Shihlin Inverter Technical Manual
ANI00007

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1. Application FAQ

1.1 Selection of recommendations

1.1.1 SE2 series – Whether or not the three-phase 220V inverter could be connected to single-phase 220V?

[A] Do not recommend.   Please purchase a single-phase series product

1.1.2 Does Shihlin inverter support 485 communication

[A] All series of Shihlin inverters are entirely embedded with built-in RS485 communication for both Shihlin and Modbus protocol agreements

1.1.3 Reactor Model of SS2 series inverter

[A] Refer to operation manual 3.6.6

1.1.4 What Shihlin inverter is dedicated to constant pressure water supply control?

[A] Shihlin Inverter SS2 and SF series are dedicated to constant pressure water supply control function

1.1.5 Shihlin inverter output frequency range

[A] SS2, SF-GT output frequency: 0 - 650Hz
    SE2 output frequency: 0 - 1000Hz
    Other series of Shihlin INV output frequency: 0 - 400Hz

1.1.6 Is it available for Shihlin inverter used for special motors?

[A]
Water motors:

Its rated current needs be larger than standard motors. To selecting inverter capacity, it must be with reference to the rated current of inverter, and its power usually is greater than the selected driving motors and a rank above

Explosion-proof motors:

Shihlin inverter designed with non-explosion-proof structure, the driver should be placed in a safe place

Single-phase motors:

Single-phase motor is not suitable for speed adjustment of transmission. When capacitor start mode is on, high-frequency capacitance by the current surge may result in damage. Split-phase start and reverse start-up mode are on, the internal centrifugal switch does not operate, which will cause a risk of starting coils burn-out. Thus, try to use a three-phase motor, please.

Synchronous motor:

Not recommended. Both starting current and rated current are larger than standard motors. When multiple motors are under control, several synchronous motors have asynchronous phenomenon when they are gradually put into.

Pole changing motors:

Not recommended. Due to the difference between its rated current and standard motor current, must confirm the maximum current of the motor and then to choose the appropriate inverter. Poles switching MUST be executed after the motor stops.

What if poles switching is activated during execution, this will create reflux voltage. Over-current protection mechanism may be activated, and motor will stop abnormally.

Permanent magnet motor:

SF-GT (customized models) can drive a permanent magnet motor but currently is ONLY for 400V class SPM motor. Ask customers to provide information on motor nameplate and parameter of encoder specifications

1.1.7 Is it available for Shihlin Inverter to connect several motors?
[A]
A: Not recommended. In this wiring mode, the inverter cannot determine the current status of each motor to provide protection, and load status of multiple motors (unbalanced) can cause unmatched problems.
B: If this is a must, inverter capacity should be greater than the sum of the capacity of the drive motor, and each motor should separately installed thermal relay for protection purpose.
C: If each motor cannot start and stop at the same time and needs to install a contactor between the inverter and the motor, that contactor closed and opened would result in current shock and cause driver to trip off.
D: When connecting several motors, V / F control mode should be applied, and the total power line length of the driver to each motor shall comply with section 1.4.4 description

1.1.8 What series of Shihlin inverters support closed-loop vector control (PG card and encoder)?
[A]
SF-G Series: PG01 (suitable for incremental photoelectric encoder)
SF-GT series:
PG03 (suitable for incremental photoelectric encoder)
PG04 (suitable for resolver)
In addition to the above series, other series neither supports encoder access nor closed-loop control

1.1.9 Can a 380V / 440V inverter drive (a) 220V / 200V motors?
[A]
Not recommended.
A. When 200V inverter is driven, DC voltage comes 300V, the maximum value of impact voltage on motor terminals is 2 times higher than DC Voltage. Motor has no problem on the dielectric strength.
B. However, the case of 400V inverter-driven, DC voltage will become 600V approximately. While wiring length increases, the impact voltage will increase, the situation of insulation damage on the motor will occur.

1.1.10 Does Shihlin inverter have built-in PLC function?
[A] No

1.1.11 Does Shihlin inverter support ProfiBus, DeviceNet, CanOpen and Ethernet protocol?
[A]
SE2 Series can support Profibus protocol with PD01 expansion card connected.
SE2 series can support DeviceNet protocol with DN01 expansion card connected.
~~Currently, all series support neither CanOpen nor Ethernet protocol~~

1.1.12 Does Shihlin inverter support given torque control (torque control)?

[A] SF-GT series supports torque control with PG03

1.1.13 Does Shihlin inverter support positioning control (position control)?
[A] Currently, all series doesn't support positioning control

1.1.14 Can Shihlin inverter be used at high altitudes
[A] For current series of Shihlin inverter, we recommend to install underneath 1000m altitude. When the altitude increases, the air is thin, cooling conditions worsen, insufficient insulation distance shall be derated. Reference: increase the altitude 100m, 2% derating run

1.1.15 How Shihlin inverter power reduction, how to calculate electricity saving?
[A]
Associated with the power consumption during motor operation as follows:
A. Flow (air flow) Q is proportional to the motor frequency (speed)
B. Pressure (air pressure) H is proportional to the square of motor frequency (speed)
C. Power consumption is proportional to the triple of the motor frequency (speed)

According to the above, followed by load demand change of inverter to motor to decrease frequency of operation, it could reduce power consumption.
For example:
Motor frequency decreased from 50Hz down to 25Hz during operation
Theoretically: (25 * 25 * 25) / (50 * 50 * 50) = 0.125, that means the power demand is less than 13% of electricity.

1.1.16 What is the power specification limit of Shihlin Inverter excluding braking unit? And how to select the braking unit and braking resistor?

[A]

A. Currently, 30KW of Shihlin inverter and the above doesn't have brake unit.

B. Braking unit specifications selection: Refer to inverter power as braking unit selection. SF-040-30K / 22K-G power brake unit selection: 30KW. Special case needs a proper calculation, calculation with reference to Note .2

C. Braking unit suppliers will provide the manufacture specifications of braking resistor

Note:
1. In a large crane and high inertia environment, the power of braking resistor may be appropriate to increase and the impedance is still the same.

2. When heavy drops by crane, the electric motor acts as a generator generating electrical energy, and the drive of electric motor comes from the potential energy of weight, according to energy conservation law, the regenerated power should be equal to the released potential energy of weight as well as equal to the thermal energy consumption of resistance(without considering power loss). So, computing the power of potential energy (decrease) can estimate braking power.

PE = GM $\times$ VM

PW = PE $\times$ (1-η)

PE : Power generated by dropping potential energy, units: W

PW: Braking power, unit: W

GM: Largest drop weight, units: Newton (9.8N / Kg)

VM: The fastest dropping speed, unit: m / s

η: Typically 20%. (Internal friction power factor of motor and inverter)

1.2 Operation mode

1.2.1 Start through the panel (Customer FAQs)

Parameter P.79 = 1 set to PU mode (Operating Manual Section 4.1)

1.2.2 How SS2 Series to externally connect a switch and adjust the frequency via knob

A. Parameter P.79 = 4 set to mixed mode 1 (Operation Manual Section 4.1)

B. External terminals, SD and STR/STF, connect a switch to control Reverse/Forward

1.2.3 SS2 Series wiring problem, what terminals and forward/reverse are given by voltage?

A. Parameter P.79 = 2 set to external mode (Operating Manual Section 4.1)

B. 2 - 5 terminals with a given voltage, SD and STR / STF (STF forward rotation; STR reverse rotation)

1.2.4 Where to set parameters of SS2 Series external switches and potentiometers (Common FAQs)

A. Parameter P.79 = 2 set to external mode (Operating Manual Section 4.1)

B. 10 - 2 - 5 terminals connects potentiometer, SD connects STR / STF (STF Forward rotation/ STR reverse rotation)

1.2.5 SS2 Series set a fixed frequency (EX: 30Hz)

A. Parameter P.79 = 2 set to external mode (Operating Manual Section 4.1)

B. Shorten SD-M1, and set P.5 = 30 (fixed frequency needed)

1.2.6 SS2 Series inverter with power in to drive the power motor, and then the operation frequency can be adjusted by panel knob

A. Parameter P.79 = 4 set to mixed mode 1 (Operation Manual Section 4.1)

B. Shorten SD and STF with a conductive wire

1.2.7 SE2 Series inverter JOG mode ON

Parameter P.79 = 1, press MODE button to switch to JOG mode

1.2.8 How Shihlin Inverter external terminals set start and stop control, communication control frequency

Parameter P.79 = 6

Communication parameters needs to refer to the specific product manual communication parameters of the Inverter

1.2.9 Shihlin SS2 inverter, start signal comes from the external terminals (SD and STF), forward and reverse frequency have two individual potentiometers to control.
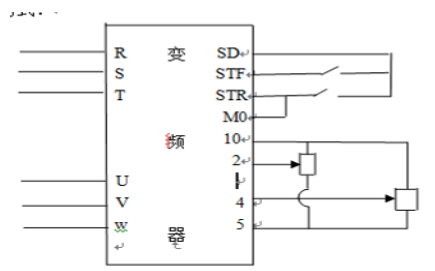
Parameter P17 = 1, P.79 = 2, P.80 = 5

1.3 Parameter setting

1.3.1 How SS2 Series restores factory settings

A. Set parameter P.79 = 1

B. P.998 (After set P.998=ALLC , press and hold the SET button for 2 seconds or more to display END)

1.3.2 SS2 Series inverter connected with conveyor, would like to watch conveyor speed on inverter display

A. Check conveyor speed while inverter is working at 60Hz

B. Adjust parameter P.37 set as customer target speed

Example: Display 3600 rpm while working at 50HZ

Setting formula: (3600 × 60) / 50 = 4320

Set the parameter P.37 = 4320

1.3.3 SS2 Modification of motor poles

A. Check nameplate of motor and confirm the number of poles

B. Adjust parameters P.303 = Motor poles (operating manual section 5.65)

1.3.4 SS2 rotating speed not fast enough

Properly tune up frequency. (Based on inverter frequency configure to determine which parameter values should be tuned up)

1.3.5 How SS2 uses the multi-speed

A. Parameter P.79 = 2 set to external mode

B. Set multi-speed through M0 / M1 / M2 terminals and set P.4, P.5, P.6 parameters (Operating Manual section 3.5.6 terminal wiring), multi-speed terminal combinations setting method, please refer to the operating manual section 5.4 multi-speed execution.

