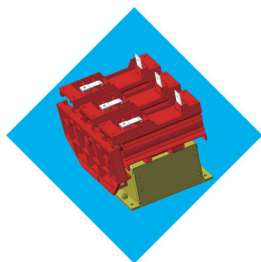


WESTPOWER
威 帕

W-VL Vacuum Contactor
W-VL 真空接触器



W-VL Vacuum Contactor W-VL 真空接触器

Product Introduction 产品简介

The new generation 3-phase AC contactor with solid encapsulated polar pole and electromagnetic operating mechanism manufactured by Westinghouse Electric, W-VL vacuum contactor, is suitable for the application scenarios where frequent operations are needed in a 3-phase AC system with a rated operating voltage lower than 12kV and a rated frequency of 50Hz/60Hz. The W-VL vacuum contactor has excellent breaking performance and is suitable for controlling and protecting (in conjunction with fuse) such electrical equipment as motors, transformers, capacitors, etc.

由美国西屋公司生产的新一代电磁操作机构的固封极柱式三相交流接触器——W-VL真空接触器，适用于额定工作电压12kV以下，额定频率50Hz/60Hz的三相交流系统中需要频繁操作的场合，W-VL真空接触器具有卓越的开断性能，适合控制和保护（配合熔断器）电机、变压器、电容器组等电气设备。

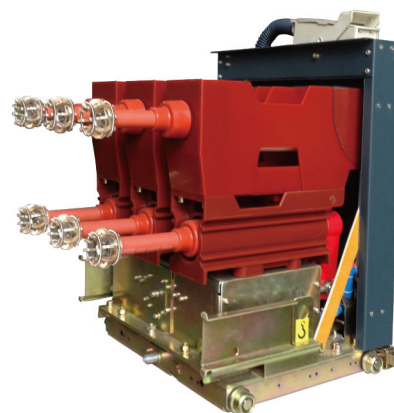


W-VL Vacuum Contactor
W-VL 真空接触器

Main Technical Features 主要技术特点

- i) Chopping current <math>< 0.5A</math>;
- ii) Extremely little maintenance;
- iii) Suitable for frequent operation;
- iv) Long electrical and mechanical life;
- v) Good interchangeability;
- vi) Suitable for being installed at substation and switchgear assemblies;
- vii) Dedicated wide voltage range power supply module provided for electrically self-held closing electromagnet;
- viii) Suitable for higher elevations;
- ix) Resistant to greater air pollution.

- 1、截流值<math>< 0.5A</math>;
- 2、极少量的维护;
- 3、适合频繁操作;
- 4、电气与机械寿命长;
- 5、良好的互换性;
- 6、适合安装于成套式变电站和开关柜;
- 7、为电气自保持合闸电磁铁提供的专有的宽电压电源模块;
- 8、更高的海拔;
- 9、更高耐空气污染等级。



W-VL Vacuum Contactor
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Interruption Principle 开断原理

Main contacts of the contactor are operated in a ceramic vacuum interrupter with a vacuum degree up to $1.33 \times 10^{-4} \text{Pa}$. When the contactor is turned off, the moving and static contacts in the vacuum interrupter drop out rapidly. Metallic vapor generated by the high-temperature contacts during the opening process sustaining the arc until the current crosses the zero point for the first time. When the current crosses the zero point, the metallic vapor rapidly condensates to re-establish a very high dielectric strength between the moving and static contacts and in turn maintain a very high transient recovery voltage.

Because of a chopping current of the contactor $< 0.5 \text{A}$, only a very low overvoltage harmless to the equipment will be exerted to the started motor.

接触器主触头在陶瓷的真空灭弧室中操作，灭弧室的真空度高达 $1.33 \times 10^{-4} \text{Pa}$ 。接触器分闸时，真空灭弧室的动静触头快速地开断。在分闸过程中高温触头产生的金属蒸汽使电弧持续到电流第一次过零点。在电流过零点时，金属蒸汽迅速凝结使动静触头之间重新建立起很高的电介质强度，维持很高的瞬态恢复电压值。

因为接触器的截流值 $< 0.5 \text{A}$ ，对于切合已经启动的电动机仅产生很低无危害设备的过电压。

Decrease the chopping current and reduce the operating overvoltage:

During the small current is being broken, arc energy is not strong enough to continue arcing, the arc current decreases and the current suddenly changes to zero, which may result in overvoltage.

The contacts, made from special Copper-Chromium alloy, enable the contactor to break great short-circuit currents and while ensuring the small chopping current (reaching as low as 0.5A at the minimum level).

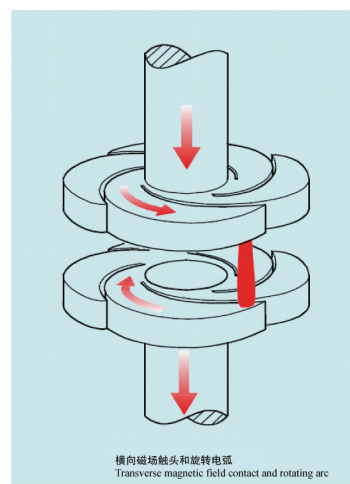
减小截流值，降低操作过电压：

开断小电流过程中，电弧能量不足以支持其继续燃弧，电弧流值降低电流突变为0，可能导致过电压。

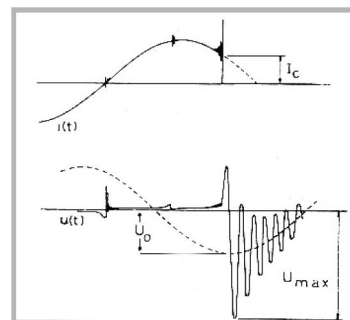
触头采用特有的铜铬合金，使其既可以开断大的短路电流，又可以保证小的截流值（截流值最小可达到 0.5A ）。



横向磁场触头和旋转电弧
Transverse magnetic field contact and rotating arc



横向磁场触头和旋转电弧
Transverse magnetic field contact and rotating arc



Product Structure 产品结构

Depending upon the type of holding, there are two available versions of the W-VL vacuum contactors: electrically self-held and mechanically self-held, while depending upon the form of construction there are also two available versions of the W-VL vacuum contactors: fixed type vacuum contactor and handcart type combined electrical apparatus (contactor-fuse combined electrical apparatus).

The handcart type contactor-fuse combined electrical apparatus mainly consists of a fixed type contactor, a fuse holder and a fuse specific handcart. The fuse holder is equipped with a linkable tripping mechanism which ensures that the contactor can be opened even when only the fuse in one phase blows out and similarly can prevent the contactor from being closed even when the fuse in one phase is not installed.

