

BULB SOCKET ASS'Y

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[APPENDIX]

[SPECIFICATION APPROVAL]

1. Scope

1.1 Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of Bulb Holder. The applicable product description and part number are as follows:

Part number	Descriptions
2005159	Bulb Socket Ass'y for T20
2005340	
2109118	
2005161	
2188432	
2109302	Bulb Socket Ass'y W5W S/R

* Extension Cover (PN2109120, PN2109938) for 2109118

1.2 Qualification

When test are performed the following specified documents and standards should be used.
All inspections should be performed using the relating inspection plan and product drawing.

2. Applicable Documents

2.1 Reference Documents

- A. SAE/USCAR-15 Revision 3
- B. USCAR-15 Revision 4(only for out-gassing Test)
- C. USCAR 21

2.2 Definition of Terms :

2.2.1 Contact (Terminal) :

An electrically conductive metallic member, used independently or as a component of connector Assembly. This is assembled with Housing and can support to hold bulb.

2.2.2 Housing:

A dielectric component member of connector. Housing is available to hold Rec.Terminal.

2.2.3 Wire Seal

Attached on wire of receptacle contact. The purpose of this wire seal is water-proofing.

2.2.4 Connector

Connector is an assembly of housing. Bulb housing is assembled with tab contact, plug housing assembled with receptacle contacts.

3. Requirements :

3.1 Design and Construction

Product Design, construction and physical dimensions shall be followed applicable product drawing.

3.2 Material and Finish

A. Terminal

Part number	Material	Finish
2005163	Cu Alloy	Pre-tinned
2005164	Cu Alloy	Pre-tinned
2109304	CuNiSi Alloy	Pre-tinned

B. Housing

Bulb Ass'y for T20 : PA46-GF15

Bulb Ass'y W5W S/R : PA46-GF15

C. Accessories and Hardware :

Wire Seal : Silicon, Seal Ring : Silicon

Extension Cover : PA66-GF15

** Refer applicable drawing for more detail.

3.3 Performance and Test Descriptions

The product is designed to meet electrical, mechanical and environmental performance requirements specified in Par.3.4. All test are performed at ambient temperature unless otherwise specified.

3.3.1 General Requirements

A. Sample selection

Test samples are to be subjected to production intend processing, including final packaging.

B. Equipment Tolerances

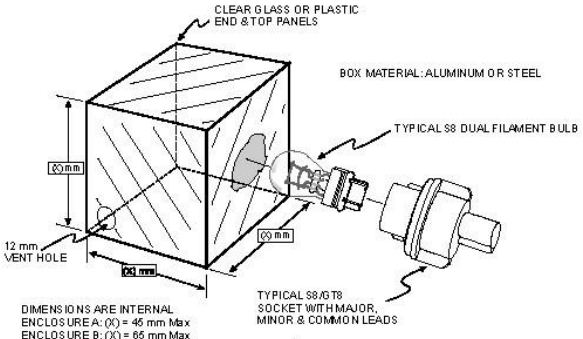
Test Equipment must be capable within the limits found in the Equipment Tolerance Table.

EQUIPMENT TOLERANCE TABLE

Test chamber Temperature	Nominal $\pm 3^{\circ}\text{C}$
Time	Nominal $\pm 0.5\%$
Forces	Nominal $\pm 0.01\text{N}$
Distances	Nominal $\pm 0.01\text{mm}$
Voltages	Nominal $\pm 0.01\text{V}$ for photometrics
	Nominal $\pm 0.1\text{V}$ for all other tests
Mean Spherical Candela	Nominal $\pm 2.0\%$

3.4 Test Requirements and Procedures Summary

No	TEST DESCRIPTION	ACCEPTANCE CRITERIA	PROCEDURES
3.4.1	Bulb Insertion, Removal Force	<W5W, T20> Insertion force : 10N~60N Removal force : 10N ~60N	Using Bulb, Min/Max gage, : 1. Mount socket in appropriate mechanism to hold it securely. 2. Using force gauge fully seat each bulb, at a rate of 50 mm/min., into a socket. 3. Record the maximum force in 'N'. ** Do not over insert bulb. 4. Using a force gauge remove bulb at a rate of 50 mm/min. from socket. 5. Record the force required to remove the bulb.
3.4.2	Bulb Wobble	The maximum allowable movement at the filament location in any direction is 1.5 mm	1. Apply a 4.5 N force for T20 Holder 2. Apply a 4.5 N force for W5W Holder * Record gauge movement as measured in each of four directions.
3.4.3	Socket Insertion/Removal	- Installing a Holder Max : 2.0N-M for T20 Max : 1.3 N-M for W5W - Removal force Max : 3.0N-M for T20 Max : 2.5N-M for W5W Min : 1.0N-M for T20 Min : 0.7N-M for W5W	1. Insert socket into the maximum material thickness test panel. 2. Rotate socket with torque wrench until fully installed. 3. Record maximum force in N-M or in.-lbs. 4. Unlock socket locking mechanism, if applicable. 5. Rotate socket (removal direction) with torque wrench until fully uninstalled. 6. Record maximum force in N-M or in.-lbs. 7. Repeat Step 1-2 and 4-6 using minimum Material thickness test panel

