OPERATION AND MAINTANENCE MANUAL

CYLINDER HYDROSTATIC TESTING MACHINE

Project Name: SUPPLY & INSTALLATION OF "HALON RECLAIMATION AND REFILING FACILITY (HRRF)"

(ISO No. 5006 DATED 22nd MAY 2012)

CLIENT

INDIAN AIR FORCE

24 ED, Manauri, Allahabad

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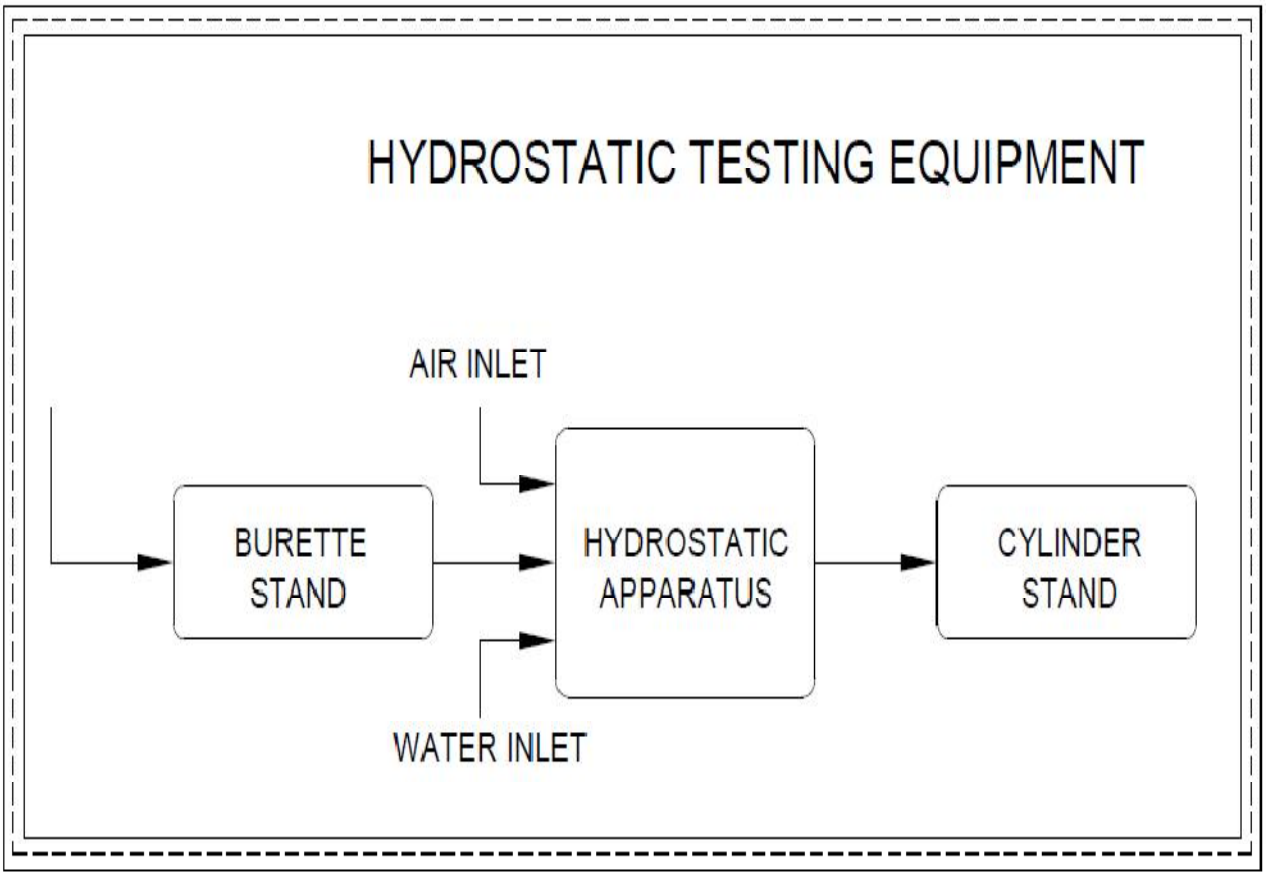
1. Introductions/Technical Specifications:-

Objective: -The objective of "**CYLINDER HYDROSTATIC TESTING MACHINE"**is to Check the Strength and leaks of compressed Gas cylinders.

