

F&elt Series  
Isolated Analog Input Module for USB  
**ADI12-8(USB)GY**



This product is a USB2.0 compatible terminal module that extends the analog input function of USB port of PCs. This product features 8ch 12-bit analog input and is isolated from the bus line to the PC. The signal lines can be connected directly to the terminals on this product. To simplify use in embedded applications, this product includes a bracket for attaching to a 35mm DIN rail. The number of input channels can be increased by purchasing an optional device module. Windows driver is bundled with this product.

\* Specifications, color and design of the products are subject to change without notice.

**Features**

**Conversion speed 10μsec/ch+20μsec, 12bit resolution, Difference input 8ch**

This product includes analog inputs (10μsec/ch + 20μsec, 12-bit, differential inputs, 8ch). Compatible to USB1.1/USB2.0 and capable to achieve high speed transfer at HighSpeed (480 Mbps).

As this product can be used on any PC that supports USB, it is suitable for use with notebook PCs that do not have PCI bus expansion slots. If using with a desktop PC, this product can be connected easily without needing to open the computer's cover.

**Isolated from the bus by a digital isolator**

This product is isolated by a digital isolator which improves the noise performance with respect to the PC.

**Equipped with the buffer memory (256K data) which can be used in either FIFO or ring format**

This product includes buffer memory (256K data for analog input) which can be used in either FIFO or ring format. You can perform analog input in the background, independent of software and the current status of the PC.

**Windows compatible driver libraries are attached.**

Using the attached driver library API-USBP(WDM) makes it possible to create applications of Windows. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

**Sampling can be driven by a clock or by various triggers**

Sampling can be started and stopped by software and level comparison (compares the level of a specified channel with a specified compare level value) triggers. The sampling period can be controlled by the internal clock (high-precision timer included on the board).

**Easy to increase the input channels using an expansion module**

Adding optional modules (up to 3 units) can easily increase the input channels. The unique structure for connection by stacking enables easy and compact system configuration.

**Screw-less connector plug facilitating wiring and plugging/unplugging**

Wiring and plugging/unplugging are easy as the screw-less connector plug is used.

**Capable of being mounted on 35-mm DIN rails**

This product is equipped with an attachment for mounting on 35-mm DIN rails on the back, allowing this product to be attached onto and detached from DIN rails.

**LabVIEW is supported by a plug-in of dedicated library.**

Using the dedicated library makes it possible to create each application for LabVIEW.

**Packing List**

- USB module[ADI12-8(USB)GY]... 1
- First step guide ...1
- CD-ROM \*1 [API-USBP(WDM)]...1
- Interface connector (plugs) FK-MC0,5/9-ST-2.5...2
- Power connector MC1.5/3-ST-3.5...1
- AC adapter (1.5m)...1
- AC cable (1.5m)...1
- USB cable (1.8m)...1
- Rubber feet...4
- Magnet...2

\*1 The CD-ROM contains the driver software and User's Guide.

## Specification

### Hardware Specification

Item	Specification
<b>Analog input</b>	
Input format	Bus-isolated voltage input
Input range	Bipolar $\pm 10V$ , $\pm 5V$ Unipolar 0 - 10V, 0 - 5V
Maximum input voltage	$\pm 20V$
Input impedance	1M $\Omega$ (Min.)
Input channel	Differential input 8 channels
Resolution	12 bits
Non-linear error	$\pm 3LSB$
Conversion rate	10 $\mu$ sec/ch + 20 $\mu$ sec *1
Data buffer	256K data (262, 144 data)
Internal sampling timer	10 $\mu$ sec - 1,073,741,824 $\mu$ sec *2
<b>Communication</b>	
USB transmission speed	12Mbps (full speed), 480Mbps (high speed) *3
Current consumption	+5VDC 650mA (Max.) *4
<b>Others</b>	
Number of modules used at the same time	127 modules (Max.) *5
Use condition	0 - 50°C 10 - 90%RH (no condensation)
Physical dimensions (mm)	50.4(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)
Weight of the module itself	100g
Module installation method	One-touch connection to 35mm DIN rails (standard connection mechanism provided in the system)
Expansion module	ADI12-8(FIT)GY: 3 modules (Max.), Current consumption/module: +5VDC 350mA(Max.)
Connectors	FK-MC 0.5/12-ST-2.5 (made by PHOENIX CONTACT) 2.5mm-pitch nominal current: 4A (Max.)
Applicable wire	AWG28 - 20
Bundled AC adapter (POA200-20)	90 - 264VAC 5.0VDC $\pm 5\%$ 2.0A (Max.) Length of cable is about 1.5m. Length of AC cable is about 1.5m
Certification	RoHS, CE, VCCI

