Preface

Thank you for choosing the GTAKE GK690 Series Vector Control AC Motor Drives.

The GK690 Series is a vector AC Motor Drive that can perfectly control AC asynchronous motors and permanent magnet synchronous motors. With built-in PID, multi-speed, simple PLC, I/O terminals, given pulse frequency, power failure and stop parameter storage, given dual frequency source control, VF separation, no instantaneous interruption and swing frequency control, it provides highly integrated solutions for equipment manufacturing customers and is of great value in reducing system costs and improving system reliability.

This manual will provide you with installation, wiring, parameter setting, troubleshooting, daily maintenance and other related features, as well as operating methods and precautions.

In order to use this series of drives correctly, give full play to its excellent performance and ensure the safety of users and equipment, please be sure to read this manual carefully before using the GK690 Series of AC Motor Drives. Improper use may cause the AC Motor Drive to operate abnormally, malfunction, or even result in equipment damage, casualties or other accidents!

Please keep this user manual properly.

When the AC Motor Drive is connected to the motor for the first time, please set the motor nameplate parameters: rated frequency, rated power, rated voltage, rated current, rated speed, rated power factor and motor connection method.

Since we are always committed to the continuous improvement of products, the product information is subject to change without prior notice.

For the latest changes and more, please consult GTAKE team.

Contents

Chapter 1 Safety Precautions

The safe operation of this product depends on correct transportation, installation, operation and maintenance. Before performing these tasks, be sure to pay attention to the relevant safety tips.

1.1 Definitions of Safety Signs

There are three safety signs in this manual. Please be fully familiar with the following icons and meanings, and be sure to comply with the marked precautions before continuing to read this manual.

	**Danger**	It indicates that improper use may cause danger and may result in personal injury or death.
	**Prohibited**	It indicates a matter that must not be done.
	**Attention**	It indicates that improper use may cause danger, which may cause moderate or slight personal injury or damage to the equipment.

1.2 Safety Matters

Purpose

Danger
◆ This series of drives should not simply be used in medical equipment and other situations directly related to personal safety. ◆ This series of drives are produced according to a strict quality management system. If failure of the drive may cause major accidents or losses, safety measures such as redundancy or bypass need to be adopted.

Arrival inspection

Attention
◆ Check whether the drive is damaged; if there is any damage or missing part, do not install, or an accident may occur. ◆ Check whether the rating on the nameplate is consistent with your ordering requirements. If not, please contact the manufacturer in time.

Installation

Attention
◆ When transporting and installing, please hold the bottom of the product. Do not just hold the shell to allow the LED keypad display unit or cover to bear force to prevent injury and damage due to falling. ◆ The drive should be installed on flame-retardant materials such as metal, away from flammable objects and heat sources. ◆ The installation and use environment should be free of rain, water droplets, steam, dust and oily dirt; no corrosive, flammable gases, liquids; no metal particles or metal powders, etc. ◆ Do not drop or leave metal foreign objects inside the drive, or there is a risk of fire and property damage. ◆ During installation, do not let drilling residue fall into the inside of the drive, or it may cause drive failure. ◆ If the drive is installed in a cabinet, ensure smooth ventilation between the control cabinet and the outside. ◆ The control loop wiring should be separated from the power loop wiring to avoid possible interference.

Wiring

Danger
◆ Wiring must be performed by qualified personnel, or there is a risk of electric shock or damage to the drive. ◆ Before wiring, make sure the input power is completely disconnected, or there is a risk of electric shock or fire. ◆ The ground terminal PE of the drive must be reliably grounded, or there is a risk of electric shock. ◆ The leakage current of the drive is greater than 3.5mA. To ensure safety, the drive and motor must be grounded. ◆ Do not touch the main circuit terminals, and do not contact the main circuit terminal wiring of the drive with the shell, or there is a risk of electric shock. ◆ The connection terminals of the braking resistor are (+) and PB. Do not connect other terminals as this may cause a fire. ◆ The exposed part of the nose of the main circuit wiring cable should be wrapped with insulating tape, or there is a risk of property damage.

Wiring

Attention

- The three-phase power supply mustn't be connected to the output terminals U, V, and W, or the drive will be damaged.
- It is absolutely prohibited to connect capacitors or phase-advanced LC/RC noise filters to the output end of the drive, or the internal components of the drive will be damaged.
- Confirm whether the number of power supply phases and rated voltage are consistent with the nameplate of the product, or the drive may be damaged.
- The main circuit wiring and control circuit wiring of the drive should be routed separately or cross vertically, or the control signal will be interfered.
- When the cable length between the drive and the motor is long (>50) meters, it is recommended to use an output reactor to prevent overcurrent caused by excessive distributed capacitance from causing drive failure. Please consult the manufacturer's technical personnel for details.

Operation

Danger

- Do not operate the drive when your hands are wet, or there is a risk of electric shock.
- The drive can only be powered after the wiring is completed and the cover is installed. It is strictly forbidden to remove the cover while the power is on, or there is a risk of electric shock.
- When the automatic fault reset or restart after power outage function is set, safety isolation measures should be taken for the mechanical equipment, or personal injury may occur.
- Only after confirming that the operation command has been cut off can the fault and alarm signals be reset, or personal injury may occur.

Attention

- Do not start or stop the drive by turning on or off the power supply, or the drive may be damaged.
- Before operation, please confirm whether the motor and machinery are within the allowed range of use, or the equipment may be damaged.
- Do not touch the radiator and braking resistor as they are very hot, or there is a risk of burns.
- When used on lifting equipment, a mechanical brake device should be provided.
- Do not change the parameters of the drive at will. Most of the factory-set parameters can meet the operating requirements. Only some necessary parameters need to be set. Modifying the parameters at will may cause damage to the mechanical equipment.

- Where there is switching between power frequency and variable frequency, the two contactors controlling the switching between power frequency and variable frequency should be interlocked.

Repair and inspection

Danger
◆ Do not touch the terminals of the drive when the power is on, or there is a risk of electric shock. ◆ Be sure to turn off the power before removing the cover. ◆ Repair and inspection can be carried out after at least 10 minutes of power off. At this time, the charging indicator light is completely extinguished or the positive and negative bus voltages are confirmed to be below 36V. Otherwise, the residual voltage of the main circuit electrolytic capacitor may cause electric shock to personnel. ◆ Please designate qualified electrical engineers to perform maintenance, inspection or replacement of parts.

Attention
◆ There is a CMOS large-scale integrated circuit on the circuit board. Do not touch it with your hands to prevent static electricity from damaging the circuit board.

Repair and inspection

Prohibited
◆ It is prohibited to switch loads at the output end during operation of the drive. ◆ Do not touch the high-voltage terminals inside the drive to prevent electric shock. ◆ Live work is prohibited. ◆ Non-professionals are prohibited from performing maintenance, inspection or replacement of parts.

Maintenance

Attention
◆ Clean the cooling fan regularly and check to see if it is normal; clean dust accumulated in the machine regularly. ◆ Check regularly whether the input and output wiring of the drive is damaged or loose. ◆ Check whether the wiring screws of each terminal are tight. Check the wires for aging. ◆ The electrolytic capacitor of the drive may explode when burned, and various circuit boards will also produce toxic gases when burned. Therefore, the drive should be recycled through relevant departments for environmental protection.

1.3 Precautions

Motor insulation check

When the motor is used for the first time, before reuse after being left for a long time, and during regular inspections, the motor insulation should be checked to prevent damage to the drive due to insulation failure of the motor windings. During insulation inspection, the motor connection must be separated from the drive. It is recommended to use a 500V voltage megohmmeter to ensure that the measured insulation resistance is not less than 5MΩ.

Thermal protection of motor

When an adapted motor is selected, the drive can implement thermal protection for the motor. If the selected motor does not match the rated capacity of the drive, especially when the rated power of the drive is greater than the rated power of the motor, be sure to adjust the motor protection parameters in the drive or install a thermal relay in front of the motor to protect the motor.

Operation above power frequency

This drive can provide output frequency from 0Hz to 300Hz. To operate above 50Hz, in addition to the vibration and noise increase of the motor, the bearing capacity of the motor bearings and mechanical devices must also be considered.

Resonance of mechanical devices

Within a certain output frequency range, the drive may encounter the mechanical resonance point of the load device, which can be avoided by setting the jump frequency parameters of the drive.

Lubrication of mechanical devices

Mechanical devices that require lubrication, such as reduction boxes and gears, may be damaged due to poor lubrication effects when running at low speeds for a long period of time. Be sure to check in advance.

About motor heat and noise

Because the output voltage of the drive is a PWM wave, it contains certain harmonics. Therefore, when using the drive, the temperature rise, noise and vibration of the motor will increase slightly compared with power frequency operation.

When there is a voltage-sensitive device or a capacitor to improve the power factor on the output side

The output of the drive is a PWM wave. If the output side is equipped with a capacitor to improve the power factor or a varistor for lightning protection, it may easily cause instantaneous overcurrent of the drive or even damage the drive. Please do not use.

Contactors and other switching devices used at the input and output ends of the drive

If a contactor is installed between the power supply and the input end of the drive, this contactor is not allowed to control the start and stop of the drive. When it is necessary to use this contactor to control the start and stop of the drive, the interval should not be less than one hour. If a contactor or other switching device is installed between the output end and the motor, ensure that the drive is switched on and off when there is no output, or the module within the drive may be easily damaged.

Use outside the rated voltage value

It is not suitable to use the GK690 Series drive outside the allowable operating voltage range specified in the manual, as it may easily cause damage to the components in the drive. If necessary, please use the corresponding step-up or step-down device for voltage transformation.

Three-phase input changed to two-phase input

The three-phase drive in the GK690 Series cannot be changed to two-phase. Otherwise it will cause malfunction or damage to the drive.

Lightning surge protection

This series of drives is equipped with a lightning overcurrent protection device, which has certain self-protection capabilities against induced lightning. For areas where lightning is frequent, customers should also install additional protection on the front end of the drive.

Altitude and derating use

In areas where the altitude exceeds 1000m, the heat dissipation effect of the drive becomes poor due to the thin air and must be derated. In this case, please contact us for technical consultation.

Some special usage

If you need to use methods other than the recommended wiring diagrams provided in this manual, such as common DC bus, please contact us.

Attention when scrapping the drive

The electrolytic capacitors in the main circuit and the electrolytic capacitors on the printed circuit board may explode when burned. Toxic gases are produced when plastic parts are burned. Please dispose of it as industrial waste.

About adapting motors

1) The cooling fan of the non-variable frequency motor is coaxially connected to the rotor shaft. When the rotation speed decreases, the cooling effect of the fan decreases. Therefore, when the motor overheats, a strong exhaust fan should be installed or replaced with a variable frequency motor;

2) The drive has built-in standard parameters of adaptive motor. According to the actual situation, it is necessary to identify the motor parameters or modify the default values to match the actual values as much as possible, otherwise the operation effect and protection performance will be affected;

3) A short circuit inside the cable or motor may cause the drive to alarm or even crash. Therefore, please first perform an insulation short-circuit test on the initially installed motor and cables. This test also needs to be performed regularly during routine maintenance. Note that when doing this kind of test, be sure to completely disconnect the drive from the part being tested.

Chapter 2 Product Introduction

2.1 Description of Drive Nameplate

On the lower right side of the drive, there is a nameplate indicating the model and rating of the drive. The content of the nameplate is shown in Figure 2-1:

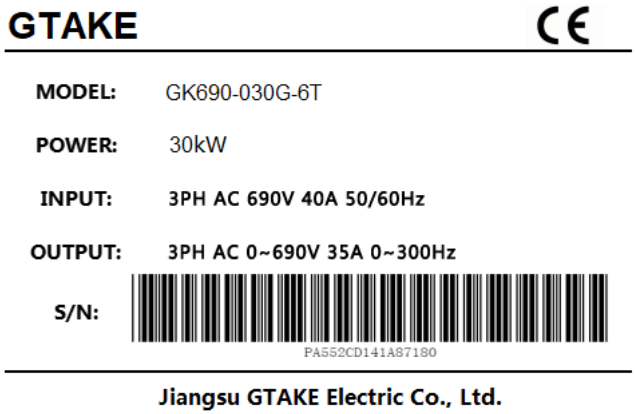


Figure 2-1 Nameplate

2.2 Drive Naming Rules

The naming rules of the drive are shown in Figure 2-2:

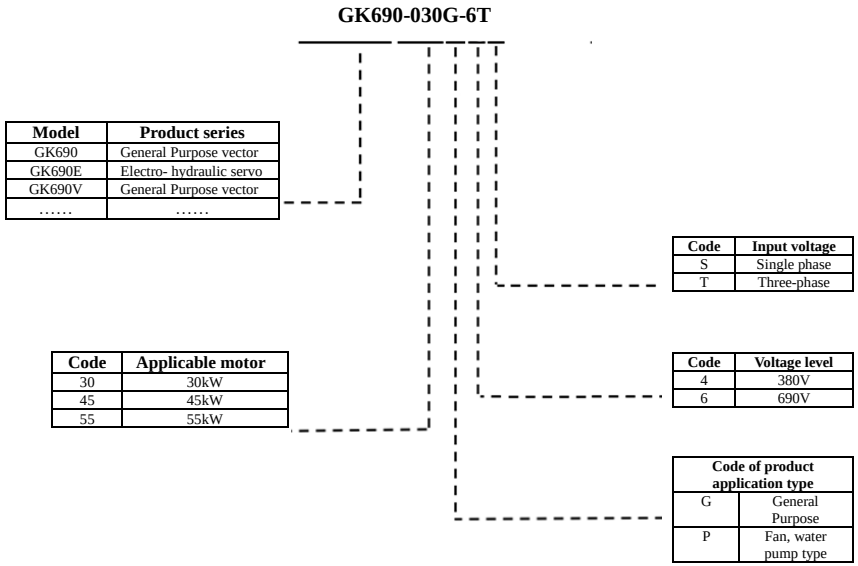


Figure 2-2 Product naming rules

2.3 Models of GK690 Drive Series

Table 2-1 List of GK690 690V series drive models

Drive model	Input Voltage/V	Rated output Power/kW	Rated output current/A	Adaptive motor /kW
GK690-015G-6T	Three-phase 690V	15.0	19	15.0
GK690-018G-6T		18.0	22	18.0
GK690-022G-6T		22.0	28	22.0
GK690-030G-6T		30.0	35	30.0
GK690-037G-6T		37.0	45	37.0
GK690-045G-6T		45.0	54	45.0
GK690-055G-6T		55.0	63	55.0
GK690-075G-6T		75.0	86	75.0
GK690-090G-6T		90.0	98	90.0
GK690-110G-6T		110.0	121	110.0
GK690-132G-6T		132.0	150	132.0
GK690-160G-6T		160.0	175	160.0
GK690-185G-6T		185.0	198	185.0

GK690-200G-6T		200.0	218	200.0
GK690-220G-6T		220.0	245	220.0
GK690-255G-6T		255.0	270	255.0
GK690-280G-6T		280.0	320	280.0
GK690-315G-6T		315.0	350	315.0
GK690-355G-6T		355.0	380	355.0
GK690-400G-6T		400.0	430	400.0
GK690-450G-6T		450.0	466	450.0
GK690-500G-6T		500.0	540	500.0
GK690-560G-6T		560.0	600	560.0
GK690-630G-6T		630.0	680	630.0
GK690-710G-6T		710.0	770	710.0
GK690-800G-6T		800.0	870	800.0
GK690-1000G-6T		1000.0	1080	1000.0
GK690-1200G-6T		1200	1240	1200.0
GK690-1400G-6T		1400	1460	1400.0

