金聖泰實業股份有限公司
KINGSTONE COMPONENT INC.

ECKERLE

IMS-P4 Driver Operation Manual

Servo pump install wiring and parameter list
5.5～75KW

Servo **D**riving **P**ump System - *For Injection Molding Only*

Please read it carefully before use the product
and keep it to inquire about it expediently

NO：JSWJ－01－40－01－04

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Catalog

■ Introduction of P4 drive

◆ Product Receiving Confirmation

Please check the following items when received goods.

Table1.2 Confirming

Confirming Items	Confirming Instructions
Different from what you ordered?	Confirm the side name plate “TECORP”
Somewhere damaged?	Check the general appearance to see if it is damaged during transportation
Loose of fastened part such as screw?	Check with screwdriver when necessary.

◆ Appearance of the drive

This is appearance of the drive

correspond: 45P5～4015

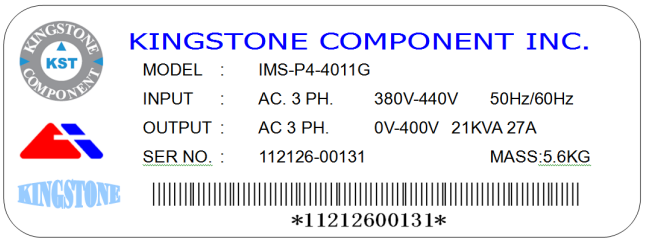
correspond :4018～4030

correspond :4037～4075

■ Example Nameplate

The following nameplate is an examplate for a standard model IMS-P4-4011

MODEL: Type of the drive
INPUT: Power supply parameter
OUTPUT: Output parameterof the drive
SER NO: Fuselage coding **MASS:** Weight



PIC:1.2 TAGS

Diagram1.1 nameplate

◆ Explanation of Drive Model

In the column of MODEL of the name plate, the series number, voltage scale, maximum motor capacitor and retrofit marks are indicated with the figures and lett

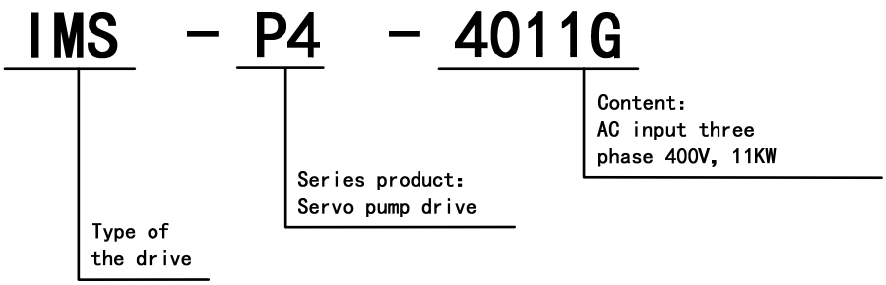


Diagram 1.2 explanation of drive model

◆ Capacity standard and peripheral equipments configuration

Table 1.2 Capacity standard and peripheral equipments configuration

Tyoe IMS-P4-*****		45P5	47P5	4011	4015	4018	4022	4030	4037	4045	4055	4075
Rated Power(KW)		5.5	7.5	11	15	18.5	22	30	37	45	55	75
Maximum output current(A) 5s		26	33	41	50	58	66	90	110	130	155	200
Maximum pressure holded current(A) 5s		22	28	33	45	54	62	80	100	120	150	180
Power supply	rated voltage,rated frequency	Three phase 350、380、400、420V 50/60H										
	Allow voltage pulsation	+10%, -15%										
	Allow frequency pulsation	±5%										
※ Braking resistor	(W)	500	500	800	800	1000	1000	1000	1600	1600	1600	1600
	(Ω)	36	36	24	24	18	18	18	12	12	12	12
※ Filter	(A)	20	20	35	35	50	50	80	80	100	150	200
rotary transformer cable		LE17-***: *** shows cable's length, (cm)。 Like : LE17-300 shows cable's length is 3m										
※ pressure sensor		You may choose a variety of pressure sensors。Recommendation : danfoss 060G3557										
※ Breaker(A)		20	30	50	60	75	100	100	150	150	200	200
※ Contactor(A)		20	20	30	50	50	50	80	100	100	160	160

※Attention : The items with the ※ shoud be purchased and installed by customers

◆ Type selection of the main parts for servo pump

We can suppose the system flow is Q（L/min)；system pressure is P_1（kgf/cm^2)；motor maximum speed is Vmax（rpm)。

Attention: the allowed maximum speed of the pump shoud equal or less than the allowed maximum speed of the motor(Vmax), else, pease reduce maximum speed of the motor(Vmax).

■ Pump choose

Pump's pressure choose:

The rate pressure of the pump should equal or greater than the system pressure(P_1（kgf/cm^2）)

Pump's flow choose:

Per revoltion flow of the pump : 1（ml/rev）=Q（L/min）×1000（ml/L）/ Vmax（rpm)。

Pump's type choose:

Pease choose the pump according to the following table

Table1.3 variety of pump characteristic

Type	Price	Cubage effciency	Stability	Noise	Dependability	Pressure (monopole)	Speed
Gear pump	low	low	mid	mid	high	low	mid
Ram pump	mid	high	low	high	low	mid	low
Screw pump	high	mid	high	low	mid	high	high

■ Servo motor choose

Servo motor rating speed choose：

The following diagram is the characteristic curve of Servo motor.

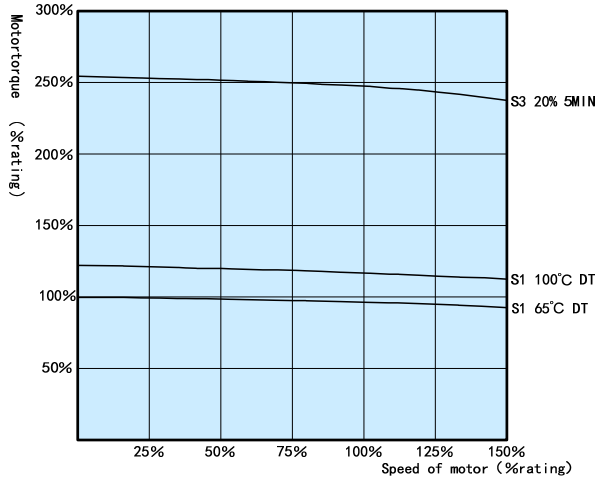


Diagram 1.3 the characteristic of servo motor

Form the diagram we know，along with the motor speed increased, the motor torque will descend. After the speed exceed 150% of the rating speed, the servo motor arrived magnetic saturation gradually, the torque descend fleetly. So we should not choose this speed as the working speed.

So ： We advice choose a motor which the highest speed is 140% of the rating speed.

Rating speed ： V（rpm）＝Vmax（rpm）/140％

Attention ： If you want a better control effect , please choose a motor which the highest speed is 130% of the rating speed.

Servo motor rating torque choose：

According to the energy conservation law，injection molding machine's highest output power is :

P_2max（KW）＝P_1（kgf/cm^2）×0.9807（kgf/cm^2/bar）×Q（L/min）/ 600

The highest output power of the motor is:（according to 90% of the energy conversion efficiency）:

P_3max（KW）＝P_2max（KW）/ 90％

The highest torque:

Tmax（Nm）＝P_3max（KW）×9550/ V（rpm）

According to the character of servo motor，the injection molding machine need a durative and high torque output, so the motor's working condition should between （S1 100℃ DT） and （S3 20％ 5MIN）.

Attention ： We advice choose a motor which the highest torque is 150% of the rating torque.

The rating of motor：**T（Nm）＝Tmax（Nm）/150%**

Attention ： If we choose the double-discharge ram pump or duplex gear pump，by reduce pump flow when the machine is pressure hold can reduce the motor's output torque substantially, and the motor working in (S3 20% 5MIN). so we can choose the motor which the highest torque is 230% of the rating torque.

◆ Overall Dimension and Install Dimension

The following is the overall dimension of the P4 drive

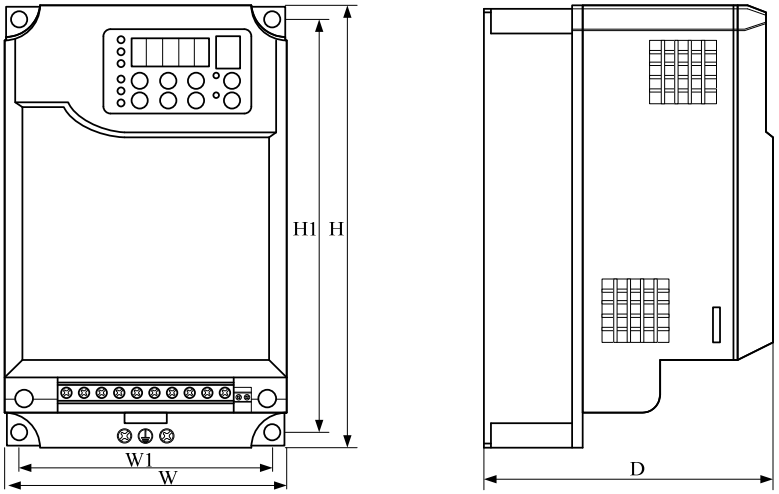


Diagram 1.4 7.5～15Kw

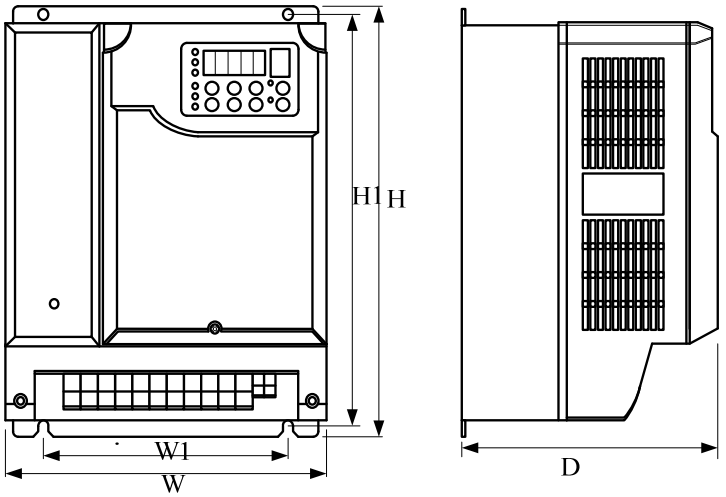


Diagram 1.5 18.5～30kW

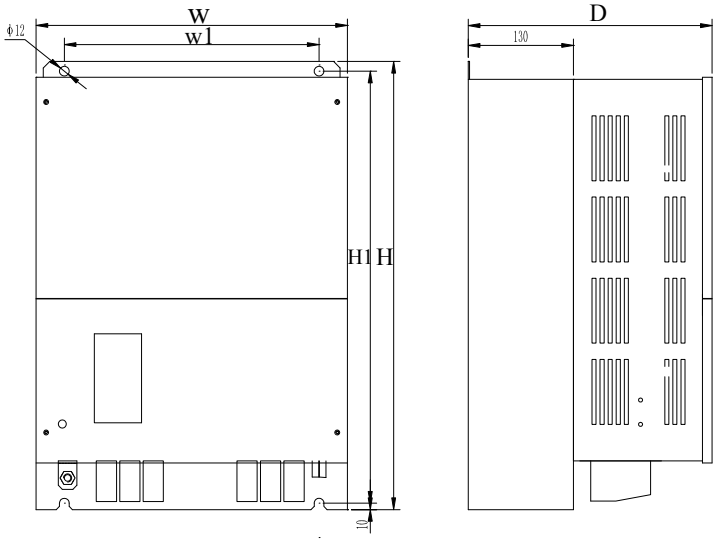


Diagram 1.6 37~75Kw

Table 1.4 Install Dimension

IMS-P4-*****-		47P5～4015	4018～4022	4030	4037	4045	4055	4075
Install dimension mm)	W	170	260	260	380	380	380	380
	H	308	357	357	555	555	555	555
	D	181	192	192	295	295	295	295
	W_1	154	188	188	310	310	310	310
	H_1	292	341	341	533	533	533	533
Fastening screw (Φmm)		7	7	7	8	8	8	8
weight (kg)		5.6	13.6	13.6	37.6	37.6	43	43

Attention : If you want use the data of the "*" please contact us!

◆ Confirming and managing the install site

Install the drive in the following environment and keep the most suitable condition.

■ Install site

Please install the drive under the following condition:

Environment temperature: -10~40℃ Environment humidity: 90%RH (no dewing)

•Do not install the drive where the metal powder, oil and water are easy to get inside.

•Do not install the drive where has inflammable materials such as wood.

•Do not install the drive where the sunlight is direct.

•Install the drive in clean environment where no oil mist and dust or in the enclosure where suspended

•Matter can be screened. •Install the drive where there is no radioactive matter.

•Install the drive where there is no harmful gas or liquid. •Install the drive where the vibration is slight.

•Install the drive where the saline matter is little.

■ Environment Temperature Management

Install the drive where temperature is stable to ensure the reliability. Install cooling fan or cooling air conditioner to keep the temperature below 45℃ when the drive is installed in the enclosure.

■ Stop Foreign Material from Falling into the Drive during Operation

During the installing, cover the dustproof shield to avoid the falling of the drilling dust and remnant metal into inside. When the installing is completed, remove the dustproof shield to keep good ventilation and heat dissipation of the drive.。

◆ Installing Direction and Space

To ensure the cooling effect of the drive, please be sure to install vertically and ensure certain space

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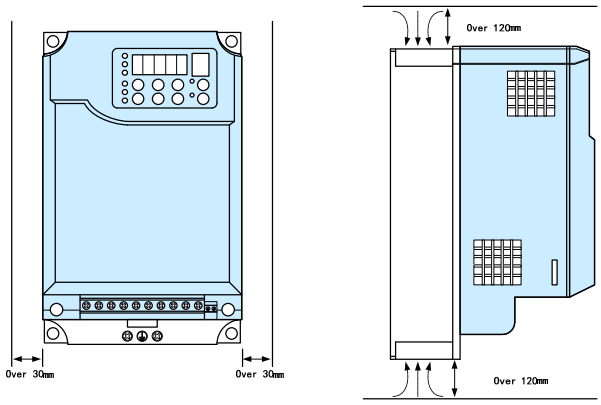


Diagram 1.8 Installing Direction and Space

◆ Other install attentions

To pledge the servo pump running stably, please pay attention to the following attentions

■ Servo motor install attentions

It will be repeated a high-speed start-stop when the servo pump was working，it can create the motor shake，so please pledge the motor installed firmly and reasonably，the following diagram is show a mode of install.

