SDKELI®

Instructions for CSRME Safety Controllers

Shandong Keli Photoelectric Technology Co., Ltd.

Catalog

Ⅰ Directives and Standards

- CSRME safety controllers（hereinafter referred to as CSRME）meet the following criteria:
- GB 27607-2011
  GB 5226.1-2008
  GB/T 15969.2-2008
  GB/T 16855.1-2008
  GB/T 16855.2-2007
  GB/T 20438 .1-2006
  GB/T 20438 .2-2006

Ⅱ User Notes

Before installing, operating or maintaining CSRME, be sure to read the instructions and be familiar with the device through the appearance. If you have any questions, please call the service hot line of our company 400-666-0416 for consultation.

- **Quality Assurance**

The warranty period of CSRME is 12 months.

When the products are used for special purposes, our company will make any promise to its applicability. Users needs to decide whether to use it according to their needs. For the situations of special uses, our company will make no quality assurance.

- **Responsibility&Authority**

The company shall not take responsibilities for any special, indirect or causal damages related to the product in any way or loss of business profits, unless this kind of responsibilities are clearly stated in the product order contract.

Under any circumstance, the company's responsibilities shall not exceed the unit prices of the involved products.

The company will only provide maintenance and change services for the quality problems under the condition of correct operation, storage, installation and maintenance. After the company's technical personnel have confirmed that the above conditions are met and the products are not contaminated, abused, misused or modified maintained improperly, our company will provide quality after-sales services for users according to the provisions of the order contract.

- **Precautions for Using**

According to users' requirements, the company may provide the third party certificates of CSRME. But, these certificates themselves are not sufficient to elaborate the applicability of CSRME to end products, machines or systems.

Special attention must be given to the following application examples:

outdoor use, the existence of potential chemical pollution or electrical interference or applications not described in the instructions.

nuclear power control system, combustion system, railway system, aviation system, medical equipment, recreational facilities, vehicles and facilities provided by individual industries or the government;

systems, machines and equipment that may be hazardous to lives or properties

Please learn about all the application limitations of CSRME.

Don’t apply CSRME to applications which may have severe life or property dangers and can’t guarantee the safety of the entire system.

- **Performance Data**

The performance data given in this instructions only serves ad the selection guidance for users. It doesn’t constitute the quality assurance. It only represents the result under the testing conditions. The user must combine it with the practical applications.

- **Specification Change**

Product specifications and accessories may be changed at any time based on improvements and other reasons.

When the product's rating, performance or structural changes, its specifications will be changed accordingly. For the changes of product specifications and models, the company will not give further notice. If you have any questions, please call the service hot-line for consultation.

- **Errors and Omissions**

In the process of preparing the instructions, we have strove to make the content correct and complete. But, we don’t guarantee that there is no error or omission in the instructions. Our company will not take responsibility for the errors or omissions that may occur.

- **Copyright and Copy Permission**

Without permission, it is not allowed to make copies of this instructions for sale or promotion.

This instructions is protected by the copyright and is only used together with CSRME. No matter what your purpose is, please notify us before copying or reprinting this instructions. If you need to copy or transmit the instructions, please ensure the content Integrity.

Ⅲ Precautions for Safety

The following special information may occur in any place of this instructions to warn the user about the potential dangers or warn the user to pay attention to the information elaborating or simplifying some program.

Safety warning signs are used to warn of potential hazards. Please be sure to comply with all safety information with this sign to avoid possible casualties.

! Warning

This is a safety warning sign. The content of this logo is very important.
Operators must strictly implement the safety information of the signs to avoid the possibility of personal injuries.

Attention
This is the sign of key message. The content of this logo is very important. Operators must understand and perform as much as possible according to the information required to avoid possible legal disputes and product damage.

Ⅳ Precautions for Safe Using

In order to ensure the safe use of the product, please be sure to observe the following matters.

- Before using this product, read the instructions carefully and understand the installation procedures, operation&inspection procedures and maintenance procedures.
- CSRME should be installed, examined and maintained by professionals.
- Professionals refer to the staff who have been trained professional and have gained the qualifications or the people who have rich knowledge, training and experience and have been proven to have the ability to solve this kind of problem.
- Don’t drop this product.
- When the product is in use, it should be in accordance with the relevant standards and laws and regulations of the local country or region.

Part I Product Introduction

1.1 Product Over

CSRME is developed according to GB27607. The safety level of the machine tool control system reaches the requirements of GB 27606 through the relevant equipment monitoring the safety of the machine tools. Its safety level meets the requirements of ISO 13849-1 PLe and IEC 61508 SIL3.

CSRME has many interfaces. It has the limited programmable function which can replace various kinds of safety control modules or safety PLC. This greatly simplifies the safety design of the machine tool control system and reduced the coat.

1.2 Specifications and Models

The specification and model of this machine is CSRME-2810D02Z.

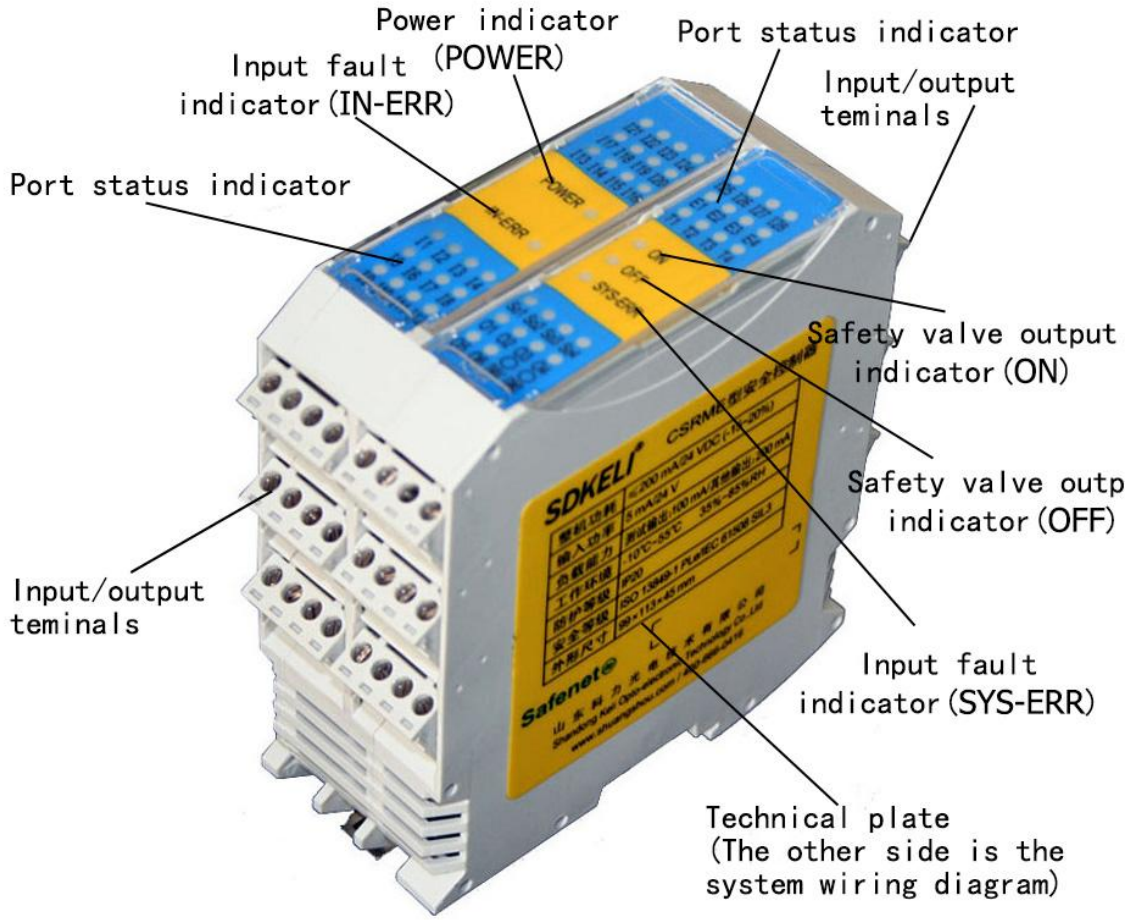
Attention
The specification and model of the controller is decided by our company.If the customers orders the safety controller of the same function control logic, they may place the order according to this specification and model. If the function control logic changes, you may communicate with our company and we will regenerate the specification and model of the ordered machines.

