# E7 Control and protection switch

## Quick selection

### Selection Guide

The product specifications are detailed on pages 678-687 of this catalog.

| Product name | Derived code | Shell frame current | Controller category | Rated current of controller | Auxiliary contact category | Control voltage | Cooption function | Leakage current value |
|---|---|---|---|---|---|---|---|---|
| CDK1 | None | 63 | M | 1 | 02 | M | None | 1 |
| | None<br>D<br>D1<br>D2<br>J<br>J2<br>Z | 63:63A<br>125:125A | M: Digital tube | 1:1A<br>3:3A<br>6:6A<br>…<br>125:<br>125A | 02<br>06<br>0209<br>0609 | M:220V<br>Q:380V | None:<br>Basic<br>F: Fire fighting<br>G: Isolation<br>L: Leakage | 1: 30mA<br>2: 50mA<br>3: 75mA<br>4: 100mA<br>5: 150mA<br>6: 200mA<br>7: 300mA<br>8: 500mA |
| | None: Basic<br>D: Low-speed basic model + high-speed fire-fighting model<br>D1: Basic type<br>D2: Fire fighting type<br>J: Star-delta decompression starter<br>J2: High-power star-delta decompression starter<br>Z: Autotransformer starter | | | | 02:2 open + 1 closed + 1 short + 1 overload<br>06:3 open + 3 closed + 1 short + 1 overload<br>0209:4 open + 2 closed + 1 short + 1 overload<br>0609:5 open + 4 closed + 1 short + 1 overload | | | |

Note: 1. The conventional default contact is 06;

2. Fire-fighting type: with overload alarm without tripping function

# E7 Control and protection switch

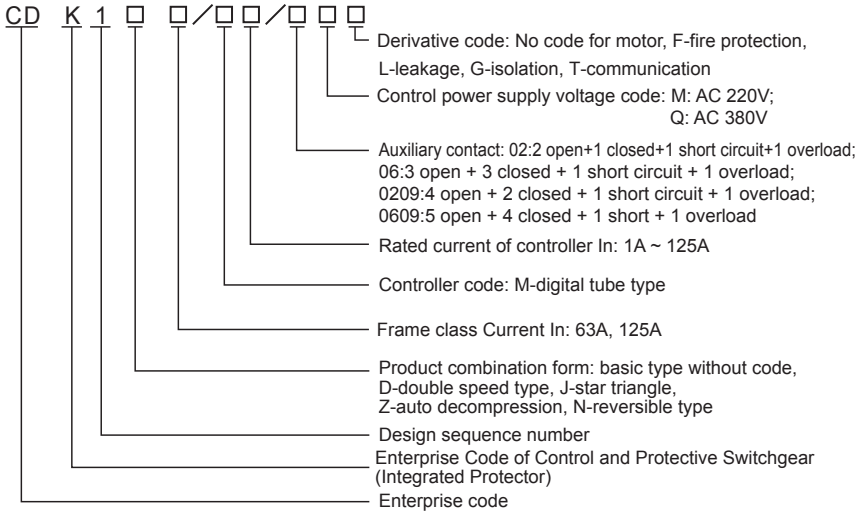
## CDK1 Control and protection switch

### Scope of application

CDK1 adopts modular single product structure, integrates the main functions of traditional circuit breaker (fuse), contactor, overload (or overvoltage, phase failure, etc.) Protection relay, starter, isolator, motor comprehensive protector, etc., and has the functions of remote automatic control and local direct manual control, as well as panel indication and electromechanical signal alarm. It has the functions of overvoltage and undervoltage protection, phase failure and phase loss protection, small size, high reliability, high short-circuit breaking capacity, short arcing distance and other advantages, and time-current protection characteristics with good internal self-matching of various characteristics (inverse time overload long delay protection, short circuit short delay protection, instantaneous short circuit protection and fast instantaneous short circuit protection four-section protection characteristics). Functions and/or function modules can be selected as required, so that perfect control and protection functions can be provided for various power lines (such as frequent or infrequent starting of a motor and load of a power distribution circuit), the action is accurate, unnecessary power failure can be avoided, and the power supply reliability is improved. The CDK1 series is especially suitable for the following occasions or systems because of its superior performance and advantages:

