Residual(Zero Sequence) Current Transformer (ZCT) and Protection Device Selection
剩余（零序）电流互感器与保护装置选用

Overview 概述

Residual current transformer (ZCT) and residual current action relay (KYL-ER-LK) form as Residual Current Device (RCD). Suitable for AC660V and under, 50 or 60 Hz, TT, TN-S or IT system (with insulation monitoring device), RCD is used to detect potentially hazardous earth fault current, preventing direct/indirect electric shock or fire。

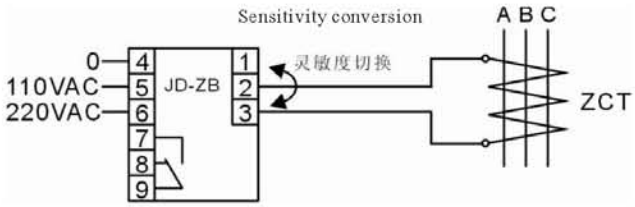
Under normal operation, vector sum of currents in three-phase is zero (i.e. IA+IB+IC=0) , so there is no current on secondary circuit of ZCT. When direct/indirect electric shock, especially personal electric shock, equipment malfunction occurs, a portion of the phase conductor current will not return through the neutral conductor, three phase balance is damaged, RCD activate.

Based on the type and size of system, user can choose the suitable ZCT and preset the residual current limit of relay.

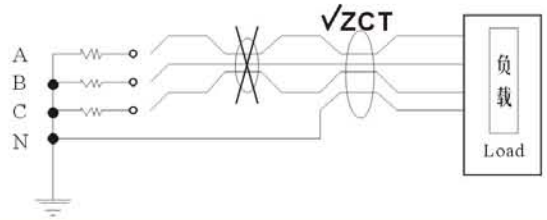
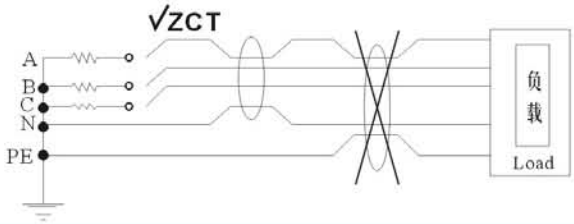
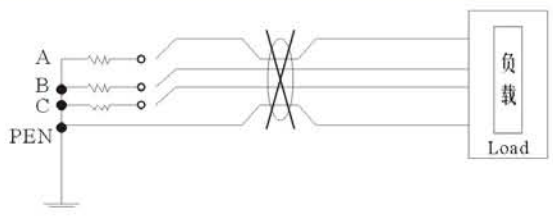
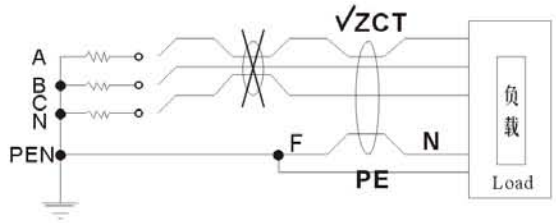
剩余电流互感器（ZCT）配合剩余电流动作继电器（KYL-ER-LK）构成剩余电流动作保护装置（RCD）。它适用于交流660V及以下，频率为50或60Hz 的TT、TN-S或带绝缘监视装置的IT系统，RCD用作将有潜在危险的接地故障电流，转换成报警信号或动作电流切断回路。防止直接或间接电击，电气火灾。

在正常运行中，因三相电流矢量和为零（即IA+IB+IC=0），所以ZCT的次级回路没有电流。当出现直接、间接电击、尤其是人身触电，设备故障，部分的相电流将不会通过中性线返回，平衡破坏，RCD动作。

