



NKB1 Control & Protective Switching Device

1. General

NKB1 series control & protective switching device (CPS) is mainly applied to circuit with AC current frequency of 50 Hz or 60Hz, rated operational voltage up to 690V, rated operational current from 1A to 125A, controller setting current from 0.4A to 125A, control motor power from 0.12kW to 55kW. It is capable of making, carrying and breaking currents under normal conditions, including specified operating overload conditions and of making, carrying for a specified time and breaking currents under specified abnormal conditions such as those of short-circuits.

NKB1 series CPS is applied to power distribution and motor protection & control of various occasions or systems, e.g. infrastructure, buildings, communications, etc.

Standard: IEC60947-6-2 Multiple function equipment- Control and protective switching devices (or equipment) (CPS).

Symbol: 

2. Features

NKB1 series CPS adopts the integrated modular structure, integrating the main functions of circuit breaker, contactor, over load relay, starter, disconnecter, and so on.

With small volume and high reliability, it consists of the advantages of high short current breaking capacity and short flashover distance. It can provide inverse time delay protection, short circuit short time delay protection, instantaneous short circuit protection, and fast short circuit protection. Once function selected according to requirements, it can provide protection for various motor starting, control circuits and distribution circuits with accurate and reliable performance.

NKB1 series product consists of enclosure, electromagnetic transmission mechanism, operation mechanism, main circuit contacts sets, intelligent release and auxiliary contacts, and can control the making and breaking of the circuit locally or remotely.

The CPS has a variety of circuit protection functions: start delay, phase failure, three phases unbalance, under current, over voltage, under voltage, etc.

The CPS has different types for your choice: basic type, fire-fighting type, leakage type, communication type. The whole series products have isolation function.

The CPS has the one key recovery function and self-setting function, to meet the different needs of the users.

The CPS has two control modes: remote automatic control & local manual control. It has panel indication & electromechanical signal alarm function.

3. Operating conditions

Ambient temperature: $-5^{\circ}\text{C} \sim +40^{\circ}\text{C}$, average day temperature value $\leq +35^{\circ}\text{C}$. It can operate reliably at $-25^{\circ}\text{C} \sim +70^{\circ}\text{C}$ for a short period.

Altitude: $\leq 2000\text{m}$, derating by 10% every 1000m when higher than 2000m.

Humidity: When ambient air temperature is $+40$ degrees, the relative humidity $\leq 50\%$; Higher relative humidity is allowed at lower temperatures. When the mean monthly minimum temperature is $+25^{\circ}\text{C}$, the maximum relative humidity of the month shall be 90%, and the condensation on the surface of the product due to the temperature changes shall be taken into consideration.

The average maximum relative humidity of the month is 90% when the minimum monthly average temperature is $+25^{\circ}\text{C}$, and the condensation occurring on the surface of the product due to temperature variation is taken into account.

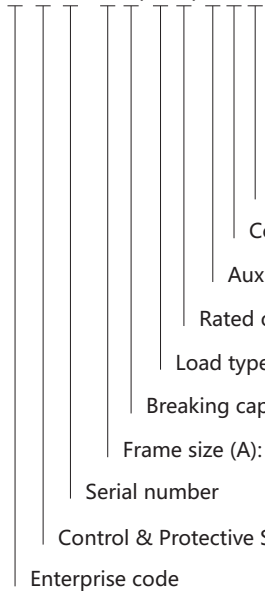
Pollution degree: 3

Installation category: III

Installation site requirement: The external magnetic field of the installation site shall not exceed 5 times of the geomagnetism in any direction. No explosive gas, no corrosive gas; no rain or snow invasion; dry and ventilated.

