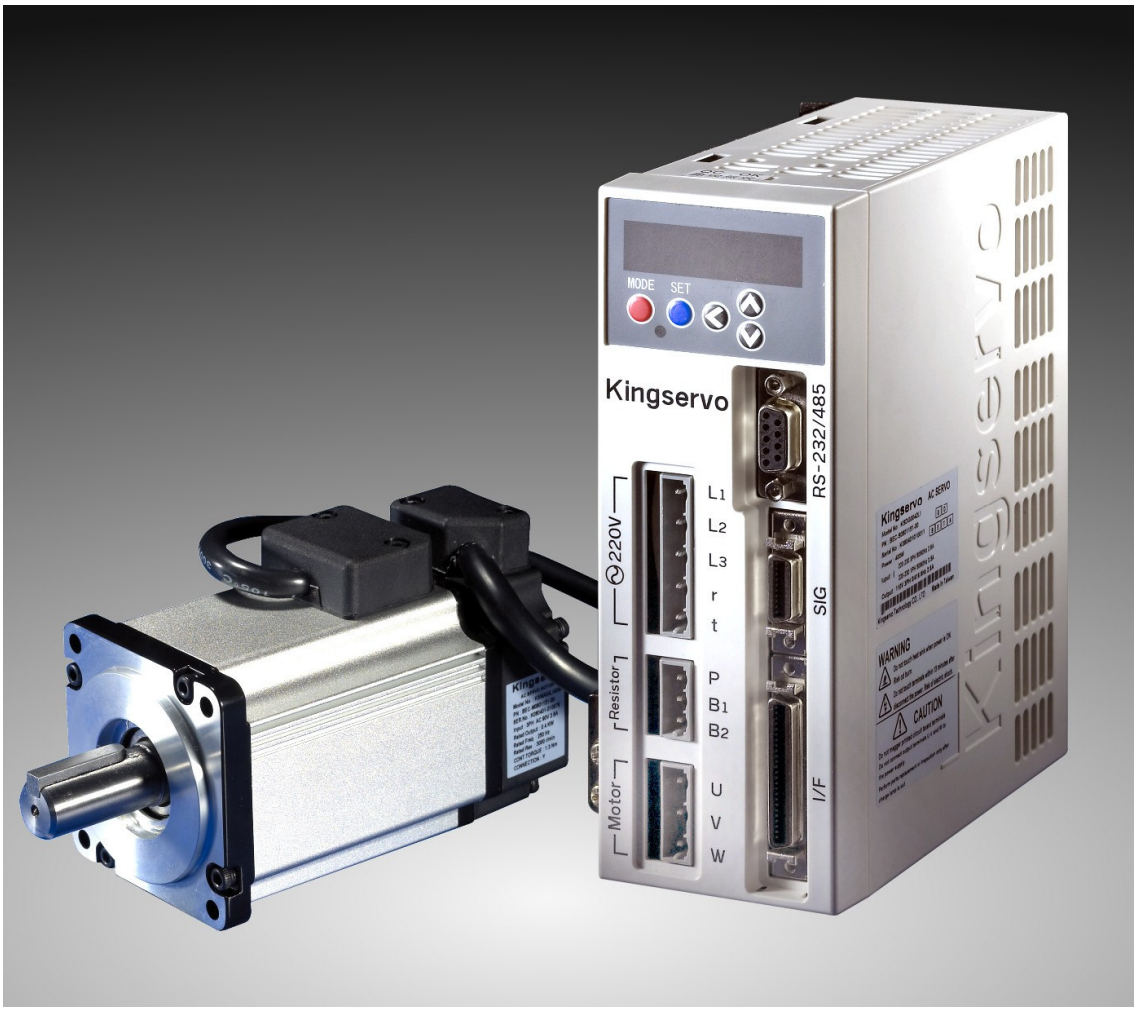
Kingservo

Manual

AC Servo MotorKSMA

Servo Driver KSDG Series



20081014(3rd Version)

Contents

Chapter One: Identificaiotns of Products

1-1Safety Sign

警告

禁止

Warning Sign

拆封後請立即核對機種型號與外盒資料是否相同。

請將伺服馬達儲存於乾燥、無灰塵、腐蝕性氣液體之環境。

若伺服馬達儲存時間超過六個月，每三個月需定期檢視軸芯狀況及補充防鏽油脂。

請務必確實進行配線，確認電線及信號線是否正確，否則可能造成馬達故障及損壞。

不可將電源線及信號線連接於同一回路，並請將兩線分離，以避免雜訊產生。

欲移動馬達或配線時，請將電源切斷十分鐘後再執行，以免造成觸電。

請注意馬達溫度須於規定範圍內。

偵測到任何不正常之異味、噪音、煙霧、熱氣或異常振動時，請立停止馬達運轉並關閉電源 。

Inhibition Sign

1-2 Check before Usage

After unpackage, verify:

- Check whether the numbers of parts are as same as the specification?
- Check whether there is any damage to the appearance during transportation?

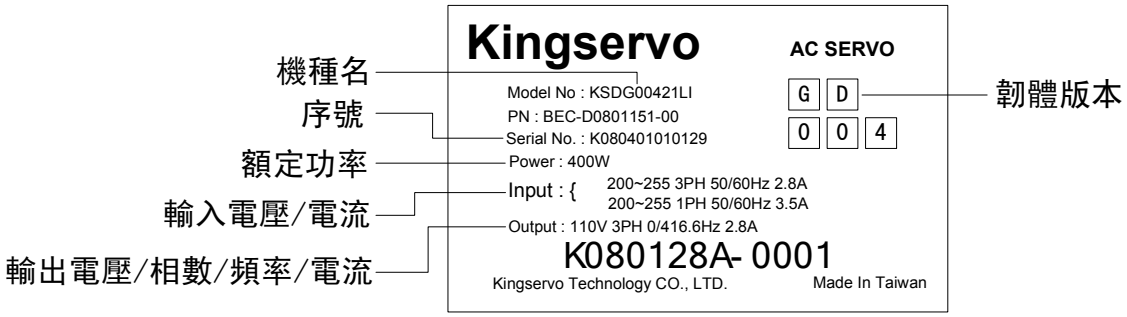
Verify whether driver motor controller and motor are the Kingservo Ac Servo series?

package contents:

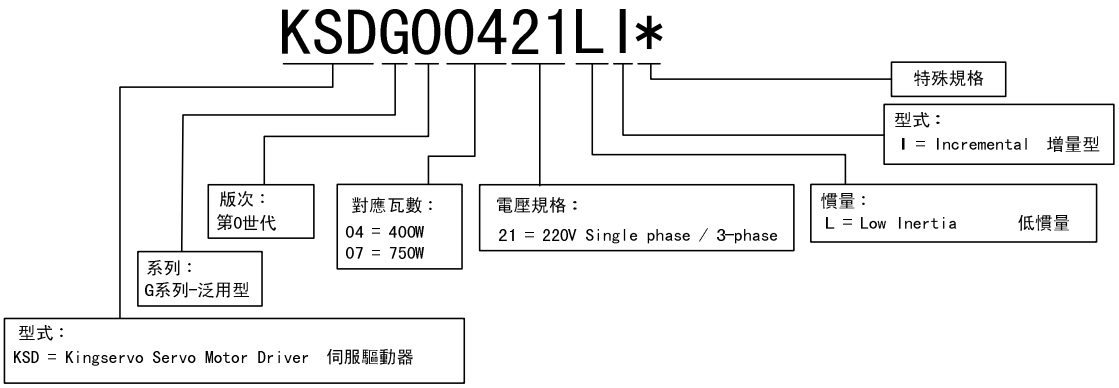
- motor
- key slot
- encoding line
- power line
- controllor
- connector
- operation handle of connector

1-3 Indentification of AC Servo Driver Type

1-3-1 Name-plate of Driver

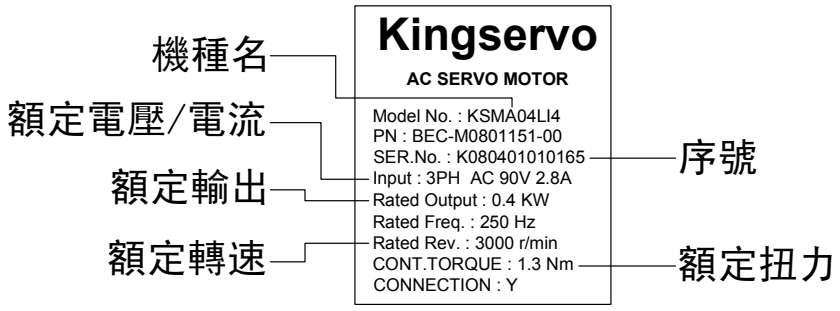


1-3-2 Identifications of Driver Type

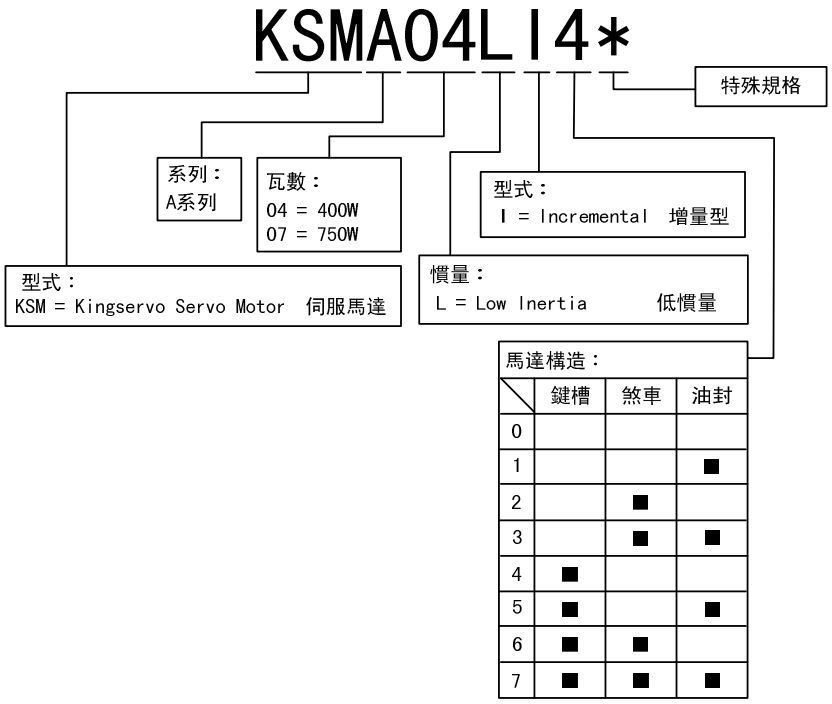


1-4 AC Encoding Principles of Servo Motor Type

1-4-1 Name-plate of Servo Motor



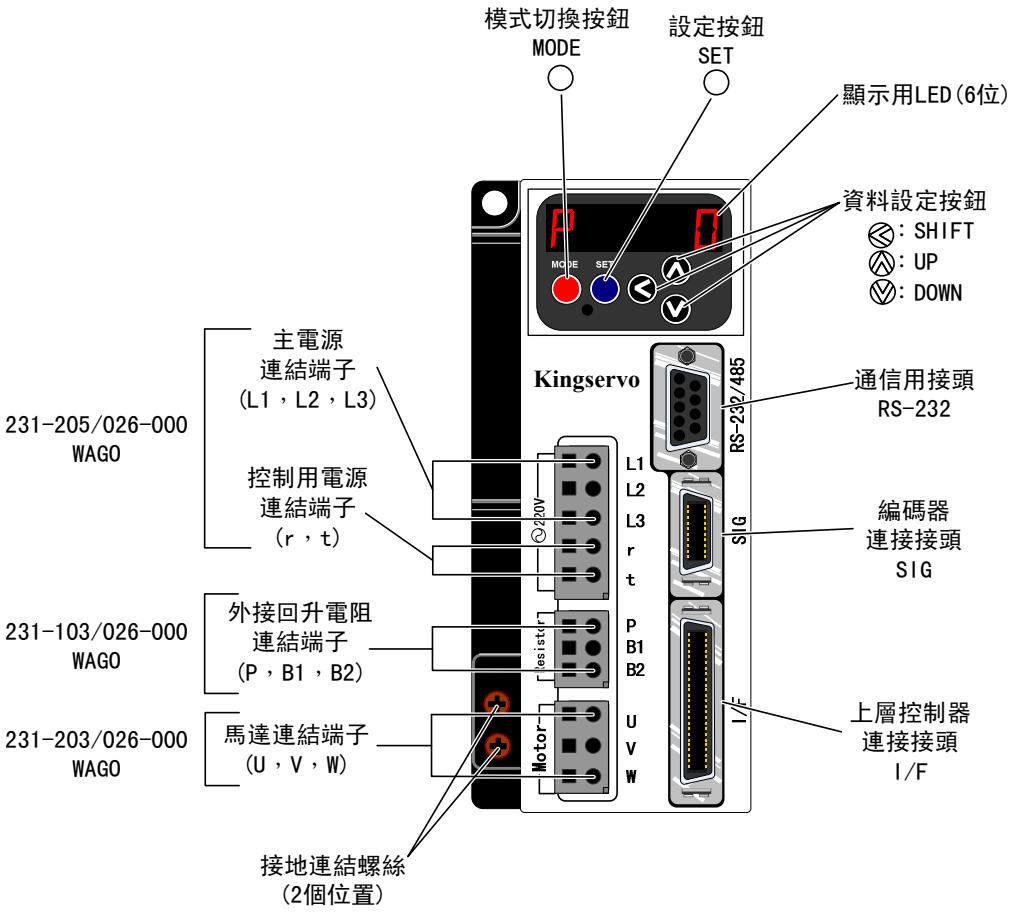
1-4-2 Identification of Servo Motor Type



1-5 Name of Parts

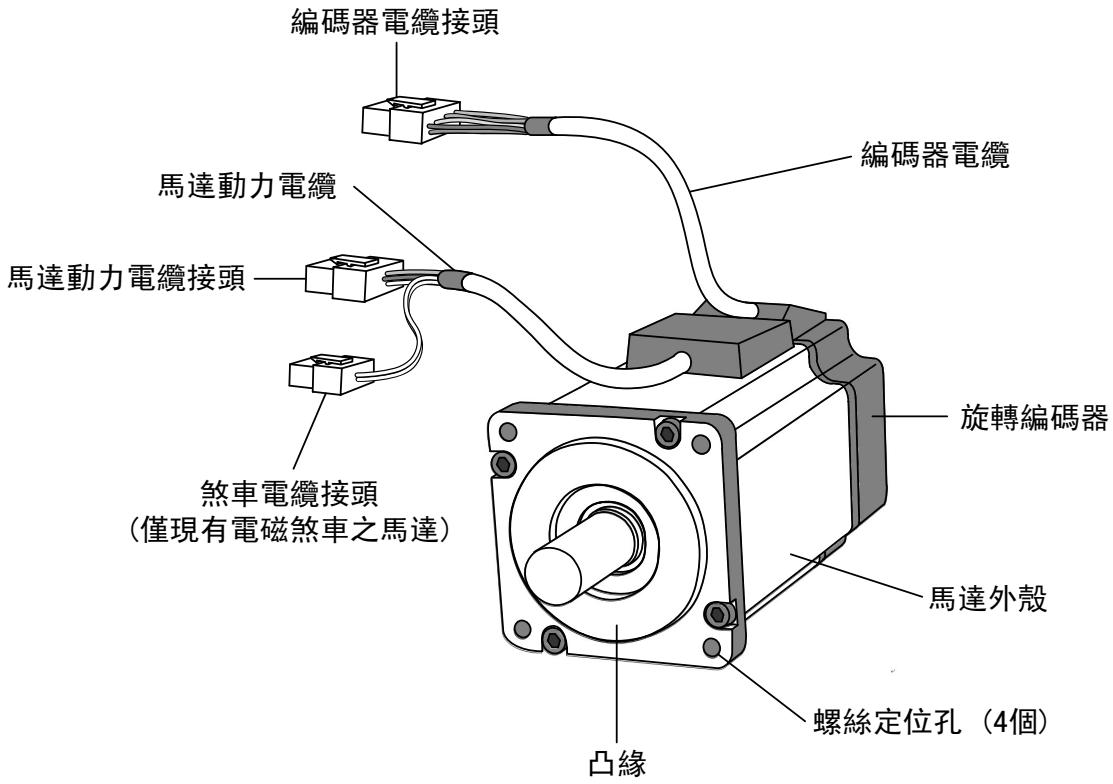
1-5-1Driver

- KSMG 400W・750W



1-5-2 Motor

- KSMA 400W・750W



1-6 Usage

1. Usage Modes:

Choose one of following modes. Mode selection must be determined through I/F connector(MDR) wiring.

Mode	Mode Name
Single Mode	Location Control
	Speed Control
	Torque Control
Mixed Mode	Location and Speed Control
	Location and Torque Control
	Speed and Torque Control

2. I/F Signal Connection Line

1. connect main power line(L1, L2, L3), control power(r, t), flyback resistor(P, B1, B2), connector of encoder line(SIG) and power line of motor(U, V, W) in accordance with connection of peripheral devices of controller and controller wiring diagram.

2. Increase I/F connector(MDR) wiring and connect them by

·connection of single mode

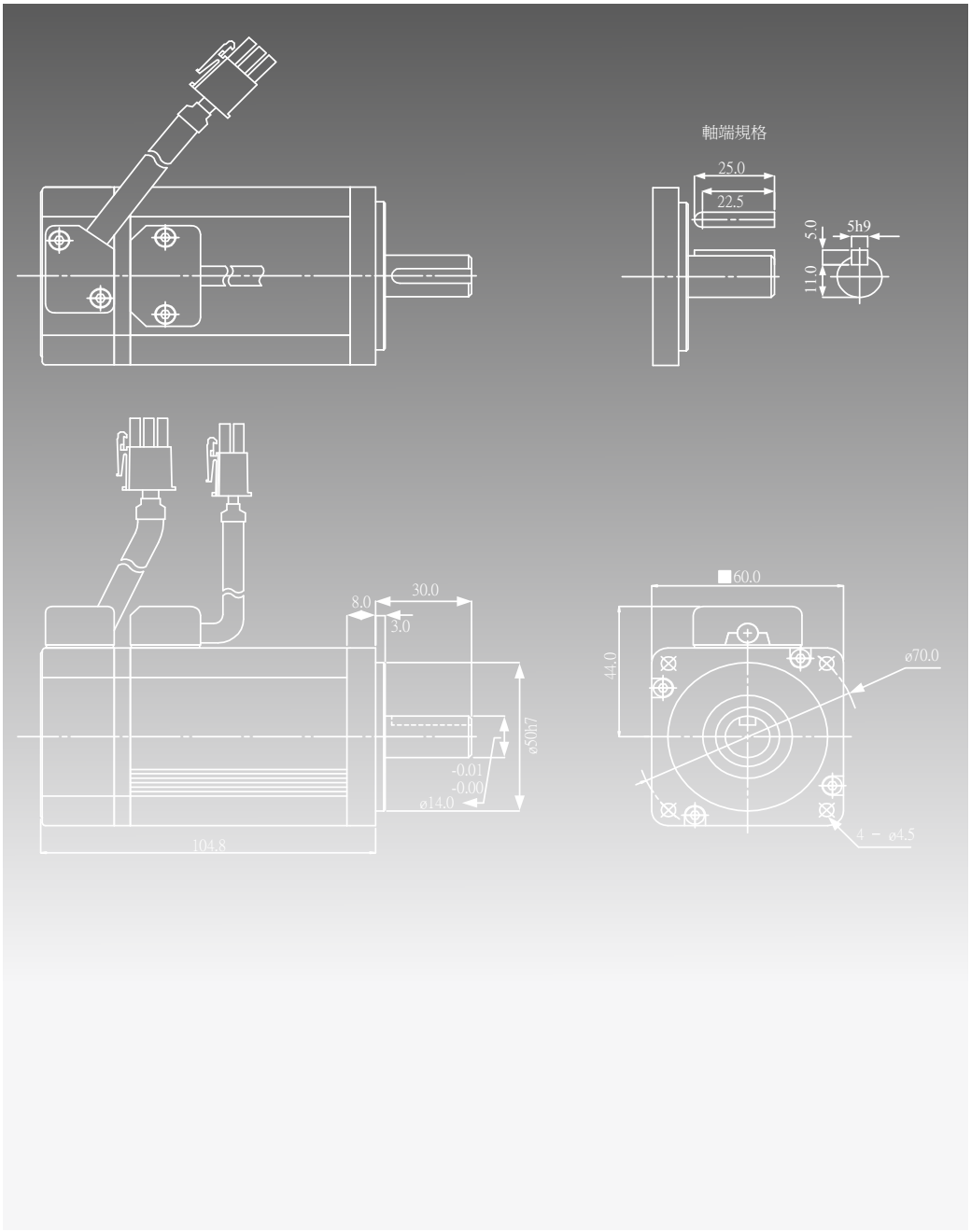
·connection of all signal pins

Connecting another terminal of upper-level controller to set up parameters of control mode, and then operate.

About the function definition of I/F pin mode, adjust parameter Pro2 to contol mode function of PIN14, 6, and 18.

Speed and torque mode control use few pin. Wile single application, the numbers of I/F Pin Weld line.

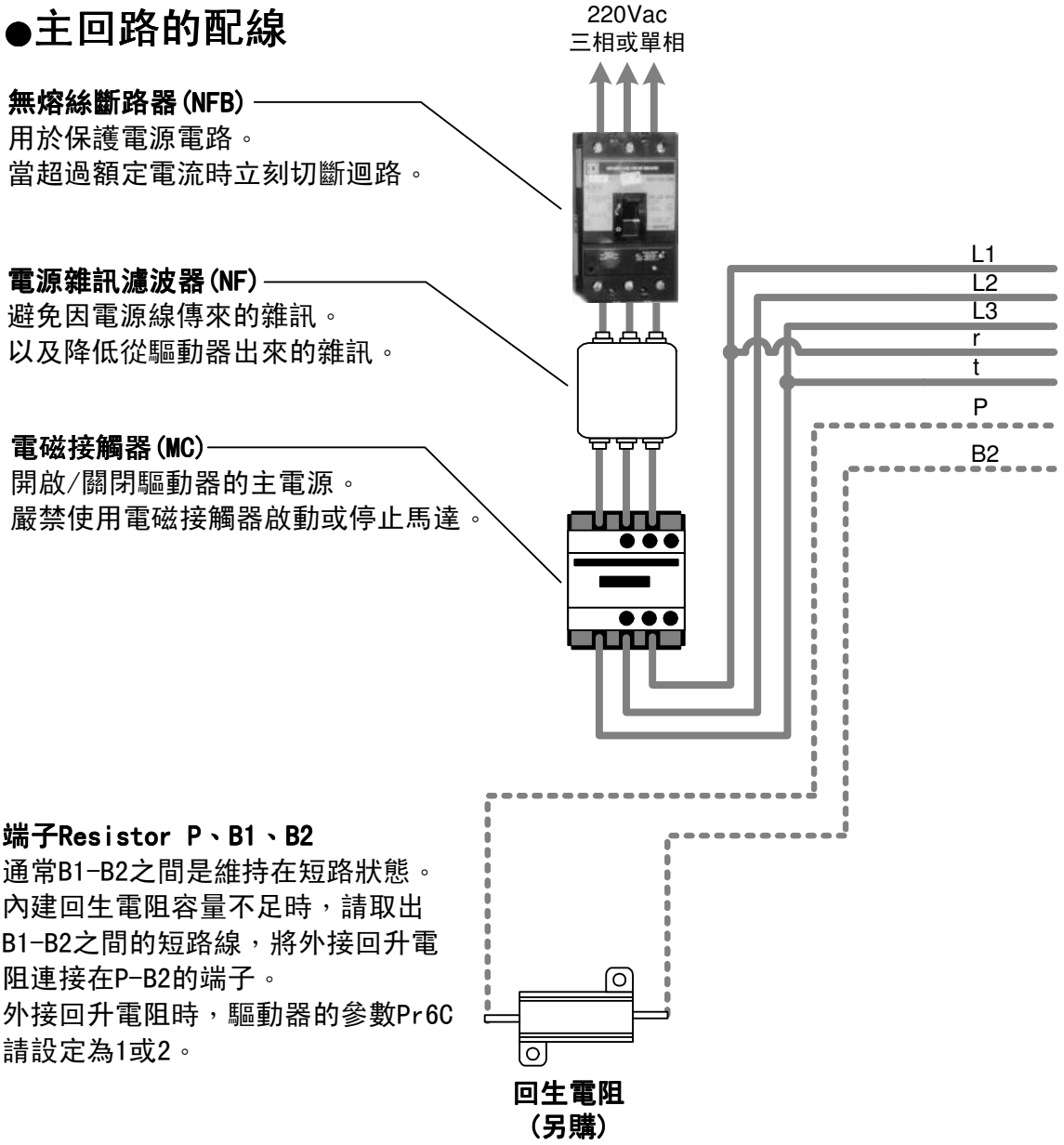
3. While I/f connector(MDR) does not connect controller, the motor can be test run.

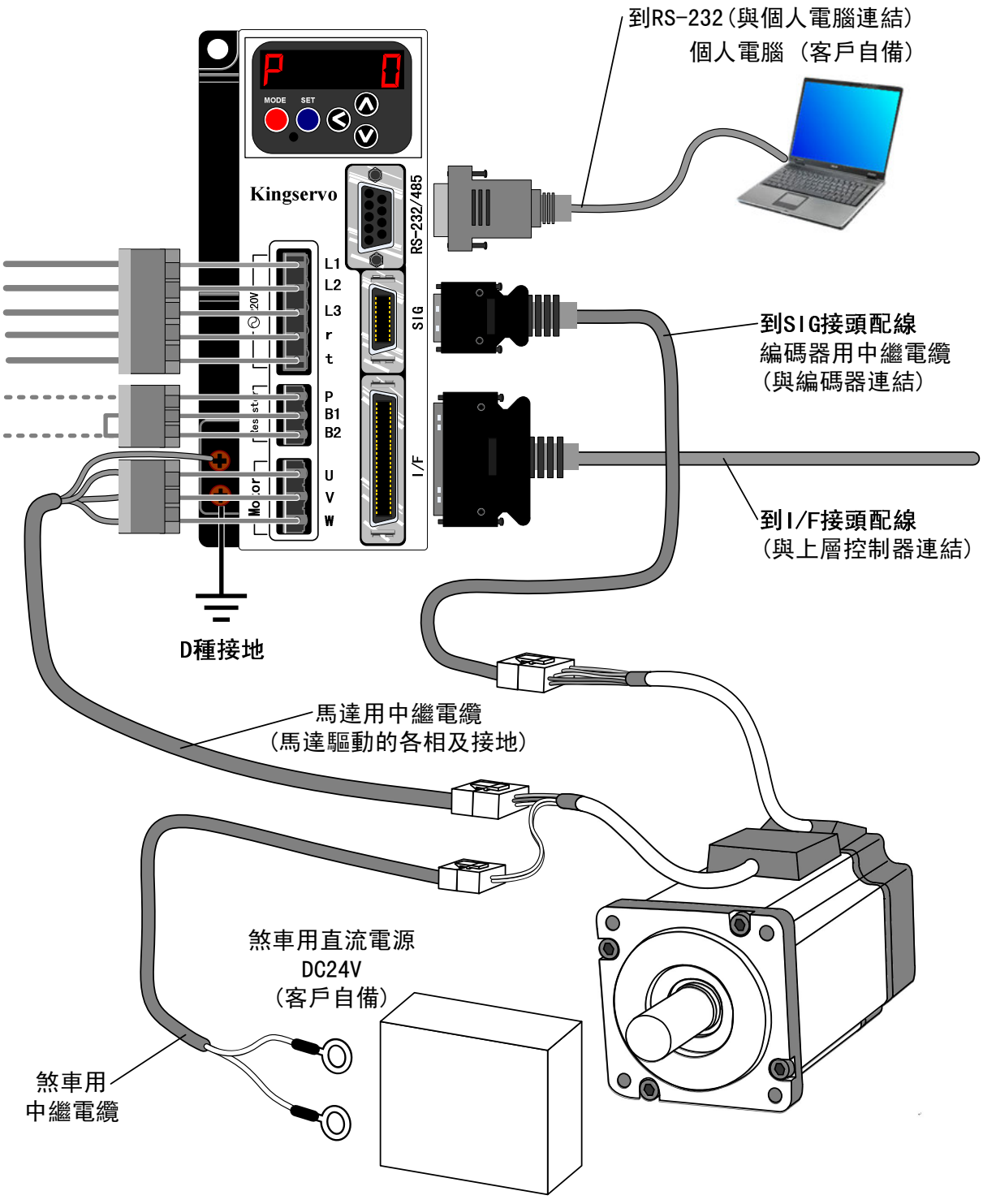

軸端規格
25.0
22.5
5.0
5h9
11.0
8.0
30.0
3.0
ø50h7
-0.01
-0.00
ø14.0
104.8
60.0
44.0
ø70.0
4 – ø4.5

