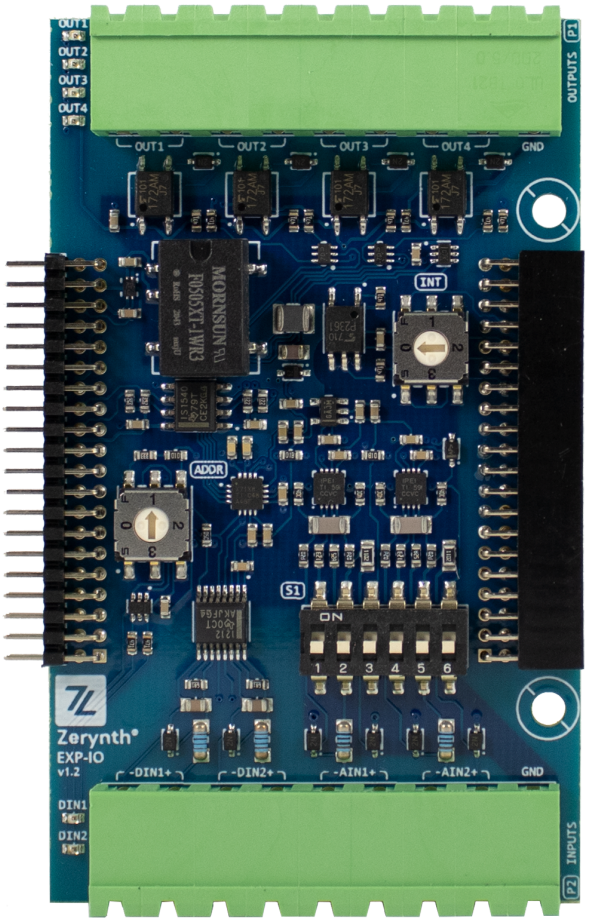
EXP-IO User Manual



For more details, visit: www.zerynth.com

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Table of contents

Table of contents	**2**
Overview	**3**
Modular Expansion System	**4**
zBUS	**4**
General Characteristics	**5**
Screw Description	**5**
Technical Specifications	**6**
Components' Guide and Pin Mapping	**7**
Software	**10**
Zerynth SDK	**10**
Declaration of Conformity	**11**
Warnings	**11**
Instructions for safe use	**12**

Overview

The **EXP-IO expansion board** is a mixed input/output module that features:

- **Relay:** The board features 4 Solid state relays, normally open connection rated at 36Vdc. This enables developers to control actuators easily using Software libraries with Zerynth SDK.
- **Opto-isolated digital inputs:** 2 channels of opto-isolated digital inputs are available on the board.
- **2 Analog Channels:** Connect your sensor easily and read the data from the sensors over the 2 industrial-compatible channels on the board. The channels support voltage-based (±10V), current-based (±20mA) or resistive sensor (with internal bias for a nominal 10kΩ impedance)

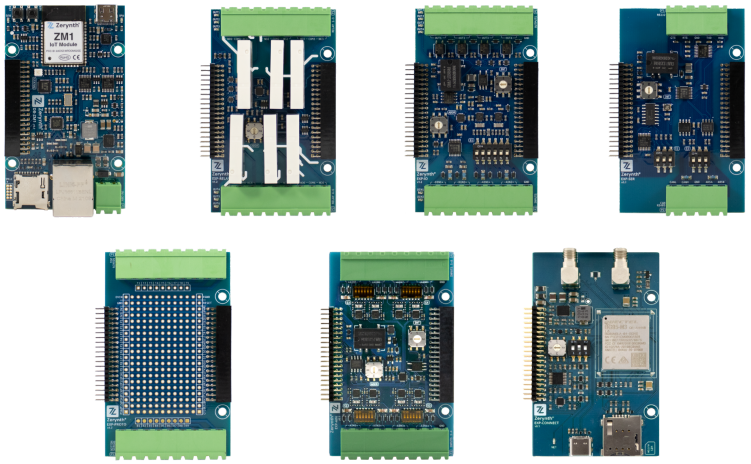
Zerynth expansion boards work seamlessly with all of the Zerynth Development boards. Combined they can act as a Development Board for prototyping a Product, and a core for industrial applications.

The zBUS allows the connection in a cascade of different add-on modules to create specific industrial applications that fit into a DIN-RAIL case.

