



**Puspresnas**  
Pusat Prestasi Nasional

# KISI-KISI DAN SOAL-SOAL

**LOMBA KOMPETISI SISWA (LKS)  
TINGKAT NASIONAL XXIX  
TAHUN 2021**



**BIDANG LOMBA**

**Sistim Kendali Industri**  
Industrial Control



Member Of  
**worldskills**

# CIRCUIT DESIGN INDUSTRIAL CONTROL

**Worldskills\_Indonesia\_2021\_Circuit\_Design\_Trial**

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**

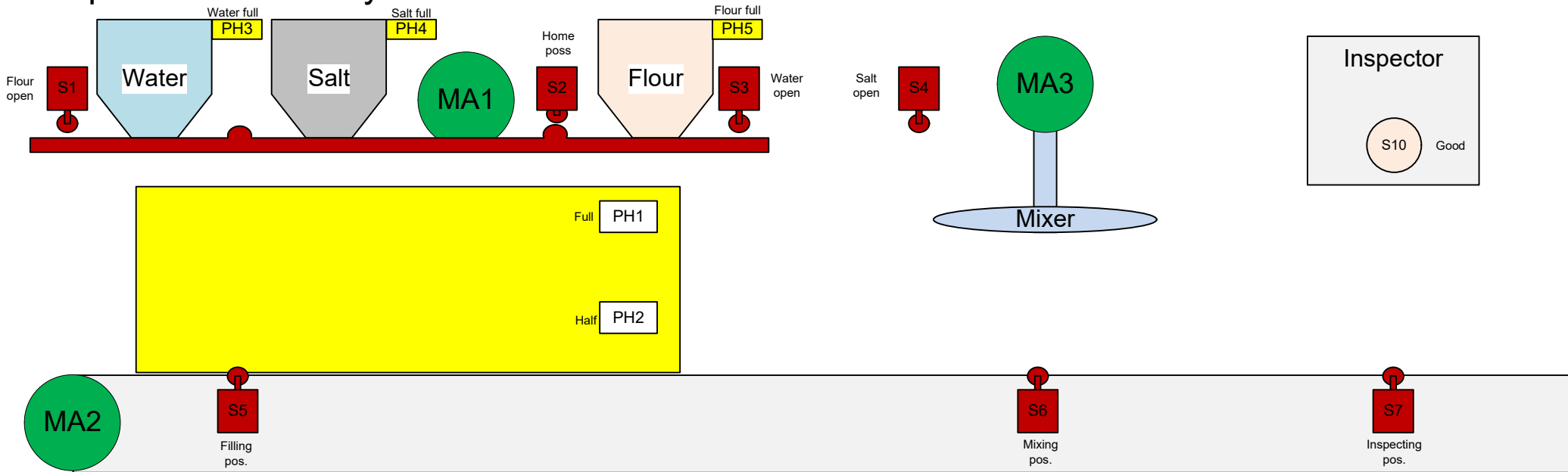
### Instruksi Pengiriman file

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

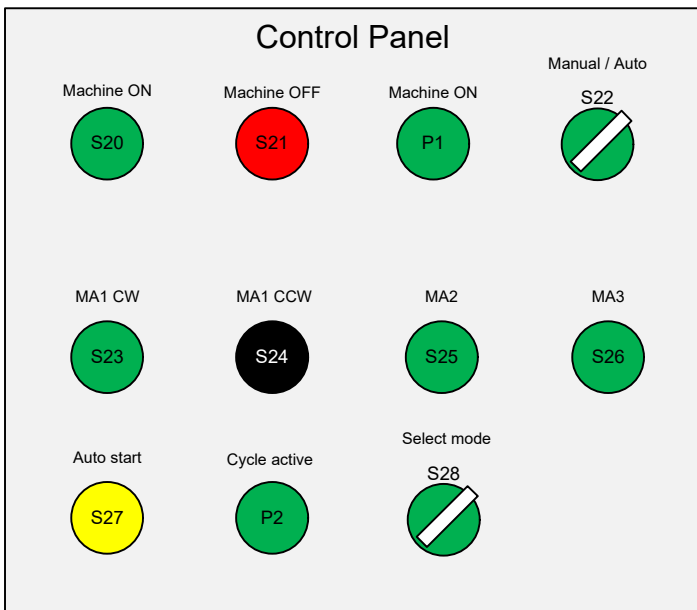
Note: Pada saat file diterima, Juri akan cek file yang dikirim dengan video rekaman zoom

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

# Representation of System



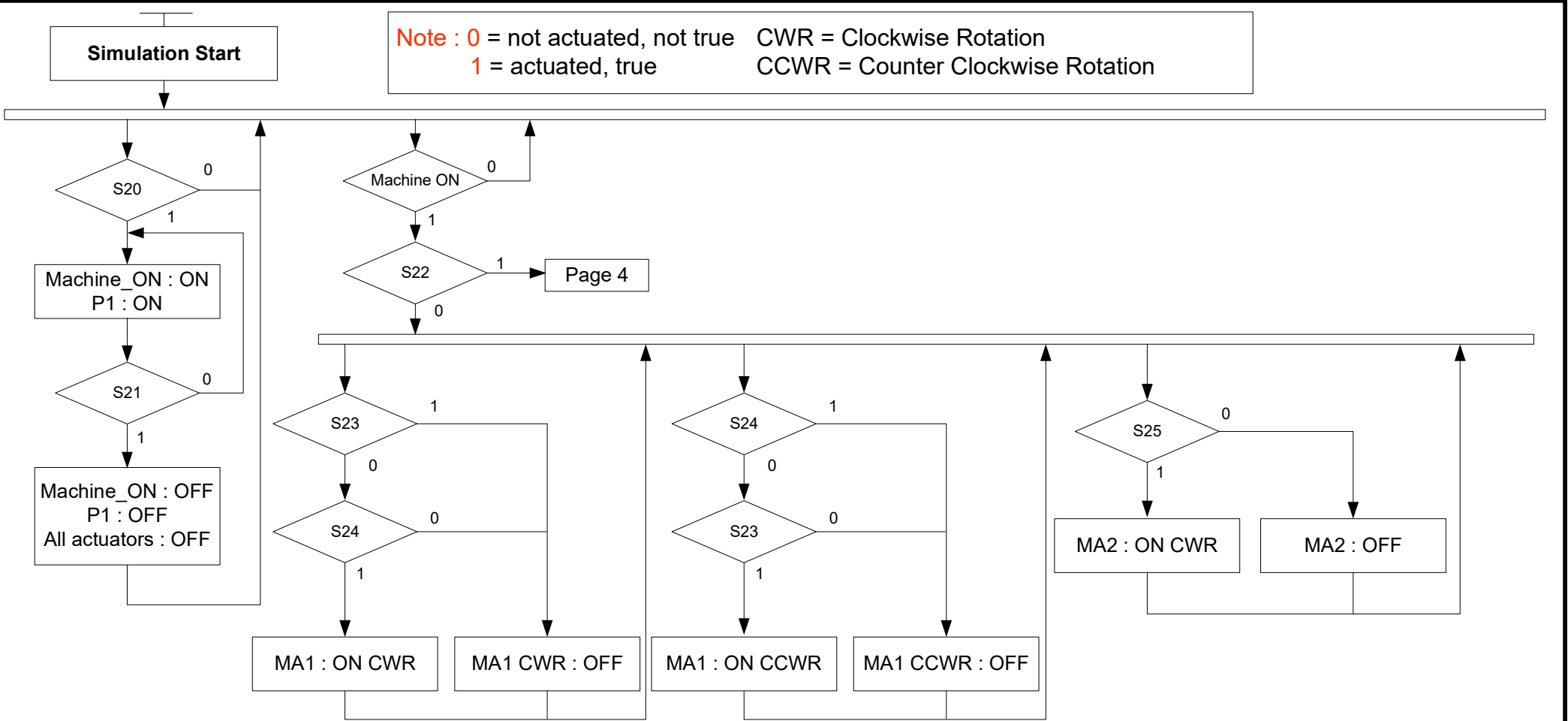
## Control Panel & Switches

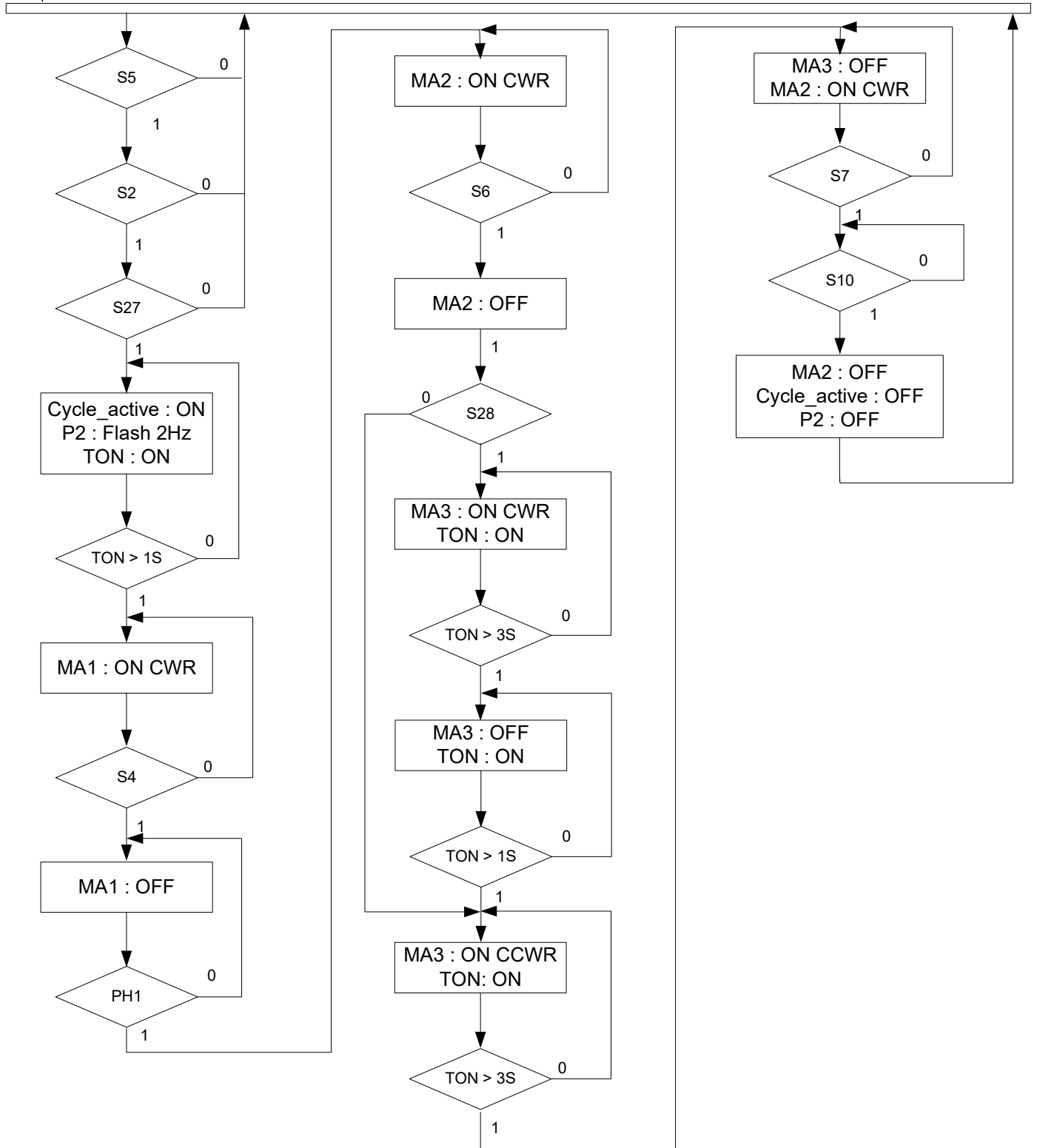


- S1 : Detent switch NO
- S2 : Detent switch NO
- S3 : Detent switch NO
- S4 : Detent switch NO
- S5 : Detent switch NO
- S6 : Detent switch NO
- S7 : Detent switch NO
- S10 : Push button NO
- S20 : Push button NO
- S21 : Push button NC
- S22 : Detent switch NO
- S23 : Detent switch NO
- S24 : Detent switch NO
- S25 : Detent switch NO
- S26 : Detent switch NO
- S27 : Push button NO
- S28 : Detent switch NO

- PH1 : Detent switch NO
- PH2 : Detent switch NO
- PH3 : Detent switch NO
- PH4 : Detent switch NO
- PH5 : Detent switch NO
- P1 : Green Light
- P2 : Green Light
- MA1 : DC Motor
- MA2 : DC Motor
- MA3 : DC Motor

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







# SKILL 19 - PROFESSIONAL PRACTICE

## MODULE: CIRCUIT DESIGN AND/OR MODIFICATION

### GUIDANCE

PP-Nr	DESCRIPTION	OK	NOT OK
1	straight vertical connecting lines		
2	straight horizontal connecting lines and devices		
3	straight horizontal drawing of devices		



<p>4</p>	<p>vertical distances between contacts or devices</p>		
<p>5</p>	<p>horizontal distances between contacts or devices</p>		
<p>6</p>	<p>device labelling control circuit</p> <p>Button = S Relay = K Timer = KT</p>		





<p>7</p> <p>device labelling main circuit</p> <p>Kontaktor = Q Motor = MA Solenoid = MB</p>		<p>Q1  Q1 </p> <p>Q1  MB1 </p> <p>MA1 </p>	<p>Q1  </p> <p>K1  K2 </p> <p></p>
<p>8</p> <p>provision of legend for each path</p>		<p>+24V</p> <p>K25</p> <p>Q1</p> <p>0V</p> <p>Legend of this path</p>	<p>+24V</p> <p>K25</p> <p>Q1</p> <p>0V</p>
<p>9</p> <p>Branch circuit on the right</p>		<p>+24V</p> <p>K25</p> <p>K21</p> <p>K1</p> <p>K2</p> <p>0V</p>	<p>+24V</p> <p>K25</p> <p>K21</p> <p>K1</p> <p>K2</p> <p>0V</p>

# FAULT FINDING INDUSTRIAL CONTROL

**Worldskills\_Indonesia\_2021\_Fault Finding**

Submitted by :

Name : LODI JOYO SISWANTO

Member Country or region : ID

Nama : \_\_\_\_\_

Provinsi : \_\_\_\_\_



## Modul B – Fault Finding

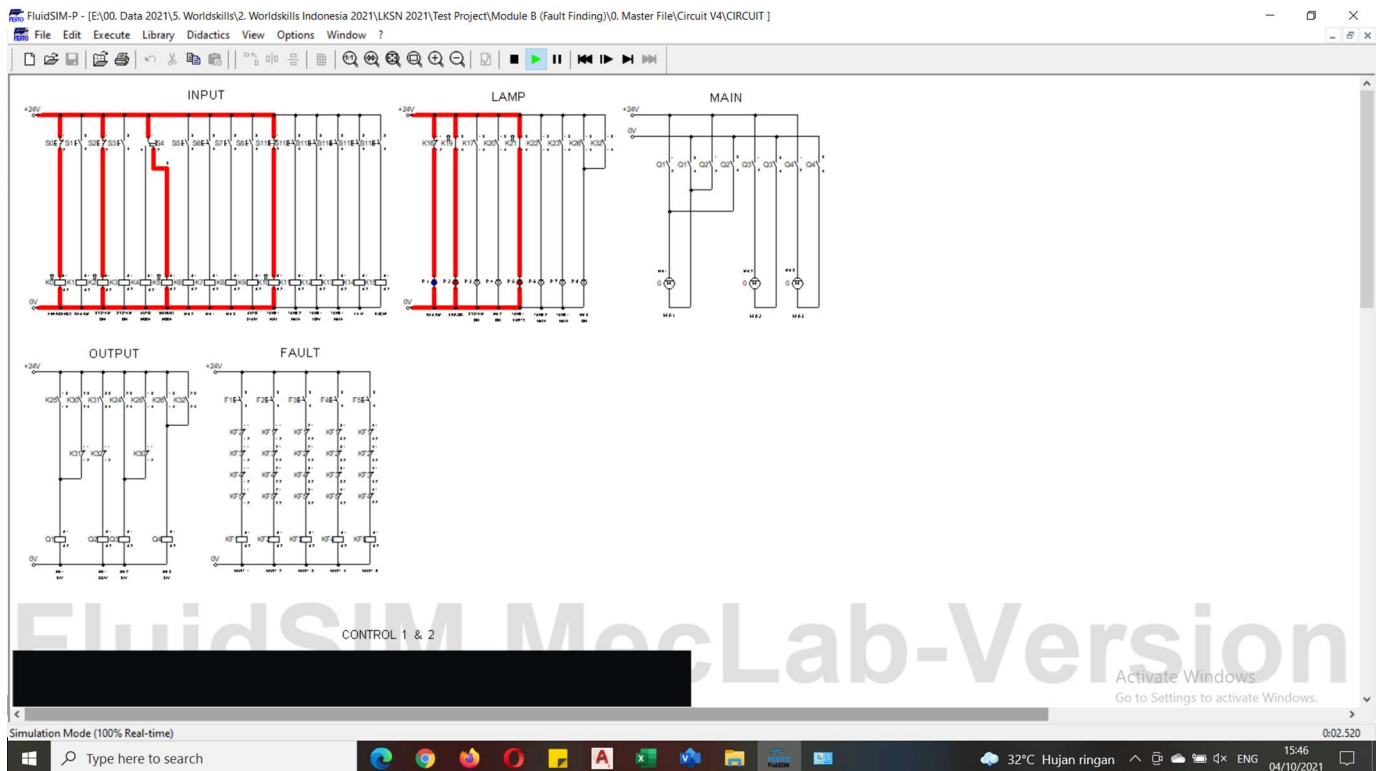
Waktu Pengerjaan : 30 Menit  
Software : Google chrome remote desktop & **Fluidsim MecLab V4.5 Pneumatics** untuk simulasi mesin  
Jumlah Fault : 5 Fault

