

Edge Computing Computer User Manual

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1. Edge Computing Computer Module List

Product No.	Description	Remarks
GFPC-0303	Edge Computer for iO-GRID	

**Caution (ATTENTION):**

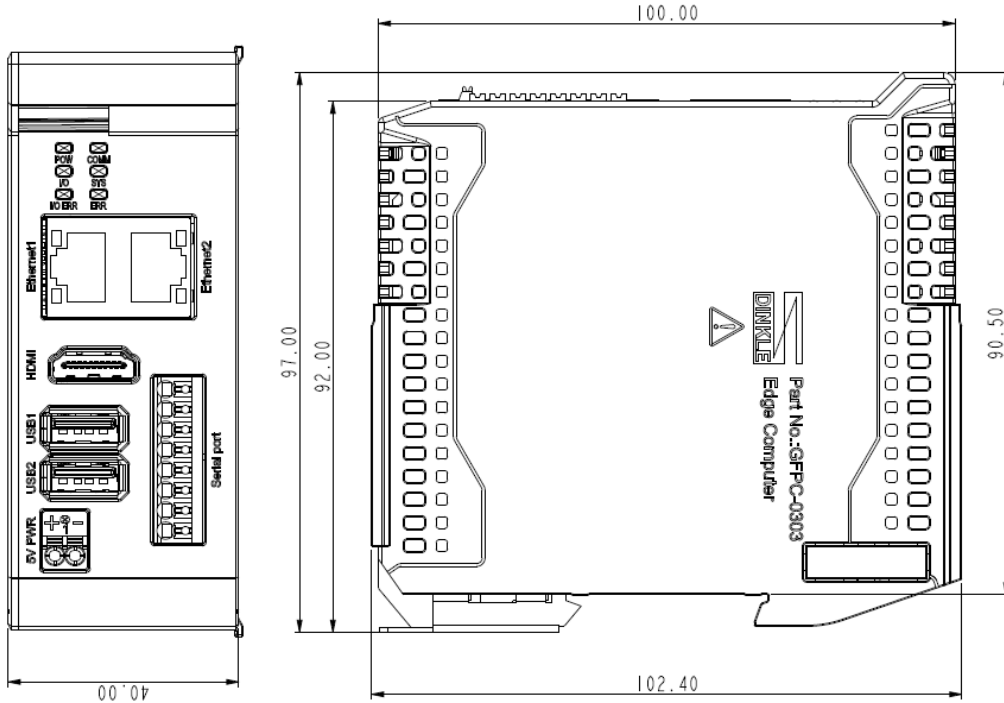
1. THIS DEVICE IS FOR INDOOR USE ONLY, DON'T PUT OR USE IT IN HIGH TEMPERATURE AND HIGH MOISTURE ENVIRONMENT.
CET EQUIPEMENT EST DESTINE A UN USAGE INTERIEUR UNIQUEMENT NE PAS STOCKER OU UTILISER DANS UN ENVIRONNEMENT A HAUTE TEMPERATURE ET HAUTE HUMIDITE.
2. AVOID FALLING AND BUMPING OTHERWISE THE ELECTRICAL 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. Edge Computing Computer Module Specification

Technical Specification	
CPU	Broadcom BCM2837B0 Cortex-A53, 64bit SoC @ 1.2GHz
Memory	32 GB eMMC Flash memory
Display	HDMI * 1
USB	USB 2.0 *2
Ethernet	100 Mbps Port *2
Indicator	LED for System status * 6
Serial	RS485/RS422/RS232 * 1
Ext. Power Supply	5 VDC
Current Draw	Max. 1A@5 VDC
General Specification	
Dimension (W*D*H)	40 x 100 x 97 mm
Weight	169 g
Ambient Temperature (operation)	0...+60°C
Storage Temperature	-20...+75°C
Permissible Humidity (noncondensing)	RH 95%
Safety Approval	CE
Wiring Range(IEC/UL)	0.2 mm ² ~ 1.5 mm ² / AWG 28 ~ 16
Wiring Ferrules	DN00510D、DN00710D