4. Type & designation

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Additional function code:
 Basic type: blank
 Fire-fighting type: F
 Leakage type: L
 Communication type: T
 Isolation type: G

Control supply voltage code: M-230V, Q-400V

Auxiliary contacts set code: 06-3NO 2NC+1 fault release+1 fault alarm

Rated operational current Ie(A): 1, 3, 6, 12, 16, 25, 32, 45, 63, 80, 100, 125

Load type code: M-motor protection, L- distribution protection

Breaking capacity code: C-15kA, Y-35kA

Frame size (A): 45, 125

Serial number

Control & Protective Switching Device (CPS)

Enterprise code

5. Technical parameter

Table 1 Main circuit technical parameter

Type	NKB1-45								NKB1-125			
Rated operational voltage Ue(V)	400,690/50Hz											
Rated insulation voltage Ui(V)	690								800			
Rated impulse withstand voltage Uimp(kV)	4								6			
Conventional free air thermal current Ith(A)	16				45				80		125	
Rated operational current Ie(A)	1	3	6	12	16	25	32	45	63	80	100	125
Utilization categories	AC-43,AC-44											
Number of poles	3P											

Table 2 Setting current of the controller

Frame size	Rated operational current Ie (A)	Controller rated current Iet (A)	Overload setting current range Ir1 (A)	Controllable motor power Pe (kW) (400V)
45	1	1	0.4~1	0.12~0.3
	3	3	1.2~3	0.37~1.2
	6	6	2.4~6	1.0~2.7
	12	12	4.8~12	2.2~5.5
	16	16	6.4~16	3.0~7.5
	25	25	10~25	5.0~12
	32	32	12.8~32	6.5~15
125	45	45	18~45	9.0~22
	63	63	25~63	12~30
	80	80	32~80	15~37
	100	100	40~100	22~45
	125	125	50~125	27~55

Table 3 Operating conditions for controlling electromagnet

Rated control supply voltage	Conventional operation	Operation voltage range
M : AC230V	CPS reliable close	(85%~110%)Us
Q : AC400V	CPS open or trip	(20%~75%)Us

Table 4 Electrical life

Type	NKB1-45		NKB1-125	
Electrical life (10 ⁴)	AC-43	120	100	
	AC-44	3	2	
Mechanical life (10 ⁴)	1000		500	
Duties: Intermittent duty	300	Loading factor 40%	120	Loading factor 25%

