Littelfuse® | Cole Hersee® A Littelfuse® Brand

PROTECT & CONTROL DC ELECTRICAL CIRCUITS

Battery Disconnect Switches

Selecting The Right Switch For Your Application

Selecting the Right Switch

Is Critical To The Reliability Of Your Equipment

The Importance of a Battery Disconnect Switch

Battery disconnects are installed in an electrical system allowing the operator to completely disconnect electrical current running through a vehicle or piece of equipment. Being able to isolate the flow of electricity has many safety, security, and cost saving benefits.

Short-Circuit Protection

Road salt corrosion is becoming an increasingly common problem. In the event corrosion leads to a short-circuit resulting in a fire, a battery switch can be activated to prevent further damage to the vehicle or injury to occupants. On an unattended vehicle, chaffed or damaged wires can short-circuit causing a thermal event that can destroy the equipment, vehicles around it, or the building where it is parked.

Safety and Security

Mechanics can ensure a vehicle electrical system is shut down by operating a battery switch. With the addition of built-in or accessory lock-out tag-out the mechanic can ensure the vehicle cannot be energized or started during service. Another benefit of lock-out tag-out is that owners can secure a switch with a padlock making it difficult for thieves, vandals, or unauthorized users to operate the equipment.

Save Costs

Parasitic loads (power consumed even when the equipment is shut off) can drain a battery on equipment stored for long periods of time. By disconnecting the battery, the electrical system will not have any parasitic loads that can drain the battery and cause premature failure. Using a battery switch can help prevent costly battery replacements and ensure that the battery is fully charged for the next job.

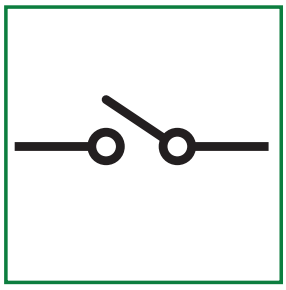
Selecting the Correct Amperage Rating

Deciding which switch to select for your vehicle can be a confusing process. The primary consideration for selection is the output of the alternator, which should be the highest continuous output on the vehicle.

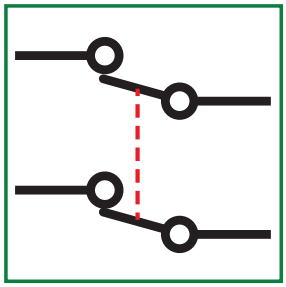
The intermittent duty capacity should be calculated for the maximum potential draw on the battery bank. The battery disconnect switch should be able to withstand the full discharge of the battery bank for about 10 seconds. If properly selected, and in the event of a short circuit, the switch can survive and shut off power to prevent further damage. If the switch cannot withstand a full short, the contacts could weld shut and the switch will not be able to operate and protect the system.

Differences Between Poles and Throws

The differences between a single pole switch or a double pole switch are often not very clear and requirements vary based on the application. Pole refers to the number of circuits controlled by a switch and throw refers to the extreme positions of the actuator.



Single Pole, Single Throw Switch



Double Pole, Single Throw Switch

Pole

Single pole switches are designed to control one circuit whereas double pole switches are designed to control two circuits simultaneously or serially. When discussing master battery disconnect switches, single poles are the most common. They are designed to cut off the battery by disconnecting either the positive or ground to cut off the battery from the electrical circuit.

Double pole switches are chosen based on the amperage of each individual circuit. Some battery switches are designed for one high current circuit and one lower current auxiliary circuit. These are commonly used in applications that require an alternator field disconnect.

Double pole switches can also be used to control two high current circuits. Examples of two high current circuits include those with multiple voltages (12, 24, or 36), high amperage current that is split between two circuits, and applications that disconnect both positive and ground simultaneously to completely isolate the battery. An isolated battery is the safest type of installation because this method eliminates any chance of accidental shorting.

Throw

Single throw switches close a circuit at only one position. Double throw switches close a circuit in two positions. Double throw switches are not commonly used for battery circuits and are more common in low current applications. However, certain switches have more than two throws, such as the M-750 series switches. These battery selector switches are triple throw meaning they create a circuit in three different positions.

