Order Code - 53000: **IoT Workbench** is designed to provide a seamless plug-and-play experience, making it effortless to establish connections and enabling students, hobbyists, enthusiasts, and professionals to focus more on program and application development. Equipped with onboard I/Os, communication interfaces, and peripherals, this workbench is an all-in-one solution for IoT projects, prototyping, and experimentation. It eliminates the need for soldering, allowing users to design, test, and experiment with circuits quickly and efficiently. Widely adopted in educational institutions and R&D labs across the globe, this workbench is the perfect platform for innovation.

Raspberry Pi 4

At the heart of this IoT Workbench is the Raspberry Pi 4, a powerful single-board computer that delivers exceptional performance. It features a quad-core ARM Cortex-A72 processor, up to 8GB of RAM, dual 4K HDMI outputs, USB 3.0 ports, and Gigabit Ethernet. With its robust processing power and extensive connectivity options, the Raspberry Pi 4 is ideal for developing advanced applications, from home automation and multimedia systems to AI and machine learning projects.

ESP32-S3

The ESP32-S3 is a standout component of this workbench, offering enhanced features for IoT and wireless applications. As the successor to the popular ESP32, it combines Wi-Fi and Bluetooth 5 (LE) capabilities, making it perfect for connected projects. Its dual-core processor ensures efficient multitasking, while its low power consumption makes it suitable for battery-operated devices. With a rich set of peripherals and GPIOs, the ESP32-S3 is a powerhouse for IoT development, enabling seamless integration with sensors, actuators, and cloud platforms.

Raspberry Pi Pico W

The Raspberry Pi Pico W adds a compact yet powerful dimension to this IoT Workbench. Built around the RP2040 microcontroller, it features a dual-core ARM Cortex-M0+ processor and 2.4GHz Wi-Fi connectivity. This tiny but mighty board is perfect for projects requiring a small footprint and wireless communication, such as sensor networks, wearable devices, and smart home applications.

Arduino Pro Micro

The Arduino Pro Micro 5V 16M is a compact and versatile microcontroller development board that brings the power of the ATmega32U4 microcontroller to your IoT Workbench. Designed for projects requiring a small form factor and USB connectivity, this board is an excellent choice for hobbyists, students, and professionals alike. Its integration of USB functionality directly into the microcontroller eliminates the need for an external USB-to-serial converter, making it ideal for projects where space and efficiency are critical.

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com

Main Highlighting Features of 53000-IoT Workbench

- Beginner-Friendly & Versatile: IoT Workbench offers a range of development kits and boards designed for ease of use, making them ideal for beginners and professionals alike. The platform is supported by a large community, ensuring ample resources for learning and troubleshooting.
- Connectivity & Performance: Equipped with Wi-Fi and Bluetooth-enabled microcontrollers, IoT Workbench provides cost-effective, high-performance, and energy-efficient solutions for IoT applications .
- comprehensive Learning Resources: The platform includes extensive tutorials and resources to facilitate hands-on learning, enabling users to build and prototype IoT solutions quickly.
- Modular & Scalable: IoT Workbench integrates a modular approach with Grove sensors, streamlining IoT prototyping through plug-and-play components that simplify hardware
- integration.
- End-to-End IoT Ecosystem: Beyond hardware, IoT Workbench offers an end-to-end IoT platform, including connectivity, device management, and cloud integration for seamless deployment.
- Cloud & AI Integration: By leveraging the power of Azure IoT Cloud, IoT Workbench enables seamless data processing and real-time analytics. Additionally, its AI-powered edge computing capabilities makeit ideal for advanced IoT applications.
- Industrial & Consumer Applications: Whether for industrial automation or consumer IoT projects, IoT Workbench provides high-performance development kits tailored to diverse needs.
- Cost-Effective & Flexible: Designed for both hobbyists and professionals, IoT Workbench delivers modular IoT solutions that balance affordability with powerful functionality.
- Robust Sensor & Hardware Technology: With a strong foundation in sensor technology and hardware development, IoT Workbench ensures reliable performance across various IoT environments.

