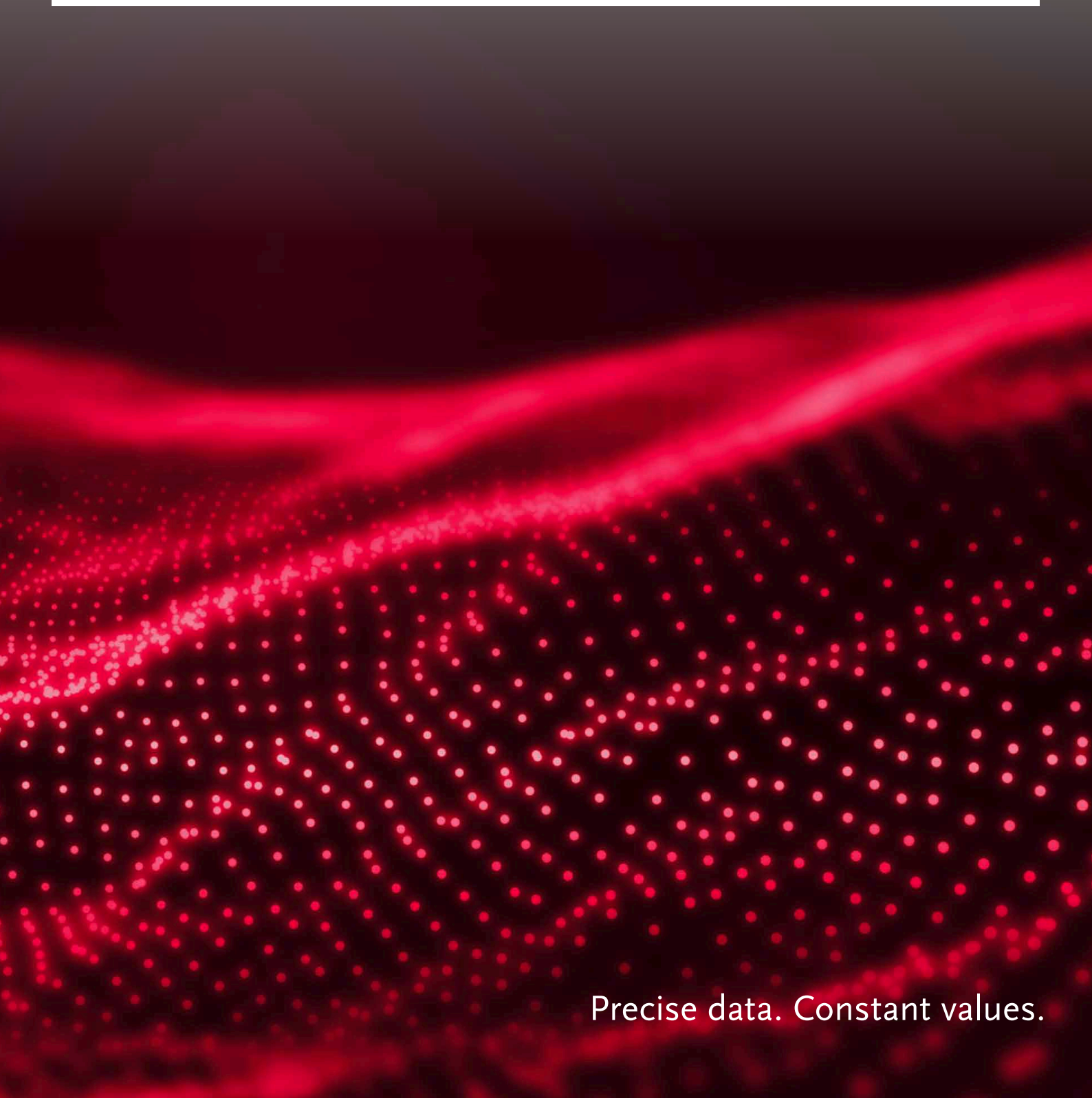
LAUDA scientific

Precise measuring instruments for viscosity and surface science

Product range 2022 / 2023

Version 2022-06-01



Precise data. Constant values.

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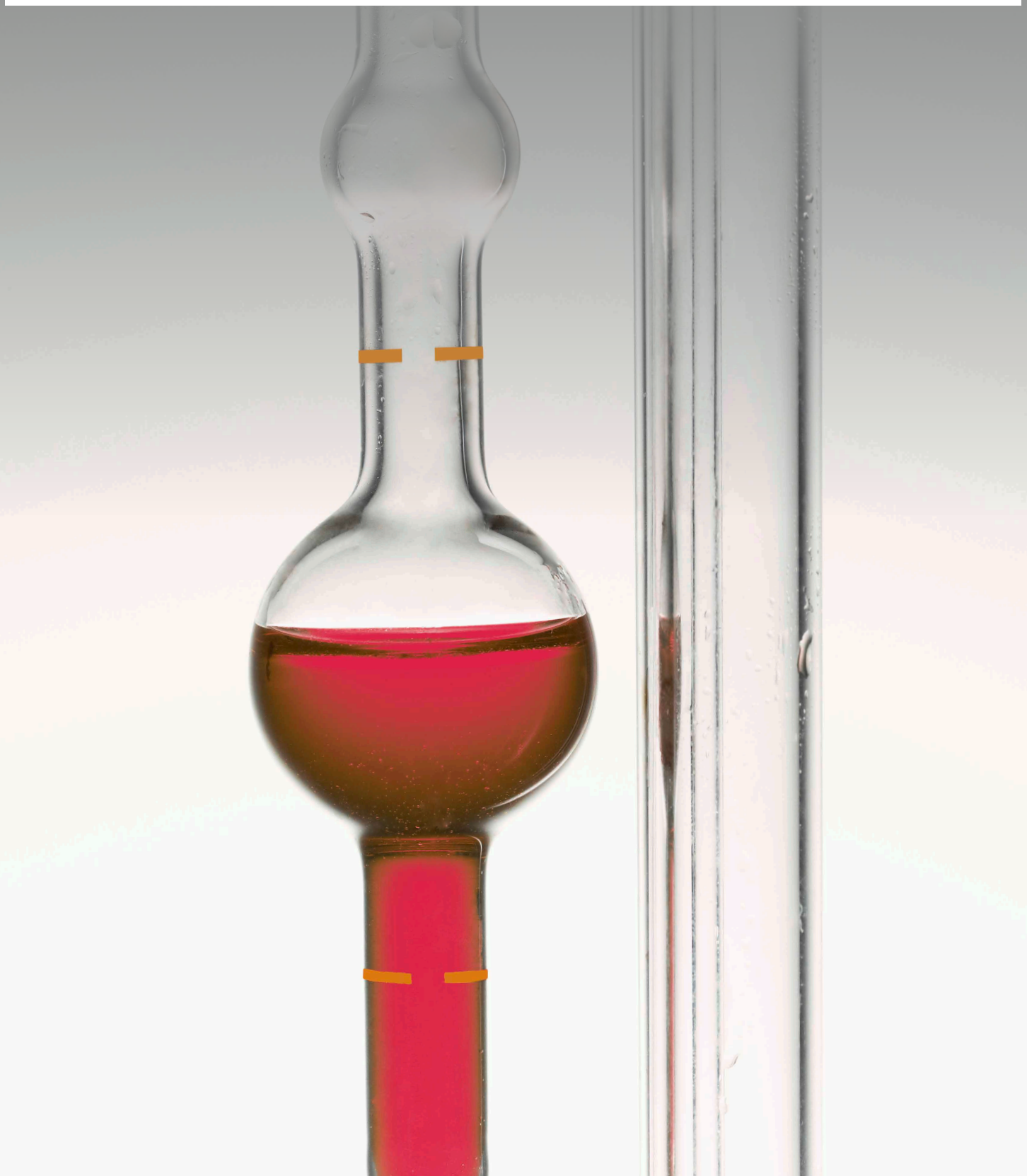
LAUDA scientific

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

iVisc stand(s)
- \+ Accessories iVisc stands

→ **Glass capillaries**
- \+ Viscosity calibration standards
- \+ Visco.Fix Carousel

