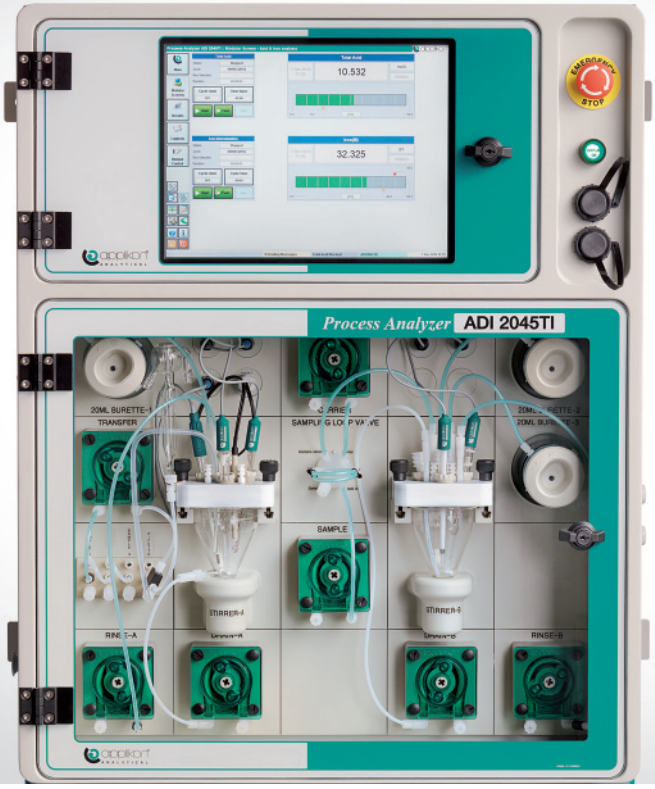
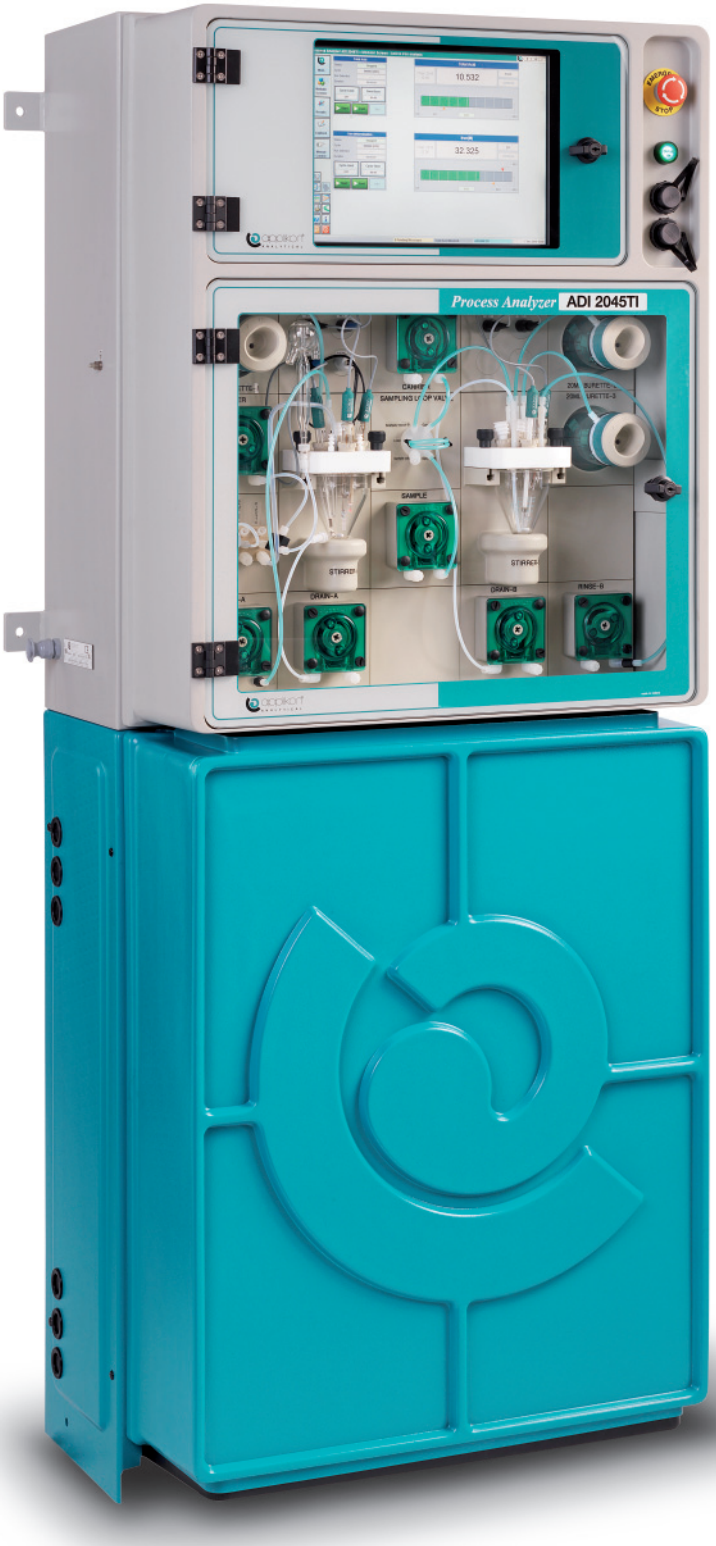
ADI 2045TI
Process Analyzer



