Servodrive

TLDR-S

Instruction Manual
V1.70

http://www.wlzdhtech.com

Thank you for choosing this weiling product

We will be glad to receive any possible information which could help us improving this manual. The e-mail address is the following:tongling@tlzdh.com.Before using the product, read the safety instruction section carefully. Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period. Weiling has the right to modify products, data and dimensions without notice. The data can only be used for the product description and they can not be understood as legally stated properties.This manual is updated according to software version V1.70.

The identification number of the software version can be read on the drive(or inverter) nameplate or on the label on the FLASH memories mounted on the regulation card.

Tables of Contents

Chapter 1 - Safety Precautions

1.1 Safety Precautions

- Do not install near the vicinity flammable and explosive items
- Do not to restrict or prohibit the use of places to use the machine
- Must be sure the power is off before wiring
- If you want remove the drive,you must operate in five minutes when the drive power is off,otherwise there is a risk of electric shock
- The drive must be reliable grounding,otherwise there is a risk of electric shock。
- Do not disassemble, repair or modify the drive for yourself。
- This series is used only for the control of permanent magnet synchronous motor
- Do not use damaged drive
- Do not touch the braking resistor
- Must be in accordance with the terminal voltage polarity connection

1.2 Use Precautions

- Must carry on the wiring, installation and operation by professional personnel.
- The drive must be use with matching servo motor，And keep a good thermal environment。
- Do not provide commercial power directly to the servo motor, otherwise it will be damaged
- It is strictly prohibited to hammer percussion servo motor, otherwise may cause damage to the encoder。
- It is strictly prohibited to disassemble the servo motor
- Please follow the instructions to correct wiring, otherwise it will damage the drive
- Drive installation must avoid direct sunlight, high temperature, dust, metal powder, moisture environment

Chapter 2 - Functions and General Features

TLDR-Series——For our company, it is a new generation of high performance servo drive ， field oriented control，large output torque，good ability of instantaneous overload 。Specially used in injection molding machine。

Drive Features：

- Fast, accurate, stable speed control mode；
- Function of An adaptive PID；
- Lower noise by using space vector modulation；
- Store the latest 3 fault code and record number of failure；
- Overload protection；
- Flux reduction function；
- Convenient maintenance and commissioning；
- High performance rotary transformer decoding chip；
- 3 differential analog input；
- 2 configurable Analog output；
- 4 two-way digital signal input；
- 2 relay switch output。

Chapter 3 - Delivery Inspection and Product Specifications

3. 1 Delivery Inspection Procedures

Upon delivery, check the following:

- the packaging for any external damage.
- whether the delivery note matches your order.Open the packaging with suitable tools.

Check whether any parts were damaged during transport.

- the device type corresponds to your order.

In the event of any damage or of an incomplete or incorrect delivery. please notify the responsible sales offices immediately.

The devices should only be stored in dry rooms within the specified temperature ranges .

3. 2 Drive type designation

TL DR – S xxx
1 2 3 4

1：TL - Products name WEILING；

2：DR - Motor drive series；

3：S - Product is applied to the injection machine and other industries；

4：Drive power=Its value is divided by 10，unit：kW；

For example:TLDR-S220 indicate that the drive power is 220 /10 =22kW 。

3. 3 Technical indicators

3. 3. 1 Permissible environmental conditions

- Environment

Degree of protection —— IP20
Installation altitude —— Max 1000 m (3281 feet) above sea level; Above 1000 m(3281 feet) a current reduction of 1.2% for every 100 m (328feet) of additional height applies.。

- Temperature

operation —— 0～40℃(32～104 ℉)

storage —— -20～55℃(-4～131 ℉)

transport —— -20～60℃(-4～140 ℉)

- Air humidity

operation —— 5%～85%，without moisture condensation or icing
storage —— 5%～95%

3. 3. 2 AC Input/Output Specifications

The drive must be connected to an AC mains supply，No external connection of the regulator power supply to the existing AC Input supply is required since the power supply is taken from the DC Link circuit。When commissioning, set the Mains voltage parameter to the value of the AC Input voltage concerned。This automatically sets the threshold for the Undervoltage alarm at the appropriate level
In some cases AC Input chokes, and possibly noise suppression filters should be fitted on the AC Input side of the device.
Table 3.3.2.1： Input/Output Specifications

INPUT												
TYPE		S075	S110	S150	S185	S185H	S220	S300	S370	S370H	S450	S550
AC input voltage	V	400V -15% / +10%										
AC input frequency	Hz	50Hz ±5%										
AC input current	A	11	15.8	23	31.5	38	44	49	66.7	78	89.5	102
OUTPUT												
Output power for continuous service	kW	7.5	10.3	15.2	20.8	24.9	27.7	30.5	41.6	48.5	54.7	62.4
Recommend motor power	kW	5.5	7.5	11	15	18	20	22	30	37	40	45
Max output voltage	V	0.98 * AC input voltage										
Max output frequency	Hz	400										
Output current for continuous service	A	10.8	14.8	20.3	29	33	39	53	65	65	80	97
Switch frequency	kHz	8kHz									4 kHz	
Overload current	A	See table 3.3.3.1：parameter of drive overload										
Braking resistor （needed）	W	200	200	300	500	500	750	1000	1000	1500	1500	1500
	Ω	68	68	40	28	15	15	15	15	12	12	12
filter（optional）	A	20	20	35	35	50	50	65	65	80	80	100

3.3.3 Drive overload current

TLDR-S managed I2xT algorithm that dedicated to applications where a limited overload is required for a longer period of time。The current rated and overload values as shown in table3.3.3.1

Table 3.3.3.1：Drive overload current

TYPE	P	fout=0 Hz			0 < fout < f1	fout>f1			f1	T slow ovld	T fast ovld
		In rated	I slow ovld	I fast ovld		In rated	I slow ovld	I fast ovld			
	[kW]	[Arms]	[Arms]	[Arms]		[Arms]	[Arms]	[Arms]	[Hz]	[S]	[S]
S055	5.5	11.2	16.8	22.4	calculated with a linear interpolation	14.0	21.0	28.0	3	60	0.5
S075	7.5	12.8	19.2	25.6		16.0	24.0	32.0	3	60	0.5
S075H	7.5	14.4	21.6	28.8		18.0	27.0	36.0	3	60	0.5
S110	11	20.8	31.2	41.6		26.0	39.0	52.0	3	60	0.5
S150	15	28.0	42.0	56.0		35.0	52.5	70.0	3	60	0.5
S185	18.5	31.2	46.8	62.4		39.0	58.5	78.0	3	60	0.5
S185H	18.5	35.2	52.8	70.4		44.0	66.0	88.0	3	60	0.5
S220	22	40.0	60.0	80.0		50.0	75.0	100.0	3	60	0.5
S300	30	52.8	79.2	105.6		66.0	99.0	132.0	3	60	0.5
S370	37	61.6	92.4	123.2		77.0	115.5	154.0	3	60	0.5
S370H	37	68.0	102.0	136.0		85.0	127.5	170.0	3	60	0.5
S450	45	80.0	120.0	160.0		100.0	150.0	200.0	3	60	0.5
S550	55	96.0	144.0	192.0		120.0	180.0	240.0	3	60	0.5

The I2xT algorithm depends on the output frequency. At 0Hz frequency, the rated current reduction factor is 0.7 … 0.9 according to sizes， as shown in table3.3.3.1。
For output frequencies ranging from 0Hz to F1, the overload times should be calculated using a linear interpolation of 0Hz and F1 values。F1 is the frequency shown in the table for each drive size.。
The rated and overload currents and the corresponding overload and recovery times do not depend on the room temperature.。
The I2xT algorithm manages two drive overload levels:

1. Slow overload (150% In for 60s every 300s)
2. Fast overload (200% In for 0.5s every 60s)

Current limit management :

When the drive delivers a current higher than the in value shown in table 3.3.3.1，I-slow-ovld% increases up to 100%.at this time the drive overload alarm（F009=11）and stop output.

I-slow-ovld% reaches 100% in 60s if the current delivered by the drive is 150% of In.

