

Andino X1: Industrial Raspberry Pi PC

Overview, Variants, Accessories

Shop – <u>https://andino.shop/</u> Products – <u>https://andino.systems/</u>

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Andino X1 – Overview



Overview

The Andino X1 is a microcontroller board for the Raspberry Pi in a DIN rail housing, e.g. for mounting in the control cabinet in an industrial environment. It is used to adapt digital inputs and outputs for a voltage of 24 volts. The X1 has its own Arduino-compatible microcontroller for precise signal preprocessing and adaptation of signal generators and actuators.

Additionally, it accommodates a Raspberry Pi (3B+/4). With the Andino X1, all relevant interfaces of the Pi are protected to meet the requirements for robust use, according to the relevant standards. The digital inputs and outputs are galvanically isolated and protect the Pi from voltage peaks up to 5 kV. For this purpose, the power supply has been designed to filter out interference signals and voltage spikes.

Contents of Delivery

- Andino X1 with ATMega 328 microcontroller & Arduino compatible bootloader
- Raspberry Pi 3B+/4
- Breadboard
- High quality DIN rail housing

Features

- Arduino compatibility. Programmable via PC or from Raspberry Pi via /dev/ttyAMA0.
- Time critical signal measurement by signal preprocessing in the controller
- Protection of the Pi GPIO interfaces: Filtering of interfering signals and voltage peaks
- Versatile software resources (Node-Red & Python library)
- DIN rail & 24V power allow installation in control cabinets
- Industrial power supply
- Galvanic isolation of the Raspberry Pi GPIOs transferred to protected terminals
- RTC (Real-Time Clock)

Andino X1 – Overview

Raspberry Pi compatible

The 40-pin connector is compatible with a Raspberry Pi 3B+/4, allowing easy data processing with our specially developed software, Python libraries and Node Red nodes. In addition, since all our software is based on Raspberry Pi OS, you can choose from a variety of other software developed for the Raspberry Pi or Debian.

Arduino compatible

The Atmel ATMega328 microcontroller of the Andino X1 comes with an Arduino compatible bootloader. The combination of the Arduino and Raspberry Pi on the Andino X1 is perfectly suited for use in home automation and sensor technology as well as in more demanding industrial automation applications. The strengths of both boards complement each other perfectly. While the Raspberry Pi single-board computer can take on complex tasks as a full-fledged computer (e.g. hosting databases and web servers), the Arduino microcontroller can take care of fast signal preprocessing. The Atmel controller communicates with the Pi via UART. The X1 is programmable with the Arduino IDE via USB from a PC or from a Raspberry. The microcontroller comes with pre-installed firmware that enables communication with applications on the Raspberry Pi and other devices.

Integrated Power Supply

The X1 board has a 9 - 24 V wide range DC input with reverse polarity protection. Powerful, reliable, stable power supply: 5 volts, 2.6 amps – enough power for the Raspberry, your USB hardware and custom adaptation. Built-in EMC protection circuits protect the Pi from voltage spikes and power surges on the supply line.

Galvanic Isolation

The X1 board has two galvanically isolated inputs (isolated up to 5kV) and two relay outputs for 42 Volt and 1 Ampere. The IO are controlled by a microcontroller. Further GPIO of the Raspberry Pi as well as IO of the microcontroller are led on an internal pin header. Thus it is possible to bring own adaptations on the screw terminals.

Expandable

Via the SPI and the I2C interface of the Raspberry Pi further hardware extensions can be connected and routed to the free screw terminals. Thus, wiring conforming to industrial standards is possible. Products with corresponding extensions (4G modem, CAN bus, LoRa-WAN modem and many more) are also available.

Real Time Clock (RTC)

The integrated, battery-buffered RTC provides the correct time even if no NTP (time) server is available. The high precision time chip DS3231 from Dallas Semiconductors is used. Due to the internal temperature compensation of the oscillator, the chip achieves a very high accuracy of ± 2 ppm at 0°C to ± 40 °C.

