



tyco

Electronics

Energy Division

GUROFLEX MV

Two-component cold-pour compound for medium voltage bulk-insulation applications

Questions and Answers

What is GUROFLEX MV?

GUROFLEX MV is a two-component cold-pour insulating compound developed and manufactured by Tyco Electronics Energy. It has excellent electrical characteristics for medium voltage insulation.

(See Technical Data Sheet)

What is it for?

Its principal application is as an electrically insulating filling compound for cable connection enclosures associated with transformers, switchgear and motors for system voltages up to 36 kV.

Other known applications include insulation of bus bar enclosures ('band-joints') and as a cavity-filler in MV bushings.

(See Product Brochure EPP-1190)

What is its chemical basis?

Each of the two liquid components is a modified hydrocarbon resin. When the two are mixed together there is a progressive cross-linking reaction during which the compound becomes a soft rubbery solid. In contrast to conventional two-part resins, there is negligible generation of heat during curing. The reaction is irreversible and the cured compound cannot melt or flow even at high temperatures.

Is GUROFLEX MV intended as a replacement for heat-shrink or other terminations in cable boxes?

No. The majority of cable termination applications in conventional modern transformer and switchgear boxes can be satisfied with appropriate cable terminations and bushing insulation boots.

Circumstances where GUROFLEX MV is the right choice include:

- Bushing-connection metalwork is bulky and/or awkwardly shaped and therefore not suitable for heat-shrink or other types of applied insulation
- There is more than one cable core per phase
- Adequate air clearances cannot be achieved
- The environmental conditions within the cable box are unusually difficult e.g. persistent humidity, dust, chemical pollution etc.

How is it supplied?

GUROFLEX MV is supplied as a kit comprising secure cans and an installation instruction. These components are contained in a heavy duty plastic bag.

Standard kit volumes are 5.3 litres and 10 litres of compound. The 5.3 litre kit includes a mixing spatula.

Product references are GUROFLEX-MV-C530 and GUROFLEX-MV-C1000.

Other volumes can be made available if required.

Note that the product is measured and supplied by volume, not weight. For conversion from weight to volume use a density of 1.11 (i.e. 1 kg of compound has a volume of 0.9 litres).

How is it mixed and poured, and what is the 'pot-life'?

The larger of the two component cans is used as the mixing vessel. Thorough mixing (indicated by uniform colour of the mix) takes up to 3 minutes, after which the compound is poured directly into the enclosure. The mixed compound has a 'pot-life' of about 30 minutes, but it is recommended to pour it without unnecessary delay. This allows maximum time for any air bubbles to escape.

Mixing is easier and quicker with a mechanical stirrer fitted to an electric drill. Power-assisted mixing is strongly recommended for the 10 litre kit. The 5.3 litre kit can easily be mixed by hand; a wooden spatula is included in the kit for this purpose.

No heating is required – this is a major advantage for GUROFLEX MV over hot-pour compounds such as bitumen and viscous oils (See Installation Instruction EPP-1023))

Will the compound 'go off' (cure) before filling can be completed?

Filling a large cable box may take an hour or more. During this time the first mixes will have started the reaction process. This is not a problem because the reaction is slow and results in only a gradual increase in viscosity. There is no sudden change in characteristics as seen with polyurethane resins.

It is strongly recommended that filling the enclosure is completed in one continuous operation. However, if it is essential to pause during the mixing/filling process (overnight for example), it is acceptable to pour fresh mixes on to newly-cured compound provided the surface of the cured compound has been thoroughly protected against contamination and moisture.

Does the filled enclosure need ‘topping-up’?

No. There is negligible shrinkage of the compound during the curing reaction. This is an important advantage over hot-pour compounds that will shrink during cooling and usually need topping up (generally after 24 hours) before the equipment can be energised.

Is there a possibility of long-term leakage from cable boxes?

No. Since GUROFLEX MV cures to a solid, no long-term leaks are possible. Small leaks occurring during the mixing/pouring process can be plugged with mastic or tape. These leaks will stop when the viscosity of the compound increases during curing. This is another major advantage over bitumen and other hot-pour compounds that remain essentially liquid and can gradually leak from box front-plates and cable glands.

Can equipment be energised immediately after pouring the compound?

Yes. The electrical characteristics of the compound are similar in liquid and cured solid form. This was confirmed during testing with a standard 11 kV transformer cable box. The test assembly was subjected to a full 95 kV impulse voltage test (60 shots) started 3 minutes after filling and completed in about 15 minutes whilst the compound was still fully liquid. Once the enclosure has been filled it can be sealed. No further inspection or attention (e.g. ‘topping up’) is necessary before putting the equipment into service.

Is it hazardous?

No. GUROFLEX MV was developed specifically to be non-hazardous and to pose no known threat to the environment. The components require no hazard classification, and this status has been confirmed by independent testing. It is therefore very safe to handle and no special precautions are necessary in disposing of the waste containers, stirrers etc. Combustion products are those expected of a basic hydrocarbon. (See Safety Data Sheets for detailed information)

Has it been tested?

