

APPENDIX IX

RELIABLE VALVES

1. FOREWORD

1.1. This Appendix shall apply when the valve is specified in the Test Specification as a Reliable Valve.

1.2. Reliable Valves are defined as valves designed and manufactured to give continuity of operation superior to ordinary valves when used under Service conditions of shock and vibration.

2. TEST PROCEDURE FOR RELIABLE VALVES

All Reliable valves submitted to the Inspection Authority shall undergo the following tests as detailed in the Test Specification.

2.1. Group A Tests. All valves shall be inspected in accordance with Section 5.1 of the general specification and tested for insulation resistance and reverse grid current. Any failures will not count in any further assessment of quality.

2.2. Formation of Lot. All the remaining valves shall be formed into a Lot; see Appendix XI, Section 1, Clause 3.1.1.

2.3. Holding Period. The valves assembled into the Lot shall be stored for a period of not less than 28 days. Those valves normally fitted with pin protectors shall be stored with the pin protectors in position. During the holding period sampling inspection will be made to the schedule detailed below and in accordance with Appendix XI, Sections 1 and 2, unless otherwise stated.

2.4. Sampling Inspection Tests

2.4.1. Electrical Tests

2.4.1.1. Sampling Inspection by Attributes. Sampling Inspection by Attributes shall be used when an Inspection Level and an Acceptable Quality Level (AQL) are given in the Test Specification. The sampling plans for these tests will be determined by the individual specification and by Appendix XI, Section 1. The primary electrical tests will be at Inspection Level II and to an AQL of 0.65%. These tests will be grouped together in Group B and will be subject to an overall AQL of 1%. The secondary electrical tests will be at Inspection Level I and to an AQL of 2.5%. These tests will be grouped together in Group C and will be subject to an overall AQL of 6.5%. Certain electrical tests which may be destructive, difficult to perform, require specialist testing, or are loosely controlled will be performed at Inspection Levels 1A or 1C and to an AQL of 6.5%. These tests will be grouped together in Group D and, in general, there will be no overall AQL given for this group. When an Inspection Level is specified for each individual test the manufacturer may select a different sample for each test. If he elects to use a single sample of the specified number of valves for all the tests in the group any failure shall be removed forthwith from the test and shall count but once in the evaluation of the AQL values. It will not be necessary to replace any defective valve which has thus been removed. If the manufacturer elects to use separate samples for each test the acceptance and rejection numbers for the combined AQL for the total failures shall be the same as if a single sample had been used throughout.

2.4.1.2. Sampling Inspection by Variables. Sampling Inspection by Variables shall be performed in accordance with Appendix XI, Section 2, and with the Test Specification.

2.4.2. Mechanical Tests

2.4.2.1. Glass Envelope Strain Test. This test shall be as given in Section 7 of the general specification. This is not a destructive test and valves which pass will be accepted for delivery.

2.4.2.2. Base Strain Test. This test shall be as given in Section 7 of the general specification or as amended by the Test Specification. This is a destructive test and valves used for this test will not be accepted for delivery.

2.4.2.3. Lead Fragility Test. This test shall be as given in Section 5 of the general specification. This is a destructive test and valves used for this test will not be accepted for delivery.

2.4.2.4. Vibration and Shock Tests. The Vibration and Shock Tests shall be grouped together in Group E and shall be performed on a sampling basis; they shall include one or more of the following tests:-

2.4.2.4.1. Resonance Search Test. This test shall be as given in Section 11 of the general specification. This is not a destructive test and valves which pass will be accepted for delivery.

2.4.2.4.2. Fatigue Test. This test shall be as given in Section 11 of the general specification. This is a destructive test and valves used for this test will not be accepted for delivery.

2.4.2.4.3. Shock Test. This test shall be as given in Section 11 of the general specification. This is a destructive test and valves used for this test will not be accepted for delivery. Where reduced testing is in operation and no failures have been experienced in the last 10 successive lots this requirement will be waived provided that production is continuous.

