Metrohm
Ion analysis

711 Liquino

The Liquid Handling revolution in the laboratory.

711 Liquino with 700 Dosino, keypad and memory card

Metrohm – 40 years of dosing experience and innovation

In 1956 Metrohm marketed the first piston burette – a Metrohm invention. Up to now, the Dosimat with its Exchange Units has been the focal point of our dosing and dispensing concept. Today, based on this experience, we offer an alternative in the form of the 711 Liquino which, together with the 700 Dosino, constitutes an innovative expansion of our range of dosing instruments. The Liquino's many functions make it the indispensable «Liquid Handler» in the laboratory. Manually, these functions – if at all – could only be performed with large expenditures in time and money. The 711 Liquino carries out all its tasks automatically, is remotely controlled and runs without supervision day and night. An important point is the chemical resistance of the materials used: The reagents only get into contact with FEP, PTFE, ETFE and borosilicate glass. Using ETFE cylinders, even substances that attack glass can be dispensed.

The innovative four-way stopcock opens up new dosing functions

With the motor-driven flat stopcock made of Al_2O_3/SiC, which needs no grease and has four bores, liquids can be transferred without moving any connection tubing. The dead volume of this stopcock is extremely small.

High-precision dosing over a wide range of volumes

Using individual dosing programmes, the 711 Liquino controls up to four 700 Dosinos with their Dosing Units of 2, 5, 10, 20 or 50 mL, which are mounted directly onto the reagent bottles from different manufacturers. The dosing setup consists of the 700 Dosino controlled by a stepper motor and the Dosing Unit. Thanks to the screw connections made of FEP it is possible to dose liquids at virtually any location. The cylinder is available in glass or ETFE. The maximum dosing volume is 1000 L (!), the minimum theoretical dosing volume amounts to 1/10 000 of the used Dosing Unit's volume, i.e. 0.2 µL if a 2 mL cylinder is used.

Modest space requirements

Relief for cluttered lab benches: The very modest space requirements of the Dosino, sitting on top of the reagent bottle, allows supervision of the dosing operations from the desk. Keypad and electronics are thus separated from the wet chemistry.

Clearly arranged keys

The Liquino is so small that it fits onto any bookshelf

Detailed view of the Dosing Unit; left with glass cylinder, right with ETFE cylinder. Note the unique flat stopcock with its four bores

The Liquino and one keypad ...

Whether with two (tandem dosing) or one Dosino, the Liquino is always ready for dosing

711 Liquino – the Liquid Handling centre that fits your palm

The progress of dosing techniques requires new ideas. Via the alphanumeric keypad of the Liquino and the clearly organised dialogue, complex dosing programmes can be set up, stored and subsequently recalled by simply pressing a key.

Here are a few examples:

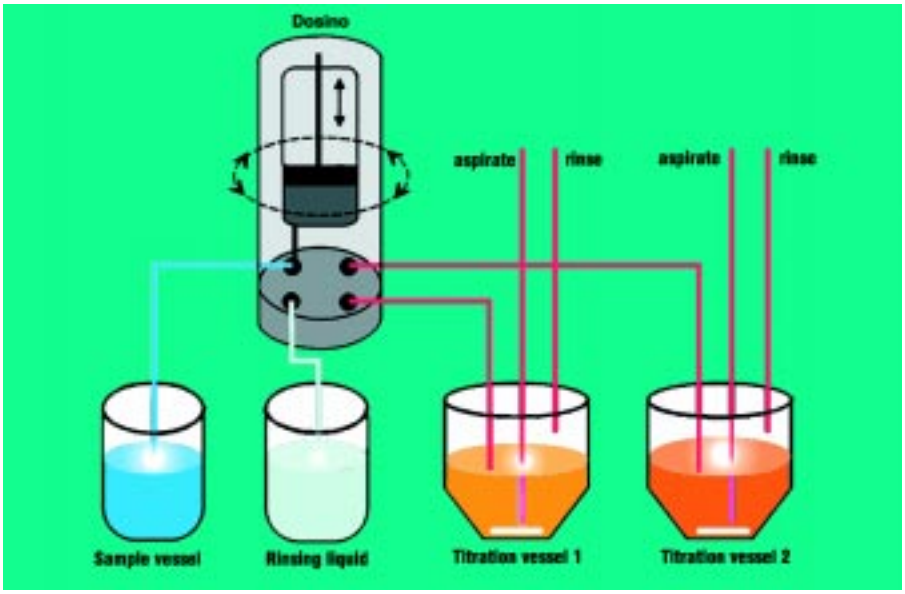
Dispensing functions in the XDOS mode: the new dosing experience!

