compere®

KPM83 Multifunction Protecting Measuring and Controlling Unit 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.

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	Quick-break	v	v							
	Differential quick-break 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	v								
	Short circuit protection					v				

Protection functio	Overheating protection					v				
	Post acceleration	v								
	Recloser	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%

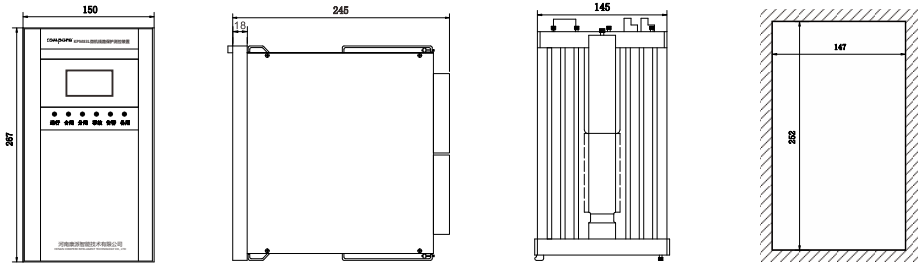
Power measurement error ≤0. 5%

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)

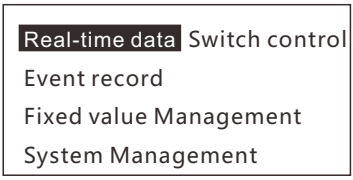
Alarm -- Lights up when the monitored system has an alarm signal (red)

Alternate--reserved for other devices

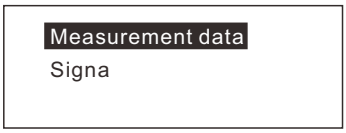
3. 3 Operation instruction

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

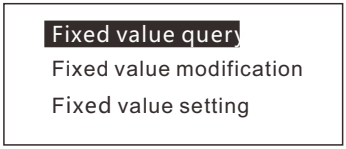


1. Real-time data includes measurement data and signal. When selected, the status of the corresponding data and signal will be displayed



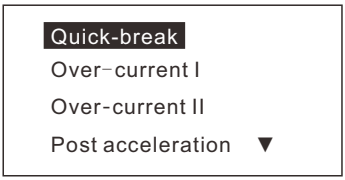
2. The event record shows the 32 recent events. The one displayed below the first page is the latest event. The event record won't be lost after the device is powered off.

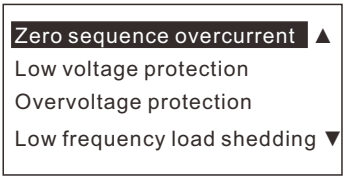
3. Fixed value Management including three menu:

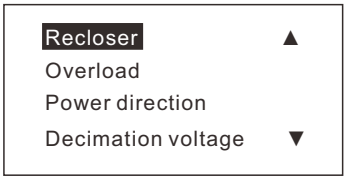


The fixed value query and modification have the same interface. The modification interface can modify the fixed value. The query interface cannot. After the fixed value has been modified, retreat to fixed value management interface and select the 'fixed value setting' menu, press the Enter key to confirm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

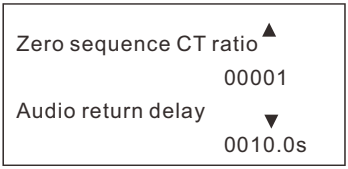
The fixed value setting is divided into several groups according to the function. Taking the circuit protection as an example, the following setting groups are available.

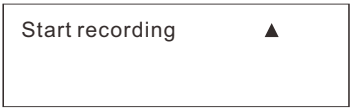






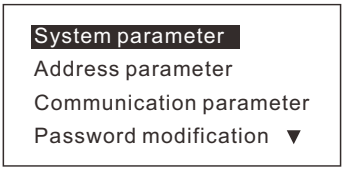
'Other' includes as shown below, like setting PT CT ratio:

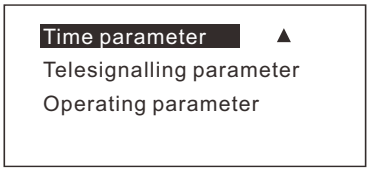




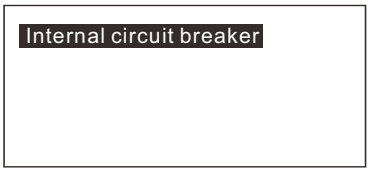
4. System management includes:

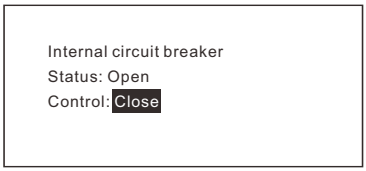
The system parameter is used to correct the measurement quantity; The address parameter is the local address of the device in communication;The password modification is used to confirm the operation authority of the machine. It can be debugged by the technician with the operation authority, or press 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 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 circuit protection measurement and control device

4.1 Overview

KPM83L Microcomputer circuit 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	Quick-break	8	Zero sequence overcurrent
2	Two segment time limit overcurrent	9	Overvoltage protection
3	Reverse time overcurrent	10	Low voltage protection
4	Overload	11	Low frequency load shedding
5	Post-acceleration	12	Power direction
6	Recloser	13	PT disconnection
7	Voltage extraction		

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, recloser action signal, quick-break signal, overcurrent action signal, zero-sequence overcurrent signal);

IA, IB, IC, Ua, Ub, Uc, Ia2, Ib2, Ic2, U0, I0, P, Q, F, COSφ medium analog value;

protection event sequence recording（SOE）, Power loss is not lost.

4.4 Technical parameters

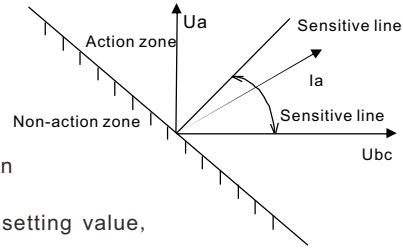
Content / Index	Overcurrent	Zero sequence overcurrent	Recloser	Post acceleration	Low frequency load shedding	Low voltage protection	Overvoltage protection
Voltage fixed value						0.1Un-1Un	0.5Un-1.3Un
Current fixed value	0In - 20In	0In -20In		0In -20In			
Time fixed value	0s- 60s	0s- 60s		0.02s- 1s		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



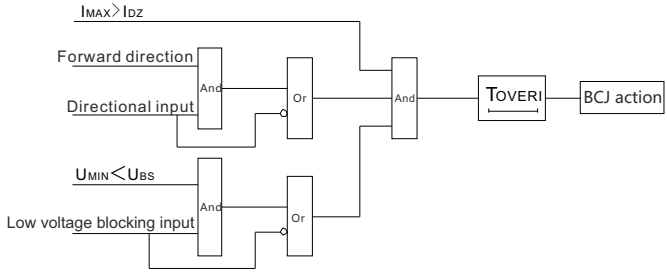
The device is equipped with three-stage current protection, quick-break + two-stage definite time limit. The current and time of each segment can be set independently, and the control word can be separately set to control the retreat of the protection of this segment.

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.

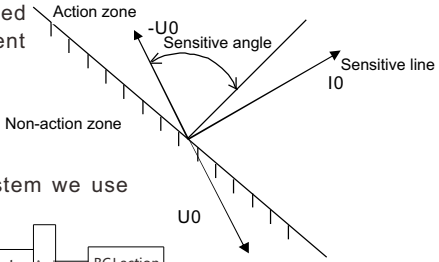
The directional element adopts the 90° wiring mode, and the schematic diagram of the directional component action range is as shown in the right (taking Ia as an example).

The logical block diagram of overcurrent protection is as follows:



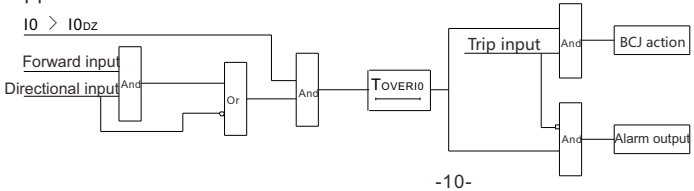
2. Zero-sequence overcurrent protection

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. Recloser

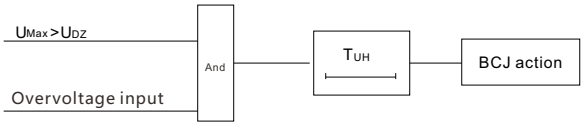
There are two ways to start the three-phase one-time recloser: protection start and non-corresponding start. The function of recloser can be used or exited according to the setting control word. When the recloser is not working, u can choose the fixed control word to exit. The recloser mode can be selected 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 recloser 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.

Recloser 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.

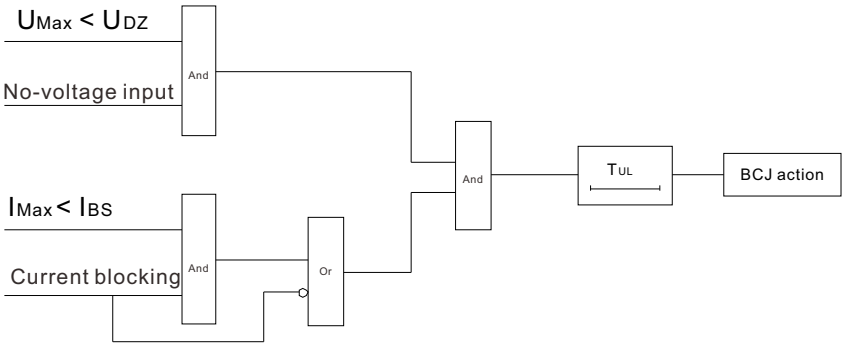
The logic block diagram of overvoltage protection is as follows:



7. No-voltage protection

The no-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 no-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. When the fault occurs, the protection device will send control loop disconnection alarm signal after 0.5 second delay.

11. Bus coupler

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

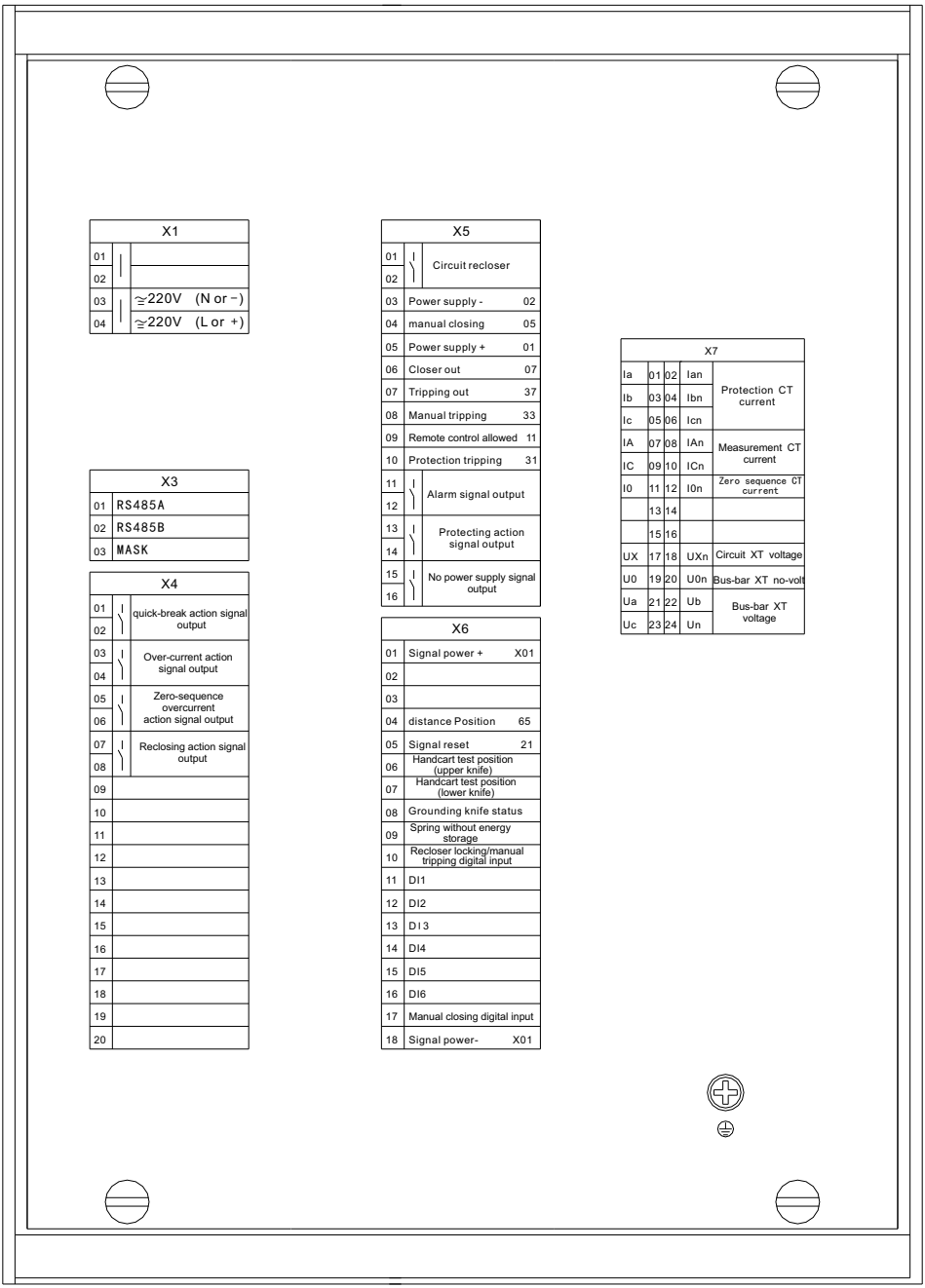


Fig 1 KPM83L Microcomputer circuit protection measurement and control device terminal diagram DC

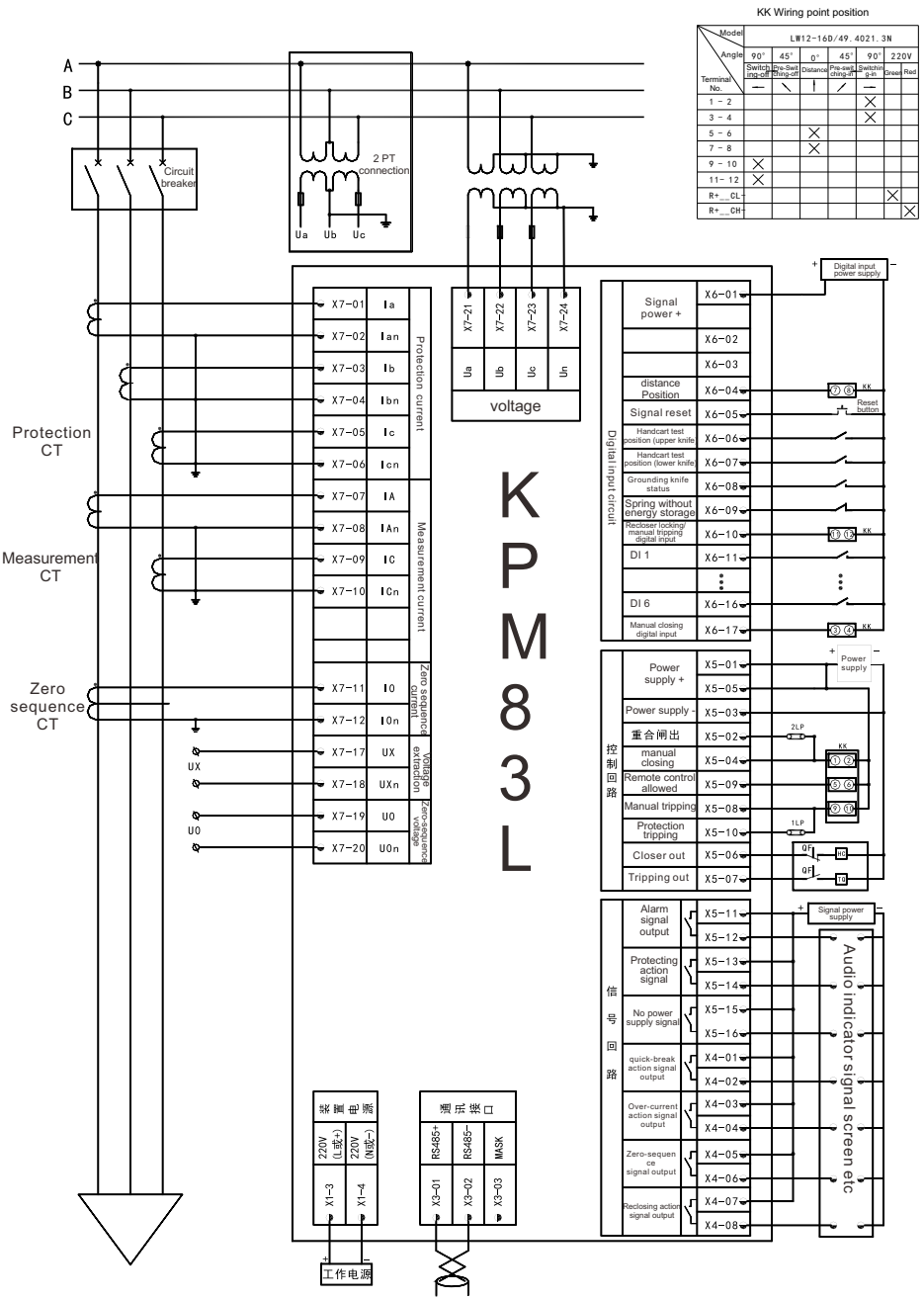
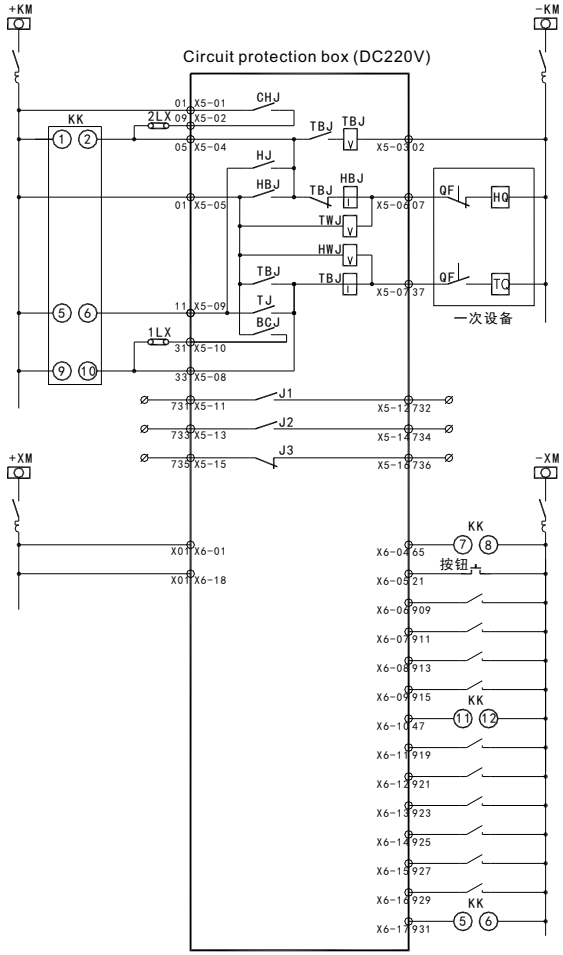
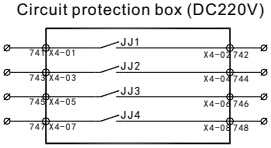


Fig 2 KPM83L Microcomputer circuit protection measurement and control device wiring diagram(DC)



Reclose
Manual close
Remote close
Closing circuit
Tripping relay signal
Closing relay signal
Tripping circuit
Remote trip
Protective trip
Manual trip
Alarm signal output
Protection action signal output
Power-off signal output
Position
Signal reset
Handcart test position (upper knife)
Handcart test position (lower knife)
Grounding knife status
Spring without energy storage
Recloser locking/ manual tripping digital input
DI1
DI2
DI3
DI4
DI5
DI6
Manual closing digital input



Quick-break action signal output
Overcurrent action signal output
Zero-sequence overcurrent action signal output
Reclosing action signal output

Circuit breaker manual switch(KK)

Mode	LW12-16D/49.4021.3N						
Angle	90°	45°	0°	45°	90°	DC220V	
Terminal No.	Trip	In-place	distance	In-place	Close	Green	Red
1 - 2	—	\	|	/	—		
3 - 4					×		
5 - 6			×				
7 - 8			×				
9 - 10	×						
11- 12	×						
R+__CL-						×	
R+__CH-							×

Note:
1. Distance position means: if the control through the internal processing of the protection device, it is distance. The internal 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 circuit protection measurement and control device control principle diagram

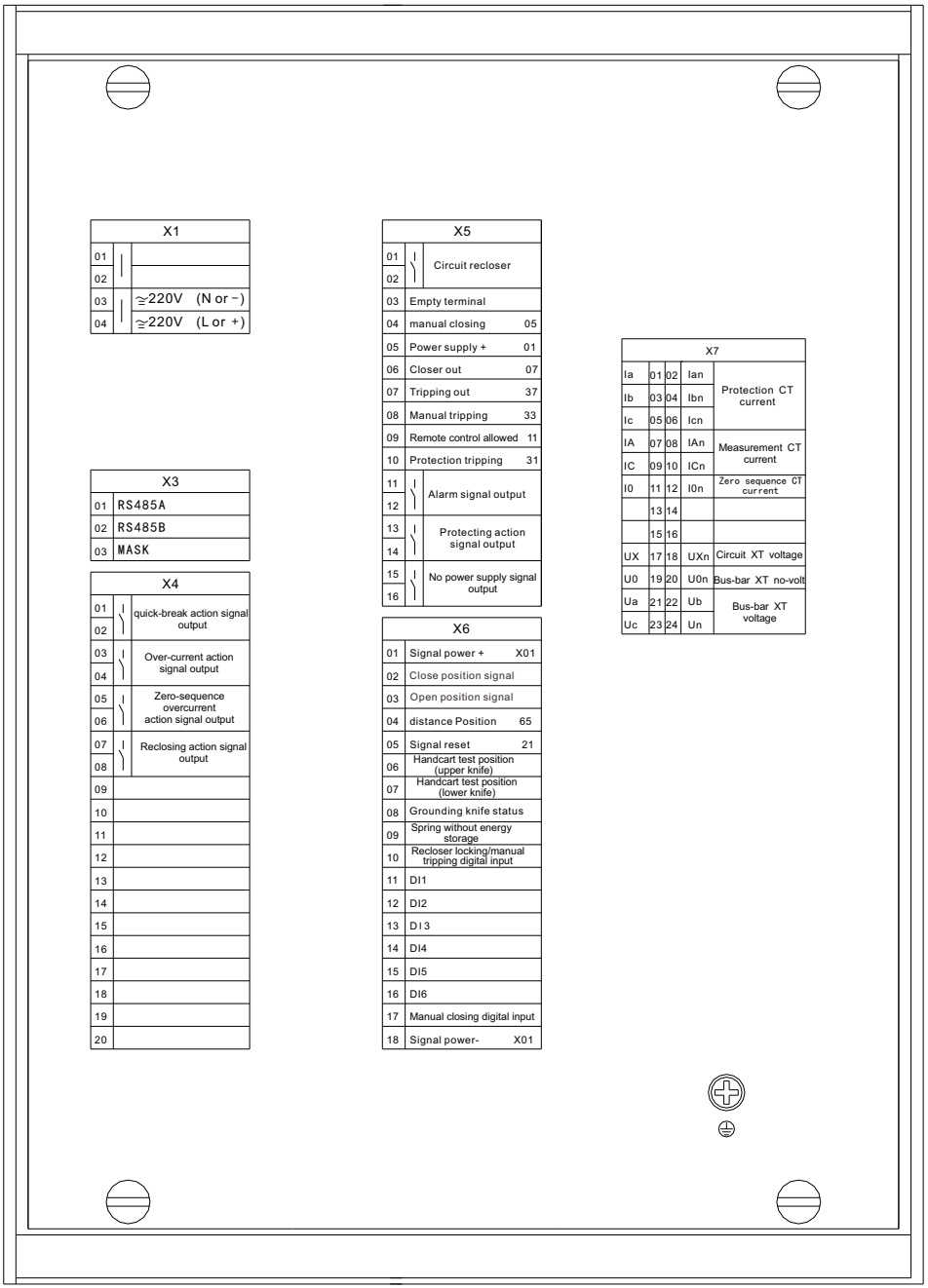


Fig 1 KPM83L Microcomputer circuit protection measurement and control device terminal diagram (AC)

