

Titration Sensors



Titration Sensors

pH

Argentometry and Redox

Photometry

Conductivity

Surfactants

Reference



Intelligent Sensors
for All Titration Applications

METTLER TOLEDO

Extensive Experience with Innovative Titration Sensors

Potentiometry is the method of choice for analytical identification of one or more substances in mixed phases. Reliable and durable titration sensors from METTLER TOLEDO with their variety of designs and perfectly matched reference systems, glass membranes and diaphragms, are suitable for a diversity of applications.



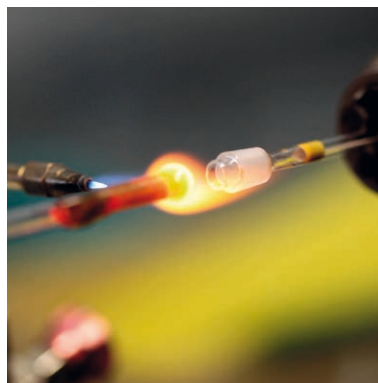
Plug and Play means reliability

With the comprehensive range of Plug and Play pH, platinum and silver titration sensors, any application challenge can be overcome. The Sensor Chip in the sensor head stores data such as sensor type, serial number, calibration data and usable life, which is automatically read out to the titrator setup when connected. That ensures, without any action on the part of the operator, that only the correct sensor with the specific, valid data is used.



Enormous capabilities

METTLER TOLEDO has been a source of skills and expertise for the production of a vast range of titration sensors capable of meeting the specific analytical requirements of every industry for over 40 years.



Precision and reliability

Alongside experienced craftsmanship, maximum utility of automated production methods ensures the consistently high quality expected of the sensors.



Guaranteed quality

No sensor leaves the production facility untested. Only on successful completion of the final check do the sensors receive their individual quality certificates ready for dispatch. Strict guidelines regarding the slope or membrane glass resistance of the pH sensors guarantee ultimate performance.



Smart design

A clean diaphragm is a fundamental requirement for precise measurements. It is the interface between the reference system and the sample. If it is clogged with precipitation deposits, precise measurement cannot be guaranteed. The METTLER TOLEDO ARGENTHAL™ Ag/AgCl reference system with silver-ion trap keeps the reference electrolyte completely free of silver ions, preventing precipitation with sulfide, protein or TRIS buffer containing solutions.

Application Examples from Practical Experience

The following small selection of examples shows how the right combination of **METTLER TOLEDO titration sensor and titrator provides the perfect solution for specific segment applications.**



Chemical

Precise sulfuric acid content using the pH sensor DGi111-SC

The precise determination of sulfuric acid concentration is of major significance not only for the chemical industry but for others too, as small differences can sometimes have serious consequences for product characteristics. A titration system consisting of T7 Excellence titrator, InMotion Autosampler and DGi111-SC pH sensor enables automated detection of 9% sulfuric acid concentration with a deviation of only 0.01% and an outstanding repeatability of only 0.05% in 6 sample series. Ultimate precision in routine analysis.



Pharmaceutical

Clotrimazole titration in acetic acid using the pH sensor DGi113-SC

Important pharmaceuticals such as clotrimazole have to be titrated directly in non-aqueous solvents due to their low acidic strength. In accordance with the requirements of the European approved drugs list and USP, pure acetic acid is used as the solvent and perchloric acid as the titrant. The outstanding chemical stability and ease of regeneration of the DGi113-SC's pH glass membrane guarantee the required durability under such demanding conditions. The high electrolyte flow from the moving plastic sleeve is essential for rapid response and stability of the sensor signal. The DGi113-SC has all the attributes required for precise results in non-aqueous titration applications.

Water



Chloride titration in drinking water using the silver ring sensor DMi141-SC

Chloride in water can occur naturally (e.g. mineral solutions such as brine) but can also be the result of contamination by fertilizer or waste water. Among other things, a high chloride content has a destructive effect on concrete and ferrous metals. With the DMi141-SC, chloride in water can be titrated with excellent repeatability (relative standard deviation < 0.5%) over a range of concentrations from 15 ppm to 1% using the appropriate concentration of silver nitrate titrant.

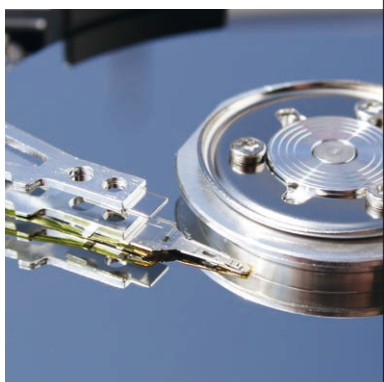
Beverages



Determining the pH and acidity of wine using the pH sensor DGi115-SC

The pH and acidity of wine are essential parameters for assessing its quality. Laboratories have to analyze large numbers of wine samples for these two variables on a daily basis. A T7 and InMotion Autosampler with the DGi115-SC provide the means for mastering the task as precisely and efficiently as possible.

Electroplating



Automated nickel and hypophosphite titration using the DP5 Phototrode™ and platinum ring sensor DMi140-SC

Tribological coatings for the automotive industry consist of metal or metal oxides electroplated or anodized from aqueous solutions. For quality assurance, the baths have to be checked every day. Nickel and hypophosphite/orthophosphite are titrated in electroless nickel baths using the DP5 and the DMi140-SC, respectively. The two titrations are handled by two InMotion Autosamplers that are controlled by a T9 Excellence titrator. At least 70 samples a day can be analyzed very efficiently and reliably.

Generalists and Specialists for the Chemical Industry

In order to cope with the enormous breadth of analyses from raw materials to specialized chemicals, there is not only a need for versatile glass and metal sensors but also for specialized sensors in order to reliably titrate in a vast diversity of sample matrices. METTLER TOLEDO can supply the right solutions for these demands.

