

A CHINESE-ENGLISH GLOSSARY OF TRANSFORMER TECHNOLOGY

汉英 变压器 技术词汇

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内 容 提 要

根据变压器海外项目的招投标、设计制造和国际监造等工作及国际交流的需求,编者结合诸多专业资料和长期实际工作经验,从变压器专业技术角度出发,编写了《汉英变压器技术词汇》。本词汇中的词条是经过精选集成,也是变压器专业技术人员必须掌握的基本术语。读者在日常工作中通过学习记忆词汇,可较大幅度提高变压器专业英语水平。

本词汇共二十二章,收录五千多词条,内容包括变压器种类、基础词汇、电工基础、变压器标准用语、变压器各部件及试验报告、包装及运输、试验装备、通用设备及工具、通用材料、标准件、图纸及技术文件用语、外贸用语等。为方便读者使用,附录 A 编入了应用实例。

本词汇主要供电力系统和变压器制造行业从事变压器海外项目招投标的技术人员、翻译人员、设计制造和管理人员以及高等院校电机工程等相关专业的教师和学生使用。

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前 言

Preface

电力工业是国民经济发展的基础，电力变压器是电力输送的重要设备。近几年来，变压器电压等级和容量提升很快，随着 500kV 超高压和 1000kV 特高压电网建设和 $\pm 800\text{kV}$ 直流输电技术的应用，进一步推动了变压器行业设计技术、制造技术和海外市场的迅猛发展，变压器技术的国际交流日趋广泛而重要。根据变压器制造、电力行业和大中专学校电机专业等读者的需要，编者在 1997 年编写《变压器常用术语（汉英对照）》的基础上，编写了《汉英变压器技术词汇》。本词汇加强了电工基础、变压器标准用语、试验报告及应用实例等方面的介绍。

本词汇涉及变压器基础理论、常用标准、结构设计、制造工艺、试验报告、对外贸易等方面，内容丰富且深入浅出。为了提高读者的综合应用能力，本词汇中的词条包含单词、短语和句子，是变压器专业技术人员必须掌握和牢记的基本知识。同时为了方便读者查阅和记忆，第二章“基础词汇”中包含部分单位换算，第三章“电工基础”中包含部分公式。“附录 A”编入了典型的中英文版变压器试验报告，从而更加增强了本词汇的实用性。

本书的出版得到了沈阳变压器研究所、保定天威集团、北京 ABB 公司、北京双语公司的大力协助，在此谨表感谢，陈继红在本书的版式设计中作了大量工作，在此也一并感谢。

本书出版之际，正值编者所在山东电力设备厂建厂 50 周年，在此，谨以此书献给山东电力设备厂所有员工。

由于编者水平有限，时间仓促，编写工作难免有不足之处，敬请读者批评指正。

编者

2008 年 1 月

使用说明

1. 本书是一本侧重于变压器专业的《汉英变压器技术词汇》，是按照变压器基础理论、常用标准、结构设计、生产制造、出厂试验、包装发货、对外贸易等二十二章的内容进行排序，比较适合变压器制造、电力行业和大中专学校电机专业等读者的常规思路，一般不必看检索就能找到所须查阅的部分。第三章“电工基础”和第四章“变压器标准用语”的内容较多，是本词汇的重点，因此进行了分节编排。

2. 每章中的词条是按专业特征排列，即按电工基础理论讲授的次序、标准的分类和编写顺序、词汇和条目在变压器技术中的主次地位、在产品制造流程中的先后，把同类特征的词汇和条目进行集中编辑等原则进行排列。

3. 本书将第二章“基础词汇”和第三章“电工基础”中的物理概念和经典公式直接编入对应的词条下面，目的是方便读者查阅和记忆。如

兆帕 MPa ($1\text{kg}/\text{cm}^2 = 10^5\text{Pa} = 100\text{kPa} = 0.1\text{MPa}$)

电路的欧姆定律 Ohm's law of electric circuit

$$U = IR; \sum u = iR; \dot{U} = \dot{I}Z$$

4. 本书采用分类编辑的方法，部分术语会在不同章节重复出现，以方便读者阅读和记忆。



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第一章

Chapter 1

变压器种类

变压器	transformer
心式变压器	core-type transformer
壳式变压器	shell-type transformer
电力变压器	power transformer
配电变压器	distribution transformer
油浸式变压器	oil-immersed type transformer
干式变压器	dry-type transformer
升压变压器	step-up transformer
降压变压器	step-down transformer
增压变压器	booster transformer
发电机变压器	generator transformer
变电站变压器	substation transformer
主变压器	main transformer
启动备用变压器	starting and stand-by transformer
厂用变压器	station service transformer
厂用变压器	power plant transformer
所用变压器	substation transformer
联络变压器	system-interconnection transformer
自耦变压器	auto-transformer
有载调压变压器	transformer with on-load tap-changer
无励磁调压变压器	transformer with off-circuit tap-changer
全密封变压器	full-sealed transformer
换流变压器	converter transformer
分裂变压器	dual-low-voltage transformer

单相变压器	single-phase transformer
三相变压器	three-phase transformer
多相变压器	polyphase transformer
单相变压器组	three-phase banks with separate single-phase transformer
三相接地变压器	three-phase earthing transformer
三绕组变压器	three-winding transformer
两绕组变压器	two-winding transformer
双绕组变压器	double-winding transformer
多绕组变压器	multi-winding transformer
独立线圈变压器	separate winding transformer
油浸式变压器	oil-immersed type reactor
包封线圈干式变压器	encapsulated-winding dry-type transformer
树脂浇注式变压器	cast-resin transformer
包绕线圈干式变压器	resin-fiber glass covered winding dry-type transformer
非包封线圈干式变压器	non-encapsulated-winding dry-type transformer
全封闭干式变压器	totally enclosed dry-type transformer
封闭干式变压器	enclosed dry-type transformer
非封闭干式变压器	non-enclosed dry-type transformer
干式变压器	dry-type reactor
全自保护变压器	completely self-protected distribution transformer
浸难燃油变压器	noninflammable medium impregnated transformer
H级绝缘变压器	transformer with H class insulation
气体绝缘变压器	gas insulated transformer
电炉变压器	furnace transformer
电弧炉变压器	arc furnace transformer
工频感应炉变压器	power frequency induction furnace transformer
电阻炉变压器	resistance furnace transformer
矿热炉变压器	ore furnace transformer
盐浴炉变压器	salt bath furnace transformer
整流变压器	rectifier transformer
电化学整流变压器	electro-chemistry rectifier transformer

牵引整流变压器	traction rectifier transformer
牵引变压器	traction transformer
矿用变压器	mining transformer
防爆变压器	flame-proof transformer
隔离变压器	isolation transformer
试验变压器	testing transformer
串级试验变压器	cascade transformer
串谐试验变压器	series-resonant transformer
串联变压器	series transformer
灯丝变压器	filament transformer
电焊变压器	welding transformer
钎焊变压器	brazing transformer
船用变压器	marine transformer
起动自耦变压器	starting auto-transformer
起动变压器	starting transformer
移动变压器	movable substation
无危害变压器	fail-safe transformer
抗短路变压器	short-circuit proof transformer
中频变压器	intermediate-frequency transformer
互感器	instrument transformer
直流互感器	direct current instrument transformer
组合式互感器	combined instrument transformer
自耦式互感器	instrument auto-transformer
测量用电流/电压互感器	measurement current/voltage transformer
保护用电流/电压互感器	protective current/voltage transformer
电流互感器	current transformer (CT)
电压互感器	voltage transformer; potential transformer (PT)
全绝缘电流互感器	fully insulated current transformer
母线式电流互感器	bus-type current transformer
电缆式电流互感器	cable type current transformer
棒式电流互感器	bar primary type current transformer
单铁心式电流互感器	single-core type current transformer
多铁心式电流互感器	multi-core type current transformer

复绕式电流互感器	compound-wound current transformer
自耦复绕式电流互感器	auto-compound current transformer
绕线式电流互感器	wound primary type current transformer
贯穿式电流互感器	through type current transformer
瓷箱式电流互感器	porcelain type current transformer
套管电流互感器	bushing-type current transformer
电容式电流互感器	capacitor type current transformer
支柱式电流互感器	support-type current transformer
倒立式电流互感器	top-type current transformer
浇注式电流互感器	cast-resin type current transformer
钳式电流互感器	split-core type current transformer
速饱和电流互感器	rapid-saturable current transformer
扩大额定值的电流互感器	extended rating type current transformer
串级式电流互感器	cascade-type current transformer
零序电流互感器	residual current transformer
累加用电流互感器	summation current transformer
匹配用电流互感器	current matching transformer
P 级	performance class P
TPS 级	performance class TPS
TPX 级	performance class TPX
TPY 级	performance class TPY
TPZ 级	performance class TPZ
电容式电压互感器	capacitor type voltage transformer
接地电压互感器	earthed voltage transformer
不接地电压互感器	unearthed voltage transformer
串级式电压互感器	cascade-type voltage transformer
匹配用电压互感器	voltage matching transformer
零序电压互感器	residual voltage transformer
浇注式电压互感器	cast-resin type voltage transformer
双功能电压互感器	dual purpose type voltage transformer
调压器	voltage regulator
感应调压器	induction-voltage regulator
移圈调压器	moving-coil voltage regulator

接触调压器	variable-voltage transformer
磁性调压器	magnetic control voltage regulator
自动调压器	automatic voltage regulator
感应自动调压器	automatic induction-voltage regulator
接触自动调压器	automatic variable regulator
自耦调压器	autoformer regulator
磁饱和调压器	magnetic saturation voltage regulator
动线圈	moving winding
电抗器	reactor
并联电抗器	shunt reactor
限流电抗器	current-limiting reactor
中性点接地电抗器	neutral-earthing reactor
三相中性点电抗器	three-phase neutral reactor
接地变压器	earthing transformer
起动电抗器	starting reactor
平衡电抗器	interphase reactor
平波电抗器	smoothing reactor
消弧电抗器	arc-suppression reactor
阻尼电抗器	damping reactor
调谐电抗器	tuning reactor
滤波电抗器	filter reactor
饱和电抗器	saturable reactor
铁心电抗器	iron core reactor
空心电抗器	air core reactor
包封绕组干式电抗器	encapsulated-winding dry-type reactor
非包封绕组干式电抗器	non-encapsulated-winding dry-type reactor
密封式电抗器	sealed reactor
串联电抗器	series reactor
放电线圈	discharge coil
消弧线圈	arc-suppression coil
阻波器	wave trap coil
镇流器	ballast
成套变电站	complete substation

组合式变电站	integral unit substation
矿用隔爆移动变电站	mining flame proof movable substation
分相封闭母线	isolated phase bus
共箱封闭母线	non-segregated phase bus
共箱隔相封闭母线	segregated phase bus
密闭式	sealed type
包封式	enclosed type
户外式	outdoor type
户内式	indoor type
柱上式	pole-type
移动式	movable type
列车式	trailer mounted type
自冷	natural air cooling; self-cooling (ONAN)
风冷	forced-air cooling (ONAF)
强油风冷	forced-oil and forced-air cooling (OFAF)
强油水冷	forced-oil and forced-water cooling (OFWF)
强油导向风冷	forced-directed oil and forced-air cooling (ODAF)
强油导向水冷	forced-directed oil and forced-water cooling (ODWF)
恒磁通调压	constant flux voltage variation (CFVV)
变磁通调压	variable flux voltage variation (VFVV)
混合调压	combined voltage variation (CbVV)
油保护系统	oil preservation system
储油柜系统	conservator system
隔膜式油保护系统	diaphragm-type oil preservation system
惰性气体压力系统	inert gas pressure system
带气垫的密封式油箱系统	sealed-tank system with air-cushion
充满油的密封系统	sealed system full-filled with oil

第二章

Chapter 2

基础词汇

变压器种类	kind of transformer
产品代号	symbol of the product
产品型号	type of product
额定值	rating
额定参数	rated parameter
特高压 ^①	ultra-high voltage
超高压 ^②	super-high voltage
高压 ^③	high voltage
电网	grid
电源	power resource
千瓦	kilowatt (1kW = 10 ³ W)
兆瓦	megawatt (1MW = 10 ⁶ W)
吉瓦	gigawatt (1GW = 10 ⁹ W)
太瓦	terawatt (1TW = 10 ¹² W)
千伏	kilovolt (1kV = 10 ³ V)
兆伏	megavolt (1MV = 10 ⁶ V = 1000kV)
吉电子伏	giga-electron-volt (1GeV = 10 ⁹ eV)
千伏安	kVA (1kVA = 10 ³ VA)
兆伏安	MVA (1MVA = 10 ⁶ VA)
吉伏安	GVA (1GVA = 10 ⁹ VA)

① 1000kV, 750kV

② 500kV, 330kV

③ 220kV, 110kV

太伏安	TVA (1TVA = 10^{12} VA)
千乏	kilovar (1kvar = 10^3 var)
兆乏	megavar (1Mvar = 10^6 var)
吉乏	gigavar (1Gvar = 10^9 var)
太乏	teravar (1Tvar = 10^{12} var)
额定容量	rated power
额定电压	rated voltage
额定电流	rated current
短路阻抗	short-circuit impedance
额定频率	rated frequency
联结组标号	connection symbol
相位移	phase displacement
对应端子	corresponding terminals
绕组联结图	connection diagram of windings
空载损耗	no-load loss
涡流损耗	eddy-current loss
磁滞损耗	hysteresis loss
空载电流	no-load current
励磁电流	exciting current; energizing current
负载损耗	load loss
附加损耗	additional losses; supplementary load loss
杂散损耗	stray losses
总损耗	total losses
损耗比	loss ratio
冷却方式	type of cooling
电压组合	voltage combination
高压电压	HV voltage; h. v. voltage
中压电压	MV voltage; m. v. voltage
低压电压	LV voltage; l. v. voltage
直流电压	DC voltage; d. c. voltage
交流电压	AC voltage; a. c. voltage
额定电压比	rated voltage ratio
电抗电压	reactance voltage

电阻电压	resistance voltage
阻抗电压	impedance voltage
电压降	voltage drop
电压升	voltage rise
电压调整率	voltage regulation
零序阻抗	zero-sequence impedance
三相变压器的零序阻抗	zero-sequence impedance of three-phase transformer
绝缘水平	insulation level
绝缘试验	dielectric test
外绝缘空气间隙	external clearances in air
海拔	altitude above sea-level
设备最高电压	highest voltage for equipment
线路端子	line terminal
中性点端子	neutral terminal
中性点	neutral point
中性点直接接地	neutral point earthed directly
中性点不直接接地	neutral point earthed not-directly
中性点经小阻抗接地	neutral point earthed via a small reactor
单相接地故障	single-phase earthed fault
单相短路故障	single-phase short-circuit fault
三相短路故障	three-phase short-circuit fault
全绝缘	uniform insulation
分级绝缘	non-uniform insulation
正常绝缘	normal insulation
绝缘配合	insulation co-ordination
降低绝缘	reduced insulation
基本绝缘水平	basic insulation level (BIL)
试验	test
额定耐受电压	rated withstand voltage
耐压试验	voltage withstand test
额定工频耐受电压	rated power-frequency withstand voltage (AC)
额定冲击耐受电压	rated impulse withstand voltage

额定操作冲击耐受电压	rated switching impulse withstand voltage (SW)
额定雷电冲击耐受电压	rated lightning impulse withstand voltage
额定雷电冲击全波耐受电压	rated full wave lightning impulse withstand voltage (LI)
额定雷电冲击截波耐受电压	rated chopped wave lightning impulse withstand voltage (CW)
工频耐压试验	power-frequency voltage withstand test
外施耐压试验	separate-source voltage withstand test
感应耐压试验	induced over-voltage withstand test (IOW)
短时感应耐压试验	IOW test for short duration (ACSD)
长时感应耐压试验	IOW test for long duration (ACL D)
带局放测量的感应耐压试验	IOW test with partial discharge measurement
冲击耐压试验	impulse voltage withstand test
操作冲击试验	switching impulse test
操作冲击波	switch surge; switch impulse
雷电冲击试验	lightning impulse test
雷电冲击全波试验	full wave lightning impulse test
雷电冲击截波试验	chopped wave lightning impulse test
主绝缘	main insulation
纵绝缘	longitudinal insulation
内绝缘	internal insulation
外绝缘	external insulation
温升试验	temperature-rise test
温升	temperature rise
突发短路试验	short-circuit test
动热稳定	thermo-dynamic stability
绕组额定电压	rated voltage of a winding
额定连续电流	rated continuous current
额定短时电流	rated short-time current
消弧电抗器额定电流	rated current of an arc-suppression reactor
磁通密度	magnetic flux density
磁感应强度	magnetic induction intensity
磁场强度	magnetic field intensity

电流密度	current density
标么值	per unit value (p. u.)
安匝数	ampere-turn number
安匝平衡	ampere-turn balancing
额定安匝数	rated ampere-turn number
安匝数标么值	p. u. of ampere-turn number
安匝分布图	ampere-turn distribution diagram
轴向安匝分布图 ^①	diagram of axial ampere-turn distribution
辐向安匝分布图 ^②	diagram of radial ampere-turn distribution
额定漏磁密	rated leakage flux-density
漏磁密标么值 ^③	p. u. of leakage flux-density
漏磁分布图	leakage-flux distribution diagram
轴向漏磁分布图 ^①	diagram of axial leakage-flux distribution
辐向漏磁分布图 ^②	diagram of radial leakage-flux distribution
热点	hot spot
最热点	hottest spot
局部过热	local overheat
分接	tapping
主分接	principal tapping
分接因数	tapping factor
正分接	plus tapping
负分接	minus tapping
分接级	tapping step
分接范围	tapping range
分接电压比	tapping voltage ratio
分接工作能力	tapping duty
分接参数	tapping parameter
线圈的分接电压	tapping voltage of a winding
线圈的分接容量	tapping power of a winding

① 心式变压器用

② 壳式变压器用

③ 漏磁密标么值 = 安匝数标么值

线圈的分接电流	tapping current of a winding
满容量分接	full-power tapping
降低容量的分接	reduced-power tapping
开断电流	switched current
循环电流	circulating current
额定通过电流	rated through-current
最大额定通过电流	maximum rated through-current
额定级电压	rated step voltage
最大额定电压	maximum rated voltage
恢复电压	recovery voltage
过渡阻抗	transition impedance
固有分接位置数	number of inherent tapping positions
工作分接位置数	number of service tapping positions
分接变换操作	tap-change operation
操作循环	cycle of operation
逐级控制	step-by-step control
负荷	burden
额定负荷	rated burden
准确级	accuracy class
准确度	accuracy
灵敏度	sensitivity
一次电流/电压	primary current/voltage
二次电流/电压	secondary current/voltage
互感器的二次回路	secondary circuit of CT and PT
二次回路	secondary circuit
励磁电流	energizing current
额定电流比	rated transformation ratio of a current transformer
额定电压比	rated transformation ratio of a voltage transformer
实际电流比	actual transformation ratio of a current transformer
实际电压比	actual transformation ratio of a voltage transformer
电流误差	current error
电压误差	voltage error
相位差	phase displacement

比值误差校验	ratio error verification
相位差校验	phase displacement verification
复合误差	composite error
计算机辅助计算	computer aided calculation (CAC)
计算机辅助设计	computer aided design (CAD)
计算机辅助制造	computer aided manufacturing (CAM)
计算机辅助试验	computer aided test (CAT)
参数化计算	parametrization calculation
参数化设计	parametrization design
分析软件	analysis software
电场分析软件	electric field analysis software
磁场分析软件	magnetic field analysis software
力场分析软件	stress field analysis software
热场分析软件	thermo-field field analysis software
波过程分析软件	wave process analysis software
有限元法	finite element method (FEM)
图解法	graphic method
外推法	extrapolation method
图解外推法	graphic-extrapolation method
归纳法	inductive method
插入法	interpolation method
最大似然法	maximum likelihood method
模拟法	simulation method
中断	abort
重试	retry
忽略	ignore
相容性	compatibility
扩散系数	diffusion coefficient
暂态特性	transient characteristics
暂态误差	transient error
额定连续热电流	rated continuous thermal current
额定短时热电流	rated short-time thermal current
额定动稳定电流	rated dynamic current

额定仪表限值一次电流	rated instrument limit primary current (IPL)
额定仪表保安电流	rated instrument security current
仪表保安系数	instrument security factor (FS)
保安因数	security factor
额定准确限值一次电流	rated accuracy limit primary current
误差补偿	error compensation
二次极限感应电势	secondary limiting e. m. f.
额定电压系数	rated voltage factor
准确限值系数	accuracy limit factor
额定一次电流	rated primary current
额定一次电压	rated primary voltage
额定二次电流	rated secondary current
额定二次电压	rated secondary voltage
额定输出	rated output
剩余电流	residual current
电流扩大值	extended rating current
内部负荷	internal burden
拐点电压	knee point voltage
剩余电压	residual voltage
高压端子	high voltage terminal
中压端子	intermediate voltage terminal
低压端子	low voltage terminal
开路中间电压	open-circuit intermediate voltage
电容分压器分压比	voltage ratio of a capacitor divider
绝缘热稳定性	dielectric thermal stability
额定网侧视在功率	rated apparent power on line side
额定阀侧视在功率	rated apparent power on valve side
额定网侧电流	rated current on line side
额定阀侧电流	rated current on valve side
额定网侧电压	rated voltage on line side
额定阀侧电压	rated voltage on valve side
稳定精度	accuracy of a voltage stabilizing
额定输入电压	rated input voltage

输入电压范围	input voltage range
额定输出电压	rated output voltage
输出电压范围	output voltage range
自动调压速度	response speed
损耗变动量	power loss variation
安全特低电压	safety extra-low voltage (SELV)
基本绝缘	basic insulation
附加绝缘	supplementary insulation
双重绝缘	double insulation
加强绝缘	reinforced insulation
铁心噪声	core sound level
噪声水平; 声级	sound level; sound level
声压级	sound pressure level
声功率级	sound power level
声级试验	sound level test
声级测量	sound level measurement
背景噪声	background sound level
环境噪声	A-weighted ambient sound level
水平加速度	horizontal acceleration
垂直加速度	vertical acceleration
地震烈度	earthquake intensity
工频	power frequency
中频	medium frequency
高频	high frequency
振荡频率	oscillating frequency
谐振频率	resonance frequency
串联谐振	series resonance
并联谐振	parallel resonance
自振频率	natural frequency of vibration
频率响应	frequency response
谐波测量	harmonics measurement
寄生电感	stray inductance
寄生电容	stray capacitance

分布参数	distributing parameters
分布电感	distributing inductance
分布电容	distributing capacitance
杂散电容	stray capacitance
叠加电荷	superimposed charge
介电常数	dielectric constant
油-纸绝缘系统	oil-paper insulation system
绝缘电阻	insulation resistance
绝缘电阻吸收比	absorption ratio of insulation resistance (R_{60s}/R_{15s})
极化指数	polarization-ability factor (PI) (R_{10min}/R_{60s})
介损	loss tangent $\tan\delta$
介质损耗因数	dielectric loss factor
绝缘击穿	insulation breakdown
碳化	carbonization
爬电距离	creepage distance
沿面放电	creeping discharge
放电	discharge
局部放电	partial discharge
局部放电测量	measurement of partial discharge
方波响应	step response
方波发生器	step generator; rectangular wave generator
超声定位	ultrasonic location
超声定位仪	ultrasonic locating instrument
破坏性放电	disruptive discharge
局部放电起始电压	partial discharge inception voltage
局部放电终止电压	partial discharge extinction voltage
过电压	overvoltage
短时过电压	short time overvoltage
暂态过电压	transient overvoltage
操作过电压	switching overvoltage
大气过电压	atmospheric overvoltage
伏秒特性	voltage-time characteristics
截断时间	time to chopping

波前时间	time to crest
视在波前时间	virtual front time
半峰值时间	time to half value crest
有效值	r. m. s. value; RMS value; root-mean-square value
平均值	mean value
峰值	peak value; crest value
标称值	nominal value
电极	electrode
电位梯度	potential gradient
等电位	equipotential
屏蔽	shield
磁屏蔽	magnetic shield
电磁屏蔽	electromagnetic shield
静电屏蔽	electrostatic shield
磁分路	magnetic shunt
静电板	electrostatic plate
静电环	electrostatic ring
静电屏	electrostatic screen
地屏	earthing screen
电磁感应	electro-magnetic induction
电磁单元	electro-magnetic unit
有效面	effective surface
标准大气条件	standard atmospheric condition
视在电荷	apparent charge
体积电阻	volume resistance
导电率	admittance
电导	conductance; conductivity
电晕放电	corona discharge
闪络	flashover
避雷器	surge arrestor
避雷器的残压	residual voltage of an arrestor
绝缘材料耐温等级	temperature class of insulation

无损探伤	non-distractive flaw detection
红外线扫描	infrared scanning
红外线测温仪	infrared thermometer
近似于	approximate (approx.)
每分钟转数	revolution per minute (rpm)
速度	speed; velocity
加速度	acceleration
重力加速度	gravitational acceleration
引力	traction
数量	quantity
部门	department (dept.)
缩写	abbreviation
以下简称为 × × ×	hereinafter referred as × × ×
参见 × × ×	see × × × ; vide × × ×
常用单位	units commonly used
包括缩写	including abbreviations
环境设备	ambience apparatus
有功分量	active component
无功分量	reactive component
有功输出	active output
无功输出	reactive output
有功传输	active transimition
无功传输	reactive transimition
无功补偿	reactive compensation
静止无功补偿	static var compensation (SVC)
可控电抗器	thyristor controlled reactor (TCR)
串补	series compensation (SC)
可控串补	thyristor controlled series compensation (TCSC)
次同步谐振	secondry synchronization resonance (SSR)
超低频振荡	super low-frequency surge
柔性交流输电系统	flexible AC transmission system (FACTS)
灵活	flexible
故障	fault

概率	probability
正态分布	normal distribution
灵敏度	sensitivity
准确度	accuracy
真值	true value
误差	error
偏差	measured error
绝对	absolute
相对	relative
允差	tolerance
校准	calibration
近似	approximate
虚拟	dummy
线性	linear
非线性	non-linear
对称	symmetry
非对称	asymmetry
同步	synchronous
非同步 (异步)	asynchronous
等值电路	equivalent circuit
等值对称排列	equivalent symmetrical arrangement
地震	earthquake; seism
震动	shake
振动	vibration
振荡	oscillating; surge
谐振	resonance
谐波	harmonic
模拟	simulation
相似	similitude
响应	response
辅助	auxiliary
微分	differential
积分	integral

差动	differentiate
集成	integrate
最大	maximum
最小	minimum
正数	positive number
负数	negative number
奇数	odd number
偶数	even number
水平	horizontal
垂直	vertical
乘方	involution
开方	extraction of root
自感	self-inductance
互感	mutual inductance
电阻	resistance
电抗	reactance
阻抗	impedance
感抗	inductive reactance
容抗	capacitive reactance
内部的	internal
外部的	external
输入	input
输出	output
进口	import
出口	export
与……并联	in parallel with. . .
与……串联	in series with. . .
与……平行	to be parallel to. . .
与……垂直	to be perpendicular to. . .
与……成正比	to be proportional to. . .
与……成反比	to be inversely proportional to. . .
电气强度	electric intensity; electric strength
机械强度	mechanic intensity; mechanic strength

抗弯强度	flexural intensity; flexural strength
抗压强度	elastic intensity; elastic strength
抗拉强度	tensile intensity; tensile strength
屈服强度	bend intensity; bend strength
复数	complex number ($a + jb$)
实数部分	real component
虚数部分	imaginary component
整数	integer
分数	fraction
分子	numerator
分母	denominator
假分数	improper fraction
小数	decimal
四舍五入	round off
钝角	obtuse angle
锐角	acute angle
补角	supplementary angle
余角	complement angle
n 的 5 次方	5th power of n
幂	exponent, exponential
直角坐标	cartesian coordinate
极坐标	polar coordinate
横坐标	abscissa
纵坐标	ordinate
X-轴	X-axis
Y-轴	Y-axis
面积	area
体积	volume
米	meter
分米	decimeter
厘米	centimeter
毫米	millimeter
千米; 公里	kilometer

英里	mile
海里	knot
码	yard
英寸	inch
密耳	mil (1 mil = 10^{-3} inch)
角密耳	mil (1 mil = $360^\circ/6400 = 3.375'$)
圆密耳	circular mil
磅	pound (lb)
磅/平方英寸	pound per square inch (ppsi)
英尺	foot
英制热量单位	British thermal unit (BTU)
马力	horsepower
压强	intensity of pressure
帕斯卡	Pascal (Pa)
千帕	kPa
兆帕	MPa ($1\text{kg}/\text{cm}^2 = 10^5\text{Pa} = 100\text{kPa} = 0.1\text{MPa}$)
毛	torr (1 torr = 1 mmHg = 133Pa)
巴	bar (1 bar $\approx 1\text{kg}/\text{cm}^2 = 10^5\text{Pa} = 100\text{kPa} = 0.1\text{MPa}$)
毫巴	mbar (1 mbar = 100Pa)
黏度	viscosity
帕斯卡秒	Pascal · second
泊	poise
厘泊	centipois
焦耳	joule (J)
千瓦时	kilowatt-hour (kWh)
特斯拉	tesla (1 T = 10^4 Gs)
高斯	gauss (Gs)
奥斯特	oersted (Oe)
库仑	coulomb (C)
皮库	pico-coulomb (pC)
牛顿	newton (N)
摄氏度	Celsius; centigrade ($^\circ\text{C}$)

开尔文	Kelvin
法拉	farad (F)
皮法	pico-farad (pF)
升	liter (L)
立方分米	cubic decimeter
立方厘米	cubic centimeter
加仑	gallon
桶	barrel
石油	petroleum
公顷 (1 万平方米)	hectare ($10^4 \text{m}^2 = 15 \text{亩}$)
标准国际单位制	standard international unit
厘米 - 克 - 秒单位制	CGS unit
许用值	permitted value
安全系数	safety margin
稳定系数	stability margin

第三章

Chapter 3

电 工 基 础

电工基础

electrics basic

第一节 线 性 电 路

集中参数线性电路中的稳定状态 steady state of linear circuit with lumped parameters

直流电路 direct current circuit

正弦电流电路的基本概念 basic concept of sinusoidal current circuit

正弦电流电路的矢量图与符号计算法 vector diagram and symbolic calculation method of sinusoidal current circuit

互感及感应耦合电路 mutual induction and induction coupling circuit

网络的理论与计算 theory and calculation for network

三相电路 three-phase circuit

非正弦周期电流的电路 non-sinusoidal periodic current circuit

电路的欧姆定律 Ohm's law of electric circuit

$$U = IR; \sum u = iR; \dot{U} = \dot{I}Z$$

欧姆定律的算子形式 Ohm's law in operator form

$$U(p) = I(p)Z(p)$$

库仑定律 Coulomb's law

$$U_{AB}(e) = \int_e \bar{E} \cdot d\bar{e}$$

基尔霍夫第一定律 (电路) Kirchhoff's first law of electric circuit

$$\sum I = 0; \sum i = 0; \sum \dot{I} = 0$$

基尔霍夫第二定律 (电路)	Kirchhoff's second law of electric circuit
	$\sum U = 0; \sum u = 0; \sum \dot{U} = 0$
基尔霍夫第一定律的算子形式	Kirchhoff's first law in operator form
	$\sum I(p) = 0$
基尔霍夫第二定律的算子形式	Kirchhoff's second law in operator form
	$\sum U(p) = 0$
焦耳 - 楞次定律	Joule-Lenz's law
	$Q = 0.239 I^2 R t$
电磁感应定律	electromagnetic induction law
	$e = -\frac{d\phi}{dt}$
郎日万定理 (无功守恒定理)	Langevin's theorem (reactive conservation theorem)
	$\dot{U}_{12} \dot{I}_{12}^* + \dot{U}_{13} \dot{I}_{13}^* + \cdots + \dot{U}_{23} \dot{I}_{23}^* + \cdots + \dot{U}_{(n-1)n} \dot{I}_{(n-1)n}^* = 0$
傅里叶级数	Fourier series
	$f(t) = A_0 + \sum_{k=1}^{\infty} A_{km} \sin(k\omega t + \Psi_k)$
	$= A_0 + \sum_{k=1}^{\infty} B_{km} \sin k\omega t + \sum_{k=1}^{\infty} C_{km} \cos k\omega t$
	$A_0 = \frac{1}{T} \int_0^T f(t) dt = \frac{1}{2\pi} \int_0^{2\pi} f(\omega t) d(\omega t);$
	$B_{km} = A_{km} \cos \Psi_k; \quad C_{km} = A_{km} \sin \Psi_k$
	$B_{km} = \frac{2}{T} \int_0^T f(t) \sin k\omega t dt = \frac{1}{\pi} \int_0^{2\pi} f(\omega t) \sin k\omega t d(\omega t)$
	$C_{km} = \frac{2}{T} \int_0^T f(t) \cos k\omega t dt = \frac{1}{\pi} \int_0^{2\pi} f(\omega t) \cos k\omega t d(\omega t)$
直流电路	direct current circuit
线性电路	linear circuit
电源	source

负载	load
直流	direct current (d. c.)
交流	alternate current (a. c.)
电压	voltage
电流	current
阻抗	impedance
电阻	resistance
电抗	reactance
容抗	capacitive reactance
感抗	inductive reactance
导纳	admittance
电导	conductance
电纳	susceptance
容纳	capacitive susceptance
感纳	inductive susceptance
导体	conductor
电容	capacitance
电感	inductance
串联	series connection
并联	parallel connection
混联	series-parallel connection
支路	branch
内阻	internal resistance
开路	open circuit
短路	short circuit
电荷	electric charge
库仑电场	Coulomb's field
库仑	coulomb
静电场	electrostatic field
静电电路	electrostatic circuit
电场	electric field
电场强度	electric field intensity
电场能量	energy of electric field



