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Analog Input V1.0

6 channel analog probes, 5 – 24V or 4 – 20 mA. 5 – 24V supply
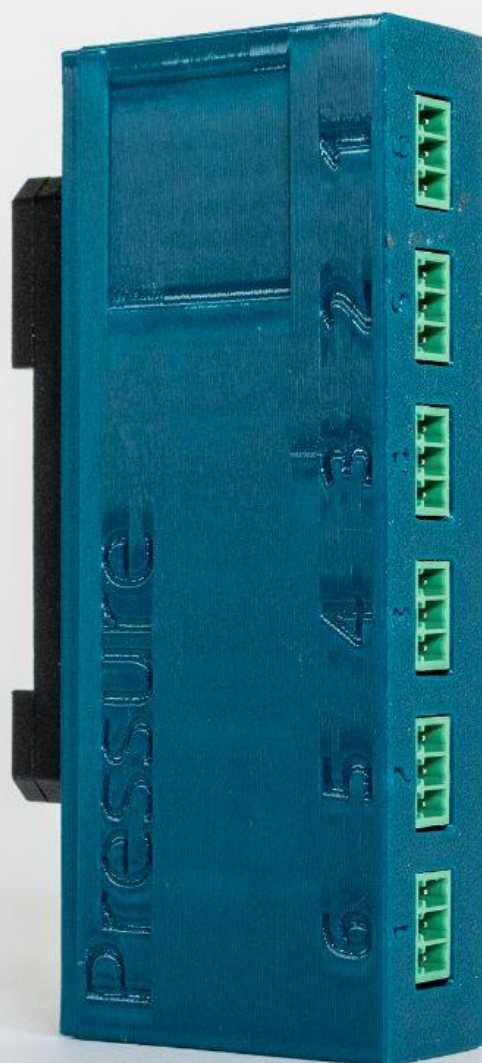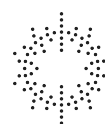
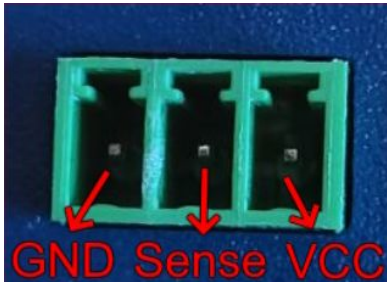Photo showing version 1.0

Introduction

Usage

The Analog Input box is meant to be used to output a DC voltage between 5 – 24V on two pin and measure a voltage or current on the middle pin.

The middle pin has a 12 bit ADC and adjustable amplifier, such that it can measure 4–20mA or 0–5V or another configurable range (e.g. 0 – 24V).

This box can be used for most industrial sensors; such as pressure sensors, flow sensors, load, force sensors, humidity, current, proximity, inductive, capacitive, position, etc.

Data communication

Data communication happens over USB with the serial communication protocol (COM-port, /dev/ttyXX).

Baud rate 115200, with 8 data bits, no parity, and 1 stop bit. (8N1)

After you connect to the box it will output one line of text to the terminal every 0.1 second (10 Hz).

The content of this line is specified on the next page.

You can also send commands to the box. Just type in a command, then the box will change output voltage and input amplification accordingly.

This video gives an introduction to serial data and commands: https://youtu.be/-64MM8h5SdI
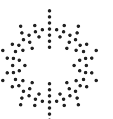
Introduction

Integration with TurboCtrl

TurboCtrl AutoConfig will detect the box and insert each channel in IO.conf as a pressure sensor.
You can configure both the output voltage and the input range in IO.conf, see details on page 5 & 6.

This video gives an introduction to autoconfig: https://youtu.be/MhT1DqOuWLE

This video gives an introduction to TurboCtrl programming: https://youtu.be/MhT1DqOuWLE

TurboCtrl.ai supports many sensor and actuator types:
Temperatures, pressure, humidity, oxygen and other gasses, gas and liquid flow sensors, DC ports, AC ports, VFDs, current, voltage, oven controllers, light controllers, motors, audio, video, scales, position, liquid level, density, viscosity, integration with Festo and other pneumatics systems. And much more

Buy connectors

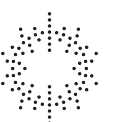This box uses KANGNEX WJ15EDGK-3.81-3P connectors for input/output.

