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DVP04AD-S
DVP04AD-S2

Instruction Sheet
安　裝　說　明
安　装　说　明

Analog Input Module

類比輸入模組

模拟输入模块

DVP-0010130-01
20210224

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Warning ..... ENGLISH

EN ✍ DVP04AD-S/DVP04AD-S2 is an OPEN-TYPE device. It should be installed in a control cabinet free of airborne dust, humidity, electric shock and vibration. To prevent non-maintenance staff from operating DVP04AD-S/DVP04AD-S2, or to prevent an accident from damaging DVP04AD-S/DVP04AD-S2, the control cabinet in which DVP04AD-S/DVP04AD-S2 is installed should be equipped with a safeguard. For example, the control cabinet in which DVP04AD-S/DVP04AD-S2 is installed can be unlocked with a special tool or key.

EN ✍ DO NOT connect AC power to any of I/O terminals, otherwise serious damage may occur. Please check all wiring again before DVP04AD-S/DVP04AD-S2 is powered up. After DVP04AD-S/DVP04AD-S2 is disconnected, Do NOT touch any terminals in a minute. Make sure that the ground terminal ⏚ on DVP04AD-S/DVP04AD-S2 is correctly grounded in order to prevent electromagnetic interference.

FR ✍ DVP04AD-S/DVP04AD-S2 est un module OUVERT. Il doit être installé que dans une enceinte protectrice (boitier, armoire, etc.) saine, dépourvue de poussière, d'humidité, de vibrations et hors d'atteinte des chocs électriques. La protection doit éviter que les personnes non habilitées à la maintenance puissent accéder à l'appareil (par exemple, une clé ou un outil doivent être nécessaire pour ouvrir a protection).

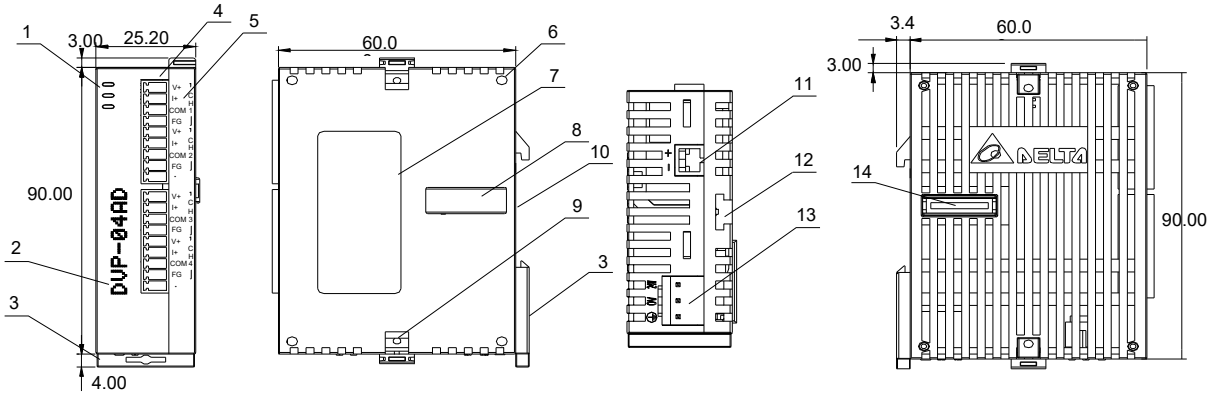
FR ✍ Ne pas appliquer la tension secteur sur les bornes d'entrées/Sorties, ou l'appareil DVP04AD-S/DVP04AD-S2 pourra être endommagé. Merci de vérifier encore une fois le câblage avant la mise sous tension du DVP04AD-S/DVP04AD-S2. Lors de la déconnection de l'appareil, ne pas toucher les connecteurs dans la minute suivante. Vérifier que la terre est bien reliée au connecteur de terre ⏚ afin d'éviter toute interférence électromagnétique.