2.4.3. Life Tests. The electrical life tests will be generally grouped together in Group F and will be performed on a sampling basis. The general requirements of these tests will be based on the procedure given in Appendix VI or as given in the Test Specification. In addition, selected tests may be required at intervals during life testing. Intermediate failure rates and the overall AQL will be stated in the Test Specification. These tests are destructive and valves used will not be accepted for delivery except those which pass the stability life test.

2.5. Retests after Holding Period. At the end of the Holding Period all the valves in the Lot, excluding those used for the destructive Sampling Inspection Tests shall be tested for air leaks and open or short circuits between electrodes. A lot will be accepted if the number of inoperative valves as defined above does not exceed 0.5%. For other tests as detailed in the Test Specification the maximum allowable failure will be specified.

2.6. Sampling Inspection Procedure for Small Lot Sizes. The Sampling Inspection Procedure as given above will apply to lot sizes of 801 valves and above. The following modified procedure shall apply for lot sizes of 800 valves and below.

2.6.1. Lot Sizes 301 to 800 Valves

Group B Primary Electrical Tests remain as specified.

Group C Secondary Electrical Tests remain as specified.

Group D, E and F Where individual and combined AQL's are specified the combined AQL only shall apply. Where no combined AQL is specified the individual AQL's shall be modified as follows:- increase 2.5% to 4% and increase 6.5% to 10%, the Inspection Levels remaining at 1A or 1C as specified. In addition, for the stability life test in Group F the AQL shall be increased to 1.5%, the Inspection Level remaining at 1.

2.6.2. Lot Sizes 50 - 300 Valves

2.6.2.1. Non-Destructive Tests. On all tests (other than destructive tests) where the specified individual AQL is less than 1.5% it shall be increased to 1.5%, and where the specified combined AQL is less than 4% it shall be increased to 4%.

2.6.2.2. Destructive Tests. Where the combined AQL is less than 6.5% it shall be increased to 6.5% and the individual AQL's shall not apply. Where no combined AQL is specified the individual AQL applicable to the destructive test shall be increased to 6.5%. The following Deferred Acceptance or Chain Sampling Procedure shall be used.

2.6.2.2.1. Deferred Acceptance or Chain Sampling System for an AQL of 6.5%.

- (a) A sample of two valves shall be taken at random from each lot for test.
- (b) The samples from five consecutive lots shall be accumulated. If there be not more than one failure in all the samples together the lots shall be accepted.
- (c) The results of the next lot shall be added to those of the immediately preceding four lots and the current lot shall be accepted if all five lots together contain not more than one failure, and so on for succeeding lots.
- (d) If whilst sampling according to (b) more than one failure occurs all the lots in the chain up to this point shall be rejected. If whilst sampling according to (c) more than one failure occurs only the lot under inspection shall be rejected and test procedure shall start again from (b).

2.6.2.2.2. Deferred Acceptance or Chain Sampling System for an AQL of 10%.

- (a) A sample of two valves shall be taken at random from each lot for test.
- (b) The samples from five consecutive lots shall be accumulated. If there be not more than two failures in all the samples together the lots shall be accepted.
- (c) The results of the next lot shall be added to those of the immediately preceding four lots and the current lot shall be accepted if all five lots together contain not more than two failures, and so on for succeeding lots.
- (d) If whilst sampling according to (b) more than two failures occur all the lots in the chain up to this point shall be rejected. If whilst sampling according to (c) more than two failures occur only the lot under inspection shall be rejected and test procedure shall start again from (b).

2.6.2.2.3. Re-Submission of Rejected Lots. Rejected lots may be resubmitted together as a single lot in accordance with Appendix XI, Clause 10, using the sampling scheme for normal inspection applicable to the appropriate lot size. If the number of valves is less than 301 the plan for 301 to 800 valves in clause 2.6.1 shall be used.

2.6.3. Production Rate Less than Fifty Valves Per Week. Since the test sampling procedures described above are not applicable to a rate of manufacture of less than fifty valves per week the test specification or contract documents will indicate where 100% testing shall not be used and will specify the requirements for the destructive tests for such cases.