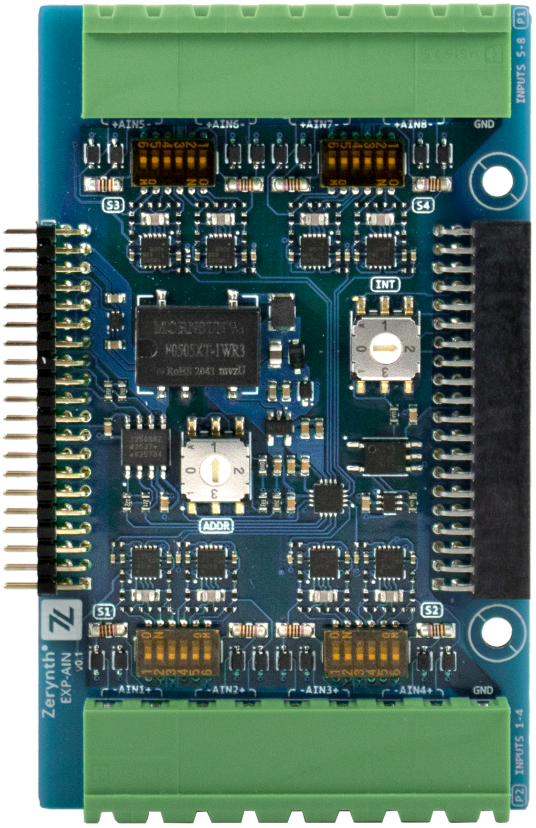
EXP-AIN User Manual



For more details, visit: www.zerynth.com

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Overview

The **EXP-AIN expansion board** enables monitoring and controlling of industrial processes using 8 industrial analog sensor channels.The channels support voltage-based (±10V), current-based (±20mA) or resistive sensors .

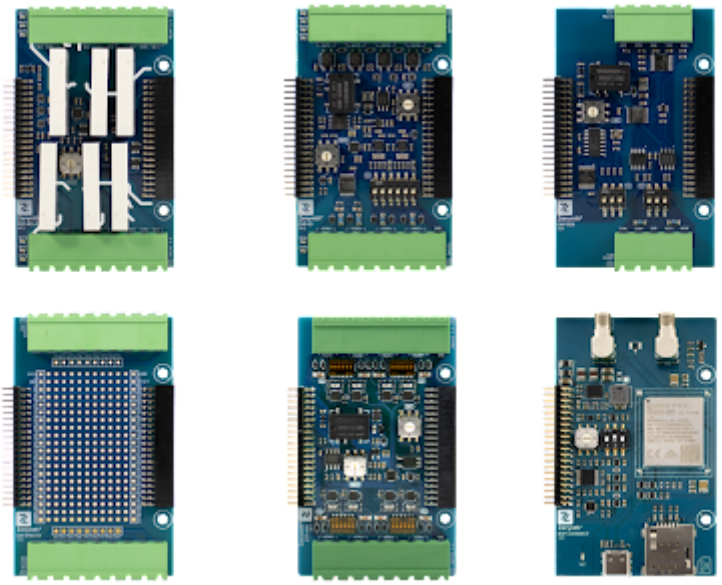
Zerynth expansion boards work seamlessly with all of the Zerynth Development boards. Combined, they can act as a Development Board for prototyping a Product, and a core for industrial applications.

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.



General Characteristics

8 Analog Channels: Each channel 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 based on voltage or current signal(within channel Voltage and current ratings).

Screw Description

P1 - Upper screw terminal		
Screw Number	**Symbol**	**Description**
1,2	AIN5-/AIN5+	Analog Input Channel 4-20mA/0-10V/Resis./Current
3,4	AIN6-/AIN6+	Analog Input Channel 4-20mA/0-10V/Resis./Current
5,6	AIN7-/AIN7+	Analog Input Channel 4-20mA/0-10V/Resis./Current
7,8	AIN8-/AIN8+	Analog Input Channel 4-20mA/0-10V/Resis./Current
9	GND	Isolated Ground reference for analog bias