❶ Introduction

■ Model Explanation & Peripherals

- Thank you for choosing the Delta DVP series PLC. The analog input module DVP04AD-S/DVP04AD-S2 receives external 4-point analog signal input (voltage or current) and converts it into 14-bit digital signals. A DVP series slim type PLC can read data from DVP04AD-S/DVP04AD-S2 or write data to DVP04AD-S/DVP04AD-S2 by means of the instruction FROM/TO. There are 49 CRs (control registers) in the module, and each register has 16 bits.
- Users can select input from voltage or current via wiring. Voltage input range is ±10VDC (resolution is 1.25mV). Current input range is ±20mA (resolution is 5μA).

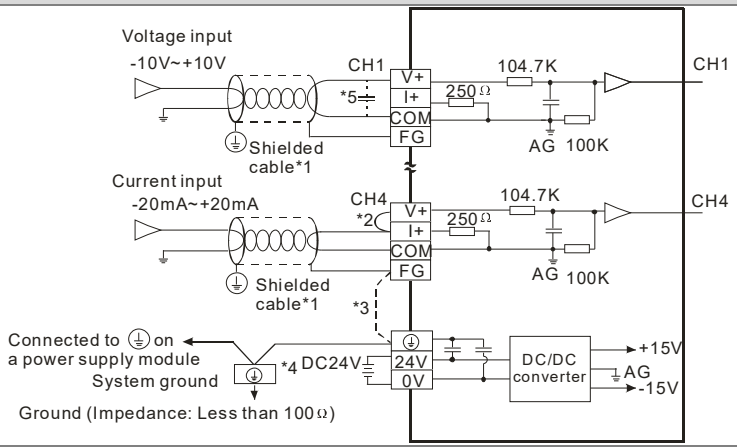
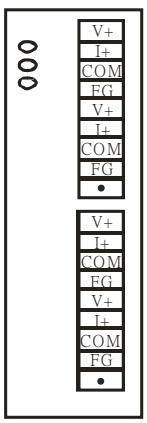
■ Product Profile & Outline



Unit: mm Figure 1

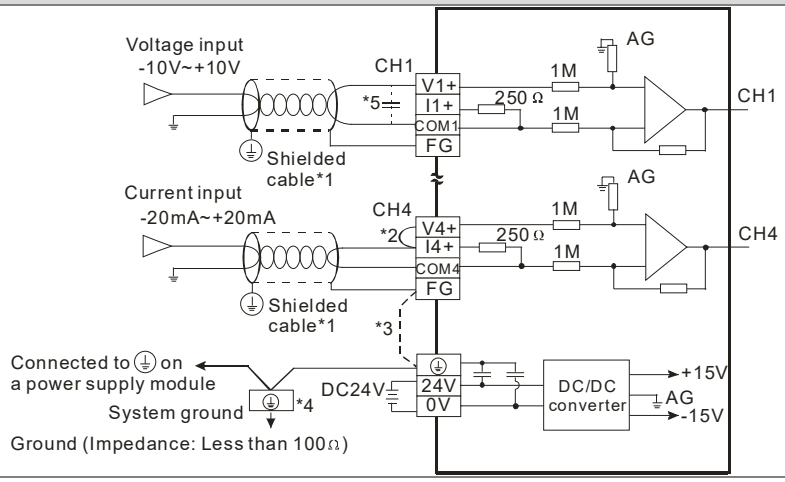
1. POWER, RUN and ERROR indicators	8. Extension port
2. Model name	9. Extension unit clip
3. DIN rail clip	10. DIN rail groove (35mm)
4. I/O terminals	11. RS-485 communication port
5. I/O point indicators	12. Mounting groove of the extension unit
6. Mounting hole of the expansion unit	13. DC power input
7. Nameplate	14. Extension port

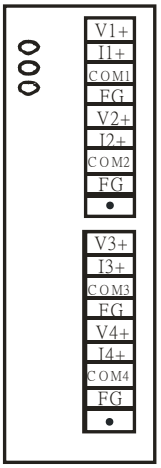
■ External Wiring

DVP04AD-S	Arrangement of the terminals
	

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DVP04AD-S2	Arrangement of the terminals





Note 1: Please isolate the analog input cable from other power cables.
Note 2: If current is connected, the connection between V+ and I+ (the connection between V4+ and I4+) needs to be a short circuit.
Note 3: If there is much noise, please connect the terminal FG to the ground terminal.
Note 4: Please connect ⏚ on a power supply module and ⏚ on the analog input module to the system ground, and then ground the system ground or connect the system ground to a distribution box.
Note 5: If ripple voltage results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.
※ *Use cables with the same length (less than 200 m) and wire resistance of less than 100 ohm.*
Warning: DO NOT wire to the empty terminal ●.

