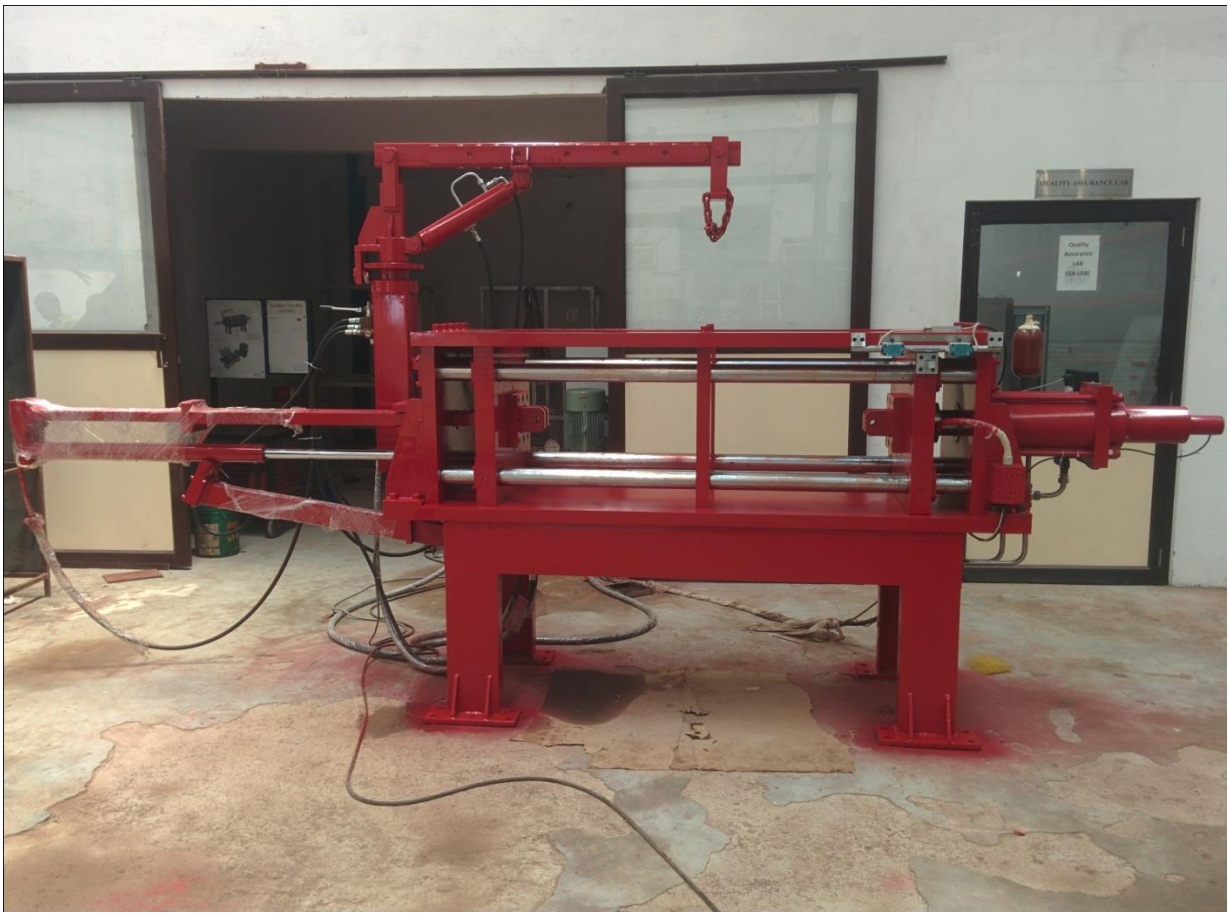
NULEAR POWER CORPORATION OF INDIA LIMITED.

USER OPERATIONAL MANUALOF SNUBBER TEST RIG

SUBMITTED BY:
Neometrix Engineering (P) Limited
E-148, Sec-63
Noida (U.P.)
+91-120-4500800-100 lines

SNUBBER TEST RIG:



CONTENTS:-

IMPORTANT NOTES

WARNING!

This is a High Pressure System and requires handling by trained personnel ONLY.

Mishandling of the system may cause Injury. Please Follow the User Manual Instructions.

Please read this manual before doing anything with the system and follow the instructions carefully.

Signal words CAUTION and NOTE have special meanings.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in damage.

NOTE indicates information to assist maintenance and better running of the system.

WORD FROM THE DIRECTOR

Dear User,

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

- Snubber-Test-Bench-5State of 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 work.

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 and **wish to become your preferred supplier for these services**.

With Best Regards,
Shailendra Pratap Singh

2.Introduction of Snubber Test Rig:

2.1 Test Rig Description

The Test Rig is Electro Hydraulic. Safety & user Friendliness are the key features of the provided Test Rig. The Test Rig has been designed to address all the requirements of the Design Document.

- With this Test Rig, Operator can work independently.
- The entire Test as specified can be done on this Test Rig.

The List of the test to be tested on the Rig is as follows:
(a) Lost Motion test with automated interpretation of results.
(b) Free Operability test over full stroke**.**
(c) Drag Force test with automated interpretation of results
(d) Lock (Sensitivity) test along with measurement of sensitivity and drift speed with automated interpretation of results**.**

The control panel consists Control panel for user operation, 24V DC Power Supply, UPS, Printer and Emergency Switch etc.

The Schematics Diagram of Snubber Test Rig and detailed representative of major items for manufacturing are given in the list. List is given in Manual.
The change in Design for betterment of test rig is highlighted as according to requirement.
All necessary safety features are incorporated in the design of Snubber Test Rig .The installation has proper earthling arrangement for discharging static charge. And hence minimize the fire hazards. All labeling on the Test Rig are written in English.

3. MEASUREMENT AND CONTROL

3.1 Pressure Indicator:

The maximum working pressure of the Rig is 200 bars. Pressure transmitter of ranges 0-250 bars are used for the dynamic pressure indication. Output from the dynamic pressure is connected to the Data Acquisition & control System for recording.

