

- RTD: PT100, PT1000, PT500 & NI100: 2, 3 & 4 wire
- 1500 V Isolation, 6-way
- Modbus Communications
- Adjustable Sampling Time
- Accuracy to 0.2 °C
- Configuration and Setup Software IEC 61131
- Flexible Power (10-40 Vdc or 19-28 Vac)
- DIN Rail Mount (TS 35)
- Removable Terminal Blocks



The Z-NET™ model Z-4RTD has 4 configurable RTD input channels. Each channel can be configured to a different RTD type and have different filtering. The Z-4RTD allows the user to select between higher sampling time or higher resolution. The communications and sampling time are configured through software. The current version of the Z-NET software (requires a CPU module) or Z-PROG may be used for configuration of the Z-4RTD parameters.

The Z-NET™ Series offers flexible, cost effective solutions to industry's increasingly diverse applications including distributed control, data acquisition, SCADA & telemetry. An ideal solution for process control and management using distributed I/O on plant and machinery. The I/O modules can be widely distributed or grouped together and accept all standard field signals. Modbus RTU protocol guarantees universal connectivity so applications are limitless: data acquisition, automation, telemetry control, etc.

More flexibility from ioSelect.

General Specifications

RTD Input	PT100, PT500, PT1000, NI100
Resolution	14/13 bit + sign (5 µV)
Power Supply	10 to 40 Vdc 19 to 28 Vac 50/60 Hz
Protection	400 W/s
Power Consumption	0.7 W max.
Isolation	1500 Vac, between channels and power and communication ports
Overload Protection	60 V
Status Indicators	Error, Power, RX & TX
Operating Temp	-10 to 65 °C (14 to 149 °F)
Storage Temp	-20 to 85 °C (-4 to 185 °F)
Humidity	30 to 90% @ 40 °C non-cond.
Weight	120 g (4.2 oz)
Dimensions	100 x 112 x 17.5 mm (3.94 x 4.41 x .69 in)

Performance Specifications

Communications Port	RS-485 - 2-Wire
Speed (baud)	9600, 19,200, 38,400, 57,600
Sampling Time	400 mS @ 14 bit, 200 mS @ 13
Protocol	Modbus RTU
RTD Standard	
PT100, PT500 & PT1000	EN60751/A2 (ITS-90)
Class/Base Precision	0.05
RTD Input Error	
Calibration	0.04%
Linearity	0.025%
Thermal Stability	0.01%/ °C
Excitation current	
PT500 and PT1000	333 µA nominal
PT100 and NI100	875 µA nominal
Lead Length Comp	20 Ω for PT100 -30 Ω all others
Input Filter	1-60 seconds

Ordering Information: IOS-ZNET-4RTD

4-Channel RTD Input Module (V/I)

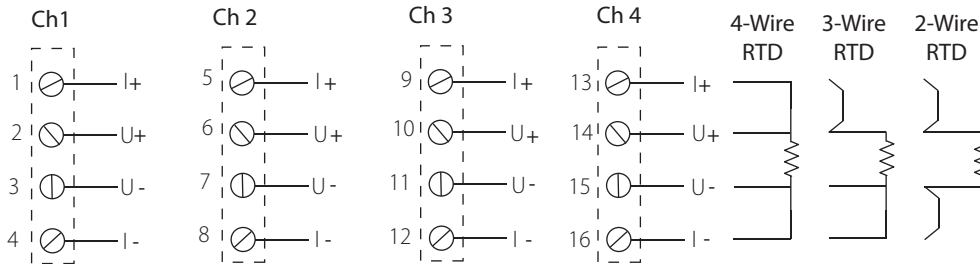
Accessories: IOS-ZNET-DINAL
IOS-ZNET-DIN2
IOS-ZNET-DIN4
IOS-ZNET-DIN8

Din Rail Power and Comms Connector
Din Rail Power and Comms Connector for 2 modules
Din Rail Power and Comms Connector for 4 modules
Din Rail Power and Comms Connector for 8 modules

