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5011618601-06E1

http://www.delta.com.tw/products/plc.asp

DVP06XA-S

Analog Input/Output Mixed Module
Instruction Sheet

1 WARNING

⚠ Please carefully read this instruction thoroughly prior to use the DVP06XA-S.

⚠ In order to prevent electric shock, do not touch the terminals or conduct any maintenance while PLC is power on. DO NOT open the PLC. Only qualified staff or associated person is allowed to conduct the internal electrical work on PLC.

⚠ This is an OPEN-TYPE device and already certified to meet the IEC 61131-2 (UL 508) safety requirements when installed in an enclosure.

⚠ DVP06XA-S must be placed in an environment away from high temperatures, high humidity, exceessive vibration, corrosive gases, liquids, airborne dust, and metallic particles.

⚠ Do not apply AC power to any of the input/output terminals, or it may cause permanent damage to the DVP06XA-S.

⚠ Do not touch the internal circuit for at least 1 minute after the power supply is Off.

⚠ Make sure that DVP06XA-S is properly grounded ⏚, to avoid any electromagnetic noise.

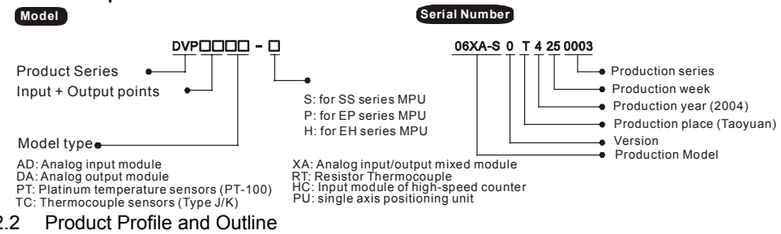
2 INTRODUCTION

2.1 Model Explanation and Peripherals

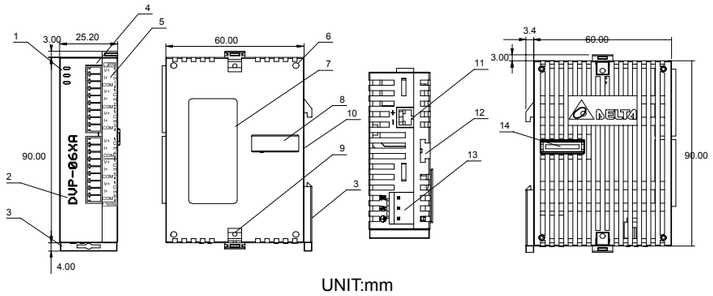
- Thank you for choosing DELTA DVP Series PLC. The DVP06XA-S allows the connection of four analog inputs and 2 groups 12 bits digital outputs (voltage/current). The PLC converts the input into a 12-bit digital signal and the output into a 2 points analog signal, which then are manipulated by using TO and FROM commands in the ladder logic program. There are 49 Controlled Registers (CR, each register has 16-bit) in each module. The DVP06XA-S series can read/write the data by using commands FROM / TO via DVP-PLC SS/SA/SX MPU program.
- Software version of DVP06XA-S analog input/output mixed module can be updated via RS-485. Power supply and main processing units are sold separately.
- Users can select input from voltage or current via wiring. Voltage input range is ±10V DC (resolution is 5 mV) and current is ±20mA (resolution is 20 μA).
- Users can select output from voltage or current via wiring. Voltage output range is 0V ~ +10V DC (resolution is 2.5 mV) and current is 0mA ~ 20mA (resolution is 5 μA).

