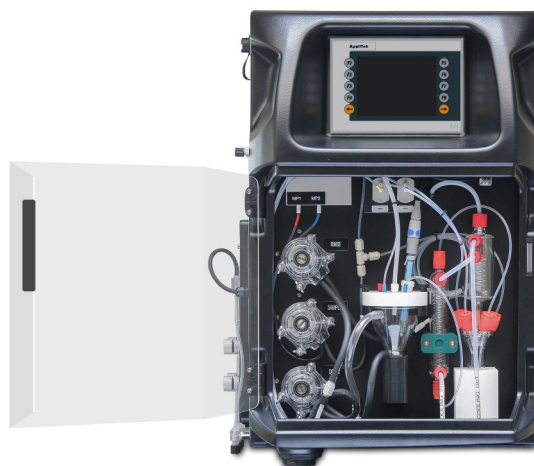


On-line, automatic monitoring of Chemical Oxygen Demand (COD) in water and waste water



Advanced features

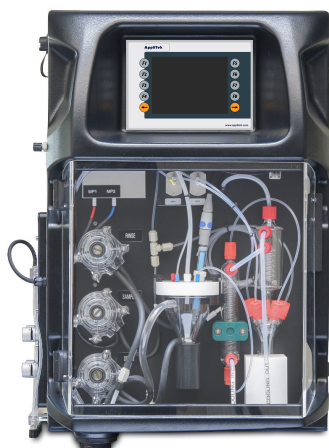
- Compliance with international standard methods: wet-chemical oxidation conform with ISO 6060 (potassium dichromate method); or ISO 8467 / JIS K0806 (potassium permanganate method)
- Analytical mainframe available in several configurations depending on standard method, measuring ranges and individual requirements
- **MW** model: accelerated sample oxidation by built-in microwave unit (dichromate method only)
- Second generation design with small footprint and shorter liquid pathways
- Complete separation between electronics and wet part
- Multiplexing up to eight (8) sampling points possible
- Incorporated industrial PC with AppliTek controller software
- Extended data communication and exchange features

Application fields

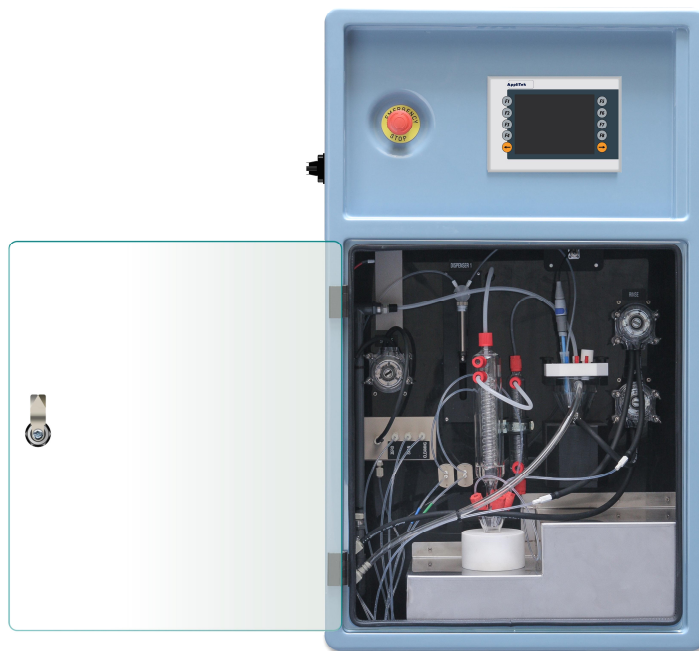
- Industrial waste water
- Municipal waste water
- Surface water

High analytical performance

- Low reagent/titrant consumption by high precision micropumps
- Excellent levels of detection (LOD)
- Smart features: automatic validation and automatic cleaning
- Factory configured, tested and calibrated



AppliCOD®, standard configuration



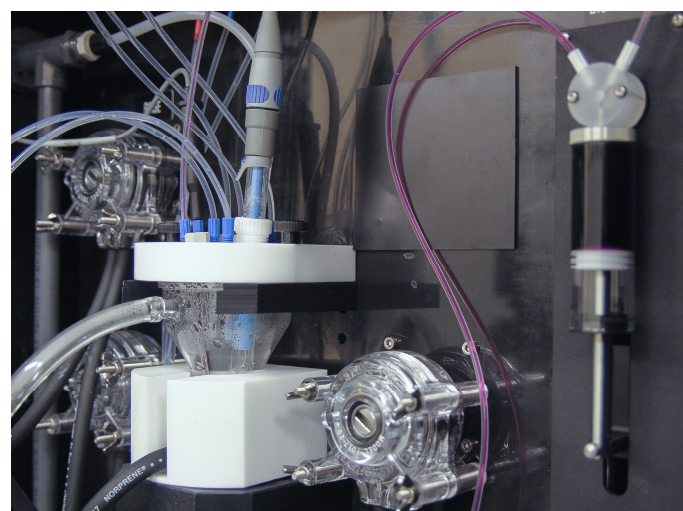
AppliCOD® MW with built-in microwave unit