- Power distribution and motor protection and control systems in metallurgy, coal mine, steel, petrochemical, port, ship, railway and other fields;
- Motor control center (MMC) and power distribution center;
- Power stations and substations;
- Ports and railway systems (such as airports, railway and highway passenger transport centers);
- Highway lighting and ventilation system;
- Military garrison control and protection systems (such as border posts, radar stations, etc.);
- Fire pumps and fans for various occasions;
- Modern building lighting, power conversion, pumps, fans, air conditioning, fire, lighting and other electrical control and protection series;
- Hospital
- Commercial buildings (such as shopping malls, supermarkets, etc.);
- Telecommunication communication room;
- Information processing center (such as municipal, bank, stock exchange center, etc.)
- Single motor control and protection system in factory or workshop;
- Remotely controlled lighting system.

### Product model and meaning



# E7 Control and protection switch

## CDK1 Control and protection switch

### Technical parameters

#### Parameters of the main circuit

The main circuit is mainly composed of the main body and the intelligent release, which are the minimum configuration of the applicable CDK1 products.
The rated current In of the main body, the agreed heating current Ith, the rated insulation voltage Ui, the rated frequency, the rated working voltage Ue and the rated working current Ie range or the control power range of the optional intelligent controller are shown in Table 2 and Table 3.

■ Table 2 Basic parameters of main circuit

| Inm | Rated working current of intelligent controller Ie (A) | Ith(A) | Ui(V) | Rated frequency (Hz) | Ue(V) |
|---|---|---|---|---|---|
| 63 | 1, 3, 6, 10, 16, 32, 45, 63 | 63 | 690 | 50 | 380/690 |
| 125 | 45, 63, 100, 125 | 125 | | | |

■ Table 3 Main Parameters of Main Circuit

| Shell frame current Inm | Rated working current of controller Ie | Long delay setting current Ir | Short time delay setting current Is | 380V control power kw | Main body rated current In | Heating current Ith | Use categories |
|---|---|---|---|---|---|---|---|
| 63 | 1 | 0.4~1 | 1.2~12 | 0.05~0.33 | 16 | 16 | AC-44 |
| | 3 | 1.2~3 | 3.6~36 | 0.33~1.2 | 16 | 16 | |
| | 6 | 2.4~6 | 7.2~72 | 1~2.5 | 16 | 16 | |
| | 10 | 4~10 | 12~120 | 1.6~4 | 16 | 16 | |
| | 16 | 6.4~16 | 19.2~192 | 2.5~7.5 | 16 | 16 | |
| | 32 | 12.8~32 | 38.4~384 | 5.5~15 | 45 | 45 | |
| | 45 | 18~45 | 54~540 | 7.5~22 | 45 | 45 | |
| | 63 | 25.2~63 | 75.6~756 | 11~30 | 63 | 63 | |
| 125 | 45 | 18~45 | 54~540 | 7.5~22 | 100 | 100 | AC-44 |
| | 63 | 25.2~63 | 75.6~756 | 11~30 | 100 | 100 | |
| | 100 | 40~100 | 120~1200 | 18.5~45 | 100 | 100 | |
| | 125 | 50~125 | 150~1500 | 22~55 | 125 | 125 | |

