

Science Together



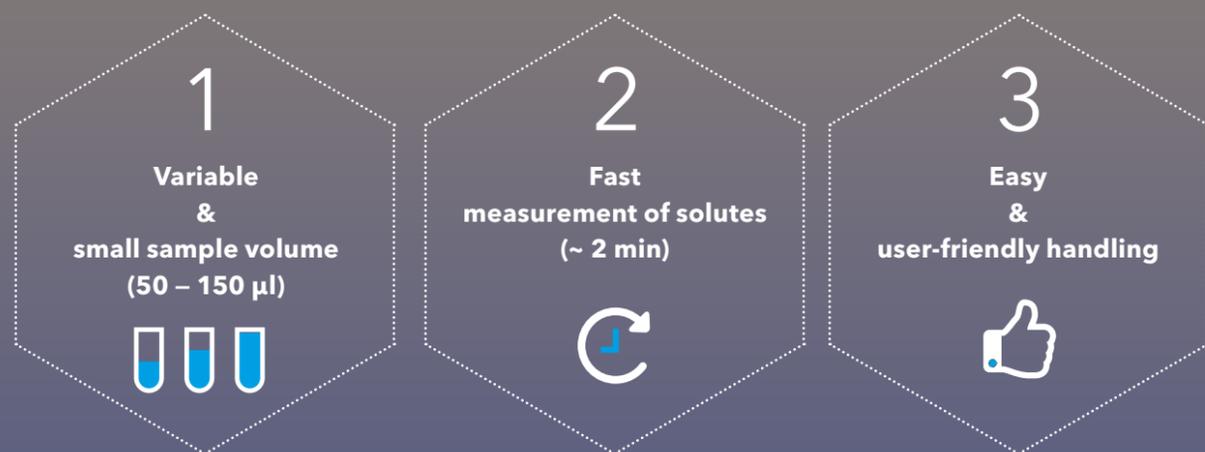
# Freezing point osmometry

Made in Germany



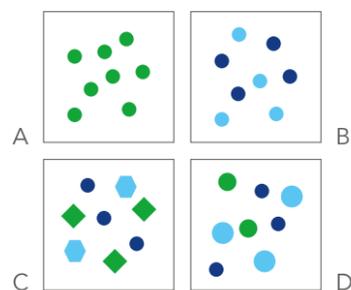
# The KNAUER freezing point osmometer

The K-7400S Semi-Micro Osmometer can determine the exact freezing point of aqueous solutions. The osmolality of various samples like pharmaceutical solutions or soft drinks can thus be easily determined.



## Theory of osmolality

Osmolality is a general measure of the particle concentration in a solute. It's not depending on the nature of molecules but just their number. Therefore, a two molar solution of a non-dissociating molecule (A) has the same osmolality as a one molar solution of a fully dissociating salt composed of two ions (B). The osmolality of a solution is the same, even when molecules vary in shape (C) as well as in size (D). Therefore, all solutions containing the same number of osmotically active particles – regardless of their chemical properties – exhibit the same osmolality.



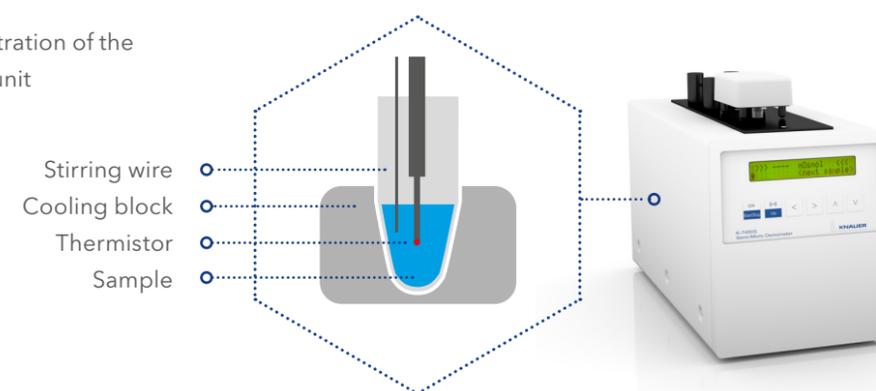
## Freezing point osmometry

The measurement principle of the K-7400S Semi-Micro Osmometer is based on the colligative property of freezing point depression.