3.2 Fluid Level Indicators :

A vertical fluid level is mounted at front of tank to permit visual monitoring of the level inside the reservoir.

3.3 Control Panel

- The control Panel shall provide means for activating, monitoring and indicating the various operating parameters of the Snubber Test Rig.

The panel shall have the following mounted on it-

- Emergency shut down switch.
- Data Acquisition & Control System .
- Control Box for CSAS system.
- Key Board and Mouse.
- UPS for uninterrupted power supply to the system to controlling or emergency shutdown.

3.5 Data Acquisition & Control System

- A program made on LABVIEW software is provided for measuring & controlling all the parameter for test rig.
- DAS include a 17” TFT Monitor, Keyboard, Mouse and UPS.

3.6 WIRE ROUTING

Wires as for as possible bunched and routed through Cable tray are mounted. Power and control cables are separated.

4. INSTALLATION GUIDELINES

4.1 CAUTION:-

- Rotation of the motor should be in accordance to the pump i.e. in clockwise direction seeing at the back of electrical motor.
- Coupling of motors should be very well.
- Fit all the motors with anti vibration pad.
- Hydraulic Oil to be filled should be **CLEAN**.
- Use the test schedule guidelines before testing.
- Increase pressure slowly.
- Tank should be covered properly.
- Turn off the Power Pack **Immediately** when not in use.

4.2 IMPORTANT DO'S & DONT'S LIST

DO'S

1. Do check the level of the HYDRAULIC OIL filled in the Tank; it should be up to the high level mark of the level indicator in order to avoid increase in the temperature of oil. It also helps in better suction for the Pump.
2. Do check HYDRAULIC OIL is Free of any contamination.
3. Do Flush the tank in every 6 months.
4. Do read the manual properly before testing.
5. Do follow the test schedule.
6. Check that the system is properly connected to the input and output system.
7. Do check the Unit Connections properly before pressurizing the system.
8. If any leakage is detected close the appropriate Valve.

9. Do check that Unit electrical connector is connected properly before operation.
10. Check the position of Limit Switch before starting the Test and adjust according to the snubber.

DON'TS

1. Don't run the motor if the Oil Level is Low.
2. Don't run the motor if the Oil is contaminated.
3. Don't run the motor in anticlockwise direction.
4. Do not let Filler Breather Open.
5. Do not interrupt the system in running condition.
6. Don't start the test if the Snubber is not mounted on the test Rig.
7. Don't run the test while the Snubber is being mounted.

5. Other functioning of the Rig

- As per the requirement , the test rig is fully automated with results of the tests being saved individually in the Drive.
- Individual test windows has been provided for all the tests.
- Selection of Snubber is as per the requirement.
- A pointer is provided for the visual inspection of movement of snubber.
- A crane (**BOOM**) is provided to lift the Snubber for mounting in Rig.
- Two manually operated levers are provided for the following tasks:
  - One for Boom . to control its upwards and downwards movement.
  - Second for the Adjusting plate. To control its inward or outward movement.

- The signals from Pressure Transmitter, Temperature sensor, LVDT and Load Cell is connected to Computer through adequate signals processing PCI cards.
- National Instruments (www.ni.com) make Data Acquisition Card is provided.

Software has all the following features (As discussed above)

- Display at Test process on Computer screen.
- Online values display of the test readings.
- Pressure, flow, Temperature, time, voltage /current etc.
- Real time Reports generation in the form of charts /graphs.
- Test result storage / retrieval.

- **Neometrix will do Installation & Commissioning. The facilities required is as follows:**
  - **Hydraulic Oil- VG-46 or Equivalent.**
  - **3-Phase power ~ 415±5 V**
  - **1-Phase power ~ 220±5 V**
  - **Electric power should have proper earthing.**