用户可按系统类型和大小，选择合适的剩余电流互感器，以及预设继电器的剩余电流整定值。



System wiring and description 系统接线与说明

System 系统	System wiring 系统接线	Description 说明
TT		It's recommended to use RCD, because when single phase ground fault occurs, fault current is small, and is hard to estimate, which can't reach operating current of switch, and dangerous voltage will occur on enclosure. 推荐采用RCD，因为当发生单相接地故障时，故障电流较小，且难以估计，达不到开关的动作电流，外壳上将出现危险电压。
TN-S		RCD is applied to cut off the fault quicker and more sensitively to improve safety and reliability, and PE wire should not pass through ZCT, N wire has to pass through ZCT, and should not be grounded repeatedly. 可以采用RCD更快速灵敏地切断故障，以提高安全可靠性，此时PE线不得穿过ZCT，N线必须穿过ZCT，且不得重复接地。
TN-C		RCD is not applied because PE wire and N wire are combined into one, if PEN wire is not grounded repeatedly, when enclosure is electrified, the in and out current of ZCT is equal, RCD is refused to operate, if PEN wire is grounded repeatedly, some single phase current will go to repeatable grounding, and when it reaches to certain value, RCD will operate incorrectly. 不能采用RCD，因为PE线与N线合一，若PEN线不重复接触，当外壳带地，ZCT进出电流相等，RCD拒动；若PEN线重复接地，部分单相电流将流入重复接地，达到一定值时，RCD将误动。
TN-C-S		TN-C system is at the front of F point, and RCD is not applied, TN-S is at the back of F point, RCD can be applied, but PE wire should not pass through ZCT. F点前为TN-C系统，不能采用RCD，F点后为TN-S系统，可以采用RCD，但是PE线不得穿过ZCT。

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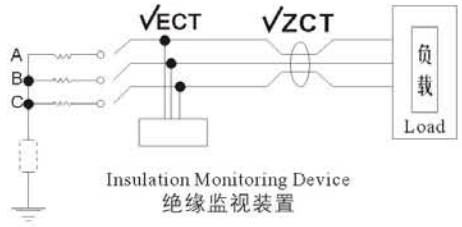
System 系统	System wiring 系统接线	Description 说明
IT	 Insulation Monitoring Device 绝缘监视装置	RCD is applied according to the rule to avoid the reduction of system insulation and as second backup fault protection, according to wiring forms, apply protection measure that is similar to TT or TN system, firstly, insulation monitoring device should be applied to forecast primary fault. 按规定采用RCD，为防止系统绝缘降低和作为二次后备故障保护，依据接线形式，采用类似TT或TN系统的保护措施，首先应采用绝缘监视装置，预测一次故障。

Selection on ZCT 剩余（零序）电流互感器的选择

According to cross section area，number of cables pass through ZCT and current rating，choosing the suitable ZCT.
根据电缆截面面积、穿越ZCT的电缆根数和额定电流，选用合适的剩余（零序）电流互感器。

1.Aperture dimension孔径尺寸：

ZCT aperture (Φ) > coefficient x single cable outside diameter (d), (no of cables pass through ZCT)
ZCT 孔径(Φ) > 系数 x 单根电缆外径(d)，( )括号内数字为穿越ZCT的电缆根数
Φ> 2d,（2）；Φ> 2.2d,（3）；Φ> 2.5d,（4）；Φ> 3d,（6）

Cable OD (d) list 电缆外径（d）一览表：

No. of core芯数	Cable type 电缆类别	Cross section area for single cable单根电缆截面面积 (mm^2)									
		16	25	35	50	70	95	120	150	185	240
1	VV (d) (mm)	10.7	12.5	14.0	15.3	17.1	19.4	21.1	25.0	25.4	28.3
	YJV (d) (mm)	9.7	11.4	12.5	14.1	16.2	18.3	20.2	22.3	24.8	27.9
2	VV (d) (mm)	18.5	22.0	19.1	21.9	24.5	28.1	30.5	33.9	37.3	-
	YJV (d) (mm)	17.9	21.3	23.6	26.7	31.0	35.1	39.0	43.3	48.2	54.3
3	VV (d) (mm)	19.6	23.3	22.2	25.6	28.9	33.9	36.1	41.6	45.1	50.7
	YJV (d) (mm)	18.9	22.6	25.1	28.5	33.2	37.6	41.8	46.4	51.7	58.3
3+1	VV (d) (mm)	21.5	25.6	25.6	30.0	33.6	38.6	42.4	48.5	42.8	55.4
	YJV (d) (mm)	20.6	24.8	27.6	31.6	36.8	41.8	46.5	51.6	57.6	64.9
4	VV (d) (mm)	21.0	24.6	24.9	28.1	32.6	42.4	40.4	44.6	49.3	55.6
	YJV (d) (mm)	22.4	27.2	30.5	35.0	40.8	46.5	51.7	57.4	64.1	72.3

Note 备注：
VV - PVC insulation and sheathed 绝缘是聚氯乙烯护套，YJV - XLPE insulation and PVC sheathed 绝缘是交联聚氯乙烯护套
(d)(mm) Single cable outside diameter单根电缆外径

