INTERNAL VISUAL INSPECTION OF ELECTROMAGNETIC RELAYS

ESCC Basic Specification No. 2043600

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DCR No.	CHANGE DESCRIPTION
1706	Specification upissued to incorporate changes per DCR.

TABLE OF CONTENTS

1 SCOPE

This specification, to be read in conjunction with ESCC Basic Specification No. 20400, "Internal Visual Inspection", contains additional requirements for electromagnetic relays. They shall apply, where relevant, to each device inspected.

2 GENERAL REQUIREMENTS

2.1 APPLICABILITY

The following criteria may not be varied or modified after commencing any inspection stage. Any ambiguity or proposed minor deviation shall be referred to the ESCC Executive for resolution and approval.

2.2 PROCEDURE

Before encapsulation, the relays shall be inspected on a laminar flow bench. The workbench shall fulfil adequate cleanliness conditions. All items shall be examined in such a manner that a minimum of handling and movement of the component is involved. Apart from the clothing normally prescribed for wear in clean rooms, inspectors shall wear gloves or finger-cots when manipulating relays.

3 EQUIPMENT REQUIRED

3.1 MAGNIFICATION

The optical equipment necessary for the inspection is a stereoscopic microscope and the magnification shall be X10.

3.2 MOUNTING FIXTURES

Suitable fixtures may be used to assist in the inspection process provided they do not of themselves cause damage to the device. Care shall be taken that adequate provision is made to avoid accidental damage.

3.3 ELECTRICAL EQUIPMENT

The appropriate electrical equipment shall be provided for energising relay coils and visualising contact opening and closing.

4 DETAILED REQUIREMENTS

4.1 REJECT CRITERIA

A component shall be rejected if it exhibits any of the defects listed in any of the following paragraphs. Where applicable, drawings have been included to provide additional explanatory material.

4.2 GENERAL

(a) Loose particles (in particular, free particles of insulating material or detachable metal particles shall not be accepted).
(b) Chemical contamination (grease, varnish, ink, etc.).
(c) Blistering or flaking of plating on any metal part.

N.B. If cleanliness requirements for relay and housings are not met, further cleaning operations shall be allowed, followed by another inspection.

4.3 COILS

(a) Tool or fixture nicks on coil insulation and lead wire insulation (see Figure 1 in Para. 5.1).
(b) Evidence of cracks, holes or marks in coil insulation exposing copper wires of the coil winding (see Figure 1 in Para. 5.1).
(c) Incomplete coverage of coil winding by an insulation tape (see Figure 1 in Para. 5.1).
(d) Finishing end of wrapping not adhering to coil.
(e) Loose particles of insulating material.
(f) Embedded metal particles in coil insulation.
(g) Incorrect position of lead wires, so that they are in the way of moving parts or within 0.2mm of their furthest travel.
(h) Dirty coil insulation. (Recleaning is permitted).

4.4 ELECTRICAL WELDS

(a) Weld point missing.
(b) Burnt welds.
(c) Weld flashes. (They can be accepted if they are firmly attached).
(d) Welds with cracks.
(e) Weld projection (dimple) not flattened (see Figure 2 in Para. 5.2).
(f) Weld point overlapping frame and header (see Figure 3 in Para. 5.3).
(g) Any gap (except by design) between frame and header, where indicated (see Figure 3 in Para. 5.3).
(h) Bent frame leg (see Figure 4 in Para. 5.4).
(i) Welding pressure too high, leg deformed by more than 50% of its thickness (see Figure 4 in Para. 5.4).
(j) Lead wire deformed by more than 50% or less than 25% of its initial thickness (see Figure 5 in Para. 5.5).
(k) Incorrect position of lead wire on terminal relative to header (see Figure 6 in Para. 5.6).

4.5 MAGNETIC CIRCUITS, ARMATURE, ACTUATOR

(a) The physical contact area between pole piece and armature is less than two thirds of the design contact area or > 0.05mm where indicated (see Figure 7 in Para. 5.7).
(b) Gap greater than 0.4mm between pole piece and frame (see Figure 8 in Para. 5.8).
(c) Armature is not moving freely.
(d) End or side play in excess of design.
(e) Lack of parallelism between armature and actuator arm (unless by design) (see Figure 9 in Para. 5.9).
(f) The actuator arm stands proud of the armature, unless by design (see Figure 9 in Para. 5.9).
(g) Excessive deformation of actuator at weld point (> 50%) of its initial thickness (see Figure 10 in Para. 5.10).

(h) Deformation of armature.
(i) Actuator bead asymmetrically located (see Figure 11 in Para. 5.11).
(j) Irregular shape of actuator bead (see Figure 11 in Para. 5.11).
(k) Cracks or chip-outs in bead (see Figure 11 in Para. 5.11).
(l) One or more bubbles (a single bubble produced because of the manufacturing process may be acceptable) weakening the bead (see Figure 11 in Para. 5.11).
(m) Foreign materials (black dots).

4.6 CONTACTS

(a) Tool marks.
(b) Scratches or visible damage.
(c) Any corrosion, unsmooth surface.
(d) Deformation of contacts in excess of design.
(e) Deformation of terminals in excess of design.
(f) Bad adherence of plating around brazing area.
(g) Brazing alloy (braze construction) in excess of design (see Figure 12 in Para. 5.12).
(h) Weld splash (weld construction) (see Figure 13 in Para. 5.13).
(i) Incorrect contact alignment (see Figure 14 in Para. 5.14):
    1. The plane containing the surfaces of the contacts are misaligned by more than one third of the design contact area.
    2. The physical contact area is less than two thirds of the design contact area.
(j) Incorrect parallelism between header and contacts (see Figure 14 in Para. 5.14).
(k) Incorrect parallelism between contacts (see Figure 14 in Para. 5.14).
(l) Clearance between actuator and contacts less than design.
(m) Incorrect position of actuator bead relative to contacts (see Figure 15 in Para. 5.15).

4.7 HEADERS

(a) Nicks, dents on periphery of header, where the can is Tungsten-Inert Gas, Electron Beam, Laser Beam, welded.
(b) Glass on the flange or the side of the header (see Figure 16 in Para. 5.16).
(c) Blistering or flaking of gold or nickel plating.
(d) Header post bent more than 10° (see Figure 16 in Para. 5.16).
(e) Metal shavings on the flange or side of the header longer than the width of the flange.
(f) Bent or deformed flanges (see Figure 16 in Para. 5.16).
(g) Grease, varnish, ink or similar stain on the flange or side of the header.
(h) Any conductive material overlapping the glass seal.
(i) Cracked or chipped glass seal (see Figure 17 in Para. 5.17).
(j) Non-uniformity of finish of lead or pillar, particularly at the glass seal.
(k) Nicks or bulges in the wire diameter outside stated lead tolerance.
(l) Individual bubbles diameter more than a third of the minimum distance between the terminal and the header, or an area of adjacent bubbles in the seal area bigger than 12.5% of the seal area (see Figure 18 in Para. 5.18).