6. HYDRAULIC LIST OF MATERIALS:

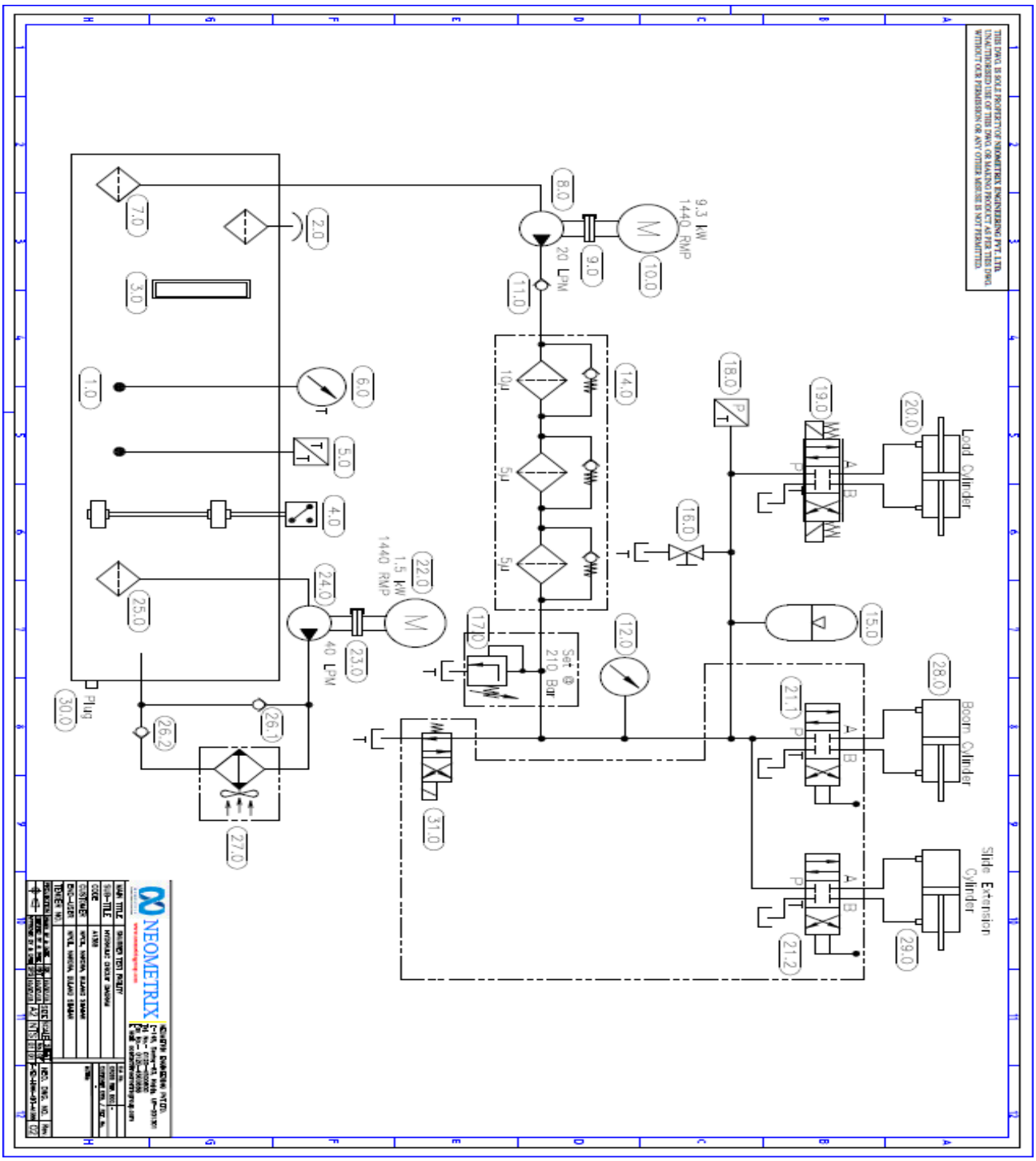
Hydraulic Power pack					
S.No.	**Item**	**Specification**	**Model No.**	**Make**	**Qty**
1	Reservoir	Tank capacity: 200 Liter Material : SS	Fabricated, As per Drawing	Fabricated	1
2	Filler Breather		FSB-25	Hydroline	1
3	Level Gauge			Shridhan	1
4	Temperature Gauge with Calibration Certificate	Range: 0 to 100 degree C, Dial Size: 4”, Stem length: 250 mm(approx.), stem diameter: 8 mm, Process Connection : 1/2” BSPP	3825-B9-09	Wika	1
5	RTD with transmitter	Range: 0 to 150Degree C, Stem length: 300 mm(approx.) stem diameter: 8 mm, process Connection : 1/2” BSPP	PT 100	Wika	2
6	Suction Strainer	149 micron, 60 LPM Flow Capacity	SC3015	Hydroline	2
7	Gear Pump	Flow - 20 lpm	1P -3044	Dowty	1
8	Electric Motor for above Pump-foot cum Flange Mounting	9.3 kw , 1460 rpm, 4 pole, Flange mounted	Frame : ND132M	Crompton Greaves	1
9	Bell housing & Geared Coupling	To suit the above Motor & Pump		Standard	1
10	Pressure Gauge with calibration certificate	Range:- 0-280 PSI , Dial Size:- 4" , 1/2" BSPP connection ,	232-series	Wika	1

		Inline mounted			
11	Pressure Cum Unloading Valve	Relief Range:- Upto 250 Bar , with 2/2 DC valve	4WE6	Rexroth	1
12	Pressure Line Filter	10 micron , Max working pressure - 630 bar	HD.069-156	Argo Hytos	1
13	Pressure Line Filter	5 micron , Max working pressure - 630 bar	Element model no V3-0520-03k4	Argo Hytos	1
14	Pressure Line Filter	5 micron , Max working pressure - 630 bar	Element model no V3-0520-03k4	Argo Hytos	1
15	Pressure Transmitter	0-250 bar	S-10	Wika	1
16	Relief Valve	Sub plate mounted relief valve suited to bladder accumulater application, max pressure- 315 bar	DB-10	Rexroth	1
18	Blader Accumulator		AS-1	EPE	1
19	High Pressure hoses	Working Pressure : 210 Bar Length :as per required		Gates	A/R

	For Cooling system				
20	Gear Pump	40 LPM Gear Pump	1P-3090	Dowty	1
21	Electric Motor for above pump	1 Kw , 4 pole three phase motor	Frame: M2BA 090 L-4	ABB	1
22	Bell housing & Geared Coupling	Fabricated		A/R	1
23	Heat exchanger	Heat Exchanger	SX.031	Standard Radiator	1

24	Suction Strainer	149 micron, 60 LPM Flow Capacity	SC3015	Hydroline	2
Hydralics On Test Bed					
25	Double Acting Servo Actuator	Cylinder Bore Dia.- 63 mm,Piston Dia.-32 mm,Stroke Length -100 mm	As per drawing	Fabricated	1
26	servo valve	servo valve	G631-3003B	Moog	1
27	Hydralic Hoses	W.P - 250 Bar	As per required	Parker	2
Mechanical Test Bed					
28	Mechanical Test Bed	as per drawing			1
Instrumentation (sensors) and DAQ					
29	LVDT+Position magnet+ Cable Connector	Range- 0 to 180 mm , Supply 24 VDC, Output :0.5 ... 10 V	PCST24-M18-180-U2-P1A(LVDT) +PCST-MAG2-G2(Position Magnet)	ASM GMBH	1
30	Universal Load cell	Capacity 25000 kg,LPCH, Excitation Voltage(Rec):5 to20 V AC/DC	LPM025TT000XX1	PT Ltd New zealand	1
31	Industrial Rack	As per Drawing	19"	APW President/Rittal/Stanard	1
32	PC	min.500GB		Compaq	1
33	Monitor	17" TFT			1
34	UPS	600VA		Odyssy	1

