DAUDIN CO., LTD.

2301TW
V2.0.0

iO-GRID M

Analog Input/Output Module User's Manual

Table of Contents

1. Analog Input/Output Module List

Product No.	Description	Remarks
GFAX-RM10	2-channel analog input module, 2-channel analog output module (-10…10VDC)	
GFAX-RM11	2-channel analog input module, 2-channel analog output module (0…10VDC)	
GFAX-RM20	2-channel analog input module, 2-channel analog output module (0… 20mA)	
GFAX-RM21	2-channel analog input module, 2-channel analog output module (4… 20mA)	

Product Description

GFAX, analog input and output module series is specially designed for industrial applications. Its the open-type industrial equipment which is intended for installation within enclosures supplied in the field. Device with two analog inputs and two analog outputs, 12-bit analog-to-digital and analog-to-digital conversion. And its circuit design & all the components of GFAX series are compliant with the latest requirements and standards of UL, CE & RoHS. It has a complete circuit protection design to resist overload, overvoltage and short circuit etc. It is avoided to damage & failure caused from improper operations.

Caution (ATTENTION):

1. THIS DEVICE IS FOR INDOOR USE ONLY, DON'T PUT OR USE IT IN HIGH TEMPERATURE AND HIGH MOISTURE ENVIRONMENT.
   CET EQUIPEMENT EST DESTINE A UN USAGE INTERIEUR UNIQUEMENT NE PAS STOCKER OU UTILISER DANS UN ENVIRONNEMENT A HAUTE TEMPERATURE ET HAUTE HUMIDITE.
2. AVOID FALLING AND BUMPING OTHERWISE THE ELECTRICAL COMPONENTS WILL BE DAMAGED.
   ÉVITEZ DE TOMBER ET DE VOUS ÉCRASER, SINON LES COMPOSANTS ÉLECTRIQUES SERONT ENDOMMAGÉS
3. DON'T TRY TO DISASSEMBLE OR OPEN THE COVER UNDER ANY CIRCUMSTANCE IN ORDER TO AVOID DANGER.
   NE TENTEZ JAMAIS DE DEBALLER OU D'OUVRIR LE COUVERCLE POUR EVITER TOUT DANGER.
4. IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.
   SI L'APPAREIL N'EST PAS UTILISE DE LA MANIERE INDIQUEE PAR LE FABRICANT, LA PROTECTION FOURNIE PAR L'APPAREIL PEUT ETRE ALTEREE.
5. THE INSTALLATION THAT THE SAFETY OF ANY SYSTEM INCORPORATING THE EQUIPMENT IS THE RESPONSIBILITY OF THE ASSEMBLER OF THE SYSTEM.
   L'INSTALLATION DE TOUT SYSTÈME INTÉGRANT CET ÉQUIPEMENT EST LA RESPONSABILITÉ DU CONSTRUCTEUR DU SYSTÈME.
6. USE WITH COPPER CONDUCTORS ONLY. INPUT WIRING: MINIMUM 28 AWG, 85°C, OUTPUT WIRING: MINIMUM 28 AWG, 85°C
   DESTINÉ À ÊTRE UTILISÉ AVEC DES CONDUCTEURS EN CUIVRE SEULEMENT. CABLAGE D'ENTREE: MINIMUM 28 AWG, 85 ° C. CABLAGE DE SORTIE: MINIMUM 28 AWG, 85 ° C.
7. FOR USE IN A CONTROLLED ENVIRONMENT. REFER TO MANUAL FOR ENVIRONMENTAL CONDITIONS.
   POUR UN ENVIRONNEMENT CONTROLE. REPORTEZ-VOUS AU MANUEL DES CONDITIONS ENVIRONNEMENTALES.
8. DISCONNECT ALL SOURCES OF SUPPLY BEFORE SERVICING.
   COUPER TOUTES LES SOURCES D'ALIMENTATION AVANT DE FAIRE L'ENTRETIEN ET LES RÉPARATIONS.
9. PROPER VENTILATION IS REQUIRED TO REDUCE THE RISK OF HAZARDOUS OR EXPLOSIVE GAS BUILDUP DURING INDOOR CHARGING. SEE OWNERS MANUAL.
   UNE VENTILATION ADÉQUATE EST NÉCESSAIRE AFIN DE RÉDUIRE LES RISQUES D'ACCUMULATION DE GAZ DANGEREUX OU EXPLOSIFS DURANT LA RECHARGE À L'INTÉRIEUR. VOIR LE MANUEL D'ENTRETIEN.

2. Analog Input/Output Module Specification

2.1 GFAX-RM10

Module Specification	
Number of Inputs/Output	2 inputs/2outputs
Voltage Supply	5 VDC via Dinkle Bus
Current consumption	<140 mA @ 5VDC
Resolution	12 bit
Input/Output Signal Type	±10 VDC
Input Signal Design	Differential
Accuracy	±0.1%
Input Impedance	400 KΩ (conventional)
Sample Rate	500 / Sec
Output Impedance	>2 KΩ
Communication Interface	RS485 via Dinkle Bus
Communication Specification	
Fieldbus Protocol	Modbus RTU
Format	N, 8, 1
Baud Rate Range	1200-1.5 Mbps
General Specification	
Dimension (W*D*H)	12 x 100 x 97mm
Weight	61g
Ambient Temperature (operation)	-10…+60˚C
Storage Temperature	-25˚C…+85˚C
Permissible Humidity(non-condensing)	RH 95%
Altitude Limit	< 2000 m
Ingress Protection (IP)	IP 20
Pollution Severity	II
Safety Approval	CE
Product Certification	UL 61010-1 & UL 61010-2-201
Wiring Range (IEC / UL)	0.2 mm2 ~ 1.5 mm2 / AWG 28~16
Wiring Ferrules	DN00510D、DN00710D

2.2 GFAX-RM11

Module Specification	
Number of Inputs/Output	2 inputs/2outputs
Voltage Supply	5 VDC via Dinkle Bus
Current Consumption	<140 mA @ 5VDC
Resolution	12 bit
Input/Output Signal Type	0...10 VDC
Input Signal Design	Differential
Accuracy	±0.1%
Input Impedance	400 KΩ (conventional)
Sample Rate	500 / Sec
Output Impedance	>2 KΩ
Communication Interface	RS485 via Dinkle Bus
Communication Specification	
Fieldbus Protocol	Modbus RTU
Format	N, 8, 1
Baud Rate Range	1200-1.5 Mbps
General Specification	
Dimension (W*D*H)	12 x 100 x 97mm
Weight	61g
Ambient Temperature (operation)	-10…+60˚C
Storage Temperature	-25˚C…+85˚C
Permissible Humidity(non-condensing)	RH 95%
Altitude Limit	< 2000 m
Ingress Protection (IP)	IP 20
Pollution Severity	II
Safety Approval	CE
Product Certification	UL 61010-1 & UL 61010-2-201
Wiring Range (IEC / UL)	0.2 mm2 ~ 1.5 mm2 / AWG 28~16
Wiring Ferrules	DN00510D、DN00710D

2.3 GFAX-RM20

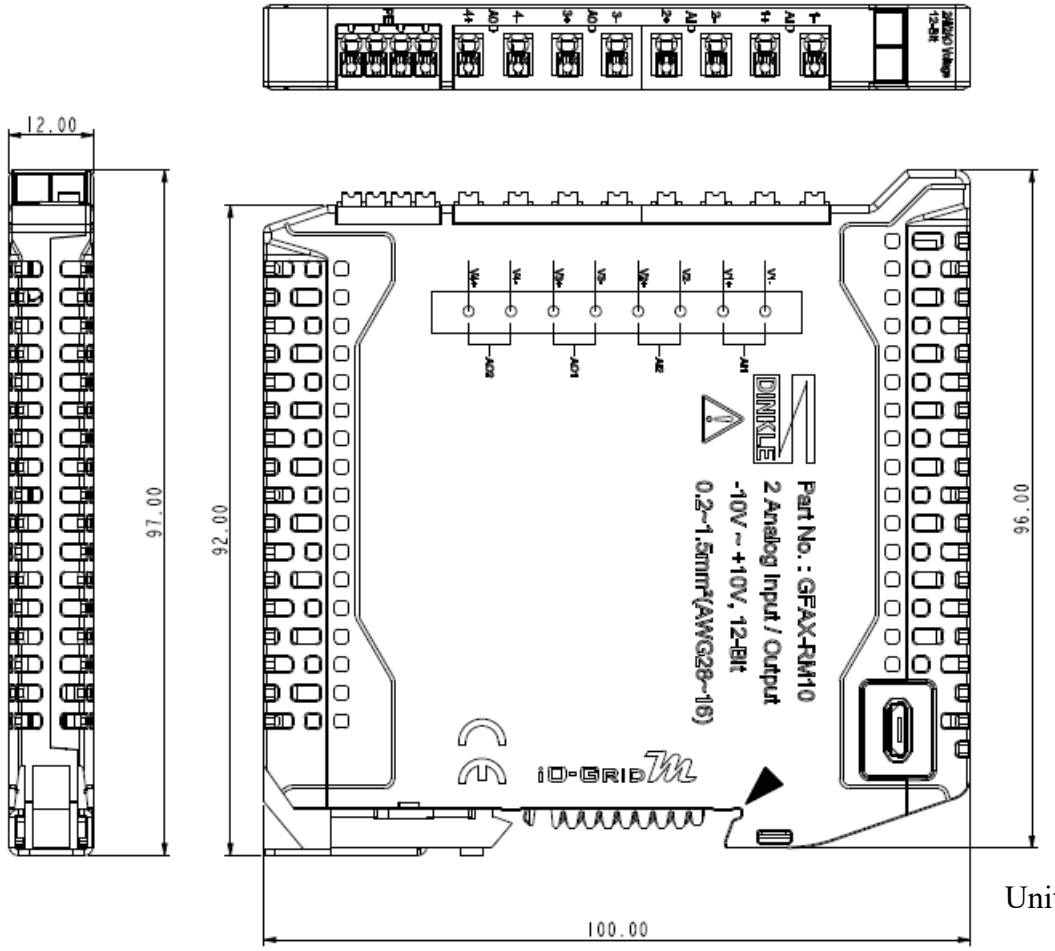
Module Specification	
Number of Inputs/Output	2 inputs/2outputs
Voltage Supply	5 VDC via Dinkle Bus
Current Consumption	<240 mA @ 5VDC
Resolution	12 bit
Input/Output Signal Type	0…20 mA
Input Signal Design	Differential
Accuracy	±0.1%
Input Impedance	100Ω (conventional)
Sample Rate	500 / Sec
Output Impedance	< 500Ω
Communication Interface	RS485 via Dinkle Bus
Communication Specification	
Fieldbus Protocol	Modbus RTU
Format	N, 8, 1
Baud Rate Range	1200-1.5 Mbps
General Specification	
Dimension (W*D*H)	12 x 100 x 97mm
Weight	61g
Ambient Temperature (operation)	-10…+60˚C
Storage Temperature	-25˚C…+85˚C
Permissible Humidity(non-condensing)	RH 95%
Altitude Limit	< 2000 m
Ingress Protection (IP)	IP 20
Pollution Severity	II
Safety Approval	CE
Product Certification	UL 61010-1 & UL 61010-2-201
Wiring Range (IEC / UL)	0.2 mm2 ~ 1.5 mm2 / AWG 28~16
Wiring Ferrules	DN00510D、DN00710D