### 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 yang disediakan
8. Setiap fault, peserta diizinkan untuk menjawab 3 kemungkinan posisi fault, dikarenakan proses analisa hanya menggunakan logika, tidak menggunakan multimeter / tester namun jika peserta yakin dengan 1 posisi, peserta tidak diwajibkan untuk mengisi 2 kemungkinan posisi lainnya
9. **Jika ingin pindah ke fault** berikutnya, **peserta harus memberitahu juri**. Setelah itu juri akan menonaktifkan fault saat ini dan mengaktifkan fault selanjutnya
10. **Peserta tidak dapat kembali ke fault sebelumnya**

# Penjelasan Rangkaian

## Tampilan rangkaian Fault Finding :

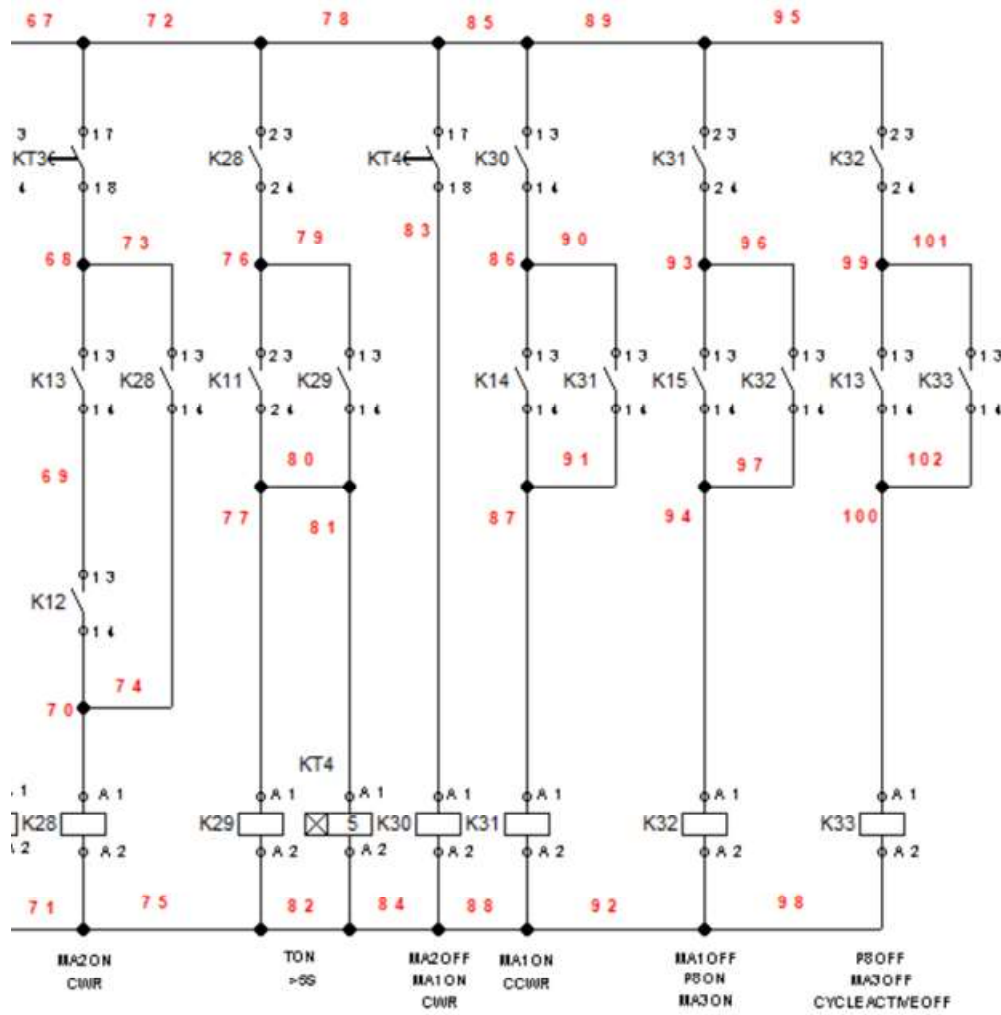


Peserta hanya diperbolehkan mengoperasikan rangkaian input, lamp, main dan output saat waktu tes / simulasi

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

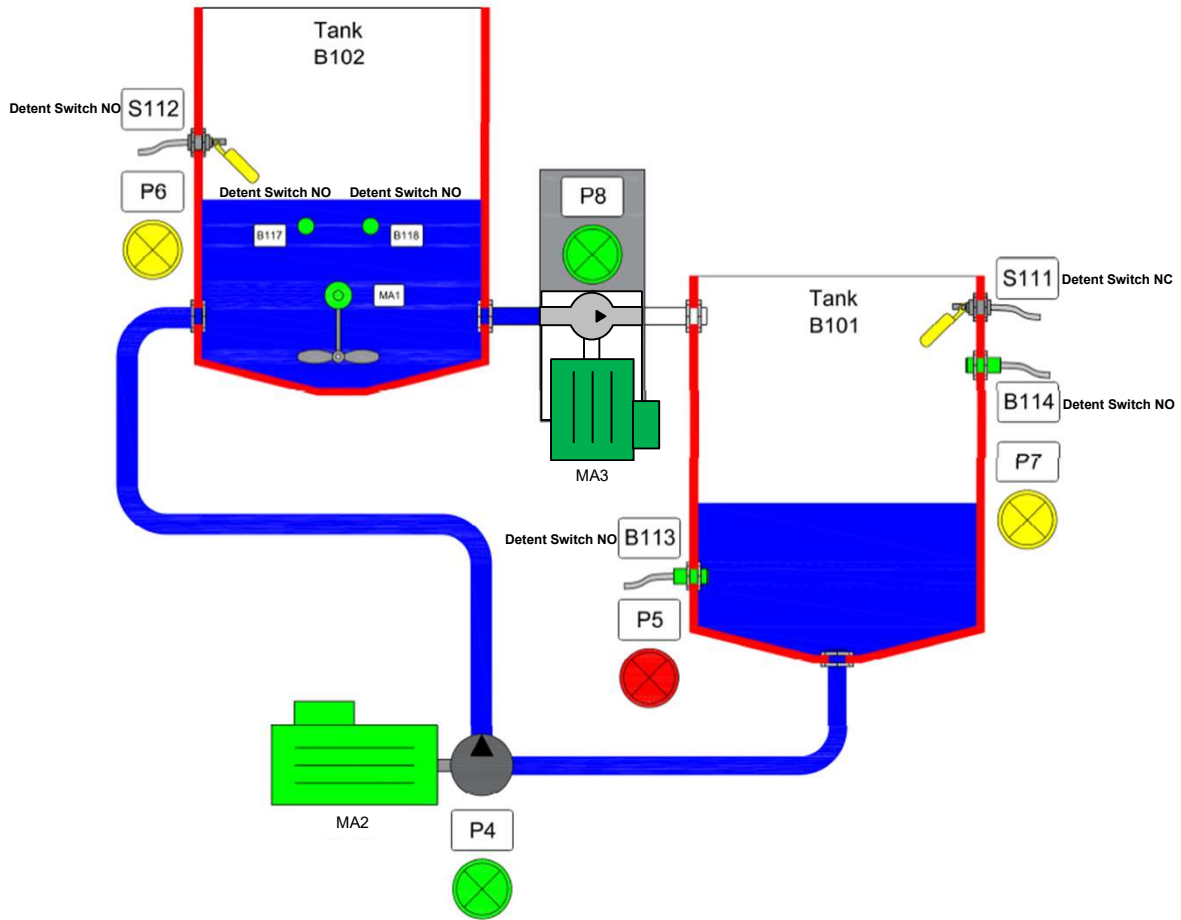
Setelah peserta melakukan simulasi mesin dan analisa, ternyata kemungkinan fault terjadi karena Q1 ON sebelum detail waktu 5S. Maka kemungkinan faultnya yaitu short circuit pada nomor kabel 78-83, atau nomor kabel 79-83

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

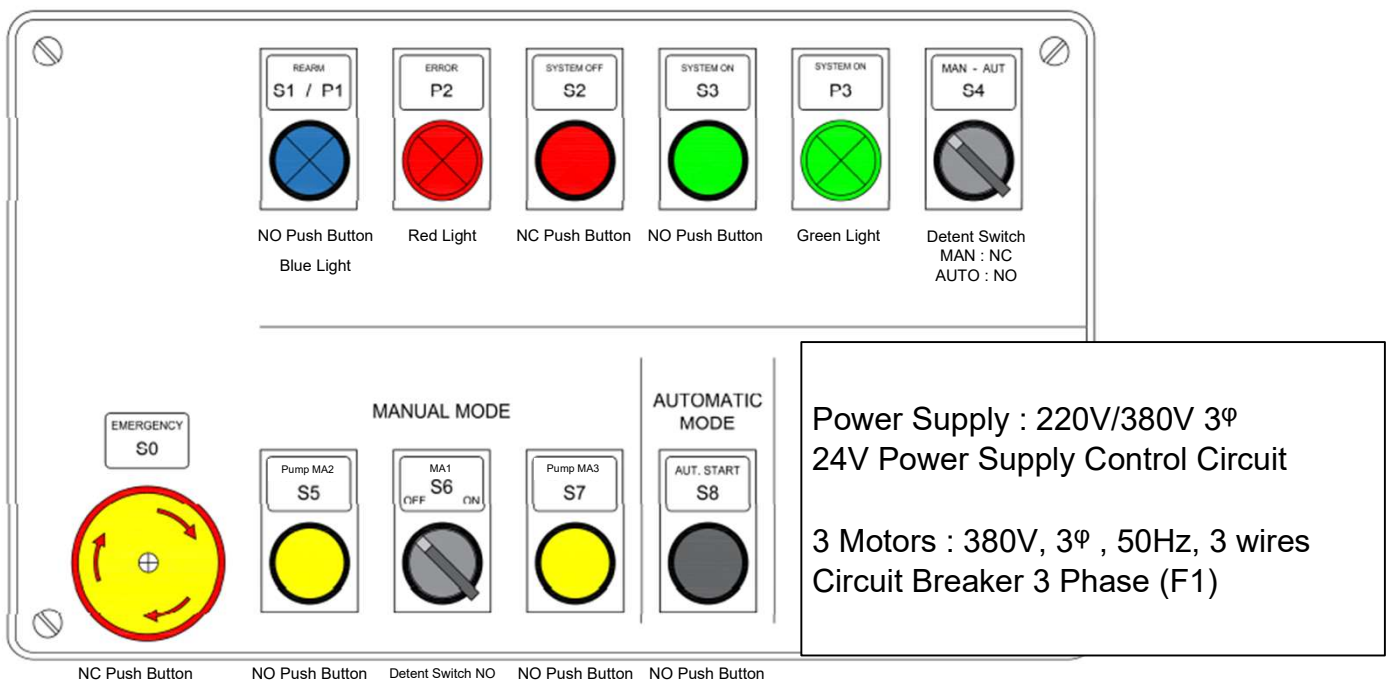
Fault No.	Type	Posisi 1	Posisi 2	Posisi 3
1	OC	90	91	
2	SC	78-83	79-83	
3				
4				
5				

Lembar jawaban berupa excel sheet yang terdapat pada komputer juri

# Representation of System

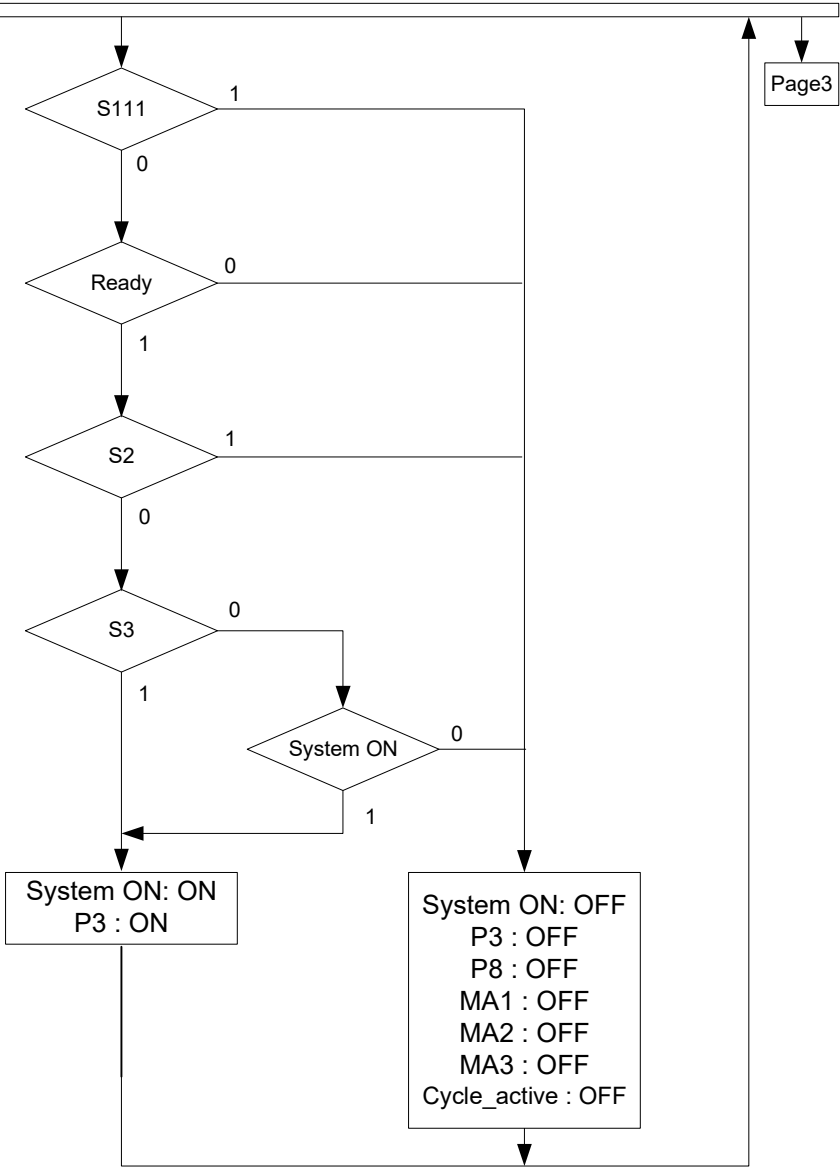
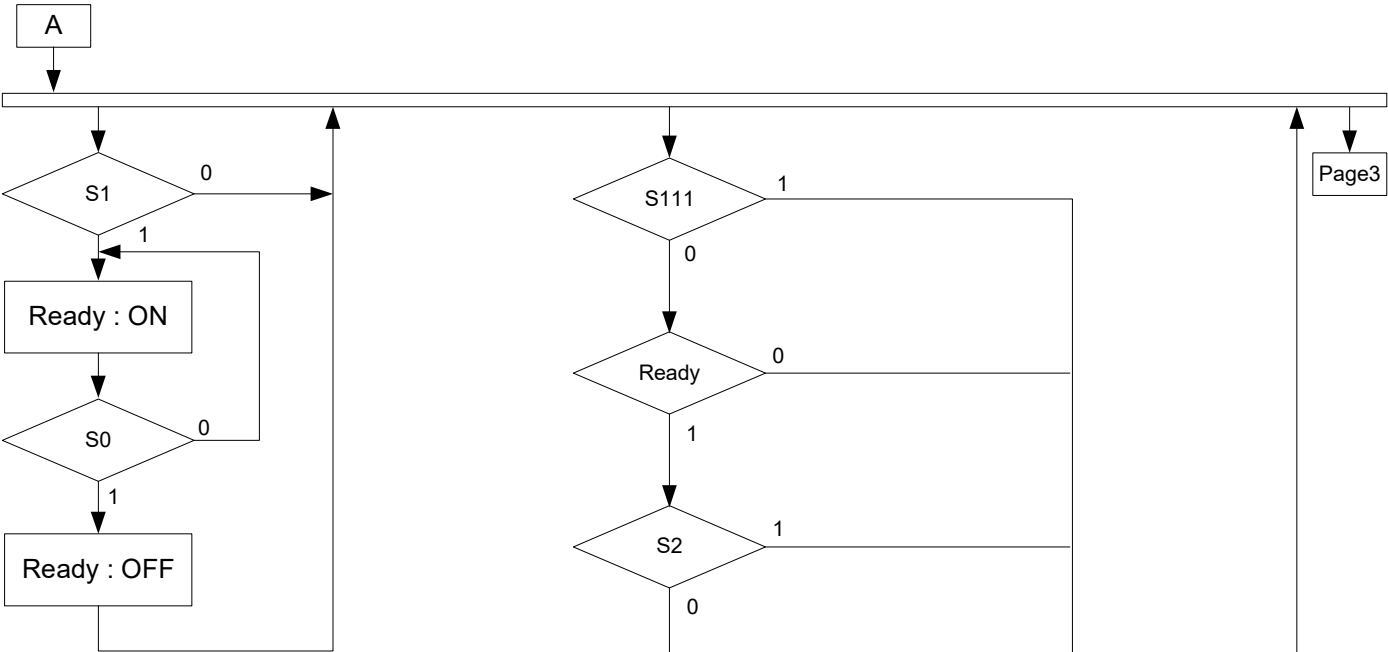