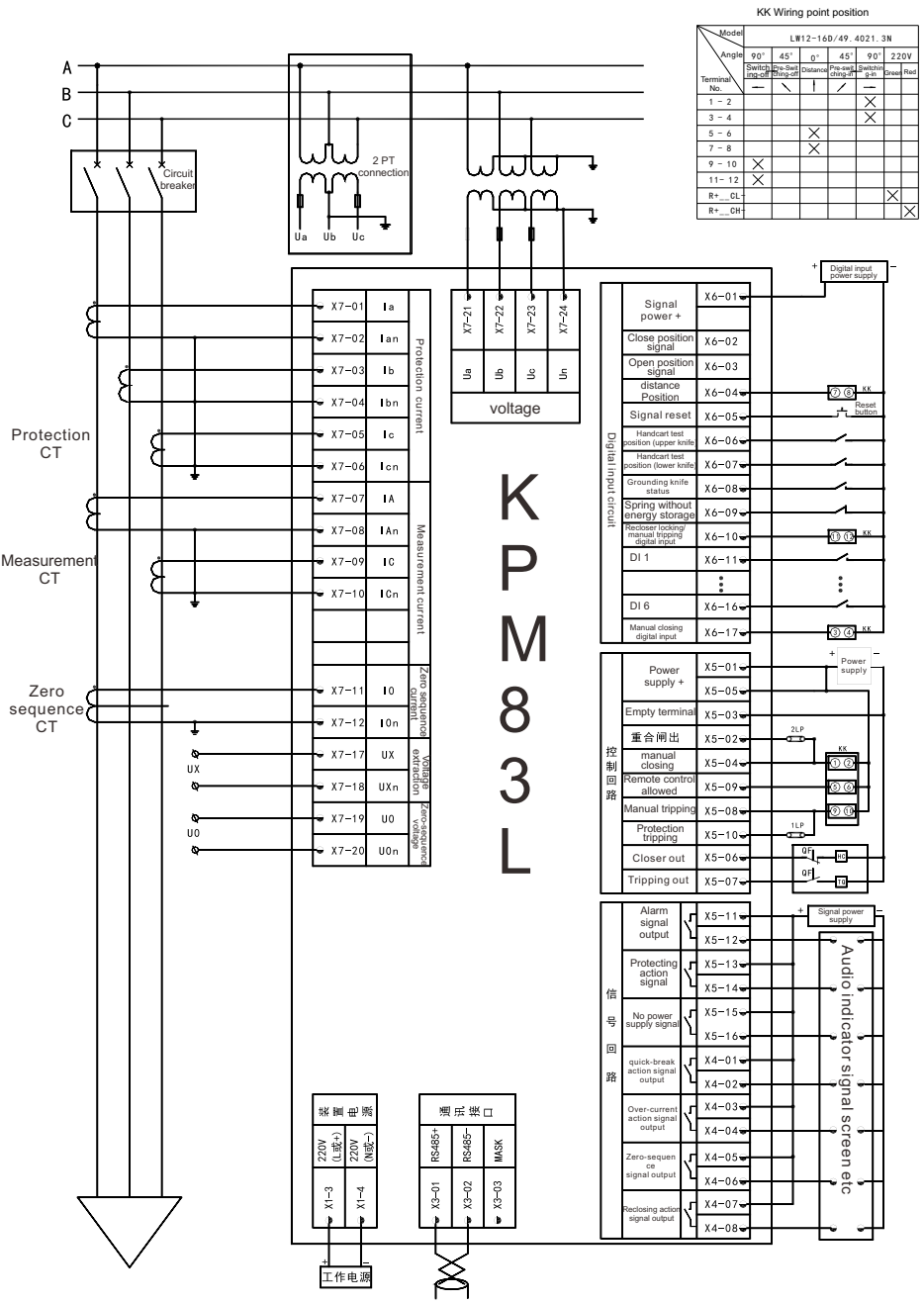


Fig 2 KPM83L Microcomputer circuit protection measurement and control device wiring diagram（AC）

5. KPM83T microcomputer transformer protection and monitoring device

5.1 Overview

KPM83T microcomputer transformer protection measurement and control device is mainly used for comprehensive protection, control and measurement of transformers with voltage levels of 35KV and below.

5.2 protection function

No.	Protection function	No.	Protection function
1	Quick-break	6	High voltage zero-sequence overcurrent
2	Overcurrent I	7	Low voltage inverse time zero-sequence
3	Overcurrent II	8	PT disconnection
4	Overload	9	Non-power protection
5	Inverse time overload	10	

5.3 Measurement and control functions

14-way remote signaling is opened for collection;

Remote control of circuit breaker,signal output (alarm signal, protection action signal, power-off signal,quick-break action signal,over-current action signal,zero-sequence over-current action signal, overload alarm signal,self-trip signal,high-temperature alarm signal);

IA,IB,IC,Ua,Ub,Uc,Ia2,Ib2,Ic2,I01,I02,P,Q,F,COS medium analog;

protection event sequence recording (SOE).

5.4 Technical parameter

Index / Content	Current fixed value	Time fixed value	fixed value error	Heat capacity coefficient	Prewarning heat capacity coefficient
definite time overcurrent	0.2In – 20In	0S – 60S	< 5%		
Inverse time overload	0.2In – 20In	0S – 60S	< 5%	10 – 2500	10 – 2500
definite time overload	0.2In – 20In	0S – 60S	< 5%		
High voltage zero sequence overcurrent	0.2In – 20In	0S – 60S	< 5%		
Low voltage zero sequence inverse time overcurrent	0.2In – 20In	0S – 60S	< 5%	10 – 2500	

5.5 analog input

The input analog values are: protection currents Ia2, Ib2, Ic2, I01 (high voltage side), I02 (low voltage side) for overcurrent protection and high voltage side zero sequence overcurrent protection; measuring currents IA, IB, IC for current monitoring and power calculation; voltage Ua, Ub, Uc as low voltage blocking components and measuring voltage and power.

5.6 Protection principle

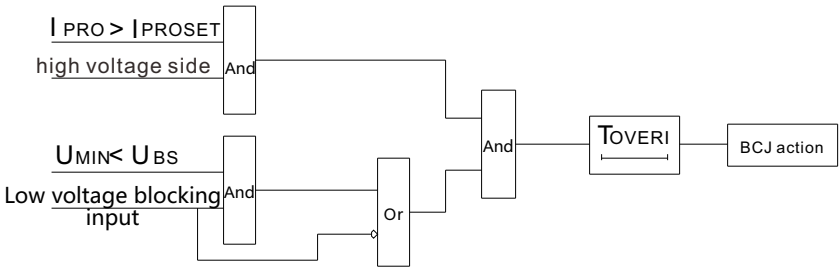
1. overcurrent protection

The device is equipped with two-stage (two-stage definite time) current protection. The current and time of each segment can be independently set. The control word can be set separately to control the retreat of the protection of this segment.

After the amplitude of any phase current is greater than the set value, the component is determined to operate.

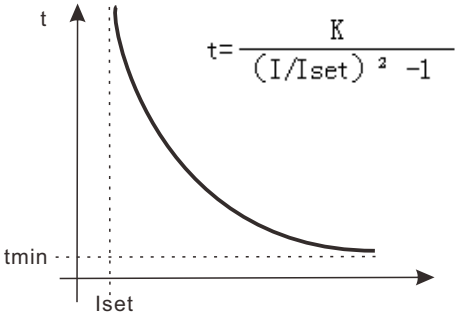
The current-protected blocking element has a low-voltage blocking, and the blocking can be set and retracted by a fixed value setting.

The logical block diagram of overcurrent protection is as follows:



2. Inverse time overload protection

The current of the inverse time overload protection and time satisfy the graph shown in the following figure:



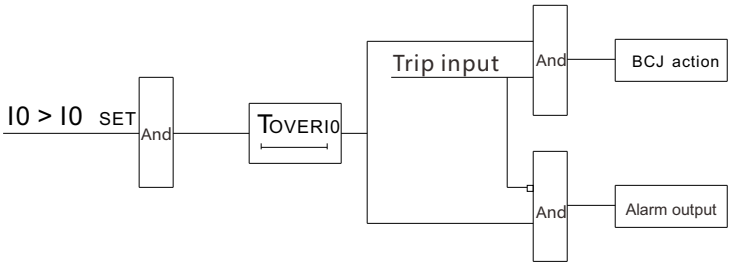
note:
K---Heat capacity coefficient
Iset---Overload inverse-time start current
tmin---Minimum time

3. High-voltage side zero-sequence overcurrent protection

The high-voltage side zero-sequence overcurrent protection is set for the grounding system. Zero-sequence overcurrent protection is determined by the method of zero-sequence current fundamental wave.

The zero sequence protection acts on a trip or signal and can be selected by the control word.

The logical block diagram of zero sequence overcurrent is as follows:



4. Low-voltage side zero-sequence inverse-time overcurrent protection

The low-voltage side zero-sequence inverse-time over-current protection is determined by the low-voltage side zero-sequence current fundamental wave method. The zero-sequence protection action thousand trip or signal can be selected by the control word.

The action current vs. time graph is overloaded with the inverse time limit.

5. Overload protection

The overload protection of the transformer is mainly to prevent overcurrent caused by overload when the transformer is abnormally operated.

6. Non-electricity parameter protection

Non-electricity parameter protection includes heavy gas,high oil temperature,abnormal pressure ,and light gas alarm and oil temperature rise alarm. Among them,the pressure abnormality is the protection trip mode or the alarm mode(trip/alarm), which can be selected by setting the control word.

7. Control circuit disconnection

The device is equipped with a control circuit disconnection monitoring function, which uses the combined contacts of the combined and trip relays to judge whether the control loop is normal through software. When the fault occurs, the control circuit disconnection alarm signal is issued after 0. 5 second delay.

8. PT disconnection check

The device has a PT disconnection check function,and the device sends an alarm signal when it detects that the PT is disconnected. Criterion for PT disconnection:

① 1There 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 power failure.

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

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

Criterion ① is mainly used to determine the symmetry three-phase disconnection, and at the same time to supplement the asymmetric disconnection. The current blocking condition is used to prevent the protection device from falsely transmitting an alarm signal when no voltage is applied during the debugging process.

Criterion ② is specifically used to judge the asymmetric disconnection of the PT.

5.7 KPM83T operating device (with anti-jump circuit)

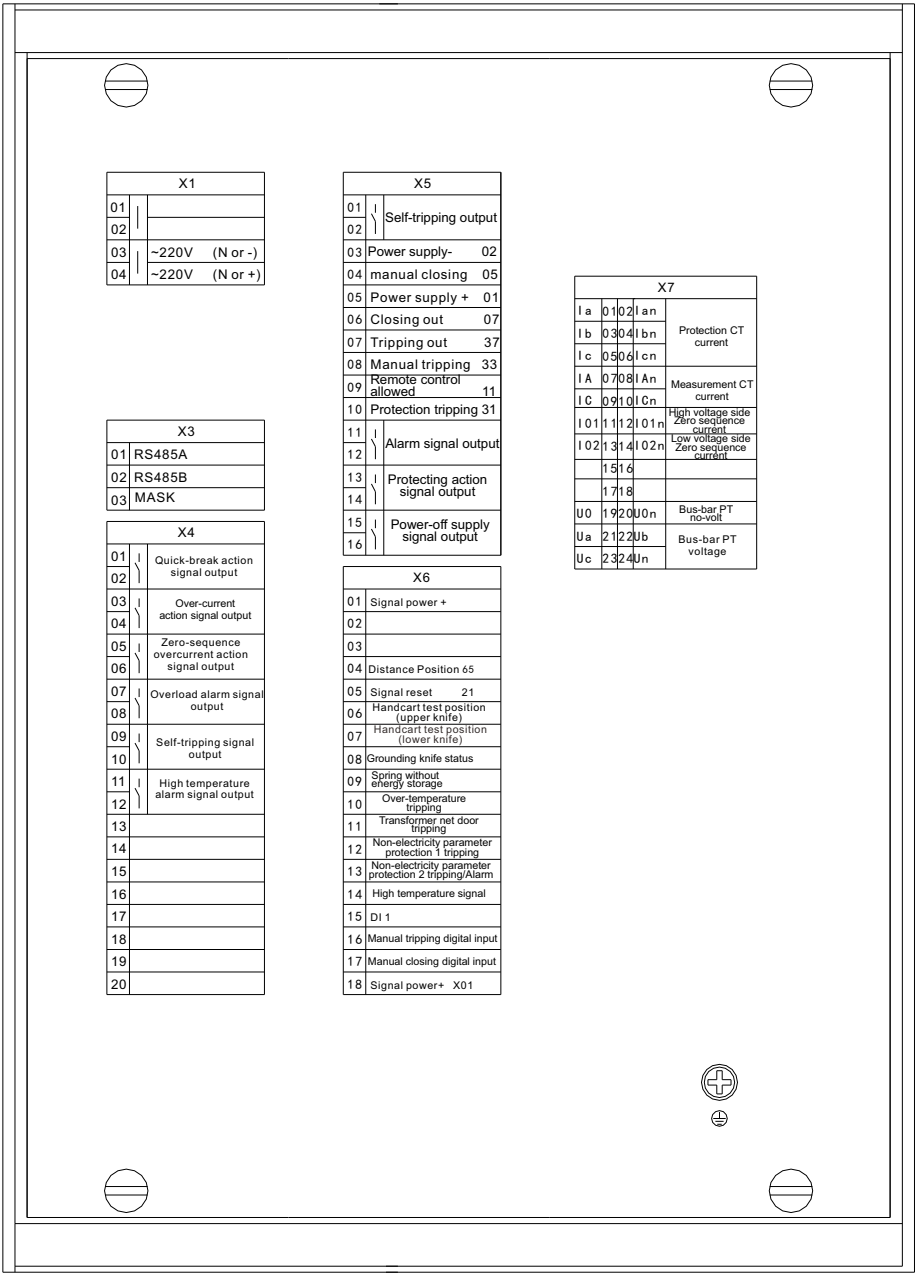


Fig1: KPM83T Microcomputer transformer protection measurement and control device terminal diagram DC

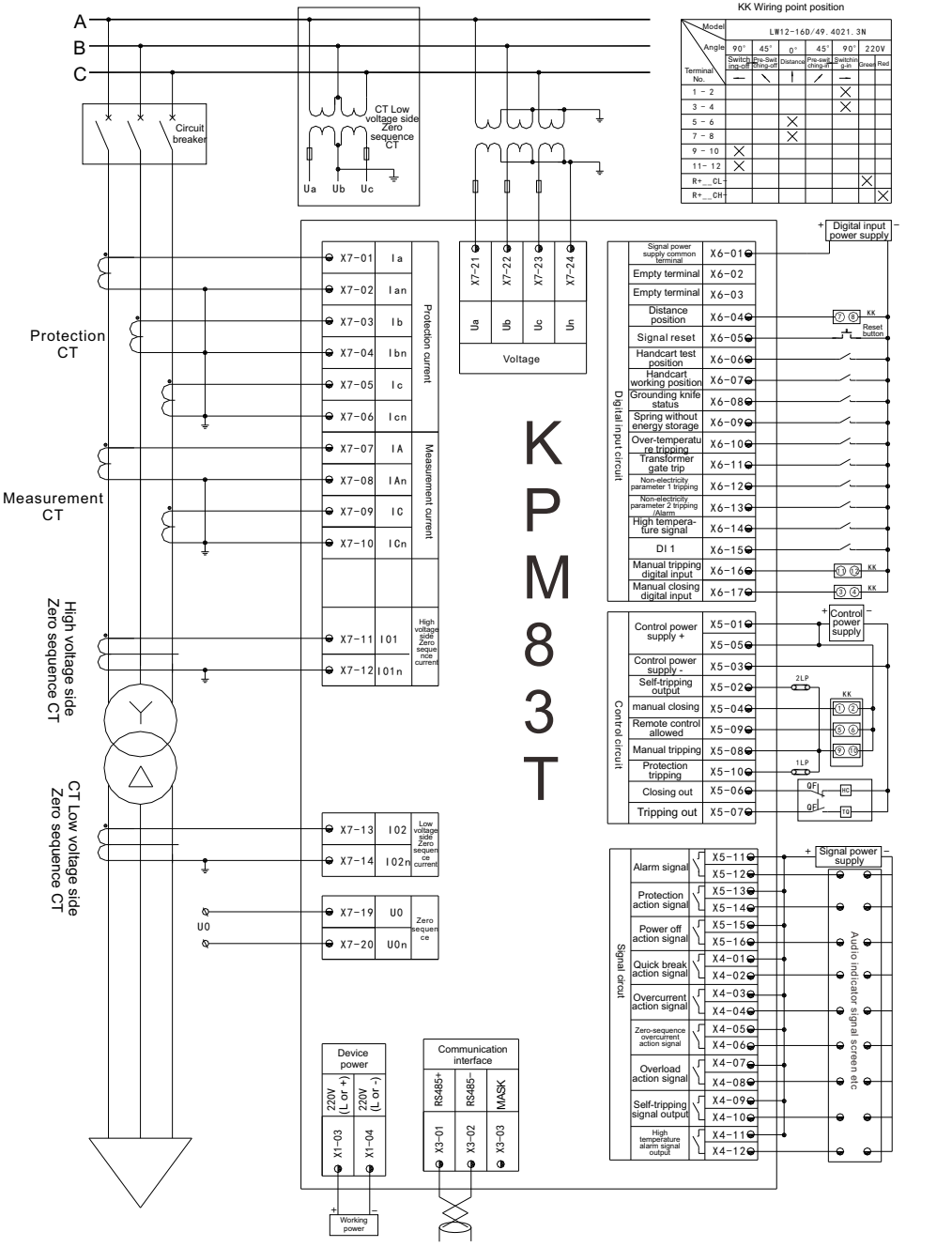
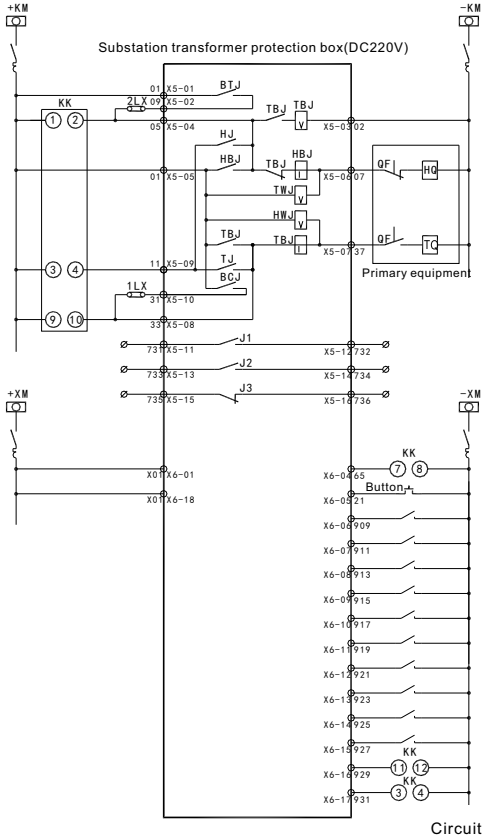
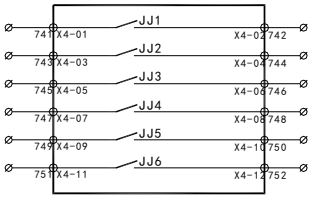


Fig2: KPM83T Microcomputer transformer protection measurement and control device wiring diagram DC



Self-tripping output
manual closing
Remote control allowed
Switching in holding circuit
Tripping position relay signal
Closing position relay signal
Tripping holding circuit
Remote control tripping
Protection tripping
Manual tripping
Alarm signal output
Protection action disappearance signal output
Power-off signal output
Distance position
Signal reset
Handcart test position
Handcart working position
Grounding knife status
Spring without energy storage
Over-temperature tripping
Transformer gate trip
Non-electricity parameter 1 tripping
Non-electricity parameter 2 tripping/Alarm
High temperature signal
DI 1
Manual tripping digital input
Manual closing digital input



Quick-break action signal output
Over-current action signal output
Zero-sequence overcurrent action signal output
Overload alarm signal output
Self-tripping signal output
High temperature alarm signal output

Circuit breaker manual split switch KK

Model	LW12-16D/49.4021.3N						
Angle	90°	45°	0°	45°	90°	DC220V	
	Switching -off	In-place	Distance	In-place	Switching -in	Green	Red
Terminal No	—	\	|	/	—		
1 – 2					×		
3 – 4					×		
5 – 6			×				
7 – 8			×				
9 – 10	×						
11– 12	×						
R+__CL-						×	
R+__CH-							×

Note:

1. Distance position means: if the control through the internal processing of the protection device, it is distance. The internal 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.
4. The self-trip is non-electrical parameter protection (Transformer net door tripping, over temperature tripping, non-electrical parameter protection 1 tripping) tripping output, 2LX is blocking contiguous;
5. 'Non-electrical parameter protection 1 tripping' is the tripping signal, which can be used as the “heavy gas tripping” inlet for oil change, its tripping output is self-trip (BTJ);

“Non-electrical parameter protection 2 tripping” selects trip or alarm by control word. It can be used as a "pressure release" inlet for oil change and a protection trip (BCJ) for trip output.

‘Non- electrical parameter 1" and "non- electrical parameter 2" cannot be used as a alarm signal.