The drive can also deliver a maximum current of 200% of In. In this case, when the output current exceeds the 150% threshold, the I-fast-ovld% value is increased until 100% is reached in 0.5s,and alarmed

Chapter 4 - Installation Guidelines

4.1 Drive Mechanical Specification

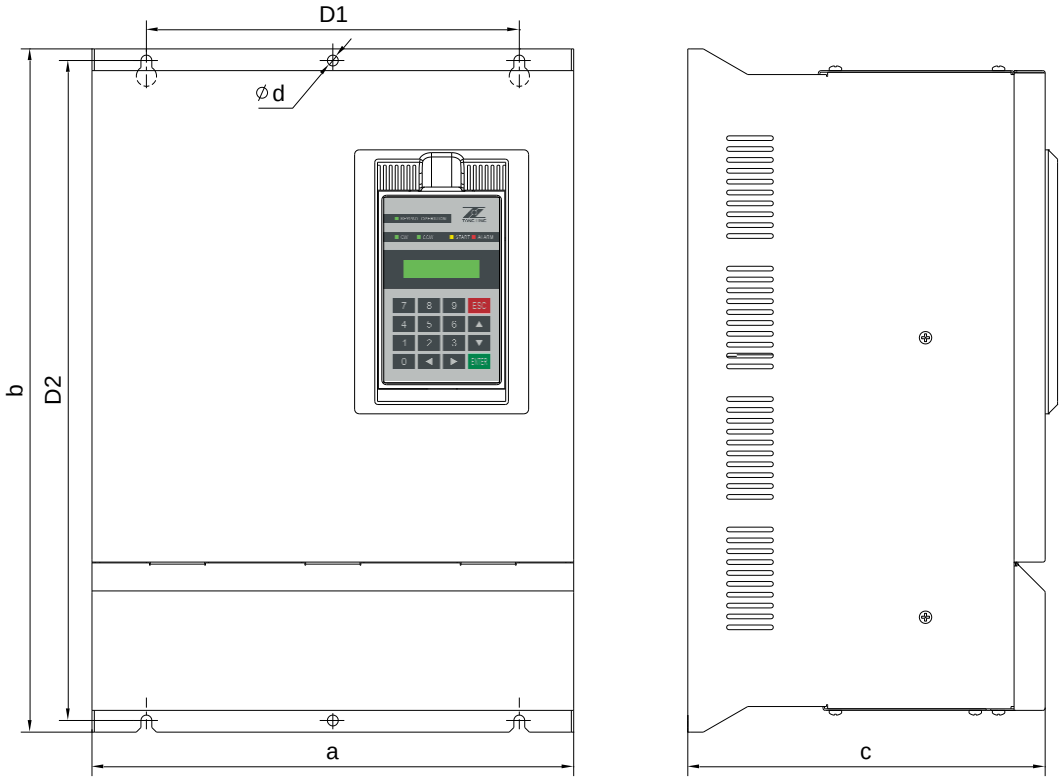


Table 4.1.1 Drive Mechanical Specification

SIZE		S075 H	S110	S150	S185	S185 H	S220	S300	S370	S370 H	S450	S550
a	mm	210		230		310			314	385		
b	mm	330		360		440			440	530		
c	mm	190		190		230			231	260		
D1	mm	140		160		240				300		
D2	mm	315		345		425				515		
Φd		M6										

4.2 Drive Installation

- Drive installation should avoid vibration，Control the vibration in 0.5G)(4.9m/S^2)，prohibited under gravity and impact.
- Drive must be installed in power distribution cabinet , Avoid contact with corrosive, flammable gas,and prevent the conductive material,metal powder,oil mist, liquid into the internal。
- Installation environment temperature ： 0-40℃,good heat dissipation and ventilation conditions。

NOTE! Fastening screws should be re-tightened after a few days of operation。

The drives must be mounted in such a way that the free flow of air is ensured. The clearance to the device must be at least 120 mm (4.8 inches). A space of at least 50 mm (2 inches) must be ensured at the front.。As shown in table 4.2.1。

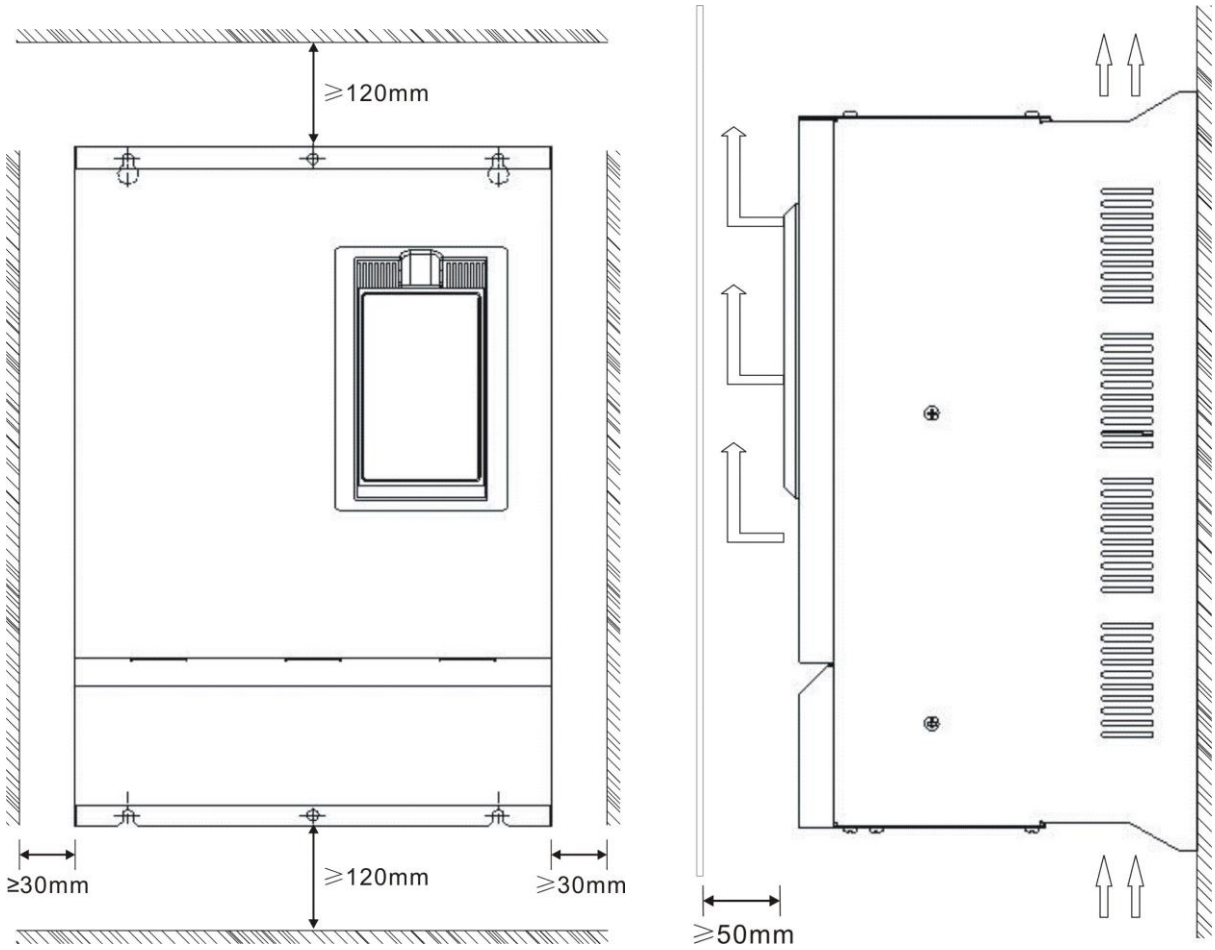


Table 4.2.1 drive installation diagram

4. 3 Motor Installation

- Installation environment temperature ： 0-40 ℃ (ice-free),and need to be forced cooling。Humidity should be less than 90%RH, no condensation。
- Motor installation should avoid vibration，Control the vibration in 0.5G)(4.9m/S^2) 。
- Do not violent disassemble coupling,or the encoder will be damaged
- Suggested the use of elastic coupling
- Motor cable not immersed in oil or water。

Chapter 5 - Wiring Procedure

5.1 Function of Leds On The Regulation Card

Table 5.1.1 Leds On The Regulation Card

name	color	function	descriptions
PWR	green	power	Led lit during the voltage +5V is present and at correct level;
RUN	green	run	Led flashing per second during CPU normal operation;
PWM	yellow	output	Led lit during IGBT modulation period;
RET	red	reset	Led lit during hardware reset;
ALARM	red	fault	The led flashing per second when the drive had common fault, The led lit when the drive had disable fault;
RS485	green	RS485 power	The led lit when RS485 interface is supplied

5.2 Jumpers On The Regulation Card

Table 5.2.1 Jumpers On The Regulation Card

name	function	default
S1	Connect the Analog and digital ground ;	ON
S2	Connect the 24V voltage ground to the earth;	ON
S5	Resolver and photoelectric encoder adaptation ON =photoelectric encoder OFF=resolver	OFF
S8	Analog 1 input type (J3-1 and J3-2) ON = 0～20 mA OFF= 0～10V	OFF
S4	Analog 2 input type (J3-3 and J3-4) ON = 0～20 mA OFF= 0～10V	OFF
S6	Analog 3 input type (J3-5 and J3-6) ON = 0～20 mA OFF= 0～10V	OFF
S11 S12 S13 S14	(J4) The selection of encoder signal OFF=signal of resolver and PTC ON = signal of photoelectric encoder	OFF
S3 S7	drive power self recognition ON = use OFF= no use	ON