(m) Any foreign material in the glass seal with a maximum dimension greater than half the distance between the lead and the edge of the seal, or a grouping of smaller foreign materials whose overall maximum dimension exceeds 50% of the glass seal (see Figure 19 in Para. 5.19).

NOTE:
This criterion shall not apply if the foreign material is successfully removed. The glass seal shall be re-examined to verify there are no induced or hidden chips or cracks.

(n) Eccentricity of lead passing through the centre of the glass-to-seal greater than 10% of the glass feedthrough diameter (see Figure 20 in Para. 5.20).

(o) Lead tilted more than 5° (see Figure 21 in Para. 5.21).

(p) Incorrect position of solder hooks (see Detail Specification).

(q) Glass seal protruding above or below header along terminal by more than 0.5mm (see Figure 22 in Para. 5.22).

4.8 HOUSINGS

(a) Tool marks.

(b) Scratches or visible damage.

(c) Corrosion.

(d) Dents.

(e) Deformation by shocks.

If applicable:

(f) Mounting brackets which are spot-welded (electrically) to the housing (see Figure 23 in Para. 5.23).

(g) Incorrect position of mounting brackets (see PID).

(h) Excess brazing alloy on bracket, causing change of dimensions.

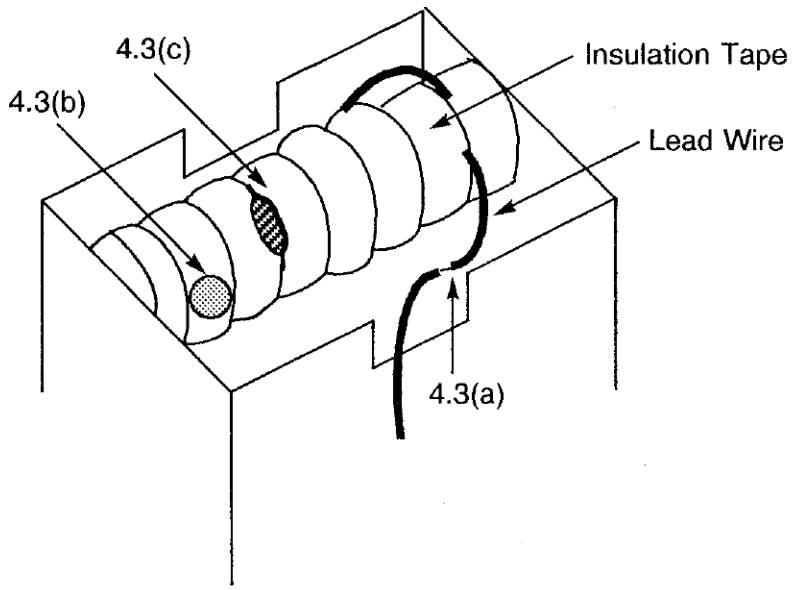
(i) Granular brazing alloy.

(j) Microholes in brazing alloy.

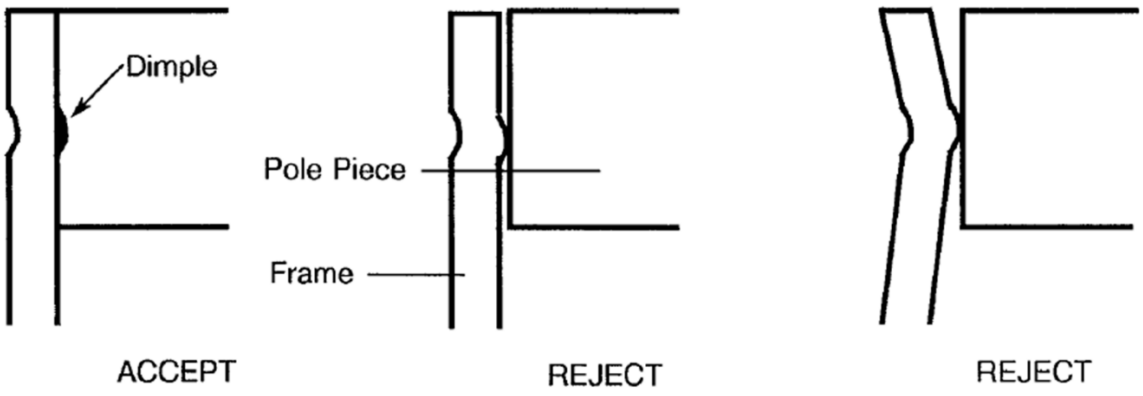
(k) General lack of alloy around bracket/housing.

