UV500

Online Water Analyser

HORIBA

TETHYS INSTRUMENTS

UV500 Online Water Analyzer

The high-end model

TETHYS INSTRUMENTS

Specialist Of UV Spectroscopy

> UV500 Online Water Analyser

***The UV500** is an on-line water analyser based on a high-resolution UV-visible spectrograph.*

It allows to monitor simultaneously many different parameters for waste water treatment plants or river monitoring stations with an excellent stability and low operating cost.

The same spectrograph can measure organic matter, nitrate, colour, turbidity, phosphate, ammonia and hydrogen sulphide. A complementary UV-visible fluorescence module allows the measurement of aromatics hydrocarbons (PAH). Nephelometric turbidity by visible or infra-red laser diode is also available.

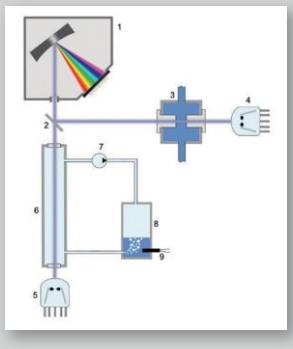
The full UV-visible spectrum can also be used to monitor specific chemical process making the UV500 an ideal instrument for chemical plants. Different materials are available for the flow cell and hydraulic parts depending on the matrix chemical compatibility.

External probes can be added for physicochemical parameters like pH, ORP, dissolved oxygen, conductivity and turbidity.

Thanks to its automatic cleaning system and its extremely long life time lamp, the maintenance is roughly limited to the periodic refill of the inexpensive cleaning solution and eventually reagents depending on the parameters.

UV-Visible Spectroscopy *on Liquid and Gas Phase : a Unique Method*

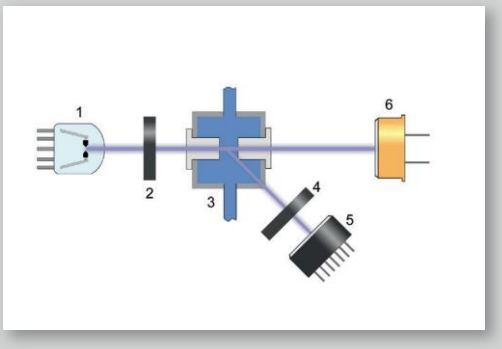
- A 2048 pixels high resolution spectrograph scanning wavelengths from 180 nm to 750 nm is the master part of the UV500. Direct absorbance measurement for UV254, COD, BOD, TOC, NO_3, Colour PO_4 and Cr VI brings fast and stable measurements with a simple hydraulic circuit. Factory predefined or local multi-point calibration allows to get readings of COD, BOD and TOC under the UV alternative method for compatible applications. UV spectroscopy brings faster results than conventional methods like COD, BOD, TOC with much less maintenance once the correlation is determined.
- An additional circuit allows the measurement of ammonia and hydrogen sulfide on the gas phase after a stripping step. This unique method allows measurements on extremely turbid or coloured samples like activated sludge as the gas phase is not affected. A fast Fourier transform (FFT) brings an exceptional selectivity and no interference has never been reported after years of operation on many different applications for Amoni measurement.
- The patented flow cell allows very high level of suspended solid without clogging. The turbidity is automatically compensated by a dual-wavelength method.
- The UV source is a xenon flash lamp specified for 10^9 flashes that correspond to more than 10 years of life time with one measurement every minute.
- Physico-chemical measurements like pH, ORP, dissolved oxygen, conductivity can be added to the internal measurements by using external probes. The dissolved oxygen probe is based on fluorescence method for a lower maintenance and higher stability.



