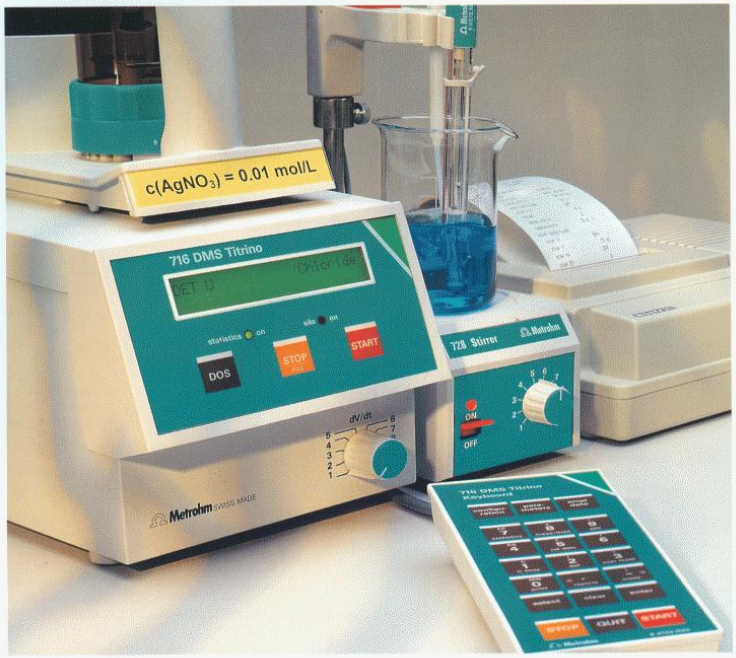
Metrohm
Ion analysis

716 DMS Titrino



The dynamic titrator in compact form.

Az Ön viszonteladója:

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Titration modes

The 716 DMS Titrino has multipurpose application possibilities thanks to its ability to handle all basic methods important for titration practice:

DET — Universally applicable dynamic titration (**D**ynamic **E**quivalence-point **T**itration) with automatic evaluation of the equivalence point. Adaptation of the volume increments to the slope of the titration curve provides precise results in a minimum of time. Even very poorly defined equivalence points are reliably detected. The titration data can be used for automatic determination of the pK value.

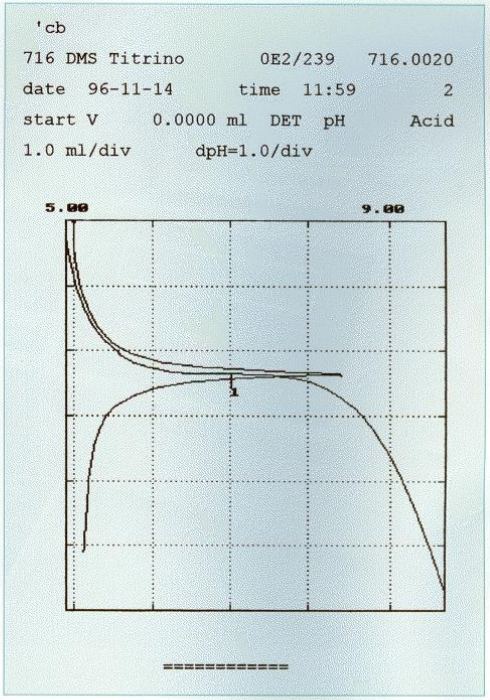
MET — Monotonic titration (**M**onotonic **E**quivalence-point **T**itration) with automatic evaluation of the equivalence point. MET employs constant volume increments and is particularly suitable for kinetically inhibited titrations, e.g. acid number and base number in oils (TAN and TBN), diazotisation of aromatic amines and determination of the chemical oxygen demand (COD). The titration data can be used for automatic determination of the pK value.

SET — Endpoint titration (**S**et **E**ndpoint **T**itration) for rapid routine determinations with or without polarisation of the indicator electrode. If desired, the vessel contents can be conditioned between determinations and the corresponding drift value displayed.