5 FIGURES

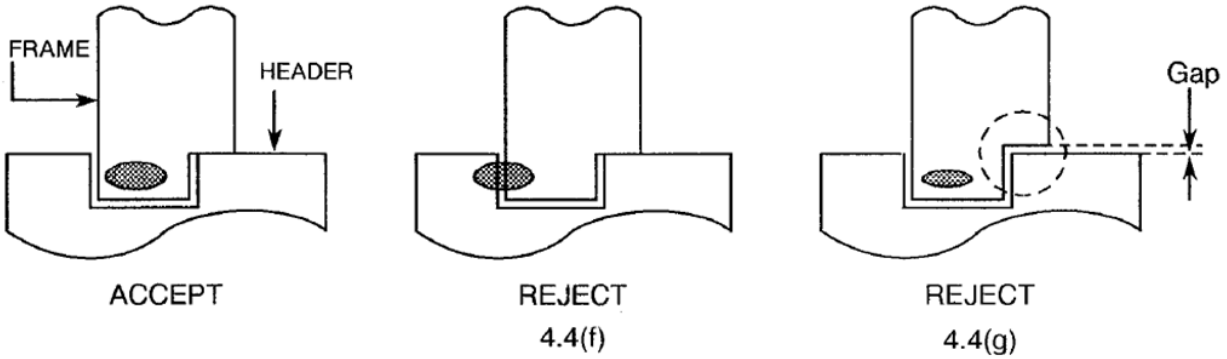
5.1 FIGURE 1: COIL DEFECTS



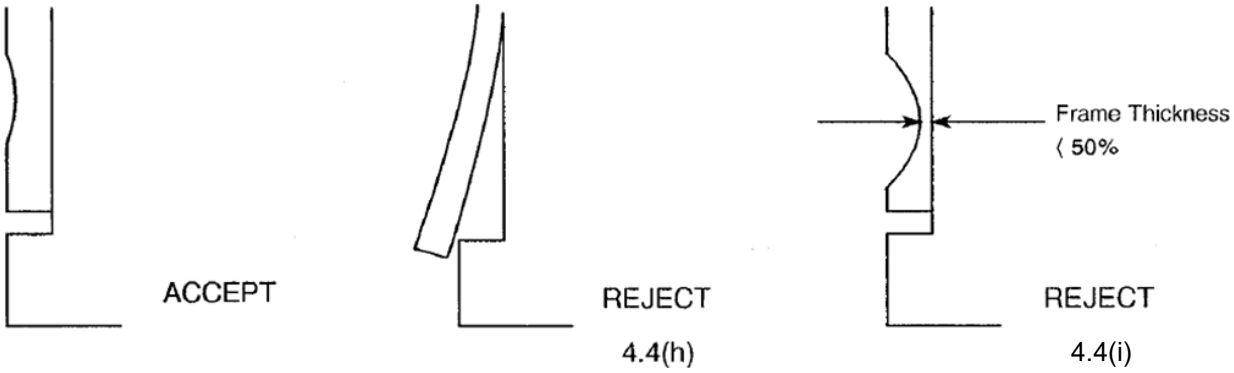
5.2 FIGURE 2: FLATTENING OF WELD PROJECTION



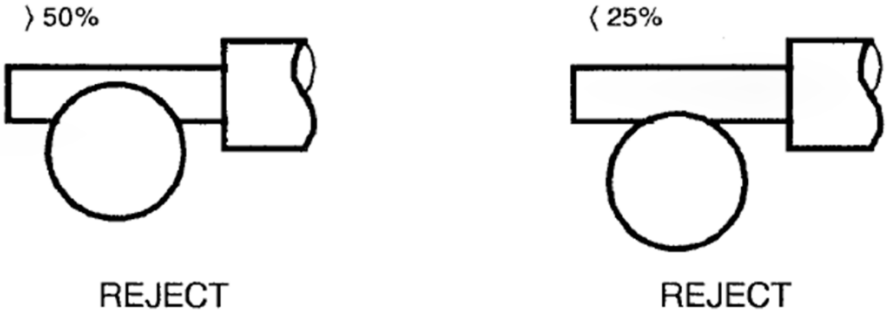
5.3 FIGURE 3: FRAME TO HEADER WELD



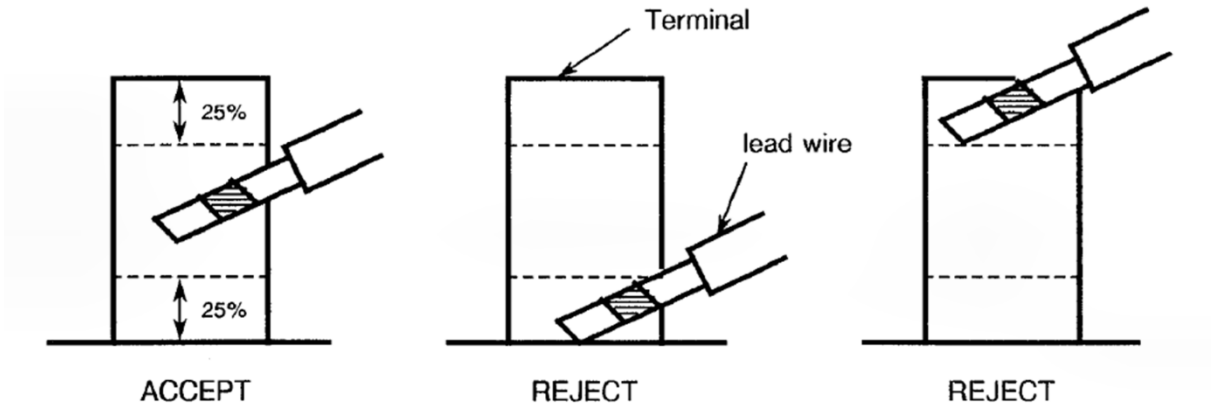
5.4 FIGURE 4: FRAME TO HEADER WELD CROSS-SECTION



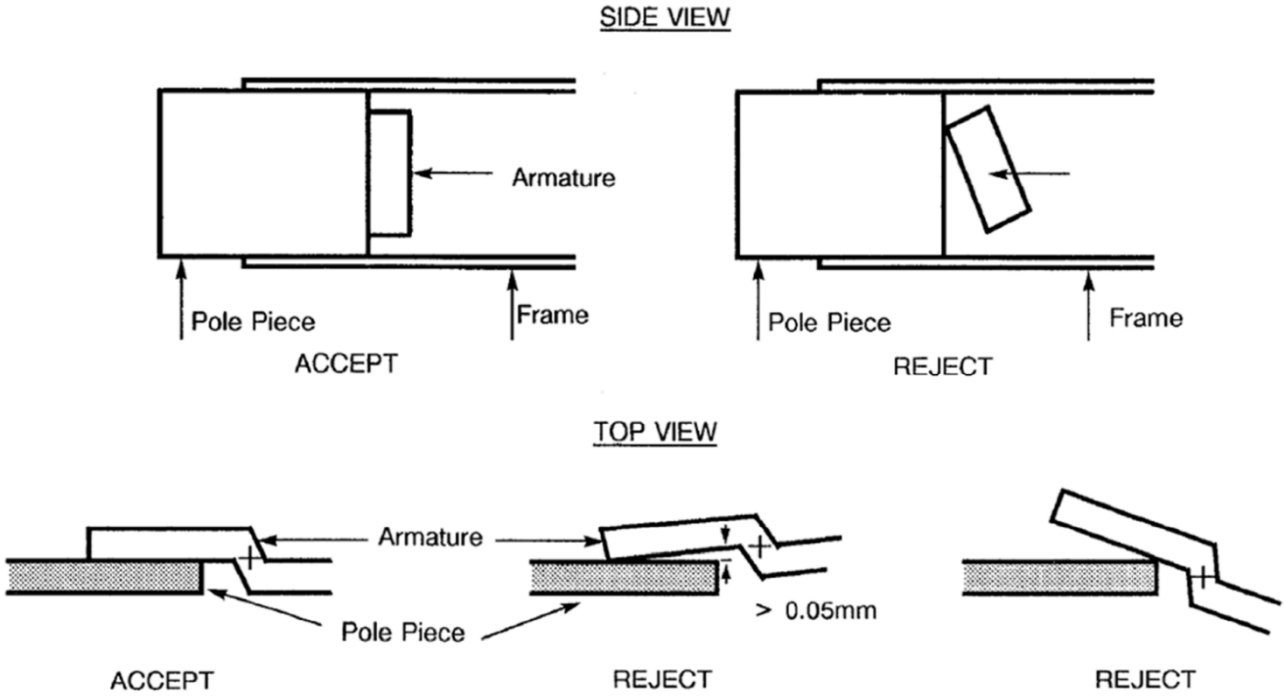
5.5 FIGURE 5: LEAD WIRE TO TERMINAL WELD CROSS-SECTION



