NUMBER 108-5037

AMP SECURITY CLASSIFICATION Customer Release

DESIGN OBJECTIVES

The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, AMP (Japan), Ltd. makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, AMP (Japan), Ltd. may change these requirements based on the results of additional testing and evaluation. Contact AMP Engineering for further details.

In case when "product specification" is referred to in this document, it should be read as "design objectives" for all times as applicable.

1. Scope:

1.1 This specification covers general requirements for MATE-N-LOK Connectors.

2. Materials Used:

Housings are molded of Nylon. Contacts are fabricated of brass, pretinned brass, phosphor bronze and pretinned phosphor bronze or equivalent. Post-tinned or gold-plated contacts are also available.

3. Appearance:

The contacts shall be free from presence of rust, discoloration, cracks and deformation which are detrimental to the connector functions.

4. Construction, Feature and Dimensions:

4.1 Construction:

Connector housings are classified into three types, according to the mounting features. They are panel mounting type, motor frame mounting type and free hanging type.

4.1.1 Panel Mounting Type:

This type of connector consists of two halves of housing blocks, --- Cap Housing and Plug Housing. Cap Housing accommodates pin contacts and is mounted on the panel, whereas Plug Housing accommodates socket contacts and is mated with Cap Housing which is mounted on the panel.

4.1.2 Motor Frame Mounting Type:

This type of connector consists of two halves of housing blocks, --- Cap Housing and Plug Housing. Cap Housing accommodates pin contacts and mounted on flat or curved panel, whereas Plug Housing accommodates socket contacts and is mated with Cap Housing which is mounted on the panel.

4.1.3 Free Hanging Type:

This type of connector consists of two halves of housing blocks,--- Cap Housing and Plug Housing. Cap Housing accommodates pin contacts, and Plug Housing accommodates socket contacts. These two halves of housings are mated one another without being mounted on the panel.

4.2 Features and Dimensions:

The features and dimensions of the connector assembly shall be in accordance with the applicable customer product drawings.

LTR	REVISION RECORD	DR	CHK	DATE
E_1	Design Objectives	K.U	Y.T	10-15-93
E	Revised per RFA-546	[illegible]	[illegible]	6-20-82
D	Revised per RFA74-158	[illegible]	[illegible]	7-30-74

DR [illegible] 7-30-74
CHK [illegible] 7-30-74
APP [illegible] 7-31-74

AMP (Japan), Ltd. TOKYO, JAPAN

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SHEET 1 OF 8

NAME Design Objectives MATE-N-LOK Connector

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5. Performance:

5.1 Initial Performance:

5.1.1 Low Level Contact Resistance:

When tested in accordance with the test method specified in Para. 7.1, the low level contact resistance shall be 20mΩ maximum per contact position.

5.1.2 Insulation Resistance:

When tested in accordance with the test method specified in Para. 7.2, the insulation resistance between adjacent contacts and the contacts and the ground shall be not less than 10,000MΩ.

5.1.3 Dielectric Strength:

When tested in accordance with the test method specified in Para. 7.3, there shall be no evidence of abnormalities such as flashover and current leakage over the connector assembly.

5.1.4 Temperature Rising:

When tested in accordance with the test method specified in Para. 7.4, the temperature rising of the connector assembly shall be not greater than 20 degrees Celsius.

5.1.5 Connector Mating and Unmating Force:

When tested in accordance with the test method specified in Para. 7.5, the connector mating and unmating force shall be conforming to the specified values listed in Tables 1-1 and 1-2 under specified test conditions stated in Paras. 7.5.1 and 7.5.2 respectively.

