

Name _____ Student ID _____ Group name _____

Name _____ Student ID _____ Group name _____

Lab II: Actuators

Objectives

1. To gain insight into basics of hard-wire control through hands-on labs.
2. To understand principles of operation and applications of commonly used industrial automation actuators.

Warnings

1. Read the lab sheets before coming into the lab. Tidy up your cloth and your hairs before coming into the lab. Flip flop and clog are forbidden. Food and drinks are not allowed in the lab.
2. Strictly follow the instructions.
3. Some parts of many circuits involve 220 Vac power lines. Care must be taken when conducting your experiments.

Part 0: Self-Holding Circuit

Instruction

1. Make a circuit according to the circuit diagram shown in Figure 1. This circuit is to control the state of a 24 Vdc pilot lamp using an NO contact of the relay.
2. Ask a laboratory supervisor to verify your circuit before turning on the power supply.
3. Activate the switches, record the results and answer the questions in the next section.

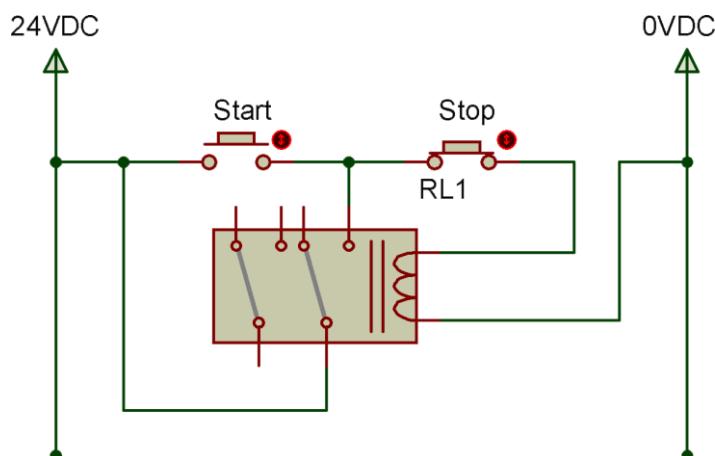


Figure 1: circuit diagram of Self-Holding circuit

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Group name A01
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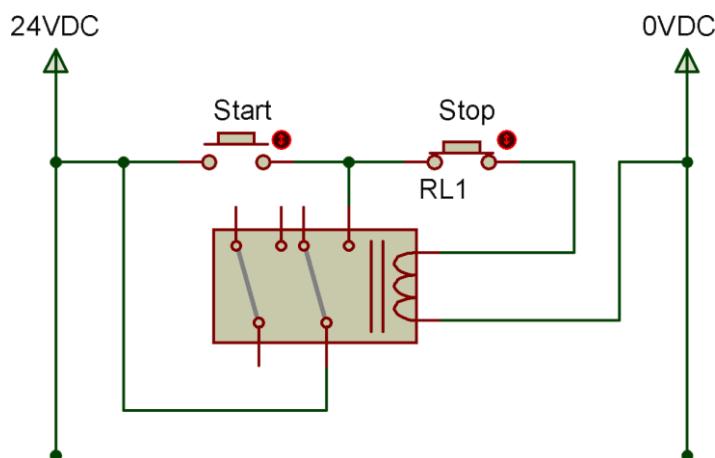


