

Protocol
of tests of the thermoelectric module TB-127-1.4-1.5HT(150)C by method of
temperature cycling with the polarity change on the automated equipment.

Purpose of test: trouble-free life of the module TB-127-1.4-1.5HT(150)C.

Place of carrying out: Kryotherm company.

Period of carting out: 15.06.05 - 28.08.07.

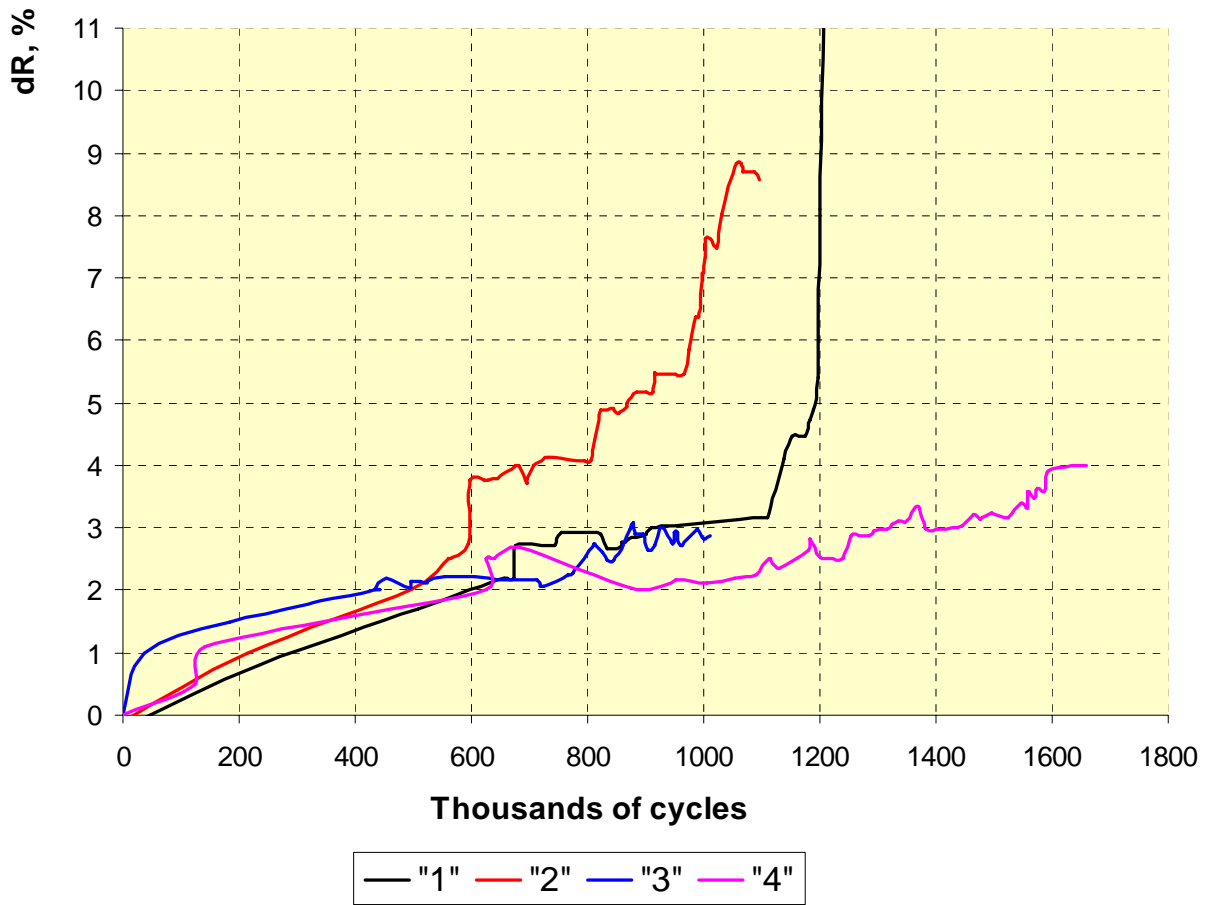
Testing object: thermoelectric module TB-127-1.4-1.5HT(150)C.

Testing method: temperature cycling of the cold side from +40°C to +90°C and backwards polarity change of module. Temperature of the hot side $T_h = (35 \pm 5)^\circ\text{C}$. Time of cycle – (40-60) sec. Current $I = 0,7I_{\text{max}}$. Failure criterion – 5% of resistance changing.

