

# USER MANUAL CUM TEST PROCEDURE

# SNUBBER TEST FACILITY





SNUBBER TEST for Mechanical And Hydraulic Snubber

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## SNUBBER TEST for Mechanical And Hydraulic Snubber

### 1. Recommendations

#### WARNING

Before using the Snubbers Test Bench, Please read this instructions manual carefully, so as to avoid

- Injury
- Accident
- Operating Faults
- Damage to the Equipment

Only rigorous application of the various instructions ensures.

- Longer Life
- Good reliability
- Safety of personnel using this equipment's

**NOTE: NEVER REMOVE A DEVICE OR PIPING WHILE THE MOTOR OF THE HYDRAULIC UNIT IS RUNNING AND MAKE SURE THE CIRCUIT IS NOT UNDER PRESSURE.**

Factory setting must not be altered without our Prior permission.

Apart from this instructions manual, the instructions in the user manual must also be strictly respected.

Neometrix cannot be held responsible for injury or damage resulting from a dangerous manipulation, lack of maintenance or improper use of equipment.

### 2. CONVENTIONS AND SYMBOLS

To attract your attention, you will find certain explanations accompanied by symbols defining the risk involved and informing users of the consequences of failure to respect installation and Maintenance instructions

- ❖ **Danger!** The symbol below refers to personal safety. It is used to warn of situations which can lead to death or serious injury.



- ❖ **WARNING!** This symbol concerns using the equipment. It is used to warn of Situation which can cause damage or destruction of the product.



- ❖ **ELECTRICAL RISK!** This symbol refers to personal safety. It warns people that this Installation involves electrical risk



- ❖ **USER AND MAINTENANCE OPERATIVE PROTECTION!**

Hand Gloves, Safety shoes and Safety glasses are mandatory for personal working on the snubber test system.



## SNUBBER TEST for Mechanical And Hydraulic Snubber

Type: ..... Snubber Test facility.

This test Bench Includes.

- ❖ Loading Structure
- ❖ Hydraulic power Pack
- ❖ Data Acquisition system.

A set of Wire and Hoses to connect above three units

### 4.1 Identifications of Main Components

A. Loading Structure with Servo actuator which is equipped with servo valve and two bladder type accumulator and Positive locking device and hydraulic cylinder for moving middle moveable plate.



