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**187 SERIES POSITIVE LOCK MARK-II CONNECTOR**

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**1. SCOPE**

1.1. Content

This specification covers the requirement for product performance, test methods and quality assurance provisions for 187 SERIES POSITIVE LOCK MARK-II CONNECTOR.

Applicable product description and part numbers are as shown in Appendix 1

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed. The specifications are

109-5000: Test specification, General Requirement for Test Methods

501-5004: Qualification Test Report

501-134136: Qualification Test Report

1.4. Revision Summary

Revisions to this specification include:

- Initial release of specification.

**2. APPLICABLE DOCUMENTS AND FORMS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Connectivity Specifications

114-5041 Application Specification

2.2. Commercial Standards and Specifications

IEC 61984 International Standard – Safety Requirements and Tests

IEC 60335 International Standard – Safety of Household and Similar Appliance

IEC 60512 International Standard – Connectors for Electronic Equipment – Tests and Measurements

IEC 60695 International Standard – Fire Hazard Testing

UL 1977 Safety Standards – Component Connectors for Use in Data, Signal, Control, and Power Applications

EIA-364 Electrical Connector/Socket Test Procedures Including Environmental Classifications

2.3. Reference Documents

[109-1](#) General Requirements for Testing

[102-950](#) Qualification of Separable Interface Connectors

**3. REQUIREMENTS**

3.1. Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable TE drawing.

A. Housing: 66 Nylon (UL94V-2, V-0)

46 Nylon (UL94V-2)

B. Contacts: Pre-tinned Brass or Unplated Brass

(P/N: 170324-1, 170325-1, 170326-1, 1376429-1)

(P/N: 1318306-1, 2238279-1, 63498-1, 63498-2...For 0.8t TAB

Pre-tinned Phos Bro

(170324-5, 170325-5, 170326-5)

Nickel plated Phos Bro

(P/N:170324-2, 170325-2)

Pre-tinned High Heat Resistance Copper Alloy

(P/N: 170325-6, 170326-6)

Customer Tab: Customer tab shall be made of 70% copper, 30% zinc brass with or without tin-plating, conforming to JIS H 3100, C2600P-1/2H.

WARNING: At least one mating component, contact or tab, must be tin plated in tests and applications. Combinations of unplated contacts mated with unplated tabs is not allowed

3.3. Ratings

A. Voltage Rating: 250VAC

B. Current Rating: Refer to Fig.2 for maximum allowable current to be applied

C. Temperature Rating:

Housings: -40°C to +105°C UL94V-0

-40°C to +120°C UL94V-2

Contacts: -40°C to +125°C Pre-tinned Brass or Unplated Brass

-40°C to +130°C Pre-tinned Phos Bronze or Nickel plated Phos Bronze

3.4. Performance Requirements and Test Description

The product should meet the electrical, mechanical, and environmental performance requirements specified in Figure 1. All tests shall be performed at ambient environmental conditions otherwise specified.

3.5. Test Requirements and Procedure Summary

Item	Test Description	Requirement	Procedure
3.5.1	Visual Examination	Meets requirements of product drawing and AMP specification 114-5041	EIA-364-18. Visually, dimensionally and functionally inspected per applicable quality inspection plan.

Figure 1(cont.)

**ELECTRICAL REQUIREMENT**

3.5.2	Termination Resistance (Low Level)	3mΩ Max. (Initial) 6.1mΩ Max. (Final)	EIA-364-23 Subject mated contact assembled in housing to 20mV Max open circuit at 100mA. Termination resistance is calculated after deducting the resistance of the crimped wire of 75mm in length. Figure 4.
3.5.3	Insulation Resistance	1000MΩ Max. (Initial) 100MΩ Max. (Final)	EIA-364-21 Impressed voltage 500VDC test between adjacent circuits of unmated connectors. Figure 5.
3.5.4	Dielectric withstanding voltage	No creeping discharge nor flashover shall occur. Current Leakage: 1mA Max.	EIA-364-20 2kVAC for 1 minute. Test between connector/earth of unmated connectors. Figure 5.
3.5.5	Temperature Rise	30°C Max. under loaded specified current or rating current.	EIA-364-70 Measure temperature rise by energized current Figures 2-1 and 2-2.