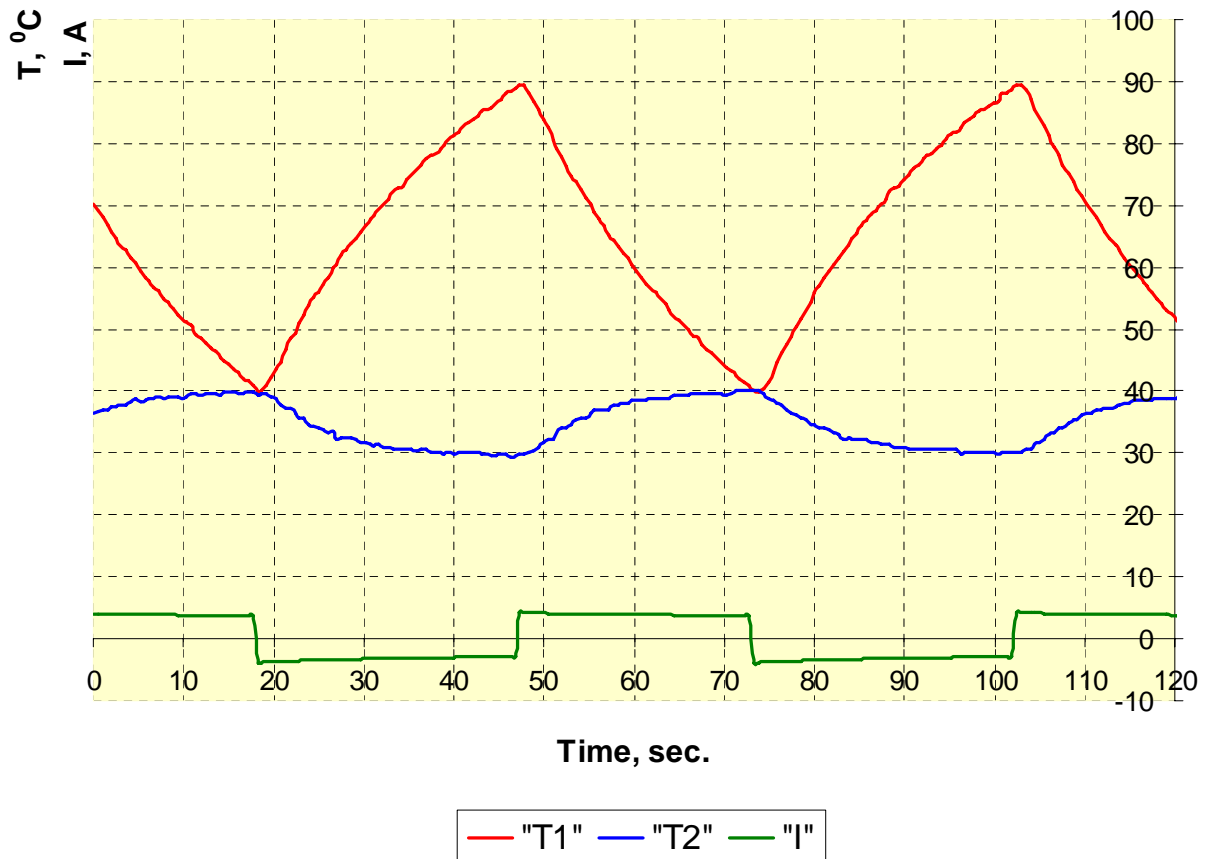
Test results:

| № | Before tests parameters | | After tests parameters | | Relative parameters variation, %. | | Number of cycles before the resistance variation on the 5%. | Number of cycles which module has tested. |
|---|--------------------------------------|--------|--------------------------------------|--------|-----------------------------------|--------------|-------------------------------------------------------------|-------------------------------------------|
| | $Z \times 10^{-3}, 1/^\circ\text{C}$ | R, Ohm | $Z \times 10^{-3}, 1/^\circ\text{C}$ | R, Ohm | $\Delta Z/Z$ | $\Delta R/R$ | | |
| 1 | 2,635 | 2,044 | 2,069 | 2,597 | -21,5 | 27,0 | 1170000 | 1270108 |
| 2 | 2,631 | 2,286 | 2,418 | 2,492 | -8,1 | 9,0 | 950000 | 1149760 |
| 3 | 2,645 | 2,110 | 2,579 | 2,173 | -2,5 | 3,0 | 1094603 | 1094603 |
| 4 | 2,622 | 2,126 | | | | 4,5 | 1670750 | 1670750 |

Relative change of module electrical resistance



The temperature profile of module



Conclusion: The module TB-127-1.4-1.5HT(150)C hold more than 950000 cycles. For modules № 1, 2, 3 tests were finished. Tests with module № 4 are in progress.