Lifting hook

Fixed plate right side

Positive Locking Device

Hydraulic Cylinder for Moving beam

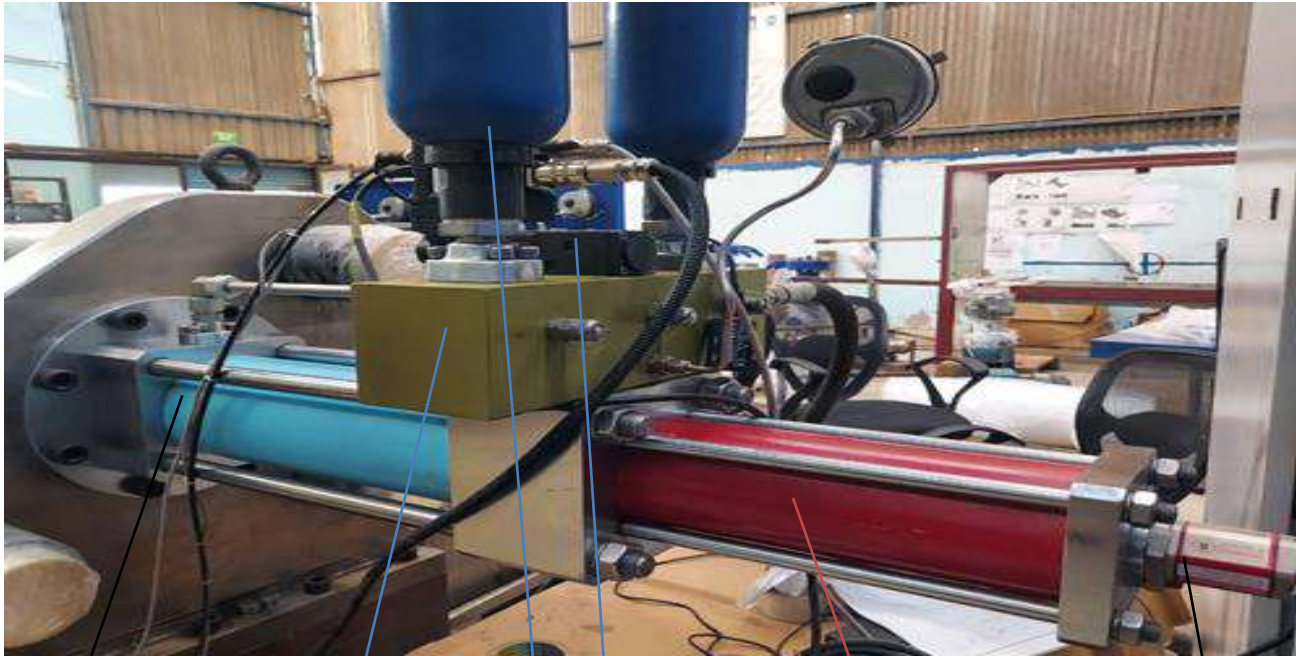
Fixed plate left Side

Base Frame

Moveable Plate



**B. Servo Actuator with Integrated LVDT.**



Double Acting  
Servo Actuator

Servo Valve  
Manifold

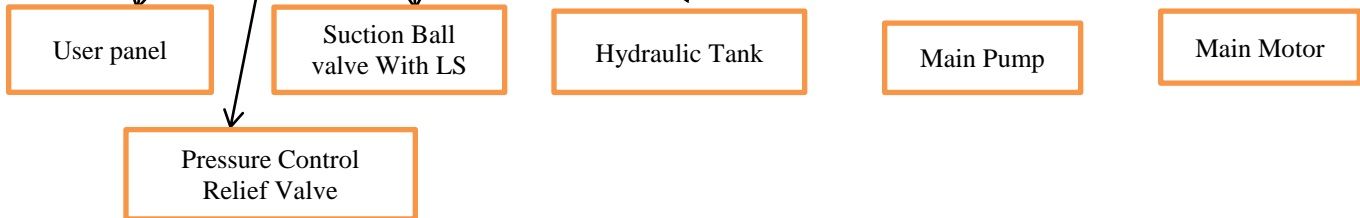
Axis Pro Servo  
Valve

LVDT  
HOUSING

LVDT-250 mm

Bladder Accumulator-2.5  
Litre

### 2.1 Hydraulic Power Pack.



### 2.2 Data Acquisition System.



### 3. Commissioning of the Snubber test Bench.

### **3.1 Laying out of the Snubber test Bench**

- ❖ The Snubber test bench must be placed on concrete slab of 7 m long and 4 m wide, flat uniform and non-slip, with a weight bearing capacity of at least 5 Ton.

## **4. How to operate Snubber test Bench.**

### **4.1 Limits and precautions of use**

### **4.2 Before Starting up.**

- Check the condition of hoses (no leaks or cracking, poor condition of the envelope), because of the risk of explosion when pressure is applied.
- Check the condition of pie, joints, fittings end (No Leaks should be there).
- Check the condition of Servo Cylinder, Moveable Cylinder (No Leaks, or Loosening of Bolts) should be there that may cause injury.
- Check the oil level in the tank, because lack of oil carries risk of running pump in dry.
- Make sure the connection between the hydraulic unit and cylinders via the hoses does not put any mechanical stress on the connectors due to weight, thermal dilation, transmission of vibrations etc.
- Before starting the system loading/unloading valve should be Off conditions.

