Precise Capillary Viscometry – Easy, Flexible and Independent: AVS® 470

No PC needed: “Suction” and “Pressure” measurements with just one instrument

The AVS® 470 is the first viscosity measurement device that allows “suction” and “pressure” measurements completely independent of a PC. This allows for maximum independence and flexibility; set up a measuring station that meets the highest requirements even under difficult conditions, e.g. to monitor production or quality control in the polymers and mineral oil industry.

Perfectly equipped for fully automatic viscosity measurements

The AVS® 470 is a measuring system that includes almost everything you need to take precise and reproducible measurements. All common types of viscosity calculation are integrated into the device, a small PS2 keyboard allows you to enter additional data. A serial printer can be used to conveniently document your results.

So, in a minimum of space, you can set up a measuring station equal in every way to complex measuring installations in terms of precision and reproducibility.

"Suction" or "Pressure"?
Preferred applications in comparison

		"Pressure"	"Suction"
highly viscous samples e.g. oils, polymers		■	■
Solvents: (examples)	highly volatile	■	–
	Dichloromethane	■	–
	Chloroform	■	–
	Sulfuric acid	–	■
	Dichloroacetic acid	–	■
	Toluene	■	■
	Hexafluoro-isopropanol	■	■
	m-cresol	–	■
	Formic acid	–	■
	Phenol-dichlorobenzene	–	■
	Phenol-Tetrachloroethane	–	■

Simple and updateable Modular Concept

The AVS® 470 is of a modular design and an optional optical or TC version ViscoPump II module.

You can use your existing accessories such as thermostats, stands, flow-through coolers or automatic cleaners e.g. AVS® 26. Also, virtually all customary capillary viscometers can be used.

- Automatic and highly precize measurements – independent of a PC
- "Suction" and "pressure" measurements with the same system
- Simple data input and parameterization via included PS2-mini-keyboard
- GLP documentation compliant when connected to an optional printer