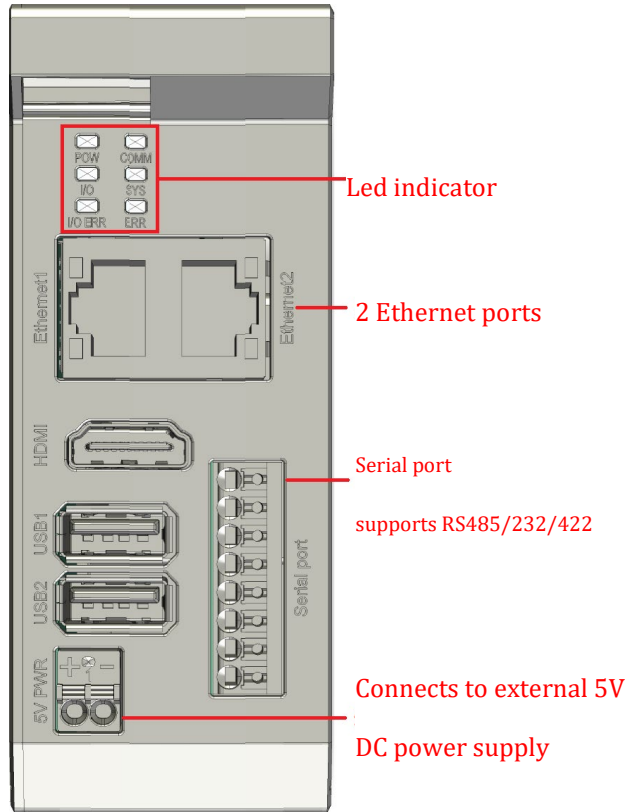
3. Edge Computing Computer Module Information

3.1 Edge Computing Computer Module Dimensions



Unit: mm

3.2 Edge Computing Computer Module Panel Information



I. LED Indicator Light

LED	Color	Status
POW	Green	On : Power on Off : Power off
I/O	Green	On: Polling the I/O modules on the fieldbus Off: Polling the I/O modules on the fieldbus stopped
I/O ERR	Red	On: I/O modules anomaly on the fieldbus Off: Status normal
COMM	Green	On: Serial Port in communication Off: Serial Port not in communication
SYS	Green	On: System running Off: System suspended
ERR	Red	On: System error Off: Status normal



II. Ethernet1/ Ethernet2 ports

Supports 10/100 Mbps transmission

III.USB1/ USB2 ports

Supports USB 2.0

IV.HDMI

Supports 1920*1080 resolution

V. 5V PWR

This port can provide 5V DC of power when not powered by the fieldbus

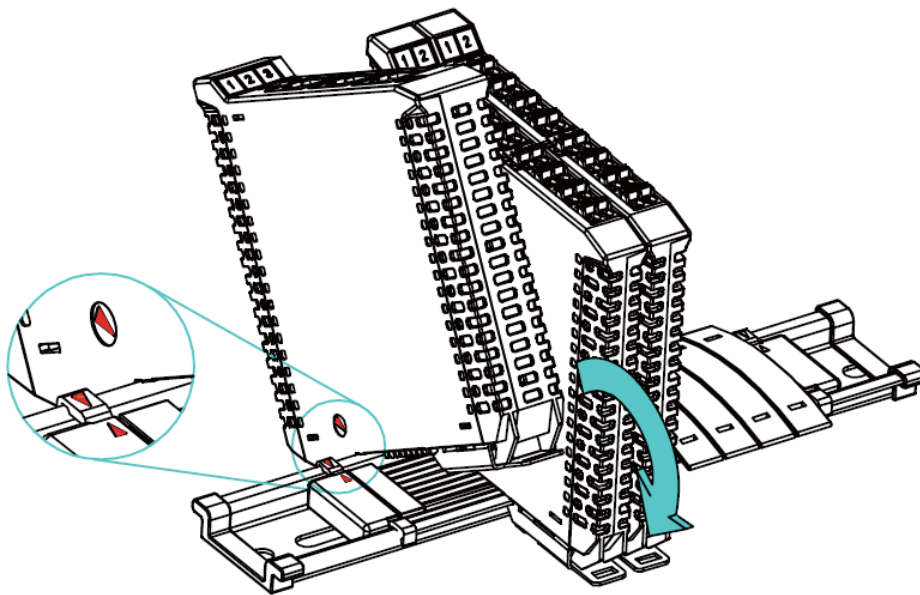
VI.Serial Port

Supports RS485/RS232/RS422 (can only 1 at a time)

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”.

