# @ctiveIO

temperature input 3421

- **18 bit, 3-wire temperature sensing (RTD)**
- **galvanically isolated**
- **4 channels, multiplexed sampling**
- **differential input**

Pinout

LED:		
	☐ 0 4 ☐ ☐ 8 12	
	☐ 1 5 ☐ ☐ 9 13	
	☐ 2 6 ☐ ☐ 10 14	
	☐ 3 7 ☐ ☐ 11 15	
0; (8)	channel 1 active	
1; (9)	channel 2 active	
2; (10)	channel 3 active	
3; (11)	channel 4 active	
4; (12)	channel 1 error	
5; (13)	channel 2 error	
6; (14)	channel 3 error	
7; (15)	channel 4 error	
E:	failure, red	
P:	power supply, red	
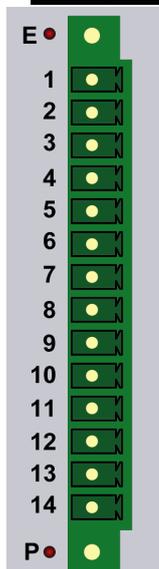
Pin	Signal
1	RL0+
2	RL0-
3	RLL0
4	RL1+
5	RL1-
6	RLL1
7	RL2+
8	RL2-
9	RLL2
10	RL3+
11	RL3-
12	RLL3
13	+24V=
14	0V

Attributes

Dataformat:
Standard integer (18-Bit) format:
$262143 = T_{max}$
$0 = T_{min}$

Applications:
18 bit temperature sensing, 4channels, 3-wire RTDs:

- @P3421L: temperature input, left slot
- @P3421R: temperature input, right slot

Related application:
16 bit temperature sensing, 2-wire RTDs:
- @P3220L: 2channels, left slot
- @P3220R: 2channels, right slot
- @P3420L: 4channels, left slot
- @P3420R: 4channels, right slot

18 bit temperature sensing, 3-wire RTDs:
- @P3221L: 2channels, left slot
- @P3221R: 2channels, right slot

18 bit temperature sensing, 4-wire RTDs:
- @P3222L: 2 channels, left slot
- @P3222R: 2 channels, right slot

16 bit temperature sensing, thermocouples:
- @P3223L: 2 channels, left slot
- @P3223R: 2 channels, right slot
- @P3423L: 4 channels, left slot
- @P3423R: 4 channels, right slot

Electrical Data

Power supply external .... 24V=+/-20%
Supply current .... 60mA at 24V=, typical
Operating current @ctiveBus .... 40mA at 3,3V / 0mA at 5V
Power supply protection .... 30V overvoltage, surge

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System Information

System ID 0x191
System adress space ....32 bit in, 32 bit out

Environmental Conditions

EMC ....EN 61000-4-2 (IEC-801-2) / EN 61000-4-4 (IEC-801-4)
Operating temperature [°C] ....0..+55
Storage temperature [°C] ....-20 .. +70
Humidity (rel) ....98 % (non condensing)
Protection class*...IP 20 (DIN 40 050)
*The protection class is valid only with housing and connector installed

Mechanical Data (effective if mounted in @M housing)

Weight ....approx. 0,05 kg including connector (PCB only)
Dimension ....105mm x 80mm x 12mm (PCB only)

