

**液壓伺服油電系統**  
ELECTRO-HYDRAULIC SERVO SYSTEM

**操作說明書**  
OPERATION MANUAL

野力機電實業有限公司  
YE LI ELECTRIC & MACHINERY CO., LTD.

[V20130725]

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# 前　　言

歡迎使用野力機電實業有限公司製造之液壓伺服油電系統。請您仔細閱讀本操作手冊，以確保正確地操作系統。此外，請將本操作手冊妥善保存在安全地點，以便隨時查閱。

◆ 本手冊適用下列使用者:

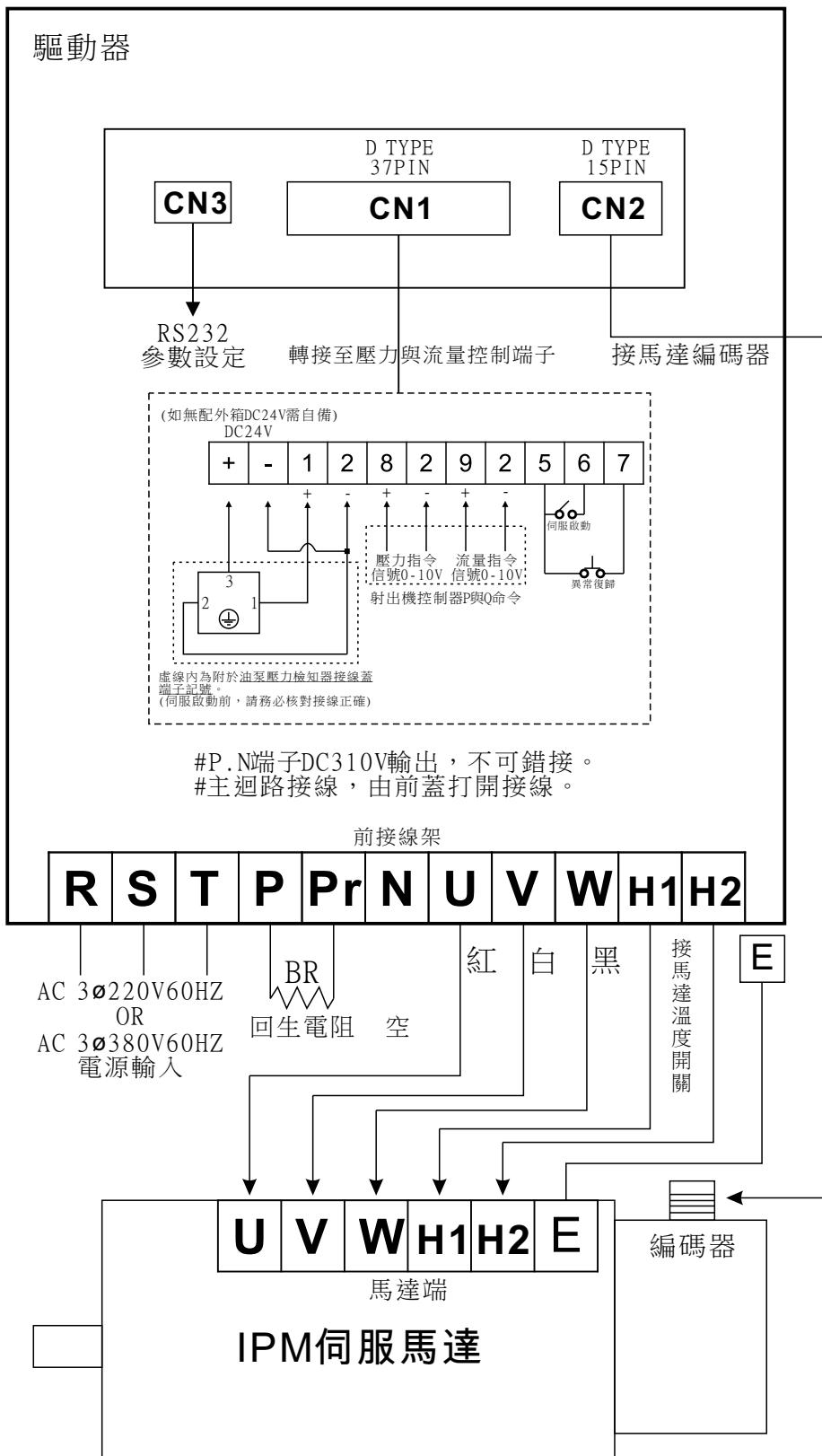
- ① 控制系統的設計人員
- ② 安裝與配線人員
- ③ 使用與維修人員

◆ 請務必遵守以下事項:

- ① 安裝環境必須沒有水氣、腐蝕性氣體及可燃性氣體。
- ② 接線時禁止將輸入電源直接與馬達的U、V、W接線端連接，一旦接錯，將損壞驅動器及馬達。
- ③ 接地線必須確保安全接地。
- ④ 在通電時，請勿拆卸驅動器、馬達、油泵或更改配線。