MEAS — Measurement of pH, voltage U in mV (potentiometrically or with polarised electrodes), temperature in °C.

CAL — pH calibration with up to nine buffers and calculation of the regression line.

TIP — Titration Procedure: coupling of up to nine single steps to form a procedure. The individual steps can be methods, pauses, the status conditions of two different lines of the «Remote» socket and also any messages or prompts of your choice up to 16 characters in length.



User-friendly operation

Interactive dialogue with the 716 DMS Titrino is effected in plain English, German, French or Spanish via the backlit liquid crystal display. The method memory is loaded in the factory with a number of standard methods that you can immediately put to use.

For routine operations, the keypad can be detached; operation is then via the three keys of the front panel: nothing could be simpler!

Sample weight and/or sample identification can be requested by the Titrino if desired before every titration, which helps to avoid mix-ups.

The non-volatile memory is used for methods and parameters; in sample changer applications it also assumes the role of the pushup (silo) storage for sample data. The entire range of alphanumeric characters is available for the identification of methods, results and samples.

```
'fr
716 DMS Titrino          0E2/239    716.0020
date  96-11-14        time  13:35           6
U(init)             13 mV  DET U    Chloride
smpl size       0.429 g      id#1         458
id#2           Run 27        id#3      Berger
EP1             2.395 ml                74 mV
Cl(-)           2.155 g/l
cont.            5.33 %
stop V reached
            ============
```

Advanced methodological features

In many cases the titration time can be shortened by addition of a start volume. The 716 DMS Titrino offers you the possibility of adding a fixed start volume or one related to the sample size. After addition of the start volume, a wait or reaction time can be inserted.

During the titration, the measured variable, i.e. the potential (mV) or the pH value, is shown in the display together with the dispensed volume. Further, the number of endpoints already found is displayed.

The 716 DMS Titrino has two high-impedance electrode inputs that can be selected according to requirements and individually calibrated. In titrations in non-aqueous media they act as differential amplifier inputs. Another input is available for polarised electrodes; the polariser can be programmed over a wide range and allows to take full advantage of voltametric (dead stop) and amperometric indication methods.

In the DET and MET modes, pK values can be determined in the range pK = 3.5 ... 10 with good accuracy by the Henderson-Hasselbalch method; naturally, prior calibration is essential here. In the SET mode with the conditioning switched on, the drift is displayed continuously and can be plotted on a recorder.

pH stat applications with recording of the volume against time on an external line recorder as well as long-term dispensing operations extend the application range of the 716 DMS Titrino in the organic synthesis laboratory.

Evaluation

Normally, the 716 DMS Titrino evaluates all potential jumps. However, you have the possibility to modify the endpoint determination as follows:

- Evaluate only the greatest potential jump.
- Evaluate only the last potential jump (for summation parameters, e.g. acid numbers).
- Evaluate only potential jumps in specified windows.
- Evaluate only potential jumps at specified voltages (fixed endpoints, e.g. for ASTM standard methods).

There are virtually no restrictions to entry of the calculation formulae.

The statistics function allows the calculation of mean values and absolute or relative standard deviations; outliers can be eliminated.

```
'sr
716 DMS Titrino          0E2/239    716.0020
date  96-11-14        time  13:42           8
pH(init)              5.63  DET pH  Titer_pH
smpl size          0.094 g
Titer              0.9620
                 mean( 3)    +/-s         s/%
Titer              0.9627  0.00107        0.11
                 ===========
```

Titration stands made to measure

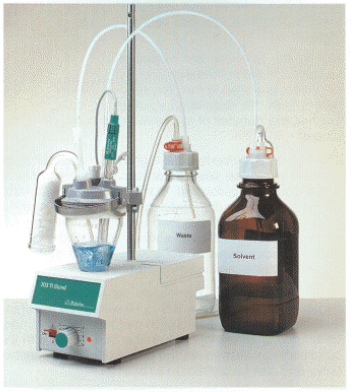
A fact of life: Titrations need stirring. The 728 Magnetic Stirrer manages this in a simple and practical manner.