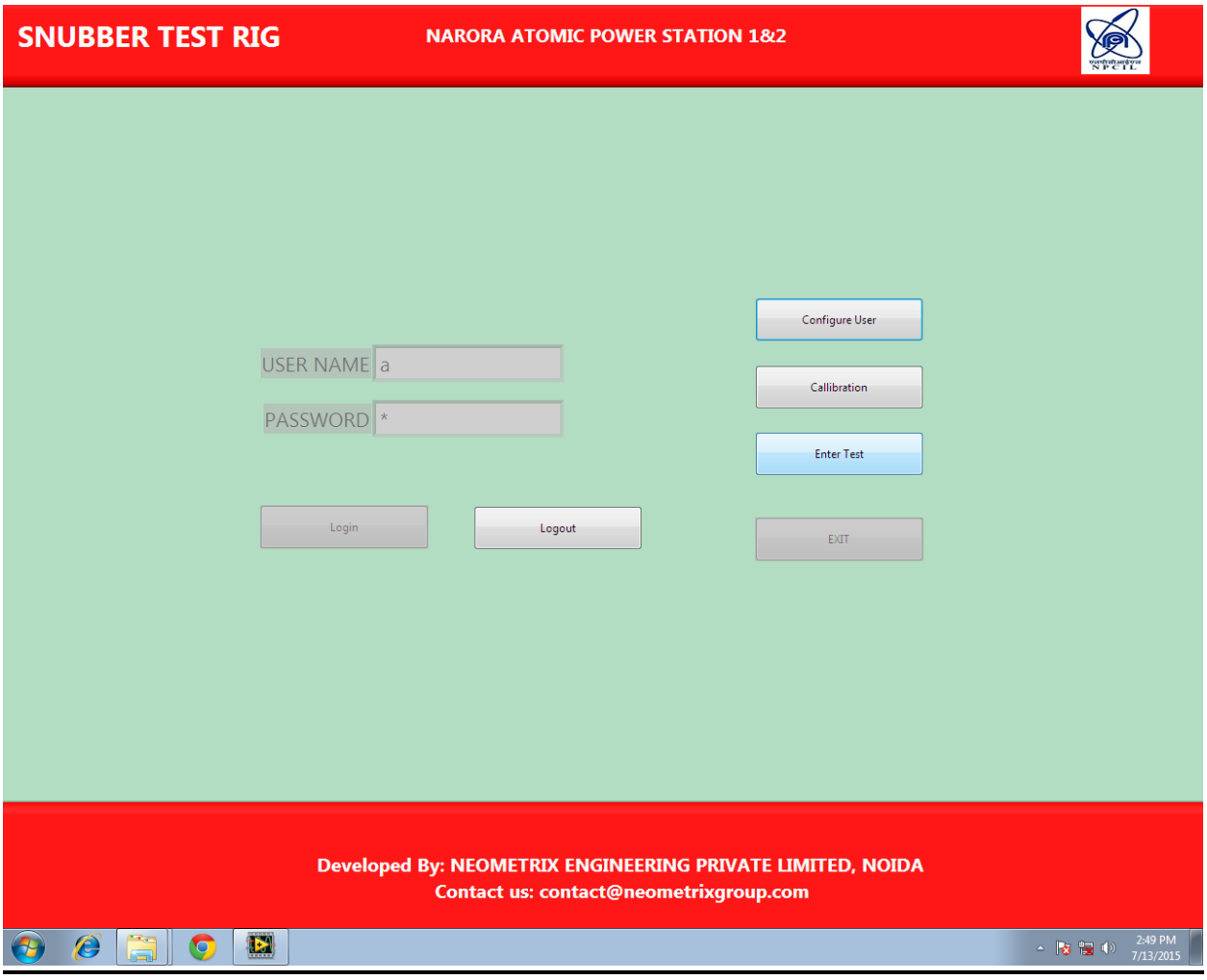
HYDRAULIC CIRCUIT DIAGRAM:-



TEST WINDOW DESCRIPTION:

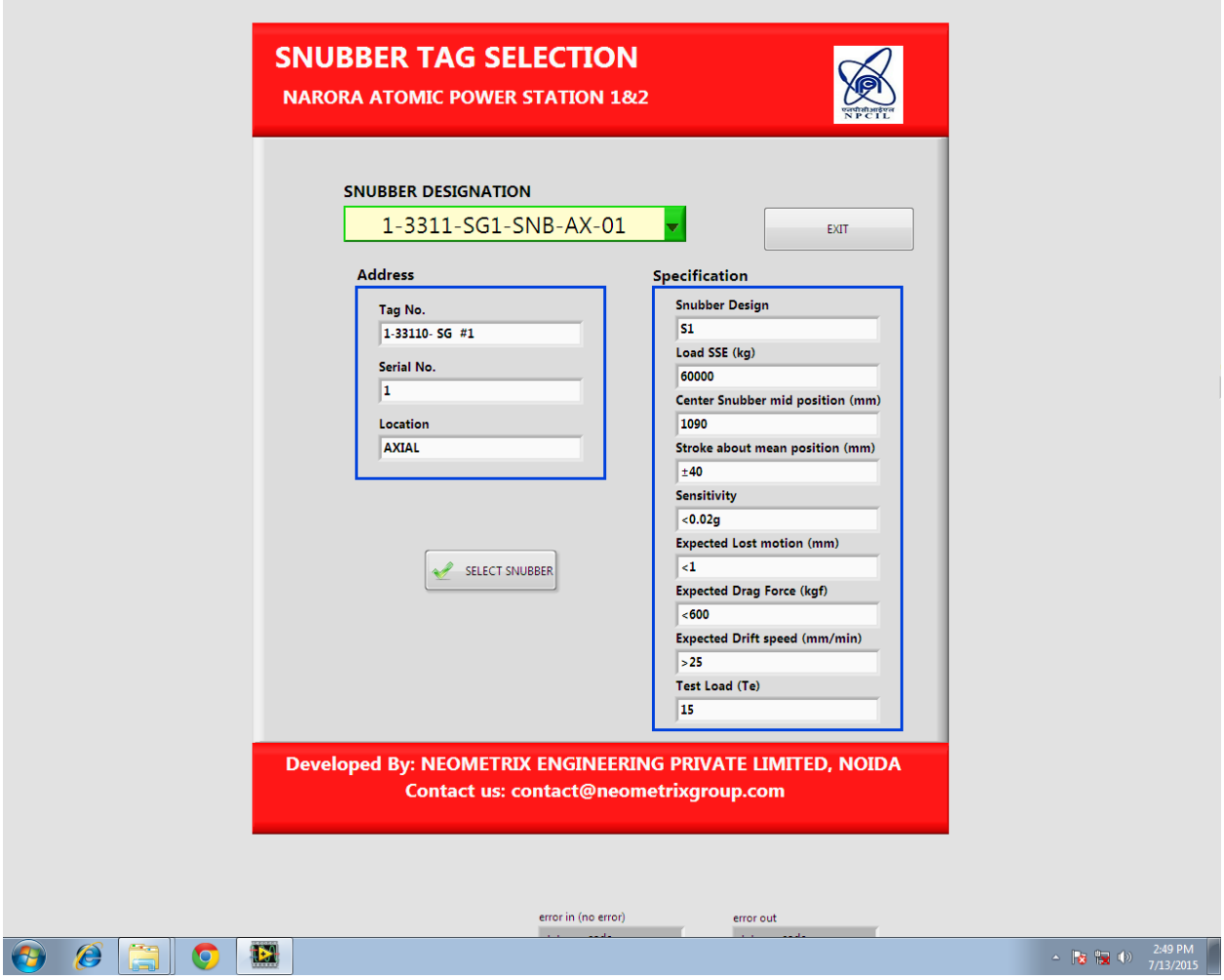
This is the main Testing window screen. Here following features can be observed:

