compere®

KPM83L Line Protection & Monitoring Deivice

User Manual

HENAN COMPERE SMART TECHNOLOGY CO., LTD.

Application

Suitable for protection and monitoring of power system equipment below 35KV.

Hardware

◆ Back plugging and unplugging module, separated the strong and weak electricity; the reinforced unit chassis is designed to resist strong vibration and interference. It can be decentralized mounted in the switch cabinet for running

◆ 32-bit microcomputer processor, large-capacity RAM and Flash Memory, strong ability of data processing, logic operation and information storage, fast running speed and high reliability

◆ 16-bit high-precision A/D, high measurement accuracy

◆ Running and event reports can be saved no less than 32 recent events

◆ Graphic LCD, menu operation

Main Features

◆ Multi-tasking operating system, modular programming; good real-time performance and high reliability.

◆ Standard communication protocol for easy communication with PC monitoring or gateway.

◆ Complete circuit breaker operation loop, setting the remote control function of the circuit breaker.

◆ Protection and measurement and control integration, single device interval complete main function.

Our company reserves the right to modify this manual; if the product does not conform to the manual, please refer to the actual product description.

2021.9

Contents

1.Device brief introduction

1.1Overview

KPM83 series microcomputer comprehensive protection measure and control device realizes the protection, measurement and control functions of circuits, transformers, capacitors and motors under the voltage level of 35KV and monitoring of voltage transformers, back-up battery automatically switching, etc.

1.2 Main features

- Reinforced unit chassis is designed to resist strong vibration and interference, especially suits for harsh environments. It can be decentralized mounted in the switch cabinet for running.
- All integrated circuits use military-grade standards to ensure higher stability and reliability.
- Using 32-bit MCU as CPU, configures large-capacity RAM and Flash Memory, with strong ability of data processing, logic operation and information storage, fast running speed and high reliability.
- 16-bit A/D is used for data acquisition, data acquisition is 24 points per week, and the protection measurement accuracy is high.
- The graphic LCD screen can display various operating states and data in real time, the information is detailed and intuitive, and the operation and debugging are convenient.
- Large capacity information record: It can save no less than 32 recent events historical reports, with action parameters, power-down retention, easy for accident analysis.
- Adopts MODBUS-RTU protocol with RS-485 communication interface. The networking is economical and convenient, and can directly communicate with the computer monitoring and gateway.

1.3 Function & configuration

Function \ Model		KPM 83L	KPM 83T	KPM 83TD	KPM 83C	KPM 83M	KPM 83MD	KPM 83P	KPM 83B	KPM 83U
Protection function	Cut-off acting	v	v							
	Differential cut-off acting protection			v			v			
	Over-current I	v	v		v	v				v
	Over-current II	v	v		v	v				
	Negative sequence over-current I					v				
	Negative sequence over-current II					v				
	Inverse time overcurrent					v				
	Zero sequence overcurrent	v	v		v	v				v
	Unbalanced zero sequence over-current				v					
	Overload	v	v			v				
	Inverse time overload		v							
	Overvoltage protection	v			v	v				
	Zero sequence overvoltage				v	v				
	Unbalanced zero sequence overvoltage				v					
	Low voltage protection	v			v			v		
	Low voltage protection I					v				
	Low voltage protection II					v				
	Low voltage inverse time zero sequence		v							
	Voltage extraction									
	Short circuit protection					v				

Protection function	Overheating protection					v				
	Post acceleration	v								
	Reclose	v								
	PT disconnection	v	v		v			v		
	Discharge PT overvoltage				v					
	Non-electrical protection		v	v			v			
	Low-frequency load shedding	v								
	Power direction	v								
	Ratio Difference Protection of Second Harmonic Braking			v			v			
	CT break detection and blocking function			v			v			
	Fault Recording						v			
	Long startup time protection					v				
	Charge protection								v	v
	Insulation monitoring							v		v
	Control loop disconnection									
Measurement function	Circuit breaker remote control split output signal	v	v	v	v	v				
	IA,IB,IC,UA,UB,UC,Ia2,Ib2,Ic2,U0, I0,P,Q,F,cosΦ,etc	v	v		v	v				
	Iah,Ibh,Ich,Ia1,Ib1,Ic1						v			
	Unbalanced current real-time display			v						

2.Technical Parameters

2.1 Rated parameters

Rated DC voltage: 220V / 100V

Rated AC data: Phase voltage 100/3V

Zero-sequence voltage 100V

AC current 5A / 1A

Zero-sequence current 1A

Rated frequency 50Hz

Thermal stability:	AC voltage loop	Long term running	1.2Un
	AC current loop	Long term running	1.2In
		1s	40In
	Zero-sequence current loop	Long term running	1A
		1s	40A

2.2 Power consumption

AC voltage loop: < 1VA/phase(rated)

AC current loop: < 1VA/phase (5A); < 0.5VA/phase (1A)

Zero-sequence current loop: < 0.5VA

Protection power loop: < 12W (normal condition); <15W(Under the protectionaction)

2.3 Environmental conditions

Working Environment:

Operating temperature:-25℃~+55℃. The wettest month's monthly average maximum relative humidity is 90%,while the monthly average minimum temperature of the month is 25 °C and no condensation in the surface,While the maximum temperature is +40 °C,the average maximum humidity does not exceed 50%

Storage Environment:

Storage temperature: -30℃ ~ +75℃; Relative humidity: <80%

Stored rain and snow proof indoors. Ambient air does not contain acidic, alkaline or erosive and explosive gas; no excitation is applied under the limit value, there is no irreversible change in the device. After the temperature is restored, the device should work normally.

Atmospheric pressure: (80kPa-110kPa <relative altitude <2km)

2. 4 EMC performance

Pulse group immunity: IEC61000-4-5, level 4

Can stand with of 1MHz and 100kHz damped oscillation wave pulse group leveling test according to G B/T14598. 13-1998 (the first half-wave voltage amplitude is 2. 5kV, the differential mode is 1kV)

Fast transient immunity: GB/T14598. 10-1997, level 3

Radiated electromagnetic field immunity: GB/T14598.9-1995, level 3

Electrostatic discharge: GB/T14598.14-1998-4.1, level 3

2.5 Electrical insulation performance

Insulation resistance: Using open circuit voltage 500V measurement instrument to test between each charged conductive circuit and ground (outer casing or exposed non-charged metal parts), between AC and DC circuit, between AC current circuit and AC voltage circuit, the instrument tests its insulation resistance value should not be less than 100MΩ.

Medium strength: The device communication loop and the 24V weak electric input and output terminal grounded can withstand the AC voltage of 50Hz and 500V (effective value).The test lasts for 1min without breakdown or flashover phenomenon; some of the charged conductive circuits are grounded separately (between the outer casing and the exposed non-charged metal parts), between the AC and the DC loop,between the AC current loop and the AC voltage loop, can withstand AC voltage of 50Hz,2kV (effective value),and the test lasts for 1min without breakdown or flashover phenomenon.

Impulse voltage: the device communication loop and 24V weak electric input and output terminal grounded can withstand 1kV (peak) standard lightning wave impact test; its charged conductive terminals are respectively grounded, between AC and DC loop, between the AC voltage loop and AC current loop, it can withstand the 5kV (peak) standard lightning wave impact test.

