Chapter 2

PRESSURE CONTROL VALVE
(801427) Ref. No. 6D/2160, (803734) Ref. No. 6D/2699 and (802704) Ref. No. 6D/2531

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF APPENDICES

Introduction

1. The pressure control valve (*Ref. No.* 6D/2160) is used in aircraft liquid oxygen systems and operates in conjunction with a filler-vent valve, liquid oxygen container and a liquid check valve. Used in the appropriate circuit it controls the system working pressure, provides an economizer circuit and limits the maximum system pressure by relief valves.

DESCRIPTION

2. Referring to fig. 1 and 2, the pressure control valve consists of two parts machined from light alloy which accommodate a pressure control valve, two relief valves and associated external pipe connectors. The spring-loaded pressure control valve is provided in liquid oxygen systems so that when the working pressure of the system is reached, the valve closes to prevent further quantities of oxygen passing into the gas space of the liquid oxygen container. Any liquid remaining in the line located between a check valve and this control valve will evaporate and build up a pressure sufficient to close the check valve of the system.

3. In addition to the functions described above, this pressure control valve serves as an economizer circuit by opening a bore in the pressure closing valve at approximately 170 lb/in^2, allowing a part liquid, part gaseous supply to be taken.

OPERATION

4. The operation of the pressure control valve is as follows.

5. System pressure is applied to the outside of a bellows assembly, the inside being open to atmosphere, and the bellows contraction being controlled by springs. As the bellows contract progressively with rising system pressure, the pressure closing

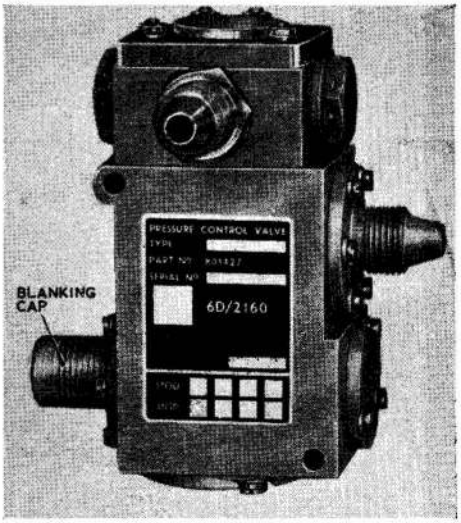

Fig. 1. Pressure control valve (Ref. No. 6D/2160)

valve closes at 150 ± 10 lb/in². This is the system operating pressure.

6. Further increase in the system pressure compresses the bellows until the pressure opening valve opens at 170 lb/in², thus providing a passage for gas from the top of the container to pass to the system. This enables economical part liquid, part gaseous supply to be provided by the container. Reverse flow through the economizer circuit is prevented by a non-return valve.

7. Maximum system pressure is limited by the relief valve which is pushed open by the contraction of the pressure control bellows when 200 ± 5 lb/in² is reached.

8. A differential pressure valve operating at approximately 50 lb/in² is connected across the pressure closing valve seat to prevent excess pressure in the pressure raising and supply lines into the main system. Filters are fitted over the pressure relief valve (mod. Inst/GL3) and in the control valve connections (fig. 2). These filters are spring-loaded to allow them to be by-passed automatically in the event of blockage.

9. Referring to fig. 1, a later version of this valve introduces external differences only. The 6-hole flange for the fill and vent valve connection (on earlier versions) is replaced by a 4-hole flange assembly. A small flange located immediately below the fill and vent valve connection, is superseded by a plate and circlip assembly.

Pressure control valve, Ref. No. 6D/2699

10. The system operating pressure was increased to 160 ± 10 lb/in² by modification Inst/GL3, which also provided a filter for the vent chamber. This modification introduces pressure control valve, Ref. No. 6D/2699.

Pressure control valve, Ref. No. 6D/2531

11. A further variant of the pressure control valve is scaled under Ref. No. 6D/2531. This valve differs only in the pressure settings to suit low L.P. liquid oxygen systems.

INSTALLATION

12. Details of the location of the pressure control valve in a typical liquid oxygen system reference should be made to Part 1, Sect. 3, Chap. 2 of this publication and Air Diagram 7315, issue 2.

SERVICING

13. For details of routine servicing, reference should be made to the appropriate Servicing Schedule. General information on liquid oxygen installations is given in Part 1, Sect. 1, Chap. 3. The filters shown in fig. 2 should be removed for cleaning in accordance with the Servicing Schedule, but blockage of the filters will not necessarily render this unit unserviceable.

14. The filters (*fig.* 2) are removed after disconnecting the fill and vent valve and built-up coil pipeline connections. Remove the small flange assemblies and withdraw the filters from the body of the valve. A third filter is fitted in the pressure relief valve assembly and this may be removed for cleaning by the removal of the top cover plate (*fig.* 1).

