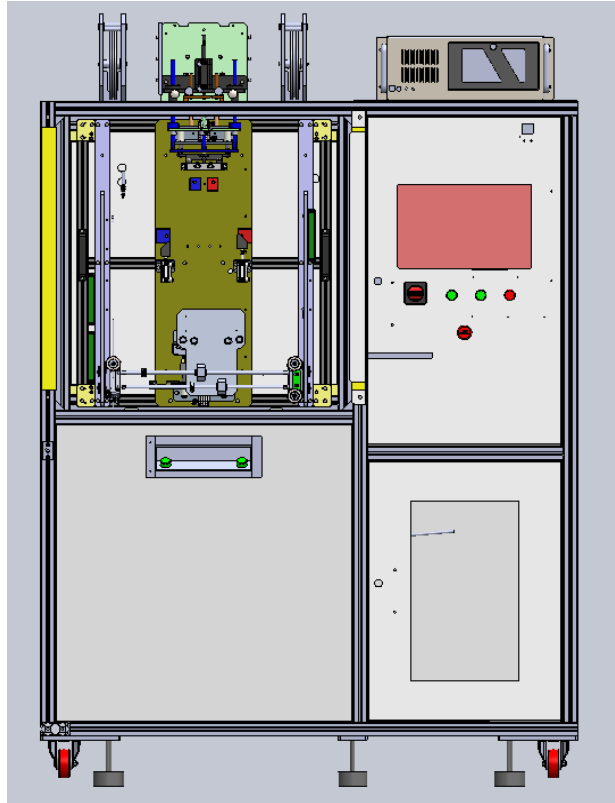


User Manual

EOL Testing Machine



FOR
ADITHYA AUTO PARTS, PUNE
Developed by
Sasyaka Engineering Solutions
Pvt. Ltd.

End of line testing
machine

25/01/2020 Issue

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1.0 Introduction

This is the user manual for End of line testing machine (EOL). This manual provides information as a basic document for understanding the machine and its functionalities.

- This machine has been developed as an end of line testing machine for window regulator including both software and hardware.
- This machine is used for testing certain parameters of window regulator at the end of assembly line.

It consists of :-

1. Mechanical Section.
2. Electrical Section.
3. Controller Section.

2.0 SYSTEM OVERVIEW

- The System contains a mechanical setup which simulates the window regulator arrangement as in the real application scenario.
- The mechanical system simulate the weight of glass along with the glass frictional force.
- The mechanical system is integrated with the software and hardware accordingly.
- The system contains actuators to engage simulated friction weights, wire draw displacement sensor to check the stroke length of window regulator, loadcell for measuring the stall force and anti-pinch functionality (for future models), and all these systems are integrated with the software by an electrical control panel.

2.1 Installation

The steps of installation can be explained briefly as follows:

1. Packing Details:
 - WR EOL-501 machine along with a printer inside the machine in a smaller box are packed inside an individual wooden enclosure.
 - The industrial PC has been packed individually along with all its necessary accessories (Keyboard, Mouse).
 - All the sample Window regulator parts supplied to Sasyaka by Aditya are packed in an individual box which also contains of the sheet metal cover of the IPC.
 - The monitor(HMI) of the IPC has been packed individually in another small rectangular box.
2. Unpacking
 - The package contains EOL machine with an inbuilt electrical panel inside control cabinet. The machine should be carefully unpacked and a survey for any physical damage is to be conducted.
 - It should next be cleaned and made ready for installation. Procedures for any installation in the environment chamber should be duly followed.
 - For safety, certain fragile items may have been disassembled and packed separately. This will have to be unpacked and inspected accordingly before reassembly.
3. Re-assembly:
 - Connect all connectors to IPC i.e. Ethernet, NI PCIe cables, Serial ports, power cable, etc.
 - Mount Tower light at its original place.
 - Connect up printer.
 - Mount HMI and connect all connector to ports.

4. Electrical connections:

- Make all power connections to the control cabinet as required namely, single phase 230V, 16A, 50 Hz input.
- Run a thorough electrical check for loose wires and parts that may have dislodged itself during transit before switching on the electrical panel.
- Ensure the Connections between Contactor to motor.

4. Pneumatic connections:

- Incoming pneumatic air at minimum 6 Bar with tube size 8mm must be connected to the machine.

5. Location and alignment:

- The EOL Machine can be placed on its respective location.

6. Setup trials:

- Setup trials will consist of the following:
 - Here the user can check all the inputs from the sensor and also checks whether all the outputs are properly connected to the actuators.
 - User can use the switches in the maintenance mode user interface for checking the inputs and outputs.
 - Calibration before taking the actual test - Here the important parameters will have to be validated/calibrated by the person in-charge.
 - Test trials: Here a test device will be placed into the fixture and a few cycles will be run to check for functionality as well as validation of the values recorded. It is highly recommended that this stage is done with a set of master devices (identified by the end user) which can then be used at any stage to verify the machine.

7. Training

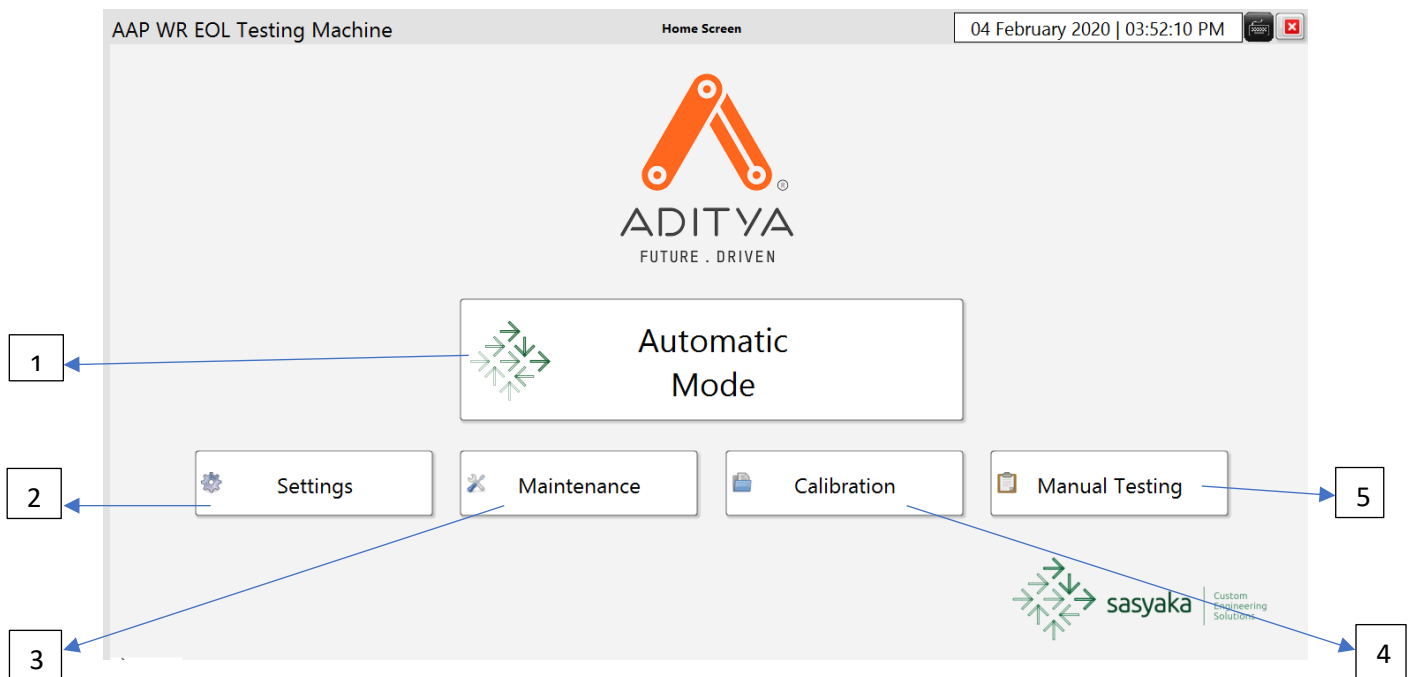
The person in-charge should be trained before running this machine in the following aspects:

- Machine operation
- HMI operation
- Proper loading and unloading methods of WR Fixture.
- Understanding Machine limitations and logging a problem when seen.
- Close adherence to preventive maintenance guide.
- Close adherence to daily maintenance as recommended.
- Against misuse to the equipment.