Multi-purpose wet chemical analysis

Metrohm Applikon

ADI 2045TI Process Analyzer – the On-Line analytical tool to watchdog your process 24/7!



Highlights

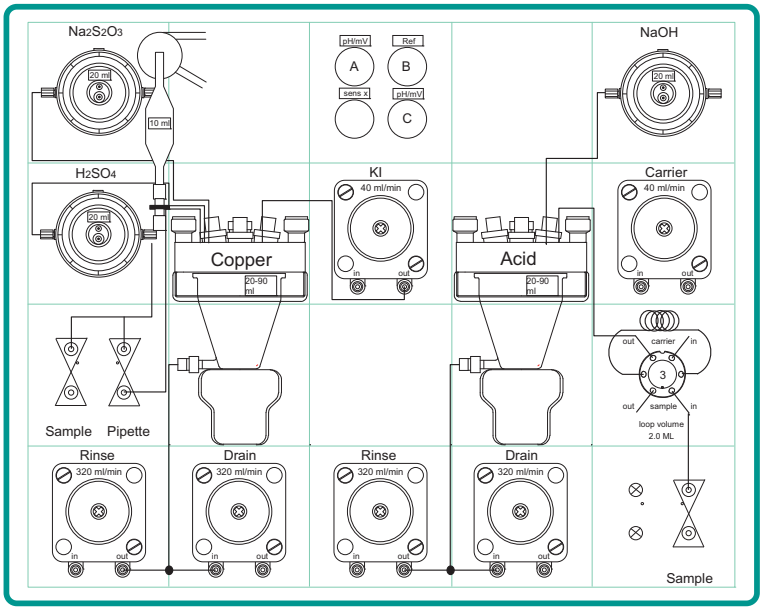
- Modular design for maximum flexibility and adaptation to your process requirements
- Multiple streams, analysis methods and chemical component possibilities
- Simultaneous analysis of different streams and methods
- Auto calibration, cleaning and result validation
- Real time titration, trend graphs and result databases
- 15” TFT flat panel touch screen
- Industrial PC Controller with compact flashcard drive
- Flexible I/O modules for liquid handling, preconditioning and control signal interfaces
- ***tiamo***™ software for method programming and automation. Direct transfer of your proven Metrohm laboratory method to your process analyzer
- Ethernet TCP/IP network communication/remote operation
- Batch principal for lower operational cost
- IP66/NEMA 4 rated housing for harsh industrial environments
- Standalone unit or part of an integrated turnkey system

The hardware – highest flexibility guaranteed

ADI 2045TI – the next generation in on-line and at-line wet chemical analysis

The ADI 2045TI represents the latest generation of wet chemical analyzers. At its core lies an Industrial PC with compact flash drive, combined with an industry standard Communication Bus Controller for Analog and Digital I/O. The analytical system uses high quality Metrohm analysis modules like the Titrando range of titrators. Combining Metrohm's knowledge and experience in laboratory analysis with Applikon's experience in process control instrumentation results in an analyzer that can perform nearly every on-line wet chemical analysis in the most difficult environments.