2.4 GFAX-RM21

Module Specification	
Number of Inputs/Output	2 inputs/2outputs
Voltage Supply	5 VDC via Dinkle Bus
Current Consumption	<240 mA @ 5VDC
Resolution	12 bit
Input/Output Signal Type	4…20 mA
Input Signal Design	Differential
Accuracy	±0.1%
Input Impedance	100Ω (conventional)
Sample Rate	500 / Sec
Output Impedance	< 500Ω
Communication Interface	RS485 via Dinkle Bus
Communication Specification	
Fieldbus Protocol	Modbus RTU
Format	N, 8, 1
Baud Rate Range	1200-1.5 Mbps
General Specification	
Dimension (W*D*H)	12 x 100 x 97mm
Weight	61g
Ambient Temperature (operation)	-10…+60˚C
Storage Temperature	-25˚C…+85˚C
Permissible Humidity(non-condensing)	RH 95%
Altitude Limit	< 2000 m
Ingress Protection (IP)	IP 20
Pollution Severity	II
Safety Approval	CE
Product Certification	UL 61010-1 & UL 61010-2-201
Wiring Range (IEC / UL)	0.2 mm2 ~ 1.5 mm2 / AWG 28~16
Wiring Ferrules	DN00510D、DN00710D

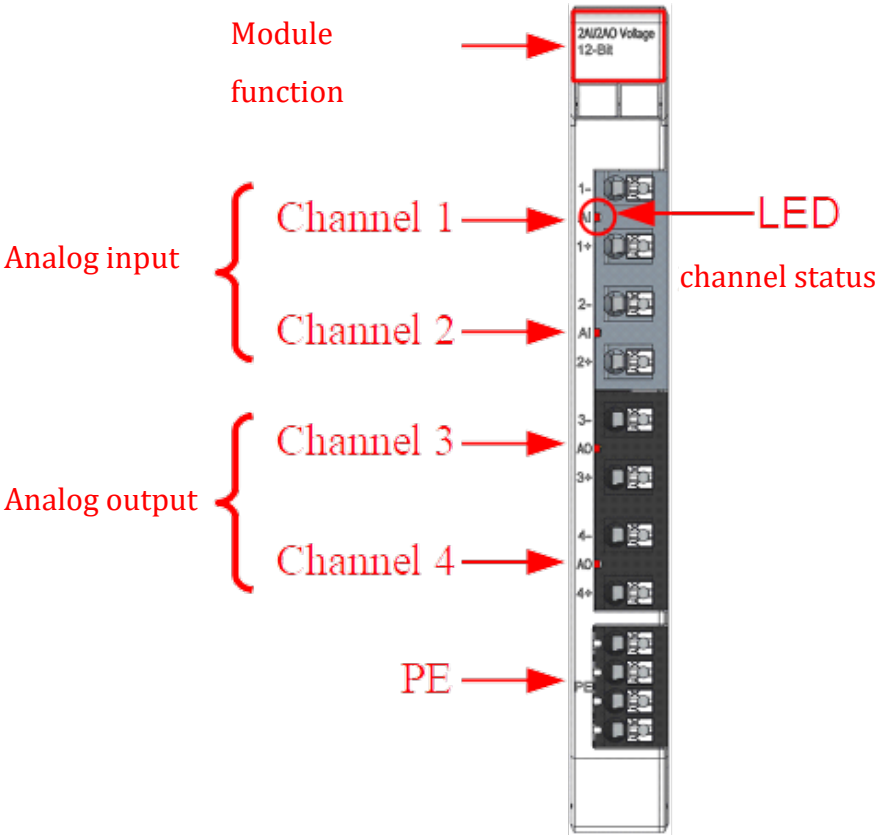
3. Analog Input Module Introduction

3.1 Analog Input Module Dimensions



Unit: mm

3.2 Analog Input/Output Module Panel Information



I. Terminal block connector definitions

Terminal block labeling	Connector definitions	Terminal block labeling	Connector definitions
1-	Channel 1 (-)	**3-**	Channel 3 (-)
1+	Channel 1 (+)	**3+**	Channel 3 (+)
2-	Channel 2 (-)	**4-**	Channel 4 (-)
2+	Channel 2 (+)	**4+**	Channel 4 (+)
PE	Earth terminal into the DIN rail		

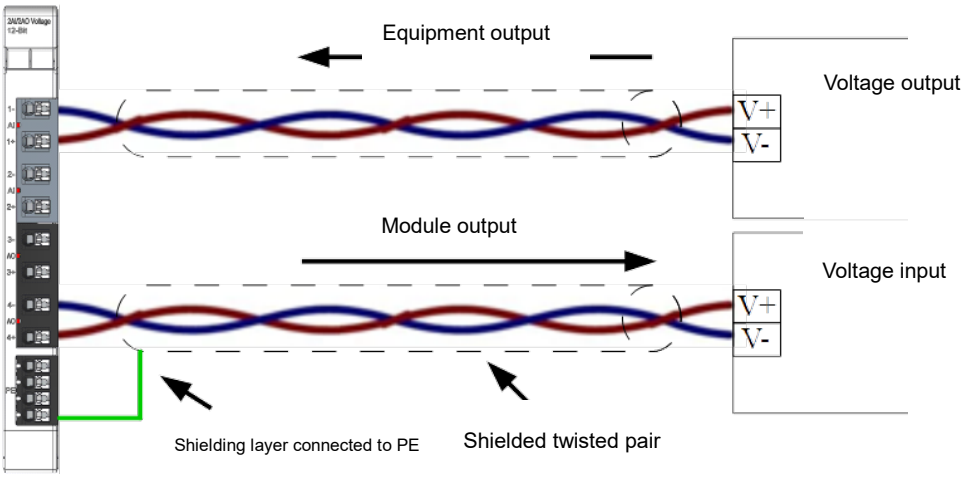
II. LED Channel Indicator Light

Each channel's port has a LED indicator next to it

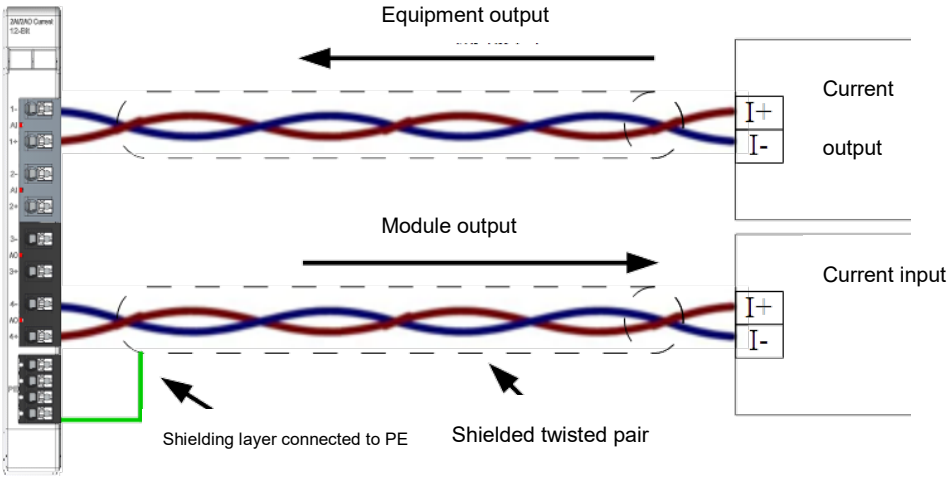
LED Status	Status
Solid	**Normal**
Blinking	**Exceeding the limit**