Fig3: KPM83T Microcomputer transformer protection measurement and control device control principle diagram

5.8 KPM83T AC operation device (Without anti-jump circuit)

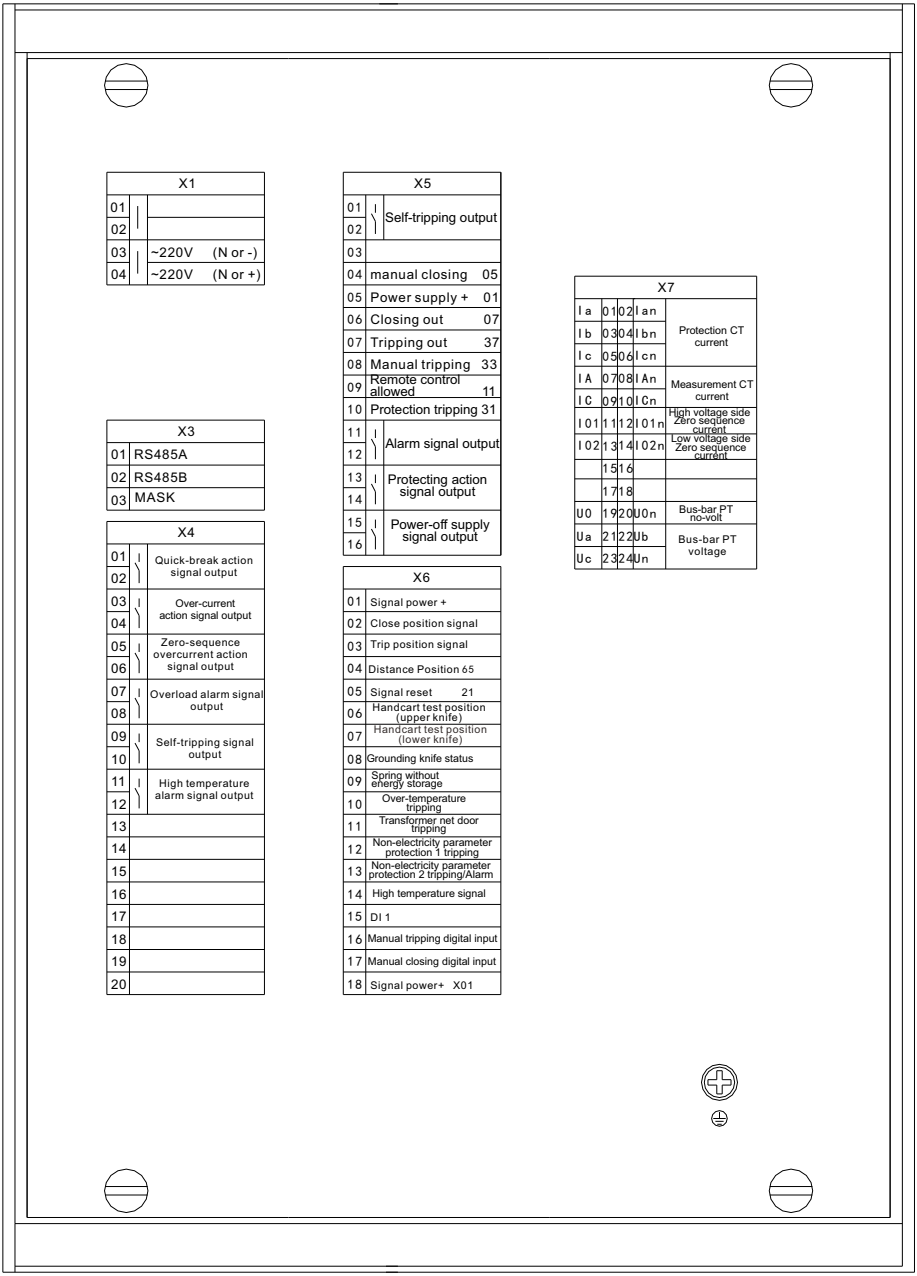


Fig4 KPM83T Microcomputer transformer protection measurement and control device terminal diagram AC

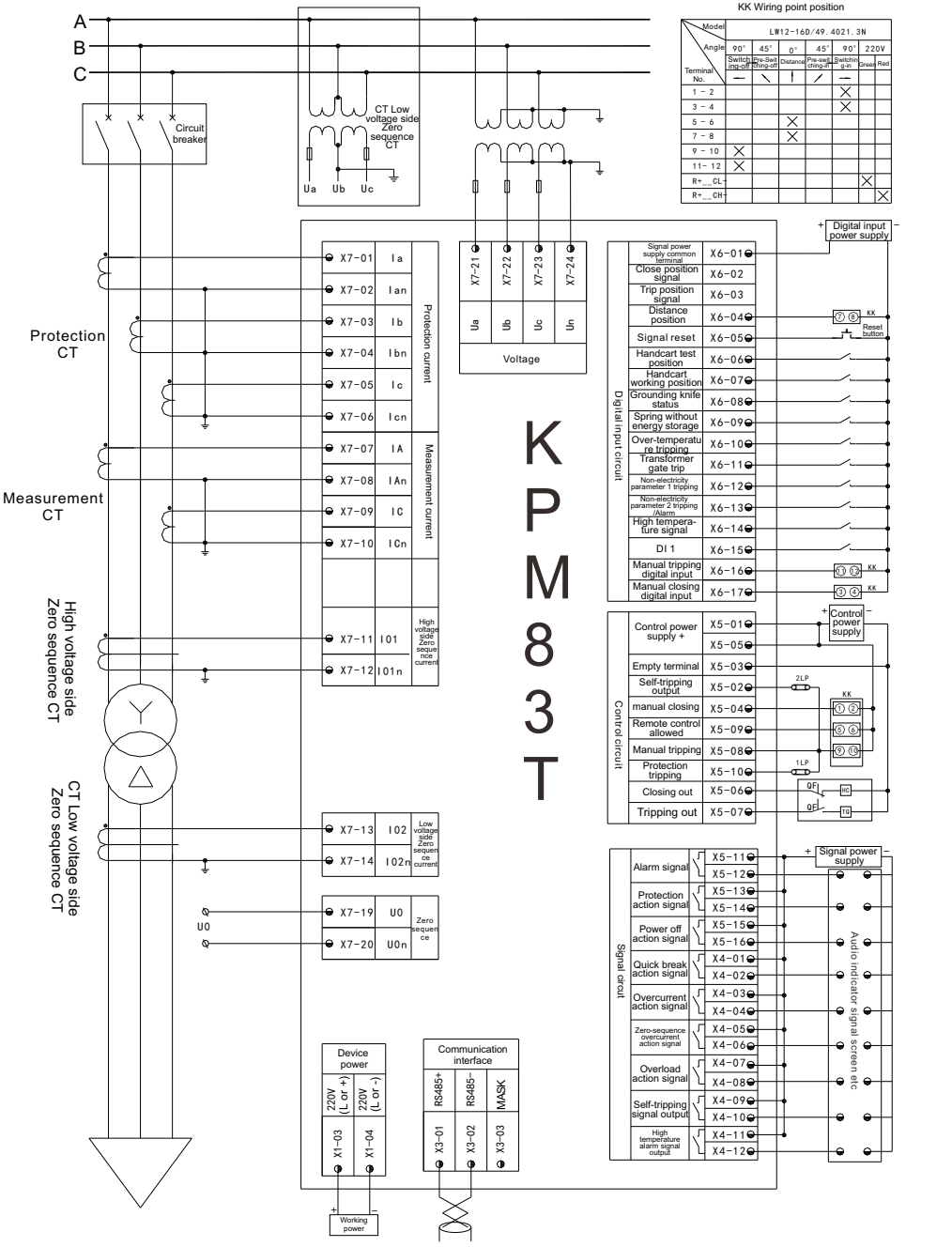


Fig5 KPM83T Microcomputer transformer protection measurement and control device terminal diagram AC

6. KPM83TD Microcomputer transformer differential protection device

6.1 Overview

KPM83TD microcomputer transformer protection device is mainly suitable for comprehensive protection and control of transformer differential of 35KV and below.

6.2 Protection function

No.	Protection function	No.	Protection function
1	Differential quick-break protection	**3**	CT disconnection checking and blocking function
2	Ratio differential protection for second harmonic braking	**4**	Non-electrical parameter protection

6.3 Measure and control function

12-wire remote signaling digital input for collection;

Alarm signal (alarm signal, protection action signal, power disappearance signal, reclosing action signal); display unbalanced current in real time.

6.4 Technical Specifications

1. Differential quick-break protection: current setting: 2In-12In, fixed value error: <5%.
2. Ratio differential protection for second harmonic braking: overcurrent setting: 0.2In-10In, fixed value error: <5%

6.5 Analog input

Iah, Ibh, Ich, Ial, Ibl, and Icl are the differential protection output currents on the high and low voltage sides as the differential protection quantity.

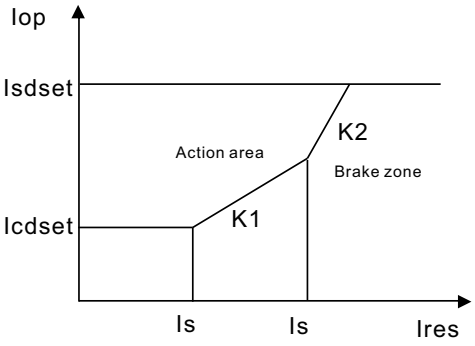
6.6 Protection principle

1. Differential quick-break protection

When the difference current is greater than the set value, it indicates that there is a serious fault inside the transformer. The differential protection should be immediately actuated and tripped without any braking. The differential current quick-break protection action setting should be set to avoid various unbalanced currents and inrush current setting.

2. Ratio differential protection of second harmonic braking

Differential protection with ratio braking, the action characteristics are as shown:



note:
Iop---the difference current of the same phase on each side (calculated)
Ires---Brake current (maximum of the three side currents of the maximum difference current phase)
Is1,Is2---inflection points 1, 2 (set by the user)
K1,K2---two-segment line slope (set by the user)
Isdset---differential current speed determination
Icdset---rate differential setting

3. Second harmonic blocking principle

The device uses the ratio of the second harmonic to the fundamental wave in the three-phase differential current as the criterion for the magnetizing inrush current. When the second harmonic ratio in any phase differential current is greater than a fixed value, that is, the blocking condition is satisfied, the three-phase ratio differential protection is blocked.

4, CT disconnection blocking

The conditions for determining the CT disconnection are:

① One of the three-phase currents on one side is reduced to zero, and the other two-phase currents and the other two sides are unchanged.

②The maximum phase current on this side is greater than 0.2 IE.

③The maximum phase current (three sides) is less than 1.2 IE.

④ The alarm signal will be sent after the line is disconnected, and the differential protection can be selected to be blocking or not according to the control word; The CT disconnection criterion is useful for CT sudden disconnection, but does not work for the CT contact resistance gradually becomes larger till disconnection, it can play the role of CT disconnection alarm because of the differential flow alarm.

5. Current phase and balance compensation on each side of the transformer

In order to eliminate the unbalanced current caused by the CT ratio selection on each side of the transformer, it is necessary to calculate the adjustment coefficient in the medium and low voltage side current loop of the transformer, and input the device to completely compensate the unbalanced current caused by the software.

The secondary current phase of the current transformer on each side of the transformer is corrected by software. This device can perform phase correction on the Y/Δ 11 wiring mode.

6. Non-electrical parameter protection

Non-electrical parameter protection includes heavy gas, pressure-regulating heavy gas, light gas, pressure-controlled light gas, pressure release, and high oil temperature.

7. CT wiring points

Noted when wiring the CT, the direction of the flow to transformer is the positive direction of the current on each side.

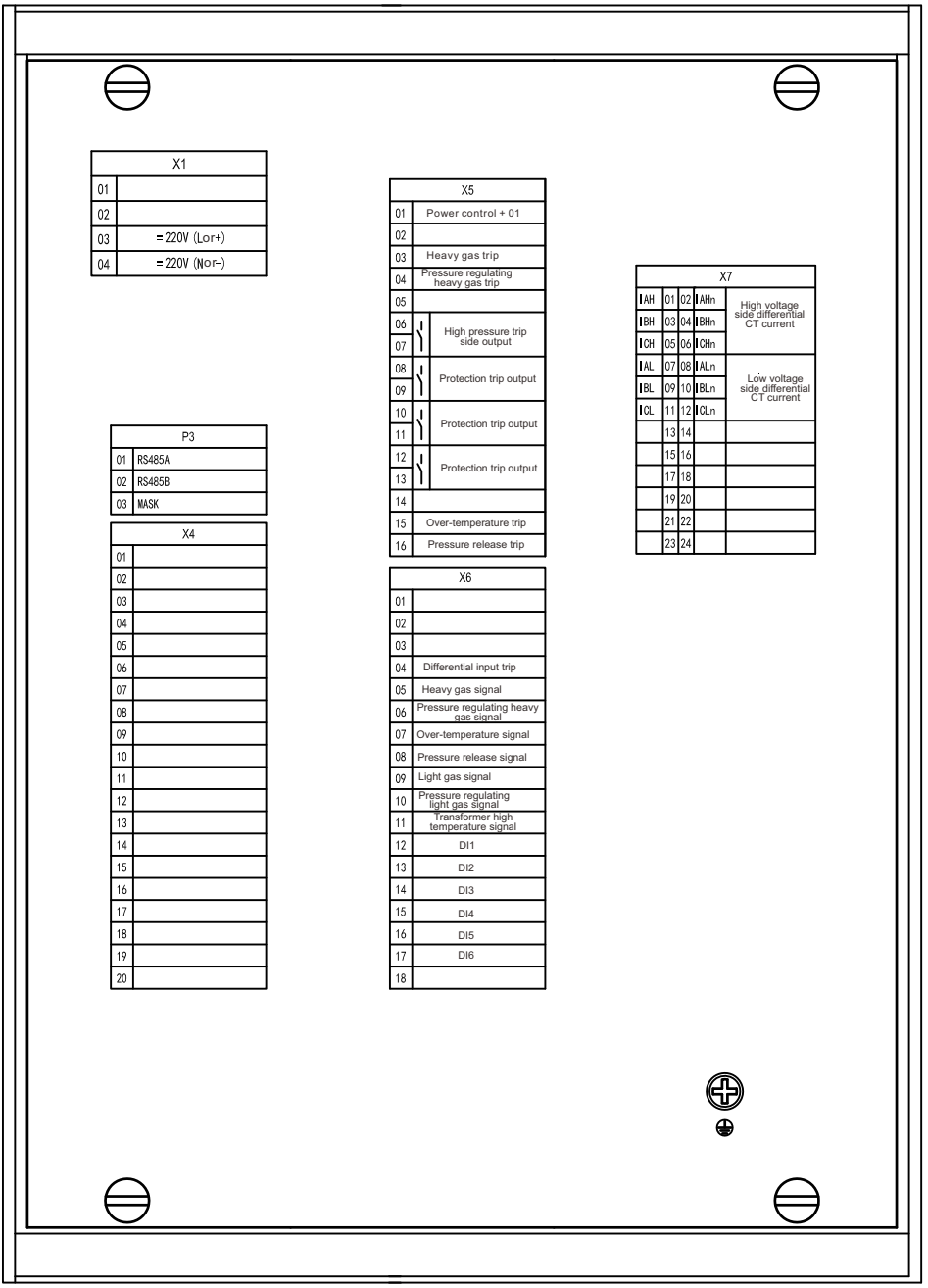


Fig 1: KPM83TD Microcomputer transformer differential protection device terminal diagram

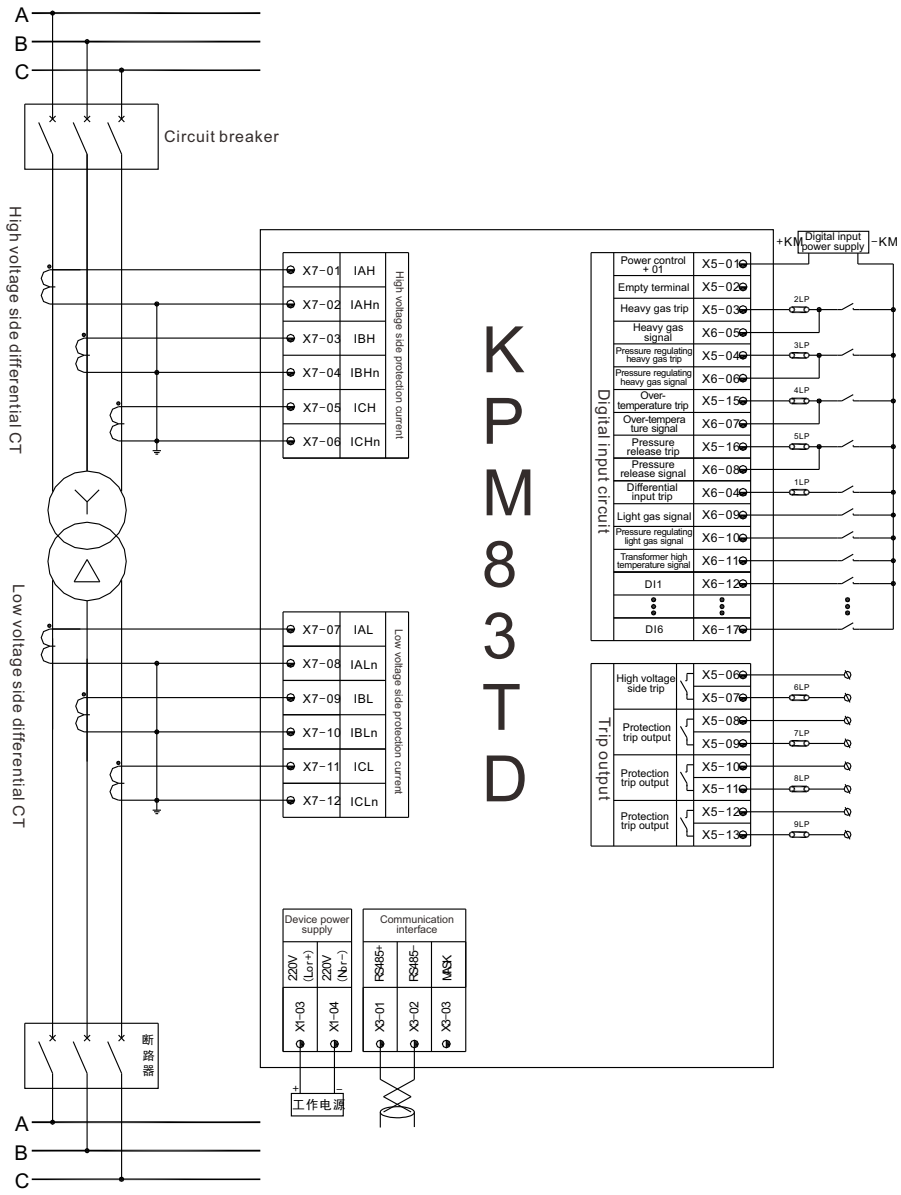
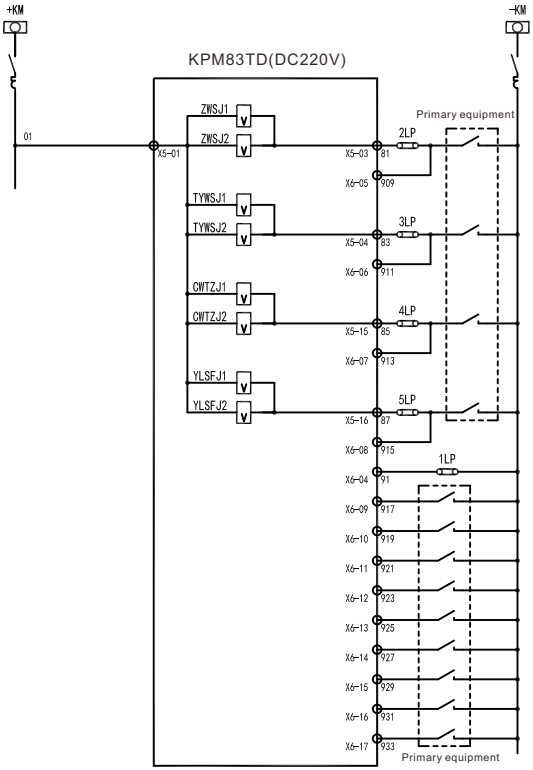


Fig2: KPM83TD Microcomputer transformer differential protection device wiring diagram



Note:

1. BCJ is the differential protection exit relay;
2. Differential input trip is a hard contact set to block differential protection.

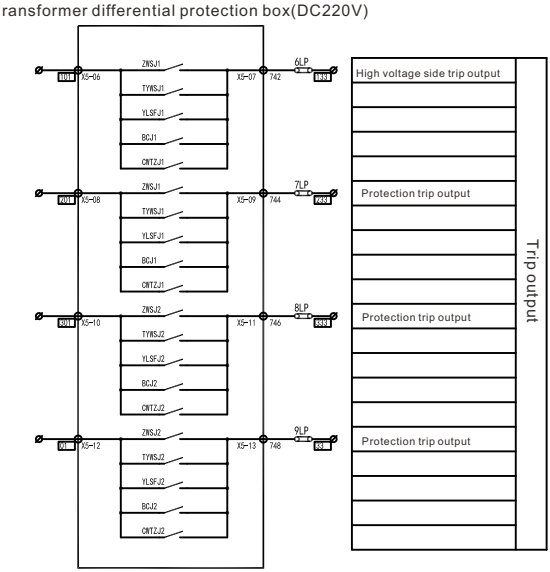


Fig3 Microcomputer transformer differential protection device control principle diagram

7. KPM83C microcomputer capacitor protection measurement and control device

7.1 Overview

KPM830C microcomputer capacitor protection measurement and control device is mainly used for comprehensive protection, control and measurement of capacitors with voltage levels of 35KV and below.

7.2 Protection function

NO	Protection function	NO	Protection function
1	Over current I segment	6	Imbalance protection (Differential pressure and differential current)
2	Over current II segment	7	Discharge PT over voltage
3	Over voltage protection	8	Zero sequence over current
4	Low voltage protection	9	Imbalance zero sequence over current
5	Zero-sequence over voltage	10	PT disconnection

7.3 Measurement and control functions

14 remote signals digital input collection, device remote signal displacement, accident remote signal. The name and alarm mode of the remote signal can be set by the user according to the actual requirements.

Circuit breaker remote control split signal exit (alarm signal, protection action signal, power supply disappear, unbalanced zero sequence overcurrent, overcurrent action signal, zero sequence overcurrent action signal,unbalanced zero sequence overvoltage signal); IA, IB, IC, Ua, Ub, Uc, Ia2, Ib2, Ic2, U0, I01, I02, P, Q, F, COS medium analog;

protection event sequence record (SOE), etc.

7.4 Technical Specifications

Index / Content	Voltage/Current fixed value	Time fixed value	Fixed value error
Overcurrent protection	0.1In-20In	0s-60s	<5%
Zero sequence overcurrent protection	0.1In-20In	0s-60s	<5%
No-voltage protection	0.1In-20In	0s-60s	<5%
Overvoltage protection	0.1In-20In	0s-60s	<5%

7.5 Analog input

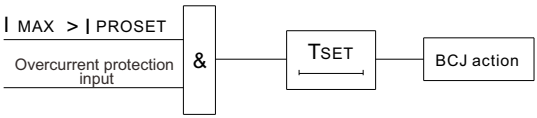
The input analog quantity is: protection current Ia2, Ib2, Ic2, as the overcurrent protection quantity; measurement current IA, IB, IC is used for current monitoring and power calculation. Ua, Ub, Uc are bus PT voltage inputs, U0 is zero sequence voltage input, Ubp1, Ubp2 are two sets of capacitor unbalanced voltage inputs.

7.6Protection principle

1. Overcurrent protection

The device is equipped with two-stage definite time characteristic overcurrent protection, which is used to cut off the fault between the capacitor bank and the circuit breaker and the internal fault of the capacitor.

When the maximum current is greater than the set value, the protection is actuated after a delay. The protection logic block diagram is as follows:



2. Zero-sequence overcurrent protection

Zero-sequence overcurrent protection is set for internal faults in a capacitor bank with a single delta connection.

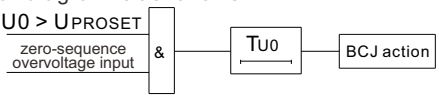
When the zero-sequence current is greater than the set value, the protection is actuated after a delay. Protection logic block diagram is same with phase-to-phase overcurrent protection.

Action criteria are as follows

Zero sequence overcurrent protection: 3I0>3I0set T>Tset

3. Zero-sequence overvoltage protection

When the capacitor bank adopts single star connection, the internal fault of the capacitor bank will cause the opening triangle overvoltage; when multiple capacitors are cut off, the three-phase parameters of the capacitor bank are asymmetrical, and the zero-sequence voltage will appear relative to the neutral point of the capacitor bank. The installation of zero-sequence overvoltage protection can quickly remove faults and effectively protect normal capacitors. The protection logic block diagram is as follows:



4. over-voltage protection

Overvoltage protection is to prevent the capacitor from being damaged by a voltage of 1.1Un or higher.

A circuit breaker closing criterion is added to the overvoltage protection.

5. No-voltage protection

When the busbar loses power due to system failure, but the capacitor terminal voltage has not been discharged below 0.1Un, if the incoming line is coincident and the busbar is charged, the capacitor may be subjected to high voltage and damaged. Therefore, the no-voltage protection should be installed to cut off the capacitor bank when the busbar loses voltage.

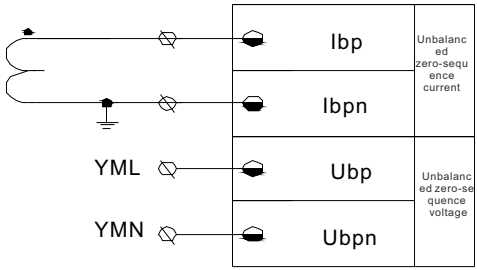
In order to prevent malfunction of the voltage transformer circuit disconnection, the current protection is added with current blocking. When any phase current is greater than the blocking current constant value, the protection output is blocked.

The maximum voltage in the protection reaction Uab, Ube, Uca, the setting voltage can be 0.5Un, the setting delay should be less than the action delay of the incoming reclosing or the backup power supply.

To prevent the malfunction of the voltage loss protection when the capacitor is not put into operation, the circuit breaker trip block is added.

6. Unbalanced voltage, current protection

Unbalanced voltage/current protection is used to quickly remove internal faults in the capacitor bank.