- \*1 Converting speed of A/D converter. The minimum executable sampling period is depending on internal processing time and is about 600 $\mu$ sec (using one channel) - 2msec (using 32 channels).
- \*2 It takes the unit of 1000 $\mu$ sec (1000 $\mu$ sec, 2000 $\mu$ sec, 3000 $\mu$ sec,...) when expansion module being used.
- \*3 USB module executes API function by USB communication. The executing time of API function by USB communication is about several msec in practice (Depending on the contents handled by API function, it may be longer than that). The responding speed of USB module is based on the environment of the host PC being used.
- \*4 Always use the supplied AC adapter or power supply unit (option).
- \*5 The USB interface can accommodate up to 127 devices on the bus. As a USB hub itself is counted as one device, however, 127 USB modules cannot be connected together.

### Software Specification

Item	Specification
Support OS	Microsoft Windows 98 or Second Edition Microsoft Windows Me Microsoft Windows 2000 Professional Microsoft Windows XP Professional, Home Edition Microsoft Windows Vista
Support language	Microsoft Visual C++ Ver 5.0, Ver 6.0 Microsoft Visual C++ .NET 2002, 2003 Microsoft Visual Basic Ver 5.0, Ver 6.0 Microsoft Visual Basic .NET 2002, 2003 Microsoft Visual C# .NET 2002, 2003 Borland Delphi Ver 5.0, Ver 6.0 Borland C++ Builder Ver 5.0, Ver 6.0
System requirement	-PC (IBM PC/AT compatibility, DOS/V) with USB port -CD-ROM drive -Recommend the environment on which the using language can run smoothly

## Support Software

### Driver Library API-USBP(WDM) (Bundled)

It is the library software, and which supplies command of hardware produced by our company in the form of standard Win32 API function(DLL). Using programming languages supporting Win32API functions, such as Visual Basic and Visual C++ etc., you can develop high-speed application software with feature of hardware produced by our company. In addition, you can verify the operation of hardware using Diagnostic programs.

< Operating Environment >

OS Windows Vista, XP, Server 2003, 2000, Me, 98

Adaptation language Visual Basic, Visual C++, Visual C#, Delphi, C++ Builder

CONTEC provides download services (at <http://www.contec.com/apiusbp/>) to supply the updated drivers and differential files.

Further details may be found in the help within supplied CD-ROM or the homepage of our company.