Advantages AVS® 470

AVS® 470 – Precise and Reliable

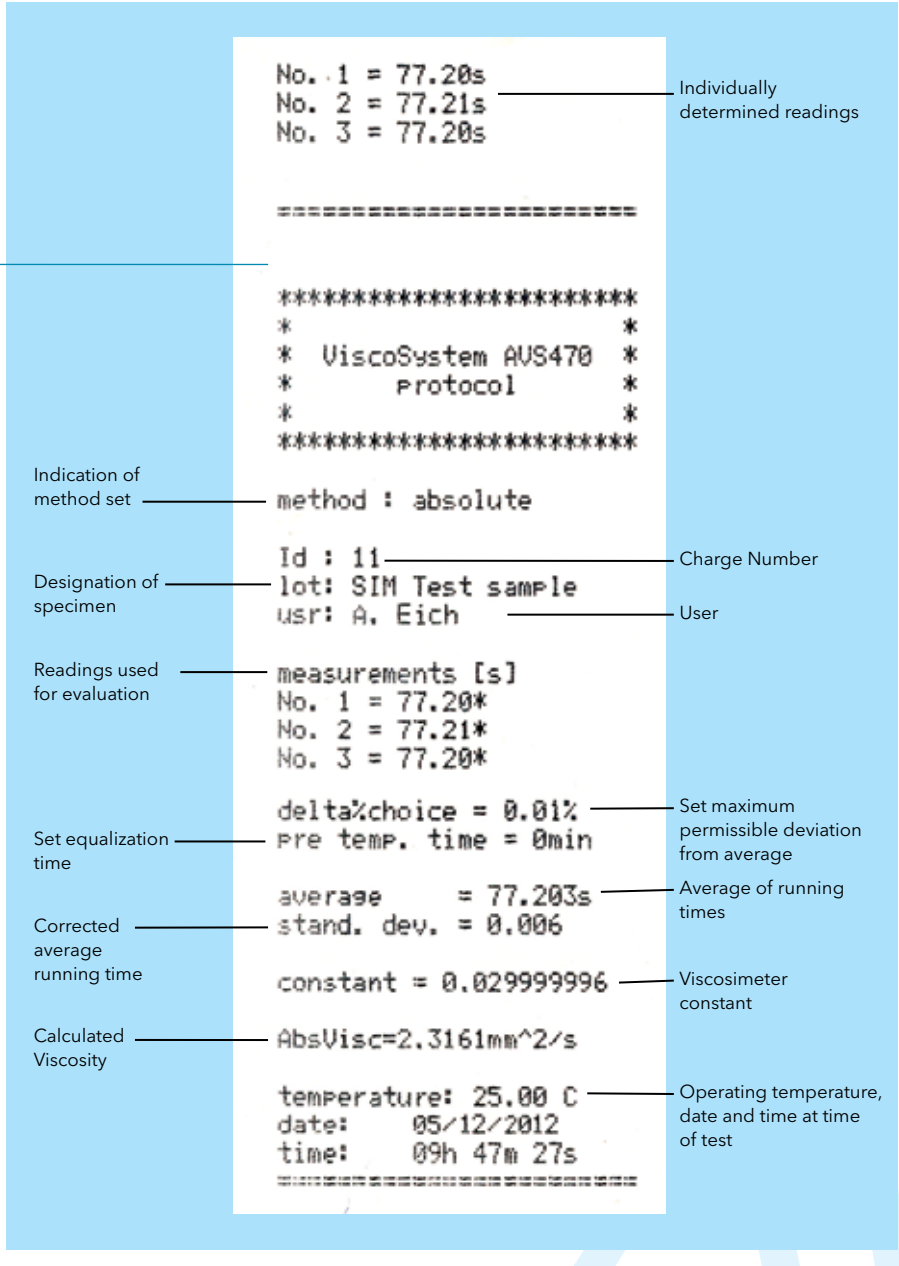
Working with the AVS® 470 is easy

The desired measurement method can be preselected and started on the device. The entire measurement is automatic to eliminate subjective measurement errors. Once the set pre-heating time is reached, the desired number of measurements are taken and the viscometer automatically cleaned if required.The status of the measurements is continuously displayed.

If required, individual parameters may be input via an included PS 2 keyboard. A serial printer can be used to print measurement logs.

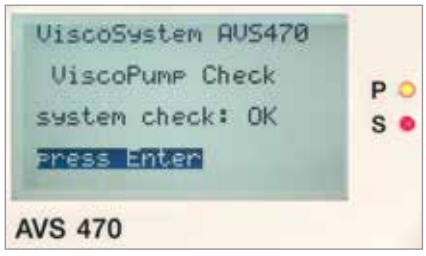
The connections are on the front panel of the device for easy control. Over-pumping and oversuction are prevented by the use of a an optional capacitive sensor.

The print-out shows everything you need for reliable documentation of your test.

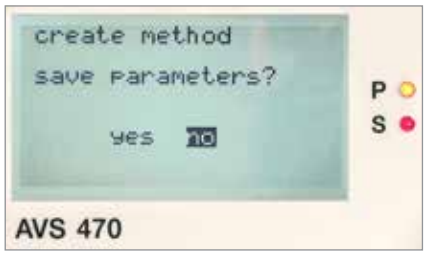


Technical data

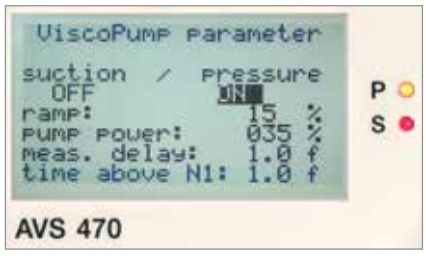
Clear user guidance, clear status – even without PC!



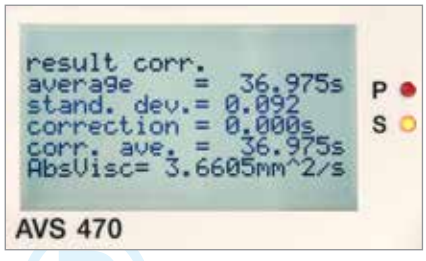
After switching on the AVS® 470 a self test is run and then an entry prompt appears.



The parameters can be set in the test mode. The t_0 value is determined automatically.



All setup parameters can be preset conveniently, e.g. pressure/suction, velocity, waiting time between two tests, etc.



The readings can be read off conveniently on the display regardless of whether or not a printer is connected.

