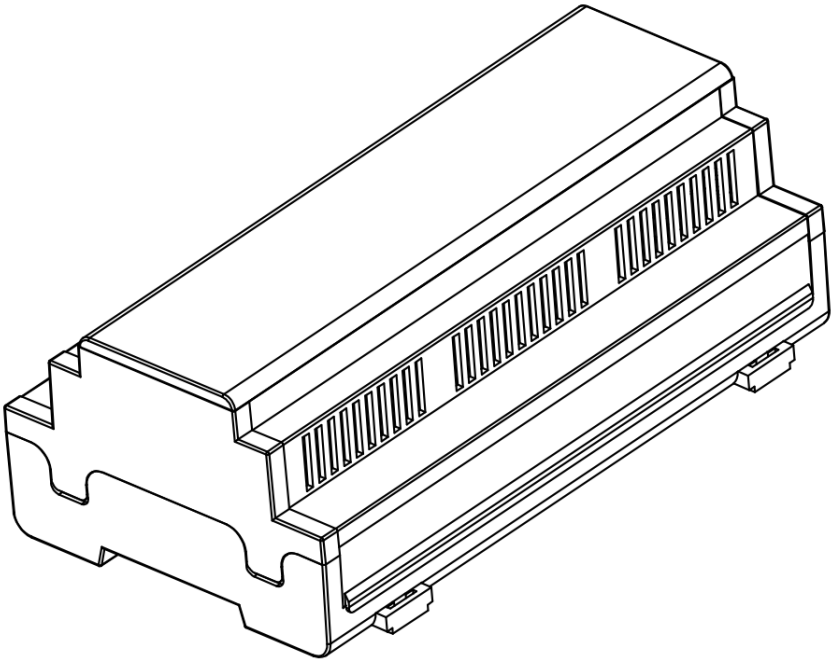
# Andino IO

## Raspberry Pi extension with RS232, RS485/422, CAN, 6 inputs

## User Manual

This manual is part of the product. It contains important information on commissioning and operation! Keep this in mind, even if you pass the product to a third party! Please keep this manual for future reference!



# Table of Contents

## Safty Instructions

The current VDE regulations must be observed for all devices which require an electrical voltage for their operation. Particularly relevant for this product are the VDE guidelines VDE 0100, VDE 0550/0551, VDE 0700, VDE 0711 and VDE 0860. Please also observe the following safety instructions:

- Do not use the Andino IO if it is damaged.
- Components do not belong in children's hands!
- When handling products that come into contact with electrical voltage, the valid VDE regulations must be observed.
- In commercial facilities, the accident prevention regulations of the Association of Professional Cooperatives for electrical installations and operating equipment must be observed.
- Components, subassemblies or devices may only be commissioned if they have previously been installed in a housing in a safe manner. During installation, they must be disconnected from the power supply.
- The product must not be dropped or subjected to strong mechanical pressure as it may be damaged by the effects.
- The unit must be protected from moisture, splashing water and heat.
- Do not operate the unit in an environment where flammable gases, vapors or dust are present.
- Devices operated with a supply voltage greater than 24 V- may only be connected by a qualified person.
- In schools, training facilities, hobby and self-help workshops, the operation of assemblies is to be supervised by trained personnel.
- If the device has to be repaired, only original spare parts may be used! The use of deviating spare parts can lead to serious damage to property and personal injury! The unit may only be repaired by an electrician!
- This device is not intended to be used by persons (including children) with limited physical, sensory or mental abilities, or lack of experience and / or lack of knowledge, unless directed or supervised by a person responsible for their safety from her instructions on how to use the device.

## Additional Information

Further information, application examples, frequently asked questions (FAQ) can be found on the product page:

***https://andino.systems***

## Product description

The Andino IO is a microcontroller board for the Raspberry Pi in a DIN-rail housing for installation in a control cabinet.

It is used to adapt digital inputs and outputs for a voltage of 24 V and contains a Raspberry Pi (3B+/4). The inputs and outputs as well as the power supply of the Pi are protected by ridged connectors.

Communication between the microcontroller and the Pi takes place via the UART interface.

The Andino IO offers the following advantages:

- The sensitive GPIO of the Raspberry Pi are protected
- Actuators and sensors can be electrically connected to the Raspberry Pi
- Industrial-grade power supply for the Raspberry Pi
- Provides mounting on a DIN rail for installation in manifolds
- Large variety of input/output options (RS232, RS875/RS422, CAN, 6 digital inputs, 3 relays)