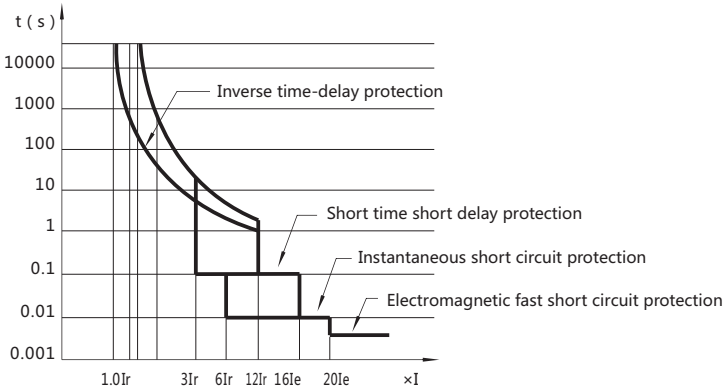


Table 1 NKB1 time-current characteristics

6. Controller technical parameter

Function	Parameter setting	Delay setting	Factory defaults	Setting parameters	Fault status output		
					Basic type	Fire-fighting type	
Overload protection	(0.4 ~ 1)Ie	Protection curve	F1	(0.4 ~ 1)Ie	Delay tripping	Delay alarm	
Short circuit short time delay protection	(3 ~ 12)Ir+OFF	0.1 ~ 0.4s	8Ir/0.2s	(3 ~ 12)Ir+OFF	Delay tripping	Delay alarm	
Instantaneous short circuit protection	(6 ~ 16)Ie	<50ms	14Ie	(8 ~ 16)Ie	Instantaneous tripping	Tripping + alarm	
Phase unbalance (phase failure, phase lose) protection	(20% ~ 80%)+OFF	1 ~ 40s	30%/10s	(20% ~ 80%)+OFF	Delay tripping	Delay alarm (tripping)	
Under-current protection	(0 ~ 0.8)Ir+OFF	1 ~ 60s	OFF	(0 ~ 0.8)Ir+OFF	Delay tripping	Delay alarm (tripping)	
Under-voltage protection	Us230V	(154V ~ 198V)+OFF	1 ~ 30s	176V/10s	(154V ~ 198V)+OFF	Delay tripping	Delay alarm (tripping)
	Us400V	(266V ~ 342V)+OFF	1 ~ 30s	304V/10s	(266V ~ 342V)+OFF		
Over-voltage protection	Us230V	(230V ~ 286V)+OFF	1 ~ 30s	264V/10s	(230V ~ 286V)+OFF	Delay tripping	Delay alarm
	Us400V	(400V ~ 494V)+OFF	1 ~ 30s	456V/10s	(400V ~ 494V)+OFF		
Start delay protection	(0 ~ 99s)+OFF	0 ~ 99s	3s	(0 ~ 99s)+OFF	During the start delay, shield certain protection function, e.g. instantaneous short circuit tripping.		
Locked rotor protection	(5 ~ 9)Ir+OFF	0 ~ 50s	OFF	Hidden menu	Delay tripping	Delay alarm (tripping)	
Residual current protection	(30 ~ 500mA)+OFF	0.1 ~ 1s	100mA	(30 ~ 500mA)+OFF	Tripping	Alarm	

Notes: Communication and leakage are optional model function; communication type product adopts RS485 communication line, RJ45 interface, Modbus protocol.
 Overload protection setting curve (1.Ir1 operation times) :F0 (overload protection close) , F1(51), F2(98) , F3(144) , F4(200)
 The power signal of under/over voltage protection of the controller is taken from the control terminal Us(A1--A2).

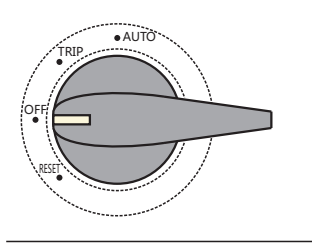
6.1 Controller menu

- Controller menu grading: open setup menu, hide setup menu, calibration menu;
- Open the setup menu: the user can set functional parameters as required;
- A key recovery operation: perform a key recovery operation when parameter setting problem occurs, and the controller will restore the factory settings (factory defaults);
- Self-setting operation: when the load operation is stable, perform this self-setting operation, the controller will set the setting current according to the circuit parameters automatically.

6.2 Controller display

- When NKB1 is connected to the working power supply, the LED displays the voltage value, and this can be used as a voltmeter, with the last three figures display the voltage value;
- NBK1 can be used as an ammeter at runtime, and circularly displays three phase alternating current running condition;
- Troubleshooting: no-load runs NKB1, and press "data" key to view the last fault type.

7. Operating instruction (handle)



Connect AUTO: (automatic control position) the CPS controls the connection of the electromagnet coil, and realizes remote automatic control by making & breaking the control power supply.

Trip: when there's fault tripping, the mechanism of the switch trips, the main contacts open, and the electromagnet coil circuit is disconnected.

OFF: manual operation, the electromagnet coil circuit is cut off, the main contacts of the switch remains in the open position.