Residual Current Action Relay 剩余电流动作继电器

KLY-RE-LK

Products Features 产品特点

AC type residual current relay.
Without auto re-closing,manual reset.
Residual current relay is used with individual zero-sequence CT to monitor and measure.
The effective value of earth fault current.
Adjustment scope of active value(IΔn) - 30mA~1A.
Adjustment scope of delay(IΔs) 0.06~2s.
2 LED indicating lights, green light is used to indicate power, red light is used to indicate alarm
2 Buttons for 'TEST' and 'REST'.
Residual current CT has open-circuit detecting which can force the relay to act.
Contact method optional.
Easy to install.

AC型剩余电流动作继电器。
无自动重合闸，需手动复位。
用于与独立的零序电流互感器一起监控与监测接地故障电流有效值。
动作值可调(IΔn) - 30mA~1A。
延时可调(IΔs) - 0.06~2s。
2 个LED指示灯，绿色指示电源，红色指示报警。
2 个用于“测试”和“复位”的按钮。
剩余电流互感器开路检测，可以强制继电器动作。
触点方式可选。
安装便捷，导轨和螺钉紧固两种安装方式。

Technical Parameters 技术参数

Input signal 主要特性	
Rated Active Current 额定动作电流(IΔn)	30mA,100mA,300mA,500mA,1000mA, Settings可设置。
Rated Non-active Current 额定不动作电流	0.5 IΔn
Delay Time延时时间*	0.06s，0.3s，0.5s，1s，2s，Settings可设置。

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General properties 一般特性	
Auxiliary power 辅助电源	DC24V，AC100V，AC220V。
Output 输出	DPST relay(single pole, double throw) 单刀双掷继电器
Power consumption(maximum)功耗	-5℃～+40℃：Humidity湿度：23%～93%RH(must be no condensation必须无结露)
Operating temperature 工作温度	-40℃～+70℃：Humidity湿度：23%～93%RH(must be no condensation必须无结露)
Storage temperature 贮存温度	Storage temperature 贮存温度
Weight 重量	0.8Kg
Safety level安全等级	CAT Ⅲ -600V；Pollution level 污染等级：3
Case protection level 外壳防护等级	IP20

*When the rated active value of residual current is 30mA, relay transiently acts, following requirement shall be met:
*额定剩余动作电流为30mA时，继电器瞬时动作。满足以下要求：

Active value of residual current 剩余电流动作值	I△n	2I△n	0.25A	0.5A
Active time 动作时间(s)	0.3	0.15	0.04	0.04

Ordering Information订购资料

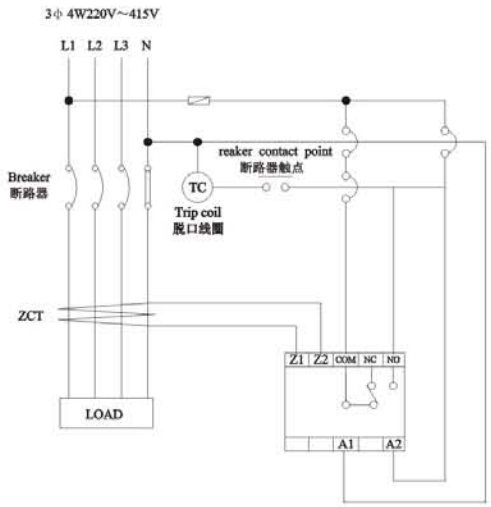
KLY	—	R	E	LK	—	□	—	□
Corporate ID 企业代号		Relay ID 继电器代号	Electricity Relay 电量继电器	Multi-function Relay ID 零序漏电保护	—	▼		■

▼ Relay action types 继电器动作类型

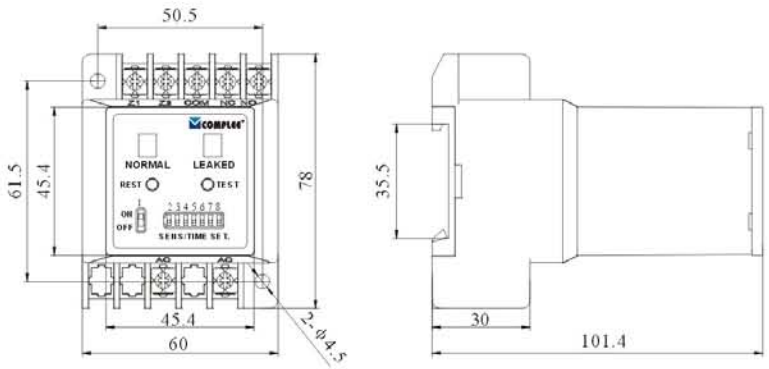
Code代号	Content内容	Code代号	Content内容
A	ND Modle 模式	B	NE Modle 模式