3.3 Analog Input/Output Module Wiring Diagram

I. GFAX-RM10,GFAX-RM11 (voltage input/output type)



II. GFAI-RM20,GFAI-RM21 (current input type)



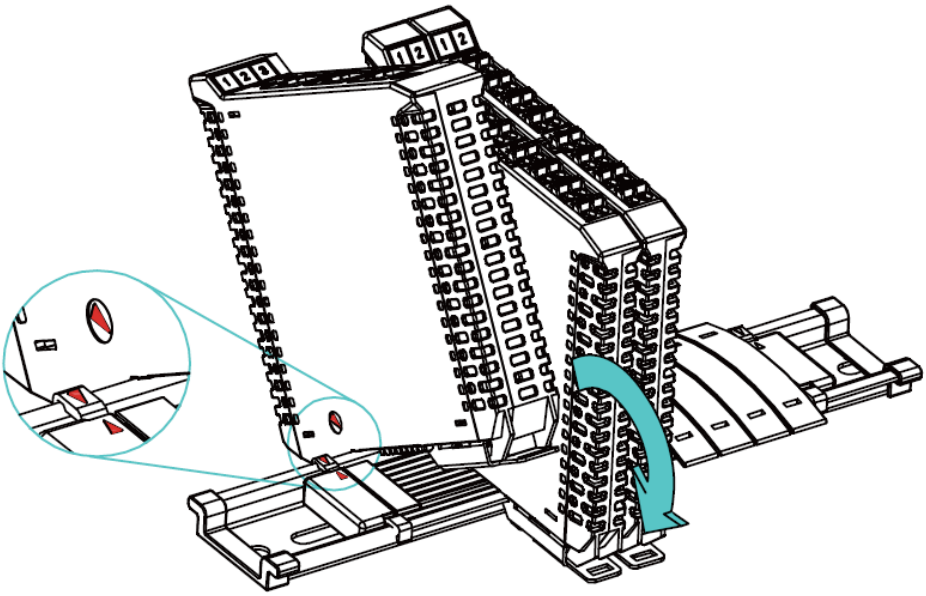
※PE terminal will connect the shielded wire to the DIN rail. The casing of the control box must be grounded properly

4. Module Installation/Disassembly

4.1 Installation

I. Align the red arrow on the side of the module to the arrow on the DIN rail.

II. Press the module down and the metal clamp will slide (thanks to its spring mechanism)
and grab on the other side of the DIN rail. Continue to push down until the metal clamp “clicks”.

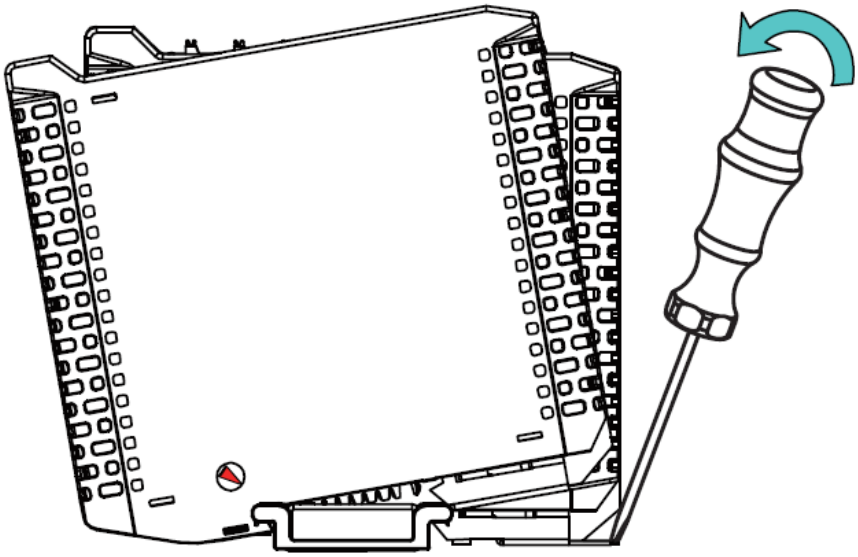


*Note: Make sure the red arrows on the module and the rail are pointing the same direction.

4.2 Removal

I. Use a screwdriver to pull the metal hook sideways and detach the module from the DIN rail.

II. Remove all modules from the DIN rail in reverse order of installation.



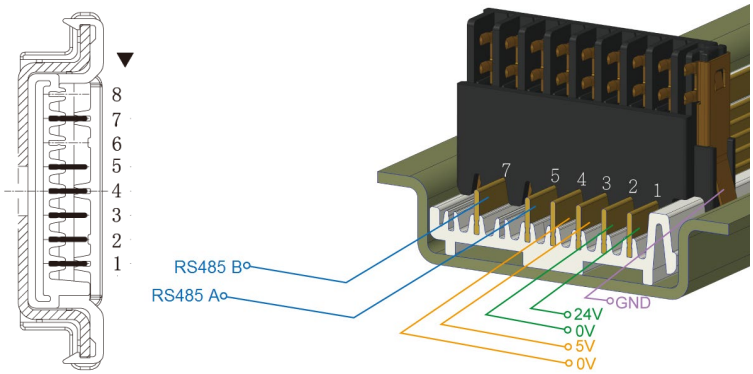
5. iO-GRID M Series Introduction

iO-GRID M series utilizes the standard Modbus communication protocol and supports Modbus RTU/ASCII and Modbus TCP. Please choose products and factory controllers to figure your system based on your communication protocol.

5.1 iO-GRID M Components

I. DINKLE Bus

Rail 1 to 4 are defined for power supply, rail 5 and rail 7 are defined for communication.



DINKLE Bus Rail Definitions:

Rail	Definition	Rail	Definition
8	—	**4**	0V
7	RS485B	**3**	5V
6	—	**2**	0V
5	RS485A	**1**	24V

II. Gateway Module

A gateway module converts between Modbus TCP and Modbus RTU/ASCII. The module provides two sets of external Ethernet ports to connect to the controller and the Internet

There are two types of gateway modules available:

4-channel gateway module: Provides 4 RS485 ports to connect to a control module

Single-channel gateway module: No external connectivity for the RS485 ports. The RS485 signals are transmitted via DINKLE Bus and I/O module.

Gateway module products information:

Product No.	Description
GFGW-RM01N	Modbus TCP-to-Modbus RTU/ASCII gateway module. ,4 Ports
GFGW-RM02N	Modbus TCP-to-Modbus RTU/ASCII gateway module. ,1 Port

III. Control module

The control module manages I/O modules and sets up the configuration. Provides external RS485 ports to connect to the controller.

There are two types of control modules available:

3-channel control module:

Provides 3 external RS485 ports, suitable stations with 2 or more **control modules**. Among the RS485 ports, 2 of them will be connected to the controller and the control module of the next system.

Single-channel control module:

Provides one single RS485 port to connect to the controller, suitable for single-module stations.

Control module products information:

Product No.	Description
GFMS-RM01N	RS485 control module, Modbus RTU/ASCII 3 Ports
GFMS-RM01S	RS485 control module, Modbus RTU/ASCII 1 Port

IV. I/O Module

Daudin offers different types of I/O modules with different functions:

Product No.	Description
GFDI-RM01N	16-channel digital input module (source/sink)
GFDO-RM01N	16-channel digital output module (sink)
GFDO-RM02N	16-channel digital output module (source)
GFAR-RM11	8-Channel relay module, grounded
GFAR-RM21	4-Channel relay module, grounded
GFAI-RM10	4-channel analog input module (±10VDC)
GFAI-RM11	4-channel analog input module (0…10VDC)
GFAI-RM20	4-channel analog input module (0… 20mA)
GFAI-RM21	4-channel analog input module (4… 20mA)
GFAO-RM10	4-channel analog output module (±10VDC)
GFAO-RM11	4-channel analog output module (0…10VDC)
GFAO-RM20	4-channel analog output module (0… 20mA)
GFAO-RM21	4-channel analog output module (4… 20mA)
GFAX-RM10	2-channel analog input module, 2-channel analog output module (± 10VDC)
GFAX-RM11	2-channel analog input module, 2-channel analog output module (0…10VDC)
GFAX-RM20	2-channel analog input module, 2-channel analog output module (0… 20mA)
GFAX-RM21	2-channel analog input module, 2-channel analog output module (4… 20mA)

6. I/O Module Parameter Settings and Introduction

6.1 I/O Module Settings and Connections

I. I/O Module System Configuration List

Name/Product No.	Description
GFAX-RM10	2-channel analog input module, 2-channel analog output module (± 10VDC)
GFAX-RM11	2-channel analog input module, 2-channel analog output module (0…10VDC)
GFAX-RM20	2-channel analog input module, 2-channel analog output module (0… 20mA)
GFAX-RM21	2-channel analog input module, 2-channel analog output module (4… 20mA)
GFAX-RM10	2-channel analog input module, 2-channel analog output module (± 10VDC)
GFTK-RM01	USB-to-RS232 converter
Micro USB cable	Must have data transfer functionality
Computer	USB-compatible

II. Module Initial Setting List

Product No.	Description	Station No.	Baud rate	Format
GFMS-RM01N	RS485 control module, RTU/ASCII	1	115200	RTU(8,N,1)
GFDI-RM01N	16-channel digital input module (source/sink)	1	115200	RTU(8,N,1)
GFDO-RM01N	16-channel digital output module (sink)	1	115200	RTU(8,N,1)
GFDO-RM02N	16-channel digital output module (Source)	1	115200	RTU(8,N,1)
GFAR-RM11	8-Channel relay module, grounded	1	115200	RTU(8,N,1)
GFAR-RM21	4-Channel relay module, grounded	1	115200	RTU(8,N,1)
GFAI-RM10	4-channel analog input module (±10VDC)	1	115200	RTU(8,N,1)
GFAI-RM11	4-channel analog input module (0…10VDC)	1	115200	RTU(8,N,1)
GFAI-RM20	4-channel analog input module (0… 20mA)	1	115200	RTU(8,N,1)
GFAI-RM21	4-channel analog input module (4… 20mA)	1	115200	RTU(8,N,1)
GFAO-RM10	4-channel analog output module (±10VDC)	1	115200	RTU(8,N,1)
GFAO-RM11	4-channel analog output module (0…10VDC)	1	115200	RTU(8,N,1)
GFAO-RM20	4-channel analog output module (0… 20mA)	1	115200	RTU(8,N,1)
GFAO-RM21	4-channel analog output module (4… 20mA)	1	115200	RTU(8,N,1)
GFAX-RM10	2-channel analog input module, 2-channel analog output module (± 10VDC)	1	115200	RTU(8,N,1)
GFAX-RM11	2-channel analog input module, 2-channel analog output module (0…10VDC)	1	115200	RTU(8,N,1)
GFAX-RM20	2-channel analog input module, 2-channel analog output module (0… 20mA)	1	115200	RTU(8,N,1)
GFAX-RM21	2-channel analog input module, 2-channel analog output module (4… 20mA)	1	115200	RTU(8,N,1)