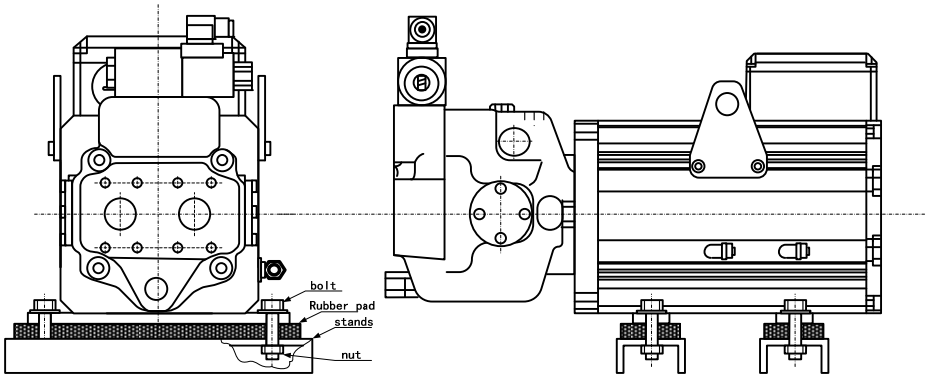


Diagram 1.6 servo motor install mode

■ Pressure sensor install attentions

Servo pump will repeat oil pumping –oil charge when it is working, it can lead the oil pipe has no oil, so we istall the pressure sensor with the oil port straight up to pleddge the pressure sensor awayls have oil.

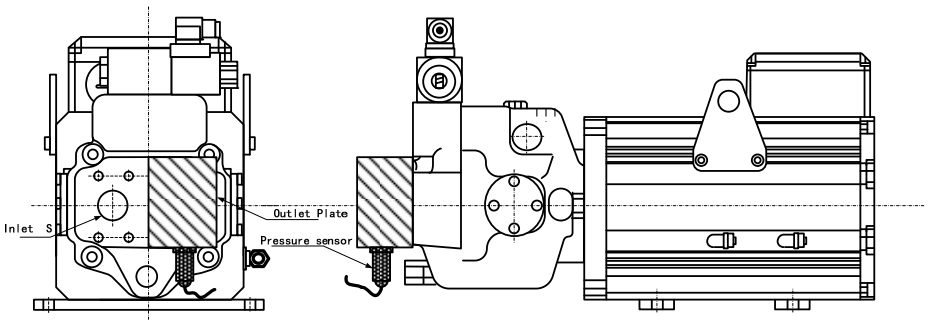
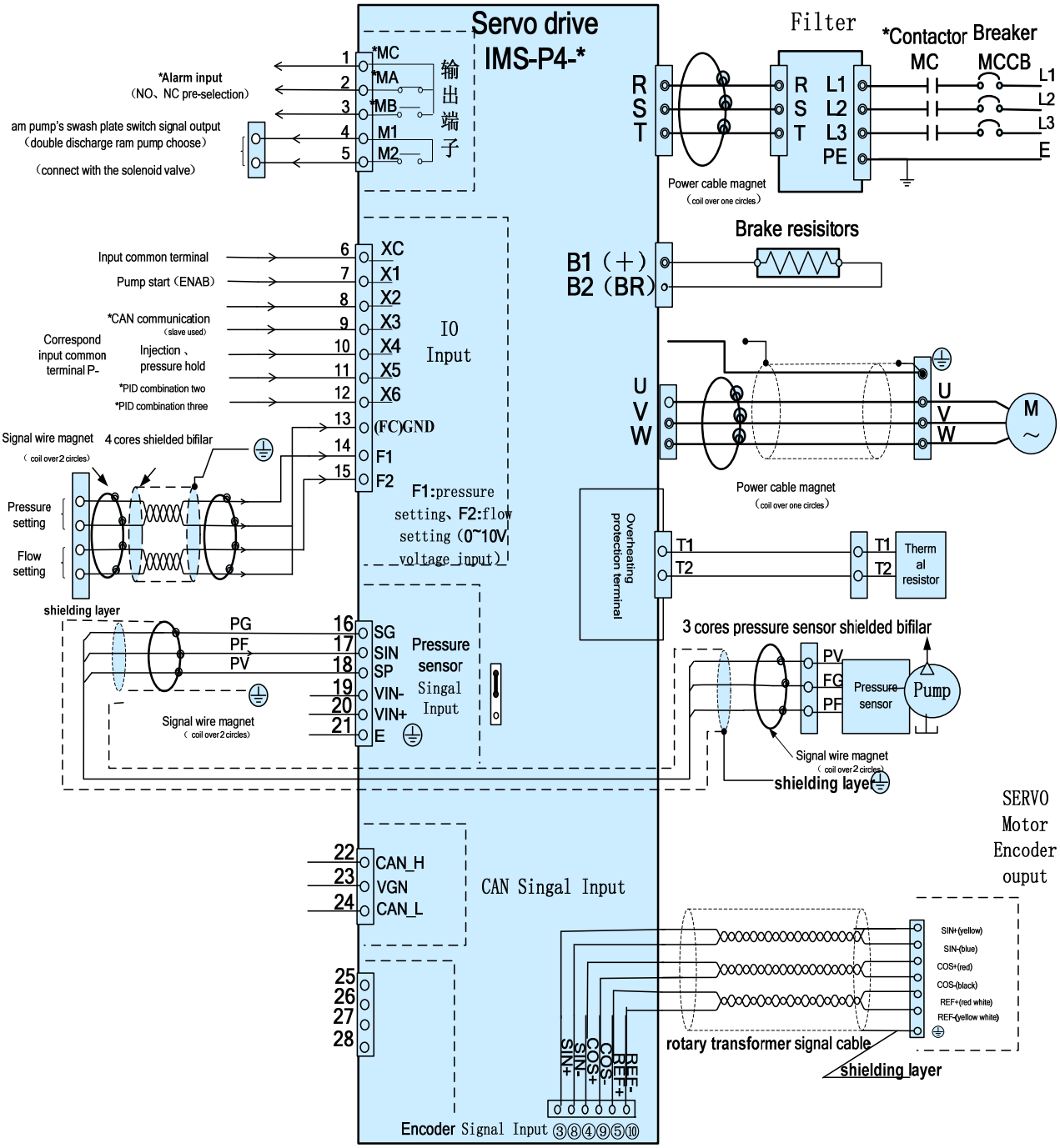


Diagram 1.7 Pressure sensor install mode

■ P4 Drive Wiring Interconnection



◆ Function of Control Loop Terminal

Table2.2 indicates the types and functions of terminal marks of control loop. Look up to the table to select proper terminal for use。

Table2.1 indicates the types and functions of terminal marks of control loop

Type	NO.	Signal	Signal name	Function explanation of function		electrical level
Output of relay	1	MC	Fault out common	When the drive faulted , MA—MC is OFF; MB—MC is ON		Dry contact below AC250V, DC30V, 1A
	2	MA	Fault detection (NC point)			
	3	MB	Fault detection (NO point)			
	4	M1	Ram pump swash plate switch signal output	Bases the related parameter (P3.07.) to switch swash plate steadily		Dry contact below AC250V, DC30V, 1A
	5	M2				
input signal of sequence control	6	XC	Power output 0V	Common of the inside power		DC (+24V) GND
	7	X1	Pump start- stop	ON: pump start, OFF: pump stop		DC +24V 80mA
	8	X2	Alarm reset	From OFF to ON: alarm reset		
	9	X3	CAN communication	ON: Use OFF: No sue		
	10	X4	Injection pressure hold (PID combination terterminal 1)	Achieve different PID control across the different terminals combination		
	11	X5	(PID combination terterminal 2)			
	12	X6	(PID combination terterminal 3)			
	13	FC	Common of analogue signal	Common of analogue signal		0V
	14	F1	Pressure setting	0～+10V/100%		0～+10V, 4～20mA
	15	F2	Flow setting			
CAN	22	CAN_H	CAN_H	CAN		
	23	VGN	Shielding layer			
	24	CAN_L	CAN_L			
Pressure sensor Singal Input	16	SG	Power Supply(GND)	0V		DC (-15V) GND
	17	SIN	Signal Input			0—10V
	18	SP	Power Supply(+15V)	+15V		DC +15V
	19	VIN-	Other methods Power Supply(GND)			DC 12~30V 50mA
	20	VIN+	Other methods Power Supply(+)			
	21	E	E	Shielding layer		
Encoder	NO.	15 PIN connetting	signal	NO.	15 PIN connetting	signal
	③	SIN-	SIN-			
	⑧	SIN+	SIN+	⑤	REF-	REF-
	④	COS-	COS-	⑩	REF+	REF+
	⑨	COS+	COS+	Metal case	E	Shielding layer

■ The digital manipulator of the P4 drive

◆ Display Introduction of Digital Unit Operator Parts.

The following Figure shows the name and function of the digital manipulator keys

When  in the screen of parameter and monitoring, the flickering dot in the right corner indicates the parameter is being modified.

when  in the screen of parameter setting, the flickering indicates the being modified number.

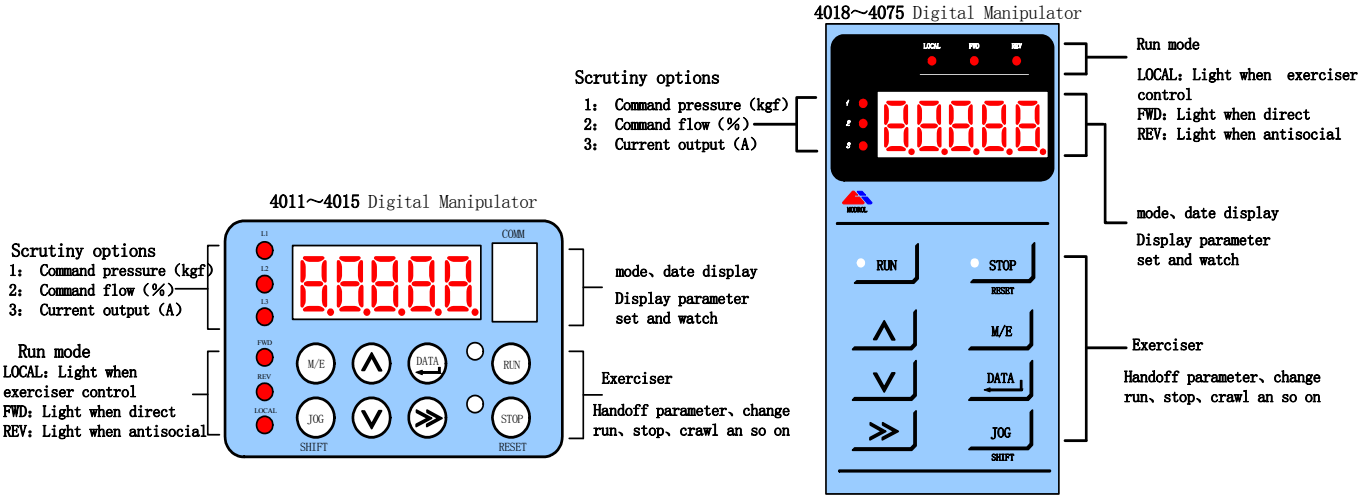


Diagram3.1 digital manipulator

◆ Operate digital manipulator

Table3.1 indicates the name and function of the digital manipulator key。

Table 3.1 function of operation key

Key	Name	Function
∧	Add	Press the key when choosing parameter code and modifying (add) set values.(the set value is circling)
∨	Reduce	Press the key when choosing parameter code and modifying (reduce) set values. (the set value is circling)
≫	Right shifting	Choose parameter code and digit of the value
DATA	Enter	Make sure the parameter are in the menu
M/E	Menu/escape	Select the parameter group and escape from last state
JOG	Inching button	Press this key, the drive is running ,modify operating speed across the operator interface, and press the key" ∧"or" ∨",then the drive will operator forward or reverse as the set speed
RUN	RUN	When the manipulator operating press this key to let the drive run ,the LED on this key light
STOP	STOP	When the manipulator operating press this key to stop drive ,the LED on this key light; When the LED on the key RUN and STOP are not light, the drive is not ready, press this key to make the drive ready

4011～4015 Situation display

There have **RUN ,STOP** indincator light on the digital manipulato's top left，this indincator light showed the running state：

1、RUN put out STOP red light-ready/stop

2、RUN red light STOP put out-run

3、RUN put out STOP put out –not ready

4、RUN red light flicker STOP put out-there still has enable signal after the Alarm reset

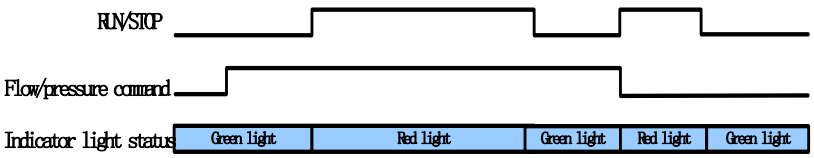


Diagram3.2 Indincator light situation display

Attention： Manipulation of the fault indincator light put out and reset

Method one：output a alarm reset signal from computer(No.17th terminal)（standing over 0.3S）make the drive is in ready condition, in order to keep running.

Method two：After use the "**DATA**"key of the manipulator to confirm the fault；or amend some parameters，the drive will in not ready condition。So we must press the "**STOP"** key（standing over 0.3S）to make the drive is in ready condition ， and then ,it can run again.

Mehod three：cut off the power supply of the drive, until the digital manipulator has not display,so we give the power again, to make the drive is in ready condition, and then,it can run again.

To deal with the "RUN" red light flashes

When we execute alarm reset after the drive out of order, the drive controlled by external terminal,so the "RUN"red light flashes. Please cut off the No.11 terminal to make the drive in ready condition, and if you want the drive run ,please connect No.11 terminal again.