反电动势	counter e. m. f.
电位	potential
电能	electric energy
感应电场	induced electric field
局外电场	strange electric field
法拉	farad
法拉第	Faraday
焦耳	joule
击穿	puncture
电枢	armature
电位差	potential difference
电位降	potential drop
电压降	voltage drop
电压损失	voltage loss
电容器	capacitor
电抗器	reactor
变阻器	rheostat
整流器	rectifier
换向器	commutator
整流	rectification
调压	voltage regulation
变换比	ratio of transformation
电动势	electromotive force (e. m. f.)
电功率	electric power
导电系数	specific conductance
电流连续性	continuity of current
电位单值性	uniqueness of potential
平面电路	plane circuit
网孔	mesh
电源外特性	external characteristic of source
绝缘体	insulator
匹配	matching
线性电阻	linear resistance



非线性电阻	non-linear resistance
正弦电流电路的基本概念	basic concept of sinusoidal current circuit
周期	period
周期电流	periodic current
交流电路	a. c. circuit
交变电压	alternating voltage
位移电流	displacement current
铁磁物质	ferromagnetic substance
正弦电流电路	sinusoidal current circuit
正弦电流	sinusoidal current
初相位	initial phase
角频率	angular frequency
正弦量	sinusoid
电压三角形	voltage triangle
电流三角形	current triangle
功率三角形	power triangle
阻抗三角形	impedance triangle
导纳三角形	admittance triangle
谐振	resonance
电压谐振	voltage resonance
电流谐振	current resonance
谐振曲线	resonance curves
谐振频率	resonance frequency
频率	frequency
频率特性曲线	frequency characteristic curve
幅角	argument
模	modulus
振幅	amplitude
幅度频谱	amplitude spectra
正弦电流电路的矢量图与符号算法	vector diagram and symbolic calculation method of sinusoidal current circuit
矢量图	vector diagram
正方向	positive direction

旋转矢量	rotating vector
复振幅	complex amplitude
复有效值	complex effective value
复阻抗	complex impedance
复导纳	complex admittance
复功率	complex power
符号法	symbolic method
司坦麦兹符号法	Steinmetz's symbolic method
位形图	topographic diagram
圆图	circle diagram
反形法	method of inversion
含源支路的欧姆定律	Ohm's law for branch with e. m. f.
参数	parameter
特性阻抗	characteristic impedance
品质因数	quality factor
趋肤效应	skin effect
有效电阻	effective resistance
邻近效应	proximity effect
损失角	loss angle
视在功率	apparent power
有功分量	active component
有功功率	active power
无功分量	reactive component
无功伏安	reactive volt-ampere
平均功率	average power
乏	var
功率因数	power factor
功率的守恒	conservation of power
效率	efficiency
线性电容	linear capacitance
线性电感	linear inductance
通量	flux
磁通	magnetic flux

磁链	magnetic linkage
主磁通	main flux
全磁通	flux linkage
磁极	magnetic pole
磁感线	line of magnetic induction
磁耦合	magnetic coupling
磁场能量	energy of magnetic field
漏损电导	leakage conductance
漏磁通	leakage flux
互感及感应耦合电路	mutual induction and induction coupling circuit
耦合系数	coefficient of coupling
自感	self-induction
互感系数	mutual induction; inductance
亨利	henry
韦伯	weber
麦克斯韦	maxwell
网络的理论与计算	theory and calculation for network
支路电流法	method of branch currents
支路电压法	method of branch voltage
回路电流法	loop current method
节点电位法	node potential method
节点	node
独立节点	independent node
回路	loop
独立回路	independent loop
回路电动势	loop e. m. f.
二端网络	two-terminal network
星形网络	y-connected network
三角形网络	Δ -connection network
T形电路	T-network
π 形电路	π -network
四端网络	four-terminal network
无源四端网络	passive four-terminal network

含源四端网络	active four-terminal network
入端阻抗	input impedance
入端导纳	input admittance
转移阻抗	mutual impedance
转移导纳	mutual admittance
网络	network
叠加原理	principle of superposition
互易原理	reciprocity theorem
补偿原理	compensation theorem
对偶原理	principle of duality
参数变动定理	theorem of variation
含源二端网络定理 (戴维南定理)	theorem of active two-terminal network (Thevenin's theorem)
网孔电流法	mesh current method
定电势源	voltage source
定激流源	current source
等效	equivalent
等效电阻	equivalent resistance
等效阻抗	equivalent impedance
等效导纳	equivalent admittance
等效变换	equivalent transformation
等效电路	equivalent circuit
端钮	terminal
三相电路	three-phase circuit
单相制	single phase system
三相制	three phase system
多相制	polyphase system
平衡制	balanced system
对称三相电路	symmetrical three-phase circuit
不对称三相电路	unsymmetrical three-phase circuit
对称分量法	method of symmetrical components
星形接法	y-connection
三角形接法	Δ -connection

线电压	line voltage
线电流	line current
中性点	neutral point
中线	neutral wire
相	phase
相序	phase sequence
相电压	phase voltage
相电流	phase current
相电动势	phase electromotive force
相位 (相位角)	phase; phase angle
相位差	phase difference
方均根值	root-mean-square (r. m. s.) value
有效值	effective value
平均值	average value
伏安	volt-ampere
伏特	volt
伏特计	voltmeter
安培计	ammeter
非正弦周期电流的电路	non-sinusoidal periodic current circuit
非正弦电流电路	non-sinusoidal current circuit
周期函数	periodic function
傅里叶级数	Fourier series
谐波	harmonics
高次谐波	higher harmonics
谐波分析	harmonic analysis
谐波分析仪	harmonic analyzer
洛推法 (矢量合成法)	Rote's method
波形因数	form factor
波顶因数	amplitude factor
畸变因数	distortion factor
频谱	frequency spectra
幅度频谱	amplitude spectra
相位频谱	phase spectra

等效正弦量	equivalent sinusoid
滤波器	filter
铁心线圈	coil with iron core
赫兹	hertz
永久磁铁	permanent magnet
瞬时值	instantaneous value
瞬时功率	instantaneous power
稳定状态	steady state
过渡状态	transient state
过渡过程	transient process
暂态	transient state
示波器	oscillograph
合理化单位制	rationalized system of units
实用单位制	practical system of units

第二节 非线性电路

集中参数非线性电路与磁路中的稳定状态	steady state of non-linear electric and magnetic circuit with lumped parameters
非线性电阻电路	non-linear resistance circuit
磁路	magnetic circuit
含非线性电感与电容的周期电流电路	periodic current circuit with non-linear inductance and capacitance
磁路的欧姆定律	Ohm's law of magnetic circuit $U_m = \Phi R_m$
基尔霍夫第一定律 (磁路)	Kirchhoff's first law of magnetic circuit $\sum \Phi = 0; \sum \Phi = 0; \sum \Phi = 0$
基尔霍夫第二定律 (磁路)	Kirchhoff's first law of magnetic circuit $\sum H_e = \sum IW$
磁通连续性定理	principle of continuity of magnetic flux $\oint_S \bar{B} \cdot d\bar{S} = 0$

安培环路定律

Ampere's circuital law

$$\oint_e \bar{H} \cdot d\bar{e} = \sum I$$

非线性电阻电路

non-linear resistance circuit

伏安特性

volt-ampere characteristic

非线性电路

nonlinear circuit

非线性电阻

nonlinear resistance

对称非线性电阻

symmetric nonlinear resistance

可控非线性电阻

controllable nonlinear resistance

有条件线性化法

linear method with definite condition

热效非线性电阻

thermal resistance

热敏电阻

thermister

热惯性

thermal inertia

静态电阻

static resistance

动态电阻

dynamic resistance

二极管真空管

diode

三极管

triode

半导体二极管

semi-conductor diode

晶体管

transistor

电子管

electronic tube

离子管

gas-filled tube

镇流管

ballast lamp

白炽灯

incandescent lamp

电弧

electric arc

砂砾陶

thyrite

猜试法

cut-and-try method

稳压比

coefficient of stabilization

稳压器

voltage stabilizer

整流

rectification

磁路

magnetic circuit

电工钢

electrical-sheet steel

硅钢

silicon steel

主磁通

main magnetic flux

韦伯	weber
麦克斯韦	maxwell
高斯	gauss
奥斯特	oersted
安匝	ampere-turn
磁通	magnetic flux
磁压	magnetic potential difference
磁导	permeance
磁阻	reluctance
磁滞	hysteresis
涡流	eddy current
漏感	leakage inductance
漏抗	leakage reactance
衔铁	armature
磁动势	magnetomotive force
磁化力	magnetizing force
磁饱和	magnetic saturation
漏磁通	leakage flux
铁磁物质	ferromagnetic material
励磁电流	exciting current
磁通密度	magnetic flux density
磁感应强度和磁场强度之间的关系	relation between B and H $\bar{B} = \mu \bar{H}$
磁感应强度	magnetic induction intensity (B)
磁场强度	magnetic field intensity (H)
磁导系数	magnetic permeability ($\mu = \mu_r \mu_0$)
真空磁导系数	vacuum magnetic permeability ($\mu_0 = 4\pi \times 10^{-7} \text{H/m}$)
相对磁导系数	relative magnetic permeability (μ_r)
磁化电流	magnetizing current
交变磁化	alternating magnetization
永久磁铁	permanent magnet
去磁系数	demagnetization coefficient

回复曲线	returning curve
等效正弦量	equivalent sinusoid
涡流损失	eddy current loss
磁滞损失	hysteresis loss
铁内损失	iron loss
磁化曲线	magnetizing curve
起始磁化曲线	initial magnetizing curve
剩磁感应强度	residual magnetic induction
矫顽磁场强度	coercive force
磁滞回线	hysteresis loop
局部磁滞回线	local hysteresis loop
基本磁化曲线	fundamental magnetizing curve
动态磁化曲线	dynamic magnetizing curve
动态磁滞回线	dynamic hysteresis loop
复磁导系数	complex magnetic permeability
修正系数	correction factor
含非线性电感与电容的周期 电流电路	periodic current circuit with non-linear inductance and capacitance
非线性电感	nonlinear inductance
非线性电容	nonlinear capacitance
静磁导系数	static magnetic permeability
动磁导系数	dynamic magnetic permeability
静态电感	static inductance
动态电感	dynamic inductance
等效电感	equivalent inductance
铜内损失	copper loss
扼流线圈	choke coil
铁磁谐振	ferroresonance
基磁(直流磁化)	control magnetization
铁磁功率放大器	magnetic amplifier
可逆电感	reversible inductance
可逆磁导系数	reversible magnetic permeability
非线性电介质	nonlinear dielectric

强性电介质 ferroelectric

第三节 电路中的过渡过程

集中参数电路中的过渡过程 transient process of circuit with lumped parameters
 线性电路中的过渡过程及其经典算法 transient process and it's sutra calculation method of linear circuit

解线性电路过渡过程的积分变换法与叠加法 integral transformation and super position method for solution of transient process of linear circuit

非线性电路中的过渡过程 transient process of non-linear circuit

傅里叶变换 Fourier transformation

$$F(j\omega) = \lim_{T \rightarrow \infty} \int_{-T/2}^{T/2} f(t) \in^{-j\omega t} dt = \int_{-\infty}^{\infty} f(t) \in^{-j\omega t} dt$$

傅里叶反变换 (傅里叶积分) Inverse Fourier transformation (Fourier integral)

$$f(t) = \lim_{T \rightarrow \infty} \left[\sum_{-\infty}^{\infty} \tilde{A}_k \in^{jk\omega_1 t} \right] = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(j\omega) \in^{j\omega t} d\omega$$

拉普拉斯变换 (拉普拉斯积分) Laplace transformation (Laplace integral)

$$F(p) = \int_0^{\infty} f(t) \in^{-pt} dt$$

拉普拉斯反变换 (布罗姆维奇积分) Inverse Laplace transformation (Bromwich integral)

$$f(t) = \frac{1}{2\pi j} \int_{c-j\omega}^{c+j\omega} F(p) \in^{pt} dp$$

亥维赛德变换 (卡尔松变换) Heaviside transformation (Carson transformation)

$$F(p) = p \int_0^{\infty} f(t) \in^{-pt} dt$$

杜阿密尔积分 (叠加法) Duamier integral (super position method)

$$i(t) = u(0)g(t) + \int_0^t u'(\tau)g(t-\tau) d\tau$$

线性电路中的过渡过程及其经典算法	transient process and its sutra calculation method of linear circuit
稳定状态	steady state
过渡过程	transient process
换路	switching
换路定律	law of switching
起始条件	initial conditions
通解	general solution
特解	particular solution
强制分量	forced component
稳定分量	steady state component
自由分量	force-free component
暂态分量	transient component
衰减因子	attenuation factor
衰减常数	attenuation constant
时间常数	time constant
临界情况	critical state
临界电阻	critical resistance
自由振荡	free oscillation
振荡的过渡过程	oscillatory transient process
振荡电路	oscillating circuit
减幅振荡	damped oscillation
等幅振荡	undamped oscillation
解线性电路过渡过程的积分变换法与叠加法	integral transformation and super position method for solution of transient process of linear circuit
频谱	frequency spectra
幅度频谱	amplitude-frequency spectra
相位频谱	phase spectra
原函数	original function
象函数	transform function
算子法	operational calculus
展开定理	expansion theorem
留数定理	residue theorem

算子阻抗	operational impedance
内电动势	internal e. m. f.
算子导纳	operational admittance
单位阶跃函数	unit step function
单位脉冲函数	unit impulse function
过渡电导	transient conductance
脉冲过渡电导	transient conductance under unit voltage impulse
非线性电路中的过渡过程	transient process of non-linear circuit
图解积分法	graphical integral method
有条件线性化法	linear method with definite condition
分段线性化法	piecewise linear method
有限增量法	method of finite increment
稳定性的判据	stability criterion
张弛振荡	relaxation oscillation

第四节 分布参数电路

分布参数电路	circuit with distributed parameters
分布参数电路中的稳定状态	steady state of circuit with distributed parameters
分布参数电路中的过渡过程	transient process of circuit with distributed parameters
电报方程 (均匀线方程)	telegraph equations (uniform line equations)
	$r_0 i + L_0 \frac{\partial i}{\partial t} = - \frac{\partial u}{\partial x}$
	$g_0 u + C_0 \frac{\partial u}{\partial t} = - \frac{\partial i}{\partial x}$
分布参数电路中的稳定状态	steady state of circuit with distributed parameters
均匀线	uniform line
均匀线方程	equations of uniform line
传播常数	propagation constant
波阻抗	surge impedance
特性阻抗	characteristic impedance
复波阻抗	complex surge impedance

行波	travelling wave
相位速度	phase velocity
相位常数	phase constant
正向行波	direct wave
反向行波	returning wave
波长	wave length
波前	wave front
波腹	loop
波节	node
入射波	incident wave
反射波	reflected wave
反射系数	reflection coefficient
驻波	standing wave
驻波系数	standing wave ratio
无反射线	reflectionless line
匹配	matching
自然功率	natural power
奈贝 ^①	neper (1 neper = 8.68decibel; 1NP = 8.68dB)
分贝	decibel
无限长线	infinite long line
无畸变线	distortionless line
畸变	distortion
振幅畸变	amplitude distortion
失真	distortion
相位畸变	phase distortion
无损失线	lossless line
链形电路	ladder network
仿真线	artificial line
分布参数电路中的过渡过程	transient process of circuit with distributed parameters
柏德生 - 费弗聂尔法则	Peterson-Pfiefner's law

① 线路衰减单位

透射波	transmitted wave
延迟线	time delay line
算子传播常数	operational propagation constant
算子波阻抗	operational surge impedance

第五节 电磁场原理

电磁场原理	principle of electromagnetic field
静电场	electrostatic field
导电媒质中的恒定电场	constant electrostatic field in conductive medium
恒定磁场	constant magnetic field
时变电磁场	time varying electromagnetic field
库仑定律	Coulomb's law
	$U_{AB(e)} = \int_e \bar{E} \cdot d\bar{e}$
安培环路定律	Ampere's circuital law
	$\oint_e \bar{H} \cdot d\bar{e} = \sum I$
磁通连续性定理	principle of continuity of magnetic flux
	$\oint_s \bar{B} \cdot d\bar{S} = 0$
法拉第电磁感应定律	Faraday's electromagnetic induction law
	$e = -\frac{d\varphi}{dt}$
高斯定理 (静电场)	Gauss' theorem (electrostatic field)
	$\oint_s \bar{E} \cdot d\bar{S} = \frac{\sum q}{\epsilon}$
泊松方程 (静电场)	Poission's equation (electrostatic field)
	$\nabla^2 \varphi = -\frac{\rho}{\epsilon}$
拉普拉斯方程 (静电场)	Laplace's equation (electrostatic field)
	$\nabla^2 \varphi = 0$
拉普拉斯算符	Laplace's operator
	$\nabla^2 = \text{div grad}$

毕奥 - 沙伐定律 (恒定
磁场) Biot-Savart's law (constant magnetic field)

$$dB = \frac{\mu I ds \sin \alpha}{4\pi r^2}$$

$$dB = \frac{\mu I (de \times r^0)}{4\pi r^2}$$

麦克斯韦方程组 (时变
电磁场) Maxwell's equations (time varying electromagnetic field)

$$\left\{ \begin{array}{l} \text{rot} H = \delta = \gamma E + \rho v + \frac{\partial D}{\partial t} \dots\dots (1) \end{array} \right.$$

$$\oint_e E \cdot de = - \frac{d\Phi}{dt} = - \int_s \frac{\partial B}{\partial t} \cdot dS \dots (2) - \text{积分形式}$$

$$\left\{ \begin{array}{l} \text{rot} E = - \frac{\partial B}{\partial t} \dots\dots\dots (2) - \text{微分形式} \end{array} \right.$$

$$B = \mu H \dots\dots\dots (3)$$

$$D = \epsilon E \dots\dots\dots (4)$$

$$\text{div} D = \rho \dots\dots\dots (5)$$

$$\text{div} B = 0 \dots\dots\dots (6)$$

坡印亭矢量 Poynting vector
 $\Pi = E \times H$

贝塞尔方程 Bessel's equation

$$\frac{d^2 \delta}{dx^2} + \frac{1}{x} \frac{d\delta}{dx} + \delta = 0$$

$$\frac{d^2 y}{dx^2} + \frac{1}{x} \frac{dy}{dx} + (1 - \frac{n^2}{x^2}) y = 0$$

贝塞尔函数 Bessel's function

$$J_n(x) = \sum_{k=0}^{\infty} (-1)^k \frac{x^{n+2k}}{2^{n+2k} k! (n+k)!}$$

$$K_n(x) = J_n(x) \ln x - \frac{1}{2} \sum_{m=0}^{n-1} \frac{(n-m-1)! x^{-n+2m}}{2^{-n+2m} m!} - \frac{1}{2} \sum_{k=0}^{\infty} \frac{(-1)^k x^{n+2k}}{2^{n+2k} k! (n+k)!} (1 + \frac{1}{2} + \dots + \frac{1}{k} + 1 + \frac{1}{2} + \dots + \frac{1}{n+k})$$

达朗贝尔方程 D'Alembert's equation

$$\nabla^2 A - \mu \epsilon \frac{\partial^2 A}{\partial t^2} = -\mu (\delta_{传} + \delta_{徙})$$

	$\nabla^2 \varphi - \mu \varepsilon \frac{\partial^2 \varphi}{\partial t^2} = -\frac{\rho}{\varepsilon}$
高斯变换	Gauss' transformation
	$\oint_s F \cdot dS = \int_v \operatorname{div} F dV$
斯托克斯变换	Stoke's transformation
	$\oint_e F \cdot de = \int_s \operatorname{rot} F \cdot dS$
格林定理	Gelin's theorem
	$\int_v (\Psi \nabla^2 \varphi + \nabla \varphi \cdot \nabla \Psi) dV = \oint_s \Psi \frac{\partial \varphi}{\partial n} dS$
勒襄特方程	Legendre's equation
勒襄特多项式	Legendre's polynomials
梯度	gradient (grad)
	数量场 $u = u(x, y, z)$
	$\operatorname{grad} u = \frac{\partial u}{\partial x} \mathbf{i} + \frac{\partial u}{\partial y} \mathbf{j} + \frac{\partial u}{\partial z} \mathbf{k}$
散度	divergence (div)
	矢量场 $\bar{\alpha} = \alpha_x \mathbf{i} + \alpha_y \mathbf{j} + \alpha_z \mathbf{k}$
	$\operatorname{div} \bar{\alpha} = \frac{\partial \alpha_x}{\partial x} + \frac{\partial \alpha_y}{\partial y} + \frac{\partial \alpha_z}{\partial z}$
旋度	rotor; curl (rot; curl)
	矢量场 $\bar{\alpha} = \alpha_x \mathbf{i} + \alpha_y \mathbf{j} + \alpha_z \mathbf{k}$
	$\operatorname{rot} \bar{\alpha} = \begin{bmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ \alpha_x & \alpha_y & \alpha_z \end{bmatrix}$
静电场	electrostatic field
电场	electric field
电场力	electric field force
库仑电场	Coulomb's field
静电场	electrostatic field
电场强度	electric field intensity
静电感应系数	coefficient of electrostatic induction

电荷	charge
点电荷	point charge
介电系数	dielectric coefficient
真空介电系数	vacuum dielectric coefficient (ϵ_0)
相对介电系数	relative dielectric coefficient
合理化单位制	rationalized system of units
叠加原理	principle of super position
空间电荷	space charge
容积电荷	volume charge
电荷的容积密度	volume density of charges
面电荷	surface charge
电荷的面密度	surface density of charges
线电荷	linear charge
电荷的线密度	line density of charges
高斯定理	Gauss' theorem
电感应强度矢量	electric induction intensity vector
电位移矢量	electric displacement vector
高斯推广定理	extended Gauss' theorem
有源场	source field
无旋场	irrotational field
位场	potential field
电位	electric potential
电位差	potential difference
电位梯度	potential gradient
电位系数	potential coefficient
平均电位法	method of average potentials
电动势	electromotive force (e. m. f.)
介电系数	dielectric coefficient
电偶极子	electric dipole
矢量线	vector lines
电力线	lines of force of electric field
电力线管	tube of lines of force
等位面	equipotential surface

等位线	equipotential line
均匀电场	uniform electric field
平行平面场	plane-parallel field
子午平面场	meridian plane field
边界条件	boundary conditions
二线输电线的电场	electric field of a two-wire transmission line
解的唯一性定理	singularity theorem
镜象法	method of image
图解法	graphical method
网格算法	grid method of calculation
电容	capacitance
二线输电线的电容	capacitance of a two-wire transmission line
部分电容	partial capacitance
一相等效电容	one-phase equivalent capacitance
带电体	charged body
电场能量	energy of electric field
电场能量密度	energy density of electric field
虚位移法	method of virtual
圆极化	circular polarization
导电媒质中的恒定电场	constant electrostatic field in conductive medium
恒定电场	electric field of steady-state current
电流密度矢量	current density vector
电导系数	conductivity coefficient
恒定电流的连续性	continuity of steady-state current
电流管	elementary tube of current
电流线	lines of current
局外电场	strange electric field
电解槽	electrolytic cell
电阻网络法	method of resistance grid
接地电阻	grounding resistance
恒定磁场	magnetic field of steady-state current
磁链	magnetic flux linkage
磁场能量	energy of magnetic field

磁场能量密度	density of energy of magnetic field
洛仑兹力	lorentz force
矢量场	vector field
磁感应线	lines of magnetic induction
磁感应管	tube of magnetic induction
磁通连续性定理	principle of continuity of magnetic flux
无源场	solenoidal field
有旋场	rotational field
标量磁位	scalar magnetic potential
自感	self-inductance
互感	mutual inductance
内自感	internal inductance
内磁链	internal flux linkage
电磁力	electromagnetic force
等标量磁位线	equipotential line of magnetic field
二线输电线的电感	inductance of a two-wire transmission line
时变电磁场	time varying electromagnetic field
传导电流	conduction current
徙动电流	convection current
位移电流	displacement current
电磁感应定律	electromagnetic induction law
电磁能通量	electromagnetic energy flux
电磁矢量位	electromagnetic vector potential
缓变场	quasi-stationary field
正弦电磁波	sinusoidal wave
平面电磁波	plane electromagnetic wave
球面电磁波	spherical wave
边缘效应	edge effect
入射波	incident wave
反射波	reflected wave
标量场	scalar field
一相等效电感	one-phase equivalent inductance
电磁波辐射	electromagnetic wave radiation

矢量磁位	vector magnetic potential
网格点	grid point
束缚电荷	bound charge
各向同性介质	isotropic dielectric
传播系数	propagation constant
安培公式	Ampere's formula
全反射	complete reflection
全电流定律	generalized circuital law
行波	travelling wave
重力场	gravitation field of the earth
国际单位制	international system of units
折射波	refracted wave
均匀媒质	uniform medium
麦克斯韦方程	Maxwell's equations
麦克斯韦公式	Maxwell's formulas
麦克斯韦法则	Maxwell's rule
场的理论	field theory
邻近效应	proximity effect
线性极化	linear polarization
波阵面	wave front
波阻抗	wave impedance
波长	wave length
波速	wave velocity
波导	wave guide
截止波长	cut-off wave length
波动方程	wave equation
滞后电磁位	retarded electromagnetic potential
赫兹偶极子	hertz dipole
相速	phase velocity
换位	transposition
衰减系数	attenuation constant
相位系数	phase constant
透入深度	depth of penetration

电磁屏蔽	electromagnetic shielding
趋肤效应	skin effect
辐射电阻	radiation resistance
积分量	integral quantity
微分量	differential quantity
宏观问题	macroscopic problem
微观问题	microscopic problem
超距作用	action at a distance
解析函数	analytic function
互易原理	reciprocity theorem
分段算法	calculation by sections
分离变量法	method of separation of variables
有限元法	finite element method (FEM)
几个重要常量	several important constants

$$\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$$

$$\varepsilon_0 = 8.854 \times 10^{-12} \approx \frac{10^{-9}}{36\pi} \text{ F/m}$$

$$C = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = 2.998 \times 10^8 \approx 3 \times 10^8 \text{ m/s}$$

$$\sqrt{\mu_0 / \varepsilon_0} = 120\pi \approx 376.7 \Omega$$



第四章

Chapter 4

变压器标准用语

第一节 变压器标准

国家标准	national standard
国际电工委员会	IEC (International Electrical Committee)
IEC 标准	IEC standard
一、总则	
电力变压器	power transformer
总则	general
概述	general
适用范围	scope
使用条件	service condition
正常使用条件	normal service condition
海拔	altitude above sea-level
环境温度	ambient temperature
冷却介质温度	temperature of cooling medium
电源电压的波形	wave shape of supply voltage
三相电源电压对称	symmetry of three-phase supply voltage
安装环境	assembly ambient
特殊使用条件	unusual service condition
引用标准	reference standard
名词术语	terminologies
自耦变压器	auto-transformer
增压变压器	booster transformer
油浸式变压器	oil-immersed transformer

干式变压器	dry-type transformer
油保护系统	oil preservation system
端子及中性点	terminals and neutral point
端子	terminal
线路端子	line terminal
中性点端子	neutral terminal
相应端子	corresponding terminal
绕组	winding
带分接绕组	tapped winding
相绕组	phase winding
高压绕组	high-voltage winding
低压绕组	low-voltage winding
中压绕组	intermediate voltage winding
辅助绕组	auxiliary winding
稳定绕组	stabilizing winding
公共线圈	common winding
串联线圈	series winding
励磁线圈	energizing winding
额定值	rating
额定参数	rated parameter
绕组的额定电压	rated voltage of winding
额定电压比	rated voltage ratio
额定频率	rated frequency
额定容量	rated power
额定电流	rated current
分接	tappings
主分接	principal tapping
分接因数	tapping factor
正分接	plus tapping
负分接	minus tapping
分接级	tapping step
分接范围	tapping range
分接电压比	tapping voltage ratio

分接的工作能力	tapping duty
分接参数	tapping parameter
分接电压	tapping voltage
分接容量	tapping power
分接电流	tapping current
满容量分接	full-power tapping
降低容量分接	reduced-power tapping
有载分接开关	on-load tap-changer (OLTC)
分接电压调节	tapping voltage regulation
恒磁通调压	constant flux voltage variation (CFVV)
变磁通调压	variable flux voltage variation (VFVV)
混合调压	combined voltage variation (CbVV)
相位移	phase displacement
空载损耗	no-load loss
空载电流	no-load current
负载损耗	load loss
总损耗	total losses
短路阻抗	short-circuit impedance
电压降	voltage drop
电压升	voltage rise
电压调整率	voltage regulation
三相绕组零序阻抗	zero-sequence impedance of three-phase winding
阻抗电压	impedance voltage
电阻电压	resistance voltage
电抗电压	reactance voltage
温升	temperature rise
设备最高电压	highest voltage for equipment
额定绝缘水平	rated insulation level
全绝缘	uniform insulation
分级绝缘	non-uniform insulation
联结	connection
星形联结	star connection
三角形联结	delta connection

开口三角形联结	open-deltar connection
曲折形联结	zigzag connection
开路线圈	open winding
三相绕组的相位移	phase displacement of three-phase winding
联结组标号	connection symbol
试验的种类	kind of test
例行试验	routine test
型式试验	type test
特殊试验	special test
额定容量的优先数	preferred values of rated power
高于额定电压时的运行	operation at higher than rated power
铭牌	rating plates
在所有情况下都应给出的项目	information to be given in all cases
变压器种类	kind of transformer
变压器型号	type of transformer
产品代号	symbol of the transformer
标准代号	number of the specification
制造厂名	manufacturer's name
出厂序号	manufacturer's serial number
制造年月	year and month of manufacturing
相数	number of phases
冷却方式	type of cooling
总重量	total mass
绝缘油重量	mass of insulating oil
在某些情况下给出的补充项目	additional information to be given in certain cases
绝缘的温度等级	temperature class of insulation
联结图	connection diagram
运输重	transportation mass
器身吊重	active part mass
有关分接的详细说明	details regarding tappings
带有分接绕组的示意图	indication of winding which is fitted with tappings

套管电流互感器的技术数据	information for bushing type current transformers
其他要求	other requirements
中性点引出线尺寸的确定	dimensions of neutral connection
发电机用变压器的甩负荷	load rejection on generator transformers
工频电压升高时的持续时间	duration sustained for short time overvoltage at power frequency
过电压倍数	multiples of its rated voltage
允许偏差	tolerances
一般要求	general requirements
绕组电阻测量	measurement of winding resistance
电压比测量	measurement of voltage ratio
联结组标号检定	check of connection symbol
短路阻抗测量	measurement of short-circuit impedance
负载损耗测量	measurement of load loss
空载损耗测量	measurement of no-load loss
空载电流测量	measurement of no-load current
绝缘电阻测量	measurement of insulation resistance
吸收比测量	measurement of absorption ratio
极化指数测量	measurement of polarization-ability factor
介质损耗因数测量	measurement of loss tangent
绝缘例行试验	insulation routine test
有载分接开关试验	test on on-load tap-changer
操作试验	operation test
辅助线路绝缘试验	auxiliary circuit insulation test
绝缘油试验	insulation oil test
温升试验	temperature rise test
绝缘型式试验	insulation type test
绝缘特殊试验	insulation special test
绕组对地电容测定	measurement of capacitance between winding and ground
绕组间的电容测定	measurement of capacitance between windings
暂态电压传输特性测定	measurement of transmission character on transient voltage

三相变压器零序阻抗测定	measurement of zero-sequence impedance on three-phase transformer
短路试验	short-circuit test
声级测定	measurement of sound level
空载电流谐波测量	measurement of the harmonics on the no-load current
风扇和电机所吸收功率测量	measurement of the power taken by fan and pump motor
询价及订货时需提出的技术要求	information required with enquiry and order
额定值及一般数据	rating and general data
并联运行	parallel operation
出厂技术文件	technical documents for delivery
附加说明	additional explanation
二、温升	
冷却方式的标志	identification according to cooling method
字母代号	letter symbols
冷却介质的种类	kind of cooling medium
循环种类	kind of circulation
代号的排列	arrangement of symbols
温升限值	temperature-rise limits
正常使用条件下的温升限值	normal temperature-rise limits
特殊温升条件下的温升限值	reduced temperature-rise for transformer designed for high cooling medium or special air cooling condition
高海拔条件下的温升限值	reduced temperature-rise for transformer designed for high altitude
冷却空气温度的测量	measurement of the temperature of cooling air
自然空气冷却	natural air cooling
吹风冷却	forced air cooling
冷却水温度的测量	measurement of the temperature of cooling water
线圈温度的确定	determination of the winding temperature
顶层油温的测量	measurement of the top oil temperature

温升试验的时程	duration of the test of temperature rise
干式变压器的试验方法	test method for dry-type transformer
油浸式变压器的试验方法	test method for oil-immersed type transformer
顶层油温升	top oil temperature rise
线圈温升	winding temperature rise
加负载法	loading method
直接负载法	direct loading method
相互负载法	back-to-back method
短路法	short-circuit method
多绕组变压器的负载	loading of multi-winding transformer
切断电源后对变压器冷却的温度校正	temperature correction for cooling of transformer after switching off the supply
使用线性坐标的外推法	method of extrapolation using linear scales
使用对数线性坐标的外推法	method of extrapolation using log-linear scales
确定油的最终温升的方法	method for determining the final temperature rise of oil
确定切断电源瞬间线圈电阻的方法	method for determining the winding resistance at the instant of switching off the supply
三、绝缘水平和绝缘试验	
绝缘水平和绝缘试验	insulation level and dielectric test
外绝缘空气间隙	external clearances in air
设备的最高电压和绝缘水平	highest voltage for equipment and insulation level
适用于某些特殊类型变压器的规定	rules for some special classes of transformers
绝缘要求和绝缘试验的基本规定	basic rules for insulation requirements and dielectric tests
全绝缘绕组的绝缘要求和绝缘试验	insulation requirements and dielectric tests for windings with uniform insulation
分级绝缘绕组的绝缘要求和绝缘试验	insulation requirements and dielectric tests for windings with non-uniform insulation
分级绝缘绕组中性点端子绝缘要求和试验	insulation requirements and tests for the neutral terminal of a winding with non-uniform insulation
绕组的额定耐受电压	rated withstand voltage of winding

