Energy-efficient **ESP32-based** Industrial Automation Controller

**Moduino** is a lightweight, but powerful energy-efficient and fully capable automation controller series - an industrial computer for remote data control and management, equipped with latest ESP32 compute module, wide range of serial, digital and analog inputs/outputs and wireless communication interfaces.

This cost effective solution is perfect for end-point devices. Moduino is powered by **ultra-low power Dual-Core Tensilica LX6 240 MHz** processor with 8MB pSRAM and up to 16MB SPI flash memory on-board. Integrated Wi-Fi/Bluetooth modem and extra wireline/wireless interfaces make the Moduino microcomputer a versatile addition to Industrial IoT solutions offered by TECHBASE company.

Moduino devices can easily work remotely with existing **ModBerry gateway** for data accumulation and monitoring, to perform specific actions before sending the data to cloud services. The Moduino-ModBerry installation can work as standalone Ecosystem (for example via MQTT), providing fog-computing to any installation.

**END-POINT SENSORS**

The Moduino device is a comprehensive end-point controller for variety of sensors located throughout any installation. It fully supports temperature and humidity sensors and new ones are currently developed, e.g. accelerometer, gyroscope, magnetometer, etc.

**SOFTWARE & OS**

Use of ESP32-WROVER compute module adds the support for **real-time operating systems** (compared to most Raspberry Pi based Linux and Windows OS versions), and openness of the Espressif’s platform to Moduino industrial automation controller. Thanks to enormous community of ESP32 and Arduino users and developers, the Moduino can now adapt existing software solutions, tools and programming environments, for example:

- MicroPython
- Arduino (C++)
- ESP-IDF (Espressif IoT Development Framework)
- Zephyr Project (scalable RTOS)
- Mongoose OS
- etc.

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**ESP32 MODULE**

Energy-efficient compute module with real-time OS support incl. Zephyr Project, MicroPython, Arduino, etc.

**BATTERY POWERED**

Moduino X0 can be battery powered, making it perfect for remote installations and scattered objects monitoring

**WIRELESS COMMUNICATION**

Optional SMA antenna connectors allows the Moduino device to increase the effective range of Wi-Fi / Bluetooth module and additional communication interfaces, e.g. LoRa, Sigfox, NarrowBand-IoT & more

**END-POINT SENSORS**

Full support of temperature, humidity, pressure, accelerometer & light sensors with new ones in development, e.g. gyroscope, magnetometer, etc.

**SMALL SIZE**

Dimensions of the device allows the use in limited space and difficult industrial environments.
CONFIGURATION

WIRELESS COMMUNICATION

- LoRa
- Sigfox
- GPRS/GPRS + GPS
- LTE/LTE+GPS
- LTE-NarrowBand-IoT
- WMBus 169/868MHz
- Z-Wave READY
- ZigBee

SCREEN

- OLED 0.96" 128x64

I/O EXTENSIONS

- CAN
- mBus 10
- ExCARD RS-232/485
- ExCARD 8xDIO
- ExCARD 8x AI
- ExCARD 4xAI-PRO 24bit
- ExCARD 12/8/4xAO
- ExCARD 4xAO-PRO 16bit
- ExCARD 4x Relay
- ExCARD 1x Ethernet
- DIO opto-isolation
- Accelerometer

BATTERY

- Battery Ready
- Battery up to 3 years
- UPS Supercap 1-15 min
- UPS Li-Po 1-2 days