- **The «electronic dropping funnel»**
  Doses a fixed volume, with temperature monitoring if required, in a given time interval, e.g. 35.00 mL in 120 min. The Liquino calculates and displays the dosing rate and automatically takes into account the cylinder volume of the Dosing Unit.
- **Gradient dosing**
  Gradient dosing with serial control of up to four Dosinos. Dose a fixed volume, with or without pauses, at a defined rate, e.g. 230 mL at 22.5 mL/min. The Liquino calculates and displays the time needed.
- **Time-controlled dosing**
  Exact, time-base controlled dosing at a given rate, e.g. 15 min at 3.33 mL/min. The Liquino calculates and displays the total dosing volume.

- **Precision pump**
  Precision pump working at an exactly defined rate, mastering the majority of dosing tasks involving aggressive and/or toxic liquids.
- **Tandem operation**
  Continuous dosing in tandem operation, i.e., while one Dosino is refilling the other takes over.

... control various Dosinos

Rear panel of 711 Liquino sporting a large number of connectors



Metering and transfer of a sample into different titration vessels with a 700 Dosino

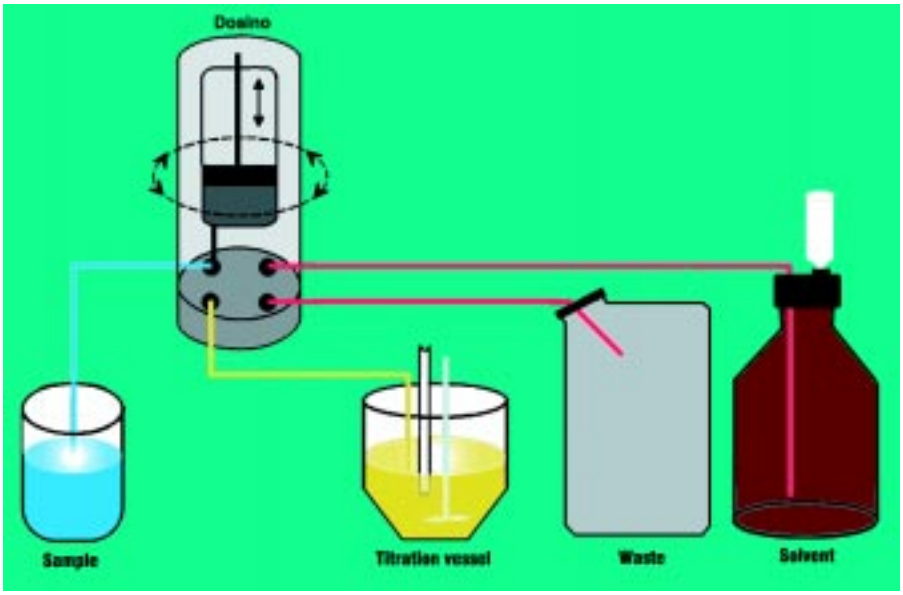
Sampling functions PIP

- **The dilutor/pipettor**

  Carries out the highly precise pipetting of small to very small liquid volumes (4 mL down to 50 µL); optional rinsing with a diluting volume.

- **The automatic sampler – fully automatic sampling, also without sample changer**

  Sample directly from a vessel and transfer into a measuring vessel, add auxiliary solutions with additional 700 Dosinos connected to the 711 Liquino and start the measurement – all automatically. After the measurement or titration the vessel contents are aspirated by a 700 Dosino or an external pump and the vessel rinsed with solvent or distilled water. Manual pipetting is no longer necessary.