List of Experiments

1. Experiments for IoT Workbench
2. Blinking the Onboard LED of ESP32-S3 and Raspberry Pi Pico W
3. Learn basic GPIO control by blinking the built-in LEDs on both microcontrollers.
4. Interfacing the LM35 Temperature Sensor with ESP32-S3
5. Measure ambient temperature and display it on the serial monitor.
6. Dual-Core Processing on ESP32-S3
7. Explore multitasking by running two independent tasks on the dual-core processor.
8. Controlling WS2812 RGB LED Matrix with Raspberry Pi Pico W
9. Create dynamic lighting patterns using the 5x5 RGB LED matrix.
10. Interfacing the MCP4725 DAC with Raspberry Pi 4
11. Generate analog signals using the I2C DAC module.
12. Reading Analog Signals with ADS1115 16-Bit ADC
13. Measure precise analog inputs using the ADS1115 module.
14. Creating a Web Server on Raspberry Pi 4
15. Host a simple web server to control GPIO pins remotely.
16. Bluetooth Communication Between ESP32-S3 and Mobile Phone
17. Send and receive data over Bluetooth using the ESP32-S3.
18. Interfacing the 20x4 LCD Display with I2C
19. Display sensor data or system information on the LCD.
20. OLED Display with ESP32-S3
21. Show text, graphics, and sensor readings on the Waveshare OLED display.
22. Fingerprint Authentication with R307 Sensor
23. Implement a fingerprint-based security system using the R307 module.
24. RFID-Based Access Control with Rc522
25. Use RFID cards and tags to create an access control system.
26. Stepper Motor Control with ULN2003A and 28BYJ-48
27. Control the stepper motor using the ULN2003A driver.
28. Servo Motor Control with Raspberry Pi Pico W
29. Use the SG90 servo motor for precise angle control.
30. Interfacing the HX711 Weight Sensor

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com

31. Measure weight using the HX711 module and a load cell.
32. Real-Time Clock (RTC) with Ds3231
33. Implement a precise clock using the DS3231 module.
34. Human Motion Detection with HLK-LD2420 Radar Sensor
35. Detect human presence using the 24GHz radar sensor.
36. Interfacing the MAX7219 LED Dot Matrix
37. Display scrolling text and patterns on the 4-in-1 LED matrix.
38. Sound Detection with Sound Sensor Module
39. Detect sound levels and trigger actions based on thresholds.
40. MP3 Playback with DFPlayer Mini
41. Play audio files using the DFPlayer Mini module.
42. Interfacing the pH Sensor for Water Quality Monitoring
43. Measure pH levels using the analog pH sensor kit.
44. TDS Sensor for Water Conductivity Measurement
45. Monitor water quality using the TDS sensor module.
46. Waveform Generation with AD9833 DDS Module
47. Generate sine, square, and triangle waves using the AD9833 module.
48. Interfacing the MAX6675 Thermocouple Sensor
49. Measure high temperatures using the K-type thermocouple.
50. Current and Power Monitoring with INA219
51. Measure current, voltage, and power consumption using the INA219 module.
52. Interfacing the PS2 Joystick Module
53. Use the joystick to control motors or other peripherals.
54. Interfacing the 4x4 Keypad Matrix
55. Create a password-based system using the keypad.
56. Interfacing the NTC Thermistor for Temperature Measurement
57. Measure temperature using the 100K NTC thermistor.
58. Interfacing the A3144 Hall Effect Sensor
59. Detect magnetic fields using the Hall effect sensor.
60. Interfacing the IR Sensor for Object Detection
61. Detect objects using the infrared sensor module.
62. Interfacing the Capacitive Proximity Sensor
63. Detect nearby objects using the M12 capacitive sensor.
64. Interfacing the Dry Reed Magnetic Switch
65. Use the magnetic switch for door/window monitoring.
66. Interfacing the LDR Module for Light Sensing
67. Measure light intensity using the digital LDR module.
68. Interfacing the Relay Module for High-Power Control
69. Control AC/DC devices using the 5V 10A relay module.
70. Interfacing the MX1508 Motor Driver
71. Control DC motors using the MX1508 dual H-bridge module.
72. Interfacing the PT Pan/Tilt Camera Platform
73. Control the 2-axis camera platform using servo motors.