■ Nameplate Explanation

■ Model Explanation

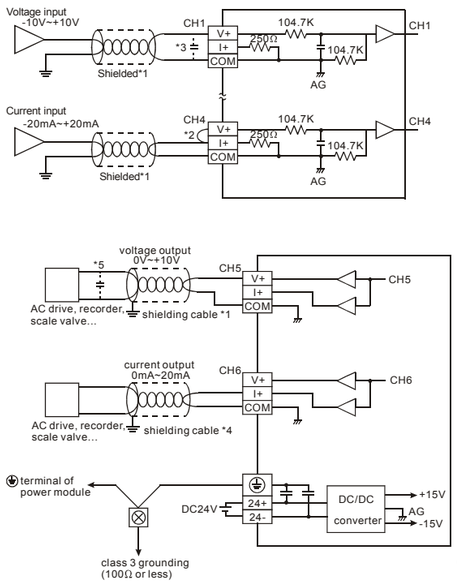


2.2 Product Profile and Outline



1. Status indicator (Power, RUN and ERROR)	8. Expansion port
2. Model	9. Expansion Clip
3. DIN rail clip	10. DIN rail location (35mm)
4. I/O terminals	11. RS-485 Communication port
5. I/O terminals layout	12. Expansion Clip
6. Expansion hole of the expansion unit	13. DC Power input
7. Specification Label	14. Expansion port

2.3 External Wiring



Note 1: Please isolate analog input and other power wiring.

Note 2: If input signal is in current, please short out between V+ and I+ terminals.

Note 3: If the noise interference from loaded input wiring terminal is significant, please connect a capacitor with 0.1~0.47μF 25V for noise filtering.

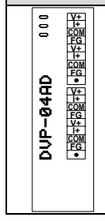
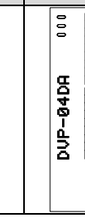
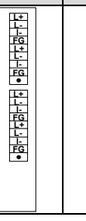
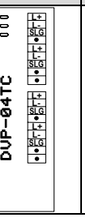
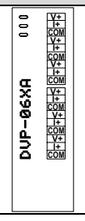
Note 4: Please isolate analog output and other power wiring.

Note 5: If the noise interference from loaded input wiring terminal is significant, please connect a capacitor with 0.1~0.47μF 25V for noise filtering.

Note 6: Please connect ⏚ power module terminal and ⏚ analog output module terminal to system earth point and make system earth point be grounded or connects to machine cover.

Warning: DO NOT wire to the No function terminal ●

2.4 Terminal of analog module layout

DVP04AD-S	DVP02DA-S	DVP04DA-S	DVP04PT-S	DVP04TC-S	DVP06XA-S	DVP08RT-S
						

3 STANDARD SPECIFICATIONS

3.1 Specifications

Mixed (06XA) Module, Analog/ Digital (A/D) Module	Voltage Input	Current Input
Power Supply Voltage	24 VDC(20.4VDC~28.8VDC) (–15%～+20%)	
Analog Input Channel	4 channels per module	
Analog Input Range	±10V	±20mA
Digital Data Range	±2000	±1000
Resolution	12 bits (1_{LSB}=5 mV)	11 bits (1_{LSB}=20 μA)
Input Impedance	200 KΩ and above	250Ω
Overall Accuracy	±0.5% of full scale of 25℃(77℉) ±1% of full scale during 0~55℃ (32~131℉)	
Response Time	3 ms × channels	
Isolation Method	There is no isolation between channels.	
Absolution Input Range	±15 V	±32 mA
Digital Data Format	2's complement of 16-bit, (13 Significant Bits)	
Average Function	Yes (CR#2~CR#5 can be set and the range is K1~K4096)	
Self diagnostic function Self Detection	Upper bound and lower bound detection per channel	
Mixed (06XA) Module, Digital/Analog (D/A) Module	Voltage Output	Current Output
Analog Signal Output Channels	2 channel per module	
Analog Output Range	0~10V	0~20 mA
Digital Data Range	0~4000	0~4000
Resolution	12 bits (1_{LSB}=2.5 mV)	12 bits (1_{LSB}=5 μA)
Output Impedance	0.5Ω or lower	
Overall Accuracy	±0.5% of full scale of 25℃(77℉) ±1% of full scale during 0~55℃ (32~131℉)	
Response Time	3 ms ×Channels	
Max. Output Current	20mA (1KΩ~2MΩ)	—
Tolerance Carried Impedance	—	0～500Ω
Digital Data Format	2's complement of 16-bit, (13 Significant Bits)	
Isolation Method	Isolation between digital and analog circuitry. There is no isolation between channels.	
Protection	Voltage output has short circuit protection but long period of short circuit may cause internal wiring damage and current output break.	