Introduction:

Traditional chemistry with contemporary analytics

The determination of Chemical Oxygen Demand (COD) is widely used to measure the level of organic contamination found in wastewater and surface waters. This water quality indicator is determined by measuring the equivalent level of oxygen required to oxidize all the organic matter in the sample, often performed in off-line laboratory methods. Many of today's commercially available on-line analyzers or sensors translate organic matter indirectly into COD *equivalent* parameters.

The **AppliCOD®** Series of On-line COD Analyzers are the answer to the needs of those customers who require “true” COD values to quantify the organic pollution of waste waters, effluents and surface water, but without human intervention or manual sampling. The superior analytical performance is exemplary of the build quality of each model of the **AppliCOD®** Series, with the use of high quality components, state of the art wet chemistry and standard smart features.



Compliance with industry standards

The **AppliCOD®** Series of On-line COD Analyzers are built on probably the most advanced and versatile analytical mainframe available for measuring COD values in water, bringing new levels of automation, reliability and performance.

Depending on your local water regulations, your first option is to choose the appropriate standard method:

- Wet-chemical oxidation by potassium dichromate ($K_2Cr_2O_7$)
- Wet-chemical oxidation by potassium permanganate ($KMnO_4$)

The second generation of the standard **AppliCOD®** is equipped with a new analyzer enclosure consisting of a solid steel back, combined with an ergonomic ABS hinged part. The wet part has been revised for optimal operation and low maintenance:

- Water-cooled reflux condenser for increased stability
- Shorter liquid pathways: reagents, cooling, drain
- Transparent door allows instant 180° visual inspection
- Reduced environmental footprint (60% weight reduction)

The built-in microwave unit of the bigger model **AppliCOD® MW** allows to drastically reduce the standard oxidation time of 2 hours of the dichromate method. This powerful unit, shielded for operator security, is installed in the wet part and achieves full oxidation at 30 minutes. All **AppliCOD®** Series share similar high quality components, such as our long-life peristaltic pumps and precision micro pumps, and the same analytical techniques.

Images - inside the wet part of the AppliCOD®: left, titration vessel of the potassium permanganate configuration, still used in many Asian countries. Image right: close-up of the condenser sitting on top of the microwave unit of the AppliCOD® MW.

On-line Analysis of Chemical Oxygen Demand

The analytical mainframe of the **AppliCOD®** Series of On-line COD Analyzers sets new standards in traditional methods thanks to the flexible architecture, satisfying the needs of many users, while compliance with international standard methods is assured.

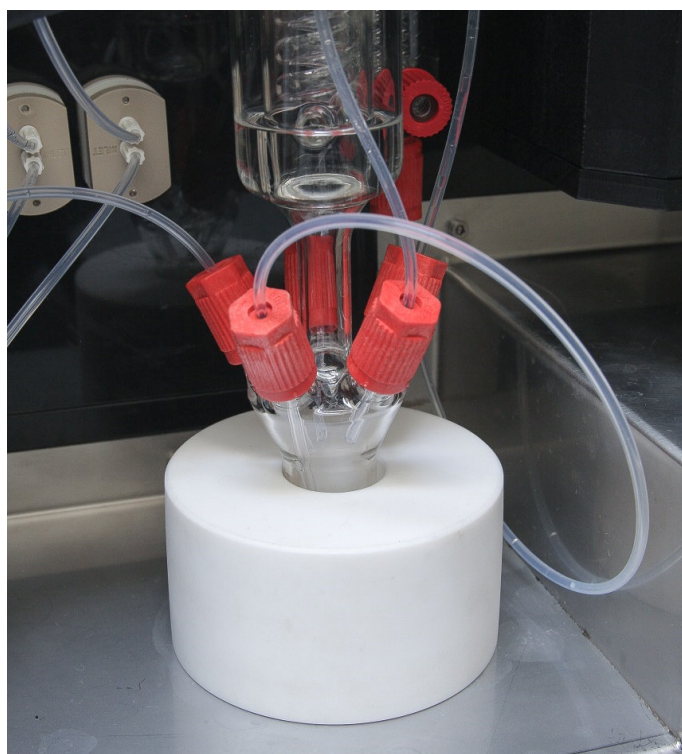
Prior to analysis, each sample is oxidized by means of a specific acid solution and heat, in accordance with the standard method applied, in order to oxidize all organic carbon to CO₂ and H₂O. Each model runs a redox titration to determine the exact concentration. The industrial panel PC controls all steps of the analysis procedure, including sampling, sample transfer, addition of reagents and reporting of the results.

