

Isolator Switch Guide



Introduction

If you are a student of electrical engineering or a professional within the field, then you know exactly what I'm talking about. However, if you are a layman, newbie, or DIY enthusiast, then the concept of isolator switches might be new and foreign to you. So, with that said, what are they? In the simplest terms, an isolator switch is a device or system that isolates a particular circuit for maintenance. Therefore, these switches are used for various electrical appliances and applications, including power grids, kitchen tools, and so much more. In this article, we'll be taking a look at what an isolator switch is, what appliances use them, why they are important, the various types that exist, and answer some of the most pressing questions about them. So, if

you are an electrical engineering student who has always wondered about isolator switches, or a DIYer who is in the process of fixing up your house, then this would be an informative article for you.

What is an isolator switch?

Well, as mentioned above, it is a device or apparatus that is used to isolate a circuit for maintenance. But, to truly understand the concept of an isolator switch, it is also necessary to understand what an isolator is. An isolator isolates an electrical circuit and prevents currents from going through. Also, it is sometimes called the main isolator switch. Therefore, it functions as a means to set apart a circuit within a system or grid for repairs or maintenance.

Consequently, it is not unusual to find isolators on power lines, grids, and so on. Another thing of note is the close relationship between isolators and circuit breakers, which many deem to do the same job. However, they have key differences that set them apart, like their functions, abilities, and so on. With that said, isolator switches can be used on an even smaller scale for household appliances and the like. In these cases, wall sockets can act as isolator devices/switches as they can be turned off to stop the flow of energy into that circuit, and once unplugged, the appliance can be worked on.

Isolators vs Circuit Breakers

Circuit breakers are a very common electrical switch which serves the function of interrupting power supply into a circuit when it detects an excess current or charge. Hence, it acts as a shield of sorts for circuits as it ensures that they don't suffer damage from excess currents trying to get through. Due to its nature, circuit breakers are very useful even when a load is still on and can also be used when the load is off. Conversely, isolators only come in handy when the circuit is in a 'no-load' position, and it is not advisable to use them when a current is passing through.

Interestingly, isolators can also be used to work with circuit breakers if the latter requires maintenance. So, from the picture painted so far, we clearly see that circuit breakers act as protectors, while isolators work to enable a problem fix.

That said, there are still a number of differences between circuit breakers and isolators, one of which is that circuit breakers work automatically, which means that you don't have to issue a specific command before it does its job and once it detects a spike in electrical current, it trips off. Whereas, with isolators, you have to manually work them before they do the job of isolating electrical currents for maintenance.

Furthermore, due to their functions and constructions, circuit breakers are typically capable of handling more power, as is evidenced by their capacity to work even with a load on. Meanwhile, isolators can only withstand a small amount of electricity as they are mainly created to be used when the electrical circuit is off.

With all of that said, it is quite clear that there are major differences between circuit breakers and isolators, and while you can be tempted to state that one works better than the other, the truth is that they are both very important to any electrical application you want to embark on.

What does an isolator switch do?

At the risk of sounding redundant, we must once again take a look at what isolators do as this is the best way to understand them. As mentioned already, they set apart electrical circuits away from the main power source so that repair work can be carried out. For instance, imagine painting a wall and finding out that there is a section of the surface that is defective and needs a new coat of paint. In such a situation, it is advisable to cordon off the other parts of the wall and maybe even cover them up to focus on the problematic section and paint easily without having to worry about getting other areas of the wall stained. This is similar to what isolators do as they enable service people to go about their jobs without any problems easily. As you well know, a large amount of electrical current can pass through a human being and harm them and even in some cases, kill. Therefore, the presence of isolator switches prevent unfortunate issues like this and are one of the safety tools that engineers use when working with something as volatile as electricity.

Moreover, as mentioned above, circuit breakers and isolator switches have a few things in common, but they are better used in concert rather than differently. For example, when repairing a damaged circuit, it is advised that you first open the circuit breaker, which interrupts power and keeps you safe even when current is flowing. Then, you open the isolator, which deadens any flow of power into that circuit, after which you close the earthing switch to prevent the escape of electricity into the ground. Once all of this has been achieved, you can successfully carry out whatever repairs are necessary without worrying about getting hurt. That said, this sequence is very important as following any other pattern will only end in tears. For instance, if you forego the circuit breaker and open the isolator first, then you'll find that the circuit has been opened in an 'ON' position, which could lead to injury.

isolator switches are very important, and they are useful for all sorts of appliances to make maintenance easy and effortless.

What appliances need an isolator switch?

The truth is that most appliances need an isolator switch as any electrical appliance carries some danger if tinkered with while powered on. However, since wall sockets can act as isolation switches, smaller appliances like microwaves, irons, and electric kettles don't need a dedicated isolation switch before maintenance is carried out. So, below, we'll look at some of the tools and devices that require an isolation switch.

Extractor Fans

Extractor fans are regularly found in bathrooms or kitchens and they work to remove stale and humid air which is then replaced with fresh air from a window. Also, due to building regulations

more and more homeowners need extractor fans. However, due to the sophistication of these machines and the power they possess, they need isolation switches for repairs or maintenance. So, fans generally make use of 3-pole isolation switches because there are three lines that usually need disconnection to completely isolate the fan. However, if an isolator switch isn't installed, maintenance on the fan might require shutting down a large swath of circuits which could affect other appliances.