线端的额定短时工频耐受电压	rated short-duration power-frequency withstand voltage for line-terminal
线端的额定操作冲击耐受电压	rated switching impulse withstand voltage for line-terminal
线端的额定雷电冲击耐受电压	rated lightning impulse withstand voltage for line-terminal
中性点端子的额定短时工频耐受电压	rated short-duration power-frequency withstand voltage for neutral terminal
中性点端子的额定雷电冲击全波耐受电压	rated full-wave lightning impulse withstand voltage for neutral terminal
耐受电压由下述绝缘试验来检验	the withstand voltages to be verified by the following dielectric tests
短时感应耐压试验	induced overvoltage withstand test for short-duration (ACSD)
带局部放电测量的短时感应耐压试验	induced overvoltage withstand test for short-duration with partial discharge measurement
相对地感应耐压试验	phase-ground induced overvoltage withstand test
相对相感应耐压试验	phase-phase induced overvoltage withstand test
线端的操作冲击试验	switching impulse test for line terminal
线端的雷电冲击全波试验	full wave lightning impulse test for line terminal
线端的雷电冲击截波试验	chopped wave lightning impulse test for line terminal
中性点端子的外施耐压试验	separate source voltage withstand test for neutral terminal
中性点端子的雷电冲击全波试验	full wave lightning impulse test for neutral terminal
带局部放电测量的长时感应耐压试验	induced overvoltage withstand test for long-duration with partial discharge measurement (ACLD)
中性点直接接地	neutral point earthed directly
中性点不直接接地	neutral point earthed not-directly
中性点经小阻抗接地	neutral point earthed via a small reactor

带有分接绕组的变压器的试验	test on a transformer having a tapped winding
干式变压器的绝缘要求和试验条件	insulation requirements and test conditions for dry-type transformer
重复的绝缘试验	repeated dielectric test
辅助接线的绝缘	insulation of auxiliary wiring
背景噪声水平	background noise level
视在电荷量 q	apparent charge q
试验顺序	test sequence
试验时的连接	test connection
在线路端子试验时的连接	connection during test on line terminal
中性点端子上的冲击试验	impulse test on neutral terminal
传递冲击波的方法	transferred surge method
试验记录	test record
试验判断准则	test criteria
试验不合格后的判断方法	criteria procedure after an unsuccessful test
在波尾截断的雷电冲击试验	test with lightning impulse chopped on the tail
截断间隙	chopping gap
截断特性	chopping characteristics
在感应试验时进行 PD 测量的使用导则	application guide for PD measurement during IOW test
测量电路和校准电路的连接	connection of measuring and calibration circuit
校准程序	calibration procedure
频率范围	frequency range
用多端子测量方法	by means of multi-terminal measurement
用图形比较方法	by means of profile comparison
确定局部放电源的位置	location of partial discharge source
从高压绕组向低压绕组传递的过电压	overvoltage transferred from high-voltage winding to low-voltage winding
冲击电压的传递	transfer of surge voltage
电容传递	capacitive transfer
感应传递	inductive transfer
传递的工频过电压	power-frequency transferred overvoltage

四、分接和联结方法

分接和联结方法	tappings and connections
各种调压的要求	requirements valid for all categories of voltage variation
主分接	principal tapping
分接范围的表示	specification of the tapping range
短路阻抗的表示	short-circuit impedance specification
主分接上的短路阻抗	short-circuit impedance on the principal tapping
其他分接的短路阻抗	short-circuit impedance on other tappings
负载损耗的要求	load loss requirements
关于温升的保证和试验的要求	requirements related to temperature rise on guarantees and tests
恒磁通调压	constant flux voltage variation (CFVV)
对恒磁通调压的补充要求	additional requirements for constant flux voltage variation
范围应指出的内容 (见附录 A. 1)	specifications shall indicate (see example 1 of Appendix A)
分接容量和分接电流 (见图 1c、b)	tapping power and tapping currents (see Figures 1c and 1b)
变磁通调压	variable flux voltage variation (VFVV)
对变磁通调压的补充要求	additional requirements for variable flux voltage variation
与空载损耗和空载电流有关的要求	requirements related to no-load loss and no-load current
混合调压	combined voltage variation (CbVV)
对混合调压的补充要求	additional requirements for combined voltage variation
相绕组的联结方法	connections of phase windings
绕组间的相位移	phase displacement between windings
带有分接的变压器的规范示例	examples of specifications for transformer with tappings
常用的变压器联结法	transformer connections in general use

组成三相组的三台单相变压器的示例	example of three single phase transformers connected to form a three-phase bank
五、承受短路的能力	
承受短路的能力	ability to withstand short circuit
对于承受短路能力的要求	requirements with regard to ability to withstand short circuit
过电流条件	overcurrent conditions
具有两个独立绕组的变压器	transformer with two separate windings
对称短路电流	symmetrical short-circuit current
以额定电流（主分接）下的阻抗电压表示的变压器短路阻抗的典型值	typical values for the short-circuit impedance of transformers expressed as the impedance voltage at rated current on principal tapping
为了获得设计和试验所需的对称短路电流，应由使用部门提出系统的短路表观容量	The short-circuit apparent power of the system at the transformer location should be specified by the purchaser in his enquiry in order to obtain the value for the symmetrical short-circuit current to be used for the design and the tests
多绕组变压器	transformer with more than two windings
带有稳定绕组的变压器	transformer with stabilizing winding
带有第三绕组的自耦变压器	auto-transformer with tertiary winding
直接与其他电器相连接的变压器	transformer directly associated with other apparatus
特殊变压器	special transformer
分接变换装置	tap-changing equipment
承受短路的能力的验证	demonstration of ability to withstand short circuit
承受短路的耐热能力	thermal ability to withstand short circuit
对称短路电流的持续时间	duration of symmetrical short-circuit current
最高平均温度的最大允许值	maximum permissible of highest average temperature
温度 θ_1 的计算	calculation of temperature θ_1
承受短路的动稳定能力	dynamic ability to withstand short circuit
短路试验前变压器的条件	condition of transformer before short-circuit test

如无其他规定, 试验应在可投入运行的新变压器上进行
应在做完 GB 1094.1 规定的例行试验之后再行短路试验

短路试验开始时, 线圈平均温度应在 $0 \sim 40^{\circ}\text{C}$

双绕组变压器的短路电流峰值 i_p

非对称试验电流的第一个峰值按下式计算

如无其他规定, 系数 $K\sqrt{2}$ 限制到 $1.8\sqrt{2} = 2.55$

双绕组变压器短路的试验电流的值和持续时间

双绕组变压器短路试验方法

为了在被试的线圈中获得短路电流的起始峰值, 合闸时应使用同步开关来调节

在没有特定的技术规范的情况下, 对于单相变压器应进行三次试验, 其中一次为 100% 最大非对称电流, 其他二次应不低于 75% 最大非对称电流

对于三相变压器, 每相的试验次数均为三次, 其中一次应为 100% 最大非对称电流

Unless otherwise agreed, the tests are carried out on a new transformer ready for service

Prior the short-circuit tests, the transformer shall be subjected to the routine tests which are specified in Part 1, GB 1094.1

At the beginning of the short-circuit tests, the average temperature of the windings shall be between 0°C and 40°C

peak value i_p of short-circuit current for two-winding transformer

The amplitude i_p of the first peak of the asymmetrical test current is calculated as follows

Unless otherwise specified, the factor $K\sqrt{2}$ is limited to $1.8\sqrt{2} = 2.55$

value and duration of short-circuit test current for two-winding transformer

short-circuit testing procedure for transformer with two windings

To obtain the initial peak value of the current in the phase winding under test, the moment of switching on shall be adjusted by means of a synchronous switch

In the absence of any particular specification, the number of tests on single-phase transformers shall be three, the testing current for one of these tests is 100% of the maximum asymmetrical current; and for the other two tests, the testing current shall not be less than 75% of the maximum asymmetrical current

For three-phase transformers, the number of tests shall be three for each phase, the testing current for one of them should be 100% of the maximum asymmetrical current

对于第 I 类容量的变压器, 每次试验的持续时间为 0.5s, 其容许偏差为 $\pm 10\%$

对于其他类容量的变压器, 其试验次数、每次试验的持续时间以及试验所在分接位置均须由制造厂与使用部门协商确定

对于三相变压器, 当采用单相电源时, 应做 9 次短路试验, 每一铁心柱上进行 3 次

当采用三相电源时, 应做 3 次短路试验, 并应在三个铁心柱的不同分接位置上进行

故障探测和短路试验结果的判断

每次试验后, 应对试验期间取得的示波图记录和气体继电器加以观察, 并须测量短路阻抗

第二节 技 术 参 数

三相油浸式电力变压器技术参数和要求

性能参数

额定容量、电压组合、联结组标号及性能参数应符合表 1 ~ 表 8 的规定

高压分接范围

技术要求

- 本标准应符合 GB 1094.1 - .5 《电力变压器》的规定
 本标准的名词术语应符合 GB/T 2900.15 《电工术语》的规定
 安全保护装置
 强油风冷和强油水冷系统
 油保护装置
 油温测量装置
 绕组温度测量装置
 变压器油箱及附件的技术要求
 测试项目
 除符合 GB 1094.1 - .5 所规定的试验项目外, 还应符合下列规定
 直流电阻不平衡率: 相间 (有中性点引出时) 为 2%, 线间 (无中性点引出时) 为 1%。应以三相实测最大值减最小值作分子, 三相实测平均值作分母计算
 变压器油箱及储油柜应承受 50kPa 的密封试验, 其试验时间为 72h, 不得有渗漏和损伤
 提供变压器吸收比 (R_{60}/R_{15}) 实测值, 测试通常应在 10 ~ 40℃ 温度下进行
- This standard shall meet the stipulations of GB 1094.1 - .5, Power Transformers
 The terminology in this standard shall meet the stipulations of GB/T 2900.15, Electrotechnical Terminology
 safety and protective devices
 forced oil air-cooling or forced oil water-cooling system and control cabinet
 protective devices for oil
 measuring devices for oil temperature
 measuring devices for windings temperature
 technical requirements for transformer tank and its accessories
 tests
 Besides tests specified by GB 1094.1 - .5, it should meet the requirements of following measurements
 Unbalancedness of DC resistance: The unbalancedness of DC resistance should not exceed 2% between phases (with neutral brought out), and 1% between line terminals (with neutral not brought out). The unbalancedness should be calculated with the difference of maximum and minimum values measured as the numerator, the average value measured among three phases as the denominator
 Transformer tank and conservator shall withstand the leakage test with a pressure of 50 kPa for 72 hours without any leak and damage
 Generally, the absorption ratio of insulation Resistance (R_{60}/R_{15}) should be measured under the temperature of 10 ~ 40℃

提供变压器介质损失角正切值 ($\tan\delta\%$)，测试通常应在 $10 \sim 40^\circ\text{C}$ 温度下进行。 $\tan\delta\%$ 温差换算系数见表 10

如果测量介质损失角正切值的温度差不是表中所列的数值时，其换算系数可用线性插入法确定。校正到 20°C 的介质损失角正切值可用下列公式计算：

提供绝缘电阻的实测值，测试通常应在 $10 \sim 40^\circ\text{C}$ 和相对湿度小于 85% 时进行。当测量温度不同时，可按表 11 绝缘电阻换算系数折算之。如果测量绝缘电阻的温度差不是表中所列的数值时，换算系数可用线性插入法确定。其校正到 20°C 的绝缘电阻值可用下列公式计算：

绝对值

标志、起吊、安装、运输和储存

150 ~ 400MVA 的变压器，运输中应装冲撞记录仪

Generally, the dielectric loss tangent of transformer ($\tan\delta\%$) should be measured under the temperature of $10 \sim 40^\circ\text{C}$. The conversion factor of $\tan\delta$ for different temperatures is listed in Table 10

If the dielectric loss tangent is measured with temperature difference other than those specified in the table, the conversion factor may be determined by linear interpolation. The following formulae may be used to corrected the measured value to the value at 20°C

The insulation resistance of transformer should be measured under $10 \sim 40^\circ\text{C}$ with the relative humidity less than 85%. The measurement under different temperatures may be corrected by the conversion factor listed in Table 11

If the insulation resistance is measured with the temperature difference other than those specified in the table, the conversion factor may be determined by linear interpolation. The measured value may be corrected to the value at 20°C with the following formulae

absolute value

symboling, hoisting, installation and storage

For transformers of 150 ~ 400MVA, an accelerograph should be fitted on the transformer during transportation

第三节 绝缘配合和试验技术

一、高压输变电设备的绝缘配合

高压输变电设备的绝缘配合	insulation co-ordination for high-voltage transmission and transformation equipment
不适用范围	This standard does not suitable for
本标准所用名词术语的定义见 GB/T 2900.19 《电工名词术语 高电压试验技术和绝缘配合》	The definition of the terminologies used in this standard are given in GB/T 2900.19, Electrotechnical Terminology, High-voltage Test Technique and Insulation Co-ordination
额定使用条件	rated service conditions
本标准参照采用了国际电工委员会 91-1 出版物的结构和内容	The compilation of this standard has consulted the contents and composition of IEC Publication 91-1
绝缘配合的基本原则	basic principles of insulation co-ordination
设备绝缘上的各种作用电压	voltage stresses affecting insulation of the equipment
正常运行条件下的工频电压, 它不超过设备的最高工作电压 U_m	power-frequency voltage, under normal operating conditions, i. e. not exceeding the highest voltage for equipment U_m
暂时过电压 (含工频电压升高)	temporary overvoltages (including a power-frequency voltage rise)
操作过电压	switching overvoltages
雷电过电压	lightning overvoltages
绝缘试验	dielectric test
绝缘试验的类型	types of dielectric test
短时 (1 分钟) 工频试验	short duration (1 min) power-frequency tests
长时间工频试验	long duration power-frequency tests
操作冲击试验	switching impulse tests
雷电冲击试验	lightning impulse tests
绝缘试验类型的选择	selection of dielectric tests

关于正常运行电压和暂时过电压的绝缘配合	co-ordination for voltages under normal operating conditions and for temporary overvoltages
关于操作和雷电过电压的绝缘配合	co-ordination for switching and lightning overvoltages
雷电过电压下的绝缘配合	co-ordination for lightning overvoltages
标称放电电流下的最大残压	maximum residual voltage under nominal discharge current
1.2/50 μ s 标准雷电冲击放电电压上限	upper limit of impulse sparkover voltage under standard impulse voltage of 1.2/50 μ s
冲击波波前放电电压最大值除以 1.15	maximum value of front of wave impulse sparkover voltage divided by 1.15
操作过电压下的绝缘配合	co-ordination for switching overvoltages
雷电和操作过电压下的绝缘配合可以用统计法或惯用法	The statistical or conventional method may be used for insulation co-ordination for switching and lightning overvoltages
绝缘配合方法的选择	choice of the procedure for insulation co-ordination
统计法	statistical procedure
惯用法	conventional procedure
330 ~ 500kV 设备的基准绝缘水平	basic insulation level for equipment of 330 ~ 500 kV
额定操作冲击耐受电压	rated switching impulse withstand voltage
对于用避雷器限制操作过电压的设备	for equipment protected against switching overvoltage by surge arresters
预期的暂时过电压	the expected values of temporary overvoltages
所用避雷器的特性	the characteristics of presently available surge arrester
避雷器的保护水平与设备操作冲击耐受电压之间应有的裕度	the margins generally considered advisable between the protective level of surge arrester and the switching impulse withstand voltage of the equipment
对于不用避雷器限制操作过电压的设备	for equipment not protected against switching overvoltage by surge arresters

在设备安装地点可能出现的过电压引起的可接受的破坏性放电概率

the acceptable risk of disruptive discharge considering the probable range of overvoltages occurring at the equipment location

仔细选用操作电器和系统的设计能做得到的、并且通常认为是经济的操作过电压水平

the degree of overvoltage control generally deemed economical and obtainable by careful selection of the switching device and in the system design

额定雷电冲击耐受电压

rated lightning impulse withstand voltage

对用避雷器保护的装置，一般可用较低的雷电冲击耐受电压。给出这些数值时，考虑到现有避雷器可能达到的雷电冲击保护水平和操作冲击保护水平之比，且由于避雷器和保护设备之间的距离对雷电冲击保护水平的影响比对操作冲击保护水平的影响要大，因而要增加适当裕度

For equipment protected by surge arresters, the lower value of lightning impulse withstand voltage may be applicable. They were chosen by taking into account the ratio of lightning impulse protective level to switching impulse protective level likely to be achieved with surge arresters, and by adding appropriate margins which may be particularly necessary in view of the greater effect of separation between the surge arrester and the protected apparatus on the protection level achievable for lightning impulse as compared with that for switching impulses

对不用避雷器保护或非有效保护的装置，应选用较高的雷电冲击耐受电压，这些数值以设备（如断路器、隔离开关、仪用互感器）外绝缘的正常雷电和操作冲击耐受电压之比为基础

For equipment not protected by surge arresters or not effectively protected, the higher value of lightning impulse withstand voltages shall be used. These values are based on the ratio that is normally obtained between the lightning and switching impulse withstand voltage of the external insulation of equipment (e. g. circuit breakers, disconnectors, instrument transformers etc.)

在一些极端情况下，必须规定较高的雷电冲击耐受电压值。这些较高值应从本标准 3.2.2 规定的标准数列值中选取

变压器类设备应作雷电冲击截波试验，雷电冲击截波耐受电压幅值一般比全波幅值高 10% 左右，截波过零系数应小于 0.3

For transformers, the chopped wave lightning impulse test should be conducted, generally, the amplitude of chopped wave lightning impulse withstand voltage is higher than that of full wave by nearly 10%, the amount of overswing to opposite polarity of the recorded impulse will be less than 0.3

各类输变电设备的绝缘水平，可根据具体情况，选取与变压器相同的绝缘水平或比变压器的绝缘水平高一些的绝缘水平

The insulation level of each type of transmission and transformation equipment may be taken the same as that of transformers or a slight higher in accordance with the status of particular equipment

分级绝缘电力变压器中性点的绝缘水平列于表 5

The insulation levels for neutral of transformers with non-uniformly insulated winding are listed in table V

二、高电压试验技术

1. 一般试验条件和要求

一般试验规定

general testing procedure

设备的绝缘试验分为型式试验和例行试验

the insulation tests for the equipment are divided into type test and routine test

操作和雷电冲击耐压试验

switching and lightning impulse withstand tests

50% 破坏性放电试验

50% disruptive discharge test

15 次冲击耐压试验

fifteen-impulse withstand test

惯用冲击耐压试验

conventional impulse withstand test

短时工频耐压试验

short duration power-frequency voltage withstand tests

高电压试验技术

high voltage test techniques

一般试验条件和要求

general test condition and requirements

试品布置和试验条件

arrangement of the test object and test condition

试品

the test object

试品与周围接地体的距离

distance required between the test object and surrounding earthed structures

试品的模拟

simulation of test object

干试验	dry tests
大气条件	atmospheric conditions
大气校正因数	atmospheric correction factors
空气密度校正因数 K_d	the air density correction factors K_d
湿度校正因数 K_h	the humidity correction factors K_h
标准大气条件	standard reference atmosphere
大气校正因数的应用	application of atmospheric correction factors
试验电压形式	type of test voltage
电极形状	electrode form
极性	polarity
指数	exponent
球对球	sphere to sphere
棒对棒	rod to rod
棒对板	rod to plate
支柱绝缘子	supporting insulator
悬式绝缘子	suspension insulator
湿度测量	measurement of humidity
湿试验	wet test
淋雨条件的规定列于表 2	Precipitation conditions are specified in table II
在试品上的淋雨条件	precipitation conditions on test object
所有测量点的平均淋雨率	average precipitation rate for all measurements
垂直分量	vertical component
水平分量	horizontal component
湿试验的试验程序	the test procedure for wet tests
2. 试验程序	
试验程序	test procedures
直流电压试验	direct voltage tests
直流电压试验的有关定义	definitions for direct voltage tests
脉动	ripple
试验电压值	value of the test voltage
试验电压	test voltage
对试验电压的要求	requirements for the test voltage

除在有关设备标准中另有规定外, 试品上的电压应是脉动因数不大于 3% 的直流电压	The test voltage, as applied to the test object, should be a direct voltage with not more than 3% ripple factor, unless otherwise specified by the relevant standards
试验电压的产生	generation of the test voltage
试验电压一般用整流装置产生, 也可用静电发生器产生	The test voltage is generally obtained by means of rectifiers, but sometimes by electrostatic generators
试验电压的测量	measurement of the test voltage
利用球隙测量	measurement with a sphere-gap
试验电流测量	measurement of the test current
电容电流	capacitance current
介质的吸收电流	dielectric absorption current
持续泄漏电流	continuous leakage current
稳态电流	steady current
局部放电电流	partial discharge current
额定耐受电压试验	rated withstand voltage tests
确保放电电压试验	assured disruptive discharge voltage tests
交流电压试验	alternating voltage tests
交流电压试验的有关定义	definitions for alternating voltage tests
峰值	peak value
方均根 (有效值)	r. m. s. value
交流电压的方均根值是指在一个周期内各个电压值平方的平均值的平方根	The r. m. s. value of an alternating voltage is the square root of the mean value of the square of the voltage values during a complete cycle
试验电压值是指其峰值除以 $\sqrt{2}$	The value of the test voltage is defined by its peak value divided by $\sqrt{2}$
对试验电压的要求	requirements for the test voltage
试验电压一般应是频率为 45 ~ 55Hz 的交流电压。试验电压的波形应接近正弦波, 两个半波应完全一样, 且峰值和方均根 (有效值) 之比等于 $\sqrt{2} \pm 0.07$	The test voltage should be an alternating voltage generally having a frequency in the range of 45 ~ 55 Hz. The voltage shape shall approximate to a sinusoid with both half-cycles closely alike and shall have a ratio of peak to r. m. s. values equal to $\sqrt{2} \pm 0.07$

试验电压的产生	generation of the test voltage
试验电压一般用试验变压器产生, 也有用串联谐振回路的	The test voltage is generally supplied from a transformer. Alternatively, it may be generated by means of a series resonant circuit
对试验变压器回路的要求	requirements for the transformer test circuit
串联谐振回路	series resonant circuit
确保放电电压	assured disruptive discharge voltage
雷电冲击电压试验	lightning impulse tests
标准雷电冲击波	standard lightning impulse
标准雷电冲击全波是指视在波前时间 T_1 为 $1.2\mu\text{s}$, 视在半峰值时间 T_2 为 $50\mu\text{s}$ 的雷电冲击全波, 如图 2 所示	The standard lightning impulse is a full lightning, impulse having a virtual front time T_1 of $1.2\mu\text{s}$ and a virtual time to half-value T_2 of $50\mu\text{s}$, as shown in Figure 2
允许偏差	tolerances
标准冲击与实际测冲击之间允许偏差如下:	The tolerances between the standard impulse and impulse actually recorded are:
峰值 $\pm 3\%$;	crest value $\pm 3\%$;
波前时间 $\pm 30\%$;	front time $\pm 30\%$;
半峰值时间 $\pm 20\%$ 。	time to half-value $\pm 20\%$.
冲击波基本上应是单向的 (注②)	The impulse should be essentially unidirectional, see note 2
含有振荡或过冲的雷电冲击波示例 (见图 1)	examples of lightning impulses with oscillations or overshoot (see Figure 1)
标准雷电冲击截波	standard chopped lightning impulse
标准雷电冲击截波是指标准雷电冲击波经过 $2\sim 6\mu\text{s}$ 被外间隙截断的波形冲击截波可用截断时间 T_c 、截断时刻 t_j 、截波峰值 U_c 、截断时刻电压 U_j 、电压过零系数 $K_0 = U_2/U_c$ 等参数 (见图 4 和图 5) 来表征	A standard chopped lightning impulse is a standard impulse which is chopped by an external gap after $2\mu\text{s}$ to $6\mu\text{s}$. It may be characterized with time to chopping T_c , instant of chopping t_j , crest of impulse U_c , voltage at instant of chopping U_j , and factor of zero crossing $K_0 = U_2/U_c$ etc. (see Figures 4 and 5)

雷电冲击截波耐受电压幅值一般比全波幅值高 10%	The amplitude of chopped wave lightning impulse with-stand voltage is higher than that of full wave by nearly 10%
截波过零系数应小于 0.3	The amount of overswing to opposite polarity of the recorded impulse will be less than 0.3
试验电压的产生	generation of the test voltage
试验电压一般用冲击电压发生器产生。冲击电压发生器主要由许多电容器组成,先由直流电源将其并联充电,然后向接有试品的回路串联放电	The impulse is usually generated by an impulse generator consisting essentially of a number of capacitors which are charged in parallel from a direct voltage source and then discharged in series into a circuit which includes the test object
冲击波形的确定	determination of impulse shape
试验程序	test procedures
要求的试验结果的准确度	the required accuracy of test results
被观测现象的随机性和测量特性对极性的关系	the random nature of the observed phenomenon and any polarity dependence of the measured characteristics
多次加压时可能产生的积累效应	the possibility of progressive deterioration with repeated voltage applications
有关统计法的某些导则见附录 A	Some guidance on statistical aspects is given in Appendix A
额定耐受电压试验	rated withstand voltage tests
非自恢复绝缘的耐受电压试验	withstand tests on non-self-restoring insulation
自恢复绝缘的耐受电压试验	withstand tests on self-restoring insulation
自恢复和非自恢复组合绝缘的耐受电压试验	withstand tests on a combination of non-self-restoring and self-restoring insulation
50% 破坏性放电电压试验	50% disruptive discharge voltage tests
多级法	the multiple level method
升降法	the up-and-down method
确保放电电压试验	assured disruptive discharge voltage test

相应于很低或很高破坏性放电概率的电压的确定

波形一定的冲击波的伏 - 秒特性曲线

操作冲击电压试验

标准操作冲击波

标准操作冲击波是波前时间 T_{cr} 为 $100 \sim 250 \mu s$, 半峰值时间 T_2 为 $500 \sim 2500 \mu s$ 的冲击波。这种波可写成 250/2500 冲击波, 图 7 中 90% 峰值以上时间 T_d 应大于 $200 \mu s$

特种操作冲击波

试验电压的产生

操作冲击波通常用常规的冲击电压发生器来产生。它也可用对试验变压器 (或被试变压器) 的低压绕组加电压冲击的方法来产生。也有其他方法, 如用快速切断变压器绕组励磁电流以产生操作冲击

在选择产生操作冲击回路用的元件时, 要避免由试品预放电电流而引起冲击波形的过大畸变。特别是在高电压下作外绝缘的污秽试验时, 这样的电流可能达到相当大的数值。如果试验回路的内阻抗很高, 可能引起电压波形的严重畸变, 甚至可以阻止发生破坏性放电

determination of voltages corresponding to very low or very high disruptive discharge probabilities
the voltage/time curve for a specific impulse wave form

switching impulse tests

standard switching impulse

The standard switching impulse is an impulse having a time to crest T_{cr} of $100 \sim 250 \mu s$ and a time to half-value T_2 of $500 \sim 2500 \mu s$. It is described as a 250/2500 impulse. In Figure 7, T_d is a time above 90% of crest, and which will be more than $200 \mu s$

special switching impulse

generation of the test voltage

Switching impulses are usually generated by a conventional impulse generator. They can also be generated by the application of a voltage impulse to the low-voltage winding of a testing transformer (or of a transformer to be tested). Other methods of generating switching impulse are also in use, one for example involving the rapid interruption of current in a transformer winding

The elements of a circuit for generating switching impulse should be chosen so as to avoid excessive distortion of the impulse shape due to pre-discharge currents in the test object. Such currents may reach quite large values, especially during pollution tests on external insulation at high voltages. If test circuits having high internal impedance, they may cause severe distortion of the voltage or even prevent a disruptive discharge from occurring

冲击电流试验	impulse current tests
试验电流	test currents
有两种类型的冲击电流。第一种波形是：电流从零值以很短的时间上升到峰值，然后以近似指数规律或强阻尼正弦波形下降到零。这种波形以视在波前时间 T_1 和视在半峰值时间 T_2 表示。第二种波形近似方波，用峰值视在持续时间和总的视在持续时间来表示	Two types of impulse currents are dealt with. The first type has a shape which increases from zero to a crest value in a short time, and thereafter decreases to zero either approximately exponentially or in the manner of a heavily damped sine curve. This type is defined by the virtual front time T_1 and the virtual time to half-value T_2 . The second type has an approximately rectangular shape and is defined by the virtual duration of the peak and the virtual total duration
试验电流值	value of the test current
试验电流值通常是指峰值。在某些回路中，当在电流上出现过冲或振荡时，试验电流值可用实际峰值或用通过这些振荡画出的平均值曲线的峰值来表示	The value of the test current is normally defined by the crest value. With some tests circuit, overshoot or oscillations may be present on the current, the value of the test current should be defined by the actual crest or by a smooth curve drawn through the oscillations
标准冲击电流	standard impulse currents
试验电流的测量	measurement of the test current
冲击电流试验时电压的测量	measurement of voltage during tests with impulse current
联合电压试验	combined voltage tests
联合电压试验的有关定义	definitions for combined voltage tests
同步	synchronization
瞬时放电电压	instantaneous discharge voltage
实际冲击电压波形	actual wave shape of the impulse voltage
叠加电压试验	superimposed-voltage tests
试验结果的统计评价法	statistical evaluation of test results
问题的说明	statement of the problem
置信限及总误差	confidence limits and overall errors
试验的分类	classification of tests

对第 1 类试验结果的分析	analysis of results from Class 1 tests
高斯纸的应用	application of Gaussian linear paper
最大似然法	maximum likelihood method
相应于很低和很高破坏性放电概率的电压值的确定	determination of voltages corresponding to very low or very high disruptive discharge probabilities
惯用额定耐受试验和确保放电试验	conventional rated withstand and assured discharge tests
原型试验	tests on prototype
3. 测量装置	
测量装置	measuring devices
高电压及冲击电流测量系统的一般原则和要求	general principles and requirements for high voltage and high impulse current measuring system
一般原则	general principles
一般要求	general requirements
仪器特性	characteristics of instruments
性能试验	performance tests
刻度因数及有效范围	the scale factor and its range of validity
响应特性（相应于被测电压或电流的类型）	the response characteristics (relevant to the types of voltage or current to be measured)
通过确定接地体、带高压或电流的邻近物体对刻度因数和响应特性的影响程度，从而确定对这些物体的最小允许距离	By determining the influence of neighbouring objects, either earthed, at high voltage or carrying a high current on the scale factor and the response, the minimum acceptance clearances to such objects shall thus be determined
施加电压或电流的幅值和持续时间以及大气条件和表面污秽对测量系统特性的影响	the influence of the applied voltage or current amplitude and duration, and of atmospheric conditions and surface pollution, if any, on the measured characteristics
测量系统在其额定电压或电流下的运行能力	the ability of the measuring system to operate at its rated maximum voltage or current
性能试验报告	record of performance
所采用的接地回路系统及接地联结方式图	connection diagrams for ground return system and earthing connections

高压引线的长度、线径及位置	the length, diameter and position of the high-voltage lead
测量电缆的型号、长度及其终端阻抗	the type, length of the measuring cable and also its terminating impedances
所用仪器的性能	the characteristics of the instruments used while carrying out the performance tests
系统对高频振荡的响应及系统适应的最高频率 f_{\max} (对冲击测量系统)	the response to high-frequency transient oscillations as a function of frequency (for impulse measuring systems) and the highest frequency f_{\max} for which the system is suitable
上述各项的允许变化范围	the allowable range for above items ⁷
例行校验	routine check
应定期或按特定试验要求对系统的刻度因数和干扰水平进行例行校验	The routine check should be made periodically, or on request in connection with a particular test, on scale factor and disturbance level of a given system
直流高电压测量系统	measuring systems for d. c. high voltages
对直流高电压测量准确度的要求	accuracy requirements for d. c. high voltage measurement
直流电压算术平均值的测量误差不大于3%	to measure the arithmetic mean value of the d. c. voltage with an error of not more than 3%
脉动幅值的测量误差不大于实际脉动幅值的10%及直流电压算术平均值的1%二数值中的较大者	to measure the ripple amplitude with an error of not more than 10% of the actual ripple amplitude or not more than 1% of the arithmetic mean value of the direct voltage, whichever is the larger
常用测量系统	measuring systems for common use
常用的测量直流电压算术平均值的系统	measuring systems commonly used for measurement of the arithmetic mean value of the direct voltage
高值电阻和直流电流表串联	high resistance and d. c. ammeter connected in series
高值电阻分压器配用直流电压表	high resistance voltage divider and d. c. voltmeter