1 : spectrograph
2 : beam splitter
3 : patented water flow cell
4 & 5 : xenon lamps
6 : gas flow cell
7 : gas pump
8 : stripping pot
9 : temperature probe

Measuring principle by absorbance (liquid and gas phase)

1 : xenon lamp
2 : excitation filter
3 : flow cell
4 : emission filter
5 : photomultiplier
6 : reference photo detector



UV fluorescence principle

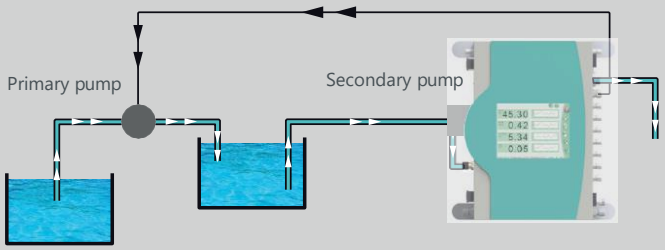
Sampling System

The UV500 can adapt to many different kind of sampling depending of the application : surface water, drinking water, process water or wastewater.

If the water is already pressurized, the sample can be directly admitted inside the analyser with a maximal pressure of 4 bars. Otherwise an optional built-in peristaltic pump, synchronised with the measurement to extend the tubing life time, allows to take the sample directly from a tank located up to 6 meters below the analyser.

For demanding applications with long distances, another peristaltic pump in a separate enclosure is proposed as an option.

For some applications on river water or wastewater where two sampling pumps are necessary, the UV500 delivers a relay contact to synchronise the primary pump. The delay and running time of each pump can be adjusted easily in the parameters menu of the analyser.



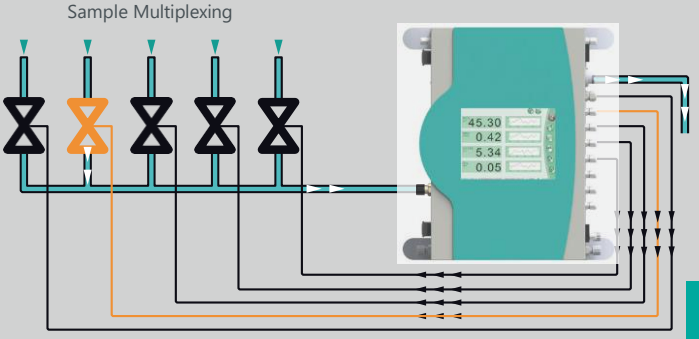
Multiplexing *System*

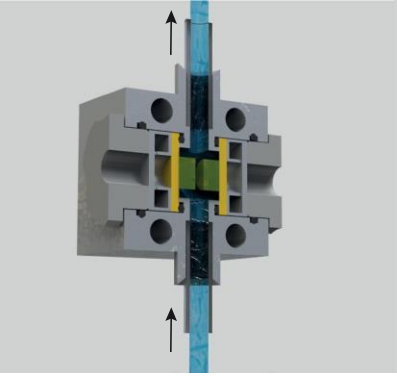
When different streams need to be analysed, for example inlet and outlet of a plant, an optional multiplexing system delivers relay contacts to control external electric-valves or external pumps.

Up to 6 different streams can be selected.

The measuring channels can be either duplicated (each one having its own 4-20 mA output or MODBUS register), or sequentially measured to fit with the maximum of 16 measuring channels (a MODBUS register tells which stream is currently being measured).

Sample Multiplexing



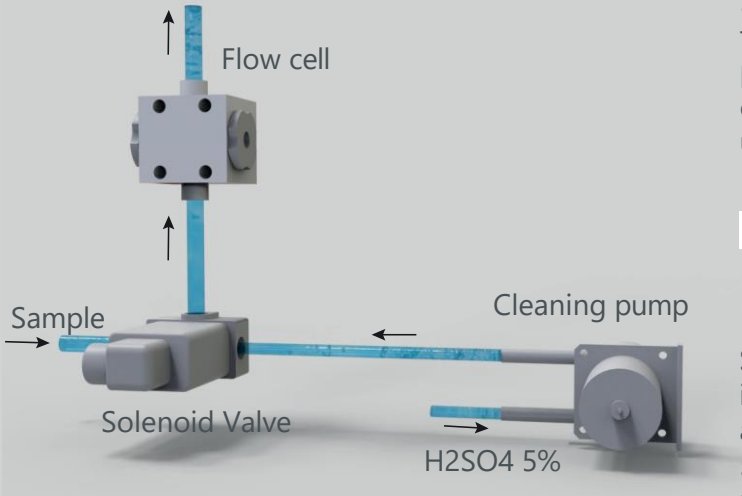


Patented Flow Cell

The patented flow cell allows to analyze very high level of suspended solids without clogging, making it suitable for industrial and municipal waste water applications. The wetted parts of the flow cell make it also suitable for most corrosive samples. The design with two cylinders enables the water to go around them, avoiding suspended particles to agglomerate and interfere with the optical measurements. The turbidity is automatically compensated by a dual-wavelength method.