If a solute is added to a liquid this results in a decreased freezing point of the solution. The depression is 1.858 K per 1 mole of ideally solved compound in one liter of water.

This effect depends only on the number of particles in the liquid and not on the physical or chemical properties of the solutes. Due to this linear correlation, the osmolality of a sample can be determined by precisely measuring its freezing point.

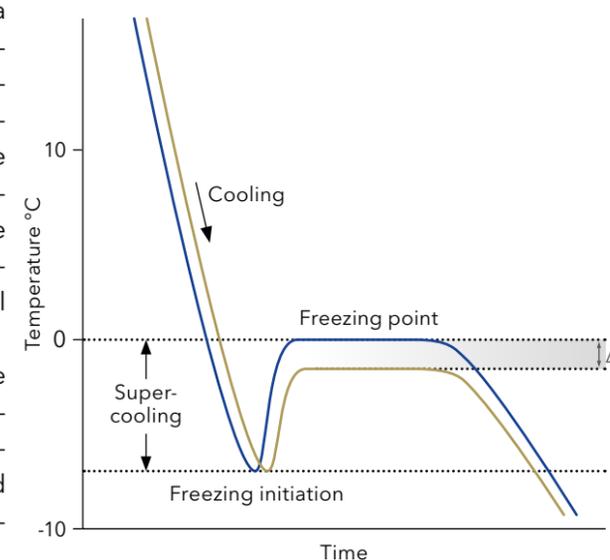
Schematic illustration of the measurement unit



## Measuring process

At the beginning of a measurement the sample is cooled by a microprocessor-controlled peltier element. During this process, the solution is supercooled below 0 °C while still being liquid. At a certain temperature the freezing process is initiated by a rotation of the stirring wire. The formation of ice crystals causes the release of thermal energy, thus rising the temperature of the sample. After a short period of time an equilibrium is reached where melting and thawing of ice crystals are balanced and the sample's temperature stays constant. This plateau marks the real freezing point of the sample.

During the whole process the temperature of the solution is measured by a high-precision thermistor. Thanks to a resolution of 1/1000 K the freezing point temperature is exactly determined and even small differences in osmolality of two samples can be measured.



# K-7400S

## Semi-Micro Osmometer

### RS-232 interface

Connection for printer or software control.



### Measuring head

With the stirring wire and its high-precision thermistor the measuring head is a key component of the osmometer.

### Parking position

The four pedestals ensure safe storage of the measuring head while the device is not in use.

### Control via keypad

The instrument can be fully controlled via the keypad. All settings for calibrations and measurements can easily be changed and displayed.

### Casing

Small and robust design that saves bench space.

## Technical data

<b>Sample volume</b>	50–150 µl
<b>Osmolality range</b>	0–2000 mOsmol/kg
<b>Resolution</b>	1 mOsmol/kg
<b>Test time</b>	~ 2 min
<b>Precision</b>	SD ≤ 4 mOsmol/kg [0–400 mOsmol/kg], RSD ≤ 1 % [400–2000 mOsmol/kg]
<b>Linearity</b>	± 1.5 % [0–2000 mOsmol/kg]
<b>Calibration</b>	Two-point calibration (0 mOsmol/kg and one free selectable osmolality), optional: Three-point calibration (0 Osmol/kg and two free selectable osmolalities)
<b>Interfaces</b>	RS-232 port
<b>Control</b>	Keypad (LC display, 2 rows with 24 characters) Optional: EuroOsmo 7400 software
<b>Power supply</b>	100–240 V, 50–60 Hz, 70 W
<b>Dimensions</b>	160 × 182 × 340 mm (W × H × D)
<b>Weight</b>	4.5 kg
<b>Ambient conditions</b>	10–35 °C, 20–80 % relative humidity (noncondensing)

