UVS®

Viscosity Systems

Welcome to UFIT

For the past 20 years, the UFIT AG is a competent partner for customers in the automotive, medical engineering, pharmaceutical and chemical industry.

The UFIT AG is specialized in the production of viscosity measuring devices for mineral oils and polymers. The use of these devices (used to determine the viscosity of a fluid) manufactured by UFIT AG ensures inter alia the assured quality of lubricants, gear wheels, airbags, plug and switch housings, bulletproof clothing, textile and adhesives, safety glass, CDs and DVDs as well as food packaging. "Strict customer focus and excellent staff training, these are the secrets of our success," says Harald Schilg, CEO of UFIT AG. - It was he who first founded the company in 2000 as a limited company, before he and his brother Peter Schilg decided in 2002 to convert in a stock corporation.

Introduction

about Viscosity measurement

Viscosity Systems

General

Measurements using capillary viscometers are based on the relation between viscosity and time. They use gravity as the driving head. The results are kinematic viscosity values. If the density is known, it is easy to calculate the dynamic viscosity.

The big advantage of this method is that gravity is a highly reliable driving head. It is not artificially generated, so this avoids potential errors. The gravity is everywhere on earth well known. That‘s why this principle is widely established in many standards and standardized practices. For Newtonian liquids this measurement is the only way to receive high precision results. There are only a few systems on the market which work with standard ubbelohde viscometers. Our system is the only one who can use a kinematic viscosity range from 1 to 50 with the same capillary size fullfilling the standards of ASTM, ISO and DIN. This is realized with a high precision constant-temperature bath for flow times higher than 1000 seconds and for flow times between 20 - 200 seconds by calculating the individual kinetic correction in accordance to DIN 51562 part 2 and 4 (Hagenbach correction).

$$\vartheta = K(t - \Delta t_H)\frac{g}{g'}$$

Kinetic energy correction [s]

Acceleration due gravity at the point of measurement

Kinematic viscosity [mm²/s]

Viscometer constant [mm²/s²]

Flow time [s]

Acceleration due gravity at the point of calibration

UVS® for polymers and oil

UVS® measurement devices are developped to measure the intrinsic viscosity of polymers as well as the kinematic viscosity of mineral oil products in compliance with DIN51562 p.1-3, ASTM D 445/446 and DIN ISO EN 3104/3105 and all polymere standards (see table applications).

Viscosity Systems

UVS® Easy line

- modern glass touchscreen
- manual filling
- 1 or 2 measure points
- semi automated cleaning
- full automated cleaning with up to 2 solvents
- printer connectivity

UFIT provides two lines:

UVS® Easy and UVS® Basic

General features

- high precision time measurement
- reproducibilty of flow time
- high precision constant bath
- space saving
- modular concept
- customized configuration
- high viscosity handling
- resistant against acids and any solvent
- infrared and thermistor detection
- safety lightbarrier control
- support of suction and pressure mode
- channel independent measurement

UVS® Basic line

- modular
- expandable
  - up to 128 measure points
  - to fully automated system with sample changer
- LIMS connectivity
- Connection to PC

Viscosity Systems

Applications

typical examples

Polymer	IUPAC	Test Method	Solvent	Concentration	Temperature
Polyamide	PA	ASTM D789	Formic acid	8.4%	25°C
Polyamide	PA	ISO 307	Formic acid	0.5%	25°C
Polyamide	PA	ISO 307	Sulphuric acid	0.5%	25°C
Polyamide	PA	ISO 307	m-cresol	0.5%	25°C
Polyamide	PA	ISO 307	m-cresol/ Phosporicacid	0.5%	25°C
Polyamide	PA	JIS K6920-2	Sulphuric acid		25°C
Polyester	PET/PBT/PCT/ PEN	ASTM D4603	Phenol/Tetrachloroethane	0.5%	30°C
Polyester	PET/PBT	ISO 1628-5 (DIN 53728)	Phenol/Dichlorobenzene	0.5%	25°C
Polyester	PET/PBT	ISO 1628-5	Dichloroacetic acid	0.5%	25°C
Polyester	PET/PBT	ISO 1628-5	o-Chlorophenole	0.5%	25°C
Polyester	PBT	ISO 1628-5	m-cresol	0.5%	25°C
Polyester	PET/PBT/PEN	ISO 1628-5	Trichlorophenole	0.5%	25°C
Polyvinylchlorid	PVC	ASTM D1243	Cyclohexanone/THF	0.2%	30°C
Polyvinylchlorid	PVC	ISO 1628-2 (DIN 53726)	Cyclohexanone	0.5%	25°C
Polyvinylchlorid	PVC	JIS K 6722	Cyclohexanone	0.5%	25°C
Polyethylen/ Polypropylen	PE / PP	ASTM D1601	Decahydronaphthalene	0,022 %	135°C
Polyethylen/ Polypropylen	PE / PP	ASTM D4020	Decahydronaphthalene	0,022 %	135°C
Polyethylen/ Polypropylen	PE / PP	ISO 1628-3	Decahydronaphthalene	0,5%, 0,1%, 0,02%	135°C

