

# ***S-flow Viscometry Systems***

**Delivery range 2010**

## S-flow 400

The S-flow<sup>®</sup>-400 is an integrated, compact system that requires little working space. The thermostatic bath, that offers extraordinary temperature stability can house up to 4 viscometers; therefore in principle four simultaneous measurements can be performed. Because of the relatively small volume of the bath it can be brought to temperature very quickly.

The viscometers are ergonomically integrated in the system which allows for easy removal, thereby reducing the risk of fracture considerably. For daily usage – such as measuring, cleaning and drying – the viscometers do not have to be removed from the bath. A clear white panel serves as background for the viscometers, allowing for a clear and reliable meniscus reading.

After the measurement has taken place the viscometers can be separately and independently cleaned and dried. This makes it possible to only clean one tube without interfering with the measurements in other viscometers. Cleaning and drying is done by injecting a suitable cleaning or drying agent into the viscometer. The integrated pump subsequently evacuates the tubes and pulls the liquids to an external collection vessel.

For measurements that have to take place at or below room temperature, an additional cooling spiral has been provided inside the thermostatic bath, to which an external oil or water cooler can be attached.



### Specifications

<b>Standard methods</b>	ASTM D445, D446
<b>Temperature range</b>	20°C to 150°C
<b>Temperature stability</b>	± 0.01°C @ 40°C ± 0.03°C @100°C
<b>Bath volume</b>	7.5 liter
<b>Viscometers</b>	Four S-flow <sup>®</sup> tubes
<b>Dimensions (l x w x h)</b>	455 x 230 x 620 mm.
<b>Weight</b>	23 kg (empty)
<b>Requirements</b>	Compressed air 5-6 Bar @ 50 l/min

## S-flow 850

The S-flow<sup>®</sup>-850 is fully microprocessor controlled, offering the user complete automation of the measurement cycle, and semi-automated cleaning and drying. State-of-the-art technology allows for ultra-precise meniscus detection, which is essential in obtaining reliable and repeatable test results.

The instrument can be configured using the control panel that utilizes a clear LCD-display. Viscosity measurements as well as viscometer calibrations can be performed with the push of a single button. The results will be given on the display upon completion of the measurement. The user can set the number of measurements he wants to perform and the instrument will calculate the average results after these measurements as well. Additional parameters can be set to configure cleaning and drying times, minimal and maximal flow times, viscometer constants and more.

For data storage and instrument control an optional Windows application is available. An external printer can also be directly connected to the instrument to print out measuring results.

Four simultaneous measurements can be performed, meeting even the needs of those facilities faced with high volume viscosity testing. After a measurement, the viscometers can be cleaned and dried by manually injecting a suitable agent into the viscometers and starting the automated cleaning/drying process. Dependent on the sample and agent used, flushing times can be set by the user.

For measurements that have to take place at or below room temperature, an additional cooling spiral has been provided inside the thermostatic bath, to which an external oil or water cooler can be attached.



### Specifications

<b>Standard methods</b>	ASTM D445, D446
<b>Timer accuracy</b>	0.0025
<b>Meniscus detection</b>	optical fiber
<b>Solvent injection</b>	manually
<b>Temperature range</b>	20°C to 110°C
<b>Temperature stability</b>	± 0.01°C @ 40°C ± 0.03°C @ 100°C
<b>Bath volume</b>	7.5 liter
<b>Viscometers</b>	Four S-flow <sup>®</sup> tubes
<b>Dimensions (l x w x h)</b>	435 x 475 x 620 mm.
<b>Weight</b>	31.5 kg (empty)
<b>Requirements</b>	Compressed air 5-6 Bar @ 50 l/min

## S-flow 1200

The S-flow®-1200 makes the next logical step after the 850 model and utilizes an additional automatic flushing unit. The user is offered complete control over the various parameters of the cleaning process, guaranteeing a completely dry and clean tube at every cycle.

Depending on the characteristics of the tube and sample, different cleaning parameters can be set for each tube individually. Upon completion of a measurement the tubes are automatically flushed with solvent and subsequently dried with air.

The standard 1200 model uses a single solvent cleaning system, but can be upgraded to include dual solvent cleaning/drying as well. See page Error: Reference source not found on further information on accessories and options.

For data storage and instrument control an optional Windows application is available. An external printer can also be directly connected to the instrument to print out measuring results.

As with all S-flow® models, four simultaneous measurements can be performed. Viscometers are easily and quickly replaced and for measurements that have to take place at or below room temperature, an additional cooling spiral has been provided inside the thermostatic bath, to which an external oil or water cooler can be attached.