1.3 Application Occasion

To use CSRME, you must observe the following requirements:

- The person in charge of the enterprise and the user has the responsibility to comply with any applicable national and local laws, regulations and norms.
- The supporting equipment and safety-related parts should be properly set to ensure that the control logic errors or control circuit failure will not lead to the risk of failure of CSRME.
- Don’t use CSRME in the following environments:
  - ■ high corrosive application environment
  - ■humid environment where condensation may occur
  - ■ environments where the degree of vibration or shock is higher than the specifications
  - ■ environments where the products may be in touch with water
  - ■ flammable and explosive environments

1.4 Appearance Information



1.5 Technical Parameters

<table>
<tr><td colspan="2">implementation standards</td><td colspan="4">GB 27607-2011
GB 5226.1-2008
GB/T 15969.2-2008
GB/T 16855.1-2008
GB/T 16855.2-2007
GB/T 20438 .1-2006
GB/T 20438 .2-2006</td></tr>
<tr><td colspan="6">electrical characteristics</td></tr>
<tr><td colspan="2">supply voltage</td><td colspan="4">DC20.4～28.8 V (ripple wave±5%)</td></tr>
<tr><td colspan="2">power consumption（no-load）</td><td colspan="4">≤6W</td></tr>
<tr><td rowspan="4">I/O port</td><td>Input feature</td><td colspan="4">5mA/24V</td></tr>
<tr><td rowspan="3">Output capacity</td><td>safety output</td><td>maximum200mA each line</td><td rowspan="3" colspan="2">The output residual pressure is no higher than 2V；
The total output capacity doesn’t exceed1A.</td></tr>
<tr><td>standard output</td><td>maximum200mA each line</td></tr>
<tr><td>test output</td><td>maximum100mA each line</td></tr>
<tr><td colspan="2">response time</td><td colspan="4">20ms</td></tr>
<tr><td colspan="2">testing function</td><td colspan="4">self-check when power-on; real-time self-check in working</td></tr>
<tr><td colspan="2">protection circuit</td><td colspan="4">Over-voltage and over-current protection； output short-circuit protection</td></tr>
<tr><td colspan="2" rowspan="4">controller state indicator</td><td colspan="4">ON（green）：safety output So1、So2（safety valve control output）output ON state</td></tr>
<tr><td colspan="4">OFF（red）：safety outputSo1、So2（safety valve control output）output OFF state</td></tr>
<tr><td colspan="4">IN-ERR（red）：input failure</td></tr>
<tr><td colspan="4">SYS-ERR（red）：system failure</td></tr>
<tr><td colspan="2" rowspan="2">Port state indicator</td><td colspan="4">yellow：power supply or the input port is in high-level, the input is bright</td></tr>
<tr><td colspan="4">green：output port is in high-level, the output is bright</td></tr>
<tr><td colspan="6">Environmental Characteristics</td></tr>
<tr><td colspan="2">environment temperature</td><td colspan="4">-10～55℃</td></tr>
<tr><td colspan="2">environment humidity</td><td colspan="4">35%～95%RH (no frost or fog coagulation)</td></tr>
<tr><td colspan="2">protection level</td><td colspan="4">IP20（meets IEC60529）</td></tr>
<tr><td colspan="2">over-voltage level</td><td colspan="4">Ⅱ（meets JIS B3502 and IEC 61131-2）</td></tr>
<tr><td colspan="2">anti-jamming performance</td><td colspan="4">meets IEC 61131-2</td></tr>
<tr><td colspan="2">anti-vibration ability</td><td colspan="4">frequency 10～55Hz，amplitude 0.35±0.05mm，20 times towards X、Y and Z direction</td></tr>
<tr><td colspan="2">Anti-impact ability</td><td colspan="4">acceleration 100m/s^2，pulse duration 16ms，1000 times towards X、Y and Z</td></tr>
</table>

	direction
Installation method	DIN DIN-Rail Mounting
casing material	ivory-white ABS
Additional Functions	
External device monitoring（EDM）	Monitor the state of the safety valve’s NC
accessory	
accessories	product qualification certificate, packing list

Part II Function Introduction

2.1 System Boundary Definition

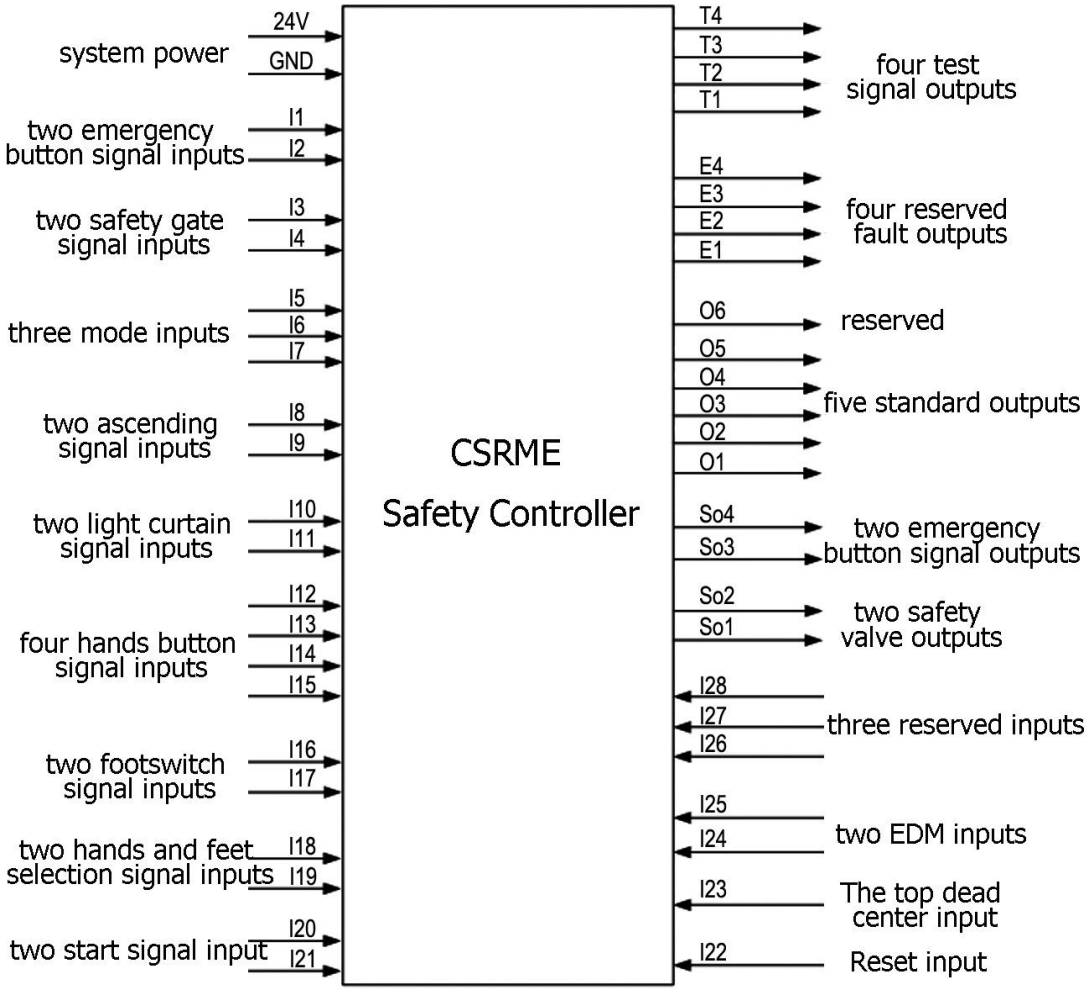
CSRME provides 28 safety inputs, 4 safety outputs，6 standard outputs and 4 test outputs. Its ports and the corresponding machine tool control signals are shown in the following table.

