Altivar 1200

Programming Manual

English

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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer must perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed. Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Chapter 1: Before you begin - Safety information

1.1 Qualification of personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used.
All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

1.2 Intended use

The HMI software is intended for industrial use according to this manual.
The HMI software is designed to commission, command and diagnose ATV1200 products.
The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.
The information on the intended use of products must also be adhered to.
Any use other than that specifically permitted in this manual is strictly prohibited and may result in death, injury and/or equipment damage.

Chapter 1: Before you begin - Safety information

1.3 Hazard categories

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

NOTICE

NOTICE indicates a potentially hazardous situation, which, if not avoided, **can result** in equipment damage.

Chapter 1: Before you begin - Safety information

1.4 Basic information

Read and understand these instructions before performing any procedure on this drive.

PLEASE NOTE

The word "drive" as used in this manual refers to the controller portion of the adjustable speed drive as defined by NEC.
Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.
No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this product.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Apply appropriate personal protective equipment (PPE).
- Many components of the product, including the printed circuit boards, operate with mains voltage. Do not touch these. Use only electrically insulated tools.
- Do not touch unshielded components or terminals with voltage present.
- Motors can generate voltage when the shaft is in rotation. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors of the motor cable.
- Before performing work on the drive system :
  - Always verify that the red LED of each power cell is ON when mains voltage is present. LED status can be checked when doors are locked through specially designed openings in the doors. If one or more of the red power cell LEDs is OFF, contact your local Schneider Electric representative immediately.
  - Disconnect all power, including external control power that may be present.
  - Place a "Do Not Turn On" label on all power switches.
  - Lock all power switches in the open position.
  - Wait for at least 20 minutes to allow the DC bus capacitors of the power cells to discharge. The DC bus LEDs located on each power cell are not an indicator of the absence of DC bus voltage.
  - If one or more of the red power cell LEDs remains ON 20 minutes after the mains voltage has been disconnected:
    - Do not repair or operate the product.
    - Contact your local Schneider Electric representative immediately.
- Always use a properly certified voltage sensing device to confirm power is off.
- Install and close all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Drive systems may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown and unsuitable settings or data.
- Perform a comprehensive commissioning test. (refer to "System Commissioning" chapter)

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines. (1)
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death or serious injury.

(1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems”.

Chapter 1: Before you begin - Safety information

1.5 Standard and terminology

Technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of the pertinent standards.

In the area of drive systems, this includes, but is not limited to, terms such as "safety function", "safe state", "fault", "fault reset", "failure", "error", "error message", "warning", "warning message", etc.

Among others, these standards include:
• IEC 61800: "Adjustable speed electrical power drive systems"
• IEC 61158: "Digital data communications for measurement and control-Fieldbus for use in industrial control systems"
• ICE 61784: "Industrial communication networks-Profiles"
• IEC 61508: "Functional safety of electrical/electronic/programmable electronic safety-related systems"

1.6 About this manual

Document scope

The purpose of this document is to:
• help you to set-up the drive,
• show you how to program the drive,
• show you the different menus, modes and parameters,
• help you with maintenance and diagnostics.

Validity note

This documentation is only valid for the Altivar 1200 drive.

Related documents

Title of Documentation	Reference Number
ATV1200 Installation manual	ST03196
ATV1200 programming manual	ST03197

Table 1-1

You can download the latest versions of these technical publications and other technical information from our website at www.schneider-electric.com.

Chapter 2: Human-Machine Interface

2.1 Typical partial front panel of the control cubicle

Fig. 2-1 is the typical partial front panel of the control cubicle of ATV1200 series medium voltage drive system, which has the following parts and buttons:

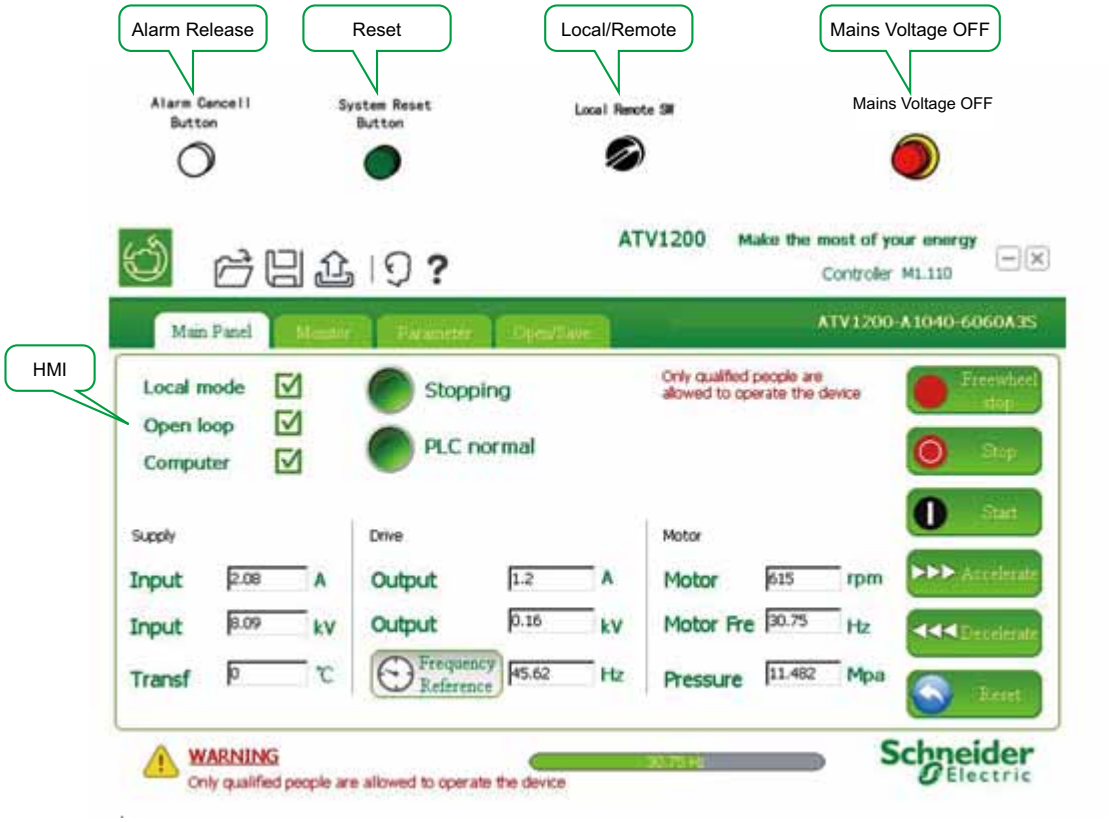

Figure 2-1 Typical partial front panel of the control cubicle of ATV1200 series medium voltage drive

Note : The relative positions of each part in Fig. 2-1 may vary according to different items, please adhere to those as they appear on the supplied products.

2.1.1 "Mains Voltage OFF" button

When there is a need to rapidly stop the medium voltage drive system, press the "Mains Voltage OFF" button. Then the medium voltage drive system will block its outputs, meanwhile opening the user's medium voltage switch automatically, thus providing protection to the whole variable speed drive system. To release, you can simply draw out the "Mains Voltage OFF" button directly.

2.1.2 Remote/Local Control knob

ATV1200 series medium voltage drive system has two control modes, i.e., local and remote modes, which are chosen by the Remote/Local Control knob. The two control modes can only influence the selection of operation instructions, and have no relationship with the frequency Command Mode of the medium voltage drive system.

2.1.2.1 Remote Control mode

When the Remote/Local Control knob is turned to Remote Control, the user can control the medium voltage drive system either through the operation console or the remote monitoring computer in the industrial field or central control room. Then the remote control buttons for Start, Stop and Soft Start are enabled, while the corresponding software control buttons on the main screen of the human-machine interface(HMI) monitoring program are faded and disabled. After receiving the indication "System Standby", the remote operator can turn on the drive with the remote Start or Soft Start buttons, or stop the drive with the remote Stop button.
When the Remote/Local Control knob is turned to Remote Control, it is necessary to use the remote monitoring computer in the industrial field or the central control room to control the medium voltage drive system, as well as to select Upper-level Machine Control Enabled in [Parameter Settings] of the HMI monitoring program.

Remark:
In Remote Control mode, the external analog reference is not enable by default. To enable the external analog reference, select analog command mode in [Parameter Settings] of the HMI monitoring program.

2.1.2.2 Local Control mode

When the Remote/Local Control knob is turned to Local Control, the remote Start, Stop and Soft Start control buttons are disabled. Meanwhile, the control function of the remote monitoring computer is also disabled. The Software Control button in the HMI touch screen is enabled. The user can use the HMI monitoring program directly to operate the medium voltage drive system. After receiving the indication of "System Standby", the interface operator can turn on the drive with the Start button on the screen, or stop the drive with the Stop or Freewheel button on the screen.

- When in Local Control mode, it can use by default the frequency command on the screen.The external analog reference can be enabled by the user in the command mode in [Parameter Settings] of the HMI monitoring program.
- Regardless of whether in "Remote" or "Local Control" mode, both the "Mains Voltage OFF" button on the cubicle door and the "Freewheel Stop" button on the HMI touch screen are enabled.

2.1.3 System Reset button

Regardless of whether in "Remote" or "Local Control" mode, pressing the System Reset button will clear the current messages.
When the medium voltage drive system is running, the System Reset button is disabled. If the system trips and stops due to a detected fault, after the "detected fault" message has gone (either by itself or through manual intervention), it will be necessary to reset using the "System Reset" button, or the "Reset" button on the HMI touchscreen, thus effectively clearing the memory state. Restarting the Drive will only be possible after the PLC indicates "Medium Voltage Closing Permitted" and "System Standby".
If the audio alarm function of the system is blocked by the user with the alarm Release button, the function can be restored by pressing the System Reset button.

2.1.4 Alarm Release button

The medium voltage drive system will sound an audio alarm signal when a fault is detected. The alarm signal can be stopped by pressing the "Alarm Release" button.
If the alarm is sounding whilst the medium voltage drive system is in operation, the system will continue to run. In this case, when the Alarm Release button is pressed, the audio alarming signal is stopped. If a further abnormal situation occurs, the alarm signal will begin to sound again, and this can be deactivated simply by pressing the "Alarm Release" button as before. If the previous " Alarm" message reappears after disappearing by itself or through manual intervention, the system will sound the alarm signal, which again can be ceased by pressing the "Alarm Release" button.

2.1.5 Integrated Human-Machine Interface

Through this interface, the user can start, stop and reset the medium voltage drive system, modify its functions and parameters, as well as browse the states and parameters of the system.

Chapter 2: Human-Machine Interface

2.2 Operation Buttons and Layout of the Main Screen

2.2.1 User log-in

When HMI first power up, restart and/or recover from screen saver, the below window will pop up automatically, read and understand the contents contains in and follow all the instructions.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Drive systems may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

- Only appropriately trained persons who are familiar with and understand the contents all pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system.
  Installation, adjustment, repair and maintenance must be performed by qualified bersonnel.
- Carefully set parameters in accordance with the application.
- Do not operate the product with unknown and unsuitable settings or data.
- Perform a comprehensive commissioning test.
- Check that any modification of the current device configuration is compatible with the application.
- The Main Panel cannot be used in case of emergency stop.

Failure to follow these instructions can result in death or serious injury.

If you agree to follow these instructions, press'OK'

OK

User Login: when clicking the tab Parameter , the user login screen will be poped up first (as shown in Fig. 2-2). Select the user name, and input the password (the operator's default password is "0", the administrator's default password is 111, while the system administrator's default password is "222"), then you can log in the system to perform corresponding parameter settings. Meanwhile, the access right for the logged user to make parameter modification is also determined. The main screen for setting parameters of the medium voltage drive system is as shown in Fig. 2-3:

Figure 2-2 The Interface for User Login

Figure 2-3 The Main Interface for Parameter Setting

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Only appropriately trained persons who are familiar with and understand the contents all pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.

To avoid unauthorized people to access to the system drive parameters and commands, the passwords must be changed from their default value.

Failure to follow these instructions can result in death or serious injury.

2.2.2 Layout of the Main Screen

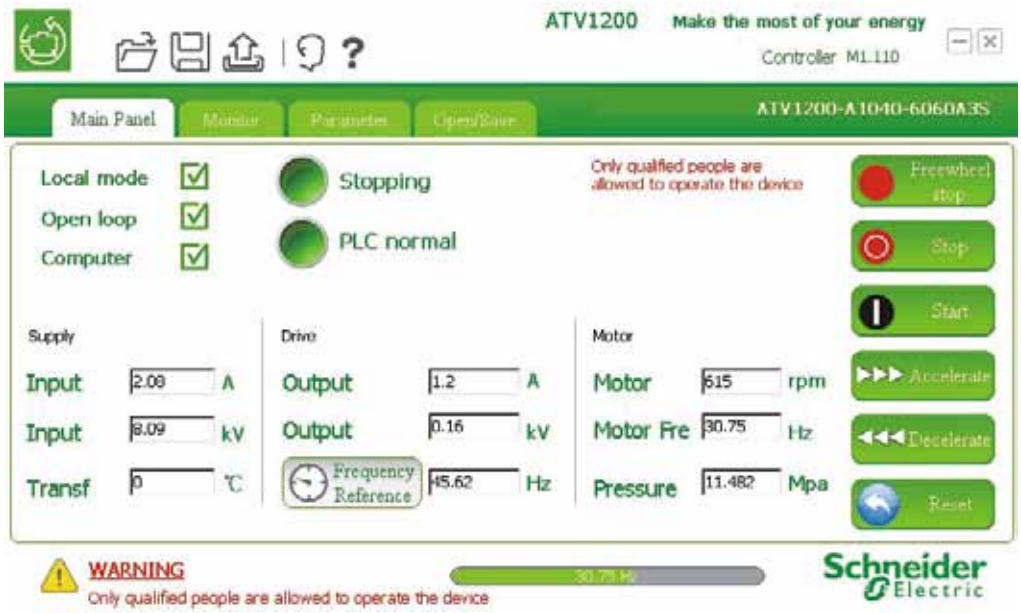

Figure 2-4 Integrated Human-Machine Interface

2.2.3 Functions of buttons

There are 14 buttons and tabs on the main screen, which are used to set the drive's functions and display its states. Their functions are described in Table 2-1.

Freewheel stop	Send stop command to the drive. After the user sends the stop command with this button, the medium voltage drive system will block its output. The load motor will delerate in freewheel stop until standstill according to its own inertia and the actual field situation. When the drive is in Standby state, this button is in grey and disabled state. This stop command is also active if the Remote/Local Control knob on the cubicle door is turned to Remote Control.
Stop	Send stop command to the drive. If the Remote/Local Control knob on the cubicle door is turned to Remote Control, this button has no effect. When in Local Control mode, after the user uses this button to send the stop command, the drive will decelerate to standstill according to the deceleration time that has been set. When the drive is in "Stopped" or "Standby" state, this button appears grey and is in disabled state.
Start	Send start command to the drive. If the Start Mode in [Parameter Settings] is set to "Soft Start", then this button is changed to "Soft Start". If the Remote/Local Control knob on the cubicle door is turned to Remote Control, this button has no effect. When in Local Control mode, if the drive is in running state, this button will appear grey and be in disabled state. When the drive is in course of deceleration or in Standby state, this button is enabled, and can be used to start the drive.
Accelerate	This button can increase the reference frequency, meanwhile avoiding two skip-frequency ranges, taking the upper limit of the skip frequency, and checking the maximum and minimum frequency values. If the Operation Mode in Function Items is selected to be "closed-loop" operation, this button will be changed into the incremental button of the controlled parameter; when the Reference Mode is set to Analog Reference, this button is disabled.
Decelerate	This button can decrease the reference frequency, meanwhile avoiding two skip frequency ranges, taking the lower limit of the skip frequency, and checking the maximum and minimum frequency value. If the Operation Mode in Function Items is selected to be "closed-loop" operation, this button will be changed into the decremental button of the controlled parameter; when the Reference Mode is set to Analog Reference, this button is disabled.
Reset	Reset the drive to the initial powered up state. After sounding of the alarm or detection of a fault, (The cause of the alarm/detected fault must be removed before resetting the system drive) then the "Reset" button must be used to clear the state, otherwise the drive cannot continue normal running. This Reset button has the same function as the Reset button on the cubicle door. Whilst the drive is in operation, the reset button is inaccessible.
Monitor	This is used to view the waveform of the input and output of the drive. This function records the user's every operation on the variable speed drive system and the drive's states at the corresponding moments.
Parameter	This function is used to set the parameters of the medium voltage drive.
Open/Save	This function displays and/or records operation data, and can also be used to export all recorded data to a USB flash disk. For details, refer to Section 6.

	By using this button, the user can exit the monitoring program of the drive (see Fig. 2-4). In principle, when the drive is in running state, exiting the monitoring program will not influence the normal operation of drive, but the running state of the drive will not be in process of being monitored. So it is recommended not to exit the monitoring program when the drive is running.
	Used to set the frequency reference, whilst avoiding the skip frequency, as well as limit the maximum and minimum frequencies. If the Operation Mode in Function Items is selected to be "closed-loop" operation, this button will be changed to input the reference value of the controlled parameter; when the Reference Mode is set to Analog Reference, this button is disabled.
	Parameter report
	Save as
	Open

Table 2-1 Description of Button Operation

Click  , the following dialog box will pop up:

Figure 2-5 Dialog box for exiting the interface

Click  , to exit the HMI monitoring program; click  , to abord.

Chapter 2: Human-Machine Interface

2.3 Display of the Main Screen

Besides the above-mentioned buttons, the main screen of the HMI monitoring program provides the realtime display for thirteen main operation parameter values of the drive, as shown in Fig. 2-6.

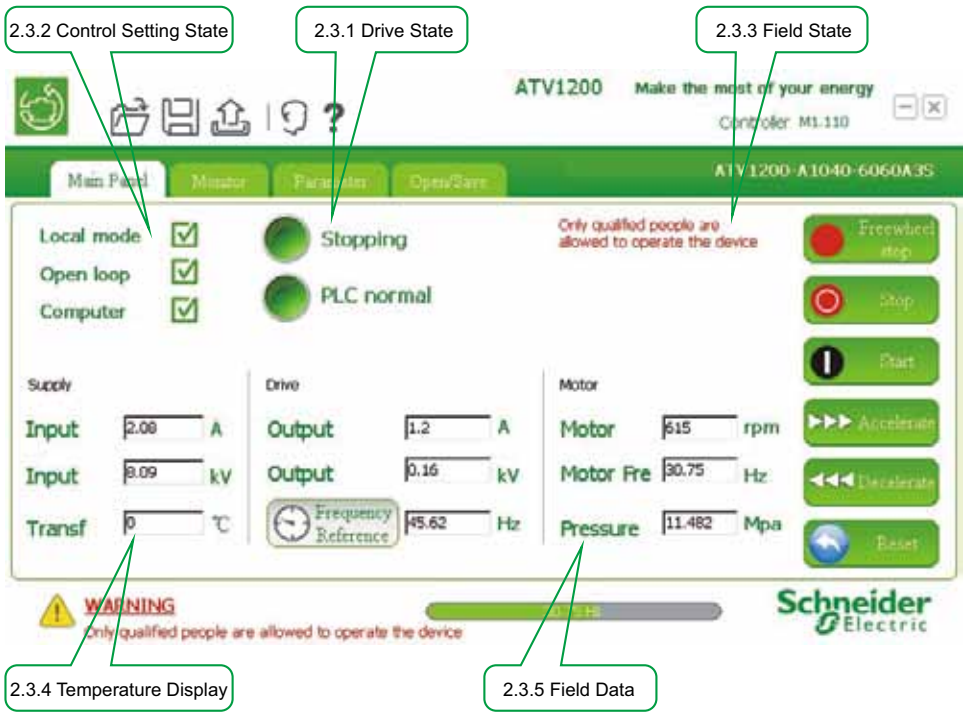

Figure 2-6 Display of the Main Screen

2.3.1 Drive State

Displays the current states of the drive, such as, "Standby", "Running", "Bypass Running", etc. During an "alarm" signal, it can display the cause directly. When [delete] “detected fault” is displayed, the specific cause can be viewed by pressing the "alarm" button.

2.3.2 Control Setting State

Displays the current control mode, operation and reference of the drive. If the user has modified the corresponding settings [in Parameter Settings], the display here will be changed at the same time.

2.3.3 Field State

Displays PLC signals, such as "Door not closed", "Transformer Overheating", etc., as well as display whether the disk space has already been filled up. If there is no signal to display, then it will display: “only operator can operate the HMI”.

2.3.4 Temperature Display

Alternately displays the temperatures of the transformer’s three phases in ºC.

2.3.5 Field Data

When “Display in the Interface” in the [Analog Input Settings] screen in [Input and Output Settings] of [Parameter Settings] is selected, the input channel data will be displayed.

2.3.6 Reference Frequency

Displays the reference frequency of the drive. The value can be modified through the soft keyboard (press the Reference Frequency button, the soft keyboard will pop up) or through the Acceleration and Deceleration buttons, as well as can be set by analog signals. When in "closed-loop" operation mode, the reference value of the controlled parameter will be displayed. If the function is set to "Soft Start", the power-frequency transfer frequency of the soft start will be displayed.

2.3.7 Operation Frequency

Displays the current output frequency of the drive. When in "open-loop" operation, during the acceleration and deceleration courses of the drive, the operation frequency and the reference frequency may be temporarily unequal due to the effect of the acceleration and deceleration time. However, after reaching the stationary-state, the operation frequency is equal to the reference frequency. When in closed-loop mode, the operation frequency is regulated in real time by the drive automatically.

2.3.8 Rotation Speed of the Motor

Display the actual rotation speed of the motor, which is computed according to the operation frequency and the load situation of the motor. The motor’s synchronized rotation speed is in proportional to the operation frequency of the motor, while the slip is substantially proportional to the load current of the motor.

2.3.9 Input Current

Display the actual rms value of the input line current of the drive in Ampere (A).

2.3.10 Output Current

Display the actual rms value of the output line current of the drive in Ampere (A).

2.3.11 Input Voltage

Display the actual rms value of the input side line voltage of the drive in kilovolt (kV).

2.3.12 Output Voltage

Display the actual rms value of the output side line voltage of the drive in kilovolt (kV).

2.4 Monitor

The Monitor menu is used to monitor and record the operation parameters of the drive. Click the tab on the main menu, the Monitor following screen will be poped up:

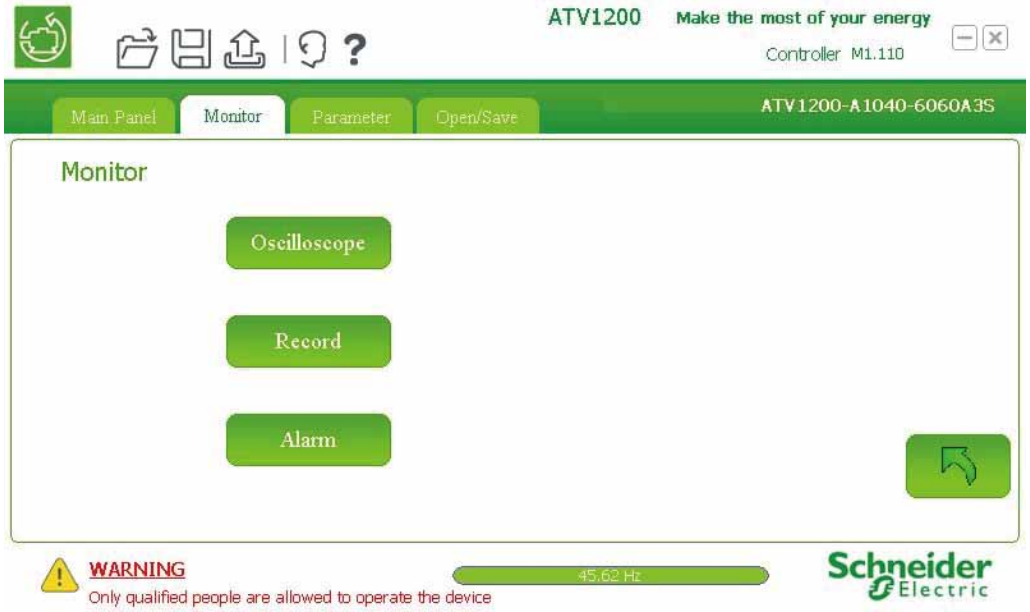

Figure 2-7 The Monitor Screen

2.4.1 Oscilloscope

The waveform setting window is used to display the realtime waveforms of the drive's input and output variables. Click the Oscilloscope button on the Monitor main screen to enter the waveform display screen, as shown in Fig. 2-8. The variable waveforms that can be displayed are listed in Table 2-2.

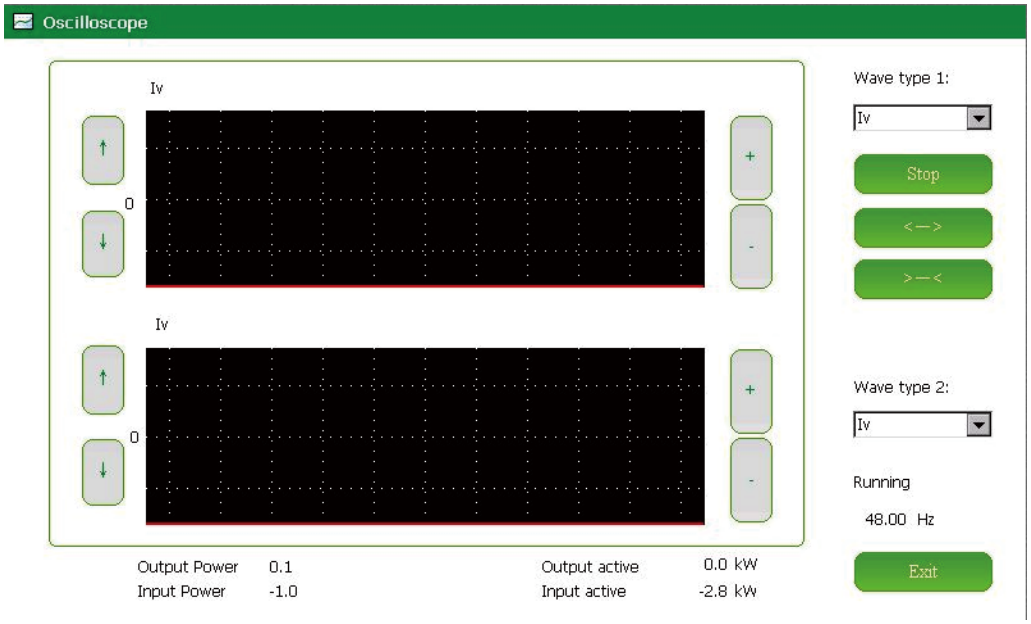

Figure 2-8 The Waveform Display screen

There are two drop-down list boxes in the waveform display screen, i.e., "Wave type 1" and "Wave type 2", through which we can view the variable waveforms as listed in the following table.

