

(中英文对照版)

(Chinese-English Bilingual Edition)



# 电力设备红外检测诊断图谱及应用规范

The Atlas of Infrared Test Diagnosis For Electrical Equipment & Its Working Regulation

上海市电力公司 编

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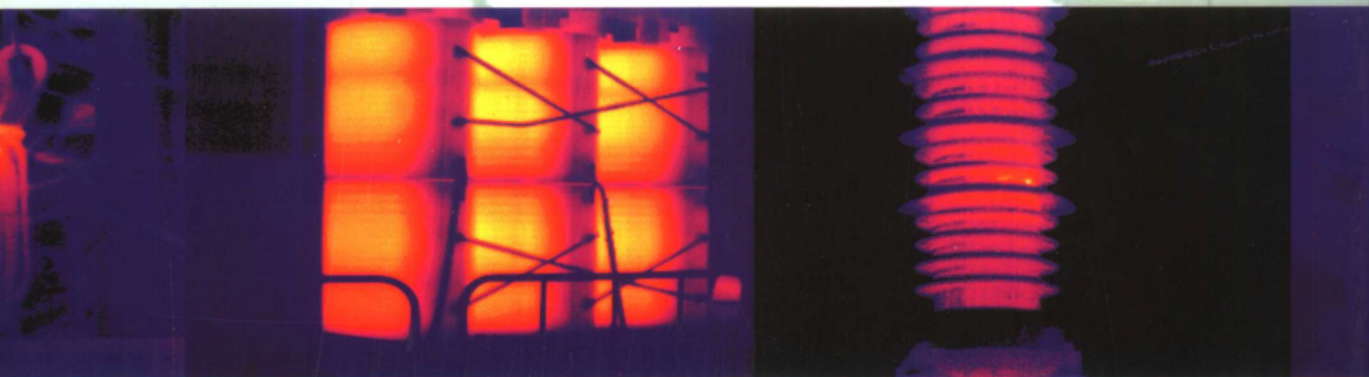
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## 内 容 提 要

本图谱是根据上海市电力公司近年来现场红外检测中精选的典型图谱编写而成的,采用中英文对照的形式出版,利用更为直观的方式推广红外检测诊断技术在电力系统中的应用,更好地指导电力设备的检修工作。

本图谱主要内容包括变电设备、电机类设备、电缆线路设备、架空线路设备、配电设备、异常案例以及红外工作的一些具体管理规范和技术操作规范。

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随着电力设备故障诊断技术的不断发展,现代红外技术不断成熟和日臻完善,电力设备的红外检测诊断技术作为一项简便、快捷的设备状态在线检测技术得到了快速发展。它具有不停电、不取样、非接触、直观、准确、实时、灵敏度高、快速、安全、应用范围广等特点,是保证电力设备安全、经济运行的重要措施。

为科学、有效、规范地开展上海市电力公司电力设备红外检测诊断工作,提高红外检测诊断的技术和管理水平,为进一步开展电力设备的状态检修积累经验,公司在原《电力设备红外检测诊断工作条例》的基础上,制订了《上海市电力公司电力设备红外检测诊断工作技术规范》和《上海市电力公司电力设备红外检测诊断工作管理规范》。同时建立了公司电力设备红外检测诊断数据中心、红外检测仪比对实验室,建立了相应的公司红外检测诊断工作网,工作网成员包括超高压公司、各供电(分)公司、电缆公司(电缆管理处)、集控站、中心站、试验中心等所有电网设备运行和管理单位,从而在公司范围内为这一工作的良好开展提供了条件。

本书是根据公司近年来现场红外检测中精选的图谱编写而成,并通过对部分典型案例的分析来指导红外诊断工作。这些图谱、典型案例和规范制度凝聚了现场检测人员、技术人员和各级管理人员的心血。编者希望通过本书的出版,以更为直观的方式推广红外检测诊断技术在电力系统中的应用,从而更好地指导电力设备的检修工作。

本书是公司近年来开展红外检测诊断工作的经验积累和总结,由于对电力设备红外热谱图及缺陷的分析尚处于积累经验阶段,故对电力设备的缺陷定性仍需结合其他检测手段共同分析、判断。

由于本书尚缺少经验可供借鉴,更限于作者的时间和水平,不足和错误之处在所难免,欢迎广大读者批评指正。

上海市电力公司

2004年7月



## Preamble



Along with the unceasing development of defects diagnose technology for the electrical equipment, modern infrared technology undergoes steady improvements and becomes mature day by day, the infrared test diagnosing technology for electrical equipment develops very rapidly as a handy and quick technology for equipment condition online testing. It is characterized by: non power-off, no sampling, non-contact, audio-visual, precise, real time, high sensitivity, fast, safe, extensive application, it is an important measure for ensuring the safe and economic operation of electrical equipment.