The safety outputs are used to control the safety valve and emergency stops. The standard outputs are used select the state of the outputs of hands button（foot switches）and safety light curtain modes. The test outputs are used to check if the user switch equipment is in short circuit or open circuit.

CSRME adopts double controlling system. It has the safety self-check function, which meets the safety in Cat.4 of ISO13849-1. The testing signals are introduced to the safety input point through external device switches to perform real-time monitoring on the switch state and inspect the short circuit, open circuit and other failures of the switch. Dynamic check is performed on external PNP input signals and the inserted inner testing signals. Detection pulse is inserted into the safety output signals to perform real-time dynamic testing.

Safety Controller Input Port	Machine Tool Control Signal	State Description
I1，I2	Emergency button button	2NC
I3，I4	Safety door switch	2NC
I5	Mode selection switch	Single time
I6		Continual
I7		microinching
I8	Cam BDC	1NO
I9		1NO
I10、I11	Safety light curtain	Line 2 PNP input
I12、I13	Hands button	1NO1NC
I14、I15		1NO1NC
I16、I17	Foot switch	1NO1NC
I18、I19	Hands/foot select	2NO
I20、I21	Start up	Line 2PNP input
I22	reset	1NO
I23	Cam TDC	1NO
I24、I25	Safety valve EDM	Line 2 24Vinput
I26、I27、I28		Reserve signal
safety controller output ports	machine tool control signals	state description
So1、So2	Safety valve	Line 2 PNP output
So3、So4	Emergency stop	Line 2 PNP output
O1		Single time mode output
O2		Continual mode output
O3		Microinching mode output
O4		light curtain state output

