ZW139A-12系列户外用户分界真空断路器

ZW139A-12 Series Outdoor User Boundary Vacuum Circuit Breaker

产品应用场合

10kV架空配电线路T接的用户内部发生故障时，如故障在其进线段，或故障虽发生在用户进线开关内侧，但其保护动作时限与变电站出线开关保护配合不当时，均会造成变电站出线开关保护掉闸。如果故障性质是永久的，变电站重合不成功，则一个中压用户界内的事故将使整条配电线路停电，这种在配电网中常见的波及事故，对社会将造成恶劣影响。

ZW139A-12型户外用户分界真空断路器，是解决上述波及事故的理想设备，该设备出线侧内置零序电流互感器，与分界控制器配合使用。安装于10kV架空配电线路的T接处或用户端，可以实现自动切除单相接地故障和自动隔离相间短路故障。确保非故障用户的用电安全。适合用于变电站，工矿企业，农村电网配电系统作保护和控制及频繁操作场所之用。

Product Applications

When any user of T connection for 10kV overhead distribution lines has internal fault, any fault occurring in its incoming line, or fault occurring in the internal side of the user incoming switch, but its protection operation timing and substation outgoing switch protection mismatching will result in tripping of the substation outlet switch protection. If the fault is permanent in nature, and the substation reclosing is unsuccessful, an accident within the MV user boundary can result in outage of the entire power distribution lines, and such extension accident commonly seen within the power distribution network will result in adverse impacts to the society.

The ZW139A-12 type outdoor user boundary vacuum circuit breaker is ideal for solving the above-mentioned extension accident. The outlet side of the device is internally built with zero-sequence current transformer, which is used in combination with the boundary controller. The T connection or the user terminal installed on the 10kV overhead distribution lines can automatically remove the single-phase ground fault and automatically isolate the phase-to-phase short-circuit fault to ensure the safe use of electricity by non-fault user. The circuit breaker is suitable for use in substations, industrial and mining enterprises, and rural power grid distribution system for protection and control purposes and at places with frequent operations.

结构特点及工作原理

结构特点

整体结构优越

ZW139A-12户外用户分界真空断路器本体采用箱式密封结构。具有良好的密封性能，是一种免维护产品。断路器本体安装可采用柱上吊装或座装安装方式均方便、灵活。分界控制器安装在断路器下方，通过户外电缆与分界断路器连接。电源变压器(电压PT)可与断路器并排方置或放置在断路器上方。

操作灵活方便

产品具有自动储能，遥控分合闸。同时具有手动储能，手动分合功能，可直接由架空线接至电压互感器输出额定电压，通过断路器侧面的端子盒中转，使用连接电缆引入到控制器上，由控制器遥控来进行操作。

绝缘性能优良

采用真空灭弧室灭弧、SF6气体绝缘。进出线套管采用环氧树脂与硅橡胶APG工艺合成，独特的硅橡胶套管进出线结构，使套管之间绝缘距离充裕，运行安全可靠。在箱体顶部安装有防爆装置，即使发生意外、内部故障，也不会有高温气体或飞溅物泄漏出来。

密封性能可靠

采用成熟的密封结构技术， 机构罩及箱体上盖采用冲压成型“V”型槽密封。主回路及二次元器件，操作机构均密封在SF6气体（零表压）中，密封性能可靠。

变比任意可调、PT二次输出中转

开关进线侧内置二相电流互感器，出线侧内置零序电流互感器，在机构罩外部侧面设有端子盒，内部CT变比线引出、电压PT二次输入端子，都在端子盒内，可做到任意调整CT变比和PT二次电源线经断路器内部中转，通过户外电缆引入控制器，减少了二次电源线过长、且控制器需另设电源接口的不便。

Structural Characteristics and Working Principle

Structural Characteristics

Superior Overall Structure

The body of the ZW139A-12 outdoor user boundary vacuum circuit breaker is used with box-type seal structure. It has excellent sealing performance, and is a maintenance-free product. The circuit breaker body is conveniently and flexibly mounted by either on-post lifting or seat mounting. The boundary controller is mounted below the circuit breaker, and connected with the boundary circuit breaker via the outdoor cable. The power transformers (voltage PT) can be placed side by side with the circuit breaker or placed above the circuit breaker.