OEM Upgrades To A Sealed

Battery Switch To Protect A Fleet In Harsh Environments

Littelfuse High-Amp Sealed Battery Switch Prevents Vehicle Failures in Harsh Environments

A municipality fleet manager reached out to a leading OEM skid steer manufacturer when they began having issues with their equipment in freezing environments for snow removal. The customer's equipment was failing in the field by intermittently experiencing total loss of electrical power. The vehicle was brought into the service shop and the mechanics could not replicate the issue or find any problem with the equipment.

Once the OEM was involved they determined that the battery switch they had fitted their equipment with from the factory was not a sealed unit. This switch was allowing moisture to build up inside the housing which was freezing over the contacts causing temporary loss of continuity. When the equipment was brought back into the shop the frozen layer on the contacts would melt off making it nearly impossible to find the cause in a climate controlled environment.

In order to solve this problem and ensure that the customer would not encounter future electrical failures due to the harsh environments and ingress of moisture, the OEM partnered with Littelfuse on a solution. Littelfuse quickly set up a team with representatives from sales, engineering and quality to visit the OEM headquarters to review and fully understand the situation. After reviewing the electrical parameters of the application, the Littelfuse team identified that numerous switches already available from Littelfuse could be drop-in or retrofit replacements. The main requirement of this application was the environmental properties of the switch, and because Littelfuse battery

disconnect switches are designed specifically for heavy duty vehicles in demanding environments, many of the switches also had IP ratings that exceeded the requirements defined by the OEM.

After looking at several different switches, a drop-in replacement was found in the 75920 series. With the 75920 series, the OEM manufacturer was able to replace the switches across the customer's entire fleet without any modification to the equipment or the Littelfuse part. The OEM then established a running change to their platform and added the 75920 series to all new equipment production in order to provide their customers with a more reliable finished product.

This is an example of how electrical system and application expertise can save maintenance costs, eliminate downtime and reduce the risk of injury when the correct switch is specified in your applications. A proactive approach to electrical system designs is recommended so that Littelfuse can bring expertise and the largest selection of switches into the conversation whenever OEMs, up-fitters, or aftermarket installers are adding a battery disconnect switch to their electrical systems.

75920 Series Quick Specs

Voltage:	6V min, 36V max
Continuous Current:	300A
Intermittent Current:	3000A x 15 sec
Ingress Protection:	IP68
Terminal Sizes:	3/8-24" or M10
Terminal Materials:	Brass or Stainless Steel
Notes:	Built-in lock-out tag-out

To download the datasheet, 2D print, or 3D model visit: littelfuse.com/75920

Single Pole










Description	08098700	08098780	08099080	08080200	2484	2484-16	2484-A	2484-06	2484-09	2484-02	2484-03
Battery Inputs	1	1	1	1	1	1	1	1	1	1	1
Continuous Rating	100A	150A	150A	150A	20A	175A	175A	175A	175A	175A	175A
Intermittent Rating					125A	800A x 15 sec.	1000A x 15 sec.	1000A x 15 sec.	1000A x 15 sec.	1000A x 15 sec.	1000A x 15 sec.
Voltage	12-24V DC	12-24V DC	12-24V DC	12-24V DC	6V DC; 12V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC
Terminal Size	M8	M10	M10	M10	3/8"-24	3/8"-24	3/8"-24	3/8"-24	3/8"-24	3/8"-24	3/8"-24
Terminal Material	Copper	Copper	Copper	Silver Plated Copper	Copper	Brass	Brass	Brass	Copper	Brass	Brass
Terminal Hardware	Zinc-plated Steel	Brass	Zinc-plated Steel	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass
Sealing	IP4X	IP4X	IP43	IP65				Splashproof			Splashproof
Actuator	Key	Key	Key	Knob	Lever	Lever	Lever	Lever	Lever	Hencol key (83353)	Hencol key (83353)
Removable Key	•	•	•							•	•
Lockout-Tagout					with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit
Notes			■ Weatherproof boot	■ Push-to-off	■ UL listed ■ Continuous Ratings 40A at 6V & 20A at 12V ■ Intermittent Ratings 250Aat 6V & 125A at 12V	■ UL listed ■ Silver contacts	■ Silver contacts	■ Silver contacts ■ O-ring in stem ■ Gasket seal in case		■ Indexing pin ■ Silver contacts	■ Indexing pin ■ Silver contacts ■ O-ring in stem










