
Power
Status
Fault
Indino 4.0
Connected Intelligence
RDL
www.rdltech.in

# Indino 4.0

## Contents

## 1. Introduction:

Indino 4.0 series defines a new way of transforming factories into smart/intelligent factories for efficient and easy remote monitoring operational status of facilities such as on/off status, pressure and temperature. Indino 4.0 supporting for wide range of industrial protocols like Modbus, MQTT, JSON, RESTful,TCP/UDP , SNMP protocol ,which makes the monitoring and solution integration, easier than ever for IT engineers through open source APIs,.

The base board on Atmega2560 controller with BLE and WiFi having processor ESP32 -32-bit LX6 processor -200 MIPS supporting OTA, having on board capabilities like 8MByte Embedded Flash, 256KByte FRAM, SDcard -32GB, USB , RS232 , RS485 ,PWDT , 12 channel 24 V opto isolated IO supported for wet and dry connection ,RTC , RDL Expansion bus for add on modules expanding the IO needs and DC to DC converter support for 12 to 36V input DC supply .

## 2. Features

**Processor**: Tensilica Xtensa 32-bit LX6 microprocessor

- **Clock frequency:** up to 240 MHz ,up to 600 DMIPS
- **ROM:** 448 KB **SRAM:** 520 KB

**Co controller *:**
ATmega 2560, 16MHz, FLASH 256KB/STM32

**Digital IO**
24v 8x Isolated Enabled digital input
24v 4x Isolated Digital output / PWM 1 Amps max
AC Isolation: 3750VRMS
Contacts supported: DRY / WET

**Analog IO**
4x ADC 0-10V/ 4-20mA max
16 bit ADC offers high resolution

**Wired Connectivity**
RS485 MODBUS , RS232 & USB
RDL expansion bus

**Memory**
FRAM 25KB , SD CARD 32GB

**RTC**
Built-in RTC for stamped data logging

**Wireless connectivity:**

- **Wi-Fi:** 802.11 b/g/n/e/i (802.11n @ 2.4 GHz up to 150 Mbit/s)
- **Bluetooth:** v4.2 BR/EDR and Bluetooth Low Energy (BLE)

**Protocol**

- TCP-IP, UDP, SNMP, MODBUS, FTP, RESTFULL, JSON&MQTT

**Security:**

- IEEE 802.11 security features : WFA, WPA/WPA2 and WAPI
- Secure boot / Flash encryption
- 1024-bit OTP, up to 768-bit for customers
- Cryptographic hardware acceleration: AES, SHA-2, RSA, ECC & random number generator (RNG).

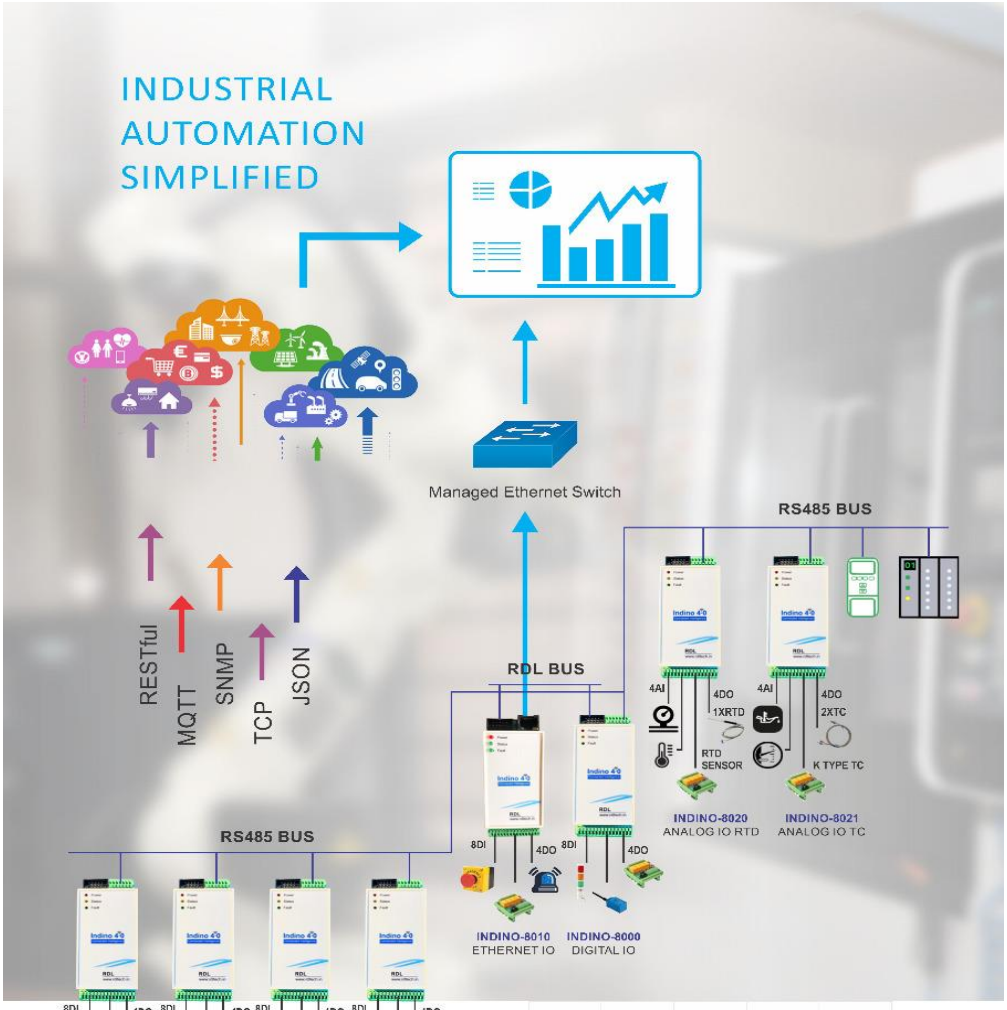
**Enclosure :**

IP 20

mounting :Wall / DIN Rail

Dimension :108 x 41.2 x 20

*Co Controller information is given in product information page




**Indino 4.0** can used to build the custom industrial solution for monitoring and controlling PLC and SCADA, HMI, VFD, Motors, servo, Valves, energy meter, actuators, relays, encoder, rfid and finger print readers and industrial sensors

## 3. Benefits

Indino 4.0 can used to build the custom industrial solution for monitoring and controlling PLC and SCADA , HMI , VFD , Motors , servo , Valves , energy meter , actuators , relays , encoder , rfid and finger print readers , industrial sensors and many more with below mentioned operational benefits .

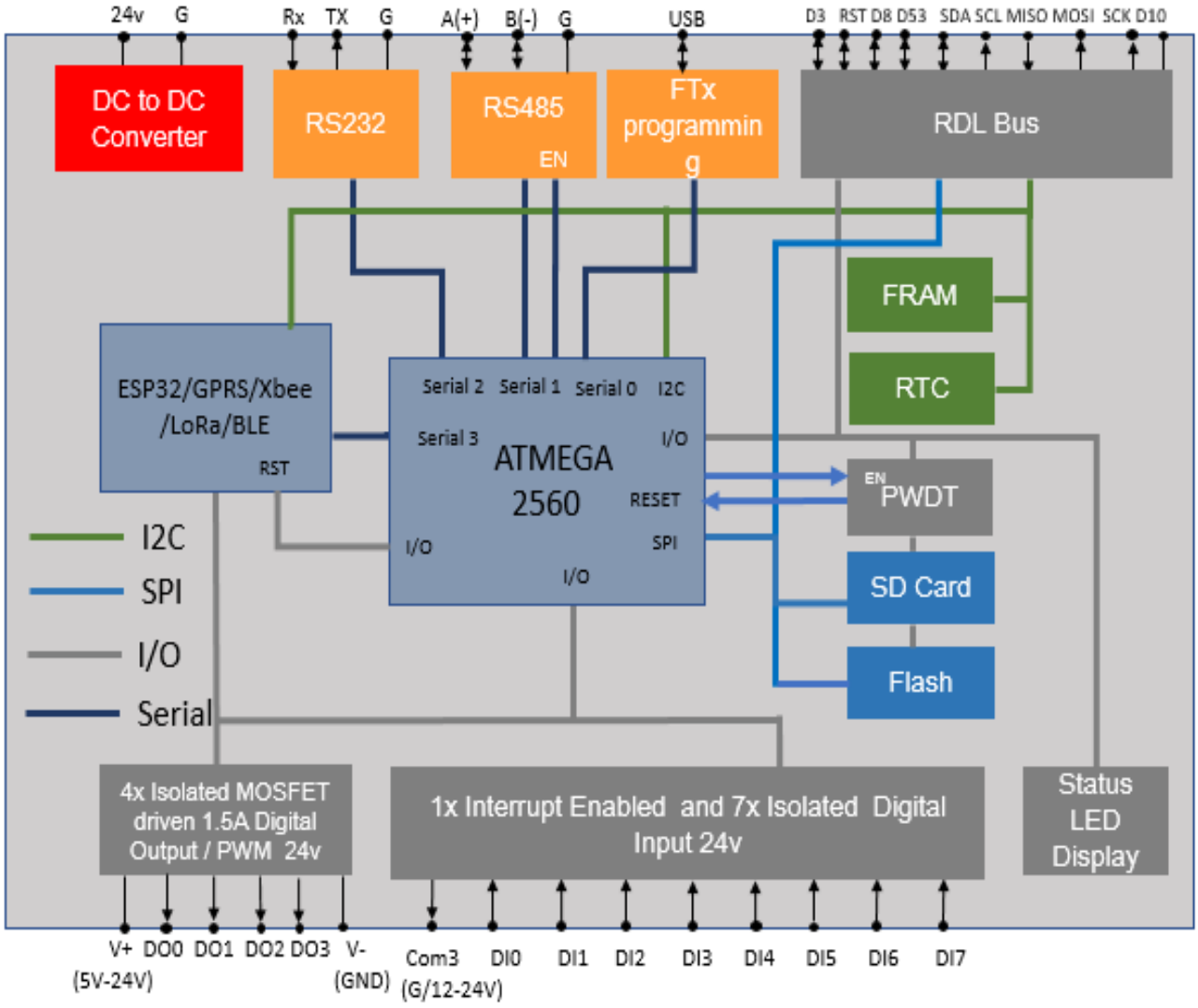
- Improved productivity.
- Reduced downtime.
- Maximized asset utilization.
- Tracking trends for real-time marketing.
- Enhanced situational awareness.
- Sensor-driven decision analytics.
- Instantaneous control and response in complex autonomous systems

## 4. Applications

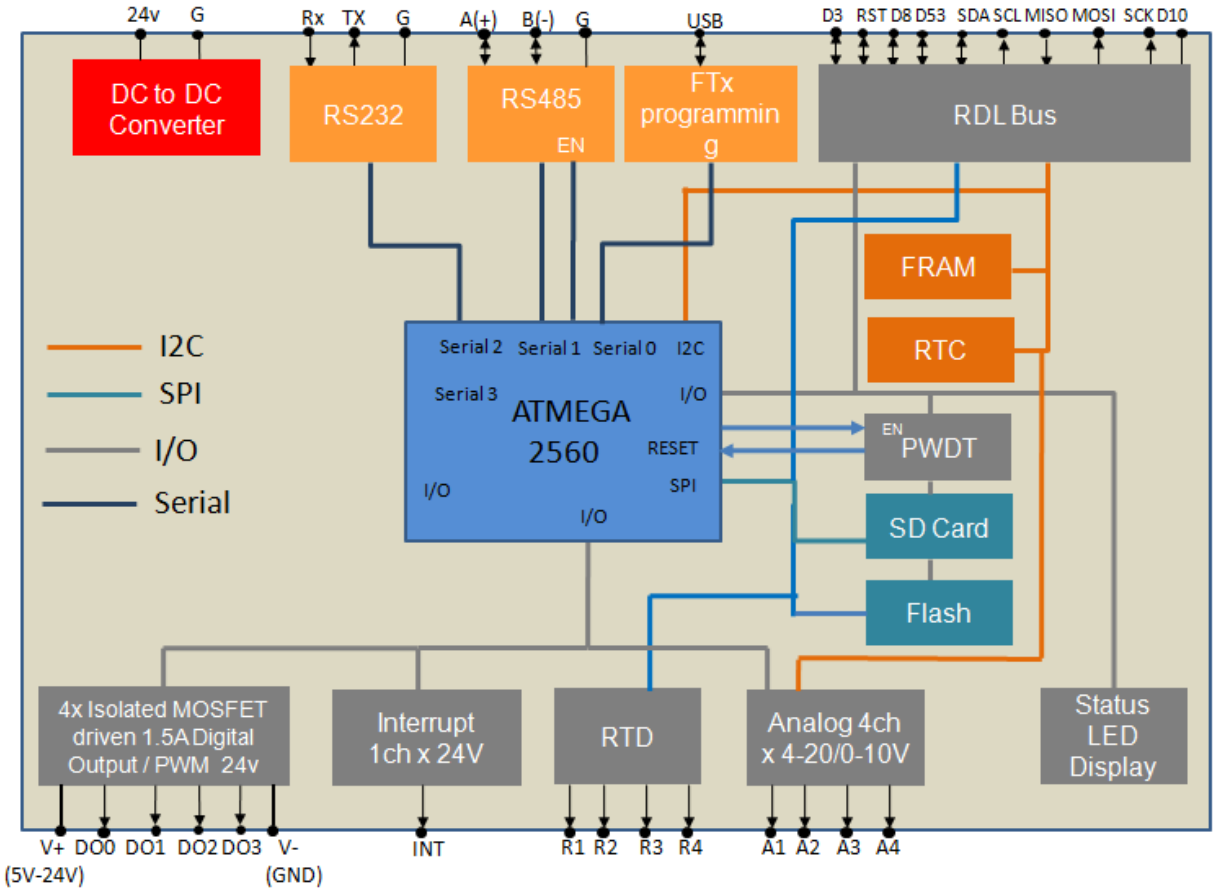
This product used for many industrial applications like