Figure 1: circuit diagram of Self-Holding circuit

Conclusions

self-holding circuit ເປົ້າຂອງຈົກຕ້າງສ່າມາດຄ້າງສ່າງຂອງ output ໄຟໄຟໃໝ່ ໂດຍໃຫ້ນັ້ນ contact ຂອງ relay ແລະ NO ພາສີໂທທະນາກຳບໍ່ມີ start ແລະເຫື່ອຈາກປາຕີຣີໃຫ້ປຸ່ມມາດເບັນກອຕົມຂໍ່ລ່ວມໆຢູ່ໄຟໄຟສ່າມາດໄວ້ເພື່ອປ່ອລ່ວມໆ ແຕ່ກຳມະກຳຮອງໃຫ້ ດຽວກຳມາດລອງນີ້ ເຮັດວຽກຮູ້ໃຫ້ນັ້ນກຳມາດປູ່ມື້ນ start contact ຄົງເລີຍວາແລ້ວໃຫ້ໄຟໄຟຕົກຕ້າຫຼືຈິງນັ້ນ ຊິ້ນ self-holding circuit ຢັບຮ່ວມຍິນ. ເຊິ່ນການຮູ້ຄລອງຈາກຕ່າງໆທີ່ໄດ້ຮັບການປະຕິບັດໃຫ້ມີການປະຕິບັດໃຫ້ກຳມາດຕ່າງໆກ່າວ່າ ດີເລີຍທີ່ກຳມາດໃຫ້ຮັບຮ່ວມຍິນ ໃຫ້ໄຟໄຟເຈົ້າປຸ່ມມາດໄປສ່ອງໂຄຍຕຽງ ສັນສົ່ງທາງທິ່ນ relay ກີ່ເລີຍທີ່ໄຟໄຟ relay ເພີ້ນເງົານີ້ ຫຼືຈິງຕົກຕ້າຫຼືຈິງກຳມາດປູ່ມື້ນ start ກີ່ຈິງທີ່ໃຫ້ໃຫ້ໄຟໄຟໄຟໄລ້ ມີເງົານີ້ໄຟໄຟໄລ້ ຖ້າໃຫ້ໃຫ້ໄຟໄຟໄລ້ ຕໍ່ມີເງົານີ້ໄຟໄຟໄລ້ ບໍ່ມີເງົານີ້ໄຟໄຟໄລ້ ຢັບຮ່ວມຍິນ ແລະ ຖ້າໃຫ້ໃຫ້ໄຟໄຟໄລ້ ຕໍ່ມີເງົານີ້ໄຟໄຟໄລ້ ດີເລີຍທີ່ກຳມາດຕ່າງໆທີ່ໄຟໄຟໄລ້ ເຊິ່ນຮູ້ຄລອງຈາກຕ່າງໆທີ່ໄຟໄຟໄລ້ ຖ້າໃຫ້ໃຫ້ໄຟໄຟໄລ້ ດີເລີຍທີ່ກຳມາດຕ່າງໆທີ່ໄຟໄຟໄລ້ ຖ້າໃຫ້ໃຫ້ໄຟໄຟໄລ້

Questions

1. Draw a complete ladder diagram of the circuit.

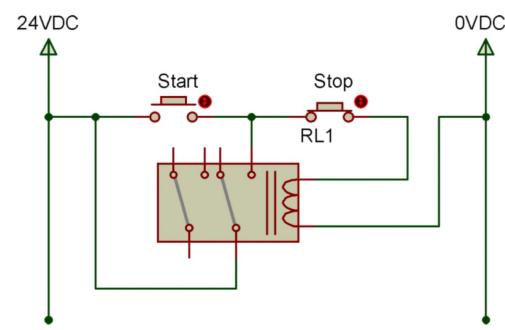
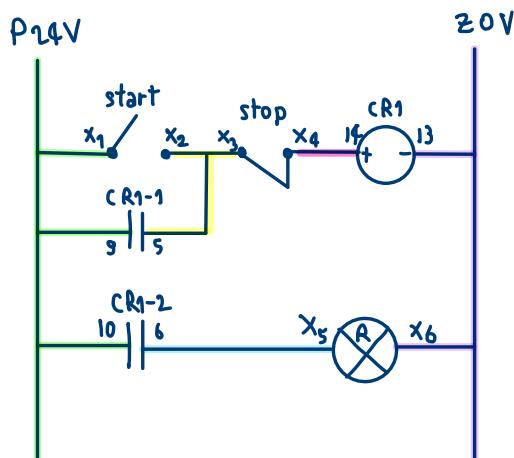


Figure 1: circuit diagram of Self-Holding circuit

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Name 2) ນາຍລົ້ງພົດ ຈີຍະສູນ
Name 3) ນາງສາວິຫຼາສັນ ແກ້ວມະນູ

Group name A01

Group name A01

Part 1: On-Delay Timer

Instruction

1. Design a circuit using an on-delay timer to control the on/off state of a 24 Vdc pilot lamp in such a way that the lamp is turned on **10 seconds** after a start button is activated. Additionally, a self-holding circuit must be used to activate the timer.
2. Ask a laboratory supervisor to verify your ladder diagram.
3. Make your circuit and ask a laboratory supervisor to verify your circuit before turning on the power supply.
4. Operate the circuit, record the results and answer the questions in the next section.