Machine Name:-"CYLINDER HYDROSTATIC TESTING MACHINE"

Block Diagram of Cylinder Hydrostatic Testing Machine:-



Purpose of Operation:-

1.) Hydrostatic testing is, the way in which such as Compressed gas Cylinders to be tested For Strength and leaks.

Description:-The "**HYDROSTATIC TEST APPARATUS**"is developed for testing the strength and leaks of Compressed gas Cylinder. This test involves filling the cylinder with a liquid, usually water, which may be dyed to aid in visual leak detection, and pressurization of the vessel to the specified test pressure.

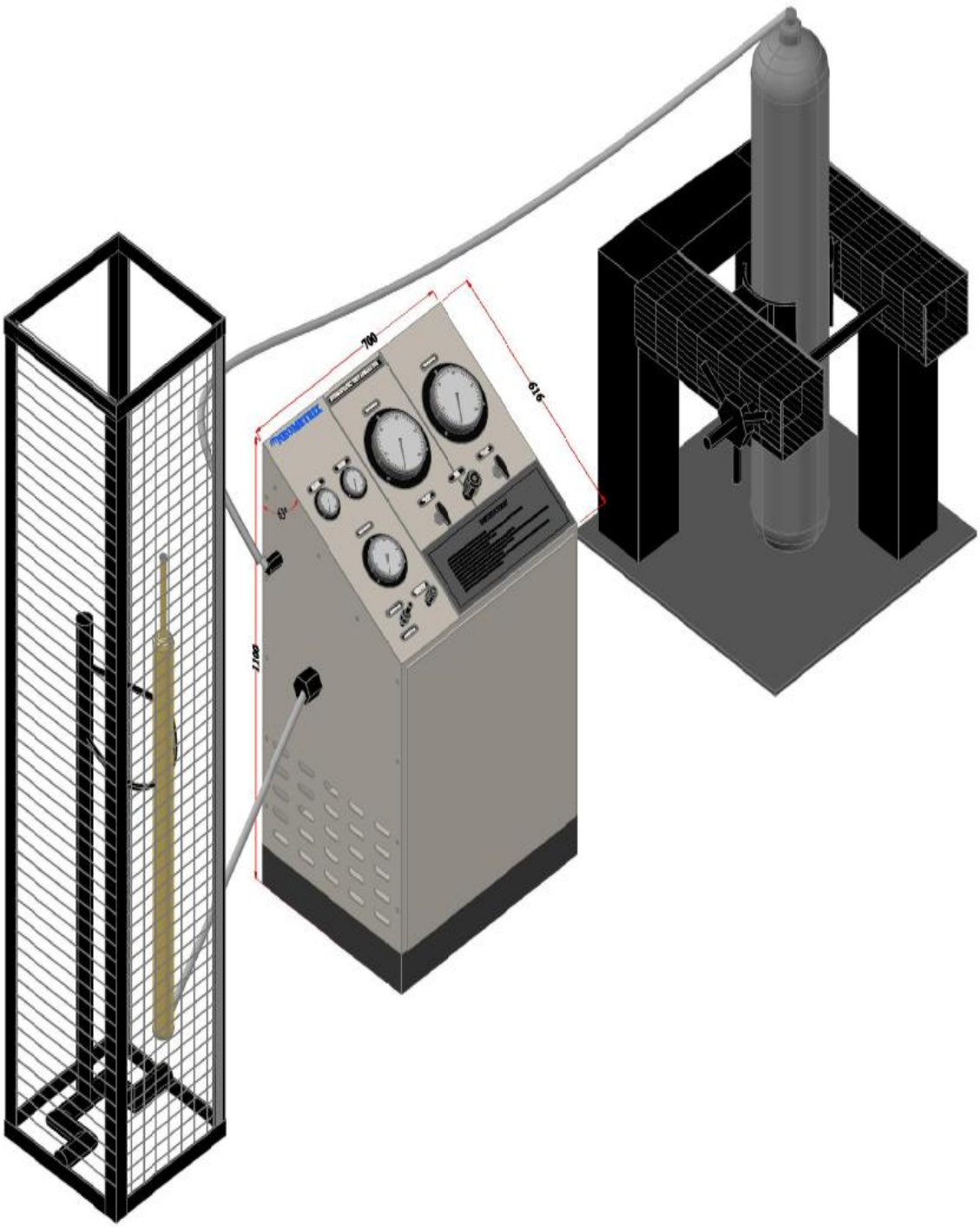
Pressure tightness can be tested by shutting off the supply valve and observing whether there is a pressure loss. The location of a leak can be visually identified more easily if the water contains a colorant. Strength is usually tested by measuring permanent deformation of the cylinder.