3.0 Software and User Interface

This machine is built with a software and a user interface based on LabVIEW from National Instruments. The software is custom designed for this machine. The following pages will introduce the user to this aspect of the machine.

Home screen :

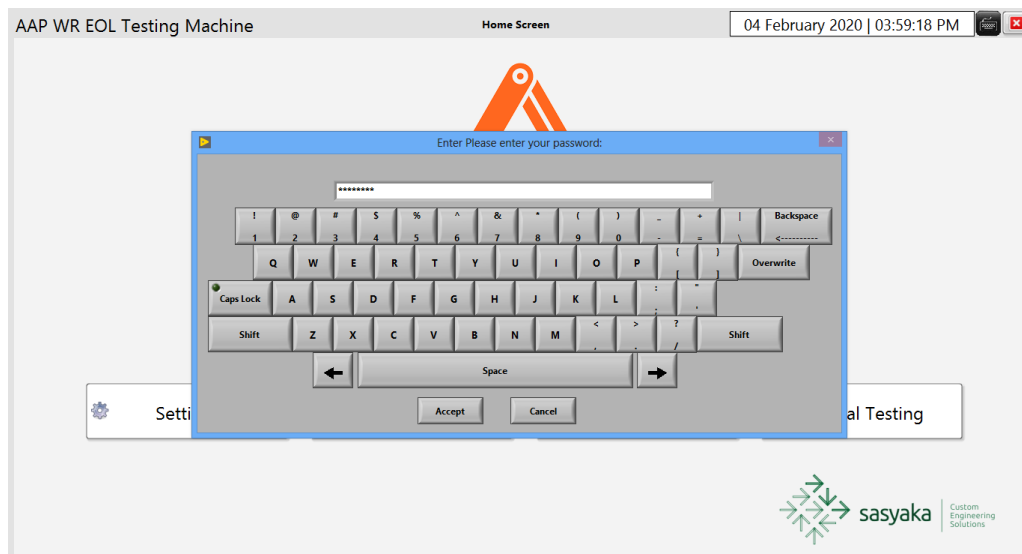


Main Menu

One can navigate through the menus. Here the options that one has is as follows:

1. **Automatic Mode** : To Run the automatic cycle.
2. **Settings** : To set the initial parameter.
3. **Maintance** : User can Access all input and outputs.
4. **Calibration** : To calibrate the Analog inputs.
5. **Manual Testing** : To run the each testing sequence separately.

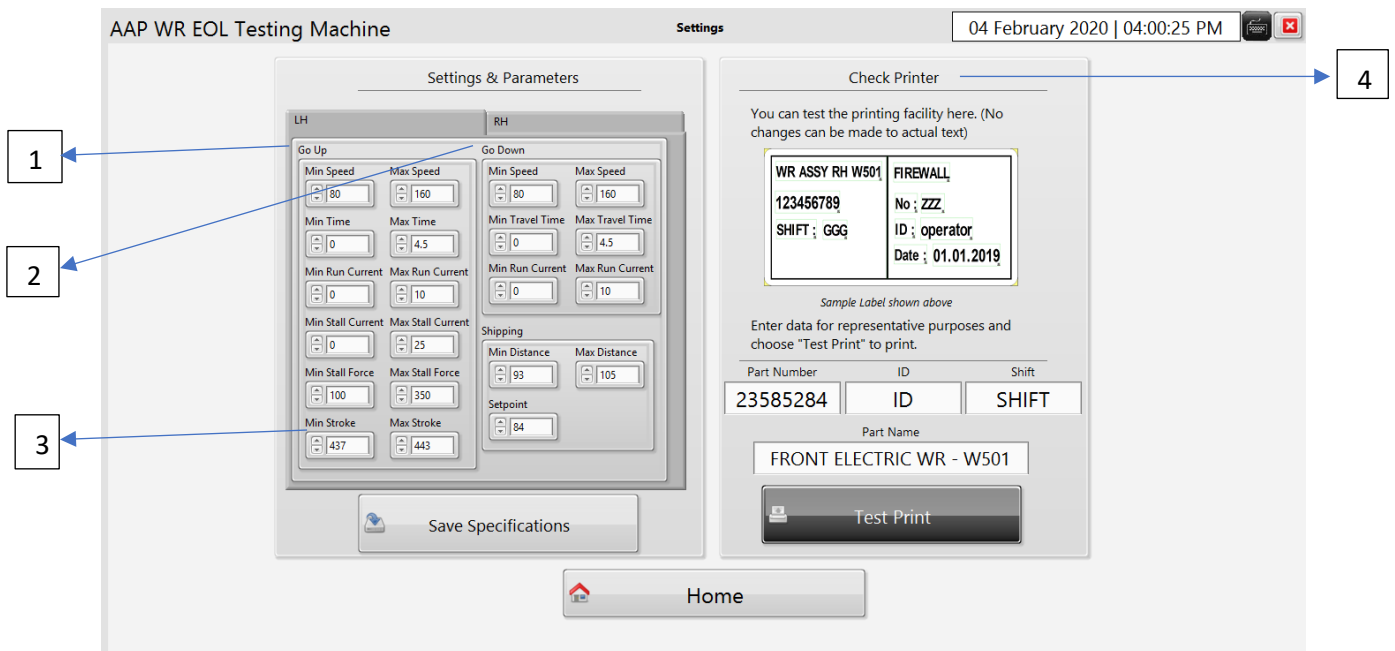
3.1 Settings:



USER ACCESS CONTROL

- The application pop-ups a virtual keyboard as soon as the user clicks settings tab. User can access the settings by typing the password. moreover ,the user can set all the initial parameters by using settings tab.

3.2 Procedure for Setting:



The user can go to settings and set the parameters.

1. **Go UP:** It is used to set the parameters of the motor when it is going up.

- **Minimum Speed:** The minimum linear speed of travel of the window regulator arm. The part is considered a failure if the speed value goes below the user defined value.
- **Minimum time:** User can set the minimum time by which the window regulator should finish its stroke, The part is considered a failure if the time value crosses the user defined value.
- **Maximum time:** User can set the minimum time by which the window regulator should finish its stroke, The part is considered a failure if the time value crosses the user defined value.
- **Maximum running current:** User can set the maximum running current window regulator that should be drawn while running, The part is considered a failure if the maximum running current value crosses the user defined value.
- **Maximum stall current:** User can set the maximum stall current the window regulator should draw while set in stall condition. The part is considered a failure if the maximum stall current value crosses the user defined value.

2. Stall Force :

- **Minimum stall force:** User can set the minimum stall force of the window regulator that acts on the load cell & The part is considered a failure if the minimum stall force value crosses the user defined value.
- **Maximum stall force:** User can set the maximum stall force the window regulator, act on load cell & & The part is considered a failure if the minimum stall force value crosses the user defined value.

3. Go Down :

- **Maximum Speed:** It is the maximum linear speed of travel of the window regulator arm. once user set this data and going the speed further below this fail part.
- **Minimum travel time:** User can set the minimum travel time by which the window regulator finishes its stroke, crossing the minimum travel time limit fail the part.
- **Maximum travel time:** The User can set the minimum time by which the window regulator finishes its stroke, The part is considered a failure if the speed value goes above the user defined value.
- **Maximum Running Current:** The User can set the maximum running current window regulator should drawn while running, The part is considered a failure if the speed value goes above the user defined value.

4. Check Printer:

- **Label:** The User can change the content of label to print by changing the part number, ID, part name.

3.3 Maintenance Mode :

In this mode you can individually check the functionality of the machine.