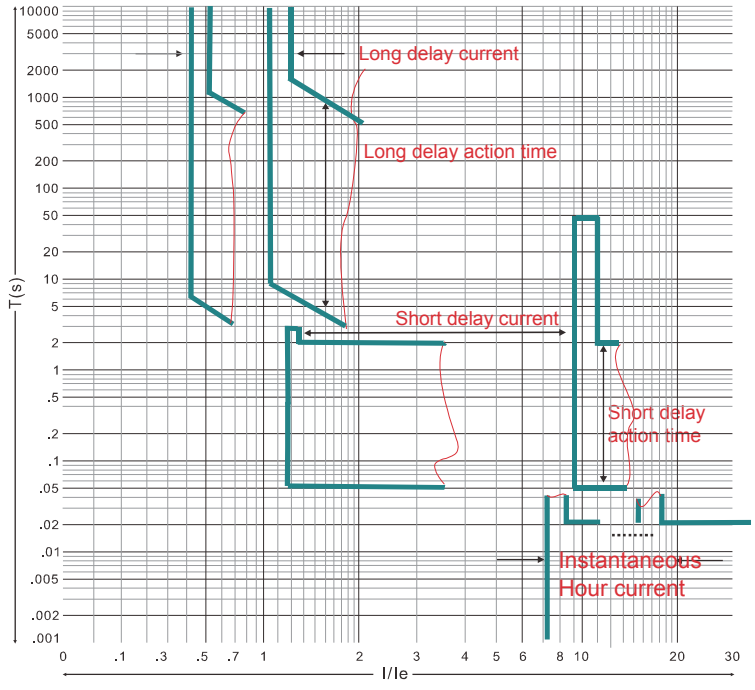
Note:
※Short-circuit instantaneous protection parameter is 16Ir ± 20%
※Setting parameter of short time delay protection for motor is 8Ir ± 10%.
※The setting parameter of short time delay protection for distribution products is 3Ir ± 10%.
※Refer to the technical parameters of Y series three-phase asynchronous motor for the above power range.
※If you have special requirements, please contact the manufacturer.

#### Basic parameters

| | | |
|---|---|---|
| Coil Control Voltage | | AC220V/AC380V |
| Coil Insulation Class | | Class E |
| Rated impulse withstand voltage | Uimp | 6KV |
| Rated operating breaking capacity | Ics | 15KA (Type 63), 25 KA (Type 125) |
| Arcing distance | | Not more than 50mm |

Product is not intended for use in IT systems

## Protection characteristic curve (I-t curve)




| Operating characteristics for motor control (usage category: AC-42, AC-43, AC-44) | | | |
|---|---|---|---|
| Serial number | Multiple of controller rated current In | Appointment time in connection with Ie | Remark |
| 1 | 1.05 | No tripping for 2h | Cold state |
| 2 | 1.2 | Trip within 2h | Hot State |
| 3 | 1.5 | Trip within 2min | Cold state |
| 4 | 7.2 | Trip within 2 ~ 10 s | Hot State |

| Operating characteristics for distribution line load (service category: AC-40, AC-41) | | | | | |
|---|---|---|---|---|---|
| Use categories | Times of rated working current Ie | | Appointment time in connection with Ie | | Remark |
| | A | B | Ie＜63A | Ie≥63A | |
| AC-40, AC-41 | 1.05 | 1.30 | 1 | 2 | |
| Note: A is the agreed inactive current, and B is the agreed action. | | | | | |

## Main technical parameters of intelligent controller

■ Start delay

During the starting time of CDK1, only phase loss, phase failure, overvoltage, undervoltage, undercurrent, short circuit, electric leakage and three-phase imbalance are protected to avoid the protection of CDK1starting large current and overcurrent; The setting time shall be selected within (1 ~ 99) seconds;

■ Overvoltage and undervoltage protection

Only the auxiliary power supply voltage is protected to ensure the normal operation of the coil and the intelligent controller;
Overvoltage protection: when the voltage of auxiliary power supply exceeds the set value (factory setting is 120% Us), the action time is ≤ 10 seconds; undervoltage protection: when the voltage of auxiliary power supply is lower than the set value (factory setting is 85% Us), the action time is ≤ 10 seconds;

■ Inverse time overload long delay protection

The user shall set the rated working current Ie of the intelligent release according to the load current I, so that the load current I is between 80% and 100% Ie. The action time shall be set according to the load characteristics. See Table 4 for the overcurrent multiple and action time characteristics.

Table 4 Action Characteristics of CDK1 Inverse Time Overload Long Time Delay Protection

| Time (s) / Serial Number (F) / Overcurrent multiple | F1 | Symbol description |
|---|---|---|
| 1.0Ir | No action | Tr-action time<br>Ir-rated working current<br>I-Operating current<br>t-1.5Ir action time |
| 1.5Ir action time t | 48s | |
| ≥1.1 | $T=(I/1.5Ir)^2 \times t$ | |

■ Undercurrent protection

Undercurrent protection: judge whether to start the undercurrent protection according to the ratio of the minimum current to the rated current (the factory setting is 50%), which can protect the motor that cannot be unloaded; it can also prevent the user from not setting the working current Ie of the CDK1 intelligent release according to the load current, which will cause the motor not to be within the effective protection range of CDK1.
When the current is less than the setting value of undercurrent protection, the action time is ≤ 10s.