1.3.6 SE2 series powered by an external voltage 0-10V, adjust operating frequency to 190HZ

A. The upper limit of frequency set to 120~400Hz: P.18 = 400

B. P.38 = 190 (P38 corresponding to 2-5 terminals input frequency/operation knob configuring frequency)

1.3.7 SE2 series potentiometer frequency cannot be tuned up

After confirming P.59 = 0, adjust parameter P.38 to a bigger value (according to customer requirements to adjust parameters)

1.3.8 Inverter parameter cannot be written

A. Confirm INV if it is on operating state (RUN lamp flashes), please stop it and then write the parameter (NO flash state)

B. Confirm parameter P.79 setting value (when P.79 = 3, written by communication method ONLY)

C. Modify parameter P.77 = 0

D. Check if the parameter is set with password protection (if P.295 = 1, then the password has been set). If you forget the password, you need to ask equipment installation staff for the password

1.4 Terminal Wiring

1.4.1 What terminals does SS2 series of brake resistor connect to?

+/P, PR (Operating Manual Section 3.5.6 _ Terminal Wiring)

1.4.2 How does SE2 series of external potentiometer wire?

A. Terminal 10 is + 10V power supply, Terminal 2 is analog input, terminal 5 is analog Common

B. That is, the middle of a potentiometer connected to the terminal 2 of INV, 10/5 respectively connect to the other two

1.4.3 When SE2 series wants to wire an outside panel, whether or not is the connection wire same as network cable?

[A] Same. (As long as other series of RJ45 interface applied with the ordinary network cable)

1.4.4 How long Shihlin inverter motor cable can extend

A. the longer the motor cable is, the greater the voltage on the cable drops, which will affect the motor torque

B. Without using the output AC reactor, the cable recommended not to exceed 300m

C. While the use of the output AC reactor, the cable recommended cable not to exceed 500m

D. Selection of output AC reactor, refer to Section 3.7.4 of operating manual

E. The inverter output to the motor diameter between partial length application:

E-1. Output AC reactor;
E-2. INV enables V / F control (Vector mode recommended in the wiring length less than 100m);
E-3. To be thicker diameter, it is recommended based on the instructions recommended value or more;
E-4. Carrier P.72 properly being decreased (wiring length of 100m or longer, we recommend the carrier frequency should be less than 4kHz)

F. Cable resistance calculation

What is the resistance of general copper wire? Assumed length of wire is 1KM.

A: Lead resistance: $R = \rho \times L / S$ (P = conductor resistivity: Copper = 0.0172. L = wire length, unit: M. S = Cross-section of conductive wire, unit: mm²).
2.0MM² = Line resistance: $R = \rho \times L / S = 0.0172 \times 1000/2 = 8.6\Omega$.
3.5MM² = Line resistance: $R = \rho \times L / S = 0.0172 \times 1000/3.5 = 4.914\Omega$.
5.5MM² = Line resistance: $R = \rho \times L / S = 0.0172 \times 1000/5.5 = 3.127\Omega$.
8.0MM² = Line resistance: $R = \rho \times L / S = 0.0172 \times 1000/8 = 2.15\Omega$.

G. The cable resistance

电缆电压降低值可用下列公式算出。

$$电缆电压降低[V] = \frac{\sqrt{3} \times 电线阻抗[m\Omega/m] \times 接线距离[m] \times 电流[A]}{1000}$$

接线距离长或想减少低速时的电压 （转矩）降低的情况下请使用粗电线。

1.4.5 How long does Shihlin INV external pull operating device can extend?

A. SS / SE / SE2 / SC / SF-G: 50m (max)

B. SS2: 100m (max)

1.4.6 How long can Shihlin inverter communication cables extend?

500m! Recommend to use of mask line and then make two ports of mask layers connected to the communication ground

1.4.7 Whether or not SH Series supports three-wire control mode

Not supported. We suggest choosing other series, such as: SS2, SE2, SF-G, SF-GT

Please refer to operational manual section of Multi-functional terminals selection

1.4.8 Does Shihlin inverter support the common DC bus?

Not supported

1.4.9 SS2 series, terminal 5-AM output voltage of 10V, can it be used as another INV frequency reference signal (0 - 10V)?

A. When this linkage control condition, its frequency output of the synchronization requirement is relaxed situation can be controlled

B. If the linkage control precision demanding situation, please use SE2 or SF Series

SS2 Series AM output function description: (Specific wiring instructions and product manuals)

模拟输出端子	AM	---	外接模拟表，用以指示输出频率或者输出电流，输出信号DC0~10V 容许负载电流 1mA。相关参数，请参考第 5 章 P.54、P.55、P.56 与 P.190、P.191。 Note: AM 的输出电压为 PWM 脉冲形式，故此模拟电压只适合外接可动线圈式表头，不适合接至数字表头或作为 A/D 转换信号至 PLC 及控制器使用。

1.4.10 Shihlin inverter analog terminals internal impedance

Series models	1-5	2-5	4-5
SS	-	10KΩ	235Ω
SS2	-	20KΩ	235Ω
SE2	-	24KΩ	235Ω
SF-G	-	10KΩ	235Ω
SF-GT	10KΩ	10KΩ	235Ω

1.5 Installation

1.5.1 DU01 fixed-base operating device GMB01 opening dimension

Flange mounting hole size: length: 84mm Width: 66mm

1.5.2 Does Shihlin Inverter support installation by through-the-wall (flange)?

Currently, only SF-G Series, G and H framework, supports through the wall (flange) installation, please refer to the operation manual

1.5.3 Does Shihlin Inverter support fixed-rail mounting (rail mounting, DIN Rail mounting)?

Currently, SS2 series supports fixed rail installation only, no need to make a purchase for accessories

1.5.4 How to estimate the amount of ventilation and heat dissipation of the inverter.

Air volume (m3 / h) ≈ (watt /T)×3.1

Heat dissipation ≈3% × inverter rated power

Where: T = Allowed temperature in controlled cabinet

　　　　3.1 = Air temperature of sea level

1.6 Abnormal

1.6.1 SS2 inverter connected to the spindle with rotation speed of 24,000rpm, which will report in alarm code of THN

    A. Set P.18 = 400Hz

    B. P.3 set based on the rated frequency spindle

    C. P.19 set according to the electrical spindle rated voltage (adjust low if needed)
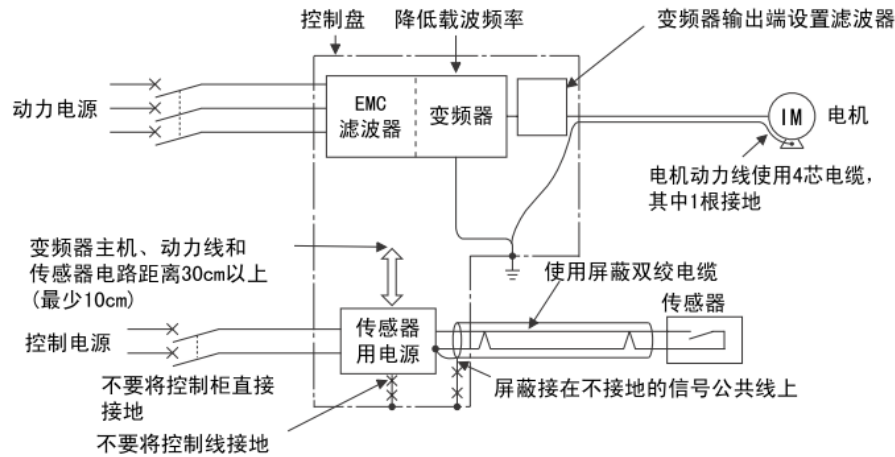
    D. P.72 = 12 (the carrier frequency)

1.6.2 SS2 gives frequency via an external current; the external starting motor is not running

    A. What if there is a start signal

    B. What if the wiring is hook up right (4-5)

    C. What if start the AU function (see parameter P.80 ~ P.84 related information: Example: After P.80 = 5, SD can be shorted with M0, then M0 is the function of the AU)

1.6.3 Interference

    General rule:

A. Power lines and control lines cannot be layout in parallel, or both must pitch more than 10cm away from each other

B. The key signal lines (such as: communication lines) should be wrapped with mask line, the mask layer double terminals to the ground; or it can also add the signal magnetic ring

C. Reduce the inverter carrier frequency (P.72)

D. Install Input filter(cost will increases, the specifications of filter refers to the product manual)

E. To ensure a good grounding connection, electrical power lines with a shield cable (or through-hole iron pipe), the mask layer is connected to the INV ground terminal and then to the ground terminal of factory

F. Put a big magnet ring on output cable by the side of INV

G. Sensors and other electrical equipment, the earth of DC power or the outer shield should not be connected with cabinet housing together, don't connect to the ground, the mask layer of sensor signal line is connected to the power ground (negative), then buckle magnetic signal if needed.

H. Communication lines come with a mask line. Also, the mask layer needs to be connected to communication ports of upper and lower communication ports, the magnetic signal can be installed if necessary

控制盘　降低载波频率　　　　变频器输出端设置滤波器

动力电源

EMC滤波器　变频器

IM 电机

电机动力线使用4芯电缆，其中1根接地

变频器主机、动力线和传感器电路距离30cm以上（最少10cm）

使用屏蔽双绞电缆

传感器

控制电源

传感器用电源

不要将控制柜直接接地

屏蔽接在不接地的信号公共线上

不要将控制线接地

For more details, please refer to "Appendix I"

1.6.4 Noise

A. Inquiry inverter series and confirm which frequency band has noise (SS2 series below 10Hz noise cannot be improved. What if it is considered, recommend for use of other series)

B. Parameter P.72 = 9 or higher to test

C. Noise occurs during SF series is running (low-speed), try to set P.285 = 0

D. Seek for Shihlin technical consultant

1.6.5 Motor is jittering while Inverter is running

A. Check inverter 3-phase output voltage and current if they both are balanced. If 3-phase output is unbalanced, return it to Shihlin

B. Check if power lines of motor and inverter sides are tightened and status of motor phase

C. Change the operating frequency and try to see if this comes from mechanical resonance. Try feedback frequency (P.91 ~ P.96)

D. What if SF series inverter jittering occurs during operation, try to set P.286 = 9

1.6.6 Inverter start torque is insufficient

A. What if V/F control is on, to properly increase the parameter values of P.0

B. Try to enable vector control mode (refer to Product Manual P.300 ~ P.307 parameter setting and operating methods. Enable vector control mode in low speed torque is the most effective way on torque improvement)

1.6.7 Not running

A. Confirm if control signals are transmitted to inverter (external terminal and communication)

B. Use a Multi-meter DC voltage profile to check if voltage of inverter PN activates normal (when input power is AC220V, DC310V; when input power is AC 380V, DC537V; when input power is AC440V, DC620V)

C. Use a multi-meter DC voltage profile to confirm if the voltage of control terminals is

normal (PC-SD: 24V, STF-SD: 24V)

D. Confirm if INV P.79 parameter setting mode is correct (Upmost)

1.6.8 Inverter cannot start via external mode

A. Confirm if the parameter of operation mode is set to P.79 = 2

B. Check the INV panel RUN lamp on the bottom left corner is flashing (SF models: FWD or REV). If RUN lamp (SF models: FWD or REV) flashes and displays 0.00, then the frequency given abnormal. Check the Multi-speed terminals (such as: M0, M1, RL and RM) or analog (2-5 and 4-5) input wiring is correct

C. If RUN lamp (SF models: FWD or REV) is not flashing, then check the wiring of start signal (eg: STF-SD and STR-SD) is connected correctly.