Chapter Two: Connectionor and Wiring

2-1Controller and peripheral configuration map

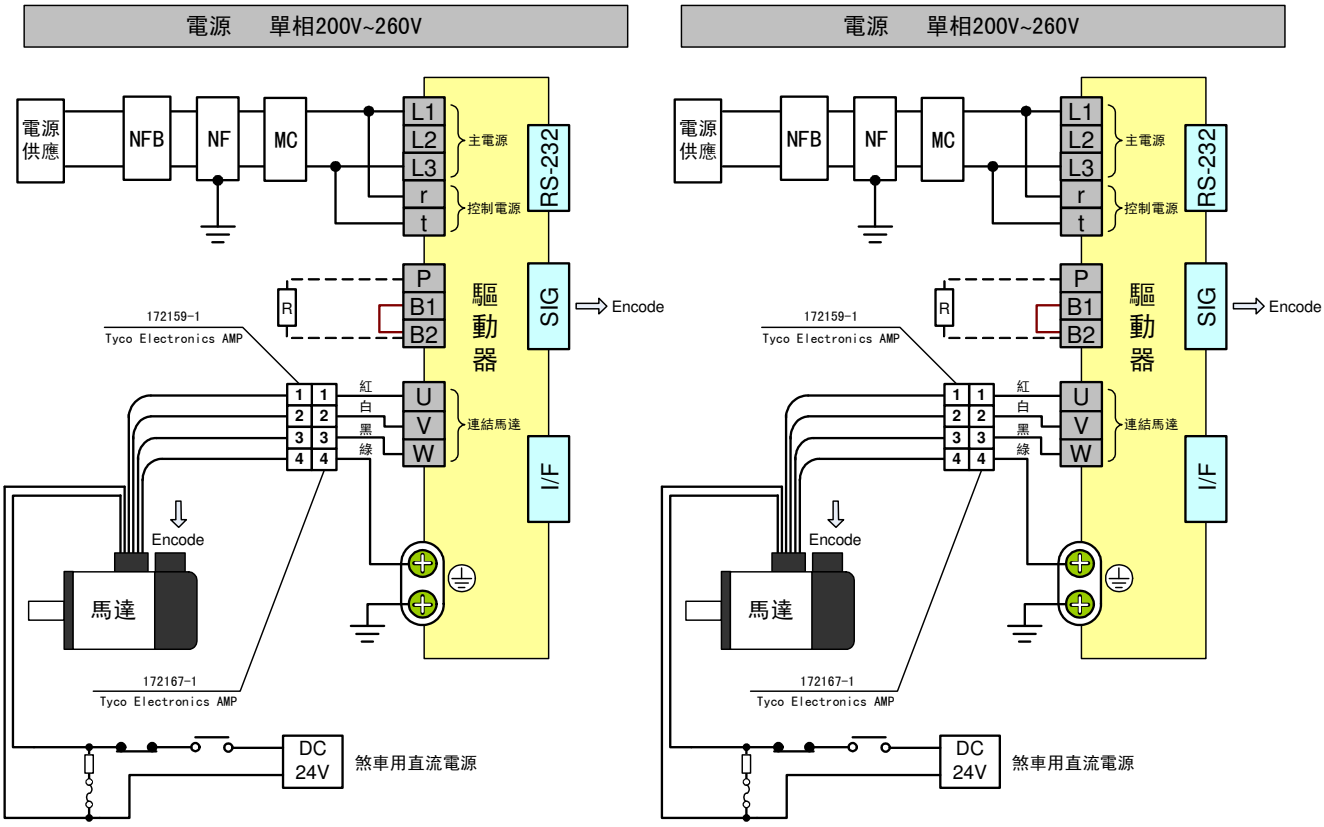
●主回路的配線

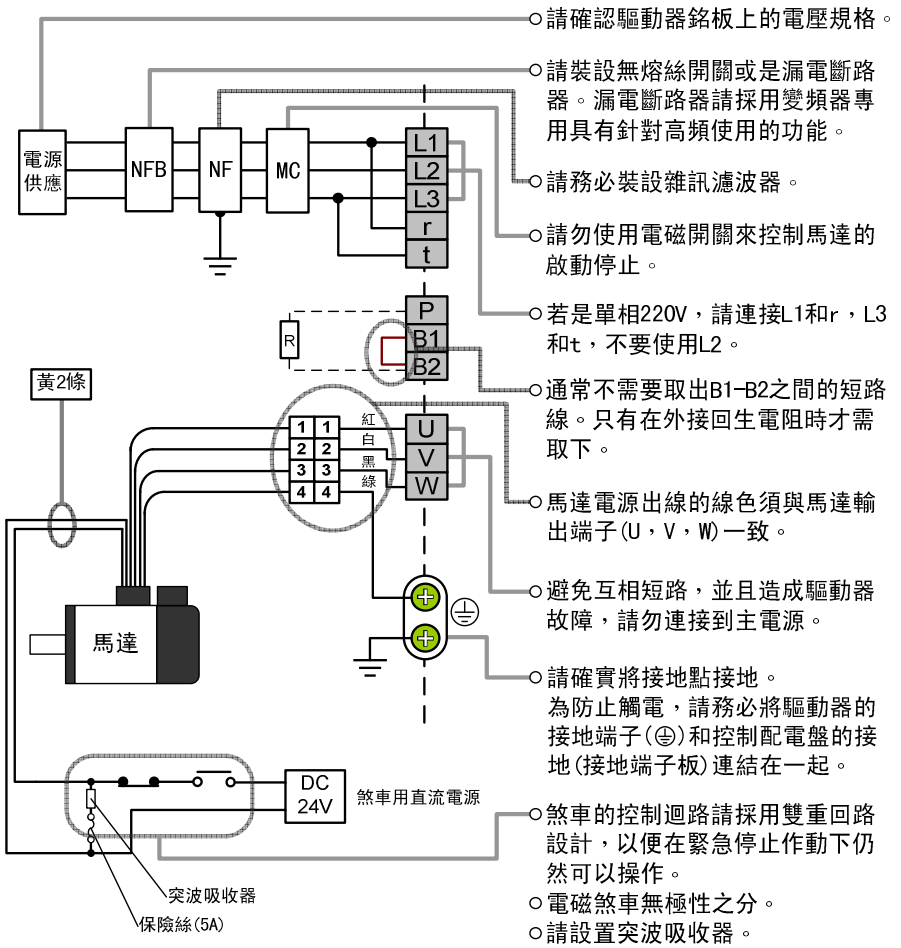



到RS-232(與個人電腦連結)
個人電腦 (客戶自備)
MODE
SET
Kingservo
RS-232/485
SIG
I/F
L1
L2
L3
r
t
P
B1
B2
U
V
W
D種接地
到SIG接頭配線
編碼器用中繼電纜
(與編碼器連結)
到I/F接頭配線
(與上層控制器連結)
馬達用中繼電纜
(馬達驅動的各相及接地)
煞車用直流電源
DC24V
(客戶自備)
煞車用
中繼電纜

2-2 Power Wiring Diagram

While alarm system is activated, the main line power should be power off immediately.





■Function of Flyback Resistor

·While load with large inertia reducing speed, flyback energy leads to rising of driver's capacitor voltage, so the flyback resistor is used to absorb and consume the excessive energy and protect driver.

·While using vertical ascending (Z axis) mechanism, flyback problem shall be payed attention to.

·specification of built-in flyback resistor: 150Ωand 50W.

■Application of Built-in Flyback Resistor

·Keep short curicuit between B1 and B2.

·Set parameter Par 6C as 0 (default value is 0).

■Application of External Flyback Resistor

·Connect P and B2 to external flyback resistor(150Ω).

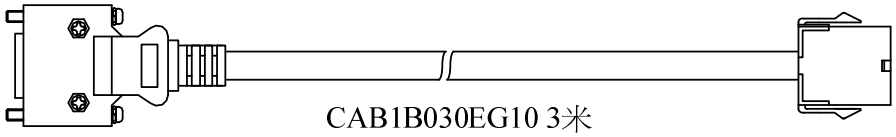
· Set Parameter Par 6C as 1.

The power consumption of external resistor is limited to 10% duty, and set Par 6C as 2.

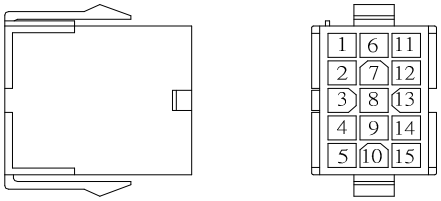
(while Par 6C is set as 2, overheating-protection fuse shall be installed, or else it may cause overheating and burning-down of flyback resistor.).

2-3 Defination of Connector Pin

2-3-1Cable of Encoder

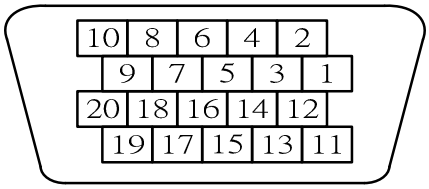


Air Connector



15 PIN

SCSI II Connector



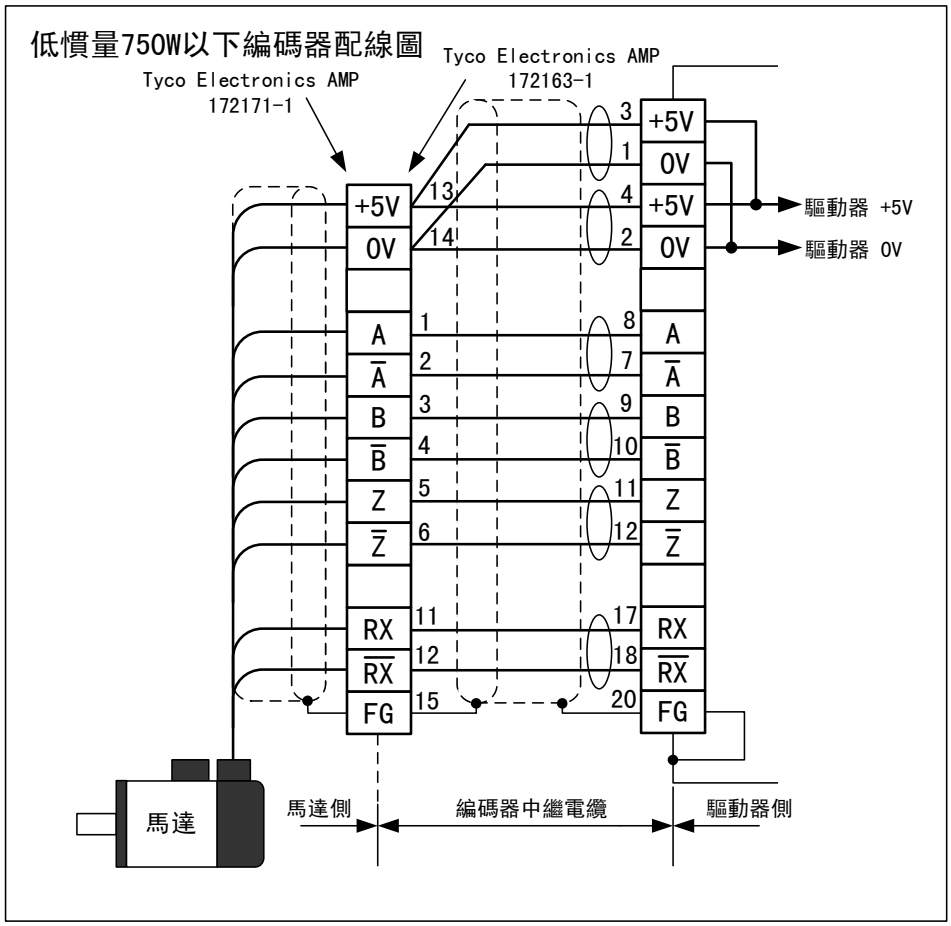
20 PIN

NO.	1	2	3	4	5	6	7-10	11	12	13	14	15
Pin Definition	A	/A	B	/B	Z	/Z	NC	RX	/RX	VCC	GND	FG
Color	Red	Green	Black	White	Yellow	Blue		Gray	Orange	Brown/ Light RED	Purple/ Ligth Green	Grounding Line of Isolation Net

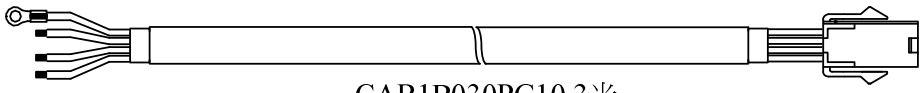
NO.	1	2	3	4	5-6	7	8	9	10
Pin Definition	GND	GND	VCC	VCC	NC	A	/A	B	/B
Color	Purple	Light Green	Brown	Pink		Red	Green	Black	White

NO.	11	12	13-16	17	18	19	20
Pin Definition	Z	/Z	NC	RX	/RX	NC	GND
Color	Yellow	Blue		Gray	Orange		Grounding line of Isolation Net

Wiring Diagram of Encoder Line

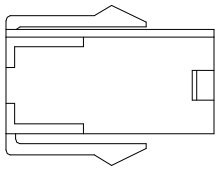


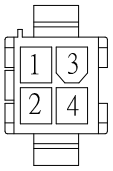
2-3-2 Power Cable of Motor



CAB1B030PG10 3米
CAB1B050PG10 5米

空中連接頭

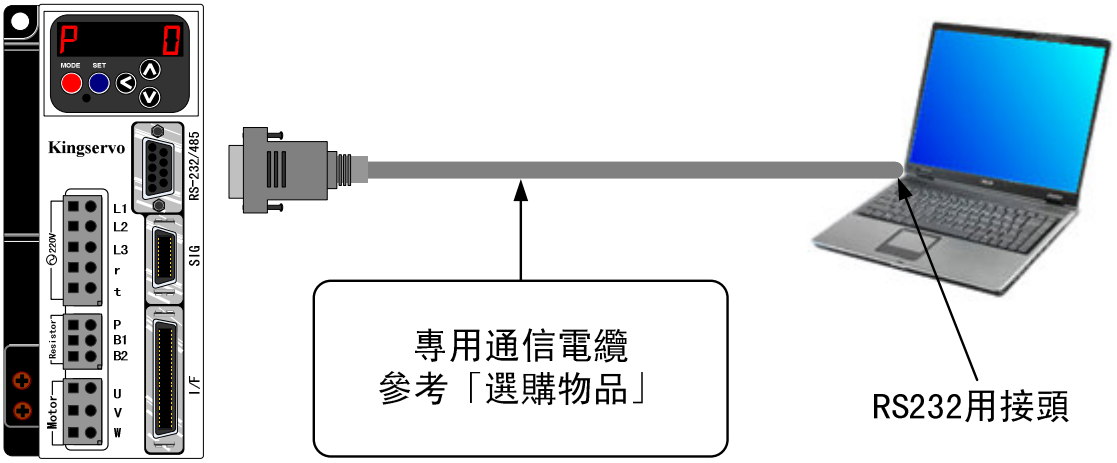


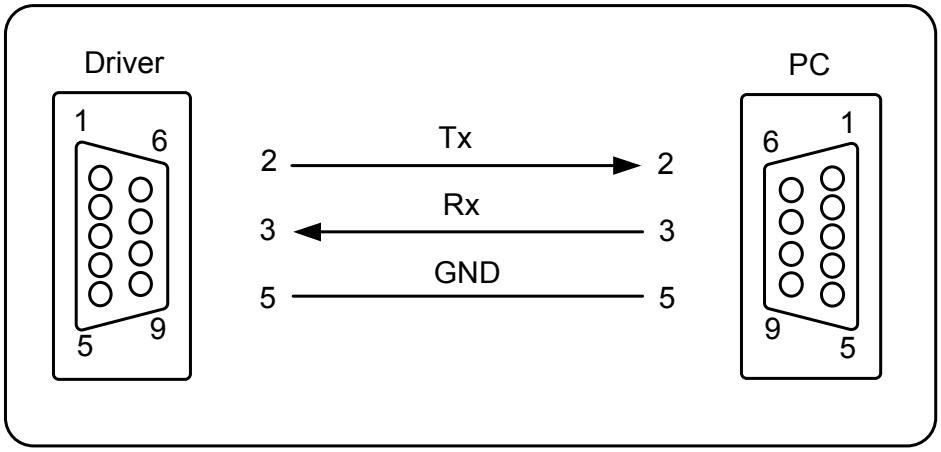


Pin NO.	Definition	Color
1	U	Red
2	V	White
3	W	Black
4	FG	Green

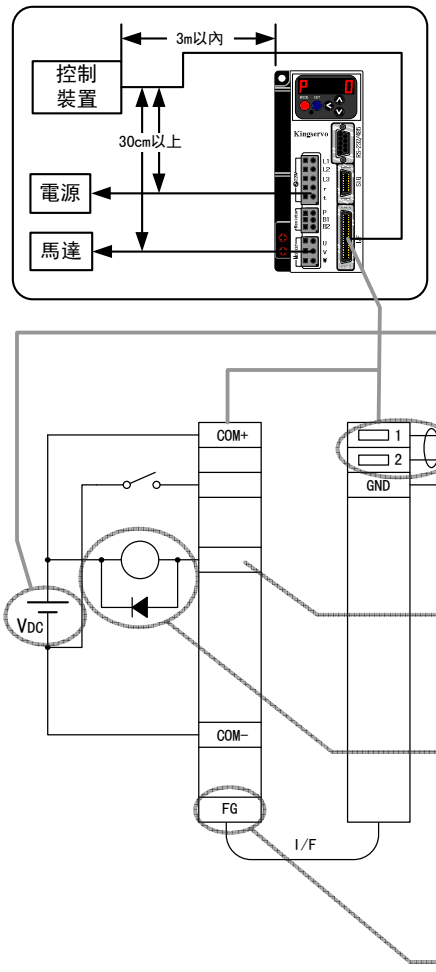
2-4 Communication Line of RS-232

While connecting computer and driver by RS-232, the communication software KSDTools can be set up. KSDTools provides many convenient functions such as to monitor the states of motor, set/modify parameters and so no.





2-5 Wiring of Connector I/F



○與上層控制器等週邊裝置的配線請在3m以內。

○與主線路配線需保持30cm以上的距離。通過同一線槽請勿綁在一起。

○請自行準備COM+~COM-之間的控制訊號用電源(VDC)。電壓：DC+12~+24V。

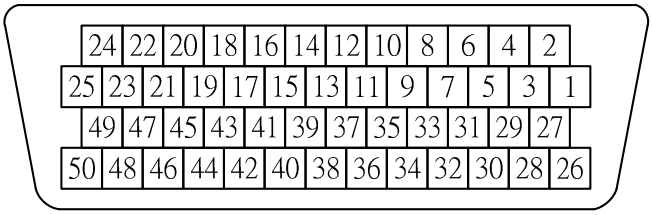
○命令脈波輸入、編碼器訊號輸出等的配線，請使用有遮蔽的對絞線。

○控制訊號輸出端子切勿施加超過24V以上的電壓，或導通超過50mA以上的電流。

○利用控制訊號輸出直接驅動繼電器時，請依照圖的方向和繼電器並聯一二極體。
如未安裝，或安裝方向錯誤，將導致驅動器受損。

○接地端子已在驅動器內部與地線連接。

2-5-1 Pins of Connector I/F(SCSI II)



Specification of Connector I/F

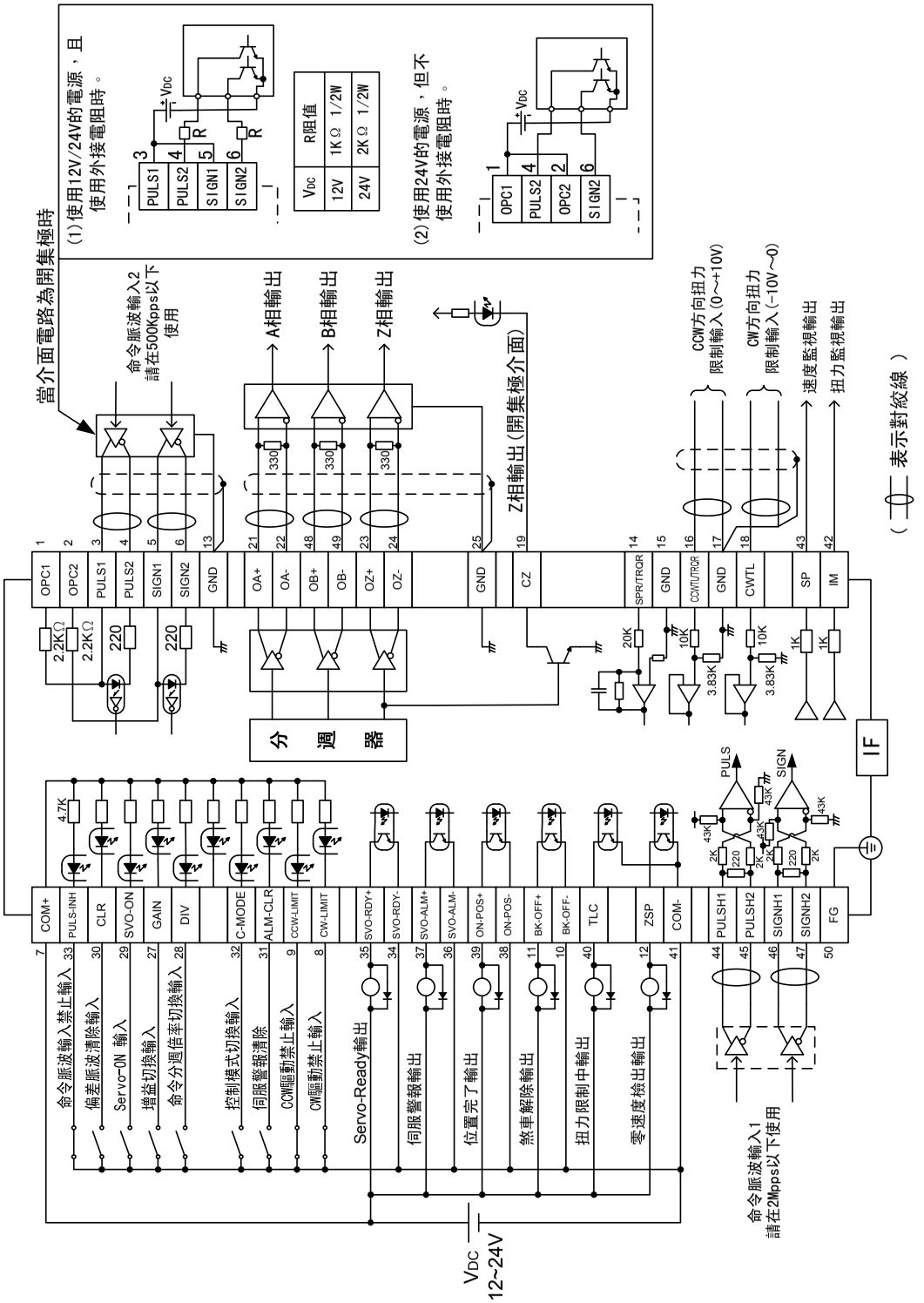
Side Connector of Driver	Connector Prepared by User		Manufacturer
10250-52A2 PL	Name of Parts	Mode	
	Connector(Welded)	54306-5011 or 54306-5019(leadfree)	Molex Inc.
	Shell of Connector	54331-0501	
	Connector(Welded)	10150-3000PE	Sumitomo 3M
	Shell of Connector	10350-52A0-008	

2-5-2**Pin** Signal ModeTable

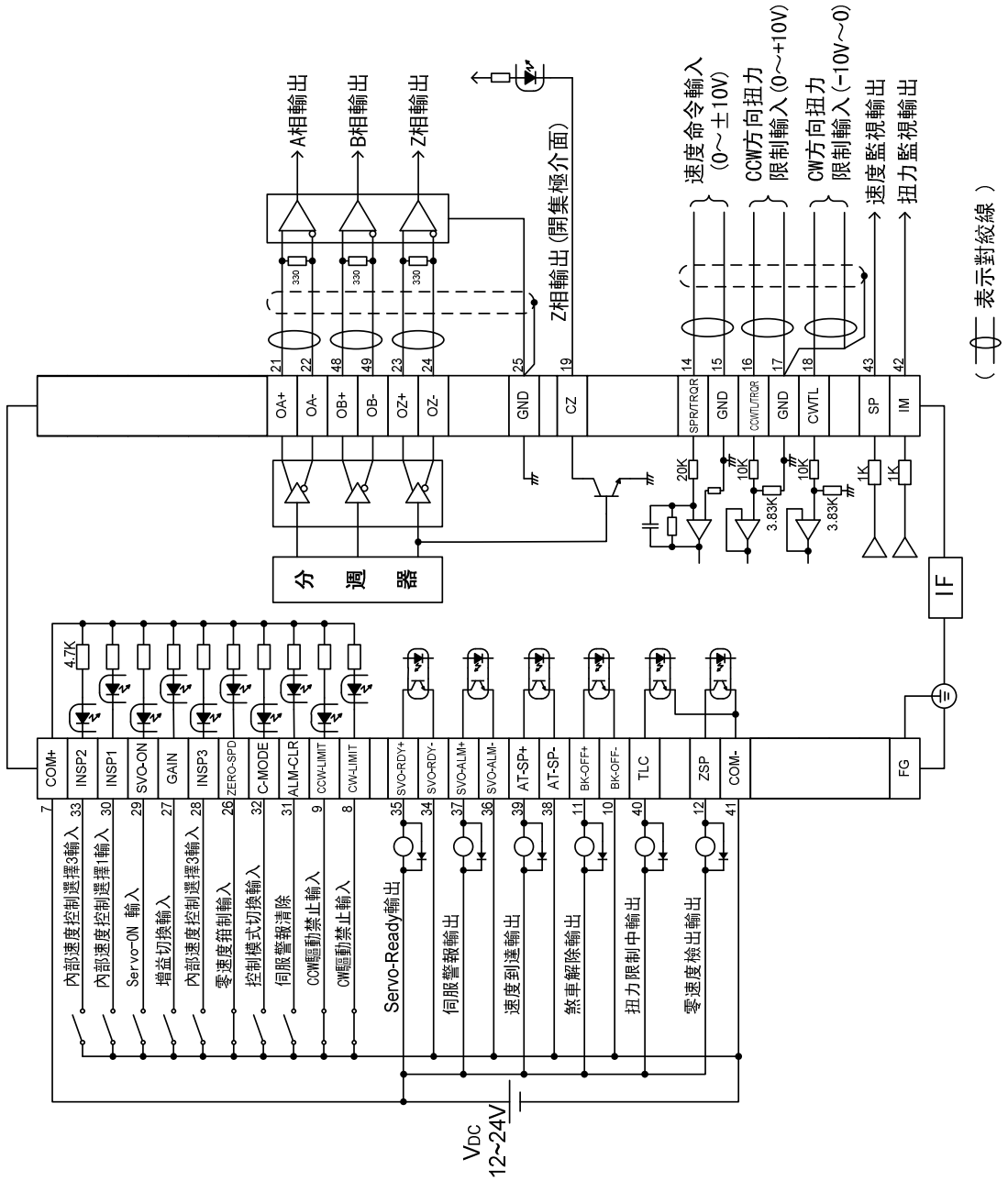
Pin	Position	Function		Speed Mode	Function		Torque Mode	Function	
1	OPC1	Position command pulse 2	Input						
2	OPC2	Position command signal 2	Input						
3	PULS1	Position command pulse 2	Input						
4	PULS2	Position command pulse 2	Input						
5	SIGN1	Position command signal 2	Input						
6	SIGN2	Position command signal 2	Input						
7	COM+	Signal Power		COM+	Signal Power		COM+	Signal Power	
8	CW-LIMIT	CW-inhibition limit	Input	CW-LIMIT	CW-inhibition limit	Input	CW-LIMIT	CW-inhibition limit	Input
9	CCW-LIMIT	CCW-inhibition limit	Input	CCW-LIMIT	CCW-inhibition limit	Input	CCW-LIMIT	CCW-inhibition limit	Input
10	BK-OFF-	Brake release(-)	Output	BK-OFF-	Brake release(-)	Output	BK-OFF-	Brake release(-)	Output
11	BK-OFF+	Brake release(+)	Output	BK-OFF+	Brake release(+)	Output	BK-OFF+	Brake release(+)	Output
12	ZSP	Zero speed check	Output	ZSP	Zero speed check	Output	ZSP	Zero speed check	Output
13	GND	Ground of analog signal							
14				SPR	Speed command	Input	SPR/TRQR	Torque or speed command	Input
15	GND	Ground of analog signal		GND	Ground of analog signal		GND	Ground of analog signal	
16	CCWTL	CCW Torque Limit	Input	CCWTL	CCW Torque Limit	Input	CCWTL/TRQR	Torque command	Input
17	GND	Ground of analog signal		GND	Ground of analog signal		GND	Ground of analog signal	
18	CWTL	CW Torque limit	Input	CWTL	CW Torque limit	Input			
19	CZ	Open set zone of signal of Z	Output	CZ	Open set zone of signal of Z phase	Output	CZ	Open set zone of signal of Z	Output
20									
21	OA+	Signal(+) of A phase	Output	OA+	Signal(+) of A phase	Output	OA+	Signal(+) of A phase	Output
22	OA-	Signal(-) of A phase	Output	OA-	Signal(-) of A phase	Output	OA-	Signal(-) of A phase	Output
23	OZ+	Signal(+) of Z phase	Output	OZ+	Signal(+) of Z phase	Output	OZ+	Signal(+) of Z phase	Output
24	OZ-	Signal(-) of Z phase	Output	OZ-	Signal(-) of Z phase	Output	OZ-	Signal(-) of Z phase	Output
25	GND	Ground of analog signal		GND	Ground of analog signal		GND	Ground of analog signal	
26				ZERO-SPD	Zero speed control	Input	ZERO-SPD	Zero speed control	Input
27	GAIN	Gain selection		GAIN	Gain selection		GAIN	Gain selection	
28	DIV	DIV slection	Input	INSP3	The thrid choice of internal speed				
29	SVO-ON	Motor is powered on	Input	SVO-ON	Motor is powered on	Input	SVO-ON	Motor is powered on	Input
30	CLR	Clear differential counter	Input	INSP2	The second choice of internal speed				
31	ALM-CLR	clear abnormal alarm	Input	ALM-CLR	clear abnormal alarm	Input	ALM-CLR	clear abnormal alarm	Input
32	C-MODE	Choosement of controlling	Input	C-MODE	Choosement of controlling modes	Input	C-MODE	Choosement of controlling	Input
33	PULS-INH	Position command pulse is	Input	INSP1	The first choice of internal speed				
34	SVO-RDY-	Standby of servo system(+)	Output	SVO-RDY-	Standby of servo system(+)	Output	SVO-RDY-	Standby of servo system(+)	Output
35	SVO-RDY+	Standby of servo system(-)	Output	SVO-RDY+	Standby of servo system(-)	Output	SVO-RDY+	Standby of servo system(-)	Output
36	SVO-ALM-	Abnormal alarm of servo	Output	SVO-ALM-	Abnormal alarm of servo system(-)	Output	SVO-ALM-	Abnormal alarm of servo	Output
37	SVO-ALM+	Abnormal alarm of servo	Output	SVO-ALM+	Abnormal alarm of servo system(+)	Output	SVO-ALM+	Abnormal alarm of servo	Output
38	ON-POS-	On-position(-)	Output	AT-SP-	Speed attainment(+)	Output	AT-SP-	Speed attainment(+)	Output
39	ON-POS+	On-position(+)	Output	AT-SP+	Speed attainment(-)	Output	AT-SP+	Speed attainment(-)	Output
	TLC	Torque limit Check	Output	TLC	Torque limit Check	Output	TLC	Torque limit Check	Output
41	COM-	Signal Power(-)		COM-	Signal Power(-)		COM-	Signal Power(-)	
42	IM	Torque monitor	Output	IM	Torque monitor	Output	IM	Torque monitor	Output
43	SPM	Speed monitor	Output	SPM	Speed monitor	Output	SPM	Speed monitor	Output
44	PULSH1	Position command pusle 1	Input						
45	PULSH2	Position command pusle 2	Input						
46	SIGNAL1	Position command signal1	Input						
47	SIGNH2	Position command signal2	Input						
48	OB+	Signal(+) of B phase	Output	OB+	Signal(+) of B phase	Output	OB+	Signal(+) of B phase	Output
49	OB-	Signal(-) of B phase	Output	OB-	Signal(-) of B phase	Output	OB-	Signal(-) of B phase	Output
50	FG	Grouding		FG	Grouding		FG	Grouding	