The 727 Titration Stand combines stirrer and a manually operated rinsing device. Here, depending on the model, you can stir either from below with a magnetic stirring bar or from above with a propeller. The hand pump is used to thoroughly rinse electrodes, burette tips and stirrer on completion of the titration.

Savings ... titration for a quarter of the cost with eco

With the new eco semimicro titration stand, Metrohm reduces the amount of sample, the reagent consumption, the waste and hence the running costs of your titration by a factor of four.

The equipment for titrations in the semimicro range comprises a titration cell with a minimal volume of 5 mL as well as the titration vessel lid with openings for the electrodes, burette tips and siphoning tube. Rinsing of the cell and the addition of solvent are performed by the pump integrated in the 703 Titration Stand. This version for siphoning off or adding expensive or harmful solvents also helps you optimise your titrations from the ecological viewpoint. The eco Karl Fischer titration is a particular case where you can save a great deal of money and use much less reagent. eco titration – economically and ecologically right.



Balance, printer

The RS 232C interface of the 716 DMS Titrino is simple to configure in dialogue with the instrument. This allows adaptation to balances from Sartorius, AND, Mettler or Precisa and printers from Seiko, Citizen, Epson, IBM and compatibles. On completion of the titration the result appears on the printer in the selected format, together with the titration curve and its first derivative, if desired.

Productive use of the laboratory PC

Thanks to the RS 232C interface, the keyboard of your PC allows you to access all instrument functions. The extremely powerful remote control language of the 716 DMS Titrino affords access to instrument features and instrument information to an extent previously unheard of, e.g. instrument status, measured variables, method designations, calculation formulae and constants as well as free storage capacity. With regard to GLP, the possibility to block parts of the keypad and hence prevent interventions by unauthorised persons is especially important.

TiNet 2 (**Ti**tration **Net**work) is a comprehensive programme package for titration. In conjunction with the Metrohm Titrinos, TiNet 2 is the optimum solution in the titration laboratory. The Titrinos have been systematically designed for communication and are hence ideal components for PC control under TiNet 2. TiNet 2 supports both the simple routine work station and complex titration systems applying the highest level of automation.

Laboratory automation

The compact 730 Sample Changer can be matched to any task, particularly thanks to its detachable sample racks, which accommodate a wide range of beaker sizes.

The pushup storage of the 716 DMS Titrino can be used to enter sample data (identification and weight) and the associated analysis methods for future use. Use of a PC allows processing and storage of the results and their export to a laboratory data system (LIMS).

The 716 DMS Titrino can be controlled through TTL signals via its conventional remote control facility (I/O lines), e.g. by the control unit of a laboratory robot.

Metrosensor electrodes

For the extensive application field of titration, the Metrosensor range includes the following electrode types:

- pH electrodes for acid-base titrations,
- silver electrodes for argentometric titrations,
- ion-selective electrodes for complexometric titrations,
- noble metal electrodes for redox titrations,
- double noble-metal electrodes for titrations with polarised electrodes.

To satisfy the demands of titration practice, the Metrosensor range offers a wealth of alternatives, e.g. pH and metal electrodes with integrated or separate reference electrode, diaphragms for difficult and not so difficult media, special electrodes for non-aqueous titrations, as well as temperature sensors.

Your Metrohm agency will be pleased to advise you and also send you on request and free of charge our electrode brochure, the electrode catalogue as well as the Monographs «Electrodes in Potentiometry» and «Practical Aspects of Modern Titration».

Accessories

Our accessories range includes a rich assortment of component parts that are indispensable for titration or greatly facilitate it, e.g., Exchange Units, titration vessels, electrode holders, as well as numerous other parts. Here also, your Metrohm agency will be pleased to advise you.