1. USERNAME and PASSWORD
   By entering the authentic username and password , the user can LOGIN the system.
2. CONFIGURE USER
   Clicking this window leads to enter the details of the operator.
3. CALIBRATION
   This button is selected when the calibration of Load Cell , LVDT , Temperature Transmitter and Pressure Transmitter is to be calibrated.
4. ENTER TEST
   By clicking on this button , the user can proceed further to the Snubber Seclection window.
5. EXIT
   This button is used to Exit the Testing Procedure.



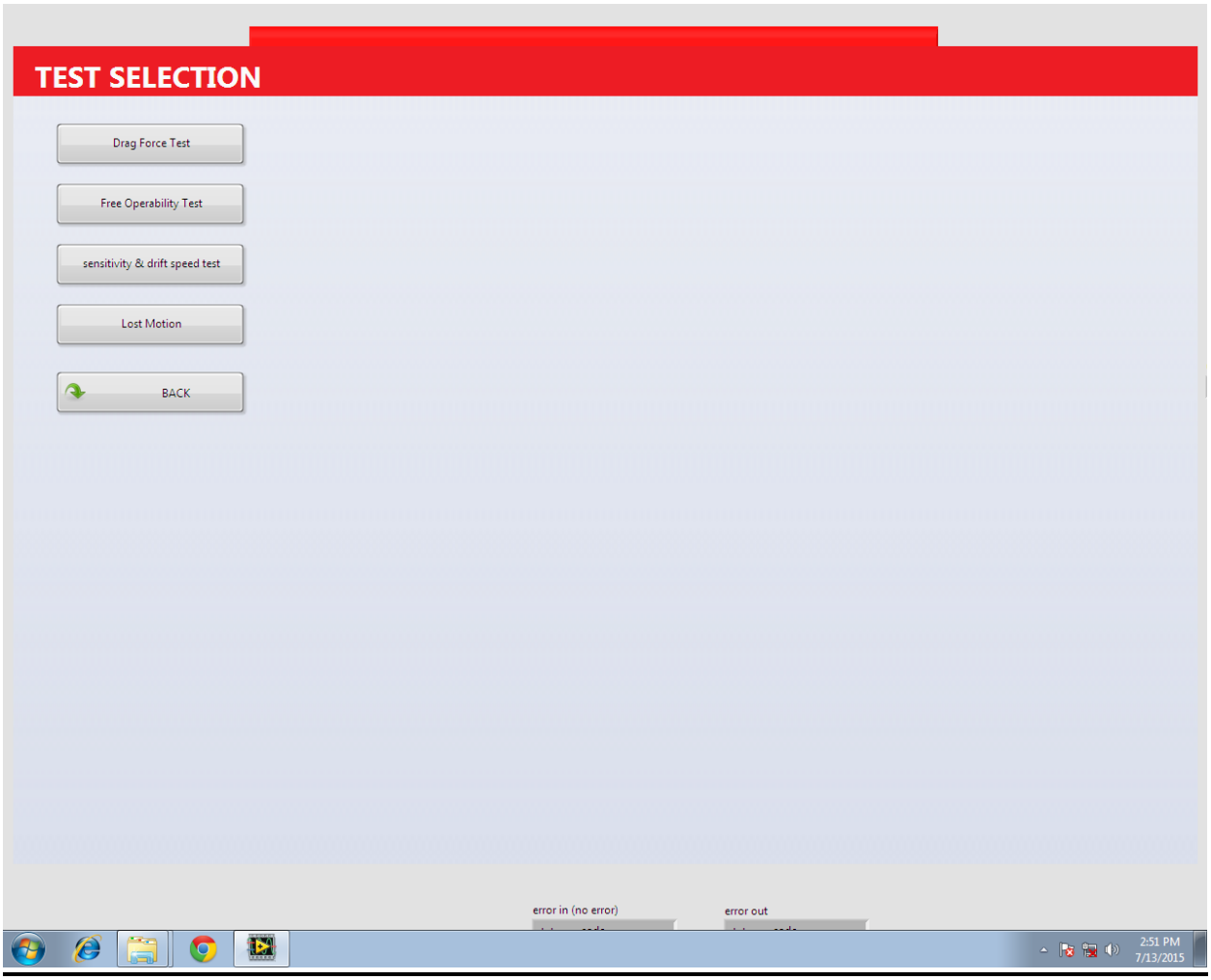
SNUBBER SELECTION:

This is the next step after entering the test .This window allows the user to select Snubber as per the testing requirements.