### **4.3 Starting up**

- Start the Electrical Panel first.
- Start the Data acquisition system then.
- Start-up UPS by pushing button (I) until the beep sounds.
- Then start up the control Software by double clicking on the “snubber test” icon.
- For safety reason it isn't possible to make motor run if the data acquisition system is not running (the control system must be able to control the actuator even if there is no pressure.

### **4.4 Shutting down the bench:**

- If motor is running then first release the system pressure first.
- Then shut down the motor.
- Then shut down the control software by selecting exit in the menu.



### **SNUBBER TEST for Mechanical And Hydraulic Snubber**

- Shut down the computer by start Menu.
- Shut down the Data Acquisition system by turning the dis-connector on front panel.
- Shut down the UPS by pushing the button (O) until “beep” stops.
- Shut down the Electrical Panel by switching to off Mode.

## **4.5 ADJUSTING MOVING PLATE:**

The length of bench for adjusting different size of snubber can be adjusted by moveable hydraulic cylinder to adjust the different size of snubber

The Middle plate of the test bench is adjustable that can be adjusted by forward and reverse button.

- Before adjusting the moving plate, ensure first that locking device is in unlock condition.
- When locking device is in locked condition then only testing of snubber could be done.
- Checked the load to be applied on snubber
- Load cell of 5 ton would be permanently mounted on test bench.
- Clevis has to change according to the testing snubber.
- Assemble the right pair of clevises, one attached to the 25 ton load cell side and other one on the 1 ton load cell size or can be say that servo actuator side. Make sure the hole of the clevises allow horizontal mounting of the axis.
- Adjust the position of the moveable plate according to the size of the snubber before performing each test.
- Before adjusting makes sure that the pressure on the locking device L-port is above 120 bars.
- Then adjust the position of the beam by pressing forward button (decrease the length) and by pressing the reverse button (increase the length) to match the length of the snubber.
- The lock the locking device by cut the pressure on the L-port of the locking device by solenoid valve.
- Now moveable plate is locked in its own position for the test

## **4.6 Mounting the snubber in the Bench**

- Lift the snubber with Proper lifting equipment (make sure that the snubber clevis ball joints are free).
- Put the snubber between the clevis and lock with Pin.

## **4.7 Running a Test with Hydraulic Snubber**

#### 4.7.1 Perform a Test

##### 4.7.1.1 A. Free operability Test- Hydraulic Snubber

Running the 80% entire stroke of the snubber at slow speed around 6 mm/min (0.11 mm/sec) under compression and tension.

During the test:

- ❖ Measuring the Snubber Stroke with cylinder displacement Sensor(for all Snubber)
- ❖ Also measuring the length of the fully retracted snubber with a measuring tape and Confirm the Stroke of the Snubber.
- ❖ Displacement Vs Time plots will be recorded.
- ❖ Test will be done from extreme position for both tension and compression for free operability and drag force measurement of test.

Test Acceptation Criterion: Free movement of snubber in the full stroke without any block.

##### 4.7.1.1 B. Free operability Test- Mechanical Snubber

Running the 80% entire stroke of the snubber at slow speed around 6 mm/min (0.11 mm/sec) under compression and tension.

During The Test

- ❖ Measuring the Snubber Stroke with cylinder displacement Sensor(for all Snubber)
- ❖ Also measuring the length of the fully retracted snubber with a measuring tape and Confirm the Stroke of the Snubber.
- ❖ Displacement Vs Time plots will be recorded.
- ❖ Test will be done from extreme position for both tension and compression for free operability and drag force measurement of test.

Test Acceptation Criterion: Free movement of snubber in the full stroke without any block.

##### 4.7.1.2 – Measurement of the drag force for Hydraulic Snubber



### SNUBBER TEST for Mechanical And Hydraulic Snubber

During the free operability test, the drag force exerted by the snubber against the displacement is recorded as drag force. The measurement is done both in tension and compression movement of the snubber. The force required to initiate the motion from rest will be the maximum which is called break away force. The average of resistance force is entered as the drag forces which are recorded separately in tension and compression. The friction force is measured by the low range load cell of capacity 50 KN

- ❖ Displacement Vs time plot will be recorded.
- ❖ Force Vs time plots will be recorded.

