

# 电子测试

2017  
6月

TEST169.COM

总 370 期

www.test169.com

邮发代号: 82-870

统一刊号: ISSN 1000-8519 | CN 11-3927/TN

光纤陀螺可靠性工程中 FMEA 和 FTA 应用研究  
基于 PCI-1721 电子束磁扫描焊接的软件设计

基于模糊控制的盐度计温控系统研究  
基于 PLC 的通信车配电机柜设计  
宽带高速扫频信号源的高精度功率控制设计

¥15

ISSN 1000-8519



9 771000 851138

# 电子测试

ELECTRONIC TEST



总第 370 期  
2017 年 6 月出版

主管单位 北京市科学技术研究院  
主办单位 北京自动测试技术研究所  
出版单位 《电子测试》编辑部  
发行单位 《电子测试》发行部  
国际标准刊号 ISSN 1000-8519  
国内统一刊号 CN11-3927/TN  
邮发代号 82-870  
定价 15 元

社长 张 东  
主编 陈晓筱  
执行主编 胡 洁

顾问成员  
王勃华 刘利吉 李 军 邢卫兵  
陆祖良 樊建军 林崇诚 李锦林

编委会主任 刘明亮  
编委会副主任 张 东

编委  
冯建科 郭占山 贺昱耀 姜岩峰  
李锦林 李小奇 李 森 满庆丰  
申晓留 王祖林 王 曦 夏 洋  
阳 辉 张剑平 张忠平

市场总监 刘 晖  
编辑部 马 旭 郜姗姗 刘丽丽  
通信地址 北京市100098-002信箱  
邮政编码 100098  
电话 010-62410551  
传真 010-59713453  
电子信箱 ed@test169.com  
网址 www.test169.com

国内发行 北京报刊发行局  
订阅处 全国各地邮局  
国外发行 中国图书进出口总公司  
出版日期 每月 5 日、15 日  
广告经营许可证 京海工商广字 0059 号  
印刷单位 北京画中国印刷有限公司

## 声明

凡向本编辑部投稿录用后,均视为同意在本编辑网站及 CNKI 中国期刊全文数据库等数据库出版,所付稿酬包含网络出版稿酬。

# 目 录

2017.12

## 设计与研发

- 无速度传感器矢量控制下的火电机组高压辅机变频器低电压穿越技术仿真研究..... 顾文, 胡伟, 徐贤, 姚新阳, 黄学良 5  
光纤陀螺可靠性工程中FMEA和FTA应用研究  
..... 林湘云, 高军, 文武, 王红涛 8  
基于PCI-1721电子束磁扫描焊接的软件设计  
..... 黄小东, 陆苇, 黄奉宾, 王建辉 11  
基于模糊控制的盐度计温控系统研究..... 梁杰 13  
基于PLC的通信车配电机柜设计..... 隗倩 15  
宽带高速扫频信号源的高精度功率控制设计  
..... 邹敏, 任利霞, 邓伟, 梁训波, 王国义 17  
电子式电流互感器采样电路的计算与测试..... 周睿旋 18  
VXI六位半数字多用表设计与实现..... 赵杰 20  
基于数字多用表自动检定校准系统的研究..... 王煜 22  
基于单片机的智能家居控制系统设计及应用..... 冯笑, 朱彦龙 23  
基于LXI总线的多通道数据采集系统的设计与研究..... 张波 25  
智能化模块设计技术在非航空电子系统设计中的应用  
..... 周前柏, 王建生, 王剑博 27  
教学楼自动门控制系统研究与设计..... 董永洲, 宋鑫轲, 王丽 30  
论机电安装工程中的电气节能施工工艺..... 赵蓉 32  
运放电路的直线方程设计..... 周立平 33  
基于功角测量和等面积法则的发电机暂态稳定在线判别研究  
..... 谢宏杰, 孔雨, 金宇清 35  
军用软件测试文档生成设计与实现..... 孙培 39