2.4 General Technical Specifications

Table 2-2 General technical specifications

Item		Specification
Power Input	Rated voltage	AC 3PH 690V (-15%~+15%)
	Rated input current	See Table 2-1
	Rated frequency	50Hz/60Hz, fluctuation range ±5%
Power Output	Standard applicable motor	See Table 2-1
	Rated capacity	See Table 2-1
	Rated current	See Table 2-1
	Output voltage	3-phase output under rated input conditions, 0~rated input voltage, error less than ±3%
Basic functions	Maximum frequency	0~300Hz, 0~3000Hz can be customized according to customer needs
	Carrier frequency	0.5KHz~16.0KHz, carrier frequency can be automatically adjusted
	Input frequency resolution	Digital setting: 0.01Hz; analog setting: 0.1Hz
	Control mode	V/F control, vector control 1 without PG, vector control with PG
	Starting torque	0.5Hz/150%
	Overload capacity	For G model, 150% rated current for 60 seconds; 180% rated current for 10 seconds (G model)
	Torque boost	Automatic torque boost; manual torque boost 0.1%~30.0%
	Acceleration and deceleration curve	Linear or S-curve acceleration and deceleration mode. Four acceleration and deceleration times, ranging from 0.0 to 3600.0s
	DC braking	DC braking frequency: 0.00Hz~maximum frequency, braking time: 0.0s~50.0s, braking action current value: 0.0%~100.0%
	Jog control	Jog frequency range: 0.00Hz~50.00Hz. Jog acceleration and deceleration time 0.0s~3600.0s
	Simple PLC, multi-speed operation	Up to 16-speed operation can be achieved through built-in PLC or control terminals
	Built-in PID	Process closed-loop control can be realized easily
	Automatic voltage	Automatically keeps the output voltage constant when the grid

	regulation (AVR)	voltage changes
	Current suppression	When the VF operating load changes, the output current is automatically limited
	Fast current limiting function	Minimizes overcurrent faults and protects the normal operation of the drive
	Dynamic overvoltage suppression	Automatically suppresses energy feedback when the operating frequency changes to prevent bus overvoltage tripping
	Oscillation suppression	Optimizes the VF oscillation suppression algorithm to achieve stable VF operation
Personalized function	Non-stop during instantaneous power outage	During instantaneous power outage, the load feedback energy is used to compensate for the voltage drop, allowing the drive to continue running in a short period of time
	V/F separation control	Independently adjust the voltage and frequency given
	Support multiple fieldbuses	Support multiple fieldbuses: Modbus, Profibus-DP, CANopen
	Fan control	Control fan operation mode and extend fan life
Operation	Command source	Operation panel given, control terminal given, communication given, switched in a variety of ways
	Frequency source	9 frequency sources: digital given, analog voltage given, analog current given, pulse given, communication given, switched in a variety of ways
	Auxiliary frequency source	9 auxiliary frequency sources, which can flexibly realize auxiliary frequency fine-tuning and frequency synthesis
	Input terminal	Standard: 8 digital input terminals, one of which supports high-speed pulse input up to 50KHz 2 analog input terminals, supporting 0~10V voltage input or 0/4~20mA current input;
	Output terminal	Standard: 2 analog output terminals, supporting 0~10V voltage output or 0/4~20mA current output 2 open-collector output terminals, one of which supports 0~50KHz square wave signal high-speed pulse output 2 relay output terminals
Display and	LED display	Display parameters

keypad operation	Parameter copy	Parameters can be quickly copied through the LED operation panel
	Key lock and function selection	Lock part or all of the keys and define the scope of some keys to prevent misoperation
	Protection function	Power-on motor short circuit detection, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheating protection, overload protection, etc.
Environment	Location of use	Indoor, away from direct sunlight, no dust, corrosive gases, flammable gases, oil mist, water vapor, dripping water or salt, etc.
	Altitude	< 1000m (derate when higher than 1000m)
	Ambient temperature	-10°C~+40°C (derate when the ambient temperature is 40°C~50°C)
	Humidity	< 95%RH, no condensation
	Vibration	< 5.9m/s² (0.6g)
	Storage temperature	－20℃~＋60℃

2.5 Dimensions

2.5.1 Overall Dimensions of the Machine

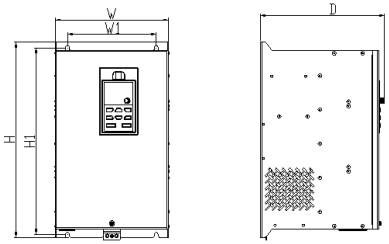
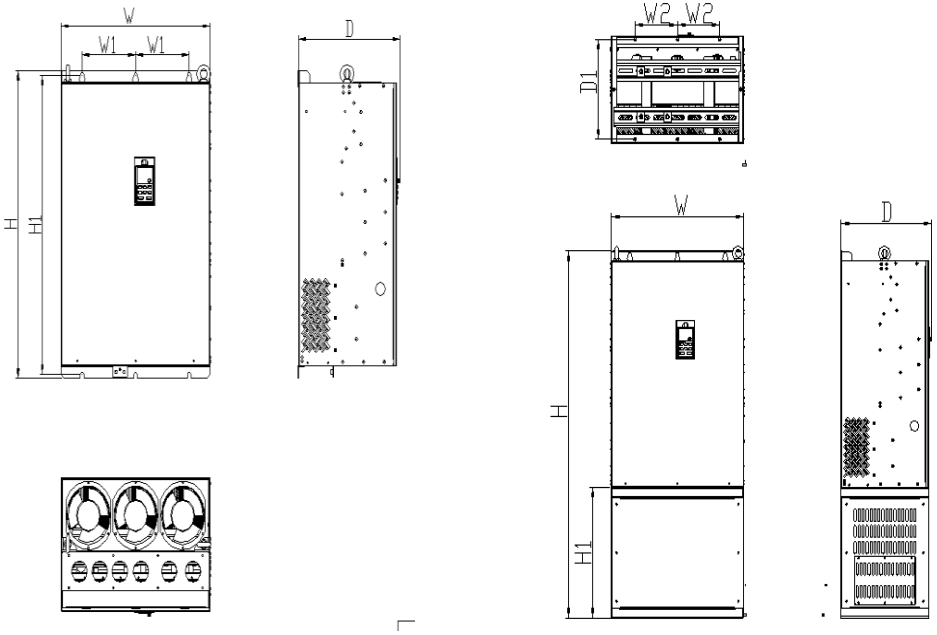


Figure 2-3 Standard dimensions of 690V drive (applicable to 15~255kW models)

Table 2-3 Overall dimensions and mounting clearance of GK690 690V drive (applicable to 15~255kW) (unit: mm)

Model	W (mm)	H (mm)	D (mm)	W1 (mm)	H1 (mm)	Mounting hole dia. F (mm)
GK690-015G-6T	270	415	282	170	397	Φ6
GK690-018G-6T						
GK690-022G-6T						
GK690-030-6T						
GK690-037G-6T						
GK690-045G-6T						
GK690-055G-6T						
GK690-075G-6T	270	575	291	170	557	Φ6
GK690-090G-6T						
GK690-110G-6T						
GK690-132G-6T						
GK690-160G-6T	335	693	354	200	667	Φ10
GK690-185G-6T						
GK690-200G-6T						
GK690-220G-6T						
GK690-255G-6T						



(Excluding base) (Including base)

Figure 2-4 Standard dimensions of 690V drive (applicable to 280~800kW models)

Table 2-4 **Overall dimensions and mounting clearance of 690V drive (applicable to 280~800kW models)**

(unit: mm)

Model	W (mm)	H (mm)	D (mm)	W1 (mm)	W2 (mm)	D1 (mm)	H1 (mm)	Mounting hole dia. F (mm)
GK690-280G-6T (excluding base)	490	857	391	180			831	Φ12
GK690-315G-6T (excluding base)								
GK690-355G-6T (excluding base)								
GK690-400G-6T (excluding base)								
GK690-280G-6T (including base)	490	1282	391		185	350	453	Φ10
GK690-315G-6T (including base)								
GK690-355G-6T (including base)								
GK690-400G-6T (including base)								
GK690-450G-6T (excluding base)	550	887	391	180			861	Φ12
GK690-500G-6T (excluding base)								
GK690-560G-6T (excluding base)								
GK690-450G-6T (including base)	550	1315	391		160	350	455	Φ10
GK690-500G-6T (including base)								
GK690-560G-6T (including base)								
GK690-630G-6T (excluding base)	680	1150	393	230			1190	Φ12
GK690-710G-6T (excluding base)								
GK690-800G-6T (excluding base)								
GK690-630G-6T (including base)	680	1600	375		230	356	500	Φ10
GK690-710G-6T (including base)								
GK690-800G-6T (including base)								

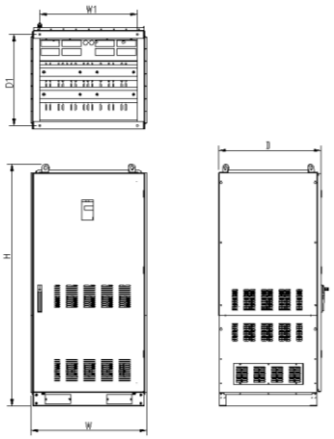


Figure 2-5 Standard dimensions of 690V drive (applicable to 1000~1400kW models)

Table 2-5 Overall dimensions and mounting clearance of 690V drive (applicable to 1000~1400kW models) (unit: mm)

Model	W (mm)	H (mm)	D (mm)	W1 (mm)	W2 (mm)	D1 (mm)	H1 (mm)	Mounting hole dia. F (mm)
GK690-1000G-6T (cabinet)	1000	2100	750	454	4	656		Φ14
GK690-1200G-6T (cabinet)								
GK690-1400G-6T (cabinet)								

2.5.2 Keypad Dimensions

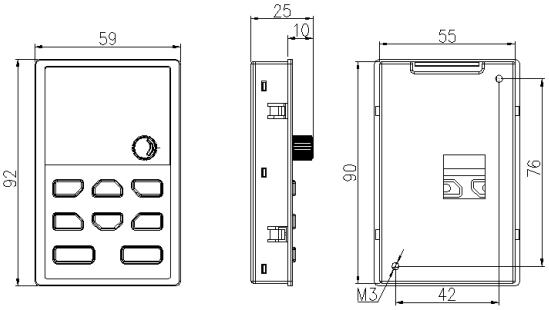


Figure 2-6 Keypad installation opening size 55*90 (mm)

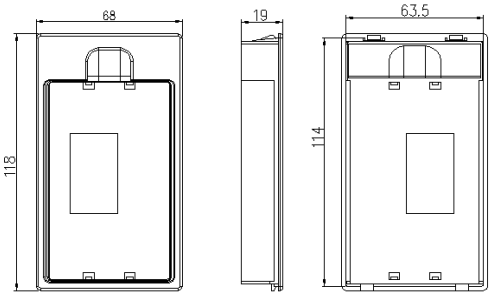


Figure 2-7 Keypad tray installation opening size 63.5*114 (mm)

2.6 Daily Care and Maintenance of drive

2.6.1 Daily Maintenance

Due to the influence of environmental temperature, humidity, dust and vibration, the components inside the drive will age, causing potential failures or reducing the service life of the drive. Therefore, it is necessary to perform daily and regular maintenance on the drive.

Note:

After disconnecting the power supply, there is still high voltage on the filter capacitor, so the drive cannot be repaired or maintained immediately. It can only be carried out after the power is cut off for 10 minutes and the bus voltage does not exceed 36V.

Daily inspection items:

1) Is the sound produced by the motor abnormal when it is running

2) Is there any vibration during motor operation

3) Is there any change in the installation environment of the drive

4) Is the drive cooling fan working properly

5) Is the drive overheated

Daily cleaning:

1) Always keep the drive in a clean state.

2) Effectively remove dust on the upper surface of the drive and prevent dust from entering the inside of the drive, especially metal dust.

3) Effectively remove oil stains from the cooling fan of the drive.

2.6.2 Regular Inspection

Depending on the usage environment, users should conduct regular inspections of the drive every 3~6 months.

☞Note:

1. Only professionally trained personnel can disassemble components, perform maintenance and replace devices;

2. Do not leave screws, gaskets or other metal objects in the machine, or there is a risk of damaging the equipment.

Regular inspection items:

1) Check the air ducts and circuit boards, and remove the dust on them regularly

2) Check whether the screws are loose

3) Check whether the drive is corroded

4) Check whether the terminals have poor contact and whether there are traces of arcing

5) Test main circuit insulation

6) Check whether the insulation wrapping tape on the power cable nose has fallen off

☞Note:

1) The drive has passed the dielectric strength test before leaving the factory. Users are not allowed to perform the test to avoid device damage due to improper testing;

2) When measuring the insulation resistance with a megohmmeter (please use a DC 500V megohmmeter), disconnect the main circuit line from the drive. Do not use an insulation resistance meter to test control circuit insulation.

2.6.3 Replacement of Wearing Parts

The wearing parts of the drive mainly include cooling fan and electrolytic capacitor for filtering. Their service life is closely related to the environment in which they are used and the maintenance status. The general life time is:

Device name	Life time
Fan	30,000 ~ 40,000 hours
Electrolytic capacitor	40,000 ~ 50,000 hours
Relay	About 100,000 times

Users can determine the replacement period based on the running time.

1. Cooling fan

   Possible causes of damage: bearing wear, blade aging.

   Criteria: Check whether there are any cracks in the fan blades, and whether there is a sound of abnormal vibration when starting up.

2. Filter electrolytic capacitor

   Possible causes of damage: Poor input power quality, high ambient temperature, frequent load jumps, and electrolyte aging. Criteria: Whether there is liquid leakage, whether the safety valve has protruded, measurement of electrostatic capacitance, measurement of insulation resistance.

3. Relay

   Possible causes of damage: Corrosion, frequent movement;

   Criteria: opening and closing failure.

2.6.4 Storage of drive

After purchasing the drive, the user must pay attention to the following points during temporary storage and long-term storage:

1) When storing, try to pack it into the original packaging box.

2) Long-term storage will cause the deterioration of the electrolytic capacitor. It must be powered on once within 2 years for at least 5 hours. The input voltage must be slowly increased to the rated value using a voltage regulator.

2.7 Drive Warranty Instructions

For specific warranty terms, please refer to the warranty agreement in the warranty card.

Chapter 3 Installation and Wiring

3.1 Installation of Drive

3.1.1 Installation Environment

The drive should be installed indoors in a well-ventilated place, and should be installed vertically:

(1) Ambient temperature: -10°C~40°C. If the ambient temperature is higher than 40°C, external forced cooling or derating is required.

Derate by 20% for every 5°C increase;

(2) The humidity of the installation site should be less than 90%, and no condensation occurs;

(3) Avoid installation in places with a lot of dust and metal powder;

(4) Avoid installation in places with corrosive and explosive gases;

(5) The vibration in the installation site should be less than 0.6g;

(6) Do not install in places exposed to direct sunlight;

(7) Do not install on flammable objects such as wood.

If you have special installation requirements, please consult and confirm with the manufacturer in advance.

3.1.2 Installation and Spacing Requirements

The installation of the drive should have sufficient ventilation distance, as shown in Figure 3-1; the installation of multiple drives is as shown in Figure 3-2(a). When two drives need to be installed up and down, the drives should be separated by a deflector, as shown in Figure 3-2(b).

