



# **COR-RiSTOR**

## **Instruction manual**

Version Coro2v1

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# 1 Components overview

This document is an handbook to understand hardware peripherals and connections of a COR-RiSTOR device. It provides a basic understanding of the complete hardware package and how they should be used in an application.

COR-RiSTOR consists of mainly 4 parts namely TiF-MEMRISTOR chip, COR-RiSTOR Plug-in Card, Sensor PCB, and COR-RiSTOR base board as shown in the figure below.



(a) TiF-Memristor carrier



(b) COR-RiSTOR Plug-in card



(c) COR-RiSTOR base board



(d) Sensor PCB

Figure 1: Main Components

## 1.1 TiF- MEMRISTOR Chip



Figure 2: TiF-MEMRISTOR Chip

TiF-MEMRiSTOR chip carrier with black plastic cover, including chip with 6 TiF-MEMRiSTOR basic cells, single-hysteresis.

Technical data chip carrier:

- Operating temperature: +10°C to +50°C / +50°F to +122°C

Technical data chip:

- Power consumption read operation: 5000nW at 5V for 1 ms
- Power consumption write operation: 100nW at 5V for 10 ms
- TiF-MEMRiSTORs: 6
- Operating temperature: +10°C to +50°C / +50°F to +122°C
- Read-out time: 0.001 seconds

## 1.2 COR-RiSTOR base board



Figure 3: COR-RiSTOR base board

COR-RiSTOR Demonstrator Device 3.2 – measuring device for correlation analysis with TiF-MEMRiSTOR Chip with 8 basic cells, single-hysteresis. consisting of:

- COR-RiSTOR Board
- Chip-Carrier with TiF-MEMRiSTOR Chip
- Sensor-PCB with cable
- COR-RiSTOR Plug-In Card
- GUI-Software “COR-ReLATOR”

Technical data:

- Power consumption: min. 120 mW with one Plug-In card | max. 720 mW
- TIF-MEMRiSTOR Chip Carrier: 1
- COR-RiSTOR® Plug-In Cards: min. 1 | max. 6
- Sensor connectors: 4
- Channel switches: 12
- Operating temperature: 0°C to +70°C / 32°F to +158°F

### 1.3 COR-RiSTOR plug-in card



Figure 4: COR-RiSTOR plug-in card

Tune your COR-RiSTOR® basic into a sensor data analysis powerhouse with additional Plug-In Cards.

Technical data:

- Power consumption: 550 mW
- Operating temperature: 0°C to +70°C / 32°F to +158°F

### 1.4 Sensor PCB



Figure 5: Sensor PCB

Module to connect different sensors to the COR-RiSTOR® Board by using RJ45 cables. By making use of additional Sensor PCB´s you will be able to connect up to 4 sensors to COR-RiSTOR basic.

Technical data:

- Power consumption: 20 mW
- Sensor connector: 1

The power is provided by the PC via USB-C cable for all the components.

## 2 Connections overview

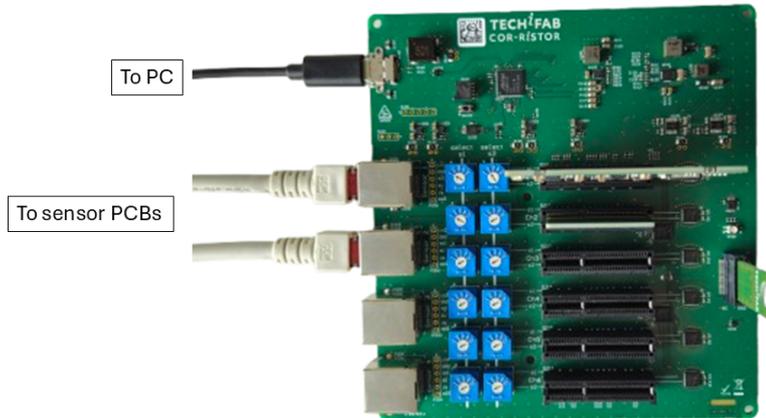


Figure 6: COR-RiSTOR base board connections

The figure above shows all connections of the COR-RiSTOR base board with peripherals. A USB-C cable is used to connect the COR-RiSTOR base board to the PC which also draws power for the entire board with sensor PCBs from the PC. It should not be connected to any external power supply other than the PC. Sensors are shown to be connected to sensor PCBs via Ethernet cables (CAT6.0). A TiF-Memristor chip carrier is mounted on the COR-RiSTOR base board, with the QR code facing towards the edge of base board. If the connection of TiF-Memristor chip carrier is correct, a green LED will shine when the GUI software is opened.