◆ Group description parameters

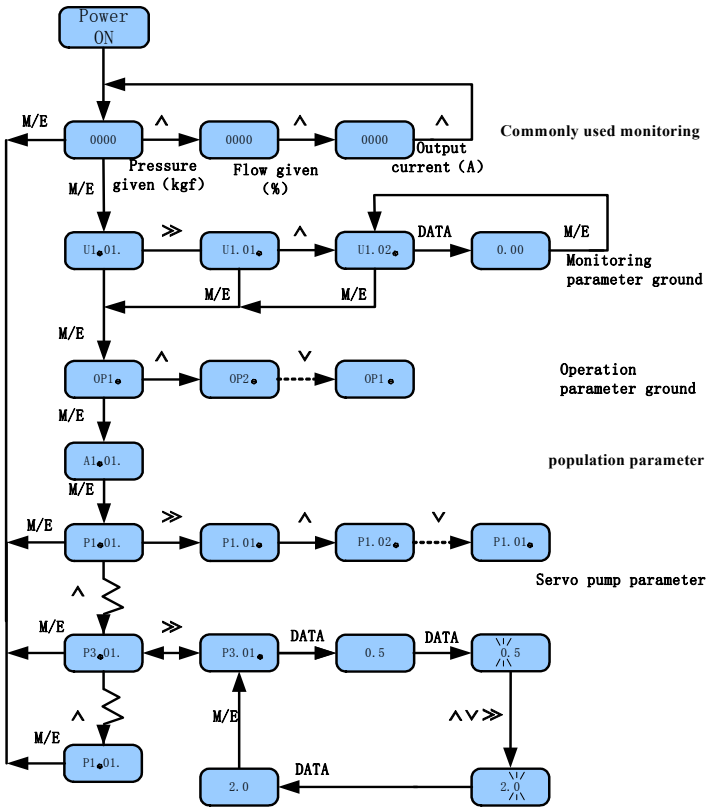
There are five common parameter groups(A-O belongs to the same group). Through setting the parameter, the reference, setup and monitor of the parameter can be realized easily. Table 3.2 indicated the group and main content of the parameter.

Table 3.2 the group and main content of the parameter

Group name	Main content
Commonly used monitoring	Can easily monitor three parameters simultaneously, are corresponded to the 1,2,3 item of
***U monitor parameter**	Can monitor the state, terminal and the malfunction record
***OP System operating parameter**	Can operating the access , encrypt, selflearning and initiating
***A～O population parameter**	Can setting all of the parameters , the P3 drive has set them reasonably, no need chang unless necessary.
P servo pump application parameter	Can setting the servo pump's parameter

◆Use the digital manipulator

The followings are the examples of use the digital manipulator。



◆ Parameter Access of Password (OP1)

By modifying the A1 from 0000 to other value and set the drive into password state; the access of system parameter is invalid to prevent the system parameter from incorrect modifying.

Note: Password state: the drive password is set effectively; the system cannot enter the modifying state.

Unlock state: the drive password is set effectively, and the unlock operation are valid. The system parameter can enter modifying state, but password is still effective.

Password-free state: the drive password is not set or effective unlock operation has been processed. The system parameter can be modified and password is invalid.

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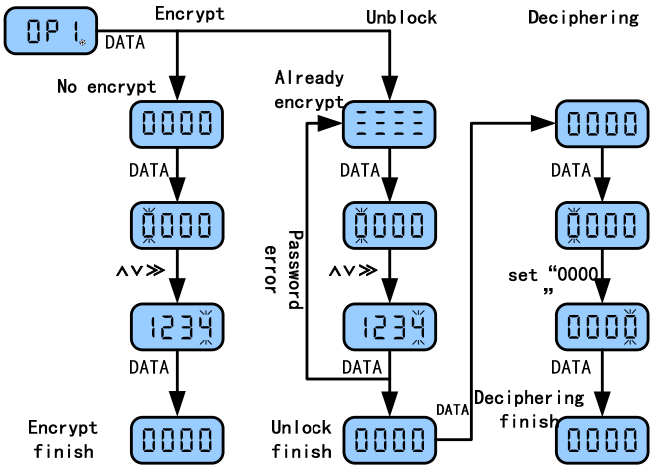
The following is a example of the Password state，

Unlock state，and Password-free state



◆Self- learning (OP3)

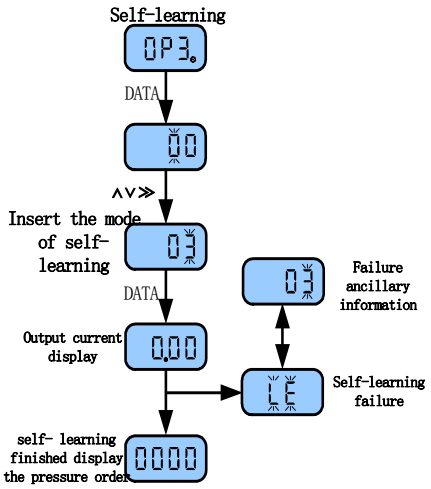
The three ways of motor parameter self-learning

- Press “enter” when OP3=0”: stator resistance self-learning(static self-learning)
- Press “enter” when OP3=1”: stator resistance and motor leakage resistor self-learning(static self-learning)
- Press “enter” when OP3=3”: position of PMSM’s magnetic poles (the coder deviated from electrical angle) self-learning(rotary self-learning)

Attention 1： Carrying out static self-learning of the motor with load. Or the correct motor parameter will received and there is danger while malfunction.

Attention 2: Do not touch the motor during the period of motor parameter self-learning!

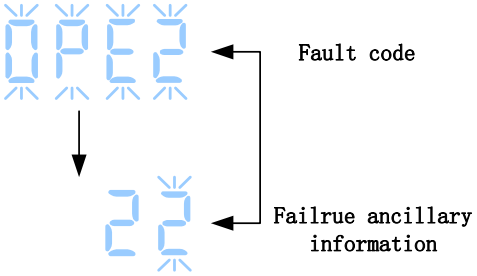
Attention 3： 自 when self-learning is failure, please make the corresponding dispose acrroding to part of the alarm explain.



◆ Alarm display

when the drive alarmed , the display panel will display the fault code , and some fault code will have failure ancillary information, it will display aternatly.

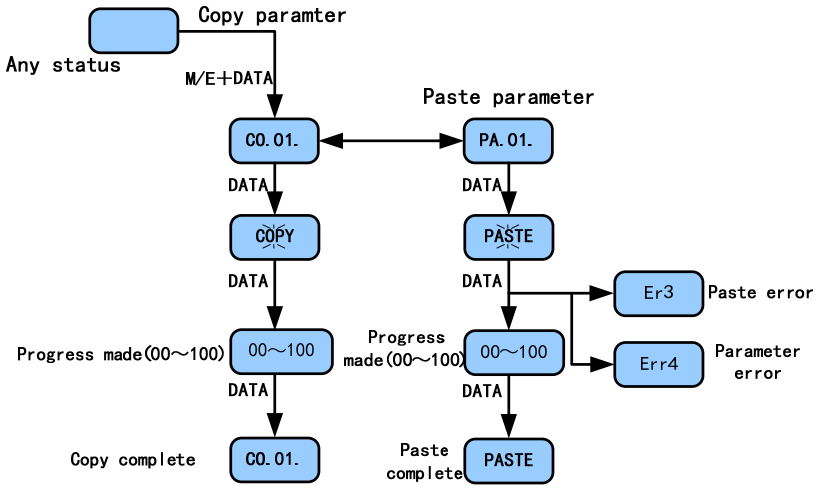
There have the failure ancillary informations like ： LE.（ motor self-learning fault ）， OPE2.（ unreasonable parameters）, OPE3.（post-conflict settings）。



◆ To deal with the parameter set

We can use the digital manipulator communicate with the mainboard to copy from the mainboard to digital manipulator and paste parameters from the digital manipulator to the mainboard, so we can achieve to deal with the parameter set.

The operating steps like the following diagram.



Press “∧” and “∨” keys in any status can return initial condition

■ P4 Drive parameters of the content and description

Parameter list consisted:

With parameters P4.01. (Motor rated power) as an example：

NO.	Name	Content	setting range	Factory settings
P4.01.	Motor rated power	Set motor power	0.1~200.0	*

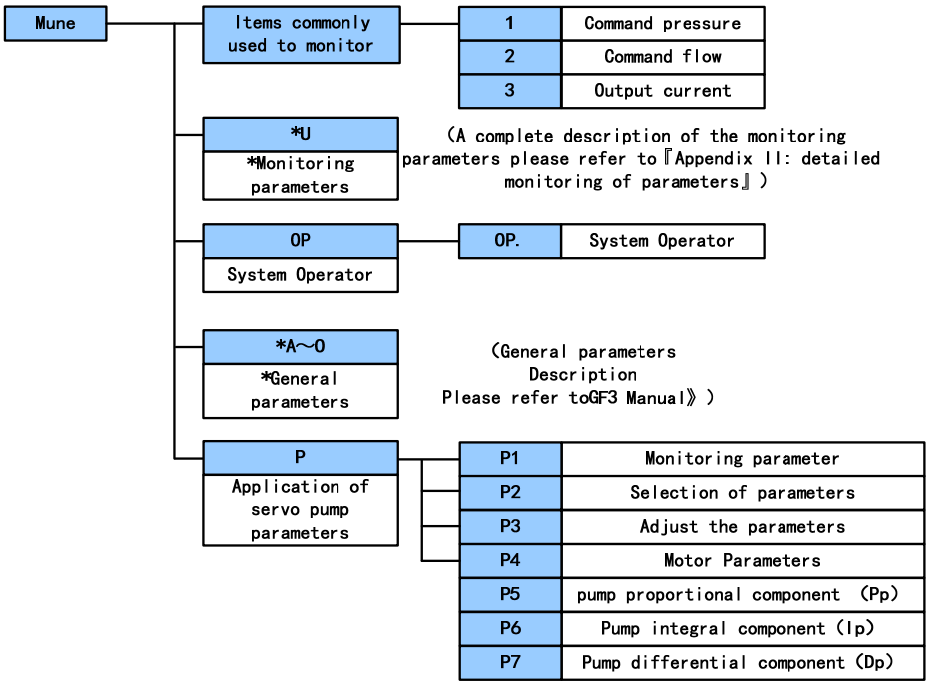
Parameter NO.：Parameter number.

Name ：Parameter name Content ：Parameter funtion and the contents of settings

Setting range：Parameter setting range Factory settings：Factory setting values，Each parameter has the corresponding factory settings（Also called the initial value）.

◆ Parameters groups

The following shows Drive parameters Groups.



◆ Parameters of the content and description

The following shows the contents of the drive parameters and description.

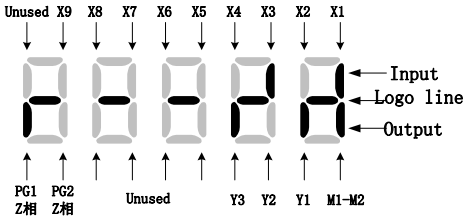
■ Items commonly used to monitor

When power ON, the drive will automatically enter commonly used to monitor the interface of the monitor. Commonly used items in the surveillance, the relative signal 1,2,3, can be respectively, to monitor content on the following.

Light number	Name	Content	Unit
1	Pressure settings	Pressure settings surveillance	Corresponds to P2.06. Settings
2	Flow settings	Flow settings surveillance	%
3	Output current	Drive output current surveillance	A

■ U：Monitoring parameters

The following shows commonly used to monitor parameters（A complete description of the monitoring parameters please refer to『Appendix II: detailed monitoring of parameters』）

NO.	Name	Content	Smallest unit
U1.04	Motor speed	Motor speed in real-time surveillance.	1RPM
U1.05.	Output current	Real-time monitoring of output current。	0.1A
U1.06.	Output torque	Drive the actual output torque of the surveillance（Relative rated output torque %）。Its maximum value was limited by P3.06. (Maximum output torque of motor)settings.	0.1%
U1.08.	Output power	Drive output power monitoring。	0.1KW
U1.10.	Radiator temperature	Drive radiator temperature monitoring。Values less than 80 ℃ can be identified as normal, values greater than 85 ℃ drive will be "OH1" alarm。	1℃
U2.01.	Input / output terminal state		~
U2.06.	Encoder pulse count	Correspond to the actual motor position, in accordance with » key to switch to the motor rotation monitoring。In drive ready state（refer to『P3 Digital drive manipulator』）, By turning the electric motor axis, detecting the value if change May affirm if coder damage and coder signal whether or not have mistake.	1Pls
U2.07.	Encoder pulse rate of change	Be used for the degree estimating that the coder signal is disturbed，Value the greater the more serious interference,value less than "10" can be identified as normal。	1Pls
U2.16.	Software version number	Cases: P3913 on behalf of - P3 Series, software version in January 2009 for the 3rd edition。	

■ OP：System parameters

The following shows the common used system parameters.