Table 1-1, Connector Mating and Unmating Force(Detent Locking Type)

	Test Paragraph	1-Pos	2-Pos. (I)	2-Pos. (II)	2-Pos. (III)	3-Pos.	4-Pos.
Mating Force Max. (kg)	7.5.1	2.5	4.5	4.5	4.5	6.0	7.5
	7.5.2	4.0	6.5	5.5	8.5	7.0	8.5
Unmating Force (kg)	7.5.1	0.15 - 1.5	0.5 - 4.0	0.5 - 4.0	0.5 - 4.0	0.8 - 4.5	1.0 - 6.0
	7.5.2	2.0 - 4.0	2.5 - 6.0	2.0 - 5.0	3.0 - 8.5	1.7 - 6.0	2.0 - 8.0

* 2-Pos. (I) Standard Type, Material: WELAMID 6600, P/N 171208, 171209
2-Pos. (II) " " " ZYTEL 101 P/N 171174, 171175
3-Pos. (III) Heavy Duty Locking Type, Mat'l: LEONA1300S P/N170923, 170924

Table 1-2, Connector Mating and Unmating Force(Leg Locking Type)

	Test Paragraph	6-Pos.	8-Pos.	9-Pos.	10-Pos	12-Pos	15-Pos	16-Pos.
Mating (kg) Force (Max.)	7.5.1	13.0	13.5	14.0	14.0	15.0	16.0	17.0
Unmating(kg) Force		2.5 - 13.0	3.5 - 13.5	4.0 - 14.0	4.0 - 14.0	5.0 - 15.0	6.0 - 16.0	6.0 - 17.0

5.1.6 Contact Insertion/Extraction Force:

When tested in accordance with the test method specified in Para. 7.6, the contact insertion force shall be not greater than 2.2kg, and the extraction force shall be in the range of 0.15 - 1.5 kg.

5.1.7 Contact Retention Force:

When tested in accordance with the test method specified in Para. 7.7, the contact retention force shall be not less than 7 kg.

5.1.8 Housing Retention Force(Not applicable to housings of having 1 thru 4 Pos.):

When tested in accordance with the test method specified in Para. 7.8, the force required to unmate the connector halves with locking device engaged shall be not less than 6 kg.

5.1.9 Crimp Tensile Strength:

When tested in accordance with the test method specified in Para. 7.9, the crimpe tensile strength shall conform to the values specified in Table 2.

Table 2, Crimp Tensile Strength: (kg)

Wire Size mm^2	0.05	0.08	0.13	0.2	0.3	0.5	0.75	1.25	2.0
(AWG)	(#30)	(#28)	(#26)	(#24)	(#22)	(#20)	(#18)	(#16)	(#14)
Crimp Tensile Strength(Min.)	0.5	0.8	1.5	3.0	4.5	7.0	9.0	12.0	16.0

5.2 Durability:

5.2.1: Repeated Insertion/Extraction Force:

When tested in accordance with the test method specified in Para. 7.10, the insertion force of the connector after repetition of 50 cycles shall be conforming to the values specified in Tables 3-1 and 3-2. The extraction force of a mated pair of contacts shall be within the range of 0.1 - 1.0 kg, and the low level contact resistance shall be not greater than 30 mΩ.

Table 3-1, Repeated Insertion/Extraction Force:(Detent Locking Type)

	Test Paragraph	1-Pos.	2-Pos. (I)	2-Pos. (II)	2-Pos. (III)	3-Pos.	4-Pos.
Insertion Force Max. (kg)	7.5.1	2.5	4.5	4.5	4.5	6.0	7.5
	7.5.2	4.0	6.5	5.5	6.5	7.0	8.5
Extraction Force (kg)	7.5.1	0.1 - 1.0	0.3 - 4.0	0.3 - 4.0	0.3 - 4.0	0.4 - 6.5	0.6 - 6.5
	7.5.2	1.2 - 4.0	1.5 - 6.0	1.0 - 5.0	1.5 - 6.0	1.0 - 6.0	1.2 - 8.0

Table 3-2, Repeated Insertion/Extraction Force:(Leg Locking Type)

	Test Paragraph	6-Pos.	8-Pos.	9-Pos.	10-Pos.	12-Pos.	15-Pos.	16-Pos.
Insertion Force (kg) Max.	7.5.1	11.0	11.0	12.0	12.0	13.0	14.0	15.0
Extraction Force (kg)		1.5 - 11.0	1.5 - 11.0	2.0 - 12.0	2.5 - 12.0	3.0 - 13.0	3.0 - 14.0	3.0 - 15.0

5.3 Environmental Performance:

5.3.1 Humidity(Steady State):

When tested in accordance with the test method specified in Para. 7.11, there shall be no evidence of abnormalities with regard to connector appearance and construction. The insulation resistance between the adjacent contacts and the contacts and the ground shall be not less than 1,000MΩ without evidence of abnormalities caused by falshover and current leakage. The extraction force of the housing blocks, having contact positions of 1 thru 3 shall be conforming to the values specified in Table 4. (The housing blocks habing contact positions of 6 thru 16 are exclusive of this application.)

