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| BHEL, Tiruchirappalli – 620014.                                     | Quality Assurance   | Technical Delivery Conditions     |
| Product: <b>ON-OFF CONTROL UNIT (APL-6) for HPLP BY PASS SYSTEM</b> |                     |                                   |
| Document No.: <b>TDC:5:198</b>                                      | Rev. No.: <b>04</b> | Effective date: <b>23/12/2014</b> |
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Revision record:

Rev 00/ 05-11-94: Fresh issue.

Rev 01/ 27-02-96: Editorial corrections.

Rev 02/ 27-12-96: Discharge flow & acceptance criteria altered.

Rev 03/29-10-08: Cl: 2.0, 4.0, 8.0 Modified.Cl.10 Acceptance Criteria on Cold current revised.

Rev 04/ 23-12-14: Cl 3, 5, 9, 10 and sketch 1 corrected.

1. **SCOPE:**

This Technical Delivery Condition (TDC) specifies the Quality requirements for On-Off control unit (APL-6) used in HPLP Bypass system

2. **GENERAL REQUIREMENTS**

- a) The supplier shall use the raw material for manufacture of On-Off Control Unit (APL-6) in accordance with BHEL drawings as specified in the Purchase Order.
- b) No substitution of material shall be done without prior written approval of BHEL.
- c) The supplier shall submit a Quality Plan indicating various checks carried out on raw materials, in-process Sub delivery components, assembly and testing etc.
- d) All the dimensions and the required surface finish shall be as per BHEL drawings.
- e) Any deviation either with respect to drawing or material testing requirements shall have prior written approval of BHEL.
- f) Heat treatment done on any of the components shall be properly documented with the help of heat-treatment charts and other records.
- g) All inspection shall be done as per supplier's Quality Plan approved by BHEL.
- h) BHEL/Authorized Representative shall have access to the supplier's works at all times to verify whether the components are manufactured in accordance with BHEL drawings and this TDC.
- i) The fasteners used shall be as per drawing and shall be procured from reputed manufacturers.

3. **MANUFACTURE:**

The tolerances shall be maintained strictly as per BHEL drawings. For the un-toleranced dimensions IS- 2102 Medium tolerance class shall be followed.

The run-out and face-out wherever required shall not exceed 0.05 mm Total Indicator Reading (T.I.R.). All components shall be checked 100% for dimensions. The dimension report shall be furnished to BHEL or its Authorized representative during inspection.

4. **ASSEMBLY:**

Assembly shall be carried out ensuring proper assembly requirements and cleanliness.

Only accepted components shall be used for assembly. Prior to assembly all the components shall be cleaned off; oil, dirt, grease and other foreign materials by ultrasonic cleaning using Acetone. All assemblies shall be preserved properly.

All machined surfaces shall be protected with PVC or similar material. O-rings and seals shall be procured from reputed sources and shall meet BHEL specification and Drawing requirements.

5. **TEST SET UP:**

Oil supply unit with oil as per specification SAE Class-3 and Viscosity between 30-60 cst.

Test Plate for mounting ON-OFF Control unit.

Pressure Gauge with range 0 to 250 kg/sq.cm.

D.C. Supply equipment for 48 V with two output "a" and "b" which can be switched on and off separately Inter connecting pipe work.

6. **PREPARATION & VISUAL INSPECTION:**

- a) Check for the proper installation of solenoid valves.
- b) Remove the cube-shaped plug from solenoids.
- c) Remove PVC cover plate.
- d) Check all the sealing surfaces for damage.
- e) Mount the ON-OFF Control unit on the test plate.
- f) Assemble the Control unit as per the attached Sketch-1.
- g) Connect the directional control valve to power supply.
- h) Maintain the Oil temperature between 25 & 40 deg. C.

7. **LEAK PROOFNESS & PRESSURE TEST:**

Leak Proofness and Pressure test shall be done at supplier's works. Conduct the leak proofness and Pressure test as indicated below.

- (1) Close the cock at "T".
- (2) Open the throttle "a" and "b".
- (3) Manually operate the directional control valve few times.
- (4) Increase the pressure to 240 kg/sq.cm.
- (5) Stop the pump and release the supply pressure. Observe the pressure in the test plate manometer. The pressure shall remain same. The pressure drop if any, shall not be more than 5 kg/sq.cm in 2 Minutes. Directional control valve in its middle position (de-energized) open the valve in "T" Line. Observe the pressure in the test plate manometer. The pressure shall remain same. The pressure drop, if any, shall not be more than 5 kg/sq cm in 2 Minutes.

8. **CURRENT CONSUMPTION TEST:**

Conduct the Current Consumption test as indicated below:

Energize Solenoid "a" and "b" independently at the directional control valve.

Measure and Record the Current consumption and the supply voltage (Cold Coil).

9. **FUNCTIONAL & PROPER INSTALLATION TEST:**

Adjust the discharge flow for APL-6 to Q = 20 liters per minute.

Switch on the directional valve "a" (solenoid "a" under voltage).

Throttle "A" completely open at valve (9).

Throttle "B" completely closed at valve (9).

APL-6 shall have through flow. If not then the throttle check valve (9) is not properly installed.

