Micro- pace step-servo motor driver of DF3 serial in GSK

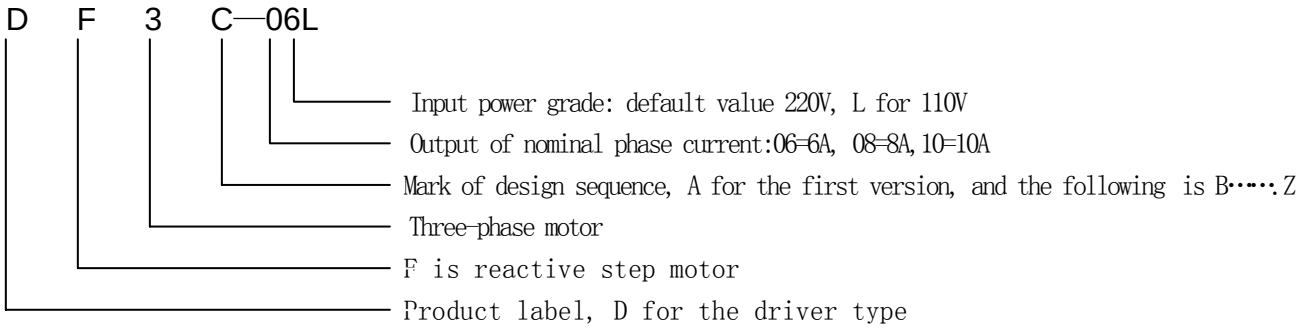
Vector subdivision grade μ step

GUANGZHOU NUMERICAL CONTROL EQUIPMENT WORKS

CONTENTS

Note: please read the instruction book carefully before installing the driver

Ⅰ、Type description



Ⅱ、Performance and features

- Micro-pace control: step motor can be operated and located for 1/5,1/10,1/20 origin step angle, so the control accuracy is increased and the defect of rough running and easy to out-of-step operation in low speed is overcome.
- Smooth-subdivision control: minimum positioning accuracy is still the origin step angle of motor, but smooth-subdivision transition is used between steps to overcome the defect of rough running and easy to out-of-step operation in low speed.
- High speed and high torque: the slaving voltage of power amplifier is DC310V, so high-torque output is obtained in high speed.
- New technique: control core consists of Single Chip Microcomputer and programmable array, good control performance; large power MOSFET amplifier tube made by IR Co. in USA, strong overload and overheat ability, hard to burnout.
- High reliability: high integrated level of control circuit, few connecting lines, dust-proof structure, protection of over temperature, over current and under voltage.

Ⅲ、Echnical data

power input: AC50/60Hz,DF3X-XX:220V+10%,-15%;DF3X-XXL:110V+10%-15%,3A(MAX)

Adapted motor: three-phase reactive step motor

Step angle subdivision: 1:1(smooth subdivision), 1:1.5,1:10,1:20,set by the third and the fourth bit of DIP switch.

Mode of distribution: 3 phase and 6 clap, 3 phase and 30 clap, 3 phase and 60 clap, 3 phase and 120 clap, constant drive current.

Input signal: impulse (CP)+direction (DIR) or clockwise rotation pulse (CW)+ counterclockwise rotation pulse (CCW), enable (FREE)

Signal level:5V,3～15mA, 1K resistance series in 12V, 2K resistance series in 24V
Maximum input pulse frequency: 250K
Minimum input pulse width: 1uS
Alarm signal output: When over temperature or over current, drive NPN tube integrated electrode to open circuit, conduct when driver is normal

Ⅳ、Interface and dial switch (DIP). Indicator-lamp

1.Ables of interfaces

Signal interface table

PIN	Terminal name	Description
1	CP/CW	Pulse (+)/Clockwise pulse (+) Input
2	$\overline{CP}$/$\overline{CW}$	Pulse (-)/Clockwise pulse (-) Input
3	DIR/CCW	Direction (+)/Counterclockwise pulse (+) Input
4	$\overline{DIR}$/$\overline{CCW}$	Direction (-)/Counterclockwise pulse (-) Input
5	$\overline{FREE}$	Enable (-) Input
6	ALM	Alarm output, conduct with COM when normal, break when alarm
7	FREE	Enable (+) Input
8	COM	Common terminal

motor interface table：

Terminal name	Description
A+	head of phase A
B+	head of phase B
C+	head of phase C
C-	ending of phase C
B-	ending of phase B
A-	ending of phase A

power interface table：

Terminal name	Description
AC220V IN	power input
AC220V IN	power input
AC220V OUT	power output
AC220V OUT	power output
PE	power earth

Note: interface name of DF3A is marked in the shell, no shell in DF3C, and the interface can be found from part numbers of circuit board.