NO.	Name	Content	Setting range	Factory settings
OP1.	Parameter access password 1	Be used for the encrypt extent of authority that the consumer parameter revises。	0000~9999	0000
OP3.	Self-learning	Motor parameters self-learning 0: line-to-line resistance（Static type） 1: line-to-line resistance and Motor leakage reactance%（Static type） 3：Permanent magnet synchronous motor magnetic declination	0,1,3	0
OP4.	Built-parameter reset	System parameters initialization 0：Standard initialization	0~100	0
OP7	Write user default parameters	do：Write user default parameters。Frequent OPE1 or OPE8 alarm be taken to the operating。	do	do
OP8	System password	For modify system parameters of the encryption authority。After set password, system parameters can not enter modify state。	0000~9999	0000

■ P：Servo pump application parameters

P1.Monitoring parameters

The following shows monitoring parameters

NO.	Name	Content	Unit
P1 01.	Pressure command	Monitoring target pressure value	Corresponds to P2.06. Settings
P1.02.	Pressure output	Monitoring pressure sensor output feedback	Corresponds to P2.06. Settings
P1.03.	Flow command	Monitoring flow command value	%
P1.04.	Flow output	Monitoring flow output	%

P2. Monitoring parameters

The following shows selection of parameters

NO.	Name	Content	Setting range	Factory settings
P2.01.	Pump displacement	Setting the displacement of the pump you used(in CC)	0～200	40
P2.02.	Pressure sensor range	According to pressure sensor specifications setting 。Unit corresponds to P2.06.	0～255	250
P2.03.	The way of pressure sensor output signal	0:1～5Voutput 1:4～20mAoutput 2:1～10V,3:0～10V 4:0.25 ～ 10.25V According to pressure sensor specifications setting	0,1,2,3,4	3
P2.04.	the way of command signals	0:0～10V 1:4～20mA	0,1	0
P2.05.	The direction of pump rotation	0: Forward 1: Reverse	0,1	0
P2.06.	Pressure display unit	0:kg/cm^2 1:Kp-si 2:Mpa 3:bar 4:atm	0,1,2,3	0
P2.07.	Pressure Sensor line protection enabled	0: not protect 1: protect	0,1	1
P2.08	The maximum output pressure	The drive allows for maximum output pressure	0～1000.0	175
The maximum motor speed	The maximum output speed of motor，When Command voltage DC equal to 10V, the corresponding motor speed,corresponds to the maximum flow	1～36000	2000	The maximum motor speed
Maximum system pressure value	System required maximum pressure，When Command voltage DC equal to 10V, the corresponding System pressure output，corresponds to the maximum system pressure value。Must be less than P2.02. Settings. Unit corresponds to P2.06.	0～255	175	Maximum system pressure value
P2.11	Directive gain	System input pressure command at the maximum, corresponding to the analog signal input	0～1000.0	100.0
P2.12	Forbitting Slaving pump to run	0：allow 1：forbit	0,1	1

P3.Adjust parameters

The following shows adjust parameters

NO.	Name	Content	Setting range	Factory settings
P3.01.	System respond to the proportional gain（Kp-s）	System respond to the proportional gain，Setting value and system respond to direct proportion	0.0～25.0	0.5
P3.02.	System respond to integral time（Ti-s）	System respond to integral time，Setting value and the system respond to direct proportion, take millisecond as unit	0～3000	5
P3.03.	System response to differential time（Td-s）	System response to differential time，Setting value and stability of the system pressure to direct proportion	0～250	0
P3.04.	Maximum pressure relief reverse torque	The percentage with rated motor torque is expressed	0～250	50
P3.05.	base-pressure	The percentage with pressure sensor range（P2.02.）is expressed	0～100%	1
P3.03.	Pressure relief reverse speed upper limit	The percentage with maximal rotation（P2.09.）rate of electric motor is expressed	0～100%	10
P3.11.	Pressure rise time	Slope processing for pressure、flow command signal。Take millisecond as unit。	10～250	100
P3.12.	Pressure fall time		10～250	100
P3.13.	Flow rise time		10～250	100
P3.14.	Flow fall time		10～250	100

P4.Motor parameters

The following shows motor parameters

NO.	Name	Content	Setting range	Factory settings
P4.01.	Motor rated power	Set motor rated power	0.1~200.0	*
P4.02.	Motor pole number	Set motor pole number	2~48	8
P4.03.	Motor rated current	Set motor rated current。This value as a reference value of motor protection	0.1~500.0	*
P4.04.	Motor rated induced electrical potential	Permanent magnet synchronous motor at rated speed , corresponding rated induced electric potential	1~480	300
P4.05.	Motor rated frequency	Set motor rated frequency $F_e=N_e\times P/120$	0.00~600.00	100
P4.06.	Motor rated rotation speed	Set motor rated rotation speed	1~36000	1500
P4.07.	Motor No-load current	Set motor No-load current. About Ie × 5%, generally set to "0"	0.1~500.0	0
P4.08.	Motor rated speed difference	Set motor rated speed difference （ Selection of asynchronous motor）	0.10~20.00	*
P4.09.	Motor onece line-to-line resistance	Set motor line-to-line resistance，Through OP3 = "0" motor self-learning to be	0.01~30.0	*
P4.10.	Motor leakage reactance %	Voltage drop caused by the motor leakage reactance，To the percentage of motor rated voltage to set	0.0~60.0	*
P4.11.	PG Pulses	The use of PG pulses per revolution	100~20000	1024

NO.	Name	Content	Setting range	Factory settings
P4.12	Encoder type	0:ABZ Increment type 1:ABZUVW Increment type 2:SINCOS 3: Rotary transformer 4: Absolute value of single-lap 5: Absolute value of multi-turn 6: Magnetic encoder	0,1,2,3,4,5,6	3
P4.13.	Motor torque coefficient	Kt of servo motor	0．00~10.00	3.3
P4.14.	Motor overload	Motor overload percentage (with a rated power for reference)	0~200	100
P4.15.	Acceleration time	Flow, pressure actual value from 0% to 100%. In seconds	0.01~600.00	0.05
P3.15.	Motor response to the proportional gain（Kp-m)、	Motor response to the proportional gain，Setting value and motor respond to direct proportion	1～30	2
P3.16.	Motor response to integral time（Ti-m）	Motor response to integral time，Setting value and motor respond to inverse ratio，Take millisecond as unit	0～255	20

PID combination Description:

Corresponding to different working conditions, through the combination of input terminals, can call the different groups of PID parameters in order to achieve the best control effect.

The relationship of combination of a variety of terminal and component value of PID by calls as follows:

PID group	Input terminals combinations			Corresponding PID component value		
	Input terminal X4	Input terminal X5	Input terminal X6	P	I	D
1	0	0	0	P3.01.	P3.02.	P3.08.
2（Injection、pressure-maintaining）	1	0	0	P6.01.	P6.02.	P6.03.
3	0	1	0	P7.01.	P7.02.	P7.03.
4	0	0	1	P8.01.	P8.02.	P8.03.

P6. Pressure maintaining PID parameter setting

NO.	Name	Content	Setting range	Factory settings
P6.01.	respond to the proportional gain（Kp-s）	System respond to the proportional gain，Setting value and system respond to direct proportion	0.0～25.0	0.5
P6.02.	respond to integral time（Ti-s）	System respond to integral time，Setting value and the system respond to direct proportion, take millisecond as unit	0～3000	5
P6.03.	response to differential time（Td-s）	System response to differential time，Setting value and stability of the system pressure to direct proportion	0～250	30

P6.04.	High pressure threshold	The pressure sensor range (P2.02.) Expressed as a percentage, from the output terminal 4,5 swash plate through a relay output switching signal	0.00 ～ 100.00%	40.00

P7. Melt PID settings

NO.	Name	Content	Setting range	Factory settings
P7.01.	respond to the proportional gain（Kp-s）	System respond to the proportional gain，Setting value and system respond to direct proportion	0.0～25.0	0.5
P7.02.	respond to integral time（Ti-s）	System respond to integral time，Setting value and the system respond to direct proportion, take millisecond as unit	0～3000	3
P7.03.	response to differential time（Td-s）	System response to differential time，Setting value and stability of the system pressure to direct proportion	0～250	20
P7.04.	Pressure correction %	Melt, the correct pressure, the pressure is accurate, stable	0～100	10
P7.05	Melt when the maximum pressure allowed	Melt, the maximum allowable pressure. Protection of oil motor	0~200	120

■ P8. Thimble PID settings

NO.	Name	Content	Setting range	Factory settings
P8. 01.	respond to the proportional gain（Kp-s）	System respond to the proportional gain，Setting value and system respond to direct proportion	0.0～25.0	0. 5
P8. 02.	respond to integral time（Ti-s）	System respond to integral time，Setting value and the system respond to direct proportion, take millisecond as unit	0～3000	3
P8. 03.	response to differential time（Td-s）	System response to differential time，Setting value and stability of the system pressure to direct proportion	0～250	20

■ P4 Drive the process of debugging

◆ Basic debugging

■ Wiring of the installation

Size of the installation in accordance with the installation of major parts, and in strict accordance with the wiring connection instructions.

Note:

1, Must be installed by the vertical and to ensure that a certain space, reference to 『Direction and space to install』;

2, Please note in strict accordance with the wiring connection, and pay attention to the shielding layer of the Connection Network, reference to 『wiring connection help』;

3, Be sure to note the electrical wiring in accordance with the encoder cable, if the LED on PG drive expansion card continue to show red light, it means that the wiring is incorrect; if flashing red light shows that Wiring adverse effects, the drive to receive the signal to interference, through the parameters of U2.07.(Encoder pulse rate of change) on the encoder signals to assess the degree of interference. If the value is greater than "10" indicates a serious interference.

4, Different capacity drives different braking resistor terminals, respectively, for B1, B2, or +, BR;

5, If the servo motor of the thermo-sensitive device is "Thermal Resistor", please connect to T1, T2 terminal of the drive ,to protect the servo motor;

If the servo motor for the thermo-sensitive devices is "Thermal Galvanic", please connect to computer systems, to protect the servo motor, drives, T1, T2 terminal connected to" Thermal Galvanic ", will cause the system not working properly;

6, Be sure the "injection、pressure-maintaining" computer system signal connected to drive terminal 14 and the corresponding PID parameters set by different PID parameters switch to "injection、pressure-maintaining" of the rapid response actions, reference to『P: Application of servo pump parameters』;

7, Please note that the filter input and output direction, "LINE"is input, "LOAD"is the output;

Combination of pumps control:

1, When control combination of pumps，please also given Master-slave Machine of the "pump start" signal, and attention from slave machine "CAN communication enable" signal wiring;

2, When control combination of pumps，Master-slave machine "Alarm output" signal can be corresponding with the computer system "alarm type" signal;

Note: A detailed description of combination of pumps control please refer to『Appendix I: Combination of servo pumps control program』

Dual displacement plunger pump control:

1, Drive "plunger pump inclined plate switch signal output" M1, M2 for the dry contact，contact capacity is AC250V，DC30V，1A below，please note that connection

■ The basic parameter settings

Before parameter settings, please disconnect "start pump" terminals.

According to the pressure sensors, pumps, motor nameplate, and machine condition,set the basic parameters （P2.、P4.） of the drive, And OP3 .= 3 (servo motor magnetic declination of self-learning)

Added parameters:

P2.01.（Servo-pump model）： The parameters for the various machine parts and components used in the same circumstances, all the parameters of the drive for curing.

Case: A machine manufacturer has designed and finished the adjustment of models 120T servo,we can cure all the parameters of the machine drive,after curing adjustment of models 120T servo is simplified into two steps:

1, disconnect the "pump start" terminal, input P2.01. (Servo pump model) parameters, reset.

2, through OP3 .= "3", for the magnetic declination motor for self-learning, closed "pump start" terminal.

P2.09.（The maximum motor speed）： The parameters used to set the maximum speed of servo motor in order to correspond to the maximum flow machine.

Case： C machine manufacturer machine a section for maximum flow 70L/min, Displacement pump used for 35ml/rpm,then P2.09. (Maximum motor speed) parameters should be set to: 70L/min divided by 35ml/rpm equivalent 2000rpm.

Note： If the computer system's maximum flow output signal under DC10V,then Servo motor can not reach a maximum speed of P2.09. (Maximum motor speed) parameter settings, Machine flow will not be able to achieve the maximum flow output.

P2.10.（Maximum system pressure）： The machine parameters used for setting the maximum system pressure.

Note： Computer system if the maximum system pressure signal under DC10V, the machine failed to meet the maximum system pressure.

P4.04.（Rated induced electrical potential）： The parameters used to set the motor rated speed corresponding to the induced electromotive force (non-rated voltage).Generally Servo motors have a nameplate on the logo,in addition, 1500rpm rated speed of servo motor nameplate marked "* V/1000rpm"， its P4.04.(Rated induced electrical potential) values should be set to"1.5 Multiplied by *".

After the parameter settings, please close "start pump" terminals, that is capable of running machine.

◆ Performance Tuning

Before parameter setting,please disconnect "start pump" terminals.

According to the state as well as the traffic load, the pressure to respond to the overall performance of the machine to adjust (P3,, P6, P7).

■ About pressure relief

Relevant parameters：P3.06.（Reverse speed limit pressure relief）

When the actual pressure value is greater than the pressure value of orders, Will be P3.06. （Reverse speed limit pressure relief）

Notes：

When P3.06. （Reverse speed limit pressure relief）set value is too large,too fast as a result of pressure relief, pump reversal will result in noise; when P3.06. （Reverse speed limit pressure relief）Set value is too small,then pressure relief is too slow.

Experience values：

P3.06. （Reverse speed limit pressure relief）＝10

■ About base-pressure and underflow

Relevant parameters：P3.04.（base-pressure）、P3.05.（underflow）

On standby state,by the show values P1.01.（Pressure command）、P1.03.（Flow rate command）we can adjust P3.05.（Base-pressure）、P3.10.（Underflow）,and amend to P1.01. (Pressure command), P1.03. (Flow rate

command) in order to achieve the necessary values. General need to retain a certain degree of base-pressure and underflow,to ensure that oil-filled circuit in state, to prevent repeated charge discharge circuit, leading to machine running unstable.