■ Three-phase unbalance (phase break and loss) protection

Three-phase unbalance protection is based on the difference between the maximum and minimum current and the ratio of the maximum current to judge whether to start three-phase unbalance (phase break, phase loss) protection;
(Unbalance rate = (maximum current-minimum current)/maximum current);
When the current difference of any two phases exceeds 20 ~ 75% (the factory setting is 30%), the action setting time is ≤ 10 seconds.

■ Locked-rotor protection

Locked-rotor protection is to prevent the motor from heating and damaging the motor due to serious operation blockage of the driving equipment or overload operation of the motor. Generally, whether to start the locked-rotor protection is judged when the working current reaches the set value.
When the working current reaches 3.5 ~ 8 times of the rated current, the action time is ≤ 0.5s.

■ Short-circuit short time delay protection

When the working current is more than 8 times of the rated current, the action time is ≤ 0.2s.

■ Leakage protection

Setting range of leakage protection value I △ n: I △ n = 30 mA ~ 500mA + OFF (see table)

Leakage action current I △ n ± 10%, leakage action time T △ n ≤ 0.1 s

| Set value sequence number | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 |
|---|---|---|---|---|---|---|---|---|
| Leakage current value mA | 30 | 50 | 75 | 100 | 150 | 200 | 300 | 500 |

**Ability to make, carry and break short circuit current**

| Ue (V) | Intelligent controller rating operating current Ie (A) | Short circuit in rated operation breaking capacity Ics | Anticipated engagement test proof current Icr (A) | Additional break ability Ic (A) |
|---|---|---|---|---|
| 380 | 1, 3, 6, 10, 16, 32, 45, 63, 100, 125 | 15KA (Type 63)<br>25KA (Type 125) | 20×100<br>(i.e 2000) | 16×100×0.8<br>(i.e 1280) |

**Electrical life times of main circuit and making and breaking conditions**

| Ue (V) | Use categories | Electrical life | | | On condition | | Breaking condition | | |
|---|---|---|---|---|---|---|---|---|---|
| | | New test article | Rated operation after short circuit test | Anticipated engagement after current test | I/Ie | U/Ue | Ic/Ie | Ur/Ue | cosφ |
| 380 | AC-43 | $100\times10^4$ | $1.5\times10^4$ | $3\times10^3$ | 6 | 1 | 1 | 0.17 | 0.35 |
| | AC-44 | $2\times10^4$ | | | | | 6 | 1 | |

**Mechanical life of the body and its modules**

| Shell grade code and module name | Mechanical life |
|---|---|
| Subject | $500\times10^4$ |
| Auxiliary contact | |
| Signal alarm auxiliary contact | $1\times10^4$ |
| Operate mechanism | |

