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## INTRODUCTION

Nowadays, the accurate control is critical for each industrial process. The industrial controllers form a crucial part of every industrial process as a means of ensuring that tasks such as production, distribution and treatment processes are carried out under the right condition. The operator has to have the enough experience in the management of the industrial controller, for achieve a correct control process.

The Industrial Controllers Trainer “CECI” designed by EDIBON, allows students to learn the principles about the many control techniques used in the industrial processes.

The “CECI” unit has the necessary components to simulate a complete process (Set point generator module and system generator module). But our design with configurable inputs and outputs delivered at lab jacks in the front panel of “CECI”, allows unit to be integrated into a real process at any time.

The industrial controller parameters of “CECI” can be configured with computer (PC), through the communication module and software of ABB industrial controller (both provided in the “CECI”), but also can configured with the industrial controller front panel. In this way “CECI” unit teaches students a complete formation in industrial controllers configuration that are using in the industries today.

The unit is provided with a set of practical exercises, through which the students will familiarize with a standard industrial controller. The students will understand the operation mode of an industrial controller. They will learn how to set up the controller to carry out different control schemes such as open loop control, closed loop control, PID control, etc.



**ISO 9000: Quality Management**  
(for Design, Manufacturing,  
Commercialization and After-sales service)



**European Union Certificate**  
(total safety)



**Certificates ISO 14000 and**  
**ECO-Management and Audit Scheme**  
(environmental management)



**Worlddidac Quality Charter**  
**Certificate**  
(Worlddidac Member)

## GENERAL DESCRIPTION

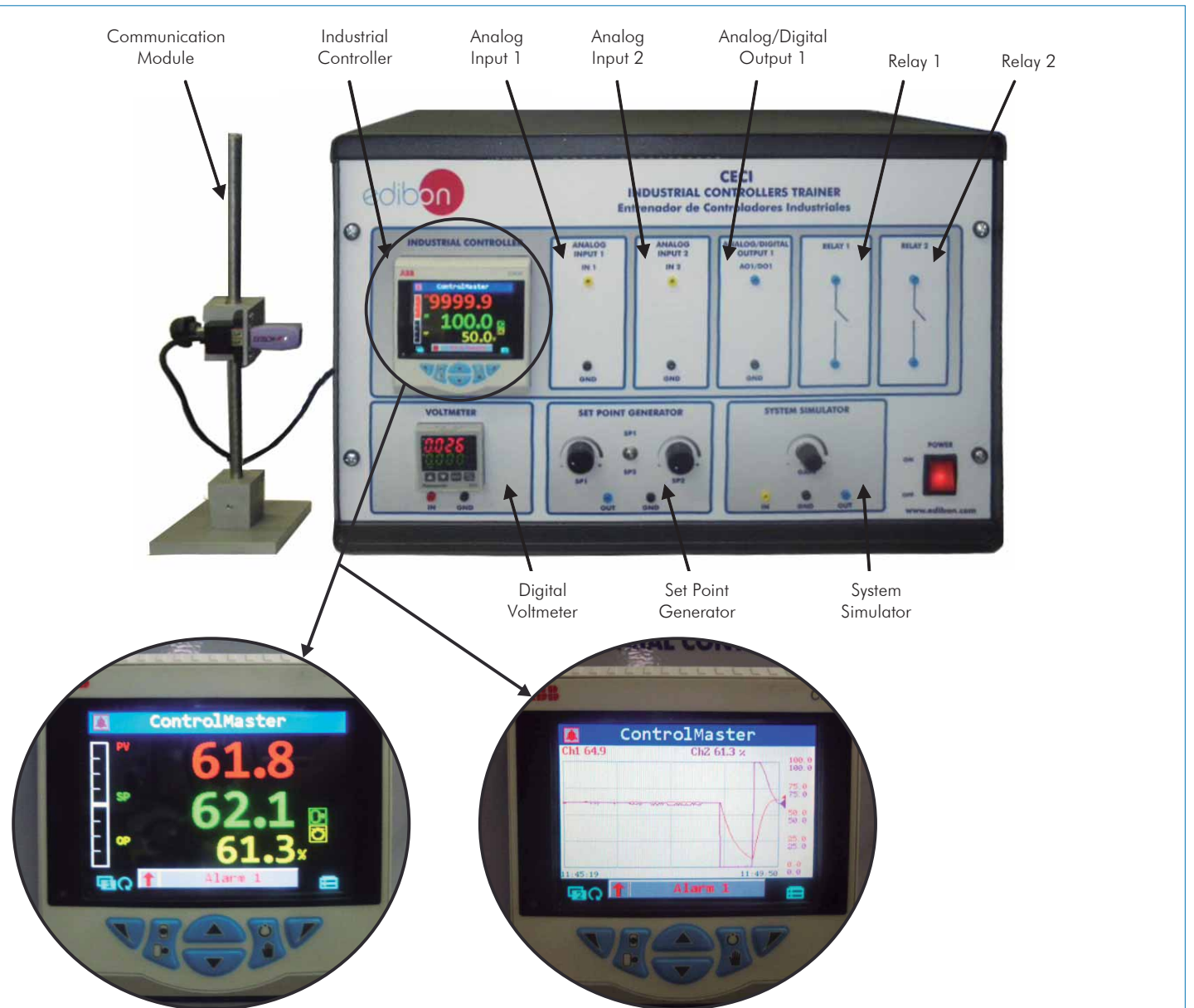
The CECI unit is based on a modular design structure whose functionality is divided into different modules to allow the student a better understanding of the unit. The modules included in the unit are: industrial controller, digital voltmeter, set point generator, system simulator and communication module.