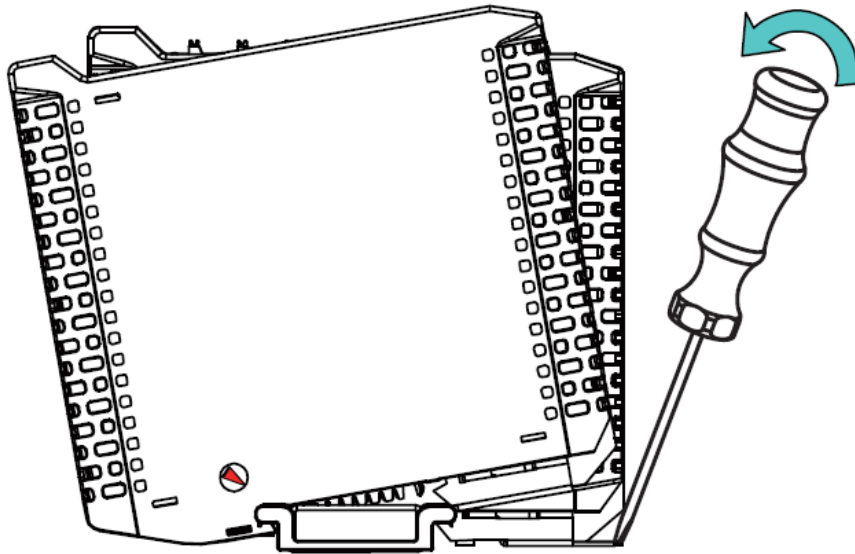


*Note: Make sure the red arrows on the module and the rail are pointing the same direction.

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.



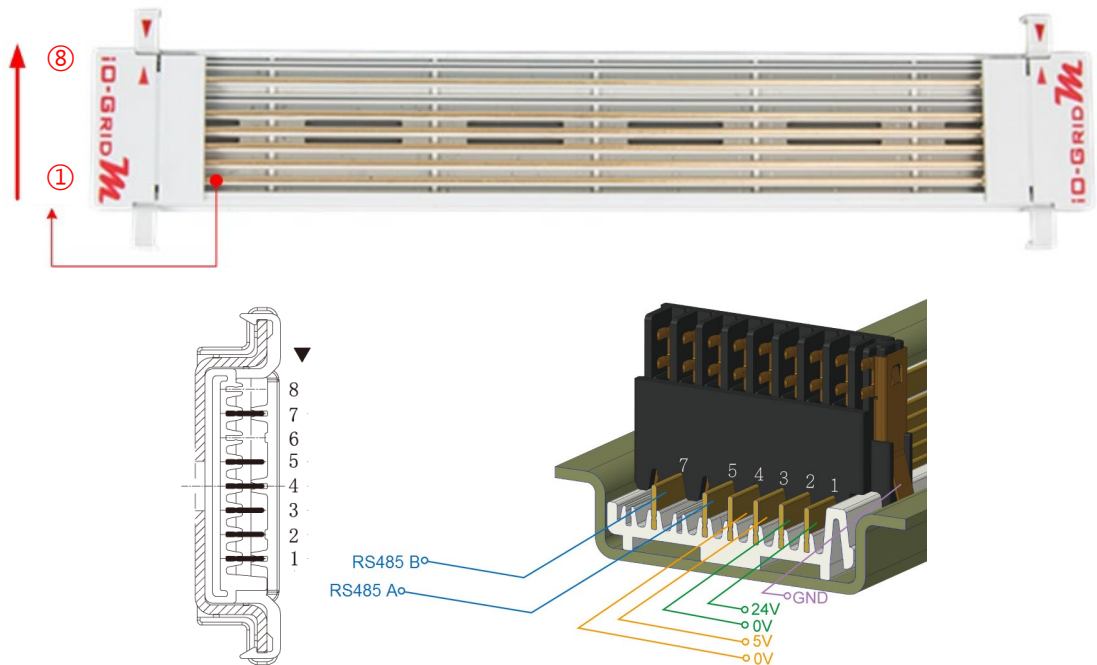
5. iO-GRID™ Series Introduction

iO-GRID™ 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.

