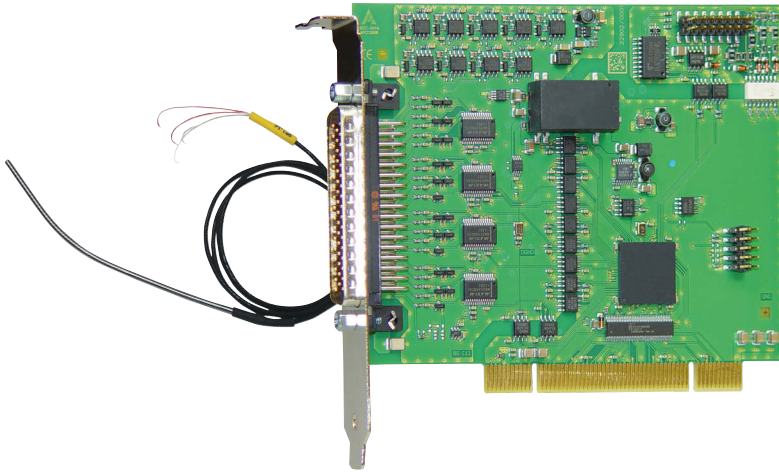


# Temperature measurement board, optically isolated, 16/8/4 channels for thermocouples, Pt100, RTD, 18-bit



## APCI-3200

Up to 16 channels for thermocouples or 8 inputs for resistance temperature detectors (RTD)

Mixed configuration of the channels

18-bit resolution

Optical isolation 1000 V

Cold junction compensation on screw terminal panel PX3200

Software linearisation

## Features

- PCI 3.3 V or 5 V
- 18-bit resolution, 16-bit accuracy
- Each channel can be configured either to thermocouples, RTD or as an analog voltage input channel
  - 16 analog inputs for thermocouple types J, K, T, E, R, S, B, N
  - or 8 diff. analog inputs for the acquisition of the resistance temperature detectors (Pt100)
  - or 16 SE/8 differential analog voltage inputs,  $\pm 1.25$  V
- 8 independent current sources for resistance temperature detectors (RTD) and one current source for the cold junction compensation
- Cold junction compensation (on separate screw terminal panel)
- Gain and offset calibration
- Linearisation through table and calculation for thermocouple types J, K, T, E, R, S, B, N and RTDs
- Programmable gain
- 16-bit accuracy with converter sample rate of 20, 40, 80 or 160 Hz (higher sample rate on request)
- 4 digital inputs, 24 V and 3 digital outputs, open collector, optically isolated
- Base address and IRQ channels set through BIOS

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Diagnostic: Short-circuits- and line break detection, depending on the type of sensor used
- Protection against overvoltage ( $\pm 30$  V) and high-frequency EMI

## Software drivers

A CD-ROM with the following software and programming examples is supplied with the board:

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### ADDIPACK functions

- Analog input
- Temperature
- Resistance
- Digital input
- Digital output

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



PCI 32-bit



LabVIEW™

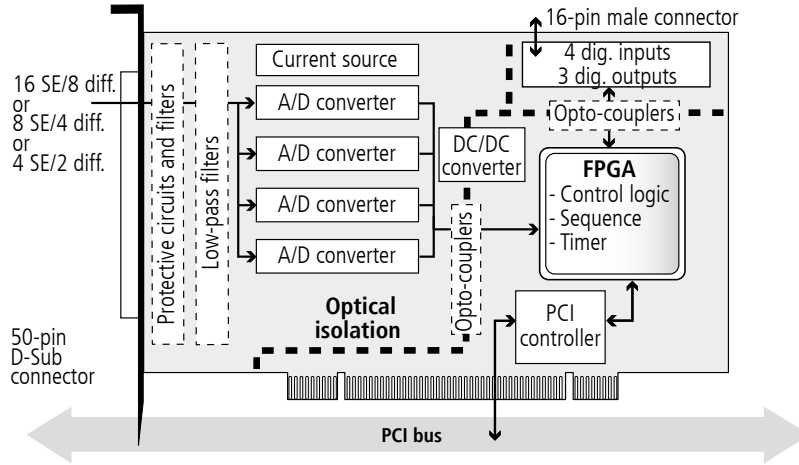


LabWindows/CVI™



DASYLab10  
Data Acquisition System Laboratory

Simplified block diagram

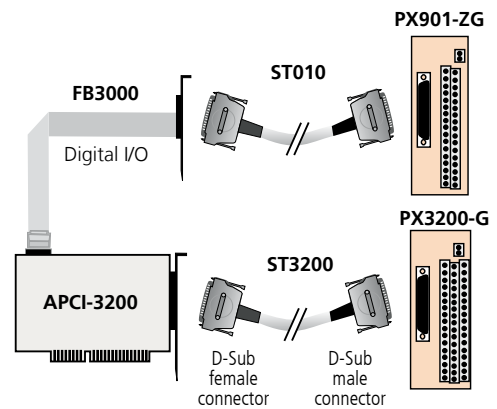


Pin assignment – 50-pin D-Sub male connector

Pin		Pin	Pin		Pin
34	EXC CJC	34	1	CJC IN	1
35	EXC 0	35	2	CH0+	2
36	GND 0	36	3	CH1+	3
37	EXC 1	37	4	CH2+	4
38	GND 1	38	5	CH3+	5
39	EXC 2	39	6	CH4+	6
40	GND 2	40	7	CH5+	7
41	EXC 3	41	8	CH6+	8
42	GND 3	42	9	CH7+	9
43	EXC 4	43	10	CH8+	10
44	GND 4	44	11	CH9+	11
45	EXC 5	45	12	CH10+	12
46	GND 5	46	13	CH11+	13
47	EXC 6	47	14	CH12+	14
48	GND 6	48	15	CH13+	15
49	EXC 7	49	16	CH14+	16
50	CH15-	50	17	CH15+	17

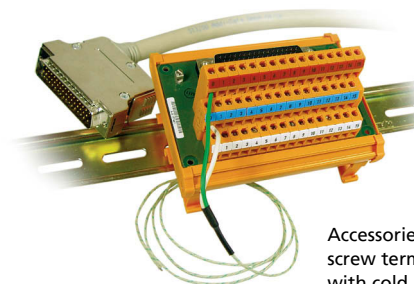
Inputs 0-3 } Module 0  
 Inputs 4-7 } Module 1  
 Inputs 8-11 } Module 2  
 Inputs 12-15 } Module 3

ADDI-DATA connection



Pin assignment – 16-pin male connector

24 V	1 ■ 2	GND
Dig. output 0 (+)	3 ■ 4	Dig. output 0 (-)
Dig. output 1 (+)	5 ■ 6	Dig. output 1 (-)
Dig. output 2 (+)	7 ■ 8	Dig. output 2 (-)
Dig. input 0 (+)	9 ■ 10	Dig. input 0 (-)
Dig. input 1 (+)	11 ■ 12	Dig. input 1 (-)
Dig. input 2 (+)	13 ■ 14	Dig. input 2 (-)
Dig. input 3 (+)	15 ■ 16	Dig. input 3 (-)



Accessories:  
screw terminal panel PX3200-G  
with cold junction compensation,  
ST3200 cable, see page 209.

## Specifications

### Analog inputs

Analog inputs:	- 16 x thermocouples or - 8 x RTD with 2 or 4 wire connection or - 4 x RTD with 3 wire connection or 16 SE/8 diff. inputs, ± 2.5 V
Resolution:	18-bit
Accuracy:	16-bit
Input amplifier:	1, 2, 4, 8, 16, 32, 64, 128
Conversion start:	Through software or external trigger

### Digital I/O

Number of I/O channels:	4 digital inputs, 24 V, 3 digital outputs, 24 V, 125 mA typ., open collector
Logical "0" level:	0-5 V
Logical "1" level:	12-30 V
Optical isolation:	1000 V through opto-couplers for analog and digital channels

### Sampling frequencies

Selectable  
Sampling frequencies  $f_{ADC}$   $f_{ADC} = 160 \text{ Hz}, 80 \text{ Hz}, 40 \text{ Hz}$  or  $20 \text{ Hz}$   
Various sampling rates  $F_s$  in „Read 1“ and in „Scan“ mode depending  
on the type of transducer RTD or thermocouple (TC)

Sensor	Selectable sampling frequencies $f_{ADC}$	Sampling frequencies in „Read 1“ mode	Sampling frequencies in „Scan“ mode	
RTD (Pt100...)	160 Hz	53 Hz / channel	32 Hz	for 2, 4, 6 and/or 8 channels
	80 Hz	26 Hz / channel	16 Hz	
	40 Hz	13 Hz / channel	8 Hz	
	20 Hz	6 Hz / channel	4 Hz	
Thermo-couples	160 Hz	26 Hz / channel	23 Hz	for 4, 8, 12 and/or 16 channels
	80 Hz	16 Hz / channel	11 Hz	
	40 Hz	6 Hz / channel	6 Hz	
	20 Hz	3 Hz / channel	3 Hz	

