



DEFENSE LOGISTICS AGENCY
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July 1st, 2015

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Final draft of Engineering Practice Study (EPS) on MIL-DTL-32139/1 through /8
(see table below for details).

Document Number	Action Taken	Complete Title	Spec-Finder (Y/N)	Reason Code	Project Number
MIL-DTL-32139/1 through /8	EPS	MIL-DTL-32139/1 Through /8 Dimensional Tolerance Change Request for Contact Depth and Contact True Position	N	VEN	5935-2015-160

The subject non-QPL document(s) has been dated 22 June 2015. Copies of this document(s) may be downloaded from the DLA Land and Maritime Web site:

<http://www.landandmaritime.dla.mil/programs/milspec/>

If you do not have access to the internet, or you have problems downloading the document, printed copies may be obtained from Ralph Antonelli at (614) 692-0576, facsimile transmission (614) 692-6939, or by e-mail ralph.antonelli@dla.mil.

Sincerely,

/ SIGNED /

ABDONASSER M. ABDOUNI
Chief,
Interconnection Branch

ENGINEERING PRACTICE STUDY

**MIL-DTL-32139/1 through /8
DIMENSIONAL TOLERANCE CHANGE REQUEST FOR
CONTACT DEPTH AND CONTACT TRUE POSITION**

PROJECT NUMBER: 5935-2015-160

22 June 2015

FINAL REPORT

**Prepared by:
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ENGINEERING PRACTICE STUDY

OBJECTIVE The purpose of this EPS was to review dimensional tolerance change to the contact depth for MIL-DTL-32139 plug and receptacle connectors and to the socket contact true position for MIL-DTL-32139 receptacle connectors.

BACKGROUND This EPS came about in a standardization improvement proposal to maintain acceptable contact wipe conditions well also promoting improved manufacturability. See attached drawings detailing the requested changes. A dimensional tolerance analysis was performed by the requesting manufacture which supports that the design can accommodate these increases in tolerance.

Methodology: Canvass military/industry for input on the attached drawings detailing the dimension changes to determine if proposed changes are acceptable and do not detract from form fit or function of current requirements. Based on the results of this EPS these proposed dimensions will either be incorporated into the applicable MIL-DTL-32139 connector specification sheets or determined to be unacceptable. The attachments below show both the current requirement and the proposed change for the contact depth for both pug (Attachment 1) and receptacle (Attachment 2) and the true position comparison for receptacles (Attachment 3).

COMMENTS: The following comments were received from Military and Industry:

Plug and receptacle contact depth

Comment 1 (Military):

“Paragraph 3.4.3.1 allows tolerance analysis, but there is no mention of statistical tolerance analysis. The issue I see is that if you apply the mathematical model with the proposed tolerance increases using the contractor's pin & socket design there is a possibility that the wipe requirement may not be met. Worst case wipe dimension could be .0132 (see below). In order to have a 100% yield on the wipe requirement given this scenario, the tolerances for their product would need to be tightened up. This would appear to be a conflict with the contractor's intentions. Given the proposed tolerance increases, other methods that might enable the contractor to meet the requirement include a "mix and match" tactic or just move forward expecting less than 100% yield. The "mix and match" tactic would appear to be inefficient. However, less than 100% yield can be an efficient methodology, as long as the production savings are greater than the yield losses.

In any case, there is no requirement to verify the wipe measurement directly since the mil spec states "may be satisfied by tolerance analysis". Bottom line: if we agree to the contractor's statistical tolerance analysis rather than mathematical tolerance analysis and agree to the tolerance increases, it appears that there is a possibility that the assembled, approved product could be in violation of the wipe requirement. It would seem that this possibility should be at contractor risk not government risk.”

Comment 2 (manufacturer):

- Stamp formed contact interaction at RISK: Wipe Distance, Contact Area, Clearances during mating
- High risk to connector reliability(increase in contact resistance) when mixed with w/connectors not held to current specification (Risk of pin and socket not being fully engaged)

Analysis: CONTACT DEPTH (MIN/MAX TOLERANCE STACK)

ANALYSIS SUMMARY:

1. Max Tolerance : If the plug and receptacle contact depths are at the maximum proposed dimensions(0.043/0.013), conditions exist where MIL-DTL-32139, 3.4.3.1 may not be met for wipe distance. Wipe distances can not be guaranteed if mating different manufacturer's products.
2. Min Tolerance: When the receptacle contact depth is at the minimum proposed dimensions(0.036), conditions exist where socket end may bottom out on insulator while mating parts; *MARGINAL CLEARANCE* identified. Furthermore, if socket bottoms out on the plug insulator then the outer Shell to Shell mated part gap will increase exposure to elements.

Comment 3 (Manufacturer)

Contact Depth Requirement (Plug) – Glenair concurs with the proposed plug contact depth of .013" to .006". With the Glenair design and manufacturing processes, there is no chance the pin will interfere with the crimped conductor inside the socket contact with the proposed contact depth.

Comment 4 (Manufacturer)

Contact Depth Requirement (Socket) – Glenair recommends retaining the existing socket contact depth of .042" to .037" requirement. Glenair and other manufactures have designed their plug insulators with the existing socket contact depth requirements. The dimension for the depth of the plug insulator mating cavity is not controlled by MIL-DTL-32139. A decrease in the socket contact depth could cause an interference between the socket contact and the bottom of the mating plug insulator cavity that shrouds the pin and accepts the socket, when all component tolerances are considered. This can lead to intermateability issues from different manufactures. To accept this change could put undue requirements and expenses on some manufactures who are already on the QPL, to change insulator and contact dimensions, plus added requalification.

Contact true position:

Comment 5 (manufacturer):

PIN AND SOCKET INTERFACE AND ENGAGEMENT

- X and Y alignment of Plug and Receptacle to respective pin and sockets.
- Contact area compromised due to misaligned pins and sockets (increased risk of stubbing)

Analysis: Stubbing Zone Area Definition: Contact stubbing zone is defined by the distance from the chamfer of the pin insulator to the edge of the socket. Calculated risk is assessed by % of area offset overlay between the insulator chamfer and the edge of the socket. A smaller overlapping area = < Risk or likelihood for stubbing to occur.

ANALYSIS SUMMARY: Marginal Risk (Pin insulator to edge of socket alignment)

–True Position: Area overlay analysis was performed at worst case conditions (Plug True Position offset of 0.002” and Receptacle TP offset). An increase in area = increase in interaction of components or risk of stubbing from current specification tolerances. This risk is present in both the original specification tolerances and in the proposed.

–True Position: If increasing TP for the receptacle, socket contacts or plug insulator may become damaged due to increased amount of stubbing. In practice, the likelihood of this occurring is low to moderate due to mating sequence of hardware not interacting until after the sockets engage with the plug insulator. Mating difficulty may be experienced after multiple mating cycles and in blind mate applications.

Comment 6 (Manufacturer)

Contact True Position Requirement – Glenair recommends retaining the existing contact true position of .004 requirement. Tolerance analysis does not support an increase in true position when considering a MMC socket contact of .0185 into a MMC plug insulator mating cavity of 0.019 per MIL-DTL-32139. Relaxing this requirement could promote contact crashing occurrences and intermateability issues.

CONCLUSION: Comments submitted indicate the following potential problems: wipe distance not being met, stubbing of insulator and socket contact, bottoming out of sockets in plug connector shells, contact crashing occurrences and possible intermateability issues.

RECOMMENDATION: As a result of the potential problems noted in the comments above DLA Land and Maritime – VAI recommends maintaining the current dimensional requirements.