Hydrostatic testing is the most common method employed for testing pressure Cylinders. Using this test helps maintain safety standards and durability of a cylinders over time. Testing of pressure cylinders for storage of gases is very important because such containers can explode if they fail under pressure.

It consists of:-

1) Air Driven Haskell pumps (MS-188).
2) Test Pressure Gauges-To check the test pressure.
3) Vent valve-For release the pressure from cylinder.
4) Selector Valve-For selecting Valve Position (On/Off).
5) Pressure Gauges-To check air Inlet /outlet pressure.
6) Filter Regulator Unit-FRL Units are provided to reduce friction &prevent corrosion of the moving parts of an air – actuated mechanism Powered by compressed air.
7) Burette-it is used to calculate the Expansion of cylinder.
8) Air Pressure Regulator-This Regulator is used to regulate the air Pressure up to 4 bar.
9) Isolation valves- these valves are used for test pressure gauges.

Diagrammatic Representation:-



3. Working of the System:-

This system consist two Parts.

a.) Burette Stand: -In this stand we used aCalibrated Glass Tube (burette), which is graduated tube of glassware that has a stopcock at its bottom end. It is used to dispense precise volumes of liquid reagents. This is used to calculate the expansion of cylinder, by reading the fine gradations on this tube.

b.) Hydrostatic Test Apparatus: - Hydrostatic testing is the most common method employed for testing pressure cylinders. Using this test helps maintain safety standards and durability of a cylinders over time. This system having an air pressure line and water line. Air pressure line is used compressed air for driving the Haskel Pump (MS-188).

In airline we used low pressure ball valve and Filter Regulator Unit;FRL (filter regulator unit) Units are provided to reduce friction & prevent corrosion of the moving parts of an air actuated mechanism powered by compressed air. There is an air regulator which is regulating compressed air up to 4 bars, and read the air inlet /outlet pressure by gauges (4.0, 5.0).

Further this water Line is divided in two parts; initially one is directly used for filling the cylinder and another line goes into the pump inlet where it pumps the volume of water for filling the cylinder which is used for testing. The burette first is zeroed then Haskel pump pressurizes the cylinder up to 1.5 times of the cylinder working pressure.

As the pressure is applied to "inflate" the cylinder, the cylinder expands and forces the water out of the cylinder and up into the Burette. The volume of water that must be pumped into the cylinder to reach the test pressure is measured to determine the total expansion.

The volume of water is expelled from the cylinder when pressure is released is measure to determine the permanent expansion. After the 30 sec test time has elapsed, the burette is then read to determine the total expansion (in Cubic centimeters) of the cylinder under test pressure.