O5		Hands/foot state output
O6		BDC state output
T1、T2、T3、T4		test output

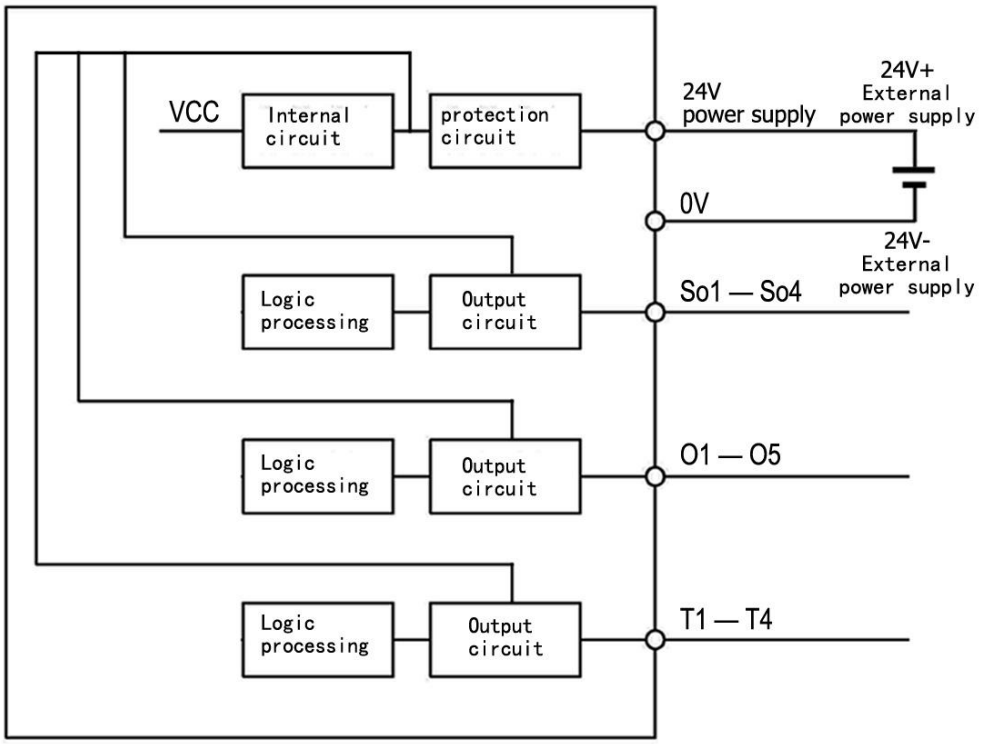


CSRME safety controller system boundary diagram

2.2 Typical Working Modules

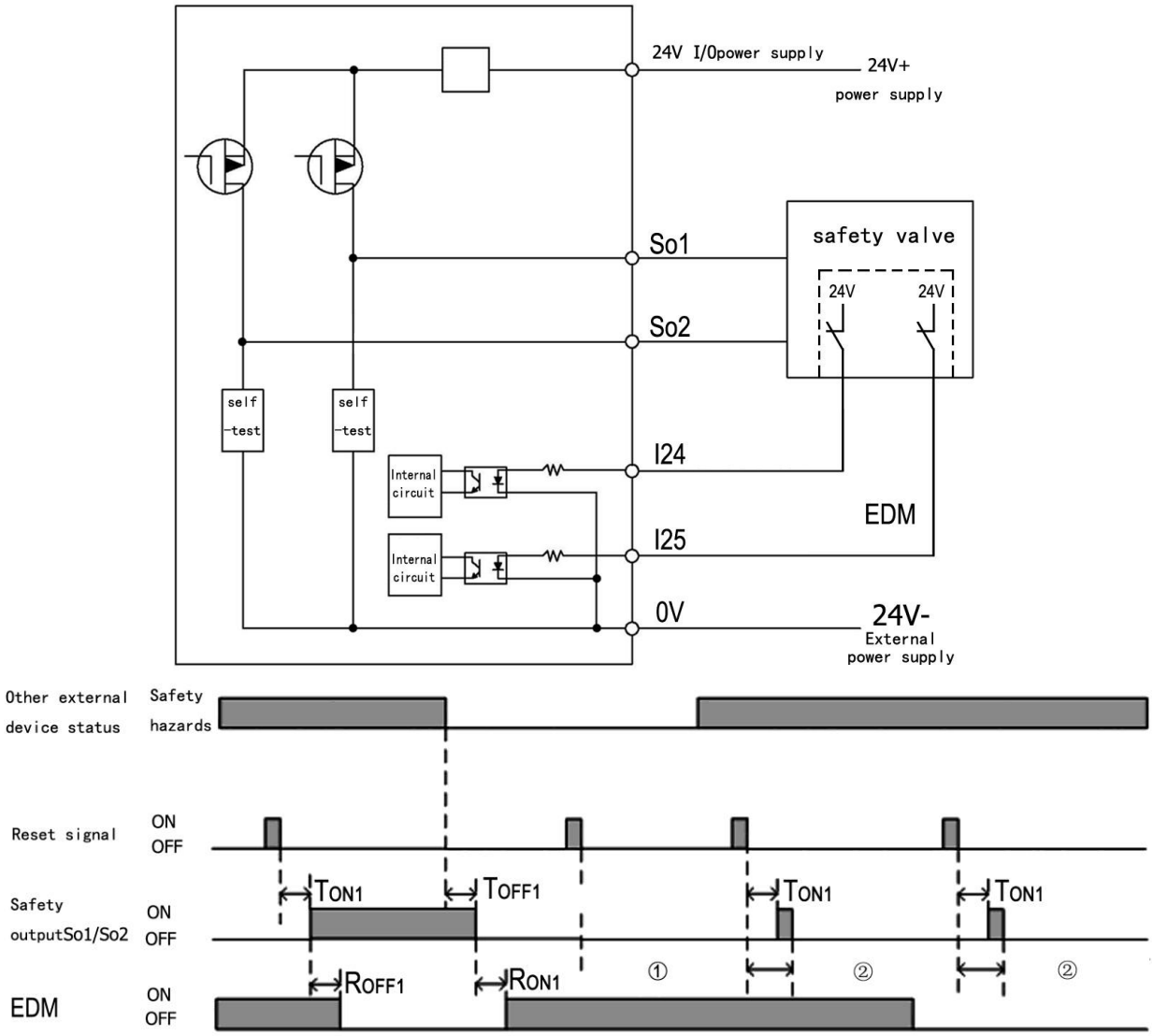
2.2.1 Power Supply Module

CSRME adopts DC24V DC power supply（DC20.4～28.8V）. In order to ensure that the output load can work normally, please make sure that the start-up voltage of the load is at least 2V lower than the external power supply voltage.



2.2.2 Safety Output Through Safety Valve and EDM Module

CSRME monitors external safety devices. When the external safety devices are in safety state, press the reset button, the safety valve safety outputs So1, So2 will output ON state. At the same time, CSRME monitors the safety valve state (EDM). If the safety valve state is not consistent with the expected state, the safety outputs So1 and So2 will enter the OFF state.



① ： The security device is in the OFF state, the reset is invalid

② ： EDM response timeout, So1 / So2 output OFF

T_{OFF1}：The response time during which the safety output So1, So2 enters the danger state through the safety device and to the output enters OFF state.

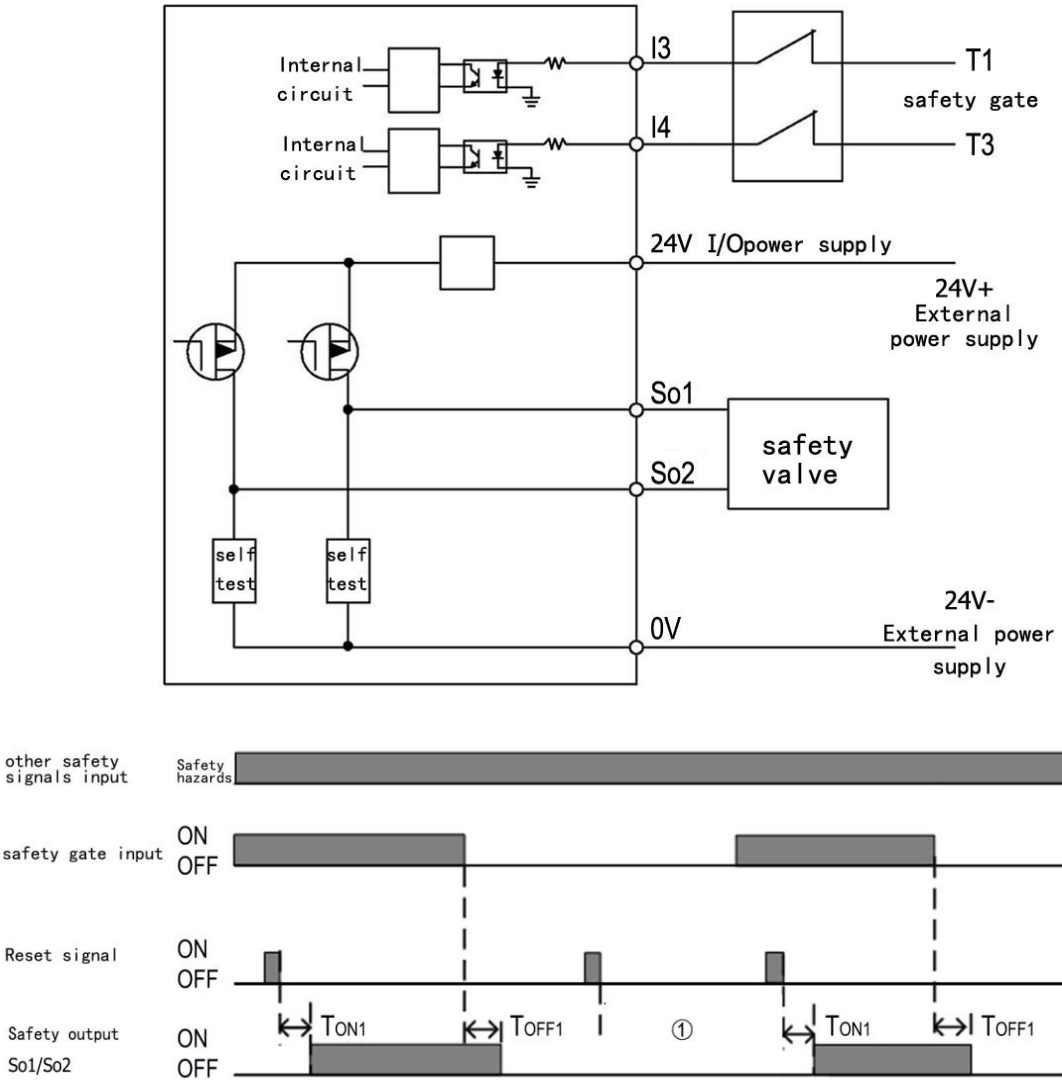
T_{ON1}： The response time during which the safety outputs So1, So2 switch from logical trigger ON state to outputting ON state.

R_{OFF1}： The response time during which the safety valve enters ON state from safety output to EDM enters OFF state.

R_{ON1}： The response time during which the safety valve enters OFF state from the safety output to the EDM enters ON state.

2.2.3 Safety Door Module

CSRME monitors the on/off signal of the safety door. Other safety devices are in safety state. After the NC of the safety door is closed, press the reset button, the safety valve outputs So1, So2 will output ON state.

