

RANCANG BANGUN *PROTOTYPE* SISTEM KEAMANAN SEPEDA MOTOR TRANSMISI MANUAL BERBASIS KOMBINASI ELEKTRO MEKANIK

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ABSTRAK

Peningkatan jumlah kendaraan bermotor di Indonesia diikuti dengan meningkatnya risiko tindak pencurian, khususnya pada sepeda motor transmisi manual keluaran tahun 2007 ke bawah yang masih menggunakan sistem keamanan konvensional. Sistem keamanan bawaan seperti kunci stang dan garpu pengunci dinilai memiliki kelemahan karena relatif mudah dibobol oleh pelaku pencurian. Penelitian ini bertujuan untuk mengembangkan *prototype* sistem keamanan sepeda motor transmisi manual berbasis kombinasi elektro mekanik yang mampu memberikan perlindungan tambahan dengan tetap mempertimbangkan kemudahan penggunaan, biaya yang terjangkau, dan kemudahan pemasangan pada kendaraan lama. Penelitian ini menggunakan metode *Research and Development* (R&D) dengan model pengembangan 4D (*Define, Design, Develop, Disseminate*). Tahap *define* dilakukan melalui analisis kebutuhan berdasarkan hasil survei terhadap masyarakat dan mekanik. Tahap *design* menghasilkan rancangan *prototype*, sedangkan tahap *develop* meliputi validasi instrumen, validasi ahli desain, dan validasi ahli manufaktur. Pengumpulan data dilakukan menggunakan angket dengan skala *Likert* yang kemudian dianalisis secara deskriptif kuantitatif menggunakan persentase tingkat kelayakan. Hasil penelitian menunjukkan bahwa instrumen penelitian memiliki validitas isi sebesar 1,00 dengan kategori sangat tinggi. Penilaian dari ahli desain memperoleh tingkat kelayakan sebesar 100% dengan kategori sangat layak, sedangkan penilaian ahli manufaktur juga memperoleh persentase 100% dengan kategori sangat layak. *Prototype* yang dikembangkan bekerja dengan memanfaatkan kombinasi sistem kelistrikan dan mekanisme penguncian sehingga ketika sistem keamanan aktif, mesin tidak dapat beroperasi secara normal, transmisi tidak berfungsi sebagaimana mestinya, serta sistem menghasilkan bunyi peringatan untuk menghambat upaya pencurian. Berdasarkan hasil tersebut dapat disimpulkan bahwa *prototype* sistem keamanan sepeda motor transmisi manual berbasis kombinasi elektro mekanik telah berhasil dikembangkan sesuai model 4D dan dinyatakan sangat layak untuk digunakan sebagai alternatif peningkatan keamanan pada sepeda motor transmisi manual, khususnya kendaraan keluaran lama yang masih banyak digunakan oleh masyarakat.

Kata kunci: sistem keamanan, sepeda motor transmisi manual, elektro mekanik, *prototype*, penelitian dan pengembangan.

DESIGN AND DEVELOPMENT OF A MOTORCYCLE SECURITY SYSTEM PROTOTYPE FOR MANUAL TRANSMISSIONS BASED ON AN ELECTROMECHANICAL COMBINATION

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ABSTRACT

The rise in the number of motor vehicles in Indonesia has been accompanied by an increased risk of theft, particularly targeting manual-transmission motorcycles manufactured in 2007 or earlier that rely on conventional security systems. Standard factory-installed security features such as handlebar and fork locks are considered vulnerable, as they are relatively easy for thieves to bypass. This study aimed to develop a prototype security system for manual-transmission motorcycles based on an electromechanical combination, designed to provide enhanced protection while ensuring ease of use, affordability, and simple installation on older vehicles. The study employed the Research and Development (R&D) method using the 4D development model (Define, Design, Develop, Disseminate). The "Define" stage involved a needs analysis based on surveys conducted with the general public and mechanics. The "Design" stage produced the prototype blueprint, while the "Develop" stage encompassed instrument validation as well as validation by design and manufacturing experts. Data were collected via Likert-scale questionnaires and analyzed using descriptive quantitative methods based on feasibility percentages. The results indicated that the research instrument possessed a content validity score of 1.00, placing it in the "very high" category. Assessments by design and manufacturing experts both yielded a 100% feasibility rating, categorizing the system as "highly feasible." The developed prototype operates by integrating an electrical system with a locking mechanism; when the security system is active, the engine cannot operate normally, the transmission fails to function as intended, and an audible warning sounds to deter theft attempts. In conclusion, the electromechanical security system prototype for manual-transmission motorcycles was successfully developed using the 4D model and is deemed highly feasible as an alternative security enhancement for manual-transmission motorcycles, particularly older models that remain widely used by the public.

Keywords: security system, manual-transmission motorcycle, electromechanical, prototype, research and development.