Modular Expansion System

Zerynth Development boards offer a game-changing way of connecting and adding functionalities to your application in a simple and easy way.
The development board offers a modular expansion system that adds expansion boards through the connectors on the board (zBUS).
Expansion boards vary in features and functionality. Currently, Zerynth offers :

- EXP-AIN: Expansion board with 8 Industrial analog input channels
- EXP-CONNECT: GSM-NB-IoT and GPS enabled expansion module.
- EXP-IO: Industrial input/output board with 4 solid-state relays, 2 analog channels (4-20mA/0-10V/NTC/current clamp) channels, 2 opto-isolated digital inputs
- EXP-RELAY: Expansion board with 6 Electromechanical power relays.
- EXP-SER: Serial Communication board with : CAN, RS232 and RS485 interfaces.
- EXP-PROTO: Prototyping board for connecting and testing different types of sensors and devices.



zBUS

The modular expansion system uses **the zBUS. The zBUS** is an efficient, powerful standard for connecting and prototyping different sensors and devices.
The zBUS uses the CN1 pin header (20x2) exposing the following:

- 16 GPIO pins.
- 4 interrupt pins.
- 2 USART/UART instances with full support (TX,RX,RTS,CTS)
- I2C, SPI support.
- 5V, 3.3 V output pins.
- Enable pin for controlling the power to attached expansion boards.

Note: The development board supports up to 3 attached expansion boards.

General Characteristics

- **4 Solid State Relays NO**
  - Max voltage (open circuit) = 36VDC
  - Max current (closed circuit) = 150mA
- **2 Opto-Isolated Digital Inputs**
  - Von = 10.1VDC (typ)
  - Voff = 9.0VDC (typ)
  - Vmax = 36VDC
  - Imax = 1.86mA (typ)
  - compatible with IEC 61131-2 Type 3
- **2 Analog Channels:** Can be configured as
  - 4-20 mA Current channel (full input range +/-20mA)
  - 0-10V Voltage channel (full input range +/-10V)
  - Resistive Sensor Channel.
    Internal bias is designed for NTC thermistor probes rated 10kΩ @ 25°C (with B=3435), but other probes may also be used depending on the temperature range to be measured.
  - Current Clamp channel (+/-20mA with internal shunt resistor).

Screw Description

P1 - Upper Screw Terminal

Screw Number	Symbol	Description
1,2	OUT1	Screw Terminal of the relay #1 (OUT1 is normally open)
3,4	OUT2	Screw Terminal of the relay #2 (OUT2 is normally open)
5,6	OUT3	Screw Terminal of the relay #3 (OUT3 is normally open)
7,8	OUT4	Screw Terminal of the relay #4 (OUT4 is normally open)
9	GND	Isolated Ground reference for analog bias

P2 - Lower Screw Terminal

Screw Number	Symbol	Description
10	DIN1-	Digitally opto-Isolated digital Inputs
11	DIN1+	Digitally opto-Isolated digital Inputs
12	DIN2-	Digitally opto-Isolated digital Inputs
13	DIN2+	Digitally opto-Isolated digital Inputs
14,15	AIN1-/AIN1+	Analog Input Channel 4-20mA/0-10V/Resis./Current
16,17	AIN2-/AIN2+	Analog Input Channel 4-20mA/0-10V/Resis./Current
18	GND	Isolated Ground reference for analog bias

NOTE: All I/O pins on screw terminals are isolated from the zBUS interface.

- Isolation: 125V(rms) / 1500V(peak)
- Overvoltage Cat.II / Pollution Deg.II

NOTE: Analog channel to channel isolation > 250kΩ

Technical Specifications

Environmental Conditions	
Temperature	-40 to +85 °C
Humidity	Max 80% not condensing
Storage Temperature	-40 to +85 °C
Degree Protection	< IP40

Components' Guide and Pin Mapping

Rotary Switch SW1 : Chooses the address of the ADC Chip. Enable multiple boards to be connected simultaneously.

Position	Address
0	0x10
1	0x11
2	0x12
3	0x13

Rotary Switch SW2 : Controls which hardware channel you want to link the interrupt.

Position	Pin on zBUS	Pin ZM1-DB
0	INTR	D35
1	INTB	NC
2	INTE1	D46
3	INTE2	D47

S1 Switch : Controls the configuration of the ADC channel.

