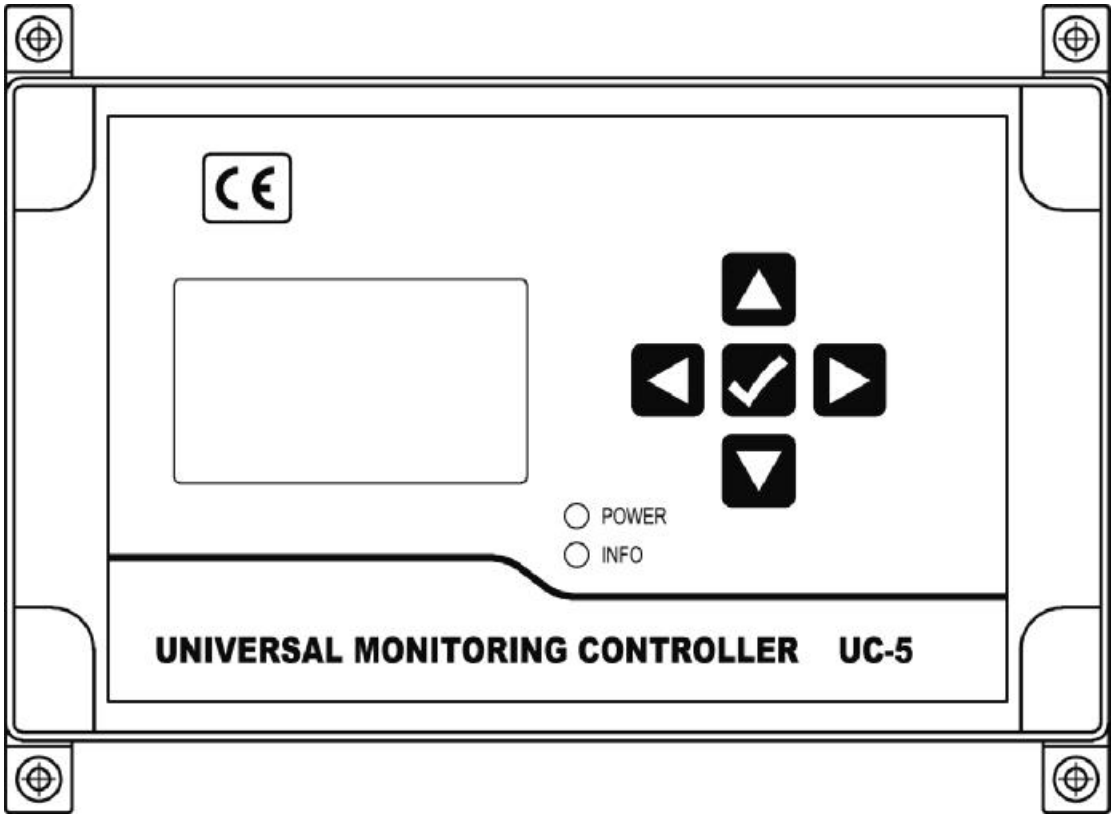
Universal monitoring controller UC-5N

User's Manual

UC-5N 润滑系统控制器用户手册



Suzhou Leetern Industry Control

Ver 1.0 October 2012

Contents

10. Technical specification

Universal Monitoring Controller UC-5 is designed for controlling and monitoring of projection Lubrication systems. It is applicable to lubrications systems for conveyor and escalator etc.

The controller UC-5 intuitively displays operating information like operating state and parameters with LCD. It is easy to use. UC-5 stores configuration data and parameters in EEPROM, which made those data can be stored safely for long time.

UC-5 owns 2 lubrication control channels. Operating modes and control parameters of each channel are completely independent, which make it can separate control two lubrication systems at the same time. It is very suitable for lubrication system that has dense lubrication points, and asks for different lubrication control requirements.

UC-5 is of completely sealed design, Its protection grade reaches IP65, thus it can work steadily in severe Industrial working environment.

Safety Warning!

There is AC high voltage on the PCB inside the controller. It directly outputs high voltage power to drive lubrication pump. Mounting and using UC-5 should be specially pay attention to safety, to avoid the danger of shock.

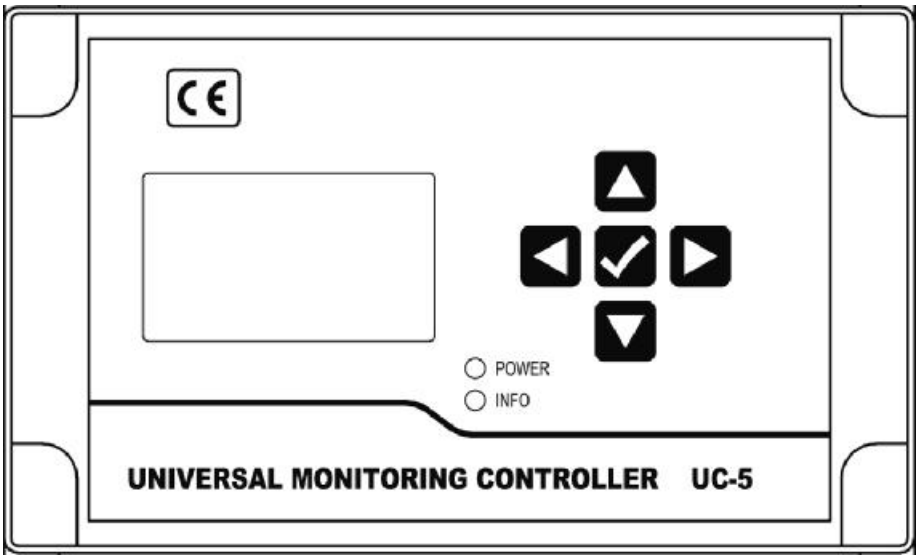
Mounting and connecting controller UC-5 must be done under power cut-off condition. Hot-line work is prohibited to prevent electric shock hazard. Ground terminal of UC-5 must be well grounded. The system should be protected with specified fuse to ensure controller safe and personal security.

UC-5 must be mounted, tested and maintained only by trained qualified personnel. In order to guarantee system operating safely and properly, its safe condition should be periodically inspected.
Although UC-5 complies with relevant safety technical requirements, the use of the controller may still entail dangers leading to personal injury of the user or third parties or damage to property. Therefore, the operation must strictly comply with operation manual. Errors that may affect safety must be rectified immediately.

UC-5 is designed for controlling and monitoring centralized lubrication systems. The user himself shall be liable for any damage caused by improper use.

1. Display and control panel

Display and control panel of UC-5：



1.1 LED indicator lights

POWER – power indicator light. When power supply to the controller is normal, the green indicator light of POWER is on.
INFO – Status information indicator light. When controller detects fault, the red indicator light will be continuously flashing.

1.2 Keys

-Key UP. Scroll up key. When selecting menu, press key UP to scroll up the menu; under setting mode, to increase the displayed value at cursor position with this key.

-Key DOWN. Scroll down key. When selecting menu, press key down to scroll down the menu; under setting mode, to decrease the displayed value at cursor position with key DOWN.

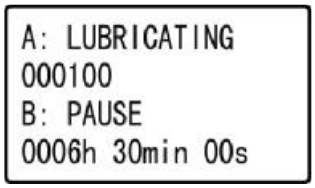
-Key LEFT. Scroll left key. To move cursor left in setting mode.

-Key RIGHT: scroll right key. To move cursor right in setting mode.

☑ -Key OK: To start MENU mode with key OK in display mode; Confirm menu or programmed parameters; This key also has function to exit fault state or advance terminate OIL DRAINING.

1.3 LCD display

LCD displays operating status and parameters.
When controller is operating, LCD mainly displays current states. “A” and “B” represent two lubrication channels.



“A: LUBRICATING” means channel A is now in lubrication phase. The figure on the next line means how much lubrication impulses remain. Example: 000100 means there is still 100 impulses remain for lubrication phase.

“B: PAUSE” means channel B is now in pause phase. The figure “0006h 30min 00s” on the next line means there is still 6 hours and 30 minutes remain for pause phase. (This also implicates that PAUSE adopts “timer” mode.)

Other possible status may be displayed on LCD are “STOP”, “OIL DRAINING’, “LOW OIL LEVEL “, “LOW CA PRESSURE” and “NO SIGNAL” etc. For more details, please see the follow chapters.

Please NOTE: Please use soft cloth with warm water or neutral detergent to clean the film panel. Organic solvent is prohibited. In order to avoid damage to panel and keep its leak tightness, do not use sharp tools/ object to touch the panel.

1.4 Change working language / adjust screen brightness

UC-5 supports multi-language. User can change current working language according to their needs. To change working language:

1、Power off the controller for at least 1 minute.

2、Press and hold the “OK” key on panel, meanwhile power on the controller.

3、 LCD displays the available languages list in current language, press key

“UP” or “DOWN” to view the available languages.

4、Select one language, then press key “OK” to save the change. Controller will start to perform control tasks.

The new selected language will not be change until next change.

Screen brightness can be adjusted to achieve the best effect.

1、Power off the controller for at least 1 minute.

2、Press and hold key “OK” on the panel, meanwhile power on the controller.

3、LCD displays the available languages list in current language.

4、Press key “LEFT” or “RIGHT” to change the contrast ratio of the screen.

5、After brightness adjustment, press key OK to save the change. Then controller starts to perform control tasks.

2. Main lubricating functions

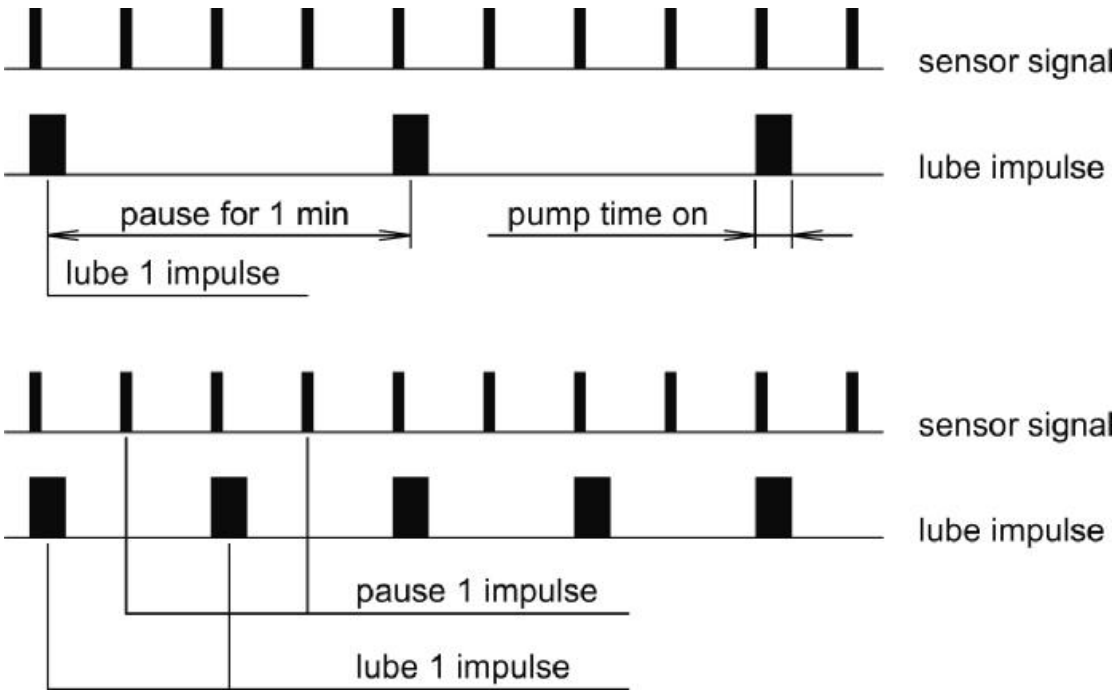
Under normal operating conditions, the controller controls lubrication system working in continuous cycle of “LUBE-PAUSE-LUBE-PAUSE…..”
Default factory setting:
LUBRICATION: 1 impulse,
PAUSE: 1min.
User can enter into setting mode to modify control modes and parameters.

UC-5 can permanently memories those programmed parameters. When power is cut off, the control unit auto stores current operating status, remain values. When next electrify starts, the control unit will continue carrying out operation from the interruption.

Controller UC-5 can also accepts external control signals, to realize interconnected control with other control system.

2.1 Select PAUSE mode

There are two kinds of pause modes, TIMER mode and COUNTER mode for user to choose from.



If user needs to lube equipment based on time (such as to lube equipment once a work shift), we recommend “TIMER mode” for PAUSE; If user needs to lube based on equipment’s working situation, we then recommend “COUNTER mode”.

No matter under which PAUSE mode, the pause value could be set as “0”. In case of this, lube system operates in LUBRICATION phase all the time and will not go to PAUSE phase any more.

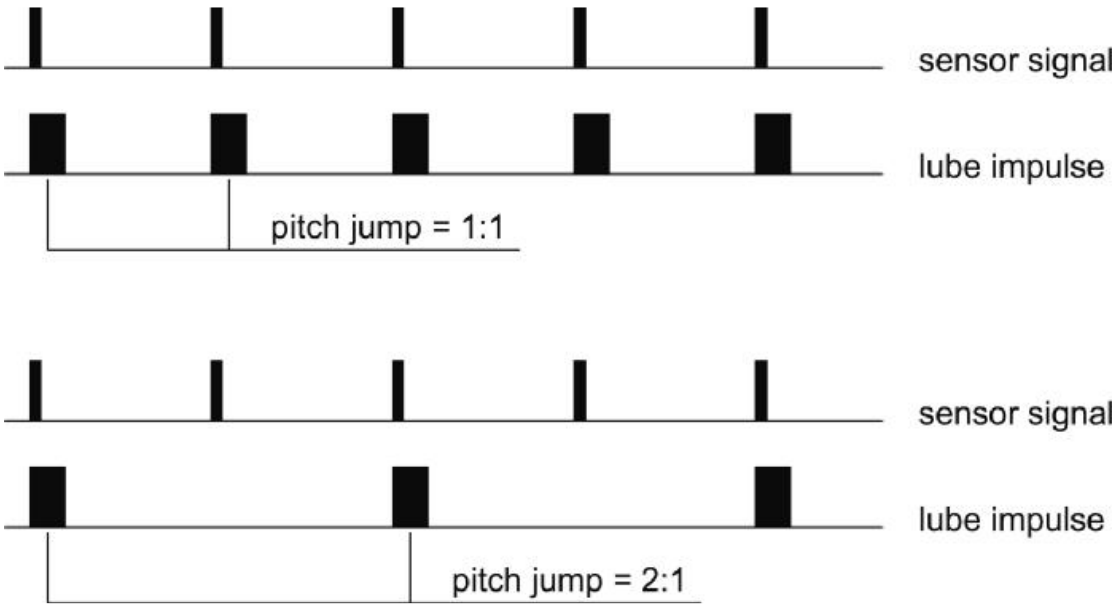
2.2 LUBRICATION control

When equipment is in lubrication phase, user can set lubrication parameters depend on situation for different needs.

Lubrication is always performing by tracking sensor impulse signals, thus there’s only COUNTER mode for LUBRICATION. In order to fully lubricating the system, there are several auxiliary parameters for precise adjustment in the process of lubrication.