→ **Viscothermostats**
- \+ Cover plates
- \+ Accessories Viscothermostats
- \+ External cooling devices
- \+ Accessories for external cooling devices
- \+ Heat transfer liquids

→ **Spare parts**
- ‖ Spare parts

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

S5 stand(s)
- + Accessories S5 stands

PVS control box
- + Additional software

Glass capillaries
- + Viscosity calibration standards
- + Visco.Fix Carousel

VRMs
- + Accessories VRM
- ‖ Connection sets with manual transfer locks
- ‖ Mounting sets
- ‖ Bottle sets

General accessories Viscometry
- ‖ Particle separation
- ‖ Dosing and sample handling

Viscothermostats
- + Cover plates
- + Accessories Viscothermostats
- + External cooling devices
- + Accessories for external cooling devices
- + Heat transfer liquids

Spare parts
- ‖ Spare parts

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

Main items:

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

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

Image similar

Recommended options:

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

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 Gl 32, 50 ml
EZV 100	14x Connection screw cap
EDF 122	Sealing rings, 50 units
EDF 093	Small aluminum plates

Image similar

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

VAS 2 Starter kit
- + Accessories VAS
  - ‖ Connection sets with automatic transfer locks
  - ‖ Deviating cover plates

Glass capillaries
- + Viscosity calibration standards

VRM
- + Accessories VRM

General accessories Viscometry
- ‖ Sample flasks
- ‖ Particle separation

Viscothermostats
- + Accessories Viscothermostats
- + External cooling devices
- + Accessories for external cooling devices
- + Heat transfer liquids

Spare parts
- ‖ Spare parts

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

Main items:

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

Included consumables:

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


Image similar

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 mm²/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

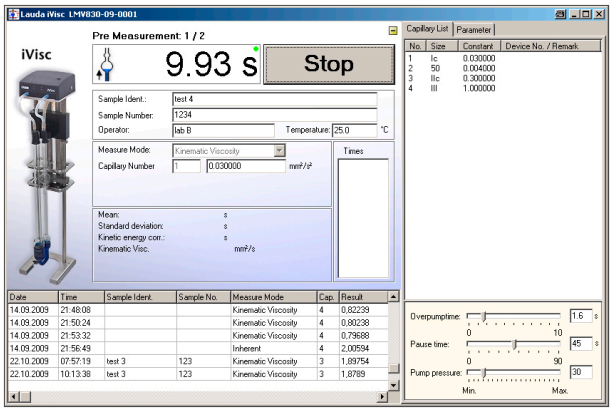
Not included:

- 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 mm²/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 mm²/s
Resolution of time measurement	0.01 s
Meniscus detection	Optical (infrared)
Light sensor control	Digital (µP)
Dimensions (W x D x H)	90 x 90 x 500 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

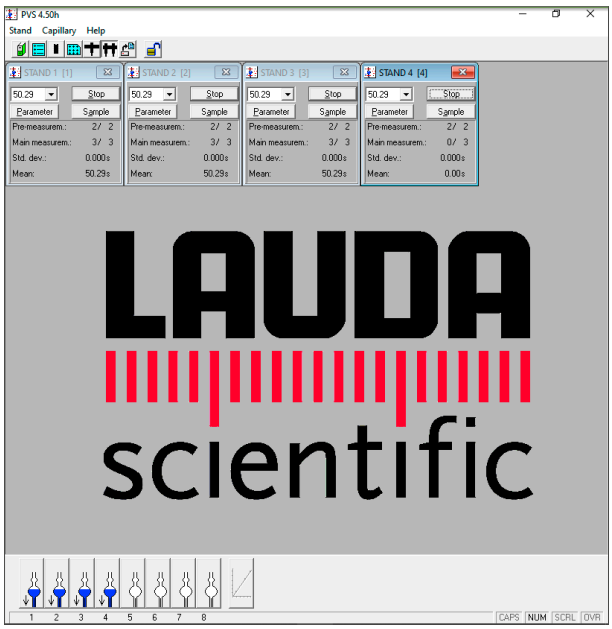
Scope of supply:

- 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 (W x D x H)	340 x 270 x 105 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

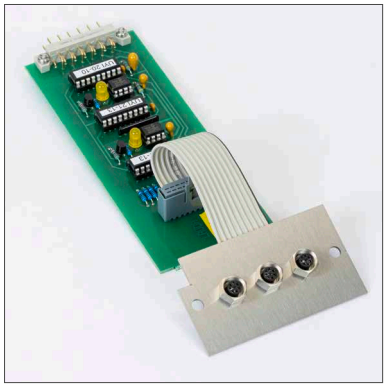


Software based on Windows

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

SDE 998-7

LRZ 913

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.

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 **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 <=> 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

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...20 ml
- Total length: approx. 290 mm
- Measurement accuracy: ±0.2 %

Size No.	Cap. const. mm^2/s^2	DIN / ASTM mm^2/s	PVS / iVisc mm^2/s	inner ⌀ 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)

Incl. Visco. Fix

For automatic measurement, with screw connections and aspirating tube.

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

Size No.	Cap. const. mm^2/s^2	DIN / ASTM mm^2/s	PVS / iVisc mm^2/s	inner ⌀ 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

Micro Ubbelohde Viscometer Type 3 (calibrated)

Incl. Visco. Fix

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

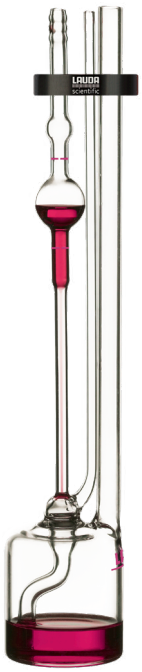
Please order one additional adapter (HKB 532) for each measuring stand (S5 or iVisc).

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

Size No.	Cap. const. mm^2/s^2	DIN / ASTM mm^2/s	PVS / iVisc mm^2/s	inner ⌀ 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: ±0.2 %

Size No.	Cap. const. mm^2/s^2		PVS / iVisc mm^2/s	inner ⌀ 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-Ubblohde 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: ±0.2 %

Size No.	Cap. const. mm^2/s^2	DIN / ASTM mm^2/s	PVS / iVisc mm^2/s	inner ⌀ 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
- Filling volume: 18...22 ml
- Total length: approx. 290 mm
- Measurement accuracy: ±0.2 %

Size No.	Cap. const. mm²/s²	DIN/ASTM mm²/s	PVS/iVisc mm²/s	inner ⌀ 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
- Filling volume: 3...4 ml
- Total length: approx. 290 mm
- Measurement accuracy: ±0.5 %

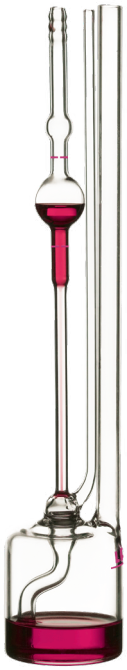
Size No.	Cap. const. mm²/s²	DIN/ASTM mm²/s	PVS/iVisc mm²/s	inner ⌀ mm	Item No.
I	0.01	1...6	0.3...6	0.40	EGV 718
Ic	0.03	3...18	0.8...18	0.53	EGV 719
II	0.1	10...60	3...60	0.70	EGV 720
IIc	0.3	30...180	8...180	0.95	EGV 721
III	1	100...800	30...800	1.26	EGV 722

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. mm²/s²		PVS / iVisc mm²/s	inner ⌀ 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
- Filling volume: 7...10 ml
- Total length: approx. 245 mm
- Measurement accuracy: ±0.3 %

Size No.	Cap. const. mm²/s²	DIN / ASTM mm²/s	PVS / iVisc mm²/s	inner ⌀ 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
- Filling volume: 7...12 ml
- Total length: approx. 245 mm
- Measurement accuracy: ±0.3 %

Size No.	Cap. const. mm² / s²	DIN / ASTM mm² / s	PVS / iVisc mm² / s	inner ⌀ 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: ±0.5 %

Size No.	Cap. const. mm² / s²	DIN / ASTM mm² / s	PVS / iVisc mm² / s	inner ⌀ 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^2/s for capillary size 0c, capillary constant 0.003, 500 ml

LZO 002-002 **Viscosity standard N1**
1.203 mm^2/s for capillary size 0a, capillary constant 0.005, 500 ml