2.6 Mechanical properties

Vibration response: IEC255-21-1:1998, level 1
Vibration durability: IEC255-21-1:1998,level 1
Impact response: IEC 255-21-2, level 1
Impact durability: IEC 255-21-2, level 1
Collision: IEC 255-21-2, level 1

2.7 Measurement accuracy

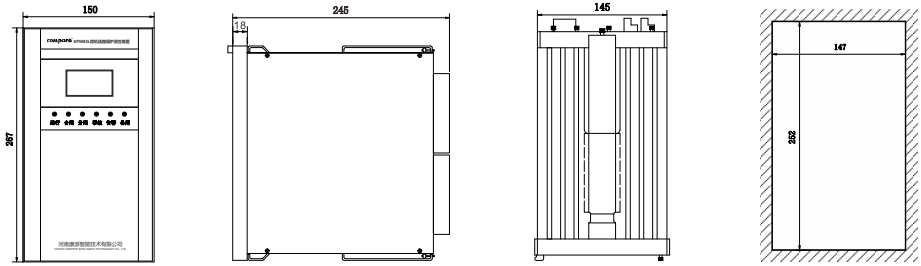
Analog value measurement error ≤±0.2%

Power measurement error ≤0. 5%

Digital input voltage 220V resolution is no more than 2ms
Pulse input voltage 24V pulse width is not less than 10ms

3.Device structure and operation description

3.1 Shape and opening size



3. 2 Button indication

The human-computer interaction interface provides management functions and external communication functions for the device. The KPM83 series microcomputer integrated protection and control device adopts a 128*64 LCD screen with backlight to provide a friendly man-machine operation interface.

Device appearance as below:

▲-- Cursor turn up or menu turn up ◄-- Cursor move left +-- Letters & numbers increase

▼-- Cursor turn down or menu turn down ►-- Cursor move right - -- Letters & numbers decrease

Confirmation – Present interface confirmation Exit – Exit current interface

Reset – reset signal of accident and alarm Backup – Used for internal debugging

Note: There are 6 LED indicators on the panel, which are

Operation--Work status indicator, the device will flash continuously during normal operation, otherwise it will continue to light (green)

Switching-in – Lights up when the circuit breaker is in the closed position (red)

Switching-off—Lights up when the circuit breaker is in the sub-position (green)

Accident--Lights up when the monitored system has a fault signal (red)

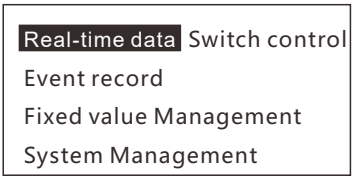
Alarm -- Lights up when the monitored system has an alarm signal (red)

Alternate--reserved for other devices

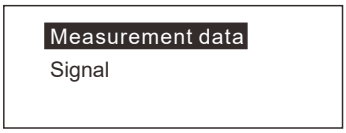
3. 3 Operation instruction

Protection Set uses a unified style user interface, friendly interface. According to the hierarchical menu mode, the prompts can be easily operated. Here is a brief introduction to the contents of the next menu.

Main menu as below

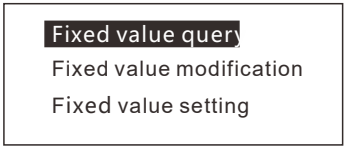


1. Real-time data includes measurement data and signal. When selected, the status of the corresponding data and signal will be displayed



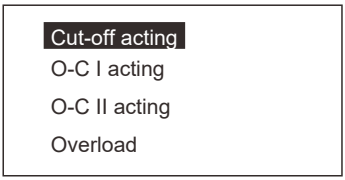
2. The event record shows the 32 recent events. The one displayed below the first page is the latest event. The event record won't be lost after the device is powered off.

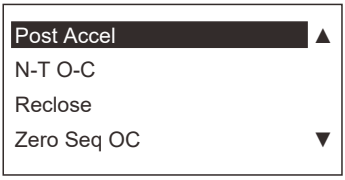
3. Fixed value Management including three menu:

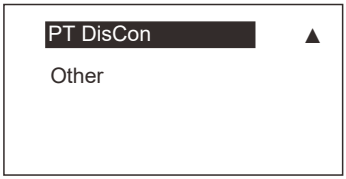


The fixed value query and modification have the same interface. The modification interface can modify the fixed value. The query interface cannot. After the fixed value has been modified, retreat to fixed value management interface and select the 'fixed value setting' menu, press the Enter key to confirm the value after input the password '000000'; Pls modify the fixed value referring to the fixed value table.

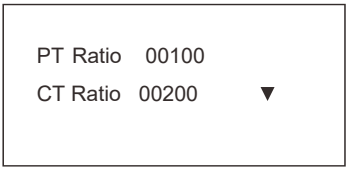
The fixed value setting is divided into several groups according to the function. Taking the circuit protection as an example, the following setting groups are available.

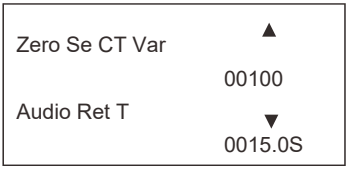






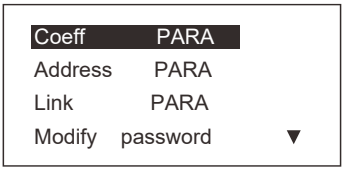
'Other' includes as shown below, like setting PT CT ratio:

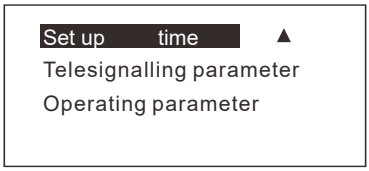




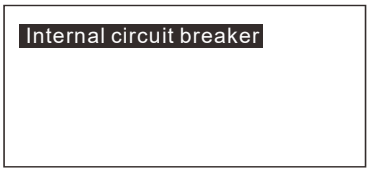
4. System management includes:

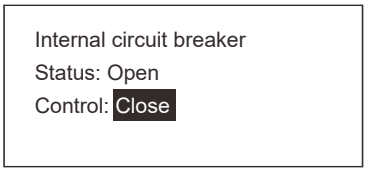
The system parameter is used to correct the measurement quantity; The address parameter is the local address of the device in communication;The password modification is used to confirm the operation authority of the device. It can be debugged by the technician with the operation authority, or press the enter key to save after the setting the parameters fixed value according to the setting table, the initial password is 000000. The communication parameters are used to set the communication baud rate; the time setting is used to modify the real-time clock of the device itself; the remote signal parameter is used to set each switch value function definition and the acquisition mode setting in the digital input circuit; the operation parameter is used to select the display mode of the device;





5.The switch control mainly controls several devices connected to protection device by the control circuit:





4.KPM83L Microcomputer line protection measurement and control device

4.1 Overview

KPM83L Microcomputer line protection measurement and control device is mainly used for circuit comprehensive protection, control and measurement under 35KV voltage.