Autocleaning

The analyser is designed to automatically clean itself with an adjustable time range, typically 24 hours, using sulfuric acid 5%. This autocleaning with acid proves to be more efficient than water or air autocleaning for dirty and oily samples. It prevents any clogging in the hydraulic circuit from heavily charged water samples. This autocleaning design enables uninterrupted measurements and low maintenance.



Autozeroing

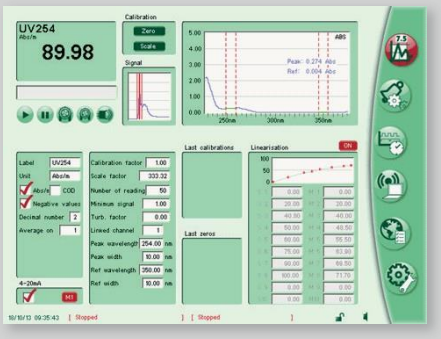
Sulfuric acid has no absorbance in the UV-visible, making it an ideal component to measure the zero. At the end of each autocleaning cycle, the zero is performed on the sulfuric acid 5%. This frequency of zeroing is the key for successful measurements as it prevents any drift in the zero to occur.

User-Friendly **Interface**

The large colour touch screen (10.4") and intuitive interface available in 9 different languages (Chinese, English, French, German, Hungarian, Italian, Portuguese, Spanish, Turkish) makes very easy to test or configure the analyser.

Many test functions allow to test and troubleshoot each element of the analysers (light signal, pump, solenoid valves, etc...) to set up quickly a maintenance diagnostic.

An acid resistant protection film on the screen assumes an efficient long-term protection.



Communication

The RS232 port supports the MODBUS protocol to transmit each measuring channel value to a SCADA system.

Additional parameters are available like status code, error code, calibration values and pumps run time.

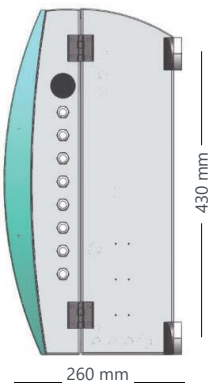
Basic 4 – 20 mA output modules can be plugged on the main board for each measuring channel, in the limit of 12 modules. A USB port enables to download on any USB key the last 5000 lines of recorded measurements as well as a diagnostic file containing the configuration and useful information for remote troubleshooting.

The recorded measurements file can be imported to Excel for graphs or other treatments.
The software of the analyser can be upgraded by connecting to a USB key.