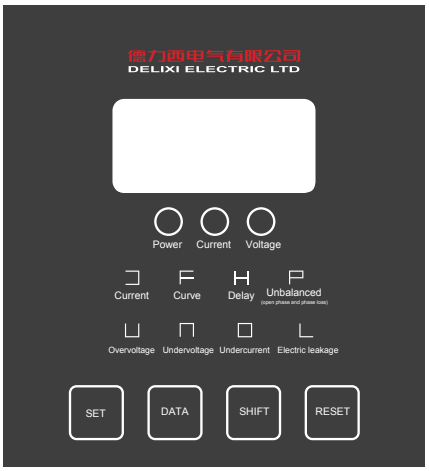
## Protection function

| | | | | |
|---|---|---|---|---|
| 1. Overload long delay protection | | | | |
| Trip level (user set value) | | F1 | Cannot be closed | Default value = 1 |
| Delay time (s) | Tr(I=1.5Ir) | 48s | | |
| 2. Short-circuit short time delay protection | | | | |
| Set value of tripping current (A) | Is | Is=(3~12)X Ir | Can be closed | Default value = 8 |
| Delay time (s) | ts | ts=0~0.4S | | Default setting = 0.2s |
| 3. Short-circuit instantaneous protection | | | | |
| Set value of tripping current (A) | Ii | Ii=(8~16)X Ir | Can be closed | Default = 16 |
| Delay time (s) | ti | ti≤0.2s | | |
| 4. Three-phase unbalance protection | | | | |
| Set value | P | P=20~80% | Can be closed | Default = 30 percent |
| Delay time (s) | T | T=1~64s | | Default value = 10 second |
| 5. Undercurrent protection | | | | |
| Setpoint (A) | Iund | Iund=(0.15~0.5)Ir | Can be closed | Default setting = 0.5Ir |
| Delay time (s) | Tund | Tund=1~64s | | Default value = 10 second |
| 6. Startup delay protection | | | | |
| Delay time (s) | Tst | Tst=1~99s | Can be closed | Default setting = 5S |
| 7. Overvoltage and undervoltage protection | | | | |
| Setpoint (V) | Overvoltage Vover | Vover=240~280V | Can be closed | Default = 264V |
| | Undervoltage Vund | Vund=160~200V | | Default setting = 187V |
| Delay time (s) | Tover | Tover=0~99s | | Default value = 10 second |
| | Tund | Tund=0~99s | | Default value = 10 second |
| 8. Leakage protection | | | | |
| Setpoint (A) | L | L=（0.03~0.5）A | Can be closed | Default setting = 0.1A |
| Delay time (s) | T | T=0.1s | | |

## Product operation or setup

### Panel display and key description

CDK1 shall set the setting current of long time delay and short time delay at the required value according to the load current of the controlled and protected line before energizing and closing. After being powered on, the nixie tube lights up to display the voltage value of the auxiliary current and circularly display the monitored operating current values of the A, B and C three-phase circuits.




Setting key: When the load is not running, press this key to enter the parameter setting state.
Shift key: select the set word position in the setting state, and the selected word position is in the flashing state.
Data key: modify the flashing word bit with a level difference of 1 (0 to 9 cycles)
Reset key: after the parameter setting is completed, press this key to save the parameter and put it into normal monitoring operation state.

### Run the operation

- After the CDK1 is connected to the working power supply, the LED displays the voltage value, which can be used as a voltmeter, and the last three digits display the voltage value.
- CDK1 can also be used as an ammeter during operation to display the operation of three-phase current circularly. Press the "Shift" key to display the operation of phase A, phase B, phase C and L (leakage) current directionally. Press the "Reset" key.
- Fault query
  Run CDK1 with no load, press the "data key", and compare with the panel fault type symbol. Check the fault types of the previous 3 times; when the voltage value is displayed, it indicates that CDK1 has exited the fault query and is put into normal monitoring operation; Or restart CDK1 to exit the fault query
- Protection parameter settings
  When the motor is started and running, do not press the setting key to avoid error or failure of the chip program;
  No-load operation CDK1; Press the "Setting key" to select the setting type, press the "Shift key" in turn, select the data shift, and press the "Data key" to modify the data;
  After a parameter is set, press the "Set" key to enter the next setting state until the end;
  Unnecessary options should be abandoned. After all parameters are set, press the reset key to exit the setting state and display the voltage value.
- Parameter setting operation sequence

| Sequence of operations | Display the contents | Code definition | Set the range |
|---|---|---|---|
| Press the set key for the first time | J000 | Rated current | Set according to load current |
| Press the set key for the second times | H05 | Start delay | 0-99 seconds |
| Press the set key for the third times | F2 | Overcurrent inverse time limit protection action No. | Select within the range of serial numbers 1 to 4 |
| Press the Set key for the fourth times | P30 | Percentage of three-phase unbalanced current | Select within 20% ~ 75% |
| Press the Set key for the fifth times | u | Overvoltage value | 0~999 |
| Press the set key for the sixth times | n | Undervoltage value | 0~999 |
| Press the set key for the seventh times | L | Code of leakage current value | Select from serial numbers 0 to 8 |
| Press the set key for the eighth times | o | Undercurrent value | 0 ~ 999, action time ≤ 30s |