DGi111-SC – the Multi-Talented Acid-Base Titration Sensor



- **Up to date anywhere, any time**

The current data stored in the Sensor Chip such as slope and zero point, monitored sensor life span, etc. is available to the titrator as soon as it is connected. This information provides certainty that the DGi111-SC is always in the correct condition required for the application – regardless of which titrator it is connected.

- **Mobility means flexibility**

The movable sleeve holder enables individual positioning of the sensor in the manual titration vessel or on the InMotion Autosampler or Rondolino sample changer. That means that smaller sample volumes can be titrated in METTLER TOLEDO standard titration beakers or in the 80 mL titration beakers of InMotion Autosamplers.

- **Simple yet stable reference**

The KCl-ARGENTHAL™ system reliably delivers stable sensor signals within a temperature range of 0 to 80 °C for the entire life of the sensor. The system is maintenance free and requires only regular filling with 3 M KCl.

- **Reliable connection to the outside world**

A small ceramic pin creates the necessary conditions for slow, even outflow of the electrolyte. If samples with a high sulfide or protein content are avoided, no problems with clogging should be encountered.

- **Quick stable signals and results**

The large HA-glass pH membrane has been optimized for rapid response times and stable signals. It delivers reliably repeatable results in aqueous systems.

DGi111-SC

Order number:	51109500
pH application range:	0–14
Temperature range:	0–80 °C
Membrane glass type:	HA-taped
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	3 mol/L KCl
Connection:	S12 (DGi111-SC) S7 (DGi111-SC)
Detection:	Plug and Play Sensor Chip
Classic design:	89596 (DGi111-SC)

DGi101-SC and DGi102-Mini – Micro Sensors for Macro Demands



The DGi101-SC and DGi102-Mini are two powerful micro pH sensors with 3 mm or 6 mm shafts especially made for small sample volumes of 5 to 20 mL and for use on the InMotion Autosamplers with 80 mL or 25 mL beakers. With the moveable sleeve holder, the height can be adjusted. Samples containing sulfides can be titrated with no problem. The ARGENTHAL™ reference system with silver ion trap means there is no possibility of diaphragm clogging.

DGi101-SC and DGi102-Mini

Order number:	51109507 (DGi101-SC)
	51109508 (DGi102-Mini)
pH application range:	0–14
Temperature range:	0–100 °C
Membrane glass type:	U-glass
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™ with silver ion trap
Reference electrolyte:	3 mol/L KCl
Connection:	S12
Detection:	Plug and Play Sensor Chip

Sb850-S7/120 and DX202-SC – where Others Fear to Tread



This is a specific combination for acid-base titration in media containing hydrofluoric acid. The antimony pin of the Sb850 half cell is passivated by fluoride ions and is therefore resistant. Similarly, the plastic shaft of the DX202-SC reference is unaffected by hydrofluoric acid. Oxides that are only soluble in highly corrosive media can be titrated without any trouble.

Sb850-S7/120

Order number:	59904405
pH application range:	0–14
Temperature range:	0–80 °C
Sensor element:	Antimony pin
Diaphragm:	n/a
Shaft material:	Polypropylene
Reference system:	External reference required
Connection:	S7
Detection:	n/a

DX202-SC

Order number:	51109295
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Ext. diaphragm:	Glass fiber
Int. diaphragm:	Glass fiber
Shaft material:	Polypropylene
Reference system:	Ag/AgCl
Int. reference electrolyte:	3 mol/L KCl
Bridge electrolyte:	3 mol/L KCl or 1 mol/L KNO ₃
Connection:	S7
Detection:	n/a

Flexibility and Durability for Difficult Petrochemical Samples

The METTLER TOLEDO sensors for non-aqueous titrations are optimized for rapid response times and signal stabilization as well as for ruggedness and durability. As a result, they easily meet the requirements of oil standards such as ASTM, IP and DIN for the titration of petrochemical products.

DGi116-Solvent – for the Most Exacting Demands



- **No mistakes**

Because of its Plug and Play Sensor Chip, the DGi116-Solvent is immediately detected as soon as it is connected to the titrator. Mix-ups are not possible.

- **Perfectly shielded**

The gold shielding on the inner reference provides perfect protection against electrostatic effects. The signal noise is substantially diminished and the result quality significantly improved.

- **Reliable reference system**

The LiCl-ARGENTHAL™ system reliably delivers stable sensor signals within a temperature range of 0 to 60 °C for the entire life of the sensor. The system is maintenance free and requires only regular filling with 1 mol/L LiCl in ethanol.

- **Stable signals and easy cleaning**

The movable ground glass junction ensures even flow of the electrolyte. The sensor signal stabilizes faster and titrations can be completed in a shorter time. The smooth glass surface prevents oil samples from sticking and considerably simplifies cleaning.

- **Fast response times and durability**

The large spherical surface area of the glass membrane ensures low membrane resistance and homogeneous distribution of the potential. So, the response time and signal noise are reduced. Due to its chemical stability and easy regeneration, the A41 membrane glass is ideal for non-aqueous titrations in a pH range of 0 to 12.

DGi116-Solvent

Order number:	51109505
pH application range:	0–12
Temperature range:	0–60 °C
Membrane glass type:	A41 spherical
Diaphragm:	Ground glass (moveable)
Shaft material:	Glass
Reference system:	LiCl-ARGENTHAL™
Reference electrolyte:	LiCl, 1 mol/L in ethanol
Connection:	S12
Detection:	Plug and Play Sensor Chip

DMi148-SC – Maximum Versatility, Minimum Maintenance



The DMi148-SC is ideally suited to detecting chloride and, by simply sulfidizing the silver ring, for titrating mercaptans in petrochemical products. Thanks to the pH glass reference, there is no diaphragm clogging and no electrolyte refilling. Automatically, other possible applications such as acid-base titration using the silver ring as reference are possible.