Table 4, Extraction Force after Humidity Test:

	Test Paragraph	1-Pos.	2-Pos. (I)	2-Pos. (II)	2-Pos. (III)	3-Pos.	4-Pos.
Extraction Force (kg)	7.5.2	1.5 - 4.0	2.0-6.0	1.5 - 5.0	2.0-6.0	1.2 -6.0	1.5-8.0

5.3.2 Ammonia Gas Resistibility:

When tested in accordance with the test method specified in Para. 7.12 there shall be no evidence of abnormalities such as cracks which are detrimental to the connector functions.

5.3.3 Heat Resistibility:

When tested in accordance with the test method specified in Para. 7.13, the connector shall show no evidence of abnormalities with regard to appearance and construction, and shall have performance conforming to the values specified in Para. 5.12 (insulation resistance) and 5.13 (dielectric strength). The insertion/extraction force of the connector assemblies having contact positions of 1 thru 4 shall be conforming to the values specified in Table 5. The housing blocks having contact positions 6 thru 16 are exclusive of this application.

Table 5, Insertion/Extraction Force after Heat Resistibility Test:

	Test Paragraph	1-Pos.	2-Pos. (I)	2-Pos. (II)	2-Pos. (III)	3-Pos.	4-Pos.
Insertion Force (kg) Max.	7.5.2	3.0	7.6	7.5	9.5	8.2	9.0
Extraction Force (kg)		2.0 - 5.2	2.5 - 7.8	2.5 - 7.5	3.0 - 9.5	1.7 - 7.8	2.0 - 10.5

5.4 Maximum Performance Rating:

5.4.1 Temperature Rating:

The temperature rating of this product is 105°C Max. for continuous operation.

5.4.2 Voltage Rating:

The voltage rating of this product is 250V Max. (AC, DC).

5.4.3 Current Rating:

The continuous rating of this product is dependent upon the wire used, number and disposition of the contacts appplied. The values shown in Table 6 will be referenced for maximum current rating of mated pair of 15-Pos. housing assemblies.

Wire Size	mm^2	0.05	0.08	0.13	0.2	0.3	0.5	0.75	1.25	2.0
	(AWG)	(#30)	(#28)	(#26)	(#24)	(#22)	(#20)	(#18)	(#16)	(#14)
Current (A)		2.5	3.0	5.0	6.0	8.0	10.0	13.0	18.0	20.0

6. Test Conditions:

6.1 Environmental Conditions:

Unless otherwise specified, the test shall be conducted under any combination of the following environmental conditions.

Temperature: 15 - 35°C
Humidity: 45 - 75%
Barometric Pressure: 650 - 800mmHg.

6.2 Test Specimens:

The test specimens used for the tests shall be prpared with the use of specified wires and contacts under proper combination and crimping application under the normal control for proper crimp height. No sample shall be reused.

7. Test Methods:

7.1 Low Level:

The termination resistance of a mated pair of contacts assembled in the connector housing shall be measured by test current at open circuit voltage of 20mA, between the probing points of Y-Y' as shown in Figure 1, with the use of milliohmmeter (Takeda's Model 6027 or equivalent recommendable). The termination resistance shall be calculated by deducting the resistance values of 150mm long wire from the total measurement reading.