4.2 Protection function

No	Protection function	No.	Protection function
1	Cut-off acting	8	Overvoltage protection
2	Two segment time limit overcurrent	9	Low voltage protection
3	Reverse time overcurrent	10	Low frequency load shedding
4	Overload	11	Power direction
5	Post-acceleration	12	PT disconnection
6	Reclose	13	
7	Zero sequence overcurrent		

4.3 Measurement and control

16 wire telesignalling digital input acquisition

Remote control of circuit breaker, signal output(alarm signal, protection action signal, power disappearance signal, Reclose action signal, cut-off acting signal, overcurrent action signal, zero-sequence overcurrent signal);

IA, IB, IC, Ua, Ub, Uc, Ia2, Ib2, Ic2, 0U, I0, P, , QF, COS φ medium analog value;

Event sequence recording（SOE）won't loss when there is power loss.

4.4 Technical parameters

Content / Index	Overcurrent	Zero sequence overcurrent	Reclose	Post acceleration	Low frequency load shedding	Low voltage protection	Overvoltage protection
Voltage fixed value						0.1Un-1Un	0.5Un-1.3Un
Current fixed value	0In - 20In	0In -20In		0In -20In			
Time fixed value	0s- 60s	0s- 60s		0.02s- 1s		0s - 60s	0s- 60s
Fix value error		<5%	<5%	<5%	<5%		
Optional fixed value error	<5%						
Reclosing time			0.1s-25s				
Sensitive angle	30°.45°.60°						
Frequency error					<0.01Hz		
Low frequency fixed value					46-54Hz		
Low voltage blocking fixed value					0Un-1Undf/dt		
df/dt blocking fixed value					0Hz/s - 10Hz/s		
Current blocking fixed value					0In-1In	0.1In-1In	

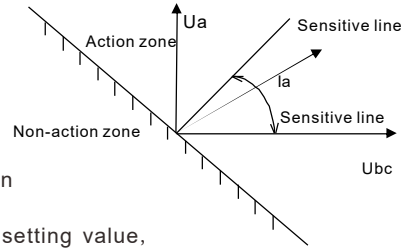
4.5 Analog input

The analog input is: protection current Ia2, Ib2, Ic2, I0, used for overcurrent protection and zero sequence overcurrent protection; measuring current IA, IB, IC for current monitoring and power calculation; voltage Ua, Ub, Uc acts as a voltage blocking component and measures voltage and power for overcurrent, direction, and low frequency load shedding; U0 is zero-sequence voltage input, used for determining the direction in zero-sequence protection; Ux is the decimation voltage, as a reclosing gate checking non-voltage/ synchronism input.

4.6 Protection principle

1.Overcurrent protection

The device is equipped with three-stage current protection, Cut-off acting + two-stage definite time limit. The current and time of each segment can be set independently, and the control word can be separately set to control the retreat of the protection of this segment.

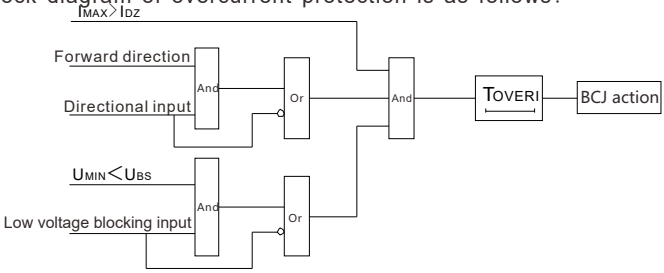


Any of phase current amplitude is greater than the setting value, starts component action.

The current protection blocking components are: low voltage blocking, PT disconnection blocking, direction locking, all of them can be set and retracted by setting.

The directional element adopts the 90° wiring mode, and the schematic diagram of the directional component action range is as shown in the right (taking Ia as an example).

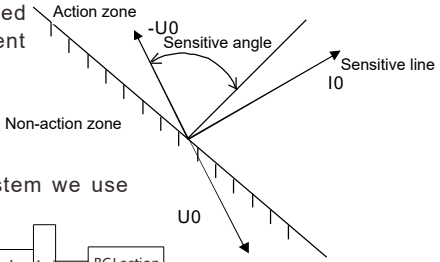
The logical block diagram of overcurrent protection is as follows:



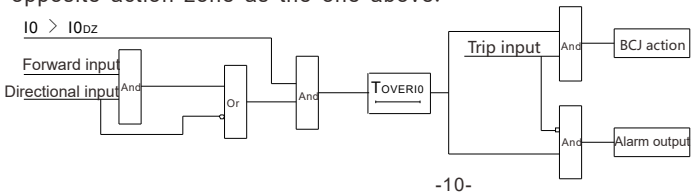
2. Zero-sequence overcurrent protection

Zero-sequence over-current protection is set for the grounding system. When the system is a small-current grounding system, the zero-sequence protection can be set to act on the signal, the zero-sequence protection acts on the trip or signal, or can be selected by the control word, and can be selected by control word whether to block by direction.

The direction of zero-sequence overcurrent is divided into large current grounding system and small current grounding system. In the fault of large current grounding system, the zero-sequence current leads the zero-sequence voltage 95 ° -110 °. So we set a sensitive angle of 70 °, as shown on the right.



For the direction of the small current grounding system we use the opposite action zone as the one above.



3. Overload

Overload protection is mainly used in overcurrent caused by overload when the circuit is abnormally operated. Overload protection can be set to trip or alarm, and the functions is set by the control word.

4. Post-acceleration

The device is equipped with post-acceleration protection. The acceleration protection after closing includes the manual close of the fault acceleration tripping and the automatic close of the fault acceleration tripping.

Protection principle: The current after the reclosing is greater than the fixed value of the post-acceleration will accelerate the tripping. The control word can be set to control the acceleration and retreat of the protection.

5. Reclose

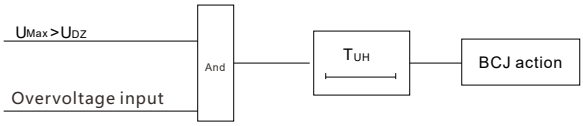
There are two ways to start the three-phase one-time reclose: protection start and non-corresponding start. The function of reclose can be used or exited according to the setting control word. When the reclose is not working, u can choose the fixed control word to exit. The reclose mode can be selected by the setting control word to not check the synchronism and non-voltage, or check the synchronism and non-voltage. Check the synchronous/ check the line voltage without pressure is the extracted voltage. The reclose must be put in after the charging is completed, the line is in normal operation, there is no external blocking reclosing signal, and the charging is completed after 15s delay.

Reclose locking signal is: manual tripping and automatic tripping

6. Overvoltage protection

Overvoltage protection is to prevent the electrical equipment from being damaged by voltages above 1.1Un for a long time. Overvoltage protection adopts line voltage in order to avoid the use of phase voltage in the single-phase grounding caused by overvoltage protection mis operation.

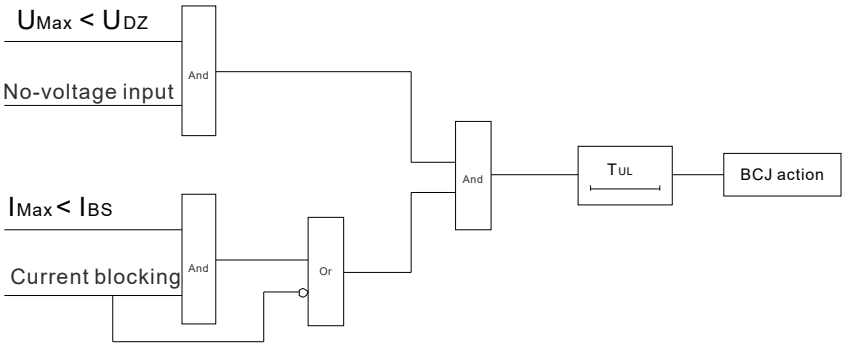
The logic block diagram of overvoltage protection is as follows:



7. Low-voltage protection

The low-voltage protection function trips according to the control word when it detects that the power supply voltage drops below the set value. In order to prevent malfunction of the voltage transformer circuit disconnection, the current blocking is added. The protection device output is blocked when any phase current is greater than the blocking current setting.