Description	2484-19	M-284	M-284-A	M-284-01	M-284-02	75908	75920	75920-05	75920-10	75921-10
Battery Inputs	1	1	1	1	1	1	1	1	1	1
Continuous Rating	175A	175A	175A	175A	175A	300A	300A	300A	300A	300A
Intermittent Rating	1000A x 30 sec.	1000A x 15 sec.	1000A x 15 sec.	800A x 15 sec.	1000A x 15 sec.	2000A x 30 sec.	3000A x 15 sec.	3000A x 15 sec.	3000A x 15 sec.	3000A x 15 sec.
Voltage	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	12V DC	12-36V DC	12-36V DC	12-36V DC	12-36V DC
Terminal Size	3/8"-24	3/8"-24	3/8"-24	3/8"-24	3/8"-24	1/2"-20	3/8"-24	3/8"-24	3/8"-24	M10
Terminal Material	Brass	Copper	Brass	Brass	Brass	Copper	Tin Plated Copper	Tin Plated Copper	Tin Plated Copper	Tin Plated Copper
Terminal Hardware	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Stainless Steel	Stainless Steel
Sealing	Splashproof				Splashproof	Splashproof	IP68*	IP68*	IP68*	IP68*
Actuator	Hencol key (83353)	Chrome Lever	Chrome Lever	Chrome Lever	Lever	Lever	Knob	Knob	Knob	Knob
Removable Key	•									
Lockout-Tagout	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	•	•	•	•
Notes	■ Indexing pin ■ Silver Contacts ■ O-ring in stem ■ Gasket seal in case	■ Extra long mounting stem	■ Silver contacts ■ Extra long mounting stem	■ Silver contacts ■ Ignition protected ■ Extra long mounting stem	■ Silver contacts ■ O-ring in stem ■ Gasket seal in case ■ Extra long mounting stem	■ Indexing pin ■ Gasket seal in case	■ Indexing pin ■ *Thermal cycling followed by immersion (1m)	■ Indexing pin ■ International I/0 marks ■ *Thermal cycling followed by immersion (1m)	■ Indexing pin ■ *Thermal cycling followed by immersion (1m)	■ Indexing pin ■ International I/0 marks ■ *Thermal cycling followed by immersion (1m)

Single Pole

Description	08098400	08098800	08098881	08098882	880062	880064	880154	08098900	08098980	08098981
Battery Inputs	1	1	1	1	1	1	1	1	1	1
Continuous Rating	250A	250A	250A	250A	300A (1x 4/0 cable)	300A (1x 4/0 cable)	600A (2x 4/0 cable)	350A	350A	350A
Intermittent Rating	600A x 120 sec.	600A x 120 sec.	600A x 120 sec.	600A x 120 sec.	1250A (1x 4/0 cable) x 30sec.	1250A (1 x 4/0 cable) x 30 sec.	2500A (1 x 4/0 cable) x 30 sec.	1500A x 120 sec.	1500A x 120 sec.	1500A x 120 sec.
Voltage	24V DC	24V DC	24V DC	24V DC	48V DC Max.	48V DC Max.	36V DC Max.	12-24V DC	12-24V DC	12-24V DC
Terminal Size	M10	M10	M10	M10	3/8"-16	3/8"-16	3/8"-16	M12	M12	M12
Terminal Material	Silver Plated Copper	Silver Plated Copper	Silver Plated Copper	Silver Plated Copper	Tin Plated Copper	Tin Plated Copper	Tin Plated Copper	Silver Plated Copper	Silver Plated Copper	Silver Plated Copper
Terminal Hardware	Zinc-plated Steel	Zinc-plated Steel	Zinc-plated Steel	Zinc-plated Steel	Stainless Steel	Stainless Steel	Stainless Steel	Zinc-plated Steel	Zinc-plated Steel	Stainless Steel
Sealing	IP65	IP65	IP65/IP69K	IP65/IP69K			IP67/ IP69K	IP65	IP65	IP65/IP69K
Actuator	Knob	Handle	Handle	Handle	Knob	Knob	Knob	Handle	Handle	Handle
Removable Key		•	•					•	•	
Lockout-Tagout				•		•	•			
Notes			■ Actuator Tether ■ Weatherproof Boot	■ Weatherproof Boot	■ Ignition protected	■ Ignition protected	■ High cranking amps ■ Ignition protected		■ Actuator Tether ■ Weatherproof Boot	■ Weatherproof Boot