Flexible and Convenient Operation

The products have advantages of automatic energy storage, remote opening and closing, and also manual energy storage, and manual switching function, and can be connected directly to the voltage transformer via overhead line to output the rated voltage, and relayed via the terminal box on the side surfaces of the circuit breaker, and is connected into the controller using connection cables, and realize operation via remote control with the controller.

Excellent Insulation Properties

Vacuum interrupter is used for arc interruption and SF6 gas insulation. The line incoming and outgoing bushings are synthesized using epoxy resin and silicone rubber APG technology. The unique incoming and outgoing structure of silicone rubber bushing allows adequate insulation distance between bushings, and safe and reliable operation. The top of the box is installed with explosion-proof devices, even if the accident or internal fault occurs, there is no leakage of high-temperature gas or spatter.

Reliable Sealing Performance

Sophisticated sealing structure technology is used, and the mechanism cover and box upper cover are sealed with stamping formed "V" groove. The primary circuit and secondary components, and the operating mechanism are sealed in SF6 gas (zero gauge pressure), rendering excellent sealing.

Transformation Ratio Freely Adjustable, PT Secondary Output Relay

The switch line incoming side is internally placed with two-phase current transformer, and the line outgoing side is internally placed with zero sequence current transformer. The external side faces of the mechanism cover are mounted with terminal box, the internal CT transformer ratio line lead-out and the voltage PT secondary input terminal are arranged inside the terminal box, so that the CT ratio can be adjusted freely and the PT secondary power line is relayed through the circuit breaker and connected into the controller via outdoor cable, thereby reducing the inconvenience caused by over-long secondary power supply line and additional power connector to the controller.

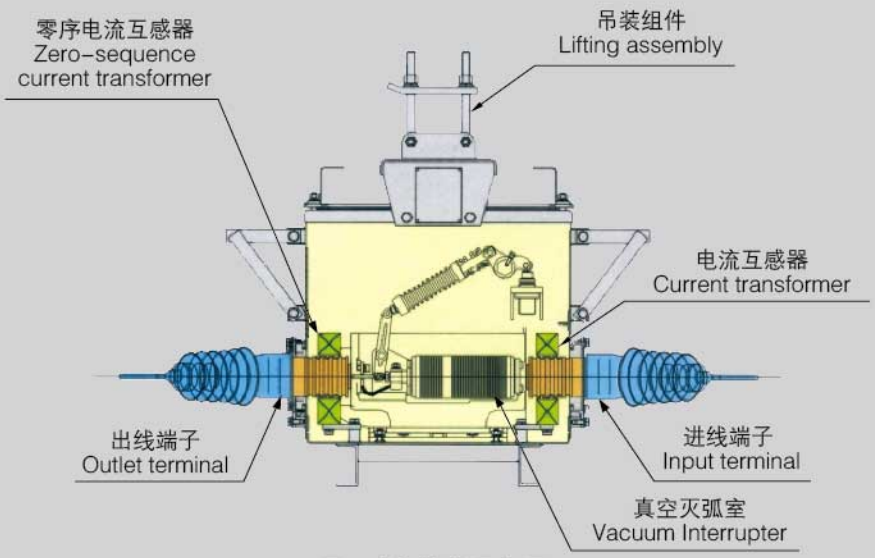

图1 内部结构示意图
Figure 1 Schematic Diagram of Internal Structure

分界控制器介绍 Introduction of Boundary Controller

图2 分界控制器及面板
Figure 2 Boundary Controller and Panel

分界控制器在电力系统中实时监测配电系统的运行情况，能根据配电系统故障情况下的电参数数据变化实际，及时准确判断系统线路产生故障的性质(属于瞬时性/永久性)，通过断路器自动切除永久性故障线路，恢复其它非故障线路的供电。本控制器具有防涌流、过流保护、速断保护、小电流接地保护和失压保护等保护环节，还具有重合闸功能、重合闸后加速功能。通过相应设定，可以实现配电线路的自动保护，非常适合在城乡配电网中使用。