- Production and process Management
- Utilities Management
- Condition Management
- Environment Management
- Industrial Smart grid
- Leakage detection
- Cold storage Management
- District metering
- Water treatment
- Generator Management
- Green House.
- Warning message in case of calamities.
- Remote system management

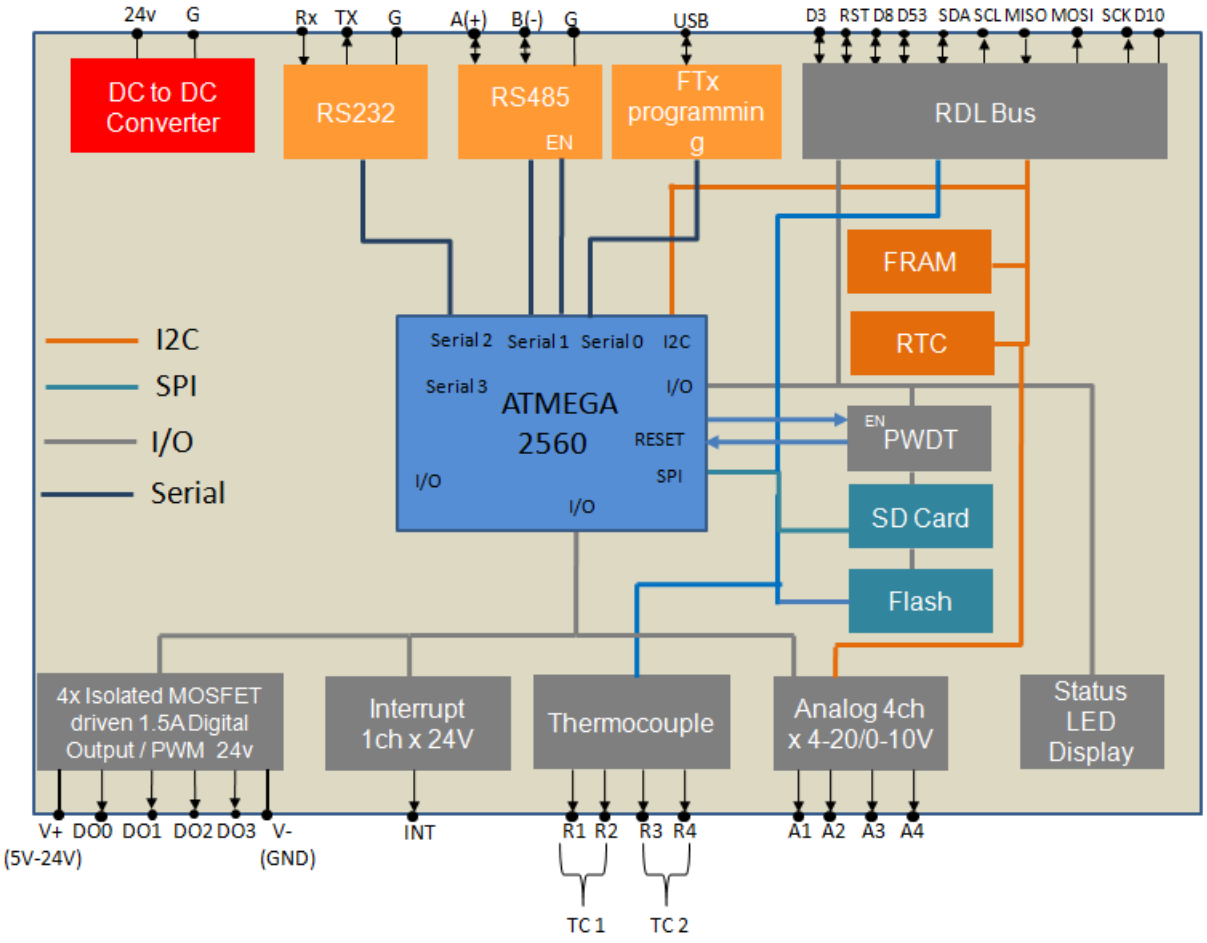
## 5. Block Diagram of INDINO -8005, 8030,8040,8050,8060



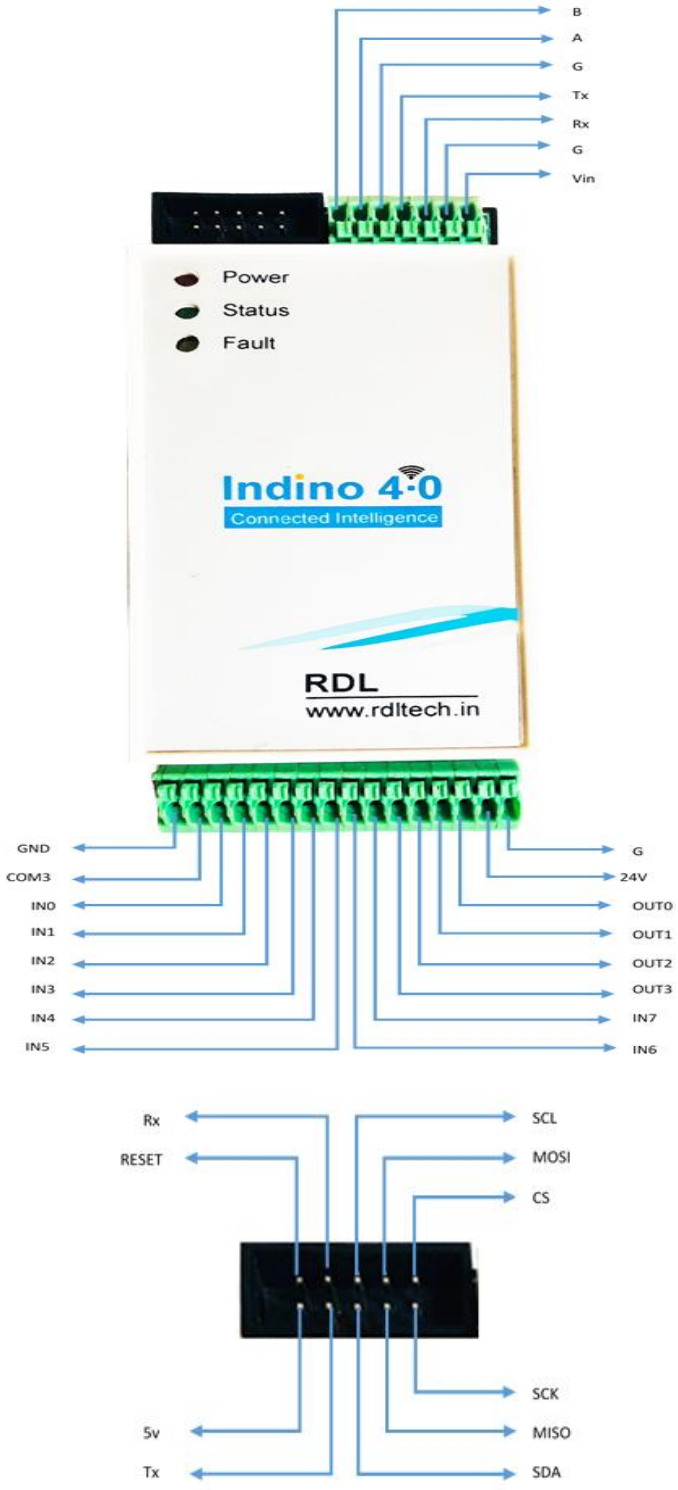
## 5.1 Block Diagram of INDINO-8020 Analog IO RTD



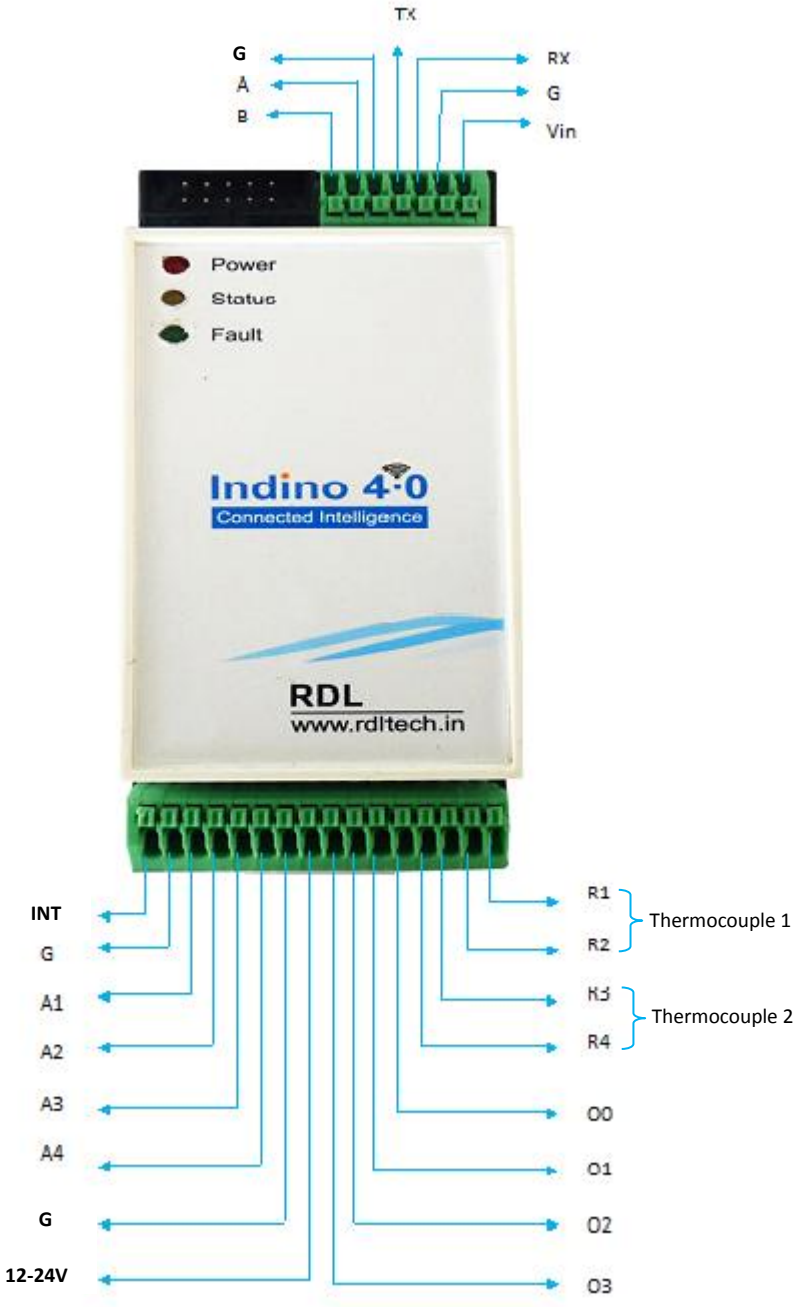
## 5.2 Block Diagram of INDINO-8021 Analog IO TC



