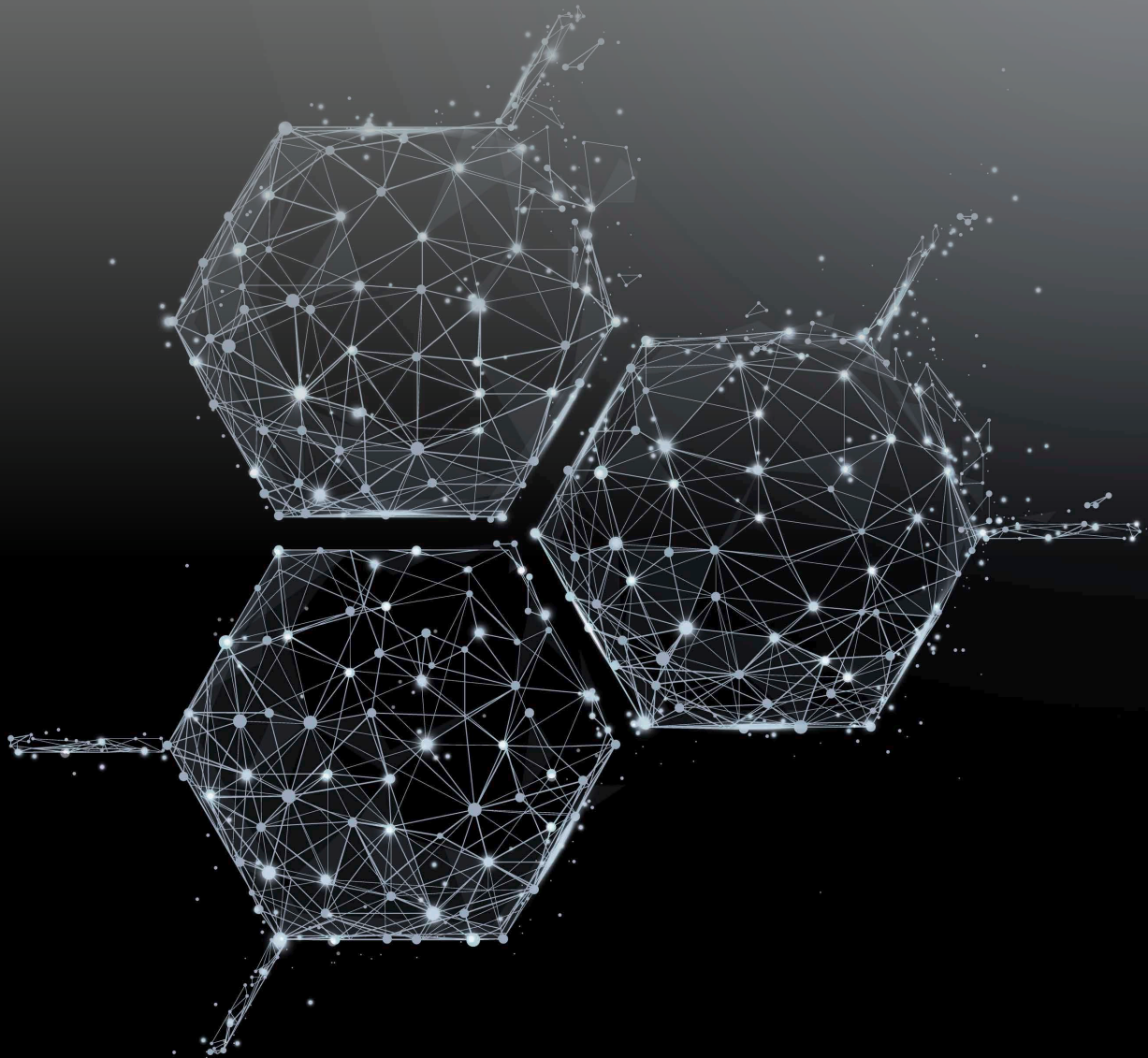


**Precise measuring instruments  
for viscosity and surface science**

**Product range 2023 / 2024**

Version 2023-04-01



**Precise data. Constant values.**

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Dear valued partners,

And here it is - the updated pricelist starting 01.04.2023.

Based on your feedback, only very few changes in the technical description of our products were necessary. We were pleased to see that the configuration guides, example configurations and video tutorials were frequently and regularly used by all of you – helping to successfully guiding your customers during the sales process.

This year, we like to attract your special attention to the new available TD 5 (page 52/53). This very compact research tensiometer comes with the Surface.Meter PC software. Its compactness and performance on the one side and the very competitive price together with the available options - like the drop-adhesion force measurement - make it an interesting alternative and will assure a sales success.

At the same time, we have to mention that the MPT C had be discontinued. Accessories, spare parts and consumables are still available and can be found on page 55.

In the process of taking over the production from our parent company LAUDA, last year a lot of efforts have been made to establish and optimize purchase and production processes. The now independent planning processes result in optimized delivery times. In 2023 we will be able to provide you most standard configurations within 3 weeks (ex works) after placing an order.

Typical examples for such configurations will be:

- || iVisc + Viscocool 6
- || Viscotemp 15 with PVS 1/2, two S 5 stands and VRM 4(S)
- || TC 1 or TD 5
- || LSA 60 package 1 or LSA 100

We are sure that this short lead time will provide you a strong advantage for all future sales projects.

Nevertheless, we should not forget that 2022 was heavily affected by manifold problems in our supply chain with the unfortune effect that the delivery times often increased. We like to thank all of you for your patience and your continuous support in explaining the situation to all your customers.

Unfortunately, most of our supplies increased their prices dramatically, in a significant number of cases up to 50%. Energy and raw material surcharges are more the rule than the exception, labor rates increased also noticeably. Even with our new purchase policy, using every discount to optimizing the price and not our inventory value, a price increase had been inevitable. Nevertheless, we managed to limit the price increase for 2023 to a level below the inflation rate in Germany.

Finally, we like to encourage you (if not done yet) to register your technicians at the Service Technician Certification Program (STCP / page 81). To ensure a high service quality is an important key factor for success and this program provides you a great tool to continuously maintain and improve the knowledge of your team.

We are doing our best to provide you all information needed to satisfy your customer's expectations and we are looking forward to a successful cooperation in 2023.

Your LAUDA Scientific Team

## General terms

This price list is valid from April 1<sup>st</sup>, 2023 and replaces any previous versions. Technical modifications, errors and omissions reserved.

Unless otherwise specified, all prices are recommended prices in EUR per piece excluding tax and packing. For individual shipments below a value of EUR 150, a processing charge of EUR 30 will be invoiced.

All our deliveries are subject to our GTC. Please refer to <http://www.lauda-scientific.de/en/gtc> for details.

All standard documents for order processing (order confirmation, packing list, commercial invoice) are included. Additional requested documents beside the standard workflow (e.g. inspection of goods before delivery, legalized documents by chamber of commerce, certificates of origin or others) will be charged according the following structure:

|| Additional document (provided by LAUDA Scientific):

**35.00 €**

|| Additional document (provided by external public authorities): **85.00 €**

|| External fees (consulate, notary, etc.):  
**invoiced acc. to actual costs**

|| Separate delivery of documents by courier:  
**invoiced acc. to actual costs**

### Handling Letter of Credit (LC)

|| Bank charges: **3%** of invoice amount  
(minimum fee of **1.000 €**)

|| Document cost: **acc. to General Terms**

|| LC will only be offered if general LAUDA Scientific LC requirements are accepted by customer

## Standard delivery

Standard delivery term:

**FCA Lauda-Königshofen / excluding packaging**

Packing, depending on ordered units:

**invoiced acc. to actual costs**

DAP/CIP can be offered via GLS, Geis, FEDEX and Hartrodt (invoiced acc. to quoted costs). Other forwarder needs to be individually agreed upfront to order.

## How to place an order

The following details are mandatory for a purchase order and will be confirmed on our order confirmation:

### Customer details:

- || Invoicing and delivery address
- || VAT number (mandatory for EU customers)
- || Contact person (tel. no / email address)

### Order details:

- || Customer reference or PO number
- || LAUDA Scientific quotation reference (if applicable)
- || Ordered items (item no, quantity, price, applicable discount, req. delivery week, agreed payment term)
- || Requested additional documents (marking, accompanying documents, etc.)

### Shipping details:

- || Forwarding agent (with full contact details) and agreed delivery term
- || Special instructions (marking, accompanying documents)

### Purchasing address:

All purchase orders need to be sent to: [orders@lauda-scientific.de](mailto:orders@lauda-scientific.de)

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In addition, LAUDA Scientific cooperates with more than 60 local representatives in over 50 countries worldwide. Also there, you will receive friendly and expert advice and assistance from trained and highly qualified sales and service staff.

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||||| **Viscometer** – For the measurement  
of kinematic viscosity

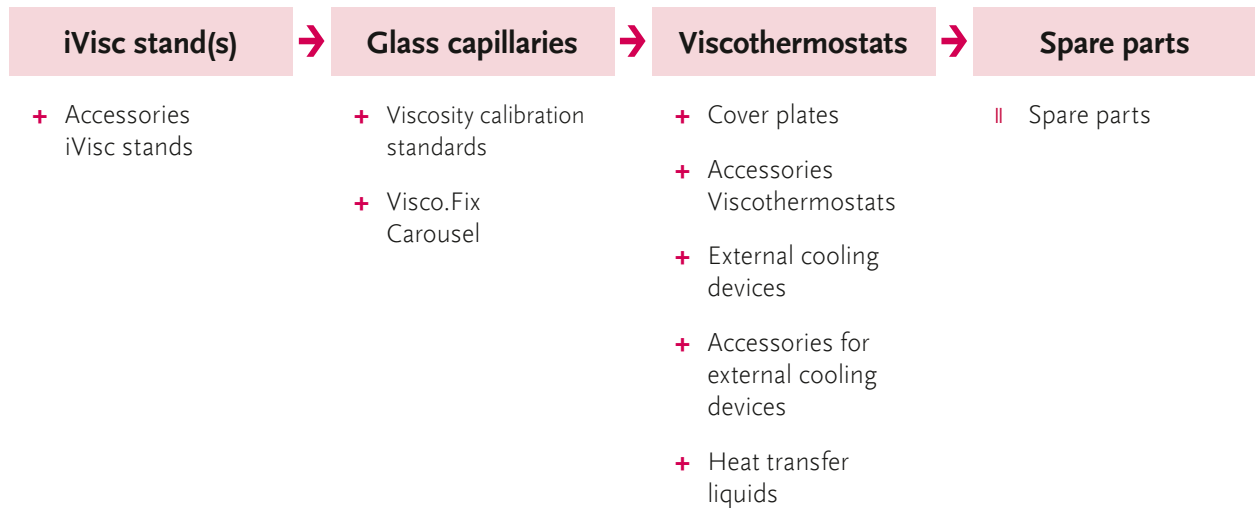


## Configuration guides and example configurations

All LAUDA Scientific viscosity measurement systems are based on a modular design and therefore offer customer-orientated flexibility. Thus their universal configuration can be correspondingly complex. For this reason we have developed the following **configurations guides**. They support you in setting up even complex systems without overlooking necessary components.

In addition, we have prepared some **example configurations** of viscosity measurement systems as frequently requested by our customers. They represent solutions for common measuring tasks and are a good starting point for your own individual configurations. Both tools are provided for each of our four basic viscosity system platforms, for **iVisc**, **PVS / S5**, **Autosampler VAS 2** and **PVS Upgrade set to VAS 2**.

## Configuration guide based on iVisc viscometer stands



### Example configuration based on iVisc viscometer stands



#### Main items:

- LMV 830 iVisc viscometer stand
- EGVH703 Ubbelohde Type 1 Ic
- L001104 Viscocool 6 S

#### Recommended options:

- EGVZ001 Visco.Fix carousel

#### Typical applications:

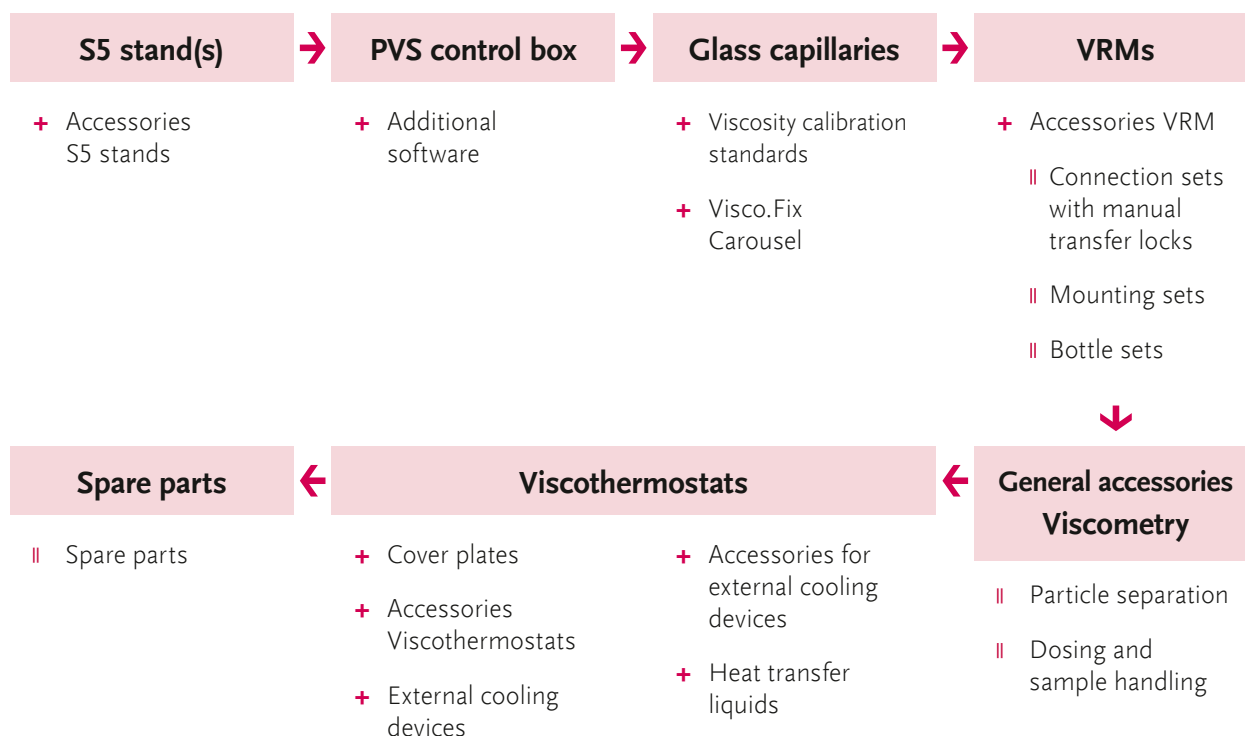
- || Flexible polymer characterization for R&D
- || Measurements close to ambient temperature
- || Low sample volume (2 to 4 samples per day)

#### Advantages and benefits:

- || Optimized bench-space by combining iVisc and Variocool 6
- || Excellent temperature stability <0.01 °C without external cooling
- || Comprehensive calculation algorithms already integrated



## Configuration guide based on PVS / S5 viscometer stands



Example configuration 1 based on **PVS / S5** viscometer stands with auto dilution and auto rinsing (VRM)

### Main items:

<b>LMVZ948</b> S5 stand	<b>LMR 911</b> Cleaning module VRM 4
<b>LMV 812</b> Control unit PVS 1/2	<b>LMRZ920</b> Connection set 6
<b>LMVZ981</b> Connect. set dosing unit MT 2	<b>LMRZ908</b> Mounting set for ET 15 S/G
<b>LMVZ932</b> Control unit for PVS box	<b>LMRZ931</b> Set of flasks and tubings 15
<b>LMZ 841</b> Sgl.-plc. magnetic stirrer set	<b>L001098</b> Viscothermostat ET 15 S
<b>EZ 195</b> PTFE magnetic stirrer	<b>HDQ 093</b> Closing lid
<b>EGVH924</b> Ubbelohde Type 4 Ic	

### Typical applications:

- || Determination of Staudinger index of hyaluronic acid products and other medical products
- || Determination of IV-values of polymers in R&D labs
- || Low sample volume (2 to 6 samples per day)

Image similar



### Advantages and benefits:

- || Software module for controlling concentration series and automatic IV number and molar mass determination
- || Meets GLP standards, e.g. for use in the pharmaceutical industry
- || Automatic cleaning and drying

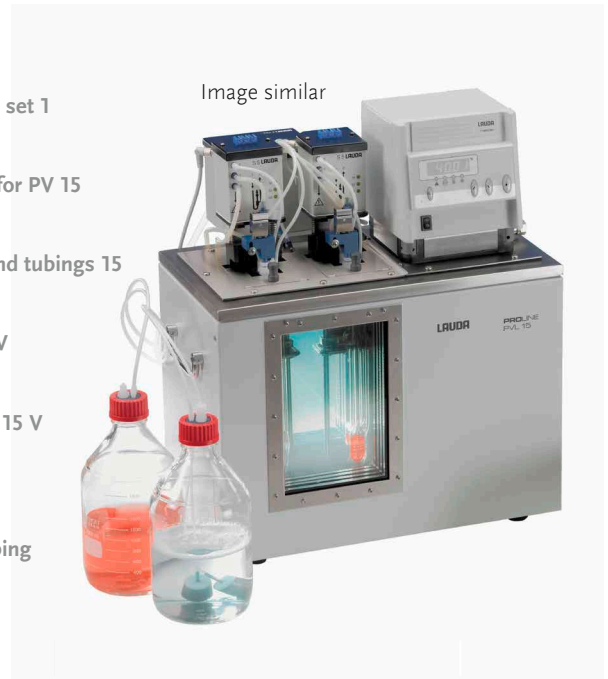
## Example configuration 2 based on **PVS/S5** viscometer stands with auto rising (VRM)

### Main items:

<b>LMVZ948</b>	2x S5 stand	<b>LMRZ909</b>	2x Connection set 1
<b>LMV 812</b>	Control unit PVS 1/2	<b>LMRZ904</b>	Mounting set for PV 15
<b>EGVH933</b>	2x Ubbelohde Type 2 Ic	<b>LMRZ931</b>	Set of flasks and tubings 15
<b>LMR 911</b>	Cleaning module VRM 4	<b>L001532</b>	Proline PV 15 V
		<b>LTZ 045</b>	Coverplate PV 15 V

### Recommended options:

<b>LCZ 9738</b>	Background lighting BL 15	<b>LZS 007</b>	2x Silicone tubing
<b>L001046</b>	LAUDA Microcool MC 250		



### Typical applications:

- || Quality control of various polymers
- || Determination of IV-values of polymers in R&D labs
- || Medium sample volume (5 to 10 samples per day)

### Advantages and benefits:

- || Software module for controlling concentration series and automatic IV number and molar mass determination
- || Meets GLP standards, e.g. for use in the pharmaceutical industry
- || Fully automatic cleaning and drying



## Configuration guide based on a PVS Upgrade set to VAS 2

### VAS Upgrade set

- + Accessories VAS
  - || Connection sets with automatic transfer locks
  - || Deviating cover plates



### General accessories Viscometry

- || Sample flasks
- || Particle separation



### Spare parts

- || Spare parts

### Prerequisites for VAS Upgrade set from PV(L) 15

- || Viscothermostat PV(L) 15
- || 2x measuring stand S5
- || PVS control box 1/2
- || 1x VRM 4

### Prerequisites for VAS Upgrade set from PV(L) 24

- || Viscothermostat PV(L) 24
- || 4x measuring stand S5
- || PVS control box 1/4
- || 2x VRM 4

## Example configuration based on a PVS 1/2 Upgrade set to VAS 15/2

### Main items:

LMV 823 Upgrade set VAS 15 for PV 15

LMRZ924 2x Connection set 3

### Included consumables:

EG 062 14x Sample bottle GI 32, 50ml

EZV 100 14x Connection screw cap

EDF 122 Sealing rings, 50 units

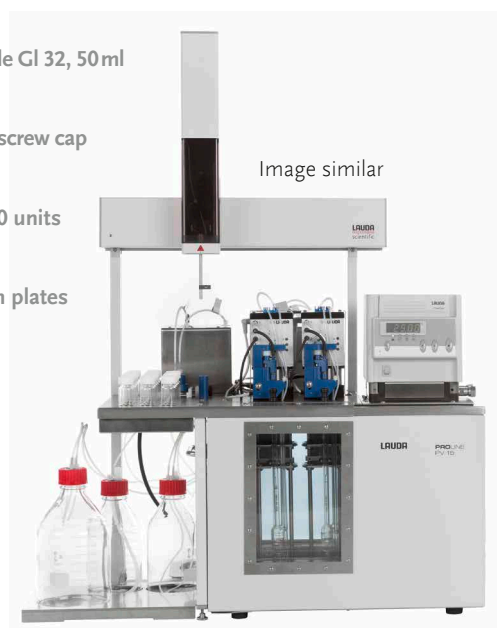
EDF 093 Small aluminum plates

### Typical applications:

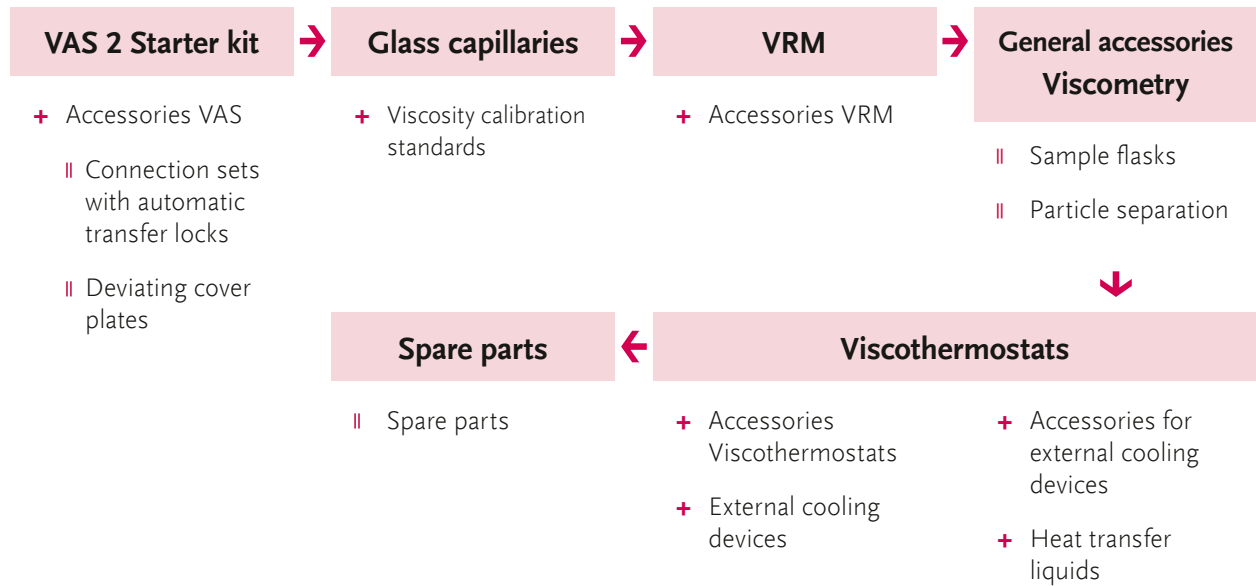
- || Fully automatic measurement of viscosity numbers in production control
- || Automatic determination of polymer chain length
- || High sample volume (up to 30 samples per day)

### Advantages and benefits:

- || Fully automatic sample handling including cleaning
- || Up to 15 samples can be measured without any operator interaction
- || Sample preparation can be integrated into the software



## Configuration guide based on an Autosampler VAS 2



### Example configuration based on a 4-place **Autosampler VAS 2** system

#### Main items:

<b>LMV 821</b>	LAUDA Scientific Autosampler VAS 24/4
<b>LMRZ924</b>	4x Connection set 3
<b>EGVH933</b>	5x Ubbelohde Type 2 Ic
<b>LMR 911</b>	2x Cleaning module VRM 4
<b>L001533</b>	Proline PV 24
<b>LCZ 9739</b>	Background lighting BL 24
<b>L001046</b>	LAUDA Microcool MC 250
<b>LZS 007</b>	2x Silicone tubing

#### Included consumables:

<b>EG 062</b>	35x Sample bottle GI 32, 50 ml
<b>EZV 100</b>	35x Connection screw cap
<b>EDF 122</b>	2x Sealing rings, 50 units
<b>EDF 093</b>	Small aluminum plates

#### Typical applications:

- || Fully automatic measurement of viscosity numbers in production control
- || Automatic determination of polymer chain length
- || Very high sample volume (up to 60 samples per day)

#### Advantages and benefits:

- || Fully automatic sample handling including cleaning
- || Up to 29 samples can be measured without any operator interaction
- || Sample preparation can be integrated into the software





## Automatic viscometer iVisc



The compact, intelligent viscosity measuring stand is designed for a large spectrum of standard glass capillary viscometers (e.g. Ubbelohde and Cannon-Fenske).