LZO 002-003 **Viscosity standard N2**
2.621 mm^2/s for capillary size I, capillary constant 0.01, 500 ml

LZO 002-004 **Viscosity standard S6**
8.872 mm^2/s for capillary size Ic, capillary constant 0.03, 500 ml

LZO 002-005 **Viscosity standard N14**
24.46 mm^2/s for capillary size II, capillary constant 0.1, 500 ml

LZO 002-006 **Viscosity standard N35**
65.3 mm^2/s for capillary size IIc, capillary constant 0.3, 500 ml

LZO 002-007 **Viscosity standard N100**
238.4 mm^2/s for capillary size III, capillary constant 1.0, 500 ml

LZO 002-008 **Viscosity standard N350**
818.4 mm^2/s for capillary size IIIc, capillary constant 3.0, 500 ml

LZO 002-009 **Viscosity standard N1000**
2592 mm^2/s for capillary size IV, capillary constant 10.0, 500 ml

LZO 002-010 **Viscosity standard N2500**
7576 mm^2/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 mm²/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 mm²/s	0.3...100 mm²/s	0.3...1,000 mm²/s
Amount of cleaning agents	2	2	2
Dimensions (W x D x H)	130 x 160 x 130 mm	130 x 160 x 130 mm	130 x 160 x 130 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 VRM 4 / 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 mm²/s,
incl. manual transfer lock 1 (UD 500), tubing set 4-leg (LMRZ937)

LMRZ910 **Connection set 2**
For viscometer without aspirating leg (Type 1, Type 3, Type 5, Type 7),
viscosity range 0.3...30 mm²/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 mm²/s,
incl. manual transfer lock 4 (UD 702), tubing set 3-leg (LMRZ938)

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

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**

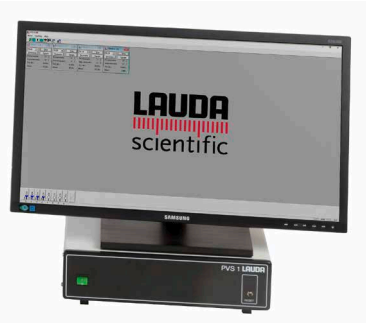
LMRZ909

LMRZ927

LMRZ931

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	50 ml	50 ml	50 ml
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...100 mm²/s	0.3...100 mm²/s	0.3...100 mm²/s
Dimensions (W x D x H)	850 x 650 x 1,100 mm	1,200 x 650 x 1,100 mm	1,200 x 650 x 1,100 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 30 ml or 100 ml sample flasks. Factory configuration only.

LMVZ986 **VAS cover plate S30**
For 30 ml sample flasks with 17 sample positions

LMVZ984 **VAS cover plate L30**
For 30 ml sample flasks with 41 sample positions

LMVZ985 **VAS cover plate L100**
For 100 ml 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

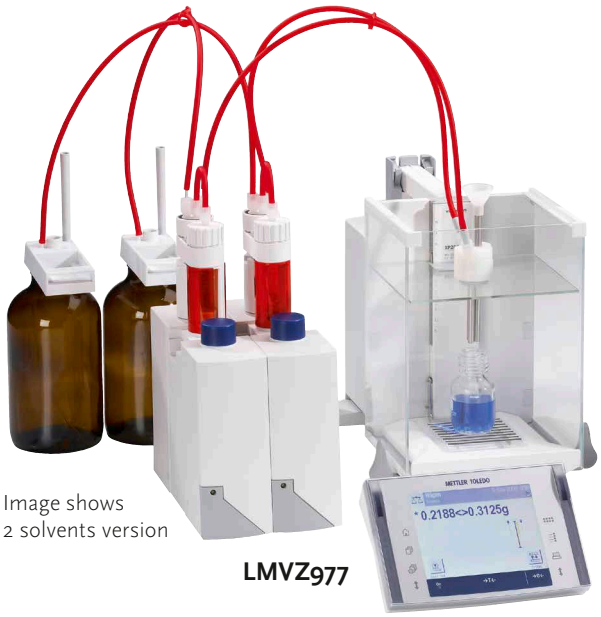


Image shows
2 solvents version

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, 20 ml

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

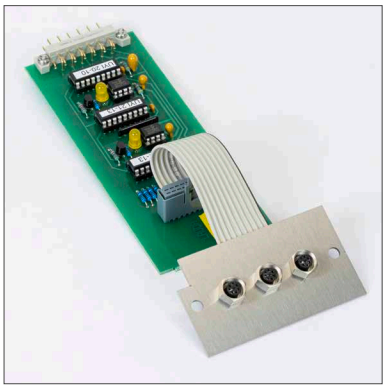
LMVZ979

General accessories for viscosity

EG 094 | ED 062 | EG 066

EDF 093

EBK 013



LMVZ930

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

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

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

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 100 ml 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**).

Viscocool 6 S, Viscotemp 18 S, ET 15 S

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

Viscocool 6 S
With Peltier cool. unit,
incl. cover plate
(Image similar)

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

For R&D applications close to ambient temperature, the **Viscocool 6** is the perfect selection. With a footprint of only 206 x 415 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.

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	Viscocool 6 S (L001104)	Viscotemp 18 S (L001106)	ET 15 S (L001098)
Material bath vessel	Polycarbonate	Glass	Polycarbonate
Working temperature range	15...90 °C	0[1]...105 °C	20[1]...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	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]
Dimensions (W x D x H)	206 x 415 x 530 mm	Ø 310 x 510 mm	428 x 130 x 532 mm

[1] Can be realized with external cooling

[2] 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[1]...105 °C	0[1]...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	19 l	27 l
Glass pane size (W x H)	152 x 233 mm	329 x 233 mm
Voltage	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]
Dimensions (W x D x H)	532 x 233 x 552 mm	708 x 233 x 552 mm

[1] Can be realized with external cooling

[2] 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.

L001532
Proline PV 15
(Image similar)

(Image similar)

L001533
Proline PV 24
(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[1]...230 °C	0[1]...230 °C	0[1]...230 °C	-60[3]...100 °C	-60[3]...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	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]	230 V, 50/60 Hz[2]
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

[1] Can be realized with additional LAUDA cooler [3] Can be realized with LAUDA RP 290 [2] Further power supply variants on request

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 MD 15 V / E 15 V**
For 2 measuring stands

LCZ 040 **Cover plate MD 15 VK / E 15 VK**
For 1 measuring stand and 2 manual / thermostating positions

LCZ 0685 **Cover plate MD 15 K / E 15 K**
For 3 manual / thermostating positions

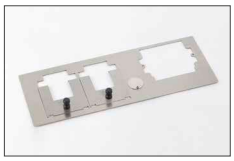

LCZ 041

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 / thermosttating 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

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

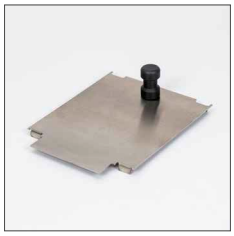

LCZ 0732


LTZ 045

Cover plates for viscothermostats

LTZ 049

LTZ 052



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 093 **Closing lid**
For V-cover plates

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 (230 V / 50 Hz)**
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 (230 V / 50 Hz)**
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 (230 V / 50 Hz)**
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 of 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, 100 cm, for temperatures -90...150 °C,
2 pcs. needed per each thermostat

LZM 055 **Metal tubing MK 200**
M16X1, 200 cm, 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 [1] | **10...110 °C [2]**

LZB 114 **Therm 180, 5 l**
LZB 214 **Therm 180, 10 l**
LZB 314 **Therm 180, 20 l**

Temperature ranges: 90...200 °C [1] | **90...150 °C [2]**

LZB 122 **Therm 250, 5 l**
LZB 222 **Therm 250, 10 l**
LZB 322 **Therm 250, 20 l**