The boundary controller performs real-time monitoring on the running conditions of the distribution system in electrical power system, and timely and accurately determine the nature of the failure of the system line (transient/permanent) according to the actual changes in the parameter data in case of failure with the electrical power distribution system, automatically cutoff the permanent fault line by circuit breaker, and recovers the power supply to other non-fault lines. The controller has protection links including surge protection, overcurrent protection, instantaneous trip protection, small current grounding protection and voltage protection, and also functions of reclosing and post-reclosing acceleration. Automatic protection of the distribution line can be realized through appropriate settings, thus ideal for use in urban and rural distribution network.

控制器工作保护原理

单相接地故障动作原理

线路正常时，变电站出线开关和分界断路器均处于合闸状态。

一旦用户界内发生单相接地故障，分界断路器内置的零序互感器检测到的零序电流接近于全网的零序电流，超过事先整定的参数。经延时，判断为界内永久性单相接地故障，分界断路器自动分闸，将故障区隔离开，使用手机短信息通信时，还会上报事故信息。

其它相邻用户和主线路的单相接地故障则属于界外故障，该断路器零序电流互感器检测到的零序电流远小于整定值，该断路器不动作。

在中性点经小电阻接地系统中，变电站虽有零序保护，但只要是该用户界内发生单相接地故障，该用户的分界断路器与变电站保护依靠动作时限配合，分界断路器先于变电站开关动作，从而切断了单相接地故障，保证其它用户安全用电。

相间故障动作原理

当用户界内发生相间故障时，分界断路器检测到短路电流，当短路电流超过过流定值时，经过延时，确认为永久性短路电流故障后，断路器分闸。断路器将故障区隔离后，使用手机短信息通信的，还会通过短信上报事故信息。

Work Protection Principle of Controller

Working Principle for Single-Phase Ground Fault

When the lines are normal, both the substations outgoing switch and the boundary circuit breaker are in closing state.

Once the single-phase ground fault occurs in the user boundary, the zero sequence current detected by the zero sequence transformer inside the boundary circuit breaker approaches network-wide zero sequence current, and exceeds the preset parameters. If the fault is determined as permanent single-phase ground fault within the boundary upon delay, the boundary circuit breaker automatically opens, and isolates the fault zone. When the mobile phone short messaging is used for communication, the accident information will also be reported to the upper level.

The single-phase ground fault of other neighboring users and the main line belongs to out-of-bound fault, the zero sequence current detected by the zero-sequence current transformer of the circuit breaker is far less than the set value, the circuit breaker does not act

When the neutral point passes the low resistance grounding system, the substations have zero-sequence protection, but as long as single-phase ground fault occurs in the user boundary, the user's boundary circuit breakers and the substation protection will work together relying on the operation time limit, the boundary circuit breaker performs switching operation prior to the substation, thereby isolating the single-phase ground fault, and ensuring safe use of electricity of other users..

Phase-to-Phase Fault Operation Principle

When phase-to-phase fault occurs within the user boundary, the boundary circuit breaker detects the short-circuit current. When the short-circuit current exceeds the over-current setting, and is confirmed as permanent short-circuit current fault upon delay, the circuit breaker opens. The circuit breaker will isolate the fault zone, and if mobile phone short message service (SMS) is used for communication, the accident information will be reported to the upper level via SMS.

保护处理方式

控制器输入信号共四个，A相电流、C相电流、零序电流、AB相间电压，控制器通过实时监测上述输入量，并于整定值进行比较来判断线路故障的类型，从而进行相应的处理。详细的情况和设定方法请参照随机附带的分界控制器使用说明书。

Protection Treatment Methods

The controller totals 4 input signals: phase A current, phase C current, zero-sequence current, and AB phase-to-phase voltage. The controller monitors the input values through real-time monitoring, and determines the type of line fault through comparison with the setting values, thus dealing with the faults accordingly. For detailed information and setting methods, refer to the instruction manual for boundary controllers supplied along with the controller.