Placing it in a suitable LAUDA thermostat (e.g. LAUDA ET 15 S, Viscocool 6 or Viscotemp 18) and using the corresponding glass capillary viscometer, the kinematic viscosities in the range from 0.3 to 30,000 mm<sup>2</sup>/s can be determined. A wide range of applications can be accommodated as a result.

### Special Features:

- || "Plug & play" device installation via a single USB cable
- || Connection of up to two iVisc units per computer
- || Intuitive operation using software start/stop button on the device
- || Exact and "intelligent" optical meniscus sensing for problematic liquids
- || Operating status display via LEDs
- || Just one cable (USB) for control and power supply via Desktop / Tower PC, Laptop, Netbook etc.
- || Just 1 watt of power consumption over USB
- || Measurement temperature from -20 to 150 °C

### Scope of supply:

- || Automatic viscometer iVisc
- || Measuring software
- || USB connection cable
- || Set of viton connection caps

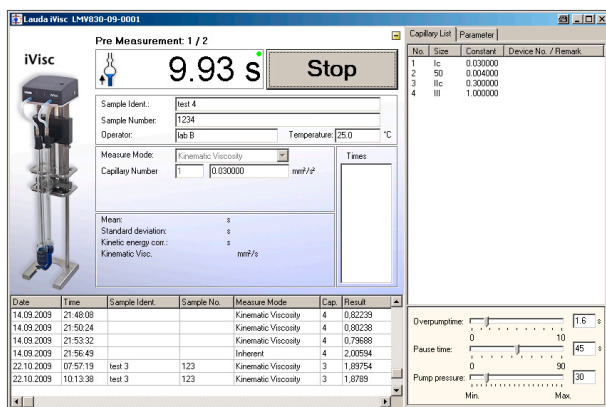
### Not included:

- || Windows-PC
- || Viscometer capillaries

### Note:

Operable with a 3-legged Ubbelohde viscometer type 1, 3, 4 or 2-legged Cannon-Fenske viscometer type 5.

Technical features	iVisc (LMV 830)
Sample temperature range	-20...150 °C
Ambient temperature	10...45 °C
Measurement range time	0...9,999.99 s
Recommended measurement range of flow time	30...1,000 s
Viscosity range	0.3...30,000 mm <sup>2</sup> /s
Resolution of time measurement	10 ms
Meniscus detection	Optical (near infrared)
Total power consumption	1 W
Dimensions (W x D x H)	95 x 96 x 425 mm
Power supply	USB
Weight, net	1.4 kg
Compatible Windows versions	7, 8, 8.1, 10, 11



## Special Features:

- || Integrated glass viscometer database library
- || Display of the current measuring sequence
- || Clear user interface with everything at a glance
- || Easy data transfer options (e.g. Excel)

## We have the user in mind

The full control of the measuring process including the pumps and pressure compensation valves, the highly flexible meniscus sensing using NIR light sensor, and the precise measurement of the flow time of the sample using the measuring capillary are all done in the head of the measuring stand.

The most common formulas and calculations are included in the software. The clear software interface considerably simplifies the daily lab routine. After the simple insertion of a filled glass capillary, the software coordinates all of the steps necessary to perform the measurement and then executes the evaluation.

Here, the precise measuring of the flow time is based on intelligent, self-adaptive NIR meniscus sensing.

## Accessories for iVisc

### UG 003 Viscometer frame

For better handling of Ubbelohde/Micro-Ubbelohde capillaries

### UG 094 Viscometer frame

For better handling of Micro-Ostwald capillaries

### EZ 054 Viscometer holder

For 2-legged glass capillaries

### HKB 532 Adapter

For use with Micro-Ubbelohde capillaries



HKB 532

## Special recommendation for iVisc

### EGVZ001 Visco.Fix carousel

For Visco.Fix glass capillary viscometers, 4 upright and 4 downward positions, incl. 4 high waste beakers and 4 low waste beakers

#### Advantages and benefits:

- || Safe storage on small footprint and no dusting of your capillaries
- || Easy cleaning, clean draining and drying of your capillaries with individual draining glasses
- || Always the right capillary at hand, even in the hectic lab routine



EGVZ001

## Measuring stand S5



The S5 is the measuring part of the PVS system. Its head is comprised of the opto-electronic meniscus detectors as well as the entire control of the measuring process including miniature pump and valves. The accuracy and resolution of the light sensor measurement system is among the best of its class. The robust micro-pump for pushing the sample up into the measuring ball as well as the chemical-resistant valves in the head of the stand allows reliable and continuous operation.

### Special Features:

- || Completely micro-processor controlled for a highly precise time measurement
- || Adaptive infrared (NIR) detection
- || Short tubing to the viscometer
- || Electrical connections only
- || For (Micro-) Ubbelohde, Cannon-Fenske-Routine and Micro-Ostwald capillaries

### Scope of supply:

- || Measuring stand S5
- || Connection cable
- || Set of viton cOnnection caps
- || Tubing

### Not included:

- || Control unit PVS Box
- || Measuring software
- || Viscometer capillaries

Technical features	S5 stand (LMVZ948)
Sample temperature range	-65...160°C
Time measurement range	0...9,999.99 s
Recommended measurement range of flow time	30...1,000 s
Viscosity range	0.3...50,000 mm <sup>2</sup> /s
Resolution of time measurement	0.01 s
Meniscus detection	Optical (infrared)
Light sensor control	Digital (μP)
Dimensions (WxDxH)	90x90x500 mm
Weight, net	4.5 kg

## Accessories for S5 stand

### UG 003 Viscometer frame

For better handling of Ubbelohde/Micro-Ubbelohde capillaries

### UG 094 Viscometer frame

For better handling of Micro-Ostwald capillaries

### EZ 054 Viscometer holder

For 2-legged glass capillaries

### HKB 532 Adapter

For use with Micro-Ubbelohde capillaries



**HKB 532**



## Control unit PVS Box



The PVS control unit is the core of the system as well as the switching station between the PC and individual components. It can be equipped with up to four plugin-in boards depending on the configuration (up to 8 S5 stands, up to 4 VRM modules, up to 4 MT dosing systems and 4 motor locks on the VAS auto-sampler systems).

### LMV 812 Control unit PVS 1/2

For 2 measuring stands

### LMV 813 Control unit PVS 1/4

For 4 measuring stands

### LMV 814 Control unit PVS 1/6

For 6 measuring stands

### LMV 815 Control unit PVS 1/8

For 8 measuring stands

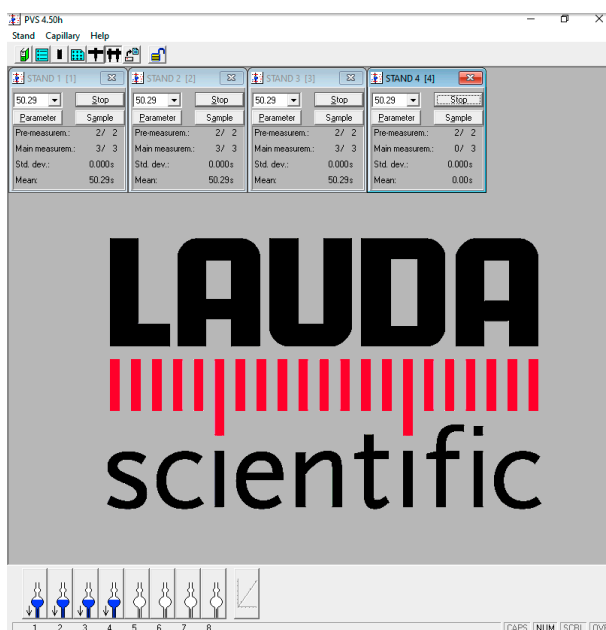
### Scope of supply:

- || Control unit PVS Box
- || Measuring software
- || RS 232 connection cable
- || Power cable (Schuko/EU)

### Note:

Each control unit can be upgraded up to max. 8 measuring stands. This number can be reduced by using additional options (e.g. dilution systems, Autosampler etc.).

Technical features	Control unit PVS Box
Interface to the PC	RS 232 C
Dimensions (WxDxH)	340x270x105 mm
Weight, net	4.6 kg
Ambient temperature	10..45 °C
Total power consumption	100 W
Compatible Windows versions	7, 8, 8.1, 10, 11

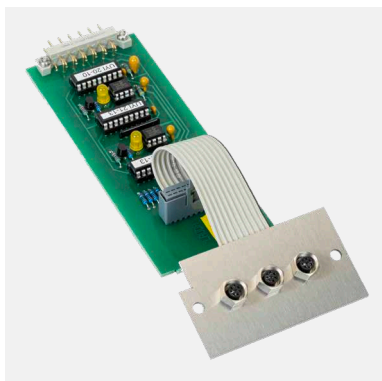


## Software based on Windows

All PVS system configurations are controlled by a standard PC through an interface. In addition, the high-performance and user-friendly standard version of the software calculates the intrinsic, kinematic, dynamic, relative, reduced and inherent viscosity and the K-value from the measured running times. Further key material properties can be determined using additional software modules.

The measuring results and evaluations can be printed out and saved in a file in ASCII format. The measurements report logs all measuring data on a day in chronological order and saves them in a file marked with the day's date. This data can be viewed at all times which means that consistent documentation is guaranteed. Further processing in other programs like MS Excel and in other networks is possible.

## Accessories for control unit PVS Box



LMVZ930

### LMVZ930 2-place plug-in unit ME 2

For additional 2 measuring stands and one additional VRM module

### Viscosity software support services

#### SDE 998-2 PVS software upgrade to Windows 10/11

Upgrade from a former Microsoft Windows version (Windows 7, 8, 8.1) to the latest version, upgrade from older version on request

#### SDE 998-3 PVS data transfer

Individualized installation file for Microsoft Windows 10/11, incl. methods and data from an already existing system (backup)

#### SDE 998-4 PVS-LIMS implementation standard

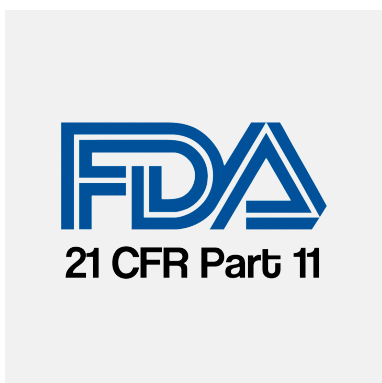
**Standard** development service for connecting the PVS software to existing database systems via ASCII data storage

#### SDE 998-5 PVS-LIMS implementation individual

**Individual** development service for connecting the PVS software to existing database systems e.g. SAP, Oracle, MS-SQL, MS-Access etc.

#### SDE 998-7 PVS support module "21 CFR part 11"

This module of our PVS software supports you in implementing the requirements of 21 CFR Part 11 for your LAUDA viscosity measurement system. Main criteria are the availability of a password-controlled 4-level user registration and the cryptic data storage. The module includes as well the IQ/OQ documentation.



SDE 998-7

### Application software

#### LDVM2017 PVS software module ENZ-DLL

For determination of enzyme activity

#### LDVM2023 PVS software module TEMP-DLL

For software control of LAUDA thermostats, incl. USB- and RS 232 connection cable, requires an LAUDA thermostat with RS 232/585 interface (LRZ 913)



LRZ 913

#### LRZ 913 RS 232/485 Interface for PV(L) visco thermostats

Plug-in module upgrading a LAUDA PV(L) visco thermostat with a RS 232/485 interface

## Auto dilution viscometry

Our solution for auto dilution viscometry greatly simplify the practical procedure of solvent viscosity measurement, since the step of dilution takes place within the glass capillary and run under complete computer control. Contact with toxic solvent and hot media is largely avoided, necessary actions by the user are reduced to the essential minimum. All this is achieved without any loss of accuracy, flexibility and data protection of the PVS system.

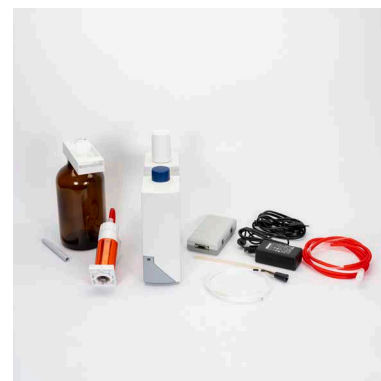
For a proper configuration of an auto dilution viscometry system, choose the suitable connecting set below. You also have to add the control plug-in unit for PVS control box (LMVZ932) as well as a stirrer system for your corresponding viscothermostat. Moreover be sure to add the suitable glass capillary viscometer together with the corresponding connection sets with transfer lock.

### LMVZ980 Connecting set dosing unit MT 1

for PVS systems without VRM 4,  
for 1 dosing unit and 1 viscometer

#### Including:

- || **Dosing set (UD 1007):** MT burette dosing unit (EBK 016), Burette top part (EBK 017-1) with dosing tube (EZ 278) and coupling adapter (EZ 277), control box (LMVZ876)
- || Connection cab large (HKA 118)



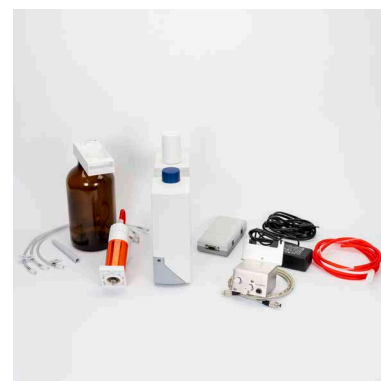
LMVZ980

### LMVZ981 Connecting set dosing unit MT 2

for PVS systems with VRM 4,  
for 1 dosing unit and max. 2 viscometers

#### Including:

- || **Dosing set (UD 1007):** MT burette dosing unit (EBK 016), Burette top part (EBK 017-1) with dosing tube (EZ 278) and coupling adapter (EZ 277), control box (LMVZ876)
- || Valve unit / overpressure safety valve (UD 652)
- || Connection cable (UK 233) for valve unit (UD 652)
- || PTFE tube VRM  $\Leftrightarrow$  transfer lock, 3 pcs. (UO 085)



LMVZ981

## Accessories for auto dilution

### LMVZ932 Control plug-in unit for PVS control box

For dilution series, for max. 2 dosing systems MT  
and 2 valve units (UD 652)

### LMZ 841 Single-place magnetic stirrer set for ET 15 S

Retrofitting possible

### LMVZ967-1 Two-place magnetic stirrer set for PV15

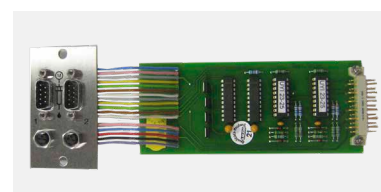
With control unit, only factory-installed

### LMVZ968-1 Four-place magnetic stirrer set for PV24

With control unit, only factory-installed

### EZ 195 PTFE magnetic stirrer bar

Small, 5x 25 mm



LMVZ932



LMZ 841

## Glass capillary viscometers with Visco.Fix



### Reliability and safety with Visco.Fix

Over 50 years of experience and continuous dialog with our customers, this is the basis for our **Visco.Fix system** for reliable handling and safe storage of your glass capillaries.

**With our Visco.Fix System, glass breakage of your sensitive Ubbelohde capillaries is a thing of the past.** The specifically designed retaining ring fixes reliably the capillary legs. The extended handle supports you in every manual procedure, e.g. installation in the temperature control bath, dealing with samples of hazardous solvents, cleaning, transportation and many more.

In combination with our specially developed **Visco.Fix carousel**, we offer you the ideal system for simple, safe and reliable handling and storage of your fragile glass capillaries.

### Benefits:

- || No more glass breakage in the tempering bath
- || Higher precision due to longer use of the same capillary
- || Significantly longer service life of your glass capillaries

Incl.  
Visco.  
Fix



### Ubbelohde Viscometer Type 1 (calibrated)

For automatic and stopwatch measurement, standard design without thread.

- || ISO 3105, DIN 51562/1, NFT 60-100
- || Filling volume: 15...20ml
- || Total length: approx. 290mm
- || Measurement accuracy:  $\pm 0.2\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No. (incl. Visco.Fix)
0c	0.003	0.7...3	0.3...2	0.47	EGVH700
0a	0.005	1...5	0.5...3	0.53	EGVH701
I	0.01	2...10	0.7...7	0.63	EGVH702
Ic	0.03	6...30	2...20	0.84	EGVH703
II	0.1	20...100	6...60	1.13	EGVH704
IIc	0.3	60...300	20...200	1.50	EGVH705
III	1	200...1,000	60...600	2.01	EGVH706
IIIc	3	600...3,000	200...2,000	2.65	EGVH707
IV	10	2,000...10,000	600...6,000	3.60	EGVH708
IVc	30	6,000...30,000	2,000...20,000	4.70	EGVH699

## Glass capillary viscometers with Visco.Fix

### Ubbelohde Viscometer for automatic cleaning Type 2 (calibrated)

For automatic measurement, with screw connections and aspirating tube.

- || ISO 3105, DIN 51562/1, NFT 60-100
- || Total length: approx. 290 mm
- || Filling volume: 18...22 ml
- || Measurement accuracy:  $\pm 0.2\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No. (incl. Visco.Fix)
0c	0.003	0.7...3	0.3...2	0.47	EGVH930
0a	0.005	1...5	0.5...3	0.53	EGVH931
I	0.01	2...10	0.7...7	0.63	EGVH932
Ic	0.03	6...30	2...20	0.84	EGVH933
II	0.1	20...100	6...60	1.13	EGVH934
IIc	0.3	60...300	20...200	1.50	EGVH935
III	1	200...1,000	60...600	2.01	EGVH936
IIIc	3	600...3,000	200...2,000	2.65	EGVH937
IV	10	2,000...10,000	600...6,000	3.60	EGVH938

Incl. Visco.Fix



Incl. Visco.Fix

### Micro Ubbelohde Viscometer Type 3 (calibrated)

For small sample quantities and/or short measuring times, standard design without thread, compatible for use with VRM cleaning modules.

**Please order one additional adapter (HKB 532) for each measuring stand (S5 or iVisc).**

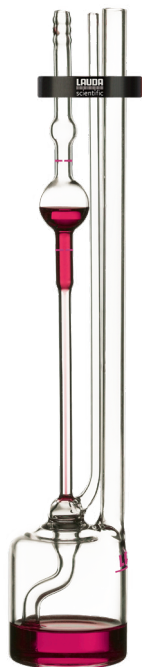
- || DIN 51562/1
- || Total length: approx. 290 mm
- || Filling volume: 3...4 ml
- || Measurement accuracy:  $\pm 0.5\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No. (incl. Visco.Fix)
I	0.01	1...6	0.3...6	0.40	EGVH718
Ic	0.03	3...18	0.8...18	0.53	EGVH719
II	0.1	10...60	3...60	0.70	EGVH720
IIc	0.3	30...180	8...180	0.95	EGVH721
III	1	100...800	30...800	1.26	EGVH722



## Glass capillary viscometers with Visco.Fix

Incl.  
Visco.  
Fix



### Ubbelohde Dilution Viscometer Type 4 (not calibrated)

For convenient implementation of dilution series and determining concentration dependencies, e.g. IV value measuring of polymers. Standard design without thread, compatible for use with VRM cleaning modules and dosing units.