**MECHANICAL REQUIREMENT**

3.5.6	Crimp Tensile Strength	Wire Size	Crimp Tensile (Min.)		EIA-364-8 Apply an axial pull-off load to crimped wire of contact secured on the tester, Operation Speed: 100mm/min.
		mm <sup>2</sup>	AWG	N (kgf)	
		0.2	24	19.6 (2)	
		0.3	22	49.0 (5)	
		0.5	20	78.4 (8)	
		0.75	18	117.6 (12)	
		1.25	16	205.8 (21)	
2.0	14	245.0 (25)			
3.5.7	Contact Retention Force	49.0 N(5kgf) min.			EIA-364-29 Apply an axial pull-off load to crimped wire. Operation Speed: 100mm/min.
3.5.8	Connector Mating Force	1 Pos: 29.4N (3.0 kgf) Max. 2 Pos: 44.1N (4.5 kgf) Max. 3 Pos: 73.5N (7.5 kgf) Max. 4 Pos: 107.8N (11.0 kgf) Max. 170324-2, 170325-2: 1 Pos: 35.3N (3.6 kgf) Max. 1318306-1 (For 0.8t TAB): 1 Pos: 39.2N (4.0 kgf) Max. 2238279-1, 63498-1, 63498-2 (For 0.8t TAB):			EIA-364-13 Operation Speed: 100mm/min. Measure the force required to mate connectors by pushing on housing  Must be use Pre-Tin Brass 0.8t TAB for 1318306-1 only.

1 Pos. 44.6N (4.55 kgf)

Figure 1(cont.)

3.5.9	Connector Unmating Force	<p>1 Pos: 5.88~29.4N (0.6~3.0 kgf)                  2 Pos: 9.8~44.1N (1.0~4.5 kgf)                  3 Pos: 19.6~73.5N (2.0~7.5 kgf)                  4 Pos: 29.4~107.8N (3.0~11.0 kgf)</p> <p>2238279-1, 63498-1, 63498-2 (For 0.8t TAB):                  1 Pos. 5.88~44.6N (4.55 kgf)</p>	<p>EIA-364-13                  Operation Speed: 100mm/min. Measure the force required to unmate connectors by pulling on housing                  Must be use Pre-Tin Brass 0.8t TAB for 1318306-1 and 63498-2.</p>
3.5.10	Mated / locked contact retention force	<p>Initial: 58.8N (6kgf) Min. test group 3                  Final: 49.0N (5kgf) Min. test group 6</p>	<p>EIA-364-13                  Measure contact locking strength. Operating Speed: 100mm/min.                  Must be use Pre-Tin Brass 0.8t TAB for 1318306-1 and 63498-2</p>
3.5.11	Vibration (Low Frequency)	<p>No electrical discontinuity greater than 1<math>\mu</math> sec. Shall occur. 6.1m<math>\Omega</math> Max. (Final)</p>	<p>EIA-364-28                  Subject mated connectors to 10-55-10 Hz traversed in 1 minute at 1.52mm amplitude 2 hours each of 3 mutually perpendicular planes. 100mA applied mounting Figure 6.</p>
<b>ENVIORNMENTAL REQUIREMENTS</b>			
3.5.12	Humidity, steady state	<p>Insulation Resistance 100M<math>\Omega</math> Min. (Final)                  Termination Resistance 6.1m<math>\Omega</math> Max. (Final)</p>	<p>EIA-364-31                  Mated connector, 90-95% R.H. 40°C 96 hours.</p>
3.5.13	Thermal Shock	<p>6.1m<math>\Omega</math> Max. (Final)</p>	<p>EIA-364-32                  Subject terminals inserted into housing to 5 cycles between -40°C/30 min. and 105°C/30min.</p>

3.5.14	Salt spray	6.1mΩ Max. (Final) 49.0 N (5kgf) min: Contact locking strength	EIA-364-26 Subject mated connectors to 5% salt connection for 96hours: After the test, rinse the sample in water, sit it for one (1) hour for drying at room temperature.
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Figure 1