In order to carry out the infrared test diagnosing work in a scientific, efficient and standard way, Shanghai Municipal Electrical Power Company to enhance the technical and managerial level, and to accumulate experience for further unfolding condition overhaul of power equipment, based on the former 《Working Regulation Of Infrared Test Diagnosis For Electrical Equipment》, instituted the 《Working Technology Regulation Of Infrared Test Diagnosis For Electrical Equipment of Shanghai Municipal Electrical Power Company》 and 《Infrared Test Diagnostic Working Managing Regulation For Electrical Equipment of Shanghai Municipal Electrical Power Company》. At the same time, the Infrared Test Diagnostic digital data Center For Electrical Equipment Within The Company, Infrared Test Instrument Contrast Lab, and the Corresponding Infrared Test Diagnostic Working Network in the company are successively established. The members of the working net include all operation and managerial units in the network, such as the Super High Voltage Co., each Power Supply Co. Cable Co. (Cable Management), Central Control Station, Central Station, Test Center, etc., thus providing good conditions for carrying out this work within the company.

This book is compiled according to the careful choice of atlas from the on site infrared tests of the company in the recent years, to guide the infrared diagnostic work by analyzing some typical cases. These atlas, typical cases and regulations are the embodiment of the painstaking lab our of the on site test personnel, technicians and management personnel of different levels. The editor hopes that by means of the publication of this book, the application of the infrared test diagnostic technology in the electrical power system, will be popularized through more audio-visual manner, and a better guide to the overhaul work for the electrical equipment will be obtained.

This book is the accumulation of experiences and summary of infrared test diagnosis of the company in the recent years, Since the analysis of the infrared thermal atlas and defects for the electrical equipment are still in the experience accumulating stage, in order to make the judgment of the electrical equipment defect, the analysis shall be performed along with the test results by the other testing means.

Since there is few experience used for reference, because what is more, due to the limitation of time and of the limitation author's understanding level, the shortcomings and error may be unavoidable. The readers are welcome to give comments and criticism.

Shanghai Municipal Electrical Power Company  
July, 2004





本书旨在通过较为直观的红外热谱图形式,对电力设备的红外检测诊断技术在电力系统中的应用起到借鉴和推广作用。有些电力设备的红外热谱图可能还没有找到其真正的缺陷原因,编者把这些图谱收集起来,提供大家参考。

本书共分三个部分:第一部分为红外图谱,包括架空线路、电缆线路、配电设备、变电设备和电机类设备;第二部分为典型案例分析;第三部分为两个规范,包括《上海市电力公司电力设备红外检测诊断工作技术规范》和《上海市电力公司电力设备红外检测诊断工作管理规范》。

本书由上海市电力公司滕乐天主编,上海电力试验研究所凌平及周新雅同志副主编,上海市电力公司蓝耕、上海电力试验研究所陈洪岗、肖嵘,市区供电公司燕劼、瞿子明,上海超高压输变电公司程世言等同志编写。

在本书的编写过程中得到了上海电力试验研究所、上海市电力公司市区供电公司、上海超高压输变电公司的大力支持,特别是市区供电公司副总工程师钱维忠同志的热心帮助,图例中标有“\*”符号的图片由香港彼岸科仪有限公司提供,在此一并表示诚挚的谢意。

限于作者的水平,限于红外检测诊断技术在电力系统中的应用正处于积累资料快速发展阶段,书中存在的不足和错误,敬请指正。

编者

2004年7月



## Foreword



This book is aimed at serving for the reference and popularization of the application of the infrared testing diagnostic technology for the electric equipment in the electrical power system, by means of more audio-visual manner of infrared thermal atlas. For those infrared thermal atlas of some electrical equipment, in which the true cause of the defects is not yet found, the editor collected these thermal images for the reference of all those concerned.