- || Filling volume: 15...75 ml
- || Total length: approx. 290 mm
- || Measurement accuracy:  $\pm 0.2\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$		PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No. (incl. Visco.Fix)
0c	0.003	–	0.3...2	0.47	EGVH921
0a	0.005	–	0.5...3	0.53	EGVH922
I	0.01	–	0.7...7	0.63	EGVH923
Ic	0.03	–	2...20	0.84	EGVH924
II	0.1	–	6...60	1.13	EGVH925

To use this type of capillary, a thermostat cover plate with the indicator "V" in the item name is required (see p. 39).

The perfect match:

Visco.Fix capillaries and the Visco.Fix carousel

#### EGVZ001

##### Visco.Fix carousel

for Visco.Fix glass capillary viscometers, 4 upright and 4 downward positions, incl. 4 high waste beakers and 4 low waste beakers

##### Advantages and benefits:

- || Safe storage and no dusting of your capillaries
- || Easy cleaning, clean draining and drying of your capillaries with individual draining glasses
- || Always the right capillary at hand, even in the hectic laboratory routine



## Standard glass capillary viscometers

Standard glass capillaries in traditional style are generally more recommended for use by experienced laboratory personnel. Nevertheless, they are manufactured to the same high standards as those incl. Visco.Fix and feature the same high precision.

For easy handling we strongly recommend supplementing the standard glass capillary viscometers with suitable viscometer frames per capillary.

### UG 003 Viscometer frame

For better handling of Ubbelohde/Micro-Ubbelohde capillaries

### UG 094 Viscometer frame

For better handling of Micro-Ostwald capillaries

### EZ 054 Viscometer holder

For 2-legged glass capillaries

### HKB 532 Adapter

For use with Micro-Ubbelohde capillaries



UG 003

## Ubbelohde Viscometer Type 1 (calibrated)

For automatic and stopwatch measurement, standard design without thread.

- || ISO 3105, DIN 51562/1, NFT 60-100
- || Filling volume: 15...20 ml
- || Total length: approx. 290 mm
- || Measurement accuracy:  $\pm 0.2\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No.
0c	0.003	0.7...3	0.3...2	0.47	EGV 700
0a	0.005	1...5	0.5...3	0.53	EGV 701
I	0.01	2...10	0.7...7	0.63	EGV 702
Ic	0.03	6...30	2...20	0.84	EGV 703
II	0.1	20...100	6...60	1.13	EGV 704
IIc	0.3	60...300	20...200	1.50	EGV 705
III	1	200...1,000	60...600	2.01	EGV 706
IIIc	3	600...3,000	200...2,000	2.65	EGV 707
IV	10	2,000...10,000	600...6,000	3.60	EGV 708
IVc	30	6,000...30,000	2,000...20,000	4.70	EGV 699



## Standard glass capillary viscometers

### Ubbelohde Viscometer for automatic cleaning Type 2 (calibrated)

For automatic measurement, with screw connections and aspirating tube.



- || ISO 3105, DIN 51562/1, NFT 60-100
- || Total length: approx. 290 mm
- || Filling volume: 18...22 ml
- || Measurement accuracy:  $\pm 0.2\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN/ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No.
0c	0.003	0.7...3	0.3...2	0.47	EGV 930
0a	0.005	1...5	0.5...3	0.53	EGV 931
I	0.01	2...10	0.7...7	0.63	EGV 932
Ic	0.03	6...30	2...20	0.84	EGV 933
II	0.1	20...100	6...60	1.13	EGV 934
IIc	0.3	60...300	20...200	1.50	EGV 935
III	1	200...1,000	60...600	2.01	EGV 936
IIIc	3	600...3,000	200...2,000	2.65	EGV 937
IV	10	2,000...10,000	600...6,000	3.60	EGV 938

### Micro Ubbelohde Viscometer Type 3 (calibrated)

For small sample quantities and/or short measuring times, standard design without thread, compatible for use with VRM cleaning modules.

**Please order one additional adapter (HKB 532) for each measuring stand (S5 or iVisc).**



- || DIN 51562/2
- || Total length: approx. 290 mm
- || Filling volume: 3...4 ml
- || Measurement accuracy:  $\pm 0.5\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No.
I	0.01	1...6	0.3...6	0.40	EGV 718
Ic	0.03	3...18	0.8...18	0.53	EGV 719
II	0.1	10...60	3...60	0.70	EGV 720
IIc	0.3	30...180	8...180	0.95	EGV 721
III	1	100...800	30...800	1.26	EGV 722



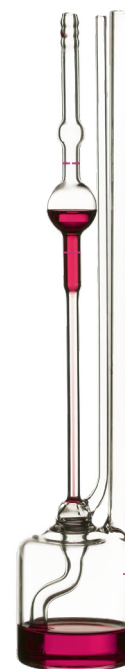
## Standard glass capillary viscometers

### Ubbelohde Dilution Viscometer Type 4 (not calibrated)

For convenient implementation of dilution series and determining concentration dependencies, e.g. IV value measuring of polymers. Standard design without thread, compatible for use with VRM cleaning modules and dosing units.

- || Filling volume: 15...75 ml
- || Total length: approx. 290 mm

Size No.	Cap. const. mm <sup>2</sup> /s <sup>2</sup>		PVS / iVisc mm <sup>2</sup> /s	inner ø mm	Item No.
0c	0.003	–	0.3...2	0.47	EGV 921
0a	0.005	–	0.5...3	0.53	EGV 922
0a	0.005	with frit G2	0.5...3	0.53	EGV 922-1SI
I	0.01	–	0.7...7	0.63	EGV 923
I	0.01	with frit G2	0.7...7	0.63	EGV 926-1SI
Ic	0.03	–	2...20	0.84	EGV 924
II	0.1	–	6...60	1.13	EGV 925



### Cannon-Fenske-Routine Viscometer Type 5 (calibrated)

For automatic and stopwatch measurement, standard design without thread.

- || ISO 3105, ASTM D 2515
- || Total length: approx. 245 mm
- || Filling volume: 7...10 ml
- || Measurement accuracy: ±0.3%

Size No.	Cap. const. mm <sup>2</sup> /s <sup>2</sup>	DIN / ASTM mm <sup>2</sup> /s	PVS / iVisc mm <sup>2</sup> /s	inner ø mm	Item No.
50	0.004	0.8...4	0.4...3	0.44	EGV 861SI
75	0.008	1.6...8	0.8...6	0.54	EGV 862SI
100	0.015	3...15	2...10	0.63	EGV 863SI
150	0.035	7...35	4...25	0.78	EGV 864SI
200	0.1	20...100	8...60	1.01	EGV 865SI
300	0.25	50...250	20...100	1.27	EGV 866SI
350	0.5	100...500	40...200	1.52	EGV 867SI
400	1.2	240...1,200	100...500	1.92	EGV 868SI
450	2.5	500...2,500	200...1,000	2.35	EGV 869SI
500	8	1,600...8,000	700...3,500	3.20	EGV 870SI
600	20	4,000...20,000	1,500...7,500	4.20	EGV 871SI



## Standard glass capillary viscometers

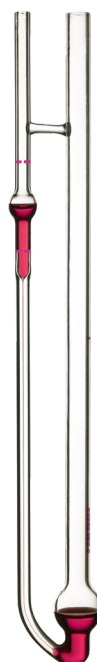
### Cannon-Fenske-Routine Viscometer for automatic cleaning Type 6 (calibrated)

For automatic measurement, with screw connections and aspirating tube.

- || ISO 3105, ASTM D 2515
- || Total length: approx. 245 mm
- || Filling volume: 7...12 ml
- || Measurement accuracy:  $\pm 0.3\%$



Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No.
50	0.004	0.8...4	0.4...3	0.44	EGV 951SI
75	0.008	1.6...8	0.8...6	0.54	EGV 952SI
100	0.015	3...15	2...10	0.63	EGV 953SI
150	0.035	7...35	4...25	0.78	EGV 954SI
200	0.1	20...100	8...60	1.01	EGV 955SI
300	0.25	50...250	20...100	1.27	EGV 956SI
350	0.5	100...500	40...200	1.52	EGV 957SI
400	1.2	240...1,200	100...500	1.92	EGV 958SI
450	2.5	500...2,500	200...1,000	2.35	EGV 959SI
500	8	1,600...8,000	700...3,500	3.20	EGV 960SI
600	20	4,000...20,000	1,500...7,500	4.20	EGV 961SI



### Micro-Ostwald Viscometer Type 7 (calibrated)

For small sample quantities and/or short measuring times, standard design without thread, compatible for use with VRM cleaning modules, recommended for heavy-foaming samples.

**Please order one additional adapter (HKB 532) for each measuring stand (S5 or iVisc).**

- || Filling volume: 2 ml
- || Total length: approx. 290 mm
- || Measurement accuracy:  $\pm 0.5\%$

Size No.	Cap. const. $\text{mm}^2/\text{s}^2$	DIN / ASTM $\text{mm}^2/\text{s}$	PVS / iVisc $\text{mm}^2/\text{s}$	inner $\varnothing$ mm	Item No.
I	0.01	1...6	0.3...6	0.43	EGV 820SI
Ic	0.03	3...18	0.8...18	0.60	EGV 821SI
II	0.1	10...60	3...60	0.77	EGV 822SI
IIc	0.3	30...180	8...180	1.00	EGV 823SI
III	1	100...800	30...800	1.36	EGV 824SI

## Viscosity standards

Viscosity standards are certified calibration oils that can be used to ensure and check the reliable and accurate function of your viscosity measurement system. Each calibration oil is delivered from the factory with an individual certificate showing exact viscosity values at different temperatures.

### **LZO 002-001 Viscosity standard N8**

0.7024 mm<sup>2</sup>/s for capillary size 0c, capillary constant 0.003, 500 ml

### **LZO 002-002 Viscosity standard N1**

1.203 mm<sup>2</sup>/s for capillary size 0a, capillary constant 0.005, 500 ml

### **LZO 002-003 Viscosity standard N2**

2.621 mm<sup>2</sup>/s for capillary size I, capillary constant 0.01, 500 ml

### **LZO 002-004 Viscosity standard S6**

8.872 mm<sup>2</sup>/s for capillary size Ic, capillary constant 0.03, 500 ml

### **LZO 002-005 Viscosity standard N14**

24.46 mm<sup>2</sup>/s for capillary size II, capillary constant 0.1, 500 ml

### **LZO 002-006 Viscosity standard N35**

65.3 mm<sup>2</sup>/s for capillary size IIc, capillary constant 0.3, 500 ml

### **LZO 002-007 Viscosity standard N100**

238.4 mm<sup>2</sup>/s for capillary size III, capillary constant 1.0, 500 ml

### **LZO 002-008 Viscosity standard N350**

818.4 mm<sup>2</sup>/s for capillary size IIIc, capillary constant 3.0, 500 ml

### **LZO 002-009 Viscosity standard N1000**

2592 mm<sup>2</sup>/s for capillary size IV, capillary constant 10.0, 500 ml

### **LZO 002-010 Viscosity standard N2500**

7576 mm<sup>2</sup>/s for capillary size V, capillary constant 30.0, 500 ml



## Cleaning modules VRM



The analysis of many polymers requires the use of hazardous solvents such as phenol / dichlorbenzene (e.g. for PET), metacresol or concentrated sulfuric acid (e.g. for PA). The VRM cleaning module enable the fully automatic cleaning and drying of the viscometers, preventing the user of getting in direct contact with those harmful substances.

Depending on the configuration, one or two viscometers can be connected and two different cleaning liquids can be set separately. The VRM 4 HT series is designed to handle even very hot samples of up to 160°C or highly viscous samples with 1,000 mm<sup>2</sup>/s. The glass viscometers are cleaned by using cleaning solvents and dried with a volatile solvent and ambient air.

The VRM 4 S enables cleaning even with concentrated sulfuric acid.

### Special Features:

- || Automatic (online) rinsing of the viscometer
- || Inert and corrosion-free for all standard solvents
- || Individual specification of cleaning procedures using PC software
- || No external connections necessary
- || Two different rinsing agents (the first for cleaning, the second for drying)
- || **VRM 4** for use with most common solvents, **VRM 4 S** with resistance to sulfuric acid, **VRM 4 HT** for high temperatures and high viscosity (external suction pump VRP (LMRZ809) necessary)

Technical features	VRM 4 (LMR 911)	VRM 4 S (LMR 912)	VRM 4 HT (LMR 913)
Temperature range	20...100°C	20...100°C	20...160°C
Viscosity range samples	0.3...100 mm <sup>2</sup> /s	0.3...100 mm <sup>2</sup> /s	0.3...1,000 mm <sup>2</sup> /s
Amount of cleaning agents	2	2	2
Dimensions (WxDxH)	130x160x130 mm	130x160x130 mm	130x160x130 mm
Weight, net	4.8 kg	4.8 kg	4.6 kg

### Note:

VRM can only be used in combination with a PVS system (not with iVisc) and are mandatory for VAS systems. For using VRM 4 HT the suction pump VRP (LMRZ809) is additionally needed.

### Necessary accessories:

- || Connection sets with sample transfer locks for capillaries
- || Mounting sets for suitable viscothermostats
- || Waste and reservoir bottles

### Scope of supply:

- || Cleaning Module VRM4/S/HT (UD 692/UD 739/UD 740)
- || Tubing set for waste and reservoir bottle (LMRZ932)
- || Connection cable to PVS (UK 230)

## Accessories for VRM

### LMRZ809 Suction pump VRP

Viscosity rinsing pump VRP for use with VRM 4 HT, PC controlled, incl. connection cable VRM

### Connection sets with manual transfer locks

For **each** measuring stand S5 there is a **seperate** connection set needed, according to the used viscometer type.

#### LMRZ909 Connection set 1

For viscometer with aspirating leg (Type 2, Type 6), viscosity range 0.3...100 mm<sup>2</sup>/s, incl. manual transfer lock 1 (UD 500), tubing set 4-leg (LMRZ937)



LMRZ909

#### LMRZ910 Connection set 2

For viscometer without aspirating leg (Type 1, Type 3, Type 5, Type 7), viscosity range 0.3...30 mm<sup>2</sup>/s, incl. manual transfer lock 2 (UD 501), tubing set 3-leg (LMRZ938)

#### LMRZ920 Connection set 6

For dilution viscometer (Type 4), incl. manual transfer lock 2 (UD 501), tubing set dilution (LMRZ939)

#### LMRZ923 Connection set 9

For viscometer with aspirating leg (Type 2, Type 6), viscosity range 100...1,000 mm<sup>2</sup>/s, incl. manual transfer lock 4 (UD 702), tubing set 3-leg (LMRZ938)



LMRZ927

### Mounting sets for viscothermostats

For proper installation of the VRM modules it is absolutely essential to select the appropriate mounting set for the corresponding viscothermostat.

#### LMRZ904 Mounting set for PV 15 / PVL 15

For mounting of max. **one** VRM module to the viscothermostat

#### LMRZ905 Mounting set for PV 24 / PVL 24

For mounting of max. **two** VRM modules to the viscothermostat

#### LMRZ906 Mounting set for PV 36

For mounting of max. **three** VRM module to the viscothermostat

#### LMRZ908 Mounting set for ET 15 S/G

For mounting of max. **one** VRM module to the viscothermostat

#### LMRZ916 Mounting set for ET 15 S/G

For mounting of max. **two** VRM module to the viscothermostat

#### LMRZ927 Mounting set for Viscotemp 15 / 24

For mounting of max. **one** VRM module to the viscothermostat



LMRZ931

### Waste and reservoir bottles

#### LMRZ931 Set of flasks and tubings 15

5x flasks DURAN (1x 2 liter, 4x 1 liter), 3x stopper with tubings

#### LMRZ930 Set of flasks and tubings 24

6x flasks DURAN (1x 5 liter, 2x 2 liter, 3x 1 liter), 3x stopper with tubings

#### LMRZ907 Stopper with tubings



LMRZ907

## Autosampler viscosity system VAS 2



The sampler offers the convenience of full automation at the highest sample throughput rate as an add-on to the two-station (VAS 15/2 and VAS 24/2) or four-station (VAS 24/4) measuring systems. Depending on the size of the sample bottles, up to 41 samples can be processed in one session. The system is controlled using a special PVS program which permits the safe application-specific allocation of the measurement samples to the matching glass viscometers, e. g. through direct “drag & drop” from the task list which was generated during sample preparation. The measurement of the samples is done in the S5 measuring stand, while the cleaning of the glass capillary viscometers and dosing syringes is done via suitable VRM modules.

### Accessories:

- || Suitable viscothermostat: Proline PV(L) 15 or 24
- || Required number and type of capillaries
- || Required number and type of VRM modules
- || Required number and type automatic transfer locks with connection sets
- || Sample flasks and screwing caps
- || Sealing rings
- || Aluminum plates
- || Insert filters
- || Sample preparation sets

### Special Features:

- || Retrofittable automatic multi-station viscosity measuring system
- || Up to four stations (VAS 24/4) for the highest possible sample throughput
- || Easy to program sample processing and fast sample switching possible
- || Assignment of processing priorities possible
- || Sample-specific applications can be defined (e.g. kinematic and relative viscosity, IV and K-values)
- || Direct glass viscometer sample injection without contamination at the tubing
- || Optional rinsing with two solvents or with next sample
- || Automatic software-controlled sample locks

## Starter kits

Images show not included accessories, e.g. thermostat and sample flasks



Technical features	VAS 15/2 (LMV 822)	VAS 24/2 (LMV 820)	VAS 24/4 (LMV 821)
Incl. autosampler type	VAS S	VAS L	VAS L
Incl. dosing syringe	Standard (UD 556)	Standard (UD 556)	Standard (UD 556)
Incl. control unit	PVS 1/2	PVS 1/4	PVS 1/4
Incl. amount of S5 measuring stands	2	2	4
Size of sample flasks	50ml	50ml	50ml
Incl. VAS cover plate	S50 for PV(L)	L50 for PV(L)	L50 for PV(L)
Amt. of sample positions	14	29	29
Syringe wash station with VRM 4	✓	✓	✓
Incl. set of waste and reservoir bottles	Flask set 15 (LMRZ931)	Flask set 24 (LMRZ930)	Flask set 24 (LMRZ930)
Viscosity range samples	0.3...100mm <sup>2</sup> /s	0.3...100mm <sup>2</sup> /s	0.3...100mm <sup>2</sup> /s
Dimensions (WxDxH)	850x650x1,100 mm	1,200x650x1,100 mm	1,200x650x1,100 mm
Weight, net	ca. 60 kg	ca. 70 kg	ca. 80 kg

A detailed **example configuration** as well as a **configuration guide** can be found on p. 12

## PVS upgrade sets to VAS 2

With our PVS to VAS upgrade sets it is possible to upgrade your existing PVS system to a fully automatic autosampler VAS 2 system. All your existing devices remain and get integrated. The modularity of our viscosity measurement systems gives you the freedom to adapt easily, flexibly and economically to your current needs at any time.

### LMV 823 Upgrade set VAS 15 for PV(L) 15

Incl. autosampler VAS S, standard dosing syringe UD 556, VAS cover plate S50 for PV(L) 15 for 50 ml sample flasks with 14 sample positions, syringe wash station with VRM 4, 2-place plug-in unit for PVS box (LMVZ930), plug-in unit for PVS box for 4 motor lock control (LMVZ943).

### LMV 824 Upgrade set VAS 24 for PV(L) 24

Incl. autosampler VAS L, standard dosing syringe UD 556, VAS cover plate L50 for PV(L) 24 for 50 ml sample flasks with 29 sample positions, syringe wash station with VRM 4, 2-place plug-in unit for PVS box (LMVZ930), plug-in unit for PVS box for 4 motor lock control (LMVZ943).

## Accessories for Autosampler viscosity system VAS 2



**LMVZ984**

### Connection sets with automatic transfer locks

For **each** measuring stand S5 there is **separate** connection set needed, according to the used viscometer type.

#### **LMRZ924 Connection set 3**

For viscometer with aspirating leg (Type 2, Type 6), incl. automatic transfer lock 1 (UD 701-B), tubing set 4-leg (LMRZ937)

#### **LMRZ925 Connection set 5**

For viscometer without aspirating leg (Type 1, Type 3, Type 5, Type 7), incl. automatic transfer lock 2 (UD 703-B), tubing set 3-leg (LMRZ938)

### Special cover plates for VAS 2

For use with 30ml or 100ml sample flasks. Factory configuration only.

#### **LMVZ986 VAS cover plate S30**

For 30ml sample flasks with 17 sample positions

#### **LMVZ984 VAS cover plate L30**

For 30ml sample flasks with 41 sample positions

#### **LMVZ985 VAS cover plate L100**

For 100ml sample flasks with 19 sample positions





## Automatic sample preparation

In combination with XPR-type laboratory balances, we offer a flexible weighing and dosing method for preparing samples for viscometry. The PC-controlled system accelerates and improves the weighing and dosing process considerably. Moreover, the automatic process provides a higher safety standard for the user. Some of the previously manual work steps are completely eliminated. The simple handling requires no special technical knowledge on the part of the lab personnel. The weighing and dosing system operates reliably and with high precision. Since the solvent dosing takes place in a closed system, the personnel benefits from a much lower exposure to dangerous solvent fumes or even direct contact at their workplaces. This allows a significantly higher sample throughput at an impressive high quality and security level.