Name	Description	Remark
Iu	Waveform display of phase U output current of the variable speed drive system	
Iv	Waveform display of phase V output current of the variable speed drive system	
Iw	Waveform display of phase W output current of the variable speed drive system	
Vu	Waveform display of phase U output voltage of the variable speed drive system	
Vv	Waveform display of phase V output voltage of the variable speed drive system	
Vw	Waveform display of phase W output current of the variable speed drive system	
Ia	Waveform display of phase A input current of the variable speed drive system from the network	
Ib	Waveform display of phase B input current of the variable speed drive system from the network	
Ic	Waveform display of phase C input current of the variable speed drive system from the network	
Va	Waveform display of phase A input voltage of the variable speed drive system from the network	
Vb	Waveform display of phase B input voltage of the variable speed drive system from the network	
Vc	Waveform display of phase C input voltage of the variable speed drive system from the network	
Input active power	Active power of the network side	
Input reactive power	Reactive power of the network side	
Output active power	Active power of the motor side	
Output reactive power	Reactive power of the motor side	
Input power factor	Power factor of the network side	
Output power factor	Power factor of the motor side	
Rotor flux amplitude	Magnitude of the rotor flux	
Rotor flux reference	Reference value of the rotor flux	
ISD	Stator excitation current	
ISQ	Stator torque current	
ISA	α-axis component of the stator current in the α-β two phase static coordinate	
ISB	β-axis component of the stator current in the α-β two phase static coordinate	
ual	α-axis component of the stator voltage in the α-β two phase static coordinate	
ube	β-axis component of the stator voltage in the α-β two phase static coordinate	
ualc	Calculated value of the α-axis component of the stator voltage in the α-β two phase static coordinate	
ubec	Calculated value of the β-axis component of the stator voltage in the α-β two phase static coordinate	
VSAL_REF	α-axis component of the stator reference voltage in the α-β two phase static coordinate	
VSBE_REF	β-axis component of the stator reference voltage in the α-β two phase static coordinate	

Table 2-2

Using the buttons on the waveform screen, waveforms can be adjusted, for example: pressing  can make the waveform move up along Y-axis. Similarly, pressing the button  can make it move down along Y-axis. The button  can compress the waveform along X-axis, while the button  can expand the waveform along X-axis. Through the button  , the waveform can be hold, so as not to disturb waveform observation in dynamic display.

2.4.2 Record

Click the Record button on the Monitor main screen to enter the Record screen. The medium voltage drive system has the function of automatically record operation parameters. Every action on the drive system by the user and the states of the drive at the corresponding moments will be recorded. The Record screen is as shown in Fig 2-9.

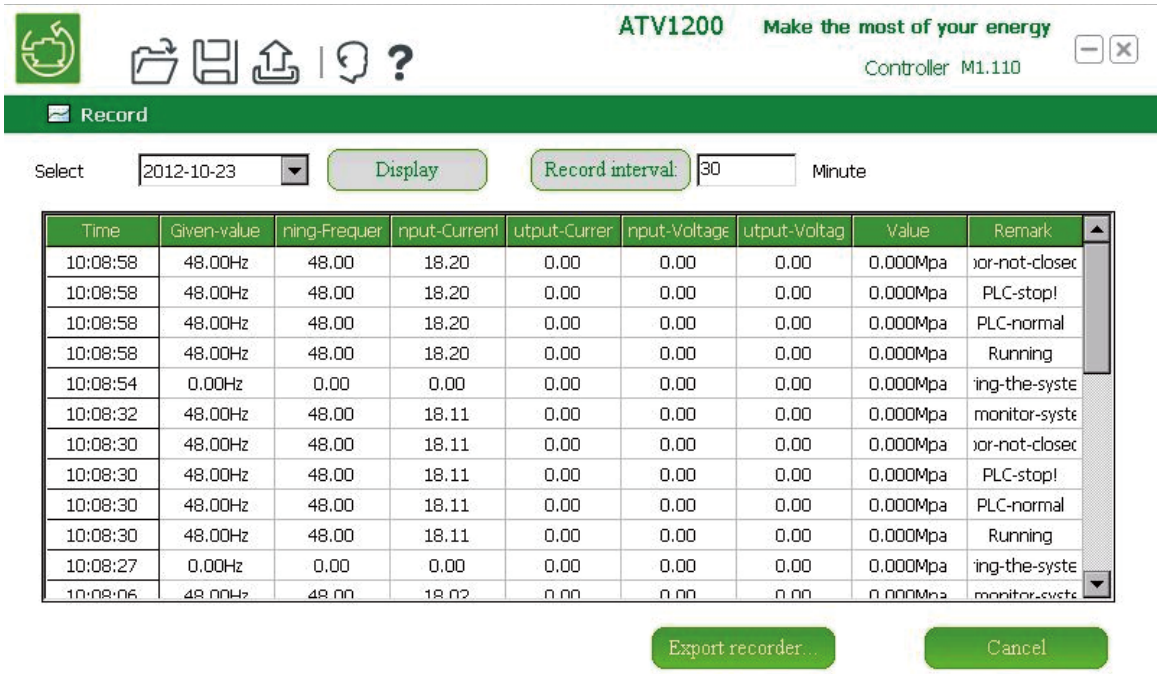

Figure 2-9 The display screen of operation record

Click the drop-down button for selecting the date, and select the date to be viewed, as shown in Fig. 2-10. Click the Display button, then the system's operation record of the selected date will be displayed. The parameters that are recorded automatically when the medium voltage drive system running includes Record Time, Given Value, Output Frequency, Input Current, Output Current, Input Voltage, Output Voltage, Actual Controlled State and Remark. The operation parameters recorded are stored in text file format into the hard disk of HMI everyday, the file named by its date, e.g., 2012.11.25.txt stands for the operation record in the day of Nov. 25, 2012. These text files are stored in the Log folder of the program's directory.

The Record interval: button in the screen is used to set the time interval for automatic parameter record. Click this button, then the software keyboard will pop up (as shown in Fig. 2-10). After setting the record interval, click OK. Thus when the system is running, it will make records according to this interval set by the user.

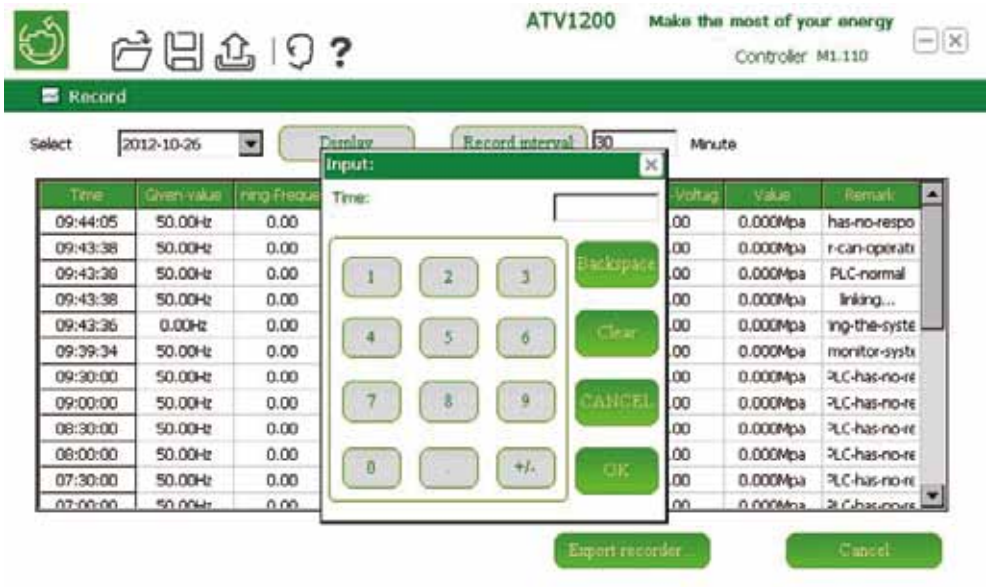

Figure 2-10 Setting the record interval

If you need to export the operation record to a USB disk, you can click the Export recorder button at the bottom of the Record screen. Then the Export Record dialog box will pop up.
When exporting the operation record, you can choose to ○ Export recorder or ◉ Copy recorder . In the Export recorder mode, when the operation record is being copied to the USB disk, the operation records stored in the HMI will be deleted at the same time; while in the Copy recorder mode, when being copied to the USB disk, the operation records stored in the HMI will not be deleted.
When there is no USB disk inserted, the interface will prompt: Please Insert the USB disk. After the USB disk inserted, the program will automatically set the record exporting path to: \USB HARDDISK\Log (this path cannot be modified), i.e., creating a folder Log in the USB disk, and save the operation records into this folder. Then, click the OK button to begin exporting operation records. After records exported, a Prompt dialog box will pop up automatically (Fig. 2-11), indicating the success of exporting operation.

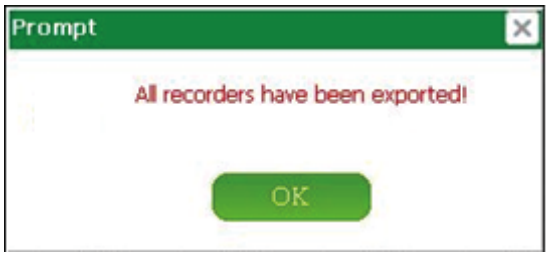

Figure 2-11 The Prompt box indicating the success of exporting

When copying records, if the record of a date cannot be copied, the corresponding indication will be displayed.

2.4.3 Power cell status

Click the Alarm button in the Monitor main screen to enter the Status window. The drive has accurate abnormal localization and query functions. In any case, the user can use the status window to know timely the current states of the system and each abnormal status that happened before, including the time, cause and position, so as to take appropriate actions.
The status window (as shown in Fig. 2-12) will pop up automatically when the system has a “Detected fault”, with the current flashing. The user can also use the Forward or Backward button to view the history of abnormal conditions. The information includes the states of the system (indicated in the upper left of the window), of each power unit and of bypass(behind the date and time display) , etc.

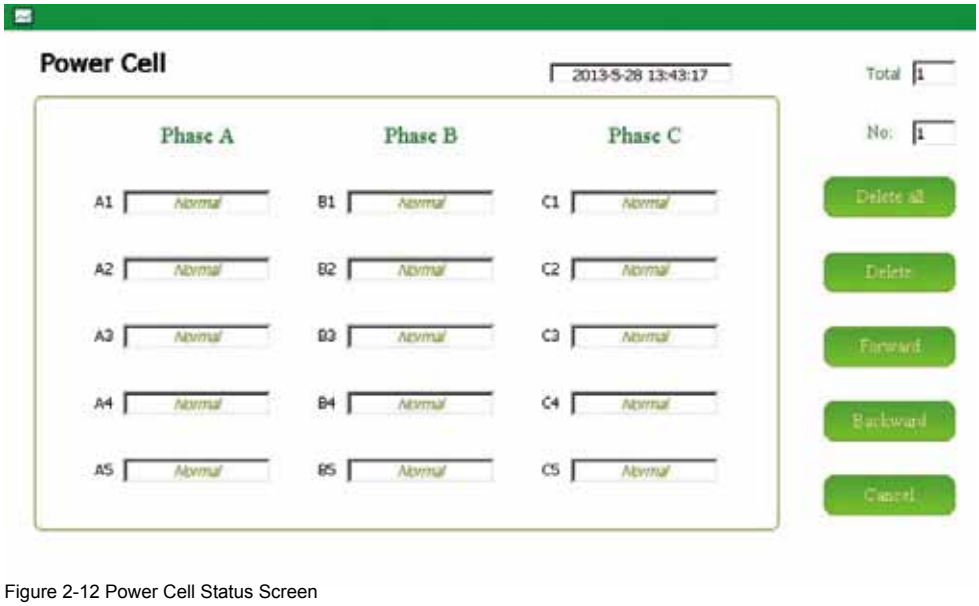

Figure 2-12 Power Cell Status Screen

When there is a “alarming” on the cubicle door, UPS, motor, transformer, fan, etc. that will not influence system operation, the alarming will be displayed in the main screen. When the alarming disappears, the display will disappear too. “Alarming” will not cause this window to pop up.
A1-A10 in the window stand for the state of eight power units of phase A, respectively. B1-B10 stand for those states of phase B, respectively, while C1-C10 stand for those states of phase B, respectively. For the drive in the series which has more or less than eight units in each phase, the number of units will increase or decrease automatically. The Delete button can delete the current page of records. When the Delete all button clicked, the confirmation dialog box will pop up. Click OK button in this box will clear the records completely.

2.5 Parameter

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

The HMI is only for the controlling and monitoring of the Medium Voltage drive system.

• Never install or operate any other software.

Failure to follow these instructions can result in death or serious injury.

[Parameter Settings] is used to set the parameters used by the drive in its operation, as shown in Fig. 2-13:

Figure 2-13 Parameter Settings screen

2.5.1 General Settings

In [Parameter Settings], click the General setting item, then the general settings dialog box will pop up, as shown in Fig. 2-14:

Figure 2-14 General Setting

Through this General Settings screen (see Fig. 2-14), the user can read the system version number of the main controller, set the system's accumulated running time, drive model, drive number, the number of drive levels, and the controller types(c196, DSP, 196MBUS). The detailed functions of each button are listed in Table 2-3.

Controller ver	Click this button to read the version number of the controller unit's program. This data is only for display, cannot be set or modified.
Total running:	Sets the accumulated with-motor running time since its delivery from the factory.
Type:	Sets the model of the current medium voltage drive system. Input the number according to the nameplate of the drive.
No:	Sets the number of the current medium voltage drive system. The drives can be centrally monitored from the upper-level computer. The monitoring computer in the central control room can monitor 32 drives at the same time, each of which can be set to a different number in this screen. The upper-level monitoring computer uses different numbers to identify each drive, so as to monitor a specific drive.
Levels cascaded:	Sets the number of levels cascaded of the medium voltage drive system.
Language:	Sets the display language of screens and parameters of the program. lang_zh_cn stands for Chinese, while lang_en_us for English.
Controller	Select the type of the drive controller: DSP control.
☑ Instruction not via PLC	With this item checked, the corresponding commands sent by the interface, such as Start or Stop commands, will be transmitted to the master controlling box, while not via the PLC; with this item unchecked, the corresponding commands are transmitted through the PLC.

Table 2-3

2.5.2 Speed Parameter Setting

In the main screen of [Parameter Setting], click the Speed parameter button, then the Speed Parameter dialog box will pop up, the parameter items of which are as shown in Fig. 2-15, the specific function of each "Parameter name" are shown in Table 2-4.

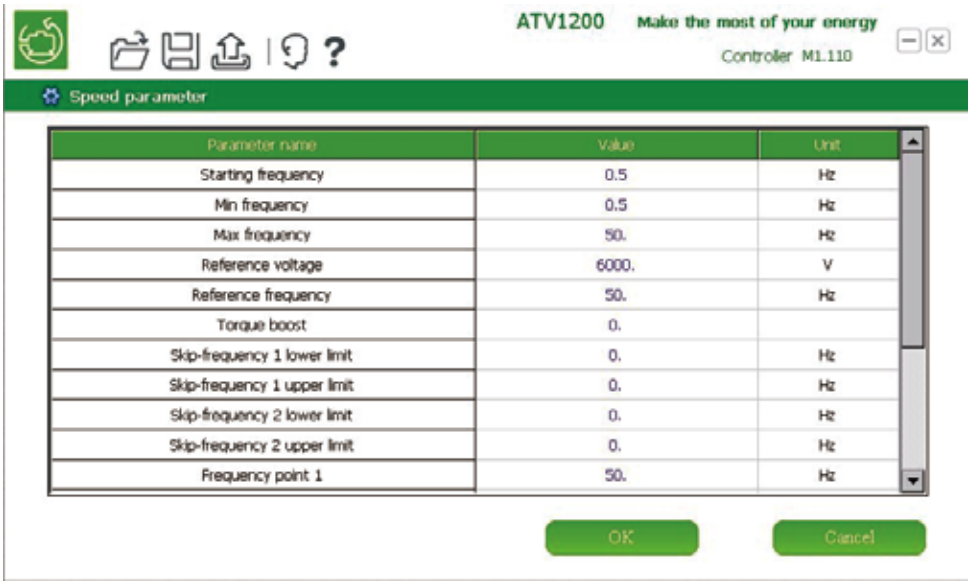

Figure 2-15 The Speed Parameter screen

Name/Description	Adjustment range	Factory setting
□ **[Starting frequency]**	0.1 - 50.0Hz	0.5Hz
The starting frequency of the drive. **Remark:** this setting is only valid when the U/f Start Mode under the Function button is set to Normal Start and the Motor Control Mode under the Control Parameter directory is selected to be U/f Control.		
□ **[Min frequency]**	0.5 - 50.0Hz	0.5Hz
The minimum frequency output of the drive. When the frequency reference is lower than this value, the drive will output this frequency. During the stopping phase, when the set frequency is lower than this value, the output will be stopped, and the stopping phase will be finished.		
□ **[Max frequency]**	0.5 -60.0Hz	60.0Hz
The maximum frequency output of the drive. When the frequency reference is higher than this value, the drive will output this frequency.		
□ **[Reference voltage]**	1.0 -10000.0V	6000V
The output voltage value when the motor is running at the nominal frequency, commonly set to the rated voltage of the motor. This parameter is writable, requiring at least the Operator access permission to write. When the output frequency of the drive is higher than the reference frequency, its output voltage will remain at the reference voltage.		
□ **[Reference frequency]**	1.0 -100.0Hz	50.0Hz
The output frequency value when the drive output is at the nominal voltage, commonly set to the rated frequency of the motor.		
□ **[Torque boost]**	0-16	0
The parameter used to boost the motor torque when running in low speed. At 0 setting there is no boost. 1-16 are different levels of boosting: 16 being the maximum boost level.		
□ **[Skip-frequency 1 lower limit]**	0.0 -50.0Hz	0
The lower limit of the first skip-frequency point.		
□ **[Skip-frequency 1 upper limit]**	0.0 -50.0Hz	0
The upper limit of the first skip-frequency point.		
□ **[Skip-frequency 2 lower limit]**	0.0 -50.0Hz	0
The lower limit of the second skip-frequency point.		
□ **[Skip-frequency 2 upper limit]**	0.0 -50.0Hz	0
The upper limit of the second skip-frequency point.		

Table 2-4 Parameters for Speed Regulation Settings

The Min/Max frequency is set according to the frequency ranges that have been used during long periods of time in a specific situation. The purpose of these parameters is primarily to overcome static torque when the variable speed drive starts from standstill. The starting frequency and torque boost will determine the starting point for the motor's operation, the two skip-frequency points are set according to the actual running requirements such as fan and pump systems, which tend to produce mechanical resonance and fan vibration at certain frequency points. When these types of circumstances arise, it is possible (by setting the above-mentioned parameters to skip the frequency points where resonance and vibration occur), to ensure that the system can run smoothly in the set frequency ranges. When the frequency reference falls into any of the above-described skip-frequency ranges, the drive will automatically output the upper or lower limits of the skip-frequency ranges until clear of frequencies where distortions may occur.

Remark: this parameter list is usually set by the engineering and debugging personnel of the drive system provider according to the user's specific operation situation. Once in formal operation, these parameters should not be subjected to casual modification.

Name/Description	Adjustment range	Factory setting
□ [Frequency point 1]	0.0-50.0Hz	50.0Hz
The parameter for staged speed regulation of the medium voltage drive system. This parameter is writable, requiring at least Operator access permission to write.		
□ [Frequency point 2]	0.0-50.0Hz	50.0Hz
The parameter for staged speed regulation of the medium voltage drive system. This parameter is writable, requiring at least Operator access permission to write.		
□ [Acceleration time 1]	0.0-500.0s	30.0s
The acceleration time of the medium voltage drive system's frequency from Starting frequency to Frequency point 1.		
□ [Deceleration time 1]	0.0-500.0s	30.0s
The deceleration time of the medium voltage drive system's frequency from Frequency point 1 to Starting frequency.		
□ [Acceleration time 2]	0.0-500.0s	30.0s
The acceleration time of the medium voltage drive system's frequency from Frequency point 1 to Frequency point 2.		
□ [Deceleration time 2]	0.0-500.0s	30.0s
The deceleration time of the medium voltage drive system's frequency from Frequency point 2 to Frequency point 1.		
□ [Acceleration time 3]	0.0-500.0s	30.0s
The acceleration time of the medium voltage drive system's frequency from Frequency point 2 to Max frequency point.		
□ [Deceleration time 3]	0.0-500.0s	30.0s
The deceleration time of the medium voltage drive system's frequency from Max frequency point to Frequency point 2.		

Table 2-5 (Continued) Parameters for Speed Regulation Settings

The medium voltage drive system can perform staged speed regulation, which is related to the parameters including Frequency point 1, Frequency point 2, Acceleration time 1, Deceleration time 1, Acceleration time 2, Deceleration time 2, Acceleration time 3 and Deceleration time 3.

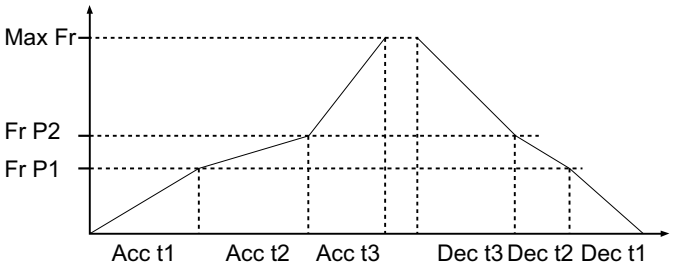

Figure 2-16

During the acceleration and deceleration phase of the medium voltage drive system, the motor can run in different frequency ranges with different acceleration times and deceleration times. The acceleration time means the time for the motor to accelerate from the minimum frequency of a certain frequency range to the maximum frequency of that range, while the deceleration time means the time for the motor to decelerate from the maximum frequency of a certain frequency range to the minimum frequency of that range. The Min frequency, Frequency point 1, Frequency point 2 and Max frequency are used to set the acceleration and deceleration frequency ranges of the medium voltage drive system. In the frequency range set by Min frequency and Frequency point 1, the system accelerates and decelerates with an Acceleration time of 1 and a Deceleration time of 1. In the frequency range set by Frequency point 1 and Frequency point 2, the system accelerates and decelerates with an Acceleration time of 2 and a Deceleration time of 2. In the frequency range set by Frequency point 2 and Max frequency, the system accelerates and decelerates with an Acceleration time of 3 and a Deceleration time of 3.

2.5.3 Motor Control

2.5.3.1 Motor Parameter

In the [Parameter Setting] screen, click the Motor control item, then the Motor Control dialog box will pop up:

Figure 2-17

Click the Motor parameter icon, then the Motor Parameter dialog box will appear, the parameter items of which are as shown in Fig. 2-18, the specific functions of each "Parameter name" are shown in Table 2-6.

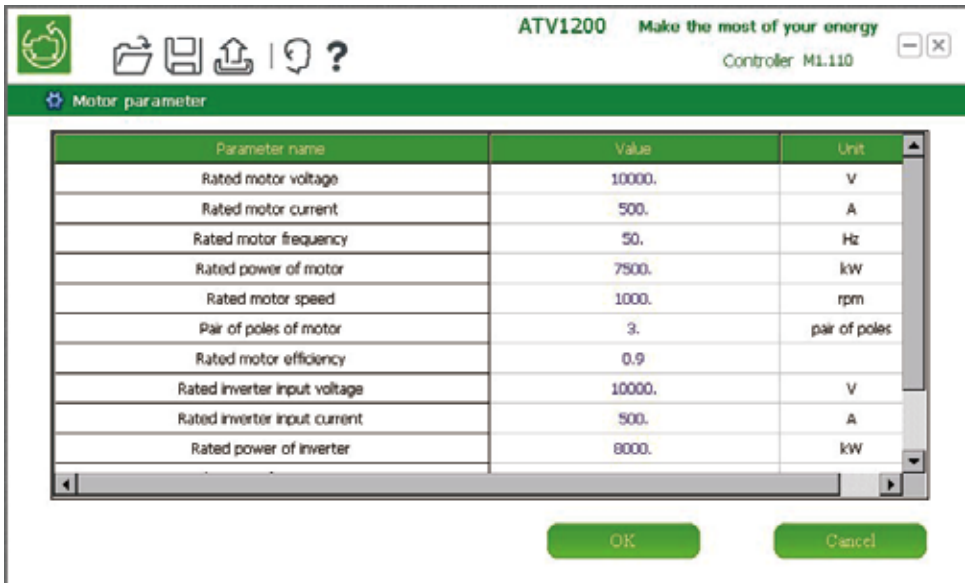

Figure 2-18

Name/Description	Adjustment Range	Unit
[Rated power of motor]	10.0-16000	kW
The rated motor power indicated on the nameplate.		
[Rated motor voltage]	100-11000	V
The rated motor voltage indicated on the nameplate.		
[Rated motor current]	1-2000	A
The rated motor current indicated on the nameplate.		
[Rated motor frequency]	5-60	Hz
The rated motor frequency indicated on the nameplate.		
[Rated motor efficiency]	5-60	Hz
Set according to the actual working conditions.		
[Rated motor speed]	1-3600	rpm
The rated motor speed indicated on the nameplate.		
[Pair of poles of motor]	1-15	
The number of pairs of poles of the motor.		
[Rated inverter input voltage]	100-138000	V
The rated inverter input voltage.		
[Rated inverter input current]	1-2000	A
The rated inverter input current.		
[Rated power of inverter]	100-16000	kW
The rated power of inverter.		
[Rated inverter frequency input]	5-60	Hz
The rated inverter input frequency.		
[Rated inverter output voltage]	100-11000	V
The rated inverter output voltage.		
[Rated inverter output current]	1-2000	A
The rated inverter output current.		

Table 2-6

2.5.3.2 Control Parameter

Click the Control parameter icon, then the Control Parameter dialog box will pop up, the parameter items of which are as shown in Fig. 2-19, the specific functions of each "Parameter name" are shown in Table 2-7.