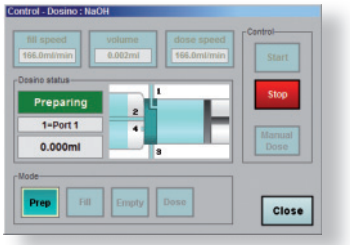
Its 5x4 wet part gives the ADI 2045TI flexibility to adapt the configuration to a specific application. With a wide range of available modules (Metrohm burettes, pumps, vessels, valves, loops, digester, and many more) there is an analyzer for each specific application problem. Depending on dosing accuracy, the required burettes or pumps can be chosen, selection valves can be implemented in case of multiple sample streams, and pumps with different speeds can be selected for sampling, rinsing, addition of reagents or draining.

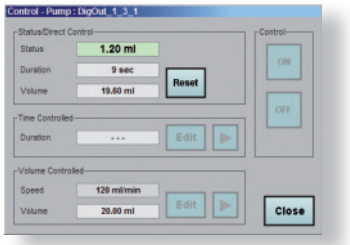


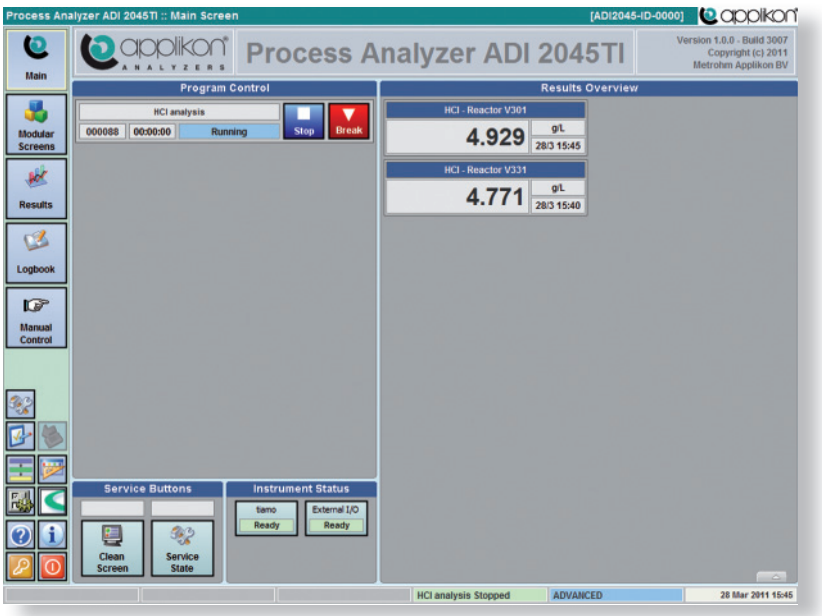
Hydraulic Planning Sheet of
Modular Wet Part (Flexible Configurations)

The software – freely programmable and user-defined

Besides the robust Metrohm hardware, the ADI 2045TI also uses the proven and widely accepted ***tiamo***™ software to run methods and perform data analysis. In this way, laboratory methods can easily be transferred to a process (on- and at-line) situation. The ***tiamo***™ software runs in the background with a ADI 2045TI control software layer on top. The control software allows the user to program sequences of methods, set conditions and alarms and to manually control the analyzers. The results are displayed in numeric numbers as well as in a trend-graph. All results are stored in a database. Remote access is easily achieved with a standard remote desktop tool.







Analysis methods – versatility at your fingertips

The ADI 2045TI is programmed for one or more of the following methods and adapted to specific process analysis requirements.

- **Titration** for a broad range of applications
- **Karl Fischer titration** for water determination in liquid streams (oil, solvents, glycol, etc.)
- **Colorimetry** for water quality analysis & various plating solutions
- **Dynamic Standard Addition** for ion specific analysis that uses Ion Selective Electrodes
- **Direct Measurement** for measuring physical parameters such as pH, conductivity and temperature

Moreover, data from third party devices such as density, flow, turbidity, etc. can be imported through the analog input channels for correcting results and providing added monitoring value.