Experience values：

P3.04.（Base-pressure）＝1 **P3.05.（Underflow）＝0.5**

■ About Response

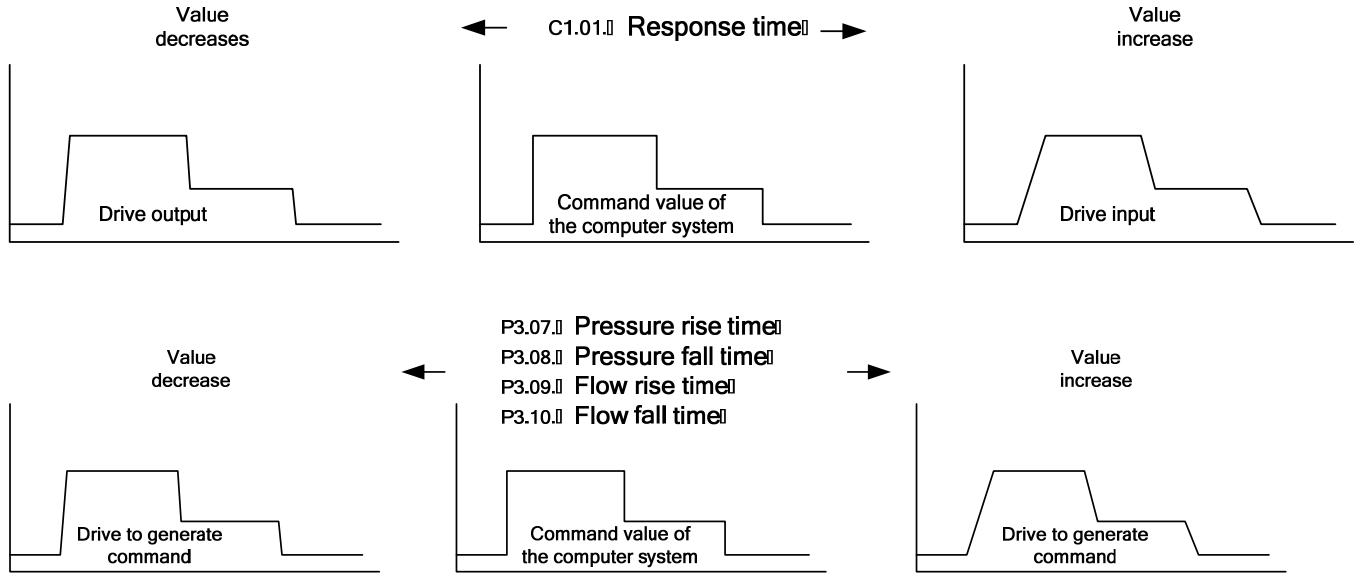
Relevant parameters：C1.01.（Response time）、P3.07.（Pressure rise time）、P3.08.（Pressure fall time）、P3.09.（Flow rise time）、P3.10.（Flow fall time）

thereinto：

The actual response：C1.01.（Response time）represents the drive output of the computer system pressure, the actual flow of orders the fastest response time；

Directive dealing with：P3.07.（Pressure rise time）、P3.08.（Pressure fall time）、P3.09.（Flow rise time）、P3.10.（Flow fall time）represent drive the output of the computer system pressure, flow, the slope of instructions to deal with.

Note：C1.01.（Response time）、P3.07.（Pressure rise time）、P3.08.（Pressure fall time）、P3.09.（Flow rise time）、P3.10.（Flow fall time）the smaller settings, the system pressure and flow in response to the faster, when set value is too small, easily give rise to the action impact; C1.01.（Response time）、P3.07.（Pressure rise time）、P3.08.（Pressure fall time）、P3.09.（Flow rise time）、P3.10.（Flow fall time）the larger settings, the system pressure and flow in response to the more gentle,when set value is too large, it is easy to lead to action in response to slow. In addition, C1.01. (Response time) to set the value too large, because the actual response to slow, easy to deflection caused by pressure.



Experience values：

C1.01.（Response time）＝0.05s

P3.07.（Pressure rise time）＝100ms

P3.08.（Pressure fall time）＝100ms

P3.09.（Flow rise time）＝100ms

P3.10.（Flow fall time）＝100ms

■ About control (PID adjustment)

Relevant parameters：P3.01./P6.01（System respond to the proportional gain（Kp-s））、P3.02./P6.02（System respond to integral time（Ti-s））、P3.03./P6.03（System respond to differential time（Td-s））、P4.16.（Motor response to the proportional gain（Kp-m））、P3.17.（Motor response to integral time（Ti-m））

In servo pump control, first of all, the realization of the servo motor in response to the control, second is the system pressure, flow rate in response to the control, therefore, it should be first to respond to the control servo motor to adjust, and then respond to the control system to adjust.

For servo motor control adjusting parameters are：**P4.16.（Motor response to the proportional gain（Kp-m））、P4.17.（Motor response to integral time（Ti-m））**

For servo pump control adjusting parameters are：

P3.01.（System respond to the proportional gain（Kp-s））、P3.02.（System respond to integral time（Ti-s））、P3.03.（System respond to differential time（Td-s））

The proportional gain（Kp）、differential time（Td）,the larger the set values,and integral time（Ti）,the smaller the set value,the faster the respond time， however,too fast response, it is easy to vibration caused by servo motor and machine movements are not smooth；

In contrast, the proportional gain (Kp), differential time (Td) smaller settings, integral time (Ti) value the greater, the response to the more slow, too slow to respond when the pressure control easily lead to instability and overshoot.

In other words, the servo motor and machine in a smooth action on the basis of the proportional gain (Kp), differential time (Td) set the value of the greater integral time (Ti) the smaller settings, the more excellent the performance of the machine。

Control process in the machine, as a result of different actions to respond to the requirements of the inconsistency, so in general, respectively, using different settings of the PID parameters, by entering the terminal, "10,11,12" switch (to switch to 8 different sets of PID parameters).

However, in order to facilitate debugging, the general only to the "action of injection pressure-maintaining" and "other actions" to distinguish and switch, Switching input signal is "14." Relatively " action of injection pressure-maintaining ", "other actions"please reduce the P3.08. (System response to differential time (Td-s)) set the value, so that machine is more gentle movements.

Combination of the various terminals of the PID component value with the call at the relationship,please refer to『P：Application of servo pump parameters』.

PID adjustment method（Application of machine to detect the movements）：

STEP1：Reduce the system respond to the proportional gain (Kp-s = 0.1), differential time (Td-s = 0), to increase system response to integral time (Ti-s = 30), reduce the system response；

STEP2：Set up a smaller proportion of the electrical response gain（Kp-m＝1）；

STEP3：In the servo motor under the premise of stable operation, gradually reduce the motor response to integral time (Ti-m). Different motor have different settings. Experience value: Ti-m＝（10～80）；

STEP4：In the servo motor under the premise of stable operation, Gradual increase in the electrical response to the proportional gain (Kp-m). Different motor have different settings. Experience value:Kp-m＝（1～10）；

Note: If using multiple sets of PID parameters for different control actions, they should first close the corresponding input (The corresponding input terminals "10,11,12"), Again for the PID parameters of the corresponding terminal, as well as the following routine.

STEP5: In the servo motor under the premise of stable operation,gradually reduce the system response to integral time (Ti-s), increase system response to differential time (Td-s). Different machine has different settings, Experience value: Ti-s=（3～30）、Td-s=（20～150）;

STEP6: In the servo motor under the premise of stable operation, gradually increase the system respond to the proportional gain（Kp-s）. Different machine has different settings, Experience value: Kp-s=（0.1～3.0）.

Experience value:

P4.16（Motor response to the proportional gain（Kp-m））=2

P4.17.（Motor response to integral time（Ti-m））=20

Action of injection pressure-maintaining PID component value:

P6.01. （System respond to the proportional gain 2）=0.3

P6.02. （System respond to integral time 2）=4

P6.03. （System response to differential time 2）=25

other actions PID component value:

P3.01.（System respond to the proportional gain（Kp-s））=0.5

P3.02.（System respond to integral time（Ti-s））=5

P3.03.（System response to differential time（Td-s））=0

After the parameter settings, please close "start pump" terminals, that is capable of running machine。

。

Added（PID control principle）:

PID algorithm formula:

$$U = Kp*e+1/Ti*Kp \int edt+1/Td*Kp\ de/dt$$

Output　P Component　I Component　D Component

e = PV(Actual value) - SV(Target value)

thereinto:

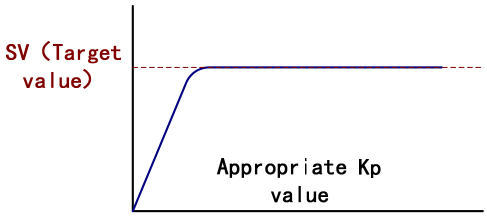
Kp: Proportional gain　**Ti:** Integral time　**Td:** Differential time

The definition of proportional constant P component principle:

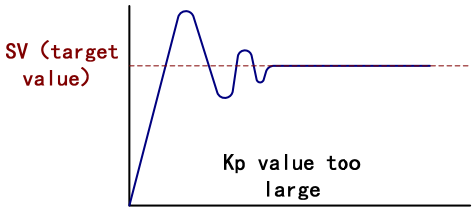
Formula can be expressed as: $U = Kp(e+1/Ti \int edt+1/Td\ de/dt)$

Proportional gain（Kp）decision to increase the slope of the output signal, is the basic factors in control process.

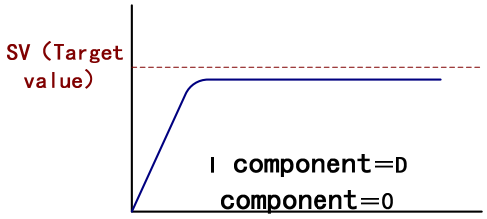
1、Ideally, the appropriate value of the Kp can be the achievement of control target.



2、However, due to the control object, control purposes, as well as changes in state of the environment, the actual control process, when asked to respond quickly, along with the increasing value of Kp, prone to overshoot and oscillation search；



3、At the same time, by a formula that when I component and the Dcomponent is zero，output U＝Kpe，only P controls.Moreover,e=PV(Actual value)–SV(Target value)，therefore, we can see that, when the PV (Actual value) has the same SV (Target value), e value of zero,at this point the output of U = 0，so control objectives can not guarantee that remain at the target；



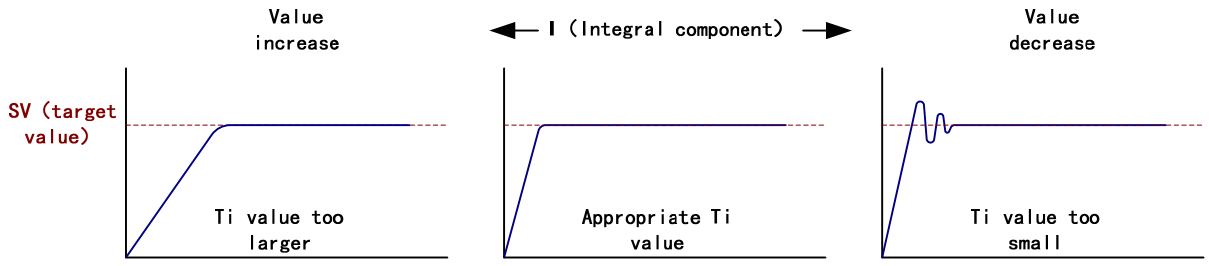
Note： To solve the above two questions 2,3, application I component need to control he implementation of the compensation action .

The definition of integration constant I component principle：

When the PV (actual value) is equal to SV (target value)，P component to zero，I component control will be activated, and by virtue of I component to stabilize the output.

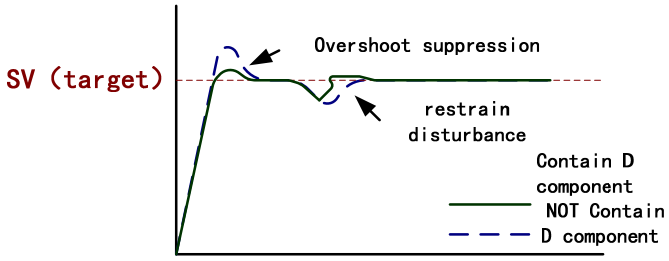
I component value is calculated by the formula **1/Ti×Kp ∫edt,** therefore integral time (Ti) set the value of the smaller,I component larger, cntrol is more stable; integral time (Ti) set the value of the larger, I component smaller, cntrol is more unstable.

However, if I component is too large, it is easy to cause system oscillation.



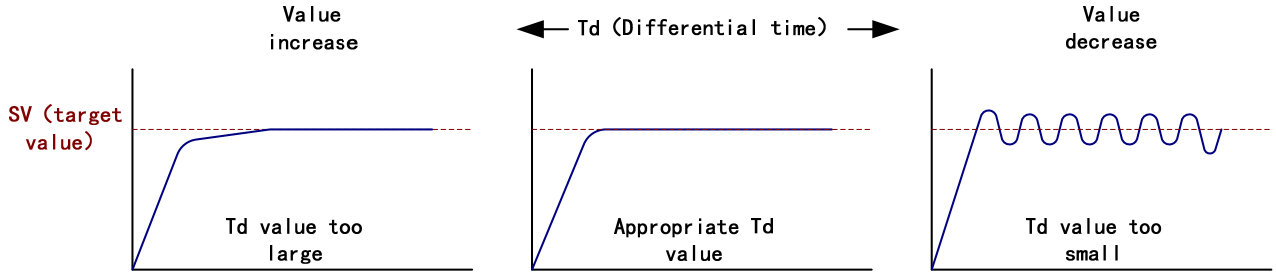
The definition of differential constant D component principle：

When the actual values change,， D component control will be activated. When actual value ralls quickly:U(output)=P component+I component +D component；When actual value rises quickly：U(output)=P component+I component -D component. D-component is therefore used to control the actual value of the rapid changes，the output value of rapid response in order to reduce the actual value and set value error, in favor of super-harmonic suppression of external interference.



D component value is calculated by the formula **1/Td×Kp de/dt**，therefore the differential time (Td) set the value of the smaller, D component the greater , the faster the reaction; the differential time (Td) set the value of the larger, D component the smaller , the slower the reaction.

However, if D component is too large, As long as the actual values of the change, output value will result in the rapid reaction caused system oscillation, even beyond the control of divergent phenomena.



■ P4 drive alarm and examination

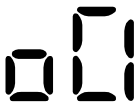
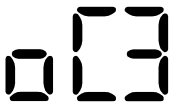
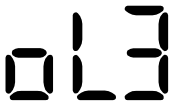
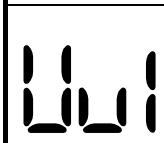
◆ Alarm detection

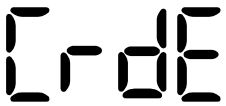
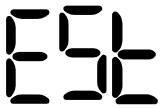
● Set one of the parameters of H1.01.～H1.07.(function selection of multifunctional input terminal) as21(malfunction reset) and set the signal ON.

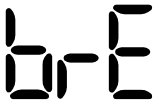
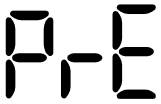
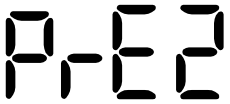
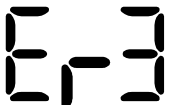
● Press “DATA”key of the digital manipulator to cancel the alarm, then press “STOP” key to restart the drive.