Metering and transfer of a sample into a titration vessel, addition of solvent and rinsing of the titration vessel – all with one single 700 Dosino

Programming of a sequence SEQ

Free programming of a complex analytical sequence allowing to combine dosing modes with integrated additional instruments. Each step (mode) has its own parameters. Between the sequences, pauses (date, time) of any length and commands for the control of external instruments can be inserted.

Thanks to brainy hardware, the Liquino is expandable!

Storage of dosing sequences

Once the dosing sequences have been optimised, the corresponding methods can be stored on a memory card and reproduced at the press of a key.

Dosing with temperature monitoring

Optional Pt 100 temperature sensors in four-wire technique are used for the temperature monitoring during dosing tasks. Upper and lower limits with individual alarm outputs complete the safety measures. If a limit is exceeded, this can be made to stop the dosing automatically or to switch on or off a heating or cooling device via remote control. The temperature profile can be printed out.

Highest dosing precision

The dosing error and the repeatability are better than required by DIN 12 650. In terms of accuracy and repeatability, the Dosino is far superior to volumetric standard glassware. The resolution of the cylinder volume amounting to 10 000 steps allows precise dosing at rates that can be set between 0.0015 mL/min and 9.96 L/h.

Direct balance connection

The Liquino is equipped as standard with an RS 232C interface allowing to connect modern balances of various makes. This eliminates transcription errors when transferring weights. For the CONT mode and the GLP test this simplification is a decisive advantage.

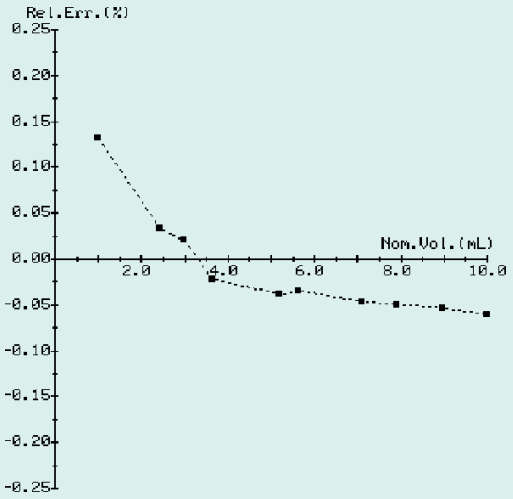
Memory card for method storage

The Dosino's success builds on carefully optimised details

Flat stopcock and burette cylinder make up the Dosing Unit, which is screwed onto the different reagent bottles. When not in use the Dosing Unit remains on the bottle, the reagent being in contact with the atmosphere via a drying tube. Depending on the reagent to be used, the 700 Dosino is mounted onto the corresponding Dosing Unit and connected to the Liquino. This is all that is needed to make the system ready for dosing. As the Dosing Unit has a very small dead volume and therefore can be rinsed directly with the new reagent, manual cleaning is normally not required upon changing the reagent.

The Dosino is mounted with a flick of the wrist

```
`cu
711 Liquino                          711.0010
date  97-04-29    time  10:30 - 10:32
*** Metrohm Ltd.
*** CH-9101 Herisau / CH
*** Development Lab. 1c
mode: GLP          user method: V-Test
operator             B.C
drive id             OP1 105
dos. unit id         294 0010
dosing unit size     10 ml
temperature          22.61 °C
liquid               water
>evaluation
  intercept          2.6 ul
  slope              0.99916
  error max. volume -0.060 %
-> GLP test PASSED!
```

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          ==================