➤ 請勿私自拆卸驅動器、馬達的外殼，對驅動器的任何更動或損壞將會使保修權利失效，本公司對此引起的後果不承擔任何責任。  
使用過程中若有疑問可諮詢本公司。

# 伺服油壓泵浦配線圖



# 伺服油壓泵安裝與使用注意事項

## □ 安裝環境

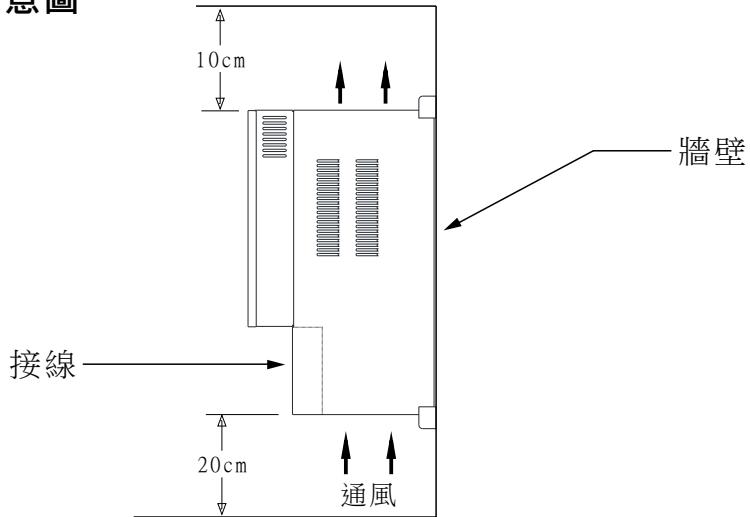
為了使伺服油電系統能有完好的性能與長期的工作壽命，請注意以下建議安裝環境，確保伺服驅動器免遭損壞。

- ◆ 應避免陽光直射，不可直接在戶外使用。
- ◆ 不可在淋雨、潮濕環境中使用。
- ◆ 不可在油霧、濺水環境中使用。
- ◆ 不可在鹽霧環境中使用。
- ◆ 不可在腐蝕性氣體與液體環境中使用。
- ◆ 不可在機械衝擊、振動場合下使用。
- ◆ 安裝於震動源附近，需安裝振動隔離機構以免受震動影響。
- ◆ 放射性材料會影響設備的使用。
- ◆ 易燃物品、稀釋劑、溶劑應遠離設備。
- ◆ 空氣中飄有金屬粉末或絲紡纖維等過濾空氣須加裝過濾裝置。
- ◆ 當環境溫度高於50°C時，必須採取降溫措施方可使用。
- ◆ 過冷與過熱會使設備故障，建議-20°C~50°C範圍使用。
- ◆ 遠離電源因干擾變動之場合，如電焊、大功率用電設備會影響設備的穩定性。

## □ 驅動器安裝

- ① 建議安裝的方向與牆壁垂直，且驅動器上下須留足夠的通風空間與接線空間(上約10公分，下約20公分)，以利於散熱，如下圖所示。
- ② 請將4處安裝孔牢固地固定在安裝面上。
- ③ 當機台內安裝多台驅動器時，驅動器互相之間左、右間隔至少4cm以上，多台並列配置時，上、下方分別預留10cm和20cm以上之空間或設置冷風扇加速空氣對留。

## □ 驅動器安裝示意圖



## □ 檢查所有接線

先檢查所有接線是否正確，包含：

- 電源線(R.S.T)檢查入電的電源電壓是否正確，
- 馬達動力線(U.V.W)要與驅動器(U.V.W)相對應正確
- 檢查壓力傳感器壓力回授信號線接線是否正確(核對接線圖)
- 檢查馬達編碼器插頭是否對接完成

# 伺服油壓調機注意事項

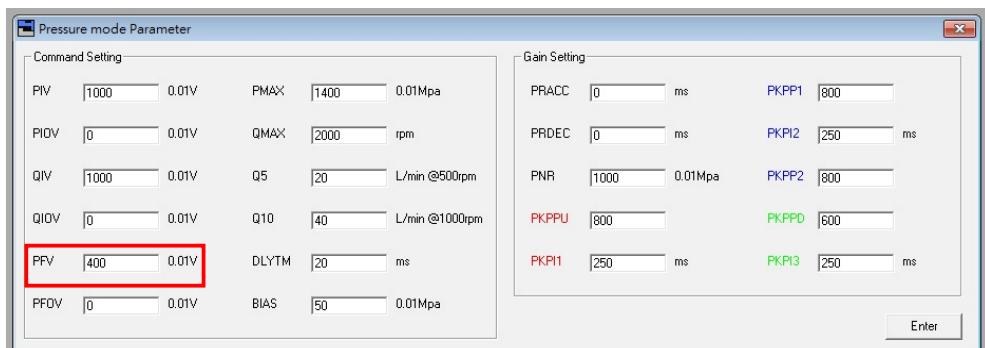
- ✓ 壓力傳感器應組裝於油路板靠近油壓泵，使伺服驅動器在讀取壓力回授信號時，避免因油路管之脹縮而使補償值不正確，並請設定正確之壓力對應值及歸零調校。
- ✓ 射出機控制器接往驅動器之壓力(P)指令與流量(Q)指令應為DC 0~+10V類比式直流電壓，如非類比式直流電壓或PWM信號要另加信號轉換板處理(因各廠家射出機控制器P與Q信號不盡相同)，P與Q信號線應各自分開以有隔離包覆之信號專用線對應+、-極性接妥。
- ✓ 安全洩壓閥洩壓值應調整高於保壓值10~20%左右，避免在額定壓力值動作區產生不正確之洩放，例如保壓值為 $140\text{kg}/\text{cm}^2$ ，洩壓閥應調整在 $155\sim 168\text{ kg}/\text{cm}^2$ 之間。
- ✓ 油路、電路配好後，檢查無誤，伺服啟動後需以小流量(約額定Q值10%)運轉，潤滑泵浦讓油管內氣體排出，待上述動作完成後再作正常連續運轉操控。