Conclusions

On-delay timer ເປົ້າ relay ທີ່ສ່າງຮົດໃຫ້ຂັ້ນວ່າລາຍໃຫ້ການຈື່ງຕອງຈະ ເພື່ອຈ່າຍໄຟເທົ່າ coil ຂອງ timer relay ກົດຈຳນັ້ນລາຍ ຊານເຊື້ອຄຽບແລກຕາມທີ່ຕຶກຕໍ່ໄວ້ relay ກົດຈຳເຊື່ອທ່າງໆ
ໃໝ່ການຮັດລອນທີ່ ຕ້ອງການໃໝ່ຫັກຕໍ່ຖຸນ start ແລ້ວໃຫ້ timer relay ຈົ່ງແລກ 10 ສິ້ນທີ່ ຂອງຕ່ອງລັບໃຫ້ໄຟເຕີດ ແລ້ວເພື່ອຄົງກູ່ມາ stop
ຢູ່ໄຟເຕີດຕໍ່ຫັກຕໍ່ຖຸນທີ່ ໂຄຍ້າໄຟເຕີດຕໍ່ຫັກຕໍ່ຖຸນ 10 ສິ້ນທີ່ ການອອກແບບອອງຈະຈົງເສີມຈາກຕ້ອງກື່ງມາ start/stop ໂຄຍ້າໃຫ້ອອງຈະ self-holding
ທີ່ຕໍ່ຈ່າຍໄຟເຫຼົ່າ coil ຂອງ relay 24VDC ກົດກຳໃຫ້ກົດຕໍ່ຖຸນ start ແລ້ວ ດຳກັນສັກວ່າໄວ້ໄລ້ ແລ້ວຈາກນີ້ກົດໃຫ້ໄຟເຕີດ contact
ຂອງ relay 24VDC ໂດຍຈ່າຍໄຟເຫຼົ່າ coil ຂອງ timer relay ເພື່ອໃໝ່ລາຍທີ່ຮຽກຕໍ່ຖຸນ start ແລ້ວ relay timer ຜົ່ນແລກ
ເພື່ອຄຽນ 10 ສິ້ນທີ່ relay timer ດີກຕ່ອງໄຟສັກວ່າໄວ້ໄຟເຕີດ

Questions

1. What kind of power is required by this timer? (AC/DC? Volts)

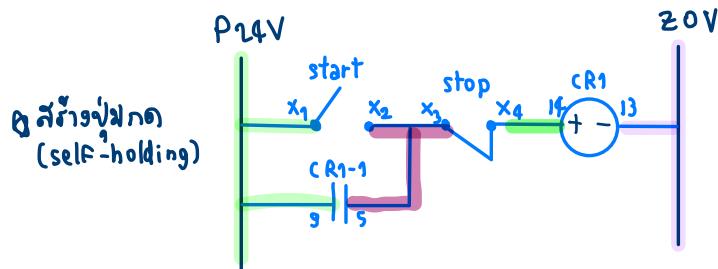
220 VAC

Name 1) ឧបាយុទ្ធនកល់ ភាគាព 63070501208
 Name 2) ឈរីតំណើលិខិត ឱយស្សុង 63070501216
 Name 3) ការិនសារិនិភាសាខ្មែរ ឈឺអាមុនុ 63070501221

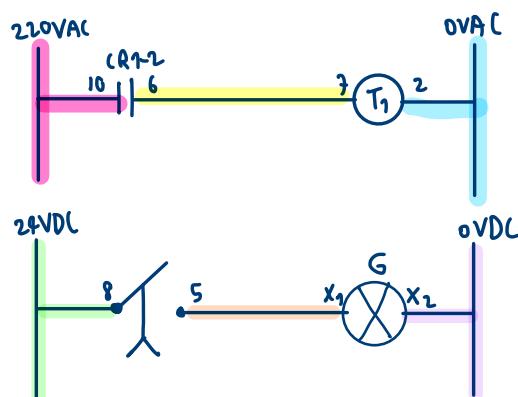
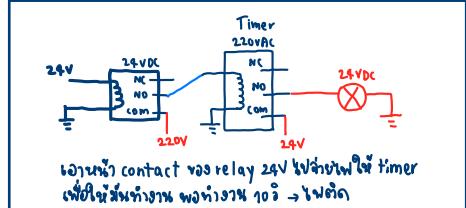
Group name A01

