On the safe side

Cord retention systems are a good means to prevent unintentional removal of the power supply. But how does it work? What are the solutions on the market? And: is there the one, best, and most clever solution of all?

We are fortunate to live in a country where failures are extremely rare. However, a power failure does not always have to be the fault of the energy suppliers. Sometimes a little slip-up is enough to break the supply. If you are not careful and accidentally pull out the wrong cable, or you get all confused with the cables in a tangled mess - which really should not happen. But when the plug is pulled.

There can be some really serious consequences. There are numerous applications where you really cannot afford to have a power disconnect occur. For example, in medical technology. In the operating room. It could be fatal if a life-support machine suddenly stops working.

They have been around for a long time

Strain relief clips and cord-retention safeguards are by no means a new concept in the world of electronics. For example, in HF measurement and laboratory technology. The manufacturers of such devices usually use small-scale signal appliance couplers mounted on the front, which have a cord-retention safeguard integrated as standard: BNC (Bayonet Neill–Concelman) using a bayonet locking mechanism. An obvious choice since measuring technology is hardly ever possible without a tangle of cables. It often looks just like the jungle at the back of a PC. Countless cables together in an extremely confined area. There had to be a solution. Not everywhere, but in some places. Keyword: Ethernet network cable.

Plug-in systems that have already integrated a solution often face the cord retaining problem. The cord-retention safeguard is introduced mechanically in both of the examples shown here.

Unfortunately when the power is supplied from the back, this is no longer so straightforward. Why? Couplers are used virtually exclusively on devices in the 1-phase range according to IEC 60320 (IEC = International Electrotechnical Commission). Worldwide. This makes sense, because it ensures the highest compatibility. However, these IEC appliance couplers do not provide a cord restraining or cord-retention safeguard on the appliance coupler itself.

Solutions

The power cord-retention safeguard is not a new problem. Accordingly, different approaches to solving the problem have been put forward over the years; all of them are mechanical. The following is a selection of solutions, which is by no means exhaustive, for IEC couplers.

Simple, effective, cord-retention safeguard: Solution with clip or bracket
Source: SCHURTER

Bracket, bail and clip solutions

At first glance, these solutions may not appear state-of-the-art , but fulfill the job - cost-effectively. The cable is screwed to the housing with a wire bail or clip. Please

note it is the cable, not the plug or socket. It is practically impossible to inadvertently pull it out. This solution really makes sense when an installation is rarely relocated and plugged in again. Simple, but not so elegant.

Retaining bail

The classic: cord-retention safeguard using a retaining bracket, which is mounted on the appliance inlet and pressed over the connector. Simple and effective, if you consider the one and the other point:
Because depending on the type of plug and all the different shapes of connectors, the bail with the right shape has to be chosen here. If the bracket and connector do not mate up perfectly, then you can forget a successful retention of the cord. This is not the ideal solution for devices that are moved more frequently and plugged in again with different cables.

If the bracket and coupler type match, then you have a viable solution. Here with additional sealing kit to increase the IP protection. Source: SCHURTER

Dedicated solutions

The dedicated solutions from various manufacturers, which are known as V-Lock, SecureLock and the like, are very popular, for example, in medical technology or data centers. Just like the Ethernet cable in computer technology, they set the standard for the supply of power to sensitive systems. What they both have in common is that the plug and the socket are perfectly matched to one another. These systems deliver what they promise.

With these kind of cord-retention safeguards, a stable mechanical connection is established between the socket and the plug. A cam on the (upper) side of the socket snaps into the opening provided on the appliance inlet. This reliable connection prevents the power cable from being unintentionally pulled out. The locking mechanism is released by pressing down on the unlocking lever with your finger.