## Specifications

<b>Standard methods</b>	ASTM D445, D446
<b>Timer accuracy</b>	0.0025
<b>Meniscus detection</b>	optical fiber
<b>Solvent injection</b>	Automatic (optional dual solvent)
<b>Temperature range</b>	20°C to 110°C
<b>Temperature stability</b>	± 0.01°C @ 40°C ± 0.03°C @ 100°C
<b>Bath volume</b>	7.5 liter
<b>Viscometers</b>	Four S-flow® tubes
<b>Dimensions (l x w x h)</b>	435 x 475 x 620 mm.
<b>Weight</b>	33 kg (empty)
<b>Requirements</b>	Compressed air 5-6 Bar @ 50 l/min

## S-flow 3000 VI

Our newest system offers two temperature baths that are centrally controlled by an advanced touch screen panel. Each bath is completely independent from the other and can be run separately, but when operating in VI mode, the system combines the results from the two baths to automatically calculate the Viscosity Index !

The system integrates all the features of the S-flow 1200 (automatic time measurement, automatic cleaning) in an extremely compact design that fits on 60% of the space of two S-flow 1200 systems, saving on costly laboratory space.

Measurement data, as well as the Viscosity Index can be printed out by an external printer.

This system is the ultimate in automated viscosity determination and offers a unique possibility for operators to perform dual temperature measurements with automatic Viscosity Index calculation.



### Specifications

<b>Standard methods</b>	ASTM D445, D446
<b>Viscosity index</b>	ASTM D2270
<b>Timer accuracy</b>	0.0025
<b>Meniscus detection</b>	optical fiber
<b>Solvent injection</b>	Automatic (optional dual solvent)
<b>Temperature range</b>	20°C to 110°C
<b>Temperature stability</b>	± 0.01°C @ 40°C ± 0.03°C @100°C
<b>Bath volume</b>	7.5 liter each
<b>Viscometers</b>	Four S-flow® tubes per bath
<b>Dimensions (l x w x h)</b>	435 x 475 x 620 mm.
<b>Weight</b>	62 kg (empty)
<b>Requirements</b>	Compressed air 5-6 Bar @ 50 l/min

## Measuring Tubes

The S-flow<sup>®</sup> viscometer type was designed as a high-speed, low-volume alternative for commonly used viscometer types such as the Ubbelohde and Cannon Fenske. Although reliable, these viscometer types present the user with a number of disadvantages:

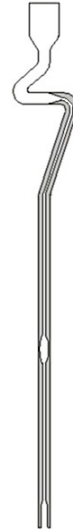
1. Large quantities of both sample and cleaning & drying solvents are required
2. Because of their large volume it's difficult to clean or dry the viscometer completely
3. Measuring cycles are generally long

The above can cause problems where quick results are necessary in a continuous feedback process to the production line and where a large number of viscosity tests is performed on a daily basis.

The S-flow<sup>®</sup> eliminates all these disadvantages. Because of the small volume of the viscometer much smaller quantities of both sample and solvents are required, which saves considerably on measurement costs, guarantees complete cleaning and drying and allows for quick sample warm-up. Up to 90% savings on solvents are feasible compared to conventional viscometers.

The shape and dimensions of the S-flow<sup>®</sup> viscometers have been designed in such a way that disturbance of the laminary flow area by turbulence is virtually non-existent. Measuring kinematic viscosity of both transparent and opaque fluids (Newtonic) with this type of viscometer meets or exceeds the requirements in relevant international standards, such as ASTM, IP, ISO, NEN, DIN etc.

The S-flow<sup>®</sup> viscometer was designed for flow times of 50 seconds and higher and viscosities of 1-3000 mm<sup>2</sup>/s. Below table shows the standard available tubes. Any viscometer constant can be supplied on request.



Nominal constant mm <sup>2</sup> /s <sup>2</sup>	Measuring range mm <sup>2</sup> /s	Nominal constant mm <sup>2</sup> /s <sup>2</sup>	Measuring range mm <sup>2</sup> /s
0.01	0.5 - 1.5	0.50	25 - 75
0.02	1.0 - 3.0	0.70	35 - 110
0.03	1.5 - 4.5	1.00	50 - 150
0.05	2.5 - 7.5	2.00	100 - 300
0.07	3.5 - 11.5	3.00	150 - 450
0.10	5.0 - 15.0	5.00	250 - 750
0.20	10.0 - 30.0	10.00	500 - 1500
0.30	15.0 - 45.0	15.00	750 - 2250

Above chart is based on flow times of 50-150 seconds, which can be regarded as normal flow times for the S-flow viscometer tubes. Should you wish to observe measurement times of 200 seconds as prescribed by ASTM D445, change the constant accordingly. Supplied viscometers are guaranteed to be delivered with a margin of ± 15% from the ordered constant.