Mixed (06XA) Module, Analog/ Digital (A/D) Module	Voltage Input	Current Input
Communication Mode (RS-485)	MODBUS ASCII/RTU Mode. Communication baud rate of 4800 / 9600 / 19200 / 38400 / 57600 / 115200. For ASCII mode, date format is 7Bits, even, 1 stop bit (7 E 1). For RTU mode, date format is 8Bits, even, 1 stop bit (8 E 1). The RS-485 is disabled when the DVP06XA-S is connected in series with MPU.	
Connect to DVP-PLC MPU in Series	When DVP06XA-S modules are connected to an MPU, the modules are numbered from 0 - 7. 0 is the closest to the MPU and 7 is the furthest. The Maximum number of modules is 8 modules and they do not occupy any digital I/O points of the MPU.	

3.2 Other Specification

Maximum Power Consumption	2W at 24 VDC (20.4VDC~28.8VDC) (-15 % ~ +20 %)
Environment Condition and Wiring	Follow the DVP-PLC MPU.
Static Electricity Prevention	All places between terminals and ground comply with the spec.

4 CR(Controlled Register)

DVP06XA-S Analog Input/Output Mixed Module					Explanation
CR No	RS-485 Parameter Address	Latched		Register Name	b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
#0	H 40C8	○	R	Model type	System used, data length is 8 bits (b7~b0). DVP06XA-S model code= H CC
#1	H 40C9	○	R/W	Input mode setting	CH6 CH5 CH4 CH3 CH2 CH1 Input mode setting: (CH1~CH4) Mode 0: input voltage mode (-10V~+10V). Factory Setting is H0000. Mode 1: input voltage mode (-6V~+10V). Mode 2: input current mode (-12mA~+20mA). Mode 3: input current mode (-20mA~+20mA). Mode 4: none use. Output mode setting: (CH5~CH6) Mode 0: output voltage mode (0V~10V). Mode 1: output voltage mode (2V~10V). Mode 2: output current mode (4mA~20mA). Mode 3: output current mode (0mA~20mA).
#2	H 40CA	○	R/W	CH1 average number	The number of readings used for "average" temperature on channels CH1~CH4. Setting range is K1~K4096 and factory setting is K10.
#3	H 40CB	○	R/W	CH2 average number	
#4	H 40CC	○	R/W	CH3 average number	
#5	H 40CD	○	R/W	CH4 average number	
#6	H 40CE	×	R	average value of CH1 input signal	Display average value of CH1~CH4 input signal
#7	H 40CF	×	R	average value of CH2 input signal	
#8	H 40D0	×	R	average value of CH3 input signal	
#9	H 40D1	×	R	average value of CH4 input signal	
#10	H 40D2	×	R/W	CH5 output signal value	Output value of CH5~CH6, the setting range is K0~K4000. The factory setting is K0 and the unit is LSB.
#11	H 40D3	×	R/W	CH6 output signal value	
#12	H 40D4	×	R	present value of CH1 input signal	Display present value of CH1~CH4 input signal
#13	H 40D5	×	R	present value of CH2 input signal	
#14	H 40D6	×	R	present value of CH3 input signal	
#15	H 40D7	×	R	present value of CH4 input signal	
#16~ #17					Reserved
#18	H 40DA	○	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-1000 ~K1000 Current input: setting range is K-1000 ~K1000
#19	H 40DB	○	R/W	To adjust OFFSET value of CH2	
#20	H 40DC	○	R/W	To adjust OFFSET value of CH3	
#21	H 40DD	○	R/W	To adjust OFFSET value of CH4	
#22	H 40DE	○	R/W	To adjust OFFSET value of CH5	Offset setting of CH5~CH6. Factory setting is K0 and unit is LSB. The setting range is K-2000~K2000
#23	H 40DF	○	R/W	To adjust OFFSET value of CH6	
#24	H 40E0	○	R/W	To adjust GAIN value of CH1	GAIN setting of CH1~CH4. Factory setting is K1000 and unit is LSB. Voltage input: setting range is K-800 ~K4000 Current input: setting range is K-800 ~K2600
#25	H 40E1	○	R/W	To adjust GAIN value of CH2	
#26	H 40E2	○	R/W	To adjust GAIN value of CH3	
#27	H 40E3	○	R/W	To adjust GAIN value of CH4	
#28	H 40E4	○	R/W	To adjust GAIN value of CH5	GAIN setting of CH5~CH6. Factory setting is K2000 and unit is LSB. The setting range is K-1600~K8000
#29	H 40E5	○	R/W	To adjust GAIN value of CH6	
#30	H 40E6	×	R	Error status	Data register stores the error status, refer to fault code chart for details.
#31	H 40E7	○	R/W	Communication address setting	RS-485 communication address. Setting range is K1~K255 and factory setting is K1
#32	H 40E8	○	R/W	Communication baud rate setting	Communication baud rate (4800, 9600, 19200, 38400, 57600 and 115200 bps). For ASCII mode, date format is 7Bits, even, 1 stop bit (7 E 1). For RTU mode, date format is 8Bits, even, 1 stop bit (8 E 1). b0: 4800 bps (bit/sec) b1: 9600 bps (bit/sec). (factory setting) b2: 19200 bps (bit/sec). b3: 38400 bps (bit/sec). b4: 57600 bps (bit/sec). b5: 115200 bps (bit/sec). b6~b13: Reserved. b14: switch between low bit and high bit of CRC code (only for RTU mode) b15: RTU mode.

