Product Overview:

The **Process Simulator and Controller Kit** is a comprehensive educational solution designed for the study, simulation, and control of various system models, ranging from basic first-order processes to complex nonlinear systems. The kit facilitates hands-on experiments to enhance understanding of core control principles, empowering users to design, test, and optimize different system configurations.

Key Applications and Test Facilities:

- **Simulation and Control**: Designed to simulate a broad spectrum of systems, from basic first-order processes to advanced nonlinear systems.

- **Experimental Setup**: Perform experiments that strengthen the theoretical understanding of control techniques, with a focus on open-loop and closed-loop control systems.

- **Fault Analysis**: Equipped with built-in fault simulation to simulate and troubleshoot system failures.

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

Core Product Features:

Trainer Modules:

The kit includes two essential trainer modules:

- **Process Simulator Module**

- **Process Controller Module**

  Each module is equipped with **fault simulation capability**, allowing users to simulate at least **8 different fault cases** per module.

Process Simulator Module:

- **System Simulation**: Simulate linear systems for both first and second-order processes.

- **Linear Adders**: Includes two adders, each with a minimum of 4 inputs.

- **Multiplier**: Adjustable constant factor for versatile simulations.

- **System Model Builders**: Two model builders to generate various transfer functions.

- **Passive Elements**: Includes resistors (R) and capacitors (C) for dynamic behavior simulations.

- **Auxiliary Items**:

  - Built-in function generator capable of producing sine, square, and triangular waveforms, with adjustable amplitude and frequency.

  - A DC reference generator (knob-controlled) that can also function as a step input generator.

  - A variable attenuator (potentiometer) for controlling signal strength.

- **Nonlinearity Simulation**:

  - Saturation simulator with adjustable saturation levels.

  - Backlash simulator with adjustable backlash bands.

  - Hysteresis simulator with adjustable parameters.

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Process Controller Module:

- **Summing Node**: Two-input summing node with complementary outputs.

- **Configurable Controller**: Offers a configurable three-term controller (P, PI, PD, PID) with the ability to independently enable/disable the terms.

- **Adjustable Parameters**: Fine-tune proportional, integral, and derivative control parameters.

- **Output Adder**: Combines P, I, and D terms for customized control outputs.

- **Auxiliary Facilities**:

    - Reference signal generator based on a potentiometer.

    - Function generator for delivering sine, square, and triangular signals with variable frequency and amplitude.

Experiment Capabilities:

- **Control Systems**: Study open-loop and closed-loop control systems.

- **Feedback Control**: Gain and bandwidth analysis for negative feedback control.

- **Disturbance Effects**: Analyze the impact of additive and multiplicative disturbances.

- **Transfer Function Simulations**: Simulate first and second-order transfer functions.

- **Response Analysis**: Perform step response analysis, generate Bode plots, and analyze stability margins and compensation methods.

- **Controller Tuning**: Use, adjust, and tune P, PI, and PID controllers.

- **Nonlinear Phenomena**: Simulate real-world nonlinear phenomena like saturation, backlash, and hysteresis.

- **Fault Simulation**: Fault detection and troubleshooting with a minimum of **8 programmable faults** per module.

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Export Sales: +91-9829132777
India Sales: +91-9588842361

IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, India.

info@tesca.in
www.**tescaglobal**.com

CIN: U29309RJ2011PTC035213
GSTIN: 08AADCT8576E1ZZ

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Fault Simulation:

- **Fault Conditions**: Each module provides at least **8 independent fault conditions**, simulating circuit shorts or disconnections at designated points.

- **External Fault Programming**: Faults can be configured via an external fault programming unit (e.g., FS1E or equivalent).

Power Supply Requirements:

- **Operating Voltage**: The system operates on a stabilized DC supply with +15V and -15V.

Accessories & Spares:

- **Power Supply and Cables**: Essential components for powering the system and setting up experiments.

Product Benefits:

- **Comprehensive Learning Tool**: Ideal for hands-on learning, offering exposure to both linear and nonlinear system simulations.

- **Fault-Tolerant Design**: Built-in fault simulation allows students and engineers to troubleshoot real-world issues, enhancing practical skills.

- **Versatile Control Techniques**: Provides in-depth practice with a wide range of

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