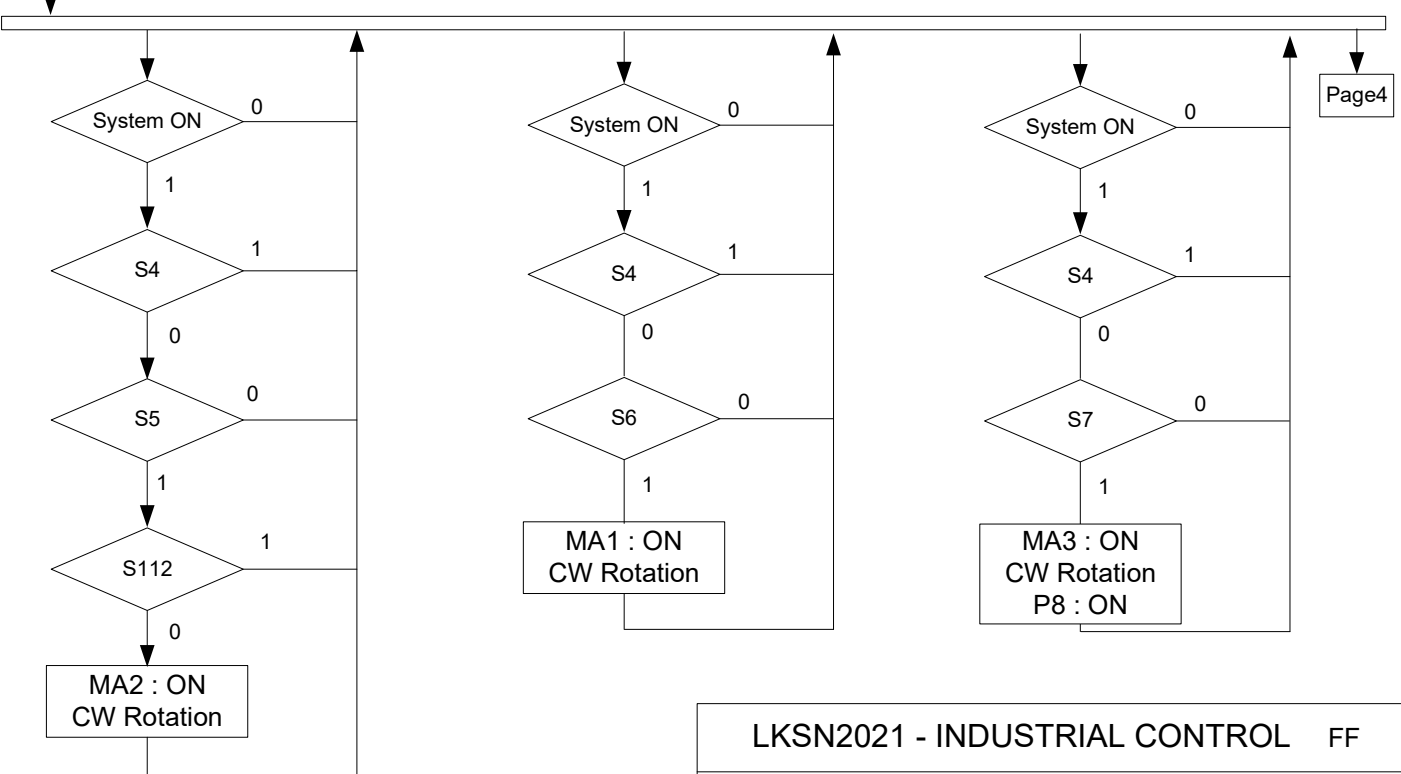
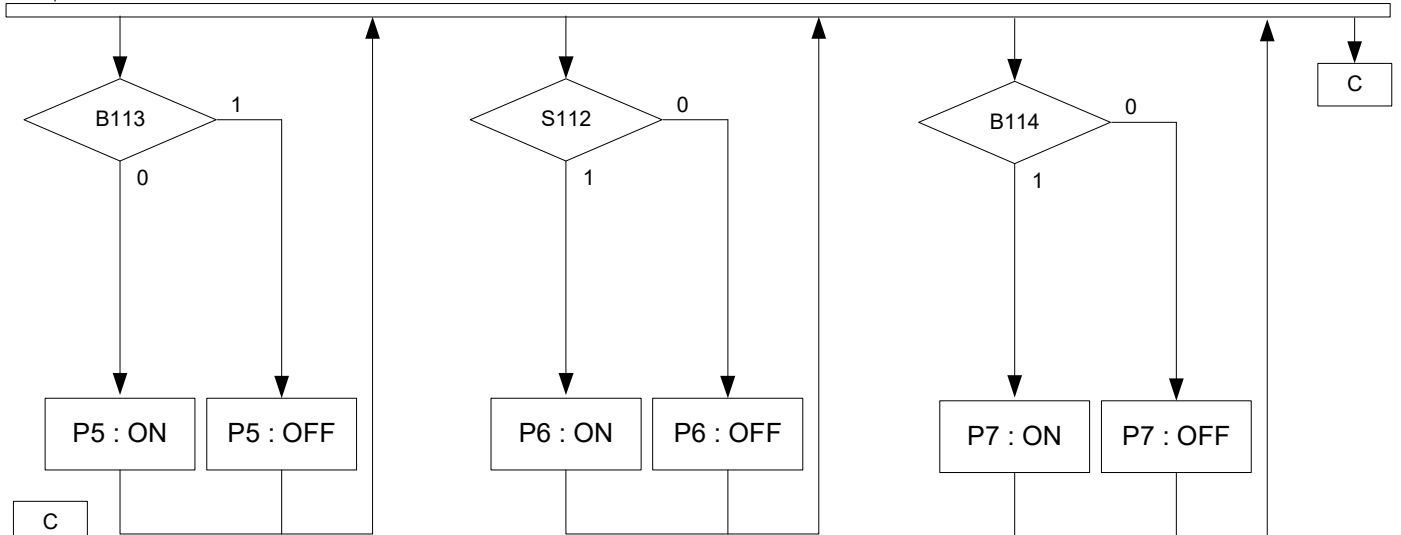
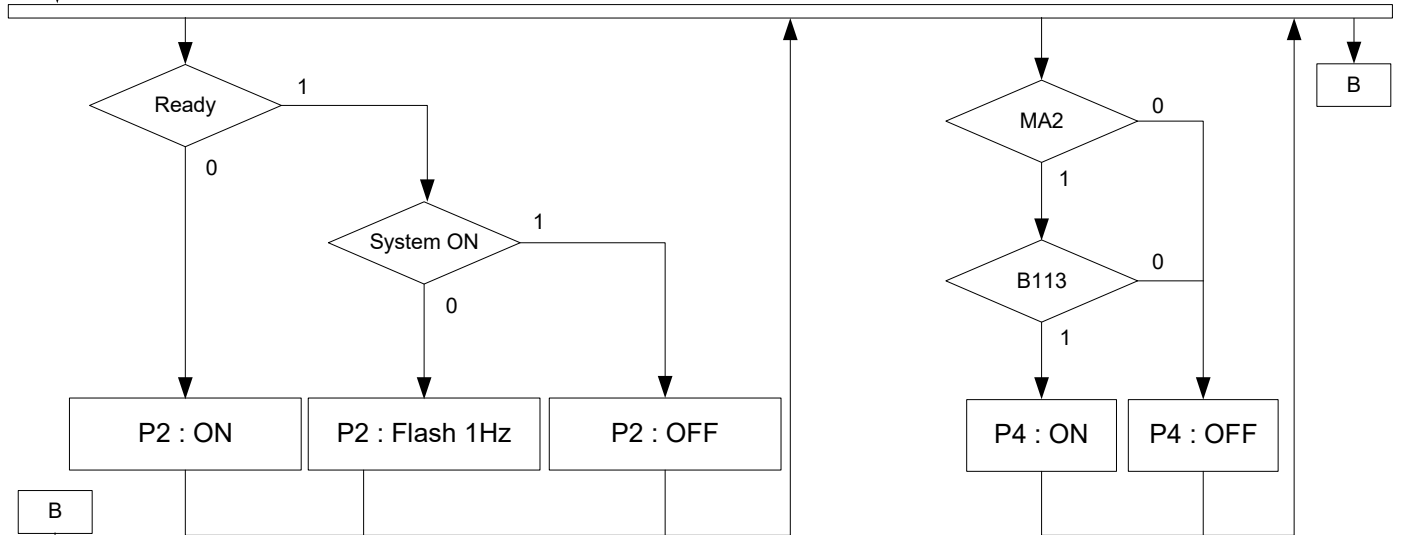
# Control Panel & Switches