Applications

typical examples

Viscosity Systems

Polymer	IUPAC	Test Method	Solvent	Concentration	Temperature
Pulp, Cellulose		ISO 5351	CED Solution	0,5% - 0,2%	25°C
Pulp, Cellulose		ASTM D1795	CED Solution	1% - 0,1%	25°C
Pulp, Cellulose		ASTM D4243	CED Solution	0,2% - 0,05%	25°C
Pulp, Cellulose		TAPPI T230	CED Solution	0,5%	25°C
Cellulose		DIN 54270	Cuen, EWNN, Nitrocellulose	0,15 - 3%	20°C
Cellulose acetate	CA	ISO 1157	Acetone	0,5%	25°C
Polymethyl methacrylate	PMMA	ISO 1628-6	Dichloromethane	0,1% - 0,5%	25°C
Polymethyl methacrylate	PMMA	ISO 1628-6	Chloroform	0,1% - 0,5%	25°C
Polycarbonate	PC	ISO 1628-6	Dichloromethane Chloroform	0,1% - 0,5%	25°C
Polystyrene	PS	ISO 1628-6	Toluene	0,1% - 0,5%	25°C
Polyphenylene sulfide	PPS			0,5%	210°C
Polyisobutene	PIB		Isooctane	0.1-0.5%	20°C
Water soluble Polymers			Water Sodium chloride		25°C
other Polymers			Dimethylketene		25°C

Mineraloils and other Newtonic liquids

DIN52562-FF		-40 - 150°C
ASTM D445		-40 - 150°C
ISO 3104		-40 - 150°C

Viscosity Systems

Measuring Instruments

UVS® Easy

UVS® Easy is a measure device for determination the kinematic, relative and kinetic viscosity of polymeric compounds or lubricants with a viscometer. Calculation and documentation of the determined values is done via the touchpad / display :

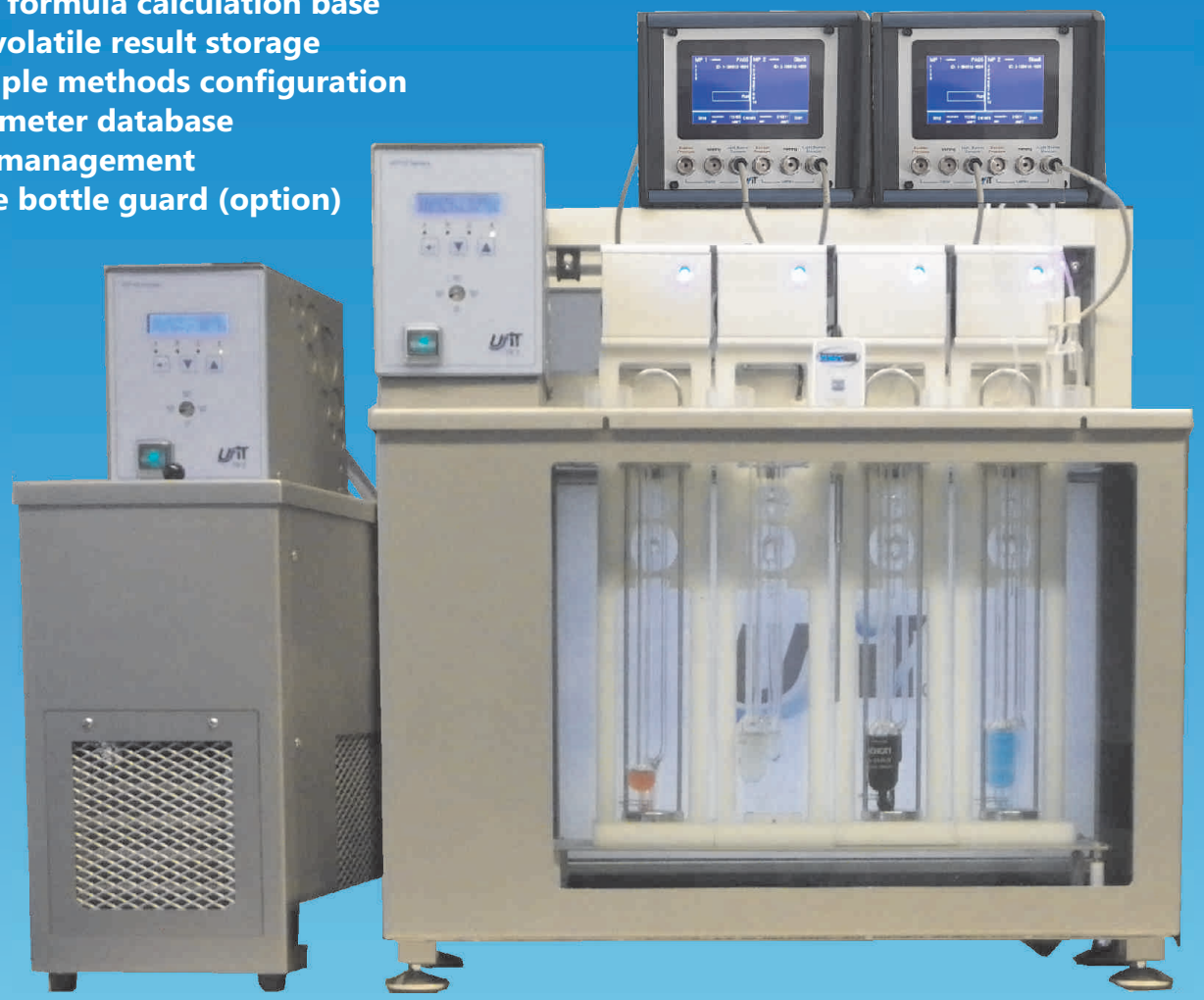
In combination with a viscometer the UVS® can measure the flowtime till 9999 seconds with accuracy in 10 milliseconds and is compliant to
- ASTM D445
- ISO 3105
- DIN 51562-1 ff
- all valid norms concerning testing of polymers

Minimum system:
- viscosity measurement for one channel with connection to light barriers stand
- Suction or Pressure mode

Option:
- Printer
- second measurement channel (Suction or Pressure mode)

or
- rinsing or cleaning unit, with waste sensor, head conductance sensor (TC) and alarm
- full automated cleaning up to 2 solvents