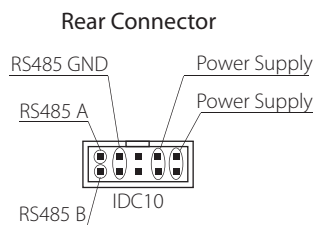
RTD Ranges

RTD	Temperature Range	Resistance Range	Error Indication
PT100	-200-650 °C (-328-1202 °F)	18.5 to 330 Ω	R < 18 Ω; R > 341 Ω
PT500	-200-750 °C (-328-1382 °F)	92.5 to 1800 Ω	R < 92.5 Ω; R > 1851Ω
PT1000	-200-210 °C (-328-410 °F)	69 to 295 Ω	R < 180 Ω; R > 1851 Ω
NI100	-60-250 °C (-76-482 °F)	69 to 295 Ω	R < 60 Ω; R > 301 Ω

Wiring Instructions



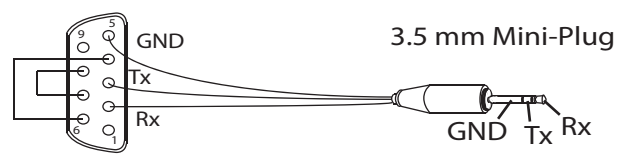
NOTE: All input terminals must have a connection. U+ is wired to I+ for a 3-wire RTD. A 2 wire RTD requires U- wired to I- and U+ wired to I+ on the terminal block.



19 to 40 Vdc
or
19 to 28 Vac
Not Polarity Sensitive
***Do not exceed upper limits of supply voltage**



RS232 Serial Port Cable



Configuration

Baud Rate & Modbus Address Selection

SW1	Baud
1 2 3 4 5 6 7 8 9 10	
0 0 0 0 0 0 0 0 0 0	9600
0 0 0 0 0 0 0 0 0 1	19200
0 0 0 0 0 0 0 1 0 0	38400
0 0 0 0 0 0 1 0 0 0	57600

SW1	Address
1 2 3 4 5 6 7 8 9 10	
0 0 0 0 0 0 0 0 0 0	EEPROM
0 0 0 0 0 0 0 0 0 1	1
0 0 0 0 0 0 0 0 1 0	2
0 0 0 0 0 0 0 1 0 0	3
0 0 0 0 0 0 1 0 0 0	4
...	...
0 0 0 0 0 0 0 0 0 0	63

SW1	Bus Terminator
9 10	
0 0	OFF
0 1	ON

SW1-9 is not used. It should remain in the Off position



CAUTION: Set the switches prior to applying power or connecting the input of the ZNET Z-4RTD

NOTE: Default configuration :
Address 001, 38400 baud, no parity, 1 stop bit

Filtering

The filtering can be set for every channel. The filter consists of two independent low-pass filters:

- Filter FIR, a running average, able to increase the rejection of disturbances to the mains power line frequency and to reduce measuring noise.
- Filter IIR exponential, with programmable time constant, able to dampen fluctuations.

If an input variation higher than the threshold "T" is detected, both filters are forced to adapt rapidly to the new value, stabilizing it only later. The filter is set with the three least significant bits of MODBUS registers 40037..40. The following is a table containing all adjustable filter types. The propagation time (90%) is indicated for each filter.

SET	SAMPLING		FILTER TYPE	PROP. TIME 90%	
	Bit ADC	Hz		<T	>T
000	13	48	Not Present	38 ms	38 ms
001	13	20	Average	197 ms	86 ms
010	14	11	Average	338 ms	149 ms
011	14	11	Average + exp	83 ms	149 ms
100	14	11	Average + exp	2.5 s	149 ms
101	14	11	Average + exp	6.7 s	149 ms
110	14	11	Average + exp	20 s	149 ms
111	14	11	Average + exp	60 s	149 ms

Installation

The ZNET™ Z-4RTD is designed to be mounted on 35 mm DIN rail. Adequate ventilation may be needed to ensure optimal operating conditions. Avoid mounting modules over devices that generate heat. If operating at the high end of the temperature specifications (near 45 °C/ 113 °F) it may be necessary to separate the modules by at least 5 mm (0.2 in).