5.3 Interfaces and Terminals Description

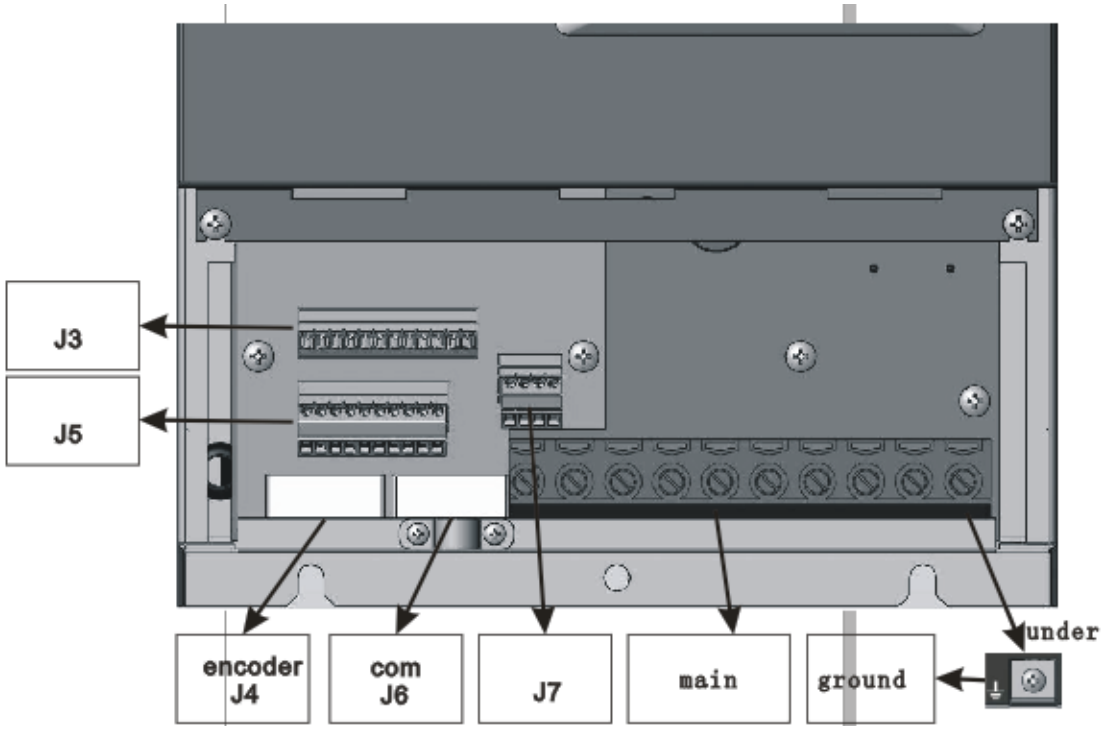


Table 5.3.1 Interfaces and Terminals diagram（7.5~18.5kW）

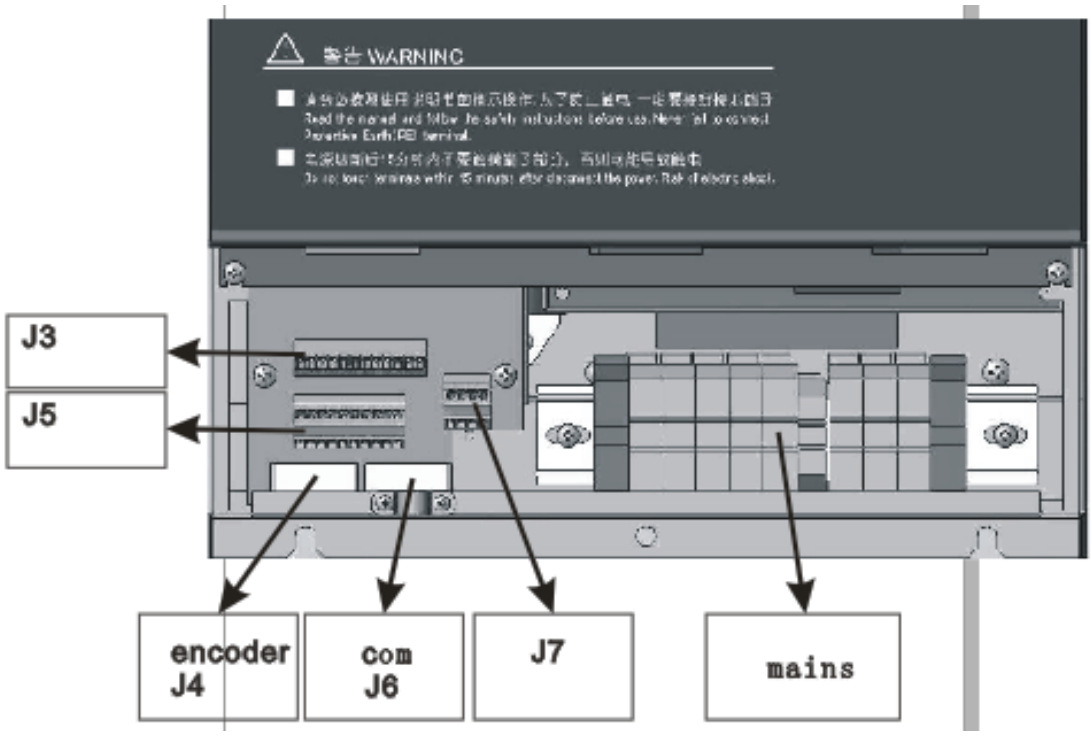


Table 5.3.2 Interfaces and Terminals diagram（22~55kW）

5.3.1 Mains Circuit Terminals

Table 5.3.1.1 Mains Circuit Terminals（7.5~18.5kW，drive ground see table 5.3.1）

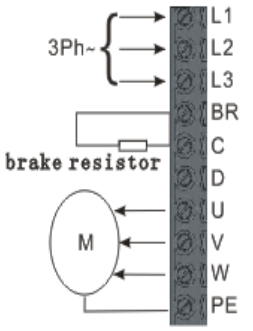
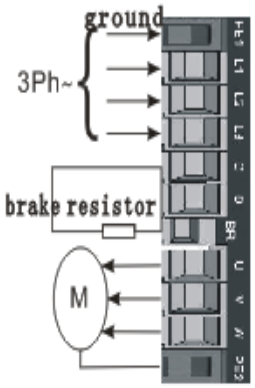
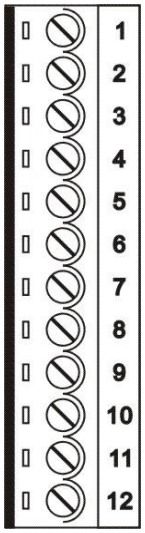
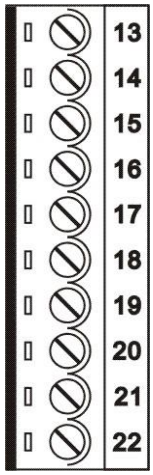
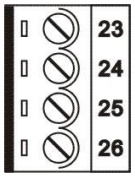
Terminals	Identification	Detail	Max
	L1	Three phase AC line input	380V-15% 460V+15% 3 phase
	L2		
	L3		
	BR	Braking resistor （must be connect between BR and C）	
	C	DC link positive electrode	770VDC
	D	DC link negative electrode	
	U	Motor connection	0.98*U_{input}
	V		
	W		
	PE	Motor ground connection	

Table5.3.1.2 Mains Circuit Terminals（22~55kW）

Terminals	Identification	Detail	Max
	PE1	Three phase AC line ground	
	L1	Three phase AC line input	380V-15% 460V+15% 3 phase
	L2		
	L3		
	C	DC link positive electrode	770VDC
	D	DC link negative electrode	
	BR	Braking resistor （must be connect between BR and C）	
	U	Motor connection	0.98*U_{input}
	V		
	W		
	PE2	Motor ground connection	

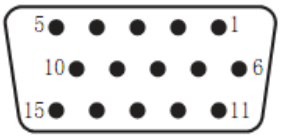
5.3.2 Control Circuit Terminals

Table 5.3.2.1 Control Circuit Terminals

J3（12pin）		function	detail	max
	1	analog input 1+	Programmable analog differential input. Signal: terminal 1.Reference point: terminal 2. Default setting: Speed Ref 1".	10V 0.25 mA (20 mA)
	2	analog input 1-		
	3	analog input 2+	Programmable analog differential input. Signal: terminal 3.Reference point: terminal 4. Default setting: Speed Ref 2".	
	4	analog input 2-		
	5	analog input 3+	Programmable analog differential input. Signal: terminal 5.Reference point: terminal 6. Default setting:null	
	6	analog input 3-		
	7	+10V reference	Reference voltage +10V, reference point: terminal 9	+10V/10 mA
	8	-10V reference	Reference voltage -10V, reference point: terminal 9	-10V/10 mA
	9	0V reference	Reference point for $\pm 10V_{DC}$	——
	10	Analog output 1	Programmable analog output 1，Default setting：null	±10V/5 mA
	11	Analog 0V	Reference point for terminal 10 and 12	——
	12	Analog output 2	Programmable analog output 2，Default setting：null	±10V/5 mA
J5（10pin）				
	13	Digital input 1	Programmable digital input， Default setting：drive start	±30v 3.2 mA@15v 5 mA@24v 6.4 mA@30v
	14	Digital input 2	Programmable digital input， Default setting：null	
	15	Digital input 3	Programmable digital input， Default setting：external fault	
	16	Digital input 4	Programmable digital input， Default setting：fault clearing	
	17	COM - DI	Digital input reference point for terminal 13,14,15,16	——
	18	+24V out	+24V DC supply output. Reference point: terminal 21	24V,120 mA
	19	MOTOR PTC	Motor PTC sensing for over temperature (cutoff R1k if used)	1.5 mA
	20			
	21	0V/24	Reference point for 24V	——
	22	24V IN	24V DC supply input	——
J7 (4pin)				
	23	Digital output 1 Relay	Programmable output,Default=DRIVE OK	250V AC 1A
	24			
	25	Digital output 2 Relay	Programmable output,Default=DRIVE FAULT	250V 1A
	26			