Showers

Electrical showers have become very common in most homes and are very convenient to use due to their many features. However, they also need to be outfitted with an isolator switch as they are situated in a special location. For clarification, a special location is an area where installation carries a greater risk of electric shock and since bathrooms tend to have a lot of water around, they fall under this category. Therefore, for the safety of yourself and any electrician, electric showers must have an isolation switch installed. Failure to do so is a code 2 defect and means you run the risk of breaching the rules enshrined in BS7671.

Refrigerators

Refrigerators, especially large ones, need an isolation switch to ease the challenges associated with maintenance and repairs. Just like with showers, refrigerators are in close proximity to water and could be dangerous if not handled properly. Also, most freezers or refrigerators have sockets that are hard to reach and require touching or moving the appliance which could be dangerous if it develops a fault. This is why an isolator switch is required and the absence of one is a possible breach of BS7671 which recommends that all kitchen appliances be outfitted with isolators.

Air Conditioners

While it is okay to hardwire your air conditioner to the switchboard, it has a few drawbacks and could even be hazardous in some cases. Therefore, it is advisable to equip your outdoor unit with an isolator switch as it protects the appliance from strikes in a storm and it also prevents your home safety switch from tripping in the event of a fault.

Where do isolator switches need to be located

To ensure the safety of technicians and everyone in general, it is advised that isolator switches be located apart from the appliance but also within reach to ensure easy access and manipulation. Also, a lot of isolator switches are lockable, and the use of remote controls is discouraged to prevent cases of accidental operation. For instance, the isolator device of appliances such as a water heater should be adjacent to the appliance, and within reach or under the control of the electrician, this is to ensure that it isn't mistakenly turned on while work is in progress. Also, if the former is impossible, it is advised that the isolator point, or switch, be put under the supervision of an authorized person. For smaller devices, a combination of a plug and socket could act as the isolator switch and, therefore, should be located as close to the appliance as possible. Furthermore, isolator switches should also be located in an accessible

space without any obstruction. For example, if the isolator switch to an appliance is buried behind a wall of pots and pans that need to be moved, then it can't be described as accessible. Hence, the space for an isolator switch should be clear of all distractions and obstructions to ensure the safety of anyone working on the appliance.

Types of Isolator Switch

As with any device, product, or system, there are different types of isolator switches that work in various ways to do the same job. Some examples are the double pole isolator switch, three pole isolator switch, and so on. We'll take a look at them one at a time and try to understand what they do and what purpose they serve.

Single pole isolator switch

This is a switch that powers down an electrical circuit and they are mostly used with single phase circuits. Also they are usually located in the live leg of the circuit and power this section down so repair work can be carried out. That said, they are mostly used for small appliances like lights and are not as safe as double pole isolator switches. This is because while these switches power down the live leg, the neutral one is still connected and can be hazardous in some cases.

Double pole isolator switch

These are also used for single phase circuits and are designed to isolate circuit breakers and transmission lines for the purpose of maintenance. Also, they are reliant on either a rotary or knife-blade disconnect method which is different from a fused isolator switch which works to break the electrical circuit.

Speaking of the systems that the double pole isolator switches rely on, rotary switches use the rotation of a lever to break the circuit while knife-blade switches make use of a hinge mechanism to lift a lever which, in turn, disconnects or isolates the circuit that is to be worked on.

Double pole isolator switches possess mechanical switches which are coupled together and represent both the live and neutral legs of the connection. Therefore, they completely shut down a circuit and isolate it from the main power source which means that both the live and neutral wires are deadened. This is important as neutral wires are naturally earthed and can still carry an electrical charge if not powered down. Therefore, if a hard-wired appliance has a neutral-earth fault, a double pole isolator turns both the live and neutral lines off and makes it safe and convenient to work on the faulty equipment without any worries.

This gives it a huge advantage over the aforementioned single pole switch which only powers down the live leg while leaving the neutral still connected and earthed, which, in turn, could turn out to be hazardous.

3 pole isolator switch

These deal with three phase supplies and quite simply put, feature three interlocked switches in the three live legs and like the other entries, they isolate electrical circuits for easy access. They are useful for some types of devices, for instance, a fan isolator switch usually employs a 3 pole isolator switch because there are usually three lines that have to be disconnected before the fan can be isolated.

4 pole isolator switch

This isolator switch shares some similarities with the 3 pole isolator switch but in addition to the three live legs, it has another neutral leg. Besides, this kind of isolator switch serves as both an isolator and a surge protector.

Fused isolator switch

A fused switch isolator switch works in the same way as the other switches we've looked at so far, however, it differs from the others in that they contain multiple fuses inside and are generally safer to work with. This is because a blown fuse can damage the circuit and cause harm to someone working on it, but if a fused isolator switch is used, it powers down all the circuits housed in it making it easier to work on the damaged area. Furthermore, it also works to protect the circuit itself as it ensures that electricity doesn't flow through the circuit while repairs are in progress and this reduces the risk of affecting the circuit adversely.