Signal interface: J1 DB9 in control board
Motor interface: J3 6P in power amplifier board
Power interface: J1 5P in power board

2. Setting of dial switch

1st bit: define input pulse mode, ON for CW+CCW, and OFF for CP+DIR
2nd bit: change-running direction, ON for clockwise rotation, OFF for counterclockwise rotation
The following table is the pace subdivision setting decided by the third and the fourth bit of step motor:

3rd bit	OFF	ON	OFF	ON
4th bit	OFF	OFF	ON	ON

Subdivision number	1	5	10	20

Note: The power must be off when change setting of the third and the fourth bit of the switch.
Definition of DIP switch bit: from left to right is 1,2,3 and 4 bit in turn in front view
Definition of DIP switch (ON/OFF): in front view downward grip for ON, upward grip for OFF

3. Indicator-lamp

Five LED are arranged in turn, the first, second and third are green, reflecting On or Off of three-phase motor current, light for On, extinguish for Off. The fourth is green; the lamp is bright when high voltage of the driver is ready. If no fault, the lamp lights in 3～4 seconds when the driver power is on. The fifth is red, the lamp lights when the driver is over temperature， over current and under voltage, but it is normal that the lamp lights in 3～4 seconds when the driver power is on, this indicates
that the high voltage is not ready.

Ⅴ、Introduction of principle

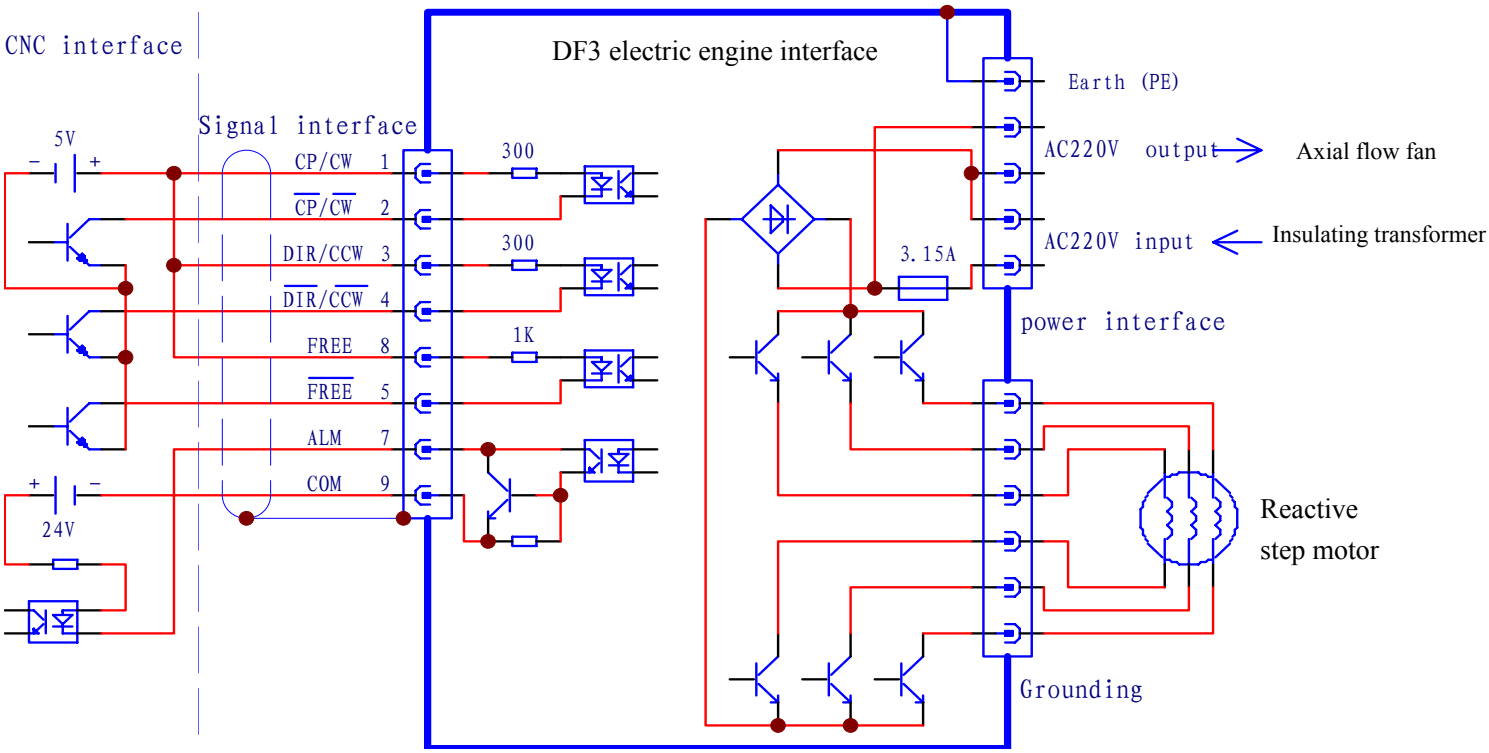
The driver consists of power board, power amplification board and control board.