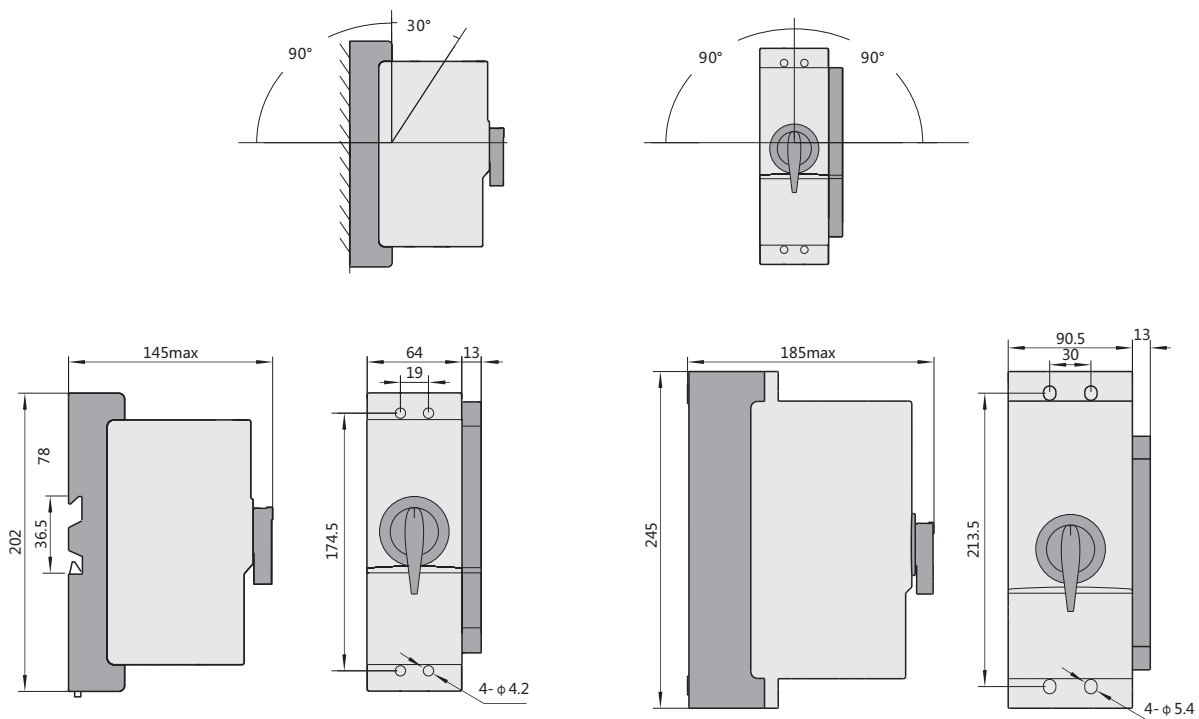
RESET: turn the operation knob, to reset and switch on the tripped switch mechanism.

Isolation status: When the switch is in the open position, pull out the isolation strip and lock it, the switch will be on the disconnected isolation status, and the handle is not operational.

Notes: The isolation type CPS has isolation handle and isolation strip.

8. Installation

NKB1 Installation dimensions



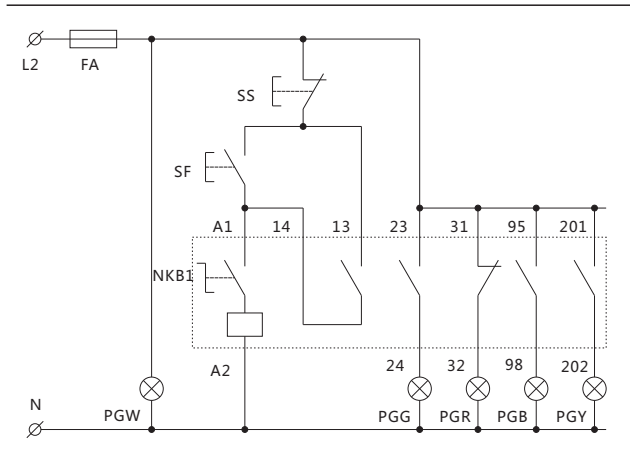
NKB1-45 Control & protective switching device

NKB1-125 Control & protective switching device

9. Basic electric control chart

9.1 Manual panel + local control

Secondary power supply	power supply protection	Power supply signal	Local manual control		Auxiliary signal			Fault signal	
			Start	Stop	Auto-lock	Run	Stop	Stop	Alarm