- 静电电压表 electrostatic voltmeter
- 旋转电压表 generating voltmeter
- 常用的测量脉动幅值的系统 measuring systems commonly used for measurement of ripple amplitude
- 具有合适频率响应的分压器配用示波器 voltage divider with oscilloscope of an adequate frequency response
- 高压电容器串接电阻, 用示波器测量电阻上的电压 high-voltage capacitor with resistance in series, to measure the voltage across the resistance with an oscilloscope
- 用电流表测量流过电容器的全波整流电流 to measure the full-wave rectified current passing through the capacitor with an ammeter
- 对测量系统的一般要求 general requirements for the measuring systems
- 分压器的分压比或高压测量阻抗的阻抗值在工作电压和温度范围内应证明足够稳定; 其误差不大于 1% The voltage ratio of the voltage divider or the value of the high-voltage measuring impedance is stable and known with an error of not more than 1%
- 在全电压时流过分压器或串联电阻的电流应不小于 0.5mA, 以防止泄漏电流和电晕电流影响测量准确度 The current passing through the voltage divider or series resistance should not be less than 0.5 mA at full voltage, so as to avoid influences on measuring accuracy due to leakage and corona current
- 测量脉动幅值的系统应有合适的频率响应; 从基波到 5 次谐波的频率响应的变化不大于 10% The frequency response of the system used for measuring ripple voltage is adequate and known to within 10% for frequencies from the fundamental of the ripple frequency up to five times this frequency
- 交流高电压测量系统 measuring systems for alternating high voltage
- 对交流高电压测量准确度的要求 accuracy requirements for a. c. high voltage measurement
- 交流高电压峰值或有效值的测量误差不大于 3% to measure the peak or r. m. s. value of the a. c. high voltage with an error of not more than 3%

谐波电压的测量误差不大于实际谐波幅值的 10% 及基波幅值的 1% 二数值中的较大者	to measure the amplitude of harmonics with an error of not more than 10% of the harmonic amplitude or not more than 1% of the fundamental, whichever is the larger
常用测量系统	measuring systems for common use
测量交流电压幅值的系统	measuring systems for alternating voltage amplitude measurement
电压互感器或分压器配以不同形式的低压仪表测量有效值或峰值	measure the peak value or r. m. s. value of voltage by a voltage transformer or a voltage divider with different types of low-voltage instruments
用电流表测量流过电容器的与电压峰值成比例的整流电流以测量峰值	the peak value of voltage is measured by a measurement of rectified current passing through a capacitor with an ammeter, this current is proportional to the peak value of voltage
用静电电压表测量有效值	measure the r. m. s. value of voltage with an electrostatic voltmeter
用旋转电压表测量峰值或任一中间值	measure the peak value or any intermediate value of voltage with a generating voltmeter
高阻值电阻与交流测量仪串联	a resistor with high resistance is connected in series with an alternating current measuring instrument
测量谐波幅值的系统	measuring systems for measurement of harmonics
分压器配用示波器测量谐波电压幅值; 谐波幅值较低时, 此法的准确度有限	measure the voltage amplitude of harmonics with an oscilloscope connected to a voltage divider; the accuracy of this method is insufficient for low amplitude of harmonic
分压器配用谐波分析仪测量基波和各谐波分量的方均根值	measure the r. m. s. value of fundamental and harmonic components with a harmonic analyzer connected to a voltage divider
滤波器配用测量仪器	instruments with filters
对测量系统的一般要求	general requirements for the measuring systems

- 互感器、分压器的分压比或高值电阻的阻值应稳定；其误差应小于1%
The voltage ratio of the voltage divider or voltage transformer or the value of the high ohmic resistance is stable and known with an error of not more than 1%
- 谐波幅值测量系统的频率响应从基波到7次谐波范围内变化小于5%
The variation of the frequency response of the measuring systems for harmonic amplitude is known within 5% for the frequencies from the fundamental to its seventh harmonic
- 谐波分析仪测量谐波分量时，7次以下谐波的测量误差不大于5%，27次以下谐波的测量误差不大于10%
For harmonic components measured with an analyzer, the measuring error for harmonics below seventh is known within 5% and the measuring error for those below 27th is known within 10%
- 冲击电压测量系统
measuring systems for impulse voltages
- 对冲击电压测量准确度的要求
accuracy requirements for impulse voltage measurement
- 测量冲击全波电压峰值处或波尾截断的冲击波，其幅值测量误差不大于3%
to measure the peak value of full impulses and impulses chopped in the vicinity of the peak on the tail with an error not exceeding 3% in amplitude
- 测量在波前部分截断的冲击波，对不同截断时间 (T_c) 的幅值测量误差 (Δ) 的要求如表1
to measure the peak value of impulses chopped on the front with an error Δ which is dependent on the time to chopping T_c as Table 1
- 冲击波形时间参数的测量误差不大于10%，对截波的截断视在持续时间，由于测量困难，还不能规定准确度
To measure the time parameters which define the impulse shape with an error not exceeding 10%, for the virtual time of voltage collapse during chopping in a chopped impulse, no specifications for accuracy are given because of the extreme difficulty of making accurate measurements of this phenomenon
- 测量冲击波上的叠加振荡应有足够的准确度
to measure the superimposed oscillations on an impulse with sufficient accuracy
- 常用测量系统
measuring systems for common use
- 分压器配用峰值电压表测量电压幅值
to measure the amplitude of voltage with peak value voltmeter connected to a voltage divider

分压器配用示波器测量电压幅值及时间参数	to measure the amplitude and time parameter of voltage with oscilloscopes connectd to a voltage divider
测量系统按高压部分组件分类	classification of measuring systems in accordance with components in the high-voltage part of the system
测量系统组件	components of the measuring system
高压部分组件：分压器，高压引线，高压引线输入端的阻尼电阻	for high-voltage parts: voltage divider, high-voltage lead and damping resistor at the input end of the high-voltage lead
其他组件：同轴电缆，示波器或峰值电压表，接地回路系统	others: coaxial cables, oscilloscope or peak value voltmeter and earth return system
测量系统按高压部分组件分成二类	Measuring systems are classified into two categories according to their high-voltage part
高压引线中的阻尼电阻如处在分压器一侧，此电阻可看作分压器的一部分，因而称为二组件系统（高压引线和分压器）	If the damping resistor is used at the divider end of the high-voltage lead, it is treated as a part of the divider and the system is then a two-component system (high-voltage lead and divider)
阻尼电阻放在高压引线的输入端时称为三组件系统（高压引线、分压器和阻尼电阻）	any damping resistor is used at the input end of the high-voltage lead, it is called a three-component system (high-voltage lead, divider and damping resistor)
对测量系统的一般要求	general requirements for measuring systems
对测量系统刻度因数的准确度的要求	the accuracy requirements of the scale factor for measuring systems
分压器的分压比应稳定，其误差不大于1%	The voltage ratio of the voltage divider should be stable and known with an error not exceeding 1%
示波器或峰值电压表的刻度因数（包括衰减器和耦合装置）应稳定；其误差不大于2%	The scale factor of the oscilloscope or peak value voltmeter (including attenuators and coupling devices) should be stable and known with an error not exceeding 2%
示波器的时标应稳定；其误差不大于2%	The time scale of the oscilloscope should be stable and known with an error not exceeding 2%

对测量系统响应特性的要求按不同的被测电压的波形,对测量系统方波响应的要求如表 2

按 GB/T 16927.1 的要求,冲击波上叠加的振荡的幅值不能超过被测峰值的 5%。测量系统对叠加在被测冲击波峰值附近的瞬态振荡的响应与振荡频率及系统方波响应有关;必要时应根据振荡频率及部分方波响应时间 T_{α} 求取振荡幅值校正因数 α (见 GB/T 16927.2 4.5.2) 对记录的振荡幅值进行校正;应知被校正的振荡幅值不小于被允许振荡幅值的 20%。 α 值等于振荡的真实幅值与测得的幅值之比。记录的振荡幅值乘以 α 即得到真实的振荡幅值。在试品上或在测量系统输入端可能出现的最高频率 f_{\max} (见 GB/T 16927.2 中的 4.6.1) 范围内,任一频率下校正因数 α 都不得超过 5

冲击电流测量系统

对冲击电流测量准确度的要求

标准冲击电流峰值的测量误差不大于 3%

response requirements for the measuring systems According to the different shape of impulse to be measured, the response time requirements for measuring system are shown in Table 2

In accordance with the requirements of GB/T 16927.1, the amplitude of superimposed oscillation on an impulse should not exceed 5% of the peak value. The response of a measuring system to transient oscillations superimposed on an impulse at the vicinity of its peak value depends on the frequency of the oscillation and on the shape of the step response of the system. Therefore, corrections shall be made to the recorded amplitudes by correction factor of oscillation amplitude α determined according to the frequency of oscillation and the partial response time T_{α} when necessary, and the corrected values of the oscillation amplitude shall then be known to not less than 20% of the maximum permitted values (Sub-clause 4.5.2 of GB/T 16927.2). The value of α is a ratio of the actual to the measured amplitude of oscillations. The actual amplitude is obtained by measured amplitude times α . The correction factor shall not exceed 5 for any frequency up to the maximum frequency f_{\max} which may be presented on the test object or at the input end of measuring system (see Sub-clause 4.6.1 of GB/T 16927.2)

measuring systems for impulse currents

requirements on accuracy for measurement of impulse current

to measure the peak value of standard impulse current with an error of not more than 3%

冲击电流波形时间参数的测量误差不大于 10%	to measure the time parameters of impulse current with an error of not more than 10%
能够检测叠加于冲击电流波形上的振荡	to permit the detection of oscillations superimposed on a current impulse
常用测量系统	measuring systems for common use
分流器接示波器或峰值电压表	oscilloscopes or peak value voltmeters connected to a shunt
变流线圈（即罗可夫斯基线圈）经积分器接示波器或峰值电压表	oscilloscopes or peak value voltmeters connected to current transformer coil (Rogovski coil) through an integrator
对测量系统的要求	requirements for measuring systems
分流器的电阻值或电流互感器的变比应稳定；其误差不大于 1%	The resistance of the shunt or the ratio of the current transformer coil is stable and known with an error of not more than 1%
系统响应时间应满足表 3 的要求	the response time of the system complies with the requirements specified in Table 3
响应的半峰值时间远比被测冲击电流波的波前时间和半峰值时间长得多	The time to half the value of the response is considerable longer than the front time and time to half-value of the impulse current to be measured
4. 测量装置使用导则	
测量装置使用导则	application guide for measuring devices
直流电压的测量	measurement of direct voltage
直流电压算术平均值的测量系统	systems for measuring the arithmetic mean value of direct voltages
稳定的高电阻与电流表串联	a stable high resistance in series with an ammeter
分压器配用低压仪表	low-voltage instrument used with voltage divider
静电电压表	electrostatic voltmeter
旋转电压表	generating voltmeter
直流电压脉动值的测量系统	system for measuring ripple voltage
分压器配用示波器	oscilloscope used with voltage divider
滤波装置与测量仪器配合	instrument used with filter
电容器和整流装置串联	capacitor connected in series with a rectifying device

分压比和刻度因数的确定	determination of voltage ratios and scale factors
稳定的高电阻与测量电流的 仪表串联	a stable high ohmic resistor connected in series with an instrument for measuring current
分压器配用低压仪表	low voltage instrument used with voltage divider
静电电压表和旋转电压表	electrostatic voltmeter and generating voltmeter
测量系统幅-频响应的确定	determination of the amplitude-frequency response of a measuring system
可能的误差来源及减少误差 的若干措施	possible sources of errors and precautions
交流电压的测量	measurement of alternating voltages
交流电压幅值的测量系统	systems for measuring the amplitude of alternating voltage
电压互感器配用低压仪表	low voltage instrument used with voltage transformer
分压器配用低压仪表	low voltage instrument used with voltage divider
电容器和整流装置串联	capacitor connected in series with a rectifying device
串联电阻配用交流电流表	the a. c. ammeter used with series resistance
静电电压表	electrostatic voltmeter
旋转电压表	generating voltmeter
交流谐波分量的测量系统	systems for measuring the amplitude of a. c. harmonics
分压器配用示波器或谐波分 析仪	oscilloscope or harmonic analyzer used with voltage divider
滤波装置配用测量仪器	instrument used with filter
分压比和刻度因数的确定	determination of voltage ratios and scale factors
电压互感器配用低压仪表	low voltage instrument used with voltage transformer
分压器配用低压仪表	low voltage instrument used with voltage divider
电容器和整流装置串联	capacitor connected in series with a rectifying device
静电电压表和旋转电压表	electrostatic voltmeter and generating voltmeter
高值电阻配用交流电流表	high ohmic resistor used with an a. c. ammeter

可能的误差来源及注意事项	possible sources of errors and precautions
冲击电压的测量	measurement of impulse voltages
冲击电压测量系统及其组件的特性	characteristics of measuring system and its components
分压器	voltage divider
高压引线	high-voltage lead
阻尼电阻	damping resistor
示波器和峰值电压表	oscilloscope and peak voltmeter
高频电缆和电缆端部的匹配	high-frequency cable and matching for cable end
接地回路	earth returns
分压比和刻度因数的确定	determination of voltage divider ratios and scale factors
冲击电压测量系统的单位方波响应及其测定	the unit step response for an impulse voltage measuring system and its measurement
线路	circuit
方波发生器	step generator
单位方波响应法	unit step response method
由方波响应示波图确定响应参数	determination of the response parameters from step response oscillograms
方波响应视在起始点和单位幅值的测定	determination of the virtual starting point on step response and unit amplitude
方波响应时间 T 的确定	determination of the step response time T
单位方波响应时间的数学表达式为:	The mathematical expression of the response time for the unit step response is as follows:
$T = \int_0^{\infty} [1 - g(t)] dt$	$T = \int_0^{\infty} [1 - g(t)] dt$
垂直引线波阻抗 Z 计算如下:	surge impedance Z of the vertical lead is calculated as follows:
$Z \approx \frac{1}{2\pi\sqrt{\epsilon_0}} \sqrt{\mu_0} \cdot \ln \frac{4h}{d} \approx 60 \ln \frac{4h}{d} \Omega$	$Z \approx \frac{1}{2\pi\sqrt{\epsilon_0}} \sqrt{\mu_0} \cdot \ln \frac{4h}{d} \approx 60 \ln \frac{4h}{d} \Omega$
水平引线波阻抗	surge impedance of the horizontal lead
真空中的导磁率:	permeability of vacuum:
$\mu_0 = 4\pi \times 10^{-7} \text{H/m}$	$\mu_0 = 4\pi \times 10^{-7} \text{H/m}$

真空中的介电系数:	permittivity of vacuum:
$\varepsilon_0 = 8.85 \times 10^{-12} \text{F/m}$	$\varepsilon_0 = 8.85 \times 10^{-12} \text{F/m}$
式中: $\tau_v = h/C$ —沿垂直引线的传播时间, h —垂直引线的长度	where: $\tau_v = h/C$, propagation time along the vertical lead $h = \text{length of the vertical lead}$
式中: $\tau_1 = l/C$ —沿水平引线的传播时间, l —水平引线的长度	where: $\tau_1 = l/C$, propagation time along the horizontal lead $l = \text{length of the horizontal lead}$
C 为电磁波的传播速度 (300m/ μs)	C is the velocity of propagation of an electromagnetic wave (300m/ μs)
不包括高压引线的测量系统的响应时间 T_i 的确定	determination of the response time T_i of the system without high-voltage lead
部分响应时间 T_α 的确定	determination of partial response time T_α
初始畸变时间 T_0 的确定	determination of the initial distortion time T_0
谐振频率范围的确定	determination of the resonant frequency range
测量系统响应参量与测量误差的关系	relation of response parameters to measuring errors
响应时间 T 与误差的关系	relation of response time T to errors
斜角波的陡度	steepness of ramp
输出电压波形是线性上升的, 且与输入电压的波形平行 (斜率相等)	The output voltage form is linear and is parallel to the input voltage form (same slope)
以 O' 点作响应起点及任何被测电压的起点	The point O' is considered as the starting point of the response and also the starting point for any voltage to be measured
外加电压在截断前的陡度	steepness of the applied voltage prior to chopping
部分响应时间 T_α 与误差的关系	errors caused by partial response time T_α
初始畸变时间 T_0 与误差的关系	errors caused by initial distortion time T_0
关于校正的判据	criteria relating to corrections
测量不必进行校正就足够正确的条件	conditions for measurements to be sufficiently accurate without corrections

初始畸变的时间 T_0 应满足：
 $T_0 \leq 0.005T_c$

对测量需要进行校正的情况
对高频振荡幅值作校正时，如不能满足式 (13) 和式 (14) 对 T_α 的要求，则可能有高频信息被遗失，示波图不能接受；如能满足式 (13) 对 T_α 的要求，但不满足式 (14) 对 f 的要求，则测得的高频振幅值衰减过多，应乘以 α 值来进行校正。对具有谐振频率范围的测量系统，谐振频率范围内的高频振荡 α 值可认为是 1

记录的振荡超过允许水平的情况

各种误差源及相应的预防措施

长波作用时分压比的情况

邻近效应

干扰水平的检验

努力消除接地回路中的环形线，或至少减到实际可能的最小尺寸

测量电缆采用双层屏蔽并改善测量仪器本身的屏蔽以及与电缆的连接采用屏蔽接头
测量电缆应尽量远离流过大电流的导线，并应贴近地面

用大面积铝板做接地回路

The initial distortion time T_0 should meet the condition: $T_0 \leq 0.005T_c$

conditions for correcting measurements

For the correction of high-frequency oscillation amplitude, if the criteria given in equations (13) and (14) for T_α are not met, the high-frequency information may be lost and cannot be received by the oscillogram; If the criterion for T_α given in equation (13) is met but does not meet that given in equation (14) for f , the amplitude of high-frequency oscillation measured may be too much damped, it should be corrected by multiplying α . For a measuring system having a resonant frequency range, the value of α for high-frequency oscillation within the resonant frequency range may be considered as unity

cases when recorded oscillations exceed permitted level

various sources of errors and precautions

divider ratio for long impulse duration

proximity effects

disturbance level check

Loops in the layout of the earthing system should be eliminated or reduced to the smallest practicable dimensions

Use double shielded measuring cable and to improve the shielding of instrument as well as the cable connecting terminals

Measuring cables should whenever possible be located away from conductors carrying heavy currents and as near as possible to the ground surface

Use a large aluminium sheet as earth returns

冲击电流的测量	measurement of impulse currents
常用的测量系统及其组件的特性	commonly used measuring systems and characteristics of their components
分流器接示波器或峰值电压表	oscilloscopes or peak voltmeters used with shunt
变流线圈 (即罗可夫斯基线圈) 经积分器接示波器或峰值电压表	current transformer coil (Rogovski coil) connected to oscilloscope or peak value voltmeter through an integrator
分流器	shunts
绞线式对折分流器	shunts made of stranded folding wire
片式对折分流器	shunts made of folding strip
管式分流器	tubular shunts
多管同轴返回	multiple tube, coaxial return
单管同轴返回	single tube, coaxial return
单管非同轴返回	single tube, non coaxial return
变流线圈 (即罗可夫斯基线圈)	current transformer coil (Rogovski coil)
变流线圈 (即罗可夫斯基线圈) 实质上是以载流导线作原线圈的一个空气芯电流互感器; 副线圈密绕许多匝, 正中地套在一根载流导体上, 互感 m 在副线圈感应出的电压 $U_i(t)$ 与被测电流的变化率 $\frac{di_1(t)}{dt}$ 成正比。	Current transformer coil (Rogovski coil) is practically an air-core current transformer with the conductor carrying current as its primary winding which is located at the centre of the secondary winding with a lot of turns wound closely, the voltage $U_i(t)$ is induced in the secondary winding by mutual inductance m , this induced voltage is proportional to changing rate $\frac{di_1(t)}{dt}$ of the current
$U_i(t) = M \frac{di_1(t)}{dt}$ 。为了使在示波器处测得的电压能与被测电流成正比, 在示波器前接入一个 RC 型积分器。从图 \times 可看出, 如果电缆波阻抗 Z_0 比变流线圈的自感电抗 ωL 大得多 ($Z_0 \gg$	to be measured. $U_i(t) = M \frac{di_1(t)}{dt}$. In order to ensure the voltage measured by oscilloscope proportional to the current to be measured, a RC integrator is inserted at the front of oscilloscope. As shown in figure \times , if the surge impedance of cable Z_0 is much greater than the self-inductance reactance ωL ($Z_0 \gg \omega L$), the voltage induced in

ωL), 则变流线圈中的感应电压 $u_i(t)$ 基本作用在 Z_0 上, 也即作用在 RC 型积分器上。又如果积分器的电阻 R 比容抗 $\frac{1}{\omega C}$ 大得多 ($R \gg \frac{1}{\omega C}$), 则流过积分器的电流决定于 R ; 故在示波器上测得的电压 $U_m(t)$ 为: $U_m(t) = \frac{1}{C} \int \frac{U_i(t)}{R} dt = \frac{1}{CR} \int M \frac{di_1(t)}{dt} dt = \frac{M}{RC} i_1(t)$ 。在上式推导中, $Z_0 \gg \omega_2 L$ 决定频率上限, $R \gg \frac{1}{\omega_1 C}$ 决定频率下限, 故变流线圈的使用频宽为 $\omega_1 \sim \omega_2$ 。变流线圈不必接入到大电流回路内; 它与电流回路绝缘, 位置上不受限制; 但它的使用频宽比分流器窄, 且不能传递直流分量

the current transformer coil $U_i(t)$ is basically acting on Z_0 , i. e. acting on the RC integrator. In addition, if the resistance of integrator R is much greater than the capacitance reactance $\frac{1}{\omega C}$ ($r \gg \frac{1}{\omega C}$), thereby, the current flowing through the integrator depends on R , the voltage measured by oscilloscope $U_m(t)$ is then: $U_m(t) = \frac{1}{C} \int \frac{U_i(t)}{R} dt = \frac{1}{CR} \int M \frac{di_1(t)}{dt} dt = \frac{M}{RC} i_1(t)$. In the derivation of above equation, $Z_0 \gg \omega_2 L$ determines the upper limit of frequency; $R \gg \frac{1}{\omega_1 C}$ determines the lower limit of frequency, therefore the frequency band utilized is $\omega_1 \sim \omega_2$. The current transformer coil needs not to connect to the heavy current circuit, it is insulated from the current circuit without restriction on positions, but its utilizing frequency band is narrower than that of shunts and cannot transfer the d. c. components

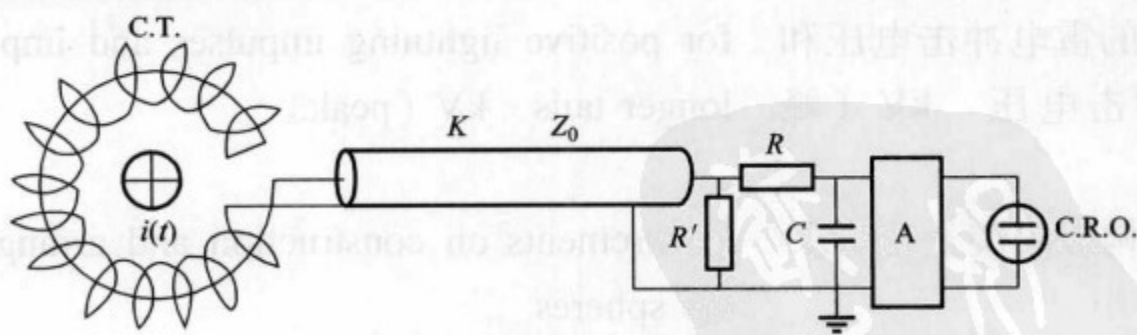


图 11 罗可夫斯基线圈示波器测量系统

Fig. 11 Rogovski coil-oscilloscope measuring system

- | | | | |
|--------------------|------------------------|-----------------|---------------------|
| $i(t)$ — 被测电流 | current to be measured | C. T. — 罗可夫斯基线圈 | Rogovski coil |
| K — 同轴电缆 | coaxial cable | R' — 匹配电阻 | matching resistance |
| R, C — RC 型积分器 | RC type integrator | A — 放大器 | amplifier |
| C. R. O. — 示波器 | oscilloscope | | |
| | (或峰值电压表) | | (or peak voltmeter) |

冲击电流测量系统的方波响应	step response of impulse current measuring systems
管式分流器的响应时间的近似计算	approximate calculation of response time of tubular shunts
分流器方波响应的实验确定法	experimental determination of the step response of shunts
斜角波作用于测量系统时误差的推导	derivation of errors for the ramp acting on the measuring system
确定试品两端是否存在振荡的程序	procedure to determine if oscillations are present across the test object
5. 测量球隙	
测量球隙	sphere-gaps for voltage measurement
交流电压	alternating voltages
标准雷电冲击及长波尾冲击	standard lightning impulses and impulses with longer tails
直流电压	direct voltages
表1 一球接地的球隙适用于交流电压、负极性的雷电冲击电压和长波尾冲击及两种极性的直流压 kV (峰值)	Table 1 sphere-gap with one sphere earthed valid for alternating voltages, negative lightning impulses and impulses with longer tails, direct voltages of either polarity kV (peak)
表2 一球接地的球隙适用于正极性的雷电冲击电压和长波尾冲击电压 kV (峰值)	Table 2 sphere-gap with one sphere earthed valid for positive lightning impulses and impulses with longer tails kV (peak)
对球隙结构和安装上的要求	requirements on construction and arrangement for the spheres
标准球隙	standard sphere-gap
对球极的要求	requirements for the spheres
对球隙结构上的要求	requirements on construction for sphere-gap
垂直球隙	vertical sphere-gap
水平球隙	horizontal sphere-gap
绝缘支撑	insulating support

球杆	sphere shank
示出最大尺寸的操作机构	operating gear, showing maximum dimensions
具有串联电阻的高压连接线	high-voltage connection with series resistor
示出最大尺寸的均压器	stress distributor, showing maximum dimensions
高压球的放电点	sparking point of high-voltage sphere
在地平面上方 P 点的高度	height of P above earth plane
没有其他物件的空间半径	radius of space free from external structures
具有串联电阻的高压连接线, 从 P 点算起不应穿过距离 B 内的平面	High-voltage lead with series resistor, it does not pass through this plane within a distance B from P
对球隙安装空间的要求	requirements for the clearance round the spheres
球隙的结线	connection of the sphere-gap
引线	leads
保护电阻	protective resistance
球隙的运行	operation of the sphere-gap
照射	irradiation
利用石英水银灯, 其功率不得小于 35W, 而且电流不得小 1A	by means of a quartz tube mercury-vapour lamp with a minimum rating of 35 watts and a current of at least 1 ampere
利用放射性物质, 把盛有放射强度为 0.2 ~ 0.6 豪居的放射性物质容器, 放在高压球极内的放电点附近即可	By means of a capsule containing radio-active material having an activity within 0.2 ~ 0.6 millicurie, the capsule is inserted in the high-voltage sphere near the sparking point
交流电压和直流电压的测量	alternating and direct voltage measurement
球隙距离固定, 逐渐升高电压, 直到放电为止	A gap with constant spacing of spheres is applied with a slowly rising voltage, until disruptive discharge occurs
加以恒电压, 将球隙距离由大到小逐渐减小, 直到放电为止	A constant voltage may be applied across the gap and the spacing between the spheres slowly reduced, until disruptive discharge occurs
雷电冲击电压的测量	measurement of lightning impulse voltages
球隙的放电电压	sphere-gap disruptive discharge voltages

放电电压的准确度 accuracy of the disruptive discharge voltage
 大气条件的影响 influence of atmosphere conditions
 空气相对密度 δ 与校正系数 K 的关系 relation between air relative density δ and correction factor K



第五章

Chapter 5

铁 心 结 构

心式	core type
壳式	shell type
铁心	core
磁路	magnetic circuit
单相两柱铁心	single-phase two-limb core
单相三柱铁心	single-phase three-limb core
三相三柱铁心	three-phase three-limb core
三相五柱铁心	three-phase five-limb core
三相五柱四框铁心	three-phase five-limb four-frame core
多框式铁心	multi-frame type core
卷铁心	wound core
叠积式铁心	laminated core
热轧硅钢片	hot-rolled silicon steel sheet
冷轧硅钢片	cold-rolled silicon steel sheet
冷轧晶粒取向硅钢片	cold-rolled grain-oriented silicon sheet steel
高导磁硅钢片	Hi-B silicon sheet steel
晶粒	crystalline grain
铁心片	core lamination
一叠铁心	a lamination stack
铁心叠积图	lamination drawing; lamination diagram
叠片	lamination
叠片系数	lamination factor
空间利用系数	space factor

层间绝缘	layer insulation
斜接缝	mitring
45°斜接缝	45°mitred joint
步进接缝	steps mitring
4 步进接缝	4-steps mitring
5 步进接缝	5-steps mitring
6 步进接缝	6-steps mitring
斜接缝的交错排列方式	over-lap arrangement for mitred joints of lamination
重叠	overlap
铁心油道	oil-duct of core
铁心气道	air ventilating duct of core
阶梯接缝	stepped lap joint
对接铁心	butt jointed core
卷铁心	wound core
渐开线铁心	evolute core; involute core
空气隙	air gap
铁心拉板	tensile plate of core limb; core drawplate
铁心柱	core limb
铁轭	yoke
上轭	upper yoke
下轭	lower yoke
旁轭	side yoke
夹件	clamp frame
上夹件	upper clamp
下夹件	lower clamp
上梁	top beam
垫脚	foot pad
侧梁	side beam
拉带	tensile belt
铁心夹件	core clamp
铁轭夹件	yoke clamp

环氧粘带	epoxy adhesive tape
稀纬环氧粘带	sparse-abb epoxy adhesive tape
聚脂带	polyester tape
夹件腹板	web of yoke clamping
夹件肢板	limb of yoke clamping
夹件加强铁	stiffening plate of clamping
压线圈的压钉	winding compressing bolt
压钉螺母	nut for compressing bolt
弹簧压钉	compressing bolt with spring
油缸压钉	compressing bolt with hydraulic damper
线圈支撑架	winding supporter
线圈支撑板	winding supporting plate
定位孔	positioning hole
带螺母的定位柱	positioning stud
拉螺杆	tensile rod
夹件夹紧螺杆	yoke clamping bolt
铁心接地片	core earthing strip
铁心地屏	earthing screen of core
旁轭地屏	earthing screen of side yoke
接地屏蔽	earthing shield
铁心窗高	core window height
中心距 M_0	centre line distance M_0
铁心中间距	center distance between limbs
木垫块	wood padding block
叠片系数	lamination factor
铁心的级	stage of lamination stacks
心柱外接圆	circumscribed circle of core leg
铁心端面	core surface perpendicular to lamination
木棒	wood bar; wood rod
定位板	positioning plate
新日本制铁公司	Nippon Steel Co.
川崎制铁公司	Kawasaki Steel Co.

阿姆可钢铁公司 (美)	Armco Steel Co.
科瓦钢铁公司 (法)	Covofi Steel Co.
特尔尼钢铁公司 (意)	Terni Steel Co.