DMi148-SC

Order number:	51109532
pH application range:	0–14
Temperature range:	0–80 °C
Sensor element:	Silver ring
Diaphragm:	n/a
Shaft material:	Glass
Reference system:	pH glass membrane
Reference electrolyte:	n/a
Connection:	S12
Detection:	Plug and Play Sensor Chip

DG300-SC and DX200 – Individually Adaptable



With this combination, you have the option of working strictly according to ASTM D664 specifications for determining acid number or, creating a sensor adapted specifically to the sample and sample matrix. The DG300-SC half-cell reacts quickly and consistently to pH changes thanks to the large, spherical membrane. The DX200 with its replaceable bridge electrolyte and constant electrolyte flow from the ground glass junction is an individually adjustable reference ideally suited to non-aqueous media.

DG300-SC

Order number:	51109286
pH application range:	0–14
Temperature range:	0–100 °C
Sensor element:	pH glass membrane
Diaphragm:	n/a
Shaft material:	Glass
Reference system:	External reference required
Connection:	S7
Detection:	n/a

DX200

Order number:	51089935
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Ext. diaphragm:	Ground glass (moveable)
Int. diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Int. reference electrolyte:	3 mol/L KCl
Bridge electrolyte:	3 mol/L KCl
	1 mol/L KNO ₃
	1 mol/L LiCl in ethanol
Cable/connection:	1 m, 4 mm banana
Detection:	n/a

Controlled Safety and Precision for Pharmaceuticals

Titration on the purity of pharmaceutical constituents and active ingredients are fundamental to ensuring their effectiveness. METTLER TOLEDO titration sensors make the required application flexibility possible and offer reliability due to their intelligent design. This ensures maximum sensor life and minimal maintenance.

DMi147-SC – Twice the Possibilities, Half the Work



- **Reliable detection:**

All relevant sensor data for identification and status monitoring is immediately available to the titrator thanks to the Plug and Play Sensor Chip.

- **Secure attachment**

With the standard glass sleeve holder, the sensor can be easily and securely positioned when fitted in the titration stand.

- **Maintenance free reference system**

The DMi147-SC has no diaphragm as the pH glass membrane provides a constant reference potential for the platinum sensor in highly acidic and therefore adequately buffered conditions required for redox titrations. No refilling of electrolyte or cleaning of clogged diaphragms are necessary, adding up to ease-of-use, minimum maintenance and a long service life.

- **Twice the capabilities**

The DMi147-SC combines two sensors, making it capable not only of redox titration using the platinum sensor but also of acid-base titration using the pH sensor. In the first case, the pH membrane is the reference, in the second the platinum ring. In both cases, the sample is not contaminated since there is no outflowing electrolyte. The question of the right choice of reference electrolyte is therefore superfluous.

DMi147-SC

Order number:	51 109522
Detection range:	0–±2000 mV
pH application range:	0–14
Temperature range:	0–80 °C
Sensor element:	Platinum ring
Diaphragm:	n/a
Shaft material:	Glass
Reference system:	pH glass membrane
Reference electrolyte:	n/a
Connection:	S12
Detection:	Plug and Play Sensor Chip

DGi113-SC – Reliability for Non-Aqueous Titrations



DGi113-SC

The DGi113-SC is the sensor for the best results in acid-base titration of pharmaceuticals in non-aqueous media using a variety of titrants adapted to the sample matrix.

DGi113-SC

Order number:	51109502
pH range:	0–12
Temperature range:	0–60 °C
Membrane glass type:	A41 cylindrical
Diaphragm:	Moveable Tefzel®
Shaft material:	Glass
Reference system:	LiCl-ARGENTHAL™
Reference electrolyte:	LiCl, 1 mol/L in ethanol
Connection:	S12 (DGi113-SC) S7 (DGi113-SC)
Detection:	Plug and Play Sensor Chip
Classic design:	89632 (DGi113-SC)

InLab®717 and InLab®718 – Tracking Down Fast-Moving Ions



InLab®717



InLab®718

These two conductivity sensors, which can be connected directly to the conductivity card of an Excellence titrator, are suitable for conductometric acid-base or precipitation titrations. They can be used in low-ion aqueous or non-aqueous media. They enable rapid titration and feature zero-maintenance and outstanding durability. For direct measurement of conductivity, the appropriate InLab®710/731 or InLab®720/741 can be used according to sample type.

More information is provided in the Lab Sensors brochure (order no. 30264253B) or at www.mt.com/electrode-guide

InLab®717

Order number:	51302401
Detection range:	10 µS/cm–500 mS/cm
Temperature range:	0–100 °C
Shaft material:	Epoxy
Cell constant:	Dependent on beaker geometry
Cell type:	4-pole platinum
Temperature sensor:	NTC
Connection/cable:	Mini-Din, 1 m
Detection:	Presence checking

InLab®718

Order number:	51340266
Detection range:	0.1–200 µS/cm
Temperature range:	–5–100 °C
Shaft material:	Epoxy
Cell constant:	Dependent on beaker geometry
Cell type:	2-pole platinum
Temperature sensor:	NTC
Connection/cable:	Mini-Din, 1.2 m
Detection:	Presence checking

Precise Detection of Multiple Parameters in Water

The importance of water in every area of life and industry is undisputed. The enormous variety of water types require analysis of different ions and parameters over a wide range of concentrations under constantly maintained conditions in accordance with strict regulations. That places exacting demands on the sensor systems but presents no problems for METTLER TOLEDO titration sensors.