7.7 KPM83C DC operation device (With anti-jump circuit)

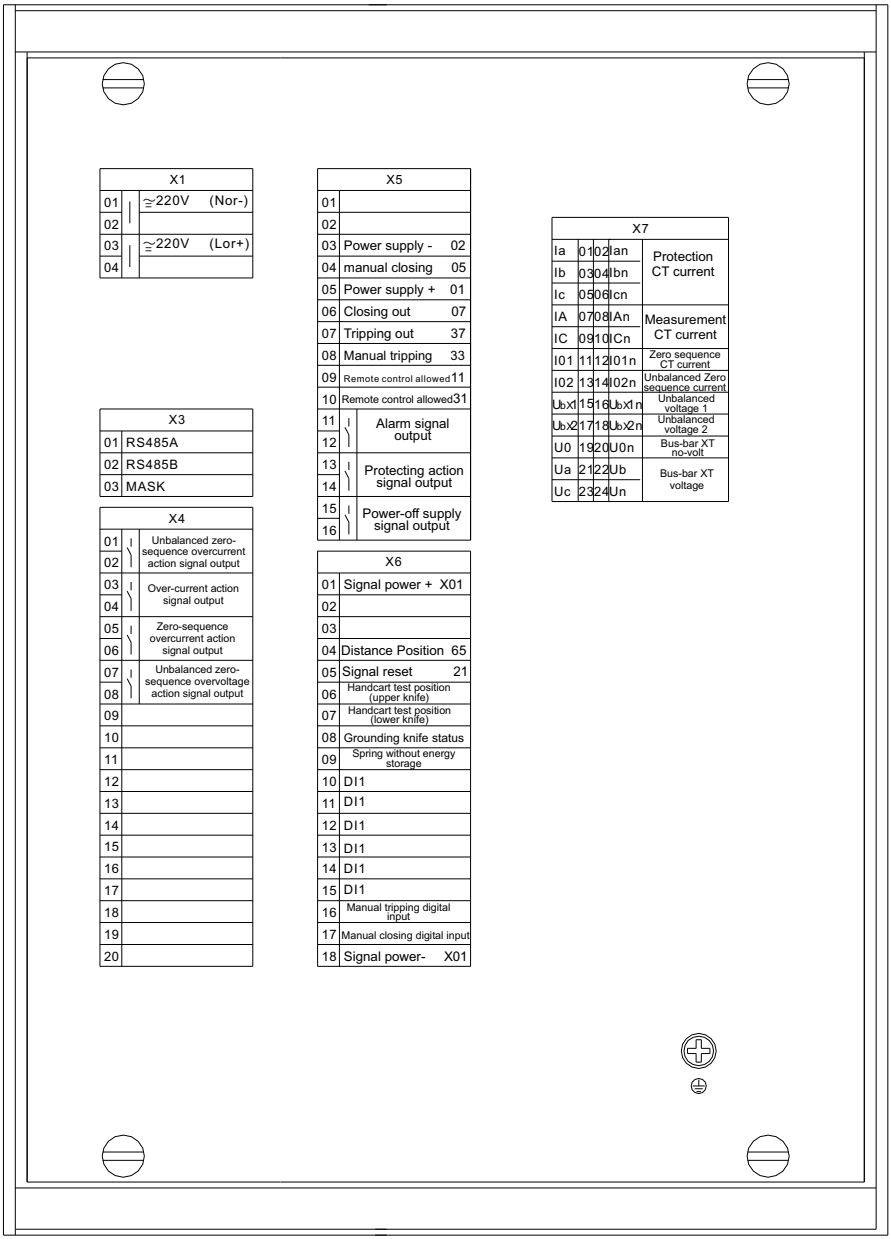


Fig1 KPM83C Microcomputer capacitor protection measurement and control device terminal diagram DC

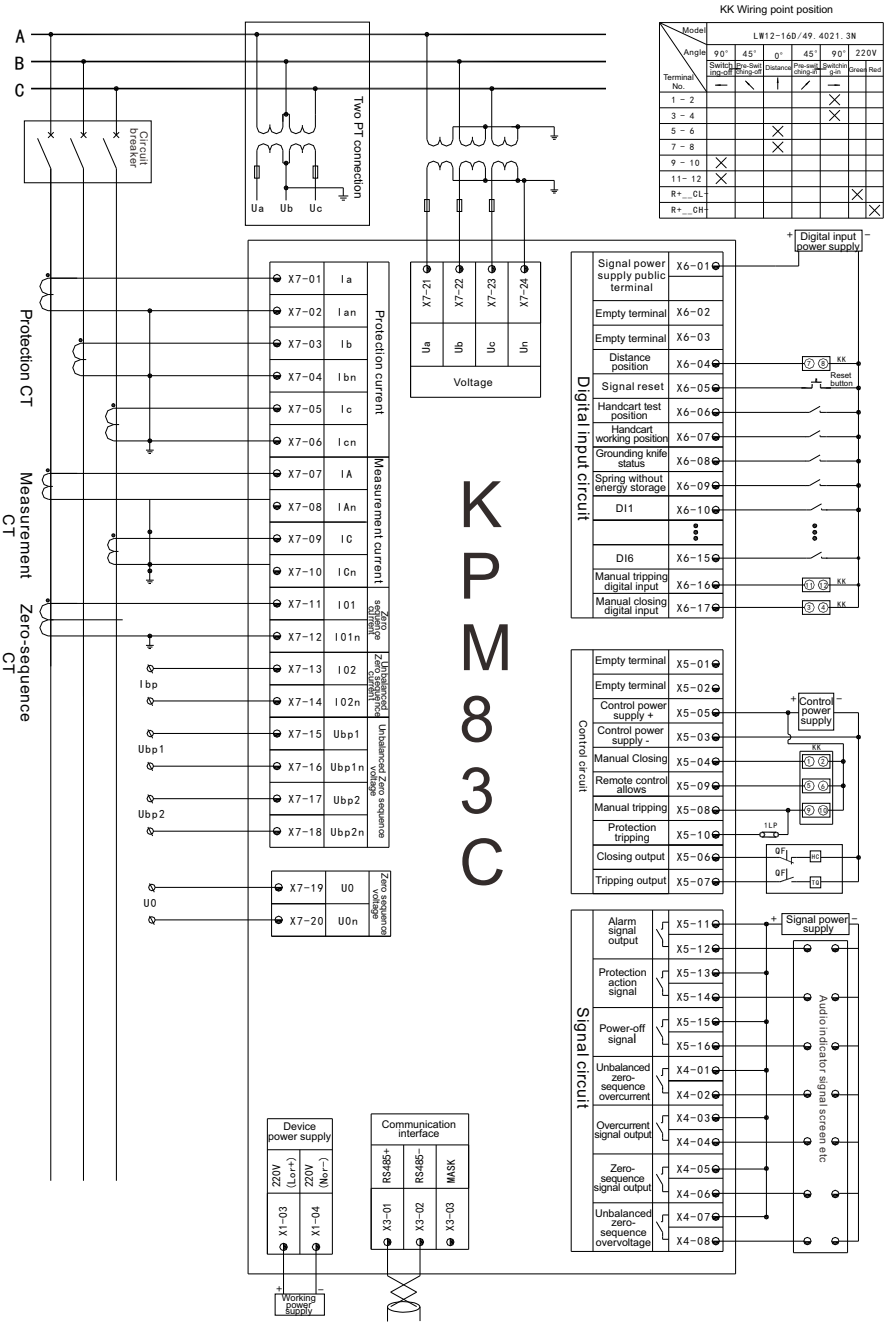
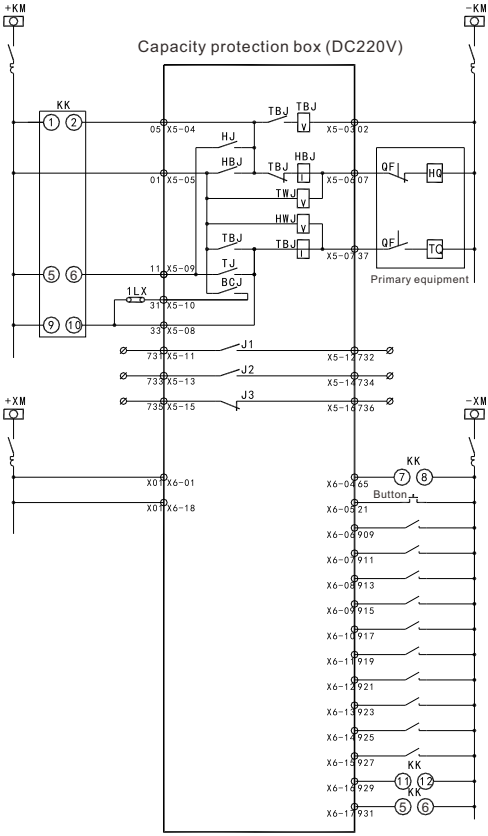
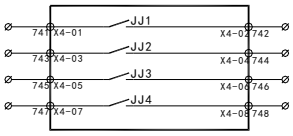


Fig 2 Microcomputer capacitor protection measurement and control device wiring diagram DC



Manual closing
Remote control closing
Closing holding circuit
Tripping position relay signal
Closing position relay signal
Tripping holding circuit
Remote control tripping
Protection tripping
Manual tripping
Alarm signal output
Protection action disappearance signal output
Power-off signal output
Distance position
Signal reset
Handcart test position (Upper knife gate)
Handcart test position (Lower knife gate)
Grounding knife status
Spring without energy storage
DI1
DI2
DI3
DI4
DI5
DI6
Manual tripping digital input
Manual closing digital input

Capacity protection box DC220V



Unbalanced zero-sequence overcurrent action signal output
Overcurrent actional signal output
Zero-sequence overcurrent action signal output
Unbalanced zero-sequence overvoltage action signal output

Circuit breaker manual split switch KK

Model	LW12-16D/49.4021.3N						
Angle	90°	45°	0°	45°	90°	DC220V	
	Switching-off	In-place	Distance	In-place	Switching-in	Green	Red
Terminal No	—	\	|	/	—		
1 - 2					×		
3 - 4					×		
5 - 6			×				
7 - 8			×				
9 - 10	×						
11- 12	×						
R+__CL-						×	
R+__CH-							×

Note:

1. Distance position means: if the control through the internal processing of the protection device, it is distance. The internal 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 KPM83C Microcomputer capacitor protection measurement and control device control principle diagram DC

7.8 KPM83C AC operation device (Without anti-jump circuit)

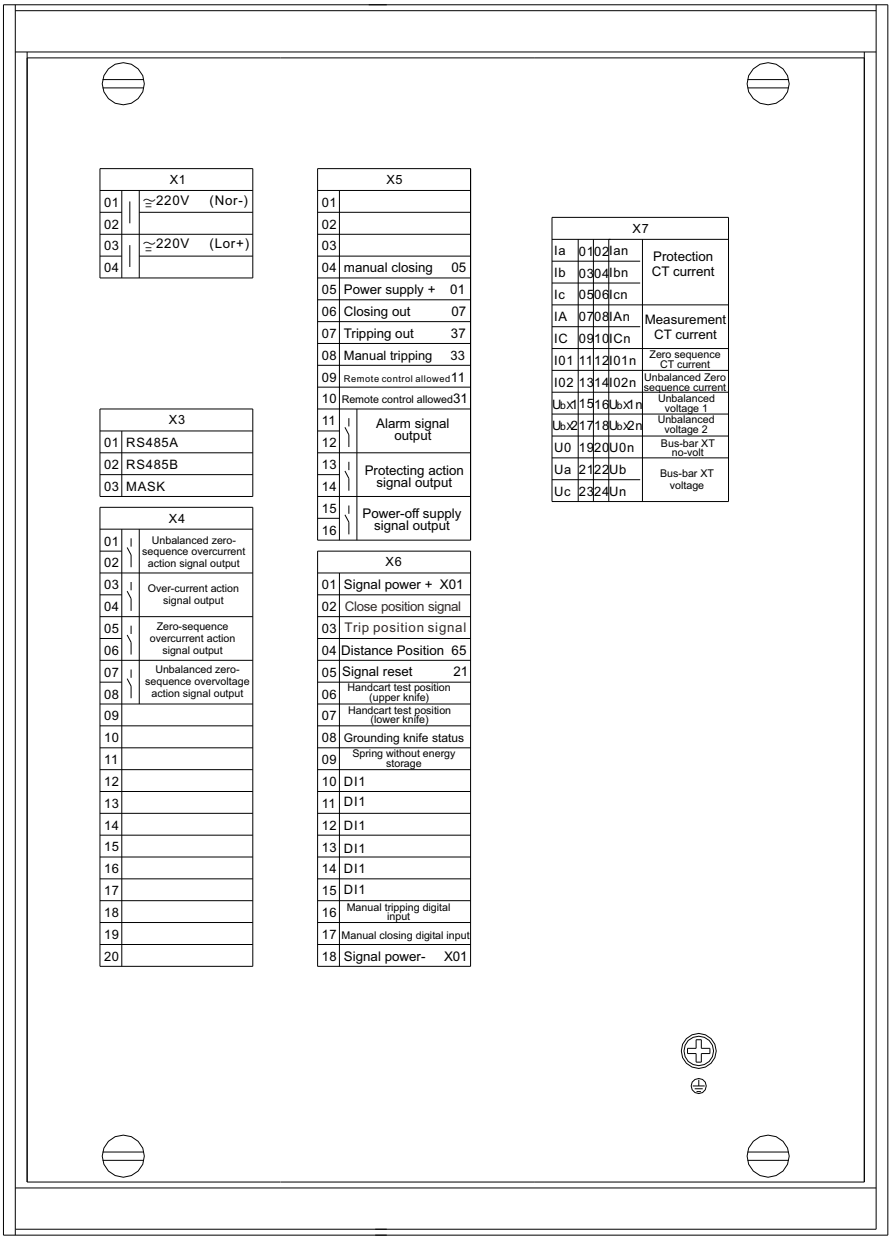


Fig 4 KPM83C Microcomputer capacitor protection measurement and control device terminal diagram AC

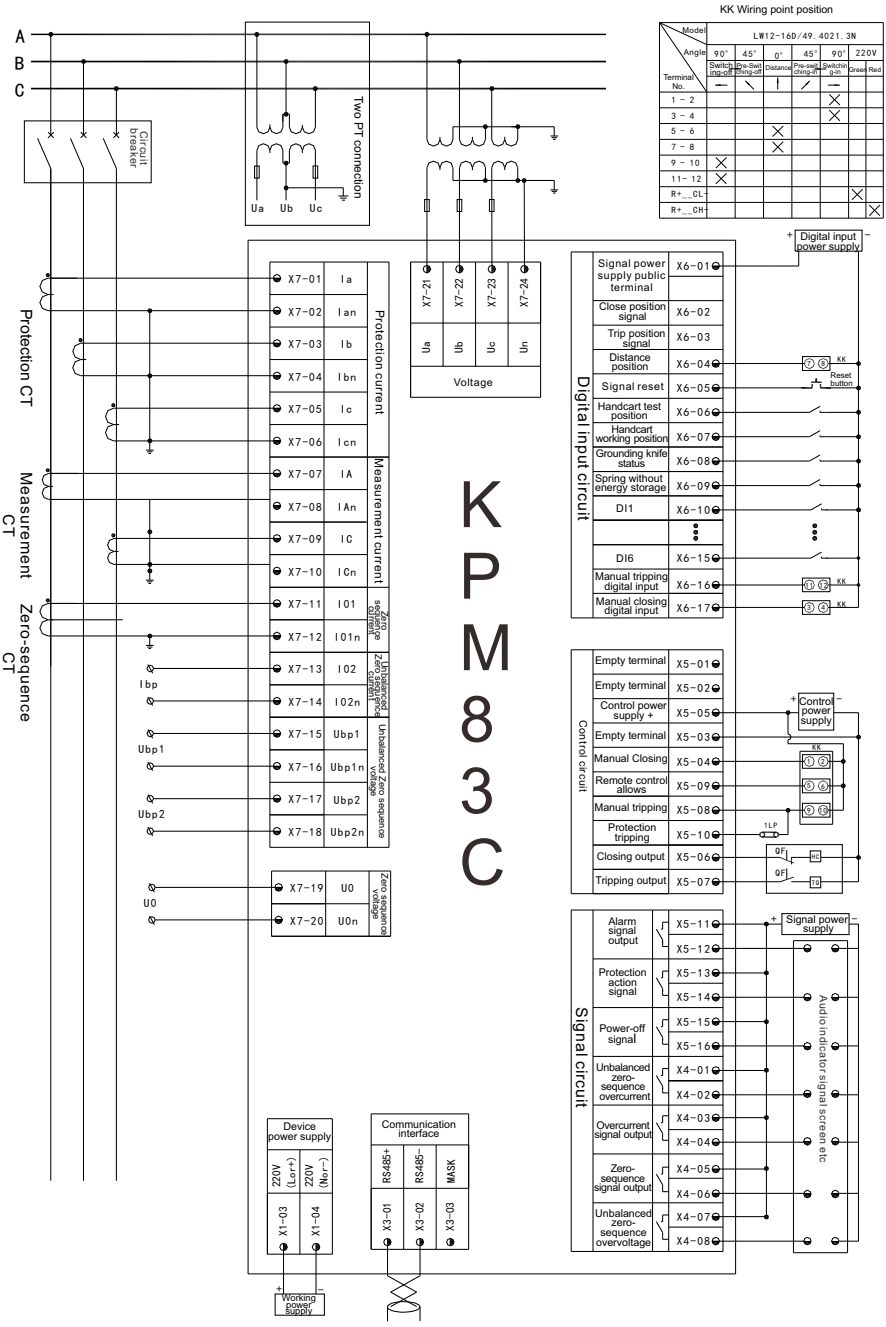


Fig 5 KPM83C Microcomputer capacitor protection measurement and control device terminal diagram AC

8. KPM83M Microcomputer motor protection measurement and control device

8.1 Overview

microcomputer motor protection measurement and control device is mainly used for comprehensive protection, control and measurement of asynchronous motor with voltage level of 35KV and below.

8.2 Protection functions

No.	Protection function	No.	Protection function
1	Long startup time protection	8	Two-segment negative sequence Overcurrent
2	Two-segment overcurrent protection	9	Overvoltage protection
3	Overload	10	Low voltage protection
4	Inverse time overcurrent	11	Zero-sequence overvoltage
5	Short circuit protection	12	Overheat protection
6	Zero-sequence overcurrent	13	Self-starting function
7	PT disconnection Monitoring	14	

8.3 Measurement and control functions

16 remote signals digital input collection.

Circuit breaker remote control split and closing, signal exit (alarm signal, protection action signal, power supply disappear signal, short circuit action signal, overcurrent action signal, zero sequence overcurrent action signal, overload alarm signal, no-volt protection signal); IA, IB, IC, Ua, Ub, Uc, Ia2, Ib2, Ic2, U0, I01, I02, P, Q, F, COS medium analog; protection event sequence record (SOE), etc.

8.4 Technical Specifications

Index / Content	Current fixed value	Time fixed value	Fixed value error	Heat capacity coefficient
Zero-sequence Overcurrent	0.2In-20In	0.1s-60s	<5%	
Definite time Overload	0.2In-6In	0s-60s	<5%	
High voltage side zero-sequence overcurrent	0.2In-20In	0s-60s	<5%	
Low voltage side zero-sequence inverse time overcurrent	0.2In-20In	0s-60s	<5%	10-2500

8.5 Analog input

The input analog quantities are: protection currents Ia, Ib, Ic, I01 (high voltage side), I02 (low voltage side) for overcurrent protection and zero sequence overcurrent protection; measuring currents IA, IB, IC for current monitoring and power calculation; voltage quantities Ua, Ub, Uc as low voltage blocking components and measuring voltage and power.

8.6 Protection principle

1. overcurrent protection

The overcurrent protection of the motor includes: two-stage overcurrent protection (maximum current is protection amount), two-stage negative sequence overcurrent protection (negative sequence current is protection amount), these three kinds of protection are not used during motor starting (The overcurrent during startup is protected by short circuit protection and the long startup time protection), the protection will be put into use after startup.

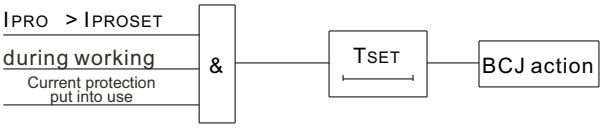
The action criterion is:

① The circuit breaker changes from separating to closing and stays in the closing position.

② I PRO > I PROSET

T > Tset

I PRO SET, TSET are the setting values of current and time of each segment. The overcurrent protection logic block diagram is as follows:

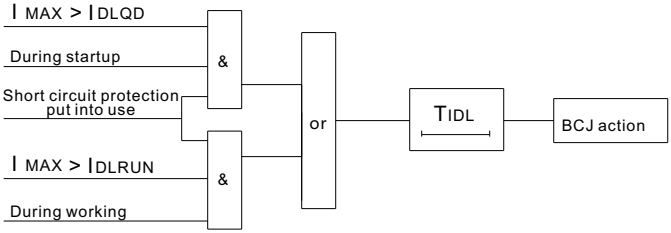


2. Short circuit protection

The short circuit protection can reflect the phase-to-phase short circuit of the generator and can also be used as the stall protection of the motor. Because the short-circuit current is even lower than the normal current during startup, the short-circuit protection is different during startup and during operation, so two fixed values are set:

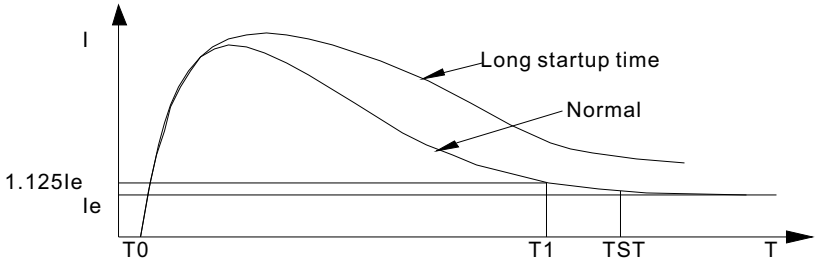
The short-circuit protection fixed value during startup and the running process. In general, the running value is half of the starting value.

The logic block diagram of short circuit protection is as follows:



3. Long startup time protection

The starting process of the motor starts as shown in the figure below. The current starts to increase rapidly from zero to several times of Ie, then it is lowered and gradually stabilized until it reaches the running state. Another curve in the figure is abnormally started, and the current cannot be smoothly lowered to Ie sides. The case where the startup time is too long is formed.



Long startup time will cause the motor overheating and harm the motor. A trip will occur when the startup process exceeds the set value. First, the shutdown process, startup process, and operation process are briefly described as follows:

When the maximum current of the three-phase current is less than the no-current setting, it enters the stop state;

in the stop state, if the current is large, the flow enters the start state;

the criterion from the start state to the running state is as follows:

$$Iop < 1.12Ie \text{ and } T>0.5TST$$

$$T> 1.5TST$$

Iop is the working current, Ie is the rated current of the motor, and TST is the set starting time.

The motor will enter the running state when any of the two conditions is met.
Long startup time protection is the protection of the motor for being starting for a long time. The protection criteria are:

I MAX>1. 12 I e

T> KSTTMAX * TST

IMAX is the maximum current maximum, and KSTTMAX is the time coefficient for long startup time.

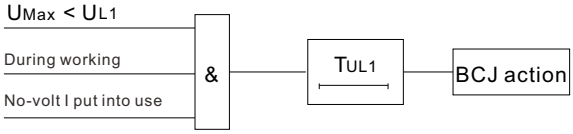
4. No-volt protection

When the grid voltage decreases, the output torque of the motor decreases with the square of the voltage, and the current absorbed by the motor increases, and the voltage drop across the impedance of the power supply network increases accordingly. Low voltage protection should be installed on secondary motors and motors that are not allowed to self-start. The no-volt protection can be put in or out of use by a soft platen.

There are two types of no-volt protection. One is that only one time limit (no-volt I) acts on the local machine; the action criterion is:

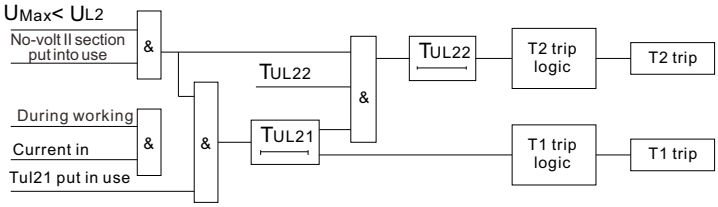
U<UsetT>Tset

Uset, Tset are the setting values of voltage loss and time respectively. U is any line voltage. The logic block diagram of the no-voltage I is as follows:



The other one has two time limits (no-volt II section), the general I time limit switches off the secondary motor or the segment switch, and the II time limit switches off the important motor (or the protection device itself). The no-volt II section is blocked by the current and the circuit breaker position.

The logic block diagram of the no-volt II section is as follows:



5. Zero sequence current protection, zero sequence overvoltage protection

When the zero sequence current (zero sequence voltage) is greater than the setting value and the protection action is performed after the set time, whether the action is tripped or not can be selected by the user. The action criteria are as follows:

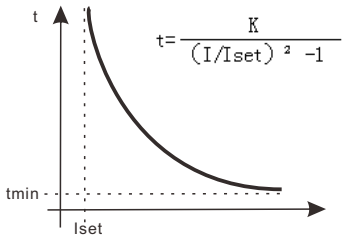
Zero sequence overcurrent protection: 3I0 > 3I0set T > T set

Zero sequence overvoltage protection: 3U0 > 3U0set T > T set

See the overcurrent protection logic block diagram for the zero-sequence overcurrent (zero sequence overvoltage) protection logic block diagram.

6. Inverse time overcurrent protection

The action current and time satisfy the graph shown in the figure below:



K-Heat capacity coefficient
Iset-Inverse time current
Tmin-Minimum time

7. Overheat protection

The overheat protection accurately reflects the accumulation inside the motor by means of the heating model of the motor. When the heat of the motor accumulates to the trip value, the motor is tripped.