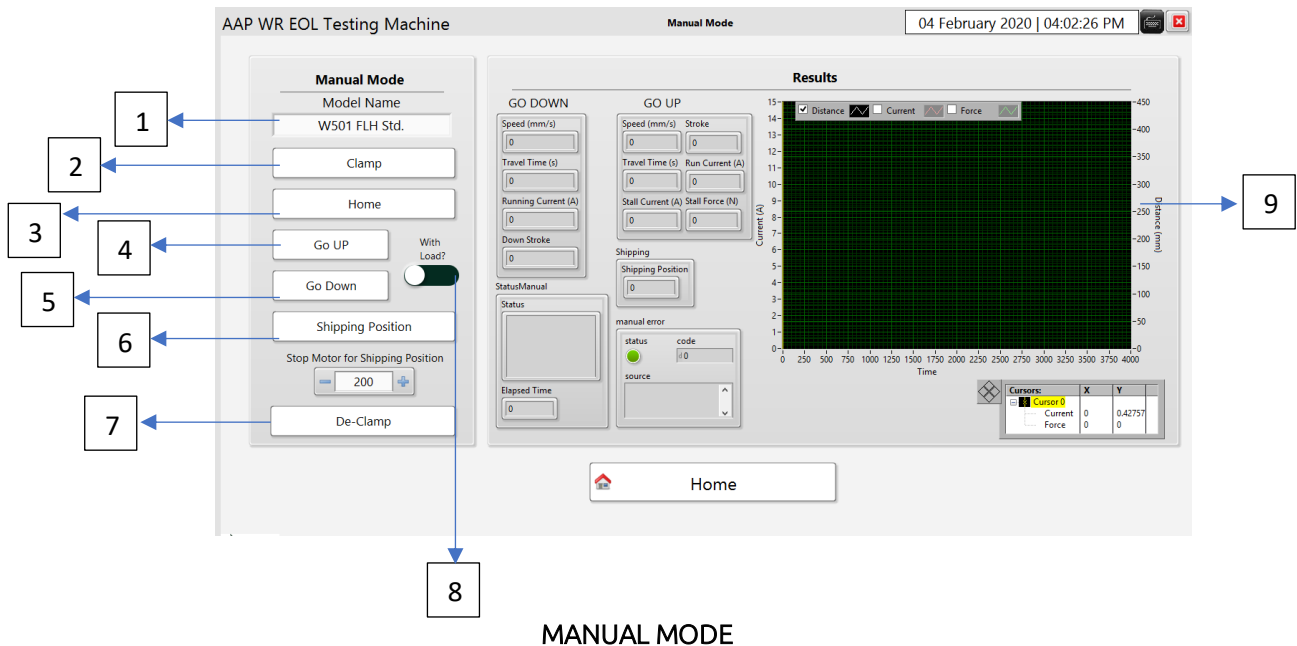


MAINTENANCE MODE

1. Inputs & Outputs: Digital inputs & Outputs.
2. Clamping Cylinder:
 - **Clamp:** To actuate the clamping cylinders.
 - **Load cell cylinder Front:** To actuate the load cell cylinder front.
3. Output : Digital outputs.
 - **Motor ON:** To Turn ON/OFF Supply for motor.
 - **Motor CW:** To Turn ON/OFF in Clockwise Direction.
 - **Motor CCW:** To Turn ON/OFF in Counter Clockwise Direction.
 - **Motor Short:** To Stop the Motor Instantaneously.
4. **Graph:** Live plot of force , current and string pot.
5. **Base plate:** To know the status of base plate sensors.
6. **Home :** To Navigate Back to Home Screen

- User can go to maintenance mode to troubleshoot. User can check the following by using maintenance mode in the user interface:
 1. Access all the digital input and outputs.
 2. Check the inputs from sensors and read switch.
 3. Check the actuators for proper working.
 4. Access to analog sensor values (Force, string pot, current)

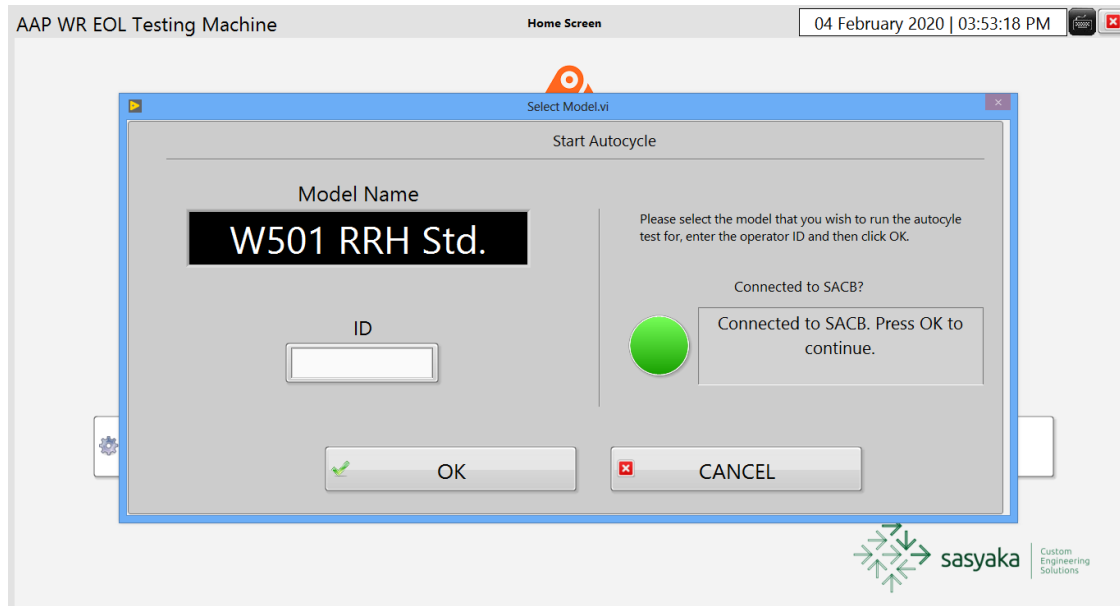
3.4 Manual Mode :



1. **Model Name:** Select the Window regulator respectively of position.
2. **Clamp:** To clamp the Window regulator (WR).
3. **Home:** Go to the home testing position.
4. **Go up:** First Sequence.
5. **Go Down:** Second Sequence.
6. **Shipping Position:** Final Sequence.
7. **De-Clamp:** De-Clamp the window regulator.
8. **With Load:** Engage the load to respective movement.
9. **Graph:** Live graph of time v/s force & Current.

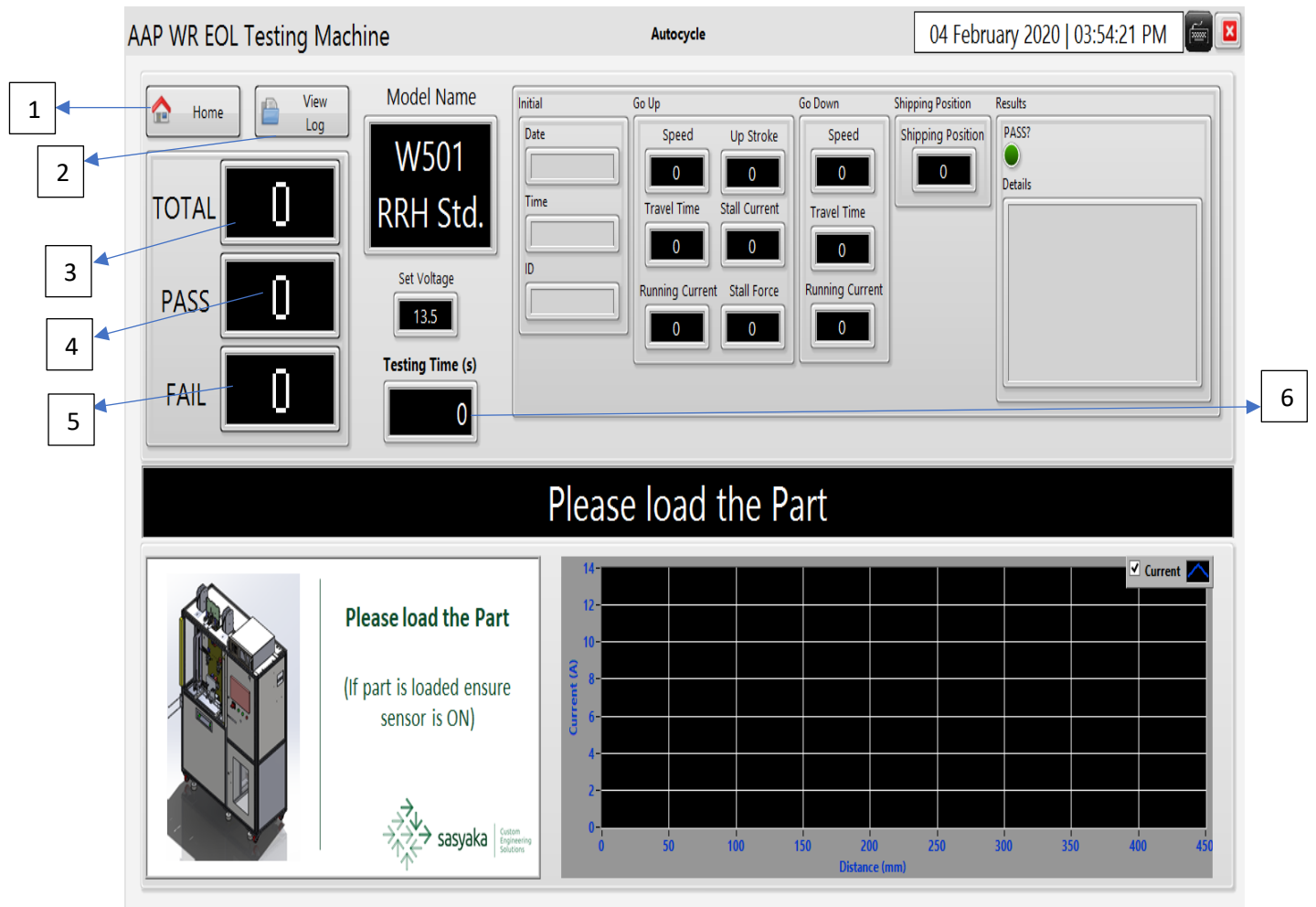
- ❖ User can run the individual testing operation using manual mode user interface. User can access all the testing sequences and check if the individual testing sequence is ready for auto loop.