DGi117-Water – all Your Water Titration Needs in One Sensor



- **No watering down of sensor data**

The pH sensor calibration data stored in the Sensor Chip of the DGi117-Water are transferred to the titrator as soon as it is connected. It can be automatically monitored if required, which means the sensor is always in optimum condition for precise, temperature-adjusted pH measurement and end point titrations.

- **Maintenance free reference**

The double-junction design with a maintenance free internal reference system (KCl gel) enables replacement of the outer reference electrolyte (1 mol/L KCl) and therefore adaptation to the particular testing conditions.

- **No interference**

The inner tube is electrically shielded by a gold coating, preventing interference from electrostatic charges which otherwise would cause high signal noise and drifting pH readings.

- **High precision in low-ion media**

The electrolyte flow through the fixed glass junction remains stable between 5 and 20 $\mu\text{L}/\text{h}$. This guarantees accurate pH readings and only minimal contamination of the sample with electrolyte.

- **All-inclusive**

Temperature-adjusted pH readings and end point titrations can be performed due to the integrated Pt1000 temperature sensor.

- **Rapid results**

The LoT glass features low membrane resistance and ensures extremely fast response time. The thin-walled spherical design reduces electrical resistance even further.

DGi117-Water

Order number:	51109506
pH application range:	1–11
Temperature range:	0–100 °C
Membrane glass type:	LoT spherical
Ext. diaphragm:	Ground glass
Int. diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Int. reference electrolyte:	KCl gel
Bridge electrolyte:	1 mol/L KCl
Connection:	S12
Detection:	Plug and Play Sensor Chip

DMi144-SC – the Long Sensor for Chemical Oxygen Demand



Chemical oxygen demand (COD) titrations are best left to automated systems due to the harsh chemical conditions and high sample numbers. The DMi144-SC platinum ring sensor is capable of fully automated redox titrations directly in standard decomposition vessels with the InMotion Autosamplers and COD kit.

DMi144-SC

Order number:	51109521
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Sensor element:	Platinum ring
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	3 mol/L KCl
Connection:	S12
Detection:	Plug and Play Sensor Chip

DMi102-SC and DMi141-SC – Precise Titration from ppm to % Chloride and More



The DMi102-SC and DMi141-SC are silver ring sensors for similar applications, e.g. titrating any ions that form precipitations with silver. This includes all halides (Cl⁻, Br⁻, I⁻), pseudo-halides (CN⁻, SCN⁻, ...) and, after prior sulfidizing of the silver ring, sulfides and mercaptans over broad concentration ranges. The DMi141-SC is the generalist, the DMi102-SC is a rugged semi-microsensor for small sample volumes of 10 to 20 mL or for use on the InMotion Autosamplers with 80 mL and 25 mL beakers.

DMi102-SC

Order number:	51109533
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Sensor element:	Silver ring
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	1 mol/L KNO ₃
Connection:	S12
Detection:	Plug and Play Sensor Chip

DMi141-SC

Order number:	51109530
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Sensor element:	Silver ring
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	1 mol/L KNO ₃
Connection:	S12 (DMi141-SC) S7 (DMi141-SC)
Detection:	Plug and Play Sensor Chip
Classic design:	89599 (DMi141-SC)

Precise ion-selective and conductivity measurements

Full details of sodium, ammonia, calcium and other ion-selective sensors as well as the right choice of conductivity sensor for water analysis can be found in the Lab Sensors brochure (order no. 30264253B) or at www.mt.com/electrode-guide.

Reliable Results for Palatable Food

The pH level, acidity and other parameters such as salt and Vitamin C content in food and beverages are essential in obtaining the right flavor and for nutritional validation. METTLER TOLEDO titration sensors guarantee food quality because the specific ingredients can be quickly and accurately titrated according to regulations.

DGi115-SC – Optimized for Acid-Base Titration in Food and Beverages



- **Reliable titration**

The sensor and calibration data stored in the Sensor Chip is always up to date and can be monitored. This guarantees that the DGi115-SC is always in good condition for pH testing or end point titrations.

- **Controlled conditions**

Due to the ARGENTHAL™ reference system with silver ion trap, the reference electrolyte (3 mol/L KCl) is free of silver ions. There is no danger of food constituents such as sulfides or proteins clogging the diaphragm.

- **Repeatable precise results**

The electrolyte flow through the fixed glass junction is constant and guarantees accurate and reproducible pH readings and end point titrations. Food ingredients sticking to the glass surface can be cleaned off easily.

- **Fast results**

The HA glass pH membrane features rapid response time, low alkali error and outstanding mechanical durability. It is the right combination for consistently high performance.

DGi115-SC

Order number:	51109504
pH application range:	0–14
Temperature range:	0–100 °C
Membrane glass type:	HA cylindrical
Diaphragm:	Ground glass
Shaft material:	Glass
Reference system:	ARGENTHAL™ with silver ion trap
Reference electrolyte:	3 mol/L KCl
Connection:	S12 (DGi115-SC) S7 (DGi115-SC)
Detection:	Plug and Play Sensor Chip
Classic design:	89806 (DGi115-SC)

DM143-SC – Vitamin C, SO₂ and More



The DM143-SC is a simple, durable and zero-maintenance sensor primarily for redox titration of important food ingredients such as Vitamin C or free and total SO₂ in wine. Depending on the method or regulations, titrations can be performed with either voltametric or amperometric indication.

DM143-SC

Order number:	51107699
Detection range:	0–±2000 mV 0–200 µA
Temperature range:	0–100 °C
Sensor element:	Double platinum pin
Diaphragm:	n/a
Shaft material:	Glass
Reference system:	n/a
Reference electrolyte:	n/a
Connection:	S7
Detection:	n/a

DMi145-SC – Easy Detection of Chloride in Food



The DMi145-SC is an ideal silver ring sensor for chloride titrations in foods. Contamination or clogging with sticky foods such as ketchup or samples with high fat content are no problem thanks to the easy-to-clean moveable plastic diaphragm. The high electrolyte flow from the diaphragm enables chloride detection to ppm-accuracy in alcoholic solutions.