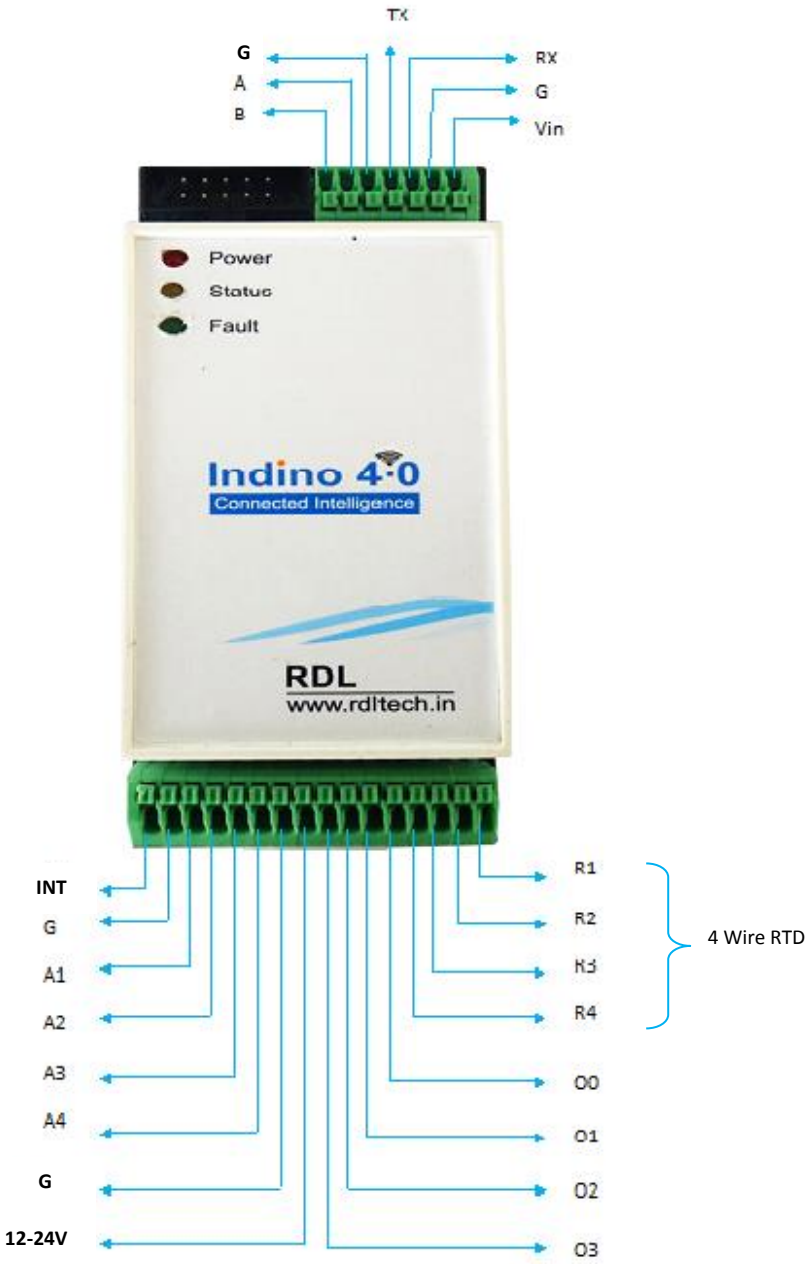
## 6.a)Digital IO Pin Configuration(INDINO-8000,8005,8030,8040,8050,8060):



## 6.b)Analog IO Pin Configuration (INDINO-8021 Analog IO TC):

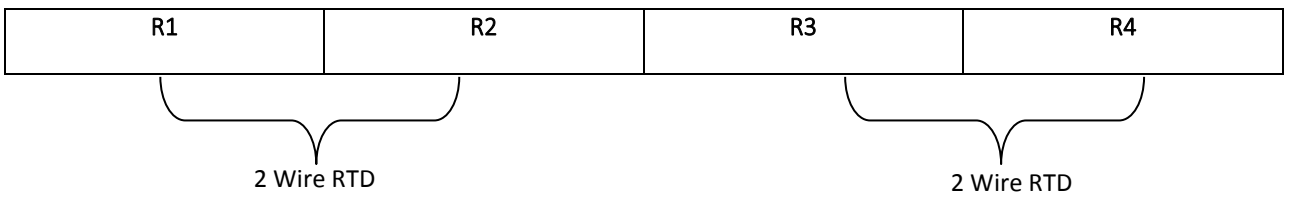


## 6.c)Analog IO Pin Configuration (INDINO-8020 Analog IO RTD):

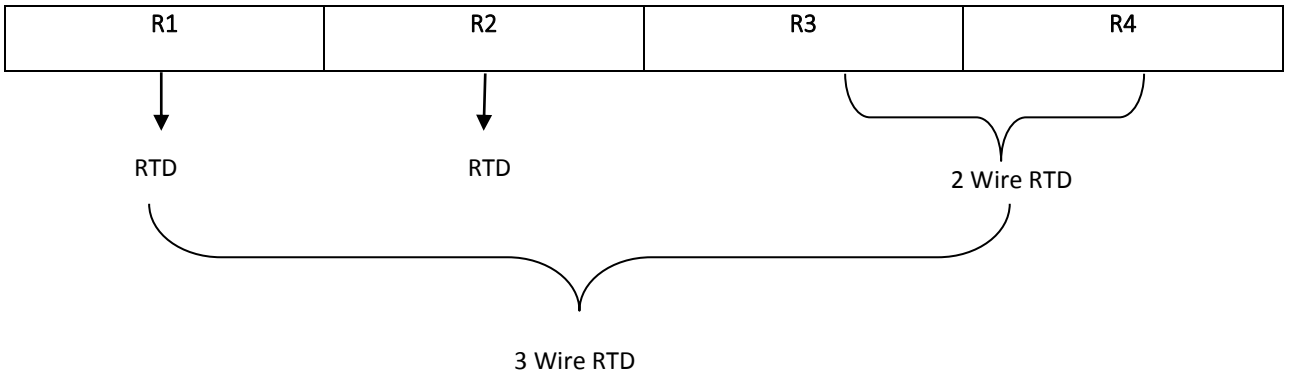



Wiring Diagram for RTD:

2 wire RTD:



3 wire RTD:



## 7.a) Digital PinMapping (INDINO-8000,8005,8030,8040,8050,8060)

| Function Blocks | Description | Pins(UNO) | Pins(Atmega) |
|---|---|---|---|
| **MAX232** | TXD1 | D18 | PD3 |
| | RXD1 | D19 | **PD2** |
| | | | |
| **RS485** | RXD2 | D17 | PH0 |
| | TXD2 | D16 | PH1 |
| | Enable | D6 | PH3 |
| | | | |
| **Physical Watch Dog Timer max 3 minutes** | Enable | D23 | PA1 |
| | Pulse Input | D22 | PA0 |
| **Opto Isolated Input 24V** | IN0 | D35 | PC2 |
| | IN1 | D34 | PC3 |
| | IN2 | D33 | PC4 |
| | IN3 | D32 | PC5 |
| | IN4 | D31 | PC6 |
| | IN5 | D30 | PC7 |
| | IN6 | D39 | PG2 |
| | IN7 | D2 | PE4 |
| | | | |
| **MOSFET Driven 1.5A PWM/Output 24V** | Output1 | D7 | PH4 |
| | Output2 | D12 | PB6 |
| | Output3 | D4 | PG5 |
| | Output4 | D5 | PE3 |

| | | | |
|---|---|---|---|
| **SD Card** | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | SD_CS | D9 | PH6 |
| | | | |
| **FLASH 8MB** | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | SRAM_CS | D11 | PB5 |
| | | | |
| **FT230x-USB** | TXD0 | D1 | PE1 |
| | RXD0 | D0 | PE0 |
| **FRAM** | SCL | D21 | PD0 |
| | SDA | D20 | PD1 |
| | | | |
| **RTC** | SCL | D21 | PD0 |
| | SDA | D20 | PD1 |
| | | | |
| **ESP32/GPRS/Xbee /LoRa/BLE** | TX3 | D14 | PJ1 |
| | RX3 | D15 | PJ0 |
| | RESET | D36 | PC1 |
| | GPIO16 | D37 | PC0 |
| | POWER_KEY(GSM/GPRS) | D41 | PG0 |
| | MIC_Input(GSM/GPRS) | D46 | PL3 |

| | | | |
|---|---|---|---|
| **RDL Bus** | | | |
| ISP / IO expander mode* | PWM (INT) | D3 | PE5 |
| | RST/G* | RST | RESET |
| | PWM | D8 | PH5 |
| | INT0 | D53 | PB0 |
| | SCL | D21 | PD0 |
| | SDA | D20 | PD1 |
| | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | PWM | D10 | PB4 |
| | | | |
| **Status LED** | PWR | +5V | +5V |
| | STAT | D13 | PB7 |
| | FLT | D49 | PL0 |

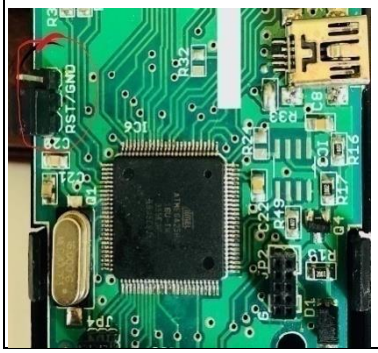
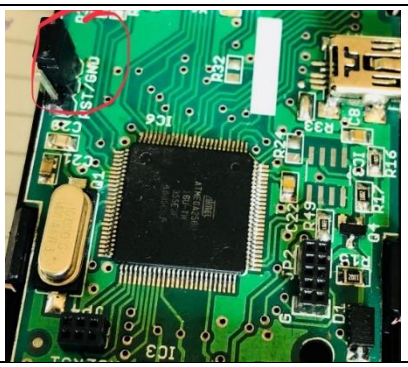
***Note: ISP/IO expander selection modeset the jumpers as shown in the figure.**

## 7. b) Analog PinMapping(INDINO-8020,8021)

| Function Block | Description | Pins(UNO) | Pins(Atmega) |
|---|---|---|---|
| **MAX232** | TXD1 | D18 | PD3 |
| | RXD1 | D19 | PD2 |
| | | | |
| **RS485** | TXD2 | D16 | PH1 |
| | RXD2 | D17 | PH0 |
| | Enable | D9 | PH9 |
| | | | |
| **Physical Watch Dog Timer max 3 minute** | Enable | D23 | PA1 |
| | Pulse Input | D22 | PA0 |
| | | | |
| **ADC/4-20mA Select 0-----analog 1------4-20mA** | ADC1 | D40 | PG1 |
| | ADC2 | D37 | PC0 |
| | ADC3 | D38 | PD7 |
| | ADC4 | D41 | PG0 |
| | | | |
| **ADC/4-20mA** | SDA | D20 | PD1 |
| | SCL | D21 | PD0 |
| | | | |
| **MOSFET Driven 1.5A PWM/Output 24v** | Output1 | D7 | PH4 |
| | Output2 | D4 | PG5 |
| | Output3 | D6 | PH3 |
| | Output4 | D5 | PE3 |
| | | | |
| **SD Card** | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | SD_CS | D11 | PB5 |
| | | | |
| **FLASH 8MB** | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | SRAM_CS | D12 | PB6 |
| | | | |
| **4 Wire RTD** | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | 4 Wire RTD_CS | D33 | PC4 |
| | DRDY | D34 | PC3 |

| | | | |
|---|---|---|---|
| **K Type 1** | MISO | D50 | PB3 |
| | SCK | D52 | PB1 |
| | K Type1_CS | D36 | PC1 |
| | | | |
| **K Type 2** | MISO | D50 | PB3 |
| | SCK | D52 | PB1 |
| | K Type2_CS | D35 | PC2 |
| | | | |
| **FT230X-USB** | TXD0 | D1 | PE1 |
| | RXD0 | D0 | PE0 |
| | | | |
| **FRAM** | SCL | D21 | PD0 |
| | SDA | D20 | PD1 |
| | | | |
| **RTC** | SCL | D21 | PD0 |
| | SDA | D20 | PD1 |
| | | | |
| **RDL Bus** | | | |
| ISP/IO expander mode* | PWM(INT) | D3 | PE5 |
| | RST/G* | RST | RESET |
| | RX3 | D15 | PJ0 |
| | TX3 | D14 | PJ1 |
| | SDA | D20 | PD1 |
| | SCL | D21 | PD0 |
| | MISO | D50 | PB3 |
| | MOSI | D51 | PB2 |
| | SCK | D52 | PB1 |
| | PWM | D10 | PB4 |
| | | | |
| **Status LED** | PWR | 5V | 5V |
| | STAT | D13 | PB7 |
| | FLT | D49 | PL0 |