CASING

- ABS ALUMINUM
- IP65-IP67 SEALED

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**SPECIFICATION**

**COST-EFFECTIVE & WIRELESS INDUSTRIAL IoT**

**Moduino X0**

**Chipset:** ESP32-WROVER-B

**Processor:** Dual-Core Tensilica LX6 240 MHz, RTC

**RAM:** 8 MB pSRAM

**Flash:** 4 / 8 / 16 MB SPI

**SD card:**

**Inputs:**
- 2x DI (surge protection: 30VDC) or 2x AI (0 ~ 10VDC)

**Outputs:**
- 2x DO Open Collector (surge protection: 30VDC) max. Current 500mA, peak min. 600W

**Ethernet:** 1x Ethernet 10/100 Mbps (optional)

**CAN:** -

**USB:** -

**Battery power support** (optional)

**Display:** OLED 0.96” 128x64 (optional)

**Power supply:** 6~30 V DC (depending on configuration)

**Casing:** ABS (default) or Aluminum (optional), DIN rail mount

**Working cond.:** -40 ~ 70°C, humidity 5 ~ 95% RH (no condensation)

**Dimensions:** ABS (2M): 90 x 36 x 32 mm (LxWxH) |
| Aluminum: 95 x 37 x 41 mm (LxWxH) |

**Wi-Fi:** 802.11b/g/n 16mbps

**Bluetooth:** Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)

**WMBus (optional):** Wireless M-Bus 868 MHz and 169MHz band

**LoRa (optional):** Semtech LoRa transceiver SX1272, LoRaWAN stack, Class A and C devices

**Sigfox (optional):** TI CC1125 Narrowband Transceiver, Class 0 devices, Sigfox pre-certified (January 2017)

**LTE (optional):** Narrowband LTE UE categories M1/NB1, 34 bands supported from 699Mhz to 2690Mhz (Total worldwide support)

**ZigBee (optional):** Compatible with IEEE 802.15.4, ZigBee 2007 / PRO

**Ext. antenna:** SMA female antenna connectors (optional)

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**Moduino X1**

**Chipset:** ESP32-WROVER-B

**Processor:** Dual-Core Tensilica LX6 240 MHz, RTC

**RAM:** 8 MB pSRAM

**Flash:** 4 / 8 / 16 MB SPI

**SD card:**

**Inputs:**
- 2x DI (surge protection: 30VDC) or 2x AI (0 ~ 10VDC)

**Outputs:**
- 2x DO Open Collector (surge protection: 30VDC) max. Current 500mA, peak min. 600W

**Ethernet:** 1x Ethernet 10/100 Mbps (optional)

**CAN:** -

**USB:** -

**Battery power support** (optional)

**Display:** OLED 0.96” 128x64 (optional)

**Power supply:** 6~30 V DC (depending on configuration)

**Casing:** ABS (default) or Aluminum (optional), DIN rail mount

**Working cond.:** -40 ~ 70°C, humidity 5 ~ 95% RH (no condensation)

**Dimensions:** ABS (2M): 90 x 36 x 32 mm (LxWxH) |
| Aluminum: 95 x 37 x 41 mm (LxWxH) |

**Wi-Fi:** 802.11b/g/n 16mbps

**Bluetooth:** Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)

**WMBus (optional):** Wireless M-Bus 868 MHz and 169MHz band

**LoRa (optional):** Semtech LoRa transceiver SX1272, LoRaWAN stack, Class A and C devices

**Sigfox (optional):** TI CC1125 Narrowband Transceiver, Class 0 devices, Sigfox pre-certified (January 2017)

**LTE (optional):** Narrowband LTE UE categories M1/NB1, 34 bands supported from 699Mhz to 2690Mhz (Total worldwide support)

**ZigBee (optional):** Compatible with IEEE 802.15.4, ZigBee 2007 / PRO

**Ext. antenna:** SMA female antenna connectors (optional)

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**Moduino X2**

**Chipset:** ESP32-WROVER-B

**Processor:** Dual-Core Tensilica LX6 240 MHz, RTC

**RAM:** 8 MB pSRAM

**Flash:** 4 / 8 / 16 MB SPI

**SD card:** microSD slot (optional)

**Inputs:**
- 2x DI (surge protection: 30VDC) or 2x AI (0 ~ 10VDC)

**Outputs:**
- 2x DI (surge protection: 30VDC) or 2x AI (0 ~ 10VDC)

**Ethernet:** 1x Ethernet 10/100 Mbps (optional)

**CAN:** 1x (default)

**USB:** 1x microUSB 2.0 (optional)

**Battery power support** (optional)

**Display:** OLED 0.96” 128x64 (optional)

**Power supply:** 6~30 V DC (depending on configuration)

**Casing:** ABS or Aluminum (optional), DIN rail mount

**Working cond.:** -40 ~ 70°C, humidity 5 ~ 95% RH (no condensation)

**Dimensions:** ABS (2M): 90 x 36 x 32 mm (LxWxH) |
| Aluminum: 95 x 37 x 41 mm (LxWxH) |

**Wi-Fi:** 802.11b/g/n 16mbps

**Bluetooth:** Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)

**WMBus (optional):** Wireless M-Bus 868 MHz and 169MHz band

**LoRa (optional):** Semtech LoRa transceiver SX1272, LoRaWAN stack, Class A and C devices

**Sigfox (optional):** TI CC1125 Narrowband Transceiver, Class 0 devices, Sigfox pre-certified (January 2017)

**LTE (optional):** Narrowband LTE UE categories M1/NB1, 34 bands supported from 699Mhz to 2690Mhz (Total worldwide support)