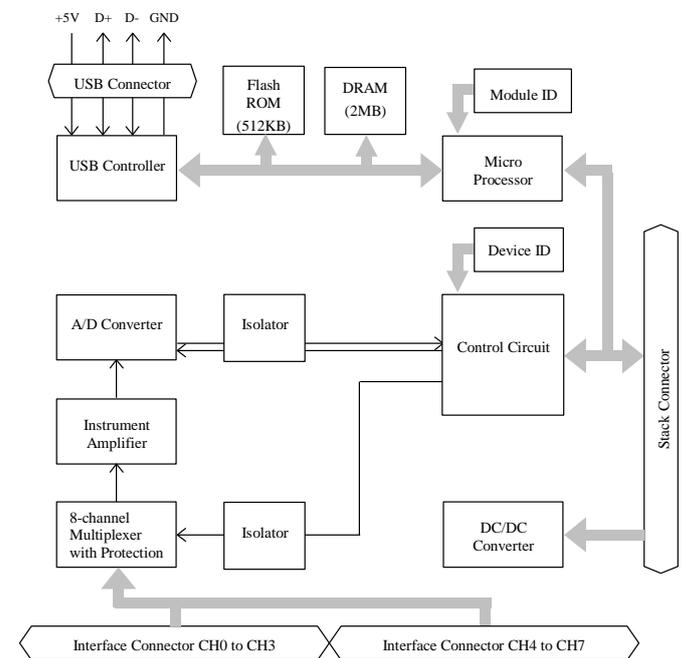
## Accessories

### Accessories (Option)

- Isolated analog input module : ADI12-8(FIT)GY  
(Expansion module for ADI12-8(USB)GY)
- AC adapter (input: 90 - 264VAC, output: 5VDC 2.0A) : POA200-20
- AC-DC power supply unit (input: 85 - 132VAC, output: 5VDC 3.0A) : POW-AC13GY
- AC-DC power supply unit (input: 85 - 264VAC, output: 5VDC 2.0A) : POW-AD22GY
- DC-DC power supply unit (input: 10 - 30VDC, output: 5VDC 3.0A) : POW-DD10GY
- DC-DC power supply unit (input: 30 - 50VDC, output: 5VDC 3.0A) : POW-DD43GY

\* Check the CONTEC's Web site for more information on these options.

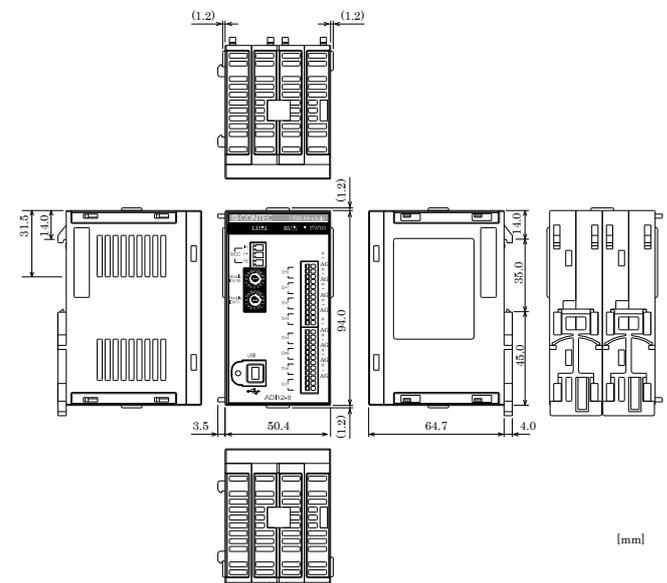
## Block Diagram



### Points

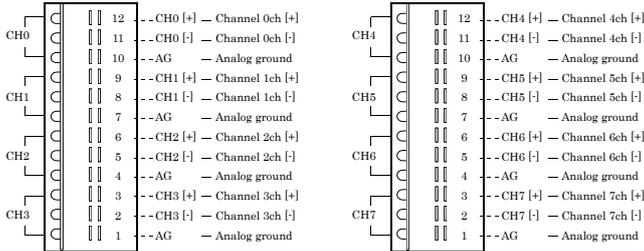
The Device ID of the USB module ADI12-8(USB)GY is fixed at "0".

## Physical Dimensions



## Signal Layout

The Module can be connected to an external device using a 12-pin connector that is provided on the Module face.

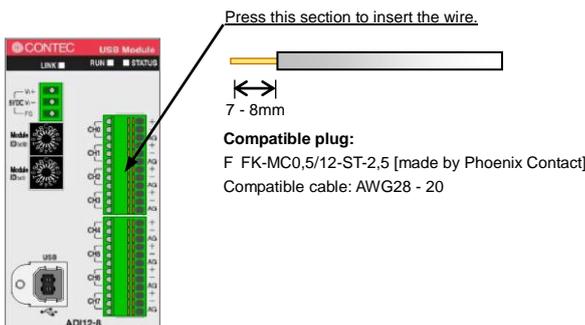


## Connection Method

When connecting the Module to an external device, you can use the supplied connector plug. When wiring the Module, strip off approximately 7 - 8 mm of the covering for the cable, and insert the bare wire by pressing the orange button on the connector plug. Releasing the orange button after the wire is inserted fixes the cable. Compatible wires are AWG 28 - 20.