# 伺服油壓調機步驟

## 步驟一、最大壓力回授電壓對應

打開POWER，驅動器入電，檢查驅動器狀態是否正常(顯示0)，此時S/ON先不開，先打開參數設定(可經由人機介面或電腦設定)，進入油壓參數設定(請參考附表)：

- 在油壓參數設定裡最重要的最大壓力回授電壓對應的最大壓力(PFV)，此一參數必須先設好，一般都使用350bar對應10V的壓力傳感器，代表 $1V = 35bar$ ，而一般油壓機的最高壓力皆為140bar，因此設定PFV為4V(即附表上的400 (0.01V)， $4 \times 35 = 140$ )，如果壓力傳感器不同，便能以此方式計算出PFV值。
- 此值填入後必須重開驅動器(需等到狀態指示燈熄滅才能重開)，新的數值才會生效。若計算的值填入後，若油壓系統保壓的值(油壓錶)對應還有落差，須向下或者向上修正此值與油壓錶對應。

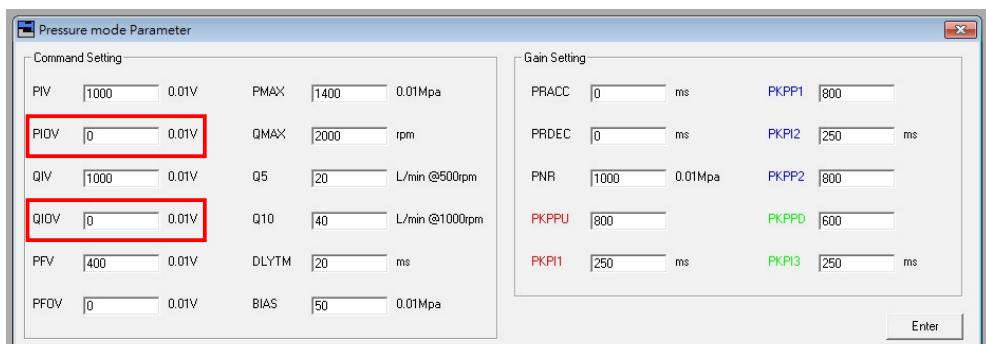


※ 輸入數值調整最大壓力回授對應(即為上圖紅框)

## 步驟二、調整流量壓力零點

接下來需調整流量壓力零點，修正此值關係到節能的效率，以獲得最大的省電效率。

- 調整流量零點: 將流量訊號(即下圖QI0V)數值設為0，然後將監控打開，此時看馬達轉數是否為0(即馬達轉動與否)，如馬達還在轉動，便修正QI0V之值，修正馬達至不轉，此時代表流量訊號給0V時，馬達必須為靜止的狀態，另外需注意在設定此值時，壓力信號(即下圖PIOV)不設為0，可先將壓力信號設定為20%-50%即可。
- 調整壓力零點: 將流量訊號(即下圖QI0V)與壓力信號(即下圖PIOV)之值皆設為0，同上步驟將監控打開看馬達轉數是否為0(即馬達轉動與否)，如馬達還在轉動，便修正PIOV之值，修正馬達至不轉，此時代表壓力訊號給0V時，馬達必須為靜止的狀態。



※ 輸入數值調整流量訊號(QI0V)與壓力信號(PIOV)(即為上圖紅框)

Pm Name	設定值	單位	功能說明
PIV	1000	0.01V	壓力命令輸入最大電壓
→ PIOV	0	0.01V	壓力命令輸入零點補正電壓
QIV	1000	0.01V	流量命令輸入最大電壓
→ QI0V	0	0.01V	流量命令輸入零點補正電壓
PFV	400	0.01V	最大壓力回授電壓對應的最大壓力
PF0V	0	0.01V	壓力回授零點補正電壓