使用环境条件

- 海拔高度：不超过2000米；
- 污秽等级：Ⅳ级；
- 周围空气温度：－40℃~＋40℃；
- 日温差：日变化25℃；
- 风速不大于35m/s；
- 地震强度不超过8级；
- 无易燃、易爆炸危险、化学腐蚀的场所。

Environmental Conditions for Use

- Altitude: not greater than 2000m;
- Contamination Level: Level IV;
- Ambient air temperature: -40 ℃ ~ + 40 ℃;
- Daily temperature difference: daily variation of 25℃;
- Wind speed not greater than 35m/s;
- Earthquake intensity of not greater than M8;
- Places without flammable, explosive hazards, and chemical corrosion.



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主要规格及技术参数 Main Specifications and Technical Parameters

断路器主要规格及技术参数
Main Specifications and Technical Parameters of Circuit

序号 No.	名称 Description	单位 Unit	参数 Parameters
1	额定电压 Rated voltage	kV	12
2	额定电流 Rated current	A	630, 1250
3	额定频率 Rated frequency	Hz	50
4	额定短路开断电流（有效值） Rated operations of short-circuit breaking current (effective value)	kA	20
5	额定短路电流开断次数 Breaking operations of rated short-circuit current	次	30
6	额定峰值耐受电流（峰值） Rated peak withstand current (peak)	kA	50
7	额定短时耐受电流（4S） Rated short-time withstand current (4S)	kA	20
8	额定短路关合电流（峰值） Rated short-circuit making current (peak)	kA	50
9	1min工频耐受电压（相间、对地/断口） 1min power frequency withstand voltage (phase-to-phase, phase-to-ground/ fracture)	kV	42/49
10	雷电冲击耐受电压峰值（相间、对地/断口） Lightning impulse withstand voltage peak (phase-to-phase, phase-to-ground/ fracture)	kV	75/85
11	机械寿命 Mechanical life	次	10000
12	额定操顺序 分-0.3s-合分-180s-合分 Rated operating sequence O-0.3s-CO-180s-CO		
13	SF6气体额定压力(表压) Rated SF6 gas pressure (gauge pressure)	Mpa	“0”
14	SF6气体年泄漏率 SF6 gas annual leakage rate		≤0.5%
15	开关重量 Switch weight	kg	140
16	开关体积(含包装箱) 1300mm×900mm×880mm Switch volume (including packaging box) 1300mm×900mm×880mm		

分界控制器主要参数
Main Parameters for Boundary Controller

序号 No.	名称 Description	单位 Unit	参数 Parameters
1	输入工作电压 Input Operating Voltage	AC220V	
2	输入工作电压频率 Input working voltage frequency	50Hz	
3	输入工作电压允许波动 Allowable fluctuation for input working voltage	±20%	
4	整机功耗 Total machine power consumption	< 10W	
5	输出电压 Output voltage	DC220V	
6	输出控制接点容量 Output control contact capacity	5A	
7	AC相电流输入值 AC phase current input value	0~50A	二次电流35A以上允许饱和 Allowed saturation for secondary current of 35A or more
8	采样零序电流输入值 Sampling zero sequence current input value	0~9A	一次电流6A以上允许饱和 Allowed saturation for primary current of 6A or more
9	速断保护电流整定值范围 Quick break protection current setting range	0.4~20A	
10	过流保护电流整定值范围 Over-current protection current setting range	0.2~8A	
11	过流保护动作延时时间值 Over-current protection operation delay time value	0.4~1000ms	
12	零序保护电流整定值范围 Zero-sequence protection current setting range	0.2~9A	零序CT变比为20：1 Zero sequence CT ratio of 20: 1
13	零序保护动作延时时间值 Zero-sequence protection operation delay time value	0~3600s	可调 Adjustable
14	重合次数 Reclosing cycles	0~3	可调 Adjustable
15	一次重合间隔 Time interval for 1st reclosing	0.3s~100s	可调 Adjustable
16	二三次重合间隔 Time interval for 2nd and 3rd reclosing	5s~100s	可调 Adjustable
17	PDA遥控距离 PDA remote control distance	不小于50米 No less than 50m