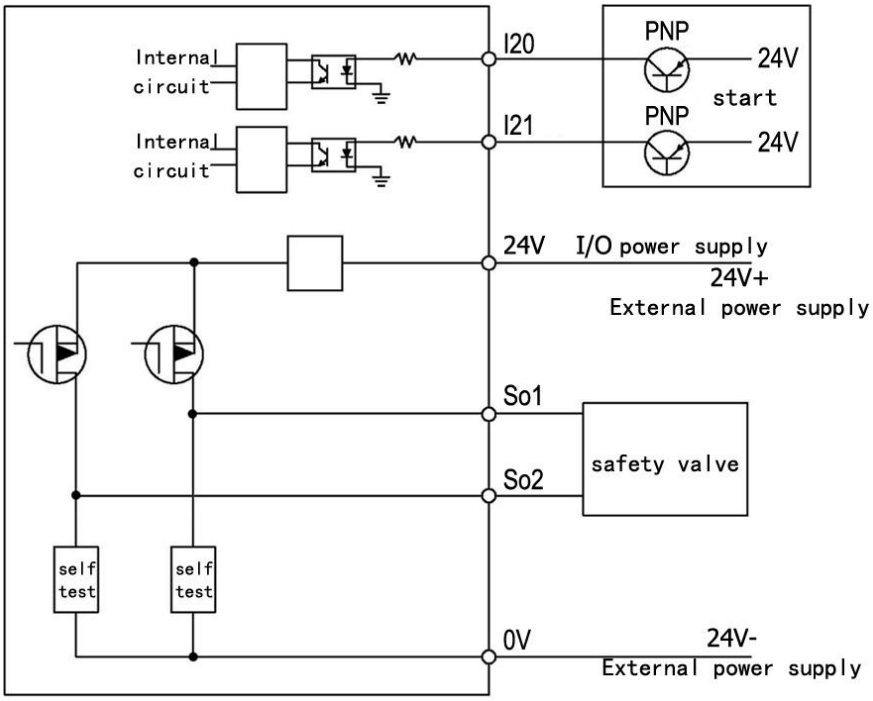


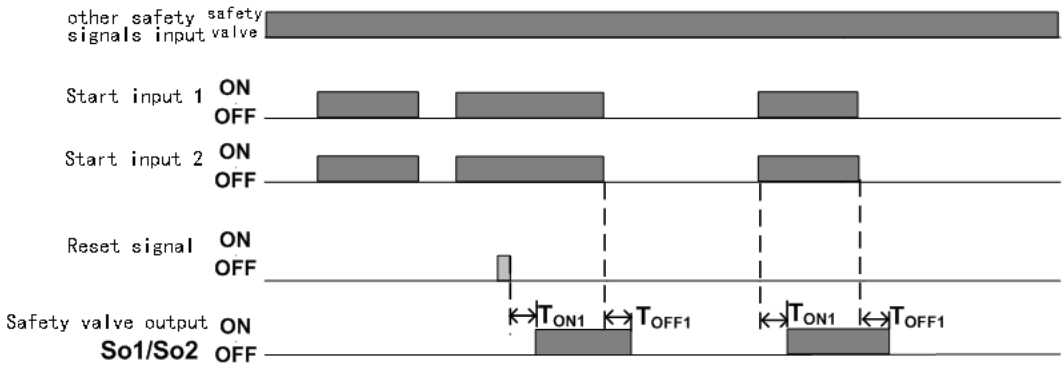
① ： The safety gate in the OFF state, the reset is invalid

2.2.4 Start-Up Module

CSRME monitors the 2-channel PNP start-up signals from the controlling system. When the safety outputs S01,S02 output the ON state, if the start-up signal switches from high-level to low-level, SO1 and S02 will output the OFF state. When the start-up signal recovers to high-level, So1 and S02 can output the ON state without manual reset. When the start-up time difference exceeds 70ms, the FAULT indicator light will be slightly light. It need manual reset to enter the normal working state.

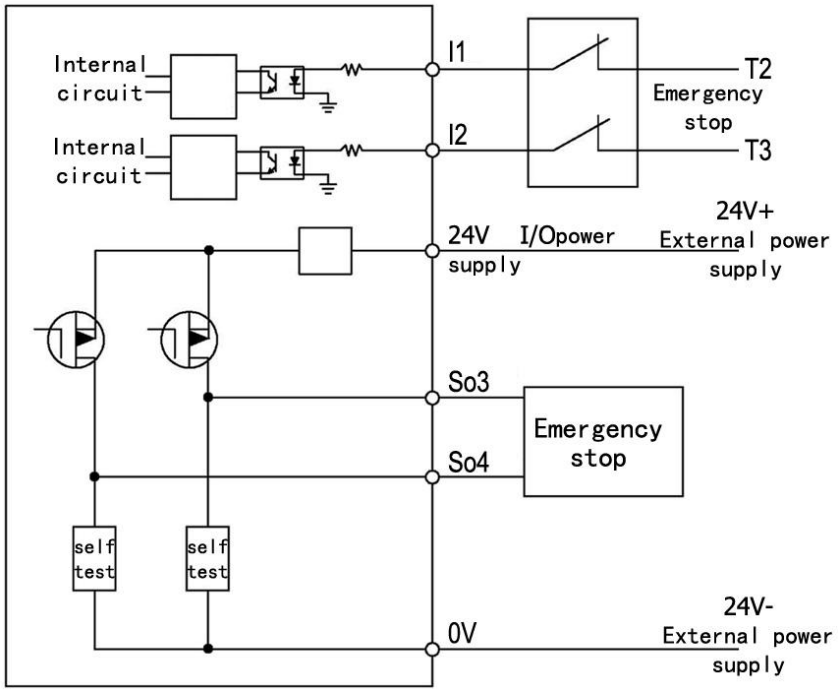
Note:The start-up signal keeps the safety outputs of the safety valve S01 and S02 in the automatic reset state.

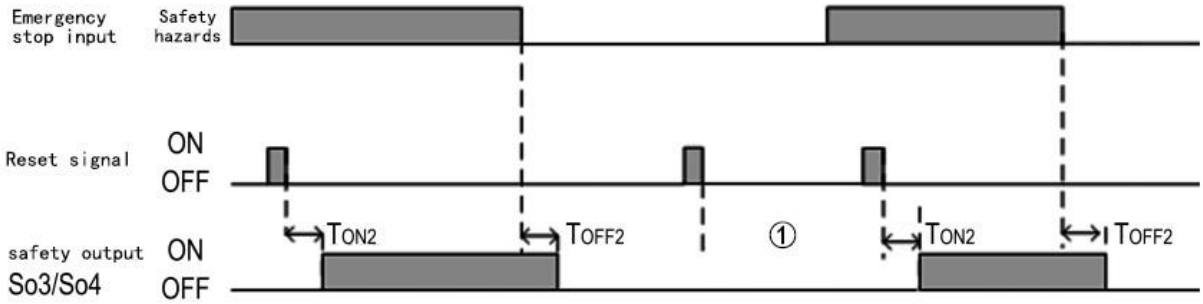




2.2.5 Emergency Stop Module

CSRME monitors the NC of the emergency stop button. When the emergency stop button is closed, press the preset button, the safety outputs So3, So4 will output the ON state. When any of the line of the emergency stop buttons' NC is severed, the safety outputs So3, So4 will output OFF state. At the same time, the safety outputs So1 and So2 will output the OFF state.





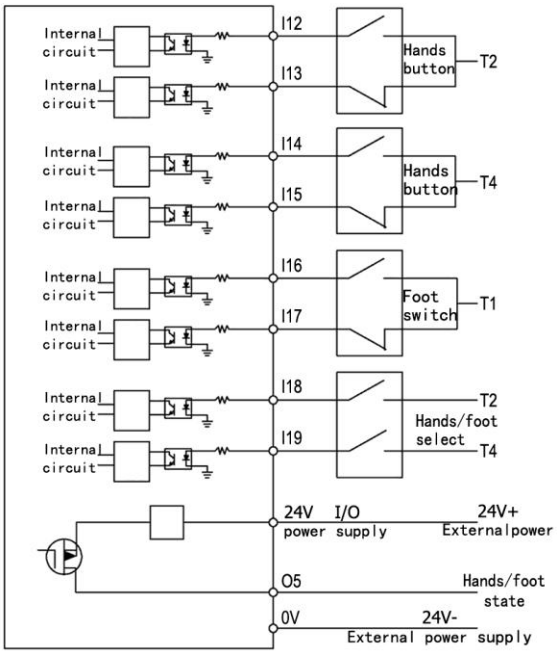
① ：The emergency stop in the OFF state, the reset is invalid

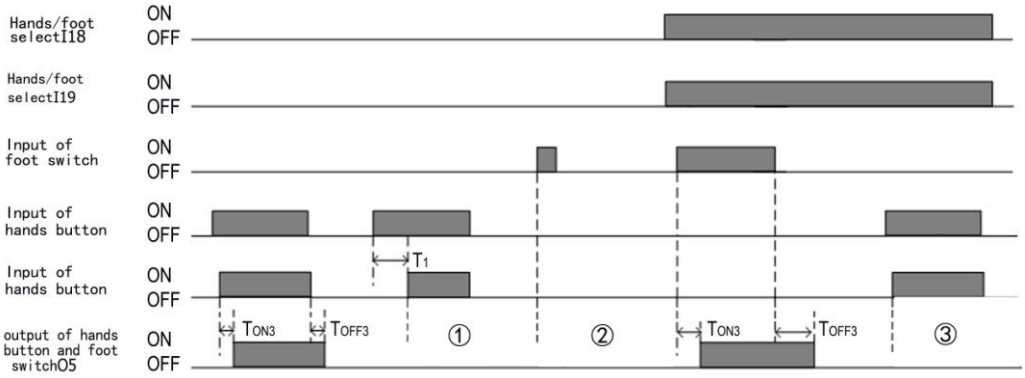
T_{OFF2}：The response time during which the safety output So3, So4 enters the dangerous state through the safety equipment to it outputs OFF state.