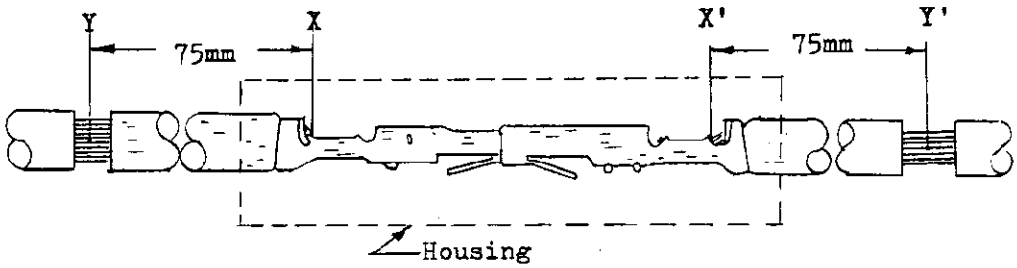

Figure 1

7.2 Insulation Resistance:

The insulation resistance shall be tested in accordance with Test Condition B, Test Method 302 of MIL-STD-202. The insulation resistance shall be measured separately between adjacent pairs of contacts, and between the contacts and the ground with the use of insulation ohmmeter.

7.3 Dielectric Strength:

The dielectric strength shall be tested in accordance with Test Method 301 of MIL-STD-202. The dielectric strength shall be measured between the adjacent contacts in the housings on the dielectric strength tester, by applying test voltage of AC 3KV for 1 minute.

7.4 Temperature Rising:

The temperature rising of the connector assembly shall be measured at the test current of 5A after having 100 cycles of repeated insertion and extraction. Measure the temperature rise in the area between X and X' in Figure 1. The wires used for this test shall be of 0.3 - 0.75mm^2(AWG #22-18).

7.5 Connector Mating and Unmating Force:

The housings, filled with the contacts, are mated together. And fasten onto the stable stand of tensile testing machine. The other half of the connector shall be engaged and disengaged by operating the head uniformly with the speed at a rate of 100mm per minute in axial direction. The measurements shall be done in the conditions stated in Para. 7.5.1 and Para. 7.5.2.

7.5.1 Measure the mating and unmating force without locking device engaged.

7.5.2 Measure the mating and unmating force with locking device engaged. (Applicable to only housings having contact positions of 1 thru 4.

7.6 Contact Insertion/Extraction Force:

Fasten the mated pair of contacts on the tensile testing machine, and measure the insertion/extraction force by operating the machine to mate and unmate the contacts in axial direction with the speed at a rate of 100mm per minute.

7.7 Contact Retention Force:

The contacts are accommodated in the connector cavities. Fasten the connector housing onto the tensile testing machine and operate the machine to pull off the contact in axial direction with the speed at a rate of 100mm per minutes. The contact retention force is determined when the contact is pulled out of the connector cavity.

7.8 Housing Retention Force:

Connector housing halves shall be filled with the contacts and mated together. Fasten any one of them onto the stable stand of tensile testing machine. The other counterpart of the connector shall be fastened onto the machine head which is driven to pull off the halves in axial direction. The housing retention force is determined when the housings are unmated by disengagement or breakage of locking device.

7.9 Crimp Tensile Strength:

Fasten the wire-crimped contact onto the stable stand of tensile testing machine. Apply the pull-off load to the crimped wire in axial direction. The crimp tensile strength is determined when the wire is pulled out of the wire crimp.

7.10 Repeated Connector Insertion/Extraction Force:

Measure the insertion and extraction force of the mating connector halves on the tensile testing machine, after repeating 50 cycles of insertion/extraction of the housings.

7.11 Humidity:(Steady State):

After placing the sample in the test chamber for 72 hours for exposure conditioning, where the temperature of 40 $\pm 2^{o}$C, the relative humidity of 90-95% is mainteained, remove out of the chamber and leave the sample in the room temperature for 30 minutes. When the sample is dried, conduct the tests on insulation resistance per Para. 7.2, on dielectric strength per Para. 7.3 and on connector unmating force per Para. 7.5.

7.12 Ammonia Gas Resistibility:

Place the sample of mated pin and socket contacts in an 8-liter desiccator for 40 minutes which is filled with ammonia gas generated by a quantity of 400g, 28% ammonia solution. After exposure under gaseous conditioning, the sample shall be inspected closely for presence of abnormalities such as cracks.

7.13 Heat Resistibility:

After placing the sample in the test chamber for 72 hours for exposure conditioning, where the temperature of 80 $\pm 2^{o}$C is maintained, remove it out of test chamber to the room temperature for 30 minutes. When the sample is stabilized, conduct the tests on insulation resistance per Para. 7.2, on dielectric strength per Para. 7.3 and on connector mating and unmating force per Para. 7.5.