

# In-line fuse holder wire crimping guidelines

## Overview

There are many varieties of wire connectors commercially available and many documents and videos to illustrate how to crimp them to specified wires. This document provides guidelines to help customers crimp wires to Eaton's electronic in-line fuse holders. The terminals that are packaged with Eaton's Bussmann Series HFA, HFB, HHB and HH family of fuse holders are very similar to commonly found wire connectors such as quick connects, ring and fork terminals. As such, the crimping method can be viewed similarly. If browsing various Internet sources on how to assemble fuse holders, one may find some very critical reviews of in-line fuse holders; however this is frequently improper assembly practices, such as poor wire crimping, or applying the wrong fuse holder.

Following these guidelines will help ensure that all end users will be satisfied with Eaton's Bussmann Series in-line fuse holders.



Figure 1. Eaton Bussmann™ Series fuse holder with wires installed.

## Basic details

Wire crimping, in this context, involves deforming the terminal to hold the wire. In doing so, this creates a mechanical connection between the wire and the terminal. Ensuring the long term integrity of the crimp is important to minimize resistance and to carry the rated current of the wire and fuse holder. If this is not done, the crimp can come loose which will cause higher resistance and increase temperature under load. This can affect fuse performance at higher temperatures, but also disconnect the mechanical connection altogether or allow contaminants or moisture inside the connection, potentially promoting corrosion. This crimping process is also referred to as a "cold weld".

There are a few keys to ensure proper crimp integrity. In electrical connections, the details are important to consider. These are illustrated below:

- **Remove the correct amount of wire insulation.** Too little will not provide enough surface area for proper crimp and too much will affect the fuse terminal or expose bare wire outside the fuse holder
- **Use the right tools.** Pliers, wire stripping tools, vises and hammers are not recommended crimp tools.
- **Wire size.** Use a wire that is within the specified wire range
- **Do not disturb the fuse terminal.** This will affect how the fuse and fuse holder integrate
- **Ensure a full crimp.** The crimping area of the terminal should become deformed to ensure the cold weld has taken place

On individual data sheets for each of these fuse holders, there are hand crimp tools that Eaton recommends to use to properly crimp specified wires. After completing the crimp, manually perform a pull test of the connection to ensure that the wire does not come loose.

The crimped terminal should withstand approximately 12 pounds of tension force along the direction of the wire. While performing this pull force, care must be taken to not disturb the fuse clip on Eaton's Bussmann Series HFB and HHB assemblies.

Since these fuse holders accept supplemental or electronic fuses, they are rated to 30 amps and under. Therefore, the wire ranges are all 10 AWG and under. Wire in this range can come in a couple different forms, from solid core to fine stranded wire. While more strands per wire can allow users to manipulate and bend the wires easier, it also makes the crimping process more difficult. Eaton generally recommends that solid or stranded wire be used with these inline fuse holders. Even more attention should be given to the crimping of fine stranded wire.



Figure 2. Fuse clip terminal and solid wire



Figure 3. Fuse clip terminal and stranded wire

Eaton's Bussmann Series HFB fuse holder is IP67 rated per IEC 60529. To gain this rating, a particular wire crimping method must be followed. The wire terminals must be crimped before assembly. After the wire is crimped to the terminal, the wire must then be fed through the fuse holder and pulled into place. A straight crimped terminal area (shown in Figure 5) will help ensure the assembly will seat properly in the fuse holder housing. Only after following these directions can the submersible IP67 rating be achieved.

While the fuse holder data sheets recommend manual hand tools, a customer may want to use more automated processes and tools. If doing so, Eaton recommends to mimic the recommended hand tools as much as possible to ensure a good crimp. This includes the overall crimping surface area, the manual hand tool dimensions for the wire size and the force directions. The items to consider remain the same between manual and more automated processes.

Eaton does offer factory crimping on the Bussmann Series HHB, HRK, HHN, HHK, HHT, HHJ and other catalog items. If a factory crimped version of the HFA, HFB, HHB or HH fuse holders is desired, please contact your local Eaton sales representative and they can evaluate if a custom configuration is the right solution for the application.



Figure 4. Wire inserted into fuse clip terminal



Figure 5. Properly crimped terminal and wire

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Printed in USA  
Publication No. 10807 — BU-MC18035  
May 2018