Test Acceptation Criterion: Drag force shall be less than the specified force.

#### **4.7.1.2 – Measurement of the drag force for Mechanical Snubber**

During the free operability test, the drag force exerted by the snubber against the displacement is recorded as drag force. The measurement is done both in tension and compression movement of the snubber. The force required to initiate the motion from rest will be the maximum which is called break away force. The average of resistance force is entered as the drag forces which are recorded separately in tension and compression. The friction force is measured by the low range load cell of capacity 50 KN

- ❖ Displacement Vs time plot will be recorded.
- ❖ Force Vs time plots will be recorded.

Test Acceptation Criterion: Drag force shall be less than the specified force.

#### **4.7.1.3- Sensitivity parameter test: locking acceleration for mechanical and locking velocity for hydraulic snubber.**

##### **Test bench adaptation:**

Remove the low range load cell and mount the higher range load cell of capacity 250 KN is on the adjustable frame between the clevis joint of the snubber.

Sensitivity Test is done with snubber at half stroke under tension and compression. First the snubber is brought to half stroke position on slow speed, and then stopped it for a moment.

Then after submit constant acceleration to the snubber from  $V_0$  to  $V_{max}$ . Displacement control function is given as the control input to the servo actuator for this test.

The force and displacement curves as a function of time are displayed in real time on screen of the control.

When snubber is blocked then rapid increase in force is seen and velocity drops down.

Blocking speed of the snubber is measured by processing the curve by extracting the velocity at which the force sharply increases and velocity drops down.



## SNUBBER TEST for Mechanical And Hydraulic Snubber

This test is carried out under tension and compression.

Test Acceptation Criterion: Blocking speed shall be in the specified range.

### **4.7.1.4- Measurement of the drift speed.**

The drift test is carried out with the snubber at half stroke, under traction and compression.

Test load is applied to the snubber causing a sudden acceleration to the snubber till the valves are locked.

Maintaining the force applied for a duration corresponding to a displacement of 2 to 4 mm, the velocity of the snubber movement is measured from displacement Vs time graph and reported as the drift speed.

The servo actuator is operated with load control as the input to apply the test load on the snubber.

Displacement control function is given as the control input to the servo actuator for this test. This test is to be carried out under traction and compression.

Verify the valve unlocking at the end of each test by measurement of the friction force at a slow speed much less than the locking speed.

Test Acceptation Criterion: Drift speed shall be in the specified range and unlocking of the snubber is verified at the slower speed.

### **4.7.1.5- Lost Motion- Mechanical and Hydraulic Snubber**

It will be calculated as the difference during free operability





## SNUBBER TEST for Mechanical And Hydraulic Snubber

### 5. TECHNICAL DATA

#### 5.1 Environment.

##### Temperature:

Operation: ..... +10 deg C to 55 deg C

Storage: ..... – 10 deg C to 70 Deg C

##### Humidity:

Operation and storage: Preferably in a dry place.

#### 5.2 Characteristics

##### 5.2.1 Dimension

###### Test Bench

Overall length: ..... 5400 mm  
Overall Width: ..... 1200 mm  
Overall Height: ..... 1200 mm  
Total weight: ..... 5000 kg

###### Hydraulic Power Pack

Overall Length: ..... 2100 mm  
Overall width: ..... 1600 mm  
Overall Height: ..... 1650 mm  
Total Weight with Oil ..... 2000 kg



**SNUBBER TEST for Mechanical And Hydraulic Snubber**

**Data Acquisition System**

Overall Length: ..... 900 mm  
Overall Width: ..... 700 mm  
Overall Height: .....1900 mm  
Total Wight (with all accessories)..... 250 kg

**5.2.2 Electrical.**

Type: ..... Three Phase, 50 Hz  
Voltage: ..... 415 VAC  
Rated Current: ..... 40 Amp.

