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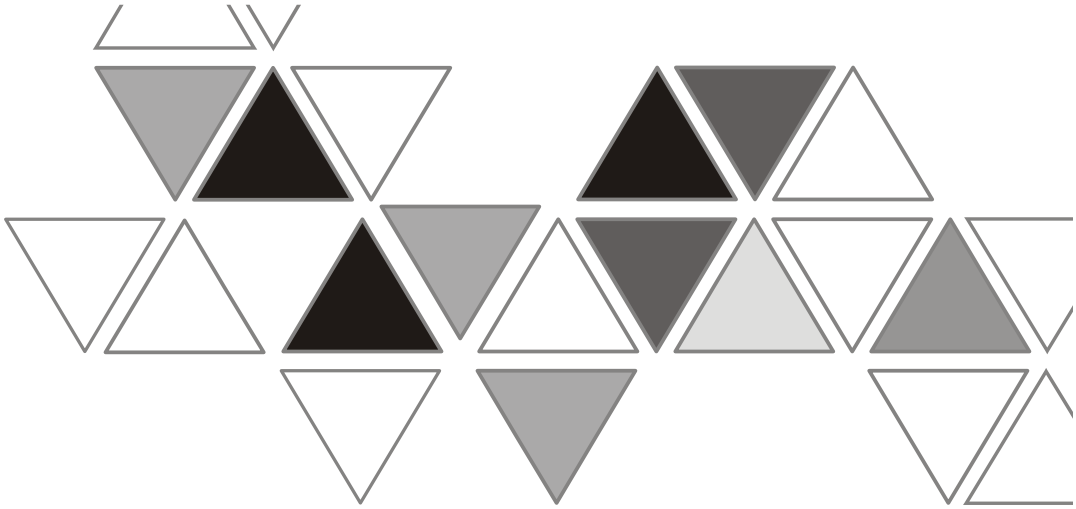
DELTA ELECTRONICS, INC.



DVP04AD-E2

INSTRUCTION SHEET

安 裝 說 明
安 装 说 明

▲ ***Analog Input Module***

▲ 類比輸入模組

▲ 模拟量输入模块

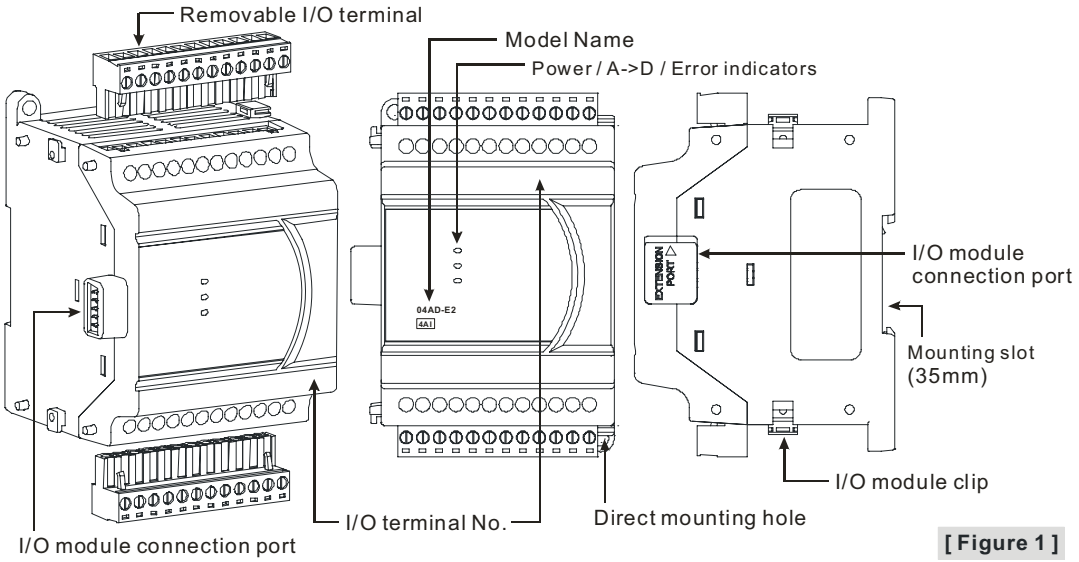
http://www.delta.com.tw/industrialautomation