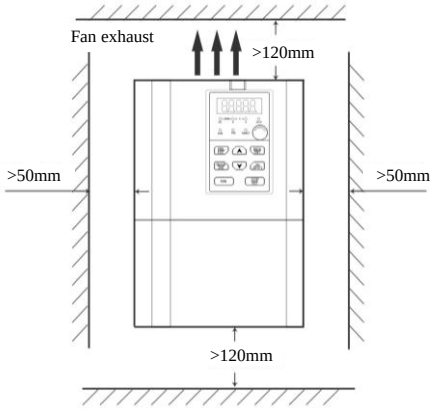


Figure 3-1 Installation distance of drive

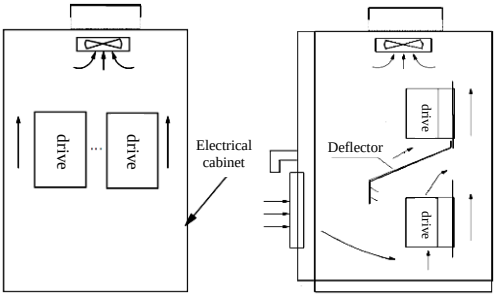


Figure 3-2 Installation of multiple drives

3.2 Wiring of Drives

3.2.1 Connection between drive and Peripheral Devices

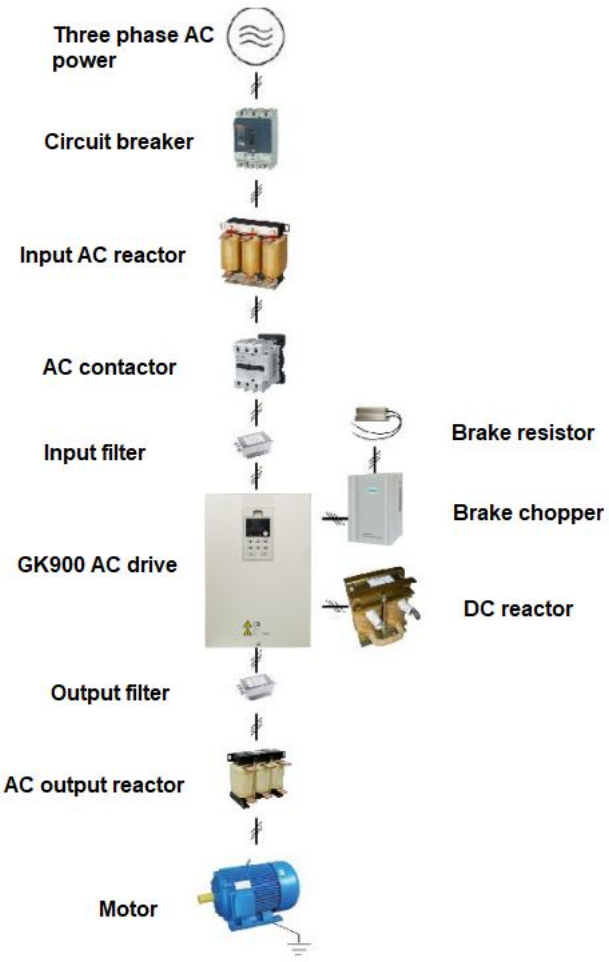


Figure 3-3 Connection between product and peripheral devices

3.2.2 Standard Wiring Diagram

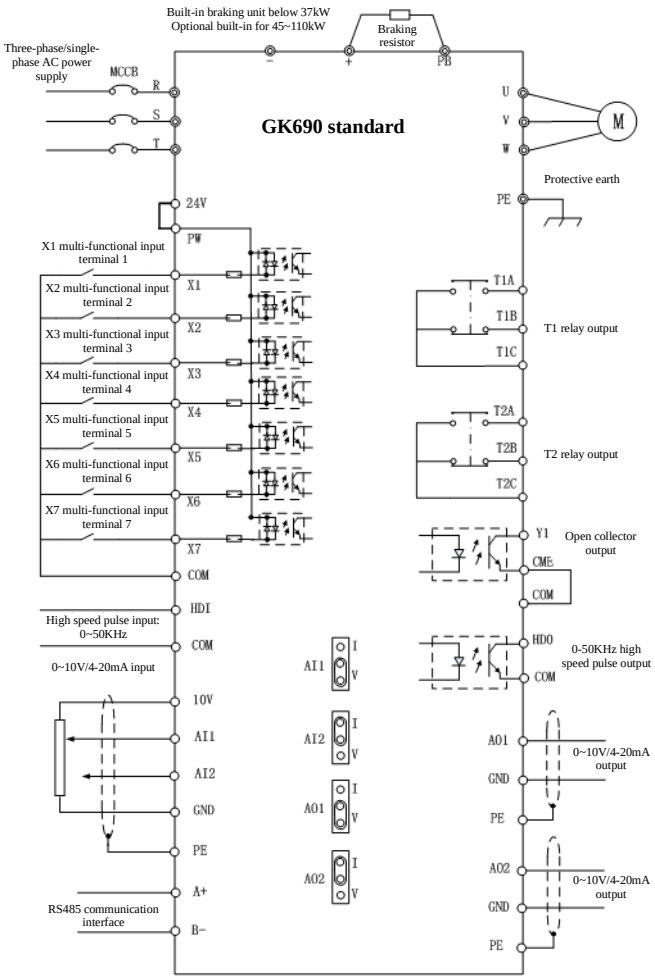


Figure 3-4 Basic wiring diagram of drive

Tip:

◎○In the figure, “ ” is the main circuit terminal, and “ ” is the control terminal.

AI1 and AI2 are jumpers for analog voltage and current input selection.

AO1 and AO2 are jumpers for analog voltage and current output selection.

3.2.3 Terminal Configuration

Before starting the terminal wiring, you need to first remove the drive cover (see the removal and installation of the cover for details) and find the main circuit terminals located at the lower end of the drive and the control terminals on the control board, as shown in the figure below.

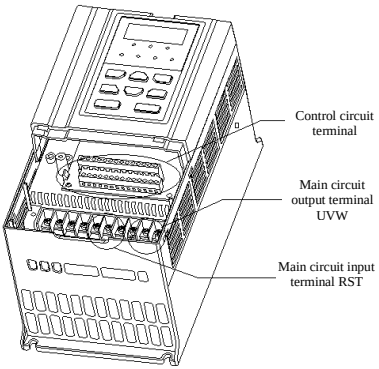


Figure 3-5 Main circuit terminal location

3.2.4 Main Circuit Wiring Diagram

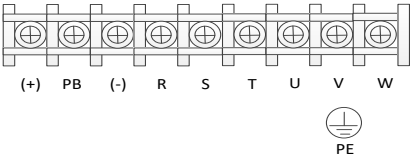


Figure 3-6 0.75~37kW main circuit terminals

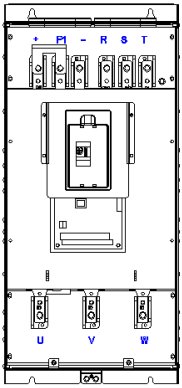


Figure 3-7 45~110kW main circuit terminals

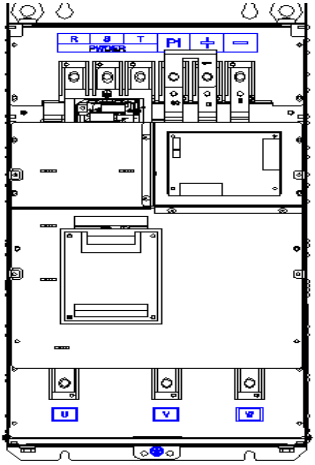


Figure 3-8 132~185kW main circuit terminals

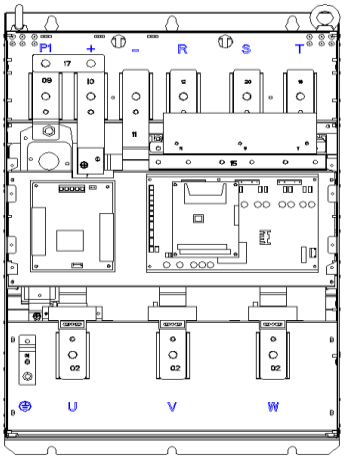


Figure 3-9 200~255kW main circuit terminals

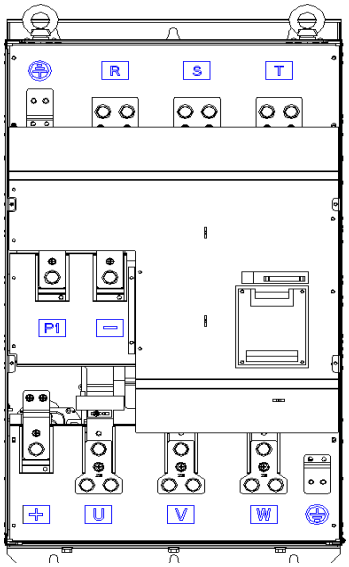


Figure 3-10 280~355kW main circuit terminals

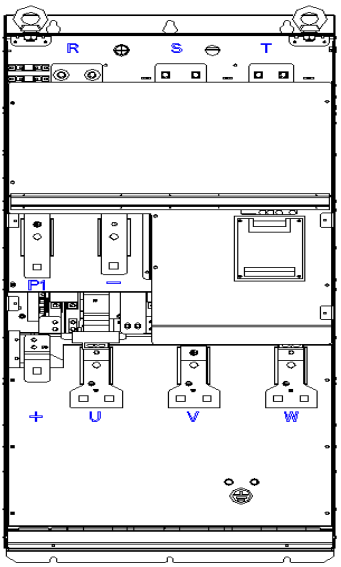


Figure 3-11 400~500kW main circuit terminals

Chapter 4 Running and Operation

4.1 Operation Panel Display Interface

The LED keypad is the main unit for drive operation control, parameter setting and display. The GK690 Series drive comes standard with an LED keypad with an adjustable potentiometer, as shown in Figure 2.6. The appearance of the keypad is shown in Figure 4-1.

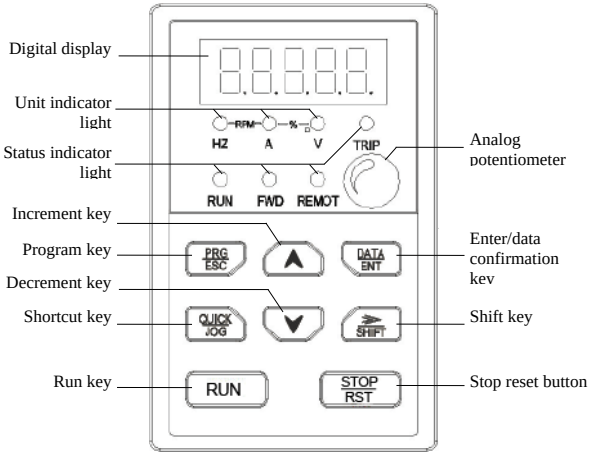


Figure 4-1 Schematic diagram of LED keypad display unit

4.2 Keypad Operation Method

4.2.1 Key Function Description

The LED keypad of the drive has 8 buttons, and their function definitions are shown in Table 4-1 below.

Table 4-1 Key description

Key	Key name	Description
PRG ESC	Program	Enter or exit the first-level menu: press this key to enter the function code editing state, press it again to return to the previous state
DATA ENT	Enter/data confirmation	Enter the next level menu or confirm data
∧	Increment	Increment of data or function

Key	Key name	Description	
	Decrement	Decrement of data or function	
SHIFT	Shift	Used to select data bits when modifying parameters In the stopped or running display interface, it can be used to cycle through the selection of display parameters	
RUN	Operation	In the operation panel control mode, it is used for running operations	During the operation of the drive, press the RUN and STOP keys at the same time, and the drive will coast to a stop
STOP RST	Stop/reset	In running state, press this key to stop the running operation; in fault state, it can be used to reset the operation. The characteristics of this key are restricted by function code F7.04	
QUICK JOG	Shortcut/Jog	Press and hold it to start jogging, release to return to the state before jogging	

4.2.2 LED Indicator Description

The drive LED operation panel is equipped with five 8-segment LED digital tubes, 3 unit indicators, and 4 status indicators. As shown in Figure 4-1. The LED digital tube can display various monitoring data such as set frequency and output frequency, as well as alarm codes, etc. The combination of 3 unit indicator lights can display five unit indicators. The meanings of status and unit indicators are explained in Table 4-2 below.

Table 4-2 Indicator light function description

Marking		Indicator light	Meaning
Status light	RUN	Running indicator light	Turns on when running, turns off when stopped
	FWD	Forward and reverse rotation indicator light	Turns on when rotating forward, turns off when rotating reversely
	REMOT	Terminal control indicator light	Turns on when the terminal controls the drive to start or stop
	TRIP	Fault indicator light	Turns on when the drive fault alarms
Unit light	Hz	Frequency indicator light	Frequency unit indication: When flashing, it is the current frequency setting value; When the light is on, it is the current frequency operating value.
	A	Current indicator light	Current unit indicator light

	V	Voltage indicator light	Voltage unit indicator light
	RPM	Speed indicator light	Speed unit indicator light: When flashing, it is the current speed setting value; When the light is on, it is the current running speed value.
	%	Percent indicator light	Percent unit indication: When flashing, it is the current parameter setting value; When the light is on, it indicates the current parameter operation.

4.2.3 Status Display Switching Method

The GK690 Series drive can directly use the SHIFT shift key to unidirectionally switch the LED digital tube to display the specific monitoring parameters of the drive when it is stopped or running. The following takes the single-phase drive in the dry running state without a motor as an example to introduce the parameter switching and display method:

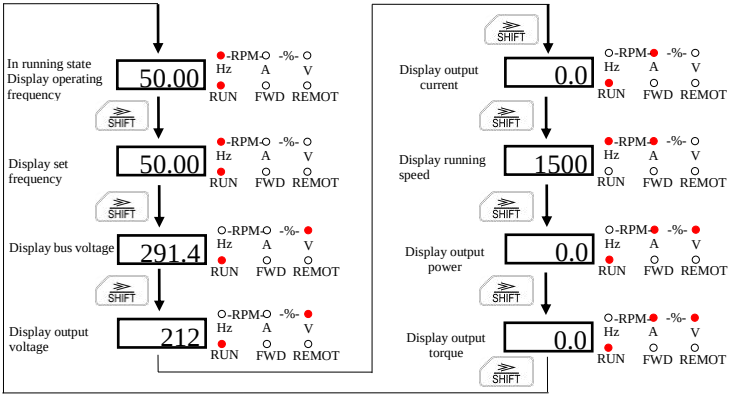


Figure 4-2 Monitoring parameter switching flow chart in running state

4.2.4 Parameter Setting and Operation Method

The following takes changing relay 1 and setting it as frequency arrival (F6.04=06) as an example to introduce how to modify the parameters of the GK690 Series drive:

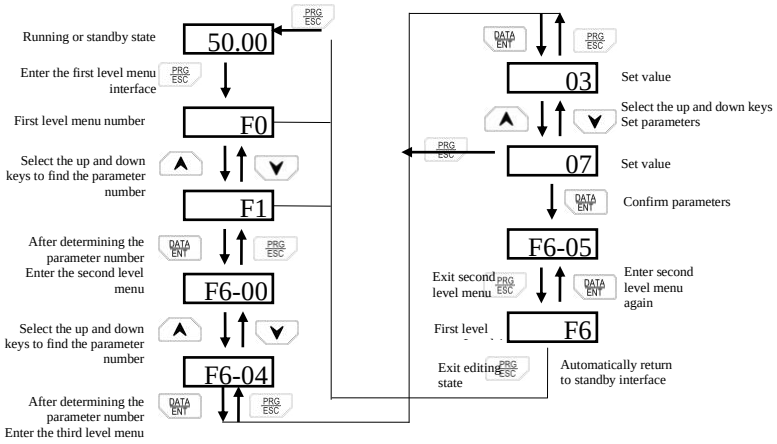


Figure 4-3 Parameter setting method flow chart

4.3 Auto-tuning of motor parameters

When selecting the non-inductive vector control operation mode (F0.00=1), the nameplate parameters of the motor must be accurately entered before the drive is operated. The GK690 Series drive matches the standard motor parameters according to the nameplate parameters; the vector control mode highly depends on the motor parameters. To obtain good control performance, it is necessary to obtain the accurate parameters of the controlled motor.

The steps for auto-tuning of motor parameters are as follows:

1) First, select the running command channel selection (F0.01) as the keypad command channel.

2) Then enter the following function codes according to the actual parameters of the motor: F2.01: rated power; F2.02: rated frequency; F2.03: rated speed; F2.04: rated voltage; F2.05: rated current.

3) Then set F0.16 = 1 or 2 to enable the drive to perform dynamic or static auto-tuning.

4) Press the RUN button and the motor starts parameter auto-tuning.

5) Finally the motor parameter auto-tuning completes.

For detailed motor parameter auto-tuning process, please refer to the description of function code F0.16.

The drive will automatically calculate the following parameters of the motor during auto-tuning: F2.06: stator resistance; F2.07: rotor resistance; F2.08: stator and rotor inductance; F2.09: stator and rotor mutual inductance; F2.10: no-load current.

☞Note:

When using rotation tuning during motor parameter auto-tuning, the motor load must be disconnected, otherwise, the motor parameters obtained by auto-tuning may be incorrect.