Measuring range (time)	up to 9,999.99 s; resolution 0.01 s	
Measuring range (viscosity)	pressure:	0.35 to 1,800 mm²/s (cSt)
	suction:	0.35 to ~5,000 mm²/s (cSt)
Measured parameter	flow-through time [s]	
Time measuring accuracy	± 0.01 %	
Measured value display	LC-Display	
Display accuracy	± 0.01 s, ± 1 Digit, but not exceeding 0.1%	
Pumping pressure	fully automatically controlled	
	suction up to ~-160 mbar, pressure up to ~+160 mbar	
Preselectable tempering period	0 to 20 min	
Preselectable no. of measurements	1 to 99 for each sample	
Connections	Pneumatic connections	threaded connections for viscometers
	Electrical connections	circular connector with bayonet lock for viscometer
		4-pin DIN socket for TC viscometer
		4-pin circular connector for capacitive sensor
		7-pin circular connector for AVS® 26, with bayonet lock
	RS232-C interface	9-pin for serial printer
	Mains connection	connector in acc. with EN 60320
	Pump connection	socket outlet in accordance with EN 60320
Ambient Conditions	Ambient temperature	+10 to +40 °C for operation and storage
	Air humidity	max. 80 % in acc. with EN 61010, Part 1
Housing	Material	steel aluminium housing;
		with chemically resistant 2-component coating
	Dimensions	(W x H x D) ~255 x 205 x 320 mm
	Weight (incl. pump module)	~5.4 kg
Power supply	90 to 240 V ~, 50 to 60 Hz	
Equipment safety	EMC in acc. with Council Directive 89/336/EWG;	
	low-voltage directive	

The AVS® 470 allows the use of the following viscometers:
Ubbelohde viscometer to DIN, Ubbelohde viscometer to ASTM, micro Ubbelohde viscometer to DIN, micro Ostwald viscometer, Cannon-Fenske routine viscometer, TC Ubbelohde viscometer, TC micro Ubbelohde viscometer.

We reserve the right to make technical changes.
AVS® is a registered trademark of SI Analytics and stands for: "Automatic Viscosity System".

AVS® 370 makes maximum precision …

Well equipped for all viscosity determination

The AVS® 370 is a measuring device, which not only measures as precisely and consistently as you expect, but also offers maximum flexibility and future extensions. Furthermore, it saves laboratory space.

Now possible for the first time ever: "suction" and "pressure" measure-ment – with <u>one</u> device

The AVS® 370 is the first viscosity measuring device, which can be used for both "suction" and "pressure" measurement. This enables simple adjustment of the measurement method for sample. Significantly reducing investment costs for additional measuring stations at which pressure and suction methods are to be used. In most cases, using the AVS® 370 also saves set-up time.

… easier and more flexible, with provision for future expansion!

Easy modular concept ideal for future expansion

The AVS® 370 has a modu-lar design. The basic version is available with one ViscoPump II module in optical or in TC version. Up to 3 other ViscoPump II modules can be installed in the compact 19" housing. The measuring station can be adapted to increasing requirements at any time.

Can be expanded from an affordable single measuring station up to an 8-sample station

The basic version of the AVS® 370 is able to measure high or low viscosity liquids. The TC version viscometers, for example, it is ideal for measuring opaque and black fluids. If necessary, each single measuring station can be expanded to a multiple measuring station with PC-controlled multitasking. The WinVisco 370 software included with the standard equipment enables parallel operation of two fully equipped AVS® 370, with a total of eight ViscoPump II modules. Each module can measure a different sample using its own method. All the results can be quickly and easily evaluated and documented independently. It could hardly be more flexible!

Compatible with existing accessories

Existing accessories (thermostats, stands, flow through cooler, etc.) can continue to be used with the AVS® 370. Also, virtually all customary capillary viscometers can be used.

"Suction" or "pressure"?
A comparison of preferred applications

		"pressure"	"suction"
Highly viscous samples e.g. oils, polymers		■	■
Solvent: (examples)	highly volatile	■	–
	Dichlormethane	■	–
	Chloroform	■	–
	Sulfuric acid	–	■
	Dichloroethanoic acid	–	■
	Toluene	■	■
	Hexafluorisopropanol	■	■
	m-Cresol	–	■
	Formic acid	–	■
	Phenol-dichlorobenzene	–	■
	Phenol-tetrachloroethane	–	■

- Automatic and highly precise measurements
- "Suction" and "pressure" measurements with the same module
- Modular concept for up to four ViscoPump II modules in one AVS® 370
- Each ViscoPump II module in a AVS® 370 can measure a different sample using a different method.
- Real multitasking for up to eight parallel measurements with the software WinVisco 370
- TC version for measurement of nontransparent and black liquids

Advantages AVS® 370

AVS® 370 – the right solution for all situations

Anyone working with the AVS® 370 is perfectly equipped for all tasks involved in determining viscosity using capillary viscometers.