No	TEST DESCRIPTION	ACCEPTANCE CRITERIA	PROCEDURES
3.4.4	Connector Insertion/Removal	[Insertion] Mating force : Min. 22N [Removal] - without primary lock : Max 75N - with primary lock & without CAP : Min 110N	[insertion] 1. Increase the mating force at a uniform rate 50 ±10mm/min. until complete mating occurs. Test all samples. [Removal] 1. Increase the un-mating force at a uniform rate Not to exceed 50mm/min. until complete separation occurs. Test all samples in 1 st group.
3.4.5	Socket Strength	No damage, distortion, disassembly Min. torque to stop position: 6N-M for T20 2N-M for W5W	Apply a 120 N force in each of four directions on axial sockets
3.4.6	Terminal Retention	- Primary lock Min : 60N - Primary lock Min (W5W) : 30N - After moisture Min(W5W) : 60N	1. Install a terminal sample into each cavity in the connector being tested. 2. Adjust the force tester to pull the terminal straight back from the connector. 3. Record the force
3.4.7	Fluid Resistance (B/socket & Extension HSG)	No visible degradation, swelling, cracking	Completely submerge at least 1 test sample in each fluid table below for 30 minutes. Fluids are to be stabilized at specified temperatures. Each sample is to be submersed in one fluid only, unless otherwise requested.
3.4.8	Outgassing	No effect to Function and the labeling must be legible	 <p>Condition : ambient temperature(23.5°C ±5°C) for 30 days Voltage : 14V</p>
3.4.9	Thermal Shock	No evidence of visible fractures, warpage or deformation	1 Cycle : -40°C 29min, 85°C 29min Transfer time : 2 min Total : 150 cycle Refer "Thermal Shock / Power Temperature Cycling / High Temperature Exposure Table".

No	TEST DESCRIPTION	ACCEPTANCE CRITERIA	PROCEDURES
3.4.10	Power Temperature Cycling	No function effect, No evidence of visible fractures, warpage or deformation	Supply power(on/off) : 14VDC Temperature Range : -40°C ~ 85°C Cycle : 306 Refer to "Thermal Shock / Power Temperature Cycling / High Temp. Exposure Table" "Power Temp. Cycle profile", "Power Temp. Cycle profile Criteria"
3.4.11	Voltage Drop	Not exceed 10 millivolts per amp (mV/A) for initial Voltage Drop test samples prior to any other testing, and 50 mV/A for samples after they have been subjected to other tests.	Power the circuit at reference maximum operating current and wait 5 minutes minimum to ensure that the test current stabilizes at the appropriate value T20 : 2.4A, W5W : 1.5A
3.4.12	High Temp. Exposure	No evidence of visible fractures, warpage or deformation	Power : 14Vdc For 5 days (85 °C)
3.4.13	Mechanical Shock	Circuit interruption : Not exceed 2 msec	Accelation : 20±5G Duration : 11±2msec Current : 2.4A
3.4.14	Temperature Rise	Max. Temperature Rise 50°C	Voltage : refer socket Classification table. See figure Temperature Rise Thermocouple Placement
3.4.15	Ozone Resistance	No damage or degradation (inc. labeling)	Ozone : 50 ± 5pphm Temp. & Duration : 50 °C, 24 hours
3.4.16	Salt Spray	No damage or degradation (inc. labeling)	Temp. : 30°C, Power : on 45 min. Off 15 min Spray : 47 hours acc. to ASTM B 117 Dry : 1 hour Repeat Spray and Dry(Total 96 hours)
3.4.17	Isolation Resistance	R > 20 Mohms @ 500 VDC For 15s	Set 500 VDC Use Megohmmeter to Measure resistance. Apply voltage for 12 sec at least
3.4.18	Temp. Humidity Cycling	This is a conditioning test that has no acceptance criteria and is intended to be run as part of test sequences.	(15 cycle) 16 hours at 95% 2 hours at -40 °C 2 hours at 85 °C 4 hours at room ambient
3.4.19	System Seal Integrity	No air bubbles. No evidence of water	1. Submerged Socket Test Initial : 30kpa for 15sec After : 15kpa for 15sec (85 °C for 70h) 2. High pressure Water Spray Spray for 30min. Rotate table 4 revolutions per min (See water spray test figure)