Method 1: Wet-chemical oxidation conform with ISO 6060 for dichromate method (K₂Cr₂O₇)

The sample is mixed with a digestion solution and sulphuric acid in an oxidation vessel. The solution is heated for two hours. During this digestion process, organic compounds are oxidized and converted to carbon dioxide, nitrates and water, while potassium dichromate is converted to chrome (III). The oxidized sample is transferred to the analysis vessel, where the redox titration is carried out. The concentration of the organic compounds that are chemically oxidized during the digestion process is determined.

Method 2: Wet-chemical oxidation conform with ISO 8467 Permanganate Index (KMnO₄), and Japanese JIS K0806.

All steps related to analysis are carried out in one and the same oxidation/analysis vessel. The sample is mixed with the permanganate solution, the sulphuric acid solution and the silver nitrate solution. This solution is heated during 30 minutes to oxidize all the organic compounds with potassium permanganate. After the oxidation, excess of oxalate solution is added and the titration with permanganate is carried out.



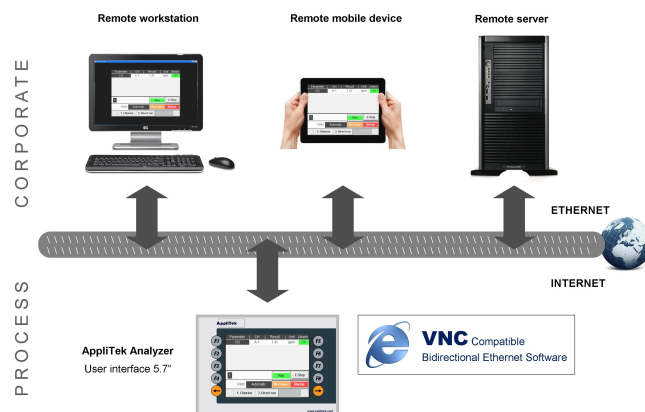
Data exchange and supervision

Each model of the **AppliCOD®** Series shares the same incorporated high quality industrial panel PC running AppliTek's proprietary controller-database software **UPAMATIC®** to control all analysis steps, actions and logs. This fully integrated software platform not only acts as the human interface but also features a host of functions specifically designed for industrial monitoring needs.

Solid state data logger recording a history of the last 1,000 analysis results These can be visualized in a chronological data table and equally be exported as Microsoft Excel files through the sealed USB port outside the analyzer cabinet.

Full integration and communication within industrial production sites and corporate networks AppliTek on-line analyzers come with industrial 4-20 mA outputs, the most common analogue transmission standard available. Ethernet communication by means of the TCP/IP protocol enables easy and reliable integration into existing corporate networks. MODBUS interfacing is possible to assure full integration and communication with DCS systems.

Remote access to the panel PC minimizing physical operator intervention The analyzer screen (the client) can remotely be taken over by means of LAN Ethernet software (such as VNC software). Authorized users can carry out all manual operations and settings from a remote PC, such as trouble-shooting before doing any physical intervention.



Smart functions

The **AppliCOD®** Series of On-line COD Analyzers are factory calibrated in function of the set measuring range and generally requires no recalibration. A preprogrammed cleaning cycle with demineralized water is standard and includes the sample lines, oxidation vessel and/or analysis vessel, in order to eliminate cross interference. An automatic validation cycle with standard solutions can be programmed in order to check the analysis program and analyzer functionality. AppliTek's controller software allows to program the sequence and interval of validation, cleaning and analysis cycle, but also to generate alarms when results are out of range.