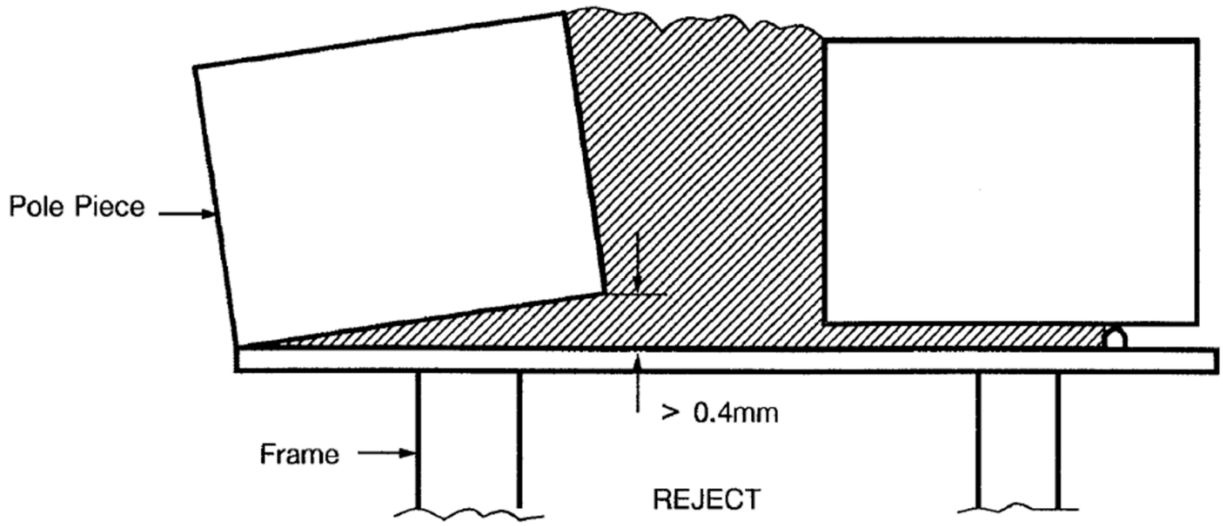
5.6 FIGURE 6: LEAD WIRE TO TERMINAL WELD



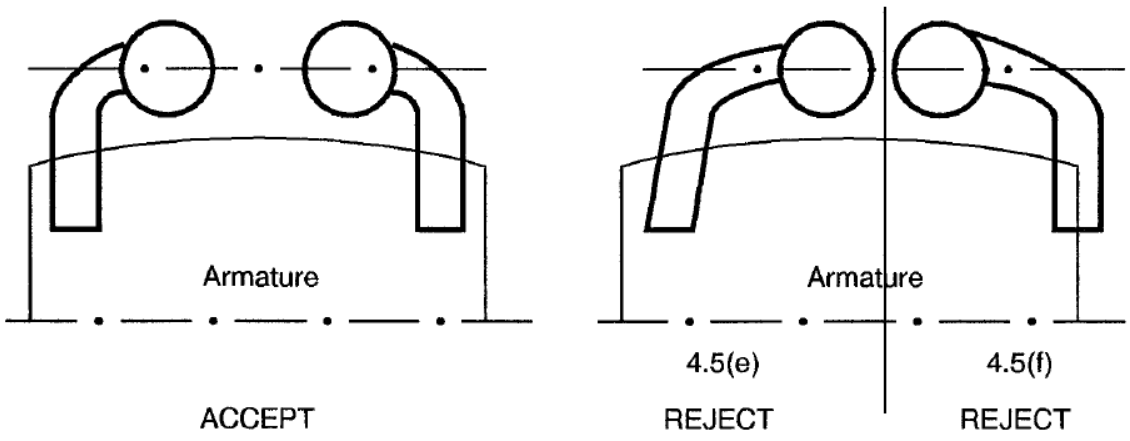
5.7 FIGURE 7: ARMATURE/POLE PIECE CONTACT AREA AND GAP