**ZigBee (optional):** Compatible with IEEE 802.15.4, ZigBee 2007 / PRO

**Ext. antenna:** SMA female antenna connectors (optional)

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### SPECIFICATION

**Cost-Effective & Wireless Industrial IoT**

#### Moduino X3
- **Chipset:** ESP32-WROVER-B
- **Processor:** Dual-Core Tensilica LX6 240 MHz, RTC
- **RAM:** 8 MB pSRAM
- **Flash:** 4 / 8 / 16 MB SPI
- **SD card:** microSD slot (optional)
- **RS-232/485:** 1x RS-232/485
- **Inputs:** 2x DI (surge protection: 30VDC) or 2x AI (0 ~ 10VDC)
- **Outputs:** 2x DO Open Collector (surge protection: 30VDC) max. 500mA, peak min. 600W or 2x AO 10bit
- **Ethernet:** 1x Ethernet 10/100 Mbps (optional)
- **CAN:** -
- **USB:** -
- **Power:** 802.11b/g/n 16mbps
- **Bluetooth:** Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)
- **WMBus (optional):** Wireless M-Bus 868 MHz and 169MHz band
- **LoRa (optional):** Semtech LoRa transceiver SX1272, LoRaWAN stack, Class A and C devices
- **Sigfox (optional):** TI CC1125 Narrowband Transceiver, Class 0 devices, Sigfox pre-certified (January 2017)
- **LTE (optional):** Narrowband LTE UE categories M1/NB1, 34 bands supported from 699Mhz to 2690Mhz (Total worldwide support)
- **ZigBee (optional):** Compatible with IEEE 802.15.4, ZigBee 2007 / PRO
- **Ext. antenna:** SMA female antenna connectors (optional)

#### Moduino X4
- **Chipset:** ESP32-WROVER-B
- **Processor:** Dual-Core Tensilica LX6 240 MHz, RTC
- **RAM:** 8 MB pSRAM
- **Flash:** 4 / 8 / 16 MB SPI
- **SD card:** microSD slot (optional)
- **RS-232/485:** 1x RS-232/485 (optional)
- **Inputs:** 2x AI (0 ~ 10VDC) or 2x DI (0 ~ 10VDC) or 2x AI (0 ~ 10VDC)
- **Outputs:** 3x DO Open Collector + 2x DO (optional) (s.p.: 30VDC), max. 500mA, peak min. 600W
- **Ethernet:** 1x Ethernet 10/100 Mbps (optional)
- **CAN:** -
- **USB:** -
- **Power:** 802.11b/g/n 16mbps
- **Bluetooth:** Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)
- **WMBus (optional):** Wireless M-Bus 868 MHz and 169MHz band
- **LoRa (optional):** Semtech LoRa transceiver SX1272, LoRaWAN stack, Class A and C devices
- **Sigfox (optional):** TI CC1125 Narrowband Transceiver, Class 0 devices, Sigfox pre-certified (January 2017)
- **LTE (optional):** Narrowband LTE UE categories M1/NB1, 34 bands supported from 699Mhz to 2690Mhz (Total worldwide support)
- **ZigBee (optional):** Compatible with IEEE 802.15.4, ZigBee 2007 / PRO
- **Ext. antenna:** SMA female antenna connectors (optional)

#### Moduino X7
- **Chipset:** ESP32-WROVER-B
- **Processor:** Dual-Core Tensilica LX6 240 MHz, RTC
- **RAM:** 8 MB pSRAM
- **Flash:** 4 / 8 / 16 MB SPI
- **SD card:** microSD slot (optional)
- **RS-232/485:** 1x RS-232/485 (optional)
- **Inputs:** 4x AI (0 ~ 10VDC) or 2x AI (0 ~ 10VDC)
- **Outputs:** 3x DO Open Collector + 2x DO (optional) (s.p.: 30VDC), max. 500mA, peak min. 600W
- **Ethernet:** 1x Ethernet 10/100 Mbps (optional)
- **CAN:** -
- **USB:** -
- **Power:** 802.11b/g/n 16mbps
- **Bluetooth:** Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)
- **WMBus (optional):** Wireless M-Bus 868 MHz and 169MHz band
- **LoRa (optional):** Semtech LoRa transceiver SX1272, LoRaWAN stack, Class A and C devices
- **Sigfox (optional):** TI CC1125 Narrowband Transceiver, Class 0 devices, Sigfox pre-certified (January 2017)
- **LTE (optional):** Narrowband LTE UE categories M1/NB1, 34 bands supported from 699Mhz to 2690Mhz (Total worldwide support)
- **ZigBee (optional):** Compatible with IEEE 802.15.4, ZigBee 2007 / PRO
- **Ext. antenna:** SMA female antenna connectors (optional)

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