The Test pressure is released and the cylinder" deflates". As the cylinder shrinks to its approximate original size, water is allowed to drain back in to the test jacket from the burette, in most cases the cylinder will not return to its original size, having been slightly stretched by the pressurization process.

This stretching is called the" Permanent Expansion" the difference between the "Total expansion "and the "Permanent Expansion" is called the Elastic Expansion. The Percentage Expansion of the cylinder is determined by the following formula**:-**

Percent expansion = (Permanent Expansion/ Total Expansion) * 100

Because the air has a different compressibility factor, than water air trapped inside the cylinder will caused inaccurate test results, so it is very important that cylinder is completely filled with water, to eliminate trapped pocket of air. The weight of the water contained in the cylinder, the test pressure test volume, and temperature are used to determine the compressibility factor for calculation of expansion values.

The reading of the pressure can be read by the test pressure gauges, when the pressure in the Test pressure gauges shows 1.5 times of the cylinder working pressure, after testing we release the Pressure from cylinder by using vent valve.

4. Initial **Unit Installation:-**

1 **Keep the Apparatus safely in well-ventilated area.**

2 **Connect the air inlet port with compressor for compressed air.**

3 **Connect the hose for water supply in cylinder.**

4 **Open the water supply and fill the cylinder.**

5 **First set the burette at zero level, and then pressurize the cylinder.**

 **Don’t touch the system component during operation.**

5. Operational Steps:-

1.) Open the water supply and fill the cylinder.

2.) Close the cylinder filling valve, and fill water in burette up to zero level. Then close the water supply.

3.) Open the airline regulator up to 4 bar with air pressure regulator.

4.) Select the selector valve to on position.

5.) Pressurize the cylinder up to 1.5 times the cylinder working pressure.

6.) When the pressure in the pressure gauge shows 1.5 times of the cylinder working pressure. Select selector valve to off position.

7.) Note down the reading of the water level in burette.

8.) Hold it for 30sec. and check for any pressure drop in test gauges.

9.) Release the pressure from cylinder by using vent valve, and note down the reading of water in burette.

10.) By the use of formula we calculate the expansion of cylinder.

11.) Same Procedure will be applicable for all Cylinders.

6. Depressurization:-

After completion of process system is to be depressurized. Following steps are to be taken for safe depressurization of the system:

1. Close the water supply ball valves of the channel.
2. Keep metering valves in open state.
3. Now open vent port. This will vent all the air and other vapors to atmosphere.
4. Also activate the selector valve's port.
5. Now release the water from cylinder and burette

Vent valve must be close and test valve must be open During testing.

8. Bill of Material:-

Circuit Code	Part No.	Description
16.0	2A01183P0016	Ball Valve:- Working Pressure-10bar, material:-ball valve, end connection:- ½" Bssp(f)
7.0	2A01183P0007	Filter Regulator unit:- Working pressure:- 16 bar, end connection:- 1" Bspp(f)
3.0, 1.0	2A01183P0003 2A01183P0001	Test Pressure gauge:- working pressure:- 1000psi, Dial size:- 6"
15.0	2A01183P0015	Selector valve
5.0	2A01183P0005	Air pressure regulator
17.0	2A01183P0001	Vent Valve
8.0	2A01183P0008	Burette
11.0	2A01183P0011	Hose:- working pressure: 600bar, internal:- SS, Id:2mm
10.0	2A01183P0010	Haskel Pump:- MS-188, (air inlet- ¼" npt(f), liquid inlet-3/8" npt(f))
13.1, 13.2	2A01183P0013	Isolation Valves: SS-42GS4
20.0	2A01183P0020	System Enclosure
21.0	2A01183P0021	SS-Seamless Tube

Vent valve must be close and test valve must be open During testing.