- Industrial Controller: the controller has two analog inputs and analog/digital output. The analog inputs plugs are used to connect the process value (PV) and set point value (SP) signals. The analog/digital output plug is used for the output process signal (OP). The controller also has two configurable relays. In addition of configuration through the software, the industrial controller parameters can also be configured with the industrial controller front panel.
- Digital Voltmeter: this module allows visualize the amplitude of a dc signal.
- Set Point Generator: this module allows to generate a step signal by switching between two different selectable voltages. The voltage levels can be adjusted using two potentiometers.
- System Simulator: this module represents a first order lag system. The time constant of the system is 20s. The gain of the system can be adjusted using the corresponding potentiometer.
- Communication module: this module consists of an infrared to USB adapter mounted in a mobile structure. The structure allows us to fix the adapter in order to align it with the controller.

The software provided with the "CECI" unit is the commercial software ABB device type manager (DTM), configuration software for Control Master industrial controller versions. This software allows students learn with real industrial controller software.

The software allows selection of type of control, industrial controller parameters, setting of alerts and alarms, type of system loop, etc. The access to configuration of different parameters is through a comprehensible Blocks scheme of the system process.

## PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



The image above shows the "Operator Page" screen, which shows the three main parameters of the industrial controller: PV (process value), ST (set point value) and OP (output signal from the industrial controller) and also displays the activated alarms.

The image above shows the "Trend display" screen, which shows the evolution of the different parameters values and also displays the activated alarms.

Main Unit (in metallic box), including:

Industrial Controller:

ABB Controller Cm30.

Display: Color 1/4 VGA TFT, liquid crystal display (LCD) with built-in backlight.

Language: English, German, French, Italian and Spanish.

Operator keypad: 6 tactile membrane keys.

Password protection: Basic/Advanced user-assigned password protection.

Trend display:

Recording of 2 variables.

Configurable sample rate (1 second to 5 minutes).

Control parameters:

Proportional band: 0 to 999.9 %.

Integral: 0 to 10000 s.

Derivative: 0 to 999.9 s.

Manual Reset 0.0 to 100 %.

Autotune: On-demand calculation of control settings.

Process alarms:

Number: 8.

Types: High/Low process and High / Low latch.