Drawing (effective if mounted in @M housing)
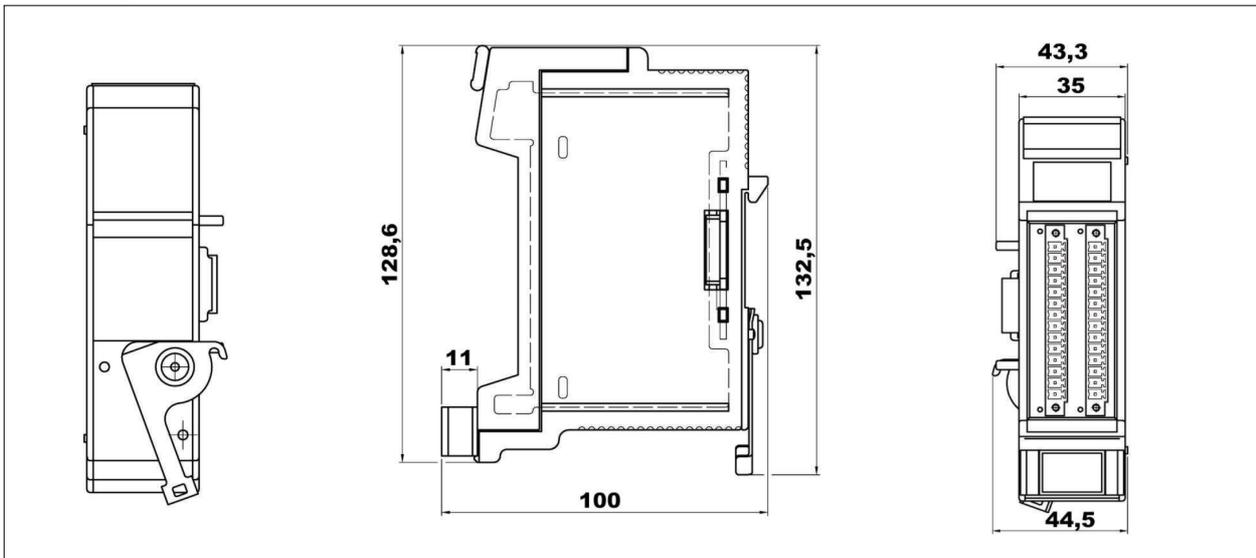
Ordering Key
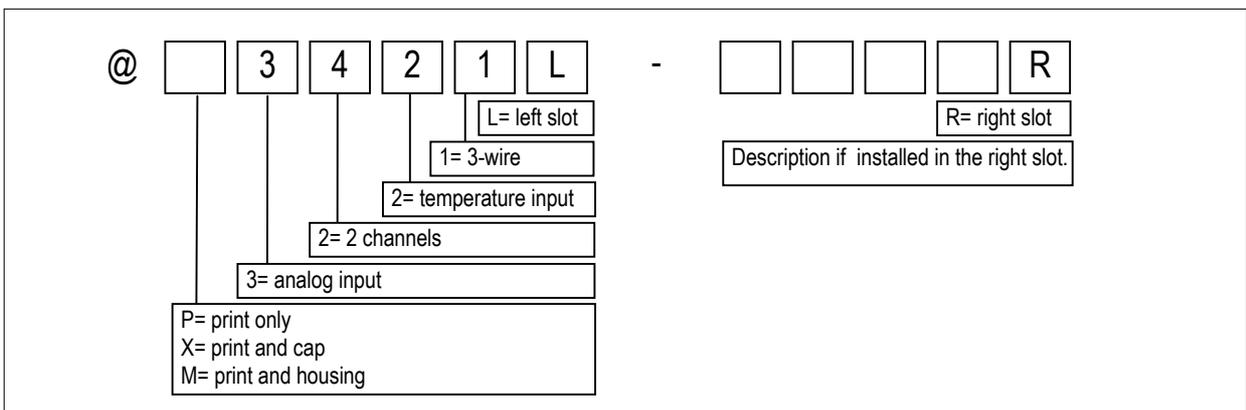
@ 3 4 2 1 L - □ □ □ □ R

L= left slot
1= 3-wire
2= temperature input
2= 2 channels
3= analog input
P= print only
X= print and cap
M= print and housing

R= right slot
Description if installed in the right slot.
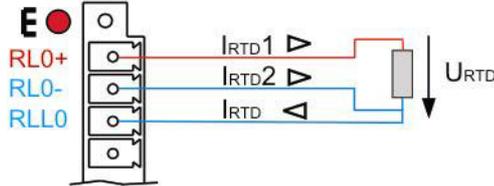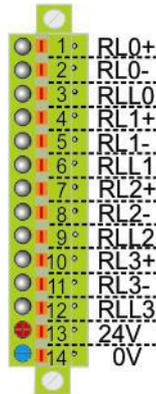
Connection

Functional description

The @P3421 temperature input module allows resistance sensors (PT, NTC, PTC) to be connected directly. All standard types of resistance temperature detectors are supported, in the range of 100Ohm up to 1KOhm nominal resistance. The internal circuitry can handle two sensors using 3-wire connection technique. Linearization over the full temperature range is realised with the aid of a microprocessor and free configurable data tables. This makes the @P3421 module a quite versatile and customizable measurement unit, not only for temperature detection, but also for simple resistance measurement. Parameterisation may be carried via the fieldbus. The default linearization-tables indeed are selected in such a way, that in most cases no configuration or alteration is needed.