3.5 Auto Cycle Mode:



Model Selection Window

- We can select the window regulator variation (Example: W501 RRH Std.) in the selection base.
- User has to enter name /ID.
- Click OK button to enter automode for the selected W.R.
- Click cancel for back to home.
- User operator get to know if the sensor actuator box (SACB) connected by the indicator at right hand side.

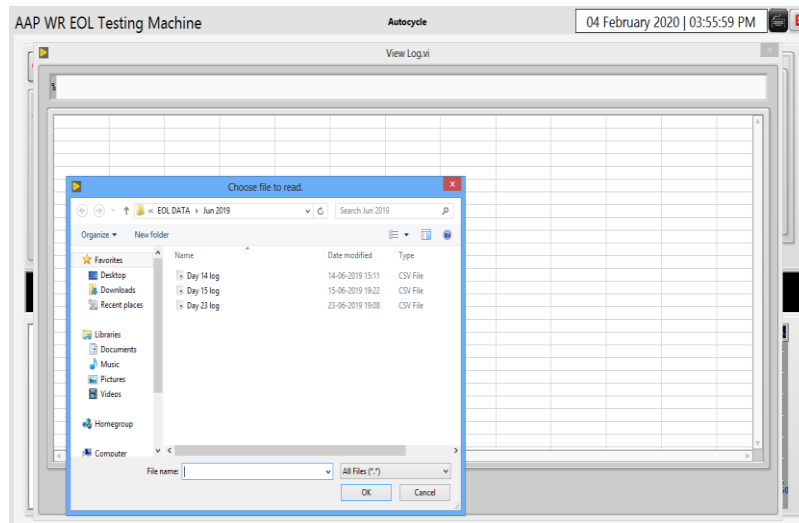


AUTO CYCLE MODE

1. **Home:** Navigate back to Home Screen.
2. **View Log:** View Log (Shows live log while running)
3. **Total:** Total number of parts tested.
4. **Pass:** Number of passed parts out of the total parts.
5. **Fail:** Number of failed parts out of the total parts.
6. **Testing time:** Testing time for an individual part.

- User can run the cycle automatically by going to auto mode. The following are the steps the user should do to run the autocycle.
 1. Select the auto mode.
 2. The opening auto mode user interface, user follow the instruction in the display.

- ❖ To get the log data press the View log button.



Note : In this operator has access to the log data in each day.

3.6 Calibration:

AAP WR EOL Testing Machine Calibration 04 February 2020 | 04:01:52 PM

Details of Calibration

There are two types of sensors used in this machine: load cell and Current sensor.


The calibration data that can be entered here is the slope (M) and intercept (C). The scaled value (Y) is calculated as:

$$Y = M \times x + C$$

Where 'x' is the raw electrical value.

For example, in the graph shown on the right (fig.1), the actual raw analog input voltage is shown in the X-axis while the scaled value is shown in the Y-axis as "Nm" units.

Please enter the appropriate values of m & c as per your calibration records.

 Save

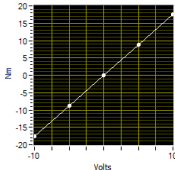


Fig.1: Plot of Input Voltage v/s Torque

Calibration of Sensors

Load Cell

Slope (M):

Intercept (C):

Stroke Sensor


Slope (M):

Intercept (C):

Current Sensor

Slope (M):

Intercept (C):

 Home

CALIBRATION MODE

- User can enter calibration tab whenever the sensor are due for calibration.
- Follow the calibration details in the calibration user interface.
- User can use calibration for calibrating all analog sensor (String pot, force sensor, current sensor).

4. 0 Operating Procedure :

Turn ON Procedure:

1. Connect the Main power supply cable from electrical panel to 3 Pin socket & switch it ON.
2. Turn on Main Switch. Make Sure that the RCCB and MCB are in ON state.
3. Turn on the UPS(long PRESS) and IPC.
4. Make Sure that all the following indicators are glowing: Machine ON RED indicator, 230V GREEN indicator, 24V GREEN indicator.
5. The HMI will turn on automatically.
6. Run the program and refer to software and user interface section for more details.

Turn OFF Procedure(COMPULSORY):

1. Close the application by following below mentioned steps
 - Open the task manger by clicking ctr+Alt+dlt.
 - Select the task option & click on "Run New Task".
 - Select the command concerned to Shut down.
 - Click ok.
2. Turn off IPC & UPS by long pressing the power button of UPS.
Turn off "Mains Switch", so "230V GREEN indicator, 24V GREEN indicator goes off".

5.0 Trouble shooting and Maintenance

The following are some troubleshooting and maintenance guidelines that can be followed in the machine.

5.1 Detailed Troubleshooting guide

The entire machine can be broadly classified into control cabinet and test fixtures. Some troubleshooting tips have been documented to help the user through possible occurring faults that may arise which does not require any service help. The document is also laid out in such a way that each group can be troubleshoot in a similar style.

Sl.no	Description	Steps
1	No Single-phase power supply to machine	Check if main power line is connected to power source.
		Use Multi meter to check voltage level across, incoming voltage should be 230V
		Check if MCB and RCCB are turned on inside the panel.
		Use a Multi meter to trace last point where voltage is available.
		Verify all connections as per wiring chart provided.
2	No 24VDC supply in machine	Check availability of incoming 24V voltage.
		Check input of 230V into power supply.
		Check output of 24V power supply across positive and negative terminals
		Check the condition of the Fuses
		Check individual wire connections to point where a lack of 24V has been detected.
3	Computer not turning on	Check power supply to the computer
		Check the power connection
4	Computer running but LCD not working or not responding to touch	Check the panel monitor
		Verify that there is no screen guard used. This touch monitor will not work with screen guards.
5	Sensor malfunctioning	To check if the input signal of any sensor is available in the controller, the maintenance mode can be used.
		Identify the sensor and check if the light is on or off in the software. If it is off, then the signal is not reaching the input module
		Check 24V supply to the sensor
6	Electrical panel over heating	Check if the panel fan is working as this is very important for maintaining the temperature within the panel.
		If the fan is functioning, check if the output finger guards are clogged or dirty.