第六章

Chapter 6

线圈结构

线圈; 绕组	winding ^① ; coil ^②
高压线圈	high-voltage winding
中压线圈	mid-voltage winding; intermediate voltage winding
低压线圈	low-voltage winding
调压线圈	tapped winding
稳定线圈	stabilizing winding
励磁线圈	energizing winding
公共线圈	common winding
串联线圈	series winding
辅助线圈	auxiliary winding
平衡线圈	balancing winding
耦合线圈	coupling winding
阀侧线圈	valve side winding
网侧线圈	line side winding
一次线圈	primary winding
二次线圈	secondary winding
开路线圈	open winding
剩余电压线圈	residual voltage winding
饼式线圈	disk winding
内屏蔽式线圈	capacitor shield winding
跨 2 段内屏蔽线圈	across 2 disks capacitor shield winding

① 侧重于功能。

② 侧重于结构。

跨 4 段内屏蔽线圈	across 4 disks capacitor shield winding
纠结式线圈	interleaved winding
跨 2 段纠结式线圈	across 2 disks interleaved winding
跨 4 段纠结式线圈	across 4 disks interleaved winding
插花纠结式线圈	sandwich-interleaved winding
连续式线圈	continuous winding
螺旋式线圈	helical winding
半螺旋式线圈	semi-helical winding
单螺旋式线圈	single-row helical winding
双螺旋式线圈	double-row helical winding
三螺旋式线圈	three-row helical winding
四螺旋式线圈	four-row helical winding
多螺旋式线圈	multi-row helical winding
分组换位	transposition by groups
标准换位	standard transposition
底位	bottom transposition
明位	obvious transposition
绞线	interleaved connection
连线	continuous transposition
屏线	shield wire
上纠下连	upper-interleaved-lower-continuous
上连下纠	upper-continuous-lower-interleaved
“242” 换位	242 - type transposition
“212” 换位	212 - type transposition
不等距交叉换位	non-isometry cross transposition
线圈展开图	planiform drawing of winding
纠结原理图	principle drawing of interleaving
换位展开图	planiform drawing of transposition
层式线圈	layer winding
圆筒式线圈	cylindrical winding
单层圆筒式线圈	single layer cylindrical winding
双层圆筒式线圈	double layer cylindrical winding
多层圆筒式线圈	multi-layer cylindrical winding

分段圆筒式线圈	sectional layer winding
分段多层圆筒线圈	sectional multi-layer winding
双饼式线圈	twin-disk winding
交错式线圈	sandwich winding
同心式线圈	concentric winding
分裂式线圈	split winding
分段式线圈	sectional winding
箔式线圈	foil winding
全绝缘线圈	uniformly insulated winding
分级绝缘线圈	graded insulated winding
第三线圈	tertiary winding
星形联结	star connection
三角形联结	delta connection
曲折形联结	zigzag connection
开口三角形联结	open delta connection
斯柯特联结	Scott connection
勒布兰克联结	Leblanc connection
左绕	left-wound
右绕	right-wound
反段线饼	reversely wound disk
正段线饼	normally wound disks
临时段线饼	temporarily wound disk
S 弯	S-bend
线匝	turn
线段	disk = disc; section
线层	layer
匝绝缘	turn insulation
层绝缘	layer insulation
段绝缘	insulation between disks; section insulation
端绝缘	end insulation
顶部端圈	top support ring
分接头	tapping terminal
分接区	tapping zone

垫块	spacer
段间横垫块	radial spacer between disks
燕尾垫块	dovetail spacer
燕尾撑条	dovetail strip
垫块的厚度	spacer thickness
垫块的宽度	spacer width
垫块的长度	spacer length
撑条	strip
轴向撑条	axial strip
角环	angle ring
反角环	cap-ring
绝缘角环	insulating angle ring
分瓣角环	split angle ring
软角环	petal collar
成形角环	mould angle ring
端圈	end ring
成形绝缘件	mould insulation component
绝缘件	insulation pieces
油道	oil-duct; oil passage
径向油道	radial oil-duct
轴向油道	axial oil-duct
段间油道	oil-duct between disks
段间过渡连线	transfer connection between disks
段间换位连线	transposed connection between disks
线圈起始端	initial terminal of winding
线圈终端	final terminal of winding
轴向深度	axial depth
径向深度	radial depth
绝缘纸筒	insulating cylinder
匝间绝缘	turn insulation
绝缘角环	insulating angled ring (collar ring)
线匝间垫条	insulating filling strips between turns
分数匝	fractional turn

整数匝	integer turn
近似一圈	approximate roll
并绕导线	parallel wound conductors
多股导线	multi-strand conductors
电磁线	electro-magnetic wire
铜导线	copper conductor
半硬铜导线	semi-hard copper conductor
组合导线	composite conductor
换位导线	transposed conductor; CTC
半硬铜换位导线	semi-hard transposed conductor
自粘换位导线	self-bonding transposed conductor
半硬自粘换位导线	semi-hard self-bonding transposed conductor
带油道网包自粘换位导线	self-bonding CTC of net with oil duct
纸包线	paper wrapped conductor
漆包线	enamelled conductor
圆线	round wire
硬拉铜导线	hard drawn copper conductor
退火导线	annealed conductor
玻璃丝包线	glass-fibre covered conductor
纸槽	paper channel
绑线	binding wire
绑绳	binding rope
静电板	electrostatic plate
静电环	electrostatic ring
静电屏	electrostatic screen
端部电容环	capacitive layer end ring
端部电容屏	capacitive layer end screen
屏蔽环	shielding ring
屏蔽线	shielding conductor
屏蔽角环	shroud petal
绝缘包扎	insulation wrapping
引出端固定	terminal fixing
线圈总高度	overall height of winding

铜线高度	copper height of winding
线圈修整	trimming of winding
线圈浸漆	varnish impregnation of winding
线圈的换位	transposition of winding
线圈的干燥与压缩	drying and compressing of winding
绝缘的压缩收缩率	shrinkage of insulation under compression
无氧铜导线	deoxygenized copper conductor
铝合金导线	aluminium-alloy conductor
许用值	permitted value
安全系数	safety margin
稳定系数	stability margin



第七章

Chapter 7

油 箱 结 构

钟罩式油箱	bell type tank
桶式油箱	barrel type tank
平面式油箱	plane type tank
波纹式油箱	corrugated type tank
带散热管式油箱	tank with bend pipe
上节油箱	upper part of tank
下节油箱	bottom part of tank
箱壁	tank wall
带磁屏蔽箱壁	tank wall with magnetic shield
带电磁屏蔽箱壁	tank wall with electromagnetic shield
带静电屏蔽箱壁	tank wall with electrostatic shield
低磁钢 20Mn23Al	low-magnetic steel 20Mn23Al
箱底	tank bottom
箱盖	tank cover
箱沿	tank rim
箱沿护框	pad frame for tank rim gasket
边缘垫片	rim
加强筋; 加强板	stiffener
垂直加强铁	vertical stiffening channel
联管头	tube connecting flange
油样活门	oil sampling valve
油样活塞	oil sampling plug
放油塞	oil draining plug
放气塞	air exhausting plug

蝶阀	butterfly valve
闸阀	gate valve
球阀	ball valve
放油活门	draining valve
压力释放阀	pressure relief valve
防爆筒	explosion-proof pipe
真空接头	connecting flange for evacuation
滤油接头	connecting flange for oil filter
温度计座	thermometer socket; thermometer pocket
名牌底板	base plate of rating plate
手孔	hand-hole
人孔	manhole
升高座	ascending flanged base
升高座	ascending flange for bushings
升高座	turret
吊攀	lifting lug
千斤顶支座	jacking lug
定位钉	positioning pin
盖板	cover plate
临时盖板	temporary cover plate
集污盒	precipitation well
导气管	air exhausting pipe
导油管	oil conduit
吊环	lifting eyebolt
有围栏的梯子	ladder with balustrade
适形油箱	form-fit tank
呼吸器	breather
气体继电器	gas relay; buchholz relay
皮托继电器	pitot relay
流动继电器	flow relay
风冷却器	forced air cooler
水冷却器	water cooler
片式散热器	panel-type radiator

管式散热器	pipe-type radiator
冷却器托架	bracket for cooler
冷却器拉杆	tensile rod for cooler
潜油泵	oil-submerged pump
流量 (立方米/分)	flow quantity (m^3/min)
扬程	lift
控制箱	control box
控制盘	control panel
端子箱	terminal box
端子排	terminal block
风扇接线盒	connecting box for fan-motors
金属软管	metallic hose
封闭母线联结法兰	joint flange for enclosed bus-bar
储油柜	conservator
胶囊式储油柜	conservator with rubber bladder
隔膜式储油柜	conservator with rubber diaphragm
波纹管式储油柜	bellows type conservator
管式油位指示器	tubular oil-level indicator
磁铁式油位指示器	magnetic type oil-level indicator



第八章

Chapter 8

器身、引线结构和总体结构

铭牌	rating plate
器身	active part; internal part; core and winding assembly
引线	leads
总装配	final assembly
铁心装配	core assembly
线圈组装	winding assembly
器身装配	active part assembly
引线装配	leads assembly
高压线圈	HV winding
中压线圈	MV winding
低压线圈	LV winding
调压线圈	tapped winding
励磁线圈	exciting winding; energizing winding
稳定线圈	stabilizing winding
公共线圈	common winding
串联线圈	series winding
高压引线	high-voltage leads
中压引线	mid-voltage leads
低压引线	low-voltage leads
线圈压紧螺栓	winding compressing bolt
线圈压紧装置	winding compressing device
线圈端部绝缘	end insulation of winding
器身定位装置	positioning device for active-part
定位装置	fixing device

铁心垫脚	foot-plate of core
垫脚	foot-pad
分接引线	tapping leads; tap leads
引线支架	supporting frame for leads
储油柜	conservator
胶囊式储油柜	rubber bladder type conservator
隔膜式储油柜	rubber diaphragm type conservator
波纹管式储油柜	bellows type conservator
储油柜支架	supporting frame for conservator
油位计	oil-level indicator
气体继电器	gas relay; buchholz relay
皮托继电器	pitot relay
储油柜联管	elbow joint for conservator
有载开关用储油柜	conservator for OLTC
有载开关用气体继电器	gas relay for OLTC
联管	tube connector
吸湿器	dehydrating breather
高压套管	HV bushing
中压套管	MV bushing
低压套管	LV bushing
中性点套管	neutral bushing
接地套管	earthing bushing
油-气套管	oil-SF ₆ bushing
油-油套管	oil-oil bushing
插拔头	insert-extract type terminal
大电流套管	heavy current bushing
加强式套管	long-creepage bushing
绝缘套管	insulating bushing
穿缆式套管	cable through type bushing
导杆式套管	leader inner-connecting type bushing
套管均压球	equipotential shielding for bushing
套管储油柜	conservator for bushing
套管绝缘护筒	insulating barrier cylinder of bushing

瓷套	porcelain insulator
爬电距离	creepage distance
试验抽头	test tap
放气阀	air outlet
放油阀	oil outlet
有载分接开关	on-load tap-changer (OLTC)
无励磁分接开关	off-circuit tap-changer (OCTC)
分接选择器	tap selector
切换开关	diverter switch
选择开关	selector switch
转换选择器	change-over selector
粗选择器	coarse tap selector
触头组	set of contacts
过渡触头	transition contacts
过渡阻抗	transition impedance
有载开关操作机构	operating mechanism of OLTC
驱动机构	driving mechanism
电动机构	motor drive
垂直传动轴	vertical driving shaft
水平传动轴	horizontal driving shaft
伞齿轮盒	bevel gear box
防雨罩	drip-proof cap
联轴节	coupling
最大分接	maximum tapping
最小分接	minimum tapping
额定分接	rated tapping; principal tapping
固有分接位置数	number of inherent tapping positions
工作分接位置数	number of service tapping positions
主分接	principal tap; main tap
正分接	plus tapping
负分接	minus tapping
分接变换操作	tap-change operation
分接位置指示器	tap position indicator

线圈分接电压	tapping voltage of a winding
线圈分接电流	tapping current of a winding
线圈分接容量	tapping power of a winding
分接范围	tapping range
分接级	tapping step
分接参数	tapping parameter
分接因数	tapping factor
分接工作能力	tapping duty
分接线	tapping connection
分接引线	tapping lead
垫脚垫块	supporting block for foot-pad
联管接头	tube connector
联结法兰	connecting flange
继电保护装置	relay protection device
在线监测装置	on-line measuring device
安全气道	explosion-proof pipe
膨胀器	expander
主排气导管	main gas-conduit
分支导气管	branching gas-conduit
滤油接口	tube connector for oil-filter
压力释放阀	pressure-relief valve
压力释放装置	pressure-relief device
美国压力释放装置	Qulitrol 208 - 60E made in USA
温度计	thermometer
温度计座	thermometer socket
信号温度计	signalling thermometer
电阻温度计	resistance thermometer
水银温度计	mercury thermometer
温度控制器	temperature control
德国温度控制器	Messko MT-ST160W made in Germany
线圈温度计	winding thermometer
德国线圈温度计	Messko MT-ST160SK made in Germany
远距离温度计	thermometer with remote indication

净油器	oil filter
虹吸净油器	oil siphon filter
油箱	tank
钟罩式油箱	bell type tank
桶式油箱	barrel type tank
平面式油箱	plane type tank
波纹式油箱	corrugated type tank
带散热管式油箱	tank with bend pipe
带磁屏蔽箱壁	tank wall with magnetic shield
带铜屏蔽箱壁	tank wall with copper shield
带电屏蔽箱壁	tank wall with electrostatic shield
上节油箱	upper part of tank
下节油箱	bottom part of tank
油样活门	oil sampling valve
油样活塞	oil sampling plug
放油塞	oil draining plug
放气塞	air exhausting plug
蝶阀	butterfly valve
闸阀	gate valve
球阀	ball valve
放油活门	oil draining valve
小车支架及滚轮	bogie frame and wheel
支架	frame
冷却器	cooler
风冷却器	forced air cooler
水冷却器	water cooler
冷却器进口	inlet of cooler
冷却器出口	outlet of cooler
潜油泵	oil-submerged pump
油流继电器	oil-flow relay
集中安装	concentrated installation
集中安装风冷器	concentrated installation of forced-oil circulating air cooler

散热器	radiator
片式散热器	panel-type radiator
管式散热器	pipe-type radiator
扁管式散热器	flat pipe-type radiator
风扇支架	supporting frame for fan motors
风扇及电机	fan and motor
风扇接线盒	connecting box for fan motors
风扇控制柜	cabinet panel for fan motor control
冷却器控制柜	cabinet panel for cooler control
指示仪表柜	cabinet panel for indicating instruments
保护控制柜	cabinet panel for protection
主控室	central control room
桥架	bridge frame
二次回路接线	secondary circuit connection
极性	polarity
极化	polarization
相间隔板	interphase insulating barrier
吊攀	lifting lug
安装轨道	installation rail
相序标志牌	designation mark of phase sequence
接地螺栓	earthing bolt
视察窗	inspection hole
手孔	hand-hole
人孔	manhole
MR 有载开关	MR OLTC
ABB 有载开关	ABB OLTC
伊林有载开关	ELIN OLTC
F&G 套管	F&G bushing
德国 HSP 套管	HSP bushing made in Germany
传奇套管	Trench bushing

第九章

Chapter 9

铁 心 制 作

产品制造	manufacturing of products
硅钢片纵剪	silicon steel sheet slitting
多刀纵剪机	multi-disk-cutter slitting machine
硅钢片横剪	silicon steel sheet cutting to length
纵剪	slitting
横剪	cut-to-length
纵剪线	slitting line
横剪线	cut-to-length line
数控横剪线	CNC cut-to-length line
乔格横剪线	GEORG cut-to-length line
开卷机	decoiler
冲孔模	hole punching die
缺口模	notch punching die
毛刺	burr
宽度偏差	width deviation
长度偏差	length deviation
角度测量平台	angular measuring platform
片的角度偏差	angular misalignment of lamination
铁心片预叠	pre-stacking of core lamination
铁心叠装	core assembly
铁心叠片	core lamination
选片	pre-selection of lamination
叠片	lamination stacking
两片一叠	stacked by two-sheet

打(敲)齐	knock to even
不叠上轭	core stacking without upper yoke
打铁心用垫块	knock block
水平尺	level gauge; level instrument
专用套筒扳手	special socket spanner
叠片的工艺孔	punching hole on the lamination for manufacturing purpose
叠板导柱	guiding bar for core assembly
叠片的定位挡板	positioning stopper for core assembly
铁心的油道撑条	strips for core oil-ducts
撑条黏结	sticking of strip
级间隔板	insulating pressboard between core stages
皮裙	leather apron
防护袖	protective sleeve
护臂	shoulder guard
护腿	shin guard
夹紧铁心工具	clamping tools for core
铁心柱的夹紧装置	tightening device for core leg
力矩扳手	torque spanner; torque wrench
千斤顶	jack
液压千斤顶	hydraulic jack
螺旋千斤顶	screw jack
差动千斤顶	differential-screw jack
倒链	chain block
起重机	crane
桥式起重机	bridge crane
单梁桥式起重机	single girder bridge crane
双梁桥式起重机	double girder bridge crane
铁心的垂直度	verticality of core
铁心翻转台	core tilting platform
积木式翻转台	block-by-block type tilting platform
铁心起立	tilt the core into vertical position
环氧粘带	epoxy adhesive tape

稀纬环氧粘带	sparse-abb epoxy adhesive tape
聚脂带	polyester tape
半导体粘带	semi-conductive adhesive tape
粘带的固化	cure of adhesive tape
切口防锈漆	antirust coating for cutting edges
铁心中间试验	interprocess core test
硅钢片涂漆	varnish coating of silicon steel sheet
片间绝缘试验	lamination insulation test
铁心料盘	lamination stocking tray
卷铁心机	core winding machine
铁心退火	core annealing



第十章

Chapter 10

线圈制作

绕线机; 卷线机	winding machine
卧式绕线机	horizontal winding machine
立式绕线机	vertical winding machine
线盘架	bracket for conductor drums; bracket for wire drums
导线盘	conductor drum, wire drum
导线拉紧装置	conductor tensile device; wire tensile device
导线复绕机	conductor rewind machine
导线矫直机	conductor straightening machine
可调绕线模	adjustable winding drum
装配式绕线模	fabricated winding drum
钢板筒绕线模	steel-plate rolled winding drum
模子直径	former diameter
线圈外径	OD (outside diameter) of winding
线圈内径	ID (inside diameter) of winding
半径	radius
木撑条	wood supporting strip
绝缘撑条	insulating strip
撑条号	number of the strip; number of chock line
撑条	strip
垫块	spacer
端圈	end ring
成形绝缘件	insulating mould parts
绝缘角环	insulating angle ring

分瓣角环	split angle ring
软角环	petal collar
绝缘件	insulation pieces
左绕	left-wound
右绕	right-wound
反段线饼	reversely wound disk
正段线饼	normally wound disk
临时段线饼	temporarily wound disk
S 弯	S-bend
静电板	electrostatic plate
静电环	electrostatic ring
屏线	shielding conductor
屏蔽头	shielding end
屏蔽角环	shroud petal
绝缘包扎	insulation wrapping
引出端固定	terminal fixing
线圈总高度	overall height of winding
铜线高度	copper height of winding
线圈修整	trimming of winding
线圈浸漆	varnish impregnation of winding
线圈的换位	transposition of winding
分组换位	transposition by groups
标准换位	standard transposition
底位	bottom transposition
明位	obvious transposition
绞线	interleaved connection
连线	continuous transposition
屏线	shield wire
上纠下连	upper-interleaved-lower-continuous
上连下纠	upper-continuous-lower-interleaved
内屏蔽式线圈	capacitor shield winding
跨 2 段内屏蔽线圈	across 2 disks capacitor shield winding
跨 4 段内屏蔽线圈	across 4 disks capacitor shield winding

纠结式线圈	interleaved winding
跨 2 段纠结式线圈	across 2 disks interleaved winding
跨 4 段纠结式线圈	across 4 disks interleaved winding
插花纠结式线圈	sandwich-interleaved winding
连续式线圈	continuous winding
螺旋式线圈	helical winding
“242”换位	242 - type transposition
“212”换位	212 - type transposition
不等距交叉换位	non-isometry cross transposition
线圈展开图	planiform drawing of winding
纠结原理图	principle drawing of interleaving
换位展开图	planiform drawing of transposition
线圈的干燥与压缩	drying and compressing of winding
绝缘的压缩收缩率	shrinkage of insulation under compression
匝数器	winding-turn recorder
线圈的导线	winding conductor
导线焊接	welding of conductors within the winding
碰焊	butt welding
碰焊机	butt welder for conductor joint
铜焊	brazing welding
铜电焊	electric brazing
脚控点焊机	foot-operated spot welder
中频焊机	mid-frequency welder
附加绝缘	additional insulation
出头固定	winding terminal fixing
出头锁紧	winding terminal fastening
打圈出头	terminal end out by looping
拿弯工具	bending tool
线圈夹具	clamping tool for winding
线圈翻转架	tilting frame for winding
扁嘴钳	flat nosed pliers
克丝钳	wire-cutting pliers
铅锤	plummet

恒压干燥	drying under constant pressure
线圈压板	winding compression plate
拉紧螺杆	tensile screw rod
弹簧压梁	spring compression
木垫块	wood padding block
铝垫块	aluminium padding block
线圈的稳定处理	isostatic treatment of winding
股间绝缘试验	insulation test between strands
导线包纸	insulation wrapping of conductor
绝缘纸	insulating paper
皱纹纸	crepe paper
丹尼森微皱纹纸	Dennison micro-crepe paper
诺曼克纸	Nomex paper
绝缘纸板	insulating pressboard
魏德曼绝缘纸板	Weidmann insulating pressboard
电工 PVA 胶	electric PVA glue
电工白乳胶	electric white latex
酪素胶; 酪蛋白胶	casein glue
酪素胶粉	casein glue powder
稀释	dilute
纸带盘	paper tape reels
包纸机	wrapping machine
立式包纸机	vertical paper wrapping machine
卧式包纸机	horizontal paper wrapping machine
恒湿箱	humidistat
裁纸机	paper slitting machine
螺旋柱形弹簧	helical spring
盘形弹簧	belleville spring washer
皱纹纸带	crepe paper tape
金属编织带	metal wire woven tape
线圈干燥后的修整	trimming of winding after drying
卧式真空干燥罐	side-loading vacuum drying autoclave
立式真空干燥罐	top-loading vacuum drying autoclave

线圈油压机

hydraulic press for winding compression

多根撑条铣切机

multi-strip milling cutter

线圈的传递及保管

conveyance and storage of windings

线圈的整体套装

assembly for full-phase windings



第十一章

Chapter 11

油 箱 制 作

钢板表面预处理	steel plate surface pre-processing
切割机	cutting machine
数控切割机	CNC cutting machine
等离子切割	plasma cutting
多用切割机	universal cutting machine
自动气割	automatic gas cutting
划线	layout
圆形样板	circular template
剪切	shearing
刨边	edge shaping
气割	gas cutting
气焊把	welding torch; welding blowpipe
割咀	cutting nozzle
焊咀	welding nozzle
焊条	welding rod
焊剂	welding paste; welding flux
焊接桌	welding bench
焊接用保护镜	welding goggles
瓶推车	cylinder trolley
折板机	bending press; bending brake
液压折板机	hydraulic bending press; hydraulic bending brake
交流电弧焊	alternating arc welding
自动电焊	automatic electric arc welding
埋弧自动焊	automatic submerged-arc welding

CO ₂ 保护焊	CO ₂ protected welding
氩弧焊	argon protected welding
惰性气体供应	inert-gas supply; shielding-gas supply
惰性气体焊枪	inert-gas torch for inert-gas welding
乙炔焊	acetylene
乙炔瓶	acetylene cylinder
乙炔气接口	gas connection; acetylene connection
瓦斯控制	gas control; acetylene control
瓦斯管	gas hose
氧器瓶	oxygen cylinder
氧气接口	oxygen connection
氧气控制	oxygen control
氧气管	oxygen hose
氧化	oxidation
高压压力表	high-pressure manometer
低压压力表	low-pressure manometer
水箱	water tank
原子氢焊	atomic hydrogen arc welding
电焊工	arc welder; welder
容器焊工	boilermaker
电焊面罩	arc welding helmet
五指手套	five-fingered welding glove
焊把臂	electrode arm
焊条把	electrode holder
电焊条压力缸	electrode-pressure cylinder
电焊条	filler rod
填充物	filler
角焊	fillet
测厚仪	fillet gauge; Am. gauge; weld gauge
型材冷弯机	cold bending machine for profiles
弯管机	pipe bending machine
钢管压弯模	bending die for steel tube
双动冲床	double-action punching machine

龙门冲床	double column punching machine
单点液压矫正机	single pole correction press
移动式摇臂钻床	movable radial drilling machine
深喉冲床	deep-throat punching machine
夹件焊装翻转架	revolving fixture for core clamping fabrication
焊接变位架	welding transposition fixture
小转台	small turntable
螺柱焊机	stud welder
点焊机	spot welder
缝焊机	seam welder
多点焊机	multi-point spot welder
端面车床	surface lathe
油箱试漏试验	leakage test for tank
油箱机械强度试验	mechanic strength test for tank
油箱真空试验	vacuum test for tank
油箱正压试验	positive pressure test for tank
煤油着色试漏	coloured kerosene leakage test
荧光试漏	fluorescent leakage test
超声探伤	ultrasonic flaw detection
磁力探伤	magnetic flaw detection
清除焊药皮	clear away welding flux
清除焊渣飞溅	clear away welding splashes
清渣锤	chipping hammer
焊渣箱	scrap box
除锈	clear away rust
钢板预处理	pre-cleaning for steel plate
型钢预处理	pre-cleaning for shape steel
喷砂处理	shot blast cleaning
喷漆	lacquer
涂漆	surface painting
油箱内壁涂漆	inner surface painting of tank
防锈底漆	antirust primer
环氧铁红底漆	iron red epoxy primer

淋漆, 喷漆	lacquer showering
溶剂, 稀释剂	thinner
硝基漆	nitrocellulose lacquer
醇酸漆	alkyd base lacquer
瓦楞箱壁油箱	corrugated wall tank

第十二章

Chapter 12

器身、引线装配及总装配

空调室	air-conditioning room
真空吸尘器	vacuum cleaner
器身	active part; internal part; core and winding assembly
引线	leads
绝缘装配	insulation assembly
器身装配	active part assembly; internal part assembly
附件安装	mounting of accessories
总装配	final assembly
装配架	assembly scaffold
绝缘纸	insulating paper
皱纹纸	crepe paper
丹尼森微皱纹纸	Dennison micro-crepe paper
诺曼克纸	Nomex paper
绝缘纸板	insulating pressboard
纸板	pressboard
魏德曼绝缘纸板	Weidmann insulating pressboard
魏德曼标准	Weidmannis standard
劲松曼标准	Jingsongis standard
层压纸板	laminated board
主要性能指标	main property standard
紧度	apparent density
水分	moisture content
收缩率	shrinkage

压缩率	compressibility
灰分	ash content
吸油率	oil absorption
电气强度	electric strength
机械强度	mechanic strength
抗弯强度	flexural strength
抗压强度	elastic strength
抗拉强度	tensile strength
屈服强度	bend strength
水抽物电导率	conductivity of aqueous extract
酪素胶	casein glue
聚酯树脂	polyester resin
改性酚醛浸渍纸	phenolic resin immersed paper
尺寸	dimension
公差	tolerance
长度	length
宽度	width
高度	height
厚度	thickness
深度	depth
外径	outer diameter
内径	inner diameter
倒圆角	rounded finish
端圈	end ring
层压端圈	laminated end ring
卷制端圈	winding end ring
压环	clamping ring
压板	compressing plate
静电板骨架	stress blanks ring; clamping ring
铁轭绝缘端圈	collars with spacers
护筒	narrow clamping rings and end rings
矩形撑条	rectangular strip
T形撑条	T-shape strip

鸽尾撑条	trapezoidal strip
异形撑条	special-shape strip
垫块	spacer
冲压垫片	punched spacer
铣削垫片	milling spacer
绝缘支撑	insulating support
L形夹件绝缘件	L-shape clamping insulating part
层压纸角板	laminated angle board
瓦楞纸板	corrugated board
绝缘纸筒	insulating cylinder
成形绝缘件	moulded insulating part
绝缘角环	insulating angle ring
分瓣正角环	segment of angle ring
分瓣反角环	segment of angle cap
引线角环片	snout segment
U形引线角环片	U-shape snout segment
U形角环片	U-shape angle ring
保护角环片	protection angle ring
引线管	lead tube
绝缘筒	insulating tube
法兰绝缘筒	flange tube
缩口绝缘筒	reducing tube
绝缘罩	insulating hood; insulating cap; insulating hat; insulating bushing
绝缘护套	insulating protection
槽垫	U-shape channel
双弯象鼻管	double curved snout
S形双弯管	S-shape tube
T形管	T-shape tube
波纹栅	falterbalg
波纹板	wave board
方管	square tube
均压球	equalizing ball

U形绝缘环	U-shape insulating ring
边界段正角环	bordering section of angle ring
边界段反角环	bordering section of angle cap
窄边正角环	edge-insulating angle ring
窄边反角环	edge-insulating angle cap
垫块链	clack bands
软角环	petal collar
绝缘件	insulation pieces
电工 PVA 胶	electrical PVA glue
电工白乳胶	electrical white latex
酪素胶; 酪蛋白胶	casein glue
酪素胶粉	casein glue powder
稀释	dilute
酚醛胶	bakelite glue
环氧树脂胶	epoxy resin glue
乳胶漆	latex paint
线圈纸筒杀紧器	tightening device for winding cylinder
斜纹布带	twill cotton tape
平纹布带	plain cotton tape
线圈吊具	winding hoisting tool
双爪线圈吊具	two-leg winding hoisting tool
三爪线圈吊具	three-leg winding hoisting tool
四爪线圈吊具	four-leg winding hoisting tool
线圈围屏的安装	assembly of insulating screen for windings
线圈围屏	winding screen
围屏拉带	fastening belt of screen
插板刀	lamination inserting knife
拆除上轭	dismantle of upper yoke
插板	reinsertion of upper yoke
轭片Π形夹	Π-shaped clips for upper yoke
力矩扳手	torque spanner; torque wrench
线圈油压千斤顶	hydraulic jacks for winding compression
油压泵站	hydraulic pump station

气垫车	air-cushion transporter
空压站	air-compressing station
引线附加绝缘	additional insulation of lead
引线夹	leads clamping
引线支架	supporting frame for leads
屏蔽	shield
电屏蔽	electrostatic shield
磁屏蔽	magnetic shield
铜屏蔽	copper shield
磁分路	magnetic shunt
地屏	earthing screen
直角支撑件	angle support
软电缆	flexible cable
引线的绝缘包扎	insulation wrapping of leads
引线绝缘	lead insulation
引线长度	lead length
引线联结	lead connection
引线附件	lead attachment
引线紧固	fastening of leads connections
储油柜	conservator
胶囊式储油柜	rubber bladder type conservator
波纹管式储油柜	bellows type conservator
隔膜式储油柜	rubber diaphragm type conservator
储油柜支架	supporting frame for conservator
油位计	oil-level indicator
气体继电器	gas relay; buchholz relay
皮托继电器	pitot relay
储油柜联管	elbow joint for conservator
有载开关用储油柜	conservator for OLTC
有载开关用气体继电器	gas relay for OLTC
联管	tube connector
吸湿器	dehydrating breather
高压套管	HV bushing

中压套管	MV bushing
低压套管	LV bushing
中性点套管	neutral bushing
接地套管	earthing bushing
油-气套管	oil-SF ₆ bushing
油-油套管	oil-oil bushing
插拔头	insert-extract type terminal
大电流套管	heavy current bushing
加强式套管	long-creepage bushing
绝缘套管	insulating bushing
穿缆式套管	cable through type bushing
导杆式套管	leader inner-connecting type bushing
套管均压球	equipotential shielding for bushing
套管储油柜	conservator for bushing
套管绝缘护筒	insulating barrier cylinder of bushing
相应端子	corresponding terminal
线路端子	line terminal
中性点端子	neutral terminal
铁心接地端子	core earthing terminal
接地端子	earthing terminal
接地标志	earthing mark
有载分接开关	on-load tap-changer (OLTC)
无励磁分接开关	off-circuit tap-changer (OCTC)
选择开关	selector switch
切换开关	diverter switch
分接选择器	tap-selector
转换选择器	change-over selector
粗调选择器	coarse change-over selector
极性选择器	reversing change-over selector
触头组	set of contacts
主触头	main contacts
通断触头	main switch contacts
过渡触头	transition contacts

分接位置指示器	tap position indicator
最大分接	maximum tapping
最小分接	minimum tapping
额定分接	rated tapping; principal tapping
操动机构	driving mechanism
电动机构	motor-drive mechanism
操动机构手柄	operating handle of driving mechanism
分接变换指示器	tap-change in progress indicator
极限开关	limit switch
机械端位止动装置	mechanical end stop
并联控制装置	parallel control device
紧急脱扣装置	emergency tripping device
过电流闭锁装置	over current blocking device
操作计数器	operation counter
电动机构的手动操作	manual operation of motor-drive mechanism
再启动装置	restarting device
电容分压器	capacitor voltage divider
电磁单元	electromagnetic unit
高压电容	high voltage capacitor
中压电容	intermediate voltage capacitor
保护装置	protective device
主电容屏	main capacitor plate
端环	end ring
端屏	end screen
磁分路	magnetic shunt
短路匝	short-circuited turn
膨胀器	expander
滑动接触电刷	sliding type current collector
滚动接触电刷	rolling type current collector
软接线片	flexible connecting strip
铜焊机	brazing transformer
磷铜焊料	phosphor-copper brazing metal
铜焊钳 (夹)	brazing pliers

锡焊	soldering
真空干燥	vacuum drying
变压法干燥	variable-pressure drying (VHD)
汽相干燥	vapour-phase drying (VPD)
煤油汽相干燥	kerosene vapour-phase drying
汽相加热阶段	vapour-phase heating period
高真空阶段	high vacuum period
整理, 压服, 干燥	trimming, compressing and drying
真空注油阶段	vacuum oil-filling period
煤油蒸发器	kerosene evaporator
煤油回收泵	kerosene recycling pump
煤油热载体	kerosene heat carrier
蒸汽加热排管	steam heating radiators
真空干燥罐	vacuum drying autoclave
真空干燥罐	vacuum drying oven
卧式真空罐	side-loading vacuum drying autoclave
立式真空罐	top-loading vacuum drying autoclave
罐盖启开油缸	opening mechanism of autoclave cover
热风循环干燥	drying with hot-air circulation
干燥炉	drying autoclave; drying oven
真空浸油	oil impregnation under vacuum
真空系统	vacuum plant
真空泵	vacuum pump
真空阀	vacuum valve
真空计	vacuum gauge
增压泵	booster pump
自动记录仪表	autographic recording instrument
干燥的终点判断	terminus determination of drying process
露点测量	dew point measurement
卡尔·费休法 (含水量测试)	Karl Fischer Method
引线绝缘包扎机	lead insulation wrapping machine
冷压焊	cold pressing

冷焊	crimping
冷压焊钳	cold pressing pliers
弧铜焊	arc brazing
箱壁绝缘隔板	insulation diaphragm on the tank wall
绝缘成形件	paper moulded insulating part
挤压, 热压	extrusion
折叠, 合拢	fold-up
移动式净油站	movable oil-purifier
油的脱水	deaquation of oil
油的脱气	degassing of oil
油的脱水装置	oil-dehydrating device
油的脱气装置	oil-degasing device
油过滤芯子	cartridge of oil-filter
过滤	filtration
污油净化	purification of contaminated oil
可翻开式面镜	flip-up window
油基	oil base
石蜡基	paraffin base
环烷基	naphthene base
油的综合试验	simplified tests of oil
油的析气性	gas-separating property of oil
油闪点	flash point of oil
油凝固点	congealing point of oil
酸值 (pH 值)	acid value (pH value)
抗氧化剂	antioxidant
抗凝剂	anticoagulen
阻化油	inhibited oil
非阻化油	uninhibited oil
油试验器	oil tester
油的胶体污染	colloidal contamination of oil
胶体颗粒	colloidal particle
吸附剂	absorbent
含水量	water content; moisture content