No	TEST DESCRIPTION	ACCEPTANCE CRITERIA	PROCEDURES												
3.4.20	Vibration	Without arcing or any other Disconnects	<table border="1"> <thead> <tr> <th data-bbox="943 306 1295 331">Frequency Breakpoint</th> <th data-bbox="1295 306 1549 331">G²/Hertz Level</th> </tr> </thead> <tbody> <tr> <td data-bbox="943 331 1295 357">10 Hz</td> <td data-bbox="1295 331 1549 357">0.005</td> </tr> <tr> <td data-bbox="943 357 1295 382">21 Hz</td> <td data-bbox="1295 357 1549 382">0.01</td> </tr> <tr> <td data-bbox="943 382 1295 407">80 Hz</td> <td data-bbox="1295 382 1549 407">0.04</td> </tr> <tr> <td data-bbox="943 407 1295 432">350 Hz</td> <td data-bbox="1295 407 1549 432">0.04</td> </tr> <tr> <td data-bbox="943 432 1295 457">2000 Hz</td> <td data-bbox="1295 432 1549 457">0.006</td> </tr> </tbody> </table> <p data-bbox="943 491 1549 552"> - Voltage : 14V - More detail refer USCAR-15 Rev.3 (5.9.2) </p>	Frequency Breakpoint	G ² /Hertz Level	10 Hz	0.005	21 Hz	0.01	80 Hz	0.04	350 Hz	0.04	2000 Hz	0.006
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3.4.21	1008 Hour Current Cycle		<p data-bbox="943 611 1549 642">- Detail refer USCAR-15 Rev.3 (4.4)</p>												

[APPENDIX]

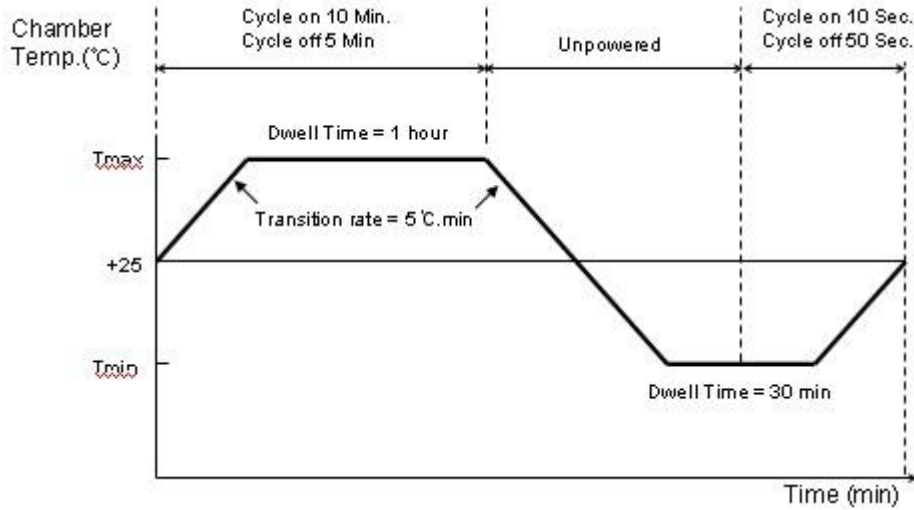
Fluid Table

FLUID TYPE	FLUID DESCRIPTION	STABILIZATION TEMPERATURE °C
Brake Fluid	SAE RM66-XX	50 ± 5
Oil	ISO 1817, Oil No. 2	50 ± 5
Gasoline	ISO 1817, liquid C	25 ± 5
Engine Coolant	50% ethylene glycol + 50% distilled water	50 ± 3
Automatic Transmission Fluid	Dexron III	50 ± 5
Windshield Washer Solvent	50% Isopropyl Alcohol + 50% Water	25 ± 5
Power Steering Fluid	ISO 1817, Oil No. 3	50 ± 5
Diesel Fuel	90% ISO 1817, Oil No. 3+ 10% P-Xylene	25 ± 5
E85 Ethanol Fuel	85% Ethanol + 15% ISO 1817 liquid C	25 ± 5
Tar Remover	45% Xylene + 55% Petroleum base mineral spirits	25 ± 5

Thermal Shock / Power Temperature Cycling / High Temperature Exposure Table

Temperature Range	Cycle Time (Min)		Sample Size	Number of Cycles		Days	Test Time
	Thermal Shock	Power Temp		Thermal Shock	Power temp	High Temp Exposure	Days
-10 to +85 °C	60	140	18	150	306	6	42
	60	140	18	282	84	11	31
	60	140	23	150	236	6.5	35.7
	60	140	23	244	80	10	27.9

