

TECHNICAL MANUAL

Oil in Water analyser FL200-H



FL200 analyser (standard version)

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1 Technical description of the proposal

1.1 Detailed description of the analyser

1.1.1 Technology

The measurement method of FL200 is based on the fluorescence signal emitted by aromatic hydrocarbons when excited by specific UV light.

The UV source of the analyser is a xenon lamp which is ensured a very low energy consumption and a long life time (more than ten years if a measurement is made every 1 minutes) thanks to a specially designed feeding mode. Many successive flashes are started for each analysis and the average of all the results is calculated by the analyser in order to ensure the perfect reproducibility of the measurements.

In most applications of the FL200 analyser, very low concentrations of contaminants have to be detected. The fluorescent signal is then very weak. To optimize the performance of the analyser, a high sensitivity photomultiplier is used as a detector. During the measurement cycle, the intensity of the exciting radiation is measured in order to compensate for any turbidity variation or lamp intensity drift.

The lamp operation is controlled throughout the measurement cycle in order to ensure the highest stability and the repeatability of measurements.

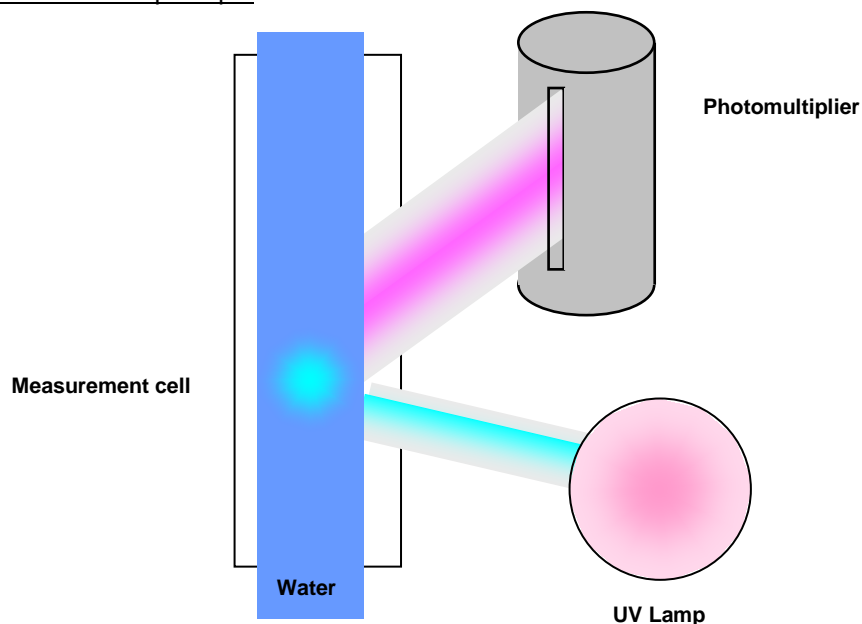
The factory calibration which is carried out before delivery makes the analyser ready to use on-site for quantitative measurements without any calibration.

A LCD panel displays the concentration of the substance to be measured. On the same screen, recording of previous measurement results is displayed.

The measurement results can be remotely transmitted using a 4-20 mA output. The variation range of this output can be set by the user.

During a measurement cycle, a synoptic drawing shows all steps of the cycle on the screen. If any fault would occur during the cycle (lamp signal fault, etc...) faulty component is indicated and the nature of the fault is described.

Measurement principle



1.1.2 Range and accuracy

The measurement range is 0 to 20 ppm Phenol equivalent in water. For this measurement range, the accuracy is better than $\pm 5\%$ or ± 1 ppm Phenol equivalent in clear water. The detection limit is 0.2 ppm Phenol equivalent in clear water.

Other ranges are available on demand.

1.1.3 Measurements and recording

Measurement cycles can be continuously set or sequentially set depending on the operation mode.

In the sequential mode the FL200 may perform one measurement cycle every minute. The time interval between measurements can be set minute by minute up to 12 hours.

The measurements performed in the automatic mode are automatically stored in an internal memory (not available in the CLASSECO version). In the manual mode, a special key on the front panel allows the operator to store the value in the memory if desired. So, the FL200 analyser has the advantages of a digital datalogger.

Each stored event contains:

- Date and time of measurement,
- Measurement result expressed in the chosen unit.