`de
711 Liquino                          711.0010
date  97-04-29    time  10:30 - 10:32
*** Metrohm Ltd.
*** CH-9101 Herisau / CH
*** Development Lab. 1c
mode: GLP          user method: V-Test
operator             B.C
drive id             OP1 105
dos. unit id         294 0010
dosing unit size     10 ml
temperature          22.61 °C
liquid               water
liquid density       0.9976 g/ml
air density          0.0012 g/ml
dens. std. weights   8.0000 g/ml
calc. factor         1.0034291

 nom.v.    mass    act.vol abs.err rel.err
  (ml)     (g)      (ml)     (ul)     (%)
-----------------------------------------
  1.000   0.9979   1.0013    1.3    0.132
  2.428   2.4205   2.4288    0.8    0.033
  2.960   2.9505   2.9606    0.6    0.021
  3.626   3.6128   3.6252   -0.8   -0.022
  5.181   5.1613   5.1790   -2.0   -0.039
  5.637   5.6158   5.6351   -1.9   -0.034
  7.097   7.0694   7.0936   -3.4   -0.047
  7.913   7.8820   7.9090   -4.0   -0.050
  8.961   8.9255   8.9561   -4.9   -0.055
 10.000   9.9598   9.9940   -6.0   -0.060
-----------------------------------------
>evaluation
  intercept          2.6 ul
  slope              0.99916
  error max. volume -0.060 %
-> GLP test PASSED!
          ============
```

GLP test report

Direct connection of a balance to the Liquino for the preparation of standards

Automatic preparation of solutions with defined content: CONT or the automatic volumetric flask

You select the desired quantity, such as amount of substance concentration, mass concentration, mass fraction, volume fraction, and the unit, e.g., mol/L, mmol/L, %, ppm, enter the desired content via the keypad and weigh in the substance on the connected balance.

After the weight transfer the Liquino calculates and doses the liquid volume required to obtain the desired content. This not only avoids calculation errors but also saves time and money. In the same way, solutions of known strength can be converted to any other content.

Expansion possibilities

The RS 232C interface built in as standard allows the remote control and programming of all dosing functions as well as the control of external instruments from a PC.

Auto control with built-in GLP test

For the automatic validation of the pump or cylinder, respectively, the 711 Liquino is connected to a balance via its RS 232C interface. The integrated GLP dosing programme automatically doses the liquid into a vessel tared on the balance, calculates the volume of the liquid dosed and compares it to the nominal volume. The validation report conforming to GLP appears on the connected printer.

Printer

For the comprehensive documentation of parameter settings and dosing profiles, a moderately priced printer can be connected to the 711 Liquino, allowing the print out of the results with the corresponding instrument settings including the instrument identification number.

The 711 Liquino in the SMPL mode together with the 719 SET Titrino for automatic wine analysis

Small-scale automation

Liquino stands for the easy handling of liquids. In combination with a Titrino, the Liquino's special **SMPL** mode (sampling) allows to automate complete sample analyses, such as the automatic performance of titrations. In fact, the 711 Liquino might be called the small-scale sample changer for a limited number of samples. After the start command the instrument does all the work for you: It prepares the titration vessel by pre-rinsing it with solvent, meters the sample, transfers it into the cell and starts the Titrino. Upon completion of the titration the Liquino aspirates the spent solution, rinses the titration vessel and prepares it for the next sample.

Multi-use wizard in the analytical laboratory

Different analytical instruments and up to four 700 Dosinos can be connected directly to the 711 Liquino. This opens up the following applications:

In potentiometry

- Automatic sampling and sample preparation