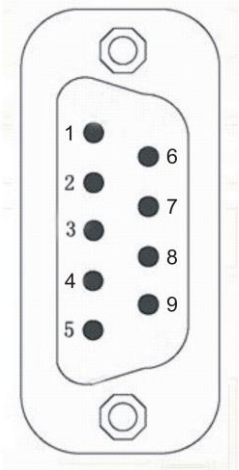
5.3.3 Encoder interface J4

Table 5.3.3.1 Encoder interface J4

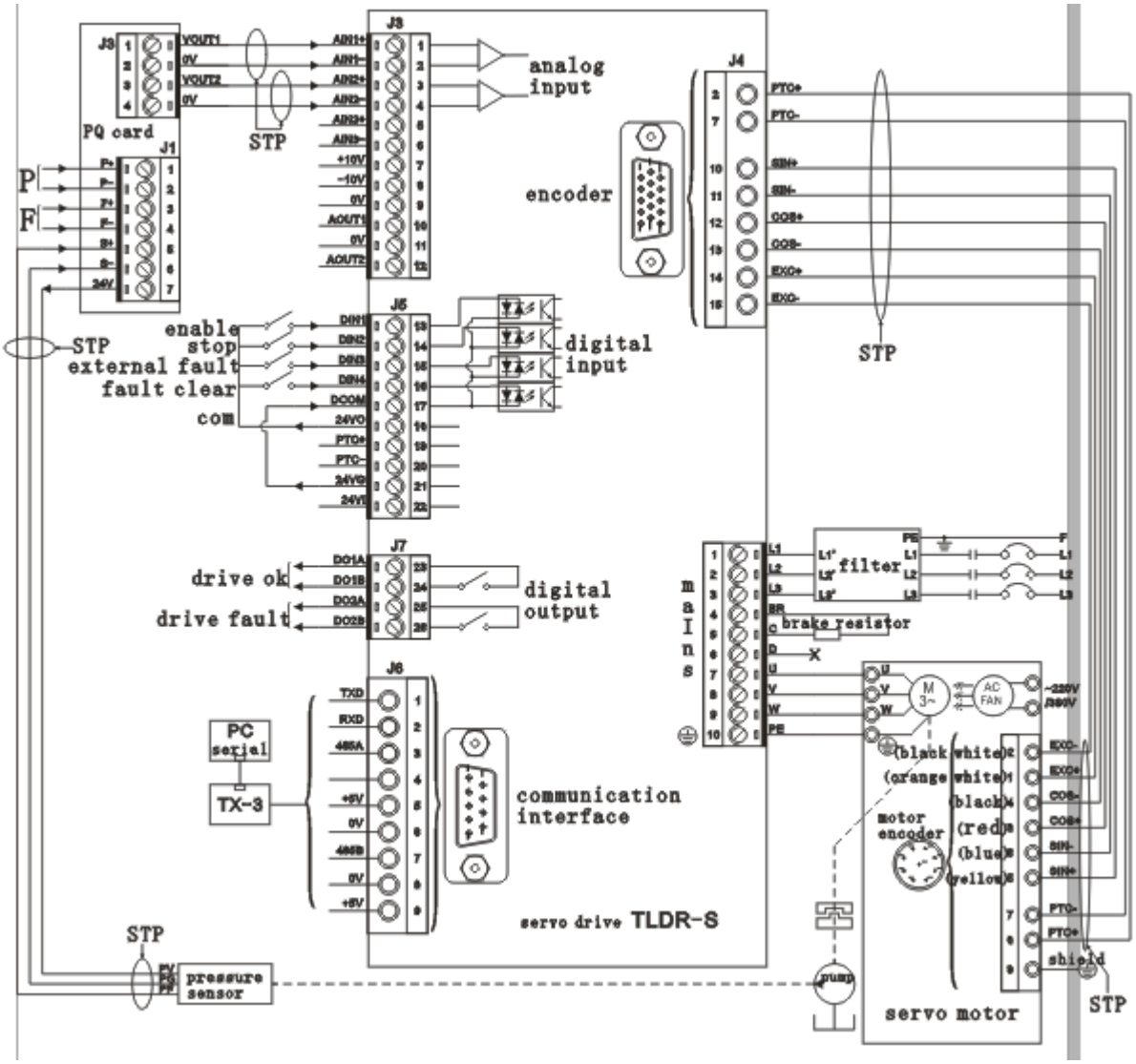
J4(DB15-F)	function		detail	I/O
	1	B-	Incremental encoder signal B-	I
	2	PTC+	Motor PTC+	I
	3	Z+	Incremental encoder signal Z+	I
	4	Z-	Incremental encoder signal Z-	I
	5	A+	Incremental encoder signal A+	I
	6	A-	Incremental encoder signal A-	I
	7	PTC-	Motor PTC-	I/O
	8	B+	Incremental encoder signal B+	I
	9	+5VE	+5V encoder supply voltage	O
	10	SIN+	Resolver SIN+	I
	11	SIN-	Resolver SIN-	I
	12	COS+	Resolver COS+	I
	13	COS-	Resolver COS-	I
	14	EXC+	Resolver EXC+	O
	15	EXC-	Resolver EXC-	O

5.3.4 Drive Communication Interface J6

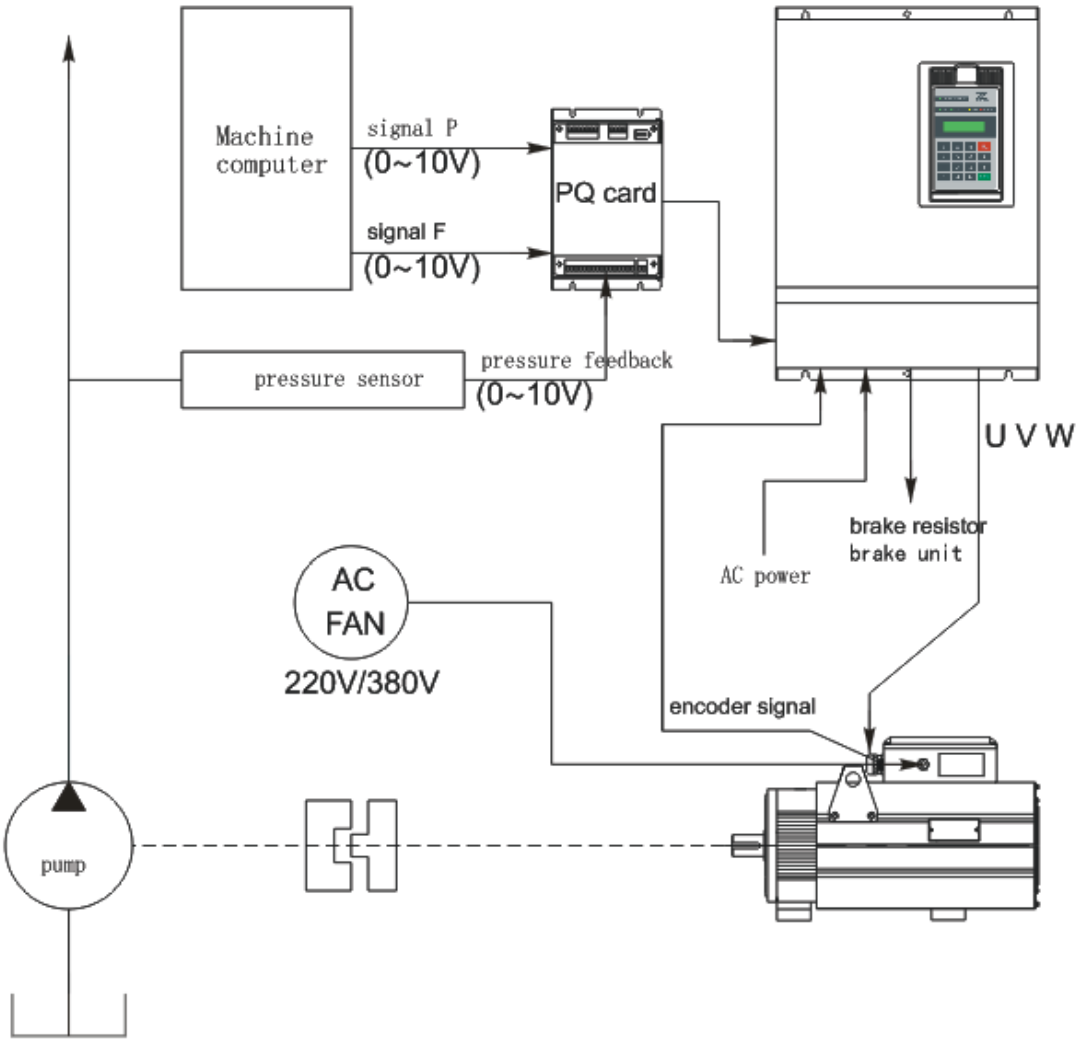
Table 5.3.4.1 Drive Communication Interface

