeding air into the system while simultaneously closing the waste hose. This way air pressure builds up inside. Leakage can be detected by a hissing noise from the leaky part.

- 1. Tap to switch on the air pump. Plug the Adapter Luer cone of the air hose into the DMA M/DSA M inlet or if not using a DMA M/DSA M into the Adapter Luer in the Filling Support of the Lovis 2000 M.
- Screw an adapter UNF/UNF (optional accessory, see Lovis 2000 M/ME Product Description List) onto that end of the waste hose that is connected to the waste bottle during operation. Screw an adapter Luer 1/4" UNF (Lovis accessories) into this adapter. Close the adapter Luer 1/4" UNF tightly with a Luer plug (Lovis accessories).

The air flows into the DMA M/DSA M measuring cell – if applicable – and then through the Lovis capillary into the waste hose.

- 3. Listen to the noise of the air pump. Make sure that the noise is not drowned out by ambient noise.
 - · The noise disappears: The system is leak tight.
 - The noise does not disappear, you may hear also a hissing noise: Try to locate the leakage.

4. When ready, remove the air hose from the Filling Support or from the DMA M/DSA M inlet. Tap to switch off the air pump. Reconnect the waste hose to the waste bottle.

Reasons for leakiness

- A hose connector may be loose check and tighten all hose connectors.
 Repeat the leak test.
- One of the hoses is damaged check all hoses and replace the damaged one. Repeat the leak test.
- The O-rings of the filling adapters for the Lovis capillary may be damaged.
 Disassemble and check the parts. If required, replace the O-rings according to Chapter 12.5. Repeat the leak test.
- The injection adapters of the DMA M/DSA M are loose or damaged (if one of these models is in use). Find solutions in the instruction manual of your DMA M/DSA M.

12.5 Replacing the O-Rings of the Filling Adapters

This procedure is applicable also for changing the standard O-rings to Kalrez[®] Spectrum 6375 (refer to the Lovis 2000 M/ME Product Description List on the supplied USB storage device).

TIP Always replace both O-Rings of a filling adapter!

Required tools and spare parts

- Hook for O-ring removal (supplied with the Accessory kit basic Lovis)
- O-Ring 5x1.5 FPM Viton[®] Extreme[™], 2 pcs. per adapter (Pack of 10 pcs. supplied with the Lovis accessories; Mat. No. 100147)

Removing the old O-rings

1. To pull the O-rings from the filling adapter (2), place the hook (3) below one O-ring (1), turn it as shown in Fig. 12 - 4 (using it as a lever) and pull the O-ring from the groove. It is not important which one is removed first.

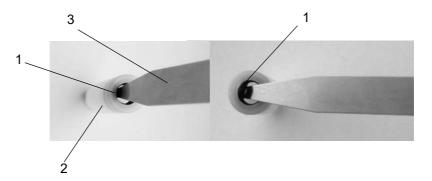


Fig. 12 - 4 Removing the O-rings from a filling adapter

2. Clean the filling adapter with suitable solvent and dry it. See also Chapter 11.2.

Attaching new O-rings

TIP Attach first the lower, then the upper O-ring.

- 1. Put an O-ring into the filling adapter.
- 2. Use the hook for O-ring removal to push the O-ring into the lower groove. First, place one section of the O-ring into its groove. Then, slowly move the hook around the inner wall of the filling adapter pushing the O-ring bit by bit into place.
- 3. Repeat the procedure for the upper O-ring.

13 Service Utilities

This chapter describes Lovis-specific utilities. General utilities find in the General Software Functions Manual.

13.1 Viewing and Printing Live Raw Data

If the monitor mode is active, you get a live view of sensor signals including raw data in this menu. You can export or print the live raw data.

After a measurement is finished, the live raw data of the main measuring unit are frozen as well as the quantities on the main screen. To unfreeze the values, tap the button.

To view live raw data

- Tap <Menu> and select "Service > Live Raw Data".
- Select "Lovis", "Calculations", "DCB Air Pump", "DCB Environment", or "DCB CAN Connector".

Lovis

You can view a list of all data of the latest measurement. This includes set values, output values as well as state values (e.g. "valid").

Calculations

You can view a list of the calculations of the currently available output quantities.

DCB - Air Pump

Air Pump State	Status of the air pump (0 or 1).
All I dilip otate	Status of the all pump (o of 1).

DMA DCB - Environment

Heatsink temperature	Temperature of the heat sink.
Room temperature	Temperature measured within the instrument.
NTC temperature	Temperature measured within the instrument.

To print live raw data

- 1. Tap <Menu>, select "Service > Live Raw Data" and choose one of the groups of live raw data quantities.
- 2. To perform a printout on paper or to a PDF file, tap <Print or Export> and follow the instructions on the screen.

13.2 Lovis Utilities

The Lovis utilities comprise functions which help to do maintenance or service on Lovis 2000 M/ME.

To perform an Initialization

1. Tap "Menu > Lovis Utilities > Initialization".

The Lovis capillary block first moves to -90°, then to 0° and stops in the selected home position (manual filling/ -45° or flow-through filling/+20°).

A red growing bar and messages on the screen indicate the procedure's progress.

2. If required, tap <Redo> or guit with <OK>.

To perform a Fan Service

- 1. Tap "Menu > Lovis Utilities > Fan Service".
- 2. Tap <Start Fan> to start the fan in the Lovis capillary block and <Stop Fan> to stop this fan again.

TIP If the instrument is set to a measuring temperature < 20 °C, the fan in the Lovis capillary block must work to ensure proper cooling of the block. If the fan was stopped the block would overheat and be damaged. Therefore the <Start/Stop Fan> button is inactive for measuring temperatures < 20 °C.

13.3 Crash Handler

The Crash Handler option of the software is available for a Lovis 2000 M master instrument only. Only users with administrator rights can access this option.

1. Tap <Menu> and select "Setup > Control Panel > Crash Handler".

The Crash Handler option provides two functions:

- You can enable that the system automatically reboots in case of a crash. The
 instrument then no longer prompts you to reboot, nor can you manually save
 a log file in that situation.
- You can enable that a log file is automatically saved if the instrument reboots. In this case, make sure that a USB storage device is connected.

14 Software Update

The instrument software comes as a complete package including firmware for all master instruments and modules of a measuring assembly.

The latest software package at delivery time is supplied on a USB flash drive with the Lovis 2000 M/ME.

NOTICE

The software can only be updated to a newer version. Down dating to an older version is not possible!

From version 2.40 on, there is the possibility to backup and restore the current measuring system setup (including software and all module firmware versions). Refer to the General Software Functions Manual.

14.1 Backing up the Instrument Settings

You can use this utility for:

- Saving the current instrument status including all method settings and your favorites list for safety reasons for the case that someone changes the settings accidentally.
- Saving the current settings before you perform a instrument software upgrade.
- Copying the instrument settings to a further Lovis 2000 M or DMA M/DSA M.

A backup file contains the following instrument settings and instrument information:

- Global settings in the control panel (regional settings, keyboard settings, network settings)
- Method settings (display layout and content, result output settings, limit settings, module settings, check definitions)
- User functions
- Users
- System settings (instrument settings, global module settings, sample list settings, audit trail settings, printout settings)
- 2. Adjustments (all adjustment data)

To make a backup of instrument settings

1. Tap <Menu> and select "Service > Backup Instrument Settings" to open the "Backup" dialog.

- 2. Select the data storage location (USB flash drive) and enter a "file name" or accept the default file name.
- 3. Tap <Next>.
- 4. Select the content of your backup file in the column "Value" and tap <OK>.
- 5. Tap <Yes> to create your backup file.

The backup file is stored into the root directory of your USB flash drive.

14.2 Restoring the Instrument Settings

NOTICE

When restoring the instrument settings, make sure that the backup file corresponds with the instrument type.

- 1. Tap <Menu> and select "Service > Restore Instrument Settings" to open the "Restore" dialog.
- 2. Tap <Details> to scan the content of the selected backup file.
- 3. Select the location of your backup (USB flash drive) and the "file name" using the two drop-down boxes.

The backup file must be stored in the root directory of your USB flash drive.

- 4. Tap <Next>.
- 5. Select the settings to be restored to your instrument in the column "Value" and tap <OK>.
- 6. Tap <Yes> to restore the settings.
- 7. Follow the instructions on the screen.

14.3 Checking the Software Version

The currently installed software version can be seen in the System Information. In this menu, you find information about the configuration of the master instrument's hardware and of the module(s), if connected. The software version, the instrument type, serial number and firmware versions of master and modules are shown in a table.

Tap <Menu> and select "Service > System Information" to open the configuration overview table.

Use the vertical scroll bar to scroll through the table.

Check the software version and compare it with the version number of the supplied instrument software on the USB flash drive. If the version number displayed on the instrument is older, you should perform a software update. For further information see the General Software Functions Manual.

14.4 Updating the Instrument Software

Updating the instrument software

The instrument software is the complete software package for the instrument, containing the module firmware, language packs and instrument software for all master instruments and modules of the measuring assembly. Anyway, module firmware or language packs can also be updated separately, if new versions are available and the other parts of the instrument software do not change.

NOTICE

To update the instrument software, you need administrator rights with activated auto logon function or the administrator must log on and perform the software update.

TIP Before starting the system update, export or print relevant measurement data and create a backup of the instrument settings (see Chapter 14.1).

To update the instrument software

- 1. Load the latest software package into the root directory of your USB flash drive.
- 2. Insert the USB flash drive into a USB interface of your instrument.
- 3. Tap <Menu> and select "Service > Update > System Update".
- 4. Select the location (USB flash drive) and the "file name" of the new software.
- 5. Tap <Update>.
- 6. Follow the instructions on the screen.
- 7. Restore the instrument settings (see Chapter 14.2), if required.

Updating the module firmware

Consult the instruction manual of your master instrument respectively the General Software Functions Manual.

Installing a language pack

Consult the instruction manual of your master instrument respectively the General Software Functions Manual.

SECTION II: Flow-Through Systems

This section describes setting up the hardware for all possible measuring assemblies including a Lovis 2000 M or a DMA M/DSA M as master instrument combined with different modules:

- · installing master instrument and modules
- connecting the hoses for pressure filling and suction filling incl. chemically resistant hoses
- putting the assembly into operation

and more.

15 Overview

Lovis 2000 M/ME is a microviscometer based on the Rolling Ball Principle explained in SECTION I – Chapter 3.3. It can be combined with DMA M/DSA M, several sample changers from the Xsample family and other modules.



Fig. 15 - 1 Lovis 2000 ME + DMA M + Xsample 530

Supported combinations

- Lovis 2000 M with sample changers Xsample 520, Xsample 22, Xsample 352/452, Xsample 52, Xsample 530 and Xsample 340, see Chapter 18.
- With DMA M series or DSA 5000 M, Lovis 2000 ME and sample changers Xsample 520/22, Xsample 352/452, Xsample 52, Xsample 530 and Xsample 340, see Chapter 19. For assemblies with DSA 5000 M only Xsample 520/22 is supported.
- With DMA M, Lovis 2000 M/ME, Alcolyzer ME, HazeQC ME, pH ME and possible subsets of these instruments see Chapter 20.
- With DMA M/DSA M, Lovis 2000 ME, pH ME and possible subsets of these instruments see Chapter 21.
- With DMA M/DSA M, Lovis 2000 M/ME, Abbemat see Chapter 22.

TIP: From November 2017 (instrument software version 2.93) on, Xsample 520 replaces Xsample 122. In case you have got an Xsample 122 and need to look up the correct way of connecting the hoses, refer to those chapters that describe assemblies with Xsample 520.

Definition of master instrument and module

A measuring assembly consists of the master instrument and one or more modules. The master instrument always controls the connected modules.

The Lovis 2000 M is the master if there is no DMA M/DSA M included.

Whenever a DMA M / DSA M is included in the measuring assembly, the density meter or density and sound velocity meter is the master.

Important information on DMA M / DSA M:

From June 2015 on, adapters for the inlet and outlet of DMA M and DSA M are made of black material. These adapters have new material numbers (please refer to Chapter 16.1.4.1 or to the product description list of the DMA M / DSA M) but their functionality and the handling is the same. If there are white adapters shown in a figure simply use the black adapters instead.



Fig. 15 - 2 DMA M with 2 Injection Adapters UNF 1/4" black

16 Checking the Supplied Parts

Lovis 2000 M/ME 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.
- 2. Check the delivery for completion by comparing the supplied parts to those noted in the tables below and in your delivery list.
- 3. If a part is missing, contact your Anton Paar representative.
- 4. If a part is damaged, contact the transport company and your Anton Paar representative.

16.1 Supplied Parts Lovis 2000 ME

16.1.1 Lovis 2000 ME Microviscometer

Table 16.1: Supplied Parts Lovis 2000 ME

Symbol	Pcs.	Article Description	Mat. No.
	1	Lovis 2000 ME Microviscometer Module	98143
0 0	2 2	Fixing screws M4x20, A4	(19751) ^a
	2	Toothed contact washer M4 (To be found in a small bag fixed to the Lovis 2000 ME	(61483) ^a
		housing)	
	1	Accessory Kit Basic - Lovis	100219
		Accessory Kit Complete - Lovis Type of accessory kit and contents depend on your order.	100220
\$2 mmm	1	Instruction Manual	

a. Material numbers in parentheses cannot be ordered separately. Available only upon request. Please contact your Anton Paar distributor.

16.1.2 Lovis 2000 M Base Unit

Supplied, if the assembly includes no DMA M / DSA M.

Table 16.2: Supplied Parts Base Unit

Symbol	Pcs.	Article Description	Mat. No.
	1	Lovis 2000 M Base Unit	94462
THE STATE OF THE S	1 Pack	Protection foils for touchscreen (1 pack = 3 pcs.)	81402
	1	Waste bottle SVM 0.5 L	17822
	1	Power cord (country specific) EUR: GBR: USA: PRC: THAI:	65146 61865 52656 27011 79730

16.1.3 Module Housing Lovis ME

Table 16.3: Supplied Parts Module Housing Lovis ME

Symbol	Pcs.	Article Description	Mat. No.
	1	Module Housing Lovis ME	98309

Table 16.3: Supplied Parts Module Housing Lovis ME

Symbol	Pcs.	Article Description	Mat. No.
9	1	CAN interface cable 0.6m	84665
	1	CAN/Devicenet terminating resistor	83999
Original from 04 2014	1	 Crush protection for use of Lovis with Xsample Originally made of metal and fixed on Xsample protective cover From April 2014 on made of plastic and fixed on Lovis capillary block) 	100871
0 6 2	3	Flathead screws M4x8 (To fix the original metal crush protection on the safety cover Xsample – not supplied with the plastic crush protection)	(84162) ^a
000	3	Distance washer 5.6x8x0.5 (For levelling the module Lovis ME on top of a master instrument)	74236
	4	Rubber foot adhesive D=15 H=10 bk PVC (For supporting the drip plate when placing a module Lovis ME on top of a master instrument)	(107419) ^a
	1	Angular screw driver Torx T10 (For fixing the screws of the original metal safety cover/crush protection – not supplied with the plastic crush protection)	21304
	1	Edge protection, PE, I = 177 mm (For the hose slit in the metal part of the Xsample safety cover.)	(1968) ^a

a. Material numbers in parentheses cannot be ordered separately. Available only upon request. Please contact your Anton Paar distributor.

16.1.4 Accessory Kits

Generally, the Lovis 2000 M/ME comes with the Accessory Kit Basic Mat. No. 100219, basic content see Table 16.5. Depending on your order, additional accessories may be delivered. The following chapters show the contents of both the basic and the optional complete kit.

16.1.4.1 Accessory Kit Complete - Lovis



This kit contains all relevant parts for operating Lovis 2000 M/ME stand alone and as a part of various measuring assemblies. The capillary/ball equipment allows measurements over the complete viscosity range of the instrument.

Fig. 16 - 1 Accessory Kit Complete - Lovis

Table 16.4: Supplied Parts Accessory Kit Complete - Lovis Mat. No. 100220

Symbol	Pcs.	Article Description	Mat. No.
	1	Screw Cap Back Side - Closed	98175
	1	Screw Cap Front Side - Closed	98171
	1	Screw Cap Back Side - Open	98177
	1	Screw Cap Front Side - Open	98166
- SS	1 set	O-Ring 5x1.5 FPM 75 Viton® Extreme™ (10 pcs.)	100147
	5	Syringe 1 mL Luer This item can be ordered in packs of 100 pcs. by the following material number	101523
	2	Syringe 10 mL Luer This item can be ordered in packs of 100 pcs. by the following material number	6442

Table 16.4: Supplied Parts Accessory Kit Complete - Lovis Mat. No. 100220

Symbol	Pcs.	Article Description	Mat. No.
-	1	USB storage device 4 GB	87093
	1	Luer Plug with Bore (10 pcs.)	99849
	1	Luer Plug w/o Bore (10 pcs.)	99850
	1	Filling Adapter Luer Female	98172
	1	Filling and Cleaning Adapter Luer Male	98624
	1	Filling Adapter UNF	98174
0155 17200055	1	Capillary Lovis 1.59 mm (uncalibrated)	93095
	1	Plug 1.59 mm (20 pcs.)	99843
018 1720035	1	Capillary Lovis 1.8 mm (uncalibrated)	93096
(11)	1	Plug 1.8 mm (20 pcs.)	99844
975 1138078		Capillary Lovis 2.5 mm (uncalibrated)	93097
		Plug 2.5 mm (20 pcs.)	99845
	1	Funnel for 1.5 mm ball - Lovis	87089
	1	Ball dispenser 1.5 mm (Fig. shows dispenser incl. attached vial with balls)	98922

Table 16.4: Supplied Parts Accessory Kit Complete - Lovis Mat. No. 100220

Symbol	Pcs.	Article Description	Mat. No.
Mat. No. 731 but of balls 1.1 steel 1.47 300 pcs. all density 07.5 butch: 8140e ¹⁵	1	Set of balls 1.5 mm (300 pcs.)	73109
No. 20859 Is 1.5 mm gold 100 pcs. Isky 07.85 gich 108/122589/Auf	1	Set of balls 1.5 mm 4µ gold (300 pcs.)	20659
	2	Adapter Luer cone	63863
	2	Adapter Luer 1/4" UNF	64792
	3	Adapter UNF/UNF	64790
	2	Adapter UNF/screwed tube	18807
	2	Adapter UNF/Hose (Female/Male)	26739
	1	Injection Adapter UNF 1/4" DSA black	159024
	2	Injection Adapter UNF 1/4" black	159025
C C	2	Hose 220x3x2 FEP 2x1/4"-28 UNF "CC"	25540

Table 16.4: Supplied Parts Accessory Kit Complete - Lovis Mat. No. 100220

Symbol	Pcs.	Article Description	Mat. No.
	1	Hose 300x3x2 FEP 1x1/4"-28 UNF "A"	109047
650	2	Hose 350x3x2 FEP 2x1/4"-28 UNF	25525
c o o o o o o o o o o o o o o o o o o o	2	Hose 530x3x2 FEP 2x1/4"-28 UNF "C"	25523
	2	Hose 600x3x2 FEP 2x1/4"-28 UNF	25524
AD	1	Hose 650x3x2 FEP 1x1/4"-28 UNF "AD"	24809
	1	Tube d=2.1 D=2.4 L=20; 1.4571	67982
	1.2 m	Hose 1.6x3.2 Tygon	67540
	0.6 m	Hose 2x4 Viton®	54628
	0.6 m	Hose 2x4 silicone	51273
	1.2 m	Hose 3x5 silicone	50814
	8	Cable clip self-adhesive L20 B15 H4 gr	62072
Section Section Control Contro	1	Brush 170x25x2.7 Nylon 0.06 (5 pcs.)	99778
	1	Hook for O-ring removal	24951

Symbol Pcs. **Article Description** Mat. No. 1 Plastic tweezers 63132 1 Angular screwdriver Torx T20 15462 (To mount the Lovis 2000 ME module into the master instrument or housing) 1 3635 Open wrench 8 mm (For tightening hose connections) 2 Fuse 5x20 5A slow ceramics 27656 Sticker "Made with Viton® Extreme™" 1 14193

Table 16.4: Supplied Parts Accessory Kit Complete - Lovis Mat. No. 100220

For the parts supplied with DMA M series, DSA 5000 M, Xsample sample changers and other modules see the respective instruction manuals and delivery lists.

16.1.4.2 Accessory Kit Basic - Lovis



This kit contains only the standard parts required in any case for manual measurement.

It is standard delivery for any Lovis.

Fig. 16 - 2 Accessory Kit Basic - Lovis

Table 16.5: Supplied Parts Lovis Accessory Kit Basic Mat. No. 100219

Symbol	Pcs.	Article Description	Mat. No.
Section Sectin Section Section Section Section Section Section Section Section	1	Brush 170x25x2.7 Nylon 0.06 (5 pcs.)	99778
	1	Hook for O-ring removal	24951

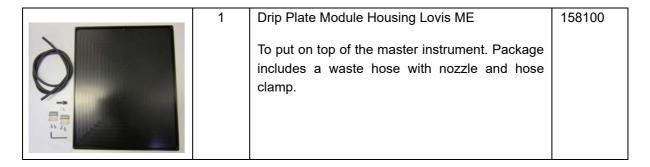
Symbol	Pcs.	Article Description	Mat. No.
- 25 5	1	O-Ring 5x1.5 FPM 75 Viton® Extreme™ (10 pcs.)	100147
	5	Syringe 1 mL Luer	
		This item can be ordered in packs of 100 pcs. by the following material number	101523
	2	Syringe 10 mL Luer	
		This item can be ordered in packs of 100 pcs. by the following material number	6442
	1	Plastic tweezers	63132
	1	Angular screwdriver Torx T20	15462
1	1	Open wrench 8 mm	3635
	4.0	(For tightening hose connections)	50044
	1.2 m	Hose 3x5 mm silicone	50814
	1	USB storage device 4 GB	87093
	2	Adapter Luer cone	63863
	2	Adapter Luer 1/4" UNF	64792
	8	Cable clip self-adhesive L20 B15 H4 gr	62072
	1	Funnel for 1.5 mm ball - Lovis	87089
E	2	Fuse 5x20 5A SLOW ceramics	27656
THE PROPERTY OF THE PROPERTY O	1	Sticker "Made with Viton® Extreme™"	14193

16.2 Options

This section lists only the most common options, which are described in the following chapters during setting up several measuring assemblies. For all available options refer to the product description list (PDL) on the supplied USB storage device.

16.2.1 Drip Plate

This item is required whenever a sample changer is part of the measuring assembly and a measuring module is placed on top of the master instrument. If the Stand for Measuring Assembly (Mat. No. 105451) is used for larger setups, the drip plate is obsolete. The drip plate will avoid damages to the master instrument in the unlikely event of a leakage. See also Chapter 17.3.



16.2.2 Waste Bottle

This glass bottle with GL45 thread allows to connect the waste hose directly to its screw cap. It is mainly designed for use with the flow-through filling set or for Xsample 22. For Xsample 520 the volume of the bottle is not sufficient if all vials are filled to the rim.

Symbol	Pcs.	Article Description	Mat. No.
	1	Waste Bottle 1 L glass Borosilicate glass 3.3, equipped with screw cap and insert with three 1/4"-28 UNF female threads for connecting the waste hose, PTFE gasket and protective netting.	101655
	1	Sealing gasket PTFE GL 45 (To order as spare part; this part applies also for the optional waste container 8 L HDPE.) Replacement according to Chapter 17.5. It is the same procedure as for the waste container 8 L HDPE.	97027

16.2.3 Options for Improved Chemical Resistance

These items can be used for measuring assemblies including an Xsample 520/22 with or without DMA M/DSA M.

Symbol	Pcs.	Article Description	Mat. No.
Contents according to the Lovis 2000 M/ME Product Description List	1 kit	Hose set Lovis + XS 122/520 Polymer This set is prepared especially for use with polymer solutions. It contains all parts required for testing most polymer solutions with Lovis and Xsample 122/520.	143728
Contents according to the Xsample 22/52 Product Description List	1 kit	Retrofit kit for Xsample 22 Chemical Contains FEP hoses, a chemically resistant pump hose "Norprene chemical" with suitable cartridge for the pump, all required clamps, connectors and tools. Especially for use with a wide range of chemicals.	96879
•	1	O-Ring 5x1.5 Kalrez® Spectrum 6375 Serves best chemical resistance against nearly all solvents, most acids and bases. For the filling adapters of a Lovis 2000 ME you need 4 pcs.	101519
Duffer National Market National Market National States National Market National Market National Nation	1	Sticker "Made with Kalrez®" This sticker is delivered automatically when ordering the above Kalrez O-rings. Put it on your device to avoid that O-rings are exchanged to a less resistant quality during maintenance or service.	101927

16.2.4 Low Volume Options

For Xsample 352/452, the following hose sets are available to save sample volume:

- Low volume hose set Lovis Xsample 352/452, Mat. No. 101906 or
- Low volume hose set Lovis Xsample PTFE, Mat. No. 171900

Installation see Chapter 18.1 or Chapter 19.1. In combination with Abbemat and Xsample 352/452, the low volume hoses are obligatory, see Chapter 22.7.

The low volume hoses are applicable only for Lovis 2000 M or DMA M with Lovis 2000 ME, but for no further module combinations.

Symbol	Pcs.	Article Description	Mat. No.
	1	Hose 300x3x1 FEP 2x1/4"-28 UNF (low volume)	21875
В		Hose 300x3x1 PTFE 2x1/4"-28 UNF (low vol.)	171898
		(replaces Mat. No. 3443)	

Symbol	Pcs.	Article Description	Mat. No.
	1	Hose 530x3x1 FEP 2x1/4"-28 UNF (low volume)	75860
		or	
600		Hose 530x3x1 PTFE 2x1/4"-28 UNF (low vol.)	171899
A		(replaces Mat. No. 25523)	
	1	Hose 600x3x1 FEP 2x1/4"-28 UNF (low volume)	21874
		or	
		Hose 600x3x1 PTFE 2x1/4"-28 UNF (low vol.)	171887
D		(replaces Mat. No. 25524)	

16.2.5 Stands and Waste Containers

Symbol	Pcs.	Article Description	Mat. No.
	1	Stand Measuring Assembly 750x380x280 This stand allows to place several modules onto a master instrument in horizontal setup. Under the stand, a waste container can be placed. (Stand comes without instrument.)	105451
	1	Waste Container HDPE 8 L This waste container can be placed under the Stand Measuring Assembly. The combination of stand and waste container is an easy solution to collect non-hazardous waste liquids. Applies for use with Xsample 520/22. For details see Chapter 17.5.	105979
	1	Stand for Xsample This stand lifts the position of the instrument by approx. 200 mm. Under the instrument, the optionally available safety waste container can be placed. This combination serves a safe and easy solution for collecting hazardous waste liquids. Applies for use with Xsample 352/452.	87584
	1	Safety Waste Container The safety waste container "Asecos" is made of stainless steel and provides a volume of 5 L, flame arrester, venting screw, connector for ground cable and dosage tap.	87585

17 Preparing Module(s) and Master Instrument

17.1 Steps to Perform the Hardware Setup

- 1. Check the mains supply according to the specifications. See Appendix A.
- 2. Prepare enough space on a flat lab bench. Pay attention to the requirements for the setup location according to Chapter 6.1.
- 1. When retrofitting an existing density meter/sound velocity meter: Operating this instrument together with a Lovis 2000 ME and other modules requires at least instrument software version 2.30 or higher. Perform the software update of the master instrument **before** setting up the measuring assembly's hardware. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software update see Chapter 14 or consult the DMA M/DSA M instruction manual.

NOTICE

Update DMA M/DSA M to the instrument software on the flash drive supplied with Lovis 2000 M/ME before mounting Lovis 2000 ME! Earlier versions do not support Lovis 2000 ME and other modules, and the DMA M/DSA M will display Error 13. You have then to remove / disconnect the Lovis 2000 ME module again before running the update.

- 2. Mount the Xsample into the master instrument. See Chapter 17.2.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME. See Chapter 6.4.
- 4. Drip plate: Prepare and place the drip plate on top of the master instrument and make sure it is correctly engaged, if applicable. See chapter Chapter 17.3. When using the optional stand for measuring assembly, the drip plate is not required to use. See Chapter 16.2.5.
- 5. Optional stand: Mount the optional stand for measuring assembly according to its supplied instructions, if applicable.
- Place the Module Housing with Lovis 2000 ME on the drip plate / stand for measuring assembly on top of the master instrument and check whether all four feet stand solidly on the master instrument's cover. If not, adjust the feet according to Chapter 17.4.
- 7. For assemblies with more modules than Lovis 2000 ME and sample changer: arrange all components as described in the respective chapters in this manual, if applicable.

8. Connect the cables:

For standard assemblies consisting of Lovis 2000 M and a sample changer or DMA M/DSA M, Lovis 2000 ME and a sample changer, perform according to Chapter 6.5.

For all measuring assemblies consisting of more components, refer to the chapter describing the respective setup.

- 9. Xsample 452/352/520: Prepare the safety cover according to Chapter 17.2.
- 10. Select the capillary and ball configuration according to your sample viscosity. Refer to Appendix A.2.
- 11. Install the measuring system for flow through filling according to Chapter 9.5. Ensure, that the capillary is completely clean (inside and outside) before placing it in the capillary block. Note down the serial number of the capillary before inserting it, you will need it later for creating the capillary in the "Capillary Administration".
- 12. Establish the hose connections according to the respective chapter in this manual. Regarding the waste hose and waste container, refer also to the instruction manual of your Xsample model.
- 13. Xsample 52/352/452: fill the solvent bottle(s).
- 14. After completing the hardware setup, continue with Chapter 24.

17.2 Safety Cover and Crush Protection

TIP: The edge protection in not applicable for Xsample 530. In case you have got an Xsample 530, continue with mounting the Crush Protection, p. 147.

Edge Protection

The edge protection is supplied with the Module Housing Lovis ME and must be mounted to prevent damage to the hose(s) which is (are) guided through the slit (1) in the metal part of the safety cover. The edge protection comes already in the correct length of 177 mm.

Attach the edge protection (2) and fit it onto the edge of the hose guiding slit according to Fig. 17 - 3.

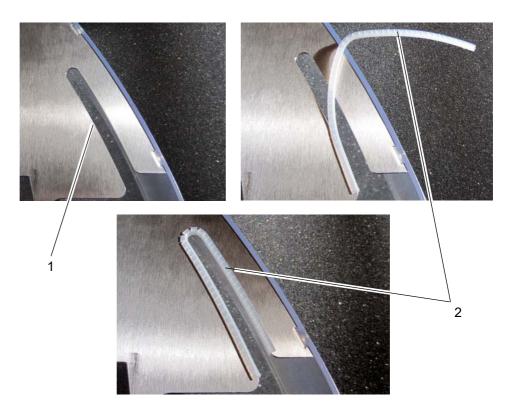


Fig. 17 - 3 Mounting the edge protection

Crush Protection

To meet the safety requirements, the crush protection Lovis/Xsample supplied with the Module Housing Lovis ME must be used in combination with Lovis 2000 ME. The following sample changers are affected:

- Xsample 352/452/530
- Xsample 520

It is not required to mount the crush protection if:

- Lovis 2000 ME is placed higher than the crush protection reaches, e.g. for measuring assemblies, where Lovis 2000 ME is placed as topmost module on two instruments below it, like the assembly described in Chapter 20.1.
- Lovis 2000 ME is not placed on the outside right in measuring assemblies with more than one module, like the assemblies described in Chapter 20.2 to Chapter 20.4.
- For an assembly consisting of DMA M, Lovis 2000 ME and Xsample 340.

From April 2014 on, the original metal crush protection has been replaced by a PVC crush protection that is fixed directly on the Lovis capillary block. Both types are described in this chapter. The new crush protection is suitable for Lovis Option Low Temperature.

Figures in this manual either show the original metal crush protection or the redesigned plastic model.

How to mount the metal crush protection

Refer to Fig. 17 - 4:

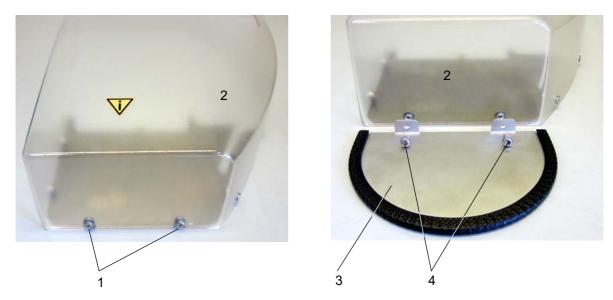


Fig. 17 - 4 Mounting the metal crush protection

- 1. Unscrew the two M4x6 screws (1; Torx T10) from the top of the safety cover (2).
- 2. Attach the crush protection Lovis/Xsample (3) and fix it with two screws M4x8 (4; Torx T10).

How to mount the PVC crush protection

Refer to Fig. 17 - 5:



Fig. 17 - 5 Mounting the PVC crush protection

1. Switch off the Lovis 2000 M/ME. Remove the protection from the double-faced adhesive tape (2) on the crush protection (1).

2. Align the top edge of the crush protection with the top of the Lovis capillary block. Align the notch (3) of the crush protection with the plastic structure (4) of the fan's cover (see arrow). Then press the crush protection towards the capillary block to fix it.

17.3 Installing the Drip Plate

NOTICE

In case an additional module is placed on top of the master instrument, install a drip plate. This additional accessory will avoid damages to the master instrument in the unlikely event of a leakage.

TIP The color of the drip plate may be different than shown in the figures in this Reference Manual. Up to the beginning of 2015, there was only one type of drip plate (Mat. No. 99384) available. From January 2015 on, a new, mechanically stable Drip Plate Module Housing Lovis ME (Mat. No. 158100) is recommended for use with Module Housing Lovis ME.

Drip Plate Module Housing Lovis ME (Mat. No. 158100) - Supplied parts:



Fig. 17 - 6 Drip Plate Module Housing Lovis ME - supplied parts

1	Drip plate
2	Hose Viton 5x8 Iso Versinic
3	Hose clamp Dmin 8.8 - Dmax 9.3 mm
4	Drain nozzle
5	Fixing brackets with 4 torx screws
6	Angular Screwdriver Torx T10

There is no need to stabilize the Drip Plate Module Housing Lovis ME. Proceed with "Assembling and placing the drip plate", p. 150.

Stabilizing the Drip Plate (Mat. No. 99384)

If placing a Lovis 2000 ME module on top of a master instrument and using the Drip Plate, the cover of the master instrument and the drip plate may bend slightly due to the instrument's weight. In that case stabilize the Drip Plate with the rubber feet, which are included in a little transparent bag that comes with the crush protection for use with an Xsample module. The bag also contains 3 distance washers to stabilize the feet of the Lovis Module Housing (see Chapter 17.4).

- 1. Unpack the Drip Plate (1) and the 4 adhesive rubber feet (2).
- 2. Loosen 3 rubber feet from the supporting film and stick them on the bottom of the drip plate as shown in Fig. 17 7.

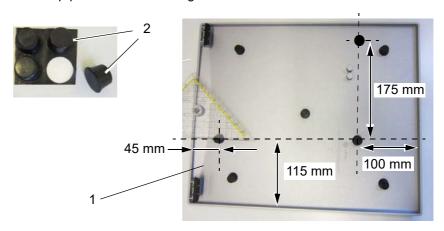


Fig. 17 - 7 Fixing the rubber feet on the Drip Plate Mat. No. 99384

Assembling and placing the drip plate

- 1. Screw the supplied drain nozzle (4) into the thread at the back side of the drip plate (1; use an open spanner 9 mm). See Fig. 17 8.
- 2. Mount the fixing brackets on the back side of the drip plate with the four torx screws and the supplied angular screwdriver.
- Slip the hose clamp (5) onto the waste hose (6). Connect the hose to the drain nozzle (4) on the back side of the drip plate (1) and secure it with the hose clamp. Trim the hose length depending on the waste vessel and its location during installation of the measuring assembly.

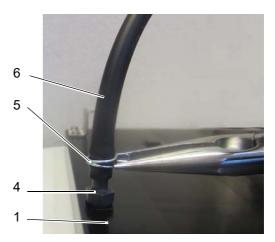


Fig. 17 - 8 Connecting the waste hose to the drip plate

4. Place the drip plate on top of the master instrument. Make sure it is correctly aligned. The two brackets engage with the carrying ledge on the rear of the master instrument. See Fig. 17 - 9.



Fig. 17 - 9 Placing the drip plate on the master instrument

5. Connect the waste hose to your waste container and secure it against slipping off.

You can connect this hose e.g.

- to the optional waste container 8 L HDPE together with the waste hose of the assembly
- to the optional waste bottle SVM 0.5 L separately
- to any other suitable vessel which allows to lead the hose always downwards
- 6. Use an adapter Luer/UNF (7; supplied with Lovis accessory kit) or a suitable nozzle with 1/4"-28 male thread, to connect the waste hose (6) to the optionally available waste containers. Use a hose clamp (5) to secure the hose against slipping off.

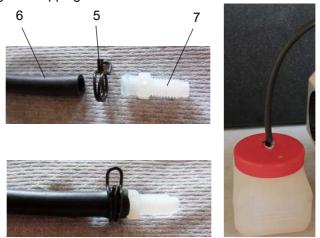


Fig. 17 - 10 Connecting the waste hose to the waste container

TIP When connecting the waste hose to the optional waste container 8 L HDPE, ensure that the adapter Luer/UNF is fixed in the insert of the screw cap. Then attach the hose with hose clamp.

7. Next, adjust the position of the Lovis Module Housing on the drip plate.

17.4 Adjusting the Position of the Module Housing

 Put the Module Housing with the mounted Lovis 2000 ME on the drip plate. Align the Module Housing with the left side of the master instrument. Check whether the Module Housing is in a stable position. The right rear foot should not stand on the inclined area of the drip plate.

If the left rear foot (seen from the front) still lifts a little bit because the weight of the Lovis bends the drip plate, close the gap with some distance washers.

- TIP For one assembly the Lovis Module Housing is placed on top of other modules (see Chapter 20.1). For such a setup also close any gap beneath a foot of the Lovis Module Housing as described below.
 - 2. Put the Module Housing on its side. It is not necessary to take out the Lovis 2000 ME Module.
 - 3. Remove the silicone part (2) of the foot in question (1) with a small flat screw driver (Fig. 17 11).

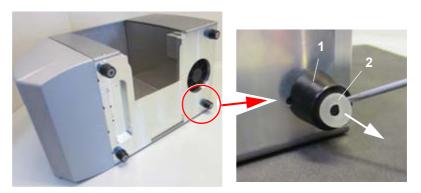
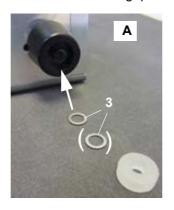


Fig. 17 - 11 Taking apart the left rear foot of Module Housing Lovis ME

4. Put one or more distance washers (3) on the center of the foot (Fig. 17 - 12, A) The distance washers also come in a little bag with the crush protection (see Chapter 17.3, Fig. 17 - 7). The number of distance washers required depends on how wide the gap is.



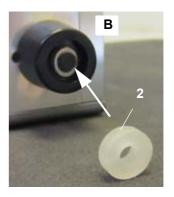


Fig. 17 - 12 Assembling the left rear foot of Module Housing Lovis ME

5. Put the silicone part (2) back onto the foot (Fig. 17 - 12, B).

Place the Module Housing with the mounted Lovis 2000 ME on top of the master instrument plus drip plate. All four feet must stand solidly on the drip plate. Add or remove a distance washer if necessary.

17.5 Optional Waste Vessels

17.5.1 Waste Container 8 L HDPE

To collect non-hazardous waste liquids, an 8 L HDPE waste container is available. The container comes complete with screw cap and insert to connect several hose types. Further it is equipped with a stop cock on the outlet for easy draining or pouring the liquid. Additionally, two adapters UNF/screwed tube and an adapter Luer/UNF is supplied.

The waste container can be placed either besides or behind the measuring assembly or - when using the optional stand for measuring assembly - under the stand besides the master instrument.

How to connect the hoses

- To connect a waste hose 2x4 mm or 2.5x4 mm, plug it onto one of the adapters UNF/screwed tube.
- To connect a waste hose with 1/4"-28 UNF thread, remove one of the adapters from the insert and screw in the hose connector.
- To connect a waste hose 3x5 mm, attach the supplied adapter Luer cone
 onto the hose. Then plug the hose into an adapter Luer/UNF on the insert of
 the screw cap.
- To connect the draining hose 5x8 from the drip plate, attach a hose clamp onto the hose and plug the hose onto the adapter Luer/UNF. Secure the hose with the clamp against slipping off.



Fig. 17 - 13 Waste container - supplied parts and connectors

1	Waste container
2	Stop cock (allows easily draining the waste container)
3	Nozzle to connect a hose to the stop cock
4	Screw cap
5	Insert with three 1/4"-28 UNF female threads (same part as for the waste bottle 1 L glass)
6	Adapter UNF/screwed tube (1 pc.)
7	Adapter Luer cone (2 pcs.)
8	Adapter Luer/1/4"-28 UNF male (2 pcs.)

17.5.2 Waste Bottle 1 L Glass

To collect also chemically aggressive waste liquids, a 1 L glass bottle is available. The bottle comes complete with screw cap and insert to connect several hose types. The waste bottle is intended for use with manually filled flow-through systems or with systems including an Xsample 22. It can be placed either besides or behind the measuring assembly.

NOTICE

Do not use this bottle with other Xsample systems. The filling volume is not enough to hold the contents (sample and solvent) of an entire magazine. You could use a 2 L glass bottle with GL45 thread instead (not available from Anton Paar GmbH) or the Safety Waste Container (Mat. No. 87585).

How to connect the hoses

The waste bottle glass 1 L serves the same insert with three 1/4"-28 UNF female threads as the waste container 8 L HDPE. See pos. 5 in Fig. 17 - 13.

You can connect hoses with 1/4"-28 UNF male connectors directly to this insert, other hoses can be connected using the adapters supplied with Lovis or several hose sets available for the measuring assemblies. Refer to Fig. 17 - 13.

17.5.3 Replacing the Sealing Gasket

This procedure applies for both, the waste container 8 L HDPE and the waste bottle 1 L glass.

To ensure leak tightness of the closure, the bottom side of the insert is equipped with a PTFE gasket. If required, this gasket can be replaced easily (sealing gasket PTFE GL45, Mat. No. 97027).

Just remove the old gasket, clean the insert (1) and attach the new gasket (2). Ensure that the gasket is well engaged in the groove (see arrow). See Fig. 17 - 14.

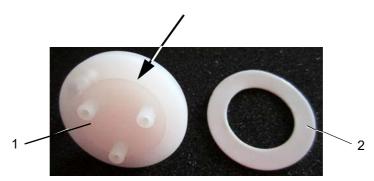


Fig. 17 - 14 Replacing the sealing gasket for the waste container/waste bottle

17.6 CAN Power Supply

When setting up an assembly with external modules that require more power than the master instrument can deliver (see technical data), a CAN power supply (Mat. No. 100655) is required to ensure proper power supply and function of all components.

Modules and instruments on the CAN chain installed before the CAN power supply are powered by the master, the rest is powered by the CAN power supply.

This item comes completely with a 24 VDC /70 W power supply and a CAN cable 0.6 m.



Fig. 17 - 15 CAN power supply

1	CAN out (female plug)
2	CAN in (male socket)
3	power LED - lights green when the 24 VDC power supply is connected and plugged to the mains supply
4	24 VDC in - to connect the power supply

17.7 General Information for Installation

How to read the parts tables in the setup description:

Ī	No.	Item	Supplied with	Purpose	Mat. No.
	1	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	Xsample needle to Lovis capillary block front	25523

- No.: number of the part in the figure above the table.
- Item: describes the part
- Supplied with: gives information, in which accessories the item can be found. Lovis means, that the part either can be found in the Lovis accessory kit or in one of the hose sets for the measuring assemblies as indicated.
- Purpose: describes, where the part is mounted.
- Mat. No.: this is the Anton Paar material number.

Ordering hoses and adapters

For each type of measuring assembly, a preconfigured hose set is available. If you need only single hoses or adapters for replacement, they can also be ordered separately. See the respective chapter in this manual and consult the Lovis Product Description List on the USB storage device supplied with your Lovis.

18 Lovis 2000 M + Xsample

For operating Lovis 2000 M together with a sample changer, the sample changer is positioned in the Lovis 2000 M Base Unit. The Lovis 2000 ME is mounted in the additional Module Housing Lovis ME, which must be placed onto the base unit.

The Lovis 2000 M Base Unit works as "master" in such an assembly.

NOTICE

For easy hose connection, the Lovis capillary block can be turned manually. To do this, ensure that the master instrument is switched off. Do not turn the Lovis capillary block when the power is on, as this may cause damage to its drive.

18.1 Lovis 2000 M + Xsample 352/452

By default, this setup uses hoses with an outer diameter of 3 mm and an inner diameter of 2 mm. Optionally, some hoses are available in a low volume design with the same outer diameter, but an inner diameter of 1 mm. Fig. 18 - 1 shows the standard hoses, but indicates where to connect the low volume hoses.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

18.1.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 352/452 into the Lovis 2000 M Base Unit according to Chapter 6.4.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME onto the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Connect the cables according to Chapter 6.5.
- 6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

7. Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.

18.1.2 Connecting the Hoses



WARNING

Liquids leaking from the instrument due to improper installation may cause injuries and risk of fire.

• The sample changer may only be connected by authorized personnel who is fully trained to use the sample changer correctly and safely.

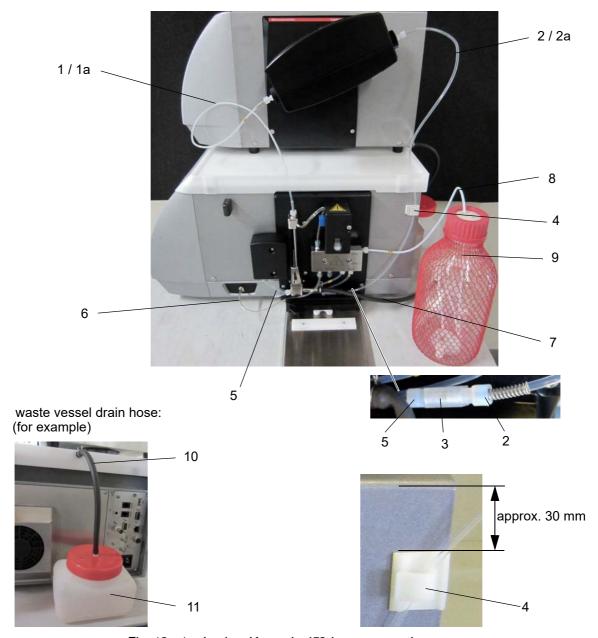


Fig. 18 - 1 Lovis + Xsample 452 hose connections

No.	Item	Supplied with	Purpose	Mat. No.
1 or 1a	Hose 530x3x2 FEP 2x1/4"-28 UNF "C" or for low volume setup: Hose 530x3x1 FEP (or PTFE) 2x1/4"-28 UNF (low volume)	Lovis ^a optional ^b	Xsample needle to Lovis capillary block front	25523 75860
2 or 2a	Hose 600x3x2 FEP 2x1/4"-28 UNF or for low volume setup: Hose 600x3x1 FEP (or PTFE) 2x1/4"-28 UNF (low volume)	Lovis optional ^b	Lovis capillary block rear to Xsample sensor hose	25524 21874
3	Adapter UNF-UNF	Lovis	Connects Xsample sensor hose and hose No. 2	64790
4	Cable clip self-adhesive	Lovis	Hose guidance	62072

- a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 352/452/530 (Mat. No. 101900).
- b. Optional: Item is part of the Low Volume Hose Set Lovis XS 352/452 (Mat. No. 101906) or Low Volume Hose Set Lovis Xsample PTFE (Mat. No. 171900)

On Xsample 352/452 most hoses are pre-assembled. See the Xsample 352/452 instruction manual.

Needle - Lovis inlet

1. Connect one end of the hose 530x3x2 (1) to the top of the Xsample 452 needle. Bend the hose at this connected end into the shape of a wide loop. It may be helpful to attach the safety cover for this purpose. Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block. See Fig. 18 - 2.

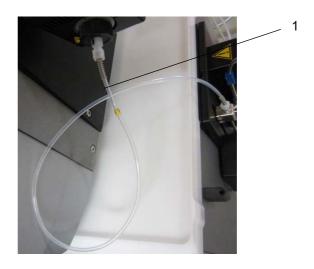


Fig. 18 - 2 Lovis + Xsample 352/452: mounting the hose between needle and Lovis inlet

Lovis outlet - Xsample sensor hose

- 2. Lead the free end of the pre-assembled hose "BA" (sensor hose) of the Xsample 352/452 (5) to the rear side and attach an adapter UNF-UNF (3).
- 3. Connect one end of the hose 600x3x2 (2) to the Filling Adapter UNF Back Side Complete at the Lovis capillary block. Screw the other end into the adapter UNF-UNF (3).
- 4. Fix the cable clip (4) on the master instrument's casing approx. 30 mm below the upper edge.
- 5. Fit the hose 600x3x2 (2) into this cable clip (4).

Drip plate – waste container

6. Trim the hose (10) coming from the drip plate to the required length, connect it to a waste vessel (15; e.g. as indicated in Fig. 18 - 1) and secure it against slipping off.

Air hose

- 7. Connect the air hose of the Xsample 352/452 (6) to the AIR OUT connector of the Lovis 2000 M Base Unit.
- 8. Connect the waste hose (7) either to the optional safety waste container or to the customer's waste container according to the Xsample 352/452 instruction manual.

Rinsing hoses

9. Prepare and connect the rinsing hose(s) (8) and the solvent bottle(s) (9) according to the Xsample 352/452 instruction manual.

Completing the installation

- 10. Xsample 452: Attach the magazine according to the Xsample 452 instruction manual.
- 11. Ensure that the edge protection of the Xsample safety cover and the crush protection are mounted; see Chapter 17.2. Attach and use the safety cover according to the Xsample 352/452 instruction manual. Avoid to squeeze or kink the hose leading to the Lovis capillary block.
- 12. To put the measuring assembly into operation, continue with Chapter 24.

18.1.3 Low Volume Setup

Required equipment:

 Low Volume Hose Set Lovis XS 352/452 (Mat. No. 101906) or Low Volume Hose Set Lovis Xsample PTFE (Mat. No. 171900)

For further details see the product description list (PDL) on the USB storage device supplied with your Lovis 2000 M/ME.

Connect the low volume hoses as indicated in Fig. 18 - 1.

To mount the low volume hoses, refer to Chapter 18.1.2. Chapter 19.1.2. For assemblies with DMA M/DSA M see Chapter 19.1.2.

Minimum required sample volume see Appendix A.5.

18.2 Lovis 2000 M + Xsample 52

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- · Cutter or a pair of scissors
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

18.2.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 52 into the Lovis 2000 M Base Unit according to Chapter 6.4.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME onto the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Connect the cables according to Chapter 6.5.
- 6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

18.2.2 Connecting the Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

 The sample filling and rinsing unit may only be connected by authorized personnel who is fully trained to use this unit correctly and safely.

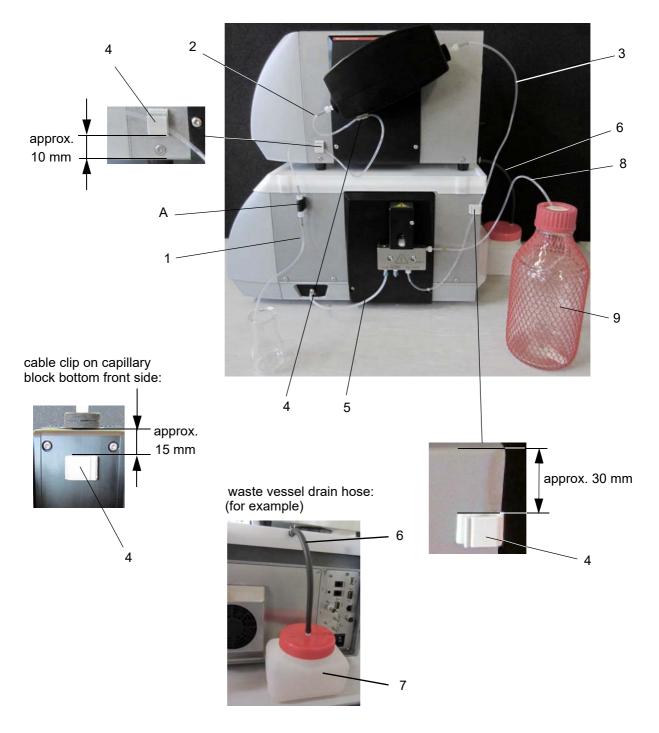


Fig. 18 - 3 Lovis + Xsample 52 hose connections

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose 300x3x2 FEP 1x1/4"-28 UNF	Lovis	sample vial to Lovis filling adapter UNF (sample filling hose)	109047
2	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis filling adapter UNF to Lovis capillary block front (sample filling hose)	25524

No.	Item	Supplied with	Purpose	Mat. No.
3	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear to "Cell" connector on valve block Xsample 52	25524
4	Cable clip self-adhesive	Lovis	hose guidance, 3 pcs.	62072
5	Hose silicone 2x4 I = approx. 200 mm	Xsample 52	air hose, Lovis AIR connector to AIR IN on the Xsample valve block	51273
6	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
7	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose; can also be used to elevate the position of the sample vessel	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 52/330 (Mat. No. 101901).

Mount the cable clips as indicated in Fig. 18 - 3: Fix one cable clip (4) on the
master instrument's casing, the second cable clip (4) on the module housing
ME and the third cable clip (4) on the front bottom side of the capillary block.

Sample vessel – Lovis inlet (sample filling hose)

- 2. The filling adapter (A) mounted on the Lovis has a continuous UNF thread. Connect the hose 300x3x2 FEP (1) to the bottom of this filling adapter and tighten it.
- 3. Screw one end of the hose 600x3x2 (2) to the Filling Adapter UNF Front Side on the Lovis capillary block.
- 4. Carefully bend the hose as shown in Fig. 18 4 and place it into the cable clips (4) on the bottom of the capillary block and on the module housing ME. Connect the free end of the hose (2) to the top of the Lovis filling adapter. (A) Tighten the connector.



Fig. 18 - 4 Lovis + Xsample 52: Connecting the sample filling hose

TIP For low-viscosity samples (below approx. 5 mPa.s), elevate the position of the sample vessel. If not connected to the drip plate, use e.g. the waste bottle supplied with the Lovis to place the sample vessel on. Or take something similar with a height of approx. 10 cm, e.g. the box of a standard bottle. This improves the stability of the liquid column in the system and allows therefore a better repeatability of results. See Fig. 18 - 5.

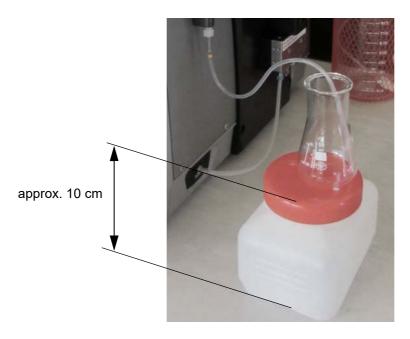


Fig. 18 - 5 Lovis + Xsample 52: sample vessel on elevated position

Lovis outlet - Xsample valve block

- 5. Screw one connector of the hose 600x3x2 FEP (3) into the Filling Adapter UNF Back Side Complete of the Lovis capillary block, the other one in to the "Cell" connector on the Xsample 52 valve block.
- 6. Fit the hose 600x3x2 (3) into the cable clip (4) on the master instrument's housing.

Drip plate - waste container

7. Trim the hose (6) coming from the drip plate to the required length, connect it to a waste vessel (7; e.g. the waste vessel supplied with Lovis 2000 M/ME or a different vessel as indicated in Fig. 18 - 1) and secure it against slipping off.

Air hose

- 8. Cut a piece of approx. 200 mm from the silicone hose 2x4 (5).
- Connect this hose to the AIR nozzle of the Lovis 2000 M Base Unit and to the "AIR IN" connector on the Xsample 52 valve block.

Rinsing hose(s)

10. Prepare and connect the rinsing hose(s) (8) and the solvent bottle(s) (9) according to the Xsample 52 instruction manual.

Completing the installation

11. To put the measuring assembly into operation, continue with Chapter 24.

18.3 Lovis 2000 M + Xsample 122/520

There are two filling options for sample changers with peristaltic pump:

Filling by pressure: The sample goes first from the needle to the pump and then from the pump to the instrument. Use this option for highly viscous or volatile samples.

Filling by suction: The sample goes first to the instrument and then through the pump.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- Cutter or a pair of scissors
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

18.3.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 520 into the Lovis 2000 M Base Unit according to the Xsample 520 instruction manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME onto the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- For assemblies with pressurized filling: Mount the cable clips on the rear side of the Module Housing Lovis ME according to Fig. 18 - 6. All other clips mount as indicated in the respective sections.

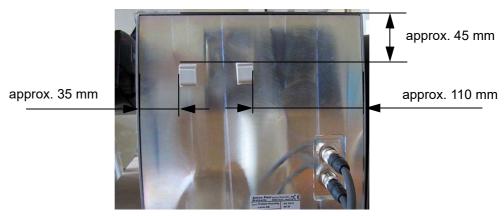


Fig. 18 - 6 Lovis Module Housing ME, mounting the cable clips

For assemblies with filling by suction: Mount the cable clips as indicated in the respective description.

- 6. Connect the cables according to Chapter 6.5.
- 7. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.
- 8. Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.

18.3.2 Connecting the Standard Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

• The sample changer may only be connected by authorized personnel who is fully trained to use the sample changer correctly and safely.

Note: Fig. 18 - 7 and Fig. 18 - 9 show two possibilities how to connect the drain hose from the drip plate to a waste container. See also the information in the description of this step.

18.3.2.1 Filling by Pressure

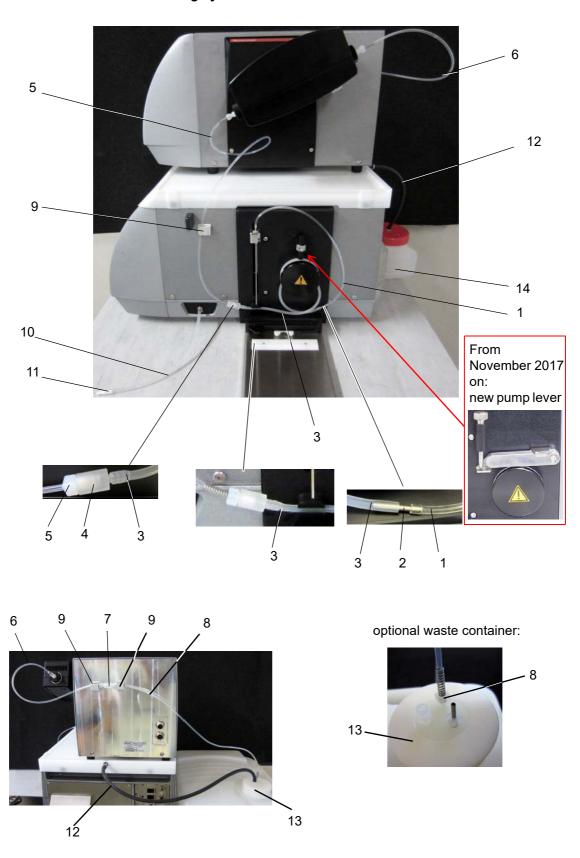


Fig. 18 - 7 Lovis + Xsample 122/520, standard hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	needle to pump hose	67540
2	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
3	Hose silicone 2x4 alternatively Hose 2x4 Viton® I = approx. 400 mm	Xsample 520 Lovis	pump hose	51273 54628
4	Adapter UNF/Hose (Female/Male)	Lovis ^a	connector for filling hose	26739
5	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	filling hose	25524
6	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
7	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 600 mm to waste	64790
8	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to waste container	25524
9	Cable clip self-adhesive	Lovis	hose guidance	62072
10	Hose silicone 3x5 I = approx. 200 mm	Lovis	air hose	50814
11	Adapter Luer cone	Lovis	tip for air hose	63863
12	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
13	Waste container 8 L HDPE	Optional	waste container	105979
14	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose; can be used alternatively if you do not want to connect the drain hose to the large waste container	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 22/320 122/520 (Mat. No. 101902).

Needle - pump - Lovis inlet

- 1. Cut a piece of approx. 270 mm from the Tygon hose 1.6x3.2.
- 2. Connect the steel tube 2.1x2.4x20 mm (2) to the Tygon hose (1).
- 3. Cut a piece of approx. 400 mm from the silicone hose 2x4 (3; from the Xsample 520 accessories). Alternatively, if you need a better chemical resistance, you can also use the Viton® hose 2x4 (from the Lovis accessories).
- 4. Plug the silicone (or alternatively Viton®) hose (3) onto the free end of the steel tube (2).

- 5. Attach an adapter UNF/Hose (4) onto the free end of the silicone (or Viton®) hose.
- 6. Plug the Tygon end of this assembled hose onto the top of the needle.
- **TIP** To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.
 - 7. Turn the pump lever into horizontal position and remove the cartridge. Coil the silicone (or Viton®) part of this assembled hose around the peristaltic pump. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
 - 8. To hold the silicone (or Viton®) hose in position, place it in the tube holder below the Xsample needle.
 - 9. Refer to Fig. 18 8: Connect the hose 530x3x2 FEP 2x1/4"-28 UNF (5) to the adapter UNF/Hose of the pump hose. Lead the hose 530X3X2 upwards. Carefully bend this hose into the shape of a loop and connect the free end to the Filling Adapter UNF Front Side on the Lovis capillary block. It may be helpful to attach the safety cover for this purpose.

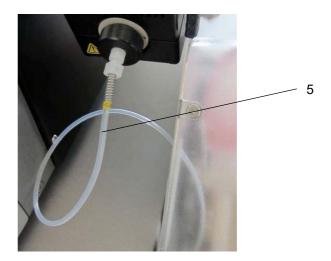


Fig. 18 - 8 Connecting the hose between pump hose and Lovis

Lovis outlet - waste container

- 10. Connect the hose 350x3x2 FEP 2x1/4"-28 UNF (6) and the hose 600x3x2 FEP 2x1/4"-28 UNF (8) with an adapter UNF/UNF (7).
- 11. Screw the free end of the hose 350x3x2 into the Filling Adapter UNF Back Side Complete of the Lovis capillary block. Bend the hose as indicated in Fig. 18 7 and secure it by placing the hose connectors with their springs in the cable clips.

12. Lead the free end of the hose 600x3x2 to a waste container and secure the hose against slipping off. When using the optional waste container 8 L HDPE, you can screw the connector of the hose directly into the screw cap of this container.

Drip plate - waste container

13. Trim the hose (12) coming from the drip plate to the required length and connect it either to the waste container 8 L HDPE (13). If you want to connect it to a separate vessel, you can use e.g. the optional available waste bottle SVM 0.5 L (14) or any other suitable vessel. Secure the hose against slipping off.