***Note: ISP/IO expander selection modeset the jumpers as shown in the figure.**

| ISP Mode selection | I/O expander mode selection |
|---|---|
|  |  |

## 8. Programming IDE

The hardware supports various Open Source Programming IDE including Arduino IDE, Atmel Studio and Arduino Compatible Compiler for LabView. For more information on this follow "**Open Source Programming IDE"** section of the following link.

https://researchdesignlab.com/indino-4-0.html

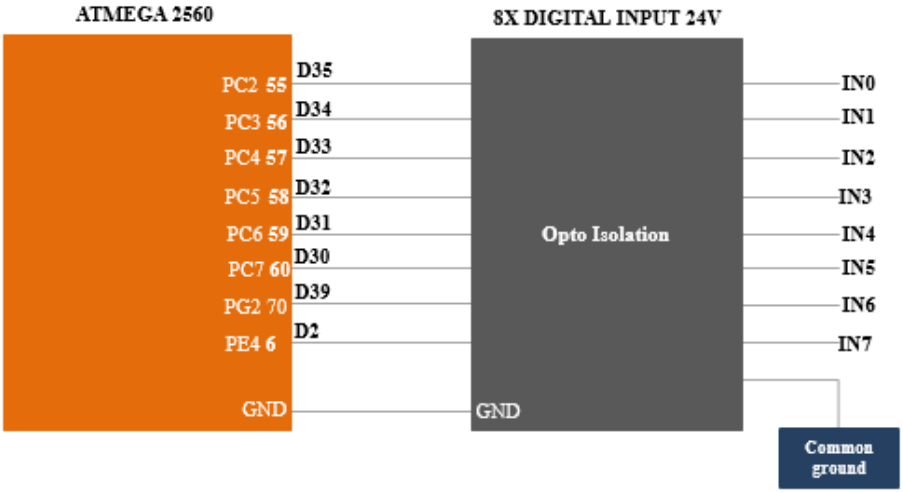
## 9. Product Specification

### 9.1Digital Input

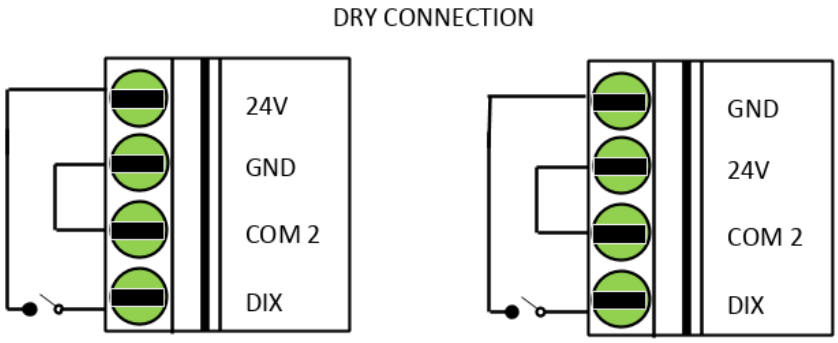
#### Specification

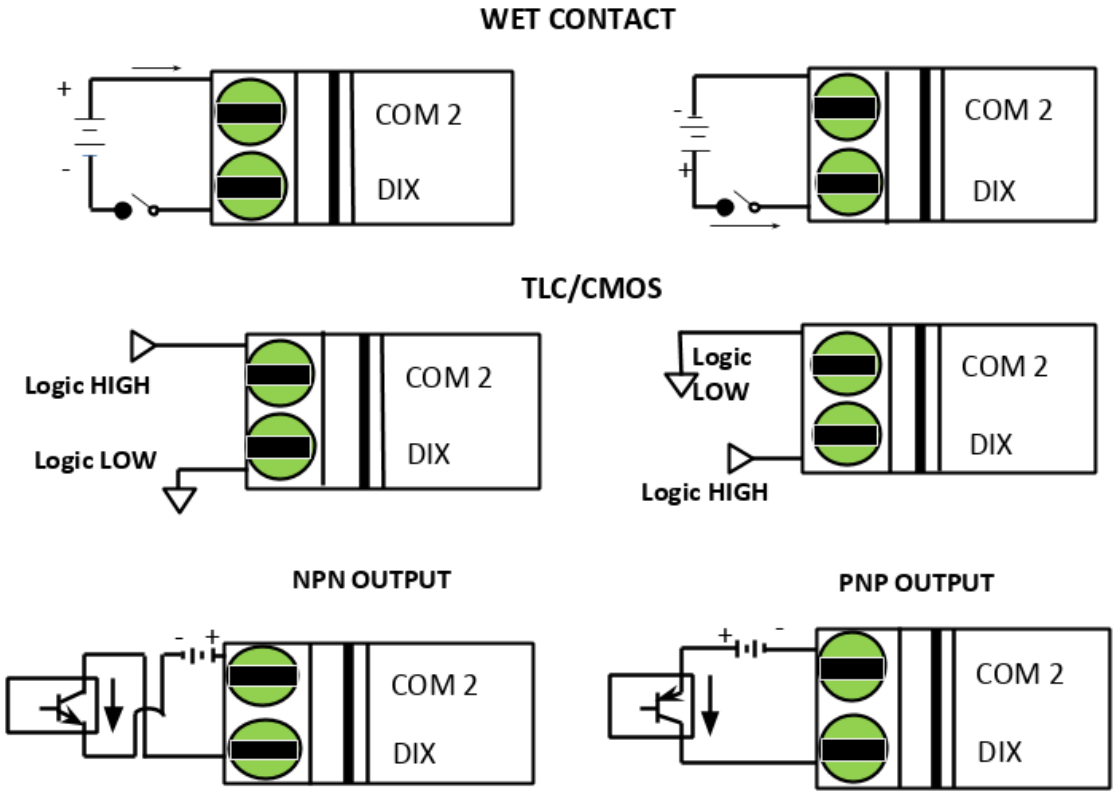
- Channels: 8
- Input Voltage: 0-24V
  - Logic High: >11V
  - Logic Low: <3V
- Isolation : 3750 VRMS
- Supports Inverted DI Status
- Supported Connection: Dry and Wet both
- Maximum Frequency : 200Hz-38kHz

## Functional Diagram



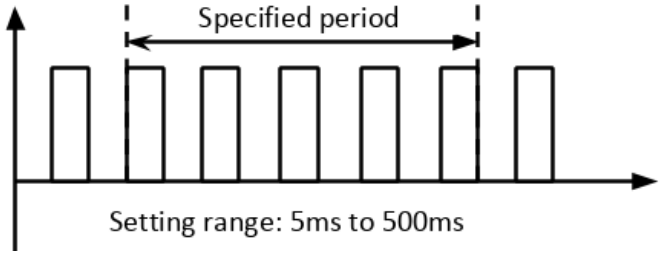

## Application Wiring






## Use Case

### 1. Measuring Frequency




### Example Code

You may look into the following link for example on reading a digital pin.

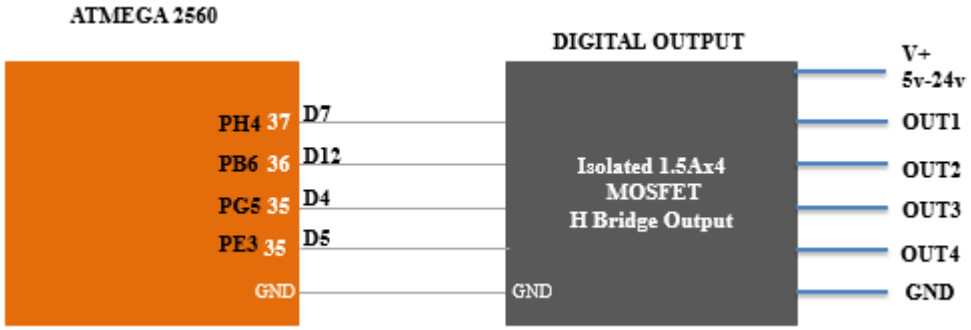
https://researchdesignlab.com/indino-4-0.html

## 9.2 Digital Output

### Specification

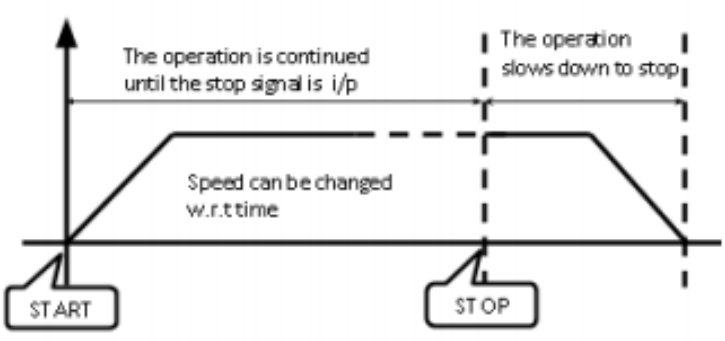
- Channels: 3
- Open Collector
- Isolation : 3750 VRMS
- Absolute maximum voltage :28V, Current :1000mA
- Cut-Off Frequency : maximum 3KHz

### Functional Diagram

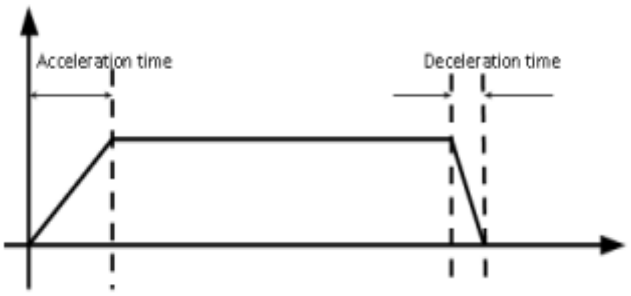



### Application:

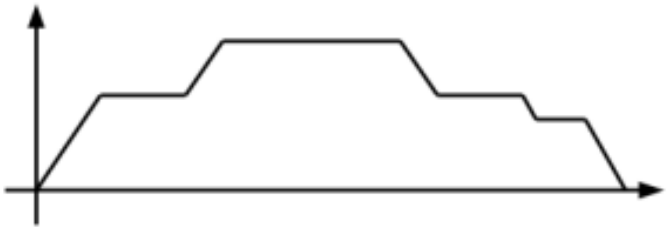
**1. Motion Control**




**2. Acceleration and Deceleration**

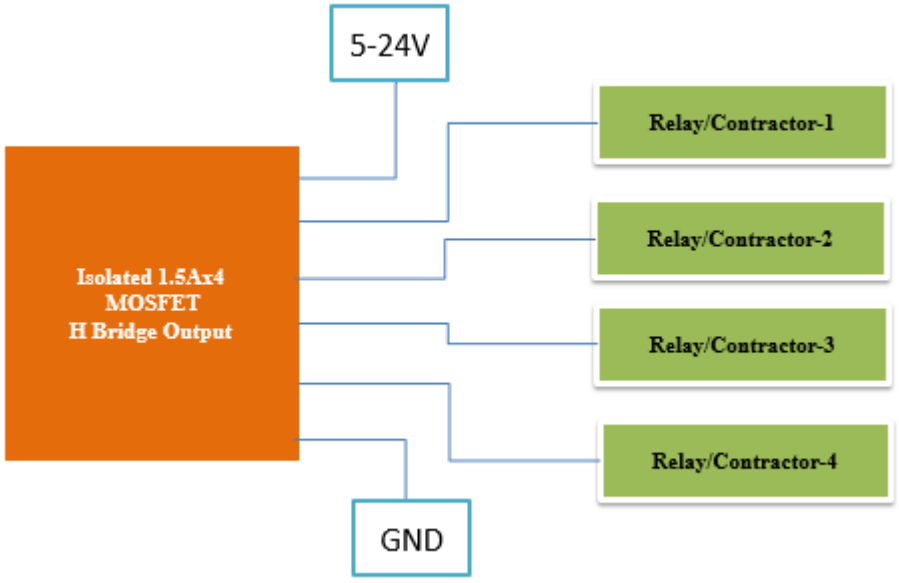


## 3. Jog Operation and Trapezoidal Control Operation



The speed can be freely changed until the operation starts to decelerate to stop

### Application Wiring




### Example Code

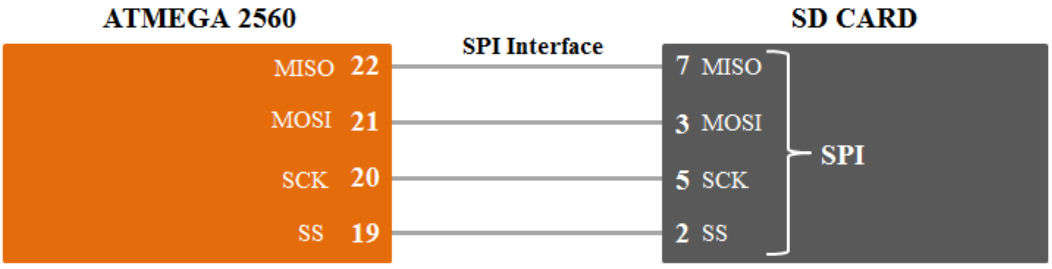
**Refer:** https://researchdesignlab.com/indino-4-0.html

## 9.3 SD Card

### Specification

- SPI Serial Interface
- Supports Fat File system

### Functional Diagram




### Example Code

You may look into the following link for example on SD Card.

