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| METRO RAIL, KOLKATA | Computerized Control Universal Brake Test Bench | COMOW Order No:- COFMOW/IR/S/P- I/OP-406772 Dated 24.08.2021 |

USER MANUAL OPERATION AND MAINTENANCE

Project : **Computerized Control Universal Brake Test
Bench**

Client : **Metro Rail, Kolkata**

PO No. : **COFMOW/IR/S/P-I/OP-406772**

PO Date : **24/08/2021**

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Dear User,

Neometrix is grateful for this opportunity provided to us to offer our products & services to you. We sincerely hope that you will be delighted to use our system and give us more opportunities to serve you.

Neometrix is very focused on Aviation and Railway industries and offers complete range of systems & services which can be of immense use to you. We specialize in Hydraulic/ Servo Hydraulic Test Rigs, Fuel System Test Rigs, Pneumatic System Test Rigs, Oxygen/ Special Gases system Test Rigs, Very High Pressure Systems, Electronic & Electrical Test Rigs. Our services include among others, the followings:

- State of the art Test Rig Design, Development, Fabrication, Installation, Commissioning, Training & Support.
- Refurbishment/ Up gradation of the Existing Test Rigs.
- Maintenance (AMC) contracts of Existing Test Rigs.
- Operations Contract for the Test Rigs.
- Setting up of complete Testing Infrastructure including civil infrastructure.

The following pages talk about some of our systems in brief. Please feel free to contact us for details of any particular system of your interest.

Neometrix is committed to offer its best solutions & services to you all the times

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and wish to become your preferred supplier for these services.

With Best Regards,

Shailendra Pratap Singh
CEO

Warnings:

1. Make sure that all electronic products are earth-grounded, to ensure Personal safety and proper operation.



2. All sensors are very sensitive; please never try to touch them.

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1. Neometrix Engineering Introduction:

Neometrix Engineering Pvt. Ltd. is a complete engineering solutions company based in New Delhi/ Noida.

We specialize in CUSTOM BUILT Turnkey Engineering Solutions.

We have expertise in various engineering domains like Hydraulics, Servo Hydraulics, ATF (Fuel), Mechanical, Pneumatic, Oxygen/ Helium (High Purity

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Gases), Electronics/ Electrical Test Benches, and Complete PC Based Automation Solutions.

We have experts in Mechanical Engineering, Chemical Engineering, Electrical/ Instrumentation Engineering, Software, Civil Engineering, Aeronautical engineering and other engineering fields.

The company has a team of ~30 highly qualified engineers and has an experience of more than 75 successfully delivered projects. We are very closely working with **HAL, RDSO, Railways, Defense Establishments, Labs and Private Industries.**

The founders are graduates from IIT Kanpur and the company remains very closely linked with IITs. We utilize the expertise available there as and when required.

We have an exclusive relationship with Parker USA (www.parker.com) for supplying Hydraulic Systems to HAL. Parker is world leader in Hydraulics (Fluid Motion & Control).

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We have an exclusive relationship with Haskel USA (www.haskel.com) for supplying very high pressure systems. Haskel is world leader in very High Pressure products.

We are alliance partners of **National Instruments USA** (www.ni.com), world leader in PC Based Test Measurement and Automation.

With such alliances and our own engineering capabilities, we are in a position to deliver you state of the art world class Test Rig.

Neometrix is a member (as Industry Partner with ministry of HRD & Ministry of Railways) of TMRS (TECHNOLOGY MISSION FOR RAILWAY SAFETY) and we are working on several Railway Safety projects with IIT Kanpur & RDSO.

Neometrix values its association with RDSO and wishes to become its most preferred partner for such services.

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We are working very closely with Research Designs & Standards Organization (RDSO).

2. Introduction of the System:

The system is designed to test the performance/Functional testing of the following 27 types of pneumatic valves of AC Brake system of AC Rake for Metro Rail.

The system is consisting Brake Pipe, Auxiliary Reservoir, Brake Cylinder Reservoir and Control Reservoir.

The system has Dew point sensor, Noise level transmitter.

The test stand have a structure composed of Aluminum –Section with pressure gauges construction housing with digital pressure gauges at front of the stand.

The right and left side and the rear side of the test stand is provided with detachable covers and doors. All the air reservoirs and pneumatic piping are accommodated inside of the test stand.

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The test stand operation is controlled by the computer system by means of predefined software.

The Universal Test Bench Test the following Valves one by one :

| | | | | | |
|---|-------------------|----|----------------------------|----|------------------------|
| 1 | Air Dryer Unit | 10 | Emergency Brake Valve | 19 | Piston Valve |
| 2 | Anti-Skid Valve | 11 | Impulse Valve | 20 | Pressure Reducer Valve |
| 3 | Distributor Valve | 12 | Leveling Valve | 21 | Relay Valve |
| 4 | Double Valve | 13 | Load Dependent Relay valve | 22 | Brake Control Unit |
| 5 | Drive Brake Valve | 14 | Magnet Valve | 23 | Ball Cock |

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|---|--------------------|----|---------------------|----|--------------------|
| 6 | Duplex Check Valve | 15 | Mean Pressure Valve | 24 | Check Valve |
| 7 | Drain Valve | 16 | Overflow Valve | 25 | Double Check Valve |
| 8 | Anti-Skid Valve | 17 | Pressure Governor | 26 | Pressure Sensor |
| 9 | Safety Valve | 18 | Test Fitting | 27 | Tyfon |

The system works on a predefined Test Sequence with an option to test the particular test.