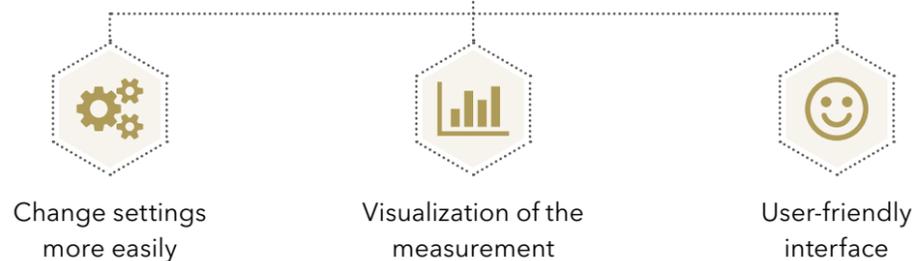
# EuroOsmo 7400 control software

Additional data management with a user-friendly interface

The K-7400S Semi-Micro Osmometer is a stand-alone device. Therefore, all functions of the instruments are accessible via the keypad. For additional storage and data management functions users can work with the EuroOsmo 7400 software. It offers a user-friendly interface to control the K-7400S Semi-Micro Osmometer via PC. Measurement parameters can easily be changed and sent to the instrument via the software. For each sample a temperature curve is displayed to visualize the measurement process.

Samples can be named individually and the measurement results can be saved for archiving. The data can also be exported in different file formats (e.g. \*.xls, ASCII or Tab delimited text files). Thus, also the import to laboratory information management systems (LIMS) is possible. Supporting the use of a barcode scanner, sample identification can be transferred automatically reducing the risk of wrong sample assignment.