Petrochemistry, plastics industry

- Acid and base number in oil samples (TAN/TBN)
- Basic nitrogen in mineral oil
- Bromine number and bromine index in petroleum products
- Chloride in lubricants
- Epoxy end groups
- Hydroxyl number in resin
- Isocyanate content
- Mercaptans and hydrogen sulphide in fuels
- Organic chloride in crude oil

Water, waste water, environmental protection

- Alkalinity of fly ash
- Anionic surfactants in industrial effluent
- Chemical oxygen demand (COD) of waste water
- Iodide traces in sea water
- Oxidisability of waste water
- Sulphate in sewage sludge and water samples

Metals, electroplating

- Aluminium, oxalic and sulphuric acid in anodising bath
- Chloride traces in copper and nickel baths
- Chromium(VI) and total chromium in chromium bath
- Silver and cyanide in silver bath
- Zinc in cyanide-containing plating bath

Pharmaceuticals, biology, medicine

- Aluminium oxide and magnesium oxide in antacid tablets
- Ampicillin and penicillin; content determinations
- Bactrim in cough mixture
- Bismuth and magnesium in disinfectant powder
- Calcium, magnesium and chloride in infusion solution
- Chlorhexidine digluconate in disinfectant solution
- Tranexamic acid in injections
- Vitamin C in tablets

Food and beverages

- Acetic acid and chloride in mayonnaise
- Acidity of milk and yoghurt
- Calcium and magnesium in water samples and juices
- Iodide traces in table salt
- Reducing sugars in wine and sweets
- Sodium cyclamate in sweeteners
- Vitamin C in fruit juices

Miscellaneous

- Anionic surfactants in shower lotion
- Chloride in cement, clinker, concrete, sand
- Hydrogen sulphide in coloured liquors of the paper industry
- Non-ionic surfactants in household cleaner
- Potassium, phosphate and ammonium in fertiliser
- Silver in photographic emulsion

Titration modes

DET	Dynamic titration with adaptation of the volume increments to the slope of the titration curve. Acquisition of the measured value as soon as the selected equilibrium criterion has been met or the wait time has elapsed.
MET	Monotonic titration with selectable, fixed volume increments. As soon as the selected equilibrium criterion has been met or the wait time has elapsed, the next volume increment is added.
SET	Titration to fixed endpoint (potentiometrically or with polarised electrodes); 2 endpoints can be set. Titration solution can be conditioned; pH stat applications are possible.
MEAS	Measuring instrument function for pH, voltage U (potentiometrically or with polarised electrodes), temperature T.
CAL	pH calibration with up to 9 buffers.
TIP	Titration Procedure: coupling of up to nine single steps to form a procedure.

pK value

The titration data (DET and MET mode) can be used for automatic determination of the pK value in the range pK = 3.5...10 with good accuracy.

Programmable polariser

I_{pol} can be set in the range −127 ... +127 µA,
U_{pol} in the range −1270 ... +1270 mV.

Sensor connections

Two high-impedance inputs for pH electrodes, ion-selective electrodes, etc.

Separate input for a polarised electrode, e.g. double noble-metal electrode for KF water determination, or low-resistance electrode, e.g. noble metal electrode for redox titrations.

Input for Pt 100 or Pt 1000 resistance thermometer.

Differential potentiometry

Built-in differential amplifier for work in poorly conducting media, e.g. in non-aqueous solvents.

Automatic request of the sample data

The 716 DMS Titrino can be so programmed that after the start of every titration it requests input of the sample weight and/or sample identification.

Start volume

Shortens the titration. Can be defined in absolute terms (0.00 ... 999.99 mL) or as a function of the sample weight (factor x sample weight). The dispensing rate for the start volume is selectable.

Reaction time

After addition of the start volume, a wait time can be inserted.

Stop criteria for DET and MET mode

Stop after addition of a given reagent volume (mL), after attainment of a certain pH value, a voltage (mV) or a current or after a certain number of endpoints have been found.