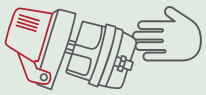
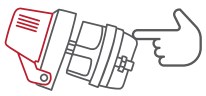
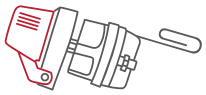
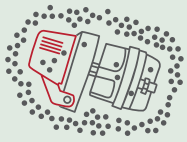
Double Pole

Description	75903	75904	75904-01	75904-02	75904-03	M-290	M-290-01	M-290-05	75912	75907	08084300	08084400	880175	M-750
Battery Inputs	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Continuous Rating	125A large studs 20A small studs	125A large studs 20A small studs	125A large studs 20A small studs	125A large studs 20A small studs	125A large studs 20A small studs	125A large studs 20A small studs	125A large studs 20A small studs	125A large studs 20A small studs	125A	300A	250A	500A	500A per circuit	310A
Intermittent Rating	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	1000A x 15 sec. (Large studs)	750A x 15 sec.	2000A x 30 sec.	1000A x 2 sec	1500A x 2 sec.	2250A x 30 sec. (2 x 4/0 cables)	500A
Voltage	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	6-36V DC	24V DC	24V DC	12-24V DC	6-36V DC
Terminal Size	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	two 3/8"-24 two 10-32	3/8"-24	two 1/2"-20 two 10-32	M10	M12	M12	3/8"
Terminal Material	Copper/Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Copper	Silver Plated Copper	Silver Plated Copper	Tin Plated Copper	Copper
Terminal Hardware	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Brass	Stainless Steel	Stainless Steel	Stainless Steel	Brass
Sealing							Splashproof		Splashproof		IP67/IP69K	IP67/IP69K	IP67/ IP69K	
Actuator	Chrome Lever	Chrome Lever	Chrome Lever	Hencol key (83353)	Hencol key (83353)	Chrome Lever	Chrome Lever	Chrome Lever	Chrome Lever	Lever	Handle	Handle	Knob	Knob
Removable Key					•						•	•		
Lockout-Tagout	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	with 24505 kit	•	•	•	
Notes			■ Indexing pin	■ Indexing pin	■ Indexing pin	■ Silver contacts ■ Extra long mounting stem	■ Silver contacts ■ O-Ring ■ Extra long mounting stem	■ UL listed ■ Silver contacts ■ Extra long mounting stem	■ Indexing pin ■ O-ring in stem ■ Gasket sealing in case ■ Hencol	■ Indexing pin	■ Weatherproof Boot ■ Silver contacts	■ Weatherproof Boot ■ Silver contacts		■ M-752 w/ alternator field disconnect ■ M-754 w/ pilot light circuit

Harsh Environments and Ingress Protection Ratings

Environmental factors play a huge role in a product's ability to do its job and survive the lifetime of the equipment. Ingress Protection, or IP, indicates the degree of protection of a switch housing. IP ratings are a measure of how resistant a part is to environmental contaminants such as dust and water. IP rating selections should be based on where the switch will be mounted and what type of environment the equipment will be used in.

The numbers following IP represent levels of sealing and can range from no sealing (IP00) to protection against dust and continuous immersion in water (IP68). The table below provides a description of the protection at each level.