Other Conditions that may Contribute to High Operational Temperature:

- High power voltage (> 30Vdc / > 26 Vac)
- Powering an input sensor and one output consistently at a high output level

Power supply upper limits must not be exceeded. Excessive power level will result in damage to the module.

Serial Interface

The RS485 serial interface is based on a balanced differential communication line with typical impedance of 120 ohm. The maximum length of the connection is not defined but depends on the communication speed, the signal-interference ratio and the cable quality. Generally, the maximum length with guaranteed operation is fixed at 1200 m. The connection cable does not have to be shielded if the distance is only a few meters in a “low noise” electrical environment. For distances between 15 and 100 m, a shielded twisted cable can be used without particular specifications; whereas, for connections over 100 m you are advised to use, for example, CEAM CPR 6003 or BELDEN 9841 cable.

The communication line should preferably be of the chain type, avoiding star configurations and limiting branches to a few meters. Terminate the ends of the lines by setting the related dip-switch on the module to ON, or by fitting a 120 Ω resistor parallel to the line. Connect the cable shield to the terminal on both sides, and connect to earth on at least one side. If necessary to reduce interference, connect the other side to earth by means of a 10 nF capacitor.

Modbus Registers

The Z-4RTD has MODBUS 16 bit (words) registers, accessible by RS485 or RS232 serial communication. This means data can be acquired from a PC or a controller. The next sections describe the supported MODBUS commands, and the functions of the registers.

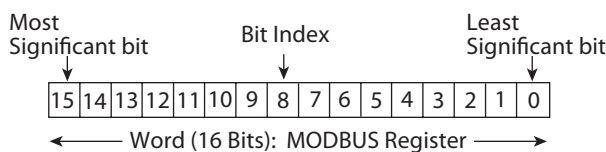
SUPPORTED MODBUS COMMANDS

Code	Function	Description
03 *	Read Holding Registers	Read up to 16 word registers
04 *	Read Input Registers	Read up to 16 word registers
06	Write Single Register	Write a word register
16	Write Multiple Registers	Write up to 16 word registers

* The two functions have the same effect

HOLDING REGISTERS

The 16-bit Holding Registers have the following structure:



The Bit notation [x:y] shown in the table indicates all the bits from x to y. For example, Bit [2:1] indicates bit 2 and bit 1, and illustrates the meaning of the various linked combinations of the values of the two bits. Remember that the MODBUS 3, 4, 6 and 16 single and multiple reading and writing functions can be executed on the following registers.

Default values are indicated with the “*” symbol.

Register	Description	ADDRESS	R/W
MACHINE ID	Bit [15:8]: contain the module's ID: 22 (hexadecimal: 0x17) Bit [7:0]: contain the firmware's revision.	40001	R
STATUS_INP	Status of input channels	40002	R
Bit [15]	1 = Fault on Channel 1		
Bit[14]	1 = Fault on Channel 2		
Bit [13]	1 = Fault on Channel 3		
Bit [12]	1 = Fault on Channel 4		
Bit [11]	1 = Fault on Channel 1 sensor		
Bit [10]	1 = Fault on Channel 2 sensor		
Bit [9]	1 = Fault on Channel 3 sensor		
Bit [8]	1 = Fault on Channel 4 sensor		
Bit [7]	1 = Communication error with Channel 1		
Bit [6]	1 = Communication error with Channel 2		
Bit [5]	1 = Communication error with Channel 3		
Bit [4]	1 = Communication error with Channel 4		
Bit [3]	1 = Init Error on Channel 1		
Bit [2]	1 = Init Error on Channel 2		
Bit [1]	1 = Init Error on Channel 3		
Bit [0]	1 = Init Error on Channel 4		
CHAN1_TENTHS	Channel 1 measurement (tenths of °C or tenths or hundredths of Ohms)	40003	R
Bit [15:0]	Temperature of channel 1 in tenths of °C or resistance in tenths or hundredths of Ohms		
CHAN2_TENTHS	Channel 2 measurement (tenths of °C or tenths or hundredths of Ohms)	40004	R
Bit [15:0]	Temperature of channel 2 in tenths of °C or resistance in tenths or hundredths of Ohms		