**5.2.3 Hydraulic.**

Hydraulic unit:

Operating pressure:.....280 bar.  
Maximum Flow rate:..... 23 LPM@ 1500 rpm.

Hydraulic clamps on the bench:

Max pressure: ..... 120-160 bar.  
Max Load (each) ..... 15 Ton.

**5.2.4 Other.**

Noise Level @ 1m: ..... 80 dBA

**Operating Procedure for Snubber Test Facility.**

1. Check List before Starting Hydraulic Power Pack
2. Check List for Snubber Test Bed.
3. Check list for monitoring Positive Locking devices.
4. Check List for Servo valve and Servo Actuator.
5. Check list for DAQ system.
6. Check list for software system.

**1. Check List before starting Hydraulic Power Pack.**

- See Filter Clogging indicator on panel for filter elements clogging status.
- Hydraulic Joints, like pipe, fittings, for any possible leakage. If there is any leakage from hydraulic joints then leakage should be arrested first.
- Proper Outlet Hose connection to Hydraulic servo actuator, locking devices, and moving hydraulic cylinder should be done.
- Check Pressure Gauge Needle. (Before starting of power pack pressure gauge needle should be on Zero).
- Pilot Pressure Control valve mounted on Panel should be on minimum. For doing the same rotate the knob anti clockwise direction.

**2. Check List for snubber test bed.**

- Mounting bolts of left and right side should be plate should be full tight if it is loose then tight with proper tools (Allen key -20 mm).
- Set Test Bed for Snubber Mounting.
- Check Load cell tightening and check nut of load cell should be full tight, if not then tight with proper Tools (Allen key no-6).
- Clevis mounting plate with male thread which goes into load cell should also be properly mounted.
- Mount Proper clevis as per designate snubber with proper tool (Allen key-20 mm).

### Procedure for adjustment of moveable plate to suit different size of Snubbers.

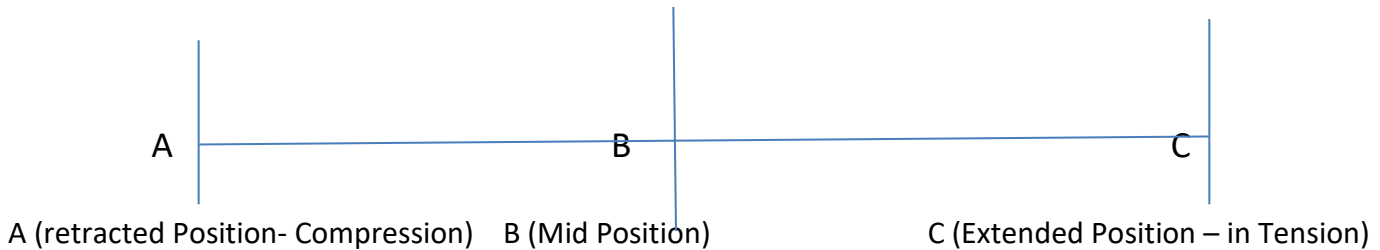
- First on cooling cum filtration motor and Cooler after preliminary test of inspection. Run for 15-20 minutes.
- Then start main pump keeping system pressure at minimum, ensure minimum pressure by checking Pressure Control valve (23.0) mounted on front panel should be full loose.
- Run system with Pressure for 5-10 minutes.
- Then first "ON" Loading & unloading valve aka dump valve (13.0).
- Then check Pressure at main pressure gauge (14.1) and locking pressure gauge (40.0) mounted on front panel.
- For adjusting pressure system pressure (14.1) i.e. to increase and decrease pressure for main pressure then it should be done from Pressure control valve mounted on control panel. To increase pressure rotate pressure control valve (23.0) in clockwise direction and to decrease pressure rotate pressure control valve (23.0) in anti-clockwise direction.
- For adjusting Locking Pressure (40.) i.e. to increase and decrease locking pressure (40.) then it will be done by adjusting pressure reducing valve (37.1) by rotating clockwise direction for increment and to decrease rotate anti clockwise direction.