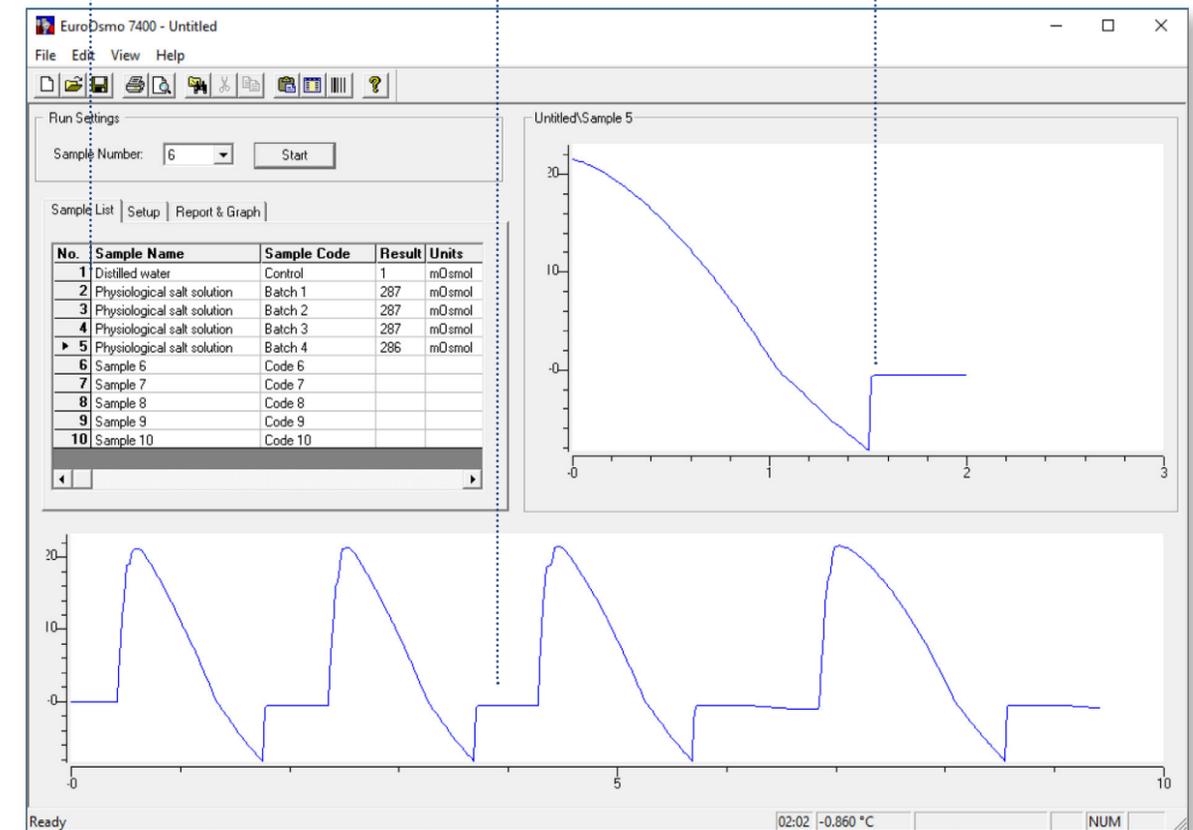
## Features



**Sample & result list**  
Individual naming of samples and overview of test results.

**Monitor view**  
Overview of the last measurements to allow quality control of the analysis.

**Measurement view**  
Visualization of the current measurement.



### Operating systems:

- Windows XP
- Windows Vista
- Windows 7
- Windows 8
- Windows 10

### PC hardware:

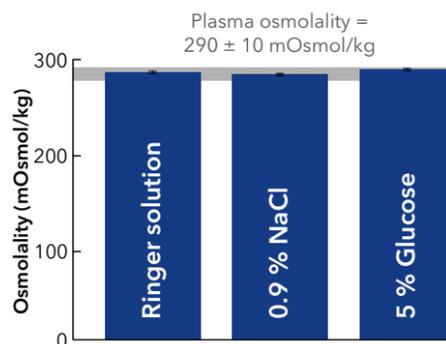
The system requirements for installation of the software are very low. In general, EuroOsmo 7400 is working on every PC that is suited for one of the listed operating systems. One RS-232 port is required for connection to the instrument.

# Applications of freezing point osmometry

Freezing point osmometry is a fast and reliable method to determine the osmolality of various solutions. In combination with the small sample size required and the simple measurement procedure it is a preferred method for laboratory analysis in industry and academia.

## Quality control of pharmaceutical solutions

The osmolality of solutions used in the clinical and pharmaceutical field is an important issue that requires regular monitoring. Especially infusion solutions but also solutions for external use like eye drops and rinsing solutions have to be isotonic to ensure the physical well-being of the patient. Therefore, strict quality control is needed. The K-7400S allows a quick analysis of such solutions and provides reliable results even with small sample volumes. Thanks to the broad measurement range, high osmolality solutions can also be analyzed.



**Analysis of isotonic infusion solutions**  
Three commonly used infusion solutions were analyzed regarding their osmolality. All of them were in the range of human Plasma (290 ± 10 mOsmol/kg) and thus are suited for therapy. Physiological saline solution is also used for inhalation, rinsing or as eye drop solution. The correct osmolality is crucial for these treatments as well.

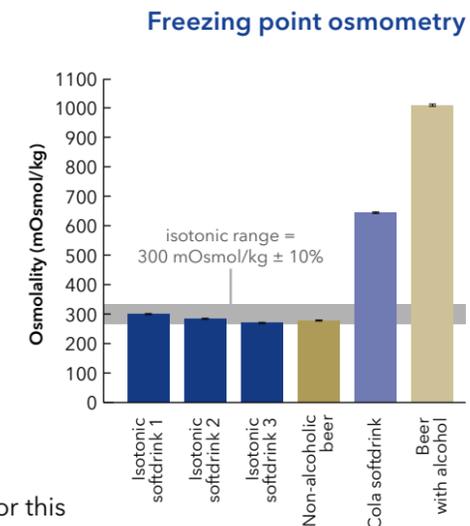
**European Pharmacopoeia**  
The K-7400S Semi-Micro Osmometer complies with the European Pharmacopoeia for osmolality (Ph. Eur. 2.2.35).