### Included accessories:

- || 1x MT burette dosing unit for 1 solvent
- || 1x replaceable burette 20 ml
- || 1x RS 232 interface box with power adapter
- || Weighing balance MT XPR 20x with dosing attachment and software module
- || Software for embedding in viscometry measuring program



Image shows  
2 solvents version

**LMVZ977**

### Special Features:

- || High-quality XPR balance and special software module for gravimetric or volumetric dosing
- || No influence on the solvent temperature and prethermostating not necessary
- || Direct transfer of concentration and initial weight to the PVS software
- || User navigation via high-resolution display on the balance
- || Input of sample data via PC or barcode reader
- || Multiple solvents – can be added for different sample types

### Extension modules for second solvent

#### **EBK 016** MT burette dosing unit

For titration

#### **EBK 017-1** Burette top part

For dosing unit, 20ml

### Software control and balance mounting set

#### **LMVZ979** Sample preparation upgrade kit

Only to be ordered when Mettler balance XPR 20x and Mettler dosing unit with top part already are used or will be purchased by the customer. Upgrade kit incl. software, balance mounting set and control interface and cables



**LMVZ979**

## General accessories for viscosity



EG 094 | ED 062 | EG 066

### Sample preparation

#### 30 ml flasks

**EG 066 Sample bottle 30 ml**  
With 24 mm thread, for PG 30

**EZV 104 Connection screw cap with hole**  
White, for sample bottle (EG 066)

**EDF 124 Sealing rings**  
For connection screw cap (EZV 104), 50 units

**EDF 092 Small aluminum plates**  
For sample bottle (EG 066), 1,000 units



EDF 093

#### 50 ml flasks

**EG 062 Sample bottle GL 32, 50 ml**  
For PG 50

**EZV 100 Connection screw cap with hole**  
Red, GL 32, for sample bottle (EG 062)

**EZV 141 Screw cap GL 32**  
PTFE coated, red, for sample bottle (EG 062)

**EDF 122 Sealing rings**  
For connection screw cap (EZV 100), 50 units

**EDF 093 Small aluminum plates**  
For sample bottle (EG 062), 1,000 units



EBK 013

#### 100 ml flasks

**EG 094 Sample bottle GL 45, 30 ml**  
For PG 100

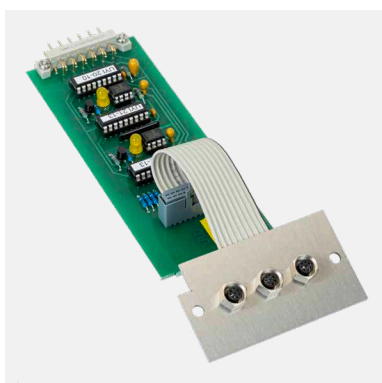
**EZ 165 Connection screw cap with hole**  
Red, GL 45, for sample bottle (EG 094)

**EDF 097 Small aluminum plates**  
For sample bottle (EG 094), 1,000 units

**EBK 010 Multi-place magnetic stirrer RT 35**  
Not heated, 35 positions, for 50 ml sample bottle (EG 062)

**EBK 013 Magnetic stirrer block MRH 15**  
Heated, 15 positions, for 50 ml sample bottle (EG 062)

**EZ 195 PTFE stirrer**  
Small, 5x 25 mm



LMVZ930

### Upgrade PVS box

**LMVZ930 2-place plug-in unit ME 2**  
For additional 2 measuring stands and one additional VRM module

## General accessories for viscosity

### Particle separation

**LMVZ958 Insert filter for EG 062 (50 ml)**

Incl. 100 units filter plates (EZ 209)

**LMVZ988 Insert filter for EG 094 (100 ml)**

Incl. adapter (HKF 048) and 100 units filter plates (EZ 209)

**HKF 048 Adapter for insert filter (LMVZ988)**

For 100ml flasks

**EZ 209 Filter plates**

Mw. 0.077 for insert filter (LMVZ958), 100 units

**EZ 209-2 Filter plates**

Mw. 0.01 for insert filter (LMVZ958), 100 units



LMVZ958

### Dosing and sample handling

**EG 060 Glass funnel**

For easy and clean handling of samples

**UD 410 Filter inserts for glass funnel (EG 060)**

Stainless steel, 20 units, 0.03 mm

**HX 615 Funnel for granules**

PVDF

**EGP 012 Disposable syringe**

20 ml, 100 units, PE / PP

**EGZ 015 Steel needles for disposable syringe (EGP 012)**

Stainless steel, 100 units

**EGZ 019 Glass syringe**

For applying polymer samples



EGP 012 | EGZ 015

### Waste and reservoir bottles

**LMRZ931 Set of flasks and tubings 15**

5x flasks DURAN (1x 2 liter, 4x 1 liter), 3x stopper with tubings

**LMRZ930 Set of flasks and tubings 24**

6x flasks DURAN (1x 5 liter, 2x 2 liter, 3x 1 liter), 3x stopper with tubings

**LMRZ907 Stopper with tubings**



LMRZ931



LMRZ907

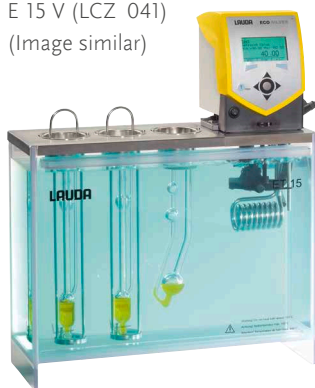
## Viscothermostats

LAUDA Scientific viscothermostats provide accurate tempering for all glass capillary viscometers. Various products are available to support different system configurations where international norm standards require a precise temperature stability (**ASTM 0445**, **ISO 3105** and **DIN 51562**).

### Viscocoool 6 S, Viscotemp 18 S, ET 15 S

#### ET 15 S

Incl. cover plate  
E 15 V (LCZ 041)  
(Image similar)



#### Viscocoool 6 S

With Peltier cool. unit,  
incl. cover plate  
(Image similar)



For R&D applications close to ambient temperature, the **Viscocoool 6** is the perfect selection. With a footprint of only 206x415 mm and an integrated thermoelectric unit it provides cooling without any additional devices.

The **ET 15 S** is a very economic bath made from polycarbonate where a maximum of three glass capillary viscometers for manual measurement using the stop watch or up to two automatic measuring stations for iVisc or S5 (PVS) can be used. If required, when using dilution viscometers for example, up to two magnetic stirrers can be added to the thermostat.

#### Viscotemp 18 S

Incl. cover plate  
18 5K (LCZ 0736)  
(Image similar)



The **Viscotemp 18 S** had been designed for temperatures around 100°C, e.g. for operation with silicone oils and aggressive samples. Cover plates for either five manual measuring units or for one iVisc or S5 measuring stand plus one additional glass capillary viscometer can be provided.

Technical features	Viscocoool 6 S (L001104)	Viscotemp 18 S (L001106)	ET 15 S (L001098)
Material bath vessel	Polycarbonate	Glass	Polycarbonate
Working temperature range	15...90°C	0 <sup>1)</sup> ...105°C	20 <sup>1)</sup> ...100°C
Temperature stability	± 0.01 K	± 0.01 K	± 0.01 K
Max. amount measuring stands	1	1	2
Max. amount manual thermost. positions	2	5	3
VRM mounting set available	✘	✘	✓
Heater power	1.3 kW	1.3 kW	1.3 kW
Bath volume	6.5 l	18.5 l	15 l
Voltage	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>
Dimensions (WxDxH)	206x415x530 mm	Ø310x510 mm	428x130x532 mm

<sup>1)</sup> Can be realized with external cooling

<sup>2)</sup> Other power supply variants on request

## Viscotemp 15 / 24 S

The Viscotemp 15 S / 24 S provides a high-quality stainless steel bath and glass window and can be used in the most common temperature range from 0 up to 105 °C. The well-arranged single-chamber system with optional background lighting allows a crystal-clear view and can be easily cleaned. Typical applications for that products are the determination of the viscosity index of motor oils or the solution viscosity of plastics.

The **Viscotemp 15 S** can be used with up to four manual measuring stations or two automatic measuring stands, iVisc or S5 (PVS).

**Viscotemp 24 S** offers the capacity to work with maximum seven viscometers or up to four automatic measuring stands. On both versions the VRM 4 cleaning module can be installed. The corrosion-resistant thermostating bath allow the handling with aggressive samples, e.g. polyamides dissolved in sulfuric acid and is approved for the usage of suitable silicon oils (e.g. Therm 180) as heat transfer liquid.

### L001105

#### Viscotemp 15 S

Incl. cover plate  
15 2V (LCZ 0730)  
(Image similar)



### L001107

#### Viscotemp 24 S

Incl. cover plate 24 4V (LCZ 0733)  
(Image similar)



### Special Features:

- || Corrosion-resistant stainless steel bath with 19 to 27 liter bath volumes
- || For up to 4 automatic or 7 manual measuring stations
- || Clear design makes quick cleaning possible
- || Variopump with six pumping levels and pump flow distribution for perfect homogeneity
- || Display with standards-compliant resolution of 0.01 K, intuitive operation via cursor and soft-keys

Technical features	Visctemp 15 S (L001105)	Viscotemp 24 S (L001107)
Working temperature range	0 <sup>1)</sup> ...105 °C	0 <sup>1)</sup> ...105 °C
Temperature stability	± 0.01 K	± 0.01 K
Max. amount measuring stands	2	4
Max. amount of manual thermostating positions	4	7
VRM mounting set available	✓	✓
Heater power	1.3 kW	1.3 kW
Bath volume	19l	27l
Glass pane size (W x H)	152 x 233 mm	329 x 233 mm
Voltage	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>
Dimensions (W x D x H)	532 x 233 x 552 mm	708 x 233 x 552 mm

<sup>1)</sup> Can be realized with external cooling

<sup>2)</sup> Further power supply variants on request

## Proline PV(L) 15 / 24 / 36

LAUDA Scientific Proline PV(L) viscothermostats provide an outstanding temperature stability and homogeneity over the complete temperature range for all typical viscosity applications. As such, they are ideal for use with the fully automated PVS-S5 or iVisc viscometer and they are mandatory for the use with the VAS autosampler systems. Thanks to the double-chamber principle, a constant liquid level in the measuring room is guaranteed – even when changing the temperatures.

The special **PVL models** are equipped with five layers of insulating glass. By connecting a PRO circulation thermostat RP 250 or RP 290, they are suited for low-temperature measurements down to -40 or -60 °C.

**L001533**  
**Proline PV 24**  
(Image similar)



**L001532**  
**Proline PV 15**  
(Image similar)



(Image similar)

**L003010**  
**Proline PV 15**  
With ball bearing and  
silicon oil heat transfer liquid

### Special Features:

- || Corrosion-resistant stainless steel bath with 15, 24 or 36 liter bath volume
- || Double-chamber system for constant liquid level in the measuring chamber of bath
- || Multi-glazing with optional heating avoids fogged up glass panes
- || For up to 6 automatic or 9 manual measuring stations
- || Integrated heat exchanger for counter-cooling, can be combined with LAUDA circulation thermostats
- || High control precision thanks to adaptive PID regulation
- || Optional external sensor controls the temperature at the measuring location
- || Integration of magnetic stirrers and combination with VAS systems possible

Technical features	PV 15 (L001532)	PV 24 (L001533)	PV 36 (L001534)	PVL 15 (L001538)	PVL 24 (L001539)
Working temperature range	0 <sup>1)</sup> ...230 °C	0 <sup>1)</sup> ...230 °C	0 <sup>1)</sup> ...230 °C	-60 <sup>3)</sup> ...100 °C	-60 <sup>3)</sup> ...100 °C
Temperature stability	± 0.01 K	± 0.01 K	± 0.01 K	± 0.01 K	± 0.01 K
Max. amount measuring stands	2	4	6	2	4
Max. amount manual positions	3	7	9	3	7
Heater power	3.5 kW	3.5 kW	3.5 kW	3.5 kW	3.5 kW
Bath volume	11...15 l	19...24 l	28...36 l	11...15 l	19...24 l
Glass pane size (W x H)	149 x 230 mm	326 x 230 mm	506 x 230 mm	149 x 230 mm	326 x 230 mm
Voltage	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>	230V, 50/60 Hz <sup>2)</sup>
Dimensions (W x D x H)	506 x 282 x 590 mm	740 x 282 x 590 mm	1,040 x 282 x 590 mm	506 x 282 x 590 mm	740 x 282 x 590 mm

<sup>1)</sup> Can be realized with additional LAUDA cooler    <sup>2)</sup> Further power supply variants on request    <sup>3)</sup> Can be realized with LAUDA RP 290

## Cover plates for viscothermostats

### Viscotemp 18

**LCZ 0737 Cover plate 18 1V1K**

For 1 measuring stand and 1 manual / thermostating position

**LCZ 0736 Cover plate 18 5K**

For 5 manual / thermostating positions



**LCZ 0737**



**LCZ 0736**

### ET 15

**LCZ 041 Cover plate E 15 V**

For 2 measuring stands

**LCZ 040 Cover plate E 15 VK**

For 1 measuring stand and 2 manual / thermostating positions

**LCZ 0685 Cover plate E 15 K**

For 3 manual / thermostating positions



**LCZ 041**

### Viscotemp 15

**LCZ 0730 Cover plate 15 2V**

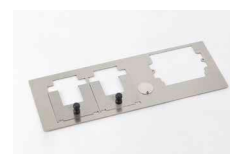
For 2 measuring stands

**LCZ 0731 Cover plate 15 1V2K**

For 1 measuring stand and 2 manual / thermostating positions

**LCZ 0729 Cover plate 15 4K**

For 4 manual / thermostating positions



**LCZ 0730**



**LCZ 0731**

### Viscotemp 24

**LCZ 0733 Cover plate 24 4V**

For 4 measuring stands

**LCZ 0734 Cover plate 24 2V4K**

For 2 measuring stands and 4 manual / thermostating positions

**LCZ 0732 Cover plate 24 7K**

For 7 manual / thermostating positions



**LCZ 0729**



**LCZ 0732**

### Proline PV 15

**LTZ 045 Cover plate PV 15 V**

For 2 measuring stands

**LTZ 048 Cover plate PV 15 VK**

For 1 measuring stand and 2 manual / thermostating positions

**LTZ 017 Cover plate PV 15 K**

For 3 manual / thermostating positions



**LTZ 045**

## Cover plates for viscothermostats



LTZ 049



LTZ 052



HDQ 090



HDQ 093

### Proline PV 24

#### LTZ 046 Cover plate PV 24 V

For 4 measuring stands

#### LTZ 049 Cover plate PV 24 VK

For 3 measuring stands and 3 manual /thermostating positions

#### LTZ 019 Cover plate PV 24 5K

For 5 manual /thermostating positions

#### LTZ 023 Cover plate PV 24 7K

For 7 manual /thermostating positions

### Proline PV 36

#### LTZ 047 Cover plate PV 36 V

For 6 measuring stands

#### LTZ 021 Cover plate PV 36 K

For 9 manual /thermostating positions

### General

#### LTZ 052 Retrofit kit for manual measurements

For cover plates V / VK

#### HDR 016 Lid (round)

For use in K-cover plates

#### HDQ 090 Closing lid

For V-cover plates, complete

#### HDQ 093 Closing lid

For V-cover plates, using measuring stands

## Accessories for viscothermostats



LCZ 9738 | LCZ 9739 | LCZ 9740

#### LCZ 9681 Heatable window frame for Proline PVL 15

Avoids fogged up glass panes, LiBus (optional, installing by factory)

#### LCZ 9682 Heatable window frame for Proline PVL 24

Avoids fogged up glass panes, LiBus (optional, installing by factory)

### Bath illumination

#### LCZ 9738 Background lighting BL 15

LED back-light panel for Viscotemp 15 and Proline PV(L) 15

#### LCZ 9739 Background lighting BL 24

LED back-light panel for Viscotemp 24 and Proline PV(L) 24

#### LCZ 9740 Background lighting BL 36

LED back-light panel for Proline PV 36

#### EKS 068 Extension cable LiBus

5 m, for Background lighting BL 36 (LCZ 9740)



## Accessories for viscothermostats

### LRZ 913 RS 232/485 Interface for PV(L) viscothermostats

Plug-in module upgrading a LAUDA PV(L) viscothermostat with a RS 232/485 interface, necessary for temperature control via PC with PVS software module TEMP-DLL (LDVM2023)

### ETP 059 External temperature probe PT100-94

For viscothermostats

### LRZ 918 Pt 100 LiBus module

Plug-in unit for use with external temperature probe PT100-94 (ETP 059)



LRZ 913

## Magnetic stirrer equipment for dilution viscometry

### LMZ 841 Single-place magnetic stirrer set

For ET 15 s (retrofitting possible)

### LMVZ967-1 Two-place magnetic stirrer set for PV15

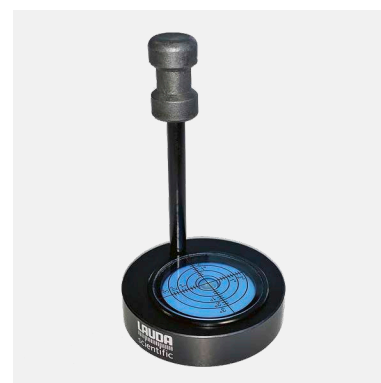
With control unit, installing by factory

### LMVZ968-1 Four-place magnetic stirrer set for PV24

With control unit, installing by factory

### UD 1190 Spirit level

For viscometer alignment



UD 1190

## Add. external cooling equipment

### L001046 LAUDA Microcool MC 250 (230V / 50Hz)

Circulation chiller, working temp. range -10...+40°C, temperature stability 0.5 ± K, other power supply variants on request, requires silicone tubing (LZS 007)

Use with Viscotemp and ET 15 S requires cooling coil set (LCZ 0719)

### LMVZ884 Cool.Fix

Heat exchanger for temperatures up to -50°C, incl. 2x metal tubing MK 100 (LZM 053)

Requires external cooling-heating circulator (e.g. LAUDA PRO RP 290 E)

### L000022 LAUDA PRO RP 245 E (230V / 50Hz)

Compact circulation thermostats for use with Proline PVL thermostats, working temp. range -45...+200°C, temperature stability 0.05 ± K, heater power max. 2.5 kW, cooling output (at 20°C) 0.8 kW, (at -30°C) 0.15 kW, other power supply variants on request

### L002502 LAUDA PRO RP 290 E (230V / 50Hz)

Compact circulation thermostats for use with Proline PVL thermostats, working temp. range -90...+200°C, temperature stability 0.05 ± K, heater power max. 2,5 kW, cooling output (at 20°C) 0,8 kW, (at -60°C) 0,39 kW, other power supply variants on request



LAUDA Microcool MC 250



LMVZ884  
Cool.Fix

## Accessories for additional external cooling equipment



**LCZ 0719**  
Cooling coil set



**LZS 007**

### **LCZ 0719 Cooling coil set**

For use with circulating chillers and viscothermostats ET 15 S and Viscotemp series, also suitable for direct use with tap water

### Tubings

For connecting circulation chillers with the cooling coil of viscothermostats

#### **LZS 001 Silicone tubing**

8 mm inner diameter (9 mm insulated), price per meter

#### **LZS 007 Silicone tubing**

11 mm inner diameter (9 mm insulated), price per meter

#### **LZM 053 Metal tubing MK 100**

M16X1, 100cm, for temperatures -90...150°C,  
2 pcs. needed per each thermostat

#### **LZM 055 Metal tubing MK 200**

M16X1, 200cm, for temperatures -90...150°C,  
2 pcs. needed per each thermostat

#### **LZS 018 Viton tubing**

12 mm inner diameter (10 mm insulated), price per meter  
for temperatures -20...150°C

#### **HKA 068 Adapter**

M16X1 – M14X1,5

#### **EZS 012 Tubing clamp**

For silicon and viton tubings (LZS 001, LZS 007, LZS 018)

## Heat transfer liquids



**LZB 114 | LZB 214 | LZB 314**

### Silicon oil

Temperature ranges: 0...180°C<sup>1)</sup> | **10...110°C<sup>2)</sup>**

**LZB 114 Therm 180, 5 l**

**LZB 214 Therm 180, 10 l**

**LZB 314 Therm 180, 20 l**

Temperature ranges: 90...200°C<sup>1)</sup> | **90...150°C<sup>2)</sup>**

**LZB 122 Therm 250, 5 l**

**LZB 222 Therm 250, 10 l**

**LZB 322 Therm 250, 20 l**

Temperature ranges: -20...180°C<sup>1)</sup> | **-20...100°C<sup>2)</sup>**

**LZB 116 KRYO 20, 5 l**

**LZB 216 KRYO 20, 10 l**

**LZB 316 KRYO 20, 20 l**

Temperature ranges: -50...120°C<sup>1)</sup> | **-40...50°C<sup>2)</sup>**

**LZB 121 KRYO 51, 5 l**

**LZB 221 KRYO 51, 10 l**

**LZB 321 KRYO 51, 20 l**

<sup>1)</sup> Temperature range  
technically approved

<sup>2)</sup> Temperature range recommended  
for viscosity measurement

## Heat transfer liquids

### Silicon oil

Temperature ranges: -70...30 °C<sup>1)</sup> | -60...30 °C<sup>2)</sup>

**LZB 130** KRYO 95, 5l

**LZB 230** KRYO 95, 10l

**LZB 330** KRYO 95, 20l

**LZB 929** Aqua Stab water stabilizer, 100 ml

Algicide for viscothermostats, not suitable for Viscocool 6 and ET 15



**LZB 929**  
Aqua Stab

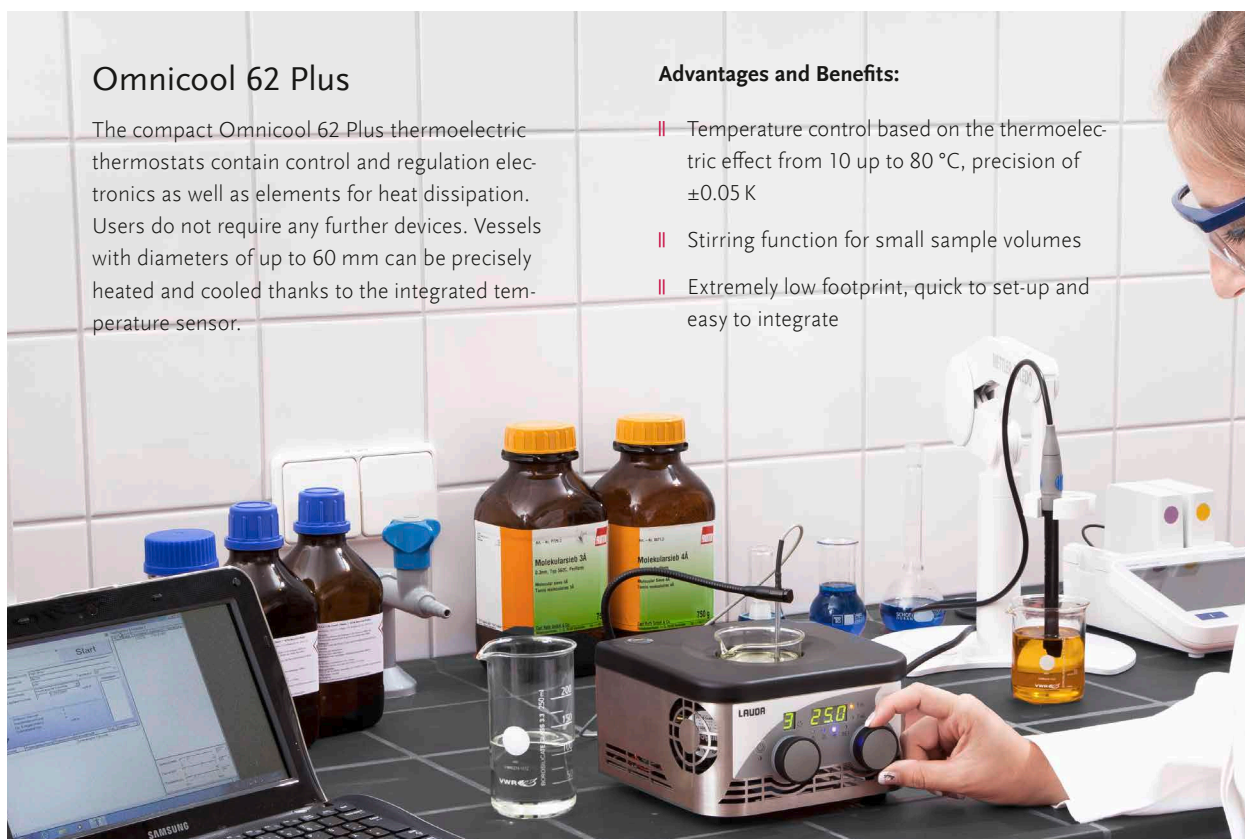
## Omnicool 62 Plus

### Omnicool 62 Plus

The compact Omnicool 62 Plus thermoelectric thermostats contain control and regulation electronics as well as elements for heat dissipation. Users do not require any further devices. Vessels with diameters of up to 60 mm can be precisely heated and cooled thanks to the integrated temperature sensor.