Power Temperature Cycle Profile



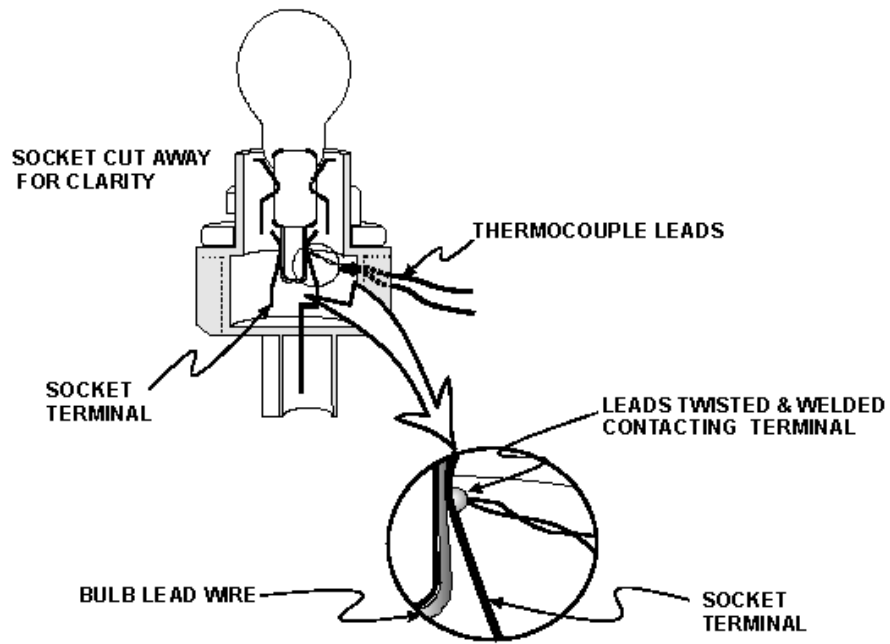
Power Temperature Cycle Profile Criteria

Min. number of 1 life cycles	
Function	Number of Cycles
On / Off	200 minimum

Temperature range	-40°C to 85°C
Operating Type	Normal operating mode with continuous monitoring
Temperature Transition Rate	(5 ± 1) °C/min or modified with the approval of Engineering
Power off	High to low temperature transitions. During first half of low temperature dwell
Supply Voltage	14.0 Vdc

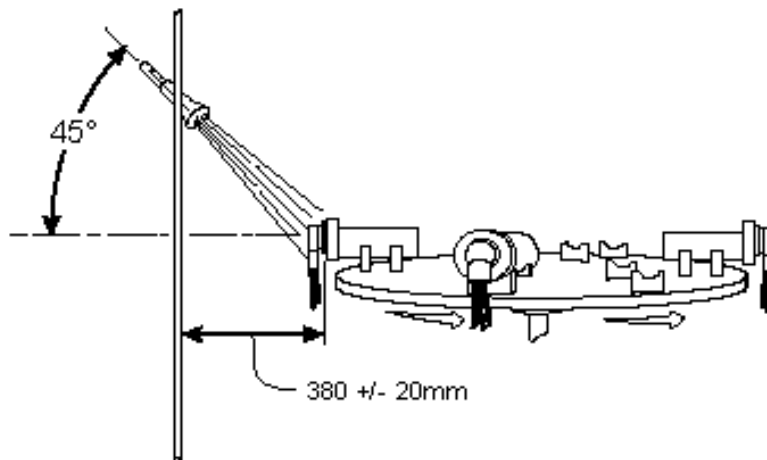
Socket Classification Table

SOCKET CLASSIFICATION	USED WITH BULB TYPE	VOLTAGE TEST DEVICE	TEST CURRENT (amps) ± 1%	
			MAJOR	MINOR
I	S8 Wedge/GT8	Shorted S8/GT8	2.4	0.6
II	T3 ¼ & T5	Shorted W2 Bulb	1.5	N.A.
III	T1 ¾	Shorted W1 Bulb	0.3	N.A.
IV	T20	Shorted T20 Bulb	2.4	0.6
V	H21	Shorted H21 Bulb	1.9	N.A.
Other*				



Temperature Rise Thermocouple Placement Figure

Figure 2: Temperature Rise Thermocouple Placement
(Socket design shown for reference only)




Water Spray Test Figure

[SPECIFICATION APPROVAL]

PREPARED BY,

Y.H. KIM,




20. Jan. '12

PRODUCT ENGINEER

CHECKED BY,

K.T. LIM



20. JAN '12

ASSIST PRODUCT ENGINEER

APPROVED BY,

H.G. CHO



1/20/12

ENGINEERING DIRECTOR