The W-VL vacuum contactor is in a cascaded modular layout which is unique, novel, simple, compact, results in low energy consumption and noises, high operating reliability, and strong adaptability, and the users can make their free selection between the fixed type and handcart type.

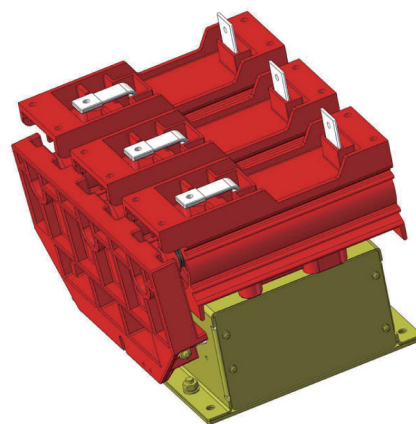
W-VL真空接触器按合闸保持的方式可分为具有电气自保持和机械自保持两种，按结构形式可分为：

固定式真空接触器，

手车式组合电器（接触器-熔断器组合电器）；

手车式接触器-熔断器组合电器主要由固定式接触器、熔断器支座、熔断器特定的底盘手车组成。熔断器支座上都装有联动脱扣机构，保证接触器在即便只有一相熔断器熔断时也能联动分闸。同样即使有一相熔断器未安装时，该装置也可防止接触器合闸。

W-VL真空接触器结构采用模块叠加式总体结构布局，独特新颖、简单、紧凑、能耗和噪音低、操作可靠性高、产品适应性强，用户可以自由选择固定式、手车式等形式。



Operating Conditions 使用条件

Normal Operating Conditions

Ambient Temperatures:

maximum temperature: +40 °C

maximal mean daily temperature: +35 °C

minimal temperature: -25 °C

Ambient humidity:

max. mean daily RH: ≤95%

max. mean monthly RH: ≤90%

max. mean daily saturated vapor pressure: ≤ 2.2×10^{-3} MPa

max mean monthly saturated vapor pressure: ≤ 1.8×10^{-3} MPa

Elevation: not exceeding 2000m

Seismic intensity: not exceeding 8 degrees

Amplitude of electromagnetic interference: not exceeding 1.6kV

Pollution degree: pollution resistance classification: Class IV

Others: No pollutions caused by corrosive and flammable gases, steam or salt mist in surrounding atmosphere.

Special Operating Conditions:

In case of difference between actual operating conditions and normal operating conditions, please contact us and reach appropriate agreement with us in case of special requirements.

正常使用条件

环境温度:

最高温度: +40°C;

最高日平均温度: +35°C;

最低温度: -25°C。

环境湿度:

最大日平均相对湿度: ≤95%;

最大月平均相对湿度: ≤90%;

最大日平均饱和蒸汽压: ≤ 2.2×10^{-3} MPa;

最大月平均饱和蒸汽压: ≤ 1.8×10^{-3} MPa。

海拔高度: 不超过2000m;

地震烈度: 不超过8度;

电磁干扰的幅值: 不超过1.6kV;

污染等级: 耐空气污染IV级;

其他: 周围空气没有明显的受腐蚀性和可燃性气体、蒸气或盐雾的污染。

特殊使用条件

如果使用条件和这些正常使用条件不同, 有特殊要求的请与我们联系再达成适当的协议。

Operating Principle 动作原理

The closing operation of the vacuum contactor is performed relying upon the actuation by the electromagnetic operating mechanism, while the opening operation is performed by the opening spring.

A mechanically closable latching device maintains the mechanically self-held vacuum contactor with that latching device in the closed position and at the same time compresses the closing spring to make preparations for the opening operation. At the time of opening, the opening electromagnet actuates to trip the latching device and then the opening spring driving mechanism completes the opening operation (see figure below).

For each close-open operation completed by the handcart type contactor, the indication screen on the panel provides the corresponding indications, and the contactor, if equipped with a counter, will automatically record the number of operations.

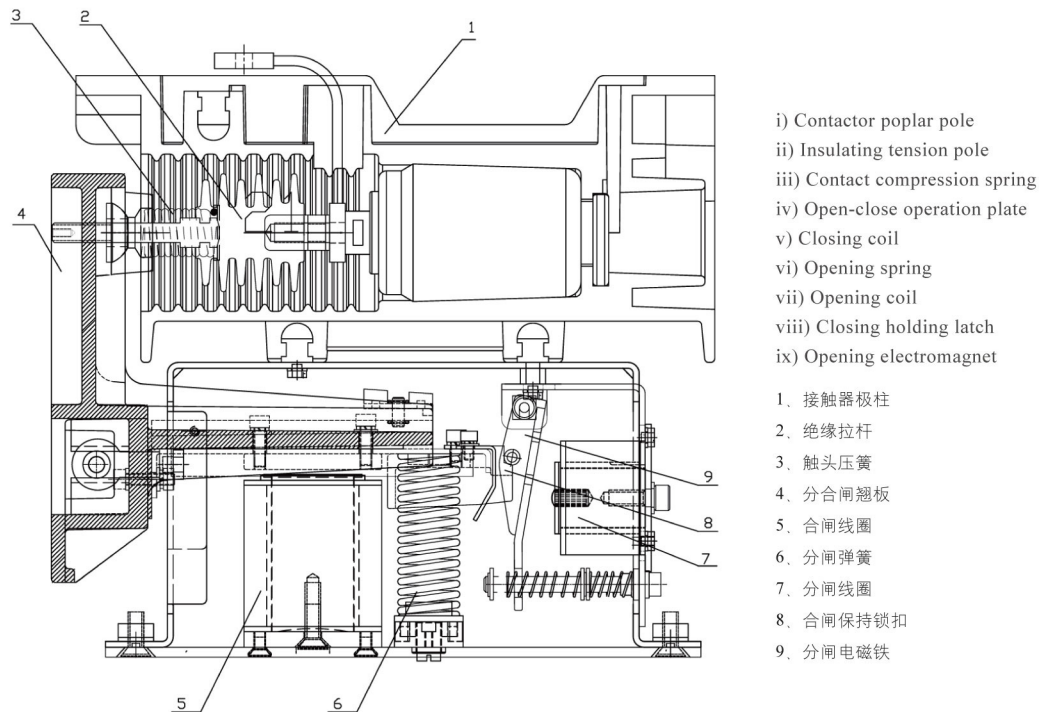
The vacuum contactor is capable of manually opening. Generally, the abovementioned manual operation function can be used only at the time of no-load commissioning and testing.