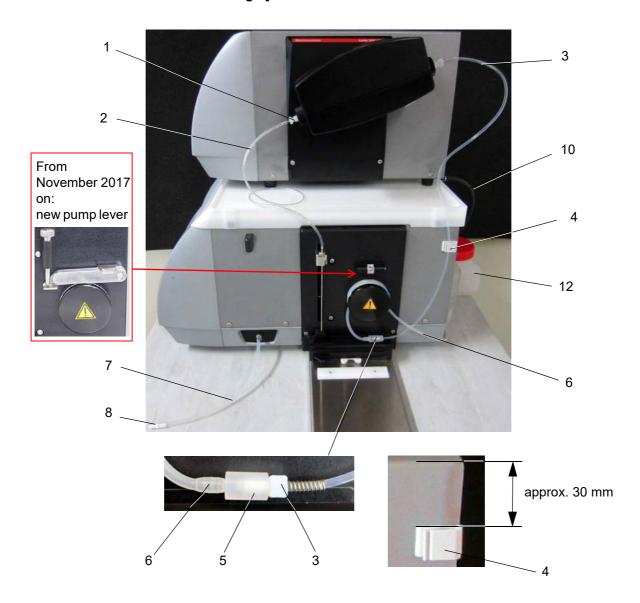
Air hose

- 14. Cut a piece of approx. 200 mm from the silicone hose 3x5 (7). Attach an adapter Luer cone (8) onto one end.
- 15. Connect this hose to the AIR outlet of the Lovis 2000 M Base Unit.

Completing the installation

- 16. Attach the magazine and the safety cover according to the Xsample 520 instruction manual. Ensure that the edge protection of the Xsample safety cover and the crush protection are mounted; see Chapter 17.2. Lead the hose, which is connected between needle, pump and the front side of the Lovis capillary block, through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose.
- 17. To put the measuring assembly into operation, continue with Chapter 24.

18.3.2.2 Filling by Suction



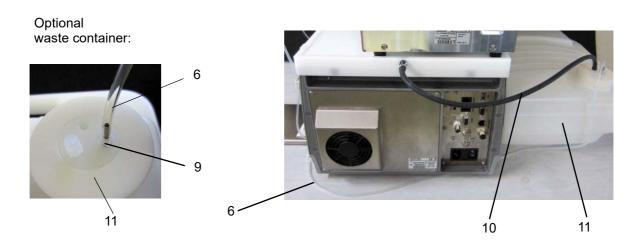


Fig. 18 - 9 Lovis + Xsample 122/520 standard hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Adapter UNF/screwed tube	Lovis ^a	for connecting the Tygon filling hose	18807
2	Hose Tygon 2375, 1.6x3.2 mm; I = approx. 450 mm	Xsample 520 Lovis	filling hose, needle - Lovis capillary block	67540
3	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block - pump hose	25524
4	Cable clip self-adhesive	Lovis	hose guidance	62072
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for filling hose	26739
6	Hose silicone 2x4 mm alternatively Hose 2x4 Viton® I = min. 600 mm, depending on location of the waste container	Xsample 520 Lovis	pump and waste hose	51273 54628
7	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
8	Adapter Luer cone	Lovis	tip for air hose	63863
9	Adapter UNF/screwed tube	Lovis; opt. waste container	to connect the pump hose to the optional waste container	18807
10	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
11	Waste container 8 L HDPE	Optional	waste container	105979
12	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose; can be used alternatively if you do not want to connect the drain hose to the large waste container	17822
13	Tube d=2.1 D=2.4 L=20; 1.4571	Lovis	optional use to split the silicone hose 2x4 used as pump and waste hose.	67982

a.Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 22/320 122/520 (Mat. No. 101902).

Needle - Lovis inlet

- 1. Screw an adapter UNF/screwed tube (1) into the Filling Adapter UNF Front Side on the Lovis capillary block.
- 2. Cut a piece of approx. 450 mm from the Tygon hose 1.6x3.2.

3. Refer to Fig. 18 - 10: Plug the Tygon hose (2) onto the needle top of Xsample 520. Bend the hose into the shape of a loop and plug the free end onto the adapter UNF/screwed tube (1) on the front side of the Lovis capillary block. It may be helpful to attach the safety cover for this purpose.



Fig. 18 - 10 Mounting the hose between Xsample needle and Lovis

TIP To remove the Tygon hose, do not pull it. This may damage the hose and the hose cannot be re-used. Move the hose from the connector using your finger tips.

Lovis outlet - pump - waste container

- 4. Screw an adapter UNF/Hose (5) onto one end of the hose 600x3x2 FEP 2x1/4"-28 UNF (3).
- 5. Connect this hose to the Filling Adapter UNF Back Side Complete of the Lovis capillary block.
- 6. Cut a piece of min. 600 mm (or the required length to reach your waste container) from the silicone hose 2x4.
- TIP You can split the silicone hose 2x4 (6) into two parts of approx. 250 mm and the length you require to reach the waste container. Connect the two pieces with a tube d=2.1 D=2.4 L=20 (13). Advantages: easy replacement of the hose part used in the peristaltic pump, less consumption of hose material. See Fig. 18 11.

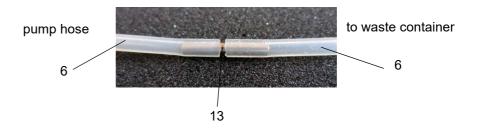


Fig. 18 - 11 Optional splitting the waste hose

- 7. Plug one end of this hose (or if you have splitted to hose the free end of the hose with I = 250 mm) onto the adapter UNF/Hose (5).
- 8. Turn the pump lever to the horizontal position and remove the cartridge. Coil the silicone hose around the peristaltic pump as shown in Fig. 19 10. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
- Lead the free end of the silicone hose to the waste container. Secure the hose against slipping off.
 If you use the optional waste container 8 L HDPE (11): Screw an adapter UNF/screwed tube (9) into the insert of the bottle's screw cap. Plug the hose (6) to this adapter.
- 10. Fix the cable clip (4) on the master instrument's housing as indicated in Fig. 18 9.
- 11. Fit the hose 600x3x2 (3) into the cable clip (4).

Drip plate - waste container

12. Trim the hose (10) coming from the drip plate to the required length and connect it either to the waste container 8 L HDPE (11). If you want to connect it to a separate vessel, you can use e.g. the optional available waste bottle SVM 0.5 L (12) or any other suitable vessel. Secure the hose against slipping off.

Air hose

- 13. Cut a piece of approx. 200 mm from the silicone hose 3x5 (7). Attach an adapter Luer cone (8) onto one end.
- 14. Connect this hose to the AIR outlet of the Lovis 2000 M Base Unit.

Completing the installation

- 15. Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection of the Xsample safety cover and the crush protection are mounted; see Chapter 17.2. Lead the hose, which is connected between the needle and the front side of the Lovis capillary block, through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose. Attach the safety cover (refer to the instruction manual of Xsample 520).
- 16. To put the measuring assembly into operation, continue with Chapter 24.

18.3.3 Connecting Chemically Resistant Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

The sample changer may only be connected by authorized personnel who
is fully trained to use the sample changer correctly and safely.

Required equipment:

- Hose set Lovis + XS 122/520 Polymer (Mat. No. 143728)
- Xsample 520 instruction manual
- Angular screwdriver Torx T10 (supplied with the module housing ME)

TIP If your application requires an improved chemical resistance, a Lovis chemical resistance upgrade set (Mat. No. 101899) is available. See Appendix B.3.

For easy filling and good chemical resistance, use glass vials 50 mL (Mat. No. 12915) with wide-neck opening for the Xsample magazine (24 vials). The vials can be covered with lab sealing film.

Refer to the Xsample 520 instruction manual:

Follow and adhere to all safety instructions and additional information given in section "Installing the Optional Kit for Resistant Hoses.

- 1. Switch off the master instrument.
- 2. Replace the standard steel needle by the chemically resistant Hastelloy needle according to the Xsample 520 instruction manual, section "Installing the Optional Kit for Resistant Hoses Exchanging the Needle".
- 3. In case of retrofitting, remove all standard hoses except the hose connected to the rear side of the Lovis capillary block.

18.3.3.1 Filling by Pressure

Connect the hoses according to Fig. 18 - 12 and the table of parts below. Refer also to Chapter 18.3.2, further to the Xsample 520 instruction manual.

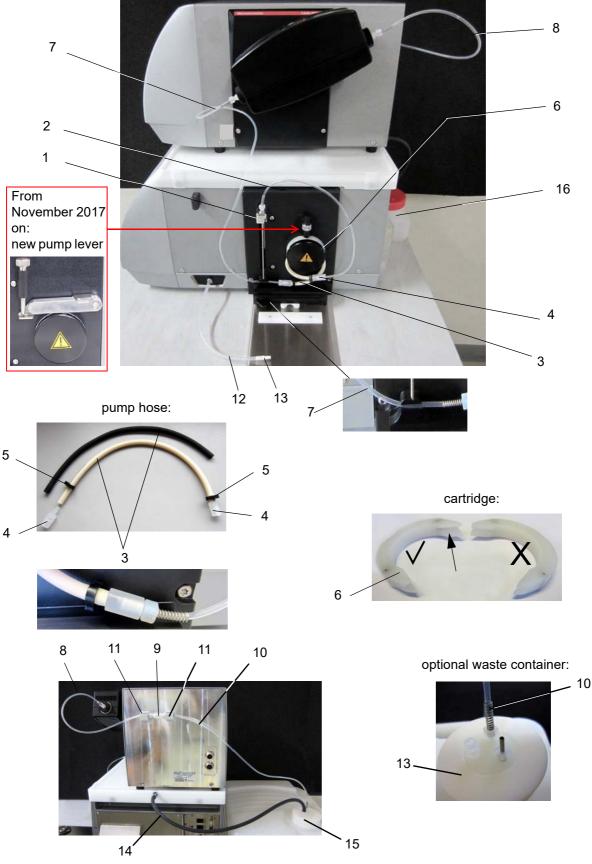


Fig. 18 - 12 Lovis + Xsample 122/520, chemically resistant hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Hastelloy needle	Hose set Xs 520 Polymer (P)	chemically resistant needle with UNF thread	92421
2	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	needle to pump hose	25525
3	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm) or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm)	Hose set Xs 520 P or ordered separately	pump hose, chemically resistant	93980 or 93982
4	Adapter UNF/Hose	Hose set Xs 520 P	hose connectors, pump hose	26739
5	Hose clip Dmin 5.8, Dmax 6.5	Hose set Xs 520 P	to secure the pump hose on the adapter UNF/Hose	21531
6	Cartridge PVDF 3.2x6.4	Hose set Xs 520 P	pump cartridge for chemically resistant hoses	94086
7	Hose 600x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	pump hose - Lovis capillary block front side	25524
8	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
9	Adapter UNF/UNF	Lovis ^a	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 600 mm to waste	64790
10	Hose 600x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	adapter UNF/UNF to waste container	25524
11	Cable clip self-adhesive	Lovis	hose guidance	62072
12	Hose silicone 3x5 mm, approx. 200 mm	Lovis	air hose	50814
13	Adapter Luer cone	Lovis	tip for air hose	63863
14	Hose Viton 5x8 + hose clamp Dmin 8.8 - Dmax 9.3 mm, length depends on place of waste container	Drip plate	drain hose from drip plate	72546 + 21307
15	Waste container 8 L HDPE	Optional	waste container	105979
16	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose; alternatively, connect the drain hose to the large waste container	17822

a. Lovis: Item in the Lovis Accessory Kit Complete or in the Hose set Lovis + XS 122/520 Polymer (Mat. No. 143728).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. Alternative options to plastic containers (HDPE, Waste bottle SVM 0.5 L) are:

- Waste bottle 2 L glass thread GL 45 (not available from Anton Paar) or
- Safety waste container (Mat. No. 87585).

18.3.3.2 Filling by Suction

Connect the hoses according to Fig. 18 - 13 and the table of parts below. Refer also to Chapter 18.3.2, further to the Xsample 520 instruction manual.

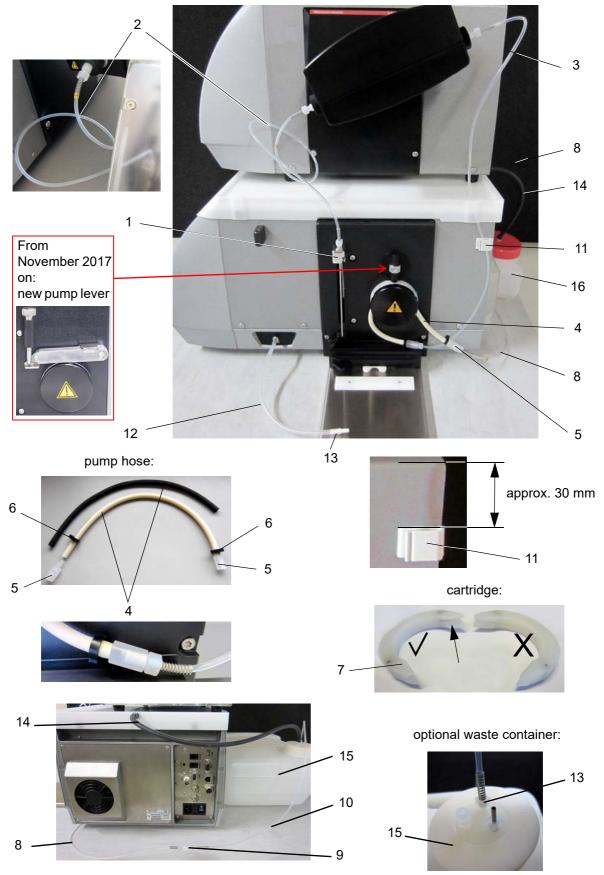


Fig. 18 - 13 Lovis + Xsample 122/520, chemically resistant hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Hastelloy needle	Hose set Xsample 520 Polymer (P)	chemically resistant needle with UNF thread	92421
2	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	needle to Lovis capillary block front side	25523
3	Hose 600x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 (P)	capillary rear front side to pump hose	25524
4	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm	Hose set Xs 520 (P) or ordered separately	pump hose, chemically resistant	93980 or 93982
5	Adapter UNF/Hose	Hose set Xs 520 (P)	hose connectors, pump hose	26739
6	Hose clip Dmin 5.8, Dmax 6.5	Hose set Xs 520 (P)	to secure the pump hose on the adapter UNF/Hose	21531
7	Cartridge PVDF 3.2x6.4	Hose set Xs 520 (P)	pump cartridge for chemically resistant hoses	94086
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; pump hose adapter UNF/Hose to adapter UNF/UNF	25523
9	Adapter UNF/UNF	Lovis	connects the hose 530 mm coming from the pump with the hose 600 mm to waste	64790
10	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; adapter UNF/UNF to waste container	25524
11	Cable clip self-adhesive	Lovis	hose guidance	62072
12	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
13	Adapter Luer cone	Lovis	tip for air hose	63863
14	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
15	Waste container 8 L HDPE	Optional	waste container	105979
16	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose; can be used alternatively if you do not want to connect the drain hose to the large waste container	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose set Lovis + XS 122/520 Polymer (Mat. No. 143728).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. Alternative options to plastic containers (HDPE, Waste bottle SVM 0.5 L) are:

- Waste bottle 2 L glass thread GL 45 (not available from Anton Paar) or
- Safety waste container (Mat. No. 87585).

18.4 Lovis 2000 M + Xsample 22

There are two filling options for sample changers with peristaltic pump:

Filling by pressure: The sample goes first from the needle to the pump and then from the pump to the instrument.

Filling by suction: The sample goes first to the instrument and then through the pump.

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- · Cutter or a pair of scissors

18.4.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 22 into the Lovis 2000 M Base Unit according to the Xsample instruction manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME onto the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Connect the cables according to Chapter 6.5.
- 6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

18.4.2 Connecting the Standard Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

 The sample filling unit may only be connected by authorized personnel who is fully trained to use the sample filling unit correctly and safely.

18.4.2.1 Filling by Pressure

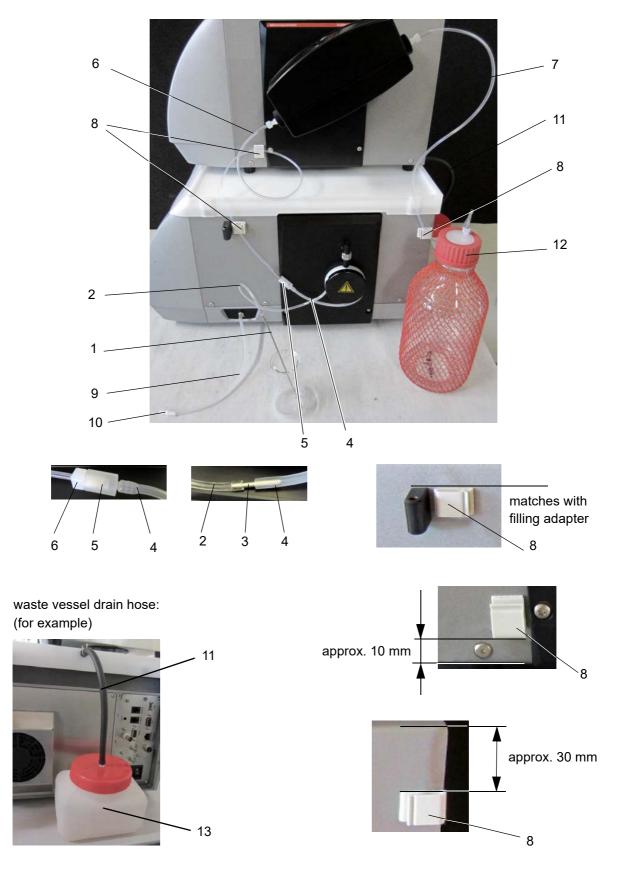


Fig. 18 - 14 Lovis + Xsample 22, standard hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Needle	Xsample 22	sample filling needle, to be placed in the sample beaker	67394
2	Hose Tygon 2375, 1.6x3.2 mm I = approx. 250 mm	Xsample 22	hose between needle and pump hose	67540
3	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 22	connector between Tygon hose and pump hose	67982
4	Hose silicone 2x4 mm; alternatively Hose 2x4 Viton® I = approx. 250 mm	Xsample 22 Lovis	pump hose	51273 54628
5	Adapter UNF/Hose (Female/Male)	Lovis ^a	connector for filling hose	26739
6	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	filling hose	25524
7	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose	25524
8	Cable clip self-adhesive	Lovis	hose guidance, 3 #	62072
9	Hose silicone 3x5 mm; I = approx. 200 mm	Lovis	air hose	50814
10	Adapter Luer cone	Lovis	tip for air hose	63863
11	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
12	Waste bottle 1 L glass	Optional	waste container	101655
13	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 22/320 122/520 (Mat. No. 101902).

1. Fix the cable clips (8) on the module housing ME and on the Lovis 2000 M base unit's housing as indicated in Fig. 18 - 14.

Needle - pump - Lovis inlet

- 2. Cut a piece of approx. 270 mm from the Tygon hose 1.6x3.2 (2).
- 3. Attach one end of this hose to the needle (1).
- 4. Connect the tube 2.1x2.4x20 mm (3) to the other end of the Tygon hose (2).
- **TIP** To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.
 - 5. Cut a piece of approx. 250 mm from the silicone hose 2x4 (4).
 - 6. Connect the silicone hose (4) to the free end of the tube 2.1x2.4x20 mm (3).
 - 7. Attach an adapter UNF/Hose (5) onto the free end of the silicone hose (4).

- 8. Turn the pump lever to the horizontal position and remove the cartridge. Coil the silicone hose around the peristaltic pump as shown in Fig. 18 14. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
- 9. Connect a hose 600x3x2 FEP (6) to the adapter UNF/Hose.
- 10. Refer to Fig. 18 15: Lead the end of the hose 600x3x2 (6) you have connected to the adapter UNF/Hose upwards and bend it carefully around the edge of the Lovis 2000 M Base Unit. Place the hose into cable clip mounted on the Lovis 2000 M Base Unit (8). Then bend the hose in front of the Lovis capillary block into the shape of a loop. Screw the hose connector into the Filling Adapter UNF Front Side on the Lovis capillary block. To hold the hose in place, fit it into the cable clip (8) mounted on the module housing ME.

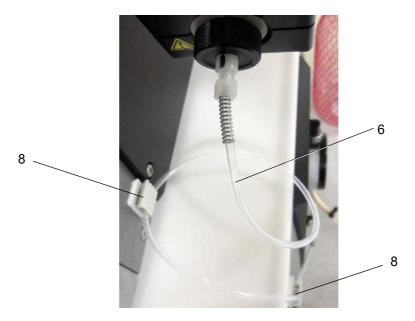


Fig. 18 - 15 Lovis + Xsample 22 - connecting the FEP hose to Lovis

11. Fit the hose 600x3x2 (6) into the cable clips (8).

Lovis outlet - waste container

- 12. Connect a further hose 600x3x2 FEP (7) to the Filling Adapter UNF Back Side Complete of the Lovis capillary block.
- 13. Fit the hose 600x3x2 (7) into the cable clip (8) and lead it into the waste vessel. Secure the hose, to prevent it from slipping off.
 When using the optional waste bottle glass 1 L, you can connect this hose directly to the cap of this bottle.

Drip plate - waste container

14. Trim the hose (11) coming from the drip plate to the required length. Connect it e.g. to the optional available waste bottle SVM 0.5 L (13) or any other suitable vessel. Secure the hose against slipping off.

Air hose

- 15. Cut a piece of approx. 200 mm from the silicone hose 3x5 (9). Attach an adapter Luer cone (10) onto one end.
- 16. Connect this hose to the AIR outlet of the Lovis 2000 M Base Unit.

Completing the installation

17. To put the measuring assembly into operation, continue with Chapter 24.

18.4.2.2 Filling by Suction

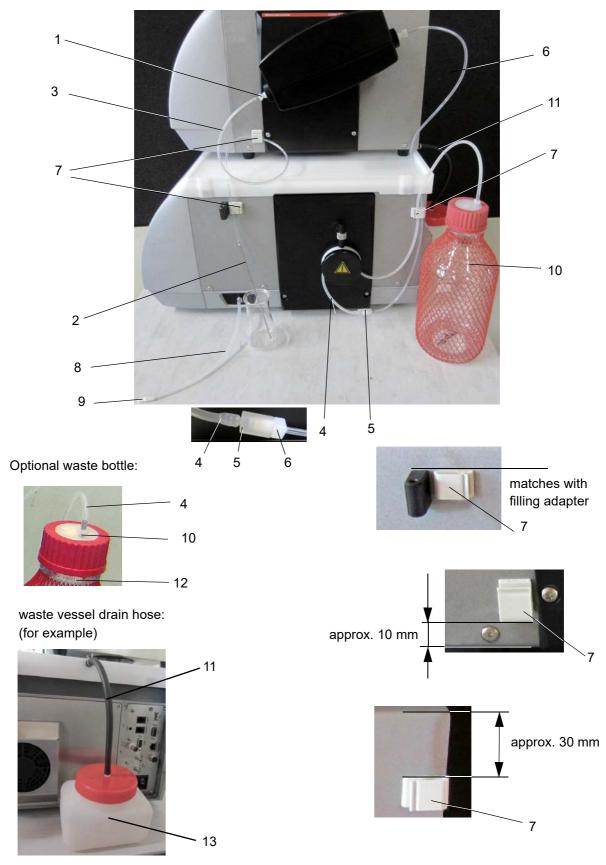


Fig. 18 - 16 Lovis + Xsample 22, standard hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Adapter UNF/screwed tube	Lovis ^a	hose connector front side of Lovis capillary block	18807
2	Needle	Xsample 22	sample filling needle, to be placed in the sample beaker	67394
3	Hose Tygon 2375, 1.6x3.2 mm I = approx. 500 mm	Xsample 22	hose between needle and pump hose	67540
	Hose silicone 2x4 mm	Xsample 22		51273
4	alternatively Hose 2x4 Viton® I = approx. 600 mm)	Lovis	pump/waste hose	54628
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
6	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to pump hose	25524
7	Cable clip self-adhesive	Lovis	hose guidance, 3 #	62072
8	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
9	Adapter Luer cone	Lovis	tip for air hose	63863
10	Adapter UNF/screwed tube	Lovis	to connect the waste hose to the optional waste bottle glass 1 L	18807
11	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
12	Waste bottle 1 L glass	Optional	waste container	101655
13	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 22/320 122/520 (Mat. No. 101902).

1. Fix the cable clips (7) on the module housing ME and on the master instrument's housing as indicated in Fig. 18 - 16.

Needle - Lovis inlet

- 2. Screw an adapter UNF/screwed tube (1) into the Filling Adapter UNF Front Side on the Lovis capillary block.
- 3. Cut a piece of approx. 500 mm from the Tygon hose 1.6x3.2 (3).
- 4. Refer to Fig. 18 17: Plug this Tygon hose (3) onto the adapter UNF/ screwed tube (1). Bend the hose in front of the Lovis capillary block into the shape of a loop. To hold the hose in place, fit it into the cable clip (7) mounted on the module housing ME. Connect the free end of the hose to the needle (2). Place the hose into cable clip mounted on the Lovis 2000 M Base Unit (8).

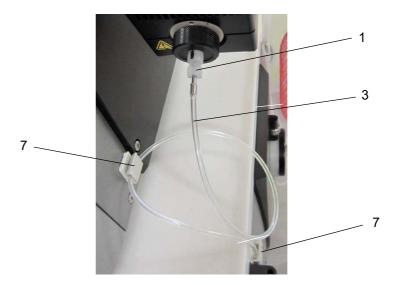


Fig. 18 - 17 Lovis + Xsample 22 - connecting the Tygon hose between needle and Lovis

TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.

Lovis outlet – pump – waste container

- 5. Connect a hose 600x3x2 FEP (6) to the Filling Adapter UNF Back Side Complete of the Lovis capillary block.
- 6. Cut a piece of approx. 600 mm from the silicone hose 2x4 (4).
- 7. Attach an adapter UNF/Hose (5) to one end of this hose.
- 8. Connect this end of the silicone hose (4) to the hose 600x3x2 FEP (6) which comes from the rear side of the Lovis capillary block.
- 9. Turn the pump lever to the horizontal position and remove the cartridge. Coil the silicone hose around the peristaltic pump as shown in Fig. 18 16. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
- 10. Fit the hose 600x3x2 (6) into the cable clip (7).
- 11. Lead the free end of the silicone hose (4) to the waste container. Fit the hose into the same cable clip (7) where you have placed the hose 600x3x2 (6). Secure the hose against slipping off.
 - If you use the optional waste bottle glass 1 L (10): Screw an adapter UNF/ screwed tube (10) into the insert of the bottle's screw cap. Plug the silicone hose (4) onto this adapter.

Drip plate - waste container

12. Trim the hose (11) coming from the drip plate to the required length. Connect it e.g. to the optional available waste bottle SVM 0.5 L (13) or any other suitable vessel. Secure the hose against slipping off.

Air hose

- 13. Cut a piece of approx. 200 mm from the silicone hose 3x5 (8). Attach an adapter Luer cone (9) onto one end.
- 14. Connect this hose to the AIR outlet of the Lovis 2000 M Base Unit.

Completing the installation

15. To put the measuring assembly into operation, continue with Chapter 24.

18.4.3 Connecting Chemically Resistant Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

 The sample filling unit may only be connected by authorized personnel who is fully trained to use the sample filling unit correctly and safely.

Required equipment:

- Retrofit kit for Xsample 22 Chemical (Mat. No. 96879) or
- Xsample 22 instruction manual

TIP If your application requires an improved chemical resistance, a Lovis chemical resistance upgrade set (Mat. No. 101899) is available. See Appendix B.3.

Refer to the Xsample 22 instruction manual:

Follow and adhere to all safety instructions and additional information given in section "Installing the Optional Kit for Resistant Hoses".

- 1. Switch off the master instrument.
- 2. In case of retrofitting, remove all standard hoses except the FEP hose connected to the rear side of the Lovis capillary block.

18.4.3.1 Filling by Pressure

Connect the hoses according to Fig. 18 - 18 and the table of parts below. Refer also to Chapter 18.4.2, further to the Xsample 22 instruction manual.

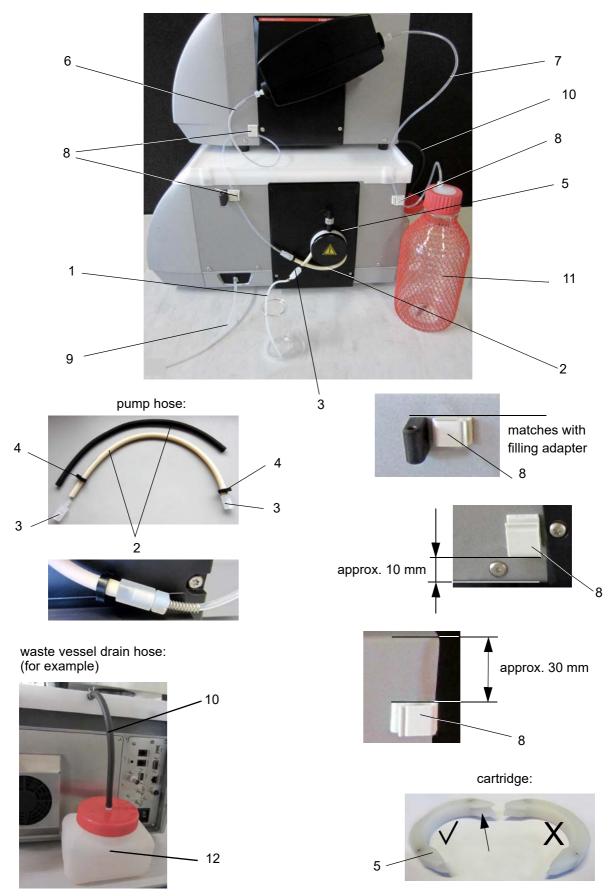


Fig. 18 - 18 Lovis + Xsample 22, chemically resistant hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose 190x3x2 PTFE 1x1/4"-28 UNF or	Retrofit kit Chemical	sample vessel to pump hose hose 650x3x2 can be trimmed to the	78453
'	Hose 650x3x2 FEP 1x1/4"-28 UNF	Lovis	required length depending on size and position of the sample vessel	24809
	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm	Retrofit kit		93980
2	or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm	or ordered separately	pump hose, chemically resistant	or 93982
3	Adapter UNF/Hose	Retrofit kit	hose connectors, pump hose	26739
4	Hose clip Dmin 5.8, Dmax 6.5	Retrofit kit	to secure the pump hose on the adapter UNF/Hose	21531
5	Cartridge PVDF 3.2x6.4	Retrofit kit	pump cartridge for chemically resistant hoses	94086
6	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to Lovis capillary block front side	25524
7	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to waste container	25524
8	Cable clip self-adhesive	Lovis	hose guidances, 3 #	62072
9	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
10	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
11	Waste bottle 1 L glass	Optional	waste container	101655
12	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. An alternative option to the plastic Waste bottle SVM 0.5 L is to use a glass bottle or the Safety waste container (Mat. No. 87585).

18.4.3.2 Filling by Suction

Connect the hoses according to Fig. 18 - 18 and the table of parts below. Refer also to Chapter 18.4.2, further to the Xsample 22 instruction manual.

Note - Preparing and connecting the sample filling hose:

Connect the hose 190x3x2 PTFE (or 650x3x2 FEP - trim this hose to the required length depending on the size and position of your sample beaker) (1) to the bottom of the Lovis filling adapter (A). Connect the hose 530x3x2 FEP to the top of the filling adapter and tighten the connector. Bend the hose as shown in Fig. 18 - 18. Connect the free end of this hose to the Filling Adapter UNF Front Side on the Lovis capillary block. To hold the hose in place, fit it into the cable clip (9) mounted on the bottom of the capillary block.

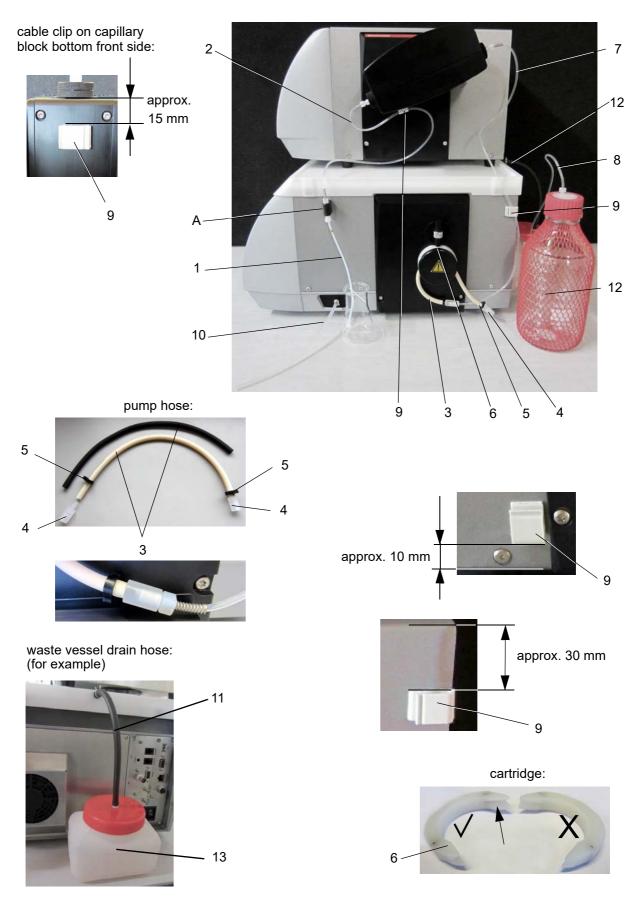


Fig. 18 - 19 Lovis + Xsample 22, chemically resistant hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose 190x3x2 PTFE 1x1/4"-28 UNF	Retrofit kit Chemical	filling hose, sample vessel to hose (2)	78453
2	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	hose from hose (1) to Lovis capillary block front side	25523
	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm	Retrofit kit		93980
3	or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm	or ordered separately	pump hose, chemically resistant	or 93982
4	Adapter UNF/Hose	Retrofit kit	hose connectors, pump hose	26739
5	Hose clip Dmin 5.8, Dmax 6.5	Retrofit kit	to secure the pump hose on the adapter UNF/Hose	21531
6	Cartridge PVDF 3.2x6.4	Retrofit kit	pump cartridge for chemically resistant hoses replaces the standard cartridge	94086
7	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to pump hose	25524
8	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; pump hose to waste container	25524
9	Cable clip self-adhesive	Lovis	hose guidance, 3 #	62072
10	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
11	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
12	Waste bottle 1 L glass	Optional	waste container	101655
13	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS™ 22/320 122/520 (Mat. No. 101902).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. An alternative option to the plastic Waste bottle SVM 0.5 L is to use a glass bottle or the Safety waste container (Mat. No. 87585).

18.5 Lovis 2000 M + Xsample 530

From software version 2.70 on, you can operate Lovis 2000 M with the automatic sample changer Xsample 530. From software version 2.80 on, a sample recovery unit (SRU) is available for Xsample 530. Refer also to the Recommended Configurations in the Lovis 2000 M/ME Product Description List supplied on the customer USB storage device.

A combination of Lovis 2000 M/ME with Option Low Temperature and Xsample 530 is available on request only.

Please contact support-visco@anton-paar.com.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device)

18.5.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 530 into the Lovis 2000 M Base Unit according to Chapter 6.4.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME onto the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Connect the cables according to Chapter 6.5.
- 6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.
- 7. Prepare the Lovis crush protection according to Chapter 17.2.

18.5.2 Connecting the Hoses



WARNING

Liquids leaking from the instrument due to improper installation may cause injuries and risk of fire.

The sample changer may only be connected by authorized personnel who
is fully trained to use the sample changer correctly and safely.

If using a sample recovery unit (SRU), please refer to the Xsample 530 Instruction Manual for installing it and connecting its hoses. Connect all other hoses as described in this chapter.

NOTICE

If using an SRU, the Adapter UNF-UNF (2; Fig. 18 - 20), which connects the Lovis inlet hose (1) and hose "Cell – Needle" (5) must be placed **below** clip (9), **not between** clip (8) and (9). Otherwise there is a risk that the needle hose (5) rubs against or gets caught on the SRU and is damaged. See Fig. 18 - 21.

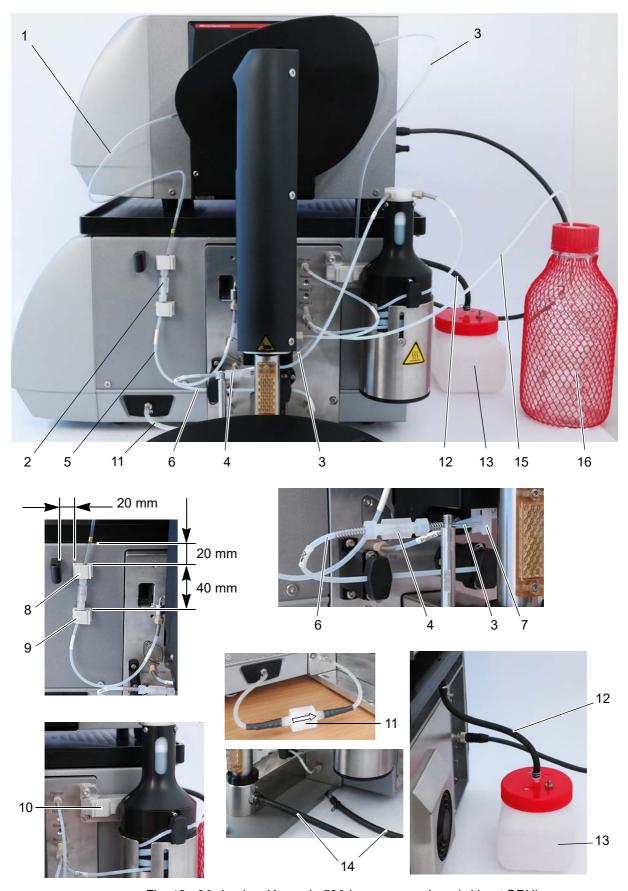


Fig. 18 - 20 Lovis + Xsample 530 hose connections (without SRU)

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose 530x3x2 FEP 2x1/4"-28 UNF "C"	Lovis	Adapter UNF-UNF from Xsample hose "Cell – Needle" to Lovis capillary block front	25523
2	Adapter UNF-UNF	Lovis ^a	Connects Xsample hose "Cell – Needle" and hose no. 1	64790
3	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis capillary block rear to Xsample hose "Cell – Sense"	25524
4	Adapter UNF-UNF	Lovis ^a	Connects Xsample hose "Cell – Sense" and hose no. 3	64790
5	Xsample hose "Cell – Needle" (pre-assembled)	Xsample	Connection to Xsample needle	110151
6	Xsample hose "Cell – Sense" (pre-assembled)	Xsample	Connection to liquid sensor	110152
7	Hose clip (pre-assembled)	Xsample	Guidance for hose no. 3 and hose "Piston pump – 1"	
8, 9	Cable clip self-adhesive	Lovis	Guidance for hose no. 1	62072
10	Cable clip self-adhesive	Lovis	Guidance for hose no. 3	62072
11	Check valve with silicone air hose 3x5 (pre-assembled)	Xsample	Connects the internal air pump of the master instrument with connector "Low" on Xsample	166080
12	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	Drain hose from drip plate	72546 21307
13	Waste Bottle SVM 0.5 L	Lovis	Waste vessel for drain hose	17822
14	2 x 1.5 m waste hose 5x8 Viton-BK ISO Versinic, pre-assembled	Xsample	Drain liquid from the waste nozzles on the cleaning tubular and on the Xsample magazine support to a waste container	72546
15	Rinse hose 750x3x2 PTFE 1x1/4"-28 UNF	Xsample	Connects "Rinse 1"/ "Rinse 2"/ "Rinse 3" to the rinse bottle	110156
16	Rinse bottle	Xsample	Bottle containing cleaning liquid	21312

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+XS 352/452/530 (Mat. No. 101900).

On Xsample 530 most hoses are pre-assembled. See the Xsample 530 instruction manual.

Fix the cable clips (8, 9 and 10) as shown in Fig. 18 - 20. The specified distances are approximate values.

Needle - Lovis inlet

 Connect one end of the hose 530x3x2 (1) and the free end of the Xsample hose "Cell – Needle" (5) with the adapter UNF-UNF (2). Bend the hose (1) as shown in Fig. 18 - 20. Screw the free end of hose (1) into the Filling Adapter UNF Front Side on the Lovis capillary block.

2. Fix the adapter UNF-UNF (2) between the cable clips (8 and 9).

If using a sample recovery unit (SRU), fix the adapter UNF-UNF (2) below cable clip (9) as shown in Fig. 18 - 21.

NOTICE

Otherwise there is a risk that the needle hose (5) rubs against or gets caught on the SRU and is damaged.

Fix the hose 530x3x2 (1) in cable clip (8) to stabilize it. Bend the hose into a loop (counter-clockwise) as shown in Fig. 18 - 21 before connecting it to the Filling Adapter UNF Front Side on the Lovis capillary block.

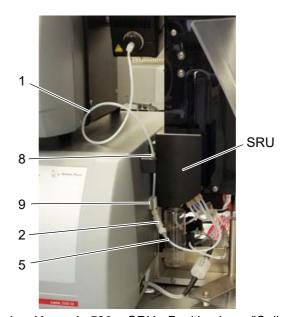


Fig. 18 - 21 Lovis + Xsample 530 + SRU - Position hose "Cell – Needle"

Lovis outlet - Xsample hose "Cell - Sense"

- 3. Screw an adapter UNF-UNF (4) to the free end of the pre-assembled hose "Cell Sense" (6) of the Xsample 530.
- 4. Connect one end of the hose 600x3x2 (3) to the Filling Adapter UNF Back Side Complete on the Lovis capillary block. Guide the hose downwards and through the opening below the Xsample 530 carriage (behind the cleaning tubular with the reflector). Screw the free end of hose (3) into the adapter UNF-UNF (4).
- 5. Fit hose 600x3x2 (3) into hose clip (7) from below. This clip also holds Xsample hose "Piston pump 1".
- 6. Bend the hose 600x3x2 (3) as shown in Fig. 18 20 and fit it into cable clip (10) on the support of the piston pump.

Air hose

7. Attach the free end of the pre-assembled Xsample 530 silicone hose 3x5 mm of the check valve (11) to the "AIR" nozzle of the Lovis 2000 M Base Unit. See arrow on the check valve.

NOTICE

Ensure that the check valve does not rub against the attached magazine. Ensure that the silicone hose is not bent or kinked, else the airflow cannot reach the measuring system.

Drip plate - waste container

8. Trim the hose (12) coming from the drip plate to the required length, connect it to a suitable waste vessel (13; e.g. as shown in Fig. 18 - 20) and secure it against slipping off.

Waste hoses

9. Connect one waste hose (14) each to the waste nozzle on the cleaning tubular and to the waste nozzle on the Xsample magazine support. Connect the free ends of the waste hoses either to the optional safety waste container or to the customer's waste container according to the Xsample 530 instruction manual.

Rinsing hoses

10. Prepare and connect the rinsing hose(s) (15) and the solvent bottle(s) (16) according to the Xsample 530 instruction manual.

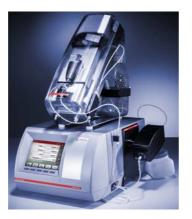
Completing the installation

- 11. Attach the magazine according to the Xsample 530 instruction manual.
- 12. Ensure that the crush protection is mounted; see Chapter 17.2. Attach and use the safety shield according to the Xsample 530 instruction manual. Avoid to squeeze or kink the hoses leading to and from the Lovis capillary block.
- 13. To put the measuring assembly into operation, continue with Chapter 24.

NOTICE

This measuring assembly should not be used with compressed air for filling and drying the measuring system. Using compressed air could damage the Lovis capillary adapters.

18.6 Lovis 2000 M + Xsample 340



From software version "Service Release 2.81 for Xsample 340" on, you can operate Lovis 2000 M with the modular syringe filling device Xsample 340. Refer also to the Recommended Configurations in the Lovis 2000 M/ME Product Description List supplied on the customer USB storage device.

Fig. 18 - 22Lovis 2000 M + Xsample 340 with cleaning option

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device)

18.6.1 Preparing Master Instrument and Modules

- 1. Place the drip plate on top of the Lovis 2000 M master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 2. Place the Xsample 340 on the drip plate on top of the master instrument and make sure that it stands solidly on all four feet.
- 3. Connect the cables and the CAN terminating resistor:
 - Take the CAN cable from the Xsample 340 accessories.
 - Plug the male connector of the CAN cable into the CAN interface of the master instrument and tighten the fixing screw using moderate force.
 - Plug the female connector of the CAN cable into the "CAN in" interface on the rear of Xsample 340 and tighten the fixing screw.
 - Plug the CAN terminating resistor from the Xsample 340 accessories to the "CAN out" interface on the rear of Xsample 340. Tighten the fixing screw.

Refer also to the Xsample 340 Instruction Manual.

- Connect the Lovis 2000 M to the mains according to Chapter 6.3.
- 4. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

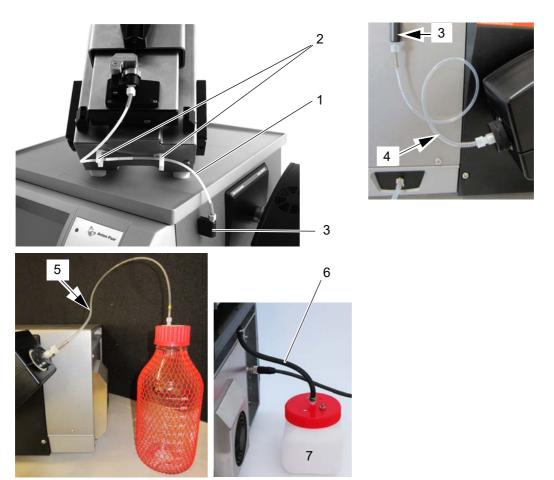
18.6.2 Connecting the Hoses



WARNING

Liquids leaking from the measuring assembly due to improper installation may cause injuries and risk of fire.

The filling device may only be connected by authorized personnel who is fully trained to use the filling device correctly and safely.



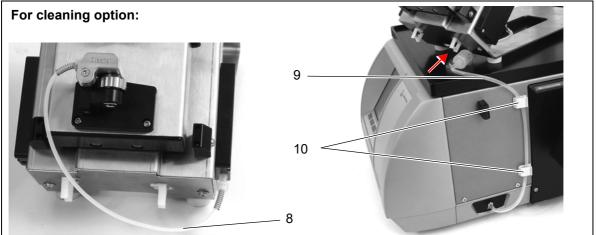


Fig. 18 - 23 Lovis + Xsample 340 hose connections

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose "Tefzel – Peek"	Xsample	Outlet of Xsample's Luer adapter to Lovis filling support	164798
2	Hose holders	mounted on Xsample	Guidance for hose no. 1	
3	Filling support	mounted on Lovis	Connects Xsample hose "Tefzel – Peek" (no. 1) and hose no. 4	
4	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Filing support to Lovis capillary block front	25525
5	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis capillary block rear to waste container	25523
6	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	Drain hose from drip plate	72546 21307
7	Waste Bottle SVM 0.5 L	Lovis	Waste vessel for drain hose	17822
Addi	tional hoses for Xsample 340 with cle	aning option - if	using them, connect these hoses fire	st
8	Hose "Cleaner" 180x3x2 2x1/4"-28 UNF	Xsample	Connector "cleaner" on Xsample's distributor plate to inlet of Xsample's cleaner unit	164802
9	Check valve with silicone air hose (pre-assembled)	Xsample	Lovis "AIR" nozzle to "Pressurized Air" nozzle on Xsample's distributor plate. !!! The arrow on the valve must point away from the Lovis "AIR" nozzle !!!	166080
10	Cable clip self-adhesive	Lovis	Guidance for silicone hose no. 8	62072

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Lovis Flow-through filing set (Mat. No. depends on capillary diameter - see Lovis 2000 M/ME Product Description List).

If using Xsample 340 with cleaning option, refer to the Xsample 340 Instruction Manual for connection of the rinsing hoses and rinsing bottles. If using compressed air for drying, also refer to the Xsample 340 Instruction Manual.

TIP: If using Xsample 340 with cleaning option, it is easier to mount the hoses for cleaning BEFORE connecting the hoses to the Lovis 2000 M.

Xsample 340 - Lovis inlet

- Swing the safety cover of Xsample 340 open. Take one hose labeled "Tefzel – Peek" from the Xsample 340 accessories. Screw the end "Peek" into the outlet of the Luer adapter of Xsample 340.
- 2. Screw the free end "Tefzel" into the top of the Lovis Filling Support (3). Put the hose (1) into the two hose holders (2) of Xsample 340.

3. Take the hose 350x3x2 FEP (4) of the Lovis capillary set for flow-through filling. Fasten one end to the Filling Support (3) from below. Bend the hose into a loop:

TIP Avoid sharp bends or kinks!

- Take the free end of the hose and bend it sideways towards the capillary block. Guide it counter-clockwise into a wide loop.
- Fasten the free end to the Filling Adapter UNF which projects from the Lovis capillary block.

Lovis outlet - Waste

The hose 530x3x2 FEP (5) serves as connection to the waste bottle.



CAUTION

A light-weight waste vessel (like the plastic vessel of the standard delivery) will move around at the end of the waste hose when the Lovis capillary block turns. It could easily tilt and waste liquid would spill out.

Use the waste bottle glass 1 L which is massive enough to prevent undesirable movement and comes with a break protection or the optional safety waste container.

4. Fasten one end of the waste hose (5) to the Filling Adapter UNF on the back side of the Lovis capillary block.

Fasten the other end to the screw cap of the waste bottle.

Drip plate - waste container

5. Trim the hose (6) coming from the drip plate to the required length, connect it to a suitable waste vessel (7; e.g. as shown in Fig. 18 - 23) and secure it against slipping off.

Xsample "Cleaner" hose (for Xsample 340 with cleaning)

- 6. Screw the hose end labeled "Cleaner" (8) into the connector "Cleaner" of the distribution plate of Xsample 340.
- 7. Screw the free end into the inlet of the cleaner unit of Xsample 340.

NOTICE

To avoid buckling the hose "Cleaner", do not put it into the Xsample's hose holder.

Check valve with silicone air hose

8. The check valve and the silicone air hose (9) come pre-assembled with Xsample 340.

NOTICE

- Mount the check valve in the correct flow direction. Air flows from the Lovis "AIR" nozzle to the connector "Pressurized Air" on the Xsample 340.
 Therefore, the arrow on the valve must point away from the Lovis "AIR" nozzle (see arrow in Fig. 18 - 23).
- Ensure that the hose is not buckled, or else the airflow cannot reach the measuring system.
- 9. Connect the right end of the silicone hose (9) to the Lovis "AIR" nozzle.
- 10. Put the check valve on the drip plate and lead the hose below the rack of Xsample 340.
- 11. Cut the silicone hose to the required length and attach the free end of the silicone hose to the "Pressurized Air" nozzle on the distributor plate of Xsample 340.
- 12. Fix two cable clips (10) on the side of Lovis 2000 as shown in Fig. 18 23. Secure the silicone hose (9) with the cable clips. Guide the air hose close to the instrument's side. It must not get entangle with the moving hose 350x3x2 FEP (4) which is connected to the capillary block.

NOTICE

The valve must be placed on the drip plate.

Completing the installation

- 13. Make sure all hose connectors are properly tightened (finger tight).
- 14. Close the safety cover according to the Xsample 340 instruction manual. Avoid to squeeze or kink the hoses leading to and from the Lovis capillary block.
- 15. To put the measuring assembly into operation, continue with Chapter 24.

19 Lovis 2000 ME + DMA M / DSA M + Xsample

For operating Lovis 2000 ME together with a DMA M / DSA M and a sample changer, the sample changer must always be mounted into the density meter. The Lovis 2000 ME is to be mounted into the additional Module Housing Lovis ME, which must be placed onto the density meter.

In such an assembly the density meter works as "master".

NOTICE

For more convenient connection of the hoses, the Lovis capillary block can be turned manually. To do this, ensure that the master instrument is switched off. Do not turn the Lovis capillary block when the power is on, as this may cause damage to its drive.

19.1 Lovis 2000 ME + DMA M + Xsample 352/452

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

19.1.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 352/452 into the DMA M according to the Xsample 352/452 instruction manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.
- 5. Place the Module Housing Lovis ME on the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 6. Connect the cables according to Chapter 6.5.
- 7. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

19.1.2 Connecting the Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

The sample changer may only be connected by authorized personnel who
is fully trained to use the sample changer correctly and safely.

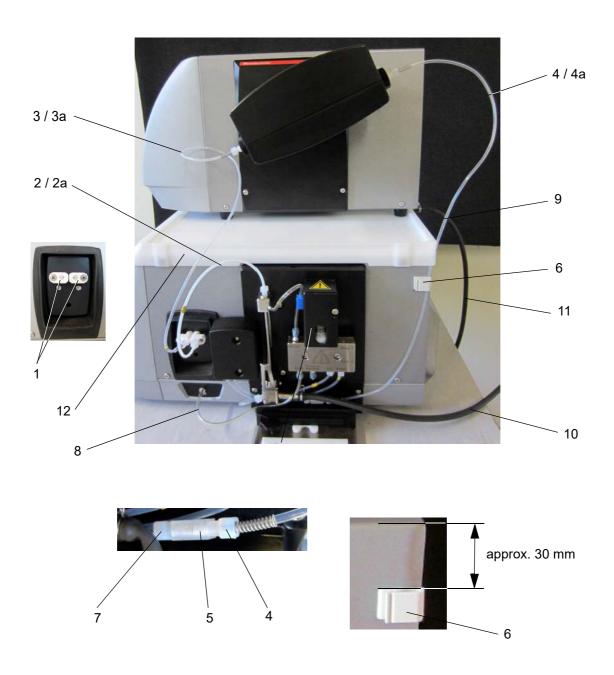


Fig. 19 - 1 Lovis + DMA M + Xsample 352/452 hose connections

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4"	Xsample 352/ 452	Filling adapters for DMA M	159025
2	Hose 300x3x2 PTFE 2x1/4"-28 UNF, marked "AA"	Xsample 352/ 452	Hose between needle and density cell inlet	3443
or 2a	or for low volume setup: Hose 300x3x1 FEP (or PTFE) 2x1/4"-28 UNF; marked "B"	optional ^a		21875
3	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	density cell outlet to Lovis capillary block front side	25523
or 3a	"C" or for low volume setup: Hose 530x3x1 FEP (or PTFE) 2x1/4"-28 UNF (low volume)	optional ^a		75860
4	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis		25524
or 4a	or for low volume setup: Hose 600x3x1 FEP (or PTFE) 2x1/4"-28 UNF (low volume)	optional ^a	Lovis capillary block rear side to Xsample sensor hose	21874
5	Adapter UNF/UNF	Lovis	Connects Xsample sensor hose and hose No. 4	64790
6	Cable clip self-adhesive	Lovis	Hose guidance	62072

- a. Optional: Item is part of the Low Volume Hose Set Lovis Xsample 352/452 (Mat. No. 101906) or Low Volume Hose Set Lovis Xsample PTFE (Mat. No. 171900)
- b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+Xsample 352/452 (Mat. No. 101903).

On Xsample 352/452 most hoses are pre-assembled. See the Xsample 352/452 instruction manual.

 Replace the currently installed injection adapters of the DMAM by the injection adapters UNF (1) supplied with the Xsample 352/452. To do this refer to the Xsample 352/452 instruction manual.

Needle - master instrument inlet

2. Connect one end of the hose 300x3x2 PTFE (2) to the top of the Xsample needle, the other end to the inlet of the density cell.

Master instrument outlet - Lovis inlet

3. Connect one end of the hose 530x3x2 (3) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block into the shape of a wide loop. It may be helpful to attach the safety cover for this purpose. Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block. See Fig. 19 - 2.

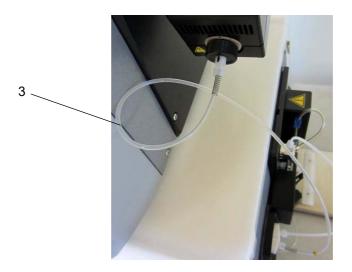


Fig. 19 - 2 Lovis + DMA M + Xsample 452 - Connecting the hose between DMA M and Lovis

Lovis outlet - Xsample sensor hose

- 4. Lead the free end of the pre-assembled hose "BA" (sensor hose) of the Xsample 352/452 (7) to the rear side and attach an adapter UNF-UNF (5).
- 5. Connect one end of the hose 600x3x2 (4) to the Filling Adapter UNF Back Side Complete of the Lovis capillary block. Screw the other end into the adapter UNF-UNF (5).
- 6. Fix the cable clip (6) on the master instrument's casing approx. 30 mm below the upper edge.
- 7. Fit the hose 600x3x2 (4) into the cable clip (6).

Air hose

8. Connect the air hose of the Xsample 352/452 (8) to the AIR connector of the DMA M.

Waste hose

9. Connect the waste hose (10) either to the optional safety waste container or to an other waste container. Refer to the Xsample 352/452 instruction manual.

Rinsing hose(s)

10. Prepare and connect the rinsing hose(s) (9) and the solvent bottle(s) according to the Xsample 352/452 instruction manual.

Drip plate - waste container

11. Connect the drain hose (11) coming from the rear side of the drip plate (12) either to the waste container where you have connected already the waste hose or to a separate waste vessel and secure it against slipping off. As a separate vessel you can use e.g. the waste vessel 500 mL (Mat. No. 6210) supplied with the DMA M/DSA M, see Fig. 19 - 16.

Completing the installation

12. Attach the magazine (1 - if applicable) and the safety cover (2) according to the Xsample 352/452 instruction manual. See Fig. 19 - 3. Ensure that the edge protection of the Xsample safety cover and the crush protection are mounted; see Chapter 17.2. When attaching the safety cover, lead the hose which is connected between the density cell and the front side of the Lovis capillary block through the slit in the metal part of the safety cover (see arrow).

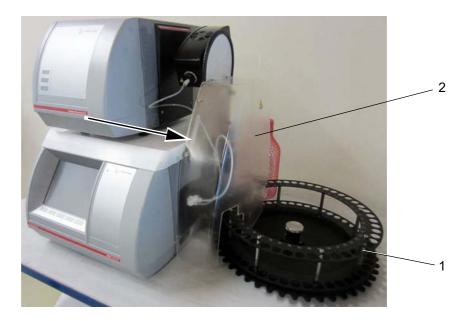


Fig. 19 - 3 Lovis + DMA M + Xsample 352/452 complete

13. To put the measuring assembly into operation, continue with Chapter 24.

19.1.3 Low Volume Setup

Required equipment:

 Low Volume Hose Set Lovis Xsample 352/452 (Mat. No. 101906) or Low Volume Hose Set Lovis PTFE (Mat. No. 171900)

For further details see the product description list (PDL) on the USB storage device supplied with your Lovis 2000 M/ME.

To mount the low volume hoses, refer to Chapter 19.1.2. For assemblies without DMA M/DSA M see Chapter 18.1.2.

Minimum required sample volume see Appendix A.5.

19.2 Lovis 2000 ME + DMA M + Xsample 52

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Cutter or a pair of scissors

19.2.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 52 into the DMAM according to the Xsample 52 instruction manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME on the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

19.2.2 Connecting the Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

 The sample filling and rinsing unit may only be connected by authorized personnel who is fully trained to use the sample filling and rinsing unit correctly and safely.

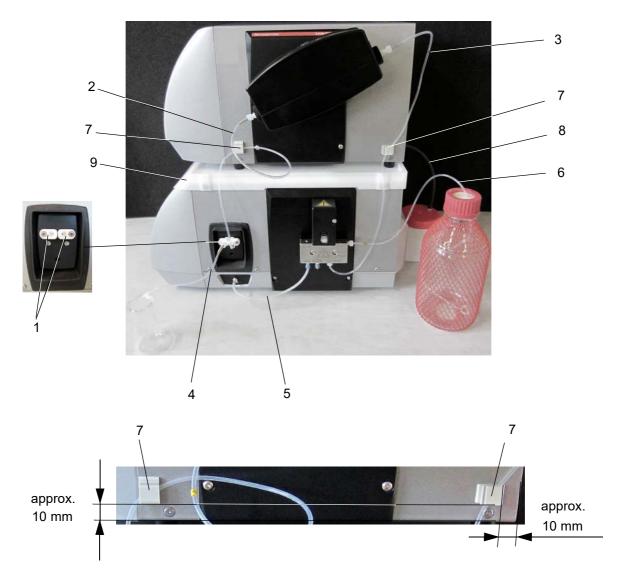


Fig. 19 - 4 Lovis + DMA M + Xsample 52 hose connections

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4"	Xsample 52	Filling adapter for DMA M	159025
2	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	density cell outlet to Lovis capillary block front side	25523
3	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to "Cell" connector on valve block Xsample 52	25524
4	Hose 300x3x2 PTFE 1x1/4"-28 UNF	Lovis	sample filling hose; sample vessel - density cell inlet	109047
5	Hose silicone 2x4 mm I = approx. 200 mm	Xsample 52	air hose	51273
6	Hose 750x3x2 PTFE 1x1/4"-28 UNF	Xsample 52	hose(s) for rinsing liquid(s)	21230
7	Cable clip self-adhesive	Lovis	hose guidance, 2 pcs.	62072

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 52/330 (Mat. No. 101904).

- 1. Replace the currently installed injection adapters of the DMAM by the injection adapters UNF (1) supplied with the Xsample 52. To do this refer to the Xsample 52 instruction manual.
- 2. Fix the cable clips (7) on the module housing ME as indicated in Fig. 19 4.

Sample vessel – master instrument inlet

3. Connect the hose 300x3x2 (4) to the inlet of the density cell. Bend it according to the shape and size of your sample vessel.

TIP For low-viscosity samples (below approx. 5 mPa.s), elevate the position of the sample vessel to improve the stability of the liquid column in the system. This leads to better repeatable results. If not connected to the drip plate, use e.g. the waste vessel 500 mL supplied with the DMA M to place the sample vessel on. Or take something similar with a height of approx. 10 cm, e.g. the box of a standard bottle. Best results can be achieved, if the bottom of the sample vessel is on the same height as the connecting nozzles of the density meter (approx. 12.5 cm). See Fig. 19 - 5.



Fig. 19 - 5 Lovis + DMA M + Xsample 52: elevated sample vessel

Master instrument outlet - Lovis inlet

4. Connect one end of the hose 530x3x2 (2) to the outlet of the density cell. Carefully bend the hose into the shape shown in Fig. 19 - 6. Screw the other end into the Filling Adapter UNF Front Side on the Lovis capillary block. Fit the hose into the cable clip (7).