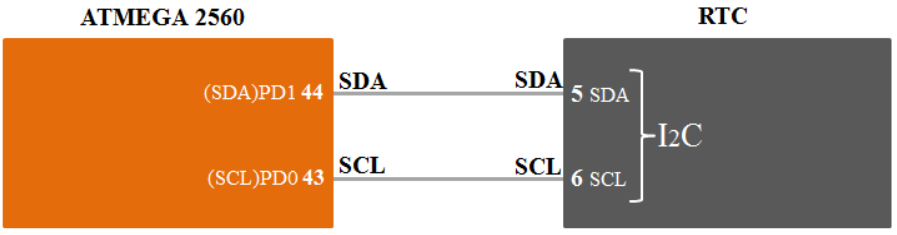
https://researchdesignlab.com/indino-4-0.html

## 9.4 RTC

### Specification

- DS1307 with I2C Serial Interface
- Counts Seconds, Minutes, Hours, Date, Month, Day, and Year with Leap-Year Compensation.
- 56-Byte, Battery-Backed, NV RAM for Data Storage
- Consumes <500nA in Battery Backup Mode with Oscillator Running

### Functional Diagram




### Example Code

You may look into the following link for example code on RTC.

https://researchdesignlab.com/indino-4-0.html

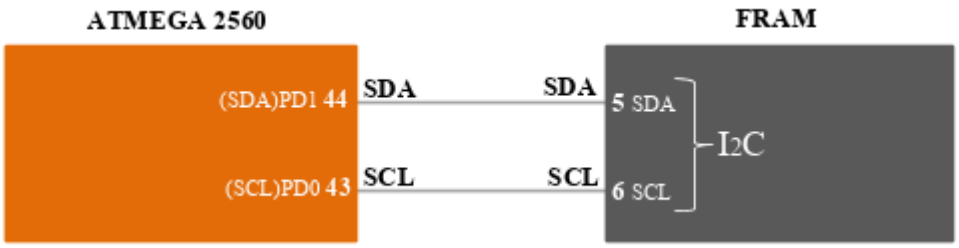
## 9.5 FRAM

FRAM is specifically used for applications such as production counting, production rejection where variable subjected to continuous write cycle

### Specification

- MB85RC256V, I2C compatible with Bit configuration : 32,768 words × 8 bits
- Operating frequency : 1 MHz (Max)
- Read/write endurance : 1012 times / byte
- Number of write cycles: 100 Trillion times
- Operating power supply voltage : 2.7V to 5.5V, current 200 µA
- Data Retention: 10 years (+85°C), 95 years (+55°C), over 200 years (+35°C).

### Functional Diagram




### Example Code

You may look into the following link for example on RTC

https://researchdesignlab.com/indino-4-0.html

## 9.6 PWDT (Physical Watch Dog Timer)

External physical watchdog is connected along with inbuilt watchdog timer.
There are many instances where we need to set watch dog time for more than 8 seconds (typically bulk file upload takes in minutes). As inbuilt WDT is limited to maximum of 8Sec, we have gone a step further to support watch dog time up to 3 minutes.

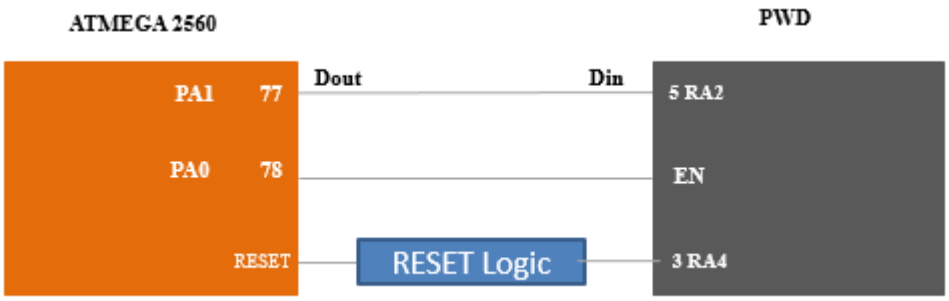
If you do not required PWDT then we can disable it by disabling Enable pin

Note: User must program PWDT to refresh before the timer (3 min) expires.

### Specification

- PWDT supports up to 3minutes.
- PIC12F1840 used for PWDT
- Refresh time : 1 pulse in every 3 minutes
- Operating temperature range: –40 to 125 °C

### Functional Diagram




### Example Code

You may look into the following link for examples on watchdog timer.

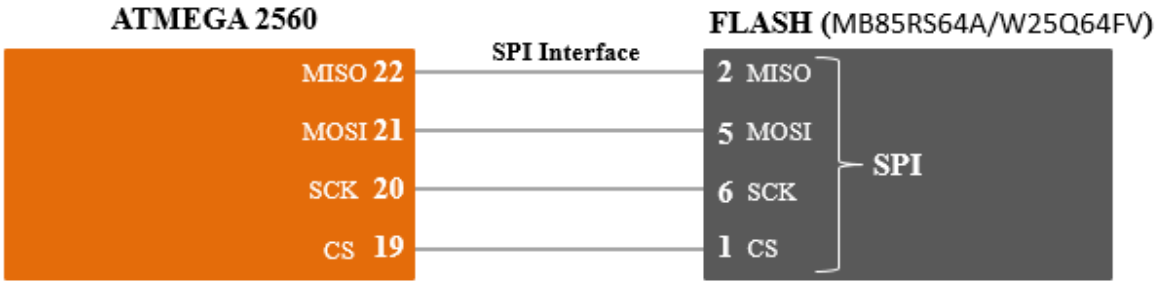
https://researchdesignlab.com/indino-4-0.html

## 9.7. Flash

Flash is specifically used for embedded server.

- Family of SPI Flash memories
- Highest performance serial flash
- Efficient “Continuous Read “ OPI mode
- Low power and wide Temperature range
- Flexible architecture with 4KB sectors
- Advanced security feature
- Space Efficient packaging

### Functional Diagram




### Example Code

You may look into the following link for example on how to use flash.

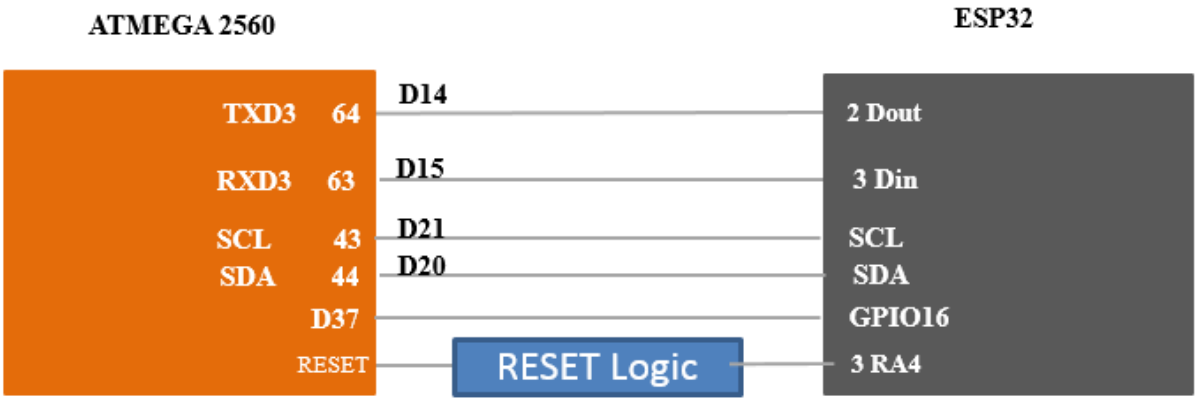
https://researchdesignlab.com/indino-4-0.html

## 9.8. ESP32

This is Add-On pluggable module. One among ESP32 is comes with the product. For more details on this, look into Order Information Table.

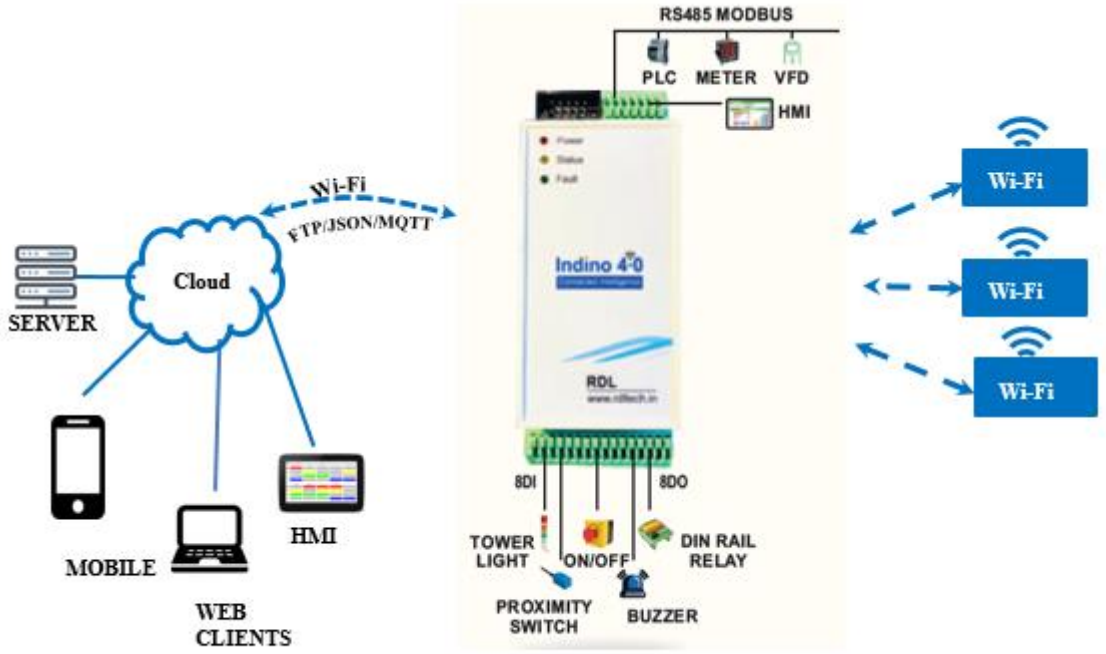
This is specifically used for wireless connectivity with existing infrastructure.