真空接触器通过电磁操动机构控制而实现接触器的合闸操作，分闸操作则由分闸弹簧实现。

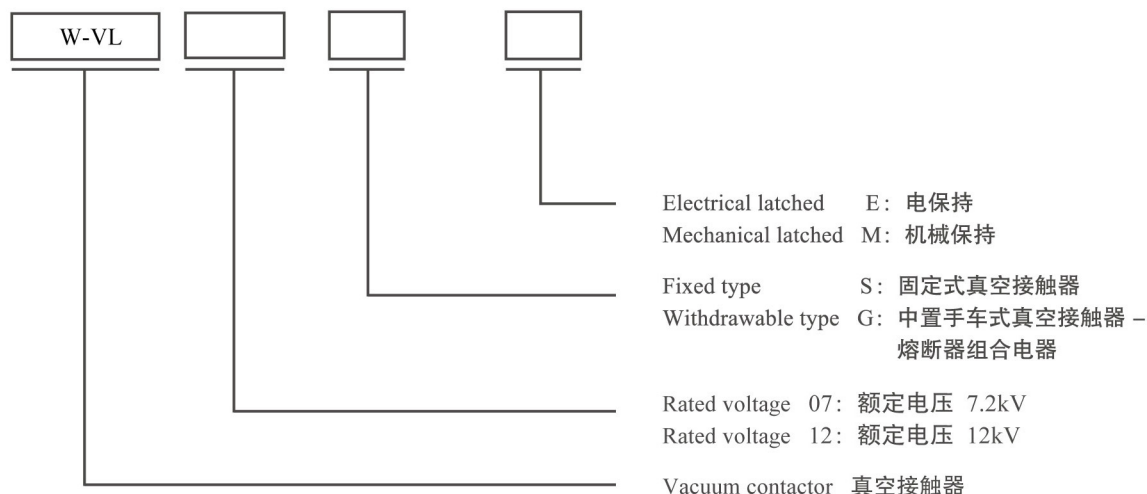
对带有锁扣装置的机械自保持式真空接触器来说由机械合闸锁扣装置使接触器保持合闸状态。同时将分闸弹簧压缩，为分闸做准备。分闸时，分闸电磁铁动作使合闸锁扣装置解扣，由分闸弹簧驱动操作机构完成分闸。（见下图）

手车式接触器每完成一次合分操作，面板上的合分指示牌将作出相应的指示，同时接触器若安装计数器的将自动记录操作次数。

真空接触器具有手动分闸操作功能。一般情况下上述手动操作功能只能在空载调试和检测时使用。



Model Designation 产品型号



Example: W-VL-12S07M-T125A represents the W-VL centrally installed handcart type vacuum contactor-fuse combination with a rated voltage of 0.7kV; type of holding: mechanical, fuse current: 125A, transformer protection.

Note: For specific options to be ordered, please complete the List of Options. In case of other special requirements, please contact the manufacturer for consultation and specifically describe these requirements at the time of ordering.

例，W_VL-12S07M-T125A，表示W_VL中置手车式真空接触器熔断器组合电器，额定电压0.7kV，保持方式：机械保持，熔断器电流：125A，变压器保护。

注：具体订货选项请用户填写订货选项表，若有其他特殊要求请与制造厂联系协商，并在订货时具体说明。

Applicable Standards 符合标准

GB/T14808-2001(IEC 60470-2000)	《High-voltage AC Contactors and Contactor-based Motor-starters》
GB/T11022-1999	《Common Specifications for High-voltage Switchgear and Controlgear Standards》
GB5273-1985	《Terminals for Transformers, High-voltage Apparatuses and Bushings》
GB311.1-1997	《Insulation Co-ordination for High Voltage Transmission and Distribution Equipment》
GB15166.2-1994	《AC High-voltage Fuses and Current-limiting Fuses》
GB/T14808-2001(IEC 60470-2000)	《交流高压接触器和基于接触器的电动机起动器》
GB/T11022-1999	《高压开关设备和控制设备标准的共用技术要求》
GB5273-1985	《变压器、高压电器及套管的接线端子》
GB311.1-1997	《高压输变电设备的绝缘配合》
GB15166.2-1994	《交流高压熔断器限流式熔断器》

Technical Data 技术参数

Technical Data of W-VL Vacuum Contactor

W-VL真空接触器技术参数

项目 Items		单位 Unit	数值 Value
额定电压 Rated voltage		kV	12
额定绝缘水平 Rated insulation level	雷电冲击耐受电压 (峰值) Lightning impulse withstand voltage (peak)	kV	75
	工频耐受电压 (1min) Power frequency withstand voltage (1min)	kV	42
额定频率 Rated frequency		Hz	50、60
额定电流 Rated current		A	400
额定开断电流 Rated breaking current		kA	4
额定关合电流 Rated making current		kA	4
极限开断电流 Maximum breaking current		kA	4.5
额定短时耐受电流 (4s) Short-time withstand current (4s)		kA	4
过载耐受电流 (1s) Overload withstand current (1s)		kA	8
额定工作方式 Rated operation mode			长期工作制 Uninterrupted duty
保持方式 Type of holding		类 Type	机械自保持, 电气自保持 Mechanically self-held and electrically self-held
机械寿命 Mechanical life		万次 10000 operations	100*
电寿命 Electrical life	AC-3	万次 10000 operations	25
	AC-4	万次 10000 operations	1

Note: The mechanical latch shall be replaced after each 300000 operations for the mechanically self-held vacuum contactor marked with * in the table.

备注: 表中*机械自保持的机械寿命每30万次需要更换机械锁扣。

(W_VL vacuum contactor-fuse) Technical Data of F-C Combined Electrical Apparatus
(W-VL真空接触器-熔断器) F-C组合电器技术参数

项目 Items	单位 Unit	数值 Value
额定电压 Rated voltage	kV	3.6, 7.2, 12
额定绝缘水平 Rated insulation level	雷电冲击耐受电压 (峰值) Lightning impulse withstand voltage (peak)	60, 75
	工频耐受电压 (1min) Power frequency withstand voltage (1min)	32, 42
额定频率 Rated frequency	Hz	50, 60
额定电流 Rated current	A	取决于熔断器的额定电流 Depending upon the rating of the fuse
额定短路开断电流 Rated short circuit breaking current	kA	50
额定交接电流 Rated take-over current	A	≤3150
机械寿命 Mechanical life	万次 10000 operations	100*
电寿命 Electrical life	AC-3	25
	AC-4	1
熔断器的最大额定电流 (可选) Max rated current of fuse (optional)	A	50-400, 25-355, 6.3-200

Note: The mechanical latch shall be replaced after each 300000 operations for the mechanically self-held vacuum contactor marked with * in the table.