● Disconnect the main loop power source before connect again.。

Table 5.1 alarm display and countermeasure

Alarm display	Content	Cause
	Over Current in Speed Changing of Drive During acceleration and deceleration, the output current exceeds the threshold (about 200% rated current)	● Proportional gain and differential gain is too high or integral time is too little ● output side of the motor was short circuited and earthed
	Over current in stable speed of drive During the state of stable speed, output current exceeds the threshold (about 200% rated current)	● output side of the motor was short circuited and earthed ● Proportional gain and differential gain is too high or integral time is too little ● Overload， capacity of the drive is too small
	over current or overheated of drive module output current exceeds the threshold (about 200% rated current)	● output side of the motor was short circuited and earthed ● The “TI-SM” module is damaged ● Overload， capacity of the drive is too smal
	**overload of motor:**Electronical thermal protection resulted in the action of overload protection	● Output current overheating protect ● Output current is 180% of the rating current, last 10s ● Overload， capacity of the drive is too smal
	**Over voltage of main loop during decelerating:** Main loop voltage exceeds threshold value 400V class：770V	● Over voltage of power source ● Short decelerating time, large amount of regenerative power
	**Over voltage of main loop in stable speed:**Main loop DC voltage exceeds threshold 400Vclass：770V	● Over voltage of power source ● Over regenerative power
	**Abnormal voltage of main loop during motor stop:**Main loop DC voltage exceeds threshold 400Vclass：770V	● Power source voltage exceeds operating range of drive
	**Low voltage of main loop during motor stop:** Main loop DC voltage lower than threshold value during motor stop 400Vclass：420V	● power off in transient state ● Wiring connection of input power source loose ● Power is cutted off
	**Low voltage of main loop during motor operating:** Main loop DC voltage lower than threshold value during motor stop 400Vclass：420V	● power off in transient state ● over voltage fluctuation of input power source ● Wiring connection of input power source loose ● Lack of phase of Input power source

Alarm display	Content	Cause
	**Heat sink overheating**	● Over high environment temperature ● Heating element around ● Stop running of heating fan ● Blocking of Heat sink
	**Other overheating**	● Overheating of charged resistance ● Failure of heating fan ● Disconnection or loose contact of main contactor
	**Motor self-learning failure**	● Assistant code is display in parameter U4.16., please look up to table 5.1 for detailed info
	**Self-checking of Expanding card error**	● Does not connect expanding card with record of expanding card
	PG disconnection Frequency output instruction exits while no PG pulse signal received	● PG disconnection ● Frequency output instruction exits while no PG pulse signal received
	**PG disconnection** Frequency output instruction exits while no PG pulse signal received	● Incorrect self-checking
	**Improper parameters** Assistant info please look up to U4.16.	● Assistant code showed in parameter U4.16., detailed info please look up to table 5.2
	**Terminal setting conflict** Assistant info please look up to U4.16.	● Assistant code showed in parameter U4.16.
	**Urgent stop**	● During the period of the terminal works, hand movement breaks off operation and press “stop”key
	**Pressure sensor signal lost** The parameter of P1.02.is different from the pressure gauge	● The wiring of pressure sensor is falling off ● Pressre sensor is damaged
	Malfunction of operator operator can not communicate with mainboard	● loose contact of operator
	**Malfunction of communication** drive can not communicate with external	●
	**Input phase lacking** Main loop	● Transient power off ● Over voltage fluctuation of input power source ● Wiring connection of input power source loose ● Phase lacking of input power source ● Filter capacitor degradation
	**Output phase lacking** lack of phase at output side of drive	● Disconnection of output cable ● Disconnection of motor winding ● loose of output terminal

Alarm display	Content	Cause
	**Abnormal braking**	● Abnormal braking loop
	**Self-checking malfunction of current mutual inductor**	● effected by strong interfere ● disconnection of motor
	**Mainboard fault 1**	● Occurred overtime reset(crash)
	**Mainboard fault 2**	● The data in E^2PROM numerate error or paste faiuare
	**Mainboard fault 3**	● Fractional frequency CPU communication error
	**Program error** **Abnormal pulse fluctuation of encoder**	● Encoder is interfered or improper installed
	**Expand program error**	● Details sees the explanation expanding a pattern's
	**Expand program error**	● Details sees the explanation expanding a pattern's
	**Expand program error**	● Details sees the explanation expanding a pattern's
	**Over ranged of parameter setting**	● The write-in or software edition of host stiff changes illegal EEPROM
	**Expand a parameter surpassing range**	● Change the parameter expanding a pattern arousing expansion surpassing range
	**Operation implement inner parameter content makes mistakes**	● The content of Operation is empty ● The content of Operation is half-baked
	**Error when edit parameter of operator**	● Carry out function of writing parameter set during motor operation

◆ LE. Failure of Motor Self-learning

The following table is analysis of theancillary information when self-learning is error.

Table 5.1 alarms of the self-learning

U4.16.displayed value (Assistant info in alarming)	contect
1	Can not reach testing current-disconnection of motor, parameter setting error
2	Unreasonable testing result
3	Can not reach testing motor speed-overload of motor axis of rotation, parameter setting error, incorrect number of encoder wires
4	Incorrect encoder phase
7	The electric motor does not rotate (electric motor or coder disconnection)
9	Inconformity or coder be wrong in line number in the coder pole number and the electric motor pole

◆ oPE2. Unreasonable Parameters

The following indicate the assistant parameter U4.16.and its explanation when the parameters are unreasonable.

Table 5.2 Alarm of Unreasonable Parameters(According to parameter U4.16.)

U4.16.Displayed Value (Assistant info in alarming)	contect
3	No-load motor currentE2.07 is larger than rated motor currentE2.03.
4	No-load motor currentE2.07 is larger than 60% of maximal output current.
5	First line resistance E2.09. smaller than reasonable value
6	Unreasonable first line resistance of motor E2.09.-rated current E2.03. * phase current>rated voltage E2.04.
7	Unreasonable power factor calculation of motor. Related parameters: rated power E2.01., rated current E2.03., first line resistance E2.09. and iron loss of motor in torque compensation E2.11.
8	Too small no-load current

■ P4 Drive Common Problems and Solutions

◆ Parameters can not be set

The drive parameters can not be set，please implement the following approach.

Note： The parameters used to monitor can not be set，Including: U. parameters group and P1. parameters group.

■ Press the DATA button, numerical parameters to be modified to amend the state can not enter (Value does not flicker)

At this point, it is necessary to consider the following reasons.

Drive in operation

Drive in the run mode, parameter settings may not be carried out. After disconnect the "pump start" terminal ,set parameter.

Drive has been set up password, And enter the password is incorrect

Drive has been set up password（OP1 parameter shows  ），and did not unlock the decryption operation correctly，unlock the decryption operation please refer to『P3 drive digital manipulator』.

◆ The electric motor does not revolve (parameter P1.04. (Flow output) = “0”)

When the electric motor does not revolve ,please implement the following approach.

■ Even if the system output corresponding pressure, flow directions, motor does not revolve

At this point, it is necessary to consider the following reasons.

Drive is not in operation

Drive is not in operation.

1、**RUN Extinguished STOP Red light** means ready / stop. But did not enter the running state，please close "start pump" terminal, start pump；

2、**RUN Extinguished STOP Extinguished** means the drive is not ready. Please disconnect "start pump" terminals first, press the **STOP** button, so that drive is in a state of readiness（RUN Extinguished STOP Red light），and closed "start pump" terminals, start pumps, in order to continue running.

3、**RUN Red light flashing STOP Extinguished** means that after the failure of the drive, when reset alarm, no disconnect "start pump" terminal. Please disconnect again and close "pump start" terminal into operation.

4、**Alarm occurred** means the drive is not ready. Please deal with alarm reset.

Alarm reset operation is as follows：

Way one：Computer system output alarm reset signal（NO.17 terminal）（Continued for more than 0.3S）,so that drive is in a state of readiness in order to continue running.

Way two：After using the operator DATA keys to confirm the failure, or modify certain fixed parameters, the drive will be in a not ready state. STOP button must be pressed (0.3S sustained above) so that drive is in a state of readiness in order to continue running.

Way three：Cut off three-phase 380V power supply，after the digital operation display goes out and then reclose power, so that drive is in a state of readiness in order to continue running.

Drive did not receive the corresponding pressure, flow command

Pressure, flow signals are DC 0 ~ 10V voltage signal，through parameter P1.01. (Pressure command , unit from P2.06. decision) and P1.03. (Flow command, unit%) detect the size of input pressure, flow signals.，If one is "0", the motor will not spin. Please make the following deal：

1、Use multimeter to test with a computer system board related to terminal if corresponding DC voltage signal is correct output；

2、Check the wiring between the computer system board and the driver is correct or not.

Pressure sensor feedback signal error

Through the parameter P1.02. (Pressure feedback unit from P2.06. decision) can detect the pressure sensor the size of the feedback signal，If the pressure sensor feedback signal error，namely parameter P1.02. Pressure readings and the actual value does not correspond to (the actual pressure can be obtained through the pressure gauge, pressure gauge to be the first to confirm the work of normal)，operational control will lead to error, electric does not rotate.

1、For different forms of pressure sensors，please set the correct parameters P2.02. (Pressure sensor range) and P2.03. (Pressure sensor output signal of the way)；

2、Multimeter testing with pressure sensor output signal is converted into pressure values of pressure and the actual value of the corresponding（The actual pressure can be obtained through the pressure gauge, pressure gauge to be the first to confirm the work of the normal）.

Drive UVW three-phase output broken circuit

If the above have been identified and normal, at the same time through the commonly used to monitor or parameter(U1.05.) detected a smaller output current，Please use multimeter to confirm whether the drive UVW three-phase output broken circuit，under normal circumstances, between drive UVW three-phase output were detected the resistance to a smaller value（About 1Ω ,the greater the electrical power, the smaller the resistance value）。

◆ Motor rotation, but the system can not be increased pressure

Motor rotation, but the system can not be increased pressure，please implement the following approach.

■ In closed circuit, even given the rather high pressure, flow command, the pressure is still unable to rise, and the flow output (P1.04.) is rather large

At this point, it is necessary to consider the following reasons.

The hydraulic oil back to tank through other bypass

If the detected a large number of hydraulic oil through the oil pump mouth（Generally can be known through the state of oil pipeline vibration），but pressure can not be increased，it means that the hydraulic oil back to tank through other bypass.

1、Please check whether the safety relief valve opening is too large, through the relief valve back to the oil；

2、Please check the existence of the direction of valve movement error, failed to form a closed circuit；

3、Please check whether the phenomenon of a large number of oil spills.

There is no hydraulic oil through the pipeline

Since the parameter P1.04. (Output flow) is based on the actual motor speed to be converted into，even if there is no hydraulic oil through the oil pump mouth（Generally can be known through the state of oil pipeline vibration），parameter P1.04. (Output flow) value will be based on the actual motor speed changes, but can not be increased pressure

1、Make sure that the tank had been added sufficient hydraulic oil, if there is valve switch in tank export ,please open valve；

2、Please allow continuous operation of pump for some time (20s or so) to ensure full of hydraulic oil circuit；

3、Pump reversal, if the above has been confirmed, but still can not increase the pressure, please change the direction of pump rotation.

Operation to change the direction of pump rotation：

Step1：Change the drive　power cord of three-phase output U, V, W two-phase random；

Step2：Disconnect "start pump" terminal，re-enter the parameters of OP3 = "3" for electrical motor self-learning, closed "pump start" terminal.

■ In the closed circuit, even given rather high pressure, flow commands, the pressure is still unable to rise, and the flow of output (P1.04.) is rather small

At this point, it is necessary to consider the following reasons.

Drive did not receive the pressure of the corresponding command

Pressure signal is DC 0 ~ 10V voltage signal，through parameter　P1.01. (Pressure command, unit from P2.06. decision) detect the size of input pressure signal. If the drive pressure input signal is rather small, that is, the pressure can not be increased. Please make the following deal：

1、Multimeter testing with a computer system board related to terminal corresponding correct output DC voltage signal；

2、Check the wiring between the computer system board with the driver is correct or not.

Drive did not receive the corresponding flow command

Flow signal is DC 0 ~ 10V voltage signal，through parameter P1.03.（Flow command, unit%）detect the size of input signal. If the input drives flow signal is too small, that is not sufficient to complement the leakage flow, the pressure can not be increased. Please make the following deal：

1、Multimeter testing with a computer system board related to terminal corresponding correct output DC voltage signal；

2、Check the wiring between the computer system board with the driver is correct or not.

Pressure sensor feedback signal error

Through the parameter P1.02. (Pressure feedback unit from P2.06. The decision) can detect the pressure sensor the size of the feedback signal，If the pressure sensor feedback signal error, that is, parameter P1.02. Pressure readings and the actual value does not correspond to（The actual pressure can be obtained through the pressure gauge, pressure gauge to be the first to confirm the work of the normal），operational control will lead to error, the pressure can not be increased.

1、For different forms of pressure sensors，Please set the correct parameters P2.02. (Pressure sensor range) and P2.03. (Pressure sensor output signal of the way)；

2、Multimeter testing with pressure sensor output signal is converted into pressure values of pressure and the actual value of the corresponding（The actual pressure can be obtained through the pressure gauge, pressure gauge to be the first to confirm the work of the normal）.

Pressure sensor detection range is too small

When the system pressure is required greater than the pressure sensor maximum output pressure , the high pressure control can not be above.

The drive received pressure command value is smaller than system given pressure command value

When the system is given the pressure command value, the drive received pressure command value (P1.01.) is relatively too small, that is, the system can not achieve the required pressure, at this time, systems need to adjust the pressure of a given command value. Method as follows：

1、Be adjusted through the computer system. Computer system by adjusting the relative pressure to adjust the output voltage value，If the voltage value has been adjusted to the maximum, please adjust the drive.

2、Be adjusted through the drive. Through the parameter P2.10. (System pressure) adjustment.

Drive output has reached the maximum output torque

Through the parameters of U1.06. (Motor output torque, unit%) can detect the size of motor output torque，If the parameter U1.06. value is close to or equal to E5.10. (Maximum output motor torque) settings, it will not be able to output a larger system pressure. Please a corresponding increase in E5.10. (Maximum torque) settings.