Before & during Power Up		
sl.no	Description	Steps
1	Mains ON indicator is not lit	<p>Please check whether incoming power is entering the system through the supplied power connector. Ensure the point is turned ON and is supplying power at the required specifications.</p> <p>If all above is OK, open the service panel and check with Multi meter on the incoming terminals of the Power Switch.</p>
2	Mains ON is lit, Power ON indicator is not lit	<p>Please check whether the Power Switch is turned ON & the RCCB-MCB is turned ON.</p> <p>If all above is OK, open the service panel and check with Multi meter on the outgoing terminals of the RCCB-MCB. Also check at the Terminal blocks mounted on the back of the GA sheet.</p>
3	Mains ON & Power ON are lit, 24V ON indicator is not lit	<p>Please check if the UPS is turned ON. Next check if the incoming power on the GA sheet is getting AC power supply. Next, check if the RCCB on the GA sheet is turned ON. Next check the 24V fuse TB on the GA sheet.</p>
4	All 3 indicators are lit, but Computer is not turning ON	<p>Check if the UPS is ON.</p> <p>Use the IPC key to open its front panel. Turn ON the IPC using the rocker power switch.</p> <p>Open the Service Panel and ensure the plug is properly plugged into the socket on the back of the UPS. Also ensure the other end of the cable is fitted securely on the back of the IPC, and that the IPC power button is switched on.</p>

6.0 Do's and Don'ts

Find below the list of do's and don'ts that should be followed while running the machine.

Sl.no	DO's	DON'Ts
1	Run the machine only after following the instructed procedure.	Do not bypass any sensor during operation.
2	Ensure that the machine is levelled.	Do not change alignment of any fixture
3	Check if all the fasteners are tightened.	Do not keep your fingers near any moving part
4	Constantly check for wear of parts that would affect performance.	Do not move any sensors without any reason. These settings have been reached after intensive testing.
5	Check if all sensors are mounted properly.	Do not remove any part from the machine which may be deemed to be unessential unless requested by the designer.
6	Clean all sensor holes keep them away from dirt as this could disturb signals and light intensity.	
7	Ensure that the correct fixture is being used.	

7.0 Preventive Maintenance

Preventive maintenance checklist is a useful guide on how to maintain the machine to ensure longer life of all components used. The preventive maintenance checklist is segregated into daily, weekly, monthly for convenience as well as precautions to be taken in case of long idle periods.

Daily checklist		
Sl.no	Required to	Action
1	Check physical condition of all parts visually	Alert authorized person in this case
2	Check if parts are loose	Tighten using a torque wrench depending on screw size
3	Check alignment of machine with interfacing machine	Realign where necessary
4	Check for any abnormal condition/noise	Stop the machine
5	Clean the machine of debris before starting the machine	
6	Check if any part may have fallen into existing gaps on machine	Remove all parts that don't belong to the area
7	Observe any damage to sensors	
8	Check if all input electrical wiring is in healthy condition	
Weekly/ Monthly checklist		
Sl.no	Required to	Action
1	Follow the daily checklist	
2	Check all electrical connections	Run the maintenance mode if required
3	Check the health of all sensors	Visual as well as functional
4	Observe any signs of wear and tear	This can lead to misalignment of parts. It should be watched carefully
5	Thorough cleaning of the machine	

8.0 Electrical IO List

DIGITAL INPUT				
Inputs	Naming For Controller Mapping	NI PCI 6518		Qty
		Controller Name	Electrical Name	
Machine				
Machine ON	Machine_ON	P0.0	di1_01	1
ESTOP	E_stop	P0.1	di1_20	1
Pressure SW	SW_Pressure	P0.2	di1_02	1
Start SW	SW_Start	P0.3	di1_21	1
Safet curtain	SC	P0.4	di1_03	1
Load lifting up				
Load lifting CLY up	RS_Load_lifting_up_Rear	P0.5	di1_22	1
	RS_Load_lifting_up_front	P0.6	di1_04	1
Load lifting down				
Load lifting CLY down	RS_Load_lifting_down_Rear	P0.7	di1_23	1
	RS_Load_lifting_down_front	P1.0	di1_05	1
Load cell cyl				
Loadcell CYL	RS_Loadcell_Rear	P1.1	di1_24	1
	RS_Loadcell_front	P1.2	di1_06	1
Reject Bin				
Reject Sensor 1		P1.3	di1_25	1
Reject Sensor 2		P1.4	di1_07	1
Reject-Door limit SW		P1.5	di1_26	1
Buffer				
Buffer 1		P1.6	di1_08	
Buffer 2		P1.7	di1_27	
Electrical Connections				
"VCC "			di1_10 24V	1
DI-GND			di1_09 24V-GND	1
			Total	14

Baseplate related				
Clamping				
Clamping CYL				
	RS_Clamping_top_Front	C0	C0	1
	RS_Clamping_bottom_Front	C1	C1	1
	RS_Clamping_MotorLH_Front	C2	C2	1
	RS_Clamping_MotorRH_Front	C3	C3	1
Part presence				
Part presence (LH)	IPS_Part presence_top_LH	C4	C4	1
	IPS_Part presence_Bottom_LH	C5	C5	1
Part presence (RH)	IPS_Part presence_top_RH	C6	C6	1
	IPS_Part presence_Bottom_RH	C7	C7	1
Load engage				
Load engaged	IPS_Load engaged_1	C0	C0	1
	IPS_Part presence_2	C1	C1	1
BUFFER :				
	BUFFER - 1	C2	C2	
	BUFFER - 2	C3	C3	
	BUFFER - 3	C4	C4	
	BUFFER - 4	C5	C5	
	BUFFER - 5	C6	C6	
	BUFFER - 6	C7	C7	
			Total	10

Note:
RS: Reed Switch
CYL: Cylinder
IPS: Inductive proxy sensor
SACB 1:Sensor actuator box 1
SACB 2:Sensor actuator box 2
MCO: Model Change over

DIGITAL OUTPUT				
Outputs	Naming For Controller Mapping	NI PCI 6518		QTY
		Controller Name	Electrical Name	
Machine				
Tower Red	TL_Red	P2.0	do1_11	1
Tower Orange	TL_Orange	P2.1	do1_30	1
Tower Green	TL_Green	P2.2	do1_12	1
Tower Buzzer	TL_Buzzer	P2.3	do1_31	1
Clamping				
Clamping CYL	SOL_Clamping	P2.4	do1_13	1
Load lifting up				
Load lifting CLY up	SOL_Load_lifting_up_front	P2.5	do1_32	1
Load lifting CLY up	SOL_Load_lifting_up_rear	P2.6	do1_14	1
Load lifting down				
Load lifting CLY down	SOL_Load_lifting_down_front	P2.7	do1_33	1
Load lifting CLY down	SOL_Load_lifting_down_rear	P3.0	do1_15	1
Load cell Cyl				
Load cell Cyl	SOL_Loadcell	P3.1	do1_34	1
WR Motor				
Motor ON		P3.2	do1_16	1
Motor CW		P3.3	do1_35	1
Motor CCW		P3.4	do1_17	1
Motor Short		P3.5	do1_36	1
BSL Contactor		P3.6	do1_18	1
VCC			do1_28 24V	
D-GND			do1_19 24V-GND	
BUFFER:				
Buffer 1		P3.7	do1_37	
			Total	15