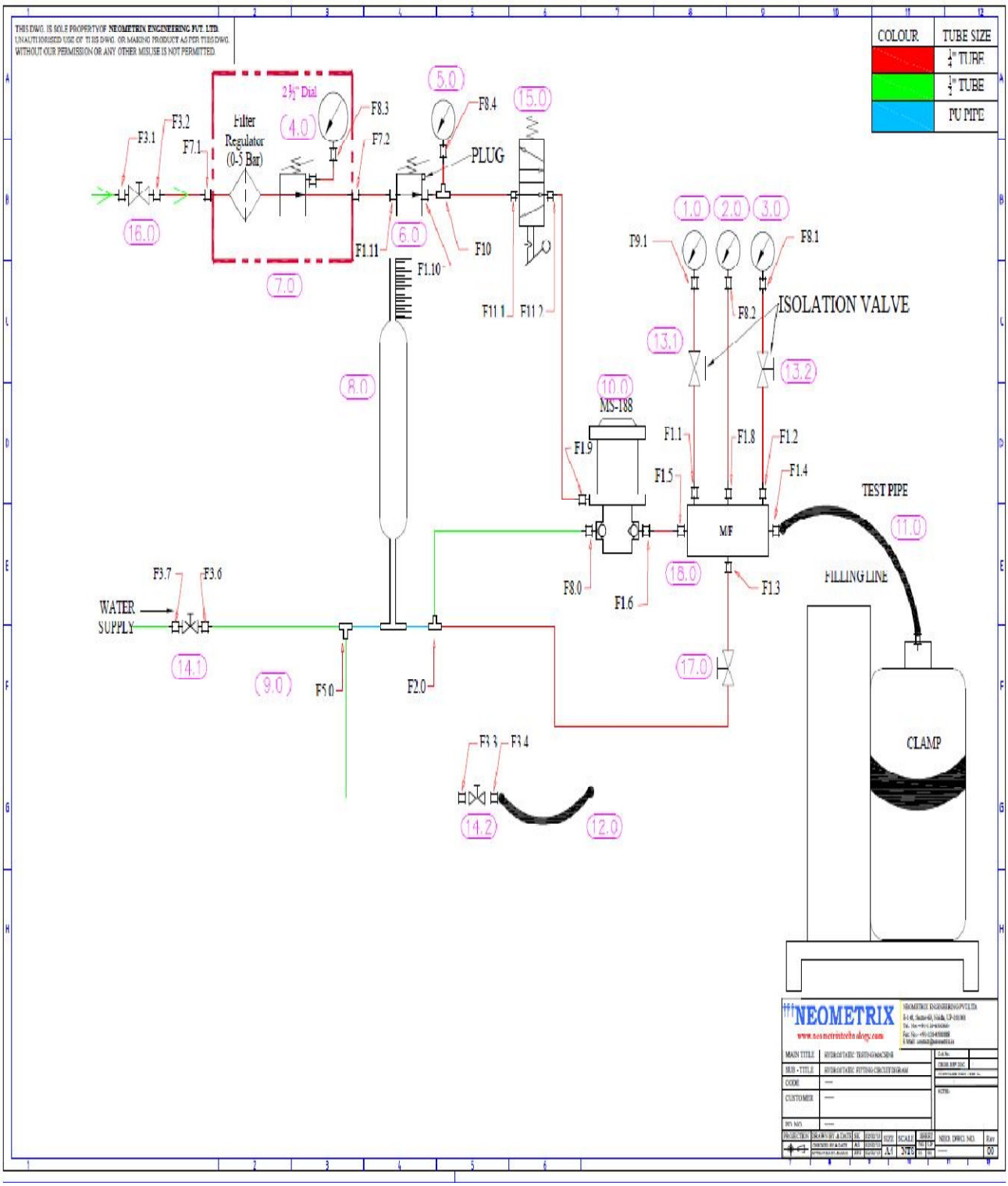
List of Spares:-

S No.	Item	Description	Qty.
1	Ball valve	Material:- brass, end connection:- ½" BSP(f)	1
2	Pressure Gauge	Pressure range:- 0 to 280 bar, End connection:- ½" BSPM	1