Drive output has reached the highest capacity output

Through the parameter U1.05. (Electrical motor output current, unit A) can detect the size of the electrical motor output current, If the parameter U1.05. Value has been close to or equal to the maximum output current value, the drive will reach the upper limit of capacity, Although the drive does not meet the maximum output torque at all, nor can the output a larger system pressure. Please choose a higher level of drive capacity.

Type TI-MS-P3-****	45P5E	47P5E	4011E	4015E	4018E	4022E	4030E	4037A1	4045A1	4055A1	4075A1
Maximum Output Current（A）For 5s	26	33	41	50	58	66	90	110	130	155	200

■ In closed circuit, the given high pressure, low flow command, the pressure can not be increased

In closed circuit, in recognition to a higher pressure, flow signal, under the premise the pressure can be increased to normal , flow signal is reduced, the pressure can not rise, it is necessary to consider the following reasons.

Flow command settings is too low

The flow command（P1.03.）is too low will lead to oil output（P1.04.）is not sufficient add the flow of leakage oil flow（Different types and models of pumps at different pressure conditions different from the leakage flow)，Impossible to achieve a higher output pressure. By detecting the relationship between parameters P1.03. (Flow command), and P1.04. (Output flow), When the P1.03 .= P1.04.,but the pressure can not rise, this means the flow of commands set the value too low.

Did not set the appropriate underflow

Computer system can set the minimum flow "Underflow" (Qmin)，The drive itself can also set it through the parameter P3.10. (underflow)，“underflow”by controlling the flow of the minimum output value, added to ensure that oil leakage flow,

the pressure to achieve the corresponding output. As long as for different pump and pressure to make corresponding "underflow " setting.

Note： After underflow settings, can not set the output value less than underflow.

◆ System pressure control instability, overshoot

System pressure control instability, overshoot， please implement the following approach.

■ The whole paragraph pressure, pressure systems control are unstable and overshoot

At this point, it is necessary to consider the following reasons.

Unreasonable regulation of PID control

Response parameter adjust unreasonable, it is easy to cause the system pressure instability, overshoot, Please refer to 『on the control (PID adjusted)』 re-adjustment of PID parameters.

Note： Overshoot phenomenon in the whole paragraph pressure, the greater the actions flow command , the more serious overshoot phenomenon（Especially when U1.04. (Motor speed), more than P4.06. (Motor rated speed)），Reduce the integral time (I) set value, increasing the differential time (D) set value will be conducive to better curb the phenomenon of overshoot.

■ System pressure does not stabilize when higher

At this point, it is necessary to consider the following reasons.

Unreasonable regulation of PID control

Unreasonable regulation of PID control, it is easy to lead to instability in the system pressure, please refer to 『on the control (PID adjusted)』readjust PID parameter.

Drive output has reached the maximum output torque

Through the parameter U1.06. (Motor output torque, unit%) can detect the size of motor output torque, If the parameter U1.06. value is close to or equal to P3.06. (Maximum motor output torque) of the set value, will not be able to output the pressure of a larger system, the system pressure on the state of instability. Please a corresponding increase in P3.06. (Maximum torque) settings.

Drive current output has reached the maximum pressure current output

Through the parameter U1.05. (motor output current, unit A) can detect the size of the electrical output current, if the parameter U1.05. Value has been close to or equal to the maximum pressure output current value, Although the drive does not meet the maximum output torque at all, nor can the output pressure of a larger system, the system pressure on the state of instability. Please choose a higher level capacity drive.

Type IMS-P4-****	45P5E	47P5E	4011E	4015E	4018E	4022E	4030E	4037A1	4045A1	4055A1	4075A1
The largest pressure-current (A) for 60s	22	28	33	45	53	60	80	100	120	140	180

◆ System flow can not increase

Oil flow can not be increased, please implement the following approach.

■ Given the corresponding pressure, flow commands, flow can not meet the command value

At this point, it is necessary to consider the following reasons.

Pressure output value (P1.02.) has reached the pressure command value (P1.01.)

When pressure output value has reached the pressure command, flow will no longer be increased. Please check whether the state normal.

1、If not normal, please adjust the machine to reduce the load pressure, in order to achieve the corresponding the output flow;

2、If normal, increase the pressure command value, in order to achieve the corresponding output flow.

Drive received the flow command value is smaller than system given flow command value

When the system given flow command value, drive received the flow command value (P1.03.) is relatively small, that is, the system can not achieve the required flow, at this time, system need to be adjusted to set the value of the flow command. Method as follows：

1、Be adjusted through the computer system. Through the computer system relative flow of the output voltage value adjustment if the voltage value has been adjusted to the maximum, please adjust the drive.

2、Be adjusted through the drive. Through the parameter P2.09. (Maximum motor speed) to adjust.

Note：Relative flow of the computer system output voltage value V≈（Maximum flow / displacement pump / motor maximum speed（P2.09.））×10，

Note：The system highest peak flow ≈ screw maximal rotation speed × melting plastic oil motor displacement

◆ Mechanical Vibration

Mechanical vibration，please implement the following approach.

Note：Ascertain the coder signal first being fine or not please. If the PG card flashing red LED display, encoder signals are bad：Ground connection effect is bad , the PG card and connector assembly connection are bad or the coder line and power line are on the same level to go on foot gleam. Through the parameter U2.07. (Encoder pulse rate of change) on the encoder signals the degree of interference to assess, the value is greater than "10" indicates a serious interference.

■ Mould machine start or stop appears vibration

At this time, please take the following approach.

1、Be adjusted through the computer system. Increases appear to the slope of the vibration actions, so that a more gentle control to reduce vibrations cease.

2、Be adjusted through the drive. Increase the P3.07. (Pressure rise time), P3.08. (Pressure fall time), P3.09. (Flow rise time), P3.10. (Flow fall time) settings, allowing the system pressure, flow in response to moderate and reduce vibration cease.

■ Mould machine vibration under stationary

At this time, please take the following approach.

The situation for the servo motor vibration，Please reduce the motor response to the proportional gain (Kp-m), motor response to integral time (Ti-m) settings, So that servo motor PI control response to moderate, reduce motor vibration.

■ Mould machine vibration occurred during operation

At this time, please take the following approach.

Mould machine in idle state and the premise not appearing to vibrate, please reduce the P3.03. (System response to differential time (Td-s))set value, If P3.03. (System response to differential time(Td-s))set the value of "0", Mould machine still appearing in running process to vibrate, please reduce the system respond to the proportional gain (Kp-s) set value , increase system response to integral time (Ti-s) set value, so that machine moves gently, reducing machine vibration.

Note：“The action of injection、pressure-maintaining”please keep the corresponding system response to differential time (Td-s), to contain the pressure overshoot.

◆ Alarm Processing

Alarm occurred, please implement the following approach.

Alarm reset operation is as follows：

Method One：Computer system output alarm reset signal(terminal 17) (0.3S sustained above) so that drive is in a state of readiness in order to continue running.

Method two：After using the operation implement DATA key to affirm the malfunction；or modifying certain fixed parameters, The drive will not in a ready state. STOP button must be pressed (0.3S sustained above) so that drive is in a state of readiness in order to continue running.

Method three：Cut off the three-phase 380V power supply, power supply closing again after digital operation implement demonstrates put out, so that drive is in a state of readiness in order to continue running.

■ OC1、OC2、OC3 Alarm Processing

At this point, consider the following reasons.

Note：If the drive continues OC3 alarm, it means that the drive internal hardware failure, please contact manufacturers!

If the deal failed to lift the adoption of the following warning, please choose a greater capacity level drive.

The first time operation appears to give an alarm

According to that『P3 drive tests process』after the part debugging is finished, the first time operation is to appear to give an alarm.

1、Servo motor UVW three-phase output short-circuit or grounding, please use a multimeter and megohmmeter measuring to confirm；

2、Pressure command value (P1.01.) Is too high, if a larger load, easy to lead to long-term output is greater than the maximum system pressure of the pressure value, the drive output overload；

3、Electrical motor parameter (P4.) not set correctly, resulting in abnormal motor control;

4、Electrical self-learning (OP3. = 3) is not normal to complete, after the replacement of motor not OP3 = 3 (servo motor magnetic declination of self-learning)；

5、Encoder loose or incorrect wiring（if the LED on PG card long-term display red light, then the encoder signal is error: PG card, connector, encoder loose or incorrect wiring）；

6、In response to set the value too high（refer to『about response』及『about controlling (adjust PID)』）.

Occasional alarm

Occasionally drive or when to perform certain specified actions appears alarm.

1、Servo motor UVW three-phase output short-circuit or grounding, please use a multimeter and megohmmeter measuring to confirm;

2、Corresponding to the appropriate course of action set up the computer system the slope of the value is too small, please increase the slope of the appropriate settings;

3、Pressure command value (P1.01.) Is too high, if a larger load, easy to lead to long-term output is greater than the maximum system pressure of the pressure value, the drive output overload;

4、Encoder signal bad（If the PG card LED is flashing red light, the encoder signal is bad：adverse effect of grounding，PG card and connector bad wiring ,or encoder-ray lines and power lines wiring parallel），Through the parameter U2.07. (Encoder pulse rate of change) on the encoder signals the degree of interference to assess, the value is greater than "10" indicates a serious interference;

5、In response to set the value too high（refer to『about response』及『about controlling (adjust PID)』）.

■ OL3 Alarm Processing

At this point, it means that drive long-term in high-load state.

1、Electrical motor parameter (P4.) not set correctly, resulting in abnormal motor control;

2、Relative drive, the system is in long-term high-load state. If the control is in need of long-term high-load conditions, use a greater capacity level of drive.

■ OU1、OU2 Alarm Processing

At this point, it is necessary to consider the following reasons.

1、Braking resistor not connected, wiring loose or braking resistor damaged, please use a multimeter on the drive connection terminals B1, B2 (or +, BR) to confirm;

2、In response to set the value too high（refer to『about response』及『about controlling (adjust PID)』）.

■ OU3 Alarm Processing

At this point, it is necessary to consider the following reasons.

1、Servo motor UVW three-phase output short-circuit or grounding, please use a multimeter and megohmmeter measuring to confirm;

2、When power on, supply voltage exceed the driver scope of work，please use a multimeter or oscilloscope to the drive terminals R, S, T to confirm.

■ Other Alarm Processing please refer to『P3 Drive alarm explained』

■ Appendix I: servo pump parallel connection control

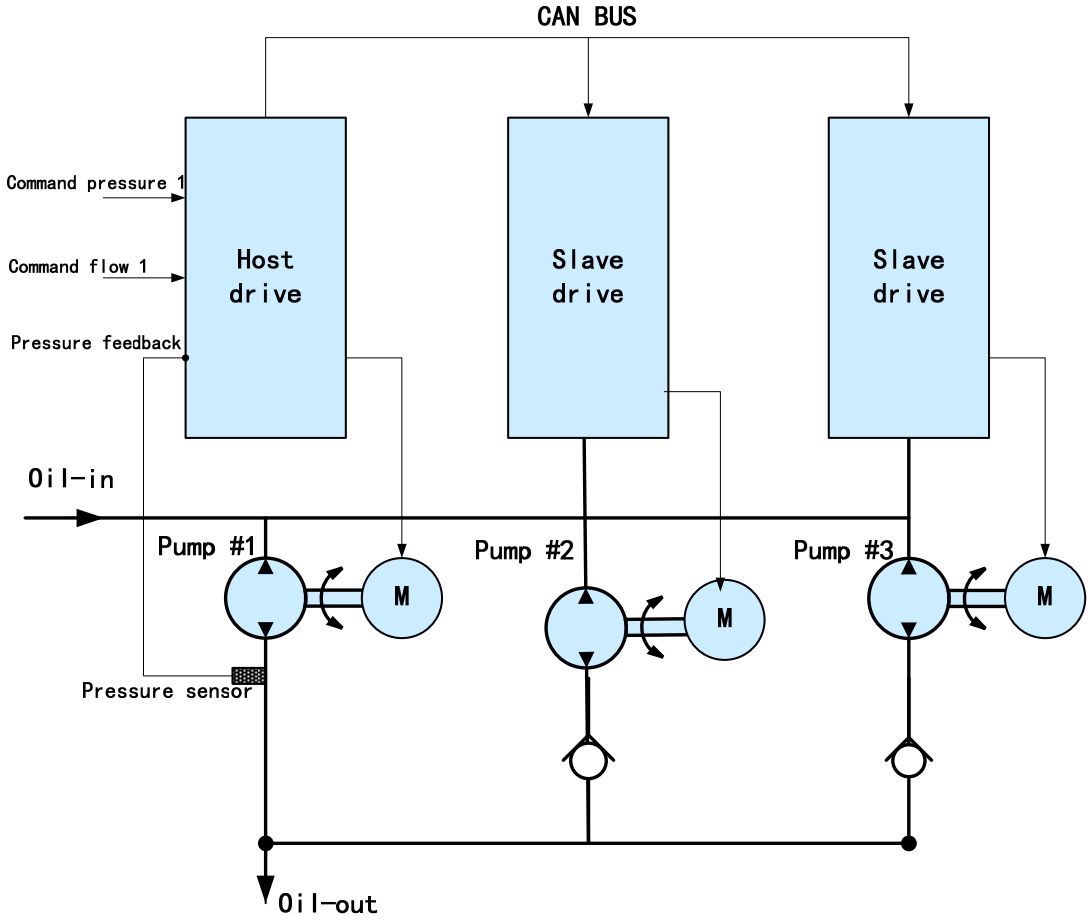
Parallel connection pump is dividired :“pumps parallel flow”and“pumps diffluence/parallel flow”two schemes。

Pumps parallel： A suit of servo pump as the host drive , the others as slave pumps, they working , action, run and stop in accordance with the host drive.