PIN	OFF	ON
1	Gain ADC AIN1 = 1	Gain ADC AIN1 = 5
2	AIN1 read as voltage	AIN1 read as Current
3	-	AIN1 read as resistive sensor
4	Gain ADC AIN2 = 1	Gain ADC AIN2 = 5
5	AIN2 read as voltage	AIN2 read as Current
6	-	AIN2 read as resistive sensor

For Voltage measurement - 0 10V standard industrial voltage sensor:

Switch pin	State
S1.1	OFF
S1.2	OFF
S1.3	OFF

For Current measurement - 4-20 mA standard industrial sensor:

Switch pin	State
S1.1	ON
S1.2	ON
S1.3	OFF

For Resistive passive industrial sensor:

Switch pin	State
S1.1	ON
S1.2	OFF
S1.3	ON

NOTE: Current clamp (transformer) can be connected using the 4-20mA configuration of the DIP switches, exploiting the full input range of ±20mA. That is ±2V across the on-board 100 Ohm resistor, that cannot handle power dissipation required by ±10V. Current transformer turns ratio must be chosen so that the secondary current does not exceed 20mA.

NOTE: All input/Output pins on this board have a max voltage rating of 36V across positive/negative pairs.

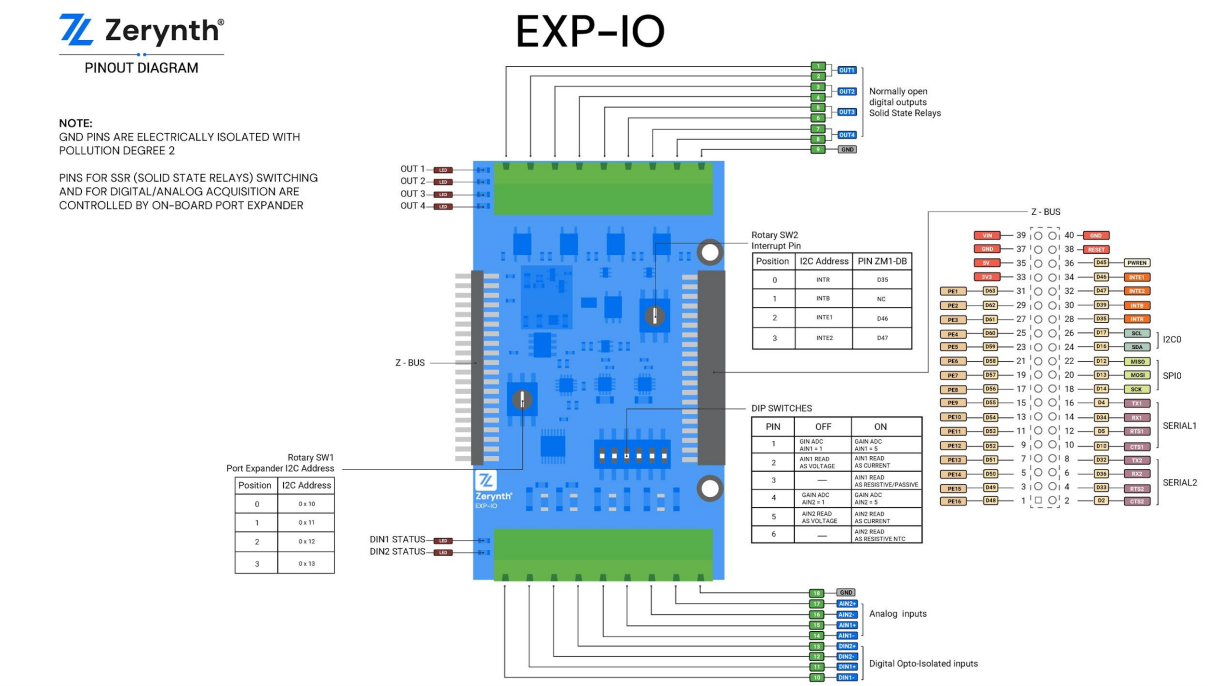
LED: The expansion board has 6 pins, each of the 4 relays has a dedicated LED to signal its state. DIN1, DIN2 also have status LEDs.

Power Supply: The board is powered by the 5V internal signal from the ZM1 Development Board.

Ground: The ground of the EXP-IO board is isolated from other references of the other expansion boards.

CN1 Pin Headers: The Zerynth zBUS consists of a 20x2 pin header.

