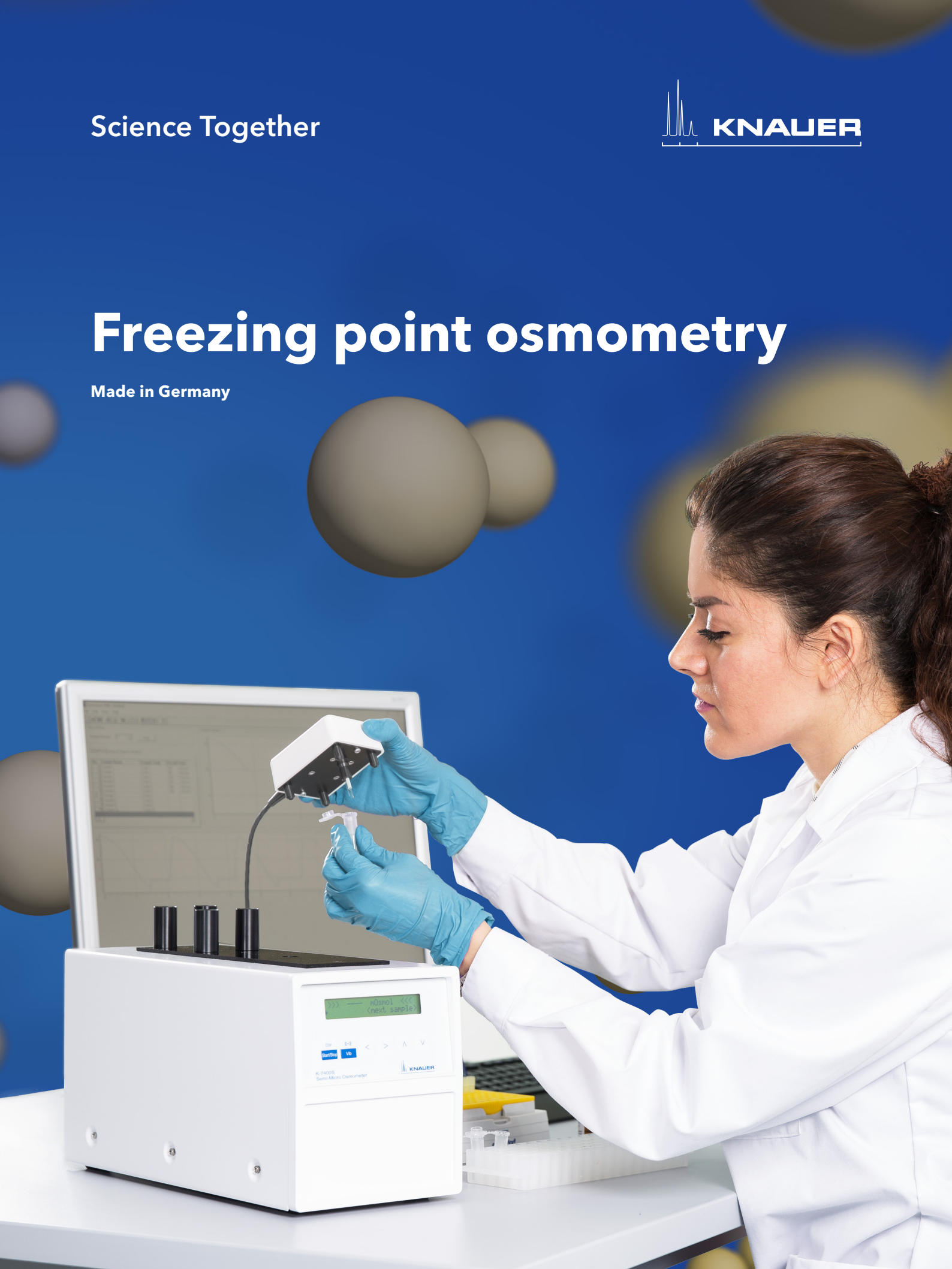
Science Together

KNAUER

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.

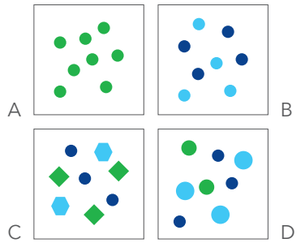
1
Variable & small sample volume (50 – 150 µl)

2
Fast measurement of solutes (~ 2 min)

3
Easy & user-friendly handling

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.

