

FOAM GASKET APPLICATION IN THE ELECTRONICS INDUSTRY

Completely protected

Nowadays, the life veins of highly automated industrial production come together in the switch cabinets used in the electrical distribution and control and safety technology of the production systems. The sensitive electronics involved are given the best possible protection against faults and mechanical damage by the control cabinet body. But the control cabinet needs to be sealed off too.

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Switch cabinets make an important contribution to trouble-free industrial production if they are reliably sealed against environmental influences. Today, polyurethane foam gaskets are increasingly used for that reason. They seal the cabinet body and the doors off so that dirt, dust and moisture cannot penetrate into the interior, and cannot damage the electronics. This reliably

prevents interference and avoids production losses. New on the market are the 2-component polyurethane foam seals from Sonderhoff which can be flexibly adapted to different requirements. For this there is a wide range of properties available according to each type of material:

- low assembly and tack-free times due to very fast reacting foams,
- high flame protection according to fire safety standard UL 94 HF-1,

- suitable for indoor or outdoor use,
- good recovery after compression of the foam gaskets, as well as
- high tightness according to the testing classification NEMA for North America or IP-classes (ingress protection) in Europe.

The sealing properties mentioned increase the protection of the electrical and electronic components in switch cabinets against dust, rain, splash and stream water, as well as fire.

Shortened assembly and tack-free times

The fast reacting foam seals for the sealing of switch cabinets and electronics housings allow short curing times. They can be adapted to the customer's production speed and application process cycle as required. For instance, with the ultra-fast, 2-component polyurethane foam seal for indoor switch cabinets, the sealing surface is tack-free after just 3.5 minutes and the assembly time can be reduced by more than half from its previous approximately 60 minutes to around 25 minutes*.

For switch cabinets that are permanently exposed to the influences of weather, special fast-curing foam seals are available that have been tested outdoors. One of these, an ultra-fast-reacting foam seal, can be installed after just 20 minutes (standard 60 minutes). It has



Figure 1: The excellent elastic recovery of the new 2C polyurethane foam sealing is crucial when the switch cabinet doors are opened and closed frequently for ensuring a consistently high sealant effect when closed.



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The fast curing foam seals generally adhere very well to powder paint coated switch cabinets, and with adhesion-promoting primer good adhesion can also be reached on stainless steel housings.

a tack-free time around 3 minutes, compared to the previous time of 12 minutes (the given times can vary depending on the environmental influences). The advantage is obvious: shorter tack-free times mean that further processing steps can start sooner. The above mentioned figures vary depending on the temperature and processing and machinery-mediated influences.

Advantages of short assembly times

During the development of seal formulas, the specific production concepts and application processes used by the customers need to be considered especially. In the development of 2-component control cabinet seals, for example, it is important to coordinate the reaction behaviour and pot time until the start of expansion, as well as the curing time of the foam seal, as precisely as possible with the customer's production processes in switch cabinet assembly.

The installation time is also crucial in switch cabinet assembly, i.e. the time needed for the foam seal to cure and the

time from which the foamed components can be put together to create a switch cabinet. Until final assembly, the individual switch cabinet components - side pieces, back wall and doors - are usually stored in piles until they are fully cured. If the new switch cabinet seals enable the installation times to be reduced by at least half, significantly fewer components need to be stacked up for a shorter length of time. This saves on storage space and warehouse costs. Investments in tempering furnaces, such as the type used to cure 1K foam seals, are not necessary thanks to the significantly faster reaction behaviour of the 2-component fast-cure foam gaskets.

Good surface adhesion and elastic recovery

The type and characteristics of the substrate play a major role in the surface adhesion of foam seals. The new fast-cure foam seals generally adhere very well to switch cabinet housings that are usually coated with powder paint (Figure 1). This is often not the case with stainless steel housings (Figure 2). Here, howev-

er, pre-treatment with an adhesion-promoting primer can produce good results. Plastic housings also exhibit adequately good adhesive properties; however this depends greatly on the type of plastic used. Foam seals on plastics such as ABS, PC or PA6 generally adhere well, whereas PE, PP, PS PVC or PMMA often require pre-treatment. In this case, primers or thermal processes such as flame treatment, plasma or corona treatment are usually used.

In the case of electronics housings made from plastic, it is usually sufficient for the foam seal to be held in the groove. Essentially, the surface adhesion must always be checked on an application-by-application basis.

The seal foamed switch cabinet side pieces, back walls and roof elements are installed during final assembly and then not opened again. The cabinet doors, on the other hand, are opened and closed frequently, which means that special requirements apply to the elastic recovery of the seal used here. Under test conditions (80° C, 50% compression, 22 h) the indoor foam seals recovered by around



Figure 3: Foam seals with flame protection are used in places where the strict US fire safety regulations apply, set out in the UL 94 HF-1 for the sealing of switch cabinets.

92%. In the case of outdoor foam seals, the elastic recovery is even better, at around 95%. This means that the foam structure is able to maintain a consistently high sealing effect even after frequent opening and closing of the doors.

Optimised sealing parameters

The fast curing switch cabinet seals for indoor or outdoor use are water-repellent. The water uptake in their compressed state at room temperature is less than around 3% for outdoor foam seals and around 5% for indoor foam seals. This means that with the whole construction protection classes up to IP 67 can be achieved, depending on the component design and the foam system used. In North America, the sealing of steel switch cabinets with these fast-cure seals is tested in a system test in accordance with NEMA 4. The switch cabinets are subjected to a water jet test for this, in which all columns with seals are checked for tightness with a water jet sprayed at a rate of over 240 l/min and for a testing time of 40 minutes.

The test also examines the protection against dust.

Flame protection in the event of a fire

Flame protection is one element of the broad spectrum of properties of the described foam seals for the sealing of switch cabinets and electronics housings (Figure 3). As required the fire safety standard UL 94 HF-1 can be fulfilled, the highest fire safety class for polyurethane foam seals in the USA, and is therefore classified as self-extinguishing without burning droplets. It also complies with US testing standard UL 50E for switch cabinets and electronics housings in non-explosion-protected zones, as well as UL 508 for the safety of electrical switchgear. All three are key requirements for the marketing of electrical equipment and other electronic applications in the US, Canada and Mexico.

Concluding remark

Perfectly sealed switch cabinets that ensure high-performance and fault-free

electrical distribution are not only used in industrialised nations. They are one of the prerequisites for the industrialisation of developing countries all over the world. For the plastic and metal processing companies in these countries everything for the sealing of switch cabinets and electronics housings is available, from the broad spectrum of properties of sealing products to the mixing and dosing systems for the foam dispensing of the components. ■

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