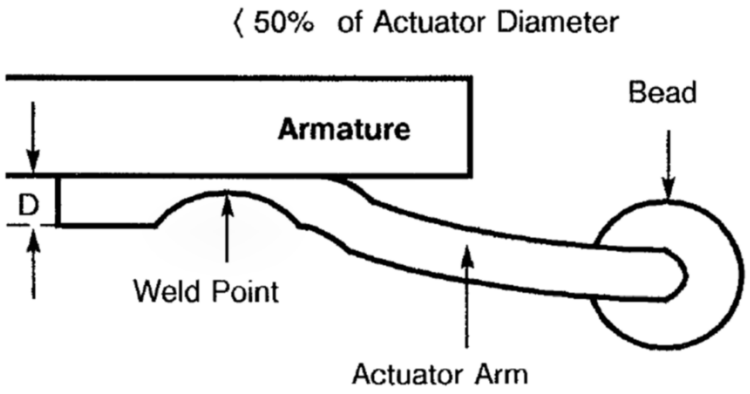
5.8 FIGURE 8: POLE PIECE / FRAME GAP



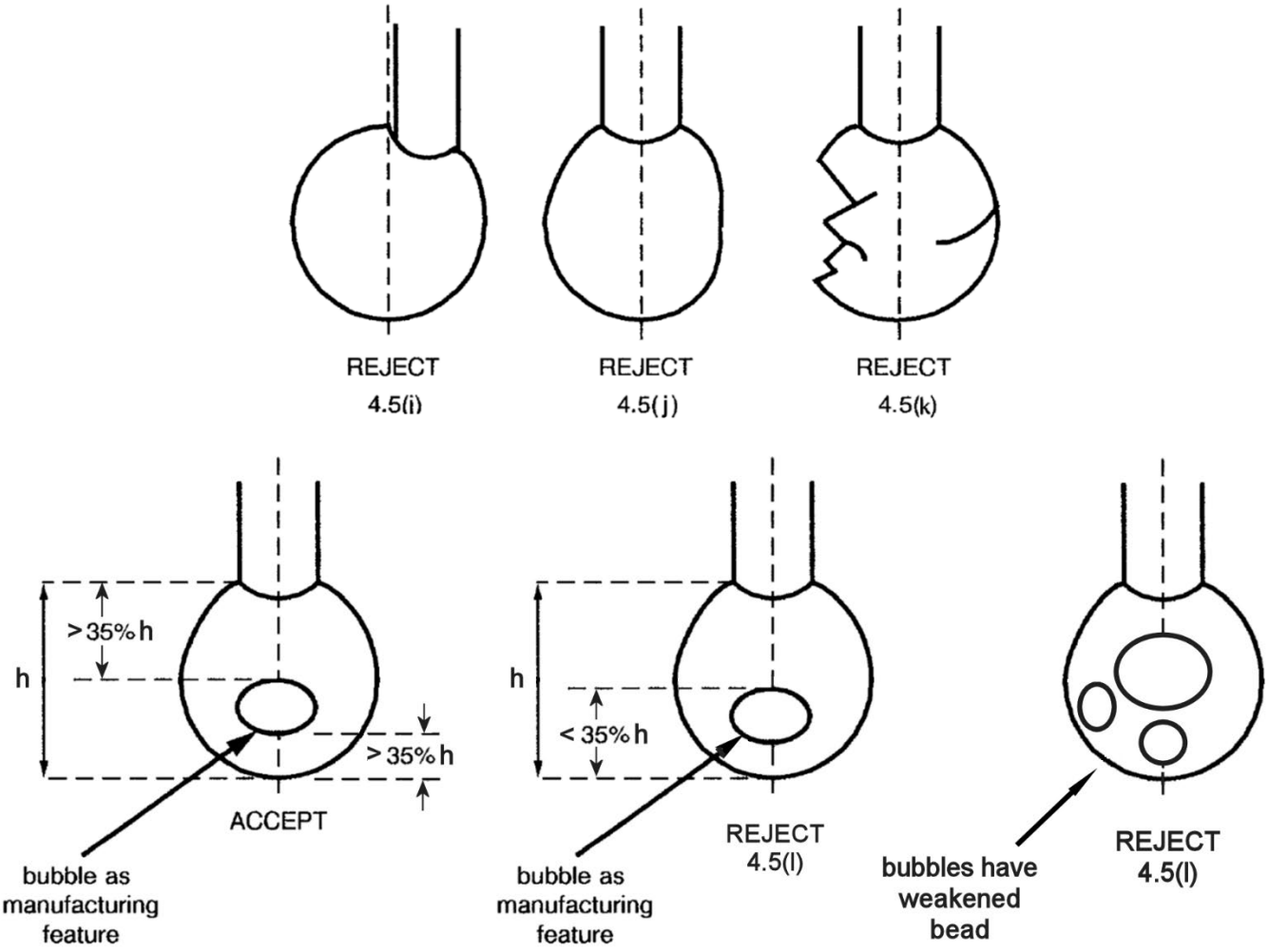
5.9 FIGURE 9:ACTUATOR POSITION



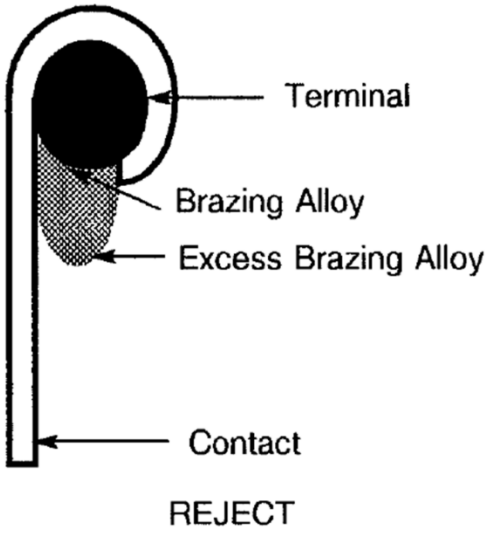
5.10 FIGURE 10: ACTUATOR / ARMATURE WELD



