

# 中文摘要

由於近年來科技發展進步神速，因此電力系統之保護電驛在設計及應用方面，受其影響而持續不斷改變；由以往的電磁機械式設計，伴隨著半導體，積體電路及微處理機的技術發展而演變，再加上光纖通訊與數位式保護電驛相結合，使得保護電驛在電力系統及電力設備於異常狀態時，所能提供之信賴性、安全性、選擇性、速動性及經濟性等應用性能可大幅提高，其能將故障檢出隔離，藉以減輕電力設備損壞程度及維持電力系統穩定度與可靠度。

差動式保護電驛乃為快速動作型保護電驛，故在電力系統保護協調應用上可做為主保護，不需與下游之保護電驛做協調；且差動式保護電驛與過電流電驛保護相似，均可應用於電力系統各種不同電力設備之保護。但電力設備內部故障如由過電流電驛保護，則可能因故障隔離清除時間較長，致使輕者因電磁及機械力量使得結構產生變化，重者導致電力設備產生電弧、起火，進而造成開關器具燒損或套管炸毀，而危害到鄰近設備甚至人員。尤其電壓等級愈高之設備，更需較高級的保護設備。如若延遲清除故障，將對電力系統造成更嚴重之損害，其修護亦將較為困難，所以使用差動式保護電驛快速隔離電力設備之內部故障乃為保護電力系統及設備最有效之方法。

由於電子科技的突飛猛進，微處理機的技術已引進保護電驛的設計與應用領域，一具保護電驛不僅將具有保護（Protection）、監控（Supervisory）、遙控（Remote Control）及資訊擷取（Data Requisition）等多功能，而且保護電驛的設計都已系統化，一具電驛即可以完成電力系統的多種保護模式，例如差動保護、失步保護、後備過電流保護、過/欠電壓保護、斷路器失靈保護等等多種保護模式。所以用傳統的靜態試驗方法來檢測，已難以證明電驛所設計的保護功能是否正確無誤。最好的方法是用動態試驗來分析及測試保護電驛的功能是否正確。以美國 dole 公司的保護電驛測試儀器 F6150 為例，皆已內建各種廠家的數位式保護電驛測試方法，並附有動態試驗方法，但目前國內會使用的機電顧問公司尚寥寥可數，而無法於系統供電前正確的測試保護電驛的功能及接線是否正確，導致日後送電後造成電驛誤動作，使得工業界造成嚴重的停電損失。

本論文將對差動式保護電驛在電力系統中的運用作一說明，並提出對差動式保護電驛，接線完工後的正確有效的模擬測試方法，以供相關單位參考，期望能減少日後差動式保護電驛所產生的誤動作，減少工業界的停電損失，對台灣的工業界有所幫助。

## 英文摘要

Because of the science and technology was quick progress in recent years, the protection relays of the power system are in design and application, influenced by it and change constantly. From past electromagnetic machinery type follows the technical development of microprocessor, optical-fiber communications and multi-functional combination that is to offer reliability and economy. The rapidly operation in power system when in abnormal state that can examine the fault to isolate, in order to abate the electric equipment damaged condition and maintain stability and reliability of power system.

The digital protection relays not only have multi-functional protections and information retrieval that also designed by systematized. If using the traditional static method to test, it has been already difficult to prove whether it is correct to operate the designed function of protection relays. In high-order tester of protection relay has been built of some different type testing of production, and enclose the dynamic test method, but there are still very few electrical consultant companies adopted at present. The differential protection relays were fast movement types to protect the electric systems, so can be done in order to mainly protect and use in the power system. There were not needs to protect the electric on protecting coordination with the others. Also, the differential protection relays protected the electric system were similarly the over-current relays, apply to the protection of all kinds of electric equipment of power system. But if the fault is passed the over-current relays to protect within the electric equipment, the fault will be isolated and removed time longer, that cause the lighter electromagnetic and mechanical strength make structure is it change to produce, may be getting serious to cause electric equipment produce electric arc, on fire, and then cause the switch equipment to burn and decrease or the sleeve pipe is demolished, and endanger and get and is near the equipment even personnel. The equipment especially the higher in grade of voltage, need more advanced protection equipment even more. If postpone removing the fault, will cause more serious harm to the power system, its maintenance will be also comparatively difficult, so it is for protect power system and the most effective method of the equipment to use the electric differential relays fast inside faults which isolates the electric equipment.

This thesis presents the applications of differential protection relay in the power system at first. It also proposes the test criterion of protection relays wiring after completed, makes the method to use of testing that is effective, and reduces the losses of out of order in the industrial produce.