T_{ON2}：The response time during which the safety output So3, So4 switches from logical trigger ON state to outputting ON state.

2.2.6 Hands Button/Foot Switch Module

CSRME can monitor the hands button（2×1NO1NC）or foot switch（1NO1NC）. When the two lines of hands and foot switches are both closed, choose the foot switch. After the foot switch is pressed, the standard output O5 will output the ON state.When one of the hands and foot switches is severed or they are both severed, choose the hands button. After the two hands button are pressed at the same time, the standard output O5 will output the ON state. When the time difference during which two hands press the buttons exceeds 500ms, the standard output O5 will have no response.





① ： When time difference of hands button exceeds, O5 will have no response.

② ： In hands button mode, when you step on the foot switch, O5 will have no response.

③ ： In foot switch mode, when you press the hands button, O5 will have no response.

T_{OFF3}： The response time during which the state switches from hands button releasing state to the standard output O5 o 0utputs the OFF state.

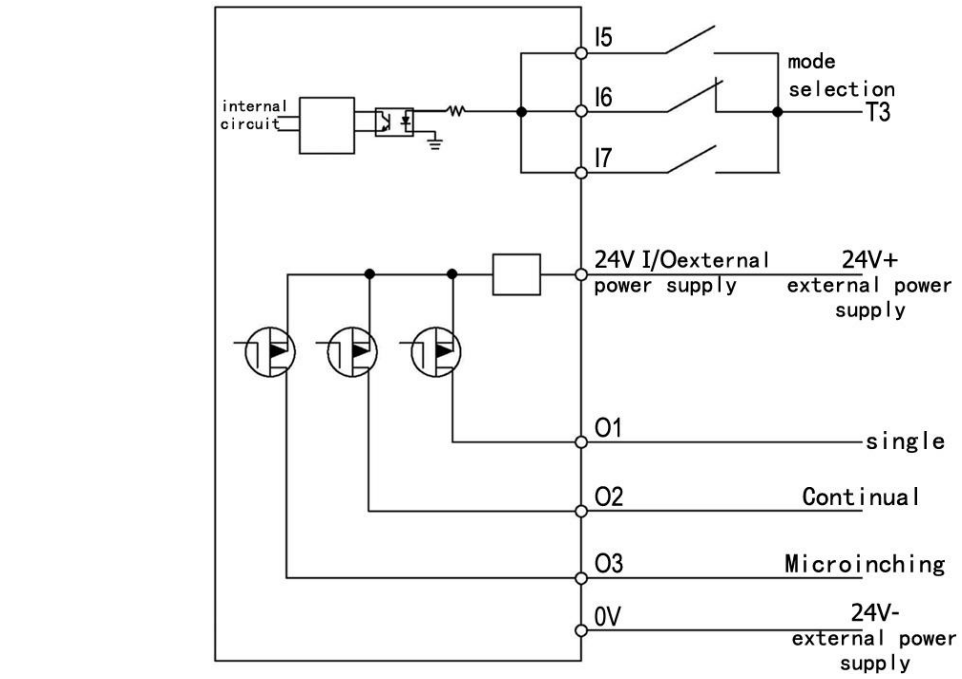
T_{ON3}：The response time during which the state switches from hands button conducting state to the standard output O5 outputs the ON state.

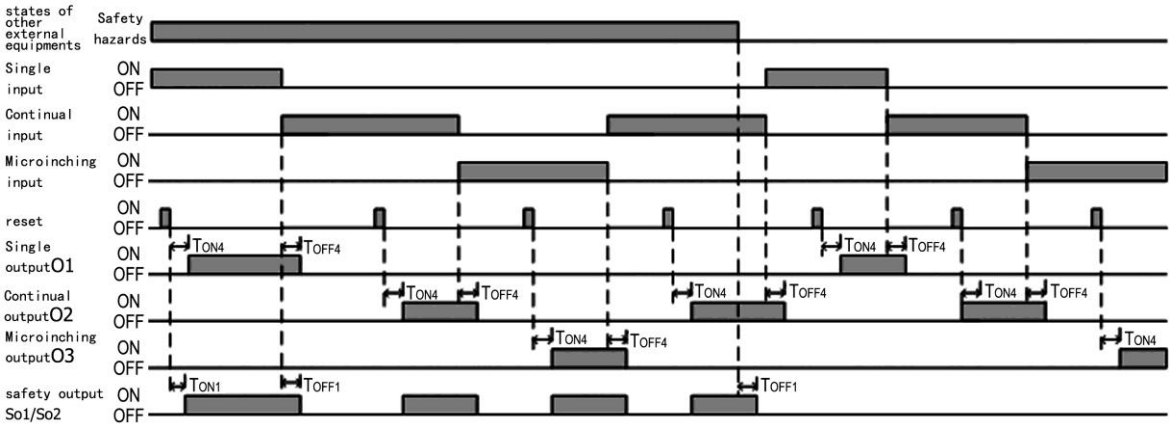
T_1： The time difference of the two hands button inputs is longer than 500ms. It's regarded as wrong output and there is no output response.

2.2.7 Mode Selection Module

CSRME monitors the mode selection switch. Only one working mode can be chosen every time and it corresponds the independent input/output port, see in the following Table. When the working mode is chosen, press the preset button, its corresponding standard output port will output the ON state.

Working Mode	Corresponding Input Port	Corresponding Standard Input Port
Single time	I5	O1
Continual	I6	O2
Microinching	I7	O3