4.4 4.2 Drive Statuses

4.4.1 Power-on Initialization Status

During the power-on process of the drive, the system first initializes, and the LED displays “00000”. After the initialization is completed, the drive is in standby state.

4.4.2 Motor Parameter Auto-tuning Status

1: Static parameter identification

During static auto-tuning of motor parameters, it is not necessary to disconnect the motor from the load. Before auto-tuning of motor parameters, the motor nameplate parameters (F2.01~F2.05) must be correctly entered. After auto-tuning, the stator resistance, rotor resistance and leakage inductance of the motor will be detected. The mutual inductance and no-load current of the motor cannot be measured, and the user can input the corresponding values based on experience.

2: Dynamic parameter identification 1

Before auto-tuning of motor parameters, you must correctly input the motor nameplate parameters (F2.01~P2.05), disconnect the motor from the load, and set the appropriate acceleration and deceleration time to keep the motor in a stationary and no-load state. Otherwise, the auto-tuning results may be incorrect.

3: Dynamic parameter identification 2

The motor can be tuned under a certain load to obtain Rs, Ld, Lq, encoder reverse direction and installation angle (encoder parameters need to be set)

Before auto-tuning of motor parameters, the acceleration and deceleration time (F0.11, F0.12) should be appropriately set according to the inertia of the motor. Otherwise, over-current and over-voltage faults may occur during auto-tuning of motor parameters.

Set F0.16 to 2 and press DATA/ENT to start motor parameter auto-tuning. At this time, the LED displays “TURN” and flashes. Press RUN to start parameter auto-tuning. After “TURN” is displayed, the motor starts running and “RUN” light flashes. When the auto-tuning is completed, the “RUN” light turns off, and finally the display returns to the stop state interface. When “TURN” flashes, you can press PRG/ESC to exit the auto-tuning state.

During the process of parameter auto-tuning, you can press STOP/RST to terminate the auto-tuning operation.

4.4.3 Stop State

In the stop state, there are nine stop state parameters that can be selected to be displayed or not, namely: set frequency, bus voltage, switch input status, PID setting, PID feedback, analog input AI1 voltage, analog input AI2 voltage, and current segment number of multi-stage speed; press the SHIFT key to switch display parameters in sequence.

4.4.4 Running Status

In running state, there are fifteen status parameters that you can choose to display or not, namely: operating frequency, set frequency, bus voltage, output voltage, output current, operating speed, output power, output torque, PID setting,

PID Feedback, high-speed pulse input, analog input AI1 voltage, analog input AI2 voltage, current segment number of multi-segment speed; press the SHIFT key to switch display parameters in sequence.

4.4.5 Fault S

GK690 Series drive provides a variety of fault information. For details, please refer to Chapter 7 GK690 drive Troubleshooting.

Chapter 5 Parameter List

Symbol description:

◇——The parameter can be changed during operation;

◆——The parameter cannot be changed during operation;

¤——The parameter is a status monitoring parameter or a reserved parameter;

5.1 F0 Group Basic Functions

Param.	Designation	Scope	Factory default	Attr.
F0.00	Control mode	0: V/F control 1: No PG vector control 2: With PG vector control	0	◆
F0.01	Running command channel selection	0: Keypad control (LED off) 1: Terminal control (LED on) 2: Communication control (LED flashing) 3: CAN communication control	0	◇
F0.02	Frequency source A selection	0: Keypad setting 1: Analog AI1 setting 2: Analog AI2 setting 3: High-speed pulse HDI setting 4: Simple PLC operation 5:Multi-speed setting 6: PID control setting 7: Remote communication setting 8: Keypad analog potentiometer setting 9: CAN communication setting 10: Analog AI3 setting	8	◇

Param.	Designation	Scope	Factory default	Attr.
F0.03	Frequency source B selection	1: Analog AI1 setting 2: Analog AI2 setting 3: High-speed pulse HDI setting 5:Multi-speed setting 6: PID control setting 7: Remote communication setting 8: Keypad analog potentiometer setting 9: CAN communication setting 10: Analog AI3 setting	1	◇
F0.04	Frequency source B reference	0: Relative to maximum frequency 1: Relative to frequency source A	0	◇
F0.05	Frequency source combination mode	0: Frequency source A 1: Frequency source B 2:A+B 3: Switching between A and B 4: A and (A+B) are switched by the Xn terminal 5: B and (A+B) are switched by the Xn terminal 6:MAX(A,B) 7:MIN(A,B) 8: If A is valid, it is A; if A is invalid, it is B 9:A-B	0	◇
F0.06	Keypad setting frequency	0.00 Hz ~ maximum frequency	50.00Hz	◇
F0.07	Maximum output frequency	5.00~300.00Hz	50.00Hz	◆
F0.08	Upper limit of operating frequency	Lower limit of operating frequency ~ maximum frequency	50.00Hz	◆
F0.09	Lower limit of operating frequency	0.00Hz ~ upper limit of operating frequency	0.00Hz	◆

Param.	Designation	Scope	Factory default	Attr.
F0.10	Keypad and terminal UP/DOWN setting	0: Valid, save when drive is powered off 1: Valid, not save when drive is powered off 2: Invalid 3: Setting is valid when running, cleared when stopping 4: Cleared when modifying the keypad setting frequency	0	◇
F0.11	Acceleration time 1	0.1~3600.0S	Model determined	◇
F0.12	Deceleration time 1	0.1~3600.0S	Model determined	◇
F0.13	Motor phase sequence selection	0: Running in default direction 1: Running in opposite direction 2: Reversal rotation prohibited	0	◆
F0.14	Carrier frequency setting	0.1~16.0kHz	Model determined	◇
F0.15	AVR function selection	0: Invalid 1: Valid throughout the process 2: Invalid when decelerating	2	◆
F0.16	Motor parameter identification	0: No operation 1: Static parameter identification 2: Dynamic parameter identification 1 (no load) 3: Dynamic parameter identification 2 (with load)	0	◆
F0.17	Parameter initialization	0: No operation 1: Restore factory parameters (excluding motor parameters) 2: Clear memory information 3: Restore all factory parameters (including motor parameters)	0	◆

Param.	Designation	Scope	Factory default	Attr.
F0.18	Parameter copy	0: No action 1: Upload parameters 2: Download parameters (all) 3: Download parameters (except motor parameters)	0	◆

5.2 F1 Group Start/Stop Control

Param.	Designation	Scope	Factory default	Attr.
F1.00	Starting mode	0: Direct start 1: Start after DC brake 2: Start after speed tracking	0	◇
F1.01	Starting frequency	0.00~300.00Hz	0.50Hz	◇
F1.02	Starting frequency holding time	0.0~50.0S	0.0S	◇
F1.03	Braking current before starting	G type: 0.0~100.0% P type: 0.0~80.0%	0.0%	◇
F1.04	Braking time before starting	0.0~50.0S	0.0S	◇
F1.05	Acceleration/deceleration mode	0: Linear 1: S curve	0	◇
F1.06	Stop mode selection	0: Decelerate to stop 1: Free stop	0	◆
F1.07	Stop braking start frequency	0.00~maximum frequency	0.00Hz	◇
F1.08	Stop braking waiting time	0.0~50.0S	0.0S	◇
F1.09	Stop DC braking current	G type: 0.0~100.0% P type: 0.0~80.0%	0.0%	◇
F1.10	Stop DC braking time	0.0~50.0S	0.0S	◇
F1.11	Forward and reverse dead time	0.0~3600.0S	0.0S	◇
F1.12	Action selection when the operating frequency is lower than the lower limit frequency	0: Run at the lower limit frequency 1: Zero frequency operation	0	◆
F1.13	Power-on terminal operation protection selection	0: Terminal operation command is invalid when power-on 1: Terminal operation command is valid when power-on	0	◇

Param.	Designation	Scope	Factory default	Attr.
F1.14	Waiting time before restart after power outage	0.0~3600.0S	2.0S	◇
F1.15	Speed tracking measurement delay time	0.00~10.00S	2.00S	◇

5.3 F2 Group Motor 1 Parameters

Param.	Designation	Scope	Factory default	Attr.
F2.00	Drive type	0: G type 1: P type	Model dependent	◆
F2.01	Rated power of motor	0.4~6553.5KW	Model dependent	◆
F2.02	Rated frequency of motor	0.01Hz ~ maximum frequency	50.00Hz	◆
F2.03	Rated speed of motor	0~60000rpm	Model dependent	◆
F2.04	Rated voltage of motor	50~760V	Model dependent	◆
F2.05	Rated current of motor	0.1~6553.5A	Model dependent	◆
F2.06	Stator resistance of motor	0~65.535Ω	Model dependent	◇
F2.07	Rotor resistance of motor	0~65.535Ω	Model dependent	◇
F2.08	Stator/rotor inductance of motor	0~655.35mH	Model dependent	◇
F2.09	Stator/rotor mutual inductance of motor	0~6553.5mH	Model dependent	◇
F2.10	No-load current of motor	0.1~6553.5A	Model dependent	◇
F2.11	Motor type	0: asynchronous motor 1: Synchronous motor	0	◆
F2.12	Synchronous motor stator resistance	0~65.535 ohms	0.010 ohms	◇
F2.13	Synchronous motor ld inductance	0~655.35mH	0.30mH	◇
F2.14	Synchronous motor lq inductance	0~655.35mH	0.30mH	◇

Param.	Designation	Scope	Factory default	Attr.
F2.15	Synchronous motor back electromotive force constant	0.0~6553.5v	300.0v	◇
F2.16	Pulse width during auto-tuning	0~65535	0	◇
F2.17	Number of motor poles	2~100	4	◆

5.4 F3 Group Vector Control Parameters

Param.	Designation	Scope	Factory default	Attr.
F3.00	Speed loop proportional gain 1	1~3000	1000	◇
F3.01	Speed loop integration time 1	1~8000	300	◇
F3.02	Switch low point frequency	0.00Hz~F3.05	5.00Hz	◇
F3.03	Speed loop proportional gain 2	1~3000	800	◇
F3.04	Speed loop integration time 2	1~3000	200	◇
F3.05	Switch high point frequency	F3.02~maximum frequency	10.00Hz	◇
F3.06	VC slip compensation coefficient	0~200.0%	100.0%	◇
F3.07	Speed loop filter time constant	0~10	3	◇
F3.08	Current loop Kp	0~5000	3000	◇
F3.09	Current loop Ki	0~5000	1500	◇
F3.10	Torque upper limit setting	0.0~300.0%	160.0%	◇
F3.11	Torque control	0: Invalid 1: Digital setting 2: Keypad potentiometer 3: Analog AI1 setting 4: Analog AI2 setting 5: High-speed pulse setting 6: Multi-stage speed setting 7: Communication settings 8: Analog AI3 setting	0	◇
F3.12	Keypad setting torque	0.0%~200.0%	50.0%	◇
F3.13	Low speed torque boost during torque control	0.0%~20.0%	5.0%	◇

Param.	Designation	Scope	Factory default	Attr.
F3.14	Overvoltage PID proportional gain (Kp)	0.01~10.00	0.20	◇
F3.15	Overvoltage PID integration time	0.00~100.00S	0.10S	◇
F3.16	Asynchronous motor field weakening Kp	0.0~600.0%	40.0%	◇
F3.17	Asynchronous motor field weakening Ki	0.0~600.0%	80.0%	◇
F3.18	Encoder pulse number	0~65535	1024	◆
F3.19	Encoder pulse direction	0: Forward 1: Reverse	0	◆
F3.20	Retention			
F3.21	Synchronous motor initial position detection current	20.0~180.0%	120.0%	◇
F3.22	Synchronous motor initial position detection	0: Detect every time it runs 1: Detect when run first time after power-on 2: No detection	2	◇
F3.23	Retention	0~65535	0	¤
F3.24	Synchronous motor generator torque limit value	0.0~300.0%	150.0%	◇
F3.25	Low-speed filtering of synchronous motor position estimation	1~80	15	◇
F3.26	High-speed filtering of synchronous motor position estimation	1~80	8	◇
F3.27	Synchronous motor field weakening mode	0: No 1: Yes	1	◇
F3.28	Synchronous motor field weakening depth	0.0~20.0%	5.0%	◇

Param.	Designation	Scope	Factory default	Attr.
F3.29	Synchronous motor field weakening adjustment coefficient	1~1000	2	◇
F3.30	Low speed carrier frequency	1.0~16.0KHz	1.5KHz	◇
F3.31	Low speed current	0~100%	30%	◇
F3.32	Excitation current setting	-80%~80%	0%	◇
F3.33	Maximum field weakening current allowed by synchronous motor	0~100%	50%	◇
F3.34	Initial position detection offset	0~360.0°	0.0°	◇
F3.35	Encoder type	0: No encoder 1: Rotary encoder 2: ABZ incremental encoder	0	◇
F3.36	Retention		0	◇
F3.37	Number of pole pairs of rotating motor	1~50	1	◇
F3.38	Retention			◇
F3.39	Encoder installation angle	0.0°~359.9°	0.0°	◇
F3.40	ABZ first position detection after power-on	0: Every time when power-on 1: No detection after power on	0	◇
F3.41	ABZ encoder detection selection during auto-tuning	Ones place: 0: Do not detect AB pulse number 1: Detect AB pulse number Tens place: 0: Do not detect encoder direction 1: Detect encoder direction	0x11	◇
F3.42	Number of resolver fault detections	0~2000 Note: 0 means no detection	500	◇
F3.43	Motor stall detection range	0.00~100.00Hz	10.00Hz	◇
F3.44	Motor stall detection time	0.0~100.0S Note: 0.0 means no stall detection	0.0S	◇

Param.	Designation	Scope	Factory default	Attr.
F3.45	Encoder fault detection selection	Ones place: 0: Do not detect Z disconnection 1: Detect Z disconnection Tens place: 0: Do not detect AB disconnection 1: Detect AB disconnection Hundreds place: 0: Do not detect encoder reverse fault 1: Detect encoder reverse fault	0x110	◇
F3.46	Z signal position calibration selection	0: Do not calibrate Z signal position 1: Calibrate Z signal position	1	◇
F3.47	Current electrical angle of motor	0.0°~359.9°	0.0°	◇
F3.48	Encoder and motor running direction	0: Same direction 1: Reverse direction	0	◇
F3.49	Current loop Iq setting selection	0: Speed loop PI calculation result 1: CAN communication 2: AI1 3: AI2 4: Modbus communication settings	0	◇
F3.50	Z signal count	0~0xFFFF	0	◇
F3.51	Calibration signal count	0~0xFFFF	0	◇
F3.52	Retention	Retention	Retention	
F3.53	Retention	Retention	Retention	
F3.54	Current loop Kp coefficient	0.1%~200.0%	33.3%	◇
F3.55	Current loop Ki coefficient	0.1%~200.0%	50.0%	◇
F3.56	Retention	Retention	Retention	◇
F3.57	Retention	Retention	Retention	◇
F3.58	Feedforward gain	0.000~10.000	1.000	◇
F3.59	Feedforward filtering time	0.001~1.000s	0.003s	◇
F3.60	Position loop gain 1	0.000~10.000	0.100	◇
F3.61	Numerator of electronic gear ratio	0~9999	1000	◇

Param.	Designation	Scope	Factory default	Attr.
F3.62	Denominator of electronic gear ratio	1~9999	1000	◇
F3.63	Position loop adjustment frequency	0.00~50.00Hz	5.00Hz	◇
F3.64	Position loop adjustment range	0~200	16	◇
F3.65	Position error	-32767~32767	0	¤