#33	H 40E9	○	R/W	Reset to factory setting and set characteristics adjustable priority	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
					CH6		CH5		CH4			CH3			CH2			CH1		
					Example: Setting of CH1 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. b1 means if characteristic register is latched. b1=0 (factory setting, latched), b1=1 (not latched). 3. b2: Set to 1 and PLC will be reset to factory settings. The setting of CH5~CH6, give CH5 setting for example: b13, b12: 00: can be adjusted, latched. 01: can be adjusted, non-latched. 10: inhibit adjust. 11: reset to factory settings and clear b12, b13 to 0.																
#34	H 40EA	○	R	Software version	Display software version in hexadecimal. Example: H 010A = version 1.0A.															
#35~#48				System used																

○ means latched.
× means non-latched.
R means can read data by using FROM command or RS-485.
W means can write data by using TO command or RS-485.
LSB (Least Significant Bit): 1. Voltage input: 1_{LSB}=10V/2000=5mV. 2. Current input: 1_{LSB}=20mA/1000=20μA.
3. Voltage output: 1_{LSB}=10V/4000=2.5mV. 4. Current output: 1_{LSB}=20mA/4000=5μA.

Explanation:

1. CR#0: The PLC model type.
2. CR#1: b11~b0 are used to set 4 internal channels working mode of analog input module (AD). b12~b15 are used to set 2 channels working mode of analog output module (DA). Every channel has four modes that can be set individually. For example: if setting CH1 to mode 0 (b2~b0=000), CH2 to mode 1(b5~b3=001), CH3: mode2 (b8~b6=010), CH4: mode 3(b11~b9=011), b0~b11 need be set to H688. If setting CH5: mode 2 (b13~b12=10), CH6: mode 1 (b15~b14=01), b12~b15 need be set to H5. The factory setting is H0000.
3. CR#2 ~ CR#5: Used to set the number of piece of input readings for the average temperature calculation. The available range is K1~K4096 and factory setting is K10.
4. CR#6 to CR#9: The average value of temperature in ℃. Temperature is calculated by averaging multiple temperature readings. Example: If CR#2 is 10, the temperature in CR#6 will be the average of the last 10 readings on CH1.
5. CR#10 ~ CR#11 are used to set the output value of CH5 and CH6. The setting range is K0~K4000. The factory setting is K0 and unit is LSB.
6. CR#12 ~ CR#15: used to save the present value of input signal of CH1~CH4.
7. CR#16, CR#17, CR#28, CR#29 are reserved.
8. CR #18~ CR #21: used to adjust the OFFSET value of CH1~CH4 if analog input either in voltage or in current is 0 after it converts from analog to digital. Voltage setting range: -5V~+5V(-1000_{LSB}~+1000_{LSB}). Current setting range: -20mA~+20mA (-1000_{LSB}~+1000_{LSB}).
9. CR #22~ CR #23: used to adjust the OFFSET value of CH5~CH6 if analog input either in voltage or in current is 0 after it converts to digital. Factory setting is K0, and the unit is $_{LSB}$. The setting range is -2000~+2000. Voltage setting range: -5V~+5V(-2000_{LSB}~+2000_{LSB}). Current setting range: -10mA~+10mA (-2000_{LSB}~+2000_{LSB}).
10. CR #24~ CR #27: used to adjust the GAIN value of CH1~CH4. The value of analog input either in voltage or in current after it was converted to digital based upon full scale of 4000. Voltage setting range: -4V~+20V(-800_{LSB}~+4000_{LSB}). Current setting range: -16mA~+52mA (-800_{LSB} ~+2600_{LSB}). But it needs to notice that GAIN VALUE - OFFSET VALUE = +200_{LSB}~+3000_{LSB} (voltage) or +200_{LSB}~+1600_{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.
11. CR #28~ CR #29: used to adjust the GAIN value of CH5~CH6. The value of analog input either in voltage or in current after it converts to digital based upon full scale of 2000. Voltage setting range: -4V~+20V(-1600_{LSB}~+8000_{LSB}). Current setting range: -8mA ~+40mA (-1600_{LSB}~+8000_{LSB}). Please be noticed that GAIN VALUE – OFFSET VALUE = +400_{LSB} ~+6000_{LSB} (voltage or 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.
12. CR#30 is the fault code. Please refer to the chart below.