含气量	gas content
油气相色谱分析	gas-in-oil analysis
甲烷	methane (CH ₄)
乙烷	ethane (C ₂ H ₆)
乙炔	acetylene (C ₂ H ₂)
乙烯	ethylene (C ₂ H ₄)
丙烯	acryl (C ₃ H ₆)
一氧化碳	carbon monoxide (CO)
二氧化碳	carbon twinoxide (CO ₂)
氧	oxygen
氢	hydrogen
氮	nitrogen
总烃含量	overall hydrocarbon content
百万分之一	parts per million (ppm)
油处理设备	oil treatment plant
真空注油	vacuum oil-filling
热油循环	hot-oil circulation
注油后静放	standstill after oil-filling
密封试漏	leakage test on sealed parts
密封件, 垫片	gasket
气层	gas blanket
活性氧化铝	active aluminium oxide
活性氧化铝	activated alumina
硅胶	silica gel
压力释放阀	pressure-relief valve
压力释放装置	pressure-relief device
美国压力释放装置	Qulitrol 208 - 60E, USA
信号温度计	signalling thermometer
电阻温度计	resistance thermometer
水银温度计	mercury thermometer
温度控制器	temperature control
德国温度控制器	Messko MT-ST160W, Germany

线圈温度计	winding thermometer
德国线圈温度计	Messko MT-ST160SK, Germany
远距离温度计	thermometer with remote indication
瓷箱	porcelain casing
瓷箱互感器	porcelain casing instrument transformer
瓷箱压圈	clamping ring for porcelain casing
膨胀器	expander
二次端子箱	secondary terminal box
胶囊	rubber bladder
电缆夹	cable clip



第十三章

Chapter 13

试 验 报 告

例行试验	routine test
型式试验	type test
特殊试验	special test
试验报告	test report
工作号	serial No.
产品代号	symbol of the product
产品型号	type of product
额定参数	rated parameter
额定值	rated value; rating
保证值	guarantee value
技术协议	technical agreement
产品合同	product contract
商务合同	commerce contract
额定容量	rated power
额定电压	rated voltage
额定电流	rated current
短路阻抗	short-circuit impedance
负载损耗	load loss
空载损耗	no-load loss
空载电流	no-load current
励磁电流	exciting current; energizing current
额定频率	rated frequency
联结组标号	connection symbol
冷却方式	type of cooling

零序阻抗	zero-sequence impedance
绝缘水平	insulation level
试验依据	reference standard
试验项目	test item
试验结果	test result
试验结论	test conclusion
电压比测量	measurement of voltage ratio
联结组标号检定	check of connection symbol
额定变比	rated ratio
偏差	measured error
线圈电阻测定	measurement of winding resistance
油温	oil temperature
测量值	measured value
校正值	calibrated value
绝缘特性测定	measurement of dielectric character
绝缘电阻	insulation resistance
吸收比	absorption ratio
极化指数	polarization-ability factor (PI)
铁心绝缘电阻	insulation resistance of core
介质损耗因数及电容测量	measurement of dissipation factor and capacitance
试验电压	test voltage
介损 $\tan\delta$ 测量	measurement of $\tan\delta$
电容测量	measurement of capacitance
直流泄漏测量	measurement of direct current leakage
绝缘油试验	insulation oil test
油气相色谱分析	gas-in-oil analysis
含水量	water content; moisture content
含气量	gas content
击穿电压	breakdown voltage
试验前后	before and after test
取样阶段	sampling stage
短路阻抗和负载损耗测量	measurement of short-circuit impedance and load loss

短路阻抗测量	measurement of short-circuit impedance
负载损耗测量	measurement of load loss
测量电流	measured current
零序阻抗测量	measurement of zero-sequence impedance
线圈运行方式	winding combination
高压加电	power-up of HV winding
空载损耗和空载电流测量	measurement of no-load loss and no-load current
空载损耗测量	measurement of no-load loss
空载电流测量	measurement of no-load current
空载电流谐波测量	measurement of harmonics of no-load current
平均值电压	mean value voltage
有效值电压	r. m. s. value voltage; RMS value voltage
1.1 倍 12h 长期空载试验	12 hour excitation test at 110% rated voltage
电晕及无线电干扰试验	test of corona discharge and radio disturbance
无异常	without abnormality
油流静电试验	oil flow static electric test
油泵运行时的局放测量	partial discharge measuring with pump running
测量部位	measured location
额定工频耐受电压	rated power-frequency withstand voltage (AC)
额定冲击耐受电压	rated impulse withstand voltage
额定操作冲击耐受电压	rated switching impulse withstand voltage (SW)
额定雷电冲击耐受电压	rated lightning impulse withstand voltage
额定雷电冲击全波耐受电压	rated full wave lightning impulse withstand voltage (LI)
额定雷电冲击截波耐受电压	rated chopped wave lightning impulse withstand voltage (CW)
外施耐压试验	separate source voltage withstand test; applied test
感应耐压试验	induced over-voltage withstand test (IOW)
带局放测量的感应耐压试验	IOW test with partial discharge measurement
短时感应耐压试验	ACSD test (IOW test for short duration)
短时感应耐压试验	ACSD test with partial discharge measurement
相对地短时感应耐压试验	phase-ground ACSD test with partial discharge measurement

低压施加 200Hz 单相电源	apply voltage at 200Hz to one phase of LV
加电端子	supplied terminal
感应端子	induced terminal
感应倍数	induction multiple
试验时间	test duration
局放水平	partial discharge level
相对相短时感应耐压试验	phase-phase ACSD test with partial discharge measurement
低压施加 100Hz 三相电源	apply voltage at 100Hz to three phase of LV
长时感应耐压试验	ACLD test (IOW test for long duration)
长时感应耐压试验	ACLD test with partial discharge measurement
局部放电测量	partial discharge measurement (PD measurement)
超声定位仪	ultrasonic location device
破坏性放电	disruptive discharge
局部放电起始电压	partial discharge inception voltage
局部放电终止电压	partial discharge extinction voltage
高压入口电容测量	measurement of the effective capacitance on HV
操作冲击试验	switching impulse test
操作冲击波形图	oscillogram of switching impulse-voltage
试验电压	test voltage
负极性	negative polarity
高压线端	HV terminal
雷电冲击试验	lightning impulse test
雷电冲击全波试验	full wave lightning impulse test
雷电冲击截波试验	chopped wave lightning impulse test
雷电冲击波形图	oscillogram of lightning impulse-voltage
波形参数	wave parameter
见附录 A	to be showed in appendix A
伏秒特性	voltage-time characteristics
截断时间	time to chopping
波前时间	time to crest
视在波前时间	virtual front time
半峰值时间	time to half value crest

有效值	r. m. s. value; RMS value; root-mean-square value
平均值	mean value
峰值	peak value; crest value
标称值	nominal value
声级测定	measurement of sound level
测点布置	microphone location for measuring audible sound
距主发射面 0.3m 处测得声压级水平	average A-weighted sound pressure level (0.3m)
距主发射面 0.3m 处测得声功率级水平	A-weighted sound power level (0.3m)
距主发射面 2.0m 处测得声压级水平	average A-weighted sound pressure level (2.0m)
距主发射面 2.0m 处测得声功率级水平	A-weighted sound power level (2.0m)
温升试验	temperature rise test
短路法	short-circuit method
顶层油温升	temperature rise of top oil
油平均温升	average temperature rise of oil
高压线圈温升	temperature rise of HV winding
中压线圈温升	temperature rise of MV winding
高压加电	HV supplied
中压短路	MV short-circuit
高压置于 5 分接	tap 5 of HV
施加损耗	applied loss
基于	based on
实测值	corrected value
油箱表面热点温升	temperature rise of hot spot on the tank surface
测量条件	measurement condition
冷却器工作状态	the state of cooler
切断电源后对变压器冷却的温度校正	temperature correction for cooling of transformer after switching off the supply
使用线性坐标的外推法	method of extrapolation using linear scales

使用对数线性坐标的外推法	method of extrapolation using log-linear scales
确定油的最终温升的方法	method for determining the final temperature rise of oil
确定切断电源瞬间线圈电阻的方法	method for determining the winding resistance at the instant of switching off the supply
线路端子	line terminal
中性点端子	neutral terminal
中性点	neutral point
风扇和油泵电机吸收功率测量	measurement of the power taken by fan and pump motor
施加电压	applied voltage
测量电流	measured current
测量损耗	measured loss
有载开关顺序试验	OLTC sequence test
变压器套管电容和介质损耗因数测量	measurement of capacitance and dielectric loss factor of bushing
极性校验	check on polarity
绕组联结图	connection diagram of winding
空载电流谐波测量	measurement of the harmonics on the no-load current
无线电干扰测量	measurement of radio interference voltage
振动测量	measurement of vibration
变压器密封试验	seal test for transformer
油箱试漏试验	leakage test for tank
油箱机械强度试验	mechanic strength test for tank
油箱真空试验	vacuum test for tank
油箱正压试验	positive pressure test for tank
温升试验	temperature rise test
绕组变形试验	winding deformation test
伏安特性测定	measurement of volt-ampere characteristics
感性	inductive
容性	capacitive
过补偿	over-enough compensation

欠补偿	not-enough compensation
自感	self-inductance
互感	mutual inductance
电阻	resistance
电抗	reactance
阻抗	impedance
感抗	inductive reactance
容抗	capacitive reactance
相位移	phase displacement
对应端子	corresponding terminals
线圈联结图	connection diagram of windings
电压组合	voltage combination
高压电压	HV voltage; h. v. voltage
中压电压	MV voltage; m. v. voltage
低压电压	LV voltage; l. v. voltage
额定电压比	rated voltage ratio
电抗电压	reactance voltage
电阻电压	resistance voltage
阻抗电压	impedance voltage
电压降	voltage drop
电压升	voltage rise
电压调整率	voltage regulation
设备最高电压	highest voltage for equipment
全绝缘	uniform insulation
分级绝缘	non-uniform insulation
正常绝缘	normal insulation
主绝缘	main insulation
纵绝缘	longitudinal insulation
内绝缘	internal insulation
外绝缘	external insulation
绝缘配合	insulation co-ordination
降低绝缘	reduced insulation
磁通密度	flux density

电流密度	current density
安匝数	number of ampere-turns
轴向漏磁通	axial leakage flux
辐向漏磁通	radial leakage flux
热点	hot spot
最热点	hottest spot
局部过热	local overheat
有功输出	active output
无功输出	reactive output
有载分接开关	on-load tap-changer (OLTC)
无励磁分接开关	off-circuit tap-changer (OCTC)
选择开关	selector switch
切换开关	diverter switch
分接选择器	tap-selector
转换选择器	change-over selector
粗调选择器	coarse change-over selector
极性选择器	reversing change-over selector
触头组	set of contacts
主触头	main contacts
通断触头	main switch contacts
过渡触头	transition contacts
过渡电阻	transition resistance
电位电阻	potential resistance
分接	tapping; tap
分接位置指示器	tap position indicator
最大分接	maximum tapping
最小分接	minimum tapping
额定分接	rated tapping; principal tapping
主分接	principal tapping
正分接	plus tapping
负分接	minus tapping
分接级	tapping step
分接因数	tapping factor

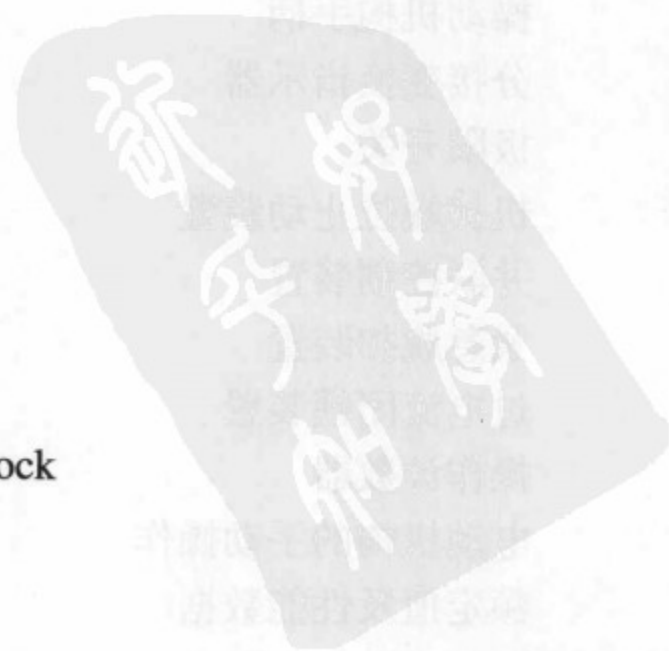
分接范围	tapping range
分接电压比	tapping voltage ratio
分接工作能力	tapping duty
分接参数	tapping parameter
线圈的分接电压	tapping voltage of a winding
线圈的分接容量	tapping power of a winding
线圈的分接电流	tapping current of a winding
满容量分接	full-power tapping
降低容量的分接	reduced-power tapping
开断电流	switched current
循环电流	circulating current
额定通过电流	rated through-current
最大额定通过电流	maximum rated through-current
额定级电压	rated step voltage
最大额定电压	maximum rated voltage
恢复电压	recovery voltage
过渡阻抗	transition impedance
固有分接位置数	number of inherent tapping positions
工作分接位置数	number of service tapping positions
分接变换操作	tap-change operation
操作循环	cycle of operation
操动机构	driving mechanism
电动机构	motor-drive mechanism
操动机构手柄	operating handle of driving mechanism
分接变换指示器	tap-change in progress indicator
极限开关	limit switch
机械端位止动装置	mechanical end stop
并联控制装置	parallel control device
紧急脱扣装置	emergency tripping device
过电流闭锁装置	over current blocking device
操作计数器	operation counter
电动机构的手动操作	manual operation of motor-drive mechanism
额定值及性能数据	rated value and characteristic data

第十四章

Chapter 14

包装及运输

变压器本体	main body of transformer
大型变压器的拆卸	dismounting of large transformer
大型变压器的发运	delivery of large transformer
冲撞记录仪	accelerograph
铁路运输	railway transportation
公路运输	highway transportation
水路运输	water transportation
海路运输	sea transportation
装车发运	loading and delivery
凹形车 (元宝车)	saddle bottomed wagon
钳夹式车	jaw-type wagon
落孔车	open web girder wagon
拖车	trailer
卡车	truck
油罐车	tanker
起重机	crane
浮吊	floating crane
履带吊	caterpillar crane
铁路轨道吊	railway crane
钢丝绳	steel cable
倒链	chain block
绞盘与滑轮组	capstan and pulley block
集装箱运输	container transport
包装箱	package



花板包装	packaged in crate
装箱单	packing list
发货日期	delivery date
到站(港)	destination
原产国	country of origin
目的国	country of destination
发出港	port of embarkation
目的港	port of debarkation; destination
发货标记	shipping mark (S. M.)
唛头; 标记	marks (mks.)
顶部	top
底部	bottom
起吊点	haul
从此提起	Heave here
易碎	fragile
易燃品	inflammable
小心	care
小心轻放	Handle with care
勿掷	Don't cast
不准叠放	Don't stack up
不准倒置	Don't turn over; Keep upright
勿倾斜	Not to be tipped
保持干燥	Keep dry
在干处保存	Keep in a dry place
在冷处保存	Keep in a cool place
怕冷	To be protected from cold
怕热	To be protected from heat
在滚子上移动	Use rollers
重心	centre of gravity
限速运输	oversize transport
不准溜放!	Don't uncouple with slipping!
发货人	consignor
收货人	consignee

毛重	gross weight
净重	net weight
毛作净重	gross for net
合同号	contract number
定单号	indent number
项目号	item number
控制号	control point
箱号	case No.
批号	batch number; lot number
车号	car number
浇铸号	cast number
序号	serial number
发货单	dispatch list
交货单	delivery order
发票	invoice
发票号	invoice number
托盘	pallet
叉车	fork lift
装载量	loading capacity
装货港口	port of loading
铁路编组站	marshalling yard
分组	subgroup
产品重量	total weight of product
器身重量	weight of active part
油重	weight of oil
运输重	transport weight
拆卸附件	dismantled accessories
备件	spare parts
易损件	parts subjected to wear
储存寿命	storage life
使用寿命	useful life
充氮运输	transported with nitrogen filling
带油运输	transported with oil filling



运输尺寸图	transportation dimension drawing
铭牌	rating plate, name plate
铭牌数据	rating plate data
标志牌	designation plate
说明牌	illustration plate
标准说明书	standard specification
指示标记	indication mark
设计代号	design code
产品代号	symbol of product
产品序号	serial No.
使用条件	service condition
通风要求	ventilation
土建	civil construction
绝缘水平	insulation level
海拔高度	height above sea level
环境温度	ambient temperature
线圈温升	winding temperature-rise
油顶层温升	top-oil temperature-rise
线圈端子位置示意图	illustrative drawing for winding terminals
线圈联结组图	illustrative drawing for winding connection
由……制造	manufactured by…; mfd. by…
……制造	made in…

第十五章

Chapter 15

试 验 装 备

冲击电压发生器	impulse voltage generator
弱阻尼电容分压器	feebleness damping capacitor voltage divider
多间隙可控截波装置	multi-gaps controllable chopping device
截断装置	chopping device
哈佛来结构	Haefely structure
海沃结构	Highvolt structure
串谐装置	series resonance device
并谐装置	parallel resonance device
变频电源	variable-frequency power source
试验发电机组	testing generator set
工频发电机组	power frequency generator set
50/60Hz 发电机组	50/60Hz generator set
100Hz 发电机组	100Hz generator set
150Hz 发电机组	150Hz generator set
200Hz 发电机组	200Hz generator set
250Hz 发电机组	250Hz generator set
工频试验变压器	power frequency testing transformer
中间变压器	medium transformer
支撑变压器	supporting transformer
调压器	voltage regulator
接触调压器	variable-voltage transformer
感应调压器	induction-voltage regulator
移圈调压器	moving-coil voltage regulator
柱式调压器	pole-form voltage regulator

补偿电容器	compensation capacitor
电容器塔	capacitors tower
补偿电抗器	compensation reactor
自励	self-energizing; self-exciting
谐振	resonance
测量仪表	measuring meter; measuring instrument
准确度	accuracy
灵敏度	sensitivity
熔丝	fuse
兆欧表	megger
万用表	universal tester
多功能自动测试仪	multi-function auto-meter
数字电压表	digital display voltmeter
数字电流表	digital display ammeter
数字瓦特表	digital display wattmeter
低功率因数瓦特表	low power-factor wattmeter
平均值电压表	mean-value voltmeter
有效值电压表	r. m. s. value voltmeter
峰值电压表	peak voltmeter
钳形电流表	tong-type ammeter
频率表	frequency meter
噪声仪	sound level meter
变比测试仪	ratio meter
直阻测量仪	winding resistance measuring instrument
直流电源	direct current source
西林电桥	schering bridge
变比电桥	bridge for testing of voltage transformation ratio
介质损耗测试仪	dielectric loss test system; insulation power loss test system
红外扫描仪	infrared scanner
红外测温仪	infrared thermometer
表面温度计	surface thermometer
液晶显示	liquid crystal display (LCD)

热电偶	thermoelectric couple
水电阻	water resistance
金属电阻	metallic resistance
金属保护电阻	metallic protecting resistance
局放测试仪	partial discharge tester
模拟局放测试仪	simulation partial discharge tester
4通道数字局放仪	4-channels digital partial discharge tester
方波发生器	step generator; rectangular wave generator
阻抗盒	impedance box
超声定位仪	ultrasonic locating instrument
高压示波器	high-voltage oscilloscope
记忆示波器	memory oscilloscope
同步示波器	synchronous oscilloscope
分压器	voltage divider
电容分压器	capacitor voltage divider
标准电容器	standard capacitor
静电电压表	electrostatic voltmeter
旋转电压表	generating voltmeter
精密电流互感器	exactitude current transformer
精密电压互感器	exactitude potential transformer
绕组变形测试仪	winding deformation measuring instrument
球隙	sphere-gap
法拉第笼	faraday cage
试验装备	test equipment; test instrument; test device; test facilities

第十六章

Chapter 16

通用设备及工具

绝缘件数控加工中心

CNC machining centre for insulation part

车床

lathe

立式车床

vertical lathe

端面车床

surfacing lathe

马鞍车床

saddle bed lathe

自动车床

automatic lathe

数控车床

CNC lathe

大角车床

turret lathe

铲背车床

backing-off lathe; relieving lathe

旋压车床

bulging lathe

钻床

drill

台钻

bench drill

立钻

vertical drill

摇臂钻

radial drill

电钻

electric drill

胸压手摇钻

breast drill

曲柄摇钻

crank brace drill

手拉钻

fly drill

平摇钻

hand drill

空心钻

hollow drill

钻柄

shank

铆钉枪

riveter

铆钉

rivet

镗床

boring machine

坐标镗床	jig boring machine
落地镗床	facing boring machine
铣床	miller; milling machine
螺旋铣床	screw miller
万能铣床	universal miller
花键铣床	spline miller
龙门铣床	planer type miller
插床	slotting machine
插齿机	gear sloter
双柱龙门刨床	double housing planer
单臂刨床	open side planer
刨边机	edge planer
铣边机	edge miller
刨子	plane
刨铁	plane iron
长刨	jointer
液压刨床	hydraulic planer
牛头刨床	shaper
液压牛头刨床	hydraulic shaper
拉床	broaching machine
弓锯床	hack saw
圆盘锯床	disk saw; circular saw
带锯床	band saw
钢锯	jack saw
曲线锯	jigsaw
大锯	pit saw
小锯	rip saw
锯条	saw blade
压力机	press
液压机	hydraulic press
冲床	punch
冲压床	punch press
剪板机	shearing machine; guillotine shear

剪断机	punch shear
折板机	bending press; bending brake
压延机	calender; mangle
滚丝机	thread hobbing machine
磨床	grinder
外圆磨床	circular grinder
内圆磨床	internal grinder
螺纹磨床	thread grinder
万能工具磨床	universal tool grinder
砂带机	finisher belt grinder
单臂吊车	cantilever hoisting crane
机动装配架	movable and adjustable scaffold
多层热压机	multi-layer heat press
点焊设备	spot welding
点焊焊条把	spot welding electrode holder
冲模	punch dies
拉伸模	stretch drawing die
落料模	cupping die
级进模	progressive die
双动模	double-action die
挤压模	extrusion die
压印模	stamping or embossing die
翻边模	curling die
卷边模	curling die
凸模	male die
凹模	female die
模座	die holder
导柱	guide post; guide pole
闭合高度	die height
钻具	drilling guide; drilling jig
夹具	fixture; jig
夹块	fixture block
铣削夹具	milling fixture

焊接夹具	welding fixture
样板	sampler
钢丝钳	wire cutter; wire-cutting pliers; pliers
剥线钳	wire-stripping pliers
台虎钳	bench vice
旋转虎钳	rotary vice
管钳	pipe wrench
铁钳	pinchers
弹簧夹钳	spring clip
工作用卡钳	work clamp
地线卡钳	earthing clamp
成套工具	kit
扳手	spanner; wrench
活动扳手	adjustable spanner; shifting spanner
梅花扳手	box spanner; box wrench
套筒扳手	socket spanner; socket wrench
死扳手	solid spanner; solid wrench
双头扳手	double-end spanner; double-end wrench
力矩扳手	torque spanner; torque wrench
螺丝刀	screw-driver
十字头螺丝刀	cross head screw-driver
锤	hammer
大锤	sledge hammer
尖头锤	pick hammer
斧锤	peen hammer
锻锤	forging hammer
拔钉锤	claw hammer
丝锥	tap
机用丝锥	machine tap
圆扳牙	round screw die
手锯	hand saw
刀锯	blade saw
卷尺	tape measure
皮尺	band tape

钢皮尺	steel tape
钢卷尺	steel tape; convex rule
折尺	folding ruler
分线规	dividers
量规	gauge
角规	angle gauge
角尺	marking ruler
内角规	internal gauge
两角规	compasses
万能角度尺	universal angle meter
卡尺	calliper
千分表	dial gauge
百分表	micrometer
水平仪	level gauge
表架	dial gauge stand
磁力表架	magnetic stand
油石	oil-stone, whetstone
长方油石	rectangular oil-stone
三角油石	triangular oil-stone
细磨刀石	hone
锉刀	file
扁锉	flat file
方锉	square file
圆锉	round file
三角锉	triangular file
组锉	group file
粗纹锉	coarse file
螺旋锉	spiral drill
木锉	rasp
气焊枪	gas welding torch
气割枪	gas cutting torch
麻花钻	twist drill
钻套	drill socket
刀具	cutter



组合铣刀	cutter block
镗杆	cutter spindle
铣刀轴杆	cutter spindle
端面铣刀	face cutter
三角刮刀	triangular scraper
折刀	jack knife
多用开刀	multi-bladed knife
刮纸刀	paint scraper
钳工案	fitter's bench
保险锁	safety lock
活板式风门	trapdoor
力矩扳手	torque spanner; torque wrench
千斤顶	jack
液压千斤顶	hydraulic jack
螺旋千斤顶	screw jack
差动千斤顶	differential-screw jack
倒链	chainblock
起重机	crane
桥式起重机	bridge crane
单梁桥式起重机	single girder bridge crane
双梁桥式起重机	double girder bridge crane
气垫车	air-cushion transporter
空压站	air-compressing station
钢丝绳	steel wire rope
链条吊具	chain sling
扁平吊带	webbing sling
圆环吊带	round sling
卡环	shackle
刹紧器	ratchet buckle
刹紧带	ratchet strap
吊钩	hook
吊夹	lifting clamp
吊梁	lifting girder
液压钳	hydraulic pressing clamp



第十七章

Chapter 17

通用材料

原材料	original materials
黑色金属	ferrous metal
有色金属	non-ferrous metal
绝缘材料	insulating material
保温材料	heat-resistant material
钢号	grade of steel
低碳钢	low-carbon steel
合金钢	alloy steel
低温钢	low-temperature steel
不锈钢	stainless steel
紫铜	copper
无氧铜	deoxidized copper
高电导率铜	high conductivity copper
黄铜	brass
青铜	bronze
磷青铜	phosphor bronze
铅	lead
锡	tin
镍	nickel
锑	antimony
锌	zinc
铂	plumbum
金	gold
银	silver



钨	tungsten
汞	mercury
纸带, 线带, 胶带	ape
紧缩带	shrinkable tape
平纹布带	plain cotton tape
斜纹布带	twill cotton tape
玻璃丝带	glass fibre woven tape
透明粘带	transparent adhesive tape
稀纬布带	reduced weft cotton tape
铜箔	copper foil
铝箔	aluminium foil
绝缘纸	insulating paper
皱纹纸	crepe paper
丹尼森微皱纹纸	Dennison micro-crepe paper
诺曼克纸	Nomex paper
绝缘纸板	insulating pressboard
魏德曼绝缘纸板	Weidmann insulating pressboard
电缆纸	cable paper
电话纸	telephone paper
电容器纸	condenser paper, capacitor paper
半导体纸	semi-conducting paper
金属化纸	metallized paper
金属化皱纹纸	metallized crepe paper
上胶绝缘纸	glue coated insulating paper
上胶绝缘纸	bakelite coated insulating paper
双面上胶绝缘纸	glue coated insulating paper for double surface
压光皱纹纸	calendered crepe paper
压光绝缘纸	calendered insulating paper
牛皮纸	kraft paper
青壳纸	fish paper
纸浆	pulp
绝缘纸板	insulating pressboard
特硬纸板	hard press board (HPB)

高密度纸板	high-density pressboard
层压纸板	laminated pressboard
瓦楞纸板	corrugated pressboard
成型绝缘纸板	moulded insulating pressboard
成型绝缘件	moulded insulating parts
压光绝缘纸板	calendered insulating pressboard
硬化纤维纸板	fibreboard
硬化纤维纸管	fibretube
网面纸板	wire side pressboard
毡面纸板	felt side pressboard
胶纸板	bakelized paper board
软木板	cork
木材	timber
层压木板	plywood
环氧树脂	epoxy resin
环氧玻璃布板	epoxy resin glass-fibre board
电工 PVA 胶	electrical PVA glue
电工白乳胶	electrical white latex
酪素胶; 酪蛋白胶	casein glue
酪素胶粉	casein glue powder
稀释	dilute
酚醛胶	bakelite glue
环氧树脂胶	epoxy resin glue
聚醋酸乙烯酯	polyvinyl acetate
聚乙烯醇	polyvinyl alcohol
聚酰亚胺	polyimide
聚酰胺; 尼龙	polyamide
聚酰胺树脂	polyamide resin
聚氯乙烯	polyvinyl chloride (PVC)
聚乙烯树脂	polyvinyl resin
聚乙烯缩醛	polyvinyl acetal
聚缩醛树脂	polyacetal resin
聚酯树脂	polyester resin

聚丙烯酸树脂	polyacrylic resin; polyacrylate
聚碳酸脂	polycarbonate
聚丙烯腈	polyacrylonitrile
聚胺脂	polyurethane
有机玻璃	perspex
聚甲基丙烯酸甲脂	polymethylmethacrylate
醋酸	acetic acid; ethylic acid
水曲柳	Northeast China ash tree
乳胶漆	latex paint
胺基醇酸漆	lacquer of amido base
硝基漆	lacquer of nitro base
防锈漆	antirust paint
快干漆	quick-drying paint
稀释剂	lacquer thinner
溶剂	solvent
丙酮	acetone
龙胆紫	gentian violet
绝缘材料丙酮抽出物	acetone extraction of insulating materia
挥发物含量	volatile content
抗凝剂	anti-congulator
抗氧化剂	anti-oxidant
试管	test tube
烧杯	beaker
干燥器	desiccator
滴定管	buret
比色计	coloremeter
长颈瓶	flask
蒸发皿	evaporating dish
坩埚	crucible
锥形杯	beaker flask
量瓶	mesuring flask
钢板的轧制方向	rolling direction of steel plate
纸的抄纸方向	machine direction of paper

单芯电缆	single-lead cable
多芯电缆	multi-lead cable
电源电缆	power supply lead; power supply cable
辫子线	braided wire
编织铜	braid copper
裸导线	bare conductor
橡胶电缆	cabtyre cable
交联聚合物电缆	cross-linked polymer cable
铠装电缆	sheathed cable
屏蔽电缆	shielded cable
单丝漆包线	single silk covered enamel wire
双纱包线	double cotton covered wire
铜箔	copper foil
铝箔	aluminium foil
铜带	copper tape
铜排	copper busbar
铜网	copper wire screen
100 目	100 mesh
合成橡胶	synthetic rubber
氯丁橡胶	polychloroprene rubber
抗油橡胶	oil-proof rubber
软木橡胶	cork rubber
工程塑料	engineering plastics
阻化油	inhibited oil
非阻化油	uninhibited oil
熔丝	fuse

第十八章

Chapter 18

标 准 件

无头螺杆	button head cap screw
光螺栓	bright bolt
光螺母	bright nut
方头螺栓	coach bolt
半圆头螺栓	cup head bolt
T形头螺栓	Tee head bolt
六角头螺栓	hexagonal head bolt
内六角头螺栓	hexagonal socket head bolt
镀锌螺栓	galvanized bolt
全螺纹螺栓	full thread bolt
地脚螺丝	foot bolt; anchor bolt
吊环螺丝	eyebolt
木螺丝	lag bolt
圆螺母	ring nut
滚花螺母	knerled nut
联结螺母	union nut
管路螺母	nut for pipe lines
锁紧螺母	locking nut
对开螺母	split nut
翼形螺母	wing nut; thumb nut
方螺母	square nut
夹紧螺母	grip nut
槽顶螺母	crown nut

销	pin
铰联销	hinge pin
定位销	locating pin
导销	pilot pin
柱螺旋销	stud pin
开口销	split pin
锥销	tapered pin
垫圈	washer
光垫圈	bright washer
防尘垫圈	dust washer
平垫圈	flat washer
加厚垫圈	thickened washer
止退垫圈	locking washer
外舌止退垫圈	lug washer
曲面垫圈	ogee washer
轴承	bearing
滚柱轴承	roller bearing
锥形柱轴承	tapered roller bearing
套筒轴承	sleeve bearing
球面滚柱轴承	spherical roller bearing
推力轴承	thrust bearing
向心推力滚珠轴承	angular contact ball bearing
双列滚珠轴承	double-row bearing
滚珠轴承	ball bearing
弹簧	spring
板弹簧	band spring
叠板弹簧	bow spring
盘簧	coiled spring
碟形弹簧	elastic washer; belled spring washer
齿轮	gear
正齿轮	spur gear
人字齿轮	chevron gear

伞齿轮
内齿轮
差动齿轮
蜗轮
渐开线齿轮

bevel gear
annular
differential gear
worm gear
involute gear



第十九章

Chapter 19

图纸和技术文件用语

零件	parts; details
部件	component parts
组件	assembly parts
基础件	basic parts
共用件	shared parts
从……借用	shared with…
标准件; 通用件	standard parts
外购件	general parts
附件	accessories
配合件	mating parts
可拆卸件	dismountable parts
成套设备	a complete set of equipment
初步设计	preliminary design
技术设计	technical design
技术设计说明书	instruction for technical design
技术协议	technical agreement
技术设计任务书	assignment for technical design
技术条件	technical condition
技术要求	technical requirement
合同附件	appendix to the contract; annex to the contract
检验鉴定大纲	examination and appraisal program
试制总结	summary of trial production
型式试研报告	type test report
出厂试验报告	routine test report

技术经济分析	technical and economical analysis
可行性分析	feasibility study
出厂技术文件	technical documents for product delivery
产品合格证	quality certificate
变压器使用说明书	operation instruction of transformer
技术证书	technical certificate
技术数据	technical regulation
技术手册	technical manual
试验条件	test condition
试验数据	test data
试验号	test number
试验样品号	test piece number
试验结果	test result
布置图	disposal drawing
总图	general layout
外形尺寸图	overall dimension drawing
工作图设计	working drawing design
安装图	installation drawing
示意图	illustrative drawing
线路原理图	principle circuit diagram
方框图	block diagram
表	table
图表	graph
图纸	drawing
图号	drawing number
尺寸	dimension
运输尺寸图	shipping dimension drawing
基础图	foundation drawing
电子版图	electronic edition drawing
原图	originals
底图	transparent print
蓝图	blue print
复制图	duplicates