### Functional Diagram



### Use Case

**Interfacing Industrial Data Logger with Wi-Fi (ESP32)**




### Example Code

You may look into the following link for examples on esp8266.

https://researchdesignlab.com/indino-4-0.html

## 9.9. RS485 Modbus

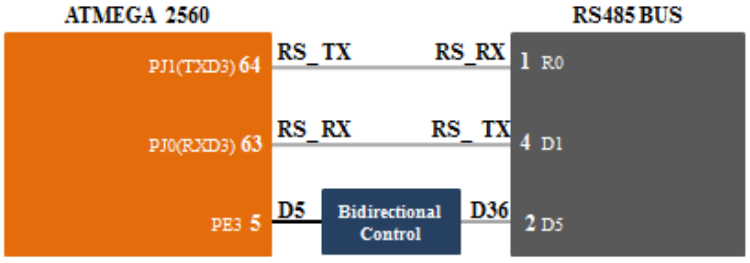
- Modbus is an Industrial standard serial communication protocol.
- Open protocol
- Information is stored in the Slave device in four different tables.
  Two tables store on/off discrete values (coils) and two store numerical values (registers). The coils and registers each have a read-only table and read-write table.
- Each table has 9999 values.
  Each coil or contact is 1 bit and assigned a data address between 0000-270E.
  Each register is 1 word = 16 bits = 2 bytes and also has data address between 0000 and 270E.
- Supported Functions are

- Coils
- Discrete inputs
- Input Registers
- Holding Registers.

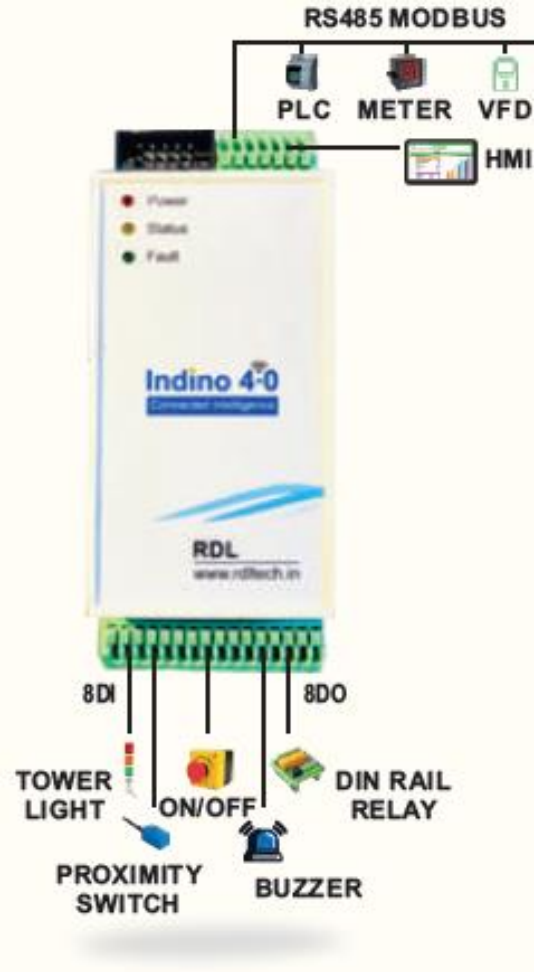
## Specification

- LTC485 IC.
- Supports slave address up to 32.
- Supports Modbus protocol with RTU and ASCII formats.
- Configurable baud rate from 4800 to 115200.
- Configurable packet format (data bits, parity bit, stop bits)

## Functional Diagram



### Use Case




### Example Code

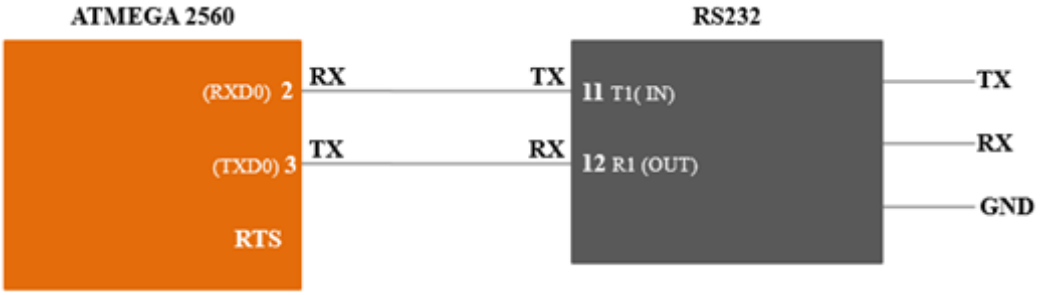
You may look into the following link for examples on Modbus examples.

https://researchdesignlab.com/indino-4-0.html

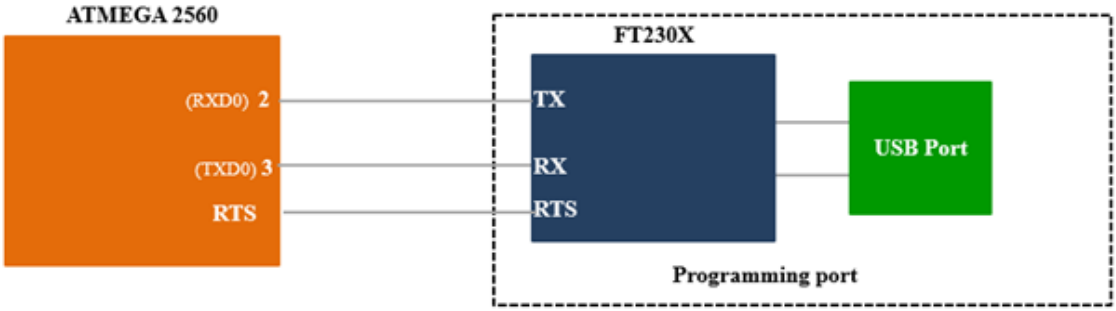
## 9.10. RS232

Used for programming the board. When in user mode, the port could be used for data communication.

## Functional Diagram




## FT232:




## Example Code

You may look into the following link for examples on FT232/MAX232 serial communication.

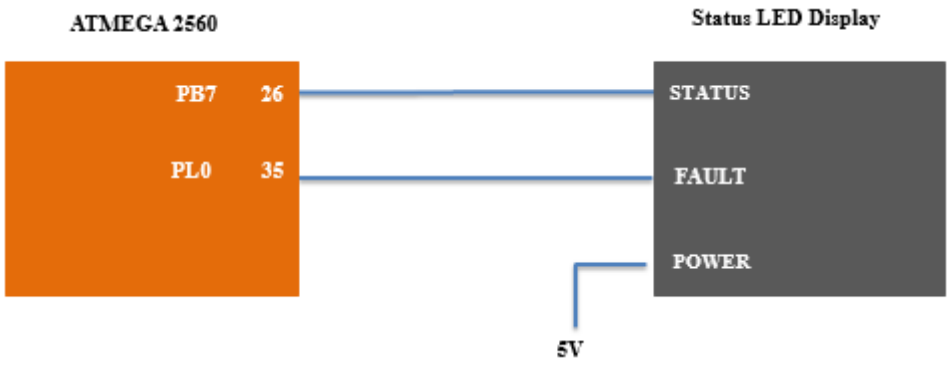
https://researchdesignlab.com/indino-4-0.html

## 9.11. Status LED Display

Status LED's can be programmed as per used needs for visual indication of an event.

Refer Digital Output Section

### Functional Diagram




### Example Code

You may look into the following link for more details on programming LED pins.

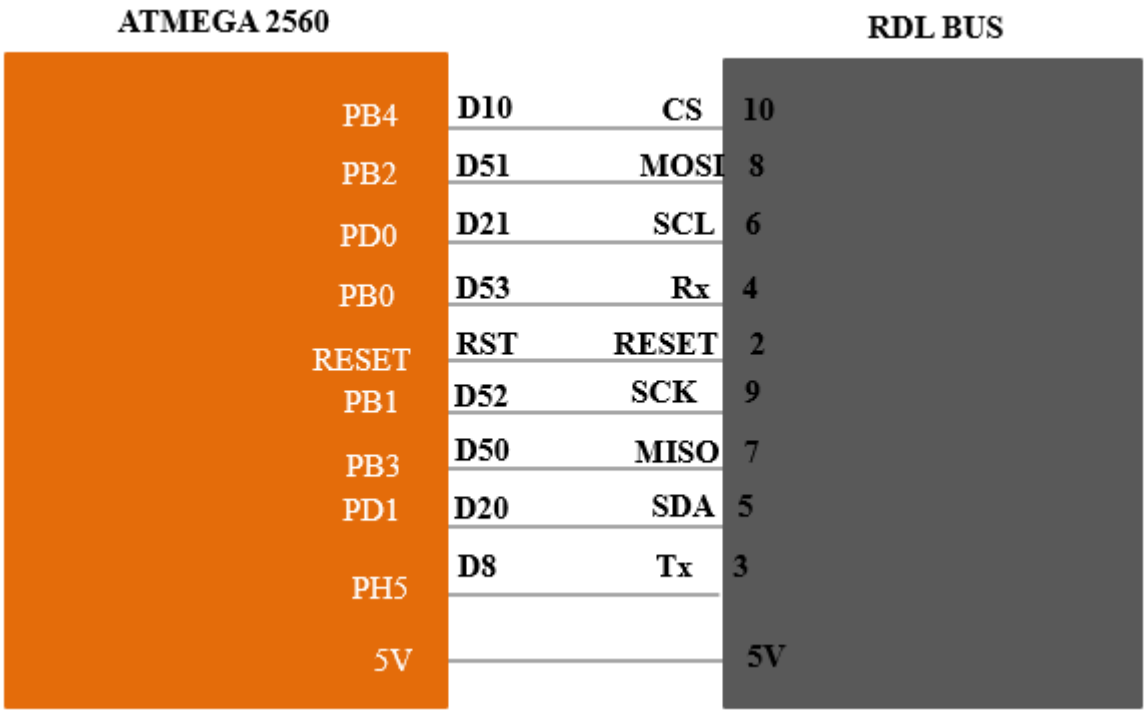
https://researchdesignlab.com/indino-4-0.html

## 9.12. RDL BUS

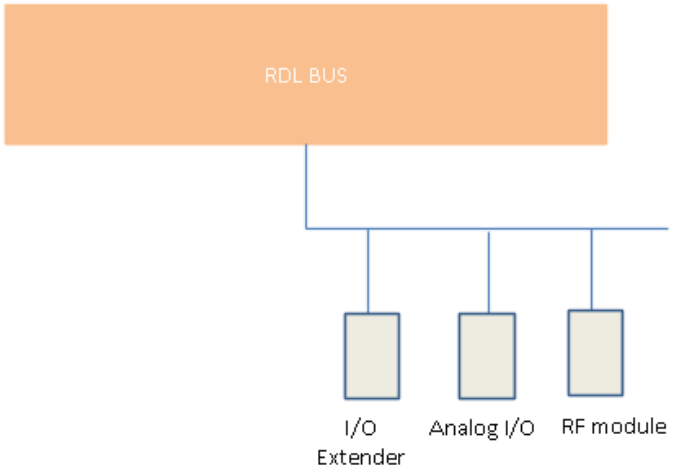
### Specification

- Extend I/O pins for communicating with external devices.
- Extends SPI pins, I2C pins, UART pins and Digital I/O pins.