P2 - Lower Screw terminal		
Screw Number	**Symbol**	**Description**
10,11	AIN1-/AIN1+	Analog Input Channel 4-20mA/0-10V/Resis./Current
12,13	AIN2-/AIN2+	Analog Input Channel 4-20mA/0-10V/Resis./Current
14,15	AIN3-/AIN3+	Analog Input Channel 4-20mA/0-10V/Resis./Current
16,17	AIN4-/AIN4+	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

Dip-Switches

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 : Each Analog channel can be configured with 3 DIP switches that enable specific features, **The same settings are applied for S2, S3, S4.**

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

Each Switch controls two ADC channels as follows

- S1 switch → x=1, y=2 → AIN1 and AIN2 channels.
- S2 switch → x=3, y=4 → AIN3 and AIN4 channels.
- S3 switch → x=5, y=6 → AIN5 and AIN6 channels.
- S4 switch → x=7, y=8 → AIN7 and AIN8 channels.

For Voltage measurement - 0 10V standard industrial voltage sensor (Select switch number n according to the needed analog channel):

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

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

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

For Resistive passive industrial sensor:

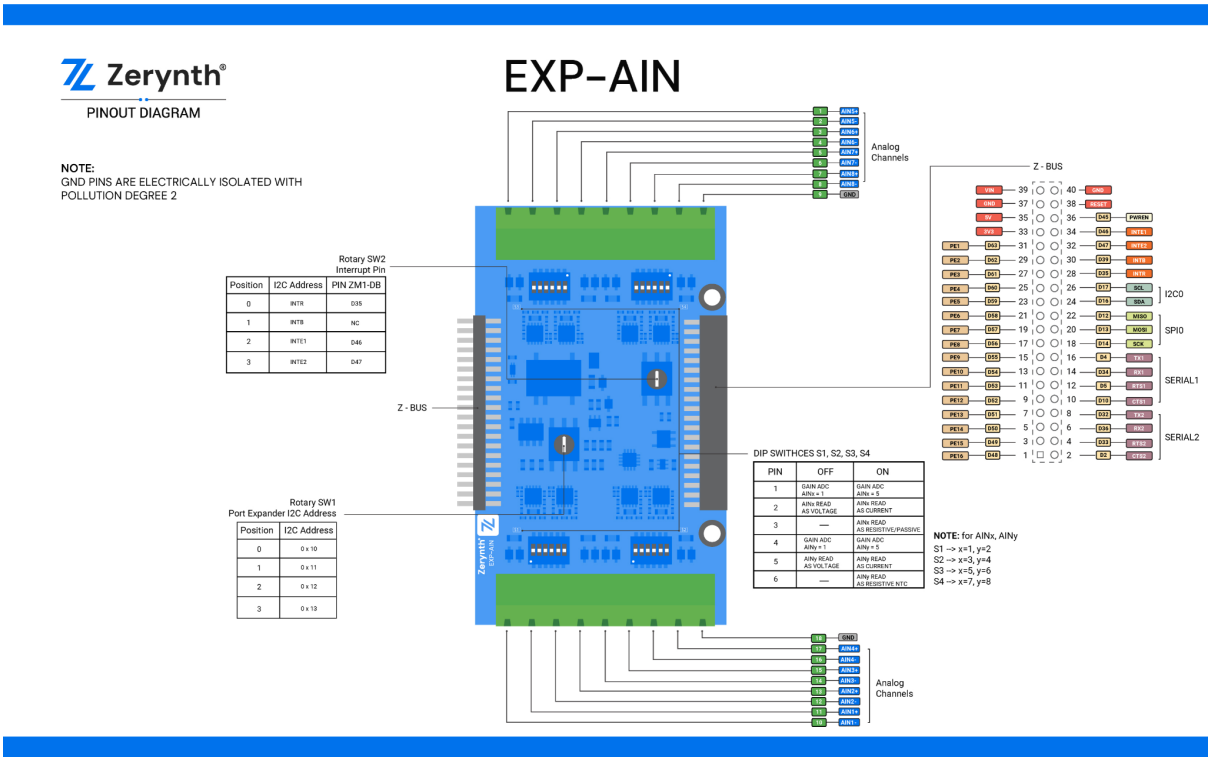
Switch pin	State
Sn.1	ON
Sn.2	OFF
Sn.3	ON

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, which 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.

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

Pin Map



zBUS Pin Description

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

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 docs.zerynth.com

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 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.

Zerynth®

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.