2-5-3 Wiring Diagram of Control Mode

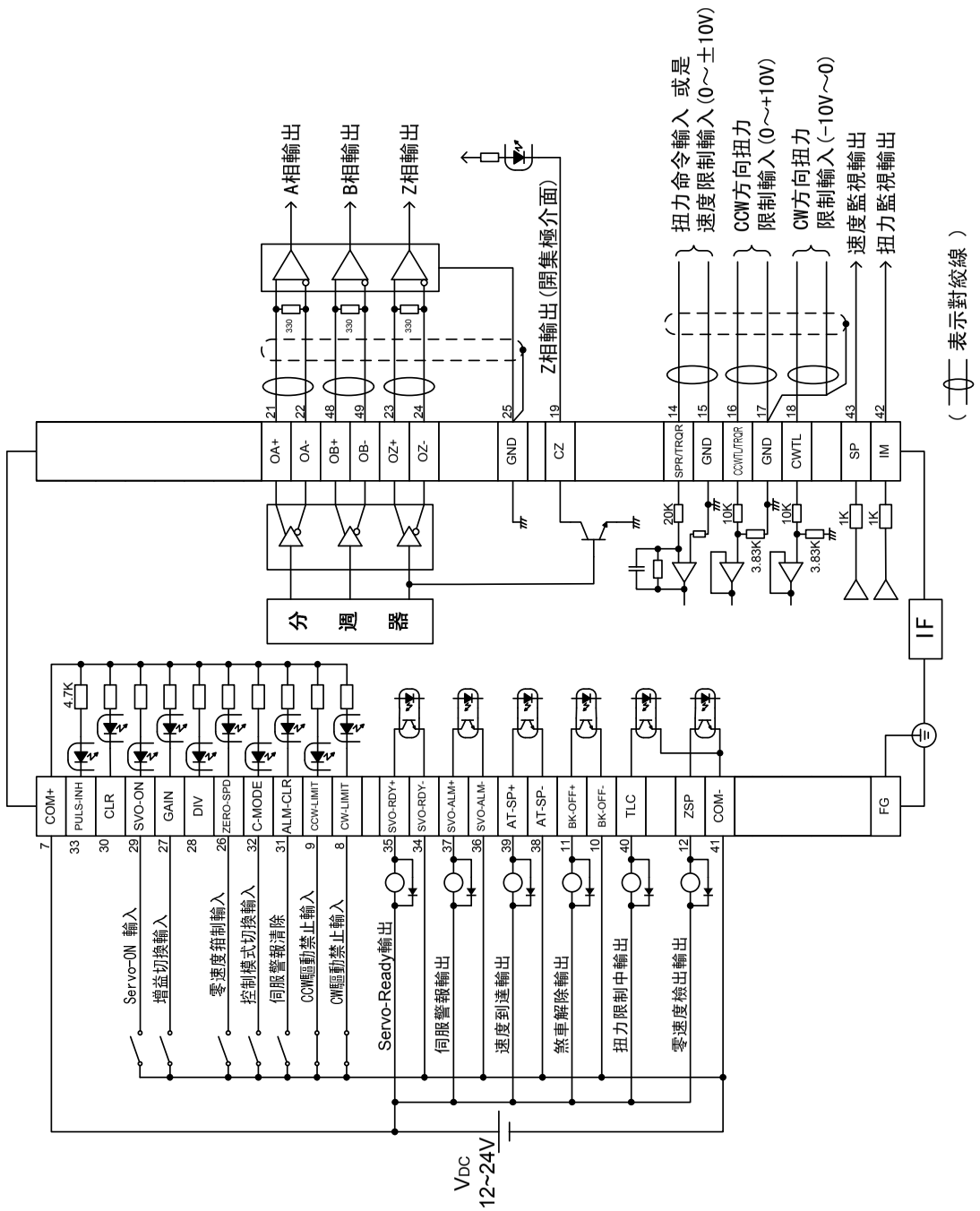
Position Mode

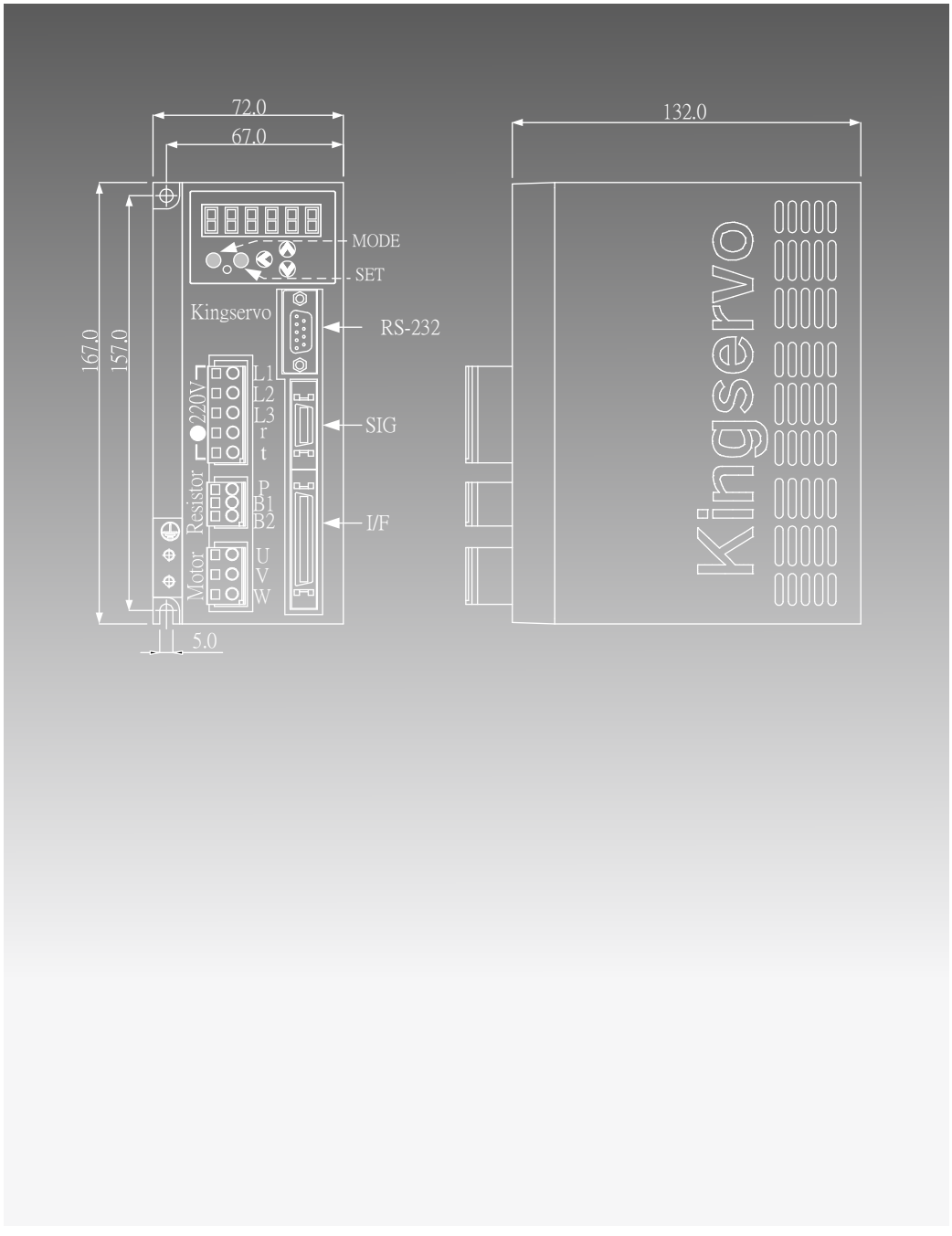


Speed Mode


A相輸出
B相輸出
Z相輸出
Z相輸出 (開集極介面)
速度命令輸入 (0～±10V)
CCW方向扭力限制輸入 (0～+10V)
CW方向扭力限制輸入 (-10V～0)
速度監視輸出
扭力監視輸出
( ) 表示對絞線
分 週 器
OA+ OA- OB+ OB- OZ+ OZ- GND CZ SPR/TRQR GND CCWTL/TRQR GND CWTL SP IM
330
20K 10K 10K 10K 3.83K 3.83K 1K 1K
IF
COM+ INSP2 INSP1 SVO-ON GAIN INSP3 ZERO-SPD C-MODE ALM-CLR CCW-LIMIT CW-LIMIT
4.7K
SVO-RDY+ SVO-RDY- SVO-ALM+ SVO-ALM- AT-SP+ AT-SP- BK-OFF+ BK-OFF- TLC ZSP COM- FG
內部速度控制選擇3輸入
內部速度控制選擇1輸入
Servo-ON 輸入
增益切換輸入
內部速度控制選擇3輸入
零速度箝制輸入
控制模式切換輸入
伺服警報清除
CCW驅動禁止輸入
CW驅動禁止輸入
Servo-Ready輸出
伺服警報輸出
速度到達輸出
煞車解除輸出
扭力限制中輸出
零速度檢出輸出
VDC 12~24V

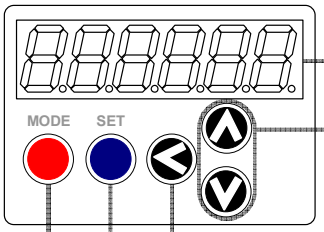
Torque Mode


A相輸出
B相輸出
Z相輸出
Z相輸出(開集極介面)
扭力命令輸入 或是
速度限制輸入(0～±10V)
CCW方向扭力
限制輸入(0～+10V)
CW方向扭力
限制輸入(-10V～0)
速度監視輸出
扭力監視輸出
(表示對絞線)
OA+
OA-
OB+
OB-
OZ+
OZ-
GND
CZ
SPR/TRQR
GND
CCWTL/TRQR
GND
CWTL
SP
IM
330
20K
10K
10K
10K
3.83K
3.83K
1K
1K
分 週 器
IF
4.7K
COM+
PULS-INH
CLR
SVO-ON
GAIN
DIV
ZERO-SPD
C-MODE
ALM-CLR
CCW-LIMIT
CW-LIMIT
SVO-RDY+
SVO-RDY-
SVO-ALM+
SVO-ALM-
AT-SP+
AT-SP-
BK-OFF+
BK-OFF-
TLC
ZSP
COM-
FG
Servo-ON 輸入
增益切換輸入
零速度箝制輸入
控制模式切換輸入
伺服警報清除
CCW驅動禁止輸入
CW驅動禁止輸入
Servo-Ready輸出
伺服警報輸出
速度到達輸出
煞車解除輸出
扭力限制中輸出
零速度檢出輸出
VDC
12~24V


72.0
67.0
132.0
MODE
SET
Kingservo
RS-232
167.0
157.0
220V
L1
L2
L3
r
t
SIG
Resistor
P
B1
B2
I/F
Motor
U
V
W
5.0
Kingservo

Charpter Threee: Panel Operation

3-1 Panel Structure



LED面板顯示，發生Error時，面板的6個LED燈號開始閃爍，並顯示Error畫面。
發生警告時，所有LED燈號開始緩慢閃爍。

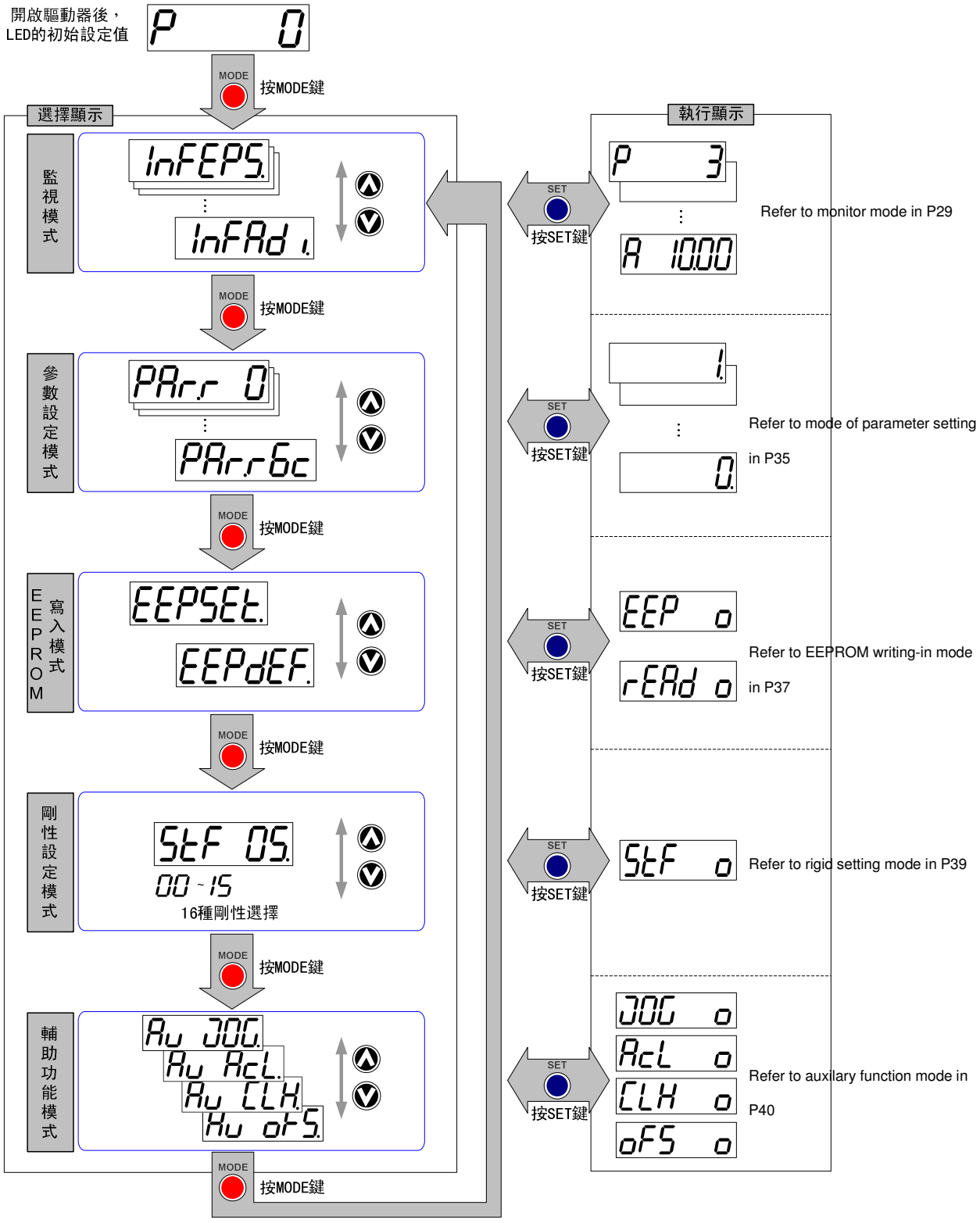
各模式的顯示變更、資料變更、參數選擇等的操作。
(對小數點燈號閃爍的位數有效)
鍵：數值遞增
鍵：數值遞減

鍵：小數點移位功能(往左循環)
• 小數點閃爍時，即可調整上下鍵改變LED數值。

設定鍵
選擇顯示或操作的接換

MODE模式切換鍵，可切換5種模式：
(1)監視模式
(2)參數設定模式
(3)EEPROM寫入模式
(4)剛性設定模式
(5)輔助功能模式

3-2 Mode Category and Contents



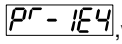
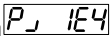
3-3 Monitor Mode

·Instruction of state display：

● Position Deviation

–sign: axis core rotates along CW

Non-sign: axis core rotates along CCW

Display Scope：–9999 ~ 9999 （value less than low limit is displayed with  ,value over upper limit is displayed with  ）

Unit：Pulse

● Rotary Speed of Motor

–sign: axis core rotates along CW

Non-sign: axis core rotates along CCW

Unit：rpm

● Torque Output

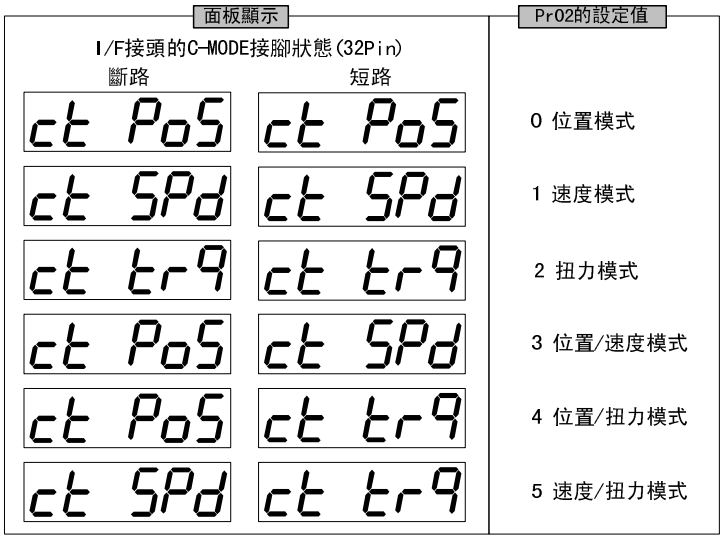
–sign: axis core rotates along CW

Non-sign: axis core rotates along CCW

Scope：–300 ~ 300 (100% in rated torque)

Unite：%

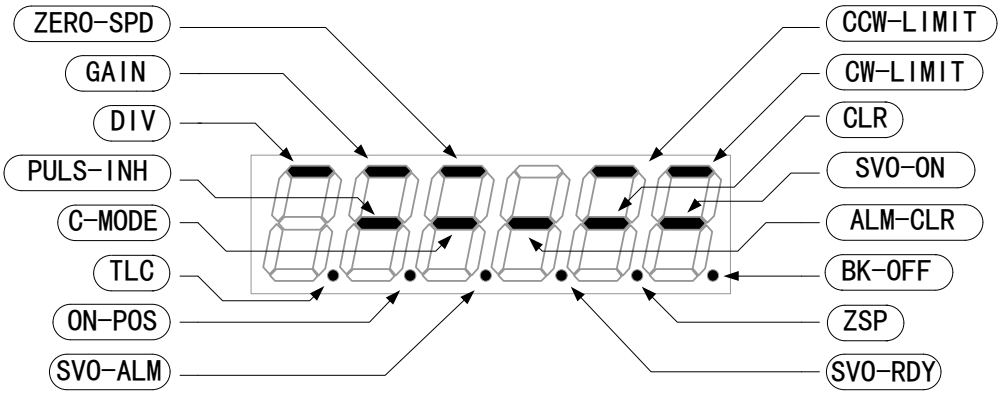
• Display of Control Mode



• Display of state of output signal

It's used to display the state of input/output signal connecting to I/F.

It's can be used to test whether the wiring is correct or not.



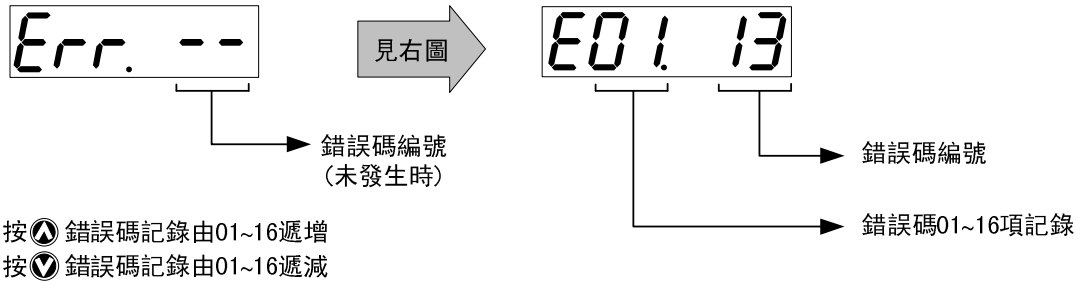
▬ lights, it means that the signal input switch is on. ● lights, it means the signal input switch is off.

* About the names and functions of all output signals, refer to the conneciton of all control modes.

* It's switch connecting CCW-LIMIT and CW-LIMIT, use B connection of usually closed switch.

• Display of Anomaly Record

Including current one, it can trace back to causes of the last 14 alarms.



按▲ 錯誤碼記錄由01~16遞增
按▼ 錯誤碼記錄由01~16遞減

Error Code and its Contents:

Error Code	Name	Error Code	Name
--	No fault	20	Protection of faults of encoder A and B
11	Voltage protection--controlling power shortage	21	Protection of faults of encoder communication
12	overvoltage protection	24	Protection of excessive position deviation
13	Voltage protection--main power shortage	26	Overspeed protection
14	Excessive current protection	36	Protection of EEPROM parameters faults
15	Overheating protection	37	Protection of EEPROM check code faults
16	Overload protection	38	Protection of inhibition input of driver
18	Flyback overload protection	48	Protection of fault of Z phase of encoder
99	Protectiono of excessive current of driver hardware		

＊ The 11th , 13th ,36th ,37th and 38th error code will not be maintained in the record.

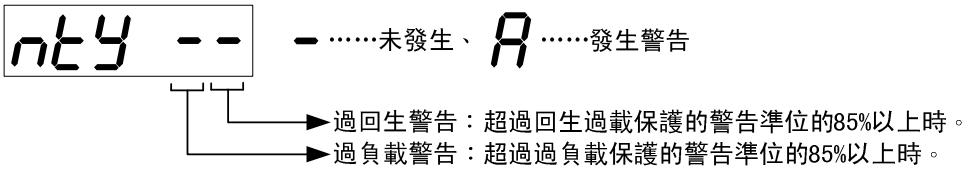
The causes of often occurred fautls:

Error Code	Name	Causes
Err.11	Voltage protection--controlling power shortage	While DSP is low voltage, inhibit process of EEPROM and display error.
Err.12	overvoltage protection	Occurs while voltage is over AC 260V.
Err.13	Voltage protection--main power shortage	Occurs while voltage is lower than AC 170V or connection of single phase power isnot correct.
Err.18	Flyback overload protection	Occurs while DC-bus is over DC400V(AV283V), flyback rate is 100%, the bench-mark of flyback limit is DC 368V, 0%, and DC 395V, 85%.
Err.20 Err.48 Err.21	Protection of faults of encoder A and B Protection of fault of Z phase of encoder Protection of faults of encoder communication	Verify whether connector of SIG encoder correctly connect to driver. Verify connection of male and female connector of encoder cable is correct.
Err.14 Err.99	Excessive current protection Excessive current protection of driver hardware	Verify whether motor power(U,V,W) is short circuit or loose.

- **Display of Software Version**

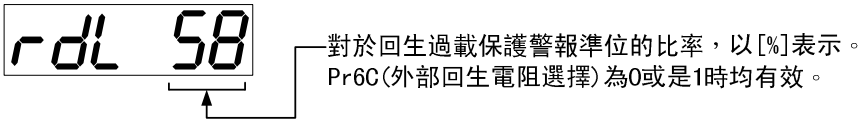
To display the software version of driver.

- **Alarm Display**

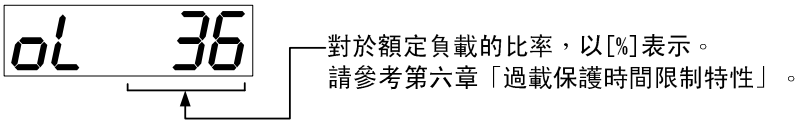


Over 85%, the LED panel will keep on flickering.

- **Display of Fyback Load Rate**



- **Display of Overload Rate**

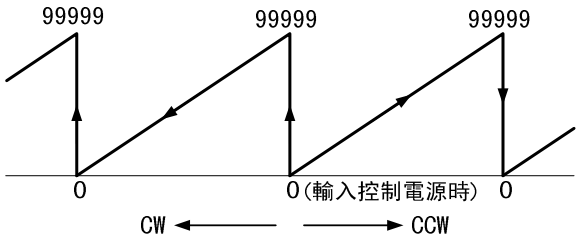


• Display of Sum of Regeneration Pulses and Commnad Pulses.

Scope：0～99999

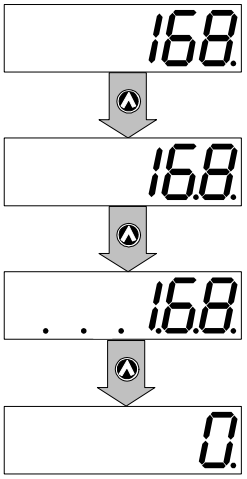
Unit：Pules

Sum of pulses after inputting control power. The following graph is display of overflow.



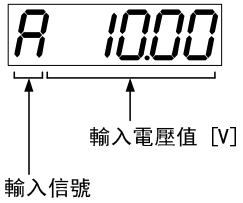
持續壓住 ▲ 時，
「•」會往左方增加。

［清除為0的執行顯示］



When the sum of pusls are any numbers, continuously press ▲ key for about 3 seconds, and the sum of regeneration pulses and command pulses will be zero clearing.

• Display of Analog Input Data



Press ▲ ▼ to choose the signal No. that you expect to monitor.

Note: voltage over ±10V can not display correctly.

3-4 **Parameter Setting Mode**

. Operation of Choosing Screen:

From the initial state of LED,

press MODE twice,

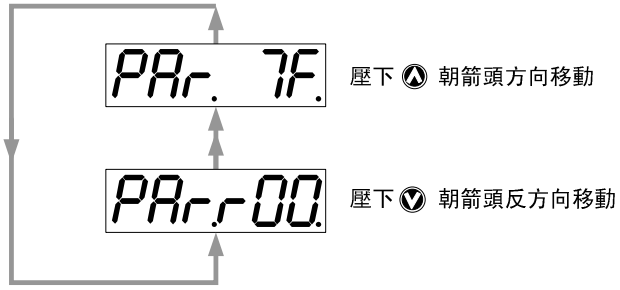
parameter setting mode 

的顯示

參數No.（16進位）

<說明事項>
若在此行有顯示”r”的參數，變更後存入EEPROM的內容需再次將電源關閉後才會有效。

Press ▲ or ▼ to choose the parameter No.



• Operation of Execution Srceen

Press SET to 

的執行顯示

閃爍小數點所在的位數，表示可變更的位數。

參數值

<說明事項>
每個參數均有限制可往上移動的位數。

① Press ◀ to move dot to the modifying positon.

② Press ▲ or ▼ to set the parameter value.

Use ▲ to increase valueand ▼ to decrease value.

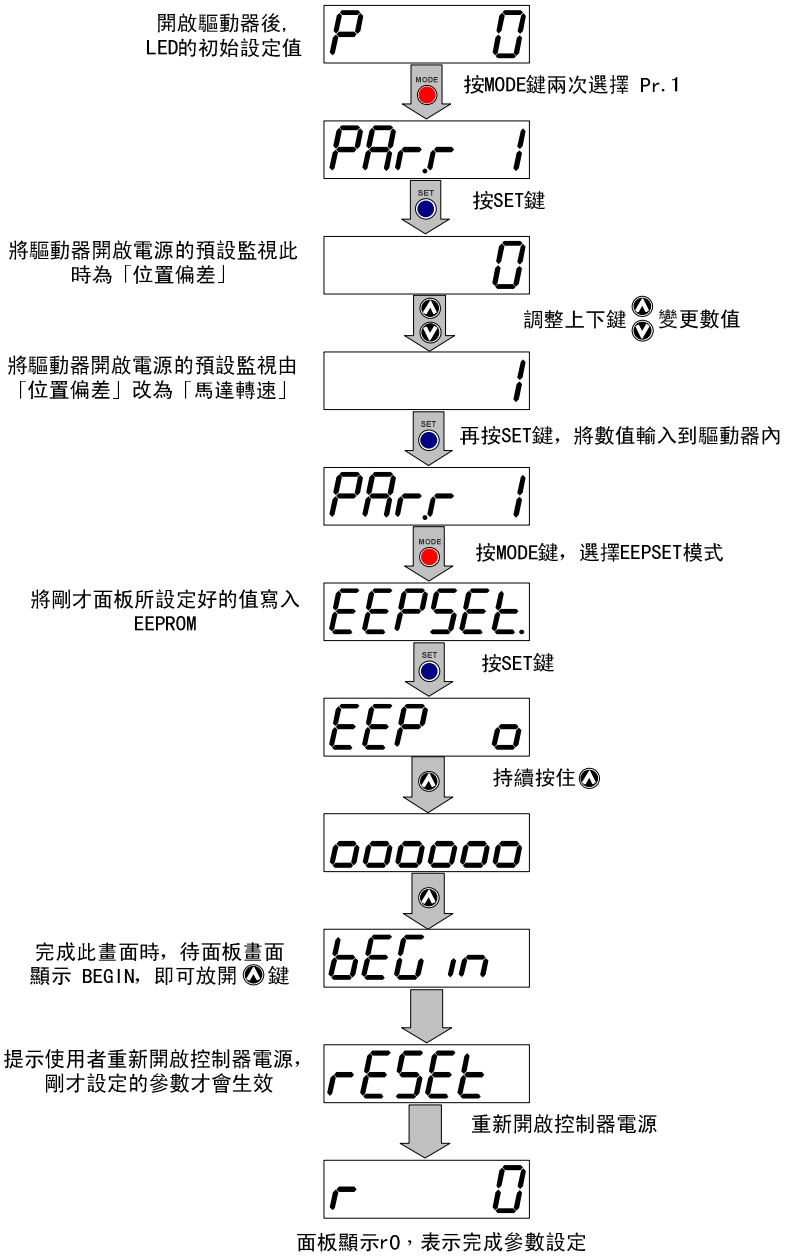
After setting parmeters, refer to the structure of all modes in P28 and return to choice selection.