- Preparation of standard solutions for measurements with ion-selective electrodes (ISE)
- Preparation of dilution series for the validation of SOPs (Standard Operating Procedures)
- Automatic addition of calibration standards during Karl Fischer titrations
- Standard additions during content determinations using ISE

In polarography, thanks to the direct Dosino connection

- Automatic addition of calibration standards
- Emptying and rinsing of polarographic vessels
- Preparation of standards

In IC and/or HPLC

- Preparation of, e.g., a 500 ppm solution with the eluent for the preliminary evaluation of the solubility
- Calibration using an internal standard
- Calibration using an external standard
- Determination of the tolerable ratio of buffer to eluent
- Filling of sample vessels with rinsing solutions for IC and HPLC sample changers

In spectroscopy

- Sample preparation steps
- Standard preparation for AAS, ICP-AES
- Reagent dosing in colorimetry

General analytical laboratories

- Preparation of calibration standards
- Diluting without using pipets and volumetric flasks
- Addition of ultrapure reagents for wet ashing

In automation

- Transfer, with small dead volume, of liquids from a sample changer system into a stationary titration vessel
- Transfer of a sample into two different measuring vessels

Short description

Compact, multi-functional dosing and control instrument for analysis. Four dosing instruments and 1 temperature sensor can be connected.

Connections for dosing instruments

Maximum 4 dosing instruments, maximum 2 of them can be active at the same time.

Type of dosing instrument

700 Dosino, burette cylinder volumes 2, 5, 10, 20 or 50 mL
Resolution 10 000 steps per burette volume

Range of dosing rates

From 0.0015 mL/min to 166 mL/min (9.96 L/h)

Temperature sensor input

Sensor	Pt 100
Measuring method	Four-wire technique
Constant current	5 mA
Measuring range	–40 ... 240 °C

External display (on keypad)

Backlit LCD	2 x 24 characters character height 5 mm

Keypad

Foil-covered keypad, splashwater-proof

Communication interface

RS 232C for serial data communication with balance, PC, printer or other peripheral instruments

«Remote», conventional I/O lines

Programmable parallel interface for the control of external instruments
8 x input 5 V TTL or CMOS, active = low >100 ms
8 x output open collector <40 V <20 mA

Time clock

Battery-buffered

Memory

RAM	battery-buffered, 64 kB

Memory card

Type	Memory card according to standard JEIDA 4.X / PCMCIA 2.X (68 pins)
Capacity	128 kB (6.2245.010); corresponds to ca. 500 methods, one method typically occupies 100...200 bytes. Other card types have up to 2 MB capacity.

Safety specifications

Construction and testing according to IEC 1010 / EN 61010 / UL 3101-1, protection class I, EN 60 947-1 protection type IP2L1

Electromagnetic compatibility (EMC)

Emitted interference	The 711 Liquino complies with the basic specifications EN 50081-1 01.92, EN 55011 (class B), EN 55022 (class B) and NAMUR.
Noise immunity	The standards EN 50082-1 01.92, IEC801-2 to IEC801-6, EN 60555-2 and NAMUR are complied with.

Ambient temperature

Nominal operating range	5…40 °C
Storage, transport	–20…60 °C

Ambient humidity

Max. 95% relative humidity (at ≤40 °C)

Power connection

Voltage	100 ...120 V ± 10% 220 ... 240 V ± 10%
Frequency	50 ... 60 Hz
Power consumption	ca. 28 VA

Dimensions

Height	208 mm
Width	96 mm
Depth	208 mm

Weight

2.36 kg (without accessories and without keypad)

Ordering information

711 Liquino

Compact control instrument with memory card for dosing tasks in combination with max. four 700 Dosinos. Pt 100 input (four-wire technique) for temperature monitoring.

2.711.0010 711 Liquino including separate keypad

700 Dosino

2.700.0020 Drive for Dosing Unit, together with which it is screwed directly onto bottles with GL45 glass thread (1 L reagent bottles from Baker and Riedel-de Haën, adapters see below). Fixed cable (2 m) with 8-pin mini DIN plug for connection to the 711 Liquino.