## 2.1 Sensor PCB

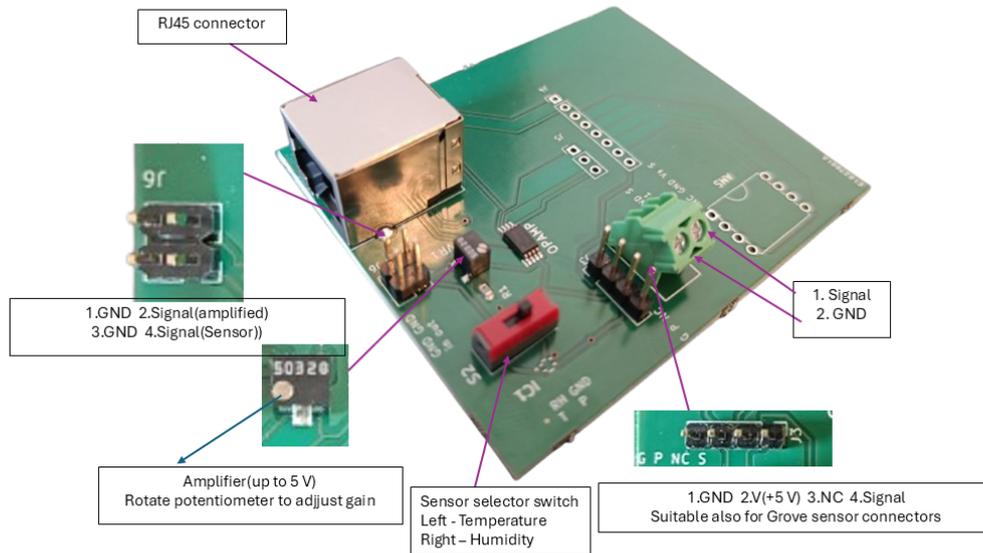


Figure 7: Sensor PCB connections

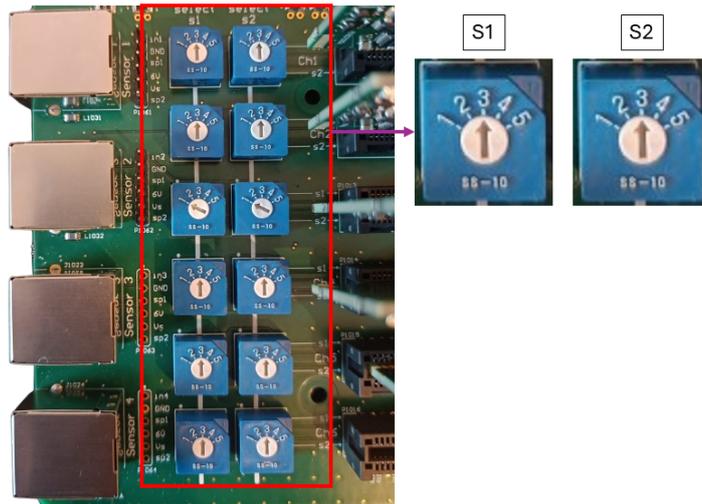
Sensor PCB is a peripheral device to let user connect different type of analog sensors to COR-RiSTOR. One Sensor PCB is required for each sensor. As shown in the fig. 7, sensor PCB is equipped with a RJ45 connector to connect the PCB with COR-RiSTOR via RJ45/Ethernet CAT6 cable.

Sensor can be connected in multiple ways, e.g., active sensor can be connected on Terminal block with Signal and GND inputs. There is a grove suitable terminal with 4 jumper pins available for passive sensors. Only Sensors that require 5V as operating voltage can be used here. Temperature and Humidity Sensors such as SMD sensirion SHT40I-HD1B can be mounted on IC1. For demo configuration, SHT40I-HD1B is already mounted on IC1. S2 sensor selector switch is used to toggle between Temperature and Humidity inputs as shown in the fig. 7. Pressure sensors such as AMS 6916-1200-B-H can be mounted on the AMS through-hole on the PCB.