5.5 F4 Group V/F Control Parameters

Param.	Designation	Scope	Factory default	Attr.
F4.00	V/F curve setting	0: Linear V/F curve 1: Square V/F curve 2: User-defined V/F curve 3: Reserved 4: Reserved	0	◆
F4.01	V/F frequency point 1	0.00Hz~F4.03	10.00Hz	◆
F4.02	V/F voltage point 1	0.0%~100.0% (rated voltage of motor)	20.0%	◆
F4.03	V/F frequency point 2	V/F frequency point 1~F4.05	25.00Hz	◆
F4.04	V/F voltage point 2	0.0%~100.0% (rated voltage of motor)	50.0%	◆
F4.05	V/F frequency point 3	V/F frequency point 2 ~ rated frequency of motor	40.00Hz	◆
F4.06	V/F voltage point 3	0.0%~100.0% (rated voltage of motor)	80.0%	◆
F4.07	V/F slip compensation coefficient	0.0%~200.0%	0.0%	◇
F4.08	V/F slip compensation time constant	0.00~10.00S	0.20S	◇
F4.09	Torque boost	0.0 (automatic) 0.1~30.0	Model dependent	◇
F4.10	Torque boost cutoff	0.0~100.0% (relative to rated frequency of motor)	50.0%	◇
F4.11	Energy-saving operation selection	0: No action 1: Automatic energy-saving operation	0	◆
F4.12	Oscillation suppression gain Kp	0~100	10	◇
F4.13	Oscillation suppression gain Ki	0~100	10	◇

Param.	Designation	Scope	Factory default	Attr.
F4.14	Voltage separation control	0: Voltage separation invalid 1: Keypad setting voltage source 2: Analog AI1 setting voltage source 3: Analog AI2 setting voltage source 4: High-speed pulse HDI setting voltage source 5: Multi-speed setting voltage source 6: Communication setting voltage source 7: Analog AI3 setting voltage source	0	◆
F4.15	V/F separation voltage setting	0.0~1000.0V	0.0V	◇
F4.16	Voltage rise time	0.1~3600.0S	1.0S	◇
F4.17	Voltage drop time	0.1~3600.0S	1.0S	◇
F4.18	VF field weakening coefficient	20.0%~300.0%	200.0%	◇

5.6 F5 Group Input Terminals

Param.	Designation	Scope	Factory default	Attr.
F5.00	Terminal command mode	0: Two-wire type 1 1: Two-wire type 2 2: Three-wire type 1 3: Three-wire type 2	0	◆
F5.01	Switch input X1 function	0: No function 1: Forward running 2: Reverse running 3:Three-line running control 4: Forward inching 5: Reverse inching 6: Free stop 7: Fault reset 8: Pause 9: External fault input 10: Frequency setting increase (UP) 11: Frequency setting decreases (DOWN) 12: Frequency increase/decrease setting clear 13:Multi-speed terminal 1 14: Multi-speed terminal 2 15: Multi-speed terminal 3 16:Multi-speed terminal 4 17: Acceleration/deceleration time selection 1 18: Acceleration/deceleration time selection 2 19: PID control pause 20: Swing frequency pause (stop at current frequency) 21: Swing frequency reset (return to center frequency) 22: Acceleration/deceleration prohibited	1	◆
F5.02	Switch input X2 function		2	◆
F5.03	Switch input X3 function		7	◆
F5.04	Switch input X4 function		0	◆
F5.05	Switch input X5 function		0	◆
F5.06	Switch input X6 function		0	◆
F5.07	Switch input X7 function		0	◆
F5.08	High-speed pulse input HDI function		0	◆

Param.	Designation	Scope	Factory default	Attr.
		23: Torque control prohibited 24: Counter trigger 25: Counter clear 26: Frequency source switching 27: High-speed pulse input 28: Motor switching 29: PLC status reset 30: Switch running command to terminal 31: DC braking 32: Position control		
F5.09	Switch value X closing logic	0: Closing valid 1: Disconnect valid Ones place: X1, Tens place: X2, Hundreds place: X3, Thousands place: X4, Ten thousands place: X5	00000	◆
F5.10	Terminal UP/DOWN change rate	0.01~50.00Hz	0.50Hz	◇
F5.11	AI1 lower limit value	0.00~10.00V	0.00V	◇
F5.12	AI1 lower limit corresponding setting	-150.0~150.0%	0.0%	◇
F5.13	AI1 knee point 1 input voltage	0.00~10.00V	10.00V	◇
F5.14	AI1 knee point 1 corresponding setting	-150.0~150.0%	100.0%	◇
F5.15	AI1 input filtering time	0.01~10.00S	0.10S	◇
F5.16	AI2 lower limit value	0.00~10.00V	2.00V	◇
F5.17	AI2 lower limit corresponding setting	-150.0~150.0%	0.0%	◇
F5.18	AI2 knee point 1 input voltage	0.00~10.00V	10.00V	◇
F5.19	AI2 knee point 1 corresponding setting	-150.0~150.0%	100.0%	◇
F5.20	AI2 input filtering time	0.01~10.00S	0.10S	◇
F5.21	HDI lower limit	0.00~50.00 KHz	0.00KHz	◇

Param.	Designation	Scope	Factory default	Attr.
	frequency			
F5.22	HDI lower limit frequency corresponding setting	-150.0~150.0%	0.0%	◇
F5.23	HDI upper limit frequency	0.00~50.00 KHz	50.00KHz	◇
F5.24	HDI upper limit frequency corresponding setting	-150.0~150.0%	100.0%	◇
F5.25	HDI input filtering time	0.01~10.00S	0.10S	◇
F5.26	Keypad UP/DOWN benchmark	0: 0.01Hz 1: 0.1Hz	0	◇
F5.27	High-speed pulse input HDI2 function	Same as F5.08	0	◇
F5.28	Retention	Retention	0	◇
F5.29	AI1 knee point 2 input voltage	0.00~10.00V	10.00V	◇
F5.30	AI1 knee point 2 corresponding setting	-150.0~150.0%	100.0%	◇
F5.31	AI1 upper limit value	0.00~10.00V	10.00V	◇
F5.32	AI1 upper limit corresponding setting	-150.0~150.0%	100.0%	◇
F5.33	Enable Up/down frequency superposition	0: Disable 1: Enable	1	◇
F5.34	X1 terminal closing delay	0.0~6000.0S	0.0S	◇
F5.35	X1 terminal disconnection delay	0.0~6000.0S	0.0S	◇
F5.36	X2 terminal closing delay	0.0~6000.0S	0.0S	◇
F5.37	X2 terminal disconnection delay	0.0~6000.0S	0.0S	◇
F5.38	Terminal UP/DOWN change selection	0: Every second 1: Every time	0	◇
F5.39	VDI1 terminal function definition	0~40	0	◆

Param.	Designation	Scope	Factory default	Attr.
F5.40	VDI2 terminal function definition	0~40	0	◆
F5.41	VDI3 terminal function definition	0~40	0	◆
F5.42	VDI4 terminal function definition	0~40	0	◆
F5.43	VDI5 terminal function definition	0~40	0	◆
F5.44	VDI1-VDI5 communication settings	0~0x01F	0	◇
F5.45	AI2 knee point 2 input voltage	0.00~10.00V	10.00V	◇
F5.46	AI2 knee point 2 corresponding setting	-150.0~150.0%	100.0%	◇
F5.47	AI2 upper limit value	0.00~10.00V	10.00V	◇
F5.48	AI2 upper limit corresponding setting	-150.0~150.0%	100.0%	◇
F5.49	AI3 lower limit value	0.00~10.00V	0.00V	◇
F5.50	AI3 lower limit corresponding setting	-150.0~150.0%	0.0%	◇
F5.51	AI3 upper limit value	0.00~10.00V	10.00V	◇
F5.52	AI3 upper limit corresponding setting	-150.0~150.0%	100.0%	◇
F5.53	AI3 input filtering time	0.01~10.00S	0.10S	◇

5.7 F6 Group Output Terminals

Param.	Designation	Scope	Factory default	Attr.
F6.00	HDO terminal output mode selection	0: Pulse output 1: Open collector switching output	0	◇
F6.01	HDO (open collector switch) output selection	0: No output 1: drive running 2: drive running forward 3: drive running reversely	1	◇
F6.02	Open collector output terminal Y1		4	◇

Param.	Designation	Scope	Factory default	Attr.
F6.03	Retention	4: Fault output	0	◇
F6.04	Relay 1 output selection	5: Frequency level detection FDT1 output	1	◇
F6.05	Relay 2 output selection	6: Frequency arrival 7: Running at zero speed 8: Set counter value reached 10: Overload alarm 11: Simple PLC stage completed 13:Running time reached 14: Upper limit frequency reached 15: Lower limit frequency reached 16: Ready to run 17: Frequency level detection FDT2 output 18: AI1 greater than AI2 19: AI1 smaller than F8.29 20: AI1 greater than F8.30 21: AI1 at F8.29~F8.30 22: pid disconnected 23: Overcurrent output (operating current greater than F8.33) 24: Brake release and lock control 25: PT1 temperature threshold exceeded 26: PT2 temperature threshold exceeded 27: Zero current 28: Current exceeds limit 29: Dehydrator running time reached 30: Forward jogging 31: Reverse jogging 32: DC braking 33: Power outage restart alarm	4	◇
F6.06	HDO (pulse) output selection	0: Running frequency 1: Set frequency	0	◇
F6.07	AO1 output selection	2: Running speed	1	◇

Param.	Designation	Scope	Factory default	Attr.
F6.08	AO2 output selection	3: Output current 4: Output voltage 5: Output power 6: Set torque 7: Output torque 8: Analog AI1 input value 9: Analog AI2 input value 10: Pulse frequency input 11: Speed loop result output 12: Analog AI3 input value	0	◇
F6.09	AO1 output lower limit	0.0~100.0%	0.0%	◇
F6.10	AO1 output corresponding to lower limit	0.00~10.00V	0.00V	◇
F6.11	AO1 knee point 1 corresponding setting	0.0~100.0%	100.0%	◇
F6.12	AO1 knee point 1 output voltage	0.00~10.00V	10.00V	◇
F6.13	AO2 output lower limit	0.0~100.0%	0.0%	◇
F6.14	AO2 output corresponding to lower limit	0.00~10.00V	2.00V	◇
F6.15	AO2 knee point 1 corresponding setting	0.0~100.0%	100.0%	◇
F6.16	AO2 knee point 1 output voltage	0.00~10.00V	10.00V	◇
F6.17	HDO (pulse) output lower limit	0.0~100.0%	0.0%	◇
F6.18	HDO (pulse) output corresponding to lower limit	0.00~50.00KHz	0.00KHz	◇
F6.19	HDO (pulse) output upper limit	0.0~100.0%	100.0%	◇
F6.20	HDO (pulse) output corresponding to upper limit	0.00~50.00KHz	50.00KHz	◇

Param.	Designation	Scope	Factory default	Attr.
F6.21	Jogging signal output selection	0: Yes 1: No	1	◇
F6.22	Y1 terminal closing delay	0.0~6000.0S	0.0S	◇
F6.23	Y1 terminal disconnection delay	0.0~6000.0S	0.0S	◇
F6.24	Relay 1 terminal closing delay	0.0~6000.0S	0.0S	◇
F6.25	Relay 1 terminal disconnection delay	0.0~6000.0S	0.0S	◇
F6.26	Relay 2 terminal closing delay	0.0~6000.0S	0.0S	◇
F6.27	Relay 2 terminal disconnection delay	0.0~6000.0S	0.0S	◇
F6.28	AO1 knee point 2 corresponding setting	0.0~100.0%	100.0%	◇
F6.29	AO1 knee point 2 output voltage	0.00~10.00V	10.00V	◇
F6.30	AO1 output upper limit	0.0~100.0%	100.0%	◇
F6.31	AO1 output corresponding to upper limit	0.00~10.00V	10.00V	◇
F6.32	AO2 knee point 2 corresponding setting	0.0~100.0%	100.0%	◇
F6.33	AO2 knee point 2 output voltage	0.00~10.00V	10.00V	◇
F6.34	AO2 output upper limit	0.0~100.0%	100.0%	◇
F6.35	AO2 output corresponding to upper limit	0.00~10.00V	10.00V	◇
F6.36	AO3 output selection	Same as F6.07	0	
F6.37	AO3 output lower limit	0.0~100.0%	0.0%	◇
F6.38	AO3 output corresponding to lower limit	0.00~10.00V	0.00V	◇
F6.39	AO3 output upper limit	0.0~100.0%	100.0%	◇
F6.40	AO3 output corresponding to upper limit	0.00~10.00V	10.00V	◇

Param.	Designation	Scope	Factory default	Attr.
F6.41	Output terminal polarity selection	0~0x0F BIT0: Relay 1 BIT1: Relay 2 BIT2:Y1 BIT3:HDO Positive output polarity if each bit is 0, negative output polarity if it is 1	0	◇

5.8 F7 Group Keypad and Display

Param.	Designation	Scope	Factory default	Attr.
F7.00	User password	0~65535	0	◇
F7.01	Retention			
F7.02	Change parameter display	0: Display all parameters 1: Only display modified parameters	0	◇
F7.03	QUICK/JOG key function selection	0: Jogging 1: Forward reverse switching 2: Clear UP/DOWN settings 3: Running command channel switching (switching between terminal and keypad)	0	◇
F7.04	STOP/RST key stop function selection	0: Only valid for operation panel control 1: Valid for operation panel and terminal control 2: Valid for panel and communication control 3: Valid for all control modes	2	◇
F7.05	Parameter selection for running status display	0~0x7FFF BIT0: Running frequency BIT1: Set frequency BIT2: Bus voltage BIT3: Output voltage BIT4: Output current BIT5: Running speed BIT6: Output power	0x303F	◇

Param.	Designation	Scope	Factory default	Attr.
		BIT7: Output torque BIT8: PID given value BIT9: PID feedback value BIT10: Set speed BIT11: High-speed pulse input BIT12: Analog AI1 value BIT13: Analog AI2 value BIT14: Current segment number of multi-stage speed BIT15: Reserved		
F7.06	Parameter selection for stop status display	0~0x7FFF BIT0: Running frequency BIT1: Set frequency BIT2: Bus voltage BIT3: Output voltage BIT4: Output current BIT5: Running speed BIT6: Output power BIT7: Output torque BIT8: PID given value BIT9: PID feedback value BIT10: Set speed BIT11: High-speed pulse input BIT12: Analog AI1 value BIT13: Analog AI2 value BIT14: Current segment number of multi-stage speed BIT15: Reserved	0x3006	◇
F7.07	Speed display coefficient	0.01~655.35% Mechanical speed = 120 * running frequency * F7.07 / number of motor pole pairs	100.00%	◇
F7.08	Rectifier module temperature	0~200.0℃	——	¤
F7.09	Drive module temperature	0~200.0℃	——	¤

Param.	Designation	Scope	Factory default	Attr.
F7.10	Software version 1	1.00~10.00	——	¤
F7.11	Software version 2	0.00~99.99		
F7.12	Drive rated power	0.4~900.0KW	——	¤
F7.13	Cumulative running time	0~65535h	——	¤
F7.14	Running frequency display	0: Before compensation 1: After compensation	0	◇
F7.15	Output power display coefficient	50.0%~500.0%	100.0%	◇
F7.16	Output current filtering time	0.1~10.0S	1.0S	◇
F7.17	Cumulative power-on time	0~65535h	——	¤
F7.18	Power consumption calibration coefficient	50.0~200.0%	100.00%	◇
F7.19	Cumulative power consumption clearing selection	0: Do not clear 1: Clear	0	◇
F7.20	Total power consumption low	0~9999 kWh Total power consumption=F7.21*10000+F7.20	——	¤
F7.21	Total power consumption high	0~655.35 million kWh Total power consumption=F7.21*10000+F7.20	——	¤

5.9 F8 Group Auxiliary functions

Param.	Designation	Scope	Factory default	Attr.
F8.00	Acceleration time 2	0.1~3600.0S	20.00S	◇
F8.01	Deceleration time 2	0.1~3600.0S	20.00S	◇
F8.02	Acceleration time 3	0.1~3600.0S	20.00S	◇
F8.03	Deceleration time 3	0.1~3600.0S	20.00S	◇
F8.04	Acceleration time 4	0.1~3600.0S	20.00S	◇
F8.05	Deceleration time 4	0.1~3600.0S	20.00S	◇
F8.06	Jogging running frequency	0.00~50.00Hz	5.00Hz	◇
F8.07	Jogging running acceleration	0.1~3600.0S	Model	◇