How to automatically achieve the right results

PC-controlled, the AVS® 370 determines the time which the liquid to be examined requires to flow through the measuring distance in the capillary viscometer with quartz precision. The time is displayed with a resolution of 0.01 s (1 digit).

Measurement of the flow time of the liquid's meniscus can be scanned optoelectronically or with TC sensors. During optoelectronic scanning the meniscus is detected by glass light fibers, with TC sensors the sensor detects the different thermal conductivity of the sample and air. The AVS® 370 offers an extraordinarily broad range of uses, from viscosity measurement of clear fluids to black or fully opaque liquids.

New: Two working principles with the same device.

With the AVS® 370 you can use one device to work with either "pressure" or "suction" offering more flexibility with the liquids to be examined.

In the "pressure" method an overpressure is applied to the liquid in the capillary, this is particularly advantageous for fluids with a low boiling point. For the "suction" principle the sample is sucked up into the capillary by a vacuum. Greater reproducibility is achieved using the "suction" method for higher viscosity samples.

Working with AVS® 370 is easy

The entire measurement procedure is place automatic, subjective measuring errors are reliably eliminated. The PC starts the measurement. After the set preconditioning period the selected number of measurements processed and the measured values saved.

The system protects against accidental overpumping or oversuction by means of a capacitive sensor. This prevents the sample to be measured from getting into the vessel containing the liquid or inside the device.

Unique flexibility

In the PC-controlled multiple measurement station, the AVS® 370 offers unique flexibility while working in a very small space: Up to eight modules, which equates to two fully equipped AVS® 370, can be run in parallel with the WinVisco 370 software. Each module can measure the same or different samples using "pressure" or "suction", independent of each other. In this way, a series of measurements can be prepared quickly and immediately evaluated and documented with the computer. This significantly reduces the time required to carry out viscosity measurements, especially for in process controls and quality assurance.

Technical data

Measuring range (time)	up to 9,999.99 s; resolution 0.01 s	
Measuring range (viscosity)	pressure:	0.35 to 1,800 mm²/s (cSt)
	suction:	0.35 to ~5,000 mm²/s (cSt)
Measured parameter	flow through time [s]	
Accuracy of the time measurement	± 0.01 %	
Measured value display	via PC	
Display accuracy	± 1 digit (0.1 %)	
Pump pressure	automatically controlled	
Preselectable tempering period	0 to 20 min	
Preselectable number of measurements	up to 10	
Connections	Pneumatic connections	threaded connections for viscometers
	Electrical connections	circular connector with bayonet lock for measuring stands and TC viscometers
	RS232-C interface	9-pin
	Mains connections	plug in accordance with EN 60320
	Pump connection	socket outlet in accordance with EN 60320
Data Input/Output	serial to EIA RS232-C	
Ambient conditions	Ambient temperature	+ 10 to + 40 °C
	Air humidity	max. 85 % rel.
Housing	Material	coated aluminum plate
	Dimensions (for 1 to 4 modules)	(W x H x D) ~255 x 205 x 320 mm
	Weight (incl. 1 module)	~5.4 kg
Power supply	90 to 240 V ~, 50 to 60 Hz	
Equipment safety	EMC-Compatibility according to the Directive 89/336/EEC of the Council;	
	low-voltage directive according to the Directive 73/23/EEC of the Council,	
	as amended by the Directive 93/68/EEC of the Council	
Multi-tasking	for 1 to 8 ViscoPump II modules, with WinVisco 370 software	

The following viscometers can be used with the AVS® 370:
Ubbelohde viscometer to DIN, Ubbelohde viscometer to ASTM, micro Ubbelohde viscometer to DIN, micro Ostwald viscometer, Cannon-Fenske routine viscometer, TC-Ubbelohde viscometer, TC-micro Ubbelohde viscometer.