### CAUTION

Removing the connector plug by grasping the cable can break the wire.



### Making a connection using the differential input format

This is a method of measuring the voltage of signal source by connecting the 3 wires (2 signal wires- plus input pin[+] and minus input pin[-], analog ground[AG]) of the module.

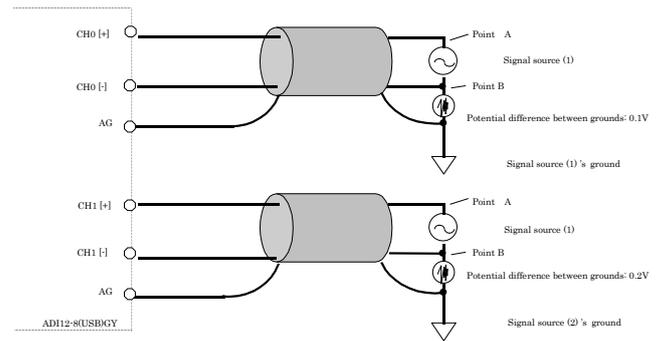
How to connect:

- (1) Connect the analog ground to the signal source ground.
- (2) Connect [+] input to signal source plus pin (Point A).
- (3) Connect [-] input to signal source minus pin (Point B).

Minus pin and ground are both connected to a same point for the signal source. In this case, connect both module's minus input and analog ground to signal ground. You must connect 3-wires to take an accurate measurement.

Even when the module ground and the signal source have a potential difference in between, using a 3-wire connection eliminates its effect from the measurement results. In addition, the 3-wire input offers better noise immunity than the 2-wire input (single-end input).

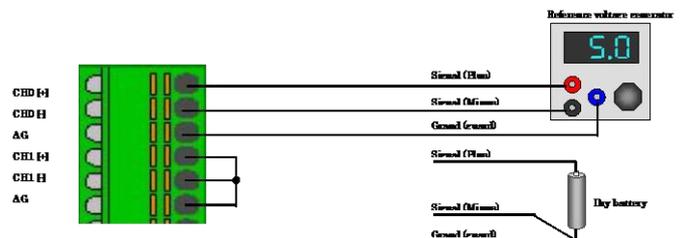
### Connecting an Interface Connector and Connectors That Can Be Used



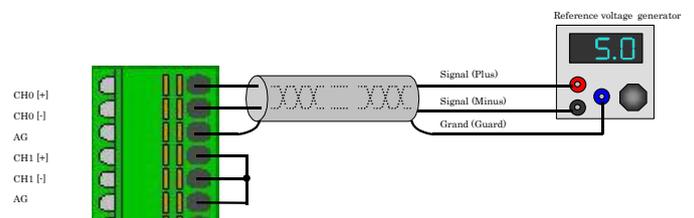
As shown in the above figure, when several signal sources are measured, the potential differences between the module's ground and signal source's ground may be different, such as 0.1V or 0.2V. 0.1V offset voltage higher than the voltage of the signal source is added on CH0[+] and 0.2V on CH1[+]. Similarly, the offset voltage of the potential difference between grounds is added on CH0[-] and CH1[-] individually. However, with the connecting of 3-wires differential input, the value of voltage to be converted is the value between point A and point B, the potential difference between grounds can be canceled, so the measuring without error can be performed. Although the maximum value of voltage on each input pin is  $\pm 20V$ , you should use the module with the potential difference of  $\pm 2V$  between grounds.