※ 只需修正這六個參數，而最重要的參數為PFV這個參數，此參數關係到油壓機的最大壓力。

# 驅動器異常顯示與處理

## 保護顯示一覽表

伺服驅動器本身有過電壓、過電流等多項警示訊息與保護功能，一旦異常故障發生，保護功能動作，伺服驅動器停止輸出，馬達停止運作。請依據伺服驅動器異常顯示內容對照其異常原因及處置方法進行處理。

顯示狀態		動作說明	處理對策
0	READY	伺服器系統準備妥當與馬達主線路及編碼器連線正確	伺服馬達可以開始控制運作
1	OC	超過瞬間值以上的不正常大電流產生時，過電流警報，致使停機	檢查負載是否超過額定值，主回路元件是否損壞，輸出線路是否短路
2	OV	負載慣量過大，動態煞車過於頻繁，而使回生電壓超過安全值，主回路保護系統警報，致使停機	檢查過負載慣量是否超過額定，選擇加裝回生放電電阻
3	OL	伺服馬達負載達 150 % 以上時，如連續一分鐘即發出警報，致使停機	檢查過負載元因
4	OH	伺服馬達線圈溫度高於 135°C 時以及驅動器散熱片溫度高於 85°C 時，發出警報，致使停機	檢查工作環境及通風措施是否不良
5	OS	當馬達轉速超過額定轉速 120% 時，發出警報，致使停機	檢查速度指令是否超出容許量或負載過大
6	EE	編碼器接線錯誤斷線或 U.V.W 回授信號接錯時 發出警報，致使停機	參考接線圖，重新檢查接線是否正確
7	PF	主回路直流電壓低於 240VDC 時，工作電壓不足，發出警報，致使停機	檢查交流電源是否低於容許值或主回路濾波電容損壞 550W以上請接3φ 電源
8	RESET	驅動器控制系統重置	警報狀況解除後系統重新運作
9	OVF	變異誤差量	檢查負載是否過大或脈波頻率過高
	CPU	中央處理器錯誤	重置後開機

# 故障原因與排除方法

1. 關模安全盤關門後未彈起?  
檢查門是否關妥或清洗安全盤。
2. 關模方向盤未送電?  
檢查電線及輸出板或更換。
3. 機械安全桿設定不當?  
調整好機械安全桿。
4. 低壓位置設定不當?  
適當調整低壓起點位置。
5. 高壓位置設定不當?  
將高壓位置調整在鎖模動作位置。
6. 開模方向盤沒送電?  
檢查電線及輸出板或更換之。
7. 鎖模時間太久模具產生內應力?  
停機前應將模微開。
8. 射座進退方向盤未送電?  
檢查方向盤電線是否斷線及輸出板是否需更換。
9. 射座壓板太緊?  
加點潤滑油。
10. 鬆退位置設定不當?  
調整鬆退位置在加料停止後面。
11. 料管電熱故障?  
檢查電熱片及相關線路。
12. 料管冷卻水未開，塑膠溶到落料處?  
料管水栓打開。
13. 塑料包著螺桿?  
溫度再升高讓料溶化，並清除管內塑料。
14. 入心時間到定位沒ON?  
入心時間調長。
15. 成品跳過電眼?  
調成品落下之位置。
16. 油溫設定不當?  
油溫控制器常設在55度C左右。
17. 機械手臂回位會晃動?  
將機械手臂回位調慢
18. 自動時安全門打開太久?  
按回手動狀態。
19. 包裝數量到(預定數到)?  
開門再關門。
20. 調模方向盤未送電?  
檢查調模方向盤電線是否斷線，輸出板是否需更換。
21. 系統故障?  
按一下“系統復歸”。
22. 機台接地不良?  
把機台接地處理好。
23. 各種接觸器未加R.C?  
將接觸器線圈加R.C(DC線圈加二極體)。
24. 散熱不良?  
電器箱裝風扇降低周邊溫度。