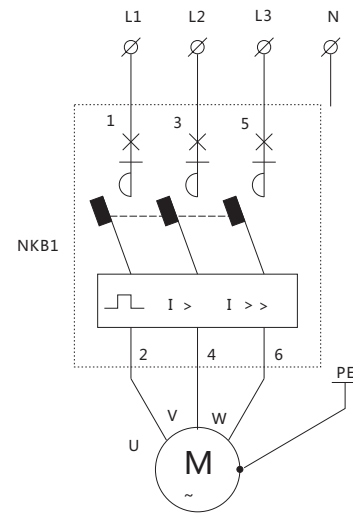
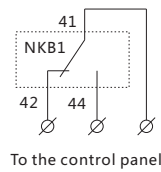
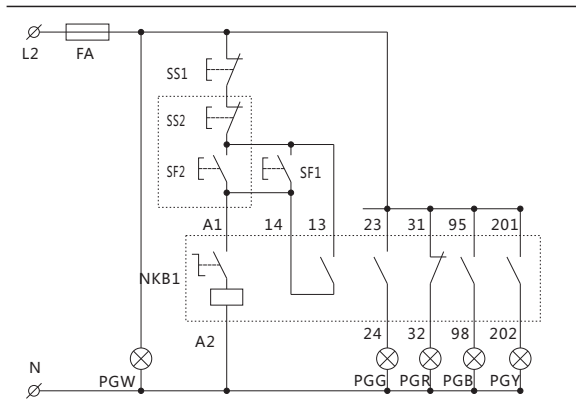
NKB1 Auxiliary group circuit instruction (06 auxiliary)

	NO	NC	NC	NO	NC	a	b
Auxiliaries	13	23	31	41	41	95	201
	14	24	32	44	42	98	202
	AC-15 Ie:5A Ue:400V			AC-15 Ie:3A Ue:230V			

Notes: auxiliary a (95/98): fault tripping signal port;
 Auxiliary b (201/202): fire-fighting type fault tripping signal port.

9.2 Manual panel + local control+ remote control

Secondary power supply	Power supply protection	Power supply signal	Local & remote manual control	Auxiliary signal			Fault signal		External signal		Signal
				Auto-lock	Run	Stop	Stop	Alarm	Stop	Run	Power supply



Notes: This diagram is applicable to all kinds of motor when single equipment is in normal operation and adopts simultaneous local and remote control.

10. Attention

- 10.1 Before installing the CPS, make sure that the operation knob can work normally and is on the OFF position; "AUTO" indicates the connection status of the main circuit; "TRIP" indicates the free tripping position that caused by circuit fault, and the circuit fault must be removed by the responsible person before one operates the switch; "OFF" indicates the main circuit open position; the free tripped switch can only be reset and switched on by turning the operation knob to "RESET" .
- 10.2 Before installing the switch, make sure that the power supply of the coil and auxiliaries comply with the product instruction as well as with the actual control line.
- 10.3 Energizing (85% ~110%)Us to the coil, the electromagnet closes reliably when the knob is on "AUTO" position, and the electromagnet releases reliably when the knob is on "OFF" position. The current setting has been set up before leaving the factory, and users can adjust it according to actual needs.
- 10.4 NKB1 can continue to run after breaking short circuit current, but it need checking and confirmation of its operation status before continue operation.
- 10.5 In high power motor controlling application (above 11kW), when choosing the starting mode, the user shall take starting torque, current multiple, voltage drop, circuit capacity into consideration. According to general requirements, to start normally with proper load and satisfy the reliable operation of NKB1 electromagnet, the voltage reduction limit shall not exceed 80% of the rated value, and the starting current multiple shall not exceed(4 ~ 5) times.
- 10.6 The exposed part of the external connecting wire of the incoming and outgoing terminal of the switch shall be wrapped with insulator.
- 10.7 In the process of transportation and storage, the products shall be protected from rain and snow. The storage environment shall meet the following conditions: daily average temperature shall be +25°C, relative humidity shall be less than 90%, the environment temperature shall be no higher than +40°C and no less than -5°C.

11. Ordering instructions

During product selection, the user shall specify the following contents, if necessary, application conditions or requirements shall be further specified:

Product name & type;

Rated current of the switch, intelligent controller type & rated current;

Control power supply voltage of the electromagnet coil;

Additional functions required.