2.2.1 Pitch jump setting

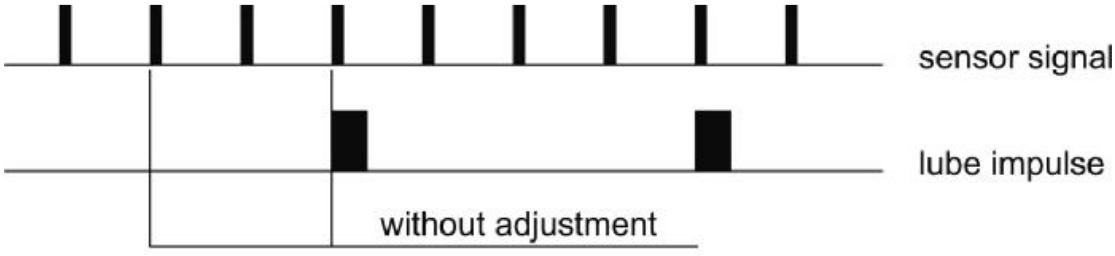
Oil projection action performs by tracking sensor-signal impulses. If the impulses are too dense, and pump is required to project oil by tracking each impulse, this would lead to the pump cannot track signals successfully. This result in the oil projection cannot be performed properly.

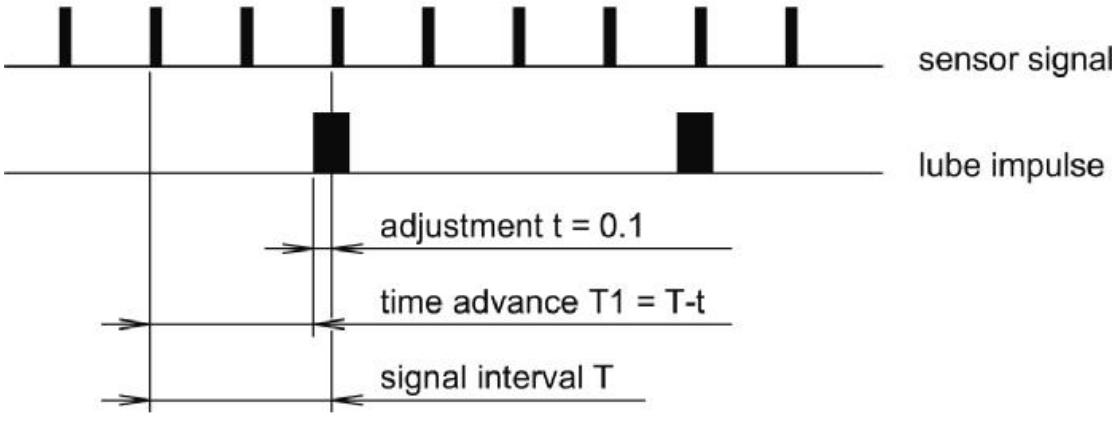


User can eliminate this phenomenon by proper pitch jump setting. After setting pitch jump value, UC-5 performs oil projection and lubrication movement once every N pitches as show in figure below.
Pitch jump 1:1 means oil projection follows every sensor signal impulse in LUBRICATION phase; 2:1 means oil projection performs once every two sensor signal impulses. Pitch jump can be adjusted in range of 1:1 to 999:1.

2.2.2 Oil projection adjustment

For the reason of installation or chain speed changes, oil projection movements sometimes don't match sensor signal impulses. Such as projects oil after receiving sensor signal. Due to the electric, machine and hydraulic circuit of lubrication system exist time delay, the projected oil may not right onto lubrication points. Then user could adjust oil projection time to advance the projection action, which can make the lubricant fall at lubrication points as show in figure below.





Oil projection time can be adjusted within the scope of 0s to 9.99 s. If the adjustment value is set as "0", which means oil projection adjustment function is disabled.

2.2.3 Pump time on (Electrifying time)

Lubrication pump is driven by electrical impulses. The impulse electrifying time of pump is different for different pump type, specification as well as lubrication systems.
The range of programmable electrifying time (pump time on) is 0.1s~9.99s.

2.3 Insert lubrication

Under normal operating conditions, the controller controls lubrication system to work in continuous cycle of “LUBE-PAUSE-LUBE-PAUSE…..”, and it mostly stays in PAUSE time. If user wants to start lubrication (by chance) during PAUSE phase, or inspect the system’s lubrication function, user may use insert lubrication function to realize it. After startup this function, selected channel goes into lubrication state. When lubrication finishes, system automatically returns back to PAUSE state.

User can point one channel or all channels to perform lubrication. Insert lubrication operation can be done in menu mode.

Insert lubrication operation is carried out in Menu mode. After the inserted lubrication operation starts, LCD displays “LUBRICATING ·” to differ from normal “LUBRICATING” .

The inserted lubrication operation can be early ended by briefly press OK key.

2.4 Oil draining

In case to discharge the air in pipes or replace expired lubricant, “oil draining” function is then required. In “OIL DRAINING” status, controller ignores those LUBRICATION and PAUSE settings. It drives pump with an interval of 0.5s to discharge the pipe until oil draining impulses decrease and finish. System then automatically goes to LUBRICATION phase.

The default setting of oil draining is 999 impulses. Detailed OIL DRAINING operation is listed in setting mode.
In the process of “OIL DRAINING”, shortly press key “OK” can advanced stop oil draining and turn to INSERTED LUBRICATION phase.
The controller will stop oil draining when it detects **low level** or **low compressed air pressure** fault during oil draining process and then goes to

stopped status.

Oil draining operation is also carried out in menu mode.

2.5 External Control (operational control)

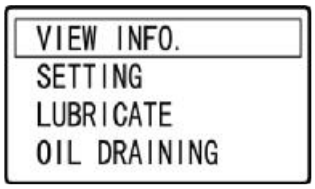
There is a set of terminals inside the controller to support the input of external control signals.
When external control signal is effective, controller performs operational control normally. When external control signal is cut-off, controller pauses and lubrication system goes to stop state. After external control signal recovers, controller will continue control operation from the point it paused.

3. View working parameters

User can use this function to view programmed working parameters of the controller.

3.1 Enter menu mode

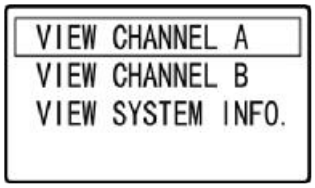
Press and hold key “OK” for 2 seconds to enter into MENU mode.



Use key “DOWN” and “UP” to select “VIEW INFO.” and then press key “OK”, controller enters into view working parameters state.
In MENU mode, if there is no key operation for more than 2 minutes, controller will automatically goes back to display mode.

3.2 Select item to view

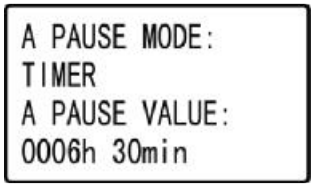
Select “VIEW INFO. ” and then press key “OK”, controller enters into parameter checking state. LCD displays:



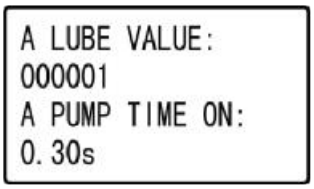
Use key “DOWN” and “UP” to select item to view.

3.3 View channel parameters

Once user select to view one channel’s parameters, controller will only display programmed parameters for this channel. Here is the example to view Channel A’s parameter:

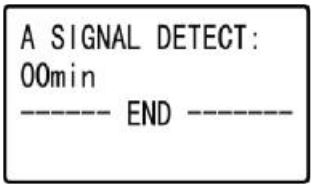


Press key “DOWN”, LCD displays



Press key “DOWN”, LCD displays

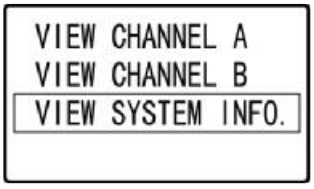
Press key “DOWN”, LCD displays



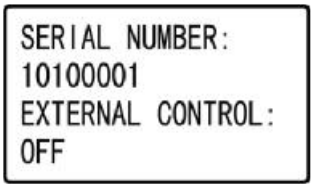
If signal monitoring is set as 0 (zero) (signal monitoring OFF), signal monitoring item will display “OFF”.
LCD displays “----END----”, which means all parameters for channel A is displayed. Press key “OK” at this time, controller goes back to display mode.

3.4 View system information

Enter into VIEW INFO. menu, select item “VIEW SYSTEM INFO. ”



Press key “OK”, then LCD displays serial number and programmed parameters for external (operational) control. Serial number was set at factory and user cannot change it.



Press key “DOWN”, LCD displays compressed air pressure monitoring function setting:

LCD displays “----END----”, which means all parameters for the system is displayed. Press key “OK” at this time, controller goes back to display mode**.**

During view information period, press key “UP” can returns last screen. It can returns to the primary menu mode screen.

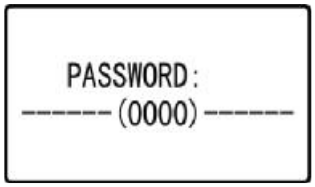
4. Parameter and function setting

All functions and control parameters of UC-5 can be modified via setting mode.

Enter into MENU mode with the method of chapter 3.1, select “SETTING” then press key “OK”.

4.1 Verify password

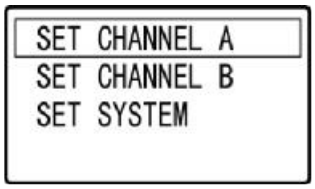
To prevent controller’s programmed parameters is modified accidentally; password is required for entering the setting mode.



Please input 4 digit password. If the password is correct, user can go to next step. If user continue input wrong password 3 times, controller automatically exits MENU mode and goes back to display mode.
Controller default password is “0000”.

4.2 Select item to be programmed

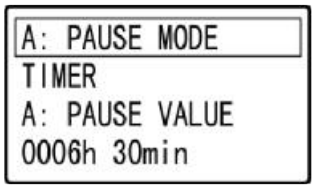
After enter SETTING state, LCD displays



Press key “DOWN” and “UP” to select the item.

4.3 PAUSE setting

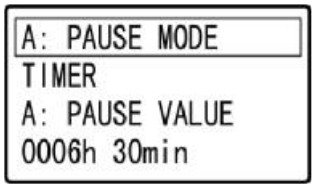
Select one channel and press key “OK” to enter into setting mode for this channel. For example, choose “SET CHANNEL A”, then LCD shows as follow figure:



Press key “DOWN” and “UP” to choose the specific item to be set.

4.3.1 PAUSE mode setting

Choose “A: PAUSE MODE”, press key “OK”, the words on the next line glittering to remind user the PAUSE mode is modifiable.
To change PAUSE mode with key “DOWN” or “UP” between “TIMER” mode and “COUNTER” mode.

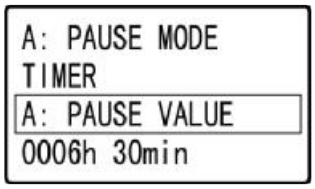


Press key “OK” to confirm the new setting of pause mode.

Once PAUSE mode is changed, PAUSE value will auto restore the default factory setting; If PAUSE is set as TIMER mode, the default value is 1min; If PAUSE is set as COUNTER mode, the default value is 1 impulse.

4.3.2 PAUSE value setting

Press key “DOWN” to select “A: PAUSE VALUE”. After press key “OK”, the least significant digit of the PAUSE value on the next line begin to blink (this is called cursor position). User can modify PAUSE value.



With key “DOWN” and “UP” can modify the figure at cursor position. With key “LEFT” and “RIGHT” can move cursor left and right.

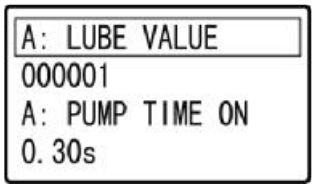
When PAUSE is set in “COUNTER” mode, the setting range of PAUSE is 0~9999 9999 impulses. And when PAUSE is set in “TIMER” mode, the range is 0~9999h 59min.

PLEASE NOTE: The controller will check the parameter-changing situation in real time. It refuses any changes that beyond the setting range.

Press key “OK” to confirm new PAUSE value setting.

4.4 Lubrication setting

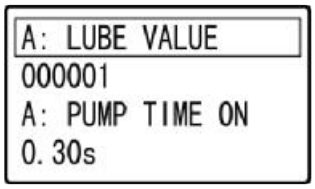
Press key “Down” till the content on LCD shows as figure below:



Select the item to be set with key “DOWN” and “UP”.

4.4.1 Lubrication value setting

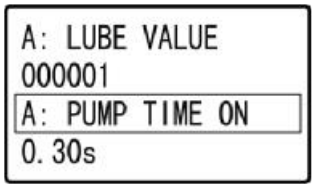
Choose “A: LUBE VALUE” and press key “OK”. When the least significant digit of the lubrication parameter value blinks, then user can modify lubrication value.



LUBRICATION value setting range is 1~999 999.
Press key “OK” to confirm the new setting of lube value.

4.4.2 Pump time on (Electrifying time) setting

Press key “DOWN” to select “A: PUMP TIME ON”. After press key “OK”, the least significant digit of the power on time value begins to blink. User then can modify power on time.

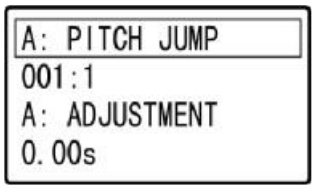


The setting range is between 0.1s to 9.99s.

Press key “OK” to confirm the new setting.

4.4.3 Pitch jump setting

Press key “DOWN” till the content on LCD shows as figure below:

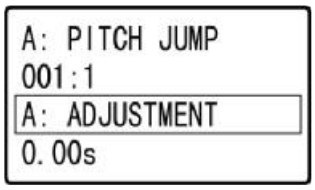


Choose “A: PITCH JUMP”. After press key “OK”, the least significant digit of the pitch jump value begins to blink. User then can modify the value.
The setting range is between 1:1 to 999:1.

Press key “OK” to confirm the new setting of pitch jump parameter.

4.4.4 Oil projection adjustment setting

Press key “DOWN” to choose “A: ADJUSTMENT”. Press key “OK”, the least significant digit of oil-projection adjustment parameter begins to blink. User can modify the value.

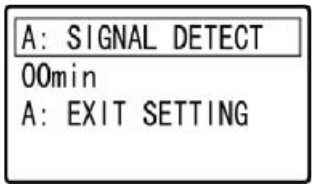


And the setting range of oil projection is between 0s to 9.99s. If the value is set as 0, which means the oil projection adjustment function is disabled.
We recommend not setting the parameter in a small value like 0.01s~0.02s.

Press key “OK” to confirm the new setting.

4.5 Signal monitoring setting and exit

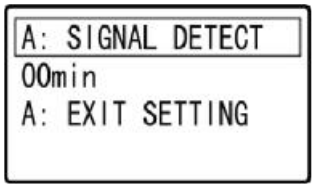
Press key “DOWN” till the content on LCD shows as figure below:



Select the item with key “DOWN” and “UP”.

4.5.1 Signal monitoring and control setting

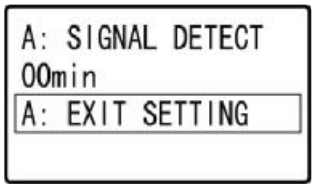
Choose “A: SIGNAL DETECT”. After press key “OK”, the parameter value on the next line begins to blink, user can modify it.



If signal monitoring is set as 0 (zero) (signal monitoring OFF), signal monitoring item will display “OFF”. Press key OK, user than can modify the vaule.
Signal monitoring parameter setting range is 0min~99min. If the value is set as “0”, which means the signal monitoring function is deactivated.

Press key “OK” to confirm the new setting. For the specific meaning of signal detect, please refer to the chapter “Fault detection and clearance”.

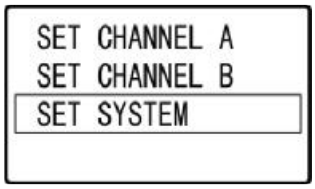
Select “A: EXIT SETTING” with key “DOWN”. Then press key “OK” to quit setting. Controller now turns back to display mode. If press key “UP”, then controller goes back to last setting screen.