# 保養與檢查

非受過專業訓練的維護人員，嚴禁觸碰內部的電路元件，有觸電的危險！為了使液壓伺服油電系統長期保持良好的狀態，有必要進行良好的保養與定期的檢查。

## □ 注意事項

切斷所有電源以後的一段時間內，驅動器內部電容仍存有高壓電，請問必確認放電後，方可進行檢查。

## □ 檢查項目

需定期檢查的項目見下表：

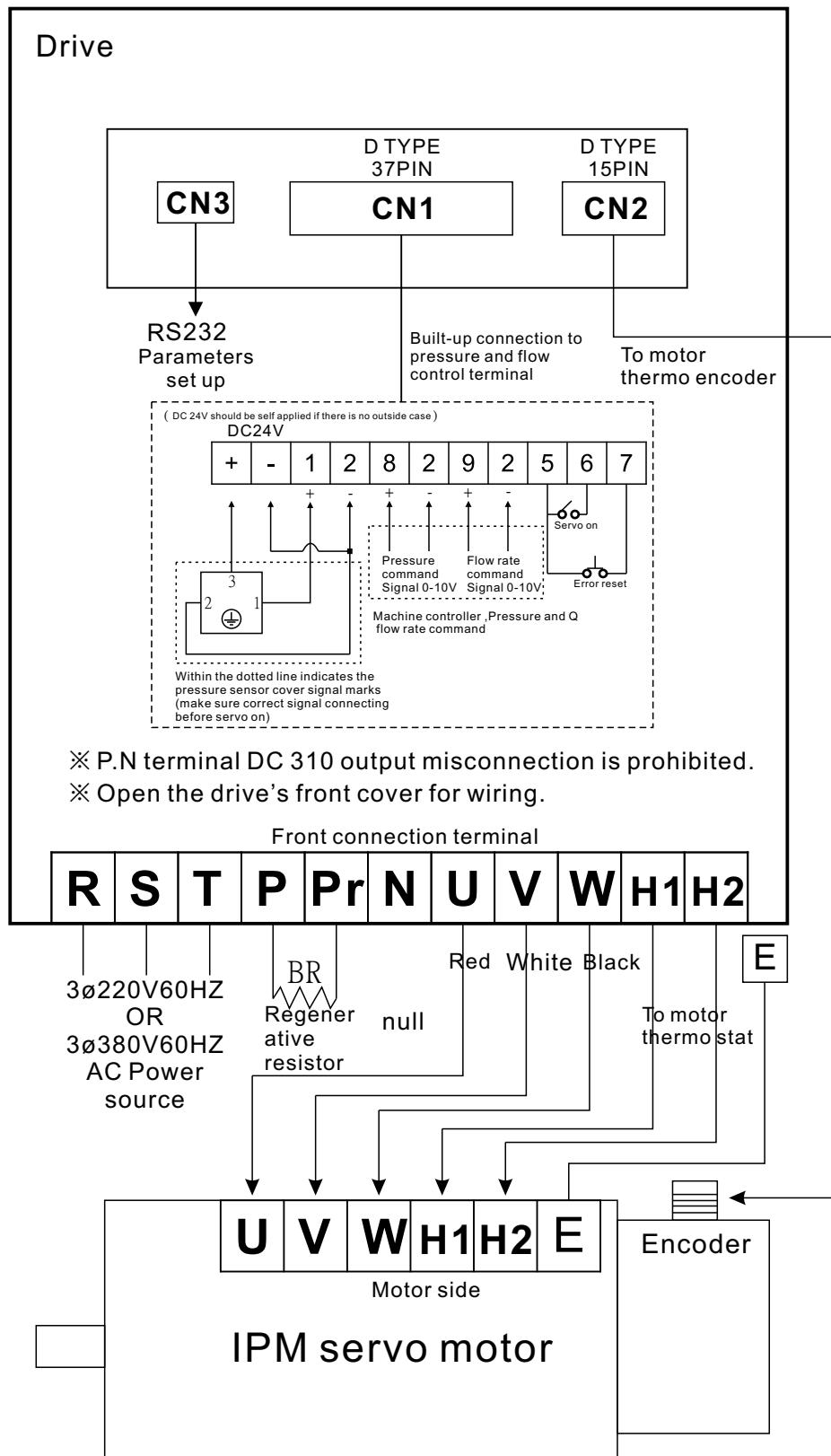
檢查項目	檢查內容	檢查方法及 測量儀器	判斷標準
使用環境	周圍溫度、溼度、油水 金屬粉等	目視、溫度計 溼度計	達成說明書的要求
電源電壓	供電電壓是否正常	三用電表	達成說明書的要求
	送電程序是否正常		
外觀及 元件檢查	是否有異常振動、雜音、 變形、破損	目視、 鎖緊螺絲、 三用電表	無異常
	外置式放電電阻連接是否鬆 脫、電阻是否老化、阻值是 否		
電路檢查	有無異味	聽、聞、看	無異常
	冷卻風扇是否正常轉動		
	所有相關接線是否有鬆脫		
	連接線是否有破損、 壓壞		
	電容是否有變形、 漏液		

# PREFACE

Welcome to apply the hydraulic servo system from Yeli Electric and Machinery Co., Ltd. Please carefully read the operating manual to ensure correct operation of the system. Keep this manual in a proper place for future reference.

- ◆ This manual is suitable for the following users:
  - ① Control system designers
  - ② Installation and wiring personnel
  - ③ Users and maintenance staff
- ◆ The following items are obliged to be followed:
  - ① Moisture, corrosive gases and flammable gases in the installation environment are not allowed.
  - ② Do not connect the input power source directly with the U, V or W wiring terminals of motor. Otherwise, it will cause the drives and motors damage or fire hazard.
  - ③ The ground wire must ensure the safety grounding for sake of drives and motors damage or electric shock.
  - ④ When power is applied, the driver、motor、pump dismantle or wire changing is prohibited.
- Do not dismantle the drive and motor housing. Any unauthorized change or artificial damage will invalidate the warranty rights. Yeli will not take responsibility for the result of unauthorized modification of this product. Yeli shall not be liable for any damage or trouble resulting from unauthorized modification.  
This manual is subject to change without notice.