List of Consumable Items:-

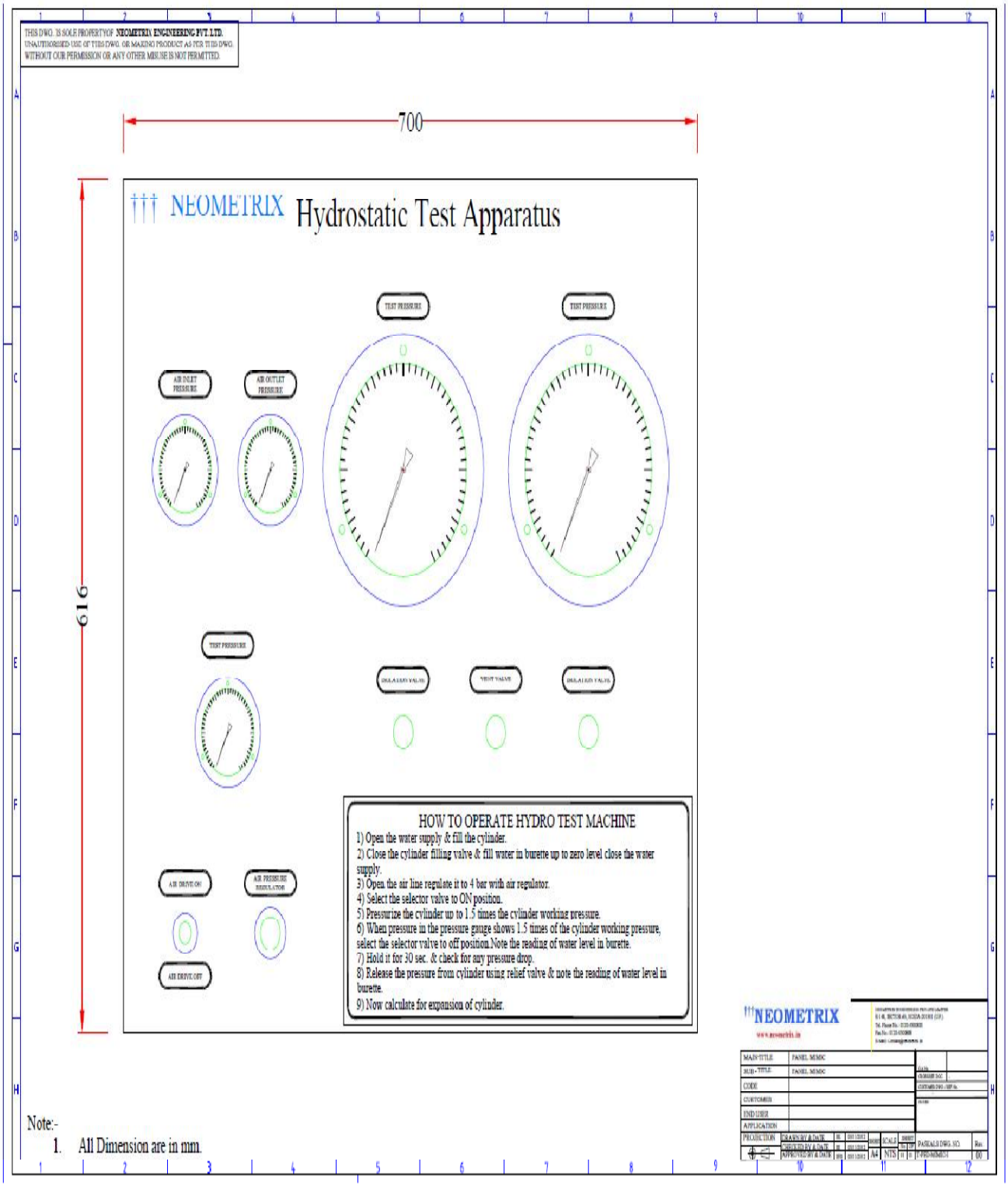
S No.	Item	Description	Qty
1	Connector	1/4" NPT Fx 1/4" OD tube	1
2	Union Tee	SS-316,1/4" OD Tube connection	1
3	Ferrule Set	1/2" OD Tube – ferrule set	2
4	Ferrule Set	1/4" OD Tube – ferrule set	4
5	Connector	1/2" NPT Fx 1/2" OD tube	1