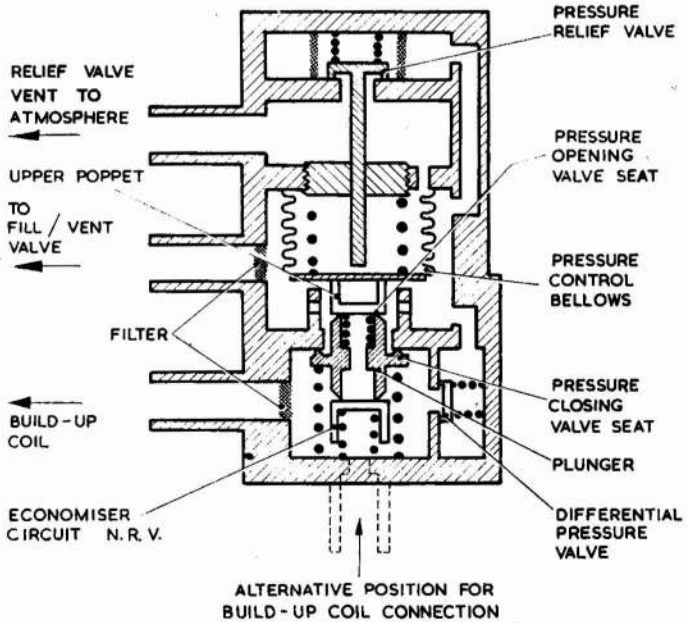

Fig. 2. Pressure control valve, diagrammatic view

Appendix 1

STANDARD SERVICEABILITY TEST (R.N.)

for

PRESSURE CONTROL VALVE

Ref. No. 6D/2160 and 6D/2699

Introduction

1. The tests laid down in this appendix must be applied to the above-mentioned equipment immediately prior to installation in aircraft, in accordance with the appropriate Servicing Schedule and at anytime serviceability is suspect. The tolerances specified must not be exceeded.

TEST EQUIPMENT

2. The following test equipment is required:—

Description	Ref. No.	Remarks
Oxygen leak tester	6D/1418	1 off
Cones cap, $\frac{5}{16}$ in. B.S.P.	28F/15688	2 off
Sleeves, outer, $\frac{5}{16}$ in. B.S.P.	28F/5723	2 off
Pressure gauge, 0-250 lb/in^2	6C/263	2 off
Valve, oxygen master, Mk. 10	6D/1862	1 off
N.A.T.O. air supply or dry gaseous oxygen		As required
Thermometer, 0-200°C	6C/6685-99-943-2934	1 off

TESTS

3. All tests must be carried out in a clean, dry atmosphere.

WARNING . . .

The presence of oil or grease in contact with oxygen at high pressure is dangerous since it introduces a grave risk of explosion.

Visual checks

4. (1) Remove the transit blanks and check the valve for defects and damage.

(2) Check all the retaining bolts for security and ensure that all the wire-locking is intact.

Functional checks

Note . . .

Connections 1 *and* 3 *may be fitted to their alternative positions.*

5. (1) Blank off connections 2 and 3. Connect the air or oxygen supply to connection 1. (*fig.* 1).

(2) Increase the supply pressure to 225 lb/in^2 and maintain this pressure for one minute. Check that there is no leakage.

(3) Reduce the supply pressure to zero and remove the blank from connection 2.

(4) Connect the control valve (V1) and pressure gauge (P2) to connection 2 (*fig.* 1). Ensure that the control valve is closed.

(5) Slowly increase the supply pressure. Check that the readings of both gauges rise simultaneously until they read 150-160 lb/in^2, (160-170 lb/in^2 for valve 60/2699). Further increase of supply pressure, up to a maximum of 190 lb/in^2 must not effect any increase of the reading of P2 from 160 lb/in^2, (170 lb/in^2 for valve 6D/2699). A slight increase, due to valve seat leakage, is permitted, provided the conditions of test given in para. 5, (7) are observed.

(6) Increase the reading of P1 to 190 lb/in^2 and open the control valve to maintain the reading of P2 between 150-160 lb/in^2, (160-170 lb/in^2 for valve 6D/2699).

(7) Connect the oxygen leak tester to the outlet of the control valve. Check that the leakage rate does not exceed 20 cc/min. (10 bubbles in 10 seconds). Disconnect the leak tester.

(8) Reduce the supply pressure to zero and close the control valve (V1). Interchange the connections 1 and 2 and remove the blank from connection 3.

(9) Gradually increase the supply pressure and check that the readings of P1 and P2 rise simultaneously until a pressure of 150-160 lb/in² (160-170 lb/in² for valve 6D/2699) is indicated.

(10) Continue increasing the supply pressure, checking that the reading of P2 remains steady, until a pressure of 170-180 lb/in² (180-190 lb/in² for valve, 6D/2699) is obtained, when the readings of gauge P1 and P2 must equalize.

(11) Continue to increase the supply pressure until gas escapes from connection 3. Check that the reading of gauge P1 is between 195-205 lb/in².

(12) Reduce the supply pressure to zero and disconnect the valve from the test rig.

(13) Place the valve in the drying cabinet for one hour at 70°C. After drying out, fit the transit blanks to all connections immediately.

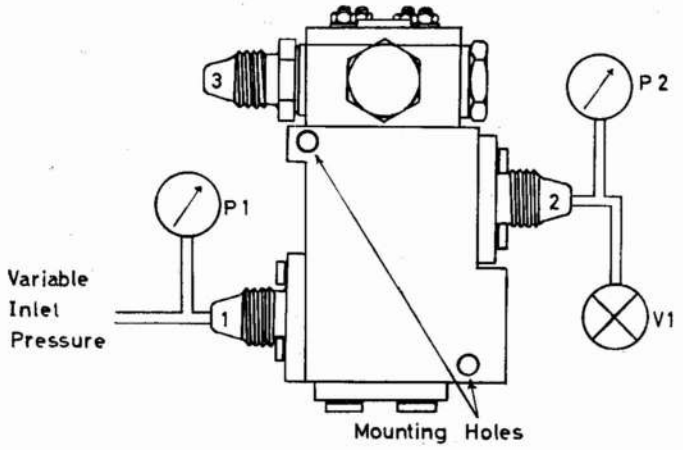

Fig. 1. Test circuit and identification of connections

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