

ELECTRICAL CONNECTOR ASSEMBLY ERGONOMIC DESIGN CRITERIA

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1. SCOPE:

This document describes the design and assembly force guidelines for conventional and mechanical assist (lever and slide-lock) electrical connectors and CPA's.

All possible designs and applications cannot be anticipated in creating these guidelines. Where there are questions of adherence to this document, such as use of an "off-the-shelf" design, always consult the responsible Ergonomics department.

Refer to SAE/USCAR-12 Wiring Component Design Guidelines for additional guidelines.

2. REFERENCED DOCUMENTS:

1. SAE/USCAR-2 Performance Specification for Automotive Electrical Connector Systems
2. SAE/USCAR-12 Wiring Component Design Guidelines

3. GENERAL:

In all cases, ASSEMBLY FORCES SHOULD BE AS LOW AS POSSIBLE while maintaining satisfactory electrical, mechanical, and environmental performance.

Part packaging, process and workstation design requirements/constraints may require a reduction in maximum forces specified in this document. Consult with the OEM ergonomics department in these cases. Such situations include but are not limited to:

1. Obstructed access
2. Limited visibility
3. Awkward or non-neutral postures, especially wrist deviation

4. DESIGN GUIDELINES – MECHANICAL ASSIST CONNECTORS:

Mechanical assist type connectors use levers, cams, or slides to allow increased electrical capability with less ergonomic stress. Assembly forces up to 75N are allowable for such connectors provided these guidelines are met. Lever-lock or mechanical assist connectors fall into three categories as shown in table 4.1. Required touch contact area and assembly force varies with each category.

4.1 Lever Contact (Grip) Area Design:

Design the lever contact (grip) per table 4.1.

Category	If the Maximum Assembly Force Is:	Then the Minimum Contact Area must be at least: (See Figure 4.1.1)	Typical Operator Hand Posture During Assembly:
1	$\leq 22\text{N}$	No minimum requirement	One-finger press
2	$\leq 45\text{N}$	10mm x 20mm	thumb/2 or more fingers press
3	$\leq 75\text{N}$	10mm x 35mm	Two thumbs or palm/heel of hand press

TABLE 4.1: Connector Categories and Requirements

- 4.1.1 Make the contact area a continuous flat surface. An example is shown in figure 4.1.1. Serrations, knurls, ridges, etc are permissible within the guidelines of figure 4.1.2.

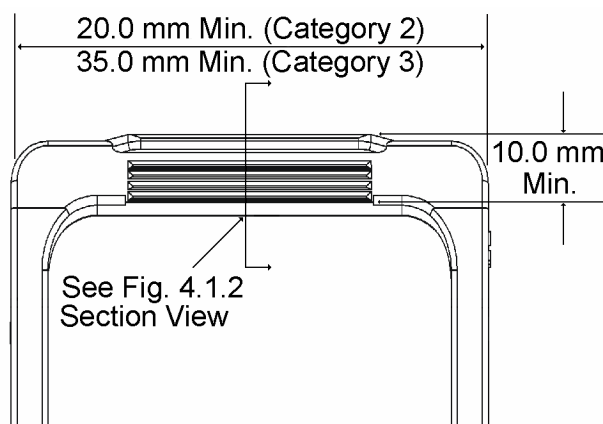


FIGURE 4.1.1: Lever Contact Surface Area Example

- 4.1.2 An end stop is defined as a ridge perpendicular to the bearing surface located at the distal edge of the surface. Such features are OPTIONAL and may help prevent the thumb/finger(s) from sliding off of the lever. Maximum dimensions of this feature are shown in figure 4.1.2

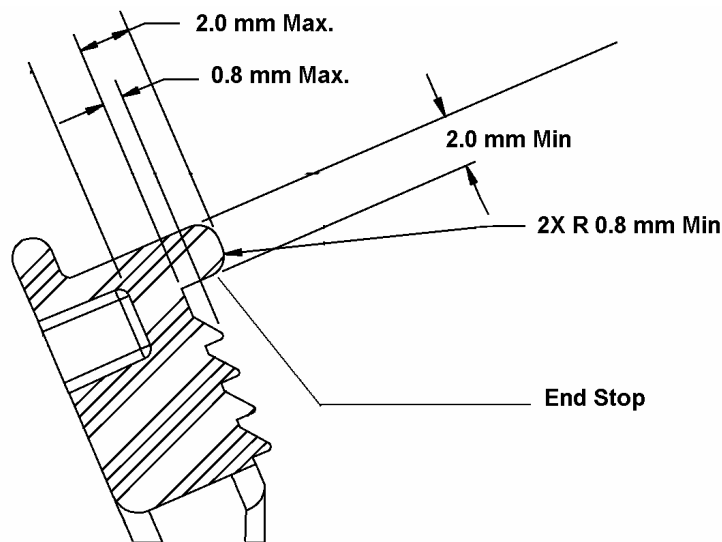


FIGURE 4.1.2: Section View – Maximum Dimensions of OPTIONAL Contact Surface Features
(ref. Figure 4.1.1)

4.2 Maximum Assembly Force:

The maximum allowable assembly force is the peak force required to actuate the lever from its fully opened position to its fully locked position. Forces at any point in the path may not exceed the maximum force shown in table 4.1.

4.3 Disengage Force:

Disengagement of the connector in the assembly plant may be required for testing. In these cases, values for the maximum disassembly force with the secondary lock or CPA released are the same as the maximum assembly force for each category (table 4.1).