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KISI-KISI

**LOMBA KOMPETENSI SISWA (LKS)-SMK
TINGKAT NASIONAL XXX TAHUN 2022**

BIDANG LOMBA

**Sistim Kendali Industri
(Industrial Control)**



Teknologi Manufaktur dan Rekayasa

CIRCUIT DESIGN INDUSTRIAL CONTROL

Worldskills_Indonesia_2022_Circuit_Design_Pre

Submitted by :
Name : LODI JOYO SISWANTO
Member Country or region : ID

Nama : _____
Provinsi : _____



Modul A - Circuit Design

Waktu Pengerjaan : 1 Jam

Software : Fluidsim MecLab V4.5 Pneumatics

Buatlah rangkaian pengendali dan rangkaian utama menggunakan software Fluidsim sesuai dengan deskripsi mesin dan flowchart.

Instruksi Penyimpanan file

1. Simpan file dengan format Circuit Design_nomor peserta
2. Contoh : Circuit Design_01

3. Nama yang tidak sesuai dengan contoh tidak akan dinilai

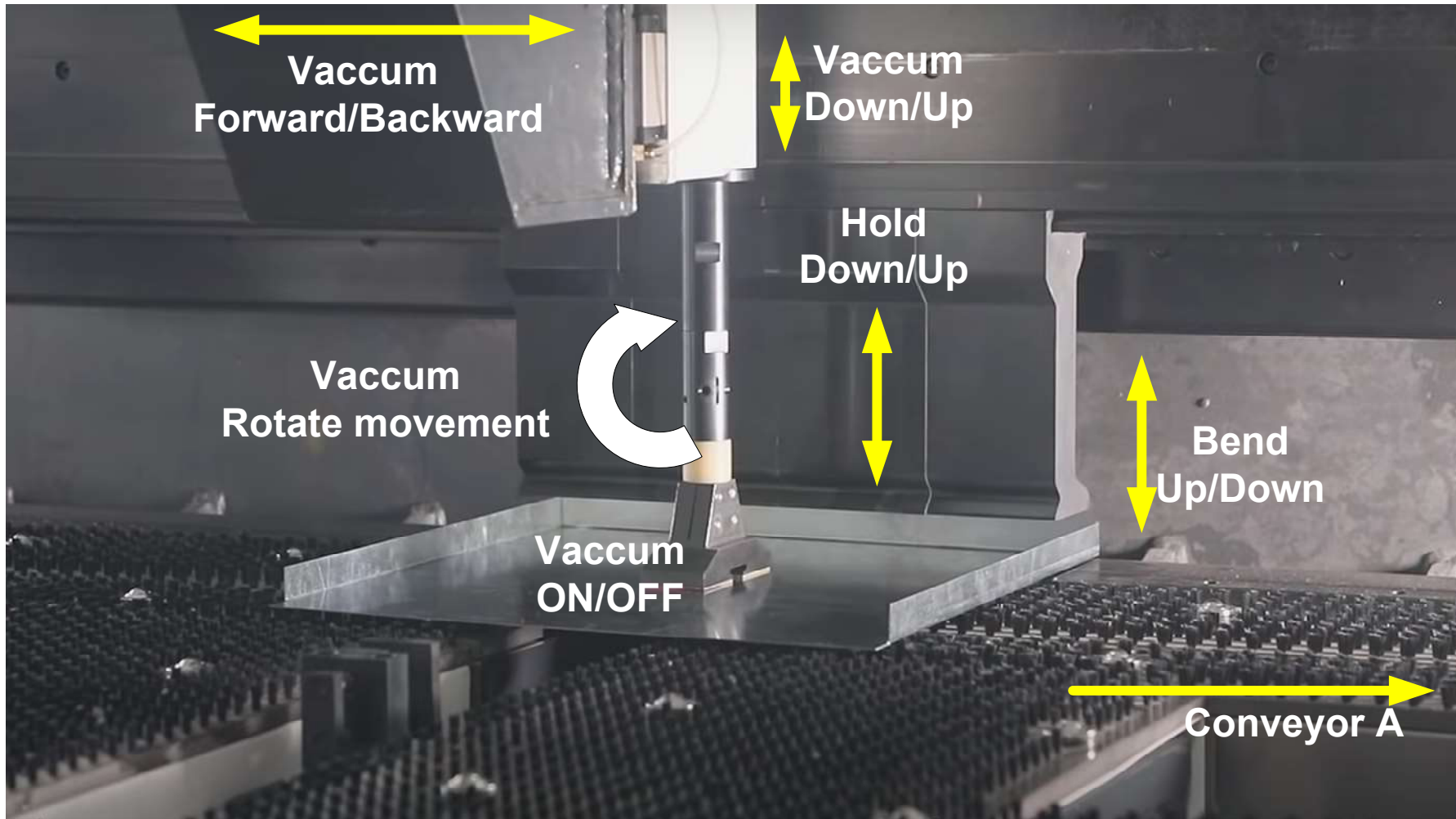
Instruksi Pengiriman file

1. Kirim file sesuai instruksi juri
2. Kesempatan mengirim file hanya 1 kali
3. Jika ada 2 file yang dikirim, file pertama yang akan dinilai

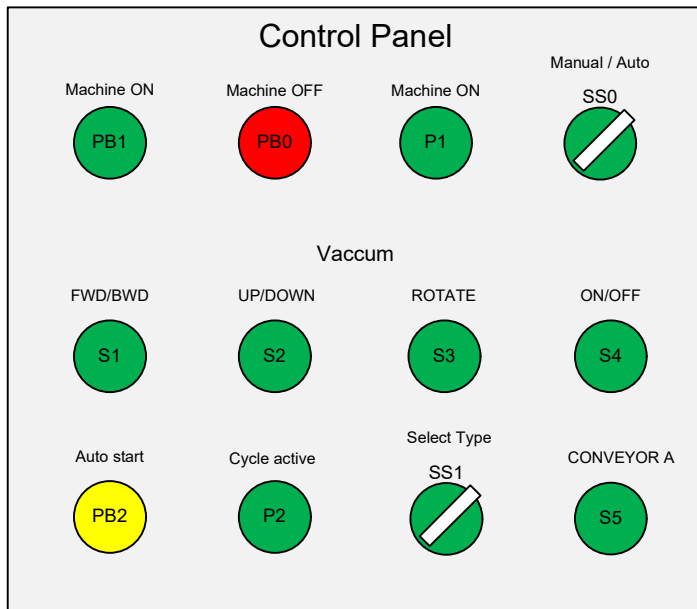
Note: Pada saat file diterima, Juri akan cek file yang dikirim dengan video rekaman zoom

Jika file yang dikirim dan hasil rekaman tidak sesuai, peserta akan didiskualifikasi

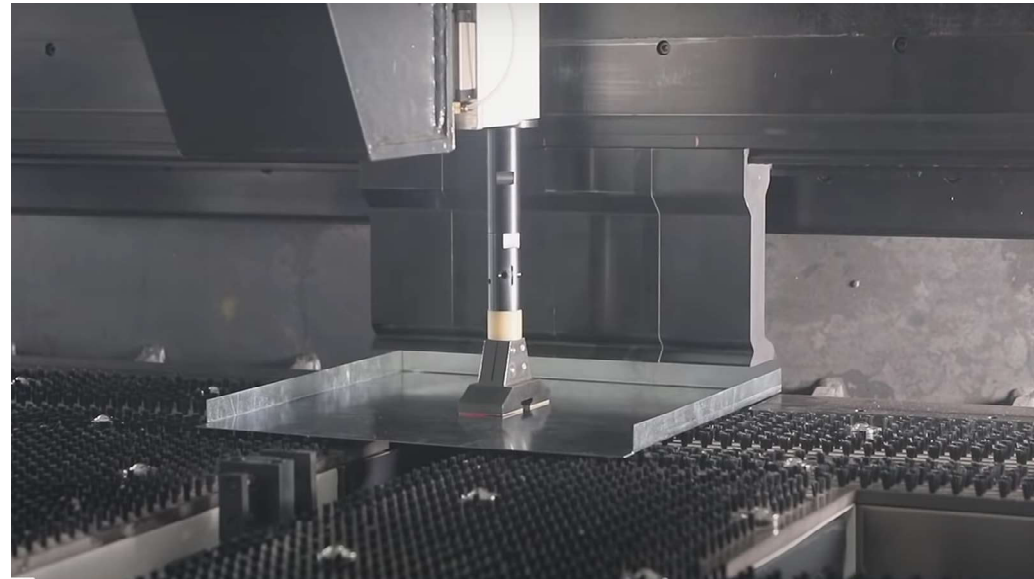
Bending Plate Machine



Control Panel



Machine



Tag/Variable Control Panel

S1 : Push button NO
 S2 : Push button NO
 S3 : Push button NO
 S4 : Push button NO
 S5 : Push button NO
 PB0 : Push button NC
 PB1 : Push button NO
 PB2 : Push button NO
 SS0 : Detent switch NO
 SS1 : Detent switch NO
 P1: Green Light
 P2: Green Light

Tag/Variable Machine

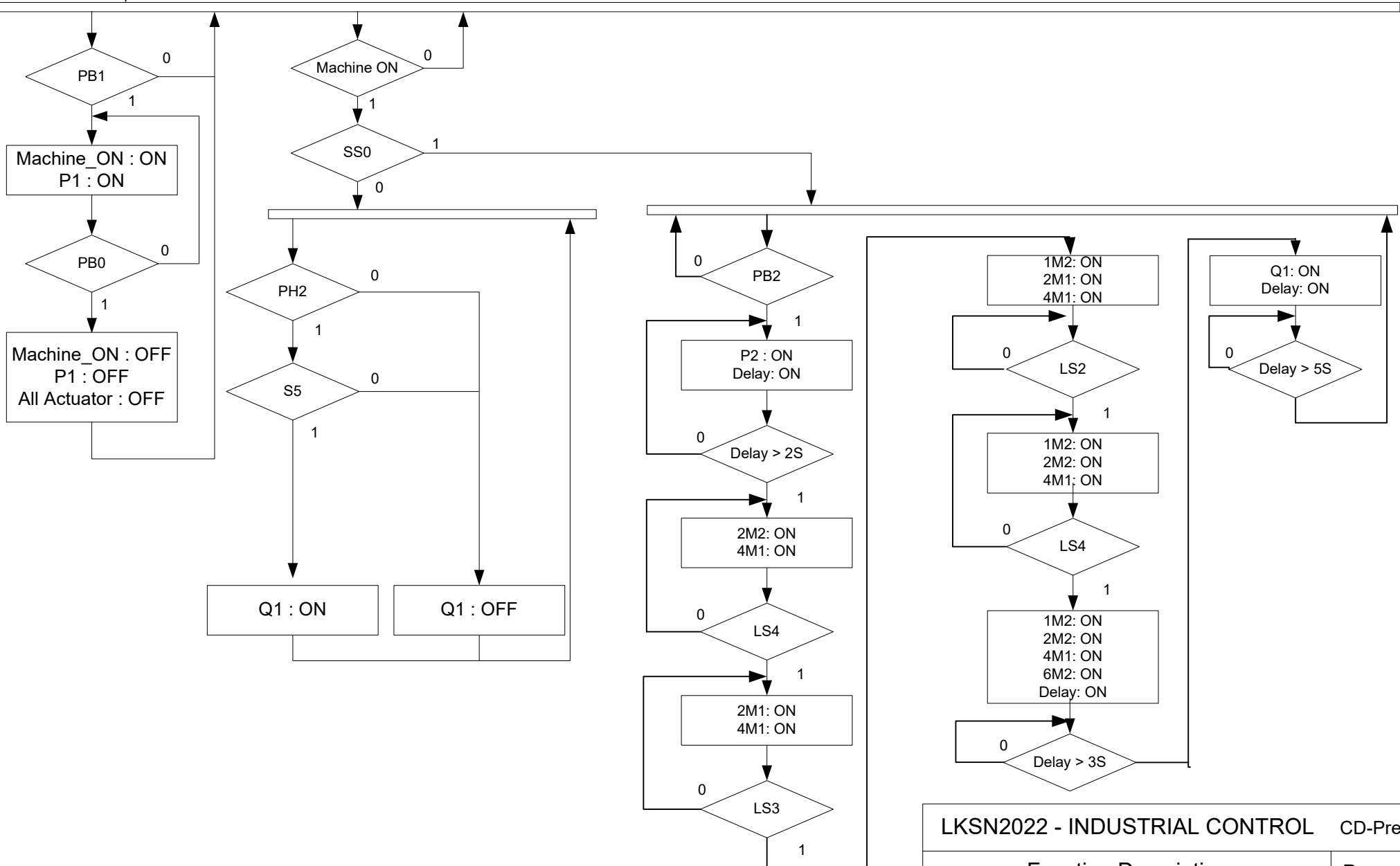
LS1: Vaccum Backward
 LS2: Vaccum Forward
 LS3: Vaccum Up
 LS4: Vaccum Down
 LS5: Vaccum Rotate
 LS6: Vaccum ON
 LS7: Hold Up
 LS8: Hold Down
 LS9: Bend Down
 LS10: Bend Up
 PH1: Supply Position
 PH2: Bend Position
 PH3: End Conveyor A

1M1: Solenoid Vaccum Backward
 1M2: Solenoid Vaccum Forward
 2M1: Solenoid Vaccum Up
 2M2: Solenoid Vaccum Down
 3M1: Solenoid Vaccum Rotate
 4M1: Solenoid Vaccum ON
 5M1: Solenoid Hold Up
 5M2: Solenoid Hold Down
 6M1: Solenoid Bend Down
 6M2: Solenoid Bend Up
 Q1: Contactor Conveyor A

Note: LS use Cylinder Sensor & PH Use Detent Switch

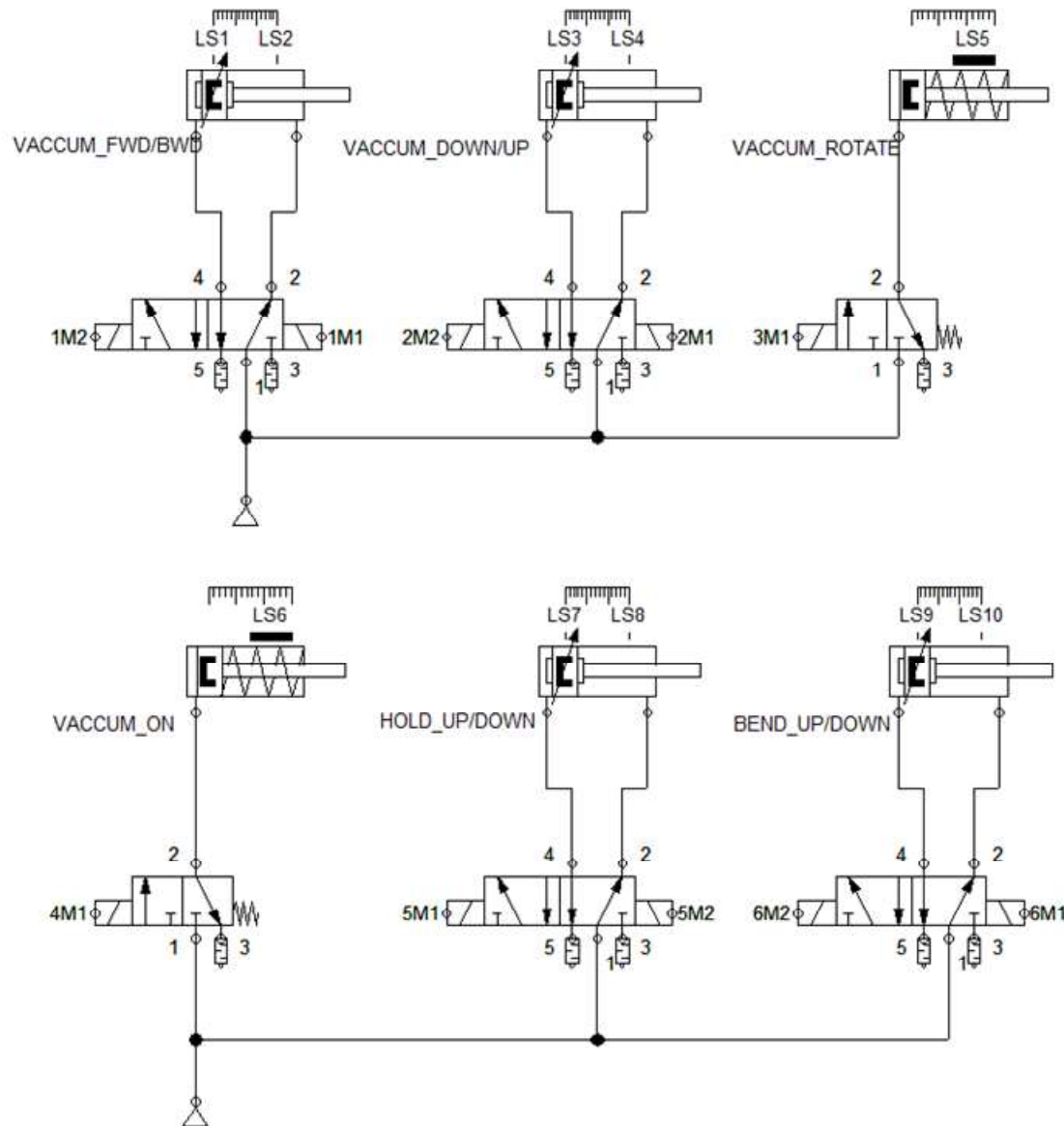
Simulation Start

Note : 0 = not actuated, not true
1 = actuated, true
CWR = Clockwise Rotation
CCWR = Counter Clockwise Rotation

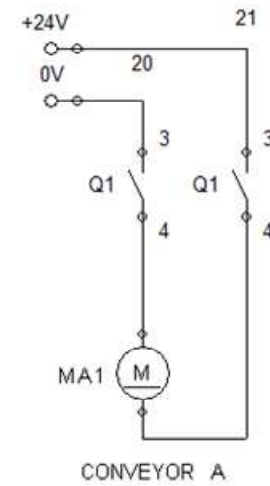


Contoh Rangkaian Fluidsim sesuai dengan deskripsi mesin dan flowchart pada soal kisi-kisi

PNEUMATIC CIRCUIT

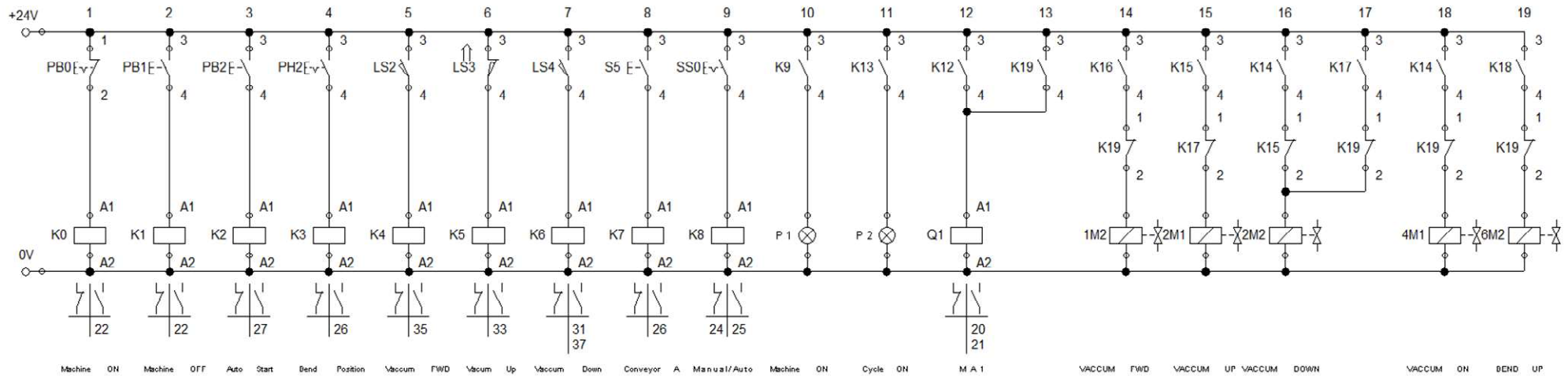


MAIN CIRCUIT



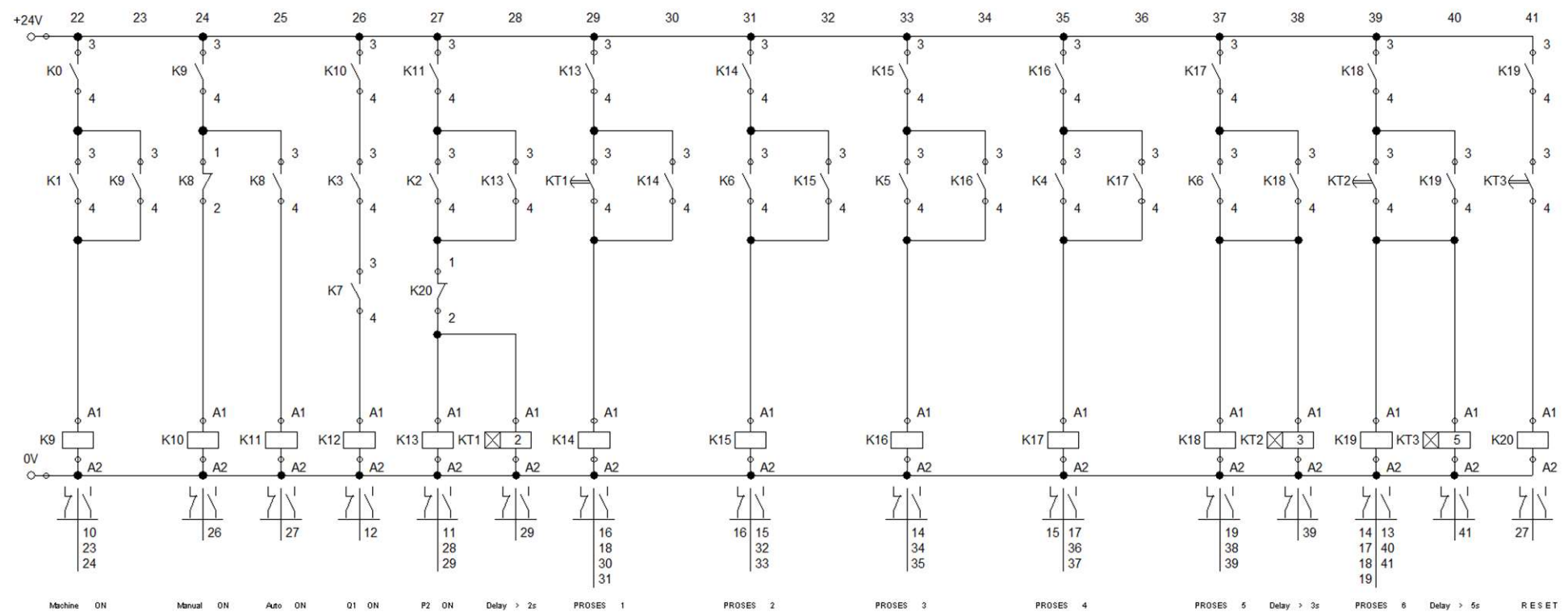
Contoh Rangkaian Fluidsim sesuai dengan deskripsi mesin dan flowchart pada soal kisi-kisi

INPUT OUTPUT CIRCUIT



Contoh Rangkaian Fluidsim sesuai dengan deskripsi mesin dan flowchart pada soal kisi-kisi

CONTROL CIRCUIT



FAULT FINDING INDUSTRIAL CONTROL

Worldskills_Indonesia_2022_Fault Finding

Submitted by :

Name : LODI JOYO SISWANTO

Member Country or region : ID

Nama : _____

Provinsi : _____



Modul B – Fault Finding

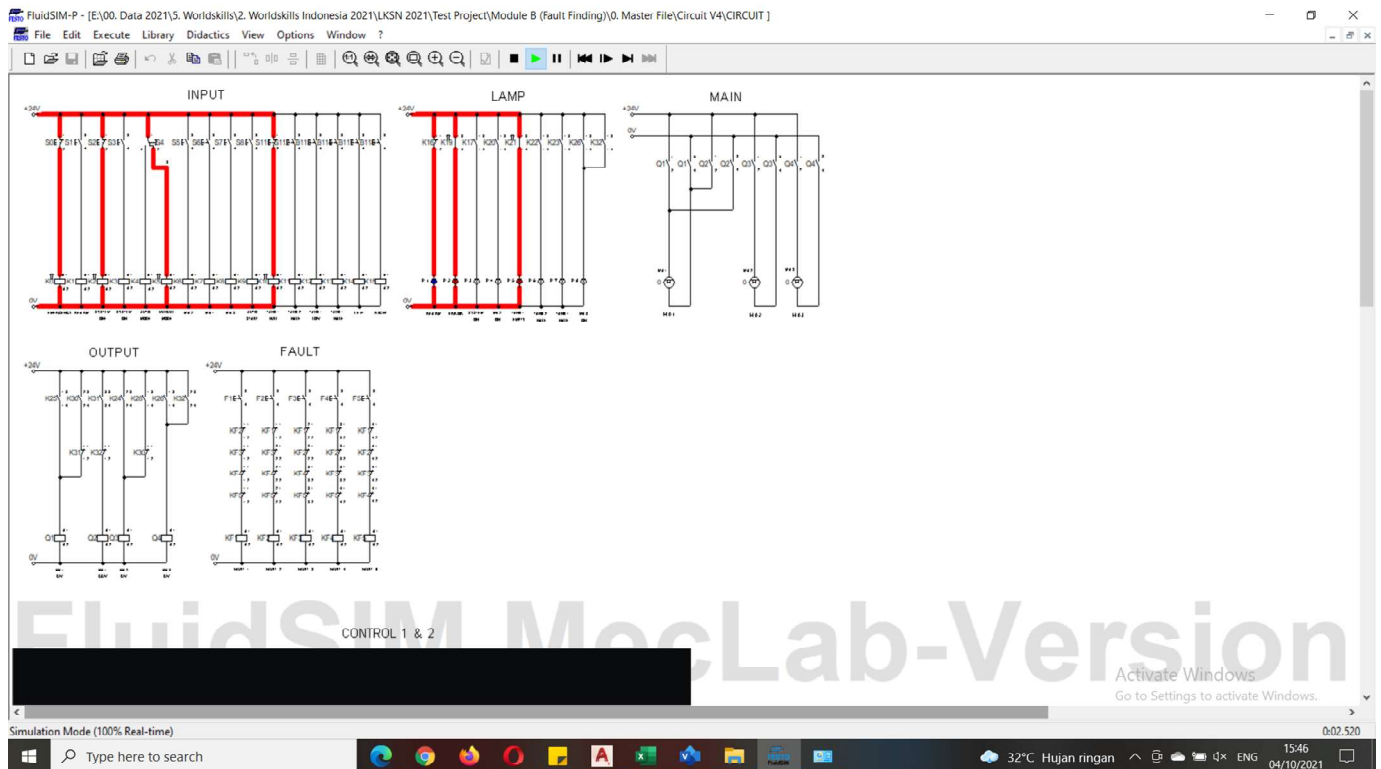
Waktu Pengerjaan : 30 Menit
Software : Google chrome remote desktop & **Fluidsim MecLab V4.5 Pneumatics** untuk simulasi mesin
Jumlah Fault : 5 Fault

Instruksi :

1. Peserta akan mulai dengan fault no.1
2. **Hanya ada 1 fault dalam satu waktu**
3. Peserta mensimulasikan mesin dan menganalisa fault yang ada sesuai dengan rangkaian yang diberikan
4. Peserta hanya diperbolehkan mensimulasikan dan melihat rangkaian main, input, lampu, output
5. **Peserta dilarang untuk membuka rangkaian kendali (control)**
karena semua fault terdapat pada rangkaian kendali
6. Sanksi pengurangan nilai akan diberikan jika membuka rangkaian kendali
7. Jika fault sudah diketahui, peserta diperbolehkan mengisi jenis fault dan posisinya pada lembar excel yang disediakan
8. Setiap fault, peserta diizinkan untuk menjawab 3 kemungkinan posisi fault karena proses analisa hanya menggunakan logika dan tidak menggunakan multimeter / tester. Jika peserta yakin dengan 1 posisi, peserta tidak diwajibkan untuk mengisi 2 kemungkinan posisi lainnya
9. Jika peserta mengisi lebih dari 1 posisi fault dan **salah satu posisi tidak masuk dalam kemungkinan**, maka **jawaban dianggap salah**
10. **Jika ingin pindah ke fault** berikutnya, **peserta harus memberitahu juri**. Setelah itu juri akan menonaktifkan fault saat ini dan mengaktifkan fault selanjutnya
11. **Peserta tidak dapat kembali ke fault sebelumnya**

Penjelasan Rangkaian

Tampilan rangkaian Fault Finding :

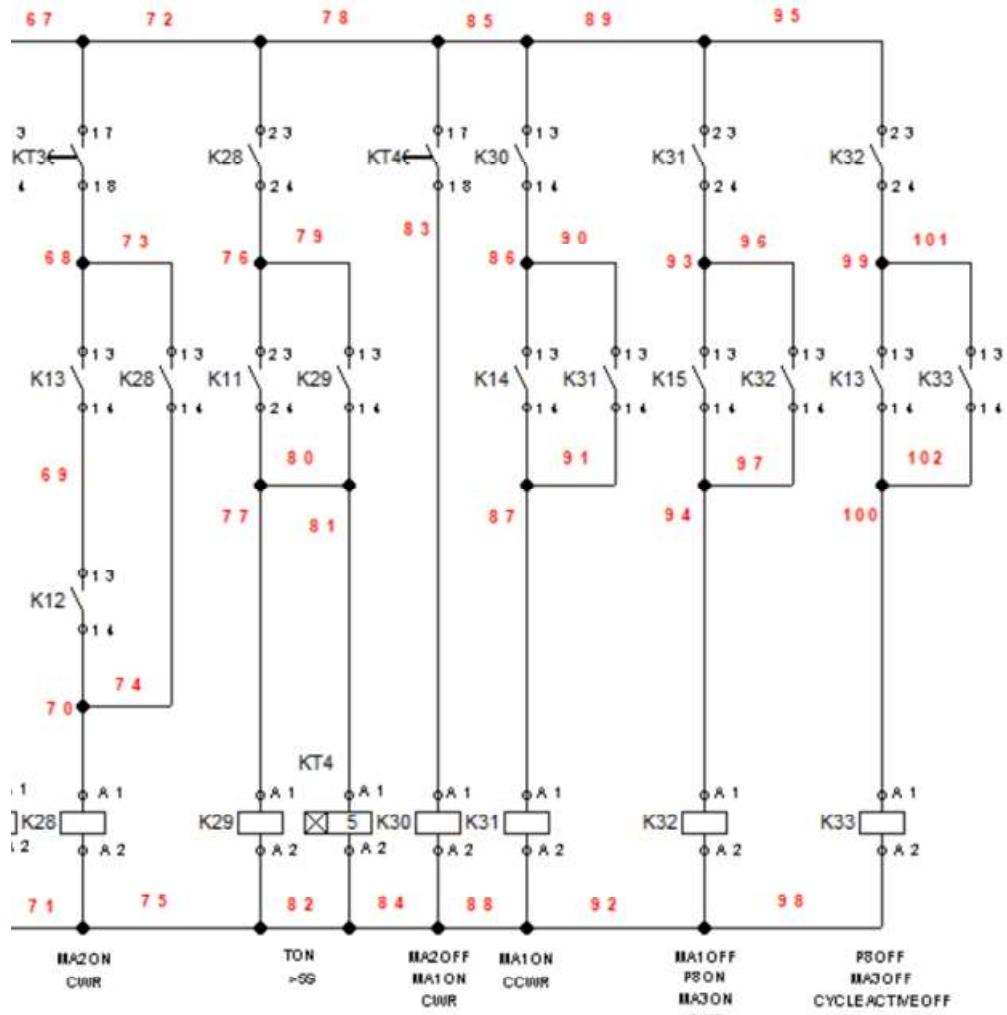


Peserta hanya diperbolehkan mengoperasikan rangkaian input, lamp, main dan output saat waktu tes / simulasi

Fault hanya terdapat pada rangkaian control circuit, sehingga **peserta dilarang membuka shape pada rangkaian control circuit.**

Peserta dilarang mematikan Simulasi

Penjelasan Fault



Nomor berwarna merah = nomor kabel / posisi fault

Jenis Fault :

Open circuit (OC) = kabel putus

Short circuit (SC) = kabel terhubung / jumper

Contoh Kasus :

Fault No. 1

Setelah peserta melakukan simulasi mesin dan analisa, ternyata kemungkinan fault terjadi karena K31 tidak holding/ mengunci. Maka kemungkinan faultnya yaitu open circuit pada nomor kabel 90 atau nomor kabel 91

Fault No. 2

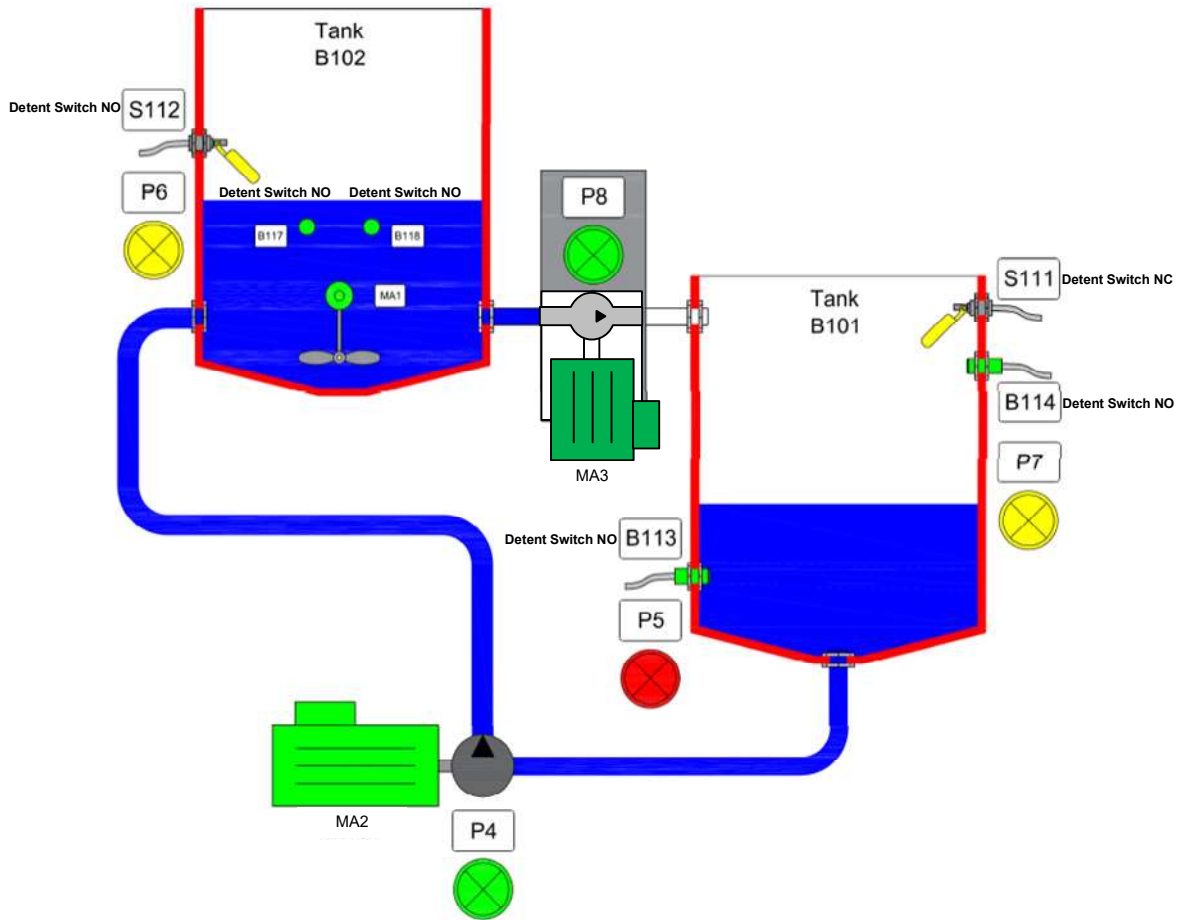
Setelah peserta melakukan simulasi mesin dan analisa, ternyata kemungkinan fault terjadi karena Q1 ON sebelum detail waktu 5S. Maka kemungkinan faultnya yaitu short circuit pada nomor kabel 78-83, atau nomor kabel 79-83

Berdasarkan contoh kasus diatas, maka cara pengisian lembar jawaban yang benar seperti berikut

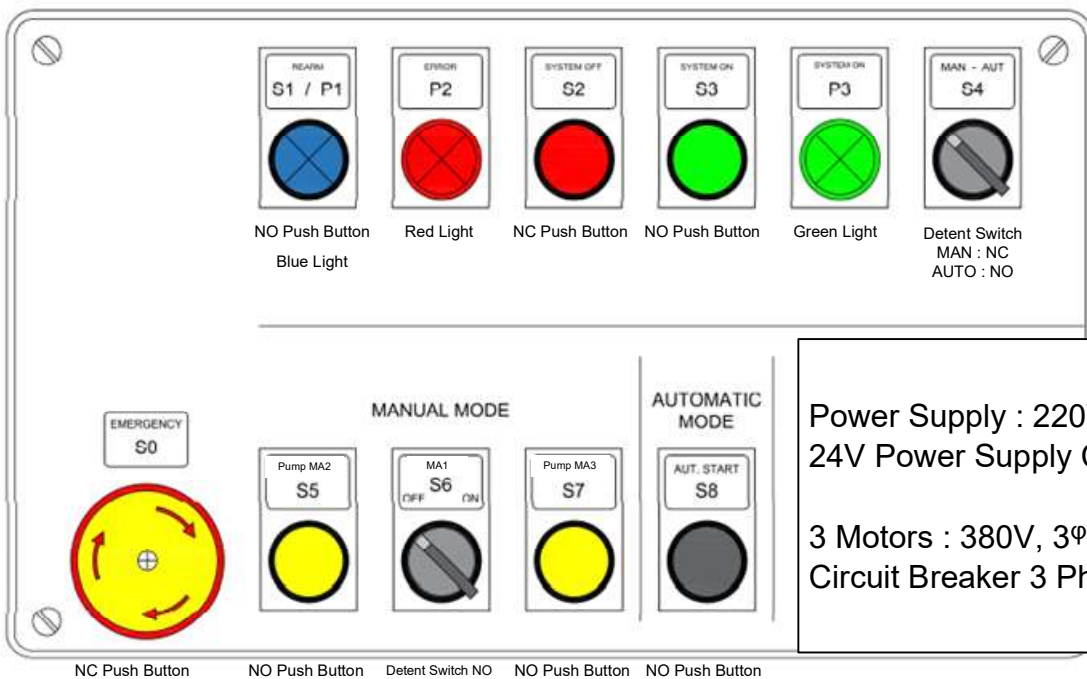
Fault No.	Type	Posisi 1	Posisi 2	Posisi 3
1	OC	90	91	
2	SC	78-83	79-83	
3				
4				
5				

Lembar jawaban berupa excel sheet yang terdapat pada komputer juri

Representation of System



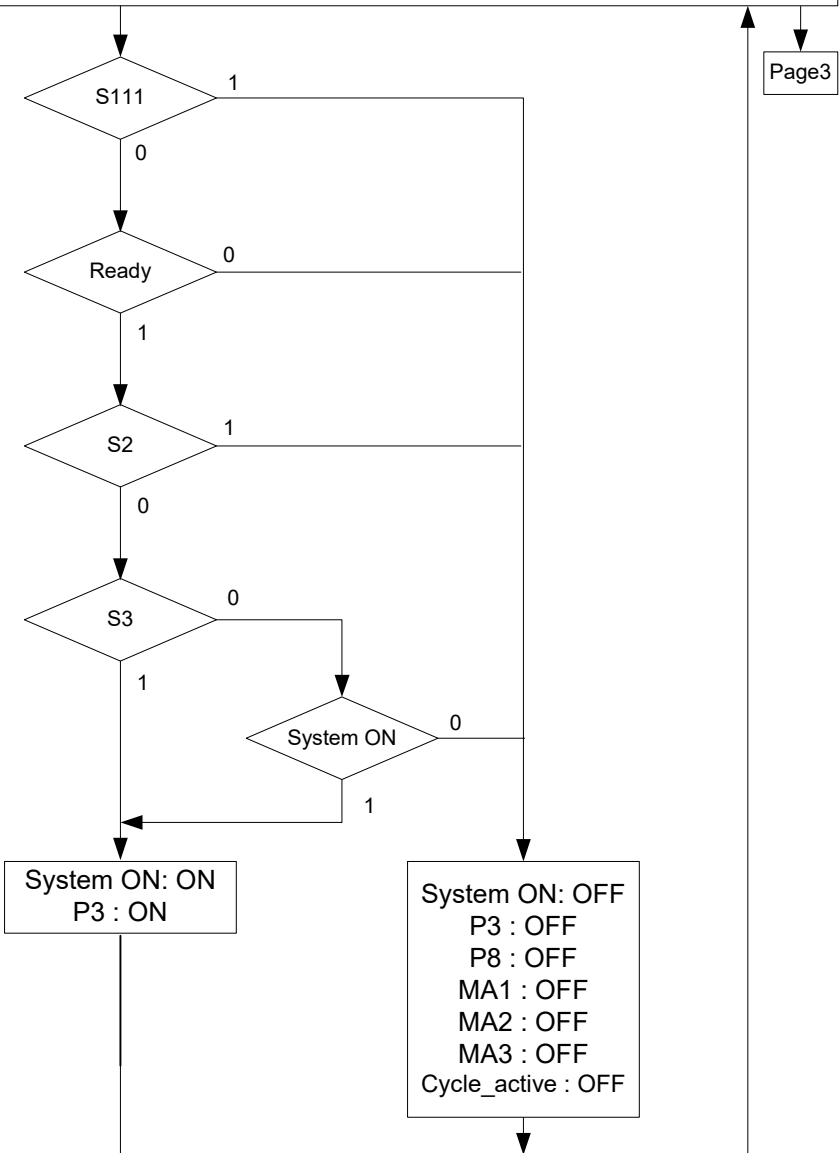
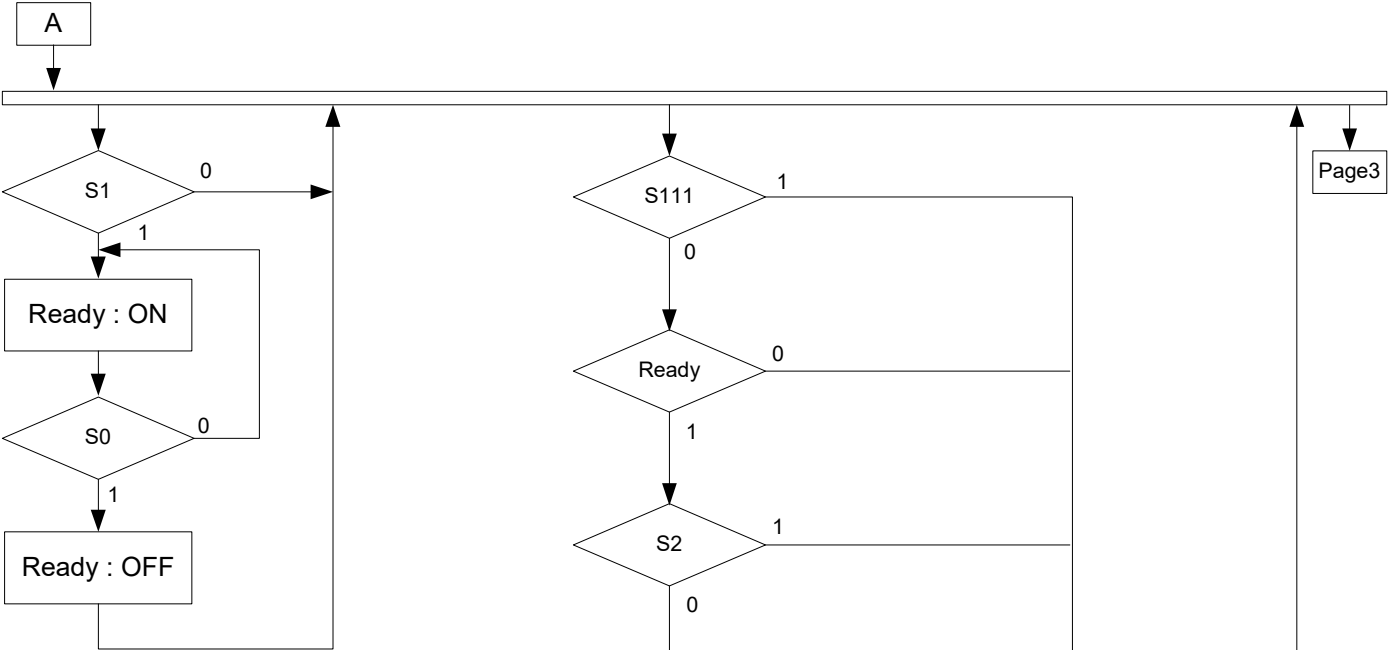
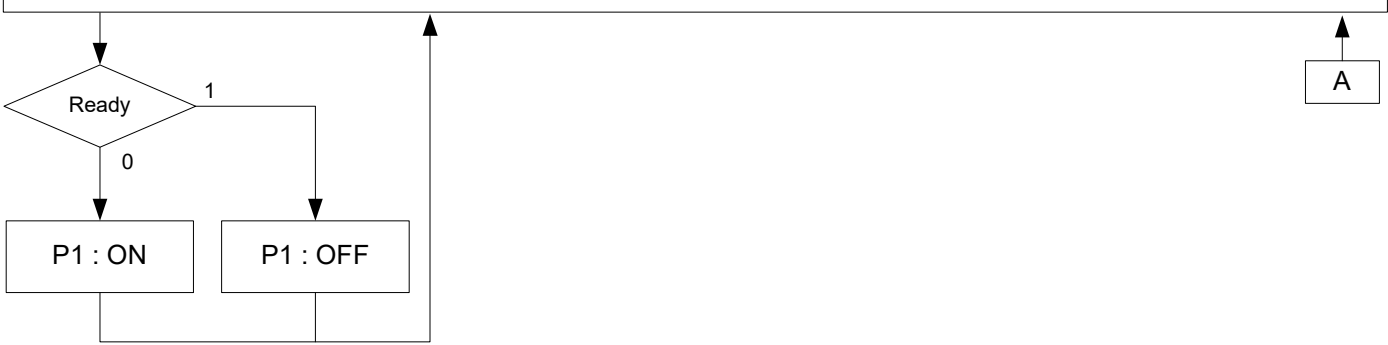
Control Panel & Switches

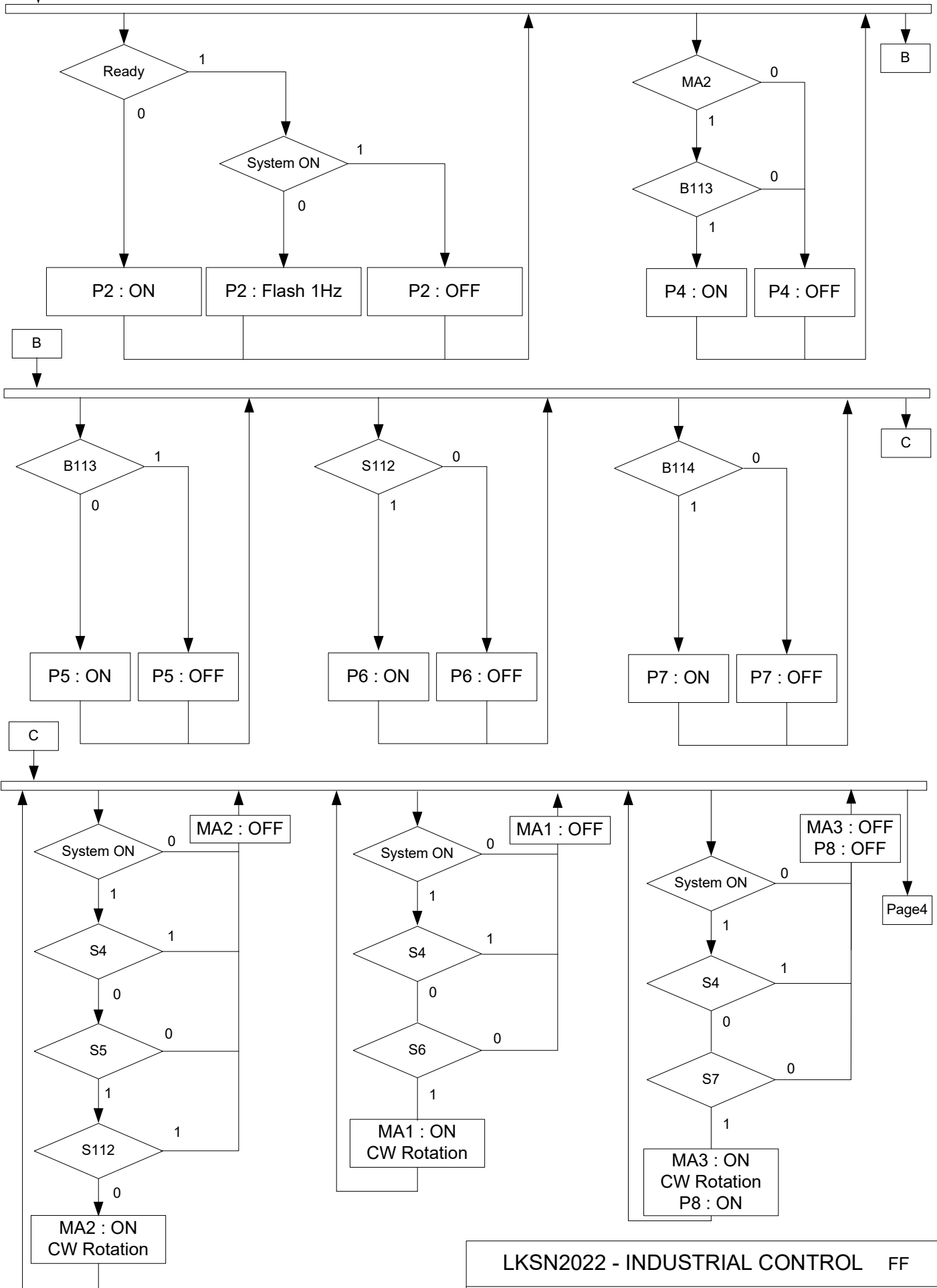


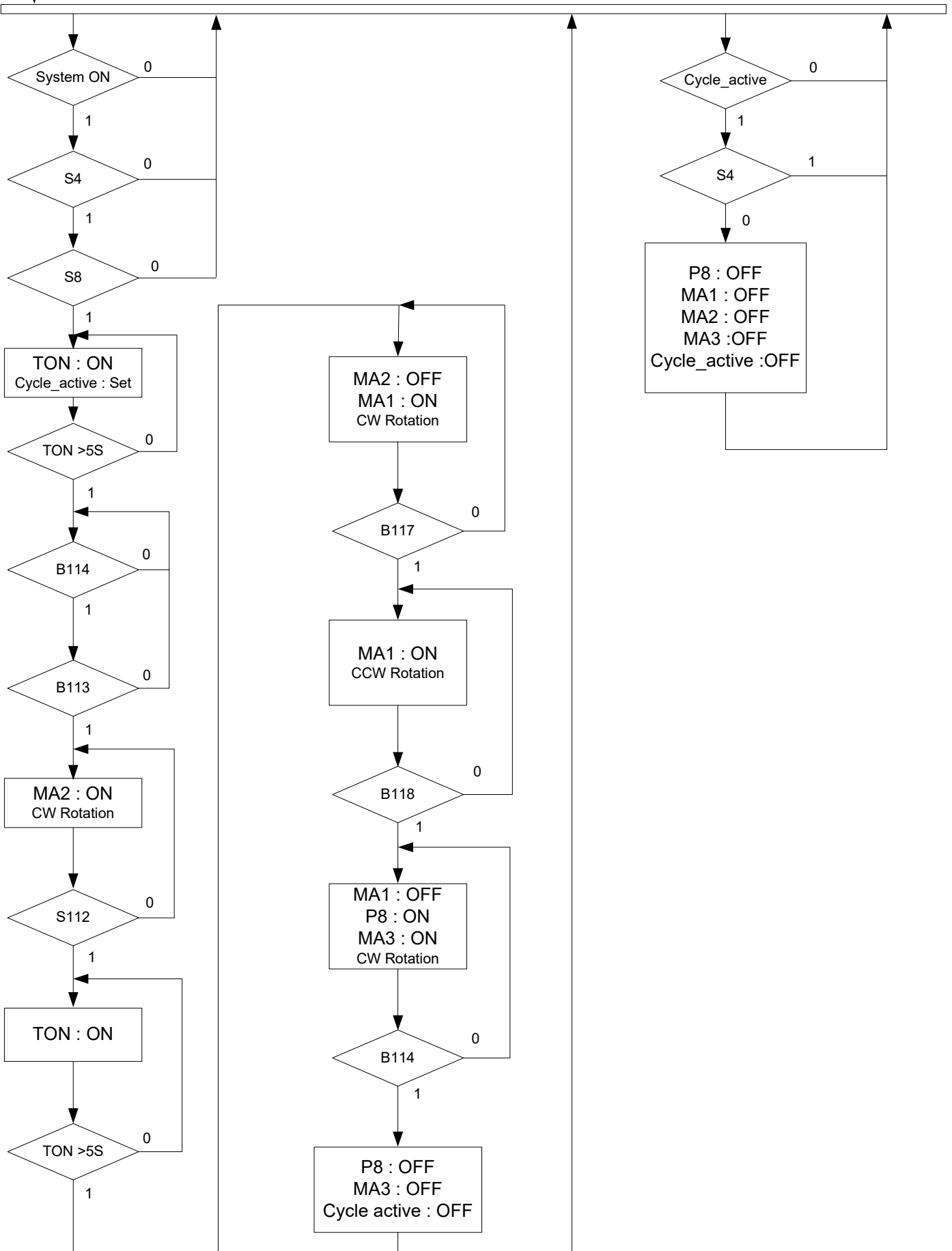
Power Supply : 220V/380V 3 ϕ
 24V Power Supply Control Circuit
 3 Motors : 380V, 3 ϕ , 50Hz, 3 wires
 Circuit Breaker 3 Phase (F1)

Simulation Start

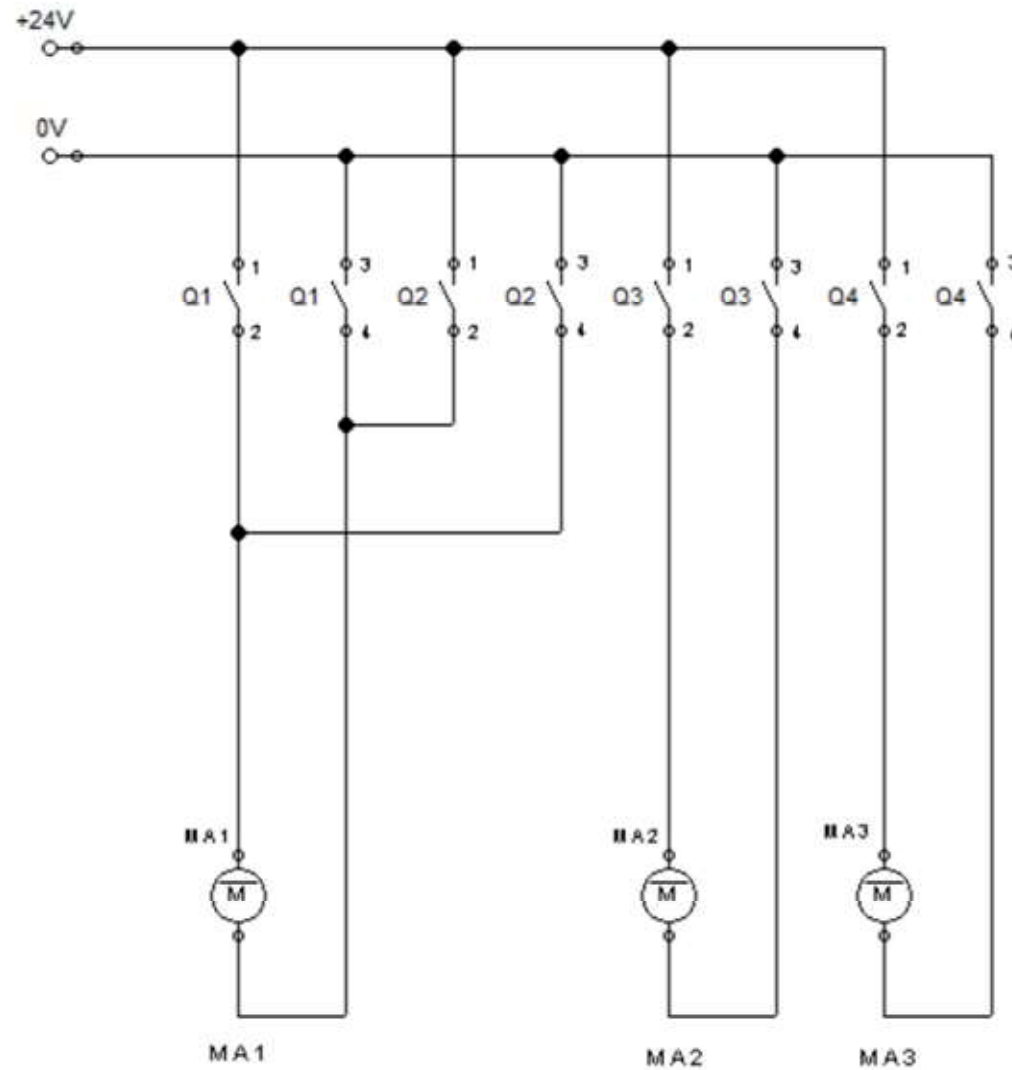
Note : 0 = not actuated, not true
1 = actuated, true



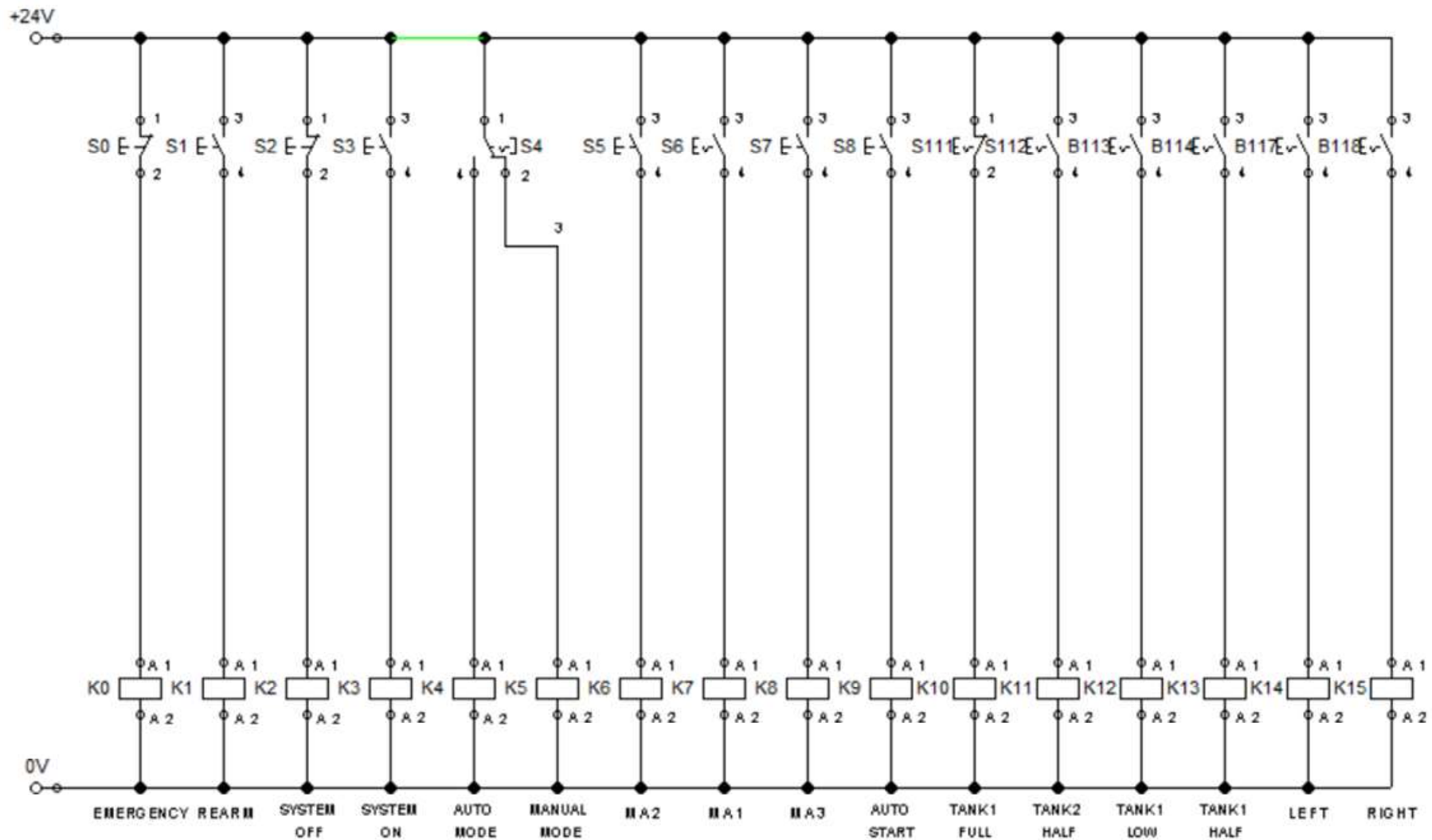




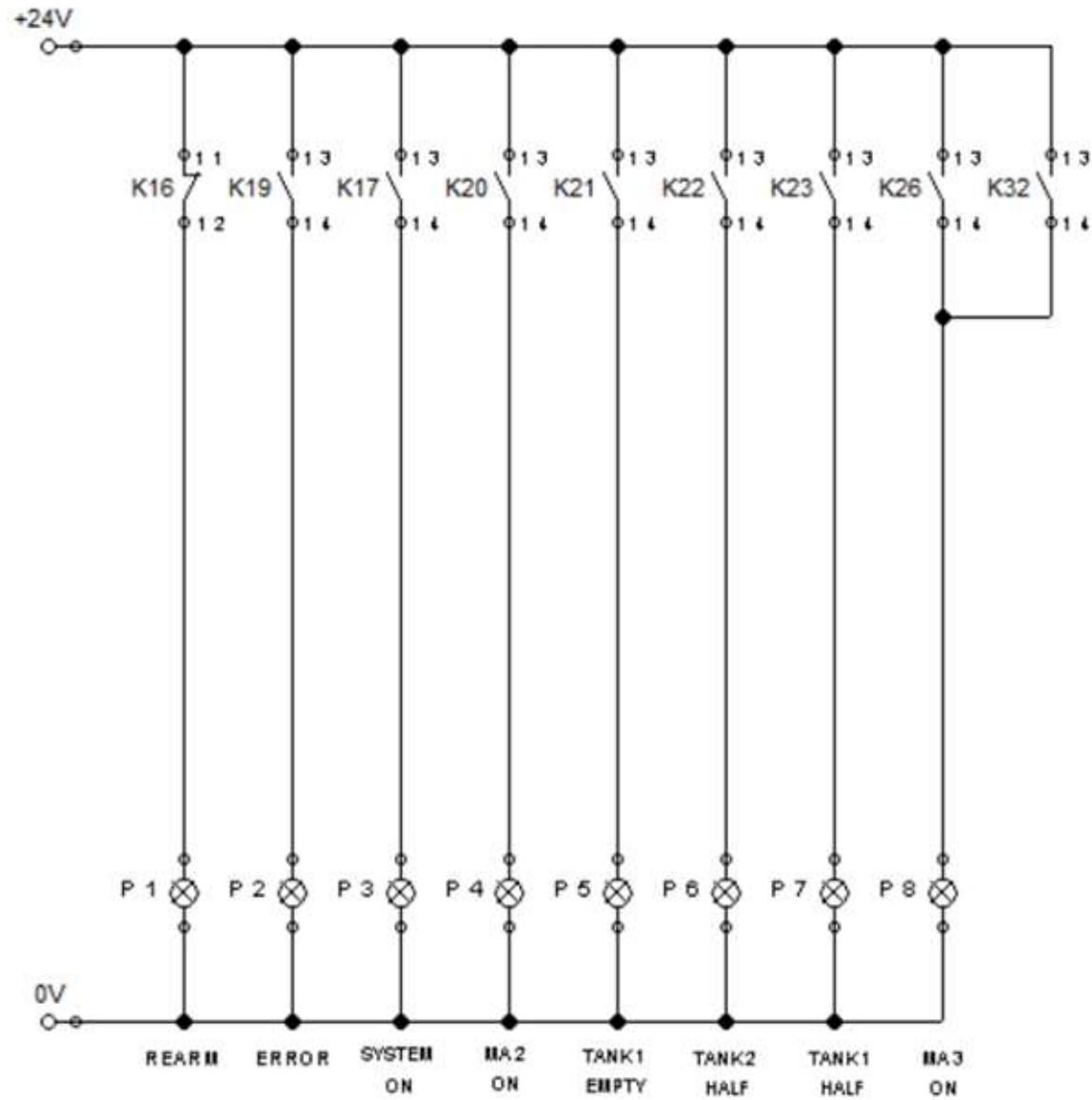
MAIN



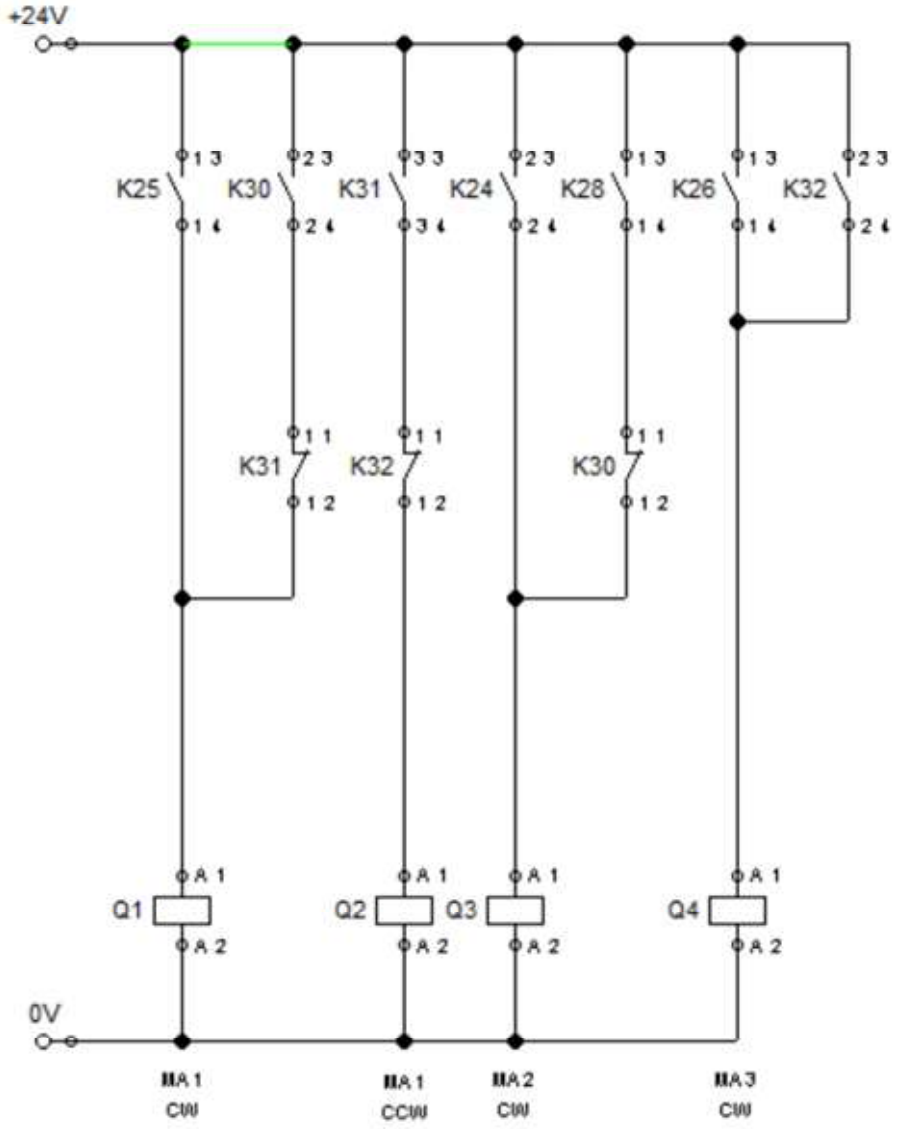
INPUT



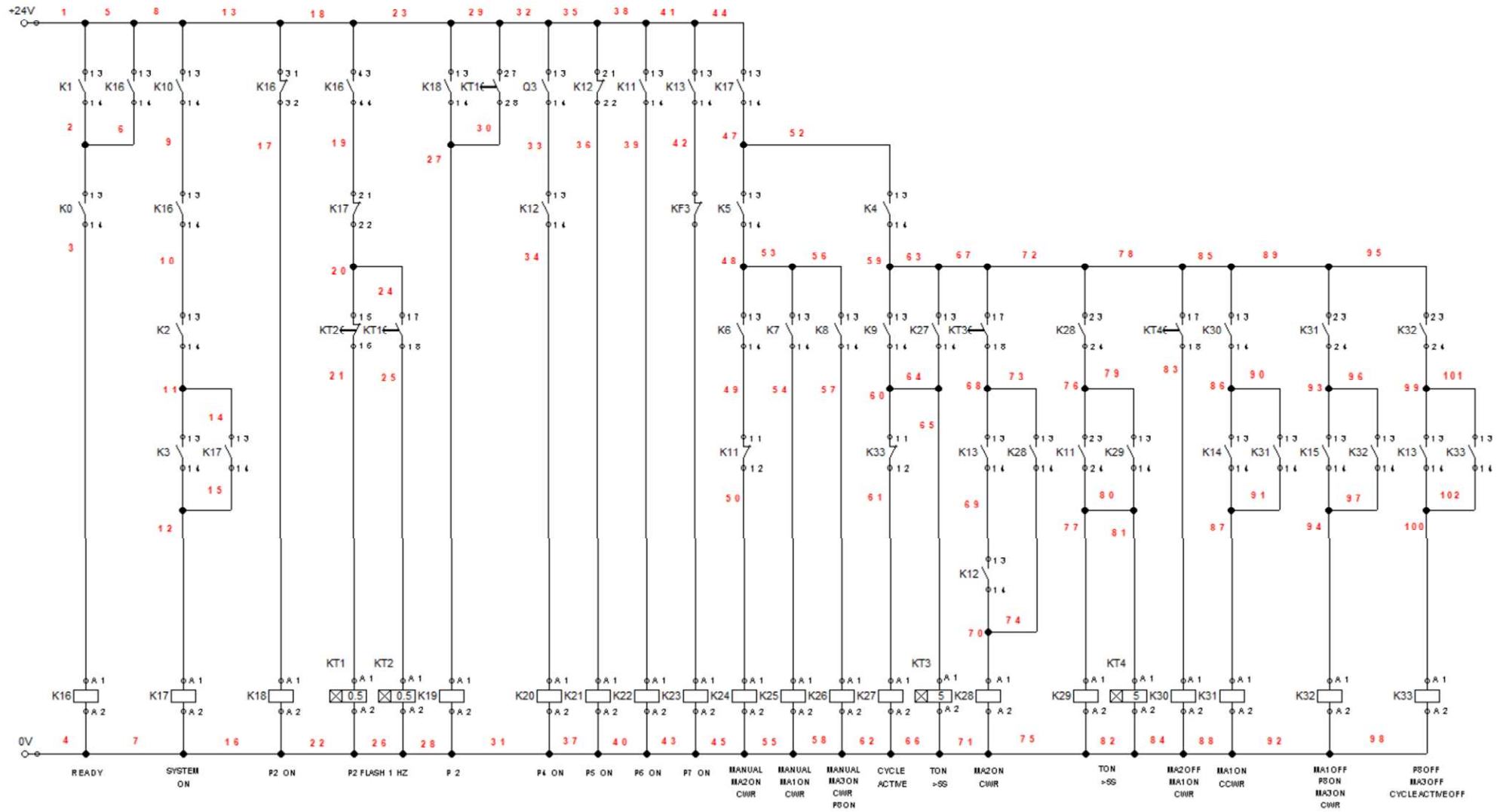
LAMP



OUTPUT



CONTROL CIRCUIT



TEST PROJECT

MODULE C (MAIN_PROJECT)

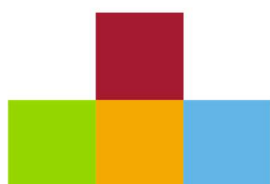
INDUSTRIAL CONTROL

WORLDSKILLS_INDONESIA_2022_MP_PRE

Submitted by:

Name: Lodi Joyo Siswanto

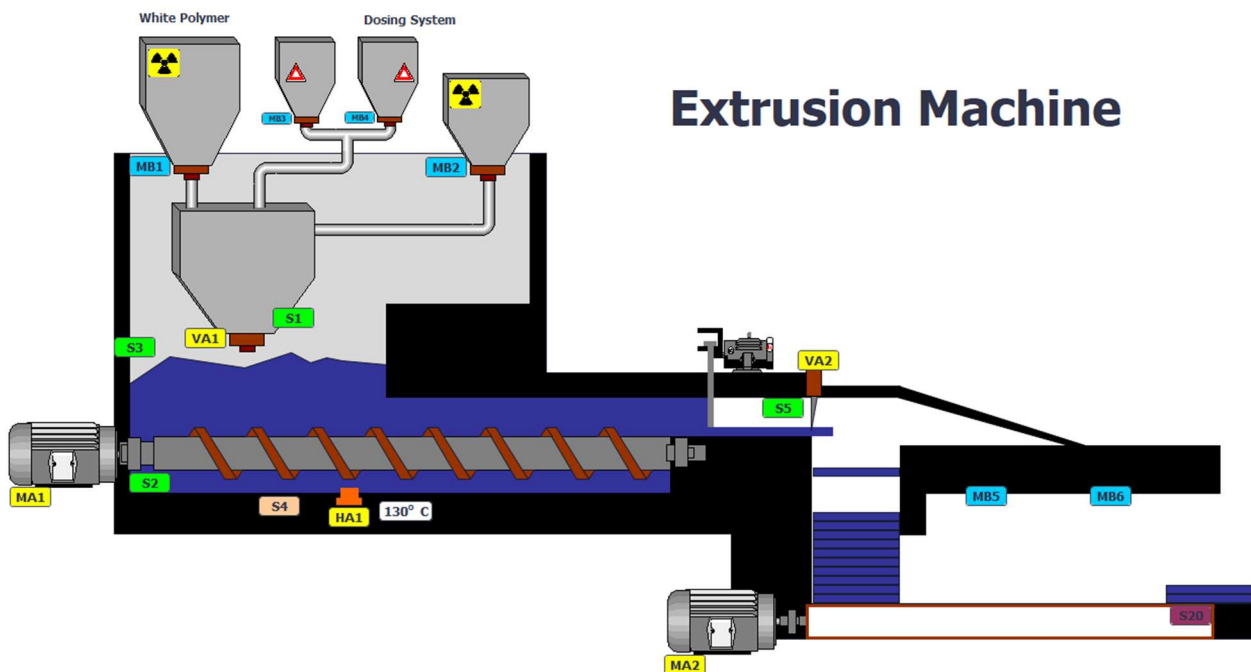
Member country or region: ID





Module 1 – Main project

With the attached mounting layout and its electrical diagrams it is intended to simulate the operation of the following **Extrusion Machine**.



Legend :

MA1: Mixing motor

MA2: After Cutting Conveyor

VA1: Materials Valve

VA2: Cutting Valve

HA1: Materials Heater

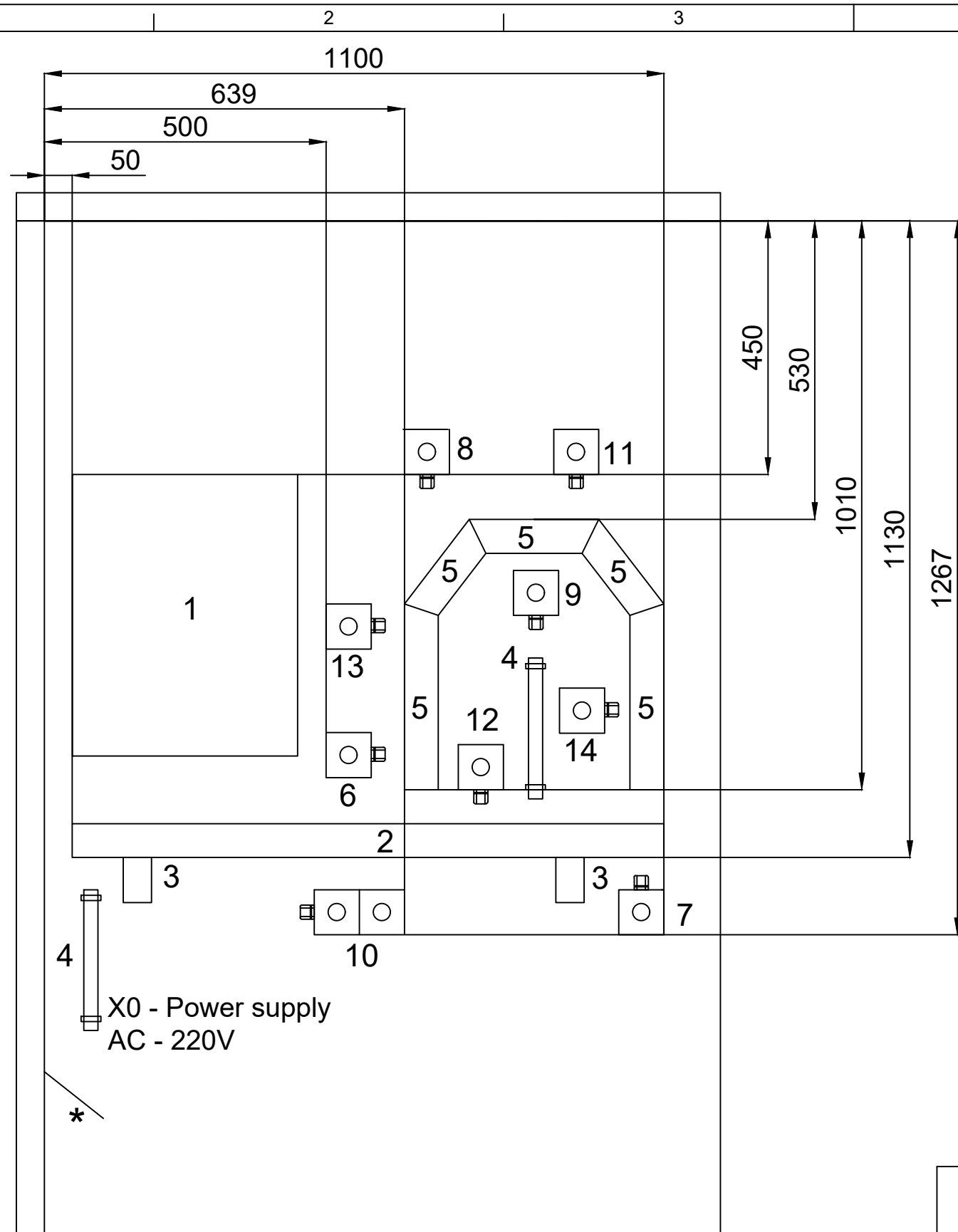
S1: Tank Materials Empty

S2: Chamber Empty

S3: Chamber Full

S4: Temperature Reached

S5: Cutting Position



1. Control Box (400x500mm)
2. Cable tray (100x60mm)
3. Bracket cable tray
4. PVC tube 20mm
5. Wall duct (60x40mm)
6. Housing MA1
7. Housing MA2
8. Housing VA1
9. Housing VA2
10. Housing (HA1 & S4)
11. Housing S1
12. Housing S2
13. Housing S3
14. Housing S5

WALL INSTALLATION NOT IN SCALE

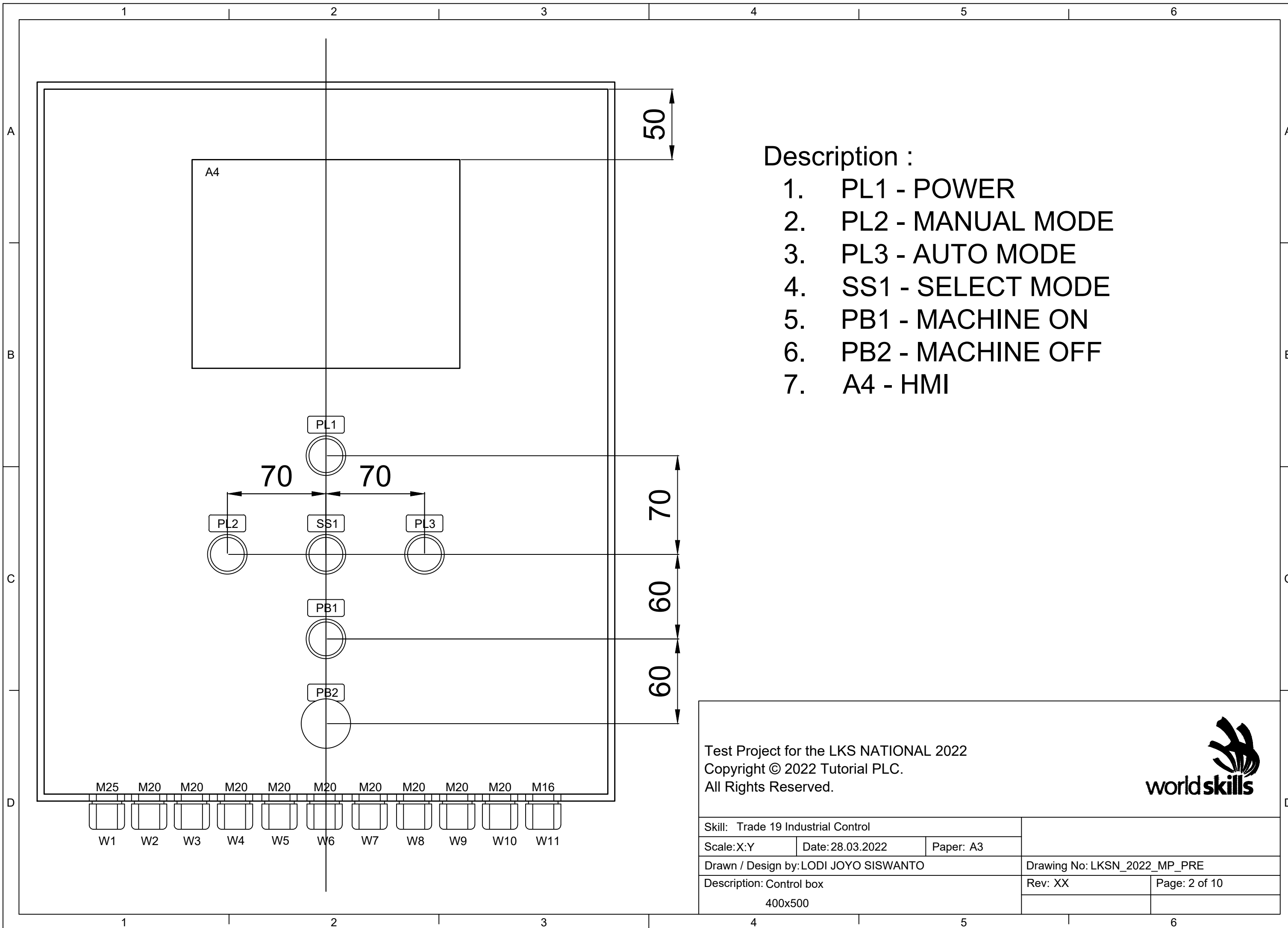
* All measurements from a horizontal and vertical line ap 10 - 30mm from the end of the booth.

All devices, which are not in the mesuarements, the mounting is up to the competitor

Test Project for the LKS NATIONAL 2022
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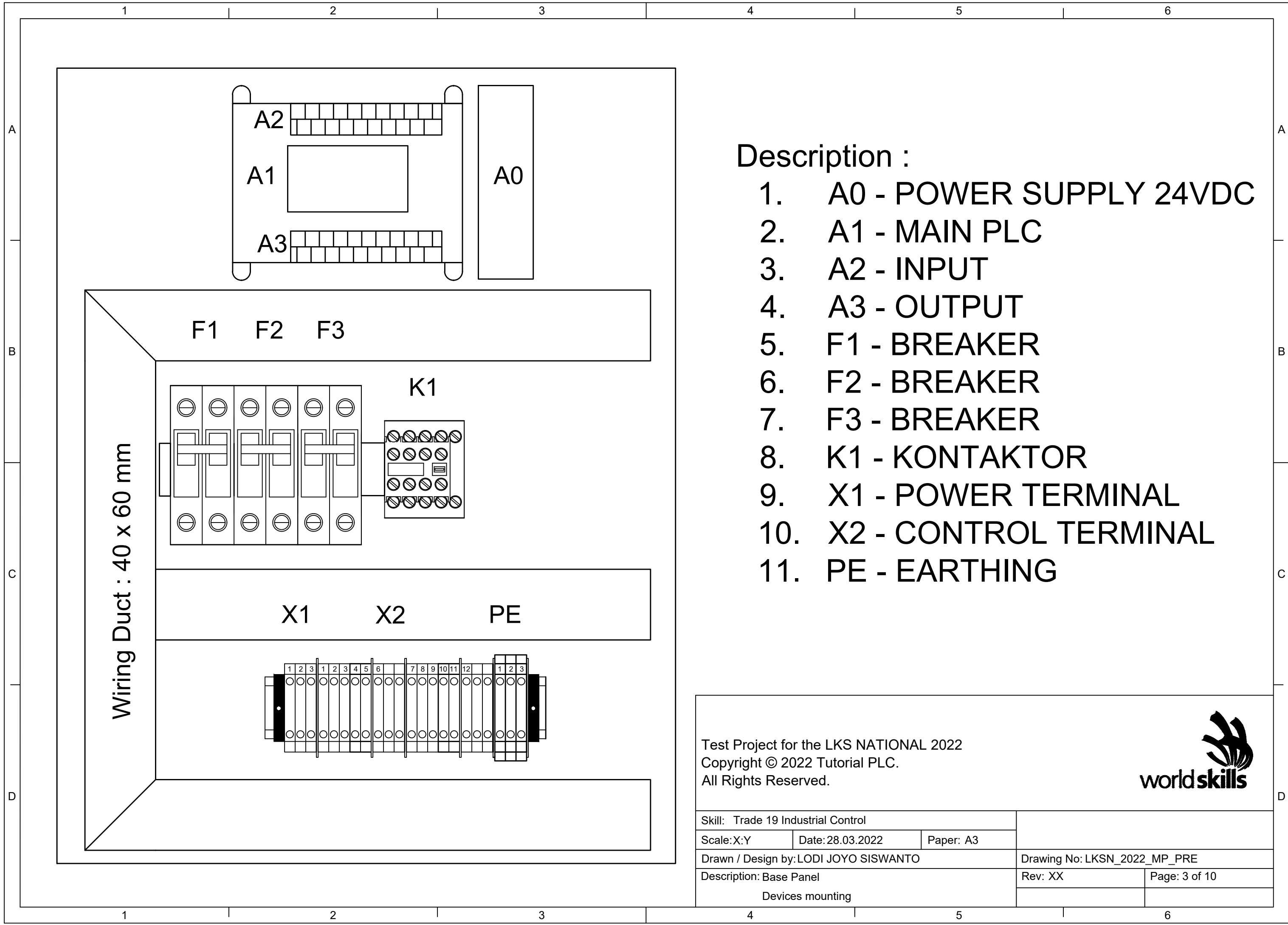
Skill: Industrial Control 19				
Scale: X:Y	Date: 28.03.2022	Paper: A3		
Drawn / Design by: LODI JOYO SISWANTO			Drawing No: LKSN_2022_MP_PRE	
Description: Wall layout			Rev:	Page: 1 of 10



Description :

1. PL1 - POWER
2. PL2 - MANUAL MODE
3. PL3 - AUTO MODE
4. SS1 - SELECT MODE
5. PB1 - MACHINE ON
6. PB2 - MACHINE OFF
7. A4 - HMI

Test Project for the LKS NATIONAL 2022 Copyright © 2022 Tutorial PLC. All Rights Reserved.				
Skill: Trade 19 Industrial Control				
Scale: X:Y	Date: 28.03.2022	Paper: A3		
Drawn / Design by: LODI JOYO SISWANTO		Drawing No: LKSN_2022_MP_PRE		
Description: Control box 400x500		Rev: XX	Page: 2 of 10	



Description :

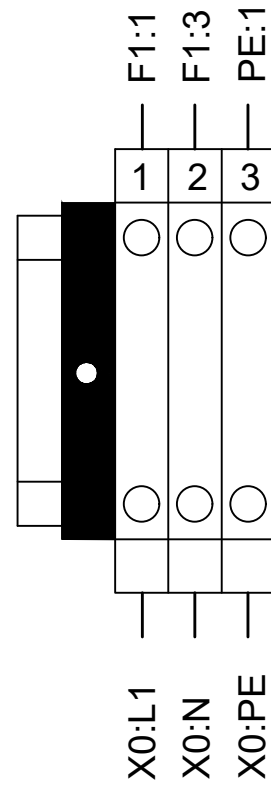
1. A0 - POWER SUPPLY 24VDC
2. A1 - MAIN PLC
3. A2 - INPUT
4. A3 - OUTPUT
5. F1 - BREAKER
6. F2 - BREAKER
7. F3 - BREAKER
8. K1 - KONTAKTOR
9. X1 - POWER TERMINAL
10. X2 - CONTROL TERMINAL
11. PE - EARTHING

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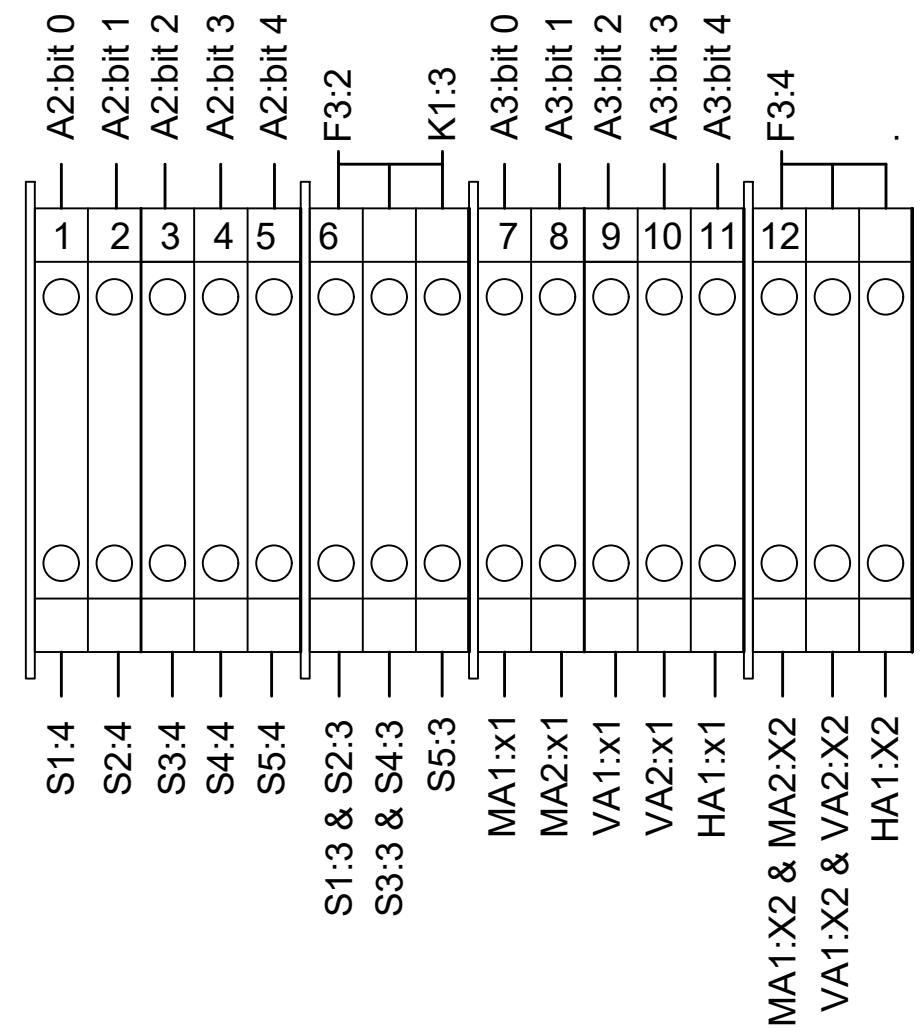


Skill: Trade 19 Industrial Control					
Scale: X:Y	Date: 28.03.2022	Paper: A3			
Drawn / Design by: LODI JOYO SISWANTO			Drawing No: LKSN_2022_MP_PRE		
Description: Base Panel			Rev: XX	Page: 3 of 10	
Devices mounting					

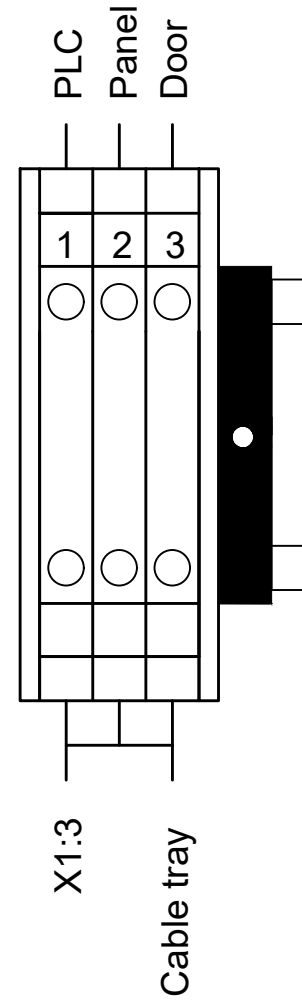
X1



X2




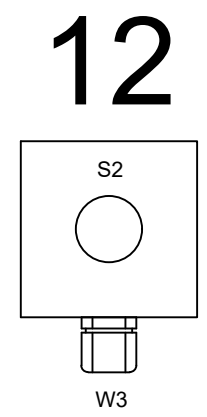
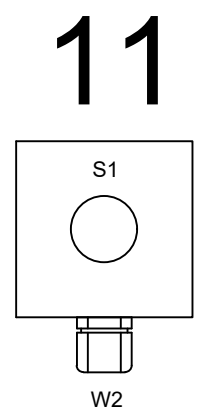
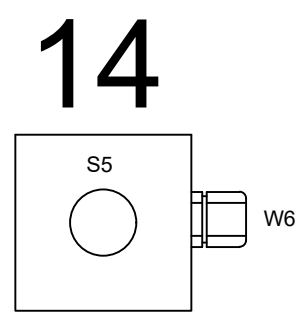
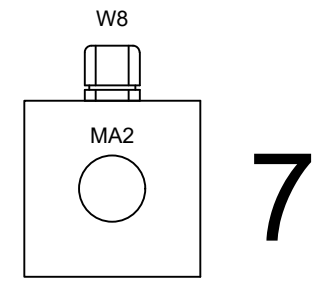
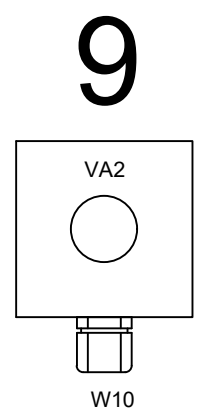
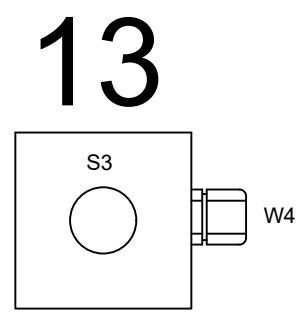
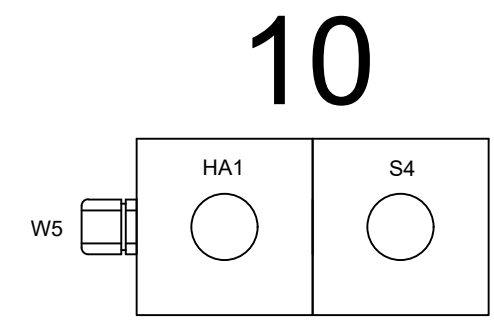
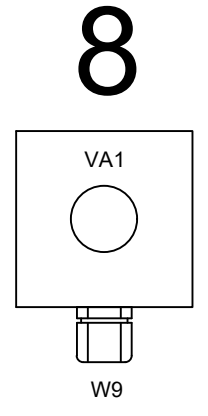
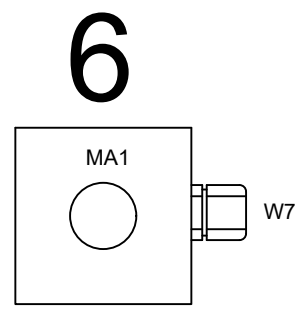
PE



Note :

1. PE use Terminal size 30
2. X1, X2 use Terminal size 10

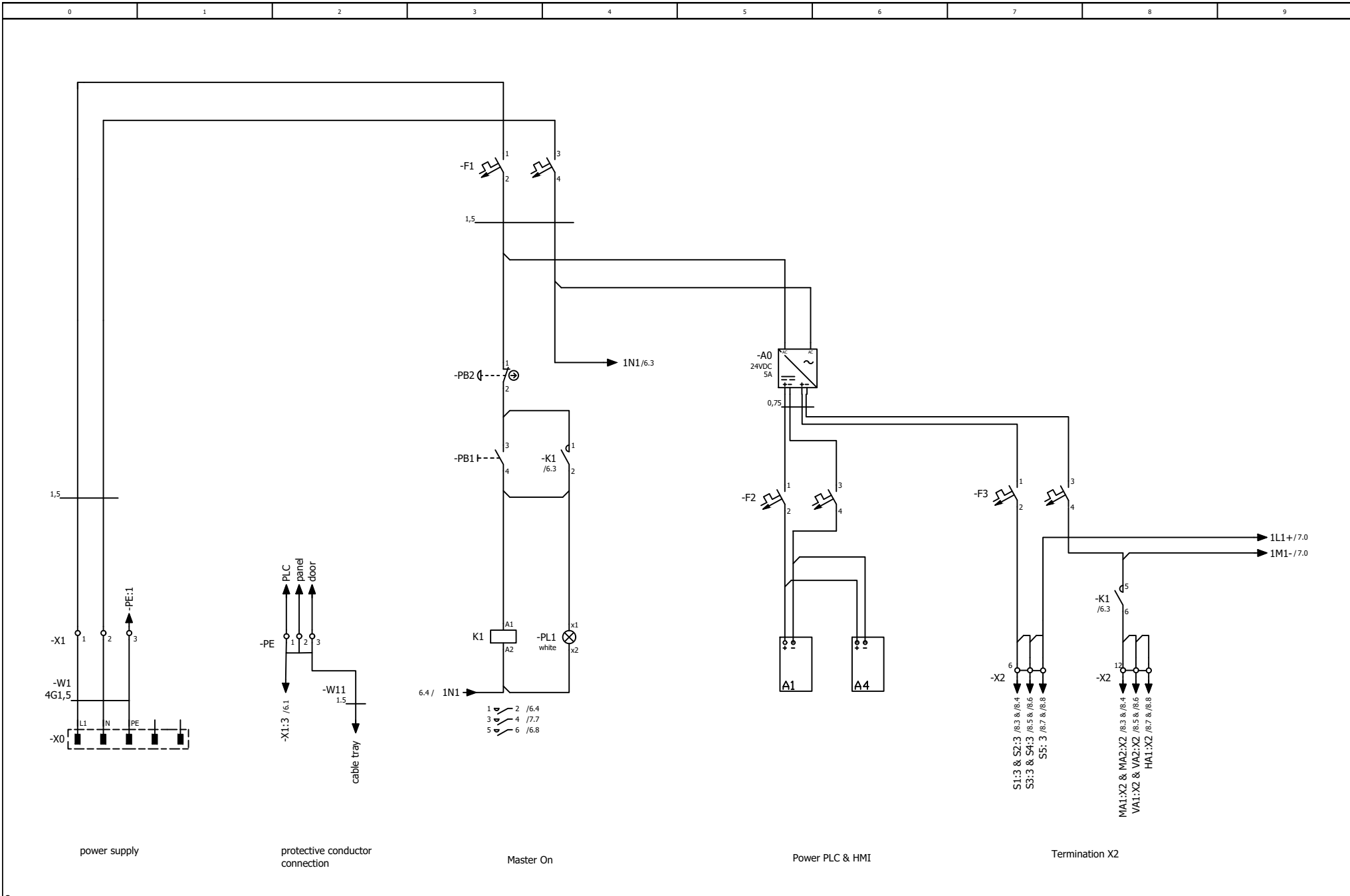
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Skill: Trade 19 Industrial Control			
Scale: X:Y	Date: 28.03.2022	Paper: A3	
Drawn / Design by: LODI JOYO SISWANTO		Drawing No: LKSN_2022_MP_PRE	
Description: Termination		Rev:	Page: 4 of 10



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Skill: Trade 19 Industrial Control					
Scale: X:Y	Date: 28.03.2022	Paper: A3			
Drawn / Design by: LODI JOYO SISWANTO			Drawing No: LKSN_2022_MP_PRE		
Description: Detail - Cable Number			Rev:	Page: 5 of 10	



2		Datum	28.03.2021	LKS NATIONAL2022 Industrial Control	Main Circuit	=	LKS_N_2022_MP_PRE	Blatt 6
		Bearb.	LODI JOYO SISWANTO					
		Gepr.						
Änderung	Datum	Name	Urspr	Ersatz von	Ersetzt durch			Blatt 10

PLC - INPUTS

<u>INPUT</u>	<u>ADDRESS</u>	<u>SYMBOL</u>	<u>FUNCTION</u>
I 0	S1	Tank Materials Empty
I 1	S2	Chamber Empty
I 2	S3	Chamber Full
I 3	S4	Temperature Reached
I 4	S5	Cutting Position
I 5		
I 6	K1	Ready
I 7	SS1	Mode Select
I 8		
I 9		
I 10		
I 11		
I 12		
I 13		
I 14		
I 15		

PLC - OUTPUTS

<u>OUTPUT</u>	<u>ADDRESS</u>	<u>COLOR</u>	<u>SYMBOL</u>	<u>FUNCTION</u>
Q 0	GREEN	MA1	Mixing Motor
Q 1	GREEN	MA2	After Cutting Conveyor
Q 2	GREEN	VA1	Materials Valve
Q 3	GREEN	VA2	Cutting Valve
Q 4	YELLOW	HA1	Materials Heater
Q 5			
Q 6	GREEN	PL2	Manual Mode
Q 7	GREEN	PL3	Auto Mode
Q 8			
Q 9			
Q 10			
Q 11			
Q 12			
Q 13			
Q 14			
Q 15			

TESTPROJECT MODULED(PROGRAMMING) INDUSTRIAL CONTROL

LKSNATIONAL_2022_HMI_PRE

Submitted by:

Name: Lodi Joyo Siswanto

Member country or region: ID

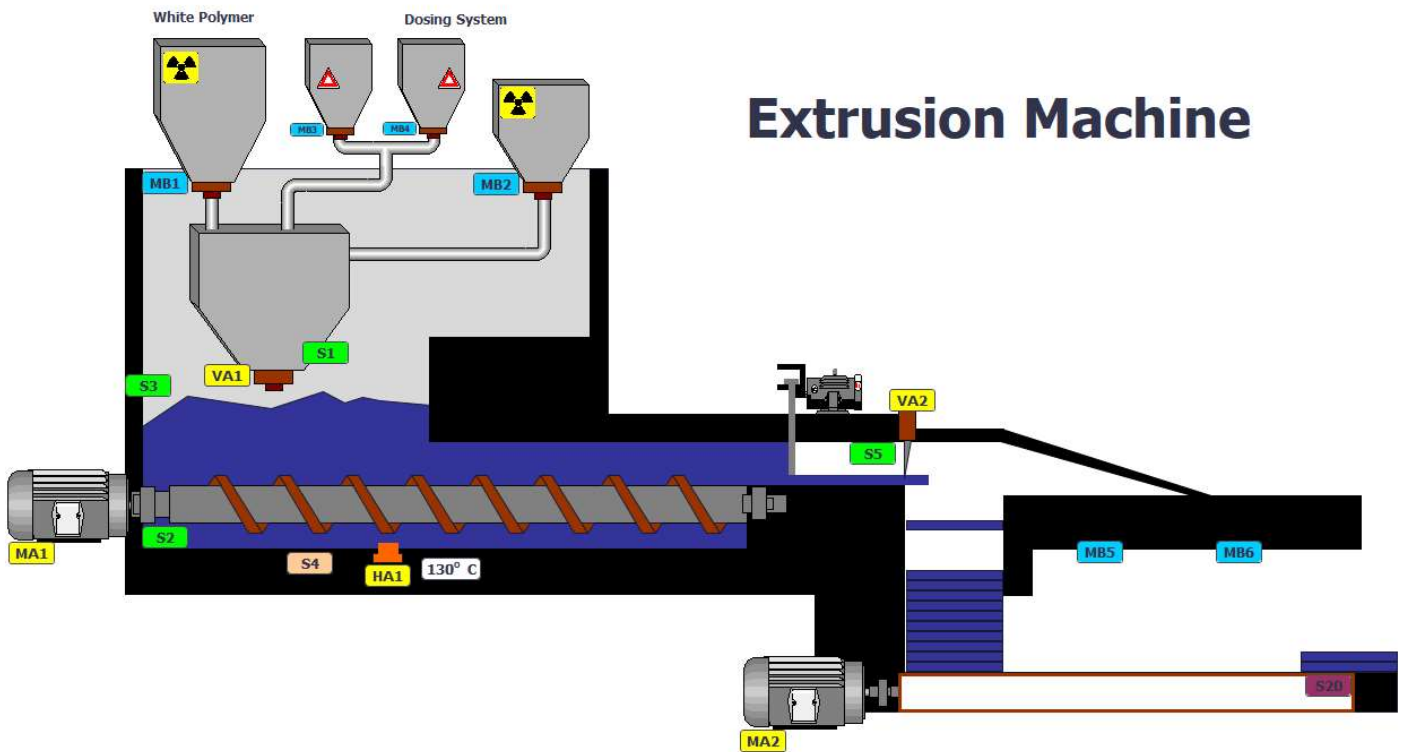




Module D– Main project

With the attached mounting layout and its electrical diagrams it is intended to simulate the operation of the following **Extrusion Machine**.

Extrusion Machine



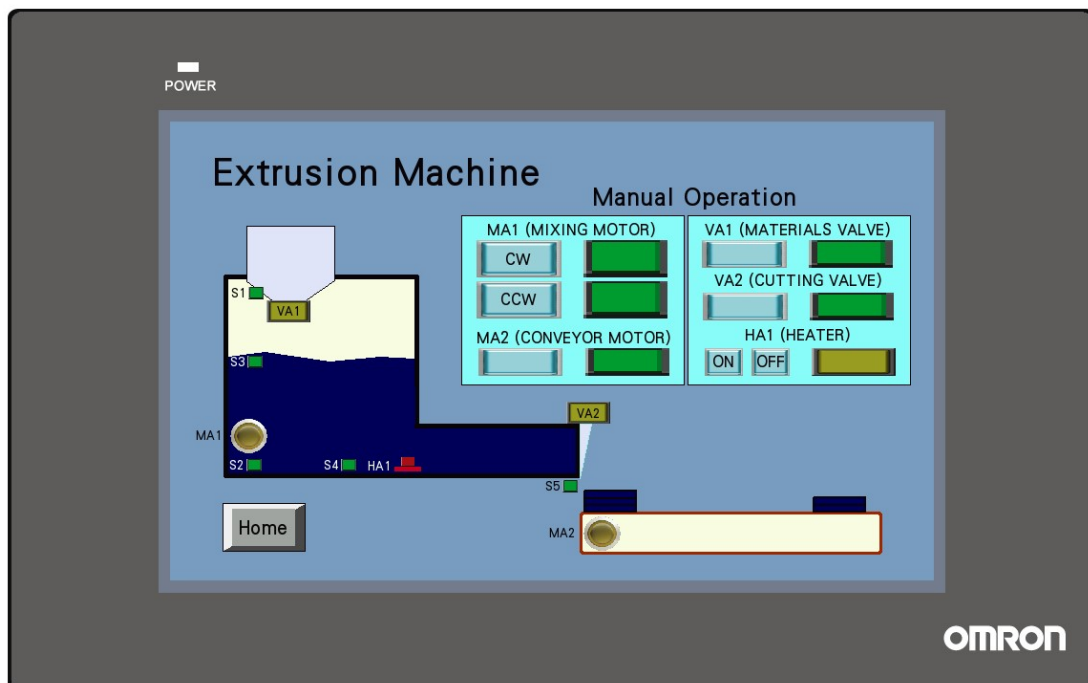
Legend :

- MA1:** Mixing motor
- MA2:** After Cutting Conveyor
- VA1:** Materials Valve
- VA2:** Cutting Valve
- HA1:** Materials Heater
- S1:** Tank Materials Empty
- S2:** Chamber Empty
- S3:** Chamber Full
- S4:** Temperature Reached
- S5:** Cutting Position

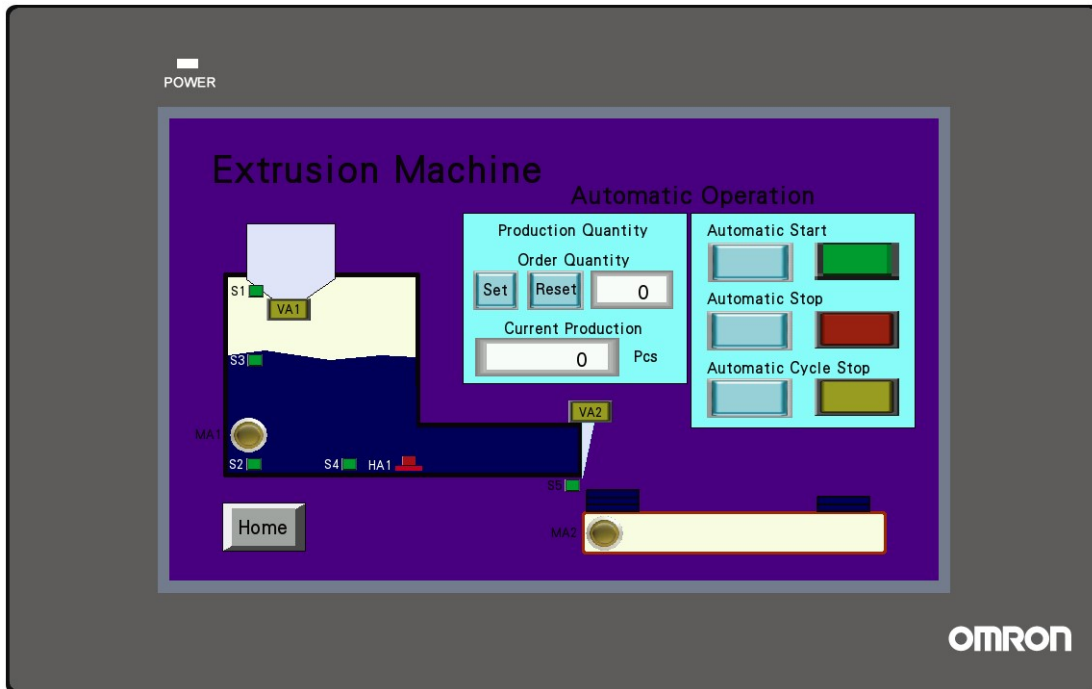
HMI – Screen “HOME”



HMI – Screen “Manual”



HMI – Screen “Automatic”



PLC Inputs/ Outputs

SYMBOL	TYPE	COMMENT
S1	BOOL	PLC – Input (A2)
S2	BOOL	PLC – Input (A2)
S3	BOOL	PLC – Input (A2)
S4	BOOL	PLC – Input (A2)
S5	BOOL	PLC – Input (A2)
K1	BOOL	PLC – Input (A2)
SS1	BOOL	PLC – Input (A2)
MA1	BOOL	PLC – Output (A3)
MA2	BOOL	PLC – Output (A3)
VA1	BOOL	PLC – Output (A3)
VA2	BOOL	PLC – Output (A3)
HA1	BOOL	PLC – Output (A3)
PL2	BOOL	PLC – Output (A3)
PL3	BOOL	PLC – Output (A3)
Mode_Manual	BOOL	PLC – Variable
Mode_Auto	BOOL	PLC – Variable
Cycle Active	BOOL	PLC – Variable
Cycle Stop	BOOL	PLC – Variable
HMI_Button_1	BOOL	PLC – Variable
HMI_Button_2	BOOL	PLC – Variable
HMI_Button_3	BOOL	PLC – Variable
HMI_Button_4	BOOL	PLC – Variable
HMI_Button_5	BOOL	PLC – Variable
HMI_Button_6	BOOL	PLC – Variable
HMI_Button_7	BOOL	PLC – Variable
HMI_Button_8	BOOL	PLC – Variable
HMI_Button_9	BOOL	PLC – Variable
HMI_Button_10	BOOL	PLC – Variable

PLC Inputs/ Outputs

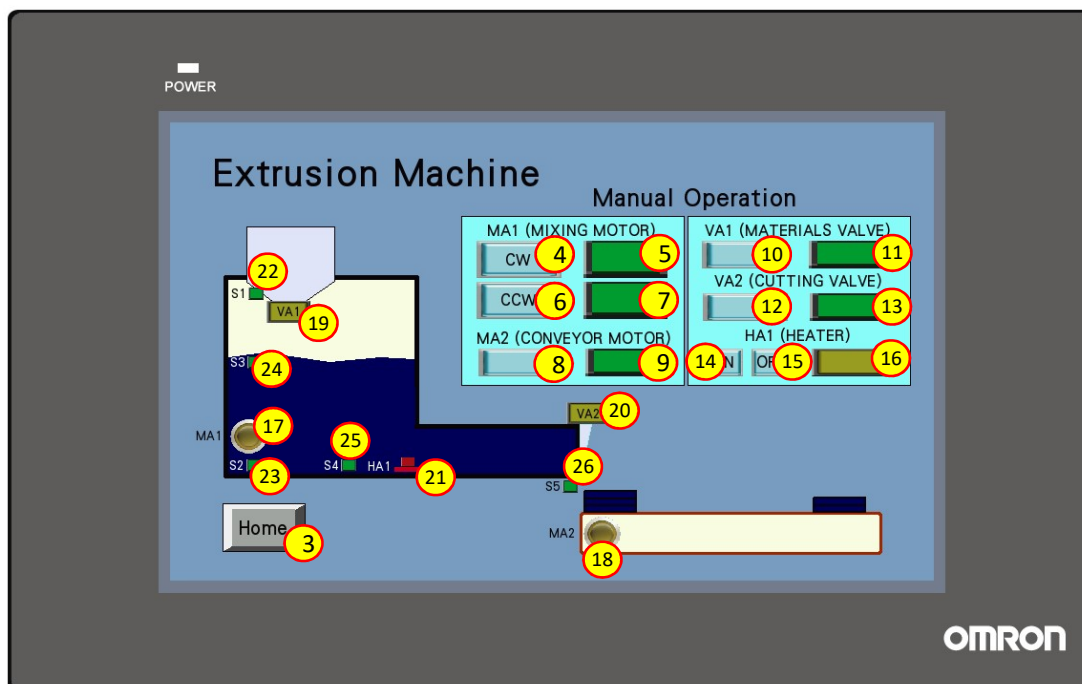
SYMBOL	TYPE	COMMENT
HMI_Button_11	BOOL	PLC – Variable
HMI_Button_12	BOOL	PLC – Variable
MA1_CW	BOOL	PLC – Variable
MA1_CCW	BOOL	PLC – Variable
ORDER_QTY	INT	PLC – Variable
QTY_PROD	INT	PLC – Variable

Details : Home Screen



Position	Variable	Action	Comment
1	---	Button Event	Active "Manual Screen"
2	---	Button Event	Active "Automatic Screen"

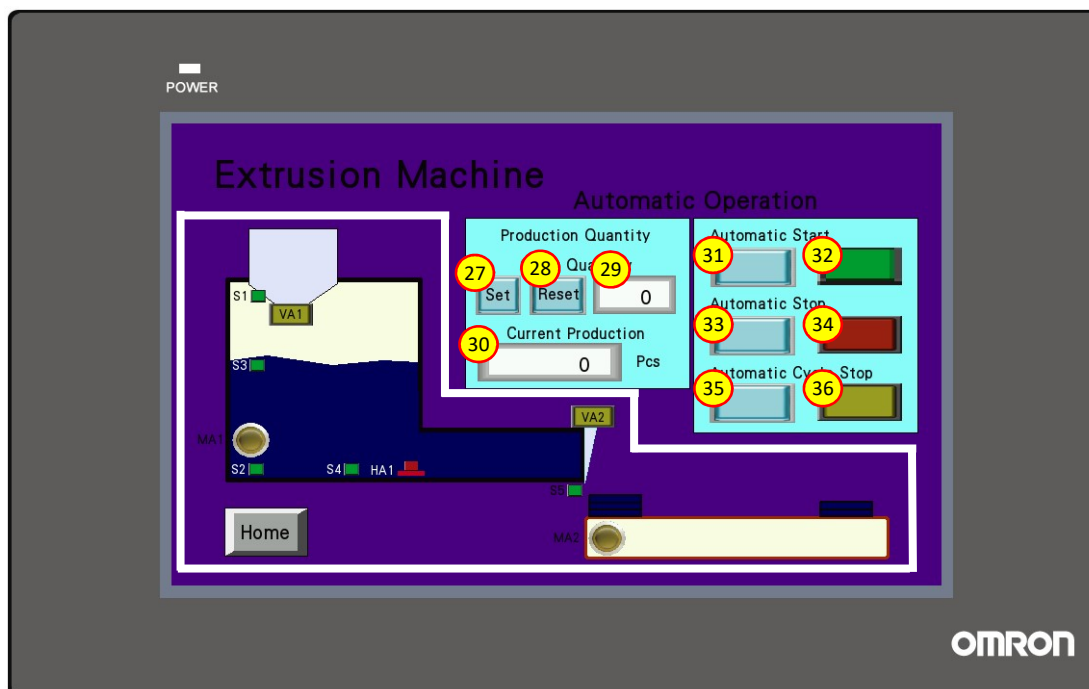
Details : Manual Screen



Position	Variable	Action	Comment
3	---	Button Event	Active "Home"
4	HMI_Button_1	Button Event	Set bit while key is pressed/Momentary
5	MA1_CW	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
6	HMI_Button_2	Button Event	Set bit while key is pressed/Momentary
7	MA1_CCW	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
8	HMI_Button_3	Button Event	Set bit while key is pressed/Momentary
9	MA2	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
10	HMI_Button_4	Button Event	Set bit while key is pressed/Momentary
11	VA1	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
12	HMI_Button_5	Button Event	Set bit while key is pressed/Momentary
13	VA2	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
14	HMI_Button_6	Button Event	Set bit while key is pressed/Momentary
15	HMI_Button_7	Button Event	Set bit while key is pressed/Momentary
16	HA1	Background Control Colour	State "0" = Colour "Dark Yellow" State "1" = Colour "Light Yellow"

Position	Variable	Action	Comment
17	MA1	Background Control Colour	State "0" = Colour "Dark Yellow" State "1" = Colour "Light Yellow"
18	MA2	Background Control Colour	State "0" = Colour "Dark Yellow" State "1" = Colour "Light Yellow"
19	VA1	Background Control Colour	State "0" = Colour "Dark Yellow" State "1" = Colour "Light Yellow"
20	VA2	Background Control Colour	State "0" = Colour "Dark Yellow" State "1" = Colour "Light Yellow"
21	HA1	Background Control Colour	State "0" = Colour "Dark Red" State "1" = Colour "Light Red"
22	S1	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
23	S2	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
24	S3	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
25	S4	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
26	S5	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"

Details : Automatic Screen



The functions from the drawing of the Screen Automatic are the same from the drawing of the Screen Manual with the exception of the things that are outside the White square in the image.

Position	Variable	Action	Comment
27	HMI_Button_8	Button Event	Set bit while key is pressed/Momentary
28	HMI_Button_9	Button Event	Set bit while key is pressed/Momentary
29	ORDER_QTY	Input Field	Range 0 to 50
30	QTY_PROD	Output Field	Range 0 to 1000
31	HMI_Button_10	Button Event	Set bit while key is pressed/Momentary
32	Cycle Active	Background Control Colour	State "0" = Colour "Dark Green" State "1" = Colour "Light Green"
33	HMI_Button_11	Button Event	Set bit while key is pressed/Momentary
34	Cycle Active	Background Control Colour	State "0" = Colour "Light Red" State "1" = Colour "Dark Red"
35	HMI_Button_12	Button Event	Set bit while key is pressed/Momentary
36	Cycle Stop	Background Control Colour	State "0" = Colour "Dark Yellow" State "1" = Colour "Light Yellow"

PROGRAMMING INDUSTRIAL CONTROL

LKSNATIONAL_2022_Programming_PRE

Submitted by :
Name : Lodi Joyo Siswanto
Member country or region : ID

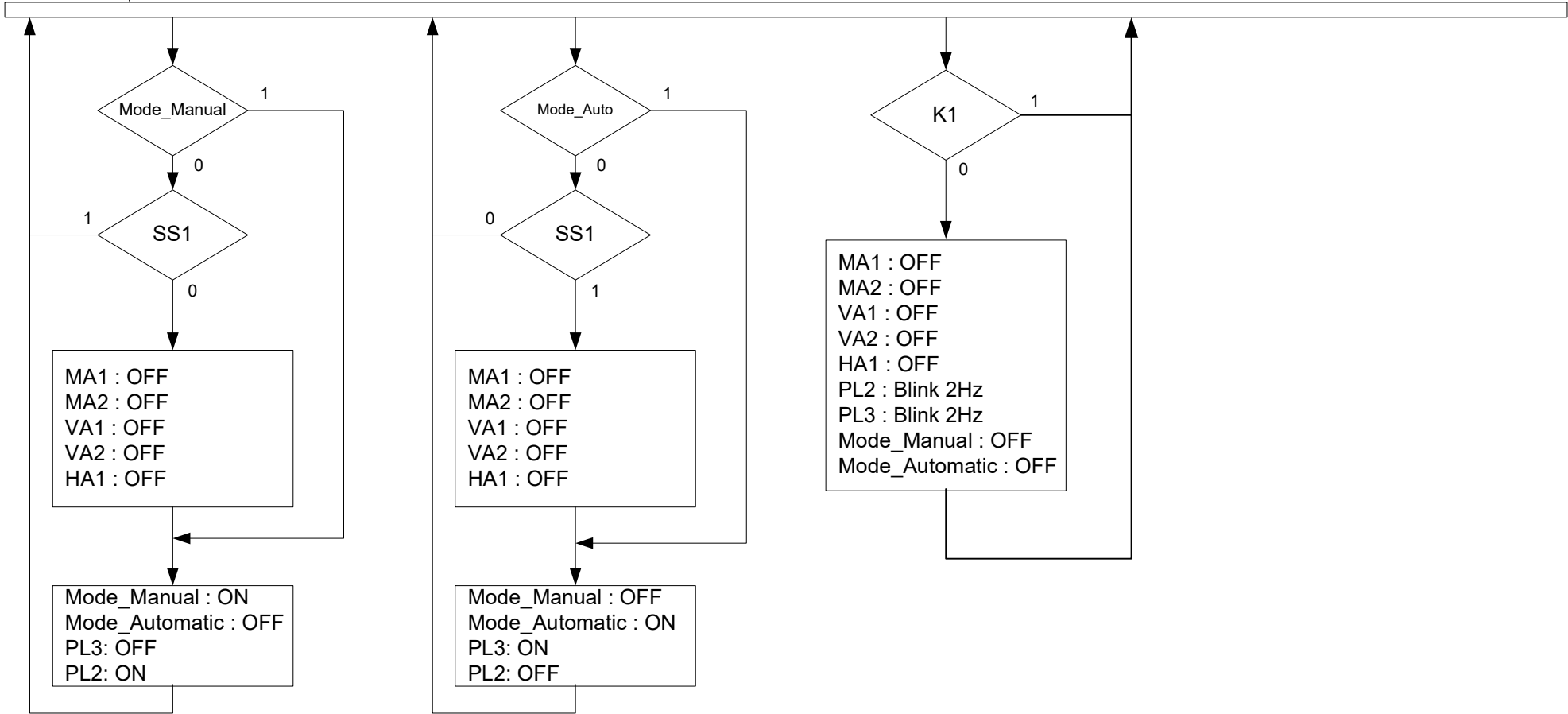
Nama : _____
Provinsi : _____



Power On

All actuators : OFF

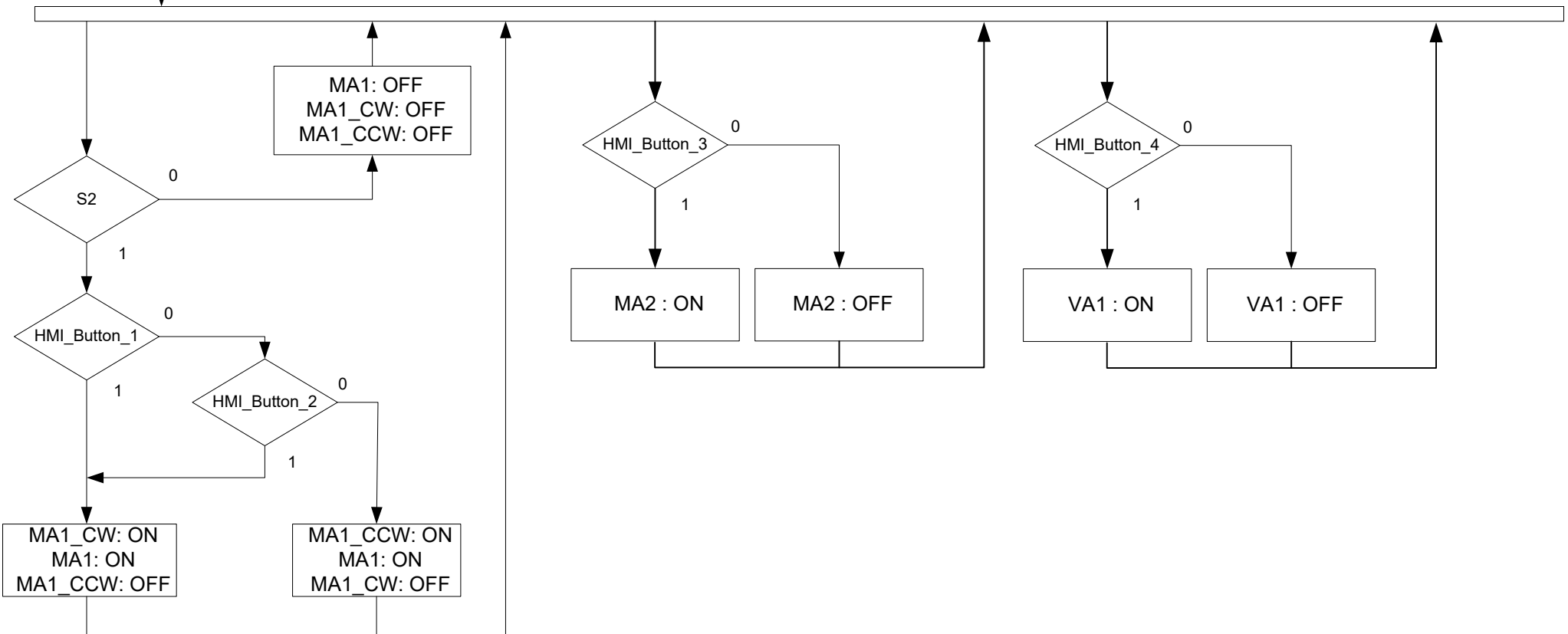
Note :
Switches, push buttons or other devices actuated / true = state "1" on the function diagram
Switches, push buttons or other devices not actuated / false = state "0" on the function diagram



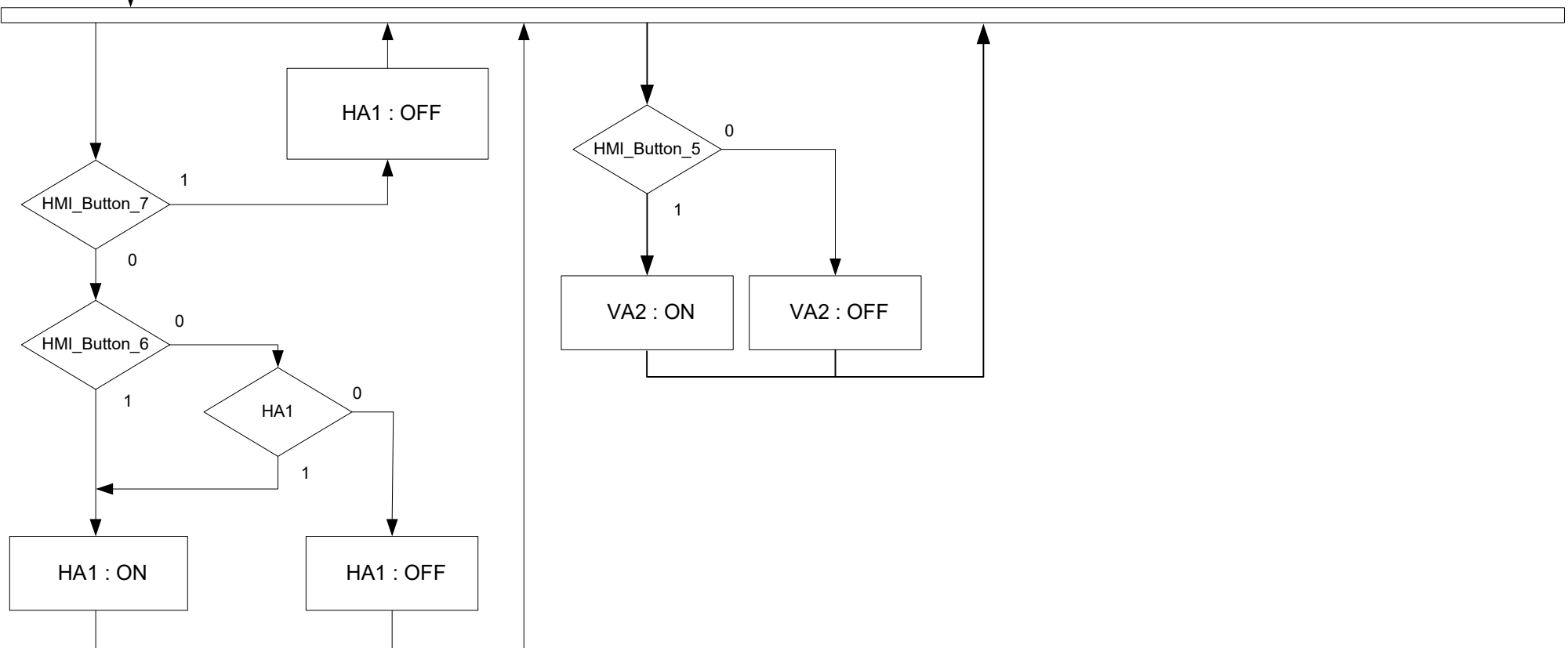
Mode_Manual

Mode_Auto

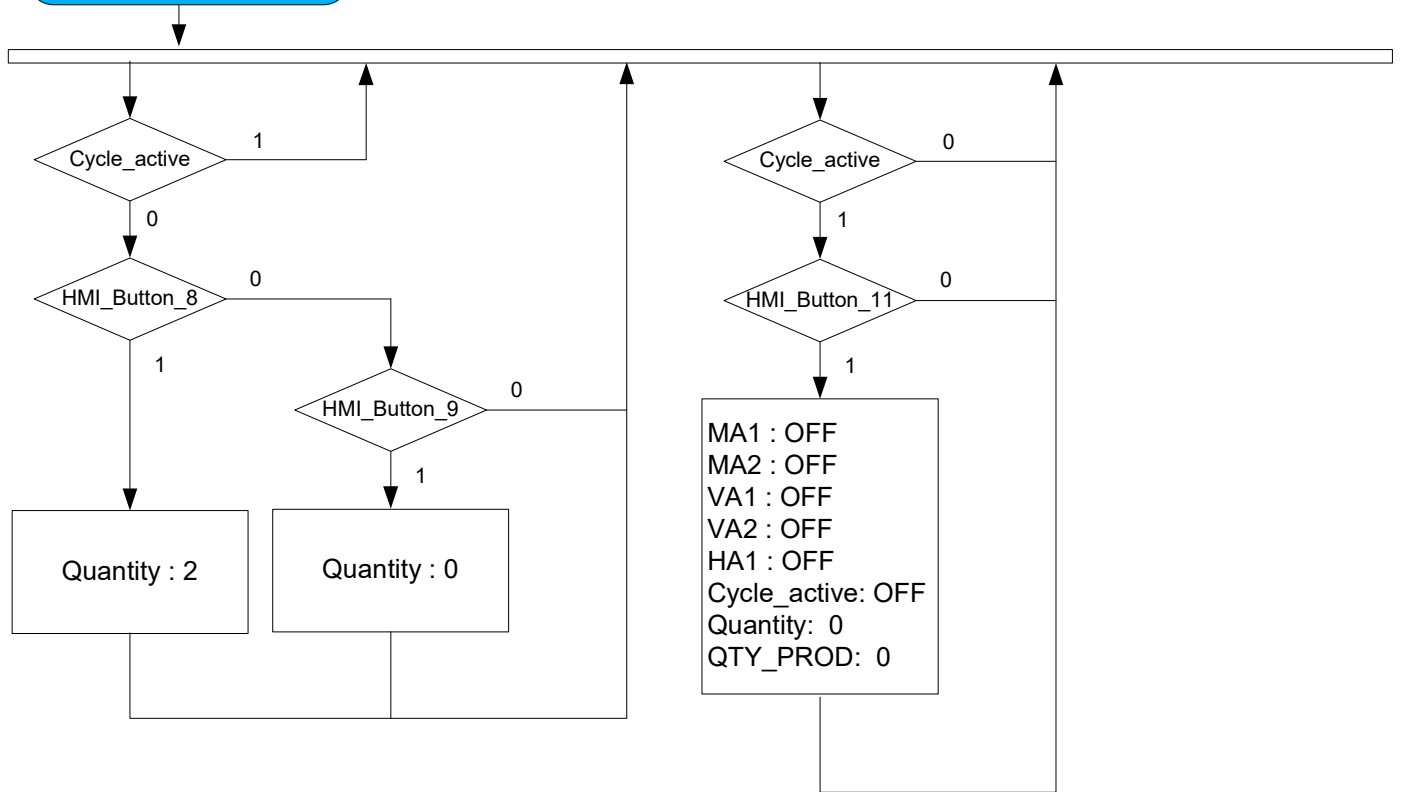
Mode_Manual



Mode_Manual



Mode_Automatic



Mode_Automatic