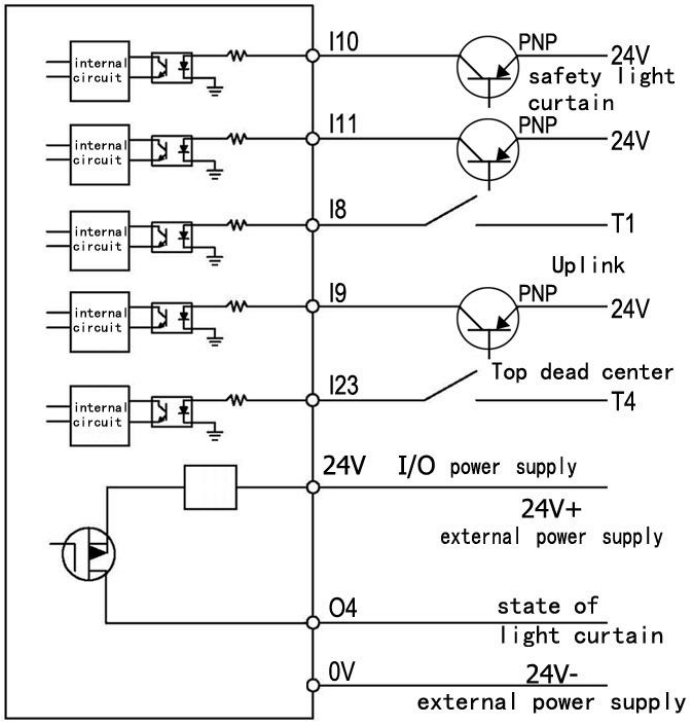


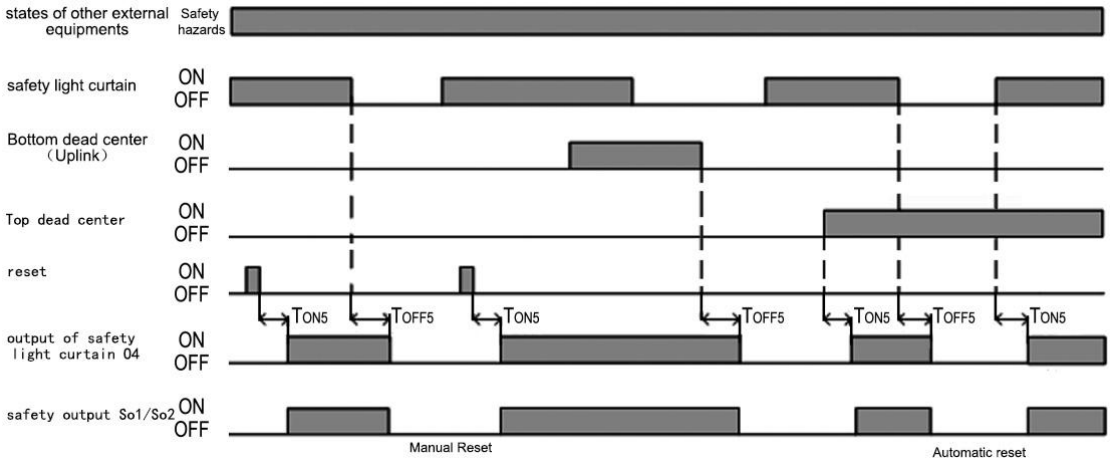
T_{OFF4}: The response time during which the mode selection input enters OFF state and the corresponding mode output enters OFF state.

T_{ON4}: The response time during which the mode selection output switches from logical trigger ON state to the the mode output enters ON state.

2.2.8 Light Curtain Module

CSRME monitors the state of the light curtain. When the input signals of the two PNP light curtains are both on ON state, the standard output O4 will output the ON state.





T_{OFF5}: The response time during which the light curtain's state switches from light curtain output to OFF state and the standard output O4 enters the OFF state.

T_{ON5}: The response time during which the light curtain's state output switches from the logical trigger ON state into the standard output and O4 enters ON state

Warning

In the state of suppression, other measures need to be taken to ensure the safety of the system!

Part III Installation and Wiring

Before installation, please read the warning information in this manual to avoid personal injuries caused by the wrong installation.

3.1 Installation Environment

Warning

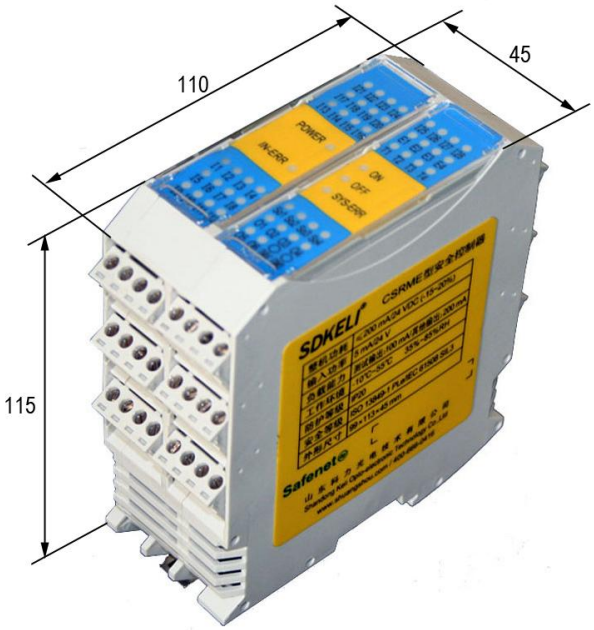
- Do not install the safety controller in direct sunlight environment.
- Do not install the safety controller in an environment that is outside the specified temperature and humidity conditions.
- Do not install the safety controller in a condensation environment caused by abrupt temperature changes.
- Do not install the safety controller in an environment of multi-dust, multi-oil fume, multi-salt or multi-metal dust.
- Do not install the safety controller in an environment filled with corrosive gases, flammable gases, flammable gas, ammonia gas and electrolyte or organic solvents.
- Do not install the safety controller in an environment of direct vibration or impact.
- Do not install the safety controller in an environment near the emission components of high voltage wires, high voltage equipment, power lines, radio equipment, large switches and the occurrence of sudden waves.

3.2 Installation

Warning

- If the vibration of the work environment is beyond the specified value in the technical parameters table, other appropriate measures should be taken to reduce the vibration of the device.
- Ensure that the product is firmly installed and the connection is correct.

- CSRME should be installed in closed control cabinet with the protection level of IP54 or higher(see IEC/EN60529)
- Use TH35-7.5/15 standard DIN rail (see IEC 60715) to fix the controller on the control panel.
- The space of other devices on right or left side of the controller should reserve at least 20mm and the upper or lower space should reserve more than 50mm to make sure that the controller works normally.
- The dimensions of the controller are shown in the following figure:



3.3 Wiring

3.3.1 Notes

Warning

- Wiring when the power of CSRME is turned OFF.
- The load must be connected between the output and OV and short circuit between the output and t+24V must be avoided, or the output will output the ON state signal.
- The signal lines of CSRME should not be connected to DC power suppliers with the output voltage higher than 28.8V. Besides, it can't be connected to AC power suppliers, or it may lead to electric shock.
- The working power supply of CSRME should not exceed 28.8V, otherwise it may affect the stability of the controller.
- Properly perform the wiring after confirming the signal names of all the terminals.
- Be sure to route the CSRME cable separate from high-potential power lines or through an exclusive conduit.

Attention

Hot plugging for the connectors of T4 is forbidden!