CIRCUIT:-


COLOUR
TUBE SIZE
¼" TUBE
½" TUBE
PU PIPE
Filter Regulator (0-5 Bar)
PLUG
ISOLATION VALVE
MS-188
MF
TEST PIPE
FILLING LINE
WATER SUPPLY
CLAMP
NEOMETRIX

GA DRAWING OF CYLINDER HYDROSTATIC TESTING MACHINE:-

Panel Mimic:-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700
616
NEOMETRIX
Hydrostatic Test Apparatus
TEST PRESSURE
TEST PRESSURE
AIR INLET PRESSURE
AIR OUTLET PRESSURE
TEST PRESSURE
INFLATION VALVE
TEST VALVE
INFLATION VALVE
AIR DRIVE ON
AIR PRESSURE REGULATOR
AIR DRIVE OFF
HOW TO OPERATE HYDRO TEST MACHINE
1) Open the water supply & fill the cylinder.
2) Close the cylinder filling valve & fill water in burette up to zero level close the water supply.
3) Open the air line regulate it to 4 bar with air regulator.
4) Select the selector valve to ON position.
5) Pressurize the cylinder up to 1.5 times the cylinder working pressure.
6) When pressure in the pressure gauge shows 1.5 times of the cylinder working pressure, select the selector valve to off position.Note the reading of water level in burette.
7) Hold it for 30 sec. & check for any pressure drop.
8) Release the pressure from cylinder using relief valve & note the reading of water level in burette.
9) Now calculate for expansion of cylinder.
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MAIN-TITLE
PANEL MIMIC
SUB-TITLE
PANEL MIMIC
CODE
CUSTOMER
END USER
APPLICATION
PROJECTION
DRAWN BY & DATE
CHECKED BY & DATE
APPROVED BY & DATE
SCALE
A4
NTS
PARTS & DWG. NO.
Note:-
1. All Dimension are in mm.

9. Safety and Precautions:-

1. All threaded joints should be fully tightened.

2. Electrical supply should be off after completion of operation.

3. Please check that the vent valves should be closed, before starting the testing, if not so please close it by rotating it in clockwise direction.

4. During venting, rotate the Vent Valve slowly in anticlockwise direction otherwise this Pressured may cause Noise.

5. Switch off the electrical supply after completion of testing.

6. Don't touch any component during testing.

7. Before starting the test make sure that all pipe connections in water line must be fully tightened.

8. Don't change setting of needle valve.

9.Don't run Haskel Pump, when system is not running.

10. Don't touch electric open point inside the machine when machine is in running mode.

Don't touch electric open point inside the machine
When machine is in running mode.

11. Specification sheet:-

Please find here the attached Specification sheet for the following Items.

- **Swagelok Tubes, Fittings**
- **Swagelok Needle valve**
- **Wika Pressure Gauges**
- **Festo air pressure regulator**
- **Festo filter regulator unit**
- **Haskel Pump(MS-188)**
- **Festo selector valve**
- **Parker Hose**

Vent valve must be close and test valve must be open During testing.

13. Help /Customer support:

We are at Neometrix Engineering are committed to serve our customer .This System is completely checked for leak and test for a Pressure of 10 Bar.

If in case if you are finding the system to work improperly or malfunctioning please contact us at the below mentioned Address our engineer will Reach to your service and solve the problem.

Contact Us:

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