## 理论与算法

- 加热炉炉内跟踪数据模型优化..... 田斌 42  
微波印制电路板加工工艺探索... 崔良端, 朱忠翰, 贾亮, 沈岳峰, 金俊 43  
基于遗传算法的生产车间调度方法研究..... 张文慧 45  
基于小波的电源动态控制技术研究..... 梁东莺, 郑玮琨 47  
Matlab软件在数学建模中的应用分析..... 汤名权 49  
战储包装综合评价及优化设计方法研究..... 周雯, 刘昱 51  
单轴应变Si NMOS电流模型研究..... 王颖 54  
公共建筑能耗监测模型探究..... 高鹤 56  
基于博弈论的无线自组网路由协议研究..... 董长庆 59  
基于曲线拟合的投弃式剖面仪电感量算法..... 付孝洪 61  
一种示位标信号的数字化解调方法..... 木建一, 于海鹏 62  
基于信息熵的实验教学量化研究..... 赵琳娜, 王海珍, 宝力高 64  
考虑微电网并网接入的配电网无功优化..... 王斌, 陈永杰 66

## 网络与信息工程

- 智能预测在能源管理系统中的应用..... 吕灏源 69

## Design and development

|  |   |    |
|--|---|----|
| The low-voltage cross technology simulation study of high voltage auxiliary power converter under the control of the speed sensor vector control.... | Gu Wen, Hu Wei, Xu Xian, Yao Xinyang, Huang Xueliang        | 5  |
| Appliedstudy of FMEA and FTA in reliability engineering of fiber optic gyros   | ..... Lin Xiangyun, Gao Jun, Wen WU, Wang Hongtao           | 8  |
| Software design of electron beam magnetic scanning welding based on PCI-1721   | ..... Huang Xiaodong, Lu Wei, Huang Fengbin, Wang Jianhui   | 11 |
| Research on temperature control system of salinity meter based on fuzzy control.....   | Liang Jie   | 13 |
| Design of the power distribution cabinet in communication vehicles based on PLC.....   | Wei Qian  | 15 |
| Design of high precision power control for wideband high speed sweep signal source   | ..... Zou Min, Ren Lixia, Deng Wei, Liang Xunbo, Wang Guoyi | 17 |
| Calculation and test of sampling circuit of electronic current transformer.....  | Zhou Ruini  | 18 |
| Design and Implementation of VXI Bus Six and A Half Digital Multi-Meter.....   | Zhao Jie  | 20 |
| Research on automatic verification and calibration system based on digital multimeter.....   | Wang Yu   | 22 |
| Design and application of intelligent home control system based on MCU.....  | Feng Xiao, Zhu Yanlong                                      | 23 |
| Research on Multi-channel Data Acquisition System Based on LXI.....  | Zhang Bo  | 25 |
| Non-Avionics Monitor Processor design method and technology research   | ..... Zhou Qianbai, Wang Jiansheng, Wang Jianbo             | 27 |
| Building automatic door control system research and design.....  | Dong Yongzhou, Song Xinke, Wang li                          | 30 |
| The technology of electric energy saving in electromechanical installation engineering   | ..... Zhao Rong   | 32 |
| Amplifier design method of linear equations.....   | Zhou Liping   | 33 |
| Generator based on power angle measurement and equal area rule On line identification of transient stability.....                                    | Xie Hongjie, Kong Yu, Jin Yuqing                            | 35 |
| Design and implementation of military software test document generation.....   | Sun Pei   | 39 |

## The theory and algorithm

|  |   |    |
|--|---|----|
| Optimization of tracking data model in furnace furnace.....                                      | Tian Bin  | 42 |
| Research on processing technology of microwave printed circuit board                             | ..... Cui Liangduan, Zhu Zhonghan, Jia Liang, Shen Yuefeng, Jin Jun | 43 |
| Research on scheduling method of production workshop based on genetic algorithm.....             | Zhang Wenhui  | 45 |
| Research on power supply dynamic control technology based on Wavelet                             | ..... Liang Dongying, Zheng Weikun                                  | 47 |
| Analysis on the Application of Matlab software in mathematical modeling.....                     | Tang Mingquan   | 49 |
| Study on Comprehensive Evaluation and Optimization Design Method of Strategic Reserves Packaging | ..... Zhou Wen, Liu Yu  | 51 |
| Uniaxial strain Si NMOS current model study.....   | Wang Ying   | 54 |
| Research on energy consumption monitoring model of public buildings.....                         | Gao He  | 56 |
| The study of wireless self-organizing routing protocols based on game theory.....                | Dong Changqing  | 59 |
| A inductance clustering algorithm of XCTD based on the curve fitting.....                        | Fu Xiaohong   | 61 |
| Digital demodulation method for emergency position indicating radio beacon                       | ..... Mu Jianyi, Yu Haipeng   | 62 |
| Quantitative Research on Experimental Teaching Based on Information Entropy                      | ..... Zhao Linna, Wang Haizhen, Bao Ligao                           | 64 |
| Distribution Network Reactive Power Optimization Considering The Operation of Microgrid          | ..... Wang Bin, Chen Yongjie  | 66 |