## Functional Diagram



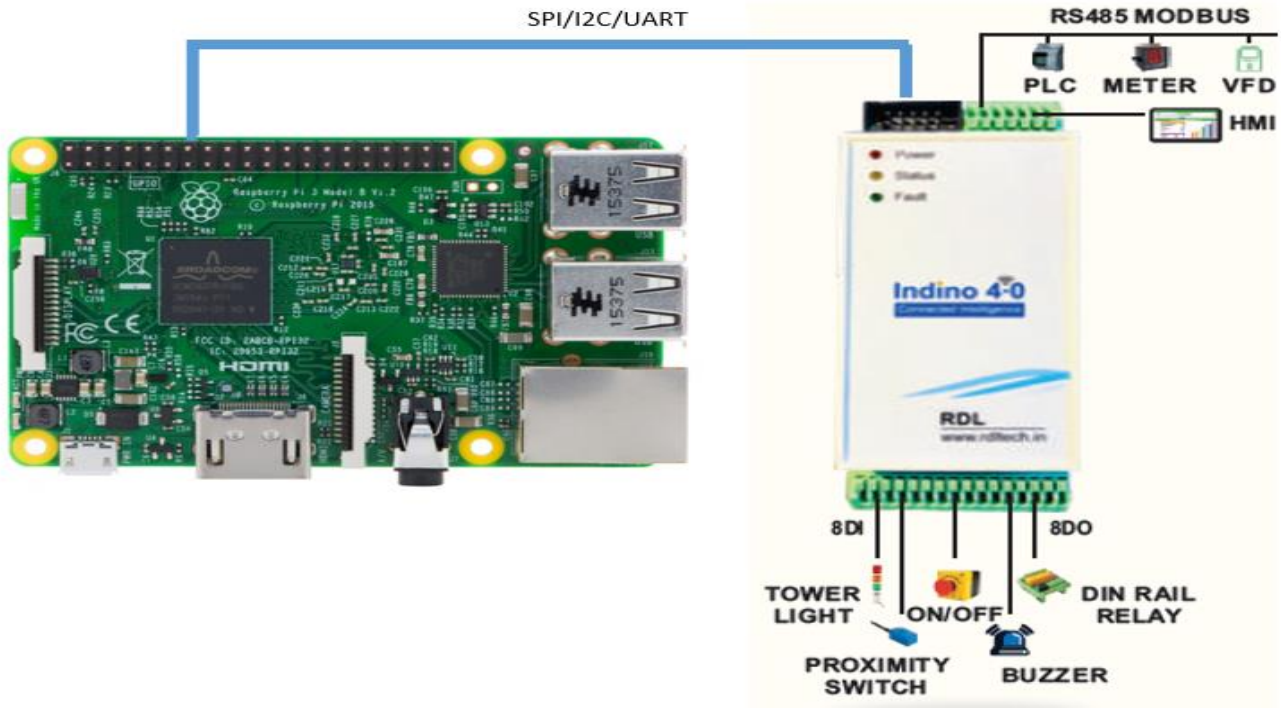

## Application Wiring



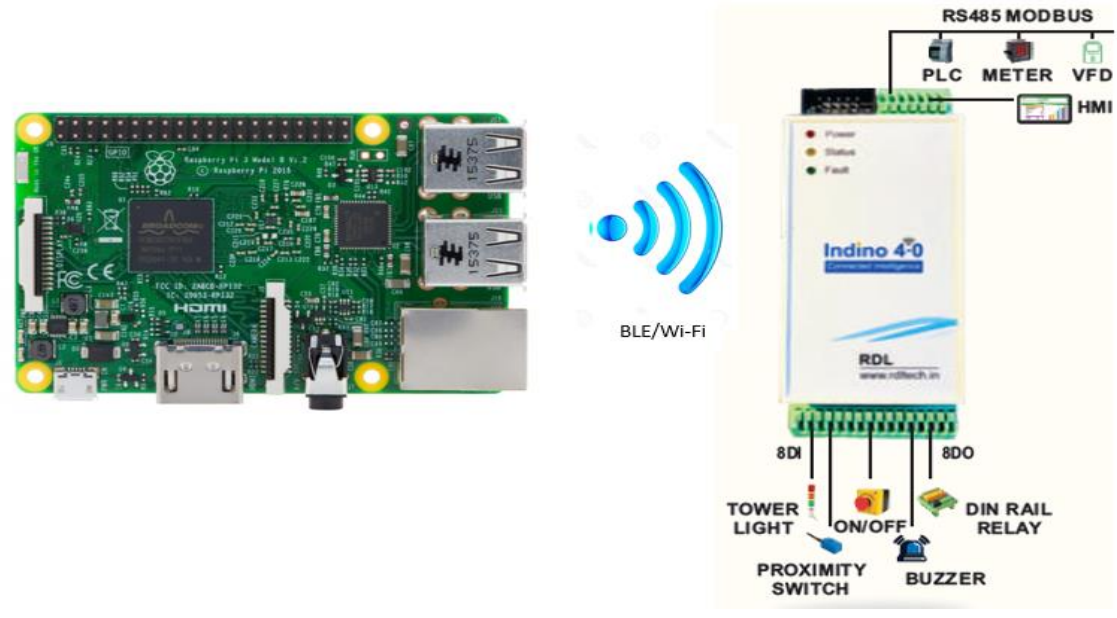
# 10. Interfacing Indino with Raspberry

Indino can easily interface with Raspberry Pi with all industrial connected sensors and drives with given open source API via following below given interfacing methods. For more details look into the open source API manual.

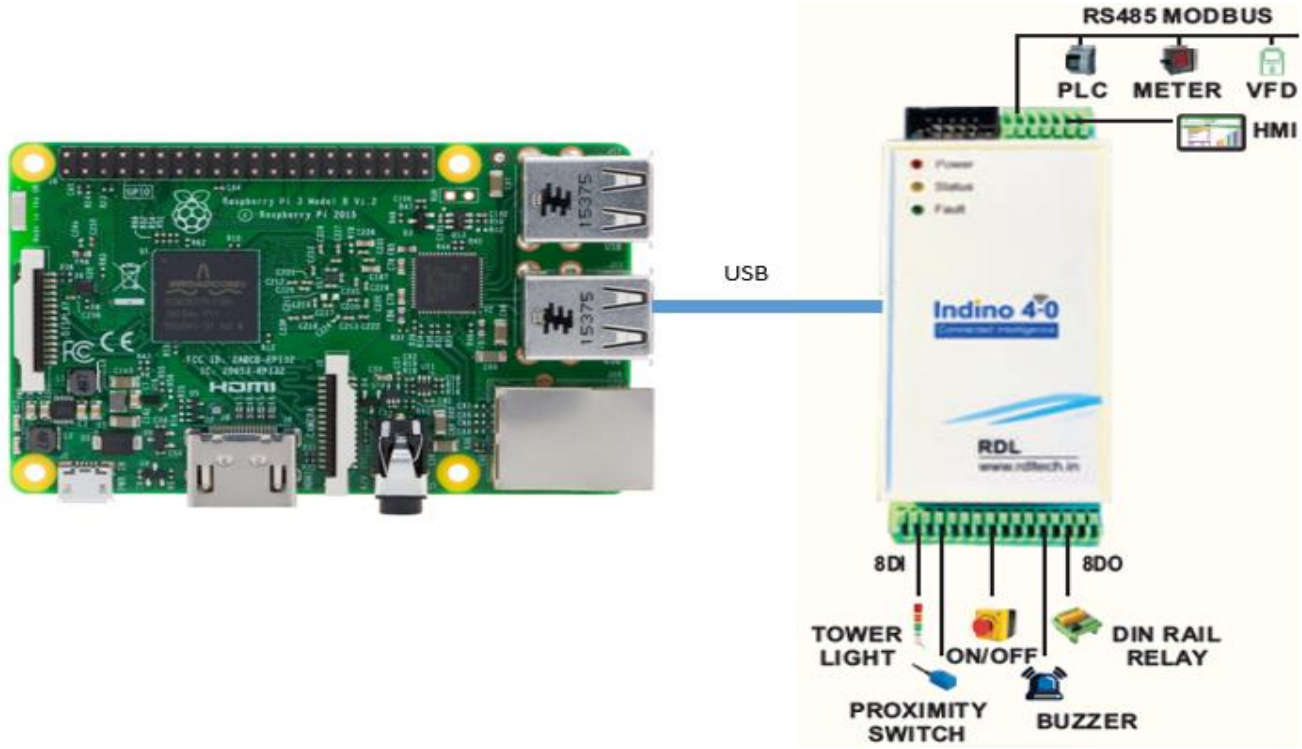
## 10.1. With SPI/I2C/UART



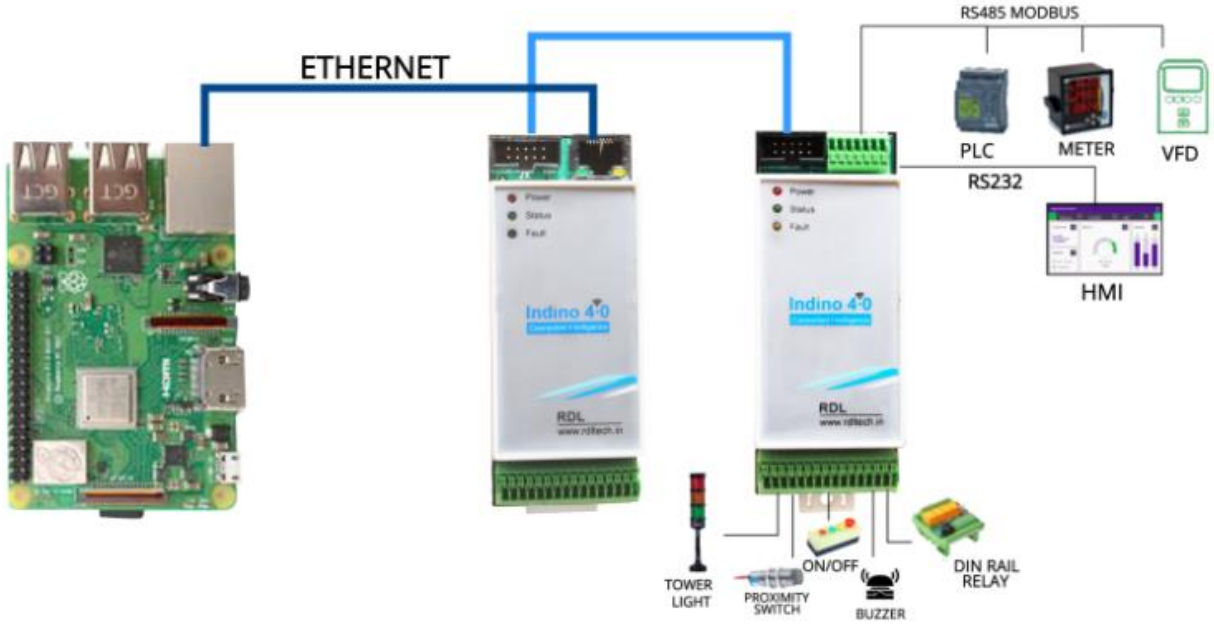

## 10.2 Interfacing via Wi-Fi and BLE



### 10.3 Interfacing via USB



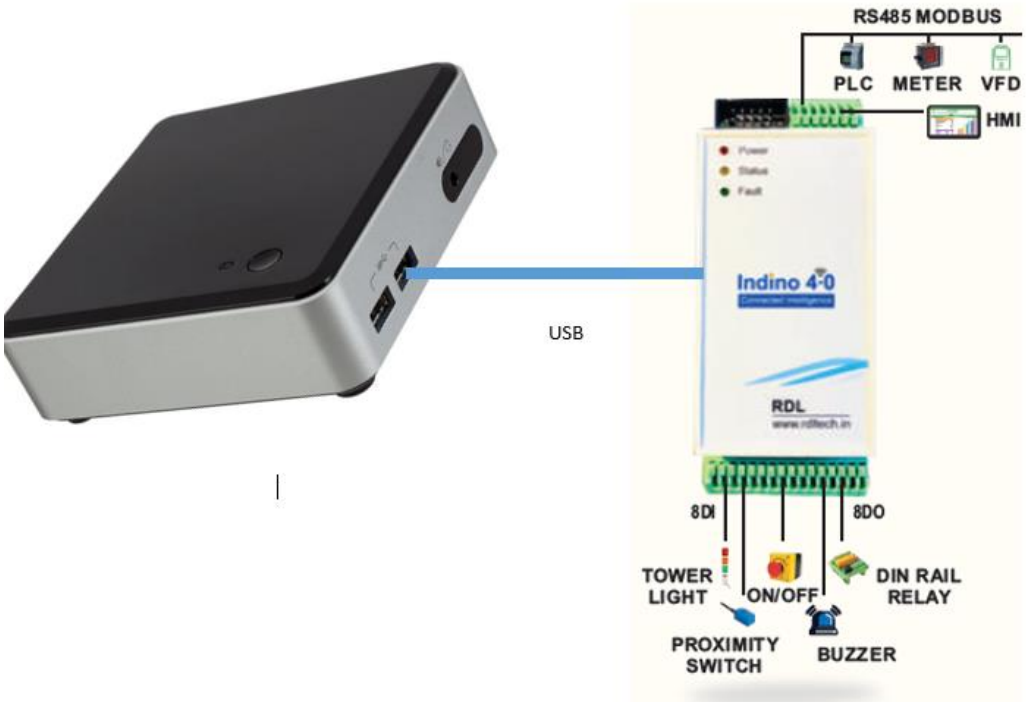

### 10.4. Interfacing via Ethernet



# 11. Interfacing Indino with Intel NUC:

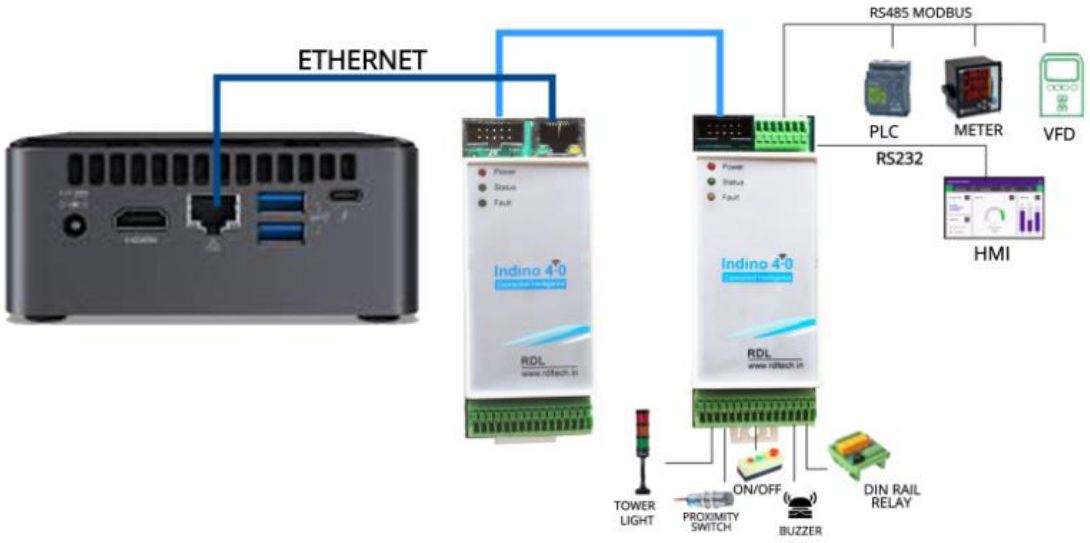
Indino can easily interface with Intel NUC with all industrial connected sensors and drives with given open source API via following below given interfacing methods. For more details look into the open source API manual.