Fault description	Content	b15~b8	B7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal (Low voltage alarm)	K1(H1)	Reserved	0	0	0	0	0	0	0	1
User setting D/A output exceeds range	K2(H2)		0	0	0	0	0	0	1	0
Setting mode error	K4(H4)		0	0	0	0	0	1	0	0
Offset/Gain error	K8(H8)		0	0	0	0	1	0	0	0
Hardware malfunction	K16(H10)		0	0	0	1	0	0	0	0
Digital range error	K32(H20)		0	0	1	0	0	0	0	0
Average times setting error	K64(H40)		0	1	0	0	0	0	0	0
Command error	K128(H80)		1	0	0	0	0	0	0	0

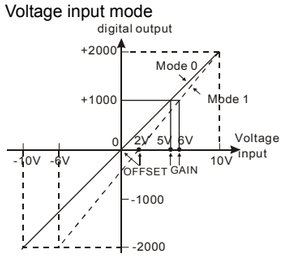
Note: Each fault code will have corresponding bit (b0~b7). Two or more faults may happen at the same time. 0 means normal and 1 means having fault.

13. CR#31: RS-485 communication address. Setting range is 01~255 and factory setting is K1.
14. CR#32: RS-485 communication baud rate: 4800, 9600, 19200, 38400, 57600 and 115200. b0:4800bps, b1:9600bps (factory setting), b2:19200bps, b3:38400 bps, b4:57600 bps, b5:115200 bps, b6~b13: Reserved, b14: switch between low bit and high bit of CRC code (RTU mode only) b15: ASCII / RTU mode. For ASCII mode, date format is 7Bits, even, 1 stop bit (7 E 1). For RTU mode, date format is 8Bits, even, 1 stop bit (8 E 1).
15. 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.
16. CR#34: software version.
17. CR#35~ CR#48: system used.
18. The corresponding parameters address H 40C8~H 40F9 of CR#0~CR#48 will allow user to read/write data via RS-485.
    A. Baud rate can be 4800, 9600, 19200, 38400, 57600, 115200bps.
    B. MODBUS communication protocol can be either in ASCII or in RTU mode. For ASCII mode, date format is 7Bits, even, 1 stop bit (7 E 1). For RTU mode, date format is 8Bits, even, 1 stop bit (8 E 1).
    C. Function code: 03H read data from register.
    06H write one WORD into register.
    10H write multiple WORD into register.