#### Advantages and Benefits:

- || Temperature control based on the thermoelectric effect from 10 up to 80 °C, precision of ±0.05 K
- || Stirring function for small sample volumes
- || Extremely low footprint, quick to set-up and easy to integrate



### LMP 8003 Omnicool 62 Plus

Incl. Sample beaker 150 ml, 60x80 mm (EG 082-1), PTFE magnetic stirrer bar (EZ 195), external temperature probe PT 1000 (ETP 088) and holder for temperature probe (LMZ 056)

#### EG 082 Sample beaker

50 ml, 60x80 mm, 10 pcs.

#### EZ 195 PTFE stirrer bar

magnetic, small (5x250 mm)

#### ETP 088 External temperature probe PT 1000

#### LMZ 056 Holder for temperature probe PT 1000



**ETP 088**



**LMZ 056**

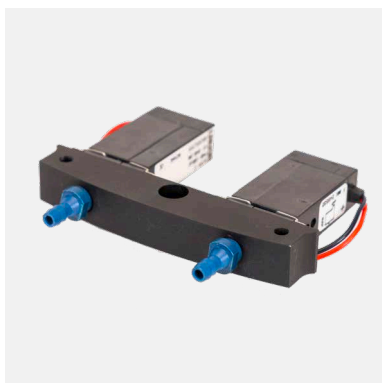
## Spare parts for Viscometry



HKO 064



LMRZ929



HX 628-A



HX 546

### Measuring stands (iVisc and S5)

#### RKJ 020 Viton tube

Metre goods, for connecting iVisc and S5 with capillary, inner diameter 3 mm, wall thickness 1 mm, black

#### HKO 064 Screw-in tube connector

For iVisc and S5 air outlet and pressure balancing connector

#### EMP 084 Membrane pump

For pressing up the sample, 3 V, DC

#### HOB 029 Optical fiber rod bottom/left

#### HOB 030 Optical fiber rod bottom/right

#### HOB 031 Optical fiber rod top/left

#### HOB 032 Optical fiber rod top/right

#### EZ 288 Offset screwdriver

For easy loosening of screws when changing optical fibers

#### LMRZ928 Set of connection caps (Silicon)

Red, with tubings

#### LMRZ929 Set of connection caps (Viton)

Black, with tubings, for use with H<sub>2</sub>SO<sub>4</sub>

### iVisc only

#### EKS 083 USB connection cable iVisc to PC

USB 2.0 Type A to Type B, Length 1.5 m, black

#### HX 628-A Valve block iVisc

Complete valve unit for pumping and measuring

#### EVM 112 Magnetic valve for valve block iVisc (HX 628-A)

Single magnetic valve for pumping or measuring

#### UL 595--E Circuit board measuring stand iVisc

Pre-programmed circuit board (serial number of dedicated iVisc needs to be advised)

### S5 only

#### RKJ 014 Silicon tube

Metre goods, for connecting S5 with capillary, inner diameter 3 mm, wall thickness 1.5 mm, temperature resistance up to -80°C

#### HX 546 Valve block S5

Complete valve unit for pumping and measuring

#### EVM 086 Magnetic valve for valve block S5 (HX 546)

Single magnetic valve for pumping or measuring

#### HOE 302 Connection tube

For pump

#### UYI 018 EPROM micro controller for S5 stand

Needed in case of firmware update

#### UL 484--E Circuit board measuring stand S5

Spare circuit board incl. pump (EMP 084)

## Spare parts for Viscometry

### PVS control box

**UK 230** Connection cable PVS box to S5 stand  
2 m, with connector M9 7 pin

**EKS 037** Connection cable RS232 PVS box to PC  
2 m, with connector RS232 (Sub-D 9 pin)

**EEF 012** Micro fuse  
G 5x20 TR 1A, for the power supply unit of the PVS box

### Automatic dilution

**UD 652** Valve unit / overpressure safety valve  
For PVS systems with automatic viscometer cleaning,  
for 1 dosing unit max. 2 viscometer

**UK 233** Connection cable for valve unit (UD 652)

**HKA 118** Connection cab large, Viton

**EZ 277** Coupling MT

**EZ 278** Dosing tube MT

**EBK 017-1** Burette top part, 20 ml  
For replacement, used with MT burette dosing unit (EBK 016)

### Cleaning module VRM

**LMRZ932** Set of tubes WR  
Connection tubes VRM to waste and reservoir bottles

**LMRZ937** Set of tubes 4-leg  
Connection tubes VRM and S5 stand to capillary with aspiration tube

**LMRZ938** Set of tubes 3-leg  
Connection tubes VRM and S5 stand to capillary without aspiration tube

**LMRZ939** Set of tubes for dilution  
Connection tubes VRM, S5 stand and burette to dilution capillary

**UD 500** Manual transfer lock 1  
For viscometer with aspiration leg (Type 2/6)

**UD 501** Manual transfer lock 2  
For viscometer without aspiration leg (Type 1/3/4/5/7)

**UD 702** Manual transfer lock 4  
For viscometer with aspiration leg and high viscosity (Type 2, type 6)

**HKR 208** Disc VRM  
For sealing manual transfer lock 1 (UD 500)

**HKR 226** Disc VRM  
For sealing manual transfer lock 2 (UD 501)

**EDO 018** O-ring for transfer lock  
For Micro and Dilution Ubbelohde

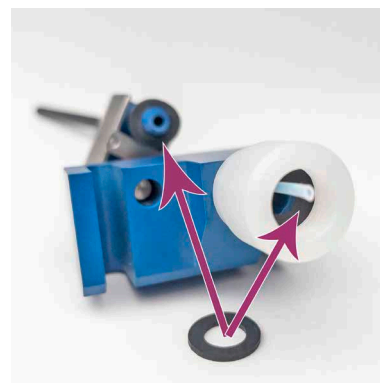
**UD 651** Valve unit complete  
For connecting VRM 4 HT (LMR 913)



UD 652



EBK 017-1



HKR 208



HKR 226

## Spare parts for Viscometry



**HX 590-B**



**HX 589-B**



**HX 592-1**



**EVM 116**

### Cleaning module VRM

**UK 230** Connection cable VRM to PVS 1

**UD 753** Pumping set VRM 4

Containing pump (EMP 138) and connection tubes

**UD 754** Pumping set VRM 4 S

Containing pump (EMP 175) and connection tubes

**HX 589-B** Plug-in unit

For dosing VRM 4 and VRM 4 HT

**HX 590-B** Plug-in unit

For aspirating VRM 4

**HX 591** Plug-in unit

Electronic part for VRM 4

**HX 631-B** Plug-in unit

For dosing H<sub>2</sub>SO<sub>4</sub> VRM 4 S

**HX 632-B** Plug-in unit

For aspirating H<sub>2</sub>SO<sub>4</sub> VRM 4 S

**HX 635-A** Plug-in unit

For aspirating VRM 4 HT

**UL 578-1E** Circuit board

Electronic for Plug-in unit (HX 591) for VRM 4

**HX 592-1** Valve block 3-way

Aspirating part, for VRM 4

**HX 593-1** Valve block 4-way

Dosing part, for VRM 4

**HX 634-1** Valve block 3-way

Aspirating part, for VRM 4 S

**HX 633-1** Valve block 4-way

Dosing part, for VRM 4 S

**EVM 116** Magnetic valve for valve blocks VRM 4

For valve blocks HX 592-1, HX 593-1

**EVM 117** Magnetic valve for valve blocks VRM 4 S

For valve blocks HX 633-1, HX 634-1

**EMZ 110** Valve plate

For pumping set VRM 4 (UD 753) and VRM 4 S (UD 754)

**EMZ 111** Valve membrane

For pumping set VRM 4 (UD 753) and VRM 4 S (UD 754)

**UD 643** Magnetic valve direction A

2-2 way, incl. plug

**UD 644** Magnetic valve direction B

2-2 way, incl. plug

**EDO 068** O-ring for pumping set

For VRM 4 (UD 753) and VRM 4 S (UD 754)

## Spare parts for Viscometry

### VAS 1 (up to 2018) and VAS 2 (from 2018)

**UD 701-B Automatic transfer lock 1**

For viscometer with aspiration leg (Type 2/6)

**UD 703-B Automatic transfer lock 2**

For viscometer without aspiration leg (Type 1/3/4/5/7)

**UD S334 Dosing syringe 5ml for VAS, standard quality SS**

Not suitable for the usage with dichloroacetic acid and sulfuric acid

**UD 556 Dosing syringe 5ml for VAS, high quality SS**

Recommended for usage with sulfuric acid

**UD 442-1 Dosing syringe 5 ml for VAS, titanium**

Recommended for usage with dichloroacetic acid

**HKR 208 Disc VRM**

For sealing automatic transfer lock 1 (UD 701-B)

**HKR 226 Disc VRM**

For sealing automatic transfer lock 2 (UD 703-B)

**EDO 018 O-ring for transfer lock**

For Micro and Dilution Ubbelohde

**HKO 064 Screw-in tube connector**

For S5 air outlet and pressure balancing connector

**LMVZ943 Plug-in unit for 4 motor lock control**

### VAS 2 only (from 2018)

**EZ 823 Syringe protection tube Titanium for VAS 2**

### VAS 1 only (up to 2018)

**EBE 038 External controller unit for VAS 1**

**EZ 207 Rubber cord weight relief (280–290 mm)**

**EZ 208 Rubber cord needle wiper (90–95 mm)**

**EZ 317 Clamping piece (black frame)**

For syringe (requires EZ 289)

**EZ 289 Syringe holder (blue)**

**EZ 261 Syringe protection tube for VAS 1**

**EZ 261-1 Syringe protection tube Titan for VAS 1**



UD 701-B



UD S334 | UD 556 | UD 442-1



HKO 064

## Spare parts for Viscometry



**EU 260**

### Viscothermostats

**EKS 097 Connection cable**

For Proline PV(L) viscothermostats

**UK 263 Mains control cable**

For Proline PV(L) in connection with DLK 10/25

**LCZ 0785 Bath 15 T**

For ET 15, polycarbonate, transparent

**EGG 014 Bath ETG 18**

For Viscotemp 18, glass, transparent

**EU 260 Bath ETP 6**

For Viscocool 6, polycarbonate, transparent



||||| **Tensiometer** – For the measurement  
of surface and interfacial tension



## TC1 manual ring / plate tensiometer



The LAUDA Scientific TC1 is a stand-alone, manual tensiometer for research, quality control and education. Wherever surface tension and interfacial tension measurements according to the Du-Noüy ring and Wilhelmy plate methods are needed – the TC1 is just doing that according to international standards. It is used in the field of transformer oils, in cleaning processes, in the beverage industry and in many other areas. Their precise load cells and robust construction make the TC1 a perfect match when an easy-to-use instrument with high precision is needed. The TC1 manual tensiometer with its measurement templates offers exactly that, along with an unmatched reproducibility and a robust design.

### Special Features:

- || Wide measurement range up to 300 mN/m (0.01 mN/m resolution)
- || Automatic detection of the maximum force for accurate measurement
- || Automatic Zuidema and Waters correction for precise correction of Du-Noüy ring measurements
- || User-friendly due to an innovative measuring assistant including predefined standard methods
- || Intuitive touch-based graphical user interface with integrated user management including different user levels to meet GLP requirements
- || Optional temperature control without additional bench space requirements

### Scope of supply:

- || TC1 manual tensiometer, incl. Tensio.Touch control and mains cable (EU)
- || Measuring ring acc. to Du-Noüy, 2-legged (Pt/Ir) (EZ 325)
- || Calibration weight 500 mg (EZ 033-1) and tweezers (EZ 034)
- || Density measurement set (UD 320)
- || Sample beakers,  $\varnothing$  6 cm, 10 units (EG 011)

Technical features	TC1 (LMT 870)
Surface tension measuring range	0...300 mN/m (ring) 0...999 mN/m (plate)
Surface tension resolution	0.01 mN/m
Density resolution	0.002 g/cm <sup>3</sup>
Weighing system resolution	0.1 mg
Table movement	Manual (precision drive)
Ring correction	Automatic (acc. Zuidema and Waters)
Predefined methods in acc. to	ASTM D971, EN 14210, IEC 62961, EN 14370, EN 14059 and more
Temperature range with PTT+ TDJ 805	5...80 °C
Dimensions (W x D x H)	230 x 230 x 391 mm
Power consumption	10 W
Weight, net	9.5 kg

## TD4 fully automated ring / plate tensiometer

The LAUDA Scientific TD4 is an fully automated stand-alone tensiometer for research and quality control. Wherever surface tension and interfacial tension measurements according to the Du-Noüy ring and Wilhelmy plate methods is needed – the TD4 is just doing that according to international standards. It is used in the field of transformer oils, in cleaning processes, in the beverage industry and in many other areas. Its precise load cell, position sensor and sample stage motor makes the TD4 a perfect match when an easy-to-use instrument with high precision is needed. Due to its motor driven stage the TD4 with its measurement templates offers user-independency and high resolution, even at low interfacial tensions.

### Special Features:

- || Wide measurement range up to 300 mN/m (0.01 mN/m resolution)
- || User-independent measurements with automatic maximum detection and sample stage movement
- || Automatic Zuidema and Waters correction for precise correction of Du-Noüy ring measurements
- || Precise, high-resolution distance measurement for exact measurements with the Wilhelmy plate method
- || User-friendly due to an innovative measuring assistant including predefined standard methods
- || Intuitive touch-based graphical user interface with integrated user management including different user levels to meet GLP requirements
- || Optional temperature control without additional bench space requirements



Technical features	TD4 (LMT 860)
Surface tension measuring range	0...300 mN/m (ring) 0...999 mN/m (plate)
Surface tension resolution	0.01 mN/m
Density resolution	0.002 g/cm <sup>3</sup>
Weighing system resolution	0.1 mg
Table movement	Automatic
Ring correction	Automatic (acc. Zuidema and Waters)
Predefined methods in acc. to	ASTM D971, EN 14210, IEC 62961, EN 14370, EN 14059 and more
Temperature range with PTT+ TDJ 805	5...80 °C
Dimensions (WxDxH)	245 x 205 x 335 mm
Power consumption	10 W
Weight, net	11 kg

### Scope of supply:

- || TD4 automatic tensiometer, incl. Tensio.Touch control and mains cable (EU)
- || Measuring ring acc. to Du-Noüy, 2-legged (Pt/Ir) (EZ 325)
- || Calibration weight 500 mg (EZ 033-1) and tweezers (EZ 034)
- || Density measurement set (UD 320)
- || Sample spacer S, height 16 mm (LMTZ935)
- || Sample beakers, ø 6 cm, 10 units (EG 011)

## TD5 the compact scientific instrument with perfect control and new methods

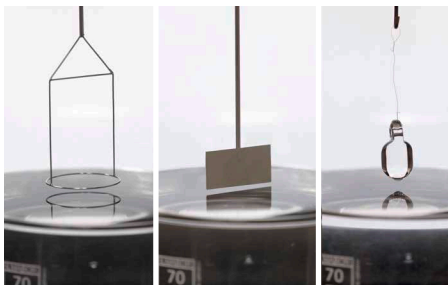
The Du Noüy-ring/Wilhelmy-plate method for the measurement of surface and interfacial tension in liquids is an established method for the characterization of surfactant solutions, oils and other liquids. With the TD5 and its powerful Surface.Meter software you have full control of the measurement as you see all raw data in real time. On top of this, the TD5 offers unique methods like the drop adhesion force measurements. The latter is of specific interest as it allows to directly measure the liquid-solid interactions. With this and other features the TD5 is one of the most compact research-grade tensiometer on the market.



### Special Features:

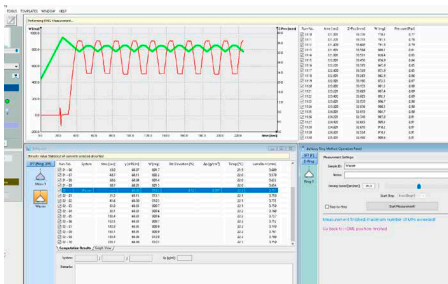
- || Extremely compact research tensiometer
- || Surface/Interfacial tension measurement with full control
- || Powerful Surface.Meter software
- || Advanced analytical methods like drop adhesion force tests

## For research, quality control and product development



### Measurement modes and options

- || Surface tension and interfacial tension measurements according to the respective norms
- || Surface and Interfacial tension measurements using the Pull-through method
- || Density measurement software and tool included
- || Drop adhesion measurements to determine solid liquid interactions
- || Micro-Penetration measurements optional
- || Internal and external calibration. External calibration weight included
- || Temperature range 5...80°C, optional temperature sensor available



### Comprehensive Software with full control

- || Surface.Meter software for standard surface and interfacial tension measurements and drop-adhesion force measurements
- || Complete control over all parameters like weight and position
- || Easy data handling and export for all QC and research purposes
- || Integrated liquid database
- || Integrated calibration procedure with the option to use an external calibration weight
- || Sample area is protected by windshield and the sample spacers allow measurement of small sample volumes

## Accurate temperature with TDJ 80 temperature control unit and LOOP

- || Low space requirement with convenient controls within the Surface.Meter software
- || Temperature-controlled measurements between 5 and 80 °C



## Innovative drop-adhesion force measurement

- || Precise measurement of solid-solid and liquid-solid interactions
- || With the help of a cuvette various environmental phases are possible, allowing also the measurement of bubble-solid interactions
- || Precise measurement of solid-solid and liquid-solid interactions



### Scope of supply:

- || TD5 automatic tensiometer, incl. Surface.Meter software
- || Measuring ring acc. to Du-Nouüy, 2-legged (Pt/Ir) (EZ 325)
- || Calibration weight 500 mg (EZ 033-1) and tweezers (EZ 034)
- || Density measurement set (UD 320)
- || Sample beakers,  $\varnothing$ 6 cm, 10 units (EG 011)

Technical features	TD5 (LMT 880)
Surface tension measuring range	0,75...2000 mN/m (ring) 0...999 mN/m (plate)
Surface tension resolution	0.01 mN/m
Density resolution	0.002 g/cm <sup>3</sup>
Weighing system resolution	0.1 mg
Maximum Weight	210 gr
Table movement	Motor driven PC controlled (precision drive)
Ring correction	Automatic (acc. to Zuidema and Waters)
Temperature range with PTT+ TDJ 805	5...80 °C
Dimensions (WxDxH)	226x 189x 360 mm
Power consumption	15 W
Weight, net	11.3 kg

### LMTZ936 Drop-adhesion force tool

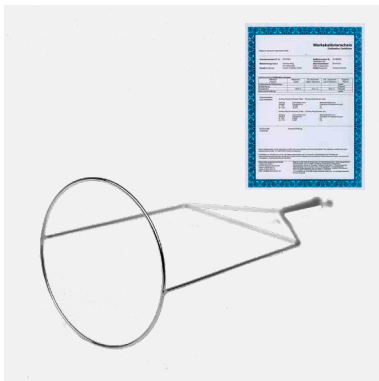
For the measurement of solid-solid and liquid-solid interactions  
Consisting of:

- || Needle holder (LMTZS100)
- || LNE 23 (EZ 532), LNE 20 (EZ 529), LNE 18 (EZ 527)