Yes. GUROFLEX MV has undergone extensive testing based on the requirements of CENELEC (European) standard HD 629.1 S1 ‘Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV’ (Table 3 – requirements for indoor terminations for extruded insulation cables). These test requirements are incorporated into British Standard BS 7888-4.1 and other European national standards. These CENELEC test requirements include and exceed those of IEC 60502-4.

GUROFLEX MV has successfully completed tests for voltage classes 6,35/11(12) kV and 19/33(36) kV. For these tests, the following assemblies were used:

- 11 kV 3-core XLPE cables (UK standard design) terminated into standard UK design transformer boxes

- 33 kV single-core XLPE cables terminated into a metal box enclosure designed with minimum clearances (to BS 2562). Impulse voltage testing of this assembly was extended to 250 kV (withstand level for 52 kV voltage class)

- 33 kV single-core XLPE cable terminated into a traditional porcelain termination housing ('sealing end').

In each case the cables were terminated with push-on stress cones or standard heat-shrink terminations and the enclosures were then filled with GUROFLEX MV.

(See Test Reports PPR-1730 and PPR-1937 for details)

What cable preparation is needed?

Cables are prepared as normal and fitted with conventional (shed-less) indoor terminations, either heat-shrink or cold-applied. The main requirement is to provide electrical stress control for the cable screen edge. Other traditional termination functions such as moisture sealing, tracking/erosion resistance are irrelevant once the enclosure is filled with solid insulation.

Cable conductor lugs and exposed stranded conductors do not have to be covered or sealed.

The crutch of a 3-core cable should have any spaces between the cores sealed with mastic or tape to prevent loss of liquid compound into the cable.

Normal cable-entry glands can be used if required, but the cured compound will provide some mechanical support for the cable, and of course there are no leakage issues.

Is GUROFLEX MV compatible with XLPE insulation and other typical cable materials?

Yes. There is no reaction with solid polymeric materials such as XLPE, EPR and PVC. Special material characteristics such as electrical conductivity are unaffected by contact with GUROFLEX MV, which is itself a solid and therefore unreactive

Are there any special temperature limitations in service?

No. Long-term ageing tests have confirmed that the material is thermally stable at the normal polymeric cable continuous operating temperature of 90 °C. Qualification testing included a standard thermal short circuit to a conductor temperature of 250 °C.

The thermal conductivity of GUROFLEX MV is similar to that of other hydrocarbon materials, including cable insulation.

Is it moisture-resistant?

Yes. The uncured and cured compound is unaffected by the presence of moisture. Absorption of moisture is very low.

Is it affected by residues of other filler compounds?

Compatibility tests have shown that it is not affected by traditional hot-pour insulating compounds such as bitumen, Pirelli (BICC) G38 and G83. If poured

on to residues of these compounds, GUROFLEX MV will not mix with them and will cure as normal. There may be some local swelling of GUROFLEX-MV in the presence of lower viscosity oil-based residues (for example transformer oil), but this will not significantly affect the performance of the compound

Can it be used to seal leaks from transformer bushings?

GUROFLEX MV is not intended as an adhesive or sealant. Leakage of oil from transformers into cable boxes should be remedied according to normal maintenance procedures. It is not recommended to fill a transformer box with GUROFLEX-MV where there is a known oil leakage problem.

Can it be mixed and poured at low and high ambient temperatures?

Yes. The viscosity and reaction rate of GUROFLEX MV are relatively insensitive to temperature. It can be successfully mixed and poured under very cold or very hot ambient conditions.

Will air be trapped in the compound as it cures?

GUROFLEX MV has been designed with a reaction rate slow enough to allow air bubbles to reach the surface while the compound is still liquid. Microscopic examination may reveal some very small bubbles remaining in the body of the material but these will not affect performance.

Does the un-mixed compound have a shelf-life?

Yes. The shelf-life is two years, in common with most reactive compounds

What about paper cables?

It is probably unlikely that there will be applications involving paper-insulated cables. No testing has so far been done with paper cables, but there is no reason to suggest that there would be any problems either during testing or service. Paper cables fitted with standard heat-shrink terminations are in any case virtually identical to polymeric cables in terms of electrical stresses and surface materials.

Please discuss possible paper cable applications with your local Tyco Electronics Energy representative before proceeding.

Can it be removed?

Yes. The soft rubbery compound can be cut and removed in solid lumps from its enclosure. It will peel away cleanly from most cable materials, allowing removal of cable if necessary.

In order to ensure easy release from the inner surfaces of the enclosure, it is recommended to coat these surfaces with Vaseline (or similar grease-like material) prior to pouring in the liquid GUROFLEX MV.
(see Installation Instruction)

John Weatherley

(who will be pleased to answer questions not addressed above)