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Medium voltage fuse cutouts with the thermal triggers - VV THERMO

In the wide offer of ETI Polam automatic protection devices and fuses, among other things, new design non-broad-gauged medium voltage fuse links with thermal triggers are also found. Their catalogue name is - VV THERMO. For correct selection of the medium voltage fuse links for use in devices for protecting against surcharge, short-circuit or an excessive temperature increase, it is necessary familiarity of their catalogue data and the ascertainment, whether they are suitable for the given device and the main voltage supply. The scope of the present article is the explanation to electric devices users some relevant problems with an exploitation and a selection of medium voltage fuse links with a thermal triggers, especially problems, with which author of the article comes together often during conferences, trade fairs or presentations of ETI-POLAM products.

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Photo

Fig. 1 Medium voltage fuse cutouts with thermal triggers - VV THERMO

VV THERMO medium voltage fuse cutouts are used most often for protecting transformers in transformer switch boxes feeding the group of receivers, they are also used in plants, housing estates, etc. Medium voltage fuse cutouts, because of their own destination - non-broad-gauged characteristic – in principle most often protect transformers against short-circuits. Transformers protection against surcharges takes place on the low-voltage side - 0, 4 kV, using most often fuses with gTr characteristics. Fuse disconnectors and medium voltage switch boxes - especially with closed construction or used in isolation of the sulphur hexafluoride (SF6), are subject to inadmissible temperature increases, whose source can be also the fuse themselves, during the prolonged surcharge or the elevated ambient temperature of the disconnector or the switch box. The considerably elevated temperature of the internal equipment in the switch box causes the accelerated wear of the insulating materials, eg. rubbers, plastics, varnishes or metal contact points and consequently shortening their vitality, and the possibility of the pronouncement of the internal short-circuit.

To avoid the excessive temperature increase of collaborative devices with the medium voltage fuse link, special construction - VV THERMO with the thermal trigger interconnected with the drift about the definite pressure power was adapted. Thermal trigger is responsible for the drift actuation, when the fuse link exceeds the certain level of the temperature, disconnector opening, break of current circuit and the limitation of the further excessive temperature rise.

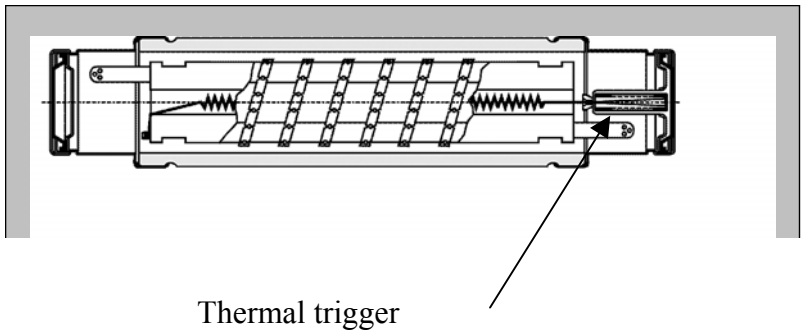
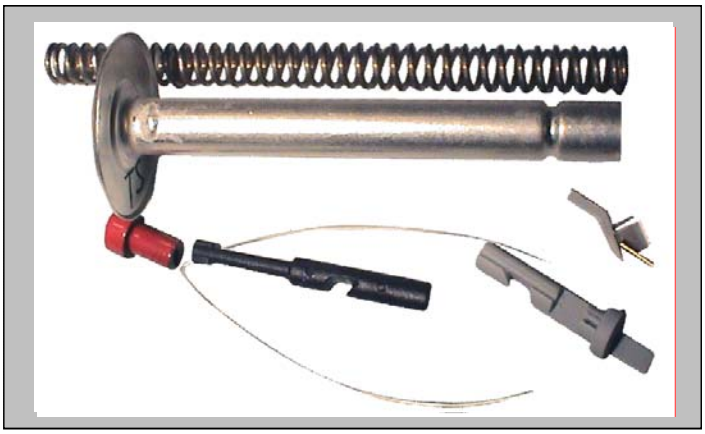


Fig. 2 Cross-section of the fuse link with thermal trigger

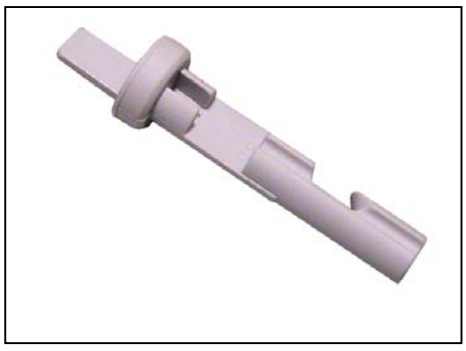
The thermal trigger of the VV THERMO fuse link is built-in into the drift casing - see Fig. 2. It consists of parts shown on the Fig. 3.