■ Auxiliary power辅助电源: DC24V,AC100V,AC220V。

Connection Diagram典型应用接线图



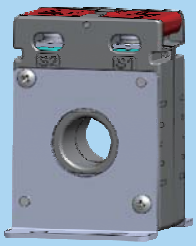
Dimension 尺寸图



Executing Standard 执行标准

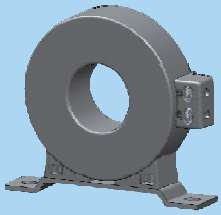
GB/T22387-2016 residual current relay
GB/T 22387-2016 剩余电流动作继电器

Introduction on Residual(Zero Sequence) Current Transformer
剩余（零序）电流互感器的介绍



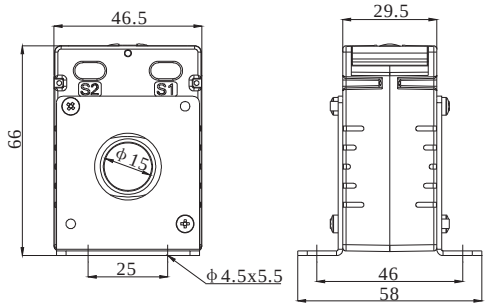
KLY-ZCT-15

KLY-ZCT-24



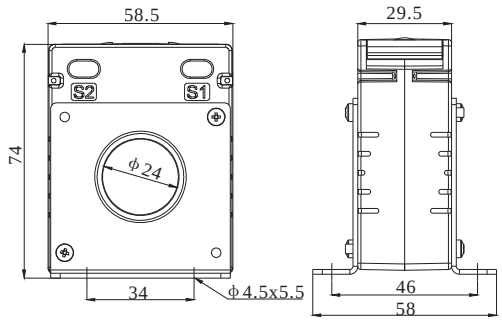
KLY-ZCT-40

KLY-ZCT-15 Residual(Zero Sequence) Current Transformer (ZCT)
KLY-ZCT-15型剩余（零序）电流互感器



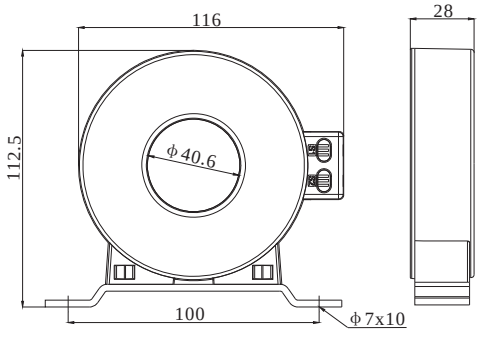
Type 型号	Through The Nuber Of Wires 通过导线数量	Max.Continuous Current (A) 最大连续电流	Max.Wire Size(mm^2) 导线最大横截面积	Maximum Outer Diameter Of Conductor 导线最大外径
KLY-ZCT-15	2	61	8	6
	3	61	8	6
	4	49	5.5	5

KLY-ZCT-24 Residual(Zero Sequence) Current Transformer (ZCT)
KLY-ZCT-24型剩余（零序）电流互感器



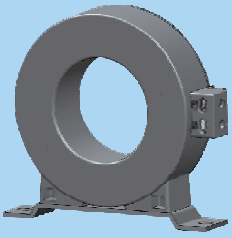
Type 型号	Through The Nuber Of Wires 通过导线数量	Max.Continuous Current (A) 最大连续电流	Max.Wire Size(mm^2) 导线最大横截面积	Maximum Outer Diameter Of Conductor 导线最大外径
KLY-ZCT-24	2	139	30	10.5
	3	139	30	10.5
	4	115	22	9.5

KLY-ZCT-40 Residual(Zero Sequence) Current Transformer (ZCT)
KLY-ZCT-40型剩余（零序）电流互感器