DMi145-SC

Order number:	51109531
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Sensor element:	Silver ring
Diaphragm:	Moveable Tefzel®
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	1 mol/L KNO ₃
Connection:	S12
Detection:	Plug and Play Sensor Chip

High Precision for Ultimate Functionality in Electroplating and Electronics

Continuous monitoring of the metal ion, acid or anion content of electrochemical baths is important for obtaining durable coatings in electroplating processes or producing perfectly functioning circuit boards in the electronics industry. Tough and well-designed METTLER TOLEDO titration sensors are ideal for titrating in such demanding sample matrices.

DP5 Phototrode™ – a Mini Rainbow for Metal Titrations and More



- **5 options for a full spectrum of titrations**

With a choice of 5 wavelengths comprising 520 nm, 555 nm, 590 nm, 620 nm and 660 nm, the DP5 can be individually adapted to the specific application. With a suitable color indicator, a wide range of complexometric titrations is possible, as well as acid/base, redox and turbidimetric titrations. This means that the cost benefits compared with more complex procedures such as AAS or ICP-AES can be fully exploited.

- **Just like a normal sensor**

Thanks to its movable sleeve holder, the DP5 can be used like any other sensor in the titration vessel, either directly on the titrator or on a InMotion or Rondolino sample changer. It will even fit in the 80 mL InMotion Autosamplers beakers.

- **A long-term investment**

The polypropylene design of the sensor shaft is resistant against most aqueous and non-aqueous media. If ever there are incompatible solvent mixtures involved, you can change to a stainless steel shaft at any time. In either case, you will have a highly durable sensor which will provide you with reliable readings over the full length of its extensive service life.

- **The right solution**

The DP5 is used where potentiometric titrations are not possible, where matrix effects corrupt the output signal of the sensor or where photometry is a specified requirement. It enables quick and easy titration because it requires neither conditioning stages nor time-consuming calibration or maintenance work. You just set the maximum transmission or absorption, and off you go.

DP5 Phototrode™

Order number: : 51109300
 : inc. region-specific
 : power adaptor (Europe/
 : USA/UK) and cable

DGi112-Pro – Specifically Adaptable to the Sample



DGi112-Pro

The DGi112-Pro is a double-junction pH sensor that enables replacement of both the reference and the bridge electrolyte for specific adaptation to the sample matrix. The HA glass membrane is distinguished by high durability and rapid response characteristics and the movable diaphragm prevents clogging and is easy to clean. Titration of acid mixtures in demanding electrochemical baths can be mastered with accurate results.

DGi112-Pro

Order number:	51109501
pH range:	0–14
Temperature range:	0–60 °C
Membrane glass type:	HA cylindrical
Ext. diaphragm:	Moveable Tefzel®
Int. diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Int. reference electrolyte:	3 mol/L KCl
Bridge electrolyte:	1 mol/L KCl 3 mol/L KNO ₃
Connection:	S12
Detection:	Plug and Play Sensor Chip

DMi140-SC and DMi101-Mini – the Perfect Choice for Redox Titration



DMi140-SC



DMi101-Mini

The DMi140-SC and DMi101-Mini are two platinum ring sensors for all types of redox titrations encountered in the electroplating or electronics industries, such as direct titration with cerium(IV)sulfate or back titrations with potassium iodide or ferrous(II) ammonium sulfate. The DMi140-SC is the generalist while the DMi101-Mini is a rugged semi-microsensor for small sample volumes of 10 to 20 mL or for use on the InMotion Autosamplers with 80 mL and 25 mL beakers.

DMi140-SC

Order number:	51109520
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Sensor element:	Platinum ring
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	3 mol/L KCl
Connection:	S12 (DMi140-SC) S7 (DMi140-SC)
Detection:	Plug and Play Sensor Chip
Classic design:	89598 (DMi140-SC)

DMi101-Mini

Order number:	51109523
Detection range:	0–±2000 mV
Temperature range:	0–80 °C
Sensor element:	Platinum ring
Diaphragm:	Ceramic pin
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	3 mol/L KCl
Connection:	S12
Detection:	Plug and Play Sensor Chip

Durability

for Paper Production

The process of pulp digestion has to be carefully controlled in order to obtain quality results without wasting time and money. Due to the vast production volumes, enormous gains can be obtained from very minor changes to the pulping process. The METTLER TOLEDO sensor DGi114-SC provides the ideal means for titrations in the delignification process.

DGi114-SC – the Tough pH Sensor for Harsh Environments



- **Unmistakable**

Due to its Sensor Chip, the sensor is unmistakably identified. The up-to-date sensor and calibration data stored are immediately available to the titrator, so mistakes are a thing of the past.

- **Stable conditions**

The ARGENTHAL™ reference system with 3 mol/L KCL electrolyte withstands high temperatures and frequent temperature changes – providing a long-lasting and stable reference system.

- **Simple maintenance**

The movable diaphragm with its high electrolyte flow enables fast and reproducible potential adjustment and adds to the ease of cleaning and maintenance – all in all an optimum design for equivalence point titrations with difficult pulp samples.

- **Durability for reliable results**

The outstanding durability of the HA glass membrane makes it perfect for the demanding conditions of acid-base titrations of black, green or white liquors.