1.1.4 Energy

The FL200 is operated using mains 110 – 240 VAC, 50 – 60 Hz.

In the standard version a 12 VDC built-in battery supplies the power in the case of mains failure (optional in the ECO version).

1.1.5 Measurement transmission

The measured concentration results may be transmitted using :

- The built-in 4 – 20 mA output (all version)
- Using the built-in RS232 communication output by connecting a computer (standard version only).

1.1.6 Alarm relays

Two alarm relays (dry contacts) for level alarms. The alarms values may be set by the user himself.

One measurement fault alarm relay that is activated in the case of a measurement fault.

1.1.7 Reliability

The measurement realized by FL200 analysers is not based on a chemical or on a physicochemical reaction but on a physical principle. No reagent is required. No contact between the water which is analysed and the measurement probe is required and therefore the measurement probe cannot be damaged by aggressive water. The only parts in contact with water are the feeding tubes (large diameter) and the quartz measurement cell the light goes through.

The steel box of the analyser is watertight, the measurement cell is protected by a quartz tube which prevents the measurement cell from being broken and allows measurement on very cold water without condensation.

Any unreliable measurement due to a failure of the measurement cycle produces an error message on the measurement frame and activates the default relay of the analyser.

A journal of events which can be read on the PC records the date and the time of all events (excepting measurements) occurring on the analyser: cleaning cycle, error measurements, potential communications or messages of the operator using the RS232 link or the modem board,....

1.1.8 Hydraulic connections

The hydraulic connections use double ring fittings. The fittings material is SS316L, but could be replaced by PP for applications in sea water (on demand).

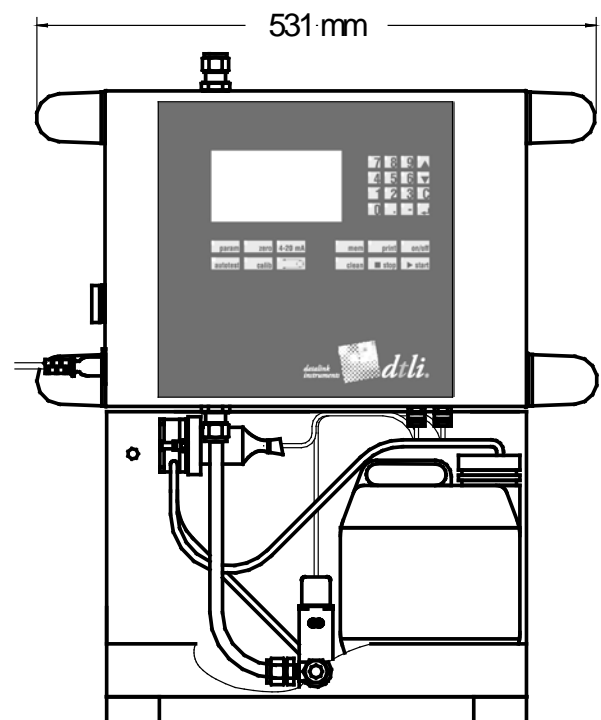
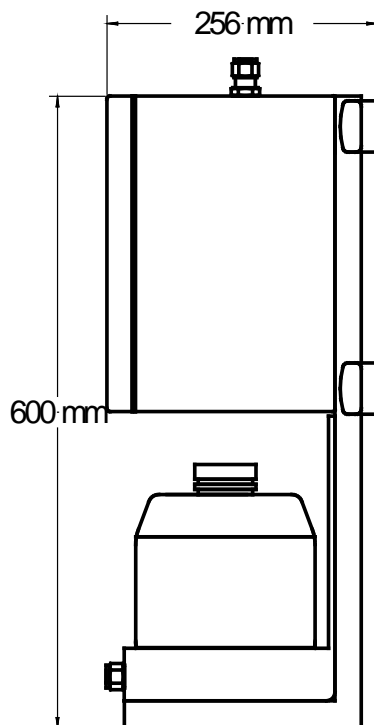
If the optional peristaltic sampling pump is used, the input fitting is a PE nut for smooth tube.

1.1.9 Consumables

No reagent is required. The only consumable liquid is the cleaning solution.