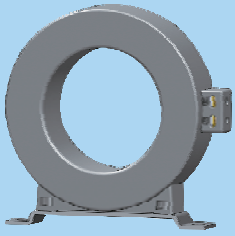


Type 型号	Through The Nuber Of Wires 通过导线数量	Max.Continuous Current (A) 最大连续电流	Max.Wire Size(mm^2) 导线最大横截面积	Maximum Outer Diameter Of Conductor 导线最大外径
KLY-ZCT-40	2	298	100	17
	3	298	100	17
	4	257	80	15.5

Introduction on Residual(Zero Sequence) Current Transformer
剩余（零序）电流互感器的介绍

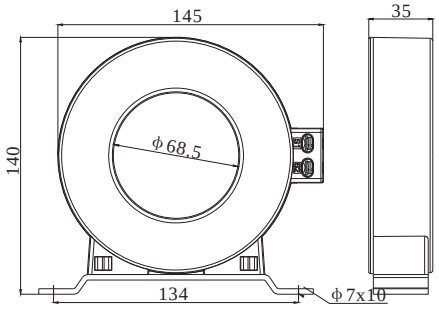


KLY-ZCT-68



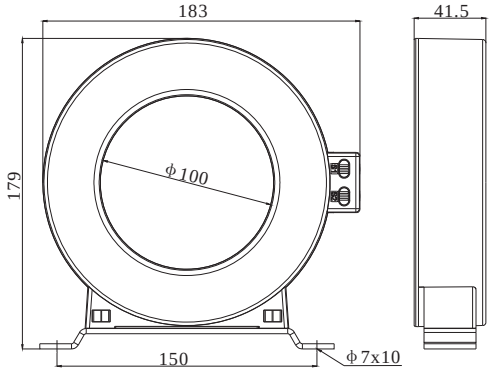
KLY-ZCT-100

KLY-ZCT-68 Residual(Zero Sequence) Current Transformer (ZCT)
KLY-ZCT-68型剩余（零序）电流互感器

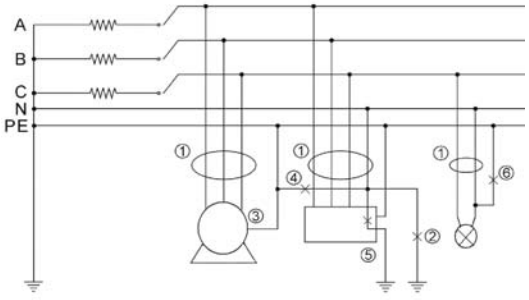


Type 型号	Through The Nuber Of Wires 通过导线数量	Max.Continuous Current (A) 最大连续电流	Max.Wire Size(mm²) 导线最大横截面积	Maximum Outer Diameter Of Conductor 导线最大外径
KLY-ZCT-68	2	650	325	29
	3	650	325	29
	4	556	250	26

KLY-ZCT-100 Residual(Zero Sequence) Current Transformer (ZCT)
KLY-ZCT-100型剩余（零序）电流互感器



Type 型号	Through The Nuber Of Wires 通过导线数量	Max.Continuous Current (A) 最大连续电流	Max.Wire Size(mm²) 导线最大横截面积	Maximum Outer Diameter Of Conductor 导线最大外径
KLY-ZCT-100	2	1185	850	45
	3	1185	850	45
	4	992	600	38

Note 注意事项

- Technical requirement on Residual Current Device should be complied with GB6829 and GB1208 or relevant standard.
- All conductors with load current should be fed through ZCT① aperture, repeat -grounded neutral ② is not allowed
- PE or PEN without load current always bypass ZCT, and connect to the protective earth of power supply ③.
- Protection branch wire should have their own neutral, which should not be connected together④, no sharing ⑤ or bypassing ZCT to connect to Pe⑥.
- Focusing on prevention, by adopting technical measures to prevent accidents, even though residual current device is applied.
- 剩余电流保护装置技术条件应符合GB6829、GB1208等有关标准规定。
- 凡有负荷电流通过的导线应全部穿过ZCT①，其中中性线N不得重复接地②。
- 凡不通过负荷电流的导线PE或PEN不得穿过ZCT、且应接到电源端保护线上③。
- 保护支线应有各自的中性线N，相邻中性线N不得相连④，不得共用⑤以及跨接⑥。
- 安装剩余电流保护装置后，仍应以预防为主，并应同时采取其他各项防止事故的技术措施。