DGi114-SC

Order number:	51109503
pH application range:	0–14
Temperature range:	0–60 °C
Membrane glass type:	HA cylindrical
Diaphragm:	Moveable Tefzel®
Shaft material:	Glass
Reference system:	ARGENTHAL™
Reference electrolyte:	3 mol/L KCl
Connection:	S12
Detection:	Plug and Play Sensor Chip

Surfactants

in a Diversity of Cosmetic Products

Due to constantly rising consumer demands, the composition of personal care products such as creams, shampoos or shower gels has become increasingly complex. Titrations of these samples have therefore become extremely exacting, demanding suitable methods combined with high-performing and versatile sensors: the METTLER TOLEDO DS800-TwoPhase and DS500 surfactant sensors.

DS800-TwoPhase – the Ultimate in Two-phase Titration Performance

DS500 – specifically for Use in Aqueous Systems



The DS800-TwoPhase is the sensor of choice for the titration of anionic and cationic surfactants in formulations, raw products, liquid detergents and shampoos using the two-phase titration method according to the EN 14480, 14668 and 14669 standards over a pH range from 1 to 12. The performance capabilities of the membrane remain entirely undiminished even after hundreds of titrations, resulting in reliable results over the full length of its extensive service life.

DS800-TwoPhase

Order number:	51109540
pH applic. range:	1–12
Detection range:	<10 ⁻⁵ mol/L to critical micelle concentration
Temperature range:	0–50 °C
Sensor element:	Polymer membrane
Membrane resistance:	<1 MΩ
Shaft material:	POM
Reference system:	External reference required
Connection:	S7
Detection:	n/a
Resistant to:	Ketones (MIBK), hexane, toluene, ethanol



With the sensor DS500, ionic surfactants can be easily titrated in aqueous matrices. Very often, a method based on precipitation titration between an anionic and a cationic surfactant is sufficient. Characteristic titration of that type can be performed in samples such as liquid detergent or household cleaners as well as in colored solutions and turbid suspensions in a pH range of 2 to 10. Non-ionic surfactants in raw products can also be precisely analysed with the DS500.

DS500

Order number:	51107670
pH applic. range:	2–10
Detection range:	<10 ⁻⁵ mol/L to critical micelle concentration
Temperature range:	0–50 °C
Sensor element:	Polymer membrane
Membrane resistance:	<1 MΩ
Shaft material:	PVC
Reference system:	External reference required
Connection:	S7
Detection:	n/a
Resistant to:	Ethanol

Excellent Hardware and Firmware for Optimum Sensor Support

The sensor inputs of the METTLER TOLEDO Excellence T5, T7 and T9 titrators and the Compact G20S titrator are optimized in terms of speed, signal-to-noise ratio and resolution. This ensures that in combination with the suitable sensor, stable pH level readings, pH-stating with tight tolerances or demanding titrations in complex substance mixtures can be performed to the highest quality standards.





Fully equipped as standard

Every Excellence titrator comes with a versatile pH sensor card. There are 2 Plug and Play compatible pH/mV sensor inputs, one of which also features current or voltage polarization, a Pt1000 temperature sensor input and a reference input. This means it has the facility for direct pH or ISE(pX) measurement, pH end point or pH/mV/pX equivalence point titrations as well as amperometric and voltametric titrations. If needed, more sensor cards can be added in the available slots, including a Coulometric Board for Karl Fischer titration or Bromine index determination.



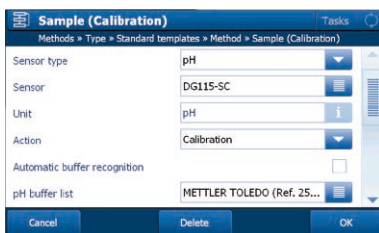
Expandable to conductivity

With the unique conductivity sensor card, new application possibilities such as conductometric titrations or direct measurements can be easily and reliably done with the full functionality of a modern Excellence titrator – there is no need for an extra meter. The conductivity card features automatic detection of the conductivity sensor and an additional Plug and Play pH/mV sensor input.



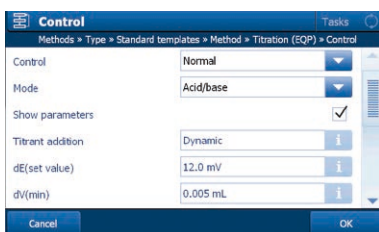
Ensuring performance capability

In order to ensure the performance capabilities of the sensor inputs, they can be periodically adjusted with certified resistors and the test unit. The process is traceable, unambiguously documented, and guarantees identical measurement conditions for all the sensor inputs of a sensor card. A calibrated pH sensor can simply be switched from one input to the other without the need for recalibration.



Automatic chemical detection

In addition to the Plug and Play sensors the pH buffers used for sensor calibration are also automatically detected by the titrator. It makes no difference in which order the buffers are measured, saving time and providing certainty.



Efficient method development

The intelligent application modes of the titrators make method optimization easy. Just select the titration method and titration speed and the optimum control parameters are automatically set to suit the selected sensor – simple and efficient method development.

Properly Serviced and Connected

Electrolyte and Cleaning Solutions

METTLER TOLEDO offers an extensive range of electrolytes and cleaning solutions, which are indispensable for correct maintenance and care, and consequently for trouble-free and extended sensor life.