5 Adjust A/D Conversion Characteristic Curve

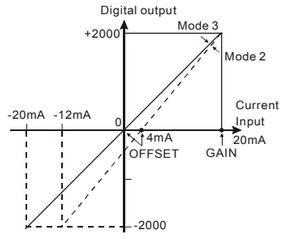
5.1 Adjust A/D Conversion Characteristic Curve of CH1~CH4

Voltage input mode



Mode 0 of CR#1: GAIN=5V(1000_{LSB}), OFFSET=0V (0_{LSB}).
Mode 1 of CR#1: GAIN=6V(1200_{LSB}), OFFSET=2V (400_{LSB}).
GAIN: Voltage input value when digital output is 4000. Setting range is -4V~+20V(-800_{LSB}~ +4000_{LSB})
OFFSET: Voltage input value when digital output is 0. Setting range: -5V~+5V(-1000_{LSB} ~ +1000_{LSB})
GAIN－OFFSET: Setting range is +1V~+15V (+200_{LSB}~ +3000_{LSB})

Current input mode:



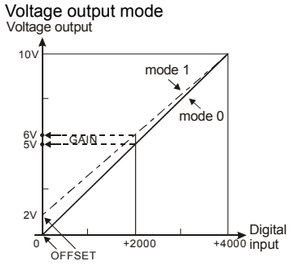
Mode 2 of CR#1: GAIN = 20mA(1000_{LSB}), OFFSET=4mA (200_{LSB}).
Mode 3 of CR#1: GAIN = 20mA(1000_{LSB}), OFFSET=0mA (0_{LSB}).
GAIN: Current input value when digital output is +4000. Setting range is -20 mA~+20mA (-1000_{LSB} ~ +1000_{LSB})
OFFSET: Current input value when digital output value is 0. Setting range is-16mA ~+52mA (-800_{LSB} ~ +2600_{LSB})
GAIN－OFFSET: Setting range is +4mA ~ +32mA (200_{LSB}~ +1600_{LSB})

Use the chart above 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.

LSB (Least Significant Bit): 1. voltage input: 1_{LSB}=10V/2000=5mV. 2. current input: 1_{LSB}=20mA/1000= 20μA.

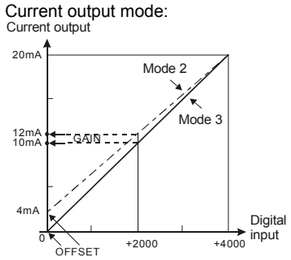
5.2 Adjust D/A Conversion Characteristic Curve of CH5~CH6

Voltage output mode



Mode 0 of CR#1: GAIN = 5V(2000_{LSB}), OFFSET=0V (0_{LSB})
Mode 1 of CR#1: GAIN = 6V(2400_{LSB}), OFFSET=2V (800_{LSB}).
GAIN: Voltage output value when digital input is K2000. Setting range is -4V~+20V(-1600_{LSB} ~+8000 $_{LSB}$).
OFFSET: Voltage output value when digital input is K0. Setting range: -5V~+5V(-2000_{LSB} ~ +2000 $_{LSB}$).
GAIN－OFFSET: Setting range is +1V~+15V(+400_{LSB} ~ +6000 $_{LSB}$)

Current output mode:



Mode 2 of CR#1: GAIN = 12mA(2400_{LSB}),OFFSET=4mA (800_{LSB}).
Mode 3 of CR#1: GAIN = 10mA(2000_{LSB}), OFFSET=0mA (0_{LSB}).
GAIN: Current output value when digital input value is K2000. Setting range is -8mA ~+40mA (-1600_{LSB} ~+8000_{LSB}).
OFFSET: Current output value when digital input is K0. Setting range is -10mA ~+10mA (-2000_{LSB} ~+2000_{LSB}).
GAIN－OFFSET: Setting range is +2mA~+30mA (+400_{LSB} ~+6000_{LSB})

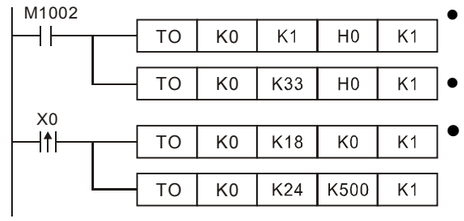
Use the chart above to adjust D/A conversion characteristic curve of voltage output mode and current output mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#14~CR#15) and GAIN values (CR#18~CR#19) depend on application.

LSB (Least Significant Bit): 1. voltage output: 1_{LSB}=10V/4000=2.5mV.

2. current output: 1_{LSB}=20mA/4000=5μA.