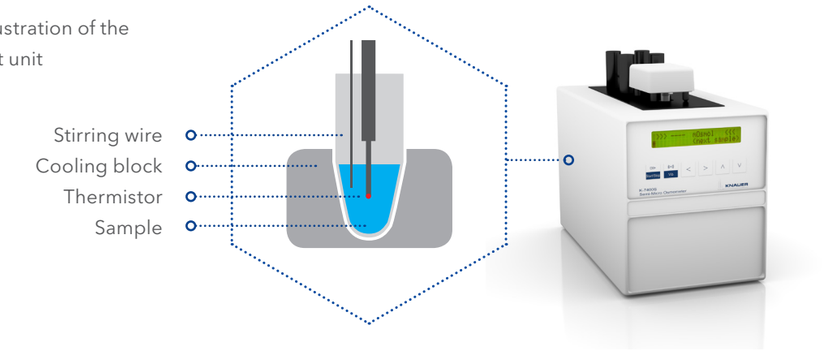


Freezing point osmometry

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.

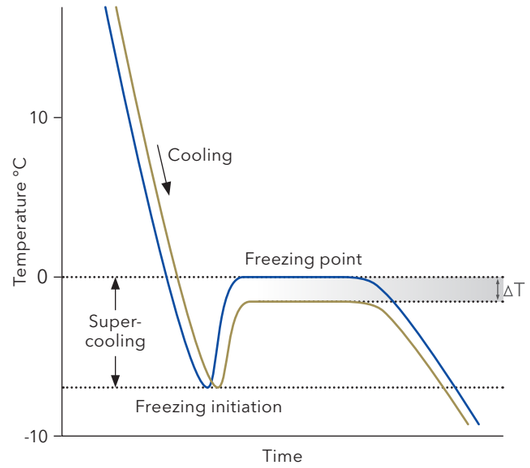
This effect depends only on the number of particles in the liquid and not on the physical or chemical properties of the solutes. Due to this linear correlation, the osmolality of a sample can be determined by precisely measuring its freezing point.

Schematic illustration of the measurement unit



Measuring process

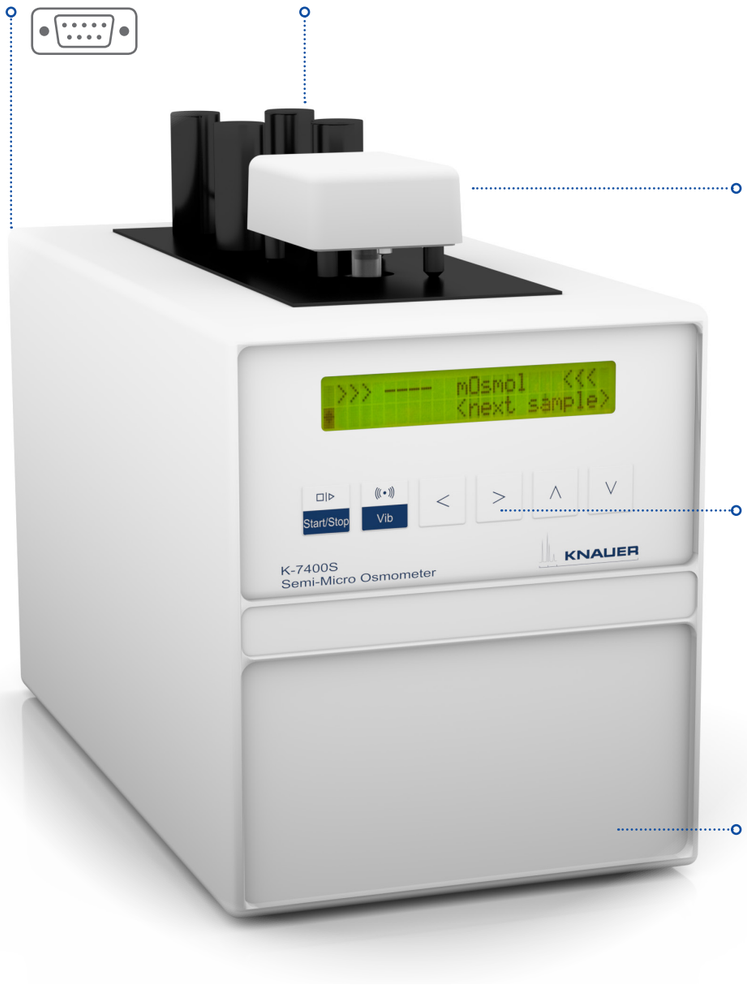
At the beginning of a measurement the sample is cooled by a microprocessor-controlled peltier element. During this process, the solution is supercooled below 0 °C while still being liquid. At a certain temperature the freezing process is initiated by a rotation of the stirring wire. The formation of 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.