Param.	Designation	Scope	Factory default	Attr.
	time		dependent	
F8.08	Jogging running deceleration time	0.1~3600.0S	Model dependent	◇
F8.09	Jump frequency 1	0.00~300.00Hz	0.00Hz	◆
F8.10	Jump frequency 2	0.00~300.00Hz	0.00Hz	◆
F8.11	Jump frequency amplitude	0.00~10.00Hz	0.00Hz	◆
F8.12	Swing frequency amplitude	0.0~100.0% (relative set frequency)	0.0%	◇
F8.13	Jump frequency amplitude	0.0~50.0% (relative swing frequency amplitude)	0.0%	◇
F8.14	Swing frequency rising time	0.1~3600.0S	5.0S	◇
F8.15	Swing frequency falling time	0.1~3600.0S	5.0S	◇
F8.16	FDT1 level detection value	0.00~300.00Hz	50.00Hz	◇
F8.17	FDT1 hysteresis detection value	0.00~10.00Hz	1.00Hz	◇
F8.18	FDT2 level detection value	0.00~300.00Hz	50.00Hz	◇
F8.19	FDT2 hysteresis detection value	0.00~10.00Hz	1.00Hz	◇
F8.20	Frequency reaches detection range	0.00~10.00Hz	2.00Hz	◇
F8.21	Set counter value	0~65530	0	◇
F8.22	Retention	0~65530	0	◇
F8.23	Overmodulation enable	0: Overmodulation invalid 1: Overmodulation valid	1	◆
F8.24	Sag control	0.00~10.00Hz	0	◇
F8.25	Brake threshold voltage	690V: 650~1170V 380V: 650~750V 220V:360~390V	690V:1140V 380V:700V 220V:380V	◇
F8.26	Acceleration/deceleration time unit	0:0.1S 1:0.01S	0	◇
F8.27	Fan control	0: Drive control 1: Always running after power on	0	◇
F8.28	Overvoltage boost	0.00~10.00Hz	10.00Hz	◆
F8.29	AI1 comparison threshold 1	0.00~10.00V	0	◇
F8.30	AI1 comparison threshold 2	0.00~10.00V	0	◇

Param.	Designation	Scope	Factory default	Attr.
F8.31	AI1 comparison residual value	0.00~1.00V	0.20	◇
F8.32	Frequency resolution	0: Two decimal places, maximum frequency 300.00Hz 1: One decimal place, maximum frequency 3000.0Hz	0	◆
F8.33	Overcurrent judgment threshold	0.0~200.0% (percentage of the rated current of the drive)	105%	◇
F8.34	Brake release and lock frequency setting	0.00~300.00Hz	2.50Hz	◇
F8.35	Brake release and lock current setting	0.0~200.0% (percentage of the rated current of the drive)	60%	◇
F8.36	Brake release delay time	0.0~20.0S	0.0S	◇
F8.37	Brake lock delay time	0.0~20.0S	0.0S	◇
F8.38	Temperature curve	Retention	Retention	◇
F8.39	Acceleration time frequency switching point	0.00~300.00Hz	0.00Hz	◇
F8.40	Deceleration time frequency switching point	0.00~300.00Hz	0.00Hz	◇
F8.41	Instantaneous power failure frequency reduction	0: Do not reduce frequency 1: Reduce frequency	0	◇
F8.42	Instantaneous power failure judgment voltage	210~1000V	220V:240V 380V:420V 690V:750V	◇
F8.43	Instantaneous power failure processing ratio	1~1000	500	◇
F8.44	Instantaneous power failure processing integral	1~1000	550	◇
F8.45	PT1 temperature judgment threshold	0.0~1000.0℃	0.0℃	◇
F8.46	PT2 temperature judgment threshold	0.0~1000.0℃	0.0℃	◇
F8.47	Options when exceeding temperature threshold PT1	0: Alarm but not stop 1: Alarm and stop	0	◇

Param.	Designation	Scope	Factory default	Attr.
F8.48	Options when exceeding temperature threshold PT2	0: Alarm but not stop 1: Alarm and stop	0	◇
F8.49	Zero current detection level value	0.0%~300% (relative to rated current of drive)	5.0%	◇
F8.50	Zero current detection delay time	0.00S~300.00S	0.10S	◇
F8.51	Output current exceeds limit	0.0%~300% (relative to rated current of drive)	200.0%	◇
F8.52	Current over limit delay time	0.00S~300.00S	0.10S	◇
F8.53	Running time setting of dehydrator each time it is started	0S~65535S (0 means no limit)	0S	◇
F8.54	Dehydrator stops and clears running time flag	0: Keep 1: Clear	1	◇
F8.55	Temperature filtering time	0.01~10.00S	1.00S	◇
F8.56	Temperature sensor type	0: Pt100 1: KTY84	0	◇

5.10 F9 Group Process PID Function

Param.	Designation	Scope	Factory default	Attr.
F9.00	PID given source selection	0: Keypad given 1: Analog quantity AI1 given 2: Analog quantity AI2 given 3: Pulse frequency given 4:Multi-stage given 5: Remote communication given 6: Keypad potentiometer given 7: Analog AI3 given	0	◇
F9.01	PID keypad given (percentage)	0.0%~100.0%	0.0%	◇
F9.02	PID feedback source selection	0: Analog AI1 feedback 1: Analog AI2 feedback 2: AI1+ AI2 feedback 3: Pulse feedback 4: Remote communication feedback 5: Running current feedback 6: Running torque feedback 7: Analog AI3 feedback	0	◇
F9.03	PID output characteristic selection	0: PID output positive 1: PID output negative	0	◇
F9.04	Proportional gain (Kp)	0.01~10.00	0.10	◇
F9.05	Integration time (Ti)	0.00~100.00S	1.00S	◇
F9.06	Differential time (Td)	0.00~10.00S	0.00S	◇
F9.07	PID output delay time	0.00~10.00S	0.00S	◇
F9.08	PID control deviation limit	0.0~100.0%	0.0%	◇
F9.09	PID output upper limit	0.0~100.0%	100.0%	◇
F9.10	PID output lower limit	-100.0~100.0%	0.0%	◇
F9.11	Feedback disconnection detection value	0.0~100.0%	0.0%	◇
F9.12	Feedback disconnection detection time	0.0~200.0S	2.0S	◇

Param.	Designation	Scope	Factory default	Attr.
F9.13	Disconnection action selection	0: No action 1: Alarm, but do not stop and run at current frequency, recover after normal operation. 2: Report a fault and shut down.	1	◇
F9.14	PID initial frequency	0.0~100.0%	0.0%	
F9.15	PID initial frequency holding time	0.0~3600S	0.0S	◇
F9.16	Sleep frequency	0~300.00Hz	0.00Hz	◇
F9.17	Sleep detection time	0~2000S	10S	◇
F9.18	Wake-up value	0.0%~100.0% (relative to set value)	80.0%	◇
F9.19	Sensor range	0.1~6553.5	100.0	◇
F9.20	PID keypad given value (numeric value)	0~F9.19	0	◇

5.11 FA Group Multi-stage Speed

Param.	Designation	Scope	Factory default	Attr.
FA.00	Multi-speed 0	-100.0~100.0%	0.0%	◇
FA.01	Multi-speed 1	-100.0~100.0%	0.0%	◇
FA.02	Multi-speed 2	-100.0~100.0%	0.0%	◇
FA.03	Multi-speed 3	-100.0~100.0%	0.0%	◇
FA.04	Multi-speed 4	-100.0~100.0%	0.0%	◇
FA.05	Multi-speed 5	-100.0~100.0%	0.0%	◇
FA.06	Multi-speed 6	-100.0~100.0%	0.0%	◇
FA.07	Multi-speed 7	-100.0~100.0%	0.0%	◇
FA.08	Multi-speed 8	-100.0~100.0%	0.0%	◇
FA.09	Multi-speed 9	-100.0~100.0%	0.0%	◇
FA.10	Multi-speed 10	-100.0~100.0%	0.0%	◇
FA.11	Multi-speed 11	-100.0~100.0%	0.0%	◇
FA.12	Multi-speed 12	-100.0~100.0%	0.0%	◇
FA.13	Multi-speed 13	-100.0~100.0%	0.0%	◇
FA.14	Multi-speed 14	-100.0~100.0%	0.0%	◇
FA.15	Multi-speed 15	-100.0~100.0%	0.0%	◇
FA.16	Stage 0 running time	0~3600.0	0	◇
FA.17	Stage 1 running time	0~3600.0	0	◇
FA.18	Stage 2 running time	0~3600.0	0	◇
FA.19	Stage 3 running time	0~3600.0	0	◇
FA.20	Stage 4 running time	0~3600.0	0	◇
FA.21	Stage 5 running time	0~3600.0	0	◇
FA.22	Stage 6 running time	0~3600.0	0	◇
FA.23	Stage 7 running time	0~3600.0	0	◇
FA.24	Stage 8 running time	0~3600.0	0	◇
FA.25	Stage 9 running time	0~3600.0	0	◇
FA.26	Stage 10 running time	0~3600.0	0	◇
FA.27	Stage 11 running time	0~3600.0	0	◇
FA.28	Stage 12 running time	0~3600.0	0	◇
FA.29	Stage 13 running time	0~3600.0	0	◇
FA.30	Stage 14 running time	0~3600.0	0	◇
FA.31	Stage 15 running time	0~3600.0	0	◇

Param.	Designation	Scope	Factory default	Attr.
FA.32	Multi-stage 0-7 acceleration/deceleration time selection	0~0xFFFF	0	◇
FA.33	Multi-stage 8-15 acceleration/deceleration time selection	0~0xFFFF	0	◇
FA.34	PLC operating mode	0: Run once and stop 1: Save the final value after running once 2: Loop operation	2	◆
FA.35	PLC power-off (fault) memory	0: No 1: Yes	0	◆
FA.36	PLC restart mode	0: Restart from the first stage 1: Start from the stage frequency at the time of interruption	0	◆
FA.37	Running time unit	0:S 1:M	0	◆
FA.38	Current program running segment number	0~15		¤
FA.39	Running time of current program segment	0.0~3600.0		¤
FA.40	Multi-stage speed 0 frequency source selection	0: Keypad given (FA.00) 1: Analog AI1 setting 2: Analog AI2 setting 3: High-speed pulse HDI setting 4: PID control setting 5: Remote communication setting 6: Keypad analog potentiometer setting 7: CAN communication setting 8: Analog AI3 setting	0	◇

5.12 Fb Group Protection and Fault

Param.	Designation	Scope	Factory default	Attr.

Param.	Designation	Scope	Factory default	Attr.
Fb.00	Motor overload protection selection	0: No protection 1: Ordinary motor (with low speed compensation)	1	◆
Fb.01	Motor overload protection coefficient	20.0% ~ 120.0% (rated current of motor)	100.0%	◇
Fb.02	Non-stop during instantaneous power outage	0: No 1: Yes	0	◇
Fb.03	Instantaneous power loss frequency reduction point	220V:210~260 380V:410~600 690V:740~1050	220V:230 380V:420 690V:830	◇
Fb.04	Instantaneous power loss frequency reduction rate	0.00Hz ~ maximum frequency	10.00Hz	◇
Fb.05	Input phase loss protection selection	0: No 1: Yes	1	◆
Fb.06	Output phase loss protection selection	0: No 1: Yes	1	◆
Fb.07	Overvoltage stall protection	0: No 1: Yes	1	◇
Fb.08	Overvoltage stall protection voltage	110~150%	220V:120% 380V:130% 690V:120%	◇
Fb.09	Current limit selection	0: No 1: Yes	1	◇
Fb.10	Automatic current limiting level	80~200%	G:160% P:120%	◇
Fb.11	Drive overload alarm	20.0~200.0%	150.0%	◆
Fb.12	Drive overload alarm time	0.0~100.0S	20.0S	◆
Fb.13	Number of automatic fault resets	0~10	0	◆
Fb.14	Automatic fault reset interval setting	0.1~20.0S	5.0S	◆
Fb.15	Type of first two faults	0: No fault 1: Reserved 2: Reserved		¤
Fb.16	Type of previous fault		——	¤
Fb.17	Type of current fault		——	¤

Param.	Designation	Scope	Factory default	Attr.
		3: Reserved 4: Acceleration overcurrent (OC 1) 5: Deceleration overcurrent (OC 2) 6: Constant speed overcurrent (OC 3) 7: Acceleration overvoltage (OU1) 8: Deceleration overvoltage (OU2) 9: Constant speed overvoltage (OU3) 10: Bus undervoltage (UU) 11: Motor overload (OL1) 12: Drive overload (OL2) 13: Input phase loss (SPI) 14: Output phase loss (SPO) 15: Rectifier module overheating (OH1) 16: Drive module overheating (OH2) 17: External fault (EF) 18:485 Communication fault (CE) 19: Current detection fault (ItE) 20: Motor auto-tuning fault (tE) 21: EEPROM fault (EEP) 22: PID feedback disconnection fault (PIDE) 23: Braking unit fault (bCE) 24: Running time reaching fault (END) 25: Electronic overload (OL3) 26: Keypad communication fault (PCE) 27: Parameter upload error (UPE) 28: Parameter download error (DNE) 29: Short circuit fault (SC) 30: Current limiting fault (LCE) 31: Phase short circuit (GF) 32: Encoder reverse fault (ECE1) 33: Encoder AB phase disconnection fault (ECE2) 34: Encoder Z phase disconnection fault (ECE3)		

Param.	Designation	Scope	Factory default	Attr.
		35: Stall fault (ECE4) 36: Resolver fault (ECE5) 37~39: Reserved 40: CAN communication fault (CAnE) 41: Position detection fault (poSE) 42: Underload fault (UL)		
Fb.18	Running frequency of current fault	0.00~300.00Hz	——	¤
Fb.19	Output current of current fault	0.0~6553.5A	——	¤
Fb.20	Bus voltage of current fault	0~1500V	——	¤
Fb.21	Retention	——	——	¤
Fb.22	Retention	——	——	¤
Fb.23	Output frequency during previous fault	0.00~300.00Hz	——	¤
Fb.24	Current during previous fault	0.0~6553.5A	——	¤
Fb.25	Bus voltage during previous fault	0~1500V	——	¤
Fb.26	Output frequency during the first two faults	0.00~300.00Hz	——	¤
Fb.27	Current during the first two faults	0.0~6553.5A	——	¤
Fb.28	Bus voltage of the first two faults	0~1500V	——	¤
Fb.29	GF protection selection	0: Allow 1: Prohibited	0	◇
Fb.30	Retention			
Fb.31	Retention			
Fb.32	Underload detection level	0.0%~150.0% (relative to rated current of motor)	50%	◇
Fb.33	Underload detection time	0.0S~100.0S	0.0S	◇

5.13 FC Group Communication Parameters

Param.	Designation	Scope	Factory default	Attr.
FC.00	Local communication address	1~247, 0 is broadcast address	1	◇
FC.01	Communication baud rate setting	0:1200BPS 1:2400BPS 2:4800BPS 3:9600BPS 4:19200BPS 5:38400BPS 6:57600BPS 7:115200BPS	3	◇
FC.02	Data bit parity setting	0: No parity (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 2) for RTU	0	◇
FC.03	Communication response delay	0~200mS	5mS	◇
FC.04	Communication timeout fault time	0.0 (invalid), 0.1~100.0S	0.0S	◇
FC.05	Transmission error handling	0: Alarm and coast to stop 1: No alarm and continue running 2: Stop in stop mode without alarm (only in communication control mode) 3: Stop in stop mode without alarm (in all control modes)	1	◇
FC.06	Communication setting coefficient	10.0~500.0%	100.0	◇

Param.	Designation	Scope	Factory default	Attr.
FC.07	Communication address flag	0: Default address 1: Compatible with other manufacturers address 1 2: Compatible with other manufacturers address 2 3: Compatible with other manufacturers address 3 4: Compatible with other manufacturers address 4	0	◇