3. System Major Specifications

Medium = Compressed Air

Pressure Rating = 10.5 Kg/cm²

Air supply Pressure Range = 8-10 Kg/cm²

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Flow Rate = 2400 LPM

Temperature Range = Ambient up to 48°C

Power Supply = 230V + 10% -20%, Single Phase, 50Hz

Contents:

The Computerized control Universal Control Brake Test Bench Consist of:

- Test Bench stand including Air reservoirs and pneumatic piping
- Measuring System (DAQ Panel)
- Computer
- Printer
- UPS
- Control Panel

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- PLC Panel
- Air Dryer

4. Do's & Don'ts for the System

Do's:

1. Read the User Manual fully before operating the System.
2. Read the Pneumatic Circuit and understand which Valve/ Component on Panel do what.
3. Check the proper closing of the Supply Valve of the system when it is not in operation.
4. Check the Source Pressure before operation.

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Don't:

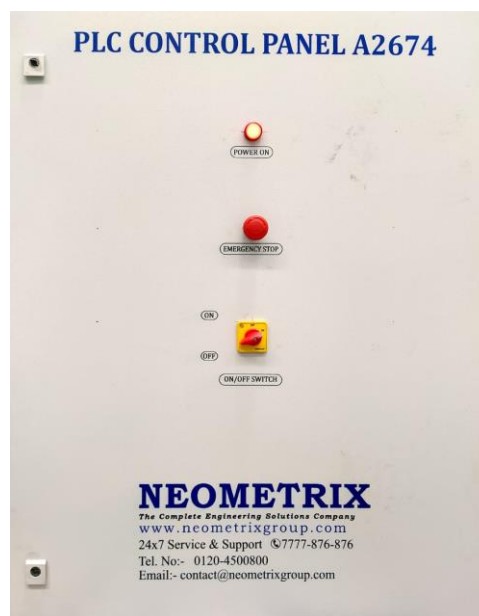
1. Never touch the sensors or their mountings.
2. Touch any circuitry inside the panel.
3. "ON" the MCB before starting the computer.

5. Starting Of The System:

- Give the DAQ panel UPS to Power Supply 230V, Single Phase, 50 Hz.
- Turn ON the Computer CPU and Monitor
- Turn on the PLC panel on/off switch at "ON" Position.

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- Turn “ON” the Main switch of control panel at DAQ panel.

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- Connect the compressed air inlet line to the air dryer inlet line and open the inlet ball valve of air dryer and test bench.
- Give Power Supply 230V, Single Phase, 50 Hz.

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to the Air dryer

6. Working Of The System:

The System is consisting dual working mode i.e. Automatic and manual

In Automatic mode the Test will be perform according to the predefined sequence automatically and also with an option for a particular test according to the requirement.

In manual mode the test will be done with control Panel and Toggles Switch.

Mode Selection- The mode selection can be done with the Mode Selector with an option-

- 1- Automatic Mode.
- 2- Manual Mode.

Automatic Mode-This mode can be selected from the Control Panel Selector Switch.

To start the testing follow following steps:

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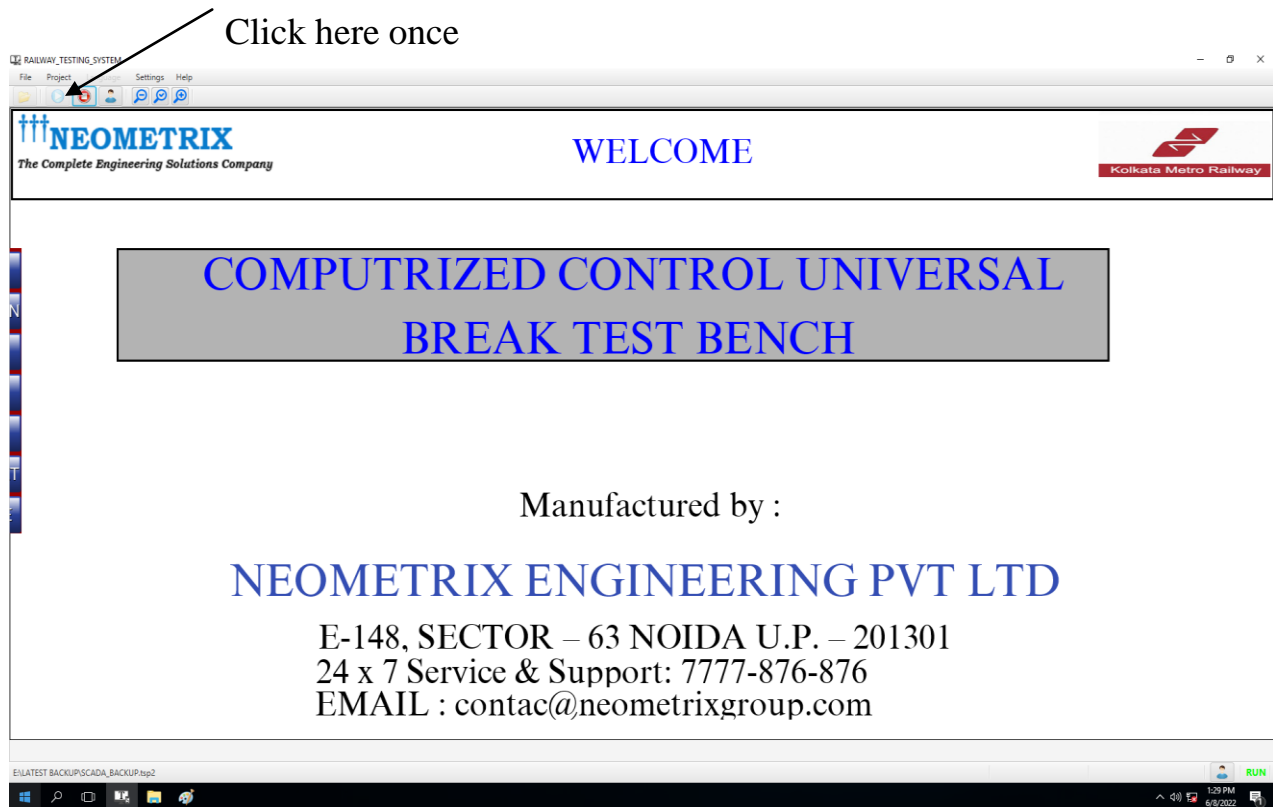
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Switch on the computer and open the CCUBTB test Run File from the Desktop the Main Menu Window will appear as show below:



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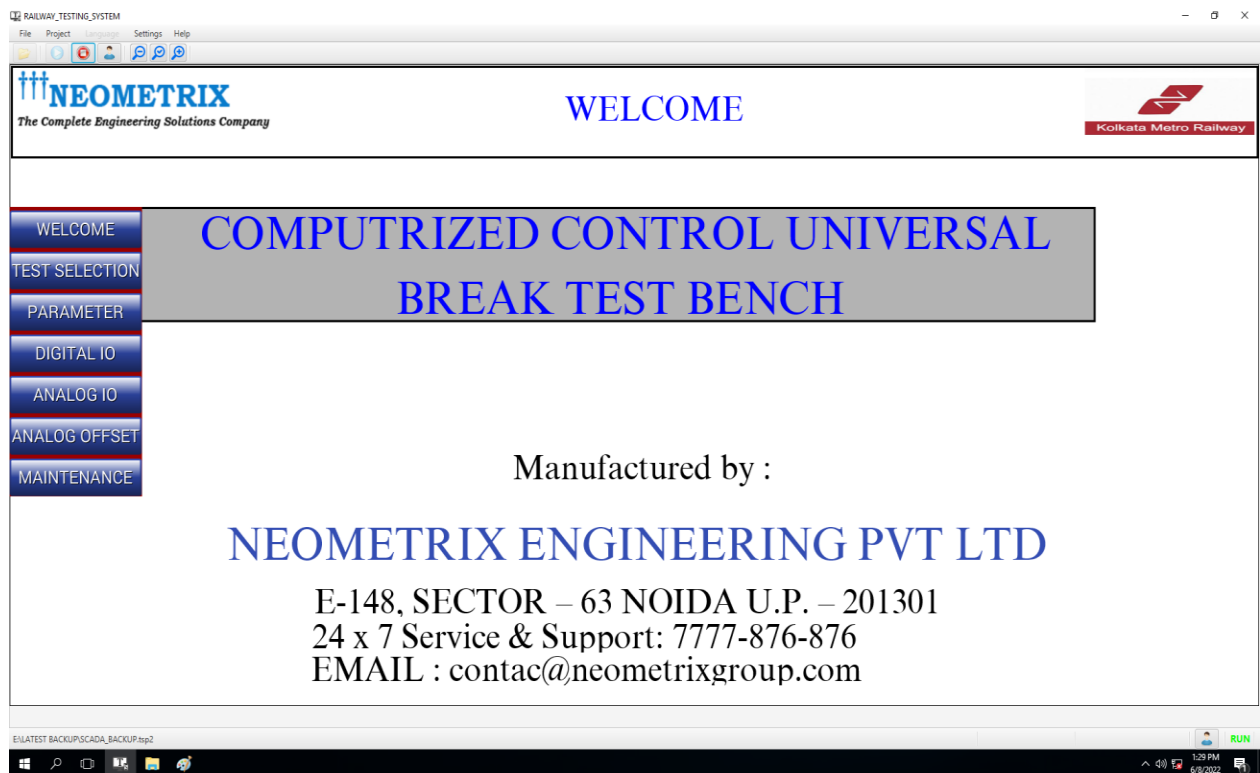
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Note: For first time Run file opening clicking on top left play button as indicated on above screen to run the software.

PARAMETER- To insert the test parameter(if required) click on PARAMETER icon as per below