#### Four cases are possible:

- „Read 1“ mode with RTD**  

$$F_s = \frac{f_{ADC}}{3}$$

With RTD (Pt100...) 3 values are acquired at each measurement:  
 - the measured value,  
 - the offset,  
 - the reference voltage.  
 $F_s = 53 \text{ Hz}, 26 \text{ Hz}, 13 \text{ Hz}, 6 \text{ Hz}$
- „Read 1“ mode with thermocouples (TC)**  

$$F_s = \frac{f_{ADC}}{6}$$

With TC 2 x 3 values are acquired at each measurement:  
 - the measured value,  
 - the offset,  
 - the reference voltage.  
 One time for the acquisition value and one time for the cold junction compensation.  
 $F_s = 26 \text{ Hz}, 13 \text{ Hz}, 6 \text{ Hz}, 3 \text{ Hz}$
- „Scan“ Mode with RTD**  

$$F_s = \frac{f_{ADC}}{5}$$

With RTD (Pt100...) 5 values (unipolar, diff.) are acquired per scan measurement to sample 2 channels: for 2 values for 1, 2, 3 and/or 4 modules  
 $F_s = 32 \text{ Hz}, 16 \text{ Hz}, 8 \text{ Hz}, 4 \text{ Hz}$
- „Scan“ Mode with thermocouples (TC)**  

$$F_s = \frac{f_{ADC}}{7}$$

With TC 7 values (bipolar, SE) are acquired, per scan measurement to sample 4 channels: for 4 values for 1, 2, 3 and/or 4 modules  
 $F_s = 23 \text{ Hz}, 11 \text{ Hz}, 6 \text{ Hz}, 3 \text{ Hz}$

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

Dimensions:	131 x 99 mm
System bus:	PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISIG)
Space required:	1 PCI slot and 1 slot opening for the digital I/O
Operating voltage:	+5 V, ±5 % from the PC
Current consumption (typ.):	550 to 600 mA depending on the version
Front connector (analog channels):	50-pin D-Sub male connector
Additional connector :	16-pin male connector for connecting the digital I/O via ribbon cable with 37-pin D-Sub connector
Operating temperature:	0 to 60 °C (with forced cooling)

### Thermocouples accuracy

Type DIN EN 60584	Range		Accuracy (+/-)
Type J	-200.0 °C	-0.1 °C	±0.6 °C
	0.0 °C	+599.9 °C	±0.2 °C
	+600.0 °C	+1200.0 °C	±0.6 °C
Type T	-200.0 °C	-80.0 °C	±0.7 °C
	-79.9 °C	+400.0 °C	±0.3 °C
Type K	-200.0 °C	-0.1 °C	±0.8 °C
	0.0 °C	+999.9 °C	±0.4 °C
	+1000.0 °C	+1300.0 °C	±0.6 °C
Type E	-200.0 °C	+1000.0 °C	±0.5 °C
	Type N	-200.0 °C	-0.1 °C
Type S	0.0 °C	+799.9 °C	±0.2 °C
	+800.0 °C	+1300.0 °C	±0.5 °C
	0.0 °C	+399.9 °C	±1.6 °C
Type R	+400.0 °C	+1768.0 °C	±0.7 °C
	0.0 °C	+399.9 °C	±1.6 °C
Type B	+400.0 °C	+1768.0 °C	±0.6 °C
	+400.0 °C	+799.9 °C	±2.0 °C
	+800.0 °C	+1820.0 °C	±1.0 °C

### Accuracy of the reference cold junction temperature

Type	Range	Accuracy (+/-)
Pt1000	0° C to +60° C	± (0.30 °C + 0.0050 x  T ) (T: Temperature in °C)

### Accuracy of the resistance thermometer (RTD)

Type DIN EN 60751	Range		Accuracy (+/-) Worst Case (Gain=1 unipolar)
Pt100	-200.0 °C	+850.0 °C	±0.4 °C
Pt200	-200.0 °C	+850.0 °C	±0.4 °C
Pt500	-200.0 °C	+850.0 °C	±0.3 °C
Pt1000	-200.0 °C	+499.9 °C	±0.2 °C
	+500.0 °C	+850.0 °C	±1.0 °C
Ni100	-60.0 °C	+250.0 °C	±0.3 °C