This book is divided into three parts: part one contains thermal atlas, including overhead lines, cable lines, power distribution equipment, transformation equipment and electrical machinery; part two contains the analyses of typical cases; part three consists of two regulations, including 《The Working Regulation Of Infrared Test Diagnosis For Electrical Equipment Of Shanghai Municipal Electrical Power Company》 and 《The Working Management Regulation Of Infrared Test Diagnosis For Electrical Equipment Of Shanghai Municipal Electrical Power Company》.

The chief editor of this book is Ten Le Tian of Shanghai Municipal Electrical Power Company (hereafter SMEPC), the vice chief editor of this book is Zhou xinya and Ling Ping of Shanghai Electrical Test & Research Institute(hereafter SETRI), the writers are Lan Geng of SMEPC, Chen Hong Gang , Xiao Rong of SETRI, Yan Jie, Qu Zhiming of Shanghai Urban Area Power Supply Company of SMEPC, Chen Shiyan of Shanghai Super High Voltage Company.

In writing period, the authors got support from SETRI, Shanghai Urban Area Power Supply Company, Shanghai Super-High Voltage Company, especially got help from the vice chief engineer Qian Weizhong of Shanghai Urban Area Power Supply Company of SMEPC. The pictures marked with “\*” were offered by Peiport Scientific Ltd. (Hong Kong), The authors hereby express sincere thanks to all of them.

Due to the limitation of the author's understanding level, and the infrared test diagnosis application in electrical power system is still on the way of high speed development of data accumulation, there may be some shortcomings and errors in the book, any comment and criticism are welcome.

Editors

July, 2004



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# 第一章 配电设备

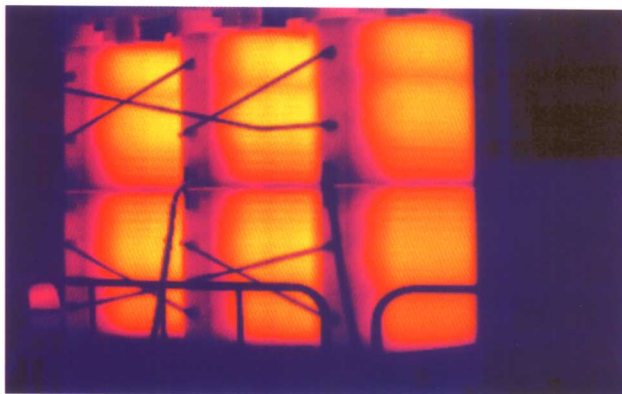
## Chapter 1 Distribution Equipments

设备名称: 35kV干式变压器

缺陷类型: 正常

Name of Equipment: 35kV Dry -type Transformer

Defect Classification: normal

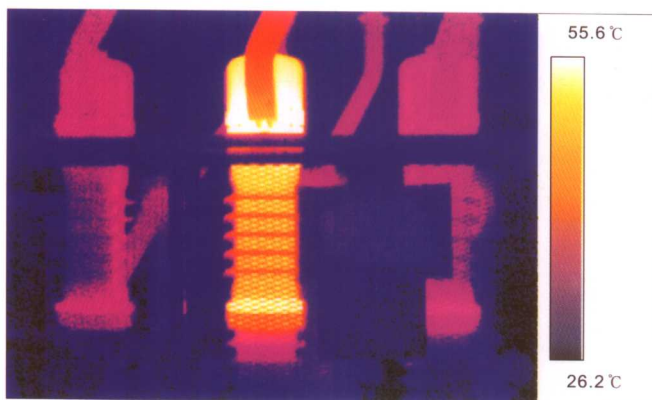


设备名称: 35kV少油断路器内部静触头

缺陷类型: B相内部动静触头接触不良发热

Name of Equipment: 35kV low oil content circuit breaker inside static contactor

Defect Classification: B phase inside moving and static contactor not connected so well, so caused heat