Note:
CYL: Cylinder
SOL:Solenoid

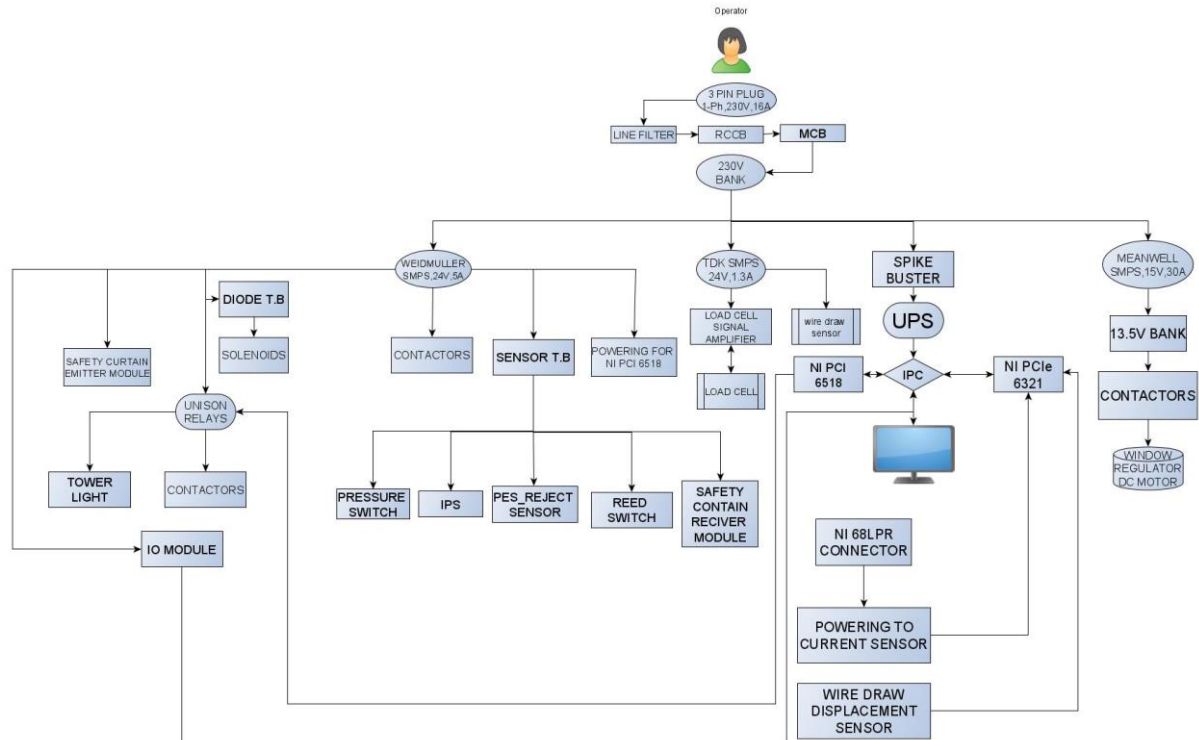
COUNTER INPUT				
Inputs	Naming For Controller Mapping	NI PCIe 6321		Qty
		Controller Name	Electrical Name	
Draw Wire Sensor				
Draw Wire Sensor	Draw_wire_sensor	PFI 8	CTR0 -A	1
		PFI 9	CTR0 -Z	1
		PFI 10	CTR0 -B	1
			Total	3

9.0 Electrical BOM List

Sr.No	Part Name	Part No.	Make	Supplier
1	MCB	A9N2P16C	Schneider	Pooja products
2	RCCB	A9N16201	Schneider	Pooja products
3	TOWER LIGHT	XVGB3S	Schneider	Pooja products
4	PUSH BUTTON -GREEN	XB5AA31N	Schneider	Pooja products
5	RED INDICATOR-230V	XB7EV04MPN	Schneider	Pooja products
6	GREEN INDICATOR-230V	XB7EV03MPN	Schneider	Pooja products
7	GREEN INDICATOR-24V	XB7EV03BPN	Schneider	Pooja products
8	CONTACTOR	LC1D32BD	Schneider	Pooja products
9	MAIN SWITCH(ROTARY)	VCF02	Schneider	Pooja products
10	EMERGENCY STOP SWITCH	XB5AS542N	Schneider	Pooja products
11	WEIDUMULLER SMPS	1469480000	weidumller	SR industries
12	POWER SUPPLY	SE-450-15	Mean well	Kanchan industrial
13	TDK_SMPS	HWS30A-24/A	TDK	Team technology
14	LINE FILTER	1-PHASE,15A,230V	EMIS	Kanchan industrial
15	1CORE CABLE,1SQ mm,RED	4510043U	Lapp	Siddhi kabel
16	1CORE CABLE,1SQ mm,BLACK	4510013U	Lapp	Siddhi kabel
17	1CORE CABLE,2.5 SQ mm,RED	4520042U	Lapp	Siddhi kabel
18	1CORE CABLE,2.5 SQ mm,BLACK	4520012U	Lapp	Siddhi kabel
19	1CORE CABLE,0.75SQ mm,Brown	4510032U	Lapp	Siddhi kabel
20	1CORE CABLE,0.75SQ mm,Blue	4510022U	Lapp	Siddhi kabel

Sr.No	Part Name	Part No.	Make	Supplier
21	SENSOR TB	"280-560 "	Wago	Lakshmi enterprises
22	4WAY GRAY TB	"280-833 "	Wago	Lakshmi enterprises
23	4WAY BLUE TB	"280-834 "	Wago	Lakshmi enterprises
24	END COVER 4 WAY	"280-314 "	Wago	Lakshmi enterprises
25	2WAY GRAY TB	"280-901 "	Wago	Lakshmi enterprises
26	2WAY BLUE TB	"280-904 "	Wago	Lakshmi enterprises
27	END COVER 2 WAY	"280-308 "	Wago	Lakshmi enterprises
28	SCREWLESS END STOPPER	249-116	Wago	Lakshmi enterprises
29	FUSE TB 24V	281-611/281-415	Wago	Lakshmi enterprises
30	FUSE TB END COVER	281-311	Wago	Lakshmi enterprises
31	JUMPERS	280-402	Wago	Lakshmi enterprises
32	SENSOR TB END COVER	280-319	Wago	Lakshmi enterprises
33	DIODE TB	280-941/281-491	Wago	Lakshmi enterprises
34	DIODE TB END COVER	280-340	Wago	Lakshmi enterprises
35	4WAY EARTH TB	280-837	Wago	Lakshmi enterprises
36	2WAY EARTH TB	280-907	Wago	Lakshmi enterprises
37	CABLE TRAY	45mm*45mm	Sazler	Vijesh Electricals
38	CABLE TRAY	25mm*45mm	Sazler	Vijesh Electricals
39	DIN RAIL			Vijesh Electricals
40	INDUCTIVE PROXY SENSOR		Sick	GJ sensors
41	Cable Tie	100 mm - White	KSS	SULOCHANA
42	Cable Tie	150 mm - White	KSS	SULOCHANA
43	Cable Tie	300mm-White	KSS	SULOCHANA
44	Blue Lug	2.5 sq. mm 12mm Long	Jigo	SULOCHANA
45	Blue Lug	2.5 sq. mm 8mm Long	Jigo	SULOCHANA
46	Grey Lug	0.75 sq. mm 8mm Long	Jigo	SULOCHANA
47	White Lug	0.5 sq. mm 8mm Long	Jigo	SULOCHANA
48	Grey Twin Lug	0.75 sq. mm 8mm Long	Jigo	SULOCHANA
49	Red Lug	1 sq. mm 8mm Long	Jigo	SULOCHANA
50	U type Blue lug	3D 3657 2.5 U fork insulated	Jigo	SULOCHANA
51	O blue type lug	3D 3130 2.5 SQ E5 insulated	Jigo	SULOCHANA
52	O Yellow type lug	3D 3132 2.5 SQ E6 insulated	Jigo	SULOCHANA
53	Single grip End Lug Blue	F 2-6.4 VFD 2.5sq	Jigo	SULOCHANA
54	IO module Turck	TBEN-S1-8DXP	Turck	Turck
55	POWER CABLE	PKG4M 5/TEL	Turck	Turck
56	DAISY CABLE(POWER)	PKG4M0-3 PSG4M/TEL	Turck	Turck
57	ETHERNET CABLE	PSGS4M RJ455 4414 5M	Turck	Turck
58	DAISY CABLE(ETHERNET)	PSGS4M PSGS4M 4414-0.3M	Turck	Turck
59	EXTENSION CABLE(POWER)	PKG4M 5 PSG4M/TEL	Turck	Turck
60	CURRENT SENSOR HALL EFFECT	ACS712	Allegro	-ONLINE Amazon-