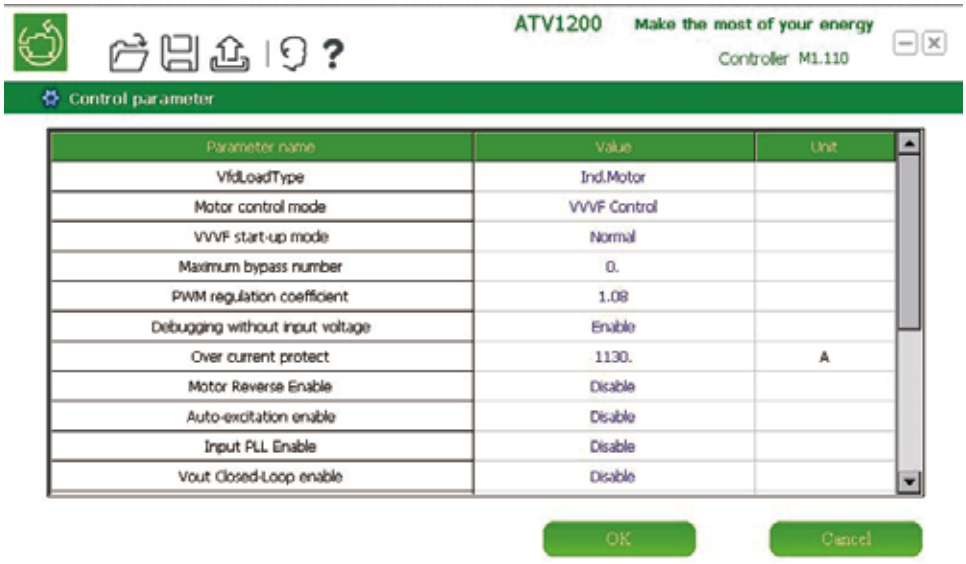

Figure 2-19

Name/Description	Adjustment Range	Factory Setting
□ [VfdLoadType]		Ind.Motor
The type of the motor driven by the drive; Which can be selected as a Synchronous motor or an Asynchronous motor.		
□ [Motor control mode]		U/f Control
Can be selected as U/f Control or Vector Control. U/f Control: means constant voltage-to-frequency ratio control. Vector Control: only used in Asynchronous motor control. Also requiring the following conditions: (1) The resistance and inductance parameters of the asynchronous motor's stator and rotor are set correctly. (2) The detected phase orders of the output voltage and current are correct.		
□ [Maximum bypass number]	0-4	0
When the power cell is abnormal, the power cell is disabled by automatic bypass. Verify the setting value is less than the total number of the drive's power cells in series.		
□ [PWM regulation coefficient]	0.5-1.2	
The regulation coefficient of the output voltage. This coefficient will influence the amplitude of the actual output voltage of the drive in a linear manner. When the drive runs in full-load to the rated frequency of the motor, this parameter can be adjusted to make the output voltage reach the rated value.		
□ [Debugging without input voltage]		Disable
Only used to debug the electrical control logic in the field when medium voltage is not connected. After debugging the electrical control logic, verify it set to "Debugging with input voltage" so as for the equipment to run with the motor properly.		
□ [Overcurrent protection]	1.0-2000	
Instantaneous breaking protection of output current. Set to 2 times that of the rated motor peak current, in A.		
□ [U/f start-up mode]		Normal
The selectable start-up modes are Normal Start or Spinning Start". Normal Start: the drive increases the frequency from the starting frequency to the set frequency. Spinning Start: only used to drive the Asynchronous motor. Also requiring the following conditions: (1) The resistance and inductance parameters of the asynchronous motor's stator and rotor are set correctly. (2) The detected phase orders of the output voltage and current are correct.		
□ [Motor Reverse Enable]		Disable
When it is set to Enabled, the option box Motor Reverse in the main dialog box Function of the Integrated HMI is enabled. When Motor Reverse is enabled, if the motor runs forward, it will gradually decelerate to standstill, then accelerate in reverse to the corresponding frequency setting for reverse operation. Then the output frequency is displayed as a negative value, while the set frequency is positive.		
□ [Auto-excitation enable]		Disable
Enable the drive to automatically adjust the auto-excitation of synchronous motors. If selected to be Enabled, it is needed to make corresponding settings in Excitation Control of Parameter Settings. Detailed setting method is given in 4.57 Excitation Control.		
□ [Input PLL Enable]		Disable
This parameter is set on an Energy Feedback System. Energy Feedback System: Enabled; Non Energy Feedback System: Disabled.		
□ [Vout Closed-Loop enable]		Disable
In constant voltage-to-frequency ratio (U/f) control mode, when the drive's input side network voltage has a slow (no more than 2% per minute) but relatively wide (such as 10%) fluctuation, in order for the drive's output voltage to keep relatively stable. This function can be enabled optionally.		
□ [U/f output coeff]		1
Used in combination with Vout Closed-Loop enable; its default value is 1, i.e. 100% of the reference voltage.		
□ [OutPLL enable]		Disable
Before synchronization transfer, verify that the amplitude, phase and frequency of the drive's output voltage is synchronized with the network voltage, which is called output voltage synchronization. If Output synchronization enable is enabled, when the difference between the drive's output frequency and the network frequency is less than 0.5 Hz, the output synchronization will begin, otherwise it will not. If the output voltage has not enough capacity for the drive to run in the range of network frequency +-0.5 Hz due to bypass, the phase synchronization will not begin.		
□ [OutPLL Volt. Coeffi.]	0-2	1
During the synchronization, the drive's output voltage will be the current network voltage multiplied by this coefficient. "1" corresponds to 100% of the current amplitude of the drive's input voltage.		
□ [OutPLL angle offset]	0-359.9	5
The angle of the output voltage ahead of the input voltage.		
□ [OutPLL kp]	1-1000	500
The proportional coefficient for phase synchronization.		
□ [OutPLL ki]	1-1000	1000
The integral coefficient for phase synchronization.		

Table 2-7

2.5.3.3 Advanced Settings

Click the Advanced settings icon, then the Advance settings dialog box pop up, as shown in Fig. 2-20.

Figure 2-20 Advanced Settings screen

Settable options include Stator/Rotor, Sampling Scaler, Offset parameter, Vector Control, VF Spinning Start, Sync Transfer and Speed Detect.

2.5.3.3.1 Stator/Rotor

In the Advanced Settings screen, click the Stator/Rotor icon, then the Stator/Rotor setting screen will pop up, as shown in Fig. 2-21, the specific function of each "Parameter name" are shown in Table 2-8.

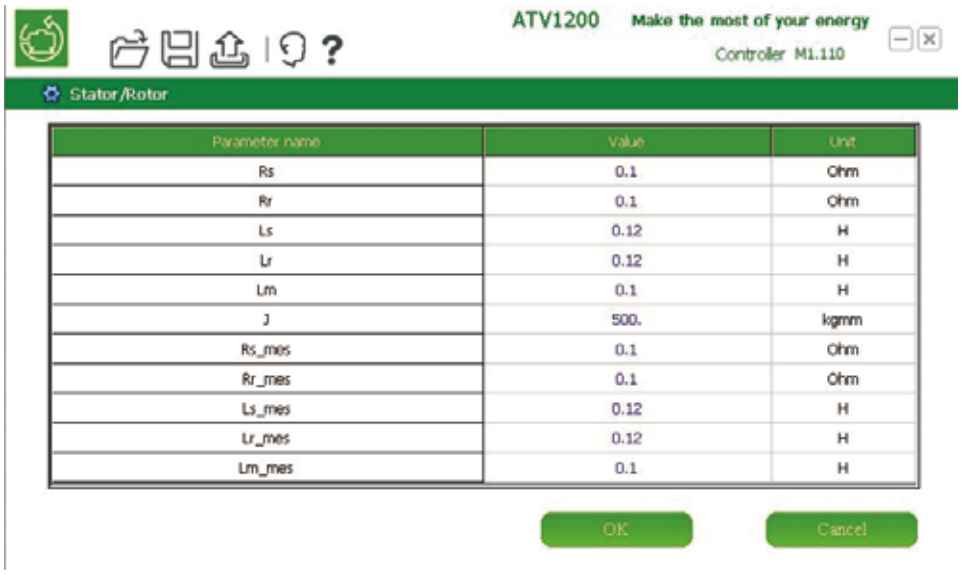

Figure 2-21 Stator/Rotor screen

When the controlled object is “Asynchronous motor”, in either case below, this column of parameters needs to be set:
1. Motor Control Mode is selected to be Vector Control;
2. Motor Control Mode is selected to be U/f Control and U/f Start Mode is selected to be Spinning Start.

Name/Description	Adjustment Range	Factory Setting
□ [Rs]	0-20	
The motor's inherent parameter, filled in according to the measurement value.		
□ [Rr]	0-20	
The motor's inherent parameter, filled in according to the measurement value.		
□ [Ls]	0-5	
The motor's inherent parameter, filled in according to the measurement value.		
□ [Lr]	0-5	
The motor's inherent parameter, filled in according to the measurement value.		
□ [Lm]	0-5	
The motor's inherent parameter, filled in according to the measurement value.		
□ [J]	0-10000	
J: the moment of inertia of the motor. Includes the moment of inertia converted onto the rotor from the mechanical load.		
□ [Rs_mes]	0-20	
Automatically generated by the motor blockage and no-load test program.		
□ [Rr_mes]	0-20	
Automatically generated by the motor blockage and no-load test program.		
□ [Ls_mes]	0-5	
Automatically generated by the motor blockage and no-load test program.		
□ [Lr_mes]	0-5	
Automatically generated by the motor blockage and no-load test program.		
□ [Lm_mes]	0-5	
Automatically generated by the motor blockage and no-load test program.		

Table 2-8

The inertia of a freewheel can be found in the motor manual, and can be converted into moment of inertia. The moment of inertia of the rotor also includes the value converted from the moment of inertia of the load. If the values of Rs, Rr, Lm, Ls and Lr can be found in the motor manual, filling in the blanks with these values is OK. If these values cannot be found in this table, the drive can use its function of automatically detecting resistance and inductance parameters of the asynchronous motor's stator and rotor, i.e., rotor blockage method, but the following conditions are required to perform the test:
(1) The detected phase orders of the output voltage and current are correct. For the information about how to detect the phase order, (please refer to the Chapter of Technology Debugging)
(2) The sampling scaling coefficient of voltage and current is set correctly.
(3) After item(2), the Zero-Offset Correction is done without medium voltage. Refer to Section 2.5.3.3 Zero-Offset Correction.
(4) The axle of the asynchronous motor has been decoupled with the mechanical load.
(5) The drive system is OK with medium voltage.
After the test, the result should be Positive Real Numbers. Manually writing the corresponding values to the first five columns of the Stator/Rotor settings table is OK.

2.5.3.3.2 Sampling Scaler

In the Advanced Settings screen, click the Sampling Scaler icon, then the Sampling Scaler setting screen will pop up, as shown in Fig. 2-22, the specific function of each "Parameter name" are shown in Table 2-9.

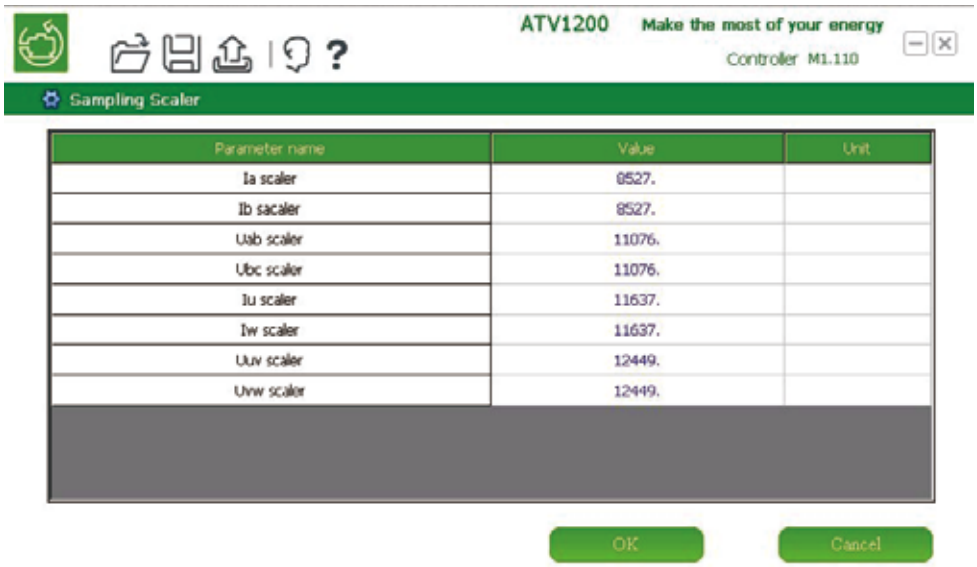

Figure 2-22 Sampling Scaler screen

Name/Description	Adjustment Range	Factory Setting
□ **[Ia scaler]**	Related to the transformer rated ratio.	Related to the transformer rated ratio.
The current scaler of input phase A.		
□ **[Ib scaler]**	Related to the transformer rated ratio.	Related to the transformer rated ratio.
The current scaler of input phase B.		
□ **[Uab scaler]**	Related to the divider resistor value on the input side.	Related to the divider resistor value on the input side.
The voltage scaler of input line voltage AB.		
□ **[Ubc scaler]**	Related to the divider resistor value on the input side.	Related to the divider resistor value on the input side.
The voltage scaler of input line voltage BC.		
□ **[Iu scaler]**	Related to the Hall change of the output current and the Hall sampling resistor.	Related to the Hall change of the output current and the Hall sampling resistor.
The current scaler of output phase U.		
□ **[Iv scaler]**	Related to the Hall change of the output current and the Hall sampling resistor.	Related to the Hall change of the output current and the Hall sampling resistor.
The current scaler of output phase V.		
□ **[Uuv scaler]**	Related to the divider resistor value on the output side.	Related to the divider resistor value on the output side.
The voltage scaler of output line voltage UV.		
□ **[Uvw scaler]**	Related to the divider resistor value on the output side.	Related to the divider resistor value on the output side.
The voltage scaler of output line voltage VW.		

Table 2-9

Remark
(1) The drives with different voltage and power have different sampling scalers. Settings of sampling scalers have been completed in the factory before the drive's delivery, so the user does not need to modify them.
(2) After modification of the sampling scalers, it is necessary to perform zero-offset correction again, and fill in the offset correction values obtained into the corresponding columns in Table 2-10.

2.5.3.3.3 Zero Offset Correction

In the Advanced Settings screen, click the Offset parameter icon for the “Offset parameter” settings screen to pop up, as shown in Fig. 2-23 the specific functions of each "Parameter name" are shown in Table 2-10.

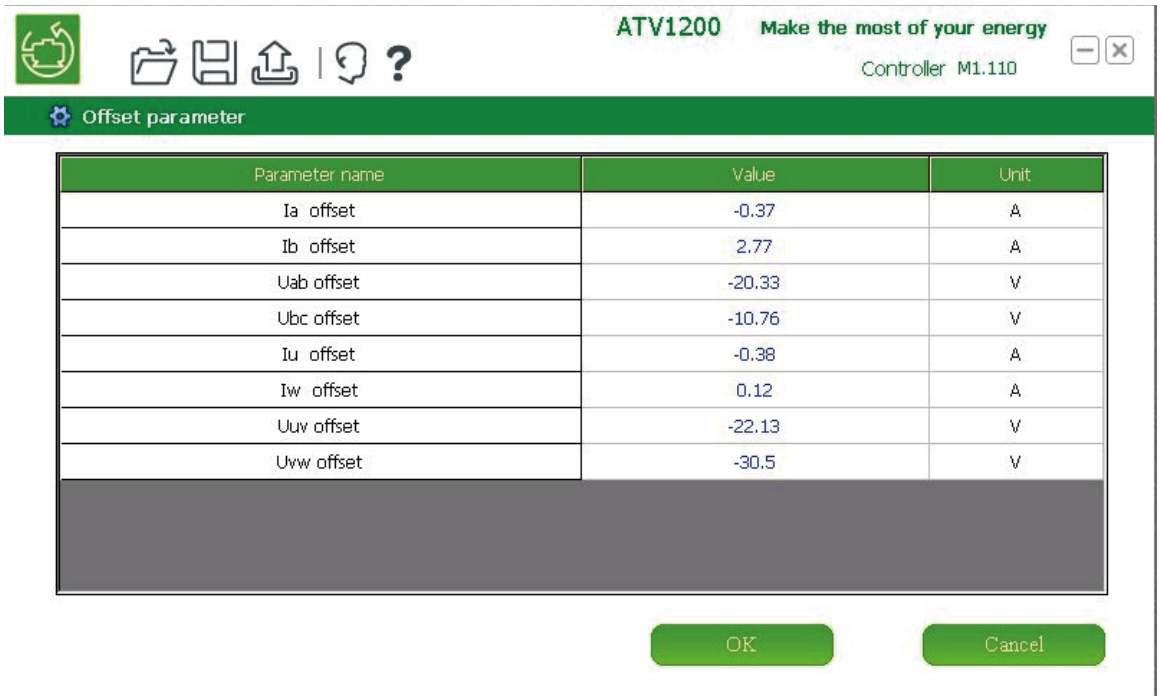

Figure 2-23

Name/Description	Adjustment Range	Factory Setting
□ [Ia offset]	-500~500	
The current zero offset correction coefficient of input phase A; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Ib offset]	-500~500	
The current zero offset correction coefficient of input phase B; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Uab offset]	-1000~1000	
The voltage zero offset correction coefficient of input line voltage AB; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Ubc offset]	-1000~1000	
The voltage zero offset correction coefficient of input line voltage BC; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Iu offset]	-500~500	
The current zero offset correction coefficient of output phase U; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Iw offset]	-500~500	
The current zero offset correction coefficient of output phase V; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Uuv offset]	-1000~1000	
The voltage zero offset correction coefficient of output line voltage UV; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		
□ [Uvw offset]	-1000~1000	
The voltage zero offset correction coefficient of output line voltage VW; It requires setting the Sampling Scaler in Table 2-9 correctly. It is only necessary to activate the Zero Offset Correction function in Section 2.5.6 and then fill in the values obtained from the correction into corresponding blanks in this table. After any modification of Sampling Scalers (including the sign), perform zero offset correction again.		

Table 2-10 Zero Offset Correction values

2.5.3.3.4 Vector Control

In the Advanced Settings screen, click the Vector Control icon for the “Vector Control” settings screen to pop up, as shown in Fig. 2-24, the specific functions of each "Parameter name" are shown in Table 2-11.

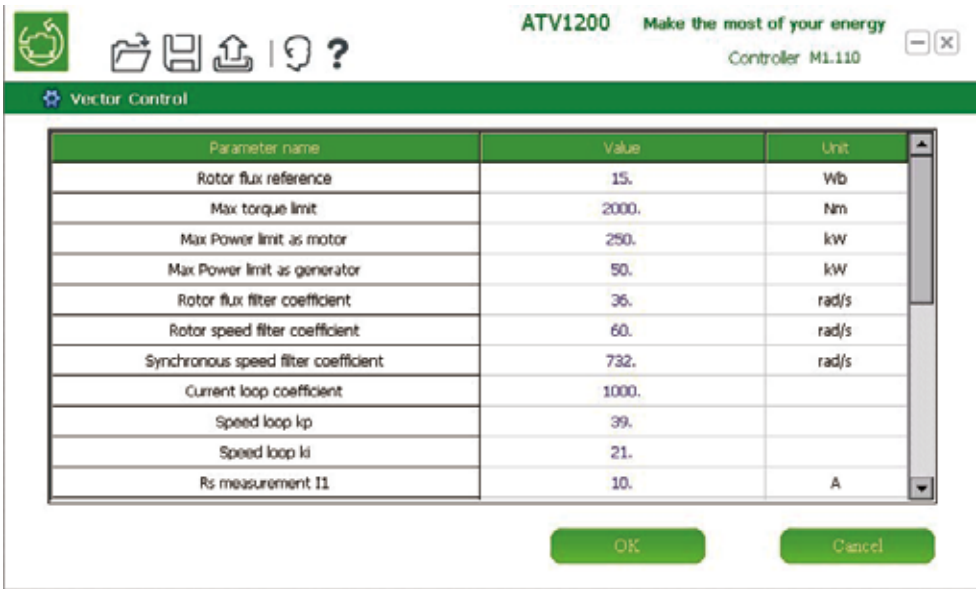

Figure 2-24

If the controlled object is an “Asynchronous motor”, in either case below, this column of parameters needs to be set:
1. Motor Control Mode is selected to be "Vector Control";
2. Motor Control Mode is selected to be "U/f Control" and U/f Start Mode is selected to be "Spinning Start".

Name/Description	Adjustment Range	Unit
□ **[Rotor flux reference]**	0-30	Wb
The reference value of the rotor's magnetic chain; Obtained from Table 2-12 according to the motor's rated voltage and frequency;		
□ **[Max torque limit]**	0-100000	N.m
The permitted maximum torque output of the motor axle. Usually taken as 1.2 x Rated torque. In the case of starting with a heavy load, it can be set to 1.5 x Rated torque.		
□ **[Max Power limit as motor]**	0-100000	kW
The permitted maximum motor power when the asynchronous motor is working in normal motor mode.		
□ **[Max Power limit as generator]**	0-100000	kW
The permitted maximum generation power when the asynchronous motor is working in generator mode.		
□ **[Rotor flux filter coefficient]**	0.2-32767	
Set to 36. It has been set properly before delivery and cannot be set by the user. In unusual cases, it can be set only by the manufacturer's own technicians.		
□ **[Synchronous speed filter coefficient]**	1-32767	
Set to 732. It has been set properly before delivery and cannot be set by the user. In unusual cases, it can be set only by the manufacturer's own technicians.		
□ **[Current loop coefficient]**	1-32767	
Set to 1200. It has been set properly before delivery and cannot be set by the user. In unusual cases, it can be set only by the manufacturer's own technicians.		
□ **[Speed loop kp]**	0-32767	
Set to 78. It has been set properly before delivery and cannot be set by the user. In unusual cases, it can be set only by the manufacturer's own technicians.		
□ **[Speed loop ki]**	0-32767	
Set to 41. It has been set properly before delivery and cannot be set by the user. In unusual cases, it can be set only by the manufacturer's own technicians..		
□ **[Rs measurement I1]**	0-500	A
Measurement current 1 which is set when measuring the motor's stator resistance automatically; Usually taken as 30% of the rated motor current.		
□ **[Rs measurement I2]**	0-500	A
Measurement current 2 which is set when measuring the motor's stator resistance automatically; Usually taken as 70% of the rated motor current.		
□ **[Locked rotor test current]**	0-500	A
Measurement current which is set when measuring the motor's inductance parameter automatically; Usually taken as 70% of the rated motor current.		
□ **[Speed sensor]**		
Determines whether to use the signal feedback of the Speed Sensor. Remark: valid only when Vector Control is used.		
□ **[Pulse number per round of Encoder]**	1000-4000	
Pulse number per round of the incremental photoelectric encoder for speed measurement. Remark: valid when the speed sensor is used!		
□ **[Current loop adaptive enable]**		
It is up to the system to select the corresponding current loop controlling parameter according to the current rotation speed when Vector Control is used. Remark: valid when Vector Control is used.		
□ **[Iq_max_p]**	1-1000	
The current amplitude limit of forward torque when in Vector Control.		
□ **[Iq_max_n]**	-1000~0	
The current amplitude limit of reverse torque when in Vector Control.		
□ **[Flux building time]**	0.1-60	
The flux building time of the motor when it starts up in Vector Control mode. Usually the default value is OK.		
□ **[Speed track time]**	0.1-60	
The time for the reference speed following the given speed when in Vector Control mode.		
□ **[Speed Loop]**		Closed Loop
Usually selected to be Speed Loop enabled when the Control Mode is Vector Control. If the Speed Loop is disabled, the Control Mode is Vector Control at given torque.		
□ **[Flux Loop]**		Open Loop
When the Control Mode is Vector Control, setting the Flux Loop to enabled can provide the motor with steady motor-side voltage characteristics.		
□ **[Flux kp]**	0-32767	50
The proportional coefficient of the flux loop.		
□ **[Flux ki]**	0-32767	200
The integral coefficient of the flux loop.		

Table 2-11

Rated voltage (V)	Rated frequency (Hz)	Reference flux (Wb)	Rated line voltage (V)	Rated frequency (Hz)	Reference flux (Wb)
3,000	50	7.25	3,000	60	6.04
3,300	50	7.98	3,300	60	6.65
4,160	50	10.8	4160	60	9.0
6,000	50	14.5	6,000	60	12.1
6,600	50	16.0	6,600	60	13.3
10,000	50	24.2	10,000	60	20.1
11,000	50	26.6	11,000	60	22.2

Table 2-12

2.5.3.3.5 VF Spinning Start

In the Advanced Settings screen, click the VF Spinning Start icon for the VF Spinning Start setting screen to appear, as shown in Fig. 2-25, the specific function ofs each "Parameter name" are shown in Table 2-13.

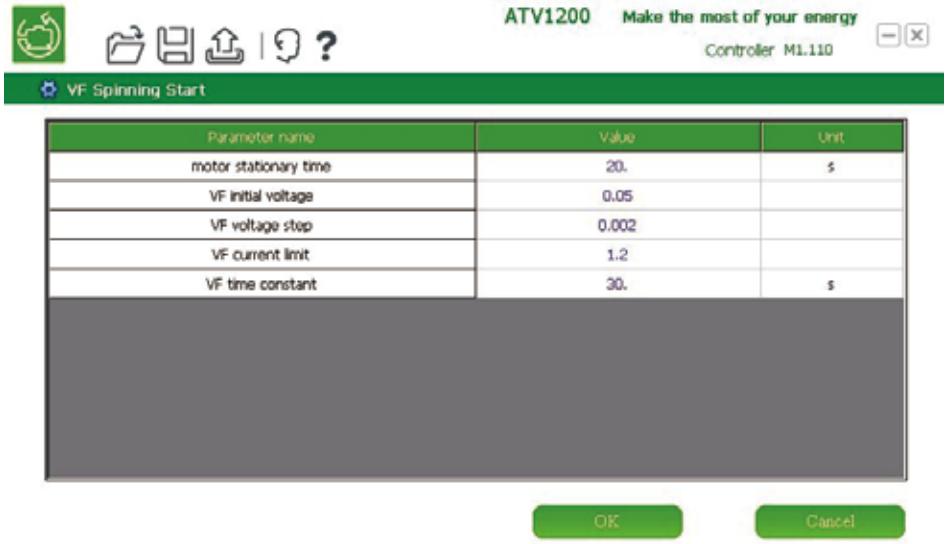

Figure 2-25

Name/Description	Adjustment Range	Factory Setting
□ **[Motor stationary time]**	0-1800	20
The time from activation of a freewheel stop in the interface until the motor comes to standstill. For the asynchronous motor, if the system is restarted during Motor stationary time, the drive will perform flying start-up. Otherwise, the drive will start the output from the starting frequency. The adjustment of this value corresponds to the inertia of the machine.		
□ **[VF initial voltage]**	0.0-0.6	0.05
The voltage output of the drive when in spinning start-up (the proportion to the rated system voltage). Using its default value is OK.		
□ **[VF voltage step]**	0.0-0.1	0.002
The incremental voltage step (the proportion to the rated system voltage). Using its default value is OK.		
□ **[VF current limit]**	1.0-1.5	1
Current limit value when the motor is in spinning start-up (the proportion to the rated motor current). When the current is over the limit value, the system will adjust the drive's output automatically. Using its default value is OK.		
□ **[VF time constant]**	1-100	30
Time constant when the motor in spinning start-up. Using its default value is OK.		