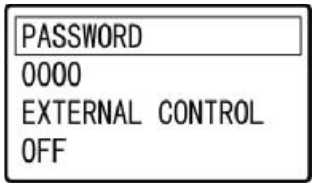
If some parameters of a channel are modified in setting mode, controller will automatically restart after user quit setting mode.

4.6 System parameters setting

This menu is for setting parameters that aim to control the whole system or parameter that does not belong to one specific lubrication channel. Enter into setting menu and select “SET SYSTEM” with key “DOWN”.

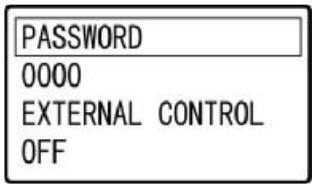


Press key “OK” to enter system information setting state. LCD displays



4.6.1 Set password

After select “PASSWORD”, press key “OK”, the least significant digit of password begins to blink. User can modify password at this time. Password range is 0000~9999.

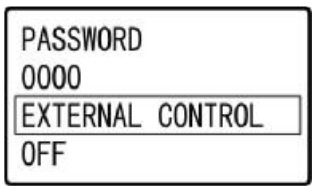


Press key “OK” to confirm and save the new password.

Please note:
The password should be kept in a safe place. If the password gets lost, the programming of parameters for the control unit is impossible. In case of that, please contact manufacturer.

4.6.2 External (operational) control setting

Select “EXTERNAL CONTROL”, press key OK, the content on the next line will be flashing to remind user it is modifiable.
Use key DOWN and UP to change external control setting. External control can be “ON” or “OFF”.



Press key “OK” to confirm the new setting. And the new external control setting will operate immediately.

4.6.3 Compressed Air (CA) pressure monitoring setting

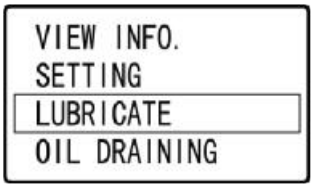
Press key “DOWN”, LCD displays

Select “CA MONITORING”, then press key “OK”. The Compressed Air (CA) pressure monitoring setting on the next line will blink, which means it can be changed.
Use key “DOWN” and “UP” to change Compressed Air monitoring setting. Compressed Air monitoring can be “ON” or “OFF”.
Press key “OK” to confirm the new setting. And the new Compressed Air pressure monitoring setting will operate immediately. If user set it as “OFF” (turns off the air pressure monitoring function) and the controller happens at “LOW CA PRESSURE” fault state, this fault information will be automatically cleared and controller goes back to normal lubrication state.

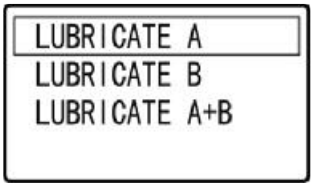
During setting mode, press key UP can go back to last setting item till main MENU screen.

5. Insert a lubrication

Controller has function to support to insert a lubrication. Enter menu mode, select “LUBRICATE” to insert a lubrication.



After enter into channel selection screen, user can select channel A or channel B to insert a lubrication; User also can select channel A+B to insert lubrication for both channels. For example:



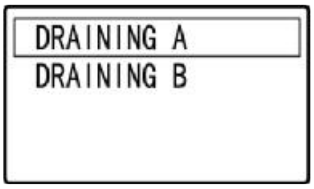
Select channel A, then press key “OK”, controller exit menu mode. The selected channel gets into lubrication state. Display information on LCD is “LUBRICATING ·”. The mark ” ·” follows LUBRICATING remind user it is a inserted lubrication.

The inserted lubrication operation can be early ended by briefly press OK key. When inserted lubrication finishes or being manually ended, system automatically returns back to PAUSE state.

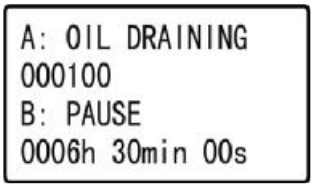
6. Oil draining operation

Controller supports oil draining function. Enter into menu mode, select “OIL DRAINING”.

Press “OK”, LCD displays



Select channel A or channel B to drain oil. For example, we select channel A
Press “OK”, then controller exit menu mode. The selected channel then performs “OIL DRAINNING” operation and LCD continuously displays remaining oil draining impulses until it finish or advance terminated.



7. Network control

Enhanced controller UC-5N owns the network operation ability. Through building a distributed lubrication control system via networking, it can offer much more supports to complicated lubrication system control.
User can use UC-5N together with other products of LEETERN (such as intelligent lubrication control station UC-3N) to build a network. They can well work in the same network with the compatible protocol and communication mode.
Reading this chapter needs basic knowledge of computer, network and electronics.

7.1 **Networking condition and capability**

Controller uses RS-485 bus and industry standard MODBUS protocol to realize the networking control.
Networking capability of UC-5N is: 1-247 slaves；Baud rate 300，600，2400，4800，9600，14400，19200，38400；no parity, odd/even parity are available.

Many PLC and industry control computer are built in the function to support MODBUS, user can use calling module or simple configuration to make them to support MODBUS.

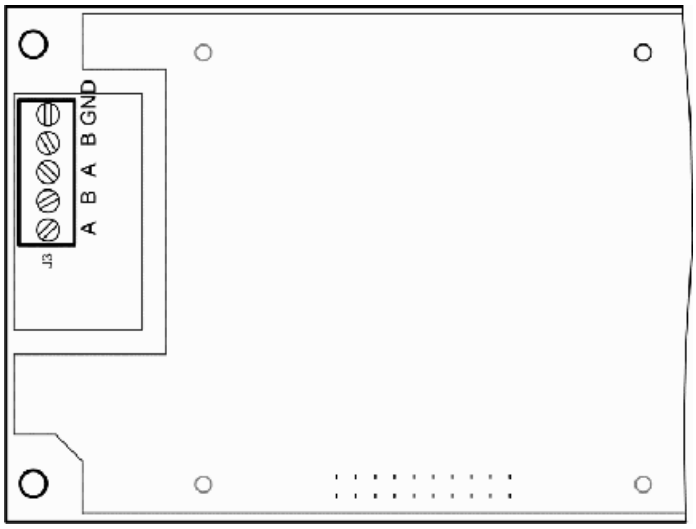
Controller UC-5N's default station number is 247，baud rate 9600，even parity，1 stop bit. In order to make sure that UC-5N can be added to the network correctly, user need to reset the station number (address) and communication parameters (refer to chapter 7.3, <set parameters corresponding to network communication>) according to real situation before connecting it to the network.

7.2 Network interface and wiring

Network wiring of UC-5N must strictly comply with RS-485 standard. Every controller must be connected hand in hand. In order to guarantee the network operates stable and reliable, T-shape connection, star-shape connection and ring connection are not allowed.
Non-standard wiring may cause the network works unstable or even completely paralyzed.
Connector J3 on the main board of UC-5N is 485 interface. It offers 2 sets of 485 access terminals, which is convenient to build hand in hand 485 network.
For longer network (>300m), especially network with few equipments, 120Ω terminal resistance must be accessed to RS-485 interface of the first and the end controllers to guarantee the stability of the network signal transmission.

Network cable must use minimum 0.5mm^2 Shielded Twisted Pair, and shielding layer should be properly grounded after connecting to RGND of each station.

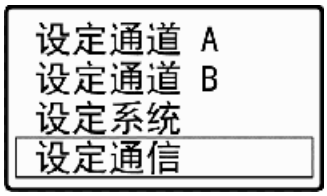
Network cable should stay away from *strong* interference sources, and it should not be laid parallel with power line.
If overhead laying is required, a separate weight bearing support must be used. Use the wire itself to bare the load is prohibited. And strict lightning protection measures must be adopted.



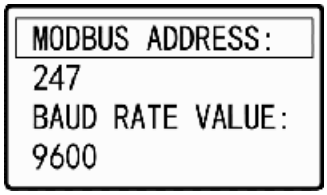
Network interface

7.3 Settings corresponding to network communication

In setting menu of UC-5N, there is an item “set communication”



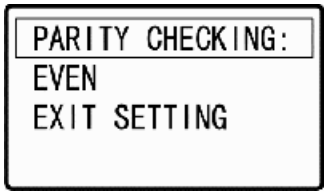
Select item “set communication” will show the follow screen (menu relates to communication setting are all in English).



Item “MODBUS ADDRESS” is used to set modbus station number. The programmable range is 1-247.

Item “BAUD RATE VALUE” is used to select a proper baud rate among all available ones. (According to relative regulations, baud rate only can be chosen among several baud rates, and cannot input a casual figure at will)

Scroll down the menu, select parity checking mode:



Parity mode can be EVEN, ODD and NONE. Stop bit will be set automatically according to MODBUS standard.

7.4 network function and instruction

After proper set station number and communication parameter, correctly connected to the network, user then can control the system via network.

Note：In modbus communication, UC-5N can only be used as the slave, and cannot be used as host.

Indicator light INFO on the panel of the controller also indicates network activities status. When data transmission is active, light INFO flash in green, the frequency of the flash is proportional to the data transmission flow. Observe this indicator light status can understand the network activity situation.

7.4.1 Priority control

In UC-5N, panel operation is prior to network control. Read data commands (function code 02H，03H) are not affected by panel operation. But there are effects on write data and force status change commands as follows:

If panel is under view parameter mode or programming mode, function code 05H(force status change), 06H(preset single register) and 10H(preset multiple registers) will be refused. Send function 05H, 06H or 10H at this time, controller UC-5N will response error code 06H (slave device busy).

If controller is now performing inserted lubrication control to one channel (this means the system is now under testing or debugging process), function 05H (force status change) to this channel will be refused. Send function 05H to this channel at this time, UC-5N will response error code 06H (slave device busy).

If controller is in halt state (external interlock control break)，function 05H (force status change) will be refused. Send function 05H at this time, UC-5N responses error code 07H (Negative acknowledge: slave cannot perform the query function).

7.4.2 Protocol content

In order to simplify control work, UC-5N limits some terms of modbus protocol.

In UC-5N's MODBUS network communication protocol, some protocol addresses are preserved. Read or write on these preserved addresses will receive error code 02H (illegal data address). There are some read-only addresses. Write on these addresses will response error code 03H (illegal data).

In this protocol, UC-5N limits function 03H(read multiple holding registers) to read one word (2 bytes) each time, if query asks a data more than 1 word, the query will be refused and response error code 03H (illegal data).

In order to compatible with modbus protocol, UC-5N supports function 10H (preset multiple registers). But, UC-5N limits function 10H that only one word can be preset each time. Actually, inside UC-5N, function 10H is performed as 06H. Therefore, If host sends function 10H, in which the data is more than one word, UC-5N will response error code 03H (illegal data).

UC-5N realized modbus protocol's subset 1 (**Exception**：for the reason that UC-5N already supports to read channel status register, function 01H is not realized). If function other than those functions supported by subset 1 is sent to UC-5N, error code 01H (illegal function) will be responsed.

UC-5N's modbus protocol supports broadcast. Except some specific addresses, function code 05H，06H and 10H support broadcast. With broadcast function can rapid deployment a control network.
For more information, please refer to appendix 《UC-5N's MODBUS network communication protocol》.

7.4.3 Lubrication function instruction

All lubrication functions mentioned in this manual can be realized via network commands. But due to the specific features of network operation, the function realization is a bit different from panel operation. We hereby only introduce the differences.

1. **Read and control channel's status**

The present status of each channel can be read out from channel status address via function code 03H. But, **do NOT** try to read in status word into channel status address to change channel status, which will result in response error code 03H. The right method to control channel status is to send function code 05H (force coil status) to slave. This function code can force any one channel change to lubrication status or pause status.
With function code 05H, user can remote reboot the controller.

2. Monitoring

Through network, user can set monitoring parameters, or to read monitoring status. But it is strongly recommended that user should handle faults and clear fault messages at site, and not to send function code 05H to clear fault messages via network. Although the function code coming from host can be accepted and performed by controller UC-5N, this cannot solve the real physical fault at site, such as there is no lubrication oil in reservoir.

3、**Parameters modification**

All control parameters can be modified via network.

UC-5N does not do double check on the orders sent via network. Therefore, user should pay attention not to set parameters beyond the range when using network command.

Whenever modify parameters relate to monitoring and system control, user has to consider current status of controller and all channels. If monitoring of the channel to be modified is now in fault state, it has to be forced return to normal states (PAUSE or LUBE) after modification.

7.5 Network problems and trouble shooting

For the reason that slave stations are located everywhere and they influence each other, it is not easy to find out the reason and handle it once there is any problem. And real network conditions are also vary. It is impossible to offer a unified solution. Here are some common principle treatments for reference.

If host cannot reach all controllers, user should check if there is any problem with the host's network and its interface. If the host can reach controllers, but some controller cannot be reached or unstable, the problem may be as:

1、Slave station number is wrong

2、Slave's communication parameters are different from host

3、slave off line

4、slave power off

5、Slave is too far away

6、Slave baud rate is too high

7、Slave receives strong interference

8、When a 120Ω terminal resistance is needed, user did not connect it.

9、Slave occurs error

If above mentioned problems occur, user first need to check if slave controller is in order. By panel operation, to check if station number is correct and communication parameter is same as the host via programming function. If there is problem, reset these parameters of the controller.

If there is no problem with station number and communication parameters, please observe the situation of the green pilot light INFO on control panel. If the green light of

INFO does not flash, please check if the network cable is properly connected.
If net cable is normal, but light INFO does not flash, please check if slave is interfered by strong interference, or the communication distance is too far, baud rate is too high. In case of this, disconnect the slave station from the network, use PC to connect 485 converter and the controller. To test it separately. Can use test tool software (for example: use “modbus poll” or “Serial debugging assistant”) to send command string 0005FFFF0000CC3FH(Note：this is hexadecimal data. Test tool software must be set to send and receive hexadecimal data also). Controller must answer the command and restart. This means the controller itself is in good condition. Otherwise, please change controller and return the faulty controller to manufacturer for inspection.

If controller is in normal condition, please check if the network cable is interferenced and to eliminate the interference.

If there is no interference, please consider if the communication distance is too far or baud rate is too high. **Please note:** if the original network parameters are at critical, even the newly build network communicate well, with time passing and temperature changing, cable and facilities are aging. The network that originally worked well may become unstable. Thus, user cannot infer the network’s current condition with the formerly communication situation.
If it IS caused by this reason, please connect a repeater at a proper place. If it is inconvenient to connect a repeater, user may lower baud rate on the condition that normal lubrication control can be guaranteed.
UC-5N particularly optimized baud rate for lubrication control tasks, it supports lower baud rate to extend communication distance and to improve communications reliability.

If user uses 232-485 converter to connect host network, then active converter is required, and also need to confirm the baud rates that the converter supports. Some passive converter’s power capacity is insufficient, when communication distance is a little bit far or there are more slave stations, the communication will be failed.
Moreover, converter’s data transformation takes time. If converter does not support enough high and low baud rate, it may cause communication problems.

8. Fault detection and clearance

The controller owns the ability to detect faults in lubrication system and give warning information to keep the system working safe and reliable.
The monitoring only performs when lubrication system is in operation. Once the external control signal is removed, the controller will pause; and after the external control signal is effective again, it recovers fault detection function.

8.1 Oil level monitoring and warning

The controller can detect the oil (lubricant) level via oil level switch. Oil level switch will open when oil level is too low. When controller detects the cut-off signal, it warns immediately and both lubrication channels get into stopped state.
Oil level monitoring is always effective and cannot be closed via setting.

8.2 Compressed Air (CA) pressure monitoring and warning

Some lubrication systems use compressed air as motive power for the pump. Controller can detect the pressure of compressed air to assure the system working safe and reliable.

The pressure switch that mounted on the compressed air pipes will open when pressure is too low. When controller detects the cut-off signal, it warns immediately and both lubrication channels get into stopped state.