<Instruction>

After modifying parameters, press SET, the values will be sent to control result; so the modificaiton of parameters greatly affecting motor(especially speed loopgain, position loop gain etc) shall not be made dramatically at one step and shall be ajusted with finetuning way.

• Instruction of Parameter Setting

Instruction of initial display example of PAr.r 1 LED



<Remarks>

- As to the parameters that will be effective after modificaiotn and reset, as they are modified and completed, it will display rESEt that “Please first power off the driver and reopen it again!”.
- While EEPROM is writing in, do not shut down power, or else it produce errors. In case similar error happens, reset all parameters and confirm them totally, then execute it.
- While writing in incorrectly, execute it again. If doing it several times, there are still errors, it may be faults.

3-5 EEPROM Writing-in Mode

3-5-1 EEPROM Writing-in Mode

˙Operation of Choosing Screen:

From the initial state of LED,

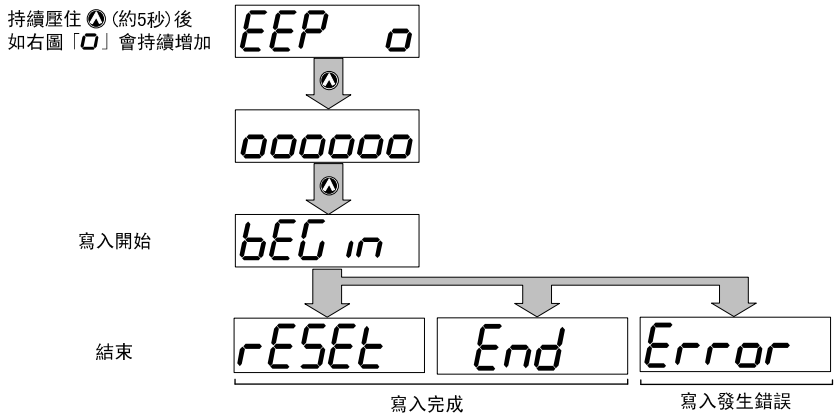
press MODE three times to enter into EEPROM mode.

Now press or to set writing-in parameters of EEPROM or writing-n factory defautl value of EEPROM.

• Operation of Execution Srceen:

Under option screen of EEPSEt., press SET to choose EEP o execution display.

While executing writing-in, continuously press until bEG in is displayed.



Modification will be effective only after it is reset. While modification of setting parameters and completion of writing-in, sreen will display rESEt, which means that “Please first power off the driver and reopen it again!”.

<Remarks>

- While EEPROM is writing in, do not shut down power, or else it produce errors. In case similar error happens, reset all parameters and confirm them totally, then execute it.
- While writing in incorrectly, execute it again. If doing it several times, there are still errors, it may be faults.

3-5-2 Write in FactoryDefault Value in EEPROM

˙Operation of Choosing Screen:

From the initial state of LED,

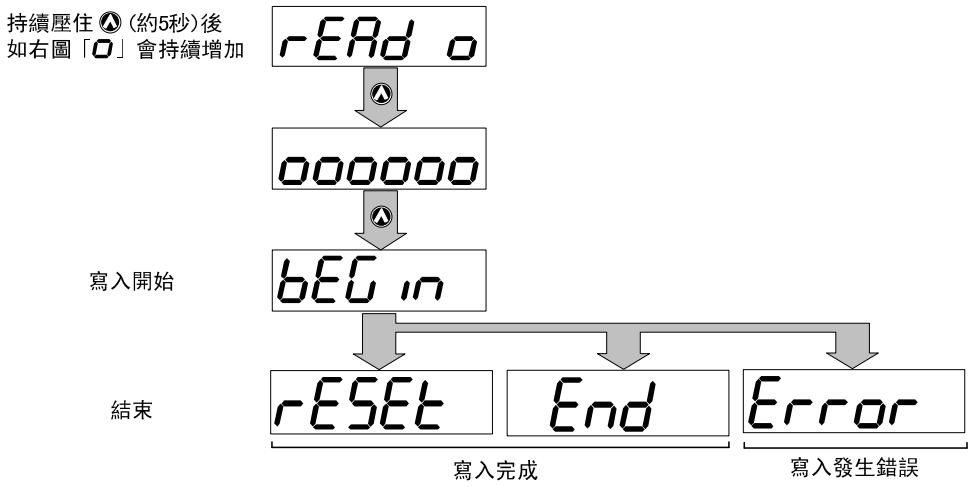
press MODE three times to enter into EEPROM writing-in mode.

Now press or to set writing-in parameters of EEPROM or writing-n factory defautl value of EEPROM.

• Operation of Execution Srceen:

Under option screen of EEPdEF, press SET to choose rEAd o execution display.

While executing writing-in, continuously press until bEG in is displayed.



<Remarks>

- While EEPROM is writing in, do not shut down power, or else it produce errors. In case similar error happens, reset all parameters and confirm them totally, then execute it.
- While writing in incorrectly, execute it again. If doing it several times, there are still errors, it may be faults.

3-6 Rigid Setting Mode

• Rigid setting and inertia adjustment

<Emphasis>

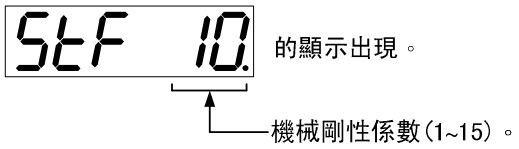
●While using rigid setting mode, internal control parameter of driver can be used to drive motor, it shall be set after load will not affect operation.

●Because of loads, after adjustment, it may cause shock or vibration, pay attention to safety and flexibly apply Pr14(time constant of torque filter) to prevent noise and Pr20(inertia rate) to reduce shock to make adjustment.

• Operation of Choosing Screen:

From the initial state of LED,

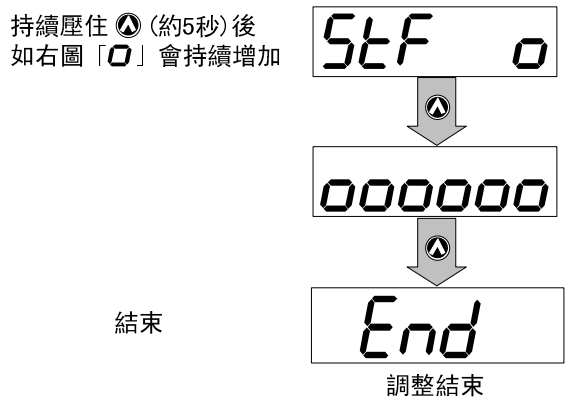
press MODE four times to enter into rigid setting mode.



Now press ▲ or ▼ to set mechanical rigid factor(1~15).

• Operation of Execution Srceen:

Press SET to display StF o execution screen。



<Attention>

For avoiding the lost of gain while closing power, write in setting value in the EEPROM.

While adustment is wrong, adjust the gain parameter back to the previous data. Except abnormality, servo motor will not cease. Moreover, as load difference , sometimes machine will produce vibration but not faults, so pay attention to the safety.

3-7 Auxiliary Function Mode

3-7-1 Testing Run

Connector I/F can be tesing run while it doesnot connect upper-level control device such as PLC.

<Attention>

●Separate motor and load, and pluck out connector I/F prior to usage.

●For avoiding abnormaly caused by vibration, user parameters(especially Pr11~Pr14, Pr20) shall be set to initial value.

·Check Before Test

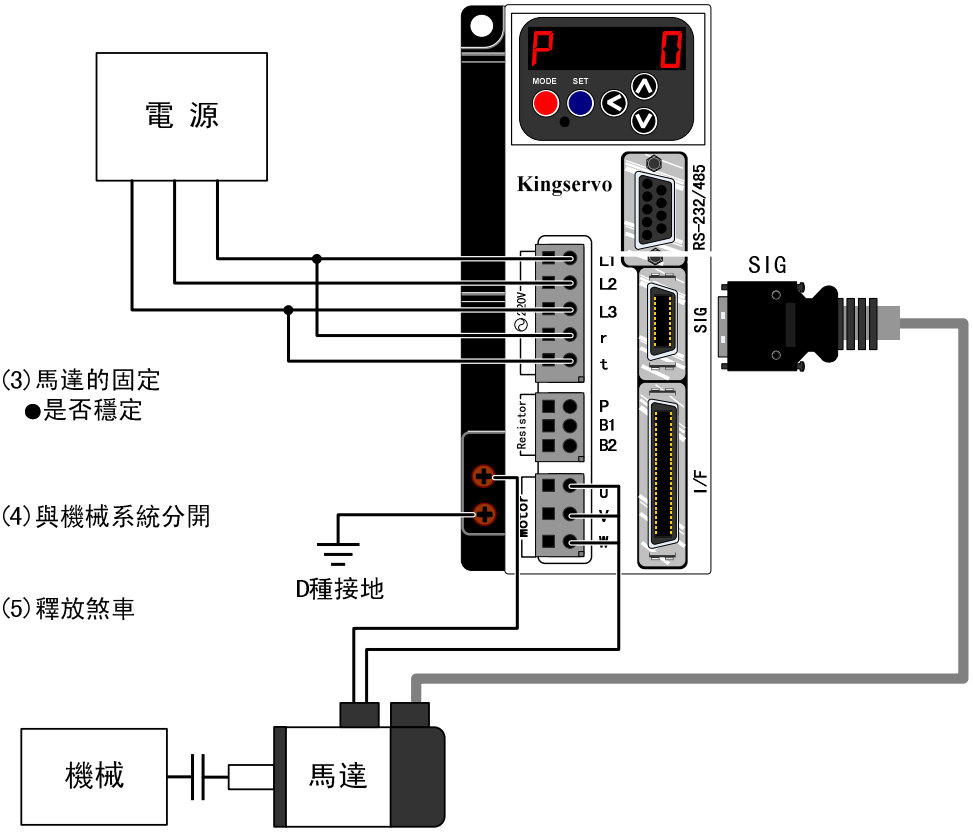
⑴配線的檢查
●是否正確
（特別是電源輸入、馬達輸出）
●有無短路，同時確認接地線是否連接
●連接部有無脫落

⑵電源、電壓的確認
●電壓是否符合規格

⑶馬達的固定
●是否穩定

⑷與機械系統分開

⑸釋放煞車



⑸測試運轉結束之後，請按下 SET 切換成Servo OFF。

• Steps of testing run

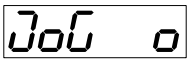
• Operation of Choosing Screen:

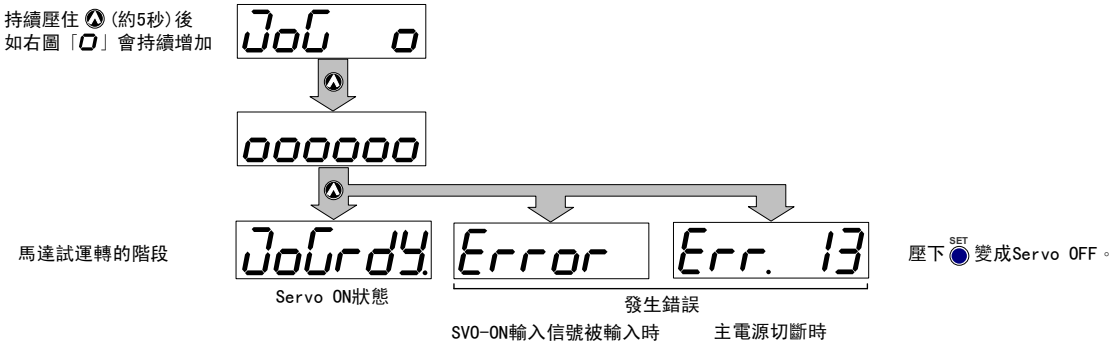
From the initial state of LED,

press MODE five times to enter into auxiliary mode.

Press ▲▼ to display  的顯示出現。

• Operation of Execution Srceen:

Press SET to display  execution screen.



Press ▲, motor rotates along CCW; press ▼, motor rotates along CW. Rotate motor with the speed set according to Pr57(JOG speed).

Free ▲▼, and the motor will cease at once.

After testing run, refer to the structure of all modes in P28 and return to option screen.

3-7-2 Clearance of Abnormality Alarm

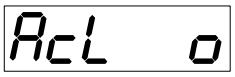
- **Operation of Choosing Screen:**

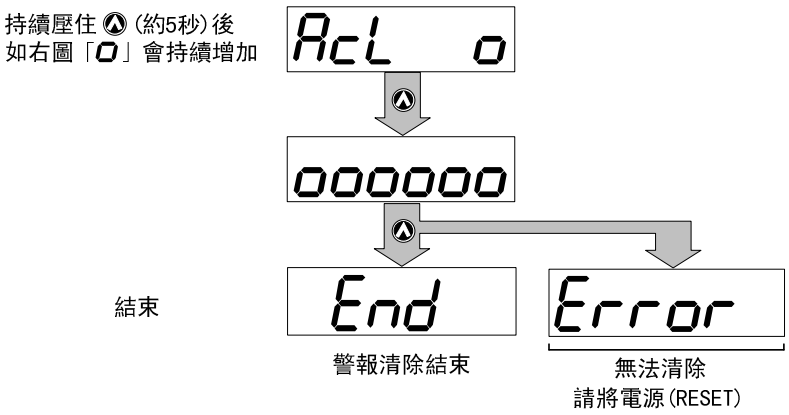
From the initial state of LED,

press MODE five times to enter into auxiliary mode.

Press ▲▼ to display  的顯示出現。

- **Operation of Execution Srceen:**

Press SET to display  execution screen.



3-7-3 Automatic OFFSET Adjustment

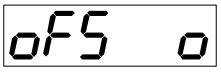
• Operation of Choosing Screen:

From the initial state of LED,

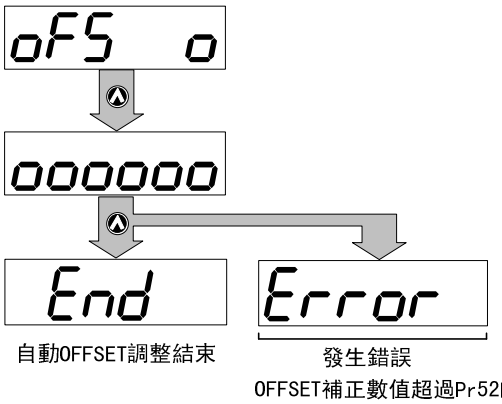
press MODE five times to enter into auxiliary mode.

Press ▲▼ to display  的顯示出現。

• Operation of Execution Srceen:

Press SET to display  execution screen.

持續壓住 ▲ (約5秒)後
如右圖「0」會持續增加



調整結束

自動OFFSET調整結束

發生錯誤
OFFSET補正數值超過Pr52的設定範圍

<Instruction>

While in position control mode, the mode is not effective.

While only executing automatic OFFSET adjustmet, data will not written into EEPROM.

After it, if requiring responding result, write in them into EEPROM.

3-7-4 Clearance of Abnormality Record

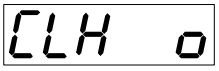
- **Operation of Choosing Screen:**

From the initial state of LED,

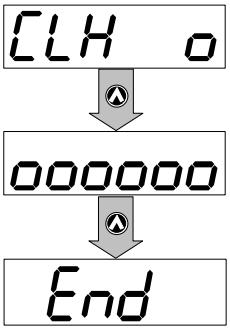
press MODE five times to enter into auxiliary mode.

Press ▲▼ to display  的顯示出現。

- **Operation of Execution Srceen:**

Press SET to display  execution screen.

持續壓住 ▲ (約5秒)後
如右圖「0」會持續增加



結束

異常履歷清除結束

<Instruction>

The function can clear the abnormaly record.

Chapter Four　Parameters

4-1Setting of Parameters and Modes

4-1-1Introduction of Parameters

Driver has parameters setting features and functions. The chapter will introduce the funciton of every parameter. Read it carefully and ajust parameters to the best　operating condition before application.

4-1-2 Setting Method

The setting mothod of parameters is as following:

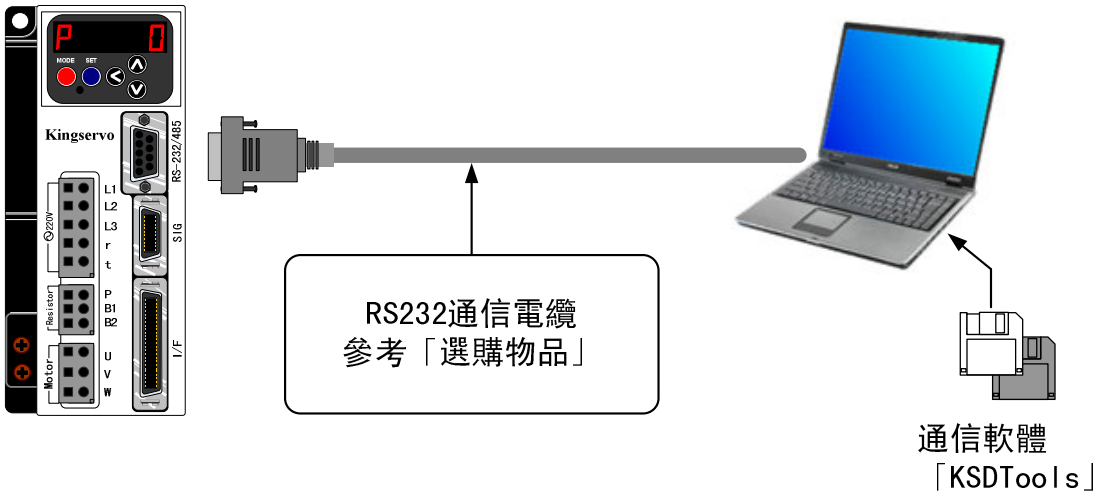
1.Front panel of machine

2.Set supporting software KSDTools by combining with computer.

<Instruction>

About the setting method of computer screen, refer to the munual of KSDTools.

4-1-3 Connection Method



4-1-4Contents and List of parameters

Type	Parameter No. (Pr□□)	Abstract
Function Seletcion	00 to 0F	selection of control mode, designation of input/output signal, setting of communicaiton transition rate etc
Adjustment	10 to 20 27 to 2B	(first and second)servo gain of position, speed and integral tec or setting of time constant of all filters. External noise detector, CCW and CW torque control offset etc.
	30 to 3D	shift related setting of the first gain to the second gain.
Position Control	40 to 4D	setting of input form and direction of commnad pulse, setting of division of output pulse of encoder and setting of division rate of command pulse etc.
Speed Control and Torque Control	50 to 5A 74 to 77	nput gain setting, rotary limit setting and offset adjustment of speed commander, internal speed(1 to 4 level) setting and setting of accelerating/decelerating time etc.
	5B to 5E	input gain setting, rotary limit setting and offset adjustment of torque commander
Program	60 to 6C	setting of output signal detection condition of on-position, zero speed attainment etc. while main power off, alarm occurs and Servo OFF, speeddown operation or setting of release condition of differential counter.

More information, refer to the parameter setting of all control modes.

●The introduction of marks of all modes is as following.

Mark	Control Mode	Setting value of Pr02
P	positon control	0
S	speed control	1
T	torque control	2

Mark	Control Mode	Setting value of Pr02
P/S	Positon(first)and speed(second) control	3＊
P/T	Positon(first)and torque(second) control	4＊
S/T	Speed(first)and torque(second) control	5＊

＊ if 3.,4and 5 complex modes are set, one of the first and second modes can be chosen according to control mode shift input(C-MODE).

While C-MODE is broken circuit, the first mode is chosen

While C-MODE is short circuit, the second mode is chosen.

Before and after 10ms of shift, don't input command.

功能選擇的相關參數

Parameter No. (Pr□□)	Function	Pre-set value	Range	Unit	Applicable Mode
★00	(Used by Manufacturer)				
★01	LED initial display state	0	0~12	-	All
★02	Control mode setting	0	0~5	-	All
03	Invalid analog torque limit input	1	0~1	-	P，S
★04	Invalid drive inhibition input	1	0~2	-	All
05	Ixternal/external shift of speed setting	0	0~3	-	S
06	Invalid zero speed clamp	0	0~2	-	S，T
07	Speed monitor option	3	0~9	-	All
08	Torque monitor option	0	0~7	-	All
09	Output option during torque limit	0	0~4	-	All
0A	Output option of zero speed detection	1	0~4	-	All
★0C	Setting of RS232C communicaiton baud	3	0~3	-	All

● Modification of parameter No. marked with ★ will be effective only after control power is reset.

增益/濾波器時間常數等調整的相關參數

Parameter No. (Pr□□)	Function	Pre-set value	Range	Unit	Applicable Mode
10	First position loop gain	47	1~2000	1/S	P
11	First speed loop gain	36	1~3500	Hz	All
12	Time constant of first speed loop integral	28	0~1000	0.01ms	All
13	First speed detection filter	0	0~5	-	All
14	Time constant of first torque filter	65	25~2500	0.01ms	All
15	Speed feed-forward	300	0~1500	0.1%	P
16	Time constant of speed feed-forward filter	50	0~6400	0.01ms	P
18	Second position loop gain	54	1~2000	1/S	P
19	Second speed loop gain	36	1~3500	Hz	All
1A	Time constant of second speed loop integral	130	0~1000	ms	All
1B	Second speed detection filter	0	0~5	-	All
1C	Time constant of second torque filter	65	25~2500	0.01ms	All
1D	Notch filter frequency	1600	50~1600	Hz	All
1E	Notch filter width	4	0~4	-	All
20	Inertia ratio	0	0~10000	-	All
27	External noise detection	0	0~8	-	All
28	External noise detection filter	0	0~6400	0.01ms	All
2A	CCW torque control offset	0	-127~127	5mV	All
2B	CW torque control offset	0.	-127~127	5mV	P，S

調整的相關參數(第2增益切換功能相關)

Parameter No.(Pr□□)	Function	Pre-set Value	Range	Unit	Applicable Mode
30	Second gain action setting	0	0~1	-	All
31	Position control shift mode	7	0~8	-	P
32	Position control shift delay time	5	0~10000	ms	P
33	Position control shift level	100	0~10000	-	P
34	Position control shift width	30	0~10000	-	P
35	Position gain shift time	4	0~10000	(set value+1)ms	P
36	Speed control shift mode	0	0~5	-	S
37	Speed control shift delay time	0	0~10000	ms	S
38	Speed control shift level	0	0~10000	-	S
39	Speed control shift width	0	0~10000	-	S
3A	Torque control shift mode	0	0~3	-	T
3B	Torque control shift delay time	0	0~10000	ms	T
3C	Torque control shift level	0	0~10000	-	T
3D	Torque control shift width	0	0~10000	-	T

位置控制的相關參數

Parameter No.(Pr□□)	Function	Pre-set Value	Range	Unit	Applicable Mode
★40	Command pulse input option	0	0~1	-	P
★41	Command pulse reversion	0	0~1	-	P
★42	Pulse input mode setting	1	0~3	-	P
43	Invalid input commnad pulse inhibition	1	0~1	-	P
★44	Output pulse pre-division of every reversion	1	1~255	-	P
★45	Feedback pulse output logic RP	0	0~1	-	P
46	First instruction division multiple numerator	1	1~10000	-	P
47	Second instruction division multiple numerator	1	1~10000	-	P
★48	FIR smooth setting	0	0~3	-	P
49					
4A	Multiplication of instruction division multiplicaiotn numerator	0	0~17	-	P
4B	Instruction division multiplication denominator	1	1~10000	-	P
4C	Smooth filter setting	1	0~7	-	P
4D	Counter clearance input mode	1	0~2	-	P

● Modification of parameter No. marked with ★ will be effective only after control power is reset.

速度/扭力控制的相關參數

Parameter No.(Pr□□)	Function	Pre-set Value	Range	Unit	Applicable Mode
50	Speed control input gain	500	10~2000	rpm/V	S，T
51	Speed control input reversion	1	0~1	-	S
52	Speed control offset	0	-2047~2047	0.3mV	S，T
53	First speed of speed setting	0	-10000~10000	rpm	S
54	Second speed of speed setting	0	-10000~10000	rpm	S
55	Third speed of speed setting	0	-10000~10000	rpm	S
56	Fourth speed of speed setting	0	-10000~10000	rpm	S，T
74	Fifth speed of speed setting	0	-10000~10000	rpm	S
75	Sixth speed of speed setting	0	-10000~10000	rpm	S
76	Seventh speed of speed setting	0	-10000~10000	rpm	S
77	Eighth speed of speed setting	0	-10000~10000	rpm	S
57	Jog speed setting	200	1~2000	rpm	All
58	Acceleration time setting	0	0~10000	1ms/(1000rpm)	S
59	Speed-down time setting	0	0~10000	1ms/(1000rpm)	S
5A	S-shape speed-up/speed-down time setting	0	0~1000	2ms	S
5B	Torque command option	0	0~1	-	T
5C	Torque control input gain	30	10~100	0.1V/100%	T
5D	Torque control input reversion	0	0~1	-	T
5E	Torqeu limit setting	300	0~300	%	All

程序的相關參數

Parameter No.(Pr□□)	Function	Pre-set Value	Range	Unit	Applicable Mode
60	On-position range	10	0~32767	Pulse	P
61	Zero speed	50	10~10000	rpm	All
62	Speed attainment	1000	10~10000	rpm	S，T
63	Setting of excessive position deviation	20000	1~32000	Pulse	P
64	Invalid abnormality of excessive position deviation	0	0~1	-	P
65	On-position output setting	0	0~3	-	P
66	State during drive inhibition input	0	0~1	-	All
68	Sequence control while alarm souds	0	0~3	-	All
69	Sequence control while server is closed	0	0~7	-	All
6A	Mechanical brake action setting while machine ceases	0	0~200	ms	All
6B	Mechanical brake action setting while action	0	0~200	ms	All
★6C	Retrogradation resistance impressing option	0	0~2	-	All

●Modification of parameter No. marked with ★ will be effective only after control power is reset.

4-2 Instruction of Parameter Function

【 】: represents factory default value

★ : reprensents that power need be restarted while modifying parameters.

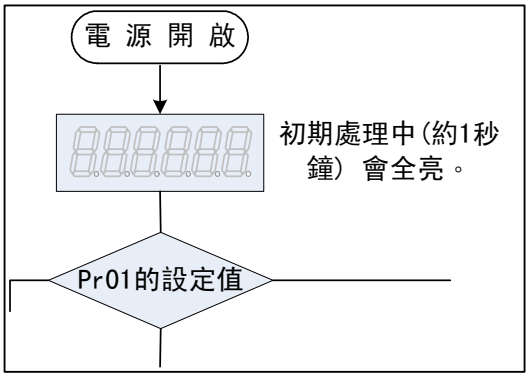
Pr01 |LED Initial Display ★

Initial Value :【 0 】

Setting Range : 0~12

Unit : –

Function : Choose data type displayed by LED in the front panel during the initial stage of power being on.



Set Value	Contents
【 0 】	Position Deviation
1	Rotary Speed of Motor
2	Torque Output
3	Control Mode
4	I/O Signal State
5	Abnormality Record
6	Software Version
7	Warning Notice
8	Retrogradation Load Rate
9	Overload Load Rate
10	Sum of Feedback Pulse
11	Sum of Command Pulse
12	Analog Input Value

Pr02 | Control Mode Setting ★

Initial Value：【0】

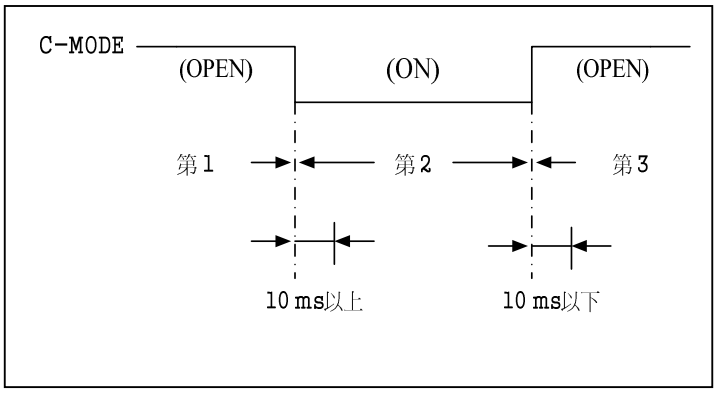
Setting Range：0~5

Unit：–

Function：Set control mode.

Setting Value	Control Mode	
	First Mode	Second Mode
【0】	Position	—
1	Speed	—
2	Torque	—
3	Position	Speed
4	Position	Torque
5	Speed	Torque

If setting is a complex mode (Pr02=3,4,5), control mode shift input (C-MODE) is used to make shift between first and second mode.



＜Attention＞

After 10ms of C-MODE input, input commander.

Position, speed and torque instruction are not allowed to input.

Pr03 | Analog Torque Limit Input Invalidity ★

Initial Value :【 1 **】**

Setting Range : 0~1

Unit : –

Function : This is the parameter that can make analog torque limit input (CCWTL,CWTL) signal invalid.