Table 2-13

2.5.3.3.6 Synchronization Transfer

In the Advanced Settings screen, click the Sync Transfer icon for the Sync Transfer settings screen to appear, as shown in Fig. 2-26, the specific functions of each "Parameter name" are shown in Table 2-14.

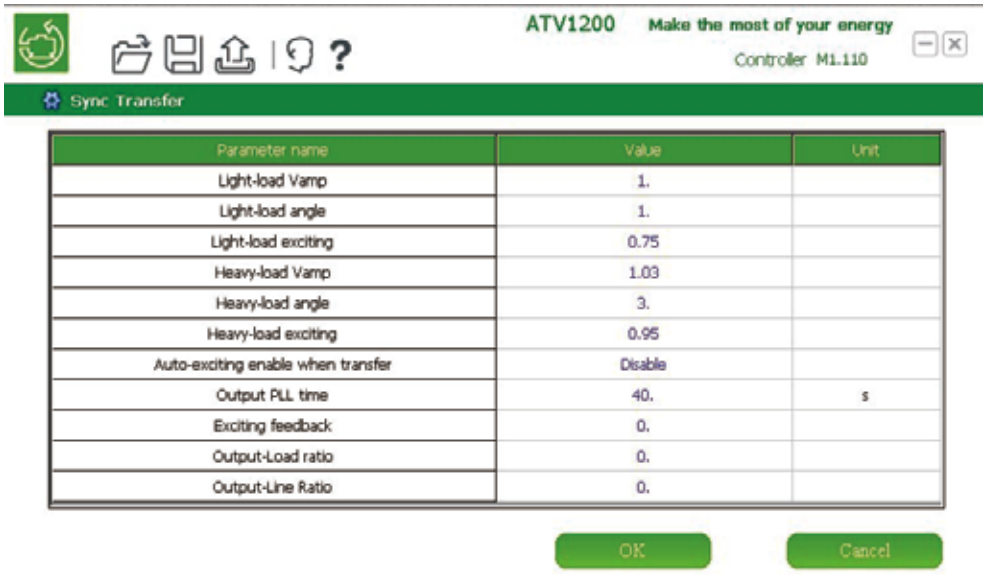

Figure 2-26 Sync Transfer screen

Name/Description	Adjustment Range	Factory Setting
□ **[Light-load Vamp]**	0.5-2.0	1
The coefficient of output voltage to system voltage when performing synchronization transfer. Change of this value can change the drive's output voltage amplitude, so as to achieve the objective to make the output and input have the same voltage amplitude.		
□ **[Light-load angle]**	0-359.9	1
This value can change the phase of the output voltage in synchronization transfer, so as to make the phase of the output voltage equal to that of the input voltage, achieving the objective of synchronization of output and input.		
□ **[Light-load exciting]**	0.5-1.2	0.75
Sets the excitation current when in synchronization transfer.		
□ **[Heavy-load Vamp]**	0.5-2.0	1.03
Same as the Light-load Vamp.		
□ **[Heavy-load angle]**	0-359.9	3
Same as the Light-load angle.		
□ **[Heavy-load exciting]**	0.5-1.2	0.95
Same as the Light-load exciting.		
□ **[Auto-exciting enables during transfer]**		Disable
Determines whether to enable automatic adjustment to the exciting current in synchronization transfer. The default value is Disabled.		
□ **[Output PLL time]**	20-200	40s
The time limit for voltage synchronization tracking during synchronization transfer. If exceeded, the synchronization transfer will be considered interrupted.		
□ **[Exciting feedback]**	0	0
Read-only parameter, only for debugging.		
□ **[Output-Load ratio]**	0	0
Read-only parameter, only for debugging.		
□ **[Output-Line Ratio]**	0	0
Read-only parameter, only for debugging.		

Table 2-14

2.5.3.3.7 Speed Detection

In the Advanced Settings screen, click the Speed Detect icon for the Speed Detection settings screen to appear, as shown in Fig. 2-27, the specific functions of each "Parameter name" are shown in Table 2-15.

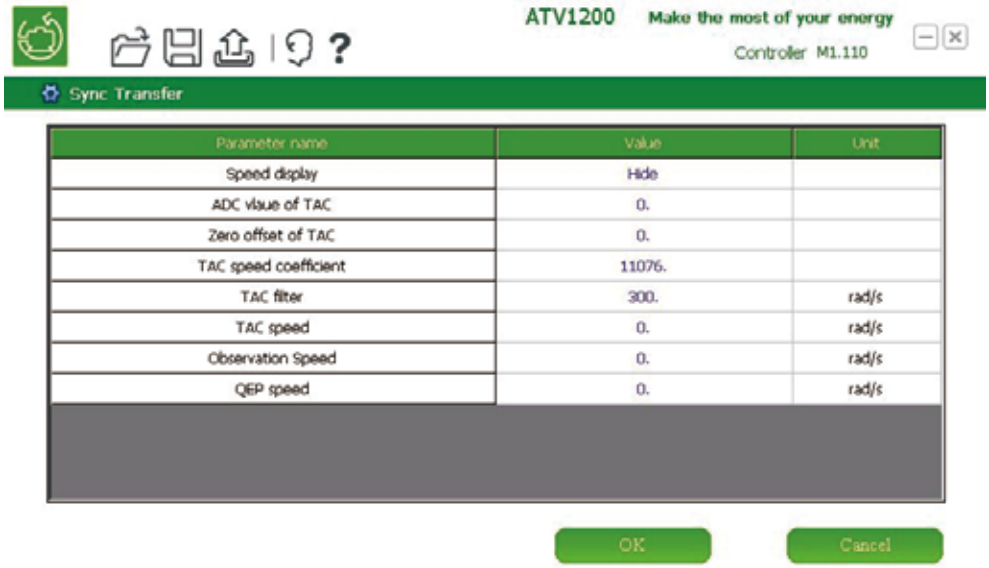

Figure 2-27

Name/Description	Adjustment Range	Factory Setting
□ **[Speed display]**		Hide
Determine whether to display the motor's actual rotation speed in the interface.		
□ **[ADC value of TAC]**	0	0
The value sampled by the master to TAC analog value, which is a read-only parameter.		
□ **[Zero offset of TAC]**	-512~511	
The zero offset of TAC.		
□ **[TAC speed coefficient]**	-32767~32767	11076
The scaling coefficient for calculating TAC speed measurement, set according to the specific TAC setting.		
□ **[TAC filter]**	-32767~32767	300 rad/s
The filter constant of the rotation speed filter calculated by TAC		
□ **[TAC speed]**	0	0
The TAC speed measurement value, which is a read-only parameter.		
□ **[Observation Speed]**	0	0
The observation value of motor speed, which is a read-only parameter.		
□ **[QEP speed]**	0	0
The observation value of motor speed obtained through encoder signal, which is a read-only parameter.		

Table 2-15

2.5.3.4 Self-regulating

In the Motor control item of the [Parameter Setting] screen, click the Self-regulating icon, then the Motor Control dialog box will pop up, which displays the parameter items as shown in Fig. 2-28.

Figure 2-28 Self-regulating screen

The options which can be set include Offset check and Motor check.

2.5.3.4.1 Offset Check

Click the Offset check icon for the Offset Correction settings screen to pop up, as shown in Fig. 2-29.

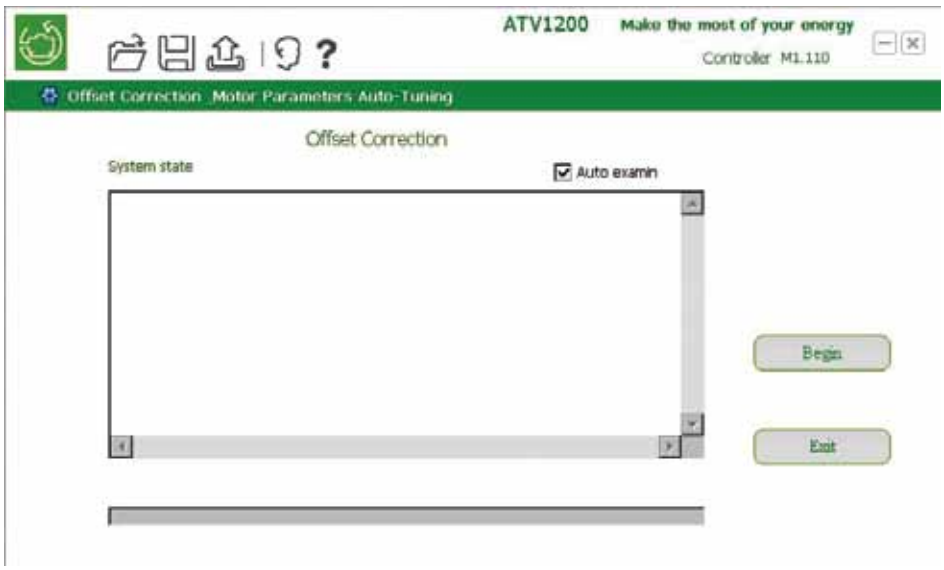

Figure 2-29

When performing zero offset correction function, ensure that the following conditions are met:
1. The parameter Sampling Scaler has already been set correctly (see Table 2-8 in Section 4.5.2);
2. There is no medium voltage applied to the drive.
3. The corrected values have been filled in the corresponding blanks for the parameters of Zero-Offset Correction in Section 4.5.3.
4. After any modification of the Sampling Scalers (see Table 2-8 in Section 4.5.2, including the sign), perform zero offset correction again.

2.5.3.4.2 Motor Check

Click the Motor check icon for the Motor Parameter Auto-Tuning settings screen to pop up, as shown in Fig. 2-30. Click Begin, the system will perform motor parameter auto-tuning, and the obtained values will automatically be filled into the Stator/Rotor item of the Advanced Settings.

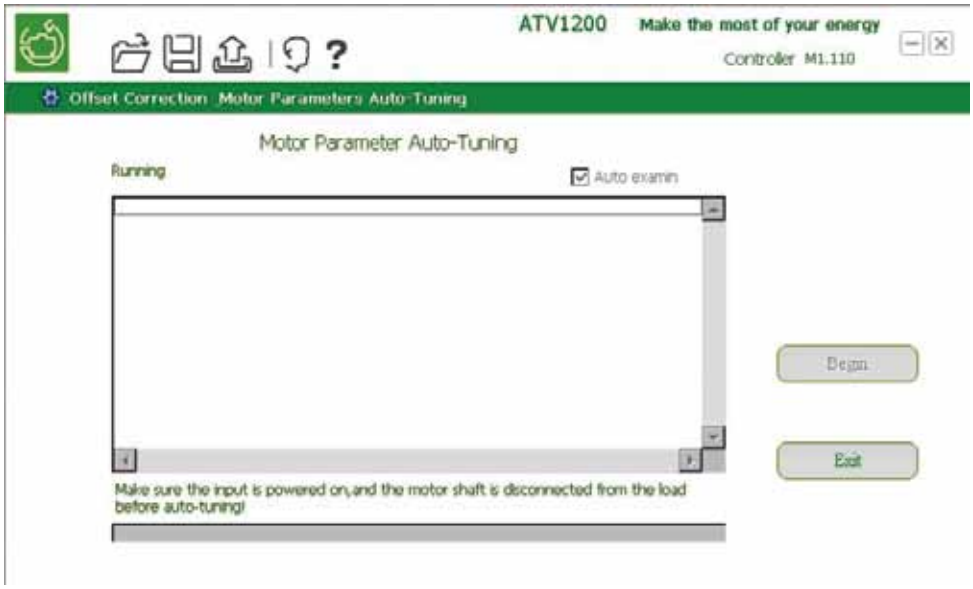

Figure 2-30

The Motor Parameter Auto-Tuning function is meant to accomplish the inherent motor parameters measurement in the Stator/Rotor item of Section 2.5.3.1. When the measurement conditions and parameter settings specified in Section 2.5.3.1 Stator/Rotor are fulfilled, click the Begin button, then the system will automatically measure the inherent parameters of the asynchronous motor according to parameter settings, and automatically fill the measurement values into corresponding parameter columns. Then the user is only required to fill the measurement values of Stator/Motor item into the first five columns so as to accomplish motor measurement.

2.5.3.5 Excitation Control

In the Motor control item of the [Parameter Setting] screen, click the Excitation Control icon, then the Excitation Control dialog box will pop up, which has the parameter items as shown in Fig. 2-31, the specific functions of each "Parameter name" are shown in Table 2-16.

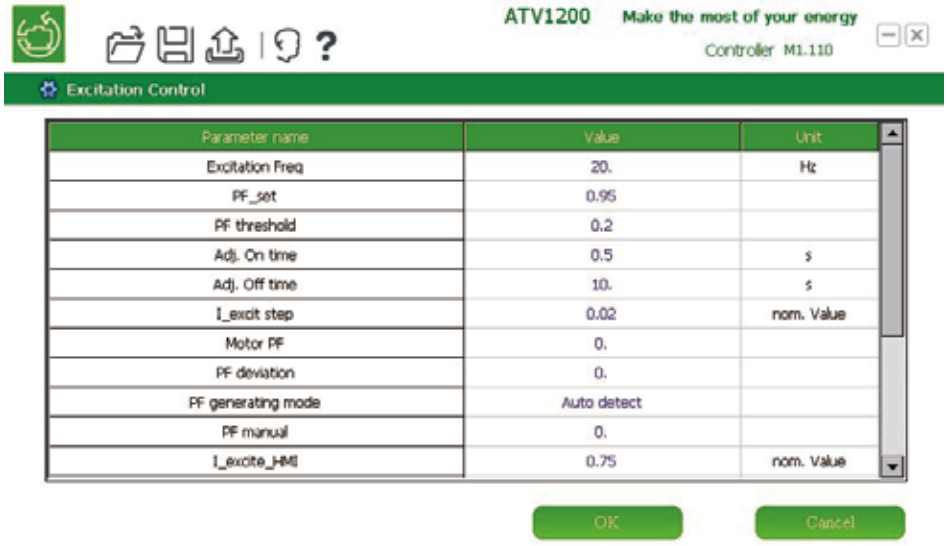

Figure 2-31

Name/Description	Adjustment Range	Factory setting
□ [Excitation Freq]	0-50	20
When the output is higher than this frequency setting, the excitation auto-adjustment will begin.		
□ [PF_set]	-1.0~1.0	0.93
The objective of the power factor control.		
□ [PF threshold]	-1.0~1.0	0.1
The permitted deviation of the power factor. When the power factor exceeds this deviation, the excitation adjustment will begin.		
□ [Adj. On time]	0.1-600	0.5
The duration of the command Increasing Excitation or Decreasing Excitation.		
□ [Adj. Off time]	0.1-600	10
The time interval between two consecutive excitation adjustment commands.		
□ [I_excit step]	0.0-0.2	0.02
The percentage of excitation increase or decrease in the amount of the rated excitation in every adjustment period.		
□ [Motor PF]	0	0
The power factor of synchronous motor that is manually set, only used in the drive debugging.		
□ [PF deviation]	0	0
The actual deviation of the power factor, used for display.		
□ [PF generating mode]		Auto detect
The current power factor generating mode of a synchronous motor, which can be computed automatically by the drive, or input manually. Manual Input is only used in the course of drive debugging. When in normal running, verify selection to be Automatic Measurement.		
□ [PF manual]	0	0
Used in combination with Excitation PF Selection. Usually used in debugging.		
□ [I_excite_HMI]	0.0-1.0	0.75
Factor of rated excitation current.		
□ [I_excite_FlySt]	0.0-1.0	0.25
Factor of rated excitation current.		
□ [T_excite_Wait_FlySt]	1-30	2
The delay time from spinning start-up speed tracking to the application of excitation current.		
□ [T_excite_Inc_FlySt]	1-100	15
The time for the excitation current to increase from zero to the rated excitation current.		
□ [I_excite_max]	0.5-1.0	0.75
Factor of rated excitation current.		
□ [I_excite_min]	0.1-1.0	0.25
Factor of rated excitation current.		
□ [Kv_flyst]	0.0-2.0	1
The voltage output of the drive when in the flying-startup of synchronous motors (the factor to motor-side voltage of the synchronous motor). Usually the default value is OK.		
□ [SynTrkAngle]	-359.9~359.9	20
When the synchronous motor is performing flying-startup, the drive will calculate the current phase of the motor according to the motor's motor-side voltage. This setting is the compensation value for the calculated value. The default value is 20˚.		

Table 2-16

2.5.4 External Control

In the [Parameter Setting] screen, click the External control icon, then the Excitation Control dialog box will pop up, which has the parameter items as shown in Fig. 2-32, the specific functions of each "Parameter name" are shown in Table 2-17.

Figure 2-32 External Control setting screen

Name/Description	Adjustment Range	Factory Setting
□ **[Start mode]**		Normal start
□ **[Normal start] (2C)** □ **[Soft start] (3C)** **Normal start:** The drive starts in normal mode. When the drive operates at the frequency setting in “open loop” mode or at the expectation value of the controlled parameter in “closed-loop” mode, select the normal start mode. **Soft start:** After start-up, irrespective of the frequency set by the user, the drive will accelerate directly to the network transfer frequency given in system parameters. When the output frequency reaches the Network transfer frequency point (set in the Parameter item in the main screen), the drive blocks its output and gives the Power-frequency Transfer command, controlling the user’s interlock circuit of electrical switching, so as to transfer the motor that has been softly started from inverter driving to power-frequency network. During "Soft Start", the selection of "Running Mode", "Command" or "Analog Reference" are unavailable.		
□ **[Command mode]**		
Selects the frequency settings mode of the drive. It is a radio box, only one of the following settings can be selected: □ **[Display]:** sets the frequency reference through the acceleration/deceleration buttons or frequency setting buttons in the main screen. □ **[Analog]:** receives external analog setting signals of 0-10V or 4-20mA, then gets the frequency reference through analog-to-digital treatment.		
□ **[Upper PC control]**		Disable
□ **[Enable]:** allows upper PC control. □ **[Disable]:** does not allow upper PC control. When the Remote/Local Control switch on the cubicle door is on Remote control position, the drive has the functions of starting, stopping, freewheel stopping, resetting or setting the output frequency through the upper monitoring PC. Select "Enable" to allow this function. If starting, stopping, freewheel stopping, resetting or output frequency setting of the drive through the upper monitoring PC are not allowed, then select "Disable". If the Remote/Local Control switch on the cubicle door is on Local control position, no matter whether set to this Enable or Disable, the upper PC control function is disabled.		

Name/Description	Adjustment Range	Factory Setting
□ **[System bypass setting]**		Disable
□ **[Enable]:** allows system bypass operation. □ **[Disable]:** forbids system bypass operation. When this function is enabled and a Medium Voltage bypass contactor has been installed, a “detected fault” will bypass the drive and connect the motor directly to the mains voltage. **⚠ WARNING** **UNEXPECTED EQUIPMENT OPERATION** Enabling this function will bypass the drive control and protection and will connect the motor directly to the mains voltage. • It should be enabled only in extraordinary situations where a thorough risk analysis demonstrates that the presence of adjustable speed drive protection trip poses a greater risk than to continue to operate the motor at full nominal voltage. • Verifiy that the application can be connected directly and instantly to the mains voltage without the need of a controller. **Failure to follow these instructions can result in death or serious injury.** For example, in the water supply system, at a given water pressure, the water pump is running at the low speed state, driven by the inverter. If the bypass comes into operation at maximum speed suddenly, it can cause the sudden increase of water pressure, maybe endangering the water network and valves. “System bypass” and “cell bypass” are two different concepts. Cell bypass “enable” is targeted to the bypass of the drive’s internal faulty power cell with de-rated mode rather than trip. If the system bypass happens when there is a “Detected fault” on the drive, the whole system of the drive will exit operation. The "System Bypass" is also different to "Soft Start". During system bypass, the motor is able to perform transfer to the network at any frequencies, so the impact of system bypass on the network, the motor and the mechanism may be much greater than that during a "Soft Start". The "Excessive-Current" factor design of the bypass switch should be considered in conjunction with the direct motor start-up.		
□ **[Valve linked]**		Disable
□ **[Enable]:** allows the valve to be linked. □ **[Disable]:** forbids the valve to be linked. A field function setting, used to set whether to allow the medium voltage inverter’s control action on valves.		
□ **[Transformer Overheat alarming]**		
The temperature threshold can be set.		
□ **Transformer Overheat Trip**		
The temperature threshold can be set.		
□ **[Motor reverse]**		Disable
□ **[Enable]:** allows motor reverse. □ **[Disable]:** forbids motor reverse. If the Control parameter in the Parameter settings item is selected, and Reverse Motor is Enabled, the Motor reverse checkbox in the main dialog box Function of the Integrated HMI will be enabled. When Motor reverse is enabled, if the motor runs forward, it will gradually decelerate to a standstill, then accelerate in reverse to the corresponding frequency setting for reverse operation. Then the output frequency will be displayed as a negative value, while the set frequency will be positive.		

Table 2-17

2.5.5 Input and Output Settings

In the [Parameter Setting] screen, click the Input/Output item, then the interface as shown in Fig. 2-33 will pop up.

Figure 2-33

Click the Setting icon in the group of Analog input for the Analog Input settings dialog box to pop up.

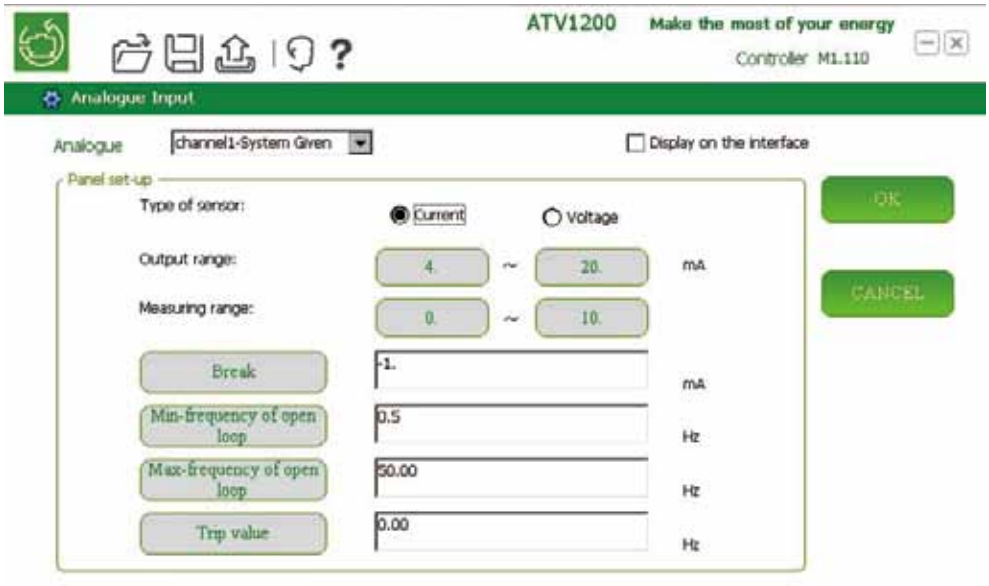

Figure 2-34 Analog Input settings screen

If the ☐ Display on the interface check box is selected, the values of the analog channel will be displayed in the Field Data parameter item of the medium voltage drive system's main monitoring screen.
As shown in Fig. 2-34, in the dialog box, the analog input signal of the field given channel is set to be of current source type, and the output range of that signal is set to be 4-20 mA, accordingly, the measuring range of actual field values is set to be 0.5-10 Mpa. When the command mode of the medium voltage drive system is Analog reference and the Running mode is "Closed-loop" mode, AD conversion can be performed according to this corresponding relationship, so as to make the medium voltage drive system run at the corresponding controlled given values. Meanwhile the break value of this signal is set to be 0.5 Mpa, i.e., when the value of the field given signal is less than this value, it is considered as signal break in the given channel.
The minimum and maximum frequency values related to open-loop operation provide the correspondence of AD conversion when the medium voltage drive system operates in open-loop mode with analog reference. According to this, the speed adjustment system operates in open-loop at the reference frequency value corresponding to the analog reference signal. Parameter 1 is a reserved parameter, which has no actual meaning, defined by the user here.

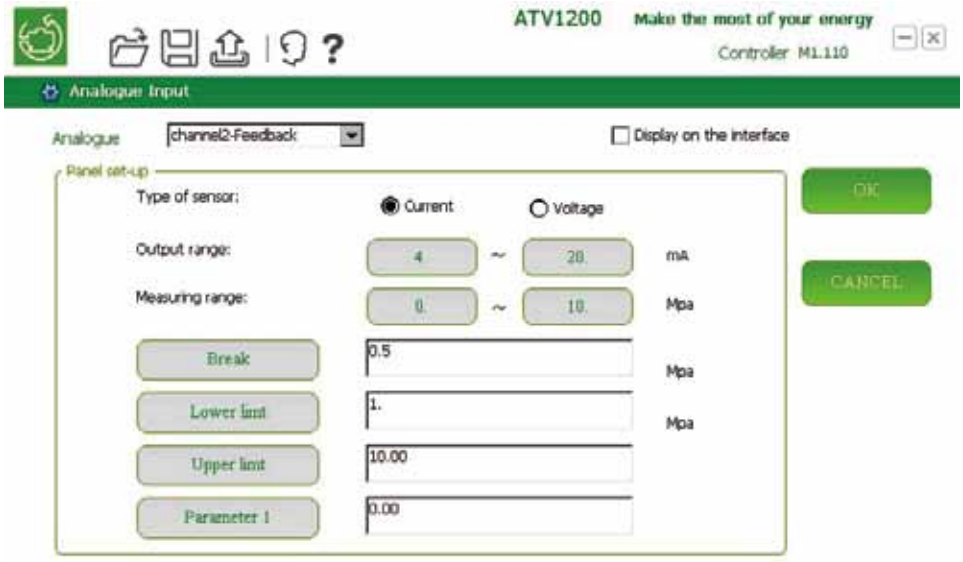

Figure 2-35 Analog Input settings method

Select channel-System Given in the drop-down box

below the Analog Input, then select Current in the item

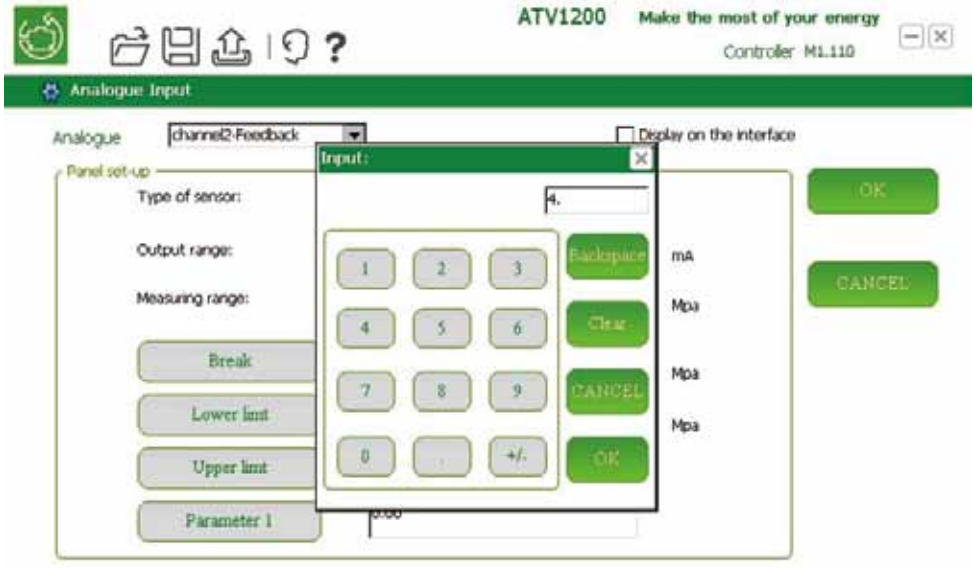

Figure 2-36 Analog Input settings method

Click the range buttons behind the Output range and Measuring range for the soft keyboard to pop up, then use it to set corresponding ranges.

