

# Combination short-circuit current ratings for non-fusible safety switches



## Safety First: protecting people and equipment

The recent changes in Electrical Workplace Safety Standard NFPA® 70E recommend that industrial users and building owners conduct an arc-flash hazard analysis for their facilities. This analysis includes a short-circuit, coordination and arc-flash system study conducted by a professional engineer, which identifies the available arc-flash energy measured in calories per centimeter-squared (cal/cm<sup>2</sup>) for electrical equipment throughout the facility. Then, a special label is affixed to the equipment warning persons working on it while energized of both the arc-flash energy and the personal protective equipment needed to ensure that the worker is adequately protected.

The UL® 98 Standard (Enclosed and Deadfront Switches) allows non-fusible switches to have a maximum short-circuit interrupting rating of 10 kA. This is because as a stand-alone device without integral overcurrent protection, the system designer may not know the upstream overcurrent protection. UL permits higher series connected fault current ratings if specific products are tested together. UL Listed combination ratings must be printed on the safety switch pub on the door, and must specify which upstream devices may be used to protect at higher fault current levels. Additionally, UL does not permit series combination ratings with motor circuit protectors.

Recent system studies have shown that many non-fusible safety switches used in industrial facilities are being applied in systems where the available fault current exceeds the product listing. A study for the system shown in the one-line diagram, **Figure 1**, proved that the available short-circuit current at the safety switch applied as a local motor disconnect was 13.5 kA.

Eaton has completed testing as defined by the UL 98 standard for heavy-duty non-fusible safety switches to achieve a higher level of series combination ratings with upstream Eaton molded-case circuit breakers and various fuse types.

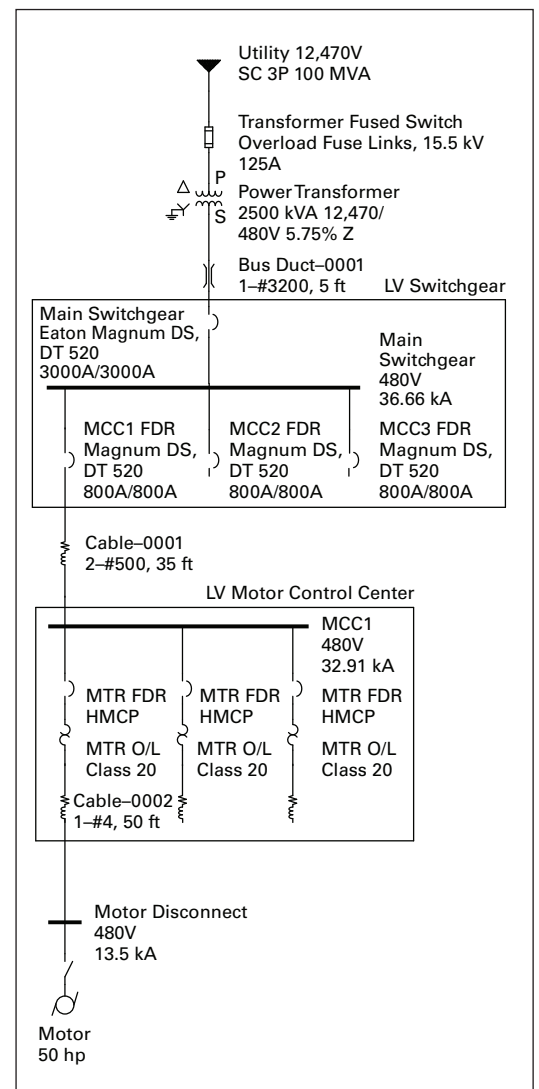


Figure 1.

**Product enhancement**

In **Table 1**, Eaton non-fusible safety switches, within the noted ampere ratings, now carry series combination short-circuit ratings as shown when combined with the identified MCCB or fuse type. With this listed rating, the safety switch shown in the one-line diagram, **Figure 1**, can be correctly applied **when the motor feeder Eaton HMCP circuit breaker is replaced with an Eaton molded-case circuit breaker** properly sized for the motor hp rating. This is a significant enhancement to the product's performance rating. To achieve these ratings, the switches have been tested in combination with all of the overcurrent devices shown. Furthermore, the applicable combination ratings are marked on the inside of the switch door, ensuring inspector approval.

**Information and application**

The circuit breaker or fuse rating is not to exceed the ampere rating of the non-fusible switch. When used on systems with greater than 10 kA short-circuit rating available, the UL Listed short-circuit rating of the non-fusible switch is based upon the switch being used in combination with fuses or molded-case circuit breakers identified in **Table 1**.

**Table 1. Non-Fusible Safety Switches**

Eaton Non-Fusible Safety Switch Ampere Rating ①	Maximum System Voltage AC	Maximum Short-Circuit Rating	Upstream Device ②	
			Fuse Class	Breaker Frame
30 and 60	600	10,000	H, K	Any circuit breaker
		14,000		FDB
		18,000		FD, EGE
		25,000		FDC, HFD, HFDE, EGH
		200,000		R, T, J, L
100	480	10,000	H, K	Any circuit breaker
		35,000		EGH, EGS
		200,000		R, T, J, L
	600	10,000	H, K	Any circuit breaker
		14,000		FDB
		18,000		FD, EGE
25,000		FDC, HFD, HFDE, EGH		
		200,000 ③	R, T, J, L	
200	480	10,000	H, K	Any circuit breaker
		65,000		HFD, HFDE, HJD, JGH
		200,000		R, T, J, L
	600	10,000	H, K	Any circuit breaker
		14,000		FDB
		18,000		FD, JD, JGE
		25,000		FDC, HFD, HFDE, HJD, JGH
		200,000		R, T, J, L

① For use on NEMA® 1, 3R, 12/3R, and 4X switches.

② Fuse or circuit breaker rating is not to exceed switch rating.

③ NEMA 12, 4/4X only. NEMA 1, 3R are 100 kAIC at 600 Vac.

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 Printed in USA  
 Publication No. TD00801005E / Z11208  
 June 2011

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