图样目录	contents of drawing
文件目录	contents of documents
零件明细表	detail list of parts
外购件明细表	detail list of purchased parts
产品用户一览表	reference list of customers
图纸标题栏	title block of drawing
副标记	sublet number
项号	numbers (Nos.); items
项目号	item number
序号	number of the specification
名称	name
图号	drawing No.
卷号	reel number
参考号	reference number
参考字母	reference letter
参考值	reference value
单个重量	unit weight
总重量	total weight
设计者	designed by...
校核者	checked by...
审定者	approved by...
设计审核	design review
隶属装配图号	pertaining to assembly drawing No.
比例	scale:
纸型	paper size
其余 ∇	for unmarked surfaces: ∇
其余倒角 $1 \times 45^\circ$	for unmarked edges: $1 \times 45^\circ$
淬火 HRC52 - 56 $^\circ\text{C}$	hardening HRC 52 - 56 $^\circ\text{C}$
表面淬火	surface hardening
表面发蓝	surface bluing
镀锌	galvanized
镀镍	nickel plating
镀铬	chromium plating

镀镉	cadmium plating
镀锡	tin plating
镀银	silver plating
酸洗	pickling
磷化	phosphorated
钝化	passivation
涂两遍底漆	coated with two layers of primer
表漆	surface coating
半导体涂层	semi-conducting coating
热浸	hot dipping
热搪	hot dipping
防晕层	anti-corona coating
点固焊	tack weld
角焊	fillet weld
点焊	spot weld
螺杆桩焊	stud weld
配焊	welded according to practical condition
与配合件配钻孔	drilled together with mating parts
钻后铰孔	ream after drilling
透孔	through hole
喷砂清理	blast cleaning; shot cleaning; shot-blast cleaning
焊后磨平	grinding to flat after welding
去毛刺	clear away burrs
回火	tempering
校直	straightening
校平	flattening
对称件	symmetrical parts
锥度孔	tapered hole
锻件	forging parts
铸件	die casting parts
角钢长 960	angle L = 960
槽钢长 960	channel L = 960
整齐度	evenness

表面光洁度	finish
表面粗糙度	roughness
倾斜度	inclination
圆度	circularity
椭圆度	ellipticity
偏心度	eccentricity
同心度	concentricity
不同心度	inconcentricity
平度	flatness
不平度	unflatness
直度	straightness
不直度	unstraightness
平行度	parallelism
不平行度	imparallelism
垂直度	perpendicularity
不垂直度	imperpendicularity
展开图	unfolded view
A-A 放大	A-A enlarged
B-B 转 90°	B-B turned by 90°
K 向	viewed from K
A-A 剖面	A-A section
对中心	alignment
不对中心	disalignment
冲铆三点锁紧螺母	nut locked by punching three points
拼接	pieced together
改版	revise; revision
允许误差	deviation permit

第二十章

Chapter 20

质 量 控 制

质量	quality
质量手册	quality manual
质量控制	quality control (QC)
质量方针	quality policy (QP)
质量计划	quality plan (QP)
质量管理	quality management (QM)
全面质量管理	total quality control (TQC)
质量保证	quality assurance (QA), quality guarantee (QG)
质量体系	quality system (QS)
质量保证体系	quality assurance system (QAS)
质量责任制	institution of quality liability
质量监督	quality supervision, quality surveillance
质量鉴定	quality appraising
质量审核	quality approving, quality audit
质量信息	quality information
质量缺陷	quality defect
质量等级	quality grade
质量成本	quality related cost (QRC)
质量环	quality loop
质量记录	quality record
质量说明书	quality specification
质量档案	quality archives
评估成本	appraisal cost
外部损失成本	external failure cost

内部损失成本	internal failure cost
可靠性	reliability
可用性	availability
检查制度	inspection institution
检查证明	inspection certificate
工厂检查证明书	works inspection certificate
工件	workpiece
关键工序	critical process
工序检查	in-process inspection
特殊工序	special process
逐级控制	step-by-step control
验收检验	acceptance inspection
首件检验	first item inspection
工序间检验	in-process inspection
最终检验	final inspection
例行试验	routine test
型式试验	type test
特殊试验	special test
投运试验	commissioning test
合格	conformity
不合格	unconformity
合格品	conforming unit
复合误差	composite error
缺陷; 故障	nonconformity
设计评审	design review
控制点	control point
操作循环	cycle of operation
精度	accuracy
校准	calibration
误差	error
产品质量鉴定	appraising quality of a product
产品鉴定	product appraisal
技术鉴定者	surveyor of the technical inspection



制造工艺流程	manufacturing flow
装配工艺流程	flowchart for assembly
标准偏差	standard deviation
正态分布	normal distribution
设计定型	finalization of design
版本	version
定型改版	finalized revision
市场调查	market survey; market research
供应商评估	supplier appraisal
供应商评价	supplier evaluation



第二十一章

Chapter 21

外 贸 用 语

世界贸易组织	World Trade Organization (WTO)
联合国贸发会议	United Nation Conference of Trade and Development
关贸总协定	General Agreement of Tariff and Trade (GATT)
国际货币基金组织	International Monetary Fund (IMF)
世界银行	World Bank
国际商会	International Chamber of Commerce (ICC)
贸易术语解释通则	International Rules for the Interpretation of Trade Terms
国际标准化组织	International Organization for Standards (ISO)
最惠国条款	most-favoured-nation clause
国际法	international law; law of nations
国际海洋法	maritime international law
海事仲裁	maritime arbitration
对外贸易政策	foreign commercial policy
对外贸易惯例	custom of foreign trade
现行外汇制度	current exchange system
外汇管制	foreign exchange control
外汇	foreign exchange
自由汇兑	free exchange
美元自由兑换黄金	free convertibility of the dollar for gold
兑换率	rate of conversion
浮动汇率	floating exchange rate
进口检疫规章	Foreign Quarantine Regulation
卫生检疫规定	Health and Sanitary Regulation

人为法，成文法	positive law; formal law
习惯法，不成文法	common law
进口和出口	Import and Export
转口贸易	transit trade
船上交货价（离岸价）	free on board (FOB)
离岸价包括理舱费	free on board stowed (FOB stowed)
离岸价包括理舱和平仓费	FOB stowed and trimmed
成本加运费	cost and freight (CFR)
成本加运费船方不承担卸货	cost and freight free out (CRF FO)
船方不承担装卸费	free in and out (FIO)
船方不承担装货费	free in (FI)
船方不承担卸货费	free out (FO)
成本加保险费运费（到岸价）	cost, insurance and freight (CIF)
工厂交货价	ex works (EXW)
货交承运人	free carrier (FCA)
船边交货价	free alongside ship (FAS)
运费付至	carriage paid to (CPT)
运费及保险费付至	carriage and insurance paid to (CIP)
边境交货价	delivered at frontier (DAF)
目的港船上交货	delivered ex ship (DES)
目的港码头交货（关税已付）	delivered ex quay (duty paid) (DEQ)
仓库交货价	ex warehouse
敞车上交货价	free on truck (F. O. T.)
飞机上交货价	free on plane (F. O. P.)
未完税交货	delivered duty unpaid (DDU)
完税后交货	delivered duty paid (DDP)
保险	insurance (ins.)
全险，一切险	all risks insurance
保险证明书	certificate of insurance (C/I)
保险单	insurance policy
海上保险单	marine insurance
保险费	insurance premiums
海关总署	custom house administration

海关	custom
关境	customs area
护照	passport
签证	put a visa on
入境签证	entrance visa
出境签证	exit visa
报关单	customs declaration
清关	clearance of customs
代理贸易	agency trade
代理商	agent (Agt.); factor
海运经纪人	shipbroker
船主	shipowner
托运人	shipper
运费	freight (Frt.)
杂费	sundry charges
总清单	general list
总额	amount, sum total
总价	total price
信用证	letter of credit (L/C)
信用保证书	letter of guarantee (L/G)
信用卡	credit card
信汇	mail transfer
索赔	claim
索赔单证	claims documents
索赔证件	claim document
保险索赔	insurance indemnity
赔偿, 赔偿物, 赔偿金	compensation
索赔期限	deadline for demanding compensation
要求延长索赔的期限	request to extend time-limit of claim
起诉	suit
包装太差	poor packing
货物变质	quality deterioration
合资经营	joint venture

合资企业	joint enterprises
合股公司	joint stock enterprise
跨国公司	transnational corporations
子公司	subsidiaries
公司	company (Co.)
有限公司	Company Limited (Co. Ltd.)
投资倾向	propensity to invest
盈利性	productiveness
进口许可证	import permit
生产许可证	production permit
购货合同	purchase contract
售货合同	sales contract
往来账目	above the line
预算中经常开支账目	above the line payments and receipts
账户, 账单	account (A/C, Acct.)
某人账内	account of (A/O)
查账	reconcile accounts
记账	on account (o/a)
付讫	paid (pd.)
公章	official seal
承兑银行	accepting bank
银行转账	bank transfer
汇票	bill of exchange
即期汇票	demand draft (D/D)
远期汇票	bill at usance
即付汇票	payable on demand
空头支票	check without funds; bad cheque; rubber cheque; worthless check
过期支票	postdated check
票根	counterfoil
记名支票	order cheque
透支	overdraft (O. D.)
分期付款	progress payment

可行性研究	feasibility study
货样	sample
专利品	proprietary articles
专利权使用费	patent royalty
现货	stock in hand; stock on hand
存货清单	stock-sheet
谈判	negotiation; discuss
草约	ad referendum contract
合同	contract (Cont.)
合同号	contract number (Cont. No.)
合同有效期	life of contract
条款	article (Art.)
付款条件	term of payment
装运条件	term of shipment
交货条件	term of delivery
订金	inpayment
预付费用	prepaid expense
附件	attachment; enclosure (Enc l.)
公证人证明	notarial certificate
意向书	letter of intent
协议书	agreement
意向协议书	agreement of intent
附加协定	supplementary agreement
样本	specimen copy
口头协议	verbal agreement
口头谅解	verbal understanding
订单	indent (ind.)
定单; 定货单	orders; order form; order sheet
小费	key money
回扣; 佣金; 酬金	kick-back
销路	outlet
滞销	sluggish sales

分批交货	partial delivery
整批交货	wholesale delivery
分批装运	partial shipment
价目表	price catalogue
买方	purchaser, buyer
供货人	supplier
试销	sale on trial
买空卖空	bear and bull
卖空	bear sale
日常费用	running cost
现金短缺	short of cash
支付手段	means of payment
双方协定	mutual agreement
交货地点	place of delivery
原产地	place of origin
提货单	delivery order
有追索权	with recourse
无追索权	without recourse
流动资金	working funds
售后服务	after service
税	tax; duty
增值税	value added tax (VAT)
印花税	stamp duty
港口税	harbor dues
从价税	ad valorem duties
从价进口税	ad valorem import duties
免税	exempt duty
免税物品	duty-free article
免税进口	duty-free entry
优惠关税	preferential duties
优惠待遇	preferential treatment
现金交易	cash and carry

现金支付	cash payment
交货付款	cash on delivery
证明	certificate
合格证	certificate of conformity
交货证明书	certificate of delivery (C/D)
进口证明书	certificate of importation
检查证明书	certificate of inspection
制造厂证明书	certificate of manufacturer
产地证明书	certificate of origin
质量证明书	certificate of quality
收据	certificate of receipt
不如期交货	fail to deliver goods at the time stipulated
价格昂贵	high price
引进方	licensee
输出方	licensor
单价	unit price
总价	total price
运货单	waybill
违反合同	violation of contract
交货时间	time of delivery
支付期限	time of payment
装船期 装运期	time of shipment
价格偏低	underpriced
招标	tender invitation; invitation to bid; invitation to tender
投标	tender; bid
发出招标	put out to tender
公开招标	public tender
招标人	tenderee
投标人	tenderer
投标书	bidding documents
开标	open bids

可接受的报价

acceptable offer

最低价格

rock-bottom price

委托书

proxy statement

分包商

subcontractor



第二十二章

Chapter 22

办公用语

你是什么地方人？

Where do you come from?

我是英国人。

I'm English.

我来自伯明翰。

I come from Birmingham.

我讲英语和法语。

I speak English and French.

感谢你为我所做的一切。

Thank you for all you've done for me.

你好吗？

How are you ?

今天感觉怎样？

How are you feeling today?

你去哪儿了？

Where are you?

如果有什么要帮忙的，尽管开口。

If there's anything I can do for you, let me know.

谢谢，非常感谢！

Thanks, I appreciate that!

能告诉我商店在哪儿吗？

Can you tell me where the shop is?

它就在地下一层。出电梯往右拐。

It's on basement level one. Turn right when you get off the elevator.

您能告诉我到哪儿去复印吗?

Could you tell me where the copier is, please?

沿楼道一直走。复印室是靠右手第二间。

You just walk down this hallway. The copy room is the second room on the right.

有事要我帮忙吗?

What can I do for you?

我好像找不到餐厅了。

I can't seem to find the lunch room.

它就在楼下。

It's right downstairs.

我在找张先生的办公室。您知道它在哪儿吗?

I'm looking for Mr. Zhang's office. Do you know where it is?

对不起,不知道。

I'm sorry, I don't know.

你能指给我去银行的路吗?我迷路了。

Could you point me the direction of the bank? I've lost my way.

从这道楼梯下楼到一层往左。你不会找不着的。

Just take these stairs down to the first floor and turn left. You can't miss it.

你知道李先生的电话号码?

Do you have the number for Mr. Li?

在这儿呢,0531-85858888。

Here it is, 0531-85858888.

顺便也帮我捎点吃的来。

Pick me up something to eat too, please.

我需要李女士办公室的电话。

I need the number for Ms. Li's office.

请稍等,先生。在这里,87120024。

Just one moment, sir. Here you are — 87120024.

你要我什么时候把这些计划送到您的办公室,李先生?

When would you like me to send those plans over to your office, Mr. Li?

你最好能在周五下午以前把它们交给我,王女士。

It would be good if you could get them to me by Friday afternoon, Ms. Wang.

不成问题。请再说一遍具体地址好吗?

That shouldn't be a problem. What is the exact address, again?

涿源大街 777 号, 3 号楼, 301 室。

777 Luoyuan Avenue, Building 3, Room 301.

能告诉我您的电话号码和通讯地址吗?

Could you tell me your telephone number and mailing address?

当然可以。我的电话是 85859009, 我住在机一西路 3 号。邮编是 250022。

Sure. My number is 85859009, and I live at 3 Jiyixi road. The zip code is 250022.

我想搭你的车。

I was hoping to catch a ride with you.

你愿意我把样品留给您吗?

would you like me to leave the samples with you?

好, 你就先留下, 下星期什么时候再给我打个电话。

Yeah, why don't you do that, and then you can give me a call sometime next week.

耽误您的时间了。下星期再联系。

Thanks for your time. I'll talk to you next week.

我想知道你上星期准备的演示报告完成了没有?

I was wondering if you finished that presentation you were preparing for on last week?

快了。一两天就能完。

Just about. It should be done in the next couple of days.

李先生昨天问我这事了。

Mr. Li was asking me about it yesterday.

我会给他打电话的。

I'll give him a call.

我需要这些数字作统计。你算出来了吗?

I need those figures for accounting. Have you finished the calculations?

快完了。一小时之内我就能把它们准备好。

I'm just finishing now. I'll have them ready within an hour.

不用谢。好了我就给您打电话。

You're welcome. I'll call you when they're ready.

谢谢你, 先生。打扰了。

Thank you, sir. Sorry to trouble you.

哪儿的话, 夫人。告诉他用完后就交给我的秘书。

Not at all, ma'am. Just tell him to leave it to my secretary when he's finished with it.

你什么时候能把成品交给我?

When can you get the finished product to me?

最迟下周末就能准备好。

We should have it put together by the end of next week.

很好,这样就比计划提前了。干得不错。

Great! That'll be ahead of schedule! Good work.

过奖,常言道:我们的目标就是使别人满意。

Well, as the saying goes — we aim to please!

我们是不是去吃点什么,好好叙谈叙谈。

Why don't we grab a bite to eat and do some catching up?

好啊,干嘛不呢?我正好有点时间。你想去哪儿吃?

Yeah, why not? I've got a little free time on my hands. Where do you want to eat?

诸位好。我想简单自我介绍一下。我不知道你们中有多少人知道我。张先生退休后,我将接管市场部。我刚刚从美国 GE 公司调来,我在那儿做销售经理,从 2000 年一直至今。

Hi, everybody. I just want to make a brief introduction. I don't know how many of you know me. I'll be taking over the marketing division when Mr. Zhang retires. I've just come over from USA GE Co., where I was the Director of Sales from 2000 until this year.

这是李先生。刚从销售部调来。

This is Mr. Li. He's just come over from sales.

好啊,欢迎你的到来。李先生。

Good. Well, welcome aboard, Mr. Li.

对不起,王女士。您能告诉我党女士办公室的传真号码吗?

Excuse me, Ms. Wang. Could you tell me the fax number for Ms. Dang's office please?

没问题,就在这里。0531-85859888。如果这个号码不通,试一下 0531-85859035。

Sure. I have it right here. — 0531-85859888. If that one doesn't work, try 0531-85859035.

嗨,你是张先生吧?我是林云。我被指派负责你的培训,帮你了解公司情况。认识你很高兴。

Hi, Mr. Zhang? I'm Lin Yun. I've been asked to handle your training and introduce a little bit of the company to you. It's nice to meet you.

认识你也很高兴, 林云女士。这个公司似乎太大了。我真不知道能否适应得了它。

It's nice to meet you, too, Ms. Lin Yun. This company seems so big right now, I don't know how I'll ever get used to it.

一星期之后你就会轻车熟路了。我先给你一份各个部门的清单。每个部门旁边都标着它的位置和经理姓名。

After a week, you'll be running around here like a pro. Let me give you this list of departments, first. Next to each department is its location and the name of the manager.

太好了, 这能帮大忙了, 林云女士。

Great — That'll be a big help, Ms. Lin Yun.

好。我想请大家集中到这个项目上来。我们什么时候可以着手这项工作呢?

All right. I want to bring everybody in on this project. when can we start working on this?

嗯, 我们可以明早 8:00 先开一个战略方针会。

Well, we could probably get started with a strategy meeting tomorrow morning at 8:00.

我肯定要见你一面的, 李先生。我只是需要安排开我的时间。

I definitely want to meet with you, Mr. Li. I just need to sort out my schedule.

我知道你这几天时间排满了。可这件事我们必须得抓紧。

Well, I know you're pretty booked up these days. But, we've got to work fast on this.

这点我知道。我们没有时间耽搁了。我可以给你定在 10:30, 你看行吗, 李先生?

I realize that. We don't have any time to waste. I can put you down for 10:30.

Could you make that, Mr. Li.

让我想想, 没有问题。到那时见。

Let me see. That's no problem. I'll see you then.

李先生, 你今天能给我挤出点时间吗?

Mr. Li, can you squeeze me in sometime today?

这可够呛, 王女士。我的确忙不开。

That's a big order, Ms. Wang. I am really swamped.

我明白你的意思。可我必须在收税的之前跟你过一遍账。

I know what you're saying, but I have to go over the books with you before I go see our tax guy.

好吧,让我想想怎么办。2:30 怎么样?在我午餐会议后。超不过半小时吧?

Right. Okay, let me see what I can do. How about 2:30 right after my lunch meeting? It won't take more than a half hour, will it?

恐怕这星期我们的确人手不够,李先生。我们想给您服务,可就怕没有时间。

I'm afraid we are really short staffed this week, Mr. Li. I'd like to accommodate you, but I just don't think I'll have the time.

你的意思是不打算见我了吗?

Are you telling me you're not going to meet with me?

绝对不是,先生。我只是想挪到下星期。下周初我会空闲得多。

Not at all, sir. I'd just like to push it up to next week. I'll have a lot more free time at the beginning of next week.

好吧,我不愿意这样,不过我想也别无选择了。

Well, I don't like it, but I guess I don't have any choice.

李先生办公室。我是林云,能帮您吗?

Mr. Li's office. Lin Yun speaking. May I help you?

嗨,林云。我是华龙。我需要和李先生约个时间。

Hi, Lin Yun. It's Hua Long. I need to book some time with Mr. Li.

没问题,华龙先生。你想什么时候见他?

Certainly, Mr. Hua Long. When would you like to meet with him?

你能看看他星期三是怎么安排的吗?

Can you see what his schedule is like on Wednesday?

我能跟你约个时间一起看一下培训手册吗?

Can I set up a time with you to go over the training manual?

可以。让我拿日历来。行,我星期二一天没事,星期四上午也行。

Sure. Let me just grab my calendar. All right. I'm free all day Tuesday and Thursday morning.

星期二上午对我合适。10:30 到我办公室怎样?

Tuesday morning is good for me. How about 10:30 in my office?

好。没问题。到时候见。

Okay. Sounds good. See you then.

咱们下周开会前先见一下面，华龙。我有些想法想和你交换一下。

Let's meet before next week's meeting, Hua Long. I want to kick around some ideas with you.

没问题。我一星期都不太忙。对我来说任何时间都行。

No problem. I've got a really light week. Anytime's fine by me.

那好，咱们就下星期一下午见。三点左右？

Well, let's plan to get together next Monday afternoon, around 3 o'clock?

行，我在本子上记一下。

All right, I'll put you in my book.

我得在你休假之前见你一次，佳能。有几件事需要弄清楚。

I'll need to meet with you before you go on vacation, Jia Neng. I have a few things to clear up.

我很乐意。可我这星期时间太紧了。我想唯一的空闲是星期三午饭时间。

I'll be glad to. But my schedule is super tight this week. I think the only time I have free is at lunch on Wednesday.

这行。我没问题。

That's fine. I can make that.

好，那么我们星期三中午见。

All right, then. I'll see you at noon on Wednesday.

我想在咱们今天散会前定下开这个会的时间。你们能看看你们的时间安排吗？

I'd like to set a fixed time for this meeting before we finish today. Can you all take a look at your schedules?

星期四上午总是这儿最空闲的时候。咱们可以定星期四上午 10:00。

Thursday mornings are usually the slowest around here. Why don't we set it for Thursday at 10:00 a. m. ?

我不行。周四上午 9:30 我已经有了个例会。星期三下午 2:00 怎样？

That's out for me. I already have a standard meeting on Thursdays at 9:30 a. m.

How about Wednesday afternoon at 2:00 p. m. ?

我们部门没问题。不知道你们其他人觉得怎样。

That's all right for my department. I don't know how the rest of you feel.

文治，我需要找个时间和你们大家碰头。

Wen Zhi, I need to work out a time to get together with your people.

每个人都必须到吗？林云和佳能这星期在休假。

Does everybody need to be there? Lin Yun and Jia Neng are on vacation this week.

最好每个人都能到。下周定个时间如何？

It would be best if everybody could be there. How about next week sometime?

我来看看时间表。我下午给您回话，行吗？

Let me take a look at the schedule. I'll get back to you this afternoon, all right?

我们需要大家同心协力投入到这个项目上来，因此我想和大伙儿定时间在下星期开个会，听取各位的建议。

We're going to need everybody's input on this project, so I'd like to fix a time to meet next week and hear what you all have to say.

我倾向于定在上午。下周大部分的下午我得外出。

I'd prefer to meet in the morning. I'm going to be out of the office most afternoons next week.

我没问题。咱们就定在星期三上午9:30吧。如有必要星期四可以继续。

I don't have any problem with that. Let's set it up for 9:30 Wednesday morning.

We can carry it over to Thursday if we need to.

好的。你们大家怎么想？

That's fine. What do the rest of you think?

喂，是维修部吗？

Hello? Is this the Maintenance Department?

对，是的。什么事？

Yeah. That's right. What can I do for you?

我们的打印机有很多问题。你能下午过来看看吗？

We're having a lot of trouble with our printer. Could you come and take a look at it sometime this afternoon?

让我看看，好，没问题。我大约两点多钟过去。

Let me see. Yeah, all right. I'll be over about two.

打扰了，周强。你这会儿忙吧吗？

Excuse me, Zhou Qiang? Are you busy at the moment?

不太忙，林云。有事吗？

Not really, Lin Yun. What do you need?

我的传真机快坏了。你能帮我看看吗？

My fax machine's on the blink. Would you take a look at it?

好。我还有一件事先要做。我大约 10:00 上去怎么样?

Sure. I just need to do one other job first. How about if I come up around 10:00?

刘芳女士?我正盘算着哪天开一个新年聚会。你看看这几天行吗?

Mrs. Liu Fang? I've been trying to figure out when we should have the New Year's party. Could you take a look at these dates?

当然。29号不行了。我要外出开一整天演讨会。28号或30号都行。

Sure. The twenty-ninth is out. I'll be out of the office all day at seminar. Either the twenty-eighth or the thirtieth is fine.

嗯,那我们就定30号吧。可以从3点开到5点。这样的话,大家可以结束后就回家。

Well, why don't we make it the thirtieth? We can set it up from three to five. That way, everybody can just go home afterwards.

我觉得不错。你来做请柬,我得走了。五分钟后我有个会。

Sounds good to me. You make up the invitations, I've got to run. I've got a meeting in five minutes.

谢谢你的申请,刘先生。李先生想在下周早些时候约你面谈一次。你有时间吗?

Thank you for your application, Mr. Liu. Mr. Li would like to set up an interview for early next week. Do you have time?

有,夫人。除星期五上午,下周哪天都行。

Yes, ma'am. I could come in any day next week, except for Friday morning.

好。让我看看他的时间表。他星期二下午一点半有空,到时你能来吗?

Fine. Let me take a look at his schedule. He's free on Tuesday afternoon at 1:30.

Could you come in then.

是的。很好。

Yes. That would be fine.

那么,我下星期来见你,张洁女士。

Then, I'll see you next week, Ms. Zhang Jie.

好。就定在星期二中午。带上你的作品。

Yes. Let's say Tuesday at noon. Bring your portfolio with you.

当然。还有其他什么东西你想让我带来吗?张杰先生。

Certainly. Is there anything else you would like me to bring, Ms. Zhang Jie.

不用,就这些。我已经有你的履历表了。

No, that's all. I already have your resume.

那么,李先生。再次对耽搁表示道谦,但您下次回来时我们会把所有的事办妥的。

Well, Mr. Li. I'm sorry, again, for the delay, but we should have everything completed by the time you get back.

我当然希望如此了。我们可以安排在27号见面吗?这样你们会有足够的时间。

I certainly hope so. Can we arrange to meet on the 27th? That should give you enough time.

是的,先生。还有富余。谢谢您的理解。咱们是不是可以定在27号上午10:00?

Yes, sir. That's more than enough time. I do appreciate your understanding. Why don't we say 10:00 o'clock on the 27th?

好,张女士。到那时见。

Fine, Ms. Zhang. I'll see you then.

好的,林云女士,您将什么时候到达本城?

All right, Ms. Lin Yun, when will you be arriving in the city?

我将乘上午11:30的飞机到达。办公室离机场有多远?

I should be coming in on the 11:30 morning flight. How far is the office from the airport?

只有25分钟左右。我会派人接您。星期五15号,上午11:30,对吧?

Only 25 minutes or so. We'll send somebody to meet you. That's 11:30 a. m. Friday the 15th?

对。我会在行李区等着。

That's right. I'll be in the baggage area.

林云吗?我们今天为高朋举行告别聚会。

Lin Yun? We're having a farewell party for Gao Peng today.

什么时候?我真想去,可我今天的日程表实在太满了。

What time? I'd like to go, but my calendar is really full today.

我们12:00开始,预计要开整个下午。

We're starting at 12:00 and it'll go on for the rest of the afternoon.

我尽量争取。我大约在三点左右能抽出点时间来。

I'll try to make it. I should be able to fit sometime in around 3 o'clock.

早上好,李先生。我是刘芳,张先生的秘书。张先生让我与您约定一个会晤。
Good morning, Mr. Li. This is Liu fang, Mr. Zhang's secretary. Mr. Zhang has asked me to set up a meeting with you.

没问题,刘女士。等我拿一下记事簿。我的秘书出去了。我一切都乱了。
Certainly, Miss Liu, let me get my book. My secretary's out, and I can't keep anything straight!

我能理解。您愿意让我待会儿再打来吗?

I understand. Would you like me to call you back?

不必,这就行。30号下午4:00怎么样?一小时够吗?

No. That's all right. How about the 30th at 4:00 p. m? Is an hour enough?

我的确想见你一面,看看你们的产品目录。我们正在重新装修,也准备添置些东西。

I do want to meet with you and take a look at your catalogue. We're redecorating and are going to add some things.

好啊,我愿意帮你解决问题。下周二周四的任何时候我都可以出来。

Well, I'll be glad to help you out. I can come out anytime on Tuesday or Thursday of next week.

那咱们就定在星期四下午1:30。我们肯定需要一些新文件柜和至少一套组合办公桌。

Let's put it down for 1:30 on Thursday afternoon. We'll definitely need some new filing cabinets and at least one desk unit.

好。星期四我把我们的办公家具和办公设备的目录都带来。

Fine. I'll bring both our office furniture and equipment catalogues on Thursday.

罗刚,能和你见个面谈谈我们部门的预算问题吗?

Luo Gang? would it be possible to meet with you to discuss my department's budget?

当然啦,林云。让我查查我的时间安排。我12号有空,也就是这星期四,上午9:00。

Of course, Lin Yun. Let me look at my schedule, I have some free time on the 12th. That's this Thursday at 9:00 a. m. .

行,这不错。你能大略说说明年我们能有多少钱吗?

All right. That'll be fine. Can you put together a rough idea of the Kind of money I'll have available for the next year?

可以。我已经为所有部门制定了一个总预算。

Certainly. I've already worked out a general budget for all the departments.

噢，美芳。我们打算给你个生日的惊喜。但是你的确太忙了。你能跟我讲你什么时候有空吗？

Well, Mei Fang. We were going to try to surprise you for your birthday. But you're just too busy! Can you tell me when you'll be free?

哦，罗刚。你们真太好了。我非常想和大伙儿聚一聚。星期五怎么样？

Oh, Luo Gang. That's really sweet of you guys. I would love to get together with all of you. How about Friday?

太好了！什么时间？

Great! What time?

我一下午都有空。我们1:00在大厅里见好吗？

I'm free all afternoon. Why don't we meet at 1 o'clock in the lobby?

东方，有几件事我需要和你一起核审一下。

Dong Fang, I need to go over a few things with you.

当然好，罗刚先生。您什么时间方便？

Certainly. Mr. Luo Gang. When would you like to meet?

我想在今天下午，销售会议之后。

I was thinking about this afternoon, after the sales meeting.

好，就在3:30？

Fine, at 3:30?

美芳，请你帮我个大忙。

Mei Fang, I have a big favor to ask you.

多大的忙，林云？

How big, Lin Yun?

是这样。我希望你能替我出席一下今天下午的战略会议。

Well. I was hoping you would cover for me at the strategy meeting this afternoon.

可我不行，林云。今天下午我得连续开两个委员会会议。

But, I can't, Lin Yun. I've got two committee meetings back to back this afternoon.

您能在那里稍坐一下吗，夫人？我这就告诉罗刚先生您已经到了。

Would you please take a seat over there, madam? I'll let Mr. Luo Gang know that you're here.

谢谢。我可以在这里等。

Thanks. I can wait here.

是这样，也许得等候一段时间。这会儿罗刚先生正在开会。在那里等可能会更舒服些。

Well, it may take some time. Mr. Luogang's at a meeting at the moment. It would probably be more comfortable over there.

我明白了。那么好吧。谢谢。

I see. All right, then. Thanks.

嗨。是总务处吗？

Hi. Is this supply?

是总务处。能为你做什么吗？

Yeah. This is supply. What can I do for you?

我是发展部的林云。我需要两盒公司信笺，一盒圆珠笔和一盒信封。

This is Lin Yun in Development. I need two boxes of company letterhead, one box of ball-point pens, and a box of envelopes.

好，没问题。你的分机号码是什么？

All right. No problem. What's your extension?

嘿，林云？你是去买盒饭吗？

Hey, Lin Yun? Are you getting take-out?

是啊，你要什么吗？

Yeah, do you want something?

是的，谢谢。你能给我买份鸡肉沙拉三明治，一份薯条和一大杯减肥可乐吗？

Yeah, thanks. Could you pick me up a chicken salad sandwich, an order of fries, and a large diet coke?

没问题。你身上有现金吗？我的钱恐怕不够了。

No problem. Do you have any cash on you? I don't think I have enough.

杜邦，你记着把我借给你的软件带来了吗？

Du Bang, Did you remember to bring back that software I lent you?

噢，林云！对不起。全忘在脑后了。

Oh, Lin Yun! I'm sorry. It completely slipped my mind!

没关系，杜邦。如果你能明天把它带来，我会很高兴的。

That's okay. Du Bang. If you could just bring it in tomorrow, I'd appreciate it.

一定。我真的非常抱歉！

Definitely. I'm really sorry!

假期过后我们将需要许多新东西。咱们先列张单子。

We're going to need a lot of new stuff after the holidays. Let's make a list.

好的, 李林先生。你是怎么考虑的?

Fine, Mr. Li Lin. What do you have in mind?

嗯, 首先我们先得给你买张新桌子, 另外我想替换掉那台旧打字机。

Well, to begin with, we're going to have to get a new desk for you and I'd like to replace the old typewriter.

好! 我赞成! 我们是该再要一台了! 我这就去办! 您还想订些什么?