Technical specifications

Analytical data

Analysis method

ISO 6060 (Cr method)

or

ISO 8467 / JIS K0806 (Mn method)

Parameter

Chemical Oxygen Demand

Standard measuring ranges (Cr method)

One single range, factory set:

5 - 100 mg/L O₂ 80 - 1,500 mg/L O₂
40 - 500 mg/L O₂ 100 - 10,000 mg/L O₂
60 - 1,000 mg/L O₂

Standard measuring ranges (Mn method)

One single range, factory set:

0 - 20 mg/L O₂ 0 - 200 mg/L O₂

Cycle time

< 130 minutes incl. oxidation of 120 minutes (Cr method)

< 40 minutes incl. oxidation of 30 minutes (Cr method, microwave accelerated)

< 40 minutes incl. oxidation of 30 minutes (Mn method)

Calibration

Factory calibrated

Cleaning

Automatic, free adjustable sequence

Detection limit

Better than 5 mg/L

Precision / Repeatability

Better than 5% full scale for standard solutions

Utilities

Power

220 - 240 VAC, 2 A, 50 Hz, max. 120 VA

Other voltages available on request

Instrument air (purging)

Dry and oil free according to ISA-S7.0.01-1996 quality standard for instrument air

Tap water

Cooling of the condenser and cooler

Demineralized water

Cleaning and/or dilution

Drain

Atmospheric pressure, vented, min. Ø 64 mm

Earth connection

Dry and clean earth pole with low impedance (< 1 ohm) using an earth cable of > 2.5 mm²

Environmental data

Ambient operating conditions

10 °C – 30 °C +/- 4 °C deviation at 5 - 95% relative humidity non-condensing

(50 °F – 86 °F +/- 7.2 °F deviation)

Reagent temperature

Keep between 10 °C - 30 °C (50 °F - 86 °F)

Sample pressure

By external overflow vessel

Sample flow rate

Fast loop sample supply required - minimal flow rate depends on application

Sample particulates

Maximum size 40 µm, < 0.1 g/l

Reagents

Reagent containers (included)

Outside cabinet: 5 (Cr method), 6 (Mn method)

Containers come with torqueless screw caps.

Reagent solutions (Cr method)

Dichromate solution ≤ 1 L / 30 days *

Acid solution ≤ 2 L / 30 days *

Titrant solution: depending on range

(fac.) Mercury sulphate: chloride interference

* Based on 1 analysis result/130 min

Reagent solutions (Mn method)

Sodium oxalate solution ≤ 7.5 L / 30 days *

Acid solution ≤ 4.4 L / 30 days *

Silver nitrate solution ≤ 2.2 L / 30 days *

Titrant solution: depending on range

* Based on 1 analysis result/40 min

Cleaning solution (recommended)

Demineralized water / specific chemical solution

Options / add-on units

Sample preconditioning I

EZ-Size® self-cleaning filtration unit, various pore sizes available, requiring fast loop

Sample preconditioning II

MicroSize® self-cleaning microfiltration unit, various pore sizes available

Reagent level detection

Installed on reagent containers; alarms are generated by controller software

Multiple streams

ModuPlex® 2 or 3 streams (8 on demand)

Control and communication

User interface / controller

Industrial PC with 5.7" TFT colour user interface, compact flash memory

Backlit touchscreen, brightness adjustable

Data handling, logging and security

- Standard Ethernet 10 M (RJ45) NE 2000
- Communication ports supporting Ethernet connectivity to MODBUS TCP/IP
- Log files with 1,000 values/results are stored
- Easy export to spreadsheet files
- Sealed USB port for data or result graph download and program upload
- User interface with administrator access and menu keys activated/inactivated
- Data retention in case of power failure, initialization program for safe status after restart

Analogue outputs

Maximum 8, active 4 –20 mA

Max. 500 Ohm load

Alarms (digital outputs)

- Malfunctioning alarm (potential free contact)
- Result alarm (potential free contact)

MODBUS TCP/IP, MODBUS-RS232 -RS485

Optional

Mechanical data

Protection class

Analyzer cabinet: IP55

Touch screen/Industrial PC: IP65

Cabinet and materials, hinged part

Thermoform ABS / Door: plexiglass

Cabinet and materials, wall section

Galvanized steel, powder coated

Wetted materials

PE / PP / PFA / Norprene

Dimensions (H X W X D)

69 cm (27.2") x 46.5 cm (18.3") x 33 cm (13")

Model with built-in microwave unit:

100 cm (39") x 60 cm (24") x 46.5 cm (18")

Total weight

25 kg (55 lbs.) (standard model)

75 kg (165 lbs.) (model with microwave unit)

Certification

CE conformity certificate

Factory Acceptance Test (FAT)