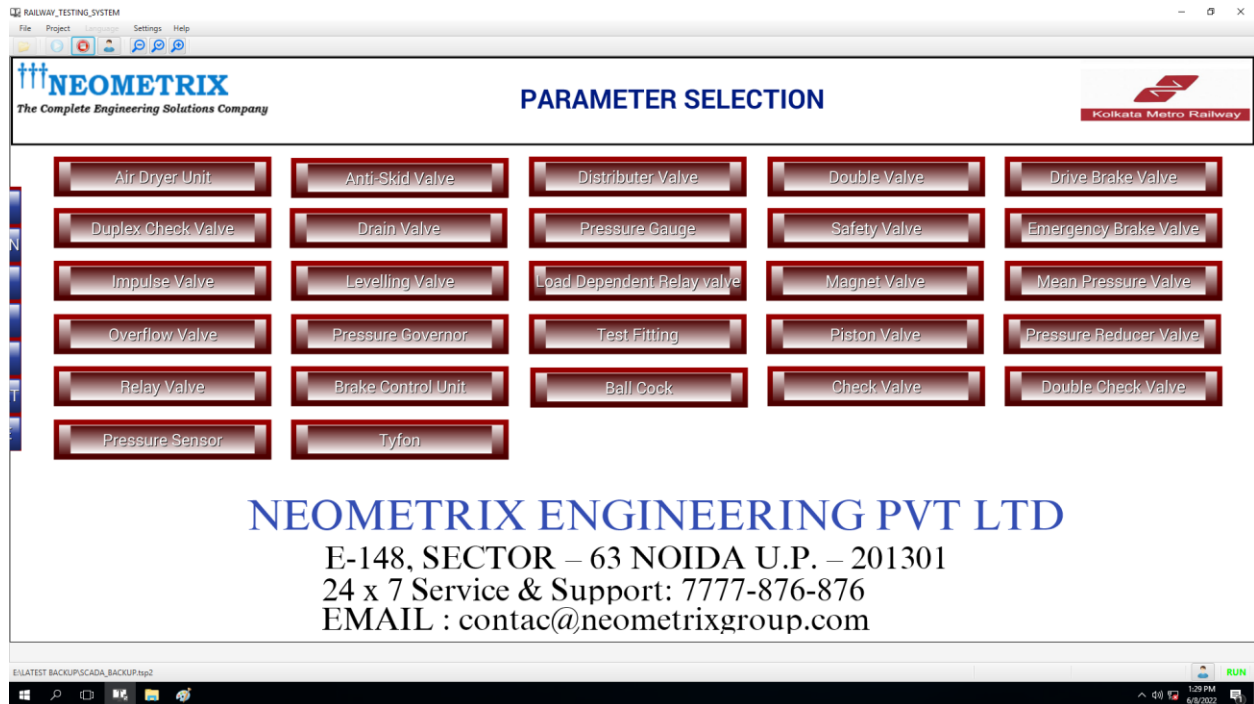


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After clicking the PARAMETER icon the CCUBTB detail window will appear as shown-



Click on Particular Valve for Parameter setting if applicable

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START TEST: Click on TEST SELECTION from main Menu

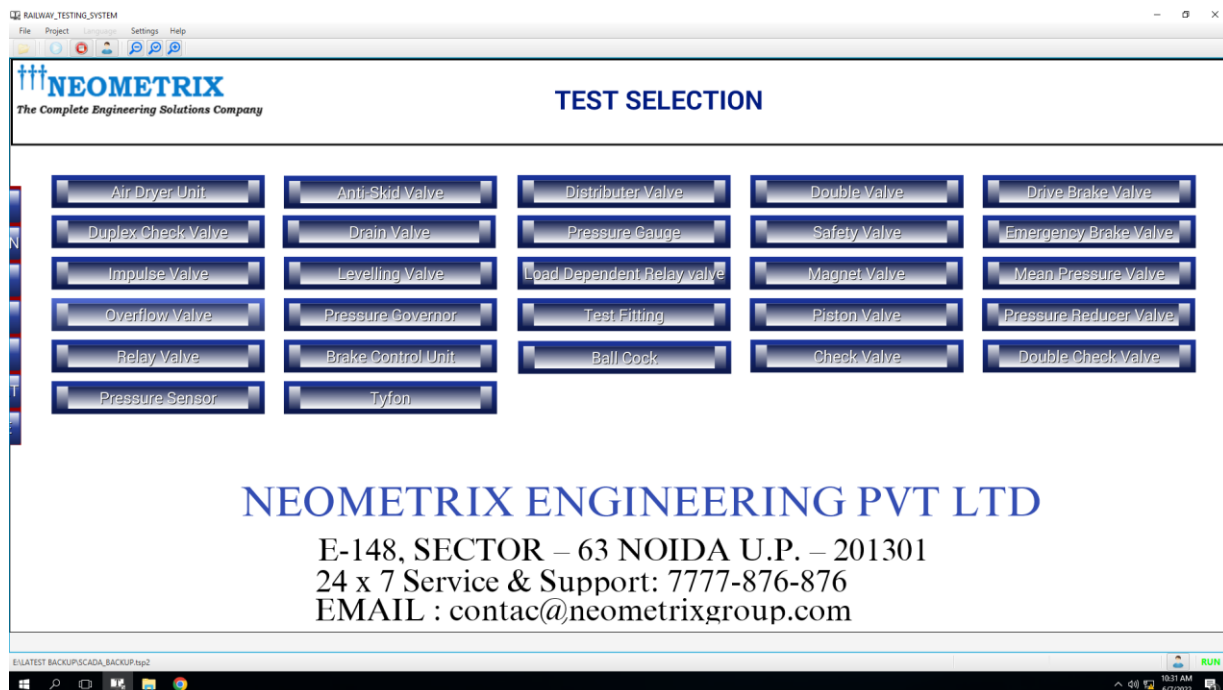
After clicking the TEST SELECTION icon the CCUBTB detail window will appear as shown-

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To start a test click on a particular valve as per test setup ready for testing. Now Test can be started by clicking on START button, Test will automatically run for define time and report will be save in PDF format.

To start the other valve testing follows the same procedure from Test Selection Screen after Test setup.

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Manual Mode-This mode can be selected from the Control Panel Selector Switch. All the operation of valve control will be done by toggle switch as per test requirement of testing units.