The logical block diagram of the Low-voltage protection is as follows:



8. PT disconnection check

The device has a PT disconnection check function. It will send an alarm signal when detects the PT is disconnected.

PT disconnection criterion:

① There is a phase voltage less than a fixed value, and a phase current is greater than 0.04In, used to detect three-phase voltage loss and asymmetric disconnection;

② The negative sequence voltage is greater than the fixed value, used to detect asymmetric disconnection.

After satisfying any of the above conditions, the device reports that the PT is disconnected after 3s delay.

The criterion ① is mainly used to determine the symmetry three-phase disconnection, also as supplement of the asymmetric disconnection at the same time.

The current blocking condition is added to prevent the protection device falsely transmitting an alarm signal when no voltage is applied during the debugging process.

The criterion ② is specifically used to determine whether there is PT asymmetric disconnection.

9. Low frequency load shedding function

The device is equipped with low-frequency load shedding function with low voltage blocking, current blocking and slip blocking. When the device is put into operation, if the frequency exceeds its normal range (45Hz-55Hz), the low frequency load shedding function is blocked. If the voltage is too low, it may be a fault state. The protection device should trip and block the low frequency load shedding function. If the current is too small, it may not be caused by the frequency reduction caused by this circuit. Even if the current is reduced, it still won't be functioning, so the protection device will block the low frequency load shedding function too. The A and C phases of the device with larger currents will be blocked. When the circuit is started with a large load such as a motor, the system frequency is rapidly reduced, so the slip lock is used.

10. Control loop disconnection

The device is equipped with a control loop disconnection monitoring function, which uses the combined contacts of the closing and tripping relays to judge whether the control loop is normal through software. It is constituted by 

. When the fault occurs, the protection device will send control loop disconnection alarm signal after 0.5 second delay.

11. About Bus coupler

This device can be used for the bus coupler protection. If there are special requirements, pls tell us before ordering.

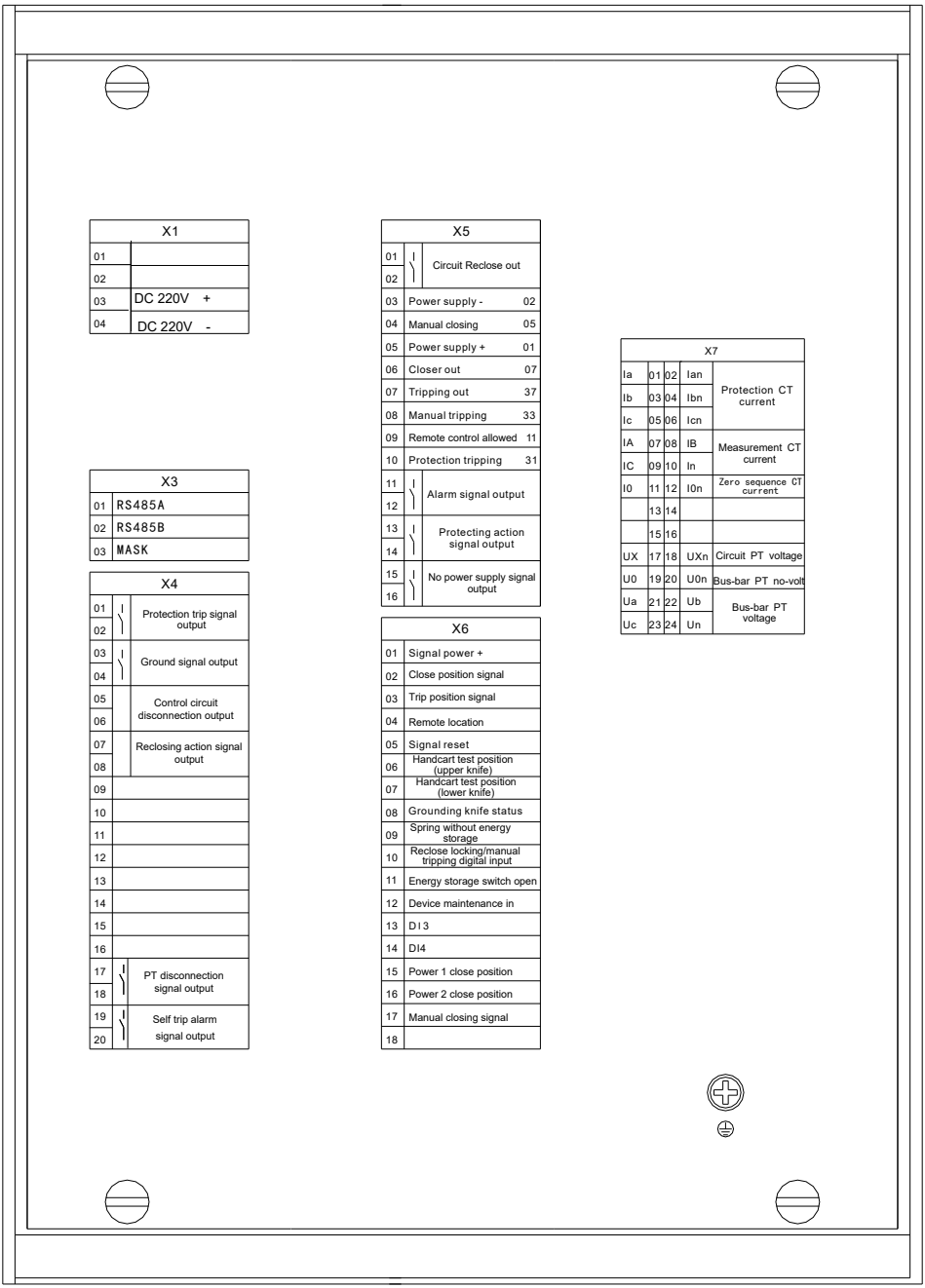


Fig 1 KPM83L Microcomputer line protection measurement and control device terminal diagram (DC with anti-trip)