❷ Specifications

■ Functions

Analog/Digital (4A/D) module	Voltage input	Current input
Power supply voltage	24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%)	
Analog input channel	4 channel/each module	
Analog input range	±10V	±20mA
Digital conversion range	±8,000	±4,000
Resolution	14 bits (1_{LSB}=1.25mV)	13 bits (1_{LSB}=5μA)
Overall accuracy	±0.5% of full scale of 25°C (77°F). ±1% of full scale during 0 ~ 55°C (32 ~ 131°F)	
Input impedance (DVP04AD-S)	200KΩ	250Ω
Input impedance (DVP04AD-S2)	≧1MΩ	250Ω
Response time	3ms × Number of channels	
Isolation method	The analog circuit is isolated from the digital circuit by an optocoupler, but the analog channels are not isolated from one other.	
Absolute input range	±15V	±32mA
Digital data format	16-bit 2's complement	
Average function	Yes (CR#2 ~ CR#5 can be set and setting range is K1 ~ K20)	
Self diagnose function	Upper and lower bound detection/channels	
Communication mode (RS-485)	Supported, including ASCII/RTU mode. Default communication format: 9600, 7, E, 1, ASCII; refer to CR#32 for details on the communication format. Note1: RS-485 cannot be used when connected to CPU series PLCs. Note2: Refer to Slim Type Special Module Communications in the appendix E of the DVP programming manual for more details on RS-485 communication setups.	
Connecting to a DVP series PLC	If DVP04AD-S/DVP04AD-S2 modules are connected to a PLC, the modules are numbered from 0 – 7. 0 is the closest and 7 is the furthest to the PLC. 8 modules is the max and they do not occupy any digital I/O points of the PLC.	

■ Others

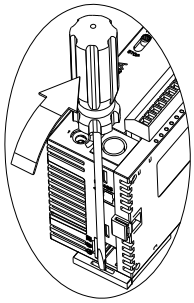
Power specification	
Max. rated consuming power	24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%), 2W, supply from external power.
Environment condition	
Operation/storage	1. Operation: 0°C ~ 55°C (temperature), 5 ~ 95% (humidity), pollution degree 2 2. Storage: -25°C ~ 70°C (temperature), 5 ~ 95% (humidity)
Vibration/shock immunity	Standard: IEC61131-2, IEC68-2-6 (TEST Fc)/IEC61131-2 & IEC68-2-27 (TEST Ea)

❸ Installation and Wiring

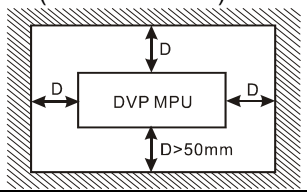
■ Mounting Arrangements and Wiring Notes

DIN Rail Installation

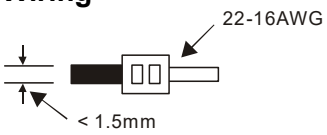
The DVP-PLC can be secured to a cabinet by using the DIN rail that is 35mm high with a depth of 7.5mm. When mounting the PLC on the DIN rail, be sure to use the end bracket to stop any side-to-side motion of the PLC, thus to reduce the chance of the wires being pulled loose. On the bottom of the PLC is a small retaining clip. To secure the PLC to the DIN rail, place it onto the rail and gently push up on the clip. To remove it, pull down on the retaining clip and gently pull the PLC away from the DIN rail. Please see the figure on the right.