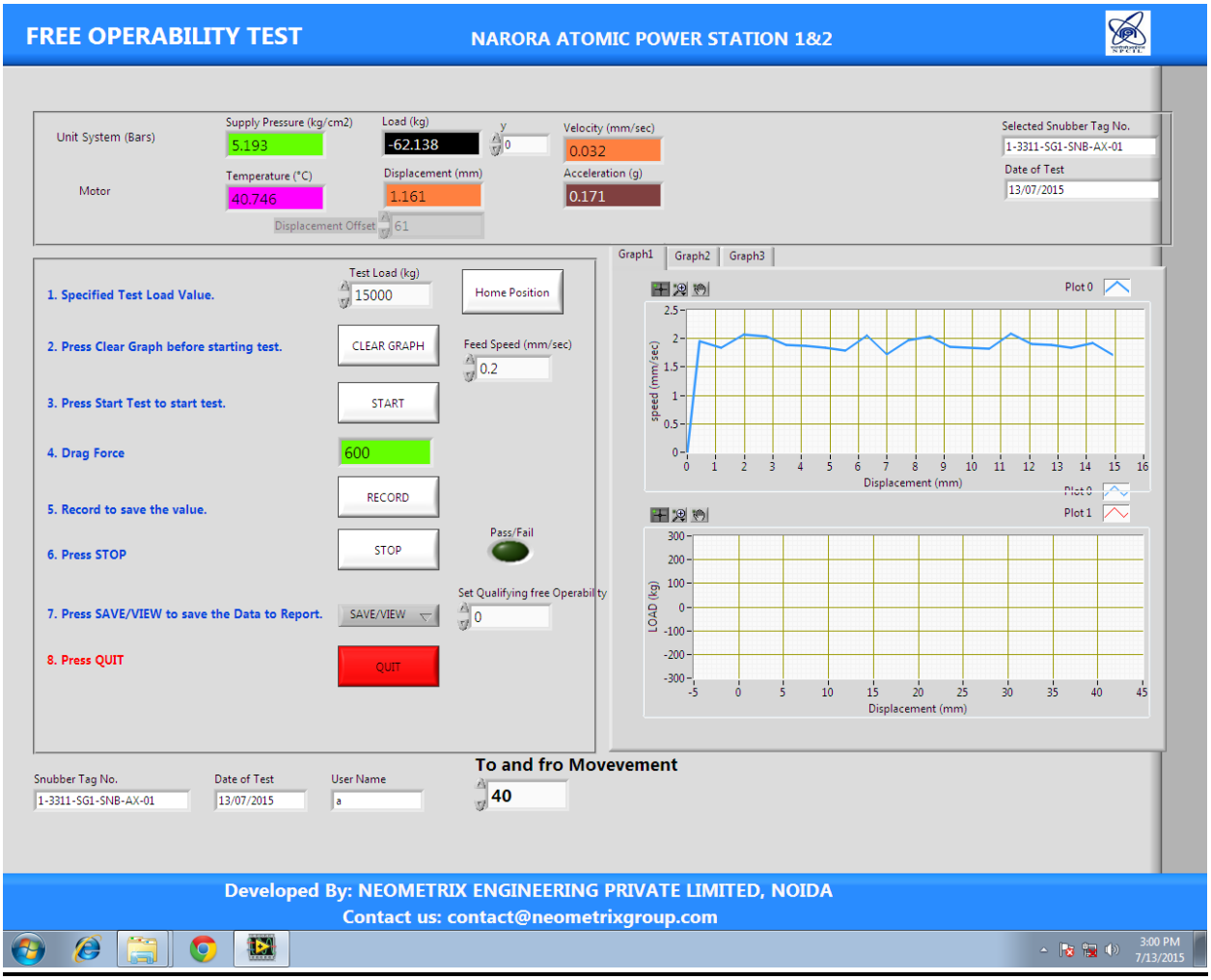
After selecting the snubber , click on select snubber button to proceed to the Test selection window.