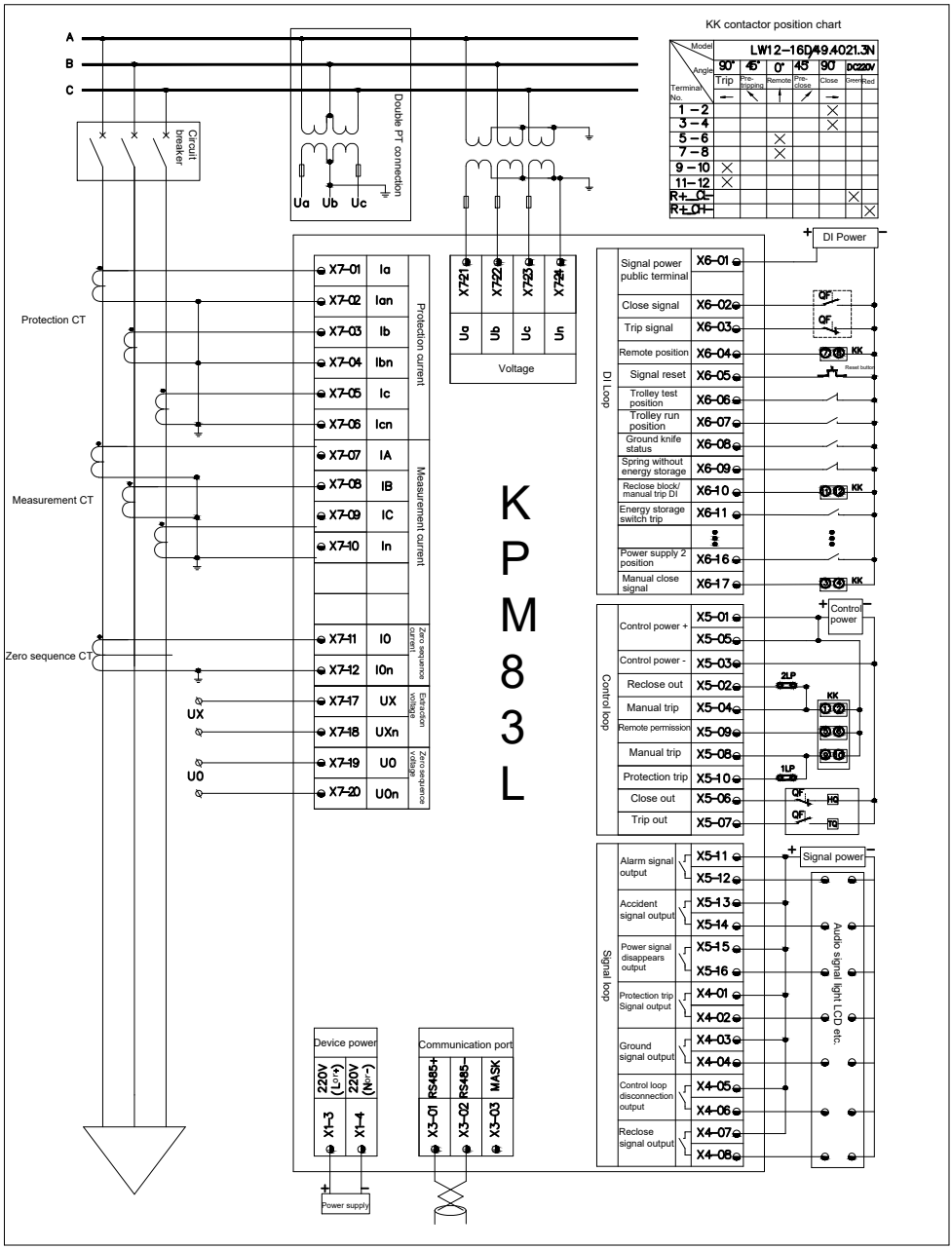
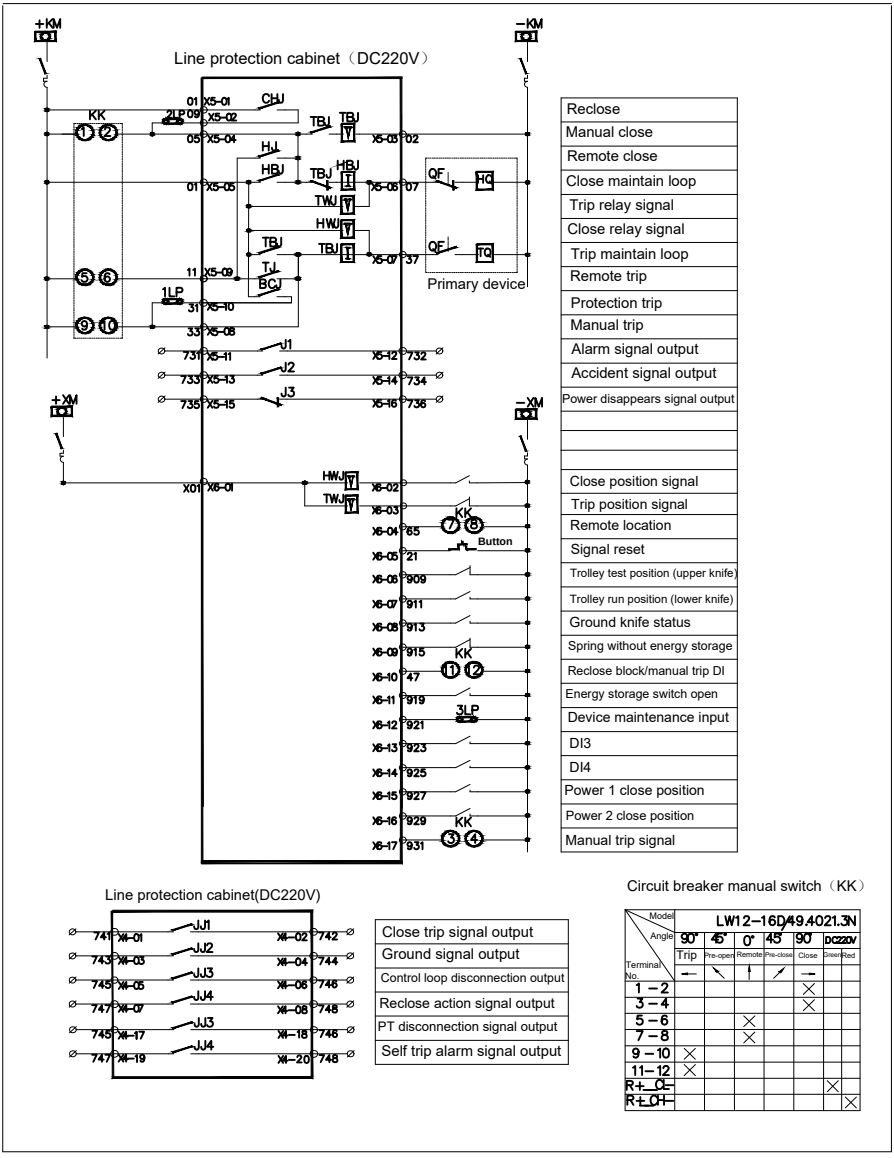


Fig 2 KPM83L Microcomputer line protection measurement and control device wiring diagram (DC with anti-trip)



Note:

1. Remote position means the control through the internal processing of the protection device. The processing is not through the protection device is in-place.
2. This circuit diagram is in DC operation. If it is AC operation, please specify when ordering.
3. XM is the signal bus. In the DC control system, the signal bus and control bus can use the same power supply; if there is a separate signal power supply in the system, the voltage level (DC220V or DC24V) must be specified when ordering.