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Real multitasking for up to 8 measurements in parallel mode …

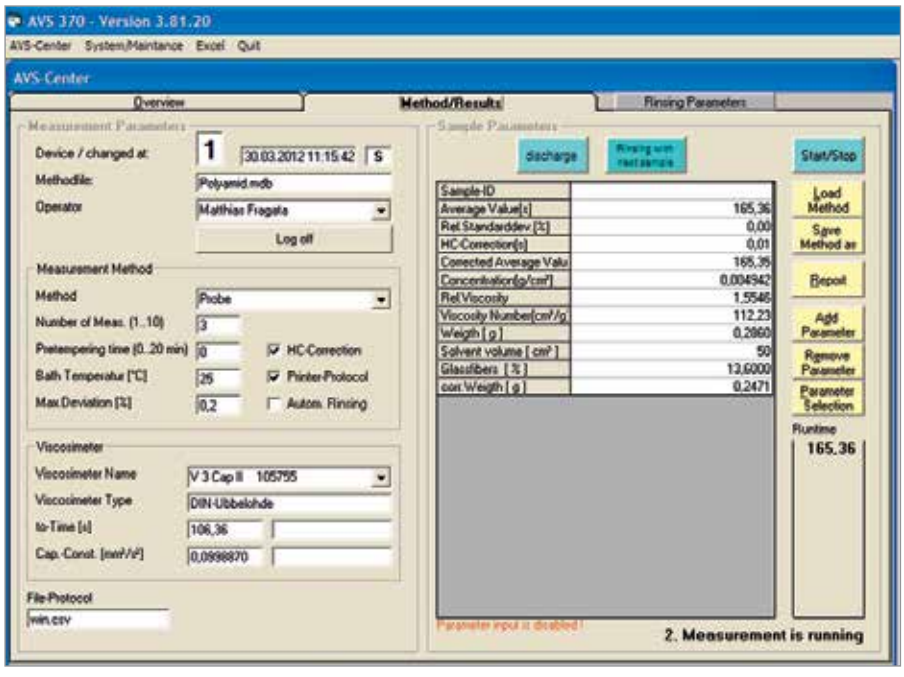
Easy to understand and proven: The WinVisco 370 software

WinVisco 370 is the ideal software for the AVS® 370*). It is supplied as part of the standard equipment. Up to eight viscosity measurement modules can be controlled with only a few operational steps. The device parameters are easy to enter: Constants, t_0 flow time, number of measurements, preconditioning period, type of viscometer, date and sample labeling for each measurement station.

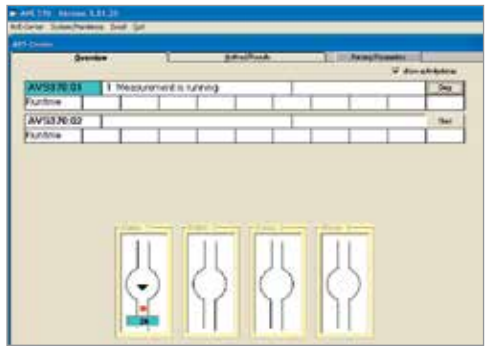
WinVisco 370 works in a real multitasking mode making it possible for each measurement to be processed independently from the others. It also means that time-consuming measurements can be carried out from the same PC, without hindering the course of other, faster measurements. During the measurements you can change the monitor displays, start or stop other measurements, print or save measured values. All data provided by the software can be passed on to LIMS system.

WinVisco 370 supports three groups of users. For simple use, access is limited to: select viscometer, measure, load and save methods as well as enter parameters. In the highest level, users with administrator status can access all the software's facilities. Each user is given a user ID, an access level and a password.

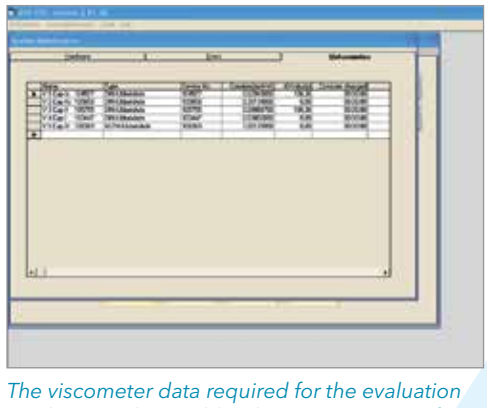
*) *The language (English or German) can be chosen after installation over the program menu.*



All the important parameters required for the measurement are displayed on the "Methods/ Results" page. If necessary, the parameter editor can be called up using "Add Parameter", in order to enter non-standard or customer specific formulae.