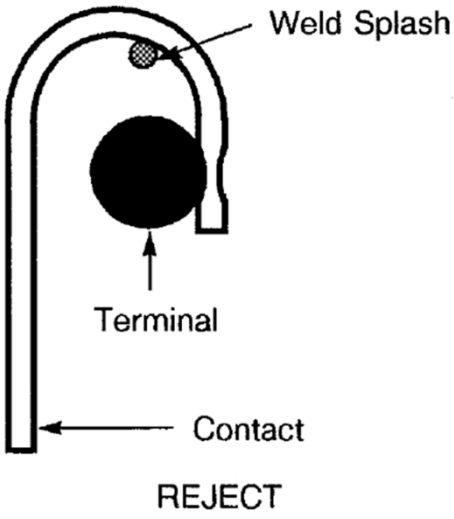
5.11 FIGURE 11: ACTUATOR GLASS BEAD



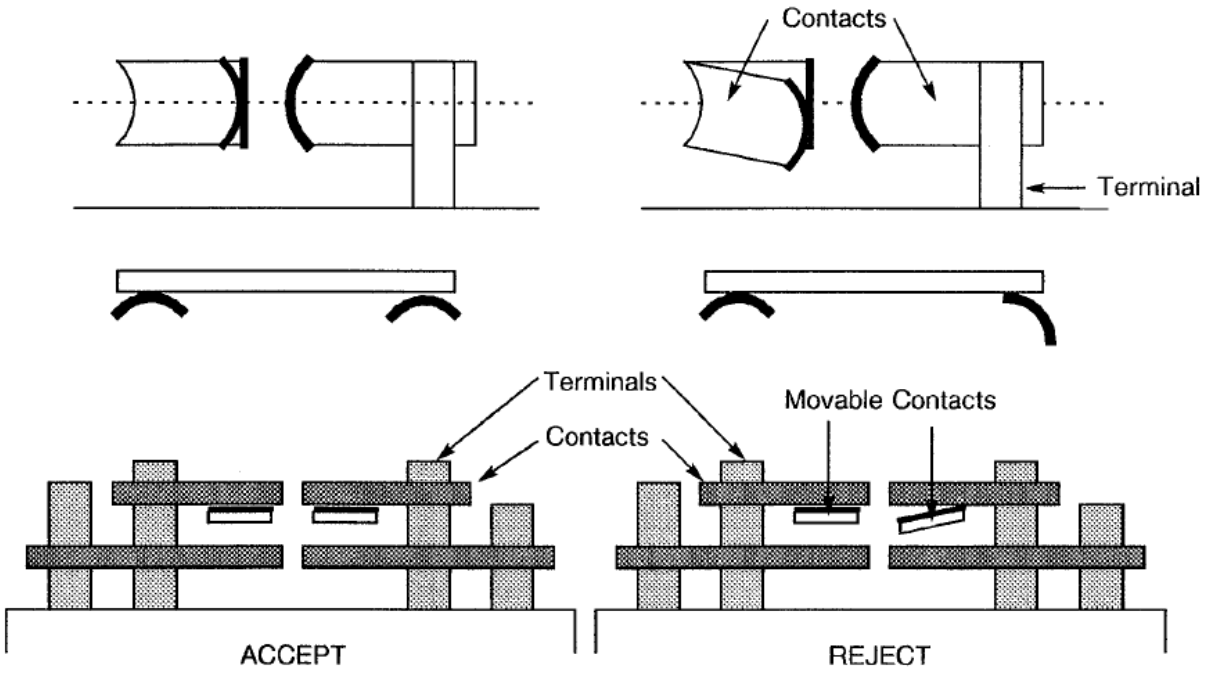
5.12 FIGURE 12:CONTACT / TERMINAL BRAZE



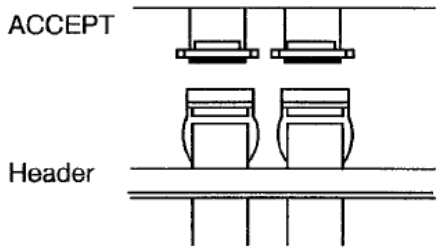
5.13 FIGURE 13: CONTACT / TERMINAL WELD

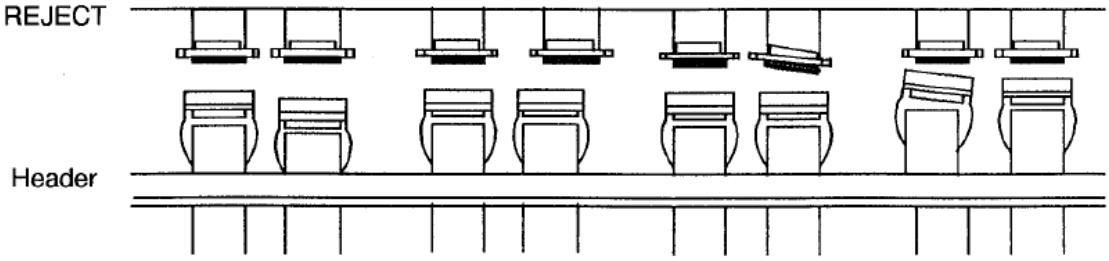


5.14 FIGURE 14: EXAMPLE OF CONTACT ALIGNMENTS



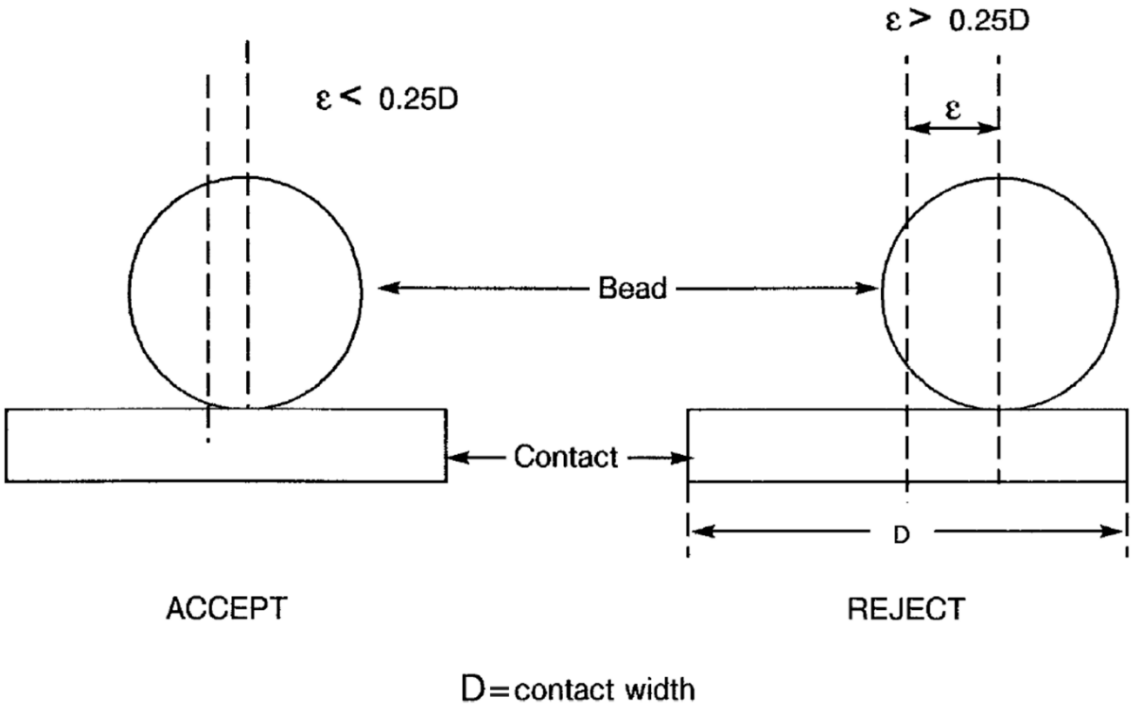
4.6(i)