## 第一章 配电设备

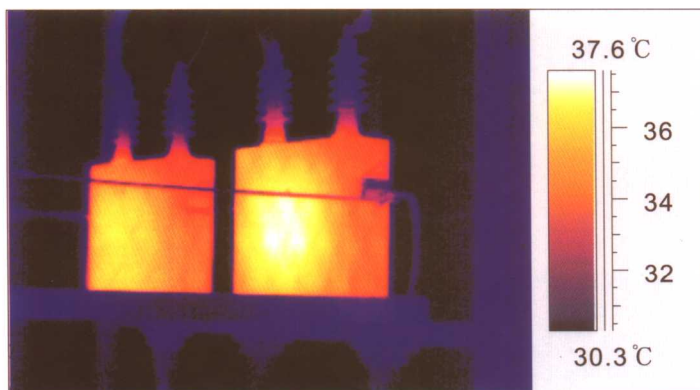
### Chapter 1 Distribution Equipments

设备名称: 10kV 电容器

缺陷类型: 内部缺陷

Name of Equipment: 10kV capacitor

Defect Classification: inside defect

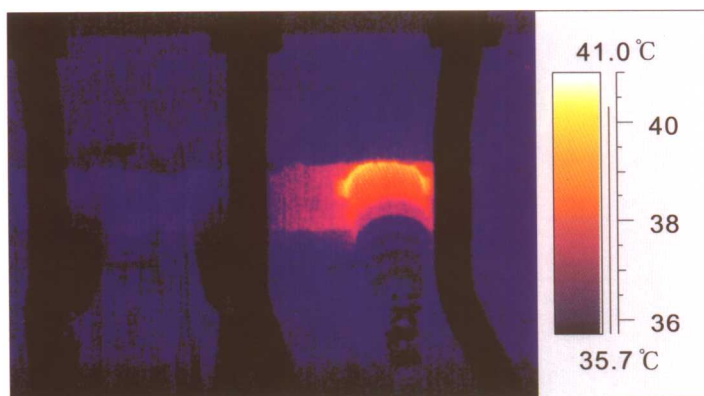


设备名称: 35kV 套管穿芯电流互感器

缺陷类型: 线圈故障

Name of Equipment: 10kV bushing core penetrating current transformer

Defect Classification: coil defect



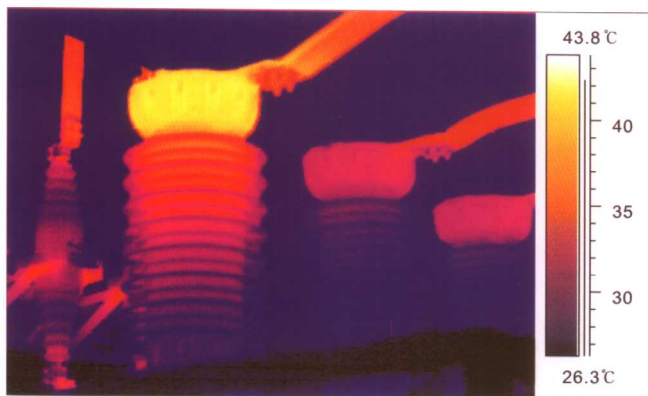


设备名称: 35kV SF<sub>6</sub>断路器内部触头

缺陷类型: 断路器内部触头接触不良

Name of Equipment: 35kV SF<sub>6</sub> circuit breaker inside contactor

Defect Classification: circuit breaker inside contactor contacted not so well



红外图像 Infrared Thermal Photo



可见光图像 Visible Photo

## 第一章 配电设备

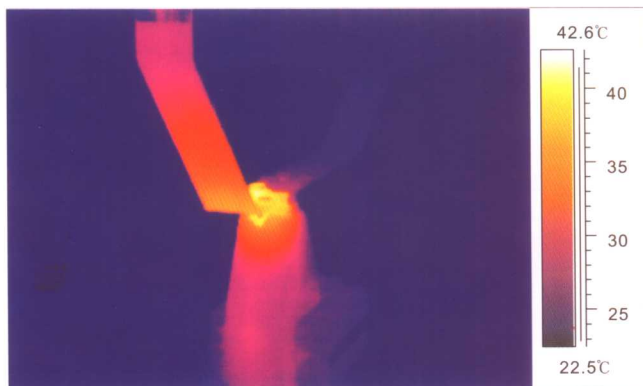
### Chapter 1 Distribution Equipments

设备名称: 10kV穿柜电流互感器接头

缺陷类型: 接头接触不良发热

Name of Equipment: 10kV box current transformer joint

Defect Classification: joint contacted not so well, so caused heat

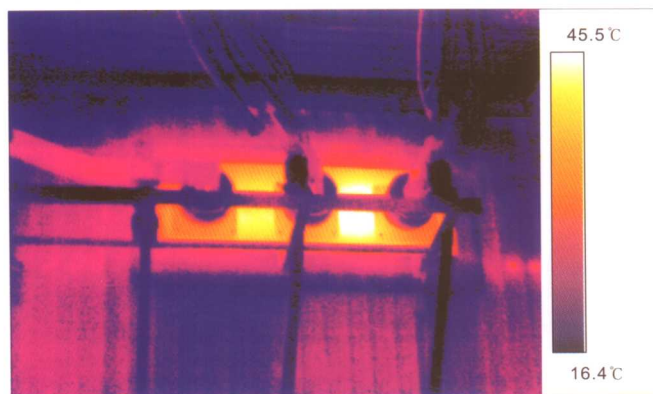


设备名称: 10kV母线穿墙套管

缺陷类型: 穿墙钢板涡流发热

Name of Equipment: 10kV bus wall bushing