Temperature ranges: -20...180 °C [1] | **-20...100 °C [2]**

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

Temperature ranges: -50...120 °C [1] | **-40...50 °C [2]**

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

[1] Temperature range technically approved

[2] **Temperature range recommended for viscosity measurement**

Heat transfer liquids

Silicon oil

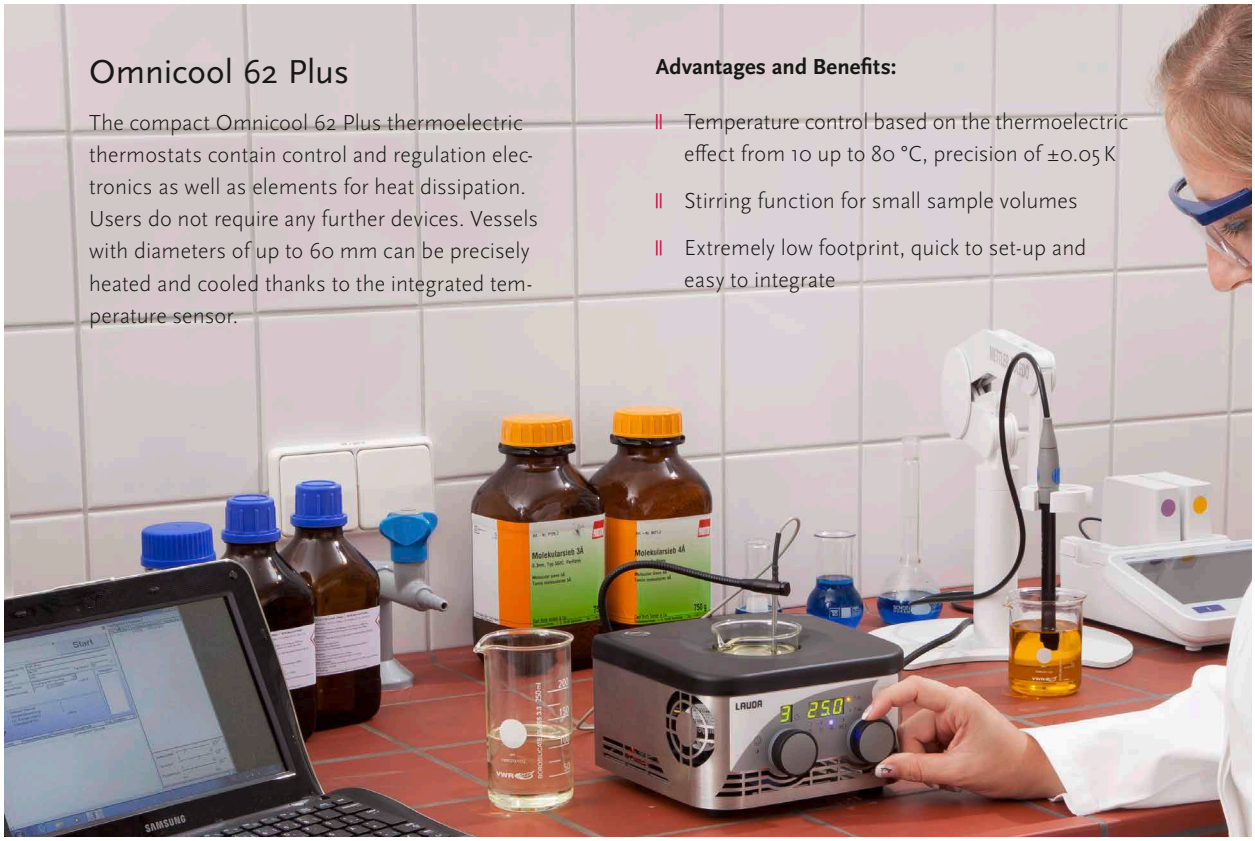
Temperature ranges: -70...30 °C [1] | **-60...30 °C** [2]

LZB 130 KRYO 95, 5 l
LZB 230 KRYO 95, 10 l
LZB 330 KRYO 95, 20 l

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**

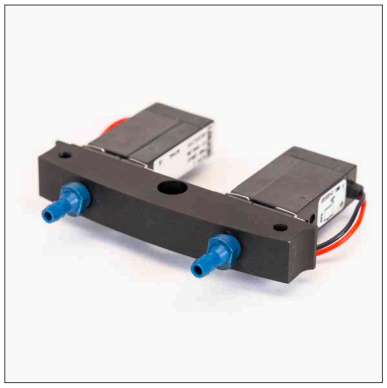
ETP 088

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_2SO_4

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)

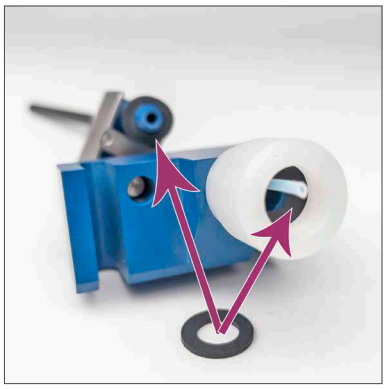
HKR 226 **Disc VRM**
For sealing manual transfer lock 2 (UD 501)

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

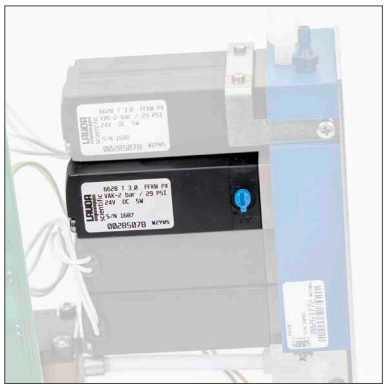
HKR 226

Spare parts for Viscometry

HX 590-B

HX 589-B

HX 592-1



EVM 116

Cleaning module VRM

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

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_2SO_4 VRM 4 S

HX 632-B **Plug-in unit**
For aspirating H_2SO_4 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 556 Dosing syringe, standard
UD 442-1 Dosing syringe Titanium, 5 ml

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

Viscothermostats

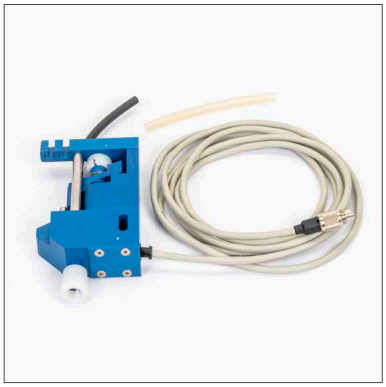
EKS 097 Connection cable
For Proline PV(L) viscothermostats

UK 263 Mains control cable
For Proline PV(L) in connection with DLK 10 / 25

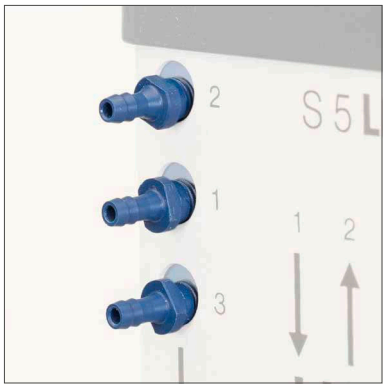
LCZ 0785 Bath 15 T
For ET 15, polycarbonate, transparent

EGG 014 Bath ETG 18
For Viscotemp 18, glass, transparent

EU 260 Bath ETP 6
For Viscocool 6, polycarbonate, transparent



UD 701-B



HKO 064

UD 556 | UD 442-1

EZ 823

LAUDA scientific

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, ⌀ 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/cm³
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	10...40 °C
Temperature range with PTT+	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:

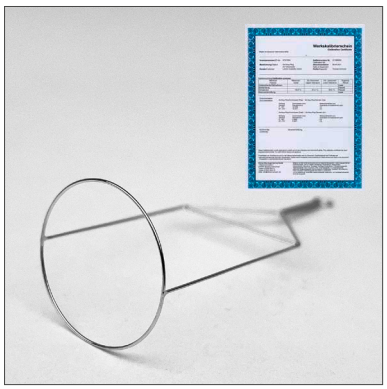
- Wide measurement range up to 300 mN/m (0.01 mN/m resolution)
- User-independent measurements with automatic maximum detection and sample stage movement
- Automatic Zuidema and Waters correction for precise correction of Du-Noüy ring measurements
- Precise, high-resolution distance measurement for exact 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/cm³
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	10...40 °C
Temperature range with PTT+	5...80 °C
Dimensions (W x D x H)	245 x 205 x 335 mm
Power consumption	10 W
Weight, net	11 kg