IOT Board Narration

1. Raspberry Pi 4 Model-B with 8 GB RAM.
2. Raspberry Pi Pico WH.
3. WeAct Studio ESP32-S3-DevKitC-1 ESP32-S3 WiFi Bluetooth-compatible BLE 5.0 Mesh Development Board Wireless Module Micro python.
4. Pro Micro 5V 16M Mini Leonardo Microcontroller Development Board for Arduino.
5. Amazon Basics 32GB Micro SDHC Memory Card with Adapter, Upto 98MB/s, IPX6.
6. NHP 12V 5A 60W Plastic Case Single Output SMPS.
7. DC-DC Step-Down Buck Converter Power Supply Module 24V 12V 9V to 5V 5A 25W.

Note: Specifications are subject to change.

8. Mini 360 Step-Down Buck Converter Power Module.
9. WS2812 5050 5x5 Digit RGB LED Matrix.
10. MAX7219 Digital Tube Display Module Control Module.
11. MAX7219 LED Dot Matrix 4 In 1 Display with 5P Line Module.
12. LCD2004 Parallel LCD Display with IIC/I2C Interface.
13. Waveshare 2.42inch OLED Display Module, 128×64 Resolution, SPI / I2C Communication.
14. CJMCU MCP4725 I2C DAC Breakout Development Board.
15. I2C ADS1115 16 Bit ADC 4 channel Module with Programmable Gain Amplifier.
16. T Type GPIO Breakout board with 40 pin Cable and 400pt Breadboard for Raspberry Pi 3.
17. Tactile Push Button Switch 6x6x5 (Pack of 10).
18. 5V Active Electromagnetic Buzzer (Pack of 5).
19. DIP Switch 8 Way Slide Type Red - DS-08R.
20. Self-Lock Switch-KFC-8X8-A.
21. MTS-103R-Miniature Toggle Switch-3 Pin (ON-OFF-ON).
22. PS2 Joystick Module Breakout Sensor.
23. BF350 High Precision Resistance Strain Gauge / Pressure Sensor / Weighing Sensor.
24. 10k Sliding Adjustable Linear Potentiometer.
25. LM35 TO-92-3 Board Mount Temperature Sensors.
26. A3144 Hall Effect Sensor Module.
27. Correlation Photoelectric Infrared Count Slot Sensor Module 10 mm.
28. CRJ-A12-5ANB NPN M12 Pro-Range Capacitive Proximity Sensor Detection Distance(5mm).
29. Dry Reed Pipe Magnetron Magnetic Switch Module.
30. ULN2003A Driver Module Stepper Motor Driver.
31. 28BYJ-48 Stepper Motor DC 5V.
32. MX1508 Dual H Bridge DC PWM Stepper Motor Driver.
33. Techtonics Servo bracket PT pan/tilt camera platform 2-Axis FPV for SG90 MG90.
34. Transparent 830 Points Solderless Breadboard.
35. R307 Optical Fingerprint Reader Sensor Module.
36. RFID Reader/Writer RC522 SPI S50 with RFID Card and Tag.
37. 5V 10A Relay Module.
38. NTC MF52 100K ohm 3950 Thermistor 1% (Pack of 5).
39. Sound Detection Module Sensor for Intelligent Vehicle Compatible with Arduino.
40. DFRobot DFPlayer -A Mini MP3 Player.
41. DS3231 RTC Module Precise Real Time Clock I2C AT24C32 without cell.
42. HX711 Dual-Channel 24 Bit Precision A/D weight Pressure Sensor.
43. Digital LDR Module.
44. CJMCU-219 INA219 I2C Interface No Drift Bi-directional Current / Power Supply Monitoring Module.
45. Walk On Air USB Type-C Breakout Female Connector (Receptacle) | 6 Pin USB C Female Socket to 2.54mm Breakout Board | Type C PCB Development Board (Pack of2).
46. Amazon Brand - Solimo Fast Charging Braided Type C Data Cable Joint, Suitable For All Supported Mobile Phones (1 Meter, Black).
47. USB TYPE C Male Plug Soldering Connector PCB Board.
48. PD65W Fast Charging Adapter Module Dc5521.
49. Multipurpose PCB Ruler Engineering Measuring Tool-1Pcs.
50. DC JACK-005.
51. PD65W Fast Charging Adapter Module Mini Board.
52. Digitek (DCR-007) USB-A 3.0 & Type C High-Speed Multi-Card Reader Supports All Standard SD/SDHC/SDXC and Micro SD/Micro SDHC/Micro SDXC Cards.
53. Hi-Link HLK-LD2420 24Ghz Human Body Micro Motion Sensing Detection Radar Sensor Module HLK-LD2410.
54. MCU-3221 INA3221 Three Way I2C Output Current Power Monitor.
55. NA226 IIC Interface Bidirectional Current Power Monitoring Sensor.
56. GY-9833 AD9833 Programmable DDS Signal Waveform Generator.