For heat dissipation. Make sure to provide a minimum clearance of 50mm between the unit and all sides of the cabinet. (shown as below)



Wiring



1. Use 22-16AWG (1.5mm) single or multiple core wire on I/O wiring terminals. The specification of the terminal is shown in the figure on the left hand side. The PLC terminal screws shall be tightened to 1.95kg-cm (1.7 in-lbs).
2. DO NOT place the I/O signal wires and power supply wire in the same wiring duct.
3. Use 60/75°C copper wires only.

❹ CR (Control Register)

CR#	RS-485 parameter address	Latched		Register name	b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
					Reserved / CH4 / CH3 / CH2 / CH1
#0	H'4000	○	R	Model type	For system use Data length: 8 bits (b7 ~ b0) Model code of DVP04AD-S: H'88 Model code of DVP04AD-S2: H'90 Users can read the model type by means of a program to check if the expansion module exists.
#1	H'4001	○	R/W	Input mode setting	Input mode setting: The factory setting is H'0000. Mode 0: Voltage input mode (-10V ~ +10V) Mode 1: Voltage input mode (-6V ~ +10V) Mode 2: Current input mode (-12mA ~ +20mA) Mode 3: Current input mode (-20mA ~ +20mA) Mode 7: Disabling a channel (Only applicable to DVP04AD-S2)
CR#1: CR#1 is used to set 4 internal channels working mode of analog input module. Every channel has four modes to set that can be set individually. For example: if set CH1 to mode 0 (b2 ~ b0 = 000), CH2 to mode 1 (b5 ~ b3 = 001), CH3: mode 2 (b8 ~ b6 = 010), CH4: mode 3 (b11 ~ b9 = 011). Then CR#1 is set to H'0688 and the upper bit (b12 ~ b15) will reserved. The factory setting of CR#1 is H'0000.					
#2	H'4002	○	R/W	CH1 average times	Average times setting of channel CH1 ~ CH2. Setting range is K1 ~ K20 and factory setting is K10.
#3	H'4003	○	R/W	CH2 average times	
#4	H'4004	○	R/W	CH3 average times	Average times setting of channel CH3 ~ CH4. Setting range is K1 ~ K20 and factory setting is K10.
#5	H'4005	○	R/W	CH4 average times	
#6	H'4006	╳	R	Average value of the CH1 input signal	Display average value of CH1 ~ CH4 input signal. The default value in CR#2/CR#3/CR#4/CR#5 is 10, that is, the average value of the CH1/CH2/CH3/CH4 input signal is calculated every 10 times.
#7	H'4007	╳	R	Average value of the CH2 input signal	
#8	H'4008	╳	R	Average value of the CH3 input signal	
#9	H'4009	╳	R	Average value of the CH4 input signal	
#12	H'400C	╳	R	present value of CH1 input signal	Display present value of CH1 ~ CH4 input signal.
#13	H'400D	╳	R	present value of CH2 input signal	
#14	H'400E	╳	R	present value of CH3 input signal	
#15	H'400F	╳	R	present value of CH4 input signal	
#18	H'4012	○	R/W	To adjust OFFSET value of CH1	Offset setting of CH1 ~ CH4. Factory setting is K0 and unit is LSB. Voltage input: setting range is K-4,000 ~ K4,000. Current input: setting range is K-4,000 ~ K4,000.
#19	H'4013	○	R/W	To adjust OFFSET value of CH2	
#20	H'4014	○	R/W	To adjust OFFSET value of CH3	
#21	H' 4015	○	R/W	To adjust OFFSET value of CH4	
#24	H'4018	○	R/W	To adjust GAIN value of CH1	GAIN setting of CH1 ~ CH4. Factory setting is K4,000 and unit is LSB. Voltage input: setting range is K-3,200 ~ K16,000. Current input: setting range is K-3,200 ~ K10,400.
#25	H'4019	○	R/W	To adjust GAIN value of CH2	
#26	H'401A	○	R/W	To adjust GAIN value of CH3	
#27	H'401B	○	R/W	To adjust GAIN value of CH4	
CR#18~CR#27: Please be noticed that GAIN value – OFFSET value=+800 LSB ~ +12,000LSB (voltage) or +800 LSB ~ +6,400 LSB (current). If the value difference comes up small (within range), the output signal resolution is then slim and the variation is definitely larger. On the contrast, if the value difference exceeds the range, the output signal resolution becomes larger and the variation is definitely smaller.					
#30	H'401E	╳	R	Error status	It is the data register to save all error status. Please refer to error code chart for detail.