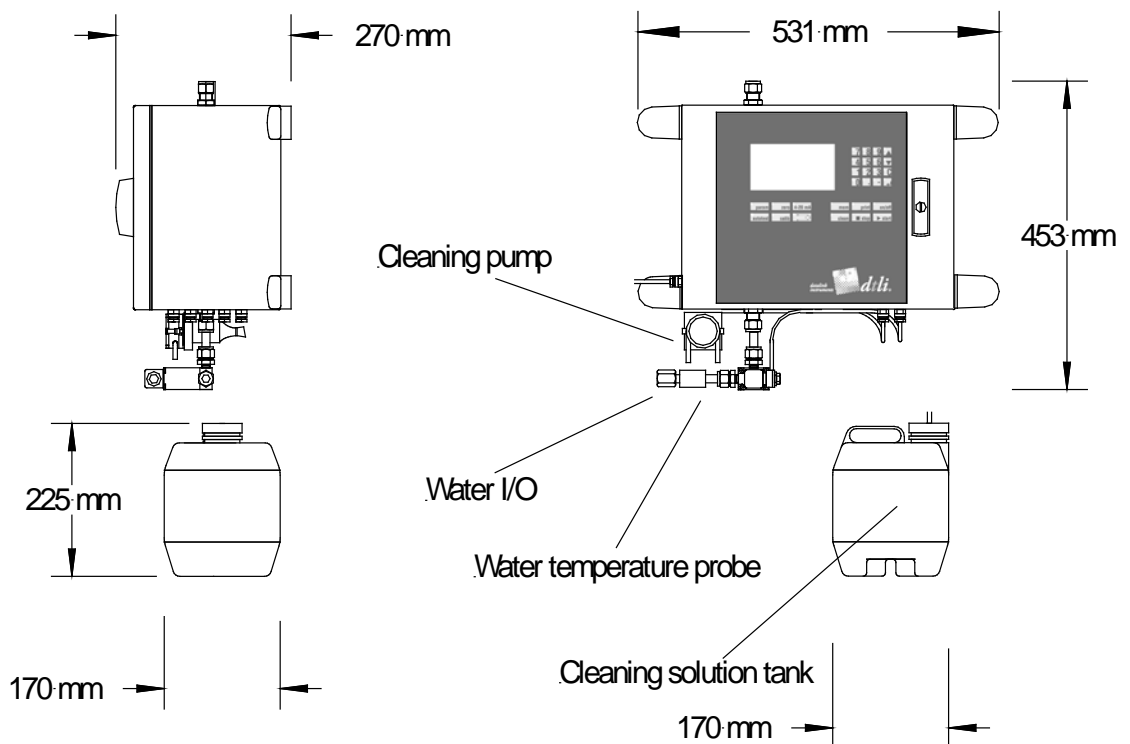
1.2 Summarized characteristics : FL200 standard version

Weight :	18 Kg
Range :	0 – 20 ppm Phenol equivalent
Energy :	100-240V 50/60 Hz 60 W + internal battery 12 V
Outputs :	4-20 mA isolated, 12 bits resolution High threshold/low threshold relay Alarm default relay
Enclosure :	Watertight IP55 Painted steel box for electronics and spectrophotometer.
Communication :	RS232 or RS485 (on demand) for PC, or MODBUS
Water flow rate :	typical 0.6 L/mn
Measurement cell volume :	100 ml
Sample temperature	> 1 to 60°C
Sample Pressure	No pressure if sampling pump 0.1 to 5 bar without sampling pump



1.3 Summarized characteristics : FL200 ECO version

Weight :	15 Kg
Range :	0 – 20 ppm Phenol equivalent
Energy :	100-240V 50/60 Hz 60 W + internal battery 12 V (Option)
Outputs :	4-20 mA isolated, 12 bits resolution High threshold/low threshold relay Alarm default relay
Enclosure :	Watertight IP55 Painted steel box for electronics and spectrophotometer.
Water flow rate :	typical 0.6 L/mn
Measurement cell volume :	100 ml
Sample temperature	> 1 to 60°C
Sample Pressure	No pressure if sampling pump 0.1 to 5 bar without sampling pump

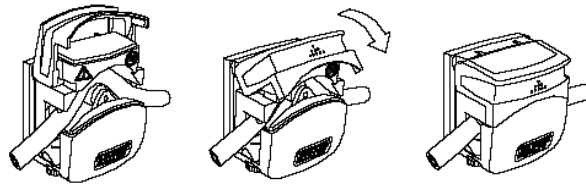


2 Possible options

2.1 Possible options for both standard and ECO version

2.1.1 Peristaltic sampling pump

If the water is to be pumped from a natural source or a large container, an optional peristaltic pump can be used. It is supplied with power by the battery of the analyser and can be either manually or automatically operated, using the keyboard of the analyser.