Battery isolator switch

A battery isolator switch is used mainly with batteries and it works to divert electrical flow away from a section of the battery to another section. That said, it is commonly used with trucks, airplanes and other vehicles and appliances that use multiple batteries to operate. Hence, it functions to ensure that the appliance or vehicle still works well even if one of the batteries is dead and unresponsive. So, in the instance of a large truck, a battery isolator will separate the various batteries and prevent the truck from drawing from all the batteries at the same time which could lead to an electric system failure. It also makes sure that the truck always has some backup energy to draw from. To further clarify this, in a two-battery system, both are connected to the isolator, which is, in turn, attached to the vehicle's alternator. The isolator then decides which battery has more power and draws from that while the idle battery is charged. On top of that, battery isolator switches are very important in case of an emergency and when the vehicle is in storage to ensure electrical isolator.

Building regulations for isolator switch

Building regulations for isolator switches vary depending on the jurisdiction, but they have a couple of common themes such as ease of use, visibility, and freedom from obstruction. These are all points we've talked about when discussing the ideal places for isolator switches to be placed. In addition to this, there are a few other regulations to take into consideration including the fact that the switch should be located about 750mm to 1200mm above the ground.

Furthermore, isolator switches should be easy to operate and shouldn't need both hands to operate and they should always indicate when they are on/off. This is to ensure that there is no

confusion as to their status as this could potentially be dangerous when work is being carried out on the appliance or circuit in question. An additional point is that the front plates of isolator switches should be different from their backgrounds, this is to ensure that they are easy to identify and are not confused for something else.

However, finding the relevant legislation for isolator switches can be challenging, but there are a few of them on the internet along with books that have the best practises and ethics contained in them.

Cost of an electrician

From all that we have discussed above, it is clear that the job of an electrician isn't something to be handled by an amateur and if you are not licensed or have no experience dealing with electrical outlets, then it is best to call an electrician. Since they are trained and professional, they not only know more about the job than you do, they are also likely to know the best devices and tools to use to do a particular job. For instance, if you need a shower isolator switch installed, an electrician will know what type of switch is best for the job and how to carry out its set up and also its repairs.

Naturally, the first thing that comes to mind when you think of an electrician is how much they cost and while they are generally not cheap to hire, they provide peace of mind that can't come from any other source. So, how much does a competent electrician cost? The truth is that the price of hiring an electrician varies on several factors including the location, the severity of the job, and the experience of the personnel.

Location

If you live in the United States, the concept of location is varied as you have to consider where the electrician is coming from and the proximity of stores from where they can buy supplies. On the other hand, the price of electricians varies from state to state. For instance, an electrician in an urban area such as New York will cost over \$100 an hour while conversely those who are situated in more rural areas will come a lot cheaper.

Severity

The rate an electrician will ask for is tied to the amount of work you want done. For instance, changing a light fixture will be a lot cheaper than wiring a house. So, if you are looking to engage an electrician, you need to consider the work you want done. That said, the most expensive types of jobs are smart home installations which could get as high as \$2000.

Experience

Depending on how much experience the electrician has, their prices may be very high, or moderate. There are three license types for electricians namely, apprentice, journeyman, and master. So, you can expect to pay a lot of money to get a master electrician, however, you are also confident that they will deliver excellent service based on their level of experience.

With all of that said, there are a few other factors to consider including the time in which you call them. That means if you call an electrician at night, during a holiday, or on short notice, you are going to pay possibly double the hour rate that you're used to.

Furthermore, a master electrician will most likely collect a first hour rate in excess of \$150 and an average hourly rate of \$100. Meanwhile, a journeyman should cost about \$55 per hour while an amateur should cost about \$40 per hour. It should be noted that this is not a fixed price and it could vary depending on many of the factors we've discussed above.

FAQs

Q: Who can fit an isolator switch?

A: An isolator switch should be fitted by an experienced electrician as they have the expertise and experience to know the right tools to use for the job. While isolator switches can be installed by you, it is much better to leave it to a professional.

Q: What is a fan isolator switch?

A: With a name like that, you might be tempted to believe that fan isolator switches are for regular fans. However, this is untrue and they are more commonly used with extractor fans and this is because such fans contain considerable energy and could be dangerous. Therefore, a fan isolator switch works to isolate the fan which makes it easier to carry out repairs and maintenance.

Q: Can you use a circuit breaker as an isolator device

A: While this is theoretically possible, it is usually advised to use an isolator device for isolating a circuit for the purpose of maintenance. This is because, while a circuit breaker protects the circuit from overload, and can be operated when the load is still on. However, with isolator switches, they only work when the load is off.

Q: What is a battery isolator

A: A battery isolator works to divert energy away from one battery and into another. This is so the device or vehicle doesn't take up power from more than one source which could drain the batteries faster.

Q: What is electrical earthing

A: Electrical earthing is the process of diverting electrical discharge into the earth through the use of a low resistance wire. It is implemented by simply connecting a wire that isn't carrying any current to the ground.

Sources

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