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2. Draw a complete ladder diagram of the circuit.
 * កណ្តាល start & stop ទិន្នន័យ self-holding នេះ



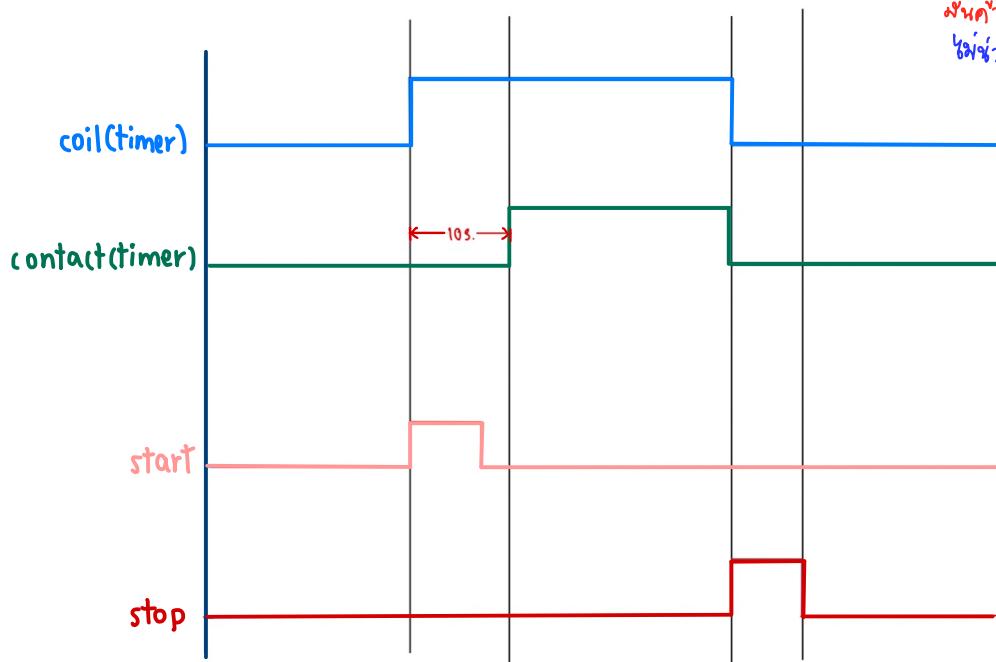
note!!



នាយកុំព្យូទ័រ : x_1, x_2, x_3, \dots គឺជាឧុលិតរបស់ការងារ

3. Draw a timing diagram showing states of coil and contact of the timer in different situations including start & stop and power failure & recovery.

ការងារត្រួតពិនិត្យ \rightarrow ឯករាជការក្នុងការងារ
 ដើម្បីត្រួតពិនិត្យ ការចូលរួម
 នៃការងារ នៃការងារ និងការងារ
 ដើម្បីការងារ ការងារ និងការងារ (ការងារក្នុងការងារ)

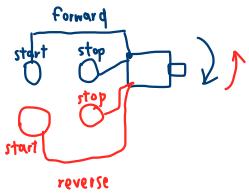


ការ forward → ទីស្តីរួចរាល់លើក្នុងការការពិនិត្យលក្ខណៈរបស់មូលដ្ឋាន & reverse → ក្នុងការការពិនិត្យលក្ខណៈរបស់មូលដ្ឋាន

Part 2: Forward & Reverse Motor Control

Instruction ស្រាវជ្រាវដែលឱ្យការការពិនិត្យលក្ខណៈរបស់មូលដ្ឋានធ្វើឡើងនូវការការពិនិត្យលក្ខណៈរបស់មូលដ្ឋាន