5.14 FL Group CAN Communication Group

Param.	Designation	Scope	Factory default	Attr.
FL.00	CAN communication enable	0: Invalid 1: Yes	0	◇
FL.01	CAN communication baud rate	0: 33.3 kbps 1: 83.3 kbps 2: 125 kbps 3: 250 kbps 4: 500 kbps 5: 1Mbps	3	◇
FL.02	CAN local receiving ID	0~0x07FFF	0x01F2	◇
FL.04	CAN local sending ID	0~0x07FFF	0x01F3	◇
FL.06	Reception interval protection time	0.0~100.0S Note: 0.0S means no reception protection time, When it is non-zero, it means that the timing starts after the communication is established (the first frame of data is received). If the set value is exceeded and the data is not received, a communication interruption fault will be reported.	0.0S	◇
FL.07	Sending interval	0.1~500.0ms	100.0ms	◇
FL.08	Receive data 2	0: No data (sending data is 0, receiving is not processed) 1: Set frequency 2: Output frequency 3: Speed loop output/current loop input (Iq) 4: Output current 5: Output voltage 6: Output power 7: Bus voltage	1	◇
FL.09	Receive data 3		2	◇
FL.10	Receive data 4		3	◇
FL.11	Send data 2		1	◇
FL.12	Send data 3		1	◇
FL.13	Send data 4		3	◇

Param.	Designation	Scope	Factory default	Attr.
		8: Speed 9:AI1 10:AI2 11: Pulse input 12: IGBT temperature		

5.15 FU Group Monitoring Parameters

Param.	Designation	Scope	Factory default
FU.00	Set frequency	——	——
FU.01	Running frequency	——	——
FU.02	Bus voltage	——	——
FU.03	Output voltage	——	——
FU.04	Output current	——	——
FU.05	Output power	——	——
FU.06	Output torque	——	——
FU.07	Set speed	——	——
FU.08	Running speed	——	——
FU.09	PID given value	——	——
FU.10	PID feedback value	——	——
FU.11	Analog AI1 value	——	——
FU.12	Analog AI2 value	——	——
FU.13	High-speed pulse input	——	——
FU.14	Current segment number of multi-stage speed	——	——
FU.15	Current stage running time of multi-stage speed	——	——
FU.16	Digital input terminal status 1	——	——
FU.17	Digital input terminal status 2	——	——
FU.18	Counter value	——	——
FU.19	G/P integrated display	0~1, 0 is G type; 1 is P type	——
FU.20	Drive rated power	——	——
FU.21	Drive rated power	——	——
FU.22	Drive rated current	——	——
FU.23	Input terminal status	Hexadecimal	——
FU.24	Encoder feedback frequency	——	——
FU.25	PT1 voltage value	——	——
FU.26	PT2 voltage value	——	——
FU.27	PT1 temperature value	——	——
FU.28	PT2 temperature value	——	——
FU.29	Digital tube full light display	8.8.8.8.8	8.8.8.8.8

Param.	Designation	Scope	Factory default
FU.30	Dehydrator running time	——	——
FU.31	Remaining running time of dehydrator	——	——
FU.32	Virtual terminal setting	——	——
FU.33	Analog AI3 value	——	——

Chapter 6 Troubleshooting

6.1 Fault Alarm and Countermeasures

The drive has alarm information and protection functions. Once a fault occurs, the drive fault relay contact will act. Before seeking service, you can follow the instructions in this section to conduct self-examination, analyze the cause of the fault, and find out the solution. If you cannot solve it by yourself, please seek service, contact the agent of the drive you purchased or directly contact our company.

If an abnormality occurs during power-on and operation of the GK690 drive, a fault code will be displayed on the drive display panel. At this moment, the drive has effectively taken protection for this fault, the output terminal stops outputting, and the current fault information indicated by the display panel is represented by a display code consisting of 2~5 letters and numbers.

When a fault occurs, the keypad of the drive displays the fault function code. The fault code, meaning and corrective measures are as follows.

Fault code	Fault type	Possible cause	Measures
0	No fault		
OC1	Overcurrent during acceleration operation	1. Acceleration time is too short 2. Motor parameters are inaccurate 3. Grid voltage is low 4. Drive power is too small 5. V/F curve is inappropriate	1. Extend the acceleration time 2. Perform parameter self-tuning on the motor 3. Check grid input power 4. Choose a drive with a large power level 5. Adjust V/F curve settings and adjust manual torque boost
OC2	Overcurrent during deceleration operation	1. Deceleration time is too short 2. Load inertia torque is large 3. Drive power is too small	1. Extend the deceleration time 2. Add appropriate energy-consuming braking components 3. Choose a drive with a higher power level
OC3	Overcurrent during constant speed operation	1. Sudden change or abnormality in the load 2. Grid voltage is low	1. Check load or reduce sudden change of load 2. Check grid input power

Fault code	Fault type	Possible cause	Measures
		3. Drive power is too small	3. Choose a drive with a higher power level
OU1	Overvoltage during acceleration operation	1. Abnormal input voltage 2. After a momentary power outage, restart the rotating motor	1. Check grid input power 2. Avoid shutdown and restart
OU2	Overvoltage during deceleration operation	1. Deceleration time is too short 2. Large load inertia 3. Abnormal input voltage	1. Extend the deceleration time 2. Increase energy consumption braking components 3. Check grid input power
OU3	Overvoltage during constant speed operation	1. Abnormal input voltage 2. Abnormal changes in input voltage 3. Large load inertia	1. Check grid input power 2. Install input reactor 3. Add appropriate energy-consuming braking components
UU	Bus undervoltage	1. Grid voltage is low 2. Instantaneous power outage	1. Check grid input power 2. RESET operation
OL1	Motor overload	1. Grid voltage is too low 2. Rated current of the motor is set incorrectly 3. Motor is stalled or the load suddenly changes too much 4. Power setting is too high	1. Check the grid voltage 2. Reset the rated current of the motor 3. Check the load and adjust the torque boost amount 4. Choose the right motor
OL2	Drive overload	1. Accelerate too fast 2. Restart the rotating motor 3. Grid voltage is too low 4. Load is too large	1. Increase the acceleration time 2. Avoid shutdown and restart 3. Check the grid voltage 4. Choose a drive with higher power
SPI	Phase loss on the input side	Input R, S, and T have phase loss	1. Check grid input power 2. Check the installation wiring
SPO	Phase loss on the output side	1. U, V, W phase loss output 2. The three-phase load is seriously asymmetrical	1. Check the output wiring 2. Check the motor and cables

Fault code	Fault type	Possible cause	Measures
OH1	Rectifier module overheating	1. Instantaneous overcurrent of the drive 2. There is a phase-to-phase or grounding short circuit in the three output phases 3. The air duct is blocked or the fan is damaged 4. The ambient temperature is too high 5. The control board connection or plug-in is loose 6. The auxiliary power supply is damaged and the driving voltage is undervoltage 7. Power module bridge arm straight through 8. Control board abnormality	1. See overcurrent countermeasures 2. Rewiring 3. Clear the air duct or replace the fan 4. Reduce ambient temperature 5. Check and reconnect 6. Seek technical support from the manufacturer 7. Seek technical support from the manufacturer 8. Seek technical support from the manufacturer
OH2	Drive module overheateding		
EF	External fault	Xn external fault input terminal acts	Check external device input
CE	Communication fault	1. Improper baud rate setting 2. Communication errors using serial communication 3. Communication is interrupted for a long time	1. Set the appropriate baud rate 2. Press the STOP/RST key to reset and seek service 3. Check the communication interface wiring
ItE	Current detection circuit fault	1. Poor contact in the control board connector 2. The auxiliary power supply is damaged 3. Hall device is damaged 4. The amplification circuit is abnormal	1. Check the connector and reconnect the wires 2. Seek technical support from the manufacturer 3. Seek technical support from the manufacturer 4. Seek technical support from the manufacturer
tE	Motor auto-tuning fault	1. The capacity of the motor and the drive do not match	1. Change the drive model 2. Set the rated parameters according to

Fault code	Fault type	Possible cause	Measures
		2. Improper setting of motor rated parameters 3. The parameters learned through auto-tuning deviate too much from the standard parameters 4. Auto-tuning timeout	the motor nameplate 3. Make the motor no-load and re-identify 4. Check motor wiring and parameter settings
EEP	EEPROM reading and writing fault	1. An error occurs in reading and writing of control parameters 2. EEPROM is damaged	1. Press the STOP/RST key to reset and seek service 2. Seek technical support from the manufacturer
PIDE	PID feedback disconnection fault	1. PID feedback disconnection 2. PID feedback source disappears	1. Check the PID feedback signal line 2. Check the PID feedback source
bCE	Braking unit fault	1. Braking line failure or brake pipe damage 2. The resistance of the external braking resistor is too small	1. Check the braking unit and replace with a new brake pipe 2. Increase the braking resistance
END	The running time has reached	The set cumulative running time has reached	Use the parameter initialization function to clear recorded information
OL3	Electronic overload	1. Temperature sensor wiring is loose 2. Motor temperature is too high	1. Check the temperature sensor wiring and eliminate the fault 2. Reduce the carrier frequency or take other heat dissipation measures to cool down the motor
PCE	Keypad communication failure	The connection cable between the keypad and the control board is damaged	Replace the connection cable between the keypad and the control board
UPE	Parameter upload error	1. The connection line between the keypad and the control board is too long, and the parameters are interfered during the transmission process 2. When downloading	1. Shorten the connection between the keypad and the control board to reduce interference 2. Before downloading, confirm whether the data saved by the keypad matches the data of the drive
DNE	Parameter download error		

Fault code	Fault type	Possible cause	Measures
		parameters, the data saved by the keypad does not match the data of the drive	
SC	Short circuit fault	1. Accelerate too fast 2. IGBT internal damage 3. Interference causes malfunction 4. Check if the grounding is proper 5. Whether the output is short-circuited	1. Increase the acceleration time 2. Check whether the peripheral equipment has strong interference sources 3. Seek technical support from the manufacturer
LCE	Current limit exceeds range	1. The load is too large or the motor is blocked 2. The drive selection is too small	1. Reduce the load and check the motor and mechanical conditions 2. Choose a drive with a larger power level
GF	Short circuit between phases	Short circuit between motor wires	Check motor wire insulation
ECE1	Encoder reverse fault	1. Encoder not connected 2. The encoder direction is reversed	1. Check the encoder wiring 2. Swap the A and B phase wiring of the encoder
ECE2	Encoder AB phase disconnection fault	1. Encoder is damaged 2. The phases A and B of the encoder wire are not connected properly	1. Replace the encoder 2. Connect encoder phase A and B
ECE3	Encoder Z phase disconnection fault	1. Encoder is damaged 2. The Z phase of the encoder wire is not connected properly	1. Replace the encoder 2. Connect the encoder Z phase
ECE4	Stall fault	1. Encoder is damaged 2. Parameter auto-tuning is incorrect	1. Replace encoder 2. Re-carry out parameter auto-tuning
ECE5	Resolver failure	1. The resolver is not wired or is damaged	1. Connect the resolver wires or replace the resolver
CAnE	CAN communication	1. CAN communication line is not connected properly	1. Reconnect the CAN communication line

Fault code	Fault type	Possible cause	Measures
	fault	2. Unmatched terminal resistor	2. Match the 120Ω terminal resistor
poSE	Position detection failure	1. There is a problem with the encoder Z signal	1. Replace the encoder or eliminate Z signal interference
UL	Underload fault	1. Unreasonable parameter settings of Fb.32 and Fb.33	1. Set reasonable parameters of Fb.32 and Fb.33 2. Set Fb.33 to 0 to cancel underload protection
OT1	PT1 over-temperature protection	PT1 temperature is greater than the F8.45 setting threshold	1. The temperature of PT1 is too high, check the peripheral reasons 2. Check the PT1 temperature sensor wiring
OT2	PT2 over-temperature protection	PT2 temperature is greater than the F8.46 setting threshold	1. PT2 temperature is too high, check the peripheral reasons 2. Check the PT2 temperature sensor wiring

6.2 Common Faults and Troubleshooting

6.2.1 No display after power on

Use a multimeter to check whether the input power of the drive is consistent with the rated voltage of the drive. If there is a problem with the power supply, please check and eliminate it. Check whether the three-phase rectifier bridge is intact. If the rectifier bridge has exploded, please seek service.

Check whether the CHARGE lamp is on. If not, the fault is generally concentrated on the rectifier bridge or buffer resistor. If it is on, the fault may be on the switching power supply. Please seek service.

6.2.2 Air switch trips after powering on

Check whether there is a ground or short circuit between the input power supplies and eliminate the problem. Check whether the rectifier bridge has broken down. If it is damaged, seek service.

6.2.3 The motor doesn’t rotate after drive runs

Check whether there is balanced three-phase output between U, V, and W. If yes, the motor circuit or the motor is damaged, or the motor is blocked due to mechanical reasons. Please exclude. If there is output but the three phases are unbalanced, the drive driver board or output module may be damaged. Please seek service. If there is no output voltage, the driver board or output module may be damaged, please seek service.

6.2.4 Drive displays normally after powering on, but the air switch trips after running

① Check whether there is a short circuit between phases of the output modules. If yes, please seek service.

② Check whether there is a short circuit or grounding between the motor leads. If yes, please exclude it.

③ If tripping occurs occasionally and the distance between the motor and the drive is relatively long, consider adding an output AC reactor.

④ When the drive is under normal protection, press STOP/RESET on the keypad to reset the fault after troubleshooting, and then restart the drive.

⑤ Or after troubleshooting, cut off the main power supply of the drive. After all the LED keypads are extinguished, power on again, and then start the drive.

⑥ If none of the above methods can make the drive work normally, please record the fault code, drive specification and product number displayed on the keypad, and then contact our technical personnel.

Chapter 7 Communication Protocol

GK690 Series drive provides RS-485 communication interface and adopts the international standard Modbus-RTU format communication protocol for master-slave communication. You can achieve centralized control (setting drive control commands, operating frequency, modification of related function code parameters, monitoring of drive working status and fault information, etc.) through PC/PLC and control of host computer to adapt to specific application requirements.

7.1 Protocol Content

The Modbus serial communication protocol defines the frame content and usage format of asynchronous transmission in serial communication. These include: the format of master polling and broadcast frames, and slave response frames; the frame content organized by the master includes: slave address (or broadcast address), execution commands, data and error checking, etc. The slave's response also adopts the same structure, including: action confirmation, return data and error checking, etc. If an error occurs when the slave receives a frame, or it cannot complete the action required by the master, it will organize a fault frame as a response and feed it back to the master.

7.2 Application Method

GK690 Series drives can be connected to the "single master multiple slaves" control network with RS-485 bus.

7.3 Bus Structure

(1) Interface mode

RS-485 hardware interface

(2) Transmission method

Asynchronous serial, half-duplex transmission mode. At the same time, only one of the master and the slave can send data and the other can receive data. During the serial asynchronous communication process, data is sent frame by frame in the form of messages.

(3) Topological structure

Single master multi-slave system. The setting range of the slave address is 1~247, 0 is the broadcast communication address. The address of each slave in the network is unique. This is the basis for ensuring Modbus serial communication.

7.4 Protocol Description

The communication protocol of the series drive is an asynchronous serial master-slave Modbus communication protocol. Only one device (master) in the network can establish the protocol (called “query/command”). Other devices (slaves) can only respond to the master’s “query/command” by providing data, or take corresponding actions based on the master’s “query/command”. The master here refers to a personal computer (PC), industrial control equipment or programmable logic controller (PLC), etc., and the slave refers to the GK690 Series drive or other control equipment with the same communication protocol. The master can not only communicate with a slave individually, but also publish broadcast information to all slaves. For the master “query/command” accessed separately, the slave must return a message (called a response). For broadcast information sent by the master, the slave does not need to feedback response information to the master.

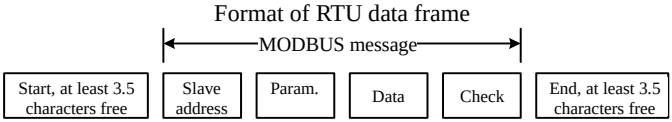
7.5 Communication Frame Structure

The Modbus protocol communication data format of GK690 Series drives is in RTU (Remote Terminal Unit) mode.