Andino X1 – Overview

Tested Standards – EMC

The Andino X1 was tested together with a Raspberry Pi in its DIN rail housing for its electromagnetic compatibility (EMC).

The tests included immunity to static electricity discharge, high-frequency electromagnetic fields, fast transient electrical disturbances (burst), surge voltages, conducted disturbances – induced by high-frequency fields, and magnetic fields with energy-related frequencies.

The Andino X1 not only passed these tests, but also met the more stringent limit in each case. This underlines its industrial suitability and brings the Raspberry Pi into the industrial environment.

More Information: <u>https://andino.systems/andino-x1</u>







Andino X1: Open with Raspberry Pi



Andino X1: Open with Raspberry Pi and Breadboard



Andino X1: Block Diagram



Andino X1: Pins A-E for Extensions and own wiring setups

Andino X1 – Variants

Andino X1: Industrial Raspberry Pi PC with RS485/RS422, Arduino compatible

RS485/RS422

This version includes a fully isolated RS485 / RS422 interface. The interface can be controlled by the Raspberry Pi as well as by the Arduino controller.

Andino X1: Industrial Raspberry Pi PC with 2x RS232, Arduino compatible

2x RS232

The Dual-Channel RS232 extension adds two RS232 interfaces to the Andino X1, which can be controlled via the Raspberry Pi, as well as the Arduino controller.

Andino X1: Industrial Raspberry Pi PC with 7 digital inputs, Arduino compatible

7 Inputs

This variant of the Andino X1 contains an extension that increases the number of digital inputs from 2 to 7 and thus allows the connection of several devices or sensors. It is also possible here to operate DS18B20 temperature sensors using our ready-made software.

Andino X1: Industrial Raspberry Pi PC with CAN Bus, Arduino compatible

CAN Bus

The CAN extension of this variant of the Andino X1 allows the integration of devices via a CAN bus. The interface can be controlled via the Raspberry Pi.



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	$\tilde{\otimes}$	→ Input 4 →
	Ň	→ Input 3 → ✓
m	Ň	► Input 2
∎	Ň	→ Input 1 →
vcc [•
24 Volt	\$	



Andino X1 – Modem Variants



Andino X1: Industrial Raspberry Pi PC with 2G/EDGE Modem, Arduino compatible

2G Modem

The inclusion of a 2G modem allows the Andino X1 to send and receive SMS, as well as basic Internet connectivity at up to 220 kbit/s via EDGE.

This allows the use even far away from the existing network infrastructure: Status messages can be transmitted via SMS or read out via our Node-Red Nodes, which are specially made for the X1. Due to the versatile programming possibilities of the Andino X1 (e.g. Python), many other options for data transmission are also available.



Andino X1: Industrial Raspberry Pi PC with 4G/LTE Modem, Arduino compatible

4G Modem

The integration of a 4G modem enables fast data transmission of the Andino X1 – even far away from existing network infrastructure. This means that not only status messages can be transmitted, but also larger amounts of data from any sensors, cameras or similar can be reliably transferred.

In addition, the 4G modem allows convenient sending and receiving of SMS via our Node-Red Nodes specially made for the X1.



Andino X1 – Variants

Raspberry Pi Compute Module 4 IO Board

The Andino X1 can also be ordered with the Raspberry Pi Compute Module 4. In this case, the CM4 is delivered with the help of a specially developed IO board with otherwise identical hardware to the other Andino X1 variants. The board adapts the CM4 to the same Raspberry Pi form factor. It also allows connecting SSDs via a PCIe to M.2 adapter and thus faster boot times, higher storage capacities and a better longevity than an SD card.