DVP-1130130-01

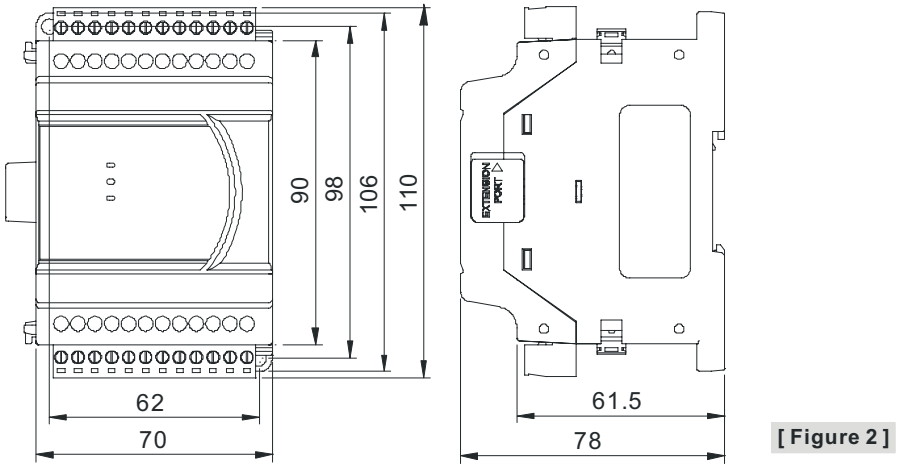
Thank you for choosing Delta's DVP series PLC. DVP04AD-E2 analog input module receives external 4 points of analog input signals (voltage or current) and converts them into 16-bit digital signals. You can select voltage input or current input by the wiring. In addition, you can access the data in the module by applying FROM/TO instructions or read the average value of channels directly by using MOV instruction (Please refer to allocation of special registers D9900 ~ D9999).

- This instruction sheet provides only information on the electrical specification, general functions, installation and wiring. For detailed program design and applicable instructions, please refer to "DVP-ES2 Operation Manual: Modules". For details of the optional peripheral, please refer to the instruction sheet enclosed in the package.
- This is an OPEN TYPE I/O module and therefore should be installed in an enclosure free of airborne dust, humidity, electric shock and vibration. The enclosure should prevent non-maintenance staff from operating the device (e.g. key or specific tools are required for operating the enclosure) in case danger and damage on the device may occur.
- DO NOT connect the input AC power supply to any of the I/O terminals; otherwise serious damage may occur. Check all the wiring again before switching on the power. Make sure the ground terminal ⏚ is correctly grounded in order to prevent electromagnetic interference.

■ Product Profile & Dimension



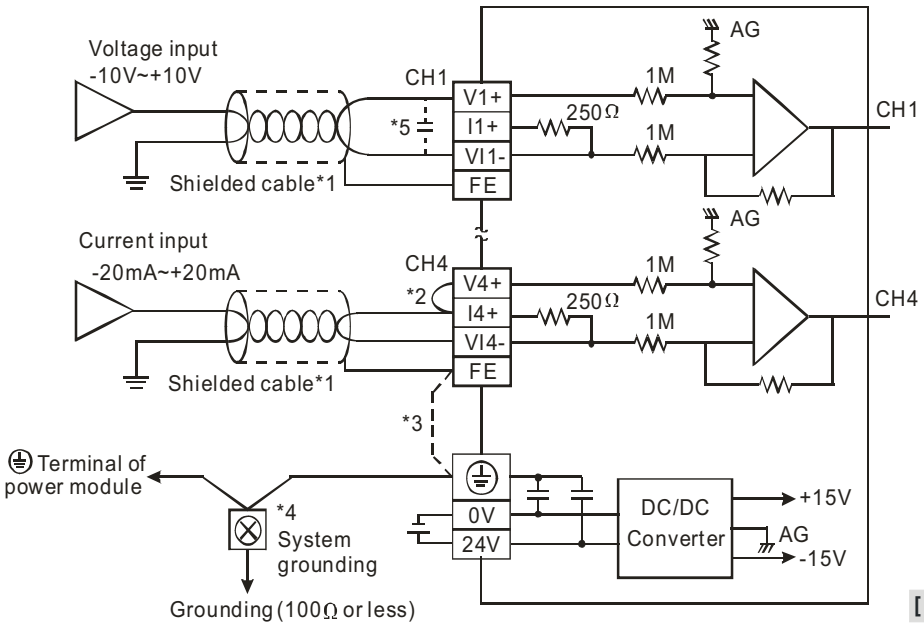
[Figure 1]



[Figure 2]

Unit: mm

■ External Wiring



[Figure 3]

Note 1: When performing analog input, please isolate other power wirings.