### Measuring voltage

The following is an example of connection that connects to a reference voltage generator by using a flat cable. When measuring devices only with plus and minus, such as dry cell, because of 2-points connection, you should connect both CH0[-] and AG to minus. The unused channel inputs must be connected to the analog ground.



Moreover, you should connect the module by using a 2-core shielded cable in situations where the signal source is at a considerable distance from the module or the noise immunity must be increased.



### CAUTION

When an analog ground is not connected, the conversion data can be unpredictable.

In situations where the connecting cable is subject to noise, accurate analog input can fail to occur. To avoid this problem, the connecting cable should be installed away from any sources of noise.

An excessively long connecting cable can fail to ensure accurate analog input. The connecting cable should be as short as possible.

The analog signals that are input into the [+] input or [-] input should not exceed the maximum input voltage relative to the module analog ground. A voltage greater than the input voltage can damage the equipment.

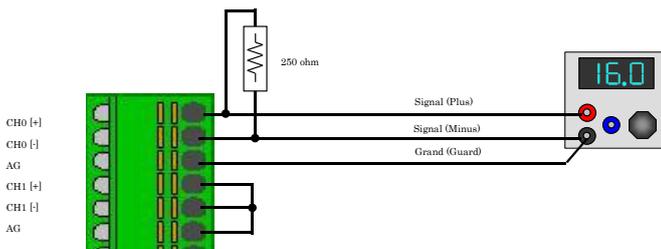
If either the [+] or [-] input pin is not connected, the resulting conversion data can be unpredictable. If a channel is not connected to a signal source, both its [+] input and [-] input pins must be connected to the analog ground.

### Measuring current

When using this product to measuring current, please use a resistance to convert current to voltage and perform measuring. You can measure the current output device of 0 - 20mA in the range of 0 - 5V voltage input by connecting a resistance of 250Ω between the [+] input and the [-] input. If the error of the resistance you use is great, the conversion data would be influenced and you can fail to obtain the correct measuring result. It is recommended that a precision resistance(±0.1%) should be used on the connector side.

Furthermore, when several current sources are measured, the potential difference between their GNDs must not exist. For this product, the CPU in the module is isolated from external device whereas the analog input channels is not isolated each other, therefore, the analog grounds cannot be connected together.

When the channels are subject to the potential voltage each other, you should use isolation converter to isolate channels.



### CAUTION

When an analog ground is not connected, the conversion data can be unpredictable.

In situations where the connecting cable is subject to noise, accurate analog input can fail to occur. To avoid this problem, the connecting cable should be installed away from any source of noise.

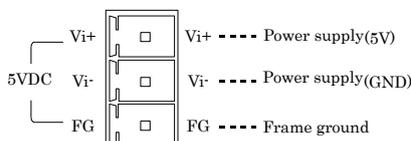
The analog signals that are input into the [+] input or [-] input should not exceed the maximum input voltage relative to the module analog ground. A voltage greater than the input voltage can damage the equipment.

If either the [+] or [-] input pin is not connected, the resulting conversion data can be unpredictable. If a channel is not connected to a signal source, both its [+] input and [-] input pins must be connected to the analog ground.

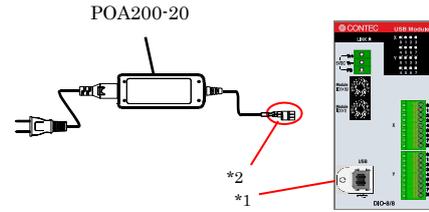
## Connecting an External Power Supply

This module must be connected with an external power supply (in a self-powered state).

Connect the external power supply to the +5 VDC input terminal.



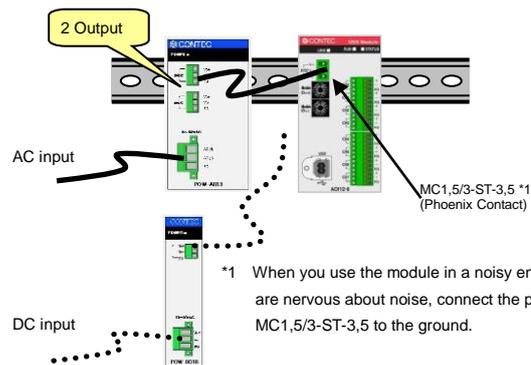
When using the supplied AC adapter [POA200-20], please connect directly to the input terminals.