Block Diagram
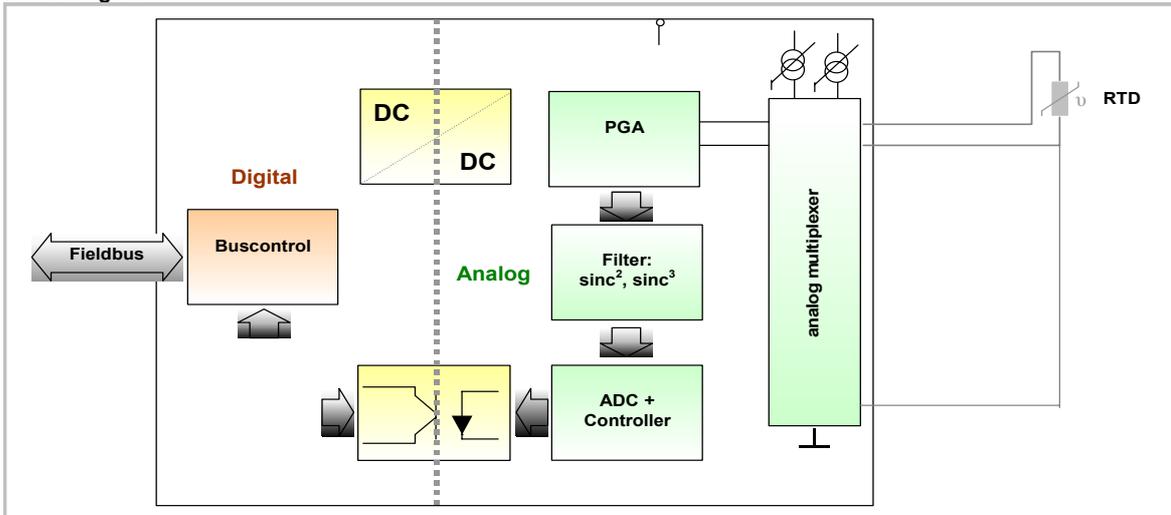
The measuring current (adjustable from 200µA up to 1,1mA) is switched between the input channels. RTD excitation is provided from the module by two matched current sources. When using a three-wire RTD, this method allows an equal current to flow in each RTD lead, which cancels the effects of lead resistances. Sensor malfunctions, such as broken or shorted wires, can be observed and indicated by the module.

The inputs can, if required, be scaled differently. The input range is resolved by the converter with an effective resolution of 18-Bit. In most cases this is quite enough to achieve a temperature resolution of 0.01°C. The Accuracy of each input is between +/-1.0°C over the sensors temperature range.

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Data Exchange (a quick overview)

System bus data during initialization

Bit	Name	Description
3 - 0	STATUS / VERSION	Write: must be set to '0001' during initialization
		Read: returns the software version
7 - 4	TABLE 4	Write: identifies the sensor connected to channel 4
		Read: returns the last valid setting
11 - 8	TABLE 3	Write: identifies the sensor connected to channel 3
		Read: returns the last valid setting
15 - 12	TABLE 2	Write: identifies the sensor connected to channel 2
		Read: returns the last valid setting
19 – 16	TABLE 1	Write: identifies the sensor connected to channel 1
		Read: returns the last valid setting
20	ACTIVE 4	Write: a logic '1' activates channel number 4
		Read: returns the last valid setting
21	ACTIVE 3	Write: a logic '1' activates channel number 3
		Read: returns the last valid setting
22	ACTIVE 2	Write: a logic '1' activates channel number 2
		Read: returns the last valid setting
23	ACTIVE 1	Write: a logic '1' activates channel number 1
		Read: returns the last valid setting
27 - 24	not used	No function
31 - 28	HEADER	Write: always write a 0xA (10) to enable initialisation
		Read: returns the last valid setting + DONE

System bus data after initialization

Bit	Name	Description
23 - 0	TEMPERATURE	Write: has no effect
		Read: the actual standardised temperature (1/100Kelvin) of the current active temperature channel
25 - 24	CHANNEL	Write: has no effect
		Read: the active channel number ('00' for channel 1 or '01' for channel 2)
27 – 26	not used	No function
30 - 28	HEADER	Write: changes operation mode of the module
		Read: returns the last valid setting + DONE

Temperature data

The temperature data is standardized to 1/100 Kelvin. To get the temperature in °C a conversion is necessary. Here is an conversion example in C: ....

Temperature Data	**=**	***0x85007477***	// the temperature value sent by the module
Temperature Data &	**=**	***0x00FFFFFF***	// mask the header
Temperature Data	**=**	***(Temperature Data – 27315)/100***	

The result in this example would be <u>25.00°C</u>

For a detailed description of the temperature module please refer to the temperature module user guide.

Revision change

version	description	date
00	serie 0	02/03
01	added: Data Exchange	04/05

I/O

analog

input