Note 2: When the A/D module is connected to current signals, make sure you short-circuit "V+" and "I+" terminals.

Note 3: If the noise is too significant, please connect FE to the grounding terminal.

Note 4: Please connect the ⏚ terminal on both the power module and A/D module to the system earth point and ground the system contact or connect it to the cover of power distribution cabinet.

Note 5: If the ripples at the loaded input terminal are too significant that causes noise interference on the wiring, connect the wiring to 0.1 ~ 0.47μF 25V capacitor.

■ I/O Terminal Layout

V1+	I1+	VI1-	FE	V2+	I2+	VI2-	FE	V3+	I3+	VI3-	FE

DVP04AD-E2 (4AI)

24V	0V	⏚	FE	V4+	I4+	VI4-	FE

■ Electrical Specifications

Analog / Digital module (04A/D)	
Power supply voltage	24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%)
Max. rated power consumption	1W, supplied by external power source
Connector	European standard removable terminal block (Pin pitch: 5mm)
Operation/storage temperature	Operation: 0°C~55°C (temperature), 50~95% (humidity), Pollution degree2 Storage: -25°C~70°C (temperature), 5~95% (humidity)
Vibration/shock immunity	International standards: IEC61131-2, IEC 68-2-6 (TEST Fc)/ IEC61131-2 & IEC 68-2-27 (TEST Ea)
Series connection to DVP-PLC MPU	The modules are numbered from 0 to 7 automatically by their distance from MPU. Max. 8 modules are allowed to connect to MPU and will not occupy any digital I/O points.

■ Functions Specifications

Analog / Digital module	Voltage input		Current input		
Analog input channel	4 channels / each module				
Range of analog input	±10V	±5V	±20mA	0 ~ 20mA	4 ~ 20mA

Analog / Digital module	Voltage input		Current input		
Range of digital conversion	±32,000	±32,000	±32,000	0 ~ 32,000	0 ~ 32,000
Max./Min. range of digital data	±32,384	±32,384	±32,384	-384~+32,384	-384~+32,384
Hardware Resolution	14 bits	14 bits	14 bits	13 bits	13 bits
Input impedance	≧1MΩ		250Ω		
Range of absolute input	±15V		±32mA		
Overall accuracy	±0.5% when in full scale (25°C, 77°F) ±1% when in full scale within the range of 0 ~ 55°C (32 ~ 131°F)				
Response time	400 μs / each channel				
Digital data format	2's complement of 16 bits				
Average function	Supported. Available for setting up sampling range in CR#8 ~ CR#11. Range: K1 ~ K100.				
Self-diagnosis	Upper and lower bound detection in all channels				
Isolation method	Optical coupler isolation between digital circuits and analog circuits. No isolation among analog channels. 500VDC between digital circuits and Ground 500VDC between analog circuits and Ground 500VDC between analog circuits and digital circuits 500VDC between 24VDC and Ground				

■ Control Register

CR#	Attrib.		Register name	Explanation
#0	O	R	Model name	Set up by the system: DVP04AD-E2 model code = H'0080
#1	O	R	Firmware version	Display the current firmware version in hex.
#2	O	R/W	CH1 input mode setting	Input mode: Default = H'0000. Take CH1 for example: Mode 0 (H'0000): Voltage input (±10V) Mode 1 (H'0001): Voltage input (±5V) Mode 2 (H'0002): Voltage input (0 ~ +10V) Mode 3 (H'0003): Voltage input (0 ~ +5V) Mode 4 (H'0004): Current input (±20mA) Mode 5 (H'0005): Current input (0 ~ +20mA) Mode 6 (H'0006): Current input (+4~ +20mA) Mode -1 (H'FFFF): Channel 1 unavailable
#3	O	R/W	CH2 input mode setting	
#4	O	R/W	CH3 input mode setting	
#5	O	R/W	CH4 input mode setting	
#8	O	R/W	CH1 sampling range	Set sampling range in CH1 ~ CH4: Range = K1 ~ K100 Default = K10
#9	O	R/W	CH2 sampling range	
#10	O	R/W	CH3 sampling range	
#11	O	R/W	CH4 sampling range	
#12	X	R	CH1 average input value	Average value of input signals at CH1 ~ CH4
#13	X	R	CH2 average input value	
#14	X	R	CH3 average input value	
#15	X	R	CH4 average input value	
#20	X	R	CH1 present input value	Present value of input signals at CH1 ~ CH4
#21	X	R	CH2 present input value	
#22	X	R	CH3 present input value	
#23	X	R	CH4 present input value	

