



ADI 1010 Bio Controller, The Smart System.

The ADI 1010 Bio Controller is the smallest and most intelligent controller in the Applikon product range. It is specially developed for process development in laboratory scale bioreactor systems and offers you an easy to use and powerful instrument that excels in accurate and dependable process control.

The ADI 1010 Bio Controller is Applikon's new generation adaptive process controller for autoclavable and steam-in-place bioreactor systems up to a 20-liter total volume. The ADI 1010 controls pH, temperature, dissolved oxygen, foam/level and stirrer speed. Controlling strategies are configured specifically for each user. With this, the ADI 1010 provides you with a "smart" adaptive control system tailored to your particular process.

Technical Specifications:

The Bio Controller ADI 1010 is a controller for running bio processes in autoclavable bio reactors. Available control loops:

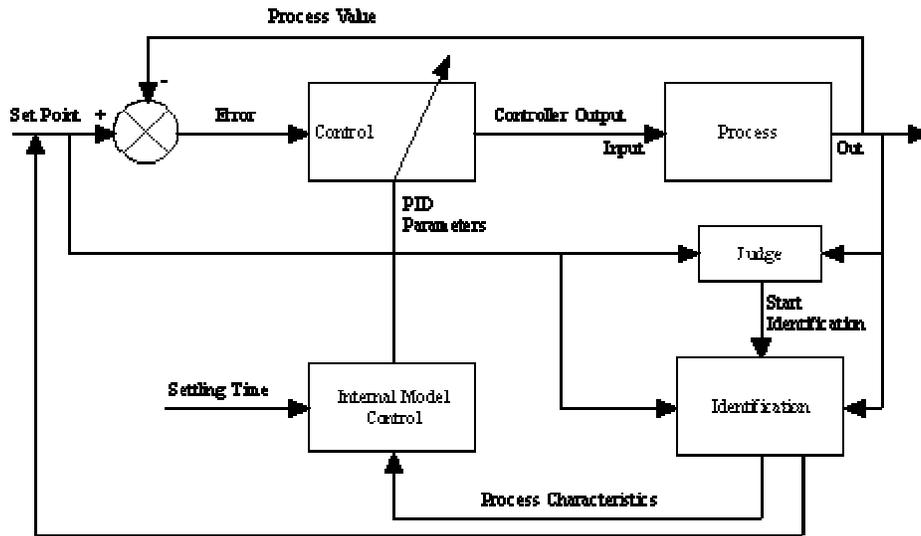
- pH,
- Temperature,
- Dissolved oxygen,
- Level / Anti-Foam (contact or no-contact),
- Stirrer speed (manual or remote control)

The control algorithm for pH, Temp. and dO₂ is based on three ingredients (PID): "P"roportional control (controller output relates to current deviation from set point) "I"ntegral control (controller output relates to integrated deviation from set point) "D"erivative control (controller output relates to the deviation trend)

The Bio Controller ADI 1010 is capable of ADAPTIVE PID CONTROL, which means that the PID control parameters are adapted for changes in process characteristic.



Schematic presentation of an adaptive PID controller:



In case the controller is started without historical data, it starts with "moderate" control data. The JUDGE evaluates the response of the Process-Output and decides whether a new identification of the Process Characteristics is required.

IDENTIFICATION is executed based on small variations in set point value (to both sides); the character of the process is identified through the way the process control reacts to these minor disturbances in set point value.

Finally INTERNAL MODEL CONTROL converts the identified process character into new PID control parameters.

Identification is based on a measuring and verification process. During this interval, process control is carried out based on current control parameters.

Note: The identification process for pH and dO takes approx. 15 . . 20 minutes. Temperature control is characterized with a much slower response; therefore the identification process for temperature control takes approx. 90 minutes.

In case the Bio Controller has collected process data from previous runs , it can continue control based on this history or can restart based on the default parameters.

Sensor Input Specifications:

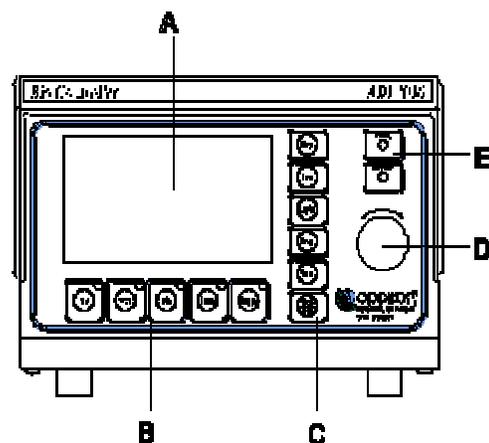
The installed input amplifiers have the following specifications:

pH amplifier:	Range:	0 - 14 pH
Accuracy:		± 0.01 pH
R _{in} :		> 10 ¹⁵ Ω
Temp. amplifier:	Type:	Pt-100
Range:		0 - 150°C
Accuracy:		± 0.1°C
dO ₂ amplifier:	Type:	Polarographic
Range:		0 - 500 % (air)
Accuracy:		± 0.1 %
Level amplifier:	Type:	On/Off signal
Sensitivity (firmware selectable)		
High:		> 26 μS - 100 %
Low:		> 200 μS 100 %

The front view of the Bio Controller shows the graphical display, parameter & function keys, a digital potentiometer (dial) and indicators:

Where:

- A = graphical display
- B = parameter selection keys
- C = function keys (for operation)
- D = digital potentiometer (dial)
- E = indicators (power-on and remote operation)





At the rear of the Bio Controller connections can be found for sensors, serial communication, I/O and mains:

Where:

A = sensor connections

B = cable connection for serial communication (SCADA system)

C = I/O cable connection, to Power Unit

D = I/O cable connection, to external Stirrer Controller ADI 1032*

E = mains entry with power switch and fuse holder