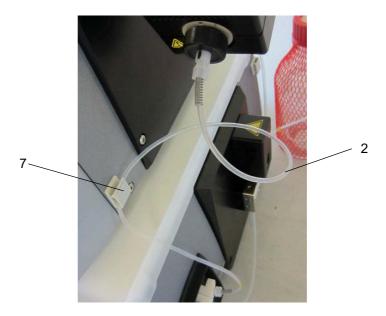


Fig. 19 - 6 Lovis + DMA M + Xsample 52 - Mounting the hose between DMA M and Lovis

Lovis outlet - Xsample valve block

5. Connect one end of the hose 600x3x2 (3) to the Filling Adapter UNF Back Side Complete of the Lovis capillary block. Screw the other end into the "Cell" connector on the Xsample 52 valve block, then fit the hose 600x3x2 (3) into the cable clip (7).

Air hose

- 6. Cut a piece of approx. 200 mm from the silicone hose 2x4 (5).
- 7. Connect this hose to the AIR outlet of the DMA M and to the "AIR IN" nozzle of the Xsample 52 valve block.

Rinsing hose(s)

8. Prepare and connect the rinsing hose(s) (6) and the solvent bottle(s) according to the Xsample 52 instruction manual.

Drip plate - waste container

9. Connect the drain hose (8) coming from the rear side of the drip plate (9) either to the waste container where you have connected already the waste hose or to a separate waste vessel and secure it against slipping off. As a separate vessel you can use e.g. the waste vessel 500 mL supplied with the DMA M, see Fig. 19 - 16.

Completing the installation

10. To put the measuring assembly into operation, continue with Chapter 24.

19.3 Lovis 2000 ME + DMA M / DSA M + Xsample 122/ 520

There are two filling options for sample changers with peristaltic pump:

Filling by pressure: The sample goes first from the needle to the pump and then from the pump to the instrument.

Filling by suction: The sample goes first to the instrument and then through the pump.

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- Cutter or a pair of scissors
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

19.3.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 520 into the DMA M or DSA M according to the Xsample 520 instruction manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.
- 5. Place the Module Housing Lovis ME on the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.

6. For assemblies with pressurized filling: Mount the cable clips on the rear side of the Module Housing Lovis ME according to Fig. 19 - 7 and all other as described in the respective sections.



Fig. 19 - 7 Mounting the cable clips

For assemblies with filling by suction: Mount the cable clips as indicated in the respective description.

- 7. Connect the cables according to Chapter 6.5.
- 8. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

19.3.2 Connecting the Standard Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

• The sample changer may only be connected by authorized personnel who is fully trained to use the sample changer correctly and safely.

19.3.2.1 Filling by Pressure

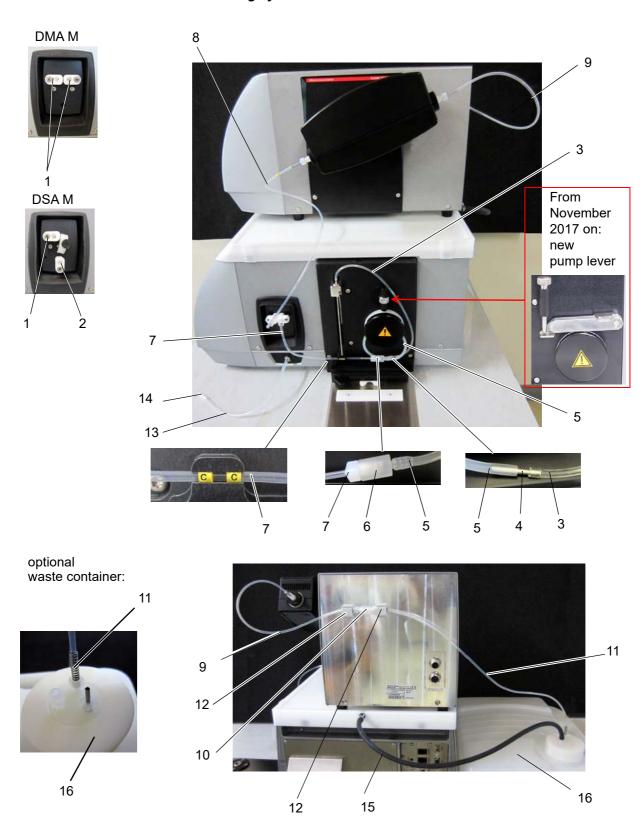


Fig. 19 - 8 Lovis + DMA M/DSA M + Xsample 122/520, standard hoses; pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	DMA M: filling adapter density cell in-/outlet DSA M: filling adapter density cell outlet	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapter sound velocity cell inlet	159024
3	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
4	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
5	Hose silicone 2x4 mm alternatively: Hose 2x4 Viton® I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273 54628
6	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
7	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet or sound velocity cell inlet	25540
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
10	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 600 mm to waste	64790
11	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; adapter UNF/UNF to waste container	25524
12	Cable clip self-adhesive	Lovis	hose guidance	62072
13	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
14	Adapter Luer cone	Lovis	tip for air hose	63863
15	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
16	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).

1. When using a DMA M: Replace the currently installed injection adapters of the DMA M by the injection adapters UNF (1). To do this refer to the Xsample 520 instruction manual.

b. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

2. When using a DSA M: Replace the currently installed injection adapters by an injection adapter UNF (1) for the outlet of the density cell and an injection adapter UNF 1/4" DSA (2) for the inlet of the sound velocity cell. To do this refer to the Xsample 520 and DSA M instruction manual.

Needle - pump - master instrument

- 3. Cut a piece of approx. 270 mm from the Tygon hose 1.6x3.2 (3).
- 4. Connect the steel tube 2.1x2.4x20 mm (4) to the Tygon hose (3).
- 5. Cut a piece of approx. 250 mm from the silicone hose 2x4 (5). Alternatively, if you need a better chemical resistance, you can also use the Viton® hose 2x4 supplied with the Lovis accessories.
- 6. Plug the silicone (or alternatively Viton®) hose (5) onto the free end of the steel tube (4).
- 7. Attach an adapter UNF/Hose (6) onto the free end of the silicone (or Viton®) hose.
- 8. Plug the Tygon end of this assembled hose onto the top of the needle.
- TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.
 - 9. Turn the pump lever into horizontal position and remove the cartridge. Coil the silicone (or Viton®) part of this assembled hose around the peristaltic pump. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
 - 10. Connect the hose 220x3x2 FEP 2x1/4"-28 (7) between the adapter UNF/ Hose (6) and the inlet of the density cell. When using a DSA M, connect this hose to the inlet of the sound velocity cell. Position the marker rings "C" this way, that they fit into the hose holder on the Xsample 520. Secure the hose by placing it into the hose holder.

Master instrument outlet - Lovis inlet

11. Refer to Fig. 19 - 9: Connect one end of the hose 530x3x2 (8) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block into the shape of a loop. It may be helpful to attach the safety cover for this purpose (as shown in Fig. 19 - 11). Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block.

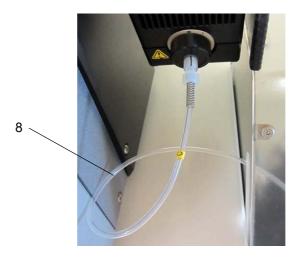


Fig. 19 - 9 Lovis + DMA M + Xsample 520 pressure filling - connecting the hose between Lovis and DMA

Lovis outlet - waste container

- 12. Connect the hose 350x3x2 FEP 2x1/4"-28 UNF (9) and the hose 600x3x2 FEP 2x1/4"-28 UNF (11) with an adapter UNF/UNF (10).
- 13. Screw the free end of the hose 350x3x2 into the Filling Adapter UNF Back Side Complete of the Lovis capillary block. Bend the hose as indicated in Fig. 19 8 and secure it by placing the hose connectors with their springs in the cable clips.
- 14. Lead the free end of the hose 600x3x2 to a waste container and secure the hose against slipping off. When using the optional waste container 8 L HDPE, you can screw the connector of the hose directly into the screw cap of this container.

Drip plate - waste container

15. Trim the hose (15) coming from the drip plate to the required length and connect it either to the waste container or to a separate vessel and secure it against slipping off. As a separate vessel you can use e.g. the waste vessel supplied with the DMA M, see Fig. 19 - 16.

Air hose

16. Cut a piece of approx. 200 mm from the silicone hose 3x5 (11). Attach an adapter Luer cone (12) onto one end.

17. Connect this hose to the AIR outlet of the DMA M or DSA M.

Completing the installation

- 18. Attach the magazine and the safety cover according to the Xsample 520 instruction manual. Ensure that the edge protection of the Xsample safety cover and the crush protection are mounted; see Chapter 17.2. Lead the hose, which is connected between the density cell and the front side of the Lovis capillary block, through the slit in the metal part of the safety cover. For an assembly with attached magazine and safety cover see Fig. 19 13.
- 19. To put the measuring assembly into operation, continue with Chapter 24.

19.3.2.2 Filling by Suction

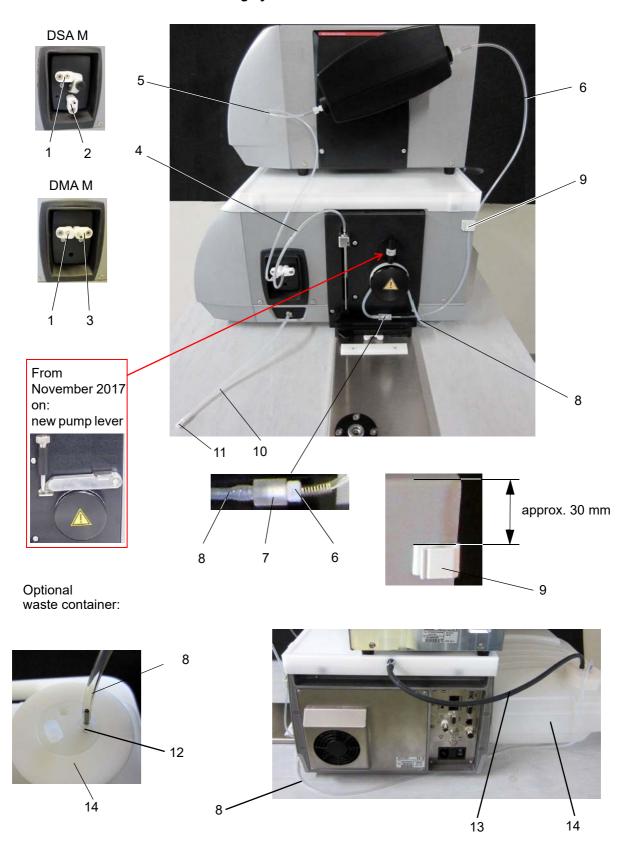


Fig. 19 - 10 Lovis + DMA M/DSA M + Xsample 122/520, standard hoses; filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell outlet	159025
2	Injection adapter fitting DSA	DSA M	filling adapter sound velocity cell inlet	159961
3	Injection adapter fitting	Xsample 520	filling adapter density cell inlet	159536
4	Hose Tygon 2375, 1.6x3.2 mm; approx. 270 mm	Xsample 520	filling hose, needle - density cell inlet (DMA M) or sound velocity cell inlet (DSA M)	67540
5	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
6	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side - pump hose	25524
7	Adapter UNF/Hose (Female/Male)	Lovis	connector for filling hose	26739
	Hose silicone 2x4 mm; alternatively:	Xsample 520		51273
8	Hose 2x4 Viton® I = min. 600 mm but depends on where the waste container is placed	Lovis	pump and waste hose	54628
9	Cable clip self-adhesive	Lovis	hose guidance	62072
10	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
11	Adapter Luer cone	Lovis	tip for air hose	63863
12	Adapter UNF/screwed tube	Lovis; optional waste container	to connect the pump hose to the optional waste bottle	18807
13	Hose Viton 5 x 8 with Hose clamp Dmin 8.8 - Dmax 9.3 length depends on where the waste container is placed	Drip plate	drain hose from the drip plate	72546 21307
14	Waste container 8 L HDPE	Optional	waste container	105979
15	Tube d=2.1 D=2.4 L=20; 1.4571	Lovis	optional use to split the silicone hose 2x4 used as pump and waste hose.	67982

- a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).
 - 1. When using a DMA M: Replace the currently installed injection adapters of the DMA M by an injection adapter UNF (1) for the outlet and an injection adapter fitting (3) for the inlet of the density cell. Refer to the Xsample 520 instruction manual.
 - 2. When using a DSA M: Replace the currently installed injection adapters by an injection adapter UNF (1) for the outlet of the density cell and an injection adapter fitting DSA (2) for the inlet of the sound velocity cell. Refer to the Xsample 520 and DSA M instruction manual.

Needle - master instrument

3. Cut a piece of approx. 270 mm from the Tygon hose 1.6x3.2.

- 4. Plug the Tygon hose (4) onto the needle top of Xsample 520.
- When using a DMA M: Connect the other end of the Tygon hose to the injection adapter fitting on the DMA (3).
 When using a DSA M: Connect the other end of the Tygon hose to the injection adapter fitting DSA (2).
- TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.

Master instrument - Lovis inlet

6. Refer to Fig. 19 - 11: Connect one end of the hose 530x3x2 (5) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block into the shape of a loop. It may be helpful to attach the safety cover for this purpose. Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block.

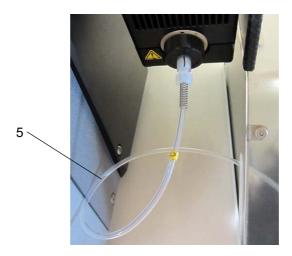


Fig. 19 - 11 Lovis + DMA M + Xsample 520 suction filling - connecting the hose between Lovis and DMA

Lovis outlet – pump – waste container

- 7. Fix the cable clip (9) on the master instrument's housing approx. 30 mm below the upper edge.
- Screw an adapter UNF/Hose (7) onto one end of the hose 600x3x2 FEP 2x1/ 4-28" UNF (6). Connect the other end to the Filling Adapter UNF Back Side Complete of the Lovis capillary block.
- 9. Cut a piece of min. 600 mm or the length you require to reach your waste container from the silicone hose 2x4 (8).

TIP You can split the silicone hose 2x4 (8) into two parts of approx. 250 mm and the length you require to reach the waste container. Connect the two pieces with a tube d=2.1 D=2.4 L=20 (15). Advantages: easy replacement of the hose part used in the peristaltic pump, less consumption of hose material. See Fig. 19 - 12.



Fig. 19 - 12 Optional splitting the waste hose

- 10. Plug one end of this hose (or if you have splitted to hose the free end of the hose with I = 250 mm) onto the adapter UNF/Hose (7).
- 11. Turn the pump lever to the horizontal position and remove the cartridge. Coil the silicone hose around the peristaltic pump as shown in Fig. 19 10. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
- 12. Lead the free end of the silicone hose to the waste container and secure it against slipping off.
 If you use the optional waste container 8 L HDPE (14): Plug the hose onto the adapter UNF/screwed tube (12) on the screw cap of this container.
- 13. Fit the hose 600x3x2 (6) into the cable clip (9).

Drip plate - waste container

14. Trim the hose (13) coming from the drip plate to the required length and connect it either to the waste container or to a separate vessel and secure it against slipping off. As a separate vessel you can use e.g. the waste vessel 500 mL supplied with the DMA M, see Fig. 19 - 16.

Air hose

- 15. Cut a piece of approx. 200 mm from the silicone hose 3x5 (10). Attach an adapter Luer cone (11) onto one end.
- 16. Connect this hose to the AIR outlet of the DMA M / DSA M.

Completing the installation

17. Attach the magazine (1) and the safety cover (2) according to the Xsample 520 instruction manual. See Fig. 19 - 13. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. Lead the hose, which is connected between the density cell and the front side of the Lovis capillary block, through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose.

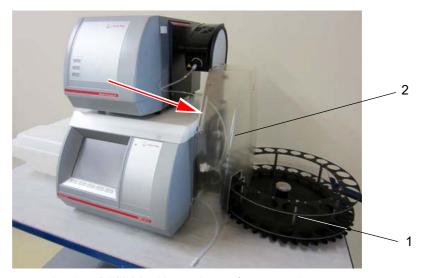


Fig. 19 - 13 Lovis + DMA M + Xsample 122/520 complete

18. To put the measuring assembly into operation, continue with Chapter 24.

19.3.3 Connecting Chemically Resistant Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

• The sample changer may only be connected by authorized personnel who is fully trained to use the sample changer correctly and safely.

Required equipment:

- Hose set Lovis + XS 122/520 Polymer (Mat. No. 143728)
- Xsample 520 instruction manual
- Angular Screwdriver Torx T10 (supplied with the module housing ME)

TIP If your application requires an improved chemical resistance, a Lovis chemical resistance upgrade set (Mat. No. 101899) is available. See Appendix B.3.

For easy filling and good chemical resistance, use glass vials 50 mL (Mat. No. 12915) with wide-neck opening for the Xsample magazine (24 vials). The vials can be covered with lab sealing film.

Refer to the Xsample 520 instruction manual:

Follow and adhere to all safety instructions and additional information given in section "Installing the Optional Kit for Resistant Hoses.

- 1. Switch off the master instrument.
- 2. Replace the standard steel needle by the chemically resistant Hastelloy needle according to the Xsample 520 instruction manual, section "Installing the Optional Kit for Resistant Hoses Exchanging the Needle".
- 3. In case of retrofitting, remove all standard hoses except the hose connected to the rear side of the Lovis capillary block.

19.3.3.1 Filling by Pressure

Connect the hoses according to Fig. 19 - 14 and the table of parts below. Refer to Chapter 19.3.2, further to the Xsample 520 and the DMA M / DSA M instruction manual.

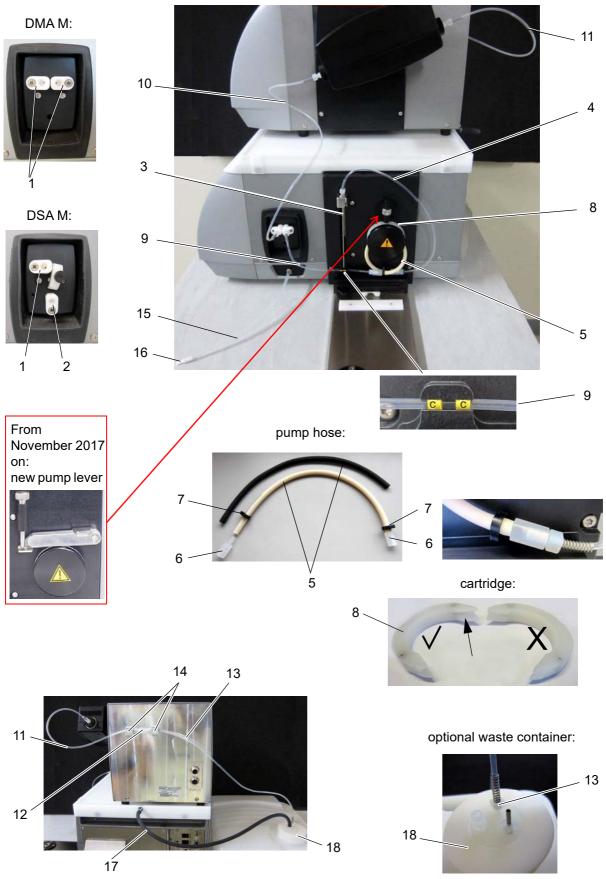


Fig. 19 - 14 Lovis + DMA M/DSA M + Xsample 122/520, chemically resistant hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^{a, b}	DMA M: filling adapter density cell in-/outlet DSA M: filling adapter density cell outlet	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapter sound velocity cell inlet	159024
3	Hastelloy needle Xsample 520	Hose set Xs 520 Polymer (P)	chemically resistant needle with UNF thread, replaces the standard needle	92421
4	Hose 350x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	needle to pump hose	25525
5	Hose Norprene Chemical 3.2x6.4 (approx. 250 mm) or Hose Norprene A-60-G 3.2x6.4 (approx. 250 mm)	Hose set Xs 520 P or ordered separately	pump hose, chemically resistant	93980 or 93982
6	Adapter UNF/Hose	Hose set Xs 520 P	connectors for the pump hose	26739
7	Hose clip Dmin 5.8, Dmax 6.5	Hose set Xs 520 P	to secure the pump hose on the adapter UNF/Hose	21531
8	Cartridge PVDF 3.2x6.4	Hose set Xs 520 P	pump cartridge with large groove for chemically resistant hoses 3.2x6.4	94086
9	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis ^{a, b}	pump hose to density cell inlet (DMA M) or sound velocity cell inlet (DSA M)	25540
10	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to flow-through adapter on the Lovis capillary block front side	25523
11	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
12	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 600 mm to waste	64790
13	Hose 600x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	waste hose; Lovis capillary block rear side to waste container	25524
14	Cable clip self-adhesive	Lovis	hose guidance	62072
15	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
16	Adapter Luer cone	Lovis	tip for air hose	63863
17	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
18	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).

b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/320 122/520 (Mat. No. 102591).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. Alternative options to the plastic container (HDPE) are:

- Waste bottle 2 L glass thread GL 45 (not available from Anton Paar) or
- Safety waste container (Mat. No. 87585).

19.3.3.2 Filling by Suction

Connect the hoses according to Fig. 19 - 15 and the table of parts below. Refer also to Chapter 19.3.2, further to the Xsample 520 and the DMA M / DSA M instruction manual.

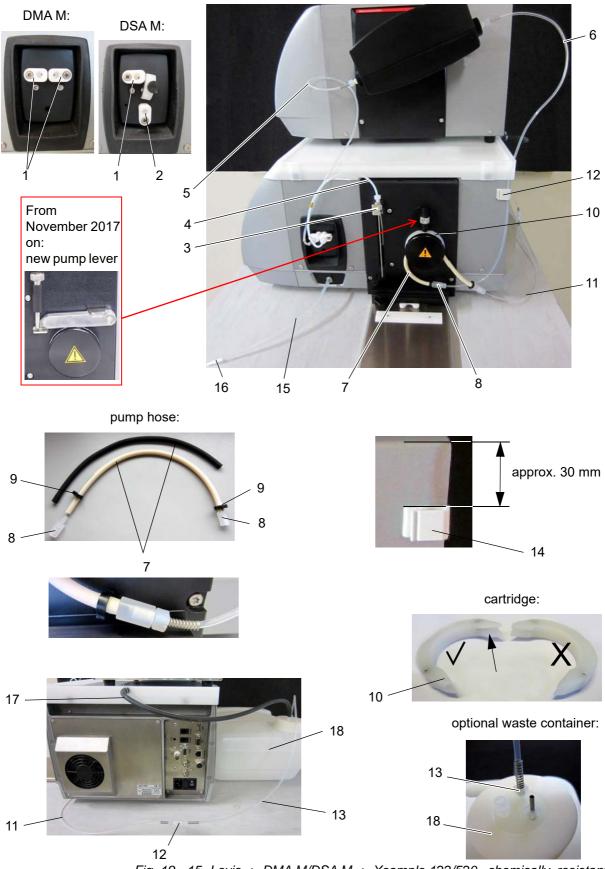


Fig. 19 - 15 Lovis + DMA M/DSA M + Xsample 122/520, chemically resistant hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^{a, b}	DMA M: filling adapter density cell in-/outlet DSA M: filling adapter density cell outlet	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapter sound velocity cell inlet	159024
3	Hastelloy needle Xsample 520	Hose set Xs 520 Polymer (P)	chemically resistant needle with UNF thread, replaces the standard needle	92421
4	Hose 350x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	needle to density cell inlet (DMA M) or sound velocity cell inlet (DSA M)	25525
5	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
6	Hose 600x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	Lovis capillary block rear side to pump hose	25524
7	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm	Hose set Xs 520 P or ordered separately	pump hose, chemically resistant	93980 or 93982
8	Adapter UNF/Hose	Hose set Xs 520 P	connectors for the pump hose	26739
9	Hose clip Dmin 5.8, Dmax 6.5	Hose set Xs 520 P	to secure the pump hose on the adapter UNF/Hose	21531
10	Cartridge PVDF 3.2x6.4	Hose set Xs 520 P	pump cartridge with large groove for chemically resistant hoses 3.2x6.4	94086
11	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose: pump hose to adapter UNF/UNF	25525
12	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from the pump hose with the hose 600 mm to waste	64790
13	Hose 600x3x2 FEP 2x1/4"-28 UNF	Hose set Xs 520 P	waste hose; adapter UNF/UNF to waste container	25524
14	Cable clip self-adhesive	Lovis	hose guidance	62072
15	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
16	Adapter Luer cone	Lovis	tip for air hose	63863
17	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307

a. Lovis: Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/ 520 (Mat. No. 101905).

b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/320 122/520 (Mat. No. 102591).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. Alternative options to the plastic container (HDPE) are:

- Waste bottle 2 L glass thread GL 45 (not available from Anton Paar) or
- Safety waste container (Mat. No. 87585).

19.4 Lovis 2000 ME + DMA M /DSA M + Xsample 22

There are two filling options for sample changers with peristaltic pump:

Filling by pressure: The sample goes first from the needle to the pump and then from the pump to the instrument.

Filling by suction: The sample goes first to the instrument and then through the pump.

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- · Cutter or a pair of scissors
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

19.4.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 22 into the DMA M or DSA M according to the Xsample 22 instruction manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME on the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Connect the cables according to Chapter 6.5.
- 6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

19.4.2 Connecting the Standard Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

 The sample filling unit may only be connected by authorized personnel who is fully trained to use the sample filling unit correctly and safely.

The standard hoses are supplied with the Xsample 22 and with the Lovis 2000 ME accessories.

19.4.2.1 Filling by Pressure

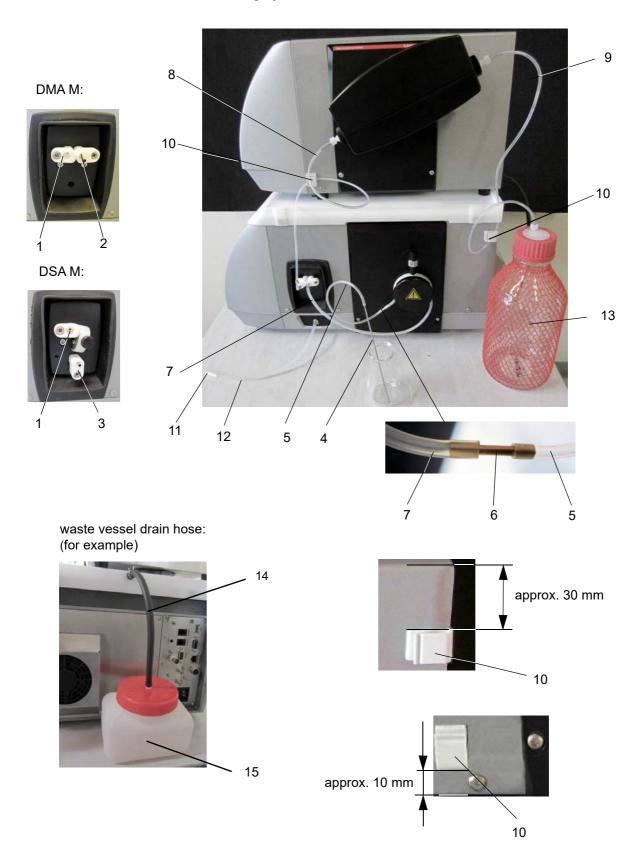


Fig. 19 - 16 Lovis + DMA M/DSA M + Xsample 22, standard hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell outlet	159025
2	Injection adapter fitting	Xsample 22	filling adapter density cell inlet	159536
3	Injection adapter fitting DSA	DSA M	filling adapter sound velocity cell inlet	159961
4	Needle	Xsample 22	sample filling needle, to be placed in the sample vessel	67394
5	Hose Tygon 2375, 1.6x3.2 I = approx. 200 mm	Xsample 22	hose between needle and pump hose	67540
6	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 22	connector between Tygon hose and pump hose	67982
	Hose silicone 2x4 mm	Xsample 22		51273
7	alternatively: Hose 2x4 Viton® I = approx. 400 mm	Lovis	pump hose; between Tygon hose and density cell inlet	54628
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
9	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; Lovis capillary block rear side to the waste container	25524
10	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
11	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
12	Adapter Luer cone	Lovis	tip for air hose	63863
13	Waste bottle 1 L glass	Optional	waste vessel	101655
14	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
15	Waste vessel 500 mL	DMA M/ DSA M	waste vessel for drain hose	6210

- a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).
 - When using a DMA M: Replace the currently installed injection adapters of the DMA M. Mount the injection adapter UNF (1) to the front connector of the density cell. Mount the injection adapter fitting (2) to the rear connector of the density cell. Refer to the Xsample 22 instruction manual.
 - 2. When using a DSA M: Replace the currently installed injection adapters of the DSA M. Mount the injection adapter UNF (1) to the front connector of the density cell. Mount the injection adapter fitting DSA (3) to the inlet of the sound velocity cell. Refer to the Xsample 22 and to the DSA M instruction manual.
 - 3. Fix the cable clips (10) on the module housing ME and on the housing of the master instrument as indicated in Fig. 19 16.

Needle - pump - master instrument

- 4. Cut a piece of approx. 200 mm from the Tygon hose 1.6x3.2 (5).
- 5. Attach one end of this hose to the needle (4).
- 6. Connect the tube 2.1x2.4x20 mm (6) to the other end of the Tygon hose (5).
- TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.
 - 7. Cut a piece of approx. 400 mm from the silicone hose 2x4 (7).
 - 8. Connect the silicone hose (7) to the free end of the tube 2.1x2.4x20 mm (6).
 - 9. Turn the pump lever to the horizontal position and remove the cartridge. Coil the silicone hose around the peristaltic pump as shown in Fig. 19 16. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
 - 10. Plug the free end of the silicone (7) hose onto the injection adapter fitting (2) on the DMA M respectively to the injection adapter fitting DSA M (3).

Master instrument outlet - Lovis inlet

11. Refer to Fig. 19 - 17: Connect one end of the hose 530x3x2 (8) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block into the shape of a loop. Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block. To hold the hose in place, fit it into the cable clip (10) mounted on the module housing ME.

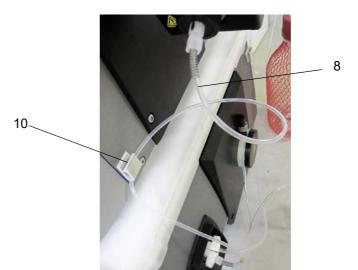


Fig. 19 - 17 Lovis + DMA M + Xsample 22 - connecting the hose between Lovis and DMA

Lovis outlet - waste vessel

- 12. Connect the hose 600x3x2 FEP (9) to the Filling Adapter UNF Back Side Complete of the Lovis capillary block.
- 13. Fit the hose 600x3x2 (9) into the cable clip (10) and lead it into the waste vessel. Secure the hose, to prevent it from slipping off.
 When using the optional waste bottle glass 1 L (13), you can connect this hose directly to the cap of this bottle.

Drip plate - waste container

14. Trim the hose (14) coming from the drip plate to the required length, connect it to a waste vessel (15; e.g. as indicated in Fig. 19 - 16) and secure it against slipping off.

Air hose

- 15. Cut a piece of approx. 200 mm from the silicone hose 3x5 (11). Attach an adapter Luer cone (12) onto one end.
- 16. Connect this hose to the AIR outlet of the DMA M / DSA M.

Completing the installation

17. To put the measuring assembly into operation, continue with Chapter 24.

19.4.2.2 Filling by Suction

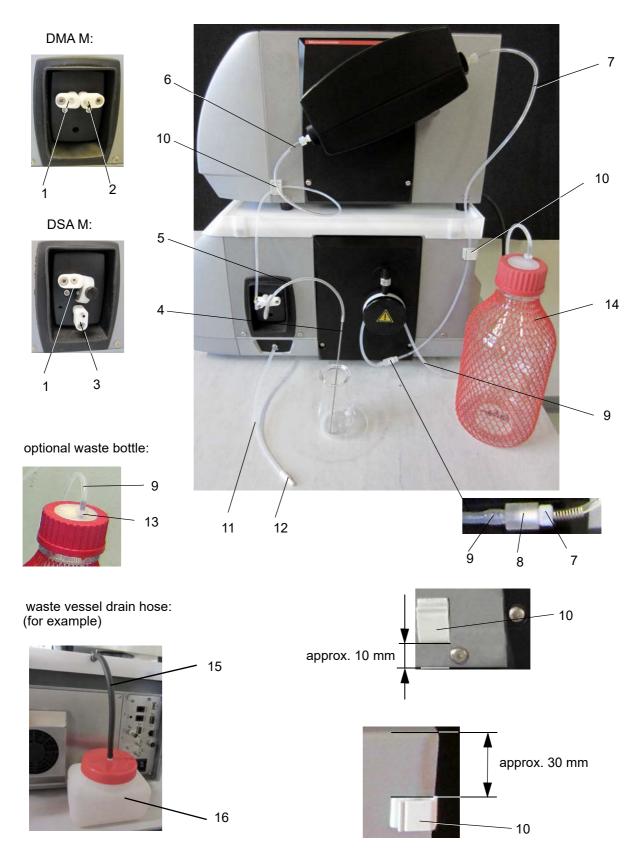


Fig. 19 - 18 Lovis + DMA M/DSA M + Xsample 22, standard hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell outlet	159025
2	Injection adapter fitting	Xsample 22	filling adapter density cell inlet	159536
3	Injection adapter fitting DSA	DSA	filling adapter sound velocity cell inlet	159961
4	Needle	Xsample 22	sample filling needle, to be placed in the sample vessel	67394
5	Hose Tygon 2375, 1.6x3.2 mm; approx. 200 mm	Xsample 22	needle to density cell inlet	67540
6	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	outlet of density cell to Lovis capillary block front side	25523
7	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to pump hose	25524
8	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
9	Hose silicone 2x4 alternatively: Hose 2x4 Viton® approx. 600 mm	Xsample 22 Lovis	pump and waste hose	51273 54628
10	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
11	Hose silicone 3x5 (approx. 200 mm)	Lovis	air hose	50814
12	Adapter Luer cone	Lovis	tip for air hose	63863
13	Adapter UNF/screwed tube	Lovis	connector for waste hose	18807
14	Waste bottle 1 L glass	Optional	waste vessel	101655
15	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
16	Waste vessel 500 mL	DMA M/ DSA M	waste vessel for drain hose	6210

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).

Refer to Fig. 19 - 18:

1. When using a DMA M: Replace the currently installed injection adapters of the DMA M:

Mount the injection adapter UNF (1) to the front connector of the density cell. Mount the injection adapter fitting (2) to the rear connector of the density cell. Refer to the Xsample 22 instruction manual.

2. When using a DSA M: Replace the currently installed injection adapters of the DSA M.

Mount the injection adapter UNF (1) to the front connector of the density cell. Mount the injection adapter fitting DSA (3) to the inlet of the sound velocity cell. Refer to the Xsample 22 instruction manual and to the DSA M instruction manual.

3. Fix the cable clips (10) on the module housing ME and on the housing of the master instrument as indicated in Fig. 19 - 18.

Needle - master instrument inlet (sample suction hose)

- 4. Cut a piece of approx. 200 mm from the Tygon hose 1.6x3.2 (5).
- 5. Plug the Tygon hose (5) onto the needle (4). Connect the other end to the injection adapter fitting (2) on the DMA M or to the injection adapter fitting DSA (3).
- TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.

Note: When using the chemically resistant hose set, this combination of needle and Tygon hose is replaced by the hose 190x3x2 PTFE 1x1/4"-28 UNF as shown in Fig. 19 - 21.

Master instrument outlet - Lovis inlet

6. Refer to Fig. 19 - 19: Connect one end of the hose 530x3x2 (6) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block into the shape of a loop. Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block. To hold the hose in place, fit it into the cable clip (10) mounted on the module housing ME.

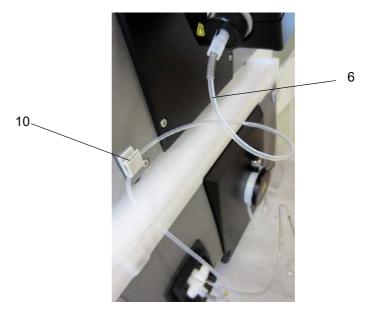


Fig. 19 - 19 Lovis + DMA M + Xsample 22 - connecting the hose between Lovis and DMA

Lovis outlet - waste container

- Screw an adapter UNF/Hose (8) onto one end of the hose 600x3x2 FEP 2x1/4-28" UNF (7). Connect the other end to the Filling Adapter UNF Back Side Complete of the Lovis capillary block.
- 8. Cut a piece of approx. 600 mm from the silicone hose 2x4 (9).
- 9. Plug one end of the silicone hose 2x4 onto the adapter UNF/Hose (8).
- 10. Turn the pump lever to the horizontal position and remove the cartridge. Coil the silicone hose around the peristaltic pump as shown in Fig. 19 18. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
- 11. Lead the free end of the silicone hose to the waste container. If you use the optional waste bottle glass 1 L (14): Screw an adapter UNF/screwed tube (13) into the insert of the bottle's screw cap. Plug the hose (9) to this adapter.
- 12. Fit the hose 600x3x2 (7) into the cable clip (10) mounted on the master instrument's casing.

Drip plate - waste container

13. Trim the hose (15) coming from the drip plate to the required length, connect it to a waste vessel (16; e.g. as indicated in Fig. 19 - 18) and secure it against slipping off.

Air hose

- 14. Cut a piece of approx. 200 mm from the silicone hose 3x5 (11). Attach an adapter Luer cone (12) onto one end.
- 15. Connect this hose to the AIR outlet of the DMA M / DSA M.

Completing the installation

16. To put the measuring assembly into operation, continue with Chapter 24.

19.4.3 Connecting Chemically Resistant Hoses



WARNING

Liquids leaking from the instrument because of improper installation may cause injuries and risk of fire.

 The sample filling unit may only be connected by authorized personnel who is fully trained to use the sample filling unit correctly and safely.

Required equipment:

- Retrofit kit for Xsample 22 Chemical (Mat. No. 96879) or
- Xsample 22 instruction manual

TIP If your application requires an improved chemical resistance, a Lovis chemical resistance upgrade set (Mat. No. 101899) is available. See Appendix B.3.

Refer to the Xsample 22 instruction manual:

Follow and adhere to all safety instructions and additional information given in section "Installing the Optional Kit for Resistant Hoses".

- 1. Switch off the master instrument.
- 2. In case of retrofitting, remove all standard hoses except the hose connected to the rear side of the capillary block.

19.4.3.1 Filling by Pressure

Connect the hoses according to Fig. 19 - 20 and the parts list below. Refer also to Chapter 19.4.2, further to the Xsample 22 and the DMA M /DSA M instruction manual.

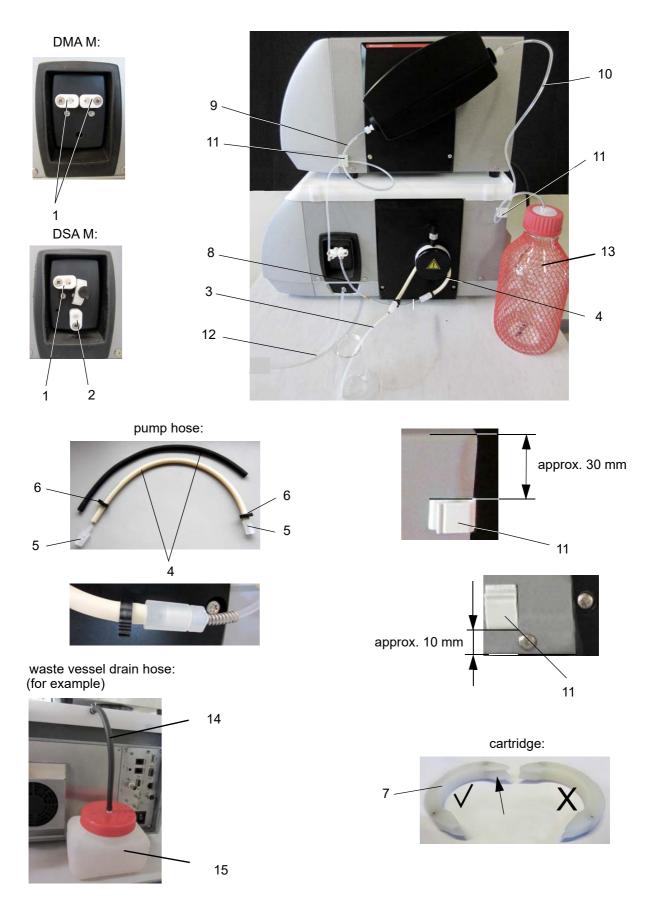


Fig. 19 - 20 Lovis + DMA M/DSA M + Xsample 22, chemically resistant hoses, pressurized filling

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Retrofit kit	DMA M filling adapter density cell in-/outlet	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^a	filling adapter sound velocity cell inlet	159024
3	Hose 190x3x2 FEP 1x1/4"-28 UNF	Retrofit kit Chemical	sample vessel to pump hose	78453
	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm	Retrofit kit		93980
4	or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm	or ordered separately	pump hose, chemically resistant	or 93982
5	Adapter UNF/Hose	Retrofit kit	connectors for the pump hose	26739
6	Hose clip Dmin 5.8, Dmax 6.5	Retrofit kit	to secure the pump hose on the adapter UNF/Hose	21531
7	Cartridge PVDF 3.2x6.4	Retrofit kit	pump cartridge with large groove for chemically resistant hoses 3.2x6.4	94086
8	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	pump hose to density cell inlet	25540
9	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
10	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; Lovis capillary block rear side to the waste container	25524
11	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
12	Hose silicone 3x5 (approx. 200 mm)	Lovis	air hose	50814
13	Waste bottle 1 L glass	Optional	waste vessel	101655
14	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
15	Waste vessel 500 mL	DMA M/ DSA M	waste vessel for drain hose	6210

a. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. An alternative option to the plastic Waste bottle SVM 0.5 L is to use a glass bottle or the Safety waste container (Mat. No. 87585).

19.4.3.2 Filling by Suction

Connect the hoses according to Fig. 19 - 21 and the table of parts below. Refer also to Chapter 19.4.2, further to the Xsample 22 and the DMA M /DSA M instruction manual.

b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).

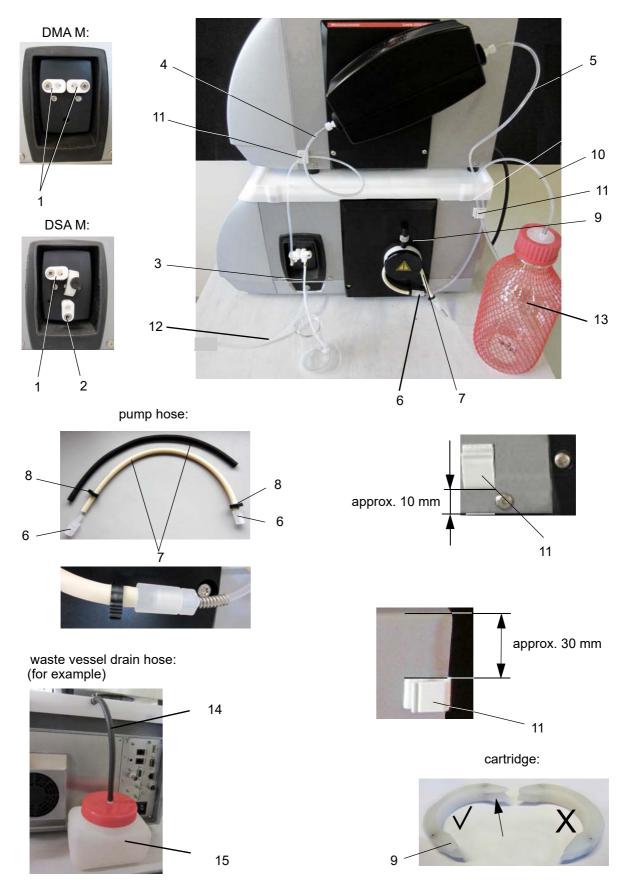


Fig. 19 - 21 Lovis + DMA M/DSA M + Xsample 22, chemically resistant hoses, filling by suction

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Retrofit kit	DMA M: filling adapter density cell in-/outlet	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^a	filling adapter sound velocity cell inlet	159024
3	Hose 190x3x2 PTFE 1x1/4"-28 UNF	Retrofit kit Chemical	sample vessel to density cell inlet	78453
4	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	density cell outlet to Lovis capillary block front side	25523
5	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to pump hose	25524
6	Adapter UNF/Hose	Retrofit kit	connectors for the pump hose	26739
	Hose Norprene Chemical 3.2x6.4 I = approx. 250 mm	Retrofit kit		93980
7	or Hose Norprene A-60-G 3.2x6.4 I = approx. 250 mm	or ordered separately	pump hose, chemically resistant	or 93982
8	Hose clip Dmin 5.8, Dmax 6.5	Retrofit kit	to secure the pump hose on the adapter UNF/Hose	21531
9	Cartridge PVDF 3.2x6.4	Retrofit kit	pump cartridge with large groove for chemically resistant hoses 3.2x6.4	94086
10	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	waste hose; from pump hose to waste container	25524
11	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
12	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
13	Waste bottle 1 L glass	Optional	waste vessel	101655
14	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
15	Waste vessel 500 mL	DMA M/ DSA M	waste vessel for drain hose	6210

a. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

TIP Make sure waste containers are chemically resistant against your samples and cleaning liquids. An alternative option to the plastic Waste bottle SVM 0.5 L is to use a glass bottle or the Safety waste container (Mat. No. 87585).

b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905).

19.5 Lovis 2000 ME + DMA M + Xsample 530

From software version 2.70 on, you can operate a combination of DMA M plus Lovis 2000 ME with the automatic sample changer Xsample 530. From software version 2.80 on, a sample recovery unit (SRU) is available for Xsample 530. Refer also to the Recommended Configurations in the Lovis 2000 M/ME Product Description List supplied on the customer USB storage device.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device)

19.5.1 Preparing Master Instrument and Modules

- 1. Mount the Xsample 530 into the DMAM according to the Xsample 530 Instruction Manual.
- 2. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 3. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 4. Place the Module Housing Lovis ME onto the drip plate on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 5. Connect the cables according to Chapter 6.5.
- 6. Prepare the Lovis crush protection according to Chapter 17.2.
- 7. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

19.5.2 Connecting the Hoses



WARNING

Liquids leaking from the instrument due to improper installation may cause injuries and risk of fire.

The sample changer may only be connected by authorized personnel who
is fully trained to use the sample changer correctly and safely.

If using a sample recovery unit (SRU), please refer to the Xsample 530 Instruction Manual for installing it and connecting its hoses. Connect all other hoses as described in this chapter.

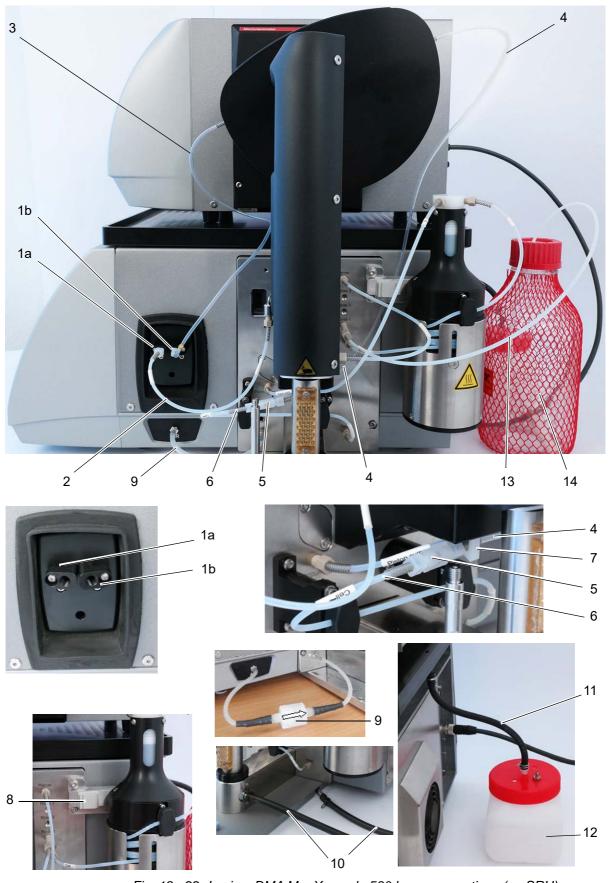


Fig. 19 - 22 Lovis + DMA M + Xsample 530 hose connections (no SRU)

No.	Item	Supplied with	Purpose	Mat. No.
1	2 x Injection Adapter UNF 1/4"	Xsample	Filling adapters for DMA	159025
2	Xsample hose "Cell – Needle" (pre-assembled)	Xsample	Xsample needle to density cell inlet	110151
3	Hose 530x3x2 FEP 2x1/4"-28 UNF "C"	Lovis	Density cell outlet to Lovis capillary block front	25523 ^a
4	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis capillary block rear to Xsample hose "Cell – Sense"	25524
5	Adapter UNF-UNF	Lovis ^a	Connects Xsample hose "Cell – Sense" and hose no. 4	64790
6	Xsample hose "Cell – Sense" (pre-assembled)	Xsample	Connection to liquid sensor	110152
7	Hose clip (pre-assembled)	Xsample	Guidance for hose no. 4 and hose "Piston pump – 1"	
8	Cable clip self-adhesive	Lovis	Guidance for hose no. 4	62072
9	Check valve with silicone air hose 3x5 (pre-assembled)	Xsample	Connects the internal air pump of the master instrument with connector "Low" on Xsample	166080
10	2 x 1.5 m waste hose 5x8 Viton-BK ISO Versinic, pre-assembled	Xsample	Drain liquid from the waste nozzles on the cleaning tubular and on the Xsample magazine support to a waste container	72546
11	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	Drain hose from drip plate	72546 21307
12	Waste Bottle SVM 0.5 L	Lovis	Waste vessel for drain hose	17822
13	Rinse hose 750x3x2 PTFE 1x1/4"-28 UNF	Xsample	Connects "Rinse 1"/ "Rinse 2"/ "Rinse 3" to the rinse bottle	110156
14	Rinse bottle	Xsample	Bottle containing cleaning liquid	21312

a. Alternative option for operation with DMA M: Instead of this hose and hose 600x3x2 (Mat. No. 25524) you can use low volume hoses (from hose set Mat. No. 101906)

On Xsample 530 most hoses are pre-assembled. See the Xsample 530 instruction manual.

Fix the cable clip (8) as shown in Fig. 19 - 22. The specified distances are approximate values.

DMA M

 Replace the currently installed injection adapters of the DMA M by injection adapters UNF 1/4" black (1a/1b) supplied with Xsample 530. Refer to the Xsample 530 Instruction Manual.

Needle - DMA M inlet

2. Connect the free end of the Xsample hose "Cell – Needle" (2) to the inlet of the density cell (1a).

DMA M outlet – Lovis inlet

3. Connect one end of the hose 530x3x2 (3) to the outlet (1b) of the density cell. Bend the hose upwards at this connected end. Bend the hose in a wide loop towards the front of the Lovis capillary block. See Fig. 19 - 22. Screw the free end of hose (3) into the Filling Adapter UNF Front Side on the Lovis capillary block.

Lovis outlet - Xsample hose "Cell - Sense"

- 4. Screw an adapter UNF-UNF (5) to the free end of the pre-assembled hose "Cell Sense" (6) of the Xsample 530.
- 5. Connect one end of the hose 600x3x2 (4) to the Filling Adapter UNF Back Side Complete on the Lovis capillary block. Guide the hose downwards and through the opening below the Xsample 530 carriage (behind the cleaning tubular with the reflector). Screw the free end of hose (4) into the adapter UNF-UNF (5).
- 6. Fit hose 600x3x2 (4) into hose clip (7) from below. This clip also holds Xsample hose "Piston pump 1".
- 7. Bend the hose 600x3x2 (4) as shown in Fig. 19 22 and fit it into cable clip (8) on the support of the piston pump.

Air hose

8. Attach the free end of the pre-assembled Xsample 530 silicone hose 3x5 mm of the check valve (9) to the "AIR" nozzle of the DMA M. See arrow on the check valve.

NOTICE

Ensure that the check valve does not rub against the attached magazine. Ensure that the silicone hose is not bent or kinked, else the airflow cannot reach the measuring system.

Drip plate - waste container

9. Trim the hose (11) coming from the drip plate to the required length, connect it to a suitable waste vessel (12; e.g. as shown in Fig. 19 - 22) and secure it against slipping off.

Waste hoses

10. Connect one waste hose (14) each to the waste nozzle on the cleaning tubular and to the waste nozzle on the Xsample magazine support. Connect the free ends of the waste hoses either to the optional safety waste container or to the customer's waste container according to the Xsample 530 instruction manual.

Rinsing hoses

11. Prepare and connect the rinsing hose(s) (13) and the solvent bottle(s) (14) according to the Xsample 530 instruction manual.

Completing the installation

- 12. Attach the magazine according to the Xsample 530 instruction manual.
- 13. Ensure that the crush protection is mounted (Chapter 17.2). Attach and use the safety shield according to the Xsample 530 instruction manual. Avoid to squeeze or kink the hoses leading to and from the Lovis capillary block.
- 14. To put the measuring assembly into operation, continue with Chapter 24.

NOTICE

This measuring assembly should not be used with compressed air for filling and drying the measuring system. Using compressed air could damage the Lovis capillary adapters.

19.6 Lovis 2000 ME + DMA M + Xsample 340

From software version "Service Release 2.81 for Xsample 340" on, you can operate a combination of DMA M plus Lovis 2000 ME with the modular syringe filling device Xsample 340. Refer also to the Recommended Configurations in the Lovis 2000 M/ME Product Description List supplied on the customer USB storage device.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessory kit)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device)

19.6.1 Preparing Master Instrument and Modules

- 1. Mount the Lovis 2000 ME in the DMA M (master). See Chapter 6.4.
- 2. Place the drip plate on top of the DMA M master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 3. Place the Xsample 340 on the drip plate on top of the master instrument. Align Xsample 340 to the rear of the drip plate and close to the plate's right-hand side (approx. 10 mm space). Otherwise you cannot correctly connect the inlet hose to the DMA M.

Make sure that Xsample 340 stands solidly on all four feet.

- 4. Connect the cables and the CAN terminating resistor:
 - Take the CAN cable from the Xsample 340 accessories.
 - Plug the male connector of the CAN cable into the CAN interface of the master instrument and tighten the fixing screw using moderate force.
 - Plug the female connector of the CAN cable into the "CAN in" interface on the rear of Xsample 340 and tighten the fixing screw.
 - Plug the CAN terminating resistor from the Xsample 340 accessories to the "CAN out" interface on the rear of Xsample 340. Tighten the fixing screw.

Refer also to the Xsample 340 Instruction Manual.

- Connect the DMA M to the mains according to its instruction manual.
- 5. Mount the capillary with flow-through adapters in the Lovis (Chapter 9.5).

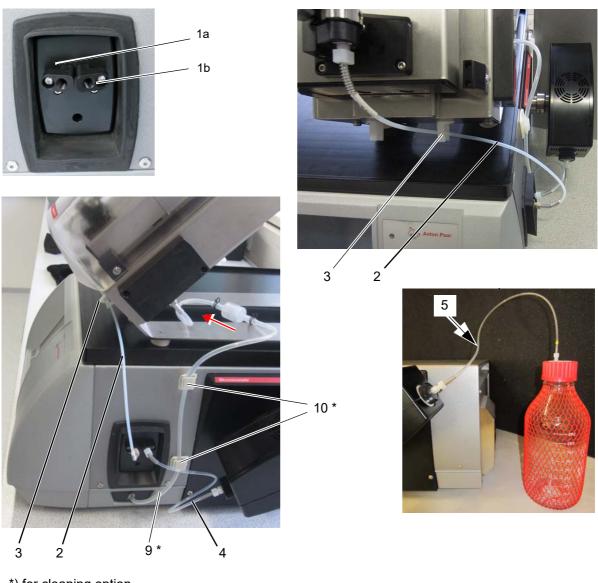
19.6.2 Connecting the Hoses



WARNING

Liquids leaking from the measuring assembly due to improper installation may cause injuries and risk of fire.

 The filling device may only be connected by authorized personnel who is fully trained to use the filling device correctly and safely.



*) for cleaning option

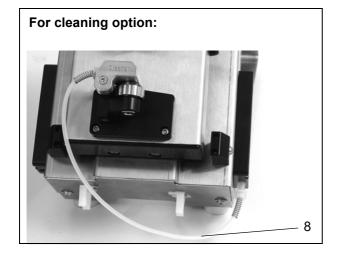




Fig. 19 - 23 Lovis + DMA M + Xsample 340 hose connections

No.	Item	Supplied with	Purpose	Mat. No.
1	2 x Injection Adapter UNF 1/4"	Xsample	Filling adapters for DMA	159025
2	Hose "Tefzel – Peek"	Xsample	Outlet of Xsample's Luer adapter to density cell inlet	164798
3	Hose holder	mounted on Xsample	Guidance for hose no. 1	
4	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Density cell outlet to Lovis capillary block front	25525
5	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis capillary block rear to waste container	25523
6	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	Drain hose from drip plate	72546 21307
7	Waste Bottle SVM 0.5 L	Lovis	Waste vessel for drain hose	17822
Addi	tional hoses for Xsample 340 with cle	aning option - if	using them, connect these hoses fire	st
8	Hose "Cleaner" 180x3x2 2x1/4"-28 UNF	Xsample	Connector "cleaner" on Xsample's distributor plate to inlet of Xsample's cleaner unit	164802
9	Check valve with silicone air hose (pre-assembled)	Xsample	DMA "AIR" nozzle to "Pressurized Air" nozzle on Xsample's distributor plate. !!! The arrow on the valve must point away from the DMA "AIR" nozzle !!!	166080
10	Cable clip self-adhesive	Lovis	Guidance for silicone hose no. 8	62072

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Lovis Flow-through filing set (Mat. No. depends on capillary diameter - see Lovis 2000 M/ME Product Description List).

If using Xsample 340 with cleaning option, refer to the Xsample 340 Instruction Manual for connection of the rinsing hoses and rinsing bottles. If using compressed air for drying, also refer to the Xsample 340 Instruction Manual.

TIP: If using Xsample 340 with cleaning option, it is easier to mount the hoses for cleaning BEFORE connecting the hoses to the DMA M and Lovis 2000 ME.

DMA M

 Replace the currently installed injection adapters of the DMA M by injection adapters UNF 1/4" black (1a/1b) supplied with Xsample 340. Refer to the Xsample 340 Instruction Manual.

Xsample 340 - DMA M inlet

- Swing the safety cover of Xsample 340 open. Take one hose labeled "Tefzel – Peek" from the Xsample 340 accessories. Screw the end "Peek" into the outlet of the Luer adapter of Xsample 340.
- 2. Screw the free end "Tefzel" into the density cell inlet (1a). Put the hose (2) into the right-hand hose holder (3) of Xsample 340.
- 3. Take the hose 350x3x2 FEP (4) of the Lovis capillary set for flow-through filling. Screw one end into the density cell outlet (1b). Bend the hose into a loop:

TIP Avoid sharp bends or kinks!

- Take the free end of the hose and bend it sideways towards the capillary block. Guide it counter-clockwise into a wide loop.
- Fasten the free end to the Filling Adapter UNF which projects from the Lovis capillary block.

Lovis outlet - Waste

The hose 530x3x2 FEP (5) serves as connection to the waste bottle.



CAUTION

A light-weight waste vessel (like the plastic vessel of the standard delivery) will move around at the end of the waste hose when the Lovis capillary block turns. It could easily tilt and waste liquid would spill out.

Use the waste bottle glass 1 L which is massive enough to prevent undesirable movement and comes with a break protection or the optional safety waste container.

4. Fasten one end of the waste hose (5) to the Filling Adapter UNF on the back side of the Lovis capillary block.

Fasten the other end to the screw cap of the waste bottle.

Drip plate - waste container

5. Trim the hose (6) coming from the drip plate to the required length, connect it to a suitable waste vessel (7; e.g. as shown in Fig. 19 - 23) and secure it against slipping off.

Xsample "Cleaner" hose (for Xsample 340 with cleaning)

- 6. Screw the hose end labeled "Cleaner" (8) into the connector "Cleaner" of the distribution plate of Xsample 340.
- 7. Screw the free end into the inlet of the cleaner unit of Xsample 340.

NOTICE

To avoid buckling the hose "Cleaner", do not put it into the Xsample's hose holder.

Check valve with silicone air hose

8. The check valve and the silicone air hose (9) come pre-assembled with Xsample 340.

NOTICE

- Mount the check valve in the correct flow direction. Air flows from the Lovis "AIR" nozzle to the connector "Pressurized Air" on the Xsample 340.
 Therefore, the arrow on the valve must point away from the DMA M "AIR" nozzle (see arrow in Fig. 19 - 23).
- Ensure that the hose is not buckled, or else the airflow cannot reach the measuring system.
- 9. Connect the right end of the silicone hose (9) to the DMA M "AIR" nozzle.
- 10. Put the check valve on the drip plate and lead the over the rack of Xsample 340.
- 11. Cut the silicone hose to the required length and attach the free end of the silicone hose to the "Pressurized Air" nozzle on the distributor plate of Xsample 340.
- 12. Fix two cable clips (10) on the side of DMA M as shown in Fig. 19 23. Secure the silicone hose (9) with the cable clips. Guide the air hose close to the master instrument's side. It must not get entangle with the moving hose 350x3x2 FEP (4) which is connected to the Lovis capillary block.

NOTICE

The valve must be placed on the drip plate.

Completing the installation

- 13. Make sure all hose connectors are properly tightened (finger tight).
- 14. Close the safety cover according to the Xsample 340 instruction manual. Avoid to squeeze or kink the hoses leading to and from the Lovis capillary block.
- 15. To put the measuring assembly into operation, continue with Chapter 24.

20 Assemblies with DMA M, Multiple Modules and Xsample

Supported combinations:

 DMA 4500/5000 M + Xsample 22/520 + Alcolyzer Beer ME + HazeQC ME + Lovis 2000 ME + pH ME / pH ME Beverage

This measuring assembly can also be filled manually when using at least two 20 mL syringes per sample.

Besides the full measuring assembly any subset of the above modules is supported.

DMA 4500/5000 M + Xsample 352/452 + HazeQC ME + Lovis 2000 ME

Fig. 20 - 1 shows a complete horizontal setup consisting of DMA M, Lovis 2000 ME, Alcolyzer ME, HazeQC ME, pH ME and Xsample 520, further the optional Waste Container HDPE 8 L and the optional Stand For Measuring Assembly. Such an assembly can be used e.g. for both beer and wort measurement.



Fig. 20 - 1 Assembly for beer and wort measurement

NOTICE

When retrofitting an existing DMA M/DSA M with a pH ME unit: Check your master instrument. The pH ME module can only be used with instruments which have a small removable cover on the rear side interface panel for inserting the electronic board of pH ME. If in doubt, contact your local Anton Paar distributor.

CAN power supply: When setting up an assembly with external modules that require more power than the master instrument can deliver (see technical data), a CAN power supply (Mat. No. 100655) is required to ensure proper power supply and function of all components. Modules and instruments on the CAN chain installed before the CAN power supply are powered by the master, the rest is powered by the CAN power supply. See Chapter 15.