CR#	Attrib.		Register name	Explanation
#28	O	R/W	Adjusted Offset value of CH1	Set the adjusted Offset value of CH1 ~ CH4. Default = K0 Definition of Offset in DVP04AD-E2: The corresponding voltage (current) input value when the digital output value = 0.
#29	O	R/W	Adjusted Offset value of CH2	
#30	O	R/W	Adjusted Offset value of CH3	
#31	O	R/W	Adjusted Offset value of CH4	
#34	O	R/W	Adjusted Gain value of CH1	Set the adjusted Gain value in CH1 ~ CH4. Default = K16,000 Definition of Gain in DVP04AD-E2: The corresponding voltage (current) input value when the digital output value = 16,000.
#35	O	R/W	Adjusted Gain value of CH2	
#36	O	R/W	Adjusted Gain value of CH3	
#37	O	R/W	Adjusted Gain value of CH4	
#40	O	R/W	Function: Set value changing prohibited	Prohibit set value changing in CH1 ~ CH4. Default= H'0000.
#41	X	R/W	Function: Save all the set values	Save all the set values, Default =H'0000
#42	X	R/W	Function: Return to default setting	Set all values to default setting, Default = H'0000
#43	X	R	Error status	Register for storing all error status. Refer to table of error status for more information.
#100	O	R/W	Function: Enable/Disable limit detection	Enable/Disable the upper and lower bound detection function. Default= H'0000.
#101	X	R/W	Upper and lower bound status	Display the upper and lower bound value, Default =H'0000
#102	O	R/W	Set value of CH1 upper bound	Set value of CH1~CH4 upper bound. Default = K32000.
#103	O	R/W	Set value of CH2 upper bound	
#104	O	R/W	Set value of CH3 upper bound	
#105	O	R/W	Set value of CH4 upper bound	
#108	O	R/W	Set value of CH1 lower bound	Set value of CH1~CH4 lower bound. Default = K-32000.
#109	O	R/W	Set value of CH2 lower bound	
#110	O	R/W	Set value of CH3 lower bound	
#111	O	R/W	Set value of CH4 lower bound	
Symbols: O: When CR#41 is set to H'5678, the set value of CR will be saved. X: set value will not be saved. R: able to read data by using FROM instruction. W: able to write data by using TO instruction.				

※ CR#43: Error status value. See the table below:

Description					
bit0	K1 (H'1)	Power supply error	bit6	K64 (H'40)	CH4 Conversion error
bit1	K2 (H'2)	Hardware error	bit9	K512(H'0200)	Mode setting error
bit2	K4 (H'4)	Upper/lower bound error	bit10	K1024(H'0400)	Sampling range error
bit3	K8 (H'8)	CH1 Conversion error	bit11	K2048(H'0800)	Upper / lower bound setting error
bit4	K16 (H'10)	CH2 Conversion error	bit12	K4096(H'1000)	Set value changing prohibited
bit5	K32 (H'20)	CH3 Conversion error	bit13	K8192(H'2000)	Communication breakdown on next module
Note: Each error status is determined by the corresponding bit (b0 ~ b13) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error					

■ Explanation on Special Registers D9900~D9999

When DVP-ES2 MPU is connected with modules, registers D9900~D9999 will be reserved for storing values from modules. You can apply MOV instruction to operate values in D9900~D9999.