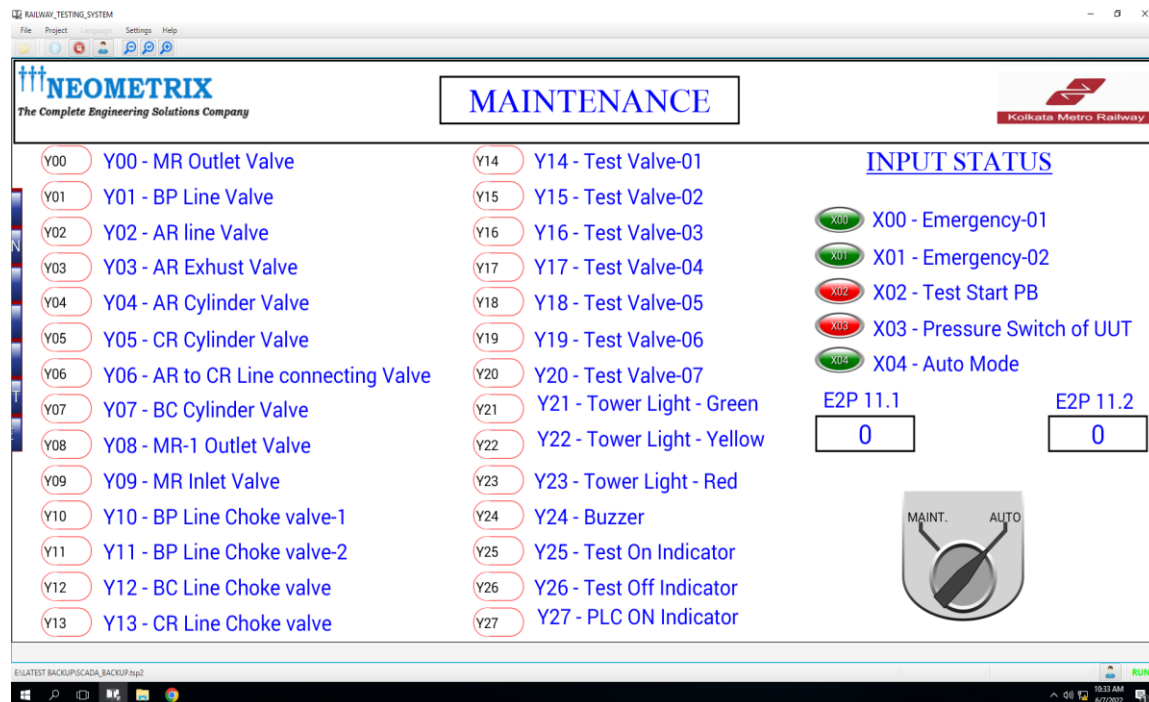


7. Maintenance of the Test Stand

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From the Main menu Click on the MAINTENANCE icon, after clicking on maintenance icon following windows will appear



On above screen select the selector switch on maintenance mode.

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After this particular valve proper functioning can be monitored by switching on from the screen.

- Closed the air dryer inlet and outlet valve.
- Closed the air compressor outlet valve
- Exhaust the air from main reservoir by opening the drain valve of reservoir from inside the test stand panel.
- Now check the seals for fittings if any leakage observed during testing and tight it properly.
- Check the air dryer function as per air dryer maintenance manual.
- Check the Air filter drainage and drain the moisture.
- Check the pressure gauge calibration certificate if the calibration of pressure gauges and pressure transmitter is over dated then remove and do the needful for calibration.
- After calibration of pressure gauges and pressure transmitter mount on its place as per circuit.
- Now closed the main reservoir drain valve
- Open the air dryer inlet valve and outlet valve and supply on compressor air supply line
- Now observed if any leakage on circuit
- If not then click on auto mode from maintenance screen.

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- Now select on TEST SCREEN icon and do the testing of unit as per requirement.

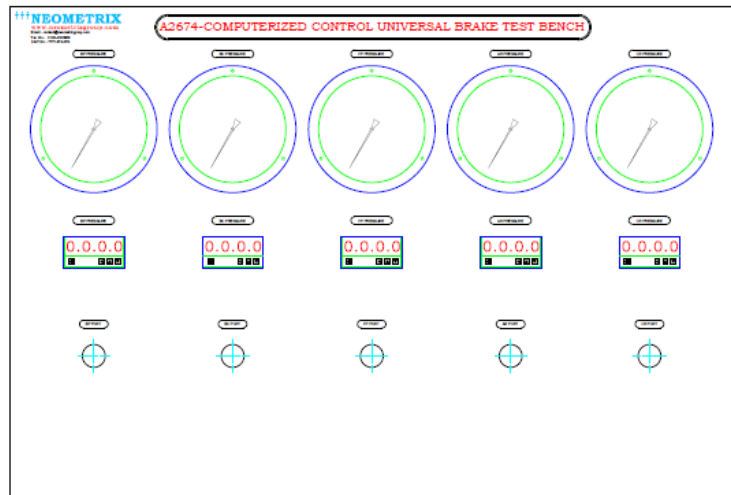
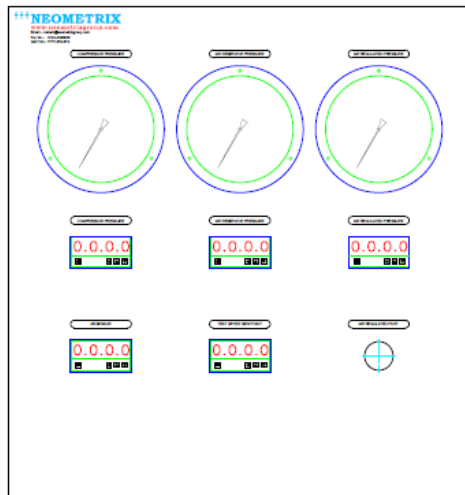
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8. Panel Mimic of the System