1.6.9 SE2 Inverter responds motor is not running smoothly and current stall

A. Understand the issue taking place at acceleration occurred or constant speed or deceleration?

B. Not smooth during acceleration – properly extend the acceleration time;

Not smooth during constant speed – properly lower the load and use the folding line V/F (parameter P.14 / P.98 / P.99) to adjust output voltage of fixed-speed frequency.

Not smooth during deceleration – properly extend the deceleration time, or to change the set value of P.19 parameter 9999 <-> 380

1.6.10 SS2 INV on the use of CNC machine tools found electricity leakage

A. During inverter operation induced voltage occurs. For personal safety and equipment security, it must be grounded during installation (refer to SS2 product manuals 3.5.6 terminal wiring, Note 4)

B. If inverter is installed in the none-grounded occasion, it is recommended to reduce the carrier or choose Shihlin series specified for CNC machine (such as: SS2--0 ** - *** KMT).

C. Due to SS2 INV design principles, electricity leakage will be more obvious during acceleration and deceleration (low frequency). This belongs to a normal phenomenon, DC braking can be turned off (P.10, P.11, P.12 = 0) or appropriate to lower the values of DC brake voltage (P.12) to improve.

D. The mechanism of electricity leakage and handling procedure, please refer to "Appendix "

1.6.11 Motor oscillation jitter (speed unsteadiness, current ramping up and down and buzzing, etc.)

A. Confirm if target frequency is steady, especially analog (0 ~ 5V / 10V) at a given frequency. Generally, poor quality of external potentiometer matters.

B. Confirm if the motor load is abnormal.

C. Try to change the set value of P.19, modify to 380 or 99999;

D. As described above without exception, then confirm the frequency range of the

phenomenon. If the occurrence is less than 1/2 of base frequency of motor, then adjust P.285 = 0, 2 or 3; if the frequency is greater than 1/2 of the base frequency of motor, adjust P.286 = 9.

1.6.12 Why output voltage is high when general multi-meter measures inverter output voltage

A. Inverter actually transmits PWM wave. In addition to base wave, it also contains Carrier signal, Carrier frequency is much higher than Fundamental, and Square wave signal as well, which contains a large number of Higher harmonics. General multi-meter only measures AC Sine wave with below 500Hz, and measuring the results of the fundamental Carrier. They are included into it. Such as Inverter Run 380V output, the measurement results are generally in 400V or more.

B. Frequency meter for testing should have the ability to break down its fundamental wave in a variety of PWM waveform.

C. Recommend measuring the inverter output voltage with universal good selection of market-resolution digital multimeter, index multimeter (eg: FLUKE "Fluke" brand multi-meter) or the use of isolation probe plus oscilloscope measurements.

*Note: The INV voltage current measurement interpretation:

变频器的电源侧，电机侧的电压·电流由于含有谐波，通过测量仪器测量值会不相同。使用工频的测量仪器测量时，请以下图的测量仪器和电路进行测定。

2. Troubleshooting

2.1 Overcurrent (OC0 / 1 / 2 / 3)

2.1.1 OC0

Failure Description: Overcurrent happens when no inverter output

A. First, disassemble the motor and see if it reports OC0, if not, check the condition of power line insulation

B. If it still reports OC0, then return it to Shihlin manufacturer for repair

2.1.2 OC1

Failure Description: Over-current occurs during INV acceleration

A. Recommend to increase the acceleration time setting of P7

B. Check the motor power cable insulation condition

2.1.3 OC2

Failure Description: INV over-current occurs during constant speed operation

A. It is recommended to reduce the load, removing motor stall

2.1.4 OC3

Failure Description: The inverter over-current occurs during decelerate

A. Recommended to increase the deceleration time settings of P.8

B. Recommended to set parameter P.19 = power supply voltage (eg. 380)

2.1.5 Remarks

When the inverter doesn't give power signal or the inverter output terminals are not connected to motor, control cabinet has a contactor operation which may cause the inverter jumping up error messages of OC0 ~ 3: It is recommended that main contact of contactor parallel connected to suitable surge absorber in order to eliminate contact noise (typically on the case of starting the motor through contactor), please seek Shihlin Electric technical support.

2.2 Short-circuit overcurrent (SCP)

A. Disconnect wiring between inverter and motor and to observe if the operating inverter reports SCP. If yes, please report and return to manufacture to repair.

B. If you disconnect the wiring between the inverter and the motor and it does not report SCP, check the motor power cable and motor windings if it is short or burned, then replace, please.

C. If the motor power cable and the motor windings are not short or burned, please confirm if the inverter output terminal is connected with contactors. Please make sure being switched while INV doesn't have output signals.

D. Configure alarm reset function (See parameter P.57, P.58, P.65, P.67, P.68)

2.2.1 Remarks

When the inverter doesn't transmit power signal or the inverter output terminals are not connected to motor, when the contactor in control cabinet is on, the inverter reports SCP alarm: It is recommended that main contact of contactor parallel connected to suitable surge absorber in order to eliminate contact noise (typically on the occasion of starting the motor through contactor), please seek Shihlin Electric technical support.

2.3 Overvoltage (OV0/1/2/3)

2.3.1 OV0

Fault Description: Over-Voltage occurs when INV doesn't have any output.

A. Supply voltage input through a multi-meter to detect if it is normal.

B. Check if customer's motor connects to ground. Try to change the grounding status. (If grounding terminal is connected originally, to remove the grounding wire; if not connected to grounding terminal, try to hook up motor with grounding terminal)

C. Use a multi-meter to check if the inverter module got damaged, refer to the inverter operating manual section, "IGBT module test"

D. Any related OV0 happens; we recommend ship the devices back to the factory for test.

2.3.2 OV1

Failure description: Over-voltage occurs during INV acceleration

A. Supply voltage input with a multimeter to detect if this is normal

B. Check if the customer motor was grounded. Then, try to change the grounding status (when the grounded originally, remove grounding wire; when the ground had no grounding status orginally, try to hook up the motor with grounding terminals)

2.3.3 OV2

Failure Description: Over-voltage occurs while INV is running constant-speed

A. Supply voltage input with a multimeter to detect if it is normal

B. Check if the customer motor was grounded. Then, try to change the grounding status (when the grounded originally, remove grounding wire; when the ground had no grounding status originally, try to hook up the motor with grounding terminals)

C. If there are other high-power electrical equipment (Ex: A large capacity of fans), when it starts and stops, it may affect the quality of power supply, it could lead inverter to report an alarm of OV2. At this moment, you should consider that

adding an AC reactor of input terminal of INV to improve.

2.3.4 OV3

Failure Description: Over-voltage occurs during deceleration occurs

A. Check if the deceleration time is too short, increase the deceleration time

B. If there is the installation of the braking resistor, braking parameters (P.30, P.70) setting is reasonable, whether or not braking resistor is reasonable.

C. Set the parameter P19 = 9999 or 99999

2.4 Communication Error (OPT)

A. Check if the communication wiring is normal or disconnected.

B. Check if the host (PC or PLC or other device) communication protocol parameters and set the parameters of the inverter are well-matched

C. Whether the exclusion is due to interference (drive does not run or do not take under motor condition, the communication is normal)

D. If the item C above is recognized as the cause by interference, please enhance the wiring: double terminals mask line and the mask layer is connected to ground communication system.

E. Please refer to "Shihlin Inverter Communication Manual"

2.5 Fan abnormality (FAN)

A. Check if the inverter fan is running and if the foreign body is blocked.

B. What if the fan is running normally, the parameter of P.245 is set to 10.

C. What if the parameters cannot be read or written to 10, set the parameter of P.77 = 9999 (or 99999), and set the parameter of P.447 = 0

2.6 Overload (THN / THT)

2.6.1 THN

Failure Description: motor overheat (electronic thermal relay)

A. Recommend to set the parameter of P.22 = 150 (or further parameter setting P.9=0) (What if this is SF-G series, when P.186 = 0, then P.22 = 120). Besides, you could also confirm followed by the following steps

B. Confirm the specifications of the motor and INV specifications to see if they both are matched.

C. Confirm if the system overloads and then it displays exceeding the rated current during the operation of INV. (While used for lifting applications, the INV is recommended to tune high)

D. Check if the motor wiring is correct. (Refer to wiring diagram of motor nameplate, which is correctly configured by delta connection or star connection, and check if the wiring length is too long or phase lacking)

E. Confirm if INV parameters are reasonable. (Whether torque boost P.0 is too large or not, the substrate voltage P.19, the base frequency P.3, motor rated current P.9 set whether the power supply and motor match, whether the acceleration and deceleration time settings are too small or not, whether the current stall prevention P.22 set is too large or not)

F. Motor or wiring got damaged (measured with a multi-meter to check if the resistance between motor phases is balanced or not)

G. Measured with a multi-meter AC to check if the INV 3-phase output voltage is balanced or not. (Multi-meter could be selected by Indicator type or Fluke digital multi-meter)

2.6.2 THT

Failure Description: INV IGBT overheat (electronic thermal relay)

A. Recommended to set parameter of P.22 = 150 (if the SF-G series is, when P.186 = 0, P.22 = 120). Besides, you can also confirm this followed by steps

B. Confirm the specifications of the motor and INV to see if the both selections are

matched

C. Confirm if the system overloads and then it displays exceeding the rated current during the operation of INV. (While used for lifting applications, the INV is recommended to tune high)

D. Check if the motor wiring is correct. (Refer to wiring diagram of motor nameplate, which is correctly configured by delta connection or star connection, and check if the wiring length is too long or phase lacking)

E. Confirm if INV parameters are reasonable. (Whether torque boost P.0 is too large or not, the substrate voltage P.19, the base frequency P.3, motor rated current P.9 set whether the power supply and motor match, whether the acceleration and deceleration time settings are too small or not, whether the current stall prevention P.22 set is too large or not)

F. Motor or wiring got damaged (measured with a multi-meter to check if the resistance between motor phases is balanced or not)

G. Measured with a multi-meter AC to check if the INV 3-phase output voltage is balanced or not. (Multi-meter could be selected by Indicator type or Fluke digital multi-meter)

2.7 Module overheat (NTC)

Failure Description: INV module overheat

A. Check if fan is running normal. Clean up all possible debris on the cooling fan which possibly influences heat dissipation.