TEST SELECTION WINDOW



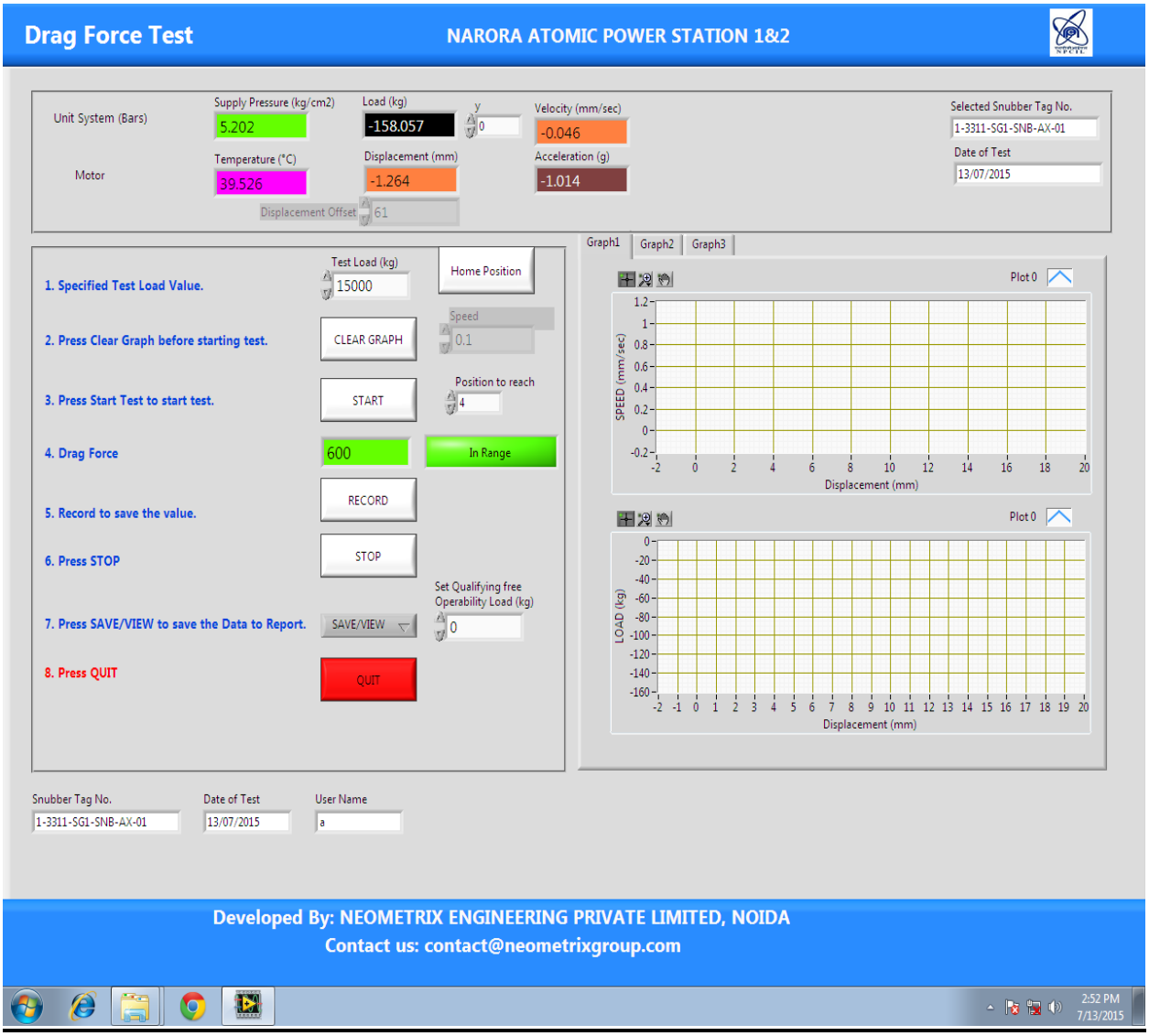
Select from the Tests mentioned to proceed to desired test.

FREE OPERABILITY TEST



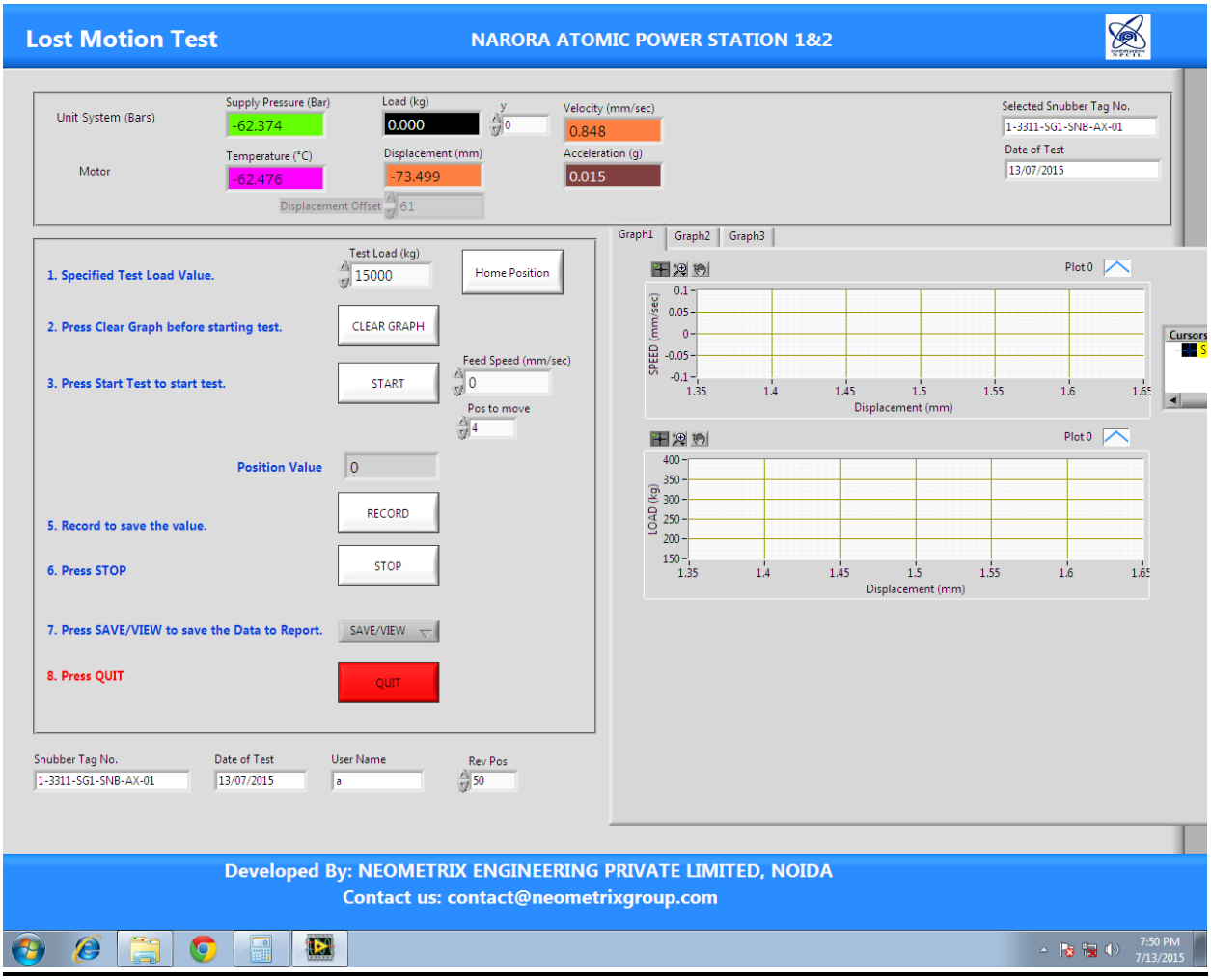
The above window gives a glance of the free operability test.