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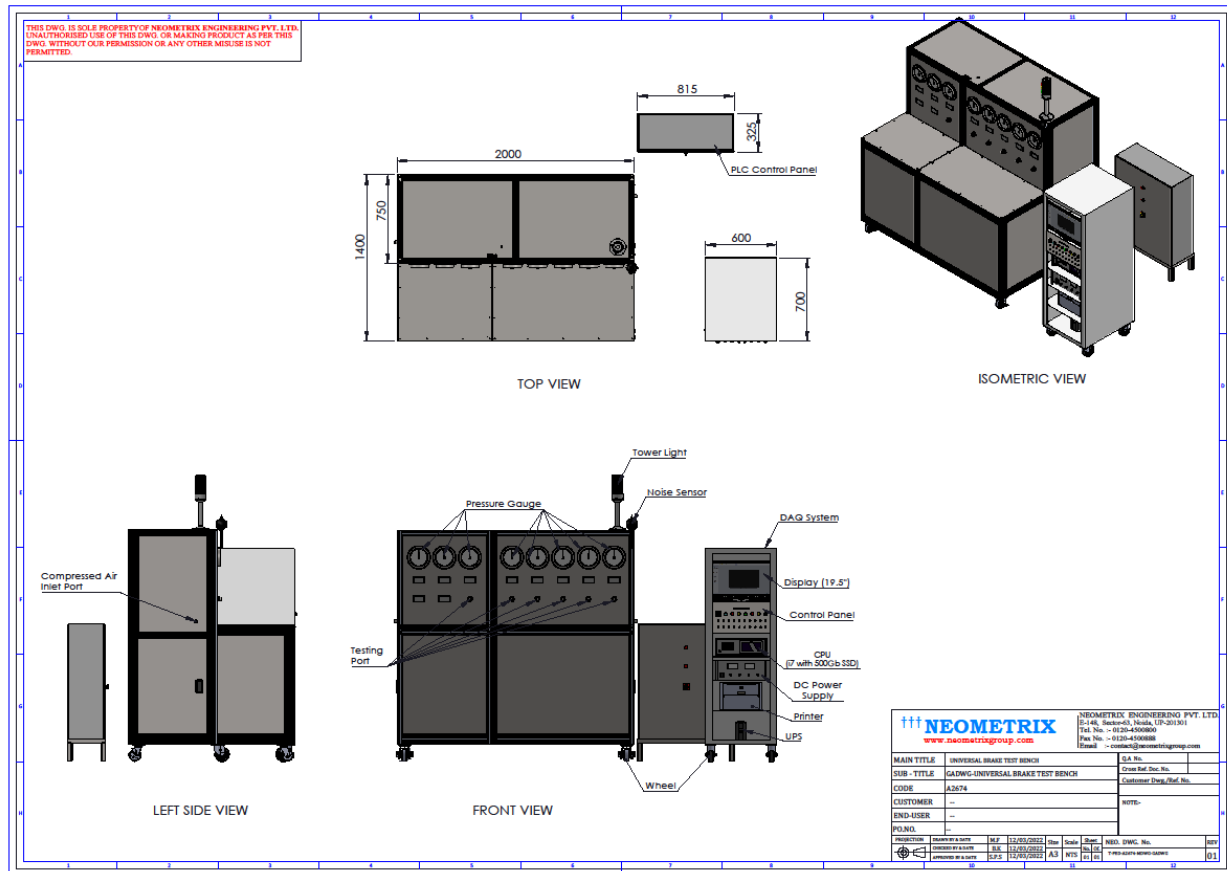
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9. GA Drawing of Test Stand



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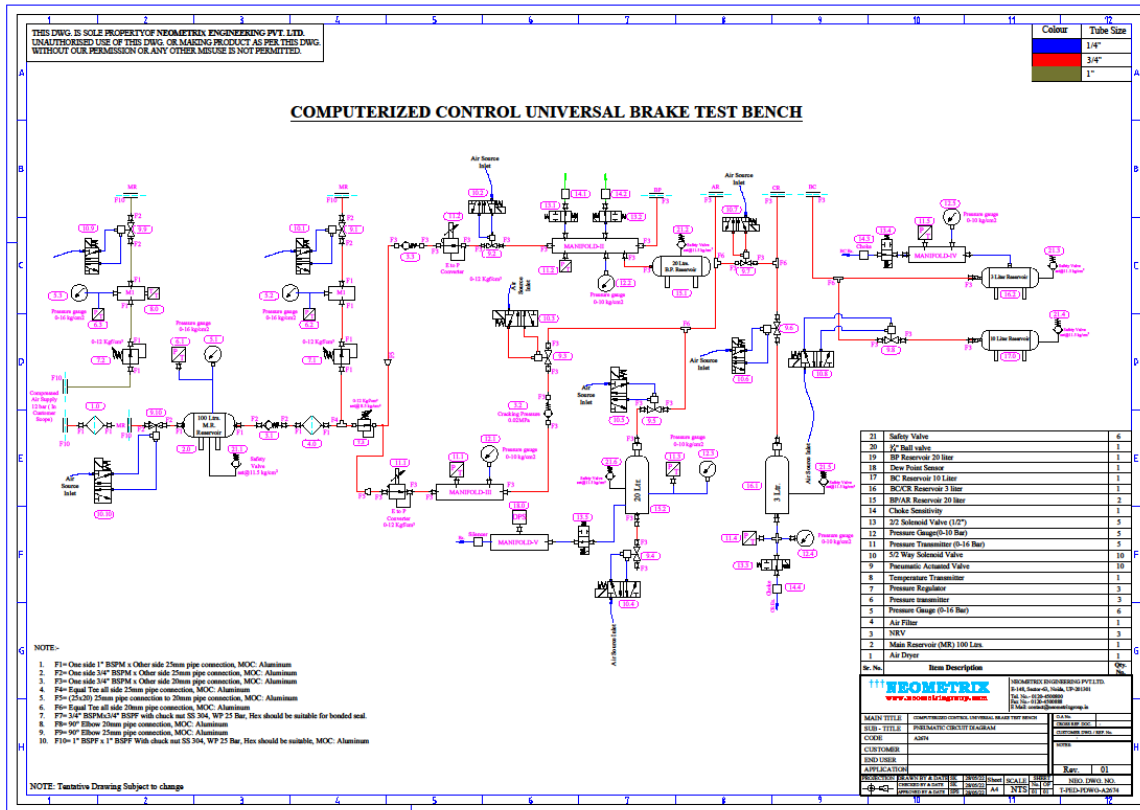
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10. Pneumatic Circuit diagram



