

# Fuse holder IP rating defined



## Overview

1/4" and 5 mm ferrule fuses have been designed into many applications to protect key equipment and wiring from dangerous conditions resulting from overloads and short circuit events. Applications range from industrial control equipment, Heating, Ventilation, and Air conditioning (HVAC), electronic controls, measurement and test equipment, radio and telecom equipment among many others. Due to the inherent construction of these ferrule fuses, often times they need to be installed in fuse accessories to easily integrate them into the circuit, isolate them from people and their surroundings and to make them readily accessible if an event occurs that opens the fuse as intended.

As a result of the wide range of applications ferrule fuses are used, the fuse accessories must meet the conditions described above and provide protection to the electrical circuit from the surrounding environment as fuse installation and replacement may be easiest in conditions that are not contaminant free places.

Understanding the desire to apply fuses in the most convenient location for end users, for installation and replacement but also space considerations, Eaton has tested a wide range of its supplementary fuse accessories to International Electrical Commission (IEC) 60529 to establish ingress protection (IP) ratings.

Part family	IP rating	Description
HTB-XXI-SP	IP53	1/4" panel mount fuse holder
HTB-XXM-SP	IP53	5 mm panel mount fuse holder
HFA	IP64	1/4" in-line fuse holder
HFB	IP67	1/4" in-line fuse holder
HKP-W-R	IP53	1/4" panel mount fuse holder
HMR	IP67	1/4" panel mount fuse holder

**Table 1.** Eaton Bussman Series fuse holder IP ratings

IP ratings make it easier for Eaton Bussmann™ Series customers to understand previously used terms, like splash-proof and drip-proof, as the test conditions in IEC 60529 are well recognized. A summary of test conditions is given at the end of this Application Note and a more detailed description can be found in the IEC 60529 standard.

Eaton's Electronics Division encourages the use of 1/4" and 5 mm fuses to protect key systems and wiring. These established IP ratings makes it easier to apply these fuses in more demanding applications (including potentially submersible environments) and more convenient locations which may need environmental protection. If using any 1/4" or 5 mm fuse accessories from any manufacturer, Eaton recommends a careful review to ensure that the right environmental protection is achieved as it is recommended that each application is analyzed individually.



## IP rating designations

### IPXY

IP= Code Letters (International Protection)

X= First Characteristic numeral (0 through 6)

Y= Second Characteristic numeral (0 through 9)

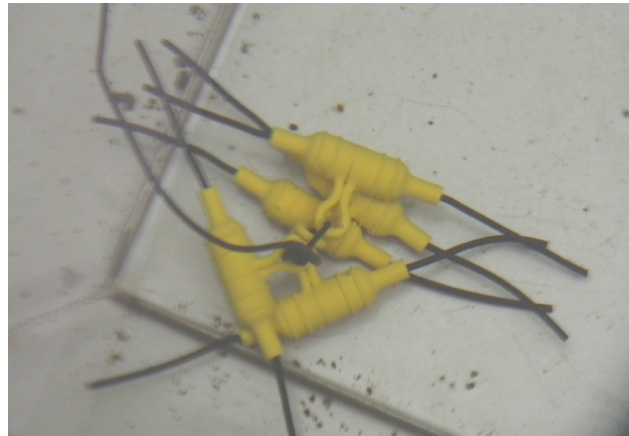
First Numeral	Protection against ingress of solid foreign objects
0	Non-protected
1	50 mm diameter and greater
2	12.5 mm diameter and greater
3	2.5 mm diameter and greater
4	1.0 mm diameter and greater
5	Dust-protected
6	Dust-tight

Second Numeral	Protection against ingress of water with harmful effects
0	Non-protected
1	Vertically falling drops (Equivalent to 1 mm rainfall per minute)
2	Vertically falling water drops when enclosure tilted up to 15 degrees (Equivalent to 3 mm rainfall per minute)
3	Water spraying at an angle of 60 degrees (10 L per minute)
4	Water splashing against the enclosure from any direction (10 L per minute)
5	Water jets against the enclosure from any direction (12.5 L per minute)
6	Powerful water jets against the enclosure from any direction (100 L per minute)
7	Water immersion of up to 1 meter for 3 minutes
8	Water immersion of more than 1 meter continuously

**Table 2.** IP ratings designations



**Figure 1.** HFB-R with specified wire, installed per specification, tested under IP6x test conditions



**Figure 2.** Same HFB-R in-line fuse holders immersed in 1 meter of water to meet IPx7 test conditions



**Figure 3.** HTB panel mount fuse holders mounted in enclosure and tested to IPx3 conditions at 60 degrees from horizontal

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Printed in USA  
Publication No. 10709 BU-MC17043  
September 2017