10.0 Electrical Flow Chart



1. **RCCB:** A Residual Current Circuit Breaker (RCCB) is essentially a current sensing device used to protect a low voltage circuit in case of a fault. It contains a switch device that switches off whenever a fault occurs in the connected circuit.
2. **MCB:** A miniature circuit breaker (MCB) automatically switches off electrical circuit during an abnormal condition of the network means in overload condition as well as faulty condition.
3. **Line Filter :** A **line filter** is the kind of electronic filter that is placed between electronic equipment and a line external to it, to attenuate conducted radio frequencies -- RFI, also known as electromagnetic interference (EMI) -- between the line and the equipment.
4. **24V SMPS: 24V Power Supply:** A power supply converts mains AC to low-voltage regulated DC Power.
5. **Relay:** It is an electrically operated Switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as Solid state relay. Relays are used where it is necessary to control a

circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

6. Diode TB: can be used to restrict voltage peaks due to surges, static discharge or inductive load switching.
7. **Controller:** It Offers high levels of processing power and connectivity for automated image processing, data acquisition, and control applications in extreme environments.
8. NI PCIe 6321 is a 16 AI (16-Bit, 250 kS/s), 2 AO (900 kS/s), 24 DIO Multifunction I/O Device—The PCIe-6321 offers analog I/O, digital I/O, and four 32-bit counters/timers for PWM, encoder, frequency, event counting, and more. The device delivers high-performance functionality leveraging the high-throughput PCI Express bus and multicore-optimized driver and application software.
9. NI PCI 6518 is a 32-Channel, ± 30 V, 16 Sink/Source Inputs, 16 Source Outputs, Bank-Isolated Digital I/O Device—The PCI-6518 is an industrial digital I/O interface, with two banks optically isolated channels. The device is ideal for industrial control and manufacturing test applications. The PCI-6518 module is an industrial digital I/O interface, with eight banks of isolated channels
10. Current Sensor: A **current sensor** is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current in an ammeter or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control.

The sensed current and the output signal can be:


- Alternating current input,
 - analog output, which duplicates the wave shape of the sensed current.
 - bipolar output, which duplicates the wave shape of the sensed current.
 - unipolar output, which is proportional to the average or RMS value of the sensed current.
- Direct current input,
 - unipolar, with a unipolar output, which duplicates the wave shape of the sensed current
 - digital output, which switches when the sensed current exceeds a certain threshold.

11. Contactor : A **contactor** is an electrically-controlled switch used for switching an electrical power circuit. A contactor is typically controlled by a circuit which has a much lower power level than the switched circuit, such as a 24-volt coil electromagnet controlling a 230-volt motor switch.
12. Load Cell : A **load cell** is a type of transducer, specifically a *force* transducer. It converts a force such as tension, compression, pressure, or torque into an electrical signal that can be measured and standardized. As the force applied to the load cell increases, the electrical signal changes proportionally.
13. Load cell signal conditioner: It is a device that converts an electrical signal into another form of signal. Load cell signal conditioning may include amplification, attenuation, excitation, filtering and isolation.
14. IPS Sensor: An **inductive sensor** is a device that uses the principle **of electromagnetic induction** to detect or measure objects. An inductor develops a magnetic field when a current flows through it; alternatively, a current will flow through a circuit containing an inductor when the magnetic field through it changes.
15. String Pot: **String Pots** (also known as cable actuated position transducers, draw wire sensors, string potentiometers, and yoyo pots) convert mechanical motion into an electrical signal that may be metered, recorded, or transmitted.

11.0 Manufacturing BOM List

Sr. No.	Part Number	QTY.	Manufactured by
1	6005	2	Sri Vivekananda Industries
2	8009	1	Sri Vivekananda Industries
3	70012	2	Sri Vivekananda Industries
4	7001	2	Sri Vivekananda Industries
5	8102	1	Sri Vivekananda Industries
6	4010	1	Sri Vivekananda Industries
7	4013	1	Sri Vivekananda Industries
8	6001	4	Sri Vivekananda Industries
9	6003	2	Sri Vivekananda Industries
10	6201	2	Sri Vivekananda Industries
11	6202	2	Sri Vivekananda Industries
12	8002	1	Sri Vivekananda Industries
13	6304	1	Sri Vivekananda Industries
14	6204	1	Sri Vivekananda Industries
15	8003	2	Sri Vivekananda Industries
16	6301	2	Sri Vivekananda Industries
17	6302	1	Sri Vivekananda Industries
18	6305	1	Sri Vivekananda Industries
19	7001	2	Sri Vivekananda Industries
20	7101	6	Sri Vivekananda Industries
21	8004	2	Sri Vivekananda Industries
22	8005	2	Sri Vivekananda Industries
23	8006	1	Sri Vivekananda Industries
24	8007	1	Sri Vivekananda Industries
25	8008	1	Sri Vivekananda Industries
26	8101	1	Sri Vivekananda Industries
27	8103	1	Sri Vivekananda Industries
28	1101	1	Sri Vivekananda Industries
29	8010	2	Sri Vivekananda Industries
30	3011	8	Sri Vivekananda Industries

Sr. No.	Part Number	QTY.	Manufactured by
31	6002	2	Sri Vivekananda Industries
32	2001	1	Sri Vivekananda Industries
33	2002	1	Sri Vivekananda Industries
34	2003	1	Sri Vivekananda Industries
35	3001	1	Sri Vivekananda Industries
36	3002	1	Sri Vivekananda Industries
37	3003	1	Sri Vivekananda Industries
38	4003	1	Sri Vivekananda Industries
39	4009	8	Sri Vivekananda Industries
40	4008	4	Sri Vivekananda Industries
41	4007	8	Sri Vivekananda Industries
42	4001	1	Sri Vivekananda Industries
43	4005	1	Sri Vivekananda Industries
44	4004	1	Sri Vivekananda Industries
45	4006-1	2	Sri Vivekananda Industries
46	4006-2	1	Sri Vivekananda Industries
47	4006-3	1	Sri Vivekananda Industries
48	5002	1	Sri Vivekananda Industries
49	5002 (weight)	4	Sri Vivekananda Industries
50	5002-2 (weight)	4	Sri Vivekananda Industries
51	8007	1	Sri Vivekananda Industries
52	L-blk	1	Sri Vivekananda Industries
53	Left blk	1	Sri Vivekananda Industries
54	right blk	1	Sri Vivekananda Industries
55	1104	1	Sri Vivekananda Industries
56	1108	1	Sri Vivekananda Industries
57	1109	2	Sri Vivekananda Industries
58	1111	1	Sri Vivekananda Industries
59	1112	2	Sri Vivekananda Industries
60	1113	2	Sri Vivekananda Industries

Sr. No.	Part Number	QTY.	Manufactured by
61	1114	2	Sri Vivekananda Industries
62	1115	2	Sri Vivekananda Industries
63	5004	1	Sri Vivekananda Industries
64	5006	1	Sri Vivekananda Industries
65	5006_2	1	Sri Vivekananda Industries
66	5007	4	Sri Vivekananda Industries
67	5010	1	Sri Vivekananda Industries
68	5011	1	Sri Vivekananda Industries
69	40012	2	Sri Vivekananda Industries
70	40034	2	Sri Vivekananda Industries
71	40035	2	Sri Vivekananda Industries
72	encoder mount	1	Sri Vivekananda Industries
73	8009		Sri Vivekananda Industries
74	shafts	8	Sri Vivekananda Industries
75	5002(Clamp bootom)	1	Sri Vivekananda Industries
76	1109	2	Sri Vivekananda Industries
77	1108	2	Sri Vivekananda Industries
78	1104	1	Sri Vivekananda Industries
79	40012	2	Sri Vivekananda Industries
80	40032	2	Sri Vivekananda Industries
81	8001	1	Sri Vivekananda Industries
82	6024		Sri Vivekananda Industries
83	top pin	4	Sri Vivekananda Industries
84	mirro plate	4	Sri Vivekananda Industries
85	Center foot mount	2	Sri Vivekananda Industries
86	Index Plunger pin	4	Sri Vivekananda Industries
87	Rejection side hook	1	Sri Vivekananda Industries
88	Hook mounting plte	3	Sri Vivekananda Industries
89	Hook	2	Sri Vivekananda Industries
90	4009-1	8	Sri Vivekananda Industries
91	6002-1	4	Sri Vivekananda Industries
92	6204-1	1	Sri Vivekananda Industries
93	8003-1	2	Sri Vivekananda Industries
94	Slot block	4	Sri Vivekananda Industries
95	1117	2	Sri Vivekananda Industries
96	1116	4	Sri Vivekananda Industries
 <p>sasyaka Custom Engineering Solutions</p>		Prepared by	
			Roopa M L
			21-01-2020
			1 of 1

12.0 Mechanical Spare List



Mechanical spares list

Project No : 1922

Date : 04/01/20

Made by : SR

Rev: 0

Sl No.	Description	Part No.	make	Category	Changeover forecast *	Comment
1	clamp top attachment	5010	Sasyaka/Manufac tured	Mechanical	1 year	This is a wear part made out of nylon and may have to be replaced periodically.
2	clamp bottom attachment	5011	Sasyaka/Manufac tured	Mechanical	1 year	This is a wear part made out of nylon and may have to be replaced periodically.
3	Roller sleeever	3011	Sasyaka/Manufac tured	Mechanical	1 year	This is a wear part made out of aluminium and may have to be replaced when damaged.
4	Metal cables		Misumi	Mechanical	5 years	
5	bearing	688-zz	SKF	Mechanical	5 years	9 of these are being used in the machine. It is recommended to keep a spare.