B. Reduce the carrier, set parameter P.72 = 2

C. Reduce motor load to decrease the INV output current

D. If INV is installed in the environment of high temperature, then need to install more heat dissipation devices on cabinet.

E. Check the INV radiator duct dust and debris

F. INV P.161 = 12 switched to the voltage monitor module temperature profile. What if the temperature value is small, it is recommended to contact factory for technical assistance.

2.8 Memory abnormal (EEP)

Failure Description: The memory of INV parameters read/write abnormal or read/write times more than its life

A. Please return to manufacture for repair

B. Confirm the same type of INV applications whether or not enable the frequency memory function (P.61 = 1?) of remote control functions. Advised to close frequency memory function, please see the relevant remarks in manual;

C. Confirm if HEE or H1009 as the target frequency written into instruction is used under communication mode. Suggested to use HED or H1002 as replacement and only write target frequency into RAM.

D. If it is SS2 models, make sure the parameter values of P.59, it is recommended set to 0 or 10;

E. If DU06 operation, confirm its PU_F and recommend set to 2;

Note: The above confirmation and suggestion aimed at reducing memory the write times prolong life

2.9 ERR

There are a number of situations which may result in ERR. Please confirm each followed by the instructions below:

A. Insufficient supply voltage, check R-S-T by a multi-meter if the AC voltage RST Operating Manual declared, if P-N DC voltage is normal (200V series: Not less than 240VDC & 400V series: not less than 456VDC);

B. Check if operator cable is loosen or operator and the inverter are not well matched;

C. Check if RES terminals of control board are wired correctly and in the ON state;

2.10 Encoder type exception (PG1)

Encoder Input Type Error
Check P.351 set value, set to 1 or 2 under general circumstances. Please refer to the manual instruction of Encoder

2.11 PG card feedback signal abnormality (PG2)

PG detection frequency is 0 and exceeds the set time of P.352

A. Check if the wiring of encoder is correct or not; power and signal lines

B. Check if encoder and motor connections are loosen or not;

C. Check if the motor is running (blocked?);

D. Check set value of P.352 is too small or not. Make an appropriate extension;

2.12 Speed deviation (PG3)

During closed-loop control, if the difference between motor frequency and INV output frequency exceeds the set value of P.353 and lasting time exceeds the set value of P.354 are detected.
A. Check if set value of P.350 meets encoder type;
B. Check if motor is functioning properly;

2.13 High current fluctuation and noise during SF high-power INV starting process

A. Check if motor and load are in normal condition, confirm if there is anything going on with mechanical assembly.

B. P.286 = 9

C. Try to increase the set value of P.0 and carrier parameter of P.72

D. Try to set (P.14) through a polyline V / F control mode

E. Found that starting is not smooth or reporting THT, try to set P.14 = 1 (for fans and water

pump load)

2.14 Other

If the methods above cannot work out, feedback the following status:
A. The INV software version (P.188) and serial number
B. Parameter setting (If customer originally uses the other brand of INV, please ask to feedback detail specification of INV and parameter setting)
C. The INV wiring (including power cables: Power-RST, UVW- motor, ground conditions, the control cables; if customers do not use any INV before, please feedback the wiring status)
D. Motor nameplate specification (rated voltage, current, frequency, speed, number of pole)
E. Control logic (complete cycle of operation of each component in the wiring operation

flow, including the INV frequency, etc.)

3. The tuning method

3.1 V/F control

V/F control mode is suitable for most situations, settings and tuning are relatively simple as major preferred use.
The following circumstances must use V/F control:
A. Motor capacity should be two or more times smaller than the capacity of the inverter;
B. Rated frequency 120Hz or above high-speed motor;
C. One INV drives multiple motors;
D. No way to complete motor parameter auto-tuning;

Tuning method:
A. Starting torque insufficient: P.0 increase
B. Insufficient torque at a specific frequency moment: To use of P.14, P.98, P.99 polyline V/F to enhance the output voltage at the frequency
C. Focusing on P.3 (rated frequency up and down), P.19 (220V / 380V ← → 99999), P.22 (150%) of use
D. Other scenarios, please refer to section description of "1.6" and "3"

3.2 V/F closed-loop control (V/F + PG)

V/F control with PG speed compensation
Refer to 3.1 instructions.
V/F control and achieving precise speed control

Tuning method:
   A. What if it belongs to V/F control, it's not necessary to proceed motor parameter auto-tuning;
   B. P.300 = 1, P.350 ~ P.351 setting followed by encoder model type;
   C. Confirm if encoder connection and settings are correct, you can set P.300 = 0, P.161 = 10, executing 5Hz, 10Hz, 30Hz with V/F mode, respectively. In the meanwhile, observing the "Monitoring voltage profile" of operation device to see if the feedback of motor frequency is equivalent to operating frequency and stable or not; otherwise, you should check the correction of encoder type, wiring and installation of the motor shaft.

3.3 No speed sensor vector control (SVC)

With inference of motor speed to achieve speed control with better performance
The following scenario is recommended to use vector control without speed sensing:
   A. A load that fluctuates dynamically but small speed variation;
   B. Need low-speed (5Hz or below) with high torque;
Tuning method:
   A. It must work on motor parameters auto-tuning, P.302 ~ P.307 must be written in strict accordance with motor nameplate. No guess or copied from other motor;
   B. Motor power rating should be equal to or a level lower than INV power rating;
   C. Should adopt P.301 = 1 dynamic auto-tuning. Before auto-tuning, the motor shaft must be disconnected from the load; otherwise, or should adopt P.301 = 2 static auto-tuning;
   D. The flag of auto-tuning process completed normal is it doesn't displayed in "FAL" during process, if the display of "FAL" shows, please check if the motor parameter setting is wrong, and set P.22 = 0, then perform auto-tuning again;

E.   After the auto-tuning is completed, set P.300 = 2 or 3, then start vector control;

F.   If the restriction is to perform static auto-tuning and the operation presents load free current is too large after vector control execution, please try to lower the value of P.308 (Example: 30% × motor rated current), then execute P.997, and re-run;

3.4 Closed-loop vector control (FOC + PG)

To Install PG expansion card with encoder motor to achieve high performance, high precision speed control, torque control.

The following scenario is recommended to use a closed-loop vector control:

A. A load that fluctuates dynamically but small speed variation;

B. Need low-speed (5Hz or below) with high torque;

C. Would like to implement torque control;

D. Under the situation of motor shaft stops, it still generates a locked torque;

E. To prevent excessive torque from mechanical damage which results in a demand of torque limit

Tuning method:

A.   P.350 setting according to encoder model series;

a-1:

That P.351 Encoder Input Type setting is correct or not could be confirmed through P.77 = 99999, setting P.713 = 54, the INV with PU mode presses FWD to run 5HZ, then switch to voltage to monitor the change in the value profile; for example, set : P.351 = 1, if the value incremented means setting correct. If the value decreasing, then need to set P.351 = 2. Report to PG1 ~ PG2 under execution can be set P.352 = 0; P.354 = 0.

B.   To confirm the encoder settings and wiring connections are correct, set P.300 = 0, P.161 = 10, run 5Hz, 10Hz, 30Hz with a V/F mode, respectively. At the same time, monitor voltage profile by Operator to see if the feedback of motor frequency is equivalent to the operating frequency and stable; otherwise, you should check the encoder type, wiring, and installation of the motor shaft.

C.   You must first perform motor parameter auto-tuning, P.302 ~ P.307 must be written in strict accordance with the motor nameplate, no speculation or copied from other motor;

D.   Motor power rating level should be comparable or one level lower than INV power rating;

E.   Should adopt P.301 = 1 dynamic auto-tuning. However, before auto-tuning, the motor shaft must be disconnected from the load; otherwise, or should adopt P.301 = 2 static auto-tuning;

F.   The flag of auto-tuning process completed normal is it doesn't displayed in "FAL" during process, if the display of "FAL" shows, please check if the motor parameter setting is wrong, and set P.22 = 0, then perform auto-tuning again;

G.   After the auto-tuning is completed, set P.300 = 4, then start vector control;

H.   If the restriction is to perform static auto-tuning and the operation presents load free current is too large after vector control execution, please try to lower the value of P.308 (Example: 30% × motor rated current), then execute P.997, and re-run;

3.5 Key confirmation after tuning [NOTE]

After the parameters setting are completed, you should confirm its model selection and tuning under customer practical operation (operation flow, load, etc.) are reasonable:

A. Observe the process of acceleration and deceleration, the small lights on both sides of the operator are not flicker at the same time, please refer to the operation manual warning code section (see Fig. A)

B. While running at full capacity for long, observe if the monitoring current exceeds 85% of the inverter rated current during constant speed execution;

C. Set P.161 = 6, multiple operating procedure (acceleration - constant speed - deceleration) or working under full load for long time, to observe whether the electronic product heat rate shown by monitor voltage profile is significantly increased or not;