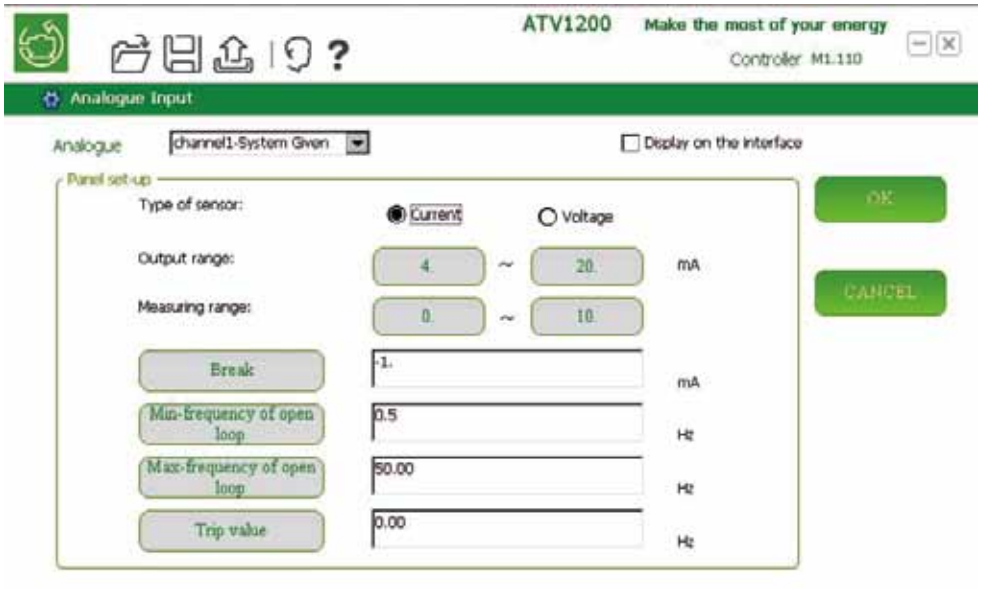

Figure 2-37 Analog Inputs setting method

Finally, click the buttons of Break, Min-frequency of open-loop, Max-frequency of open-loop for the soft keyboard to pop up, then use it to set corresponding values, click the OK button to accomplish the setting.

- The analog signals received by the medium voltage drive system can be current source signals or voltage source signals. If the user selects Display in the Command mode, then any choice made in analog reference signal is invalid.
- The analog feedback signals are set by the user according to the type of the analog feedback signal source.
- When setting the type of the analog reference signal, please notice the wiring form of the signal at the same time. The wiring forms of current source signals and voltage source signals for connecting to the control cubicle are slightly different.

Click the Default icon for the Analog Input Defined dialog box.

Remark: in this setting, if you want to modify the Channel name, Parameter definition, etc., you need to select SHOW in the path of Parameter-General settings-Input panel for the soft keyboard to appear, then the modification will be possible.

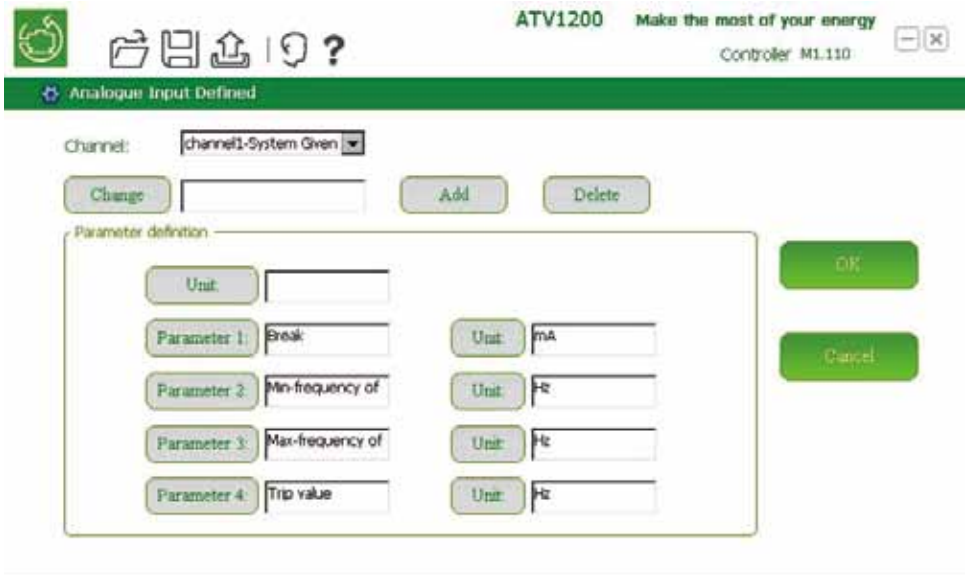

Figure 2-38 Analog Input Defined screen

Through the editing of the definitions of analog inputs, the channel number of analog inputs can be increased or decreased, meanwhile the content and unit of other reserved parameters related to that input channel can be defined, the already defined name of the analog input and the content and unit of its reserved parameters can also be modified. For example, the name of Channel 1 is defined as System Given, which has no data unit. And the name of Parameter 1 of Channel1-System Given is defined as Break, of which the unit is mA; the name of Parameter 2 is Min-frequency of Open-loop, of which the unit is Hz; the name of Parameter 3 is Max-frequency of Closed-loop, of which the unit is Hz; the name of Parameter 4 is Trip value, of which the unit is Hz.

To modify the name of the analog input channel that has already been defined.

Firstly, select the channel to modify, type the new channel name in the editing box after the Change button, then click the Change button to accomplish the channel definition, as shown in Fig. 2-39.

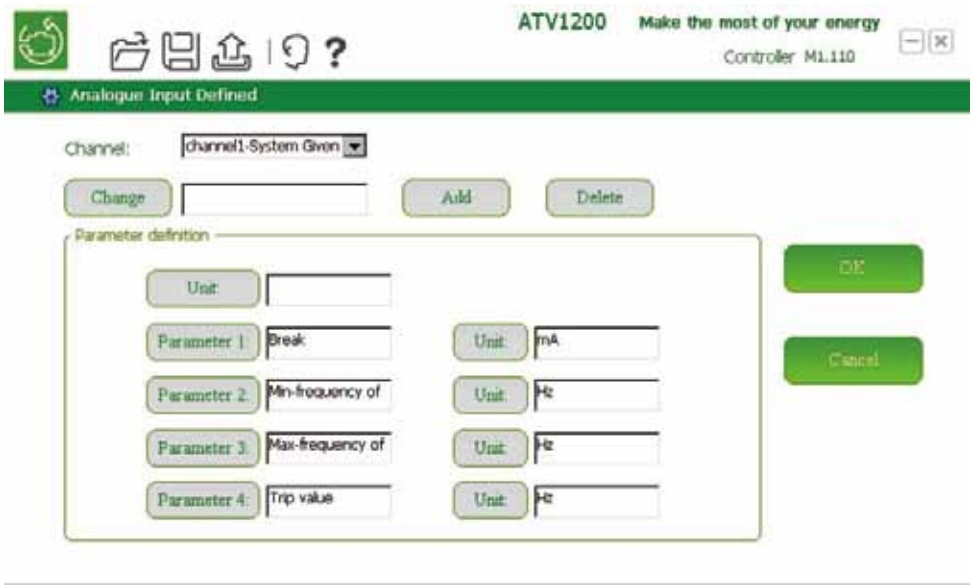

Figure 2-39 Channel definition

Select channel1-System Given , input “local given” in the editing box, then click Change .

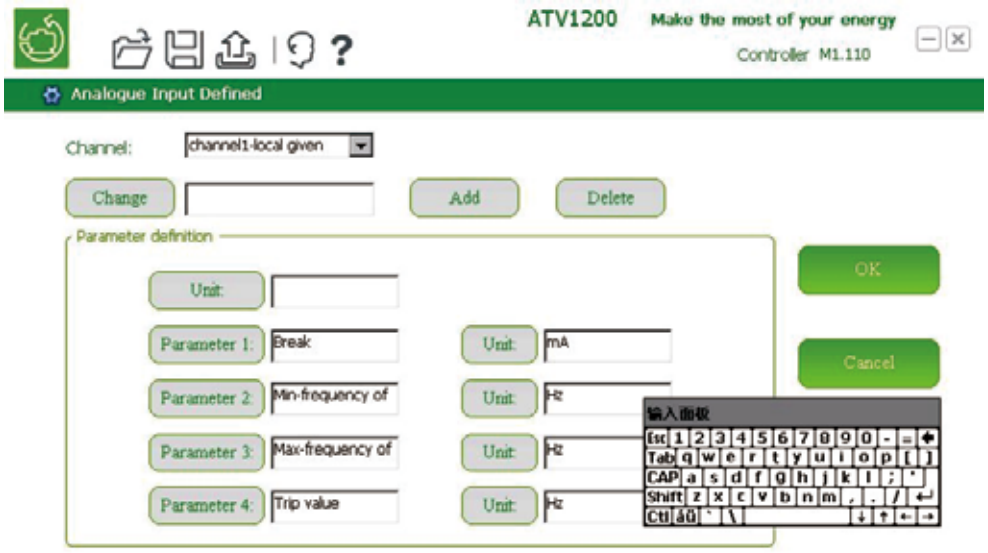

Figure 2-40 Method for modifying a channel name

The name of Channel 1 is changed to “local given”.
2. To delete the name of the analog input channel that has already been defined, Firstly, select the channel to be modified, click the Delete button, then the confirmation dialog box appears. Click OK and the channel name will be deleted, as shown in Fig. 2-41.

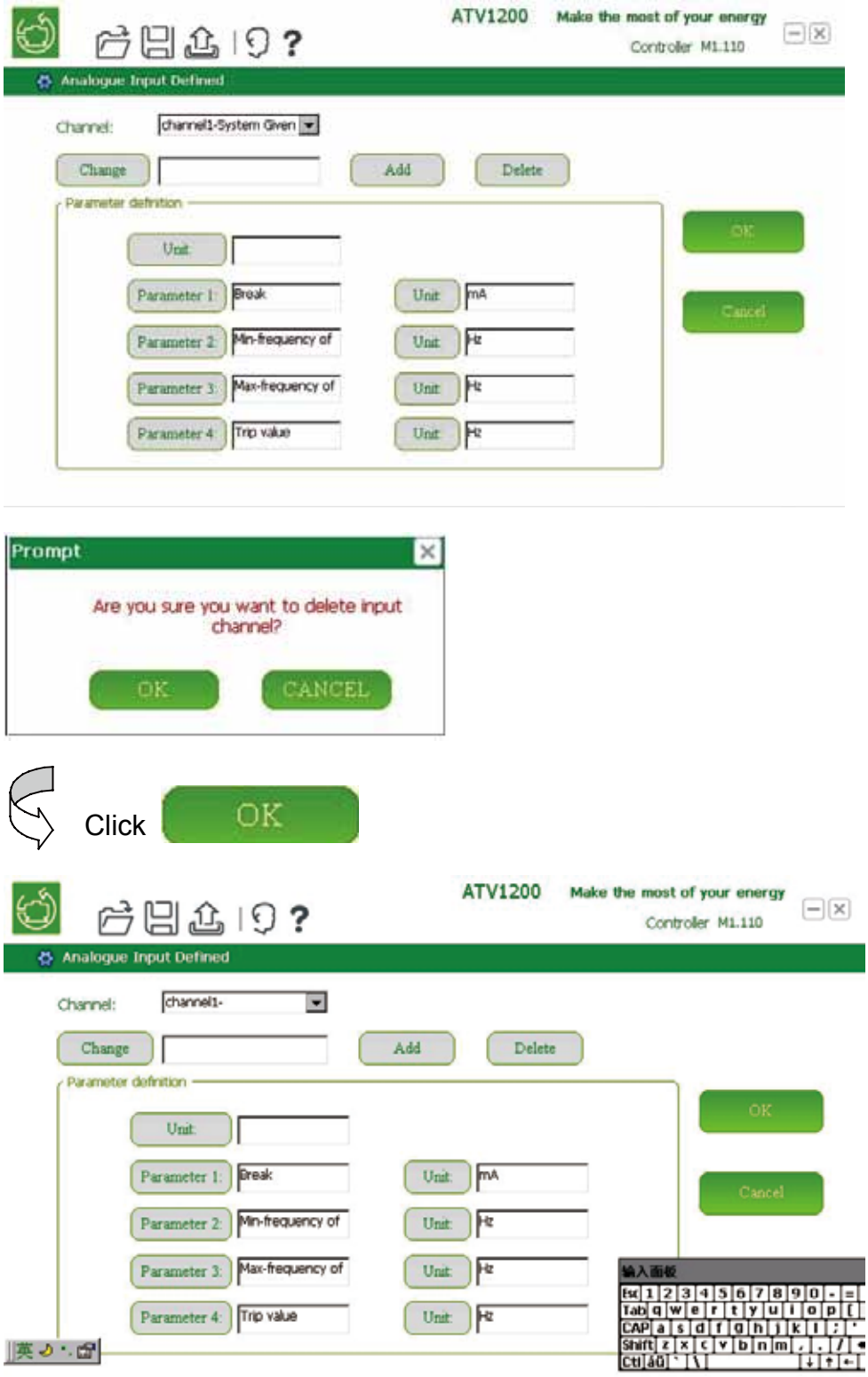

Figure 2-41 Method for deleting a channel name

3. Fig 2-41 method for deleting, the text beneath describes creating a new name! To add the name of the analog input channel that has already been defined.

Firstly, type the new channel name, e.g., “field given”, in the box after the Change button. Click the Add button, the Prompt dialog box appears. After clicking OK, the new channel name will be created, as shown in Fig. 2-42.

Figure 2-42 Method for adding channel

In the Input/Output screen, click the Analogue output button for the Analog Output dialog box to pop up.

Figure 2-43 Analog Output settings screen

By selecting the channel number of the analog output and the data content output in this channel, defining the sensor type of the output meter as well as the correspondence between the meter's measurement range and voltage/current, the analog value required by the user can be output correctly. For example, if the user wants to display the output frequency of the medium voltage drive system through analog output channel 1, the external meter is a 4-20mA current meter, which has the dial plate range of 0-50 Hz, the corresponding settings are as shown in Fig. 2-44.

Figure 2-44 Analogue output channel settings

Select "outPut channels 1" in the drop-down list box after "Select"

Figure 2-45 Analogue output channel settings(continued)

In the Running speed drop-down list box after **Select data:** , select the output physics quantity, then select Current in the radio box after **Sensor:** .

Figure 2-46 Analogue output channel settings(continued)

In the Input/Output settings screen, click , and icons in the PLC box respectively for PLC Signal settings dialog box to pop up, the specific functions of parameters included in the dialog box are as shown in Table 2-18.

Name/Description	Adjustment Range	Factory Setting
■ [PLC]		
□ [PLC signal]		
As shown in Fig. 2-47. This item can display the meaning of each register bit of PLC and corresponding treatment methods. If the PLC register VB 6.0 indicates transformer overheating, and its treatment method is to give indication when the state is 1, then when its state bit is 1, the monitoring interface will indicate Transformer overheating. The definition of each relative register bit of the PLC is set in [Signal Definition].		
□ [PLC parameter extension]		
As shown in Fig. 2-52, field parameters of the PLC can be extended according to the user's different needs. This function can achieve addition, deletion or modification to PLC data. Such actions will come into effect after system restart. For example, the function of adding valve linked and door interlock of PLC in Fig. 5.2.9. So according to the user's definition as given here, in the System Function settings of the main monitoring screen of the medium voltage drive system, it can be set whether to allow the opening of the doors or the valves be linked when the system is running(as shown in Fig. 2-52).		
□ [PLC signal definition]		
As shown in Fig. 2-49, the medium voltage drive system can set the definition of digital field signals according to the user's different needs. By defining the PLC register bit and its field meaning, and according to the indication method corresponding to the value of the bit, the monitoring main interface and upper PC monitoring interface of medium voltage drive system can display digital inputs or outputs of the user's site accurately. For example, if PLC register VB 6.0 is defined to indicate transformer overheating, and its treatment method is to give indication when the state is 1, then when its state bit is 1, the monitoring interface will indicate Transformer overheating. Furthermore, according to field requirements, the corresponding PLC register bits can be added or deleted in this dialog box through the Data Node Edit window, so as to facilitate the extension of user data nodes, as shown in the adding process of register bit VB 9.0 in Fig. 2-49.		

Table 2-18

Click the icon for the PLC Input/Output signal definition to be displayed.

Figure 2-47 Display of PLC signal definition

Click the icon for the PLC Input/Output signal definition dialog box to be displayed.

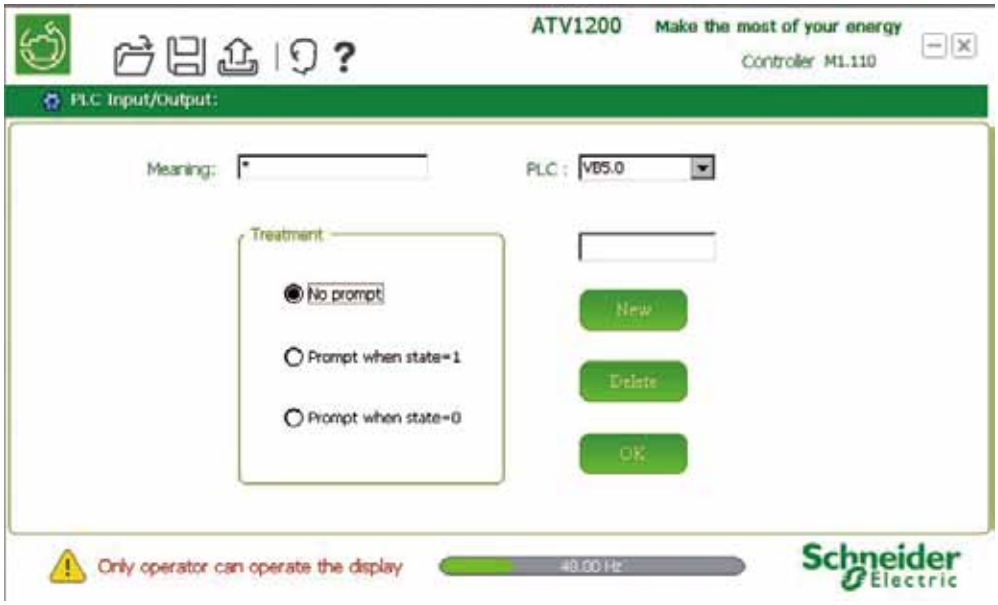

Figure 2-48 PLC signal definition

The medium voltage drive system can set the definition of digita fieldl signals according to the user's different needs. By defining the PLC register bit and its field meaning, and according to the indication method corresponding to the value of the bit, the monitoring main interface and upper PC monitoring interface of medium voltage drive system can display digital inputs or outputs of the user's site accurately. For example, in Fig. 2-49, if PLC register VB 6.0 is defined to indicate transformer overheating, and its treatment method is to give indication when the state is 1, then when its state bit is 1, the monitoring interface will indicate Transformer overheating. Furthermore, according to field requirements, the corresponding PLC register bits can be added or deleted in this dialog box through the Data Node Edit window, so as to facilitate the extension of user data nodes, as shown in the adding process of register bit VB 9.0 in Fig. 2-49.

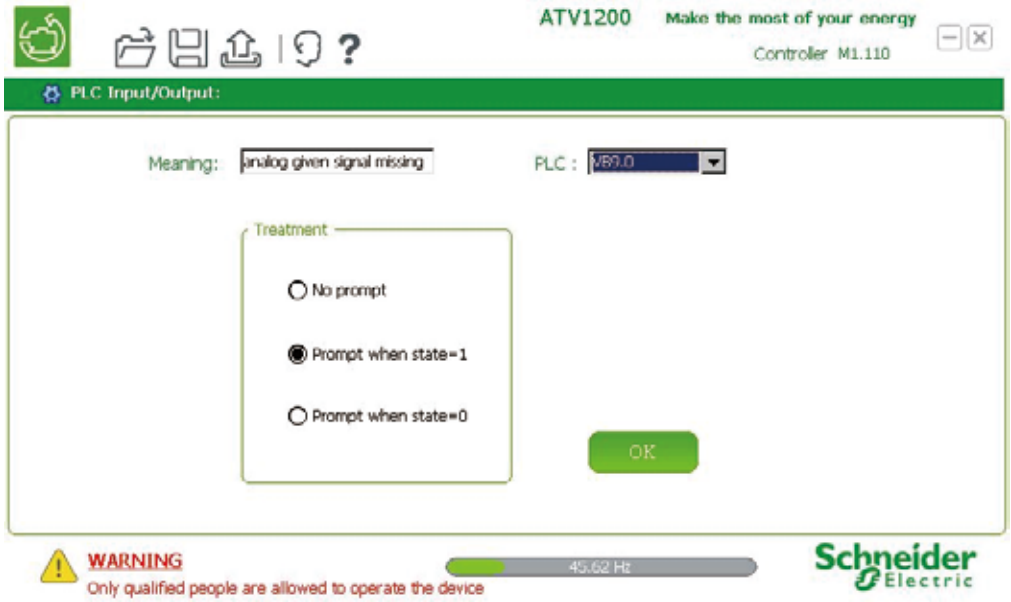

Figure 2-49

In the editing box above select the New button, input "VB9.0", then click the New button.

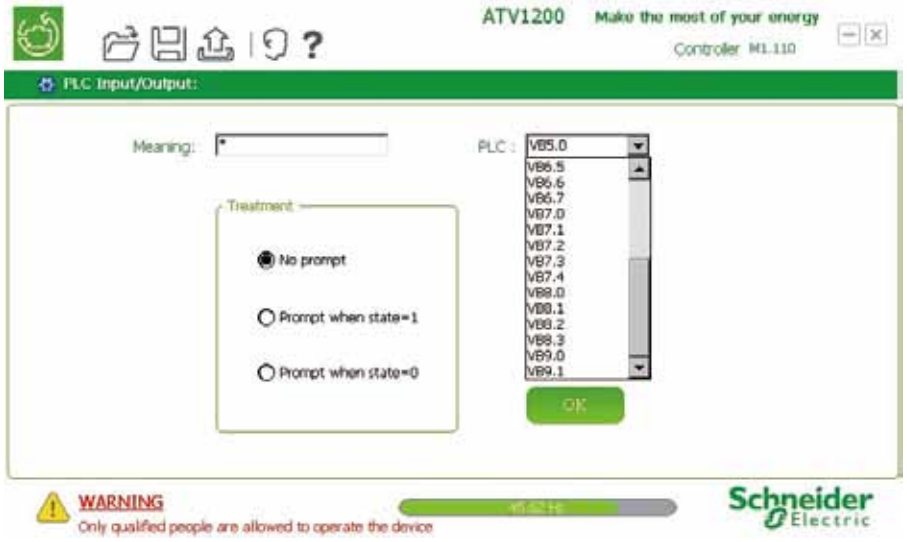

Figure 2-50

At the bottom of the editing box for PLC register bits, you can see the newly added item……
If you want to delete that node, you can select the node in the editing box for PLC register bits, such as VB9.0, then click the Delete button. The Prompt dialog box for confirmation will appear. Click Delete , then, at the bottom of the editing box for PLC register bits, you can see the node VB9.0 has been deleted, as shown in Fig. 2-51.

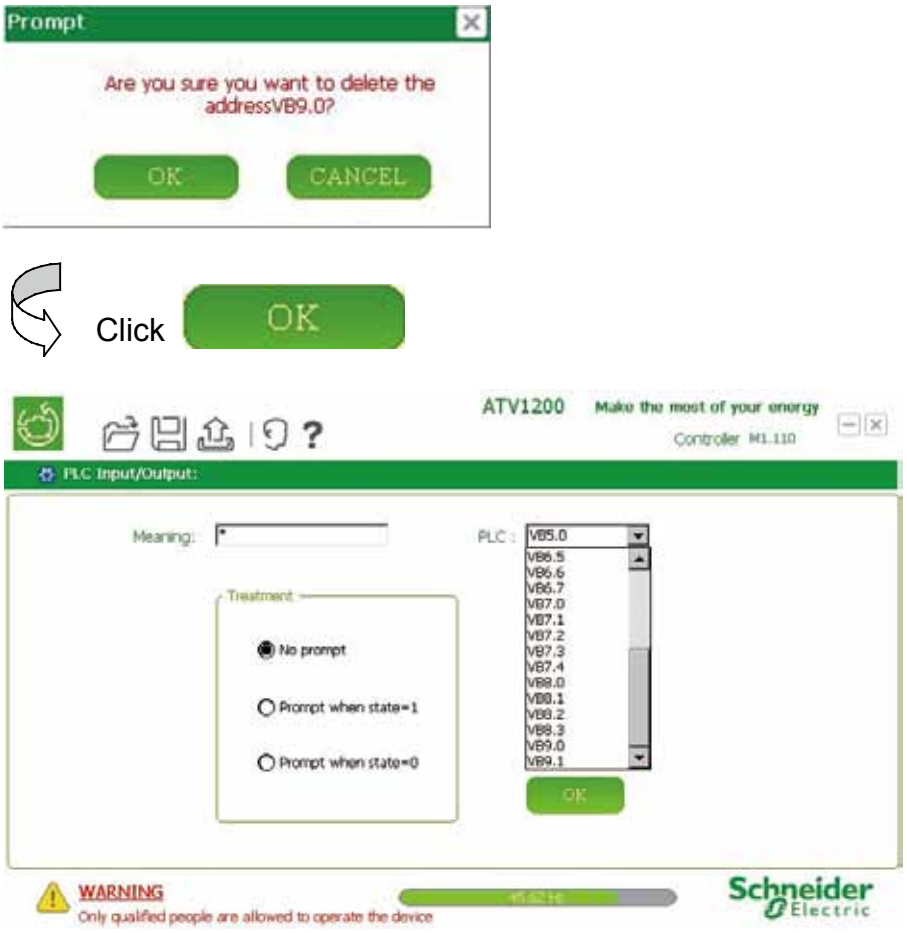

Figure 2-51

Click the PLC extend icon for the PLC Parameter Edit extension dialog box to pop up.