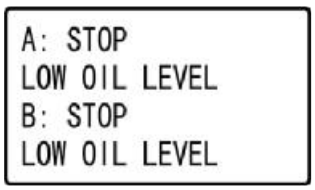
Compressed Air pressure monitoring function can be set as “ON” or “OFF” via system setting.

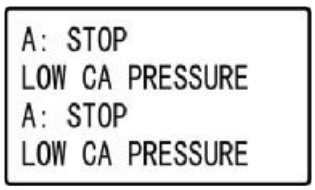
8.3 Signal monitoring and warning

If signal monitoring value is set as figure other than “0”, which means signal monitoring function is initiated. The controller will track sensor impulse signals. If there’s no signals detected in the time of monitoring, controller gives warning immediately. Meanwhile, the corresponding channel will turn into stopped state.
Signal transducer is out of order or chain stops may cause impulse signal disappear.

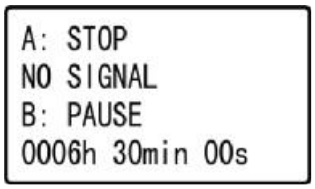
8.4 Fault display and handle

When controller detects fault, LCD screen will show relevant fault information. Meanwhile, the indicator light of FAULT on the panel is flashing. The contact of fault output relay inside the controller will cut off to pass the fault information to control room or other control system.
Fault information for low oil level and low Compressed Air pressure to be displayed on LCD are as shown in figures:



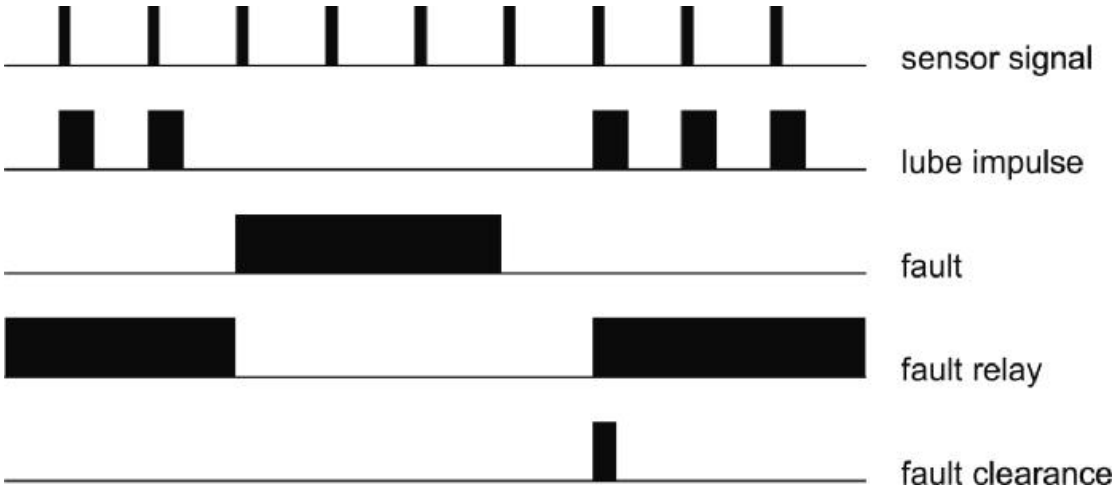


Fault information for signal detect to be displayed on LCD is show as figure:



Differ from “LOW OIL LEVEL” and “LOW CA PRESSURE” faults, “NO SIGNAL” fault only cause stopped state to its own channel for protection. The other channel is not affected.

When fault occurs, controller responses and handles the fault as show in the figure:



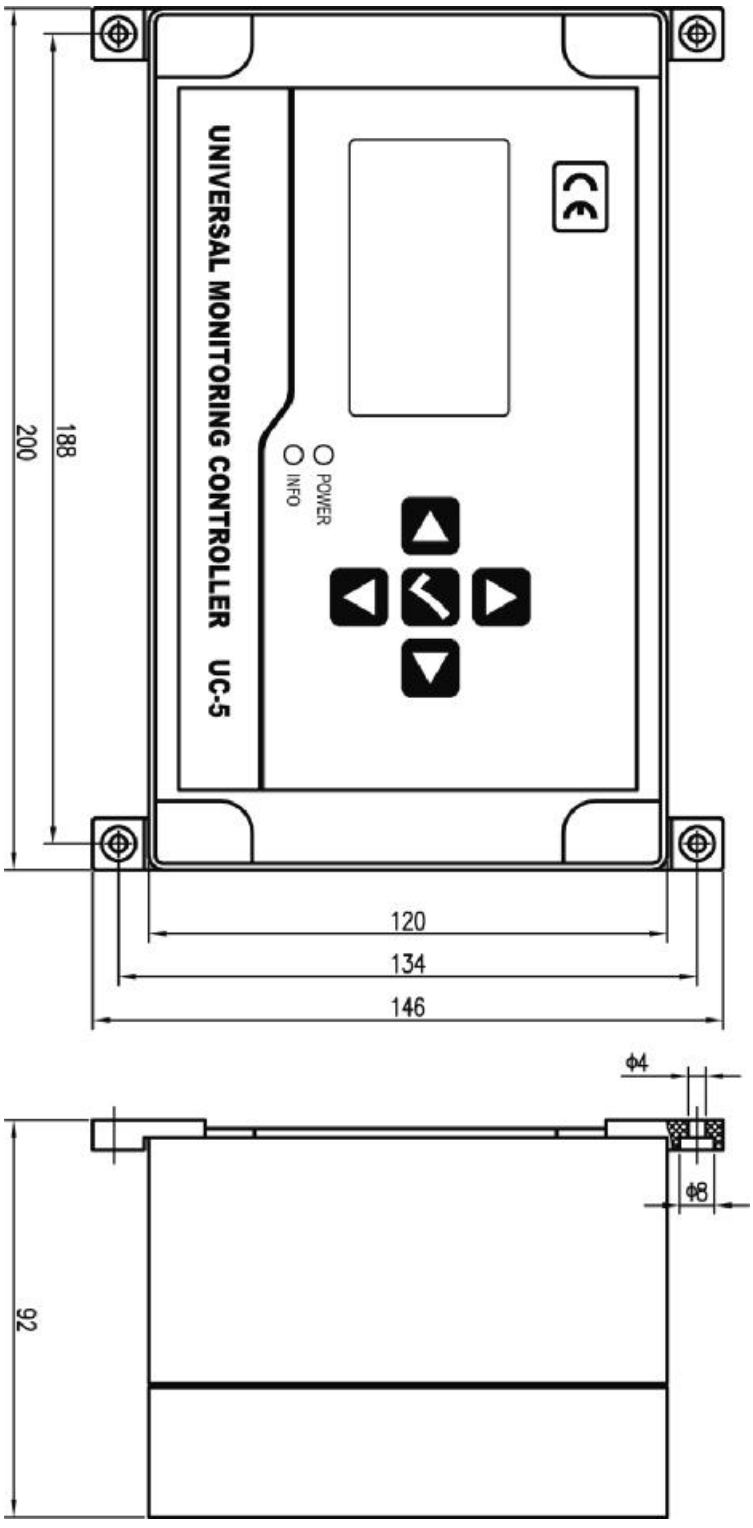
The fault information that caught by controller will be stored in EEPROM. It will

not disappear (even power-off) until user clears the fault manually.

After handling the fault, press key “OK” shortly to quit Fault State and clear fault information. Controller will then goes back to normal lubrication cycle. But if the reason that causes the fault still exist, the above operation does not work.

9. Installation and electrical connection

9.1 Installation

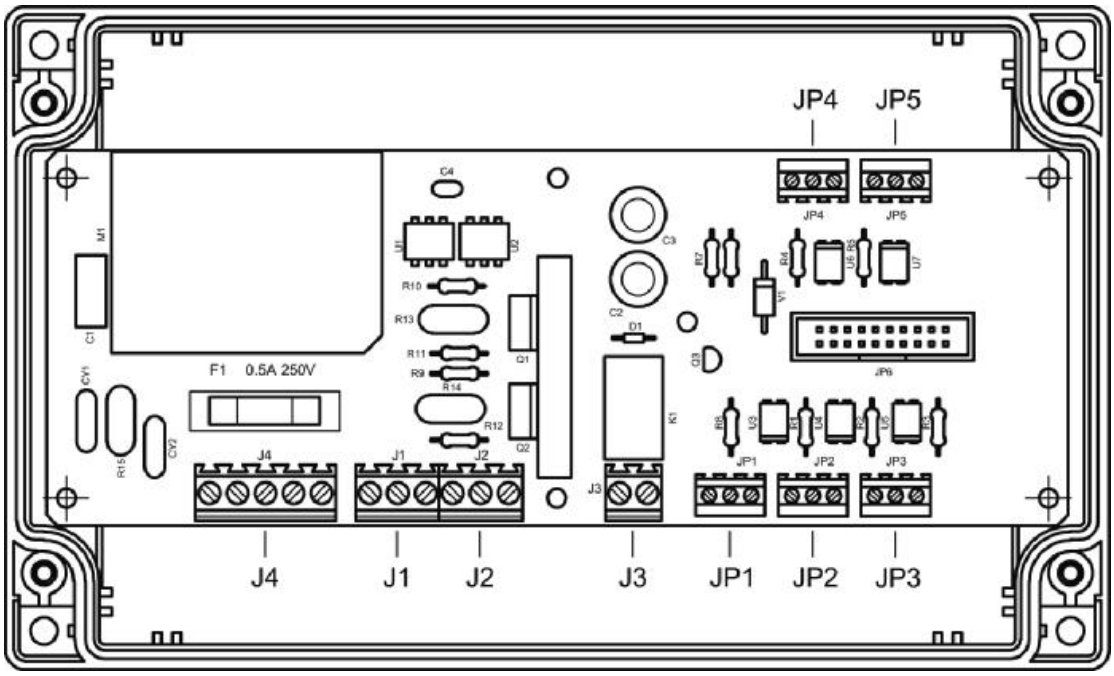


Installation dimensions of the controller is show as figure above.
The control panel of the controller should be perpendicular to the earth, and controller to be fixed on a place that is secure, non-violent vibration, no corrosive atmosphere and out of direct sunlight. It is recommend fixing the controller with machine screws. (Self-tapping screws should not be used to prevent fall off damage to the controller with time passing.)

9.2 Power supply

Required power supply is: Voltage: 85~264V, 45~65Hz of industry frequency AC. please input power class II.
For the controller is designed with multiple level power supply filtering, UC-5 can effectively filter those strong interference that superimposed in power supply, which ensures control system work well. Even so, it is still necessary to supply the controller a separate power supply and avoid being power supplied together with large-scale electrical equipment (such as frequency transformer) that creates electrical interference easily. If the interference of the power supply is too strong that the controller cannot work steady, user may connect another filter to the power input side of the controller.

9.3 Electrical connection



Cut off power first. Carefully pry off the small covers at four corners with

small slotted screwdriver, remove four screws inside. Lift top case and disconnect the flat cable that connecting the Operate & control unit with Power and Input Output unit.
Put the top case aside carefully, the inside Power and InputOutput unit is shown as figure.
Connect external electrical equipment onto this Power and InputOutput unit. Electrical input and output terminals are indicated in the figure. From left to right, the terminal code is 1,next is “2”, “3”etc. The definition of each terminal is as follow.

J4: Power input terminal

Terminal code	Definition	Instruction
1	AC_N	AC_ N
2	Not available	
3	AC _L	AC_L
4	Not available	
5	PG	Ground protection and interference clearance

J1 : Output terminal of channel A

Terminal code	Definition	Instruction
1	PG	Ground protection and interference clearance
2	Pump drive output N	To connect pump N
3	Pump drive output L	To connect pump L

J2: Output terminal of channel B

Terminal code	Definition	Instruction
1	PG	Ground protection and interference clearance
2	Pump drive output N	To connect pump N
3	Pump drive output L	To connect pump L

J3: Terminal for fault relay output

Terminal code	Definition	Instruction
1	Relay contact A	
2	Relay contact B	

JP1: Signal input terminal for channel A

Terminal code	Definition	Instruction
1	DC 0V	Current circuit for DC 0V
2	Sensor signal input	Connect PNP type sensor output
3	DC 24V	Supply work power of +24V to sensor

JP2: Signal input terminal for channel B

Terminal code	Definition	Instruction
1	DC 0V	Current circuit for DC 0V
2	Sensor signal input	Connect PNP type sensor output
3	DC 24V	Supply work power of +24V to sensor

JP3: Signal input terminal of oil-level switch

Terminal code	Definition	Instruction
1	DC 0V	Current circuit for DC 0V
2	Signal input of Oillevel switch	Connect switch between terminal 2 and 3.
3	DC 24V	Supply work power of +24V to sensor

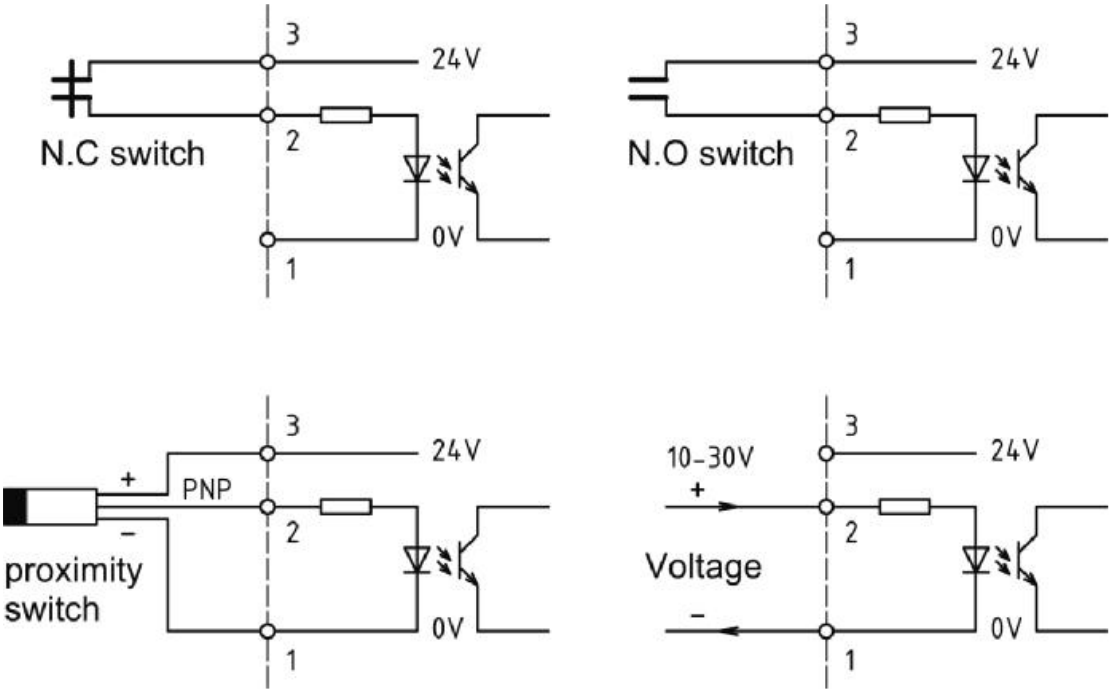
JP4: Pressure switch signal input terminal of compressed air

Terminal code	Definition	Instruction
1	DC 0V	Current circuit for DC 0V
2	signal input of Pressure switch	Connect switch between terminal 2 and 3.
3	DC 24V	Supply work power of +24V to pressure switch.

