copenhagen atomics

Temperature V6.1

10 channel thermocouple box, accepts type B, E, N, J, K, S, T, R and load calibration values
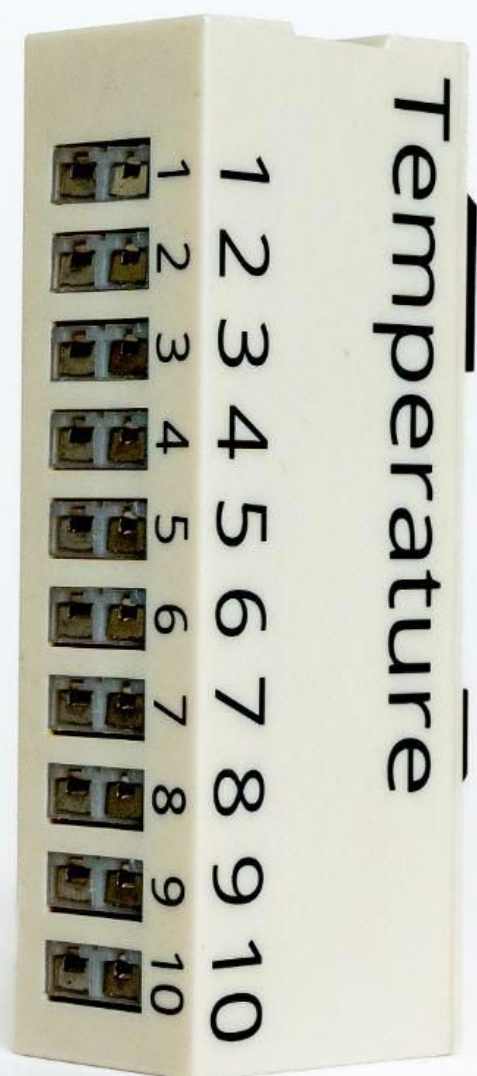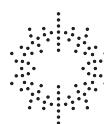
Photo showing version 6.1

Introduction

Usage

The temperature box are made to measure temperatures from thermocouples of different types: E, J, K, M, N, R, T, S

You can read more here:

https://en.wikipedia.org/wiki/Thermocouple

The box accepts the commands Status and Serial.

The box returns the temperature of all 10 channels with 10 Hz in degrees celsius.

The box has galvanic insulation between the USB-C port and the thermocouple ports.

Any channel will output "10000" in the event of a missing thermocouple or error.

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 turn channels on and off accordingly.

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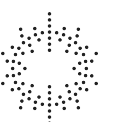
Introduction

Integration with TurboCtrl

TurboCtrl AutoConfig will detect the box and insert each channel in IO.conf as a type-K thermocouple. It is possible to configure the system for other thermocouples too. Type E, J, K, M, N, R, T, S

The temperature of the inside electronics of the box is available too to debug issues around calibration and high accuracy.

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.
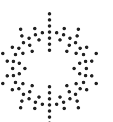
Buy connectors

This box uses miniature thermocouple Type K male connector.

You can buy the connectors here: https://dk.farnell.com/omega/smpw-k-m/thermocouple-connector-k-type/dp/2978130

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

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

Specs

Serial terminal output (baud: 115200)

Output	p1 temp	p2 temp	…	p10 temp.	internal temp.	status code
Unit	[°C]	[°C]	…	[°C]	[°C]	[–]

IO config setup

| Format	Example	Description
TypeK;SensorName;boxName;port TypeJ;SensorName;boxName;port	TypeK;Heater1;tm01;01 TypeJ;Heater1;tm01;01	Ports 1–10 have connectors on the box and the final value is internally on the box.

Commands

Command	‹Arguments›	Description
Status	–	Verbose output of the current box status.
Serial	–	

Specification

Parameter	Condition	Value	Unit(s)
Measurable range with K–type thermocouple*	min.	–270	°C
	max.	1260	°C
Accuracy of K–type thermocouple**		±0.75	%
		±2.2	°C
Measurable range with J–type thermocouple*	min.	–210	°C
	max	1200	°C
Accuracy of J–type thermocouple**		±0.75	%
		±2.2	°C
USB power	max.	0.40	W
USB current	max.	77	mA

* Theoretical box min./max., probes can be made for other ranges!
** Whichever is greater of the two inaccuracy measures
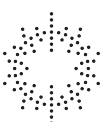
Specs

Status code

The last output of the temperature 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
Error bit	Over temperature	Under Voltage	Over Voltage	Over Current