## Analysis of isotonic drinks

Isotonic drinks are becoming more and more popular among professional and amateur athletes. Due to their special composition, contained nutrients and minerals can be rapidly resorbed and thus shall allow a fast recovery after exhausting sports activity. In contrast, non-isotonic drinks as normal cola or beer need to be diluted in the intestine prior to adsorption. Thus, these beverages rather have a dehydrating effect. Since osmolality of the solution is the critical feature in this context, an exact

test method is needed. For this determination, the K-7400S Semi-Micro Osmometer is perfectly suited because it works independently of sample composition. Therefore, drinks as diverse as sugar-containing softdrinks, their sugar-free counterparts as well as alcoholic and non-alcoholic beers and many more can easily be analyzed. This renders it a fast and reliable method for both quality control and for comparing different beverages regarding their potential beneficial effect.



### Analysis of several isotonic and non-isotonic drinks.

Six different samples of isotonic and non-isotonic drinks were analysed using the K-7400S Semi-Micro Osmometer. All beverages advertised to be isotonic, had osmolality values within the range of 300 mOsmol/kg ± 10% (grey bar). Thus, they met the specifications for isotonic drinks defined by the European Food Safety Authority. In contrast, a usual softdrink or an alcoholic beer exhibited much higher osmolalities.



**PHARMACEUTICS**  
For quality control of infusion solutions, inhalation, rinsing solutions and eye drops.

**INDUSTRY**  
For process monitoring and quality checks of reagents and chemicals.

**BEVERAGES & FOOD**  
For analysis and quality control of beverages like isotonic drinks and beer.

**ACADEMIA**  
For research on plant sap and insect haemolymph and testing of nutrient solution and cell culture media.

# A tradition of osmometry

KNAUER is one of the pioneers in the field of osmometry

In many laboratories, the accurate concentration of solved molecules in a liquid is essential for daily work routine.

The KNAUER K-7400S Semi-Micro Osmometer is ideally suited for this task, since most solutes in a liquid can be measured. The determination of total particle concentration or osmolality becomes fast and simple.

KNAUER is one of the pioneers in the field of osmometry and is known for its reliable and user-friendly instruments for many decades. In 1962 the company founder Dr. Herbert Knauer invented the company's first freezing point osmometer. Since then the measurement technology was continuously adapted and advanced. The latest development in this line of products is the K-7400S. Based on proven KNAUER freezing point technology, this new device features the small footprint, the robustness and silent operation of its popular predecessor, but has been improved significantly in specifications.



Today



2006

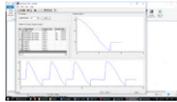


1993



1962

## Ordering information

Product	Art. No.	
	A0006AC	K-7400S Semi-Micro Osmometer with Measuring head, incl. calibrating solutions (400, 850 mOsmol/kg), plastic sample tubes and IQ (OQ is available on request)
<b>Accessories &amp; spare parts</b>		
	A0840-2	Measuring head for K-7400S Semi-Micro Osmometer, for plastic sample tubes*
	A01240	300 mOsmol/kg calibration solution (12 vials)
	A01241	400 mOsmol/kg calibration solution (10 vials)
	A01250	850 mOsmol/kg calibration solution (12 vials)
	A01248	2000 mOsmol/kg calibration solution (12 vials)
	A0272	Plastic sample tubes**, 500 pcs
	A0720	Plastic sample tubes**, 1000 pcs
	A02330	Cleaning tissue, lint free
	A3711	Plain paper printer for the K-7400S Semi-Micro Osmometer with power supply and RS-232 printer cable (optional for stand-alone use)
	A7013	Paper roll (60 m); spare part for printer
	A7014	Ribbon tape; spare part for printer
	A3705	EuroOsmo 7400; recommended software package for the K-7400S Semi-Micro Osmometer (optional)
	A13120	Computer for EuroOsmo 7400 incl. monitor and English Windows operating system
	A13270	Barcode scanner for EuroOsmo 7400 (optional)

\* The measuring head is downward compatible with the K-7400 Semi-Micro Osmometer (A3707, A3709) and replaces earlier variants for plastic sample tubes (A0840-1) and glass sample tubes (A0840).

\*\* Sample tube characteristics can impact osmometry results significantly. The plastic sample tubes offered by KNAUER are tested suitable for freezing point osmometry.

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Chromatography,  
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HPLC

FPLC

Osmometry

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