Electrolytes for reference systems	Order no. 25 mL	Order no. 250 mL	Order no. 6×250 mL
KCl 3 mol/L solution for ARGENTHAL™ reference systems and as bridge electrolyte (DGi101-SC, DGi102-Mini, DG(i)111-SC, DMi101-Mini, DM(i)140-SC, DGi112-Pro, DGi114-SC, DG(i)115-SC, DX200, DX202-SC)	51343180	51350072	51350080
1 mol/L KNO ₃ (DMi102-SC, DM(i)141-SC, DMi145-SC, DX200, DX202-SC)	51343182	51350078	51350086

Solutions for reference systems: bridge electrolytes

1 mol/L KCl (DGi112-Pro, DGi117-Water, DX200, DX202-SC)	51343181		
---	----------	--	--

Solutions for surfactant sensors

Inner electrolyte for the DS500	51107899		
Inner electrolyte for the DS800-TwoPhase	51109542		
Emulsifier for two-phase titration with the DS800-TwoPhase	51109543		

Cleaning solutions

Pepsin hydrochloric acid for cleaning protein contamination from diaphragms. Acting time approx. 1 hour		51350100	
Thiourea solution for cleaning silver sulfide contamination from diaphragms. Acts to discoloration		51350102	
Reactivation solution for regenerating pH glass sensors. Acting time 1 min	51350104		

Conductivity standards	Order no. 6×250 mL	Order no. 250 mL	Order no. 30 sachets of 20 mL
84 µS/cm		51302153	30111141*
1413 µS/cm	51350096	51350092	51302049
12.88 mS/cm	51350098	51350094	51302050

*10 sachets





Useful Accessories

Whether a temperature sensor for temperature-compensated pH measurement or simply wetting caps for correct storage of titration sensors are required, METTLER TOLEDO offers useful accessories.



Accessory	Description	Order number
DT1000 temperature sensor	Pt1000 temperature sensor for temperature-compensation of pH-level readings	51109828
Wetting caps (minimum order 5 items)	For sensors with shaft diameter of 12 mm	30243851
	For sensors with shaft diameter of 8 mm (DGi102-Mini, DMi101-Mini, DMi102-SC)	51340021

Cables for Plug and Play and Classic Sensors

The METTLER TOLEDO Plug and Play sensors require a Plug and Play cable for connection to the titrators. This cable can also be used for classical sensors with the exception of the DM143-SC. Multiple shielding prevents electrostatic effects on the transmission of measurement and reference signals or the Sensor Chip data.

Connection	Cable length (cm)	Designation	Connector	Order number
S12 grey 	70	Lemo		89601
	100			89602
	160			51108034
MultiPin™ 	100	Lemo/Pt1000		30281914
	200			30517417

DM143-SC double platinum pin sensor: for this model, classic sensor cables are used, which can also be used with all classic sensors. As with the Plug and Play cables, the signal integrity is protected from interference effects.

Connection	Cable length (cm)	Designation	Connector	Order number
S7 grey 	70	Lemo		51109183
	100			51109184
	160			51109185

Buffer Solutions with Quality Test Certificate

Any pH measurement and end point titration can only be as accurate as the buffer solutions used for calibrating the pH sensor. The internationally valid pH scale is defined according to the standard reference materials (SRMs) of the NIST (National Institute of Standards and Technology, USA). The buffer solutions supplied by METTLER TOLEDO are provided with a quality test certificate that guarantees the stated specifications and compliance with the standards. They are ideally suited for use in quality systems.

You can download their test certificates and safety data sheets from www.mt.com/buffer.

Buffer solutions	pH level at 25 °C	Order no. 250 mL	Order no. 6×250 mL	Order no. 30 sachets of 20 mL
Standard pH buffer solutions	2.00	51350002	51350016	30111134
	4.01	51350004	51350018	51302069
	7.00	51350006	51350020	51302047
	9.21	51350008	51350022	51302070
	10.00	51350010	51350024	51302079
	11.00	51350012	51350026	30111135
	Rainbow I (3×10 sachets of 20 mL 4.01/7.00/9.21)			51302068
	Rainbow II (3×10 sachets of 20 mL 4.01/7.00/10.00)			51302080
pH buffer solutions according to NIST and DIN 19266	4.006	51350052		30111136
	6.885	51350054		30111137
	9.180	51350056		30111138
	10.012	51350058		30111139
DKD certified buffer solutions	4.01	51350032	51350042	
	7.00	51350034	51350044	
	9.21	51350036	51350046	
	10.00	51350038	51350048	
Redox buffer solutions	220 mV/pH 7	51350060	51350062	
	468 mV/pH 0.1		51350064 (6×30 mL)	

The Right Sensor

by Industry and Application

Using the table below (and on the following page) you can easily see which **METTLER TOLEDO** titration sensor is best for your particular industry and application. For more detailed information on the individual sensors refer to the indicated pages of the brochure.

Industry	Titration application	Titration type
Chemical	Acidic and basic solutions	Acid-/base, aqueous, potenti- or conductometric
	Concentrated alkalis	Acid-/base, aqueous
	Nitrating acids	Acid-/base, non-aqueous
	SiO ₂ and Na ₂ O in water glass	Acid-/base, aqueous
	Acidity/alkalinity of polyols	Acid-/base, non-aqueous
	Chlorine and chlorate in alkalis	Redox, iodometric
	Chloride in alcohol solutions	Precipitation
	Identification of indigo and hydrosulphite	Redox, iodometric
Petrochemical	TAN according to ASTM D664, IP177, EN12634	Acid-/base, non-aqueous
	AN according to ASTM D8045	Thermometric, non-aqueous
	TBN according to ASTM D4739, IP276, ISO 3771, ASTM D2896	Acid-/base, non-aqueous
	Mercaptans in oils according to ASTM D3227, IP272, ISO 3012	Precipitation, non-aqueous
	Chloride in crude oil	Precipitation, non-aqueous
	Bromine number according to ASTM D1159, IP130, ISO 3839	Redox, bromatometric
	Iodine value in biodiesel according to EN14111	Redox, iodometric
	Titration of oils according to IP400	Conductometric
	Epoxy value of polymers (ASTM D1652, DIN 53188)	Acid-/base, non-aqueous
	Peroxide number in oils	Redox, iodometric
Pharmaceutical/Bio-technology	Acid numb. in B100 biodiesel (EN14104) or E85 bioethanol (ASTM D1613)	Acid-/base, non-aqueous, potenti- or photometric
	Pharmaceutical constituents and active ingredients (aspartame, clotrimazole, etc.)	Acid-/base, non-aqueous potentiometric, conductometric
	Pharmaceutical constituents and active ingredients (phenol, glycerine, ampicillin, vitamin E, etc.)	Redox, bromatometric, iodometric, cerimetric
	Sulfonamides	Redox, diazotitration
	Halides according to the European Pharmacopoeia and USP	Precipitation
	Chloride in physiological solutions	Precipitation, potentiometric
	Non-ionic surfactants in pharmaceutical products	Precipitation, photometric (turbidity)
	Free acids in glycerine according to Pharmacopoeia 5.0	Acid-/base, aqueous
Conductivity of purified water to USP26	Conductivity measurement	