1. Design a circuit to control the forward & reverse direction of a motor. The circuit must have or perform as follows.



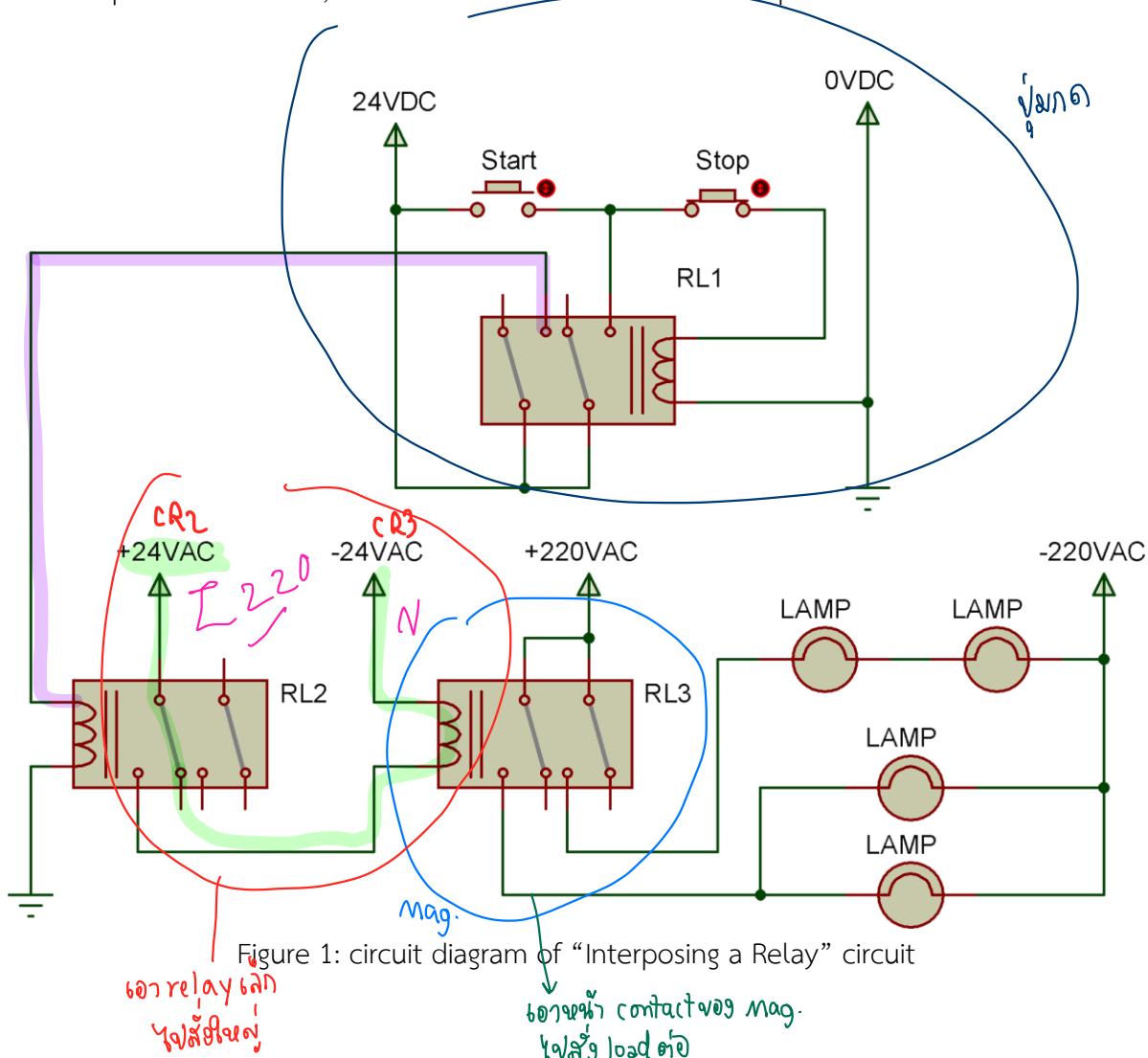
- a. There should be three pushbuttons: Forward (NO), Reverse (NO) and Stop (NC).
- b. The motor is started when Forward or Reverse is pressed (not at the same time).
- c. When the motor is running (in any directions) and the Stop is pressed, the motor will be in a stop state (slow down and finally stop completely).
- d. To change the direction of the motor while running (in any directions), the motor must be in the stop state. ឧបេលីយ៍នៃការការពិនិត្យលក្ខណៈរបស់មូលដ្ឋាន ត្រូវការ stop កំនែនដែលបាន
- e. If the Forward is pressed while the motor is in the forward state, nothing changes. This also applies to the reverse state.
- f. The circuit must follow the characteristics of the self-holding circuit when a power failure occurs.

