Isolated Analog Output Module
for USB2.0

DAI12-4(USB)GY

This product is a USB2.0 compatible terminal module that extends the analog output function of USB port of PCs.   This product features 4ch 12-bit analog output 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 output channels can be increased by purchasing an optional device module. Windows driver is bundled with this product.

RoHS Compliant

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

Features

Conversion speed 10μsec (voltage) or 20μsec (current), 12-bit resolution, analog output 4ch

This product includes analog outputs (voltage : 10μsec, current : 20μsec, 12-bit, 4ch).   Compatible to USB1.1/USB2.0 and capable to achieve high speed transfer at HighSpeed (480 Mbps).   The voltage or current output range set (voltage : +/-10V, +/-5V, 0 - 10V, 0 - 5V, current : 0 - 20mA).   The range is set by software.

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 output) which can be used in either FIFO or ring format.   You can perform analog output 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.

Output signal can be controlled by a clock or various trigger conditions

The output signal can be started and stopped by software trigger.
The sampling period can be controlled by the internal clock (high-precision timer included on the board).

Easy to increase the output channels using an expansion module

Adding optional modules (up to 3 units) can easily increase the output 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 the module 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.

Specification

Hardware Specification

Item	Specification
Analog output	
Output format	Bus-isolated voltage/current output
Output range	Voltage: Bipolar ±10V, ±5V
	Unipolar 0 - 10V, 0 - 5V (output current ±5mA)
	Current: 0 - 20mA
Output impedance	Voltage range: 10Ω (Max.)
Output channel	4 channels
Resolution	12 bits
Conversion accuracy	Voltage range ±3LSB, Current range ±5LSB
Settling time	Voltage range 10μsec, Current range 20μsec *1
Data buffer	256K data (262, 144 data)
Internal sampling timer	10μsec - 1,073,741,824μsec *2
Communication	
USB transmission speed	12Mbps (full speed), 480Mbps (high speed) *3
Current consumption	+5VDC 700mA (Max.) *4
Others	
Number of modules used at the same time	127 modules (Max.)
Use condition	0 - 50ºC 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	DAI12-4(FIT)GY: 3 modules (Max.), Current consumption/module: +5VDC 400mA(Max.)
Connectors	FK-MC0.5/12-ST-2.5 (made by PHOENIX CONTACT) 2.5mm-pitch nominal current: 4A (Max.)
Applicable wire	AWG28 - 20 Cross-section 0.08 - 0.51mm
Bundled AC adapter (POA200-20)	90 - 264VAC 5.0VDC ±5 2.0A (Max.) Length of cable is about 1.5m. Length of AC cable is about 1.5m.

*1   Converting speed of D/A converter.   The minimum executable outputting period is depending on internal processing time and is about 400msec (using one channel) - 1msec (using 16 channels).
*2   It takes the unit of 1000msec (1000msec, 2000msec, 3000msec,...) 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.

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++ Ver5.0, Ver 6.0
	Microsoft Visual C++ .NET2002, 2003
	Microsoft Visual Basic Ver 5.0, Ver 6.0
	Microsoft Visual Basic .NET2002, 2003
	Microsoft Visual C# .NET2002, 2003
	Borland Delphi Ver 5.0, 6.0
	Borland C++ Builder Ver 5.0, 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 output module   : DAI12-4(FIT)GY
(Expansion module for DAI12-4(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
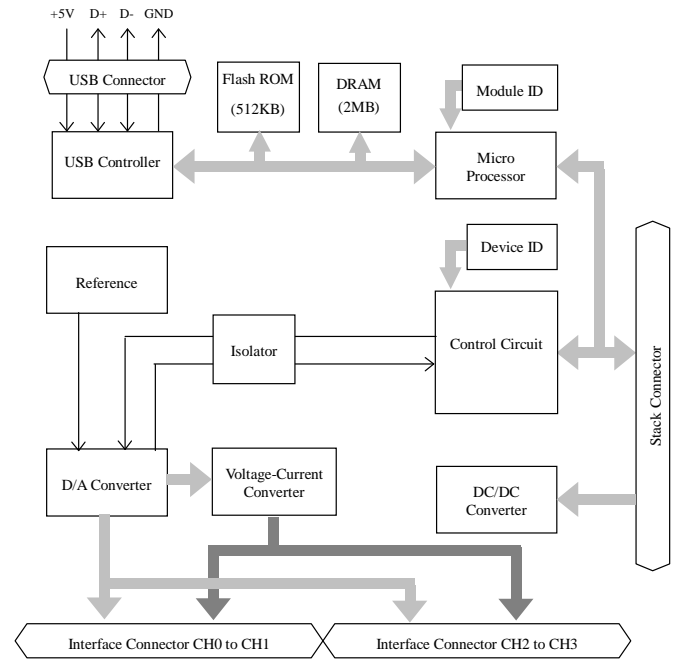(input: 10 - 30VDC, output: 5VDC 3.0A)   : POW-DD10GY