# ELECTRO-HYDRAULIC SERVO PUMP WIRING DIAGRAM



# ELECTRO-HYDRAULIC SERVO PUMP INSTALLATION AND USER'S GUIDE

## □ Installation condition

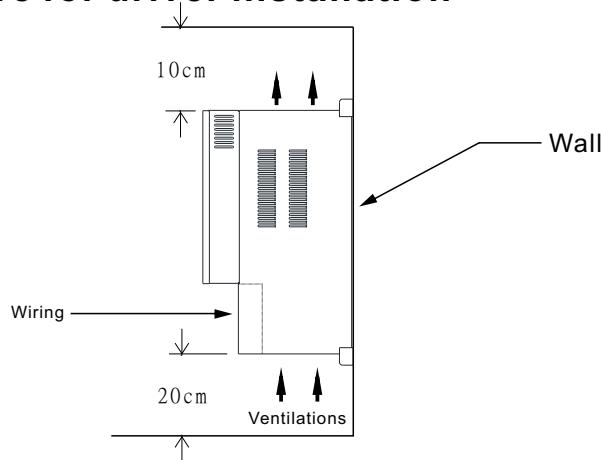
Limited installation condition is for the Electro-hydraulic servo system operation life. Environments suggestions should be followed to prevent servo driver from damage

- ◆ Direct exposing to sun light is prohibited, indoor use only.
- ◆ Do not use in rain shower and humidity condensed conditions.
- ◆ Oil mist and water spray are not allowed.
- ◆ Do not use in condition of salty mist.
- ◆ Keep away from corrosive gas and fluid.
- ◆ Keep away from mechanical shock and vibration condition.
- ◆ Shock absorbers or isolation mechanism are necessary for shock and vibration vicinity installation.
- ◆ Radiant material affects the device use.
- ◆ Keep away from inflammable, thinner or solvent.
- ◆ Filtering devices are necessary for condition that metal powder or silky fiber are floating in the air.
- ◆ When ambient temperature is over 50 degrees Celsius, cooling measure should be applied before devices employed.
- ◆ Sub-cooled or overheat will cause devices breaking down, employing temperature within -20 to 50 degrees Celsius is suggested.
- ◆ Keep away from electrical noise such as electric welding or high power consumption equipment which could affect the stability of the device.

## □ Servo driver installation

- ① Install driver perpendicular to a vertical wall, retaining sufficient ventilation and wiring space (approximate 10cm above and 20 cm below) for heat removal and operation. Shown as below figure:
- ② Please secure the four fixing holes to installation plane stiffly.
- ③ When install multiple drivers side by side in a cabinet, it must allow at least 4 cm spacing left and right for each driver. Leave 10 and 20 cm above and below the driver for cooling fan to increase ventilation rate.

## □ Schematic figure for driver installation



## □ Schematic figure for driver installation

### Examine all electric wiring

Examine all wiring connection rightness, including:

- Power source line (R. S. T.) voltage.
- Driver output power line (U.V.W) connects with corresponding motor power line (U.V.W).
- Pressure transducer feed back signal wiring (checking with transducer wiring diagram).
- Motor encoder connecting and abutment.

# NOTICES OF ELECTRO-HYDRAULIC SERVO SYSTEM

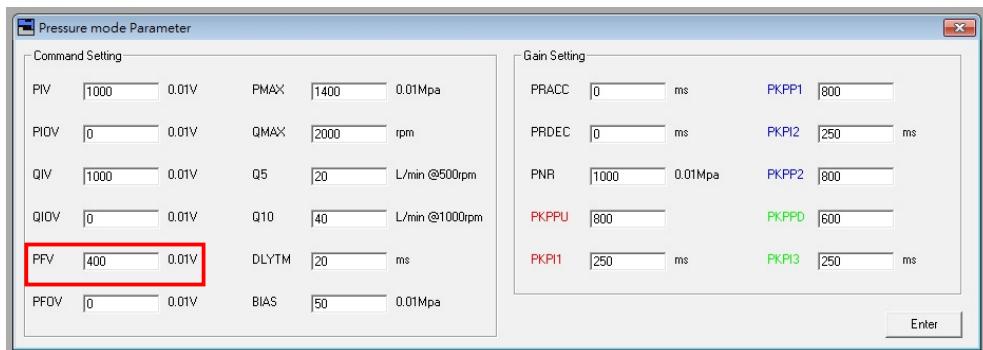
- ✓ Pressure transducer should be install in the hydraulic manifold block which is closed to oil pressure pump to prevent incorrect compensation due to enforced rubber pressure tube expansion. Pressure corresponding value setting and zero adjusting is necessary.
- ✓ The injection mold machine controller to driver's pressure(P) command and flow rate(Q) command signals are DC 0V~ +10V analog DC voltage. A signal conversion board is necessary for non-DC or PWM voltage signal (depends on each machine controller's difference). Shielding signal wires should be applied to P and Q separately and corresponding + and – polarity be connected properly.
- ✓ Relief pressure of safety relief valve shall be set up with 10~20% higher than packing pressure. This prevents with the incorrect relief in rated pressure acting region. For example, a 140kg/cm<sup>2</sup> packing pressure, the relief pressure should be 155~168 kg/cm<sup>2</sup>.
- ✓ After hydraulic circuit and electric wiring are ready and checked, start up servo and operate system in a small flow rate (about 10% of Q rating value) for the hydraulic circuit lubrication and air exhausting. The normal continuous operation can be executed then.