The pumping rate is 0.5 L per minute and the pumping is efficient up to five meters high maximum.

2.1.2 Water presence detector

Detect by conductivity the presence or not of water in the analyser.

When the analyser is fed under pressure with permanent circulation, the detector forbids all the automatic measurements if the presence of water is not detected. A device default message is produced.

Also, the auto-calibration of the zero of the analyser will be forbidden if the cleaning solution is not detected. This prevents an adjustment of the zero on an empty measurement cell or which would not have been cleaned for lack of solution.

2.2 Possible option for ECO version only

2.2.1 Stainless steel stand-up system

Makes the analyser ready for a lab application without hanging it on a wall.

2.2.2 Built-in battery

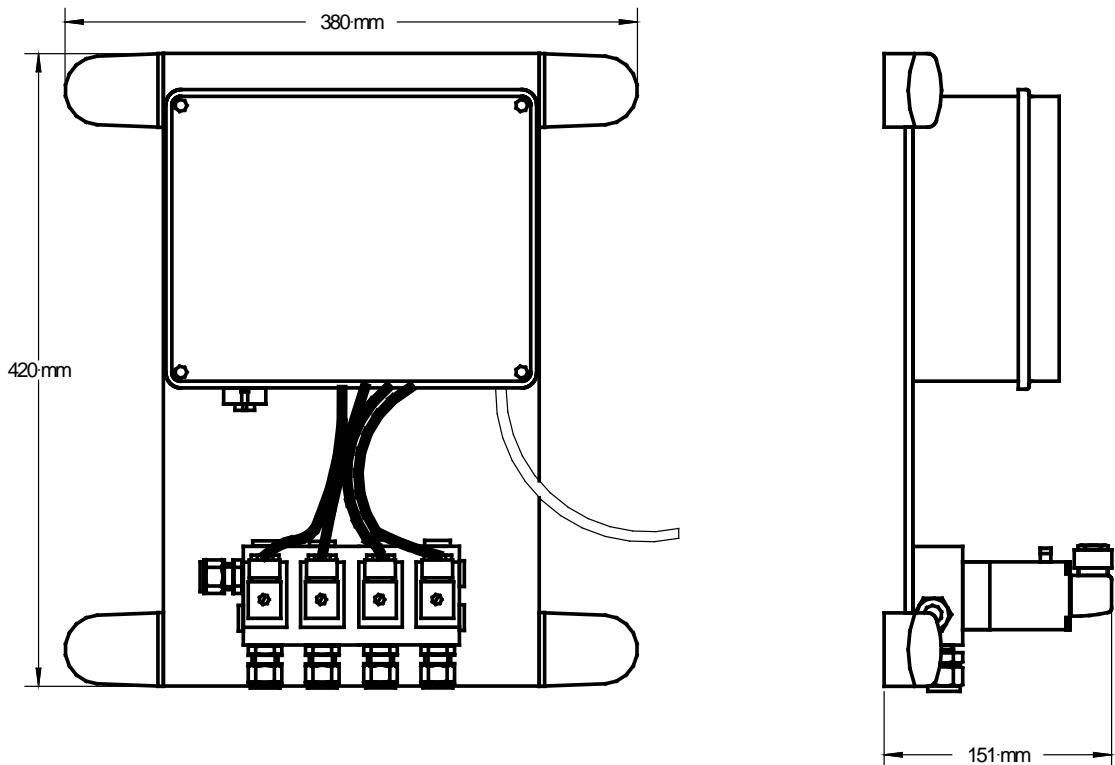
Give the analyser a total autonomy that allows mains short breakdown protection or use on the field without external energy power.

2.3 Possible option for standard version only

2.3.1 Four channel multiplexing system

This option allows the analysis of up to four different water networks with the same analyser.

When a measurement cycle is started, all water channels are successively analyzed. The water flowing time must be programmed on each channel. As soon as a channel is started on the analyser, the corresponding pump (or electric valve) is activated during the flowing time which has been previously programmed.