*   Check the CONTEC's Web site for more information on this product.
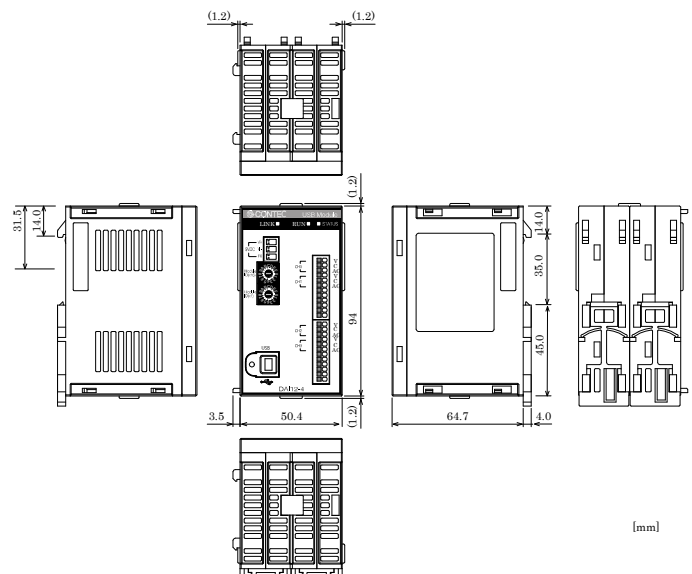
Packing List

USB module [DAI12-4(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
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.

Block Diagram
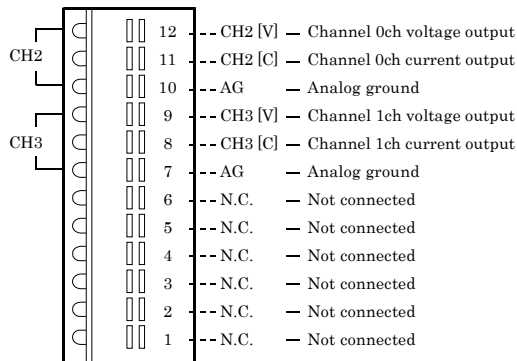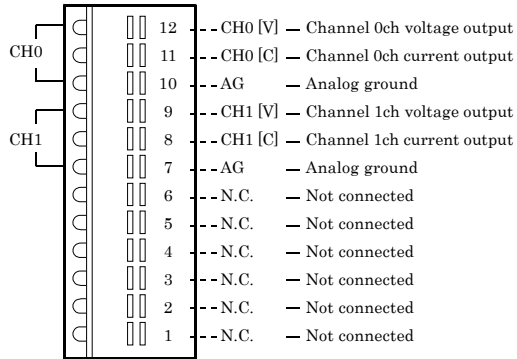

Physical Dimensions
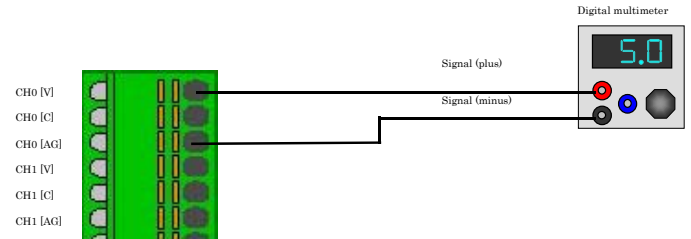

[mm]

Connecting to an External Device

Signal Layout

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

CH0	12	CH0 [V]	Channel 0ch voltage output
	11	CH0 [C]	Channel 0ch current output
	10	AG	Analog ground
CH1	9	CH1 [V]	Channel 1ch voltage output
	8	CH1 [C]	Channel 1ch current output
	7	AG	Analog ground
	6	N.C.	Not connected
	5	N.C.	Not connected
	4	N.C.	Not connected
	3	N.C.	Not connected
	2	N.C.	Not connected
	1	N.C.	Not connected

CH2	12	CH2 [V]	Channel 0ch voltage output
	11	CH2 [C]	Channel 0ch current output
	10	AG	Analog ground
CH3	9	CH3 [V]	Channel 1ch voltage output
	8	CH3 [C]	Channel 1ch current output
	7	AG	Analog ground
	6	N.C.	Not connected
	5	N.C.	Not connected
	4	N.C.	Not connected
	3	N.C.	Not connected
	2	N.C.	Not connected
	1	N.C.	Not connected

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.