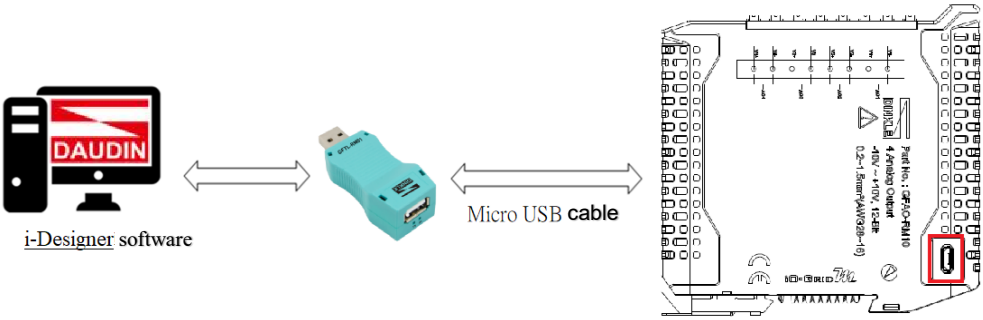
III. Setup Software Functions:

The setup software shows the I/O module station numbers, baud rates and data formats.

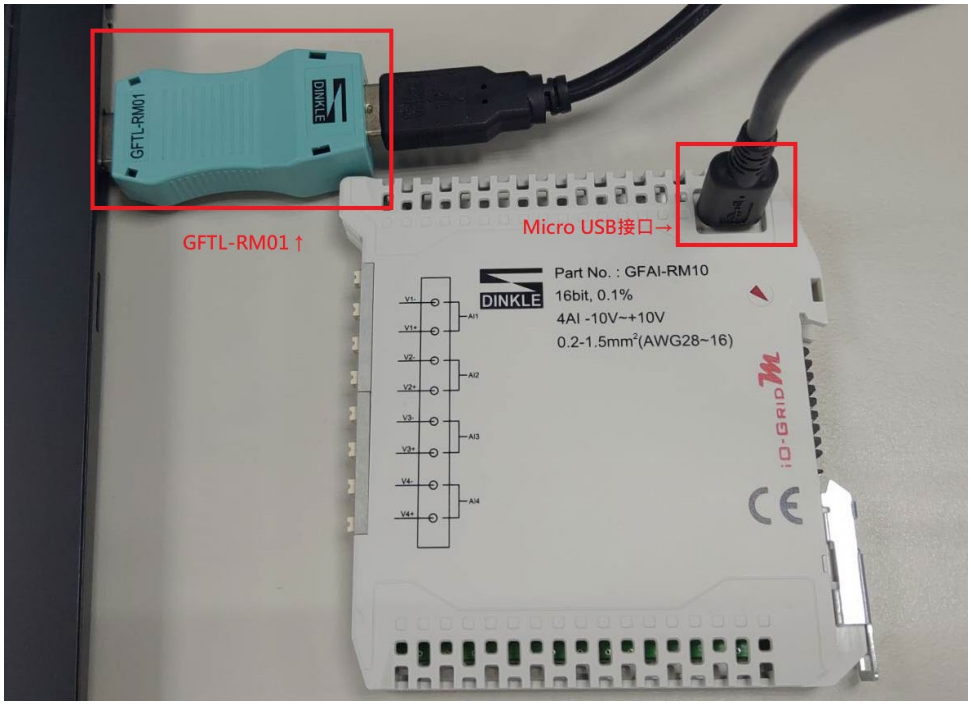
IV. I/O Module Settings and Connections

Connect the Micro USB port and GFTL-RM01 (RS232 converter) to your computer and open the iO-Grid M Utility program to set up I/O module parameters

I/O module connection illustration:



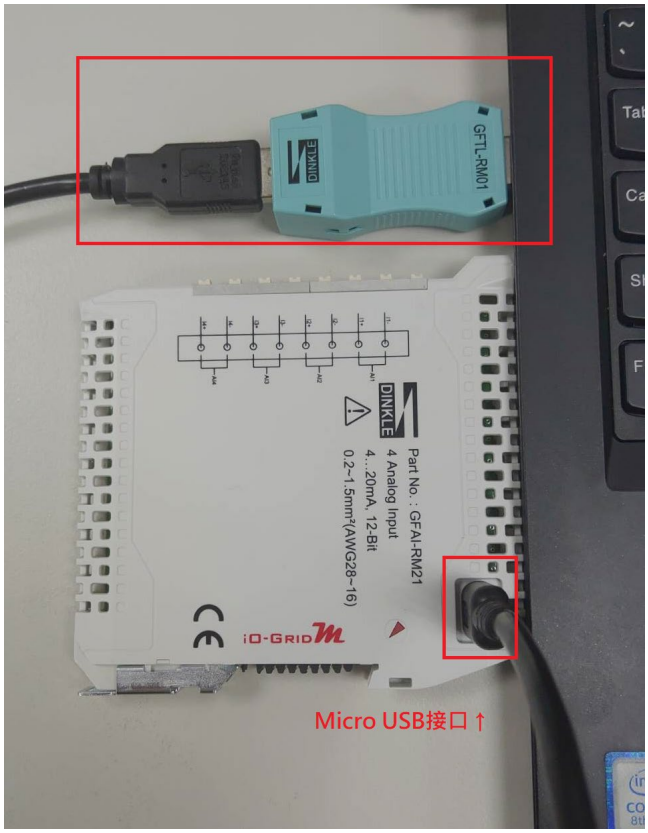
I/O module connection image:



※ Please do now power the I/O module during the setup

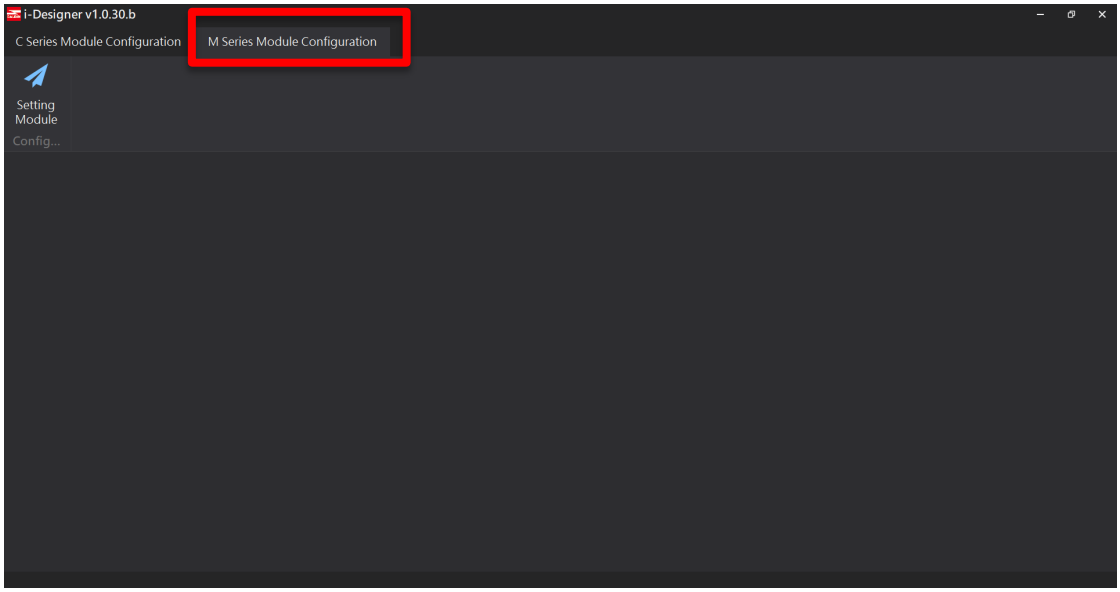
6.2 i-Designer Program Tutorial

I. Connect to the I/O module using GFTL-RM01 and a Micro USB cable

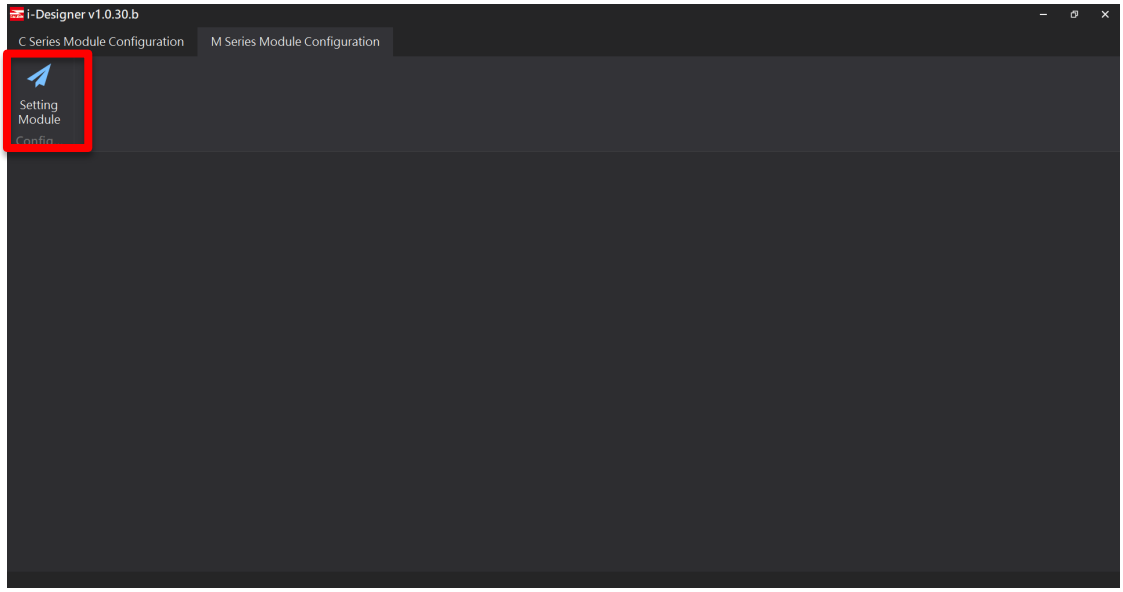


II. Click to launch the software

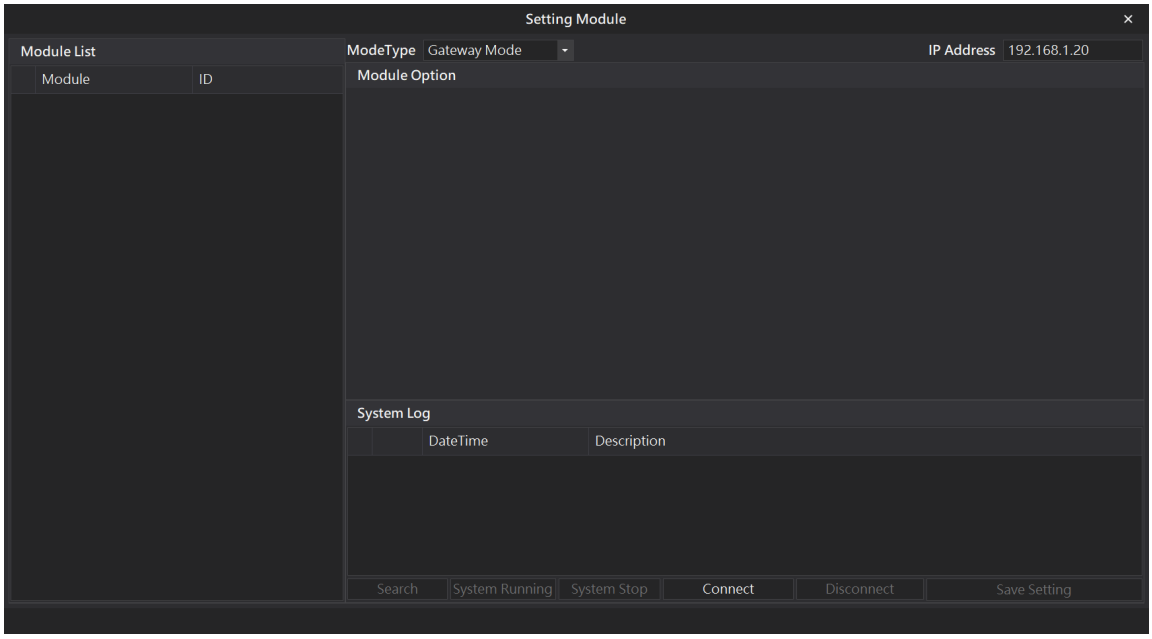
III. Select “M Series Module Configuration”



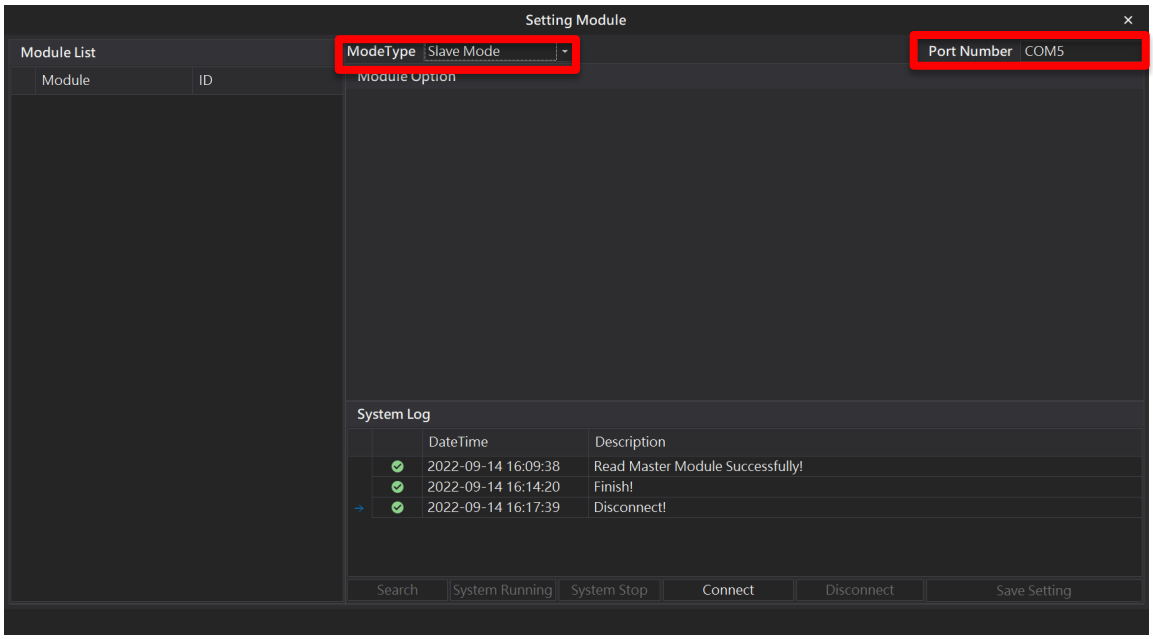
IV. Click on the “Setting Module” icon



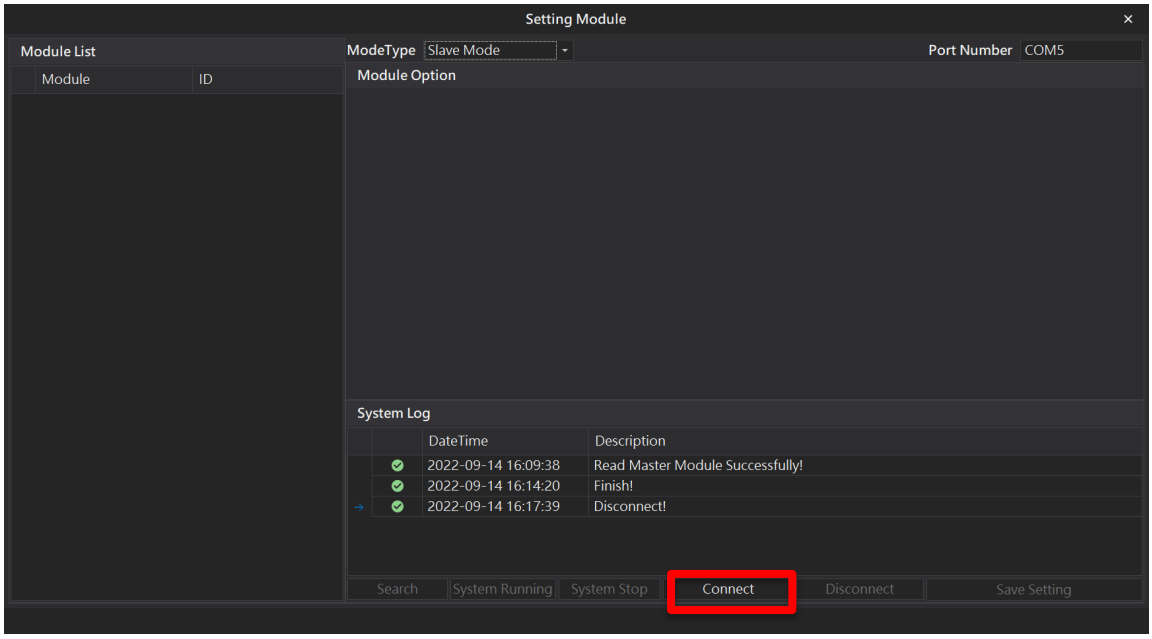
V. Enter the "Setting Module" page for M-series



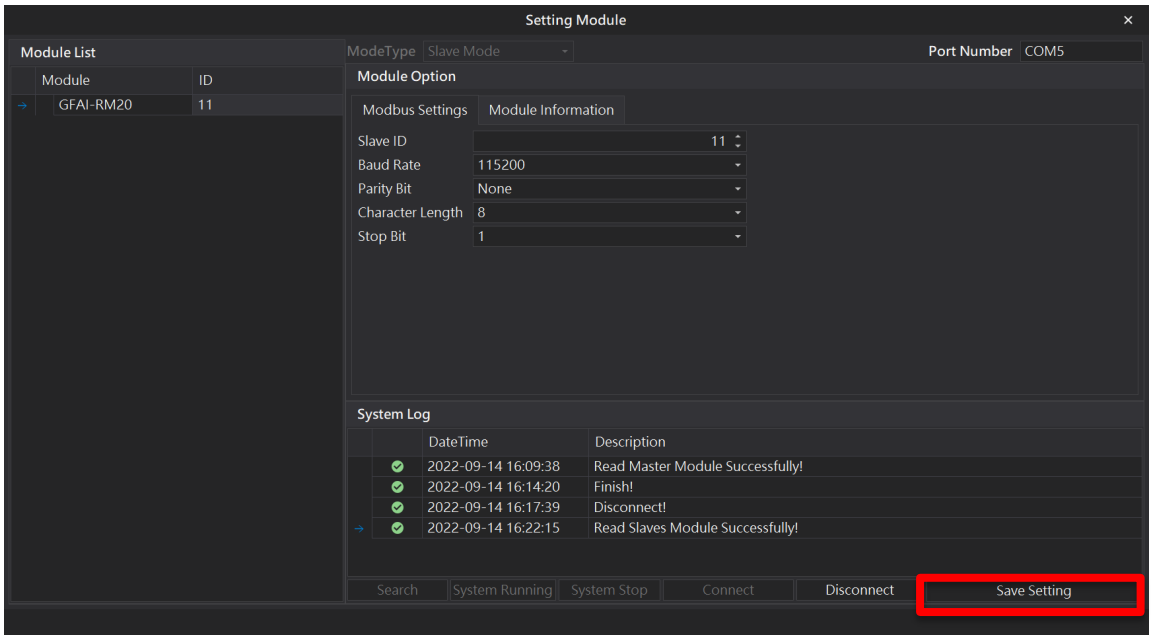
VI. Select the mode type based on the connected module