5.2 iO-GRID™ 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

I. 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

II. 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

III. I/O Module

Dinkle 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 ($\pm 10\text{VDC}$)
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 ($\pm 10\text{VDC}$)
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)

6. iO-GRID M Module Initial Setting List

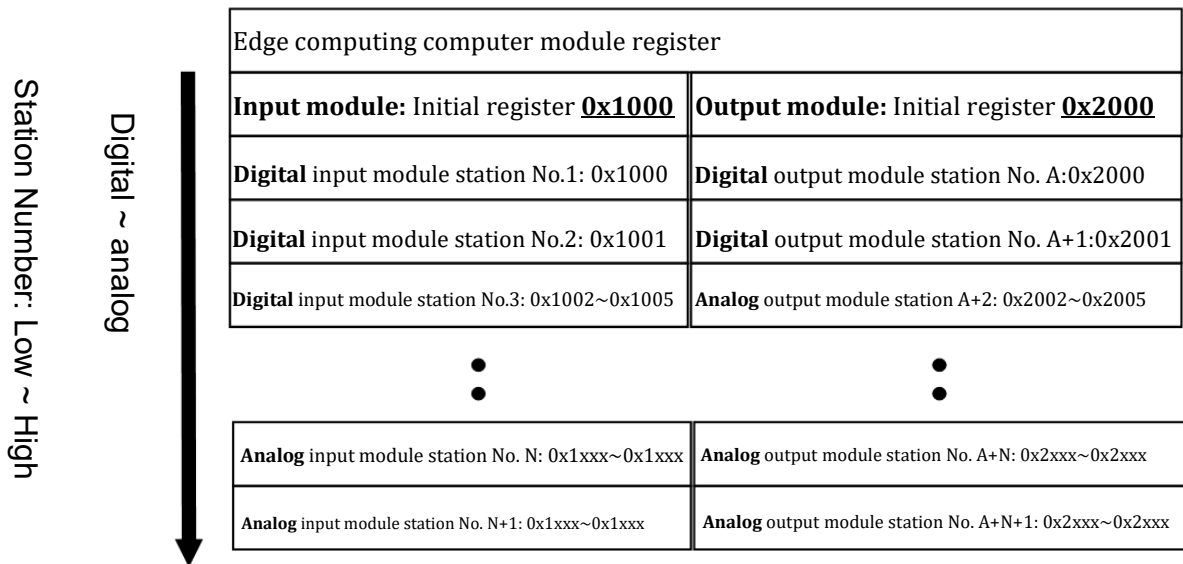
Product No.	Description	Station No.	Baud rate	Format
GFMS-RM01N	RS485 Control module Modbus RTU/ASCII 3 Ports	1	115200	RTU(8,N,1)
GFMS-RM01S	RS485 Control module Modbus RTU/ASCII 1 Port	1	115200	RTU(8,N,1)
GFDI-RM01N	16-channel digital input module (source/sink)	1	115200	RTU(8,N,1)
GFDO-RM01N	16-channel 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 (± 10 VDC)	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 (± 10 VDC)	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)

7. Edge Computing Computer Module Register Configuration

I. Register Assignment

The edge computing computer module will, based on the user's module configuration, automatically assign each module a register address based on the modules' functions, types (digital or analog), station number and data consumption. The registers are assigned based on the priority below: Digital→Analog→Station number

Register address assignment:



The address for input initial registers starts from 0x1000;

the address for output initial registers starts from 0x2000;

A single piece of 16-channel digital module will take up 1 WORD/ 2 BYTE while a single piece of 4-channel analog module will take up 4 WORD/ 8 BYTE of data.

II. Input module initial register (0x1000)

The edge computing computer module will, based on the user's module configuration, automatically assign each module an input module register based on the modules' functions, types (digital or analog), station number and data consumption.

The registers are assigned based on the priority below: **Digital→Analog→Station number**

The input initial register address for the (digital) input module with the lowest station number: 0x1000.

Example: With 2 digital input modules (station number 1 and 4) and 2 analog input modules (station number 2 and 3), the edge computing computer module will assign the following input module registers:

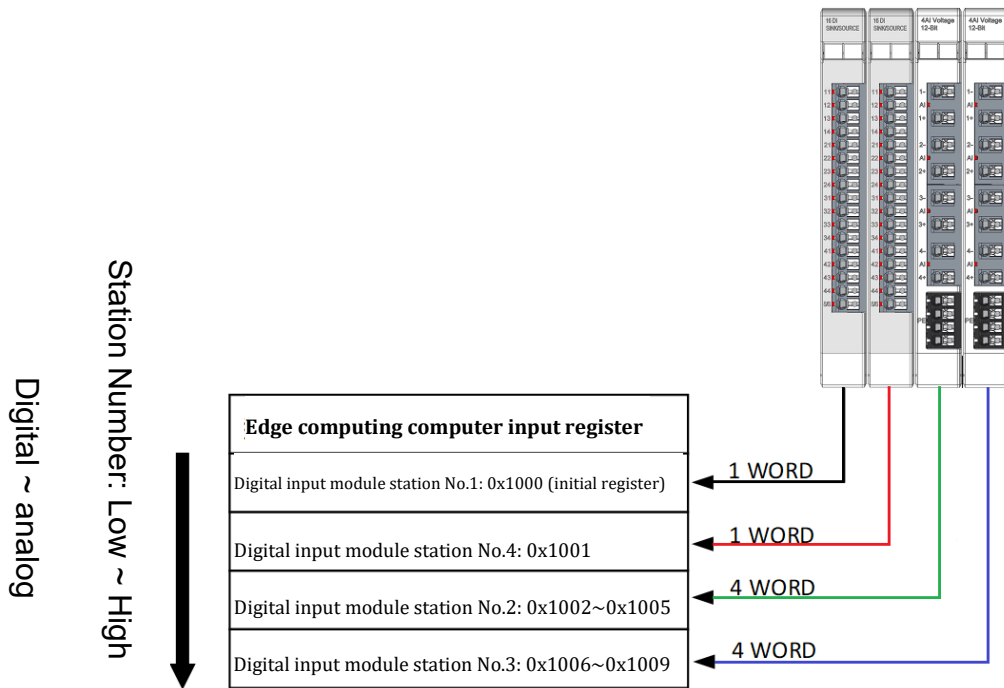
Digital input module (station No.1): 0x1000 (output initial register; takes up 1 WORD of data)

Digital input module (station No.4): 0x1001 (a range of registers assigned by the edge computing computer module, with the address of 0x1001 (1 higher than the 0x1000 of the station No.1 register address; takes up 1 WORD of data).

Analog input module (station No.2): 0x1002~ 0x1005 (a range of registers assigned by the edge computing computer module), with the address of 0x1002 (1 higher than the 0x1001 of the station No.4 register address; takes up 4 WORD of data).

Analog input module (station No.3): 0x1006~0x1009 (the edge computing computer module, based on the register assigned to station No.2 and its data consumption, assigns the address of 0x1006 (1 higher than the 0x1005 of the station No.2 register address)).

Edge Computing Computer Module Input Register Assignment:



III. Output module initial register (0x2000)

The edge computing computer module will, based on the user's module configuration, automatically assign each module an output module register based on the modules' functions, types (digital or analog), station number and data consumption.

The registers are assigned based on the priority below: **Digital→Analog→Station number**

The output initial register address for the (digital) output module with the lowest station number: 0x2000.

Example: With 2 digital output modules (station number 1 and 4) and 2 analog output modules (station number 2 and 3), the edge computing computer module will assign the following output module registers:

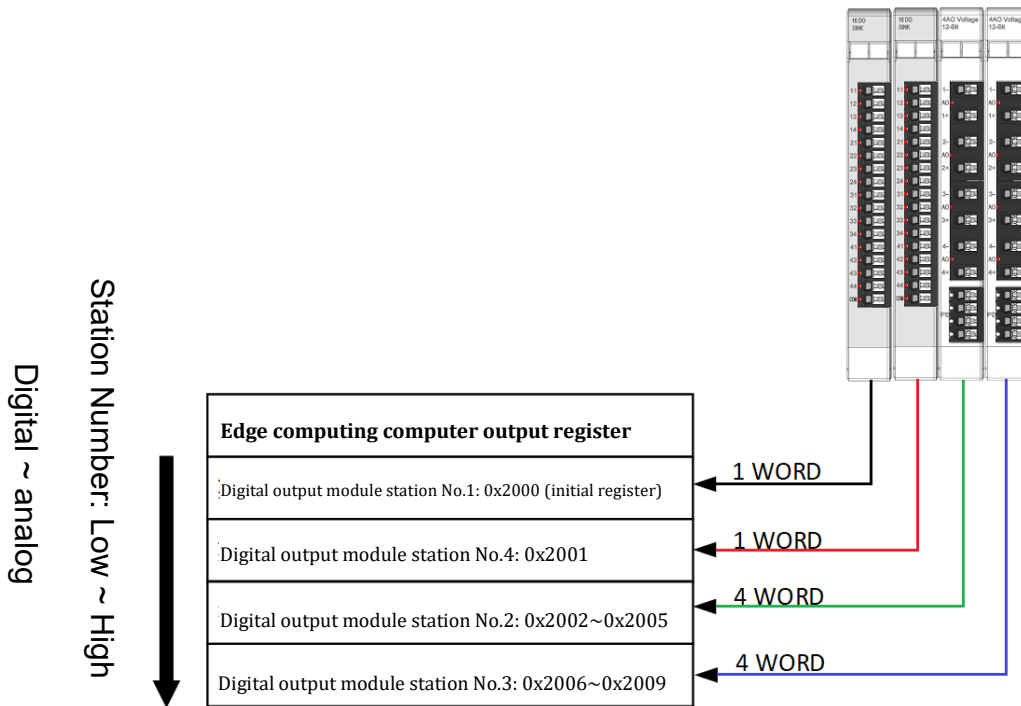
Digital output module (station No.1): 0x2000 (output initial register; takes up 1 WORD of data)