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com

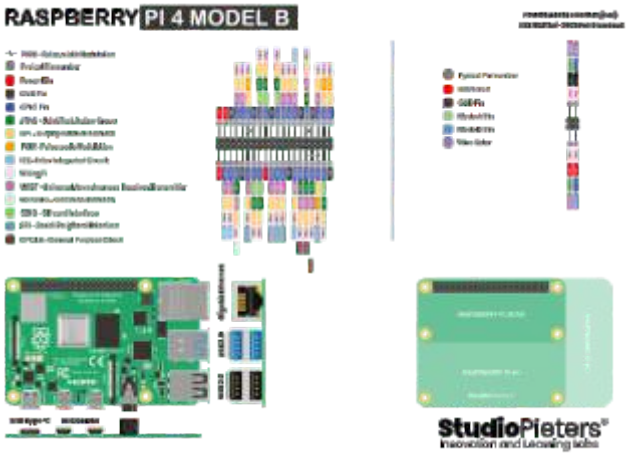
57. MAX6675 Module+K Type Thermocouple Sensor Measure.
58. xcluma Analog pH Sensor Electrode Kit with Amplifier Circuit.
59. Techtonics Analog TDS Water Conductivity Sensor Module, 0~1000ppm Water Quality Monitoring TDS Meter Board.
60. Robodo TB6600 Stepper Motor Driver Controller 4A 9~42V TTL 16 Micro-Step CNC 1 Axis.
61. PC System (High Performance Computing System) with Windows 7, 8, 8.1 or 10 with 32- or 64-bit Operating System.
62. DSO

Accessories

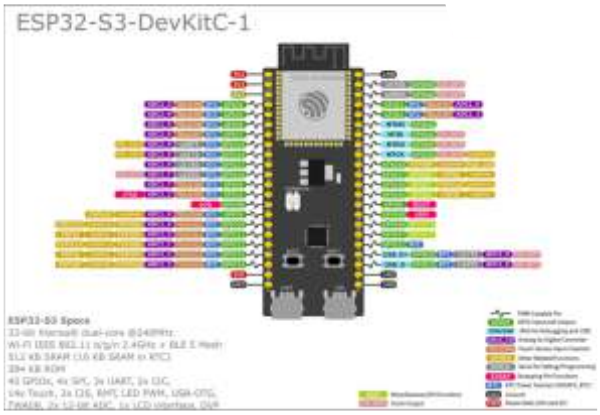
1. MicroSD card with programs and software for raspberry pi
2. Mains Lead.
3. Operating Instruction Manual.
4. Data Cable

