

CHAPTER 11 MOTOR DISCONNECTS AND SAFETY SWITCHES

The UL 98 standard for motor disconnects requires a larger distance between phase terminals, which prevents most of the smaller, less expensive rotary switches from meeting this requirement. As a result most rotary switches are approved to UL 508 and listed as controllers.



Cooper Crouse-Hinds offers both industrial and explosion protected motor disconnect switches.

11.1 INTRODUCTION

Motor disconnects and safety switches are used to isolate and disconnect the electrical power of electrical installations during maintenance, cleanings and repair work.



The Cooper Crouse-Hinds GHG 26 Series, nonmetallic 10 to 180 amp motor disconnect switches are rated IP 66 and are UV protected for extreme outdoor environments



Flameproof motor with nonmetallic disconnect switch for Zone 1 applications.

11.2 EXPLOSION PROTECTED DESIGN

Because the function is to switch off the electrical supply, the opening and closing of contacts will create an arc or spark. The most common method is to make the switch itself explosion protected using a flameproof housing and increased safety terminals Ex-de. The Ex-de switch can then be mounted in a non-metallic or general-purpose enclosure suitable for the area as opposed to an explosionproof enclosure. The switch and enclosure are usually designed together to minimize the size of the installation.

11.3 HORSEPOWER RATINGS OF SWITCHES

The horsepower rating of the switch determines the size of the motor that the switch can be used with. The North American standard is UL 98 while the IEC uses the motor switch capacity of AC3 according to EN 60 947-4-1. This standard requires that switches be capable of switching 10X rated current in the ON position and 8X current in the OFF position up to 50 switching cycles. The AC3 switching capacities are often times rated in kilowatts which can be converted to horsepower using the conversion 1 kW = 1.36 HP.

Comparing the AC3 to the UL 98 testing requirements shows that the two tests are very similar.

Horsepower Testing Requirements IEC vs NEC

	Endurance Test AC 3 EN 60 947-4-1	UL 98
Test Voltage	1.05%	1.05%
Test Current	2 x	1 x
Power Factor*	0.45	0.75
Cycles	w/locked rotor - 1000 w/out - 5000	w/locked rotor - 6000 w/out - 400
Current load time	0.05 sec.	Not fixed
Time Btwn. loads	10 sec.	6 cycles/min. (10 sec. @ 60 Hz)
Locked Rotor Test		
Test Voltage	1.05%	1.05%
Test Current	8x	5x
Power factor	0.45	0.45
Cycles	50	50
Current Load Time	0.05	Not fixed
Time Between Loads	10 sec.	6 cycles/min. (10 sec. @ 60 Hz)

*The lower power factor will result in a higher inductance, making this particular test under the EN standard more difficult



The SpecOne series of safety switches are rated according to the AC3 switch capacity.

Converting the AC3 switch capacity (kW) values to horsepower ratings provides the following ratings for the Zone 1 nonmetallic disconnect switches.

Switch	Current	400V	480V	600V
GHG 261	10 A		6.2 kW = 8.4 HP	
GHG 262	20 A	10.5 kW = 14.3 HP	10.5 kW = 14.3 HP	9.0 kW = 12.2HP
GHG 263	40 A	22.5 kW = 30.6 HP	27.2 kW = 37 HP	31.3 kW = 42.6 HP
GHG 264	80 A	47 kW = 64 HP	56 kW = 76.1 HP	54 kW = 73.5 HP
GHG 265	125 A	84 kW = 114.2 HP	93 kW = 126.5 HP	98 kW = 133.3 HP
GHG 266	180 A	108 kW = 147 HP	108 kW = 147 HP	110 kW = 150 HP

11.4 UL 98 VS UL 508

According to NEC 430-101 there must be a disconnecting means capable of disconnecting motors and controllers from the circuit. Controllers are defined and grouped together under UL 508. These include push button stations as well as most of the smaller disconnect switches on the market today. The disconnecting means must be located within sight of the controller.

UL 98 defines those disconnects which can be used as motor disconnects. The most obvious discrepancy between the 2 standards is that UL 98 requires a larger distance between phase terminals, which prevents most of the smaller, less expensive rotary switches from meeting this requirement. As a result most rotary switches are approved to UL 508 and listed as controllers.



All Crouse-Hinds SpecOne disconnect switches are provided with lockouts.

11.5 SWITCH LOCKOUTS

In order for the disconnects to be used to safely isolate the electrical supply, there must be means to lock the switch in the off position. Under the IEC philosophy the handle and cover are locked out in the "off" position. The cover can only be removed when the switch is in the "on" position. This prevents turning the switch on with the cover removed and allows for troubleshooting when the switch is energized with the cover removed. This may be the opposite of some North American switches where the cover can only be removed when the switch is in the off position. For motors less than 7.5HP, the EN standard requires a visible indication that the switch is ON or OFF.



Each Cooper Crouse-Hinds SpecOne™ disconnect switch has a position ring with OFF-ON or (O-I) defined switch positions. The contact blocks can have optional auxiliary contacts for wiring to separate lamps or other devices for local or remote indication.

11.6 VARIABLE FREQUENCY DRIVE SWITCHES

For variable frequency drive (VFD) switches it may be necessary to have the conduit control circuit switched off 100% before breaking the main feed. Because a minimum of time feed is required, the auxiliary contacts are switched by a separate actuator which must be operated before the main switch actuator can be turned off. When switching the main actuator on, the control actuator closes automatically.