2.3.2 Remote measurement command

This option allows to start a measurement cycle by activating an analog input with a voltage pulse. This is useful when the analyser is integrated in a system monitored by a PLC.

An output contact is activated when the analyser is ready for a measurement command. If the analyser is not ready (cleaning cycle or previous measurement cycle still in process, keyboard being used) the output contact is disabled.

2.3.3 pH measurement

A pH probe can be connected to the FL200 analyser. In that case, the measurement benefits from assets of the FL200 that constitute the automatic cleaning (if the probe is placed on the channelling of exit) and of the storage of the measurement in the memory.

The temperature compensation is automatically made by the analyser.

2.3.4 Conductivity measurement

It is the same for the conductivity measurement in the range of 0 – 2000 $\mu\text{S}/\text{cm}$.

2.4 Standard / Classeco (ECO) sum-up and comparison

✓	Included
■	Optional
✗	Not Available

	STANDARD VERSION	ECO VERSION
<i>Dimensions</i>		
<i>Weight :</i>	18 Kg	15 Kg
<i>Length: (mm)</i>	531	531
<i>Height: (mm)</i>	600	453
<i>Width: (mm)</i>	270	256
<i>Features:</i>		
Watertight IP55 Painted steel box for electronics and spectrophotometer.	✓	✓
Automatic chemical Cleaning System	✓	✓
Datalogger Data compatible with standard worksheets, particularly Excel® to obtain graphs easily.	✓	■
Digital and graphic Display	✓	✓
Feet and Cleaning system Tank Holder	✓	■
Peristaltic sampling pump	■	■
Water presence detector	■	■

Additional Parameter (up to 4 parameters per analyser)	-	✗
Multiplexing System (Up to 4 channels)	-	✗
Remote measurement command	-	✗
High Temperature & High Pressure option (up to 100°C, 10 bar)	-	✗
<i>Power:</i>		
100-240V 50/60 Hz 60 W	✓	✓
Internal 12V battery	✓	-
External 12V / 24V Battery Powering mode	✓	✓
DC-DC Converter	-	-
<i>Outputs and Communication:</i>		
4-20 mA isolated output	✓	✓
High / Low Threshold Relay	✓	✓
Default Alarm Relay	✓	✓
RS232 output	✓	-
RS485 output	-	-

3 Recommendation for maintenance and routine checking

3.1 Soft checking recommendation

3.1.1 Description

Any measurement system needs to be routinely checked even if no corrective action is operated. The automatic process ensures the repetitive operations, but an operator check-up as to be done from time to time.

The routine check-up can be summarized as follows:

- Visual control of flow cell
- Flow cell cleaning using the cleaning system
- Zero checking / adjustment on a zero solution
- Measurement cycle test on process water

3.1.2 Periodicity

Once every 1 month.

3.1.3 Duration

Less than 15 minutes.

3.1.4 Operator

Local operator.

3.2 Calibration checking

3.2.1 Description

This operation is to be done after the soft check-up. It consists in a measurement using a standard solution. In the case of a difference between the measured value and the standard, an automatic calibration cycle has to be done.

3.2.2 Periodicity

Once every 6 months.

3.2.3 Duration

Less than 15 minutes.

3.2.4 Operator

Local operator.

3.3 Yearly preventive maintenance

3.3.1 Description

This operation is recommended. If the previously described check-up are made the analysis performance of the probes will be maintained. However, a detailed cleaning process is sometime required, depending on water environment incidences. The preventive maintenance visit allows a detailed inspection of all optical and hydraulic parts.

From our experience, we observe that analysers which are preventively maintained show a better reliability over several years.

3.3.2 Periodicity (*facultative*)

Once a year.

3.3.3 Duration

1 day (trip not included).

3.3.4 Operator

DTLI technician or DTLI representative.

4 Operational limits

4.1 Electromagnetic compliance

The system proposed fully complies with EM standards in industrial field. The wirings should be performed with shielded cable and the shield should be connected to the transmitter carcass.

4.2 Temperature

The FL200 analyser is designed to be operated with liquid water whose temperature must necessarily be kept between 1 and 60°C. Apart from this range of temperature, measurements will be less reliable.

Freezing conditions would lead to strong damage.

4.3 Interference

All fluorescent species that emit in the 300 – 400 nm range could interfere with the measurement (styrol for instance).