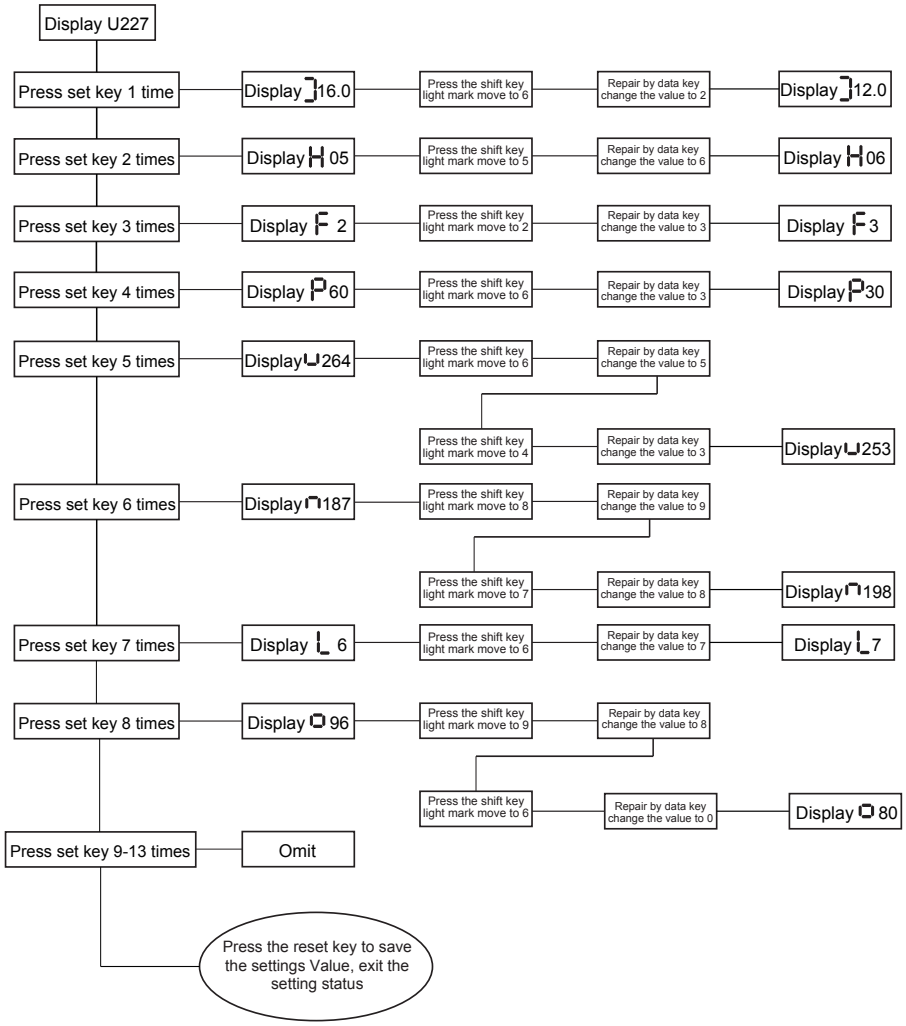
☐ After setting, press the "Reset" key to exit the setting state and save the setting value.
☐ Some functions have been abandoned when they leave the factory. The specific selection is based on the user's needs.

## Give an example

- CDK1-63/16A
- Motor 5.5K W, I = 12 A (motor power factor is different, current varies)
- Request

· Ie=12A ·Three-phase current unbalance percentage value = 30
· Undercurrent value = 80% · Leakage current value = 300 mA, (corresponding to No.7)
· Overcurrent inverse time limit protection action sequence number = 3
· Undervoltage value = 198V · Overvoltage value = 253V · Start delay T = 6s

First, switch on the power supply and run the CDK1 control protector with no load.