You can buy the connectors here:
https://lcsc.com/product-detail/Pluggable-System-Terminal-Block_Ningbo-Kangnex-Elec-WJ15EDGK-3-81-3P_C8413.html

The box comes with a USB-C to USB-C cable included and standard DIN rail mounting.

i For more information, please contact sales@copenhagenatomics.com

Specs

Serial terminal output (baud: 115200)

Output	p1	p2	p3	p4	p5	p6	status code (see next page)
Unit	[Volts[1]]	[Volts[1]]	[Volts[1]]	[Volts[1]]	[Volts[1]]	[Volts[1]]	[–]

1. Default calibration. In current mode this is milliamps. With additional calibration (see IO config setup below) the unit is the users choice.
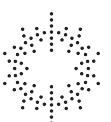
IO config setup

Format	Example	Description
AnalogInput; Name; BoxName; port number / skip; inputMin; inputMax; pmin; pmax; [voltage/current]; [sensorBias]	AnalogInput;TankIn;pr01;01;0.5;4.5;–1;5	Will scale 0.5 – 4.5 Volts to –1 – 5 (Bar. This is an example taken from a Ganlitong Pressure sensor)
—	AnalogInput;TankIn;pr01;01;0.25;4.75;–250;250	Will scale 0.25 – 4.75 Volts to –250 – 250 (mBar. This example for a MXPV7025 sensor)

Specification

Parameter	Condition	Value	Unit(s)
Voltage sensing range (minimum)	typ.	0	V
Voltage sensing range (maximum)	min.	5.1	V
	typ.	5.1	V
	max.	24.1	V
VCC output voltage.	min.	5.1	V
	typ.	5.1	V
	max	24.1	V
Input impedance (for voltage measurement)	typ.	1	GΩ
Input impedance (for current measurement)	typ.	160	Ω
Survivable input voltage	max.	28	V
USB Communications Standard		2.0	
USB Speed	typ.	12	MHz
USB Voltage	typ.	5	V
USB Power	min.	0.1	W
	max[1].	5	W

1. Maximum power depends what is plugged in. Tested with 6x 24V sensors running at 25 mA each (Box power conversion efficiency ~73%)

Specs

Commands

Command	<Arguments>	Description
p<1–6> <volt 12>	Port nr., volt 1 – 24V	Set the output voltage on the port number
p<1–6> <inmax 10>	Port nr., volt 1 – 24V	Set the input maximum voltage on the port number
Serial	–	Display the serial number and PCB version.
Status	–	Verbose output of the current status.
CAL <1–6>,g,c,<0–1>	Port nr, Sensor scale, Sensor offset, Voltage/Current Measurement	g and c make a transformation to take the voltage/current output to a sensor output (e.g. pressure in Bar, mBar, Humidity RH%, Temperature, etc...) 0 = Voltage measurement, 1 = Current measurement (milliamps)

Status code

The last output of the Analog Input box is a 32–bit status code. The 16 most significant bits are general status bits available across all boxes as listed below.

Bit 31 (MSB)	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25
Error bit	Over temperature	Under Voltage	Over Voltage	Over Current	Version error	USB error

The 16 least significant bits of the status code are Analog Input box specific and described below.

Bit 13 – 8	Bit 7	Bit 6	Bit 5–0 (LSB)
I2C error per port	VCC Raw error bit	VCC error bit	Voltage / Current measurement port (x+1)*

* bit 0: port 1 measures (=0) Voltage, or (=1) Current. bit 1: port 2...

All bit fields not described above are unused.
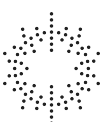
Application Example

To setup the box for use with a Pressure sensor, the below configuration could be performed.

Physical Setup

Select a 3-pole pluggable terminal as described on Page 4. Connect the Black Wire to Position 1, the Yellow Wire to Position 2 and the Red Wire to Position 3.

