

## ZN139-12/D 系列永磁式真空断路器

### ZN139-12/D Series Permanent Magnet Vacuum Circuit Breaker



#### 产品特点

- ▶ 国内最先进的帝森南自永磁操作机构（“双接触面设计”专利技术）；
- ▶ 国内最具信任度的帝森南自智能控制器；
- ▶ 配国际最先进的西门子或由帝森南自监制的机械寿命达4万次真空灭弧室；
- ▶ 公司生产体系通过西门子验收，并授予“原厂配套”证书；
- ▶ 最早通过西高所型式试验，国内实际运行时间最久；
- ▶ 机构机械寿命12万次；
- ▶ 可选配OLM-NZ1型智能在线监测装置，实现智能化。

#### Product Features

- ▶ Domestically the most advanced TYSEN-SAE permanent magnet operating mechanism (patented technology of "dual contact surface design");
- ▶ TYSEN-SAE intelligent controller domestically with the best level of trust;
- ▶ Equipped with internationally the most advanced Siemens vacuum interrupter or the vacuum interrupter with mechanical life of 40,000 cycles made under supervision of TYSEN-SAE;
- ▶ Its production system successfully passed the acceptance of Siemens, and was awarded the "OE parts" certificate;
- ▶ The earliest product successfully passing the type testing of the Xi'an HV Apparatus Research Institute, and having the longest actual running time at home;
- ▶ Mechanism with mechanical life of 120,000 cycles;
- ▶ Optional OLM-NZ1 intelligent on-line monitoring devices, having achieved intelligence.

“双接触面设计”专利技术

Patented technology of "dual contact surface design"

## 结构特点及工作原理

ZN139-12/D户内真空断路器总体结构为永磁操动机构与灭弧室前后布置形式。主导电回路部分为三相落地式结构。其主回路采用复合绝缘方式。

本产品的永磁操动机构采用全新的工作原理和结构，其最大优势在于真正解决了永磁场的吸合力，在分闸的初始阶段对分闸的阻碍，完全匹配于真空灭弧室的特性要求。永磁操动机构通过主传动轴驱动主拐臂，直接操作开关的分合，省去了传统操动机构中复杂、易损的储能和锁扣装置，极大地简化了传动环节，从而真正实现高可靠，长寿命。

永磁操动机构是由分、合闸线圈，上、下磁磁轭，内、外磁轭，动、静衔铁，手动分闸装置及永磁体组成。合闸时，电磁驱动力与永磁吸引力的正向叠加，驱动动衔铁到达合闸终端位置，并依靠永磁吸合力来实现稳态保持（即双稳态的合闸稳态保持），同时，完成了对合闸触头弹簧和分闸弹簧的储能，分闸时通过分闸线圈通电，使得动衔铁产生与永磁磁场同极性的排除力，使合闸保持力骤降到临界值，在分闸弹簧和触头弹簧的共同作用下驱动动衔铁到达分闸终端位置，此时永磁吸合力又将动衔铁稳态保持在分闸位置（即双稳态的分闸稳态保持）。

该机构设有手动分闸装置，用于特殊情况下带负荷紧急分闸操作。

ZN139-12/D真空断路器可根据用户要求，制作成固定安装单元，也可配用专用推进机构组成手车单元使用。机构操作电源一般由配电房内的直流屏直接提供，特殊情况下也可以根据用户需要配置高可靠的储能单元，通过智能控制单元驱动永磁机构，以满足交、直流操作的场所。

## Structural Characteristics and Working Principle

The ZN139-12/D indoor vacuum circuit breaker is in overall structure of front-and-rear arrangement of the permanent magnet actuator and the interrupter. The main electrical circuit part is in three-phase floor-type structure. Its main circuit is insulated by composite insulation.