Figure A:

| 代码	显示屏上的显示	原因	处理方法
电流失速	闪烁	当输出电流大于失速防止准位时，变频器显示屏左侧的三个小灯会闪烁，表示变频器当前处于电流失速状态，此时会造成电机运转不顺畅。	1. 检查 P.22、P.23、P.66 设定是否合理 2. 检查 P.7、P.8 设定值是否过小
电压失速	闪烁	(+/P)-(-/N)间电压过高，变频器会处于电压失速状态，显示屏右侧的三个小灯闪烁，此时会造成电机运转不顺畅	1. 在主回路端子 P 和 PR 间加回生制动电阻 2. 检查 P.7、P.8 设定值是否过小

4. Application Examples

4.1 Shihlin Inverter Water Supply Control

Requirements:
The customer uses a two-wire sensor {+: Power supply 12 ~ 36V; -: Signal output (4 ~ 20mA)}, set the line pressure 2.1kg

Recommended models: SS2, SF-G
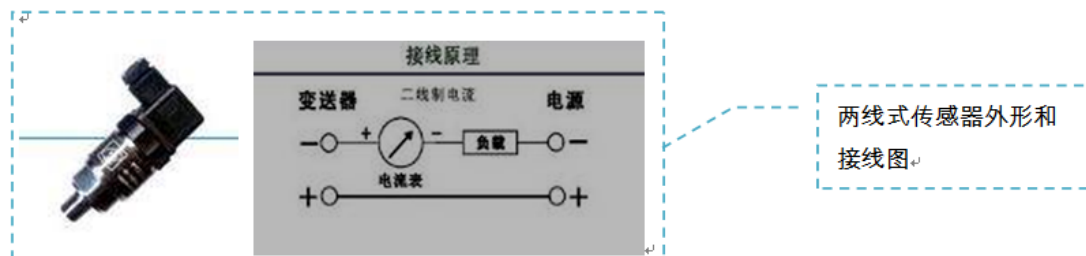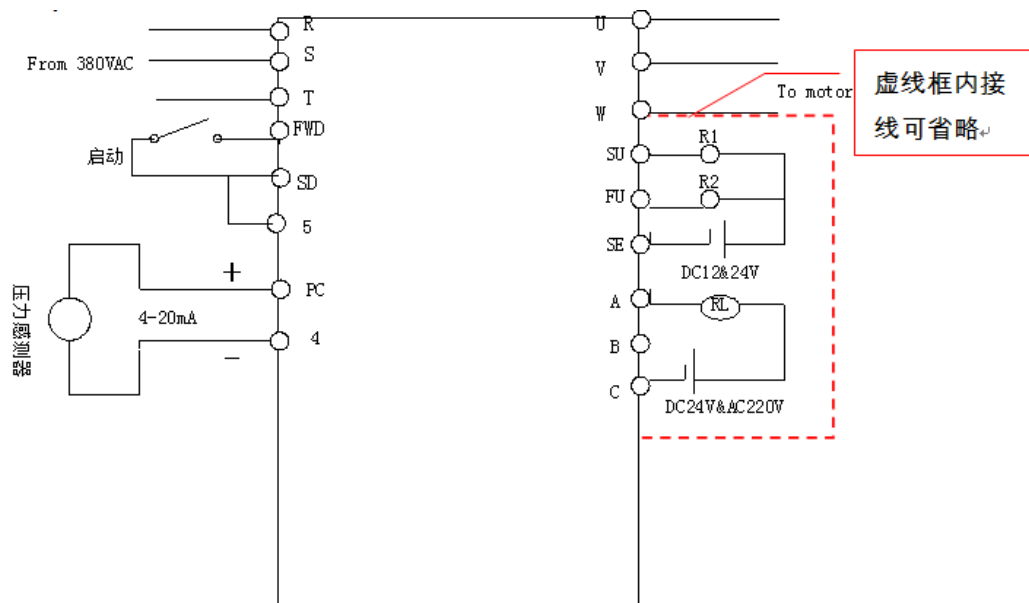
Parameter setting:

Parameter code	Default value	Defined value	Description
P.8	20	10	Deceleration time
P.79	0	2	External mode
P.110	1	2	Panel Water Monitoring Mode
P.170	0	2	Feedback signal selection (current)
P.172	20	15	Proportional gain (steady improvement)
P.173	1	2	Integral gain (steady improvement)
P.225	20	21	Use pressure（2.1Kg)

Note: Shihlin INV PC and SD 24V DC power supply, load carrying capacity is within 100mA
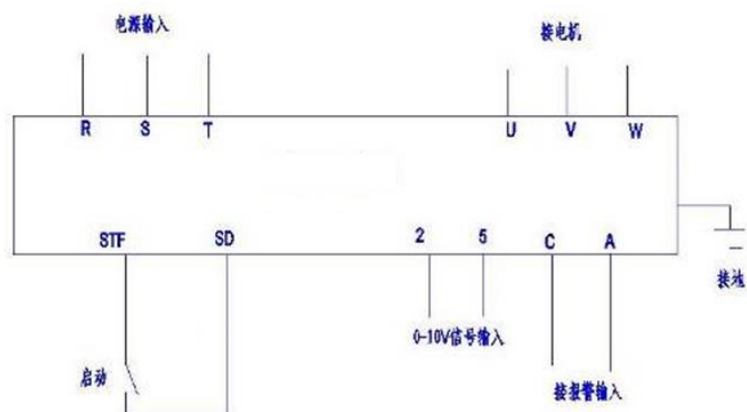
4.2 Shihlin INV for high-speed motor (motor spindle)

Requirements:
Customers use Shihlin INV to drive electronic spindle (high-speed motor), the maximum speed up to 36000RPM, INV operating frequency controlled by system to output 0 ~ 10v for operating frequency control, external button to start forward.

Recommended models: SS2

Wiring:

Parameter setting:

| No.	Parameter Number	Parameter name	Factory default	Use value	Remark
1	P.3	Base frequency	50	600	Consistent with motor rated frequency
2	P.7	acceleration time	10	3	
3	P.8	Deceleration time	10	2.4	
4	P.18	High speed maximum frequency	120	600	Consistent with motor rated frequency
5	P.19	Substrate voltage	9999	380	Consistent with motor rated voltage
6	P.20	Deceleration frequency quasi-bit	50	600	
7	P.38	Target frequency	50	600	
8	P.72	Carrier frequency	5	9	

    A.   When INV is used for high speed motor, please make sure that INV sets P.3 = rated motor frequency, P.19 = rated motor voltage.

    B.   If customers request less motor noise on side, you could be appropriate to increase the P.72.

    C.   Such as jitter occurs, the abnormal sound phenomenon, appropriately try to decrease the value of P.72.

    D.   Some certain high-speed motor applied to a very short acceleration and deceleration time, P.7, P.8 set values needs to be within 1s.

4.3 Shihlin INV using multi-potentiometer to mainly and auxiliary modulate frequency control

Requirements: Customer uses 4 pcs of potentiometers to control 3 INVs, one of the potentiometers controls 3 INVs about the main speed, and the other three potentiometers separately control their connected INVs corresponding to its fine-tuning speed.

Recommended models: SS2
Wiring:
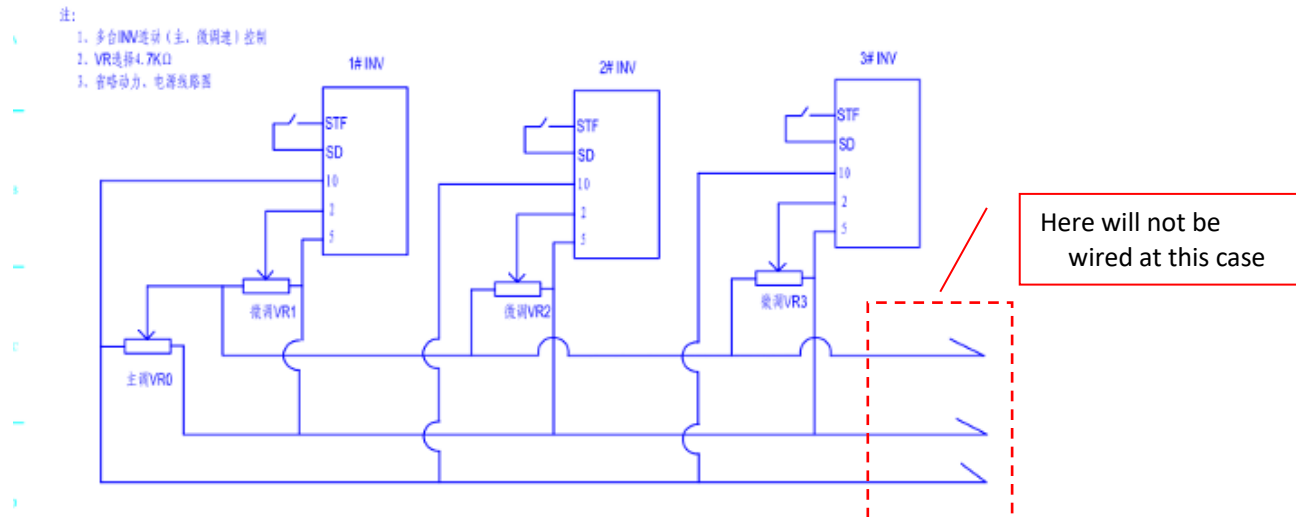
Parameter setting:

Parameter code	Factory default	defined value	Description
P.38	50	60	Target frequency
P.79	0	2	control method
P.194	0	0	Please refer to the inverter manual 5.52 2-5 signal input terminal (P.192 ~ P.195) Description
P.195	50	50	

Remarks:
The external potentiometer of Shihlin INV must meet 1KΩ/1W or higher, especially for this case, after potentiometers are connected parallel, it is important to consider the influence of INV operation frequency after the impedance of the potentiometer is getting small.
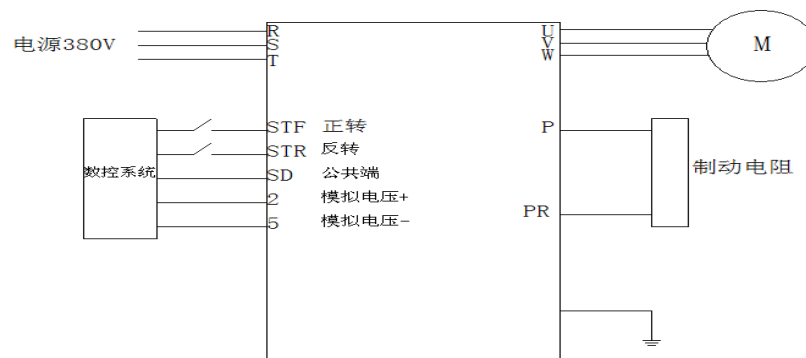
4.4 Shihlin Inverter used for CNC lathes

Requirements:

The INV start / stop is controlled by numerical control system as well as the operation frequency is controlled by numerical control system 0V-10V, low frequency with sufficient torque.