To achieve the best possible measuring results for assemblies with Xsample 22/520, consider the following tips:

TIPS

- Connect the hoses always as described for pressure filling. This reduces generally bubble formation, it is the best solution for setups with large height using several components placed one above the other. Or for setups with a long liquid column due to many instruments in a line.
- Xsample filling mode: Set the filling mode to "Forward only" (see your Xsample instruction manual). Filling "Forth and back" or "Forward with air gap" may lead to a bad filling quality in large setups with long liquid lines.
- If applicable: The Alcolyzer ME must always be the first module after the density meter. Never place the Alcolyzer ME behind other modules in the line as this may lead to bad results.
- If applicable: The pH ME module should always be the last in the line because of its cell geometry.

20.1 Lovis 2000 ME + DMA M + Alcolyzer ME + HazeQC ME + pH ME / pH ME Beverage + Xsample 520/22 - Vertical Setup

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- · Cutter or a pair of scissors
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

20.1.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 520/22 into the DMA M according to the Xsample 520 or Xsample 22 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.

Arranging master instrument and modules

Refer to Fig. 20 - 2:

- 4. Place the pH ME / pH ME Beverage measuring cell unit (1) according to the pH ME / pH ME Beverage instruction manual.
- 5. Place the drip plate (6) on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 6. Xsample 520 only: Prepare the Xsample safety cover (edge protection) according to Chapter 17.2.
- 7. Place the Alcolyzer ME module (3) on the drip plate on the right side of the DMA 4500/5000 (2; = master instrument).
- 8. Place the HazeQC ME turbidity meter (4) on the drip plate on the left side of the master instrument.
- 9. Place the Module Housing Lovis ME (5) on top of the two modules and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.



Fig. 20 - 2 Placing master instrument and modules - vertical setup

1	pH ME / pH ME Beverage
2	DMA M
3	Alcolyzer ME
4	HazeQC ME
5	Lovis 2000 ME
6	Drip plate

Connecting the cables

10. Connect the cables according to Fig. 20 - 3

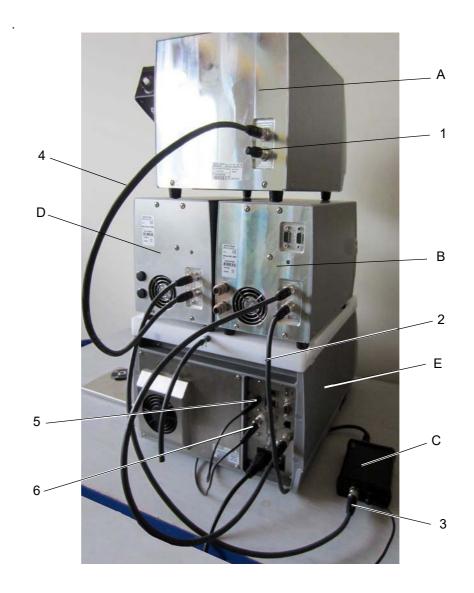


Fig. 20 - 3 Connecting the cables and the CAN power supply - vertical setup

Α	Lovis 2000 ME
В	HazeQC ME
С	CAN power supply (Mat. No. 100655)
D	Alcolyzer ME
Е	Master instrument
1	CAN/Devicenet terminating resistor to CAN socket on Lovis ME
2	interface cable between HazeQC ME CAN socket and plug of CAN power supply
3	interface cable between Alcolyzer Beer ME CAN plug and socket of CAN power supply
4	interface cable between Alcolyzer ME CAN socket and Lovis ME CAN plug
5	temperature sensor cable from pH ME / pH ME Beverage
6	cable of pH ME / pH ME Beverage, to BNC connector of the master instrument

Mounting the cable clips

11. Fix the cable clips on the instrument housings according to Fig. 20 - 4.

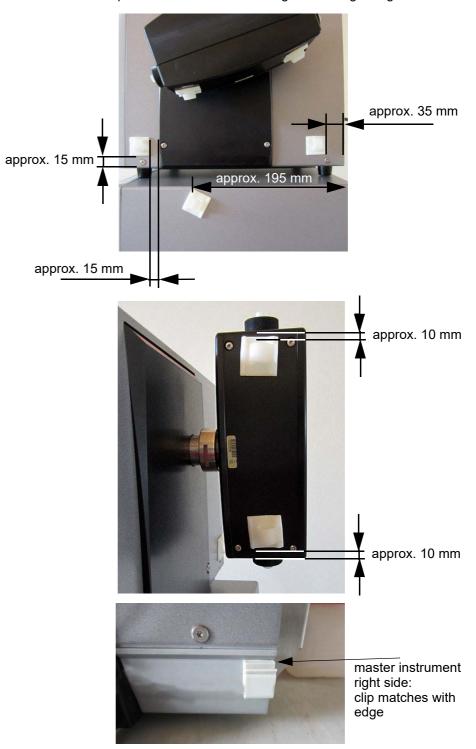


Fig. 20 - 4 Positioning the cable clips (hose guidances)

Mounting the capillary

12. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

20.1.2 Connecting the Hoses - Vertical Setup

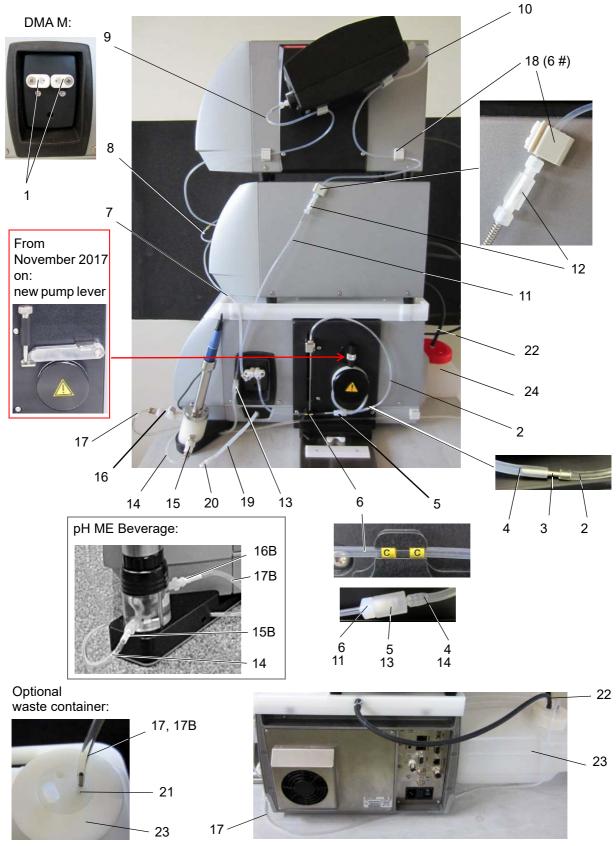


Fig. 20 - 5 Connecting the hoses - complete system, vertical setup

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	DMA M: filling adapter density cell in-/outlet	159025
2	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
3	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
4	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
6	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to HazeQC lower connector	25523
8	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	HazeQC upper connector to Alcolyzer ME lower connector	25540
9	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Alcolyzer ME upper connector to Lovis capillary block front side	25524
10	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF (direction to pH ME / pH ME Beverage)	25524
11	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	from adapter UNF/UNF to hose pH ME (Beverage)	25525
12	Adapter UNF/UNF	Lovis	connects the hose 600 mm coming from Lovis capillary block rear side with the hose 350 mm	64790
13	Adapter UNF/Hose (Female/Male)	Lovis	connector for hose to pH ME (Bev.)	26739
14	Hose Tygon 2375, 1.6x3.2, I = approx. 340 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
15	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
15B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
16	Jack with compression fitting or	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
16B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
17	Hose PU 2.5x4 mm	pH ME		15272
17B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
18	Cable clip self-adhesive	Lovis	hose guidance	62072
19	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
20	Adapter Luer cone	Lovis	tip for air hose	63863

No.	Item	Supplied with	Purpose	Mat. No.
21	Adapter UNF/screwed tube	Lovis; opt. waste container	to connect the waste hose to the optional waste container	18807
22	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
23	Waste container 8 L HDPE	Optional	waste container	105979
24	Waste vessel 500 mL	DMA M	waste vessel for drain hose, if you do not want to connect the drain hose to the large waste container	6210

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis Modular Assembly (Mat. No. 105880).

 If required, replace the currently installed injection adapters of the DMA M by the injection adapters UNF (1). Refer to the DMA M instruction manual respectively to the instruction manual of your Xsample model. The procedure of dismounting/mounting is the same for all types of DMA M injection adapters.

For connecting the hoses refer to Fig. 20 - 5 and the detail pictures given within the text, further to the list of parts:

Needle - pump - master instrument inlet

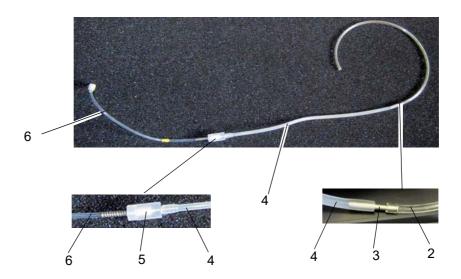


Fig. 20 - 6 Assembling the hose between needle and inlet of master instrument

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Refer to Fig. 20 - 6:

- 2. Cut a piece of approx. 270 mm from the Tygon hose 1.6x3.2 (2).
- 3. Connect the steel tube 2.1x2.4x20 mm (3) to the Tygon hose (2).
- TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.
 - 4. Cut a piece of approx. 250 mm from the silicone hose 2x4 (4).
 - 5. Plug the silicone hose (4) onto the free end of the steel tube (2).
 - 6. Attach an adapter UNF/Hose (5) onto the free end of the silicone hose (4).
 - 7. Carefully bend a hose 220x3x2 FEP 2x1/4"-28 (6) and connect it to the adapter UNF/Hose (5).

Refer to Fig. 20 - 5:

- 8. Xsample 520: Plug the Tygon end (2) of this assembled hose onto the top of the needle.
 - Xsample 22: Plug the Tygon end (2) of this assembled hose onto the steel needle supplied with Xsample 22.
- 9. Turn the pump lever into horizontal position and remove the cartridge. Coil the silicone part of this assembled hose around the peristaltic pump. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
- 10. Connect the free end of the hose 220x3x2 FEP 2x1/4"-28 (6) to the inlet of the density cell. Position the marker rings "C" this way, that they fit into the hose holder on the Xsample 520. Secure the hose by placing it into the hose holder.

Master instrument outlet - HazeQC ME - Alcolyzer ME inlet



Fig. 20 - 7 Hoses master instrument outlet to Alcolyzer ME

Refer to Fig. 20 - 7, see also the complete assembly in Fig. 20 - 5:

- 11. Connect the hose 530x3x2 FEP 2x1/4"-28 (7) to the outlet of the density cell (see arrow).
- 12. Carefully bend this hose into its shape as shown in Fig. 20 7, then connect it to the lower connector of HazeQC ME (inlet).
- 13. Carefully bend the hose 220x3x2 FEP 2x1/4"-28 (8) into its shape and connect it between the upper connector (outlet) of HazeQC ME and the lower connector (inlet) of the Alcolyzer ME.

Alcolyzer ME outlet - Lovis 2000 ME inlet

Refer to Fig. 20 - 8:

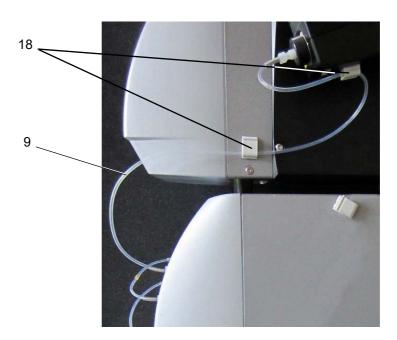


Fig. 20 - 8 Hose Alcolyzer ME to Lovis 2000 ME inlet

- 14. Connect one end of the hose 600x3x2 FEP 2x1/4"-28 (9) to the upper connector (outlet) of the Alcolyzer ME (see arrow in Fig. 20 7).
- 15. Carefully bend the hose as indicated in Fig. 20 8. Then connect the free end of this hose to the Lovis 2000 ME capillary block front side.
- 16. Fit the hose into the two cable clips (18) to guide it and to minimize vibrations of the hose when the capillary block is turning.

Lovis 2000 ME outlet - pH ME / pH ME Beverage inlet

- 17. Connect one end of the hose 600x3x2 FEP 2x1/4"-28 (10) to the Lovis 2000 ME capillary block rear side.
- 18. Screw an adapter UNF/UNF (12) onto the free end of this hose and connect the hose 350x3x2 FEP 2x1/4"-28 (11).

10 18 12 13 11

19. Bend the hose 600x3x2 (10) according to Fig. 20 - 9 and fit it into the cable clips (18).

Fig. 20 - 9 Fitting the hose connected to Lovis 2000 ME rear side

- 20. Place the adapter UNF/UNF (12) directly into the cable clip (18) mounted on the Alcolyzer ME to fix the hose in place.
- TIP The shape of the cable clips may vary. If a cable clip is too small to place the adapter UNF/UNF in it or the adapter cannot be held by the cable clip, place the spring of the hose connector into the cable clip (as shown in the above figure).
 - 21. Cut a piece of I = approx. 340 mm from the Tygon hose 1.6x3.2 (14).
 - 22. Attach an adapter UNF/Hose (13) onto the free end of this hose.
 - 23. Connect the Tygon hose 1.6x3.2 to the FEP hose coming from Lovis 2000 ME by screwing the connector of the 350x3x2 FEP hose (11) into the adapter UNF/Hose (13).
 - 24. Plug the free end of the Tygon hose through the outer opening of the pH ME /pH ME Beverage base plate.
 - 25. pH ME: Slip the sleeve nut (15a) over the Tygon hose 1.6x3.2 (14). Fit the hose onto the plug (15) and secure it with the sleeve nut. See Fig. 20 10. pH ME Beverage: Attach the Tygon hose 1.6x3.2 (14) to the Adapter Luer to Tygon Tube (15B). See Fig. 20 10.

pH ME Beverage (lower connector).

15

pH ME Beverage:

15B

15B

17B

26. Connect the Tygon hose 1.6x3.2 (14) to the inlet of the pH ME / pH ME Beverage (lower connector).

Fig. 20 - 10 Mounting the plug to the inlet hose for the pH ME (Beverage) module

pH ME / pH ME Beverage - waste container

- 27. Take the PU hose 2.5x4 (17) or the silicone hose 2x4 (17B). Cut a piece that is long enough to reach your waste container.
- 28. pH ME: Mount the jack (16) to the PU hose (17) in the same way as shown for the plug (15) in Fig. 20 10. pH ME Beverage: Attach the silicone hose 2x4 (17B) to the Adapter Luer to Tygon Tube (16B). See Fig. 20 10.
- 29. Connect the waste hose (17, 17B) to the outlet of the pH ME / pH ME Beverage (upper connector).
- 30. Lead the waste hose (17, 17B) to your waste vessel and secure it against slipping off. When using the optional Waste Container HDPE 8 L see Fig. 22 16 and Fig. 22 17 you can plug the free end of this hose directly to this container using an adapter UNF/screwed tube (21).

Drip plate - waste container

31. Trim the hose (22) coming from the drip plate to the required length and connect it either to the waste container 8 L HDPE (23). Alternatively you can connect it to a separate vessel, use e.g. the waste vessel 500 mL (24) or any other suitable vessel. Secure the hose against slipping off.

Air hose

- 32. Cut a piece of approx. 200 mm from the silicone hose 3x5 (19). Attach an adapter Luer cone (20) onto one end.
- 33. Connect this hose to the AIR outlet of the master instrument.

Completing the installation

- 34. For Xsample 520 only: Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection is fixed on the Xsample safety cover; see Chapter 17.2. Lead the two hoses (hose between Alcolyzer and outlet of density cell; hose between Lovis capillary block rear side to pH ME), through the slit in the metal part of the safety cover and attach the safety cover (refer also to the instruction manual of Xsample 520). Avoid to squeeze or kink the hoses.
- 35. To put the measuring assembly into operation, continue with Chapter 24.

20.2 Lovis 2000 ME + DMA M + Alcolyzer ME + HazeQC ME + pH ME / pH ME Beverage + Xsample 520/22 - Horizontal Setup

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- · Cutter or a pair of scissors
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Stand for measuring assembly 750x380x280 (Mat. No. 105451)

20.2.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 520/22 into the DMA M according to the Xsample 520 or Xsample 22 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 4. Xsample 520 only: Prepare the Xsample safety cover (edge protection) according to Chapter 17.2.

Arranging master instrument and modules

5. Place the stand for measuring assembly (1) onto the top of the master instrument (2) according to Fig. 20 - 11. The guides (3) on the right and rear side should touch the master instrument's housing. This way the stand is held correctly in position and the Xsample safety cover can be attached easily. If required, level the stand with the adjustable feet (open spanner 10 mm).



Fig. 20 - 11 Positioning the stand for horizontal setup of a measuring assembly

Refer to Fig. 20 - 12:

- 6. Place all modules onto the stand (2) as shown in Fig. 20 12. For pH ME measuring cell unit put the left front foot of Lovis 2000 ME into the opening on the base plate of pH ME /pH ME Beverage. Refer also to the instruction manual of pH ME /pH ME Beverage. If possible, put your waste container under the stand besides the master instrument. When using the optional Waste Container HDPE 8 L, the waste hose can be directly plugged or screwed to this container.
- 7. Check whether Lovis 2000 ME stands solidly on all four feet. Otherwise refer to Chapter 17.4.



Fig. 20 - 12 Placing master instrument and modules - horizontal setup

1	Master instrument
2	Stand for measuring assembly
3	Alcolyzer ME
4	HazeQC ME
5	Lovis 2000 ME
6	pH ME

Connecting the cables

8. Connect the cables according to Fig. 20 - 13.

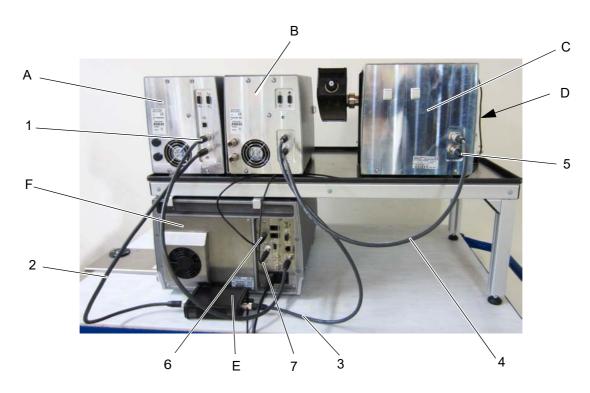


Fig. 20 - 13 Connecting the cables and the CAN power supply - horizontal setup

Α	Alcolyzer ME
В	HazeQC ME
С	Lovis 2000 ME
D	рН МЕ
E	CAN power supply (Mat. No. 100655)
F	Master instrument
1	interface cable between master instrument and Alcolyzer ME (CAN plug)
2	interface cable between Alcolyzer ME (CAN socket) and CAN power supply
_	(plug)
3	interface cable between CAN power supply (socket) and HazeQC ME (CAN
	plug)
4	interface cable between HazeQC ME (CAN socket) and Lovis 2000 ME (CAN
-	plug)
5	CAN/Devicenet terminating resistor on Lovis ME
6	temperature sensor cable from pH ME
7	cable of pH ME, to BNC connector of the master instrument

Mounting the cable clips

9. Mount the cable clips according to Fig. 20 - 14.

Lovis 2000 ME



HazeQC ME

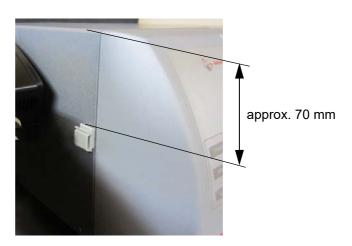


Fig. 20 - 14 Mounting the cable clips on Lovis 2000 ME rear side and on HazeQC ME - horizontal setup

Mounting the capillary

10. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

20.2.2 Connecting the Hoses

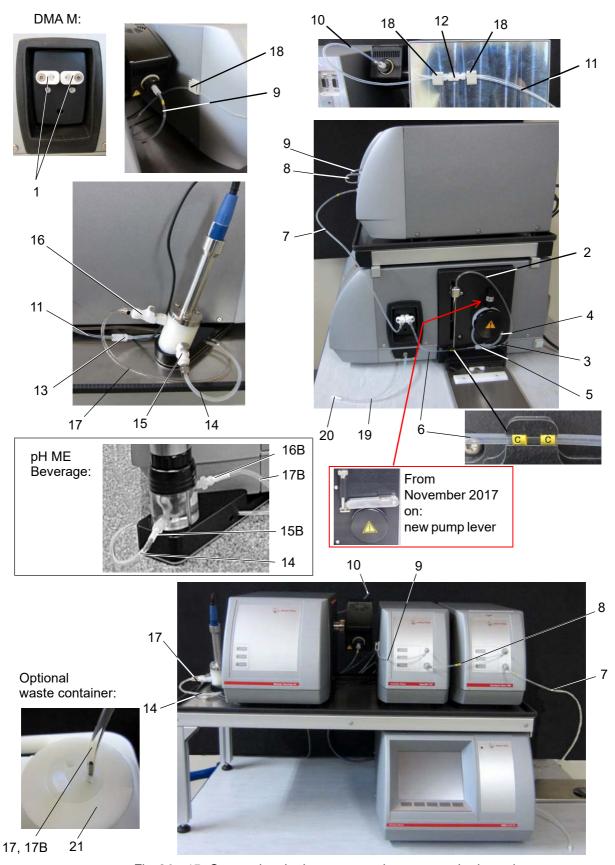


Fig. 20 - 15 Connecting the hoses - complete system, horizontal setup

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	DMA M: filling adapter density cell in-/outlet	159025
2	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
3	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
4	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
6	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Alcolyzer ME lower connector	25523
8	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	Alcolyzer ME upper connector to HazeQC ME lower connector	25540
9	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	HazeQC ME upper connector to Lovis capillary block front side	25523
10	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
11	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to Tygon hose for pH ME (Beverage)	25525
12	Adapter UNF/UNF	Lovis	connects the hose 350 mm from Lovis capillary block rear side with the hose 350 mm to pH ME (Bev.)	64790
13	Adapter UNF/Hose (Female/Male)	Lovis	connector for hose to pH ME (Bev.)	26739
14	Hose Tygon 2375, 1.6x3.2, I = approx. 340 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
15	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
15B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
16	Jack with compression fitting or	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
16B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
17	Hose PU 2.5x4 mm	pH ME	wests have from management and	15272
17B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
18	Cable clip self-adhesive	Lovis	hose guidances, 3 pcs.	62072
19	Hose silicone 3x5 mm, approx. 200 mm	Lovis	air hose	50814
20	Adapter Luer cone	Lovis	tip for air hose	63863
21	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis Modular Assembly (Mat. No. 105880).

Needle - pump - master instrument inlet

 For Xsample 520: Prepare and connect the hose between needle and inlet of the density cell according to Chapter 20.1.2, steps 2 to 10, Fig. 20 - 6 and Fig. 20 - 15.

For Xsample 22: Plug the free Tygon end of this assembled hose to the steel needle supplied with Xsample 22. Perform all other steps for this hose as described for Xsample 520.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Master instrument outlet - Alcolyzer ME - HazeQC ME inlet

2. Bend and connect the hose 530x3x2 FEP 2x1/4"-28 (7) between the outlet of the density cell and the Alcolyzer ME front side. Refer to Fig. 20 - 16.

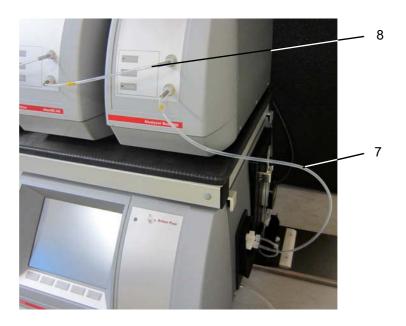


Fig. 20 - 16 Hoses between master instrument outlet, Alcolyzer ME and HazeQC ME outlet

3. Carefully bend the hose 220x3x2 FEP 2x1/4"-28 (8) into its shape and connect it between the upper connector (outlet) of Alcolyzer ME and the lower connector (inlet) of the HazeQC ME according to Fig. 20 - 16.

HazeQC ME outlet - Lovis 2000 ME inlet

4. Refer to Fig. 20 - 17: Carefully bend the hose 530x3x2 FEP 2x1/4"-28 (9) into its shape. Connect the hose to the upper connector of HazeQC ME (outlet), then place the hose in the cable clip (18). Now guide the hose in shape of the loop as shown and connect it to the Lovis 2000 ME capillary block front side.

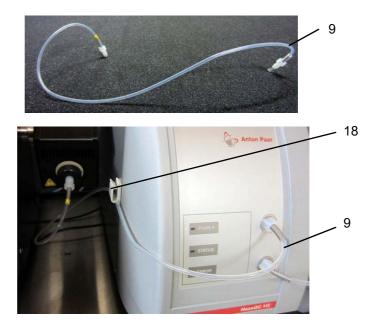


Fig. 20 - 17 Hose between HazeQC ME and Lovis 2000 ME

Lovis 2000 ME outlet – pH ME / pH ME Beverage inlet

5. Prepare the hose between Lovis 2000 ME and pH ME (Beverage): Connect the two hoses 350x3x2 FEP 2x1/4"-28 (10, 11) using an adapter UNF/UNF (12). Connect this assembled hose to the Lovis 2000 ME capillary block rear side. Fix it in position by putting the springs of the hose connectors into the cable clips (18) on the rear side of Lovis 2000 ME as shown in Fig. 20 - 18.

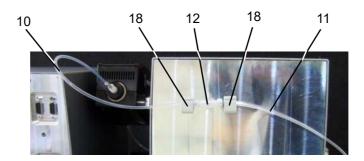


Fig. 20 - 18 Assembling the hose between Lovis 2000 ME and HazeQC ME

- 6. Cut a piece of I = approx. 340 mm from the Tygon hose 1.6x3.2 (14).
- 7. Attach an adapter UNF/Hose (13) onto the free end of this hose.
- 8. Connect the Tygon hose 1.6x3.2 to the FEP hose coming from Lovis 2000 ME by screwing the connector of the 350x3x2 FEP hose (11) into the adapter UNF/Hose (13).
- 9. Plug the free end of the Tygon hose through the outer opening of the pH ME /pH ME Beverage base plate.

- 10. pH ME: Slip the sleeve nut (15a) over the Tygon hose 1.6x3.2 (14). Fit the hose onto the plug (15) and secure it with the sleeve nut. See Fig. 20 19. pH ME Beverage: Attach the Tygon hose 1.6x3.2 (14) to the Adapter Luer to Tygon Tube (15B). See Fig. 20 19.
- 11. Connect the Tygon hose 1.6x3.2 (14) to the inlet of the pH ME / pH ME Beverage (lower connector).

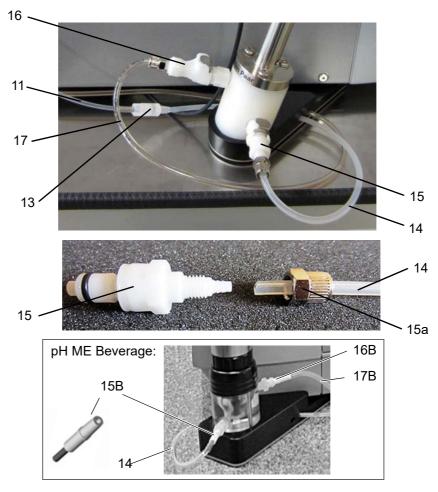


Fig. 20 - 19 Connecting the hoses to pH ME

pH ME / pH ME Beverage outlet - waste container

- 12. Take the PU hose 2.5x4 (17) or the silicone hose 2x4 (17B). Cut a piece that is long enough to reach your waste container.
- 13. pH ME: Mount the jack (16) to the PU hose (17) in the same way as shown for the plug (15) in Fig. 20 19.pH ME Beverage: Attach the silicone hose 2x4 (17B) to the Adapter Luer to Tygon Tube (16B). See Fig. 20 19.
- 14. Connect the waste hose (17, 17B) to the outlet of the pH ME / pH ME Beverage (upper connector).

15. Lead the waste hose (17, 17B) to your waste vessel and secure it against slipping off. When using the optional Waste Container HDPE 8 L – see Fig. 22 - 16 and Fig. 22 - 17 – you can plug the free end of this hose directly to this container using an adapter UNF/screwed tube (21).

Air hose

16. Cut a piece of approx. 200 mm from the silicone hose 3x5 (19). Attach an adapter Luer cone (20) onto one end. Connect this hose to the AIR outlet of the master instrument. See Fig. 20 - 15.

Completing the installation

- 17. For Xsample 520 only: Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection is fixed on the Xsample safety cover; see Chapter 17.2. Lead the hose between Alcolyzer ME and outlet of density cell through the slit in the metal part of the safety cover and attach the safety cover (refer also to the instruction manual of Xsample 520). Avoid to squeeze or kink the hose.
- 18. To put the measuring assembly into operation, continue with Chapter 24.

20.3 Lovis 2000 ME + DMA M + Alcolyzer ME or HazeQC ME + pH ME / pH ME Beverage + Xsample 520/22

The setups and requirements are very similar to the complete system in horizontal setup described in Chapter 20.2. So this chapter does not describe all steps in details - refer to the respective sections as indicated.

20.3.1 Preparing Master Instrument and Modules

1. For preparation, arrangement of master instrument, stand and modules refer to Chapter 20.2.1, further to Fig. 20 - 21.

Connecting the cables

2. Connect the cables according to Fig. 20 - 20.

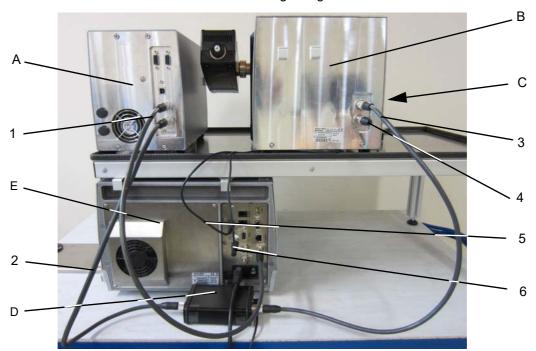


Fig. 20 - 20 Connecting the cables - DMA M + Lovis 2000 ME + HazeQC ME + pH ME / pH ME Beverage + Xsample 122/520

Α	Alcolyzer ME or HazeQC ME
В	Lovis 2000 ME
С	pH ME / pH ME Beverage
D	CAN power supply (Mat. No. 100655)
Е	Master instrument
1	interface cable between master instrument and Alcolyzer ME or HazeQC ME (CAN plug)
2	interface cable between Alcolyzer ME or HazeQC ME (CAN socket) and CAN power supply (plug)
3	interface cable between CAN power supply (socket) and Lovis 2000 ME (CAN plug)
4	CAN/Devicenet terminating resistor on Lovis 2000 ME
5	temperature sensor cable from pH ME / pH ME Beverage
6	cable of pH ME / pH ME Beverage, to BNC connector of the master instrument

Mounting the cable clips

3. Mount the cable clips according to Chapter 20.2.1, step 9, Fig. 20 - 14. Depending on your setup, mount the single cable clip either on the housing of HazeQC ME or Alcolyzer ME.

Mounting the capillary

4. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

20.3.2 Connecting the Hoses

Fig. 20 - 21 shows an assembly with Alcolyzer ME. The installation for an assembly with HazeQC ME is the identical procedure.

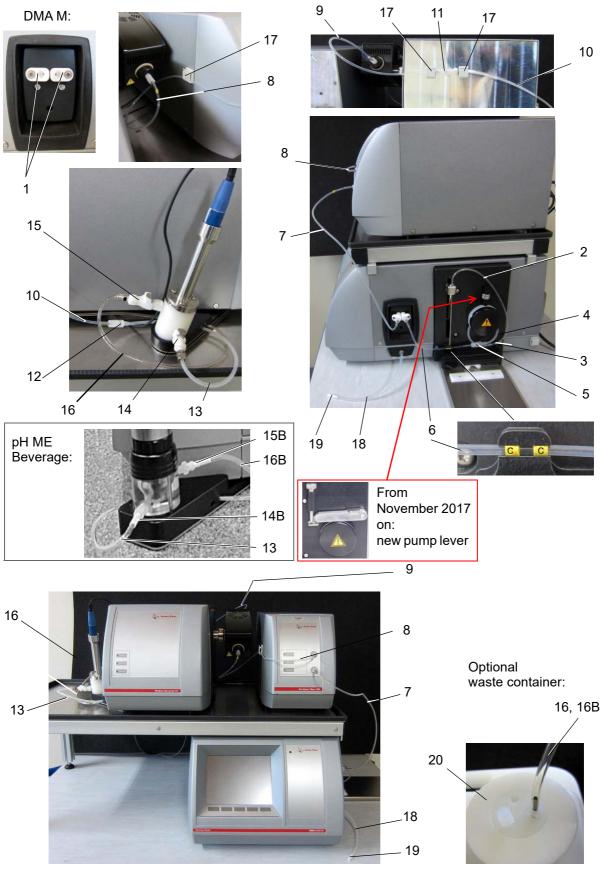


Fig. 20 - 21 All hoses connected - DMA M + Lovis 2000 ME +Alcolyzer ME + pH ME (Beverage) + Xsample 122/520

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	DMA M: filling adapter density cell in-/outlet	159025
2	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
3	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
4	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
6	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Alcolyzer ME or HazeQC ME lower connector	25523
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	Alcolyzer ME or HazeQC ME upper connector to Lovis capillary block front side	25523
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
10	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to Tygon hose for pH ME (Beverage)	25525
11	Adapter UNF/UNF	Lovis	connects the hose 350 mm from Lovis capillary block rear side with the hose 350 mm to pH ME (Bev.)	64790
12	Adapter UNF/Hose (Female/Male)	Lovis	connector for hose to pH ME (Bev.)	26739
13	Hose Tygon 2375, 1.6x3.2, I = approx. 340 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
14	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
14B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
15	Jack with compression fitting	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
15B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
16	Hose PU 2.5x4 mm	рН МЕ		15272
16B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
17	Cable clip self-adhesive	Lovis	hose guidances, 3 pcs.	62072
18	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
19	Adapter Luer cone	Lovis	tip for air hose	63863
	†	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis Modular Assembly (Mat. No. 105880).

Needle - pump - master instrument inlet

 For Xsample 520: Prepare and connect the hose between needle and inlet of the density cell according to Chapter 20.1.2, steps 2 to 10, Fig. 20 - 6 and Fig. 20 - 21.

For Xsample 22: Plug the free Tygon end of this assembled hose to the steel needle supplied with Xsample 520. Perform all other steps for this hose as described for Xsample 520.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Master instrument outlet - Alcolyzer ME or HazeQC ME inlet

 Bend and connect the hose 530x3x2 FEP 2x1/4"-28 (7) between the outlet of the density cell and the Alcolyzer ME / HazeQC ME front side.
 Refer to Fig. 20 - 16.

Alcolyzer ME or HazeQC ME outlet - Lovis 2000 ME inlet

3. Prepare and connect the hose according to Chapter 20.2.2, step 4.

Lovis 2000 ME outlet - pH ME / pH ME Beverage inlet

4. Prepare and connect the hoses in the same way as described in Chapter 20.2.2, steps 5 to 11. Refer also to Fig. 20 - 21 and the item list.

pH ME / pH ME Beverage outlet - waste container

5. Prepare and connect the hose according to Chapter 20.2.2, steps 12 to 15.

Air hose

6. Cut a piece of approx. 200 mm from the silicone hose 3x5 (18). Attach an adapter Luer cone (19) onto one end. Connect this hose to the AIR outlet of the master instrument. See Fig. 20 - 21.

Completing the installation

- 7. For Xsample 520 only: Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection is fixed on the Xsample safety cover; see Chapter 17.2. Lead the hose between Alcolyzer ME or HazeQC ME and outlet of density cell through the slit in the metal part of the safety cover and attach the safety cover (refer also to the instruction manual of Xsample 520). Avoid to squeeze or kink the hose.
- 8. To put the measuring assembly into operation, continue with Chapter 24.

20.4 Lovis 2000 ME + DMA M + Alcolyzer ME or HazeQC ME + Xsample 520/22

The setups and requirements are very similar to the complete system in horizontal setup described in Chapter 20.2. So this chapter does not describe all steps in details - refer to the respective sections as indicated.

20.4.1 Preparing Master Instrument and Modules

1. For preparation, arrangement of master instrument, stand and modules refer to Chapter 20.2.1, further to Fig. 20 - 23.

Connecting the cables

2. Connect the cables according to Fig. 20 - 22.

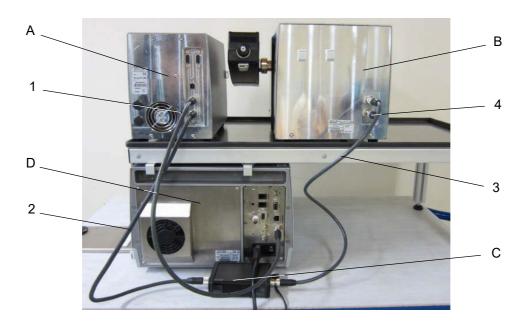


Fig. 20 - 22 Connecting the cables - DMA M + Lovis 2000 ME + HazeQC ME + Xsample 122/520

Α	Alcolyzer ME or HazeQC ME
В	Lovis 2000 ME
С	CAN power supply (Mat. No. 100655)
D	Master instrument
1	interface cable between master instrument and Alcolyzer ME or HazeQC ME (CAN plug)
2	interface cable between Alcolyzer ME or HazeQC ME (CAN socket) and CAN power supply (plug)
3	interface cable between CAN power supply (socket) and Lovis 2000 ME (CAN plug)
4	CAN/Devicenet terminating resistor on Lovis 2000 ME

Mounting the cable clips

Mount the cable clips according to Chapter 20.2.1, step 8. Depending on your setup, mount the single cable clip either on the housing of HazeQC ME or Alcolyzer ME.

Mounting the capillary

4. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

20.4.2 Connecting the Hoses

Fig. 20 - 21 shows an assembly with Alcolyzer ME. The installation for an assembly with HazeQC ME is the identical procedure.

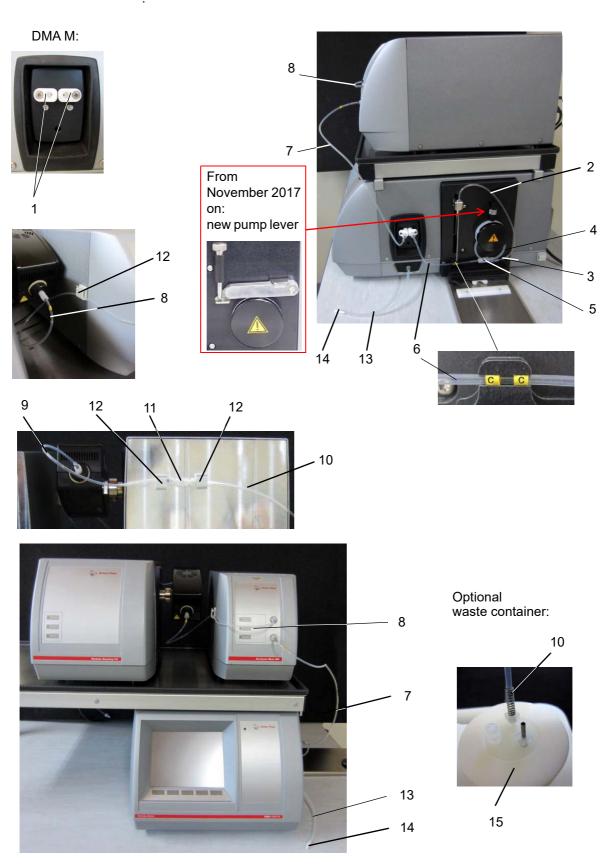


Fig. 20 - 23 All hoses connected - DMA M + Lovis 2000 ME + Alcolyzer ME + Xsample 122/520

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	DMA M: filling adapter density cell in-/outlet	159025
2	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
3	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
4	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
6	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Alcolyzer ME or HazeQC ME lower connector	25523
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	Alcolyzer ME or HazeQC ME upper connector to Lovis capillary block front side	25523
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
10	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to waste container	25524
11	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 600 mm to the waste container	64790
12	Cable clip self-adhesive	Lovis	hose guidances, 3 pcs.	62072
13	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
14	Adapter Luer cone	Lovis	tip for air hose	63863
15	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis Modular Assembly (Mat. No. 105880).

Needle - pump - master instrument inlet

1. For Xsample 520: Prepare and connect the hose between needle and inlet of the density cell according to Chapter 20.1.2, steps 2 to 10, Fig. 20 - 6 and Fig. 20 - 21.

For Xsample 22: Plug the free Tygon end of this assembled hose to the steel needle supplied with Xsample 22. Perform all other steps for this hose as given for Xsample 520.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Master instrument outlet - Alcolyzer ME or HazeQC ME inlet

2. Bend and connect the hose 530x3x2 FEP 2x1/4"-28 between the outlet of the density cell and the Lovis 2000 ME front side. Refer to Fig. 20 - 16.

Alcolyzer ME or HazeQC ME outlet - Lovis 2000 ME inlet

3. Prepare and connect the hose according to Chapter 20.2.2, step 4.

Lovis 2000 ME outlet - waste container

- 4. Connect a hose 350x3x2 FEP 2x1/4"-28 (9) and a hose 600x3x2 FEP 2x1/4"-28 (10) using an adapter UNF/UNF (11). Connect the free end of the hose 350x3x2 to the Lovis capillary block rear side. Carefully bend the hose into its shape and fix it by placing the springs of the hose connectors in the cable clips (12) on the rear side of the module housing ME.
- 5. Lead the free end of the hose 600x3x2 (10) to the waste container and secure it against slipping off. When using the optional Waste Container HDPE 8 L (15), you can screw the free end of this hose directly to this container.

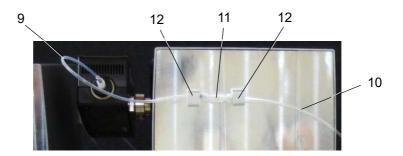


Fig. 20 - 24 Connecting the hose between Lovis 2000 ME and waste container

Air hose

6. Prepare and connect the hose according to Chapter 20.2.2, step 14.

Completing the installation

- 7. For Xsample 520 only: Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection is fixed on the Xsample safety cover; see Chapter 17.2. Lead the hose between Alcolyzer ME or HazeQC ME and outlet of density cell through the slit in the metal part of the safety cover and attach the safety cover (refer also to the instruction manual of Xsample 520). Avoid to squeeze or kink the hose.
- 8. To put the measuring assembly into operation, continue with Chapter 24.

20.5 Lovis 2000 ME + DMA M + HazeQC ME + Xsample 352/452 - Vertical Setup

Required equipment:

- Angular screwdriver Torx T20 (from Lovis accessories)
- · Cutter or a pair of scissors
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Hose Set Lovis Modular Assembly (Mat. No.105880) or Lovis Accessory Kit Complete (Mat No. 100220)

The figures show the assembly using an Xsample 452. The magazine is not mounted to give a better view on the hoses. Hose and cable connections are done in the same way for Xsample 352.

General specifications for this assembly

- To ensure bubble-free filling the maximum filling viscosity is 100 mPa.s.
- For Xsample 452, a magazine for 24 vials with 50 mL filling volume is required (minimum sample volume 32 mL).
- To reduce the required drying time, use compressed air with an air preparation kit (refer to the Lovis 2000 M/ME Product Description List).

20.5.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.40 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 352/452 into the DMA M according to the Xsample 352 or Xsample 452 instruction manual. The DMA M is the master instrument.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.

Arranging master instrument and modules

Refer to Fig. 20 - 25:

- 4. Place the drip plate (4) on top of the master instrument (1) and make sure it is correctly engaged. See Chapter 17.3.
- 5. Xsample 352/452: Prepare the Xsample safety cover (edge protection) according to Chapter 17.2.
- 6. Place the Module Housing Lovis ME (2) on the drip plate and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.

7. Place the HazeQC ME turbidity meter (3) on top of the Module Housing Lovis ME (2).



Fig. 20 - 25 Placing master instrument, Lovis 2000 ME and HazeQC ME

1	DMA M
2	Lovis 2000 ME
3	HazeQC ME
4	Drip plate

Connecting the cables

8. Connect the cables according to Fig. 20 - 26.

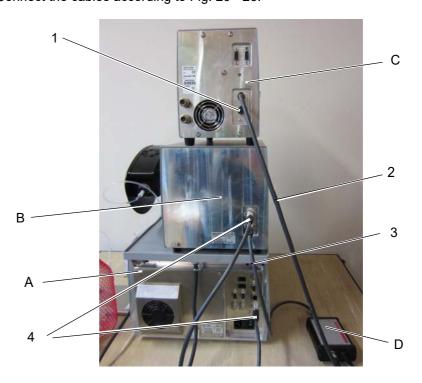


Fig. 20 - 26 Connecting the cables and the CAN power supply

Α	Master instrument
В	Lovis 2000 ME
С	HazeQC ME
D	CAN power supply (Mat. No. 100655)
1	CAN/Devicenet terminating resistor to CAN socket on HazeQC ME
2	interface cable between HazeQC ME CAN plug and socket of CAN power supply
3	interface cable between Lovis ME CAN socket and plug of CAN power supply
4	interface cable between Lovis ME CAN plug and CAN socket of master instrument

Mounting the cable clips

9. Fix the cable clips on the Lovis ME module housing according to Fig. 20 - 27.

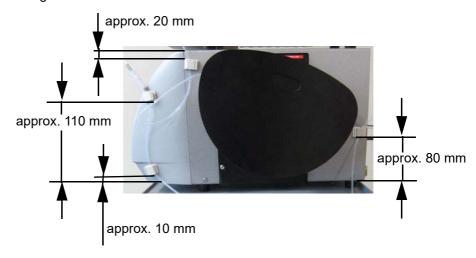


Fig. 20 - 27 Positioning the cable clips (hose guidances)

Mounting the capillary

10. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

20.5.2 Connecting the Hoses

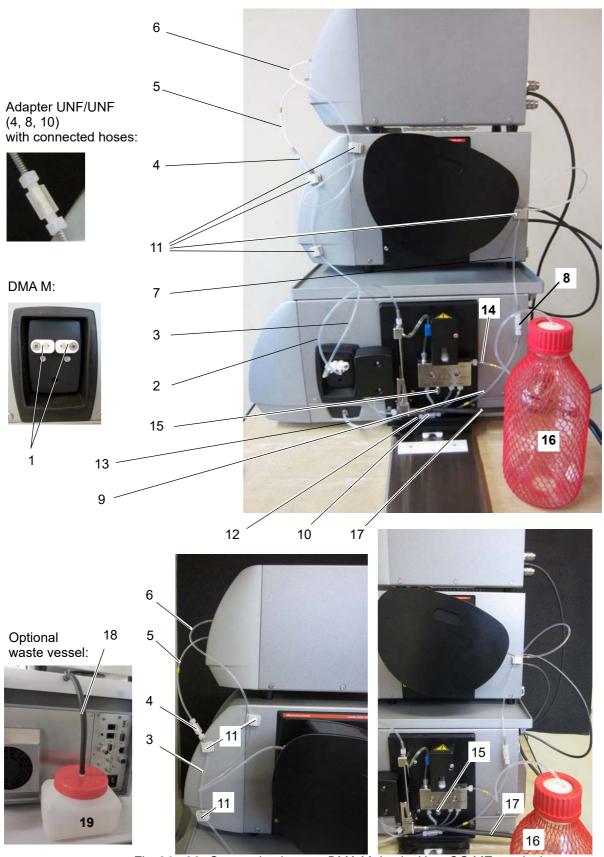


Fig. 20 - 28 Connecting hoses - DMA M, Lovis, HazeQC ME, vertical setup

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	DMA M: filling adapter density cell in-/outlet	159025
2	Hose 300x3x2 PTFE marked "AA"	Xsample 352/452	hose from needle to density cell inlet	3443
3	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	hose from density cell outlet to adapter UNF/UNF (direction to HazeQC ME)	25523
4	Adapter UNF/UNF	Lovis	connects the hose 530 mm coming from density cell outlet to the hose 220 mm to HazeQC ME lower connector	64790
5	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	hose from adapter UNF/UNF to HazeQC ME lower connector	25540
6	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	hose from HazeQC ME upper connector to Lovis capillary block front side	25524
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	hose from Lovis capillary block rear side to adapter UNF/UNF (direction to Xsample sensor hose)	25523
8	Adapter UNF/UNF	Lovis	connects the hose 530 mm coming from Lovis capillary block rear side to the hose 220 mm (direction to Xsample sensor hose)	64790
9	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	hose from adapter UNF/UNF to adapter UNF/UNF (direction to Xsample sensor hose)	25540
10	Adapter UNF/UNF	Lovis	connects the hose 220 mm to the Xsample sensor hose	64790
11	Cable clip self-adhesive	Lovis	hose guidance	62072
12	Hose 740x3x2 FEP 2x1/4"-28 UNF "BA"		sensor hose Xsample 352/452	48722
13	Hose 2x4 silicone		"Air IN" of the valve block to the "Air" nozzle of DMA M	51273
14	Hose 750x3x2 PTFE 1x1/4"-28 UNF "AD"	Xsample 352/452	Hose(s) for rinsing liquids	21230
15	"Pressure" connector of valve block		to connect a hose from the compressed air supply	
16	bottle(s) for rinsing liquid		solvent bottle(s)	21312
17	Hose 5x8 Viton-BK ISO Versinic		waste hose to a waste container ^b	72546
18	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm; length depends on place of waste container	Drip plate	drain hose from drip plate	72546 21307
19	Waste vessel 500 mL	DMA M	waste vessel for drain hose, if you do not want to connect the drain hose to the large waste container	6210

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis Modular Assembly (Mat. No. 105880).

b. Connect the hose to a customer's waste container or to the optional safety waste container (Mat No. 87585)

For connecting the hoses refer to Fig. 20 - 28 and the detail pictures given within the text, further to the list of parts:

Needle - master instrument inlet

- If required, replace the currently installed injection adapters of the DMA M by the injection adapters UNF (1). Refer to the DMA M instruction manual respectively to the instruction manual of your Xsample model. The procedure of dismounting/mounting is the same for all types of DMA M injection adapters.
- 2. Screw one end of the hose 300x3x2 PTFE (2) into the top of the Xsample needle, the other end into the inlet of the density cell.

Master instrument outlet - HazeQC ME inlet

- 3. Screw one end of the hose 530x3x2 FEP 2x1/4"-28 UNF (3) into the outlet of the density cell. Bend the hose upwards. Screw the other end of this hose into an adapter UNF/UNF (4). Guide the hose through two cable clips (11) near the front edge of the Lovis ME module housing.
- Screw on end of the hose 220x3x2 FEP 2x1/4"-28 UNF (5) into the free end
 of the adapter UNF/UNF (4). Screw the other end of this hose into the lower
 connector of the HazeQC ME.

HazeQC ME inlet - Lovis 2000 ME inlet

- 5. Screw one end of the hose 600x3x2 FEP 2x1/4"-28 UNF (6) into the upper connector of the HazeQC ME. Guide the hose through the cable clip (11) near the top edge of the Lovis ME module housing.
- 6. Bend the hose into a wide loop and screw the other end into the filling adapter on the front side of the Lovis capillary block.

Lovis 2000 ME outlet - Xsample sensor hose

- 7. Connect the following hoses with two adapters UNF/UNF:
 - Hose 530x3x2 FEP 2x1/4"-28 UNF (7) Adapter UNF/UNF (8)
 - Adapter UNF/UNF (8) Hose 220x3x2 FEP 2x1/4"-28 UNF (9)
 - Hose 220x3x2 FEP 2x1/4"-28 UNF (9) Adapter UNF/UNF (10)
- 8. Screw the free end of the hose 530x3x2 FEP 2x1/4"-28 UNF (7) into the filling adapter on the back side of the Lovis capillary block. Bend the hose upwards counter-clockwise into a wide loop and then guide it downwards through the cable clip (11) near the back edge of the Lovis ME module housing.
- 9. Screw the Xsample 352/452 sensor hose (12) into the free end of the adapter UNF/UNF (10).

Air hose

10. Connect the air hose (13) of the Xsample 352/452 to the AIR connector (air pump outlet) of the DMA M master instrument.

Compressed air

11. Connect a hose either from your compressed air supply or the optional air preparation set to the "Pressure" connector on the valve block (15). Further information see Chapter 23.

NOTICE

If the pressure supplied to Xsample 352/452 is higher than 1.5 bar (21.7 psi), the valves in the valve block may not close correctly. This may cause Xsample 452 to malfunction or be damaged. Only use compressed air with these specifications: Maximum pressure for incoming air: 1.5 bar (21.7 psi). The air must be dry and free of oil, water and dust.

TIP If you want to reduce the drying time significantly, we recommend using an optional air preparation set with membrane air dryer, see Chapter 23.2. You can also refer to the Lovis Product Description List on the USB storage device supplied with your Lovis.

Rinsing hose(s)

12. Prepare and connect the rinsing hose(s) (14) and the rinsing liquid bottle(s) (16) according to the Xsample 352/452 instruction manual.

Waste hose

13. Connect the waste hose (17) to the waste container according to the Xsample 352/452 instruction manual.

Drip plate - waste container

14. Trim the hose (18) coming from the drip plate to the required length and connect it to the waste container. Alternatively you can connect it to a separate vessel, use e.g. the waste vessel 500 mL (19) or any other suitable vessel. Secure the hose against slipping off.

Completing the installation

- 15. Xsample 452: Attach the magazine according to the Xsample 352/452 instruction manual.
- 16. Ensure that the edge protection of the Xsample safety cover and the crush protection are mounted; see Chapter 17.2. Attach and use the safety cover according to the Xsample 352/452 instruction manual. Avoid to squeeze or kink the hose leading to the Lovis capillary block.

To put the measuring assembly into operation, continue with Chapter 24.

21 Assemblies with pH ME / pH ME Beverage

Supported combinations

- DMA 4100/4500/5000M, DSA 5000M + Lovis 2000 ME + pH ME / pH ME
 Beverage + Xsample 520/22
- Lovis 2000 M + pH ME / pH ME Beverage + Xsample 520/22

Instead of using a sample changer the system can also be manually filled by syringe - min. two 10 mL syringes for sample displacement required.

NOTICE

When retrofitting an existing DMA M/DSA M or Lovis 2000 M: Check your master instrument. The pH ME module can only be used with instruments which have a small removable cover on the rear side interface panel for inserting the electronic board of pH ME. If in doubt, contact your local Anton Paar distributor.

21.1 DMA M/DSA M + Lovis 2000 ME + pH ME / pH ME Beverage - Manually Filled by Syringe

For setting up a manually filled system, you have two options:

- The pH ME (Beverage) module and the master instrument are connected, the Lovis capillary is filled separately.
- The master instrument and all modules are connected with hoses. The whole system is filled with a syringe connected at the master instrument. This setup is described in the following.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

21.1.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Lovis 2000 ME into the DMA M/DSA M according to Chapter 6.4.

- 3. Place the pH ME (Beverage) measuring cell unit according to the pH ME / pH ME Beverage instruction manual.
- 4. Attach the cable clips onto the master instrument as indicated in Fig. 21 1.
- 5. Connect the cables according to Chapter 6.5.
- 6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

21.1.2 Connecting the Hoses

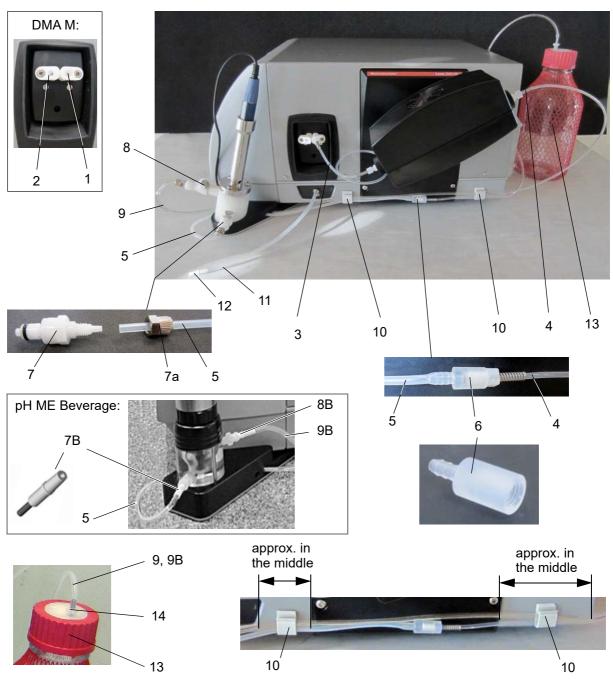


Fig. 21 - 1 Lovis ME + DMA M + pH - connecting the hoses

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell outlet	159025
2	Injection adapter Luer DMA	DMA M	filling adapter density cell inlet	159096
3	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	density cell outlet to Lovis capillary block front side	25525
4	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to filling hose pH ME (Bev.) module	25524
5	Hose Tygon 2375, 1.6x3.2 I = approx. 410 mm	pH ME (Bev.)	from hose 600x3x2 to pH ME (Bev.)	67540
6	Adapter UNF/Hose	Lovis	connects the hose 600x3x2 FEP and the hose Tygon 410x1.6x3.2	26739
7	Plug with compression fitting	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
7B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
8	Jack with compression fitting	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
8B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
9	Hose PU 2.5x4 mm	рН МЕ		15272
9B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
10	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
11	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
12	Adapter Luer cone	Lovis	tip for air hose	63863
13	Waste bottle 1 L glass	Optional	waste vessel	101655

- a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set pH Option Lovis (Mat. No. 105880).
- b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Flow-through filling set.

Refer to Fig. 21 - 1:

- Replace the currently installed rear injection adapter of the DMA M by the injection adapter UNF (1) supplied with Lovis 2000 ME. For replacement of injection adapters refer to the instruction manual of the DMA M.
 - When using a DSA M: The injection adapter Luer for the DSA M must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.
- 2. If required, replace the currently installed front injection adapter of the DMA M by the injection adapter Luer DMA (2) supplied with this instrument.

When using a DSA M: The injection adapter UNF for the DSA must be mounted on the outlet of the density cell (upper connector). Refer to the instruction manual of the DSA M.

Master instrument outlet - Lovis inlet

3. Refer to Fig. 21 - 2. Connect the hose 350x3x2 FEP (3) to the injection adapter UNF (1) on the DMA M. Bend this hose into the shape of a loop. Now connect it to the Lovis capillary block front side.



Fig. 21 - 2 Connecting the hose between DMA M and Lovis

Lovis outlet - pH ME / pH ME Beverage

- 4. Connect the hose 600x3x2 FEP (4) to the Lovis capillary block rear side and bend it carefully as indicated.
- 5. Cut a piece of I = 410 mm from the Tygon hose 1.6x3.2 (5) and plug an adapter UNF/Hose (6) onto one end of this hose. Connect this adapter to the hose 600x3x2 FEP (4).
- 6. Plug the free end of the Tygon hose (5) through the outer opening of the pH ME/pH ME Beverage base plate.
- 7. pH ME: Slip the sleeve nut (7a) over the Tygon hose 1.6x3.2 (5). Fit the hose onto the plug (7) and secure it with the sleeve nut. See Fig. 21 1. pH ME Beverage: Attach the Tygon hose 1.6x3.2 (5) to the Adapter Luer to Tygon Tube (7B). See Fig. 21 1.
- 8. Connect the Tygon hose 1.6x3.2 (5) to the inlet of the pH ME / pH ME Beverage (lower connector).

pH ME / pH ME Beverage outlet - waste container

9. Take the PU hose 2.5x4 (9) or the silicone hose 2x4 (9B). Cut a piece that is long enough to reach your waste container.

- 10. pH ME: Mount the jack (8) to the PU hose in the same way as shown for the plug (7) in Fig. 21 1.
 - pH ME Beverage: Attach the silicone hose 2x4 (9B) to the Adapter Luer to Tygon Tube (8B). See Fig. 21 1.
- 11. Connect the waste hose (9, 9B) to the outlet of the pH ME / pH ME Beverage (upper connector).
- 12. Plug the free end of the waste hose through the inner opening of the pH ME base plate. Fit the hose into the two cable clips mounted on the DMA M. Lead the hose to your waste vessel and secure it against slipping off. If you use the optional waste bottle glass 1 L (13): Screw an adapter UNF/ screwed tube (14) into the insert of the bottle's screw cap. Plug the hose (9) to this adapter.

Air hose

- 13. Cut a piece of approx. 200 mm from the silicone hose 3x5 (11). Attach an adapter Luer cone (12) onto one end.
- 14. Connect this hose to the AIR outlet of the master instrument.

Completing the installation

15. To put the measuring assembly into operation, continue with Chapter 24.

21.2 DMA M/DSA M + Lovis 2000 ME + pH ME / pH ME Beverage + Xsample 520/22

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

21.2.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 520/22 into the DMA M according to the Xsample 520 or Xsample 22 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.

- 4. Place the pH ME (Beverage) measuring cell unit according to the pH ME / pH ME Beverage instruction manual.
- 5. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 6. Place the Module Housing Lovis ME on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4
- 7. For Xsample 520 only: Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.
- 8. Attach the cable clips (16) as indicated in Fig. 21 4.
- 9. Connect the cables according to Fig. 21 3.

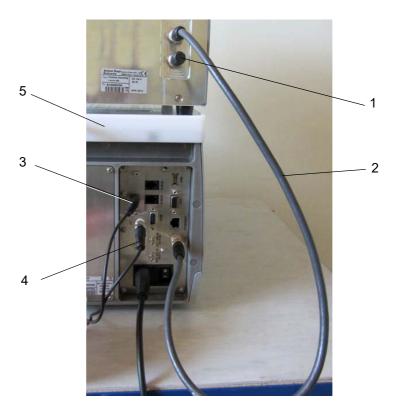


Fig. 21 - 3 Connecting the cables

1	CAN/Devicenet terminating resistor to CAN socket on Lovis ME
2	Interface cable between DMA M/DSA MCAN socket and Lovis ME CAN plug
3	Temperature sensor cable from pH ME / pH ME Beverage
4	Cable of pH ME / pH ME Beverage, to BNC connector of the master instrument
5	Drip plate

10. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

21.2.2 Connecting the Hoses

For a better filling performance and less bubble formation the hoses must be connected for filling by pressure.

Refer to Fig. 21 - 4:

 Replace the currently installed rear injection adapter of the DMA M by the injection adapter UNF (1). For replacement of injection adapters refer to the instruction manual of the DMA M. The procedure of dismounting/mounting is the same for all types of DMA M injection adapters.

When using a DSA M: The injection adapter Luer for the DSA M must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.

When using an Xsample 22: An injection adapter fitting for the DMA M/DSA M on the inlet of the density cell respectively the sound velocity cell must be mounted. Refer to the instruction manual of Xsample 22 and of the master instrument.