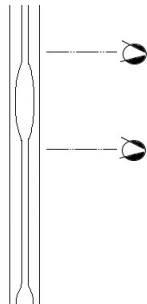
### Dual solvent injection

The S-flow 1200/1 is fitted with a single solvent injection system. In some cases, it can be necessary to use an additional solvent. Often, this is required for measurements at or around room temperature. If the solvent that is used to dissolve the sample does not evaporate quickly at this temperature, the tube will not dry because solvent residue remains inside. To solve this, an additional solvent which does evaporate quickly at the operation temperature is injected. The S-flow 1200/2 is supplied with a dual solvent injection system. The same upgrade is available for the S-flow 3000 VI. For this model, since dual solvent is usually only required for measurements at lower temperature, the price mentioned includes the dual solvent upgrade for one both. In case you need both baths to be equipped with dual solvent injection, kindly contact us for price information.

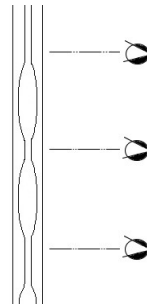
### Duplo measurement upgrade

The optional duplo measurement upgrade adds another array of optical fibers to the instrument, bringing the total number of detection points to three per tube in stead of two (see schematics below). Together with adapted S-flow tubes, which are fitted with two measuring trajectories, this enables the S-flow 1200 and the S-flow 3000 VI to perform two time measurements with a single sample injection, increasing productivity, saving even more on solvent consumption and giving instant insight in test repeatability.

single measurement



dual measurement



## Backflush kit

The optional backflush kit enables the user to clean tubes which have become clogged with particles, such as metal, dirt etc.

When such a clogging occurs, this happens in the “neck” of the viscometer (see figure), at the beginning of the capillary. This particle cannot be removed using regular cleaning, which only pulls the particle further into the capillary. Instead, the tube needs to be cleaned in reverse direction. Normally, to do this, the tube needs to be taken out of the bath and connected to a vacuum line. Solvent is then sucked up through the tube, pushing out the particle.

Now, OmniTek supplies an optional backflush kit which enables the user to clean the tube while staying inside the bath:

An extra connection is made at the back of the instrument, which is sealed off during normal operation. If the need arises for backflushing a tube, a silicon tube (included) is connected to this port, with a washing bottle (included) in between. This tube can be put on top of the viscometer that needs to be cleaned. Secondly, a bottle (included) of solvent is placed beneath the viscometer. Using the control panel on the instrument, the integrated pump of the S-flow unit can be started and the solvent will be sucked up from the vessel underneath, into the tube. From the tube it will be collected in the washing bottle. This eliminates the need to take out the tube of the bath and will be sufficient to clear the majority of particles in the tube.



## New : Viscosity standards

We now offer a full range of viscosity standards that are entirely in accordance with ASTM D2162 and have a full traceability to National Standards. With a shelf life of two years, these high quality oils provide a reliable means for calibration of the S-flow tubes. Below chart shows the most often used temperatures, but data on all standard temperatures are available. Custom blending to your specifications is possible as well.

Standard nr.	Kinematic viscosity (mm <sup>2</sup> /s, cSt)	
	40°C	100°C
N 0.4*	0.40	
N 0.8*	0.60	
N 1.0*	0.99	
N2	1.7	
S3	2.9	1.2
D5	4.1	1.5
S6	5.7	1.9
D10	7.4	2.2
N10	10	2.7
S20	18	3.9
N35	30	5.3
S60	54	7.7
N100	120	13
S200	180	18
D500	230	21
N350	320	26
D1000	440	36
S600	520	36
N1000	1000	58
S2000	1700	86
D5000	1800	90
D7500	2700	120
N4000	2500	150
S8000	6700	240
N15000	13000	410
S30000	23000	660



\* This product is classified as hazardous and according to EU regulations special carriage provisions must be made. This results in additional carriage costs. Contact us for more specifics.

## New : Cooling circulators



For measurements at temperatures close to room temperature, additional cooling is required to obtain sufficient bath stability. Alternatively, if you wish to use a single system at two temperatures, additional cooling can reduce the time required for the bath to cool down considerably. We now offer a high quality 7.5 liter/minute cooling circulator, which can be directly connected to the cooling spiral that is integrated in all S-flow models.