VII. Click on "Connect"



VIII. Set up I/O modules' station numbers and communication format (must click on "Save" after changing them)

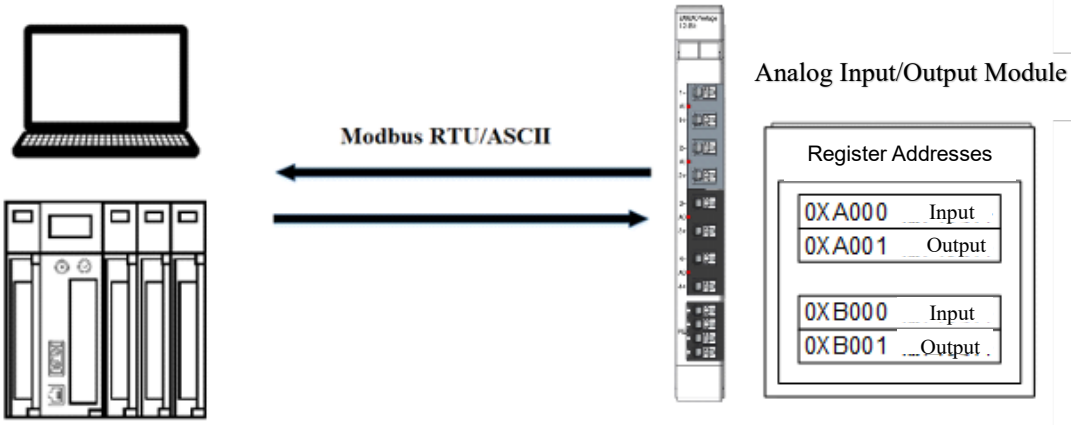


7. Analog Input Module Control Register Description

7.1 Analog Input Module Register Communication Method

I. Use Modbus RTU/ASCII to read single-chip analog input module registers

The address for the analog input module register to be read is: 0xA000…0xA003



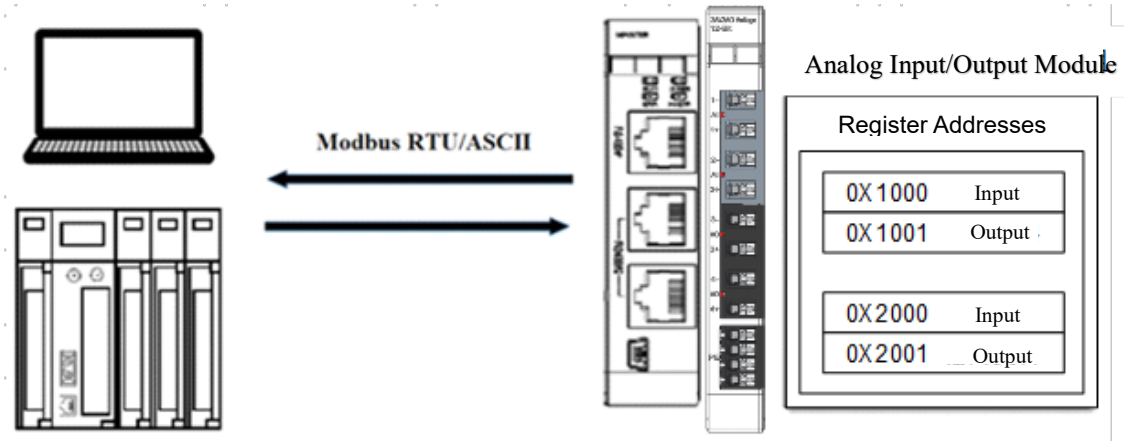
※With no control module, RS485 wire must be connected with an adaptor plug and an adaptor socket to send the signal to the Dinkle Bus

The configuration that uses Modbus and RTU/ASCII to read single-chip analog input module registers is listed below:

Name/Product No.	Description
GFAX-RM10	2-channel analog input module, 2-channel analog output module (± 10VDC)
GFAX-RM11	2-channel analog input module, 2-channel analog output module (0…10VDC)
GFAX-RM20	2-channel analog input module, 2-channel analog output module (0… 20mA)
GFAX-RM21	2-channel analog input module, 2-channel analog output module (4… 20mA)
BS-210	Adapter Socket
BS-211	Adapter Plug

II. Use Modbus RTU/ASCII with control modules to read single-chip analog input module registers

Once an analog input module is set up with a control module, it will automatically assign analog input modules' input records registers between 0x1000 and 0x1003



※When using control modules, RS485 can connect to control modules with 0170-0101.

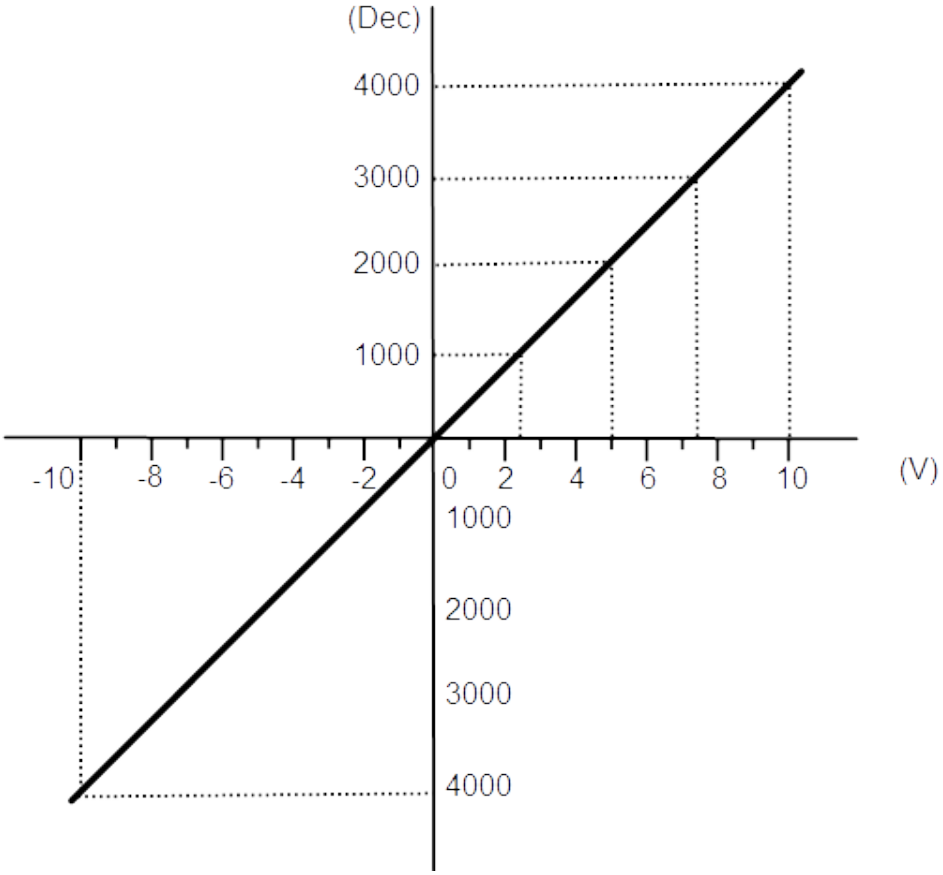
The configuration that uses Modbus RTU/ASCII to read analog input module registers is listed below:

Name/Product No.	Description
GFMS-RM01N	Master Modbus RTU, 3 Ports
GFAX-RM10	2-channel analog input module, 2-channel analog output module (± 10VDC)
GFAX-RM11	2-channel analog input module, 2-channel analog output module (0…10VDC)
GFAX-RM20	2-channel analog input module, 2-channel analog output module (0… 20mA)
GFAX-RM21	2-channel analog input module, 2-channel analog output module (4… 20mA)
0170-0101	RS485(2W)-to-RS485(RJ45 interface)

7.2 Input/Output Module Register A/D Conversion Chart

I. Voltage Range:-10V...10V

Conversion Diagram:



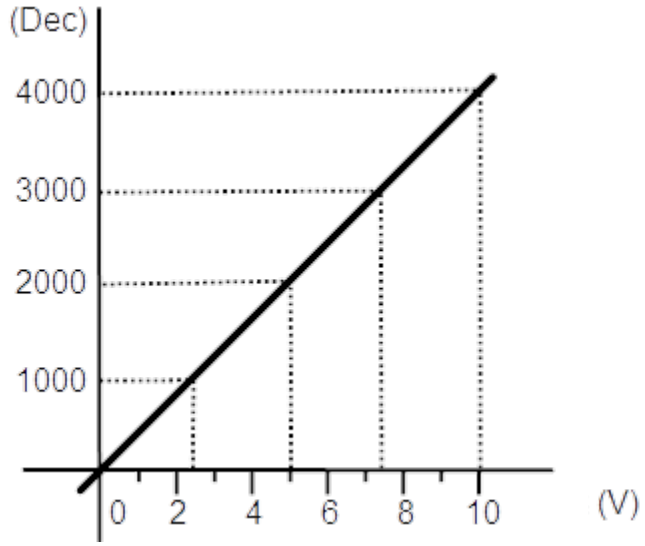
Voltage Conversion Chart:

	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
10	4000	4040	4080	4120	4160	4200	-	-	-	-
9	3600	3640	3680	3720	3760	3800	3840	3880	3920	3960
8	3200	3240	3280	3320	3360	3400	3440	3480	3520	3560
7	2800	2840	2880	2920	2960	3000	3040	3080	3120	3160
6	2400	2440	2480	2520	2560	2600	2640	2680	2720	2760
5	2000	2040	2080	2120	2160	2200	2240	2280	2320	2360
4	1600	1640	1680	1720	1760	1800	1840	1880	1920	1960
3	1200	1240	1280	1320	1360	1400	1440	1480	1520	1560
2	800	840	880	920	960	1000	1040	1080	1120	1160
1	400	440	480	520	560	600	640	680	720	760
0	0	40	80	120	160	200	240	280	320	360
0	0	-40	-80	-120	-160	-200	-240	-280	-320	-360
-1	-400	-440	-480	-520	-560	-600	-640	-680	-720	-760
-2	-800	-840	-880	-920	-960	-1000	-1040	-1080	-1120	-1160
-3	-1200	-1240	-1280	-1320	-1360	-1400	-1440	-1480	-1520	-1560
-4	-1600	-1640	-1680	-1720	-1760	-1800	-1840	-1880	-1920	-1960
-5	-2000	-2040	-2080	-2120	-2160	-2200	-2240	-2280	-2320	-2360
-6	-2400	-2440	-2480	-2520	-2560	-2600	-2640	-2680	-2720	-2760
-7	-2800	-2840	-2880	-2920	-2960	-3000	-3040	-3080	-3120	-3160
-8	-3200	-3240	-3280	-3320	-3360	-3400	-3440	-3480	-3520	-3560
-9	-3600	-3640	-3680	-3720	-3760	-3800	-3840	-3880	-3920	-3960
-10	-4000	-4040	-4080	-4120	-4160	-4200	-	-	-	-

※A/D conversion range is limited between -4200 (-10.50V) and 4200 (+10.50V). When voltage input exceeds the range, it is limited to 4200 (or -4200).

II. Voltage Range:0V...10V

Conversion Diagram:



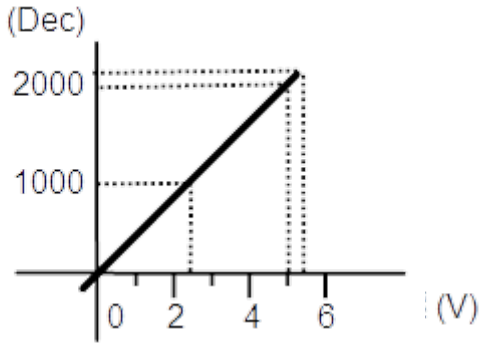
Voltage Conversion Chart:

	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
10	4000	4040	4080	4120	4160	4200	-	-	-	-
9	3600	3640	3680	3720	3760	3800	3840	3880	3920	3960
8	3200	3240	3280	3320	3360	3400	3440	3480	3520	3560
7	2800	2840	2880	2920	2960	3000	3040	3080	3120	3160
6	2400	2440	2480	2520	2560	2600	2640	2680	2720	2760
5	2000	2040	2080	2120	2160	2200	2240	2280	2320	2360
4	1600	1640	1680	1720	1760	1800	1840	1880	1920	1960
3	1200	1240	1280	1320	1360	1400	1440	1480	1520	1560
2	800	840	880	920	960	1000	1040	1080	1120	1160
1	400	440	480	520	560	600	640	680	720	760
0	0	40	80	120	160	200	240	280	320	360
0	0	-40	-80	-120	-160	-200				

※A/D conversion range is limited between -200 (-0.50V) and 4200 (+10.50V). When voltage input exceeds the range, it is limited to 4200 (or -200).

III. Voltage Range:0V...5V

Conversion Diagram:



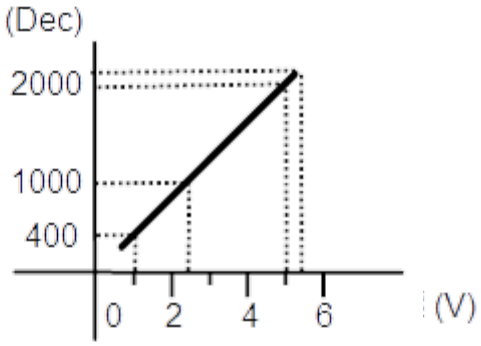
Voltage Conversion Chart:

	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	2000	2040	2080	2120	2160	2200				
4	1600	1640	1680	1720	1760	1800	1840	1880	1920	1960
3	1200	1240	1280	1320	1360	1400	1440	1480	1520	1560
2	800	840	880	920	960	1000	1040	1080	1120	1160
1	400	440	480	520	560	600	640	680	720	760
0	0	40	80	120	160	200	240	280	320	360
0	0	-40	-80	-120	-160	-200				

※A/D conversion range is limited between -200 (-0.50V) and 2200 (+5.50V). When voltage input exceeds the range, it is limited to 2200 (or -200).

IV. Voltage Range:1V...5V

Conversion Diagram:



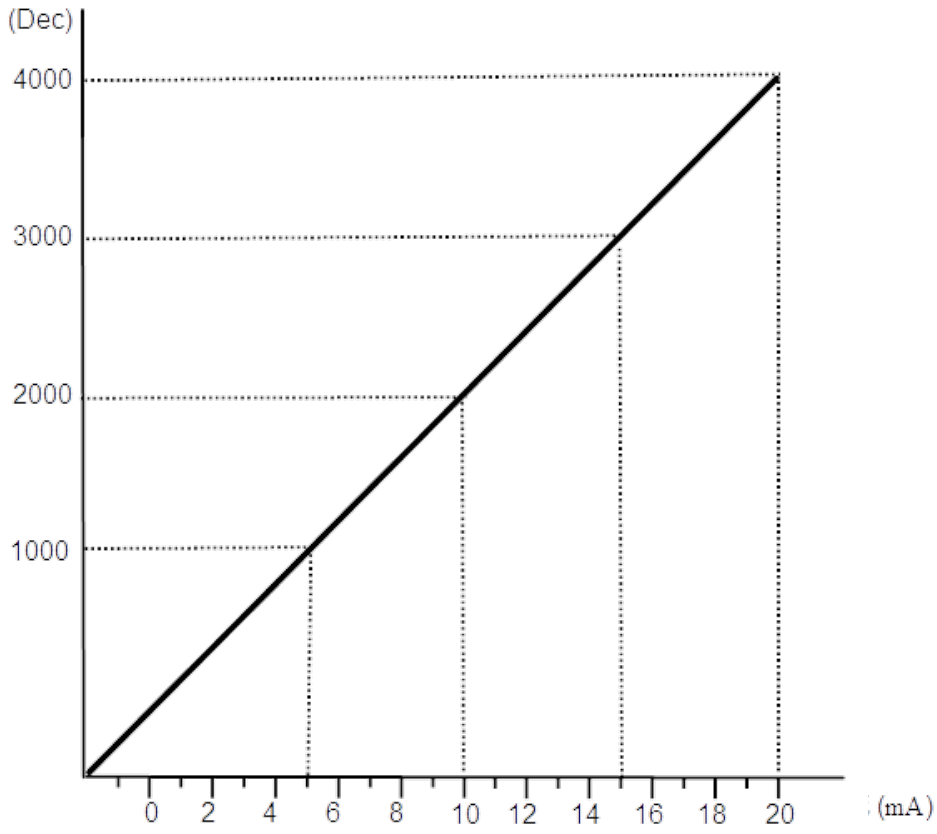
Voltage Conversion Chart:

	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	2000	2040	2080	2120	2160	2200				
4	1600	1640	1680	1720	1760	1800	1840	1880	1920	1960
3	1200	1240	1280	1320	1360	1400	1440	1480	1520	1560
2	800	840	880	920	960	1000	1040	1080	1120	1160
1	400	440	480	520	560	600	640	680	720	760
0						200	240	280	320	360

※A/D conversion range is limited between 200 (0.50V) and 2200 (+5.50V). When voltage input exceeds the range, it is limited to 2200 (or 200).

V. Current Range: 0...20mA

Conversion Diagram:



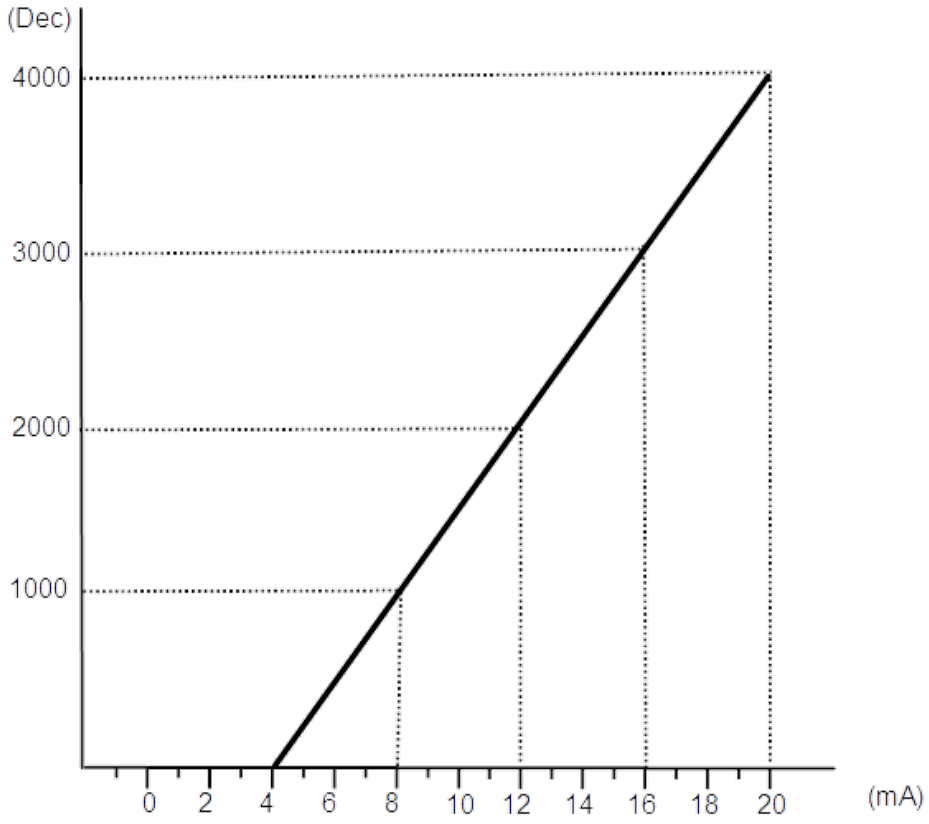
Current Conversion Chart:

	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
20	4000	4020	4040	4060	4080	4100	4120	4140	4160	4180
19	3800	3820	3840	3860	3880	3900	3920	3940	3960	3980
18	3600	3620	3640	3660	3680	3700	3720	3740	3760	3780
17	3400	3420	3440	3460	3480	3500	3520	3540	3560	3580
16	3200	3220	3240	3260	3280	3300	3320	3340	3360	3380
15	3000	3020	3040	3060	3080	3100	3120	3140	3160	3180
14	2800	2820	2840	2860	3880	2900	2920	2940	2960	2980
13	2600	2620	2640	2660	2680	2700	2720	2740	2760	2780
12	2400	2420	2440	2460	2480	2500	2520	2540	2560	2580
11	2200	2220	2240	2260	2280	2300	2320	2340	2360	2380
10	2000	2020	2040	2060	2080	2100	2120	2140	2160	2180
9	1800	1820	1840	1860	1880	1900	1920	1940	1960	1980
8	1600	1620	1640	1660	1680	1700	1720	1740	1760	1780
7	1400	1420	1440	1460	1480	1500	1520	1540	1560	1580
6	1200	1220	1240	1260	1280	1300	1320	1340	1360	1380
5	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180
4	800	820	840	860	880	900	920	940	960	980
3	600	620	640	660	680	700	720	740	760	780
2	400	420	440	460	480	500	520	540	560	580
1	200	220	240	260	280	300	320	340	360	380
0	0	20	40	60	80	100	120	140	160	180
0	0	-20	-40	-60	-80	-100	-120	-140	-160	-180

※A/D conversion range is limited between -200 (-1.0mA) and 4200 (+21.0mA). When current input exceeds the range, it is limited to 4200 (or -200).

VI. Current Range: 4...20mA

Conversion Diagram:



Current Conversion Chart:

	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
20	4000	4025	4025	4075	4100	4125	4150	4175	4200	-
19	3750	3775	3800	3825	3850	3875	3900	3925	3950	3975
18	3500	3525	3550	3575	3600	3625	3650	3675	3700	3725
17	3250	3275	3300	3325	3350	3375	3400	3425	3450	3475
16	3000	3025	3050	3075	3100	3125	3150	3175	3200	3225
15	2750	2775	2800	2825	2850	2875	2900	2925	2950	2975
14	2500	2525	2550	2575	2600	2625	2650	2675	2700	2725
13	2250	2275	2300	2325	2350	2375	2400	2425	2450	2475
12	2000	2025	2050	2075	2100	2125	2150	2175	2200	2225
11	1750	1775	1800	1825	1850	1875	1900	1925	1950	1975
10	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725
9	1250	1275	1300	1325	1350	1375	1400	1425	1450	1475
8	1000	1025	1050	1075	1100	1125	1150	1175	1200	1225
7	750	775	800	825	850	875	900	925	950	975
6	500	525	550	575	600	625	650	675	700	725
5	250	275	300	325	350	375	400	425	450	475
4	0	25	50	75	100	125	150	175	200	225
3	-	-	-200	-175	-150	-125	-100	-75	-50	-25

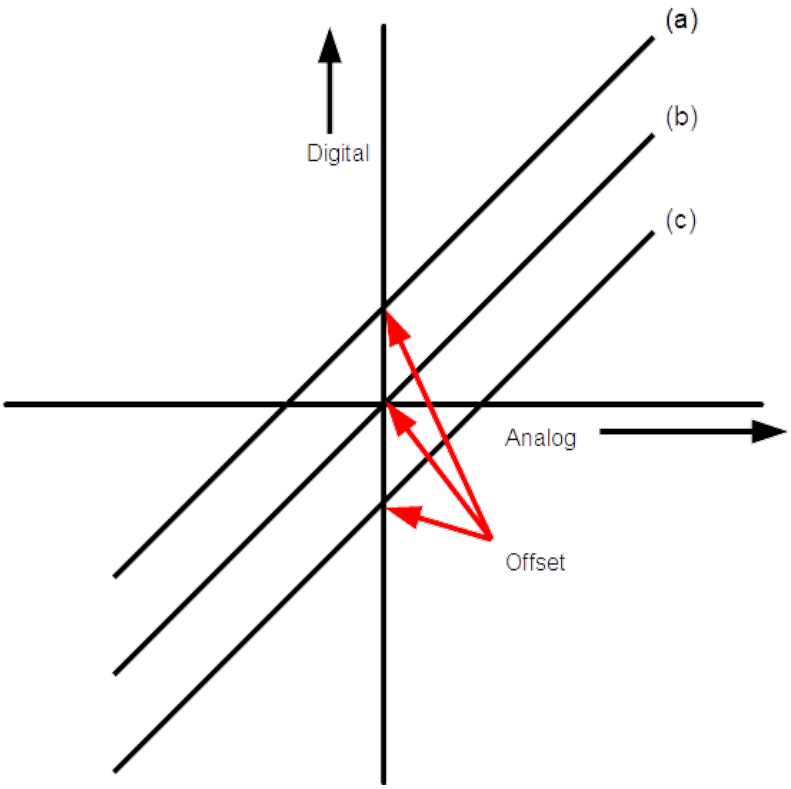
※A/D conversion range is limited between -200 (3.2mA) and 4200 (+20.8mA). When current input exceeds the range, it is limited to 4200 (or -200).

7.3 Function Settings

I. OFFSET Setting

OFFSET should be adjusted when an external device has 0 output while the reading is not zero.

Example: If the external equipment output 0V to the module and the reading is -50 (DEC), then the OFFSET should be set at 50.



(a): Offset is set at -100 when the reading is 100

(b): 0

(c): Offset is set at 100 when the reading is -100

II. Upper/Lower Limit Setting

Example: With voltage between -10V and 10V, upper limit of 3000 (DEC) and lower limit of 500 (DEC):

Input:

With input of 10V of voltage, the upper limit is 3000 (DEC).

With input of 5V of voltage, the upper limit is 2375 (DEC).

With input of 0V of voltage, the upper limit is 1750 (DEC).

With input of -5V of voltage, the upper limit is 1125 (DEC).

With input of -10V of voltage, the upper limit is 500 (DEC).

Output:

With 3000 (DEC), the AO module has an output of 10V.

With 2375 (DEC), the AO module has an output of 5V.

With 1750 (DEC), the AO module has an output of 0V.

With 1125 (DEC), the AO module has an output of -5V.

With 500 (DEC), the AO module has an output of -10V.

※When using upper/lower limits, upper/lower limits must have been established for all four channels

7.4 Modbus function code 0x03 Demonstration

I. Use Modbus RTU/ASCII to read single-chip analog input module registers

Modbus function code	Code sent example (ID:0x01)	Code replied example (ID:0x01)
0x03	01 03 A0 00 00 01	01 03 02 00 00

※In this example, the reading is from Channel 1 with module ID of "01"

※When not using control modules for communications, the registers will be assigned between 0xA000 and 0xA001

II. Use Modbus RTU/ASCII to read single-chip analog input module upper/lower limit registers

Modbus function code	Code sent example (ID:0x01)	Code replied example (ID:0x01)
0x03	01 03 A0 02 00 01	01 03 02 00 00

※In this example, the reading is from Channel 1 with module ID of "01"

※When not using control modules for communications, upper/lower registers will be assigned between 0xA0002 and 0xA003

III. Use Modbus RTU/ASCII with control modules to read single-chip analog input module registers

Modbus function code	Code sent example (ID:0x01)	Code replied example (ID:0x01)
0x03	01 01 03 10 00 00	01 03 02 00 00

※In this example, the reading is from Channel 1 with module ID of "01"

※When using control modules for communications, the registers will be assigned between 0x1000 and 0x1001

7.5 Modbus function code 0x10 Demonstration

IV. Use Modbus RTU/ASCII to write in single-chip analog output module registers

Modbus function code	Code sent example (ID:0x01)	Code replied example (ID:0x01)
0x10	01 10 B0 00 00 01 02 0F A0	01 10 B0 00 00 01

※In this example, we are writing in Channel 3 with module ID of "01"

※When not using control modules for communications, the registers will be assigned between 0xB000 and 0xB001

V. Use Modbus RTU/ASCII to write in single-chip analog output module upper/lower limit registers

Modbus function code	Code sent example (ID:0x01)	Code replied example (ID:0x01)
0x10	01 10 B0 03 00 01 02 XX XX	01 10 B0 04 00 01

※In this example, we are writing in Channel 3 with module ID of "01"

※When not using control modules for communications, the registers will be assigned between 0xB002 and 0xB003

VI. Use Modbus RTU/ASCII with control modules to write in analog output registers

Modbus function code	Code sent example (ID:0x01)	Code replied example (ID:0x01)
0x10	01 10 20 00 00 01 02 0F A0	01 01 10 20 00 00

※In this example, we are writing in Channel 3 with module ID of "01"

※When using control modules for communications, the registers will be assigned between 0x2000 and 0x2001