1: invalid input

0: valid input

If not using torque limit function, set Pr03 to “1”.

This parameter is invalid in the torque control mode, CCW/CW torque limit value will be set by Pr5E.

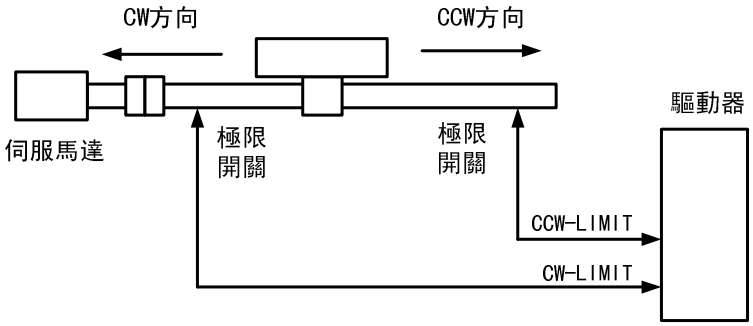
Pr04 | Drive Inhibition Input Invalidity ★

Initial Value :【1】

Setting Range : 0~2

Unit : –

Function : Especially in straight-line drive, for avoiding mechanical damage caused by machine overun the range(as shown in the following figure), limit switches are set in both sides of axis to prohibit drive from moving to direction of switch operation. Dirver owns drive inhibition funciton and sets the action of drive inhibition input.



Set Value	CCW-LIMIT/ CW-LIMIT Input	Input	Connect COM-	Action
0	Valid	CCW-LIMIT (CN I/F,Pin-9)	Close	Close normal state of limit switch in the end of CCW
			Open	CCW is prohited、CW is permitted
		CW-LIMIT (CN I/F,Pin-8)	Close	Close normal state of limit switch in the end of CW
			Open	CW is prohited、CCW is permitted.
【1】	Invalid	Ignore CCW-LIMIT/CW-LIMIT input，drive inhibition funciton is invalid		
2	Valid	If one of CCW/CW inhibtion inputs is open circuit with COM-, Err38(drive inhibition input protection) occurs.		

<Notes>

1. As Pr04 setting is 0 and drive inhibition input valid, program set by Pr66(drive inhibition time program) is used to make speed-down and cease. For detail, refer to instruction of Pr66.
2. If Pr04 setting is 0 and CCW-LIMIT and CW-LIMIT input is open meanwhile, driver is judged as abnormal state, Err38(drive inhibition input protection) will occur.
3. While used in the vertical axis and limit switch at the top of work piece acts, it may cause disappearance of upward torque and work piece to move downward. At the moment, donot use this function and use upper-level controller to process trip limit.

Pr05 | Internal/external shift of speed setting ★

Initial Value：【1】

Setting Range：0~3

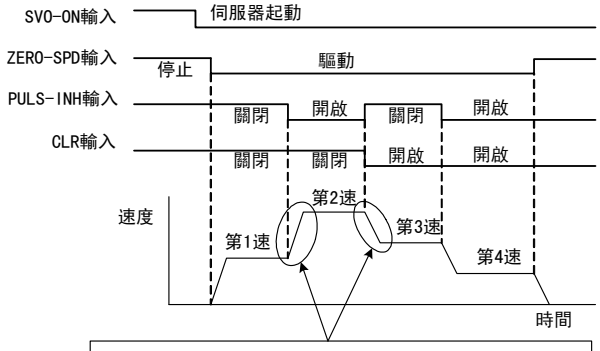
Unit：–

Function：set internal speed of simple execution speed control node.

- Set the validity of internal speed setting.
- 8 types of internal speed. Their instruction data are setting to Pr53（1st speed）、Pr54（2nd speed）,Pr55（3rd speed）,Pr56（4th speed）,Pr74（5th speed）,Pr75（6th speed）,Pr76（7th speed）and Pr77（8th speed）.
- As setting value is 1 or 2, shift of 4 internal speed commands is selected by 2 inputs.
  - PULS-INH（CN I/F，Pin-33）：Option input of first speed of speed setting
    CLR（CN I/F，Pin-30）：Option input of 2nd speed of speed setting, ignore DIV input.
- As setting value is 3, shift of 8 internal speed commands is selected by 3 inputs.
  - PULS-INH（CN I/F，Pin-33）：Option input of first speed of speed setting
  - CLR（CN I/F，Pin-30）：Option input of second speed of speed setting
  - DIV（CN I/F，Pin-28）：Option input of third speed of speed setting

PULS-INH (Pin-33)	CLR (Pin-30)	DIV (Pin-28)	Pr05 Setting Value			
			0	1	2	3
OFF	OFF	OFF	Analog speed command (CN I/F，Pin-14)	1st speed of internal speed（Pr53）	1st speed of internal speed（Pr53）	1st speed of internal speed（Pr53）
ON	OFF	OFF	Analog speed command (CN I/F，Pin-14)	2nd speed of internal speed（Pr54）	2nd speed of internal speed（Pr54）	2nd speed of internal speed（Pr54）
OFF	ON	OFF	Analog speed command (CN I/F，Pin-14)	3rd speed of internal speed（Pr55）	3rd speed of internal speed（Pr55）	3rd speed of internal speed（Pr55）
ON	ON	OFF	Analog speed command (CN I/F，Pin-14)	4th speed of internal speed（Pr56）	Analog speed command (CN I/F，Pin-14)	4th speed of internal speed（Pr56）
OFF	OFF	ON	Analog speed command (CN I/F，Pin-14)	1st speed of internal speed（Pr53）	1st speed of internal speed（Pr53）	5th speed of internal speed（Pr74）
ON	OFF	ON	Analog speed command (CN I/F，Pin-14)	2nd speed of internal speed（Pr54）	2nd speed of internal speed（Pr54）	6th speed of internal speed（Pr75）
OFF	ON	ON	Analog speed command (CN I/F，Pin-14)	3rd speed of internal speed（Pr55）	3rd speed of internal speed（Pr55）	7th speed of internal speed（Pr76）
ON	ON	ON	Analog speed command (CN I/F，Pin-14)	4th speed of internal speed（Pr56）	Analog speed command (CN I/F，Pin-14)	8th speed of internal speed（Pr77）

- 4 types of varying speed examples using internal speed instruction. Except CL/INH input, if expecting to control motor's drive and cease, input zero speed clamp input (ZERO-SPD) and server on input (SVO-ON).



＜注意＞
加速時間、減速時間、以及S字形加減速時間可使用參數進行個別設定。
請參考本章的Pr58：加速時間設定
Pr59：減速時間設定
Pr5A：S字形加減速時間設定

Pr06 | Zero Speed Clamp Invalidity ★

Initial Value :【0】

Setting Range : 0~2

Unit : –

Function : Set zero speed clamp input（ZERO-SPD：CN I/F PIN 26）.

Setting Value	ZERO-SPD Input（PIN 26）
【0】	Ignore ZERO-SPD input, non-zero speed clamp state.
1	Valid ZERO-SPD Input, if openning with COM-, speed command is 0.
2	If changing to direction sign and openning with COM-, speed command direction is CCW; if keeping short circuit with COM-, its direction is CW.

Pr07 | Speed Monitor (SPM) Option

Initial Value :【3】

Setting Range : 0~9

Unit : –

Function : Make choice and set the relation voltage output to speed monitor signal output(SPM:CN I/F PIN 43) and motor's actual speed and intruction speed.

Setting Value	SPM Signal	Relation Between Output Voltage Level and Speed
【0】	Motor speed	6V/375rpm
1		6V/750rpm
2		6V/1500rpm
3		6V/3000rpm
4		6V/6000rpm
5	Command speed	6V/375rpm
6		6V/750rpm
7		6V/1500rpm
8		6V/3000rpm
9		6V/6000rpm

Pr08 | Torque Monitor(TM) Option

Initial Value :【0】

Setting Range : 0~7

Unit : –

Function : Set relation between output level of analog torque monitor signal(TM:CN I/F,PIN 42) and TM, or deviation pulse number.

Setting Value	TM Signal	Relation Between Output Level and TM, or Deviation Pulse Number
【0】	Torque	3V/100%
1		3V/200%
2		3V/300%
3	Position Deviation	3V/31p
4		3V/125p
5		3V/500p
6		3V/2000p
7		3V/8000p

Pr09 | Output Option During Torque Limit Control ★

Initial Value :【0】

Setting Range : 0~4

Unit : –

Function : Assign the functions of output during torque limit(TLC:CN I/F PIN 40).

Setting Value	Function	Mark of Signal	Remarks
0	Output during torque limit	TLC	About detail of functios of all output mark, refer to instruciton of CN I/F connectors' s wiring.
1	Zero speed detection output	ZSP	
2	Warning signal output	WARN ALL	
3	Over-retrogradation warning output	WARN REG	
4	Overload warning output	WARN OL	

Pr0A |Zero Speed Detection(ZSP) Output Option ★

Initial Value :【0】

Setting Range : 0~4

Unit : –

Function : Assign function of zero speed detection(ZSP:CN I/F PIN 12).
Relation of setting value of Pr0A and ZSP output function is same with TLC output option of above Pr09.

Pr0C | Setting of RS232C Communication Baud ★

Initial Value：【3】

Setting Range：0~3

Unit：–

Function：

Setting Value	Baud
0	19200bps
1	38400bps
2	57600bps
3	115200bps

Pr10 | First Position Loop Gain

Initial Value：【47】

Setting Range：1~2000

Unit：1/S

Function：Decide response of position control.

Large gain setting can shorten position time, but too large setting also may cause vibration.

Pr11 | First Position Loop Gain

Initial Value：【36】

Setting Range：1~3500

Unit：Hz

Function：Decide response of speed loop.

After raising position loop gain, for improving response feature of servo integrity, so speed loop gain also must be improved. But careful attention is that too highersetting value may cause vibration too.

Pr12 | First Speed Loop Integral Time Constant

Initial Value：【28】

Setting Range：1~1000

Unit：ms

Function：Set speed loop integral time constant.

Value is smaller , deviation faster reaches 0 when machine stops.

If setting value is 999, it can still keep integral function.

If setting value is 1000, it has no integral function.

Pr13 | First Speed Detection Filter

Initial Value :【0】

Setting Range : 0~5

Unit : –

Function : Aftere detecting speed, time constant of lowpass filter(LPT) can be set and have six setting sections(0~5). Lager setting value, larger time constant. Although it cam reduce noise produced by motor, but relatively reduce response feature and generally is set to factory value【0】.

Pr14 | First Torque Filter Time Constant

Initial Value :【65】

Setting Range : 25~2500

Unit : 0.01ms

Function : Set time constant of one time delay filter inserted into torque commander section.

Effectively contain vibration caused by reversion resonance

Pr15 | Positive Regeneration of Speed

Initial Value :【300】

Setting Range : 0~1500

Unit : 0.1%

Function : Set speed feed-forward in positon control

Although setting value is larger, postion deviation is smaller and reponse characteristics is improved, but it is easier to cause Over Shoot.

Pr16 | Positive Regeneration Filter

Initial Value :【50】

Setting Range : 0~6400

Unit : 0.01ms

Function : Set time constant of one time delay filter inserted into speed feed-forward section.

Large setting value may cause Over Shoot of speed. If operation noise is too bigger, to set the filter can improve it.

Pr18 | Second Position Loop Gain

Initial Value：【54】

Setting Range：1~2000

Unit：1/S

Function：Set position loop, speed loop, speed detection filter and torque instruction filter. All have two groups of gains or time constant(first, second). Their funcitons/contents are same with time constant of above first gain.

Pr19 | Second Speed Loop Gain

Initial Value：【36】

Setting Range：1~3500

Unit：Hz

Function：Refer to Pr18

Pr1A | Second Speed Loop Integral Time Constant

Initial Value：【130】

Setting Range：1~1000

Unit：ms

Function：Refer to Pr18

Pr1B | Second Speed Detection Filter

Initial Value：【0】

Setting Range：0~5

Unit：-

Function：Refer to Pr18

Pr1C | Second Torque Filter Integral Time Constant

Initial Value：【65】

Setting Range：25~2500

Unit：0.01ms

Function：Refer to Pr18

Pr1D | NOTCH Frequency

Initial Value：【1600】

Setting Range：50~1600

Unit：Hz

Function：Set frequency of resonance restraint NOTCH filter.

If the parameter is set to “1600”, then NOTCH filter is invalid.

Pr1E | NOTCH Width

Initial Value：【4】

Setting Range：0~4

Unit：-

Function：Make 5 stages setting for width of resonance restraint NOTCH filter. larger setting, larger width. Factroy setting is generally used.

Pr20 | Inertia Ratio

Initial Value：【0】

Setting Range：0~10000

Unit：-

Function：Set ratio of load inertia and rotor inertia

Pr20＝（load inertia/rotor inertia）× 100%

If inertia ratio is set correctly, then setting unit of Pr11 and Pr19 is Hz.

As Pr20 inertia ratio is larger than actual ratio, setting unit of speed loop gain will be larger.

As Pr20 inertia ratio is smaller than actual ratio, setting unit of speed loop gain will be smaller.

Pr27 | External Noise Observation

Initial Value：【0】

Setting Range：0~8

Unit：-

Function：Set compensation value of external torque noise observation to improve stability of speed loop. Larger compesation value, faster response. However, large setting value easily cause resonance noise.

※If load mechanism is the mechanism with intensely changing inertia, this funciton is not suitable to be open and shall be set to 0.

Pr28 | External Noise Detection Filter

Initial Value：【500】

Setting Range：0~6400

Unit：0.01ms

Function：Set constant of one time delya filter of external torque noise detection compensation to improve resonance noise caused by Pr27 compensation.

Pr2A | CCW Torque Control Offset

Initial Value：【0】

Setting Range：-127~127

Unit：5mV

Function：This parameter is used to adjust OFFSET of external analog instruction system including upper-level device.

Pr2B | CW Torque Control Offset

Initial Value：【0】

Setting Range：-127~127

Unit：5mV

Function：Refer to Pr2A

Pr30 | Second Gain Action Setting

Initial Value：【0】

Setting Range：0~1

Unit： –

Function：Make choice to PI/P action shif and First/Second gain shift.

Setting Value	Gain Option and shift
0	Fixation to first gain(PI/P can be shifted)
1	First/second gain can be shifted.

PI/P action shift is made by gain shift input(GAIN CN I/F PIN 27).

GAIN Input	Speed Loop Action
Open with COM-	PI Action
Connection wihtCOM-	P Action

Pr31 | Position Control Shift Mode

Initial Value：【7】

Setting Range：0~8

Unit：-

Function：Select shift conditon of first and second gains in the control mode.

Setting Value	Gain Shift Condition
0	Fixation to First Gain
1	Fixation to Second Gain
2	As gain shift input（GAIN）is ON, select 2nd gain(Pr30 must be set to 1).
3	As torque instruction changes intensely, select second gain.
4	Fixation to First Gain
5	As instruction speed is big, select second gain.
6	As position deviation is large, select second gain.
7	If there is position instruction, select second gain.
8	If position is not completed, select second gain.

Pr32 | Position Control Shift Delay Time

Initial Value：【5】

Setting Range：0~10000

Unit：ms

Function：Set the time from time of selected shift condition leaving from Pr31 to delay time of actually return first gain.

Pr33 | Position Control Shift Level

nitial Value：【100】

Setting Range：0~10000

Unit：-

Function：It is valid as Pr31 is set to 3~8. set determinant level of first/second gain shift.

Pr34 | Position Control Shift Level Width

Initial Value：【30】

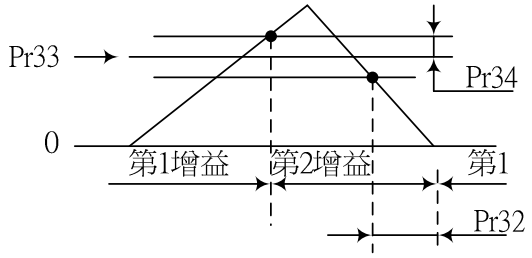
Setting Range：0~10000

Unit： －

Function：Set upper-and-lower sluggish width of determinant level set by above Pr33.

•The definitions of above Pr32(delay), Pr33(level) and Pr34(sluggish) are as following figure.

•It’s valide as the setting values of Pr32(delay), Pr33(level) and Pr34(sluggish) must be absolute value(positive/negative).



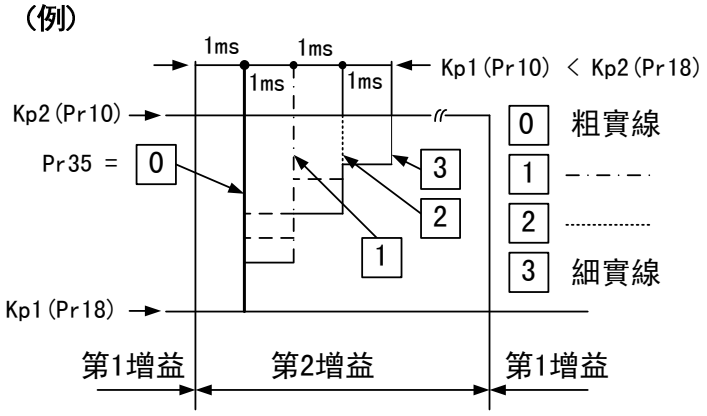
Pr35｜Position Gain Shift Time

Initial Value：【4】

Setting Range：0~10000

Unit：(setting value +1)ms

Function：As second gain shift function is valid and gain is shifting, only set periodic shift time for position loop gain.



- Set shift time as small position loop gain shifts large position loop gain(reduce the impact to machine as dramatic change of gain).
- Setting value should be smaller than KP2 and KP1.

Pr36｜Speed Control Shit Mode

Initial Value：【0】

Setting Range：0~5

Unit： -

Function：In speed control mode, make choice to the shift condition of first/second gain. It's the content that eliminates position control section in Pr31(Position control shift mode).

Setting Value	Gain Shift Condition
0	Fixation to First Gain
1	Fixation to Second Gain
2	As gain shift input（GAIN）is ON, select 2nd gain(Pr30 must be set to 1).
3	As torque instruction changes intensely, select second gain.
4	Fixation to First Gain
5	As instruction speed is big, select second gain.

Pr37 | Speed Control Shift Delay Time

Initial Value：【0】

Setting Range：0~10000

Unit：ms

Function：The content is same with following ones in position control mode.

Pr32：Shift delay time

Pr33：Shift level

Pr34：Shift level width

Pr38 | Speed Control Shift Level

Initial Value：【0】

Setting Range：0~10000

Unit： -

Function：Refer to Pr37

Pr39 | Speed Control Shift Level Width

Initial Value：【0】

Setting Range：0~10000

Unit： -

Function：Refer to Pr37

Pr3A | Torque Control Shift Mode

Initial Value：【0】

Setting Range：0~3

Unit： -

Function：In torque control mode, make choice to the shift condition of first/second gain. It's the content that eliminates position control and speed control section in Pr31

Setting Value	Gain Shift Condition
0	Fixation to First Gain
1	Fixation to Second Gain
2	As gain shift input（GAIN）is ON, select 2nd gain(Pr30 must be set to 1).
3	As torque instruction changes intensely, select second gain.

Pr3B | Torque Control Shift Delay Time

Initial Value：【0】

Setting Range：0~10000

Unit：ms

Function：The content is same with following ones in position control mode.

Pr32：Shift delay time

Pr33：Shift level

Pr34：Shift level width

Pr3C | Torque Control Shift Level

Initial Value：【0】

Setting Range：0~10000

Unit： -

Function：Refer to Pr3B

Pr3D | Torque Control Shift Level Width

Initial Value：【0】

Setting Range：0~10000

Unit： -

Function：Refer to Pr3B

Pr40 | Command Pulse Input Option ★

Initial Value：【0】

Setting Range：0~1

Unit：-

Function：Command pulse input can be input from photo-coupler or line drive exclusive input.

Setting Value	Content
【0】	Optical coupler(I/F PULS1：PIN 3，PULS2：PIN 4，SIGN1：PIN 5，SIGN2：PIN6)
1	Line drive exclusive input(I/F PULSH1：PIN 44，PULSH2：PIN 45，SIGNH1：PIN 46，SIGNH2：PIN 47)

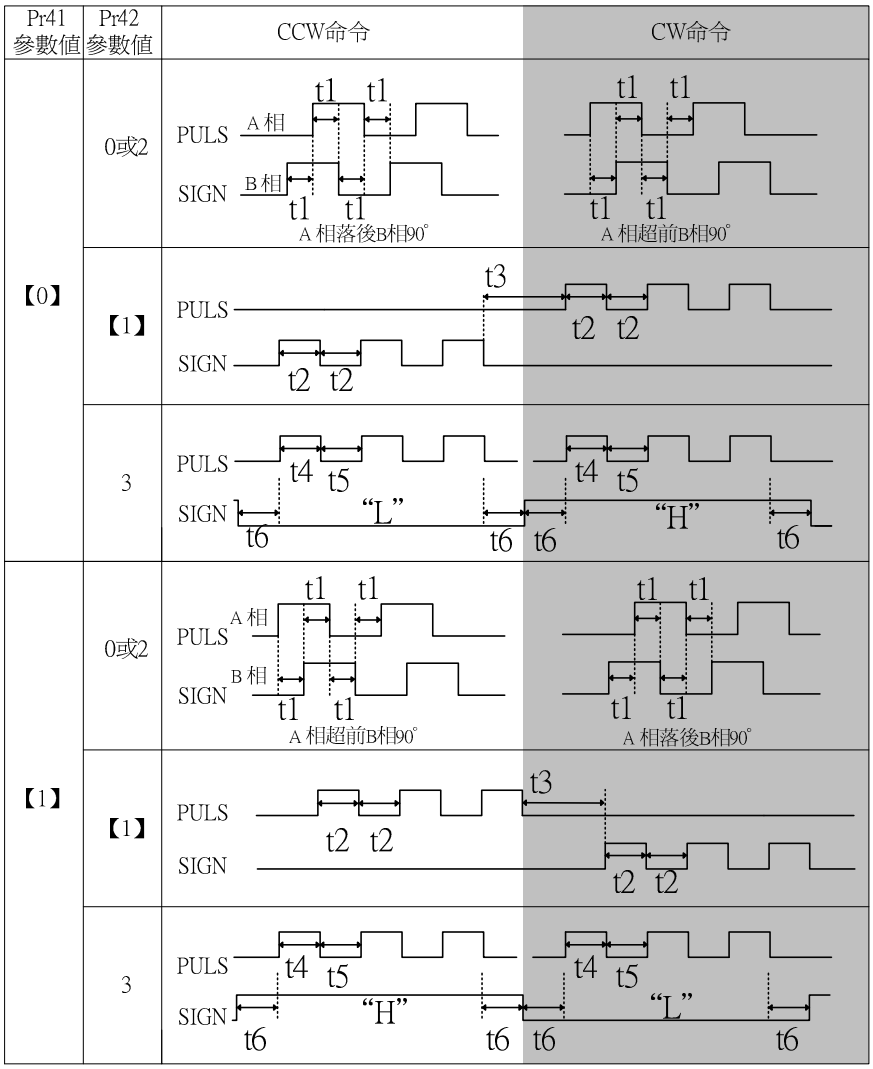
Pr41 | Control Pulse Reversion ★

Initial Value：【0】

Setting Range：0~1

Unit： -

Function：Set rotary direction and form of command pulse for command pulse input.



Pr41=0,

Pr42=0 or 2 Command pulse form is 90° phase differnce of 2 phase pulse(A phase+B phase)

Pr42=1 Command pulse form is CW pulse wave line and CCW pulse wave line.

Pr42=3 Command pulse form is pulse wave line+sign

•Allowable maximum frequency and minimum time range of command pulse input sign.

PULS/SIGN Input Interface		Allowable Input Maximum Frequency	Minimum required time width					
			t1	t2	t3	t4	t5	t6
Line drive executive pusle line interface		2Mpps	500ns	250ns	250ns	250ns	250ns	250ns
Pulse line interface	Lind drive interface	500kpps	2μs	1μs	1μs	1μs	1μs	1μs
	Interface of open zone polarity	200kpps	5μs	2.5μs	2.5μs	2.5μs	2.5μs	2.5μs

Rising/decending time of comman pulse input signa shall be kept lower than 0.1μs.

Pr42 | Pulse Input Mode Setting ★

Initial Value：【0】

Setting Range：0~3

Unit： -

Function: as same as Pr41

Pr43 | Input Command Pulse Inhibition Invalidity

Initial Value：【0】

Setting Range：0~1

Unit： -

Function：Select between valid/invalid command pulse input inhibition input(PULS-INH：CN I/F PIN 33).

Setting Value	PULS-INH Input
0	Valid
1	Invalid

As PULS-INH is open with COM-, Command pulse input is inhibited.

If INH input is not applied, set Pr43 to 1. It's not necessary to connect PULS-INH（CH I/F PIN 33）with COM-(PIN 41) outside of driver.

Pr44 | Output Pulse Pre-division of Every Reversion ★

Initial Value：【1】

Setting Range：0~225

Unit： -

Function：Set pre-division of one reversion pusle number of encoder pulse input to upper-level device.

Pr45 | Feedback Pulse Output Logic RP ★

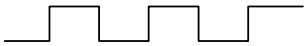
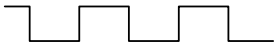
Initial Value :【 0 **】**

Setting Range : 0~1

Unit : -

Function : The phase relation of output pulses of rotary encoder is that B phase wave system is lag behind A phase wave system as they rotate along CW, but B phase waves keep ahead of A phase waves as they rotate along CCW.

This parameter can be used to reverse logic of B phase pusle wave and the B phase pulse wave relation relating with A phase pulse wave.

Setting Value	A Phase（OA）	Motor CCW Rotation	Motor CW Rotation
0	B Phase（OB） Non-Reversion		
1	B Phase（OB） Reversion		

Pr46 | First Instruction Division Multiple Numerator

Initial Value :【 1 】

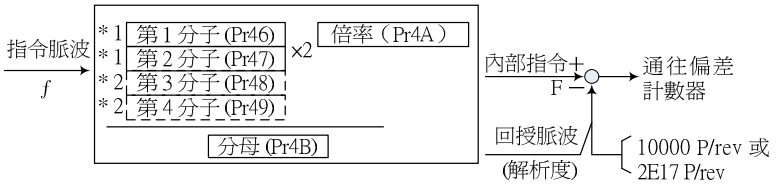
Setting Range : 1~10000

Unit : -

Function : Instrunction pulse division multiple(electronic gear) funciton.

- Objects
  ① Set motor rotation and offset of per unit input instruciton pulse.
  ② As pulse oscillation capability(allowable output maximum frequency) is limited and can not reach the motor speed, this function can be used to improve instruction pulse frequency.
- Zones of division multiple.

The upper limit of numeratro is 2621440. if setting value is over upper limit, then setting is invalid. More attention is that 2621440 will be numerator.



Option of instruction multiple division numerator

*1：First/second option under instruction division multiple input shift（DIV：CN I/F PIN 28）.

DIV OFF	Select First Numerator（Pr46）
DIV ON	Select Second Numerator（Pr47）

＜Setting Example＞

•As division multiple ratio is equal to 1, basically it shall use instruction of encoder resolution input (f) to turn around motor once. Therefore as encoder's resolution is 10000P/r, for gaining once rotation of motor, its input value shall be 5000 Pluse as multiple ratio is 2 and 40000 Pulse at 1/4 division.

•Set Pr46, 4A and 4B to make internal instruciton (F) of division multiple be equal with encoder resolution(10000 or 2^{17}).

$$F = f \times \frac{Pr46 \times 2^{Pr4A}}{Pr4B} = 10000 \text{ 或 } 2^{17}$$

F：Internal instruction pulse number of one rotation of motor

f：instruction pulse number of one rotation of motor

Encoder Resolution	2^{17} (131072)	10000(2500 P/r × 4)
Example 1： Instruction input(f) is set to 5000 as average one motor rotation.	$\frac{Pr46\ [1] \times 2^{Pr4A\ [17]}}{Pr4B\ [5000]}$	$\frac{Pr46\ [1] \times 2^{Pr4A\ [15]}}{Pr4B\ [10000]}$
Example 2: Instruction input(f) is set to 40000 as average one motor rotation.	$\frac{Pr46\ [10000] \times 2^{Pr4A\ [0]}}{Pr4B\ [5000]}$	$\frac{Pr46\ [2500] \times 2^{Pr4A\ [0]}}{Pr4B\ [10000]}$

Pr47 | Second Instruction Division Multiple Numerator

Initial Value：【1】

Setting Range：1~10000

Unit： -

Function：Refer to Pr46

Pr48 | FIR Smooth Setting ★

Initial Value：【0】

Setting Range：0~3

Unit： -

Function：set average moving times of FIR filter multiply command pulse.

Pr4A |Instruction Division Multiple Numerator Multiplication

Initial Value：【0】

Setting Range：0~17

Unit： -

Function：Refer to Pr46

Pr4B | Instruction Division Multiple Denominator

Initial Value：【1】

Setting Range：1~10000

Unit： -

Function：Refer to Pr46

Pr4C | Smooth Filter Setting

Initial Value：【1】

Setting Range：0~7

Unit： -

Function：Smooth filter is the one time delay filter inserted at the back of instruction division multiplication ratio of driver pulse input command.

Objects:

- If instruction pulse is too thick, generally serration action of motor shall be reduced.
- The examples of instruction may become thick are as following:

  1.Multiplication of instruction division multiple increases(more than 10 times).

  2.Instruction pulse frequency is low.

  Time constant of smooth filter has 8 types of settings.

Setting Value	Time Constant
0	Non Filter Function
1	Small Time Constant
↓	↓
7	Large Time Constant

Pr4D | Counter Clearance Input Mode

Initial Value：【0】

Setting Range：0~2

Unit： -

Function：Set clearance of counter clearance input signal(CN:CN I/F 30PIN) of clearing deviation counter.