## Network and Information Engineering

|  |                   |    |
|--|-------------------|----|
| The use of intelligence in energy management systems.....  | Lv Haoyuan        | 69 |
| Design Research of Networked experiment Measurement System Framework.....  | Xiong Fengyang    | 70 |
| Discussion on NB-IoT-based Smart Water Construction.....   | Wan Ruyi, Li Zhen | 72 |
| Current situation and Prospect of communication platform for automobile enterprise based on unified communication..... | Li Xueyuan        | 74 |

|                       |                |
|-----------------------|----------------|
| 网络化试验测试系统框架设计技术研究     | 熊凤阳 70         |
| 基于NB-IoT的智慧水务建设探讨     | 宛如意, 李震 72     |
| 基于统一通信的汽车企业通信平台的现状及展望 | 李雪源 74         |
| 自动测试系统通用测试平台技术研究      | 夏磊, 刘毅, 周靖宇 76 |
| 航空发动机试验测试及数据管理技术研究    | 张波 78          |
| 计算机电子控制技术及其运用的相关探讨    | 郭磊 80          |
| GNSS在航行新技术的应用         | 冯军红, 刘莉雯 82    |
| 物联网微波能量传输系统天线的研究      | 秦武 85          |

## 测试工具与解决方案

|                           |                      |
|---------------------------|----------------------|
| 低压下户计量集抄装置常见电气故障          | 范玉林 87               |
| 关于新时期电气设备维修问题的研究          | 冯沛均 88               |
| 变电所携带型高压接地线改造设计分析         | 朱晓光, 李家鑫, 王斌 90      |
| 提高海洋仪器的环境适应性和可靠性          | 梁杰 91                |
| 测控技术与仪器的智能化技术应用研究         | 石寰宇 93               |
| 电力变压器保护技术现状及未来发展趋势        | 张勇 95                |
| 电子围栏系统在水厂中的应用             | 鲁莹莹 97               |
| 西门子S120变频器的优点及调试          | 时亨岭 99               |
| 试述变配电室降温方式                | 张志敏, 蔡斌, 周俊 101      |
| 谈电力运维安全隐患排查治理             | 何新萍 102              |
| GPS-RTK在夏日哈木铜镍矿区勘探线测量中的应用 | 丁启顺 104              |
| 电子衡器的日常维护事项及典型故障的处理探讨     | 罗长城, 石凌 106          |
| 一种航空机载软件测试项目的进度改进模型       | 周敏刚, 封滇利, 张蕾, 秦浩 108 |

## 科技论坛

|                        |              |
|------------------------|--------------|
| 基于B/S科研计划管理系统的设计研究     | 吴焯 111       |
| 浅析智能建筑中的电气工程和自动化技术     | 赵露银 112      |
| 物联网技术的发展及其工业应用的实践研究    | 吴荣昌 114      |
| 绿色LED照明技术及其应用研究        | 胡振荣 115      |
| 汽车电子产品检测认证现状及未来的发展趋势分析 | 秦媛 116       |
| LED光源优势及其在汽车灯具的应用前景研究  | 田应军, 于建文 118 |
| 人工智能在计算机网络技术中的应用研究     | 姜学东, 王昊欣 120 |
| 变电运行设备的维护技术探讨          | 王泽 122       |
| 如何避免雷电对民航电子设备的危害       | 邹昌宏 123      |
| 浅谈变电站变电运行管理措施          | 李吉存 125      |
| 浅谈如何提升民航网络信息系统安全防护策略   | 罗航 126       |
| 电信通信工程建设的应用管理探析        | 黄毅 127       |
| 电力设计与电网规划对电网安全的影响探究    | 孙飞, 王宁 129   |
| 探究计算机实验室机房网络维护的主要途径    | 姜学东, 王昊欣 131 |
| 电气自动化技术在电气工程中的应用       | 刘小钰 133      |
| 节能技术在现代城市路灯照明中的应用      | 吕世春 134      |
| 计算机在通信技术应用中发展研究        | 王昊欣, 姜学东 135 |