Recommended models: SS2-043-3.7K, SS2-043-5.5K
Wiring:

Parameter setting:

Parameter code	Parameter Description	defined value	Parameter code	Parameter Description	Defined value
P.1	Upper frequency	100	P.300	Motor control mode	2
P.7	acceleration time	2	P.302	Motor Rated Power	3
P.8	Deceleration time	1.5	P.303	Motor poles	4
P.19	Substrate voltage	380	P.304	Motor rated voltage	380
P.20	Deceleration Level	100	P.305	Motor rated frequency	50
P.22	Stall Prevention Level	180	P.306	Motor rated current	7.1
P.38	Target frequency (voltage)	100	P.307	Motor rated speed	1430

Remark:
   A. During INV operation, monitoring rotation status by CNC system panel found when execution speed and rated speed are not linear proportionally, please adjust the value of P194 ~ P195. (Tuning method, please refer to the product manual section of 5.52 terminal input signal)

B. In order to truly reflect the characteristics of the INV torque, please activate the function of dynamic motor parameter auto-tuning, "disengage the motor belt." (Please refer to the product manual, section 5.65 of motor control mode)

Disengage the motor belt while auto-tuning

C. When parameter (P.302 ~ P.307) is setting, it must be corresponding to motor nameplate: rated power, poles, poles, voltage, current, frequency and speed parameter.
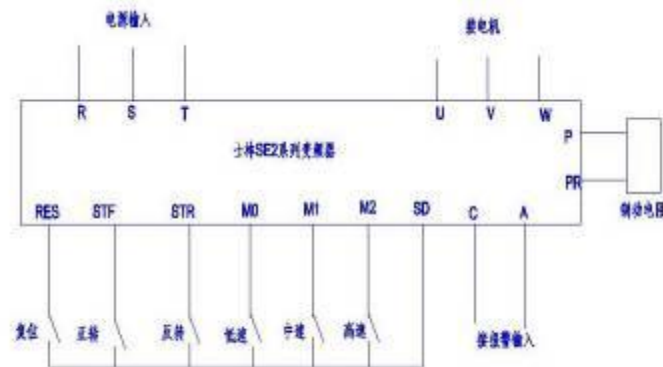
4.5 Shihlin INV used for electroplating crane

Requirements:
The INV takes 7-speed running, start, stop, speed controlled by external signal. The INV output side in series to two magnetic contactors to achieve one to two alternative controls (Control logic decided by PLC signals).

Recommended models: SS2-043-2.2K or SE2-043-2.2K (software version V0.600 or above)
Wiring:

Parameter settings:

No.	Parameter code	Parameter name	Default value	Set value
1	P.4 ~ P.6; P.24 ~ P.27	Multi-speed settings (seven speeds)	-	The apparatus set manufacturer needs
2	P.7	acceleration time	5	1.4
3	P.8	Deceleration time	5	1.4
4	P.19	Substrate voltage	99999	380
5	P.22	Stall prevention operation level	200	150
6	P.30	Regenerative braking function selection	0	1
7	P.70	Special regenerative braking rate	0	15
8	P.65	Retry selection	0	4
9	P.67	Return the number of abnormal	0	10
10	P.68	Reset waiting time	6	0.1

Remarks

A. In order to start driving fast response issued by the PLC and stop signal, the drive requires a shorter deceleration time setting, and use with brake motors. However, due to too short acceleration and deceleration time may cause the drive to decelerate due to overvoltage or overcurrent warning, so add a braking resistor to the inverter.

B. To avoid falling objects or drive motor is blocked because the police turned over current differences, brake motor drive is stopped should reach about 5Hz pull, when you start to reach around 5Hz release, it is recommended to enable the drive frequency detection function (see P.40, P.42, P.43, P.85 explanation);

C. UVW of the inverter series magnetic contactor when the drive motor is switched alternately to achieve, be sure to consider alternate signal operation timing to ensure the inverter is running without any magnetic contactor switching.

D. In order to avoid electromagnetic contactor by the inverter and other external interference in the work of the normal operation, the inverter uses different alarm automatic reset function. (Non-load converter determines exceptional circumstances to perform automatic reset)
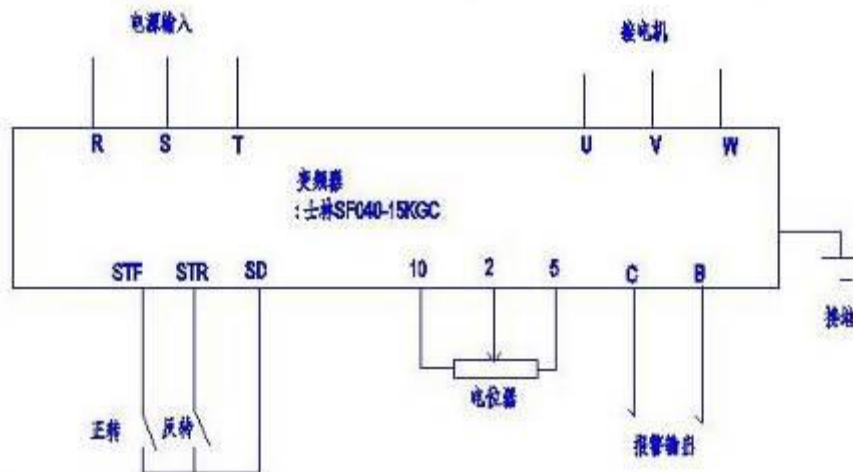
4.6 Shihlin INV used for pressing machine

Requirements:
Pressing machine tonnage of 160T (uniaxial single point), the motor specifications 380V / 15KW. Inverter start / Stop controlled by external terminal and operation frequency controlled by an external potentiometer.

Recommended Models: SF-040-18.5 / 15K-GD
Wiring:

Parameter settings:

Parameter Code	Default	Defined value	Description
P.7	20	60	Appropriate to extend the deceleration time allows the motor to start, stop smooth running.
P.8	20	80	
P.72	5	9	Appropriate to increase the carrier frequency ambient noise suppressed field (different aircraft carriers maximum different)
P.79	1	2	External terminal control
P.282	1020	4050	Noise suppression parameter shall (ensure that two is greater than the first two)
P.285	1	0	This parameter is adjustable low frequency vibration
P.286	0	9	Motor adjustable slight jitter value Pr286

Remarks

A. During pressing machine operation, it was found that transmission belt is jittering. Please adjust P286 = 9 ~ 10
B. The worse noise occurs while the motor is running, it may be appropriate to increase the value of P72 and try to adjust P282 = 4050 or 5060
C. The motor belt is jittering when pressing machine is running in a low speed, please adjust P285 = 0
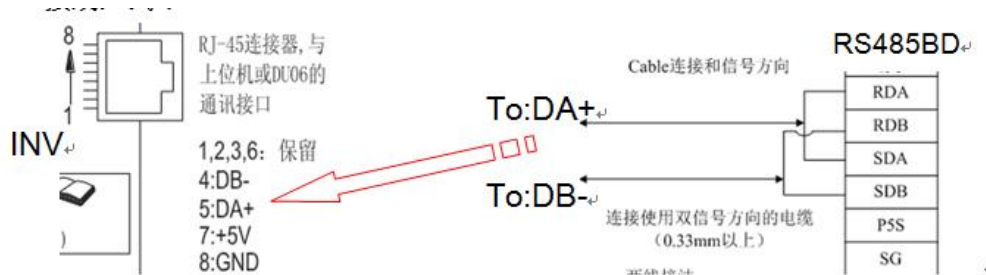D. Please refer to "Appendix 2" for further detail information.

4.7 Shihlin INV and Mitsubishi FX2N PLC communication control

Requirements:

Mitsubishi FX2N-40MR + RS485 BD board and SS2-043-0.75K communication, we need to start and stop.

Recommended models: SS2-043-0.75K

Wiring:

Communication instruction code:

Shihlin Protocol

ENQ	变频器局号 0	命令码 HFA	等待 时间	资料 H0002	校验码 Sum Check	CR
H05	H30 H30	H46 H41	H30	H30 H30 H30 H32	H44 H39	H0D

Sum Check 计算方法：H30＋H30＋H46＋H41+H30+H30+H30+H30+H32=H1D9，取低8位D9，转换为ASCII

Parameter Setting:

Parameter Code	Default value	Defined value	Explanation
P.33	1	0	0: Modbus protocol; 1: Shihlin protocol
P.36	0	1	Inverter station number
P.79	0	3	Inverter operation
P.153	0	1	Communication error handling
P.154	4	0	Modbus communication data format

Remarks:

    A．Modbus communication protocol needs to do parameter written into Mitsubishi PLC communication module, write register D8120 (transmission rate, the start bit, data bits, verification format, stop bits), in line with general information of P.154 setup requirements.

    B．Modbus communication protocol selects ASCII transmission format, PLC needs to send data to do LRC check. (LRC verification method, please refer to INV manual section 5.16 communication function ASCII mode LRC calibration value calculation)

    C．In order to ensure stable communication quality, recommend communication cables use twisted mask cables to connect, and the mask layer recommended doubly terminated communications (that figure above shown GND connected with SG via mask layer).