JP5: External control signal input terminal

Terminal code	Definition	Instruction
1	DC 0V	Current circuit for DC 0V
2	External signal input	Input signal of 10~30V, or connect switch between terminal 2 and 3.
3	DC 24V	Supply work power of +24V to sensor

The typical connection method between input terminal's internal circuit structure and external circuit is shown as figure:



Please note:

① The 24V power supplied by terminal is only for sensor and external switch's initiation. It is NOT allowed to use for other purposes due to its limited load capacity. Otherwise, it may cause error to the controller.

② To meet controller's needs, proximity switch must be 3-wires PNP proximity switch with no load current less than 50mA.

When delivery, there is no openings on the controller's shell (case). User should make openings and connect wires depend on his own needs. Wires should be brought out from PG waterproof joint to keep the tightness of the controller.

In order to protect the **Power and InputOutput unit** from damage, **please remove it before making holes.**

10. Technical specification

Voltage of power supply	85V~264V, 45~65Hz
Max. output	>3A
Pump current on time	0.1sec~9.99sec
Lubrication counting	1~999 999
Pause time	0~9999h 59min
Pause counting	0~9999 9999
Pitch jump range	1:1~999:1
Oil projection adjustment	0~9.99 sec
External input signal	10V ~30V DC，input equivalent resistance of 5.1k
Max. signal frequency	1000Hz (duty ratio 1:1)
Fault relay output	250V AC，5A Max，normally-closed
Operation temperature	-20℃~+50℃
Fuse	250V 0.5A (5×20)
Protection grade	IP65

Manufacturer: Suzhou Leetern Industry Control
Office: Rm. 501, Bldg. 45, No. 188, West Guoxin Road,
Wuzhong Dist. Suzhou, China
Technical Support Fax: +86-512-68661838
Technical Support Email: suns@leetern.com support@leetern.com
Website: http://www.leetern.com

目　　录

UC-5 润滑系统控制器用户手册

UC-5 润滑系统控制器是为喷射润滑系统设计的，适用于输送机、扶梯等机械的润滑系统控制。

UC-5 控制器采用液晶显示器（LCD）直观显示控制器的工作状态和工作参数，使用方便；控制参数存储在 EEPROM 存储器内，可以长期地可靠存储。

UC-5 控制器内部包含两个润滑控制通道，每个通道的工作方式、控制参数是完全独立的，可以同时对两个润滑系统分别进行控制，非常适合润滑点密集、而控制要求又不相同的润滑系统的控制。

UC-5 控制器采用全密闭设计，防护等级可以达到 IP65，能够胜任严酷工业环境下的控制工作。

安全警告！

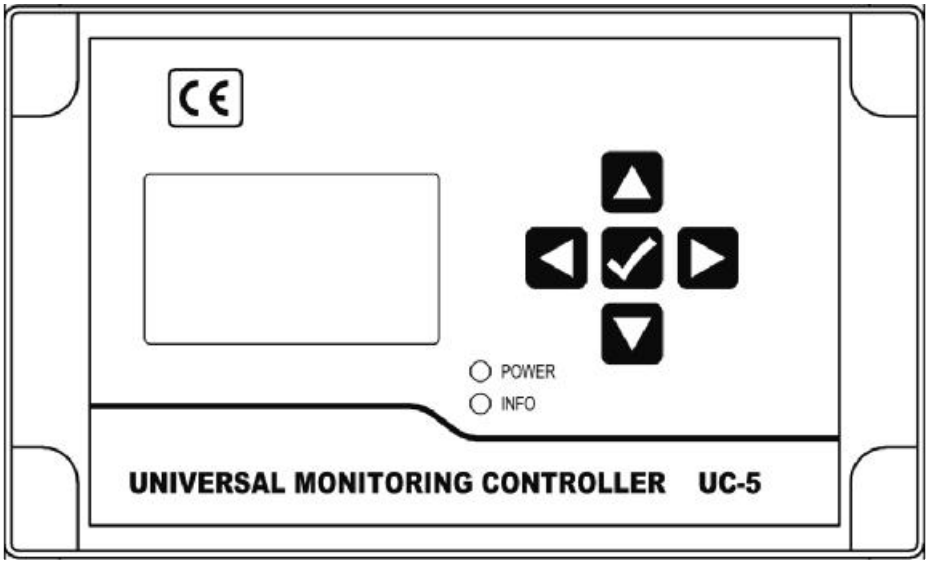
控制器内部电路板上有交流高电压，并直接输出高压电力驱动润滑泵。安装、使用时候要特别注意安全、防止发生电击危险。

控制器安装、接线必须在断电情况下进行，严禁带电作业以防止发生触电危险。控制器专门的接地端子必须良好接地，系统要用规定规格的熔断器保护，以确保控制器设备和人员的安全。

控制器必须由受过专业训练的人员安装、调试和维护。使用过程中要定期检查系统的安全状况，以确保系统的安全运行。

1. 显示控制面板

控制器的显示控制面板如下图



1.1 LED 指示灯

POWER – 电源指示灯。当控制器电源供应正常时候，这个绿色的指示灯点亮。

INFO – 状态信息指示灯。如果控制器检测到润滑系统发生了故障，这个红色灯会连续闪烁。

1.2 薄膜按键

▲ – UP 键: 向上滚动键。在进行菜单选择时候，按下此键，向上滚动菜单选项；在进行参数设定时候，按下此键，光标位数值递增。

▼ – DOWN 键: 向下滚动键。在进行菜单选择时候，按下此键，向下滚动菜单选项；在进行参数设定时候，按下此键，光标位数值递减。

◀ – LEFT 键: 向左滚动键。在进行参数设定时候，按下此键，光标位向左滚动。

▶ – RIGHT 键: 向右滚动键。在进行参数设定时候，按下此键，光标位向右滚动。

✓ – OK 键: 用于启动控制器进入菜单模式;在进行菜单选择或者参数设定时，用于确认选项参数。此键还有退出故障状态和提前终止放油的功能。

1.3 液晶显示器

用来显示润滑系统状态和设定参数。

在控制器工作时候，液晶显示器是主要的状态显示工具。两个润滑通道分别用 A 和 B 表示，典型的状态显示画面如下

“A: 润滑状态”表示 A 通道处于润滑状态下，下面一行的数字表示还剩余多少个润滑脉冲，例如，000100 表示还剩余 100 个脉冲润滑即将结束。

“B: 间歇状态”表示 B 通道处于间歇状态下，下面一行的 0006h 30min 00s 表示间歇还剩余 6 小时 30 分钟（这也隐含指示了间歇是采用定时方式控制)。

其它可能出现的状态指示还有“停机”、“放油”、“油位低”、“气压低”和“没有信号”等。后续章节会加以介绍。

请注意：薄膜面板不能用有机溶剂来擦洗。如果想清洁面板，可以用软布蘸中性洗涤剂擦拭。绝不能用尖锐的物体刺薄膜面板，以免损坏薄膜面板，破坏控制器的密封。

1.4 更改工作语言和调整屏幕

控制器支持多种工作语言，并可以根据用户需要改变当前的工作语言。方法如下:

1、控制器断电 1 分钟;

2、按住面板上 OK 键不放，同时给控制器通电；

3、控制器液晶显示器上，会以当前语言种类显示语言选择。按 UP 或 DOWN 键，当前语言种类跟随变化。

4、选定用户需要的语言种类后，按 OK 键确认并保存。而后，控制器启动，开始执行控制任务，并以所选定的语言显示工作信息。

选定的语言种类会永久保存，直到被下一次被设定改变。

控制器的液晶显示器屏幕可以调整，使得其对比度达到最佳效果。方法如下：

1、控制器断电 1 分钟；

2、按住面板上 OK 键不放，同时给控制器通电；

3、控制器液晶显示器上，会以当前语言种类显示语言选择。

4、按 LEFT 键或 RIGHT 键改变屏幕对比度。按 LEFT 键，减小屏幕对比度，屏幕显示变淡；按 RIGHT 键，增加屏幕对比度，屏幕显示变深。

5、对比度调整到合适的状态后，按 OK 键确认并保存。而后，控制器启动，开始执行控制任务。

2. 主要润滑功能

在工作状态下，控制器控制润滑系统在“润滑-间歇-润滑-间歇…”的连续循环中工作。

出厂默认的控制方式和控制参数，是润滑 1 个脉冲、间歇 1 分钟。可以进入控制器的设定模式，修改这些控制方式和控制参数。

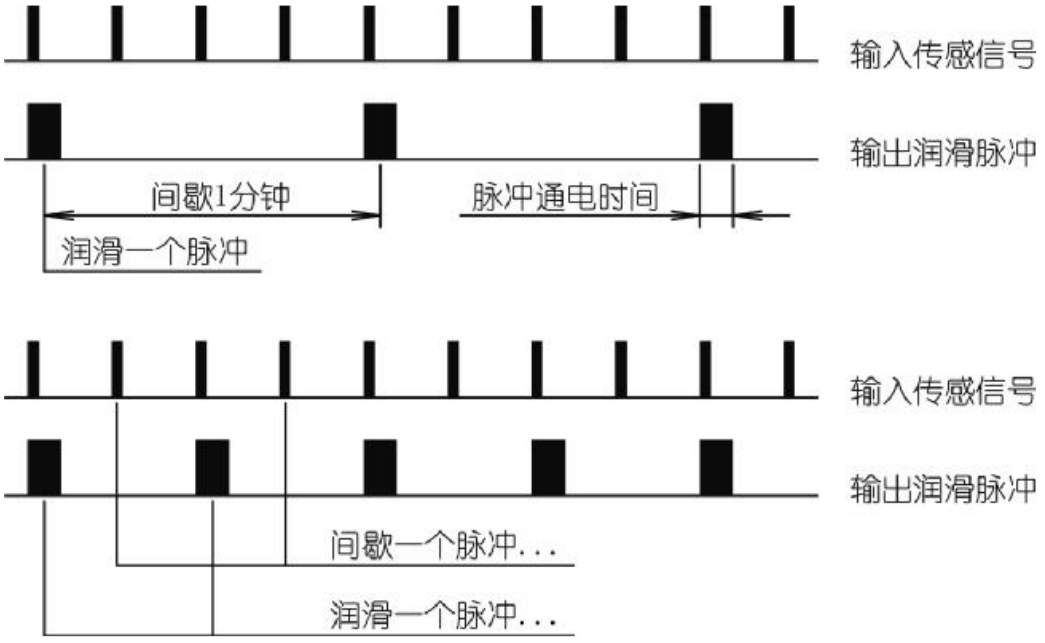
控制器能够永久记忆设定的工作参数，不会因断电等原因丢失。另外，它也能记忆当前的工作状态和剩余参数，如果发生断电，控制器自动保存这些数据，当再次来电时，会从中断处继续执行润滑任务。

控制器还能检测外部控制信号，实现与其他控制系统的联锁控制。

2.1 间歇方式的选择

间歇有定时方式和计数方式两种方式，用户可根据需要进行选择。

如果用户希望根据工作时间（例如，设备在每个操作班次润滑一次）进行润滑，建议间歇采用定时方式；如果用户希望根据设备运转情况进行润滑，建议间歇采用计数方式。



无论在何种间歇方式下，间歇参数数值都可以设定为 0。这时候，间歇功能被关闭，润滑系统连续在润滑状态下运转，不再进入间歇状态。

2.2 润滑控制

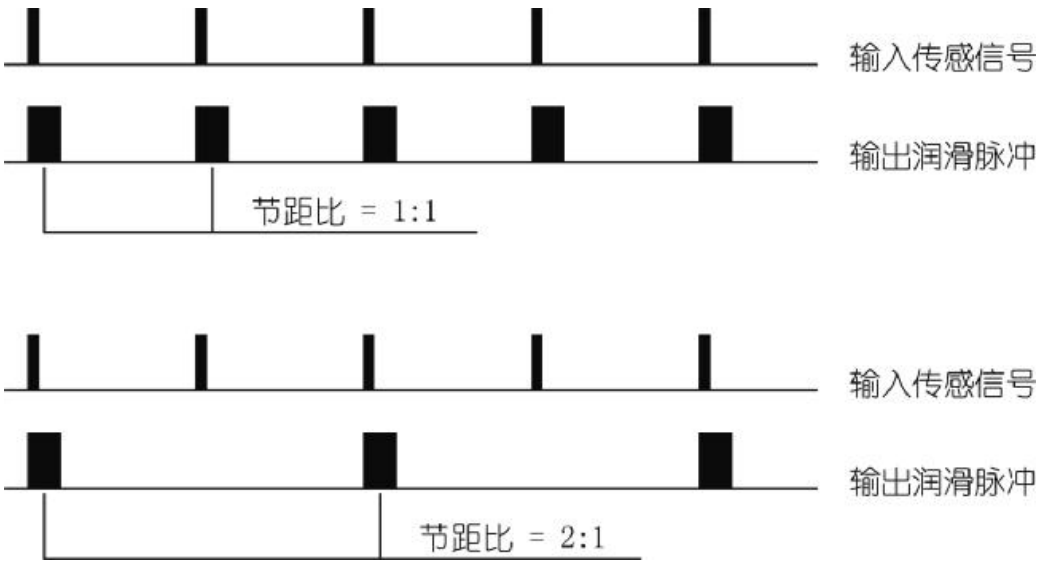
设备在进行润滑时，可以根据情况设置润滑相关的控制参数，来适应不同的润滑需要。

润滑总是跟踪传感脉冲信号进行的，因此它只有计数方式这一种工作方式。但是为了更好地完成润滑任务，在润滑控制过程中有若干辅助参数用于精细调整润滑过程。

2.2.1 节距比设置

喷油润滑动作是跟踪传感信号脉冲进行的。如果传感信号脉冲过于密集，并且要求润滑泵跟踪每个传感信号脉冲进行喷油，就会导致润滑泵来不及跟随传感信号动作，使喷油润滑无法正常进行，典型的现象就是润滑泵一直保持通电而不释放。

可以通过合理设置节距比来比消除这一现象。设置了节距比参数后，控制器在执行润滑任务时，每检测到 N 个节距数的传感信号执行 1 次喷油润滑动作，如下图所示。



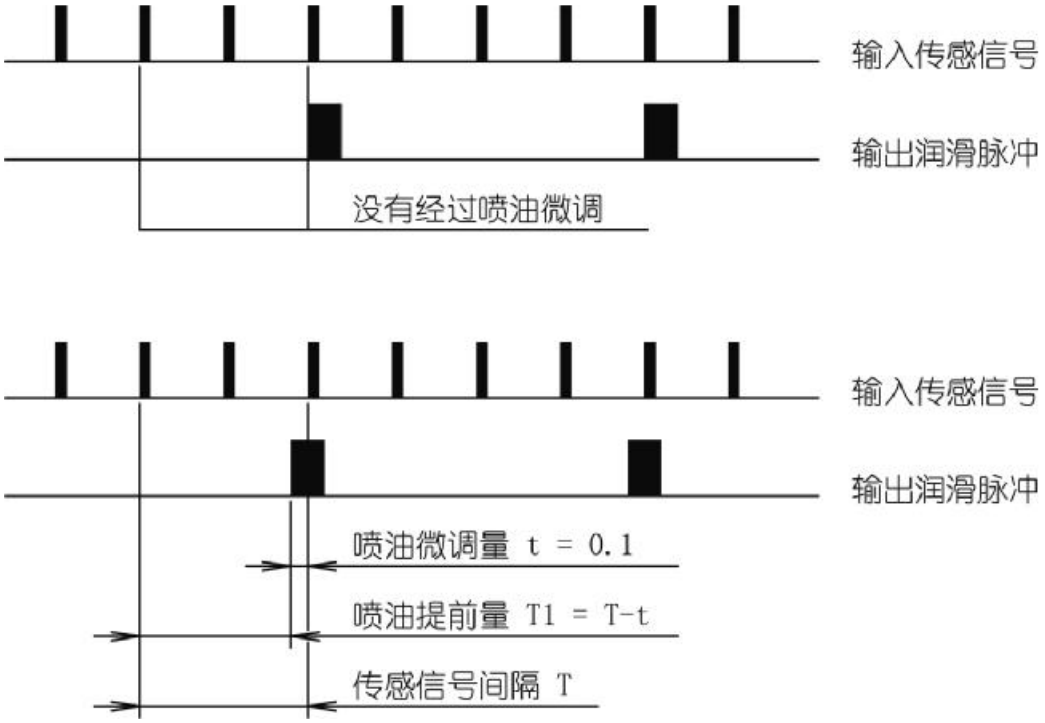
节距比 1:1 表示在润滑期间，每个传感信号脉冲都跟随喷油润滑动作；2:1 则表示在润滑期间，每 2 个传感信号脉冲产生 1 次喷油润滑动作，依此类推。