Modbus Registers

Register	Description	ADDRESS	R/W
CHAN3_TENTHS	Channel 3 measurement (tenths of °C or tenths or hundredths of Ohms).	40005	R
Bit[15:0]	Temperature of channel 3 in tenths of °C or resistance in tenths or hundredths of Ohms		
CHAN4_TENTHS	Channel 4 measurement (tenths of °C or tenths or hundredths of Ohms).	40006	R
Bit[15:0]	Temperature of channel 4 in tenths of °C or resistance in tenths or hundredths of Ohms		
CHAN1_FLOAT_H	Measurement of channel 1 in floating point (most significant word)	40007	
Bit [15:0]	Temperature in °C or resistance in Ohms (msw)		
CHAN1_FLOAT_L	Measurement of channel 1 in floating point (least significant word)	40008	R/W
Bit [15:0]	Temperature in °C or resistance in Ohms (lsw)		
CHAN2_FLOAT_H	Measurement of channel 2 in floating point (most significant word)	40009	R
Bit [15:0]	Temperature in °C or resistance in Ohms (msw)		
CHAN2_FLOAT_L	Measurement of channel 2 in floating point (least significant word)	40010	R
Bit [15:0]	Temperature in °C or resistance in Ohms (lsw)		
CHAN3_FLOAT_H	Measurement of channel 3 in floating point (most significant word)	40011	R
Bit [15:0]	Temperature in °C or resistance in Ohms (msw)		
CHAN3_FLOAT_L	Measurement of channel 3 in floating point (least significant word)	40012	R
Bit [15:0]	Temperature in °C or resistance in Ohms (lsw)		
CHAN4_FLOAT_H	Measurement of channel 4 in floating point (most significant word)	40013	R
Bit [15:0]	Temperature in °C or resistance in Ohms (msw)		R
CHAN4_FLOAT_L	Measurement of channel 4 in floating point (least significant word)	40014	R
Bit [15:0]	Temperature in °C or resistance in Ohms (lsw)		
STATUS_INP	Copy of register 40002 containing the status of the input channels	40015	R
CHAN1_WIRE	Measurement of channel 1 connection wire	40016	R
Bit [15:0]	Value of the channel 1 connection wire in mΩ		
CHAN2_WIRE	Measurement of channel 2 connection wire	40017	R
Bit [15:0]	Value of the channel 2 connection wire in mΩ		
CHAN3_WIRE	Measurement of channel 3 connection wire	40018	R
Bit [15:0]	Value of the channel 3 connection wire in mΩ		
CHAN4_WIRE	Measurement of channel 4 connection wire	40019	R
Bit [15:0]	Value of the channel 4 connection wire in mΩ		
ERR_CH1_CH2	Details of Errors on Channel 1 (MSB) & Channel 2 (LSB)	40025	R
Bit[15]	1 = Power supply voltage error (ch1)		
Bit[14]	1 = Reception error (ch1)		
Bit[13]	1 = EEPROM saving error (ch1)		
Bit[12]	1 = EEPROM saving blocked (ch1)		
Bit[11]	1 = Reading error of Resistor (Rx) (ch1)		
Bit[10]	1 = Reading error of 3 wire resistor (ch1)		
Bit[9]	1 = Acquisition error (ch1)		
Bit[8]	1 = Reading error CRC EEPROM (ch1)		