Figure 2-52

Field parameters of the PLC can be extended according to the user's different needs. This function can achieve addition, deletion or modification to PLC data. Such actions will come into effect after the system restart. For example, the function of adding valve linked and door interlock of PLC in Fig. 2-53. So according to the user's definition as given here, in the System Function settings of the main monitoring screen of the medium voltage drive system, it can be set whether to allow to the opening of the doors or the valves
be linked when the system is running(as shown in Fig. 2-53).
If you want to delete a PLC parameter extension item, you should firstly select the row to delete in the table, such as VW274, door interlock item, then click the Delete button. The Prompt dialog box for confirmation will appear. Click OK , then the PLC parameter extension item corresponding to the selected row will be deleted, as shown in Fig. 2-53.

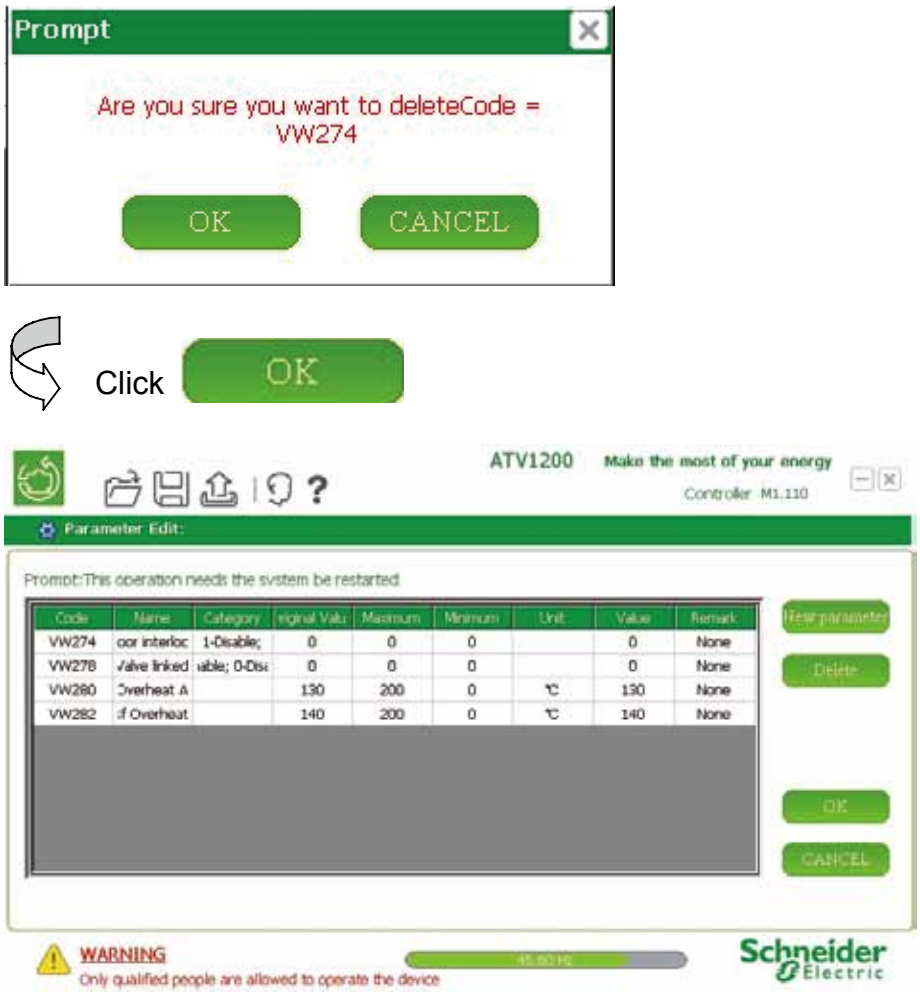

Figure 2-53

If you want to add PLC parameter extension items, you should select a certain row in the table, then click New parameter button, inserting a new row in front of the selected row, and inputting the corresponding parameter extension value in the new row, as shown in Fig. 2-54.

Figure 2-54

Click the Analogue Signals icon for the Analog Signals dialog box to pop up, as shown in Fig. 2-55.

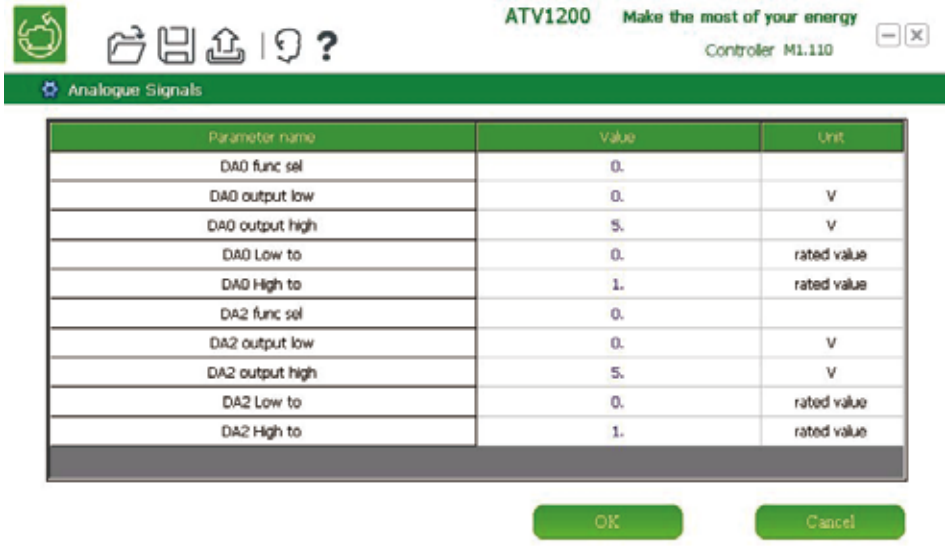

Figure 2-55

2.5.6 Fault Management

In the [Parameter Setting] screen, click the Fault Management button, then the Fault Management screen will pop up, as shown in Fig. 2-56, of which the parameter descriptions are given in Table 2-19.

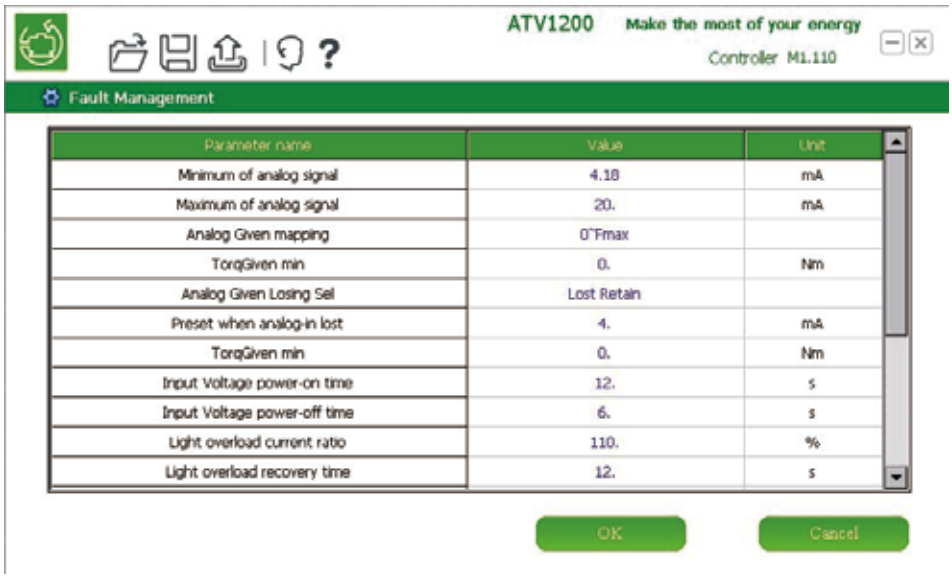

Figure 2-56 Fault management

Name/Description	Adjustment Range	Factory Setting
□ **[Minimum of analog signal]**	0.0-20.0	4.18 mA
The minimum current value of analog input signal of the master cubicle.		
□ **[Maximum of analog signal]**	0.0-20.0	20.0 mA
The maximum current value of analog input signal of the master cubicle.		
□ **[Analog Command mapping]**		0-Fmax
The range of controlled quantities indicated by the input range of analog quantities: (1) 0~Fmax :corresponds to 0 to the maximum value; (2) Fmin~Fmax:corresponds to the minimum value to the maximum value.		
□ **[TorqGiven min]**	-20000~20000	0 Nm
□ **[Analog Command Losing Sel]**		Lost Retain
The action of drive when the selected analog quantity is lost. **Options:** Lost Retain: retains the current given value. Preset Given: takes the preset given value as the given value.		
□ **[Preset when analog-in lost]**	3-20	4 mA
When [Analog Command Losing Sel] is Preset Given, it is up to this parameter to set the preset given value.		
□ **[TorqGiven min]**		0 Nm
By editing the definitions of analogue inputs, the channel number of analog inputs can be increased or decreased, meanwhile the content and units of other reserved parameters related to that input channel can be defined, the already defined name of the analog input and the content and units of its reserved parameters can also be modified. See Fig. 5.2.3.		
□ **[Input Voltage power-on time]**	0-30	12.0s
After medium voltage power-on of the drive, it will take this delay time to perform a hardware self-test, so as to exclude the possibility of hardware self-test anomalies caused by system power-up interference.		
□ **[Input Voltage power-off time]**	0-20	6.0s
1. The drive is in running state; 2. Motor Control Mode is set to Vector Control, or U/f Start-up Mode is set to Spinning Start; 3. The drive loses medium voltage input voltage; 4. The medium voltage input voltage is restored. When the four above-mentioned conditions are met, if the time from medium voltage input voltage power-off to restoration is less than the value that is set here, the drive will automatically identify and track the motor rotation speed, as well as restore motor running; if the time from medium voltage input voltage power-off to restoration is greater than the value that is set here, the drive will enter standby state.		

Name/Description	Adjustment Range	Factory Setting
□ [Light overload current ratio]	100-130	120%
If the drive's output current ratio exceeds this setting, it will gradually decrease the output frequency, until the output current is not higher than the rated current. Remark: in this course. (1) if the "Light overload recovery time" has not elapsed, only the reference frequency that is set below the current output frequency is valid, i.e., at this time, the drive can only run in decreased frequency state. (2) after the "Light overload recovery time" has elapsed, the drive will restore normal running at the recovered reference frequency.		
□ [Light overload recovery time]	1-60	12s
When the drive's output current ratio exceeds the settings of Light overload current ratio, the drive will decrease the output frequency automatically, making the actual current decrease gradually. After the output current drops to or below the rated current, the drive will wait for a period of time, which is called Light overload recovery time.		
□ [Heavy overload current ratio]	100-150	150%
1. The drive's output current ratio has exceeded this setting; 2. The time set by Heavy overload time has elapsed. If the two conditions above are met at the same time, the drive will report a "Detected fault", System Overload, and blocks the output immediately.		
□ [Heavy overload time]	1-60	3S
The permitted time period for the drive's output current ratio being higher than the Heavy overload current ratio. In this period, the drive will continue running. After the period, it will block the output immediately.		
□ [cell alarming delay time]	1-60	3.5s
1.power cell alarm: cell under voltage, cell phase loss, cell overheating; 2.alarm delay: the time period for the power cell Alarm permitted by the drive. If an anomaly occurs to the power cell, the master system will report a "cell alarming" through the I/O port to the PLC; if the "cell alarm" disappears during the preset delay time, the master system will stop sending "cell alarm" signal to PLC, and the system will continue normal operation. If the "cell alarm" does not disappear during the preset delay time, the power cell in "cell alarm" will come into bypass state(optional function), meanwhile displaying the information "Bypass running" on the HMI. If medium voltage drive system is set without cell bypass function, the medium voltage drive system will trip at the same time as the upstream breaker		
□ [Grounding Running Duration]	0~1800	1800s
1. When the master controller detects single phase grounding of the output, the Drive State bar in the HMI will indicate "Output Grounding Operation", meanwhile sending a "Alarming" to the PLC. If the grounding fault disappears in the period of Grounding Running Duration and the duration of normal state is equal or longer than 10s, the master will cancel the alarming to PLC and the display on the HMI. If the abnormal lasts longer than the Grounding Running Duration, the drive will report Stopping with "Detected fault", and be displayed on the HMI. 2. When the Grounding Running Duration in the Debug Parameters of the embedded HMI is set to the maximum value, 18000 (i.e., 1800 seconds), the drive will not stop in the case of grounding fault, instead, it will keep running.		
□ [U/f fly-startup time]	0.1-50	10s
When the asynchronous motor is starting in spinning mode, it will employ vector control mode first. After the delay set by U/f fly-startup time, the system will switch automatically to U/f control mode.		
□ [Line voltage recovery time]	0-200	2s
The permitted time period for the system to restart after power-loss. In case of medium voltage power-loss, if the power-loss time is not longer than this period, then when the medium voltage power resumes, the system can restart automatically.		
□ [Scaning delay time]	1-3000	1500
The delay time for scaning , used for programmer debugging.		
□ [resttime]		0
CPU reset time, used for programmer debugging.		

Table 2-19

2.5.7 Application

In the Parameter Settings screen, click the Application button for the Application dialog box to pop up, as shown in Fig. 2-57.

Figure 2-57 Application functions

2.5.7.1 PID Regulation

In the Application screen, click the PID regulation for the PID Settings dialog box to appear, as shown in Fig. 2-58, the specific parameters of which are shown in Table 2-20.

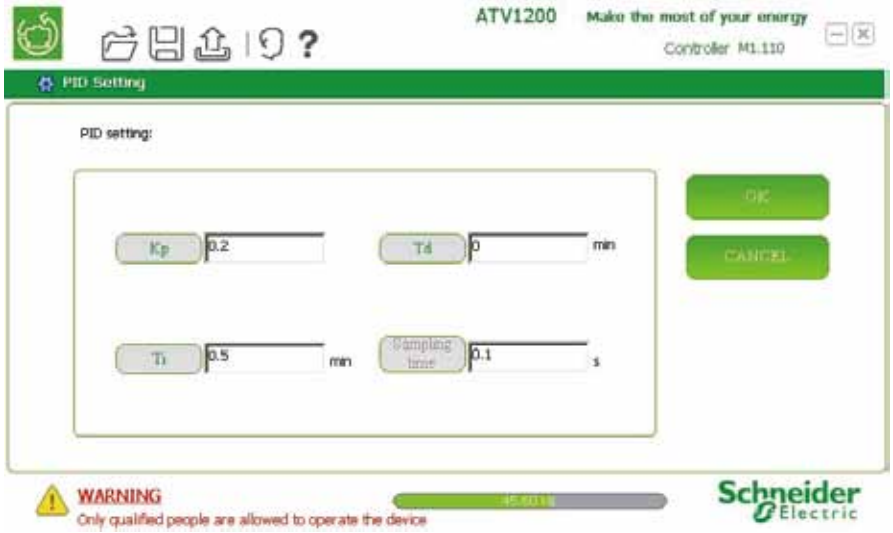

Figure 2-58 PID regulator parameters

Name/Description	Adjustment Range	Factory Setting
□ [PID Setting]		
As shown in Fig. 2-58, used to input every parameter of the PID regulator. The proportional coefficient, integral time constant and differential time constant of the PID regulator can be modified in real time during the drive's operation.		
□ [Kp]		0.2
The proportional coefficient of the PID regulator, can be positive, negative or of zero value. Increasing this coefficient's absolute value can speed up the regulation. But when too high, the system tends to oscillating due to overshoot. In the case that both integral and differente coefficients are positive, if the proportional coefficient is also positive, the drive will perform positive regulation, i.e., if the given value is higher than the feedback value, it will increase the output frequency; if the given value is lower than the feedback value, it will decrease the output frequency. For example, in the constant-pressure water supply application, if the given water pressure is higher than the actual value, the regulator will increase the drive's output frequency to accelerate the pump, making the actual water pressure climb to the given value. In the case that both integral and differential coefficients are positive, if the proportional coefficient is also positive, the drive will perform negative regulation, i.e., if the given value is higher than the feedback value, it will decrease the output frequency; if the given value is lower than the feedback value, it will increase the output frequency. For example, in constant-temperature control systems which use fans to perform forced air cooling, if the given temperature is higher than the actual value, the regulator will decrease the drive's output frequency to decelerate the fan so as to decrease the air flow rate, making the actual temperature climb to the given value. When there is no need for proportional regulation, the proportional coefficient should be set to zero. In this case, both the integral and differential regulation can be performed, in which the PID regulator will take the proportional coefficient as 1 when it is performing integral or differential operations. When the proportional coefficient is not zero, its change can also influence the effect of the integral and differential regulation of the regulator.		
□ [Ti]		0.5
The integral time constant of the PID regulator in seconds, which can be positive, negative, but cannot be zero. Normally it is set to be a positive value. Only when there is no need for the proportional regulation while the integral regulation alone is needed and the regulator performs negative regulation, this coefficient will be set to a negative value. Increasing the absolute value of this coefficient will make the response slower. When the proportional coefficient is a positive value or zero, and the integral coefficient is set to be positive, the drive will perform positive regulation, i.e., if the given value is higher than the feedback value, it will increase the output frequency; if the given value is lower than the feedback value, it will decrease the output frequency. When the proportional coefficient is a positive value or zero, and the integral coefficient is set to be negative, the drive will perform negative regulation, i.e., if the given value is higher than the feedback value, it will decrease the output frequency; if the given value is lower than the feedback value, it will increase the output frequency. When there is no need for integral regulation, the integral coefficient should be set to infinity.		
□ [Td]		0
The differential time constant of the PID regulator in seconds, which can be positive, negative or zero. Normally it is set to be a positive value. Only when there is no need for the proportional regulation while the differential regulation alone is needed and the regulator performs negative regulation, this coefficient will be set to a negative value. Increasing the absolute value of this coefficient will make the dynamic response of the regulator faster. When the proportional coefficient is a positive value or zero, and the differential coefficient is set to be positive, the drive will perform positive regulation, i.e., if there is a sudden increase of the given value or a sudden decrease of feedback value, it will increase the output frequency. When the proportional coefficient is a positive value or zero, and the differential coefficient is set to be negative, the drive will perform negative regulation, i.e., if there is a sudden increase of the given value or a sudden decrease of feedback value, it will decrease the output frequency. When there is no need for differential regulation, the differential coefficient should be set to zero.		
□ [Sampling time]		0.1
The calculation period of the PID regulator in seconds, which is to be positive and not be negative or zero. Its default setting is 0.1s.		

Table 2-20

2.5.7.2 Automatic Scheduling

In the Application screen, click the Schedule table for the Schedule table parameter settings dialog box to appear, as shown in Fig. 2-59, the specific parameters of which are shown in Table 2-21.

Figure 2-59

Name/Description	Adjustment Range	Factory Setting
□ **[Write Schedule table setting]**		
As shown in Fig. 2-59, the user can click the Add button, then in the Input Schedule dialog box that pops up, select Running Mode and set Running Time and set the given value.		

Table 2-21

2.5.7.3 Speed Ramp

In the Application screen, click the Speed ramp for the Speed ramp parameter settings dialog box to appear, as shown in Fig. 2-60.

Figure 2-60

The method for setting the Speed ramp parameters is shown in Fig. 2-60.
First, click Speed ramp button for the soft keyboard to pop up, then set the number of Speed ramp segments, such as 3. Click Ok .

Figure 2-61

In the drop-down list box, you can see three speed points, select one of them, e.g., Speed point 1,then click the speed button after it, e.g., the  button as shown in the above figure, for the soft keyboard to pop up. Set the speed value of Speed point 1, e.g. 30. Then click  .

Figure 2-62 Speed ramp settings

In special applications such as in steal factories, when there is need for high-, medium- and low-speed operation, you can set it to operate in three stages, then select ■ High/low speed regulation production item. In case of using Remote Control and Display, three buttons will appear at the bottom of the main screen of the upper PC monitoring program, i.e., Low speed, Medium speed, and High speed, which corresponds to the frequencies of Speed point 1, Speed point 2 and Speed point 3, respectively. Simply through clicking the button corresponding to the desired speed, the given frequency can be set to the value of the corresponding speed point.

2.5.7.4 Function Lock

In the Application screen, click the Function lock for the Function lock setup parameter settings dialog box to pop up. By setting the Function lock, the "locked" state of "Local" or "Remote Control" can be defined, i.e., in "Local" or "Remote Control" mode, selecting whether the "Schedule", "Command" mode, "Start" mode and "Run" mode of the system are lock-enabled or not, also selecting whether to respond to the function lock set by PLC using the check box ☑ respond plc lock . When the system is in local or remote control mode, it will bind all functions automatically according to the function lock, as shown in Fig.2-63.

Figure 2-63 Function lock setup

2.5.7.5 Controlled object

In the Application screen, click the Controlled object for the Object Settings parameter settings dialog box to pop up, as shown in Fig. 2-64. Through this settings window, Water Pressure/MPa, Flowrate/m^3/h, Air Pressure/Pa, and Water Level/m, etc. can be set according to users' various requirements. The content of title bar in the main monitoring screen can also be changed by setting the user name.

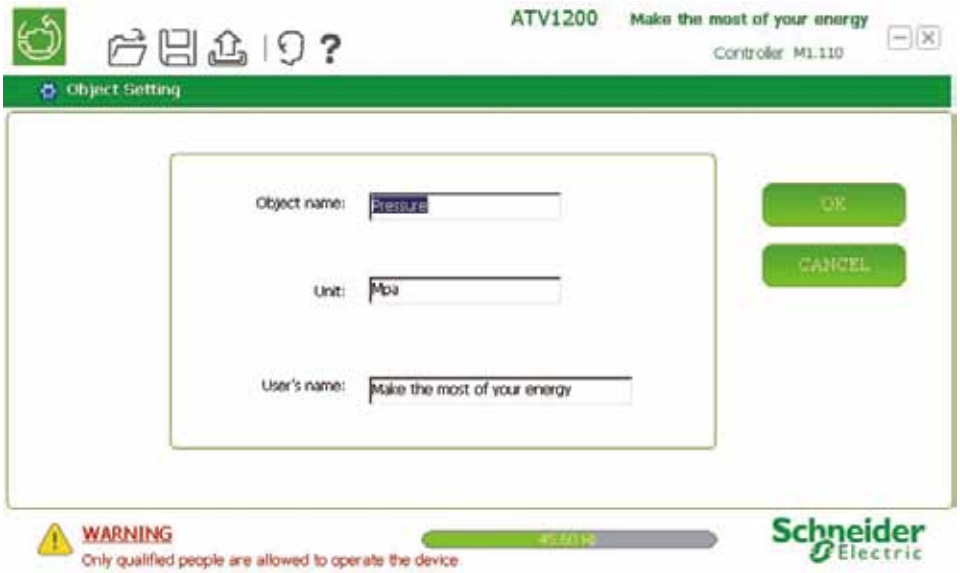

Figure 2-64

2.5.7.6 Sampling Scaler

In the Application screen, click the Sampling scaler for the Sampling scaler parameter settings dialog box to pop up, as shown in Fig. 2-65, the specific parameters of which are shown in Table 2-22.

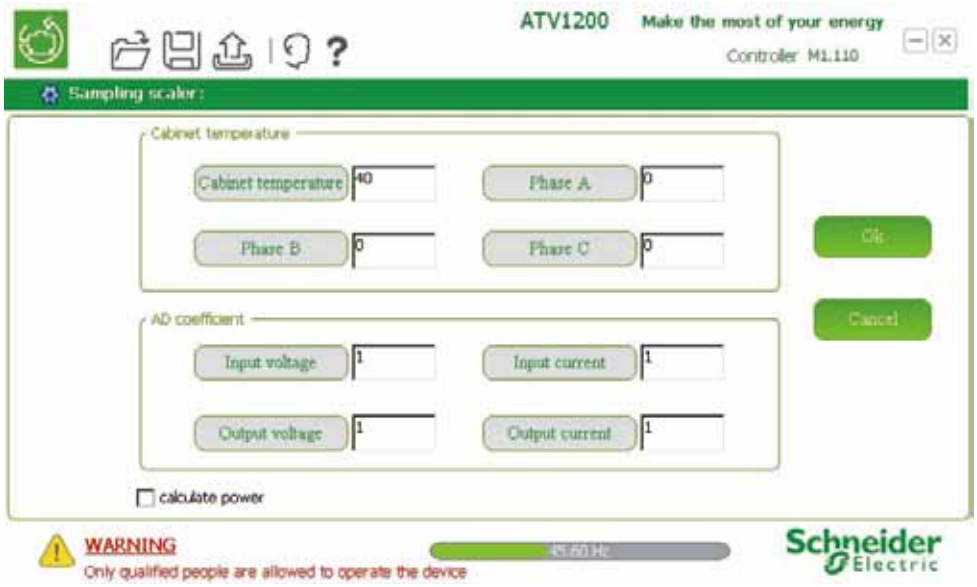

Figure 2-65 Sampling scaler settings

This function is used to set the overheating settings and three temperature adjustment coefficients relative to cabinet temperature, AD coefficients, including adjustment coefficients corresponding to input voltage, input current, output voltage and output current.
The meanings of parameters displayed on the screen is given in Table 2-22.

Name/Description	Adjustment Range	Factory Setting
□ [Cabinet temperature]		40 ºC
Used to set the alarm value of the cabinet temperature. When the cabinet temperature is higher than this value, the overheating alarm will be activated		
□ [Phase A]		0
Used to set the temperature correction value of two cell cabinets 1, so as to compensate for the temperature deviation of the temperature controller.		
□ [Phase B]		0
Used to set the temperature correction value of two cell cabinets 2, so as to compensate for the temperature deviation of the temperature controller.		
□ [Phase C]		0
Used to set the temperature correction value of controlling cabinet 3, so as to compensate for the temperature deviation of the temperature controller.		
□ [Input voltage]		1
The amplification ratio for the displayed value of the medium voltage drive system's actual input voltage.		
□ [Input current]	1	
The amplification ratio for the displayed value of the medium voltage drive system's actual input current.		
□ [Output voltage]		1
The amplification ratio for the displayed value of the medium voltage drive system's actual output voltage.		
□ [Output current]		1
The amplification ratio for the displayed value of the medium voltage drive system's actual output current.		