# ELECTRO-HYDRAULIC SERVO SYSTEM TUNING PROCEDURE

## STEP 1. Maximum pressure feed back signal corresponding voltage

Power on, check driver's normal status (display 0), there is no S/ON, open parameters set up function (via interface operator or PC) into oil pressure parameter setting (refers to attached list).

- The most important issue in the oil pressure parameter setting is maximum pressure feed back voltage corresponding pressure value (PFV). A default value is given via 350bar corresponds 10V transducer, represents 1V=35bar. Maximum pressure of a general oil pressure machine is usually 140bar, the PFV will set to 4V (i.e.,  $400 \text{ (0.01V)}$ ,  $4 \times 35 = 140$  in attached list). Different transducer value application can be calculated in the same way.
- After new value has been filled in, power off driver wait until status indication light extinguish then power on driver, the new set value will take effect. Revise value upward or downward to meet if oil system packing pressure value is different to oil pressure dial reading.

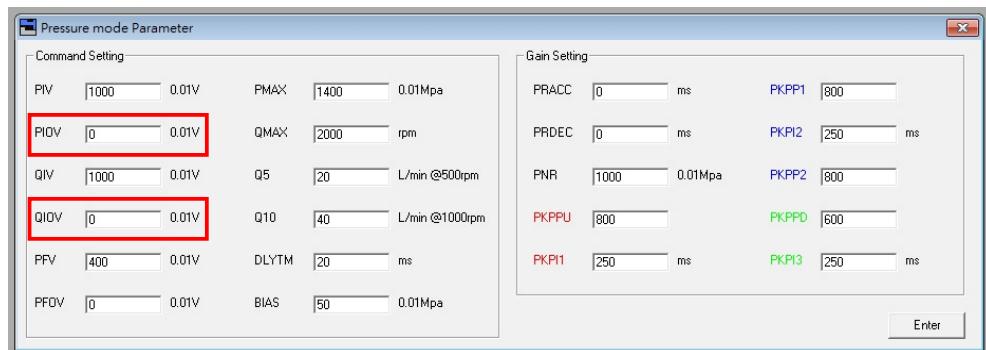


※ Input value to tune up maximum pressure feedback correspondent (red box shown in the above figure).

## STEP 2. Pressure and flow rate zero point adjustment

Following steps will perform pressure and flow rate zero point adjustment to obtain the maximum energy saving efficiency.

- Flow rate zero point adjustment: If speed monitoring indicates that motor rotates while flow rate signal (QI0V) has been set to zero, adjust QI0V value in order that motor is in stall condition. Notice that pressure signal (PI0V) pre-setting value is about 20%~50%.
- Pressure zero point adjustment: If speed monitoring indicates that motor rotates while flow rate signal (QI0V) and pressure signal (PI0V) have been set to zero, adjust PI0V value in order that motor is in stall condition.



※ Input values for flow rate (QI0V) and pressure signal (PI0V) adjustment.(red box shown in the above figure)

Pm Name	Value	Units	Descriptions
PIV	1000	0.01V	maximum pressure command voltage
PI0V	0	0.01V	pressure command zero offset voltage
QIV	1000	0.01V	maximum flow rate command voltage
QI0V	0	0.01V	flow rate command zero offset voltage
PFV	400	0.01V	maximum pressure feedback voltage at maximum pressure
PF0V	0	0.01V	pressure feedback zero offset voltage

※ There are only six parameters for adjusting. Most of all is PEV parameter which is relevant to maximum hydraulic pressure.

# DRIVER EXCEPTIONAL DISPLAY AND HANDLING

## Protection display table

Driver output will be terminated and motor stop when its internal alarm signal such as over voltage, over current etc. is triggered and arouse protection functions. Please follow servo drive exceptional display table descriptions to perform adequate procedure fixing the errors.