Register	Description	ADDRESS	R/W
Bit[5]	1 = EEPROM saving error (ch2)		
Bit[4]	1 = EEPROM saving blocked (ch2)		
Bit[3]	1 = Reading error of resistor (ch2)		
Bit[2]	1 = Reading error of 3 wire resistor (ch2)		
Bit[1]	1 = Acquisition error (ch2)		
Bit[0]	1 = Reading error CRC EEPROM (ch2)		
ERR_CH3_CH4	Details of errors on Channel 3 (MSB) & Channel 4 (LSB)	40026	
Bit[15]	1 = Power supply voltage error (ch3)		
Bit[14]	1 = Reception error (ch3)		
Bit[13]	1 = EEPROM saving error (ch3)		
Bit[12]	1 = EEPROM saving blocked (ch3)		
Bit[11]	1 = Reading error of Resistor (Rx) (ch3)		
Bit[10]	1 = Reading error of 3 wire resistor (ch3)		
Bit[9]	1 = Acquisition error (ch3)		
Bit[8]	1 = Reading error CRC EEPROM (ch3)		
Bit[7]	1 = Power supply voltage error (ch4)		
Bit[6]	1 = Reception error (ch4)		
Bit[5]	1 = EEPROM saving error (ch4)		
Bit[4]	1 = EEPROM saving blocked (ch4)		
Bit[3]	1 = Reading error of Resistor (Rx) (ch4)		
Bit[2]	1 = Reading error of 3 wire resistor (ch4)		
Bit[1]	1 = Acquisition error (ch4)		
Bit[0]	1 = Reading error CRC EEPROM (ch4)		
RESET	Module reset	40029	R/W
Bit[15:0]	Write value 0XCCCC to reset the module		
ADDR	Module's address and parity control	40035	R/W
Bit[15:8]	Set the module's address. Permissible values from 0x00 to 0xFF (0-255). Default = 1		
Bit[7:0]	Parity: 0 = None, 1 = Even, 2 = Odd		
ADDR	Modules baud rage and response time	40036	R/W
Bit[15:8]	Set the Baud rate: 0x00: 4800 Baud 0x01: 9600 Baud 0x02: 19200 Baud 0x03: 38400 Baud (Default) 0x04: 57600 Baud 0x05: 115200 Baud 0x06: 1200 Baud 0x07: 2400 Baud		
Bit[7:0]	Response delay time in characters that represent the number of pauses of 6 characters each to be entered between the end of the Rx message and the start of the Tx message. Default =0.		
CONFIG_CH1	Configuration for channel 1	40037	R/W
Bit[15:8]	For internal use only, do not modify		
Bit[7:6]	Sensor Type: 0 = PT100 (default); 1 = NI100; 2 = PT500; 3 = PT1000		
Bit[5]	Type of returned data: 0 = Temperature (°C is default); 1 = Resistance (Ohms)		
Bit[4]	Third wire compensation: 0 = NO (default); 1 = YES		
Bit[3]	Mains frequency rejection: 0 = 50 Hz (default); 1 = 60 Hz		