Correct the installation and repeat as above.

Open throttle "B" at valve (9) fully.

Measure the pressure drop, with Solenoid "a" energized and then with Solenoid "b" energized, between "P" line and "T" line. The pressure drop for both valves shall be same. Operate and check the manual controls at the directional control valve.

Throttle "A" and "B" shall be adjusted to maintain 10 liters /minute flow rate at a supply pressure of 80 kg/sq. cm.

Operate electrically few times and see for proper functioning.

**10. ACCEPTANCE CRITERIA:**

Power consumption for APL-6 at 48 V solenoid shall be as indicated below:

Cold current: 625 ± 10% mA.

Pressure Drop for

a) APL 6 with twin throttle check valve (type Z2-FS6-30): 34 ± 6 kg/sq. cm.

b) APL 6 with twin throttle check valve (type Z2-FS6-40): 48 ± 6 kg/sq. cm.

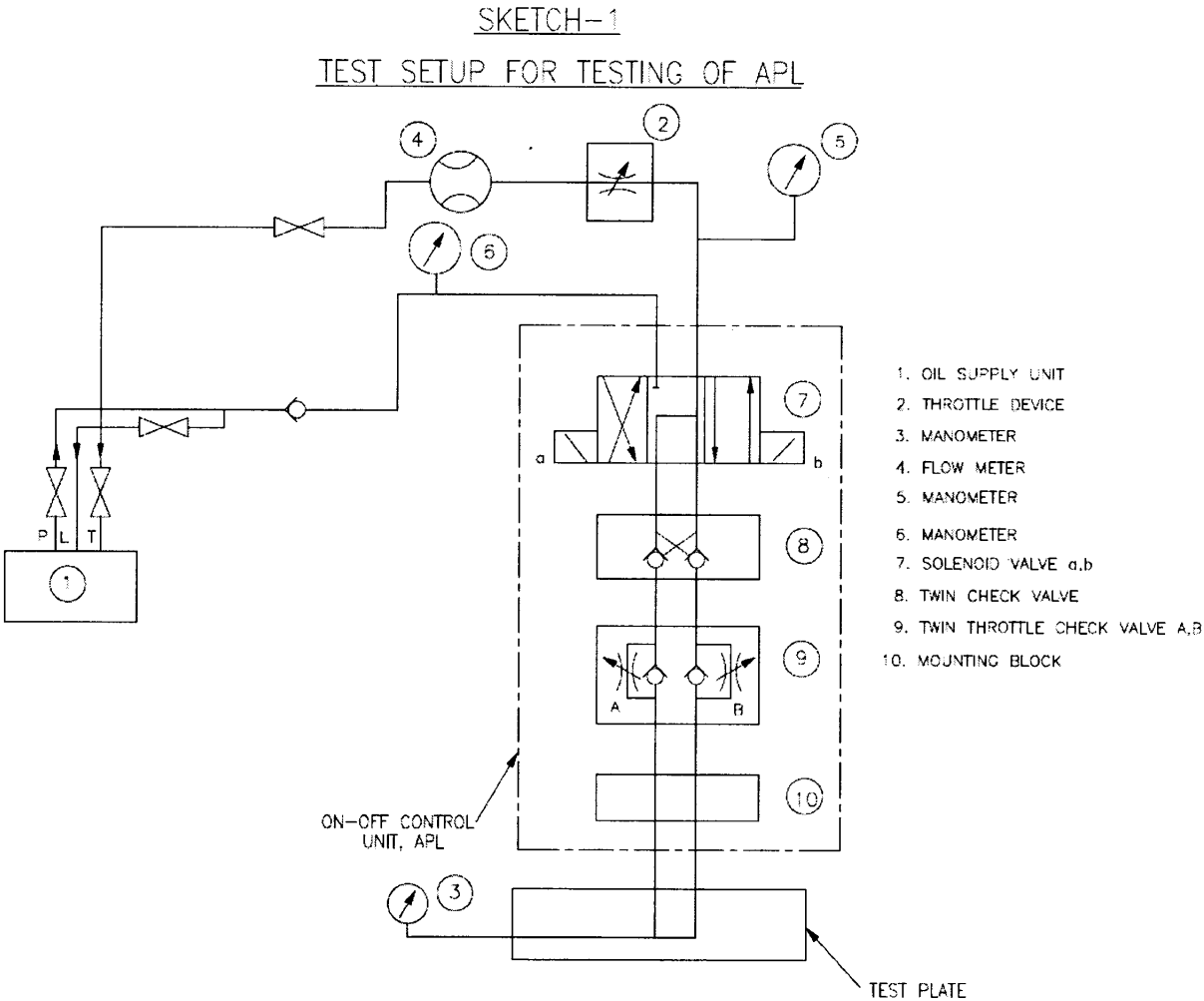
**11. CERTIFICATION:**

The test results shall be recorded .The test details/ records at supplier's works shall be duly signed by BHEL./Authorized Inspection Agency.

**12. PACKING:**

Re-Assemble the cube shaped plug and cover plate at step control unit and pack the unit in a plastic bag with silica gel. Pack the plastic bags in a card board box.

Mark the serial no, Purchase Order number and type on the box.



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