Fig. 3
Thermal trigger components parts used in fuse link VV THERMO



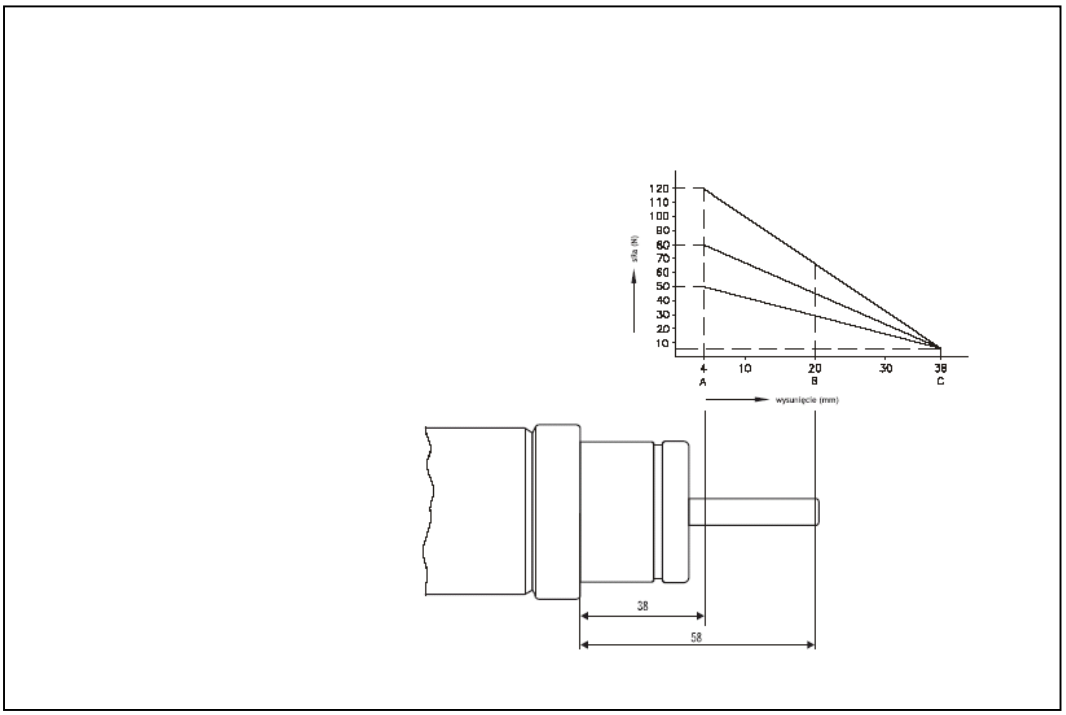
One of the most important parts is oblong funnel (Fig. 4) made from special material, which becomes very plastic, when interior inserts of the fuse link reach the temperature approx. 200ºC.

Fig. 4
Thermoplastic funnel used in thermal trigger



When the funnel becomes plastic, it releases metal hook, which holds up the drift. The drift by means of springs, becomes pushed out with suitable force outside of the fuse link and causes the start of the disconnector.
This means, that the VV THERMO fuse link thermal trigger can operate even at the rated current In (does not cause burn-through of the fuse element) even, if the admissible external (casing) temperature of the fuse link - approx. 130^{o}C - will be exceeded. I have to outlined, that short duration surcharges of the fuse link, do not cause to operate the drift and the unforeseeable pauses in the power supply.
In the ETI Polam offer are available two kinds of VV THERMO fuse links, in respect of the pressure power of the drift :
VV-D THERMO - 80 N
VV -- E THERMO - 120 N
On Fig. 5 is present the dynamic characteristic - the dependence of the pressure power of the drift in the dependence from the length of his stick out from the fuse.

Fig. 5 Dynamic characteristic of the drifts used in
VV THERMO fuse links



VV THERMO fuse links have same dimensions as standard fuse links - without thermal trigger and may be used in disconnectors of the same type.

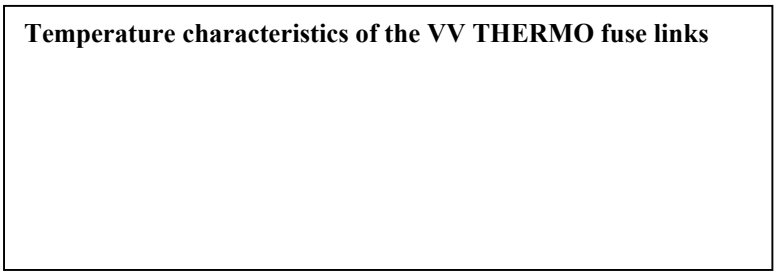


Fig. 6 Temperature characteristics of the VV THERMO fuse links.

On the Fig. 6 are shown the thermal characteristics of the VV-D THERMO fuse link -12kV - 40 A in the time function (min.), conditioned on the elevated ambient temperature (approx. 40 oC).
Characteristic were taken in 4 points - on the upper contact point, on the central part of the ceramic body, on the bottom contact point and on the fuse casing in the distance approx. 25 cm from the fuse link. On this characteristics one can notice (on all curves) settled point of maximum temperature of the fuse link, which is a point of getting down to work the thermal trigger in the temperature approx. 130 ^{o}C. From this moment the current stops to flow through the fuse link, but the fuse link temperature still grows to approx. 190 ^{o}C, because of the heat accumulation in the interior parts of fuse. After this period of time, the fuse cools down, his temperature and consequently co-operative with him devices also falls down.
Next article will introduce rules used in proper selection of medium voltage fuse cutouts to protect such devices as: engines, transformers, condensers, batteries, etc.

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