Dosing Units with glass cylinder for 700 Dosino, including accessories

6.3031.120 Dosing Unit 2 mL with titration and dosing tip
6.3031.150 Dosing Unit 5 mL with titration and dosing tip
6.3031.210 Dosing Unit 10 mL with titration and dosing tip
6.3031.220 Dosing Unit 20 mL with titration and dosing tip
6.3031.250 Dosing Unit 50 mL with titration and dosing tip

Dosing Units with ETFE cylinder for 700 Dosino, including accessories

6.3030.120 Dosing Unit 2 mL with titration and dosing tip
6.3030.150 Dosing Unit 5 mL with titration and dosing tip
6.3030.210 Dosing Unit 10 mL with titration and dosing tip
6.3030.220 Dosing Unit 20 mL with titration and dosing tip
6.3030.250 Dosing Unit 50 mL with titration and dosing tip

6.1608.023 Reagent bottle with GL45 thread, 1 L, brown glass
6.1608.030 Reagent bottle with GL45 thread, 1 L, clear glass
6.1608.040 Reagent bottle with GL45 thread, 1 L, polyethylene (PE)
6.1608.050 Reagent bottle with GL45 thread, 1 L, clear glass

Threaded adapters for Dosing Units

6.1618.000 Adapter 32 mm/GL45 (Riedel-de Haën, Fluka)
6.1618.010 Adapter 28 mm/GL45 (Fisher)
6.1618.020 Adapter S40/GL45 (Merck)
6.1618.050 Adapter 40 mm/GL45 (10 L PE canister, 6.1621.000)
6.1829.020 FEP tubing M6, length 50 cm, for PE canister

Options

Stand rods, memory cards, pipetting equipment

6.2047.010	Support mounting for Dosino
6.2026.010	Stand rod
6.2245.010	Additional memory card
6.1562.040	Pipetting equipment

727 Titration Stand for attachment to the 700 Dosino together with a magnetic or propeller stirrer

2.727.0014	727 Titration Stand with rinsing pump and rinsing head, including 220 V power adapter with Euro plug; requires 2.722.0010 Propeller Stirrer
2.727.0011	727 Titration Stand with rinsing pump and rinsing head, including 110 V power adapter with US plug; requires 2.722.0010 Propeller Stirrer
2.722.0010	722 Propeller Stirrer for 2.727.001X; with controller and stirrer propeller
2.727.0104	727 Titration Stand with controller and built-in magnetic stirrer, rinsing pump and rinsing head, including 220 V power adapter with Euro plug
2.727.0101	727 Titration Stand with controller and built-in magnetic stirrer, rinsing pump and rinsing head, including 110 V power adapter with US plug

Accessories for XDOS and CONT, GLP programmes

6.2047.010	Support mounting for Dosino
6.2026.010	Stand rod
6.1805.120	Expansion tubing for burette tip, 1 m long
6.1608.023	1 Litre reagent bottle with GL45 thread, brown glass
6.1608.030	1 Litre reagent bottle with GL45 thread, clear glass
6.1608.040	1 Litre reagent bottle with GL45 thread, polyethylene (PE)

Accessories for tandem dosing

6.1808.070	T connector M8 for tandem dosing
6.1543.170	Tip with M8 thread
6.1446.030	Ball stopper
3x 6.1805.510	PTFE tubing with M8 thread nipple, 60 cm long
2x 6.1808.040	Adapter M6 outside / M8 inside
2x 6.1829.010	FEP aspiration tubing with M6 thread nipple, 25 cm long
2x 6.1608.023	Reagent bottle with GL45 thread, brown glass
2x 6.2047.010	Support mounting for Dosino
2x 6.2026.010	Stand rod

Connecting cables for printer, balance and PC

6.2125.020*	Connecting cable for Seiko thermal printer DPU 411-20 Type II
6.2134.050	Connecting cable for Citizen iDP 562 RS or Epson FX, LX, LQ printers
6.2125.040*	Connecting cable for Epson printer EX 800/LQ 850 (DIN plug)
6.2125.030*	Stackable plug for connecting printer and balance at the same time
6.2125.020*	Connecting cable for Mettler balances AE 011/012 and for AND balances (use Mettler cable ME 33995 for Mettler balances AM, AT, PM and Mettler interface LC-RS25 for Mettler balances AB, AG)
6.2134.060	Cable for Sartorius balances MP8 and MC1 (RS 232C)
6.2125.080*	Cable for Precisa balances
6.2134.040	Connecting cable for IBM® PC/XT/AT and compatibles with 9-pin connector

* Requires additional 6.2125.010 adapter cable RS 232C 25 pin – 9 pin.

Metrohm
Ion analysis

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