The capability to choose a combination of methods means in many cases that a single ADI 2045TI will fulfill all analysis requirements. Furthermore, the option for simultaneous analysis to increase response times makes the ADI 2045TI an even more powerful analyzer.

Unique feature «Simultaneous Analysis» between two streams or two sensing methods yields faster response times for tighter process control.

Wet chemistry methodologies

Titration

Titration is one of the few absolute content determination methods available. The ADI 2045TI performs potentiometric titrations by means of a high precision burette unit (800 Dosino) and high performance electrodes:

Self-finding Inflection point techniques can be either Dynamic (DET) or Monotonic (MET) through a full scan depending on the type of titration running and accuracy required.

For some applications it's even more desirable to titrate to a «fixed» end point (pH or mV) using the (SET) method that is also temperature compensated.

Karl Fischer titrations are specific to water content from low level to percent ranges without probe calibration. It is the most selective methodology applied in the petrochemical industry.

Precision burettes dosing titrants or reagents

Why titration?

- From mg/L to % measuring ranges
- Most proven and absolute method
- Speciation of analytes in complex matrices
- Multipoint titration yields several parameters
- No modeling or method calibration against stream composition

Differential colorimetry

The photometric absorption method featuring a uniquely designed compact photometer module makes colorimetry a robust, accurate on-line analysis tool.

The photometer module comprises a thermostated cuvette (20-60 °C) with 3 cm light path and LED light technology.

The color development stabilization is automatically detected by use of differential absorbance measurements.

Method Features:

- No influence of cuvette fouling, sample color or sample temperature.
- High accuracy, repeatability and sensitivity, typical in the low µg/lL
- Wide measuring ranges with use of linear and curved calibration lines
- Low reagent usage, typical 0.5 to 1 ml per analysis

Cuvette LED module

Dynamic Standard Addition (ISE)

This method works with ion-selective electrodes over a wide measuring range. Buffer is added to the sample followed by a temperature compensated measurement. A precise amount of standard solution is added by burette and again a measurement is taken. From the difference it will calculate the original concentration. Thus, the result for each analysis is validated and unaffected by matrix effects of the sample.

Metrohm Applikon – the first choice for diverse applications in virtually any industry

- Salt in crude in oil refinery
- Hardness in brine in chlor/alkali industry
- Caustic, carbonate, amines for various scrubbing technologies
- Alkalinity in brew water for beverage industry
- Ammonia in nitrification/denitrification waste water treatment
- Hydrogen sulphide and ammonia in stripped sour water
- TMAH in semiconductor photolithography
- WAD / Total cyanide in metal mining
- Peracetic acid in aseptic cleaning for bottling in the beverage industry
- Chloride & iron as metal corrosion control indicators
- ABC test in causticizing liquors in pulp & paper
- Sodium & silica in dimin and boiler feed water in power utilities