# CONTENTS

2017.12

|  |                              |    |
|--|------------------------------|----|
| The Research on General Test Platform for ATS.....                                   | Xia Lei, Liu Yi, Zhou Jingyu | 76 |
| Research On Aeroengine Testing and Data Management Technology.....                   | Zhang Bo                     | 78 |
| Discussion on computer electronic control technology and its application.....        | Guo Lei                      | 80 |
| Application of GNSS in New Navigation Technology.....                                | Feng Junhong, Liu Liwen      | 82 |
| Antenna Research of Microwave Energy Transmission System for Internet of Things..... | Qin Wu                       | 85 |

## Test tools and Solutions

|   |  |     |
|---|--|-----|
| The lower pressure household meter is a common electrical fault.....  | Fan Yulin                                    | 87  |
| Research on the maintenance of electrical equipment in new period.....                                      | Feng Peijun                                  | 88  |
| Analysis on Reconstruction Design of Substation with High Voltage Ground Wire<br>.....                      | Zhu Xiaoguang, Li Jiaxin, Wang Bin           | 90  |
| Improving the environmental adaptability and reliability of Marine Instruments.....                         | Liang Jie                                    | 91  |
| The intelligent measurement and control technology and instrument technology application research<br>.....  | Shi Huanyu                                   | 93  |
| The present situation of power transformer protection technology and the future development trend<br>.....  | Zhang Yong                                   | 95  |
| Brief introduction of the application of GSM wireless alarm system.....                                     | Lu Yingying                                  | 97  |
| Advantages and debugging of Siemens S120 converter.....   | Shi Hengling                                 | 99  |
| On the way of cooling in the distribution room.....   | Zhang Zhimin, Cai Bin, Zhou Jun              | 101 |
| Power operation and maintenance of security risks investigation and management.....                         | He Xiping                                    | 102 |
| The application of GPS-RTK measurement in summer hamu copper nickel mine exploration line in<br>.....       | Ding Qishun                                  | 104 |
| Discussion on routine maintenance of electronic weighing apparatus and treatment of typical faults<br>..... | Luo Changcheng, Shi Ling                     | 106 |
| Improved Model of the Testing for Airborne Software<br>.....  | Zhou Mingang, Feng Yanli, Zhang Lei, Qin Hao | 108 |

## Science and Technology Forum

|  |                            |     |
|--|----------------------------|-----|
| Based on the design of the B/S research program management system.....   | Wu Ye                      | 111 |
| Analysis of Electrical Engineering and Automation Technology in Intelligent Building..   | Zhao Luyin                 | 112 |
| The practice of the development of Internet technology and its industrial application research<br>.....                              | Wu Rongchang               | 114 |
| Research on green LED lighting technology and its application.....   | Hu Zhenrong                | 115 |
| Analysis of current situation and future development trend of inspection and certification of<br>automotive electronic products..... | Qin Yuan                   | 116 |
| Advantages of led light source and its application prospect in automobile lamps<br>.....   | Tian Yingjun, Yu Jianwen   | 118 |
| Research on Application of artificial intelligence in computer network technology<br>.....   | Jiang Xuedong, Wang Haoxin | 120 |
| Maintenance and technical discussion of transformer running equipment.....   | Wang Ze                    | 122 |
| How to avoid the lightning harm to civil aviation electronic equipment.....  | Zou Changhong              | 123 |
| To discuss the operation and management measures of substation substation.....   | Li Jicun                   | 125 |
| Discuss how to improve the civil aviation network information system security protection strategy<br>.....                           | Luo Hang                   | 126 |
| Analysis on application management of telecommunication engineering construction.....  | Huang Yi                   | 127 |
| Transmission network planning design and the impact on power grid safety.....  | Sun Fei, Wang Ning         | 129 |
| Explore the main way of computer lab computer network maintenance.....   | Jiang Xuedong, Wang Haoxin | 131 |
| The application of electric automation technology in electrical engineering.....   | Liu Xiaoyu                 | 133 |
| The application of energy-saving technologies in the lighting of street lamps in modern cities<br>.....                              | Lv Shichun                 | 134 |
| Research on the development of computer application in communication technology<br>.....   | Wang Haoxin, Jiang Xuedong | 135 |