- \*1 When you use the module in a noisy environment or are nervous about noise, ground the module (using a M3 screw).
- \*2 When you use the module in a noisy environment or are nervous about noise, connect the AC adapter's connector plug to the ground.

Beside the AC adapter, a power supply for installation on a DIN rail is also available (as an option). Use the appropriate power supply depending on the operating environment and application.

Type	Model	Input	Output	External dimension (mm)	DIN rail
AC adapter	POA200-20 (Bundled)	90 - 264VAC	5.0VDC±5% 2.0A(Max.)	40.0(W) x 105.0(D) x 30.0(H) (No protrusion)	-
AC-DC power supply	POW-AD13GY	85 - 132VAC	5.0VDC±5% 3.0A(Max.)	52.4(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding
AC-DC power supply	POW-AD22GY	85 - 265VAC	5.0VDC±5% 2.0A(Max.)	52.4(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding
DC-DC power supply	POW-DD10GY	10 - 30VDC	5.0VDC±5% 3.0A(Max.)	25.2(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding
DC-DC power supply	POW-DD43GY	30 - 50VDC	5.0VDC±5% 3.0A(Max.)	25.2(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding



For the power supply for installation on a DIN rail, use the connector MC 1,5/3-ST-3,5 (Phoenix Contact).

### Connecting method

To connect the external power supply and USB cable to the unit, take the steps below:

- (1) Connect the external power supply connector to supply power to the USB module.
- (2) Use the USB cable to connect the USB module to the PC.

To remove the external power supply and USB cable from the unit, take the steps below:

- (1) Unplug the USB cable.
- (2) Remove the external power supply connector to stop power supply to the USB module.

### CAUTION

To use the AC adapter, connect it to the USB module first, then plug the AC adapter's connector into a wall outlet.

When the USB module is not used, leave the AC adapter unplugged.

Continuously using the AC adapter heated affects its life.

Use the AC adapter not in a closed place but in a well-ventilated place not to be heated. The AC adapter heats up itself when loaded heavily. If the AC adapter is exposed to high temperature or used continuously, you should keep the load at about 80% of the maximum load (at 1.6 A for the POA200-20).

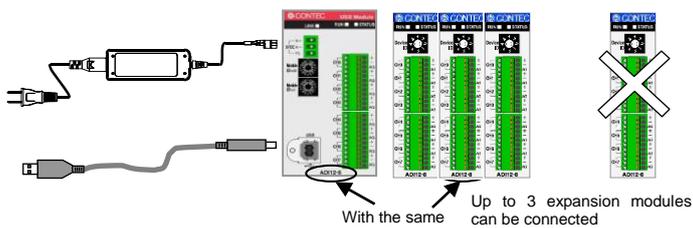
## Connecting with Expansion Accessories

When lacking of analog input channel used to connecting external device, you have to purchase a new same module, and thus it not only increases cost but also doubles installation space. At the same time, adding channels is considered when designing this module, and additional module can be connected by the connector on module side, so that not only the cost but also the installation space are controlled.

Up to 3 modules this product can be connected when adding channels.

In the case of combination of the USB module “ADI12-8(USB)GY” and three expansion modules “ADI12-8(FIT)GY”, it is possible to control 32 channels input by way of one USB port.

Model	Input channel	Current consumption	Function
ADI12-8(FIT)GY	8	+5VDC 350mA (Max.)	Expansion module for ADI12-8(USB)GY



### Points

- Up to 3 modules can be connected.
- Please use the supplied AC adapter when adding modules.
- Modules with different function from the USB module can not be connected.
- The analog grounds of both USB module and expansion module are isolated from each other.