Microcontrollers

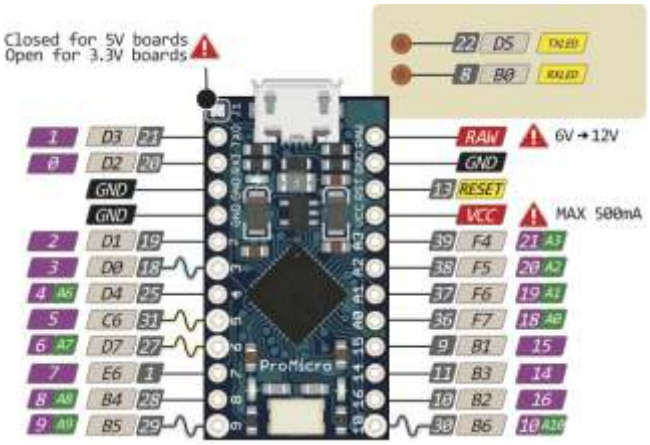
Respberry Pi



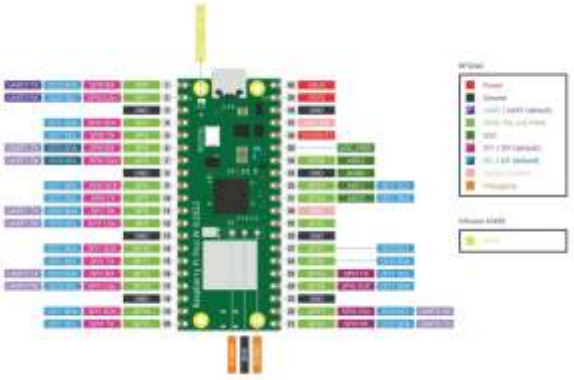
ESP-32



Arduino Pro Micro



Raspberry Pi Pico W



Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com

Technical Specification		
Name of Components	**Specifications**	**Common Applications**
Raspberry Pi 4 Model-B	64-bit Quad-Core Cortex-A72 @ 1.5GHz, 8GB LPDDR4 RAM	IoT, Robotics, AI, Embedded Systems, Computing
Raspberry Pi Pico WH	RP2040 dual-core processor, Wireless connectivity	Embedded Systems, Prototyping
WeAct Studio ESP32-S3-DevKitC-1	-	IoT, Wireless Projects
Pro Micro 5V 16M	-	DIY Electronics, USB Projects
Sensor Type	-	Common Applications
Card Reader	-	Data Transfer
GPIO Breakout Board	Compatible with Raspberry Pi 3/4	GPIO Expansion
Raspberry Pi PoE HAT	Supports IEEE 802.3af/802.3at PoE	Power over Ethernet Supply
Amazon Basics 32GB MicroSDHC Memory Card	Up to 98MB/s, IPX6	Data Storage for Raspberry Pi
NHP 12V 5A 60W Plastic Case SMPS	Single Output	Power Supply for Electronics
DC-DC Step-Down Buck Converter	24V 12V 9V to 5V 5A 25W	Voltage Regulation
Mini 360 Step-Down Buck Converter	Compact Module	Voltage Regulation for Prototyping
WS2812 5050 5x5 Digit RGB LED Matrix	Addressable RGB LEDs	Lighting, Displays
LCD2004 Display with I2C	20x4 LCD Display	Text Output for Projects
MAX7219 Digital Tube Display Module	LED Dot Matrix Control	Display Applications
Waveshare 2.42-inch OLED Display	128×64 Resolution, SPI / I2C Communication	Small Display for IoT Devices
CJMCU MCP4725 DAC Module	I2C, 12-bit DAC	Analog Output for Microcontrollers
I2C ADS1115 16-bit ADC Module	4-channel ADC with PGA	Sensor Data Acquisition
T Type GPIO Breakout Board	40-pin Cable & Breadboard	GPIO Expansion for Raspberry Pi
Tactile Push Button Switch	6x6x5 (Pack of 10)	Manual Input for Circuits
5V Active Electromagnetic Buzzer	Pack of 5	Audio Alerts & Alarms
DIP Switch 8 Way Slide Type	DS-08R	Configurable Switching for Circuits
Self Lock Switch	KFC-8X8-A	Toggle Switch for On/Off Applications
PS2 Joystick Module	Analog Joystick	Robotics, Game Controllers
BF350 Strain Gauge Sensor	High Precision	Weight & Pressure Measurement
LM35 Temperature Sensor	TO-92-3 Package	Temperature Sensing
ULN2003A Driver Module	Stepper Motor Driver	Motor Control
MX1508 H-Bridge DC Motor Driver	PWM Control	Stepper & DC Motors
R307 Optical Fingerprint Sensor	Biometric Sensor	Security & Authentication
RFID Reader/Writer RC522	SPI, S50 RFID Card	Contactless Authentication
DS3231 RTC Module	I2C, AT24C32 without Cell	Real-Time Clock for Projects
HX711 Load Cell Amplifier	24-bit ADC	Weight Measurement
Digital LDR Module	Light Detection	Light Sensing & Automation
CJMCU-219 INA219 Power Monitoring	Bi-directional Current/Power Monitoring	Power Management
MAX6675 Thermocouple Module	K-Type Sensor	Temperature Measurement
xcluma Analog pH Sensor	With Amplifier Circuit	Water Quality Monitoring
Techtonics Analog TDS Sensor	0-1000ppm Conductivity Measurement	Water Quality Testing
Robodo TB6600 Stepper Driver	4A, 9-42V, 16 Micro-Step	CNC Motor Control