## 3.6. Crimping wire contents for evaluation.

Wire Size (AWG)	Composition of wire		Applicable JIS and JCS spec.	Current A(DC)
	Calculated Cross Section of conductor mm <sup>2</sup>	Number of Strands / Diameter of a Strand N/φ mm		
#24	0.22	11/0.16	UL1007	2.5
#22	0.31	12/0.18	JCS-246	3.0
#20	0.51	20/0.18	JIS-C-3406	5.0
#19	0.62	24/0.18	N/A	6.0
#18	0.76	30/0.18	JIS-C-3316	7.0
#17	1.02	40/0.18	N/A	9.5
#16	1.27	50/0.18	JIS-C-3316	12.0
#14	1.96	37/0.26	JIS-C-3316	15.0

Figure 2-1 For 170324-X, 170325-X, 170326-X, 1376429-X

Wire Size (AWG)	Composition of wire		Applicable JIS and JCS spec.	Current A(DC)
	Calculated Cross Section of conductor mm <sup>2</sup>	Number of Strands / Diameter of a Strand N/φ mm		
#18	0.86	34/0.18	-	7.0
#16	1.34	26/0.26	-	12.0
#14	2.19	41/0.26	-	15.0

Figure 2-2 For 1318306-1, 2238279-1, 63498-1, 63498-2

**4. PRODUCT QUALIFICATION TEST SEQUENCE**

Test Items	Test Group					
	1	2	3	4	5	6
	Test Sequence (a)					
Visual Examination					1	1
Termination Resistance (Low Level)						2, 4, 6, 8, 10
Dielectric Withstanding Voltage					5, 8	
Insulation Resistance					4, 7	
Temperature Rise				1		
Vibration (Low Frequency)						3
Contact Locking Strength			1			11
Contact Retention Force		1				
Connector Mating Force					2	
Connector Unmating Force					3	
Crimp Tensile Strength	1					
Thermal Shock						7
Humidity (Steady State)					6	5
Salt Spray						9

Number indicates sequence in which the tests are performed.

Figure 3.

The applicable product description and part numbers are as shown in Appendix 1.

Product Part No	Description
170324-X	187 Series Positive Lock Receptacle Contact
170325-X, 63498-X	187 Series Positive Lock Receptacle Contact
170326-X	187 Series Positive Lock Receptacle Contact
1376429-X, 2238279-X	187 Series Positive Lock Receptacle Contact
1318306-X	187 Series Positive Lock Receptacle Contact (For 0.8t TAB)
172074-X	1Pos. Positive Lock Housing
X-173974-X	1Pos. Positive Lock Housing
X-172210-X	2Pos. Positive Lock Housing (6mm Pitch)
X-175578-X	2Pos. Positive Lock Housing (7mm Pitch)
X-174587-X	2Pos. Positive Lock Housing (6mm Pitch Guide)

X-1318920-X	2Pos. Positive Lock Housing (with R) (6mm Pitch Guide)
179720-X	2Pos. Positive Lock Housing (10mm Pitch)
1376281-X	2Pos. Positive Lock Housing (17.9mm Pitch)
X-174712-X	2Pos. Positive Lock Housing (Micro Switch)
176498-X	2Pos. Positive Lock Housing (15mm Pitch)
X-353148-X	2Pos. Positive Lock Housing (16mm Pitch)
1376053-X	2Pos. Positive Lock Housing (12mm Pitch)
1376282-X	2Pos. Positive Lock Housing (12mm Pitch Parallel)
X-172075-X	3Pos. Positive Lock Housing (Micro Switch)
X-1318921-X	3Pos. Positive Lock Housing (With R) (Micro Switch)
174513-X	4Pos. Positive Lock Housing (for Defroster Devise of a Refrigerator)
X-173150-X	4Pos. Positive Lock Housing (for Power Relay)
1969870-X	3Pos. Positive Lock Housing Comb. (1) 187 and (2) 250