节距比可以在 1:1-999:1 范围内调整。

2.2.2 喷油调节

因为安装误差的原因，或者链条速度变化以后，可能会出现喷油动作与传感信号脉冲不协调的情况。例如，收到传感信号以后再喷油，由于润滑系统的电气、机械、液压油路都存在时间延迟，喷出的润滑油可能不能准确地落到润滑点上。

这时候可以通过调整喷油调节数值，将喷油动作时刻提前，以使润滑油准确地落在润滑点上，如下图所示。



喷油调节时间可以在 0-9.99 秒范围内调整。如果喷油调节时间设置为 0，即关闭了喷油调节功能。

2.2.3 通电时间

润滑泵是通过电脉冲驱动的。根据泵种类、型号以及润滑系统的不同，泵的每次脉冲通电时间也不相同。控制器支持用户根据需要，自行设定泵的通电脉冲的持续时间，通电时间可以在 0.1 秒-9.99 秒范围内调整。

2.3 中间润滑

通常情况下，控制器是按照“润滑-间歇-润滑…”的循环自动运行的，并且处于间歇状态的时间比较长。如果想临时启动一次润滑，或者检测一下系统的润滑功能，可以启动中间润滑来实现。启动中间润滑后，润滑通道进入润滑状态，润滑结束后，自动返回间歇状态。

操作中，可以指定进入中间润滑状态的通道，也可以命令所有通道进入中间润滑状态。

中间润滑的操作在菜单模式中进行。中间润滑启动后，液晶显示器画面显示的“润滑状态”短语后缀入一个“.”符号，显示为“润滑状态.”，以示与自动循环进入的润滑状态的区别。

用户所启动的中间润滑，可以在润滑过程中通过短暂按 OK 键来提前结束。

2.4 放油

当需要排出管路内空气或替换管路内润滑油时候，可以使用放油功能。在放油状态下，控制器不理会润滑和间歇的设定，按照 0.5 秒的间隔驱动润滑泵，排空管路，直到放油脉冲递减结束后，自动转入润滑状态。

放油脉冲数出厂设定是 999 个脉冲，具体放油操作功能在菜单模式中。

润滑通道在放油过程中，短暂按下面板上 OK 键，放油过程即提前终止，转入中间润滑状态。

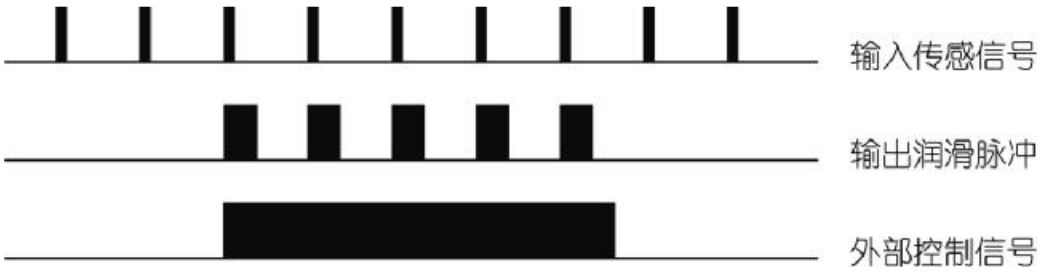
如果在放油过程中检测到了低油位或低气压故障，润滑通道立即终止放油，进入故障停机状态。

放油操作也在菜单模式中进行。

2.5 运行控制

控制器内部设有一组端子，可以接入外部的运行控制信号。

如果运行控制功能被设定为启用，控制器执行运行控制：控制器运行期间监测到外部控制信号有效时，正常执行润滑控制；监测到外部控制信号断开时，控制器暂停控制，润滑系统进入停机状态。外部控制信号恢复后，控制器从暂停点开始，继续原来的控制过程。

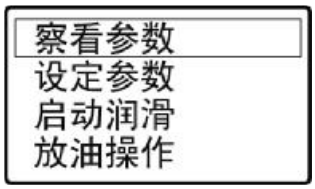


3 工作参数察看

用户可以使用工作参数察看功能来察看控制器的工作参数的设定内容。

3.1 进入菜单模式

按下控制器面板上 OK 键不放，2 秒后控制器进入菜单模式，此时显示器显示画面如下（由于印刷方面的原因，本手册用线框表示显示画面上的反白显示项目）



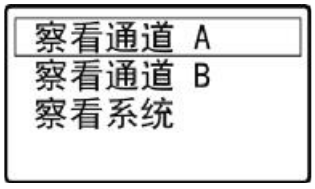
可以用 DOWN 键和 UP 键来选择具体操作的项目。随着相应按键的按动，当前被选择项目跟随变化，而被选择的项目显示字样将被反白显示（黑底白字）。

当前选项选择为“察看参数”按下 OK 键，即可进入察看参数状态。

在菜单模式下，超过 2 分钟没有按键操作，控制器会自动退出菜单模式，返回显示模式。

3.2 选择察看项目

选定“察看参数”，按 OK 键进入察看参数状态，液晶显示器画面显示



可以用 DOWN 键和 UP 键来选择具体设定的察看项目。

3.3 察看通道参数

如果选定了察看某一通道参数，控制器开始显示这个通道的设定参数。以选定了察看通道 A 为例，液晶显示器画面显示

按 DOWN 键，液晶显示器画面显示

按 DOWN 键，液晶显示器画面显示

按 DOWN 键，液晶显示器画面显示

如果信号监控设定为 0（信号监控关闭），信号监控项目将显示为“关闭”。

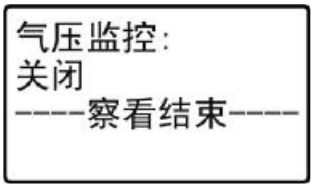
液晶显示器画面显示“察看结束”，表示通道参数已经显示完毕。此时按下 OK 键，控制器结束察看，返回显示模式。

3.4 察看系统信息

如果在进入察看状态后，选择察看系统

按下 OK 键，液晶显示器画面显示控制器开始显示系统编号和运行控制设定状态。系统编号是制造商出厂设定的，用户不能改变

按 DOWN 键，液晶显示器画面显示压缩空气气压监控设定状态



液晶显示器画面显示“察看结束”，表示系统信息已经显示完毕。此时按下 OK 键，控制器结束察看，退回显示模式。

在察看过程中，按 UP 键可以返回上个画面，一直可回溯到菜单模式的初始画面。

4　参数和功能的设定

需要修改控制器的各个功能和工作控制参数时，可以通过菜单模式的设定功能予以修改。

按照《3.1　进入菜单模式》介绍的方法进入菜单模式，然后选择“设定参数”选项，按下 OK 键即可进入参数设定状态。

4.1　验证密码

为了防止控制器的设定被意外修改，在进入设定参数状态时，必须要输入密码进行验证。此时液晶显示器画面开始显示密码输入框

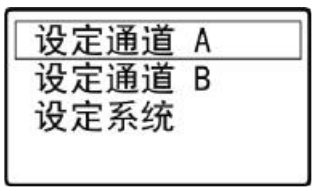
请输入 4 位数字组成的密码。如果密码验证正确，转入下一步操作。如果密码连续 3 次输入错误，控制器自动退出菜单模式，回到显示模式。

如果密码验证正确，那么在本次菜单模式下就会一直有效，不会反复要求验证密码，直到退出本次菜单模式为止。

控制器出厂初始密码为 “0000”。

4.2　选择设定项目

进入设定参数状态后，液晶显示器画面显示



可以用 DOWN 键和 UP 键来选择具体设定的项目。

4.3 间歇相关设定

选定某个润滑通道，按下 OK 键，即进入通道设定过程。

例如，选定“设定通道 A”后，液晶显示器画面开始显示

可以用 DOWN 键和 UP 键来选择具体设定的项目，对间歇相关参数进行设定。

4.3.1 间歇方式设定

选择“A: 间歇方式设定”，按下 OK 键以后，下面表示间歇控制方式的文字会闪烁，提示用户可以更改间歇方式。

可以用 DOWN 键和 UP 键来改变间歇方式。间歇方式可以在“定时方式”和“计数方式”之间改变。

按下 OK 键即确认新的间歇方式设定。

如果在设定中改变了间歇方式，间歇参数将自动恢复到出厂默认数值上：间歇控制采用定时方式时，默认的间歇参数是 1 分钟；间歇控制采用计数方式时，默认的间歇参数是 1 个脉冲。

4.3.2 间歇参数设定

按 DOWN 键，选择“A: 间歇参数设定”，按下 OK 键后，下行显示的的间歇参数数值最低位开始闪烁(这个位称为光标位)，提示用户可以更改间歇参数。

用 DOWN 键和 UP 键可以更改光标位的数值；用 LEFT 键和 RIGHT 键可以左右移动光标位。

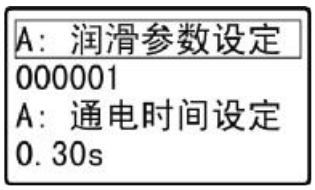
间歇采用计数方式控制时，间歇参数设定范围在 0-9999 9999；间歇采用定时方式控制时，间歇参数设定范围在 0-9999 小时 59 分钟。

请注意：控制器会实时检查参数更改情况。如果改变后的间歇参数数值大于最大允许值或小于最小允许值，控制器将拒绝这个更改。

按下 OK 键即确认新的间歇参数设定。

4.4 润滑相关设定

按 DOWN 键，液晶显示器显示画面内容更新为



可以用 DOWN 键和 UP 键来选择具体设定的项目，对润滑相关参数进行设定。

4.4.1 润滑参数设定

选择“A: 润滑参数设定”，按 OK 键，显示的润滑参数数值最低位闪烁，即可修改润滑参数。

润滑参数设定范围在 1-999 999。

按下 OK 键即确认新的润滑参数设定。

4.4.2 通电时间设定

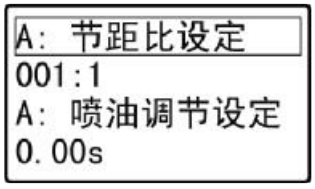
按 DOWN 键，选择“A: 通电时间设定”，按 OK 键，显示的通电时间数值最低位闪烁，即可修改通电时间。

通电时间设定范围在 0.1 秒-9.99 秒。

按下 OK 键即确认新的通电时间设定。

4.4.3 节距比设定

按 DOWN 键，液晶显示器显示画面内容更新为



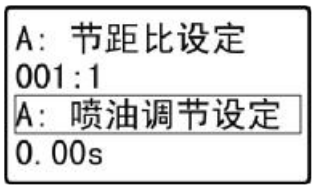
选择“A: 节距比设定”，按 OK 键，显示的节距比参数数值最低位闪烁，即可修改节距比参数。

节距比参数设定范围在 1:1-999:1。

按下 OK 键即确认新的节距比设定。

4.4.4 喷油调节设定

按 DOWN 键，选择“A: 喷油调节设定”，按 OK 键，显示的喷油调节参数数值最低位闪烁，即可修改喷油调节参数。



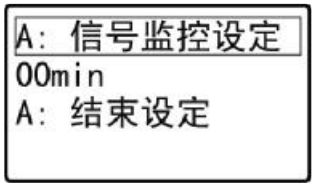
喷油调节设定范围在 0-9.99 秒。如果设定喷油调节为 0，即关闭了喷油调节功能。

不建议喷油调节参数设定在 0.01-0.02 秒这样很小的数值上。

按下 OK 键即确认新的喷油调节设定。

4.5 信号监控设定和结束设定

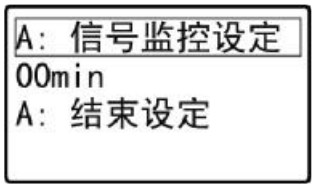
按 DOWN 键，液晶显示器显示画面内容更新为



即可用 DOWN 键和 UP 键来选择具体操作设定项目。

4.5.1 信号监控设定

选择“A: 信号监控设定”，按下 OK 键以后，显示的信号监控参数数值最低位闪烁，即可修改信号监控参数。



如果信号监控设定为 0（信号监控关闭），信号监控项目将显示为“关闭”。按下 OK 键，监控参数开始显示为 00min，并且数值最低位闪烁，即可修改信号监控参数。

信号监控参数设定范围在 0-99 分钟。如果设定信号监控为 0，即关闭了信号监控功能。

按下 OK 键即确认新的信号监控设定内容，信号监控的具体含义请见“故障检测和处理”有关章节。

如果按 DOWN 键，选择了“A: 结束设定”，按下 OK 键后，设定过程结束，控制器回到显示模式；如果按 UP 键，即返回上一设定画面。

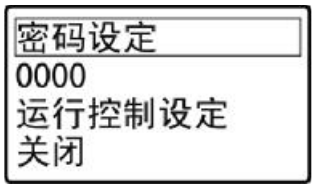
如果在通道设定过程中修改了某项设定内容，退出菜单模式后控制器将自动重启动。

4.6 设定系统参数

作用于控制器全局，或者不属于某一具体润滑通道的参数，在设定系统参数功能内进行设定。进入设定项目选择画面后，用 DOWN 选择“设定系统”

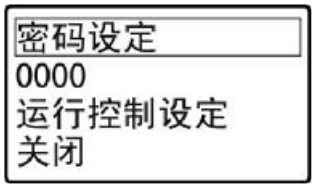
按 OK 键进入系统参数设定状态。

进入系统参数设定状态后，液晶显示器画面显示



4.6.1 密码设定

选择密码设定项目后，按 OK 键，显示的密码数值最低位闪烁，即可修改密码，密码的设定范围是在 0000-9999。



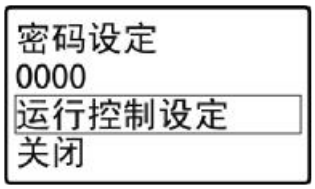
设定新密码，然后按下 OK 键确认并储存新密码。

请注意：用户要妥善保管新密码。如果遗忘了密码，将不能再进入设定状态修改工作参数的设定。万一发生这种情况，请将控制器返回制造商处理。

4.6.2 运行控制设定

选择“运行控制设定”，按下 OK 键以后，下面表示运行控制设定内容的文字会闪烁，提示用户可以更改运行控制设定。

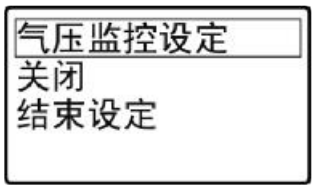
可以用 DOWN 键和 UP 键来改变运行控制设定。运行控制设定可以在“启用”和“关闭”之间改变。