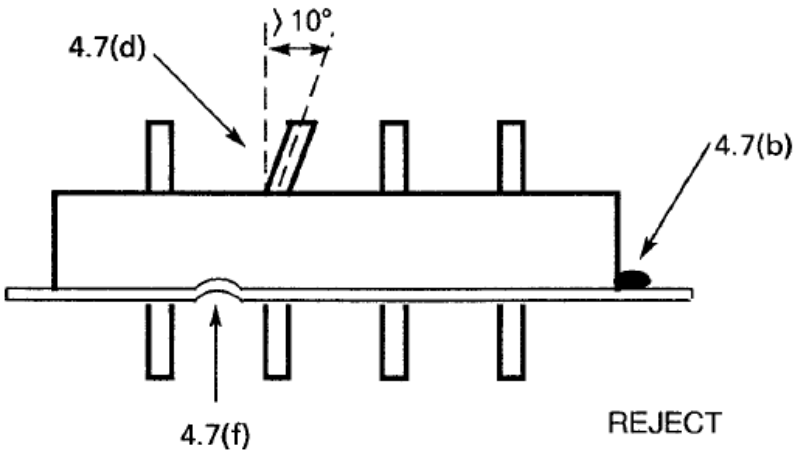


4.6(i1) 4.6(i2) 4.6(j) 4.6(k)

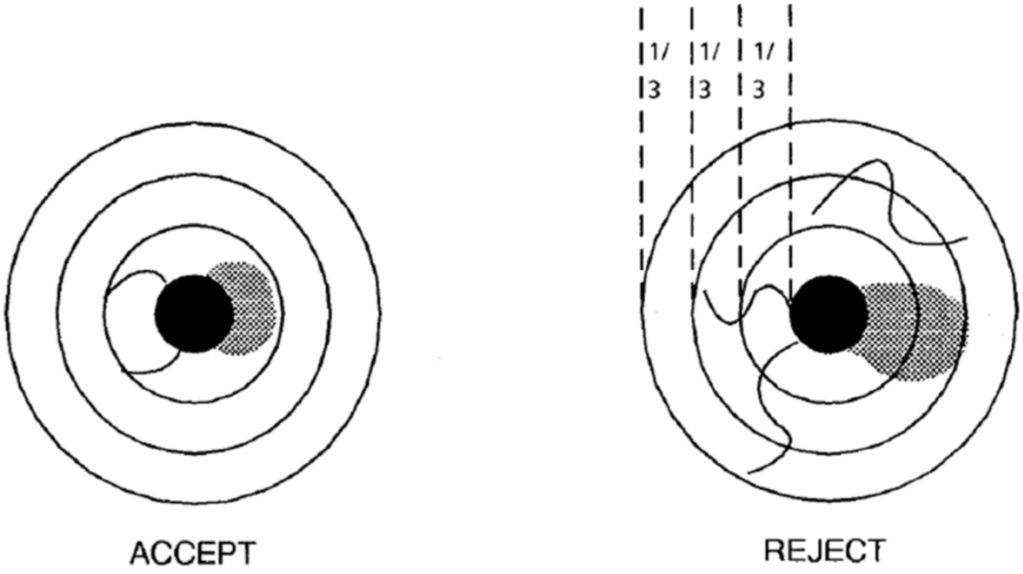
5.15 FIGURE 15: ACTUATOR / CONTACT POSITION



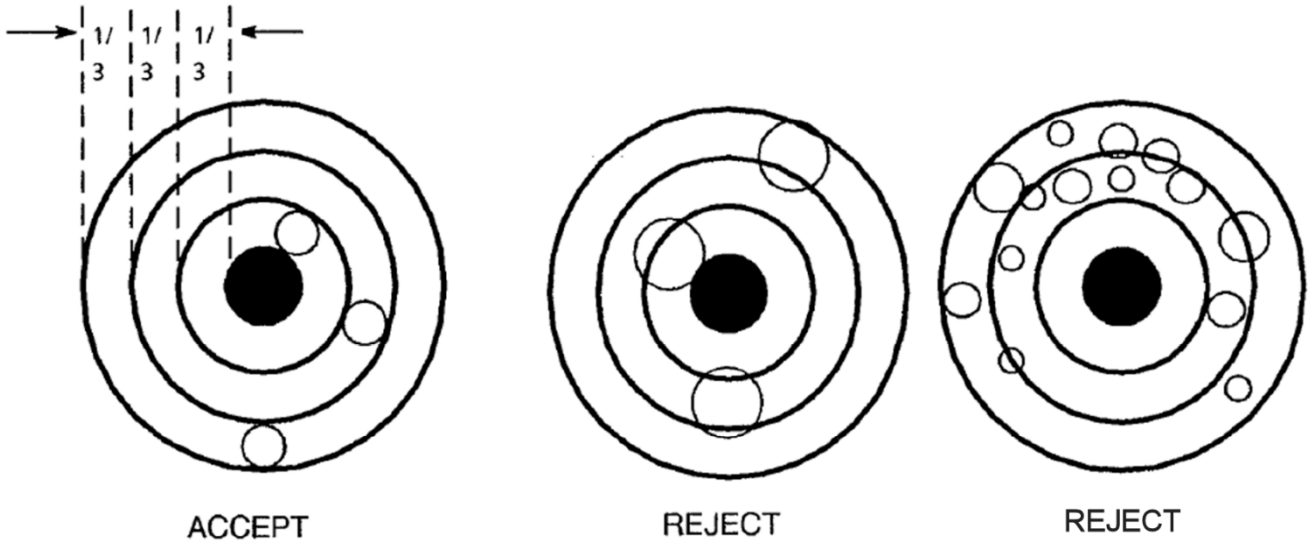
5.16 FIGURE 16: HEADER DEFECTS



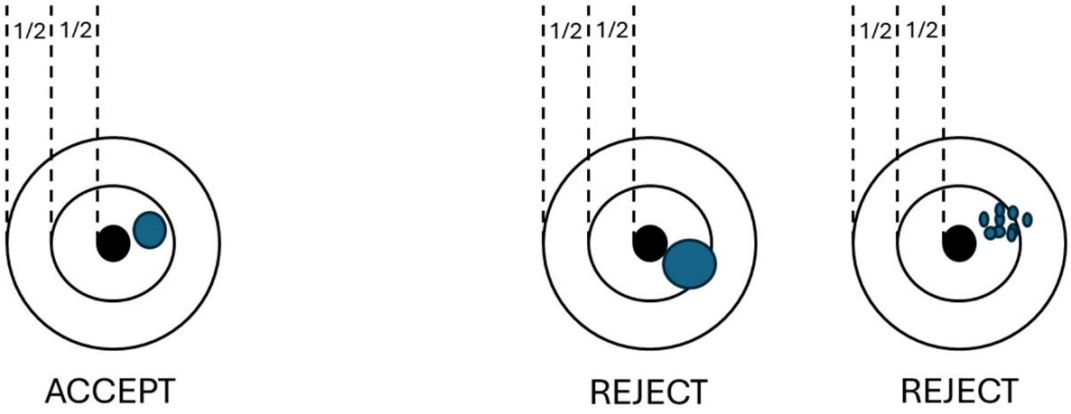
5.17 FIGURE 17: GLASS-TO-METAL SEAL CRACKS AND CHIP-OUTS