> UV500 Parameters Specifications

UV500

UV500-Premium



Parameter	Standard range Other ranges on request	Resolution	Accuracy Reading on standard solution
UV254	0-200 Abs/m 0-600 Abs/m 0-2000 Abs/m	0.1 Abs/m 0.1 Abs/m 0.1 Abs/m	± 5% ± 5%
COD/TSS (Option)	0-100 mg/L 0-2000 mg/L 0-20000 mg/L	0.1 mg/L 0.1 mg/L 0.1 mg/L	± 5% ± 5% ± 5%
BOD/BOD5 (Option)	0-100 mg/L 0-1000 mg/L 0-10000 mg/L	0.1 mg/L 0.1 mg/L 0.1 mg/L	± 5%
TOC/TSS (Option)	0-100 mg/L 0-1000 mg/L 0-10000 mg/L	0.1 mg/L 0.1 mg/L 0.1 mg/L	± 5% ± 5%
Ammonia NH4/N-NH4	0-100 mg/L NH_4	0.1 mg/L NH_4	± 2%
Nitrate	0-100/250 mg/L	0.1 mg/L NO_3	
Colour	0-100 Pt-Co 0-1000/2500 Pt-Co	0.1 Pt-Co 0.1 Pt-Co	± 2% or +/-5%
PAH (aromatics)	0-10 mg/L C_6H_6	0.1 mg/L C_6H_6	± 2%
Oil in water	0-100 ppm OIW 0-1000 ppm OIW	0.1 ppm OIW 0.1 ppm OIW	± 2%
Phosphate/TP	0-2 mg/L P-PO_4 0-20 mg/L P-PO_4	0.1 mg/L P-PO_4 0.1 mg/L P-PO_4	± 2% ± 2%
H2S/S-H2S	0-20 mg/L H_2S/S-H2S	0.1 mg/L H_2S/S-H2S	± 2%
Chromium VI	0-2 mg/L Cr VI	0.1 mg/L Cr VI	± 2%
Turbidity	0-10 NTU 0-100 NTU 0-1000 NTU	0.1 NTU 0.1 NTU 0.1 NTU	± 2% ± 2%
pH	0-14	0.01 pH	± 1%
Cl2	0-5mg/L (free)	0.01 mg/L	± 2%
Dissolved oxygen	0-25 mg/L O_2	0.1 mg/L O_2	± 2%
Conductivity	0-2000 µS	1 µS	
External turbidity (TSS by correlation)	0-4 NTU 0-40 NTU 0-400 NTU	0.1 NTU 0.1 NTU 0.1 NTU	± 2% ± 2% ± 2%
External TSS	0-1500 mg/L TSS 0-30000 mg/L TSS	0.1mg/L TSS 0.1mg/L TSS	± 2% ± 2%
Temperature	0-80 °C	0.1 °C (+/-2%)	

> UV500 General Specifications

Sample flow	Recommended: 0 - 5 L/min 0 - 0.5 L/min for NH_4 or H_2S
Sample pressure	0 - 4 Bar (0 - 1 Bar with sampling peristaltic pump) 0 - 0.5 Bar for NH_4 or H_2S
Sample temperature	0 - 80 °C 0 - 30 °C for NH_4 or H_2S
Wet parts materials	Quartz, Polypropylene, Polyethylene, FPM (viton), PMMA (+ Pharmed and glass for NH_4 or H_2S)
Measuring time	5 sec (except PO_4, NH_4, H_2S : 3 min, Cl2: 6 min)
Measurement interval	1 min to 720 min Physicochemical parameters may be continuous
Memory	5000 lines of measurements (up to 16 channels) with date and time
Consumption	Cleaning solution (5% sulfuric acid): 220 mL/day Reagent for PO_4 : 2 mL; Cl2: 1.2ml per measurement NaOH 10% for NH_4 : 2 mL per measurement HCl 10% for H_2S : 2 mL per measurement
Maintenance interval	Recommended: 6 months to 1 year (except for refilling)
Power supply	90 - 264 VAC / maxi 100 VA : 50 - 60 Hz
Screen	Colour TFT LCD 640x480 pixels with LED backlight
Communication	RS232 with MODBUS protocol RS485 for external probes (DO, TSS)
Certifications	CE, EN 61010-1, EN 61326 / A1 / A2 / A3
Enclosure	Stainless steel with epoxy coating, IP65, wall mounting brackets
Dimensions	521x473x250 mm for UV500 420x425x227 mm for UV500-Compact (UV500-C)
Operation temperature	0~50oC (ambient)
Weight	20 to 30 kg depending on the configuration

> UV500 Parts References

Basic unit

UV500 — ***Basic unit (no measurement included)***
Color graphic display 640x320 pixels with touch screen
Built-in data logger, memory 5000 measurements for each parameter
12 sockets for input and output modules (not included, refer to options)
7 available glands for inputs / outputs
RS232 included (Sub-D 9 ways female connector) with 2 meters cable for PC
RS485 included for communication with MODBUS protocol
USB port included for USB key connection
Automatic cleaning system with 2 liters tank
Power supply 90 - 264 VAC / maxi 100 VA: 50 - 60 Hz with power cord 2 meters
Enclosure IP65/Nema4x stainless steel 316 521x473x250 mm (HxWxD) / 20 to 30 kg
Mounting lugs for wall