按下 OK 键即确认新的运行控制设定。如果在设定中改变了运行控制设定，新的设定将立即发挥作用。

4.6.3 气压监控设定

按 DOWN 键，液晶显示器画面显示



选择“气压监控设定”，按下 OK 键以后，下面表示气压监控设定内容的文字会闪烁，提示用户可以更改气压监控设定。

可以用 DOWN 键和 UP 键来改变气压监控设定。气压监控设定可以在“启用”和“关闭”之间改变。

按下 OK 键即确认新的气压监控设定。如果在设定中启用了气压监控，新的

设定将立即发挥作用；如果在设定中关闭了气压监控功能，并且控制器正在气压低故障状态，将自动清除故障信息，返回正常润滑状态。

在设定过程中，按 UP 键可以逐条返回上条设定选项，直至回到菜单模式的初始画面。

5 中间润滑

控制器支持中间润滑功能。进入菜单模式，选择“启动润滑”即可启动中间润滑功能

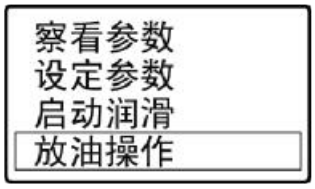
进入润滑通道选择画面后，可以选择 A 通道或者 B 通道进入中间润滑；也可以选择 A+B 通道，令两个通道同时进入中间润滑状态。例如，选择 A 通道润滑

选定 A 通道后，按下 OK 键，控制器退出菜单模式，所选定的通道进入润滑状态，开始运行润滑功能。进入中间润滑状态的通道，显示“润滑状态.”，后缀的“.”提示这是中间润滑。

中间润滑可以提前结束。在中间润滑状态下，短暂按 OK 键，处于中间润滑状态的通道立即退出润滑状态，返回间歇状态。

6 放油操作

控制器支持放油功能。进入菜单模式，选择放油操作即可启动放油功能



进入放油选择画面后，可以选择 A 通道或者 B 通道进行放油。例如，选择 A 通道放油

选定 A 通道后，按下 OK 键，控制器退出菜单模式，所选定的通道进入放油状态并连续显示剩余的放油脉冲数，直到放油结束或提前终止。

7. 网络控制

增强型号的 UC-5N 控制器具备联网工作的能力。通过联网，组成一个分布式润滑控制系统，对复杂润滑系统控制提供更多支持。

UC-5N 还可以与 LEETERN 公司其他产品（如 UC-3N 智能润滑控制站）共同组网，采用兼容的协议和通信方式在同一个网络内共同工作。

7.1 组网的条件和能力

控制器采用 RS-485 总线，通过工业标准的 modbus 协议实现联网控制。

UC-5N 的组网能力为：1-247 个从站；波特率 300，600，2400，4800，9600，14400，19200，38400；校验可选无校验、奇校验或者偶校验。

很多 PLC 和工控计算机内置了对 modbus 的支持，可以通过调用模块或者简单组态就能够支持 modbus 协议。

UC-5N 控制器出厂的默认站号是 247，波特率 9600，偶校验，1 位停止位 。在控制器接入网络前，请根据《7.3 与网络通信相关的设定》重新设定站号和通信参数，以使控制器能够正确加入网络。

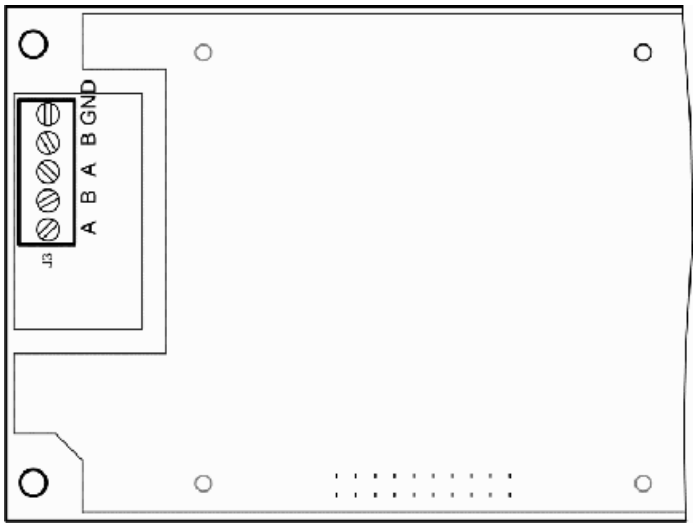
7.2 网络接口和布线

UC-5N 控制器的网络布线要严格遵守 RS-485 规范。各个控制器要采用手拉手的方式连接成网络，不能采用中间抽头的 T 形连接，也不能采用星形连接和环状连接。不规范的布线，将导致网络工作不稳定甚至网络完全瘫痪。

UC-5N 主板上 J3 连接器为 485 接口，提供了两组 485 接入端子，便于接成手拉手的 485 网络。

较长的网络(>300m)、特别是网络上设备较少的网络，要在首末端控制器的 RS-485 接口接入 120Ω终端电阻，以使网络信号传输稳定。

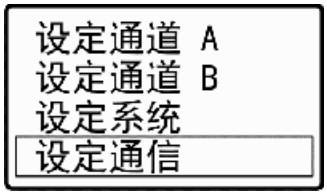
网络线要采用不小于 0.5mm^2 的屏蔽双绞线，并且屏蔽层要连接各个控制器的 RGND 后进行良好接地，保证网络传输的稳定；网络线要远离强电磁干扰场合，并且不能与电力线路平行敷设。如果需要架空敷设，必须采用另外单独的承重支撑，禁止利用网络线自身承重，而且要采取严格的防雷击措施。



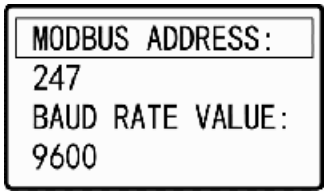
网络接口

7.3 与网络通信相关的设定

支持网络通信的 UC-5N，设定菜单会有一项“设定通信”选定这个选项,会出现如下画面



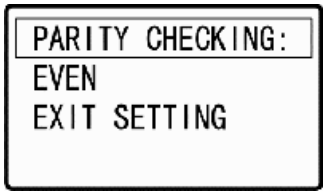
选定“设定通信”后，出现如下画面（与通信相关的设定菜单均为英文）



“MODBUS ADDRESS:”设定项目是设定 MODBUS 站号,可以设定的范围为 1-247

“BAUD RATE VALE:”设定项目用于在若干个波特率中选定一个需要的波特率（按照相应规范，波特率只能在特定的几个波特率中选择，而不能任意输入一个波特率数值）

向下翻页，出现如下画面，可以选择校验方式



校验方式可以在“EVEN”（偶校验）“ODD”（奇偶校验）“NONE” （无校验）三种之间选择。停止位数将会根据 MODBUS 标准，自动设定。

相应地，支持网络通信的 UC-5N，在阅读菜单上也会有“察看通信”的选项，其察看项目内容与设定项目内容相对应。

7.4 网络功能和指示

当控制器设定好站号和通信参数、正确接入线路以后，就可以进行联网控制了。

请注意：UC-5N 在 modbus 通信中，只能作为从站存在，不能将 UC-5N 作为 modbus 主站使用。

控制器面板上的 INFO 指示灯，同时也是网络状态指示灯。当有数据传输产生于网络时，INFO 指示灯会以绿色闪烁，闪烁的频繁程度与数据传输流量成正比。观察这个指示灯的状态，可以了解网络活动的情况。

7.4.1 优先权控制

在 UC-5N 控制器中，面板的就地操作优先权大于网络控制。读取数据的命令(功能码 02H，03H)不受面板操作的影响，但是写数据和强制状态转换的命令会有如下的影响：

如果面板在进行阅读或者编程，功能码 05H(强制状态转换)、06H(预置单个寄存器)和 10H(预置多个寄存器)会被拒绝执行，此时发送给控制器 05H、06H 或者 10H 功能码命令，控制器会返回 06H 号错误代码 (从站忙碌)。

如果控制器正在对某一通道执行中间润滑控制(这意味着正在进行测试或者系统调试)，对这个通道的功能码 05H(强制状态转换)会被拒绝执行，此时发送给控制器这个通道 05H 功能码命令，控制器会返回 06H 号错误代码 (从站忙碌)。

如果控制器在挂起状态(外部联锁控制断开), 功能码 05H(强制状态转换) 会被拒绝执行，此时发送给控制器 05H 功能码命令，控制器会返回 07H 号错误代码 (从站不能执行要求的程序功能)。

7.4.2 协议内容的一些规定

为了简化控制，UC-5N 控制器对 modbus 协议一些方面进行了限制。

UC-5N 的 MODBUS 网络通信协议中，有一些协议地址是保留的。对这些保留地址进行读写，将会返回 02H 号错误代码 (不合法数据地址)。另有一些地址是只读的，对这些地址进行写入，会返回 03H 号错误代码 (不合法数据)。

通信协议中，对 03H 功能码(读多个保持寄存器)进行了限制，规定每次只能读 1 个字(2 字节)，如果命令请求了 1 个以上的数据，命令被拒绝执行并返回 03H 号错误代码 (不合法数据)。

为了保持与 modbus 协议兼容, UC-5N 支持 10H 功能码(预置多个寄存器)。但是, UC-5N 对 10H 功能码也作了每次只能预置 1 个字的限制。实际上, UC-5N 内部是把 10H 功能码命令转换成为 06H 功能码命令来执行, 因此, 如果向 UC-5N 发送多于 1 个字数据的 10H 功能码命令, 会返回 03H 号错误代码 (不合法数据)。

UC-5N 实现了 modbus 协议的类别 1 子集。如果试图对 UC-5N 发送类别 1 子集所支持的功能码以外的功能码命令，将会返回 01H 号错误代码 (不合法功能码)。

UC-5N 的 modbus 协议支持广播。05H，06H，10H 功能码除一些特定地址外，均支持广播，使用广播功能可以快速部署一个控制网络。

其他方面细节，请参考附录:《UC-5N 的 MODBUS 网络通信协议》。

7.4.3 润滑功能方面的说明

本手册中提及的所有润滑功能都可以通过网络命令来实现。由于网络操作的

一些特点，功能实现与面板操作略有不同。这里只介绍不同之处：

1、通道状态的读取和控制

各个通道的当前状态可以通过 03H 功能码，在通道状态地址读取。但是，不要企图向通道状态地址写入状态字来改变通道状态，这将导致返回 03H 号错误代码。正确的控制通道状态的方法是向从机发送 05H 功能码(强制线圈状态) 命令，它可以指定任何一个通道强制转换到润滑状态或间歇状态。

通过 05H 功能码，还可以远程重新启动控制器。

2、对于监控的处理

可以通过网络设定监控参数，也可以通过网络来读取监控状态。但是，建议到现场解决故障并清除故障信号，而不要通过网络发送 05H 功能码命令来清除故障信号。虽然这个来自主机的命令能够被控制器接受并执行，但这并不能解决现场实际的物理故障，例如油箱内已经没有了润滑油。

3、参数的修改

可以完全通过网络来修改各个控制参数。

UC-5N 没有对网络命令传送过来的参数设定范围作过多的检查。因此使用网络命令时要注意不要将参数设定越界。

对于监控和系统控制方面的设定和参数修改，要考虑控制器以及各个通道的当前状态。如果要修改的监控正处于故障状态，要在修改以后重新强制转换为正常工作状态（间歇或润滑）。

7.5 网络问题的排除

网络系统由于从站分布在各处且互有影响，发生问题以后不容易排查和处理。现实的网络情况也是千差万别，难于给出统一的解决方案。这里给出一些原则性处理方法。

如果主机访问不到所有控制器，应当先检查主机的网络及其接口、线路是否有问题。如果能访问到控制器，但是某个控制器访问不到或不稳定，可能是如下原因：

1、从站站号不对；

2、从站通信参数与主机不同；

3、从站断线；

4、从站失电；

5、从站距离过远；

6、从站波特率过高；

7、从占收到了强烈干扰；

8、在需要加 120Ω终端电阻的时候，没有按规定加终端电阻

9、从站故障

出现上述问题，首先要检查控制器从站是否正常。在控制器面板上，通过编程设定功能查看站号地址是否正确，通信参数是否与主机一致。如果有问题，请重新设定。

如果站号和通信参数不存在问题，请观察控制器面板上 INFO 绿色指示灯。如果 INFO 绿色指示灯从不闪烁，请先检查从站网络线是否正确连接。

如果网络线正常，但是 INFO 绿色指示灯不闪烁，请检查从站是否受到了强烈的干扰，或者是通信距离过远、波特率过高。可以在现场将从站从网络上拆除离线，然后用笔记本电脑连接 485 转换器到从站，来单独测试从站情况。可以用调试工具软件(例如：“modbus poll”或者“串口调试助手”)，向从站发送命令串 0005FFFF0000CC3FH(注意：这是 16 进制数据。串口调试工具软件也必须设置成 16 进制收发)，控制器应当响应命令重新启动。如果控制器响应命令重新启动，说明控制器无故障，否则请更换控制器，并将换下来的控制器送回制造商处检修。

如果控制器正常，请检查一下线路是否受到强干扰并排除干扰。

如果无强烈干扰，请考虑是否通信距离过远或者波特率过高。请注意：如果原本网络参数设定的就比较临界，即使新安装的网络通信正常，但随着时间推移和温度影响，线路和器材会逐渐老化，原来能工作的网络可能会变得不能正常工作。因此，不能用过去网络通信正常来推断现在网络也能通信正常。

如果是这个原因，请在适当的地方加入中继器。如果不便于加入中继器，可以在保证正常进行润滑控制的前提下，通过降低通信波特率来保证网络的正常工作。

UC-5N 控制器为润滑控制任务特别优化了波特率，支持较低的波特率以延

长通信距离、提高通信可靠性。

如果采用 232-485 转换器来连接主机网络，要采用有源转换器，并且要确认转换器支持的波特率。某些无源转换器供电能力不足，当通信距离稍远、从站数量稍多时候，会导致通信失败。另外转换器收发转换是需要时间的，有些转换器对高波特率和低波特率支持不够，可能会导致通信产生问题。

8 故障检测和处理

控制器拥有对润滑系统状态进行故障检测、报警的能力，以保护系统的安全可靠运行。

监控工作只在润滑系统运行时进行。如果运行控制设定为启用，在外部控制信号撤销时，控制器暂停故障检测；外部控制信号变为有效，控制器恢复故障检测。

8.1 润滑油油位监控报警

控制器能通过油位开关检测油箱内润滑油油位，当润滑油过低时，油位开关断开。控制器检测到油位开关断开后，立即发出警报，所有润滑通道同时进入停机状态。

油位监控是一直有效的，不能通过设定来关闭。

8.2 压缩空气压力监控报警

某些润滑系统采用压缩空气为润滑泵的动力。控制器能够通过压力开关检测压缩空气压力，保证润滑系统的安全可靠运行。

当压缩空气压力过低时，安装在压缩空气管路上的压力开关断开，这个信号被控制器检测到，控制器立即发出警报，所有通道进入故障停机状态。

压缩空气压力监控功能可以通过系统设定来启用或者关闭。

8.3 信号监控报警

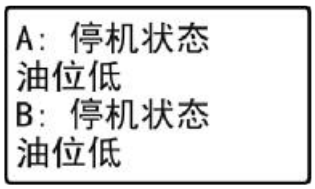
如果将设定信号监控设置为 0 以外的数值，意味着启动了信号监控功能，控制器将追踪传感器脉冲信号。如果在信号监控设定的时间范围内，没有传感脉冲信号出现，控制器将报警，同时令对应的通道进入故障停机状态。

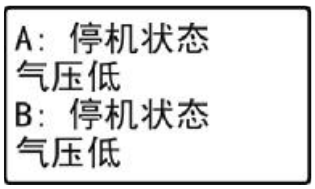
导致传感脉冲信号消失的原因，可能是传输链条已经停止运行，或者是信号传感器发生了故障。

8.4 故障显示和处理

控制器检测到任一故障，液晶显示器上会显示对应的故障信息文字，同时面板上 FAULT 灯会闪烁；控制器内部的故障输出继电器触点断开，将故障信息远传到控制室，或者与其他控制系统相连接。