When DVP-ES2 MPU is connected with DVP04AD-E2, the configuration of special registers is as below:

Module #0	Module #1	Module #2	Module #3	Module #4	Module #5	Module #6	Module #7	Description
D1320	D1321	D1322	D1323	D1324	D1325	D1326	D1327	Model Code
D9900	D9910	D9920	D9930	D9940	D9950	D9960	D9970	CH1 average input value
D9901	D9911	D9921	D9931	D9941	D9951	D9961	D9971	CH2 average input value
D9902	D9912	D9922	D9932	D9942	D9952	D9962	D9972	CH3 average input value
D9903	D9913	D9923	D9933	D9943	D9953	D9963	D9973	CH4 average input value

Note 1: D9900 ~ D9999 are average input values of CH1 ~ CH4 and the sampling range is K1 ~ K100. When the sampling range is set to K1, the values displayed in D9900~D9999 are current values. You can use: 1. ES_AIO Configuration Function of WPLSoft or 2. FROM/TO instructions (CR#8 ~ CR#11) to set the sampling range as K1.

■ Adjust A/D Conversion Curve

Users can adjust the conversion curves according to the actual needs by changing the Offset value (CR#28 ~ CR#31) and Gain value (CR#34 ~ CR#37).

Gain: The corresponding voltage/current input value when the digital output value = 16,000.

Offset: The corresponding voltage/current input value when the digital output value = 0.

- Equation for voltage input Mode0 / Mode2: 0.3125mV = 20V/64,000 = 10V/32,000

$$Y = 16000 \times \left(\frac{X(V)}{10(V)} \times 32000 - Offset \right) \Big/ \left(Gain - Offset \right)$$

Y=Digital output, X=Voltage input

- Equation for voltage input Mode1 / Mode3: 0.15625mV = 10V/64,000 = 5V/32,000

$$Y = 16000 \times \left(\frac{X(V)}{5(V)} \times 32000 - Offset \right) \Big/ \left(Gain - Offset \right)$$

Y=Digital output, X=Voltage input

- Equation for current input Mode4 / Mode5: 0.625μA = 40mA/64,000 = 20mA/32,000

$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - Offset \right) \Big/ \left(Gain - Offset \right)$$

Y=Digital output, X=Current input

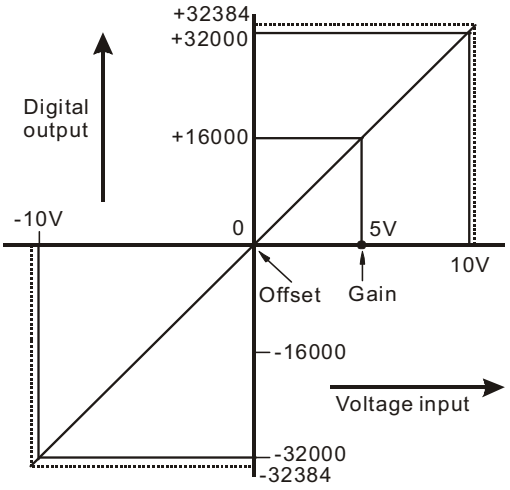
- Equation for current input Mode6: 0.5μA = 16mA/32,000

  Adopt the Equation of current input Mode4/Mode5, substitute Gain for 19200 (12mA) and Offset for 6400 (4mA)

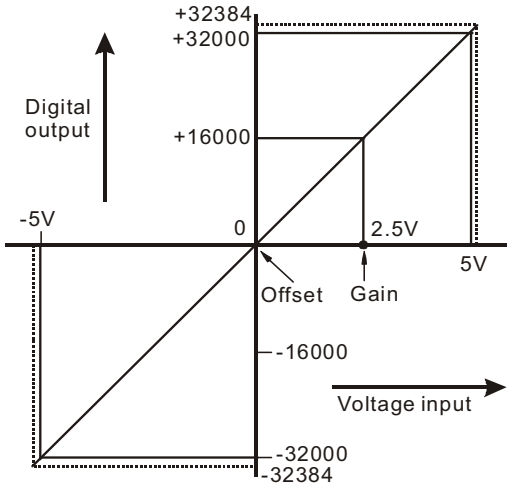
$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - 6400 \right) \Big/ \left(19200 - 6400 \right)$$

Y=Digital output, X=Current input

• Mode 0:

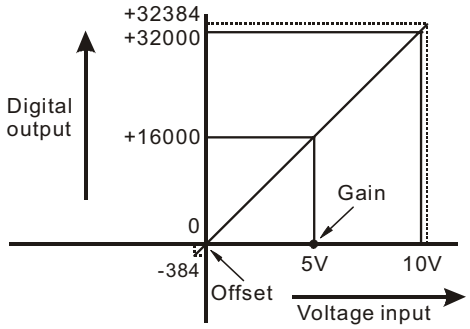


• Mode 1:

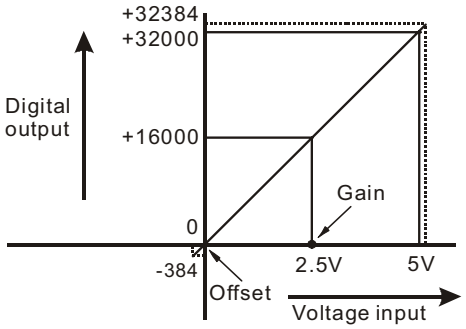


Mode 0 of CR#2 ~ CR#5	-10V ~ +10V，Gain = 5V (16,000)，Offset = 0V (0)
Mode 1 of CR#2 ~ CR#5	-5V ~ +5V，Gain = 2.5V (16,000), Offset = 0V (0)
Range of digital conversion	-32,000 ~ +32,000
Max./Min. range of digital conversion	-32,384 ~ +32,384

• Mode 2:

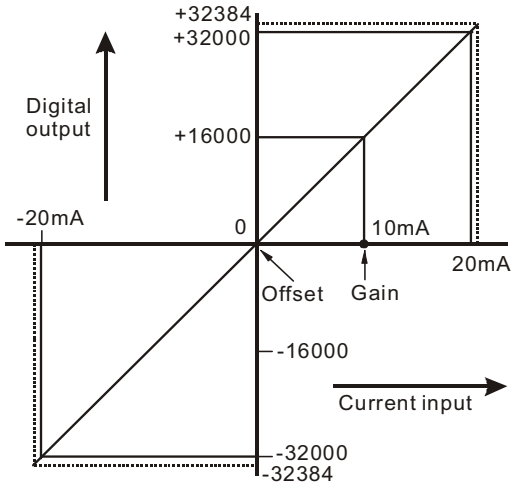


• Mode 3:



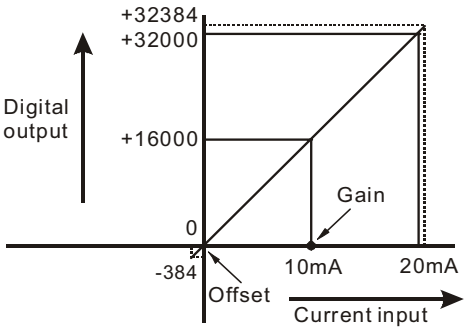
Mode 2 of CR#2 ~ CR#5	0V ~ +10V, Gain = 5V (16,000), Offset = 0V (0)
Mode 3 of CR#2 ~ CR#5	0V ~ +5V, Gain = 2.5V (16,000), Offset = 0V (0)
Range of digital conversion	0 ~ +32,000
Max./Min. range of digital conversion	-384 ~ +32,384

• Mode 4:

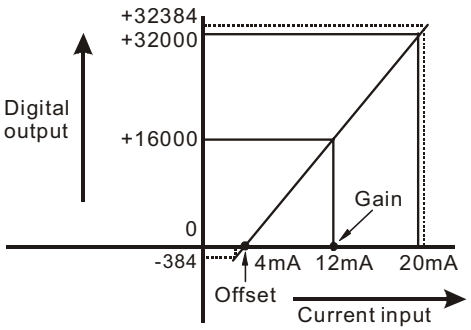


Mode 4 of CR#2 ~ CR#5	-20mA ~ +20mA, Gain = 10mA (16,000), Offset = 0mA (0)
Range of digital conversion	-32,000 ~ +32,000
Max./Min. range of digital conversion	-32,384 ~ +32,384

- Mode 5:



- Mode 6:



Mode 5 of CR#2 ~ CR#5	0mA ~ +20mA, Gain = 10mA (16,000), Offset = 0mA (0)
Mode 6 of CR#2 ~ CR#5	+4mA ~ +20mA, Gain = 12mA (19,200), Offset = 4mA (6,400)
Range of digital conversion	0 ~ +32,000
Max./Min. range of digital conversion	-384 ~ +32,384