## Intended Use

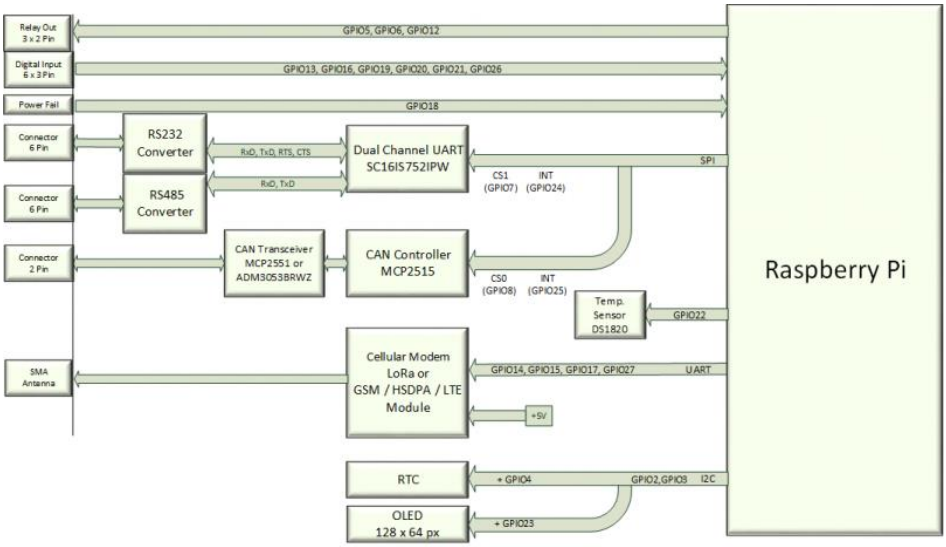
The Andino IO is designed for installation in control cabinets. The integrated voltage regulator is designed for an input voltage of max. 24 V. The housing is rated with a water resistance of IP20. The device must be protected against splash water, moisture and dust.

With a 24-volt operating voltage, the power consumption at +5 volts must not exceed 2.5 Amperes.

Any use other than specified is not permitted! Modifications can lead to damage to the product, including short circuits, fires, electric shocks, etc. The manufacturer is not responsible for any personal injuries and material damage resulting from non-intended use.

Please note that incorrect operation, connection and wiring of the device are outside our sphere of influence. Thus, we cannot accept any liability for damages resulting from this.

## Overview and schematic structure



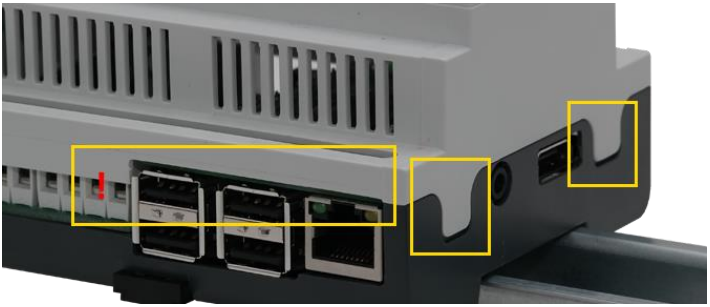

| | |
|---|---|
| Power supply | Voltage regulator with EMC protection circuit and polarity reversal protection. Power secondary +5 Volt max. 2.5 Amps! |
| Digital inputs | Galvanically isolated inputs for 24 volts. Isolated up to 5 kV. |
| Digital outputs | Relay outputs for 120VAC and 2 Ampere. |
| RTC | Real-time clock, temperature-compensated and battery-buffered. |
| Raspberry Pi | Contains a Raspberry Pi 3B+ or 4. |

## Opening the housing cover

The housing cover is held in place by four clamps. To keep the lid fastened, the clips are relatively tight. Pull the brackets one by one on one side and slightly lift the lid.

Repeat the process on the other side. Do not use force.

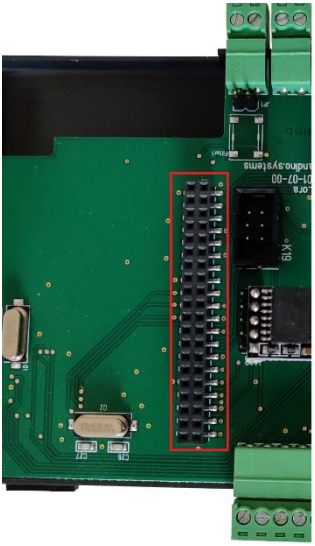
When mounting the cover, please note the cutouts. The lid must not be twisted.

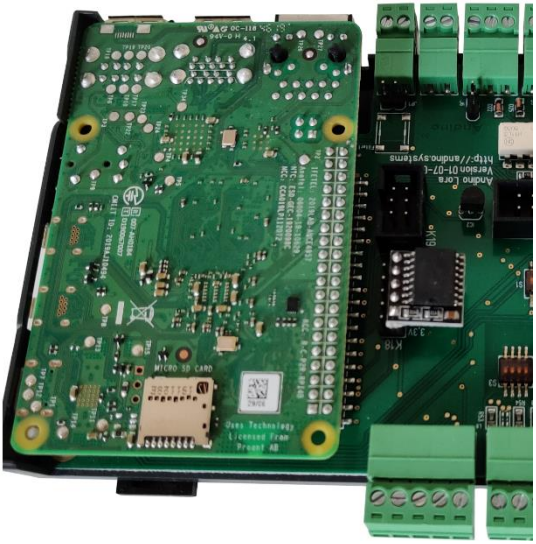


## Inserting the Raspberry Pi

The Raspberry Pi is placed upside-down, lying on the pin header. Raspberry Pi 3B+ or 4 can be used. The power supply of the Raspberry Pi is connected to the internal voltage transformer.