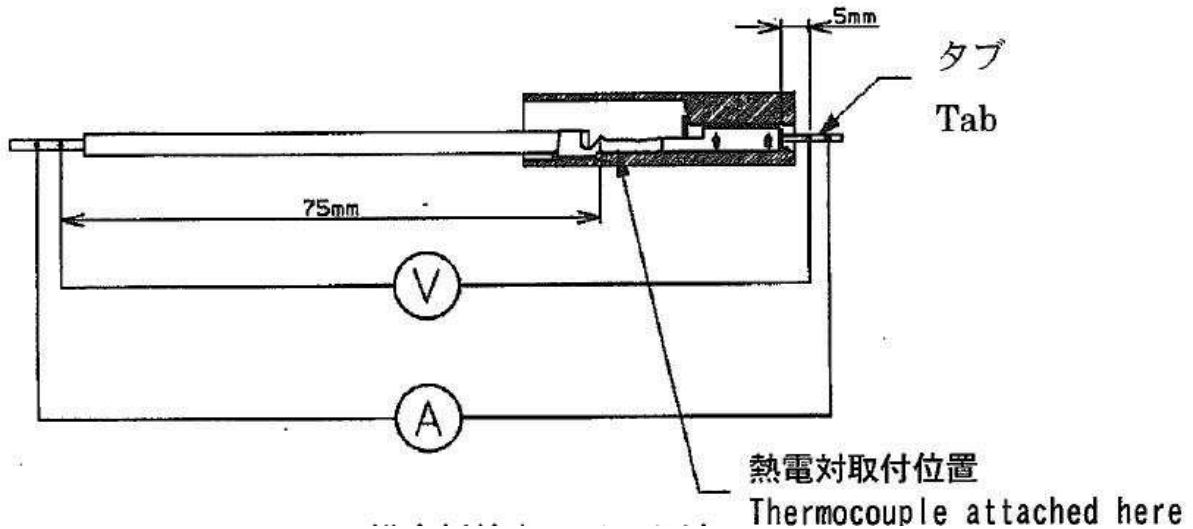


Figure 4. termination Resistance

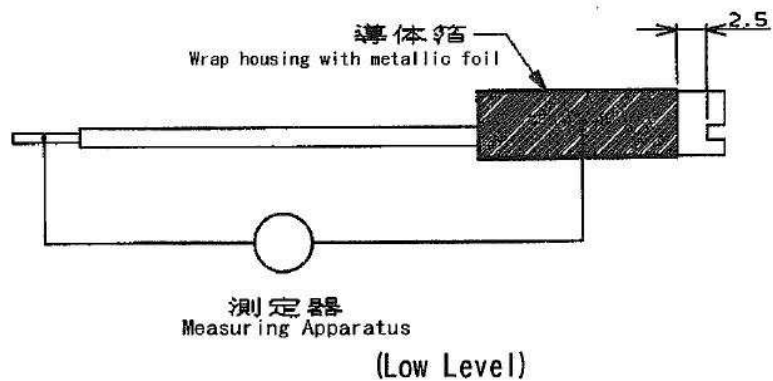


Figure 5. Insulation Resistance/ Dielectric withstanding Voltage

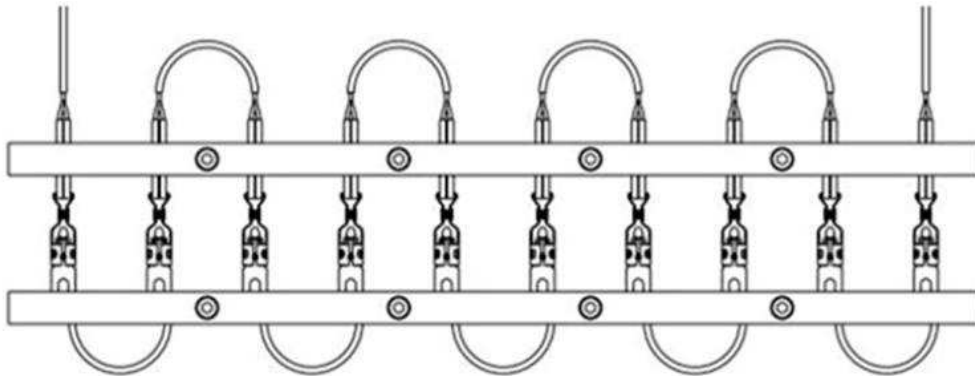


Figure 6. Vibration (Low Frequency)