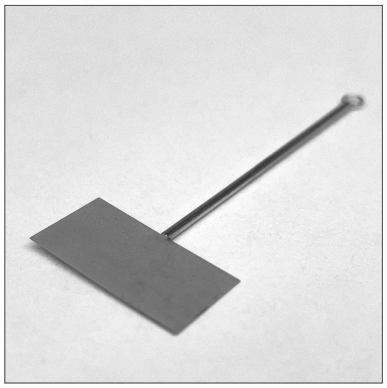
Scope of supply:

- 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, ⌀ 6 cm, 10 units (EG 011)

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 2,5 g, 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
⌀ 6 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

General accessories for tensiometer TD4 only

LMTZ934 Sample spacer L
Height 32 mm

LMTZ935 Sample spacer S
Height 16 mm

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+ (230 V / 50 Hz)

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 4,5 x 15 mm (EZ 265)
- Sample beaker ⌀ 6 cm (EG 011-1)
- Connection cable (EKS 097)

LMTZ933 **Thermostated jacket TD**
Enables fast and effective temperature control of your samples by connecting an external thermostat (e.g. LAUDA Loop 100), incl. sample beaker ⌀ 6 cm (EG 011-1) and windshield

LMTZ933

Accessories for temperature control (TC1 only)

HF 513 **Adapter plate**
For mounting PTT+ (LMTZ832) or thermostated jacket TD (LMTZZ933) on a TC1 tensiometer

Spare parts for tensiometer models TD1C / TD3

EZ 141 **Measuring ring 2-legged**
According to Du-Noüy (Pt/Ir), platinum, length 40 mm

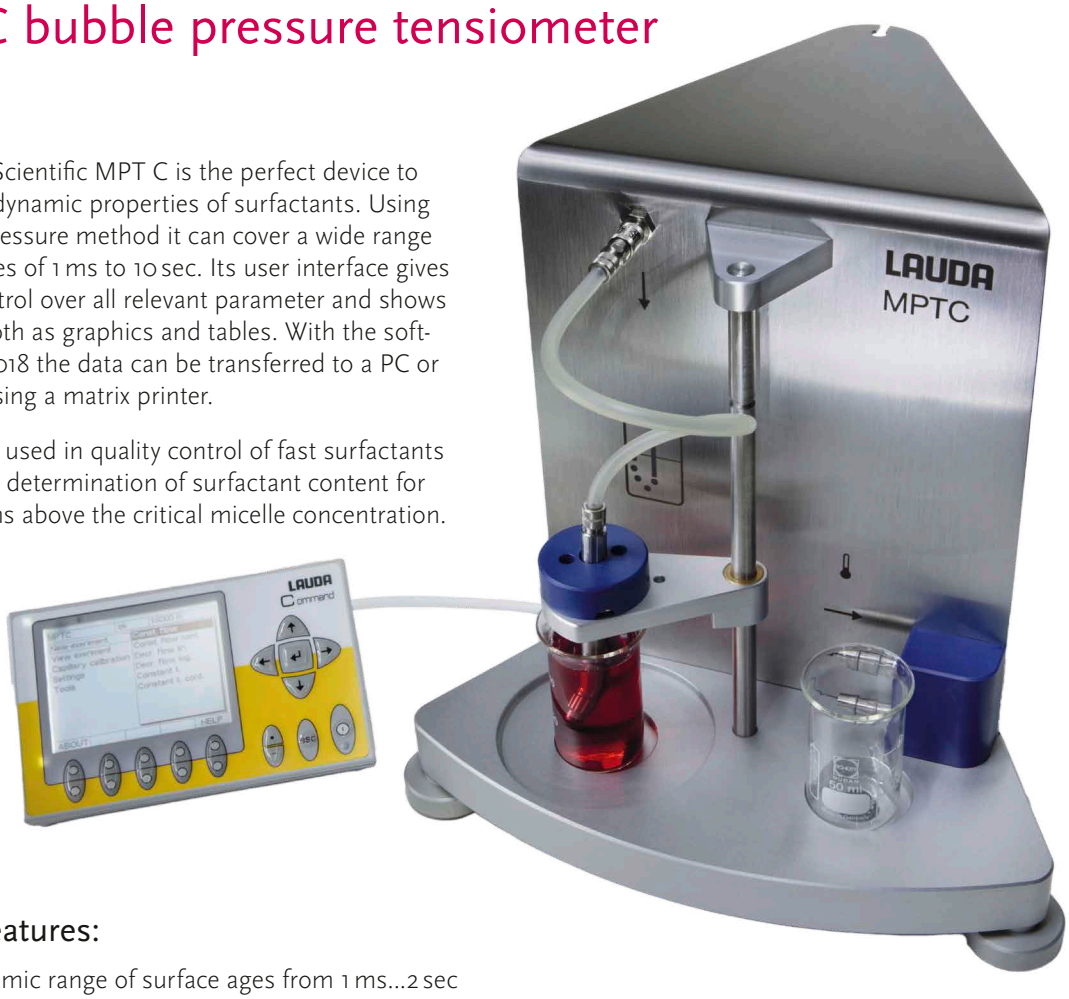
EZ 250 **Measuring ring 4-legged**
According to Du-Noüy (Pt/Ir), platinum, length 45 mm

EZ 251 **Wilhelmy plate**
Platinum, height 45 mm (incl. shaft)

MPT C bubble pressure tensiometer

The LAUDA Scientific MPT C is the perfect device to characterize dynamic properties of surfactants. Using the bubble pressure method it can cover a wide range of surface ages of 1 ms to 10 sec. Its user interface gives a perfect control over all relevant parameter and shows the results both as graphics and tables. With the software LDTM2018 the data can be transferred to a PC or be printed, using a matrix printer.

It can also be used in quality control of fast surfactants as well as the determination of surfactant content for concentrations above the critical micelle concentration.



Special Features:

- Wide dynamic range of surface ages from 1 ms...2 sec
- Measurement of time-depending behavior
- User-defined measurement point distance and duration of the measurement
- Storage of up to 50 test results and the respective parameters
- Measurement results can be either stored on a PC or printed using the optional dot-matrix printer
- Integrated pump for bubble generation

Scope of delivery:

- MPT C incl. Command module, power supply and mains cable EU (LMT 845)
- Holder for capillaries (UD 675), incl. 10 capillaries (EG 077)
- Sample beaker, 50 ml, 10 units (EG 004)

Accessories for bubble pressure tensiometer

LMC 820

Data output

LMC 820 **Matrix printer**
For printing measurement results

EAZ 041 **Print ribbon**
Spare for matrix printer (LMC 820)

EAZ 035 **Paper rolls**
For matrix printer (LMC 820), 10 rolls

Accessories for bubble pressure tensiometer

Software

LDTM2018 Data transfer software
For data export from a MPT C to a PC (e.g. Microsoft Excel), incl. RS232 cable

LDTM2018
Data transfer software

General accessories

UD 606 Digital temperature probe

EG 077 Capillaries, glass
10 units

UD 675 Holder for capillaries
Angular, incl. 10 capillaries (EG 077)

LMTZ929 Capillary, steel

EG 004 Sample beakers
50 ml, 10 units

LMTZ930 Cleaning set
Incl. ultrasonic bath, pump and capillary holder

EKN 040 Mains cable for US

Temperature control for bubble pressure tensiometer

LMTZ832 Thermoelectric thermostating unit PTT+
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 4,5 x 15 mm (EZ 265)
- Sample beaker ⌀ 6 cm (EG 011-1)
- Connection cable (EKS 097)

LMTZ832
PTT+

Alternative temperature control solutions

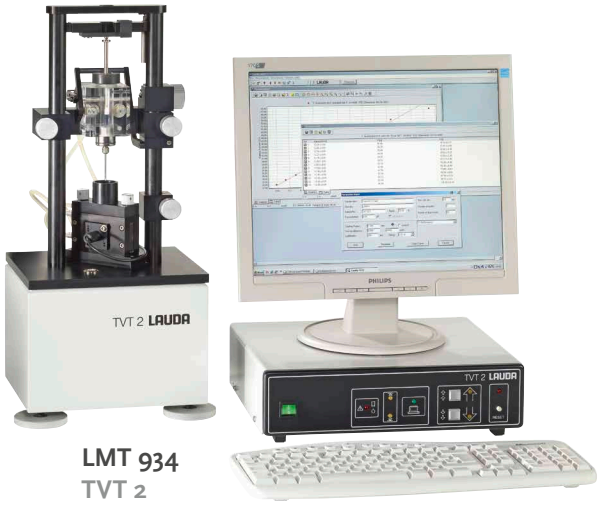
EG 047-4 Double-walled glass thermostating vessel
For MPT C

L001249 LAUDA RE 415 S (230 V / 50 Hz)
Working temp. range -15...+200 °C, temperature stability 0.02 ± K, pump pressure max. 0.55 bar, pump flow max. 22 l / min.