Setting Value	Clearance Condition
0	Level Activation
1	Edge Activation
2	Invalid

Pr50 | Speed Control Input Gain

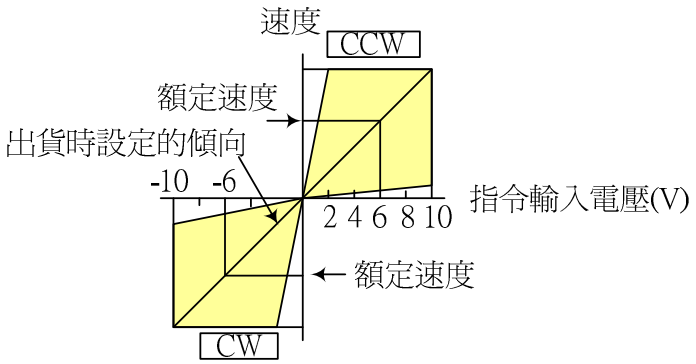
Initial Value :【 500**】**

Setting Range : 10~2000

Unit : rpm/V

Function : Set relation of voltage added to speed instruction input（SPR:CN I/F PIN 14）and motor speed.

- Use Pr50 to set the incline of relation between instruction input voltage and rotation numbers.
- Standard factory setting is Pr50=500[(r/min)/V], 6V input will produce 3000r/min.



＜Attention＞

1. Don't add ±10V to speed instruction input(SPR).
2. The driver is used in speed control mode, if position loop is installed exterior of driver, setting value of Pr50 can be used to adjust the position gain of servo system integrity. But more care is that large setting valueof Pr50 may cause vibration.

Pr51 | Speed Control Input Reversion

Initial Value：【1】

Setting Range：0~1

Unit： -

Function：Reverse the polarity of speed instruction input signal. It can be use to change rotation direction of motor as instruction polarity of upper-level device is not changed.

Setting Value	Rotation Direction of Motor
0	Use (+) instruction to turn from CCW in the axis end.
1	Use (+) instruction to turn from CCW in the axis end.

＜Attention＞

The standard factory setting of this parameter is 0, use (+) instruction to turn along CW.

As server drive system is constituted by driver set in the speed control mode and assembly of external units, if polarity of speed instruction signal came from position unit and polarity of this parameter are not identical, abnormaly action may happen to motor.

Pr52 | Speed Control OFFSET

Initial Value：【0】

Setting Range：-2047~2047

Unit：0.3mV

Function：·This parameter is used to adjust OFFSET of external analog speed instruction system including upper-level device.

•OFFSET of every setting value "1" is about 0.3mv.

•Adjustment methods of OFFSET include (1) manual adjustment and (2) auto-adjustment.

Manual Adjustment

- While use driver make OFFSET adjustment,
  set speed instruction input(SPR) to 0V correctly(or connect with signal grouding line);
  set this parameter to the value that may not cause motor rotation.
- In the compounding position loop of upper-level device end,
  In the server is locked and ceases, us zero section of deviation pulse to set this parameter.

Auto-adjustment

- As to the automatic OFFSET adjustment method, refer to automatic OFFSET adjustment of auxiliary function mode.
- Execution result of automatic OFFSET adjustment will be input into this parameter Pr52.

Pr53 | First Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function： while parameter "speed setting internal/external shift" (Pr05) is used and internal speed setting is valid, use first-to-fourth speed systems of internal instruction speed directly to make setting of Pr53~Pr56 with [r/min] unit.

In torque control mode, Pr56 becomes speed limit value.

＜Attention＞

Polarity of setting value displays polarity of internal instruction speed.

＋	Turn along CCW at the axis end.
－	Turn along CW at the axis end.

Pr54 | Second Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53

Pr55 | Third Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53

Pr56 | Fourth Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53

Pr57 | JOG Speed Setting

Initial Value：【200】

Setting Range：1~2000

Unit：rpm

Function：As to JOG speed in the JOG operation of Motor testing run mode, directly use [r/min] unit to set it. About details of JOG function, refer to instruction of Testing Run.

Pr58 ｜Acceleration Time Setting

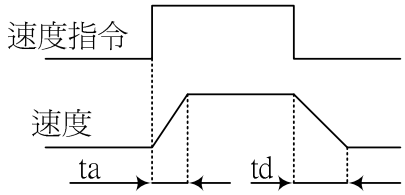
Initial Value：【0】

Setting Range：0~10000

Unit：1ms/ (1000rpm)

Function：In speed control mode, use speed intructions (speedup/speeddown) endowed inside driver to make speed control.

As there is speed instruction of input step or internal speed setting is used, action of SOFT START/SOFT DOWN can ge gained.



ta	Pr58 × 1ms/1000r/min
td	Pr59 × 1ms/1000r/min

＜Attention＞

If connector use with position loop outside of driver, do not use speedup/speeddown setting.

（Set Pr58 and Pr59 to 0）

Pr59 ｜ Speed-down Time Setting

Initial Value：【0】

Setting Range：-0~10000

Unit：1ms/ (1000rpm)

Function：Refer to Pr58

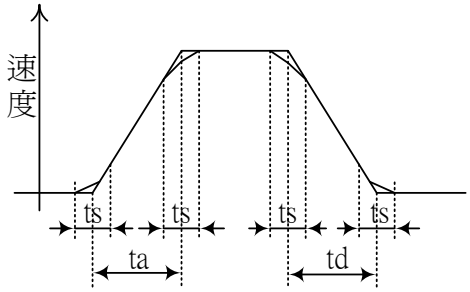
Pr5A | S-Shaped Speedup/Speeddown Time Setting

Initial Value：【0】

Setting Range：0~1000

Unit：2ms

Function：In straight-line speedup/speeddown, if in the start-up or cease, as to one needs changes in acceleration to produce bigger impact, it can attach nearly S-shaped speed-up/speed-down to speed instruction to make it operate smoothly.



ta：Pr58 td：Pr59 ts：Pr5A

1、Use Pr58 and Pr59 respectively to set speedup and speeddown time of basic straight-line section.

2、 If time width line taking retroflexion point of speeddown as center, use Pr5A set time of S-shaped section(unit:2ms).

Pr5B | Torque Command Option

Initial Value：【0】

Setting Range：0~1

Unit： -

Function：Option of torque command and speed command

Pr5B	Torque Command	Speed Command
0	SPR/TRQR	Pr56
1	CCWTL/TRQR	SPR/TRQR

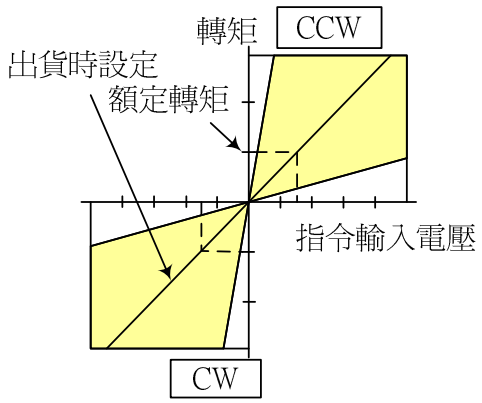
Pr5C | Torquq Control Input Gain

Initial Value：【30】

Setting Range：10~100

Unit：0.1/100%

Function：Set the relation of voltage attached to torque instruction input（TRQR：CN I/F PIN 14） and torque generated by motor.



- Unit of setting value is [0.1V/100%], if rated torque is gained, required input voltage must be set.
- Factory default setting value 30 represents 3V/100%.

Pr5D | Torquq Control Input Reversion

Initial Value：【0】

Setting Range：0~1

Unit：－

Function：Revers the polarity of torque control input signal(SPR/TRQR: CN I/F 14PIN or CCWTL/TRQR: CN I/F 16PIN)

Setting Value	Generation Direction of Motor Torque
0	（＋）instruction directs the CCW at the axis end.
1	（－）instruction directs the CW at the axis end.

Pr5E | Torque Limit Setting

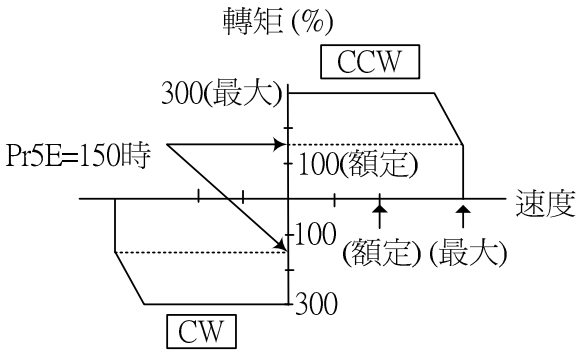
Initial Value :【300】

Setting Range : 0~300

Unit : %

Function : Inside motor, the parameter is used to set function of motor maximum torque generation limit.

In the usual situation, instantaneous allowable torque is the 3 times of rated torque. But as 3 times of torque may damage motor load(mechanic) strength, use this parameter to set maximum torque limit.



- Use % to set rated torque.
- Right figure is the example that torque is limited to 150% rated torque.
- Pr5E is used to limit CW/CCW maximum torque.

Pr60 ｜On-Position Range

Initial Value：【10】

Setting Range：0~32767

Unit：Pulse

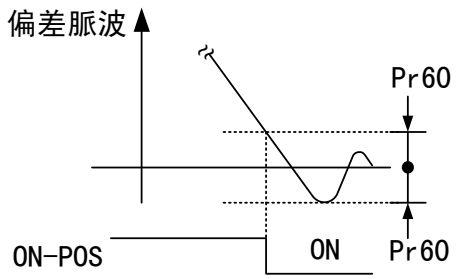
Function：As instruction parameter input is completed, set the output timing of on-position signal after motor (work piece) movement is completed.

As pulses number of deviation counter reach ± (setting value) range, output on-position signal（ON-POS）.

The basic unit of deviation pulse is the resolution of used encoder, as to different encoders, the following contents are different.

① 17digitals encoder：2^{17}＝131072

② 2500P/rev encoder：4×2500



＜Attention＞

1 .If setting value of Pr60 is too small, it will cause the longer output timing of ON-POS signal and sometimes even surge phenomenon may emerge.

2. Setting of on-position range can not affect the final position precision.

Pr61 | Zero Speed

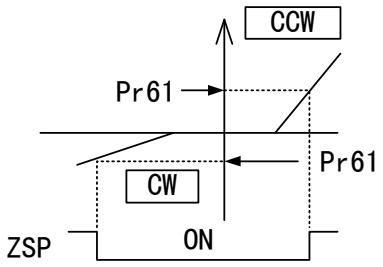
Initial Value :【50】

Setting Range : 10~10000

Unit : rpm

Function: Directly use [r/min] to set output timing of zero speed detection output signal(ZSP: CN I/F PIN 12).

As motor speed is lower than speed set by this parameter Pr61, it will output zero speed detection signal(ZSP).



Pr62 | Speed Attainment

Initial Value:【1000】

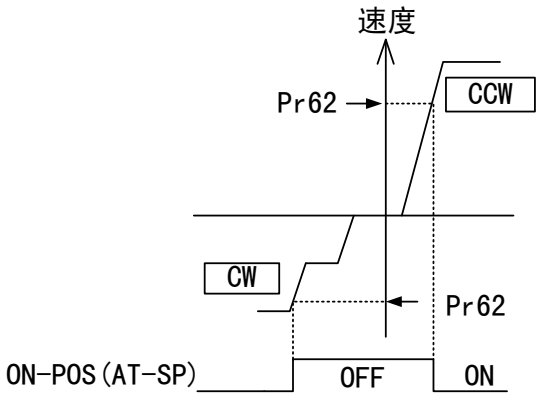
Setting Range: 10~10000

Unit: rpm

Function: In speed control mode and torque control mode, directly use [r/min] to set output timing of speed attainment signal（AT-SP：CN I/F PIN 39）.

As motor speed is over setting speed of the parameter Pr62, it will output speed attainment signal(ON-POS（AT-SP）).

Setting of Pr62 has no relation with rotation direction of motor and act in the CW/CCW.



Pr63 | Position Deviation Excess Setting

Initial Value：【20000】

Setting Range：1~32000

Unit：Pulse

Function：Use detaining pulses of deviation counter to set detection level of deviation excess judgement of "position deviation excess protection" function.

＜Attention＞

Especially as setting of positon gain is too low and setting of Pr63 is too small, even not in the abnormality state, position deviaton excess protection may happen.

Pr64 | Position Deviaton Excess Abnormality Invalidity

Initial Value：【0】

Setting Range：0~1

Unit：-

Function：This parameter can make "position deviation excess protection" function invalid.

Setting Value	Position Deviation Excess Protection
0	Valid
1	Invalid. As detaining pulses is over the determinant level set by Pr63, it will not be treated as abnormality and continue action.

Pr65 | On-Position Output Setting

Initial Value：【0】

Setting Range：0~3

Unit：-

Function：it can set action of on-position output (ON-POS：CN I/F PIN 39) connectorly with parameter Pr60(on-position range)

Setting Value	Position Deviation Excess Protection
0	As Position deviation is lower than Pr60(on-position range), it is on.
1	As there is no position commad and position deviation is lower than Pr60(on-position range), it is on.
2	As there is no position commad, zero speed detection signal is on and position deviation is lower than Pr60(on-position range), it is on.
3	As there is no position commad and position deviation is lower than Pr60(on-position range), it is on and maintains ON untile another command is input.

Pr66 | Activated Brake Do No Action in Drive Input Inhibition

Initial Value：【0】

Setting Range：0~1

Unit： -

Function：Set the drive condtion of speeddown after dirve inhibition input（CCW-LIMIT：CN I/F PIN 9 or CW-LIMIT：CN I/F PIN 8）action is valid.

Setting Value	Drive Condition		Content of deviation counter
	Speeddown	Cease	
0	DB	Free-run	Hold
1	Free-run	Free-run	Hold

Pr68 | Sequence Control While Alarm Sounds

Initial Value：【0】

Setting Range：0~3

Unit： -

Function：Set drive condition of speeddown and cease after machine protection function of driver is activated and sends out alarm.

Setting Value	Drive Condition		Content of deviation counter
	Speeddown	Cease	
0	DB	DB	Clear
1	Free-run	DB	Clear
2	DB	Free-run	Clear
3	Free-run	Free-run	Clear

DB：About dynamic brake action, refer to sequence figure of “Servo state process as abnormality occurs.

Pr69 | Sequence Control While Server is Closed.

Initial Value：【0】

Setting Range：0~7

Unit： -

Function：As server （SVO-ON signal：CN /IF PIN 29 turn OFF from ON）is closed, set the following items.

① Drive conditon of speeddown and cease.

② clearance of deviation counter.

Setting Value	Drive Condition		Content of deviation counter
	Speeddown	Cease	
0	DB	DB	Clear
1	Free-run	DB	Clear
2	DB	Free-run	Clear
3	Free-run	Free-run	Clear
4	DB	DB	Hold
5	Free-run	DB	Hold
6	DB	Free-run	Hold
7	Free-run	Free-run	Hold

(DB：dynamic brake action)

Pr6A |Set Mechanic Brake Action Time as Server is OFF

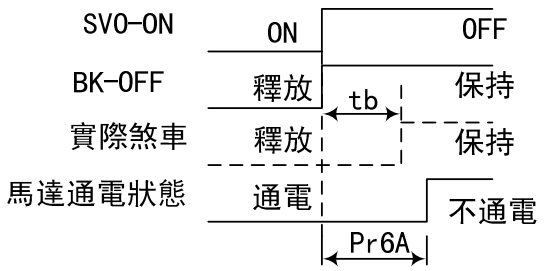
Initial Value：【0】

Setting Range：0~200

Unit：ms

Function：As motor stops and Servo OFF, set time begins from brake release signal （BK-OFF：CN I/F　PIN 10，PIN 11）become off (maintain brake)to motor is not powered (Servo Free).

- Set parameter according to brake action delay time(tb) for avoiding slight movement/fall of motor(work piece).
- With setting of Pr6A≧tb, make Servo OFF after brake is actually activated.



Refer to sequence diagram of Servo ON/OFF operaiton after motor ceases.

Pr6B |Set Mechanic Brake Action Time as Server is ON

Initial Value：【0】

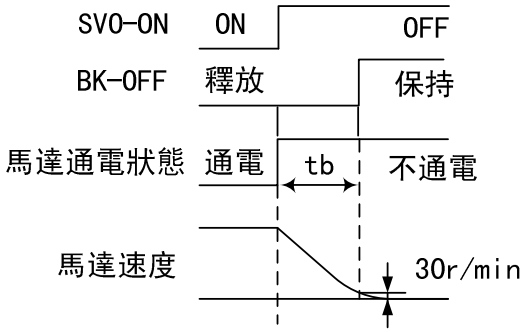
Setting Range：0~200

Unit：ms

Function：As motor switch to Servo OFF, set time begins from Servo ON input signal (SVO-ON：CN I/F PIN 29) is detected to be OFF(maintain brake) to brake release signal (BK-OFF：CN I/F PIN 10,11) is OFF.

•Set for avoiding rotating motor to damage brake.

•While motor is rotating and Servo OFF, in right figure tb will be lower than setting time of Pr6B or any time as rotary speed of motor is under 30r/min.



Refer to sequence diagram of Servo ON/OFF operaiton after motor ceases.

Pr6C |Retrogradation Resistance Impressing Option

Initial Value：【0】

Setting Range：0~2

Unit：－

Function：Directly use internal retrogradation resistance or chop away internal retrogradation resistance and install retrogradation resistance in the exterior(P-B2 space of connection terminal block) of driver to set this parameter.

Setting Value	Used Retrogradation Resistance	Retrogradation Resistance Overload Protection
0	Internal Resistance	Cooperate with internal resistance to make retrogradation resistance overload protection act.
1	Impressing Resistance	Taking action limit of impressing resistance as 10% DUTY, make it generate retrogradation resistance overload protection
2	Impressing Resistance	No protection

Pr74 | Fifth Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53

Pr75 | Sixth Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53

Pr76 | Seventh Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53

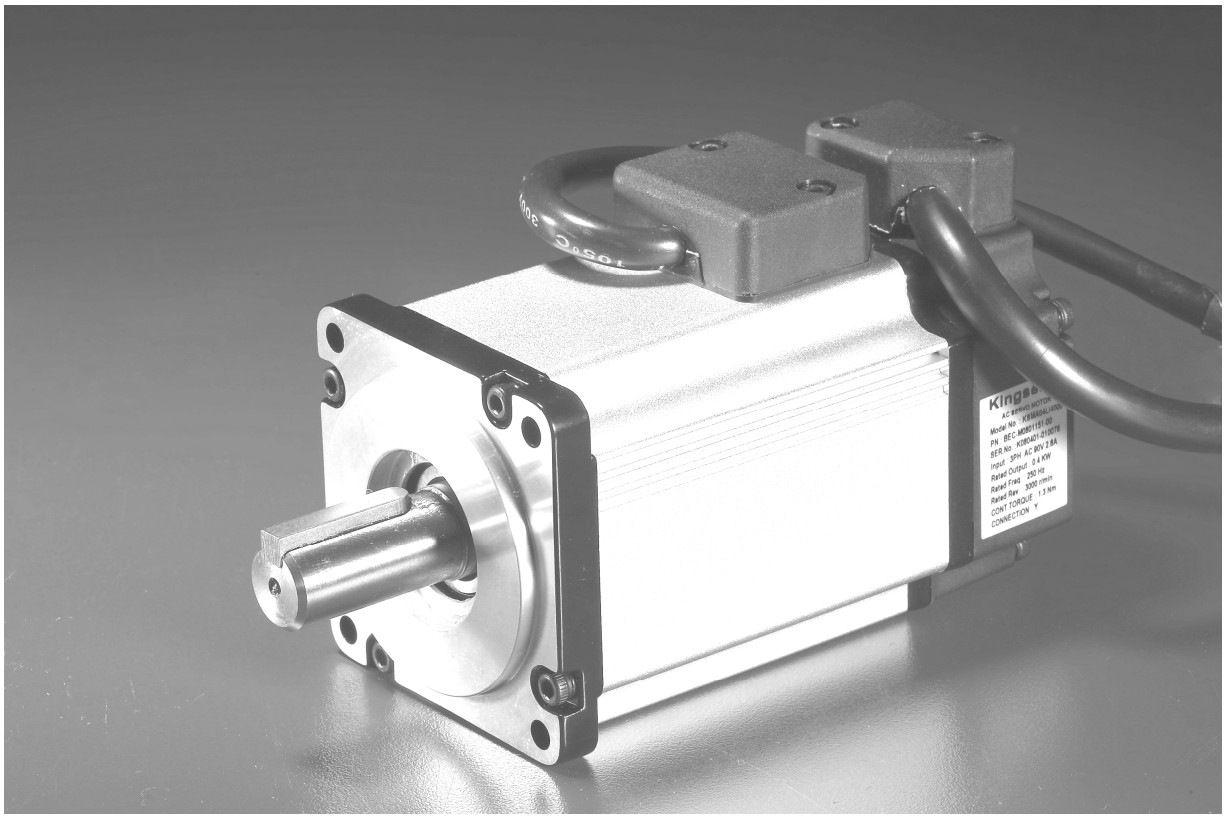
Pr77 | Eighth Speed of Speed Setting

Initial Value：【0】

Setting Range：-10000~10000

Unit：rpm

Function：Refer to Pr53



Chapter Five:Usage of Pins of Control Mode

5-1 Pin Table of Position, Speed and Torque Mode

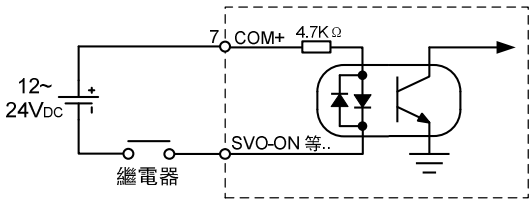
Pin	Position	Function		Speed Mode	Function		Torque Mode	Function	
1	OPC1	Position command pulse 2	Input						
2	OPC2	Position command signal 2	Input						
3	PULS1	Position command pulse 2	Input						
4	PULS2	Position command pulse 2	Input						
5	SIGN1	Position command signal 2	Input						
6	SIGN2	Position command signal 2	Input						
7	COM+	Signal Power		COM+	Signal Power		COM+	Signal Power	
8	CW-LIMIT	CW-inhibition limit	Input	CW-LIMIT	CW-inhibition limit	Input	CW-LIMIT	CW-inhibition limit	Input
9	CCW-LIMIT	CCW-inhibition limit	Input	CCW-LIMIT	CCW-inhibition limit	Input	CCW-LIMIT	CCW-inhibition limit	Input
10	BK-OFF-	Brake release(-)	Output	BK-OFF-	Brake release(-)	Output	BK-OFF-	Brake release(-)	Output
11	BK-OFF+	Brake release(+)	Output	BK-OFF+	Brake release(+)	Output	BK-OFF+	Brake release(+)	Output
12	ZSP	Zero speed check	Output	ZSP	Zero speed check	Output	ZSP	Zero speed check	Output
13	GND	Ground of analog signal							
14				SPR	Speed command	Input	SPR/TRQR	Torque or speed command	Input
15	GND	Ground of analog signal		GND	Ground of analog signal		GND	Ground of analog signal	
16	CCWTL	CCW Torque Limit	Input	CCWTL	CCW Torque Limit	Input	CCWTL/TRQR	Torque command	Input
17	GND	Ground of analog signal		GND	Ground of analog signal		GND	Ground of analog signal	
18	CWTL	CW Torque limit	Input	CWTL	CW Torque limit	Input			
19	CZ	Open set zone of signal of Z	Output	CZ	Open set zone of signal of Z phase	Output	CZ	Open set zone of signal of Z	Output
20									
21	OA+	Signal(+) of A phase	Output	OA+	Signal(+) of A phase	Output	OA+	Signal(+) of A phase	Output
22	OA-	Signal(-) of A phase	Output	OA-	Signal(-) of A phase	Output	OA-	Signal(-) of A phase	Output
23	OZ+	Signal(+) of Z phase	Output	OZ+	Signal(+) of Z phase	Output	OZ+	Signal(+) of Z phase	Output
24	OZ-	Signal(-) of Z phase	Output	OZ-	Signal(-) of Z phase	Output	OZ-	Signal(-) of Z phase	Output
25	GND	Ground of analog signal		GND	Ground of analog signal		GND	Ground of analog signal	
26				ZERO-SPD	Zero speed control	Input	ZERO-SPD	Zero speed control	Input
27	GAIN	Gain selection		GAIN	Gain selection		GAIN	Gain selection	
28	DIV	DIV slection	Input	INSP3	The thrid choice of internal speed				
29	SVO-ON	Motor is powered on	Input	SVO-ON	Motor is powered on	Input	SVO-ON	Motor is powered on	Input
30	CLR	Clear differential counter	Input	INSP2	The second choice of internal speed				
31	ALM-CLR	clear abnormal alarm	Input	ALM-CLR	clear abnormal alarm	Input	ALM-CLR	clear abnormal alarm	Input
32	C-MODE	Choosement of controlling	Input	C-MODE	Choosement of controlling modes	Input	C-MODE	Choosement of controlling	Input
33	PULS-INH	Position command pulse is	Input	INSP1	The first choice of internal speed				
34	SVO-RDY-	Standby of servo system(+)	Output	SVO-RDY-	Standby of servo system(+)	Output	SVO-RDY-	Standby of servo system(+)	Output
35	SVO-RDY+	Standby of servo system(-)	Output	SVO-RDY+	Standby of servo system(-)	Output	SVO-RDY+	Standby of servo system(-)	Output
36	SVO-ALM-	Abnormal alarm of servo	Output	SVO-ALM-	Abnormal alarm of servo system(-)	Output	SVO-ALM-	Abnormal alarm of servo	Output
37	SVO-ALM+	Abnormal alarm of servo	Output	SVO-ALM+	Abnormal alarm of servo system(+)	Output	SVO-ALM+	Abnormal alarm of servo	Output
38	ON-POS-	On-position(-)	Output	AT-SP-	Speed attainment(+)	Output	AT-SP-	Speed attainment(+)	Output
39	ON-POS+	On-position(+)	Output	AT-SP+	Speed attainment(-)	Output	AT-SP+	Speed attainment(-)	Output
	TLC	Torque limit Check	Output	TLC	Torque limit Check	Output	TLC	Torque limit Check	Output
41	COM-	Signal Power(-)		COM-	Signal Power(-)		COM-	Signal Power(-)	
42	IM	Torque monitor	Output	IM	Torque monitor	Output	IM	Torque monitor	Output
43	SPM	Speed monitor	Output	SPM	Speed monitor	Output	SPM	Speed monitor	Output
44	PULSH1	Position command pusle 1	Input						
45	PULSH2	Position command pusle 2	Input						
46	SIGNAL1	Position command signal1	Input						
47	SIGNH2	Position command signal2	Input						
48	OB+	Signal(+) of B phase	Output	OB+	Signal(+) of B phase	Output	OB+	Signal(+) of B phase	Output
49	OB-	Signal(-) of B phase	Output	OB-	Signal(-) of B phase	Output	OB-	Signal(-) of B phase	Output
50	FG	Grouding		FG	Grouding		FG	Grouding	

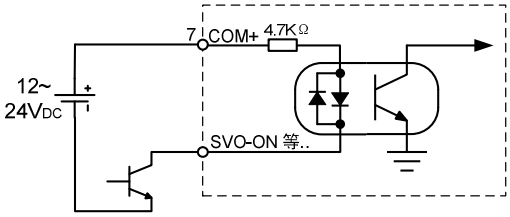
5-2 Wiring Reference of Interface Lines

5-2-1 Wring Reference of Input Loop

◆ Connection of program input signal

- Connection with connectors of witch and relay, or open collector output of transistor.
- Voltage shall be 11.4V at least for ensuring the normal operation of photo-coupler after one time test current.





◆ Connection of program input signal(pulse group input interface)

(1) Line Driver I/F(Input pulse frequency：500Kpps)

- This is a recommended signal transmission way that is not easily affected by noise and improves the precision of signal transmisson.