The allowable running time of the motor is as follows:

$$t = \frac{\tau}{I_{eq*}{}^2 - 1.05^2} \qquad I_{eq*} = \sqrt{K_1 \times \left(\frac{I_1}{I_e}\right)^2 + K_2 \times \left(\frac{I_2}{I_e}\right)^2}$$

I1 and 12 are positive and negative sequence currents, Ie is the rated current, and T is the motor heating time constant.

K1 is the positive sequence current component coefficient, and K2 is the negative sequence current component coefficient.

Because the effects of the positive sequence components are different during startup and operation, K1 has two values: 0.5 in startup and 1 in running.

The action curve is basically the same as the action curve of the inverse time overcurrent protection (please refer to the inverse time overcurrent protection).

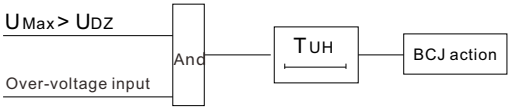
The overheat protection action will lock the remote control until the heat accumulation drops to 50% of the action value. In order to facilitate the test, the "test position" is set to enter.

8. Overload

Overload protection is mainly to prevent overcurrent caused by overload when the motor is abnormally running. Overload protection can be set to trip or alarm, and the function is set by the control word.

9. Overvoltage protection

Overvoltage protection is to prevent the electrical equipment from being damaged by voltages above the rated voltage for a long time. The logic block diagram of overvoltage protection is as follows:



10. Self-start function

After the no-volt protection action, if the voltage is restored and the self-starting function is input, the motor circuit is closed after the delay and enters the running state.

11. Notes

Because of the inverse time function, the device has a longer heat dissipation time during the test, so a “test position” input is added. When the test is started and accessed, the heat dissipation time is shortened, which is good for the test. It is not performed during operation.

8.7 KPM83M DC operation device (With anti-jump circuit)

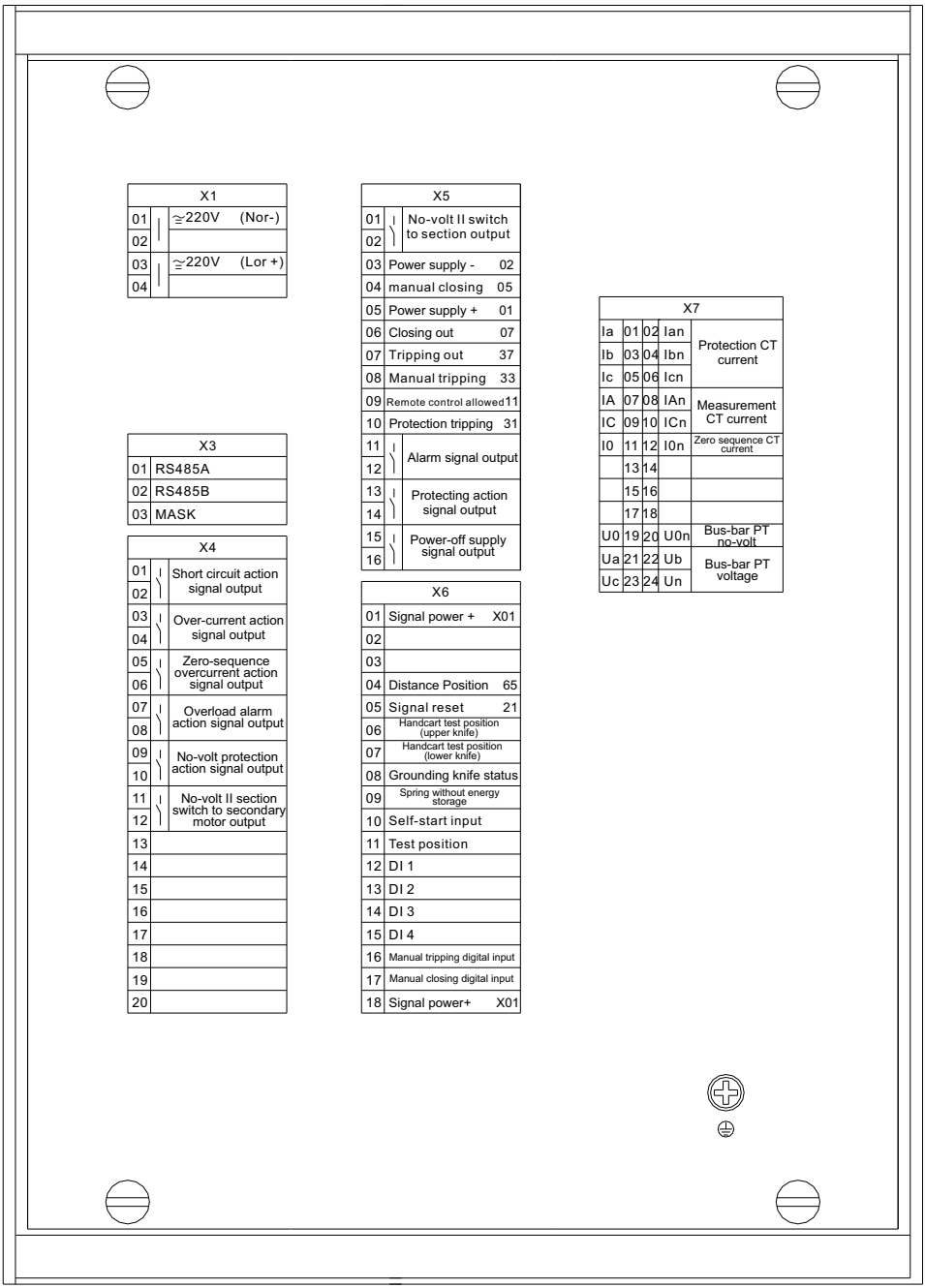


Fig 1 KPM83M Microcomputer motor protection measurement and control device terminal diagram DC

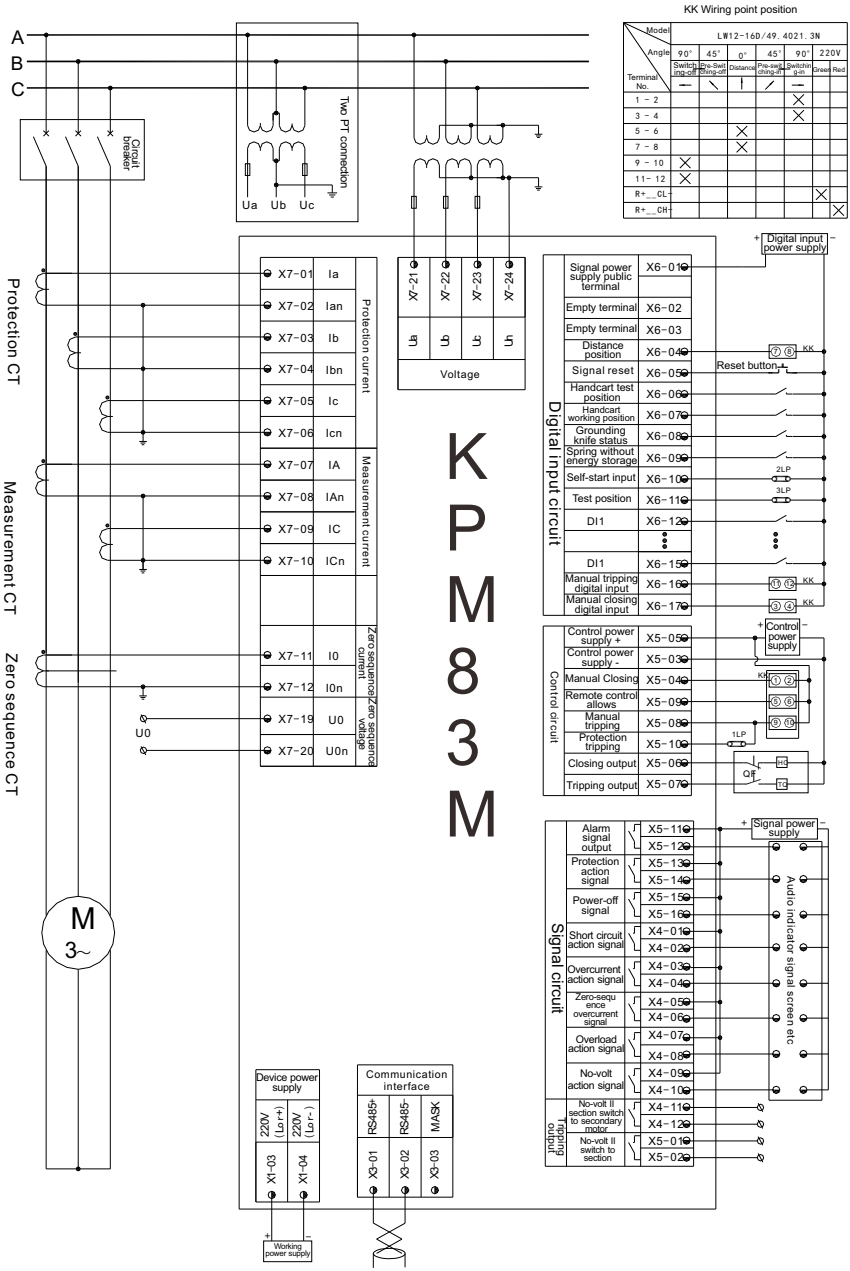
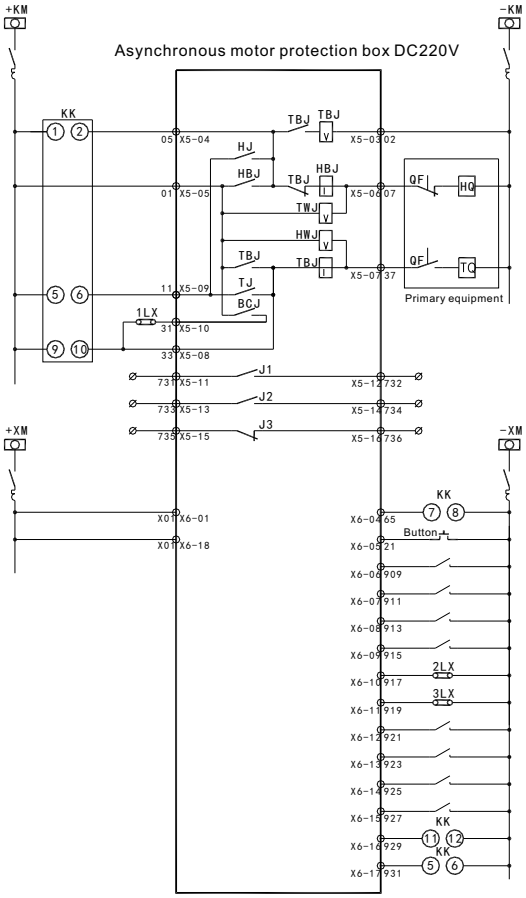
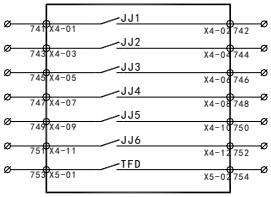


Fig 2 KPM83M Microcomputer motor protection measurement and control device wiring diagram DC



Manual closing
Remote control closing
Closing holding circuit
Tripping position relay signal
Closing position relay signal
Tripping holding circuit
Remote control tripping
Protection tripping
Manual tripping
Alarm signal output
Protection action disappearance signal output
Power-off signal output
Distance position
Signal reset
Handcart test position (Upper knife gate)
Handcart test position (Lower knife gate)
Grounding knife status
Spring without energy storage
Self-start input
Test position
DI1
DI2
DI3
DI4
Manual tripping digital input
Manual closing digital input

Asynchronous motor protection box DC220V



Short circuit action signal output	Signal output
Over-current action signal output	
Zero-sequence overcurrent action signal output	
Overload alarm action signal output	
No-volt protection action signal output	
No-volt II section switch to secondary motor output	Tripping output
No-volt II switch to Segmentation output	

Circuit breaker manual split switch KK

Model	LW12-16D/49.4021.3N					
Angle	90°	45°	0°	45°	90°	DC220V
	Switching -off	In-place	Distance	In-place	Switching -in	Sreen / Red
Terminal No	—	\	|	/	—	
1 - 2					×	
3 - 4					×	
5 - 6			×			
7 - 8			×			
9 - 10	×					
11 - 12	×					
R+__CL-						×
R+__CH-						×

Note:

1. Distance position means: if the control through the internal processing of the protection device, it is distance. The internal 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 KPM83M Microcomputer motor protection measurement and control device control principle diagram DC

8.8 KPM83M AC operation device (Without anti-jump circuit)

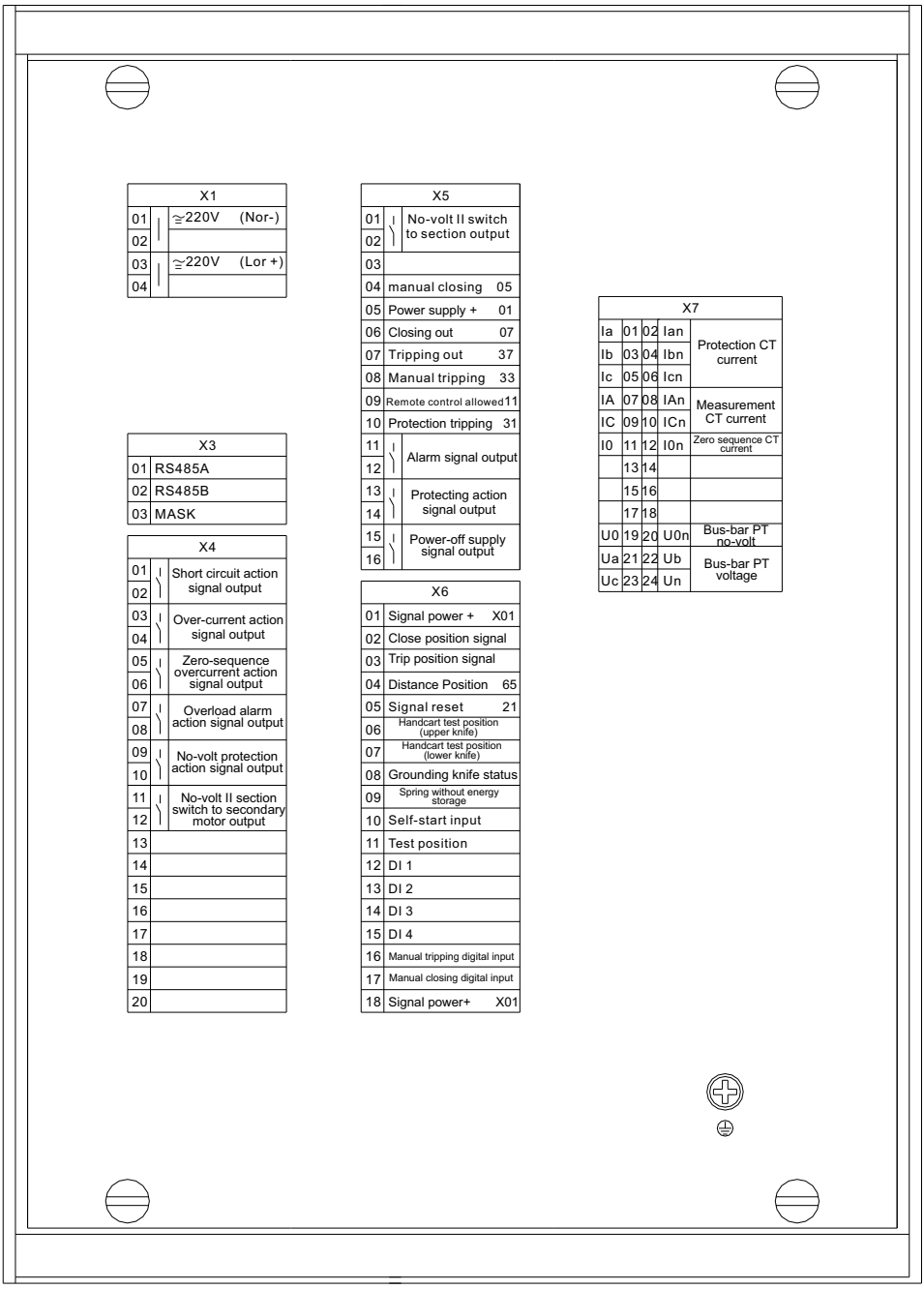


Fig 4 KPM83M Microcomputer motor protection measurement and control device terminal diagram AC

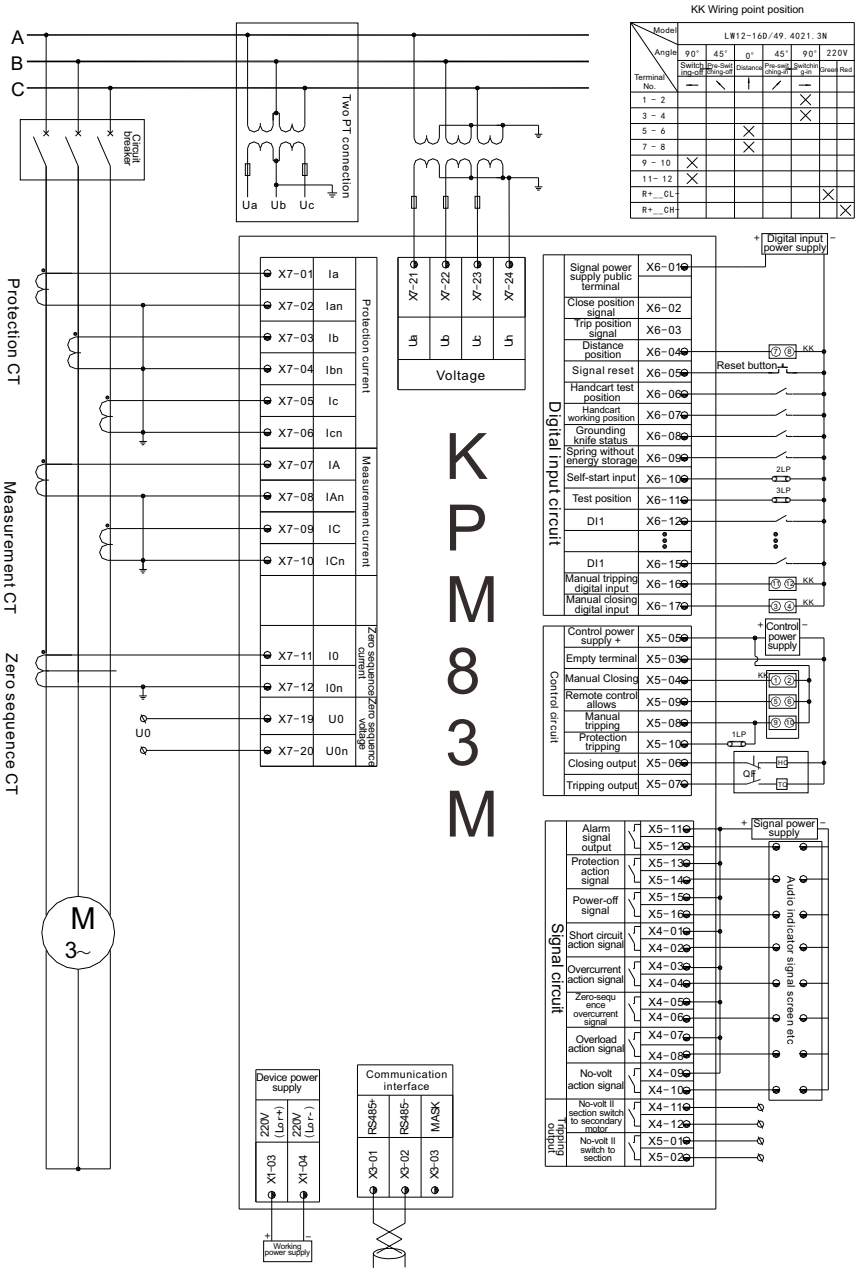


Fig 5 KPM83M Microcomputer motor protection measurement and control device wiring diagram AC

9.KPM83MD Microcomputer motor differential protection device

9.1 Overview

KPM83MD microcomputer motor differential protection device is mainly used for integrated differential protection, control and measurement of asynchronous motors with voltage levels up to 35KV.

9.2 Protection function

1	Differential quick-break protection	4	Non-electrical parameter protection
2	Ratio differential protection for second harmonic braking	5	Fault recording
3	CT disconnection checking and blocking funtion		

9.3 measurement and control functions

14-way remote signal access acquisition, device remote signal displacement, accident remote communication (remote signal name and alarm mode, users can set by themselves according to actual requirements)

Lah, Ibh, Ich, Ial, Ibl, Icl analog protection.

Event sequence record (SOE), etc.

9.4 Technical parameters

Content \ Index	Current fixed value	Overcurrent fixed value	Fixed value error
Differential quick-break protection	4In-12In		<5%
Ratio differential protection for second harmonic braking		0.2In-2In	<5%

9.5 analog input

Iah, Ibh, Ich, Ial, Ibl, Iel are the output currents of the differential protection CT of the first end side and the tail side of the motor as the differential protection quantity.

9.6 Protection principle

1.Differential quick-break protection

When the difference current is greater than the set value, it indicates that a serious fault has occurred inside the motor. The differential protection should immediately act on the trip without any braking. The differential current quick-break protection action setting should be set to avoid various unbalanced currents and currents.

2. Ratio differential protection of second harmonic braking

The differential protection with ratio braking is shown in the figure.

Second harmonic blocking principle: The device uses the ratio of the second harmonic to the fundamental wave in the three-phase differential current as the criterion of the magnetizing inrush current. When the second harmonic ratio in any phase differential current is greater than a fixed value, the blocking condition is satisfied, the three-phase ratio differential protection is blocked.

3. CT disconnection blocking

The conditions for determining the CT disconnection are:

① One of the three phase currents on one side is reduced to zero, and the currents of the other two phases and the other side are unchanged.

② The maximum phase current on this side is greater than 0.2 times IE.

③ The maximum phase current (both sides) is less than 1.2 times IE.

After the CT is disconnected, an alarm signal is issued, and the differential protection can be selected whether to block or not according to the control word; this CT disconnection criterion is useful for the sudden disconnection of the CT, but doesn't work for when the resistance of the CT contact gradually becomes large until the disconnection, but it can play the role of CT

disconnection alarm because of differential flow alarm.

4. Non-electrical parameter protection

When the protection device receives the non-electrical parameters that needs to trip the circuit breaker, it can quickly open the circuit breaker and remove the fault.

5. Event record function

The device can record protection action events, alarm events and remote signal displacement events.

The protection action event records the protection action time, protection type of the trip, and the differential current when having fault.

The alarm event records system alarm signals such as CT disconnection and differential flow alarm,etc.

The remote signal displacement records the info of remote signal displacement.

6. Fault recording

The fault recording function of the device, recorded analog quantity is Iah, Ibh, Ich, Ial, Ibl, Id,and the recorded state quantity is the switch position.

7. CT wiring points:

It should be noted in the wiring of the CT that the CT of the first and end of the motor are wired in a star shape, and the direction of the flow to the motor is the positive direction of the current.