Status Display		Description	Solution
0	READY	Servo system is ready. The main power cable and the encoder cable from the servomotor are connected correctly.	The servomotor can start a normal operation.
1	OC	An abnormally big instantaneous current triggers the OC alarm. The machine will stop.	Check whether the load exceeds the rated value, any main circuit component is damaged, or output is short-circuited.
2	OV	An abnormally high DC Bus voltage due to too heavy load inertia or frequent dynamic braking triggers the OV alarm. The machine will stop.	Check whether the load inertia is over the specification and take into consideration an extra regenerative braking resistor.
3	OL	An over 150% rated load lasting for one minute triggers the OL alarm. The machine will stop.	Check the reason of overlord.
4	OH	The temperature over 135° in the servomotor winding or over 85° in the heat sink of the servodrive triggers the OH alarm. The machine will stop.	Check the ambient temperature and the ventilation condition.
5	OS	An over 120% of the rated servomotor speed triggers the OS alarm. The machine will stop.	Check whether the speed command exceeds the allowable value or the load is over the specification.
6	EE	A broken encoder wiring or an incorrect wiring of the UVW feedback signals triggers the EE alarm. The machine will stop.	Refer to the wiring diagram and check the wiring again.
7	PF	A lower than 240V DC Bus triggers the PF alarm. The machine will stop.	Check whether the AC Mains voltage is too low or the filtering capacitor in the main circuit is damaged. Use 3ØAC power for the servodrive over 550 W.
8	RESET	The servodrive control system is reset.	The system will start again after the alarm is cleared.
9	OVF	An overflow of the position tracking error triggers the OVF alarm. The machine will stop.	Check whether the load is over the specification or the frequency of position pulse command is too high.
	CPUE	Central Processing Unit Error	Reboot after reset.

# ALARM AND RECOVERY

- |                                                                                |                                                                     |                                                                |                                                                                 |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------|
| 1. Q: Safety lock dose not work when mold is Closed?                           | A: Check whether mold is clamped and clean the safety lock.         | 13. Q: Screw wrapped with plastic material?                    | A: Pull up temperature to re-melt material and clean remaining inside the tube. |
| 2. Q: Power to mold closing directional panel fails?                           | A: Examine power or replace cable and output board.                 | 14. Q: No ON when filling core time has completed?             | A: Prolong filling core time.                                                   |
| 3. Q: Mismatching of mechanical safety rod?                                    | A: Position adjustment.                                             | 15. Q: Product jumps out not count by optical switch?          | A: Adjust product jump out position.                                            |
| 4. Q: Improper set up of low pressure set position setting?                    | A: Adjust low pressure set position setting.                        | 16. Q: Improper setting of oil temperature?                    | A: Set oil temperature control near 55°C.                                       |
| 5. Q: Improper set up of high pressure set?                                    | A: Set up high pressure position setting to mold clamping position. | 17. Q: Robot arm oscillation when return to rest position?     | A: Lower return velocity.                                                       |
| 6. Q: Power to Mold opening directional panel fails?                           | A: Examine or replace power cable and output boar.                  | 18. Q: Safety door opening is long at automatic mode?          | A: Return to manual mode.                                                       |
| 7. Q: Molding interior stress due to excessive locking period?                 | A: Slightly Open mold before machine is stopped?                    | 19. Q: Packing number is achieved (predetermined is achieved)? | A : Open door then close.                                                       |
| 8. Q: Power to extruder advance and backtrack panel fails?                     | A: Examine power cable breakage or replace output board.            | 20. Q: Power to transfer mold panel fails?                     | A: Examine transfer mold panel power cable breakage or replace output board.    |
| 9. Q: Extruder binder plate over tight?                                        | A: Add some lubricants.                                             | 21. Q: System failure?                                         | A: Press "reset"button.                                                         |
| 10. Q: Improper setting of clenching position?                                 | A: Set clenching position after material charging completed.        | 22. Q: Machine improper ground?                                | A: Fix ground to good condition.                                                |
| 11. Q: Feed pipe heater defect?                                                | A: Examine electric heating piece and relevant circuitry.           | 23. Q: Contactors without R.C.?                                | A: Apply R.C. to all contactors(apply diode to DC contactor).                   |
| 12. Q: No cooling water in feed pipe, melted plastics left out to blank point? | A: Open feed pipe cooling water hydrant.                            | 24. Q: Poor heat removal?                                      | A: Apply air ventilation for the control panel chassis.                         |

# MAINTENANCE AND INSPECTION

To prevent from electric shock hazard, untrained maintenance personnel handling internal electric parts and components are prohibited. Well and periodic maintenance and inspection is necessary for electro-hydraulic servo system operating in good condition constantly.

## □ Notes

Internal capacitors are kept with high voltage within a certain period after all power sources have been switched off. Make sure complete discharging before performing inspection.

## □ Inspection items

Items	Contents	Methods and instruments	Judgment standard
Environments	Ambient temperature ` humidity ` oil/water mist ` metal powder, etc.	Visual ` thermometer	In accordance with manual
Power source voltage	Power source voltage	Multi-meter	In accordance with manual
	Power source apply procedure		
Exterior appearance and component check	Unusual noise and vibration ` deformation ` breakage	Visual ` screw tightening ` multi-meter	Normal
	External option discharge resister loosen ` aging ` resister value		
Circuitry	Peculiar smell	Sensory check	Normal
	Cooling fan rotation or not		
	Relevant wiring loosing		
	Relevant wiring breakage or squash		
	Capacitance out of shape ` electrolyte leakage		

# 連絡我們

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