The board has the following IO capabilities:

- Raspberry Pi GPIO pins
- 2x USB 2.0
- Gigabit Ethernet
- Internal USB Header
- PCI-e Gen2 X1
- Micro HDMI



Compute Module 4 IO Board



Raspberry Pi 4



CM4 IO-Board mit PCIe auf M.2 Adapter

Furthermore, the compute module itself offers the following capabilities:

- Broadcom BCM2711 quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
- H.265 (HEVC) (up to 4Kp60 decode), H.264 (up to 1080p60 decode, 1080p30 encode)
- OpenGL ES 3.0 graphics
- 1GB 8GB LPDDR4-3200 SDRAM (depending on variant)
- 0GB ("Lite") 32GB eMMC Flash memory (depending on variant)
- Optional 2.4 GHz, 5.0 GHz 802.11 b/g/n/ac wireless
- Bluetooth 5.0



Andino X1 – Technical Specifications

Andino X1 specifications:

Microcontroller type	Atmega 328P
Power Supply	In: 9-24V Power Supply / Out: 5V, 2.6A
Digital Inputs	2 Inputs galvanically isolated up to 5kV
Relay Outputs	2 Relays 24V, 1A
Custom IO	5 pins for connection to extension or other wiring setups
Real Time Clock	Dallas Semiconductors – DS3231 Accuracy: ± 2ppm between 0 °C and +40 °C
Microcontroller Programming	Via Micro-USB

Raspberry Pi 4 specifications:

SoC	Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
RAM	2GB LPDDR4-3200 SDRAM
WiFi	2.4 GHz and 5.0 GHz IEEE 802.11ac wireless
Bluetooth	Bluetooth 5.0, BLE
Ethernet	Gigabit Ethernet
Connectivity	2 USB 3.0 ports; 2 USB 2.0 ports. Raspberry Pi standard 40 pin GPIO header 2 × micro-HDMI ports (up to 4kp60) Micro-SD card slot (accessible from outside Andino housing)

Andino X1 – Technical Specifications

Raspberry Pi 3B+ specifications:

SoC	Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64- bit SoC @ 1.4GHz
RAM	1GB LPDDR2 SDRAM
WiFi	2.4GHz and 5GHz IEEE 802.11.b/g/n/ac
Bluetooth	Bluetooth 4.2, BLE
Ethernet	Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
Connectivity	4 USB 2.0 ports Full-size HDMI Extended 40-pin GPIO header 4-pole stereo output and composite video port Micro-SD card slot (accessible from outside Andino housing)

Andino SD-Cards (Accessories)

Overview

Andino SD cards are intended for use with an Andino X1, Andino IO or Andino Terminal and can be ordered as accessories. These SD cards already contain a preinstalled version of Raspberry Pi OS and include all necessary drivers to start using the Andino PC immediately. An installation of drivers or other software is therefore no longer necessary.

The SD cards are 32GB Samsung Evo+ Class 10 UHS-1 cards.

Included Drivers:

- Driver for the Real Time Clock
- Driver for UART
- Driver for CAN-Bus (only when ordering corresponding hardware)

Included Software:

- Node-Red for Raspberry Pi
- Custom Raspberry Pi Nodes & Custom Andino Nodes
- Andinopy Python Library / TCP Stack
- Several useful testing and debugging tools

More information about Andino SD cards on: https://andino.systems/home/sd-cards

Andino SD Cards – Technical Specifications

General

Туре	Micro SD
Size	32 GB

Manufacturer Details

Manufacturer	Samsung
Model	Evo+



Antenna for 2G/4G Modem (Accessories)



Overview

The 2G/4G antenna for Andino boards allows the use of the 2G/4G modems. It has a magnetic stand and a cable with a length of 1m.

Antenna for 2G/4G Modem – Technical Specifications

Frequency range	700-960Mhz / 1710-2690Mhz
Amplification (dBi)	7dBi
Polarisation vertical	Ja
Impedance	50 Ohm
Wattage	50 Watt
Cable Type	RG174
Cable Length	1m
Connector	SMA-Stecker
Directivity	Omni Directional