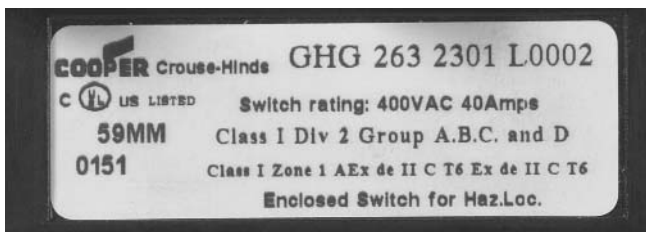


The control circuit top switch must be turned off before breaking the main supply on the SpecOne™ Zone 1 VFD switch.

11.7 EXPLOSION PROTECTION AND ENVIRONMENTAL RATINGS

The disconnect switches are rated as flameproof with increased safety terminations and are mounted in an IP66 enclosure. They are marked as follows for worldwide approval:

Eex de IIC T6
 Aex de IIC T6
 Class I, Zone 1, Groups A-D
 Class II, Division 1 Groups E, F, G cUL



11.8 INSTALLATION

The disconnect switches can be installed in any Zone 1 or 2 or Division 2 location around the world. They are also approved for Class II, Division 1 Group E,F,G locations in Canada. There are three critical factors for installation of disconnect switches: entry methods, access wiring room and dimensions.

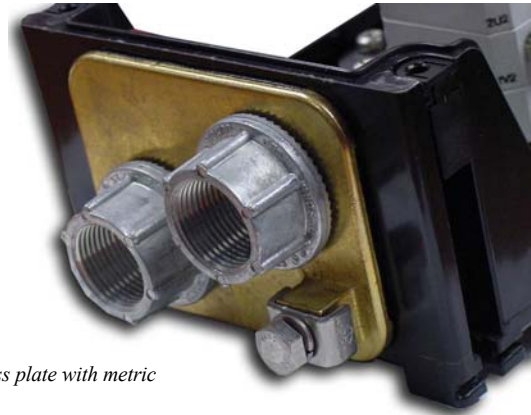


Photo of brass plate with metric adapters.

11.8.1 ENTRY METHODS

Since the products are universally approved, one must be able to bring in conduit and metallic or flexible cables.



Access is provided by NPT metric Myers adapters or with metallic cable glands through a removable gland plate. These plates can be field drilled.



For the smaller sized enclosures full wiring access is provided by the cut-away cover.

11.9 SELECTING MOTORS FOR HAZARDOUS LOCATIONS

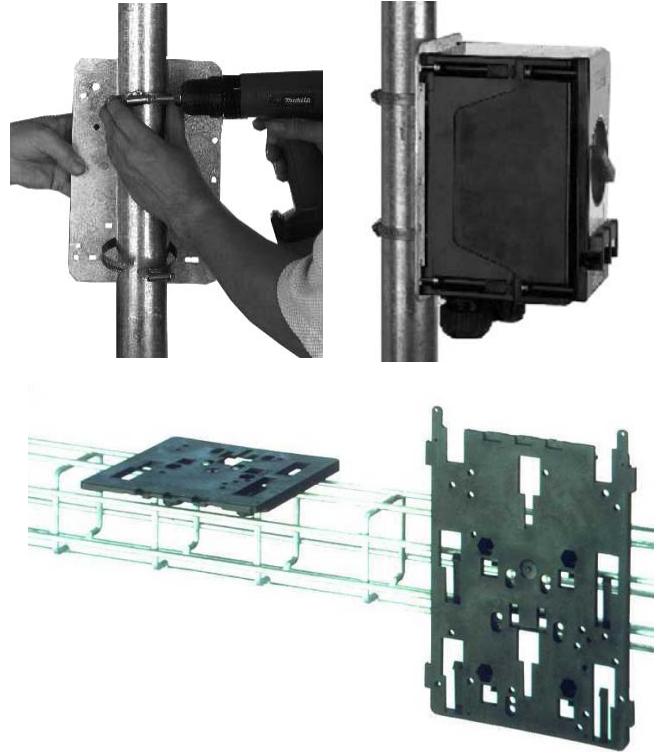
A motor for Class I will confine the effects of an internal motor explosion. This assumes that normal heating and cooling will cause the motor to breathe the surrounding atmosphere much like light fixtures or a conduit wiring system. The atmosphere in the operating environment will enter the motor enclosure. Class I explosionproof motors are only rated for use in Group C or D areas. There are no Group A or B explosionproof motors in production. However, some motors explosion-protected for Zone 1 areas are rated for Groups IIC

The design of a Class II motor for dust groups E, F and G ensures that the motors surface temperature does not exceed the ignition temperature of the combustible dusts. If the operating environment contains both Class I and Class II materials, the motor must be dual-rated as a Class I/Class II motor

There are also increased safety, Ex-e, and flameproof , Ex-d, motors rated to IEC standards. Increased safety motors must meet the IEC 70-7 standard with construction methods which ensure that the motor is non-sparking. These motors can be used in Zone 1 areas in all gas groups and are economical for motors above 20 Hp. Flameproof motors are constructed much like explosionproof motors and

All motors manufactured after February 1975 carry a T code designation. This identifies the maximum motor surface temperature that will develop under all conditions of operation , including motor overload and burnout.

For questions or comments, please contact the author at paul.babiarz@crouse-hinds.com



Like the GHG43 control stations, the Cooper Crouse-Hinds disconnect switches can be mounted on walls, conduits, or wireway cages with patented mounting plates.