备注: 表中*机械自保持的机械寿命每30万次需要更换机械锁扣。

Technical Data Mechanical Parameters

机械特性参数

项目 Items	单位 Unit	数值 Value
相间中心距 Phases center distance	mm	150 ± 0.5
触头开距 Contact distance	mm	6 ± 1
超行程 Overtravel	mm	1.5 ± 0.5
平均合闸速度 Average closing speed	m/s	0.2 ~ 0.4
平均分闸速度 Average opening speed	m/s	0.4 ~ 1
合闸时间 Closing time	机械自保持 Mechanically self-held	≤ 100 (≤ 160)
	电气自保持 Electrically self-held ms	≤ 150
分闸时间 Opening time	机械自保持 Mechanically self-held	≤ 70 (≤ 130)
	电气自保持 Electrically self-held	≤ 100
合闸弹跳时间 Closing bounce time	ms	接触器≤2, 组合电器≤3 contactor≤2, combined electrical apparatus≤3
三相分合闸同期性 3-phase opening-closing simultaneity	ms	≤ 2
每相回路电阻 Loop resistance in each phase	μΩ	接触器≤150, 组合电器≤200 contactor≤150, combined electrical apparatus≤200
重量 Weight	kg	接触器: 46, 组合电器: 98 contactor: 46, combined electrical apparatus: 98

Note: The values in () include the actuation times of the closing relay and opening relay.

备注: 表中带 () 的数值是包括合闸继电器和分闸继电器动作时间的数值。

Technical Data of Operating Mechanism

操动机构技术参数

项目 Parameter	单位 Unit	数值 Value	
额定操作电压、电流（机械保持） Rated operating voltage and current (mechanical holding)	AC/DC220V	合闸电流 5A closing current 5A	分闸电流 3.6A opening current 3.6A
	AC/DC110V	合闸电流 10A closing current 10A	分闸电流 5.6A opening current 5.6A
额定操作电压、电流（电保持） Rated operating voltage and current (electrical holding)	AC/DC220V	合闸电流 5A closing current 5A	维持电流 0.5A holding current 0.5A
	AC/DC110V	合闸电流 10A closing current 10A	维持电流 1A holding current 1A
额定操作频率 Rated operating frequency	次/h	≥600	
短时最高操作频率 Max. short-time operation frequency	次/h	≥1200	

Note: The numbers in the table are approximate.

备注：表中的数值为近似值。

Selection of Transformer Fuse 变压器保护熔断器的选用

The combination of AC vacuum contactor with fuse can avoid the use of relatively large fuses and simultaneously protect the connection buses between the LV windings of the transformer and circuit breaker on the secondary side from malfunction. The transformer fuse may be selected based on the following table.

交流真空接触器与熔断器配合，可以避免使用较大的熔断器，同时能够对变压器低压绕组与二次侧断路器之间连接母线故障进行保护。变压器保护熔断器可以按照下表选用：

额定电压 (kV) Rated voltage (Kv)	变压器容量 (kVA) Transformer capacity (kVA)													
	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
额定电压 (kV) Rated voltage (Kv)	熔断器 (A) Fuse (A)													
6/7.2	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
10/12	16	16	20	25	31.5	40	50	63	80	100	125	160	200	250

Selection of motor fuse 电动机保护熔断器的选用

For the selection of the motor fuse, operating conditions shall be determined:

Rated voltage: The rated voltage must be higher than the operating voltage.

Rated current: The rated current of the fuse used for directly start shall be calculated from the formula below: $I_y = N I_n \delta$, where N: ratio of starting current to full-load current, normally $N=6$;

I_n : motor full-load current; I_y : current within the starting time;

δ : coefficient of colligation, as listed in the table. (n = starting times per hour)

在电动机保护选择熔断器时，应确定使用条件：

额定电压：必须大于工作电压。

额定电流：用于直接起动的熔断器额定电流的使用按如下公式： $I_y = N I_n \delta$

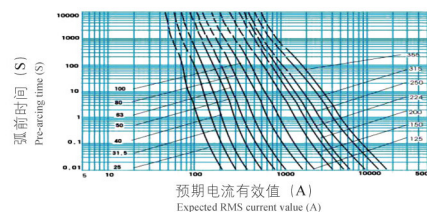
其中： N ：起动电流与满载电流之比，通常 $N=6$ ； I_n ：电动机满载电流；

I_y ：在起动时间内的电流值； δ ：综合系数 如表。（ n =每小时启动次数）

Points of the I_y value to which the starting time corresponds are plotted on the time-current curve and the curve generated by such points or on the right side is namely the rated current of the fuse. The rated current of the fuse must be more than or equal to 1.33 times of the full-load current of the motor.

将启动时间对应的 I_y 值的点绘制在时间电流特性曲线上，点所对应的曲线或靠近右边的曲线即是所使用的熔断器，熔断器额定电流必须等于或大于电动机满载电流的1.33倍。

n	2	4	8	16
δ	1.7	1.9	2.1	2.3

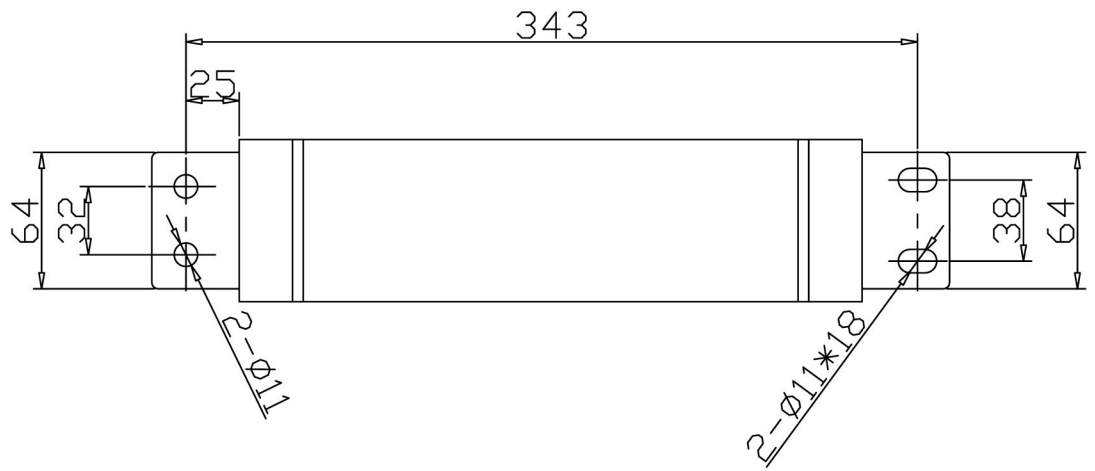
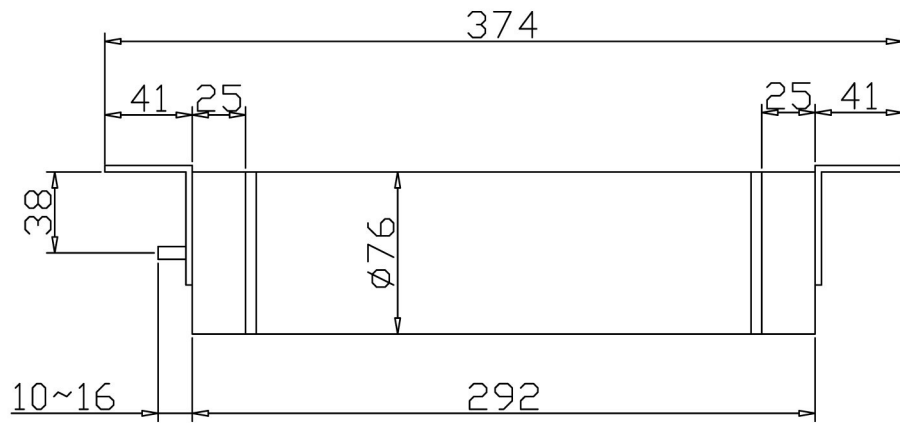