Acknowledgement: Via front panel keys or digital signals.

Source: Fully configurable (for example, PV, analog input, math block inbuilt, OP control loop deviation).

Hysteresis: Level and time.

Alarm enable: Enable/Disable of individual alarms via a digital signal.

Analog inputs:

Number: 2.

Complete configurable process input: voltage (V or mV), current (mA), resistance (ohms), Thermocouple, 3-Wire RTD, frequency, pulse, volt-free digital input and 24V digital input.

Selectable set points via software (remote from the computer) or front panel.

Analog/Digital output:

Number: 1.

Type: Configurable as analog or digital pulse.

Analog range: 0 to 20 mA (programmable).

Control output types (Configurable through software):

Current proportioning/Voltage proportioning (using resistor).

Time proportioning.

On/Off.

Motorized valve with feedback.

Motorized valve without feedback.

Split output with combinations of relay digital O/P and current O/Ps.

Relays:

Number: 2.

Type: N/O.

Contact rating: 5A, 240V.

Digital Voltmeter:

Range: 0 to 10Vdc.

Resolution: 10mVdc.

Set Point Generator:

2 Voltages selectable through a switch, which allows generate a step signal.

Amplitude: 0 to 10Vdc.

System Simulator:

Simulates a first order lag System.

Time constant (T): 20s.

Gain 1 to 10 (clockwise direction).

Communication module:

Allows connect to PC using IrDA protocol.

Software: ABB device type manager (DTM), configuration software for Control Master industrial controller versions:

The software allows selection of type of control, industrial controller parameters, setting of alerts and alarms, type of system loop, etc. The access to configuration of different parameters is through a comprehensible Blocks scheme of the system process.

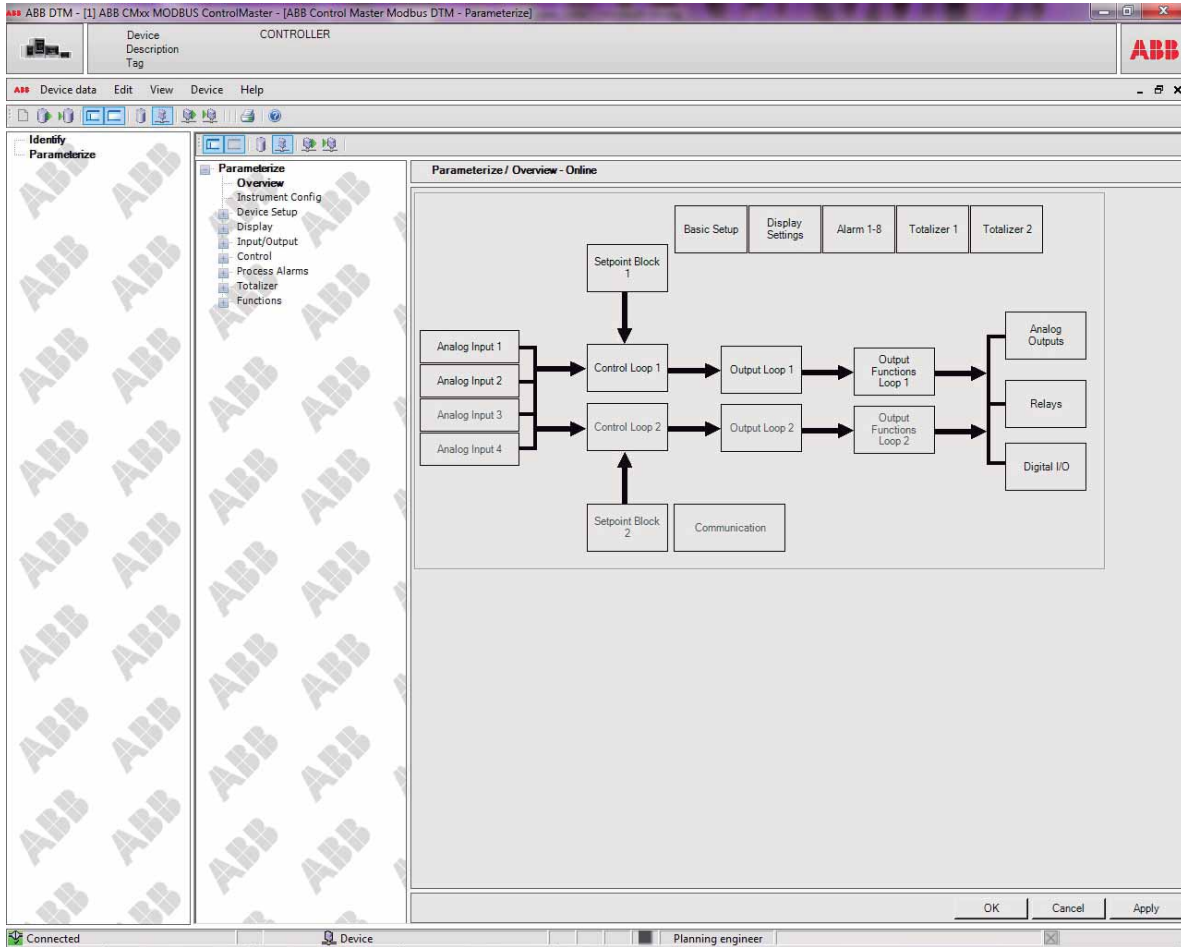
Cables and Accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