Fig 3: KPM83L microcomputer line protection measure and control device control principle (DC with anti-trip)

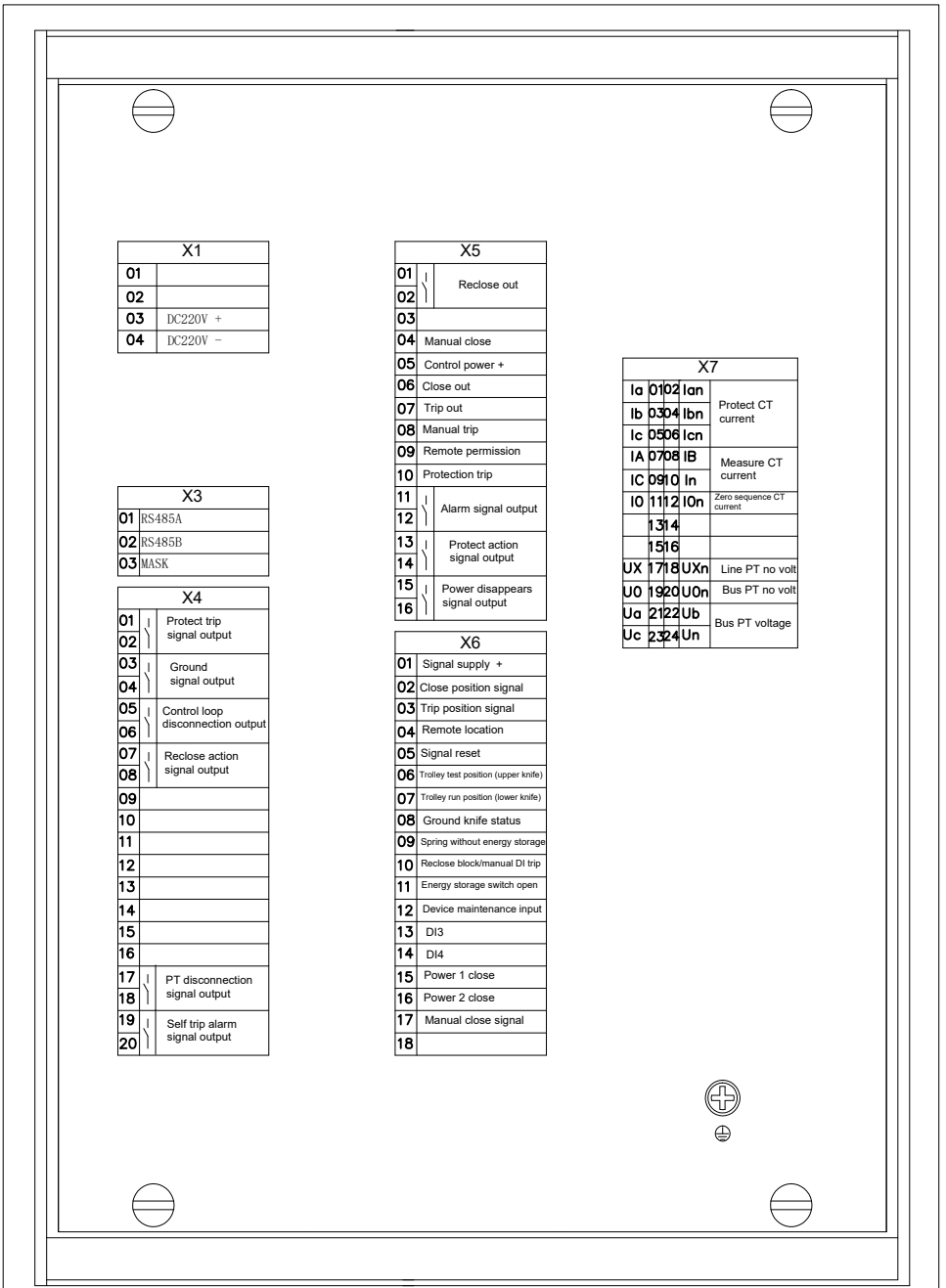


Fig 4 KPM83L Microcomputer line protection measurement and control device terminal diagram (DC without anti-trip)

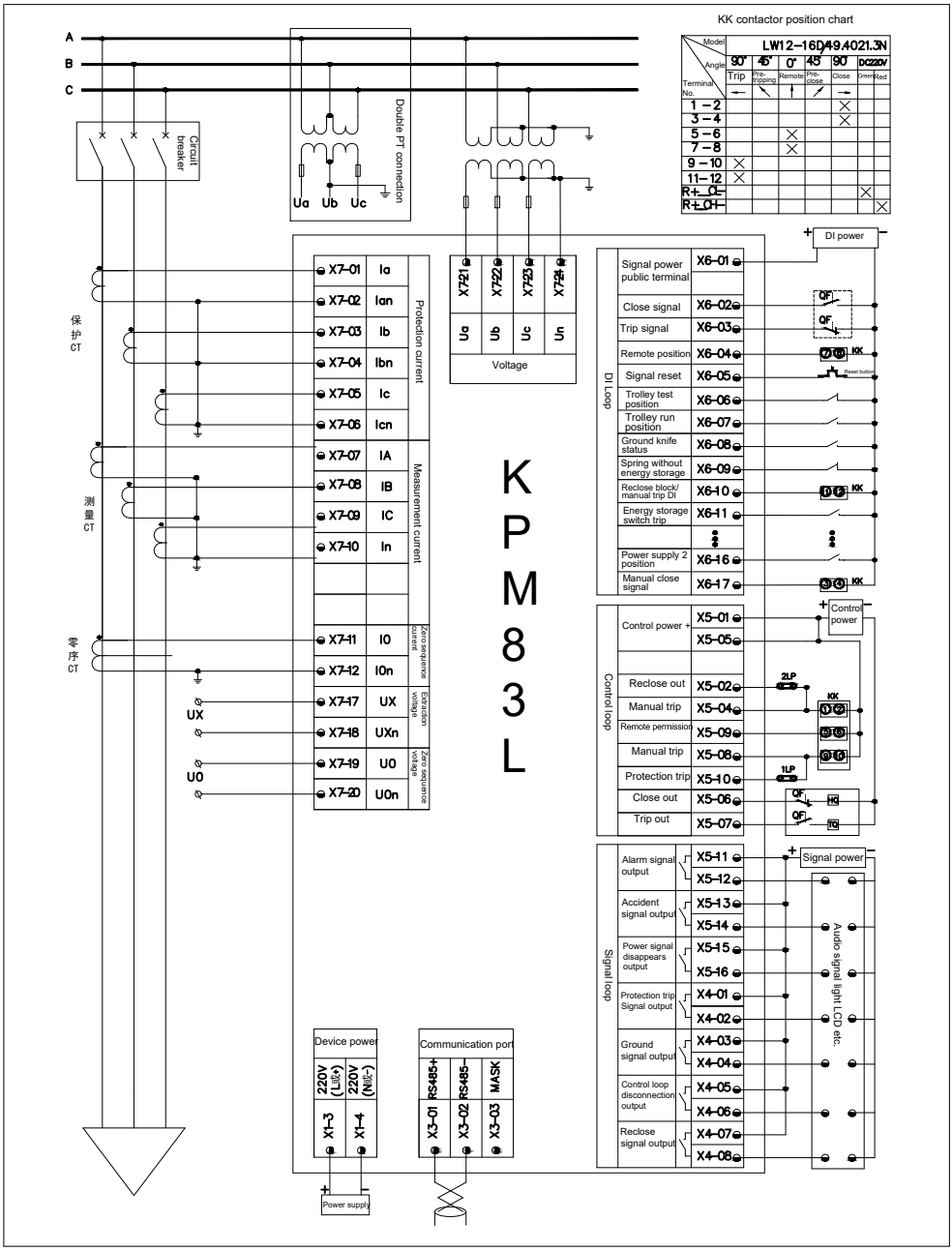
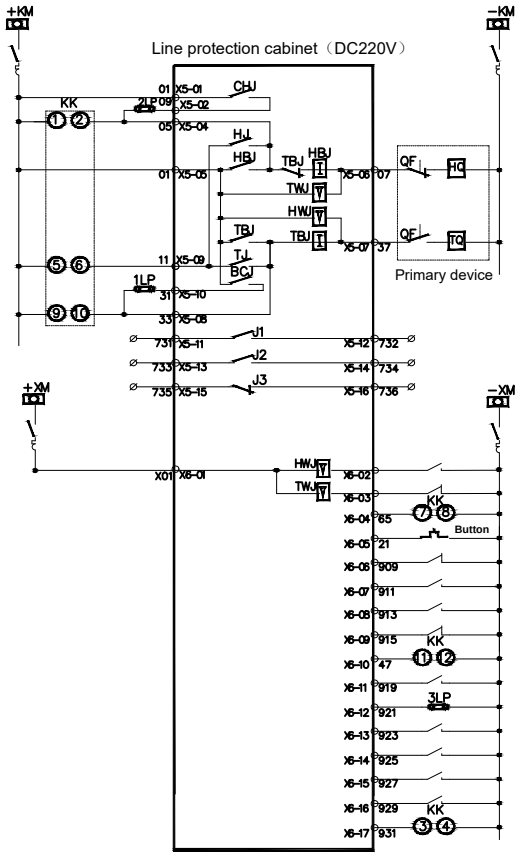
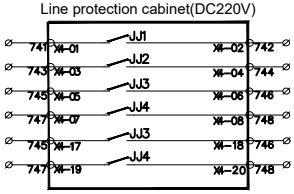