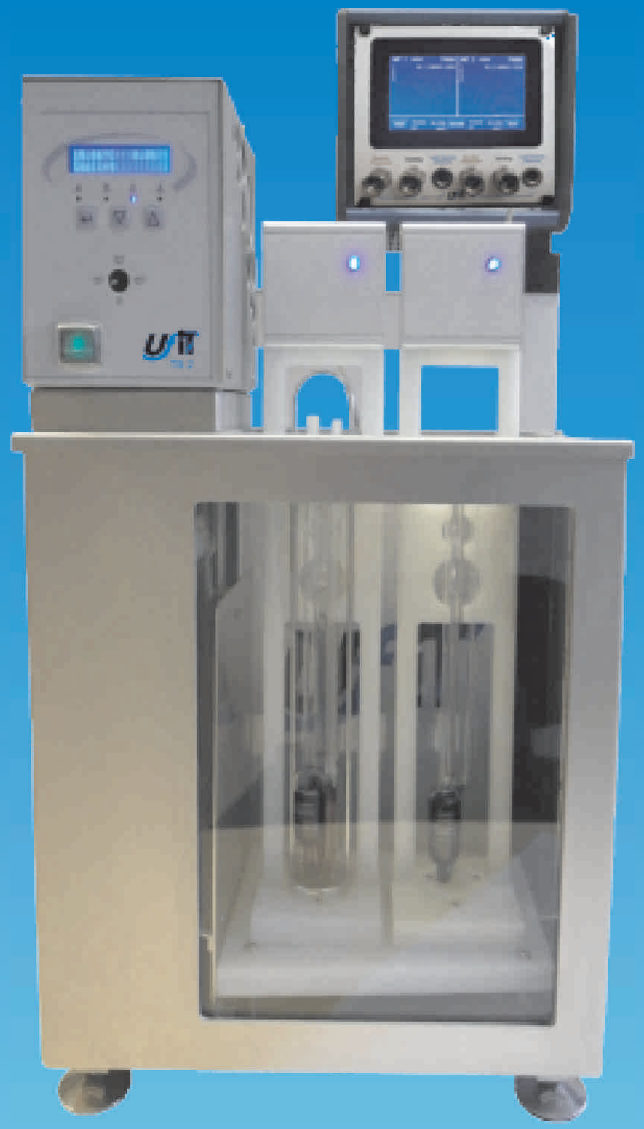
Highlights:
- **modern glass touchscreen**
- **up to 2 channel measure device per unit**
- **optional drain functionality**
- **optional automated clean functionality**
- **huge formula calculation base**
- **non volatile result storage**
- **multiple methods configuration**
- **viscometer database**
- **user management**
- **waste bottle guard (option)**



Measuring Instruments

UVS® Easy variants

Viscosity Systems



one channel
Light barrier or TC
manual filling
automated measurement

UVS® Easy 1

two independent channels
Light barrier detection
manual filling
automated measurement

UVS® Easy 2
(2 channels)

one channel
Light barrier or TC
manual filling
automated measurement
semi automated discharge to waste bottle
(option: waste guard)
semi automated cleaning with manually filled solvents
semi automated drying

UVS® Easy D
(Drain)

one channel
Light barrier or TC
manual filling
automated measurement
automated cleaning up to 2 solvents after measurement
- with discharge to waste bottle (option: waste guard)
- rinse with solvents and discharge solvents
- drying viscometer

UVS® Easy C
(Drain+ Clean)

UVS for intrinsic and kinematic viscosity

The **UVS® BASIC** is an expandable solution using a PC and our software **Viskey.**

The measuring instrument is space saving and fits into a fume hood. It measures automatically precise and high reproducible flowtimes.

The **UVS® BASIC** has two slots.The first slot contains a **UVS® MD**, the measurement device. For the second slot it is possible to use either another unit of **UVS® MD** as a second measurement point or the vacuum pump **UVS® DRAIN** for automatic sample exhaust and drying in combination with **UVS® CLEAN.**

UVS® CLEAN is the extension in case you do not want to remove the viscometer out of the bath anymore and you need not only to clean with next sample, but also clean with up to 2 solvents. Our cleaning concept avoids overcarry with a small amount of solvents.

The **UVS® SC8** is the extension in case you want to measure your samples fully automatically one sample after the other, instead of filling manually each sample into the viscometer. The system becomes a fully automatic machine for polymer or oil applications.

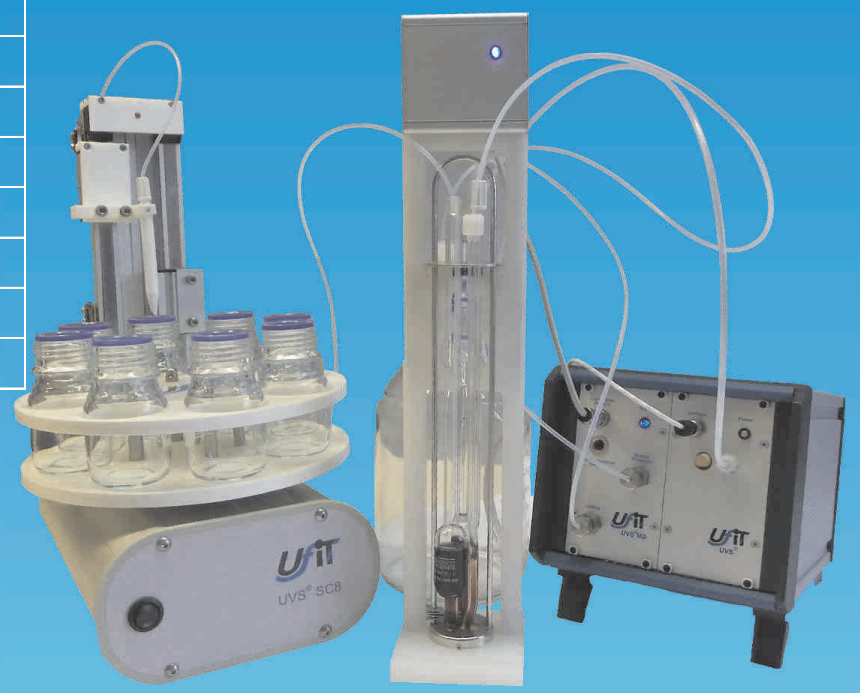
All **UVS®** measuring instruments work independently. This guarantees a high availability in production.