UV500-Compact — ***Basic unit (no measurement included)/ (UV500-C)***
Same specifications as UV500 except dimensions: 420x425x227 mm (HxWxD)

Sampling pump

P — ***Sampling peristaltic pump for unpressurized water***
Built-in on the left side of the enclosure
Flow of about 600 mL/min
Discontinuous operating to increase tube lifetime

P-EXT — ***External Peristaltic sampling pump for unpressurized water***
Flow of about 940 mL/min
Heavy duty brushless motor
Discontinuous operating to increase tube lifetime

Spectrograph (required for UV254, COD, BOD, TOC, NO_3, Colour, PO_4, Cr VI, NH_4 and H_2S measurements)

SPECTRO500 — ***UV-Visible spectrograph***
Range: 180 – 750 nm
Resolution 0.29 nm
2048 pixels

Absorbance flow cell and xenon lamp (required for UV254, COD, BOD, TOC, NO_3, Colour, PO_4, Cr VI measurements)

ABS500 — ***Flow cell and xenon lamp for absorbance measurements***
Optical path: 1, 3 or 10 mm
Lamp life time: 10 flashes
Wet materials: PMMA, Viton, Quartz

Configuration and calibration for measurements by absorbance (require SPECTRO500 and ABS500 modules)

COD-H-500 — ***COD/TSS/BOD/TOC high range***
high range: 0 – 2000 Abs/m
(equivalent to approx. 20000 mg/L on municipal waste water)

COD-M-500 — ***COD/TSS/BOD/TOC Medium range***
medium range: 0 – 600 Abs/m
(equivalent to 2000 mg/L)

COD-L-500 — ***COD/TSS/TOC/BOD low range***
low range: 0 – 200 Abs/m
(equivalent to 100 mg/L on river water)

NO3-500 — ***Nitrate***
Range: 0 – 100 mg/L NO_3 (0 – 25 mg/L N of NO_3)
Measurement possible until 250 mg/L NO_3 (60 mg/L N-NO_3)

CO-H-500 — ***Colour high range***
Range: 0 – 1000 Pt-Co unit

CO-L-500 — ***Colour low range***
Range: 0 – 100 Pt-Co unit

Measurement by UV fluorescence (required for PAH and OIW measurements)

PAH-500 — ***Poly-aromatic hydrocarbons***
Range: 0 – 10 ppm phenol
Range: 0 – 100 ppm OIW
(equivalent to approx. 0 – 100 ppm oil with 10% aromatic ratio)

Measurement module by colorimetric method (require SPECTRO500 and ABS500 module)

PO4-H-500 — ***Phosphate high range***
High range: 0 – 20 mg/L P (60 mg/L PO_4)
Sampling peristaltic pump included

PO4-L-500 — ***Phosphate low range***
Low range: 0 – 2 mg/L P (6 mg/L PO_4)
Sampling peristaltic pump included
Option: PO4-H-500: 0 – 20 mg/l P-PO4

CR6-500 — ***Hexavalent chromium (VI)***
Range: 0 – 2 mg/L Cr VI
Measurement possible up to 5 mg/L Cr VI

Measurement by nephelometry

IRTURB-H-500 — ***Internal turbidity sensor high range***
High range: 0 – 1000 NTU
Nephelometric method by laser diode at 650 nm (850 nm on request)

IRTURB-L-500 — ***Internal turbidity sensor low range***
Low range: 0 – 10 NTU
Nephelometric method by laser diode at 650 nm (850 nm on request)

IRTURB-M-500 — ***Internal turbidity sensor medium range***
Low range: 0 – 100 NTU
Nephelometric method by laser diode at 650 nm (850 nm on request)

> UV500 Parts References

Measurements by optical method

DO-F — ***Dissolved oxygen probe by fluorescence***
Range: 0 - 25 mg/L O_2
7 meters of cable

EXT-TURB-H — ***Turbidity probes high range***
High range: 0 – 30000 mg/L TSS
7 meters cable