Defect Classification: wall plate eddy current heat





设备名称: 35kV 电抗器断路器

缺陷类型: 接头接触不良发热

Name of Equipment: 35kV reactor circuit breaker

Defect Classification: joint not contacted so well, so caused heat

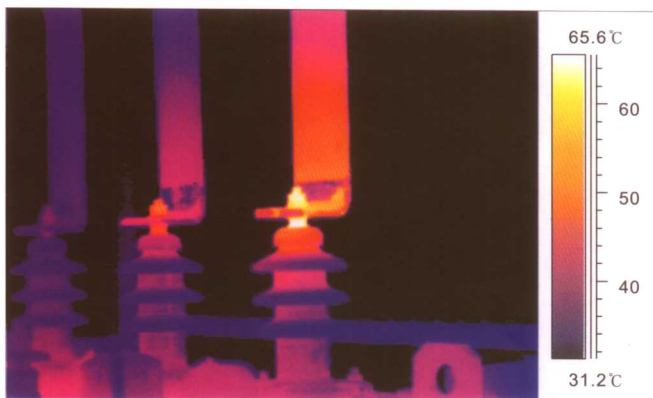


设备名称: 35kV 所用变压器接头

缺陷类型: 接头接触不良发热

Name of Equipment: 35kV transformer joint

Defect Classification: joint not contacted so well, so caused heat



## 第一章 配电设备

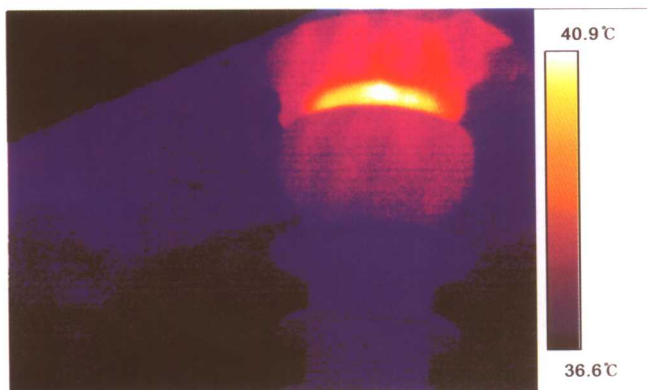
### Chapter 1 Distribution Equipments

设备名称: 35kV 支柱绝缘子

缺陷类型: 绝缘子底座放电发热

Name of Equipment: 35kV pillarinsulator

Defect Classification: insulator base discharge heat



设备名称: 35kV 阻波器

缺陷类型: 上部发热不均匀

Name of Equipment: 35kV wave trap coil

Defect Classification: the upper part heat uneven



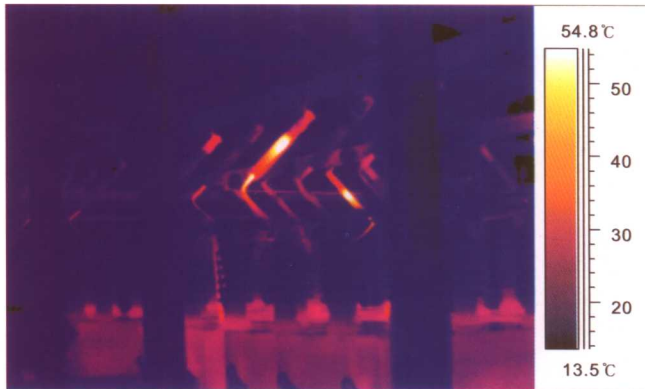


设备名称: 35kV 补偿电容器熔丝

缺陷类型: 熔丝容量不够发热

Name of Equipment: 35kV compensate capacitor fuse wire

Defect Classification: fuse wire capacity not reached heat level



设备名称: 35kV 电容器熔丝接头

缺陷类型: 接头接触不良发热

Name of Equipment: 35kV capacitor fuse wire joint

Defect Classification: joint not contacted so well, so caused heat