The function of power board is to turn 220V AC power supply into one channel DC high voltage (310V, no constant voltage) used by power amplification board, two channel DC low voltage (5V and 15V, constant voltage) used by control board, one channel 220V AC returned outside used by coolant fan.

The function of control board is to supply power amplification board current control signal, output alarm signal outside, and supply indicator lamps of phase current, high voltage and alarm according to setting of switch and condition of input control signal.

The function of power amplification board is to amplify 15V control signal from control board to 310V high voltages, maximum for 10A pulse power to drive the step motor.

Ⅵ、Schematic diagram of interfaces



Ⅶ、Installation

1. Open and check

DF3 driver is enclosed with single (axial) or double (axial), please open the box and check the packing list. If not coincidental, please contact us for settlement immediately.

2. Installation

The protection grade of DF3 is IP30. Customers must take waterproof method. Independently install or assemble with CNC controller of our GSK series.

The protection grade of DF3 is IP00(no protection). Now, only integrated assemblage is done. If consumers require independent installation, dustproof, waterproof and shockproof must be done.

(Figure 1), (Figure 2) are structure and installation dimension of DF3A, DF3C respectively. Please install according to recommended space length. The driver should be installed in well-ventilated and protected electric box.

3. Wiring

Please connect wires according to interfere table and schematic diagram of interfaces. The sectional area of power wire and motor wire should be greater than1 square millimeter. Make sure that wiring joint is firm. Prevent joint from heating to destroy parts and cause driver work abnormally, and attention good ground connection.

Ⅷ、Fault detection

When the system has fault, how do we confirm that it aroused by the driver or not? “Substitution method” can do it. This means that a new driver substitutes a “bad” one. After the substitution, if the system returns to normal condition, it is identified that the driver is bad. Otherwise, other parts but the driver should be checked. But, the

following cases are not caused by bad driver, please note:

Fault case	Fault cause
No power amplification (the motor can be locked)	No FREE signal input or its polarity reverse
Having power amplification, But the electromotor can't run	No CP, CW, CCW signal input; having CCW input signal, but the 1st bit of DIP is set on OFF
Electromotor can only run to one way	Wrong DIP set: setting is ON when input is CP+DIR, OFF when CW+CCW
The electromotor can work normally, but it may lose steps.	(1) The controller control rise and drop is too fast. (2) Mechanical system is not smooth or overloaded (3) Electromotor resonate (4) Electromotor or connecting circuit has phenomenon of leakage or poor contact
No power amplification, alarm lamp is lighting	(1) Power voltage is too low or the fluctuation is too great or power line connection is poor, or power switch is poor etc. (2) After turning off power, the interval time of power on is less than 4 second (3) Electromotor and its connected circuit leakage, short circuit (4) driver is over temperature