    D．After the INV communication parameters are set completely, you need to power off and restart the INV.
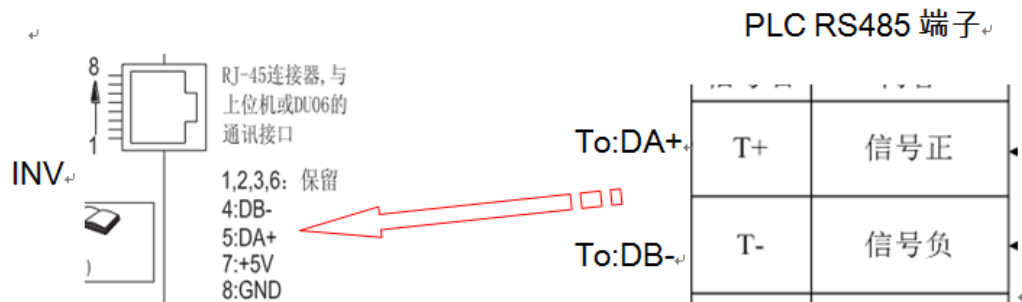
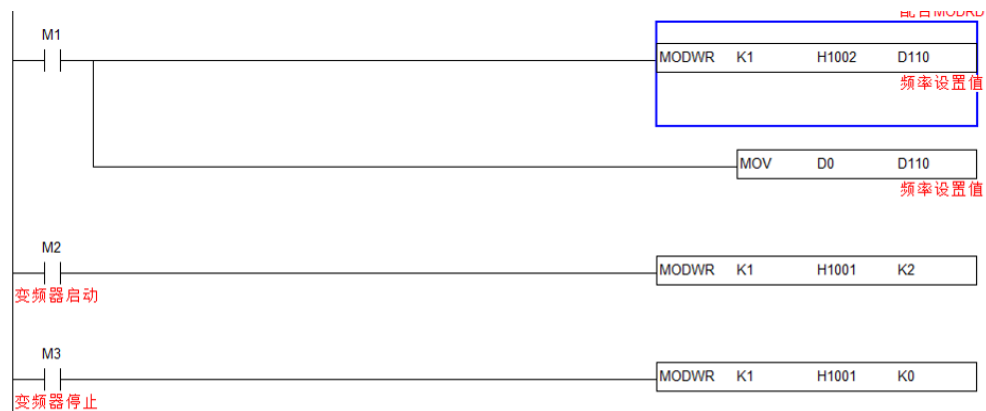## 4.7 Shihlin INV and Delta DVP ES PLC communication control

Requirements:
Delta DVP-ES PLC and SS2-043-0.75K INV communication needs to Start, Stop and Frequency setting
Recommended models: SS2-043-0.75K
Wiring:

Communication instruction code:

Parameter settings:

Parameter code	Default value	Defined value	Explanation
P.33	1	0	Protocol selection
P.36	0	1	Inverter station number
P79	0	3	Inverter operation
P153	0	1	Communication error handling
P154	4	4	Modbus communication data format

Remarks:

A. Modbus protocol communication needs parameters written into Delta PLC communication module, write register D1120 (transmission rate, start bit, data bits, verification format, stop bits), general information is consistent with P154.

B. Modbus communication protocol chooses RTU transmission format. Delta PLC can execute CRC verification by itself.
C. To ensure stable communication quality, it's recommended that communication cable adopts using twisted-pair shield cables to connect. After the INV communication parameters are set completely, you need to power off and restart the INV.

4.9 Shihlin INV and Shihlin touch-screen communication control

Requirements:
Use HMI to control INV start, stop, frequency setting and frequency monitoring.
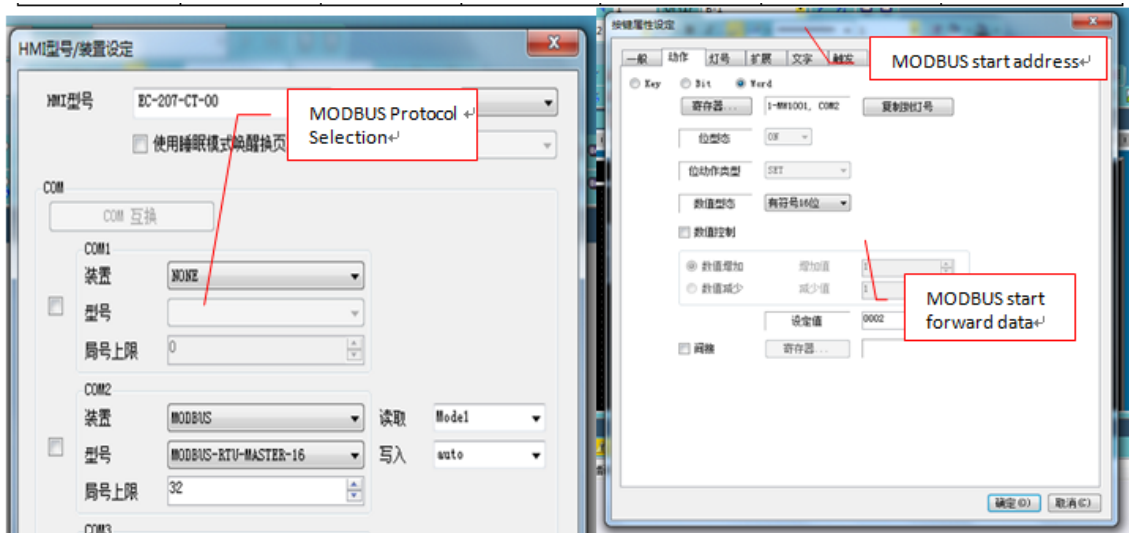Recommended models: SS2-043-0.75K, EC207-CT00
Wiring:

Parameter settings:

Shihlin inverter parameter settings			HMI parameter settings
Parameter Code	Default	Defined value	
P.33	1	0	
P.36	0	1	
P.79	0	3	
P.153	0	1	
P.154	4	4	

Remarks:

A. To ensure stable communication quality, it's recommended that communication cable adopts using twisted-pair shield cables to connect. After the INV communication parameters are set completely, you need to power off and restart the INV.

B. INV communication bit address and data table

COM port selection	Start address	Forward data	Reverse data	Stop running	Target frequency setting	Output frequency monitor
COM2	MW1001	0002	0004	0000	MW1002	MW1003

4.10 Shihlin INV and Weintek touch screen communication control

Requirements:
Use HMI to control 3 INVs start, stop, frequency setting and frequency monitoring.
Recommended models: SS2-043-0.75K, TK6070i
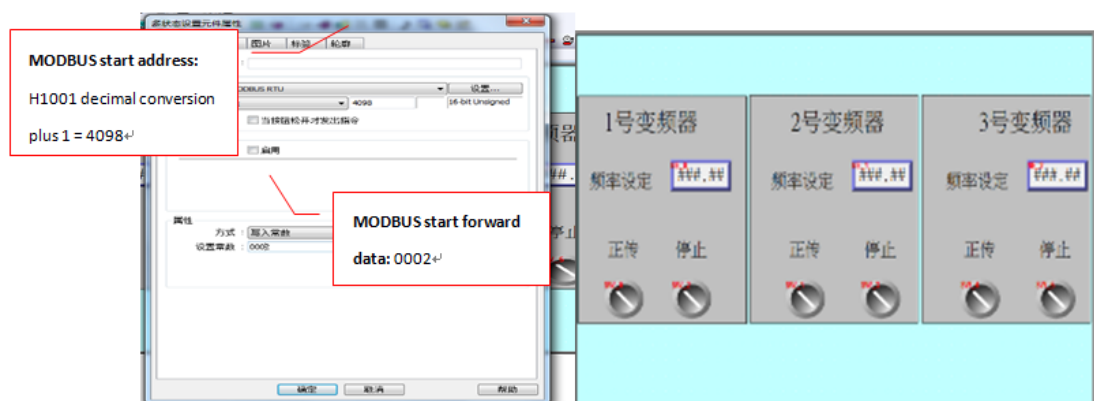Wiring:

Parameter settings:

Shihlin inverter parameter settings			HMI parameter settings
Parameter code	Default	Defined value	
P.33	1	0	
P.36	0	1-3	
P.79	0	3	
P.153	0	1	
P.154	4	4	

Remarks:
A. To ensure stable communication quality, it's recommended that communication cable adopts using twisted-pair shield cables to connect. After the INV communication parameters are set completely, you need to power off and restart the INV.
B. INV communication bit address and data table

COM port selection	Start address	Forward data	Reverse data	Stop running	Target frequency setting	Output frequency monitor
COM2	MW1001	0002	0004	0000	MW1002	MW1003

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5. Appendix
5.1 Appendix I

<u>**Inverter electric leakage handling instructions**</u>

The mechanism of electric leakage
1. There exists a large parasitic capacitance between three-phase asynchronous motor winding and case. In the case of power supply, the power cable has only 50Hz frequency power for use. Since the frequency is quite low, the leakage current through the distributed capacitance is quite low. Usually we ignore the phenomenon of electric leakage. However, when using INV to drive motors, due to the fact that INV IGBT with high-speed switch output is a number of kHz of high-frequency pulse-width modulated voltage waveform, the output is the dynamically fast hopping ripple voltage within the range of 0V to 530V. For the same motor and the same parasitic capacitance, leakage current will be hundred times increase or above.