Modbus Registers

Register	Description	ADDRESS	R/W
Bit[2:0]	Filter: 0 = Not present; 1 = Average filter		
CONFIG_CH2	Configuration for channel 2	40038	R/W
Bit [15:8]	For internal use, do not modify		
Bit [7:6]	Sensor Type: 0 = PT100 (default); 1 = NI100; 2 = PT500; 3 = PT1000		
Bit [5]	Type of returned data: 0 = Temperature (°C is default); 1 = Resistance (Ohms)		
Bit [4]	Third wire compensation: 0 = NO (default); 1 = YES		
Bit [3]	Mains frequency rejection: 0 = 50 Hz (default); 1 = 60 Hz		
Bit [2:0]	Filter: 0 = Not present; 1 = Average filter		
CONFIG_CH3	Configuration for channel 3	40039	R/W
Bit [15:8]	For internal use, do not modify		
Bit [7:6]	Sensor Type: 0 = PT100 (default); 1 = NI100; 2 = PT500; 3 = PT1000		
Bit [5]	Type of returned data: 0 = Temperature (°C is default); 1 = Resistance (Ohms)		
Bit [4]	Third wire compensation: 0 = NO (default); 1 = YES		
Bit [3]	Mains frequency rejection: 0 = 50 Hz (default); 1 = 60 Hz		
Bit [2:0]	Filter: 0 = Not present; 1 = Average filter		
CONFIG_CH4	Configuration for channel 4	40040	R/W
Bit [15:8]			
Bit [7:6]	Sensor Type: 0 = PT100 (default); 1 = NI100; 2 = PT500; 3 = PT1000		
Bit [5]	Type of returned data: 0 = Temperature (°C is default); 1 = Resistance (Ohms)		
Bit [4]	Third wire compensation: 0 = NO (default); 1 = YES		
Bit [3]	Mains frequency rejection: 0 = 50 Hz (default); 1 = 60 Hz		
Bit [2:0]	Filter: 0 = Not present; 1 = Average filter		
AUX_SETTINGS	Additional configuration register	40041	R/W
Bit[15]	Floating point interpretation: 0 = The high word is transmitted first (default); 1 = the low word is transmitted first		
Bit[14:8]	Reserved and not modifiable		
Bit[7]	Fault on Channel 1 signalled by LED: 0 = enabled (default); 1 = disabled		
Bit[6]	Fault on Channel 2 signalled by LED		
Bit[5]	Fault on Channel 3 signalled by LED		
Bit[4]	Fault on Channel 4 signalled by LED		
Bit[3]	Action in case of fault (channel 1): 0 = The temperature/resistance is forced to the programmed fault value (default); 1 = The value is frozen at the last acquired value.		
Bit[2]	Action in case of fault (channel 2)		
Bit[1]	Action in case of fault (channel 3)		
Bit[0]	Action in case of fault (channel 4)		
VAL_FAULT_1	Value loaded in case of fault on channel 1 (expressed as 40003) 8500 * (850°C)	40042	R/W
VAL_FAULT_2	Value loaded in case of fault on channel 2 (expressed as 40003) 8500 * (850°C)	40043	R/W
VAL_FAULT_3	Value loaded in case of fault on channel 3 (expressed as 40003) 8500 * (850°C)	40044	R/W
VAL_FAULT_4	Value loaded in case of fault on channel 4 (expressed as 40003) 8500 * (850°C)	40045	R/W

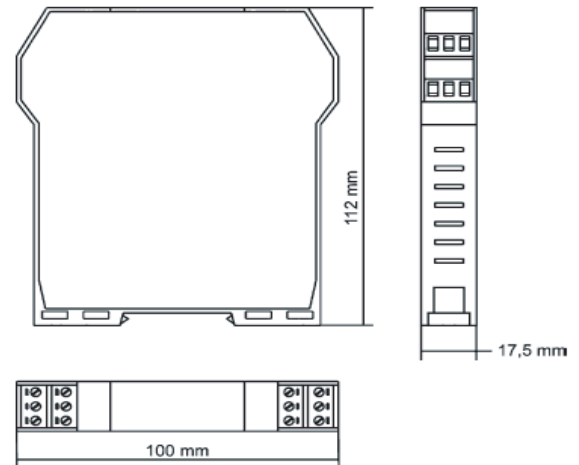
Clarifying Information

Registers 40003 - 40006 should be interpreted as follows:

- In Degree tenths, with sign, when they return a temperature.
- In tenths, without sign, when they return a resistance for PT1000 or PT500.
- In hundredths without sign when they return a resistance for PT100 or NI100.

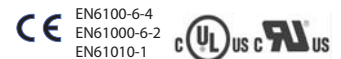
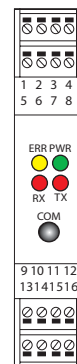
The value in registers 40042 - .40045 is copied respectively in registers 40003 - 40006, when the corresponding bit in register 40041 is 0. The same value is converted in floating-point, with factor 10 or 100 according to the type of data item returned.

Dimensions



Terminal Connections

1. Channel 1 I+
2. Channel 1 V+
3. Channel 1 V-
4. Channel 1 I-
5. Channel 2 I+
6. Channel 2 V+
7. Channel 2 V-
8. Channel 2 I-
9. Channel 3 I+
10. Channel 3 V+
11. Channel 3 V-
12. Channel 3 I-
13. Channel 4 I+
14. Channel 4 V+
15. Channel 4 V-
16. Channel 4 I-



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