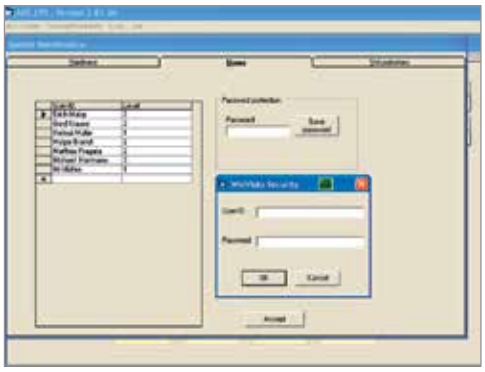


All the measurements currently running can be monitored in parallel in the overview.

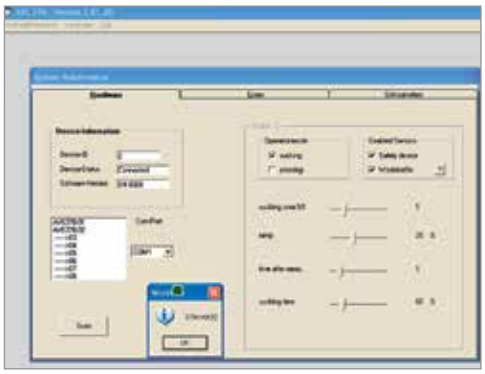


The viscometer data required for the evaluation can be stored in a table. This guarantees perfect allocation of e.g. the t_0 runtime, viscometer constants, the series number, etc. for each individual viscometer being used.

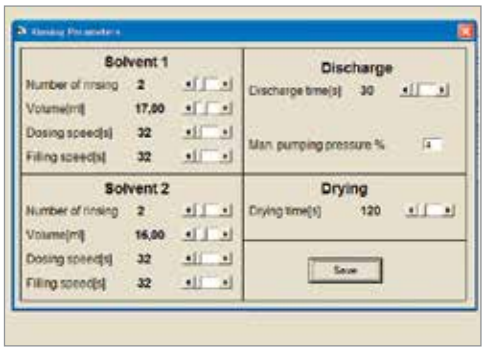
… with the proven WinVisco 370 software



The password protection prevents unwanted changes to the important measurement parameters.



The parameters can be individually adjusted to the measurement for each measuring position.

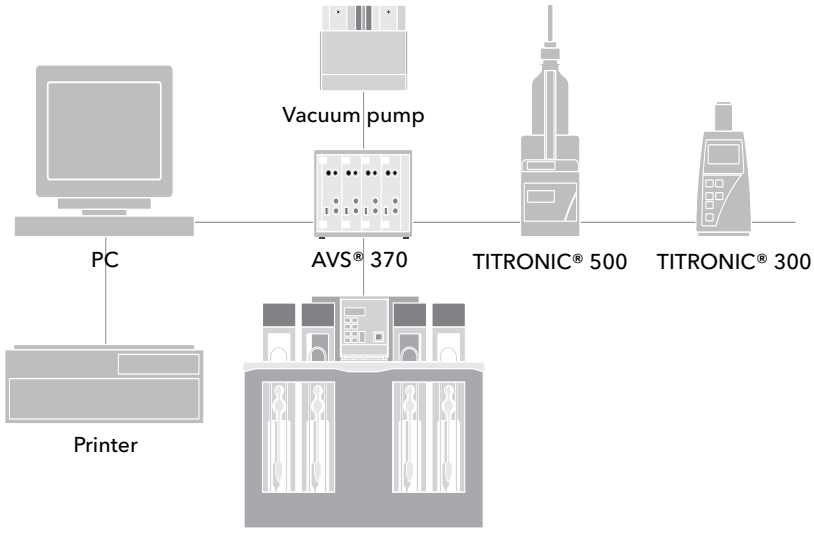


Each rinse/dry step can be individually preselected. Even the application dependent quantity of solvent and the drying time can be separately determined.

With AVS® 370 and WinVisco 370 the right connection for rinsing can be quickly determined

With the daisy chain link of the AVS® 370, additional devices can be integrated with the system and controlled using the WinVisco 370 software. For example, when working in suction mode the viscometers can be rinsed using the TITRONIC®300 or the TITRONIC® 500 burettes. The TITRONIC®300 is preferable used for light solvents, the TITRONIC® 500 for solvents with a viscosity >3 mm²/s. For highly aggressive solvents special changeable modules are available (TA50V and WA50V).