The leakage current waveform of INV input terminals (the carrier frequency 5kHZ), it's obvious to see the ripple voltage (Figure I).
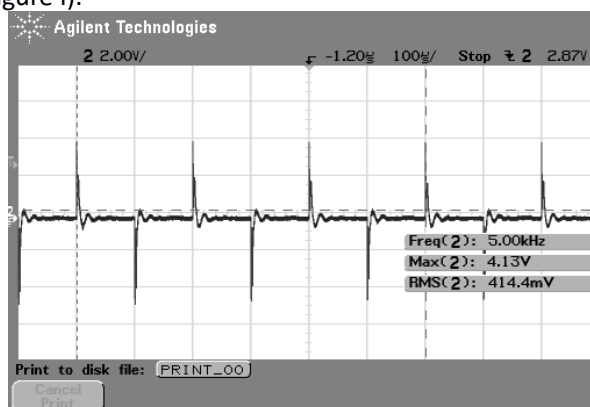

Figure I

2. The input and output layout of INV and other cable length between wiring connection(Figure 2), there exists parasitic capacitance between the earth and between motors, whereby the leakage current will flow. Current amplitude will be affected by factors of parasitic capacitances and carrier frequency, etc. so that the leakage current will be different when carrier frequency of the INV is running with setting high or low. When INV wiring layout is not connected to the reliable earth, this will directly cause amplitude of leakage voltage increases, even get people electric shock.
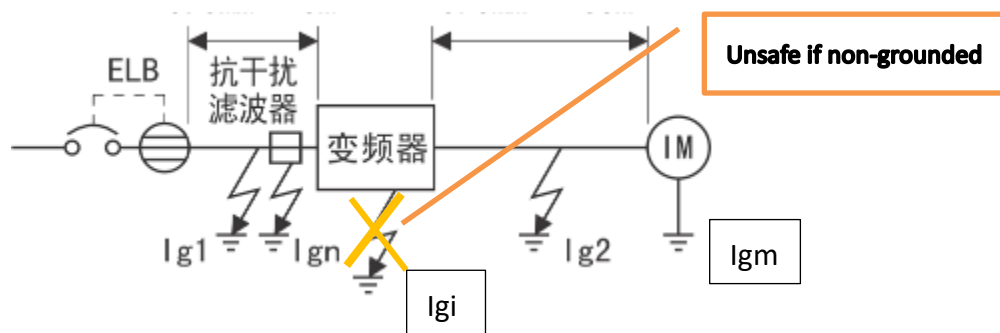

Figure II

Ig1, Ig2: Leakage current occurs when power supply of cable line is operating
Ign: Leakage current of INV input side noise filter
Igm: Leakage current occurs when motor's commercial power supply is operating
Igi: Leakage current of the INV

Leakage solutions

1. In order to reduce the leakage current of input terminal, you can adjust the grounding position of the motor shield: wire the grounding cable of motor shield to the ground terminal of inverter(Figure III) as shown. Followed by the way of connection, the safety capacitor of internal INV provides a loop path of load side leakage current, which can reduce grid side leakage current.
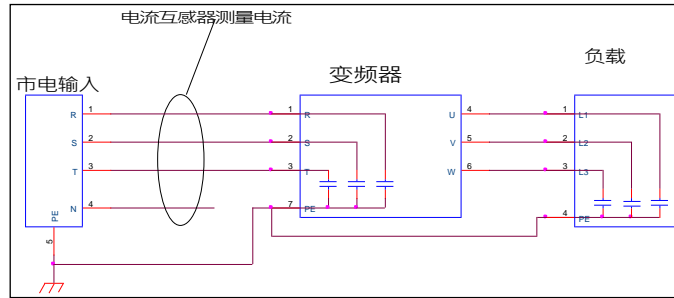

Figure III

2. To reduce INV the value of carrier frequency P.72 can effectively reduce the leakage current (Figure IV), but the motor noise will be increased instead.

| 载波频率	电磁噪音	噪音、泄漏电流	热散逸	电流波形
0.7KHz	大 ↑	小 ↑	小 ↑	
5KHz				
10KHz	小 ↓	大 ↓	大 ↓	

Figure IV

3. Add reactors on INV U/V/W side can increase load its high frequency impedance and shorten INV its distance between the output side of INV and the motor. This will be also helpful to to reduce the leakage current.

4. Principally, install the inverter's ground terminal must be connected to earth. (See Figure V).
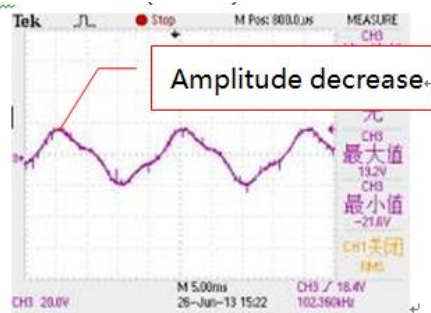

接地母排
扁平编织物
短粗接地电缆

Figure V

5. Shihlin Electric has provided dedicated machine tool used INV (Model no: SS2-0 ** - *** KMT) for machine tool industries (ungrounded). Through test, its leakage magnitude will be greatly reduced (see Figure VI).
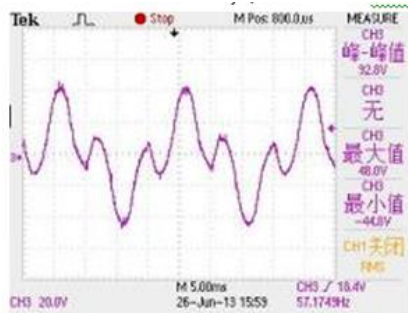
Universal models   Dedicated machine tool models

Figure VI

5.2 Appendix II

SS2 series of INV uses DU06 operators to achieve parameters copy

Parameter copy function (Pr.CP, Pr.CA) (Need to purchase DU06 operator)

Pr.CP: "Parameter copy read"

Pr.CA: "Parameter copy write"

● Parameter copy functions when motor stops. This will be active when setting P.77 = 0 and operating under PU mode. When in the case of using the same parameter settings, just set one of the inverter, then you can use Pr.CP and Pr.CA to quickly copy all parameter settings to other inverters.

● Parameter copy operation procedure:

1. The first inverter under PU mode, press MODE to switch to the parameter setting mode.
Rotate to display Pr.CP

Press the SET key to display "0"

Change the rotation value of "1" and press the SET to write

The screen displays parameter codes one by one, which means all parameter setting values in INV memory are currently copied to the memory of the operator.

When the COPY is completed, the screen will display "END" and blink.

2. The 2ⁿᵈ inverter under PU mode, press MODE to switch to the parameter setting mode. Rotate to display"Pr.CA" and press SET bottom, the screen of operator will displays the initial value of 0. Rotate and change the value of "1" and press the SET write

Change the value of "1" and press the SET write, the screen displays parameter codes one by one, which represents all parameter setting values in operator's memory are currently copied to the memory of the inverter.

When COPY is completed, the screen will display "END" and blink.

5.3 Appendix III
SF-GT series of inverter torque control tuning instructions
The basic functional parameters of torque control:

●   Requirements of torque control:

    1. Hardware configurations: When PG card installed, refer to PG card installation manual for correct wiring connection. Encoder and motor shaft need stable connection (No slippage)

        Driver software version: P188 = 0.121 and above

        Control Mode: P.300 = 4 (MUST be under closed-loop vector control mode, Torque control will be valid)
        Under a pure torque mode to give a torque command. What if a motor FWD and REV rotation cannot be achieved through a switch of FWD and REV, it must switch the given positive and negative torque command.

    2. Parameter setting procedure:
        (1) P.301 = 1 or 2, in accordance with the motor nameplate to correctly set values of P.302-P.307, performed motor parameter auto-tuning. (Specific details, please refer to the vector control tuning method of inverter operation manual)

        (2) P.300 = 4, in accordance with the encoder nameplate and wiring to correctly set values of P.350 ~ P.351, perform normal under speed mode operation; (Motor does not jitter, P161 = 10, use voltage profile to monitor digital and operating frequency value ± 1HZ or the same, please refer to section of 3.4 tuning method, closed-loop vector control FOC + PG)

        (3) P.400 = 1, the torque mode ON is active

        (4) P.401 = Internal torque command, set to a positive number represents a positive torque; set to a negative number represents a negative torque. When P.405 = 0, P.401 setting is active;

        (5) P.402 = Forward speed limit

        (6) P.403 = Reverse speed limit

        (7) P.404: Torque filter time constant, general users do not need to set;

        (8) P.405: Torque command source, 0: from P.401.
        1: From analog terminal (need to stick with P.500 or P.501 or P.502 set to 2).
        2: From communication.

        (9) P.406: Torque mode speed limit sources,
        0: From the value of parameter P.402, P.403.
        1: From the panel (or analog "determined by the value of P.79"), the value of P.403, in which case the motor first running, walking acceleration and deceleration curve (soft start).

        (10) P.407: speed loop preference,

0: The value of P.403 works on both directions (for example: Analog given positive moments and started forward, output frequency = frequency + P.403 * P.305. Given the amount of positive analog and start reversing, the output frequency = P.403 * P.305).

1: The value of P.403 is only applied in the opposite direction. (Example: Analog given positive moments and started forward, output frequency = frequency. For a given amount of positive moments analog and start reversing, the output frequency = P.403 * P.305.)

3. torque mode FWD and REV rotation problem:

(1) When P.401> 0 or amount of analog gives positive voltage, the INV receives a positive torque command, press FWD or REV, motor will rotate forward, when FWD is pressed, the upper limit of speed = P.402 + P.403 , when you press REV, the upper limit of speed = P.403;

(2) When P.401 <0 or the amount of analog gives a negative voltage, the INV receives a negative torque command, press the FWD or REV, motor will only rotate reverse when FWD is pressed, the upper limit of speed = P.403, when REV is pressed, the upper limit of speed = P.402 + P.403;

Note: When the torque command is set to negative voltage, the amount of analog needs to be set to maximum and minimum negative voltage; for example, 2-5 terminal is defined as torque command 0 ~ ± 10V. When external switch is switched to positive or negative voltage, you need to set P.511 = -100, after that, setP.513 = 10 (power cycle after setting)

4. Torque speed mode switch:
Set terminal function(P80~P86) to be 55, when terminal closed(ON), it is torque mode; when terminal opened(OFF), it is speed mode(P.400=0 can achieve this situation). Note: When speed control is switched to torque control, torque limit becomes torque command, and speed command becomes speed limit. When torque control gets back to speed control, torque command becomes torque limit, and speed limit becomes speed command.

5. When the motor under torque mode was found with oscillatory instability, appropriately decrease the setting value of P.312, power cycle.

6. When in a use of amount of analog as torque signals under torque control status, if torque has slow response, you can properly reduce the set value of P.60.

5.4 Appendix IV

Motor insulation measurement method:

     Motor insulation measure is divided into two, one is winding the insulation, the another is winding phase insulation. We are using 500V (Commonly known as the shake table) measurement, shake table shape as shown below.

1. When measuring winding of the insulation, you should take off the motor wiring from UVW terminals of INV.

2. with a shake table pen then the motor housing, turn to shake, to about 120 rev / min, when the other end of the pen then winding, when the reading is stable, that is, the windings of the insulation resistance. To three windings were measured three times the normal motor has a star or a triangle (jumper) connections connected, only leads to three qualifying, then simply shake test once on the line.

3. Phase insulation is the insulation between windings, we should take off the star or triangle the short-circuited, then shake table two leads are connected to U, V winding, turn to shake, to about 120 rev/min, when the reading is stable, that is the windings of the insulation resistance, the three-phase windings (UVW) were tested three times accordingly.

4. General electrical insulation resistance under normal temperature should be greater than 5 MΩ which represents insulation proper.

Turn to