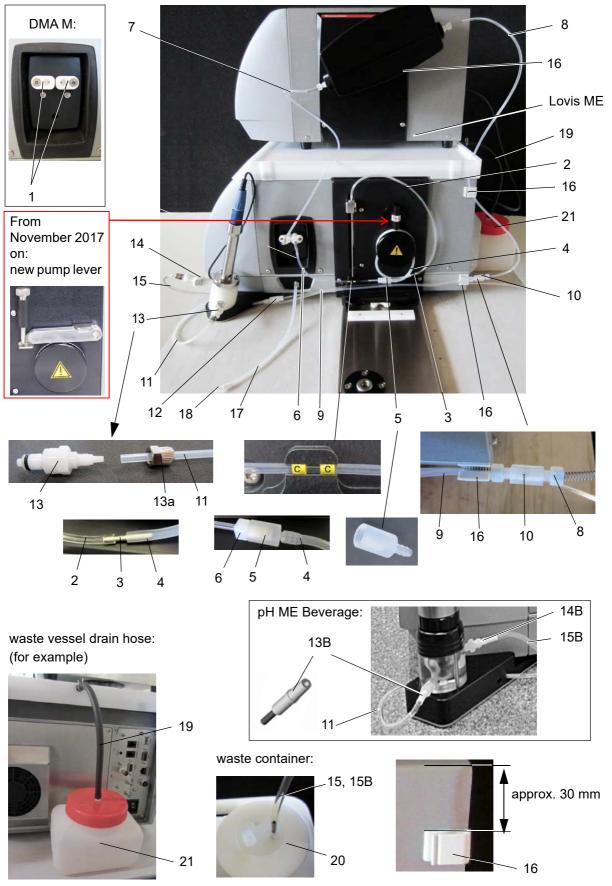


Fig. 21 - 4 Lovis ME + DMA M + pH + Xsample 122/520 – hose connection

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell outlet and inlet	159025
2	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose from needle to pump hose	67540
3	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
4	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520	pump hose	51273
5	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
6	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
8	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to filling hose pH ME (Bev.) module	25524
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	between hose 600x3x2 coming from Lovis capillary block rear side and Tygon hose 1.6x3.2 to pH ME (Bev.)	25525
10	Adapter UNF/UNF	Lovis	connects the hose 600 mm coming from Lovis capillary block rear side with the hose 350 mm	64790
11	Hose Tygon 2375, 1.6x3.2 mm, I = approx. 340 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
12	Adapter UNF/Hose (Female/Male)	Lovis	connector for hose to pH ME (Bev.)	26739
13	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
13B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
14	Jack with compression fitting or	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
14B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
15	Hose PU 2.5x4 mm	рН МЕ		15272
15B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
16	Cable clip self-adhesive	Lovis	hose guidance	62072
17	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
18	Adapter Luer cone	Lovis	tip for air hose	63863
19	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate (can also be connected to the large waste container)	72546 21307
20	Waste container 8 L HDPE	Optional	waste container	105979
21	Waste vessel 500 mL	DMA M / DSA M	waste vessel for drain hose	6210

a.Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905). When using a DSA M, these items can be found in the Hose Set Lovis+DSA+XS 22/320 122/520 (Mat. No. 102591).

Refer to Fig. 21 - 4 and to the detail pictures in the text:

Needle – pump – master instrument inlet

1. Prepare and connect the hose between needle and the inlet of the density cell of the DMA M (parts no. 2 - 6) in the (respectively the sound velocity cell for a DSA M) according to Chapter 20.1.2, steps 2 to 10 and Fig. 20 - 6.

When using an Xsample 22, refer also to Chapter 19.4.2.1.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Master instrument outlet - Lovis inlet

2. Bend the hose 530x3x2 FEP 2x1/4"-28 UNF (7) as indicated in Fig. 21 - 5. Connect it to the outlet of the density cell and then to the Lovis capillary block front side.

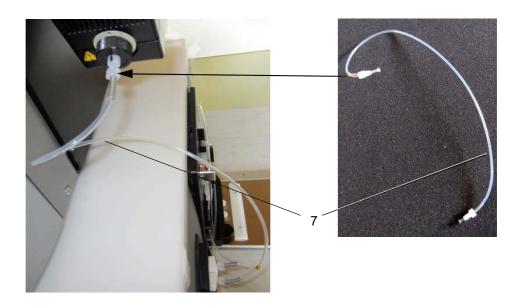


Fig. 21 - 5 Connecting the hose between DMA M and Lovis 2000 ME

Lovis outlet - pH ME / pH ME Beverage

3. Carefully bend the hose 600x3x2 FEP 2x1/4"-28 UNF (8) as shown in Fig. 21 - 6 and connect it to the Lovis capillary block rear side.



Fig. 21 - 6 Preparing the hose 600x3x2

- 4. Screw an adapter UNF/UNF (10) onto the free end of this hose and connect the hose 350x3x2 FEP 2x1/4"-28 UNF (9) to this adapter.
- 5. Cut a piece of I = 410 mm from the Tygon hose 1.6x3.2 (11) and plug an adapter UNF/Hose (12) onto one end of this hose. Connect the adapter UNF/Hose (12) to the hose 350x3x2 FEP 2x1/4"-28 UNF (9).
- 6. Plug the free end of the Tygon hose (11) through the outer opening of the pH ME/pH ME Beverage base plate.
- 7. pH ME: Slip the sleeve nut (13a) over the Tygon hose 1.6x3.2 (11). Fit the hose onto the plug (13) and secure it with the sleeve nut. See Fig. 21 4. pH ME Beverage: Attach the Tygon hose 1.6x3.2 (11) to the Adapter Luer to Tygon Tube (13B). See Fig. 21 4.
- 8. Connect the Tygon hose 1.6x3.2 (11) to the inlet of the pH ME / pH ME Beverage (lower connector).
- 9. When this long hose combination between Lovis capillary block rear side and pH ME is readily connected, place the hose 600x3x2 FEP into the cable clip mounted on the capillary block.

pH ME / pH ME Beverage outlet - waste container

- 10. Take the PU hose 2.5x4 (15) or the silicone hose 2x4 (15B). Cut a piece that is long enough to reach your waste container.
- 11. pH ME: Mount the jack (14) to the PU hose in the same way as shown for the plug (13) in Fig. 21 4.
 pH ME Beverage: Attach the silicone hose 2x4 (15B) to the Adapter Luer to Tygon Tube (14B). See Fig. 21 4.
- 12. Connect the waste hose (15, 15B) to the outlet of the pH ME / pH ME Beverage (upper connector).
- 13. Connect the other end of the waste hose to your waste container. When using the optional Waste Container HDPE 8 L (20), use the supplied adapter UNF/screwed tube to connect the waste hose to this container.

14. Place first the waste hose (15, 15B) in the cable clip (16) on the master instrument, then place the hose connector of the hose 350x3x2 (9) with its spring into the cable clip to fix it in this position.



Fig. 21 - 7 Guiding the hoses

Air hose

- 15. Cut a piece of approx. 200 mm from the silicone hose 3x5 (17). Attach an adapter Luer cone (18) onto one end.
- 16. Connect this hose to the AIR outlet of the master instrument.

Drip plate - waste container

17. Trim the hose (19) coming from the drip plate to the required length. Connect it e.g. to the waste vessel 500 mL (21) or any other suitable vessel. Secure the hose against slipping off. Or connect it to the same waste container as your waste hose.

Completing the installation

- 18. For Xsample 520 only: Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. Lead the hose connected between the master instrument's outlet and the Lovis capillary block front side through the slit in the metal part of the safety cover and attach the safety cover (refer also to the instruction manual of Xsample 520). Avoid to squeeze or kink the hose.
- 19. To put the measuring assembly into operation, continue with Chapter 24.

21.3 Lovis 2000 M + pH ME / pH ME Beverage

Required equipment:

Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

21.3.1 Preparing Master Instrument and Module

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the General Software Functions instruction manual.
- 2. Place the pH ME (Beverage) measuring cell unit according to the pH ME / pH ME Beverage instruction manual. Put the left front foot of Lovis 2000 M into the opening on the base plate of pH ME (Beverage).
- 3. Attach two cable clips (8) as indicated in Fig. 21 9.
- 4. Connect the cables according to Fig. 21 8.



Fig. 21 - 8 Connecting the cables

1	Temperature sensor cable of pH ME / pH ME Beverage
2	Cable of pH ME / pH ME Beverage, to BNC connector of the master instrument
3	Lovis 2000 M power cable

Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

6B

5B

pH ME Beverage: 7B 6 7 10

21.3.2 Connecting the Hoses

Fig. 21 - 9 Lovis 2000 ME + pH ME / pH ME Beverage – hose connection

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	filling support to Lovis capillary block front side	25525
2	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis capillary block rear side to filling hose pH ME (Bev.) module	25523
3	Adapter UNF/Hose	Lovis ^b	connects the hose 530x3x2 FEP and the hose Tygon 1.6x3.2	26739
4	Hose Tygon 2375, 1.6x3.2 I = approx. 410 mm	pH ME (Bev.)	from hose 530x3x2 to pH ME (Bev.)	67540
5	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
5B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
6	Jack with compression fitting	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
6B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
7	Hose PU 2.5x4 mm	рН МЕ		15272
7B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
8	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
9	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
10	Adapter Luer cone	Lovis	tip for air hose	63863
11	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

a. Lovis: Item can be found in the Flow-through filling set or in the Lovis Accessory Kit Complete.

b. Lovis: Item can be found in the Lovis Accessory Kit Complete or needs to be ordered separately.

Refer to Fig. 21 - 9:

Filling support – Lovis capillary block inlet

1. Connect the hose 350x3x2 FEP (1) to the filling support from below. Bend the hose into a loop. For the correct shape, refer also to QUERVERWEIS Fig!. Now connect this hose to the Lovis capillary block front side.

Lovis capillary block outlet - pH ME / pH ME Beverage

- 2. Connect the hose 530x3x2 FEP (2) to the Lovis capillary block rear side and bend it carefully as shown.
- 3. Cut a piece of I = 410 mm from the Tygon hose 1.6x3.2 (4) and plug an adapter UNF/Hose (3) onto one end of this hose. Connect this adapter to the hose 530x3x2 FEP (2).
- 4. pH ME: Slip the sleeve nut (5a) over the Tygon hose 1.6x3.2 (4). Fit the hose onto the plug (5) and secure it with the sleeve nut. See 5..



Fig. 21 - 10 Connecting the hoses for pH ME

pH ME Beverage: Attach the Tygon hose 1.6x3.2 (4) to the Adapter Luer to Tygon Tube (5B). See Fig. 21 - 9.

- 5. Connect the Tygon hose 1.6x3.2 (5) to the inlet of the pH ME / pH ME Beverage (lower connector).
- 6. Fit the hose 530x3x2 FEP (2) into the two cable clips (8). Push the spring protection of the hose connector into the clip in the middle of the Lovis (see arrow). Then the hose cannot slip any more and is fixed.

pH ME / pH ME Beverage outlet - waste container

- 7. Take the PU hose 2.5x4 (7) or the silicone hose 2x4 (7B). Cut a piece that is long enough to reach your waste container.
- pH ME: Mount the jack (8) to the PU hose in the same way as shown for the plug (7) in Fig. 21 1.
 pH ME Beverage: Attach the silicone hose 2x4 (9B) to the Adapter Luer to

Tygon Tube (8B). See Fig. 21 - 1.

- 9. Connect the waste hose (9, 9B) to the outlet of the pH ME /pH ME Beverage (upper connector).
- 10. Plug the free end of the waste hose through the inner opening of the pH ME/ pH ME Beverage base plate. Lead the hose to your waste vessel and secure it against slipping off.
 - If using the supplied waste vessel (11), screw an Adapter Luer 1/4" UNF into its cover. Attach an Adapter Luer cone to the free end of the waste hose and plug it into the Adapter Luer 1/4" UNF on the waste vessel.

Air hose

- 11. Cut a piece of approx. 200 mm from the silicone hose 3x5 (9). Attach an adapter Luer cone (10) onto one end.
- 12. Connect this hose to the AIR outlet of the master instrument.

Completing the installation

To put the measuring assembly into operation, continue with Chapter 24.

21.4 Lovis 2000 M + pH ME / pH ME Beverage + Xsample 520/22

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)

21.4.1 Preparing Master Instrument and Module

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the General Software Functions instruction manual of the master instrument.
- 2. Mount the Xsample 520/22 into the Lovis 2000 M Base Unit according to the Xsample 520 or Xsample 22 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 4. Place the pH ME (Beverage) measuring cell unit according to the pH ME / pH ME Beverage instruction manual. Put the left front foot of Lovis 2000 M Base Unit into the opening on the base plate of pH ME (Beverage).
- 5. Place the drip plate on top of the master instrument and make sure it is correctly engaged. See Chapter 17.3.
- 6. Place the Module Housing Lovis ME on top of the master instrument and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4
- 7. For Xsample 520 only: Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.
- 8. Attach three cable clips (16) as indicated in Fig. 21 4.

9. Connect the cables according to Fig. 21 - 11.

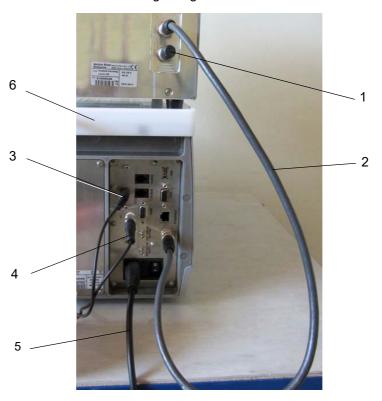


Fig. 21 - 11 Connecting the cables

1	CAN/Devicenet terminating resistor to CAN socket on Lovis ME
'	<u> </u>
2	Interface cable between DMA M/DSA MCAN socket and Lovis ME CAN plug
3	Temperature sensor cable from pH ME / pH ME Beverage
4	Cable of pH ME / pH ME Beverage, to BNC connector of the master instrument
5	Power cable
6	Drip plate

10. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

21.4.2 Connecting the Hoses

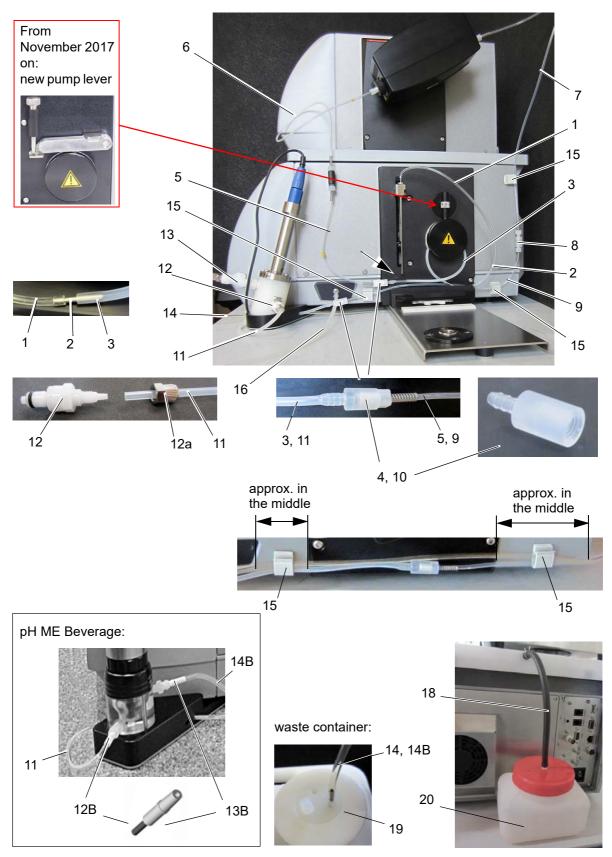


Fig. 21 - 12 Lovis 2000 M + Xsample 122/520 + pH ME / pH ME Beverage

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose from needle to pump hose	67540
2	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
3	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520	pump hose	51273
4	Adapter UNF/Hose (Female/Male)	Lovis ^a	connector for pump hose	26739
5	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	pump hose to Lovis filling support	25525
6	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	Lovis filling support to Lovis capillary block front side	25523
7	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis capillary block rear side to filling hose pH ME (Bev.) module	25524
8	Adapter UNF/UNF	Lovis ^a	connects the hose 600 mm coming from Lovis capillary block rear side with the hose 350 mm	64790
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	between hose 600x3x2 coming from Lovis capillary block rear side and Tygon hose 1.6x3.2 to pH ME (Bev.)	25525
10	Adapter UNF/Hose (Female/Male)	Lovis ^c	connector for hose to pH ME (Bev.)	26739
11	Hose Tygon 2375, 1.6x3.2 mm, I = approx. 250 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
12	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
12B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
13	Jack with compression fitting or	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
13B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
14	Hose PU 2.5x4 mm	pH ME		15272
14B	Or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
15	Cable clip self-adhesive	Lovis	hose guidance	62072
16	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
17	Adapter Luer cone	Lovis	tip for air hose	63863
18	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate	drain hose from drip plate (can also be connected to the large waste container)	72546 21307
19	Waste container 8 L HDPE	Optional	waste container	105979
20	Waste bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

a. Lovis: Item can be found in the Hose set Lovis+XS 22/320 122/520 (Mat. No. 101902) or in the Lovis Accessory Kit Complete

b. Lovis: Item can be found in the Flow-through Filling Set (including the capillary) or in the Lovis Accessory Kit Complete

c. Lovis: Item can be found in the Lovis Accessory Kit Complete or needs to be ordered separately.

For a better filling performance and less bubble formation the hoses must be connected for filling by pressure.

Refer to Fig. 21 - 9:

Needle - pump - Lovis inlet

- 1. Cut a piece of approx. 270 mm from the Tygon hose 1.6x3.2.
- 2. Connect the steel tube 2.1x2.4x20 mm (2) to the Tygon hose (1).
- 3. Cut a piece of approx. 250 mm from the silicone hose 2x4 (3; from the Xsample 520 accessories).
- 4. Plug the silicone hose (3) onto the free end of the steel tube (2).
- 5. Attach an adapter UNF/Hose (4) onto the free end of the silicone hose.
- 6. Plug the Tygon end of this assembled hose onto the top of the needle.
- TIP To remove a Tygon hose from a tube, do not pull it. This will damage the hose and it cannot be re-used. Push the hose from the connector using your finger tips respectively your finger nails.
 - 7. Turn the pump lever into horizontal position and remove the cartridge. Coil the silicone part of this assembled hose around the peristaltic pump. Attach the cartridge, hold it in place and pull the two hose ends slightly downwards, so that they are positioned in the groove of the cartridge. Then turn the pump lever to vertical position.
 - 8. To hold the silicone in position, place it in the tube holder below the Xsample needle (see arrow).
 - 9. Connect one end of the hose 350x3x2 FEP 2x1/4"-28 UNF (5) to the adapter UNF/hose of the pump hose and the other end to the Lovis Filling Support from below.
 - 10. Connect the hose 530x3x2 (6) to the top of the Lovis Filling support. Lead the hose upwards. Carefully bend this hose into the shape of a loop and connect the free end to the Filling Adapter UNF Front Side on the Lovis capillary block. Do not squeeze or kink the hose. It may be helpful to attach the safety cover for this purpose.

Lovis outlet - pH ME / pH ME Beverage

- 11. Carefully bend the hose 600x3x2 FEP 2x1/4"-28 UNF (7) as shown in Fig. 21 9 and connect it to the Lovis capillary block rear side.
- 12. Screw an adapter UNF/UNF (8) onto the free end of the hose 600x3x2 FEP 2x1/4"-28 UNF (7) and connect the hose 350x3x2 FEP 2x1/4"-28 UNF (9) to this adapter.
- 13. Cut a piece of I = 250 mm from the Tygon hose 1.6x3.2 (11) and plug an adapter UNF/Hose (10) onto one end of this hose. Connect the adapter UNF/Hose (10) to the hose 350x3x2 FEP 2x1/4"-28 UNF (9).
- 14. Plug the free end of the Tygon hose (11) through the outer opening of the pH ME/pH ME Beverage base plate.
- 15. pH ME: Slip the sleeve nut (12a) over the Tygon hose 1.6x3.2 (11). Fit the hose onto the plug (12) and secure it with the sleeve nut. See Fig. 21 9. pH ME Beverage: Attach the Tygon hose 1.6x3.2 (11) to the Adapter Luer to Tygon Tube (12B). See Fig. 21 9.
- 16. Connect the Tygon hose 1.6x3.2 (11) to the inlet of the pH ME / pH ME Beverage (lower connector).
- 17. When this long hose combination between Lovis capillary block rear side and pH ME is readily connected, place the hoses into the cable clips mounted on the Lovis (15) as shown in Fig. 21 9.

pH ME / pH ME Beverage outlet - waste container

- 18. Take the PU hose 2.5x4 (14) or the silicone hose 2x4 (14B). Cut a piece that is long enough to reach your waste container.
- 19. pH ME: Mount the jack (13) to the PU hose in the same way as shown for the plug (12) in Fig. 21 4.
 pH ME Beverage: Attach the silicone hose 2x4 (14B) to the Adapter Luer to Tygon Tube (13B). See Fig. 21 4.
- 20. Connect the waste hose (14, 14B) to the outlet of the pH ME / pH ME Beverage (upper connector).
- 21. Connect the other end of the waste hose to your waste container. When using the optional Waste Container HDPE 8 L (19), use the supplied adapter UNF/screwed tube to connect the waste hose to this container. Depending on the position of your waste container, guide the waste hose also through the cable clips (15) along the Lovis bottom edge.

Air hose

- 22. Cut a piece of approx. 200 mm from the silicone hose 3x5 (16). Attach an adapter Luer cone (17) onto one end.
- 23. Connect this hose to the AIR outlet of the master instrument.

Drip plate - waste container

24. Trim the hose (18) coming from the drip plate to the required length. Connect it e.g. to the waste bottle 500 mL (20) or any other suitable vessel. Secure the hose against slipping off. Or connect it to the same waste container as your waste hose.

Completing the installation

- 25. For Xsample 520 only: Attach the magazine according to the Xsample 520 instruction manual. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. Lead the hose connected between the Lovis Filling Support and the Lovis capillary block front side through the slit in the metal part of the safety cover and attach the safety cover (refer also to the instruction manual of Xsample 520). Avoid to squeeze or kink the hose.
- 26. To put the measuring assembly into operation, continue with Chapter 24.

22 Assemblies with Abbemat

Supported combinations:

- Lovis 2000 ME + DMA 4100/4500/5000 M or DSA 5000 M + HazeQC ME + Abbemat 300/500/350/550 + pH ME / pH ME Beverage + Xsample 22/122/ 520. Besides the full measuring assembly any subset of the above modules is supported.
- Lovis 2000 ME + DMA 4100/4500/5000 M + Abbemat 300/500/350/550/450/ 650 + Xsample 352/452/530
- Lovis 2000 M + Xsample 22/122/520 + Abbemat 300/500/350/550/450/650
- Lovis 2000 ME + DSA 5000 M + Abbemat 450/650 (+ Xsample 22/122/520)

The measuring assemblies can also be filled manually when using at least two 20 mL syringes per sample (for sample displacement).

Note:

- · Xsample 52 is not supported
- If using Lovis 2000 ME+DMA M+Abbemat+Xsample 530, use the magazine for 35 vials with 45 mL - sufficient sample volume required.
 Low volume hoses are not applicable for Xsample 530!
- The following chapters show hose connections for Abbemat 300/500/350/550. The setup in these cases is basically the same for Abbemat 450/650 (Heavy Duty Line). Use the same hoses as described for Abbemat 300/350/500/550. The main difference is that the models of the Heavy Duty Line consist of a control unit and a measuring unit. Put the measuring unit where the Abbemat 300/350/500/550 is placed in the figures. Put the control unit beneath (if using a stand) or beside. These two components need to be connected via CAN cable. Refer to the Instruction Manual of the Heavy Duty Line.

NOTICE

When retrofitting an existing DMA M with a pH ME unit: Check your master instrument. The pH ME module can only be used with instruments which have a small removable cover on the rear side interface panel for inserting the electronic board of pH ME. If in doubt, contact your local Anton Paar distributor.

CAN power supply: When setting up an assembly with external modules that require more power than the master instrument can deliver (see technical data), a CAN power supply (Mat. No. 100655) is required to ensure proper power supply and function of all components. Modules and instruments on the CAN chain installed before the CAN power supply are powered by the master, the rest is powered by the CAN power supply. See Chapter 15.

The Abbemat must also be connected both to the master instrument or to other modules with a CAN cable and to the mains supply with its separate power supply.

To achieve the best possible measuring results, consider the following tips:

- TIPS Xsample 520/22: Connect the hoses always as described for pressure filling. This reduces generally bubble formation, it is the best solution for setups with large height using several components placed one above the other. Or for setups with a long liquid column due to many instruments in a line.
 - Xsample 520/22 filling mode: Set the filling mode to "Forward only" (see your Xsample instruction manual). Filling "Forth and back" or "Forward with air gap" may lead to a bad filling quality in large setups with long liquid lines.
 - If applicable: The HazeQC ME shall always be the first module after the density meter. Do not place the HazeQC ME behind other modules in the line as this may lead to bad results.
 - If applicable: The pH ME module should always be the last in the line because of its cell geometry.
 - Xsample 352/452: Never replace a low volume hose by a standard hose.

22.1 Lovis 2000 M + Abbemat Manual Flow-Through Filling by Syringe

TIP If you need to save sample volume, you can fill the Lovis capillary and the Abbemat independent from each other. In this case you do not need the connection kit Lovis-Abbemat flow-through.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat flow-through (includes the micro flow cell and all required hoses and connectors)
- Instruction Manuals for the master instrument and for all modules combined in this measuring assembly

22.1.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Lovis 2000 ME into the Lovis 2000 M Base Unit according to Chapter 6.4.

Mounting the micro flow cell

3. Mount the micro flow cell to the Abbemat according to the Abbemat instruction manual, section "Micro Flow Cell".

Arranging master instrument and modules

4. Place the Abbemat on top of the Lovis 2000 M according to Chapter 22.2.1, step 4, Fig. 22 - 4.

Mounting the cable clips

5. Mount the cable clips to the rear of Lovis 2000 M according to Chapter 22.2.1, step 5, Fig. 22 - 2.

Connecting the cables

Connect the cables according to Chapter 22.2.1, step 6, Fig. 22 - 3.

Mounting the capillary

6. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.1.2 Connecting the Hoses

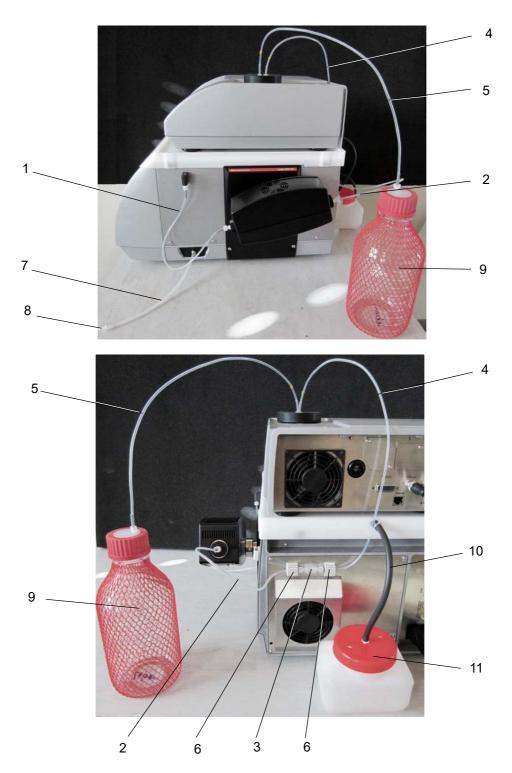


Fig. 22 - 1 Lovis 2000 M + Abbemat - All hoses connected

Note: Fig. 22 - 9 shows the assembly with optional drip plate on top of the Lovis 2000 M. For manually filled assemblies this item is an option, for assemblies operated with a sample changer it is compulsory. For more information see Chapter 17.3.

No.	Item	Supplied with	Purpose	Mat. No.
1	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^a	Lovis filling support to Lovis capillary block front side	25525
2	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
3	Adapter UNF/UNF	Lovis	to connect the hose 350x3x2 from Lovis and the hose 530x3x2 to Abbemat	64790
4	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	Adapter UNF/UNF to Abbemat inlet	25523
5	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Abbemat outlet to waste container	25524
6	Cable clip self-adhesive	Lovis	hose guidance	62072
7	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
8	Adapter Luer cone	Lovis	tip for air hose	63863
9	Waste bottle 1 L glass	Optional	waste vessel	101655
10	Hose Viton 5x8 with hose clamp Dmin 8.8 - Dmax 9.3 mm length depends on place of waste container	Drip plate (optional)	drain hose from drip plate	72546 21307
11	Waste Bottle SVM 0.5 L	Lovis	waste vessel for drain hose	17822

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Lovis Flow-Through Filling Set respectively in the Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879).

Lovis filling support - Lovis inlet

1. Connect one end of the hose 350x3x2 FEP 2x1/4"-28 UNF (1) to the Lovis filling support, the other end to the flow through adapter on the Lovis capillary block front side.

Lovis outlet - Abbemat inlet

- 2. Connect a hose 350x3x2 FEP 2x1/4"-28 (2) and a hose 530x3x2 FEP 2x1/4"-28 (4) using an adapter UNF/UNF (3). Connect the free end of the hose 350x3x2 to the Lovis capillary block rear side. Carefully bend the hose into its shape and fix it by placing the springs of the hose connectors in the cable clips (6) on the rear side of the Lovis 2000 M.
- 3. Connect the free end of the hose 530x3x2 (4) to the inlet (= take one of the two connectors, preferably the right one seen from the front) of the Abbemat.

Abbemat outlet - waste container

4. Connect the hose 600x3x2 FEP 2x1/4"-28 (5) between the outlet of the Abbemat (= the remaining free connector) and your waste container. When using the optional waste bottle 1 L glass (9), you can connect the free end of this hose directly to this bottle.

Drip plate (option)

5. When using the optional drip plate, refer to Chapter 21.2.2, step 11 and to Fig. 21 - 4 for connecting the drain hose to the waste vessel.

Air hose

- 6. Cut a piece of approx. 200 mm from the silicone hose 3x5 (10). Attach an adapter Luer cone (11) onto one end.
- 7. Connect this hose to the AIR outlet of the Lovis 2000 M.

Completing the installation

8. To put the measuring assembly into operation, continue with Chapter 24.

22.2 Lovis 2000 ME + DMA M/DSA M + Abbemat Manually Filled by Syringe

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat flow-through (includes the micro flow cell and all required hoses and connectors)
- Instruction Manuals for the master instrument and for all modules combined in this measuring assembly

22.2.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Lovis 2000 ME into the DMA M/DSA M according to Chapter 6.4.

Mounting the micro flow cell

3. Mount the micro flow cell to the Abbemat according to the Abbemat instruction manual, section "Micro Flow Cell".

Arranging master instrument and modules

4. Place the Abbemat on top of the DMA M/DSA M as shown in Fig. 22 - 4.

Mounting the cable clips

5. Mount the cable clips (9) on the rear of DMA M/DSA M according to Fig. 22 - 2.

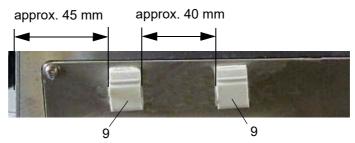


Fig. 22 - 2 Lovis 2000 M/DMA M/DSA M rear side - Mounting the cable clips

Connecting the cables

6. Connect the cables according to Fig. 22 - 7.



Fig. 22 - 3 Lovis 2000 ME + DMA M + Abbemat - connecting the cables

1	CAN/Devicenet terminating resistor to CAN socket on Abbemat	
2	interface cable between DMA M/DSA MCAN socket and Abbemat CAN plug	
3	mains cable Abbemat	
Α	Abbemat (Performance/Performance Plus)	
В	master instrument DMA M/DSA M	

Note: The Abbemat always needs a mains supply, independent from the CAN connection, as it is a device, which can also be operated stand alone.

Mounting the capillary

7. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.2.2 Connecting the Hoses

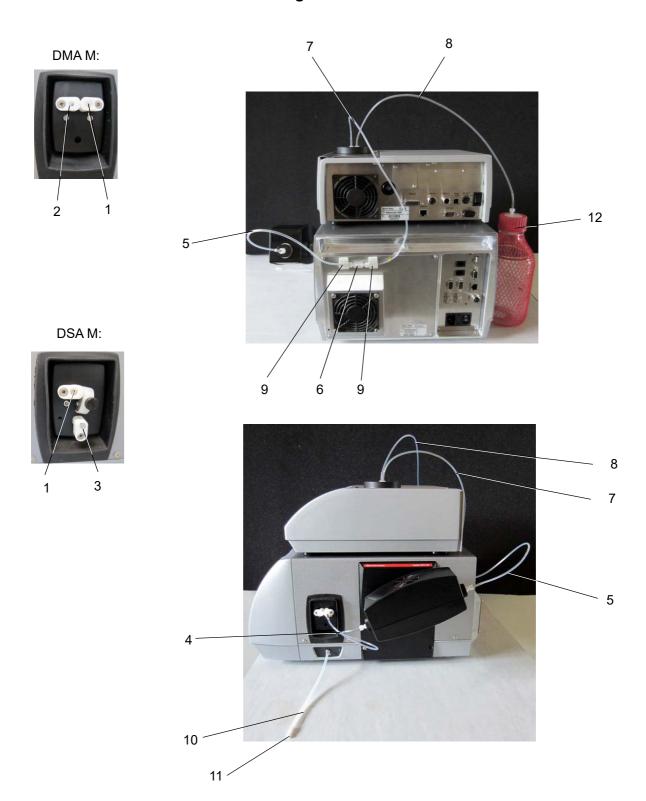


Fig. 22 - 4 Lovis 2000 ME + DMA M + Abbemat - All hoses connected

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell outlet	159025
2	Injection adapter Luer DMA	DMA M	filling adapter DMA M density cell inlet	159096
3	Injection adapter DSA (Luer)	DSA M	filling adapter DSA M sound velocity cell	159098
4	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis ^b	density cell outlet to Lovis capillary block front side	25525
5	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
6	Adapter UNF/UNF	Lovis	to connect the hose 350x3x2 from Lovis and the hose 530x3x2 to Abbemat	64790
7	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	Adapter UNF/UNF to Abbemat inlet	25523
8	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	Abbemat outlet to waste container	25524
9	Cable clip self-adhesive	Lovis	hose guidance, 2 #	62072
10	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
11	Adapter Luer cone	Lovis	tip for air hose	63863
12	Waste bottle 1 L glass	Optional	waste vessel	101655

- a. Lovis: Item can be found in the Lovis Accessory Kit Complete.
- b. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Lovis Flow-Through Filling Set respectively in the Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879).

Refer to Fig. 22 - 4:

 Replace the currently installed rear injection adapter of the DMA M by the injection adapter UNF (1). For replacement of injection adapters refer to the instruction manual of the DMA M.

When using a DSA M: The injection adapter Luer for the DSA M (3) must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.

2. If required, replace the currently installed front injection adapter of the DMA M by the injection adapter Luer DMA (2) supplied with this instrument.

When using a DSA M: The injection adapter UNF for the DSA (1) must be mounted on the outlet of the density cell (upper connector). Refer to the instruction manual of the DSA M.

Master instrument outlet - Lovis 2000 ME inlet

3. Refer to Fig. 22 - 5: Connect the hose 350x3x2 FEP (4) to the injection adapter UNF (1) on the DMA M/DSA M. Bend this hose into the shape of a loop. Now connect it to the Lovis capillary block front side.



Fig. 22 - 5 Connecting the hose between DMA M and Lovis

Lovis outlet - Abbemat inlet

- 4. Connect a hose 350x3x2 FEP 2x1/4"-28 (5) and a hose 530x3x2 FEP 2x1/4"-28 (7) using an adapter UNF/UNF (6). Connect the free end of the hose 350x3x2 to the Lovis capillary block rear side. Carefully bend the hose into its shape and fix it by placing the springs of the hose connectors in the cable clips (9) on the rear side of the master instrument.
- 5. Connect the free end of the hose 530x3x2 (7) to the inlet (= take one of the two connectors, preferably to the right one seen from the front; see Fig. 22 7) of the Abbemat.

Abbemat outlet - waste container

 Connect the hose 600x3x2 FEP 2x1/4"-28 (8) between the outlet of the Abbemat (= the remaining free connector) and your waste container.
 When using the optional waste bottle 1 L glass (12), you can connect the free end of this hose directly to this bottle.

Air hose

- 7. Cut a piece of approx. 200 mm from the silicone hose 3x5 (10). Attach an adapter Luer cone (11) onto one end.
- 8. Connect this hose to the AIR outlet of the master instrument.

Completing the installation

9. To put the measuring assembly into operation, continue with Chapter 24.

22.3 Lovis 2000 ME + DMA M/DSA M + Abbemat + Xsample 520/22

Note: This assembly can also be set up with a Lovis 2000 M as master instrument.

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat flow-through (includes the micro flow cell and all required hoses and connectors)
- Instruction Manuals for the master instrument and for all modules combined in this measuring assembly

22.3.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 520/22 into the master instrument according to the Xsample 520 or Xsample 22 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 4. Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.

Mounting the micro flow cell

5. Mount the micro flow cell to the Abbemat according to the Abbemat instruction manual, section "Micro Flow Cell".

Mounting the cable clips

6. Attach the cable clips onto the rear side of the Module Housing Lovis ME as indicated in Fig. 22 - 9, upper part.

Arranging master instrument and modules

- 7. Place the stand onto the DMA M/DSA M or Lovis 2000 M according to Fig. 20 11.
- 8. Place the Lovis 2000 ME on the optional stand on top of the DMA M/DSA M or Lovis 2000 M and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.

- 9. Place the Abbemat on the left side of Lovis 2000 ME.
- 10. If possible, you can put your own waste container into the free space under the stand.

Or use the optional Waste Container HDPE 8 L and place it under the stand besides the master instrument. This container supplies connectors to fix the waste hose.

Connecting the cables

11. Connect the cables according to Fig. 22 - 6.

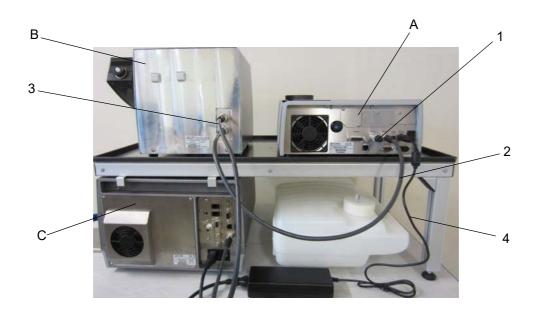


Fig. 22 - 6 Connecting the cables

1	CAN/Devicenet terminating resistor to CAN socket on Abbemat	
2	interface cable between Lovis CAN socket and Abbemat CAN plug	
3	interface cable between DMA M/DSA MCAN socket and Lovis CAN plug	
4	mains cable Abbemat	
Α	Abbemat (Performance/Performance Plus)	
В	Lovis 2000 ME	
С	master instrument DMA M/DSA M or Lovis 2000 M	

Note: The Abbemat always needs power supply from the mains, independent from the CAN connection as it is an instrument, which can also be operated stand alone. An extra CAN power supply for this assembly is not required.

Mounting the capillary

12. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.3.2 Connecting the Hoses

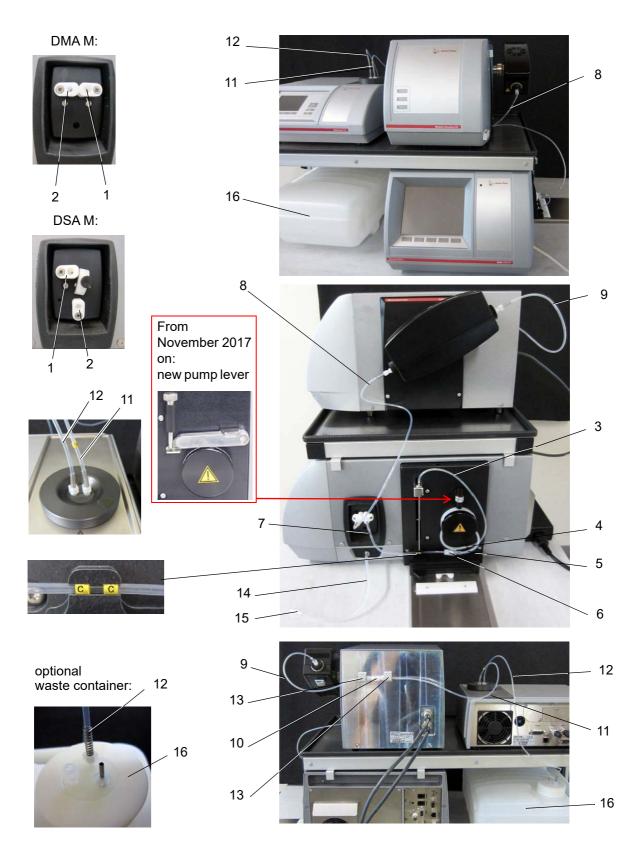


Fig. 22 - 7 Lovis 2000 ME + DMA M + Abbemat + Xsample 122/520 - all hoses connected

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapter sound velocity cell inlet	159024
3	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
4	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
5	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
6	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
7	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
10	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 530 mm to Abbemat	64790
11	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to Abbemat inlet	25523
12	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	outlet of Abbemat to waste container	25524
13	Cable clip self-adhesive	Lovis	hose guidances, 3 pcs.	62072
14	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
15	Adapter Luer cone	Lovis	tip for air hose	63863
16	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905) or in the Hose set Lovis+XS 22/320 122/520 (Mat. No. 101902), respectively in the Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879).

1. If required, replace the currently installed injection adapters of the DMA M by the injection adapter UNF (1) supplied with Lovis 2000 ME. For replacement of injection adapters refer to the instruction manual of the DMA M.

When using a DSA M: The injection adapter UNF for the DSA M must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.

Refer to Fig. 22 - 3 and to the detail pictures in the text:

b. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

Needle - pump - DMA M inlet (Lovis 2000 ME inlet)

2. When using a DMA M with Xsample 520: Prepare and connect the hose between needle and the inlet of the density cell of the DMA M (parts no. 3 - 7 in the above list) respectively the sound velocity cell for a DSA M according to Chapter 20.1.2, steps 2 to 10 and Fig. 20 - 6.

When using a DMA M with Xsample 22, refer also to Chapter 19.4.2.1.

When using a Lovis 2000 M with Xsample 520: Prepare and connect the hose between needle and the flow-through adapter of the Lovis according to Chapter 18.3.2.1, steps 1 to 9, Fig. 18 - 7.

When using a Lovis 2000 M with Xsample 22: Attach the hose clips and prepare and connect the hose according to Chapter 18.4.2.1, steps 2 to 9, Fig. 18 - 14.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

DMA M outlet - Lovis 2000 ME inlet

3. Refer to Fig. 22 - 8: Connect one end of the hose 530x3x2 FEP 2x1/4"-28 (8) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block into the shape of a loop. It may be helpful to attach the safety cover for this purpose (as shown in Fig. 19 - 11). Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block.

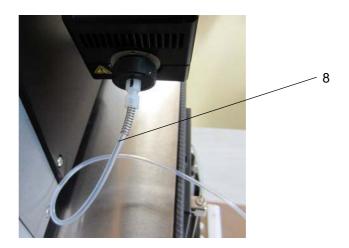


Fig. 22 - 8 Connecting the hose between Lovis and DMA M

Lovis outlet - Abbemat inlet

- 4. Connect a hose 350x3x2 FEP 2x1/4"-28 (9) and a hose 530x3x2 FEP 2x1/4"-28 (11) using an adapter UNF/UNF (10). Connect the free end of the hose 350x3x2 to the Lovis capillary block rear side. Carefully bend the hose into its shape and fix it by placing the springs of the hose connectors in the cable clips (13) on the rear side of the DMA M/DSA M.
- 5. Connect the free end of the hose 530x3x2 (11) to the inlet of the Abbemat (=> take one of the two connectors, preferably to the right one seen from the front, see Fig. 22 7).

Abbemat outlet - waste container

6. Connect the hose 600x3x2 FEP 2x1/4"-28 (12) between the outlet of the Abbemat (= the remaining free connector, see) and your waste container. When using the optional Waste Container HDPE 8 L (16), you can connect the free end of this hose directly to this container.

Air hose

- 7. Cut a piece of approx. 200 mm from the silicone hose 3x5 (14). Attach an adapter Luer cone (15) onto one end.
- 8. Connect this hose to the AIR outlet of the master instrument.

Completing the installation

- 9. For Xsample 520 only: Attach the magazine and the safety cover according to the Xsample 520 instruction manual. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. When mounting the safety cover, guide the hose connected between the master instrument's outlet and the Lovis capillary block front side through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose.
- 10. To put the measuring assembly into operation, continue with Chapter 24.

22.4 Lovis 2000 ME + DMA M/DSA M + HazeQC ME + Abbemat + Xsample 520/22

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat flow-through (includes the micro flow cell and all required hoses and connectors)
- Instruction Manual Abbemat Performance/Performance Plus Line

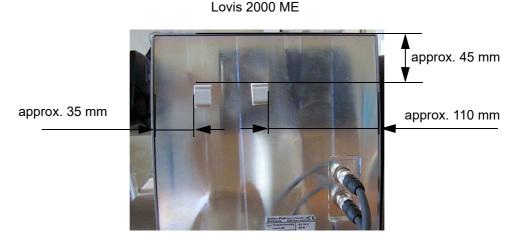
This setup and its requirements are very similar to setups with Abbemat described in Chapter 22.5 and Chapter 22.6 and other. So this chapter does not describe all steps in details - refer to the respective sections as indicated.

22.4.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Prepare the master instrument and modules and mount the micro flow cell according to Chapter 22.3.1, steps 2 to 5.

Mounting the cable clips

3. Mount the cable clips according to Fig. 22 - 9.



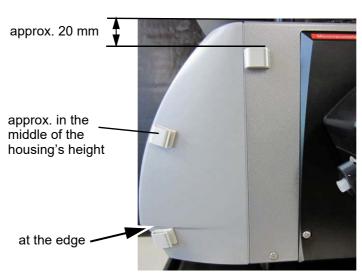


Fig. 22 - 9 Mounting the cable clips onto Module Housing Lovis ME

Arranging master instrument and modules

4. Place the stand onto the DMA M/DSA M housing according to Fig. 20 - 11.

Refer to Fig. 22 - 10:

- 5. Place the Lovis 2000 ME Module Housing on the optional stand on top of the DMA M/DSA M and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 6. Place the other modules according to Fig. 22 10.
- 7. If possible, you can put your own waste container into the free space under the stand. Or place the optional Waste Container HDPE 8 L under the stand besides the master instrument. This container supplies connectors to fix the waste hose.



Fig. 22 - 10 Lovis 2000 ME + DMA M + HazeQC ME + Abbemat + Xsample 122/ 520 - Placing master instruments and modules

1	Master instrument DMA M/DSA M	
2	Optional stand for measuring assembly	
3	Lovis 2000 ME	
4	HazeQC ME	
5	Abbemat (Performance/Performance Plus)	
6	Optional waste container 8 L HDPE	

Connecting the cables

8. Connect the cables according to Fig. 22 - 6.

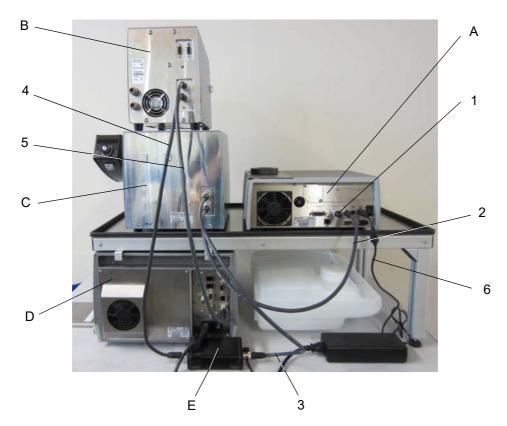


Fig. 22 - 11 Lovis 2000 ME + DMA M + HazeQC ME + Abbemat + Xsample 122/ 520 - Connecting the cables

1	CAN/Devicenet terminating resistor to CAN socket on Abbemat		
2	interface cable between Lovis CAN socket and Abbemat CAN plug		
3	interface cable between Lovis CAN plug and socket of CAN power supply		
4	interface cable between plug of CAN power supply and CAN socket of HazeQC ME		
5	interface cable between HazeQC ME CAN plug and DMA M/DSA MCAN socket		
6	mains cable Abbemat		
Α	Abbemat (Performance/Performance Plus)		
В	HazeQC ME		
С	Lovis 2000 ME		
D	master instrument DMA M/DSA M		
Е	CAN power supply		

Mounting the capillary

9. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.4.2 Connecting the Hoses

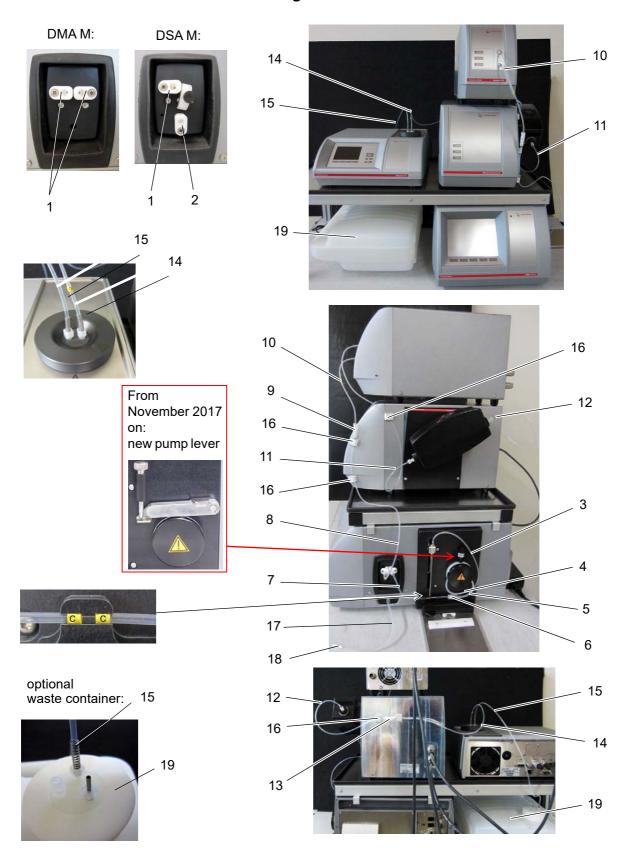


Fig. 22 - 12 Lovis 2000 ME + DMA M + HazeQC ME + Abbemat + Xsample 122/ 520 - all hoses connected

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapter sound velocity cell inlet	159024
3	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
4	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
5	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
6	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
7	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to adapter UNF/ UNF	25523
9	Adapter UNF/UNF	Lovis	connects the hose 220x3x2 coming from DMA M/DSA M with the hose 530x3x2 to HazeQC ME	64790
10	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to HazeQC ME lower connector	25540
11	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	HazeQC ME upper connector to Lovis capillary block front side	25524
12	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
13	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 530 mm to Abbemat	64790
14	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to Abbemat inlet	25523
15	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	outlet of Abbemat to waste container	25524
16	Cable clip self-adhesive	Lovis	hose guidances, 4 pcs.	62072
17	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
18	Adapter Luer cone	Lovis	tip for air hose	63863
19	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+ DMA+XS 22/320 122/520 (Mat. No. 101905), or in the Hose Let Lovis + XS 22/320 122/520 (Mat. No. 101902) respectively in the Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879).

 If required, replace the currently installed injection adapters of the DMA M by the injection adapter UNF (1) supplied with Lovis 2000 ME. For replacement of injection adapters refer to the instruction manual of the DMA M.

b. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

When using a DSA M: The injection adapter UNF for the DSA M (2) must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.

Refer to Fig. 22 - 12 and to the detail pictures in the text:

Needle - pump - master instrument inlet

2. When using a DMA M with Xsample 520: Prepare and connect the hose between needle and the inlet of the density cell of the DMA M (parts no. 3 - 7 in the above list) respectively the sound velocity cell for a DSA M according to Chapter 20.1.2, steps 2 to 10 and Fig. 20 - 6.

When using a DMA M with Xsample 22, refer also to Chapter 19.4.2.1.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Master instrument outlet - HazeQC ME inlet

3. Prepare this hose: Connect the hose 530x3x2 (8) and the hose 220x3x2 (10) with an adapter UNF/UNF (9). Bend it into the shape as shown in Fig. 22 - 13.

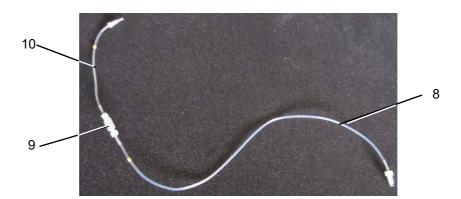


Fig. 22 - 13 Preparing the hose between master instrument outlet and HazeQC ME inlet

- 4. Connect the free end of the hose 530x3x2 (8) to the outlet of the DMA M/DSA M. If required corrects its shape as indicated in Fig. 22 14.
- 5. Connect the free end of the hose 220x3x2 (10) to the lower connector of HazeQC ME. See Fig. 22 14.

6. To keep the hose in place, fit it into the cable clips (16) as shown in Fig. 22 - 14°

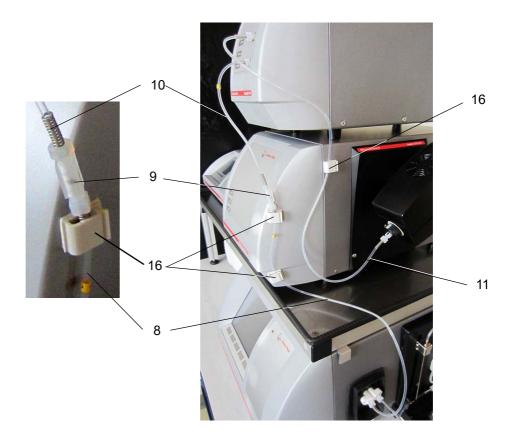


Fig. 22 - 14 Mounting the hoses between master instrument outlet, HazeQC ME and Lovis capillary block front side

HazeQC ME outlet - Lovis 2000 ME inlet

7. Bend the hose 600x3x2 FEP 2x1/4"-28 (11) into its shape as shown in Fig. 22 - 15. Then screw it into the HazeQC ME upper connector and connect it to the Lovis capillary block front side as shown in Fig. 22 - 15.

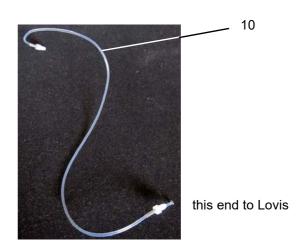


Fig. 22 - 15 Preparing the hose between HazeQC ME and Lovis capillary block front side

8. Guide the hose by placing it into the cable clip (16). See Fig. 22 - 14.

Lovis 2000 ME outlet - Abbemat inlet

- 9. Connect the hose 350x3x2 FEP 2x1/4"-28 (12) and the hose 530x3x2 FEP 2x1/4"-28 (14) with an adapter UNF/UNF (13).
- 10. Bend the free end of the hose 350x3x2 (12) and connect it to the Lovis capillary block rear side.
- 11. Connect the free end of the hose 530x3x2 (14) to the inlet of the Abbemat (=> take one of the two connectors, preferably to the right one seen from the front; detail picture of Abbemat connectors see).
- 12. Fix the hose by placing it with the connector springs in the cable clips (16) mounted on the rear side of Lovis 2000 ME Module Housing.

Abbemat outlet - waste container

13. Connect the hose 600x3x2 FEP 2x1/4"-28 (15 between the outlet of the Abbemat (= the remaining free connector, see) and your waste container. When using the optional Waste Container HDPE 8 L (19), you can connect the free end of this hose directly to this container.

Air hose

- 14. Cut a piece of approx. 200 mm from the silicone hose 3x5 (17). Attach an adapter Luer cone (18) onto one end.
- 15. Connect this hose to the AIR outlet of the master instrument.

Completing the installation

- 16. For Xsample 520 only: Attach the magazine and the safety cover according to the Xsample 520 instruction manual. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. When mounting the safety cover, guide the hose connected between the master instrument's outlet and the HazeQC ME through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose.
- 17. To put the measuring assembly into operation, continue with Chapter 24.

22.5 Lovis 2000 ME + DMA M/DSA M + Abbemat + pH ME / pH ME Beverage + Xsample 520/22

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat flow-through (includes the micro flow cell and all required hoses and connectors)
- Hose set Lovis + DMA + Xsample 22/520
- Instruction Manual Abbemat Performance/Performance Plus Line

This setup and its requirements are very similar to setups with Abbemat described in Chapter 22.4, Chapter 22.6 and other. So this chapter does not describe all steps in details - refer to the respective sections as indicated.

22.5.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Prepare master instrument and modules and mount the micro flow cell according to Chapter 22.3.1, steps 2 to 5.

Mounting the cable clips

3. Attach the cable clips onto the rear side of the Module Housing Lovis ME as indicated in Fig. 22 - 9, upper part.

Arranging master instrument and modules

- 4. Place the stand onto the DMA M/DSA M housing according to Fig. 20 11.
- 5. Place the Lovis 2000 ME Module Housing on the optional stand on top of the DMA M/DSA M and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.

6. Place the other modules according to Fig. 22 - 16. For pH ME (Beverage) measuring cell unit put the left front foot of Lovis 2000 ME into the opening on the base plate of pH ME (Beverage). Refer also to the instruction manual of pH ME/pH ME Beverage.



Fig. 22 - 16 Lovis 2000 ME + DMA M + pH ME + Abbemat + Xsample 122/520 - Placing master instruments and modules

1	Master instrument DMA M/DSA M or Lovis 2000 M	
2	Optional stand for measuring assembly	
3	Lovis 2000 ME	
4	pH ME / pH ME Beverage	
5	Abbemat (Performance/Performance Plus)	
6	Optional waste container 8 L HDPE	

7. If possible, you can put your own waste container into the free space under the stand

Otherwise, use the optional Waste Container HDPE 8 L and place it under the stand besides the master instrument. This container supplies connectors to fix the waste hose.

Connecting the cables

8. Connect the cables according to Fig. 22 - 17.

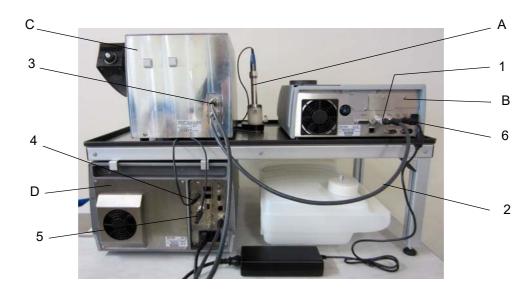


Fig. 22 - 17 Lovis 2000 ME + DMA M + Abbemat + pH ME + Xsample 122/520 - Connecting the cables

1	CAN/Devicenet terminating resistor to CAN socket on Abbemat
2	interface cable between Lovis CAN socket and Abbemat CAN plug
3	interface cable between DMA M/DSA MCAN socket and Lovis CAN plug
4	temperature sensor cable from pH ME
5	cable of pH ME (Beverage), to BNC connector of the master instrument
6	mains cable Abbemat
Α	pH ME / pH ME Beverage
В	Abbemat (Performance/Performance Plus)
С	Lovis 2000 ME
D	master instrument DMA M/DSA M or Lovis 2000 M

Mounting the capillary

9. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5

22.5.2 Connecting the Hoses

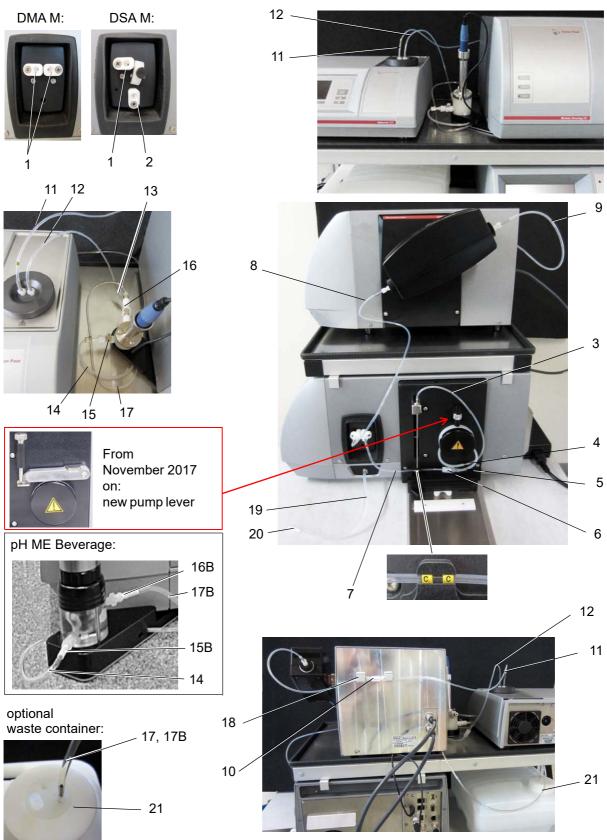


Fig. 22 - 18 Lovis 2000 ME + DMA M + Abbemat + pH ME (Beverage) + Xsample 122/520 - All hoses connected

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapter sound velocity cell inlet	159024
3	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
4	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
5	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
6	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
7	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to Lovis capillary block front side	25523
9	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
10	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 530 mm to Abbemat	64790
11	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to Abbemat inlet	25523
12	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Abbemat outlet to adapter UNF/ Hose	25525
13	Adapter UNF/Hose (Female/Male)	Lovis ^b	connector for hose to pH ME (Bev.)	26739
14	Hose Tygon 2375, 1.6x3.2, I = approx. 340 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
15	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
15B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
16	Jack with compression fitting or	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
16B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
17	Hose PU 2.5x4 mm	рН МЕ		15272
17B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
18	Cable clip self-adhesive	Lovis	hose guidances, 4 pcs.	62072
19	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
20	Adapter Luer cone	Lovis	tip for air hose	63863
21	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905) or in the Hose Set Lovis + XS 22/320 122/520 (Mat. No. 101902) or in the Hose Set pH Option Lovis (Mat. No. 105880) or in the Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879).

b. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

1. If required, replace the currently installed injection adapters of the DMA M by the injection adapter UNF (1). For replacement of injection adapters refer to the instruction manual of the DMA M.

When using a DSA M: The injection adapter UNF for the DSA M (2) must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.

Refer to Fig. 22 - 18 and to the detail pictures in the text:

Needle – pump – DMA M inlet (Lovis 2000 ME inlet)

2. When using a DMA M with Xsample 520: Prepare and connect the hose between needle and the inlet of the density cell of the DMA M (parts no. 3 - 7 in the above list) respectively the sound velocity cell for a DSA M according to Chapter 20.1.2, steps 2 to 10 and Fig. 20 - 6

When using a DMA M with Xsample 22, refer to Chapter 19.4.2.1.

When using a Lovis 2000 M with Xsample 520: Prepare and connect the hose between needle and the flow-through adapter of the Lovis according to Chapter 18.3.2.1, steps 1 to 9, Fig. 18 - 7.