电压 (kV) Voltage (kV)	额定电动机容量 (kW) Rated motor capacity (kW)													
	150	190	236	298	378	425	472	590	756	945	1058	1180	1488	1680
6/7.2	31.5	40	50	63	80	90	100	125	160	200	224	250	315	355
电压 (kV) Voltage (kV)	额定电动机容量 (kW) Rated motor capacity (kW)													
	200	250	315	394	496	589	630	710	790	985	1260	1575	1765	
10/12	25	31.5	40	50	63	71	80	90	100	125	160	200	224	

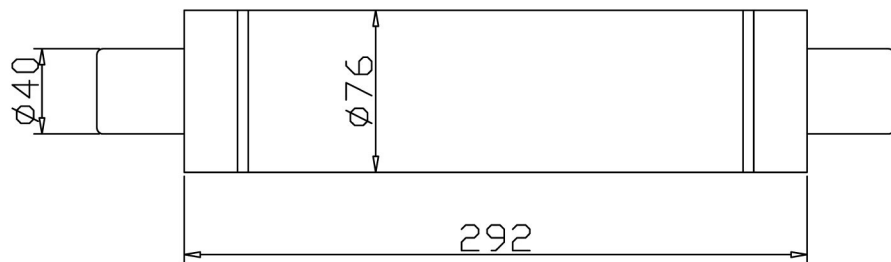
The above parameters are only for reference.
以上参数仅供参考。

Dimensions of Fuse
熔断器外形尺寸

母线式熔断器外形尺寸
Dimensions of busbar fuse



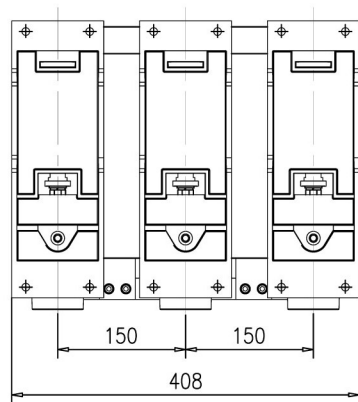
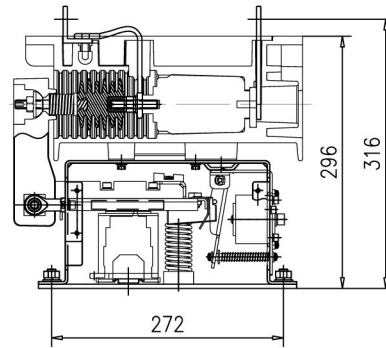
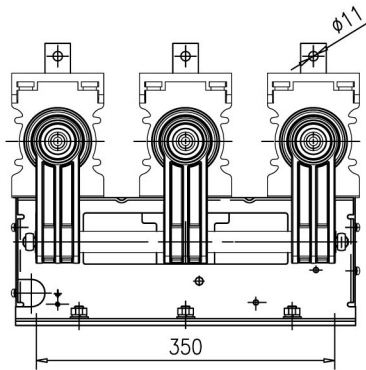
插入式熔断器外形尺寸
Dimensions of insert fuse



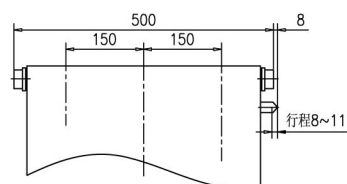
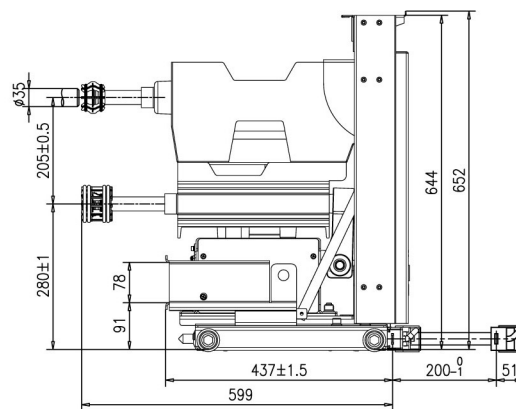
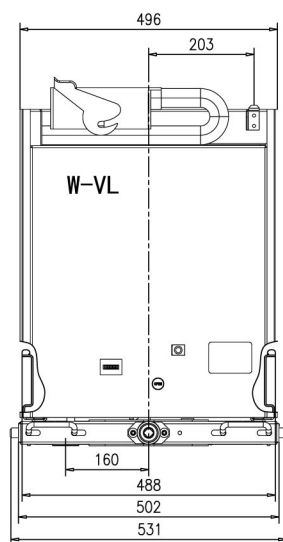
Dimension (Inter-phase clearance 150mm)

外型尺寸 (相距150mm)

