Technical Information
GF05

Pigments and Special Products

Special frits for safety cables

In spite of extensive safety precautions there is still a remaining risk of fire. Additionally, the potential damage in case of fire has increased significantly during the recent years. This is mainly due to the fact that official buildings are more and more frequented, and due to the concentration of high values in small rooms with steady increasing amount of inflammable material.

If the worst comes to the worst all relevant safety equipment like fire detectors, communication devices, emergency lighting, transportation systems with evacuating function, water pressure systems, smoke and heat flues have to remain workable for as long as possible. This counts especially for highly frequented official buildings, say hospitals, old people's homes, schools, or tower blocks.

The challenge:

In case of fire the electric system has to remain insulated and be functioning at least over a certain period of time which is stipulated by the legislation.

During a fire, ordinary cables already lose their functionability after a short time. Although flame retardant cables made of halogen containing polymers can limit the expansion of a fire, they emit corrosive and toxic gases with simultaneous release of heavy smoke. The endangering through flue gases is by far the biggest danger for human life in case of fire.

A possible solution for maintaining the functionability is based on winding mica around a cable. This method is very costly, and in most times it is combined with common polymers which release flue gases when burnt.
The task is to develop a cost/benefit optimized cable system, which guarantees the functionability even in case of fire and which does not release toxic gases.

The solution:

Together with a noted manufacturer of silicon polymers we have developed a formulation for a **glass containing safety mass** that is added directly to the silicon polymer. Out of this mixture silicon cables can be made which meet the standard requirements for **safety cables**. Therefore no costly and complicated mica winding technology is needed.

Even „regular“ silicon cables show some advantages over other polymer cables:
- extremely high weather and UV resistance
- very good flexibility
- very high stability against high temperatures of the surrounding
- no halogenes
- no toxic components or decomposition products (even in case of fire or smoldering fire)

Additionally to the above mentioned advantages, the silicon cables filled with our special glass guarantee the maintaining of function and insulation of the cable in case of fire for a certain period of time.

In spite of the high filler content of around 50 % by weight, such a cable still meets the requirements of elasticity and resistance to tearing according to DIN VDE 0472 part 602.

During a fire the cable insulation sinters to a solid ceramic coating. The conducting core of the cable is therefore still insulated, so that the functionability and insulation stay intact. There is neither a short circuit nor an interruption of the current.

Our special glass is ideal for compounders who offer cable material for the safety market as well as for cable manufacturers who compound their polymers by themselfs.

The advantages:

The advantages over the mica winding technique are the lower production cost, and there is no need to invest in expensive winding equipment. Therefore the combination silicon – special glass is ideal even for the so far unserved market of unexpensive safety cables.

Safety and innovation do not need to be expensive!

Regulatory affairs:

Maintaining the function for electric cable systems for 30 to 90 minutes during a fire is required for some buildings according to VDE 0108 and other local construction regulations. The proof is made with a test according to DIN 4102 part 12 (latest version 12/98). For maintaining the insulation properties VDE 0472 part 814 is considered.
E. g. in Germany, the tested cable system is certified by an official institute, the „Amtliche Materialprüfanstalt“. This certificate states that the end user will minimize the risks in case of fire for both people and real values.

Differences maintaining of insulation and maintaining of function

	Maintaining of Insulation	Maintaining of Function
Test norm	DIN VDE 0472 part 814 IEC 331	DIN 4102 part 12
Test conditions	Test of a straight short piece of cable without fixing at 750° C without mechanical stress	Test of a complete cable system including fixing device at more than 1000 C

In single European countries different laws and regulations are valid with various test conditions. Changes to existing regulations and laws are possible. We recommend that the end user may test his product according to the regulations of his country. The silicon/glass mixture has to be adapted to the requirements of the respective country.

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