Table 2-22

The parameter settings above can be done by clicking the corresponding button, such as the Cabinet temperature button, for the soft keyboard to pop up in order to input the setting values, as shown in Fig. 2-66.

Figure 2-66 Overheating settings

If the ☐ calculate power check box is checked, the input and output active powers and their corresponding power factors will be displayed in the Field Data parameter item in the main monitoring screen of the medium voltage drive system and the monitoring screen of the upper PC.

2.5.7.7 User Management

In the Application screen, click the User manage, the following screen will appear, as shown in Fig. 2-67.

Figure 2-67 User manager screen

2.5.8 Communication

In the Parameter Settings screen, click the Communicate button for the Port Settings dialog box to pop up, as shown in Fig. 2-68.

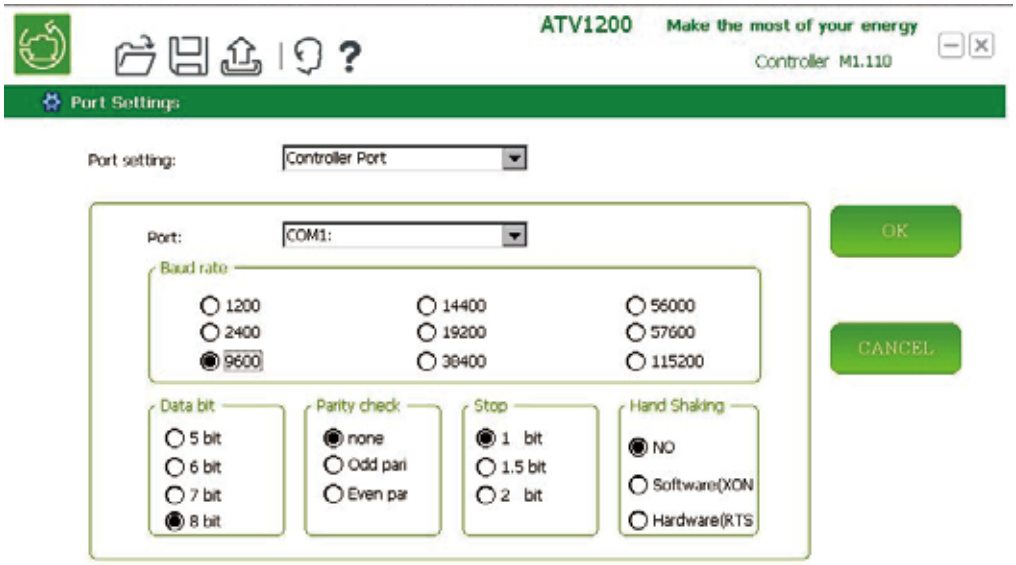

Figure 2-68 Port Settings

Before running the medium voltage drive system's main monitoring interface, it is necessary to set the attributes of each communications port. In the screen, the Port No., Baud rate, Data bit, Parity check, Stop bit and Hand Shaking mode used by each communications port (including the ports for controller, PLC communication, upper PC, temperature sampling and GPRS), so as to verify the correct communication between the industrial control machine and each device. The default settings for the controll ports are: Baud rate, 9600; Data bit, 8 bit; Parity check, none; Stop, 1 bit; and Hand Shaking, NO. The default setting for PLC communications ports is: Baud rate, 9600; Data bit, 8 bit; Parity check, Even parity; Stop, 1 bit; and Hand Shaking, NO. The default settings for upper PC communications ports is: Baud rate, 9600; Data bit, 8 bit; Parity check, Even parity; Stop, 1 bit; and Hand Shaking, NO. The default settings for temperature sampling ports is: Baud rate, 9600; Data bit, 8 bit; Parity check, none; Stop, 1 bit; and Hand Shaking, NO. The default settings for GPRS ports is: Baud rate, 9600; Data bit, 8 bit; Parity check, Even parity; Stop, 1 bit; and Hand Shaking, NO.

The Open/Save menu is used to save, recall and export drive parameters, as shown in Fig. 2-69.

Figure 2-69

2.6 Open/Save

2.6.1 Backup/Restore

Click the Backup/Restore button for the Parameter Backup_Restore dialog box to pop up (Remark: this action requires administrator access permission) , as shown in Fig. 2-70.

Figure 2-70 Backup/Restore

Parameter Backup: Store the current parameters set by the user into the hard disk as data files for recalling when needed. As shown in Fig. 2-70, after entering the Parameter Backup_Restore screen, select any unused name among the backup names from save1 to save16, then click the Backup button, then, the system will save the current parameters set by the user as the selected backup file name onto the hard disk, also displaying the backup time of this parameter file. The system can save up to 16 backup files from save1 to save16. If the file have all been used, you can select the name an obsolete file, then click the Delete button to delete the file. After deletion, the file name is retained, but its content is empty, and the Backup Time of the file is blank, so this file name can be used again for backup of a new parameter file.
Parameter Restore: the user sets the current parameter values of the system to the values in the specified data files. As shown in Fig. 2-70, after entering the Parameter Backup_Restore screen, select the desired backup file, then click the Restore button, the system will set the current parameter values into the values in the selected file. The unused parameter file can also be deleted using the Delete button here.

2.6.2 Parameter report

Click the Parameter report button, for the Report dialog box for exporting parameter reports to pop up (Remark: this action requires administrator access permission), as shown in Fig. 2-71.

Figure 2-71

After entering the parameter report settings screen, if there is no USB disk inserted, it will prompt: Please insert USB disk! After the USB disk inserted, the export path will be automatically set to: \USB HardDisk\Report (this path cannot be modified), i.e., saving the parameters into the newly created Report.csv file in the USB disk. Then, click the OK button to begin exporting the parameter report. If the export was successful, a Prompt dialog box will pop up automatically, indicating the success of exporting operation, as shown in Fig. 2-72.

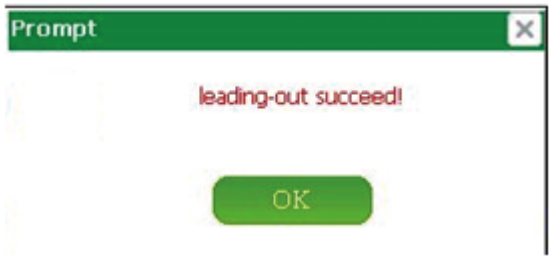

Figure 2-72

If a Report.csv file already exists in the USB disk, the system will prompt whether to overwrite it. Select “No” to cancel parameter file backup, or select “Yes “to overwrite the existing file to perform backup.

Before the drive's first power-up, it is necessary to enter the main screen and then the Parameter Settings window to set the parameters for the motor and the drive!

2.7 Running Modes of the medium voltage drive system

The ATV1200 series medium voltage drive system has many running modes such as "Open-Loop","PID-Closed-Loop", "Soft Start", "Normal Stop" and "Mains Voltage OFF", etc... No matter in which running mode, the power-up of the medium voltage drive system to be performed with the system in standby state. When the prerequisites are met, that is, controller ready, motor ready, power-up enabled, "Mains Voltage OFF" button (including "Freewheel Stop" buttons on the HMI and at the remote control) released, and no “Detected fault”, the system will send the "Medium Voltage Closing Permitted" signal. When the system receives the "medium voltage ready" signal, it will enter standby state.

2.7.1 Open-loop running

When the system is in standby state, and the "Remote"/"Local Control" knob on the cubicle door is at the "Remote Control" position, if there is a remote "Start" command received, the medium voltage drive system will start from the current state according to the acceleration time provided by the system, and operate according to the running frequency set by the user for medium voltage drive system in the end.
When the system is in standby state, and the "Remote"/"Local Control" knob on the cubicle door is at the "Local Control" position, the remote "Start" button is disabled, and the starting of the medium voltage drive system is achieved through the "Start" button on the HMI touch screen.

2.7.2 PID-Closed-loop running

If PID Enabled in the Function Settings of the HMI touch screen is selected, the medium voltage drive system will run in "PID-Closed-Loop" mode after startup. In the "PID-Closed-Loop" mode, the user can set the expectation values of the controlled quanties(such as pressure, temperature, etc.). The medium voltage drive system will adjust the motor speed automatically according to actual values of the controlled quantities and the PID parameters set by the system, so the actual values follow the expected values automatically.

2.7.3 Soft start

When the system is in standby state, and the "Remote"/"Local Control" knob on the cubicle door is at the "Remote Control" position, if the remote “Soft Start” command is valid, the medium voltage drive system will start from the current state according to the acceleration time provided by the system. Irrespective of the frequency set by the user, the medium voltage drive system will accelerate directly to the network transfer frequency (its default value in the system is 50 Hz) provided in system parameters, then send the “Power-Frequency Transfer” command to control the user’s interlock circuit of electrical switching, so as to transfer the motor that has been soft-started from the medium voltage drive system driving to power-frequency network. The “Power-Frequency Transfer” command provided by the medium voltage drive system will be kept valid for two seconds, then canceled automatically, then the medium voltage drive system will enter into standby state.
When the system is in standby state, and the "Remote"/"Local Control" knob on the cubicle door is at the "Local Control" position, if "Soft Start" in the Function of the HMI touch screen is set to "Soft Start", then the program will send "Soft Start" command after the "Soft Start" button is pressed. The "Soft Start" action is the same as that in "Remote Control" mode.

2.7.4 Normal Stop

When the "Remote"/"Local Control" knob on the cubicle door is at the "Remote Control" position, the remote Stop button can make the medium voltage drive system decelerate to standstill according to the deceleration time set by the system. When the "Remote"/"Local Control" knob on the cubicle door is at the "Local Control" position, the Stop button on the HMI touch screen will have the same function.
If the position of the "Remote"/"Local Control" knob on the door is changed or the state of any of the following messages: Controller Ready, Medium Voltage Ready, Motor Ready and Power-up Enabled is disabled when the medium voltage drive system is running, the drive system will stop automatically.

2.7.5 Mains Voltage OFF

Under any conditions, the "Mains Voltage OFF" button on the door and the "Freewheel Stop"buttons on the HMI touch screen can both be operated. After the system receives the "Mains Voltage OFF" command or a “Detected fault” occurs, it will block the pulses of power cells immediately and the motor and the mechanism will stop in freewheel mode.
In addition to blocking the pulses of power cells immediately, the "Mains Voltage OFF" button on the door also has the function of medium voltage breaker. If the "Mains Voltage OFF" button on the door is locked, the system will not display the "Medium Voltage Closing Permitted" message anymore, then the remote "Mains Voltage OFF" button and the "Freewheel Stop" buttons on the HMI touch screen will not function as medium-voltage breakers.
Remark:
- In any case, the "Mains Voltage OFF" button on the door and the "Freewheel Stop" buttons on the HMI touch screen are valid at the same time.
- The "Mains Voltage OFF" button on the door has the function of tripping the upstream breaker, while the Stop button and the "Freewheel Stop" buttons on the HMI touch screen do not have this function.

Chapter 3: System Commissioning

3.1 Control System Commissioning

3.1.1 Preparation before Commissioning

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions given in "Before you begin - Safety information" chapter before performing any procedure described in this chapter.

Failure to follow these instructions will result in death or serious injury.

Verify control wires before supplying power to control system and check strictly as per item 2.3.7, make medium voltage switch to test position before turning power on.

3.1.2 Control Power Supply

3.1.2.1 Verify the quantity of control power, the voltage, capacity and its reliability as per "technical protocol". Anode/cathode must be verified for DC control power.
3.1.2.2 Insert plug of UPS to socket (as per drawing) and make sure there is no short circuit, close AC control power switch, HMI power switch in turn, close UPS output switch
3.1.2.3 After supplying power to control system, PLC, HMI, main controller and fan of main controller box should work normally.

3.1.3 Parameter Set-up

3.1.3.1 Check set-up of transformer temperature protection
Check and set transformer overheating protection parameters as follows:
Enter interface Parameter → external control, “transf overheat alarm ” is 90ºC,“transf overheat trip “ is 110ºC.

3.1.3.2 Speed-adjustment parameter set-up
Enter interface "parameter/speed parameter", verify following parameters:
"starting frequency" is 0.5, "minimal frequency" is 0.5, "maximal frequency" is 50 (depending on nominal frequency of motor),”reference voltage” in line with input voltage, "reference frequency" is 50 (in line with motor's rated frequency), "torque boost" is 0, frequency 1 low limit, frequency 1 up limit, frequency 1 low limit and frequency 1 up limit are 0.

3.1.3.3 Speed ramp set-up
This function must be combined with site status and make good use of acceleration time and deceleration time.

3.1.3.4 Control parameter set-up
Enter "parameter → motor control → control parameter" in interface. Control parameters are usually set as follows: enable bypass number is 0, PWM coefficient keep default, Debugging without input voltage is Disabled, excessive protection is 2 times of motor rating current.

3.1.3.5 Motor parameter
Enter "parameter/motor control/motor parameter" in interface. Write motor and medium voltage drive system parameters according to nameplate.

3.1.4 Function Parameter

Enter "Parameter/External control”, set following:
Schedule mode is “manual”;
Start mode is “normal start”;
Running mode can be chosen “open-loop” or “closed-loop” according to site status;
Command mode can be selected as “computer command” or “analog command” according to site status;
Upper PC control is disabled (set enable when there is upper PC provided);
System bypass is disabled (it can be enabled when an automatic bypass cabinet is provided);
Door interlock: set enabled in commissioning (set disabled in normal operation);
Valve linked: set enabled or disabled according to status.

3.1.5 Analog Measuring Range

3.1.5.1 Analog value input set-up
Enter "parameter → input/output → analog input → setting", set channel 1-system command is: current source, input range is 4~20mA, measuring range 0~50Hz (60Hz), open loop minimal frequency is 0.5Hz, open loop maximal frequency is 50Hz (60Hz), break value is -1. Channel 2-site feedback: current source, input range is 4~20mA, measuring range is 0-sensor maximal measuring range, break value is -1.

3.1.5.2 Analog output set-up
Enter "parameter → input/output → analog output", set output channel 1 running speed, current source, output range is 4~20mA, measuring range is zero to motor's rated speed. Set channel 2 output current, current source, output range is 4~20mA, measuring range is 0~motor's rated current.
Above records must be filled into the parameter record table.
If the medium voltage drive system is in vector control mode, other parameters must be set. Detailed information is shown in item 2.3.

3.1.6 Control System Commissioning

3.1.6.1 After supplying power to the control system, HMI enters into the main interface automatically. Main interface displays "controller ready", "medium voltage not ready", no other status displayed.
3.1.6.2 Open power cell cabinet door or transformer cabinet door. HMI displays "door not closed", alertor produces flashing & sound. Indicator of door interlock signal is on. Press "alarm release" button on the controller cabinet door, flashing & sound will cease, but "door not closed" information is still on interface. Close the door, "door not closed" information will disappear on interface & site control system
3.1.6.3 Open control power supply switch, HMI displays " AC Control power shutdown ", alertor produces flashing & sound, "Alarm" indicated on the HMI. Press "alarm release" button on controller cabinet door, flashing &sound ceases, but " AC Control power shutdown " information is still on HMI, close control power supply switch, alarm message on HMI disappears.
3.1.6.4 If the medium voltage drive system supplied with a dual power sources, personnel must undertake a power source switch commissioning for a dual power source:
a. open AC power supply switch, HMI displays "AC control power shutdown";
b. close AC power supply switch , open DC power supply switch, interface displays " DC control power shutdown ", close DC power supply switch, " DC control power shutdown " disappears.
3.1.6.7 Turn switch "local/remote control" to remote control, “remote mode" indicated on the HMI. Turn switch to local control, “remote mode” signal disappear, “local mode” will be displayed on HMI.

3.1.7 Commissioning with Simulation Medium Voltage

Enter "parameter → motor control → control parameter", change "Debugging without input voltage to "Enable", commissioning with simulation medium voltage. HMI displays "system ready".
3.1.7.1 Turn "local/remote control" to local control, enter “parameter → External control”. Set command mode to "Display", set operation mode to “open-loop”. There are "local control, open loop, display" on main interface. "start" button is valid.
3.1.7.2 Click "Reference frequency" on main interface, set reference frequency (such as 30Hz). Click "start" button, medium voltage drive system starts to run in simulation status. "System ready" disappears, "Running" indicator is on. Observe running frequency increasing as per the acceleration time setting, at this time, medium voltage drive system “motor speed" signal must act accordingly. Set reference frequency to 50Hz, output frequency must follow. Click "stop", observe running frequency decrease to 0 according to deceleration time. HMI displays “system ready”. "Running" disappears, "system ready" indicator is on, "motor speed" is 0.
3.1.7.3 Turn "local/remote control" to remote control, enter “parameter → External control”. Set command mode to “analog command”, set operation mode to “open-loop”. There are "remote control, open-loop, analog" on main interface.
3.1.7.4 Set output frequency (such as 30Hz) by analog signal. HMI displays 30Hz on "reference frequency". Send remote start command, medium voltage drive system starts to run in simulation status. "System ready" disappears," Running" indicator is on. Observe the output frequency on the interface, it must increase or decrease according to actual speed ramp settings, at this time. " Motor speed" must act accordingly. Set reference frequency to 50Hz, output frequency must follow. Send remote stop command, observe output frequency decline to 0 according to deceleration time. HMI displays system ready. "Running" disappears, "system ready" indicator is on, "Motor speed" is 0.
3.1.7.5 After commissioning, enter "parameter → motor control → control parameter", change "Debugging without input voltage" to "Disable".

NOTICE

UNEXPECTED EQUIPMENT OPERATION

If "Debugging without input voltage" is not changed to "Disable" after simulation test, there will be no output voltage when medium voltage power on.

Failure to follow this instruction can result in equipment damage.

3.1.8 Interlock with upstream breaker

3.1.8.1 Make upstream breaker on test position. Press "Mains Voltage OFF" on the door, send close command from DCS to upstream breaker and it cannot be closed.
3.1.8.2 Release "Mains Voltage OFF" button, send the close command to upstream breaker and then it can be closed. Press "Mains Voltage OFF" on door and upstream breaker will trip off.
3.1.8.3 When the upstream breaker is closed, the electromagnetic lock of bypass cabinet (optional) will be without power, personnel will be unable to operate isolator switch. When the upstream breaker is open, the electromagnetic lock of the bypass cabinet is powered up and personnel can operatecan isolator switch.

3.2 Commissioning with medium voltage

3.2.1 Inspection before Supplying Medium voltage

3.2.1.1 Before supplying make sure power cables connecting is correct (input and output cable are not reversed); check validity of interlock with upstream breaker; confirm upstream breaker, cable, withstand voltage of dry transformer are qualified; "system bypass" must be set disable temporarily for medium voltage drive system with auto bypass cabinet(optional, purchase separately)
3.2.1.2 Confirm that the grid voltage level, frequency and fluctuation are meet requirements.
3.2.1.3 Check that there are no missing items remaining inside the cabinet such as tools, wires etc. Then lock the cabinet doors.
3.2.1.4 Supply control power to medium voltage drive system.

3.2.2 Testing with medium voltage

3.2.2.1 Switch off the medium voltage drive system output when running a medium voltage test. Set the upstream breaker to the working position.
After preparation, close the fan switches on the top of transformer & power cell cabinet in turn, then close the upstream breaker.

⚠ WARNING

INCOMPATIBLE LINE VOLTAGE

Ensure that the mains voltage corresponds to the input voltage of the Medium Voltage drive system before turning on power to this equipment.

Failure to follow these instructions can result in death or serious injury.

3.2.2.2 After supplying medium voltage, power-on indicator on bypass cabinet (optional) must be illuminated. Check that the red and green indicators of the power cells must be illuminated from observation window
3.2.2.3 Confirm that the fans are operating correctly and that the fan rotation direction is correct.
3.2.2.4 After testing, click "stop" on HMI. After the output frequency has dropped to 0, switch off medium voltage and set it to the test position. Close the exit isolator switch QS2 (contactor KM2) in the bypass cabinet, and then resupply medium voltage again. Turn "local control/remote control" to "remote control", set command mode to "analog command " in interface, set frequency command and start medium voltage drive system. Observe whether motor works normally (such as direction of rotation, temperature rise, vibration). Once tested, stop medium voltage drive system and switch off upstream breaker.

3.2.3 Running with Load Connected

When running the medium voltage drive system with a load it is necessary to observe the output current on HMI and also to check the feedback on the site control system; ensuring that the values on both are the same. If these are not the consistency of the measuring range must be checked.

3.3 Parameter Debugging for Vector Control

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions given in "Before you begin - Safety information" chapter before performing any procedure described in this chapter.

Failure to follow these instructions will result in death or serious injury.

3.3.1 Medium Voltage drive system Asynchronous Motor

Process	Operation	Remark
I. Remove cables between medium voltage drive system and motor		
1. Parameter examination	Check whether parameters set-up is correct.	
2. Zero shift adjustment	Execute “offset check” before supplying medium voltage.	
3. Supply medium voltage, observe input voltage	Observe whether input voltage on the interface is correct. Use multi-meter to measure line-to-line voltage between testing terminals. According to the ratio of resistance divider, to observe whether medium voltage drive system input voltage on interface is correct.	If it is not correct, check whether the input voltage sampling scaler is correct.
	Observe waveform of three phase input voltage on interface, phase A voltage must be ahead of phase B and phase B must be ahead of phase C.	
4.Output voltage observation with no-load operation of medium voltage drive system	Set "Motor Control mode" as "U/f control mode", and "U/f startup mode" as "Normal startup mode". Set appropriate reference voltage and reference frequency to start medium voltage drive system	If it is not correct, check whether the output voltage sampling coefficient is correct.
	Observe whether the effective output voltage on the interface is correct. Use multi-meter to measure line-to-line voltage between voltage testing terminals. According to the ratio of the resistance divider, observe whether medium voltage drive system output voltage on interface is correct.	
	Observe waveform of three phase output voltage on interface, phase U voltage must be ahead of phase V and phase V must be ahead of phase W.	
Proceed when display value and measured value are correct.		
II. Connect medium voltage drive system and motor, remove motor from load.		
5.To observe the output waveform of motor as running without load	Supply power to medium voltage drive system to drive motor. Run at low speed (2Hz), medium speed(35Hz), high speed(50Hz) for not less than 1 minute each. Observe waveform of output three phase voltage and current during acceleration. Waveform must be smooth, with no aberrance, and symmetrical.	

Process	Operation	Remark
6. Verify the phase sequence of output detection line	1) Waveform observation: UALC must be ahead of UBEC by 90 degree; UALC has the same phase position with output phase voltage U_U; for output phase voltage U_U, U_V and U_W, the former must be ahead of latter by 120 degree. 2) Observe whether UALC and VSAL_REF, UBEC and VSBE_REF are respectively in the same phase position. 3)Monitor ISA, it must be ahead of ISB by 90 degrees. For output 3 phase current I_U, I_V and I_W, the former must be ahead of the latter by 120 degrees, and I_U must be behind U_U by approximately 90 degrees.	1) In general, medium voltage drive system adjustment is completed in the factory. It is for the user to verify that the adjustments are correct. 2) After adjusting line sequence or sampling coefficient plus/minus, personnel need to make zero shift rectification.
7. Auto measure motor parameters	1) Remove motor and load before automatic measurement of motor parameters. 2)Set medium voltage drive system control mode "U/f control"→"normal start", vector control parameter "Rs measure I1", "Rs measure I2", " excessive-current protection" are correct. 3) Enter parameter set interface, conduct an automatic measurement of motor parameters. 4) After testing, set the result value to "motor model".	1) Ensure that the motor rotation is normal during measurement. 2) If there is excessive current during the measurement , it is possible that the phase sequence is incorrect, in which case this must be rectified. 3) The measurement time is dependant on the motor acceleration/deceleration. The measurement time must not exceed the 0~F max acceleration or deceleration sum. If the sum is exceeded, the personnel must exit the measurement interface and determine if there have been any anomalies.
8. Vector control operation	Set motor control mode "vector control". Start and run. Observe output voltage and output current at each frequency.	1) Only when the output phase sequence and the automatic measurement of motor parameters are correct, vector control mode becomes available. Otherwise, there will be an excess of current. 2) If speed encoder is present, personnel can choose “Motor control” → “Advanced setting” → “vector control” → “speed sensor” set “with speed sensor” and set correct value in “speed coder” parameter.
III. Connect medium voltage drive system to motor, then connect motor and load		
9. Vector control operation with load	Set motor control mode "vector control". Start and increase load gradually. Observe motor output voltage and output current at each speed.	
10. Verify input voltage current phase sequence	When medium voltage drive system input current ≥15% of rated current, verify voltage current phase order at input. They must be as follows: 1) For input phase voltage U_A, U_B, U_C, the former is ahead of the latter by 120 degrees. 2) Input current I_A, I_B, I_C, the former should be ahead of the latter by 120 degrees. 3) Phase position of input voltage U_A, U_B, U_C must be almost the same as input current I_A, I_B, I_C, but slightly ahead.	If the line sequence is correct, input power and power factor must be positive on interface. If it is not correct, contact Schneider.
Check again and confirm parameter set-up, and commissioning success.		

Table 3-1

3.3.1.1 Precaution

(1) If motor voltage is less than medium voltage drive system rated output voltage, personnel must set parameters according to motor nameplate.

(2) When there is a significant difference between medium voltage drive system and motor ratings (if motor capacity is less than half of medium voltage drive system's capacity), then the motor parameter ‘auto measure’ may not be correct, it cannot realize rotating-start and vector control. In this case, we suggest to choose control mode "U/f control" → "normal start".

(3) In case of one medium voltage drive system driving several motors, because motor parameters are different, "rotating start" or "vector control" will not be available. Personnel only can choose "U/f control" → "normal start".

3.3.1.2 How to confirm which waveform is ahead of the other:
By judging the phase relationship of waveform A and waveform B, if B's zero-cross point from minus to plus is in A's plus cycle, B is behind A.

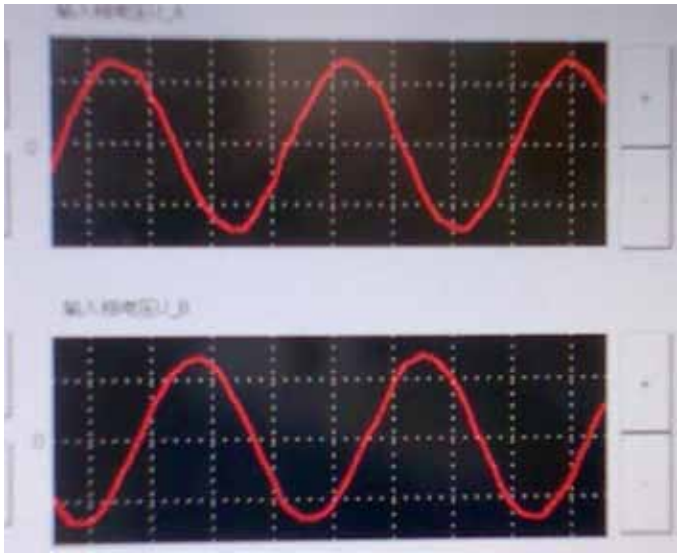

Figure 3-1 the waveform U_A is ahead of U_B by 120 degree.