- 1.- Installation, connection and familiarization with the software.
- 2.- Study of the transfer function (static and dynamic).
- 3.- Familiarize with the Set point generator, generation of a square signal using two analog signals.
- 4.- Familiarization with the navigation of an industrial controller (operator page screen, trend display screen, etc).
- 5.- Step-response of a first order system.
- 6.- Configuration of analog inputs/outputs signals of the industrial controller (electrical range, engineering units, fault detector, etc).
- 7.- Manual control of a first order system using an industrial controller (open-loop).
- 8.- Automatic PID control of a first order system using an industrial controller (closed loop).
- 9.- Obtaining the PID parameters automatically using autotuning.
- 10.-Setting alarms and diagnostics generation.
- 11.-Setting of an industrial controller using the front panel (configuration level, parameter level, operation control level, etc.).
- 12.-Remote setting of an industrial controller using the configuration software (configuration level, parameter level, operation control level, etc.).

The following images shows the typically functions of ABB configuration software:

The image below shows the blocks scheme screen of the "CECII" unit for industrial process. Through a "click" on each block allows the students access to the configuration of this part of the system. This comprehensive block scheme allows the students have a wide perspective of all the process.

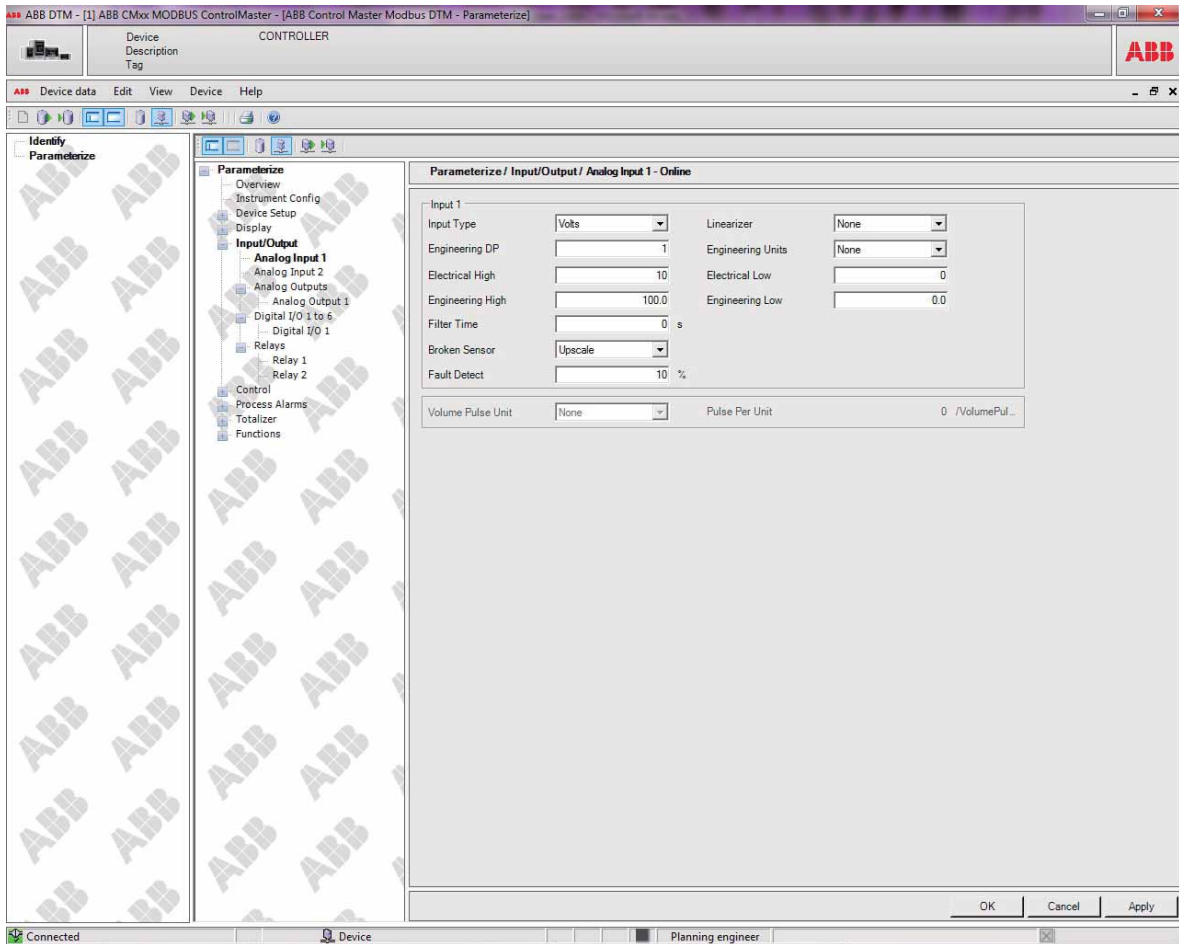


The image below shows the "basic setup" block. This block allows change the application template and the loop parameters.