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com

Cloud Details

1. ThinkPad Cloud
2. Microsoft Azure Cloud
3. AWS Cloud
4. IBM Cloud

Title: "Empowering IoT Development with ThinkPad, Azure, AWS, and IBM Cloud"

Tagline: "Innovative solutions for a smarter connected future."

Visuals: Include images of IoT devices, cloud infrastructure, and a ThinkPad laptop.

A. ThinkPad for IoT Development

- **Key Features**:
  - Powerful performance for IoT coding and prototyping.
  - Compatibility with development tools (Docker, VirtualBox, Node-RED, etc.).
  - Portability for on-site testing and debugging.

- **Role in IoT**:
  - Edge device configuration.
  - Development of IoT applications.
  - Running lightweight simulations locally.

B. Microsoft Azure for IoT

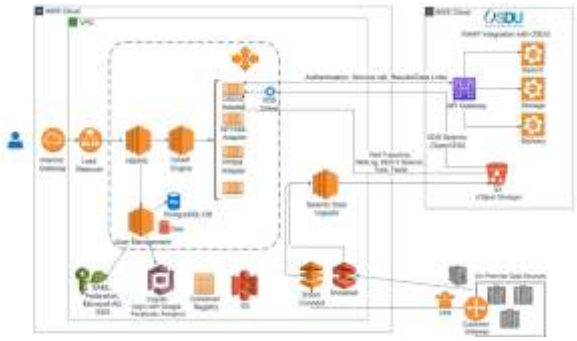
- **Key Features**:
  - **IoT Hub**: Secure device-to-cloud communication.
  - **IoT Edge**: Cloud intelligence on local devices.
  - **Stream Analytics**: Real-time processing of IoT data.

- **Use Cases**:
  - Smart cities (e.g., traffic management).
  - Predictive maintenance in manufacturing.

C. AWS for IoT

- **Key Features**:
  - **IoT Core**: Scalable device connectivity and data routing.
  - **AWS Greengrass**: Local data processing and edge computing.
  - **SageMaker**: AI/ML for IoT data insights.

- **Use Cases**:
  - Connected healthcare.



  - Supply chain optimization.

D. IBM Cloud for IoT

- **Key Features**:
  - **Watson IoT Platform**: Device management and advanced analytics.
  - **Watson AI**: AI-powered insights and automation.
  - **Blockchain in IoT**: Ensures security and transparency in IoT ecosystems.

- **Use Cases**:
  - Autonomous vehicles.
  - Energy management systems.

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com

Benefits of Using All Components Together

- **Seamless Integration**: ThinkPad for development and Azure, AWS, or IBM Cloud for deployment and scalability.
- **Efficiency**: Real-time insights and edge computing reduce latency.
- **Scalability**: Cloud services ensure your IoT solutions grow with your business.
- **Security**: Industry-grade encryption and secure communication.

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension, Jaipur-302022, Rajasthan, India,
Mob./Whatsapp: +91-9829132777; Email: info@tesca.in, Website: www.tescaglobal.com