⚠ We recommend the use of heat sinks for the CPU and the USB hub chip of the Pi!





# How to enable SPI UART

1.) Download the SPI overlay from GitHub:

**wget https://github.com/andino-systems/Andino/raw/master/Andino-IO/BaseBoard/sc16is752-spi0-ce1.dtbo**

2.) Copy the downloaded file to */boot/overlays/*

**sudo cp sc16is752-spi0-ce1.dtbo /boot/overlays/**

3.) Change the Raspberry pi boot configuration

**sudo nano /boot/config.txt**

…add this at the end of the file..

```
# ----------------------
# Andino IO from here
# ----------------------

# SPI on
dtparam=spi=on

# I2C on
dtparam=i2c_arm=on

# RTC
dtoverlay=i2c-rtc,ds3231

# CAN on SPI 0.0
dtoverlay=mcp2515-can0,oscillator=16000000,interrupt=25

# 1. UART
enable_uart=1
dtoverlay=pi3-disable-bt-overlay
dtoverlay=pi3-miniuart-bt

# 2. SPI-UART on SPI 0.1
dtoverlay=sc16is752-spi0-ce1,int_pin=24,xtal=11059200

# DS1820 Temp sensor
dtoverlay=w1-gpio-pullup,gpiopin=22,extpullup=on
dtoverlay=w1-gpio,gpiopin=22
```

4.) Disable Console on serial0

**sudo nano /boot/cmdline.txt**

Remove “console=…”

dwc_otg.lpm_enable=0 ~~***console=serial0,115200 console=tty1***~~ root=/dev/mmcblk0p2 rootfstype=ext4 .....

5.) Reboot and test

**sudo apt-get install minicom**
**sudo minicom --setup**

```
+-----------------------------------------------------------------------+
| A - Serial Device : /dev/ttyAMA0                                      |
| B - Lockfile Location : /var/lock                                     |
| C - Callin Program :                                                  |
| D - Callout Program :                                                 |
| E - Bps/Par/Bits : 38400 8N1                                          |
| F - Hardware Flow Control : No                                        |
| G - Software Flow Control : No                                        |
|                                                                       |
| Change which setting?                                                 |
+-----------------------------------------------------------------------+
| Screen and keyboard                                                   |
| Save setup as dfl                                                     |
| Save setup as..                                                       |
| Exit                                                                  |
| Exit from Minicom                                                     |
+-----------------------------------------------------------------------+
```

set Hardware Flow to No, set Device to /dev/ttyAMA0, set BPS to 38400

## Technical specifications

| | |
|---|---|
| Operating voltage: | + 24V DC |
| Current consumption: | max. 1200 mA |
| Temperature range (operation): | +5 ... 50 ° C, max. 80% rel. Humidity (non-condensing) |
| Dimensions | (HxWxD): 58 mm x 107 mm x 95 mm |
| Weight: | 140g without Raspberry Pi<br>approx 180g with Raspberry Pi |
| Optocoupler: | 24V DC, 5 mA, 5 kV Insulating |
| Relay: | 120 VAC, 2 A |

## Tested according to standards

*Radiated field strength / conducted emissions*
**DIN EN 55022**: 2011according to **VDE 0875 part 22** of 12.2011
*Störaussendung: Klasse B (Wohnbereich) (strengere Grenzwerte)*
*Störfestigkeit: Klasse A (Industriebereich) herangezogen. (höhere Einstrahlung)*

*Immunity ESD*
**DIN EN 61000-4-2**: 2009 according to **VDE 0847 part 4-2** of 12.2009

*Immunity radiated electromagnetic fields*
**DIN EN 61000-4-3**: 2006+A1:2008+ A2: 2010 according to **VDE 0847 part 4-3** of 04.2011

*Immunity Burst*
**DIN EN 61000-4-4**: 2012 according to **VDE 0847 part 4-4** of 04.2013

*Immunity Surge*
**DIN EN 61000-4-5**: 1995 +A1: 2014 according to **VDE 0847 part 4-5** of 03.2015

*Immunity high frequent uncoupled emission*
**DIN EN 61000-4-6**: 2014 according to **VDE 0847 part 4-6** of 08.2014

*Immunity magnetic fields*
**DIN EN 61000-4-8**: 2010 according to **VDE 0847 part 4-8** of 11.2010

## Delivery

Andino IOAnleitung

## Symbols

The symbol with the exclamation mark in the triangle indicates important instructions in this manual, which must be observed. Not doing so may pose a threat to your health, e.g. by electric shock.

## Disposal

Electrical and electronic equipment, which is covered by the "ElektroG" Act, is marked with the following marking and may no longer be disposed of via the residual waste. Instead, municipal collection points (e.g. recycling facilities) can be used free of charge.

As an end user, you are obliged to return used batteries and accumulators by law. Batteries / accumulators containing pollutants are marked with the following marking. Disposal in the household garbage is prohibited.

Used batteries / rechargeable batteries can be disposed of free of charge at municipal collection points. Recycling centers or wherever batteries / accumulators are sold!

**WEEE Reg Nr: DE 21223449**