UVS® Basic configuration

Viscosity Systems

UVS® Configuration

Configurations UVS basic	Measuring points	Sample filling	Cleaning solvents per MP	Waste bottles	Measuring samples at same time	Max. Sample positions
UVS basic MD	1	Manual	Manual X	0	1	1
UVS basic MD / MD	2	Manual	Manual X	0	2	2
UVS basic MD + UVS basic MD / MD	3	Manual	Manual X	0	3	3
2 x UVS basic MD / MD	4	Manual	Manual X	0	4	4
1 x UVS basic MD / Drain	1	Manual	Semiauto X	1	1	1
1 x UVS basic MD / Drain + SC8	1	Automatic	Automatic 1 (2)	1	1	24
1 x UVS basic MD / MD + SC8 + UVS waste	2	Automatic	Automatic 1	1	~1.5	24
1 x UVS basic MD / MD + 2 x SC8 + UVS waste	2 ^	Automatic	Automatic 1 (2)	1	2	48
2 x UVS basic MD / MD + 2 x SC8 + UVS waste	4	Automatic	Automatic 1 (2)	1	~2.5	48
2 x UVS basic MD / MD + 4 x SC8 + UVS waste	4	Automatic	Automatic 1 (2)	1	4	96
4 x UVS basic MD / MD + 8 x SC8 + UVS waste	8	Automatic	Automatic 1 (2)	1	8	192



Other combinations possible.

Each combination with UVS NoLimits, increases the step from manual to semi-automated cleaning and increases the speed of cleaning in case of automated systems.
In case of automatic rinsing for viscosities higher than app. 100 mm²/s UVS NoLimits is obligatory.

Viscosity Systems

Measuring Instruments

UVS® MD

UVS MD, Technical Data

Measuring range (time)		
Time	0.100 to 9999.000	s
Resolution	0.001	s
Accuracy (flow time : 0 - 100s)	± 0.001	s
Accuracy (flow time : > 100 s)	<10	ppm
Ambient temp. error of time base (15 - 35°C)	< 4	ppm
Measuring range (viscosity)		
Pressure mode	0.35 to 10000	mm^2/s
Suction mode	0.35 to 100000	mm^2/s
Pumping pressure power	+ 350	hPa
Pumping suction power	- 350	hPa
Configuration Parameters (with PC)		
Tempering period	0 to 20	min
Additional quite tempering period	0 to 20	min
No. of measurements	1 to 10 (250)	
pump power range	1 to 100	%
Rising time (ramp) of pump power	0.02 to 2	% /s
Connections		
UVS LB triple light barrier	5 pin connector with screw lock	
SI Analytics light barriers	with adapter cable	
TC-Viscometers	4 pin connector with screw lock	
Viscometer tubes	M12x1,25	
Communication backplane	DIN 41612	
Size		
Dimensions (W x H x D)	70 x 128 x 170	mm
Weight	2	kg
Materials		
Pumps	PTFE, FFKM, PPS housing	
Valves	ETFE, FFKM	
Cover	anodized aluminium	
Internal tubes, seals	PTFE, ETFE	

UVS® MD, the measuring device for flow time measuring of Newtonian fluids in common capillary viscometers with precision to millisecond. The **UVS MD** is suitable for all measurements of polymer solutions and mineral oils products.

Highlights:.

- high precision time measurement
- high reproducibilty
- high viscosity handling
- Infrared or thermister detection
- safety lightbarrier control (triple detection)
- support of suction or pressure mode

Viscosity Systems

High speed intensive cleaning and drying module by using vacuum AND pressured air

UVS NoLimits, Technical Data

Performance data

Viscosity range (25°C)	10000 mm²/s
Solvent (Min.)	20 ml

Configuration Parameters

Cleaning modes	configurable
Minimum cleaning time	30 s
Minimum drying time	30 s
Average cleaning time	90 s
Average drying time	90 s

Connections

Tube connectors to:

capillary leg	¼" -28
venting leg	¼" -28
drain leg	3 or 4 leg
filling leg	3 or 4 leg
sample tip	3 or 4 leg
vacuum bottle	10 mm
1st solvent (in)	¼" - 28
2nd solvent (in)	¼" - 28

Size

(WxHxD)	185 x 165 x 265 mm
Weight	4 kg

Materials

Pump	PTFE coated membrane, PPS FFPM
Valves	PEEK, FFPM
Cover	anodized aluminium
Internal tubes, seals	PFA, PTFE, ETFE

UVS® NoLimits, is responsible for full automated cleaning and half automated charging. This device controls pre-dilute and discharging of the sample, rinsing with up to 2 solvents and drying of the whole system. The intensive cleaning procedure reaches the complete viscometer with all parts of the system like tubes and sample needle. UVS NoLimits also supports the sample transfer to the viscometer in a save way and avoid personal contamination of hazard substances during the filling. UVS NoLimits is especially developed to handle samples in a wide viscosity range. Of course all parts are chemical resistant against all kind of organic solvents like acetone, chloroform and toluene. In case of using strong acids we provide a solution on request. UVS NoLimits is suitable for Ubbelohde and Cannon-Fenske-Routine viscometers in accordance to ASTM D446 / ISO3104. For samples like used motor oils a TC-Ubbelohde is strictly recommended.