J6(DB9-F)		function	detail	I/O
	1	TXD	TTL receive	I
	2	RXD	TTL transmit	O
	3	485A	RS-485 A	I/O
	4	-	Internal use	-
	5	+5V	RS-485 +5V	O
	6	0V	RS-485 0V(ground for +5V)	O
	7	485B	RS-485 B	I/O
	8	0V	RS-485 0V(ground for +5V)	O
	9	+5V	RS-485 +5V	O
	shell	shield	Signal shield	-

5.4 Wiring Diagram For Reference

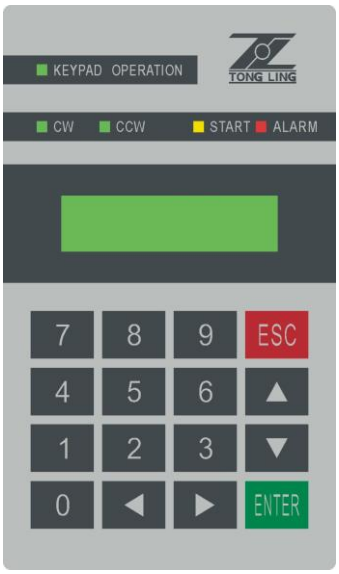


5.5 Electrohydraulic Servo System Diagram



Chapter 6 - Keypad

6.1 outside view drawing



The keypad is made of a LCD display with two 16-digit lines, five LEDs and 17 function keys
It is used:
- to display the speed, voltage, diagnostics etc. during the operation
- to set parameters and enter commands

6.2 led function

There are 5 led on the keypad， function as shown in follow table：

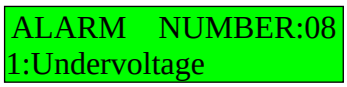
name	color	Function description
KEYPAD OPERATION	green	Led lit when 5V voltage is present and At the right level
START	yellow	Led lit during drive had output
ALARM	red	Led flashed when drive alarmed
CW	green	Led lit when motor rotate clockwise
CCW	green	Led lit when motor rotates counterclockwise

6.3 Button Description

button	detail	function
▲	Up	Scroll up menu items
▼	Down	Scroll down menu items
▶	Right	Cursor right
◀	Left	cursor left
ESC	quit/cancel/Alarm query	Used to go up one level in menu navigation; cancel and Alarm query
ENTER	conform	Used to go down one level in menu navigation; to enter Selections or numeric values after editing, to issue commands
3	Digit	0 to 9 digit

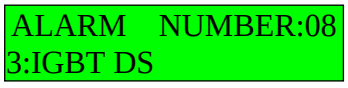
6.4 Operation Description

6.4.1 ALARMS



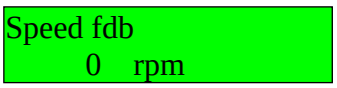
The first row shows the fault number

The second row shows the fault code



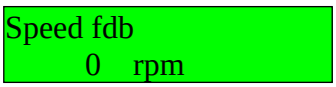
Press “▲” or “▼”, You can see all the fault

Press ESC, it turns to fault clear interface



Press ENTER can clear fault, and it turns to parameter monitor interface if all the fault can be cleared

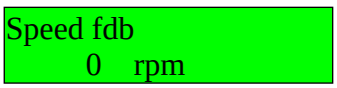
otherwise, it returns to alarm interface

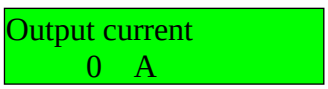


Then press ENTER, to get to parameter monitor interface

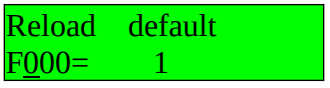
Press ESC, it returns to alarm interface

6.4.2 Parameter Monitor



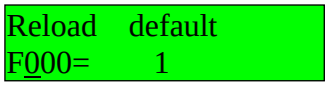


Press “▲” or “▼”, to see different value of the parameters. Detail please see parameter table F005。

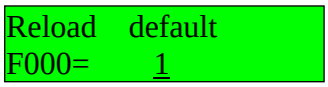


Press ENTER, get into parameter setting interface

6.4.3 Parameter Setting interface

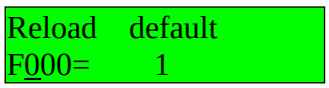


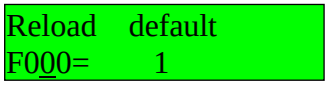
"F000"is the number of the parameter，"=1"is the value of the parameter



press"left"or"right"， to move the cursor to the digital which is needed modify.

6.4.3.1 Read the parameter of F080

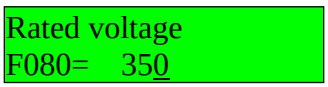




Press  move the cursor to second digital

press "digital 8" , change "F000" into "F080" 。 "350" is the value of "F080"

6.4.3.2 Modify the value of F080 into 300

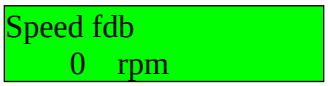


press "  " , move cursor to the place the diagram shown

press "  " , move cursor to the place the diagram shown。

press "digital 0" , change the value of "F080" into 300"

Press "ENTER" to conform



Press "ESC" , to return to parameter monitor interface

Chapter 7 - Commissioning

Note：Do follow the following step of commissioning。

7.1 Set drive data

Generally default is ok

7.2 Set motor data

Motor data needed setting as shown in table 7.2.1 ：

7.2.1 motor parameter

Parameter number	description	value
F080	Rated voltage(V)	See the nameplate of the motor
F081	Rated current(A)	See the nameplate of the motor
F082	Rated speed(rpm)	See the nameplate of the motor
F083	Pole pairs	See the nameplate of the motor
F084	Torque constant (Nm/A)	See the nameplate of the motor
F086	Phase resistance (Ω,20℃)	See the nameplate of the motor
F087	Phase inductance(mH)	See the nameplate of the motor
F088	Rotor inertia (g.m^2)	See the nameplate of the motor

Note!

- Rated voltage、rated current、rated speed、pole pairs、phase resistance and phase inductance must correct input；
- The EMF constant F085 will be automatically calculated when the parameter F084 correct input；
- Torque constant can be calculated by the following formula：

$$K_t = \frac{T_n}{I_n}$$ (T_n： rated torque(**Nm**)，I_n： rated current(**A**)。

7.3 Encoder phasing

1,Disconnect the drive enable before the drive power supplied

2,Make sure the motor phase sequence wired correctly

3**,**Set the parameter F099 == 2：then enable (if motor phase sequence is right ,start led lights first ,then CW led lights.few seconds later ,all of them go out)

4, Press enter 1 time when the START led and the CW led all gone out , then the parameter F099 turned to F099==10

5,Disconnect the enable ,set the parameter F099==0； motor phasing finished

NOTE!