When using a Lovis 2000 M with Xsample 22: Attach the hose clips and prepare and connect the hose according to Chapter 18.4.2.1, steps 2 to 9, Fig. 18 - 14.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

DMA M outlet - Lovis 2000 ME inlet

3. Bend and connect the hose 530x3x2 FEP 2x1/4"-28 according to Chapter 22.3.2, step 3, Fig. 22 - 8.

Lovis 2000 ME outlet - Abbemat inlet

4. Prepare and connect this hose according to Chapter 22.3.2, steps 4 to 5.

Abbemat outlet - pH ME

For steps 6 to 9 refer to Fig. 22 - 19.

- 5. Cut a piece of I = approx. 340 mm from the Tygon hose 1.6x3.2 (14).
- 6. Attach an adapter UNF/Hose (13) onto the free end of this hose.
- 7. Connect the Tygon hose 1.6x3.2 to the FEP hose 350x3x2 FEP 2x1/4"-28 by screwing the connector of the 350x3x2 FEP hose (12) into the adapter UNF/ Hose (13).

- 8. Plug the free end of the Tygon hose through the outer opening of the pH ME / pH ME Beverage base plate.
- pH ME: Slip the sleeve nut (15a) over the Tygon hose 1.6x3.2 (14). Fit the
 hose onto the plug (15) and secure it with the sleeve nut. See Fig. 22 19.
 pH ME Beverage: Attach the Tygon hose 1.6x3.2 (14) to the Adapter Luer to
 Tygon Tube (15B). See Fig. 22 19.
- 10. Connect the Tygon hose 1.6x3.2 (14) to the inlet of the pH ME / pH ME Beverage (lower connector).

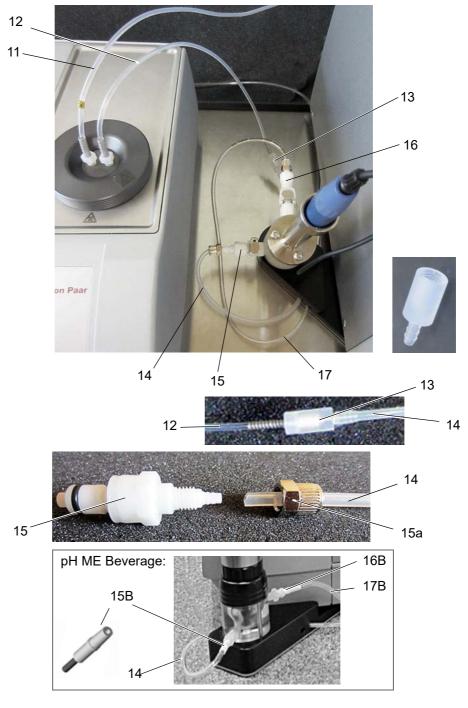


Fig. 22 - 19 Connecting the hoses between Abbemat and pH ME (Beverage)

pH ME / pH ME Beverage outlet – waste container

- 11. Take the PU hose 2.5x4 (17) or the silicone hose 2x4 (17B). Cut a piece that is long enough to reach your waste container.
- 12. pH ME: Mount the jack (16) to the PU hose (17) in the same way as shown for the plug (15) in Fig. 22 19.pH ME Beverage: Attach the silicone hose 2x4 (17B) to the Adapter Luer to Tygon Tube (16B). See Fig. 22 19.
- 13. Connect the waste hose (17, 17B) to the outlet of the pH ME / pH ME Beverage (upper connector).
- 14. Connect the other end of the waste hose to your waste container. Secure the waste hose against slipping off. When using the optional Waste Container HDPE 8 L (21), use the supplied adapter UNF/screwed tube to connect the waste hose to this container.

Air hose

15. Cut a piece of approx. 200 mm from the silicone hose 3x5 (19). Attach an adapter Luer cone (20) onto one end. Connect this hose to the AIR outlet of the master instrument. See Fig. 22 - 19.

Completing the installation

- 16. For Xsample 520 only: Attach the magazine and the safety cover according to the Xsample 520 instruction manual. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. When mounting the safety cover, guide the hose connected between the master instrument's outlet and the Lovis ME through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose.
- 17. To put the measuring assembly into operation, continue with Chapter 24.

22.6 Lovis 2000 ME + DMA M/DSA M + HazeQC ME + Abbemat + pH ME /pH ME Beverage + Xsample 520/22

Required equipment:

- Angular screwdriver Torx T20 (from the Lovis accessories)
- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat flow-through (includes the micro flow cell and all required hoses and connectors)
- Hose set Lovis + DMA + Xsample 520/22 or Hose set Lovis + DSA + Xsample 520/22
- Instruction Manual Abbemat Performance/Performance Plus Line

This setup and its requirements are very similar to setups with Abbemat described in Chapter 22.5, Chapter 22.4 and other. So this chapter does not describe all steps in details - refer to the respective sections as indicated.

22.6.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (2.30 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Prepare master instrument and modules and mount the micro flow cell according to Chapter 22.3.1, steps 2 to 5.

Mounting the cable clips

3. Attach the cable clips according to Chapter 22.4.1, Fig. 22 - 9.

Arranging master instrument and modules

- 4. Place the stand onto the DMA M/DSA M housing according to Fig. 20 11.
- 5. Place the Lovis 2000 ME Module Housing on the optional stand on top of the DMA M/DSA M and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 6. Place all other modules according to Fig. 22 20. For pH ME / pH ME Beverage measuring cell unit put the left front foot of Lovis 2000 ME into the opening of the base plate of pH ME / pH ME Beverage. Refer also to the instruction manual of pH ME / pH ME Beverage.

7. If possible, you can put your own waste container into the free space under the stand. Or place the optional Waste Container HDPE 8 L under the stand besides the master instrument. This container supplies connectors to fix the waste hose.



Fig. 22 - 20 Lovis 2000 ME + DMA M + HazeQC ME + pH ME (Bev.) + Abbemat + Xsample 122/520 - Placing master instruments and modules

1	Master instrument DMA M/DSA M or Lovis 2000 M	
2	Optional stand for measuring assembly	
3	Lovis 2000 ME	
4	HazeQC ME	
5	pH ME / pH ME Beverage	
6	Abbemat (Performance/Performance Plus)	
7	Optional waste container 8 L HDPE	

Connecting the cables

Connect the cables between master instrument and Lovis 2000 ME, HazeQC ME and Abbemat according to Fig. 22 - 6.

Connect the cables of pH ME / pH ME Beverage according to Fig. 22 - 17.

Mounting the capillary

8. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.6.2 Connecting the Hoses

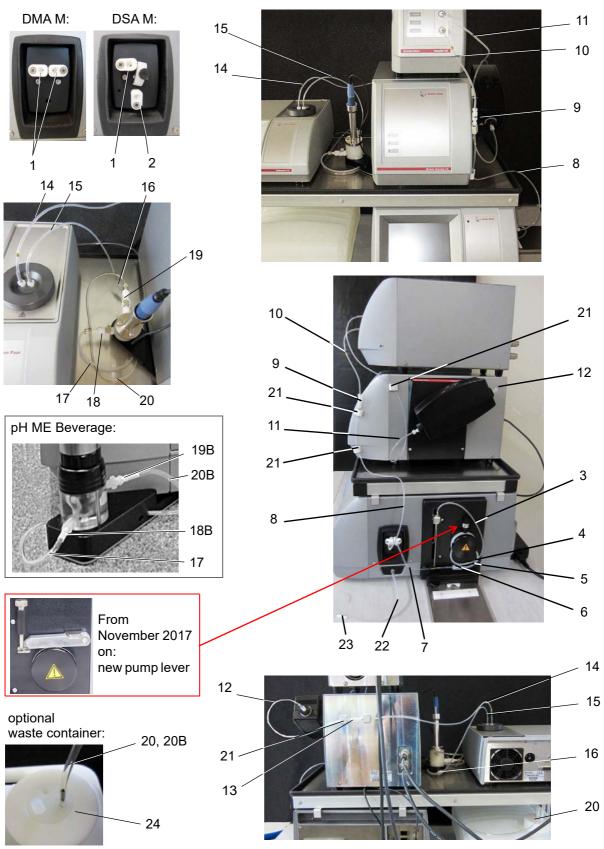


Fig. 22 - 21 Lovis 2000 ME + DMA M + HazeQC ME + Abbemat + pH ME (Beverage) + Xsample 122/520 - All hoses connected

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Lovis ^a	filling adapter density cell	159025
2	Injection adapter UNF 1/4" DSA	Lovis ^b	filling adapt. sound velocity cell inlet	159024
3	Hose Tygon 2375, 1.6x3.2 I = approx. 270 mm	Xsample 520	hose between needle and pump hose	67540
4	Tube d=2.1 D=2.4 L=20; 1.4571	Xsample 520	connector between Tygon hose and pump hose	67982
5	Hose silicone 2x4 mm, I = approx. 250 mm	Xsample 520 Lovis	pump hose	51273
6	Adapter UNF/Hose (Female/Male)	Lovis	connector for pump hose	26739
7	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	pump hose to density cell inlet	25540
8	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	density cell outlet to adapter UNF/ UNF	25523
9	Adapter UNF/UNF	Lovis	connects the hose 530x3x2 coming from DMA M/DSA M with the hose 220x3x2 to HazeQC ME	64790
10	Hose 220x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to HazeQC ME lower connector	25540
11	Hose 600x3x2 FEP 2x1/4"-28 UNF	Lovis	HazeQC ME upper connector to Lovis capillary block front side	25524
12	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Lovis capillary block rear side to adapter UNF/UNF	25525
13	Adapter UNF/UNF	Lovis	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 530 mm to Abbemat	64790
14	Hose 530x3x2 FEP 2x1/4"-28 UNF	Lovis	adapter UNF/UNF to Abbemat inlet	25523
15	Hose 350x3x2 FEP 2x1/4"-28 UNF	Lovis	Abbemat outlet to adapt. UNF/Hose	25525
16	Adapter UNF/Hose (Female/Male)	Lovis	connector for hose to pH ME (Bev.)	26739
17	Hose Tygon 2375, 1.6x3.2, I = approx. 340 mm	pH ME (Bev.)	from adapter UNF/Hose to the lower connector (inlet) of the pH ME (Bev.) module	67540
18	Plug with compression fitting or	рН МЕ	to connect the filling hose to the measuring cell jack / measuring cell	89234
18B	Adapter Luer to Tygon tube	pH ME Bev.	inlet (lower connector) of the pH (Bev.) module	133328
19	Jack with compression fitting or	рН МЕ	to connect the waste hose to the measuring cell plug / measuring cell	89233
19B	Adapter Luer to Tygon Tube	pH ME Bev.	outlet (upper connector) of the pH (Bev.) module	133328
20	Hose PU 2.5x4 mm	рН МЕ		15272
20B	or Hose silicone 2x4mm hose length depends on position of waste container	pH ME Bev.	waste hose, from measuring cell outlet of the pH (Bev.) module to the waste container	51273
21	Cable clip self-adhesive	Lovis	hose guidances, 4 pcs.	62072
22	Hose silicone 3x5 mm I = approx. 200 mm	Lovis	air hose	50814
23	Adapter Luer cone	Lovis	tip for air hose	63863
24	Waste container 8 L HDPE	Optional	waste container	105979

a. Lovis: Item can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DMA+XS 22/320 122/520 (Mat. No. 101905) or in the Hose Set Lovis + XS 22/320 122/520 (Mat. No. 101902) or in the Hose Set pH Option Lovis (Mat. No. 105880) or in the Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879).

b. Lovis: DSA specific items can be found in the Lovis Accessory Kit Complete or in the Hose Set Lovis+DSA+XS 22/ 320 122/520 (Mat. No. 102591).

 If required, replace the currently installed injection adapters of the DMA M by the injection adapter UNF (1) supplied with Lovis 2000 ME. For replacement of injection adapters refer to the instruction manual of the DMA M.

When using a DSA M: The injection adapter UNF for the DSA M (2) must be mounted to the inlet of the sound velocity cell (the lower connector). Refer to the instruction manual of the DSA M.

Refer to Fig. 22 - 21 and to the pictures indicated in the text:

Needle - pump - master instrument inlet

When using a DMA M/DSA M with Xsample 520: Prepare and connect the hose between needle and the inlet of the density cell of the DMA M (parts no. 3 to 7 in the above list) respectively the sound velocity cell for a DSA M according to Chapter 20.1.2, steps 2 to 10 and Fig. 20 - 6.

When using a DMA M/DSA M with Xsample 22, refer also to Chapter 19.4.2.1.

TIP If your application requires chemically resistant hoses for the peristaltic pump, refer to Chapter 19.3.3.1 for Xsample 520 or to Chapter 19.4.3.1 for Xsample 22.

Master instrument outlet - HazeQC ME inlet

3. Prepare and connect the hose (parts No. 8 to 10 in the above list) according to Chapter 22.4.2, steps 3 to 6, Fig. 22 - 14.

HazeQC ME outlet - Lovis 2000 ME inlet

4. Bend and connect the hose (part No. 11 in the above list) according to Chapter 22.4.2, step 7, Fig. 22 - 14.

Lovis 2000 ME outlet - Abbemat inlet

5. Prepare and connect these hoses (parts No. 12 to 14 in the above list) according to Chapter 22.3.2, steps 4 to 5.

Abbemat outlet – pH ME / pH ME Beverage inlet

6. Prepare and connect the hoses (parts No. 15 to 18 in the above list) according to Chapter 22.5.2, steps 5 to 10 and Fig. 22 - 19.

pH ME / pH ME Beverage outlet - waste container

7. Prepare and connect the hose (parts No. 19 to 20 in the above list) according to Chapter 22.5.2, steps 11 to 14.

Air hose

8. Cut a piece of approx. 200 mm from the silicone hose 3x5 (22). Attach an adapter Luer cone (23) onto one end. Connect this hose to the AIR outlet of the master instrument. See Fig. 22 - 21.

Completing the installation

- 9. For Xsample 520 only: Attach the magazine and the safety cover according to the Xsample 520 instruction manual. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. When mounting the safety cover, guide the hose connected between the master instrument's outlet and the HazeQC ME through the slit in the metal part of the safety cover. Avoid to squeeze or kink the hose.
- 10. To put the measuring assembly into operation, continue with Chapter 24.

22.7 Lovis 2000 ME + DMA M + Abbemat + Xsample 352/452

This measuring assembly can also be set up with a Lovis 2000 M as master instrument.

Required equipment:

- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Connection kit Lovis-Abbemat Xsample 352/452 (includes the micro flow cell and all required low volume hoses and connectors)
- Compressed air supply as specified in the Xsample instruction manual or optionally an "Air preparation set", according to Chapter 23.1

NOTICE

- This measuring assembly can only be used with low volume hoses and compressed air supply for filling and drying the measuring system.
- The measuring range of this assembly is limited to 500 mPa.s!

Note:

Low volume hoses have a smaller inner diameter (1 mm instead of 2 mm) than the standard hoses included in Lovis sets and accessory kits. The more viscous a sample is, the longer becomes the filling time and the greater is the risk of filling problems!

22.7.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (V2.30 build 245 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 352/452 into the DMA M according to the Xsample 352/452 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 4. Prepare the Xsample safety cover (edge protection) and the crush protection according to Chapter 17.2.

Mounting the micro flow cell

5. Mount the micro flow cell to the Abbemat according to the Abbemat instruction manual, section "Micro Flow Cell".

Mounting the cable clips

6. Attach the 3 cable clips onto the rear side of the Module Housing Lovis ME as indicated in Fig. 22 - 22.

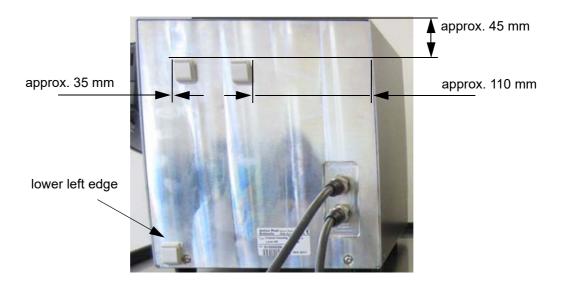


Fig. 22 - 22 Lovis 2000 ME rear side - Mounting the cable clips

Arranging master instrument and modules

- 7. Place the optional stand onto the DMA M according to Fig. 22 23.
- 8. Place the Lovis 2000 ME Module Housing on the stand on top of the DMA M and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 9. Place the Abbemat on the left side of Lovis 2000 ME.



Fig. 22 - 23 Lovis 2000 ME + DMA M + Abbemat + Xsample 352/452 - Placing master instrument and modules

1	Master instrument DMA M with Xsample 352/452
2	Lovis 2000 ME
3	Abbemat (Performance/Performance Plus)
4	Optional stand for measuring assembly

Connecting the cables

10. Connect the cables according to Fig. 22 - 24.

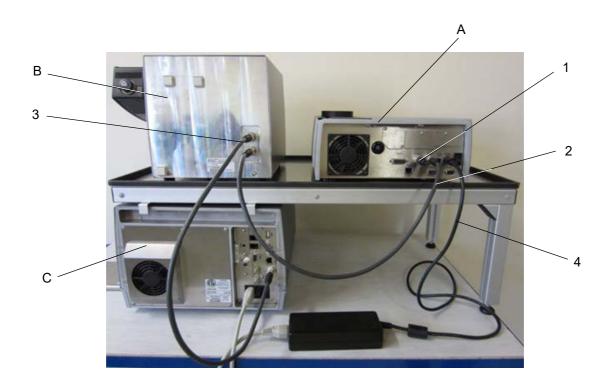


Fig. 22 - 24 Connecting the cables

1	CAN/Devicenet Terminating resistor to CAN socket on Abbemat
2	interface cable between Lovis CAN socket and Abbemat CAN plug
3	interface cable between DMA M CAN socket and Lovis CAN plug
4	mains cable Abbemat
Α	Abbemat (Performance/Performance Plus)
В	Lovis 2000 ME
С	master instrument DMA M

Note: The Abbemat always needs power supply from the mains, independent from the CAN connection as it is an instrument, which can also be operated stand alone. An extra CAN power supply for this assembly is not required.

Mounting the capillary

11. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.7.2 Connecting the Hoses

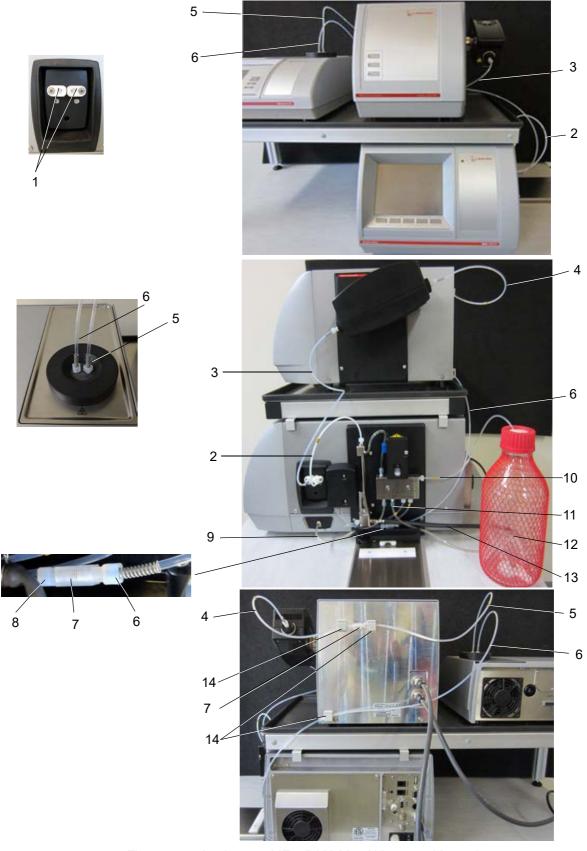


Fig. 22 - 25 Lovis 2000 ME + DMA M + Abbemat + Xsample 452

No.	Item	Supplied with	Purpose	Mat. No.
1	Injection adapter UNF 1/4" DMA	Voomple 252/452	filling adapters density cell	159025
2	Hose 300x3x2 PTFE marked "AA"	Xsample 352/452	hose between needle and DMA M	3443
3	Hose 530x3x1 FEP 2x1/4"-28 UNF		density cell outlet to Lovis capillary block front side	75860
4	Hose 350x3x1 FEP 2x1/4"-28 UNF "C"		Lovis capillary block rear side to adapter UNF/UNF	109491
5	Hose 530x3x1 FEP 2x1/4"-28 UNF		adapter UNF/UNF to Abbemat inlet	75860
6	Hose 1000x3x1 FEP 2x1/4"-28 UNF	Connection kit Lovis- Abbemat Xsample 352/452	Appenial Guliel to adapter GIVE/	
7	Adapter UNF/UNF	connects the hose 350 mm coming from Lovis capillary block rear side with the hose 530 mm to Abbern and the hose 1000 mm coming from Abbernat to Xsample 352/45 sensor hose		64790
8	Hose 740x3x2 FEP 2x1/4"-28 UNF "BA"		Sensor Hose Xsample 352/452	48722
9	Hose 2x4 silicone		"Air IN" of the valve block to the "Air" nozzle of DMA M	51273
10	Hose 750x3x2 PTFE 1x1/4"-28 UNF "AD"		Hose(s) for rinsing liquids	21230
11	Hose 2.5x4 PU transparent	Xsample 352/452	Hose from the compressed air supply to the "Pressure" connector of the valve block	15272
12	bottle(s) for rinsing liquid		solvent bottle(s)	21312
13	Hose 5x8 Viton-BK ISO Versinic	Masta hasa ta a wasta containar ^a		72546
14	Cable clip self- adhesive	Connection kit Lovis- Abbemat Xsample 352/452	hose guidances, 3 pcs.	62072

a. Connect the hose to a customer's waste container or to the optional safety waste container

On Xsample 352/452 most hoses are pre-assembled. See the Xsample 352/452 instruction manual.

Needle - master instrument inlet

1. Connect one end of the hose 300x3x2 PTFE (2) to the top of the Xsample needle, the other end to the inlet of the density cell.

Master instrument outlet - Lovis 2000 ME inlet

2. Connect one end of the hose 530x3x1 FEP 2x1/4"-28 UNF (3) to the outlet of the density cell. Bend the hose at this connected end upwards and in front of the Lovis capillary block in shape of a wide loop (3). It may be helpful to attach the safety cover to verify whether the hose is positioned correctly. Then screw the other end to the Filling Adapter UNF Front Side on the Lovis capillary block. See Fig. 22 - 26.

When using a Lovis 2000 M as master instrument, connect this hose between the top of the Xsample needle and the front of the capillary block.

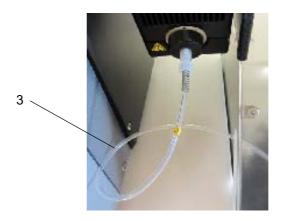


Fig. 22 - 26 Lovis + Xsample 352/452: mounting the hose between needle and Lovis inlet

Lovis 2000 ME outlet - Abbemat inlet

- 3. Connect a hose 350x3x1 FEP 2x1/4"-28 "C" (4) and a hose 530x3x1 FEP 2x1/4"-28 (5) using an adapter UNF/UNF (7). Connect the free end of the hose 350x3x1 "C" to the Lovis capillary block rear side. Carefully bend the hose into its shape and fix it by placing the springs of the hose connectors in the cable clips on the rear side of the Lovis 2000 ME.
- 4. Connect the free end of the hose 530x3x1 to the inlet of the Abbemat (take one of the two connectors, preferably the right one seen from the front).

Abbemat outlet - Xsample sensor hose

- 5. Lead the free end of the pre-assembled hose "BA" (8, sensor hose) of the Xsample 352/452 to the rear side and attach an adapter UNF-UNF (7).
- 6. Connect one end of the hose 1000x3x1 FEP 2x1/4"-28 (6) to the outlet of the Abbemat. Screw the other end into the adapter UNF-UNF of the Xsample 352/452.
- 7. Carefully bend the hose into its shape and fix it by placing the hose in the cable clip at the lower left edge on the rear side of the Lovis 2000 ME.

Air hose

8. Connect the air hose (9) of the Xsample 352/452 to the AIR connector (air pump outlet) of the DMA M master instrument.

Compressed air

9. Connect a hose either from your compressed air supply or the optional air preparation set to the "Pressure" connector on the valve block (11). Further information see Chapter 23.

NOTICE

If the pressure supplied to Xsample 352/452 is higher than 1.5 bar (21.7 psi), the valves in the valve block may not close correctly. This may cause Xsample 452 to malfunction or be damaged. Only use compressed air with these specifications: Maximum pressure for incoming air: 1.5 bar (21.7 psi). The air must be dry and free of oil, water and dust.

TIP If you want to reduce the drying time significantly, we recommend using an optional air preparation set with membrane air dryer, see Chapter 23.2. You can also refer to the Lovis Product Description List on the USB storage device supplied with your Lovis.

Rinsing hose(s)

10. Prepare and connect the rinsing hose(s) (10) and the rinsing liquid bottle(s) (12) according to the Xsample 352/452 instruction manual.

Waste hose

11. Connect the waste hose (13) to the waste container according to the Xsample 352/452 instruction manual.

Completing the installation

- 12. Xsample 452: Attach the magazine according to the Xsample 352/452 instruction manual.
- 13. Ensure that the edge protection (Xsample safety cover) and the crush protection are mounted; see Chapter 17.2. Attach and use the safety cover according to the Xsample 352/452 instruction manual. Avoid to squeeze or kink the hose leading to the Lovis capillary block.
- 14. To put the measuring assembly into operation, continue with Chapter 24.

22.8 Lovis 2000 ME + DMA M + Abbemat + Xsample 530

Required equipment:

- Lovis flow-through filling set (according to your order; further sets see the Lovis Product Description List on the USB storage device supplied with your Lovis)
- Hose Set Lovis + XS 352/452/530 (Mat. No. 101900); includes long hoses and Adapters UNF/UNF
- Connection Kit Lovis-Abbemat Flow-Through (Mat. No. 107879); includes the micro flow cell and further required hoses and connectors

NOTICE

- Use the magazine for 35 vials with 45 mL sample volume. Xsample 530
 does not support the use of low volume hoses, therefore sufficient
 sample volume is required.
- This measuring assembly should not be used with compressed air for filling and drying the measuring system. Using compressed air could damage the Lovis capillary adapters.

22.8.1 Preparing Master Instrument and Modules

- Before setting up the measuring assembly, ensure that the latest instrument software version (V2.92 build 146 or higher) is installed on the master instrument. The latest version you will find on the USB storage device supplied with Lovis 2000 M/ME. For the software version check and update, refer to the instruction manual of the master instrument.
- 2. Mount the Xsample 530 into the DMA M according to the Xsample 530 instruction manual.
- 3. Mount the Lovis 2000 ME into the Module Housing Lovis ME according to Chapter 6.4.
- 4. Prepare the Lovis crush protection according to Chapter 17.2.

Mounting the micro flow cell

5. Mount the micro flow cell into the Abbemat according to the Abbemat instruction manual, section "Micro Flow Cell".

Mounting the cable clips

6. Attach 2 cable clips to the rear side of the Module Housing Lovis ME as indicated in Fig. 22 - 29.

Arranging master instrument and modules

- 7. Place the optional stand onto the DMA M according to Fig. 22 23.
- 8. Place the Lovis 2000 ME Module Housing on the stand on top of the DMA M and check whether it stands solidly on all four feet. Otherwise refer to Chapter 17.4.
- 9. Place the Abbemat on the left side of Lovis 2000 ME.



Fig. 22 - 27 Lovis 2000 ME + DMA M + Abbemat + Xsample 530 - Placing master instrument and modules

1	Master instrument DMA M with Xsample 530		
2	Lovis 2000 ME		
3	Abbemat (Performance/Performance Plus)		
4	Optional stand for measuring assembly		

Connecting the cables

10. Connect the cables according to Fig. 22 - 24.

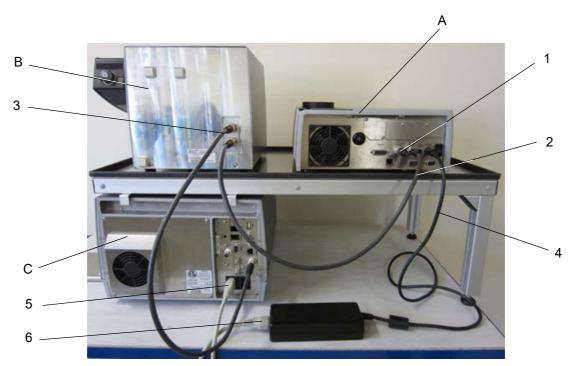


Fig. 22 - 28 Connecting the cables

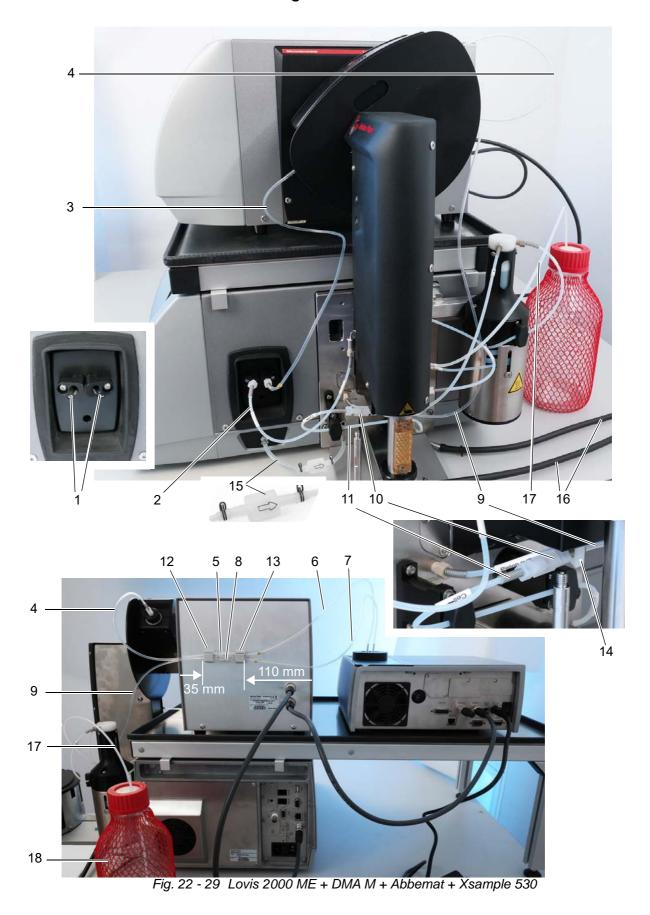
1	CAN/Devicenet Terminating resistor to CAN socket on Abbemat
2	interface cable between Lovis CAN socket and Abbemat CAN plug
3	interface cable between DMA M CAN socket and Lovis CAN plug
4	mains cable Abbemat
5	power cable of master instrument DMA M
6	power cable of Abbemat power supply
Α	Abbemat (Performance/Performance Plus)
В	Lovis 2000 ME
С	master instrument DMA M

Note: The Abbemat always needs power supply from the mains, independent from the CAN connection as it is an instrument, which can also be operated stand alone. An extra CAN power supply for this assembly is not required.

Mounting the capillary

11. Mount the capillary with flow-through adapters in the Lovis according to Chapter 9.5.

22.8.2 Connecting the Hoses



No.	Item	Supplied with	Purpose	Mat. No.
1	2 x Injection adapter UNF 1/4" DMA		Filling adapters density cell	159025
2	Xsample hose "Cell - Needle" 350x3x2 PTFE 2x1/ 4"-28 UNF (pre-assembled)	Xsample 530	Hose between needle and DMA M	110151
3	Hose 530x3x2 FEP 2x1/4"- 28 UNF "C"	Lovis,	Density cell outlet to Lovis capillary block front side	25523
4	Hose 350x3x2 FEP 2x1/4"- 28 UNF	flow-through set	Lovis capillary block rear side to Adapter UNF/UNF no. 5	25525
5	Adapter UNF/UNF	Connection kit	Connects hose no. 4 and hose no. 6	64790
6	Hose 530x3x2 FEP 2x1/4"- 28 UNF "C"	Lovis-Abbemat flow- through	Adapter UNF/UNF no. 5 to Abbemat inlet	25523
7	Hose 530x3x2 FEP 2x1/4"- 28 UNF "C"		Abbemat outlet to Adapter UNF/UNF no. 8	25523
8	Adapter UNF/UNF	Hose set Lovis- Connects hose no. 7 and hose no. 9		64790
9	Hose 600x3x2 FEP 2x1/4"- 28 UNF	Xs 352/452/530	Adapter UNF/UNF no. 8 to Adapter UNF/UNF no. 10	25524
10	Adapter UNF/UNF		Connects hose no. 9 and no. 11	64790
11	Xsample hose "Cell-Sense" 300x3x2 PTFE 2x1/4"-28 UNF (pre-assembled)	Xsample 530	Connection to liquid sensor	110152
12	Cable clip self-adhesive	Hose set Lovis-	Guidance for hoses no. 4 and no. 9	21312
13	Cable clip self-adhesive	Xs 352/452/530	Guidance for hoses no. 6 and no. 7	21312
14	Hose clip (pre-assembled)	Xsample 530	Guidance for hose no. 9 and hose "Piston pump – 1"	
15	Check valve with silicone air hose 3x5 (pre-assembled)		Connects the internal air pump of the master instrument with connector "Low" on Xsample	166080
16	2 x 1.5 m waste hose 5x8 Viton-BK ISO Versinic (pre- assembled)	Xsample 530	Drain liquid from the waste nozzles on the cleaning tubular and on the Xsample magazine support to a waste container	72546
17	Rinse hose(s) 750x3x2 PTFE 1x1/4"-28 UNF		Connects "Rinse 1"/ "Rinse 2"/ "Rinse 3" to the rinse bottle	110156
18	Bottle(s) for rinsing liquid	Xsample 530	Bottle(s) containing cleaning liquid	21312

On Xsample 530 most hoses are pre-assembled. See the Xsample 530 Instruction Manual.

 Replace the currently installed injection adapters of the DMAM by the injection adapters UNF (1) supplied with the Xsample 530. Refer to the Xsample 530 instruction manual.

Needle - master instrument inlet

2. Take the Xsample hose "Cell - Needle" (2). Connect the end labeled "Needle" to the top of the Xsample needle, the other end (labeled "Cell") to the inlet of the density cell.

Master instrument outlet - Lovis 2000 ME inlet

3. Connect one end of the hose 530x3x2 FEP 2x1/4"-28 UNF (3) to the outlet of the density cell. Bend the hose at this connected end upwards and guide it in shape of a wide loop to the inlet of the Lovis capillary block. Attach the safety shield to verify whether the hose is positioned correctly. Then screw the free end into the Filling Adapter UNF Front Side on the Lovis capillary block. See Fig. 22 - 29.

Lovis 2000 ME outlet - Abbemat inlet

- 4. Connect a hose 350x3x2 FEP 2x1/4"-28 (4) and a hose 530x3x2 FEP 2x1/4"-28 (6) using an Adapter UNF/UNF (5). Connect the free end of the hose 350x3x2 to the Lovis capillary block rear side. Carefully bend hose (4) into shape (see figure) and fix both hoses by placing the springs of the hose connectors in the cable clip (12 / 13) on the rear side of the Lovis 2000 ME.
- 5. Connect the free end of the hose 530x3x2 to the inlet of the Abbemat (take one of the two connectors, preferably the right one seen from the front).

Abbemat outlet - Xsample sensor hose "Cell - Sense"

- 6. Connect one end of the hose 530x3x2 FEP 2x1/4"-28 (7) to the outlet of the Abbemat. Screw the other end into the adapter UNF-UNF (8). Connect the hose 600x3x2 FEP 2x1/4"-28 (9) to the Adapter UNF-UNF. Fix both hoses by placing the springs of the hose connectors in the cable clip (12/13) on the rear side of the Lovis 2000 ME.
- 7. Connect an Adapter UNF-UNF (10) to the free end of hose 600x3x2 FEP 2x1/4"-28 (9). Guide the hose (9) downwards and through the opening below the Xsample 530 carriage (behind the cleaning tubular with the reflector). Fit the hose (9) into hose clip (14) from below. This clip also holds the Xsample hose "Piston pump 1".
- Carefully bend the Xsample hose "Cell-Sense" 300x3x2 PTFE 2x1/4"-28 UNF (11) into shape (upwards) and connect it to the Adapter UNF-UNF (10). Air hose

Air hose with Check Valve

9. Attach the free end of the pre-assembled Xsample 530 silicone hose 3x5 mm of the check valve (15) to the "AIR" nozzle of the DMA M. See arrow on the check valve.

NOTICE

Ensure that the check valve does not rub against the attached magazine. Ensure that the silicone hose is not bent or kinked, else the airflow cannot reach the measuring system.

TIP If you want to reduce the drying time significantly, we recommend using an optional air preparation set with membrane air dryer, see Chapter 23.2. You can also refer to the Lovis Product Description List on the USB storage device supplied with your Lovis.

Waste hose

10. Connect one waste hose (16) each to the waste nozzle on the cleaning tubular and to the waste nozzle on the Xsample magazine support. Connect the free ends of the waste hoses either to the optional safety waste container or to the customer's waste container according to the Xsample 530 instruction manual.

Rinsing hose(s)

11. Prepare and connect the rinsing hose(s) (17) and the solvent bottle(s) (18) according to the Xsample 530 instruction manual.

Completing the installation

- 12. Attach the magazine according to the Xsample 530 instruction manual.
- 13. Ensure that the crush protection is mounted (Chapter 17.2). Attach and use the safety shield according to the Xsample 530 instruction manual. Avoid to squeeze or kink the hoses leading to and from the Lovis capillary block.
- 14. To put the measuring assembly into operation, continue with Chapter 24.

23 Compressed Air - Air Preparation Sets

Xsample 352/452 can be operated (filling, cleaning) with compressed air. The maximum air pressure must not exceed 1.5 bar / 0.15 MPa (21.7 psi) as the Xsample valves then cannot switch correctly. Consult the Xsample 352/452 instruction manual. For the measuring assembly DMA M + Lovis 2000 ME + Abbemat + Xsample 352/452 it is required to use compressed air in combinations with one of the following air preparation sets. For operating Lovis 2000 M/ME with Xsample 530/340, refer to the respective instruction manual of the Xsample model.

23.1 Air Preparation Set Without Dryer

This air preparation set is an accessory especially for Lovis 2000 M/ME with sample changers with magazine in the normal temperature range to increase the sample throughput by minimizing the drying times.

NOTICE

The air preparation set without dryer shall not be used for measurements below ambient temperature. Air humidity may condense in the system and lead to wrong readings or malfunctions.

For such applications see Chapter 23.2.

23.1.1 Parts of the Air Preparation Set

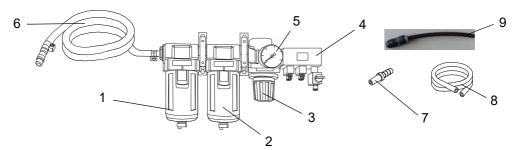


Fig. 23 - 1 Air preparation set without air dryer (Mat. No. 21903)

	Parts of the air preparation set (without air dryer)					
•	Air filter 5 µm, AF40-F04-A	6	Pressure hose 8x14; 3 m with connector			
	Mist filter 0.3 μm, AFM40-F04-A	7	Adapter Luer cone PTFE; 4 pcs.			
(Pressure regulator 0.2 MPa, AR40-F04H-1-B with 1/8" connector	8	Hose 2.5x4 (PU transparent); 10 m			
4	Distributor AR40 OAJ00149	9	Hose 4x6 polyurethane chainflex black plus			
į	Manometer (pressure gauge) 0 - 0.4 MPa, G46-4-01- L with 1/8" connector		hose connector 6 mm/4 mm (for connection to larger air inlet nozzle, if applicable)			

The kit includes also a set of fixing screws, washers and plugs.

23.1.2 Mounting the Air Preparation Set

Parts see Fig. 23 - 1.

- 1. Fix the air preparation unit (assembly of 1 6) e.g. to a wall aside or behind the measuring assembly but not too far away from the instrument.
- 2. Connect the pressure hose (6) to your compressed air supply.

The outlet of your compressed air supply should be equipped with a stopcock, which allows to switch off the air preparation set easily.

23.1.3 Connecting the Air Hoses

Parts see Fig. 23 - 1 and Fig. 23 - 2.

The distributor (4) is equipped with two adjustable outlets (4b) and a stop cock (4a). On each adjustable outlet you can set a continuous air flow, the stop cock is for switching the air flow on and off (see Fig. 23 - 2). All outlets are equipped with a plug connector (4c). The two adjustable outlets provide regulating screws (4d) and locknuts (4e) to fix each setting.

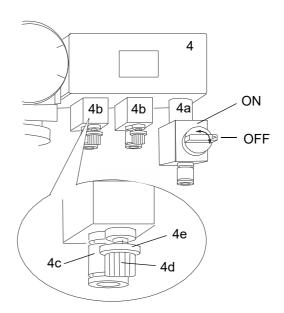


Fig. 23 - 2 Connecting air hoses to the distributor

1. Cut a piece in your required length from the supplied air hose 2.5x4.

2. Connect this hose (8) between the stop cock (4a) on the distributor and to the "Pressure" connector on the valve block of the Xsample 352/452.

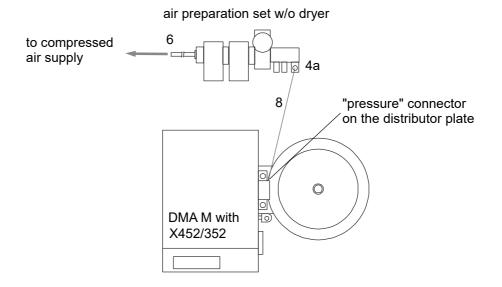


Fig. 23 - 3 Connecting the pressure hose to Xsample 352/452

23.1.4 Setting the Pressure on the Air Preparation Unit

Refer to Fig. 23 - 4:

1. Switch on your compressed air supply.

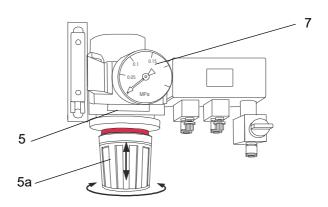


Fig. 23 - 4 Setting the correct air pressure

2. Reduce the incoming pressure:

Therefore set the pressure regulator (5) to 1.5 bar / 0.15 MPa (21.7 psi). This is the maximum allowed pressure for the Xsample 352/452.

To do this, pull the control knob (5a) downwards (you can see now a red marking ring on the regulator) and turn it until the correct pressure can be

seen on the manometer (7). Then push the control knob upwards again to lock it in this position. The set pressure is now available on all three outlets on the distributor.

23.2 Air Preparation Set for Dew Point -40 °C

Using this air preparation set enables you to operate the measuring assembly in the temperature range below ambient respectively at higher air humidity same as usual at "normal" conditions. It also allows to increase the sample throughput by decreasing drying times.

23.2.1 Parts of the Air Preparation Set

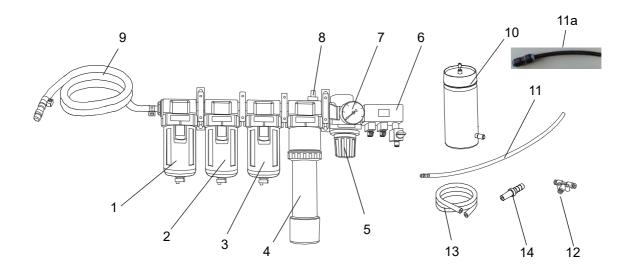


Fig. 23 - 5 Air preparation set dew point -40 °C (Mat. No. 21902)

	Air preparation set (dew point -40 °C) - parts					
1		Air filter 5 µm, AF40-F04-A				
2		Mist filter 0.3 µm, AFM40-F04-A	9		Pressure hose 8x14; 3 m with connector	
3		Micro mist filter 0.1 µm, AFD40-F04-A	10		Drying cartridge	
4		Membrane air dryer -40°C, IDG30LA-F03	11		Air hose (PU transp.) for drying cartridge	
5		Pressure regulator 0.2 MPa, AR40-F04H-1-B with 1/8" connector	11a		Hose 4x6 polyurethane chainflex black plus hose connector 6 mm/4 mm; 2 pcs. (for connection to larger air inlet nozzle, if applicable)	
6		Distributor AR40 OAJ00149	12		T-plug connector QST 4; 2 pcs.	
7		Manometer (pressure gauge) 0 - 0.4 MPa, G46-4-01-L with 1/8" connector	13		Hose 2.5x4 (PU transparent); 10 m	
8	•••	Humidity indicator for membrane air dryer	14		Adapter Luer cone PTFE; 4 pcs.	

The set includes also a set of fixing screws, washers and plugs.

23.2.2 Mounting the Air Preparation Set

Parts see Fig. 23 - 5.

- 1. Fix the air preparation unit (assembly of 1 9) e.g. to a wall aside or behind the measuring assembly but not too far away from the instrument.
- 2. Connect the pressure hose (9) to your compressed air supply.

The outlet of your compressed air supply should be equipped with a stop cock, which allows to switch off the air preparation set easily.

23.2.3 Connecting the Air Hoses

The distributor (6) is equipped with two adjustable outlets (6b) and a stop cock (6a). On each adjustable outlet you can set a continuous air flow, the stop cock is for switching the Air flow on and off (see Fig. 23 - 6). All outlets are equipped with a plug connector (6c). The two adjustable outlets provide regulating screws (6d) and locknuts (6e) to fix each setting.

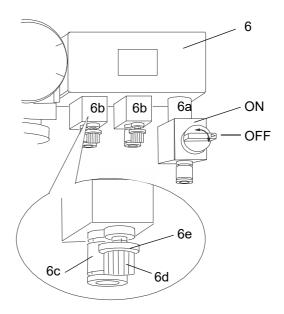


Fig. 23 - 6 Connecting hoses to the distributor of the air preparation kit -40 °C

- 1. Cut a piece in your required length from the supplied air hose 2.5x4.
- Connect this hose between the stop cock (6a) on the distributor and to the "Pressure" connector on the valve block of the Xsample 352/452 according to Fig. 23 - 7.

6b to compressed 9 air supply 6a 6b "pressure" connector 12 13 13 on the distributor 10 13 plate 13 11 DRY AIR IN: **AIRPUMP** 0 INTERNAL -DMA M / Lovis with X452(352)

air preparation set dew point -40 °C

Fig. 23 - 7 Connect pressure hose and drying cartridge to Xsample 352/452

- Connect a piece of hose 2.5x4 (13) between an adjustable outlet (6b) on the distributor (6) and the DRY AIR IN - INTERNAL nozzle on the rear of the DMA M / Lovis 2000 M to keep the interior of the instrument (electronic boards) dry.
- 4. Connect a piece of hose 2.5x4 (13) between an adjustable outlet (6b) on the distributor (6) and the T-plug connector (12).
- 5. Connect the transparent PU hose (11) to the drying cartridge (10). Plug the free end of this hose to the T-plug connector (12).
- Connect a piece of hose 2.5x4 (13) between the T-plug connector (12) and the DRY AIR IN - AIRPUMP nozzle on the rear of the DMA M / Lovis 2000 M.
- 7. Remove the protection cap from the nozzle on the top of the drying cartridge.

Why including the drying cartridge?

When operating the Xsample 352/452 with compressed air, it mainly uses the compressed air for filling sample and for cleaning purposes. But for some actions during measurement it uses also the built-in air pump, so it is required to keep also this item dry. The dry air flow must not be connected directly to the DRY AIR IN - AIRPUMP nozzle, this causes pressure building up in the air pump, which may lead to malfunctions. With this setup the air pump is not pressure loaded, it works with dried air and also the desiccant in the cartridge is kept dry.

23.2.4 Connecting the Air Hoses for Low Temperature Option

If permanently operating a Lovis 2000 M/ME in the low temperature range, use dry air to avoid condensation in the capillary block. The specifications when to use dry air are explained in Chapter 6.7. How to connect the air preparation set to a Lovis 2000 M stand-alone is also shown in that chapter.

TIP Use the stand-alone air drying setup also for use with Xsample 22/520.

The following figures show how to connect the air hoses depending on the measuring assembly. How to connect a counter cooling for DMA M/DSA M or any other module is not shown in this manual. Refer to the instruction manuals of the specific instruments or modules.

All air hoses other than the one to the drying cartridge are cut from the 10 m hose 2.5x4 (PU transparent) supplied with the air preparation set.

Assemblies with Xsample 52

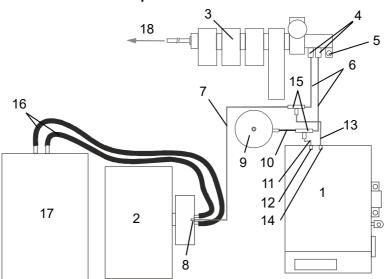


Fig. 23 - 8 Air hoses: Lovis low temperature (+ DMA M/DSA M) + Xsample 52

- Master instrument:
 Lovis 2000 M or DMA M/DSA M
- 2 ... Lovis 2000 ME (module housing)
- 3 ... Air preparation set dew point -40°C
- 4 ... Adjustable dry air outlet
- 5 ... Dry air outlet with stop cock
- 6 ... Air hose to T-plug connector
- 7 ... Air hose to capillary block
- 8 ... Opening Luer cone
- 9 ... Drying cartridge
- 10 ... Hose PU transparent to drying cartridge

- 11 ... Hose to nozzle DRY AIR IN AIR PUMP
- 12 ... Nozzle DRY AIR IN AIR PUMP
- 13 ... Hose to nozzle DRY AIR IN INTERNAL
- 14 ... Nozzle DRY AIR IN INTERNAL
- 15 ... T-plug connector
- 16 ... Thermostat hoses
- 17 ... Cooling thermostat
- 18 ... to compressed air supply

TIP Hose (13) to "DRY AIR IN INTERNAL" is not required if using Lovis 2000 M as master instrument. In that case you do not need a second T-plug connector (15).

Assemblies with Xsample 352/452 3 16 6 17 14 11 10 12 0 13 0 2 18 15 9

Fig. 23 - 9 Air hoses: Lovis low temperature (+ DMA M/DSA M) + Xsample 352/452

- Master instrument: Lovis 2000 M or DMA M/DSA M
- 2 ... Lovis 2000 ME (module housing)
- 3 ... Air preparation set dew point -40°C
- 4 ... Adjustable dry air outlet
- 5 ... Dry air outlet with stop cock
- 6 ... Air hose to "Pressure" connector of Xsample
- 7 ... Air hose to T-plug connector
- 8 ... Air hose to capillary block
- 9 ... Opening Luer cone
- 10 ... Drying cartridge
- 11 ... Hose PU transp.to drying cartridge

- 12 ... Hose to nozzle DRY AIR IN AIR PUMP
- 13 ... Nozzle DRY AIR IN AIR PUMP
- 14 ... Hose to nozzle DRY AIR IN INTERNAL
- 15 ... Nozzle DRY AIR IN INTERNAL
- 16 ... T-plug connector
- 17 ... Thermostat hoses
- 18 ... Cooling thermostat
- 19 ... to compressed air supply

TIP Hose (14) to "DRY AIR IN INTERNAL" is not required if using Lovis 2000 M as master instrument. In that case you do not need a second T-plug connector (16).

24 Putting a Measuring Assembly into Operation

Working with a measuring assembly is not the same as with just a single instrument. Each component can influence the other. Something that has no influence on one measurement may have a large influence on the determination of another result. So especially filling and cleaning is a very important factor. And the different time each component may need for a valid result.

Start-up

After installing the hardware, switch on the master instrument.

The power LED on the master instrument lights up green, the orange status LED on the module housing Lovis ME blinks during the boot sequence.

The master instrument shows the boot screen ("Loading Anton Paar Lovis ..." or Loading Anton Paar DMA M..."). During the start-up procedure, the master instrument checks for installed modules and should recognise them.

When the boot sequence is completed, the master instrument displays the main window. The status LED lights permanently.

Check of instrument software version

Check the software version of the master instrument and if required, perform a software update. This is required if

- the installed module(s) is/are not recognized by the master instrument, e.g. in case of retrofitting a Lovis 2000 ME and a sample changer to an existing DMA M / DSA M this requires software version 2.30 or higher.
 Normally this has to be performed before setting up the hardware of the measuring assembly. If not done yet, the Lovis 2000 ME must be removed/disconnected before running the update.
- the software of an installed part of the assembly is not up to date. In this case the master instrument prompts you to perform an update.

The latest instrument software version at delivery time is supplied on a USB storage device in the accessory kit basic and in the accessory kit complete - Lovis.

To check the software version and to perform a software update, see Chapter 14.

Checking the system for leak tightness

To ensure that all hoses and connectors are leak tight, perform the leak test according to Chapter 12.4.

Selecting a Method

Tap <Method> to open the list of methods.

Select the desired method and tap <OK>.

- Lovis 2000 M/ME provides several predefined methods by default. See Chapter 7.2.1.
- When using a DMA M or DSA M as master instrument, consult the instruction manual of your DMA M / DSA M for the description of methods related to the density meter / sound velocity meter.
- For the default settings of your sample changer model and for changing these settings, refer to the Instruction Manual of the Xsample.

Adapting method settings

For many module combinations only default methods do exist. Select the measuring quantities according to your application for screen display and data memory.

If you need other method settings for your application you can:

- edit an existing method or
- · create a new method

To edit an existing or create a new method, see Chapter 7.2 in SECTION I of this manual. Refer also to the Instruction Manual of your DMA M/DSA M, if applicable.

For all general information and instructions regarding the platform M software consult the General Software Functions Manual (Doc. No. XPAIB001EN) on the USB flash memory supplied with your Lovis 2000 M/ME.

Creating a capillary in the capillary administration

If you start with a new system, you must create at least one capillary. Enter the serial number of the capillary, the capillary diameter, the ball type and a capillary name in the menu "Setup > Measuring System Settings > Lovis Module > Capillary Administration". Define also, whether the capillary needs adjustment or not. Refer to the Lovis 2000 M/ME Instruction Manual respectively to Chapter 7.1.1.

TIP If you want to measure runtimes or relative viscosity only, it is not required to adjust the capillary.

Conditioning the capillary

All capillaries have undergone a cleaning procedure in the factory to remove possible residues from the production process. Anyway, to achieve better results it is recommended to clean the capillary with solvents suitable to your application. Use the supplied brushes to clean the inner surface of the capillary, then rinse and dry it. This way the wetting of the measuring surface with the sample will be improved. See Chapter 11.2.

Performing a Level Adjustment

The instruments cannot be leveled mechanically by adjustable feet. To compensate possible unevenness of the location of installation, perform a level adjustment. Perform measurements and check the run times. A level adjustment is required, if the obtained run times differ repeatedly between the forward run and the backward run. The level adjustment can be performed using the sample changer. See Chapter 25.1.

Adjusting the capillary

If you need viscosity results, it is required to adjust the capillary. To perform the adjustment using the sample changer see Chapter 25. Refer also to Chapter 8.4 for single point, standard and extended adjustment in SECTION I of this manual.

Adjustment data can also be imported from a USB storage device.

Handling measurement data

To define data memory settings, data browser settings and data export settings, refer to the Instruction Manual of the master instrument.

After performing all these steps, the measuring assembly should be ready.

Adjusting other modules of an assembly

Refer to the instruction manual of the respective module. If required, consult additionally the instruction manual of the master instrument.

25 Adjusting Lovis 2000 ME with Xsample

The following adjustments for the Lovis can be performed automated with Xsample

- Level Adjustment
- · Single Point Adjustment
- Standard Adjustment
- Extended Adjustment

Depending on your Xsample model, the steps you need to perform are different.

Xsample 452/352/530:

These models perform a special cleaning prior to starting the adjustment and a cleaning procedure after the adjustment.

Xsample 520/22:

These models do not support automatic cleaning. Ensure that the measuring cells and hoses of the system are sufficiently clean and dry before starting the level adjustment.

Xsample 52:

This model uses the same hose for sample filling and as waste hose. Waste vessel and sample vessel have to be changed during the adjustment procedure.

25.1 Level Adjustment with Xsample

The instruments cannot be leveled mechanically by adjustable feet, as they have none. To compensate possible unevenness of the location of installation, perform a Level Adjustment. This adjustment compensates differences between forward and backward inclination of the Lovis 2000 M/ME caused by a not perfectly leveled place of location. The Level Adjustment can correct an angle of max. 0.5° within one run. If the angle deviation is higher, the instrument recommends to improve the Level Adjustment. Consult also Chapter 8.3 in SECTION I of this manual.

Perform a Level Adjustment

- after first installation of the measuring assembly
- when you have moved the Lovis 2000 ME or the master instrument from its location - even if only a bit
- before adjusting a capillary. In this case, ideally perform the Level Adjustment with the capillary you plan to adjust.

NOTICE

It is not possible to perform a Level Adjustment with air, as the minimum run time must not fall below 10 seconds. Further the friction in an empty capillary will have negative influence on the run times.

- 1. Make sure that a capillary with ball is placed in the Lovis capillary block.
- 2. Prepare a vial filled with appropriate reference medium.
- 3. Select the menu "Checks / Adjustments > Other Adjustments > Lovis Module > Level Adjustment".
- 4. Put the vial into position 1 and tap <OK>.

For Xsample 520/22 ensure that the system is clean and dry, as these instruments do not perform automatic cleaning.

5. Follow the instructions given on the display.

During the Level Adjustment Lovis 2000 M/ME displays the current temperature and the progress.

When finished, the instrument shows the results for short and long measuring distance:

- Required angle correction to achieve near identical runtimes
- Average forward and backward runtimes
- Forward/Backward Deviation and Variation Coefficient
- 6. An arrow suggests the suitable action:
 - If the correction is greater than 0.5°, a message on the lower left-hand side of the instrument screen reads "Check Result. Improve". The Level Adjustment should be repeated with the same filling of the capillary. Tap <Improve>. The first correction is applied and a new adjustment is started to fine tune the angle correction.
 - For corrections smaller than 0.5°, Lovis 2000 M/ME suggests to <Apply> the Level Adjustment.
 - Tap <Reject> to discard the displayed correction and end the adjustment.
- TIP The result can be improved several times (even if Lovis 2000 M/ME suggests <Apply>). It is possible to achieve angle corrections < 0.1°.
 - 7. If after improving several times Lovis does not allow you to <Apply>, check the filling of the capillary for bubbles and check that the Lovis stands in a stable position. Refill the capillary and tap <Improve>.
 - 8. The Level Adjustment is valid and stored after tapping <Apply>.

25.2 Capillary Adjustment with Xsample

All capillary adjustments for Lovis 2000 ME can be performed using the sample changer. To perform the adjustment, you need a reference standard with certified values of dynamic viscosity and density at the respective temperature. The viscosity of the reference standard must be in the core range of the capillary/ball configuration, see Appendix A.2.

The sample changers perform the adjustment procedure in a different way. Follow the instructions on the display and consult also the instruction manual of your Xsample model, Chapter "Adjusting the Master Instrument with Xsample xxx".

TIP If you have ordered a factory adjustment, import the adjustment from the USB storage device delivered with the capillary. See Chapter 7.1.1.

Do not lose the original adjustment ball. See Chapter 8.4!

- 1. Ensure that:
 - the capillary data are entered in the Capillary Administration. If not done already, refer to Chapter 7.1.1 in SECTION I of this manual.
 - the capillary you want to adjust is in the Lovis capillary block.
 - the solvent bottles for Xsample 352/452/52/530 contain enough suitable solvent.
- 2. Prepare a vial filled with the reference standard.
- Select the desired adjustment type in the menu "Checks / Adjustments >
 Other Adjustments > Lovis Module":
 - "Single Point Adjustment" -> for one user-defined angle
 - "Standard Adjustment" -> for a fixed range of 20° to 70° angle
 - "Extended Adjustment" -> for a user defined range of 15° to 75° angle

Please refer to Chapter 8.4 for details on the available adjustment types and on the adjustment procedure.

26 Customer Maintenance Assemblies

To keep your measuring assembly working smoothly and reliably, perform regularly the following checks and maintenance work. The steps depend on the configuration of your measuring assembly.

What to do:	When:		
Visual inspection of hoses and hose connections.	Daily; before starting measurements.After changing the capillary.		
Tighten all hose connections.	Monthly.After changing the capillary.		
Leak test of all connected hoses.	 Monthly. After hoses were dis- and reconnected. If leakage is suspected. See Chapter 26.2. 		
Special cleaning of the capillary.	 Once a year. If cleaning outside the capillary block does not give satisfactory results. See Chapter 12.1. 		
Visual inspection of capillaries and adapters.	If residues inside the capillary are suspected that cannot be removed by standard flow-through cleaning. Clean the capillary manually. See Chapter 11.2. If required, perform a special cleaning. See Chapter 12.1.		
Xsample 352/452/52/530: Visual inspection of Xsample valve unit (not for Xsample 530) and piston pump.	Daily; before starting measurements.		
Xsample 520/22: Check the pump hose for wear or damage.	Daily; before starting measurements.		
Xsample 520/22: Visual inspection of the peristaltic pump for contamination caused by a damaged pump hose.	I I Jaily: hetare starting measurements		
Regularly perform all maintenance steps according to the schedule given for your Xsample model, if any.	Consult the instruction manual of		
Regularly perform all maintenance steps according to the schedule given for DMA M / DSA M, if any.	Consult the instruction manual of your DMA M / DSA M model.		

What to do:	When:
Regularly perform all maintenance steps according to the schedule given for all other modules used with your assembly, if any.	Consult the instruction manual of the respective module (Alcolyzer ME, HazeQC ME, pH ME, Abbemat).
Replacing the O-rings of the capillary adapters	 If the capillary adapters are leaking or do no longer hold tightly on the capillary. If changing to Kalrez[®] O-rings for better chemical resistance. See Chapter 12.5.

26.1 Inspection of Hoses and Hose Connectors

To meet safety requirements and for proper function of the system, a regular inspection is required.

- 1. Check all hoses and hose connectors of the measuring assembly at least monthly if they are connected properly. If required, tighten the connectors.
- Check the color of the FEP and/or PTFE hoses, especially of the hose used with the liquid sensors of Xsample 352/452/530. If this hose becomes very dark or turbid, the function of the optical sensors can be influenced. If required, replace this hose.
- 3. Check all hoses for mechanical damage (e.g. kinks). Replace damaged hoses immediately.
- 4. Xsample 520/22: Check the pump hose for damage and for proper fitting in the peristaltic pump. A hose, which is not placed correctly, will wear earlier.

26.2 Leak Test of all Connected Hoses

Generally, this leak test works by applying air pressure to the complete system while simultaneously closing the waste hose. This way air pressure builds up. Leakage can be detected by a hissing noise from the leaky part.

26.2.1 Measuring Assemblies with Xsample 352/452

Check the leak tightness of these hoses by performing the following easy procedure before starting a magazine (Xsample 452) or after the respective number of measurements (Xsample 352).

- 1. Squeeze the waste hose manually so that it is leak tight.
- Tap to switch on the air pump (or, if used, the compressed air).

The air flows via the valve block through the sensor hose, the hoses connected to the Lovis capillary block, the Lovis capillary, the DMA M / DSA M measuring cell (if applicable), the needle hose and the needle into the waste hose.