发生低油位和空气压力低故障时，液晶显示器画面显示内容如下

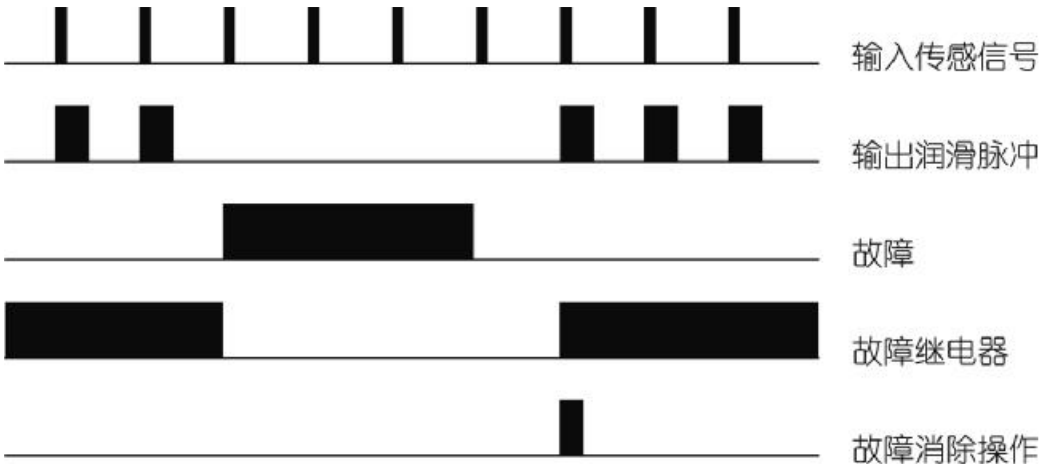




检测到信号故障时，液晶显示器画面显示内容如下

可以看到，不同于油位低或者气压低故障，无信号故障只针对自己本身所处的通道发生保护性停机，另一通道不受影响，继续自己的润滑工作。

发生故障时，控制器对故障的响应和处理示意图如下

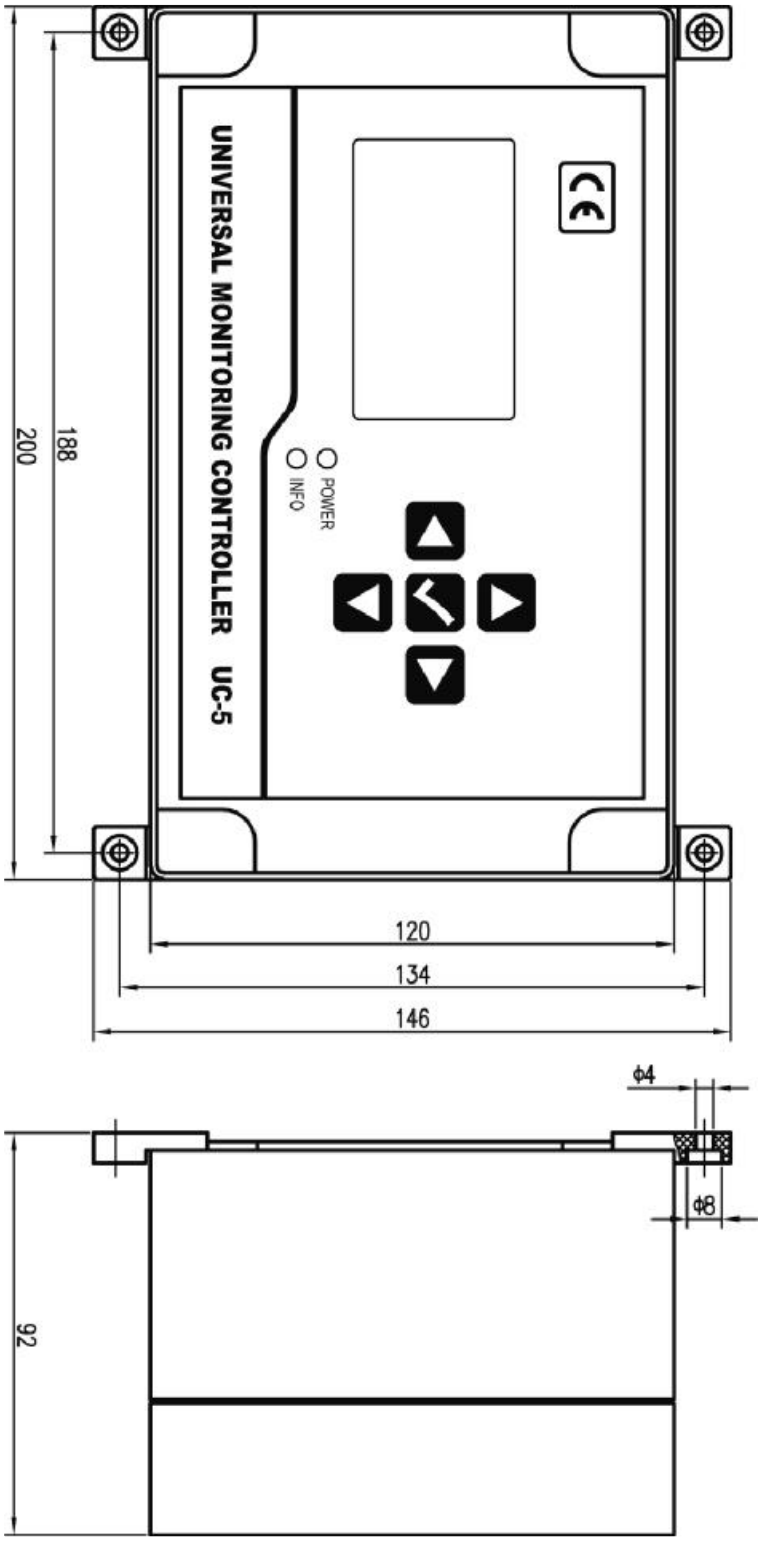


控制器捕捉到的故障信息，会记忆在控制器内，不会因断电等原因消失，直到用户手动消除故障状态为止。

用户处理故障完毕，短暂按下面板上 OK 键，即可令控制器退出故障状态、消除故障信息，回到正常润滑循环。但是如果产生故障的原因还继续存在，这个操作是无效的。

9. 安装和电气连接

9.1 控制器的安装



控制器安装尺寸如上图所示。

控制器要面板垂直于地面安装，固定在牢固、无剧烈震动和腐蚀性氛围、无阳光直射的场所。建议采用机械螺钉固定控制器，不宜用自攻螺钉固定，以防日久控制器脱落损坏。

9.2 电源供应

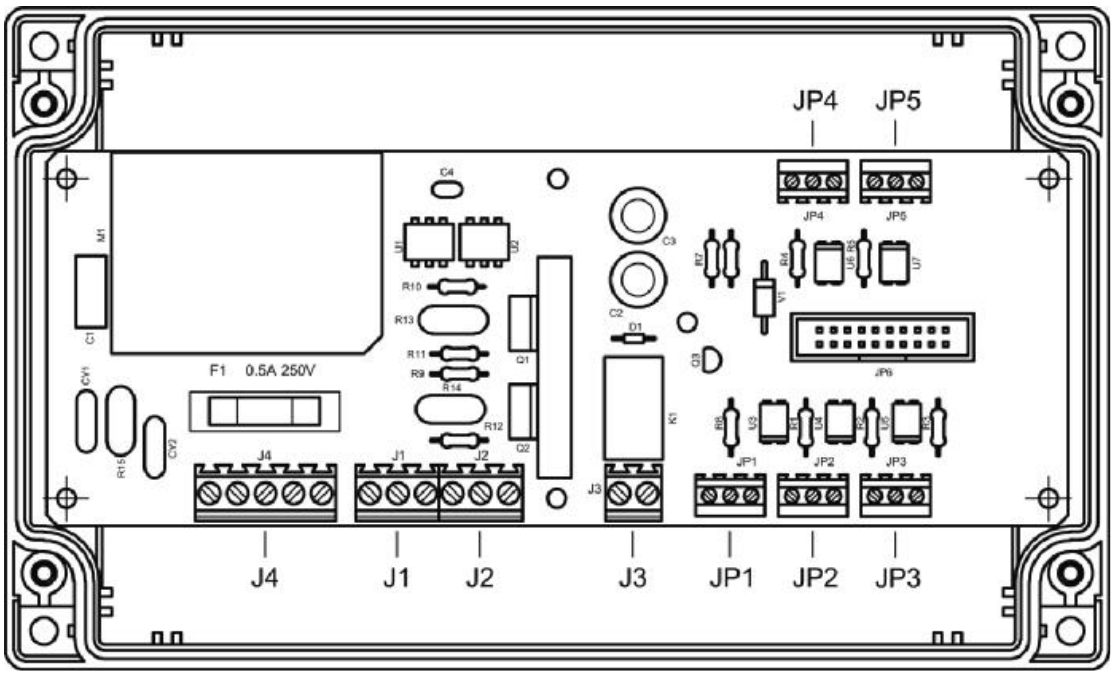
控制器供电要求为 85-264V，45-65Hz 工频交流电，请接入 II 级电源。

控制器自身设计有多重电源滤波器，可以有效地滤除电源中叠加的各种强干扰，保证控制系统正常工作。即便如此，也应当为控制器单独供电，避免与容易产生电气干扰的大型电气设备(例如变频器)共用电源。如果供电电源电气干扰过强影响控制器工作，可以在控制器电源输入端另行插入电源滤波器。

9.3 电气接线

先断开控制器电源，用平口小螺丝批小心撬下面板上四角的装饰板，旋下里面 4 个面板固定螺钉；拿起面板，拔下面板和底板间连接的扁平电缆，小心取下面板。

取下面板后，可以看到如下图的安装底板。



与外界的电气连接就在这块底板上进行，电气输入输出的端口已经在图上标。**每个端口正对接线孔观察，自左到右：第 1 个端子为“1”，其次为“2”，“3”…，以此类推。**各个端子定义如下表

J4: 电源输入端子

端子号	定　　义	说　　明
1	交流电源 N	接交流电源输入 N
2	空	
3	交流电源 L	接交流电源输入 L
4	空	
5	交流电源 G	接地保护和干扰滤除

J1: CH1 输出端子

端子号	定　　义	说　　明
1	交流电源 G	接地保护和干扰滤除
2	泵驱动输出 N	接润滑泵 N 输入端子
3	泵驱动输出 L	接润滑泵 L 输入端子

J2: CH2 输出端子

端子号	定　　义	说　　明
1	交流电源 G	接地保护和干扰滤除
2	泵驱动输出 N	接润滑泵 N 输入端子
3	泵驱动输出 L	接润滑泵 L 输入端子

J3: 故障继电器输出端子

端子号	定　　义	说　　明
1	继电器触点 A	
2	继电器触点 B	

JP1: A 通道信号输入端子

端子号	定　　义	说　　明
1	直流 0V	直流电源 0V 回路
2	A 通道传感信号输入	连接 PNP 型传感器输出端子
3	直流 24V	提供传感器工作用+24V 电源

JP2: B 通道输入端子

端子号	定　　义	说　　明
1	直流 0V	直流电源 0V 回路
2	B 通道传感信号输入	连接 PNP 型传感器输出端子
3	直流 24V	提供传感器工作用+24V 电源

JP3: 油位开关信号输入端子

端子号	定　　义	说　　明
1	直流 0V	直流电源 0V 回路
2	油位开关信号输入	在 2-3 号端子间接开关
3	直流 24V	提供油位开关工作用 24V 电源

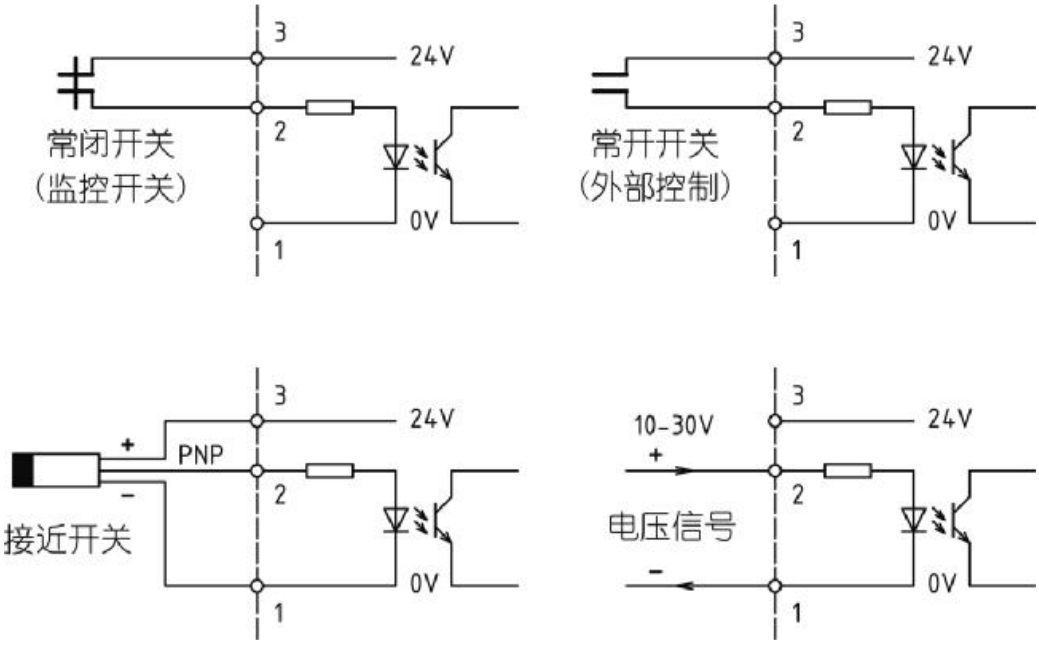
JP4: 压缩空气压力开关信号输入端子

端子号	定　　义	说　　明
1	直流 0V	直流电源 0V 回路
2	压力开关信号输入	在 2-3 号端子间接开关
3	直流 24V	提供压力开关工作用 24V 电源

JP5: 运行控制信号输入端子

端子号	定　　义	说　　明
1	直流 0V	直流电源 0V 回路
2	运行控制信号输入	输入 10-30V 信号，或在 2-3 号端子间接开关
3	直流 24V	提供运行控制开关工作用 24V 电源

输入端子的内部电路结构及其外部电路的典型接法如下图。



请注意：①端子提供的 24V 电源仅用于传感器和外接开关激励，带负载能力有限，切不可用于其他用途，否则可能导致控制器发生故障；②接近开关须选用空载电流≤50mA 的三线制 PNP 接近开关，以满足控制器的要求

控制器出厂时没有在外壳上开孔。用户要根据自己的实际需要开孔、连接引线。引线应当穿过 PG 防水接头引出，以保证控制器的密封。

为保护底板不被损坏，**在开孔前请先取下底板**。

10. 主要技术指标

工作电压 ----------	85V~264V, 45~65Hz
最大输出电流 ----------	>3A
润滑泵通电时间 -------	0.1 秒~9.99 秒
润滑计数 ----------	1~999 999
间歇时间 ----------	0~9999 小时 59 分钟
间歇计数 ----------	0~9999 9999
节距比 ----------	1:1~999:1
喷油调节 ----------	0~9.99 秒
外部输入信号 ----------	10V ~30V DC，输入等效电阻 5.1k
最高传感信号频率------	1000Hz (占空比 1:1)
故障继电器输出 -------	250V AC，5A Max，常闭
工作温度 ----------	-20℃~+50℃
保险丝规格 ----------	250V 0.5A (5×20)
防护等级 ----------	IP65

产品制造商： 苏州力天工业控制事业部

办公地址： 苏州市郭新西路 188 号 45 号楼 501 室

技术支援电话： 0512-68661838

技术支援邮箱： support@leetern.com

互联网网站： http://www.leetern.com