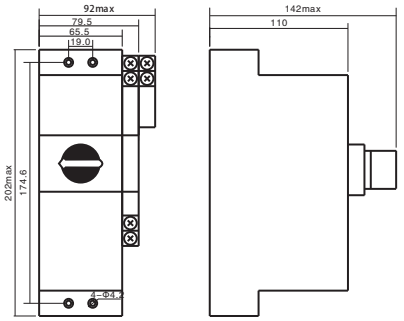


# E7 Control and protection switch

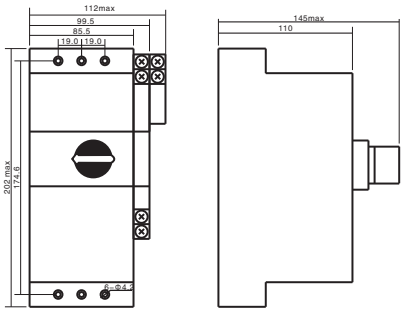
## CDK1 Control and protection switch

### Outline and installation dimensions

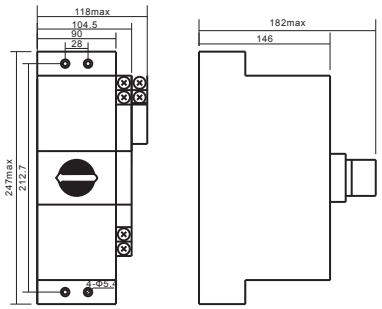
■ CDK1-63 three-pole basic type



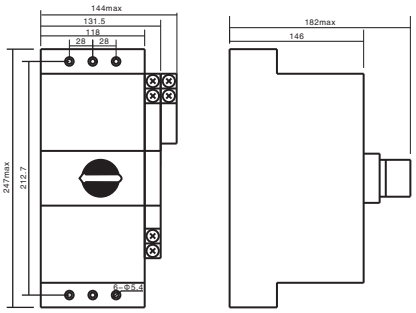

■ CDK1-63 Quadrupole Basic



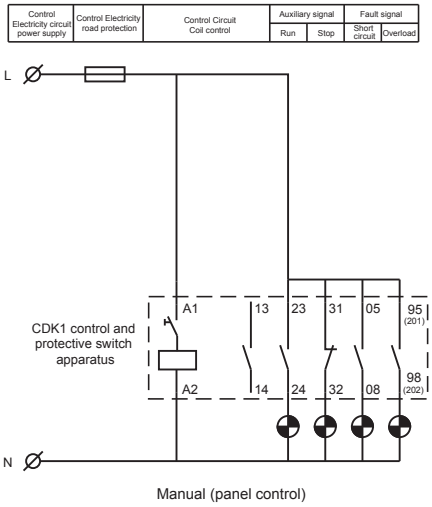

■ CDK1-125 three-pole basic type



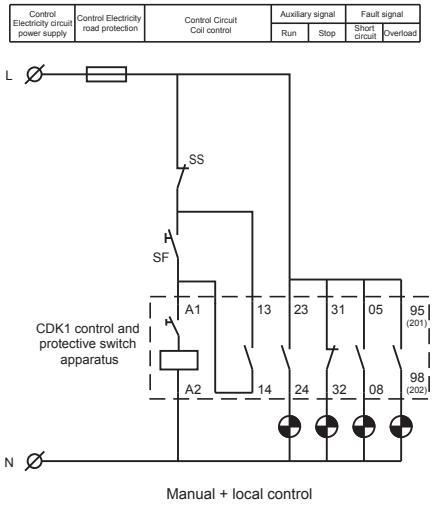

■ CDK1-125 Quadrupole Basic



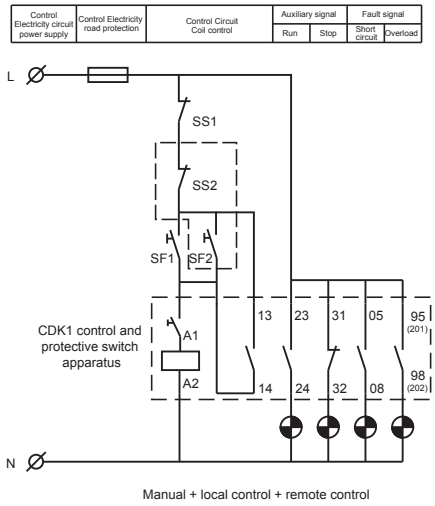
## Basic Electrical Control Diagram




Manual (panel control)




Manual + local control




Manual + local control + remote control