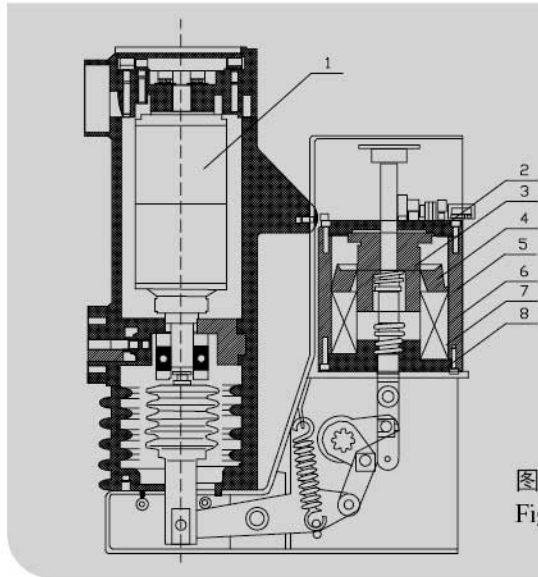
The permanent magnet actuator of this product is applied with new working principle and structure, of which the greatest advantage lies in its real solution offering to the suction force of the permanent magnet field and the hindrance to separation of brake in the initial stage of opening, thereby fully matching the features requirements of the vacuum interrupter. The permanent magnet actuator drives the main crank arm through the main drive shaft, performs the switching operation of the switch directly, and saves the need for complex and vulnerable energy storage and locking devices in conventional actuators, and greatly simplifies the drive links, thereby realizing high reliability and long service life in true sense.

The permanent magnet actuator consists of opening and closing coils, upper and lower magnetic yokes, inner and outer magnetic yokes, dynamic and static armatures, manual opening devices and permanent magnet body. When closing, the forward superposition between the electromagnetic force and the suction force of the permanent magnet drives the dynamic armature to the closing end position, and maintain a steady state relying on the permanent magnet suction force (i.e. bi-stable closing steady state maintenance), and at the same time, completes the energy storage of the closing contact spring and the opening spring, energize through the opening coil when opening, so that the dynamic armature produces exclusion force with the same polarity as the permanent magnet field, and the holding force of closing plunges into critical value, and drives the dynamic armature to the end position of the opening under joint action of the opening spring and the contact spring. At this point, the suction force of permanent magnet holds the steady state of the dynamic armature in the OFF position (i.e. bi-stable opening steady state holding).

The mechanism is equipped with manual opening devices to enable loaded emergency opening operation in case of emergency.

The ZN139-12/D vacuum circuit breaker can be made into fixed unit upon request of user, also can be equipped with special pushing framework to combine the handcart unit. The mechanism operating power is generally supplied directly from DC screen in the power distribution room, and may also be equipped with highly reliable energy storage unit according to the user requirements under special circumstances, which drives the permanent magnet mechanism through the intelligent control unit to meet the requirements at places of AC and DC operations.





复合绝缘型 Composite Insulation Type

- 1. 主回路 Main circuit
- 2. 上磁轭 Upper yoke
- 3. 动铁心 Movable core
- 4. 内磁轭 Inner yoke
- 5. 永磁体 Permanent magnet
- 6. 外磁轭 Outer yoke
- 7. 线圈 Coil
- 8. 下磁轭 Lower yoke

图1 断路器结构图  
Figure 1 Structural Diagram for Circuit Breaker

使用环境条件

- ▶ 环境温度：
  - 最高温度：+45℃
  - 最低温度：-25℃（允许在-30℃储运）
- ▶ 环境湿度：
  - 日平均相对湿度：≤95%
  - 月平均相对湿度：≤90%
- ▶ 海拔高度：1000m（1000~4000m可定制）；
- ▶ 地震烈度不超过8级；
- ▶ 使用场所无滴水、无易燃和爆炸危险、无严重污秽、无化学腐蚀性气体以及无剧烈震动。

Environmental Conditions for Use

- ▶ Ambient temperature:
  - Maximum temperature: +45 °C
  - Minimum temperature: -25 °C (allowable for storage and transportation at -30 °C)
- ▶ Environmental Humidity:
  - Daily average relative humidity: ≤95%
  - Monthly average relative humidity: ≤90%
- ▶ Altitude: 1,000m (1,000~4,000m can be customized);
- ▶ Earthquake intensity not more than M8;
- ▶ The place of use must not have any dripping, combustion and explosive hazards, severe contamination, chemical corrosive gases and severe vibration.