Typical Applications

Industry > Component	Chemical Petro Chem	Semi conductor	Metal Mining	Metal Surface	Power Utility	Pulp, Paper, Textile	Food Beverage	Water Waste Water
Acidity	•	•	•	•		•	•	•
Alkalinity	•							•
Aluminium			•	•				•
Ammonia	•	•	•					•
Boric Acid	•	•		•	•			•
Bromide	•					•		
Cadmium	•	•	•	•				•
Calcium	•					•		•
Caustic	•	•		•		•		
Carbonate	•		•			•		•
Chloride	•			•	•		•	•
Chlorine	•					•		•
Chromium	•		•	•				•
Citric Acid							•	
Cobalt	•	•	•					•
COD	•					•		•
Copper	•	•	•	•				•
Cyanide	•		•	•				•
EDTA		•	•	•	•			
FFA	•						•	
Fluoride	•	•						•
Formaldehyde	•			•				
Glucose							•	
Hardness	•			•				•
Hydrazine				•				
Hydrochloric Acid	•	•	•	•				
Hydrofluoric Acid	•	•		•				•
Hypochlorite	•					•		•
Hypophosphite	•	•		•				•
Hydrogen Sulphide	•							
Iodide							•	
Iron	•	•	•	•	•			
Indigo Dye						•		
Lactic Acid							•	
Magnesium	•							•
Manganese								•
Mercaptans	•							
Nickel	•	•	•	•				•
Nitrate	•					•		•
Nitric Acid	•	•		•				
Nitrite	•						•	•
Nitrous Acid			•					
PAA							•	
P & M								•
Peroxide	•	•		•		•		
Persulphate	•	•						
Phenol	•							•
Phosphate	•						•	•
Phosphoric Acid	•	•		•				
Potassium	•						•	•
Silica	•	•			•			•
Silver			•	•				
Sodium		•			•		•	•
Sulphide	•					•		•
Sulphite	•						•	
Sulphonic Acid	•	•		•				
Sulphuric Acid	•	•	•	•				
Surfactant	•			•				
TMAH		•						
TP & TN	•							•
Urea	•							
Water	•	•					•	
Zinc	•	•	•					•

Preconditioning and Integrated Systems

Not only the chemical analysis, but also the sample preparation or preconditioning is of the utmost importance for the success of an Metrohm Applikon Analyzer. Furthermore, the analyzer location is an important part of the analysis. The sample needs to be as representative as possible, which means that the sampling point needs to be as close to the analyzer as possible.

Metrohm Applikon can engineer and supply virtually any «unit operation» for sample preconditioning:

- Pressure reduction
- Cooling
- Heating, heat tracing
- (ultra) filtration
- Precipitation
- Dilution to avoid crystallization
- Degassing
- Homogenizing
- Flow metering
- Phase separation

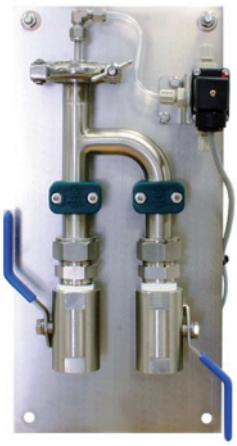
With more than 35 years of experience Metrohm Applikon can provide a complete and exact solution for almost any application. Projects range from one Analyzer in combination with simple sample preparation to complete turnkey packages with shelters, piping, wiring and interfacing. On-site, only the necessary utilities and the sample stream need to be connected, saving a lot of time and energy in the start up phase of the instrument.

Analyzer shelter with integrated sample preconditioning system

Heavy duty sampling panel

Air pneumatic multi-stream panel

Liquid-to-gas sampling



Blow-back filter

Specifications ADI 2045TI

Applied Analysis Methods	
ADI 2045TI	Titration Karl Fischer Colorimetry Dynamic Standard Addition with ion-selective electrode Direct Measurement

Measurement	Depending on the Method
Repeatability	Typical 1-2%
Inaccuracy	Typical 1-2%
Analysis Time	Typical 5-10 minutes

Sampling	Batchwise
Frequency	Programmable
Streams	Multiple
Volume	0.1-100 ml
Temperature	5-90 °C / 41-194 F
Pressure	0-4 bar / 0-72 PSI (without preconditioning)

Connectivity	
Data Communication	Ethernet: TCP/IP Network Serial Interface
Analog Output	4 x (expandable) 4-20 mA / 350 Ohm
Analog Input	2 x (expandable) 0-2 V, 4-20 mA
Digital Output	4 x 24 VDC, 2 x 12-230 VAC (expandable)
Relay Output	2 x (expandable) Potential Free
Digital Inputs	4 x 24 VDC (expandable)

General	
Power Supply	100-120 / 200-240 V / 690 VA / 50...60 Hz
Housing Material	Standard: «Electronics Cabinet»: Zinc plated steel, epoxy coated «Wet Part» door: Polystyrene, epoxy coated Optional: Stainless Steel SS316
Ingress Protection	IP66, NEMA 4
Ambient Temperature	5-40 °C
Dimensions	H x W x D 870 x 700 x 510 mm
Weight	~75 kg
Accessibility	Passcode Protected, 3 different levels

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