Pumps diffluence/ parallel flow： Two suit of servo pumps can work in parallel flow and diffuence flow (individual control)modes

■ Pumps parallel flow

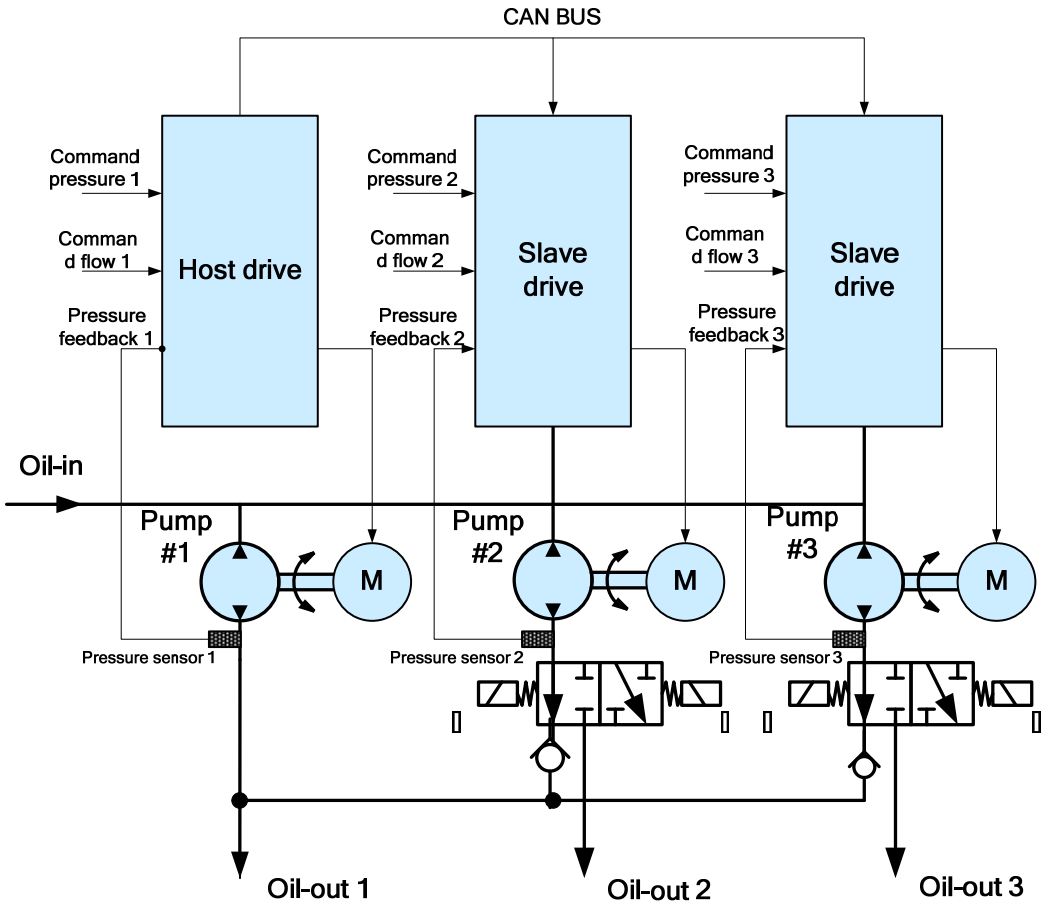
The following is showed the pumps parallel flow control diagram



Explain ： The wiring of the host drive is the same as the typical solo servo pump, the slave dirves connected with the host drive by can bus. Host and slave drives should adjust parament maccordingly (refer to the flowing parameter table), across the mode of communication to pledge the motors have a same speed to achieve pumps parallel flow.

■ Pumps diffluence/ parallel flow

The following is diagram of the pumps diffuence/ parallel flow.



Explain ：The wiring of the host and slave drives is the same as the typical solo servo pump , the slave dirves connected with the host drive by can bus(refer to the following article). Host and slave drives should adjust parament accordingly (refer to the flowing parameter table). Host and slave drivers can run independently（①loss power，②get power）; they can also run as the mode of pumps parallel flow（①get power，②loss power），Under the mode of the pumps parallel flow, the host and slave drives pledge the speed of the motors is same , to achieve pumps parallel flow. At this time , the command pressure , command flow, and the pressure feedback signals are ineffective.

◆ wiring

Attentions for the wiring of the mode of the pumps parallel flow

■ pumps parallel flow

The following is the attentions for the wiring of the mode of the pumps parallel flow.

The wiring of host drive is same as the typical solo servo pump, slaves only need connect input power, output power, braking resistor and the encoder. All of the “pump start ” signal is merged. “Enable of the CAN BUS” of Slave drive need shorted.

Attention 注：one of th e host , slave drive is alarm ,please cut off all of the “pump start” signal.

When in the pressure holding , cut off the “enable of CAN BUS”(No. 13 terminal) can achieve a better energy efficiency benefit.

■ Pumps diffluence/ parallel flow

The followings are the attentions of pumps diffluence/ parallel flow.

The wiring of the host drive is same as the typical solo servo pump.

All of the drives' "pump start" shoud be parallel connection. "Alarm output"signal is same as the "pump start". The slaves' " CAN bus enable" signal is used to switch pumps parallel flow (when it is ON)and pumps diffluence (when it is OFF).

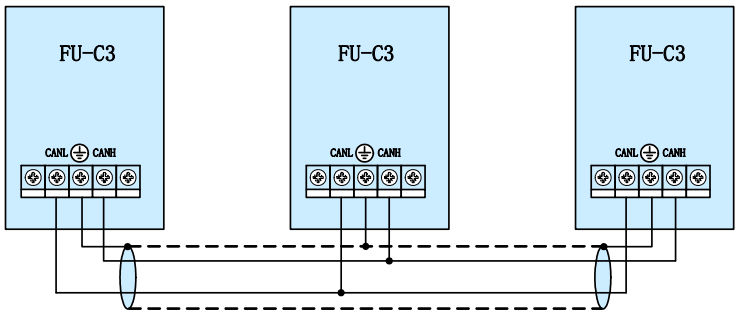
Attention ： One of the host or slaves is alarming ,please cut off all of he "Pump start" signal.

Cut off the "CAN bus enable" can achieve a better energy efficiency benenfit when it is in the condition of pumps parallel flow.

■ CAN BUS conection

The following are attentions for the wiring of the CAN bus cards-----FU-C3 cards

Every drive need to install the CAN bus card , mode of the connect is like the follow:



explain：please use the double wrap shieled wire to connect. All of the drives' CANH and CANL signal in FU-C3 cards is in tandem. All of the ⏚ terminals in FU-C3cards are connected with the shielding layer. The terminal resistances of the FU-C3 cards in first host drive and the last slave drive shoud be connected together(J1 and J2 skip stitchs shoud be shorted).

◆ Parameter setting

Especial parameter setting of pumps parallel

■ The host drive setting

The following table is showed the host drive's parameter setting, other parameters please refer to the servo pump universal method to setting.

NO.	Content	Settings	Area	Explain
H8.01	CAN BUS enable	1	0~1	effective
H8.02	CAN transmission speed	6	0~9	500K
H8.03	Node number	1	1~127	host
H8.08	PDO2 the number of send parameters	2	0~8	
H8.17	PDO2 send address 1	22	0~FFFF	
H8.18	PDO2 send address2	23	0~FFFF	
H8.27	PDO2 self sending times interval	2	0~255	send once per 2ms
H8.28	PDO2 self sending ID	2	1~127	
H8.29	Save format	0	0~1	Large end is in front

■ The slaves setting

The following is the slaves' parameter setting

NO.	Content	Settings	Area	Explain
B1.01	Running instruction selection	1	0~2	outer control
B1.04	Frequency instruction selection	2	0~6	analog terminal control
B1.05	Set mode of analog instruction	4	0~7	expanding terminal 1
H8.01	CAN BUS enable	1	0~1	effective
H8.02	CAN transmission speed	6	0~9	500K
H8.03	Node number	2	1~127	
H8.29	Save format	0	0~1	Large end is in front
H8.30	The mode of communication interrupt	1	0~4	effective
H8.31	The time of communication interrupt	0.5	0~2.50	Protect after 0.5s

◆ Debug process

Parallel pump debug process

1. Set all of the parameters , care of two drives' speed must consistent.
2. The host and the slaves must progress "OP3=3" self-learning
3. When the host debug the pressure and flow, the slaves must cut off the "pump start" signal.
4. When the slaves debug the pressure and flow, the host must cut off the "pump start" signal. Pumps parallel flow no need to do it.
5. Check the CAN bus state. Start the host ,the slaves and give the "CAN bus enable" signal, the machine can into a running state. Give a signal to let the host running , if the flow command of the slaves'(P1.03) is same as the host output flow(P1.04) , the communication is normal, else the communication is interrupted. When the communication is interrupted , please check the wiring and the parameter of the CAN bus.
6. Run the host and the slaves in the same time

■ Appendix Ⅱ: Detailed State Monitoring parameters

◆ U: Monitoring parameters

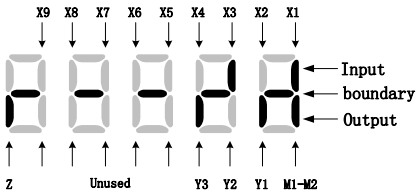
In monitoring parameter(U parameter), the parameter such as state, terminal, malfunction record can be monitored.

■ U1.state monitoring

The following table is showed the state monitoring parameter

NO.	Name	Content	Minimum unit	Selecting code
U1.01.	Target frequency	Monitor setting of target frequency	0.01Hz	1
U1.02.	Output frequency	Monitoring of output frequency	0.01Hz	2
U1.03.	Feedback frequency	Monitoring of feedback frequency	0.01Hz	3
U1.04.	Motor speed	Monitoring of motor speed	1RPM	4
U1.05.	Output current	Monitoring of output current	0.1A	5
U1.06.	Output torque	Instruction value monitoring of drive output moment force	0.1%	6
U1.07.	Output voltage	Monitoring output voltage	0.1V	7
U1.08.	Output power	Monitoring drive output power	0.1KW	8
U1.09.	DC voltage of main loop	Monitoring main loop DC voltage of drive	0.1V	9
U1.10.	Heatsink temperature	Monitoring the heasink temperature of the drive	1℃	10
U1.11.	Total operation time	Monitoring total operation time of drive	1℃	11

■ U2.Terminal monitoring

NO.	Name	Contant	Minimum unit	Selecting code
U2.01.	Input/output terminal state		~	101
U2.02.	Expanding terminal state	Make sure the ON/OFF state of expanding input/output terminal	~	102
U2.03.	F1 input analog value	Input analog value of monitoring terminal F1	0.1%	103
U2.04.	F2 input analog value	Input analog value of monitoring terminal F2	0.1%	104
U2.05.	Input analog value	Input analog value of monitoring terminal F3	0.1%	105
U2.06.	Input pulse PG/motor angle	Monitor corresponding content according to 02.05 setting	1Pls/0.1°	106
U2.07.	PG pulse deviationed peak	Used for evaluate the interference degree to PG signal	1Pls	107
U2.08.	Regenerative braking duty ratio	Braking unit ON/OFF duty ratio of drive when carry out regenerative braking	0%	108
U2.09.	UVW state	Unused	1	109

NO.	Name	Content	Minimum unit	Selecting code
U2.10.	Actual positioning deviation			110
U2.11.	Operation state	Unused state indication for inverter operating		111
U2.12.	ED%	Unused		112
U2.13.	Mark	Current AST state(refer to P6-60)		113
U2.14.	Type code			
U2.15.	Data			
U2.16.	Software editon	F3750－－mean GF3 series，Software editon is 750		

■ U3. Malfunction Record

The following is the parameters of malfunction record

NO.	Name	Content	Minimum unit
U3.01.	Malfunction record 1	The latest malfunction content	~
U3.02.	Malfunction record 1 repeat count	The latest malfunction repeat count	1
U3.03.	Cumulative operation time during malfunction 1	The latest malfunction cumulative operation time	1H
U3.04.	Malfunction record 2	The second malfunction content	~
U3.05.	Malfunction record 2 repeat count	The second malfunction repeat count	1
U3.06.	Cumulative operation time during malfunction 2	The second malfunction cumulative operation time	1H
U3.07.	Malfunction record 3	The third malfunction content	~
U3.08.	Malfunction record 3 repeat count	The third malfunction repeat count	1
U3.09.	Cumulative operation time during malfunction 3	The third malfunction cumulative operation time	1H
U3.10.	Malfunction record 4	The forth malfunction content	~
U3.11.	Malfunction record 4 repeat count	The forth malfunction repeat count	1
U3.12.	Cumulative operation time during malfunction 4	The forth malfunction cumulative operation time	1H
U3.13.	Malfunction record 5	The fifth malfunction content	~
U3.14.	Malfunction record 5 repeat count	The fifth malfunction repeat count	1
U3.15.	Cumulative operation time during malfunction 5	The fifth malfunction cumulative operation time	1H
U3.16.	Malfunction record 6	The sixth malfunction content	~
U3.17.	Malfunction record 6 repeat count	The sixth malfunction repeat count	1
U3.18.	Cumulative operation time during malfunction 6	The sixth malfunction cumulative operation time	1H

■ U4. Current Malfunction Info Recording

The following is Current Malfunction Info Recording

NO.	Name	Content	Minimum unit
U4.01.	malfunction record	current malfunction record	~
U4.02.	frequency instruction	frequency instruction of current malfunction	0.01Hz
U4.03.	output frequency	output instruction of current malfunction	0.01Hz
U4.04.	feedback frequency	unused	0.01Hz
U4.05.	output current	output current of current malfunction	0.1A
U4.06.	instruction moment force	Instruction moment force of current malfunction	0.1%
U4.07.	output voltage	output voltage of current malfunction	1V
U4.08.	DC bus voltage	DC bus voltage of current malfunction	1V
U4.09.	heatsink temperature	heatsink of current malfunction	1℃
U4.10.	input/output terminal state	input/output terminal state when malfunction input/output terminal state of current malfunction	~
U4.11.	expanding input/output terminal state	expanding input/output terminal state of current malfunction	0.1%
U4.12.	F1 input voltage value	F1 input voltage value of current malfunction	0.1%
U4.13.	F2 input voltage value	F2 input voltage value of current malfunction	~
U4.14.	running state	running state of current malfunction(refer to P6-60)	~
U4.15.	ASR state	ASR state of current malfunction(refer to P6-60)	~

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