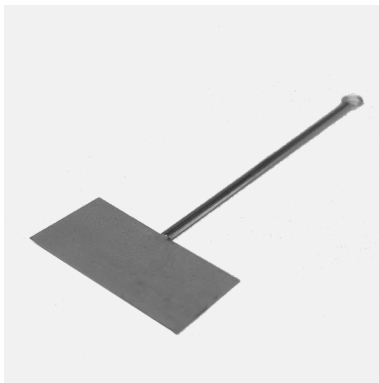
### General accessories

- LMTZ934** Sample spacer L50, Height 32 mm
- LMTZ935** Sample spacer S50, Height 16 mm
- LMTZ937** Sample spacer L70, Height 25 mm
- LMTZ938** Sample spacer L80, Height 19 mm

## Accessories for ring / plate tensiometers



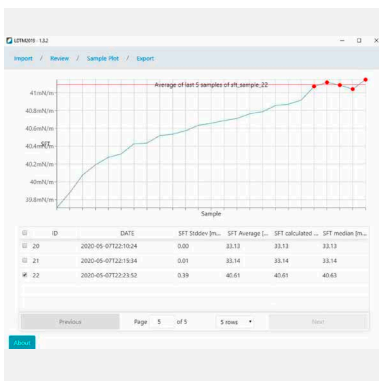
**SDK 006**  
Certificate for measuring ring



**EZ 324**  
Wilhelmy plate



**LMTZ934**



**LDTM2019**

### Certified calibration

**SDK 005 Calibration for tensiometers**

Meas. method acc. to standard DAkkS-DKD-R 3-3, meas. range up to 2,5g, calibration certificate issued by an accredited testing laboratory

**SDK 006 Certificate for measuring ring**

Calibration certificate issued by an accredited testing laboratory (ring has to be ordered separately)

**EZ 033-2 Calibration weight (500 mg) with DKD certificate**

### General accessories

**EZ 325 Measuring ring 2-legged**

According to Du Noüy (Pt/Ir), platinum, length 48 mm

**EZ 326 Measuring ring 4-legged**

According to Du Noüy (Pt/Ir), platinum, length 48 mm

**EZ 324 Wilhelmy plate**

Platinum, height 48 mm (incl. shaft)

**EZ 033-1 Calibration weight (500 mg)**

**UD 320 Density measurement set**

**EG 004 Sample beakers**

For density measurement, 50 ml, 10 units

**EG 011 Sample beakers**

ø6 cm, 10 units

**EG 081 Sample beakers**

ø7 cm, 10 units

**EG 010 Sample beakers**

ø8 cm, 10 units

**EG 047-1 Double-walled glass thermostating vessel**

For TD / TC tensiometers, height 30 mm

**EZ 286 Bunsen burner**

For cleaning ring and plate

### Data output

**LMC 820 Matrix printer**

For data logging

**EAZ 041 Print ribbon**

Spare for matrix printer (LMC 820)

**EAZ 035 Paper rolls**

For matrix printer (LMC 820), 10 rolls

### Software

**LDTM2019 Data transfer software**

For data export from a TC1 / TD4 to a PC (e.g. to Microsoft Excel)

## Temperature control for ring / plate tensiometers

### LMTZ832

#### Thermoelectric thermostating unit PTT+ (230V / 50Hz)

Thanks to its small footprint (11 x 13 cm) the PTT+ can extend our tensiometers with an active temperature control. The integrated adjustable stirrer accelerates the temperature adjustment of your samples within 5...80°C at a stability of <0.1°C. All menu items can be easily operated with single push/turn button. Other power supply variants on request.

#### Included accessories:

- || PT 100 temperature probe for external control (UD 711)
- || PTFE magnetic stirrer bar 4,5x 15 mm (EZ 265)
- || Sample beaker  $\varnothing$ 6 cm (EG 011-1)
- || Connection cable (EKS 097)



### LMTZ933 Thermostated jacket TDJ 805

Enables fast and effective temperature control of your samples by connecting an external thermostat (e.g. LAUDA Loop 100), incl. sample beaker  $\varnothing$ 6 cm (EG 011-1) and windshield, temperature range 5...80°C

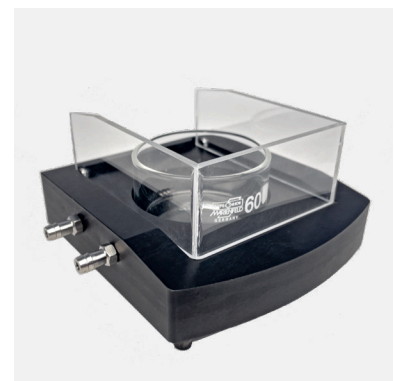
### UD 711 Temperature probe

PT 100 temperature probe for external control

## Accessories for temperature control (TC1 only)

### HF 513 Adapter plate

For mounting PTT+ (LMTZ832) or thermostated jacket TD (LMTZ933) on a TC1 tensiometer



LMTZ933

## Spare parts for tensiometer models TD1C / TD3/MPT C

### EZ 141 Measuring ring 2-legged

According to Du-Nouÿ (Pt/Ir), platinum, length 40 mm

### EZ 250 Measuring ring 4-legged

According to Du-Nouÿ (Pt/Ir), platinum, length 45 mm

### EZ 251 Wilhelmy plate

Platinum, height 45 mm (incl. shaft)

### EG 077 Capillaries, glass

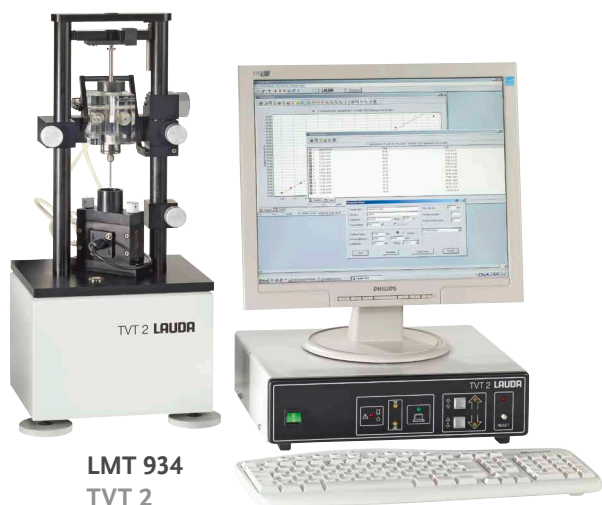
10 units, for MPT C

### UD 675 Holder for capillaries

Angular, incl. 10 capillaries (EG 077)

### LMTZ929 Capillary, steel

## TVT 2 drop volume tensiometer



The LAUDA Drop Volume Tensiometer TVT 2 is used to measure the surface and interfacial tension of liquids. Its strengths lies in the high-precision determination of dynamic interfacial tension.

The TVT 2 uses the fact that the volume of a drop released from a needle in air is dependent on its surface tension or on its interfacial tension between the two phases, if released into a second, immiscible phase (oil).

With the TVT 2, this measuring principle has been brought by LAUDA Scientific into a measuring device that is easy to use at the same time, thanks to precision engineering.

### Special Features:

- || Characterization of the dynamic behaviour of surfactant molecules at the surface and interface within seconds or hours
- || High-precision measuring of interfacial tensions in a very wide range down to very small values (0.1 mN/m)
- || Measurements on highly volatile and/or toxic substances through gas-tight system sealing
- || No wetting problems as occurs, for example, with ring, plate and frame methods
- || Low sample requirements (0.25...5 ml)
- || Simple thermostating options over a wide temperature range (5...90°C)
- || Measurements of rising and falling drops
- || Syringes and needles for various applications
- || Highly viscous and skin-forming liquids are easily and rapidly measured

### Scope of delivery:

TVT 2 incl. software, RS232 cable and mains cable Schuko / EU (LMT 934)

### Including:

- || TVT 2 Electronic part (TMT 833)
- || TVT 2 Mechanical part (TMT 934)

### Included accessories:

- || Syringe 250µl (EGP 007)
- || Standard needle SK1 (EGZ 005)
- || Cuvette standard (EGG 011)
- || Cuvette handling tool (UD 329)

## Accessories for drop volume tensiometer



EGP 006 | EGP 008 | EGP 007

### Syringes

- EGP 009 Syringe 250 µl
- EGP 010 Syringe 500 µl
- EGP 006 Syringe 1 ml
- EGP 007 Syringe 2,5 ml
- EGP 008 Syringe 5 ml
- DMU 013 Spare screw cap for needles
- EGG 011 Cuvette standard (50 x 50 x 10 mm)
- UD 329 Cuvette handling tool
- EKN 040 Mains cable for US



## Accessories for drop volume tensiometer

### Needles

**EGZ 005 Standard needle SK1**

Outer radius: 1.38 mm, inner radius: 1.08 mm

**EGZ 004 Standard needle SK2**

Outer radius: 1.05 mm, inner radius: 0.80 mm

**EGZ 006 Standard needle SK3**

Outer radius: 1.70 mm, inner radius: 1.35 mm

**EGZ 007 Standard needle SK4**

Outer radius: 0.63 mm, inner radius: 0.42 mm

**HX 453 Standard needle SK5**

Outer radius: 1.50 mm, glass

**HX 362 Aspiration tube**

For standard measurement

### Reverse measurement

**LMTZ908 Reverse measurement set**

**Including:** needle adapter (HX 410), reverse needle UK1 (HX 381), reverse needle UK2 (HX 380), reverse needle UK3 (HX 382), reverse needle UK4 (HX 441), suction tube (HX 383) and PTFE seal (HPR 159)

**HX 410 Needle adapter**

**HX 381 Reverse needle UK1**

Outer radius: 1.38 mm, inner radius: 1.08 mm

**HX 380 Reverse needle UK2**

Outer radius: 1.05 mm, inner radius: 0.80 mm

**HX 382 Reverse needle UK3**

Outer radius: 1.70 mm, inner radius: 1.35 mm

**HX 441 Reverse needle UK4**

Outer radius: 0.63 mm, inner radius: 0.42 mm

**HX 383 Suction tube (reversion)**

**HPR 159 PTFE seal**

### Temperature control

**L001249 LAUDA RE 415 S (230V / 50 Hz)**

Allows the measurement and the control of the temperature in the measuring cell in combination with temperature probe (US 055) and Pt 100 LiBus module (LRZ 918), other power supply variants on request

**LZS 007 Silicone tubing**

11 mm inner diameter (9 mm insulated), price per meter

**LRZ 918 Pt 100 LiBus module**

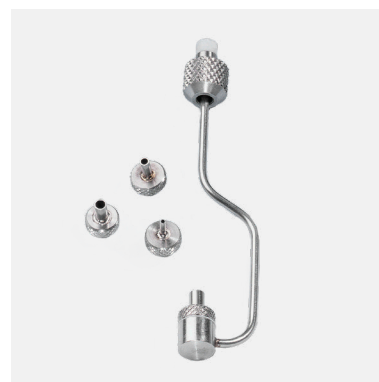
Plug-in unit for use with external temperature probe (US 055)

**US 055 Temperature probe for measuring cell**

**EKS 089 USB cable for ECO**



EGZ 007 | EGZ 006 | HX 453



LMTZ908  
Reverse measurement set



L001249  
LAUDA RE 415 S



US 055



# Contact Angle Instruments – For the measurement of surface properties

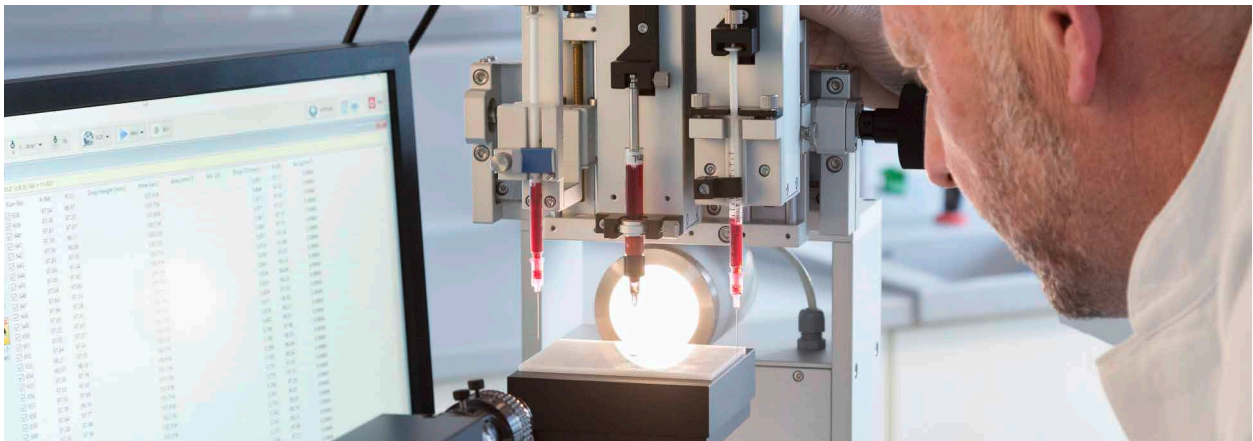


## LAUDA Scientific Surface Analyzer

### Precise software for all measuring tasks

The accuracy of contact angle and surface tension measurement based on optical systems is depending to a large extent on the software algorithms. LAUDA Scientific offers you a package for every application, adaptable to different tasks and accessories. Features such as high-speed video recording, predefinable methods, an extensive fluid library and comprehensive adaptability are convincing in practice.

In addition, there are also special methods for very small contact angles and for automatic baseline determination even for difficult surfaces. Various data export formats, focus assistant, evaluation modules for surface energy and control options for sample axes and rotating tables as well as various dosing systems supports you and your application.



## Software specifications and features

### Contact angle

- || Measurement methods supported: sessile drop, captive bubble, pendant drop
- || Range:  $0^\circ < \theta < 180^\circ$
- || Resolution: 0.01°
- || Precision: better than 0.15° (for ideal drops based on Laplace-Young equation)
- || Computation methods implemented:
  - ◆ Young-Laplace equation for axisymmetric and non-axisymmetric drops)
  - ◆ Conic
  - ◆ iTangent
  - ◆ TrueDrop™
  - ◆ Circle
  - ◆ Height/width
  - ◆ Manual
- || All methods (except manual) run automatically, no user interventions are required
- || Automatic detection of drop deposition & automatic invoking of measurement
- || Automatic baseline detection: before and after drop deposition, with stabilizing capability
- || Curved baseline support for all methods, automatic correction of contact angles due to surface curvature
- || Drop volume determination (before deposition): live tracking
- || Live image computation: single or batch
- || Adjustable frequency / duration for batch computation
- || Video recording support (see below)
- || Computation on image / video files: fully automatically (but allows user interventions if required)
- || Measurement of static, dynamic and equilibrium contact angles
- || Image caching for all calculated live images: they can be reviewed subsequently and recalculated or kept as files if necessary
- || Accurate determination of extreme low contact angle measurement (down to ca. 1°)
- || Template for automatic determination of dynamic contact angles (CAH) and for SFE measurement
- || Besides contact angle values (left / right / mean) computation results include drop geometrical
- || Parameters like volume, surface area, contact diameter and height, drop contact points coordinates, work of adhesion, spreading coefficient, sample tilting angle, etc., depending on computation method applied

## Surface tension / interfacial tension

- || Measurement methods supported: pendant / rising drop / bubble (incl. drop / bubble images with NO Apex), sessile drop (incl. constrained sessile drop)
- || Range: ca. 0.001 ~ 2000 mN/m
- || Resolution :  $\pm 0.01$  mN/m or 0.01 % (pendant / rising drop method)
- || Precision: 0.1 %
- || Incl. (but not limited to) features:
  - ◆ Fully automatic formation of drops (when an automatic dosing unit is used)
  - ◆ Fully automatic IFT measurement (faPDA)
  - ◆ Drop-/Volume-/Area locking capability (when an automatic dosing unit is used)
  - ◆ Dynamic IFT measurement (from ca. 0.1 s)
  - ◆ Enhanced Precision modes (EPM)
- ◆ Fast computing mode
- ◆ Surface / Interface relaxation measurement
- ◆ Automatic determination of liquid / fluid / solid-contact baseline and drop analyzing area
- ◆ Calculation of drop images with NO Apex eliminating restriction of FOV
- ◆ Image caching for all calculated live images: they can be reviewed subsequently and recalculated or kept as files if necessary
- ◆ Support pendant drop quality index
- || Evaluation is based on full-automatic analysis of whole drop profiles in real time. Besides IFT values computation results include drop geometrical parameters like volume, surface area, maximum diameter, height, contact angle, drop quality index etc.

## Surface free energy calculation

- || Surface free energy models supported:
  - ◆ Zisman Plot (critical wetting tension)
  - ◆ Fowkes
  - ◆ Owens-Wendt-Rabel-Kaelble (OWRK)
  - ◆ Extended Fowkes
  - ◆ Wu harmonic mean / Wu geometric mean
  - ◆ Equation-of-State
  - ◆ Lewis acid/base theory
  - ◆ Schultz-1 / -2
- || SFE measurement template
- || Computation can be invoked directly after measurement. No extra input of data is necessary. After computation wetting behavior analysis (WBA™) for the studied surface can be launched straightforwardly. Built-in support for the determination of unknown liquid SFE properties
- || Incl. reporting

## Wetting Behavior Analysis WBA™

- || Based on the chosen SFE model and measurement / computation results, wetting behavior, or adhesion of various liquids (work of adhesion) on a studied solid surface can be modeled and predicted. Different SFE models and full contact angle range ( $0^\circ < \theta < 180^\circ$ ) are supported. Analysis results may be exported in Excel-format.

## Substance database

- || More than 150 common liquids / solids included with about 200 records; editable and extensible

## Video recording and computing

- || Recording speed: adjustable, max. speed camera- & system-dependent
- || Recording time: predefinable or manually controllable. Max. time: NO limitation
- || Recording start: manual or via triggering events
- || Triggering support: leave / enter (adjustable) triggering zone, triggering events
- || Time stamp: with a resolution of 0.1 ms
- || Parameter stamp: dispensing volume, tilting angle etc., device-configuration-dependent
- || Video editing and recording directly to file supported
- || Video instant playback (fileless): supported
- || Video computation: play & computation, whole video or multiple sections; fully automatic (but allowing user-intervention if desired)
- || Video file format: AVI (lossless compression)

## Data center

- || Data display and management:
  - ◆ Organized by measurement task
  - ◆ Drop-based results-data collection and management
  - ◆ Drop-based statistical analysis and data filtering based on robust statistics
  - ◆ Plot with two Y-axes (drop-based settings)
- || Data exportable by clipboard, in Excel / text / bitmap (for plot)-format; single drop-based or whole task-based incl. reporting

## LAUDA Surface Analyzer LSA 50

The LSA 50 is a robust and precise instrument for contact angle measurements and for extremely accurate determination of surface and interfacial tension.

With this versatile measuring capabilities it is the ideal device for research and teaching.

It represents a budget-friendly entry-level device while featuring high-end accuracy. Its large and easy to load sample stage provides a precise z-axis for easy handling.



**LMO 0063**  
**LSA 50 Research**

### Features and benefits:

- || Compact size which requires only small bench space
- || Versatile measuring methods
- || Very easy handling with exchangeable manual dosing system
- || Adjustable platforms for samples and camera
- || Powerful algorithms enable precise drop analysis

Technical features	LSA 50
Lens	1,9x telecentric lens
Camera Type	Camera LCA-5 (USB 3) 1,280x960px max. res., 54 fps
Focus	12 mm fine focus with focus assistant support
Max. sample dimensions (LxWxH)	∞ x 290 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (LxW)	100x100 mm
Travel distance of sample table	Z-direction: 50 mm
Measuring range for contact angles	0–180°
Measuring range for surface and interfacial tensions	0.01...2,000 mN/m Precision: 0.1 %
Power supply	100/240V AC, 50/60 Hz.
Dimensions (WxDxH)	600x160x533 mm
Weight, net	approx. 18 kg

### LMO 0063 LSA 50 Research

For automatic measurement of contact angle, surface tension and surface free energy

#### Included standard components:

- || LSA 50 with 1,7x telecentric lens and LCA-5 camera
- || 1x z axis for manual stage control
- || 1x y/z axis for manual dosing selection / position (max. 1 liquid)
- || 1x camera axis for manual position and tilt control
- || 1x precision micrometer-driven syringe dispensing unit MDU S2 (LMOZ1001)
- || Surface.Meter software (LMOZ9001)

## LAUDA Surface Analyzer LSA 60

The LSA 60 is a robust and precise instrument for contact angle measurements and for extremely accurate determination of surface and interfacial tension using the pendant drop analysis.

It represents a budget-friendly entry-level device while featuring high-end accuracy. Its large and loadable sample stage provides a precise z-axis for easy handling.

Equipped with a micrometer-driven manual dispensing unit it can also be fitted with versatile automatic dosing systems as an option.



**LMO 0060**  
**LSA 60 Basic**

### Features and benefits:

- || Compact size which requires only small bench space
- || Very easy handling with exchangeable dosing system
- || Two axis sample platform for exact positioning with automatic locking
- || Powerful algorithms enable precise drop analysis
- || Expandable with automated dosing systems and tilting table modules

Technical features	LSA 60
Lens	6x zoom lens
Camera type	Camera LCA-3 (USB 3) 1,280x1,024 px max. res., 60 fps
Focus	12 mm fine focus with focus assistant support
Max. sample dimensions (LxWxH)	∞ x 290 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (LxW)	100x100 mm
Travel distance of sample table in X/Y/Z direction	Y: 100 mm (with built-in dust protection cover), Z: 50 mm
Measuring range for contact angles	0–180°
Measuring range for surface and interfacial tensions	0.001...2,000 mN/m Precision: 0.1 %
Power supply	100/240V AC, 50/60 Hz.
Dimensions (WxDxH)	600x160x533 mm
Weight, net	approx. 18kg

### LMO 0060 LSA 60 Basic

For automatic contact angle and surface tension measurements

#### Included standard components:

- || LSA 60 with 6,5x zoom lens and LCA-3 camera
- || 1x y/z axis for manual stage control
- || 1x y/z axis for manual dosing selection / position (max. 2 liquids)
- || 1x Micrometer-driven syringe dispensing unit MDU S1 (LMOZ1000)
- || Surface.Meter software (LMOZ9001)

### LMO 0061 LSA 60 Package 1

Including all standard components of LSA 60 Basic (LMO0060) and additionally 1x automatic direct dispensing unit ADDU 30 (LMOZ1002)



**LMO0061**  
**LSA 60 Package 1**

## LAUDA Surface Analyzer LSA 100

Thanks to the numerous precise adjusting axes and their wide ranges as well as available expansion functionalities / modules, which are of great importance for challenging applications, the LSA 100 is one of the most versatile and flexible devices on the market.