A vacuum pump (accessory) integrated with the system can be used to conveniently remove samples and solvents.



Transparent thermostat with four measuring stands

Two basic concepts are available for the rinsing:

- An AVS® 370 with up to four ViscoPump II modules (max. four measurement positions) and up to eight burettes, which enables each viscometer to be rinsed with two solvents. Time consuming removal of the transparent thermostat for external rinsing of the viscometer is no longer necessary.
- Two AVS® 370 complete with up to four ViscoPump II modules each (max. eight measuring positions), which enables semi-automatic rinsing of the viscometer with the next sample or solvent.

Ordering information AVS® 470

Ordering information AVS® 370

The AVS® 470 viscosity test station is composed of individual components.
Please request a detailed quote.

Type no.	Order no.	Description
AVS® 470 basic unit for opto-electronic sensing	285415709	AVS® 470 basic unit, housing incl. one ViscoPump II module for opto-electronic sensing, Keyboard Version: 95 V to 230 V/50-60 Hz
AVS® 470 basic unit for TC sensing	285415708	AVS® 470 basic unit, housing incl. one ViscoPump II module for TC sensing, Keyboard Version: 95 V to 230 V/50-60 Hz
VZ 8511	1054306	ViscoPump II module for optical sensing
VZ 8512	1054304	ViscoPump II module for TC sensing

The AVS® 370 viscosity test station is composed of individual components.
Please request a detailed quote.

Type no.	Order no.	Description
AVS® 370 basic unit for opto-electronic sensing	1056509	AVS® 370 basic unit, housing incl. one ViscoPump II module and WinVisco 370 software, for opto-electronic sensing
AVS® 370 basic unit for TC sensing	1056515	AVS® 370 basic unit, housing incl. one ViscoPump II module and WinVisco 370 software, for TC sensing
VZ 8511	1054306	ViscoPump II module for optical sending
VZ 8512	1054304	ViscoPump II module for TC sending

Accessories AVS® 470 and AVS® 370

Type no.	Order no.	Description
CT 72/P, 230V	285418526	Immersion thermostat 230 V and thermostatic bath (acrylic glass container with two manual gauge slides), basic configuration for the attachment of one flow-through cooler.
CT 72/P, 115V	285418513	Immersion thermostat 115 V and thermostatic bath (acrylic glass container with two manual gauge slides), basic configuration for the attachment of one flow-through cooler.
CT 72/2, 230V	285418547	Immersion thermostat 230 V and thermostatic bath (stainless steel container with one manual gauge slide), basic configuration for the attachment of one flow-through cooler.
CT 72/2, 115V	285418532	Immersion thermostat 115 V and thermostatic bath (stainless steel container with one manual gauge slide), basic configuration for the attachment of one flow-through cooler.
CT 72/4, 230V	285418568	Immersion thermostat 230 V and thermostatic bath (stainless steel container with two manual gauge slides), basic configuration for the attachment of one flow-through cooler.
CT 72/4, 115V	285418554	Immersion thermostat 115 V and thermostatic bath (stainless steel container with two manual gauge slides), basic configuration for the attachment of one flow-through cooler.
Z 900	285225620	RS232-C Data printer (230 V)
Measuring stand AVS®/S	285410502	Metal measuring stand AVS®/S, preferably for nonaqueous bath fluids
Measuring stand AVS®/SK	285410876	PVDF measuring stand AVS®/SK, corrosion-free, suitable for aqueous and nonaqueous bath fluids
Measuring stand AVS®/SK-CF	285410892	PVDF measuring stand AVS®/SK-CF, particularly for the use of Cannon-Fenske routine viscometers
Measuring stand AVS®/SK-V	285410905	PVDF measuring stand AVS®/SK-V, particularly for the use of dilution viscometers
CK 300, 115V	285414331	CFC-free flow-through cooler for enhancing the temperature constancy of the bath fluid (according to configuration and environmental conditions are ±0.02 K possible) or for measurement at room temperature or below (min. +5 °C).
CK 300, 230V	285414348	CFC-free flow-through cooler for enhancing the temperature constancy of the bath fluid (according to configuration and environmental conditions are ±0.02 K possible) or for measurement at room temperature or below (min. +5 °C).
05392	285405043	Fixing frame for Ubbelohde viscometers (not TC)