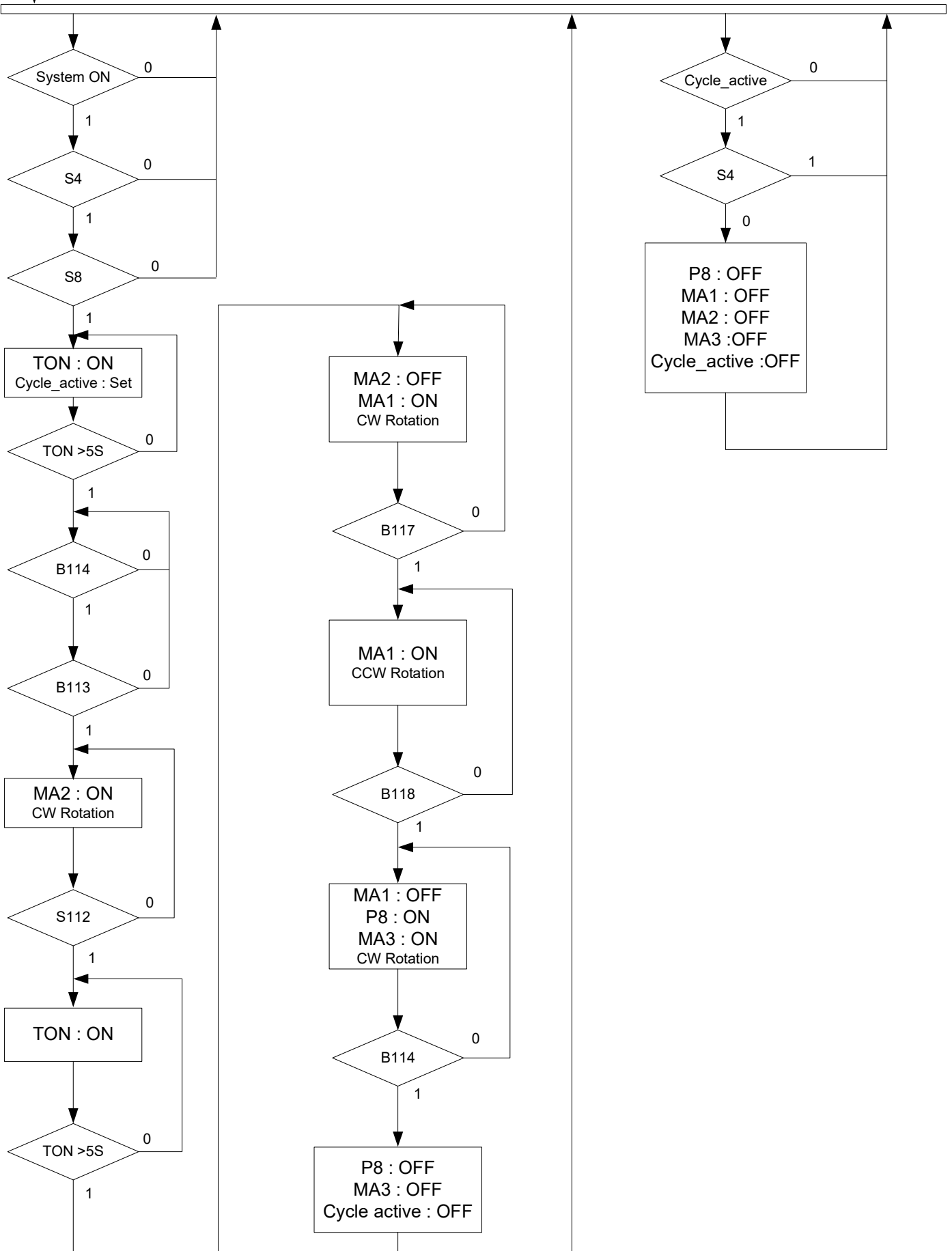
Simulation Start

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

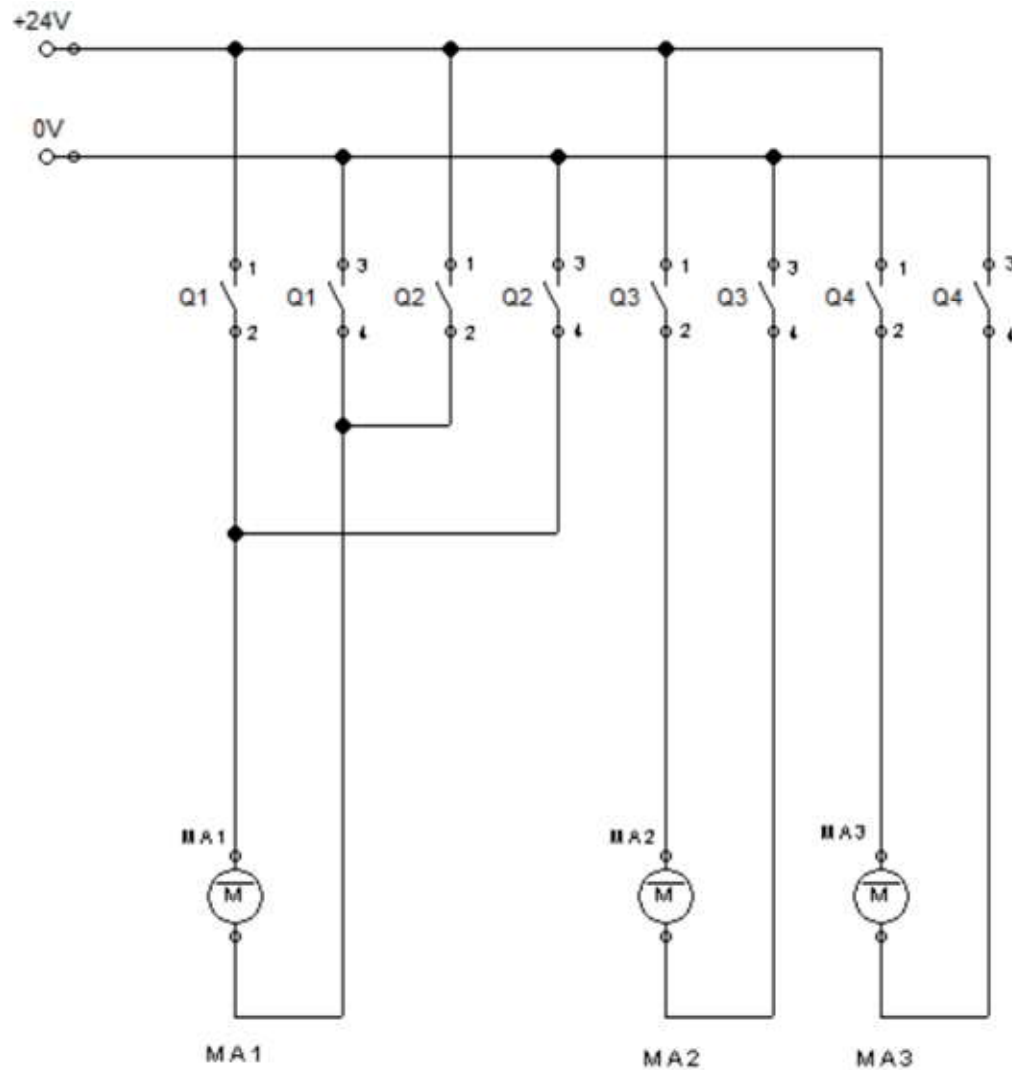




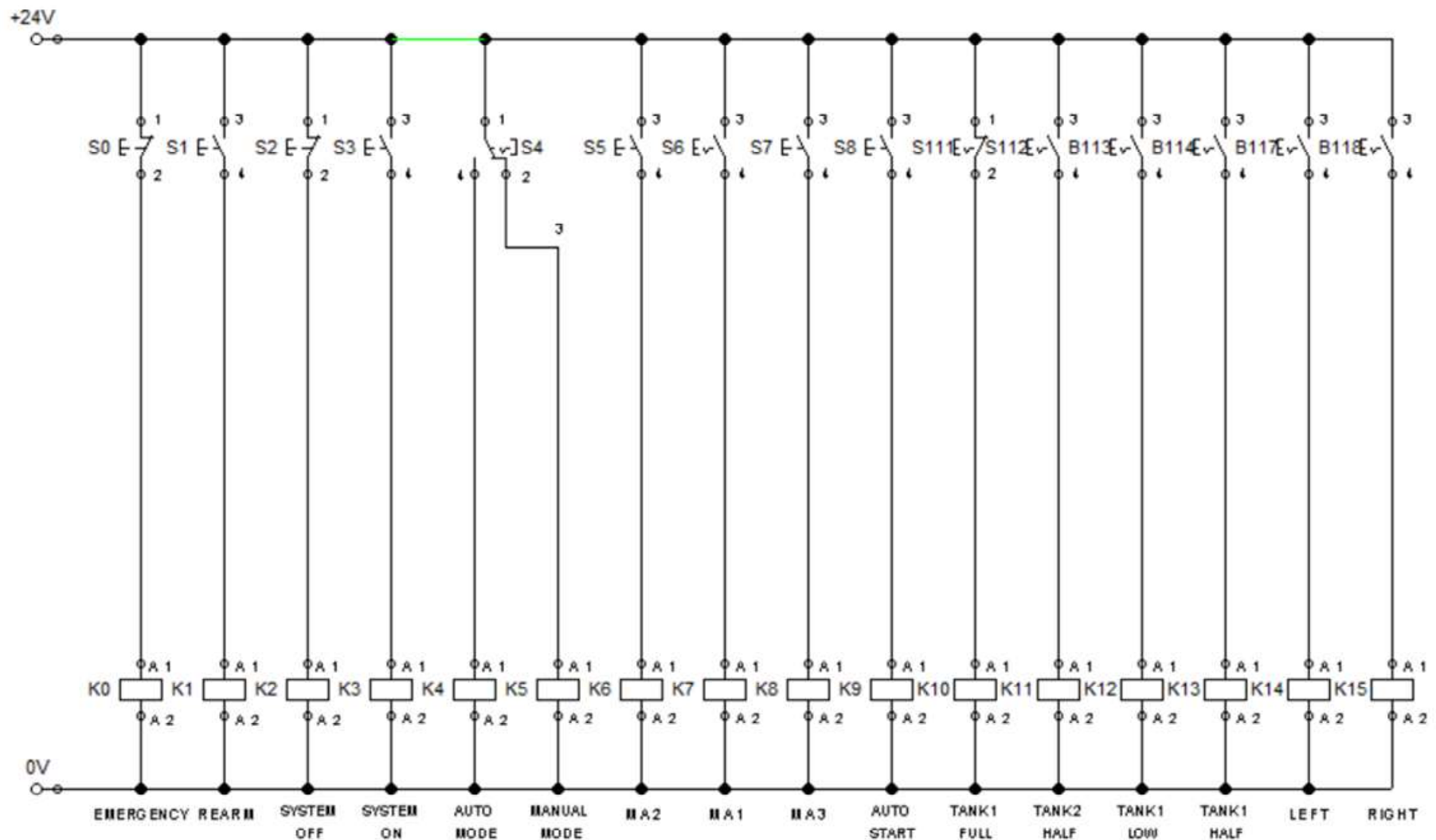




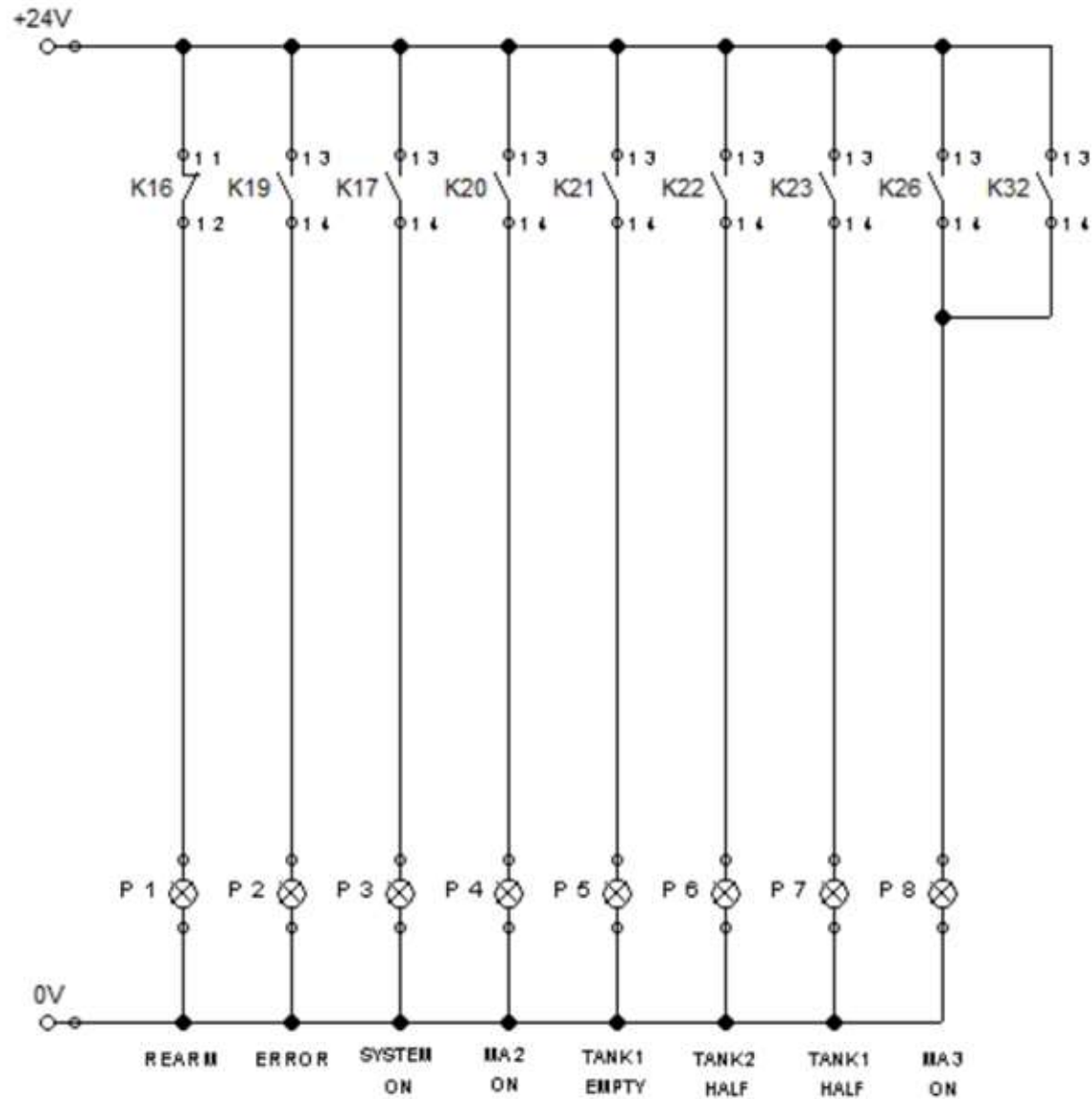
# MAIN



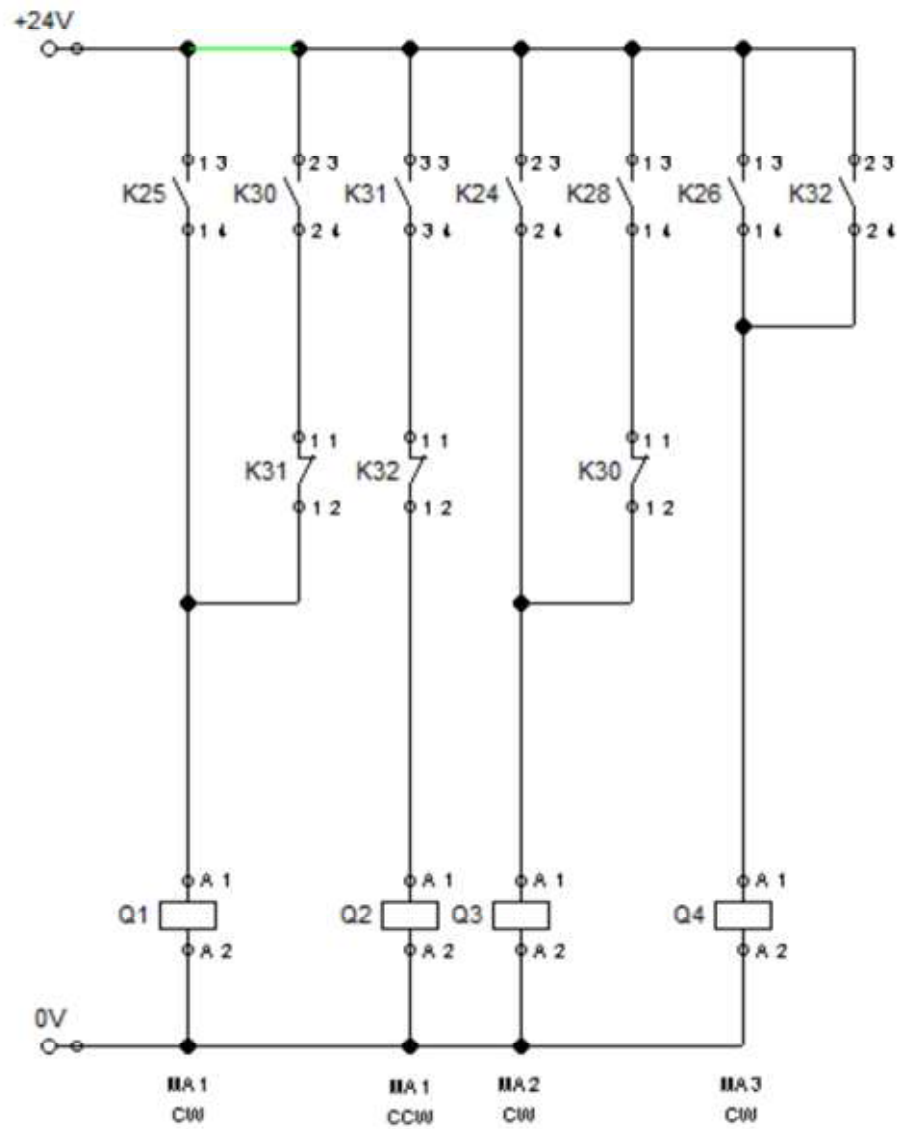
# INPUT



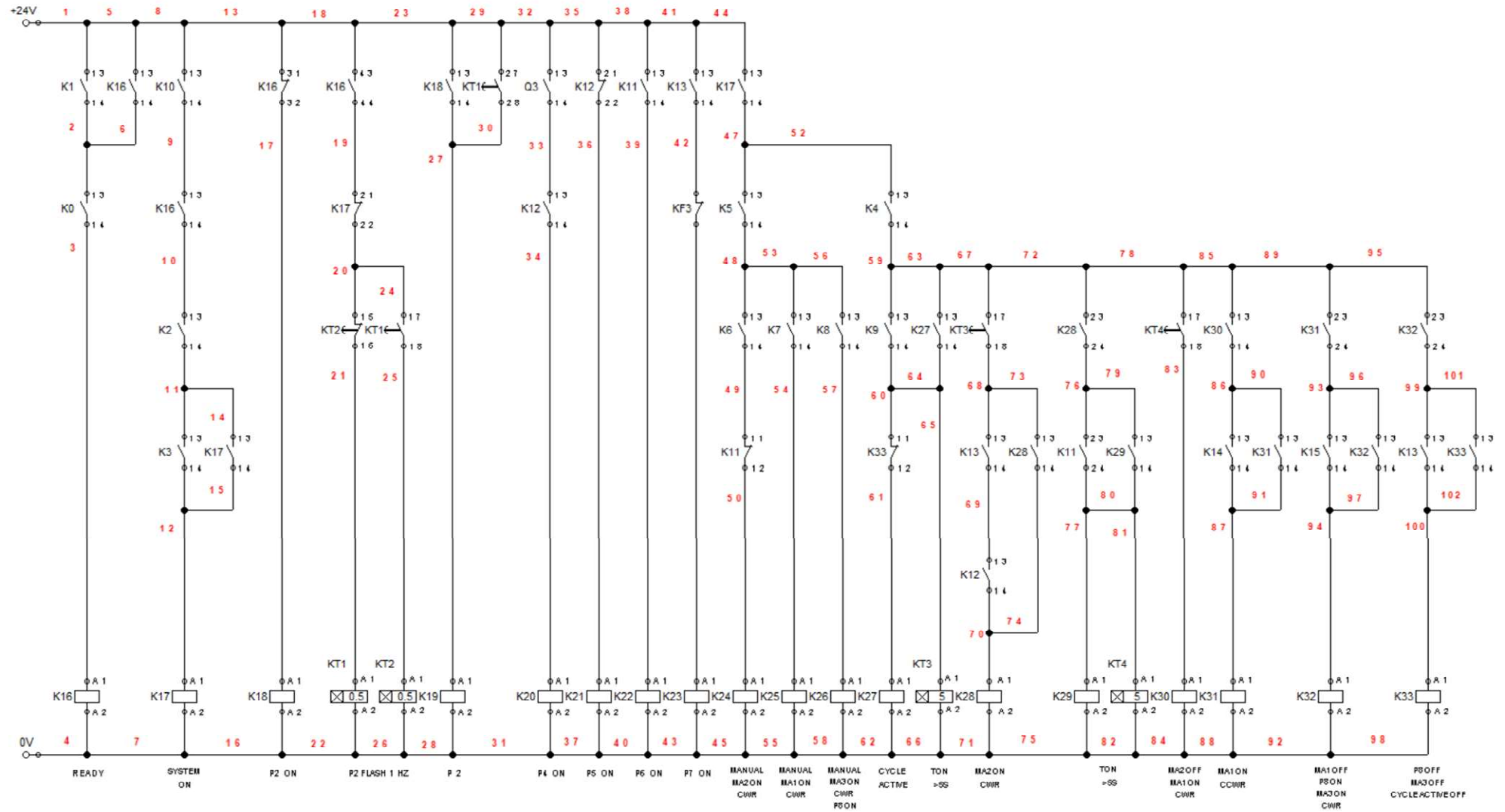
# LAMP



# OUTPUT



# CONTROL CIRCUIT



# TEST PROJECT

## MODULE C (MAIN\_PROJECT)

### INDUSTRIAL CONTROL

WORLDSKILLS\_INDONESIA\_2021\_MP\_PRE

Submitted by:

Name: Lodi Joyo Siswanto

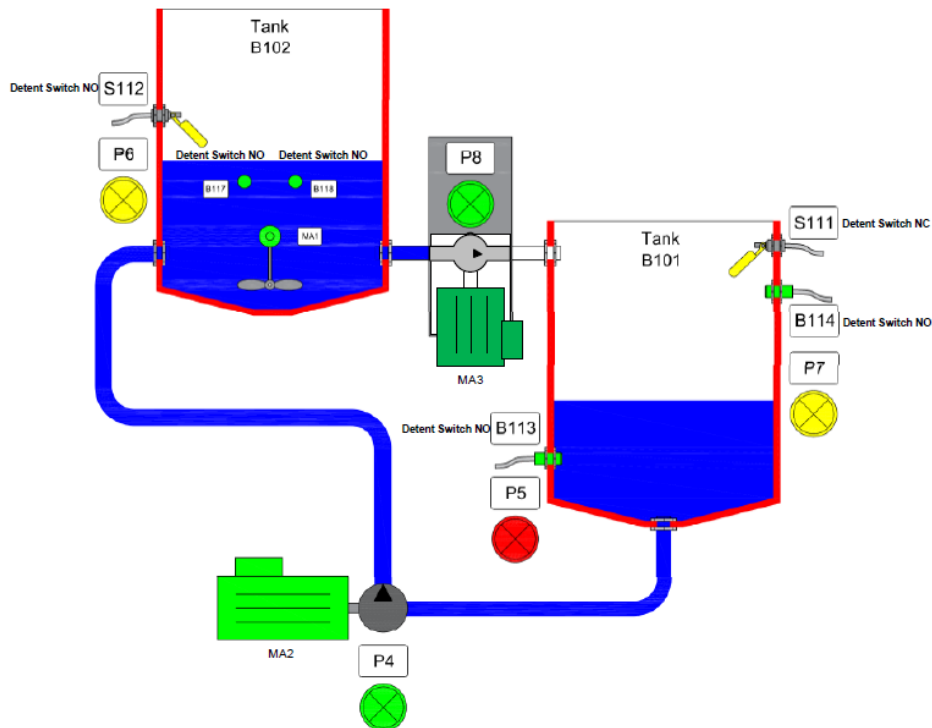
Member country or region: ID





## Module 1 – Main project

With the attached mounting layout and its electrical diagrams it is intended to simulate the operation of the following **Water Control System**.