Stationary
固定式



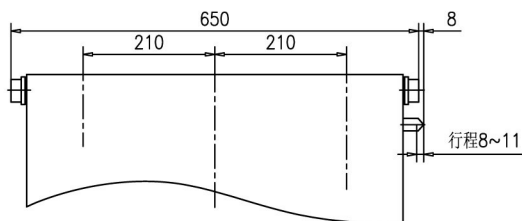
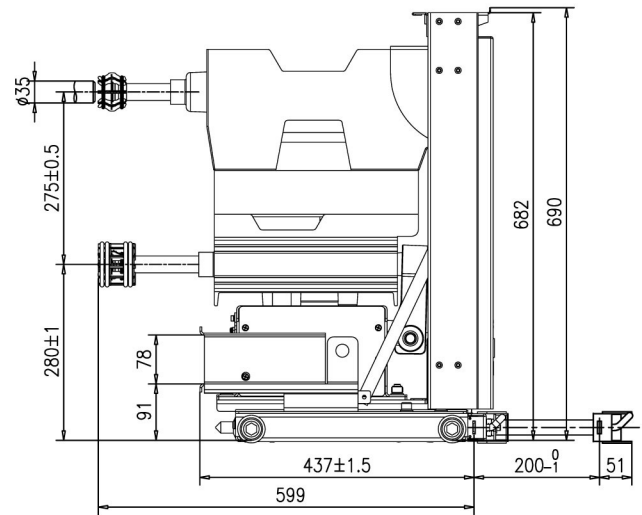
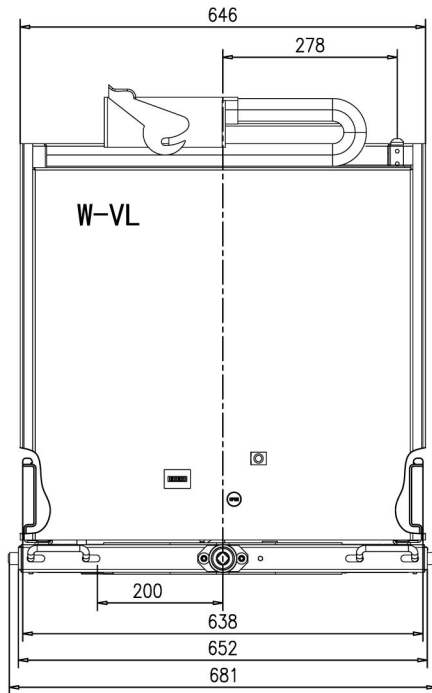
Handcart type
手推式



Dimension (Inter-phase clearance 210mm)

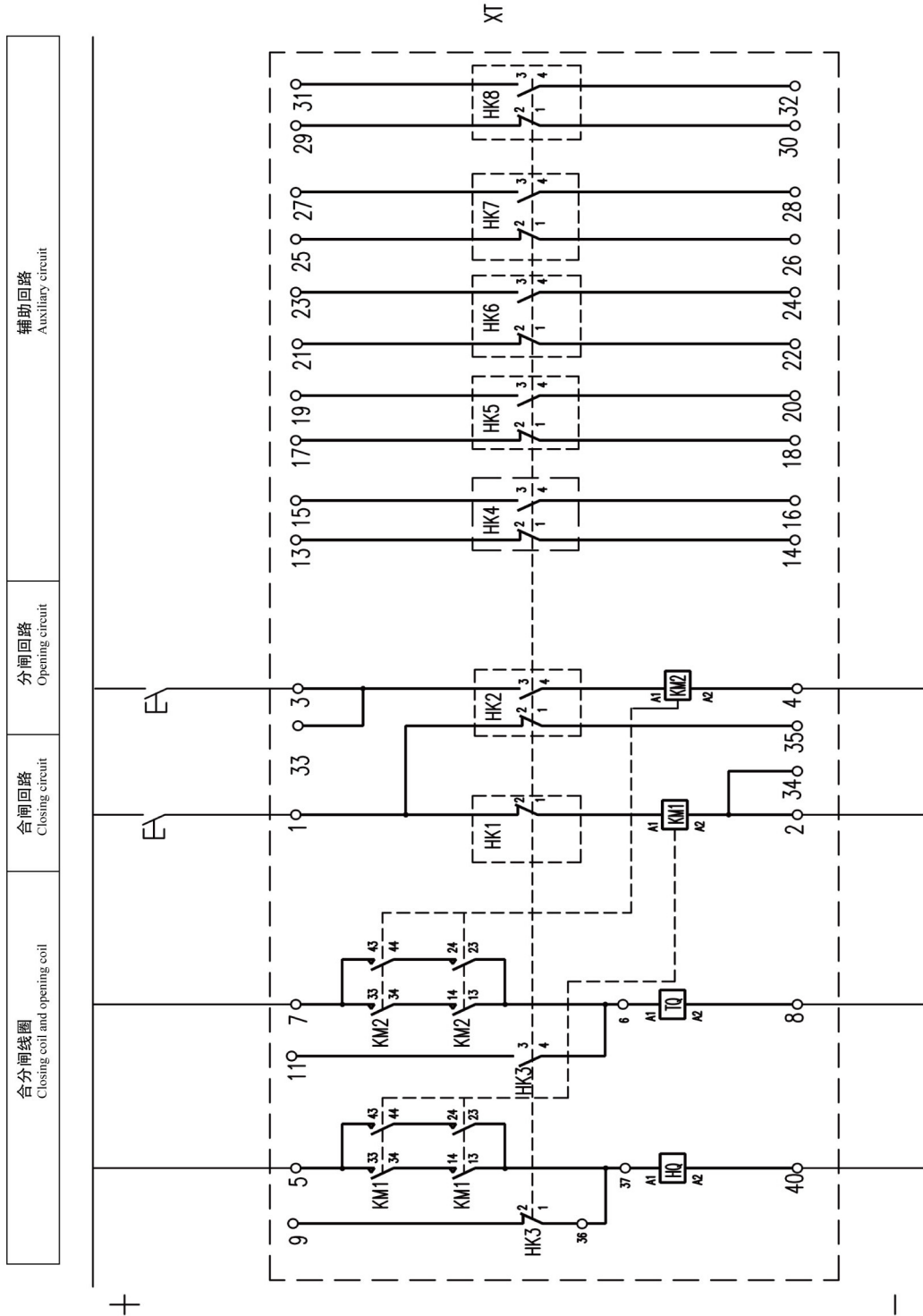
外型尺寸 (相距210mm)