EXT-TURB-L — ***Turbidity probes low range***
Low range: 0 – 1500 mg/L TSS
7 meters cable

Measurement by UV absorption in gas phase

The spectrograph option SPECTRO must be included

STRIP500 — ***Stripping system***
Include xenon lamp, flow cell, glassware, air pump, air filter and solenoid valve

NH4-500 — ***Ammonia NH4/N-NH4***
Range: 0 – 100 ppm NH_4^+ or above

H2S-500 — ***Hydrogen sulfide H2S/S-H2S***
Range: 0 – 20 ppm H_2S

Measurements by electrode *(external)*

ELPH — ***pH on-line electrode***
Range: 0 – 14
5 meters of cable (10 meters in option)
Built-in ATC RTD 100 Ohm

ELORP — ***ORP on-line electrode***
Range: -2000 mV to +2000 mV
5 meters of cable (10 meters in option)
Built-in ATC RTD 100 Ohm

ELCOND — ***Conductivity on-line electrode***
Range: 0 – 10 mS/cm
Cell constant k=1.0 cm^{-1} (medium range)
5 meters of cable (10 meters in option)
Built-in ATC RTD 100 Ohm

TN/TP

Total Nitrogen (TN) *measurement = (N-NH4 + N-NO3) x Calibration factor derived from lab measurement. NH4: 0 – 100 ppm (or above) and NO3: 0 – 250 ppm, equivalent TN = NH4-N + N-NO3:*
0 – 140 ppm (or above) with lab correlation. Resolution: 0.1mg/L and Accuracy: +/-5% reading. LOD: 0.05mg/L.
Ortho-Phosphate (PO4): Colorimetric method ***Total Phosphorus (TP)*** *measurement = PO4-P x Calibration factor derived from lab measurement.*
TP = PO4: 0 – 20 mg/l P-PO4 with lab correlation. Resolution: 0.1mg/L and Accuracy: +/-5% reading. LOD: 0.05mg/L.

EXT-TURBNEPH-H — ***Nephelometric turbidity probes high range***
Range: 0 – 400 NTU
10 meters cable

EXT-TURBNEPH-M — ***Nephelometric turbidity probes medium range***
Range: 0 – 40 NTU
10 meters cable

EXT-TURBNEPH-L — ***Nephelometric turbidity probes low range***
Range: 0 – 4 NTU
10 meters cable

Input modules

IN4-20-500 — ***4-20 mA input module***
Isolated 4-20 mA input
Impedance: 100 Ohm

LOGIC500 — ***Double logical inputs module***
Input no 1 : external pulse command for measurement
Input no 2 : measurements inhibition
Isolated 0 – 48 V DC inputs
Impedance: >10 Kohm

PH500 — ***pH/ORP module***
pH Range: 0 – 14
ATC input for platinum RTD 100 Ohm or 1000 Ohm
ORP Range: -2000 mV to +2000 mV

COND500 — ***Conductivity module***
Range: 0 – 100 µS/cm to 0 – 100 mS/cm
ATC input for platinum RTD 100 Ohm

Output modules

OUT4-20-500 — ***4-20 mA output module***
Isolated 4-20 mA output
Active output, Max load 500 Ohm

RELAY500 — ***Relay module***
Contact rating: 2A/220V

Recommanded consumables for 2 years:

P-ACI-HD1: *Head of cleaning pump (x1)*
P-RGT-HD1: *Head of reagent pump (x1) (only for NH_4 or H_2S)*
T-PHAR-1: *Tubing 6.4x9.6 mm (if optional sampling pump) (x2 to x8 depending on sampling pump use)*

Cleaning solution and reagents (if any) are not provided

Option for UV500: ATEX version.

HORIBA Advanced Techno | TETHYS TECHNOLOGY

HORIBA Advanced Techno France SAS*
100B Allée Saint-Exupéry - 38330 Montbonnot-Saint-Martin – France
Please note that since April 12, 2023, the company name has changed from Tethys Instruments SAS to HORIBA Advanced Techno France SAS. All registration numbers, including the EORI and EU VAT Reg. No. remain the same.
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