

ANALISA DAN RANCANG BANGUN SMART ELCB BERBASIS ESP8266

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ABSTRAK

Keselamatan instalasi listrik merupakan aspek penting dalam mencegah terjadinya sengatan Listrik akibat arus bocor. *Earth Leakage Circuit Breaker* (ELCB) konvensional mampu memberikan perlindungan terhadap arus bocor, namun belum dilengkapi dengan sistem pemantauan kondisi kelistrikan secara *real-time*. Penelitian ini bertujuan untuk merancang dan membangun sistem *Smart Earth Leakage Circuit Breaker* (ELCB) berbasis ESP8266 yang mampu mendeteksi arus bocor berdasarkan selisih arus antara penghantar fasa dan netral. Metode penelitian meliputi studi literatur, perancangan sistem, pengujian dan analisis. Hasil pengujian menunjukkan bahwa sistem mampu mengukur tegangan dan arus pada berbagai jenis beban, menampilkan hasil pengukuran, serta mengirimkan data *secara real-time* ke aplikasi Blynk. Sistem juga berhasil mendeteksi arus bocor berdasarkan selisih arus antara penghantar fasa dan netral, kemudian memutus aliran listrik secara otomatis ketika nilai selisih arus melebihi 30 mA. Pengujian pemutusan secara berulang sebanyak 10 kali menunjukkan waktu respon sistem berkisar antara 1,30–2,37 detik, dengan rata-rata waktu respon sebesar 1,81 detik. Meskipun demikian, sistem yang dikembangkan masih berupa *prototype* dan belum melalui pengujian kesesuaian terhadap standar perangkat proteksi arus bocor, sehingga masih memerlukan pengembangan dan pengujian lebih lanjut sebelum dapat diterapkan sebagai perangkat proteksi listrik pada instalasi rumah.

Kata Kunci: *Smart ELCB*, ESP8266, Arus Bocor, Blynk, Proteksi.

ANALYSIS AND DESIGN OF AN ESP8266-BASED SMART EARTH LEAKAGE CIRCUIT BREAKER (ELCB)

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ABSTRACT

Electrical installation safety is an important aspect in preventing electric shock caused by leakage current. Conventional Earth Leakage Circuit Breakers (ELCBs) are capable of providing protection against leakage current, but they are not equipped with a real-time electrical condition monitoring system. This research aims to design and develop a Smart Earth Leakage Circuit Breaker (ELCB) based on the ESP8266 that is capable of detecting leakage current based on the difference in current between the phase and neutral conductors. The research methods include literature study, system design, testing, and analysis. The test results show that the system is capable of measuring voltage and current under various types of loads, displaying the measurement results, and transmitting data in real time to the Blynk application. The system also successfully detects leakage current based on the difference in current between the phase and neutral conductors, then automatically disconnects the electrical supply when the current difference exceeds 30 mA. Repeated disconnection testing conducted 10 times showed that the system response time ranged from 1.30–2.37 seconds, with an average response time of 1.81 seconds. However, the developed system is still a prototype and has not undergone conformity testing against leakage-current protection device standards; therefore, further development and testing are required before it can be implemented as an electrical protection device in residential installations.

Keywords: Smart ELCB, ESP8266, leakage current, Blynk, Protection.