Fig 5 KPM83L Microcomputer line protection measurement and control device wiring diagram（ AC without anti-trip ）



Reclose
Manual close
Remote close
Close maintain loop
Trip relay signal
Close relay signal
Trip maintain loop
Remote trip
Protection trip
Manual trip
Alarm signal output
Accident signal output
Power disappears signal output
Close position signal
Trip position signal
Remote location
Signal reset
Trolley test position (upper knife)
Trolley run position (lower knife)
Ground knife status
Spring without energy storage
Reclose block/manual trip DI
Energy storage switch open
Device maintenance input
DI3
DI4
Power 1 close position
Power 2 close position
Manual trip signal



Close trip signal output
Ground signal output
Control loop disconnection output
Reclose action signal output
PT disconnection signal output
Self trip alarm signal output

Circuit breaker manual switch（KK）

Model / Angle		LW12-16D/49.4021.3N					
		90°	45°	0°	45°	90°	DC220V
Terminal No.	Trip	Pre-open	Remote	Pre-close	Close	Green	Red
1－2						×	
3－4						×	
5－6				×			
7－8				×			
9－10	×						
11－12	×						
R+_CL-							×
R+_CH-							×

Note:

1. Remote position means the control through the internal processing of the protection device. The processing is not through the protection device is in-place.
2. This circuit diagram is in DC operation. If it is AC operation, please specify when ordering.
3. XM is the signal bus. In the DC control system, the signal bus and control bus can use the same power supply; if there is a separate signal power supply in the system, the voltage level (DC220V or DC24V) must be specified when ordering.

Fig 6: KPM83L microcomputer line protection measure and control device control principle (DC without anti-trip)

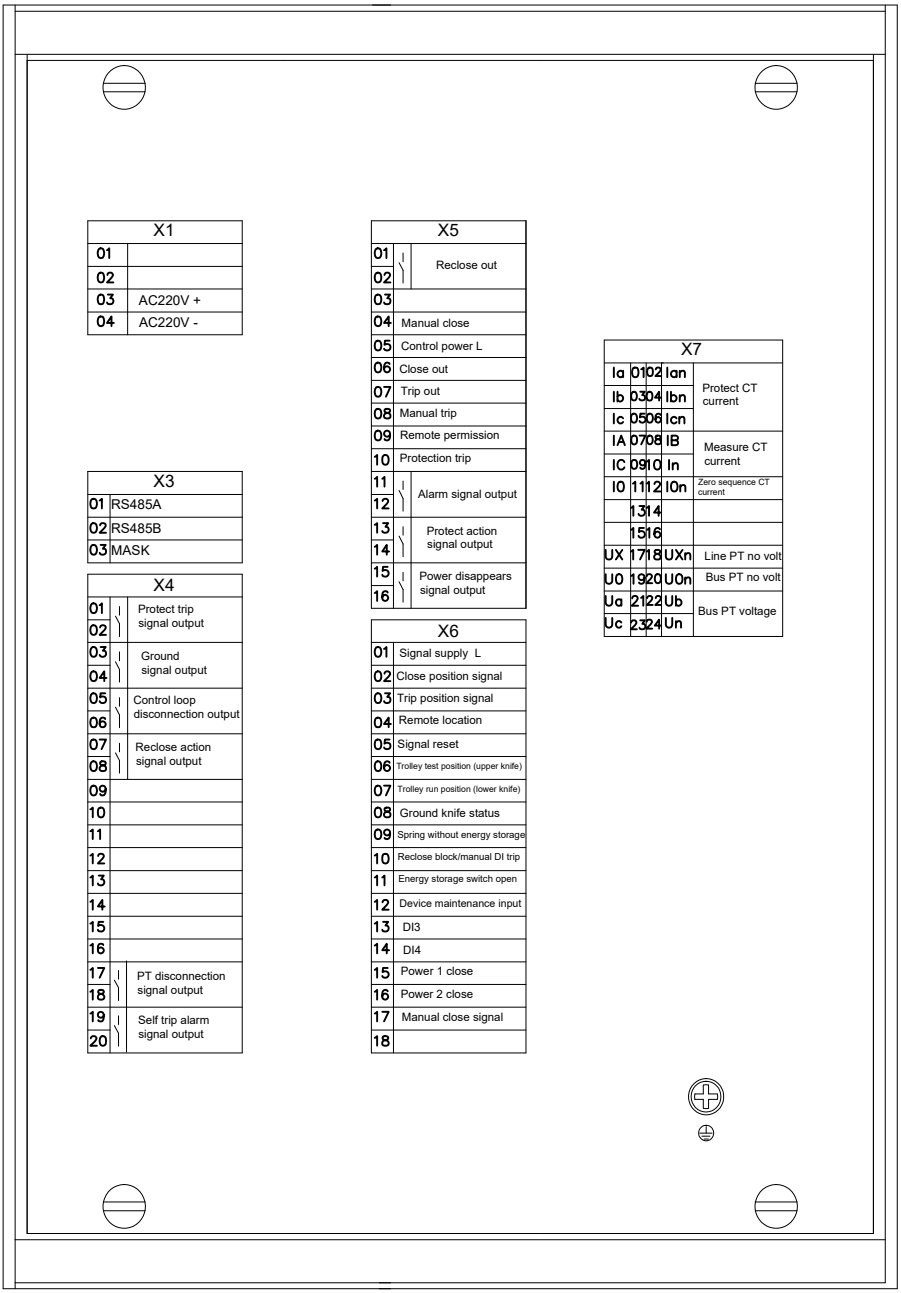


Fig 7: KPM83L microcomputer line protection measure and control device terminal diagram (AC without anti-trip)