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



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

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

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

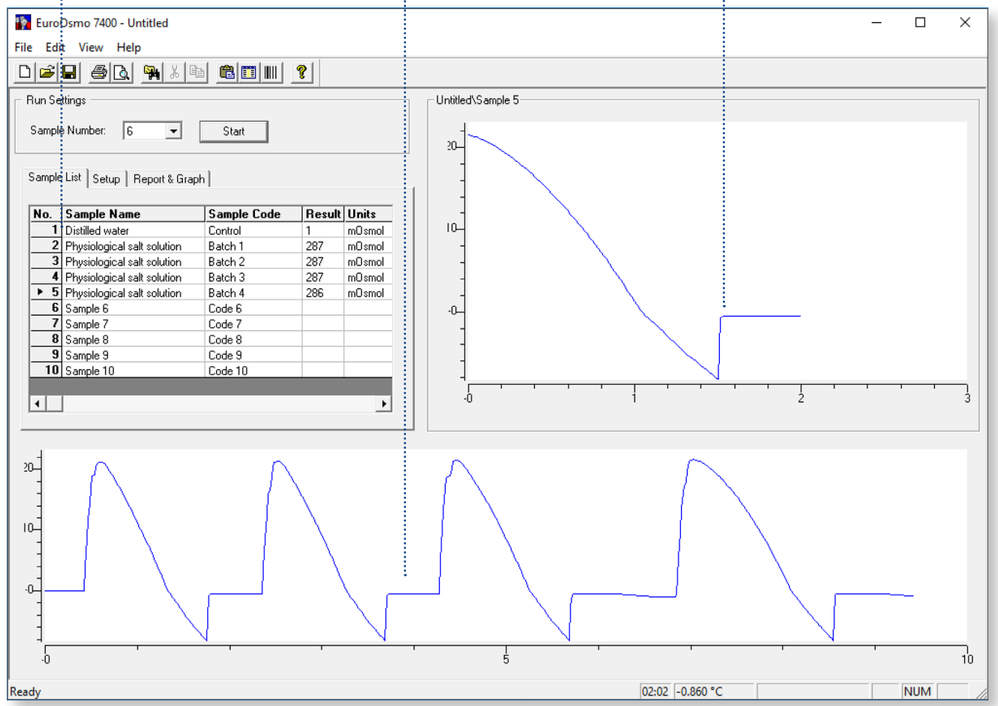
Features

- Change settings more easily
- Visualization of the measurement
- User-friendly interface

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 32-bit and 64-bit
- Windows 7 32-bit and 64-bit
- Windows 8 32-bit and 64-bit
- 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.

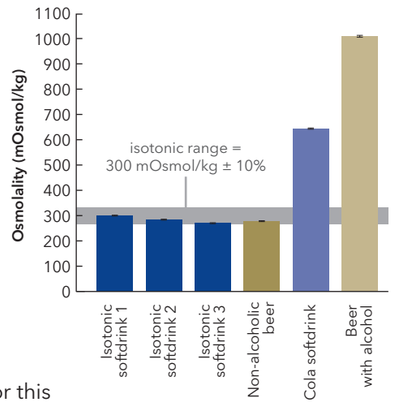
FOOD
For analysis and quality control of milk or beverages like isotonic drinks and beer.

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

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

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

Analysis of isotonic drinks



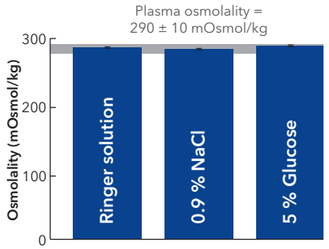
Analysis of several isotonic and non-isotonic drinks.
Six different samples of isotonic and non-isotonic drinks were analysed using the K-7400S Semi-Micro Osmometer. All beverages advertised to be isotonic, had osmolality values within the range of 300 mOsmol/kg ± 10% (grey bar). Thus, they met the specifications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

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 drinks regarding their potential beneficial effect.

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.

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.