Press this section to insert the wire.

Connector used
2.5mm pitch, 12-pin type, 4.0A nominal current
MC0, 5/12-0, 25 [made by Phoenix Contact]
Compatible plug:
FK-MC0, 5/12-ST-2, 5 [made by Phoenix Contact]
Compatible cable: AWG28 - 20

Input voltage output to an external device

Connecting digital multimeter with flat cable.

A coaxial cable can be used in situations where the module is at a relatively large distance from the external device or when the noise immunity of the module must be improved. In this case, the voltage output and the analog ground for each channel are connected to the input and the ground, respectively, of the external device by using the core wire and the shield braid of the coaxial cable.
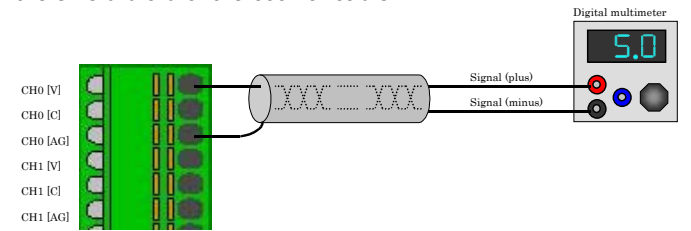
⚠ CAUTION
  When the power is turned on or the USB cable is plugged, the voltage output signal will be 0V.

  To avoid any malfunction, the voltage output signal should not be connected to the analog ground.

  To avoid any malfunction, the voltage output signal should not be connected to another analog ground signal or the output signal of external device.

  To avoid any malfunction, the connector plug should not be attached or detached when the power for the module or the external device is on.

  The maximum current capacity for a voltage output signal is ±5mA. To avoid any malfunction, do not connect an external device that generates a load exceeding this range.

  In situations where the connecting cable is subject to the effects of noise, the accurate voltage output can fail. The connecting cable should be installed away from any source of noise.

  In situations where the connecting cable is excessively long, the accurate voltage output can fail. Use a cable that is as short as possible.
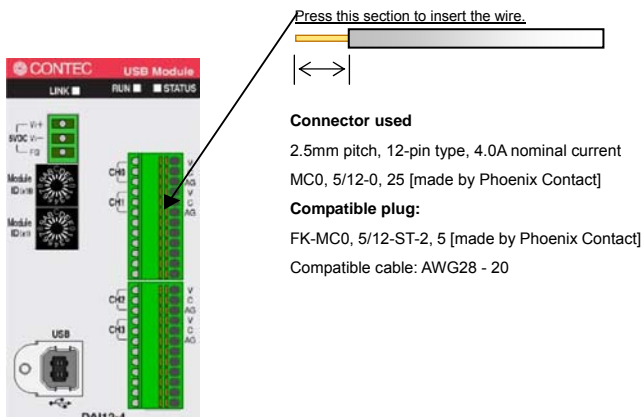
  Because the D/A converter in the module does not contain a built-in deglitcher, a glitch can sometimes occur.

## Controlling external device by current loop

Load that can be controlled by current loop have two sorts, floating load and fixed load.   If the module is used as a floating load, multiple current loops can be implemented by using the same power supply.   The use of current output requires an external power supply (10 - 24V).   In such a case, a power supply with a small ripple should be used in order to avoid an adverse impact on the conversion accuracy due to a large power supply ripple.

Moreover, the load resistance RL that is connected to the current output of each channel should be less than 500Ω, including the wire resistance.