3.3.2 Power Supply

Warning

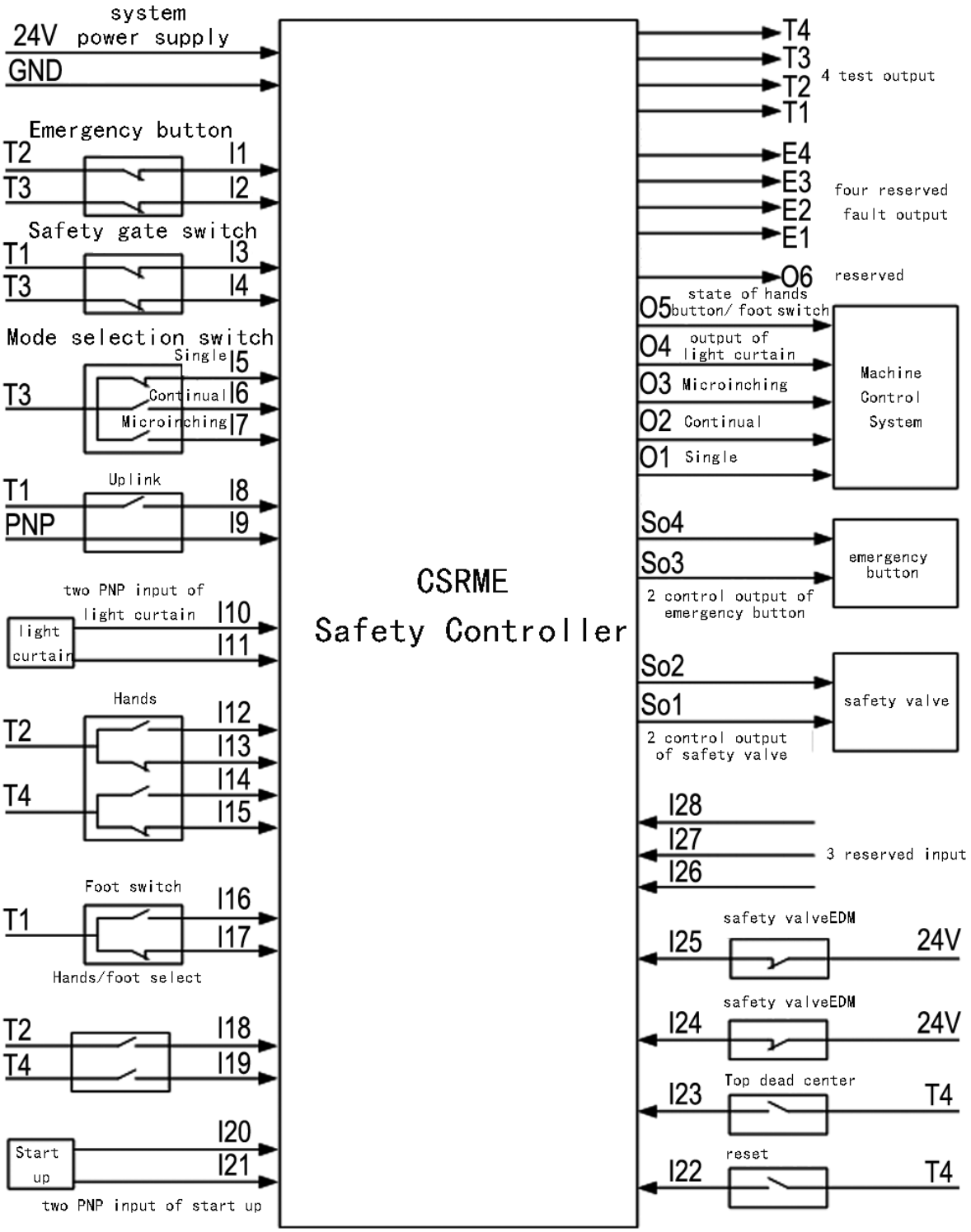
The power supply of CSRME must be configured according to the following requirements, or dangers may occur.

In order to guarantee that CSRME meet the requirements of 61131-2, the DV power supply must meet all the following requirements:

- The output voltage must be within the rated voltage（-15%～+20%）.

- It must meet the requirements of the load current.
- It must meet the EMC instructions (industrial environment).
- The power supply must have the output over-voltage and over-current protection function.
- It must meet local the laws and regulations of the user on EMC and electrical equipment's safety requirements. For instance, in EU, the power supply must meet the EMC instruction and the LVD instruction.

3.3.3 System Wiring Diagram



Part IV Checking and Debugging

Warning

CSRME needs to be checked and debugged after being installed to make sure that it can realize the expected safety protection function. During the debugging, other protection measures need to be taken to protect the operators, or it cause personal injuries.

The management personnel must check CSRME after installing it according to the following terms and record the results in details.

4.1 Installation Condition Check

□ The site is not flammable or explosive environment.

□ The environment of the site doesn't exceed the specified temperature and humidity range.

□ There is no corrosive gas, combustible gas, flammable gas and other gases in the environment of the site.

4.2 Check of the Controller

□ Whether the power input voltage of the terminal block is in the specified range of DC20.4～28.8V.

□ Whether the fault indicators IN-ERR and SYS-ERR are off.

□ Whether the controller body is fixed.

□ Whether the screw of the terminal block is loose.

4.3 Wiring check before power is turned on

☐ Provide the special power supply for CSRME. If it uses the same power supply with other devices, the power meets the requirements and other devices don't influence the working status of CSRME.

☐ The DC24V power supply which provides electricity for CSRME meets the EMC instruction, low voltage instruction and output specifications.

☐ The power supply is connected correctly and there is no reverse connection.

☐ Double insulation or reinforced insulation are adopted between the I/O line and the potential danger signals(such as dangerous voltage)

☐ There is no short circuit between the output and DC24V.

☐ None of the signal lines is connected to the dangerous voltage.

☐ The standard output cannot be used as the safe output.

☐ The connector and the crimping terminal are connected firmly and there is no loosening.

☐ Cables must not be bent, cracked, or damaged. The cables in the connector end should be relaxed to avoid damaging the connectors.

Part V Maintenance

Warning

- Daily and six-month routine maintenance and check should be performed on CSRME, or the system may be unable to work normally and lead to dangers.
- Users are prohibited to disassemble, repair or change the product. Otherwise, CSRME can not achieve its security functions and dangers will occur..

Attention

It's prohibited to plug and unplug the connector of CSRME with the electricity on!

In order to ensure the safety, CSRME needs to be maintained and checked according to the following terms. The check results should be recorded in details. When the operator is not an installation or design personnel, he or she must be trained properly about the maintenance.

5.1 Inspection at startup and when changing operators

☐ All the transmission lines are plugged firmly in the terminal heads and there is no loosening.

☐ The fault indicators IN-ERR and SYS-ERR are off..

5.2 Inspection for the guarded machine

☐ The hazardous parts stop when the power of CSRME is turned OFF while nothing is in the detection zone.

☐ The safety valve starting voltage should not exceed the safety output voltage, or the safety valve will not be able to function normally.

5.3 Items to inspect every 6 months or when machine settings are changed

In addition to inspection items in 5.1 and 5.2, following items must also be verified.

☐ The control outputs of CSRME and the guarded machine are properly wired.

☐ The cables must not be bent, cracked, nor damaged.

☐ CSRME is fixed fasten, no loose.

☐ The changing of guarded machine setting affects the safety of the control system.

Part VI Fault Diagnosis

Warning

Users are prohibited to disassemble, repair or change the product. Otherwise, SCRME may be unable to realize its safety function and cause dangers.

Attention

When CSRME is working, the system must be grounded greatly, or the anti jamming performance may be reduced!

failure phenomena	failure causes	solutions
All the indicators are off	Power fault	Check the external power supply
	Cable connection error or open circuit	Check the wiring and connectors
	Internal device damage	Replace the CSRME
One or several of the standard output indicators O1/ O2/O3/O4/O5 are off	Cable connection error or open circuit	Check the wiring and connectors
	The power supply voltage is lower than the specified value or the supply current is insufficient.	Replace it with a power supply in accordance with the requirements
	External reset button damage	Change the reset button
	Serious electromagnetic interference	Check the EMC level of the environment，eliminate the interference source
	Error test signal is inserted	Insert the correct test signal
	Output overload	Decrease the load
	Internal device damage	Replace the CSRME
One or several of the test output indicators T1/ T2/ T3/ T4 are off	The power supply voltage is lower than the specified value or the supply current is insufficient.	Replace it with a power supply in accordance with the requirements
	Output overload	Decrease the load
	Internal device damage	Replace the CSRME
“ON” output indicator light is off	Safety device failure	Check the status of other safety devices
	External reset button damage	Change the reset button
	Internal device damage or system failure	Change the CSRME
One or two of the emergence stop output indicators are off	Emergency stop output connection error or open circuit	Check the wiring and connectors
	External reset button damage	Change the reset button
	Internal device damage	Change the CSRME

Part VII Version Information

Version NO.	Issue Date;	change
V2.1	2015-05	

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