## 5. MATING TAB DESIGN

Tab Contact for mating with "187" Series Positive Lock Contacts must be of the design specified in Fig 7  
 0.8t TAB Material shall be use Pre-Tin Brass or Pre-Tin-Bro unless individual indication.

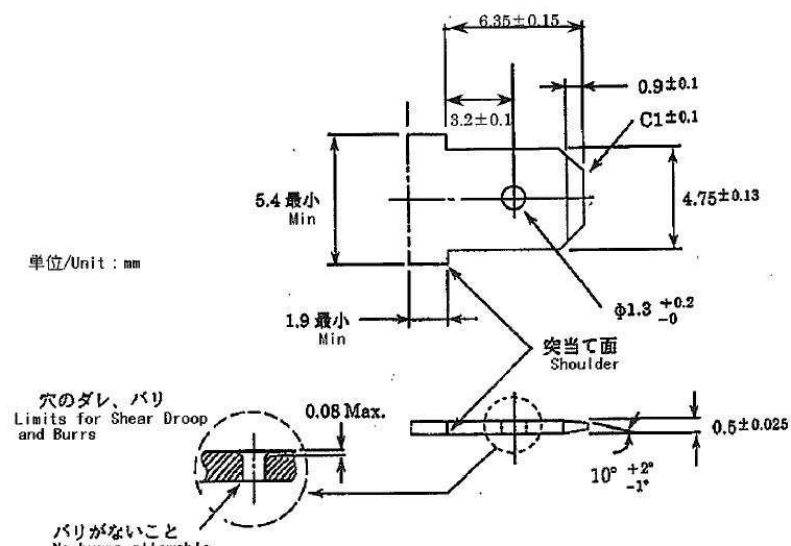


Figure 7.

### Notes:

1. Use 70/30 Brass conforming to C2600P-1/2 Hard of JIS H3100 for tab fabrication.
2. Plain metal must be used.



3. This tab design is applicable to purpose of performance testing of tabs. For the practical production purpose, refer to the following customer drawings prepared for recommendable tab design.
  - 1 Position: CP78-26022
  - 1 Position (Special Design): CP80-25076
  - 2 Position: CP80-25075
  - 3 Position (for Microswitch application): CP79-25225
  - 4 Position (for Power Relay application): C-173150ce
  - 4 Position (for Defroster Timer Device on Refrigerator): C-174513

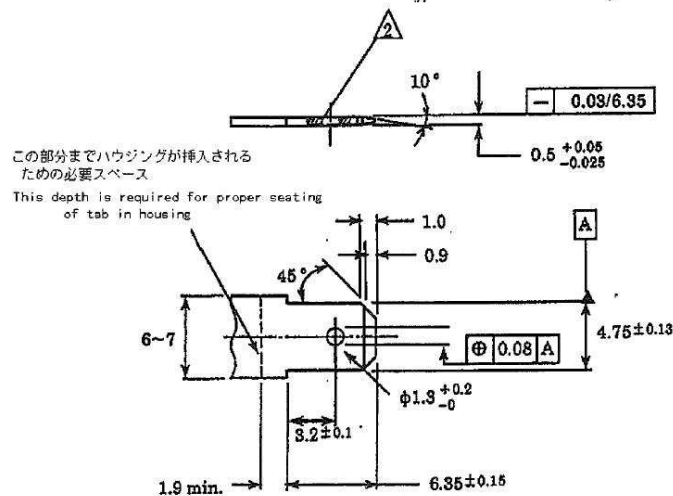


Figure 8-1. Type "A" Shouldered Type Tab

Notes:

1. The following series of drawings show the recommendable tab dimensions for mating with "187" series, 1 Position, Positive Lock Receptacle contact for aid of the customer to prepare the parts by their own in-house facilities.
2. No burrs are allowed on the tab hole edges, and the shear droop shall not exceed 0.08mm Fig 8.
3. This tab specification does not conform to the requirements of British Specification. For the details of applicability, refer to BS-5057.
4. The tabs prepared in accordance with these drawings, can accept FASTON Receptacle of the specified size. For details, refer to the recommendable tab drawing prepared for the customer.
5. The clearance spacing required for this tab to mate with "187" Series, 1Position, Positive Lock Mark II connector, is shown in Fig 8-4. The adjacent components and equipment must be keeping out from the specified dimensions.
6. Unless otherwise specified, the general tolerance of the  $\pm 0.2\text{mm}$  and angle within  $\pm 2^\circ$  shall be applied.
7. For fabrication of the tab, use 70/30 brass, in 0.5mm thickness, confirming to C-2600P-1/2H of JIS H3100.

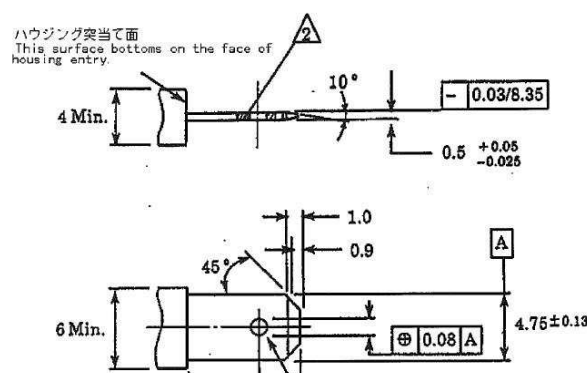


Figure 8-2. Type "B" Molded Type Tab

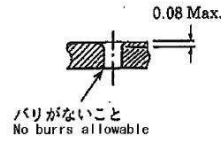


Figure 8-3. Limits for Shear droop and Burrs

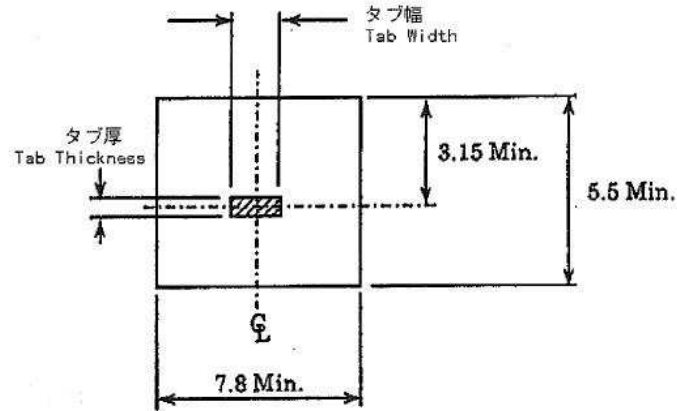
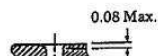
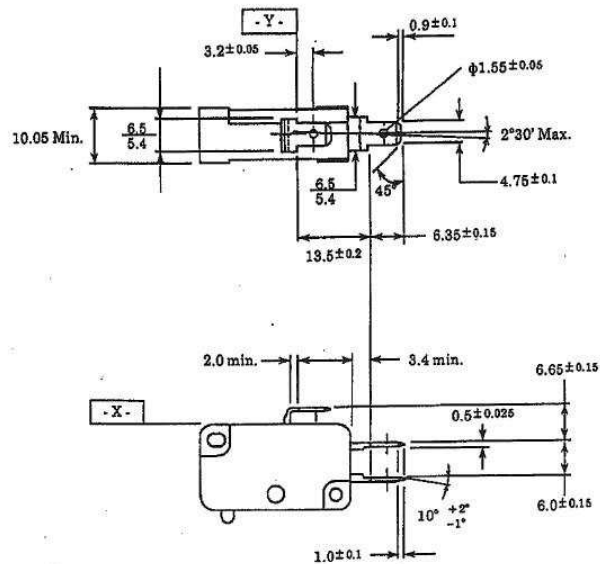