手
車
式
Handcart type



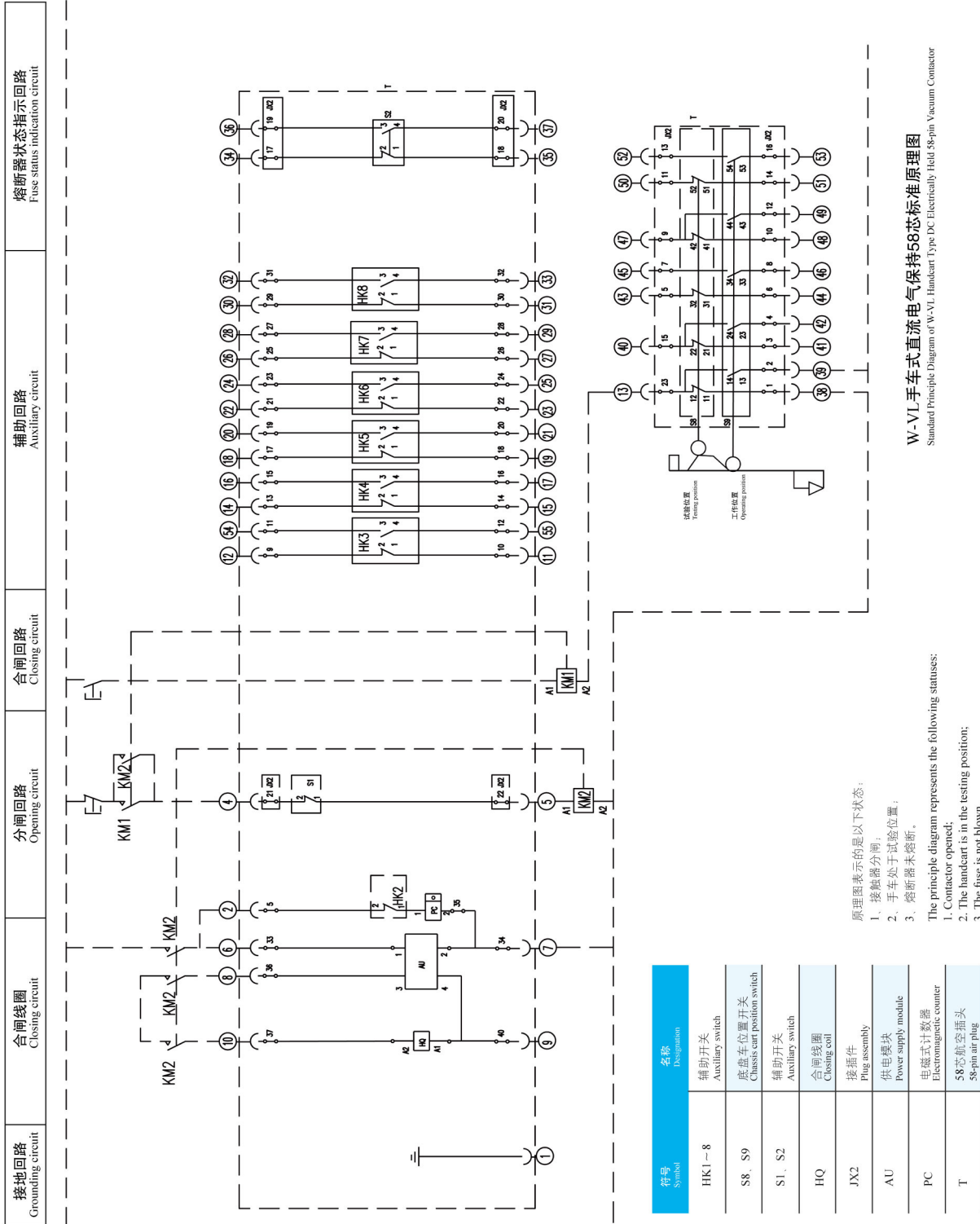
Wiring diagram of W-VL Vacuum Contactor

W_VL真空接触器内部接线原理图



W-VL 固定式直流机械保持标准原理图
Standard Principle Diagram of W-VL Fixed Type DC Mechanically Held Vacuum Contactor

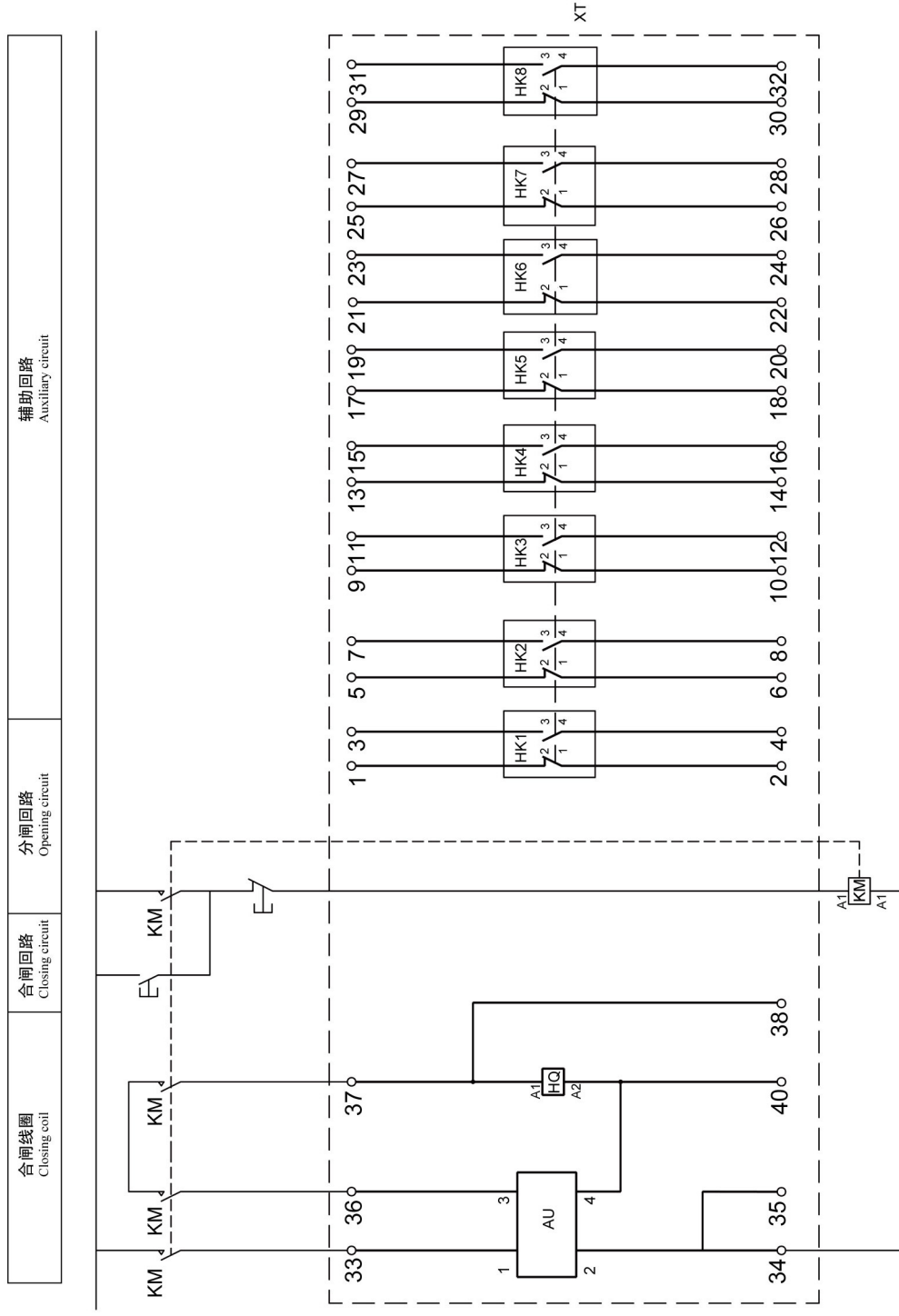
Wiring diagram of W-VL Vacuum Contactor W-VL真空接触器内部接线原理图