Connecting to a Floating Load
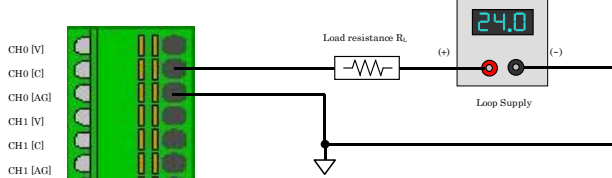
Connecting to a Fixed Load
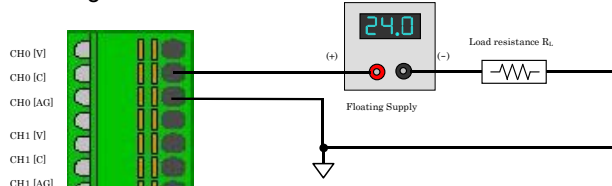
⚠ CAUTION

When the power is turned on or the module is reset, the current output signal will be 0mA.

To avoid any malfunction, the current output signal should not be connected to the analog ground.

To avoid any malfunction, the current output signal should not be connected to another analog output signal or the output signal of an external device.

To avoid any malfunction, the connector plug should not be attached or detached when the power for the module or the external device is on.

In situations where the connecting cable is subject to the effects of noise, the accurate current output can fail. The connecting cable should be installed away from any source of noise.

Connecting with Expansion Accessories

When lacking of analog output 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 DAI12-4(FIT)GY can be connected when adding channels.
In the case of combination of the USB module "DAI12-4(USB)GY" and three expansion modules "DAI12-4(FIT)GY", it is possible to control 16 channels output by way of one USB port.

Model	Output channel	Current consumption	Function
DAI12-4(FIT)GY	4	+5VDC 400mA (Max.)	Expansion module for DAI12-4(USB)GY

With the same name

Up to 3 expansion modules can be connected
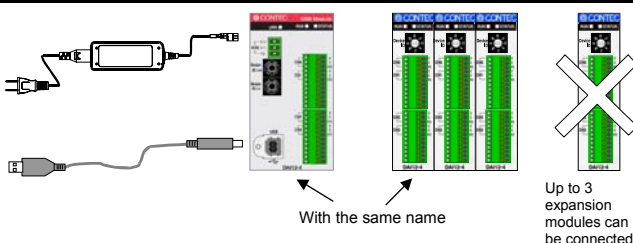
Points

Up to 3 modules can be connected.

Please use the supplied AC adapter when adding modules.

The analog grounds of both USB module and expansion module are isolated from each other.

Modules with different function from the USB module can not be connected

In addition, besides the Ac adapter, the power supplies (Option) installable on DIN rail are provided.
You can choose by the environment and purpose.

Category	Model	Input	Output	External dimensions(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) (exclusive of protrusions)	No
AC-DC power	POW-AD13GY	85 - 132VAC	5.0VDC ±5% 3.0A (Max.)	52.4(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)	Yes
AC-DC power	POW-AD22GY	85 - 265VAC	5.0VDC ±5% 2.0A (Max.)	52.4(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)	Yes
DC-DC power	POW-DD10GY	10 - 30VDC	5.0VDC ±5% 3.0A (Max.)	25.2(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)	Yes

2 outputs

AC input

DC input

MC1,5/3-ST-3,5
(Phoenix Contact)
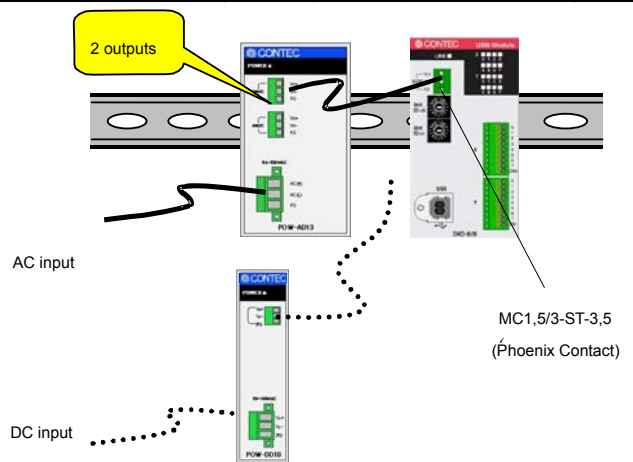
When using the power supply installable on DIN rail, please use the connector MC1,5/3-ST-3,5(Phoenix Contact).

Points

If you use external power supply, please connect in the following order.
(1) Connect the external power connector to supply power for the USB module.
(2) Connect the USB module with computer using USB cable.

You can Remove the external power supply in the following order.
(1) Remove USB cable.
(2) Remove external power connector, stop power supplying to the USB module.