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11. PNEUMATIC CKT BOM

| T-PED-BOM-A2674-COMPUTERIZED CONTROL UNIVERSAL BRAKE TEST BENCH-REV-00 | | | | | |
|--|--------------|--------------------------|-----------|---|------------|
| S.N | Nx. Part No. | Item | Ckt. Code | Specification | Make |
| 1 | 2A2674P001 | Air Dryer | 1 | Twin Tower Air Dryer,Flow 2000 LPM , working pressure 12 Kg/cm2 | Trident |
| 10 | 2A2674P002 | Pneumatic Actuated Valve | 9.1-9.10 | Working Pressure=12Bar ,End Connection=3/4"BSPF , Moc: SS 304, | Metal Work |
| 3 | 2A2674P003 | DC Power Supply | | To supply 110VDC and 24VDC of testing valves Regulated DC Voltage : 0-128VDC/15A with two digital meter to mointer output voltage and current | Aplab |
| 6 | 2A2674P004 | Pressure Gauge | 5.1-5.3 | Case:304 Stainless Steel Welded case/socket connection polished, Range: 0-16 kg/cm2, Dial Size 6.0", Back Mounting ,1/2BSP Male, with three screw front flange mounting ,Panel Cutout=100mm,High Accuracy ($\pm 0.5\%$ of full scale) With Least Count=0.1Kg/cm2, Application: compressed Air | wika |

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| | | | | | |
|----|------------|----------------------------------|-------------------|--|--------------------------|
| 6 | 2A2674P005 | Pressure Gauge | 12.1-12.5 | Case:304 Stainless Steel Welded case/socket connection polished, Range: 0-10 kg/cm ² , Dial Size 6.0", Back Mounting ,1/2BSP Male, with three screw front flange mounting ,Panel Cutout=100mm,High Accuracy (±0.5% of full scale) With Least Count=0.1Kg/cm ² , Application: compressed Air | wika |
| 7 | 2A2674P006 | Pressure Transmitter | 6.1-6.3/11.1-11.6 | 0-16Kgf/cm ² , Output Signal 4-20mA, End Connection 1/2" BSPM, Accuracy : ± 0.25 % | Wika |
| 3 | 2A2674F001 | Main Reservoir | 2 | Capacity: 100L, MOC: SS, WP: 12 Bar | Sakshi Tools /Fabricated |
| 4 | 2A2674P008 | Check Valve | 3.1-3.3 | Inline, Cracking Pressure 0.02MPa , 3/4" BSPF Port , working pressure 12 Bar | SMC |
| 5 | 2A2674P009 | safety Valve | | set@ 12kg/cm ³ , flow : 40 CFM, 1/2"BSPM | Harsad Engineering |
| 8 | 2A2674P010 | Filter with Semi-Automatic Drain | 4 | 5Micron,0-12 Kgf/cm ² , 1" BSPF Port with mounting bracket. | SMC |
| 36 | 2A2674P012 | Pressure regulator | 7.1-7.2 | Pressure Working12 bar End connection 3/4 BSPF, Pressure Setting : 0-12 kg/cm ³ | SMC |
| 37 | 2A2674P013 | Choke | | 1/4" Metering valve with silensor | SMC |

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|----|------------|---------------------------------|------------|--|--------------------------|
| 12 | 2A2674P014 | E-P Regulator | 11.1-11.2 | Pressure Range 1.0Mpa , Power Supply voltage 24VDC , Input Signal 0-10VDC, Analoge output 0-5VDC , End connection 1/2" BSP female. With 5meter cable connector , pressure display unit kg/cm2 , with L type mounting bracket | Metal Work |
| 11 | 2A2674P015 | Solenoid Valve5/2 with manifold | 10.1-10.10 | manifold for 12 nos of 5/2 Solenoid valve with single solenoid of 24 V , With all connectors with 2.5m cable. 1/4"BSPF port Size | Festo |
| 13 | 2A2674F002 | AIR Reservoir (CR) | 16.1 | Control Reservoir , Capacity: 3L, Moc: SS 304, WP: 12 Bar | Sakshi Tools /Fabricated |
| 14 | 2A2674F003 | Air Reservoir (BC) | 17 | Brake CylinderReservoir , Capacity: 10L, Moc: SS 304, WP: 12 Bar | Sakshi Tools /Fabricated |
| 16 | 2A2674F004 | Air Reservoir (BP) | 15.1 | Brake Pipe Reservoir, Capacity: 20L MOC: SS, WP: 12 Bar | Sakshi Tools /Fabricated |
| 17 | 2A2674F005 | Air Reservoir (AR) | 15.2 | Auxilaury Reservoir, Capacity: 20L, MOC: SS, WP: 12 Bar | Sakshi Tools /Fabricated |
| 18 | 2A2674F006 | Air Reservoir (BC1) | 16.2 | Auxilaury Reservoir, Capacity: 3L, MOC: SS, WP: 12 Bar | Sakshi Tools /Fabricated |
| 19 | 2A2674P016 | Pressure Dew point meter | 18 | To measure the pressure due point of air dryer outlet under , with display, Dew point range: -40 to 30 ° C | Vaisala |
| 18 | 2A2674P017 | Sound level sensor | | to measure horn Sound Intensity : 30 ~130dB (A) sound intensity of horn | KB |