W-VL手车式直流电气保持58芯标准原理图
Standard Principle Diagram of W-VL Handcart Type DC Electrically Held 58-pin Vacuum Contactor

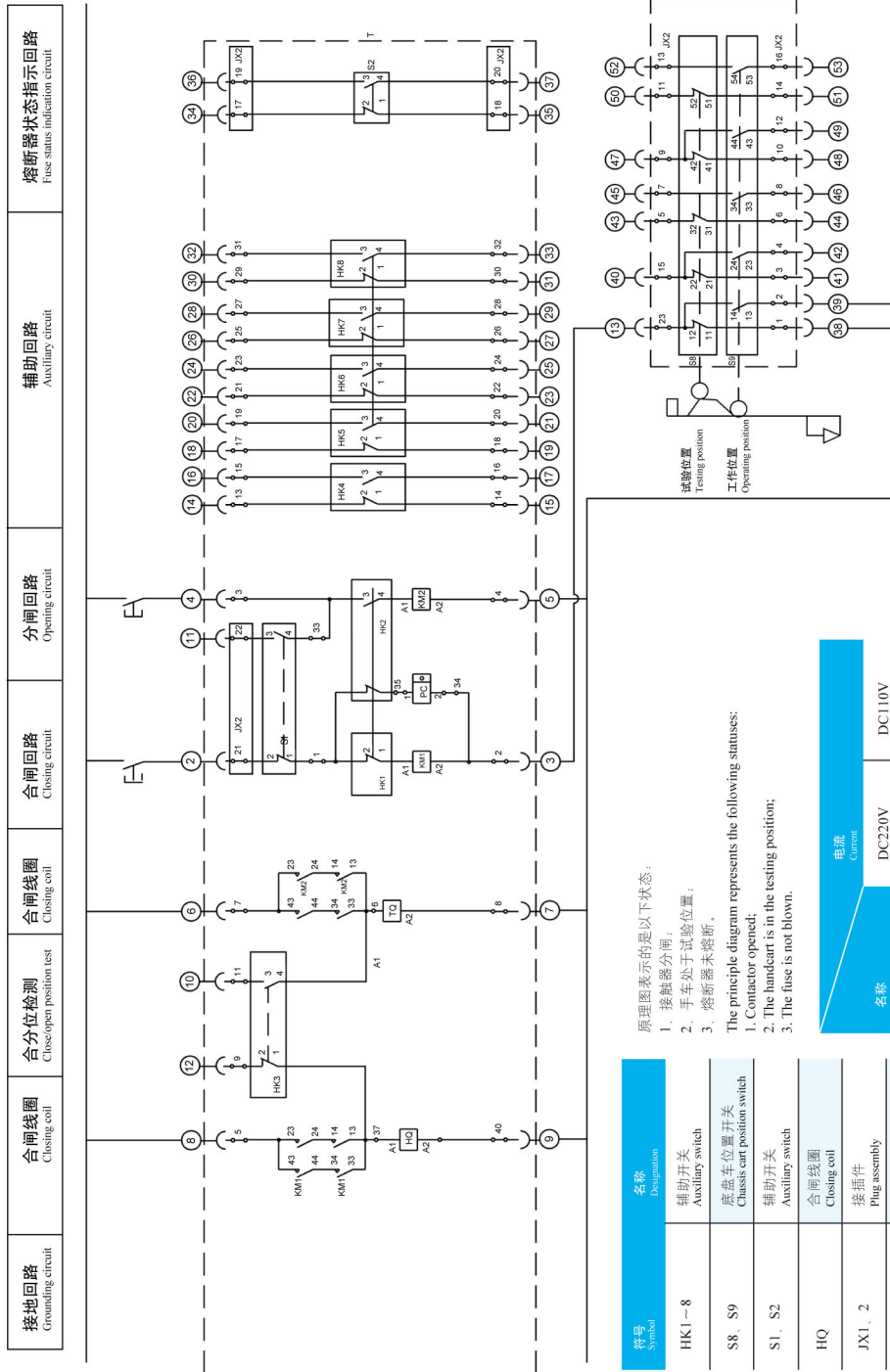
Wiring Diagram of W-VL Vacuum Contactor

W-VL真空接触器内部接线原理图



W-VL固定式交直流电保持标准原理图
Standard Principle Diagram of W-VL Fixed Type AC/DC Electrically Held Vacuum Contactor

Wiring Diagram of W-VL Vacuum Contactor W-VL真空接触器内部接线原理图



原理图表示的是以下状态:

1. 接触器分闸;
2. 手车处于试验位置;
3. 熔断器未熔断。

The principle diagram represents the following statuses:

1. Contactor opened;
2. The handcart is in the testing position;
3. The fuse is not blown.

名称 Item	电流 Current
额定合闸线圈电流 Rated closing coil current	DC220V
额定分闸线圈电流 Rated opening coil current	DC110V
继电器线圈电池 Relay coil battery	5A
	10A
	5A
	0.03A
	0.06A

符号 Symbol	名称 Designation
HK1 ~ 8	辅助开关 Auxiliary switch
S8, S9	底座车位置开关 Chassis cart position switch
S1, S2	辅助开关 Auxiliary switch
HQ	合闸线圈 Closing coil
JX1, 2	插件件 Plug assembly
KM1	合闸继电器 Closing relay
KM2	分闸继电器 Opening relay
PC	电磁式计数器 Electromagnetic counter
TQ	分闸电磁铁 Opening electromagnet
T	58芯航空插头 58-pin air plug

W-VL手车式直流机械保持58芯标准原理图

Standard Principle Diagram of W-VL Handcart Type DC Mechanically Held 58-pin Vacuum Contactor