### Legend :

**MA1:** Mixing motor

**MA2:** Motor pump 1

**MA3:** Motor pump 2

**B113 :** Tank B101 Empty

**B114 :** Tank B101 Half

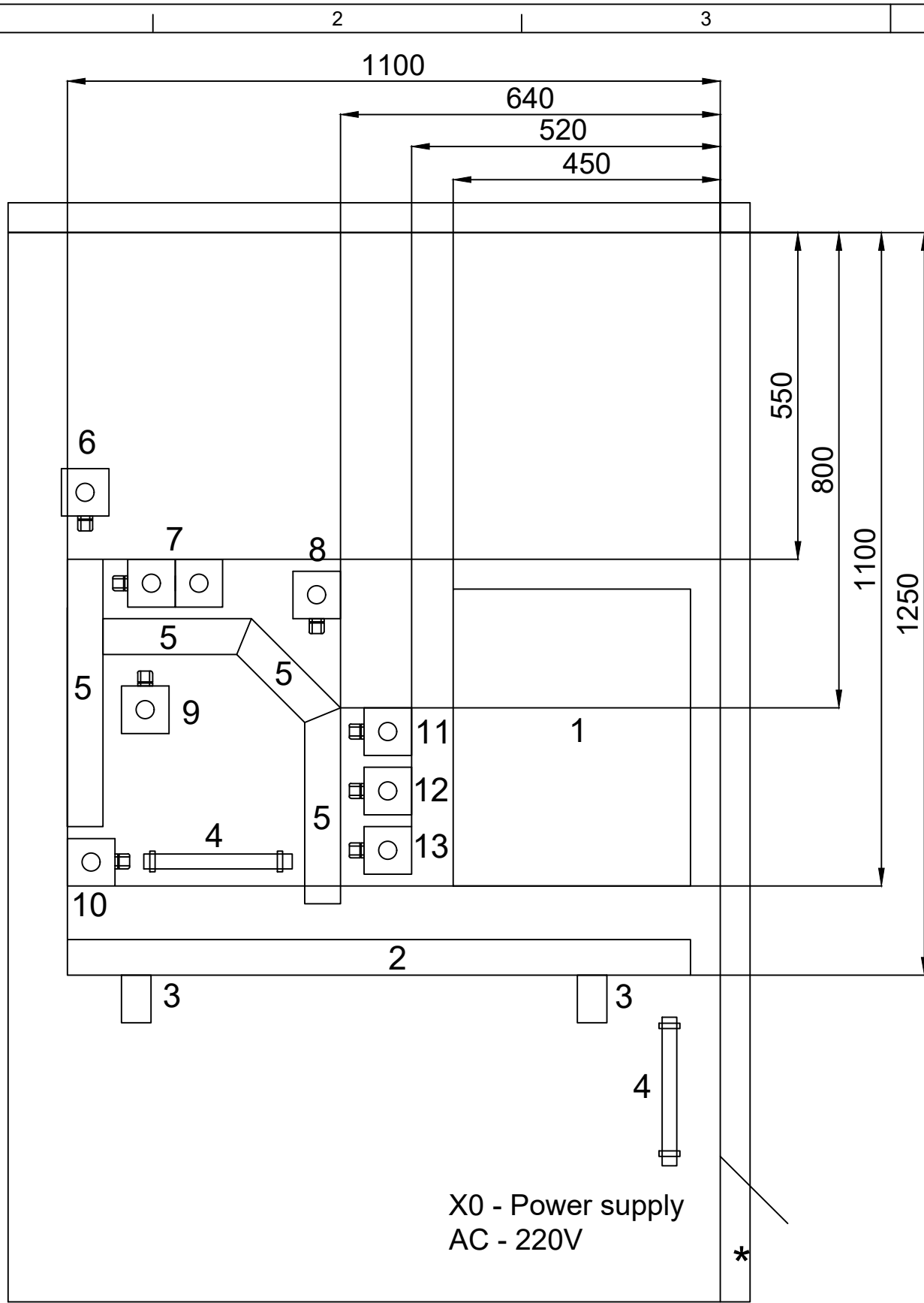
**S111 :** Tank B101 Full

**B117 :** MA1 Left

**B118 :** MA1 Right

**S112 :** Tank B102 Half





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 (B117 & B118)
8. Housing MA3
9. Housing S112
10. Housing MA2
11. Housing S111
12. Housing B114
13. Housing B113

X0 - Power supply  
AC - 220V

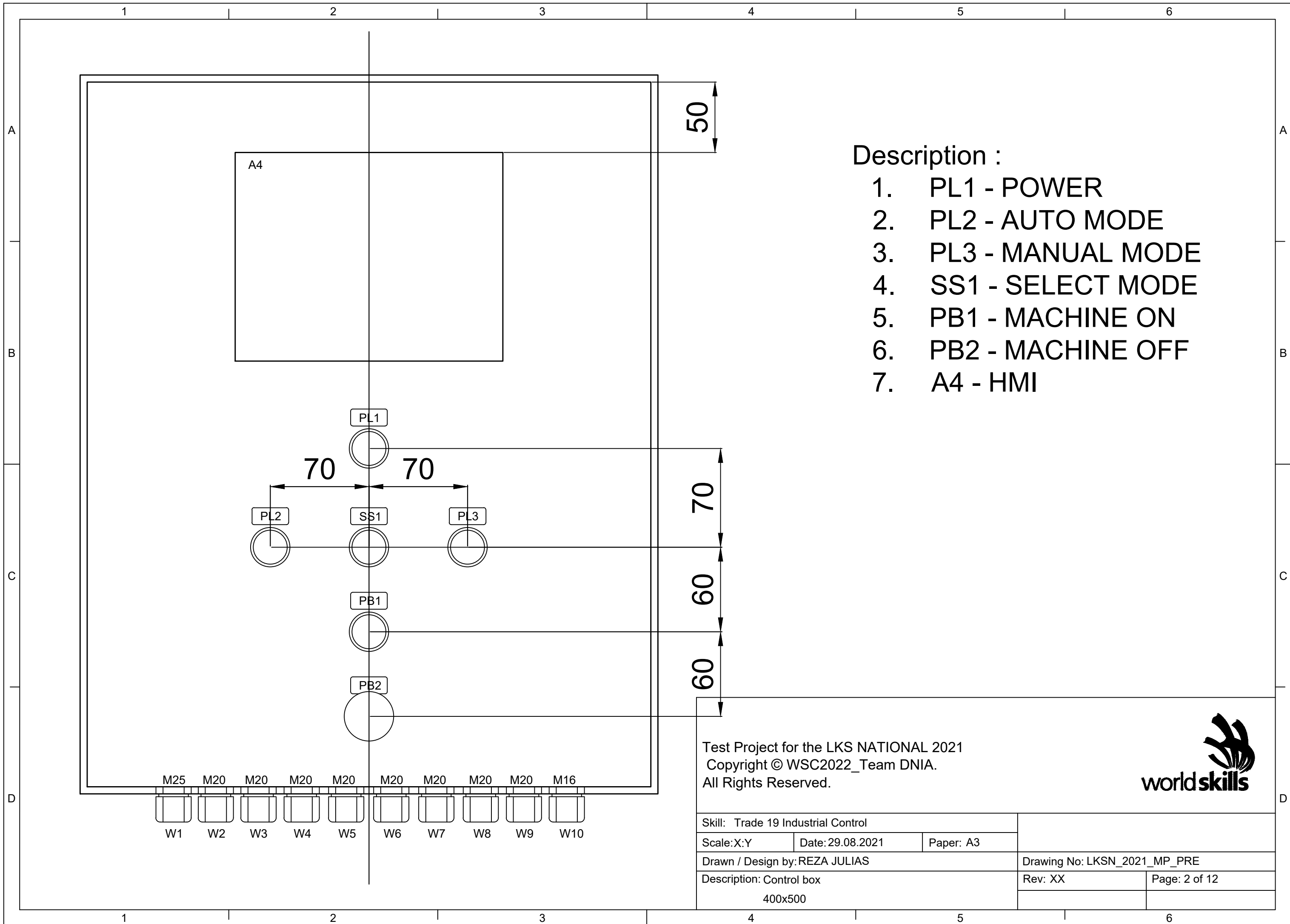
**WALL INSTALLATION NOT IN SCALE**  
\* All measurements from a horizontal and vertical line  
ap 10 - 30mm from the end of the booth.

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

Test Project for the LKS NATIONAL 2021  
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Skill: Industrial Control 19					
Scale: X:Y	Date: 29.08.2021	Paper: A3			
Drawn / Design by: REZA JULIAS			Drawing No: LKSN_2021_MP_PRE		
Description: Wall layout			Rev:	Page: 1 of 12	



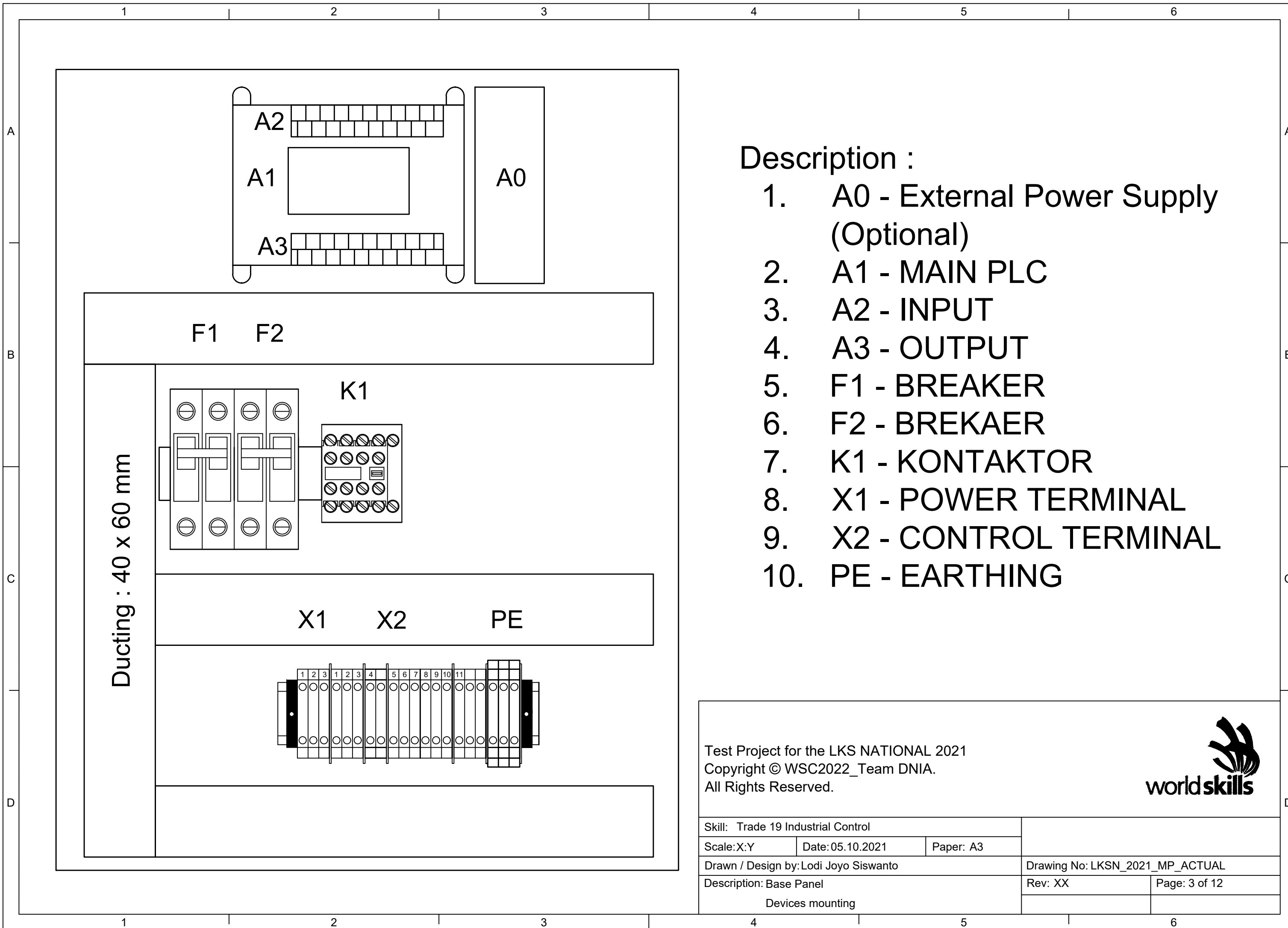
**Description :**

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

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Skill: Trade 19 Industrial Control			Drawing No: LKSN_2021_MP_PRE
Scale: X:Y	Date: 29.08.2021	Paper: A3	
Drawn / Design by: REZA JULIAS			Rev: XX
Description: Control box 400x500			Page: 2 of 12



**Description :**

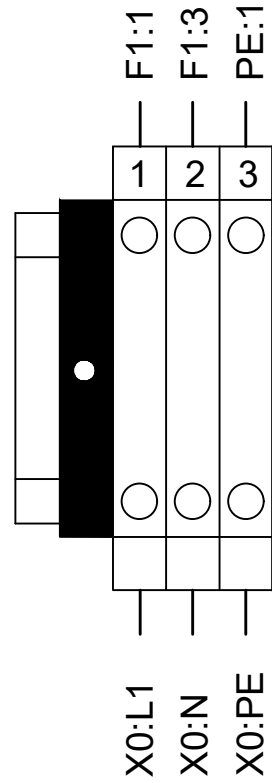
1. A0 - External Power Supply (Optional)
2. A1 - MAIN PLC
3. A2 - INPUT
4. A3 - OUTPUT
5. F1 - BREAKER
6. F2 - BREKAER
7. K1 - KONTAKTOR
8. X1 - POWER TERMINAL
9. X2 - CONTROL TERMINAL
10. PE - EARTHING

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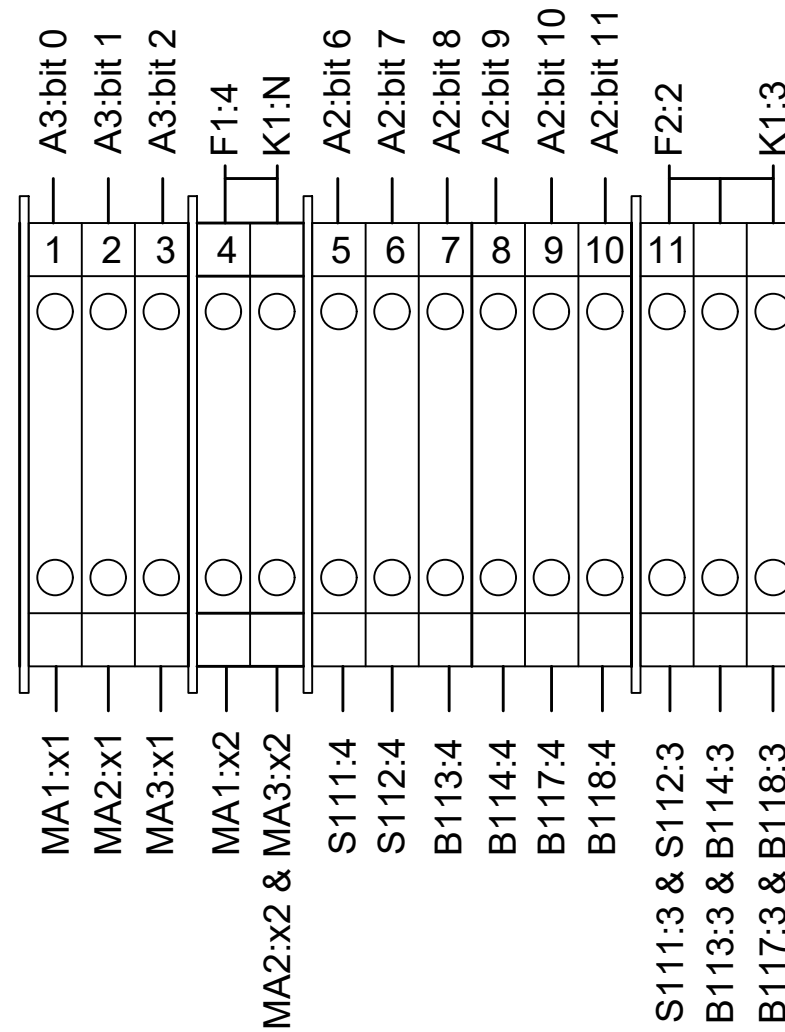


Skill: Trade 19 Industrial Control					
Scale: X:Y	Date: 05.10.2021	Paper: A3			
Drawn / Design by: Lodi Joyo Siswanto			Drawing No: LKSN_2021_MP_ACTUAL		
Description: Base Panel			Rev: XX	Page: 3 of 12	
Devices mounting					

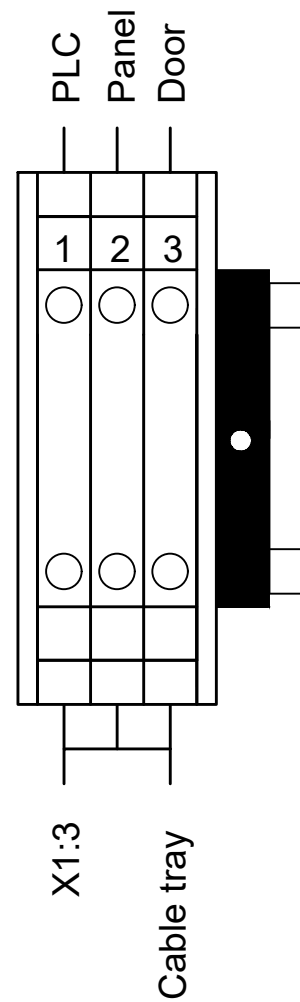
# X1



# 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: 29.08.2021	Paper: A3			
Drawn / Design by: REZA JULIAS			Drawing No: LKSN_2021_MP_PRE		
Description: Termination			Rev:	Page: 4 of 12	

1

2

3

4

5

6

A

B

C

D

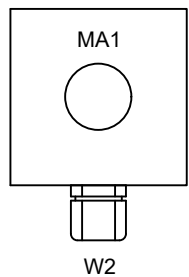
A

B

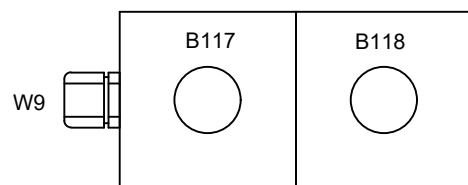
C

D

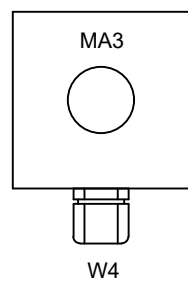
6



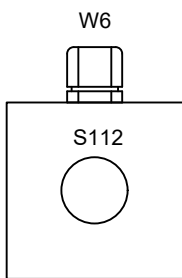
7



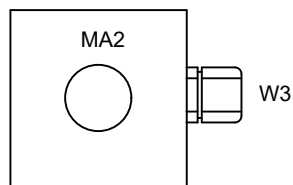
8



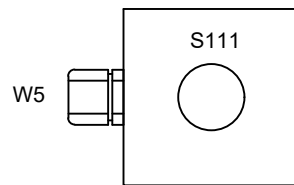
9



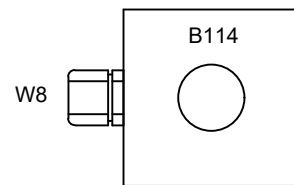
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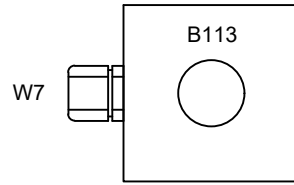
11



12



13



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Skill: Trade 19 Industrial Control					
Scale: X:Y	Date: 29.08.2021	Paper: A3			
Drawn / Design by: REZA JULIAS			Drawing No: LKSN_2021_MP_PRE		
Description: Detail - Cable Number			Rev:	Page: 5 of 12	

1

2

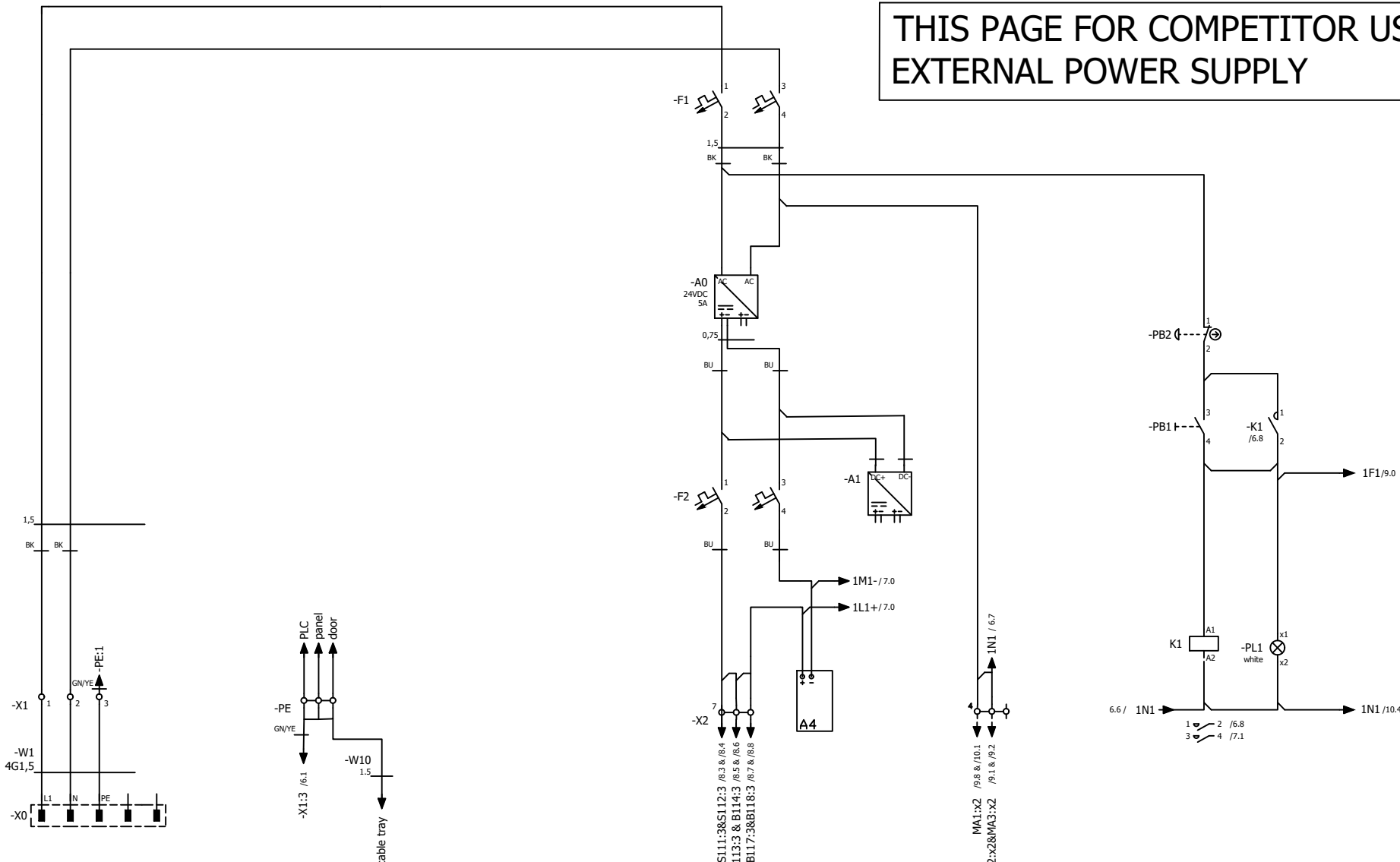
3

4

5

6

THIS PAGE FOR COMPETITOR USE  
EXTERNAL POWER SUPPLY



COLOR LEGEND:  
BN: BROWN  
WH: WHITE  
BU: BLUE  
BK: BLACK  
GN/YE: GREEN/YELLOW

			Datum	05.10.2021					=
			Bearb.	Lodi Joyo Siswanto					+
			Gepr.		LKS NATIONAL2021 Industrial Control				
Änderung	Datum	Name	Urspr	Ersatz von	Ersetzt durch			LKSN_2021_MP_ACTUAL	Blatt 6
									Blatt 12

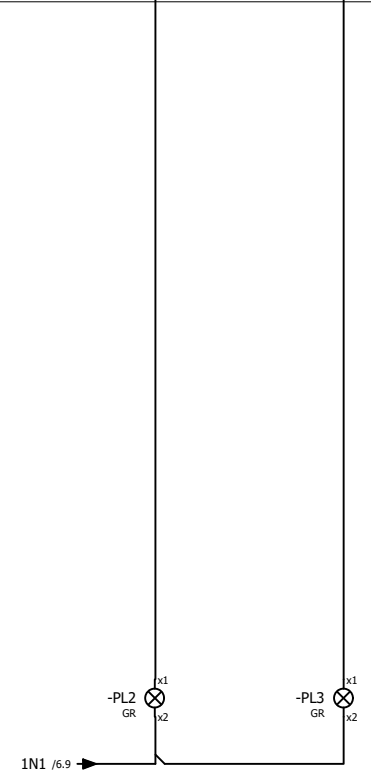
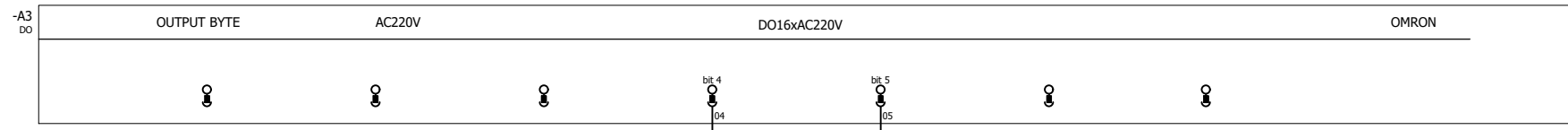












AUTO MODE      MANUAL MODE

		Datum 29.08.2021																			
		Bearb. REZA JULIAS																			
		Gepr		LKSNATIONAL2021 Industrial Control																	
Änderung		Datum		Name		Urspr		Ersatz von		Ersetzt durch						LKSN_2021_MP_PRE		Blatt 10		Blatt 12	






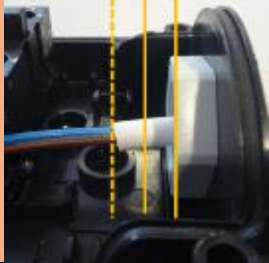

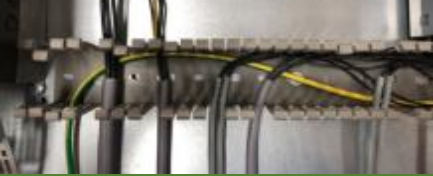


# PLC - INPUTS





<u>INPUT</u>	<u>ADDRESS</u>	<u>SYMBOL</u>	<u>FUNCTION</u>
I 0	.....	K1	READY
I 1	.....	SS1	SELECT MODE
I 2	.....		
I 3	.....		
I 4	.....		
I 5	.....		
I 6	.....	S111	TANK B101 FULL
I 7	.....	S112	TANK B102 HALF
I 8	.....	B113	TANK B101 EMPTY
I 9	.....	B114	TANK B101 HALF
I 10	.....	B117	MA1 LEFT
I 11	.....	B118	MA1 RIGHT
I 12	.....		
I 13	.....		
I 14	.....		
I 15	.....		

# PLC - OUTPUTS

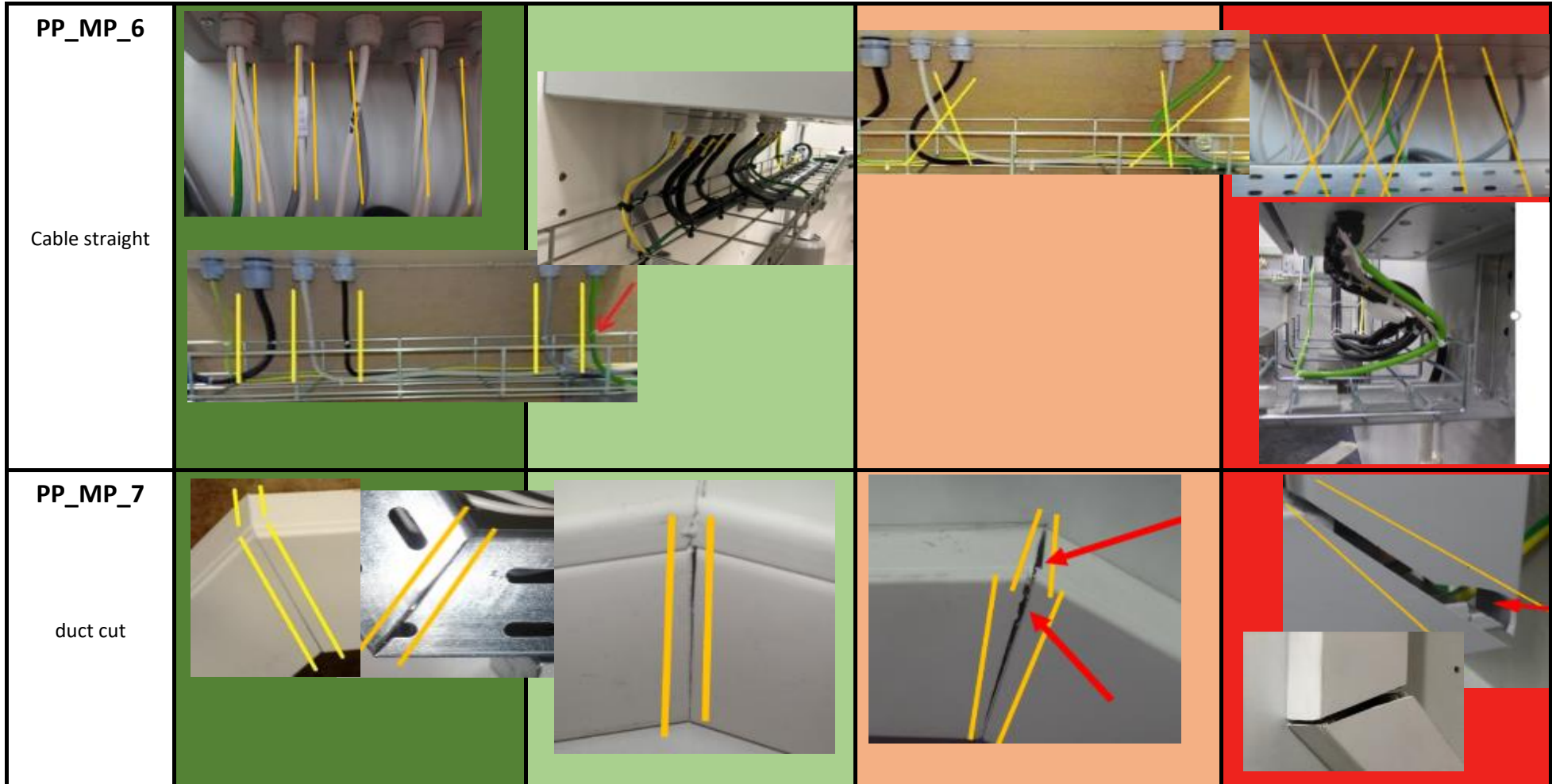
<u>OUTPUT</u>	<u>ADDRESS</u>	<u>COLOR</u>	<u>SYMBOL</u>	<u>FUNCTION</u>
Q 0	.....	GREEN	MA1	MIXING MOTOR
Q 1	.....	GREEN	MA2	MOTOR PUMP 1
Q 2	.....	GREEN	MA3	MOTOR PUMP 2
Q 3	.....	WHITE	PL2	AUTO MODE
Q 4	.....	WHITE	PL3	MANUAL MODE
Q 5	.....			
Q 6	.....			
Q 7	.....			
Q 8	.....			
Q 9	.....			
Q 10	.....			
Q 11	.....			
Q 12	.....			
Q 13	.....			
Q 14	.....			
Q 15	.....			

Topic/ Criteria	excellent (3)	professional (2)	amateur (1)	bad (0)
PP_MP_1  Level control	 		  <p data-bbox="1102 727 1470 755">Air bubble can't touch on the line</p>	

<p><b>PP_MP_2</b></p> <p>Device Wire length</p>		 <p>MÁX.</p>	 <p>length &gt; x+y</p> <p>x</p> <p>y</p> <p>more than y+x</p>	
<p><b>PP_MP_3</b></p> <p>Device Cable sheath (2 - 8 mm)</p>				
<p><b>PP_MP_4</b></p> <p>control box cable sheath</p>				 <p>too short sheath</p>

<p>PP_MP_5</p> <p>wiring control box</p>				



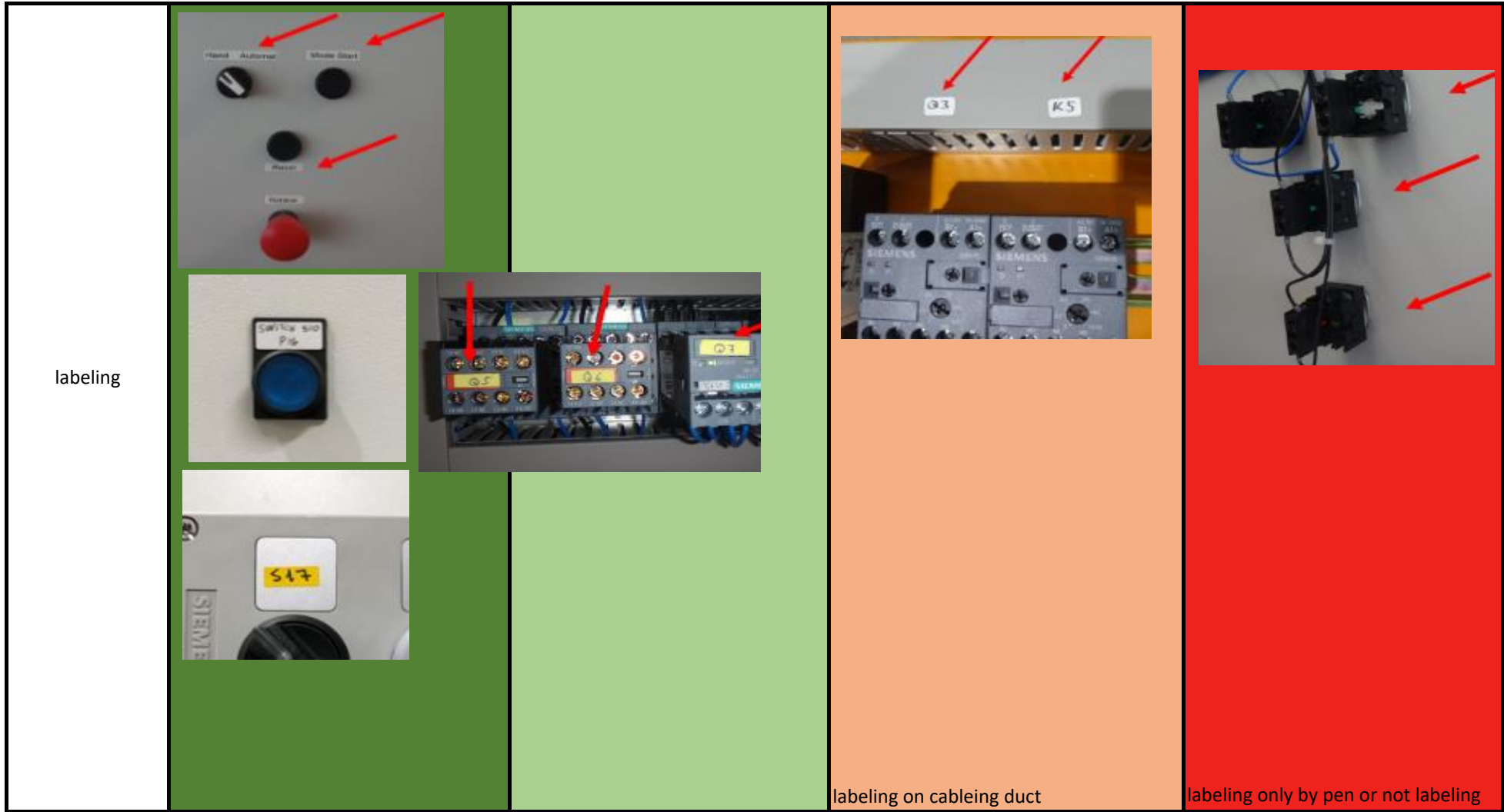




PP\_MP\_9

labeling





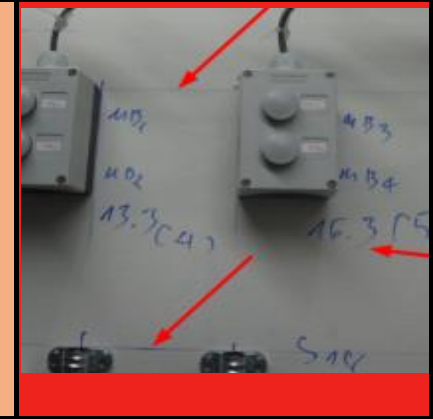
<p>PP_MP_10</p>     <p>Cabinet</p>			 <p>scratch</p>	 <p>extra hole</p>
<p>PP_MP_11</p>     <p>Cabinet wiring</p>				

PP\_MP\_12

wall clean (line  
max 10mm)



lines, scratch, extra holes



# TEST PROJECT

## MODULE D (PROGRAMMING)

### INDUSTRIAL CONTROL

LKSNATIONAL\_2021\_HMI\_PRE

Submitted by:

Name: Lodi Joyo Siswanto

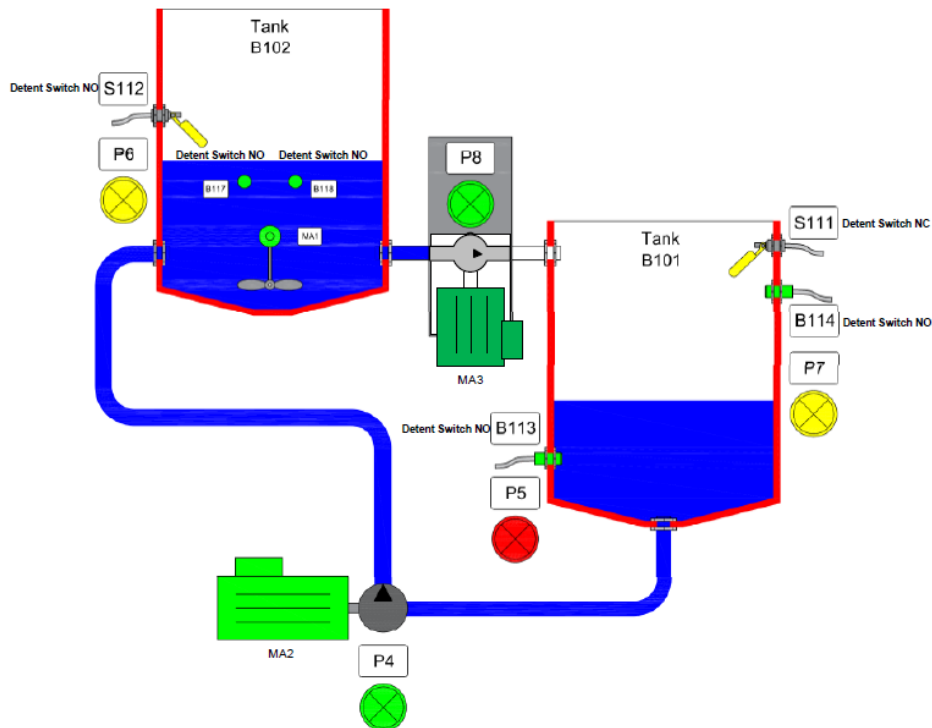
Member country or region: ID





## Module D – Main project

With the attached mounting layout and its electrical diagrams it is intended to simulate the operation of the following **Water Control System**.



### Legend :

**MA1:** Mixing motor

**MA2:** Motor pump 1

**MA3:** Motor pump 2

**B113 :** Tank B101 Empty

**B114 :** Tank B101 Half

**S111 :** Tank B101 Full

**B117 :** MA1 Left

**B118 :** MA1 Right

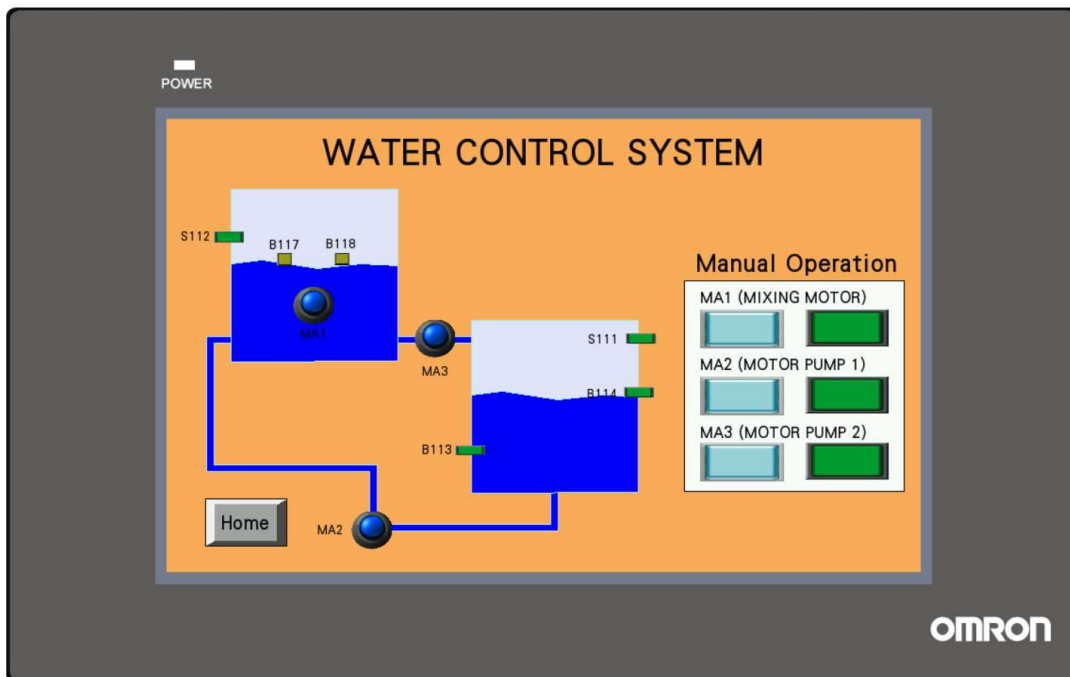
**S112 :** Tank B102 Half



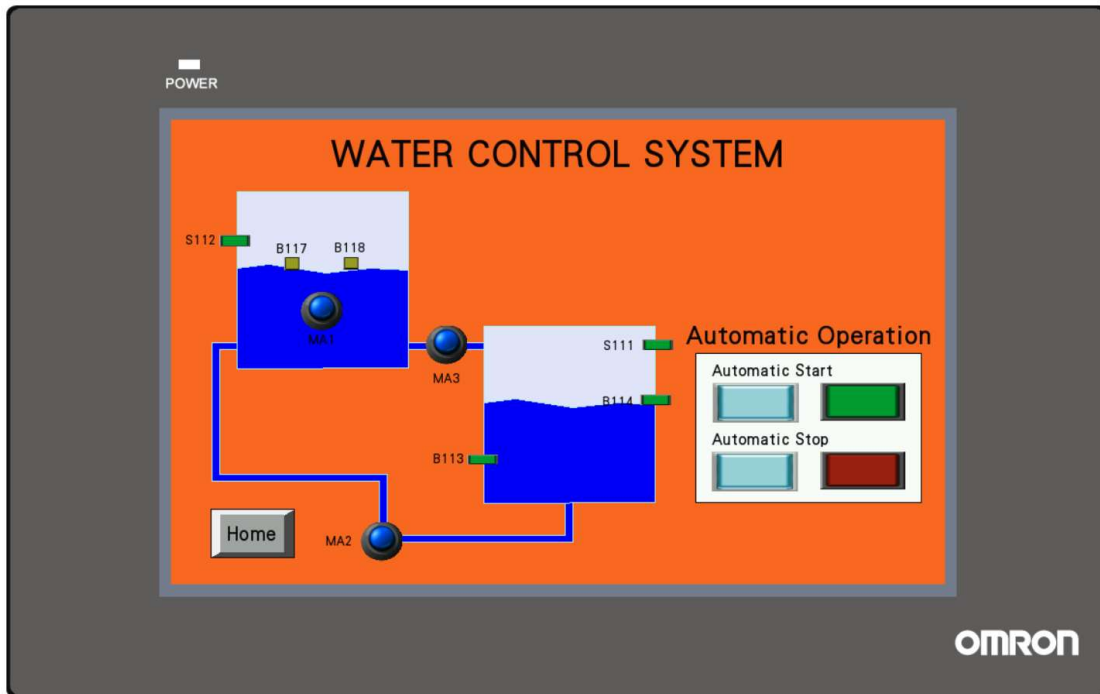
## HMI – Screen “HOME”



## HMI – Screen “Manual”



# HMI – Screen “Automatic”



## PLC Inputs/ Outputs

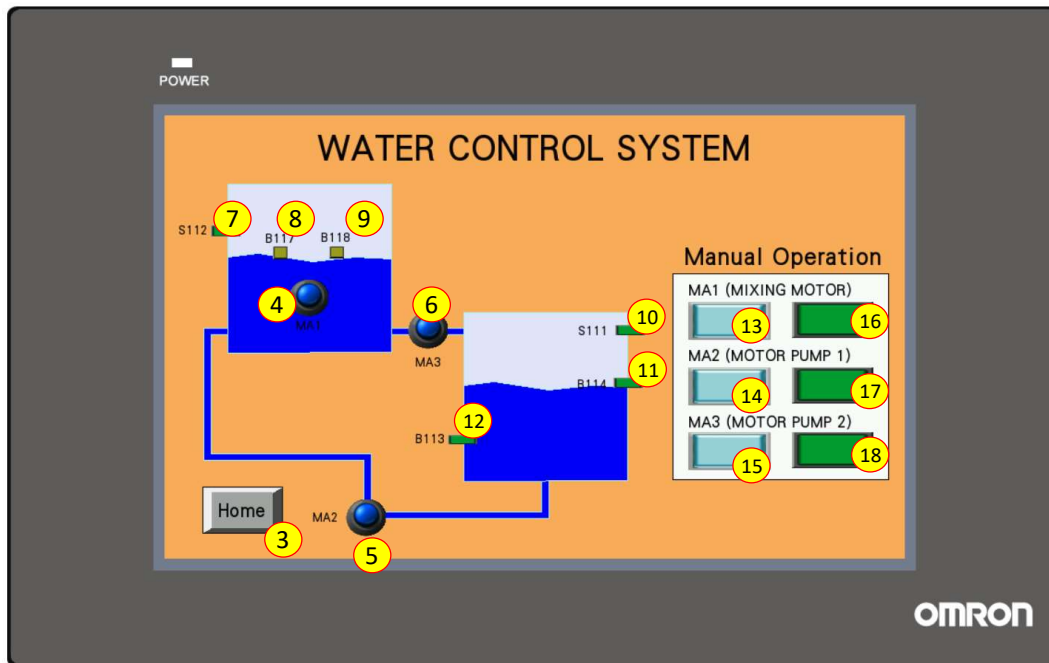
SYMBOL	TYPE	COMMENT
A2: DI_BIT0	BOOL	PLC - Input (A2)
SS1	BOOL	PLC - Input (A2)
S111	BOOL	PLC - Input (A2)
S112	BOOL	PLC - Input (A2)
B113	BOOL	PLC - Input (A2)
B114	BOOL	PLC - Input (A2)
B117	BOOL	PLC - Input (A2)
B118	BOOL	PLC - Input (A2)
MA1	BOOL	PLC - Output (A3)
MA2	BOOL	PLC - Output (A3)
MA3	BOOL	PLC - Output (A3)
PL2	BOOL	PLC - Output (A3)
PL3	BOOL	PLC - Output (A3)
Mode_Manual	BOOL	PLC - Variable
Mode_Automatic	BOOL	PLC - Variable
Cycle_active	BOOL	PLC - Variable
Cycle_Stop	BOOL	PLC - Variable
HMI_Button 0	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

## Details : Home Screen



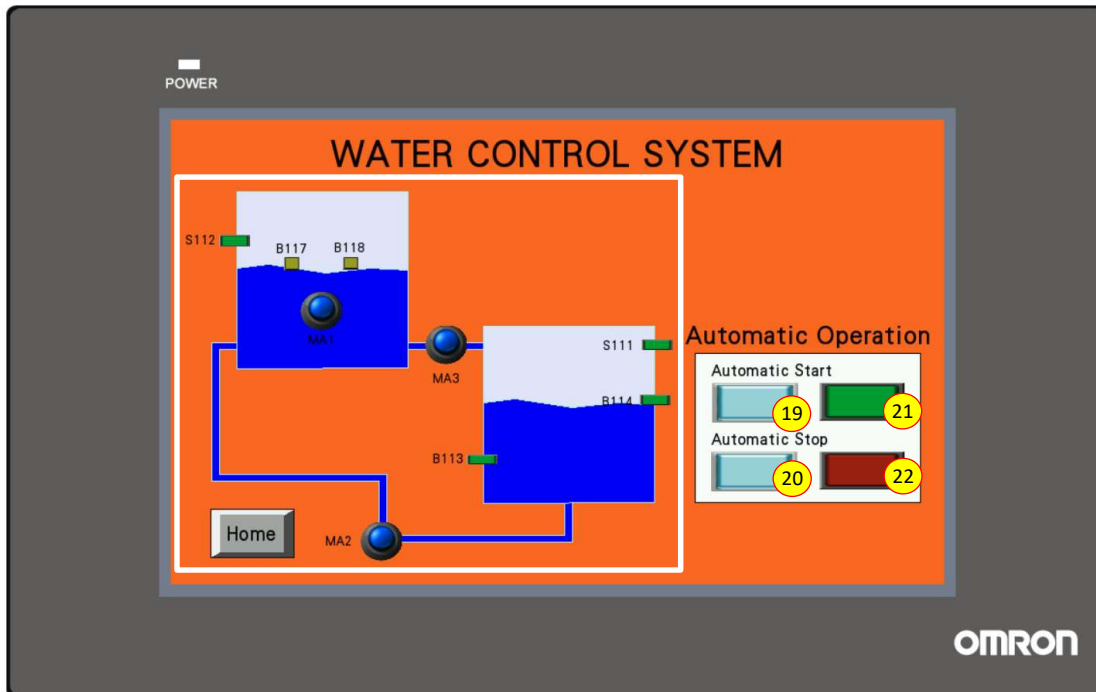
POSITION	VARIABLE	ACTION	COMMENT
1	---	Button Event	Active "Manual Screen"
2	---	Button Event	Active "Automatic Screen"

## Details : Manual Screen



POSITION	VARIABLE	ACTION	COMMENT
3	---	Button Event	Active "Home Screen"
4	MA1	Background Control Colour	State "0" = colour = BLUE State "1" = colour = LIGHT BLUE
5	MA2	Background Control Colour	State "0" = colour = BLUE State "1" = colour = LIGHT BLUE
6	MA3	Background Control Colour	State "0" = colour = BLUE State "1" = colour = LIGHT BLUE
7	S112	Background Control Colour	State "0" = colour = GREEN State "1" = colour = LIGHT GREEN
8	B117	Background Control Colour	State "0" = colour = YELLOW State "1" = colour = LIGHT YELLOW
9	B118	Background Control Colour	State "0" = colour = YELLOW State "1" = colour = LIGHT YELLOW
10	S111	Background Control Colour	State "0" = colour = GREEN State "1" = colour = LIGHT GREEN
11	B114	Background Control Colour	State "0" = colour = GREEN State "1" = colour = LIGHT GREEN
12	B113	Background Control Colour	State "0" = colour = GREEN State "1" = colour = LIGHT GREEN
13	HMI_Button 2	Button Event	Set bit while key is pressed / Momentary
14	HMI_Button 3	Button Event	Set bit while key is pressed / Momentary
15	HMI_Button 4	Button Event	Set bit while key is pressed / Momentary
16	MA1	Background Control Colour	State "0" = colour = GREEN State "1" = colour = LIGHT GREEN
17	MA2	Background Control Colour	State "0" = colour = GREEN State "1" = colour = LIGHT GREEN
18	MA3	Background Control Colour	State "0" = colour = 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
19	HMI_Button 0	Button Event	Set bit while key is pressed / Momentary
20	HMI_Button 1	Button Event	Set bit while key is pressed / Momentary
21	Cycle_Active	Background Control Colour	State "0 " = colour = GREEN State "1 " = colour = LIGHT GREEN
22	Cycle_Active	Background Control Colour	State "1 " = colour = RED State "0 " = colour = LIGHT RED

# PROGRAMMING INDUSTRIAL CONTROL

LKSNATIONAL\_2021\_Programming\_PRE

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

Nama : \_\_\_\_\_  
Provinsi : \_\_\_\_\_



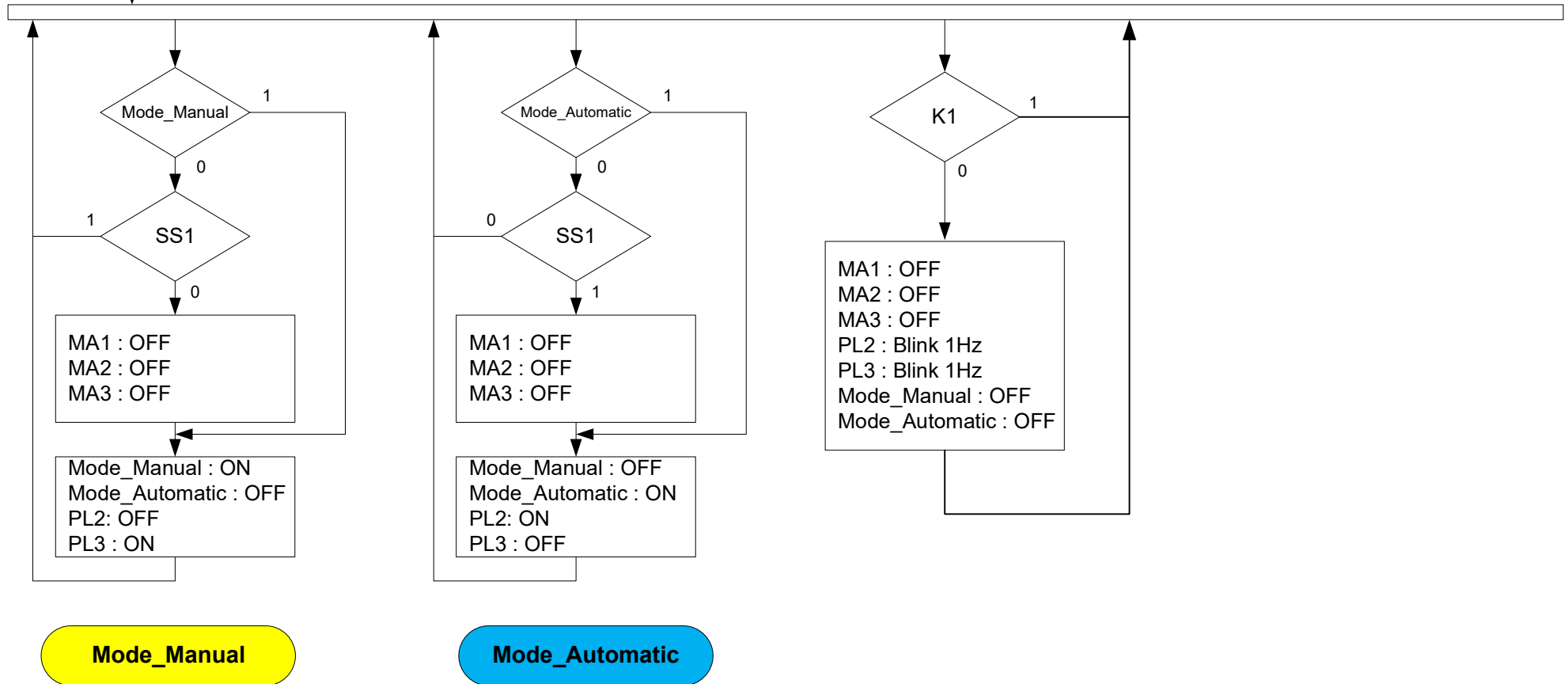
**Power On**

All actuators : OFF

Note :

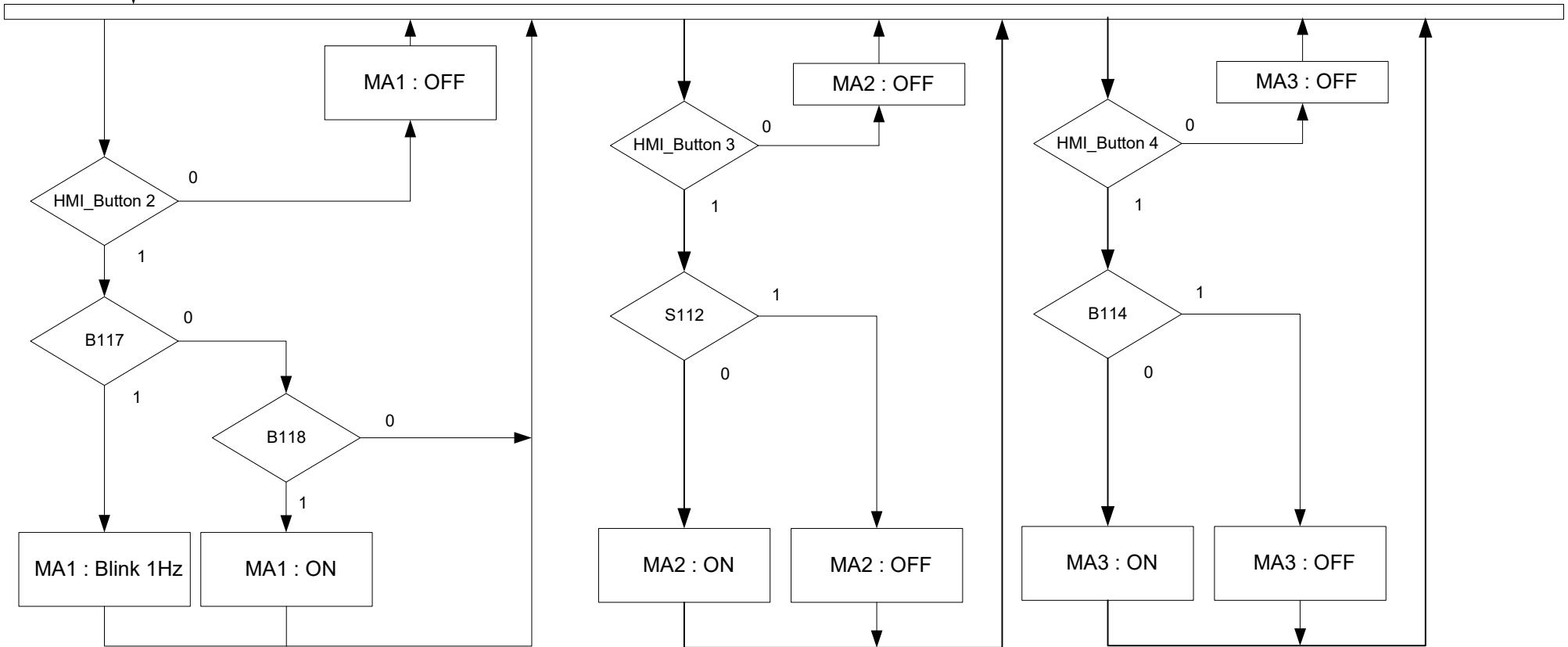
Switches, push buttons or other devices actuated / true = state "1" on the function diagram

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

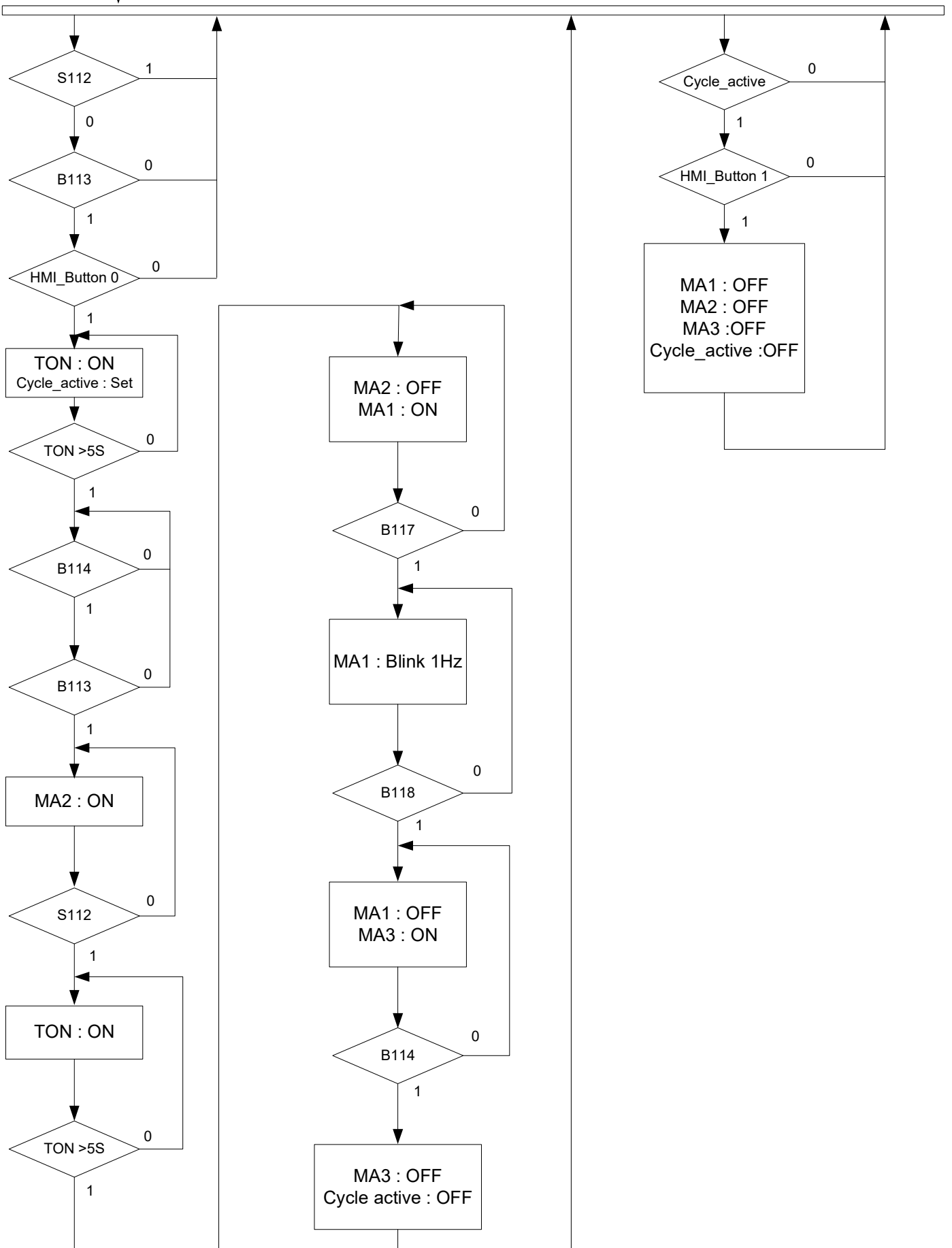




Mode\_Manual



**Mode\_Automatic**





**KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI**  
**PUSAT PRESTASI NASIONAL**

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