The extremely versatile measuring software Surface.Meter is included as a standard as well as the software module for the determination of surface free energy.

Representing the mid-size version of the LSA family, the LSA 100 is even more expandable and customizable with a wide range of dosing systems, sample stages and other accessories.



**LMO 0100**  
**LSA 100 Basic**

### Features and benefits:

- || Wide range of drop calculation methods for the contact angle, also including the unique TrueDrop method
- || Powerful surface tension measurement
- || Full support of automatic interfacial tension and CMC measurements
- || Up to two different dosing systems integrated (optional non-contact dosing systems and numerous other modules and accessories)

Technical features	LSA 100
Lens	8.7 x zoom lens
Camera Type	Camera LCA-4 (USB 3) 1,920x1,200 px (200 fps) max. res.,
Focus	12 mm fine focus with focus assistant support plus 100 mm focus adjustment axis
Max. sample dimensions (LxWxH)	∞ x 290 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (LxW)	100x100 mm
Travel distance of sample table in X/Y/Z direction	X: 100mm, Y: 100mm (both with built-in dust protection cover), Z: 50mm
Measuring range for contact angles	0–180°
Measuring range for surface and interfacial tensions	0.001...2,000 mN/m Precision: 0.1 %
Power supply	100/240V AC, 50/60 Hz.
Dimensions (WxDxH)	600x160x543 mm
Weight, net	approx. 19kg

The LSA 100 can be expanded using the following modules: all dosing systems max. 2 liquids (p. 69), AZA 50 automatic z-axis (LMOZ3002), all temperature chambers (p. 71), all sample stages (p. 71) and software modules (p. 75).



# LAUDA Surface Analyzer LSA 100

## LMO 0100 LSA 100 Basic

For automatic measurement of contact angle, surface tension and surface free energy

### Included standard components:

- || LSA 100 with 8,7x zoom lens and LCA-4 camera
- || 1x x/y/z axis for manual stage control
- || 1x x/y/z axis for manual dosing selection / position (max. 2 liquids)
- || 1x camera axis for manual position and tilt control
- || 1x Micrometer-driven syringe dispensing unit MDU S1 (LMOZ1000)
- || Surface.Meter software (LMOZ9001)
- || Software module SFE for determination of surface free energy (LMOZ9002)

## LMO 0101 LSA 100 Package 1

Including all standard components of LSA 100 Basic (LMO0100) and additionally 1x automatic direct dispensing unit ADDU 30 (LMOZ1002)

## LMO 0103 LSA 100 Research

For automatic measurement of contact angle, surface tension and surface free energy

### Included standard components:

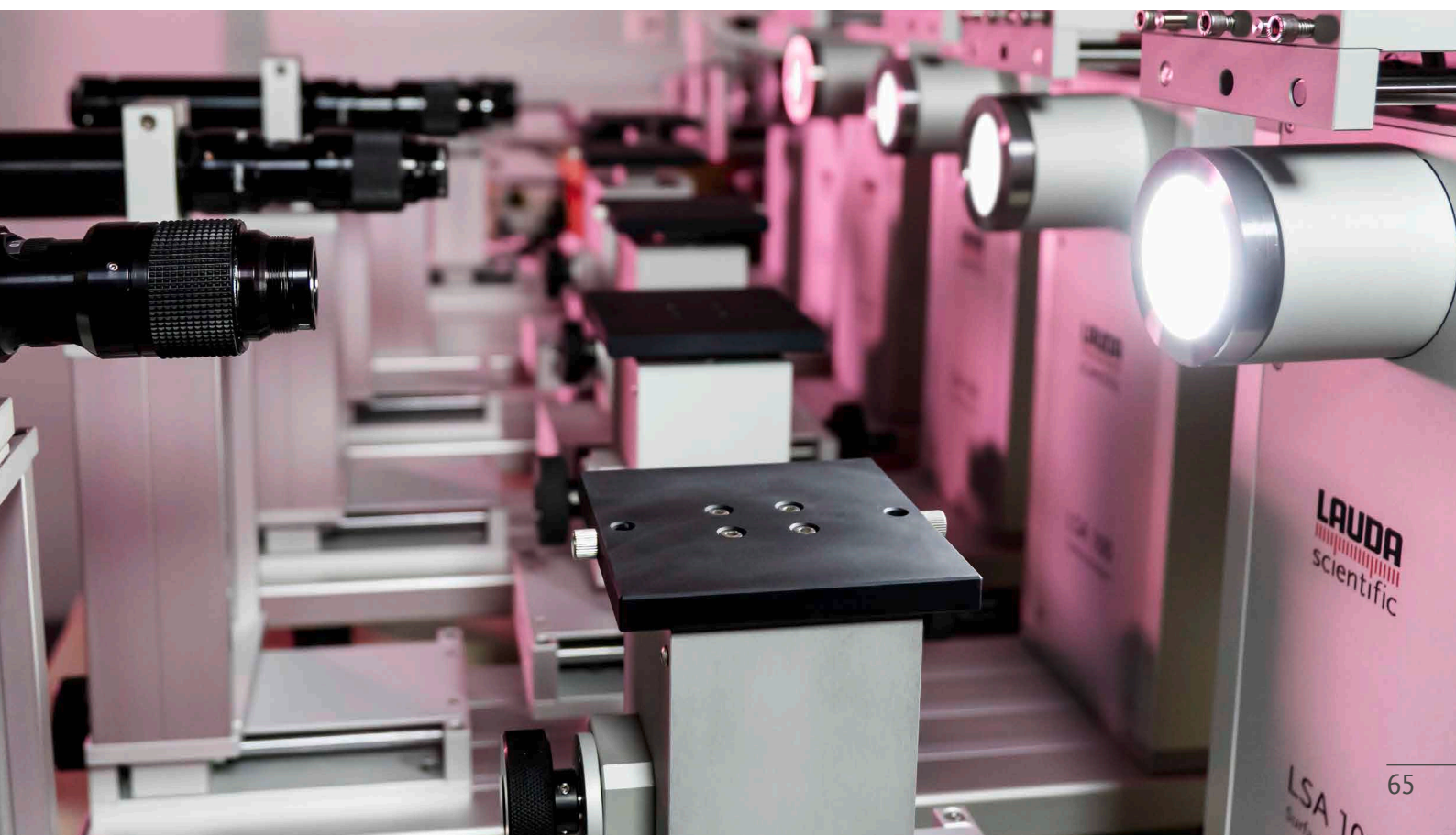
- || LSA 100 with 1,7x telecentric lens and LCA-4 camera
- || 1x x/y/z axis for manual stage control
- || 1x x/y/z axis for manual dosing selection / position (max. 2 liquids)
- || 1x camera axis for manual position and tilt control
- || 1x Micrometer-driven syringe dispensing unit MDU S1 (LMOZ1000)
- || 1x Automatic direct dispensing unit ADDU 30 (LMOZ1002)
- || Surface.Meter software (LMOZ9001)
- || Software module SFE for determination of surface free energy (LMOZ9002)



**LMO 0101**  
LSA 100 Package 1



**LMO 0103**  
Telecentric lens of the LSA 100 Research



## LAUDA Surface Analyzer LSA 200

Thanks to the numerous precise adjusting axes and their wide ranges as well as available expansion functionalities / modules, which are of great importance for challenging applications, the LSA 200 belongs, together with LSA 100, to one of the most versatile and flexible devices on the market.

This is also supported by flexible automation with automatic x/y/z axes for the sample stage.

Optional revolutionary features such as the double view module for simultaneous top and side analysis and measurements on a single drop complete the picture of this top notch surface analyzer.



**LMO 0202**  
**LSA 200 S2**

### Features and benefits:

- || Optional with up to three dosing units and up to six liquids
- || Wide range of drop calculation methods for the contact angle, supplemented by the unique TrueDrop method
- || Powerful surface tension measurement makes mechanical tensiometers obsolete
- || Depending on model up to three different dosing systems integrated (optional non-contact dosing systems and numerous other modules and accessories)

Technical features	LSA 200
Lens	8.7 x zoom lens
Camera Type	Camera LCA-10 (USB3) 1,920x1,200px (170 fps) max. res., and even much more higher rates at lower resolutions
Focus	12 mm fine focus with focus assistant support plus 100 mm focus adjustment axis
Max. sample dimensions (LxWxH)	∞ x 350 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (LxW)	100x100 mm
Travel distance of sample table in X/Y/Z direction	X: 100 mm, Y: 100 mm (both with built-in dust protection cover), Z: 50 mm
Measuring range for contact angles	0 – 180°
Measuring range for surface and interfacial tensions	0.001...2,000 mN/m Precision: 0.1 %
Power supply	100/240V AC, 50/60 Hz.
Dimensions (WxDxH)	750x190x543 mm
Weight, net	approx. 22 kg

The LSA 200 can be expanded using the following modules: all dosing systems max. 3 liquids (p. 69), all automatic sample axes (p. 70), all temperature chambers (p. 71), all sample stages (p. 71) and software modules (p. 75).

## LAUDA Surface Analyzer LSA 200

### LMO 0200 LSA 200

For automatic measurement of contact angle, surface tension and surface free energy

#### Included standard components:

- || LSA 200 with 8,7x zoom lens and LCA-10 camera
- || 1x x/y/z axis for manual stage control
- || 1x x/y/z axis for manual dosing selection / position (max. 3 liquids)
- || 1x camera axis for manual position and tilt control
- || 3x Micrometer-driven syringe dispensing unit MDU S1 (LMOZ1000)
- || Surface.Meter software (LMOZ9001)
- || Software module SFE for determination of surface free energy (LMOZ9002)

### LMO 0202 LSA 200 S2

Including the standard components of LSA 200 (LMO0200), but only with 1x MDU S1 (LMOZ1000) and additionally 2x automatic non-contact direct dispensing unit ADDN 30 (LMOZ1003)



LMO 0202  
LSA 200 S2



# LAUDA Mobile Surface Analyzer LSA MOB

## Special Features:

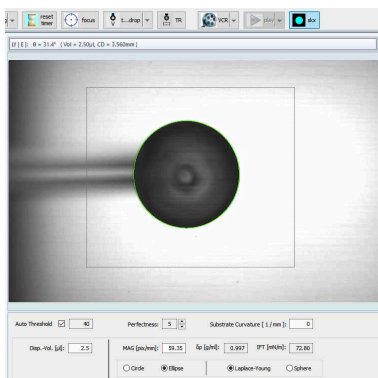
- || Mobile measuring instrument with innovative top view technology. Suitable for measurements on surfaces with complex topography and on-site inspections
- || Highest precision for any contact angle range due to Young-Laplace fit of the drop. Suitable for all drop sizes and liquids
- || No limits for sample size
- || Surface mapping of the wetting properties with high spatial resolution down to 5 mm
- || Optional robotic systems and automatic sample stages
- || Optional automatic dosing system for measurements both on horizontal and vertical surfaces



**LMO 0020  
LSA MOB-M**



**LMO 0023  
LSA MOB-C**



**LMOZ9014  
CAD (TV) software module**

### LMO 0020 LSA MOB-M

For automatic top view contact angle measurements

#### Included standard components:

- || LSA MOB
- || 1x MOB Micrometer-driven syringe dispensing unit MDU (not available separately)
- || Surface.Meter Elements software (LMOZ9000)

### LMO 0021 LSA MOB-M2

For automatic top view contact angle measurements

#### Included standard components:

- || LSA MOB
- || 2x MOB Micrometer-driven syringe dispensing unit MDU
- || Surface.Meter Elements software (LMOZ9000)

### LMO 0023 LSA MOB-C

For use in combination with conventional LSA units. For automatic contact angle measurements, simultaneously with side and top view

#### Included standard components:

- || LSA MOB-C
- || Software module CAD (TV) (LMOZ9014)

### LMO0024 LSA MOB-P

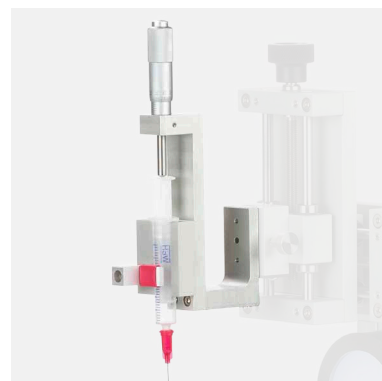
For process use

## Dosing units for LSA

### LMOZ1000 MDU S1

#### Micrometer-driven syringe dispensing unit MSU S1

For glass and disposable syringes, incl. 1x syringe holder with micrometer and mounting adapter, 20x disposable syringes (2 ml), 1x set of (different sized) needles (3x 20 pcs.) (EZ 524) with dispensing volume resolution of ca. 0.2 µl



LMOZ1000

### LMOZ1001 MDU S2

#### Precision micrometer-driven syringe dispensing unit MSU S2

For precision glass and disposable syringes (range: 25 mm), incl. 1x syringe holder with micrometer and mounting adapter, 20x disposable syringes (1 ml), 1x set of (different sized) needles (3x 20 pcs.) (EZ 524) with dispensing volume resolution of ca. 0.1 µl

### LMOZ1002 ADDU 30

#### Automatic direct dispensing unit ADDU 30

Incl. 1x gas-tight glass syringe (0.5 ml), 1x set of (different sized) needles (3x 20 pcs.) (EZ 524) with dispensing volume resolution of ca. 0.001 µl and dispensing rates of 1 µl / min...2 ml / min



LMOZ1002

### LMOZ1003 ADDN 30

#### Automatic non-contact direct dispensing unit ADDN 30

Incl. controller, 1x gas-tight glass syringe (0.5 ml), 1x set of (different sized) needles (3x 20 pcs.) (EZ 524) and disposable syringe tips

### LMOZ1008 ADDD 30

#### Automatic double dispensing unit for 2 liquids

Incl. 2x gas-tight glass syringes (0.5 ml), 1x set of (different sized) needles (3x 20 pcs.) (EZ 524) and software module

### LMOZ1004 ADUV 31

#### Automatic dispensing unit with valve ADUV 31 for 1 liquid

Incl. 1x automatic dosing unit with 3-way valve, 1x gas-tight glass syringe (0.5 ml), 1x tubing set with needle and adaptor and 1x set of (different sized) needles (3x 20 pcs.) (EZ 524)

### LMOZ1005 ADUV 32

#### Automatic dispensing unit with valve ADUV 32 for 2 liquids

Incl. 2x automatic dosing unit with 3-way valve, 2x gas-tight glass syringes (0.5 ml), 2x tubing set with needle and adaptor and 1x set of (different sized) needles (3x 20 pcs.) (EZ 524)



LMOZ1006

## Piezo dosing unit

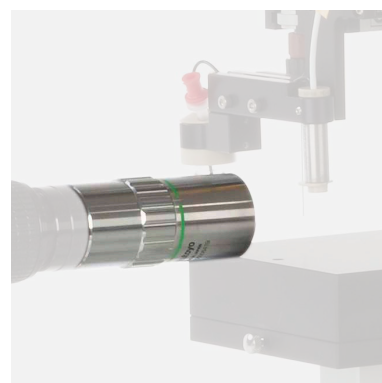
### LMOZ1006 PDDU

#### Picoliter drop dispensing unit

Piezo-electro dosing units for picoliter drop size (40 pl...250 pl), incl. controller box, strobe light, liquid vessel, connector set, USB cable and 10x 5 µm filter

### LMOZ1007 Lens upgrade set LSA 100 Micro (for PDDU)

For the analysis of small droplets in combination with PDDU (LMOZ1006), field of view 1...0.17 mm, incl. Mitutoyo 20x microscope lens attachment and 6.5x ultra-zoom converter lens



LMOZ1007

## Dosing units for LSA



**LMOZ1010**  
NLDE 30

### Special dosing equipment

#### **LMOZ1010 NLDE 30**

##### **Nanoliter dispensing extender**

Min. droplet volume: ca. 10 nl (water), Max. frequency: ca. 250 Hz, including dispensing valve with holder, controller box, tubing / fittings. Requires ADDU 30 or ADUV 3x, or (manual) dispensing unit MDU S1 / 2

#### **LMOZ1009 TLDM 30**

##### **Triple dosing module manual**

Dosing y-axis and dosing z-axis for usage with three dosing systems. Allows to use 3 dosing units for 3 liquids with the LSA 60 / 100, incl. dosing y-axis and dosing z-axis

#### **LMOZ1011 1DSH-1**

##### **1D-ADDU alignment tool**

Allows precise vertical alignment of the needle for precise Laplace evaluation, can be used with ADDU, ADDD, and ADDN, highly recommended for interfacial tension measurements, surface rheology, DOF and lamella methods

#### **LMOZ1012 3DNH-1**

##### **3D-Needle alignment tool**

## Camera upgrades



**LCA-1**

#### **LMOZ7001 Camera upgrade from LCA-3 to LCA-1**

##### **Camera upgrade for LAUDA Surface Analyzer**

USB 3.0, global shutter,  
Max. resolution 1,280x1,024 @ 170 fps camera speed

#### **LMOZ7002 Camera upgrade from LCA-1 to LCA-2**

##### **Camera upgrade for LAUDA Surface Analyzer**

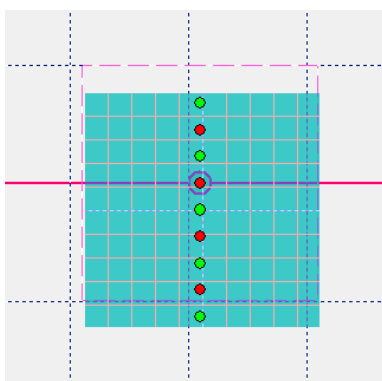
USB 3.0, global shutter,  
Max. resolution 1,920x1,200 @ 170 fps camera speed

#### **LMOZ7004 Camera upgrade from LCA-3 to LCA-4**

##### **Camera upgrade for LAUDA Surface Analyzer**

USB 3.0, Max. resolution 1,920x1,200 @ 160 fps camera speed  
1,200x60 @ 2,155 fps camera speed

## Automatic sample axes



**LMOZ9016**  
ASSM software module

#### **LMOZ3002 AZA 50**

##### **Automatic z axis**

Travel distance vertical 50 mm

#### **LMOZ3004 APA 100**

##### **Automatic x or y axis**

Travel distance horizontal 100 mm  
incl. software module ASSM (LMOZ9016) for Surface.Meter software

#### **LMOZ3005 APA 170**

##### **Automatic x or y axis**

Travel distance vertical 170 mm  
incl. software module ASSM (LMOZ9016) for Surface.Meter software

## Sample chambers

### LMOZ4000 EC 10

#### Environmental chamber

Temperature range  $-10...130^{\circ}\text{C}$ , max. sample size 52x37 mm, for use with external LAUDA thermostat

### LMOZ4001 EC 50

#### Environmental chamber for large samples

Temperature range  $-30...180^{\circ}\text{C}$ , with anti-fogging accessory, max. sample size 95x87x42 mm (LxWxH), for use with external LAUDA thermostat

### LMOZ4003 HTC 350

#### High temperature chamber

With integrated electrical heating, temperature range  $30...350^{\circ}\text{C}$ , max. sample size 60x60 mm

### LMOZ4005 HCU 20

#### Humidity control for EC 10/EC 50

Relative humidity range  $-5...90^{\circ}\text{C}$ , PC controlled

### LMOZ4006 HTC NH

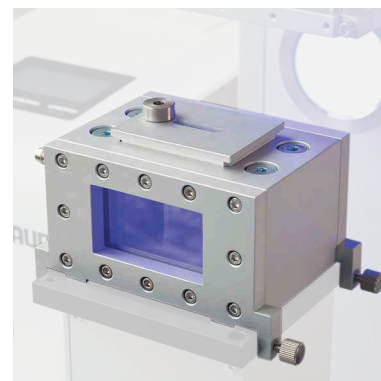
#### Needle heating set

For use with HTC 350 (LMOZ4003) for contact angle measurement and pendant drop, temperature range according to HTC 350

### LMOZ4007 EC 05

#### Syringe temperature module

Temperature range  $-20...180^{\circ}\text{C}$ , for use with external LAUDA thermostat



**LMOZ4000**  
Ec 10



**LMOZ4001**  
EC 50

## Sample stages

### LMOZ2000 ATS 360

#### Automatic tilting stage

Automatic tilting base assembly, software-controlled, tilting range  $0...360^{\circ}$ , incl. motor-driven tilting base assembly, power supply unit and mounting adapter

### LMOZ2001 RFB 20

#### Retention force balance

For measuring advancing / receding contact angle, retention force and sliding speed, g-range  $0...20\text{m/s}^2$ , incl. RFB 360, software package / support and controller box

### LMOZ2002 STS 10

#### Suction plate

For sample size 10x10cm, for use with vacuum pump (LMOZ2010)

### LMOZ2010 Vacuum pump

For use with STS 10 suction plate (LMOZ2002)

### LMOZ2004 STS 30 Powder sample holder

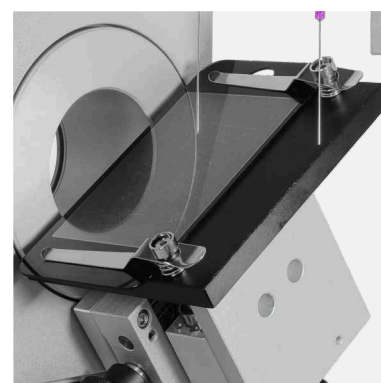
For sample size 2x2 cm

### LMOZ2005 STS 40 Film holder

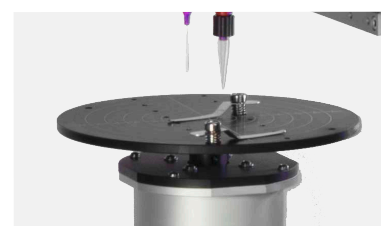
For sample size 5x5 cm

### LMOZ2011 STS 80 Film holder

For sample size 8x8 cm



**LMOZ2000**



**LMOZ2001**

## Samples stages



**LMOZ2009**  
**WT200A**

### **LMOZ2006 SFSS Fiber holder**

Incl. adjustment of position and orientation, for fibre size 50 µm...3 mm, with 3D adjustment, max. measurement range 70 mm

### **LMOZ2007 EWA-PF 100 Electro Wetting platform**

For the study of the wetting behavior under various electrical conditions, delivery without power generator

### **LMOZ2008 WT200M Wafer table**

Manual wafer table for 6- and 8-inch wafers, optional for 12-inch wafers, requires LSA 60 or higher.