- 3. Listen to the noise of the air pump or the compressed air. Make sure that the noise is not drowned out by ambient noise.
 - · The noise disappears: the hoses are leak tight.
 - The noise does not disappear, you may hear also a hissing noise. Try to locate the leakage.
- Tap to switch off the air pump (or compressed air).

Reasons for leakiness

- A hose connector may be loose check and tighten all hose connectors and repeat this check.
- One of the hoses is damaged check and replace the damaged hose and repeat this check.
- The O-rings of the filling adapters for the Lovis capillary may be damaged.
 Disassemble and check the parts. If required, replace the O-rings according to Chapter 12.5.
- The vial cap seal or the PTFE insert in the Xsample waste block is damaged.
 Find solutions in the Xsample instruction manual.
- The injection adapters of the DMA M / DSA M are loose or damaged (if applicable). Find solutions in the instruction manual of your DMA M/DSA M.

26.2.2 Measuring Assemblies with Xsample 52

Check the leak tightness of these hoses by performing the following easy procedure after approx. 50 measurements.

- 1. Tap ____ to switch on the air pump (or, if used, the compressed air).
- 2. For a soft, flexible sample filling hose (e.g. silicone): Squeeze the hose manually so that it is leak tight.

For hard sample filling hoses: Attach a piece of silicone hose 2x4 onto the open end of the sample filling hose. Squeeze the silicone hose manually so that it is leak tight.

The air flows via the valve block and the hose through the Lovis capillary, the DMA M / DSA M measuring cell (if applicable) to the sample filling hose.

- 3. Listen to the noise of the air pump or the compressed air. Make sure that the noise is not drowned out by ambient noise.
 - · The noise disappears: the hoses are leak tight.
 - The noise does not disappear, you may hear also a hissing noise. Try to locate the leakage.
- 4. Tap to switch off the air pump (or compressed air).

Remove the piece of silicone hose from the filling hose (if applicable).

Reasons for leakiness

- A hose connector may be loose check and tighten all hose connectors and repeat this check.
- One of the hoses is damaged check and replace the damaged hose and repeat this check.
- The O-rings of the filling adapters for the Lovis capillary may be damaged.
 Disassemble and check the parts. If required, replace the O-rings according to Chapter 12.5.
- The injection adapters of the DMA M/DSA M are loose or damaged (if applicable). Find solutions in the instruction manual of your DMA M/DSA M.

26.2.3 Measuring Assemblies with Xsample 520/22

Check the leak tightness of these hoses by performing the following easy procedure before starting a magazine (Xsample 520) or after the respective number of measurements (Xsample 22).

Depending on the type of waste hose, you need to close this hose in a different way.

- 1. Tap to switch on the air pump. Xsample 520 only: The needle moves upwards into service position:
 - Xsample 520 only: remove the Xsample safety cover,
 - · connect the air hose to the needle tip,
 - turn the pump lever into horizontal position and lift the cartridge to release the pump hose.
- 2. For soft, flexible hoses (e.g. silicone): Squeeze the waste hose manually so that it is leak tight.
 - For FEP or other hard hoses: screw an adapter UNF/UNF onto the free end of the waste hose. Screw an adapter Luer 1/4" UNF (Lovis accessories) into this adapter. Close the adapter Luer 1/4" UNF tightly with a Luer plug (Lovis accessories).

The air flows via the needle through the hoses into the DMA M / DSA M measuring cell (if applicable) and then through the Lovis capillary into the waste hose.

- 3. Listen to the noise of the air pump or the compressed air. Make sure that the noise is not drowned out by ambient noise.
 - The noise disappears: the hoses are leak tight.
 - The noise does not disappear, you may hear also a hissing noise. Try to locate the leakage.
- 4. When ready, remove the air hose from the needle.
- 5. Tap to switch off the air pump (or compressed air).
 - Re-attach the cartridge an turn back the pump lever into vertical position.
 - · Xsample 520 only: Re-attach the safety cover.

Xsample 520 only: The needle moves back into initial position.

6. If initially attached, remove the Luer plug, the adapter Luer 1/4" UNF and the adapter UNF/UNF from the waste hose. Then re-connect the waste hose to your waste container.

Reasons for leakiness

- A hose connector may be loose check and tighten all hose connectors and repeat this check.
- One of the hoses is damaged check and replace the damaged hose and repeat this check. A worn pump hose may be the reason for leakage.
- The O-rings of the filling adapters for the Lovis capillary may be damaged.
 Disassemble and check the parts. If required, replace the O-rings according to Chapter 12.5.
- The injection adapters of the DMA M / DSA M are loose or damaged (if applicable). Find solutions in the instruction manual of your DMA M / DSA M.

26.2.4 Measuring Assemblies with Xsample 530

Xsample 530 automatically performs a leak test when activated. Further, it performs an automatic leak test before starting the measurement of a new sample list (i.e. magazine). If required, you can set Xsample 530 to performing an automatic leak test before measuring each sample vial. Please consult the Xsample 530 Instruction Manual.

Appendix A: Technical Data

A.1 Measuring Performance

	Lovis 2000 M	Lovis 2000 ME & DMA M	Lovis 2000 ME & DSA 5000 M		
Measuring range	L		L		
Dynamic viscosity	0.3	mPa.s to 10 000 mP	a.s		
Inclination	15° to	80° inclination in 1°	steps		
Shear rate	approximately 0.5	5 s ⁻¹ to 1000 s ⁻¹ influe size and inclination	enced by capillary		
• Density	_	0 g/cm ³ t	o 3 g/cm ³		
Sound velocity	-	-	1000 m/s to 2000 m/s		
Temperature ranges					
Viscosity measurement without capillary block counter cooling	+5 °C t	to 100 °C (41 °F to 21	12 °F) ^a		
Viscosity measurement with capillary block counter cooling	-20 °C to 100 °C (-4 °F to 212 °F) ^a				
Density measurement ^b	-	0 °C to 100 °C (32 °F to 212 °F)	0 °C to 70 °C (32 °F to 158 °F)		
Sound velocity measurement ^b	-	-	0 °C to 70 °C (32 to 158 °F)		
Precision of Lovis 2000 M/ME ^b					
Temperature repeatability s.d.		0.005 °C (0.01 °F)			
Temperature accuracy		0.02 °C (0.04 °F)			
Inclination repeatability s.d.	0.02°				
Inclination accuracy	0.1°				
Measuring time resolution	0.001 s				
Measuring time accuracy	0.05 %				
Viscosity repeatability s.d.	0.1 % ^c				
Viscosity accuracy	0.5 % ^{b, d}				

- a. Specified minimum temperatures are valid for a maximum ambient temperature of 35 °C (95 °F). Lower temperatures down to -30 °C (-22 °F) can be reached depending on lower ambient temperatures and/or with special equipment (see Chapter 6.7).
- b. For precision specifications of density and sound velocity measurement refer to the instruction manual of the respective DMA M/DSA M model.
- c. Verified with 1.59 capillary at 70° angle and with Ethanol 96% at 20 °C using the same ball for all repeated measurements. For determination of repeatability for other cases see "C72IQ004EN Lovis Measuring Error Contributions" on the customer USB storage device.
- d. Verified with 1.59 capillary with single point adjustment performed on site at 70° angle; adjustment and all measurements performed with distilled water at 20 °C with the same ball. The maximum allowed deviation for other cases can be determined under the guidance of the document "C72IQ004EN Lovis Measuring Error Contributions" on the customer USB storage device.

		Lovis 2000 M	Lovis 2000 ME & DMA M	Lovis 2000 ME & DSA 5000 M
Furth	ner specifications			
Test duration		minimal 30 s, typical 3 min.		minimal 60 s, typical 4 min.
	Alinimum sample volume without asing a sample changer ^a			
	Standard capillaries Filling outside the capillary block Flow-through filling with syringe	0.4 mL to 0.8 mL 1.6 mL to 2.0 mL	1.5 mL to 2 mL ^b 2.6 mL to 3.0 mL	3.5 mL to 4 mL ^b 4.6 mL to 5.0 mL
- 1	Short capillaries	0.1 mL to 0.25 mL	-	_

a. Minimum sample volume for measuring assemblies see Appendix A.5 of the Lovis 2000 M/ME Reference Manual

A.2 Lovis 2000 M/ME Capillary Measuring Ranges

Lovis 2000 M/ME capillary measuring ranges (dynamic viscosity)						
	runtime	itime limited angle range ^a		full angle range (15° to 80°) b		
Capillary	long distance	10 s	1700 s	10 s	1700 s	
	short distance	2.5 s	425 s	2.5 s	425 s	
1.59 mm	steel ball	0.3 mPa.s	90 mPa.s	1 mPa.s	20 mPa.s	
1.59 111111	gold ball	0.2 mPa.s	65 mPa.s	0.7 mPa.s	15 mPa.s	
1.62 mm	steel ball	0.5 mPa.s	160 mPa.s	1.6 mPa.s	40 mPa.s	
PCTFE	gold ball	0.4 mPa.s	125 mPa.s	1.4 mPa.s	32 mPa.s	
1.8 mm	steel/gold ball	2.5 mPa.s	1700 mPa.s	13 mPa.s	300 mPa.s	
2.5 mm	steel/gold ball	12 mPa.s	10 000 mPa.s	70 mPa.s	1700 mPa.s	

a. Measurements can be done within the specified viscosity range, but not at all inclination angles. Liquids with a viscosity near the lower limit of the capillary can be measured at flat angles down to 15°, liquids with a viscosity near the upper limit of the capillary can be measured at steep angles of 75° or 80°.

TIP For short capillaries only the short distance is applicable. The viscosity measuring range is the same as for standard capillaries with the same diameter.

b. Minimum sample volume for separate filling of DMA M / DSA M cell and Lovis capillary

b. Measurements can be done within the specified viscosity range at all angles from 15° to 80° with one capillary. All adjustments should be performed using reference liquids within the full angle viscosity range of the used capillary.

A.3 Recommended Viscosity Standard Liquids

	Decemberded	Std.	Recomme	ended Limit [%]
Capillary	Recommended Temp. Range	Liquid	Variation Coeff.	Repeatability ^a
1.59 glass	2 °C to 40 °C	pure water	0.1 %	0.15 %
1.59 glass	5 °C to 40 °C	AP H ₂ O	0.1 %	0.15 %
1.59 glass	20 °C to 80 °C	S3 oil	0.15 %	0.25 %
1.59 glass	20 °C to 100 °C	S6 oil	0.15 %	0.25 %
1.59 glass	40 °C to 100 °C	N7.5 oil	0.15 %	0.25 %
1.59 glass	40 °C to 100 °C	N14 oil	0.15 %	0.25 %
1.62 PCTFE	2 °C to 15 °C	pure water	0.15 %	0.15 %
1.62 PCTFE	5 °C to 15 °C	AP H ₂ O	0.15 %	0.15 %
1.62 PCTFE	20 °C to 50 °C	S3 oil	0.15 %	0.25 %
1.62 PCTFE	20 °C to 60 °C	N7.5 oil	0.15 %	0.25 %
1.62 PCTFE	20 °C to 60 °C	N14 oil	0.15 %	0.25 %
1.62 PCTFE	40 °C to 60 °C	N26 oil	0.15 %	0.25 %
1.8 glass	20 °C to 100 °C	N26 oil	0.2 %	0.25 %
1.8 glass	20 °C to 100 °C	N75 oil	0.2 %	0.25 %
2.5 glass	20 °C to 60 °C	N100 oil	0.5 %	0.75 %
2.5 glass	40 °C to 100 °C	N415 oil	0.5 %	0.75 %

a. Standard deviation [%]. These values take into account the influence of the operator and the individual handling of capillaries. For determination of repeatability on site see "C72IQ004EN Lovis Measuring Error Contributions" on the customer USB storage device.

Allowed maximum deviation of viscosity values

Determine the allowed maximum deviation of viscosity values under the guidance of the document "C72IQ004EN Lovis Measuring Error Contributions" on the customer USB storage device.

TIP If using water as standard liquid, take care to degas it first.

- Put your sample in a covered vessel into an ultrasonic bath for approximately 10 minutes.
- · Choose a temperature higher than for the Level or Capillary Adjustment.
- Fill the capillary immediately after degassing.

Alternatively, boil the water for several minutes to remove dissolved air. Fill a clean glass flask full with the boiled liquid and cover it. Wait until the liquid has cooled down to the approximate adjustment temperature.

A.4 General Technical Data

	Lovis 2000 M	Lovis 2000 ME & DMA M or DSA 5000 M	Lovis 2000 ME in Module Housing
Dimensions (L x W x H)	482 x 420 x 231 mm (19.0 x 16.5 x 9. 1 in)		400 x 315 x 231 mm (15.7x 12.4 x 9.1 in)
Net weight	17.0 kg (37.4 lbs)	27.3 kg (60 lbs)	9.3 kg (20.5 lbs)
Voltage, Frequency	AC 100 V to 240 V; 50 Hz to 60 Hz		DC 24 V
Power	190 VA max.		40 W max.
Power socket	According to IEC/EN 60320-1/C14, protection class I		Power supply by master instrument via CAN Bus
Fuses	2 glass tube fuses 5x20 mm; IEC60127-2; AC 250 V; 5 A slow ceramics		SMD fuse 3.15 AF
Pressure range ^a	 1 MPa (10 bar): up to 50 °C (122 °F) 500 kPa (5 bar): 50 to 100 °C (122 °F to 212 °F) 		
Lovis counter cooling			
Pressure	1.5 bar maximum		
Circulation temperature	0 °C to 40 °C (32 °F to 104 °F)		
Housing material			
Top & side cover	Aluminum, coated with a poly acrylate resin varnish		
Back	Aluminum and stainless steel		
Front	Styrene/Butadiene, coated with a poly acrylate resin varnish		
Environmental conditions (EN 61010)	Indoor use only		
Ambient temperature	15 °C to 35 °C (59 °F to 95 °F)		
Air humidity	10 % to 90 % relative humidity, non-condensing		
Pollution degree	2		
Radiated emissions	Class A. This equipment can generate radiated disturbances in residential environment. EN 5501 +A1 class B (edition 07/2010) EN 61000-4-3 +A1 +A2 (edition 07/2010)		
Overvoltage category	II		
Airborne noise emitted	< 60 dB/A		
Altitude	max. 3000 m (9800 ft)		
Touch screen	6.4 in TFT, 640 x 480 px	10.4 in TFT PCAP, 640 x 480 px	
Memory	1000 mea	suring values	

a. Applicable only for flow-through systems with FEP or PTFE hoses with UNF threads

	Lovis 2000 M	Lovis 2000 ME & DMA M or DSA 5000 M	Lovis 2000 ME in Module Housing
Interfaces	 4 x USB (2.0 full s) 1 x Ethernet (100) 1 x CAN Bus 2 x S-Bus a 1 x RS-232 1 x VGA 		• 2 x CAN Bus
RS-232 printer settings	Baud rate: 9600; Pa Data bits: 8	rity: None; Stop bit: 1;	

a. Only for Lovis 2000 ME in combination with DMA M/DSA M models



WARNING

Serious injuries are possible through high voltage if the following hints are not adhered to.

 Only connect devices to the interfaces that comply with PELV (protective extra-low voltage) according to EN 61140 or with SELV (safety extra-low voltage) according to EN 60950.

NOTICE

Connect only Anton Paar equipment to the CAN interface and adhere to the following limits. The CAN interface power supply is limited to 72 W.

- For Lovis 2000 M models with serial no.s lower or equal 81002856, the consumption of modules in the base unit's slot has to be subtracted:
 - If the master instrument contains an Xsample module, additional equipment must not exceed a maximum power consumption of 40 W.
 - If the master instrument contains a Lovis 2000 ME module, additional equipment must not exceed a maximum power consumption of 32 W.
- From Lovis 2000 M model with serial no. 81002863 on, equipment with 72 W can be connected to the external CAN interface independent of the built-in module.

If a module (or several) with higher power requirement shall be connected, a separate CAN power supply (Mat. No. 100655) must be provided.

A.5 Minimum Required Sample Volume Assemblies

Manual flow-through filling by syringe, single determination

Measuring assembly	hoses	min. volume [mL]
Lovis + Abbemat	standard	5.5
Lovis + Appemai	low volume ^a	2.6
DMA M + Lovis + Abbemat	standard	6.5
DIMA IM + LOVIS + Appemat	low volume ^a	3.6
DCAM I Louis I Abbarret	standard	8.5
DSA M + Lovis + Abbemat	low volume ^a	5.6
DMA M + Lovis + pH	standard	13
DSA M + Lovis + pH	standard	15

a. Optional. See Chapter 16.2.4.

Filling with sample changer, single determination

Measuring assembly	hoses, vials	min. volume ^a [mL]	
Louis I Vagrania 252/450/522	standard, 12 mL	7.5	
Lovis + Xsample 352/452/530	low volume ^b , 12 mL	4.5	
Lovis + DMA M +	standard, 12 mL	9	
Xsample 352/452/530	low volume ^b , 12 mL	5.5	
Lovis + Xsample 52	12 mL	5 ^c	
Lovis + DMA M + Xsample 52	12 mL	7 ^c	
Lovis + Xsample 122/520	12 mL	8	
Lovis - Asample 122/320	50 mL	20	
Lovis + DMA M +	12 mL	10	
Xsample 122/520	50 mL	20	
Lovis + DSA M +	12 mL	12	
Xsample 122/520	50 mL	20	
Louis I Vocanala 22	12 mL	8	
Lovis + Xsample 22	50 mL	20	
Lovis - DMA M - Voemple 22	12 mL	10	
Lovis + DMA M + Xsample 22	50 mL	20	
Lovis + DMA M + Alcolyzer ME +			
HazeQC ME + pH ME +	50 mL	40	
Xsample 122/520 (Analyzing	30 IIIL	40	
system for beer and wort)			
Lovis + DMA M + HazeQC ME +			
Abbemat + pH ME + Xsample 122/ 520	50 mL	40	
Lovis + Xsample 352/452 + Abbemat	low volume ^d , 12 mL	5	
Lovis + DMA M +	1d 40 - 1	7	
Xsample 352/452 + Abbemat	low volume ^d , 12 mL		
Lovis + DMA M +	45 mL (35 pos.)	approx. 15	
Xsample 530 + Abbemat	40 IIIE (00 p03.)	арргох. 15	
Lovis + DMA M + Xsample 352/452 + HazeQC ME	50 mL	32	
Lovis + Xsample 340	5 mL syringe	3.5	
Lovis + DMA M + Xsample 340	5 mL syringe	4.5	

a. Especially with Xsample 22/122/520 the sample volume may be higher to avoid sample carryover. For Xsample 22 additionally the shape of the sample vessel has an influence on the sample volume.

b. Optional. See Chapter 16.2.4. **Xsample 530**: Hose 530x3x2 and hose 600x3x2 can be low volume hoses – never install a low volume hose as needle hose!

c. Depending further on the shape of the sample vessel.

d. This measuring assembly can only be used with low volume hoses.

Appendix B: Wetted Parts

The following materials of Lovis 2000 M/ME and its accessories are in contact with samples, cleaning liquids or cooling liquids under normal operating conditions. If using Lovis 2000 ME combined with a DMA M / DSA M model and with Xsample sample changers, refer to the respective instruction manual for the materials of the density meter/sound velocity analyzer or sample changer.

B.1 Wetted Parts

For detailed information to changes of Lovis 2000 M/ME wetted parts consult the Product Description List supplied on the USB storage device with your Lovis.

Lovis 2000 M/ME and accessories required for operation

Material	Part
Borosilicate glass 3.3	 Measuring capillary glass Glass syringe (250 μL, 10 μL) Waste bottle 1 L - optional item
PVDF (PolyVinyliDeneFluoride)	 Plug (for closing the capillary at the end) Up to 11/2012: Filling and Cleaning Adapter Luer Male Filling Adapter UNF Front Side Inner part of Filling Adapter UNF Back Side Complete (part that sits on the capillary)
PCTFE (PolyChloroTriFluoroEthylene)	 From 11/2012 on: Filling Adapter Luer Female Hollow plug (for closing the capillary at the end - for use with short capillaries, optional for the standard capillaries if better chemical resistance is required) Filling and Cleaning Adapter Luer Male Filling Adapter UNF From 04/2014 on: Capillary 1.62 PCTFE
PTFE (PolyTetraFluoroEthylene)	 Luer plug with and w/o bore (for closing the capillary at the top) Plunger tip and Luer cone of glass syringe
FPM Viton [®] Extreme™ (ETP600-S)	O-rings of filling adapters

Material	Part
Kalrez [®] Spectrum 6375	O-rings of filling adapters - optional items
PEEK (black) (PolyEther Ether Ketone)	Filling Support (for flow-through filling with syringe)
Stainless steel 1.4125 (AISI 440C)	Standard balls
Stainless steel 1.4301 (SS304)	 Hollow needles (Luer lock) for filling and cleaning of short capillaries Ball of seal pin of capillary block heat exchanger ^b Connector nozzles for cooling hoses ^b
Stainless steel 1.4303 (SS304) ^b	Seal pin of capillary block liquid heat exchanger
Gold coating (outer layer, 4 µm) ^a	Gold balls
FEP (Fluorinated Ethylene Propylene)	Hoses for flow-through filling
Tefzel = modified ETFE (Ethylene-TetraFluoroEthylene)	Screw adapters of FEP hoses
"Tynex" Nylon 612, stainless steel	Brush (for cleaning)
Goat hair, stainless steel	Brush (for cleaning) - optional item
PP (PolyPropylene)	Transparent part of Luer syringe
PE (PolyEthylene)	Green plunger of Luer syringe
HDPE (High Density PolyEthylene)	Waste bottle 0.5 L
Stainless steel	Lock device of 10 mL glass syringe
Chrome-plated brass	 Luer lock device of hollow needles Metal parts of 250 µL glass syringe
NBR Perbunan ^b	Standard cooling hoses
EPDM ^b (Ethylene Propylene Diene Monomer rubber)	Seal rings inside the counter cooling system of Lovis capillary block
PVC ^b (PolyVinyl Chloride)	Seal rings of cooling hose connectors
Aluminum ^b	Liquid heat exchanger inside Lovis capillary block

- a. Other ball materials: 3 μm nickel undercoating, stainless steel 1.4125 (AISI 440C) balls
- b. Only applicable for Lovis capillary block with counter cooling option

TIP How to improve the chemical resistance of the Lovis 2000 M/ME:

Refer to Appendix B.3 in the Lovis 2000 M/ME Reference Manual. See also Lovis 2000 M/ME Product Description List.

Accessories required for use with DMA M / DSA M

Material	Part
FEP (Fluorinated Ethylene Propylene)	Hoses for connection to DMA M/DSA M
PTFE (Poly TetraFluoroEthylene)	 Injection adapter UNF 1/4" DSA Injection adapter UNF 1/4" DMA If using the Filling Support: Hose between Filling Support and DMA M/DSA M inlet
Tefzel = modified ETFE (Ethylene-TetraFluoroEthylene)	 Screw adapters of FEP hoses Female Luer to 1/4"-28 UNF Male Adapter

Further accessories required for use with measuring assemblies

Xsample models with and w/o DMA M / DSA M

Material	Part
FEP (Fluorinated Ethylene Propylene)	Hose Liner (inside) of Norprene® Chemical hose – optional item
PTFE (Poly TetraFluoroEthylene)	Hoses Xsample 530
Norprene [®] Chemical	Chemically resistant pump hose for Xsample 520/122/22 (wide range of chemicals) – optional item
Norprene [®] A-60-G	Chemically resistant pump hose for Xsample 520/122/22 (limited range of chemicals) – optional item
Tygon [®] 2375	Hose
Silicone	Hose
Viton® FKM 75	Hose
PCTFE (PolyChloroTriFluoroEthylene)	Adapter UNF/UNF Adapter UNF/Hose (Female/ Male)
Tefzel = modified ETFE (Ethylene-TetraFluoroEthylene)	Adapter UNF/screwed tube
Stainless steel 1.4571 (AISI 316Ti)	Tube d=2.1 D=2.4 L=20
Stainless steel 1.4404 (AISI 316L)	Tube of adapter UNF/screwed tube

Find detailed information on the hoses and adapters for measuring assemblies and how to connect them in the Lovis 2000 Reference Manual, SECTION II: Flow-Through Systems. All items are also listed in the Lovis 2000 M/ME Product Description List (on USB storage device).

B.2 Parts Possibly in Contact with Sample Liquid

This chapter lists parts of Lovis 2000 M/ME which may under certain circumstances (leakage, overfilling of the capillary) also come in contact with sample or solvent. It is to be expected that these parts will become dirty if the instrument is constantly in operation and/or is used in harsh environments. This lists also helps to select a suitable cleaning liquid.

Material	Part
POM-C (black; PolyOxyMethylene)	 Screw Cap Front Side Closed Screw Cap Back Side Closed Screw Cap Front Side Open Outer part (screw cap) of Filling Adapter UNF Back Side Complete Screw Cap Back Side Open (from 11/2012) Funnel for 1.5 mm balls Cover of Lovis capillary block
PA 12 (Vestamid [®] ; Polyamide 12)	Plastic tweezers for balls
PVDF (PolyVinyliDene Fluoride)	Tip of ball dispenser
PEEK (PolyEther Ether Ketone)	 Fixing ring inside Filling Adapter UNF Back Side Complete (up to 11/2012) Twist protection clip (from 12/2013 on) Inserts on end of Lovis capillary block
PEEK (black; PolyEther Ether Ketone)	Filling Support UNF (for flow-through filling with syringe and for filling hoses in combination with some sample changer models; from 11/2012)
Copper	Inside of the Lovis capillary block
Stainless steel 1.4301 (SS304)	Spring of Filling Adapter UNF Back Side Complete (up to 11/2012)
PVC black (PolyVinyl Chloride)	Crush protection on Lovis capillary block; for use with Xsample models

B.3 Improving the Chemical Resistance

If your application requires a better chemical resistance, you can replace the following parts by parts with improved chemical resistance:

O-rings and balls

The Lovis Chemical Resistance Upgrade Set, Mat. No. 101899, contains items which offer the optimum chemical resistance against aggressive substances that can be measured with Lovis 2000 M/ME. Comes with:

- 1 set of balls 1.5 mm 4 µm gold (300 pcs.), Mat. No. 20659
- 4 pcs. O-ring 5x1.5 Kalrez® Spectrum 6375, Mat. No. 101519
- 1 sticker "Made with Kalrez®", Mat. No. 101927

The O-ring 5x1.5 Kalrez® Spectrum 6375 is also available separately per piece, Mat. No. 101519. When ordering the O-rings separately, one sticker "Made with Kalrez®" is included in the delivery.

Replace the Viton® Extreme™ O-rings of the capillary filling adapters by the Kalrez® ones according to Chapter 12.5.

Attach the sticker "Made with Kalrez®" visible on the instrument's casing to avoid that the Kalrez® O-rings are replaced by less resistant O-rings during service or maintenance.

TIP When using the short capillaries for aggressive substances it is not required to change the O-rings as they are not in contact with the sample.

Capillary filling adapters

All capillary filling adapters and the filling and cleaning adapter delivered from 11/2012 are made of PCTFE due to a better chemical compatibility. If you have already the previous version made of PVDF, you can replace them by the new PCTFE adapters. Consult the Product Description List on the USB flash drive supplied with your Lovis.

Capillary plugs

The standard capillary plugs are made of PVDF, they can be replaced by capillary plugs made of PCTFE originally designed for the short capillaries:

- Capillary plug hollow 1.59 (20 pcs.; PCTFE), Mat. No. 108489
- Capillary plug hollow 1.8 (20 pcs.; PCTFE), Mat. No. 108490
- Capillary plug hollow 2.5 (20 pcs.; PCTFE), Mat. No. 108491

Consult the Product Description List on the USB flash drive supplied with your Lovis.

Manual flow-through filling

For filling chemically aggressive substances that attack the disposable plastic syringes, a precision glass/PTFE syringe 10 mL Luer Lock, Mat. No. 109045, is available (syringe barrel: Borosilicate glass 3.3; plunger tip and Luer cone: PTFE; lock device: stainless steel).

It requires the filling support with UNF thread and an adapter Luer/UNF (Mat. No. 64792, supplied with the standard delivery) screwed into the support.

Note: If your instrument is not equipped with the filling support UNF, contact your local Anton Paar representative.

To collect chemically aggressive sample and solvent liquids, a waste bottle made of Borosilicate glass 3.3 is available.

Waste bottle glass 1 L, Mat. No. 101655, with protective netting and insert with three 1/4"-28 UNF threads to connect hoses.

Refer to Chapter 17.5.2.

Hoses for flow-through filling with Xsample 520/122/22

These kits are designed for use with Xsample 520/122/22 sample changer.

- Hose set Lovis + XS 122/520 Polymer, Mat. No. 143728
- Retrofit kit for Xsample 22 Chemical, Mat. No. 96879

Consult the Product Description List on the USB flash drive supplied with your Lovis. In case of further questions contact your local Anton Paar representative.

For retrofitting your measuring assembly with these hoses, refer to the instruction manual of your Xsample model and to the following sections in this manual:

For Lovis + Xsample 122/520: Chapter 18.3.3

For Lovis + Xsample 22: Chapter 18.4.3

For Lovis + DMA M/DSA M + Xsample 122/520: Chapter 19.3.3

For Lovis + DMA M/DSA M + Xsample 22: Chapter 19.4.3

B.4 Overview Chemical Compatibility

The resistance table on the following pages has been generated from various charts from different manufacturers and distributors. Some data are based on testing and experience. Where no temperature is given, the chemical resistance is related to ambient temperature.

This information should be used as a guideline but not as a guarantee of chemical resistance. In certain cases, e.g. when using solvent mixtures, we strongly recommend to carry out tests under your conditions (temperature, concentration, duration of contact) before starting measurements.

	Wette	d parts	5						
A Excellent B Good, minor effect C Fair, needs further tests D Unsuitable	Borosilicate glass 3.3	Stainless steel A4; 1.4125	Gold	PVDF (Polyvinylidene fluoride)	Viton® 981 Extreme (ETP 600S)	ETFE (Tefzel)	PE (Polyethylene)	PP (Polypropylene)	Kalrez 6375 *
Water	Α	Α	Α	Α	Α	Α	Α	Α	Α
Aceonitrile	Α		Α	Α	В	Α			Α
Cresols (o-, m-, p- methylphenols)	Α		Α		Α	Α		B/C	Α
Ethanol	Α	Α	Α	Α	Α	Α	Α	Α	Α
Methanol	Α	Α	Α	В	Α	Α	Α	С	Α
Acetone	Α	Α	Α	С	В	Α	Α	С	Α
Dichloromethane	Α	В	Α	В	A	-	В	C	Α
Dichlorophenole (2-Chloroph., OCP)	A		Α		Α	Α			Α
Sulfuric acid	A	C-D	Α	Α	Α	Α	В	Α	Α
Formic acid	A	В	A	A	C	A	A	A	A
Phenol	A	В	Α	A	A	Α	A	C	A
Tetrachloroethane	A	В	Α		Α	Α	В	C	A
Dichloroacetic acid	A	В	A		C	A	A		A
Dimethylamine	A	A	A		В	A	^	B/C	A
Chloroform	A	D	A	Α	A	A	D	D D	A
	A	A	A	A	A	A	U	C/D	A
Decahydronaphtalene (Decalin)				В					
Toluene	A	A C	A	В	A	Α	В	D	A
Cyclohexanone	A		A	C	С	A	A	D	A
Tetrahydrofuran (THF)	A	A	A	B/C	С	В	В	С	A
Methyl ethyl ketone (M⊟K)	A	В	Α	D	В	Α	A	С	A
Solvent naphtha	A	В	Α	A	Α	Α	A	С	A
n-Hexane	Α	A	Α	Α	Α	Α	Α	В	Α
Glycol	Α	В	Α	Α	Α	Α	Α	С	Α
Propanole (1-Propanole, n-Propanole)	Α	Α	Α	Α	Α	Α	Α	Α	Α
2-Propanole (Isopropyl alcohol, IPA)	Α	Α	Α	Α	Α	Α	В	Α	Α
Personal notes:									
* optional O-rings for the filling adapters									

		ssorie M/DSA						-	-	conta	ct with	1
	DIVIA	M/DSA	ıvı and	ASam	pie	H	samp	le liqu	iia			
A Excellent B Good, minor effect C Fair, needs further tests D Unsuitable	FEP (Fluorinated Ethylene Propylene)	PTFE (Teflon)	Silicone	. Tygon® 2375	. Viton® FKM 75		POM-C (Polyoxymethylene copolymer)	. Vestamid® (Polyamide 12; PA 12)	. Nylon (Polyamide 6.6, PA 6.6)	. Stainless steel 1.4310	PEEK (Polyether ether ketone)	Copper
Water	A	A	Α	A	A		Α	Α	Α	A	A	В
Acetonitrile Cresols	A	A A		Α	D A			C-D	C-D	Α	A A-B	Α
Ethanol	A	A	В	С	A	.00000	Α	D	A	Α	A-B A	A A
Methanol	A	A	A	A	A		A	D	C	A	A	В
Acetone	A	A	D	D	D		A	A	A	A	A	A
Dichloromethane	A	A	D	D	B/C				C		A	
Dichlorophenole (2-Chloroph., OCP)	A	A	<u> </u>	<u> </u>	В				0			
Sulfuric acid	Α	Α	D	D	A		D	D	D		D	D
Formic acid	Α	Α	D	В	D	.00000	D	C	D	B/C	A/B	C
Phenol	Α	Α	D	B/C	Α		D		D	С	Α	D
Tetrachloroethane	Α	Α	D		В	.00000			С			Α
Dichloroacetic acid	Α	Α	D		D			300000000000000000000000000000000000000				
Amines	Α	Α										
Decahydronaphtalene (Decalin)	Α	Α				.00000		Α	Α	Α		Α
Chloroform	Α	Α	D	В	A/B	00000	Α	D	D	D	Α	Α
Toluene	Α	Α	D	D	Α	00000		В	Α	Α	Α	Α
Cyclohexanone	Α	Α	D	D	D		Α		Α		Α	В
Tetrahydrofuran (THF)	В	В	D		D				Α		Α	
Methyl ethyl ketone (MEK)	Α	Α	D	D	D			В	В		B/C	Α
Solvent Naphtha	Α	Α	C/D	С	Α				Α		Α	Α
n-Hexane	Α	Α	В	В	Α		Α	Α	Α	Α	Α	Α
Glycol	Α	Α	Α		Α				С		Α	
Propanole (1-Propanole, n-Propanole)	Α	Α	Α								Α	
2-Propanole (Isopropyl alcohol, IPA)	Α	Α	С	Α	Α				С		Α	В
Personal notes:												

B.5 Chemical Compatibility PCTFE

As the 1.62 capillaries and adapters are made of PCTFE, an extra list is provided.

_				10 10		
A Resistant B Conditionally resistant, may need tests C Unsuitable	concentration [%]	temperature [°C]	resistance	concentration [%]	temperature [°C]	> resistance
Acetic acid	50	15 - 100	Α	pure	25 - 100	Α
Acetone	pure	15 - 30	Α	pure	60	В
Acetonitrile			Α			
Amines			A-B			
Aqua regia	pure	15 - 100	Α			
Benzene		15 - 30	Α		100	С
		60	В			
Benzoic acid	pure	15 - 90	Α			
Brines			Α			
Buyl acetat			Α			
Butyl alcohol (Butanol)		15 - 90	Α			
Caustic potash (Lime potash) solution	10	15 - 80	Α	50	15 - 100	Α
Caustic soda (Sodium hydroxide)	10	15 - 100	Α	50	15 - 100	Α
Chloro benzene	pure	15 - 60	В		100	С
Chloroform	<u> </u>		Α			
Chromic acid	< 50		Α	> 50		Α
Cresols (o-, m-, p- methylphenols)	pure	25	Α			
Cyclohexanone	'		Α			
Decahydronaphthalene (Decalin)			Α			
Dichloroacetic acid			Α			
Dichloromethane			В			
Dichlorophenole (2-Chloroph., OCP)			A			
Diethyl ether		15 - 30	В		60	С
Diesel fuel			Α			
Ethyl acetat		15 - 30	В		60	С
Ethyl alcohol (Ethanol)	pure	25 - 100	Α			
Ethylene glycol	'	15 - 100	Α			
Fluorine		15 - 30	С			
Formic acid	37	25 - 100	Α	pure	15 - 100	Α
Gasoline, unleaded		15 - 30	Α	'	60	В
Glycerine	all	15 - 100	Α			
Glycol			Α			
Heptane			Α			
Hexane			В			
Hydrochloric acid	30	15 - 100	A	37	20 - 100	Α
. , , a	+	10 100		<u> </u>	20 .00	- ' '
Personal notes:						

			***************************************	10 000000000000000000000000000000000000		

A Resistant B Conditionally resistant, may need tests C Unsuitable	concentration [%]	temperature [°C]	resistance	concentration [%]	temperature [°C]	resistance
Hydrofluoric Acid (HF)	50	15 - 100	Α			
Hydrofluoric Acid (HF), anhydrous		15 - 100	Α			
Isopropyl alcohol (IPA, 2-Propanole)	all	15 - 90	A			
Kerosene			В			
Methyl alcohol (Methanol)	pure	15 - 50	Α	pure	100	В
Methylethylketone (MEK)			Α			
Nitric acid	30	15 - 100	Α	53	25 - 100	Α
	96	15 - 100	Α			
Oil of turpentine, turpentine oil		15 - 60	Α		100	В
Oleum (35:65 % H2SO4+SO3)	pure	15 - 30, 50	Α			
Oleum (80:20 % H2SO4+SO3)	pure	15 - 30, 70	Α			
Organic carbonates with	<u> </u>					
lithiumhexafluoro phosphate		-20 - 60	Α			
Phenol	5	15 - 100	A	nuro	15-70	Α
	30	25 - 100	A	pure 85	25-100	
Phosphoric acid				00	25-100	Α
	pure	25 - 100	A			
Salicylic acid	satur. sol.	15 - 100	Α			
Sea w ater			Α			
Silicone fluid			Α			
Sodium chloride	10	15 - 100	Α			
Sodium hypochlorite	satur. sol.	15 - 60	Α			
Solvent naphtha			Α			
w ith dioxolane and Li-sulphur-		-20 - 60	Α			
with Mg-compounds		-20 - 60	Α			
Sulfuric acid	30	15 - 80	Α	50	15-100	Α
	96	15 - 100	Α			
Tetrachloroethane			A-B			
Tetrachloromethane		15 - 30	В		60	С
Tetrahydrofuran (THF)		10 00	В		- 00	
Toluene		15 - 30	В		60	В
Trichloroacetic acid	nuro	15 - 100	A		00	<u> </u>
Trichloro ethylene	pure	15 - 100	C		60	С
					60	C
Water		15 - 100	A			
Xylene			В			
Personal notes:						
		***************************************	***************************************			
	L					

B.6 Chemical Compatibility Borosilicate Glass

Several capillaries are made of borosilicate glass 3.3. This glass fulfills the following specifications:

- Hydrolytic class 1 (DIN 12111, ISO 719)
- Acid resistance, class 1 (DIN 12116)
- Alkali resistance, class 2 (DIN 52322, ISO 695)

Borosilicate glass 3.3 is affected by:

- · Hydrofluoric acid
- Hot phosphoric acid
- Strong alkaline solutions at elevated temperatures
- · Potassium hydroxide (caustic potash).

Appendix C: Menu Tree

The menu tree shows the default configuration for Lovis 2000 M/ME. Depending on the master instrument or the module a Lovis 2000 ME is combined with, additional menu items are available. In that case, refer to the instruction manual of the respective instrument.

Menu items marked as " * ": see also General Software Functions Manual.

Administrator	The
Administrator, Manager	are
Administrator, Manager, Operator	adr

The colors show which parts of the menu are accessible for users with administrator, manager or operator rights.

Tap <Menu> (numbers in the description of a menu item refer to the respective chapter in the manual, "RM" means: only in the Lovis Reference Manual):

Checks/ Adjustments	Checks	Water Check (default)	Select and perform a chec user-defined custom chec	k measurement (default or k if any); 8.2, RM					
	Other Adjustments	Lovis Module	Level Adjustment	8.3					
			Standard Adjustment	of capillaries; fixed angle range: 20° to 70°; 8.4					
			Extended Adjustment	of capillaries, user-def. angle range between 15° and 75°; 8.4					
			Single Point Adjustment	of capillaries, at one user-defined angle); 8.4					
			Temperature Adjustment	Manual input of values; 8.5.1, RM					
			Temperature Adjustment with MKT	Data communication with MKT via Ethernet; 8.5.2, RM					
			Reset to Temp. Factory Adjustment						
		DCB Module	Atmospheric Press. Sensor Adjustment	Not relevant for Lovis M/ME					
Data Memory	Measured Data*	Select (filter), print / expor	t measured data; 10.4 and 0	Gen. SW Functions Manual					
	Delete Measured Data*	Select (filter) and delete measured data; Gen. SW Functions Manual							
	Statistic*	, ,	urements and view, print or e Gen. SW Functions Manual	or export their statistic data nual					
	Check Data*	View, print or export data	of check measurements; 8.2	.3, RM					
	Delete Check Data*	Select (filter) and delete c	heck data; Gen. SW Functio	ns Manual					
	Adjustment Data	Lovis Module	Capillary Adjustment						
			Temperature	View, print or export adjustment data;					
			Adjustment	8.6, RM					
			Level Adjustment						
		DCB Modulo	Distance Adjustment	[
		DCB Module Print or Export		of Lovis 2000 M/ME or of ument, print or export them					
	Audit Trail*		l udit trail (protocol of log on/lo						
	Delete Audit Trail*	password changes, electronic signature); General Software Functions Manual							
	Doioto / taait Trail	General Software Functions Manual							

Lovis Utilities	Initialization	Initializes Lovis 2000 ME. Moves the Lovis capillary block into the default position (-45° for manually filled system, +20° for flow-through system).
Fan Service Start/Stop the Capillary b.		Start/Stop the Capillary block fan

Mothodo		Lovio standard	Activate Madules /	Activate year functions
Methods	Method Settings ^a	Lovis standard	Activate Modules / Constants*	Activate user functions of type "Constant" (if
		(Current Method) ^b	Constants"	any) and / or modules
			Measurement Mode (S)	Select a meas. mode, set its parameters; 7.2.3
			Repeated Mode Settings	Set parameters for Lovis repeat dev. (max. no. of determinations, saved determinations and max. repeat value); 7.2.3
			Lovis Module	Temperature Settings (Set temperature and temp. equilibration time); 7.2.5.1, RM
				Measuring Settings (Meas. cycles, angle, distance, variation coeff.); 7.2.5.2, RM
				Advanced Settings (max. no. of meas. cycles, threshold values for auto angle / auto meas. distance setting, measuring timeout for long dist.); 7.2.5.3, RM
				Density Settings ^c Use density meas. values or manual input; 7.2.5.4, RM
				Beer/Wort Setting (for brewing applic.); 7.2.5.5, RM
				Polymer Settings (for polymer applic.); 7.2.5.6, RM
				Molar Mass Calculation Settings (for polymer applic.); 7.2.5.7, RM
			Display Layout*	Set no./ size of output fields on the screen
\	\	\	Result Output*	Select the output quantities, their units, their order and the significant digits

- a. Other methods than the factory predefined ones shown here can be created by the user.
- b. This is the factory default setting. All method settings are available for each method.
- c. Available only in combination with DMA M/DSA M.

\	\	Lovis standard (Current Method)	Limits* Formula Parameters Quick Settings Management*	Select a quantity and assign limit values Set density; 7.2.4 Sort/add/delete items in the Quick Settings list; Gen. SW Funct. Manual
Methods	Method Settings ^a	Lovis detailed		
		Lovis / DMA	Available only in combinat	ion with DMA M/DSA M
		Lovis Polymer (Single	Method for polymer applic	ations
		Conc.)		
		Lovis Polymer	Method for polymer applic	ations
		(Multi Conc.)		
	Method Management	Copy/Rename/Delete met	e/Delete methods. Delete/Rename not allowed for current method ethods can be selected for measurement (button <method>) or for eting (in Method Management). The current method cannot be e. Arrange in which order methods shall be displayed</method>	
	Method Visibility*	renaming/deleting (in Metl		

a. Other methods than the factory predefined ones can be created by the user. The submenu items explained for method "Lovis standard" are also available for all other methods

		1	1	
Setup	Measuring System	Lovis Module	Capillary	Add, delete, edit
	Settings		Administration	capillaries
				For each capillary,
				set the
				Capillary Filling Mode ^a :
				Manually or flow-through
				7.1.1
			Capillary Settings	Enable/disable:
				 Automatic capillary
				detection
				- Audio signal every time
				the ball passes a coil 7.1.2
			Viscosity Standards	Add/edit/delete ref. std.
			Management	liquids and their data. To
				be used for calibrations and adjustments; 7.1.3
				•
			Polymer Solvents	Store measurement data
			Administration	of polymer solvents for
				later use; 7.1.4, RM
		Sample List*	Sample List / Sample	Enable/Disable sample
			Settings	list, set an automatic
				sample name with prefix/
				postfix, Preview
			User-defined Data	Enable/Disable fields,
			Fields	Name fields
			Sample List	Enable/Disable: Stop
			Warnings	processing if check fails
			go	(available only if using an
				Xsample model)
				Warning if list contains:
				- Sample without name,
				- Methods with different
▼				meas. temperatures
▼			Mandatory Data	Set which data fields
			Fields	require mandatory input
•		1		ı

a. This option is not available if an Xsample module is active (operation with Xsample always uses flow-through filling)



Measuring System Settings Air Pump*

Temperature Extrapolation Settings* Enable/disable automatic stop: Either if the density value is stable (only in combination with a DMA M/DSA M) or after a set time; set run time

Set temperature values and units (°C / °F) to which measuring values can be extrapolated.

Control Panel*	Date and Time	Set date and time
Control 1 and	Regional Settings	Select language, data format and keyboard layout
	Time Server Settings	Enable / disable use of time server; name time server and select time zone
	Input Units	Select between °C / °F / K for temperature input
	Printer Management	Select, edit or add printers, PDF File Printer = default
	Network	Enter IP address, subnet mask, default gateway, primary and secondary DNS
	Instrument Name and Location	
	Screen Saver	Enable/disable and set the activation time
	Sound Settings	Select when audio signal (beep) should be emitted: When measurement is finished or when touching a screen item or key
	VNC Settings	Enable/disable operation via LAN by external PC and virtual network client software "AP Instrument Viewer"
	Calibrate Touch Screen	
	Calibrate External Touch Screen	
	Keyboard and Bar Code Settings	Enable/disable bar code reader
	FTP Settings	Set Name, Path, User Name, Password for storing data to a network instead of to USB storage device
	SMTP Server Settings	Set Host, Port, User Name, Password and address for e-mail notification; test the settings
	Display Brightness	Set the display backlight brightness (20 % to 100 %)
	Reboot Options	Enable / disable: Automatic reboot on crash and automatic saving of log file on reboot
System Security*	Security Level	Low or 21 CFR Part 11, view details for each setting
- C,	Non Storage Mode	Enable / disable the Non Storage Mode (which allows operation in compliance with US Pharmacopeia 1058 CAT-B.
	Value Visibility	Select when to show measuring values and whether to show temperature values separately
	Audit Trail	Enable/disable function and reminder for backup file, set a number of days
	Electronic Signature	Enable/disable electronic signature and password
	Logon Settings	Enable/disable and set a value for: Auto-Logoff (1 to 60 min) Password expiry time (1 to 365 days)
		Minimum password length (6 to 30 characters)
	Increased Security	Enable/disable; view details
	Advanced Security	Enable/disable the following options: Advanced Data Integrity (deleting not allowed, archieve instead) Use of USB storage devices Service logon only with customer password
	Unlock Service	Enter an unlock code to access the instrument's service level (renouncing Anton Paar warranty) and enter a customer service password.

Setup

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	User Management*	User Administration	Administrator: Add/edit/delete users, change passwords, activate user accounts and auto logon. Define E-mail settings
▼			Manager: Change manager password
			Operator: Change operator password
		User Group Administration	Overview and export of user groups and their access rights for all instrument functions. Create / customize user groups and their access rights. Delete customized user groups.
	Printout Settings*	Automatic Printout	Activate automatic printout, set printout for subsamples
		Report Management	Edit report format, set the default report
		Select Logos	Report logo – select from list
			Report background – select from list
		Import Logos	Import logos from external source
Setup		Name and Address	Enter report heading - max. 50 characters per field
	Data Browser Settings*	Add, sort, delete quantities	s to be viewed in the data browser
	Expert Settings*	User Functions Management	Create, edit, delete user functions, e.g. calculations
		Delete User Function	
		Calculator	Select functions and units to verify; manual input or data diagram
		Group Calculator	Calculate instrument related quantities.
		Check Management	Water Check; edit checks / create new checks (custom type) / delete custom type checks
		Data Memory Settings	Enable/disable: Automatically delete old measurement data and/or old check data

Service	Backup Instrument Settings*	Save settings file (.abf) to USB storage device – file name: max. 50 characters; select data to be stored: Global Settings (incl. data from Viscosity Standard Management), Method Settings, User Functions, Users, Adjustments		
	Restore Instrument Settings*	Read settings file (.abf) from USB storage device		
	Update*	System Update Read file from USB storage device (.aup file)		
		Module Firmware Update	Read file from USB storage device (.afp file)	
		Install Language Pack	Read file from USB storage device (.alp file)	
		Logging Configuration	For service purposes only (.alc file)	
	System Information *	Shows all versions of hard serial numbers. Save an ir	lware, module firmware and instrument software and instrument Logfile here.	
	IQ/OQ Report*	Print or export an IQ/OQ F	Report	
	Export Instrument Data*	Export measured data, last adjustments and system information to USB st device in form of an Excel workbook Save all capillary configurations and corresponding adjustment data to US storage device		
	Export all capillary configurations			
	Lovis Usage History	View operating hours, no.	of shake test cycles and no. of measurement cycles	
	Full System Backup*		he entire system to USB storage device or with General Software Functions Manual	
	Full System Restore*	1	f available full system backup package (via USB or General Software Functions Manual	
	Live Raw Data*	Lovis		
		Calculations	View list of calculations of available output quantities	
		DCB - Air Pump	View status of air pump (0 or 1)	
		DCB - Air Pressure	View pressure and status of air pressure sensor. Not relevant for Lovis 2000 M/ME.	
		DCB - Environment	View heatsink temp. and temp. inside instrument	
	Reset to Factory Settings*	Reset the instrument to factory settings. Note! Carefully read the warning message displayed by the instrument. It tells you which data you loose actually reset. The instrument reboots.		

Appendix D: Lovis Parameters

D.1 Output Data Groups

Output data of the Lovis 2000 M/ME are divided into groups:

- System contains system relevant information.
- Lovis contains Lovis specific quantities such as dynamic viscosity.
- Lovis Polymer contains result parameters for testing polymer solutions.
- Depending on the measuring assembly further groups are available, e.g. for Density, API Functions or Sampling Unit. Refer to the manuals of the respective instruments or modules.

Parameters of data group "System"

Line Break – This option help to format data when printing or exporting them (available only for submenu Result Output of the Method Settings).

DataField1/2/3 – free data fields, can be user defined (see Appendix C / Setup or General Software Functions Manual)

Date – current date (see Appendix C or General Software Functions Manual)

Last Check Date – see Chapter 8.2 a

Last Check Name – see Chapter 8.2 a

Last Check Result – see Chapter 8.2 a

Last Check Type – see Chapter 8.2 a

Last Check User – see Chapter 8.2 a

Master Condition – shows the condition that has got the highest priority of all available state conditions of the system's measuring modules (valid / error state); i.e. the master condition is only valid if all available module conditions are valid.

Measurement Mode – see Chapter 7.2.3

Method – see Chapter 7.2

Parent Sample Id – sample ID of the parent sample, used with measurement modes that perform multiple measurements with the same sample.

Sample Error State – see Chapter 10.3

Sample Info – information on measurement mode, parent sample ID and sub measurement number.

Sample List Number – number of the current sample list entry (see General Software Functions Manual)

Sample Name – sample name entered by the user

Serial Number - instrument serial number

Sub Measurement Number – sub no. of a determination, used with meas. modes that perform multiple measurements with the same sample

Time – current time see Appendix C or General Software Functions Manual

Unique Sample ID – internal unique sample ID that can not be reset

User – current user (see General Software Functions Manual)

a. This parameter is available only for display on the main screen. You cannot select it in the Result Output (when configuring data for printing/export).

Parameters of data group "Lovis"

Ball Density – density of currently used ball (as defined for selected capillary/ball configuration)

K1 Long – adjustment constant for manual viscosity calculation compatible to AMVn (for long measuring distance)

K1 Short – adjustment constant for manual viscosity calculation compatible to AMVn (for short measuring distance)

Lovis Angle - set measuring angle

Lovis Average Runtime – average runtime of one measurement

Lovis Beer/Wort Extract – specific value for beer measurement (see Chapter 7.2.5.5)

Lovis Capillary Info – shows current angle of Lovis capillary block, name and serial no. of selected capillary and the capillary status (inside/outside)

Lovis Condition – see Chapter 10.3.1

Lovis Corr. Viscosity 12 % – specific value for beer measurement ^a

Lovis Corr. Viscosity 8.6 % – specific value for beer measurement ^a

Lovis Density - manually entered sample density value

Lovis Dyn. Viscosity

Lovis Fw/Bw Deviation – runtime deviation between forth and back run

Lovis Heatsink Temperature – actual temperature inside the Lovis capillary block

Lovis Kin. Viscosity - kinematic viscosity

Lovis Meas. Distance – used measuring distance

Lovis Repeat Deviation – relative deviation of viscosity determinations within a "Repeated Mode" measurement

Lovis Set Temperature – set measuring temperature

Lovis Shear Rate

Lovis Temperature – current measuring temperature

Lovis Variation Coefficient – see Chapter 7.2.5.2

Lovis Viscosity (%SWE) – sea water equivalent; specific value for testing brine solutions

 The viscosity of wort is commonly converted to a specific extract content (8.6 % or 12 %Plato) for a better comparability.

As the viscosities are not proportional to a dilution but follow a hyperbolic function, the viscosities are converted applying a trigonometrical function developed by Zuercher (MEBAK 3.1.4.4).

Parameters of data group "Lovis Polymer"

These parameters are calculated result values for polymer applications.

Find the equations for some of these parameters in the Short Instruction on Polymer Measurements (Doc. No. C72IB012EN, supplied on the USB storage device).

Inherent Viscosity
Intrinsic Viscosity (Billmeyer)
Intrinsic Viscosity (Deb-Chatterjee)
Intrinsic Viscosity (Huggins)
Intrinsic Viscosity (Kraemer)
Intrinsic Viscosity (Maron)
Intrinsic Viscosity (Martin)
Intrinsic Viscosity (Schulz-Blaschke)
Intrinsic Viscosity (Solomon-Ciuta)
K-Value
Mark-Houwink Exponent (a)
Mark-Houwink Factor (K)
Molar Mass (Billmeyer)
Molar Mass (Deb-Chatterjee)
Molar Mass (Huggins)
Molar Mass (Kraemer)
Molar Mass (Maron)
Molar Mass (Martin)
Molar Mass (Schulz-Blaschke)
Molar Mass (Solomon-Ciuta)
Polymer Concentration (m/m)
Polymer Concentration (m/v)
R ² (Zero Shear Relative Viscosity)
Reduced Viscosity
Relative Viscosity
Specific Viscosity
Zero Conc. Relative Viscosity
Zero Shear Viscosity – This output parameter is not only applicable for polymer applications, but also if performing a ZSS (Zero Shear Scan).

C72IB002EN-V 420

See Chapter 7.2.3.

D.2 Lovis Quick Settings Parameters

The quick settings parameters set by default are:

- Sample name the user can enter a sample name
- Measurement Mode see Chapter 7.2.3
- Lovis Density see Chapter 10.1 and Chapter 7.2.4
- Lovis Density TS/TTS see Chapter 10.1 and Chapter 7.2.4
- Lovis Capillary see Chapter 7.1.1

Optionally, the following Lovis parameters can be added to the quick settings. How to add or remove parameters to/from the quick settings is described in the General Software Functions Manual.

Parameter Type	Parameter Select	Description
Temperature		To set the measuring temperature. Enter a value in the range from -30.00 °C to 100.00 °C.
Temperature Equilibration		To set a temperature equilibration time before starting with the measurement. Enter a value in the range from 0 s to 999 s.
Use Manual Angle		To apply an entered measuring angle.
Angle		To define the measuring angle. Enter a value in the range from 15° to 80°.
Measurement Cycles		To define the amount of measurement cycles. Enter a value between 1 and 10.
Use Variation Coefficient		To apply an entered variation coefficient.
Variation Coefficient		To define the variation coefficient. Enter a value in the range from 0.1 % to 9.99 %.
Measuring Distance	Long	To measure with a distance of 100 mm.
	Short	To measure with a distance of 25 mm.
	Automatic	To automatically choose the optimum measuring distance.
Max. Measuring Cycles		To define the maximum value of measuring cycles. Enter a value between 4 and 20.

Measuring Timeout		To set a time limit within which the ball must have passed all three coils of the Lovis capillary block during a run. If this criterion is not fulfilled, you get an error message. Enter a value in the range from 60 s to 1700 s.
Auto-distance threshold		To set the runtime for automatically using the short measuring distance. Enter a value in the range from 20 s to 1700 s.
Auto-angle threshold	Always active	To set the runtime for automatically using a flatter measuring angle. Enter a value in the range from 10 s to 60 s.
Lovis Density Source	Lovis Density (manual input), DMA Density, API Density or user function	see Chapter 7.2.5.4
User Function		Select a previously defined user function
Extract Source	Manual input or Approximate Apparent Extract	see Chapter 7.2.5.5
Angle Count (for Zero Shear Scan)		see Chapter 7.2.5.6

Appendix E: Measuring under Special Conditions

E.1 Measuring Highly Viscous Samples

Filling Lovis capillaries free of bubbles is more difficult if the sample liquid is highly viscous. This chapter informs on how to fill such sample liquids.

- For Lovis 2000 M/ME liquids with a viscosity of 500 mPa.s at room temperature can be classified as highly viscous.
- Further, instructions in this chapter may be helpful if a liquid's viscosity is near the upper limit of the used measuring capillary. For example, you use a capillary 1.59 with a steel ball. The extended measuring range for this configuration is from 0.3 mPa.s to 90 mPa.s. The closer the sample's viscosity is to 90 mPa.s, the more useful the hints in this chapter will be.

Prewarm the sample liquid and equipment:

Prewarm samples that are highly viscous at room temperature to e.g. 40 °C or 60 °C (104 °F or 140 °F) – the required temperature depends on their viscosity.

The effect is better still if you also prewarm the capillary and the filling equipment (e.g. syringe, filling adapter, hollow needle...) in a lab oven.

Filling hints for standard capillaries:

Refer to Chapter 9.2 for a detailed description of single steps.

- First fill the syringe and make sure it is bubble-free. Then fill the capillary from below.
- Do not use the Filling and Cleaning Adapter Luer Male. Narrow passages enhance formation of bubbles.
- Pull the plunger out slowly and smoothly to fill the syringe. Fast and jerky
 movement enhance formation of bubbles.
- To remove big bubbles from the syringe, hold it upside down, wait till the bubbles reach the tip and push the plunger a little upwards.
- To remove very small bubbles, place the syringe with the plunger downwards e.g. into a beaker. Wait some minutes until the bubbles move upwards to the tip. Put the filled syringe in the beaker into an oven and warm the sample liquid (e.g. 40 °C or 60 °C/104 °F or 140 °F). Bubbles will raise faster and more easily.

Hold the capillary with the Filling Adapter UNF downwards, plug the syringe
into the adapter and carefully insert fill the sample from below. Push the
plunger smoothly and slowly. Check for bubbles, wipe the end of the capillary
and insert the ball. Then plug the capillary. Turn it round again, remove the
syringe and close the Filling Adapter UNF with a Luer plug.

Filling hints for short capillaries:

Refer to Chapter 9.3 for a detailed description of all steps. Hints for filling highly viscous samples are already included in this chapter. In addition, warming the sample liquid helps to remove air bubbles:

Before inserting the ball into the filled short capillary, put the capillary into a vessel (open end up) and put it into an oven. Warm the sample liquid (e.g. 40 °C or 60 °C/104 °F or 140 °F). Bubbles will raise faster and more easily.

E.2 Measuring Volatile Samples

- Very low viscous substances are usually volatile or contain volatile components.
- To prevent these components escaping, open the sample bottle and fill the syringe just before starting the measurement. Close the sample bottle immediately after taking the test specimen.
- For bottles with a membrane seal, use clean hollow needles to penetrate the
 membrane of the bottle. Stick one hollow needle through the membrane for
 pressure compensation to avoid gassing due to underpressure. Fix a second
 hollow needle on the syringe, penetrate the membrane in a second place
 and fill the syringe.
- After filling the capillary with a volatile sample, plug it as fast as possible.

If plastic syringes move jerkily with your sample (the plunger does not glide smoothly), use glass syringes instead. With very low viscous samples, a glass plunger moves more smoothly than a plastic one.

If using flow-through filling, measure the sample under counter pressure with the Pressurized Bottle.

Find glass syringes and the Pressurized Bottle in the Lovis 2000 M/ME Product Description List (section "Optional Accessories").

The Lovis 2000 M/ME Product Description List and a Short Instruction for the Pressurized Bottle (Doc. No. C72IB008EN-A) come on the USB storage device supplied with Lovis 2000 M/ME.

E.3 Measuring at High Humidity/Low Temperature Conditions

If the ambient air contains humidity and the measuring temperature is lower than the ambient temperature, condensation could occur in the capillary when blowing through air for drying. Consequently, the capillary is not really dry. The humidity gets mixed with the filled sample and causes faulty measurement results.

The higher the difference between the set measuring temperature and ambient temperature and the higher the air humidity, the easier condensation occurs.

To prevent condensation in the capillary

Use a drying cartridge (Mat. No. 65085) and connect it to the "DRY AIR IN AIR PUMP" connector at the rear of the instrument. The drying cartridge comes with all hoses required for connection.

- 1. First, connect the hose 2.5x4 PUR transparent to the drying cartridge.
- 2. Next, plug the hose connector to the transparent hose.
- 3. Then connect the hose 4x6 PUR black to the nozzle on the rear of the master instrument.

NOTICE

- Never connect hoses containing liquids or moist gases to the "DRY AIR IN AIR PUMP" connector as this may lead to condensations in the air pump and consequently damage the pump.
- Operate the "DRY AIR IN AIR PUMP" connector only at ambient pressure.

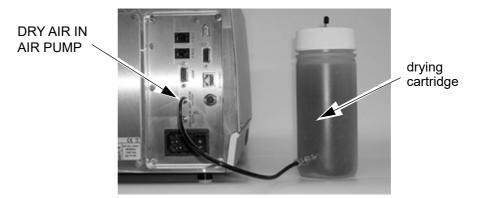


Fig. E - 1 Drying cartridge connected

For a measuring temperature of 20 °C, a drying cartridge should be used under the following conditions (see table):

Ambient temperature	Relative air humidity (r. h.)
20 °C	> 70 %
25 °C	> 50 %
30 °C	> 38 %

TIP Find more information on special equipment that helps prevent condensation in Chapter 23.