Digital output module (station No.4): 0x2001 (a range of registers assigned by the edge computing computer module, with the address of 0x2001 (1 higher than the 0x2000 of the station No.1 register address; takes up 1 WORD of data)).

Analog output module (station No.2): 0x2002~ 0x2005 (a range of registers assigned by the edge computing computer module, with the address of 0x2002 (1 higher than the 0x2001 of the station No.4 register address; takes up 4 WORD of data)).

Analog output module (station No.3): 0x2006~0x2009 (the edge computing computer module, based on the register assigned to station No.4 and its data consumption, assigns the address of 0x2006 (1 higher than the 0x2005 of the station No.2 register address)).

Edge Computing Computer Module Output Register Assignment:



7.1 Input module register 0x1000– 0x10F6 (readable)

I. Read a digital input register

GFDI-RM01N (16 bit source/sink) register format

Channel open-1; channel closed-0; reserved value-0.

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Ch44	Ch43	Ch42	Ch41	Ch34	Ch33	Ch32	Ch31
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Ch24	Ch23	Ch22	Ch21	Ch14	Ch13	Ch12	Ch11

Example:

With all channels open: 1111 1111 1111 1111 (0xFF 0xFF).

Channel 1 to 8 are open: 0000 0000 1111 1111 (0x00 0xFF).

With all channels closed: 0000 0000 0000 0000 (0x00 0x00).

II. Read an analog input register

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

Example:

Please refer to the voltage conversion chart below (with the example of 0....10V)

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	-	-	-	-

With 10V of external voltage, the reading on the register will be 4000 (0x0F 0xA0).

With 5V of external voltage, the reading on the register will be 2000 (0x07 0xD0).

With 0V of external voltage, the reading on the register will be 0000 (0x00 0x00).

※For other AD conversion charts and reference tables, please refer to **Analog Input Module User Manual**

Analog Input Module List:

Name/Product No.	Description
GFAI-RM10	4-channel analog input module (± 10 VDC)
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)

7.2 Output module register address information: 0x2000–0x20F6 (rewritable)

I. Rewrite a digital output register

GFDO-RM01N (16 bit, sink type)/ GFDO-RM02N (16 bit, source type)

register format

Channel open-1; channel closed-0; reserved value-0.

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Ch44	Ch43	Ch42	Ch41	Ch34	Ch33	Ch32	Ch31
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Ch24	Ch23	Ch22	Ch21	Ch14	Ch13	Ch12	Ch11

Example:

With all channels open: 1111 1111 1111 1111 (0xFF 0xFF).

Channel 1 to 8 are open: 0000 0000 1111 1111 (0x00 0xFF).

With all channels closed: 0000 0000 0000 0000 (0x00 0x00).

III. Rewrite an analog output register

Once an analog output module is set up with an edge computing computer module, it will automatically assign analog output modules' records registers between 0x2000 and 0x2003

Example:

Please refer to the voltage conversion chart below (with the example of 0....10V)

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	-	-	-	-

With the output voltage maintained at 10V, the reading to be written into the register will be 4000 (0x0F 0xA0).

With the output voltage maintained at 5V, the reading to be written into the register will be 2000 (0x07 0xD0).

With the output voltage maintained at 0V, the reading to be written into the register will be 0 (0x00 0x00).

※For other DA conversion charts and reference tables, please refer to [Analog Output Module User Manual](#)

Analog Output Module List:

Name/Product No.	Description
GFAO-RM10	4-channel analog output module (± 10 VDC)
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)