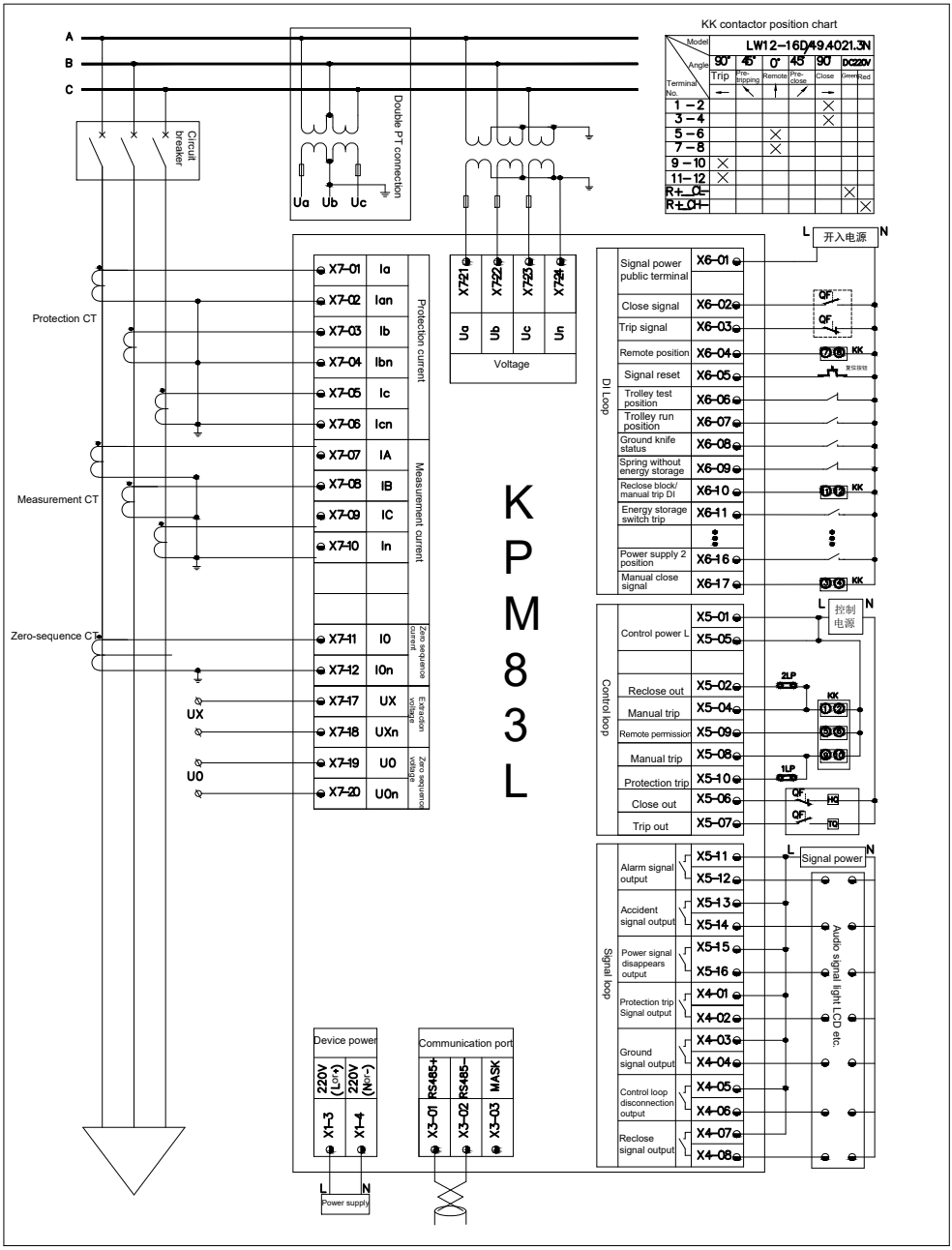
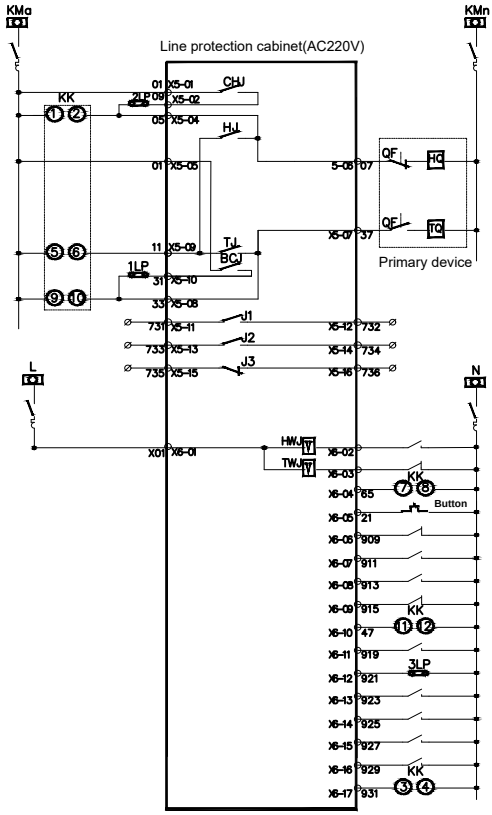
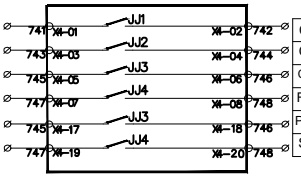


Fig 8: KPM83L microcomputer line protection measure and control device wiring diagram (AC without anti-trip)



Reclose
Manual close
Remote close
Close maintain loop
Trip relay signal
Close relay signal
Trip maintain loop
Remote trip
Protection trip
Manual trip
Alarm signal output
Accident signal output
Power disappears signal output
Close position signal
Trip position signal
Remote location
Signal reset
Trolley test position (upper knife)
Trolley run position (lower knife)
Ground knife status
Spring without energy storage
Reclose block/manual trip DI
Energy storage switch open
Device maintenance input
DI3
DI4
Power 1 close position
Power 2 close position
Manual trip signal



Close trip signal output
Ground signal output
Control loop disconnection output
Reclose action signal output
PT disconnection signal output
Self trip alarm signal output

Circuit breaker manual switch（KK）

Model	LW12-16D/49.4021.3N					
Angle	90°	45°	0°	45	90	DC220V
	Trip	Pre-open	Remote	Pre-close	Close	Green Red
Terminal No.	—	＼	|	／	—	
1－2					×	
3－4					×	
5－6			×			
7－8			×			
9－10	×					
11－12	×					
R+_CL-						×
R+_CH-						×

Note:

1. Remote position means the control through the internal processing of the protection device. The processing is not through the protection device is in-place.
2. This circuit diagram is in AC operation. If it is DC operation, please specify when ordering.

Fig 9: KPM83L microcomputer line protection measure and control device control principle (AC without anti-trip)