CR#30: Error status value (see the table below)

Error description	Value	b15 ~ b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Abnormal power	K1 (H'1)	Reserved	0	0	0	0	0	0	0	0	0	0	0	1
Mode error	K4 (H'4)		0	0	0	0	0	0	0	0	0	1	0	0
Offset/gain error	K8 (H'8)		0	0	0	0	0	0	0	0	1	0	0	0
Abnormal digital value	K32 (H'20)		0	0	0	0	0	0	1	0	0	0	0	0
Incorrect number of values averaged	K64 (H'40)		0	0	0	0	0	1	0	0	0	0	0	0
Instruction error	K128 (H'80)		0	0	0	0	1	0	0	0	0	0	0	0
The input received by CH1 is out of the range.	K256 (H'100)		0	0	0	1	0	0	0	0	0	0	0	0
The input received by CH2 is out of the range.	K512 (H'200)		0	0	1	0	0	0	0	0	0	0	0	0
The input received by CH3 is out of the range.	K1024 (H'400)		0	1	0	0	0	0	0	0	0	0	0	0
The input received by CH4 is out of the range.	K2048 (H'800)		1	0	0	0	0	0	0	0	0	0	0	0

Note: Each error code corresponds to a bit (b0 ~ b11). Two or more errors may happen at the same time. 0 means there is an error, and 1 means there is an error.

#31	H'401F	○	R/W	Communication address setting	Setting RS-485 communication address. Setting range is 01 ~ 254 and factory setting is K1.
#32	H'4020	○	R/W	Communication format setting	It is used to set communication format. For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps. Communication format: For DVP04AD-S: ASCII：7,E,1 / 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1 RTU ：8,E,1 / 8,O,1 / 8,N,1 For DVP04AD-S2 ASCII：7,E,1 / 7,O,1 / 7,N,1 / 8,E,1 / 8,O,1 / 8,N,1 / 7,E,2 / 7,O,2 / 7,N,2 / 8,E,2 / 8,O,2 / 8,N,2 RTU ：8,E,1 / 8,O,1 / 8,N,1 / 8,E,2 / 8,O,2 / 8,N,2 Factory default : ASCII,9600,7,E,1 (CR#32=H'0002) Refer to ※CR#32 communication format settings at the end of this table for more information.
#33	H'4021	○	R/W	Reset to factory setting and set characteristics adjustable priority	Factory setting is H'0000. Give CH1 setting for example: 1. When b0=0, user can set OFFSET and GAIN value of CH1 (CR#18, CR#24). When b0=1, inhibit user to adjust OFFSET and GAIN value of CH1 (CR#18, CR#24). 2. The value of b1 determines whether a characteristic register is latched while using RS485 to read-write control registers. b1=0 (latched), b1=1 (not latched). 3. When b2 is set to 1, all settings will be reset to factory setting.
CR#33 is used to set the internal function priority. For example: characteristic register. Output latched function will save output setting in the internal memory before power loss.					
#34	H'4022	○	R	Firmware version	In hexadecimal to display software version. For example: H'010A means 1.0A.
#35 ~ #48				System used	

Symbols:
○means latched. (Only valid when written in via RS-485 communication)
╳ means not latched. R means can read data by using FROM instruction or RS-485.
W means can write data by using TO instruction or RS-485.
LSB (Least Significant Bit): 1. Voltage input: 1_{LSB}=10V/8,000=2.5mV. 2. Current input: 1_{LSB}=20mA/4,000=5μA.