### **LMOZ2009 WT200A Wafer table**

Automatic wafer table for 6- and 8-inch wafers, optional for 12-inch wafers, requires LSA 60 or higher.

## Modules for advanced analysis

### **LMOZ5000 TVT 10**

#### **Drop volume tensiometer module**

For measuring surface / interfacial tension based on drop volume determination. Emulsifiers reduce the interfacial tension between oil and water, typical dynamic interfacial processes. The TVT 10 module for the LSA series analyses precisely this time dependence for fast to slow processes.

#### **Including:**

Software module (LMOZ9006), set of special needles (EZ 633, EZ 526, EZ 527) and 2x glass cuvette GC 40 (EZ 533).

#### **Hardware requirements:**

LSA 100 or LSA 200 with at least one automatic direct dispensing unit ADDU 30 or ADUV 31 /32.

### **LMOZ5002 CMC 20**

#### **Critical micelle concentration module**

For fully automatic determination of both equilibrium and dynamic critical micelle concentration (CMC) of surfactants based on pendant drop method. In sharp contrast to traditional methods, the optical pendant drop analysis (PDA) method exhibits distinct advantages in almost every aspect regarding accuracy, reliability, convenience, and applicability to solutions containing various kinds of surfactants, as well as the degree of automation.

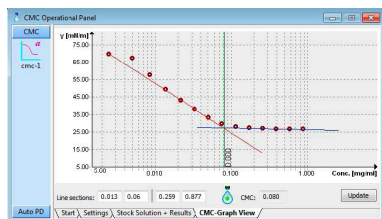
- || Fully-automatic CMC determination
- || Suitable for measurement of both surface and interfacial tension
- || End-concentration extendable after a measurement is completed
- || Suitable for all kinds of surfactants (also anionic and cationic)
- || Not only static but also dynamic CMC which can be determined at the same time

#### **Including:**

Software module (LMOZ9008), 2x glass cuvette GC 40 with cover (EZ 533), 1x magnetic stirrer incl. stir bar, 1x automatic direct dispensing unit ADUV 32 (LMOZ1005).

#### **Hardware requirements:**

LSA 100 or LSA 200 with at least one automatic direct dispensing unit ADDU 30 or ADUV 31 /32.



**LMOZ5002**  
**CMC 20**



## Modules for advanced analysis

### LMOZ5007 OEDM 20

#### Oscillating / expanding drop module

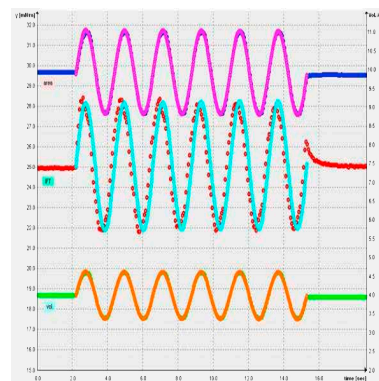
This surface / interfacial rheology module uses the pendant drop analysis. The method is based on periodically or abruptly modulating or changing the surface area of a pendant drop and tracking simultaneously the response of its surface or interfacial tension value during the process. By analyzing the shift between drop volume and surface / interfacial tension the surface / interface rheological properties and the dynamic response behavior of the surfactant in a surfactant solution can be studied and measured.

#### Including:

Software module (LMOZ9009), set of special needles (EZ 633, EZ 526, EZ 527), glass cuvette GC 40 (EZ 533) and an automatic direct dispensing unit ADDUX.

#### Hardware requirements:

LSA 100 or LSA 200



LMOZ5007  
OEDM 20

### LMOZ5006 POW 10

#### Powder / porous wettability module

LAUDA Scientific has developed a novel technique to analyze the wetting behavior using their LSA devices. The method itself is very similar to the Washburn method and it uses actually the same theory and equation.

The measurement itself is very simple. The powder module consists of a powder cell which is connected to a reservoir and the power is kept within that cell by means of a frit. A second, much thinner tube is also connected to this reservoir and serves as a volume level device.

During the measurement a high-precision dosing module pumps the test liquid into the reservoir. The level in the level detection tube is observed with the help of the LSA and precisely evaluated via image analysis. At the very moment when the liquid is touching the powder the change of the liquid level is detected. From that very moment the software keeps the meniscus constant and records the absorbed volume.

By doing so a time-dependent volume is recorded which can be evaluated with the help of the common Washburn theory.

#### Advantages over the traditional Washburn measurement method with a force tensiometer:

- || More dynamic than mechanic measurements to lack of inertia
- || Additional methods like high speed measurements of drops sinking into powder beds or porous material could be realized
- || Identical measurement cell for powder and porous material
- || Hydrophobic materials could be also measured easily in a "powder bed"

#### Including:

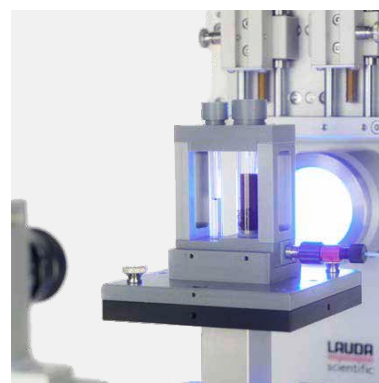
Software module (LMOZ9017) and powder module PO-V1.

#### Hardware requirements:

At least one automatic direct dispensing unit ADUV 31 / 32.

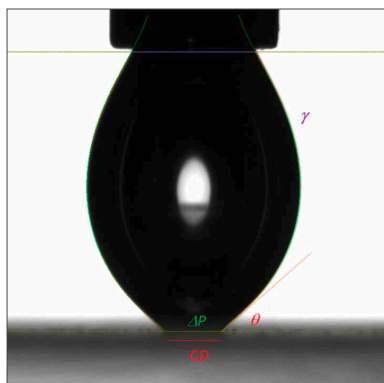
### LMOZ5008 Measurement cabinet

Shielding of the LSA against air turbulences, light incidences etc.



LMOZ5006  
POW 10

## Modules for advanced analysis



**LMOZ5010**  
DAF-CA

### LMOZ5009 DAF-IFT

#### Drop adhesion force (interfacial tension) module

Determination of tensile (vertical) adhesion force between a liquid (drop) and solid surface in air, between an air bubble and solid surface in liquid, between a liquid (drop) and solid surface in another liquid phase, between a liquid (drop) and liquid surface in air, between a liquid (drop) and liquid surface in another liquid.

#### Including:

Software module (LMOZ9020), automatic z-axis AZA 50 (LMOZ3002) and 1D-ADDU alignment tool 1DSH-1 (LMOZ1011).

#### Hardware requirements:

At least one automatic direct dispensing unit ADDU 30 or ADUV 31 / 32.

### LMOZ5010 DAF-CA

#### Drop adhesion force (Contact angle) module

Determination of advancing and receding contact angle, determination of contact angle (incl. dynamic contact angle like advancing and receding contact angle) for fiber and filaments (e.g. cylindrical wires).

#### Including:

Software module (LMOZ9021) and 1D-ADDU alignment tool 1DSH-1 (LMOZ1011).

#### Hardware requirements:

At least one automatic direct dispensing unit ADDU 30 or ADUV 31 / 32.

### LMOZ5011 SWE

#### Superwettability evaluation module

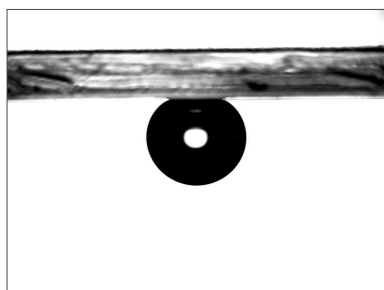
Superwettability High (SWH): Superhydrophobicity for contact angle > 150  
SWL: Superwettability Low (SWL): Superhydrophilicity for contact angle < 5

#### Including:

SWE holder, starter kit capillaries, software module (LMOZ9018) and 3D-Needle alignment tool 3DNH-1 (LMOZ1012).

#### Hardware requirements:

At least one automatic direct dispensing unit ADDU 30 or ADUV 31 / 32.



**LMOZ5003**  
CBK 10

### LMOZ5003 CBK 10

#### Captive bubble measurement kit

For performing captive bubble or sessile drop measurement in another liquid medium with Surface.Meter software (LMOZ9001). Preferred measurement mode for small hydrophilic samples.

#### Including:

Set of special needles J-form (EZ 632), 1x glass cuvette GC 40 (EZ 533) and 1x STS 20 sample holder for flat samples, films and contact lenses.

## Software modules overview

**LMOZ9002 SFE**

Determination of surface free energy.

**LMOZ9004 DoF**

Drop on filament module for contact angle measurement on filaments.

**LMOZ9005 faPDA**

Fully automatic pendant drop analysis for surface and interfacial tension measurement (SFT / IFT).

**LMOZ9006 DVT**

Drop volume tensiometry for surface and interfacial tension measurement (SFT / IFT).

**LMOZ9007 IFT (LBM)**

Interfacial tension (IFT) determination of liquids, liquid systems based on liquid meniscus (LBM).

**LMOZ9008 CMC (A)**

Fully automatic determination of critical micelle concentration (CMC) of aqueous surfactant systems, dynamically as well as statically.

**LMOZ9009 OEM 20**

Oscillating / expanding drop module for analysis of rheological properties of interfacial surfaces.

**LMOZ9010 CAD**

Contact angle measurement based on sessile drop method (side view).

**LMOZ9011 IFT (D)**

Surface and interfacial tension measurement (SFT / IFT) angle measurement based on pendant / sessile drop method.

**LMOZ9012 CAM (LBM)**

Contact angle measurement based on analysis of the liquid meniscus.

**LMOZ9014 CAD (TV)**

Contact angle measurement based on sessile drop method (top view).

**LMOZ9015 Duo.Drop**

Analysis of duo (sessile) drops with instant calculation of surface free energy (SFE).

**LMOZ9016 ASSM**

Automatic surface scanning module for fully automatic measurement and scanning of surface properties.

**LMOZ9017 POM**

Wettability of powder / porous samples for the determination of wetting / absorption properties.

**LMOZ9018 SWE**

Measurement of super wettability for the characterization of super-wetting surfaces.

**LMOZ9019 SM4EVAL**

Additional software license for calculation and evaluation.

**LMOZ9020 DAF (IFT)**

Drop adhesion force (DAF) for interfacial tension measurement (IFT).

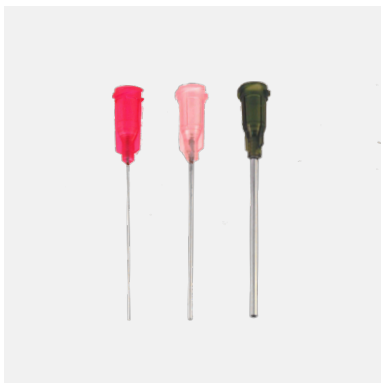
**LMOZ9021 DAF (CA)**

Drop adhesion force (DAF) for contact angle measurement (CA).

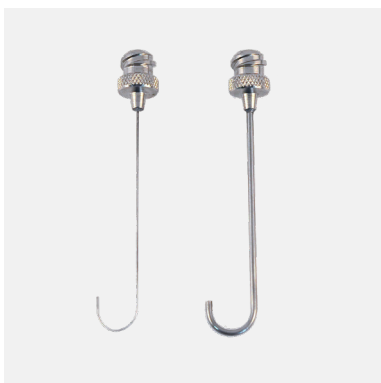
## Dosing accessories for LSA



**EZ 519 | EZ 520 | EZ 521**



**EZ 524**



**EZ 632 | EZ 633**

### **EZ 516 ADU DT Disposable tip kit**

Incl. 100x disposable tips of two different sizes and software update, for easy use of disposable syringes together with ADDU 30 (LMOZ1002), ADDN 30 (LMOZ1003), ADUV 31 (LMOZ1004), ADUV 32 (LMOZ1005), max. applicable liquid volume of 100/200µl

### **EZ 817 ADDU Disposable syringe kit**

For easy use of disposable syringes together with ADDU / ADDN, 1 ml

### **EZ 517 LSY 100**

Syringe 100µl, glass

### **EZ 518 LSY 500**

Syringe 500µl, glass

### **EZ 519 LSY 1000**

Syringe 1,000µl, glass

### **EZ 520 LSY 1000D**

Syringe 1,000µl, disposable, 100 pcs.

### **EZ 521 LSY 2000D**

Syringe 2,000µl, disposable, 100 pcs.

### **EZ 776 LNE 027D**

Needle, outer diameter 0.27 mm, disposable, 20 pcs.

### **EZ 674 LNE 050D**

Needle, outer diameter 0.50 mm, disposable, 20 pcs.

### **EZ 834 LNE 050DD**

Needle, outer diameter 0.50 mm, disposable, 20 pcs. for use with ADDD 30 (LMOZ1008)

### **EZ 522 LNE 060D**

Needle, outer diameter 0.60 mm, disposable, 20 pcs.

### **EZ 523 LNE 090D**

Needle, outer diameter 0.90 mm, disposable, 20 pcs.

### **EZ 525 LNE 127D**

Needle, outer diameter 1.27 mm, disposable, 20 pcs.

### **EZ 528 LNE 180D**

Needle, outer diameter 1.80 mm, disposable, 20 pcs.

### **EZ 526 LNE 14 Needle (1.4 mm)**

### **EZ 527 LNE 18 Needle (1.8 mm)**

### **EZ 529 LNE 20 Needle (2.0 mm)**

### **EZ 530 LNE 21 Needle (2.1 mm)**

### **EZ 531 LNE 22 Needle (2.2 mm)**

### **EZ 532 LNE 23 Needle (2.3 mm)**

### **EZ 726 LNE 24 Needle (0.26 mm)**

### **EZ 524 Set of needles**

Incl. 20x LNE 05D (EZ 674), 20x LNE 180D (EZ 528), 20x LNE 090D (EZ 523)

### **EZ 632 LNE 05J**

J-shaped needle, small diameter 0,5 mm

### **EZ 633 LNE 15J**

J-shaped needle, large diameter 1,5 mm

## Dosing accessories for LSA

### EZ 634 LNO 26

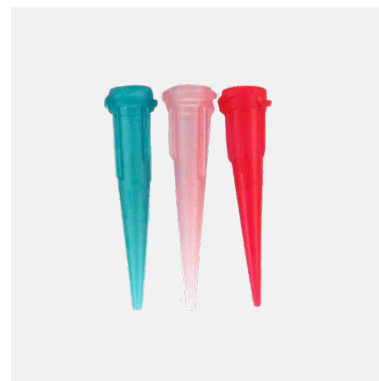
Conic nozzle, inner diameter 0.26 mm, length 30 mm, 100 pcs.

### EZ 777 LNO 60

Conic nozzle, inner diameter 0.60 mm, length 30 mm, 100 pcs.

### EZ 635 LNO 84

Conic nozzle, inner diameter 0.84 mm, length 30 mm, 100 pcs.



EZ 635 | EZ 777 | EZ 634

## General accessories for LSA

### EZ 533 GC 40

Cuvette 40mm, optical quality

### EZ 534 GC 25

Cuvette 25 mm, disposable

### EZ 535 GC 50

Cuvette 50 mm, optical quality

### EZ 636 GC 30

Cuvette 30 mm, optical quality,  
compatible with environmental chamber EC 10 (LMOZ4000)



EZ 534 | EZ 533

## Verification standards for contact angle and interfacial tension

A prerequisite for the reliable interpretation of measurement results is certainty about the reliability of the contact angle measuring instrument you are using. For this purpose, we have developed our glass carrier plate with standard drop images.

It contains 12 precise images of different sessile and pendant drop models, combined on a single glass slide. This allows you to verify the performance and reliable accuracy of your measuring instrument independent of individual samples.



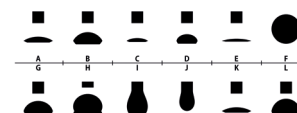
EZ 536

### Advantages and Benefits:

- || You verify the function and precision of your LAUDA Scientific contact angle measuring instrument independently of individual samples
- || Easy handling in everyday laboratory work due to a robust and protective housing
- || Cost savings by combining all relevant droplet models on a single measuring body
- || Integration into your gauge management system through own serial number per glass carrier plate

LAUDA  
scientific

Gauge #1



## Additional external temperature equipment for LSA



**L003472**  
LAUDA LOOP L 100

**L003472 LAUDA Scientific LOOP L 100 (230V / 50 (60) Hz)**  
Compact circulation thermostat for use with sample chamber equipment, working temp. range 4...80°C, temperature stability 0.1 ± K, incl. necessary tubings and software module for Surface.Meter software, other power supply variants on request



**L001252**  
LAUDA RE 630 S

**L001252 LAUDA RE 630 S (230V / 50 Hz)**  
Cooling thermostat for use with sample chamber equipment, working temp. range -30...+200°C, temperature stability 0.02 ± K, other power supply variants on request

### Tubings

**RKJ 015 Silicone tubing**  
6 mm inner diameter, price per meter

**LZS 001 Silicone tubing**  
8 mm inner diameter (9 mm insulated), price per meter

**LZS 007 Silicone tubing**  
11 mm inner diameter (9 mm insulated), price per meter

**LZS 018 Viton tubing**  
12 mm inner diameter (10 mm insulated), price per meter for temperatures -20...150°C

**EZS 012 Tubing clamp**  
For silicon and viton tubings (LZS 001, LZS 007, LZS 018)



**LZB 121 | LZB 221 | LZB 321**

### Heat transfer liquids (Silicon oil)

For temperature range -20...180°C

**LZB 116 KRYO 20, 5l**  
**LZB 216 KRYO 20, 10l**  
**LZB 316 KRYO 20, 20l**

For temperature range -50...120°C

**LZB 121 KRYO 51, 5l**  
**LZB 221 KRYO 51, 10l**  
**LZB 321 KRYO 51, 20l**

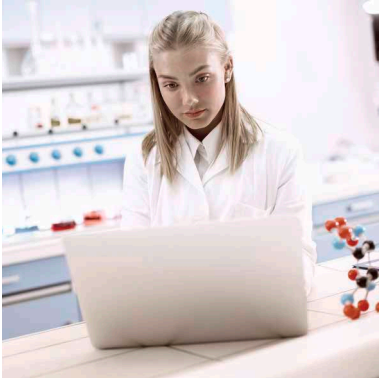
||||| **Service, installation, maintenance, training**  
**LAUDA Scientific**



**MAINTENANCE  
& REPAIR**



## Service, installation, maintenance, training



### Services on site

#### **SDI 998 Installation, maintenance, service and training**

1 day on site, flat rate per day by a qualified representative of LAUDA Scientific GmbH. Excluding travel costs and expenses (will be charged separately based on actual costs).

### Services at LAUDA Scientific GmbH

#### **SDT 998-1 User training**

Training for 4 hours by a qualified representative of LAUDA Scientific GmbH for 1-2 participants.

#### **SDT 998-2 User training**

For each additional participant.



### Remote Services

#### **SDR 998-1 Digital Software Service**

Our hardware and software specialists will support you in all aspects of installation and configuration of our measuring device software, e.g. in the context of a new installation, an operating system update, computer replacement or relocation of a devices.

Price per working hour.

#### **SDR 998-2 Digital Software Training**

With the help of our digital software training courses, we aim to increase the scope of knowledge for existing users by optimizing skill sets and increasing software familiarity and introduce new employees to the software world of LAUDA Scientific measuring instruments.

Price per working hour.



#### **SDR 998-3 Digital Application Consulting**

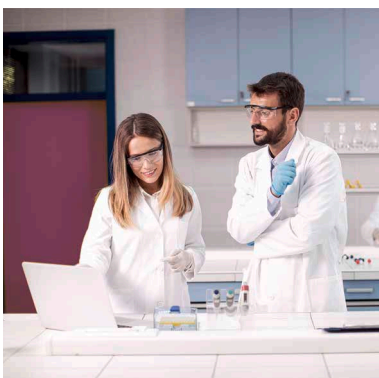
With their extensive experience, our digital application consulting specialists advise you on a wide range of topics incl. the design of measurement processes, the parameterization of new applications or increasing your data quality while taking standards.

Price per working hour.

#### **SDR 998-4 Digital Individual Remote Training**

Our specialists conduct a live training session with you that is tailored to your individual needs. We communicate directly via video conferencing systems and, if necessary, are simultaneously connected to your measuring computers via remote networking. On request, we can prepare and exchange relevant samples in advance, which we then measure simultaneously with you either directly at our premises or in an application laboratory of our renowned partners. Requires a webcam on the user site.

Price per working hour.



Purchase orders for all service activities has to be directed via email to: [service@lauda-scientific.de](mailto:service@lauda-scientific.de)

In certain cases, all mentioned services can be liable to VAT.







[www.lauda-scientific.de/en](http://www.lauda-scientific.de/en)

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