PIN-Name	Description
EVIN	External power supply voltage (9-36V)
RESET	Reset pin, Active low.
PWREN	enable/disable the power in the zBUS
5V	Regulated 5V power supply
INTE1	Configurarable interrupt for DB-ZM1 on-board port expander.
3V3	Regulated 3.3V power supply.
INTE2	Configurarable interrupt for DB-ZM1 on-board port expander.
PE1-16	Digital I/O pins connected to ZM1 on-board Port Expander
INTB	Not Connected for DB-ZM1
INTR	Native Interrupt: user configurable
SCL	I2C Serial Clock
SDA	I2C Serial Data
MISO	SPI Master Input Slave Output
MOSI	SPI Master Output Slave Input
SCK	SPI Serial Clock
TX1	UART/USART 1 Transmit Data
RX1	UART/USART 1 Receive Data
RTS1	UART/USART 1 Request To Send
CTS1	UART/USART 1 Clear To Send
TX2	UART/USART 2 Transmit Data
RX2	UART/USART 2 Receive Datal
RTS2	UART/USART 2 Request To Send
CTS2	UART/USART 2 Clear To Send



Note: Each hardware component and major feature can be handled via software through high-level functions in a dedicated library (more info in “ZM1-DB”); each expansion board connected on the zBUS needs a specific extra library.

Software

Zerynth SDK provides software libraries for each board, alongside API documentation and examples. Please check the Hardware section for more information.
https://docs.zerynth.com/latest/hardware/

Zerynth SDK

Zerynth platform is designed to simplify and accelerate the development of IoT applications. Zerynth offers tools for developers, system integrators, and businesses to enable IoT for their products, rapidly in a secure and connected way.

Zerynth SDK is the official development framework for Zerynth hardware, It includes a compiler, device drivers and libraries drivers, In addition to simple tutorials, example codes, and application examples.

Zerynth SDK and all the required libraries can be installed on Windows, Linux and Mac using the Zerynth Installer (https://www.zerynth.com/zsdk).

Declaration of Conformity

IMPORTANT: KEEP THESE INFORMATION FOR FUTURE REFERENCE FOR FULL SET UP AND INSTALLATION INSTRUCTIONS PLEASE VISIT https://www.zerynth.com/download/20238/

Warnings

- All external power supplies used with Zerynth boards must comply with the relevant regulations and standards applicable in the country of use and must provide a voltage between 9 and 36 VDC.
- The EXP-RELAY board can switch loads up to 250VAC 6A through its relays contacts (C, NO, NC). Those lines must be protected with 6 amps fuses or similar devices to limit the current.
- The manufacturer cannot guarantee compliance with the RED directive if the end user uses custom circuits other than those supplied by Zerynth (used in conformity tests).
- All expansion boards that require CE marking have been tested and meet the essential requirements set by the Directives: 2014/30/EU (EMC), 2014/35/EU (LVD), 2011/65/EU (RoHS). The declaration of conformity (DoC) can be downloaded from the website https://www.zerynth.com/download/20246/
- All Zerynth boards have undergone compliance testing for conducted and radiated emissions meeting the requirements of the following standards: FCC Part 15 B and IC ICES-003.
- Any device or component connected to one of the expansion connectors must comply with the electrical characteristics defined in the specifications described in the complete manual to ensure that the performance and safety requirements are met.
- Each cable used to connect other devices or components to the Zerynth boards must be less than 300 cm long and must offer adequate insulation and operation so that the appropriate performance and safety requirements are met.

Instructions for safe use

- Do not expose this product to water or moisture and do not place it on a conductive surface while it is operating.
- Do not expose this product to excessive heat sources which could cause it to operate outside the permitted temperature range defined in the specifications (-40, +85 ° C).
- Be careful when handling the product to avoid mechanical or electrical damage to the printed circuit board and connectors.
- If a board looks damaged, do not use it.
- Do not touch the printed circuit board when it is powered and never operate on live electrical parts.
- The printed circuit board must not come into contact with conductive objects when it is powered.
- Discharge static electricity from your body and touch only the edges of the board to minimize the risk of damage from electrostatic discharge.

EN - Waste Electrical and Electronic Equipment (WEEE) Symbol

The use of the WEEE symbol indicates that this product/board may not be treated as household waste. By ensuring this product/board is disposed of correctly, you will help protect the environment. For more detailed information about recycling of this product/board, please contact your local authority, your household waste disposal service provider or the shop where you purchased it.

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