Viscosity Systems

Measuring Instruments

UVS® Drain

- high power vacuum pump
- connection for external waste detection
- controlled by UVS MD

UVS® Drain, the device is responsible for automated cleaning. This device controls the discharging of the sample, rinsing with solvent, drying and discharging the solvent to the waste bottle. Sensor detection for a full waste bottle complies safety requirements. The cleaning process can be optimzed by configuration to save time and get best results.

UVS Drain, Technical Data

Performance data	
Ultimate vacuum (absolute)	160 mbar
Delivery at atm. pressure	6 l/min
Configuration Parameters	
Draining steps	0 to 30 Steps
Draining times	0 to 1000 sec.
Drying time	0 to 1000 sec.
Connections	
Waste sensor	4 pin connector with screw lock
Tube connector to waste bottle	3 or 4 mm
Communication backplane	DIN 41612
Size	
Dimensions (W x H x D)	70 x 128 x 170 mm
Weight	2 kg
Materials	
Pump	PTFE coated membrane, FFPM, PPS pump head
Cover	anodized aluminium
Internal tubes, seals	PFA

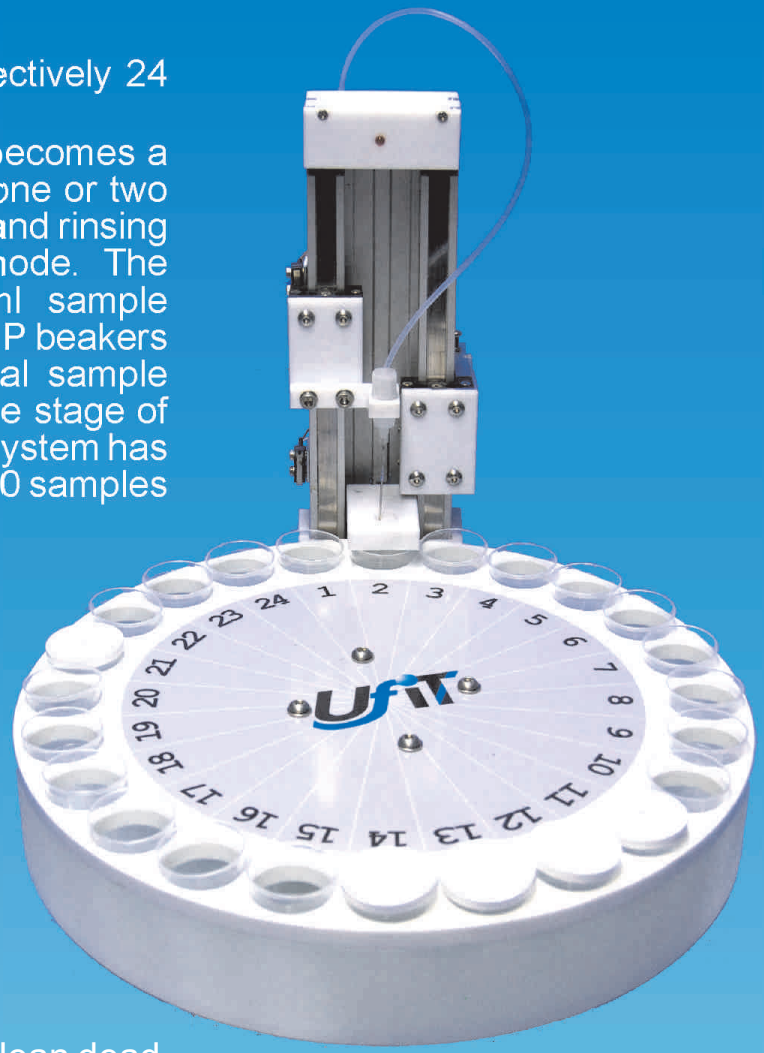
Sample Changer

SC8

Viscosity Systems

UVS® SC8, the sample changer with 8 and respectively 24 positions in dependance of the sample bottle size.
With integration of a **UVS® SC8** the **UVS® Basic** becomes a fully automatic machine. The sampler can serve one or two viscometers. In case of two viscometers the filling and rinsing procedure works in an alternating operation mode. The turntable is available for common laboratory 100 ml sample bottles, 50 ml centrifugal tubes, 30 ml disposable PP beakers and 20 ml micro tubes. An adaption of individual sample vessels are possible on request. Depending on the stage of extension - 2x **UVS®** Basic and 4x **UVS® SC8** - the system has up to 96 sample positions and can measure up to 80 samples per hour.

The rinsing of the sample transfer tube and piston pump is realized by the module **UVS® RM** supporting 2 solvents, a rinsing and a drying solvent. Rinsing with next sample is also configurable. There is a maximum of rinsing logic to avoid any carryover and saving solvent at same time.

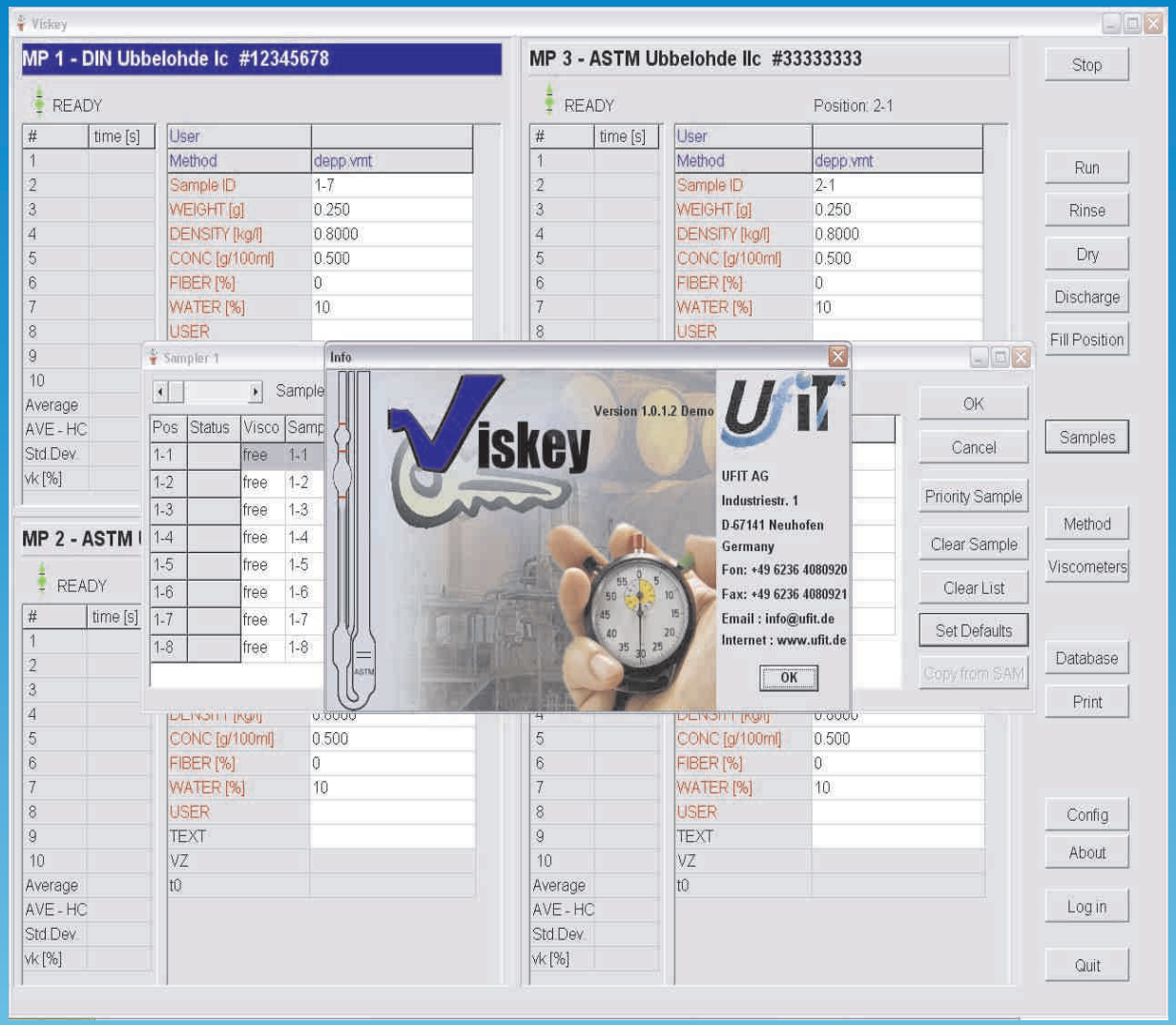


The used valves are chemical resistant and have a lean dead volume. Sample filtration with filter backwashing is available as an option for low viscous samples. A sensor recognizes empty sample flasks or unused positions for safety reasons.

Viscosity Systems

VisKey - The Key to Viscosity

Control and Evaluation Software



- ✓ Calculation of kinematic, dynamic, relative and intrinsic viscosity
- ✓ Determination of capillary constant by system calibration, blank value (t0), viscosity index, enzyme kinetic, dilution viscoity
- ✓ Formula editor for individual calculations
- ✓ No limitation of method numbers
- ✓ Each measuring station can work in a different method
- ✓ Viscometer database
- ✓ User level access controlled software with three levels: administrator, authorized user, worker
- ✓ Access restrictions can be disabled
- ✓ Multitasking operations – each measuring point works independent
- ✓ Possibility to enter sample ID using a barcode scanner
- ✓ Logbook features, CFR21 part 11 compliant
- ✓ Result database with screening and sorting functions
- ✓ Sample changer functions like priority sample, subsequent addition or removal of samples
- ✓ Supported operating system Windows XP, Vista, Win7, Win8
- ✓ Supported periphery: UVS Basic, UVS Tower, UVS Clean, SC8

Constant-temperature baths

Chiller

Viscosity Systems

TB 4 - 4V

Our viscometer baths are in compliance with DIN 51 562 (Part 1) and ASTM D 445.
Each our viscometer bath models are for use with temperatures between +10 °C and +120 °C.
For working temperatures below 35°C the chiller **TB2-C** is recommended to maintain the temperature constancy.

The resolution of 0.01°C is displayed. Other temperatures and bath sizes are on request deliverable.

TB2-C Chiller

TB 2 -2V (4 V)

Viscosity Systems

Light Barrier

UVS® LB

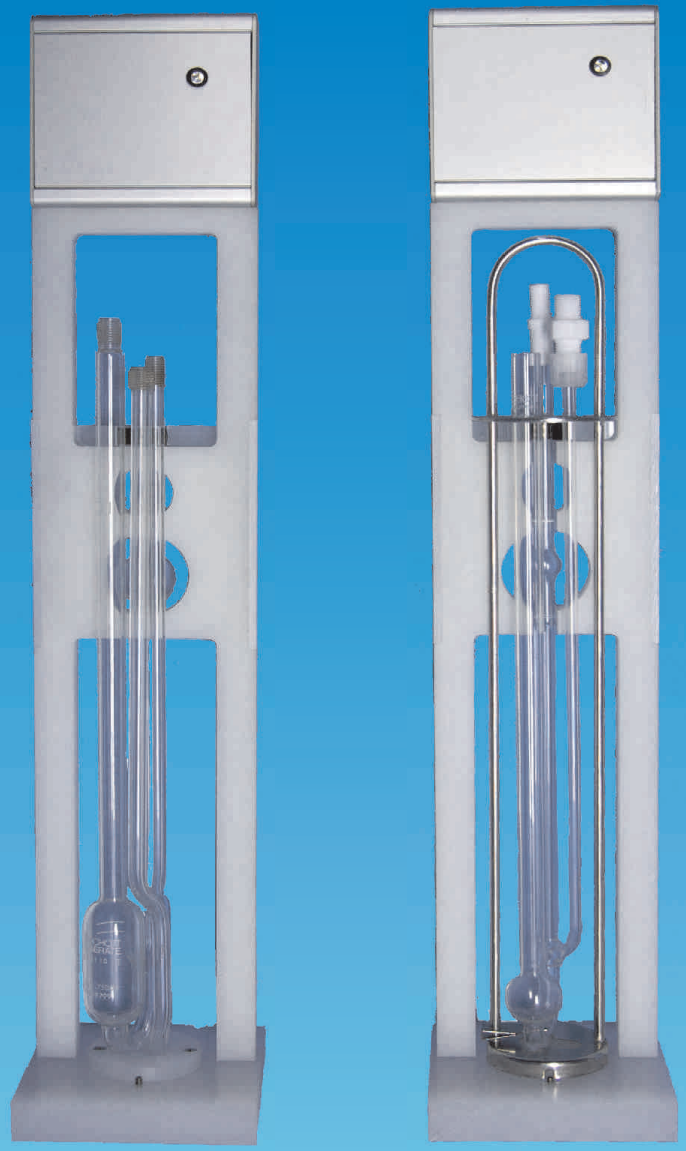
- For Ubbelohde,
  Cannon-Fenske-Routine,
  Micro-Ubbelohde,
  Micro-Ostwald,
  Canon-Fenske-Ubbelohde,
  Witeg-Ubbelohde,
  Paragon-Ubbelohde,
  Tamson-Ubbelohde

- stand resistant against solvents and acid

- Intelligent sample detection

- till 80°C, higher temperature on request

- 3rd safety light barrier



UVS LB, the Triple Detection light barrier made of PVDF.
The stand with integrated viscometer fixation is suited for all common capillaries. Viscometers.
with fixing bracket are also usable. The light barriers are working with infrared light and are able to detect certainly the meniscus pass. The third and topmost light barrier is used as "over suck" protection. For measurements with Micro-Ubbelohde viscometers this light barrier can increases the reproducibility of values through constant kept start conditions.
Additional fixation holder for Canon-Fenske Routine, Canon-Fenske Ubbelohde, Witeg-, Paragon-, Tamson-Ubbelohde available.

Thermometer E20

Viscosity Systems

The Thermometer has a three decimal reading. Thermometer uses a class "A" PT100 probe for and meets the IEC751 required accuracy of ± 0.01°C by using a correction table. A calibrated instrument has an uncertainty better ±0.01°C relative to our calibration standard. The menu reading in degree Celcius or degree Fahrenheit.

Construction

A high accuracy dataconverter samples the PT100 values.
A microprocessor converts these values. The calibration data is kept in internal non volatile memory. Each measurement has an individual stamp and can be identified easily using the PC software.

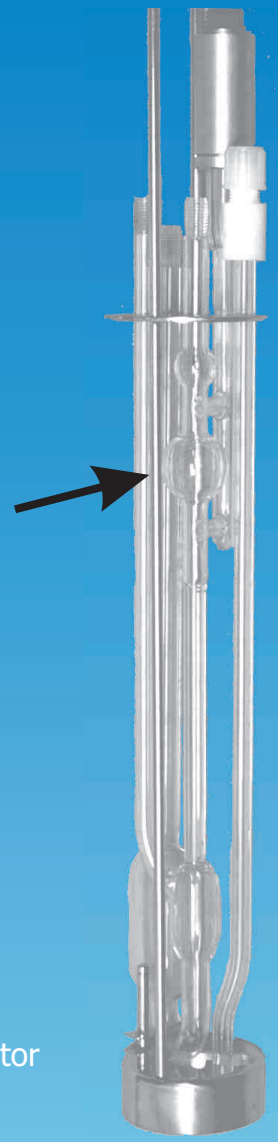
Item	Unit	
Range		-40 .. + 140°C/-40..302.°F,
Reading		°C or °F menu selectable
Iinterface		USB
Resolution	[°C/°F]	0.001
Accuracy	[°]	± 0.01
Linearity	[°]	± 0.01
Drift annual	[°]	± 0.01
Response	[Sec]	< 3
Power	[V]	5 - mains adapter RJ45
Dimensions	[mm]	62 x 39 x 22 (excluding probe)
Probe	[mm]	65x6mm - 115x3
Probe material		304 Stainless steel
Weight	[gr]	42

Viscosity Systems

Viscometer type / Application characteristics	Ubbelohde	Micro Ubbelohde	TC Ubbelohde	TC Micro Ubbelohde	Micro Ostwald	Cannon-Fenske routine	Cannon-Fenske reverse flow
	ASTM D446 ISO 3105 DIN 51562 T1	DIN 51 562 T2	ASTM D446 ISO 3105 DIN 51562 T1	DIN 51 562 T2		ASTM D446 ISO 3105	ASTM D446, ISO 3105
Polymer solutions	++	+	-	-	+	+	-
Polymer solutions Ultra short flowtimes	+	++	-	-	+	-	-
Mineraloil Transparent	++	++	++	++	+	+	+
Mineraloil opaque	-	-	++	++	-	-	++*
Foaming liquids	o	o	o	o	+	+	o
Liquid mixture with highly volatile components	+	+	+	+	++	++	o
sample volume (ml)	15-20*	3-4	18-22	3-4	2	7-10	12
Exact volume necessary	no	no	no	no	yes	(yes)	yes
	*4-leg re-commended 18-22 ml	Short flowtime		Short flowtime			* only manual measurement

Viscometers

Viscosity Systems



Ubbelohde with Thermistor

Cannon-Fenske Routine

Micro-Ubbelohde

ASTM-Ubbelohde

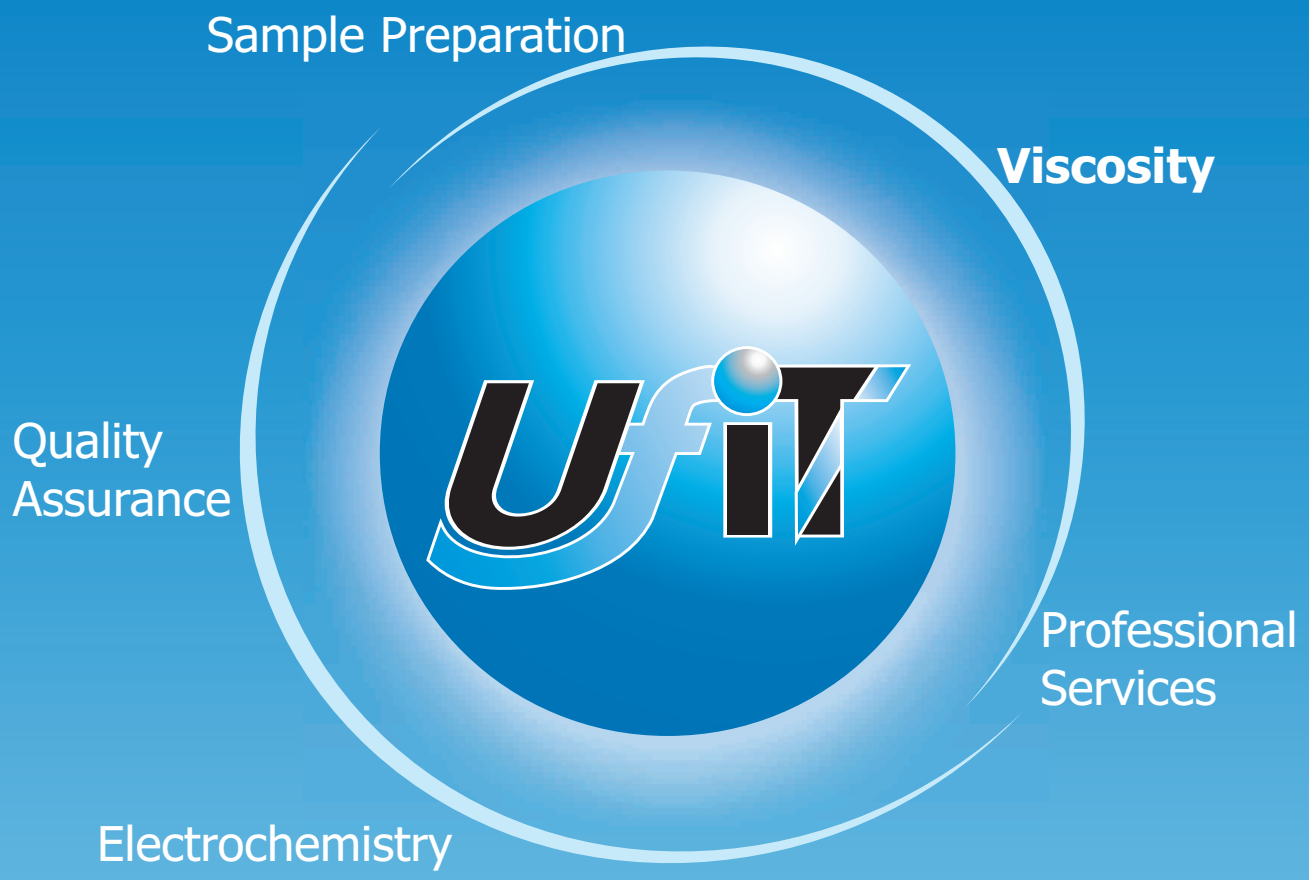
Viscosity Systems

2mag STIRRING DRYBATH 15-100

Heating - Massive heating block made of resistant aluminium alloy, PTFE-coated for increased chemical resistance and easier cleaning, lowest possible temperature gradient inside the stirring vessels, integrated electrical heater, maximum heating temperature +200 °C.

stirring - Maintenance-free and wear-free by inductive 2mag-Magnetic Drive concept, extremely wide speed range of 100 to 2,000 rpm, 100% synchronized speed, jerk-free stirring even at low speeds, 4-step power settings of the stirrer, high power setting for viscous liquids and reduced power setting for long-term operation without any heating effects caused by the stirrer, clear digital display for settings of stirrer speed, stirrer power and temperature of the integrated heater, SoftStart procedure for reliable catching/centering and safe acceleration of the stirring bar.

Viscosity Systems



Viskositäts-Systeme

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