※ Added the RESET function for 04AD-S modules with firmware V4.12 or later and 04AD-S2 with firmware V4.16 or later. Connect the module power input to 24 VDC and write H'4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

※ The corresponding parameters address H'4000 ~ H'4022 of CR#0 ~ CR#34 are provided for users to read/ write data via RS-485 communication.

※ Function codes: 03'H is for reading data from registers. 06'H is for writing a word data into registers. 10'H is for writing multiple word data into registers.

※ If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example transferring the address "H'4000" of CR#0 in hexadecimal format to decimal format, to have the result 16384 and then adding one to it, you have 16385, the Modbus address in decimal format.

※ DVP04AD-S CR#32 communication format settings: for modules with firmware V4.10 or previous versions, b11~b8 data format

selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H'00XX) and for RTU mode, the format is fixed to 8, E, 1 (H'C0xx/H'80xx). For modules with firmware V4.11 or later, refer to the following table for setups. Note that the original code H'C0XX/H'80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.11 or later.

b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU, exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	reserved	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
	-	H'5	8.O,1	H'20	115200 bps

Note *1: This is only available for ASCII format.

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

※ DVP04AD-S2 CR#32 communication format settings: for modules with firmware V4.14 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H'00XX) and for RTU mode, the format is fixed to 8, E, 1 (H'C0xx/H'80xx). For modules with firmware V4.15 or later, refer to the following table for setups. Note that the original code H'C0XX/H'80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.15 or later.

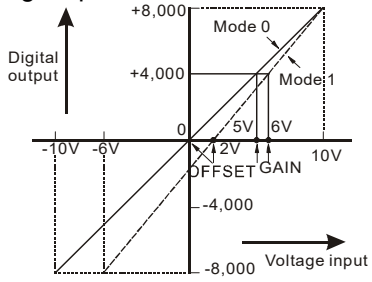
b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	7,N,1*1	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps
		H'6	7,E,2*1		
		H'7	8,E,2		
		H'8	7,N,2*1		
		H'9	8,N,2		
		H'A	7,O,2*1		
		H'B	8.O,2		

Note *1: This is only available for ASCII format.

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

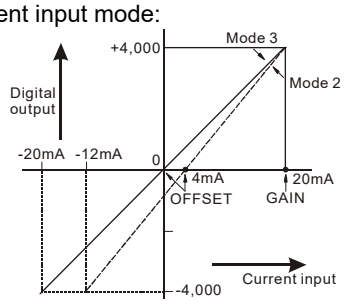
❺ Adjusting A/D Conversion Characteristic Curves

Voltage input mode:



Mode 0 of CR#1:	GAIN=5V (4,000$_{LSB}$), OFFSET=0V (0$_{LSB}$).
Mode 1 of CR#1:	GAIN=6V (4,800$_{LSB}$), OFFSET=2V (1,600$_{LSB}$).
GAIN:	Voltage input value when digital output is 4,000 Setting range is -3,200$_{LSB}$ ~ +16,000$_{LSB}$.
OFFSET:	Voltage input value when digital output is 0 Setting range: -4,000$_{LSB}$ ~ +4,000$_{LSB}$.
GAIN－OFFSET:	Setting range is +800$_{LSB}$ ~ +12,000$_{LSB}$.

Current input mode:



Mode 2 of CR#1:	GAIN=20mA (4,000$_{LSB}$), OFFSET=4mA (800$_{LSB}$).
Mode 3 of CR#1:	GAIN=20mA (4,000$_{LSB}$), OFFSET=0mA (0$_{LSB}$).
GAIN:	Current input value when digital output is +4,000. Setting range is -3,200$_{LSB}$ ~ +10,400$_{LSB}$.
OFFSET:	Current input value when digital output value is 0. Setting range is -4,000$_{LSB}$ ~ +4,000$_{LSB}$.
GAIN－OFFSET:	Setting range is +800$_{LSB}$ ~ +6,400$_{LSB}$.

The chart above is to adjust A/D conversion characteristic curve of voltage input mode and current input mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#18 ~ CR#21) and GAIN values (CR#24 ~ CR#27) depend on application.