5.3 Program Example for Adjusting A/D Conversion Characteristics Curve

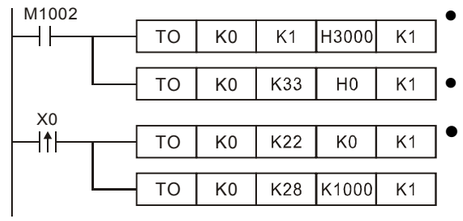
Example: setting OFFSET value of CH1 to 0V(=$K0_{LSB}$) and GAIN value of CH1 to 2.5V(=$K500_{LSB}$).



- Write H0 to CR#1 of analog input module no. 0 and set CH1 to mode 0 (voltage input -10V~+10V)
- Write H0 to CR#33 and allow to adjust characters of CH1.
- When X0 switches from Off to On, $K0_{LSB}$ of OFFSET value will be wrote in CR#18 and $K500_{LSB}$ of GAIN value will be wrote in CR#24.

5.4 Program Example for Adjusting D/A Conversion Characteristics Curve

Example: set OFFSET value of CH5 to 0V(=$K0_{LSB}$) and GAIN value of CH1 to 2.5V(=$K1000_{LSB}$).



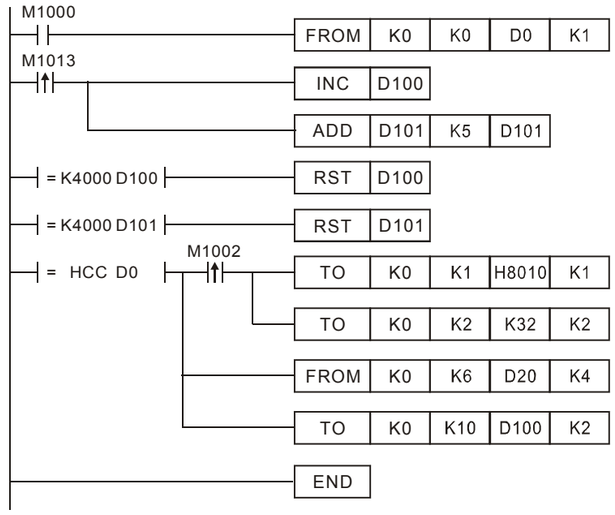
- Write H3000 into CR#1 (b12~b15) of analog input/output module#0. Setting CH5 to mode 3 (current output 0mA~ +20mA).
- Write H0 into CR#33 (b12~b15) and allow CH5, CH6 to adjust characteristics.
- When X0 switches from Off to On, $K0_{LSB}$ of OFFSET value will be wrote in CR#22 and $K1000_{LSB}$ of GAIN value $K1000_{LSB}$ will be wrote in CR#28.

6 Initial PLC Start-up

■ Lamp display:

1. Upon power-up, the ERROR LED will light for 0.5 seconds the POWER LED will light continuously.
2. No errors= POWER LED on and ERROR LED off.
   Low Voltage error (lower than 19.5V), ERROR LED will blink continuously till the power supply rises above 19.5V.
3. DVP06XA-S connected to PLC MPU in series = RUN LED on MPU will be lit and A/D LED or D/A LED should blink.
4. After receiving the first RS-485 command the A/D LED or D/A LED will blink.
5. If the input or output exceeds the upper or lower bounds, then the ERROR LED will blink.
6. When main CPU and expansion unit communicate time-out or abnormal interrupt, LED ERROR of expansion unit will keep lighting.

Example:



Explanation:

- Reading the model type of expansion module K0 (should be HCC for DVP06XA-S model type).
- If the model type is DVP06XA-S, set the input mode is (CH1, CH3, CH4)= mode 0, (CH2)= mode 2, and set the output mode is (CH5)=mode 0, (CH6)=mode 2.
- Setting the average number of CH1 and CH2 are K32.
- Reading the input signal average value of CH1~CH4 (4 data) from CR#6~CR#9 and save in D20~D23.
- In each second, D100 will increase K1 and D101 will increase K5. When the value of D100 and D101 are K4000, it will clear to 0.
- Writing the output setting value of D100 and D101 into CR#10 and CR#11. The analog output value of CH5~CH6 will change with the value of D100 and D101.