Examples of dedicated solutions: V-Lock with EMC filter and fuse holder; SecureLock in various colors. Sources: SCHURTER / Raritan

This is the weak spot of these systems: the unlocking mechanism. This requires some space. If, for example, densely packed outlet strips are used, minimizing space in between. The type of retention system is also limited, side or top latching, depending on the arrangement of the outlets (vertical, horizontal). However, considering these limitations in the strip design will ensure a highly reliable solution.

Further advantages to this type of solution include the breadth of mating inlets and outlets, which are available with a multitude of functions, that suit useful integrated features on the appliance. For example with mains filters and / or fuse holders. Or combinations with high IP protection. A compelling consideration.

Lever free solutions

Unlike the latching solutions, alternatives known as IEC Lock or Auto-Lock are used with standard universal IEC sockets or plugs. While the clever mechanism is extremely practical and universal, this approach does involve a disadvantage: The locking mechanism exerts mechanical force on the live pins in the socket or plug. In addition: It should also be noted that even with these solutions, the unlocking mechanisms are imposing, as they protrude from the coupler. And so it is necessary to consider space restraints accordingly. The advantage is quite clearly in the universal use and resulting lower costs, since only one side of the connection deviates from the standard.

Others

The zLock solution is exotic. It has a locking mechanism on the plug as well as on the socket side of the cable - pin/cam on one, clamping lock on the other. This is what makes it unique. It can be used with standard IEC sockets and plugs. This makes it ideal for use as an additional hightensile connection between two standard IEC standard couplers on both sides!

A clever locking mechanism is inside the coupler. IEC-Lock and Auto-Lock Sources: Schaffner / Quail

Locked on both sides: zLock Source: Zonit

The so-called Plug Locks are simply put over the IEC coupler. They fill the gap between plug and socket. If both parts are manufactured completely accurately, they may require considerable force to assemble - up to fatigue fracture. If, on the other hand, there is sufficient play, then such inserts are a quick and extremely cost-effective approach for cord-retention safeguard. However, it can again be argued that a truly professional solution should be solid, safe and sure.

The best solution?

Unfortunately, this is not the most well developed solution. It still depends - as always - on the application. Inside? Outside? Mobile appliances or fixed installations? There are many parameters that must be weighed against each other.
And there is another aspect: The value!

The stripped down approach. Plug Lock: Cheap but with color ID. Difficult to assemble or even use with tight-fitted couplers. Source: tripplite

Does it make sense if equipment is provided costing thousands of euros but only has a 50-cent cord retaining safeguard? Is it worth cutting costs here? If a cord retaining safeguard is required, the degree of professionalism should be matched with that of the equipment.

Company

SCHURTER continues to be a progressive innovator and manufacturer of electronic and electrical components worldwide. Our products ensure safe and clean supply of power, while making equipment easy to use. We offer a broad range of standard products including circuit protection, connectors, EMC products, switches and input systems, as well as electronic manufacturing services. Moreover, SCHURTER is ready to work with our customers to meet their application specific requirements, not covered in our standard range. You can rely on SCHURTER's global network of companies and partners to guarantee a high level of local service and product delivery.

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SYSTEM	ADVANTAGES	DISADVANTAGES	COMMENTS
Bracket / Bail	Good value, can be used everywhere	Can only be attached with a tool	Coupler itself not secured against pulling
Folding Clamp	Proven	Only works with matching components	High IP protection for the appliance can be realized with sealing kits
V-Lock	Professional, secure, solid, proven	Space requirements for unlocking	High IP protection possible, EMC filter and fuse holders available, dedicated system
P-Lock (SecureLock)	Professional, secure, solid, proven	Space requirements for unlocking	Dedicated system
IEC-Lock	Universal for all IEC couplers	Space requirements for unlocking, mechanical forces on live parts	
Auto-Lock	Universal for all IEC couplers	Space requirements for unlocking, mechanical forces on live parts	
zLock	Universal for all IEC couplers, both sides lockable	Space requirements for unlocking, mechanical forces on live parts	
Plug Lock Insert	(Almost) always usable	With exact-fit couplers impossible assembly	

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