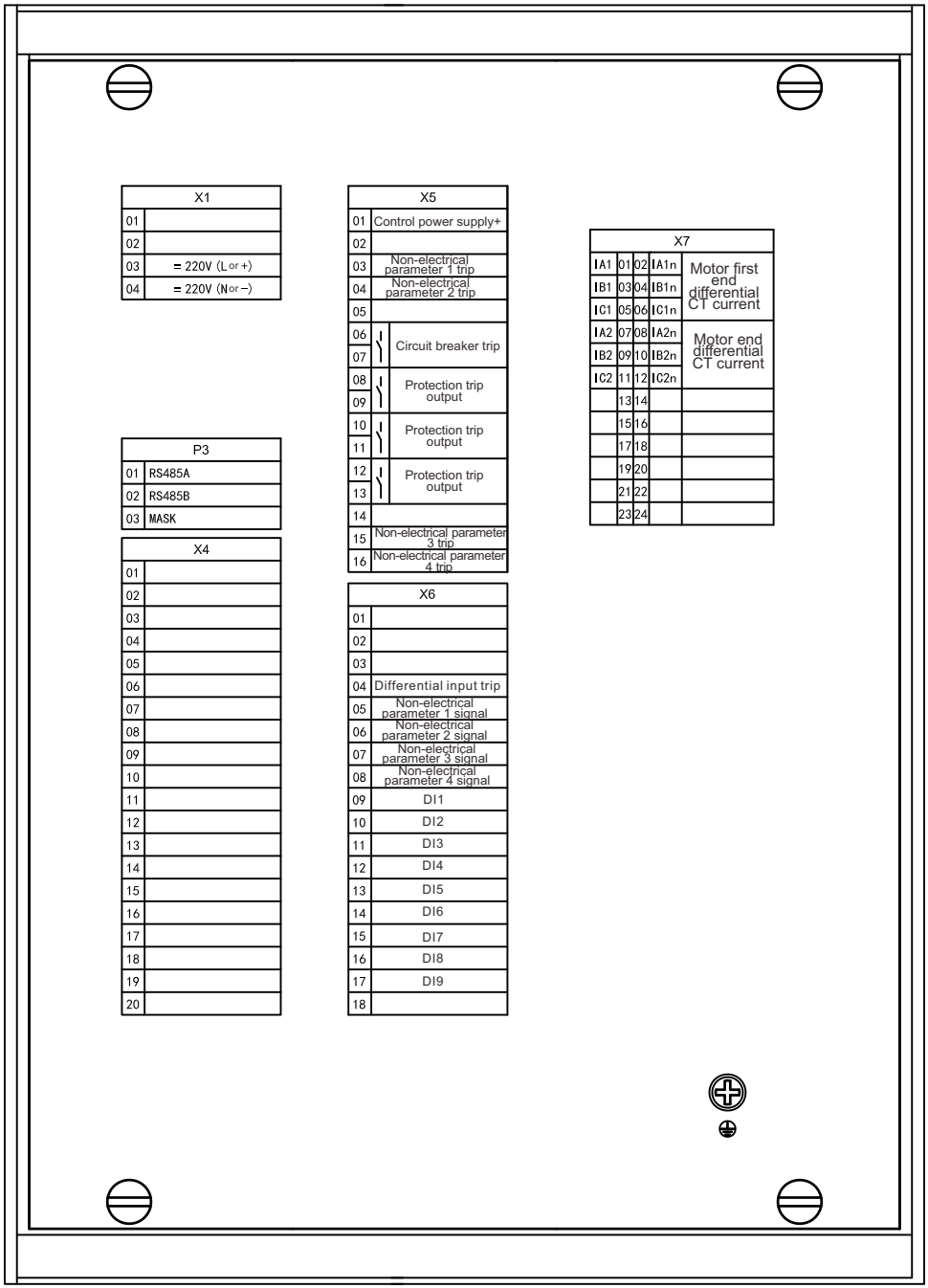


Fig1 KPM83MD Microcomputer motor differential protection device terminal diagram

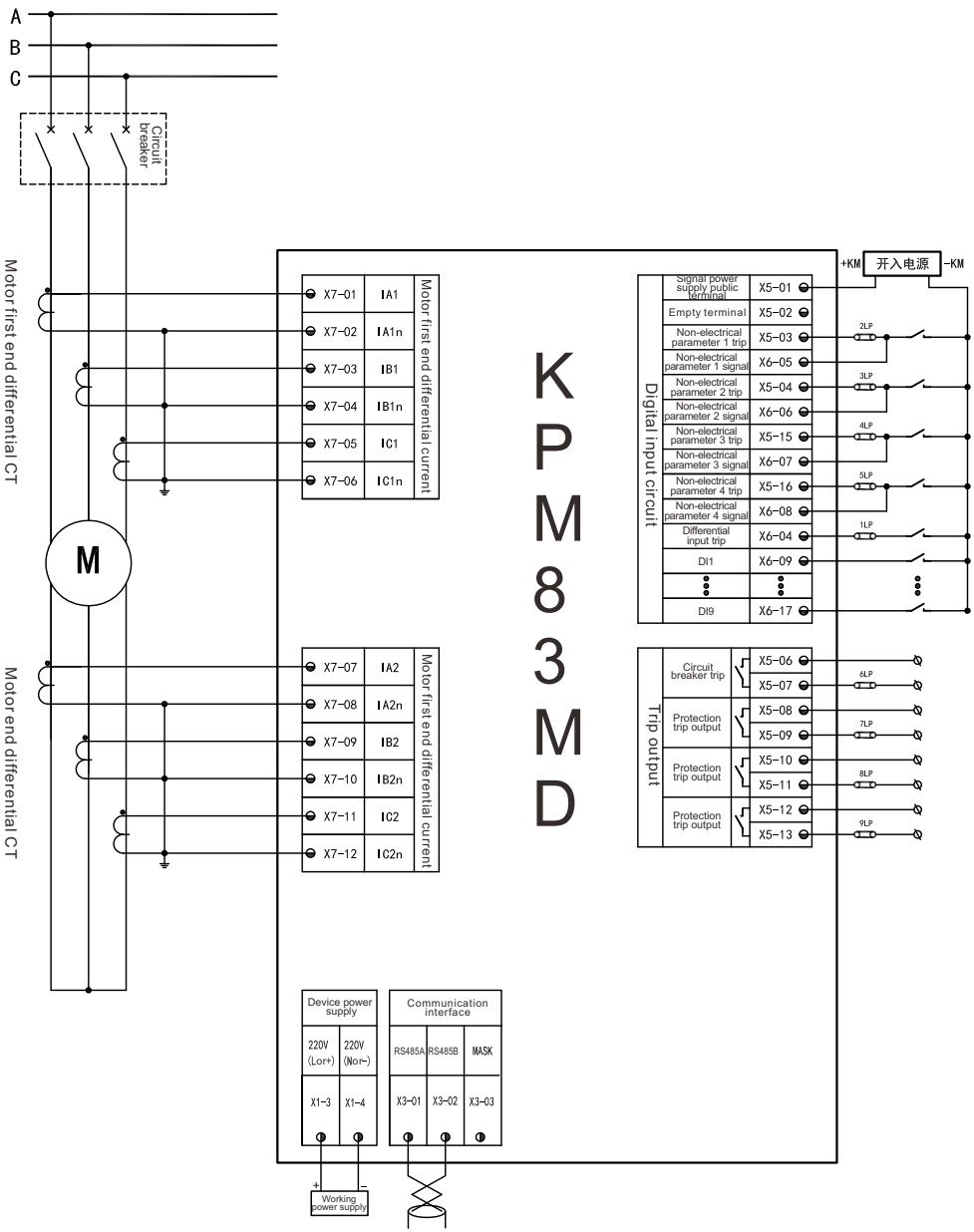
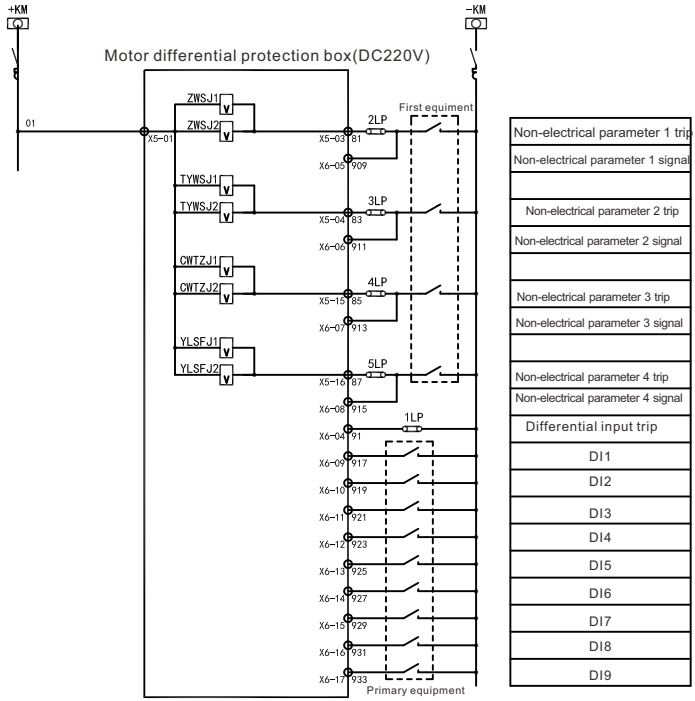


Fig2 KPM83TD Microcomputer motor differential protection device wiring diagram



Note:
1. BCJ is differential protection output relay
2. Different input trip is a hard contact that is set to block differential protection.

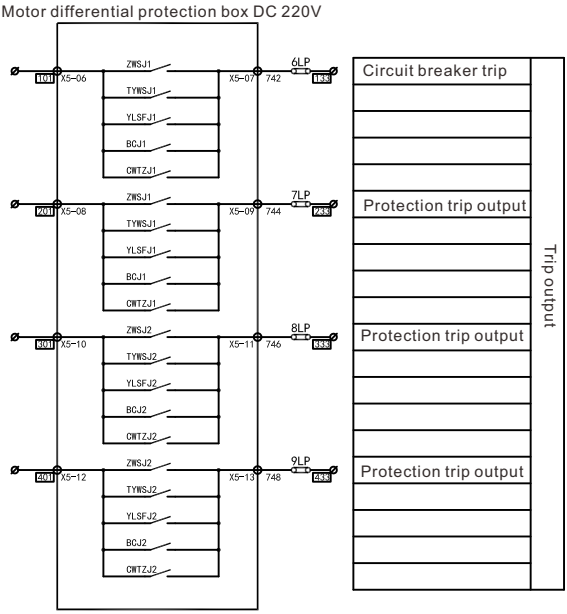


Fig3 KPM83TD Microcomputer motor differential protection device control principle diagram

10.KPM83P microcomputer PT switching protection measurement and control device

10.1 Overview

PUMG830P microcomputer PT switching protection measurement and control device is mainly used for comprehensive protection, control and measurement of single PT and PT parallel switching of voltage level of 35KV and below.

10.2 Protection function

No	Protection function	No	Protection function
1	Low voltage protection	4	PT switching function
2	Insulation monitor	5	Remote/manual parallel/parallel off
3	PT disconnection monitor		

10.3 Function description

1. PT switching function

When the double busbars are operated side by side (Or a single master bus-section by single bus mode), when one of the two groups (or two sections) PT is deactivated due to failure or maintenance, the PT switching action will run the PT secondary small bus in parallel. PT switching is divided into two types: node switching and control switching. Node switching means that no device participation is required, and only the auxiliary nodes of the bus coupling (or segmentation) switch and the PT knife gate need to be controlled. Control switching includes manual switching (via Kk handles) and remote switching, which is achieved by issuing remote commands.

2. Low voltage protection

The device monitors the two busbar voltages. When a busbar low voltage occurs, the device operates at a low voltage outlet after a set delay.

3. Zero sequence overvoltage alarm

In the small current grounding grid, the device issues a grounding warning signal when the bus voltage transformer open delta voltage (3U0) is greater than the zero sequence overvoltage setting value.

4. PT disconnection monitoring

The device has a PT disconnection check function, and when the device detects that the PT is disconnected, it sends an alarm signal. Criterion for PT disconnection is :

$$|U_A + U_B + U_C| > 7V$$

The difference between any two line voltage modes is greater than 18V, which is judged as PT disconnection. After the above conditions are met, the device will report the PT is disconnected after 3s delay.

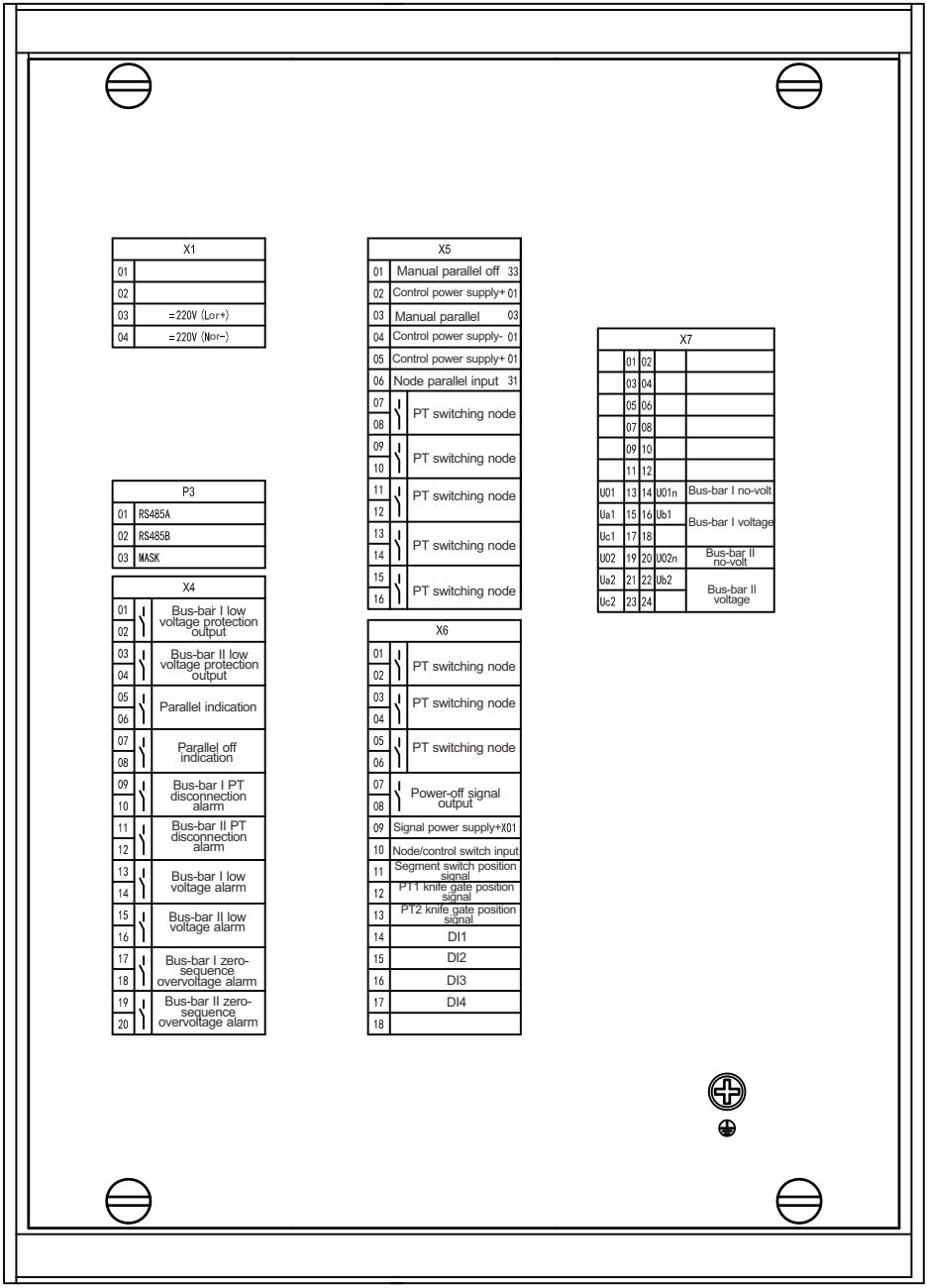


Fig 1 KPM83P microcomputer PT switching protection measurement and control device terminal diagram

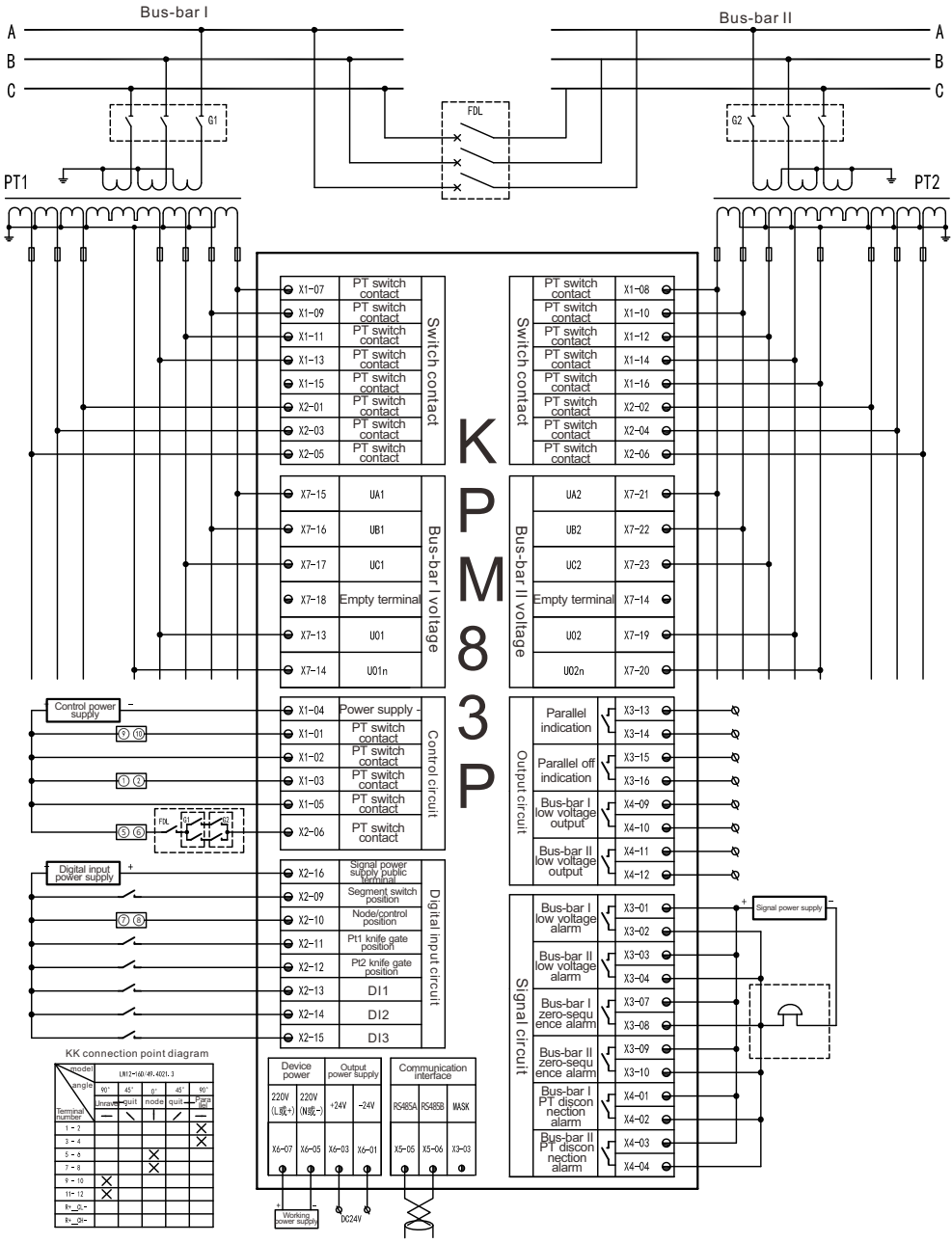
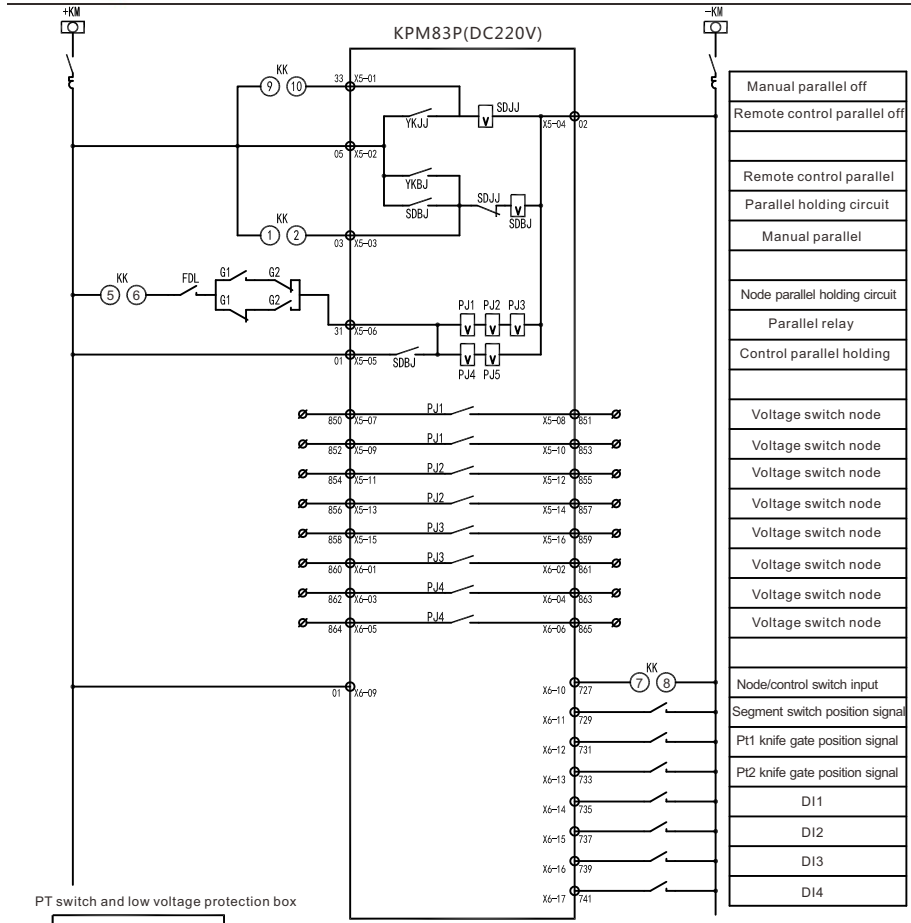
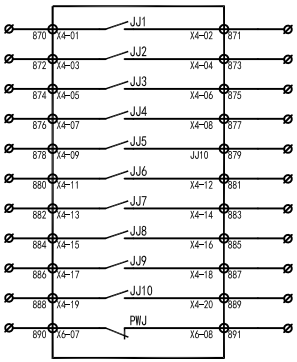


Fig 2 KPM83P microcomputer PT switching protection measurement and control device wiring diagram



PT switch and low voltage protection box



Bus-bar I low voltage protection output
Bus-bar II low voltage protection output
Parallel indication
Parallel off indication
Bus-bar I PT disconnection alarm
Bus-bar II PT disconnection alarm
Bus-bar I PT low voltage alarm
Bus-bar II PT low voltage alarm
Bus-bar I zero-sequence overvoltage alarm
Bus-bar II zero-sequence overvoltage alarm
Power off

Parallel on/off switch KK

Model	LW12-16D/49.4021.3				
Angle	90°	45°	0°	45°	90°
Terminal No.	Parallel off	Pre-parallel off	Node	Pre-parallel	Parallel
	←	↖	↑	↗	→
1 - 2					×
3 - 4					×
5 - 6			×		
7 - 8			×		
9 - 10	×				
11- 12	×				

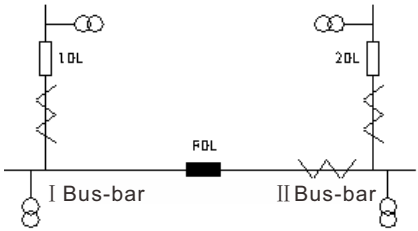
Note:
1.The meaning of the control/node is: the control is PT switching realized by the microcomputer remote control or by the external KK handle. The node mode isn't realized by the microcomputer. The PT switching in node mode is realized by the positional relationship of the sectional switch and the knife gate.
2.YKJJ is a remote control relay, YKBJ is a remote parallel relay, controlled by the CPU.

Fig 3: KPM83P microcomputer PT switching protection measurement and control device Control principle diagram

11.KPM83B Microcomputer backup power supply self-injection device

11.1 Overview

Microcomputer backup power supply automatic transfer switch device is an important function of substation, which can effectively reduce the loss caused by power failure.The wiring diagram of the automatic transfer switch device is as follows:



The automatic transfer switch usually uses the voltage loss and undercurrent as the criterion. The voltage criterion comes from the voltage transformer (the incoming voltage comes from the incoming line PT or the live display output node). If only use voltage as a criterion, the current isn't necessary to be connected to the device.

11.2 Main operation mode

1.Bridge automatic transfer switch operation mode (the incoming line I and II each has a busbar and the sectional switch is disconnected).

2.Incoming line I self-injected (input II with two-stage bus load, incoming line I as backup power).

3.Incoming line II self-injected (the incoming line I carries the load on the two-stage bus, and the incoming line II is used as the backup power).

4.Reverse incoming line self-injected.

11.3 Working principle

1. Bridge automatic transfer switch

a) The busbar is disconnected during normal operation, and each of the two incoming lines is operated with a busbar.

b) If the incoming line I and bus I (or incoming II and bus II) are power off, the other bus voltage is normal and the power bus is not faulty.

c) automatic transfer switch in the case of no external blocking: 1DL (or 2DL) is cut off, and FDL is closed after delay, the system enters the incoming line automatic transfer switch operation.