Please note that the change over forecast

* is based on the past usage of bought out components and not

13.0 Critical Spare List



sasyaka

Custom
Engineering
Solutions

Critical spares list

Project No : 1922

Date : 04/01/20

Made by : SR

Rev: 0

Sl No.	Description	Part No.	make	Category	Changeover forecast *	Comment
1	Wire draw displacement sensor with incremental encoder type	WPS-750-MK30-E	MICRO-EPSILON	Electrical	3 years	Critical to the functioning of the machine. Susceptible to physical damage, 4-5 week lead time
2	Load cell	C9C 0.5KN	HBM	Electrical	5 years	Critical to the functioning of the machine, 6-8 week lead time
3	Load cell's Signal amplifier	CLIPx BM-40	HBM	Electrical	5 years	6-8 week lead time
4	Current sensor module	ACS712	Allegro & Customised by Sasyaka	Electrical	2 years	Recommended to keep a spare.
5	Fuse	0.5A,1A,5A,25A	-	Electrical	As and when required	We provide a set of spare fuses as a part of commissioning spares.
6	SSR Relay with Socket	802 PMDD 1000600	Unison	Electrical	5 years	We provide spare relays as a part of commissioning spare.
7	Contactors	LC1D32BD	Schneider	Electrical	5 years	-
8	Weidmuller SMPS	Pro eco1469480000	Weidmuller	Electrical	5 years	-
9	TDK-Lambda SMPS	HWS30A-24/A	TDK	Electrical	5 years	8 week lead time
10	Meanwell SMPS	SE-450-15	Meanwell	Electrical	5 years	

Sl No.	Description	Part No.	make	Category	Changeover forecast *	Comment
11	RCCB	A9N16201	Schneider	Electrical	5 years	
12	Reed switch	W00952025390 B	Metal-work	Electrical	5 years	There are mutple reed switchs being used in the machine. It is recommended to keep a spare incase of accidental damage.
13	Inductive proximity sensor	WX1942	Sick	Electrical	5 years	There are mutple proximity sensors being used in the machine. It is recommended to keep a spare incase of accidental damage.
14	clamp top attachment	5010	Sasyaka/Manufactured	Mechanical	1 year	This is a wear part made out of nylon and may have to be replaced periodically.
15	clamp bottom attachment	5011	Sasyaka/Manufactured	Mechanical	1 year	This is a wear part made out of nylon and may have to be replaced periodically.
16	Roller sleever	3011	Sasyaka/Manufactured	Mechanical	1 year	This is a wear part made out of aluminium and may have to be replaced when damaged.
17	Metal cables		Misumi	Mechanical	5 years	
18	bearing	688-zz	SKF	Mechanical	5 years	9 of these are being used in the machine. It is recommended to keep a spare.

14.0 Fastener list

ITEM NO.	SIZE	DESCRIPTION	QTY.	MAKE
1	M8 x 60	Cap Head screw	6	TVS
2	M8 x 45	Cap Head screw	4	TVS
3	M8 x 16	Cap Head screw	6	TVS
4	M6 x 75	Cap Head screw	5	TVS
5	M6 x 40	Cap Head screw	15	TVS
6	M6 x 25	Cap Head screw	10	TVS
7	M6 x 20	Cap Head screw	38	TVS
8	M6 x 16	Cap Head screw	100	TVS
9	M6 x 12	Cap Head screw	50	TVS
10	M6 x 10	Cap Head screw	20	TVS
11	M5 x 35	Cap Head screw	8	TVS
12	M5 x 25	Cap Head screw	8	TVS
13	M5 x 20	Cap Head screw	20	TVS
14	M5 x 16	Cap Head screw	24	TVS
15	M5 x 12	Cap Head screw	20	TVS
16	M5 x 10	Cap Head screw	5	TVS
17	M5 x 8	Cap Head screw	5	TVS
18	M4 x 60	Cap Head screw	3	TVS
19	M4 x 50	Cap Head screw	6	TVS
20	M4 x 25	Cap Head screw	10	TVS
21	M4 x 16	Cap Head screw	32	TVS
22	M4 x 12	Cap Head screw	22	TVS
23	M3 x 10	Cap Head screw	5	TVS
24	M2.5 x 10	Cap Head screw	5	TVS
25	M2 x 25	Cap Head screw	5	TVS
26	M2 x 10	Cap Head screw	5	TVS
27	M2 x 8	Cap Head screw	5	TVS
28	M6 x 12	Button head screw	200	TVS
29	M6 x 10	Button head screw	25	TVS
30	M5 x 20	Button head screw	16	TVS
31	M5 x 16	Button head screw	5	TVS
32	M5 x 12	Button head screw	12	TVS
33	M4 x 25	Button head screw	12	TVS
34	M4 x 16	Button head screw	24	TVS
35	M4 x 12	Button head screw	6	TVS
36	M4 x 10	Button head screw	10	TVS
37	M4 x 8	Button head screw	10	TVS
38	M3 x 8	Button head screw	14	TVS
39	M3 x 5	Button head screw	20	TVS
40	M6 x 20	CSK screw	10	TVS
41	M5 x 25	CSK screw	8	TVS
42	M4 x 40	CSK screw	6	TVS
43	M4 x 16	CSK screw	20	TVS
44	M4 x 12	CSK screw	12	TVS
45	M4 x 10	CSK screw	5	TVS
46	M3 x 8	CSK screw	8	TVS
46	M3 x 5	CSK screw	8	TVS
47	PLAIN WASHER M6	Plain washer	250	TVS
48	PLAIN WASHER M5	Plain washer	60	TVS
49	PLAIN WASHER M4	Plain washer	60	TVS
50	NUT M5	Nut	6	TVS
51	NUT M4	Nut	14	TVS
52	THIN NUT M8	Thin nut	5	TVS
53	Dowel pin 6 x 25	Dowel pin	6	TVS
54	Dowel pin 6 x 16	Dowel pin	20	TVS
55	Dowel pin 6 x 12	Dowel pin	10	TVS
56	Dowel pin 3 x 10	Dowel pin	6	TVS
57	Dowel pin 3 x 16	Dowel pin	10	TVS
58	Internal cir-clip 16 x 1	Internal cir-clip	12	TVS
59	Internal cir-clip 47 x 1.5	Internal cir-clip	4	TVS
60	External cir-clip 19 X 1.2	External cir-clip	6	TVS
61	External cir-clip 25 X 1	External cir-clip	4	TVS
62	External cir-clip 8X 0.8	External cir-clip	3	TVS

Annexure

- ❖ **Electrical Charts**

Please refer to the charts at the end of document.

- ❖ **Base Plate Drawing**

Please refer to the charts at the end of document.

- ❖ **Pneumatic Circuit**

Please refer to the charts at the end of document.

The backup files of the following have been given in a pen drive from Sasyaka:

- Windows embedded-8 operating system (OS)
- .exe(executable) application
- Electrical charts
- Pneumatic drawings
- Base Plate drawings
- User manual

Along with the above-mentioned soft copies, all the related data sheets in the form of a hard copies have been submitted.