In RTU mode, the format of each byte is as follows:

Coding system: 8-bit binary, each 8-bit frame field contains two hexadecimal characters, hexadecimal 0~9, A~F.

Data format: start bit, 8 data bits, check bit and stop bit. The data format is described in the following table: In RTU mode, new frames always start with at least 3.5 bytes of transmission time silence. On a network where the transmission rate is calculated based on the baud rate, the transmission time of 3.5 bytes can be easily grasped. The data fields transmitted immediately are: slave address, operation command code, data and CRC check word. Each field transmission byte is hexadecimal 0...9, A...F. Network devices monitor communication bus activity at all times. When the first field (address information) is received, each network device acknowledges this byte. As the transmission of the last byte is completed, there is a similar transmission time interval of 3.5 bytes to indicate the end of this frame. After this, the transmission of a new frame will begin.



The information of a frame must be transmitted in a continuous data stream. If there is an interval of more than 3.5 bytes before the end of the entire frame transmission, the receiving device will clear the incomplete information and mistakenly believe that the following byte is the address field part of a new frame. Similarly, if the interval between the start of a new frame and the previous frame is less than 3.5 bytes, the receiving

device will consider it to be a continuation of the previous frame. Due to frame confusion, the final CRC check value is incorrect, causing communication failure. Standard structure of RTU frame:

Frame header START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Slave address field ADDR	Communication address: 0~247 (decimal) (0 is the broadcast address)
Functional domain CMD	03H: Read slave parameters; 06H: Write slave parameters
Data domain DATA (N-1)…DATA (0)	2*N bytes of data. This part is the main content of communication and the core of data exchange in communication.
CRC CHK low bit	Check value: CRC check value (16BIT)
CRC CHK high bit	
Frame end END	T1-T2-T3-T4 (transmission time of 3.5 bytes)
END Lo	

7.6 Command Code and Communication Data Description

7.6.1 Command code: 03H (0000 0011), read N words (Word) (up to 16 words can be read continuously)

For example: For a drive with slave address 01H, the memory starting address is 0007 (maximum output frequency address), and if one consecutive word is read, the structure of the frame is described as follows:

RTU master command information

START	T1-T2-T3-T4
ADDR	01H
CMD	03H
High bit of starting address (parameter group number)	00H (F0 group)
Low bit of starting address (parameter number)	07H (parameter No. 07 of Group F0 is: F0.07)
High bit of data number	00H
Low bit of data number	01H
CRC CHK low bit	35H
CRC CHK high bit	CBH
END	T1-T2-T3-T4

RTU slave response information

START	T1-T2-T3-T4

ADDR	01H
CMD	03H
Number of bytes	02H
Data address 0007H high bit	13H
Data address 0007H low bit	88H
CRC CHK low bit	B5H
CRC CHK high bit	12H
END	T1-T2-T3-T4

7.6.2 Command code: 06H (0000 0110), write a word (Word)

For example: write 5000 (1388H) to 0006H of the slave address 01H drive (keypad setting frequency address). The structure of the frame is described as follows:

RTU master command information

START	T1-T2-T3-T4
ADDR	01H
CMD	06H
Write data address high bit	00H
Write data address low bit	06H
Data content high bit	13H
Data content low bit	88H
CRC CHK low bit	6CH
CRC CHK high bit	43H
END	T1-T2-T3-T4

RTU slave response information

START	T1-T2-T3-T4
ADDR	01H
CMD	06H
Write data address high bit	00H
Write data address low bit	06H
Data content high bit	13H
Data content low bit	88H

CRC CHK low bit	6CH
CRC CHK high bit	43H
END	T1-T2-T3-T4

7.6.3 Communication Frame Error Checking Method

The error checking method of the frame mainly includes two parts of checking, namely the bit check of the byte (odd/even check) and the CRC check of the entire data of the frame.

7.6.3.1 Byte bit parity

You can choose different bit parity modes according to needs, or choose no parity, which will affect the parity bit settings of each byte.

The meaning of even parity: An even parity bit is appended before data transmission to indicate whether the number of “1”s in the transmitted data is an odd number or an even number. When it is an even number, the parity position is “0”, or it is set to “1” to keep the parity of the data unchanged.

The meaning of odd parity: An odd parity bit is appended before data transmission to indicate whether the number of “1”s in the transmitted data is an odd number or an even number. When it is an odd number, the parity position is “0”, or it is set to “1” to keep the parity of the data unchanged.

For example, when “11001110” needs to be transmitted, the data contains 5 “1”s. If even parity is used, the even parity bit is “1”. If odd parity is used, the odd parity bit is “0”. When transmitting data, the parity bit is calculated and placed at the position of the parity bit of the frame. The receiving device also performs parity check. If it is found that the parity of the received data is inconsistent with the preset one, it is considered that a communication error has occurred.

7.6.3.2 CRC check method:

Using the RTU frame format, the frame includes a frame error detection field calculated based on the CRC method. The CRC field detects the contents of the entire frame. The CRC field is two bytes and contains a 16-bit binary value. It is calculated by the transmitting device and added to the frame. The receiving device recalculates the CRC of the received frame and compares it with the value in the received CRC field. If the two CRC values are not equal, there is an error in the transmission.

The CRC is first stored in 0xFFFF, and then a process is called to process more than 6 consecutive bytes in the frame with the value in the current register. Only the 8Bit data in each character is valid for CRC, the start bit, stop bit and parity bit are invalid.

During the CRC generation process, each 8-bit character is independently ORed (XOR) with the register content. The result is moved in the direction of the least significant bit, and the most significant bit is filled with 0s. The LSB is extracted and detected. If the LSB is 1, the register is XORed separately with the preset

value. If the LSB is 0, it is not performed. The entire process is repeated 8 times. After the last bit (bit 8) is completed, the next 8-bit byte is XORed separately with the current value of the register. The value in the final register is the CRC value after all bytes in the frame have been executed.

This calculation method of CRC adopts the international standard CRC check rule. When editing the CRC algorithm, you can refer to the relevant standard CRC algorithm to write a CRC calculation program that truly meets the requirements.

Now a simple function for CRC calculation is provided for user reference (programmed in C language):

```
unsigned int crc_cal_value(unsigned char *data_value,unsigned char data_length)
{
        int i;
        unsigned int crc_value=0xffff;        while(data_length--)
              {
                crc_value^=*data_value++;
                for(i=0;i<8;i++)
                {
                        if(crc_value&0x0001)
                        crc_value=(crc_value>>1)^0xa001;
                        else
                   crc_value=crc_value>>1;
                }
                }
         return(crc_value);
}
```

In ladder logic, CKSM calculates the CRC value based on the frame content and uses the table lookup method. This method has a simple program and fast operation speed, but the program occupies a large ROM space. Please use it with caution when program space is required.

7.6.4 Definition of Communication Data Address

This part is the address definition of communication data, which is used to control the operation of the drive, obtain the drive status information and set the relevant function parameters of the drive, etc. The high bits of the parameter group communication address are as follows: F0 group-FD group communication address high bit 00-0D, FU group communication address high bit 0E, FL group communication address high bit 0F.

(1) Representation rules of function code parameter address

The function code serial number is used as the parameter to correspond to the register address, but it must be converted into hexadecimal. For example, the hexadecimal communication address of parameter F5.11 is 050BH, and the hexadecimal communication address of parameter FU.22 is 0E16H.

Note: Some parameters cannot be changed when the drive is running; some parameters cannot be changed no matter what state the drive is in; when changing function code parameters, pay attention to the setting range, unit, and related instructions of the parameters.

In addition, because the EEPROM is frequently stored, the service life of the EEPROM will be reduced. For users, some function codes do not need to be stored in communication mode. They only need to change the value in the on-chip RAM to meet the usage requirements. To modify the data in the EEPROM, just add 80H (128 in hexadecimal) to the high-order address of the corresponding function code. For example, if writing function code F0C.02 needs to be stored in EEPROM, set the address to 8C02H; if you only need to modify the value in RAM without storing it in EEPROM, set the address to 0C02H. This address can only be used to write to the on-chip RAM, and cannot be used for reading. Reading this address is invalid.

(2) Address description of other functions:

Function description	Address definition	Data meaning description	R/W characteristics
Communication control command	1000H	0001H: Forward running	W
		0002H: Reverse running	
		0003H: Reserved	
		0004H: Reserved	
		0005H: Decelerate to stop	
		0006H: Free stop	
		0007H: Fault reset	
Drive status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Drive standby	
		0004H: Fault in progress	
Communication setting value Address	2000H	Communication setting value range (-10000~10000) Note: Communication setting value is a percentage of relative value (-100.00%~100.00%), and communication writing operations can be	W

Function description	Address definition	Data meaning description	R/W characteristics
		performed. When it is set as a frequency source, it is relative to the percentage of the maximum frequency (F0.07); when it is set as a torque, it is relative to the percentage of twice the rated motor torque. When given or fed back as PID, the corresponding value is the percentage of PID.	
Running/stop parameter address description	3000H	Running frequency	R
	3001H	Set frequency	R
	3002H	Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Running speed	R
	3006H	Output power	R
	3007H	Output torque	R
	3008H	PID given value	R
	3009H	PID feedback value	R
	300AH	Terminal input flag status 1	R
	300BH	Terminal input flag status 2	R
	300CH	Analog AI1 value	R
	300DH	Analog AI2 value	R
	300EH	Retention	R
	300FH	Retention	R
	3010H	High-speed pulse input	R
	3011H	Retention	R
	3012H	Current segment number of multi-stage speed	R
Drive fault Information address	5000H	The fault information code is consistent with the sequence number of the fault type in the function code menu, except that hexadecimal data is returned to the host computer instead of fault characters.	R

Chapter 8 Options/Accessories

8.1 AC Reactor

AC reactor can suppress the high-order harmonics of the drive input current and significantly improve the power factor of the drive. It is recommended to use AC reactor in the following situations:

The ratio of the power capacity of the place where the drive is used to the capacity of the drive is more than 10:1. A thyristor load or a power factor compensation device with switch control is connected to the same power supply.

The voltage imbalance of the three-phase power supply is large (≥3%).

8.2 DC Reactor

When the grid capacity is much larger than the drive capacity or the power supply capacity is greater than 1000kVA, or when there is a high requirement to improve the power factor of the power supply, a DC reactor needs to be installed. DC reactors can be used simultaneously with AC reactors, which have a significant effect on reducing input high-order harmonics.

Table 8-1 Reactor selection

Drive power (kW)	Input reactor	Output reactor	DC reactor
GK690-0R7G-4TB	ACL-07-4C	OCL-07-4C	/
GK690-1R5G-4TB			/
GK690-2R2G-4TB			/
GK690-004G/5R5P-4TB	ACL-10-4C	OCL-10-4C	/
GK690-5R5G/7R5P-4TB	ACL-15-4C	OCL-15-4C	/
GK690-7R5G/011P-4TB	ACL-20-4C	OCL-20-4C	/
GK690-011G/015P-4TB	ACL-30-4C	OCL-30-4C	/
GK690-015G/018P-4TB	ACL-40-4C	OCL-40-4C	/
GK690-018G/022P-4TB			/
GK690-022G/030P-4TB	ACL-50-4C	OCL-50-4C	/
GK690-030G/037P-4TB	ACL-80-4C	OCL-80-4C	/
GK690-037G/45P-4TB			/
GK690-045G/055P-4T	ACL-120-4C	OCL-120-4C	DCL-100-4C
GK690-055G/075P-4T			DCL-120-4C
GK690-075G/090P-4T	ACL-200-4C	OCL-200-4C	DCL-160-4C
GK690-090G/110P-4T			DCL-200-4C

GK690-110G/132P-4T	ACL-250-4C	OCL-250-4C	DCL-250-4C
GK690-132G/160P-4T	ACL-300-4C	OCL-300-4C	DCL-300-4C
GK690-160G/185P-4T	ACL-330-4C	OCL-330-4C	DCL-350-4C
GK690-185G/200P-4T	ACL-400-4C	OCL-400-4C	DCL-450-4C
GK690-200G/220P-4T			DCL-500-4C
GK690-220G/255P-4T	ACL-490-4C	OCL-490-4C	DCL-500-4C
GK690-255G/280P-4T			DCL-650-4C
GK690-280G/315P-4T	ACL-600-4C	OCL-600-4C	DCL-650-4C
GK690-315G/355P-4T	ACL-660-4C	OCL-660-4C	DCL-650-4C
GK690-355G-4T	ACL-800-4C	OCL-800-4C	DCL-800-4C
GK690-400G-4T			DCL-800-4C
GK690-450G-4T	ACL-900-4C	OCL-900-4C	DCL-1000-4C
GK690-500G-4T	ACL-1000-4C	OCL-1000-4C	DCL-1200-4C
GK690-560G-4T			DCL-1200-4C
GK690-630G-4T	ACL-1200-4C	OCL-1200-4C	DCL-1600-4C
GK690-710G-4T	ACL-1300-4C	OCL-1300-4C	DCL-1600-4C
GK690-800G-4T	ACL-1500-4C	OCL-1500-4C	DCL-1800-4C
GK690-1000G-4T	ACL-2000-4C	OCL-2000-4C	DCL-2500-4C

8.3 Remote Operation Keypad

The panels of this series of drives are equipped with exquisitely designed and easy-to-use operation panels. To lead the operation panel to other places outside the machine, you need to order an extension cord. The operation panel can be moved to any place within 10m from the host computer.

8.4 Braking Unit DB and Braking Resistor BR

When the control equipment driven by the drive brakes quickly, the energy fed back to the DC bus during braking of the motor needs to be consumed through the braking unit. The 37kW and below models of this series of drives have built-in braking units. The 45-110kW models can be equipped with built-in braking units. The 132kW and above models require an external braking unit.

Refer to the following table for the resistance values and power of commonly used braking resistors:

Drive model	Braking unit	Recommended resistance value (Ω)	Number of resistors
Single phase power supply: 220V, 50/60Hz range			
GK690-0R7G-2SB	Standard	≧80W 100Ω	1

GK690-1R5G-2SB	built-in	≧100W 100Ω	1
GK690-2R2G-2SB		≧100W 100Ω	1
Three-phase power supply: 220V, 50/60Hz range			
GK690-0R7G-2TB	Standard built-in	≧160W 100Ω	1
GK690-1R5G-2TB		≧340W 100Ω	1
GK690-2R2G-2TB		≧500W 100Ω	1
drive model	Braking unit	Recommended resistance value (Ω)	Number of resistors
Three-phase power supply: 380V, 50/60Hz range			
GK690-0R7G-4TB	Standard built-in	≧140W 260Ω	1
GK690-1R5G-4TB		≧300W 260Ω	1
GK690-2R2G-4TB		≧440W 260Ω	1
GK690-004G/5R5P-4TB		≧740W 150Ω	1
GK690-5R5G/7R5P-4TB		≧1.1kW 100Ω	1
GK690-7R5G/011P-4TB		≧1.5kW 75Ω	1
GK690-011G/015P-4TB		≧2.2kW 50Ω	1
GK690-015G/018P-4TB		≧3.0kW 38Ω	1
GK690-018G/022P-4TB		≧4.0kW 32Ω	1
GK690-022G/030P-4TB		≧4.5kW 27Ω	1
GK690-030G/037P-4TB		≧6.0kW 20Ω	1
GK690-037G/045P-4TB		≧7.0kW 16Ω	1
GK690-045G/055P-4T	Optional built-in	≧9.0kW 13Ω	1
GK690-055G/075P-4T		≧11kW 10.5Ω	1
GK690-075G/090P-4T		≧15kW 7.7Ω	1
GK690-090G/110P-4T		≧9kW 10.0Ω	2
GK690-110G/132P-4T		≧11kW 8.0Ω	2

Note: Multiple braking resistors are connected in parallel. For example, the braking resistor selection of the GK690-090G/110P-4T drive: it is recommended to select two 9kW, 10Ω resistors connected in parallel, which translates into a braking resistor of 18kW, 10Ω.

Table 8-2 Resistance values and power of commonly used braking resistor