DRAG FORCE TEST

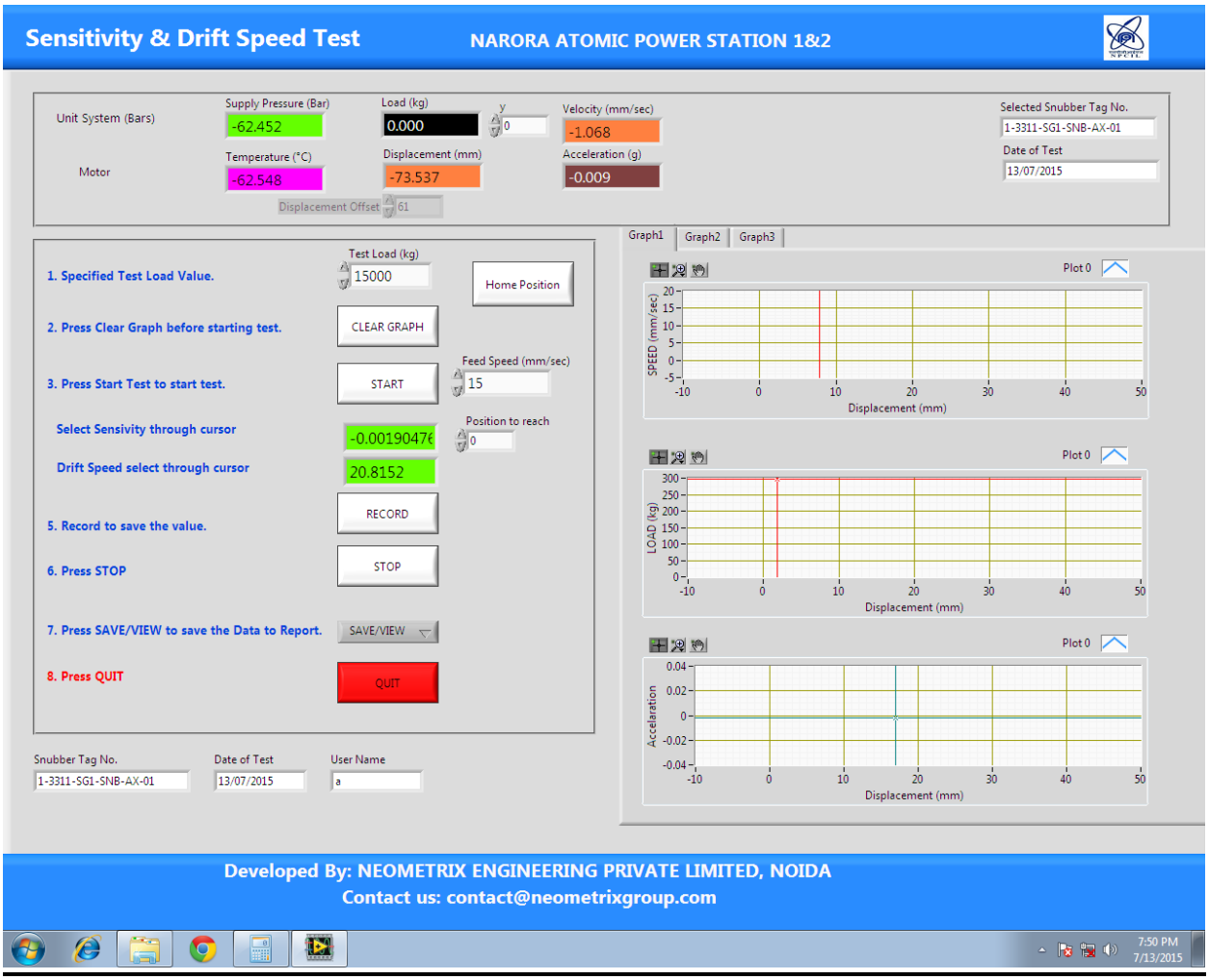


The above test window shows the Drag force test window.

LOST MOTION TEST:



Sensitivity & Drift Speed Test:



TEST PROCEDURE:

- Switch on the main power supply.
- Switch on the MCB inside the electrical panel
- Turn the knob on the panel mounted on Power pack towards MANUAL.
- Switch on the Power pack , Cooling fan and Radiator from the panel.
- Use the lever located on the TEST RIG to move the ADJUSTING PLATE as per the SNUBBER to be tested.
- Insert the pins to fix the ADJUSTING PLATE at its position.
- Turn the knob on the panel mounted on the Power Pack to AUTO.
- Switch off the Power pack , Cooling fan and Radiator from the panel.
- Mount the adaptors on the Test Rig of the Snubber to be Tested.
- RUN the software on the PC.
- Enter the USERNAME and PASSWORD and LOGIN into the system.
- Select the SNUBBER as per the requirement from the SNUBBER TAG LIST.
- Select the Test from the TEST SELECTION WINDOW.
- After entering the test, click on the HOME POSITION button.
- As the moving plate reaches its home position , again turn the AUTO/MANUAL Knob on the electrical panel to Manual Setting and switch on the Power pack , Cooling fan and Radiator from the panel.
- Pick up the Snubber using lever mounted on Test rig labeled with BOOM.
- Insert the Snubber between the adaptors.
- Insert the Adaptor Pins between Snubber and adaptors.
- Place the Limit switches mounted on Test rig to the required positions, i.e as per the stroke of the Snubber.
- Turn the Switch to AUTO Setting .
- Run the tests successfully.