

The reliability of the contact switching of the measuring signal

Dmitriev S., Dmitrieva I., Syutkina J.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 IEEE. The analysis of the factors affecting reliability of the sealed contact in measuring chains of automated test systems is held. A number of factors of influence is attributed to the advantages of reed switches. Disadvantages of reed switches are divided into two groups, depending on the structural properties of the reed switch and the applied management methods. The paper presents analytical study of performance switching reliability in switching keys with serial, parallel and series-parallel key schemes with possible options enable leakage resistance. Unique positive properties of the contacts and insulation resistance of reeds defines characteristics of the 'perfect key'. The advantages of matrix management schemes were confirmed for many channel systems at automated testing of gas turbine engines. The solution the problem of increasing reliability of the contact switching at low-level signals (up to 50 mV) from thermocouples and strain gauges is provided. The description of the mechanisms of action fritting in the surface layers of the contacting surfaces, including reed switches is given.

<http://dx.doi.org/10.1109/ICIEAM.2016.7911721>

Keywords

contact, fritting, matrix control, measuring signal, reed switch, reliability, switching

References

- [1] V.A. Denisov, V.K. Zinakov, A.M. Shapiro, "Some questions the use of magnetically sealed contacts," Instruments and Control Systems, no. 11, pp. 18-20, 1971.
- [2] V.A. Dolgov, E.Yu. Gonestas, Switching devices of automatic control systems, Moscow: Energiya, 1969.
- [3] G.V. Druzhinin, The reliability of automated systems, Moscow: Energiya, 1977.
- [4] S.V. Dmitriev, R.I. Adgamov, V.D. Shershukov, V.V. Bazlova, "Switching devices," RU Patent 418912, 1974.
- [5] S.V. Dmitriev, R.I. Adgamov, V.D. Shershukov, L.L. Izmajlov, "A device for switching electric signals," RU Patent 440792, 1974.
- [6] S.M. Shlyahenko, The theory of jet engines, Moscow: Mashinostroenie, 1975.
- [7] S.V. Dmitriev, V.A. Shmelev, I.I. Kuznecova, V.A. Garmash, "Contact switching method," RU Patent 503308, 1976.
- [8] S.V. Dmitriev, V.A. Shmelev, I.I. Kuznecova, "Devices switching lowlevel electrical signals," RU Patent 528629, 1976.
- [9] S.V. Dmitriev, "Switch matrix control method," RU Patent 467330, 1973.
- [10] G.P. Shibanov, S.V. Dmitriev, R.I. Adgamov, V.D. Shershukov, "A device for switching electric signals," RU Patent 4311818, 1972.
- [11] G.P. Shibanov, V.D. Shershukov, S.V. Dmitriev, R.I. Adgamov, L.L. Izmajlov, "Switch electrical circuits," RU Patent 424479, 1971.
- [12] Yu.G. Zarenin, M.D. Zbyrko, V.P. Kredencer, A.A. Svistelnik, V.P. Yacenko, The reliability and efficiency of ACS, Tekhnika, 1975.
- [13] G.M. Gorbunov, E.L. Solohin, Test aircraft jet engines, Moscow: Mashinostroenie, 1967.
- [14] V.A. Myasnikov, V.M. Valkov, I.S. Omelchenko, Automated and automatic process control system, Moscow: Mashinostroenie, 1978.
- [15] V.E. Pticy, "The theory of vacuum insulation breakdown," Pisma v ZHETF, vol. 55, is. 6, pp. 325, 1992.
- [16] N.V. Tatarinova, "Vacuum electrical insulation," Vacuum equipment and technology, vol. 13, no. 1, pp. 3, 2003.
- [17] S.M. Karabanov, R.M. Majzels, V.N. Shoffa, Magnetically sealed contact (reed) and products based on them, Moscow: Intellekt, 2011.
- [18] V.V. Ananin, "The new coating on the base contact of molybdenum and tungsten (sputtering)," in Proc. Magnetically operated contacts (reed switches) and products based on them, 2005, pp. 102.
- [19] R.M. Majzels, "Development of new reed. Development prospects," in Proc. Magnetically operated contacts (reed switches) and products based on them, 2008, pp. 8.
- [20] Advantages and disadvantages of reed switches. Reeds produced by the domestic industry. [Online]. Available: <http://uirjnett.ucoz.ua/load/ehlektricheskie-apparaty/preimushhestva-i-nedostatki-gerkonov/preimushhestva-i-nedostatki-gerkonov-gerkony-vypuskaemye-otechestvennoj-promyshlennostju/51-1-0-125>.
- [21] The high-voltage vacuum reed switch. [Online]. Available: <http://www.rmcp.ru/files/rus/pdf/articles/2011/cf2c025db6f852ab622517e2c6f23975.pdf>.
- [22] Reed switch on opening and closing. [Online]. Available: <http://www.asutpp.ru/datchiki/gerkon.html>.