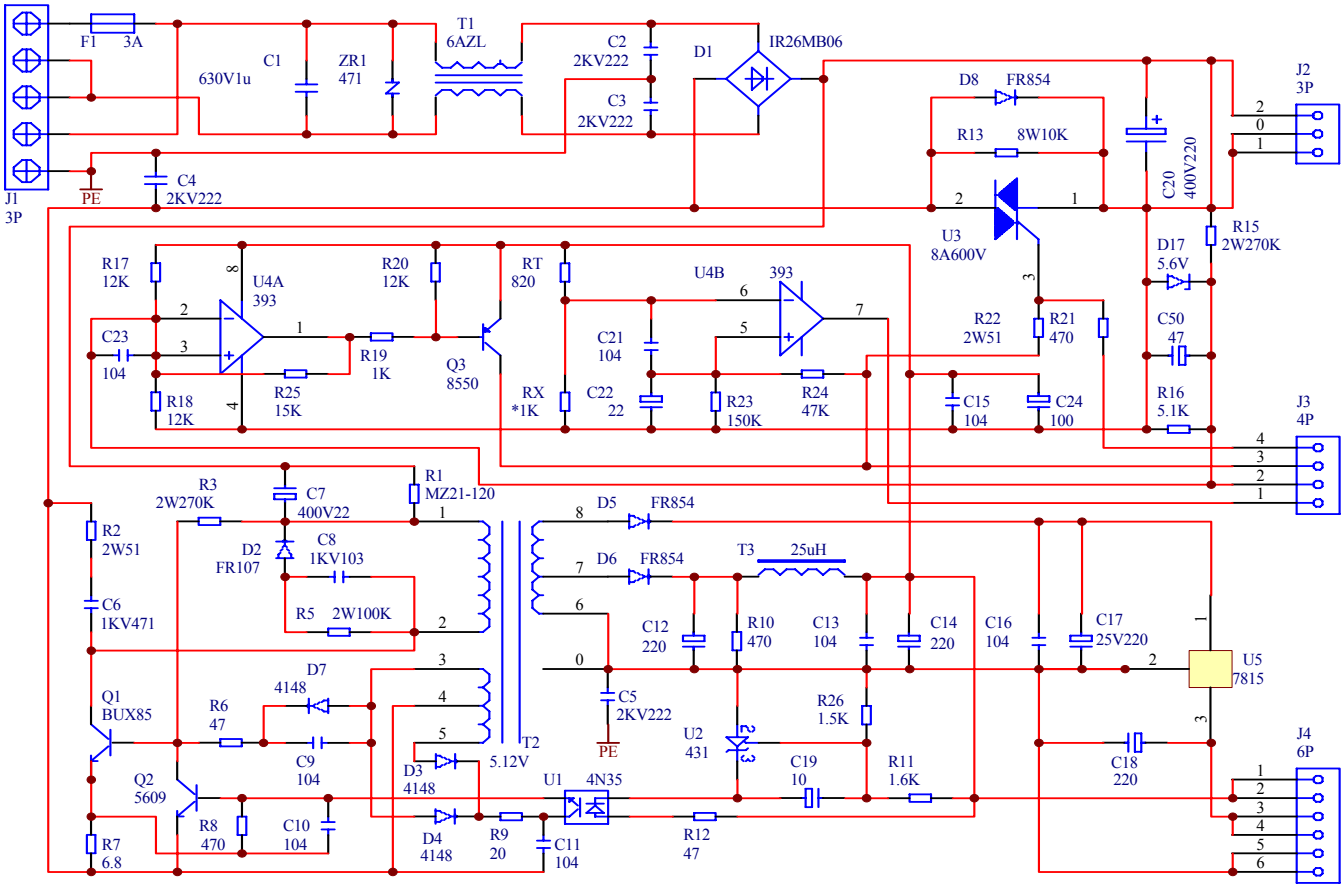
Note: As to lose step because of resonance, adjusting the damping disk in back cover of the electromotor can solve it. If the driver is damaged, please contact manufacturer for repair