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

EG 047-4

TVT 2 drop volume tensiometer



LMT 934
TVT 2

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 250 µl (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

EGZ 007 | EGZ 06 | HX 453

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

LMTZ908
Reverse measurement set

Temperature control

L001249 LAUDA RE 415 S (230 V / 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

L001249
LAUDA RE 415 S

US 055

LAUDA scientific

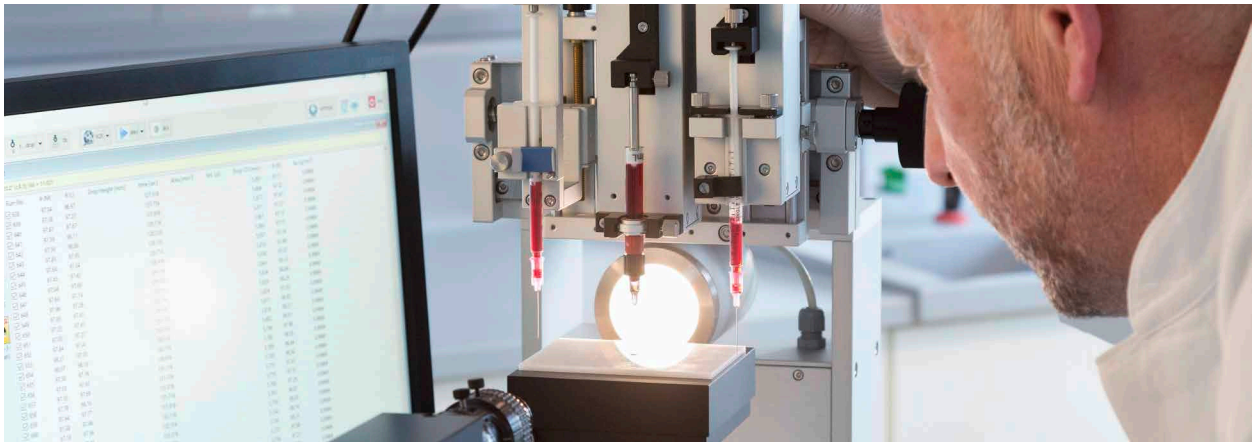
Contact Angle Instruments –
For the measurement of surface properties

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: $0° < \theta < 180°$
- 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 : ± 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

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)

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 predicated. Different SFE models and full contact angle range ($0° < \theta < 180°$) are supported. Analysis results may be exported in Excel-format.

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

Substance database

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

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 as well as the surface free energy.

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.

(Image similar)

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	1,9 x telecentric lens
Camera Type	Camera LCA-3 (USB 3) 1,280 x 1,024 px max. res., 60 fps
Focus	12 mm fine focus with focus assistant support
Max. sample dimensions (L x W x H)	∞ x 290 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (L x W)	100 x 100 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 / 240 V AC, 50 / 60 Hz.
Dimensions (W x D x H)	600 x 160 x 533 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 1,7 x telecentric lens and LCA-3 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
- 2x precision micrometer-driven syringe dispensing unit MDU S2 (LMOZ1001)
- Surface.Meter software (LMOZ9001)
- Software module SFE for determination of surface free energy (LMOZ9002)

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
- Powerful algorithms enable precise drop analysis
- Expandable with automated dosing systems and tilting table modules

Technical features	LSA 60
Lens	6 x zoom lens
Camera type	Camera LCA-3 (USB 3) 1,280 x 1,024 px max. res., 60 fps
Focus	12 mm fine focus with focus assistant support
Max. sample dimensions (L x W x H)	∞ x 290 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (L x W)	100 x 100 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 / 240 V AC, 50 / 60 Hz.
Dimensions (W x D x H)	600 x 160 x 533 mm
Weight, net	approx. 18 kg

LMO 0060 LSA 60 Basic

For automatic contact angle and surface tension measurements

Included standard components:

- LSA 60 with 6,5 x 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-1 (USB 3) 1,280 x 1,024 px (225 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 (L x W x H)	∞ x 290 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (L x W)	100 x 100 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 / 240 V AC, 50 / 60 Hz.
Dimensions (W x D x H)	600 x 160 x 543 mm
Weight, net	approx. 19 kg

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 8,7 x zoom lens and LCA-1 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)

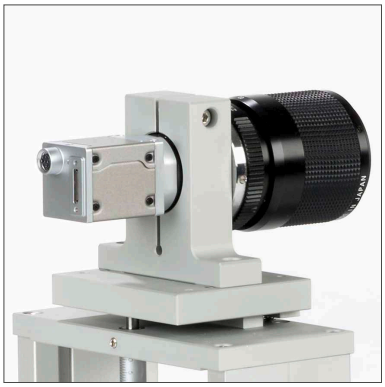
LMO 0103 LSA 100 Research

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

Included standard components:

- LSA 100 with 1,7 x telecentric lens and LCA-1 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
(shown in combination with optional LCA-4)

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 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-2 (USB 3) 1,920 x 1,200 px (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 (L x W x H)	∞ x 350 x 76 mm
Max. sample weight	15 kg (self-locking w/o clamping)
Sample table dimensions (L x W)	100 x 100 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 / 240 V AC, 50 / 60 Hz.
Dimensions (W x D x H)	650 x 190 x 543 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 8,7 x zoom lens and LCA-2 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)

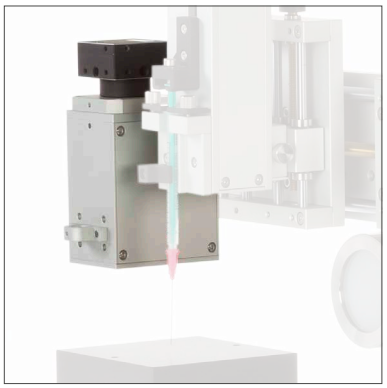
LMO 0202
LSA 200 S2

LAUDA Mobile Surface Analyzer LSA MOB

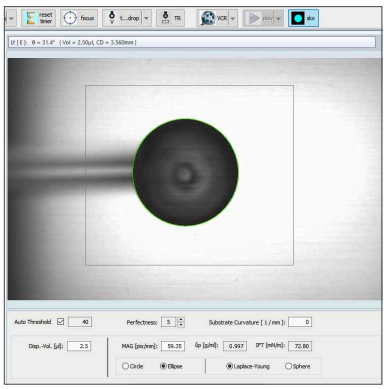
LMO 0020
LSA MOB-M

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 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

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

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

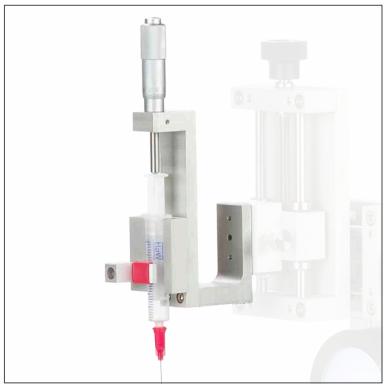
LMOZ1004 ADUV 31
Automatic dispensing unit with valve ADUV 31 for 1 liquid
Incl. 1x automatic dosing unit with 3-way valve, 1x gas-tight glass syringe (0.5 ml), 1x tubing set with needle and adaptor and 1x set of (different sized) needles (3x 20 pcs.) (EZ 524)

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 adapter and 1x set of (different sized) needles (3x 20 pcs.) (EZ 524)