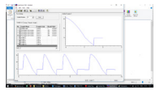
Today

2006

1993

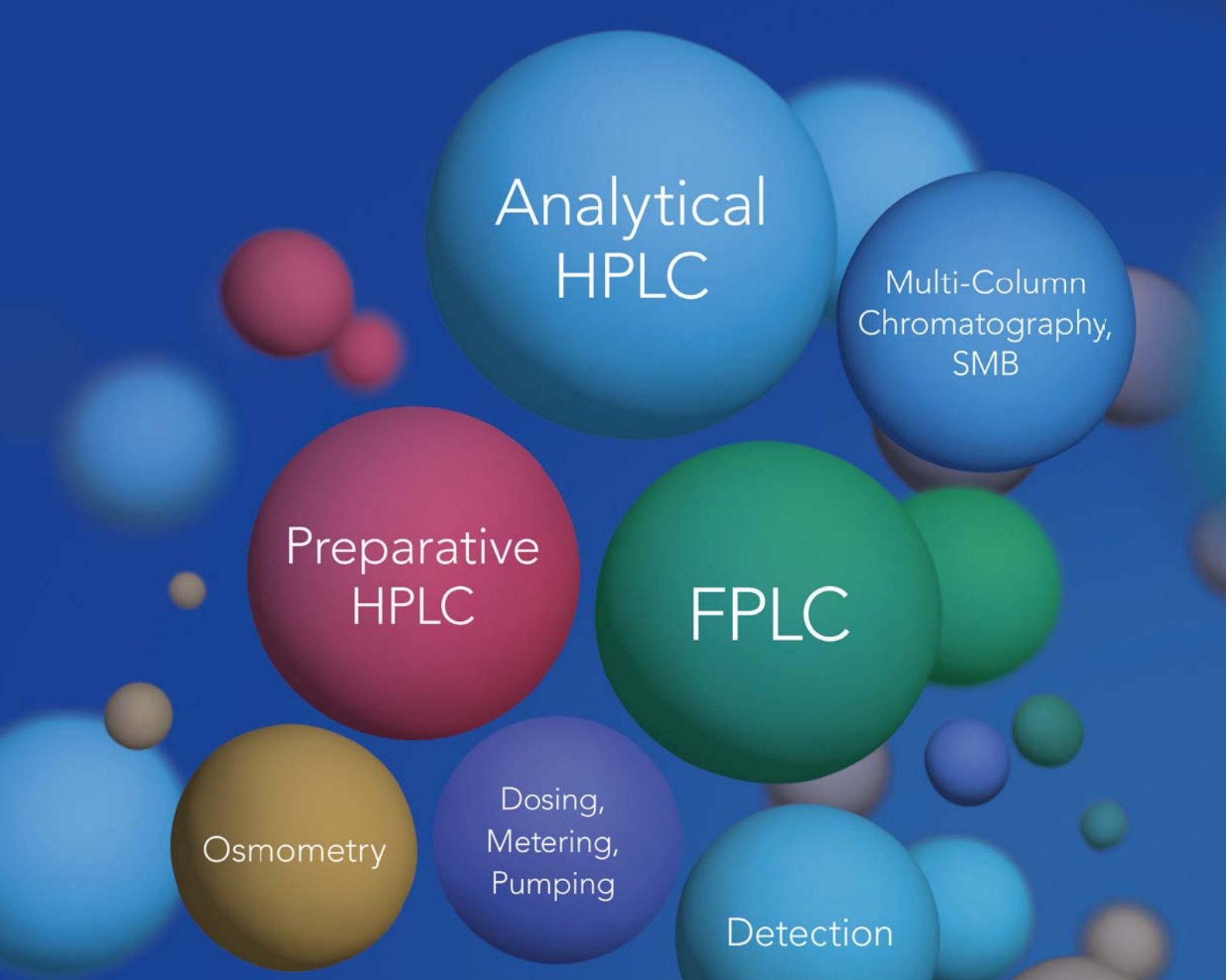
1962

Ordering information

Product	Art. No.	
	A0006AC	K-7400S Semi-Micro Osmometer with Measuring head, incl. calibrating solutions (400, 850 mOsmol/kg) and plastic sample tubes
Accessories & spare parts		
	A0840-2	Measuring head for K-7400S Semi-Micro Osmometer, for plastic sample tubes*
	A3705	EuroOsmo 7400; recommended software package for the K-7400S Semi-Micro Osmometer (optional)
	A3711	Plain paper printer for the K-7400S Semi-Micro Osmometer with power supply and RS-232 printer cable (optional for stand-alone use)
	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)
	A02721	Plastic sample tubes**, 100 pcs
	A0272	Plastic sample tubes**, 500 pcs
	A0720	Plastic sample tubes**, 1000 pcs
	A131120	Computer for EuroOsmo 7400 incl. monitor and English Windows operating system

* 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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