Ⅸ、Parameter list of three-phase reactive step motor

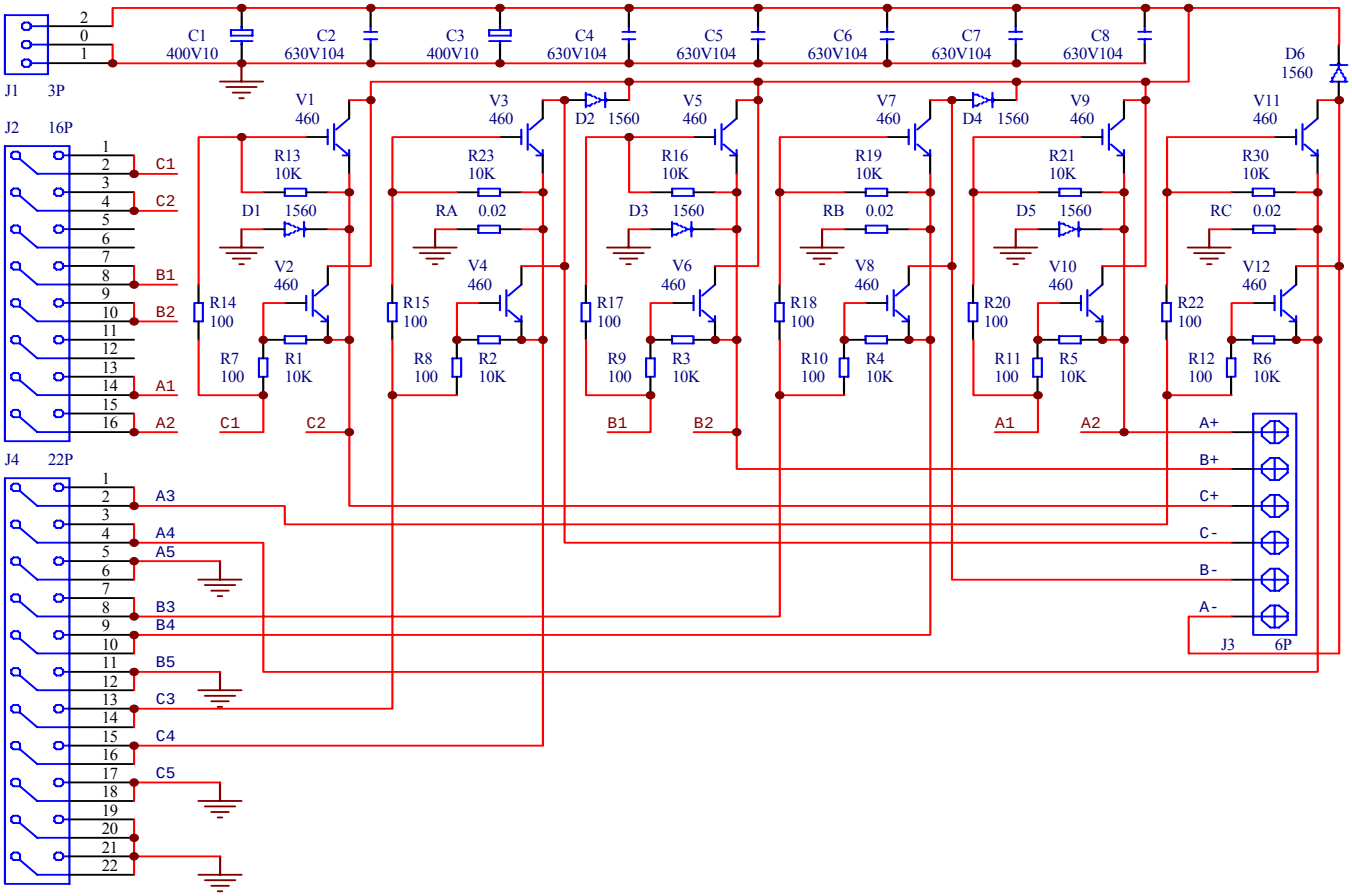
Motor type	Phase	maintain torque Nm	Half step angle	static current (A)	no-load running frequency	no-load initial frequency	running torque-frequency character (Nz)					
							1000 Hz	3000 Hz	5000 Hz	7000 Hz	9000 Hz	10000Hz
110BC380A	3	4	0.75	3	12000	2200	4.1	4.1	3.7	3.3	2.9	2.3
111BC380B	3	8	0.75	6	15000	2100	8.6	8.2	7.6	6.7	5.8	5.4
110BC380C	3	10	0.75	6	12000	1800	9.5	8.8	7.9	7.1	6.2	5.8
130BC3100A	3	12	0.6	12	15000	2100	10.8	9.4	8.2	7.4	5.8	4.1
131BC3100B	3	18	0.6	15	15000	2400	17.1	16.5	15.3	12.7	10.1	7.5
132BC3100C	3	12	0.6	8	15000	2300	10.1	9.1	8.2	6.8	5.2	4.7
133BC3100D	3	18	0.6	10	15000	2300	15.5	14.5	12.7	9.5	7.9	6.3
134BC3100E	3	25	0.6	10	12000	1800	23.3	21.9	17.7	11.1	10.2	9.8
135BC3100F	3	25	0.6	15	15000	2100	24.8	24.1	17.5	14.1	13.5	13.1

Note: The table refers to materials from the motor maker of Huazhong technical university in Wuhan, for indication only.

Ⅹ、Circuit of DF3 power board



Ⅺ、Circuit of DF3 power amplification boar



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