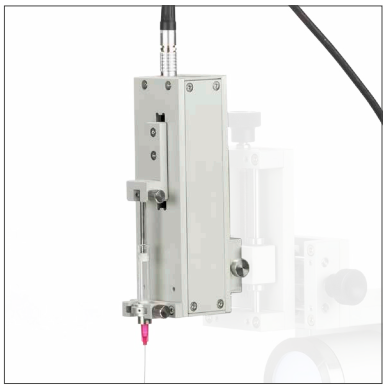
Piezo dosing unit

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

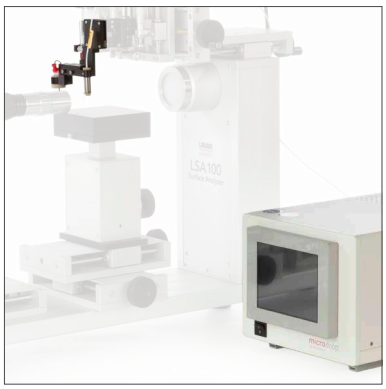
LMOZ1007 Lens upgrade set LSA 100 Micro (for PDDU)
For the analysis of small droplets in combination with PDDU (LMOZ1006), field of view 1...0.17 mm, incl. Mitutoyo 20x microscope lens attachment and 6.5 x ultra-zoom converter lens



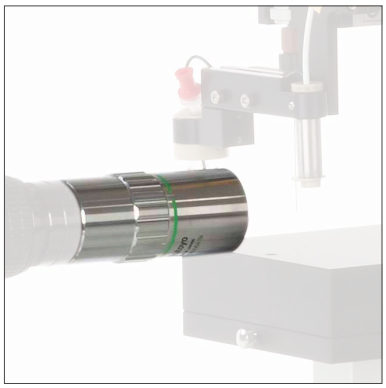
LMOZ1000



LMOZ1002



LMOZ1006



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

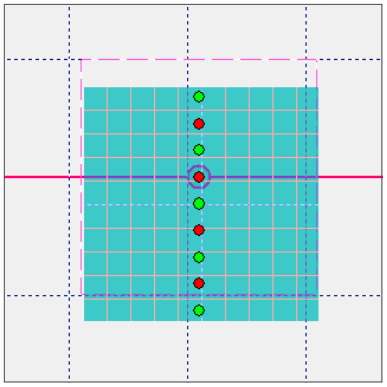
LCA-1

LMOZ7001 Camera upgrade from LCA-3 to LCA-1
Camera upgrade for LAUDA Surface Analyzer
USB 3.0, global shutter,
Max. resolution 1,280 x 1,024 @ 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 1,920 x 1,200 @ 170 fps camera speed

LMOZ7004 Camera upgrade from LCA-3 to LCA-4
Camera upgrade for LAUDA Surface Analyzer
USB 3.0, Max. resolution 1,920 x 1,200 @ 160 fps camera speed
1,200 x 60 @ 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 °C, max. sample size 52 x 37 mm, for use with external LAUDA thermostat

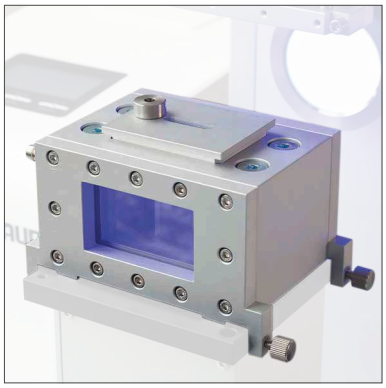
LMOZ4001 EC 50
Environmental chamber for large samples
Temperature range –30...180 °C, with anti-fogging accessory, max. sample size 95 x 87 x 42 mm (L x W x H), for use with external LAUDA thermostat

LMOZ4002 EC 150
Thermoelectric environmental chamber
With integrated thermoelectric cooling / heating, temperature range –30...150 °C, max. sample size 60 x 60 mm, cooling with external LAUDA thermostat recommended

LMOZ4003 HTC 350
High temperature chamber
With integrated electrical heating, temperature range 30...350 °C, max. sample size 60 x 60 mm

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 °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 °, incl. motor-driven tilting base assembly, power supply unit and mounting adapater

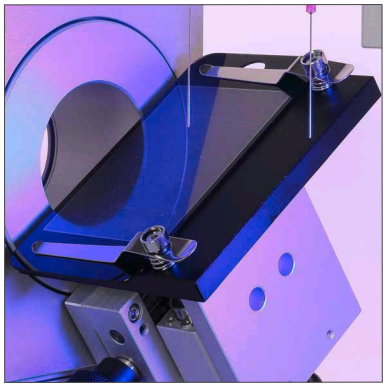
LMOZ2001 RFB 20
Retention force balance
For measuring advancing / receding contact angle, retention force and sliding speed, g-range 0...20 m/s², incl. RFB 360, software package / support and controller box

LMOZ2002 STS 10
Suction plate
For sample size 10 x 10 cm, for use with vacuum pump (LMOZ2010)

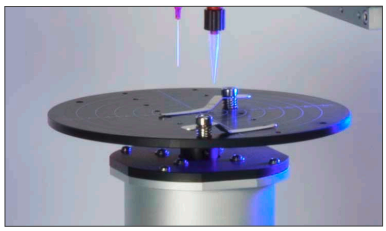
LMOZ2010 Vacuum pump
For use with STS 10 suction plate (LMOZ2002)

LMOZ2004 STS 30 Powder sample holder
For sample size 2 x 2 cm

LMOZ2005 STS 40 Film holder
For sample size 5 x 5 cm

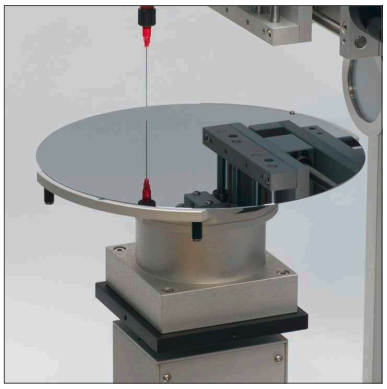


LMOZ2000



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.

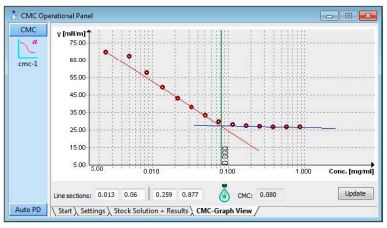
Modules for advanced analysis

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

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.

Modules for advanced analysis

LMOZ5007 OEDM 20

Oscillating / expanding drop module

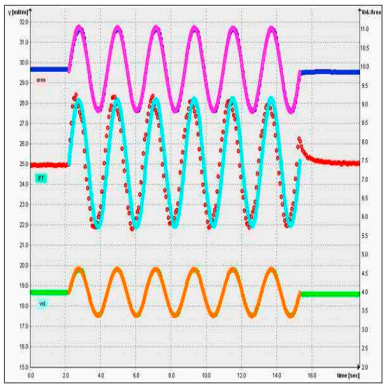
This surface / interfacial rheology module uses the pendant drop analysis. The method is based on periodically or abruptly modulating or changing the surface area of a pendant drop and tracking simultaneously the response of its surface or interfacial tension value during the process. By analyzing the 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:

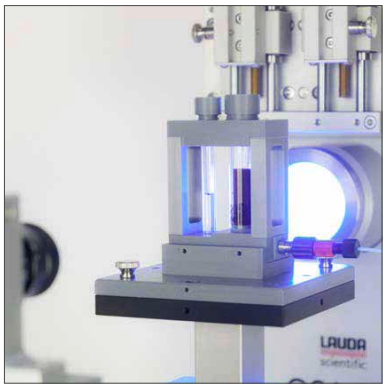
- More dynamic than mechanic measurements to to lack of inertia
- Additional methods like high speed measurements of drops sinking into powder beds or porous material could be realized
- Identical measurement cell for powder and porous material
- Hydrophobic materials could be also measured easily in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

Including:

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

Hardware requirements:

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

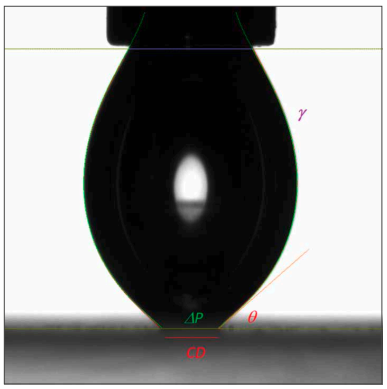


LMOZ5006
POW 10

LMOZ5008 Measurement cabinet

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

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

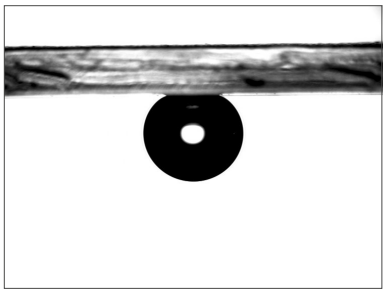
Superwettability High (SWH): Superhydrophobicity for contact angle > 150
SWL: Superwettability Low (SWL): Superhydrophilicity for contact angle < 5

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.