### Note: to unlock the locking device the Pressure Range: 120-160 kg/cm<sup>2</sup> (bar)

- Please note pressure should be around 120-160 kg/cm<sup>2</sup> (bar) in front panel Locking Pressure (40).
- After that move the adjustable plate to forward to backward according to requirement by using forward and reverse button on DAQ System Hydraulic Windows.
- Mounting of Snubber after adjusting the moveable plate, please note there should be no tolerance between clevis and clevis mounting plate. And load cell chuck nut should be fully tight.
- After mounting of snubber "OFF" the Locking Valve on hydraulic window of DAQ system.

**Testing Procedure of Hydraulic and Mechanical Snubber.**

**A. Free Operability and Drag force:**

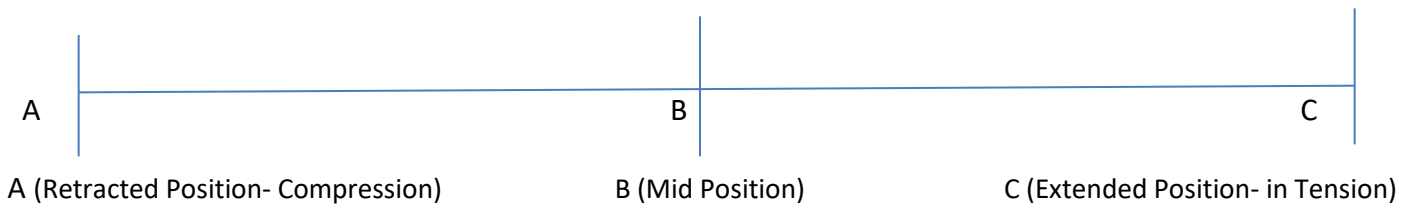


**Free Operability Test:** First bring the Snubber to the B (Mid Position) and then extend the snubber to 80 % of total Stroke to position C (Extended position in tension). From there bring back the Snubber to A (retracted Position in Compression and then to C position i.e. Extended position in compression. During the whole phase speed of test should be less than 1 mm/sec.

**Drag Force:** The average force in tension and Compression will be drag force. The force that actual put in bringing snubber to mid position and from mid position to either side of extreme position will not be recorded in graph and excel also.

**Lost Motion:** It is the difference of displacement during the movement in free operability test in tension and Compression. Same will be come in report in Kg.

**B. Sensitivity test and Drift Speed. For Hydraulic Snubber.**



**Locking in Tension:** First Bring the Snubber to the mid position then move the snubber from mid position at speed less than 1 mm/sec. after that increase speed suddenly to Vmax for Snubber to get locked after that let snubber drift for displacement of 5-10 mm during that displacement the average speed will be drift speed and same will be come on report. And graph table.

**Locking in compression:** first bring the snubber to mid position then move the snubber from mid position at speed less than 1 mm/sec. after that increase speed suddenly to Vmax for snubber to get locked after that let the snubber drift for displacement of 5-10 mm during that displacement the average speed will be drift speed and same will be come on report.



## SNUBBER TEST for Mechanical And Hydraulic Snubber

### C. Sensitivity test and Drift Speed. For Mechanical Snubber

**Locking in Tension:** First bring the snubber to the mid position then move the snubber from mid position at speed less than 1 mm/sec. after that increase speed suddenly to  $V_{max}$  for snubber to get locked after that let the snubber drift for displacement of 5-10 mm during that displacement the average speed will be drift speed and same will be come on report.

**Locking in Compression:** first bring the snubber to the Mid Position then move the snubber from mid position at speed less than 1 mm/sec. after that increase the speed suddenly to  $V_{max}$  for snubber to get locked after that let the snubber drift for displacement of 5-10 mm during that displacement the average speed will be drift speed and same will be on the report.