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

| Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
ADS_5 MSB	ADS_5 LSB	ADS_4 MSB	ADS_4 LSB	ADS_3 MSB	ADS_3 LSB	ADS_2 MSB	ADS_2 LSB	ADS_1 MSB	ADS_1 LSB

The temperature box measures the temperature on each port using an ADS1120 chip. There are 5 ADS chips each measuring temperatures on two consecutive ports i.e. ADS_1 measures the temperature on port 1 and 2. For each ADS1120 chip there are three possible states:

0x0 – Normal operation.
0x1 – Not able to reset device (Communication problem). **Temperatures can not be measured on the chip.**
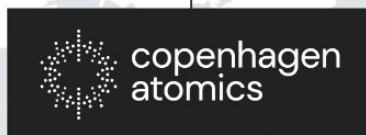0x2 – Not able to update registers. **Temperatures can not be measured on the chip.**

All bit fields not described above are unused.
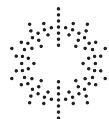
Product photos
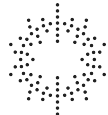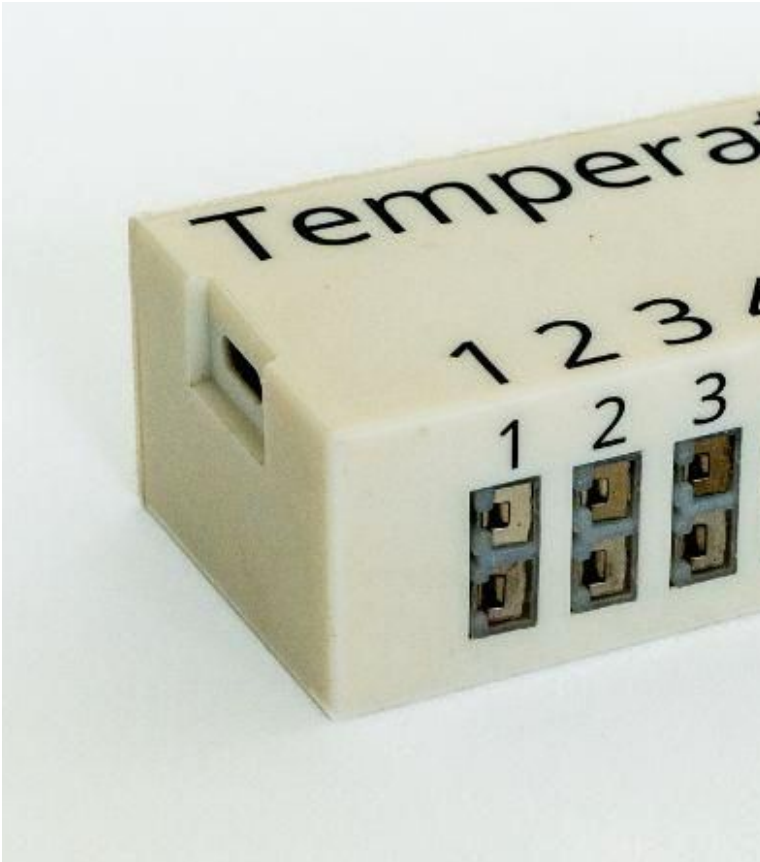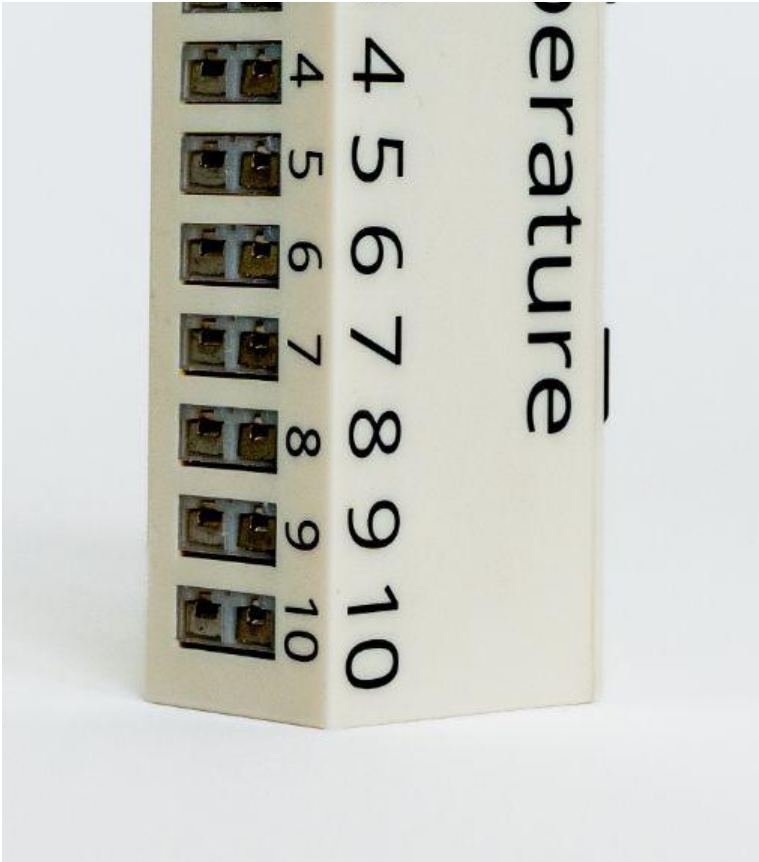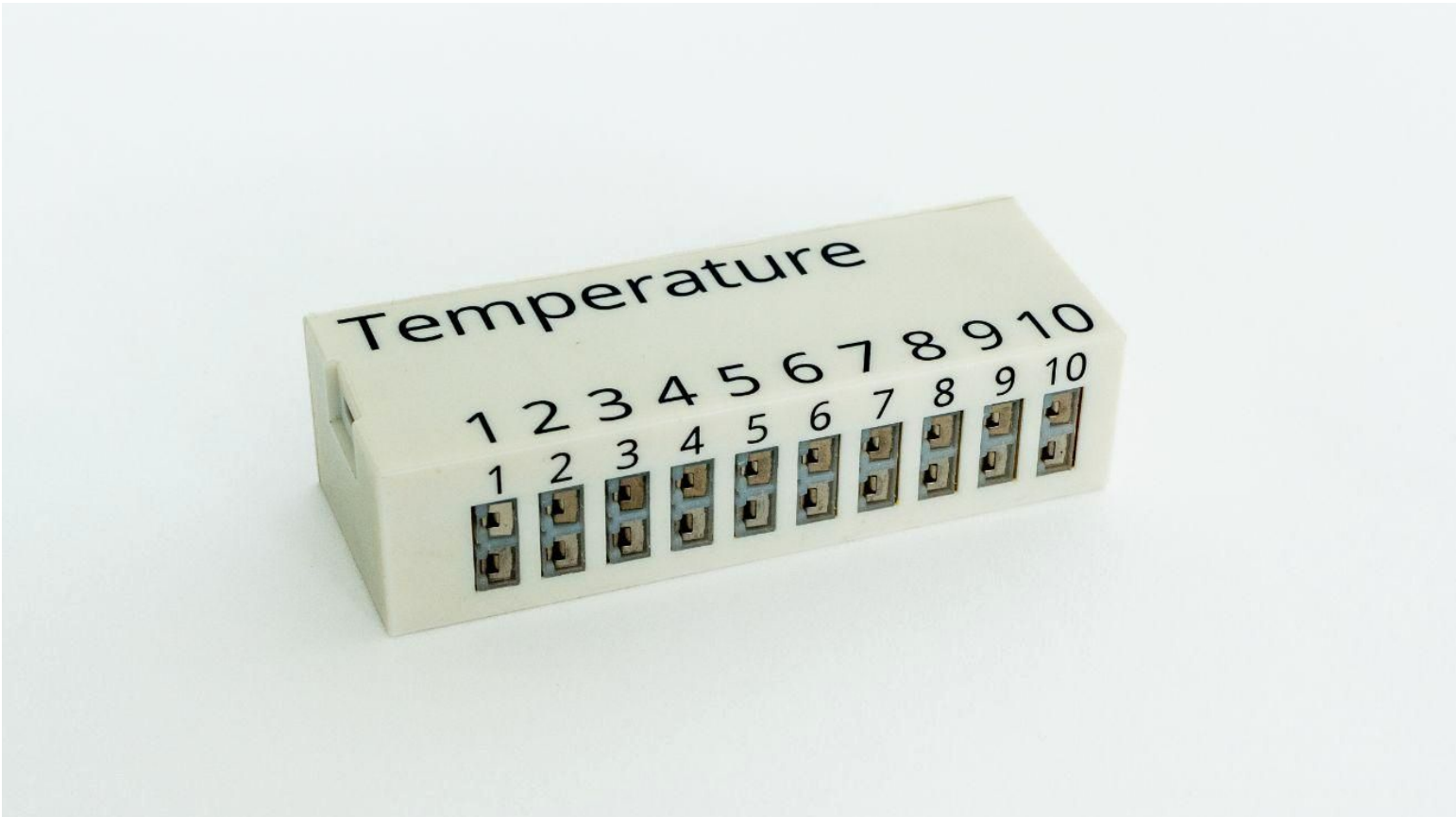
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