Endpoint evaluation for DET and MET mode

Evaluate all jumps.
Evaluate only largest jump.
Evaluate only last jump.
Evaluate jumps in specified voltage windows.
Evaluate at specified voltages (fixed endpoints).

Formula for the result calculation

For every method up to 9 formulae can be freely programmed; the result designation can be entered as an alphanumeric text.

Units for the result designation

%, ppm, g/L, mg/mL, g, mg, mL, mg/pc (mg per piece); additional alphanumeric result designations can be freely entered.

Common variables

Variables that are needed in different methods. Examples: titers, blank values and other specific results that can be used in subsequent titrations.

Statistics

Calculation of the mean value as well as the absolute and the relative standard deviation. Outliers can be eliminated and the statistics recalculated. An indicator lamp on the front panel shows whether the statistics function is switched on or off.

RS 232C data interface

Allows the printing out of results, endpoints, titration curves (also with 1st derivative) and parameters on printers made by Seiko, Citizen, Epson, IBM and compatibles.

Balances made by Sartorius, AND, Mettler or Precisa can be attached, also together with a printer.

Connection to computer (PC): Results can be printed out on the printer of the computer or exported to a LIMS. All functions of the 716 DMS Titrino can be controlled by the computer via the RS 232C interface. The VESUV programme and the 716 – PC menu programme allow convenient handling of titration data and methods with the PC.

Conventional remote control

Via I/O lines through TTL signals from the control unit of a sample changer or a laboratory robot, if need be together with a computer.

Recorder connection

The following quantities can be plotted on a laboratory recorder (option) against time:

voltage U (mV),
pH,
dU/dV,
V (mL),
dV/dt.

Dialogue languages

English, German, French or Spanish can be selected.

Display

Backlit liquid crystal display (LCD), two lines each of 24 characters, character height 5 mm.

Keypad

Affords access to all functions of the 716 DMS Titrino; can be detached in routine operation.

Memory (non-volatile)

Capacity: 10 000 bytes that can be used for methods or sample data (pushup storage for applications with sample changer). A method needs 100 ... 200 bytes, a set of sample data max. 78 bytes.

On completion of a titration, endpoints and results can be recalculated with optimised parameters.

Memory for user methods; loaded in the factory with a number of standard methods (DIN, ASTM, ISO).

Dimensions (including Exchange Unit)

Width 150 mm,
height 450 mm,
depth 275 mm

Weight (including keypad)

3.4 kg

716 DMS Titrino

2.716.0010 Compact titrator for dynamic (DET) and monotonic (MET) titrations as well as endpoint titrations (SET) (potentiometric or with polarised electrodes). Automatic determination of the pK value from the titration data is possible. TIP (Titration Procedure) allows coupling of up to nine single steps to form a procedure. Simple operation thanks to dialogue in English, German, French or Spanish. Equipped with an RS 232C data interface, remote control (I/O lines) and separate keypad.

Options

Stirrer, titration stands

2.728.0040 728 Magnetic Stirrer with stand, electrode holder, stirring bar and 728 – 716 connecting cable

2.727.0010 727 Titration Stand with rinsing pump and rinsing head
2.722.0010 722 Rod Stirrer with controller and stirrer propeller; for attachment to the 716 DMS Titrino

2.727.0100 727 Titration Stand with built-in magnetic stirrer, rinsing pump and rinsing head; for attachment to the 716 DMS Titrino

2.703.0010 703 Titration Stand

Highly integrated, manually operated titration stand with stirrer and pump for addition of solvents and aspiration of spent solution when performing endpoint titrations (SET) with conditioning between determinations

Electrode holder

6.2021.020 Electrode holder for up to 4 electrodes and 2 burette tips; for titrations in beakers (this electrode holder is part of the standard equipment of the 2.728.0040 Magnetic Stirrer)