**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 Breaker**

序号 No.	名称 Description	单位 Unit	参数 Parameters		
1	额定电压 Rated voltage	kV	12		
2	额定工频耐受电压相间、相对地/断口 (1min) Rated power frequency withstand voltage (1 min)	kV	42/48		
3	额定雷电冲击电压相间、相对地/断口 (峰值) Rated lightning impulse/fracture withstand voltage (peak)	kV	75/85		
4	额定频率 Rated frequency	Hz	50		
5	额定电流 Rated current	A	630-1250	630-3150	1250-4000*
6	额定短路开断电流 Rated short-circuit breaking current	kA	20 25	31.5	40
7	额定短路关合电流 Rated short-circuit making current	kA	50 63	80	100
8	额定峰值耐受电流 Rated peak withstand current	kA	50 63	80	100
9	额定热稳定电流 (有效值) Rated thermal stability current (effective value)	kA	20 25	31.5	40
10	额定短路持续时间 Rated short-circuit duration	s	4		
11	额定短路开断电流次数 Rated operations of short-circuit breaking current	次 Number of cycles	30	30	20
12	机械寿命 Mechanical life		30000/40000		
13	额定电流开断次数 (电寿命) Rated current breaking cycles (electrical life)		30000/40000		
14	永磁机构机械寿命 Mechanical life of permanent magnet mechanism		120000	120000	100000
15	额定单个/背对背电容器组开断电流 Rated single/back to back capacitor bank breaking current	A	630/400(40kA为800/400)		
16	相间距 Phase-to-phase spacing	mm	210-275		
17	触头开距(1) Contacts spacing (1)	mm	9 ± 1		
18	接触超行程 Contact overtravel	mm	3 ± 0.5		
19	动、静触头允许磨损累积厚度 Allowable wearing accumulation thickness of dynamic and static contacts	mm	3		
20	三相分、合闸不同期性 Time interval between opening of first and last phase of three phase circuit-breaker	ms	≤ 2		
21	触头合闸弹跳时间 Bouncing time of contactor closed	ms	≤ 2 (40kA ≤ 3)		

序号 No.	名称 Description	单位 Unit	参数 Parameters		
22	触头压力 Contact pressure	N	20kA 2000 ± 200	31.5kA 3100 ± 200	40kA 4300 ± 200
23	平均分闸速度 Average opening speed	m/s	0.8-1.2		
24	平均合闸速度 Average closing speed	m/s	0.5-0.8		
25	分闸时间 Opening time	ms	≤50		
26	合闸时间 Closing time	ms	≤70		
27	额定操作顺序 Rated operating sequence		0.3s 180s 0—CO—CO		180s 180s 0—CO—CO

注：(1) 配国产真空灭弧室时为 $11 \pm 1$ ； (2) \*4000A需要强制风冷。  
数据以最终出厂产品为准。

Note: (1)  $11 \pm 1$  when equipped with homemade vacuum interrupter; (2) \* 4000A requires forced air cooling.  
Data shall be prevailed by the final manufactured products.

### 永磁机构主要规格及技术参数

#### Main Technical Parameters and Specifications for Permanent Magnet Actuator

序号 No.	名称 Description	单位 Unit	参数 Parameters		
1	额定短路开断电流 Rated short-circuit breaking current	kA	20 25	31.5	40
2	合闸电流 Closing current	A	22	28	48
3	分闸操作电流 Opening operation current	A	1.5		2
4	合、分闸额定工作电压 Rated working voltage for closing and opening	v	DC220		
5	机械寿命 Mechanical life	次 Number of cycles	120000		100000