2. Incoming line I automatic transfer switch

In normal operation, the circuit breaker FDL of the bus coupler is closed, the circuit breaker 2DL of the incoming line II is closed, and the circuit breaker 1DL of the incoming line I is disconnected. If the incoming line II and the busbar power off, the circuit breaker 2DL of the incoming line II is disconnected, then closed the circuit breaker 1DL of incoming line I after delay.

3. Incoming line II automatic transfer switch

In normal operation, the circuit breaker FDL of the bus coupler is closed, the circuit breaker 1DL of the incoming line I is closed, and the circuit breaker 2DL of the incoming line II is disconnected. If the incoming line I and the busbar power off, the circuit breaker 1DL of the incoming line I is disconnected, then closed the circuit breaker 2DL of incoming line II after delay.

4. Reverse automatic transfer switch

The reverse automatic transfer switch first should have the distinction between the active and

power supplies, and the reverse automatic transfer switch is only activated when the control words are input. For example, the incoming line I is the main power source, in normal operation, the incoming line II is in automatic transfer switch mode. When the incoming line I and the bus line are de-energized, the 1DL is disconnected and 2DL is closed. If the incoming line I resumes power supply, the 2DL is disconnected and 1DL is closed to complete the reverse action after a delay.

11.4 Protection function

1. Charging protection

When the bridge automatic transfer switch action closes the segmentation switch, if the current at the segment is large, it means that it is combined with the fault, then the segmentation switch is cut off by delay.

2. Incoming line joint cutting function

The joint cutting function means that when the load is applied to the entire load by the incoming line I or the incoming line II, if the load is too large, it is necessary to remove the unimportant load. The joint cutting function is divided into two time limits. If the current is greater than the fixed value, the joint and part of the load are cut off after delay T1. If the current is still greater than the fixed value, , the joint 2 and the other partial load is cut off after delay T2. The joint cut function sets the fixed value, delay and input control words for incoming line I and II independently, but the outlet is shared.

11.5 Illustration

1.automatic transfer switch operating parameters

Check with voltage fixed value: If the voltage on the PT is greater than " Check with voltage fixed value ", the incoming line or busbar will judge there is voltage input.

Check no-voltage fixed value: If the voltage on the PT is less than " check no-voltage fixed value ", the incoming line or bus bar will judge there is no-voltage.

If the voltage is between the “Check with voltage fixed value” and the " check no-voltage fixed value " for 20 seconds, indicating that the incoming line or bus-bar state is uncertain, the protection device will report the incoming line or the bus entering the uncertainty.

Check no-voltage delay: confirm the PT no-voltage time, it and the " check no-voltage fixed value " is used to confirm whether the incoming line or the bus-bar is no-voltage.

Incoming line I/II automatic transfer switch delay time: When the incoming line I/II is used as the backup power supply, the time from the incoming line II/I power off to cutting off the incoming line II/I.

Bridge automatic transfer switch I/II delay time: When the bridge is running, the time from the incoming line II/I power off to cutting off the incoming line II/I.

“Incoming line I/II automatic transfer switch delay time” and " Bridge automatic transfer switch I/II delay time " set value can be adjusted according to the running condition of the incoming line II/I (such as reclosing delay).

Charging delay: When the automatic transfer switch enters a new operating mode, it takes a certain time to ensure the stability of the system, called charging delay. After the charging is completed, the next automatic transfer switch can be performed; the charging success event will be reported after the charging is completed.

Closing delay: when the automatic transfer switch is actuated, firt trip and then close, the time from voltage is stabilized after trip to closing.

The incoming line I/II uses a live display: Input the control word, then the incoming line I/II judges whether the incoming line I/II has voltage according to the input quantity "charged display node", and the line PT no longer functions.

2. automatic transfer switch operating mode

Incoming line I/II automatic transfer switch input: “Incoming line I/II automatic transfer

switch" refers to the operation mode of incoming line II/I as the main power supply and incoming line I/II as the backup power supply. When the control word is input and the incoming line II/I loses voltage, the line II/I will be cut off and the incoming line I/II will be closed. If the control word exits, it will not be acted upon.

Bridge automatic transfer switch input: the bridge operation mode refers to the incoming line I carries with the load on bus-I, and the incoming line II carries with the load on bus-II. When the control word is input and the incoming line I/II is power off, cut off incoming line I/II and close the segment switch, all the loads are carried by the incoming line II/I.

If the control word exits, it will not be acted upon.

3. automatic transfer switch operating mode selection

Among in these modes, only one operating mode can be choosed.

Bridge operation mode: The main operation mode is that each of the two power supplies has a busbar. When one of them is power off, the other power supply will carry all loads. When the power failure is restored, it returns to the main operation mode. In the bridge operation mode, the control word of "Self-injected reverse action input" in the operation mode group should be input.

Incoming line I/II as the main power supply: the main operation mode is the incoming line I/II as the main power supply, and the incoming line II/I is the backup power supply. When the main power supply is power off, the main power supply will be cut off and the backup power supply will be connected; after the main power supply is restored, the backup power supply will be disconnected and the main power supply will be connected. When either of these two modes is selected, the " Self-injected reverse action input " control word in the operation mode group needs to be input.

No main/backup mode: There is no main operating mode, the two power supplies are alternate for each other and no reverse action is required.

11.6 KPM83B Bus-bar coupler automatic transfer switch device

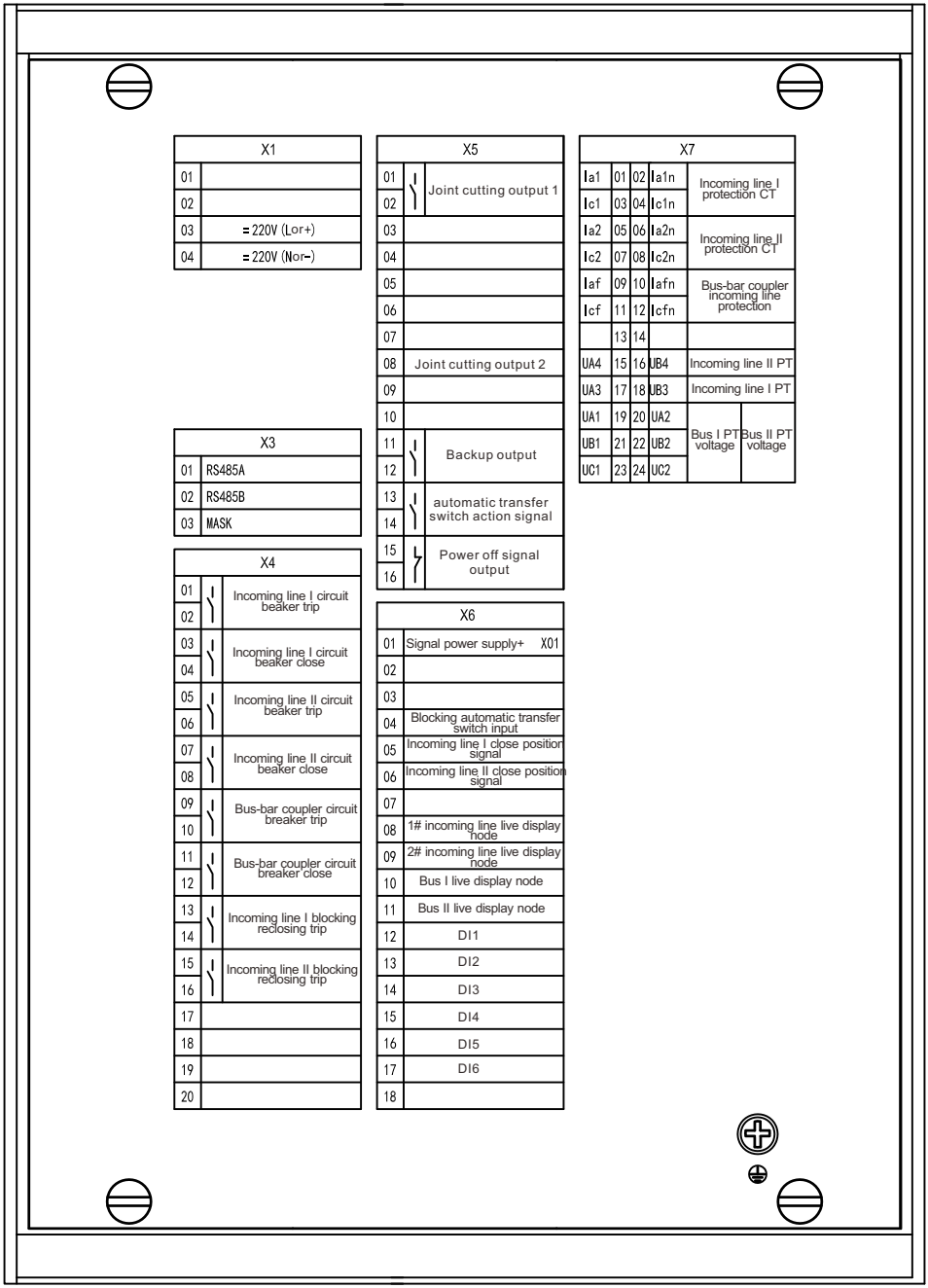


Fig 1 Microcomputer backup power supply automatic transfer switch device terminal diagram (Bus-bar coupler)

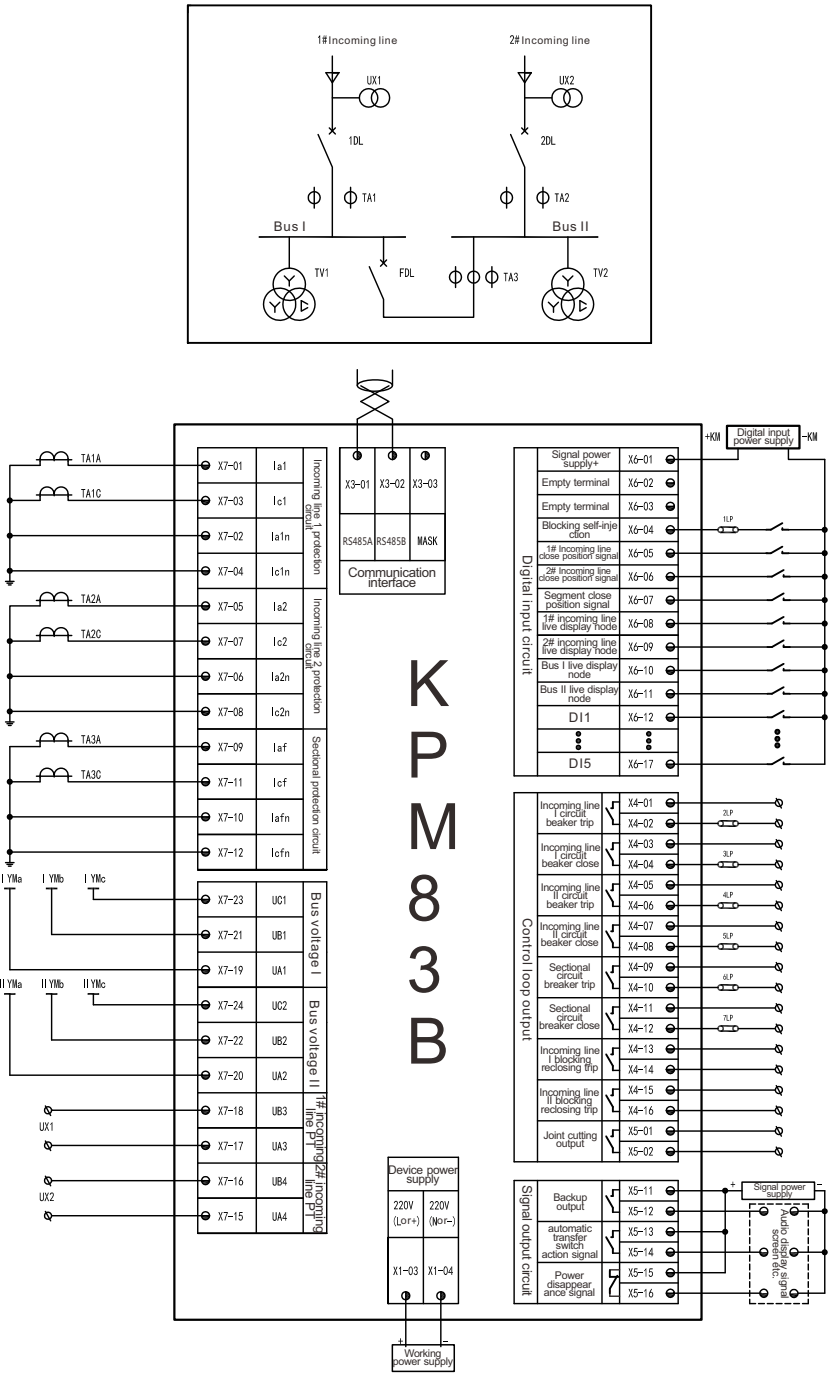
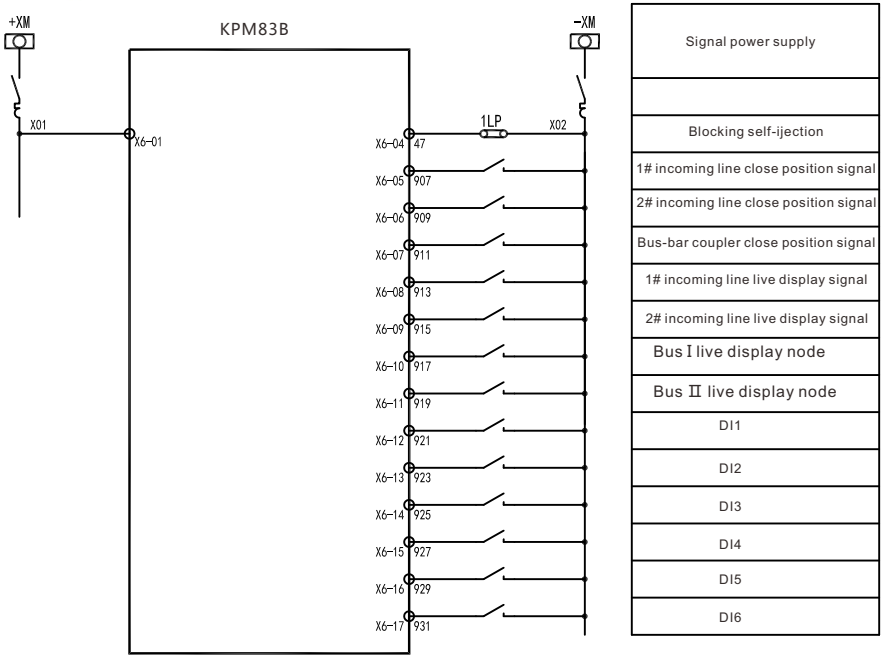
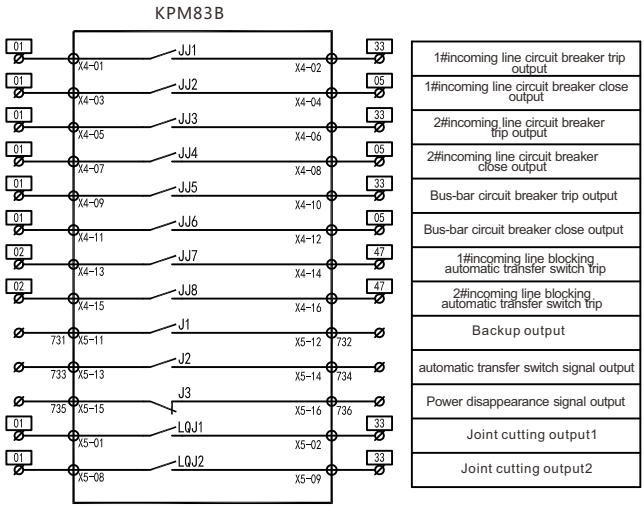


Fig2 Microcomputer backup power supply automatic transfer switch device wiring diagram（Bus-bar coupler)

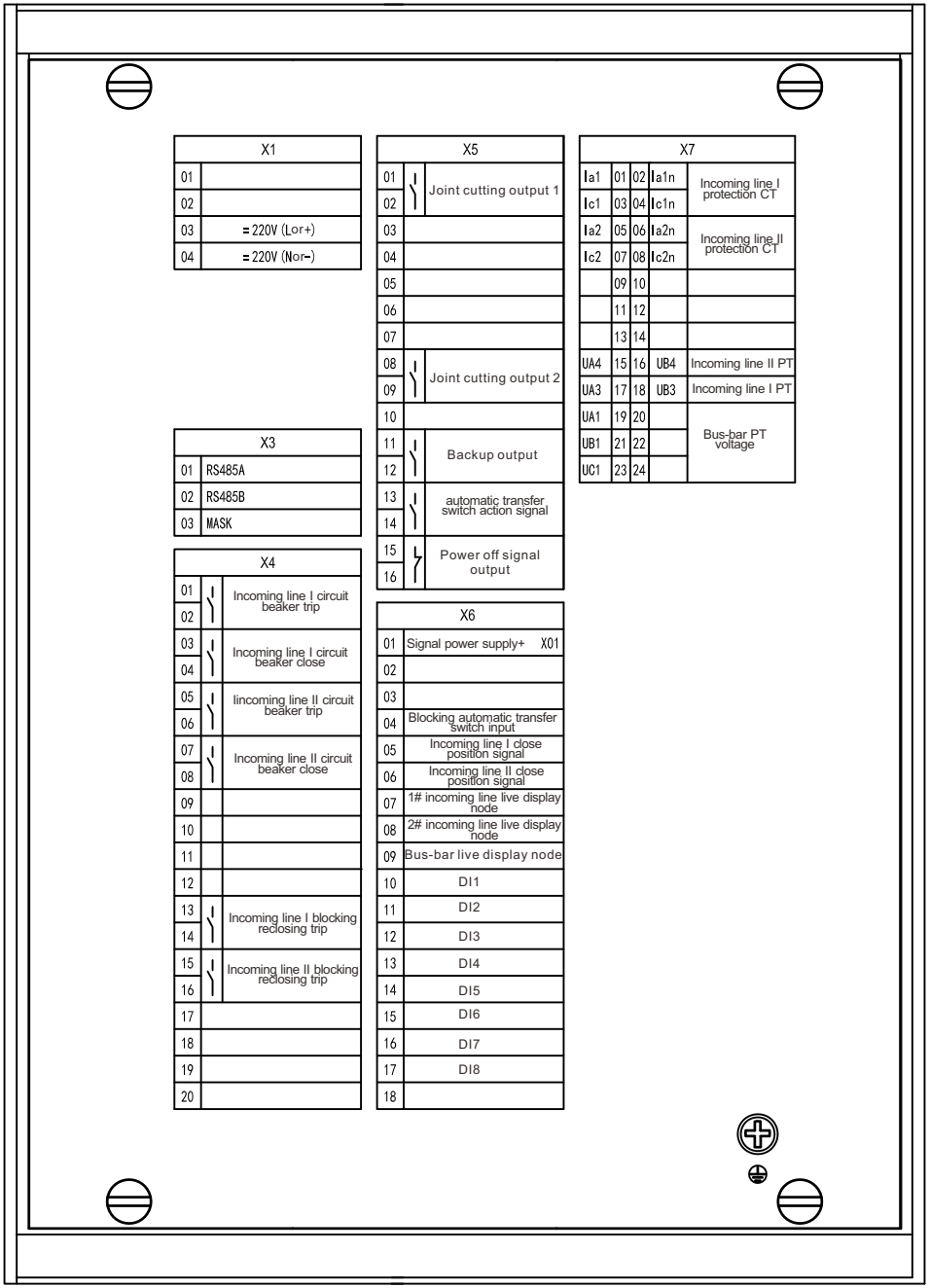




Note:
1. HSP942N automatic transfer switch device is used in the dual power single bus segmentation wiring system.
2. XM is the signal bus, the signal bus is DC220V or AC220V, which must be stated when ordering.
3. The relay signal output contact is a hold signal, and the signal is reset after reset.
4. The standby output is a reserved outlet, and the outlet is invalid in the universal device. If required, specify the purpose and node output method when ordering.

Fig 3: Microcomputer backup power supply automatic transfer switch device control principle diagram (Bus-bar coupler)

11.7 KPM83B Incoming line automatic transfer switch device



X1	
01	
02	
03	= 220V (Lor+)
04	= 220V (Nor-)

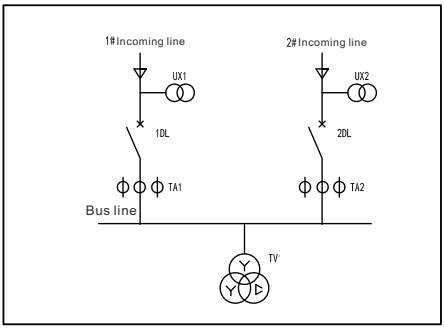
X3	
01	RS485A
02	RS485B
03	MASK

X4		
01		Incoming line I circuit beaker trip
02		
03		Incoming line I circuit beaker close
04		
05		Iincoming line II circuit beaker trip
06		
07		Incoming line II circuit beaker close
08		
09		
10		
11		
12		
13		Incoming line I blocking reclosing trip
14		
15		Incoming line II blocking reclosing trip
16		
17		
18		
19		
20		

X5		
01		Joint cutting output 1
02		
03		
04		
05		
06		
07		
08		Joint cutting output 2
09		
10		
11		Backup output
12		
13		automatic transfer switch action signal
14		
15		Power off signal output
16		

X6	
01	Signal power supply+ X01
02	
03	
04	Blocking automatic transfer switch input
05	Incoming line I close position signal
06	Incoming line II close position signal
07	1# incoming line live display node
08	2# incoming line live display node
09	Bus-bar live display node
10	DI1
11	DI2
12	DI3
13	DI4
14	DI5
15	DI6
16	DI7
17	DI8
18	

X7				
Ia1	01	02	Ia1n	Incoming line I protection CT
Ic1	03	04	Ic1n	
Ia2	05	06	Ia2n	Incoming line II protection CT
Ic2	07	08	Ic2n	
	09	10		
	11	12		
	13	14		
UA4	15	16	UB4	Incoming line II PT
UA3	17	18	UB3	Incoming line I PT
UA1	19	20		Bus-bar PT voltage
UB1	21	22		
UC1	23	24		



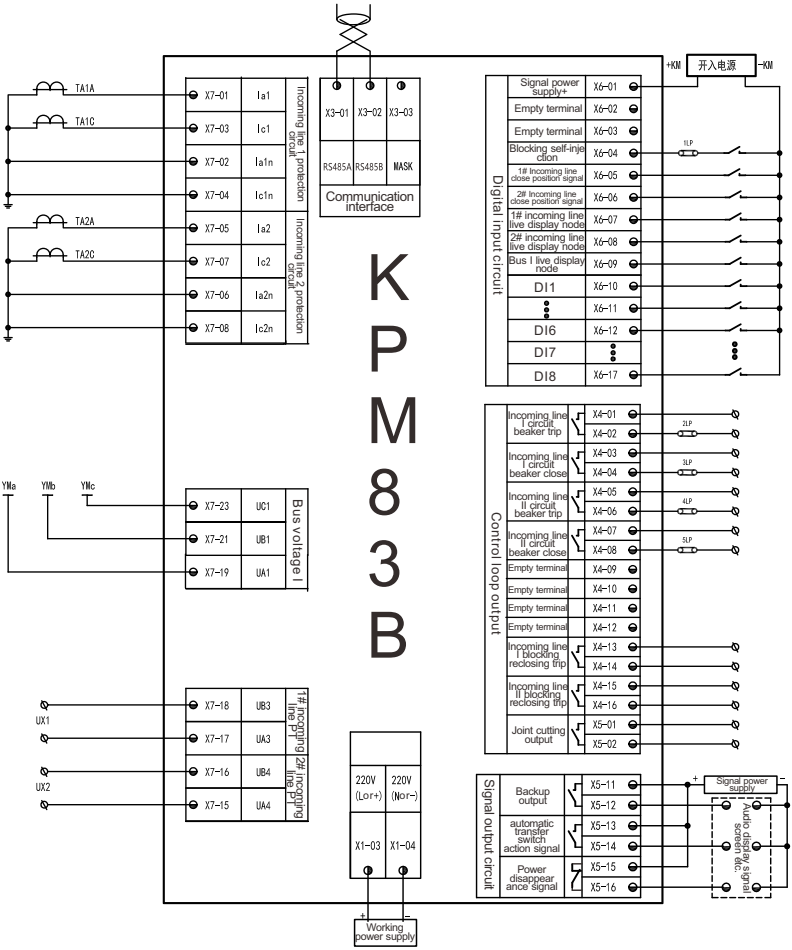


Fig 5 Microcomputer backup power supply automatic transfer switch device wiring diagram (Incoming line)

12.KPM83BU microcomputer automatic transfer switch bus-bar coupler protection monitoring and control device

12.1 Overview

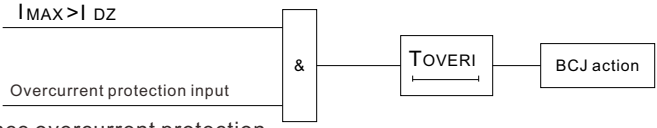
KPM83BU microcomputer automatic transfer switch mother-in-law protection and monitoring device is mainly suitable for comprehensive protection of the contact line of 35KV and below, automatic input and measurement of standby power.