(2) Open set I/F(Input pulse frequency：200Kpps)

- This method need use external control signal power(VDC).
- use current limit control resistor in concert with DC power valtage.
- About resistance value of current limit control resistor, refer to following table:

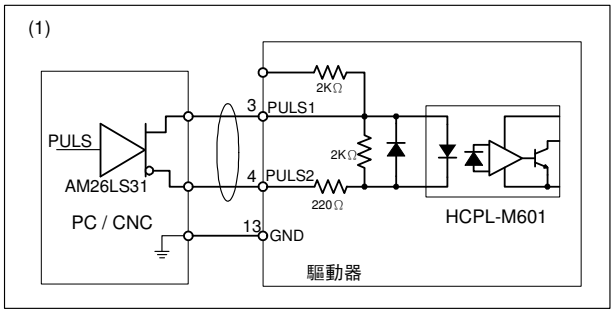
VDC	R阻值
12V	1KΩ 1/2W
24V	2KΩ 1/2W

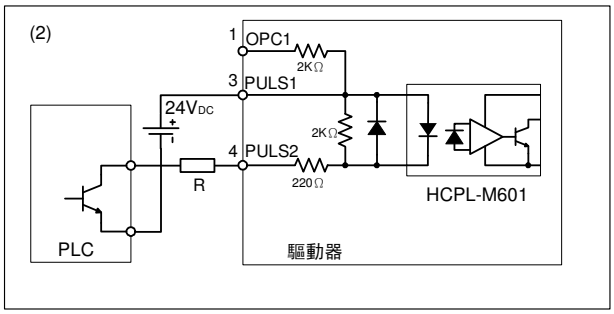
$$\frac{V_{DC}-1.5}{R+220} \fallingdotseq 10mA$$

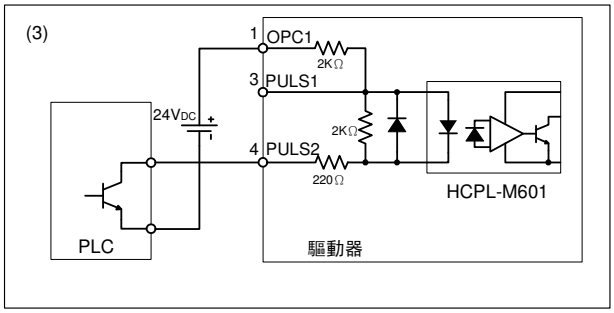
(3) Open set I/F(Input pulse frequency：200Kpps)

- Use 24V power, but not connection of external limit resistor

represents twisted pair



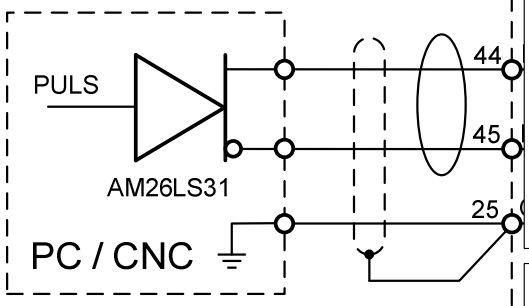




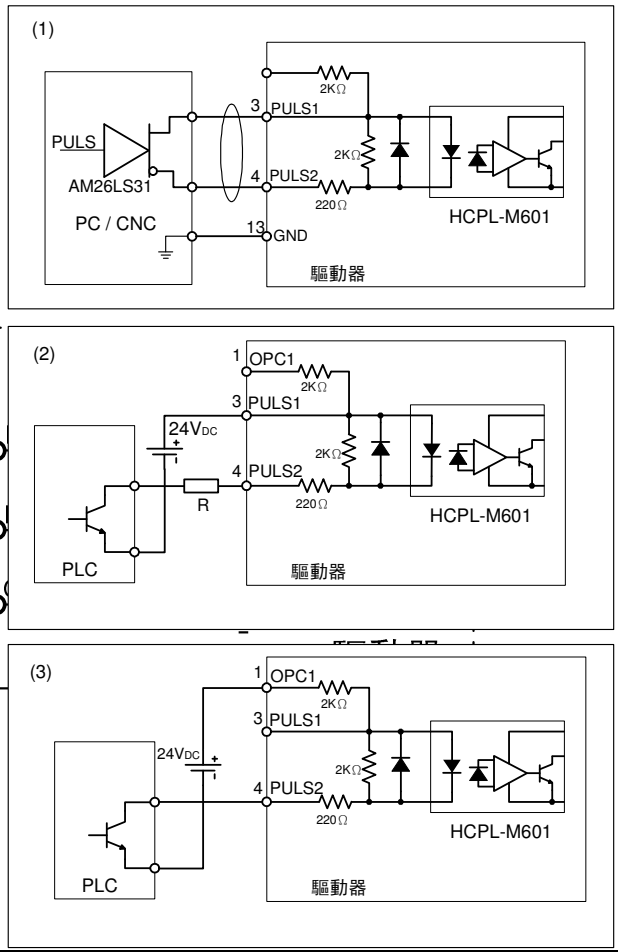
◆ Connection of program input signal(pulse group input interface)

■ Line Receiver I/F(Input pulse frequency：2Mpps)

◆ This is a recommended signal transmission way that is not easily affected by noise and improves the precision of signal transmisson as line driver I/F is used.



represents twisted pair

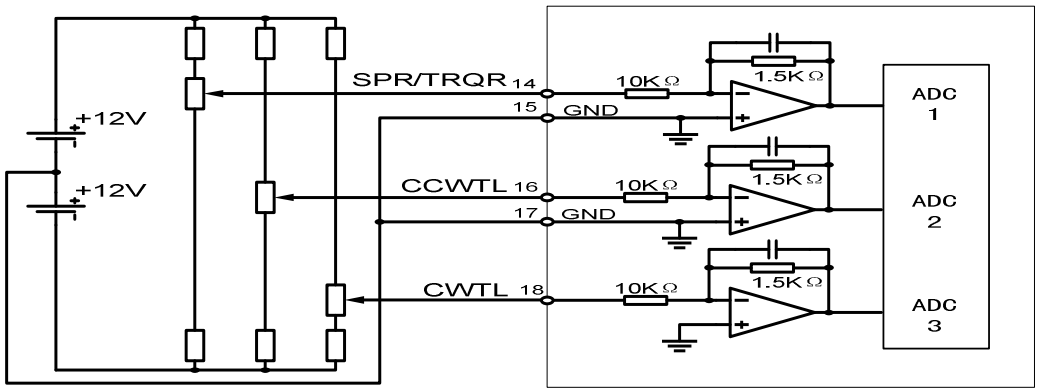


◆ Analog command input

■ Analog command has 3 goups: SPR/TRQR(Pin 14), CCWTL(Pin16) and CWTL(Pin18)

■ Alowable maximum input voltage is ±10V.

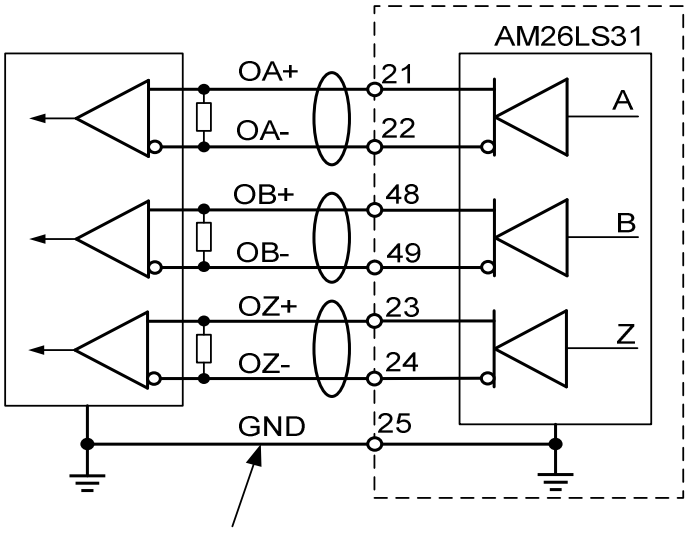
■ All commands AD can be divided into 12bit about 5mV.



5-2-2 Wiring Refernce of Output Loop

◆ Line driver(Differential output) output

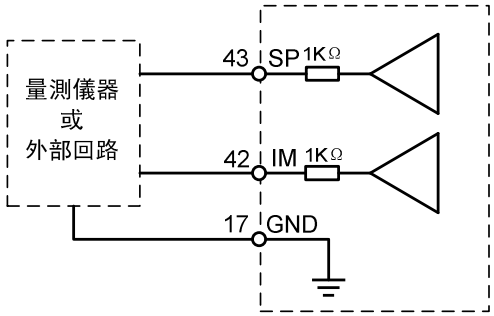
- Encoder signals(A phase, B phase and Z phase) after division process are outputed through line driver.
- Use line receiver to receive controller side (upper-level controller). The 300Ω terminal resistor shall be added beween input and reception of line driver.
- Non-insulated outpput.



驅動器與上層控制器的信號接地必須連結在一起

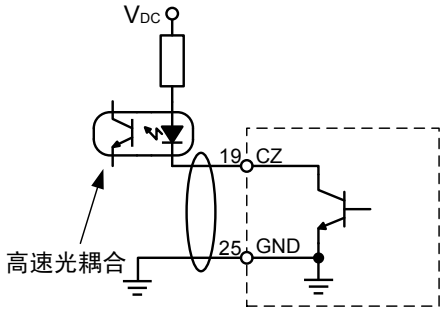
◆ Analog monitor output

- It be divide into two types of output: speed monitor signal output(SP) and torque monitor signal output(TM)
- Output signal amplitude is ±10V.
- Output impedence is 1KΩ, pay attention to input impedence of testing instrument or external line.



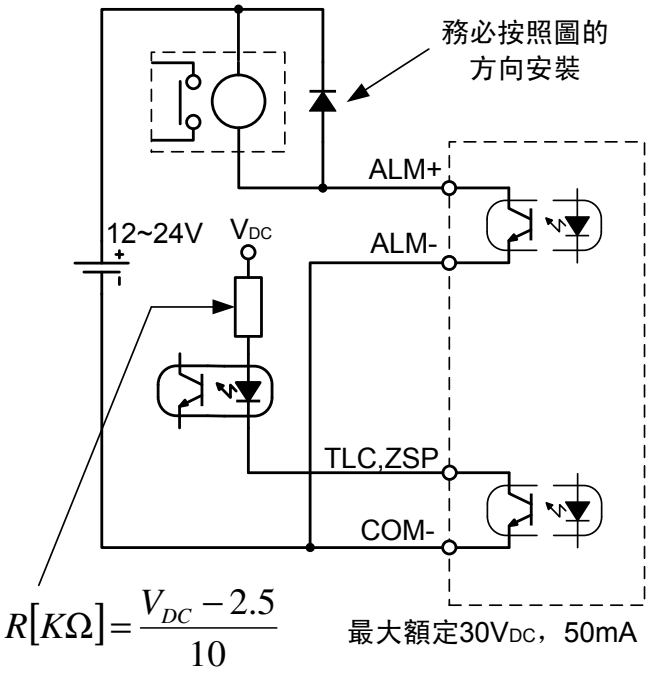
◆ Open collector output

- Non-inslated output through encoder signal of Z phase signal outputed from open collector.
- As Z phase signal pulse width is narrow, so use high-speed photo-coupler to receive signal in controller.



◆ Program output line

- Output line is outputed through open set poarity of transistor and used to connect relay and photo-coupler.
- As output of transistor is ON, voltage of Vce is about 1V. Generally TTLIC can not be connected directly.
- Transistor emitter used for output can be divided into two kinds: independent output and cascode(connected with COM-) output.
- As one time testing current used to photo-coupler is 10mA, use the following formula to decide resistance value.



$$R[K\Omega] = \frac{V_{DC} - 2.5}{10}$$

5-3 Function of Pins of Connector I/F

5-3-1 Input Interface(Sharing)：

<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td>Signal Power (+)</td><td>7</td><td>COM+</td><td>• connect with external DC power(12~24V) + polarity.
• Power voltage 12V±5%~24V±5%。</td></tr>
<tr><td>Signal Power (-)</td><td>41</td><td>COM-</td><td>• connect with external DC power(12~24V) - polarity.
• Power capacities may be different as the different structures of input/output lines and recommended one shall be over 0.5A</td></tr>
<tr><td>CW inhibition limit [input]</td><td>8</td><td>CW-LIMIT</td><td>• CW drive inhibition input(CW-LIMIT).
As the active part of machine is over the limit range in the CW, open it with COM-(its switch shall be a closed switch).
• If Pr04(drive inhibition input setting) is set to 1, then CW-LIMIT is invalid and factory setting value is invalid(1).
• Pr66(non-action of dynamic brake in the drive inhibition input) can be used select brake action as CW-LIMIT is valid.
Factrory setting value is emergent cease of dynamic brake(Pr66 is 0).</td></tr>
<tr><td>CCW inhibition limit [input]</td><td>9</td><td>CCW-LIMIT</td><td>• CCW drive inhibition input(CCW-LIMIT)。
As the active part of machine is over the limit range in the CCW, open it with COM-(its switch shall be a closed switch).
• If Pr04(drive inhibition input setting) is set to 1, then CW-LIMIT is invalid and factory setting value is invalid(1).
• Pr66(non-action of dynamic brake in the drive inhibition input) can be used select brake action as CCW-LIMIT is valid.
Factrory setting value is emergent cease of dynamic brake(Pr66 is 0).</td></tr>
<tr><td>Zero speed control [input]</td><td>26</td><td>ZERO-SPD</td><td>• Different functions as different control modes.
<table>
<tr><td>Speed Control/ Torque Control</td><td>• Zero speed clamp(ZERO-SPD)
<table>
<tr><th>Pr06</th><th>Connection with COM-</th><th>Content</th></tr>
<tr><td>0</td><td>—</td><td>ZERO-SPD input invalidity</td></tr>
<tr><td>1</td><td>Open</td><td>Speed command is zero.</td></tr>
<tr><td></td><td>Short circuit</td><td>Normal operation</td></tr>
<tr><td>2</td><td>Open</td><td>Speed command is CCW</td></tr>
<tr><td></td><td>Short circuit</td><td>Speed command is CW</td></tr>
</table>
• As Pr06 is 2 in the torque control mode, ZERO-SPD is invalid.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td>Gain option [input]</td><td>27</td><td>GAIN</td><td>• Different functions as Pr30(second gain setting) setting.
<table>
<tr><th>Pr30</th><th>Connection with COM-</th><th>Content</th></tr>
<tr><td rowspan="2">0</td><td>Open</td><td>Speed loop：PI（Proportion/Integral）action</td></tr>
<tr><td>Short circuit</td><td>Speed loop：P（Proportion）action</td></tr>
<tr><td rowspan="5">1</td><td colspan="2">If setting value of Pr31,36 and 3A is 2：</td></tr>
<tr><td>Open</td><td>Select 1st gain（Pr10、11、12、13、14）</td></tr>
<tr><td>Short circuit</td><td>Select 2nd gain（Pr18、19、1A、1B、1C）</td></tr>
<tr><td colspan="2">If setting value of Pr31,36 and 3A is not 2：</td></tr>
<tr><td colspan="2">invalid</td></tr>
</table></td></tr>
<tr><td>Division rate numerator option [input]</td><td>28</td><td>DIV</td><td>• Different functions as different control modes.
<table>
<tr><td>Position control</td><td>• Division multiple numerator of shiftable command pulse
• As short curcuit with COM-, instruction division multiple numerator shift from Pr46(1st instruction division multiple numerator) to Pr47(2nd instruction division multiple numerator)
• As selecting instruction division multiple, refer to following figure(instruction division multiple numerator option)</td></tr>
<tr><td>Speed control</td><td>• Select 3 input option(INSP3) for internal speed command
• After grouping PULS-INH/INSP1 input and CLR/INSP2, set speed of internal 8th speed .</td></tr>
<tr><td>Torque control</td><td>• Input is invalid</td></tr>
</table>
＜Attention＞
Before and after 10ms of shift, donot input command pulse.
<table>
<tr><th>CN X5 Pin-28 DIV</th><th>Iinstruction division multiple setting</th></tr>
<tr><td>Open</td><td>$\frac{\text{第1指令分周倍率分子(Pr46)}\times 2^{\text{命令分周倍率分子指數(Pr4A)}}}{\text{命令分周倍率分母(Pr4B)}}$</td></tr>
<tr><td>Short</td><td>$\frac{\text{第1指令分周倍率分子(Pr47)}\times 2^{\text{命令分周倍率分子指數(Pr4A)}}}{\text{命令分周倍率分母(Pr4B)}}$</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td>Motor power excitation [input]</td><td>29</td><td>SVO-ON</td><td>• After short with COM-, motor is Servo ON(power-up).
• If open with COM-, motor is Servo OFF and motor power is disconnected.
• Pr69(program in Servo OFF) can be used to select dynamic brake action and clerance action of deviation counter.
＜Attention＞
1.Servo ON is valid after 2 seconds of power-up, Refer to sequence diagram.
2. Don’t use Servo OFF/Servo ON to start/stop motor.
3. As shifting to Servo ON, input pulse command after 100ms at least.</td></tr>
<tr><td>Deviation counter clearance [input] /internal speed setting option one</td><td>30</td><td>CLR / INSP2</td><td>• Different functions as different control modes.
<table>
<tr><td>Position control</td><td>• Clearance input of position deviation counter(CLR)
• As short with COM-, clear deviation counter.
• Can select clearance mode in Pr4D（counter clerance input mode）
<table>
<tr><th>Pr4D</th><th>内容</th></tr>
<tr><td>0</td><td>As CLR shorts with COM-，clear deviation counter.</td></tr>
<tr><td>1 [Fatory value]</td><td>As connection of CLR and COM- is shifted from open to short, only clear positon deviation counter one time.</td></tr>
<tr><td>2</td><td>Invalid CLR.</td></tr>
</table></td></tr>
<tr><td>Speed control</td><td>• Select 2 input(INTSP2) for internal command speed</td></tr>
<tr><td>Torque control</td><td>• Input is invalid.</td></tr>
</table></td></tr>
<tr><td>Abnormality warning clearance [input]</td><td>31</td><td>ALM-CLR</td><td>• Make negative edge trigger with COM-, clear servo alarming state.
• Deviation counter will be cleared with alarm.
• Some server alarms can not be cleared with this input.</td></tr>
<tr><td>Control mode selection [input]</td><td>32</td><td>C-MODE</td><td>• As Pr02(control mode setting) is set to 3~5, the following modes can be shifted.
<table>
<tr><th>Pr0 setting value</th><th>Open with COM-（1st）</th><th>Short with COM-(2nd)</th></tr>
<tr><td>3</td><td>Position control</td><td>Speed control</td></tr>
<tr><td>4</td><td>Position control</td><td>Torque control</td></tr>
<tr><td>5</td><td>Speed control</td><td>Torque control</td></tr>
</table>
＜Attention＞
In C-MODE shift control mode, commands of control modes may cause intense changes of motor action.</td></tr>
</table>

<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td>Position command pulse inhibition [input] / internal speed setting option two</td><td>33</td><td>PULS-INH / INSP1</td><td>• Different functions as different control modes.
<table>
<tr><td>Position control</td><td>• Command pusle input inhibition input(PULS-INH).
• If open with COM-, donot receive position pulse command.
• This input can make Pr43(command pulse inhibiton input invalidity) setting invalid.
<table>
<tr><th>Pr43</th><th>Content</th></tr>
<tr><td>0</td><td>Valid</td></tr>
<tr><td>1(Factory setting)</td><td>Invalid</td></tr>
</table></td></tr>
<tr><td>Speed control</td><td>• Select 1 input (INTSP1) for internal speed speed.</td></tr>
<tr><td>Torque control</td><td>• The input is invalid.</td></tr>
</table></td></tr>
</table>

5-3-2 Input Interface(Pulse Train)

According to specification of command pulse output, select one most suitable input interface from two types of interfaces.

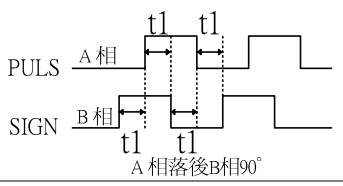
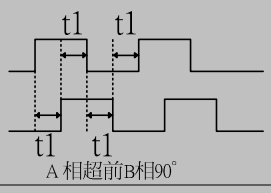
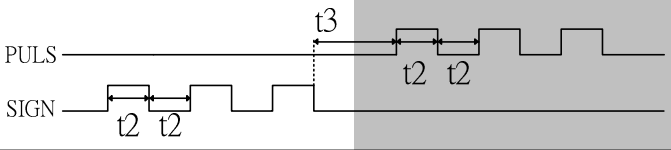
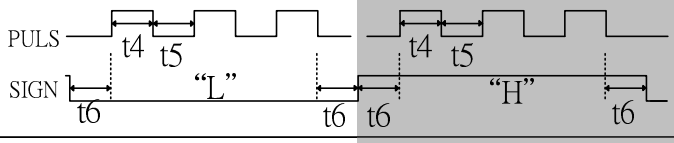
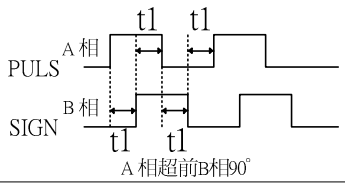
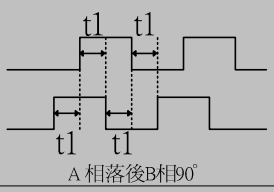
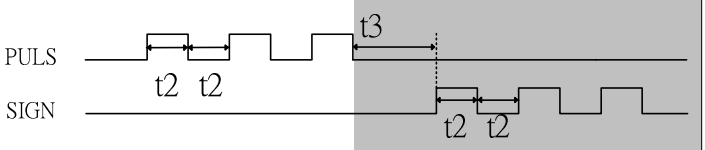
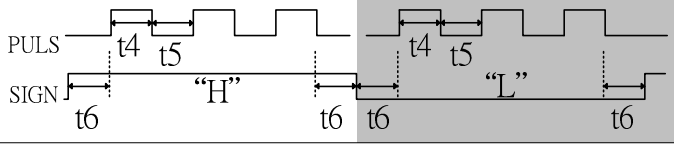
• Line drive exclusive pulse train interface

Signal Name	Pin	Mark	Function
Position command pulse one [input]	44	PLUSH1	• Set Pr40(command pulse input option) to 1 to select input terminal of position command pulse as pulse input interface. • As control modes are speed control or torque control which needs not control mode of position command, the input is invalid. • Allowable maximum input frequency is 2Mpps。 • Use Pr41(control pulse reversion) and Pr42(pulse input mode setting) to select 6 types of command pulse input form, about more details, refer to the following input forms of command pulse.
	45	PLUSH2	
Position command mark one [input]	46	SIGNH1	
	47	SIGNH2	

• Pulse Train Interface

Signal Name	Pin	Mark	Function
Position command pulse two [input]	1	OPC1	• Set Pr40(command pulse input option) to 0 to select input terminal of position command pulse as pulse input interface. • As control modes are speed control or torque control which needs not control mode of position command, the input is invalid. • Allowable maximum input frequency is 2Mpps。 • Use Pr41(control pulse reversion) and Pr42(pulse input mode setting) to select 6 types of command pulse input form, about more details, refer to the following input forms of command pulse.
	3	PULS1	
	4	PULS2	
Position command mark two [input]	2	OPC2	
	5	SIGN1	
	6	SIGN2	

•Input form of command pulse

Pr41 參數值	Pr42 參數值	CCW命令	CW命令
【0】	0或2		
	【1】		
	3		
【1】	0或2		
	【1】		
	3		

• PULS and SIGN represent input interfaces of command pulse input.

•As pulse form is CW+CCW or pulse train+sign, signal is rising edge trigger .

•If it is 2 phases of pulse, signal is edge trigger.

•Maximum input frequency and minimum necessary time width of command pulse input signal.

PLUS/SIGN Input Interface		Allowable maximum input frequency	Minimum Necessary Time Width					
			t1	t2	t3	t4	t5	t6
Exclusive Pulse Train Interface of Line Driver		2Mpps	500ns	250ns	250ns	250ns	250ns	250ns
Pulse Train(photo-coupler) Interface	Line Driver Interface	500kpps	2μs	1μs	1μs	1μs	1μs	1μs
	Open collector Interface	200kpps	5μs	2.5μs	2.5μs	2.5μs	2.5μs	2.5μs

• rising/declining time of command pulse input signal shall be controlled under 0.1μs.

5-3-3 Input Interface(Analog Command)

<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td>Speed command [input] / Torque command [input]</td><td>14</td><td>SPR / TRQR</td><td>• Different functions as different control modes.
<table>
<tr><th>Pr02</th><th>Control Mode</th><th>Function</th></tr>
<tr><td>3</td><td>Position / <u>speed</u></td><td>• External speed command input as selecting speed control(SPR)
• Settings of gain, polarity and OFFSET of speed command are as following:
Pr50（speed command input gain）
Pr51（speed command input reversion）
Pr52（speed command OFFSET）</td></tr>
<tr><td>4</td><td>Position / <u>Torque</u></td><td>• Different functions as Pr5B（torque command option）
<table>
<tr><th>Pr5B</th><th>Content</th></tr>
<tr><td>0</td><td>• Torque command(TROR)
• Settings of gain, polarity and OFFSET of torque are as following:
Pr5C (torque command input gain)
Pr51 (torque command input reversion)
Pr52 (torque command OFFSET)</td></tr>
<tr><td>1</td><td>• Speed limit
• Settings of gain and OFFSET of speed limit are as following:
Pr50（speed command input gain）
Pr52（speed command OFFSET）</td></tr>
</table></td></tr>
<tr><td>Others</td><td>Other cotrol mode</td><td>• The input is invalid.</td></tr>
</table>
• A/D convertor resolution of the input is 12Bit（including sign's Bit）.
±2047[LSB]= ±10[V], 1[LSB]≒5.0[mV]</td></tr>
</table>

＊In above complex control mode, underline of ____ / ____represents the function is valid as selecting the control mode.

<Remarks>

As to analog command input of SPR/TRQR, c

<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td>CCW Torque Limit [input] / Torque Command [input]</td><td>16</td><td>CCWTL / TRQR</td><td>• Different functions as Pr02(control mode setting)
<table>
<tr><th>Pr02</th><th>Control mode</th><th>Function</th></tr>
<tr><td>2
4</td><td>Torque control
position/torque</td><td>• Different functions as Pr5B(torque cammand option)
<table>
<tr><th>Pr5B</th><th>Content</th></tr>
<tr><td>0</td><td>Input is invalid</td></tr>
<tr><td>1</td><td>• Torque command（TRQR）
• Settings of gain and OFFSET of command are as following:
Pr5C（torque control input gain）
Pr5D（torque control input reversion）Pr2A (CCW Torque command OFFSET)</td></tr>
</table></td></tr>
<tr><td>5</td><td>speed/torque</td><td>• Torque command（TRQR） input
• Settings of gain and OFFSET of command are as following:
Pr5C（torque control input gain）
Pr5D（torque control input reversion）
Pr2A (CCW Torque command OFFSET)</td></tr>
<tr><td>4
5
others</td><td>position/torque
other control modes</td><td>• CCW analog torque limit input（CCWTL）
• Apply positive voltage(0~+10V) to limit CCW torque(about 3V/rated torque)
• As Pr03(torque limit option) Setting is not 0, input is invalid.</td></tr>
</table>
•A/D convertor resolution of the input is 12Bit（including sign's Bit）.
±2047[LSB]= ±10[V], 1[LSB]≒5.0[mV]</td></tr>
<tr><td>CW Torque Limit [input]</td><td>18</td><td>CWTL</td><td>• Change functions according to Pr02(control mode setting)
<table>
<tr><th>Pr02</th><th>Control mode</th><th>Function</th></tr>
<tr><td>2
4
5</td><td>Torque control
position/torque
speed/torque</td><td>• As selecting torque control, input is invalid.</td></tr>
<tr><td>4
5
others</td><td>position/torque
speed/torque
other control modes</td><td>• CW analog torque limit input（CWTL）
• Apply negative voltage(0~+10V) to limit CW torque(about 3V/rated torque)
• As Pr03(torque limit option) Setting is not 0, input is invalid.</td></tr>
</table>
•A/D convertor resolution of the input is 12Bit（including sign's Bit）.
±2047[LSB]= ±10[V], 1[LSB]≒5.0[mV]</td></tr>
</table>

＊In above complex control mode, underline of ____ / ____ represents the function is valid as selecting the control mode.

<Remarks>

Analog command input of CWTL,CCWTL/TRQR, voltage shall not be over±10V.

5-3-4 Output Interface(sharing)：

Signal Name	Pin	Mark	Function
Brake Release [Input]	11 10	BK-OFF+ BK-OFF-	• Output sequence signal as motor electromagnetic brake acts. • As electromagnetic brake is a release sequence, transistor output is ON. • Adccoring to Pr6A(mechanic brake action setting in cease and Pr6B(mechanic brake action setting in action)
Ready servo system [output]	35 34	SVO-RDY+ SVO-RDY-	• Diver can output signal after power-up. • after control/main power is on, if not in warning state, transistor output is ON.
Servo abnormality warning [output]	37 36	SVO-ALM+ SVO-ALM-	• Output signal in Warning state. • normally transistor output is ON, if in warning state, transistor output is OFF.
On-position [output]	39 38	ON-POS+ ON-POS-	• Different functions as different control modes. Position control: • On-position output(ON-POS)。 • Absolute value of position deviation pulse is under Pr60(On-position range), transistor output is ON. Speed control Torque control: • Speed attainment output（AT-SP）。 • As real speed of motor is over Pr62(speed attainment), transistor output is ON
Zero speed detection[output]	12 (41)	ZSP (COM-)	• Output signals have different meaning as Pr0A（ZSP output option）. • Standard factory setting value 1 is as output signal of ZSP. • About detail, refer to following table(TLC and ZSP output option).
Torque limit detection [output]	40 (41)	TLC (COM-)	• Output signals have different meaning as Pr09（TLC output option）. • Standard factory setting value 0 is as output signal of TLC. • About detail, refer to following table(TLC and ZSP output option).

• Output option of TCL,ZSP

Value of Pr09 and Pr0A	I/F TLC:Pin-40 Output	I/F ZSP:Pin-12 Output
0	• Output in torque limit(I/F TLC Pr09 standard factory setting) As Servo ON, torque command in TLC, transistor output is ON.	
1	•Zero speed detection output（I/F ZSP Pr0Astandard factory setting） As motor speeddowns under speed set by Pr61, transistor output is ON.	
2	•As warning signal output is over-flyback warning or overload warning, transistor output is ON.	
3	•As over-flyback warning reaches 85% warning level of over-flyack protection, transistor output is ON.	
4	•As overload warning reaches 85% warning level of overload warning, transistor output is ON.	