To regenerate moist ruby gel / indicator gel

The drying cartridge contains beaded ruby gel, a non-toxic drying agent, or a beaded indicator gel.

Color changes:

Ruby gel: When active, the color of the drying agent is red. Ruby gel which has absorbed liquid turns orange.

Indicator gel: When active, the color of the drying agent is orange. If the drying agent has absorbed liquid, the color turns green.

Moist drying agent can be regenerated: Pour it into a glass bowl and blow hot, dry air (max. 130 °C / 266 °F) through it for approx. 5 hours or place it in a laboratory oven for a few hours (or overnight) until it is red respectively orange again.

NOTICE

Do not use higher drying temperatures than 130 °C (266 °F). Otherwise the indicator function of the gel is spoiled.

E.4 Measuring in Harsh Environments

- Use the keys below the touch screen for operating the buttons in the lower area of the screen.
- Use a stylus or any convenient plastic stick with a soft and round ending to operate the touch screen.
- Use a PC mouse.

Protection foil for touch screen

Your Lovis 2000 M is delivered with a transparent plastic protection foil covering the touch screen. Three spare protection foils can be ordered (Mat. No. 81402).

If the touch screen has become dirty, you can exchange the used protection foil against a new one.

To exchange the protection foil of the touch screen

- 1. Remove the used protection foil from the display using your finger nails.
- 2. Hold the new foil in one hand and use the thumb finger nail of the other hand to peel off the back liner from a small area.
- 3. Position the back liner free end of the foil on one edge of the display, hold the opposite end and bend the foil backwards.
- 4. Peel off the back liner with one hand, simultaneously rolling the foil slowly onto the display with the other hand.
- 5. Carefully flatten out the foil with a clean cotton cloth, pushing bubbles towards the edges.

In case of bubbles between foil and display, gently push them towards the edges or lift up the foil partly or completely and reapply the foil more slowly.

Protective cover for keyboard (Mat. No. 13350)

If you use an optional external keyboard (Mat. No. 80807 or 80809), attach this cover to prevent getting dust, dirt or spills into your keyboard. See also the product description list (PDL) supplied on the USB flash drive.

Protective cover front (Mat. No. 88856; pack of 3 pcs.)

To protect the complete front - touch display and soft keys - of your Lovis 2000 M (or DMA M/DSA M) from spills and dirt in harsh environment, attach a protective cover front.

The covers come completely with adhesive transfer tapes and can easily be slipped onto the instrument's front.

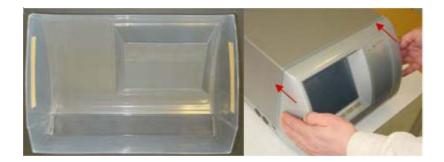


Fig. E - 2 Attaching the protective cover front

Appendix F: Trouble Shooting

F.1 Error Messages and Warnings

Warnings or error messages can be indicated or shown:

- within the main window under "Lovis Condition" or, in combination with a density meter/sound velocity meter under "Master Condition".
- · in the data memory browser
- within the results file or printout (measurement results, adjustment results)
- in a separate window

Warnings / error messages concerning a measurement in progress

If problems come up during a measurement in progress, errors or warnings are displayed in the main window. They are also part of the results file. Details can be viewed in message list.

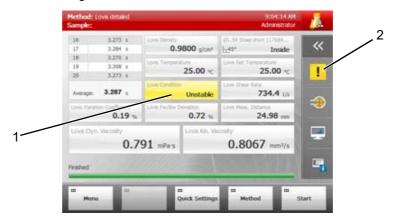


Fig. F - 1 Example Warning

- 1 ... the yellow field indicates a warning; short text message
- ... the yellow sign indicates a warning. Tap the button to open the message list. See Fig. F - 3.

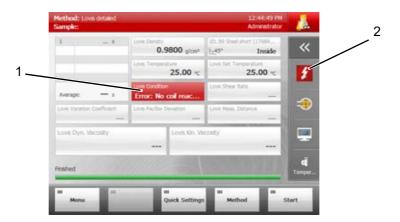


Fig. F - 2 Example: Error

- 1 ... the red field indicates an error; short text message
- 2 ... the red sign indicates an error. Tap the button to open the message list.

Message List

Sample 'Polymer 1' - canceled
The following problems occured:
, Sample 'Polymer 1' - canceled
The following problems occured:
, Sample was canceled.

Sample 'Polymer 1' - error
The following problems occured
, Error: No coil reached (Lovis Module)

Remove all

The message list gives more information on warnings and errors:

Fig. F - 3 Example view of warning and error in message list

The messages tell you:

- · For which sample the problem occurred
- · Which kind of problem occurred
- Item of the measuring assembly where the problem came up (e.g. Lovis Module)

Warning and error signs within the data memory browser and result file



Fig. F - 4 Error status displayed in data browser

The symbol indicates if you aborted a measurement by tapping <Stop>. The data browser shows date, time and sample name (if any) of that test.

The warnings and error messages displayed on the screen are also part of the result file. They are shown under "Master Condition". See below:

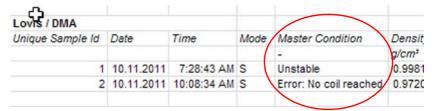


Fig. F - 5 Error displayed in result output file

Error messages / warnings coming up in a separate window

If errors or warnings occur outside a measurement, they come up in a separate window as shown in the following screenshot. Such a window contains always:

- · The text "Error" or "Warning" and the respective number
- The error message

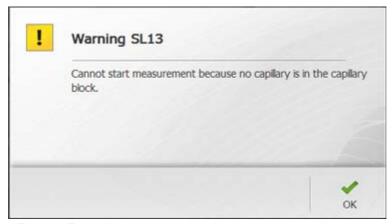


Fig. F - 6 Example error not related to measurement in progress

Error messages within the results of an adjustment

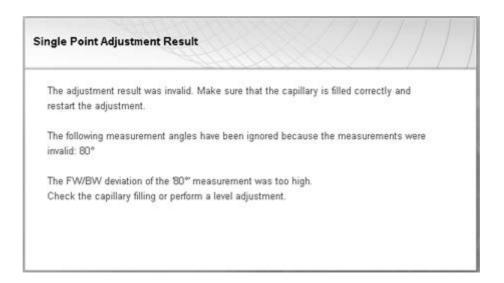


Fig. F - 7 Example error message in adjustment results

F.2 List of error messages

Message	Problem	Solution
Measurement errors / warnings		
FW/BW deviation too high	The forward/backward deviation is higher than the allowable value for the selected measuring angle. Bubbles or contaminations in the capillary. Instrument position on lab desk is tilted.	 Check the capillary and the filling. Place the instrument in horizontal position and perform a level adjustment.

EXPLANATION FW/BW deviation:

Lovis 2000 M/ME calculates the average value of the forward and backward runs of a measurement. If the instrument is not in a level position and if no level adjustment has been performed, the calculated average is faulty due to the differing forth and back runtimes. To get a valid measuring value that fault must be smaller than 0.1 %. This corresponds to a tilted position of 2.5°. The internally set FW/BW deviation is the limit which must not be exceeded to ensure that the resulting fault in the average runtime value is smaller 0.1 %. Flat measuring angles (inclination angles) are less influenced by a tilted position than steep measuring angles. Therefore the FW/BW deviation limit is not constant but a curve over the angle range:

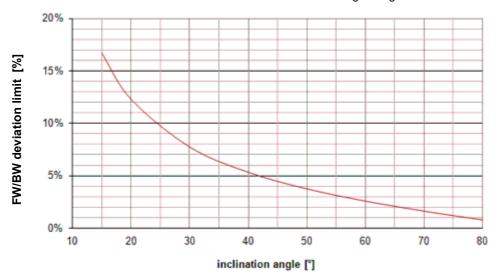


Fig. F - 8 Forward / backward deviation limit depending on the inclination angle

The below equation generates this curve:

Fw/Bw Limit [%] = $(2.596 \cdot 10^{-8} \cdot \text{Angle}^4 - 6.047 \cdot 10^{-6} \cdot \text{Angle}^3 + 5.26 \cdot 10^{-4} \cdot \text{Angle}^2 - 2.141 \cdot 10^{-2} \cdot \text{Angle} + 0.3874) \cdot 100$

An air bubble or particle in the capillary which slows down the ball in one direction (sitting in front of the ball) can also lead to differing forth and back runtimes.

Message	Problem	Solution
Measurement errors / warnings		
Runtime too short	The runtime is shorter than 2.5 s for the short distance and shorter than 10 s for the long distance.	For normal measurements: The sample viscosity is too low for the selected measuring angle and capillary diameter. • Measure at a flatter angle • Use capillary with smaller diameter For adjustments: • Use a standard liquid with
Unstable	The set value for the variation coefficient was always exceeded within the maximum number of measurement cycles.	 higher viscosity Check the capillary and the filling. Change the variation coefficient to a higher value. Increase the maximum no. of measurement cycles
No coil reached	No ball could be detected before measuring timeout was reached.	 Check whether there is a ball inside the capillary. The ball got stuck somewhere inside the capillary. Check the capillary and the filling. For highly viscous fluids the ball might be close to the capillary end and not yet have passed a coil. The measuring timeout setting (Chapter 7.2.5.3 of the Lovis 2000 M/ME Reference Manual) is unsuitable for the sample's viscosity. Set a time at least 4 times longer for this measurement.
Ball blocked	A timeout limit was exceeded after one or more valid detections (ball passing a coil) during the current measurement.	 Check the capillary and the filling. An air bubble meeting the ball might have stopped it in the middle of the capillary. The ball got stuck to the filing adapter due to an air bubble. Check the capillary and the filling. The set measuring timeout is long enough for the ball to reach at least one coil, but not long enough for the measurement as such. Set a suitable measuring timeout for this sample (Chapter 7.2.5.3 of the Lovis 2000 M/ME Reference Manual). One of the coils might be defective. If the error persists, contact your Anton Paar representative.

Message	Problem	Solution	
Errors / Warnings			
Date and time are not correct.	 The date and time are not set. The instrument has lost internal settings after an instrument software update. The internal battery is weak or defective (settings get lost whenever switching off). 	Set the current date and time (see Appendix C or General Software Functions Manual). If the error message persists after setting date and time, contact your Anton Paar representative for battery replacement. Adjustment data are not lost when replacing the battery.	
Error 13	The instrument software of the master instrument (DMA M/DSA M) does not support Lovis 2000 ME microviscometer module.	Update the instrument software of the master instrument to the latest version (comes on the supplied USB storage device).	
Temp. control failed	The temperature in the capillary block does not become stable or the difference between set measuring temperature and actual temperature increases.	If applicable: Make sure • you activated the counter cooling (for low set meas. temperatures) or deactivated	
Heatsink temp. high	The temperature in the heatsink of the capillary block is too high or too high in relation to the set measuring temperature, respectively. Error criteria: - if $T_{hs} > 80 ^{\circ}\text{C}$ - if $(T_c\text{-}T_{hs}) < \text{mdT}$ T_{hs} heatsink temperature T_c current Lovis temperature mdT max. delta T mdT depends on T_c $T_c \ge 15 ^{\circ}\text{C}$: mdT = -45 $^{\circ}\text{C}$ $T_c < 5 ^{\circ}\text{C}$: mdT = -35 $^{\circ}\text{C}$	the counter cooling (for high set meas. temperatures) the counter cooling settings are suitable for the set measuring temperature and ambient conditions (not too low or too high cooling temp.). the counter cooling liquid circulates freely (no bent or blocked hoses, liquid not too highly viscous for effective heat transport). See Chapter 6.7 for correct operation with counter cooling. Check the fan of the capillary block: Are the venting slots free and can it turn freely? See	
Heatsink temp. low	The temperature in the in the heatsink of the capillary block is too low or too low in relation to the set measuring temperature, respectively. Error criteria: - if $T_{hs} < -30 ^{\circ}C$ - if $(T_{hs}^{-} T_{c}) < -82 ^{\circ}C$ T_{hs} heatsink temperature T_{c} current Lovis temperature	Appendix C (function Fan Service). If all above actions do not solve the problem, contact your Anton Paar representative.	

F.3 Problems and Solutions

Table F.1: Measurement

Problem	Cause and Correction	See
I can not start any measurement 15 minutes or more after booting the instrument.	Verify whether one or more modules are using older firmware versions than expected from the instrument's software. This information is either displayed at the start screen or in the diagnosis list of the quick access area. Tap <menu> and select "Service > Update > Module Firmware Update" to update the respective modules using the internal firmware update package.</menu>	General Software Functions Manual

Table F.2: Touch screen

Problem	Cause and Correction	See
The screen elements do not	Bad touch screen calibration: Perform a new touch	General
react when being tapped.	screen calibration.	Software
		Functions
		Manual
The screen flickers.	Due to manufacturing tolerances of the hardware	General
	the screen may flicker for certain values of a	Software
	reduced display brightness.	Functions
	Change the display brightness	Manual

Table F.3: Data memory

Problem	Cause and Correction	See
I can not see certain results	The filter function is activated and the results do not	General
in the data memory.	match the filter criteria: Change the filter settings.	Software
		Functions
		Manual
I have deleted all results but	The filter settings in the "Delete Measured Data"	General
there are still results visible in	menu are different from the settings in the "Data	Software
the data memory.	Browser Settings" menu: Perform corresponding	Functions
	settings in both menus.	Manual

Table F.4: Data export

Problem	Cause and Correction	See
The export to the USB flash drive does not work.	The USB flash drive has the old super floppy formatting and is therefore not accepted by the instrument: Reformat to FAT 32 or exFAT try a newer USB flash drive.	
Wrong output data are exported.	The settings in the "Result Output" menu are wrong: Change the settings.	General Software Functions Manual

Table F.5: Password protection

Problem	Cause and Correction	See
The instrument boots up	A user with activated auto logon function was logged	General
without logon procedure and	on the instrument before it was switched off: Tap on	Software
no password is requested.	the user indicator icon and log on with another user	Functions
	account.	Manual

Table F.6: Printout problems

Problem	Cause and Correction	See
No printout on office printer.	Office printer problems: Check if the printer has enough paper, toner etc. See the respective printer instruction manual.	
	The office printer type is not supported by your instrument.	General Software Functions Manual
	Wrong interface used: Use the interface which was defined in the "Printers Management" menu or change the interface settings.	General Software Functions Manual
	Wrong or no definition of the printer in the "Printers Management" menu: Change the definition.	General Software Functions Manual
No printout on POS printer.	Printer problems: Check the printer. See the respective printer instruction manual.	
	Wrong or no definition of the printer in the "Printers Management" menu: Change the definition.	General Software Functions Manual
	Chinese printer: Declare the printer as "RS-232 (Chinese)" in the "Printers Management" menu.	General Software Functions Manual
The POS printer printout makes no sense.	Wrong communication settings on the POS printer: Change the DIP switch settings (see the printer instructions).	Appendix A.4
Wrong output values are printed.	The settings in the "Result Output" menu are wrong: Change the settings.	General Software Functions Manual

Appendix G:Instrument Software Versions, Instruction Manuals

Instruction Manuals - Version History

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.21 build 26	11/2011	C72IB001EN-A	Instruction manual, printed, English, first release
		C72IB002EN-A	Instruction manual for measuring assemblies, pdf, English, first release
2.21 build 37 Hotfix	01/2012	No new manuals.	No changes.
2.21 build 51	03/2012	C72IB001EN-B	Original instructions, printed, English, short version.
		C72IB002EN-B	Reference manual, pdf, English. Provides supplemental information for the operation of Lovis 2000 M/ME and the installation and operation of the measuring assemblies.
		XPAIB001EN-A	Instrument software manual platform M, software version 2.21 build 51, pdf, English.
2.30 build 231	05/2012	C72IB001EN-C	Original instructions, printed, English, short version.
		C72IB002EN-C	Reference manual, pdf, English. Provides supplemental information for the operation of Lovis 2000 M/ME and the installation and operation of the measuring assemblies. Extended by installation instructions for measuring assemblies with Alcolyzer ME, HazeQC ME and pH ME.
		XPAIB001EN-B	Instrument software manual platform M, software version 2.30 build 231, pdf, English.
	07/2012	C72IB001EN-D	Original instructions, printed, English, short version.
		C72IB002EN-D	Reference manual, pdf, English. Existing chapters revised. Extended by installation instructions for measuring assemblies with Abbemat Performance/Performance Plus.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.30 build 245 Hotfix	10/2012	No new manuals.	No changes.
2.32 build 32	11/2012	C72IB001EN-E	Original instructions, printed, English, short version.
		C72IB002EN-E	Reference manual, pdf, English. Existing chapters revised. New: Short capillary, polymer calculations, installation instructions for measuring assemblies with Xsample 352/452 and Abbemat Performance/Performance Plus.
		XPAIB001EN-B	Instrument software manual platform M, software version 2.30 build 231, pdf, English.
2.40 build 188	03/2014	C72IB001EN-F	Original instructions, printed, English, short version.
		C72IB002EN-E	Reference manual updated together with SW version 2.41 (see Index "G", April 2014), pdf, English. Existing chapters revised. New: PEEK twist protection for capillaries, no verification after adjustment, extended adjustment now for user defined angle range, rubber feet for drip plate when setting up assemblies. New measuring assembly Lovis 2000 ME + DMA M + Xsample 352/452 + HazeQC ME
		XPAIB001EN-D	General Software Functions Instruction Manual platform M, instrument software version 2.40 build 188, pdf, English.
2.41 build 55	04/2014	C72IB001EN-G	Original instructions, printed, English, short version.
		C72IB002EN-G	Reference manual, pdf, English. Existing chapters revised. New: Option Low Temperature for Lovis. Capillaries 1.62 made of PCTFE for standard and short distance. New crush protection for Lovis for operation with Xsample models.
		XPAIB001EN-E	General Software Functions Instruction Manual platform M, instrument software version 2.41 build 55, pdf, English.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.42 build 67	08/2014	C72IB001EN-H	Original instructions, printed, English, short version.
		C72IB002EN-H	Reference manual, pdf, English. Existing chapters revised. New: Lovis 2000 M can be master instrument for pH ME / pH ME Beverage pH ME Beverage was added to the measuring assemblies Appendix E contains help for measuring highly viscous or volatile samples.
		XPAIB001EN-E	General Software Functions Instruction Manual platform M, instrument software version 2.42 build 67, pdf, English.
2.60 build 46	04/2015	C72IB001EN-I	Original instructions, printed, English, short version. More detailed explanation of viscosity accuracy and repeatability.
		C72IB002EN-I	Reference manual, pdf, English. Existing chapters revised. New mechanically stable DRIP PLATE MODULE HOUSING LOVIS M.
		XPAIB001EN-H	General Software Functions Instruction Manual platform M, instrument software version 2.60 build 46, pdf, English.
2.70 build 122	07/2015	C72IB001EN-J	Original instructions, printed, English, short version. Change of software version. Announce black adapters for DMA M / DSA M.
		C72IB002EN-J	Reference manual, pdf, English. Existing chapters revised. Change of software version. Added configurations with Xsample 530 (Chapter 18.5, Chapter 19.5).
		XPAIB001EN-I	General Software Functions Instruction Manual platform M, instrument software version 2.70 build 114, pdf, English.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.80 build 145	01/2016	C72IB001EN-K	Original instructions, printed, English, short version. Change of software version.
		C72IB002EN-K	Reference manual, pdf, English. Existing chapters revised. Change of software version. Added configurations with Xsample 340 (Chapter 18.6, Chapter 19.6).
		XPAIB001EN-J	General Software Functions Instruction Manual platform M, instrument software version 2.80, pdf, English.
2.90 build 107	05/2016	C72IB001EN-L	Original instructions, printed, English, short version. Change of software version. Capillary filling mode (manually filled or flow-through) is assigned to each capillary instead of to the Capillary Settings. New feature: Viscosity Standards Management for storage of data of reference liquids for adjustment.
		C72IB002EN-L	Reference manual, pdf, English. Existing chapters revised. Change of software version. Added details on hose connection if using Lovis 2000 M + Xsample 530 + SRU. Added Low Volume Hose Set Lovis Xsample PTFE.
		XPAIB001EN-K	General Software Functions Instruction Manual platform M, instrument software version 2.90, pdf, English.
2.91 build 132	11/2016	C72IB001EN-M	Original instructions, printed, English, short version. Change of software version. Non Storage Mode, Value Visibility and Unlock Service (option to access service level). QR code for configuration of 2D bar code reader. Temp. Table scan allows for same start and end temperature value. Julabo thermostat Model F32-EH discontinued and replaced by circulator FL601.
		C72IB002EN-M	Reference manual, pdf, English. Existing chapters revised. Change of software version (see original instructions). Lovis Option Low Temperature in combination with Xsample 530 on request only.
		XPAIB001EN-L	General Software Functions Instruction Manual platform M, instrument software version 2.91, pdf, English.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.92 build 146	05/2017	C72IB001EN-N	Original instructions, printed, English, short version. Change of software version. Removed recommended limit values of forward/ backward deviation of reference standard liquids (Appendix A.3). Fw/Bw deviation depends on measurement angle, allowable limit is defined by the Lovis. Equation for allowable limit included (see Appendix F.2). How to get the density if measuring below 0 °C with Lovis as module inside a DMA M / DSA M master instrument (Chapter 6.7.3). Separately specified minimum required sample volume for separate filling of Lovis capillary and DMA M and for flow-through filling of combination (Appendix A.1). Crash handler option (Chapter 13.3).
		C72IB002EN-N	Reference manual, pdf, English. Existing chapters revised. Change of software version (see original instructions). - Abbemat Heavy Duty Line (450/650) supported with Lovis 2000 M/ME (Chapter 22). - New assembly: DMA M+Lovis ME+Abbemat+Xsample 530 (Chapter 22.8). - Added filling volume for combinations with Xsample 340 (Appendix A.5). - MKT 10 for temperature calibration/adjustment (Chapter 8.5)
		XPAIB001EN-M	General Software Functions Instruction Manual platform M, instrument software version 2.92, pdf, English.
2.93 build 129	11/2017	C72IB001EN-O	Original instructions, printed, English, short version. Change of software version.
		C72IB002EN-O	Reference manual, pdf, English. Existing chapters revised. Change of software version (see original instructions). - Xsample 520 replaces Xsample 122 redesign: new pump lever
		XPAIB001EN-N	General Software Functions Instruction Manual platform M, instrument software version 2.93, pdf, English.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.93 build 129	01/2018	C72IB001EN-O	Original instructions, printed, English, short version. No changes.
		C72IB002EN-P	Reference manual, pdf, English. No changes.
		XPAIB001EN-N	General Software Functions Instruction Manual platform M, instrument software version 2.93, pdf, English.
2.93 build 235	02/2018	C72IB001EN-O	Original instructions, printed, English, short version. No changes.
		C72IB002EN-P	Reference manual, pdf, English. No changes.
		XPAIB001EN-O	General Software Functions Instruction Manual platform M, instrument software version 2.93, pdf, English.
2.93 build 385	04/2018	C72IB001EN-O	Original instructions, printed, English, short version. No changes.
		C72IB002EN-P	Reference manual, pdf, English. No changes.
		XPAIB001EN-P	General Software Functions Instruction Manual platform M, instrument software version 2.93, pdf, English.
2.93 build 547	08/2018	C72IB001EN-O	Original instructions, printed, English, short version. No changes.
		C72IB002EN-P	Reference manual, pdf, English. No changes
		XPAIB001EN-Q	General Software Functions Instruction Manual platform M, instrument software version 2.93, pdf, English.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.94 build 46	11/2018	C72IB001EN-Q	Original instructions, printed, English, short version. • Added Advanced Data Integrity: Menu > Setup > System Security > Advanced Security: if Advanced Data Integrity is activated, data can no longer be deleted, but archieved. • Added VNC Settings: Enable / disable operation via LAN by external PC and virtual network client software "AP Instrument Viewer" (Menu > Setup > Control Panel > VNC Settings)
		C72IB002EN-Q	Reference manual, pdf, English. See instruction manual.
		XPAIB001EN-R	General Software Functions Instruction Manual platform M, instrument software version 2.94, pdf, English.
2.95 build 147	06/2019	C72IB001EN-R	Original instructions, printed, English, short version. No changes.
		C72IB002EN-R	Reference manual, pdf, English. See instruction manual. No changes.
		XPAIB001EN-S	General Software Functions Reference Guide, instrument software version 2.95, pdf, English.
2.95 build 323	07/2019	no new documents, see	e above row
2.96 build 108	10/2019	C72IB001EN-S	Original instructions, printed, English, short version. Reference if measuring polymer solutions: Polymer Measurement Short Instruction replaces Polymer Solutions Application Report. Appendix B: Corrected material of cleaning brushes bristles from PA 6.6 to Tynex" Nylon 612
		C72IB002EN-S	Reference manual, pdf, English. See instruction manual. Hose clamp 21307: change of diameter: old Dmin 9.3-Dmax 9.9/ new Dmin 8.8-Dmax 9.3. Low volume hoses now also in combination DMA M + Lovis ME + Xsample 530
		XPAIB001EN-T	General Software Functions Reference Guide, instrument software version 2.96, pdf, English.

Instrument Software	Release date	Document number of Instruction Manuals	Changes
2.96 build 108	12/2019	C72IB001EN-T	Original instructions, printed, English, short version. Added section 7, Maintenance and Repair. No new SW version.
		C72IB002EN-S	Reference manual, pdf, English. No new index.
		XPAIB001EN-T	General Software Functions Reference Guide, instrument software version 2.96, pdf, English.
2.97 build 86	07/2020	C72IB001EN-U	Original instructions, printed, English, short version. New SW version.
		C72IB002EN-U	Reference guide, pdf, English. New SW version.
		XPAIB001EN-U	General Software Functions Reference Guide, instrument software version 2.97, pdf, English.
2.98 build 44	12/2020	C72IB001EN-V	
2.96 build 44	12/2020	C/2IBUUTEN-V	Original instructions, printed, English, short version. New SW version.
		C72IB002EN-V	Reference guide, pdf, English. New SW version.
		XPAIB001EN-V	General Software Functions Reference Guide, instrument software version 2.98, pdf, English.

Instrument Software - Version History

This table lists software changes relevant for Lovis 2000 M/ME.

Version	Changes
2.21 build 26	First release supporting Lovis 2000 M/ME microviscometer.
2.21 build 37 Hotfix	Lovis utility Shake test: changed from 50.000 to 500 cycles (500 cycles ~ 16 minutes)
2.21 build 51 Hotfix	 Fixed use of Var. Coeff. for evaluating measurement repetitions. Changed auto angle range from full range to adjusted range only. Fixed find min/max angle calculations in firmware. Changed waiting times after measurement cycles. Fixed water check reference. Improved adjustment procedure. Change of error messages and constant limits. Fixed level adjustment cancellation when capillary detection is disabled Changed variation coefficient calculation to use Bessel Correction. Improved calculation of progress-information while running shake test, adjustments and measurement. Fixed detection of fan failure. (Heat sink temperature >80°C) Fixed error in export of capillary systems when more than one printer is installed. Changed set shake test cycles in final inspection procedure to 10.
2.30 build 231	 New single point adjustment allows adjusting a capillary system only at one angle. Added new redo functionality for the verification measurement of all angle adjustment types. New input option for extract value to enable more precise beer/wort application results. Added dynamic viscosity into check measurement result view. New input option for Lovis: Density source allows choosing manual input or function instead of DMA. Added support of measurement modes "Repeated Mode" and "Temperature Table Scan" with Lovis. New input option to enter exact density by starting custom checks with Lovis without DMA. Added the sample name to the result output by default to all Lovis standard methods. Support of Abbemat Performance Line, HazeQC ME, Alcolyzer Beer and pH modules with Lovis. Measurement results will be displayed even if a warning occurred during measurement. Inverted order of angles in standard and extended adjustments from ascending to descending. Changed hold time before starting verification measurements in adjustments to 90 s. Using dynamic degree of polynomial function in angle adjustments (minimum 3 points). Changed user interface texts (Meas. Length > Meas. Distance, Cap. Diameter in capillary management; Max. Std. Dev. > Max. Var. Coeff. in result page of angle adjustments). Removed high frequent whirring caused by Lovis block fan. Fixed bug in writing I-Button EPROM by using strong pull up resistor. Removed bug in user interface if measuring scans were stopped.

2.30 build 245 Hotfix	 Handling of grey implemented digits in predetermination mode fixed. Errors during expanding the quick access area resolved. Problems with mandatory data fields in combination with auto air check resolved. Lovis Adjustment Verification procedures improved. Lovis Level adjustment improved. Redo function in all Lovis adjustments fixed. Problem with Lovis Utility "Fan Service" fixed. German translations improved. Sample volume for Lovis with Xsample52 auto sampler revised. Inhibition of cleaning auto sampler system with Lovis and Abbemat removed. Simultaneous operation of DSA, DMA HP and Lovis ME supported. Start-up problems of DSA M with Lovis ME in temperature scan mode fixed.
2.32 build 32	 Added full support of Polymer Solutions. Support of short distance capillary systems for Low Volume Applications. Implemented graphical data visualization for certain measurement modes. Improved Level Adjustment procedure. Introduced new measurement mode Zero Shear Scan. Approximate calculation of shear rate although capillary is not adjusted. Showing more detailed information while capillary adjustment. Fixed Level Adjustment data memory. Removed bug in Max. Angle Calculation Fixed Lovis Fan Service. Improvements in the user interface and data grid visualization. Temperature extrapolation for measured values Advanced security enables to set customer service password and to block USB memory devices
2.40 build 188	 Show available angles, predict estimated duration and selectable angle range for Extended Adjustment Show available angles and predict estimated duration for Standard Adjustment Optional data transfer also to FTP server New function: Delete Check Data Full system backup and full system recovery via Windows File Share or via USB flash memory Lovis polymer methods: Option to use data of the previously measured solvent for current calculations
2.41 build 55	 Option Lovis Low Temperature - measurement with Lovis possible down to -30 °C. New capillary type 1.62 made of PCTFE for short and long measuring distance. Support of revised LOVIS 2000 CPU board version 8.000.000 or lower. Added new "Solvent density" for user defined concentration calculations and limits. Included new temperature control error messages and warning states for Option Low Temperature: Temperature drift of the counter cooling system is too high. The Lovis Set Temperature cannot be reached because the counter cooling is too cold or too warm. The Lovis Set Temperature cannot be reached in a certain period of time. Modified manual Lovis density input for measurement modes Temp. Scan and Temp. Table Scan. Changed valid manual input range for Lovis density: Allowable range from 0 g/cm³ up to 5 g/cm³. Extended temp. range for water viscosity/density reference. Values available from +2°C up to +85°C. Changed temperature range for Water check with Lovis: Allowable range from +2°C up to +85°C.

2.42 build 67

- It is now possible to generate two reports (LIMS & network printer) at the same time
- Remove unrequested values from final inspection report
- Critical error, which occurred at different positions in the menu, is now fixed
- Problem with input of small steps in Temperature Table Scan is now fixed
- Introduced optional redo of failed polymer sub-measurements. If a measurement of a whole polymer sample (solvent or solutions) fails after any Lovis error, the user has the possibility to redo or skip the measurement
- Added additional reference values to Capillary Adjustment Reports. The reference values for the measured sample, the temperature and the ball density are now shown in the printed or stored Adjustment Report.
- Fixed default name selection of PCTFE capillaries (In the default name of the PCTFE capillary there was one surplus blank space. The surplus blank was removed).
- In some cases an error could occur when starting the Final Inspection procedure. This problem was fixed.
- An error could occur when loading a stored sample list with polymer solutions. This problem was fixed.
- A problem was fixed that concerned the displayed ball density at other temperatures than 20 °C. When entering the ball density at 20 °C, the Lovis calculates the corresponding ball density values for different temperatures. While the Lovis has always calculated with the correct ball density values that were entered for the Capillary Adjustment, the displayed "Ball Density" had been referred to one default value at 20 °C. For software 2.42, the ball density is always displayed correctly.
- Fixed start of measurement when having unstable condition
- Changed temperature stability criteria to avoid heat sink error message on heating

2.60 build 46

- Support of measurement mode "Time Scan" for measurements with a combination of DMA M and Lovis 2000 ME.
- Improvement for measurement mode "Time Scan" for measurements with flow-through systems
- Improved the Backup / Restore procedure concerning user-defined method settings: Restore applies the method settings of the actually used backup file including all user-defined method settings. Up to version 2.60, a restore always applied the default method settings independent of user-defined settings stored in the backup file.
- Mean values will not be calculated and displayed in the master sample when a measurement was performed with mode "Temperature Scan" (TS) or "Temperature Table Scan" (TTS).
- Fixed the problem in the quick settings that occurred when selecting a solvent from the polymer solvent database for polymer solutions measurement.
- The use of short capillaries is not allowed for the flow-through filling mode.
- Corrected the assignment of units for the Mark-Houwink coefficients: The unit [ml/g] is associated with the Mark-Houwink Factor (K) instead of with the Mark-Houwink Exponent (a).
- Fixed problems concerning the IQ/OQ Report printout.
- Known issue:

Due to a fixed time out of the ball detection at the beginning of a measurement the error "ball blocked" may occur, if all three following conditions apply:

- The sample liquid's viscosity is in the upper range (i.e. long run times) of the selected capillary.
- Measurement using flow-through filling mode
- Selected measurement mode "Time Scan" (TiS)

2.70 build 122

- Support of sample changer Xsample 530
- Gxp compliant reports with several Gxp compliant checks are now generated correctly
- It's no longer possible to exceed the limit of performed checks if the endless storage mode is not used
- Resolved issue when using time scan and Lovis flow-through filling mode (see version 2.60 build 46)
- Changed units in graph for multi conc. polymer measurements
- Resolved issue in storage procedure for Sample Name in User-defined Sample List
- Removed DMA Density data lines on Last Adjustment report with Lovis 2000 M
- Known issues:
 - PDF-Export of measurements shows the current device-setup also for samples measured with preceding setup
 - Only new LIMS-Bridge version 3.21.1 is tested and released with software version 2.70. This LIMS-Bridge version is available on Anton Paar Extranet. LIMS-Bridge version 2.40.130.10 is not tested with software version 2.70.
 - Activating/deactivating the sample list is not reported in the Audit Trail
 - Bullet points in reports are sometimes not printed correctly on network printers
 - Security Level 'Low' is changed to 'user-defined' when changing the sample list type
 - A value for the Audit Trail backup reminder is shown in security level details even if the reminder is not activated
 - Using save mode 'Final One Only' a sub-sample cannot be deleted in the data browser
 - In electronic signature, the same name for electronic signature can be given for two different user names
 - In IQ/OQ reports, a hyphen is displayed instead of the custom function's quantity
 - The start of a custom check takes some time. During this time the check cannot be aborted
 - If the password length is set to a minimum of 6 characters, the user name also has to have at least 6 characters. Thus, the information "User name can be shorter than 6 characters" in the details of the security levels is incorrect
 - The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA
 - After using the Xsample 530 Utility menu it might happen that the screen saver does not automatically activate again (Xsample 530)
 - In rare cases it's possible to have a time delay of 15 to 30 seconds between positioning and measuring (Xsample 122)
 - In some cases it might appear that by pressing "Same sample again" in the user defined sample list the system does not start the measurement (Xsample 122)

2.80 build 145 New Features: - Activation/deactivation of modules via method settings - Increased DMA M temperature range to a maximum of 100 °C (serial no. 81859726 or - Added new intrinsic viscosity output unit g/dl for Lovis polymer measurement mode. Resolved Issues and Changes: - Changed maximum number of days for password expiry to 365 - Changed the output format of AP-SoftPrint to avoid formatting problems with several languages and the multiple measurement mode - It is now possible to set the same quantity several times in the result output of a method - The maximum number of user functions was increased to 150 - Reset Instrument Branding is now possible for Administrators. The naming has changed to "Reset to Factory Settings" - RS232: The command "getdata" now shows only the results of measured subsamples in modes with multiple measurements instead of results of calculated average values - Only new LIMS-Bridge versions 3.21.x are tested and released with software version 2.70 or higher. A suitable LIMS-Bridge version is available on Anton Paar Extranet. LIMS-Bridge version 2.40.130.10 is not tested with software version 2.70 or higher. - Expanded conc. input range for Lovis polymer measurement and changed format of displayed text. Known Issues: - PDF-Export of measurements shows the current device-setup - also for samples measured with preceding setup - Activating/deactivating the sample list is not reported in the Audit Trail - Security Level "Low" is changed to "user-defined" when changing the sample list type - A value for the Audit Trail backup reminder is shown in security level details even if the reminder is not activated - Using save mode "Final One Only" a sub-sample cannot be deleted in the data browser - The camera image might overlie the menu page or the favorites list, when pressing various buttons very rapidly - The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again - In IQ/OQ reports, a hyphen is displayed instead of the custom function's quantity - The start of a custom check takes some time. During this time the check cannot be aborted - If the password length is set to a minimum of 6 characters, the user name also has to have at least 6 characters. Thus, the information "User name can be shorter than 6 characters" in the details of the security levels is incorrect - The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA (Lovis) - Lovis polymer measurement mode is not working with Xsample 340 - Service Utilities: Statistics might not show proper values (Xsample 530) - Air check details cannot be shown if bar code could not be read from vial (Xsample 530) - After using the Xsample 530 Utility menu it might happen that the screen saver does not automatically activate again (Xsample 530) - In rare cases it is possible to have a time delay of 15 to 30 seconds between positioning and measuring (Xsample 122) - In some cases it might appear that by pressing "Same sample again" in the user defined sample list the system does not start the measurement (Xsample 122) 2.80 build 153 See software release notes Hotfix

2.90 build 107

New Features

- New design for empty widgets and the possibility to select it via group "--None--"
- New display layout available: 13 output fields (4 medium, 9 small)
- Added "Viscosity Standards Management" for Lovis 2000 M/ME

Resolved Issues and Changes

- Non Storage Mode is not available for combinations including Lovis 2000 M/ME
- In error and warning pop-ups the affected module is shown in the title
- Added date and time to reports made at the end of adjustment flows
- Set output language of AP SoftPrint and RS232 printer to English for Japanese, Russian, Turkish and Chinese
- Resolved issue concerning a possible crash in data browser after deleting a filter
- Fixed crash when starting a measurement with pH sensor disconnected
- Corrected formatting in check result reports
- Added Abbemat adjustment data to reports
- Enable screen saver again after using a sample handling unit utility
- Removed CAN connector current value and adjustment
- Changed limits for Mark-Houwink factor (0 to 10 mL/g) and coefficient (0 to 2) (Lovis)
- Lovis measuring system setting "Filling Mode" is changed to be a capillary system setting
- Resolved issue concerning a wrong setting of minimum character length for user names if the password length is set to a minimum of 6 characters
- Resolved issue concerning wrong limits for API calculations

Known Issues

- PDF-Export of measurements shows the current device-setup also for samples measured with preceding setup
- New LIMS-Bridge versions 3.21.x are only tested and released with software version 2.70 or higher. LIMS-Bridge version 2.40.130.10 is not tested with software version 2.70 or higher.
- In case of 24/7 operation the instrument clock shows a time drift of a few seconds per week
- An ascending order of buffers has to be followed for pH adjustments
- Activating/deactivating the sample list is not reported in the Audit Trail
- In rare cases it's possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type
- A value for the Audit Trail backup reminder is shown in security level details even if the reminder is not activated
- Using save mode "Final One Only" a sub-sample cannot be deleted in the data browser
- The camera image might overlie the menu page or the favorites list, when pressing various buttons very rapidly
- The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again
- In IQ/OQ reports, a hyphen is displayed instead of the custom function's quantity
- The start of a custom check takes some time. During this time the check cannot be aborted
- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor board is installed but no pH sensor is connected
- Alcohol sugar correction data: user and date are wrong after setting the correction with user "Service" (Alcolyzer)
- Alcolyzer M adjustment: Recommendations to apply/reject the adjustment are incorrectly reported (Alcolyzer)
- The menu "Set Sugar Correction Factor" is available when logged on as Service user even though it has no function for Alcolyzer Beer and Wine
- The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M $\,$
- Lovis polymer measurement mode is not working with Xsample 340

2.91 build 132 **New Features** - Custom user groups added - Maximum number of users increased to 1000 - Maximum number of methods increased to 400 - Value visibility modes added - Electronic signature for checks - A connection symbol is shown in the header when the device is connected to LIMS Bridge - New function to prohibit measurements after check expiration until a check has passed - The sample name can be added to export file names via automatic printout and LIMS Bridge - The automatic deletion of audit trail entries after the export via LIMS Bridge can be deactivated - Automatic export of check and adjustment data is possible via LIMS Bridge - Supports connection to a time server - Liquid level monitoring for Xsample 530 - Xsample 340 supports polymer measurements with Lovis module - Non storage mode added for Lovis - Unlock service added **Resolved Issues and Changes** - Set temperature added to custom check results - Additional audit trail entries for changes in the sample list and for exports/prints - Improved overfill and re-squeeze behavior for Xsample 530 - Added additional pop up message in Lovis polymer solvents administration import wizard **Known Issues** - In rare cases, starting the instrument with an attached USB memory device might lead to a non-responsive touchscreen - PDF-Export of measurements shows the current device-setup - also for samples measured with preceding setup - New LIMS Bridge versions 3.21.x are only tested and released with software version 2.70 or higher – LIMS Bridge version 2.40.130.10 is not tested with software version 2.70 or higher - In case of 24/7 operation the instrument clock shows a time drift of a few seconds per - In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement - Security Level "Low" is changed to "user-defined" when changing the sample list type - Using save mode "Final One Only" a sub-sample cannot be deleted in the data browser - The camera image might overlie the menu page or the favorites list, when pressing various buttons very rapidly - The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely,

otherwise the calibration procedure will start again

board is installed but no pH sensor is connected

In IQ/OQ reports, a hyphen is displayed instead of the custom function's quantity
 The start of a custom check takes some time. During this time the check cannot be

- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor

- The graph for time scan does not show any Lovis density value when using Lovis 2000 M

2.91 build 209

Hotfix

See software release notes

aborted

without DMA

2.92 build 146

New Features

- Support of MKT 10 for temperature adjustments
- Compatibility with upcoming LIMS Bridge version 3.25 and tiamo™ 2.x
- Compatibility with upcoming AP-SoftPrint version 1.6
- New Cleaning Mode SRU-Strong for big systems with SRU (Xsample 530)
- Optional setting for an automatic reboot in case a crash happens

Resolved Issues and Changes

- Changed position of camera image to the lower end of the main screen to avoid system crashes
- Resolved issue concerning a malfunction of external keyboard inputs when creating/ editing user functions
- Resolved issue concerning missing limits for measurement delay time in guick settings
- Added missing signature information in automatic printouts of check measurements if electronic signature is activated
- Added correct audit trail entry if checks are signed electronically
- Added audit trail entry if the prohibition of measurements after expiry until a check has passed is activated/deactivated
- Added audit trail entry if a system crash occurs
- Optimized RS232 communication with external systems
- Improved overfill and re-squeeze behavior of Xsample 530
- Service user level allows to edit the system volume also up to sensor 3; therefore also bigger systems can be flushed with more rinse liquid (Xsample 530)
- Fixed "Out of range" issue for viscosity values when FAS measurement mode has been used
- Avoid critical error if no capillary set when starting a measurement
- An error message comes if a short capillary is imported and the flow through filling mode is selected

Known Issues

- In rare cases, starting the instrument with an attached USB storage device might lead to a non-responsive touchscreen
- PDF export of measurements shows the current device-setup also for samples measured with preceding setup
- The instrument clock may show a time drift of a few seconds per week
- In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type
- Using save mode "Final One Only" a sub-sample cannot be deleted in the data browser
- The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again
- The start of a custom check takes some time. During this time the check cannot be aborted.
- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor board is installed but no pH sensor is connected
- The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M.

2.93 build 129

New Features

- Option to select / unselect all methods in Method Visibility
- Added pH 3 point adjustment for SOPs (pH ME)
- Statistical data can be exported for the FW and SW (Xsample 530)
- In the service user level the activation and deactivation of accessories like MPT, SRU, can be done for all master instruments capable to run with an Xsample
- Lovis capillary block position optimized during cleaning and drying with Xsample using compressed air

Resolved Issues and Changes

- Corrected timing of check exports via LIMS bridge with activated electronic signature
- Displaying of the procedure when Auto Air Check is running (Xsample 340 / Xsample 530)
- Allow 0 °C temperature steps in Temperature Table Scan on Lovis module
- Added message after export of all capillaries (Lovis)
- Changed procedure of automatic angle detection in repeated mode (Lovis)
- Added TTS for Lovis module combined with Abbemat refractometer (Lovis)
- Special cleaning cannot started with Xsample without placed capillary
- Fixed audit trail logging for Lovis using polymer solvents administration
- Fixed manual input of density reference for calculation of viscosity by Lovis module
- Fixed customized cleaning on DMA M with Xsample 340 using compressed air and Lovis module
- Optimization of Data Memory performance, especially when opening details

>> continues on following page

2.93 build 235 Feature Release

New Features

- Xsample 320 and 330 available for DMA/DSA 5000 M, and Lovis

Resolved Issues and Changes

- Improved FillingCheck™ functionality for instruments with SCU electronics
- Added missing pressure warning in quick settings at temperatures higher than 50 °C (DMA)
- Added configuration QR-Codes for barcode reader models ZEBRA DS2208, DS6707 and DS8108
- Corrected wrong temperature input limits for viscosity standards management when using temperature units other than °C
- Resolved input settings area for measuring mode Angle Scan

Known Issues

- Adjustments and checks are not available if Xsample 330 is active, therefore deactivate
 the sample changer and perform the adjustment or check manually. Checks can still be
 triggered via quick settings or sample list
- In rare cases, starting the instrument with an attached USB storage device might lead to a non-responsive touchscreen
- In rare cases it might happen, that the measurement procedure is not stopped after a cover open (Xsample 340)
- PDF export of measurements shows the current device-setup also for samples measured with preceding setup
- The instrument clock may show a time drift of a few seconds per week
- In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type
- Using save mode "Final One Only" a sub-sample cannot be deleted in the data browser
- The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again.
- The start of a custom check takes some time. During this time the check cannot be aborted (Xsample 530)
- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor board is installed but no pH sensor is connected
- The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M
- Filling messages do not show up in polymer measuring mode when using Lovis with Xsample 320/330

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2.93 build 385	New Features
Feature Release	- Magazine with more than 72 positions is available for the Xsample for 12 mL vials - Xsample 530 has got a new firmware. Firmware version: 1.324.509 Resolved Issues and Changes
	- Resolved issue regarding non-deleted samples via LIMS Bridge
	- When LIMS Bridge deletes measurement data from the instrument the corresponding audit trail entry is created with the LIMS Bridge user
	- The export of measurement data is documented in the audit trail
	- Instrument types of trademarked instruments now contain the "unregistered trademark" symbol "TM": SVM, DMA, Xsample
	- The field "used" in temperature extrapolation is now updated correctly when data channels were removed or methods were deleted
	 The error "No ID from bar code reader" was changed to a warning. Consequently AVG values are now calculated also if the barcode could not be read (Xsample 530) Backup and Restore now contains also the air pressure sensor adjustment Fixed update issues from versions older than 2.40 on Lovis 2000 M instruments
	- Changed format of Final Inspection Report for Lovis 2000 M/ME
	Known Issues
	 See previous SW version In rare cases it might happen, that the instrument will not restart automatically when settings were changed for which a restart is necessary (e.g. "Start08" information at startup, setting serial number, regional settings). In this case turn the instrument manually off and on again
2.93 build 547	Resolved Issues and Changes
Feature Release	- Resolved update problem of instruments with old SCU hardware revision (DMA with SCU electronics)
	- Resolved a database timing problem leading to a system crash in very rare cases
	Known Issues
	- See previous SW version
	>> continues on following page

2.94 build 46 Release

New Features

- The touch screen can be deactivated (dark mode) when operating the instrument via VNC interface
- Number of maximum failed login attempts can be set between 1 10
- New filling mode Piston Pump Controlled (Xsample 530)
- New cleaning mode high volume available for Xsample 530 and 630
- Adjustments and checks can be performed with Xsample 330
- LimsBridge Version 3.30.42 available only for this release.

Resolved Issues and Changes

- Added audit trail entry when (de)activating automatic printout
- Added air pressure, humidity and quality parameters to adjustment data (DMA/DSA with SCU electronics)
- Added audit trail entry if wrong password for electronic signature is entered
- With security level CFR 21 Part 11 all reports are set GXP compliant and 'Method' and 'Sample Name' are added automatically to result output
- Added instrument serial number to check export/printout
- Corrected naming of several quantities in the corresponding audit trail entries when changing them via quick settings
- Removed names on Final Inspection Reports due to new signature regulation

Known Issues

- In rare cases a start and stop may cause a freezing of the instrument, reboot it again (Xsample 530)
- Deactivate the automatic air pump stop when reaching a stable value when using an Xsample may cause problems with the flows. Deactivate the function and reboot the system.
- If a self-test fails, then doubled Sample ID's are created (Xsample 530)
- In rare cases, starting the instrument with an attached USB storage device might lead to a non-responsive touchscreen
- In rare cases it might happen, that the instrument will not restart automatically when settings were changed for which a restart is necessary (e.g. "Start08" information at startup, setting serial number, regional settings). In this case turn the instrument manually off and on again
- PDF export of measurements shows the current device-setup also for samples measured with preceding setup
- The instrument clock may show a time drift of a few seconds per week
- In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type
- Using save mode "Final One Only" with measurement mode RM (Repeated Mode) this single sub-sample cannot be deleted in the data browser
- The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again.
- The start of a custom check takes some time. During this time the check cannot be aborted (Xsample 530)
- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor board is installed but no pH sensor is connected
- The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M
- Filling messages do not show up in polymer measuring mode when using Lovis with Xsample 320/330

2.95 Build 147 Release

New Features

- Average calculation mode in respect of ASTM D4052 compliance for opaque samples (DMA $\rm M$)
- Measurement Mode Functions (DMA/DSA M)
- New display layouts available to show sub-measurement results on home screen
- GXP relevant checks are considered for GXP compliant reports even if they are not stored on the instrument anymore (DMA/DSA M)
- Instrument name and location can be selected as channels for result output (DMA/ DSA M)
- A temperature table scan is also available for systems with Abbemat (DMA M)
- Alcohol low concentration and spirits adjustment can be performed separately in an SOP (Alcolyzer)
- Improved SOP automation. Reference values can be entered all together at the end of the adjustment flow (Alcolyzer)
- Support of language Chinese Taiwan
- Checkbox for report management to activate or deactivate the "printed by" information in the footer of PDF reports
- Abbemat error messages (air reference, low sample volume) can be deactivated (Modulyzer)
- Xsample 330 function changed, now automatic cleaning and drying is possible without manual interaction of closing and opening the pump
- Filling mode "Replacement Pressure Controlled" available for Xsample 530, for continuous filling without cleaning in between.

Resolved Issues and Changes

- Lovis: Crash Recovery Packages now include the font's package for all languages.
- Lovis: Fixed a "memory low" issue during level adjustment in Asian languages.
- Signature caption 1 can be deactivated for GXP compliant PDF reports
- Improved visible progress in restore tool in case an old backup of the instrument settings is restored
- In case the value visibility is deactivated, live raw data are only visible for user 'Service' (DMA M)
- The displayed range for the dynamic viscosity value is limited from 10 mPa·s to 3000 mPa*s (DMA/DSA M with SCU electronics)
- Resolved issue of density precision class in quick settings, which was always handled as changed by user. This setting is not available anymore by default (DMA/DSA with SCU electronics)
- Resolved issue of precision class "Fast", which was automatically changed to "Standard" after a restart of the instrument (DMA 4100/4500 M with SCU electronics)
- Changed default precision class (measurement finished by) to "Standard" ("Equilibrium") (DMA/DSA M)
- Extended temperature rage down to -25 °C (DSA M with SCU electronics)
- Temperature adjustments now show the correct values in case the temperature unit of MKT 10 is set to K or °F (DMA M)
- Resolved a possible system crash in data browser after signing and archiving measured data (DMA M)
- Resolved a possible system crash in sample list detailed view if measurements were already archived/deleted from data memory (DMA/DSA M)
- Fixed calculation of user functions in case an input quantity is defined but not used
- Added missing serial number on check printouts with receipt printer
- Fixed an issue where PDFs printed on a system set to Korean language did not contain any Korean characters
- Changed RS232 printout of measurement and check data to English format to avoid question marks in case a language with special font is in use (Japanese, Korean, Chinese, Turkish, Russian)

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- Corrected displayed digits for quantity 'Mass Concentration Sugar' with respect to the selected unit
- Resolved malfunction of the button bar in data memory in case a refresh of the page happens after measurements were archived automatically via LIMS Bridge.
- Added automatic reboot at the end of manual adjustment data input (DMA/DSA M)
- The default adjustment constants are displayed by default when opening the manual adjustment data input (DMA/DSA M with SCU electronics)
- An error message is displayed at the end of a temperature adjustment with MKT in case the reference temperatures are out of range (DMA/DSA M)
- When commenting on audit trail entries a separate entry is written to ensure traceability
- Added missing '\' in export path of exported check data in audit trail
- Removed 'Set Viscosity' from changed quick settings in audit trail if it was not used in the corresponding method (DMA/DSA M with SCU electronics)
- Corrected air/water adjustment results in case an adjustment was rejected before (DMA/ DSA M with SCU electronics)
- Removed trademark symbol in instrument names for better readability (DMA M, SVM, Xsample)
- The maximum allowed water check deviation for RI was harmonized to 0.0001 nD by default for all Abbemat types (Modulyzer)
- Disconnection from VNC is now handled correctly and open menu pages are closed automatically
- New syringe configurations for Xsample 340, due to new adaper design
- Method settings will be set to standard when editing more than one entry in the sample list, therefore start sample list and then edit entries.
- Xsample 330 cannot be used with compressed air any more.

Known Issues

- Lovis: The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M
- Lovis: Filling messages do not show up in polymer measuring mode when using Lovis with Xsample 320/330
- Changing syringe adapter from 5 mL to 10 mL is not possible directly, therefore first change to 2 mL syringe and then choose the 10 mL syringe adapter (Xsample 340)
- If a filling warning was detected during the air/water at 20 °C adjustment, the pop-up has to be ignored 3 times (DMA)
- Damaged or not connected heaters will lead to a error message popup, you have to confirm it several times. When fixing the issue as deactivating or attaching a functional heater the popup will show up again, please confirm and ignore.
- In rare cases a start and stop may cause a freezing of the instrument, reboot it again (Xsample 530)
- Deactivate the automatic air pump stop when reaching a stable value when using an Xsample. It may cause problems in measurement flows. Deactivate the function and reboot the system.
- If a self-test fails, then doubled Sample ID's are created (Xsample 530)
- In rare cases, starting the instrument with an attached USB storage device might lead to a non-responsive touchscreen.
- In rare cases it might happen, that the instrument will not restart automatically when settings were changed for which a restart is necessary (e.g. "Start08" information at startup, setting serial number, regional settings). In this case turn the instrument manually off and on again.
- PDF export of measurements shows the current device-setup also for samples measured with preceding setup.
- The instrument clock may show a time drift of a few seconds per week.
- Barcode reader method assignment not possible for measurement modes TTS, TS in combination with an Xsample (DMA)
- Expiry date, Lot Number and Reference Number of the RI Standard Management is not reported correctly in the Abbemat adjustment history (Modulyzer)
- In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type

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- Using save mode "Final One Only" with measurement mode RM (Repeated Mode) this single sub-sample cannot be deleted in the data browser
- The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again.
- The start of a custom check takes some time. During this time the check cannot be aborted (Xsample 530)
- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor board is installed but no pH sensor is connected
- Alcohol sugar correction data: user and date are wrong after setting the correction with user "Service" (Alcolyzer)
- Alcolyzer M adjustment: recommendations to apply/reject the adjustment are incorrectly reported (Alcolyzer).
- If the function "Prohibit measurements until a successful check has been performed" is activated, the measured temperature is displayed incorrectly if the DMA M is rebooted
- Sometimes the air pump does not stop automatically, even if it is set in the air pump settings.

2.96 Build 108 Release

New Features

- Added optional Repeated Mode functionality to Temperature Table Scan
- Add new filter criterion "AVG/SUB" in data memory: only AVGs, only SUBs
- In combination with Alcolyzer the channel "p (original extract) (% w/w)" can be set as Extract Source in Method Settings > Lovis Module (Lovis)

Resolved Issues and Changes

- Resolved issue regarding an error with Diet Zero Adjustments in combination with CarboQC ME and Alcolyzer ME
- Fixed Angle Scan (FAS) measurements are now allowed also for capillaries without adjustment (polymer measurements) (Lovis)
- Fixed capillary data output via AP-softprint version 1.91 or higher (Lovis)
- Removed Std. Dev. and some averages that don't make sense from Polymer result output (Lovis)
- Fixed an issue where a capillary calibration could not be saved, when the viscosity standard did not contain a Lot Number (Lovis)
- Resolved issue that prevented Huggins slope "k" to be used in copies from the factory default Polymer Methods (Lovis)
- Fixed an issue where a capillary adjustment could not be started after the original standard liquid was removed from the viscosity standard management (Lovis)
- Fixed an issue where the capillary block zero position was not adjusted when changing between manual filling and flow-through-filling (Lovis)
- Resolved possible crash after method assignment via barcode reader
- Fixed issue concerning overlapping texts in the header when changing from a menu page to home screen
- Fixed an issue with user defined sampled list, where Quick Setting parameters were not correctly used
- Added a check when starting a measurement if there is enough free memory available for the expected number of sub measurements
- Fixed an issue with data memory filters, where not all the desired data would be exported after deleting a previous filter
- Fixed an issue with long audit trail exports. If the export file has more than 2000 characters, the export will be split in several files
- Fixed issue where the audit trail was marked as exported although the FTP export failed
- Fixed crash when "Alcohol Zero" checkbox is deselected in SOP management (Alcolyzer)
- Removed pH limit check in SOP to avoid aborting due to a drifting pH raw value
- Added correct equivalence factor when converting the molarity (mol/L to N) of H2SO4 and H3PO4

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- Added missing unit for special adjustment output quantity (DMA/DSA M)
- Electronic signature: Corrected displayed signing levels on PDF reports in case 2-step signing is activated and unsigned measurements/checks are printed
- Removed Windows file share feature for full system backup/restore

Known Issues

- Lovis: The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M
- Lovis: Filling messages do not show up in polymer measuring mode when using Lovis with Xsample 320/330
- If a filling warning was detected during the air/water at 20 °C adjustment, the pop-up has to be ignored 3 times (DMA)
- In rare cases a start and stop may cause a freezing of the instrument, reboot it again (Xsample 530)
- Deactivate the automatic air pump stop when reaching a stable value when using an Xsample. It may cause problems in measurement flows. Deactivate the function and reboot the system.
- If a self-test fails, then doubled Sample ID's are created (Xsample 530)
- In rare cases, starting the instrument with an attached USB storage device might lead to a non-responsive touchscreen.
- In rare cases it might happen, that the instrument will not restart automatically when settings were changed for which a restart is necessary (e.g. "Start08" information at startup, setting serial number, regional settings). In this case turn the instrument manually off and on again.
- PDF export of measurements shows the current device-setup also for samples measured with preceding setup.
- The instrument clock may show a time drift of a few seconds per week.
- Expiry date, Lot Number and Reference Number of the RI Standard Management is not reported correctly in the Abbemat adjustment history (Modulyzer)
- In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type
- Using save mode "Final One Only" with measurement mode RM (Repeated Mode) this single sub-sample cannot be deleted/archived in the data browser. Use "Delete/Archive All" instead.
- The behavior of the touchscreen calibration changes in case the DCB of devices with 6.4" displays was exchanged. The calibration cross has to be hit very precisely, otherwise the calibration procedure will start again.
- The start of a custom check takes some time. During this time the check cannot be aborted (Xsample 530)
- A measurement with measurement mode "Check" (Water Check) will fail if a pH sensor board is installed but no pH sensor is connected
- Alcolyzer M adjustment: recommendations to apply/reject the adjustment are incorrectly reported (Alcolyzer).
- If the function "Prohibit measurements until a successful check has been performed" is activated, the measured temperature is displayed incorrectly if the DMA M is rebooted

2.97 Build 86 Release

Resolved Issues and Changes

- Added a warning when an existing single point adjustment will be replaced by a new one.
- Fixed capillary adjustment procedure using Xsample 330.
- Changed cleaning procedure in polymer mode with Xsample 330.
- Data export now contains always ALL runtimes, runtimes not used for calculating the mean values are marked with "X".
- Fixed a problem in polymer multi concentration measurement, which could lead to an "argument out of range exception".
- Fixed an issue where a check of Lovis did not ask for input of a density value although Lovis density was set to manual input, if a DMA was connected.
- Level adjustment report from data memory now contains all information shown in the report before saving the adjustment.
- Japanese customers had some question marks on their RS-232 paper prints. We have fixed these shortcomings so that adjustment data and GXP information are also printed correctly in English.
- Additionally we added a new printer type for the Citizen CBM-910 Type II receipt printer to fix some special characters on your printout.
- The footnotes in PDF reports when using different calculations are fixed. When using user or measurement mode functions together with the ASTM D4052 calculation, everything is in the right place now.
- In case you are working with activated security settings and advanced data integrity, we fixed a missing audit trail entry for you when archiving a lot of measurements at the same time. Everything is traceable again.
- We also repaired the password expiry warning, which was missing in case the increased security feature was deactivated again later on.

Known Issues

- Lovis: The graph for time scan does not show any Lovis density value when using Lovis 2000 M without DMA M
- If a filling warning was detected during the air/water at 20 °C adjustment, the pop-up has to be ignored 3 times (DMA)
- In rare cases a start and stop may cause a freezing of the instrument, reboot it again (Xsample 530)
- Deactivate the automatic air pump stop when reaching a stable value when using an Xsample. It may cause problems in measurement flows. Deactivate the function and reboot the system.
- If a self-test fails, then doubled Sample ID's are created (Xsample 530)
- In rare cases, starting the instrument with an attached USB storage device might lead to a non-responsive touchscreen.
- In rare cases it might happen, that the instrument will not restart automatically when settings were changed for which a restart is necessary (e.g. "Start08" information at startup, setting serial number, regional settings). In this case turn the instrument manually off and on again.
- PDF export of measurements shows the current device-setup also for samples measured with preceding setup.
- The instrument clock may show a time drift of a few seconds per week.
- In rare cases it is possible to have a time delay up to 30 seconds after starting a measurement
- Security Level "Low" is changed to "user-defined" when changing the sample list type

2.98 Build 44 Release

- No specific changes for Lovis 2000 M/ME - Known Issues: see above.

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