## 11.1 Interfacing via USB




## 11.2 Interfacing viaWi-Fi/BLE

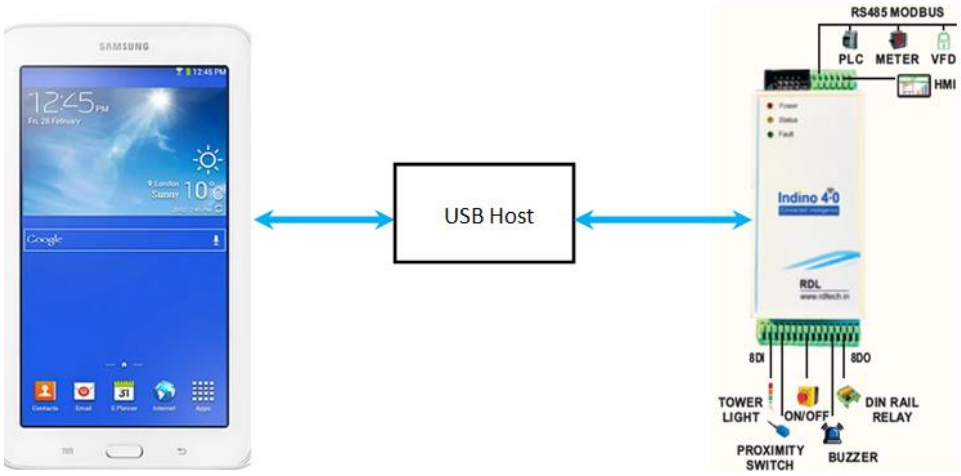
## 11.3 Using Ethernet Port



# 12. Interfacing Indino with Android Tab/Mobile Phone:

Indino can easily interface with Android Tab/Mobile phone with all industrial connected sensors and drives with given open source API via following below given interfacing methods. For more details look into the open source API manual.

## 12.1 Interfacing via OTG

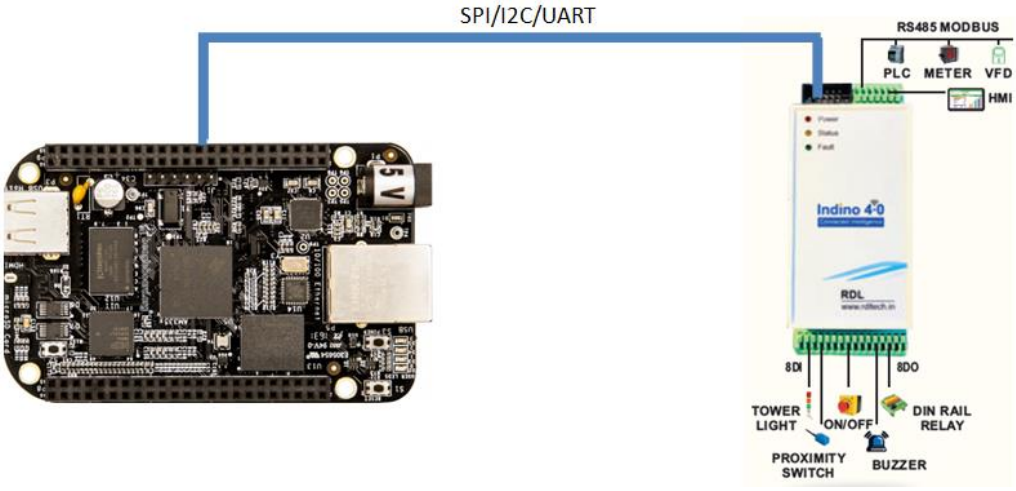



## 12.2 Interfacing viaWi-Fi/BLE

# 13. Interfacing Indino with Beaglebone:

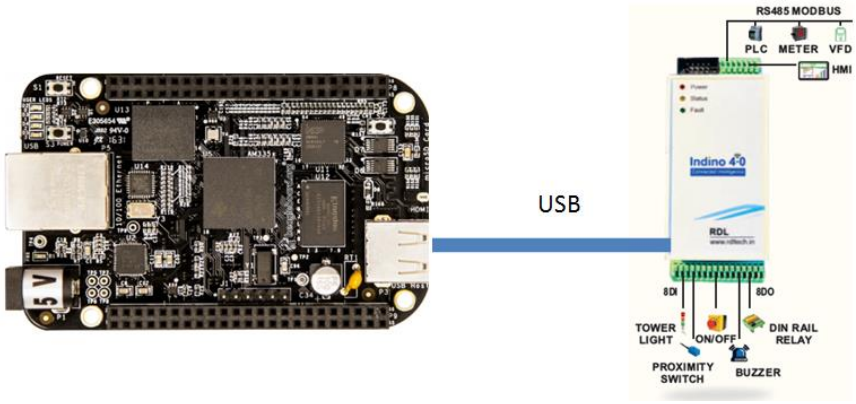
Indino can easily interface with Beaglebone with all industrial connected sensors and drives with given open source API via following below given interfacing methods. For more details look into the open source API manual.

## 13.1 With SPI/I2C/UART

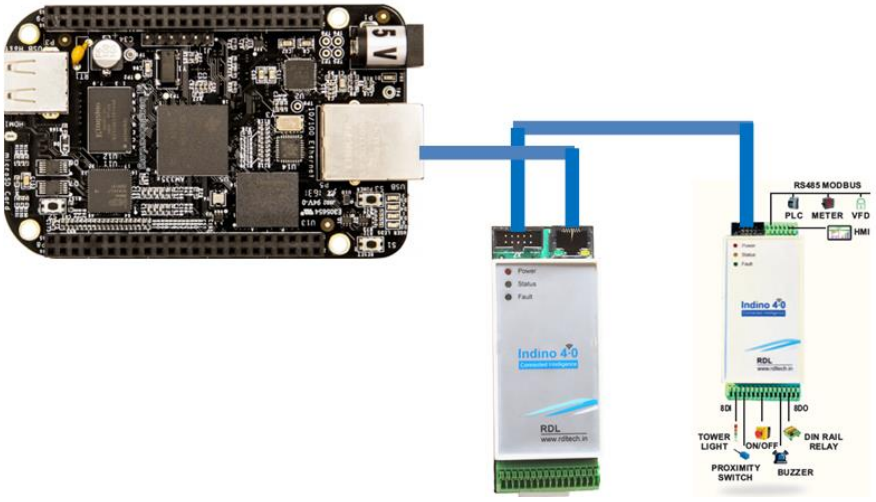



## 13.2 Interfacing via Wi-Fi and BLE

## 13.3 Interfacing via USB




## 13.4 Interfacing via Ethernet

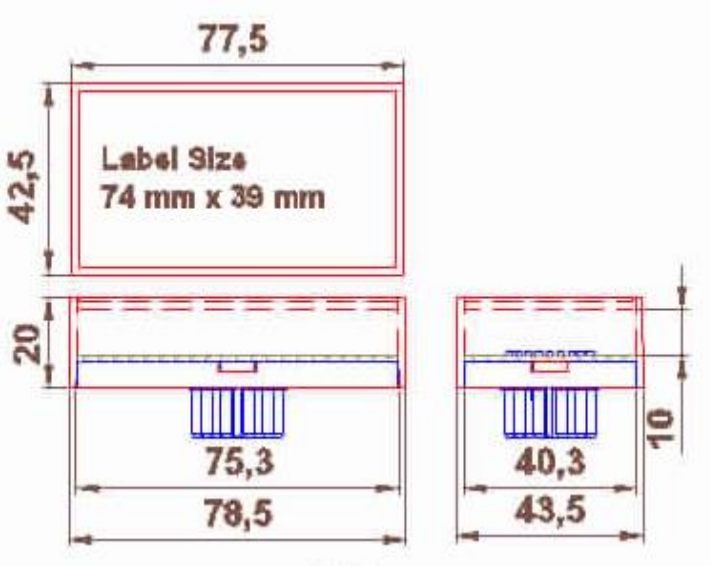


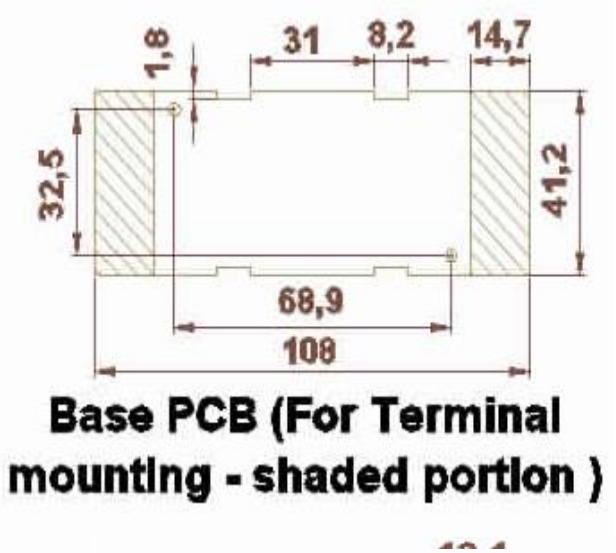
## 14. Order Information Table

| Model | INDINO-8000 | INDINO-8005 | INDINO-8010 | INDINO-8020 | INDINO-8021 | INDINO-8030 | INDINO-8040 | INDINO-8050 | INDINO-8060 |
|---|---|---|---|---|---|---|---|---|---|
| | Digital IO | Digital IO+Wifi | Ethernet IO | Analog IO RTD | Analog IO TC | GPRS IO | LORA IO | XBEE IO | GPRS GPS IO |
| DI | 8 | 8 | 6 | 1 | 1 | 8 | 8 | 8 | 8 |
| DO/PWM | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| ADC/4-20ma | x | x | x | 4 | 4 | x | x | x | x |
| GPRS | x | x | x | x | x | 1 | x | x | 1 |
| Ethernet 10/100mbps | x | x | 1 | x | x | x | x | x | x |
| RS485 | 1 | 1 | x | 1 | 1 | 1 | 1 | 1 | 1 |
| RS232 | 1 | 1 | x | 1 | 1 | 1 | 1 | 1 | 1 |
| RTD input | x | x | x | 1 | x | x | x | x | x |
| Thermo couple input | x | x | x | x | 2 | x | x | x | x |
| Wi-Fi | x | 1 | x | x | x | x | x | x | x |
| Bluetooth | 1 | 1 | x | x | x | x | x | x | x |
| LoRA | x | x | x | x | x | x | 1 | x | x |
| XBEE | x | x | x | x | x | x | x | 1 | x |

INDINO S800XX series comes with STM32 as a Co controller where as other series comes with Atmega 2560 as a co controller

## 15. Mounting and Mechanical Dimensions




Note: