ERL MAINTENANCE SUPPORT SDN BHD

Co. Reg. No. 199901023674 (498574-T)

E-MAS

Effective Railway Operations; Reliable System Maintenance

PROJECT & ENGINEERING DEPARTMENT

TECHNICAL INSTRUCTION FOR MAIN TRANSFORMER TEST BENCH

Ref. No. E00.OMD.M92060.CZ.1001.A

Release

Released:	Jayaraj	RSX	02.07.20	
Checked:	Norazman	RST	18/6/2020	
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Author:	Mohd Firdaus	PNE	18/6/2020	
	Name	**Dept.**	**Date**	**Signature**

Amendments or additions to this procedure must be indicated with a vertical black line in the adjacent left margin.

Change Record and Configuration Control

A	9 May 20	New	Mohd Firdaus
Revision	**Date**	**Modification**	**Name**

Planning Of Changes Reference For Revision: E00.OMD.M92060.CZ.1001.A					
Issues To Consider	**Checked** *(Please mark X)*				**Remarks**
1) Are there any negative impact?	YES		NO	X	
2) Will the integrity of QEMS be affected?	YES		NO	X	
3) Resources available?	YES	X	NO		Adequate
4) Allocation or relocation of responsibilities and authorities required?	YES		NO	X	

TABLE OF CONTENTS **Page**

1 Purpose

The purpose of this procedure is to provide an overview and technical instruction for operating the Test Bench for SIEMENS Main Transformer.

2 Scope, Distribution & Access

This procedure is accessible to all RST and PNE who are responsible to operate the Siemens Transformer Test Bench equipment. This document is traceable via Electronic Document Management System (EDMS).

3 Definition and abbreviation used in this procedure

Abbreviation	Description
DC	Direct Current
EMU	Electrical Multiple Unit
EUT	Equipment Under Testing
HV	High Voltage
LED	Light Emitting Diode
DC/DC	Direct Current to Direct Current

4 Introduction

This test bench is used to perform offline test to determine the functionality and condition of the blowers, pump and sensors, installed on Main Transformer for SIEMENS trains.

5 Criteria for Testing

A. The transformer unit must be in complete assembly, as such the pump, blowers and sensor are firmly assembled to the main structure, and all wirings are correctly connected. Check for test bench, ensure it is in good condition and all connection to the EUT is properly attached, as described in **Section 14**.

B. All parts must be installed and all electrical connections are secured. Grounding connection between the power source, test bench, and main transformer is secured.

6 Reference Document

A. Technical Instruction for Main Transformer Test Bench
(Doc. Ref. No.: E00.OMD.M92060.CZ.1001.*)
B. Wiring Diagram for Siemens Main Transformer Test Bench
(Doc. Ref. No.: E00.OMD.M92060.YS.1005.*)

7 Equipment List

A. Siemens Main Transformer Test Bench
B. 400V 3 phase 16A Workshop Supply
C. **Option 1:** SIEMENS Main Transformer Unit (spare unit)
D. **Option 2:** SIEMENS Main Transformer Unit (offline mode: the train is shut down and connector X11, X12, and X13 disconnected from the train)
E. Phase Motor Detection
F. Digital Multimeter
G. Set of Spanner

8 Initial Process

Perform a visual check of the equipment for damages or abnormalities. If found, please inform the superior.

9 Main Transformer Unit

Figure 9.1 and **9.2** below shows the location of connector X11 and X12 at the main transformer.

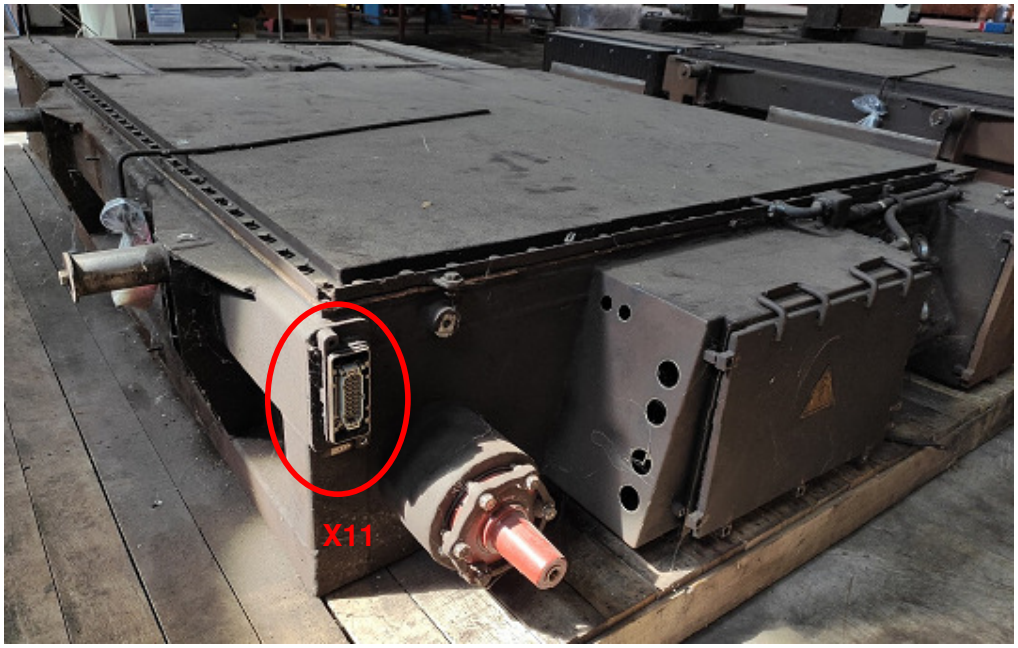


Figure 9.1: Connector X11

Figure 9.2: Connector X12

9.1 Main Transformer Control Panel Layout

A. The control panel is populated by light indicators, selector switches, and push-button switches, for operating the blowers and pump, as shown in **figure 9.3**.

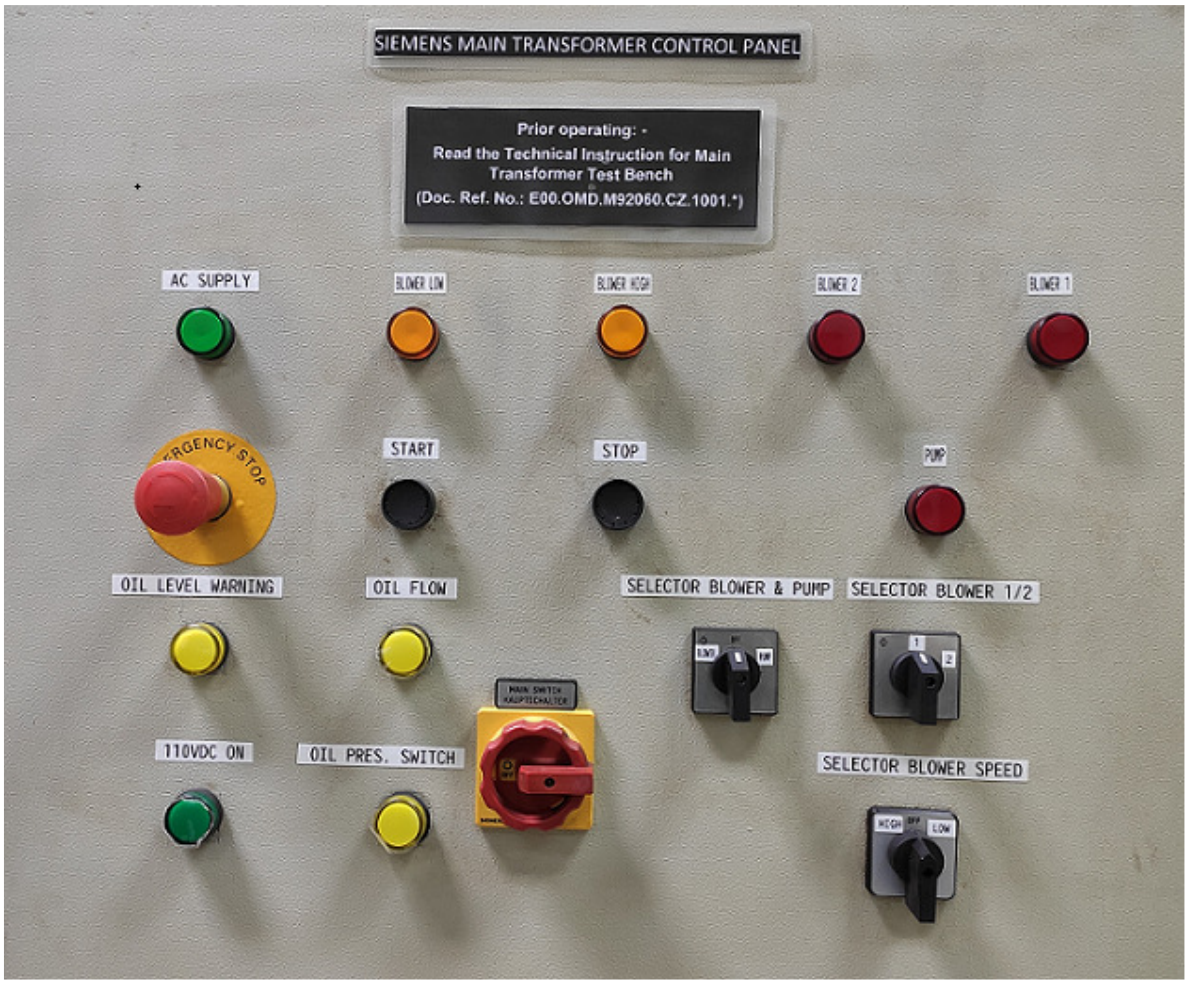


Figure 9.3: Control Panel

B. The purpose of the connector X11 is to supply the 3 phase (AC voltage) to pump and blower fans. The connector X12 is used to provide DC-Voltage to oil level indicator, oil flow indicator, pressure switch indicator, and DC-DC converter (110VDC to 24 VDC) as shown in **figure 9.4**.

Figure 9.4: Connector X11 and X12

C. The 400AC 3 phase 16A socket is for supplying AC voltage to all components in the test bench and the EUT. As shown in **figure 9.5**.

Figure 9.5: 3 phase Socket

9.2 The Parts and Operation of the Main Transformer Test Bench

9.3 Function of Main Transformer Parts

A. Transformer ventilator

- To inspect the direction of rotation and bearing condition.

B. Transformer oil pump

- To inspect the direction of oil pump flow, rotation and bearing condition.

C. Transformer sensor

- To inspect the termination of the pressure switch, signal processor (flow meter), relay module with LED indicator (K1, K2, K3, K4, and K5), and fuse of DC/DC converter.

9.4 Operation of Blower (Ventilators) and Transformer Pump

During the transformer operation, the blower will draw in the air from the side grating and exhaust them to the bottom, as shown in **figure 9.6** below. The transformer pump is used for oil circulation. **Figure 9.7** below depicts the location and rotation for the blower and pump viewed from the top after the covers being opened.

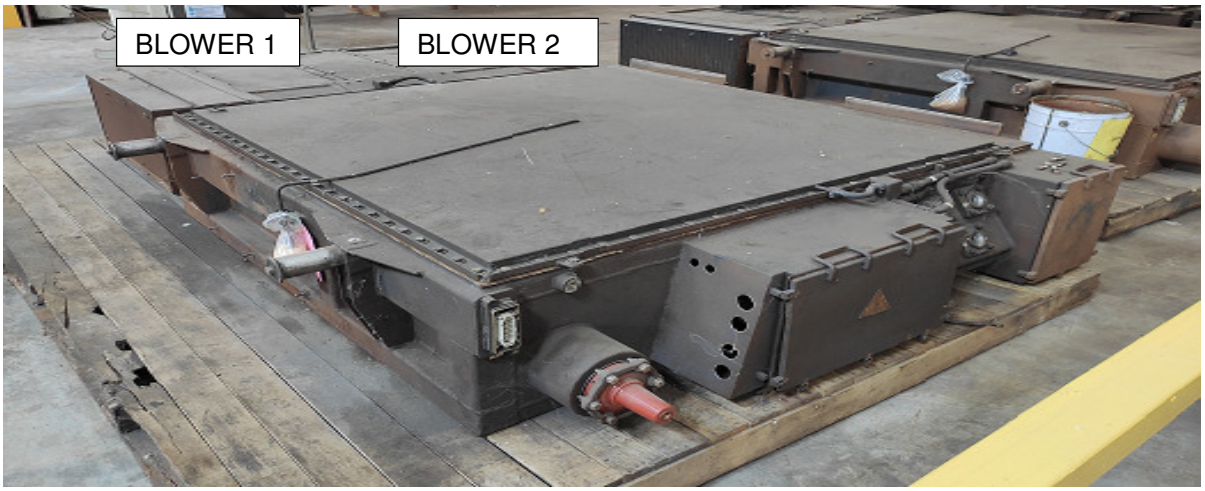


Figure 9.6: The location of ventilation blower

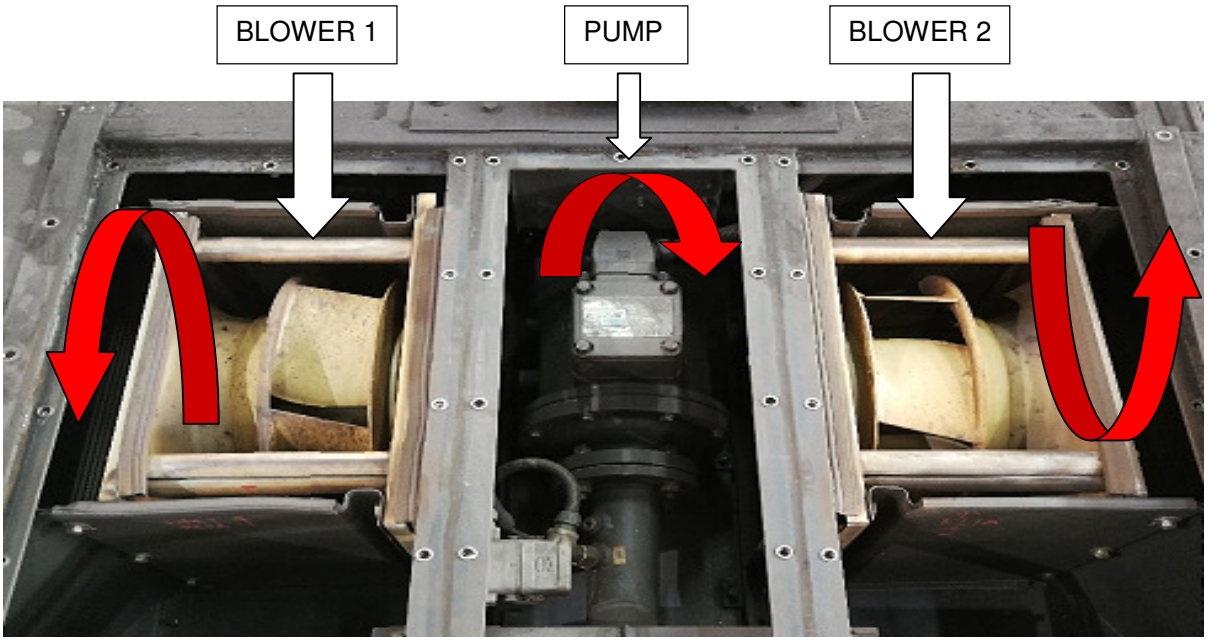


Figure 9.7: Rotation of BLOWER 1, 2 and PUMP

10 Additional tool (phase rotation detection)

Phase rotation detection is used to determine the three-phase position and motor rotation on synchronous and asynchronous motors. The contact-less detection is an ideal application for three-phase motor where the shaft is not visible.

Figure 10.1: Phase Rotation Indicator detection

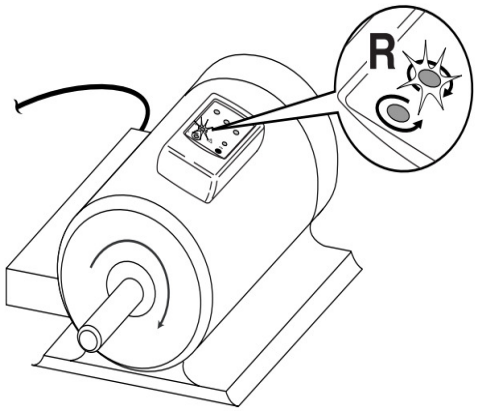
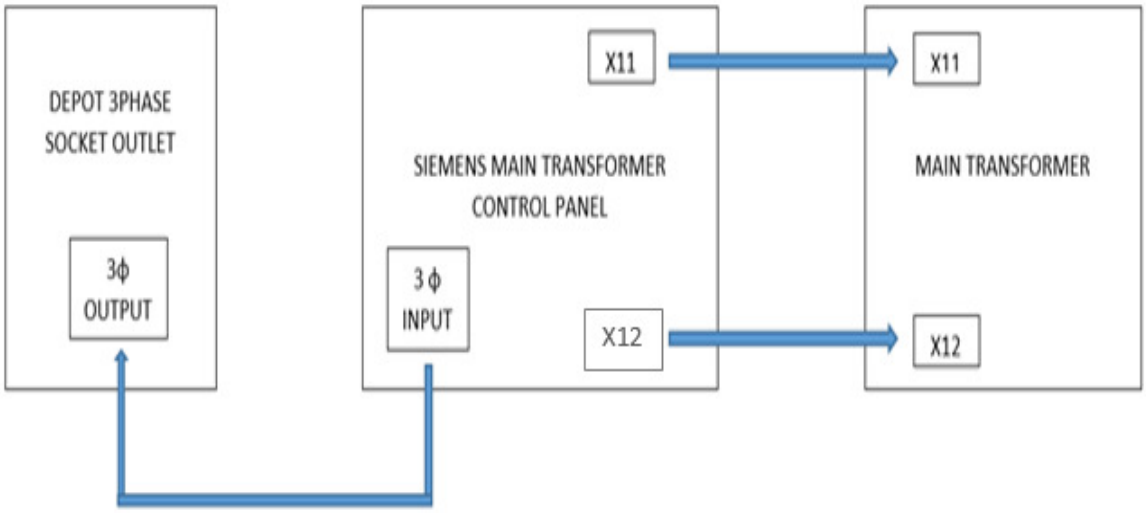


Figure 10.2: Device position at the testing object

11 Preparation

A. Connect the Siemens Main Transformer Control Panel connector **X11** and **X12** to the designated main transformer connection terminals, as shown in the **block diagram 11.1** below.

B. Plug in the input socket **3phase 16A** to the workshop socket outlet as shown as in **block diagram 11.1** below.



Block Diagram 11.1: Siemens Main Transformer Control Panel and Main Transformer connection

C. Plug in connector **X11** and **X12** to the main transformer unit as shown in **figure 11.2** and **11.3.**

Figure 11.2: Connector X11

Figure 11.3: Connector X12

D. Plug in the **3 phase 16A** input socket to the workshop socket outlet, as shown in **figure 11.4** below.

E. Make sure **X11**, **X12**, and **3 phase 16A** input socket connections are safely secured before operating the control panel.

Figure 11.4: Input Socket 3phase 16A

12 Operating Procedure

Step 1: Observe the switch condition

A. Make sure all switches are in default condition, as shown in **figure 12.1**.

- MAIN SWITCH: **OFF**
- SELECTOR BLOWER & PUMP: **OFF**
- SELECTOR BLOWER 1 or 2: **1**
- SELECTOR BLOWER SPEED: **OFF**

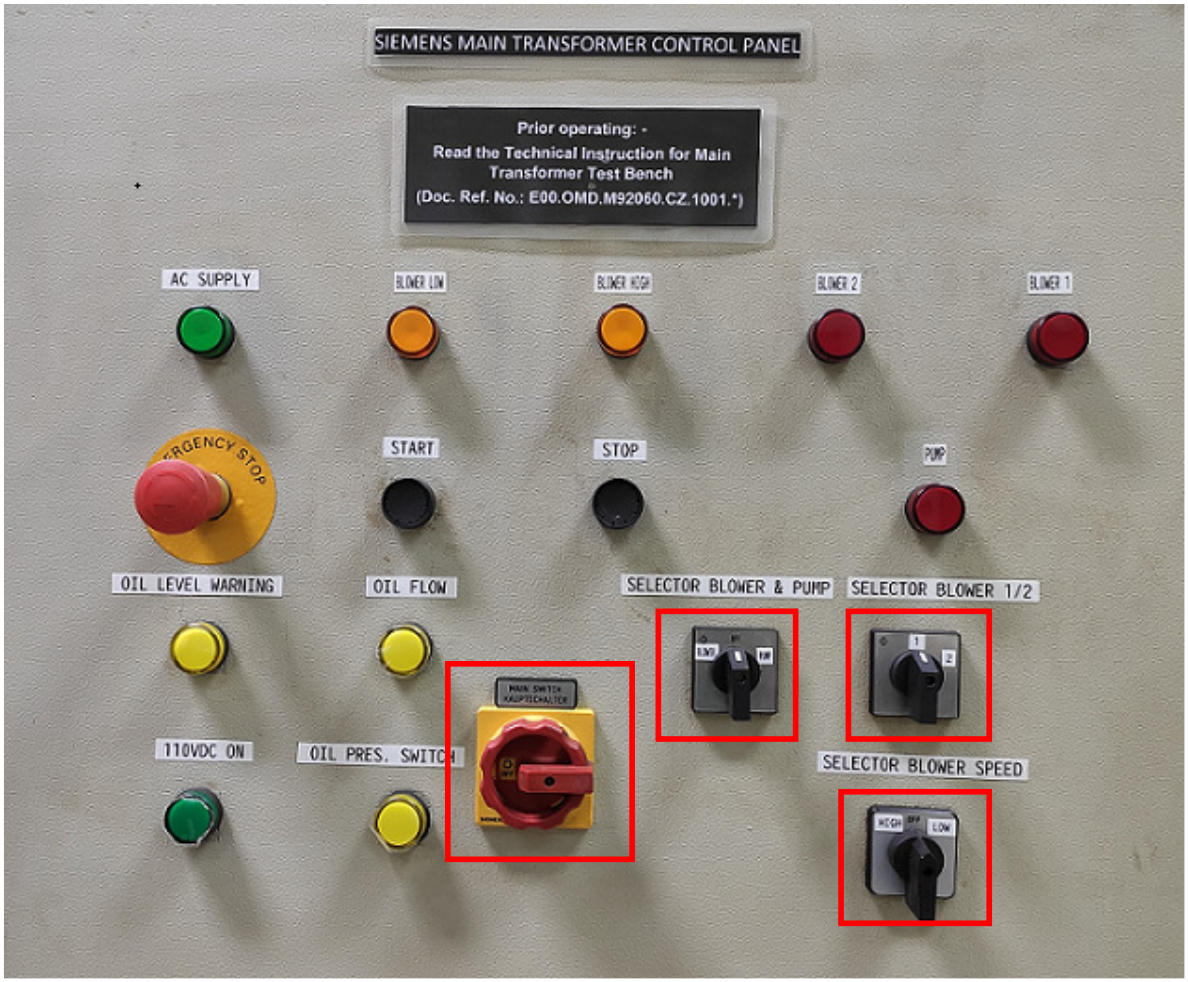


Figure 12.1: Switch position

Step 2: Switch ON the main switch

A. After switch ON the main switch knob, indicator **'110VDC ON'**, **'OIL LEVEL WARNING'**, **'OIL FLOW'** and **'OIL PRESSURE SWITCH'** will be illuminated as shown in **figure 12.2.**

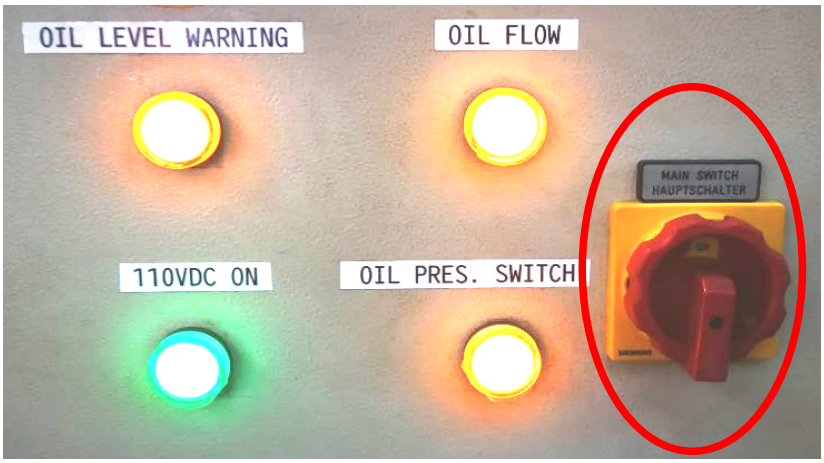


Figure 12.2: Indicator '110VDC ON', 'OIL LEVEL WARNING', 'OIL FLOW' and 'OIL PRESSURE SWITCH'

B. **Signal processor** flow meter indicator increases to the maximum value and relay contactor **K5** de-illuminated as shown in **figure 12.3** below.

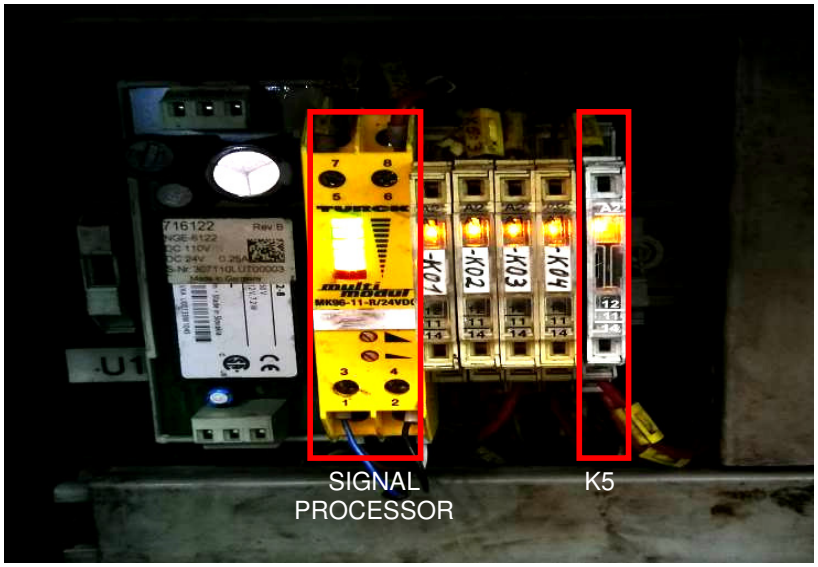


Figure 12.3: Signal processor, K1, K2, K3, K4, K5 illuminated

C. After several seconds, **'OIL FLOW'** indicator meter will OFF, as per **figure 12.4** below.

Figure 12.4: Oil Flow indicator de-illuminated

D. **Signal processor** flow meter indicator will decrease to the minimum value and the indicator **K5** is de-illuminated as shown in **figure 12.5** below. This is normal upon powering up the system and indicates that the transformer pump and transformer oil circulation flow are not running.

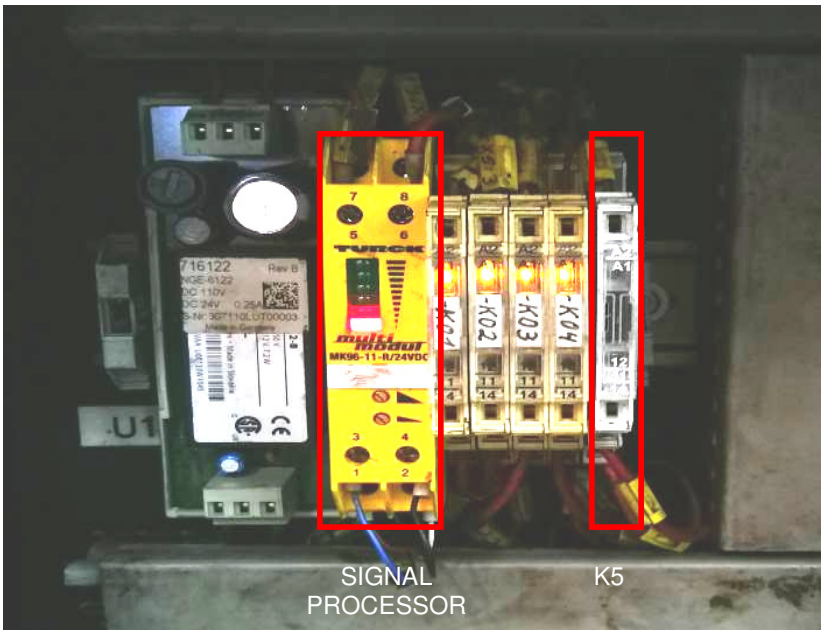


Figure 12.5: K5 lights de-illuminated

INDICATOR SENSOR	**CONDITION**
Oil Level Warning	• Insufficient oil in the transformer
Oil Flow	• Oil flow circulation detected • Delay in activation, for several seconds after turn on
Oil Pressure Switch	• Sufficient oil pressure in the transformer unit

Table 1: Sensor indicator details

Step 3: Operation of main transformer pump

A. Select **'PUMP'** at the **"SELECTOR BLOWER & PUMP**" switch knob as **figure 12.6** below.

Figure 12.6: Switch the selector to 'PUMP'

B. Press **'START'** button to operate the oil pump, as shown in **figure 12.7.**

Figure 12.7: Start push button

C. **"AC SUPPLY"** and **"PUMP"** indicator will be illuminated. Once the pump is running, check the rotation by using motor phase detection, as shown in **figure 10.1.** If pump rotation is in reverse, immediately stop pump operation by pressing the **'STOP'** button. Refer step **(D)** below and inspect the pump input supply phasing.

D. Press the **"STOP"** button to switch off the pump and the pump indicator will turn off as shown in **figure 12.8** below.

Figure 12.8: Stop push button

Step 4: Operate main transformer blower fan.

A. Select **'BLOWER'** at the "**SELECTOR BLOWER & PUMP"** selector knob, as shown in **figure 12.9** below.

Figure 12.9: Selector Blower & Pump

B. Select the blower no.1 or no.2 at the **"SELECTOR BLOWER 1/2",** depending on which blowers to operate as shown in **figure 12.10** below.

Figure 12.10: Selector blower 1 or 2

C. Select **'LOW'** mode at the **"SELECTOR BLOWER SPEED"** knob as shown in **figure 12.11** below.

Figure 12.11: Blower speed selector

D. Press **'START'** button to run the blower. **Figure 12.12** shows the dedicated blower indicator will illuminate up based on the item **(B)** as above, either **'BLOWER 1'** or **'BLOWER 2'**.

Figure 12.12: Start push button

E. Observe the blower rotation, refer instruction in **figure 10.1.** If the rotation is in reverse, inspect the blower input connection or termination polarity accordingly.

F. Press the **'STOP'** button to terminate the blower operation. Blower indicator will de-illuminate, as shown in **figure 12.13** below.

Figure 12.13: Stop push button

G. Select '**HIGH**' mode knob as shown in **figure 12.14** below.

Figure 12.14: Blower speed selector

H. Press **'START'** button to run the blower. **Figure 12.15** shows the dedicated blower indicator will illuminate based on the item **(B)** above, either **'BLOWER 1'** or **'BLOWER 2'**.

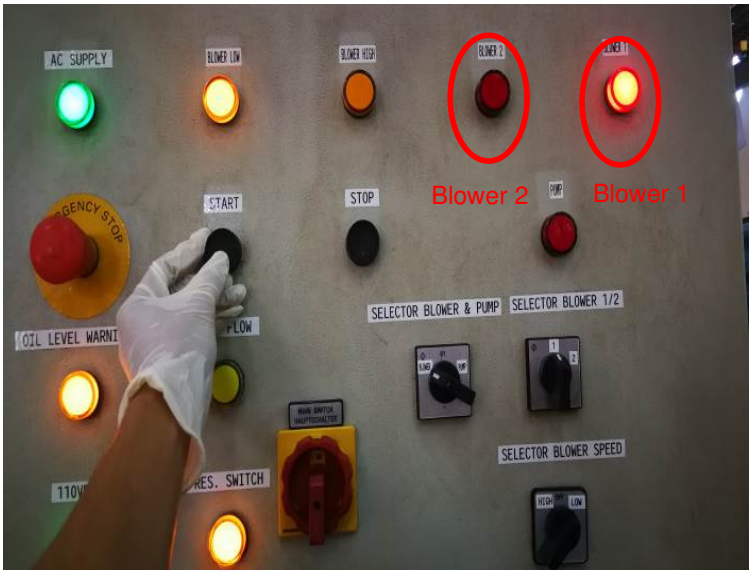


Figure 12.15: Start push button

I. Observe the blower rotation, refer instruction in **figure 10.1.** If the rotation is in reverse, inspect the blower input connection or termination polarity accordingly.

J. Press **'STOP'** button to terminate blower operation. Blower indicator will de-illuminate, as shown in **figure 12.16.**

Figure 12.16: Stop push button

Step 5: Shutting down the test bench and equipment under testing

A. Swicth **'OFF'** main switch as shown in **figure 12.1.**
B. Disconnect the end input socket 3phase 16A from the workshop socket outlet as shown in **figure 11.4.**
C. Dismantle the connector **X11** as shown in **figure 11.2** and connector **X12** as shown in **figure 11.3**.
D. Store the Siemens main transformer control panel, connectors and socket-outlet at the designated location.

14 Appendices

Refer **'Wiring Diagram for the Siemens Transformer Test Bench'**
(Doc. Ref. No.: E00.OMD.M92060.YS.1005.A)

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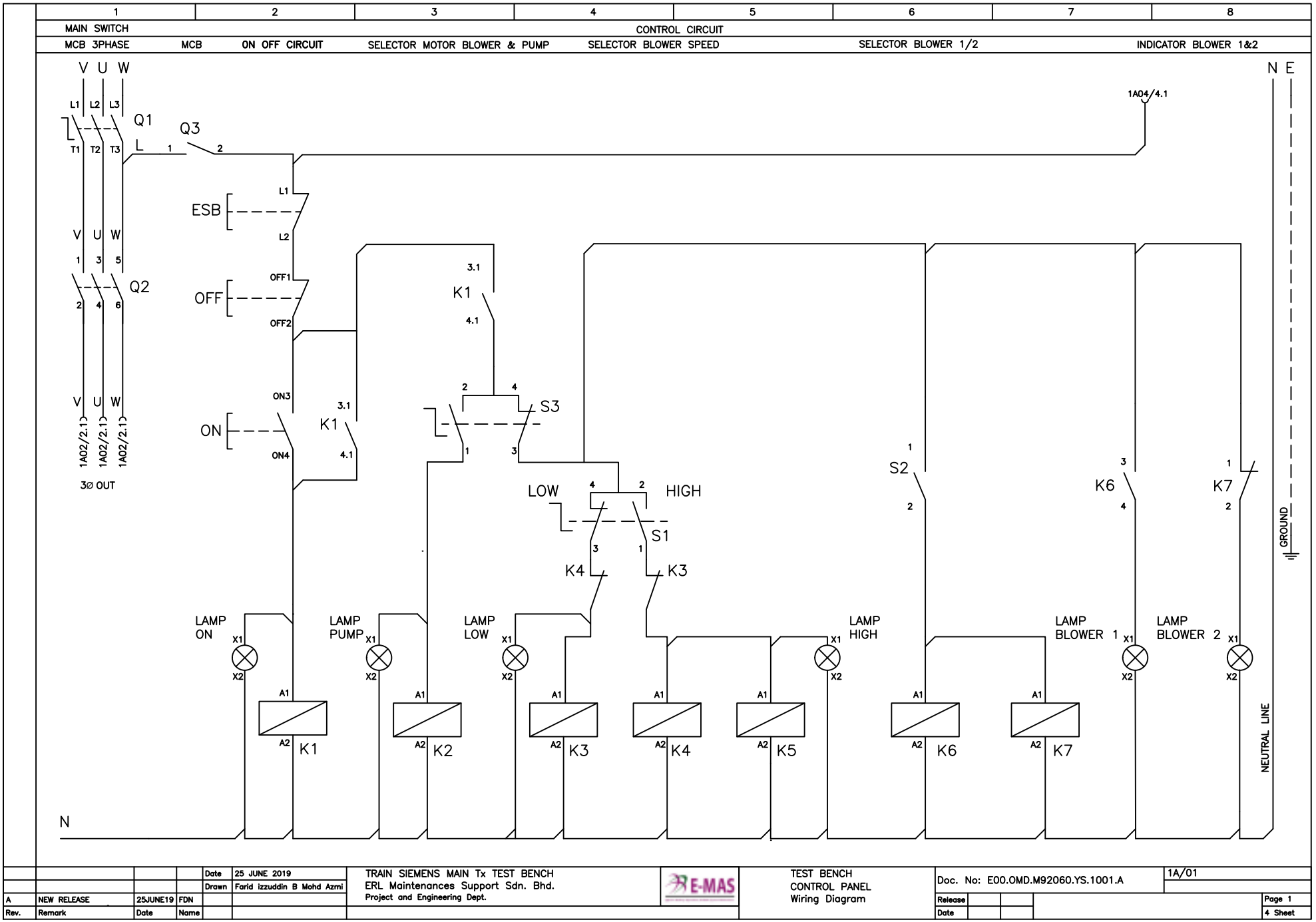
WIRING DIAGRAM FOR MAIN TRANSFORMER TEST BENCH

Ref. No. E00.OMD.M92060.YS.1005.A



				Date	25 JUNE 2019	TRAIN SIEMENS MAIN Tx TEST BENCH ERL Maintenances Support Sdn. Bhd. Project and Engineering Dept.	E-MAS	TEST BENCH CONTROL PANEL Wiring Diagram	Doc. No: E00.OMD.M92060.YS.1001.A	1A/01
				Drawn	Farid izzuddin B Mohd Azmi					
A	NEW RELEASE	25JUNE19	FDN						Release	Page 1
Rev.	Remark	Date	Name						Date	4 Sheet

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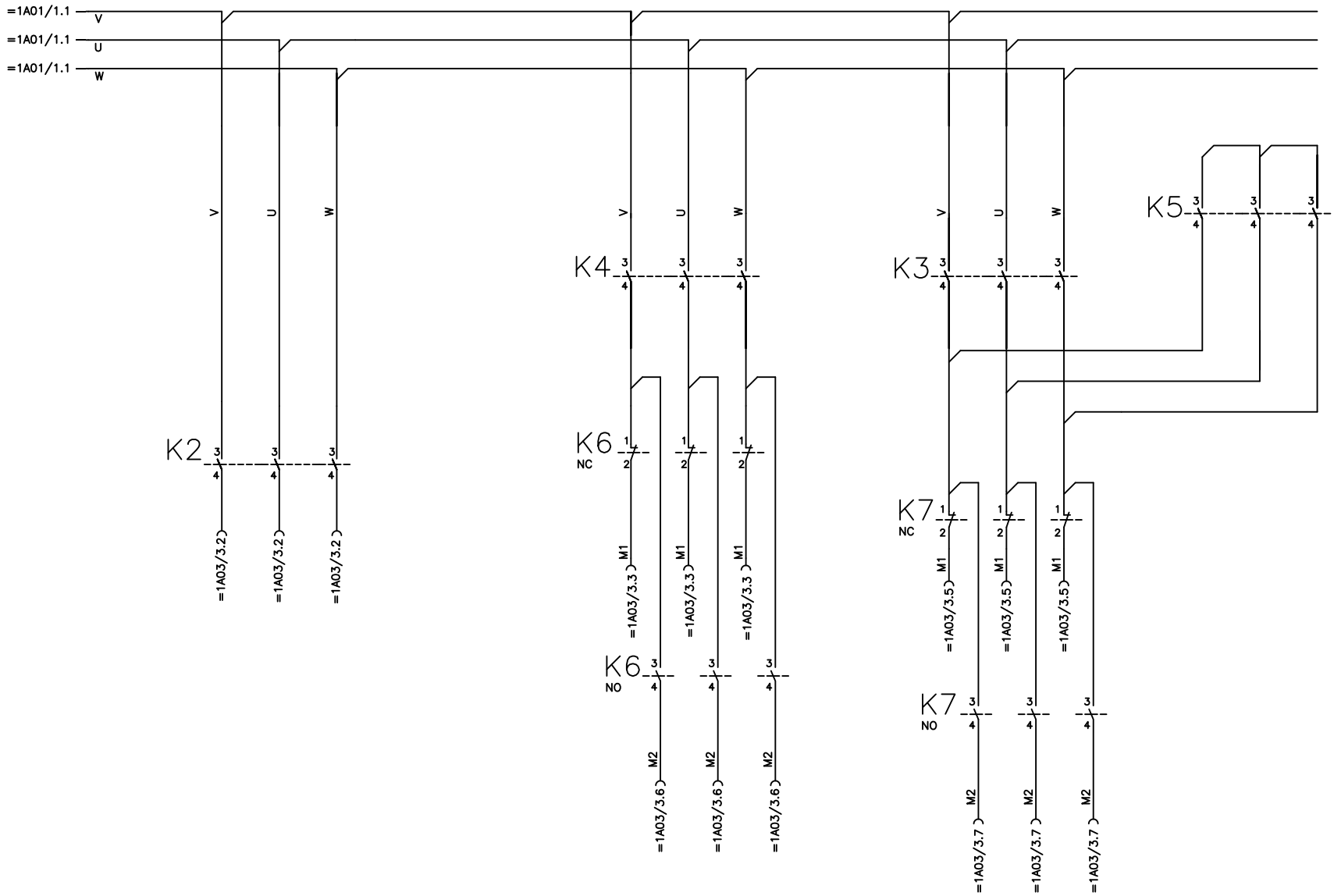
POWER CIRCUIT

3Ø OUT	OIL PUMP	HIGH SPEED BLOWER 1 & 2	LOW SPEED BLOWER 1 & 2



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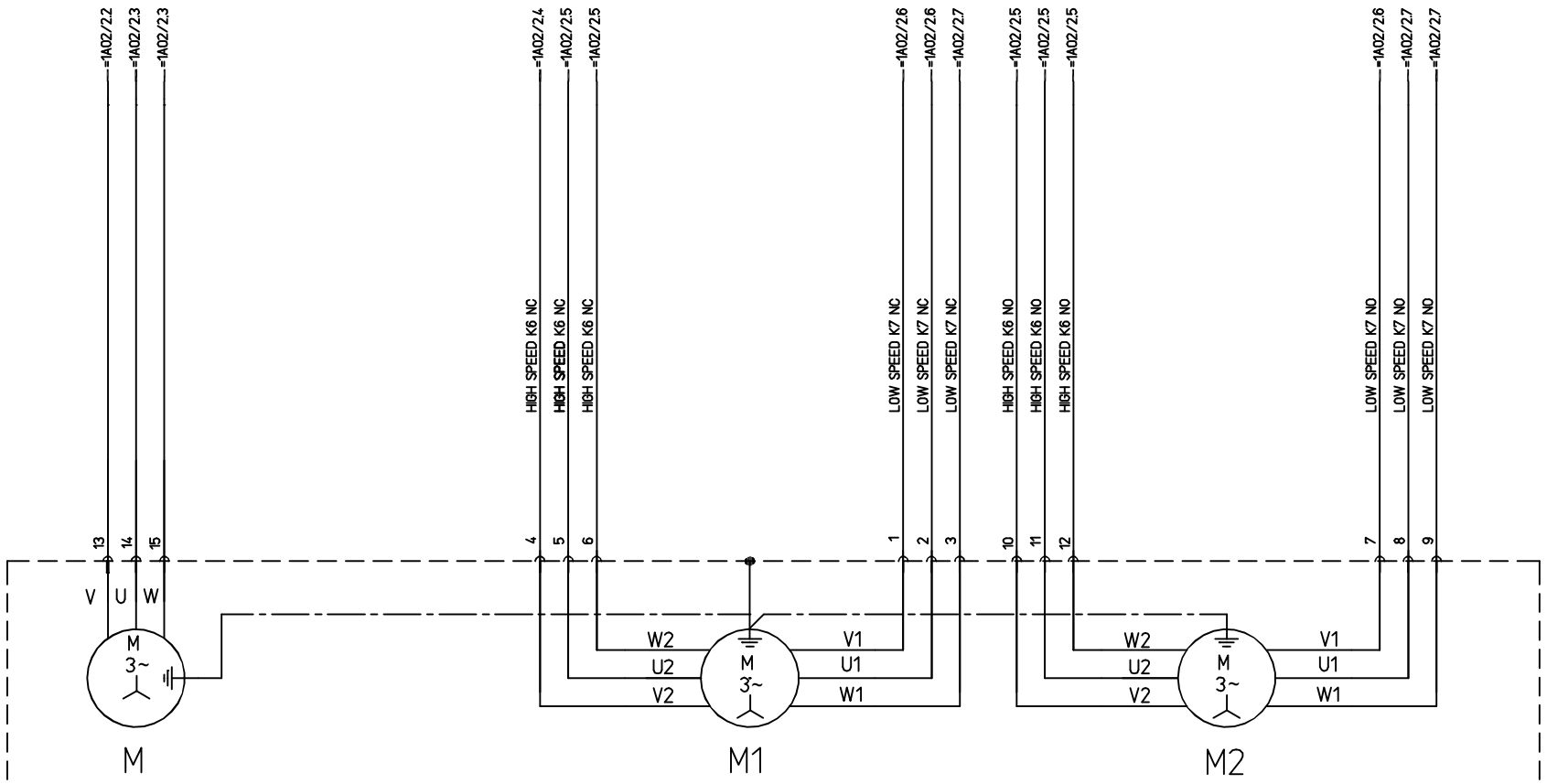
				Drawn	Farid izzuddin B Mohd Azmi					
A	NEW RELEASE	25JUNE19	FDN						Release	Page 2
Rev.	Remark	Date	Name						Date	4 Sheet

1	2	3	4	5	6	7	8
	OIL PUMP		FAN MOTOR 1		FAN MOTOR 2		
			HIGH SPEED	LOW SPEED	HIGH SPEED	LOW SPEED	



CONNECTOR X11

NOTES

1) SWITCH S2 FUNCTION IN DE-ENERGIZE(M1) AND ENERGIZE(M2) THE CONTACTOR K6 AND K7. NORMALLY CLOSE 'NC' CONTACTOR (M1). NORMALLY OPEN 'NO' CONTACTOR (M2).

2) WHEN SWITCH S3 SELECT TO BLOWER AND SWITCH S2 IN DE-ENERGIZE STATE, M1 WILL RUN AND M2 OFF BECAUSE CONTACTOR M1 IN 'NC' STATE. WHEN SWITCH S2 IN ENERGIZE STATE, M1 OFF AND M2 WILL RUN.

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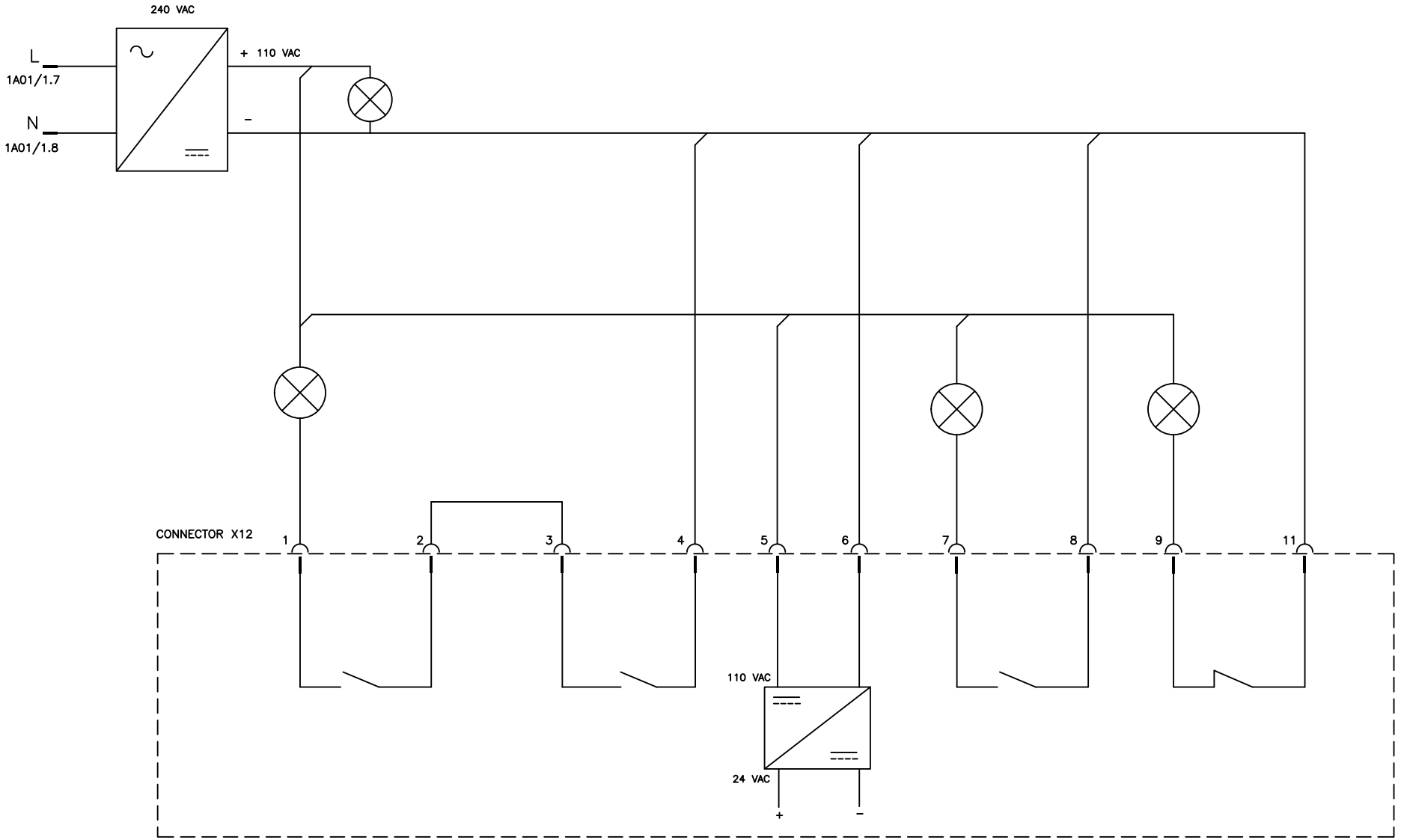
A	NEW RELEASE	25.JUNE'19	FDN				
Rev.	Remark	Date	Name				

TEST BENCH MOTOR CIRCUIT Wiring Diagram	Doc. No: E00.0MD.M92060.YS.1003.A	1A/03
	Release	Page 3
	Date	4 Sheet

1	2	3	4	5	6	7	8
AC/DC CONVERTER	OIL LEVEL INDICATOR			DC/DC CONVERTER INDICATOR			
	OIL LEVEL WARNING		OIL LEVEL TRIPPING		OIL FLOW INDICATOR		PRESSURE SWITCH INDICATOR



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TRAIN SIEMENS MAIN Tx TEST BENCH
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E-MAS

TEST BENCH
SENSOR CIRCUIT
Wiring Diagram

Doc. No: E00.OMD.M92060.YS.1004.A

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Release			Page 4
Date			4 Sheet