### Accuracy in the temperature range of -20 °C to +40 °C with Pt100

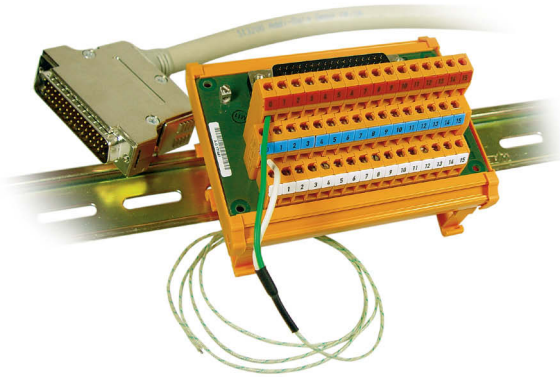
Gain	Accuracy
1	± 0.40 °C
2	± 0.20 °C
4	± 0.15 °C
8	± 0.10 °C
16	± 0.08 °C
32	± 0.08 °C
64	± 0.08 °C

### Sensor short-circuit / line break detection

Type	short-circuits	line break
Thermocouple (SE)	no detection	no detection
Resistance thermometer (diff.)	detection	detection
Potentiometer (diff.)	detection	detection



## Screw terminal panel for thermocouples/RTDs with cold junction compensation



### PX3200

Screw terminal panel with housing (PX3200-G) for DIN rail

Screw terminal panel without housing (PX3200) with 4 mounting holes

Cold junction compensation for APCI-3200

The PX3200-G screw terminal panel is used for connecting thermocouples/RTDs. It is connected to the APCI-3200 through the ST3200 cable. The housing of the female connector is connected to two ground terminals so that the board is additionally earthed for more security. All components of the board are enclosed in an earthing strip also connected to the ground terminals.

Each terminal is directly connected to one pin of the 50-pin D-Sub female connector. The designations on the terminals indicate the respective connections for the 50-pin D-Sub female connector.

The PX3200-G features an integrated CJC<sup>(1)</sup>.

The voltage ( $V_{cjc}$ ) is measured through an RTD (Pt1000) at the cold junction and used as reference voltage for the temperature measurement of the thermocouples connected to the panel.

After each acquisition, a new measurement of the cold junction compensation is made for each channel and processed through software.

<sup>(1)</sup> CJC: Cold Junction Compensation

### Specifications

#### Possible connections

Versions	Number of thermocouples (SE inputs)	Number of RTDs (diff. inputs)		
		2-wire connection	3-wire connection	4-wire connection
APCI-3200-4	4	2	1	2
APCI-3200-8	8	4	2	4
APCI-3200-16	16	8	4	8
Safety features:		Ground terminals		
Connector:		50-pin D-Sub female connector		
Dimensions of the board (PX3200):		(L x W x H) 110 x 70 x 45 mm		
Dimensions with housing (PX3200-G):		(L x W x H) 113 x 87 x 80 mm		
Temperature range:		0-70 °C		

### Ordering information

#### APCI-3200

Temperature measurement board, optically isolated, 16/8/4 channels for thermocouples, Pt100, RTD, 18-bit. Incl. technical description, software drivers

#### Versions

- APCI-3200-16:** 16 analog inputs:  
16 thermocouples  
or 8 RTDs or 16 single-ended  
or 8 diff. voltage inputs
- APCI-3200-8:** 8 analog inputs: 8 thermocouples  
or 4 RTDs or 8 single-ended  
or 4 diff. voltage inputs
- APCI-3200-4:** 4 analog inputs: 4 thermocouples  
or 2 RTDs or 4 single-ended  
or 2 diff. voltage inputs

#### Accessories

- PX3200-G:** Screw terminal panel with cold junction compensation and housing for DIN rail.
- PX3200:** Screw terminal panel with cold junction compensation and 4 mounting holes for wall mounting.
- ST3200:** Standard round cable, shielded, twisted pairs, 2 m
- FB3000:** Ribbon cable for digital I/O on separate bracket
- PX901-ZG:** Screw terminal panel for connecting the digital I/O, for DIN rail
- ST010:** Standard round cable, shielded, twisted pairs, 2 m
- ST011:** Standard round cable, shielded, twisted pairs, 5 m