3.3.2 Medium Voltage drive system Synchronous Motor

ATV1200 series medium voltage drive system can drive a synchronous motor and provide an exciter port. When driving the synchronous motor, the motor control mode only can be set to "U/f control" → "normal start".
When the medium voltage drive system is synchronous motor, the DSP main controller calculates the power factor of motor timely according to output voltage and current, and sends the exciting current command according to user given power factor.
medium voltage drive system controls exciter cabinet in two modes:

1. Passive mode

Analog 4~20mA. Process	**Operation**	**Remark**
I. Remove medium voltage drive system and motor		
1. Parameter examination	Check whether parameters are correct. ATV1200 series drive system can drive synchronous motor only in "U/f control" → "normal start".	
2. Zero shift rectifying	Carry out auto zero shift rectification first before supplying medium voltage	
3. Supply medium voltage, observe input voltage	Observe whether input voltage on interface is correct.	If it is not correct, check whether input voltage sample coefficient is correct.
	Use multi-meter to measure line-to-line voltage between VA1, VB1 and VC1 on Signal-Adjustment Board of DSP master control unit. According to the ratio of voltage, observe whether medium voltage drive system input voltage on interface is correct.	
	Observe waveform of three phase input voltages on interface, phase A voltage must be ahead of phase B and phase B must be ahead of phase C.	If phase order is not correct, personnel must adjust 2nd line order of 3rd input voltage detection line.

Analog 4~20mA. Process	Operation	Remark
4. Medium Voltage DRIVE SYSTEM runs without load. Observe output voltage	Set "Motor Control mode" as "U/f control mode", and "U/f startup mode "as "Normal startup mode". Set appropriate reference voltage and reference frequency to start medium voltage drive system.	
	Observe whether the effective output voltage of the interface is correct. Use multi-meter to measure line-to-line voltage between VU2, VV2 and VW2 on Signal-Adjustment Board of DSP master control unit. According to the ratio of voltage, observe whether medium voltage drive system output voltage on interface is correct.	If it is not correct, check whether output voltage sample coefficient is correct.
	Observe waveform of three phase output voltages on interface, phase U voltage must be ahead of phase V and phase V must be ahead of phase W.	If phase order is not correct, personnel must adjust 2nd line order of 3rd output voltage detection line.
Once the display value and measured value are correct, debugging can be undertaken.		
II. Connecting medium voltage drive system, motor exciter cabinet		
5. When the motor is running without a load, observe the output waveform. waveform	Set "control parameter" → "auto exciter adjustment" to "disable auto exciter adjustment". Set exciting current to half of rated exciting current on exciter cabinet operation panel.	
	When medium voltage drive system starts to run, control box cabinet sends command to exciter cabinet to output exciting current. medium voltage drive system runs at low speed (2Hz), middle speed (35Hz), high speed (50Hz). Repeat from low speed to high speed, from high speed to low speed for at last 30 minutes. Observe waveform of output 3 phase voltage and current during acceleration time. Waveform must be smooth, low aberrance, equal amplitude. In deviation range, output current on interface must be in line with the measurement value.	
6. Verify the phase sequence of output detection line	1) waveform observation: ualc (stator α voltage calculated value) must be ahead of ubec (stator β voltage calculated value) by 90 degrees; ualc has the same phase with output phase voltage U_U; for output phase voltage U_U, U_V and U_W, former must be ahead of the latter by 120 degrees. 2) observe whether ualc and ubec, VSAL_ REF (reference voltage α component),VSBE_ REF(reference voltage β component) are respectively in the same phase . 3) monitor ISA (stator α current) must be ahead of ISB (stator β current) by 90 degrees. For output 3 phase current I_U, I_V and I_W, the former must be ahead of the latter by 120 degrees, and I_U is behind U_U by approximately 90 degrees. 4) After adjusting phase order, double click "synchronous motor power factor" in "exciter control" on interface, get current power factor. Because exciting current is less than rated value, output power factor is low, but it must be positive but less than 1. We also can see current power factor is positive but less than 1 below "waveform display" on interface.	1) In general, medium voltage drive system adjustment is completed in the factory. The user must make the validation. 2) After adjusting line sequence or sample coefficient plus/minus, personnel need to make a zero shift rectification.

Analog 4~20mA. Process	Operation	Remark
7. Power factor auto adjustment	1) "exciter control" → "exciter adjusting frequency" set 10Hz, i.e. It carries through auto exciter adjustment when operation frequency is more than 10 Hz. 2) "exciter control" → "exciter power factor selection" set "auto measure". 3) "exciter control" → " power factor threshold" set 0.2 or 0.1. 4) "exciter control" → "set power factor " set 0.5. 5) "exciter control" → "exciter adjustment function" set "allow auto exciter adjustment. Start motor . Double click "power factor deviation" in "exciter control", get the value, check whether it is in the enable range of "power factor threshold".	When the motor is operating without a load, the power factor must be reduced, so that the auto adjustment effect becomes obvious. If power factor deviation becomes greater and greater during adjustment, the reason may be: 1) – accelerated exciter - decelerated exciter - passive relay - node is reversed 2) Output voltage current detection phase order is wrong. In early adjustment, personnel can extend exciter rest time and reduce exciter adjustment time to avoid losing control due to fast adjustment.
8. Power factor debugging	"exciter control" → "set power factor " set 0.2, 0.3, 0.4 even -0.4, -0.3, -0.2, "power factor deviation" must be in the enable threshold. Observe waveform of motor output voltage and output current at each frequency on the interface.	
III. Connect medium voltage DRIVE SYSTEM to motor, then connect motor and load		
9. Operation with load	Set appropriate power factor (such as 0.9). Start and increase load gradually. Observe motor output voltage and output current at each speed	
10. Verify input voltage current phase sequence	When medium voltage drive system input current ≥15% of rated current, verify voltage current phase order at input. They must appear as follows: 1) For input phase voltage U_A, U_B, U_C, the former must be ahead of the latter by 120 degrees. 2) Input current I_A, I_B, I_C, the former must be ahead of the latter by 120 degrees. 3) Phase of input voltage U_A, U_B, U_C must be near to input current I_A, I_B, I_C, but a little ahead.	1) Shut off medium voltage first when changing detection line order. Personnel must shut off power of main controller after power cells have been discharged. 2) If line order is correct, input power and power factor on theinterface must be positive.
Set appropriate parameters according to site requirements and begin operation.		

Table 3-2

3.4 Steps for pre-set control methods

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

• Read and understand the instructions given in "Before you begin - Safety information" chapter before performing any procedure described in this chapter.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Before the first power-up of the Medium Voltage drive system, it is necessary to set the parameters for the motor and the drive.

Failure to follow these instructions can result in death or serious injury.

3.4.1 Local control, Display Command, Open-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote/Local Control" knob on the door to the "Local Control" position.
Step 3 Enter the Function setting screen of the HMI monitoring program, then select the "Display" Command, "Normal-Start" and "Open-Loop" running modes.
Step 4 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 5 The medium voltage drive system provides the "Medium Voltage Closing Permitted"
Step 6 Switch on the incoming medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 7 Set the medium voltage drive system's output frequency with the Accelerate, Decelerate or Frequency Command button on the HMI touch screen.
Step 8 Start the medium voltage drive system with the Start button on the HMI touch screen.
Step 9 The actual frequency of the medium voltage drive system reaches the frequency setting according to the Acceleration/ Deceleration time.
Step 10 Stop the drive with the Stop or "Freewheel Stop" buttons on the HMI touch screen.

3.4.2 Local control, Display Command, Closed-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote/Local Control" knob on the door to the "Local Control" position.
Step 3 Connect the feedback to XT17:4, XT17:5 of the medium voltage drive system's PLC.
Step 4 Enter the Function settings screen of the HMI monitoring program, then select the "Display" Command, "Normal Start", and "Closed-Loop" running modes.
Step 5 Enter the Analog Input setting screen of System Tools from the HMI touch screen, then select whether the analog feedback signal is 0-10V or 4-20mA according to the wiring.
Step 6 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 7 Switch on the incoming medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 8 Set the frequency reference with the Increase, Decrease buttons on the HMI touch screen.
Step 9 Start the medium voltage drive system with the Start button on the HMI touch screen.
Step 10 Check the motor frequency follows the frequency reference.
Step 11 Stop the drive with the "Stop" or "Freewheel Stop" buttons on the HMI touch screen.

3.4.3 Local control, Analog Command, Open-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote/Local Control" knob on the door to the "Local Control" position.
Step 3 Connect the Analog Command signal to XT17:1, XT17:2 of the medium voltage drive system’s PLC.
Step 4 Enter the Function setting screen of the HMI monitoring program, then select the Analog Command, "Normal Start", and "Open-Loop" running modes.

Step 5 Enter the Analog Input setting screen of System Tools from the HMI touch screen, then select whether to use 0-10V analog voltage source given or 4-20mA current source command according to the system's wiring.
Step 6 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 7 Switch on the incoming medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 8 Set the medium voltage drive system's output frequency with the Analog Command device, then the main screen will display the analog command frequency value.
Step 9 Start the medium voltage drive system with the Start button on the HMI touch screen.
Step 10 The actual frequency of the medium voltage drive system will reach the desired frequency setting according to the Acceleration/Deceleration time.
Step 11 Stop the drive with the "Stop" or "Freewheel Stop" buttons on the HMI touch screen.

3.4.4 Local control, Analog Command, Closed-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote/Local Control" knob on the door to the "Local Control" position.
Step 3 Connect the feedback to XT17:4, XT17:5 of the medium voltage drive system's PLC; Connect the Analog Command signal to XT17:1, XT17:2 of the medium voltage drive system's PLC.
Step 4 Enter the Function settings screen of the HMI monitoring program, then select the Analog Command, Normal Start, and Closed-loop running modes.
Step 5 Enter the Analog Input settings screen of System Tools from the HMI touch screen, then select whether the analog command signal is 0-10V analog voltage source command or 4-20mA current source given and whether the analog feedback signal is 0-10V analog voltage source or 4-20mA current source according to the system's wiring.
Step 6 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 7 Switch on the incoming medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 8 Set the expectation value for the controlled quantity directly with the Analog Command device, then the main screen will display the analog given frequency value.
Step 9 Start the medium voltage drive system with the Start button on the HMI touch screen.
Step 10 The output frequency is adjusted automatically in order for the controlled quantity's actual value to reach the expected value.
Step 11 Stop the drive with the "Stop" or "Freewheel Stop" buttons on the HMI touch screen.

3.4.5 Remote control, Display command, Open-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote/Local Control" knob on the door to the "Remote Control" position.
Step 3 Enter the Function settings screen of the HMI monitoring program, then select the Computer Command, "Normal Start", and "Open-Loop" running modes.
Step 4 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 5 Switch on the incomer medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 6 Set the medium voltage drive system’s output frequency with the Accelerate, Decelerate or Frequency Command buttons on the HMI touch screen.
Step 7 Start the medium voltage drive system with the remote start button.
Step 8 The actual frequency of the medium voltage drive system reaches the frequency setting according to the Acceleration/ Deceleration time.
Step 9 Stop the drive with the remote Stop or "Mains Voltage OFF" button.

3.4.6 Remote control, Display command, Closed-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote/Local Control" knob on the door to the "Remote Control" position.
Step 3 Connect the feedback to XT17:4, XT17:5 of the medium voltage drive system’s PLC.
Step 4 Enter the Function settings screen of the HMI monitoring program, then select the Computer Command, "Normal Start", and "Closed-Loop" running modes.
Step 5 Enter the Analog Input setting screen of System Tools from the HMI touch screen, then select whether the analog feedback signal is 0-10V analog voltage source or 4-20mA current source according to the system’s wiring.
Step 6 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 7 Switch on the incomer medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 8 Set the expectation value for the controlled quantity with the Increase, Decrease or Controlled Quantity Command buttons on the HMI touch screen.

Step 9 Start the medium voltage drive system with the remote start button.
Step 10 The output frequency is adjusted automatically in order for the controlled quantity's actual value to approach its expectation value.
Step 11 Stop the drive with the remote Stop or "Mains Voltage OFF" button.

3.4.7 Remote control, Analog Command, Open-loop running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote"/"Local Control" knob on the door to the "Remote Control" position.
Step 3 Connect the Analog Command wire to XT17:1, XT17:2 of the medium voltage drive system's PLC.
Step 4 Enter the Function settings screen of the HMI touch screen, then select the Analog Command, "Normal Start", and "Open-Loop" running modes.
Step 5 Enter the Analog Input settings screen of System Tools on the HMI touch screen, then select whether to use 0-10V analog voltage source given or 4-20mA current source command according to the system's wiring.
Step 6 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 7 Switch on the incomer medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 8 Set the medium voltage drive system's output frequency with the remote analog signal, then the main screen will display the analog command frequency value.
Step 9 Start the medium voltage drive system with the remote start button.
Step 10 The actual frequency of the medium voltage drive system will reach the desired frequency setting according to the Acceleration/Deceleration time.
Step 11 Stop the drive with the remote Stop or "Mains Voltage OFF" button.

3.4.8 Remote control, Analog Command, Closed-loop running

Step 1 Turn on the controlling power supply;
Step 2 Place the "Remote"/"Local Control" knob on the door to the "Remote Control" position;
Step 3 Connect the feedback to XT17:4, XT17:5 of the medium voltage drive system's PLC; Connect the Analog Command signal of the controlled quantity to XT17:1, XT17:2 of the medium voltage drive system's PLC.
Step 4 Enter the Function settings screen of the HMI monitoring program, then select the Analog Command, "Normal Start", and "Closed Loop" running modes.
Step 5 Enter the Analog Input settings screen of System Tools from the HMI touch screen, then select whether the analog command signal is 0-10V analog voltage source command or 4-20mA current source command and whether the analog feedback signal is 0-10V analog voltage source or 4-20mA current source according to the system's wires.
Step 6 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 7 Switch on the incomer medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 8 Set the expectation value for the controlled quantity directly with the analog command device, then the main screen will display the analog command frequency value.
Step 9 Start the medium voltage drive system with the remote start button.
Step 10 The output frequency is adjusted automatically in order for the controlled quantity's actual value to reach the expected value.
Step 11 Stop the drive with the remote Stop or "Mains Voltage OFF" button.

3.4.9 Local control, Soft Start running

Step 1 Turn on the controlling power supply.
Step 2 Place the "Remote"/"Local Control" knob on the door to the "Local Control" position.
Step 3 Enter the Function settings screen of the HMI monitoring program, then select the "Soft Start" running modes.
Step 4 Enter the Parameter setting window of the HMI touch screen, then set the power-frequency transfer frequency.
Step 5 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one;
Step 6 Switch on the incomer medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 7 Start the medium voltage drive system with the Soft Start button on the HMI touch screen;
Step 8 The medium voltage drive system will automatically accelerate to the frequency point suitable for power-frequency transfer, putting the motor into power-frequency network operation;
Step 9 After power-frequency transfer, the medium voltage drive system will stop automatically.

3.4.10 Remote, Soft Start running

Step 1 Turn on the controlling power supply.
Step 2 Place the “Remote”/”Local Control” knob on the door to the "Remote Control" position.
Step 3 Enter the Parameter settings window of the HMI touch screen, then set the power-frequency transfer frequency.
Step 4 If there are any red error messages on the HMI touch screen other than medium voltage Not Ready, assess the issues and resolve them one by one.
Step 5 Switch on the incomer medium voltage switch of the medium voltage drive system and the "System Standby" message will be displayed.
Step 6 Start the medium voltage drive system with the remote Soft Start button.
Step 7 The medium voltage drive system will automatically accelerate to the frequency point suitable for power-frequency transfer, putting the motor into power-frequency network operation.
Step 8 After power-frequency transfer, the medium voltage drive system will stop automatically.
Remark: If the remote Start button is pressed during the acceleration of Soft Start, the medium voltage drive system will change automatically Normal Start mode; if the remote Start button is pressed during normal running, the medium voltage drive system will change automatically to Soft Start mode.

Chapter 4: Typical Troubleshooting and Maintenance

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions given in "Before you begin - Safety information" chapter before performing any procedure described in this chapter.

Failure to follow these instructions will result in death or serious injury.

4.1 “Alarm” classifications

The following items are regarded as Alarm:
Power cell bypass running (optional), Transformer overheating alarm, control power shutdown, analog input signal missing, ambient overheating.

Example of presentation :

When alarm is present :
- the system will not trip.
- the alertor will flash and make sound (it will be possible to stop it by pressing the button "alarm release".)
- the alarm type will be displayed on the HMI screen as long as the alarm is present.(alarm type is not saved)

4.2 “Detected fault” classifications

The following items are regarded as Detected fault:
Transformer serious overheating, feedback signal missing at closed-loop, overload, over current, door not closed (programmable), output grounding (programmable)
During the occurrences of any of the items above, the alertor produces continuous "flashing & sound", a visual "notification" or "error message", and the trip command will be sent to the upstream breaker. When the user presses the “alarm release” button, the flashing & sound cease. However, the “indication” will still remain on screen until the user resolves the issue(s) and resets the system.
When a “Detected fault” occurs, the medium voltage power supply will be switched off automatically. If the medium voltage power is not shut off for some reason, the user can press the "Mains Voltage OFF" button on the cabinet to switch off the medium voltage power supply manually.

Detected fault code	Probable Cause	Remedy
Over voltage Or Power fault	• Input Voltage Positive Fluctuating • Improper deceleration time setting • Voltage measurement circuit failure	• If input voltage is always higher than VFD rated voltage, shift the transformer ratio to +5% to lower the input voltage of power cell • Extend deceleration time • Replace power cell control board or entire power cell
Low voltage	• Input voltage negative fluctuating • Transformer secondary windings short circuit • Voltage measurement circuit failure • Upstream breaker open • Capacitor inside power cell failure	• Check breaker and transformer windings • Check capacitor in power cell • Replace power cell control board or entire power cell
Overheating	• Ambiance temperature (power cell cabinet) • Cooling fan failure • Gaseous interchange block • Temperature relay failure • Temperature measurement circuit failure	• Check AC or other cooling system • Check cooling fan • Replace filter net on the front door of cabinet • Make sure there is no gap between power cell bottom and cabinet • Replace power cell control board or entire power cell
Phase fault	• Upstream breaker open • Transformer secondary windings failure • Fuse damage • Cable connection loose • Phase detecting circuit failure	• Check breaker and transformer windings • Check power cell fuse • Check cable connection • Replace power cell control board or entire power cell

Detected fault code	Probable Cause	Remedy
Drive fault	• Power component failure • Driving board failure • Insulation damage • Cable connection loose or bolt rupture • Output current too high to be shut down	• Replace power cell drive board and control board or entire power cell • Check cable insulation and connection • Check if there is any discharge mark in cabinet
Fiber fault	• No control power supply for power cell • Optical fiber connector loose or fall off • Optical fiber break off • Power cell control board failure • Fiber board in control box failure	• Replace power cell control board or entire power cell • Replace fiber board • Replace optical fiber
Controller not ready	• Controller fails in self test • Power source board failure • Interface board failure	• Check parameter setting and reset system • Check connection between control board and bus board • Check cable connection between control board and PLC • Replace control board • Replace interface board and power source board
Controller no respond or Linking	• Control board fail • Communication port board fail • HMI communication fail • Program not matching	• Check connection of control board • Replace control board • Replace HMI • Replace communication port board • Upgrade HMI program
PLC no respond	• Program not match • HMI communication failure • PLC not running	• Upgrade software of HMI and PLC • Replace HMI • Check PLC running status
Over load	• Improper acceleration time setting • Rapid variation in load • Control board or interface board failure • CT Hall component	• Extent acceleration time • Stabilize load • Replace the faulty board • Replace CT
Overcurrent	• Improper parameter setting • Insulation damage • Cable loose • Power component failure in power cell • Control board or interface board failure • CT Hall component	• Adjust over current protection setting • Check insulation and cable connection • Replace failure power cell • Replace the board • Replace CT
Control power supply failure	• Control power supply cut off	• Supply control power to VFD
Transformer over heat	• Ambiance temperature • Cooling fan failure • Gaseous interchange block	• Check AC or other cooling system • Check cooling fan • Replace filter net on the front door of cabinet

Table 4-1

Chapter 4: Typical Troubleshooting and Maintenance

4.3 Other typical troubleshooting

4.3.1 Invalid operation frequency adjustment

Medium voltage drive system’s frequency command (speed set point) mode is set in the HMI, and is not related to the external and internal control modes of the medium voltage drive system's main controller. If user cannot modify the medium voltage drive system’s operation frequency with the external analog potentiometer, the reason may be that the frequency given mode is set as "display" in the interface. Conversely, if the User can not set the operation frequency on HMI, the reason may be that the frequency given mode is set as “analog” on HMI. If the function configuration of the medium voltage drive system is set as closed loop mode, the PID regulator will calculate output frequency. The User can only preset the desired value by external analog potentiometer or on HMI. Additionally, if medium voltage drive system can’t achieve reference frequency, the possible reason is that the reference frequency preset by users exceeds the limited value or is in the range of jump-frequency. If medium voltage drive system stops automatically after achieving a high frequency every time, the possible reason is that the start mode set-up on HMI has been set as soft-start mode.

4.3.2 Medium voltage drive system can`t start

The medium voltage drive system can only be started when the external system receives the “system ready” signal. When the controller is ready, and start is permitted, and the "Mains Voltage OFF" buttons of remote control and local cabinets are released and the medium voltage drive system has no “Detected fault”, the system will send out a "medium voltage permission” signal. After the external control system receives this signal the medium voltage must be applied and once detected as present the medium voltage drive system will go to “system ready” status. The User is recommended to check the conditions above when the medium voltage drive system can’t be started without any abnormal information reported.
If the medium voltage drive system can’t be started in “remote control” mode, check the "remote/local control" switch to verify it is in the “remote control” mode. If the medium voltage drive system interface board can’t implement the start command, check that the "remote/local control" switch is in “local control” mode.

4.3.3 No alarm sound when anomaly occurs

Once the User presses the "alarm release" button, the system will continue operating with the existing abnormal status but without audible alarm and the error messages are still displayed on HMI. In the stop mode, users can use the “system reset" command to reset the medium voltage drive system and re-enable the audible alarm function of the system.

4.3.4 Alarming exists, but no indication on the HMI

When control system is powered on and PLC is normally operating, the abnormal operating of the HMI would also cause sounding of the alarm. Inspect whether the power of HMI is normal, whether the HMI power switch is switched on, whether the HMI has entered normally into the monitoring interface, and whether the HMI communication works normally.

APPENDIX A: ATV1200 PLC Communication Address Table

communication Address	Len (Word)	Data Direction		PLC Internal Address		Definition	Comment
		Field bus	VSD				
1000	2	OUT	IN	%MF1000		Computer reference command	True number, Directly input the expected value when closed-loop running (unit must be the same as the settings of VFD),for example, when we want to control the water pressure at 0.45Mpa, input 0.45. When open-loop running, directly input expected frequency (unit Hz),for example, we want VFD running at 39.68Hz,input 39.68.
1002	1	OUT	IN	%MW1002	0	1=start	%MW1002 is the control word from DCS to VFD. Rest command is not suggested to use frequently . At anytime only one command can persist,other bits must be set to 0,or the command will not be performed correctly.
					1	Reserved	
					2	1=Freewheel stop	
					3	1=stop	
					4	1=reset	
					5	Reserved	
					6	Reserved	
					7	Reserved	
1003	1	OUT	IN	%MW1003	0	0=open loop 1=close loop	
					1		
					2		
					3		
					4		
					5		
					6		
					7		
1004	1	IN	OUT	%MW1004	0	1=Standby	%MW1004 is the state word of VSD. System bypass means VSD is offline, motor is driven directly by the supply through the bypass switch.
					1	1=VSD running	
					2	1=Remote control	
					3	1=Local control	
					4	Reserved	
					5	Reserved	
					6	1=Detected fault	
					7	1=Alarming	
					0	Reserved	
					1	Reserved	
					2	Reserved	
					3	1=Door E-stop Pushed Down	
					4	Reserved	
					5	Reserved	
					6	Reserved	
					7	Reserved	

APPENDIX A: ATV1200 PLC Communication Address Table

communication Address	Len (Word)	Data Direction		PLC Internal Address		Definition	Comment
		Field bus	VSD				
1005	1	IN	OUT	%MW1005	0	1=Transformer over heat alarming	%MW1005 is the detail information of “Alarm” and ”Detected fault” If open door is set to be Enabled in HMI of VSD, open door can only cause an alarm, not tripping the power, and shown in %MW1005:X1. If open door is set to be Disabled in HMI of VSD, open door will cause a trip of the power and shown in %MW1005:X9
					1	1=Door open	
					2	1=UPS input power down	
					3	1=Cooling fan trip	
					4	1=Power cell bypassed	
					5	1=”Alarming” reported from HMI	
					6	1=medium voltage not ready	
					7	Reserved	
					0	1=Transformer over heat trip	
					1	1=Door open Trip	
					2	1=System fault detected by controller	
					3	1=”Detected fault” reported from HMI	
					4	1= controller not healthy	
					5	1=Feedback signal missing (process feedback control mode only)	
					6	Reserved	
					7	1=medium voltage Off (not tripped by VSD)	
1006	1	IN	OUT	%MW1006	0	Reserved	
					1	Reserved	
					2	Reserved	
					3	Reserved	
					4	Reserved	
					5	Reserved	
					6	Reserved	
					7	Reserved	
					0	1=Analog Given signal missing	
					1	1= Analog Feedback signal missing	
					2	Reserved	
					3	Reserved	
					4	Reserved	
					5	Reserved	
					6	Reserved	
					7	Reserved	
1007	1	IN	OUT	%MW1007	Reserved		
1008	1	IN	OUT	%MW1008	input voltage		1000 means 1kV
1009	1	IN	OUT	%MW1009	output voltage		1000 means 1 kV
1010	1	IN	OUT	%MW1010	input current		10 means 1A
1011	1	IN	OUT	%MW1011	output current		10 means 1A
1012	1	IN	OUT	%MW1012	reference frequency		100 means 1Hz
1013	1	IN	OUT	%MW1013	output frequency		100 means 1Hz
1014	1	IN	OUT	%MW1014	input power factor		1 means cosØ=0.001 (lag)
1015	1	IN	OUT	%MW1015	input active power		1 means 1KW
1016	1	IN	OUT	%MW1016	input reactive power		1 means 1KVar
1017	1	IN	OUT	%MW1017	Reserved		
1018	1	IN	OUT	%MW1018	Reserved		
1019	1	IN	OUT	%MW1019	Reserved		