Screw the sensor into a G1/4 fitting in a pneumatic system, and connect the cable between the sensor and the AnalogInput box.

Software Configuration

Relevant Pressure Sensor Details (Ganlitong 50Y-0.5MPVGF):

1. Range: –100kPa – 500kPa (–1 Bar to 5 Bar)
2. Input Power: 5 VDC
3. Output Voltage Range: 0.5 – 4.5 V
4. Cable configuration: GX12-3pins

The following line should be set in IO.conf for an output in Bar:

```
AnalogInput; Pressure01; PressureBox01; 1; 0.5; 4.5; -1; 5
```

Or in kPa:

```
AnalogInput; Pressure01; PressureBox01; 1; 0.5; 4.5; -100; 500
```

Note:
- The 2nd and 3rd entries are custom for the system setup
- The 4th entry describes which port on the box the sensor is connected to
- The final 4 entries control the scale of the device, therefore in the first instance the box will output in Bar (scaled from 0.5 <-> 4.5 V to –1 <-> 5 Bar) and in the second in kPa (scaled from 0.5 <-> 4.5 V to –100 <-> 500 kPa).

In the case of the above sensor, the default AnalogInput Power output and Measurement ranges are suitable, so no further configuration is required.

If a sensor required 24V power, and had a measurement range of 0 - 10 V, then the following commands could be sent to configure the AnalogInput box:
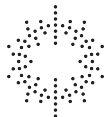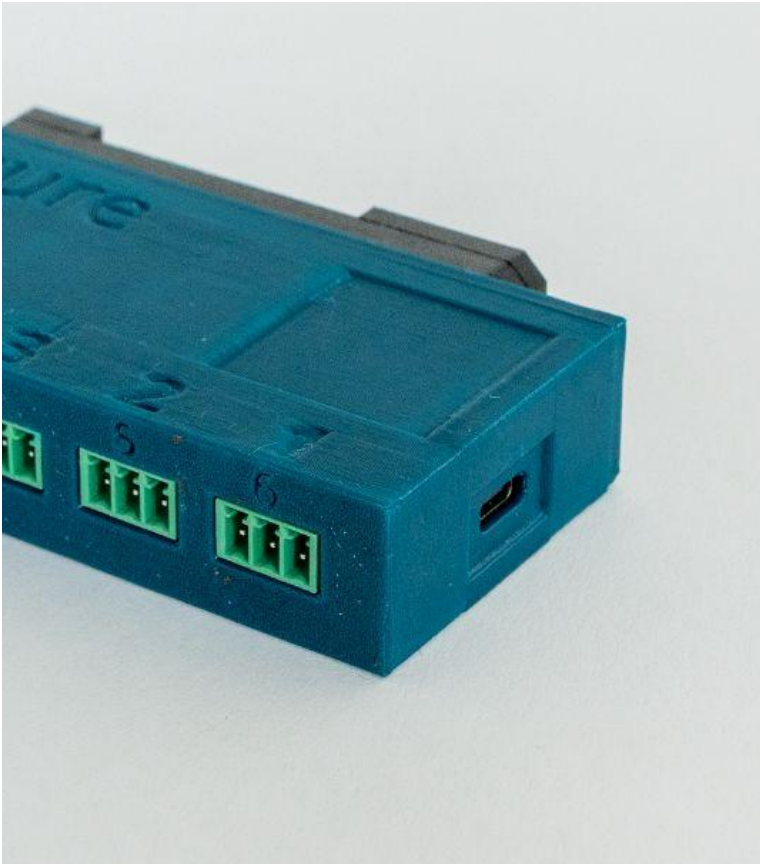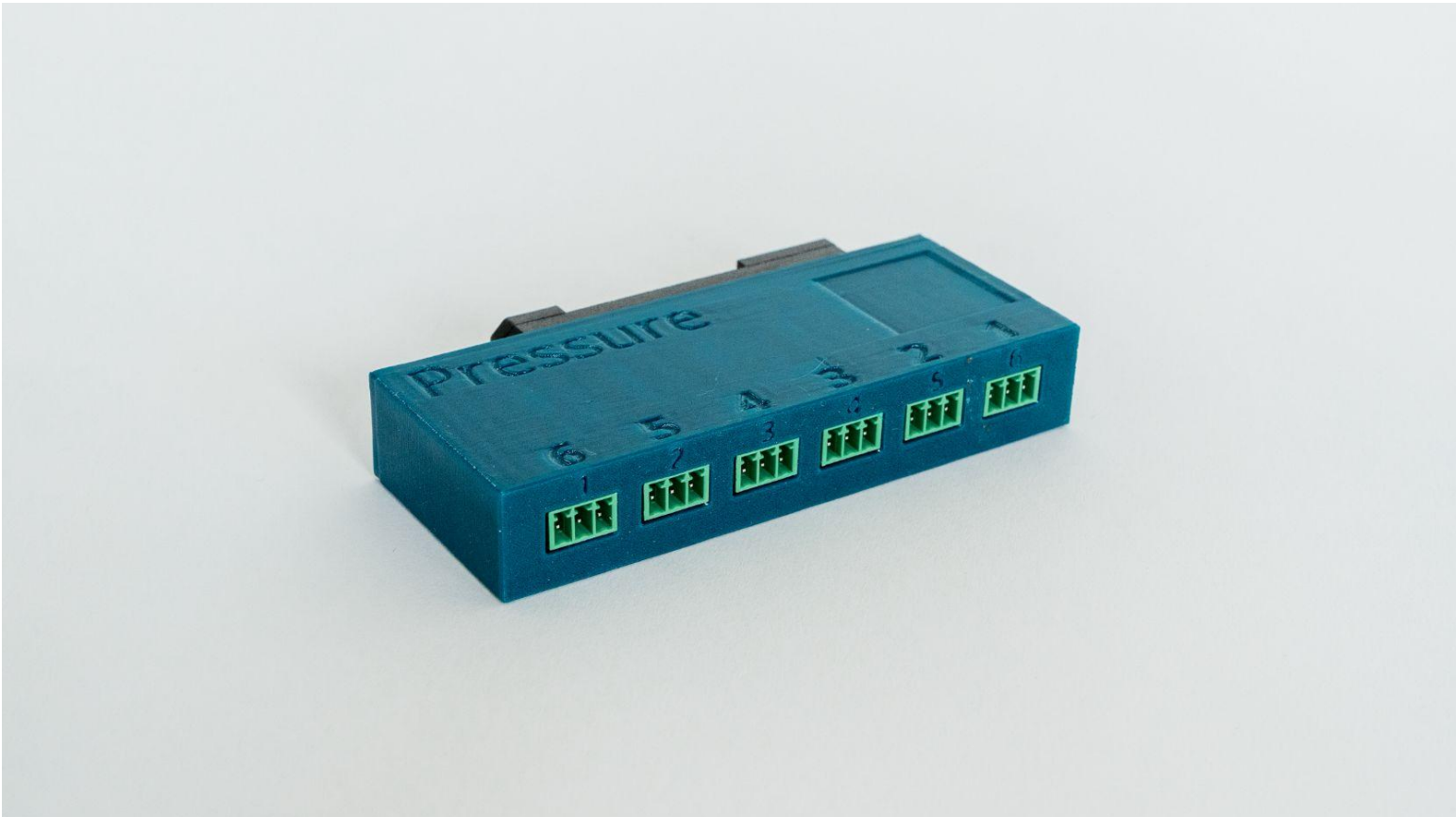
```
p1 volt 24.1
p1 inmax 10.1
```

Note:
- It is recommended that the power output and measurement voltage ranges are sized slightly above the recommended values from the datasheet to avoid non-linearities and out-of-range errors at extreme sensor values.
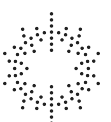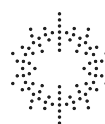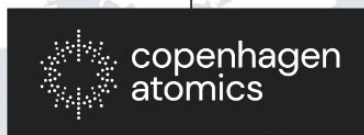
Product photos

Product photos

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