KF equipment

6.5609.000 Complete set of accessories for Karl Fischer water determinations, including electrode

Semimicro titration equipment

6.5613.000 eco semimicro titration equipment consisting of titration vessel plus lid, adsorption tube, screw nipples for electrodes, burette tips or spray nozzles; blind stoppers, septum stopper, spray nozzles, rinsing distributor, tubing connections, aspiration tip and magnetic stirring bar

Exchange Units with glass cylinder and flat PCTFE/PTFE stopcock, with one tip each for titration and dosing

6.3014.113 Exchange Unit 1 mL
6.3014.153 Exchange Unit 5 mL
6.3014.213 Exchange Unit 10 mL
6.3014.223 Exchange Unit 20 mL
6.3014.253 Exchange Unit 50 mL

Exchange Units with glass cylinder and flat ceramic stopcock, with one tip each for titration and dosing

6.3013.113 Exchange Unit 1 mL
6.3013.153 Exchange Unit 5 mL
6.3013.213 Exchange Unit 10 mL
6.3013.223 Exchange Unit 20 mL
6.3013.253 Exchange Unit 50 mL

The bottle attachments of the above Exchange Units allow direct reagent dispensing from bottles with GL45 glass threads, i.e. 1 L reagent bottles from Baker and Riedel-de Haën. For other types of bottles, the following adapters are available:

6.1602.110 Siphon for Merck reagent bottles with S40 thread
6.1618.000 Adapter 32 mm/GL45 for Fluka reagent bottles and 500 mL reagent bottles from Riedel-de Haën
6.1618.010 Adapter 28 mm/GL45 for Fisher reagent bottles

Metrodata programmes

6.6012.113 Metrodata «TiNet® 2.1», English

Comprehensive and user-friendly PC programme (WINDOWS™) for freely programmable control of linked high-performance titration systems

6.6008.010 Metrodata «VESUV® 2.1»

PC programme (DOS) for connection of 670, 678, 682, 686 Titroprocessors, 701, 702, 716, 718, 719, 720, 736 Titrinos and 691, 692, 713 pH Meters for the acquisition of titrating and measuring data, respectively. Dialogue in English or German.

6.6013.020 Metrodata 716 Menu Programme (for 716 programme versions 11 and 20)

PC programme for the processing and storage of methods and titration data of the 716 DMS Titrino. Curves can be shown on the screen, printed and stored. Dialogue and help texts in English, German, French or Spanish.

Connecting cables for printer, PC and balance

6.2125.020 Cable for Seiko DPU 411
6.2125.040 Cable for Epson EX 800/LQ 850 (DIN plug)
6.2125.050 Cable for Citizen iDP562RS, EPSON LX, LQ, FX

6.2125.060 Cable for IBM PC/XT/AT
6.2125.010 Additional adapter cable for IBM PC AT with 9-pin connector

6.2125.020 Cable for Mettler balances AE (011/012) as well as for AND balances (for Mettler balances AM, AT, PM use Mettler cable ME33995 and for Mettler balances AB, AG Mettler interface LC-RS25)
6.2125.070 Cable for Sartorius balances MP8 and MC1 (RS 232C)
6.2125.080 Cable for Precisa balances
6.2125.030 Stackable plug for the simultaneous connection of printer and balance

730 Sample Changer

Compact sample changer with extremely high flexibility. Interchangeable sample racks for various beaker types. «Metrohm bus» and «Remote» I/O lines. Including accessories.

2.730.0010 730 Sample Changer with 1 work station, 1 pump and 2 stirrer connections
2.730.0020 730 Sample Changer with 1 work station, 2 pumps and 2 stirrer connections
2.730.0030 730 Sample Changer with 1 work station and 2 stirrer connections (without pump)
2.730.0110 730 Sample Changer with 2 work stations with 1 pump each, 4 stirrer connections
2.730.0120 730 Sample Changer with 2 work stations with 2 pumps each, 4 stirrer connections
2.730.0130 730 Sample Changer with 2 work stations and 4 stirrer connections (without pump)

Sample racks, stirrers, titration head and sample beakers must be ordered separately.