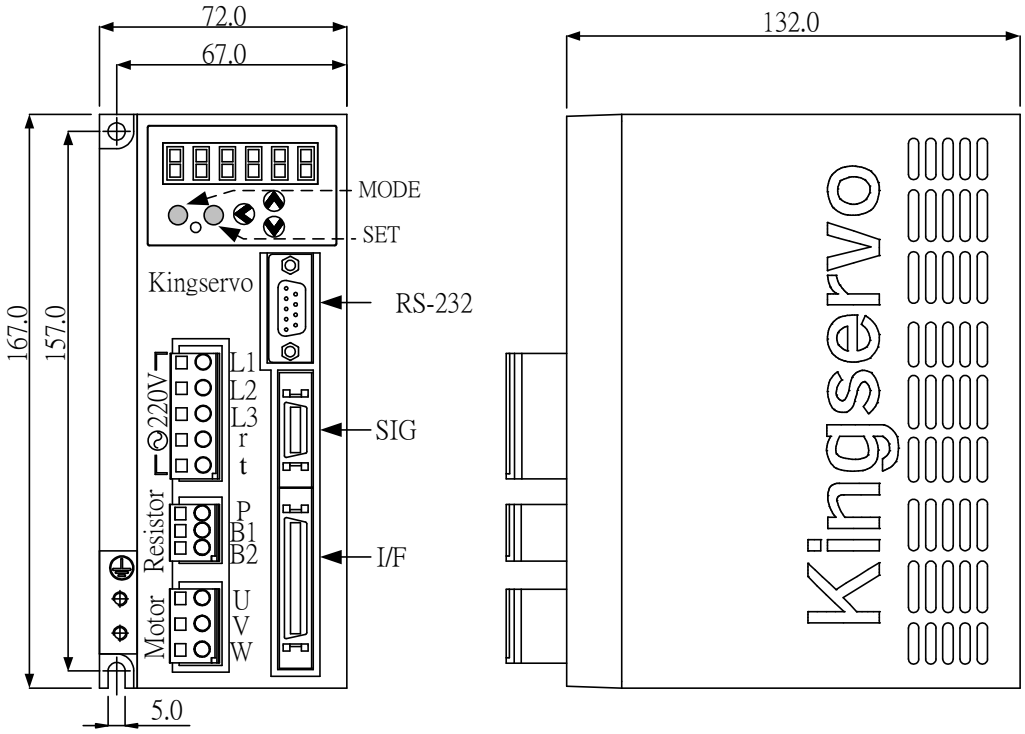
<table>
<tr><th>Signal Name</th><th>Pin</th><th>Mark</th><th>Function</th></tr>
<tr><td rowspan="6">A Phase Signal [Output]
B Phase Signal [Output]
Z Phase Signal [Output]</td><td>21</td><td>OA+</td><td rowspan="6">•Use differentioal motion ouput encoder signal proceseed with division(A, B and Z Phase).
•Set division ratio according to Pr44(output pulse pre-division of every reversion)
•Select logic relation of A phase pulse and B phase pulse in Pr45(feedback pulse output logic reversion)
•Earth line of line driver output line interface connects to and does not separate with signal earth line.
•Maximum output frequency is 4Mpps(increased 4 times).</td></tr>
<tr><td>22</td><td>OA-</td></tr>
<tr><td>48</td><td>OB+</td></tr>
<tr><td>49</td><td>OB-</td></tr>
<tr><td>23</td><td>OZ+</td></tr>
<tr><td>24</td><td>OZ-</td></tr>
<tr><td>Z Phase Signal [Output]</td><td>19</td><td>CZ</td><td>•Open collector output of Z phase signal.
•tranistor emitter of output line connects to and does not separate with signal earth line.</td></tr>
<tr><td>Torque Monitor [Output]</td><td>42</td><td>IM</td><td>• Set according to Pr08(Torque monitor(TM) option), output signals have different meanings.
• Use values of Pr08 to set proportion.
<table>
<tr><th>Pr08</th><th>Signal Meaning</th><th>Function</th></tr>
<tr><td>0-2</td><td>Torque command</td><td>•Polar voltage output with equal proportion of motor torque
＋：CW Torque
－：CCW Torque</td></tr>
<tr><td>3-7</td><td>Position deviation</td><td>•Polar voltage output with equal proportion of position deviation pulses
＋：position command in the CCW of motor position
－：position command in the CW of motor position</td></tr>
</table></td></tr>
<tr><td>Speed Monitor [Output]</td><td>43</td><td>SPM</td><td>• Set according to Pr07(speed monitor(SPM)) option), output signals have different meanings.
• Use values of Pr07 to set proportion.
<table>
<tr><th>Pr07</th><th>Signal Meaning</th><th>Function</th></tr>
<tr><td>0-4</td><td>Rotary speed of motor</td><td>•Polar voltage output with equal proportion of motor speed.
＋：CW rotation
－：CCW rotation</td></tr>
<tr><td>5-9</td><td>Command speed</td><td>•Polar voltage output with equal proportion of command speed.
＋：CW rotate
－：CCW rotate</td></tr>
</table></td></tr>
<tr><td>Analog Signal Grounding</td><td>13,15, 17,25</td><td>GND</td><td>•Analog signal grounding line
• Separate from control signal power(COM-) inside the driver.</td></tr>
<tr><td>Grounding</td><td>50</td><td>FG</td><td>•Connect grounding line terminal inside driver.</td></tr>
</table>


MODE
SET
Kingservo
RS-232/485
SIG
I/F
220V
L1
L2
L3
r
t
Resistor
P
B1
B2
Motor
U
V
W

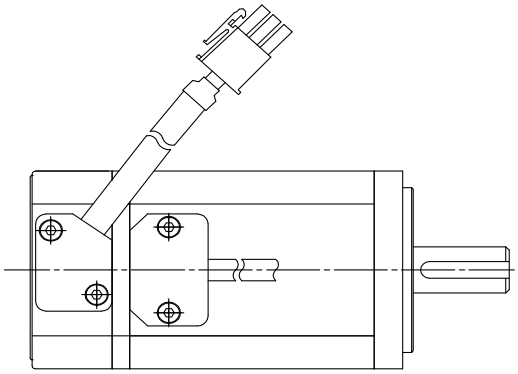
Chapter Six: Documenets

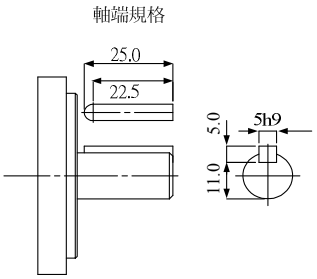
6-1Dimension Drawing

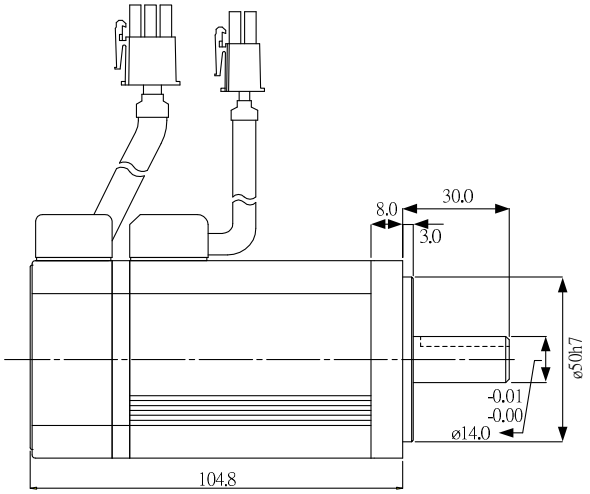
Controller KSDG 400W

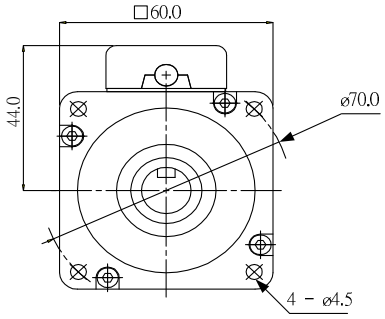


Motor KSMA 400W



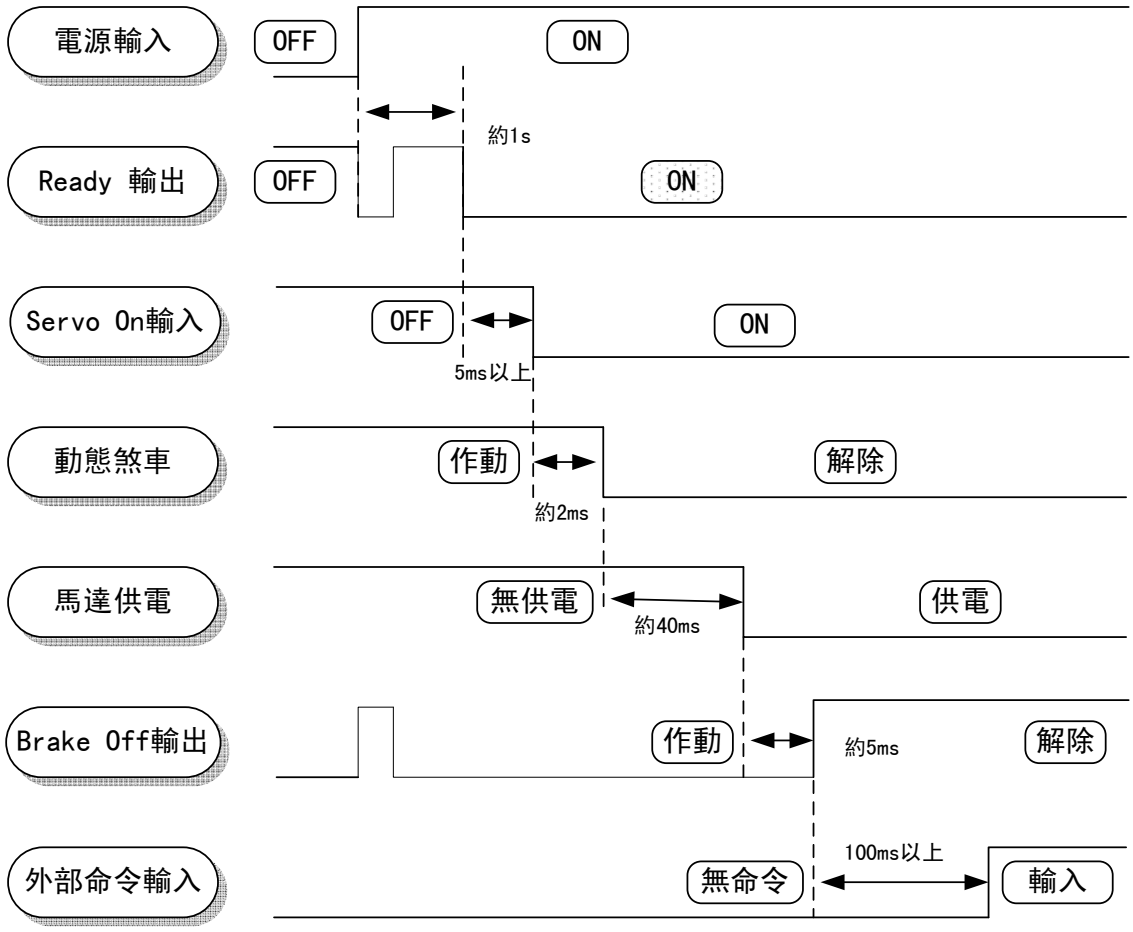






6-2 Sequence Diagram

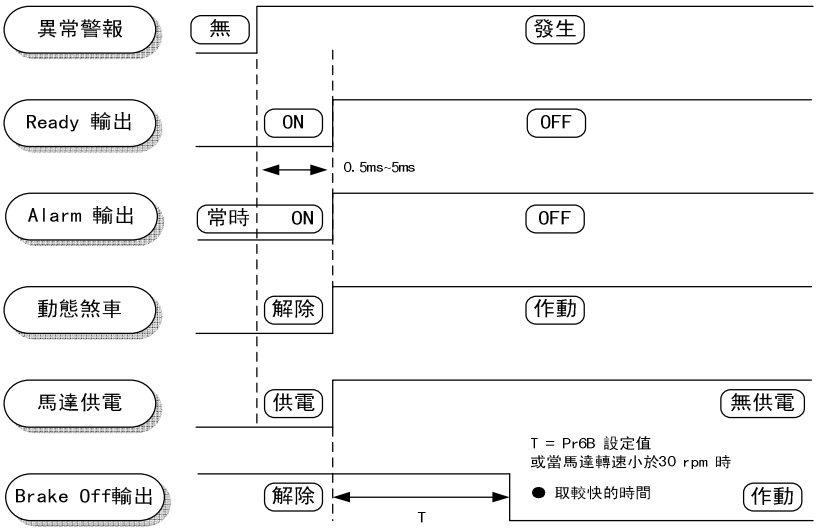
• Servo ON signal process sequence as power-up:



<Attention>

- Above charter represents the sequences from AC power starting to order inputing.
- Input Servo ON signal and external commands according to above sequences.

- **Servo state process while abnormality occurs:**

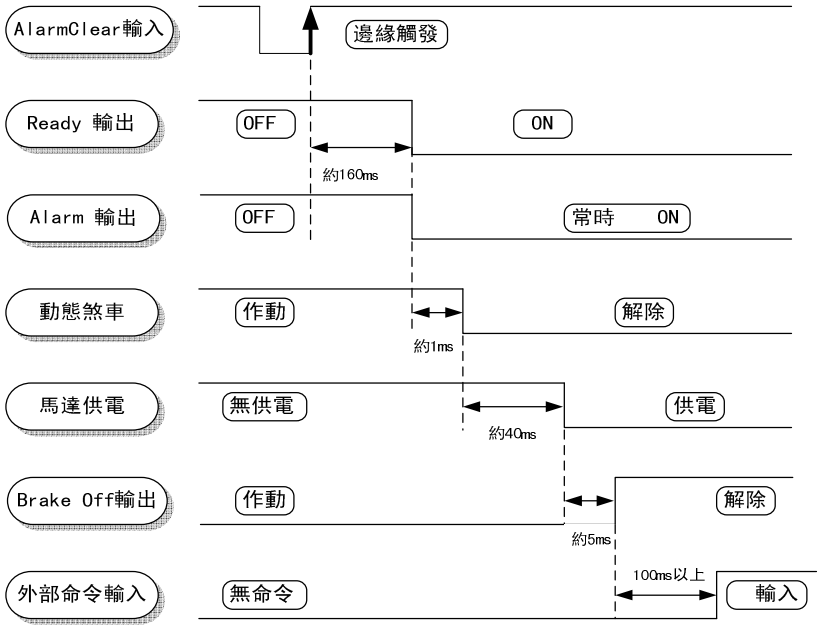


相關參數:
Pr68 警報時程序
Pr6B 動作時機械煞車動作設定

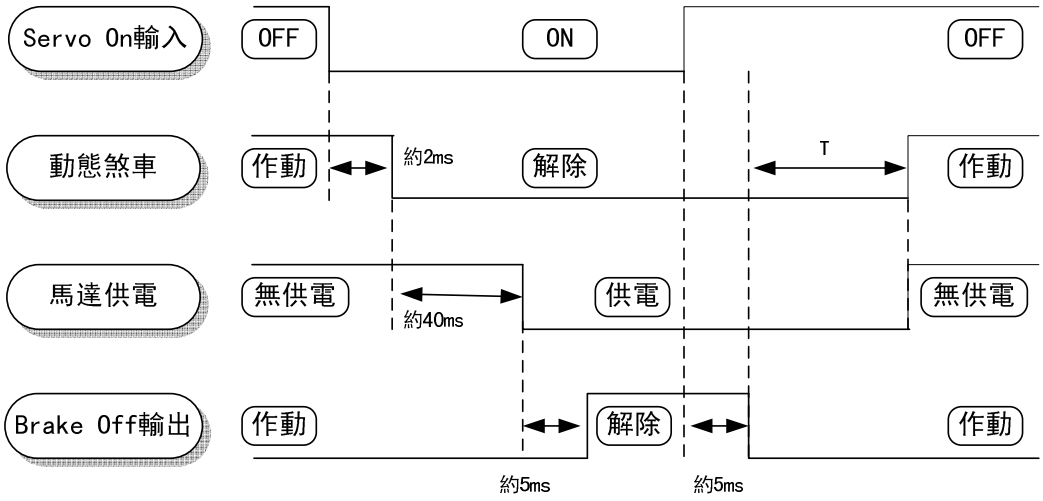
<Attention>

- T represents setting value of Pr6B or the quicker time as motor speed is under 30rpm. As motor ceases, T has no relation with Pr6A and is 0.
- About operation of dynamic brake, refer to instruction of Pr68 while alarm sounds.

- **Servo state process while abnormality is released:**



- **Operation of Servo ON/ OFF while motor ceases(Servo Lock):**



相關參數:

Pr69 ServoOff時程序

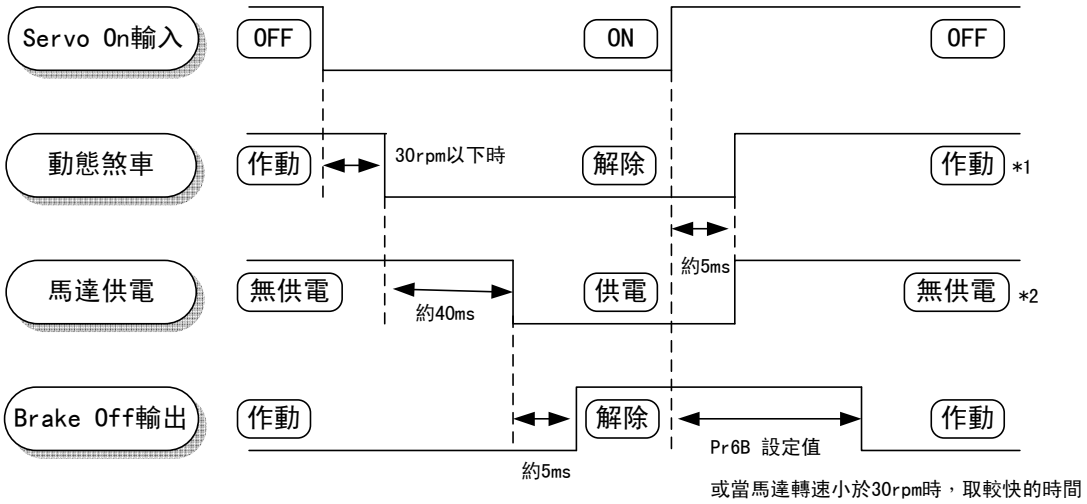
Pr6A 馬達停止時機械煞車動作設定

<Attention>

- T represents setting value of Pr6A.
- About operation of dynamic brake in Servo Off, refer to instruction(parameter setting of all control modes) of Pr69(sequence diagram of Servo Off).
- Motor speed must maintain under 30rpm, or else Servo ON can not be activated.

˙Operation of Servo ON/ OFF while motor rotating:

Emergent cease or escape program can not be re-used. In normal operation, first stop motor, and then make Servo ON/OFF action.



相關參數:

Pr69 ServoOff時程序

Pr6B 馬達動作時機械煞車動作設定

<Attention>

- T represents setting value of Pr6B or the quicker time as motor speed is under 30rpm.
- Even in the process of motor speeddown, if restarting SRV-ON signal, it will not shift to Servo-ON state before motor ceases.
- Motor speed must be under 30rpm, or else Servo-ON can not be activated.

*About operation of dynamic brake in Servo Off, refer to instruction(parameter setting of all control modes) of Pr69(sequence diagram of Servo Off).

*2 About energized state of speeddown motor in Servo Off, refer to instruction(parameter setting of all control modes) of Pr69(sequence diagram of Servo Off).

6-3 Gain Adjustment

Adjustment of Position Mode

Sequence	Parameter No.	Function	Default	Concept of adjustment
1	Pr11	1st speed loop gain	35	Rise in no abnormaly voice and range of vibration; decline while abnormaly voice occurs.
2	Pr14	1st torque filter time constant	65	Try to change the value as vibration occurs in mofiatin of Pr11 Expect to reduce vibration as machine ceases, rise Pr14 and reduce Pr11. As to intense vibration before cease, reduce Pr14.
3	Pr10	1st position loop gain	63	Adjust this value and observe setting time. Too high value may shorten setting time, but cause vibration.
4	Pr12	1st speed loop integral time constant	16	No problem in the operatio means the valus is proporiate. Low value may shorten setting time, but too low value may cause vibration. If setting is too high, deviation pulse can not properly converge and have residuary.
5	Pr15	Positive regeneration speed	300	As vibration and voice can not go beyond the range of abnormality, rise it grandually. Once positive regeneration is too lardge, except Over Shoot, on-position signal will be vibrating and setting time can not be shortened. As comamand pulse input can not be equal, to rise Pr16(positve regeneration filter) can properly improve the performance.

Adjustment of Speed Mode

Except positon loop gain and positive regeneration speed, adjustments of speed control are similar with above adjustment of position mode.

Adjustment of Torque Mode

Pr56 (4th speed of speed setting)or speed control loop of SPR speed limit input is the base of torque control. The following explains the setting of speed limit value.

■ Setting of speed limit value

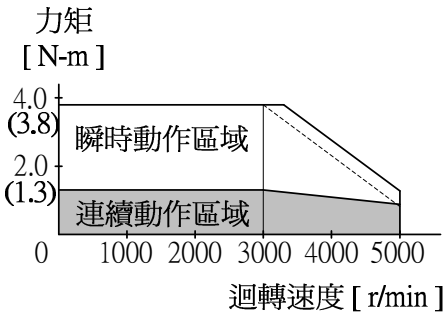
Use 4th speed of speed setting(Pr56)(torque command option(Pr5B) is 0) or speed command input(SPR/TRQR)(torque command option(Pr5B) is 1) to set speed limit value.

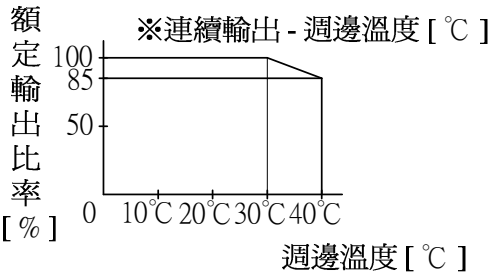
˙According to analog torque command, as motor speed reaches limit value, take speed limit value decided by 4th speed of speed setting(Pr56), or analog speed command input(SPR/TRQR) as command to shift from torque control to speed control.

For stable operation in speed control, set parameters according to adjustment of speed mode.

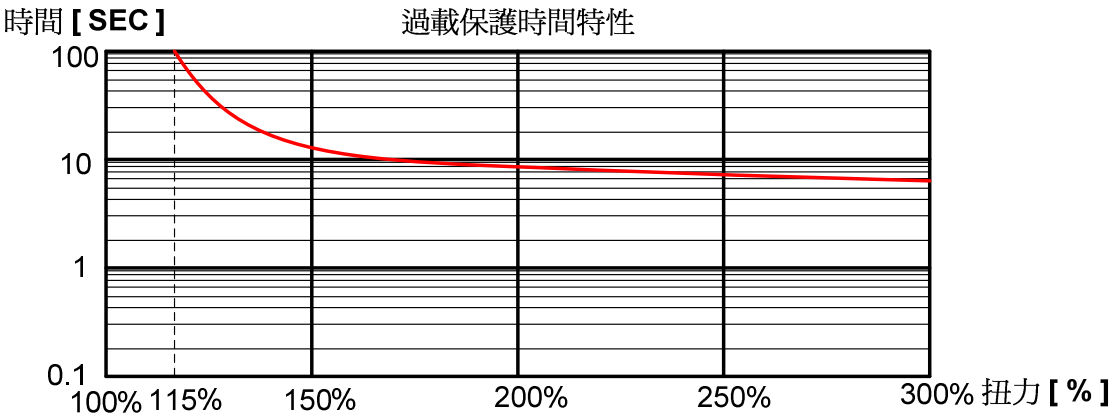
- As speed limit value=4th speed of speed setting(Pr56) or analog speed command input (SPR/TRQR) is too low or speed loop gain is too low or speed loop integral time constant is 1000(invalid), the cause is that samll input of torque limit can not reach the designated torque of analog torque command.

6-4 S-T Feature of Motor





6-5 Feature of Overload Time Limit



6-6 Connector Group of Connector and Transmission Line

6-6-1 Air Connector

Appicable Motor Mode：KSMA 400W 750W

Item	Mode	Quantity	Manufacturer	Remarks
Air connector	172167-1	1	Tyco electronics	Air connector of motor side and power connection
Connector Pin	170364-1	4	Tyco electronics	
Air connector	172171-1	1	Tyco electronics	Air connector of motor side and encoder connection
Connector Pin	170363-1	11	Tyco electronics	
Air connector	172159-1	1	Tyco electronics	Air connector of motor power connection cable
Connector Pin	170366-1	4	Tyco electronics	
Air connector	172163-1	1	Tyco electronics	Air connector of encoder connection cable
Connector Pin	170365-1	11	Tyco electronics	

6-6-2 Specification of SCSI-II Connector

Connector of diver side	Related connector prepard by user		Manufacturer
	Parts Name	Type	
SIG	Connector (Welded)	10120-3000PE	Sumitomo 3M
	Connector Shell	10320-52A0-008	
I/F	Connector (Welded)	10150-3000PE	Sumitomo 3M
	Connector Shell	10350-52A0-008	

6-6-3 Specification of Main Loop connector

Item	Mode	Quantity	Manufacturer	Remarks
Connector (Female)，5PIN，7.5mm	231-205/026-000	1	WAGO	connector used by main power(L1,L2, L3)and control power(r, t)
Connector (Female)，3PIN，5mm	231-103/026-000	1	WAGO	Connectors of flyback resistor (P, B1, B2)
Connetctor (Female)，3PIN，7.5mm	231-203/026-000	1	WAGO	Connector of motor power(U、V、V)
White pressing rod	231-131	2	WAGO	Wiring tool

6-7 Driver Specification

6-7-1 Basic Specificaiton

BASIC INFAMATION	Input voltage	Main circuit	Single/Threee phase，190~255V 50/60Hz
		Contrl circuit	Single Phase，190~255V 50/60Hz
	Environemnt	Temperature	Operation：0~55℃， Storage：-20~+80℃
		Humidity	Operation／Storage：under 90%RH（non frost）
		Height	Under 1000m
		Vibration	Under 5.88m/s², 10~60Hz(donot use it continuously in resonant frequency）
	Control Mode		IGBT PWM sine wave drive
	Feedback encoder		2500P/r (10000 Resolution) Incremental Encoder
	Control signal	Input	11 inputs (1) Servo-ON, (2) Control mode shift (3) gain shift／torque limit shift (4) different functions of warning clearance as different control modes.
		output	6 outputs (1) Servo alarm, (2)Servo ready, (3)Brake release signal, (4)Zero speed detection,(5)In torque limit, different functions of output as different control modes
	Analog signal	input	3 inputs(A/D)
		output	2 inputs（For monitor） (1) Speed monitor（Monitor pratical speed of motor or command speed. Use parameter to set monitor content and scale proportion.） (2) Torque monitor(monitor torque command(about 3V/rated torque), deviation counter and fully enclosed loop deviation. Use parameter to set monitor content and scale proportion.)
	Pulse signal	Input	4 inputs use parameter to select input pulse of line driver interface or photo-coupler interface.
		output	4 outputs line driver interface output encoder pulse(A, B and Z phase)，Z phase is outputed form open collector interface.
	Communicatio n Function	RS232	Make 1:1 communicaiton with main controller with RS22C interface.
	Front Panel		(1) 5 keys（MODE, SET, ← , ↑ , ↓）, (2)LED（6 digitals）
	Flyback		Inbuilt flyback resistor(50W)。
	Dynamic Brake		Set dynamic brake action program while power off, Servo OFF, protection function action and inhibition drive input action.
	Control Mode		6 modes, set and shifted by parameters,(1)postion control, (2)Speed control, (3)torque control, (4)position/speed control/, (5)positon/torque control, (6)speed/torque control

6-7-2 Function

FUNCTION	Control input			(1)Servo ON input, (2)Warning clerance input, (3)Gain shift input, (4)Control mode shift input(5)CW drive inhibition input, (6)CCW drive inhibition input, other different input as different of control modes.
	POSITION	Control input		(1)Deviation counter clearance (2)Command pulse inhibition (3)Anti-vibration shift input (4) Gain shift or torque limit shift input
		Control output		On-position
		Pulse input	Max pulse input frequency	Exclusive line driver inerface:2Mpps, Line driver:500kpps, Open collector:200kpps
			Input pulse interface	Support (1)RS422 line drive signal, (2)open collector signal
			Input pulse form	(1)CW/CCW pulse, (2)pulse/direction signal, (3)90° phase difference square wave
			Electronic gear (divison/multipli of command pulse)	$命令脉波频率 \times \frac{(1到10000) \times 2^{(0到17)}}{1到10000}$
			Smooth filter	Apply to one time delay filter of command input, select: (1)position control useed in rigidest machine (2)start FIR filter agaistposition control useed in rigidest machine
		Analog input	Torque limit command input	In directions of CW and CCW, independently set torque limit （3V/ rated torque）
	SPEED	Control input		(1)Zero speed clamp, (2)Internal speed option, (3)Gain shift input
		Control output		(1)Speed attainment（at-speed）
		Analog input	Speed command input	Allowable max voltage output=±10V, 6V/rated speed(standard factory setting), against command voltage, use parameter set proportion and direction of motor roatation.
			Torque limit command input	）In directions of CW and CCW, independently set torque limit （3V/ rated torque）
		Speed control range		1：5000
		Internal speed command		Use parameters to set, 4 sections.
		Soft-start/cease function		0~10s/1000r/min, respectilvely set speedup/speeddown, set S-shaped speedup/speeddown
		Zero speed clamp		Use zero speed clamp input to control internal speed to 0.

FUNCTION	TORQUE	Control Input		(1)CW Trip Limit, (2)CCW Trip Limit (3)Zero Speed Clamp
		Control Output		(1)Speed Attainment (at-speed)
		Analog Input	Torque Command Input	Allowable max voltage output=±10V, 3V/rated speed(standard factory setting), against command voltage, use parameter set proportion and direction of motor roatation.
			Speed Limit Command Input	Analog voltage input speed control, use parameters to set proportion value.
		Speed Limit Function		Use parameter to set speed limit value or use analog input to control speed limit.
	SHARINGPARTS	Need no wiring line function shield.		Following signals don't use sheild (enclosure) (1)over-trip drive inhibition, (2)torque limit, (3) command pulse inhibition, (4)zero speed clamp
		Encoder Feedback Pulse Division		Set any division proporiton value(not over the max pulse numbers of endcoder)
		Protection Function	Software Fault Warning	Over-voltage, low voltage, overspeed, overload, overheat, over-current and encoder abnormality etc.
			Hardware Fault Warning	Position deviation excess, command pulse division abnormality and EEPROM abnormality etc
		Warning Record		Including current fault warning, it can trace back previous 16 warning records.
		Setting	Panel adjustment	Five key in the front panel MODE SET △ ▽ □
			Software	KSDTools

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