1st Digit - SOLID Degree of protection against solid objects		2nd Digit - LIQUID Degree of protection against water	
	**1** Protected against a solid object greater than 50mm		**1** Protected against vertically falling water drops
	**2** Protected against a solid object greater than 12.5mm		**2** Protected against vertical water drops when enclosure tilted up to 15 degree angle
	**3** Protected against a solid object greater than 2.5mm		**3** Protected against spraying water from up to a 60 degree angle
	**4** Protected against a solid object greater than 1.0mm		**4** Protected against splashing water
	**5** Dust Protected. Prevents ingress of dust sufficient to cause harm		**5** Protected against water jets
	**6** Dust tight. No ingress of dust.		**6** Protected against powerful water jets
			**7** Protected against the effects of temporary immersion in water
			**8** Protected against the effects of continuous immersion in water under conditions agreed between manufacturer and user
			**9K** Protected against close-range high pressure, high temperature spray downs

Example

IP67

Dust tight. No ingress of dust. Protected against effects of temporary submersion in water.

Common Applications

Many emergency vehicles have switches mounted in the cab or in a box. In cases like these splashproof sealing will typically be sufficient.

Marine applications are often subject to unexpected spray and splash. In this case it's a good idea to have IP66 at the minimum.

For externally mounted switches where spray or splash is a frequent concern IP67 or better is recommended.

Key Terms and Definitions

Actuator - The part of a switch assembly used by the operator that causes switch contacts to engage or disengage. Actuators include levers, keys, knobs, handles and T-handles.

Alternator Field Disconnect - AFD. A safety feature of some disconnect switches. If the output of an alternator is quickly open-circuited the voltage rises to a potentially dangerous level. An AFD disconnects the alternator field, so that the magnetic field is turned off, and thus the voltage does not spike.

Amp/Amperage - The strength of an electric current in Amperes (the basic unit of electrical current in the International System of Units).

Circuit - The path over which an electrical charge flows.

Contacts - A pair of metallic components that touch or come apart at the point where the switch throw makes or breaks the circuit. Silver contacts are common because of their high conductivity and low electrical resistance.

Continuous Rating - The rating meant to indicate what the device can handle forever with no interruption. It is usually measured as the amperage that a device can handle for one hour without exceeding the maximum allowed temperature rise at the terminals. Continuous rated switches may be used as intermittent switches. Also known as a continuous-duty rating.

Hencol Key - Hencol (Henry + Cole) is a Cole Hersee brand name used to describe our non-bitted common keys. Hencol keys are often used for equipment that will have multiple operators. The non-bitted key allows any authorized user with a Hencol key to operate the switch.

Ignition-Protected - Electromechanical switches inevitably tend to create a spark between the contacts. In normal circumstances this is unlikely to be a problem, but in confined situations where fuel vapors may be present (In boats or in mines for example), ignition-protected switches are necessary. ISO 8846 is a marine standard of the International Organization for Standards.

Inrush Rating - The short duration rating of the switch. This rating is meant to reflect the ability of the switch to withstand a short term, high current event like starting. A large diesel engine starting in cold weather can draw close to 2000A for about 30 seconds. A switch can have multiple inrush ratings to help match your application

Intermittent Rating - The amount of current the switch can handle for 5 minutes or less with the same temperature rise as above. Intermittent rating of a switch is always higher than continuous rating. Intermittent rated switches may not be used as continuous rated switches.

IP Rating - Formally known as an International Protection rating, but often referred to as Ingress Protection, this rating determines the resistance of a device to environmental contaminants

Indexing Pin – Sometimes called a locating pin or anti-rotation pin, this pin aligns the switch with the mounting panel and prevents rotation for switches with through-hole style mounting.

Lockout/tagout (LOTO) - A safety procedure which ensures that dangerous machines are properly shut off and not able to be started up again prior to the completion of maintenance or servicing work.

Short Circuit - An abnormal low resistance path between two polarities, or polar opposite, circuits. It will likely be accompanied by overheating, an explosion, or fire. A short-circuit is also likely to cause damage to components or equipment in that circuit.

Terminals - Describes how a switch is connected to the circuit or device it activates. Battery switches are supplied with metric or standard threaded studs in many materials such as copper, brass, tin-plated brass or silver-plated brass.

Littelfuse, Inc.
Chicago, Illinois USA
+1 800 365 2653
cvp_info@Littelfuse.com

To learn more about specific products or applications visit:
Littelfuse.com/commerical-vehicle

Form: CVP230
Rev: 1-B-021218