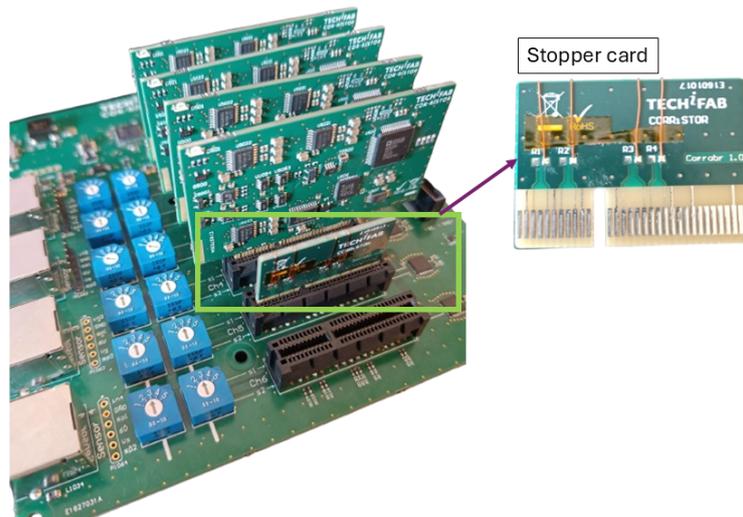
For calibration and amplification, an amplifier is placed on the Sensor PCB with potentiometer to convert the sensor output voltage in range of 0 to 5 V. Pins are explained in the fig. 7 to set the gain. E.g. User can use J6 component as shown in the fig. 7, applying 1 V on any of the signal input pins, and measuring both pre-amplified and amplified voltages on Pins 2 and 4 of J6 while adjusting the rotations on the potentiometer. For demo configuration, gain is already

set and is not required to change.

## 2.2 COR-RiSTOR base board



(a) COR-RiSTOR base board switch configuration



(b) COR-RiSTOR base board

Figure 8: COR-RiSTOR base board-Sensors-COR-RiSTOR Plug-in card configuration

COR-RiSTOR base board has 4 sensor inputs, use Ethernet cable to connect sensor PCB and COR-RiSTOR base board. Sensor numbers are explained in the fig.8a. It has 6 COR-RiSTOR plug-in card slots for 6 correlation channels. In between, there are 12 switches to choose the 2 sensors for each correlation channel marked in red box in fig.8a. The figure shows on channel 3, sensor 1 at S1 and sensor 3 at S2 position are configured to be correlated. The blue switch has total 5 selection possibilities for 4 sensors. Numbers 1 to 4 correspond to sensors 1 to 4 and number 5 on the blue switch corresponds to no sensor selection. User receives a stopper card as shown in fig.8b. This card must be used in case of using not all correlation channels are being used. User must switch to desired sensor numbers on particular Plug-in card and insert the same in the GUI software. User must start plugging in the Plug-in card from channel 1 as shown in the fig.8b without sparing any slots in between the channels. Next channel slot after the last Plug-in card channel, a stopper card must be inserted to ensure proper measurements as shown in fig.8b in the green box, when all channels are not being used.

## 2.3 Configuration on GUI software

Channel	First Sensor	Second Sensor	Device Number	Min input	Max input	COR-Relation routine
Channel 1	1	2	9	0	5	6
Channel 2	1	2	10	0	5	2
Channel 3	2	3	11	0	5	1

Figure 9: Configure sensors and channels

GUI consist of 3 tabs as shown on the top of figure above, configure, 2D Plotting and 3D Plotting. On first tab 'Configure', user must enter the details for sensor and channels as

configured on COR-RiSTOR base board as explained in fig. 8a. The details should be entered in the following sequence,

### 1. **Enter Sensors**

Enter the number of sensors connected to the COR-RiSTOR base board; this can be done via increment/decrement buttons. Sensor input fields will appear accordingly.

### 2. **Enter sensor details**

Enter sensor names, sensor, conversion formula, sensor gain set by amplifier on Sensor PCB, Min. and Max. voltage output from the sensor (provided by the sensor manufacturer).

### 3. **Enter Channels**

Enter number of channels by pressing increment/ decrement buttons, input fields will appear accordingly. For single channel, just press increment and then decrement button.

### 4. **Enter channel details**

Enter First sensor and second sensor for all channels as selected on the hardware as shown in fig. 8a. **Make sure the sensor numbers match exactly with the sensor configuration in COR-RiSTOR base board..**

### 5. **Initiate**

Press the Initiate button to start recording data. It will take a moment to initialize and user will be asked to enter a file name and location to save the recorded data as .CSV file.

Afterwards, the Initiate button will be disabled until the Stop button is pressed to stop recording or to change sensor and channel inputs. After initiation, the user can go to the next tabs and by the **Start** button on both tabs 2D Plotting and 3D Plotting, the plots can be visualized.

To start completely new Correlation, go to tab 'Configure', press **Stop** button (this will enable Initiate button) and re-enter new input details and then press **Initiate** button.

### **Save**

On both plotting tabs, plots can be saved by right-clicking on the window. After a right-click, a button will appear to save the plots.

If you encounter any problem while handling our COR-RiSTOR, please contact our support team via <https://techifab.com/contact/>. Thank you for using COR-RiSTOR!