1,Motor parameter had set correctly；2, Enable the drive must after setting the parameter F099==2

7.4 Analog Self Learning

1,Set F001=1,and F052=max speed system needed

2,set F099=3

3, The minimum deviation of analog input 1 self learning :set F096=0 when the machine computer output is equal to 0(F,P=0) ,few seconds later press enter button 1 time ,F096=0 turn to F096=100,look over the value of F100(Reference value between 50 to 200)

4,The gain of analog input 1 self learning:set F096=1 when the machine computer output is equal to max(F,P=max),few seconds later press enter button 1 time ,F096=0 turn to F096=101,look over the value of F101(Reference value between 4250 to 4800)

5, The minimum deviation of analog input 2 self learning :set F096=2 when the machine computer output is equal to 0(F,P=0) ,few seconds later press enter button 1 time ,F096=0 turn to F096=102,look over the value of F102(Reference value between 50 to 200)

6,The gain of analog input 2 equal to the gain of analog input 1 that is setting (the value of F103)= (the value of F101)

NOTE! Operating All of the above steps when the enable connected

7.5 Operation Mode

F099 == 0

Chapter - 8 Parameters

- Default：D.Size decided by drive type
- access ： R=read，W=write，Z is effective when the drive restart。
- Type：Int 16。
- Do not modify parameter of Reserved。

Table 8.1 Parameters

Number	Function[unit]	default	min	max	access(format)	remarks
PARAMETERS						
F000	F000=0,load default parameter	1	0	1	R/W/*(Int)	
F001	0 internal register given reference 1 analog input reference 2 pulse input reference	1	0	2	R/W/Z(Int)	
F002	Motor direction(axial direction) 0 clockwise(forward) 1 counter clockwise(reverse)	0	0	1	R/W(Int)	
F003	Motor speed reference,[rpm]	0	0	0	R(Int)	
F004	Motor actual speed,[rpm]	0	0	0	R(Int)	
F005	Parameter monitor	2	0	20	R(Int)	
	0 motor electrical position,[Elc.deg]	0	0	0	R(Int)	
	1 motor speed reference,[rpm]	0	0	0	R(Int)	
	2 motor actual speed,[rpm]	0	0	0	R(Int)	
	3 drive output current,[A]	0	0	0	R(Int)	
	4 drive output voltage,[V]	0	0	0	R(Int)	
	5 drive magnetizing current,[A]	0	0	0	R(Int)	
	6 drive torque current,[A]	0	0	0	R(Int)	
	7 drive output torque,[Nm]	0	0	0	R(Int)	
	8 drive output frequency,[Hz]	0	0	0	R(Int)	
	9 drive output power,[kW]	0	0	0	R(Int)	
	10 drive DC link voltage,[V]	0	0	0	R(Int)	
	11 encoder position,[mech.deg]	0	0	0	R(Int)	
	12 drive heat sink temperature,[℃]	0	0	0	R(Int)	
	13 temperature of heat sink incoming air temperature,[℃]	0	0	0	R(Int)	
	14 regulation card temperature ,[℃]	0	0	0	R(Int)	
	15 drive enable status	0	0	1	R(Int)	
	16 motor overload accumulator,[%]	0	0	0	R(Int)	
	17 brake overload accumulator,[%]	0	0	0	R(Int)	
	18 drive overload accumulator,[%]	0	0	0	R(Int)	
	19 software type(FW version)	0	0	0	R(Int)	
	20 CPU run time,[h/m/s]	0	0	0	R(Int)	
	21 digital input status	0	0	1	R(Int)	

	22 drive slow overload	0	0	0	R/W(Int)	
	23 drive fast overload	0	0	0	R/W(Int)	
	24 analog input 1[mV]	0	0	0	R/W(Int)	
	25 analog input 2[mV]	0	0	0	R/W(Int)	
	26 analog input 3[mV]	0	0	0	R/W(Int)	
F008	**Display of F005**				**R**	
F009	**alarms** **1: under voltage** **2: over voltage** **3: IGBT desaturate** **4: IGBT instantaneous over current** **5: current feedback loss** **6: IGBT module over temperature** **7: motor over temperature** **8: ambient over temperature** **9: heat sink over temperature** **10: regulation card over temperature** **11: drive overload** **12: motor overload** **13: braking unit overload** **14: over speed** **15: speed feedback loss** **16: external fault** **17: ground fault** **0: no alarm**	**0**	**0**	**20**	**R(Int)**	
F010	**Alarm clear** **0 prohibit clear** **1 enable clear**	**0**	**0**	**1**	**Z(Int)**	
F011	**Selection of analog output 1** **0 null** **1 motor speed** **2 motor current** **3 motor torque** **4 DC link voltage** **5 heat sink temperature** **6 analog speed**	**0**	**0**	**6**	**R/W(Int)**	**reserved**
F012	**Selection of analog output 2** **0 null** **1 motor speed** **2 motor current** **3 motor torque** **4 DC link voltage** **5 heat sink temperature** **6 analog speed**	**0**	**0**	**6**	**R/W(Int)**	**reserved**
FLUX						
F022	Max deflux current,[Arms]	8539	0	32767	R/Z(Int)	
F023	Deflux voltage,[V]	400	10	612	R/W(Int)	F023
F024	Output voltage filter time [ms]	10	1	500	R/W(Int)	F024

F025	Voltage proportional gain,[%]	50	0	32767	R/W(Int)	F025
F026	Voltage integral gain,[%]	2500	0	32767	R/W(Int)	F026
SPEED						
F028	**Basic value of the speed Proportional gain,[A/rpm]**	**50**	**0**	**32767**	**R/W(Int)**	
F029	**Basic value of the speed Integral gain,[A/rpm/s]**	**800**	**0**	**32767**	**R/W(Int)**	
F030	**Proportional speed 1 regulator gain at high speed1,[%]**	**9**	**0**	**100**	**R/W(Int)**	
F031	**Integral speed 1 regulator gain at high speed,[%]**	**5**	**0**	**100**	**R/W(Int)**	
F032	**Proportional speed 2 regulator gain at medium speed,[%]**	**10**	**0**	**100**	**R/W(Int)**	
F033	**Integral speed 2 regulator gain at medium speed,[%]**	**7**	**0**	**100**	**R/W(Int)**	
F034	**Proportional speed 3 regulator gain at low speed,[%]**	**11**	**0**	**100**	**R/W(Int)**	
F035	**Integral speed 3 regulator gain at low speed,[%]**	**9**	**0**	**100**	**R/W(Int)**	
F036	**Proportional speed 0 regulator gain at zero speed,[%]**	**10**	**0**	**100**	**R/W(Int)**	
F037	**Integral speed 0 regulator gain at zero speed,[%]**	**7**	**0**	**100**	**R/W(Int)**	
F038	Number of encoder number	2500	0	5000	R/W/Z(Int)	reserved
F039	**Encoder selection 0 resolver 1 encoder**	**0**	**0**	**1**	**R/W/Z(Int)**	**set '0'**
F040	**Encoder reverse 0 norm 1 reverse**	**0**	**0**	**1**	**R/W/Z(Int)**	
F041	**Drive PWM switch frequency on line 0 disable 1 enable**	**0**	**0**	**1**	**R/W(Int)**	**reserved**
F042	**Ramp function 0 disable 1 enable**	**1**	**0**	**1**	**R/W(Int)**	**reserved**
F043	**Ramp type 0 line 1 S**	**1**	**0**	**1**	**R/W(Int)**	**reserved**
F045	**Internal speed ,[rpm]**	**1000**	**0**	**3000**	**R/W(Int)**	
F050	Analog filtering function 0 disable 1 first-order filtering mode 2 The average value mode 3 The first-order filter self tuning, the average value of the input	3	0	3	R/W(Int)	
F051	Max speed of analog input2,[rpm]	300	0	3000	R/W(Int)	

F052	**Full scale speed of analog input,[rpm]**	**2000**	**0**	**3000**	**R/W(Int)**	**Enable disconnect**
F053	Analog input deadband threshold,[rpm]	5	0	F082	R/W(Int)	
F054	**Zero speed threshold,[rpm]**	**30**	**0**	**F082**	**R/W(Int)**	
F055	**Max reference speed,[rpm]**	**3000**	**0**	**3000**	**R/W(Int)**	
F056	Analog input 1 acceleration for ramp	100	1	F052	R/W(Int)	
F057	Analog input 1 deceleration for ramp	20	1	F052	R/W(Int)	
F058	Analog input 2 acceleration for ramp	100	1	F052	R/W(Int)	
F059	Analog input 2 deceleration for ramp	20	1	F052	R/W(Int)	
CURRENT						
F063	**Basic value of the current Proportional gain,[A/rpm]**	8	0	32767	R/W(Int)	
F064	**Basic value of the current Integral gain,[A/rpm/s]**	**700**	**0**	**32767**	**R/W(Int)**	
F065	**The proportional regulator gain of the current,[%]**	**10**	**0**	**100**	**R/W(Int)**	
F066	**The integral regulator gain of the current,[%]**	**10**	**0**	**100**	**R/W(Int)**	
F077	Ripple compensation of DC link 0 disable 1 enable	0	0	1	R/W(Int)	
F078	Filter of DC link voltage 0 disable 1 enable	0	0	1	R/W(Int)	
F079	Deflux loop output 0 Voltage loop output 1 Deflux loop output	1	0	1	R/W(Int)	
MOTOR DATA						
F080	**Rated voltage,[V]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 1
F081	**Rated current,[A]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 100
F082	**Rated speed,[rpm]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 1
F083	**Pole pairs**	**0**	**0**	**-**	**R/W/Z(Int)**	× 1
F084	**Torque constant,[Nm/A]**	**0**	**0**	**-**	**R/W/Z(Int)**	×1000
F085	**EMF,[V/ k rpm]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 10
F086	**Phase resistance,[ohm]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 100
F087	**Phase inductance,[H]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 100
F088	**Rotor inertia,[g · m^2]**	**0**	**0**	**-**	**R/W/Z(Int)**	× 10
F089	Resolver enable 0 disable 1 enable	0	0	1	R/W/*(Int)	