Figure 8-4. CP-78-26022



バリがないこと No burrs allowable

穴のダレ バリ Limits for Shear Droop and Burrs

Figure 9. Recommendable Dimension for 3 Position, Tab for mating with positive lock, "187" series receptacle contacts (CP-79-25225)

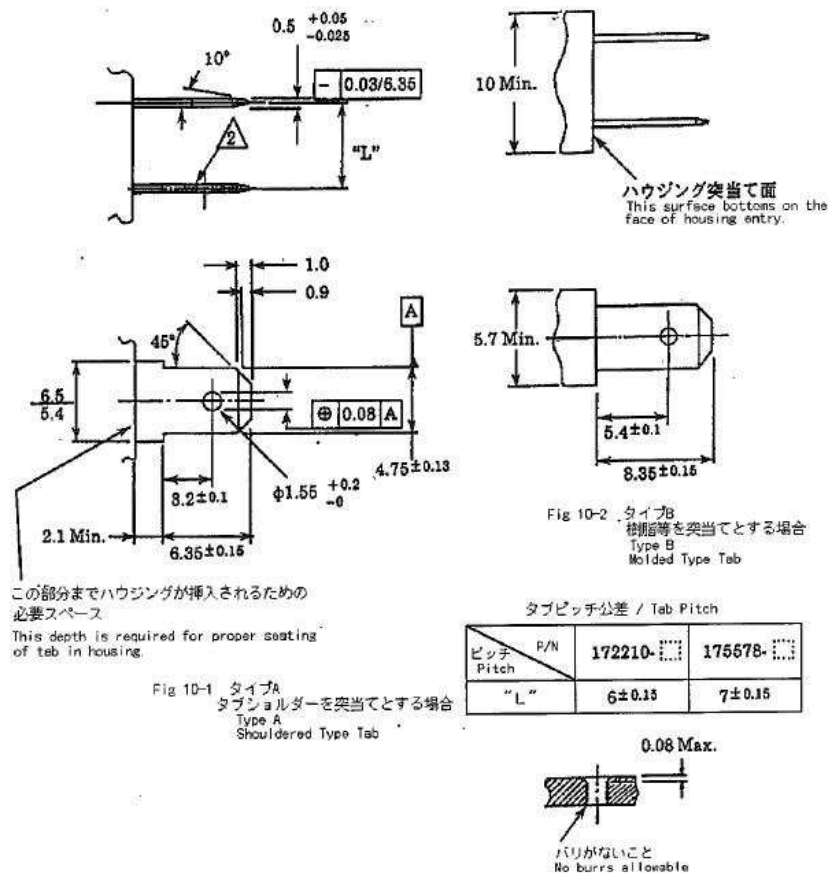


Figure 10-3. Limits for Shear Droop and Burrs.

Notes:

- The following series of drawings show the recommendable tab dimension for mating with "187" Series, 2-Position, Positive Lock Connector P/N 172210, for the aid of the customer to prepare the parts by their own in-house facilities.
- No burrs are allowed on the tab hole edges, and the shear droop shall not exceed 0.08mm (Fig 8-3).

3. For the dimension not shown in Type “B” TAB drawing, apply the common dimension shown in Type “A” Tab drawing.
4. General tolerance shall be within  $\pm 0.2$  and  $\pm 2^\circ$ .
5. For fabrication of the tab, use 70/30 brass in 0.5mm thickness, confirming to C-2600-1/2H of JIS H-3100.

**6. VALIDATION**

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AF1	Content added to 3.5.8 and 3.5.9		09-Mar-2023	S, Sontakke	K, Randolph	K, Randolph
AF						
AE	REVISED	FJ00-2624-02	16-Dec-02	T, HATANO	M, SUZUKI	M, SHINDO

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AD	REDRAWN WITH CHANGE	FJ00-1164-02	10-Jun-02	T, HATANO	M, SUZUKI	M, SHINDO
LTR	REVISION RECORD	ECN	DATE	DRAWN	CHECK	APPROVED