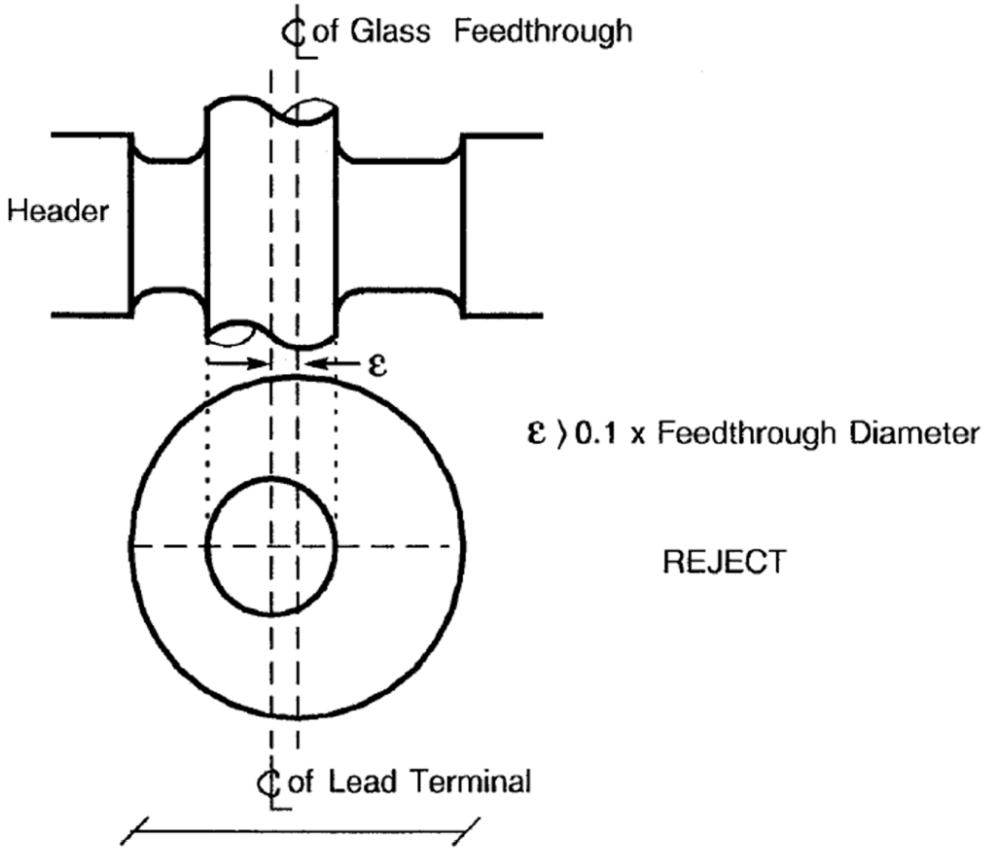
5.18 FIGURE 18: BUBBLES IN GLASS-TO-METAL SEAL



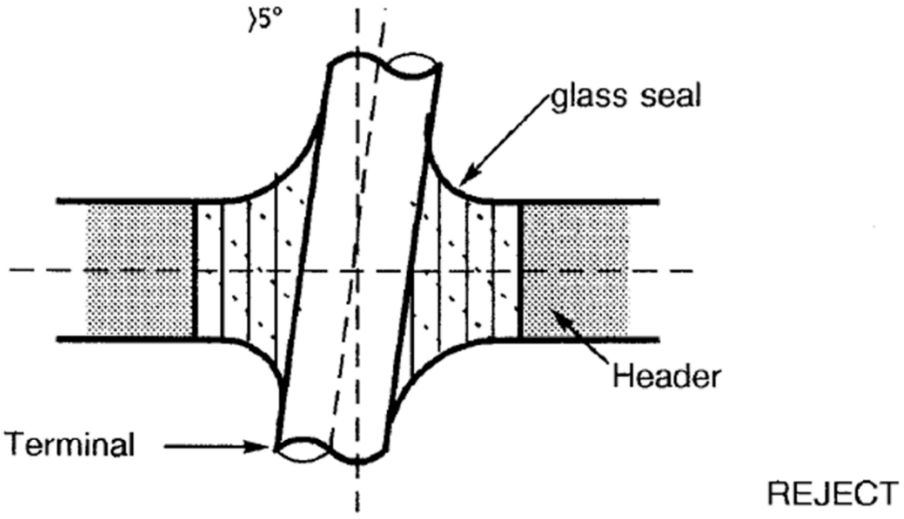
5.19 FIGURE 19: FOREIGN MATERIAL IN THE GLASS SEAL



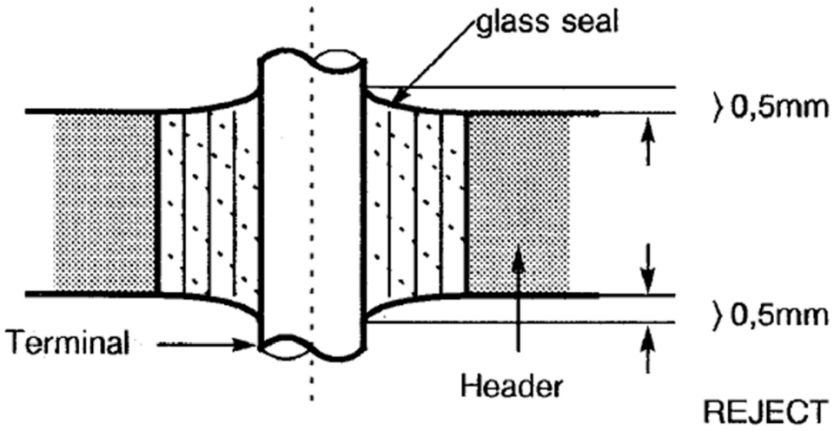
5.20 FIGURE 20: LEAD POSITION WITHIN GLASS-TO-METAL SEAL



5.21 FIGURE 21: TILT OF TERMINAL IN GLASS-TO-METAL SEAL



5.22 FIGURE 22: GLASS MENISCUS



5.23 FIGURE 23: BRACKET TO HOUSING WELD