DRIVE DATA						
F091	Main voltage 0 230V 1 380V 2 400V 3 415V 4 440V 5 460V/480V	2	0	5	R/W/Z/*(Int)	Reserved
F092	PWM switching frequency 0 4KHz 1 8KHz 2 12KHz 3 16KHz	1	0	7	R/W/Z/*(Int)	
F093	Rated speed resolution 0 0.125rpm(2048rpm) 1 0.250rpm(4096rpm) 2 0.500rpm(8192rpm) 3 1.000rpm(16384rpm) 4 0.03125rpm(512rpm)	2	0	4	R/W/Z(Int)	Reserved
F094	Ambient temperature 0 0～40 °C(32～104 °F) 1 0～50 °C(32～122 °F)	0	0	1	R/W/Z(Int)	Reserved

F095	Drive rated power 1 2.0kW - 2.0Hp 2 3.0kW - 3.0Hp 3 4.0kW - 5.0Hp 4 5.5kW - 7.5Hp 5 7.5kW - 10Hp 6 H7.5kW - 10Hp 7 11kW - 15Hp 8 15kW - 20Hp 9 18.5kW - 22.5Hp 10 22kW - 25Hp 11 30kW - 30Hp 12 37kW - 40Hp 13 45kW - 50Hp 14 55kW - 60Hp 15 75kW - 75Hp 16 90kW - 100Hp 17 110kW - 125Hp 18 132kW - 150Hp 19 160kW - 200Hp 20 250kW - 300Hp 21 315kW - 450Hp 22 400kW - 500Hp 23 500kW - 600Hp 24 630kW - 700Hp 25 0.75kW - 10Hp 26 H18.5Kw - 22.5Hp 27 H37Kw - 40Hp		1	27	R(Int)	
SELF AUTO TUNING						
F096	**Analog self tuning** **0 The minimum deviation of analog input 1 self tuning** **1 The gain of analog input 1 self learning** **2 The minimum deviation of analog input 2 self tuning** **3 The gain of analog input 2 self learning** **4 The minimum deviation of analog input 3 self tuning** **5 The gain of analog input 3 self learning**	**6**	**0**	**5**	**R/W/Z(Int)**	
F097	**encoder mechanical offset**				**R(Int)**	
F098	**The auxiliary parameter of encoder mechanical offset**				**R(Int)**	

F099	**Operation mode** **0 Field oriented mode** **1 motor self tuning(reserve)** **2 encoder phasing mode** **3 analog self tuning mode**	**0**	**0**	**3**	**R/W/Z(Int)**	
F100	**The minimum deviation of analog input 1**	**130**	**0**	**500**	**R/W/Z(Int)**	
F101	**The gain of analog input 1**	4250	0	17000	**R/W/Z(Int)**	
F102	**The minimum deviation of analog input 2**	130	0	500	**R/W/Z(Int)**	
F103	**The gain of analog input 2**	4250	0	17000	**R/W/Z(Int)**	
F104	**The minimum deviation of analog input 3**	130	0	500	**R/W/Z(Int)**	
F105	**The gain of analog input 3**	4250	0	17000	**R/W/Z(Int)**	
SPECIAL PARAMETERS						
F110	Lowspeed overload frequency,[HZ]	3	0	7	R/W/Z(Int)	
F112	Overload mode 0 IT 1 I^2T 2 Interpolation I^2T	2	0	2	R/W/Z(Int)	F112
F113	Max output current default: 1.36*I (rated current) Max : overload current	Calc	0	Calc	R/W/Z(Int)	
MOTOR OVERLOAD						
F114	**Motor overload control** **0 disable** **1 enable**	**0**	**0**	**1**	**R/W/Z(Int)**	
F115	**Utilization coefficient**	**1**	**-**	**-**	**R/W/Z(Int)**	
F116	**Motor overload factor**	**2**	**-**	**-**	**R/W/Z(Int)**	
F117	**Motor overload time,[s]**	**30**	**-**	**-**	**R/W/Z(Int)**	
F118	**Motor overload current,[A]**	**Calc**	**-**	**-**	**R/Z(Int)**	
BRAKING RESISTOR						
F119	**Braking unit** **0 disable** **1 internal braking resistor and internal braking unit** **2 external braking resistor and internal braking unit**	**1**	**0**	**2**	**R/W/Z(Int)**	
F120	**Brake resistor value,[ohm]**	**D.Size**	**0**	**-**	**R/W/Z(Int)**	
F121	**Brake unit rated power,[kW]**	**D.Size**	**0**	**-**	**R/W/Z(Int)**	
F122	**Brake resistor overload time,[s]**	**D.Size**	**0**	**-**	**R/W/Z(Int)**	

F123	**Brake resistor overload factor**	**D.Size**	**0**	**-**	**R/W/Z(Int)**	
F124	**Brake voltage threshold**	750	380	790	**R/W/Z(Int)**	
ALARM						
F155	Module temperature : 0 disable 1 enable	1	0	1	R/W(Int)	
F156	Motor temperature: 0 disable 1 enable	1	0	1	R/W(Int)	
F157	Ambient temperature: 0 disable 1 enable	1	0	1	R/W(Int)	
F158	Heat sink temperature: 0 disable 1 enable	1	0	1	R/W(Int)	
F159	Regulation card temperature: 0 disable 1 enable	1	0	1	R/W(Int)	
F164	Ground fault: 0 disable 1 enable	1	0	1	R/W(Int)	
F165	Ground fault threshold,[%]	60	0	500	R/W(Int)	
F166	Under voltage fault: 0 disable 1 enable 2 warning	0	0	2	R/W(Int)	

F177	DOWNLOAD motor parameters (Only for TLMO-motor) 0 Manual input 1 TLMO-200-48B18C2A-RPFK 2 TLMO-200-62B17C2A-RPFK 3 TLMO-200-64B19C2A-RPFK 4 TLMO-200-62B21C2A-RPFK 5 TLMO-200-63B15C2B-RPFK 6 TLMO-200-80B19C2A-RPFK 7 TLMO-200-85B20C2B-RPFK 8 TLMO-200-90B50BC2A-RPFK 9 TLMO-200-96B18C2A-RPFK 10 TLMO-200-94B22C2A-RPFK 11 TLMO-200-96B16C2B-RPFK 12 TLMO-200-11C19C2A-RPFK 13 TLMO-200-12C17C2B-RPFK 14 TLMO-200-12C25C2A-RPFK 15 TLMO-200-13C16C2A-RPFK 16 TLMO-263-13C20C2A-RPFK 17 TLMO-263-14C19C2A-RPFK 18 TLMO-263-15C15C2A-RPFK 19 TLMO-263-16C19C2A-RPFK 20 TLMO-263-16C22C2A-RPFK 21 TLMO-263-21C10C2A-RPFK 22 TLMO-263-21C15C2A-RPFK 23 TLMO-263-21C16C2A-RPFK 24 TLMO-263-21C21C2A-RPFK 25 TLMO-263-26C17C2A-RPFK 26 TLMO-263-26C23C2A-RPFK 27 TLMO-263-36C16C2A-RPFK 28 TLMO-270-14C15C2A-RPFK 29 TLMO-270-14C19C2A-RPFK 30 TLMO-270-15C15C2A-RPFK 31 TLMO-270-16C19C2A-RPFK 32 TLMO-270-16C22C2A-RPFK 33 TLMO-270-14C13C2A-RPFK 34 TLMO-270-21C16C2A-RPFK 35 TLMO-270-21C20C2A-RPFK 36 TLMO-270-21C21C2A-RPFK 37 TLMO-270-26C17C2A-RPFK 38 TLMO-270-26C23C2A-RPFK	0	0	38	R/W/Z(Int)	

F178	Renew drive max output current 0 Default(1.36*I rated) 1 manual modify value	0	0	1	R/W(Int)	
ALARM LOG						
F179	**Alarm total number**	**0**	**Calc**	**Calc**	**R(Int)**	
F180	**Third alarm**	**0**	**Calc**	**Calc**	**R(Int)**	
F181	**Second alarm**	**0**	**Calc**	**Calc**	**R(Int)**	
F182	**Latest alarm**	**0**	**Calc**	**Calc**	**R(Int)**	
F184	Alarm number	0	0	20	R(Int)	
F185	alarm bit0: under voltage bit1: over voltage bit2: IGBT desaturate bit3 : IGBT instantaneous over current bit4: current feedback loss bit5: IGBT module overtemperature bit6: motor overtemperature bit7: ambient overtemperature(above 18.5kW) bit8: heat sink overtemperature bit9: regulation card overtemperature bit10: drive overload bit11: motor overload bit12: braking overload bit13: over speed bit14: speed feedback loss 0: no alarm 1: alarmed	0	0	32767	R(Int)	
F186	alarm bit0: external fault bit1: ground fault bit2: *under voltage repetitive* bit3: *max time* bit4: *parameter error* 0: no alarm 1: alarmed	0	0	31	R(Int)	**reserved**

Chapter - 9 Fault diagnosis

9.1 fault description

(**A01**)under voltage (**F009=1**)

Drive DC-link under voltage。

(**A02**)over voltage(**F009=2**)

Disconnect of braking resistor。

(**A03**)IGBT desaturate (**F009=3**)

IGBT desaturate， Short circuit on the motor winding or on the power bridge。

(**A04**)IGBT instantaneous over current(**F009=4**)

(**A05**)current feedback loss(**F009=5**)

Current feedback sensor failure。

(**A06**)IGBT module over temperature(**F009=6**)

(**A07**)motor over temperature(**F009=7**)

Over temperature on the motor winding or PTC sensor not connected to

the drive.