LMOZ2001
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

LMOZ9001 **Surface.Meter**
Basic functions and professional accuracy for contact angle measurement, pendant drop analysis for surface and interfacial tension measurement (SFT / IFT) and control of automatic dosing units.

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 es 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 / 200 µl

EZ 817 **ADDU Disposable syringe kit**
For easy use of disposable syringes together with ADDU / ADDN, 1 ml

EZ 517 **LSY 100**
Syringe 100 µl, glass

EZ 518 **LSY 500**
Syringe 500 µl, glass

EZ 519 **LSY 1000**
Syringe 1,000 µl, glass

EZ 520 **LSY 1000D**
Syringe 1,000 µl, disposable, 100 pcs.

EZ 521 **LSY 2000D**
Syringe 2,000 µl, 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 40 mm, 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

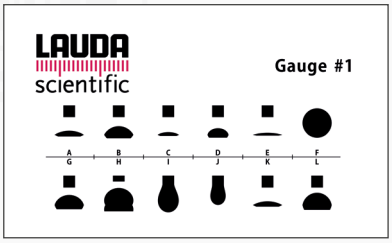
A prerequisite for the reliable interpretation of measurement results is certainty about the reliability of the contact angle measuring instrument you are using. For this purpose, we have developed our glass carrier plate with standard drop images.

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



Additional external temperature equipment for LSA

L003472
LAUDA LOOP L 100

L001252
LAUDA RE 630 S

LZB 121 | LZB 221 | LZB 321

L003472 **LAUDA Scientific LOOP L 100 (230 V / 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 (230 V / 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)

Heat transfer liquids (Silicon oil)

For temperature range -20...180 °C

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

For temperature range -50...120 °C

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

LAUDA scientific

Service, installation, maintenance, training
LAUDA Scientific

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

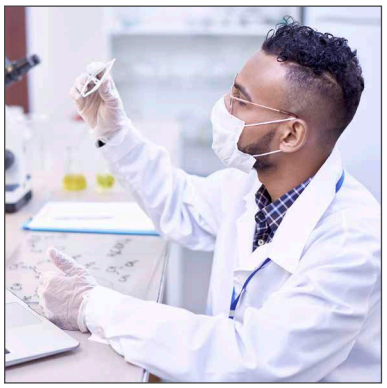
SDT 998-1 **User training**
Training for 4 hours by a qualified representative of LAUDA Scientific GmbH for 1-2 participants.

SDT 998-2 **User training**
For each additional participant.

Remote Services

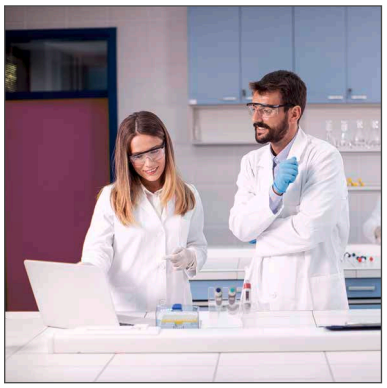
SDR 998-1 **Digital Software Service**
Our hardware and software specialists will support you in all aspects of installation and configuration of our measuring device software, e.g. in the context of a new installation, an operating system update, computer replacement or relocation of a devices.
Price 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.



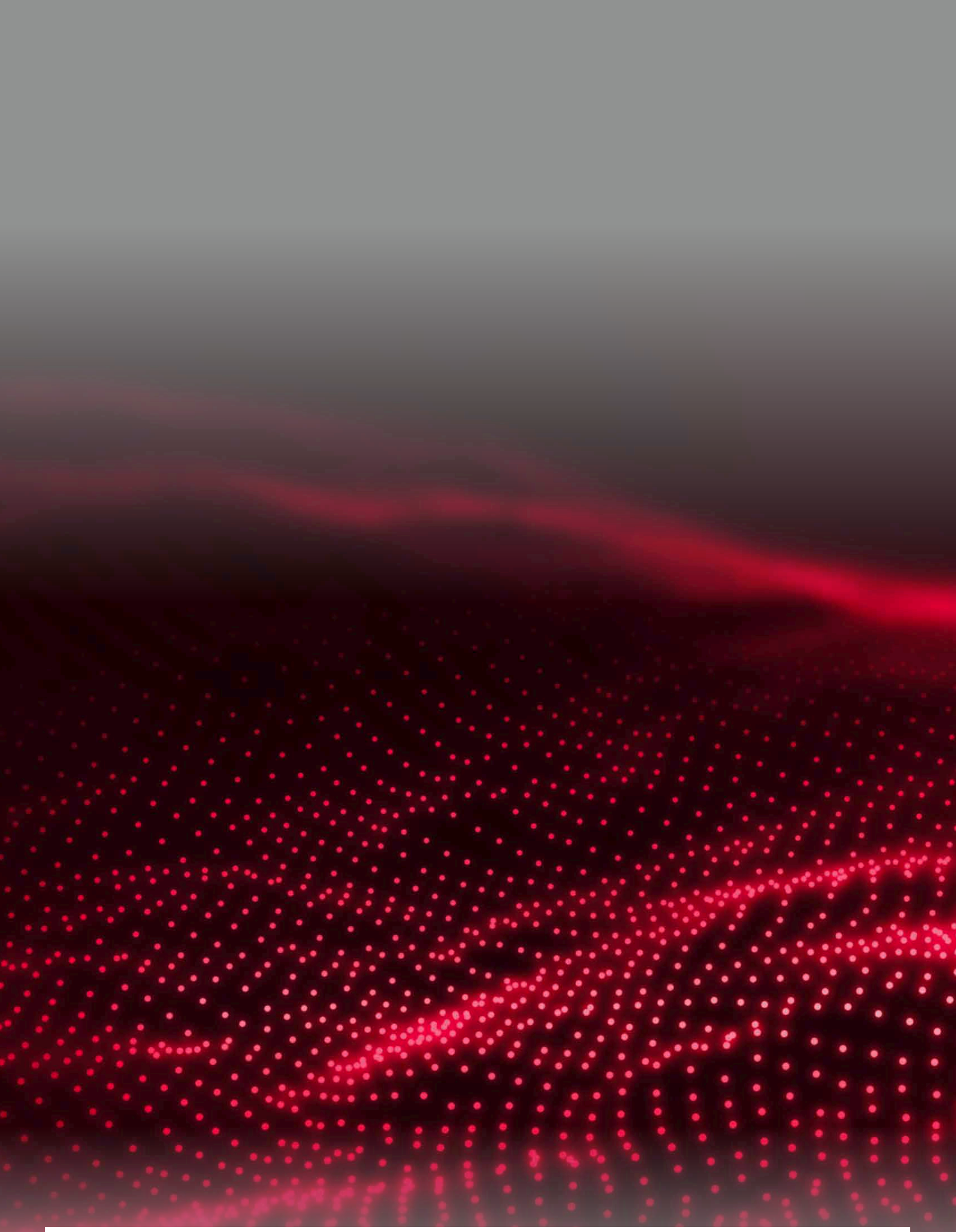
SDR 998-3 **Digital Application Consulting**
With their extensive experience, our digital application consulting specialists advise you on a wide range of topics incl. the design of measurement processes, the parameterization of new applications or increasing your data quality while taking standards.
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

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



Technical modifications, errors and omissions excepted.

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05-430-en-02
2022-06