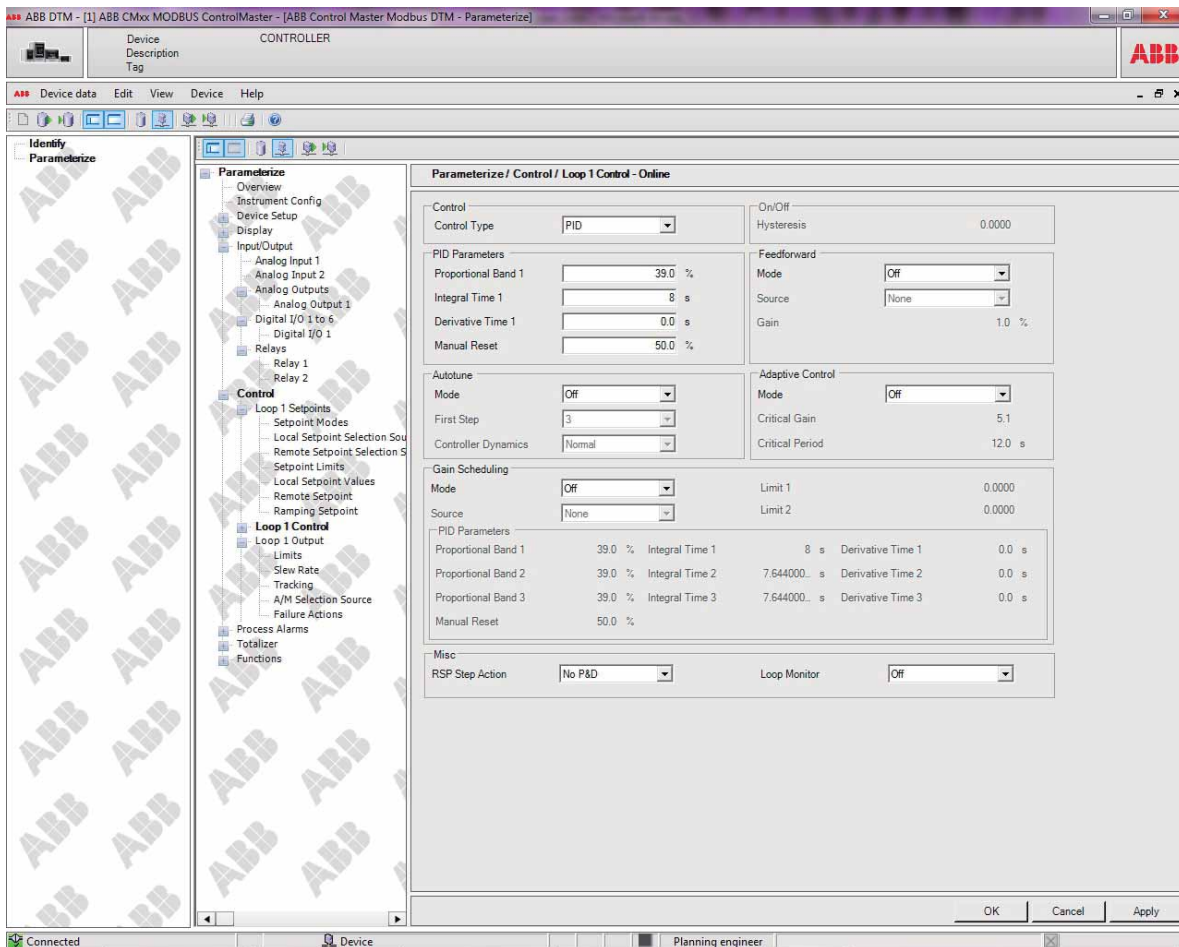
The screenshot shows the 'Parameterize / Device Setup / Basic Setup (Controller) - Online' window. The left tree view is expanded to 'Basic Setup (Controller)'. The main area contains the following configuration fields:

- Setup:**
  - App Template: Single Loop + RSP (dropdown)
  - Instrument Tag: ControlMaster (text field)
  - Mains Frequency: 50Hz (dropdown)
  - Config Action: Continue (dropdown)
  - Custom template:
- Loop 1:**
  - Output Type: Analog (dropdown)
  - Loop 1 Tag: Loop 1 (text field)
  - Split O/P Assign: Analog / Relay (dropdown)
  - Control Action: Reverse (dropdown)
- Loop 2:**
  - Output Type: Analog (dropdown)
  - Loop 2 Tag: Loop 2 (text field)
  - Split O/P Assign: Analog / Digital (dropdown)
  - Control Action: Reverse (dropdown)