(**A08**)ambient over temperature(**F009=8**)

Intake air temperature too high

(**A09**)heat sink over temperature(**F009=9**)

Drive thermal protection。

(**A10**)regulation card over temperature(**F009=10**)

Over temperature of the regulation board。

(**A11**)drive overload(F009=11)

Drive overload alarm

(**A12**)motor overload(**F009=12**)

motor overload alarm。

(**A13**)braking unit overload(**F009=13**)

Braking unit overload alarm

(**A14**)over speed(**F009=14**)

Over speed alarm。

(A15)speed feedback loss(F009=15)

Encoder feedback loss。

(**A16**)external fault(**F009=16**)

external fault

(**A17**)ground fault(**F009=17**)

ground fault

(**A18**)under voltage repetitive(**F009=18**)

(**A19**)reserved

(**A20**)parameter error(**F009=20**)

9.2 Fault Diagnosis Chart

Fault code	Fault name	Drive status	possible reasons	Solution
A01	Under voltage	disable	·power failure ·the input voltage is not stable ·the input voltage lack-phase	·restart the drive ·Check input voltage .all of above steps don't work please contact with sales offices
A02	Over voltage	disable	·deceleration time is too short ·the peak voltage is too high ·disconnect brake resistor	·Modify the deceleration time ·check the brake resistor
A03	power shortage(IDS)	disable	·internal fault ·Interference ·Device failure	·please contact with sales offices if restart does not work
A04	Over current(IOC)	disable	.Motor cable short circuit ·mismatching motor ·improper current gain	·check load ·check cable ·Check the motor specifications
A05	Current feedback loss(Curr fbk loss)	disable	·incorrect wiring of current transformer ·check terminal XTA ·current transformer fault	·check current transformer wiring
A06	ICBT module over temperature （Module OT）	disable	·IGBT module over temperature ·fans fault ·Overload current cycle is too long	·check fans
A07	Motor over temperature(Motor OT)	disable	·PTC sensor disconnect ·motor a long time overload	·reduce the motor load ·check the temperature circuit if the motor temperature is low
A08	Ambient over temperature(IAS OT)	disable	·High temperature of cooling air ·fans fault ·The cooling hole plugging	·check fans and cooling hole
A09	Heat sink over	disable	·IGBT module over	·check installation

	temperature (Heatsink OT)		**temperature** **·fans fault** **·A heating body around** **·Poor ventilation state**	**environment**
A10	**Regulation card over temperature(Regulation S OT)**	**disable**	**Ambient over temperature**	**·check ambient temperature** **·check cooling system**
A11	**Drive overload**	**disable**	**·a long time overload** **·mismatching motor**	**·check motor and drive specifications**
A12	**Motor overload**	**disable**	**·load is too large ， ramp time is too short** **·wrong setting of motor rated current**	**·reduce load and modify ramp time** **·check motor specification**
A13	**Braking unit overload (BU overload)**	**disable**	**·mismatching brake voltage threshold** **·wrong setting of brake resistor**	**·check braking resistor specification**
A14	**Over speed**	**disable**	**·Instructions speed too fast** **·Speed deviation too large** **·wrong over speed threshold** **·encoder fault**	**·check encoder** **·check internal over speed parameter**
A15	**Speed feedback loss (Spd fbk loss)**	**disable**	**·disconnect encoder** **·incorrect encoder wiring**	**·check encoder**
A16	**External fault**	**disable**	**·external input fault**	**·check external fault circuit**
A17	**Ground fault**	**disable**	**·current transformer fault** **·Motor cable insulation failure** **·encoder fault**	**·check motor cable** **·check encoder**
A18	**under voltage repetitive(UVR)**	**disable**		**.check input voltage circuit**
A19	**reserved**			
A20	**Parameter error**	**warning**		**Reset parameter**

Appendix A - serial interface

A-1 Modbus RTU Protocol

A-2 Modbus Function

The following functions are implemented on the drive：

code	Function	description
03	Read holding registers	This function allows to require the value of 16-bit (word) registers containing Drive parameters。
06	Preset single register	This function allows to set the value of a single 16-bit register。

A-3 Modbus Example

The following functions are implemented：

03 Read Output register：

This function is used to read the parameters . It is possible to read 16-

bits parameters

Read parameter example：

Read F045。

The following bytes should be sent through the RS-485 line by keypad：

07 03 00 2D 00 01 14 65

With this meaning：

07 is the address of the drive，Each drive must have a unique address。

03 is the function number Read Output register。

00 2D is the register number corresponding toF045。This is 0x002D in hex,MSB first。

00 01 is the number of 16 bit registers to read。

14 65 is the calculated CRC16 of the message。

The drive should answer in a similar way (temperature may be different)：

07 03 02 00 08 31 82

With this meaning：

07 is the address of the drive，Each drive must have a unique address。

03 is the function number Read Output register。

02 read the number of bytes 。

00 08 is the function read the value of output registers。

31 82 is the calculated CRC16 of the message。

06 Preset single register

This function sets single 16 bit parameter。

To set for example F045 to 8，send the following string：

07 06 00 2D 00 08 18 63

With this meaning：

07 is the address of the drive，Each drive must have a unique address。

06 is the function number preset single register。

00 2D is the register number corresponding toF045。This is 0x002D in hex,MSB first。

00 08 is the value of corresponding register 。

18 63 is the calculated CRC16 of the message。

The drive will answer：

07 06 00 2D 00 08 18 63

Appendix B - Common Problem and Processing Method In Electrohydraulic Servo Systems

B-1 No pressure

- ✧ Drive disable，motor does not work
  - Check drive enable wiring
  - Check whether the drive alarmed
- ✧ U、V、W phase sequence problem
  - U、V、W any two interchange
  - Check F002、F040
- ✧ Drive did not receive speed signal，and PQ card no-output
  - Check computer output signal
  - check I/V card output signal wiring if it was reconstruction of machine
  - Check the wiring between the PQ card and the drive
  - Check the drive and PQ card shielding signal value
  - Wrong pressure sensor feedback

B-2 Pressure Is Too Small

- ✧ whether the system oil-way is correct
  - Whether the hydraulic oil tank is full ， whether the T tank valves are open
  - Air existed in the oil-way；
  - Check Safety relief valve and directional valve
  - Whether the system leak oil
- ✧ Check system signal wiring
  - **Reference to B-1**
  - Check parameter F100、F101、F102、F103
  - Check drive max speed、motor rated speed、pump output volume

B-3 System Interference

- ✧ Motor rotated in static status
  - Check the ground between motor and drive
  - Check the machine ground
  - 24V power supply of PQ card can not be shared with valve
  - modify F054 or PQ card parameter F007 if the Interference is small
  - strong electricity near by
- ✧ Earth leakage protection be triggered when working
  - The leakage protector is too small
  - Check earth ground

B-4 System Pressure Instability

- ✧ Check the signal of pressure ,flow .and pressure sensor feedback
- ✧ PID set of PQ card
  - Pressure overshoot ， increase P
  - Distinguishing the PID parameter of injection and non injection
  - Distinguishing the PID parameter of each step pressure
- ✧ Check drive data
  - Check the PI value of different speed section,if speed is not stable
  - Check the time- delay,if it is because of slow response lead to overshoot
  - Check the input voltage ,if it is unstable when defluxing ， and modify F079

B-5 System Vibration

- ✧ Caused by motor
  - Check motor cable
  - Check motor encoder wiring
  - Whether the motor and oil pump connection stability
- ✧ Caused by control circuit
  - Decrease PQ card P
  - Modify drive PI value
  - Check signal of pressure and flow，Pay special attention to the pressure and flow signal start and stop
  - Increase time-delay of given signal can reduce the vibration at start and stop.
  - Check drive signal wiring

B-6 Common Faults and Solutions

- ✧ Under voltage
  - set F078=1
  - Ste F091 into smaller value
  - Decrease the max speed if it allow
- ✧ Over current
  - increase the value of F056、F057、F058、F059，if the pressure do not overshoot
  - Set F077=0
  - Decrease the value of F063
- ✧ Overload
  - Check F112
  - Check the drive power
  - Check whether the pressure overshoot
  - Check Pressure release signal
- check system return oil-way