12.2 Protection principle

1.Overcurrent protection

The device is equipped with three-stage (quick-break + two-stage definite time) current protection. The current and time of each segment can be independently set. The control word can be set separately to control the retreat of the protection of this segment.

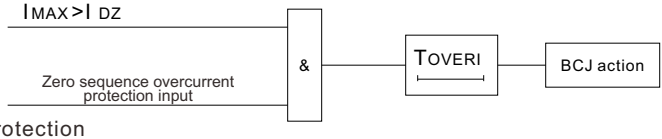
The amplitude of any phase current is greater than the setting value, and the component starta operating. The logical frame of overcurrent protection is as follows:



2. Zero sequence overcurrent protection

Zero-sequence overcurrent reflects a one-way ground fault and is suitable for direct grounding systems. The device is provided with two-stage zero-sequence overcurrent protection, and the current and time settings of each segment can be independently set.

The logic block diagram of zero sequence overcurrent protection is as follows:



3. Charging protection

When the charging busbar is charged, the charging protection pressure plate is put into the power supply, and if the busbar is short-circuited, the charging protection will choose no time limit tripping. After the charging is completed, the charging protection hard platen exits.

4. Control loop disconnection

The device is equipped with a control loop disconnection monitoring function, which uses the combined contacts of the close and trip relays to judge whether the control loop is normal through software. When the fault occurs, the control loop disconnection alarm signal is issued after 0.5s delay.

5. Event record function

The device can record protection action events, alarm events and remote signal displacement events, and the event won't lose if the device is power off. The protection action event records the protection action time, the type of protection applied to the trip, and the short-circuit current and voltage value at the time of the fault.

Remote signal displacement records the displacement of remote signal.

12.3 Instruction

1. automatic transfer switch operating parameter

Check voltage fixed value: If the voltage on the PT is greater than the " Check voltage fixed value ", the incoming line or the bus line will determine there is voltage input.

Check no voltage fixed value: If the voltage on the PT is less than the " Check no voltage fixed value ", the incoming line or busbar will determine there is no voltage.If the voltage is between the “Check voltage fixed value” setting value and the “Check no voltage fixed value”

setting value for 20 seconds, the incoming line or bus bar status is uncertain, and the protection device will report the incoming line or the bus line enters uncertain status event.

Check no voltage delay: Confirm the time when PT is no voltage, it and “Check no voltage fixed value” together confirm whether the incoming line or bus is no voltage.

Incoming line I/II automatic transfer switch delay time: When the incoming line I/II is used as the backup power supply, the time from the incoming line II/I loss power till to when the incoming line II/I is cut off.

Bridge automatic transfer switch I/II delay: When the bridge is running, the time from the incoming line II/I loss power till to when the incoming line II/I is cut off.

The " Incoming line I/II automatic transfer switch delay time " and the " Bridge automatic transfer switch I/II delay " can be set according to the operation of the incoming line II/I (such as the reclosing delay).

Charging delay: When the automatic transfer switch enters a new operating mode, it takes a certain time to ensure the stability of the system, called charging delay.

After the charging is completed, the next automatic transfer switch can be performed; the charging is completed and the charging success event is reported.

Closing delay: When the automatic transfer switch acts, the time from voltage is stabilized after the trip to closing.

The incoming line I/II uses a live display: the control word is input, and the incoming line I/II judges whether the incoming line I/II has voltage according to the "charged display node" in the input amount, and the line PT no longer functions.

2. automatic transfer switch operating mode

Incoming line I/II automatic transfer switch: “Incoming line I/II automatic transfer switch” refers to the operation mode of the incoming line II/I as the main power supply and the incoming line I/II as the backup power supply. When the control word is input, when the incoming line II/I loses power, the incoming line II/I will be cut off and the incoming line I/II will be closed. The automatic transfer switch won't work if the control words exits.

Bridge automatic transfer switch: "Bridge operation mode" refers to the incoming line I carries with the load on Bus-bar I segment, and the incoming line II carries with the load on Bus-bar II segment.

When the control word is input, when the incoming line I/II is power off, the incoming line I/II will be cut off and close and the segment switch, and the incoming line II/I will carry all loads. The automatic transfer switch won't work if the control words exits.

3. automatic transfer switch operating mode selection

Only one mode can be selected in several options.

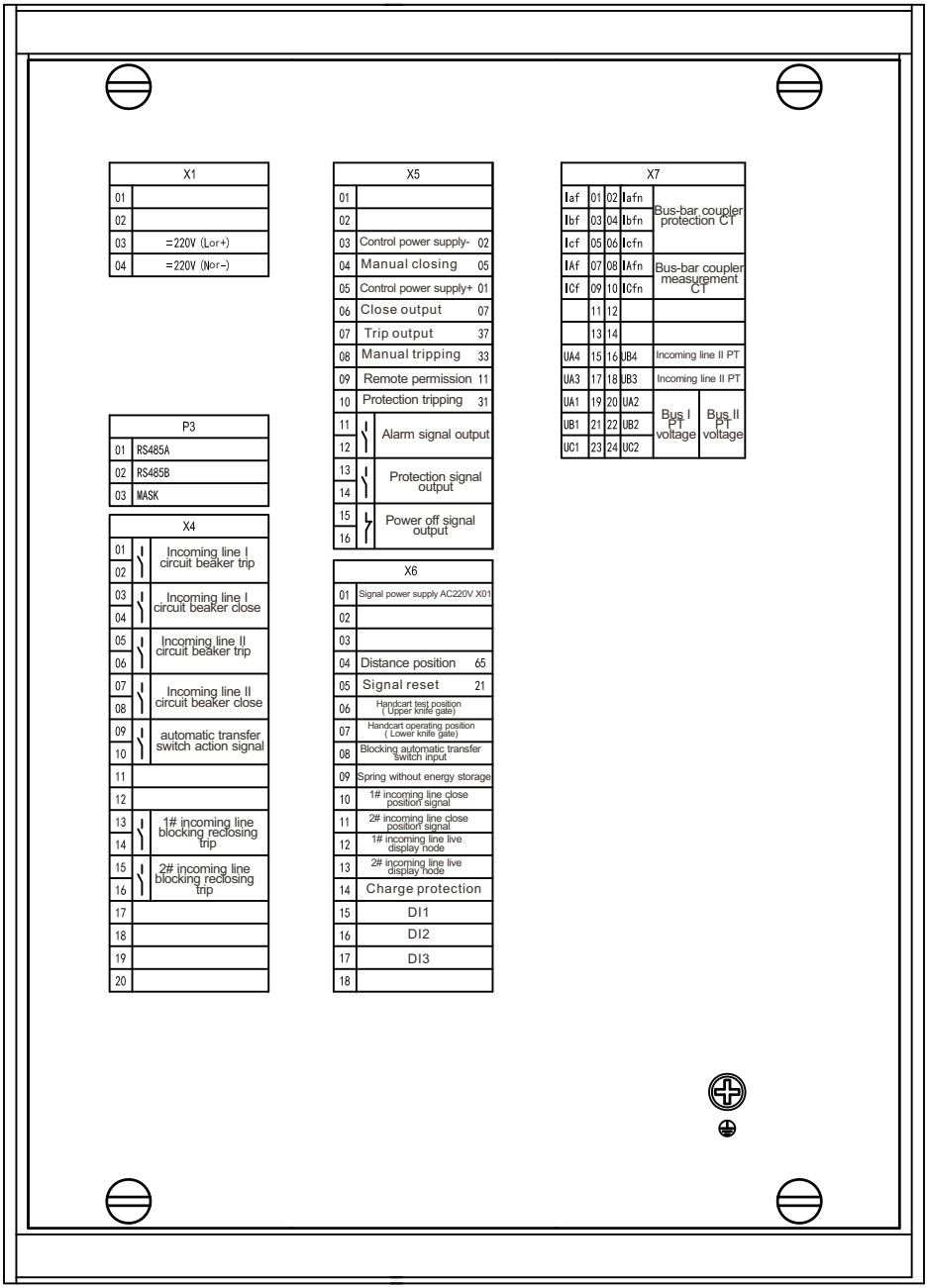
Bridge operation mode: The main operation mode is that each of the two power supplies has a busbar. When one of the power supplies loses power, the other power supply will carry all loads. When the power failure is restored, it returns to the main operation mode.

In the bridge operation mode, the “automatic transfer switch reverse action input” control word in the backup operation mode group should be input.

Incoming line I/II as the main power supply: the main operation mode is the incoming line I/II as the main power supply, and the incoming line II/I is the backup power supply. When the main power supply loses power, the main power supply will be cut off and the backup power supply will be turned on; after the main power supply is restored, the backup power supply is disconnected and the main power supply is turned on. When any of these two modes is selected, the "automatic transfer switch reverse action input" control word in the backup operation mode group should be input.

No active/backup mode: There is no main operating mode, the two power supplies are alternate with each other and no reverse action is required.

12.4KPM830BU DC operation device (With anti-jump circuit)



1. KPM83BU Microcomputer automatic transfer switch bus-bar coupler protection monitoring and cont device terminal diagram DC

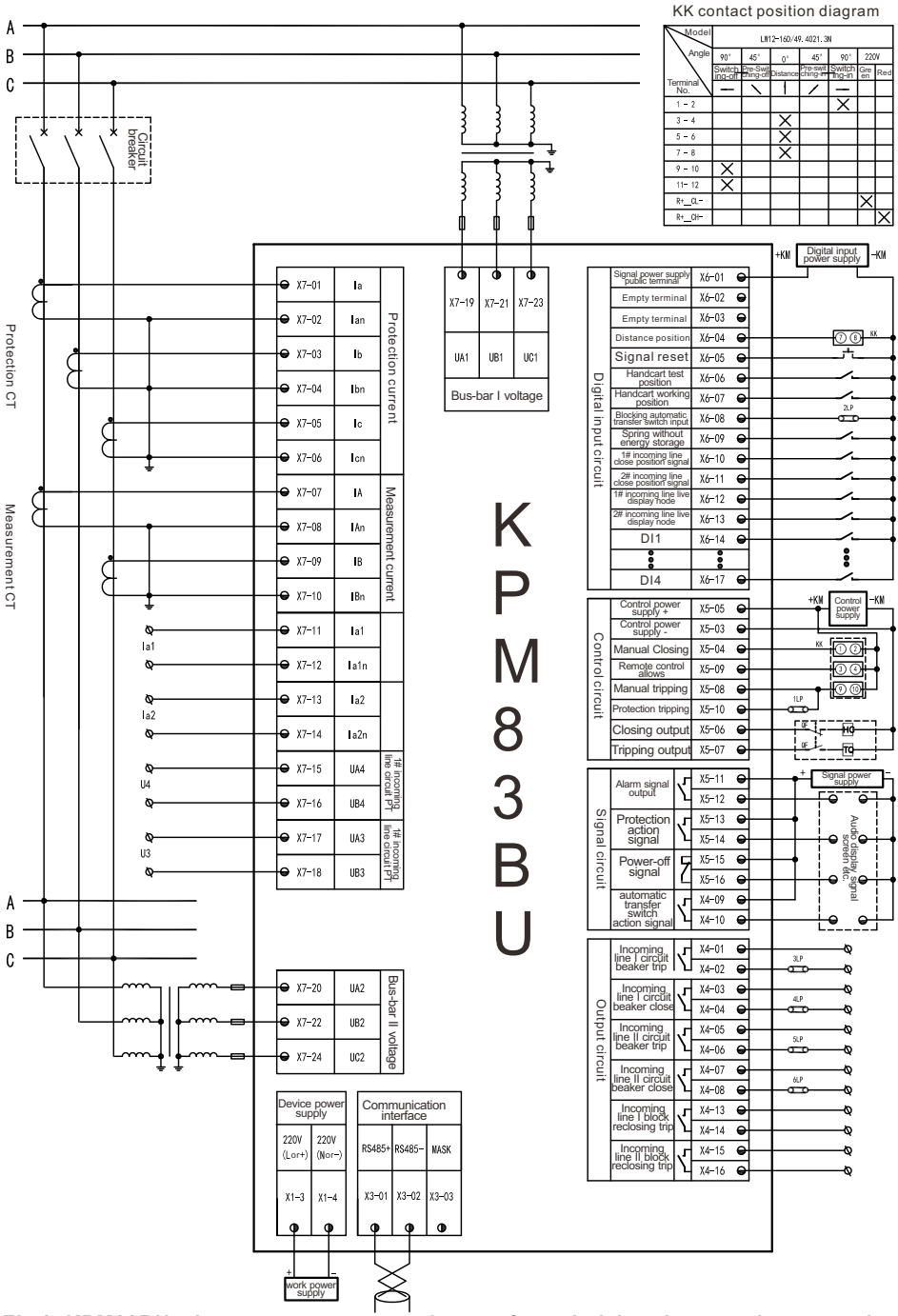
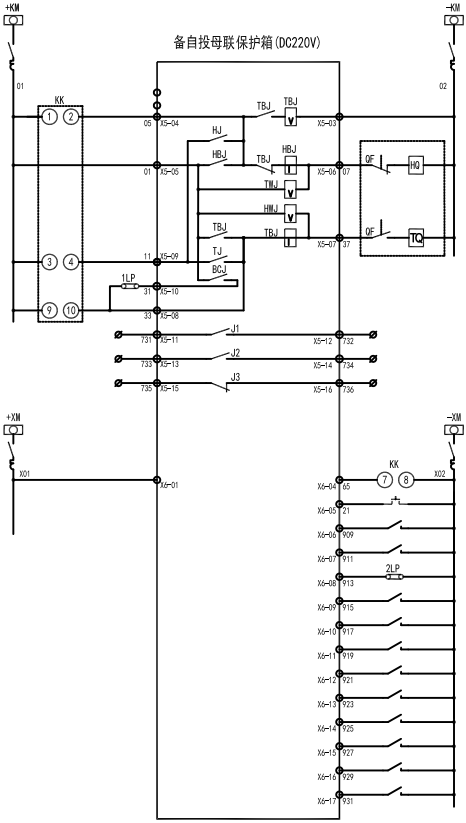
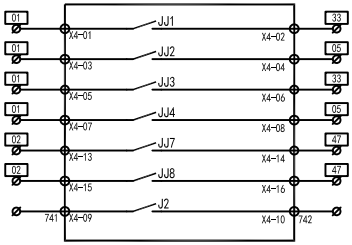


Fig 2: KPM83BU microcomputer automatic transfer switch bus-bar coupler protection monitoring and control device wiring diagram DC



Manual closing
Remote closing
Closing holding circuit
Trip relay signal
Clos relay signal
Trip protection circuit
Remote tripping
Protection tripping
Manual tripping
Alarm signal output
Protection action signal output
Power disappearance output
Signal power supply DC220V
Distance position
Signal reset
Handcart test position (upper knife)
Handcart test position (lower knife)
Blocking automatic transfer switch input
Spring without energy storage
1# incoming line close position signal
2# incoming line close position signal
1# incoming line live display node
2# incoming line live display node
DI1
DI2
DI3
DI4

备自投母联保护箱(AC220V)



1# Incoming line circuit beaker trip output
1# Incoming line circuit beaker close output
2# Incoming line circuit beaker trip output
2# Incoming line circuit beaker close output
1# incoming line blocking reclosing trip output
2# incoming line blocking reclosing trip output
automatic transfer switch action signal output

Circuit breaker manual on-off switch KK

Model / Angle / Terminal No	LW12-16D/49.4021.3N						
	90°	45°	0°	45°	90°	DC220V	
	Switching-off	In-place	Distance	In-place	Switching-in	Green	Red
	←	↖	↑	↗	→		
1 - 2					×		
3 - 4			×				
5 - 6			×				
7 - 8			×				
9 - 10	×						
11- 12	×						
R+__CL-						×	
R+__CH-							×

Note:
1. Distance position means: if the control through the internal processing of the protection device, it is distance. The internal processing is not through the protection device is in-place.
2. This circuit diagram is in DC operation. Please specify the control circuit type 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.
4. Relay signal output contacts are hold signals, reset after signal reset.

Fig 3: KPM83BU microcomputer automatic transfer switch bus-bar coupler protection monitoring and control device control principle diagram DC

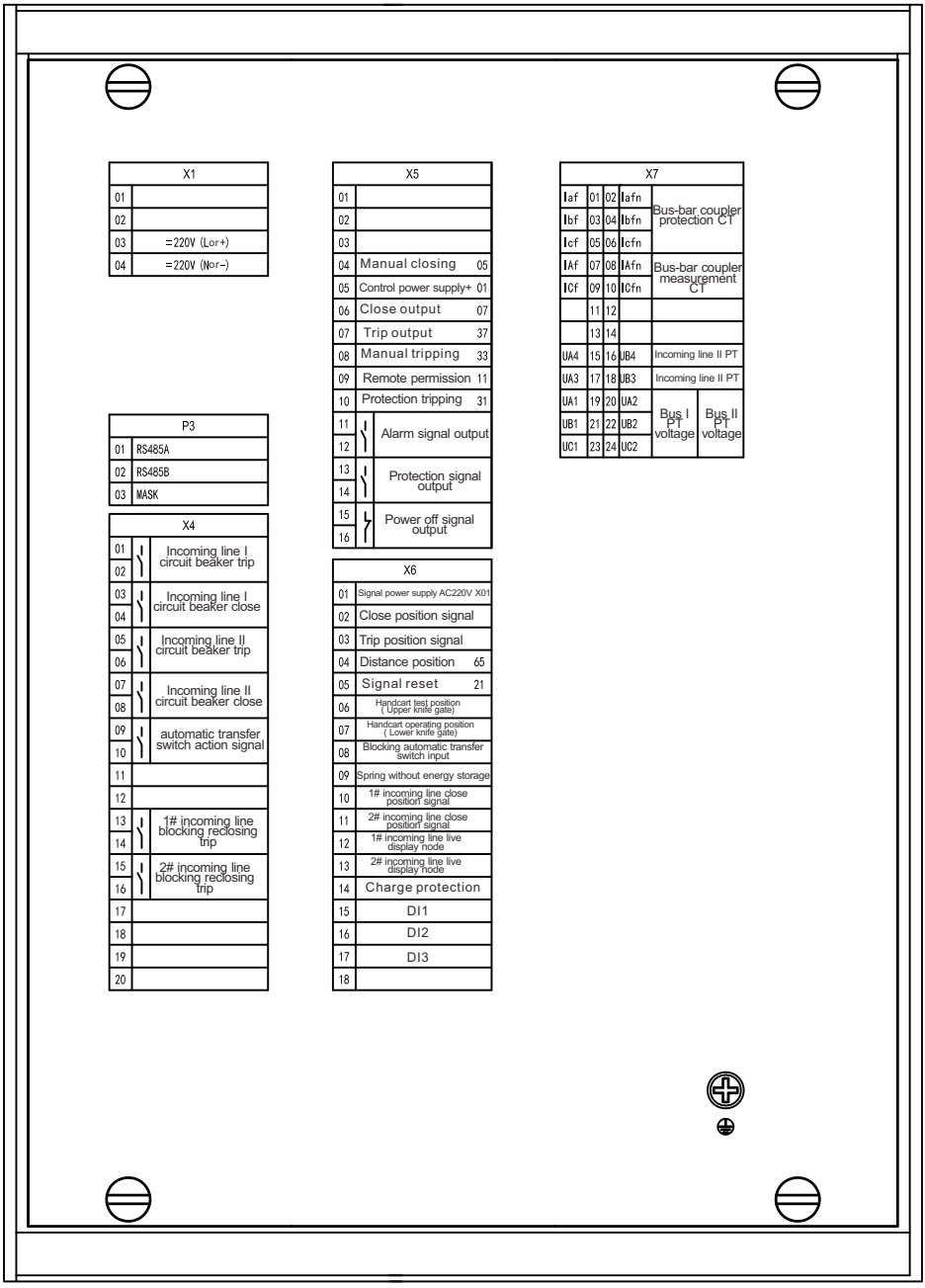


Fig4. KPM83BU Microcomputer automatic transfer switch bus-bar coupler protection monitoring and control device terminal diagram AC

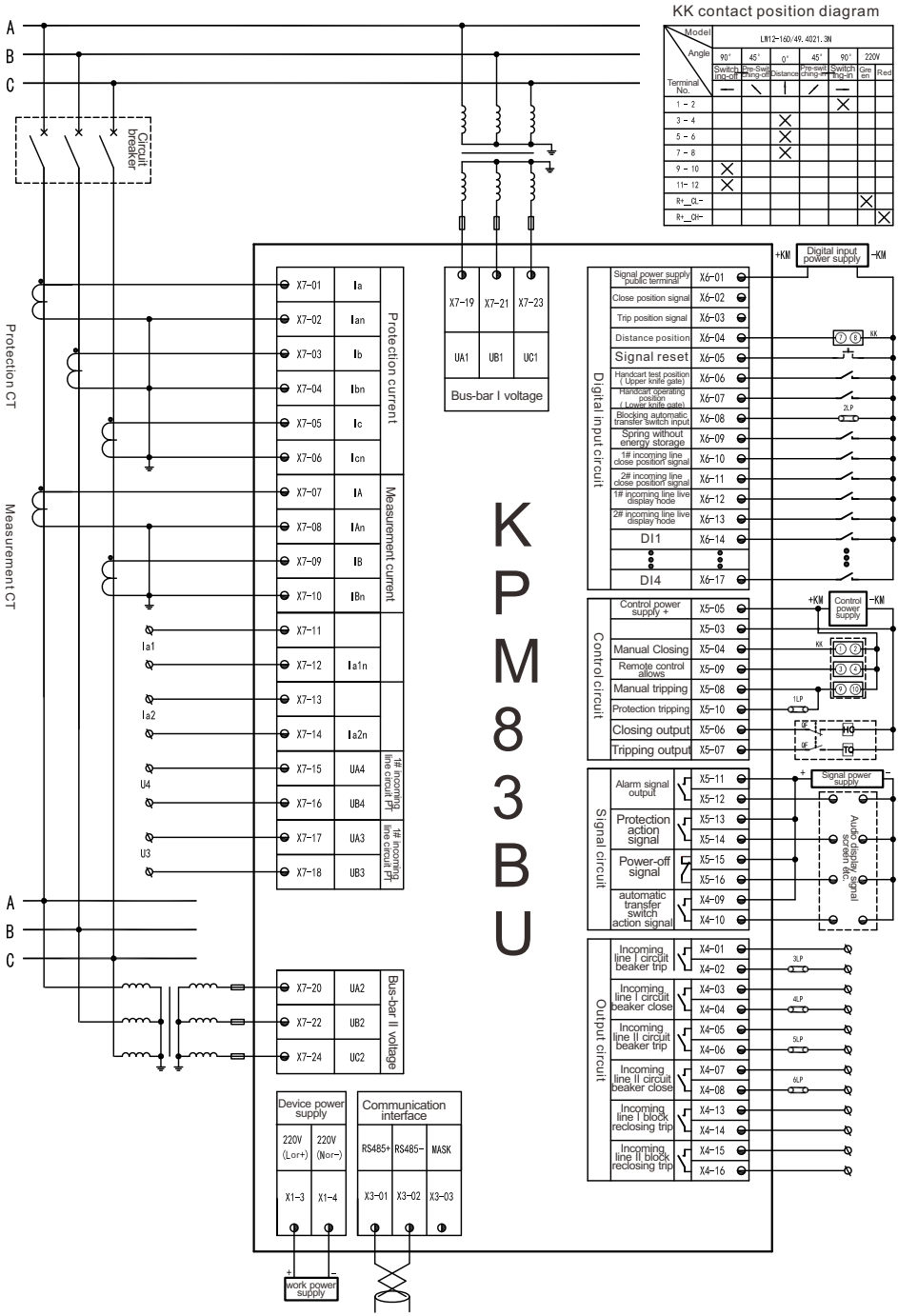


Fig 5: KPM83BU microcomputer automatic transfer switch bus-bar coupler protection monitoring and control device wiring diagram AC

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