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|----|------------|---|--|-------------|
| 25 | 2A2674P018 | Quick Coupling & Disconnecting Connector 1" | End connection 1" BSPF QCDC, Moc: SS 304, WP: 12 Bar For Compressed Air, with blulk head for panel mounted | CEJN |
| 26 | 2A2674P019 | Quick Coupling & Disconnecting Connector 3/4" | End Connection 3/4" QCDC, SS 304, WP: 12 Bar, For Compressed Air, with blulk head for panel mounted | CEJN |
| 19 | 2A2674P020 | 8mm Pu Pipe | 8mm ,Blue Pu Pipe (200 mtr) | Parker |
| 20 | 2A2674F008 | Manifold | PT and pressure gauge manifold, MOC: SS | SS |
| 21 | 2A2674F009 | Aluminium Structure | Heavy 40x40 Profile, 80x40 profile | Aluminium |
| 22 | 2A2674P021 | 10mm Pu Pipe | 10mm, 100 mtrs. | Parker |
| 23 | 2A2674P022 | 1/4"BSPM x 8mm push fitting | 1/4"BSPM x 8mm push fitting | Parker |
| 24 | 2A2674P023 | 1/2" BSMPx10 mm Push Fitting | 1/2" BSMPx10 mm Push Fitting | Parker |
| 25 | 2A2674P024 | DRO | DRO to show pressure readings | Masibus |
| 26 | 2A2674F010 | Network Rack for DAQ panel | Digital series network rack 36U x 600mm(W)x800(D) colour: RAL 7035 MTS infonet | MTS Infonet |

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|----|------------|-----------------------------------|--|---|---------------------------------|
| 27 | 2A2674F011 | SS 304 2 mm Cover panels | | SS 304 2mm thick cover panels with bend (complete set) | Jindal |
| 28 | 2A2674F012 | Top cover 5 mm | | workstation top cover plate , SS 304 | Jindal |
| 30 | 2A2674P027 | Caster Wheels | | For test bench load capacity 700 kg each | Maxima Auto claster Wheel |
| 31 | 2A2674P028 | Silencer | | 1/2" BSPM, Festo Part No: 2310 | Festo |
| 32 | 2A2674P029 | Pre-Filter | | Working Media : air , Line Size: 1" , 30 Series, flow 100 CFM , Micron rating 1 micron | Parker |
| 33 | 2A2674P030 | Post-Filter | | Working Media : air , Line Size: 1" , 30 Series, flow 233 CFM , Micron rating 1 micron | Parker |
| 34 | 2A2674P031 | Fine Filter | | Working Media : air , Line Size: 1" , 30 Series, flow 233 CFM , Micron rating 1 micron | Parker |
| 35 | 2A2674P032 | 2/2 Solenoid Valve | | 2/2 Solenoid Valve, MOC: Brass, 1/2" BSPF, Wporking pressure: 12 bar | Metal Work |
| 36 | 2A2674P022 | 1/8"BSPM x 8mm push fitting | | 1/4"BSPM x 8mm push fitting | festo |

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|----|----------------|----------------------|---|--------------|
| 37 | 2A2674P023 | Nipple without valve | Part No: 107675200 Connection: 1" BSPF Working Pressure: 16 bar Moc: Brass | CEJN |
| 38 | 2A2674P029 | Nipple without valve | Part No: 106675200 Connection: ¾" BSPF Working Pressure: 16 bar Moc: Brass | CEJN |
| 39 | 2A2674P030 | Push-Fitting | 1/4" BSPM x 12 mm pu-pipe | Festo |
| 40 | 2A2674P031 | Push-Fitting | 1/8" BSPM x 8 mm pu-pipe | Festo |
| 41 | 2A2674P032 | Silencer | Silencer for Solenoid valve | Festo |
| | 2A2674F013-025 | SS 304 Sheets | SS 304 Sheets/Covers/doors, Thickness: 2mm/3mm/5mm | Jindal |
| | 2A2674P034 | Flush Pull Handles | For SS doors Handles | Elesa ganter |
| | 2A2674P035-48 | Pipe and Fittings | AirPipe Pipe and fittings as per fitting list | Airpipe |
| | 2A2674P050-53 | SS Fitting | SS Fittings as per requirement, Tube OD fittings as per fitting List | SS 304 |
| | 2A2674F026-030 | Manifold | SS manifold and mounting bracket | SS 304 |

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|-------------------|-----------------------------|--|-----------|
| 2A2674F031 | Electrical Control panel | SS 304 ,Electrical Control Panel , Size : as per drawing, Thickness: 3 mm | Jindal |
| 2A2674P060- 62 | Hoses | Hose For UUT testings , WP : 16 Bar, For Compressed Air | Gates |
| 2A2674F032- 37 | SS fittings | SS fitting s for UUT | Global |
| 2A2674F038 | Test manifold | SS Manifold for Testing unit | Neometrix |

END OF DOCUMENT

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