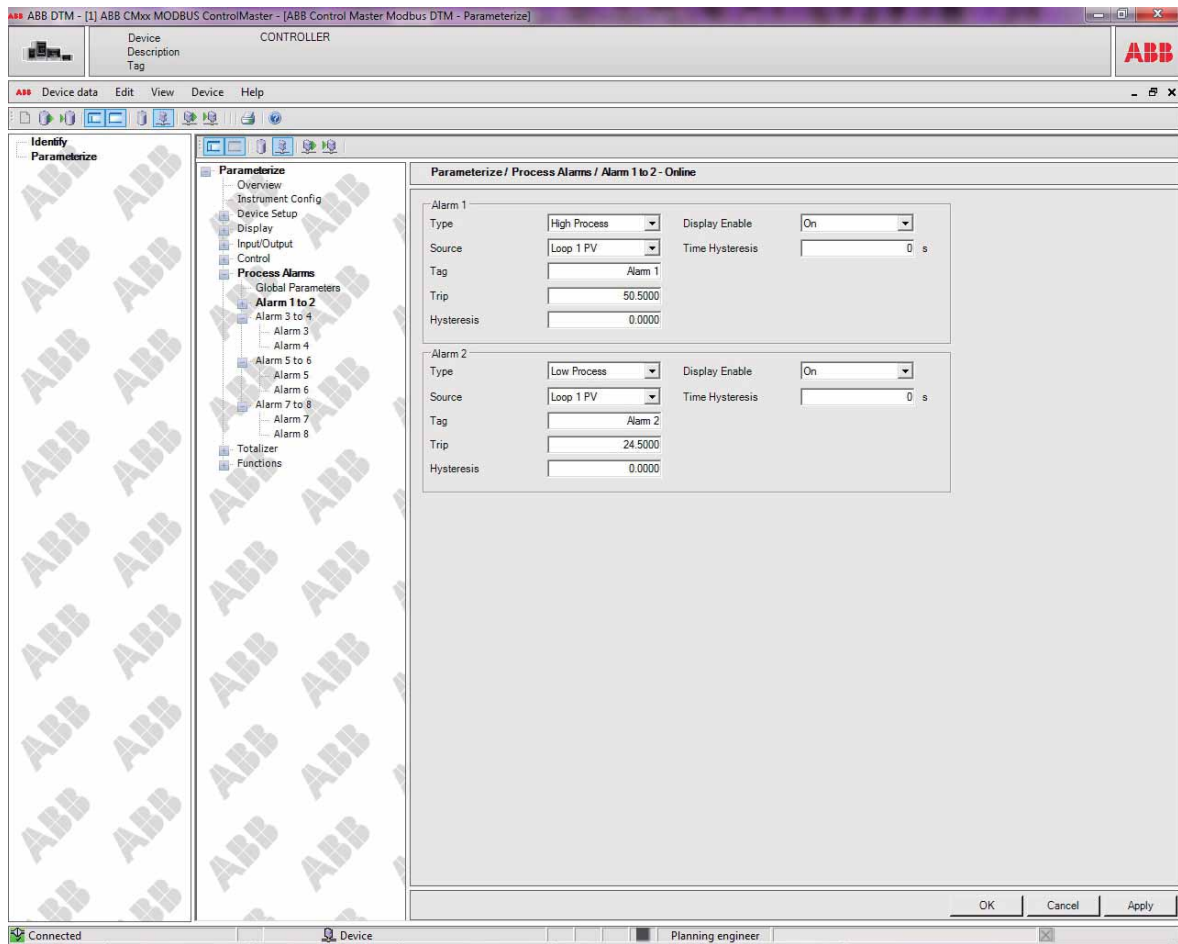
The image below shows the “CECI” screen for Analog Input which allows to configured the analog input parameters (the type of input, range of input, etc).



The image below shows the “control loop” block. This block allows configure the control type, the PID parameter, autotune configuration, etc.



The image below shows the "CECI" Process alarm block, this screen allows setting alarms and configure the alarm parameters like.



## REQUIRED SERVICES

- Electrical supply: single-phase 220V. / 50Hz. or 110V. / 60 Hz.
- Computer (PC).

## DIMENSIONS & WEIGHT

### CECI:

Main Unit: -Dimensions: 490 x 330 x 310 mm. approx.  
(19.29 x 12.99 x 12.20 inches approx.).  
-Weight: 10 Kg. approx.  
(22 pounds approx.).

### Communication Module:

-Dimensions: 100 x 100 x 310 mm. approx.  
(3.93 x 3.93 x 12.20 inches approx.).  
-Weight: 1 Kg. approx.  
(2.2 pounds approx.).

\*Specifications subject to change without previous notice, due to the convenience of improvements of the product.



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