The Right Sensor

by Industry and Application

Industry	Titration application	Titration type
Water	Acidity/alkalinity of domestic, natural source and rainwater	Acid-/base, aqueous
	Total hardness of water	Complexometry, photometric and potentiometric
	Chemical oxygen demand (COD)	Redox, chromatometric
	Perborate, percarbonate, persulfate in water	Redox, iodometric
	Chlorine residues according to ASTM D1253	Redox, arsenometric, amperometric indication
	Chloride in water	Precipitation
	Ammonia, fluoride, sodium and calcium in water	Direct measurement
	Conductivity of domestic, natural source and rainwater	Conductivity measurement
Food and beverages	Vitamin C in food and beverages	Redox with amperometric or voltametric indication
	Acid content of fruit/vegetable juices, wine, milk, vinegar	Acid-/base, aqueous
	Chloride in foods (ketchup, vegetable juices, spices)	Precipitation
	Free and total sulfur dioxide in wine	Redox, iodometric, voltametric indication
	Reducing sugar according to Rebelein	Redox, iodometric
	Saponification no. of fats in oil, margarine, butter (DIN 53401)	Acid-/base, aqueous
	Acid number of oils, margarine, fats	Acid-/base, non-aqueous
	Peroxide number of edible oils and fats	Redox, iodometric
Electronics/electroplating/engineering/automotive	Anionic/cationic surfactants in coolant/lubricants	Two-phase precipitation (EN14468, 14469, 14480)
	Nickel in electroless nickel baths	Complexometry, photometric
	Hypophosphite/orthophosphite in electroless nickel baths	Redox, iodometric
	Free cyanide in zinc baths	Precipitation
	Acid mixtures in electrolysis baths	Acid-/base, aqueous
	Cr(VI), Sn(II) in electrolysis baths	Redox, iodometric
	Cu(II) and Zn(II) in electrolysis baths	Complexometry, potentiometric
	Hydrogen peroxide	Redox, cerimetric
Cosmetics	Anionic surfactants in liquid detergents	Precipitation, single-phase, aqueous
	Anionic/cationic surfactants in cosmetic products	Two-phase precipitation (EN14468, 14469, 14480)
	Non-ionic surfactants in raw materials	Precipitation, photometric (turbidity)
	Betaine content in shampoo	Acid-/base, non-aqueous
Paper/cellulose, textiles	ABC titration of white and green liquor	Acid-/base, aqueous
	Sulfides in green and black liquor	Precipitation
	Kappa number determination	Redox, iodometric
Raw materials and precious metals	Gold	Redox, cerimetric
	Silver in alloys	Precipitation
	Al(III), Fe(III), Ca(II), Mg(II) in cement components (EN196-2)	Complexometry, photometric
Flavours, fragrances, food ingredients	Aldehydes in oil of lemons according to AOAC 955:32	Acid-/base, aqueous
	Peroxide number of etheric oils, essences	Redox, iodometric

see brochure page

		pH										Platinum			Silver			Surfactant	Color	Conductivity, titration	Amfimony	Reference	ISE	Conductivity, direct-measurement																			
		Sensor name																																									
		DGi101-SC	DGi102-Mini	DGi111-SC	DGi112-Pro	DGi-114-SC	DGi115-SC	DGi117-Water	DG300-SC	DGi113-SC	DGi116-Solvent	Dmi101-Mini	Dmi140-SC	Dmi144-SC	Dmi147-SC	Dmi143-SC	Dmi102-SC	Dmi141-SC	Dmi145-SC	Dmi148-SC	Dm405-SC	DS800-TwoPhase	DS500	DP5 Photrode™	InLab®717	InLab®718	Sb850	DX200	DX202-SC	DX218, 219, 223, 240	DX264	InLab®710, 731	InLab®720, 741										
		•	•	•	•	•	•	•																•																			

* See Lab Sensors brochure (order no. 30264253B) or www.mt.com/electrode-guide

InMotion Autosamplers Fully Automated Titration



The METTLER TOLEDO InMotion Autosamplers platform used in conjunction with the Excellence titrators forms exceptionally versatile and high-performance titration systems. It is made possible by the modular design,

the intuitive controls and the Plug and Play hardware. This means you can configure your day-to-day titrations with ease, start them at the press of a button and let them run automatically without intervention.

LabX® Titration Software Everything Under Control



METTLER TOLEDO LabX offers secure data archiving, efficient data management with control charts and individual search filters, and fast and clearly organized method development for all application-related challenges. All installation, preparation and analysis tasks can be performed on a PC and are

therefore fully recorded in the audit trail. All resources such as titrant calibration or titrant standards can be edited on the PC and printed out. Plug and Play sensors and burettes are automatically detected and all relevant data is monitored by LabX for time in service and expiration of calibration.

www.mt.com

For more information



METTLER TOLEDO Group

Analytical Division
Local contact: www.mt.com/contacts

Subject to technical changes
© 03/2021 METTLER TOLEDO
All rights reserved. 51724622C
Marketing Titration / MarCom Analytical