2. Ask a laboratory supervisor to verify your line diagram.
3. Make your circuit and ask a laboratory supervisor to verify your circuit before turning on the power supply.
4. Operate the circuit, record the results and answer the questions in the next section.

Part 3: Interposing a Relay * ចាប់ relay ឡើងវិនិយោគ relay ណូល!

Instruction ឯកសារនេះកំពង់អ្នករាយ នៃវិធានសំរាប់រាយការ

1. Make an “Interposing a Relay” circuit according to the circuit diagram shown in Figure 1. (RL1 is a relay. RL2 and RL3 are magnetic contactors)
2. Ask a laboratory supervisor to verify your circuit before connecting to the power supply.
3. Operate the circuit, record the results and answer the questions in the next section.



Conclusions

Interposing relay ຕື່ອງການໃຊ້ relay ເພື່ອມາເນັດກາກໍາງານຂອງຈະຈອກເປົ້າ ວິຊາ control circuit ກໍ່ຈະຈອກຫຼືໄອຊີ - (ວິຊາ high power circuit) ເລື່ອໜ້າກໍານົດໃຫ້ relay ທີ່ກໍານົດທີ່ກໍ່ຕົກຈະແສ່ໄຕ້ນ້ອຍ (ຫຼືຈຶ່ງສ່າມາດຈົບ ໂອດີກໍ່ຕົກຈະແສ່ສູງ)
 ຫຼືຈຶ່ງ relay ທີ່ກໍານົດທີ່ຕົກຈະແສ່ໄຕ້ນ້ອຍ (ເພື່ອໄປ່ປັບໄອຊີ ທີ່ກິນກະແສ່ສູງ ຖ້າໃຫ້) ແລະ ຂາກໄອຊີ ກໍາດຳການສ່ອງຕົກຈີ່ໄຟທ່ານີ້
 ແກໍ່ຄວາມເສີ່ນຍາຍຕ່ອງຈະ control

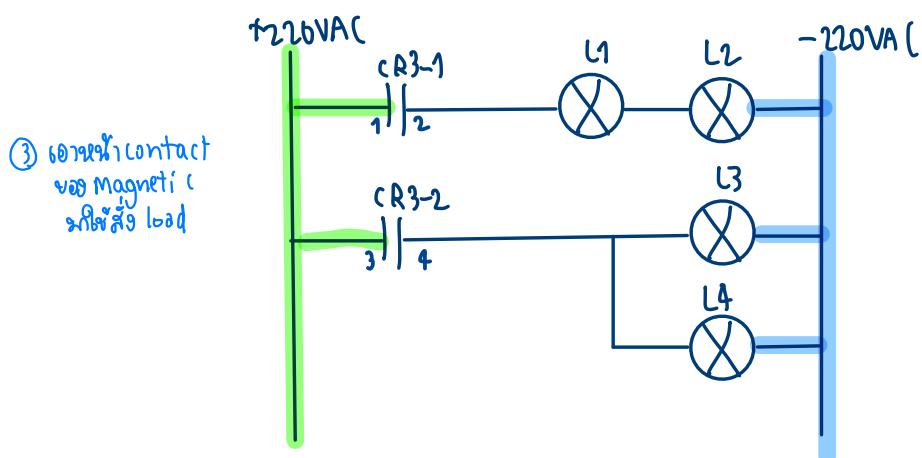
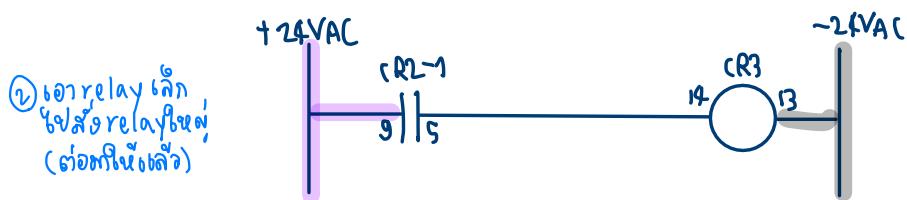
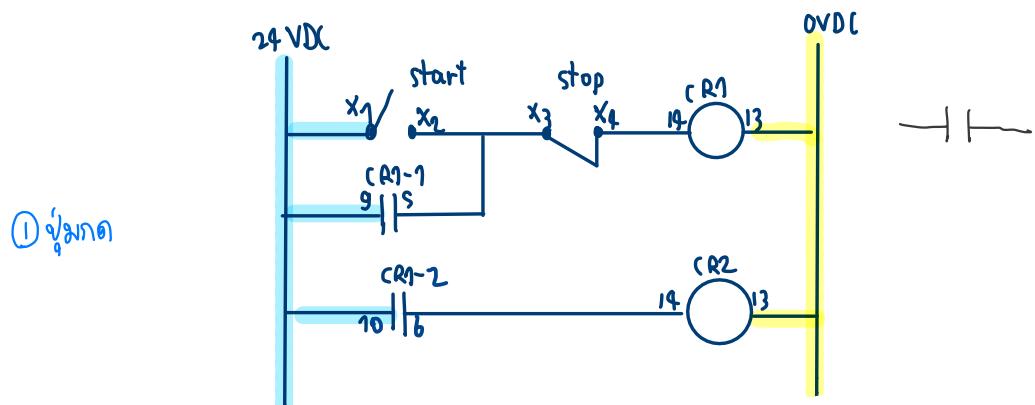
ໂຄນີໃຫ້ການຫາລອງຈີ່ຈຶ່ງໃຊ້ relay 24 VDC (coil 2) ໄປລ້ອງຈານ relay 24 VAC (coil 3) ຫຼືເພື່ອ magnetic relay ດະເນີ້ນໄດ້ວ່າ
 ສ່ວນໃໝ່ເປັນການໃຊ້ relay ທີ່ໃຊ້ໄຟ DC ໂປ່ງຈັບ relay ທີ່ໃຊ້ໄຟ AC ໃຫ້ກໍາງານ ຈາກໜ້າຫຼັງ contact ຂອງ relay 24 VAC (coil 3)
 ທີ່ຕ່ອງໄຟ 220 VAC ອຸ່ນ ຈະເປັນລົບນໍລາຍະຈາກ NO ເປົ້າ NC ກໍາໃຫ້ໄຟ 220 VAC ໂປ່ງໄປຮົງຊາລອດໄຟທ່ານີ້ຈະໄຟຕິດ ຫຼື
 ການຫາລອງຈີ່ກໍຈະຕ່ອງຊາລອດໄຟໃຫ້ 2 ລໍ່ກົງຄະວົງ ຄື່ອວຽກຮົມ ແລະ ພາຍໃນໂຄນີພາດສອງພບວ່ານລອດໄຟທ່ານີ້ກໍຈະເປັນຫຼາຍ
 ຈະສ່ວັງກ່າວ່ານລອດໄຟທ່ານີ້ແບບອຸ່ນກຽມ ເທົ່ອຈາກໄຮງຕົ້ນທີ່ຕາມຄວົມລວດໄຟທ່ານີ້ເປັນບໍ່ຫາຍ ຈະເຫັນກັນ (ໄປ່ເສົ່າງເຮັດຕັ້ງ)

Questions

- Why is one part of the outputs connecting to a parallel lamp load while the other to series lamp loads?

ເພື່ອໃຊ້ຈົບເຫັນຄວາມສ່ວ່າງອອນລອດໄຟຮະນວ່າງຊາລອດໄຟທ່ານີ້ເປັນອຸ່ນກຽມແລະ ທີ່ຫຼື່ອ່ານຂາຍ

- Draw a complete ladder diagram of the circuit.



Name _____
1) ຂາຍວິທະກຸດ ອາດທອງ 63070501208
2) ຂາຍລົງທຶນ ອີເມລື່ອງ 63070501211
3) ຂາງສ່ວນທຶນ ເພື່ອຈັກ 63070501221

_ Section in(A)

Part 4: Pneumatic circuits

ຂໍ້ຕຳມູນ start & stop

Instruction

Design a circuit to control the operation of a pneumatic circuit shown in Figure 2. The circuit must have or perform as follows.

- a. There should be two pushbuttons: Start (NO) and Stop (NC).
- b. A1 cylinder operates (, i.e., its rod moves) when the Start is pressed.
- c. A2 cylinder operates at 5 seconds after Sensor S1 is active.
- d. The rods of A1 and A2 cylinders move back to their original positions when sensor S3 is active.
- e. Whenever the Stop is pressed, each rod of A1 and A2 cylinders moves back to its original positions.
- f. The circuit must follow the characteristics of the self-holding circuit when a power failure occurs.

The student must perform 4 parts:

- i. Self-holding circuit
- ii. A1 cylinder control circuit
- iii. A2 cylinder control circuit
- iv. Complete circuit

For each part,

1. Ask a laboratory supervisor to verify your line diagram.
2. Make your circuit and ask a laboratory supervisor to verify your circuit before turning on the power supply.
3. Operate the circuit, record the results and answer the questions in the next section.

Remarks: use a flow control valve to control speed of the rod of each cylinder.

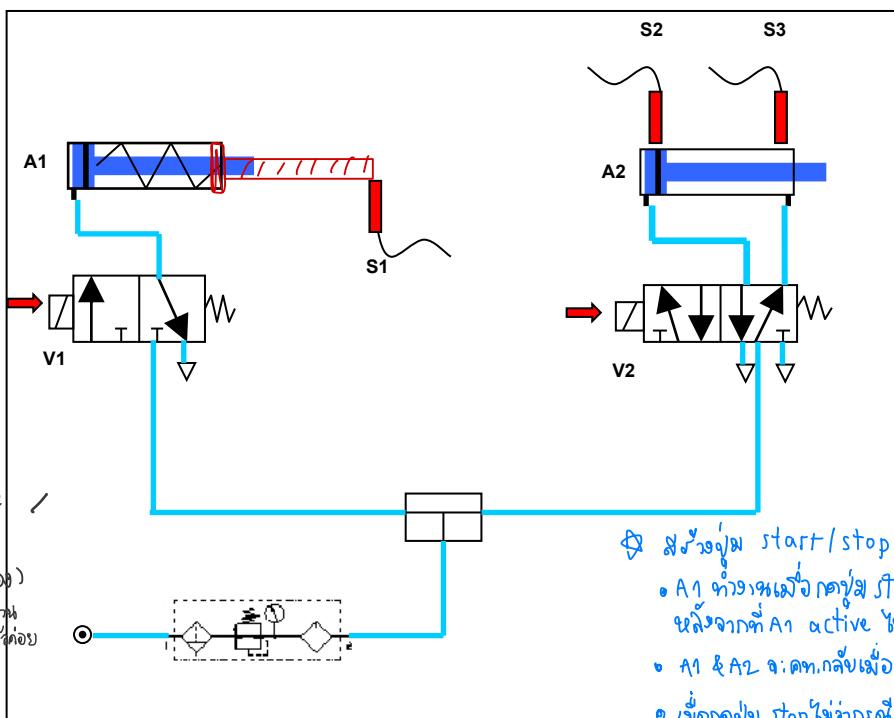


Figure 2: pneumatic circuit

Conclusions

Pneumatic circuit នឹងការងារដោយកតបី និងតិច និងតិចបី តាមរាយបី សែង និងតិចបី គឺជាការងារបែងបី និងតិចបី នៃសែងដែលកម្រិតរាយបី និងតិចបី ទៅក្នុងក្រុងសែង ដើម្បីស្រាវជ្រាវការងារបែងបី និងតិចបី នៃសែង និងតិចបី នៃកតបី និងតិចបី

Questions

1. What is the pneumatic air pressure normally used in industrial pneumatic systems?

What are the benefits of this?

Normally use compressed air, 6 bar

ផែនក្នុង : 1) សែង 3) តាមរាយបី និងតិចបី

2) ធម៌ 4) ការងារបែងបី និងតិចបី

2. What are the types of solenoid valves used in the lab?

solenoid valve 3/4 and solenoid valves 5/2

3. Draw a complete ladder diagram of the control circuit.