Yes! I agree! We could really use another one! I'll get on that right a way! What else would you like to order?

李林先生, 杜邦先生打来电话, 他想知道您能否将那些培训材料送过去。

Mr. Lilin, Mr. Dubang's on the phone. He'd like to know if you can send over those training manuals?

噢, 告诉他我明天下午把它们送到他的办公室。

Oh, tell him I'll leave them at his office tomorrow afternoon.

他希望您今天下午就把它们送去。

He was hoping that you could drop them off this afternoon.

这恐怕不行。这些材料正在复印店里复印, 明天下午 1:00 才能拿回来。

I'm afraid that I can't do that. They're at the printer's being copied. They'll be back tomorrow afternoon before 1 o'clock.

对不起, 杜邦先生? 我走之前需要您在这些上签个字。

Excuse me, Mr. Du Bang? I just need you to sign these before I leave.

当然, 林云。对不起让你等了这么久。如果你没有提醒我的话, 我可能会忘得一干二净。

Sure, Lin Yun. Sorry to have kept you waiting. If you hadn't told me, I probably would have just forgotten all about them.

这是我的职责, 先生。这里再签一个就可以了。

That's my job, sir. Just one more signature here, please.

给你。

There you are.

我不愿对你如此, 林云, 可我不得不请你再加些班。

I hate to do this to you, Lin Yun, but I'm going to have to ask you to put in some

more overtime.

非得在今天下午吗, 杜邦先生? 我已经有安排了。

Does it have to be this afternoon, Mr. Du Bang? I've already made plans.

嗯, 我希望能今天做, 可是如果你已经作了安排, 我们可以明天做。

Well, I would have preferred to do it today, but if you've already made plans, we can do it tomorrow.

如能这样我很感激, 先生。您考虑让我待多久?

I'd appreciate that, sir. How long do you think you'll need me to stay?

李林先生? 我有一份采购部的申请需要您的批准。

Mr. Li Lin? I have a request here from purchasing that needs your approval.

让我看看。是要买台带调制解调器的 586 电脑。是给谁用的?

Let me take a look. This is for a 586 computer with modem. Who's it going to?

我想是给周洁女士办公室用的。

I believe it's going to Ms. Zhoujie's office.

请给她打个电话, 我得核实一下。

Get her on the phone, please. I need to clarify this.

杜邦? 你能也在这份批准书上签字吗? 财务部现在变得越来越严格了。

Du Bang? Could you co-sign this approval sheet? Accounting's getting really picky.

我知道。他们已经退回我送的两份批准书了。我在哪儿签字呀?

I know. They've already sent back two approvals I sent them. Where do I sign?

在这儿。这是我们购置新传真机的报告。

Right here. It's for that new fax machine we're getting.

噢, 对。我想起来了。给你。希望你不会遇到我那么多麻烦!

Oh, right. I remember. There you are. Hope you don't have as many problems as I had!

你能替我给杜邦先生打个电话吗, 王宁, 我需要和他一起核对些东西。

Could you call Mr. Du Bang for me, Wang Ning, I need to go over some stuff with him.

当然, 李林先生。您能再告诉我一遍他的分机号吗? 我还没来得及把所有号码都记下来呢。

Of course, Mr. Li Lin. But, could you tell me his extension number again? I haven't got all the numbers down yet.

可以, 9-0-0-9. 别着急。你干得很好。

Sure, it's 9-0-0-9. Don't worry. You're doing a fine job.

非常感谢, 李林先生。

Thank you very much, Mr. Li Lin.

嗨, 杜邦。今天好吗?

Hi, Du Bang. How are you today?

很好, 方荣先生。您能在这份备忘录上签个字吗? 今天下午我想发给大家。

Just fine, Mr. Fang Rong. Could you please sign this memo? I want to get it out to everybody this afternoon.

没问题。就这一份吗?

No problem. Is this the only one?

没了, 今天就这一份。谢谢。

Yes. That's it for today. Thank you.

嗨, 方荣。你能跟我去趟供给处吗? 我得领一大堆东西。我怕我拿不了那么多。

Hi, Fang Rong. Would you come with me to supply? I've got to pick up a load of stuff and I'm afraid I can't carry it all.

没问题, 林云。等我拿上大衣。

Sure, Lin Yun. Let me just grab my coat.

谢谢。感谢你的帮忙。要我自己得跑两三趟。

Thanks. I appreciate the hand. I'd have to make two or three trips on my own.

不算什么。很乐意帮忙。

Don't mention it. I'm glad to help.

李林先生, 我觉得该买台新电脑了。

Mr. Li Lin? I think it's time to get a new computer.

怎么啦? 林云。我想现在这台还可以嘛。

Why, Lin Yun? I think the one we have is fine.

对于我们现在要做的工作, 这台计算机太慢了。我们的确需要一台高档一些的了。

For the amount of work we do on the computer these days, the one we're using is just too weak. We really need a higher model.

好吧, 我考虑一下。我不知财务部门是否会同意这么大一笔开销。

Well, I'll think about it. I don't know whether accounting is going to agree to such

a big purchase.

这是我老板想要的，梦露。他想要一份详细的费用及设备成本清单。

This is what my boss is expecting, Meng Lu. He wants a detailed list of expenses and equipment costs.

把这些都做起来得费些时间的，杜邦。

That's going to take a while to put together, Du Bang.

越快越好，梦露。我想不拿到这个他不会在任何东西上签字的。

The sooner, the better, Menglu. I don't think he'll sign anything till he's got that in his hands.

我现在就去做。还有别的什么吗？

I'll get to work on it right away. Anything else?

方容先生？你能帮我看一眼这个吗？

Mr. Fang Rong? Could you please take a look at this for me?

当然可以，林云。什么问题？

Certainly, Lin Yun. What's the problem?

是这样，我一直做得好好的，可我存盘后屏幕一动不动了。

Well, I was doing fine until I went to save the file and then everything froze.

让我来看看。

Let me take a look.

方容？我想你准会喜欢这套新的文字处理系统。

Fang Rong? I think you're really going to like this new word processor.

我不会。我讨厌电脑。

Not me! I hate computers.

你会的。真的。它操作起来很容易，而且可以为你干任何事。只需按键就行了。

No, really. It's so easy to use and it does everything for you. It's all at the touch of a button.

我不信。只不过你觉得容易而已。

I don't believe it. It just seems easy to you.

好吧，林云。我知道我虽然是这儿的老板，可我晕头转向了。你怎么让它运转起来的？

All right, Lin Yun. I know I'm supposed to be the boss here, but I am at a complete loss! How do you get this thing to work?

我来看看，李林先生。是什么问题？

Let me take a look, Mr. Li Lin. What seems to be the problem?

嗯，我以为只需点这个键就能打印。

Well, I thought all I had to do was push this button here to print.

这是对的。可我们这里有两台打印机。你得告诉计算机你用哪台。

Well, that's fine, but we have two printers here. You have to tell the computer which printer you want to use.

干得好，方容。一般人掌握这点要花的时间可多多了。

Good work, Fang Rong. It usually takes people a lot longer to get a grip on this.

嗯，我曾经试过这个软件包。一旦你知道了命令，运行起来就一帆风顺了。

Well, I've had some practice with this package. Once you know the commands, it's pretty smooth sailing.

是这样。既然你掌握了基本用法，我就来教你些更高级的功能。

That's true. Now that you know the basics, let me show you some more advanced functions.

好！就开始吧。

Great! Go right ahead.

好，方容。首先，输入你的密码。就选一个你容易记住的密码。

All right, Fang Rong. To get started, you enter your password. Just choose a simple one that'll be easy to remember.

那好。L-I-N-G 怎么样？这是我儿子的名字。

Okay. How about L-I-N-G? That's my son's name.

行。密码输入之后你需要键入 X-Y-S 起动程序。

Fine. And after you've entered that into the system, you need to type X-Y-S to run the program.

X-Y-S。我知道了。然后出现主菜单。

X-Y-S. I see. Then the main menu comes up.

好了，今天是你培训的最后一天，梦露。你对这套新系统感觉怎样？

Well, this is your last day of training, Meng Lu. How do you feel using this new system?

我感觉比较自如了。只是有几点问题需要弄明白。

I feel pretty comfortable with it. I just need to clarify a few things.

没问题。你想知道什么？

Sure. What do you need to know?

嗯，我不太清楚如何插入一个文件，还有怎么把图片贴到文字区域上去。

Well, I'm not very sure how to import a document or how to overlay a picture onto a text.

好的，佳宝。这种想法对。但是你把数字的顺序输错了。

Okay, Jiabao. That's the right idea. But you're putting the figures in the wrong order.

我不知道这些数字还有顺序。

I didn't realize these had to be in order.

有。按你的顺序，计算机不会认这些数字的。

Yes, the computer can't read the figures the way that you're putting them in.

噢。那我应该怎么输入呢？

Well, how should I be entering them?

梦露，我知道我不笨，可这个软件简直要把我逼疯了。

Meng Lu, I know I'm not stupid, but this program is really making me crazy!

怎么出的麻烦？

What's giving you trouble?

嗯。我设计好了这个图案然后把它合并到文字里。但是当打印时，它们都乱了。

Well. I've put together this design and I've merged it with the text. But when I go to print it, it all runs together.

也许是你把文本边缘宽度设错了。我看看。

It may be that you've set the wrong margins for your text. Let me see.

美芳，帮帮我行吗？

Mei Fang? Can you give me a hand?

当然，怎么了？

Sure. What's wrong?

哦，我把系统打开了。可我的文件打不开。

Well. I've got the system running, but I can't open my file.

让我看看我能不能把它打开。

Let me see if I can get it to work.

马彬。来看这个。这个新的电脑系统妙极了！

Ma Bin. Let me show you something. This new computer system is amazing!

有什么特别的？

What's so special?

你看这儿。这比我们前一台快两倍。再看看它的打印质量!

Take a look at this. It's got to be twice as fast as our last system and look at the quality on the printout!

真棒。使用起来容易吗?

That's fantastic. Is it easy to use?

麦克? 我不会启动这个图形软件。你能看一眼吗?

Mai Ke? I can't get this graphics program to run. Can you take a look?

可以。噢,你是命令错误。来,我来告诉你。

Sure. Oh, you're using the wrong command. Here, let me show you.

非常感谢。这是我第一次用这个软件。

Thanks a lot. This is the first time I've used this program.

没事。熟悉起来得花点时间。可实际上它特别好用。

No problem. It takes a while to get used to, but it's actually pretty easy to use.

我什么都试过了,可是我还是打印不好这些图表。你知道怎么做吗?

I have tried everything and I still can't get these charts to print, properly. Do you have any idea how to do it?

我来试试。我想你的打印参数设置不对,我来改几个数吧。

I'll try. I think you have the printing parameters set incorrectly. Let me just change a few numbers.

就这么简单啊?我可真笨!对不起麻烦你了。

That's all it takes? Do I feel stupid! Sorry to trouble you.

一点也不麻烦。有时,只要多一双眼睛就能找到问题。

No trouble at all. Sometimes it just takes an extra pair of eyes to see the problem.

马彬,我需要你的帮助。

Ma Bin, I need your help!

怎么啦,林云?计算机又有问题啦?

What's wrong, Lin Yun? Having problems on the computer again?

你怎么猜到的?我跟这台机器算是没缘。我只想看看我的活儿打印出来是什么样!

How'd you guess? I have no luck on this machine. All I want to do is look at how my work will appear when I print it out!

这不成问题,按一下功能键F8,就能出来你要的那一屏。

That's no problem. Just press function key number eight. That'll bring up the screen you need.

好吧，林云。你让我做的我都做了，可这计算机就是不做我让它做的事。

All right, Lin Yun. I have done everything that you told me to and this computer still won't do what I want it to.

到底是什么问题，杜邦？你肯定照我说的做了吗？

What's giving you trouble, Du Bang. Are you sure you did everything as I told you to do?

绝对的。首先我敲“X-R-S”进入系统，然后是密码，然后敲 G-R-A-P-H 调入我要的文件，可什么也没出来。

Absolutely! First, I type d “X-R-S” to access the system, then my password, then G-R-A-P-H for the file I wanted, but nothing came up!

你忘了一件事，你敲 G-R-A-P-H 之前得敲 C: (冒号)。

You forgot one thing. You have to type a C: (colon) before you type G-R-A-P-H.

我来教你这个系统的一些高级功能，梦露。你看这儿，这里有一个做合并用的图标。

Let me explain a few of the more advanced features of this system, Meng Lu. If you look here, there's an icon for merging.

是的，看到了。怎么用呢？

Yes, I see it. How does it work?

当你在一个文件里时，你点一下这个图标。然后打入你想合并进去的文件名。

Well, you click on the icon while you're in a document and then type the name of the document into which you want to merge.

这样我在填信封时能省很多做地址清单的时间了。我来试试。

That'll save me a lot of time on mailing list and when I'm addressing envelopes.

Let me give it a try.

干得好，杜邦。你知道怎么把屏幕上的内容打印出来吗？

Good work, Du Bang. Do you know how to print out what you have on the screen?

我想行。我只要按功能键 F9 然后回车三次就能打印，对吗？

I think so. All I have to do is press the function nine key and then return three times to get it to print, right?

对，可如果你要改变纸的尺寸或打印张数呢？

Right, but what if you want to change the paper size or the number of copies?

那么当它提问是否要作改动时我就打“Y”表示“Yes”。

Then, I just type Y for “yes” when it asks me whether I want to make any changes.

李林，是否可以增大字符而又不影响图像或改变整个文件？

Li Lin, Do you know if it's possible to increase the font size in the text without disturbing the image or altering the overall document?

这不应该成问题，刘芳。咱们先把图形挪到一边。点住图像然后把它拖到右边。

That shouldn't be a problem, Liu Fang. Let's move the picture over to the side first. Click onto the image and drag it over here to the right.

好。然后我做什么？

Okay. Now, what should I do?

现在点文字块，增大字符。只要你的文字始终保持在一个块里，就不会有问题。

Now, click onto the text block and then increase your font size. As long as all your text is in one block, it shouldn't be a problem.

华龙，我想你准会喜欢这个功能的。

Hua Long, I think you're going to get a kick out of this feature.

那是什么，美芳？我还没怎么用过这个软件呢。

What's that, Mei Fang? I haven't done much with this software package.

用这个软件你可以在电脑上做你所有的幻灯片。你甚至可以任意移动，放大或缩小。

With this package, you can do all of your slides on the computer. You, can even move them around, enlarge them or shrink them.

这样一来我的演示工作会简单多了。给我演示一下你怎么做，好吗？

That's going to make my presentations a lot simpler. Why don't you show me how you do that?

对不起，林木先生？我一直都进行得不错，可现在突然卡住了。我想是键盘锁死了。

Excuse me, Mr. Lin Mu? I was doing fine up to now, but then I got stuck. I think the keyboard's frozen.

让我来瞧一眼。是这样，你得重新启动系统。取出软盘然后同时按 Alt, Delete 和 Control 键。

Let me take a look. Yes, you're going to have to re-boot the system. Take your disk out and press the Alt, Delete, and Control keys simultaneously.

噢。好啦。系统又恢复了。可我还是不清楚刚才我什么地方错了。你瞧一下我的操作好吗？

I see. Okay. The system's come back up. But I'm still not sure what I did wrong. Could you watch what I'm doing for a minute?

当然。你做吧，我瞧瞧能否找出问题。

Certainly. Go ahead and I'll see if I can spot the problem.

林云？这是设置边缘和行宽的正确画面吗？

Lin Yun? Is this the correct screen for setting margins and line lengths?

是的，梦露。现在你只需要点取你所要的尺寸然后回车。

That's right, Meng Lu. Now you just have to click on the sizes you want and enter.

好。如果我要想改变它的字体怎么办呢？

Okay, what if I want to change the typeface?

那你还得进入另一屏。点这个角上的图标，它会给你列出所有可供选择的字体。

Then you have to go into a different screen. Click onto the icon here in the corner.

That'll show you the available typefaces.

林丽，我找不到我昨天做的那个文件了。你有什么办法吗？

Lin Li, I can't locate the document I was working on yesterday. Do you have any idea what to do?

你确信你存盘了吗？

Are you positive that you saved it?

我肯定存盘了。我做了整整一下午，然后存的盘。我就是今天早上作了几处修改，可我现在找不到它了。

I'm sure I did. I worked on it all afternoon and then I saved it. I just had a few changes to make this morning and now I can't find it.

我不知道该怎么跟你说，李天。你搜索过各个目录吗？

I'm not sure what to tell you, Litian. Have you done a directory search?

林丽！我终于使这个软件运行起来了。我一口气没歇整整干了两天。

Lin Li! I finally got this program to run! I've been working on it for the last two days, non-stop!

祝贺你！你使的什么招？

Congratulations! What did the trick?

事实上办法很简单。我仅仅改变了一些命令的顺序，再插入一个我忘掉的命令。

It was a really simple solution actually. I just had to change the order of some of my commands and insert a command I had left out.

干得不错！现在，也许你能帮我把我的软件运行起来！

Good job! Now, maybe you can help me get my program running!

我需要你大力帮忙呢，刘芳。我全糊涂了。

I'm going to need a lot of help with this, Liu Fang. I'm really confused!

这正是我在这里的目的，杜邦。咱们一步一步来。系统启动了吗？

That's what I'm here for, Du Bang. Just take it one step at a time. Have you got the system booted up?

启动了。我只能做到这一步。现在屏幕上显示 C: >。可我不知道该做什么了。

Yeah. That's as far as I've gotten. I'm looking at a C: >, but I'm not sure what to do now.

好，敲 W-I-N 进入主菜单。看见这些图标了吗？点取写着 WP5.1 的图标。这是我们要使用的文字编辑器。

Okay. Type W-I-N to bring up the main menu. See all of those icons? Click on the one that says WP5.1. That's the word processor we'll be using.

我写完这个文件了，林云。可我不知道怎么存盘。

I'm finished with the document I've been working on, Lin Yun, but I'm not sure how to save it.

你想把它打印出来吗？

Do you want to print it out?

不用。我只想把它存起来以便明天作些补充。

No, I just want to save it so I can add some more to it tomorrow.

那好。按 Escape 键再选菜单第二项。这样就会存盘然后带你回到主菜单。

All right. Then press ESCAPE and select the second option on the menu. That will save it and take you back to the main menu.

金贝？怎么做磁盘格式化的？我记不起来了。

Jin Bei? How do you format a disk? I can't remember.

先打 CD \ (反斜杠) DOS 然后回车。再打 Format A: (冒号)。

First, you type CD \ (backslash) DOS and enter. Then type FORMAT A: (colon).

好。我明白了。然后它让我插入一张磁盘。太好了。对不起，麻烦你啦。

Okay. I see. Then it asks me to insert a disk. Great. Sorry to trouble you!

没关系。一点也不麻烦。

That's all right. It's no trouble.

金贝？问你个简单问题。

Jin Bei? I've got a quick question for you.

行。什么问题？

Sure. What do you need?

我想打印前把打印纸尺寸由 A4 改成 A3，可我不知道怎么进入那个界面。

I'm trying to change the paper size from A4 to A3 before I print out, but I can't seem to get into that screen.

你得先进入打印模式，然后它会问你是否需要改动。看见了吗？

You have to go into print mode first and then it will ask you if you want to make any changes. See that?

嘿，林力，你知道这是什么意思吗？“读盘失败：放弃，重试，失败”？

Hey, Lin Li, Do you know what this means: "Failure to read disk: abort, retry, fail"?

知道。你的磁盘出了问题。是新盘吗？

Yes. There's something wrong with your disk. Is it a new one?

是新盘。我刚从盒子里取出来的！

Yeah. I just pulled it out of the box!

那我知道是什么问题了。你还没格式化磁盘呢！

Then I know what the problem is. You haven't formatted your disk!

你是怎样用计算机设计传单的，金贝？记得吗，你为马丁退休聚会设计的那种？

How did you do that flier on the computer, Jin Bei? You remember, the one you did for Mading's retirement party?

记得。我用的是一个叫 Smart Draw 的软件。怎么了？

I remember, I used a software package called Smart Draw. Why?

我在为我们办公室圣诞聚会设计个东西。我要做一个有两张图像和十行文字组合的请柬。

I'm trying to put something together for our office Christmas party. I have two images and ten lines of text to combine for an invitation.

如果是这样我要用 Adobe Illustrator 而不用 Smart Draw, 这个用起来更简单。就点那个写着 Adobe 的图标。

In that case, I would use Adobe Illustrator instead of Smart Draw. It's easier to use. Just click onto the icon that says Adobe.

我已完成了所有的学习界面, 金先生。我现在该做什么了?

I worked through all of the training screens, Mr. Jin. What should I do now?

继续下去, 试着做一个实际的文件。你想做什么呢?

Go ahead and try to work on a regular document. Is there something you'd like to work on?

有的。有些东西我一直想做。我来开始做这个吧。

Yes. I have something here that I've been wanting to work on. I'll start on that.

好, 有问题打电话给我。

Fine. If you have any questions, call me.

我想给这个文件加一个密码, 你知道怎么做吗, 林木?

I want to create a password for this document. Do you know how to do that, Lin Mu?

知道。很容易。按 Control 和 O 键, 再按 P 键。然后它会让你输入你的密码。

Yeah. It's easy. Press CONTROL "O" and then "P". Then it will ask you for your password.

敲入密码之后怎么办呢?

What do you do after you've typed in your password?

回车就行了。

Just press "ENTER" and you're done.

金贝? 你能来一下吗?

Jin Bei? Can you come here for a moment?

可以, 李林。什么问题?

Sure, Li Lin. What's wrong?

我想是我的鼠标出问题了。它不太好用了。

I think there's something wrong with my mouse. It's not working properly.

让我看看。有时这些滚轴会卡住的。

Let me take a look at it. Sometimes these rollers get stuck.

梦露女士，我已经学完培训软件了。我是否可以进入高级界面了？

Ms. Meng Lu, I've completed the training software. Should I move onto the advance screen?

当然。只要你觉得有把握，就接着往下走。

Sure. As long as you feel confident, go right ahead.

我怎么进入到那个界面呢？

How do I access that screen?

双击右上角的图标就行了。

Just click twice on the icon in the far right upper corner.

我想把这个软件包介绍给你。肯定会给你省去许多麻烦，而且实际上使用起来也很容易。

I want to introduce this new software package to you. It'll definitely save you a lot of trouble and it's basically pretty easy to use.

这是否和我们过去用的系统相似？我觉得那套系统不错。

Is it at all similar to the system we were using before? I thought that one was fine.

比起我们一直用的软件来，这套软件包可以让你做更多的事情。另外我想你会发现它比上一套用起来容易得多。咱们先来看看这本说明书吧。

The software package will let you do a lot more than the one we've been using, and I think you'll find it's easier to use than the last one. Let's start by taking a look at this manual.

好吧，我就来试试。

All right. I'll give it a shot.

林丽，我不知道你想怎么处理这笔账。我想有几点得弄清楚。

Lin Li, I'm not sure how you want to handle this account. I think there are a few things to be sorted out.

我同意，马克。我认为我们面临的最大问题是如何使其保持在预算之内。

I agree, Ma Ke. I think the biggest problem we're facing is how to bring it in under budget.

是这样。可除此之外，还有个不超过最后期限的问题。

That's true. But even beyond that, there's the question of meeting the deadlines they've set.

对。你瞧，我们可以把所有要解决的问题列一个表。这样办起来容易些。

Right. Look, Why don't we make a list of the problems we're dealing with. It'll

be easier to work through them that way.

李林，我们能讨论一下你定的奖金方案吗？我有几个问题。

Li Lin, Can we talk about this bonus plan of yours? I've got a few problems with it?

当然，王路。你是怎么考虑的？

Sure, Wang Lu. What's on your mind?

嗯，坦率地说，我觉得我们没有那么多的钱来实现你的方案。

Well, to be honest, I just don't think we're going to have enough funds to give the kind of bonuses you have in mind.

好，为什么我们不可以坐下来，算一算钱数？如果必要，我们随时可以缩小奖金幅度的。

Well, why don't we sit down and work out the numbers? We can always scale down the bonuses if we have to.

林木。胡佛中心方案出了麻烦。

Lin Mu. There's a snag in the plans for the Hu Fu Center.

怎么了？我想所有问题都解决了。

What's wrong? I thought everything was set.

是解决了。可那承包商刚刚告诉我他不能按原计划在20号前完活。

Well, it was. But the contractor's just told me he's not going to be able to finish by the twentieth, as planned.

也许我们可以制订一个加班计划。为保证20号前完工，无论如何这是值得的。Maybe we could work out an overtime schedule. It's definitely worth to finish by the twentieth.

喂！我们等午饭等了一个多小时了。你们是不是忘了我们的订餐了？

Hello! We've been waiting for our lunch for over an hour. Did you forget our order?

对不起，先生。您能再告诉我一遍您的姓名以及您订的东西吗？我在订单上查一下。

I'm sorry, sir. Could you tell me your name and order again, please? I'll check on the delay.

姓名是林木，我们订的是两份名厨沙拉。

The name's Lin Mu and the order was for two chef's salads.

谢谢您，林先生。请稍候。我这就去查您的订单。您想来点饮料吗，先生？免费的。

Thank you, Mr. Lin. Please wait one moment and let me check on the order.

Would you like anything to drink, sir? On the house.

雷刚?我得说你今天主持会议的方式我无法理解。

Lei Gang? I have to say I was bothered by the way you handled the meeting today. 为什么?我觉得会开得不错。

How so? I thought it went fine.

我想如果你能多给我们些机会表达意见的话,会更好的。

I think it would have been better if you had given us more of a chance to give our opinions.

对不起。我以为我们的意见相当一致了。

I'm sorry. I thought we were all pretty much in agreement.

嗨,雷刚。我是美华。怎么样,都好吧?

Hi, Lei Gang, it's Mei Hua. How's everything?

很好,谢谢。什么事?

Great. thanks. What's up?

我正想去吃点什么呢。你吃午饭了吗?

Oh, I was just thinking about getting a bite to eat. Have you had lunch yet?

早晨好,人事部。请讲。

Good morning, Personnel. May I help you?

你好。我可以找费凡讲话吗?

Hi, could I speak to Fei Fan please?

我就是。罗刚吗?

This is he. Luo Gang?

对,是我。下班后我能搭个车吗?

Yeah, it's me. Can you give me a lift after work?

喂,林云女士吗?

Hello, Ms. Lin Yun?

是的,你是哪位?

Yes? Who's calling?

我是林木。恐怕今天我得请一天病假。我感冒得很厉害。我希望您不介意,夫人。

It's Lin Mu. I'm afraid I'm going to be out sick today. I've got a nasty cold. I hope you don't mind, ma'am.

没问题。很遗憾听到你身体不佳。休息一下，若需要看医生，告诉我一声。
No, that's no problem. I'm sorry to hear you're not feeling well. Get some rest. If you need to see a doctor, let me know.

喂?

Hello?

方宁女士吗?我是雷刚。真抱歉您在家还麻烦您。但我出了点小事。

Ms. Fang Ning? This is Lei Gang. I'm sorry to bother you at home, but I've got a bit of problem.

哦,怎么了?

Oh? What's wrong?

我女儿刚刚碰伤了膝盖,伤得很厉害。我正要送她上医院。大约得晚到两小时。

My daughter's just banged up her knee pretty badly and I'm going to have to take her to the hospital. I'll be about two hours late.

林木?嗨,我是美华。我请求你帮个大忙。

Li Mu? Hi, it's Mei Hua. I have a big favor to ask you.

多大的忙,美华?上次你就是这么说的,结果我连加了三个晚上的班!

How big, Mei Hua? Last time you said that, I ended up working overtime 3 nights in a row!

是这样。我有一大摞东西要打。雷刚先生要我明天下午一定干完。

Well, I've got a huge load of typing and Mr. Lei Gang has insisted I get it done by tomorrow afternoon.

好吧,美华。但这是最后一次。

All right, Mei Hua. But this is the last time.

早上好。是美州航空公司吗?

Good morning. Is this American Airlines?

是的,先生。我是白茹。您有什么事情?

Yes, sir. My name is Bai Ru. How may I help you?

我需要订一个7日上午去芝加哥的航班,你能帮忙吗?

I need to get a flight to Chicago on the 7th in the morning. Can you give me a hand?

当然可以,先生。早上8:25有一个航班,还有一班是在10:35。您想要哪班呢?

Certainly, sir. There's a flight at 8:25 a. m. and one at 10:35. Which would you prefer?

非常抱歉，夫人。您能在电话里告诉我是什么问题吗？或者您希望我到您办公室去一趟？

I'm very sorry, Madam. Can you tell me what the problem is over the phone or would you like me to go to your office?

嗨，联合航空公司吗？我是林丽。我有一张今天下午2:40去上海的预订票。

Hi, United Airlines? This is Lin Li calling. I have a reservation on the 2:40 p. m. flight to Shanghai this afternoon.

是的，林丽女士，需要我帮什么忙吗？

Yes, Miss Lin Li, How may I help you?

是这样，我想把我的航班调成明天早上9:10的，可以吗？

Well, I'd like to reschedule my flight for the tomorrow morning one at 9:10. Is that possible?

实在抱歉，林丽女士。9:10那趟班机全部订满了。如果您愿意，我可以把您排在等候名单上。

I'm very sorry, Miss Lin Li. but the 9:10 flight is completely booked. I can put you on a waiting list if you would like.

阿尔法·贝塔专递服务吗？我是市场公司的马力。

Alpha Beta Courier Service? This is Ma Li calling from The Marketing Company.

早上好，美华女士。我能为您做些什么？

Good morning, Ms. Mei Hua. What can I do for you?

我们需要送这些文件到我们的胜利大街分部。你们能过来取一趟吗？

We need to deliver some documents to our Victory street branch. Can you come by and pick them up?

当然，美华女士。请问您的账号？这些文件需要什么时候送到？

Of course, Ms. Mei Hua. Could I have your account number, please? And, when do these documents need to arrive?

特快投递。能效劳吗？

Quick Serve Delivery. May I help you?

你好，我是佳豪公司的彩云。你们有个投递员大约一小时前来取走了一个包裹。

Hi, this is Cai Yun in Mr. Jiahao's office. One of your delivery men picked up a

package here about an hour ago.

对,夫人,有什么问题吗?

Yes, is there a problem? ma'am?

嗯,包裹现在还没送到地方。不知道你能否帮我追查一下,佳豪先生有些担心。

Well, it still hasn't reached its destination. I wonder if you could track it down for us. Mr. Jiahao is a bit concerned.

下午好,是贵都宾馆吗?

Good afternoon. Is this the Guidu Hotel?

是的,先生。能为您做什么?

Yes, sir. May I help you?

我是明通达与明通达律师事务所。我要为凯替那先生订房间。

Yes. I'm calling from Mintongda and Mintongda Attorneys. I need to make a reservation for Mr. Catena.

好的,先生。请问凯替那先生什么时候到,他要住几个晚上。

Fine, sir. When will Mr. Catena be arriving, and how many nights will he be staying?

早上好。我是威廉姆斯先生办公室的方宁女士。我想替威廉姆斯先生确认一下机票。

Good morning. This is Ms. Fang Ning in Mr. Williams' office. I'd like to confirm a flight for Mr. Williams.

好的,方宁女士。请问航班号和起飞日期?

Certainly, Miss Fang Ning. What is the flight number and date of departure, please?

是12月20日下午3:30飞往纽约的500号航班。姓名是约翰·威廉姆斯, W-I-L-L-I-A-M-S。

It's flight 500 to New York on December 20th at 3:30 p. m. . The name is John Williams. That's W-I-L-L-I-A-M-S.

谢谢您,方宁女士。请稍等,我这就替您确认机票。

Thank you, Miss Fang Ning. Please wait one moment while I confirm the flight.

早上好。轿车租赁公司。能帮忙吗?

Good morning. Rent-A-Car Agency. May I help you?

早上好。我是SEP广告公司的林龙。我们需要为雷刚先生安排辆汽车去机场。

Good morning. This is Lin Long calling from the SEP Advertising Firm. We need a car to the airport for Mr. Lei Gang.

没有问题，林龙先生。雷刚先生打算什么时候动身？

Certainly, Mr. Lin Long. When would Mr. Lei Gang like to leave?

我查查看。他的航班是下午 2:30 的，所以他最迟得在中午 12 点以前出发。

Let me check. — His flight's at 2:30 p. m. , so he should leave no later than 12 noon.

下午好。荷花餐饮公司。我是方宁。能帮忙吗？

Good afternoon. Lotus Catering Company. Fang Ning speaking. May I help you?

下午好，方宁。我是龙山贸易公司的马力。我们要订一个下周三下午的宴会。

Good afternoon. Fang Ning. This is Ma Li over at Longshan's Trading company.

We need to arrange a banquet for next Wednesday afternoon.

好的，马力先生。你们计划邀请多少人参加，每人多少钱的消费标准？

I see, Mr. Ma Li. How many people are you planning to invite and how much would you like to spend per person?

嗯。我们预计要来 25 人左右，每人不超过 \$ 20。

Well. We're expecting about twenty-five people and we'd like to spend no more than \$ 20 a head.

嗨，是“面包奶酪送餐服务”吗？

Hi, is this the Bread and Cheese Deli?

是的，夫人。您需要什么？

Yes, ma'am. How may I help you?

我想点两个三明治和一点饮料。你们能送来吗？

I need to place an order for a couple of sandwiches and drinks. Can you deliver?

可以，点 \$ 15 以上的菜我们都送，夫人。

Yes, we do deliveries for orders over \$ 15, ma'am.

早上好。方宁吗？我是林龙。你还记得吗，你帮我做过税表的？

Good morning, Fang Ning? It's Lin long calling. You remember you handled my tax forms for me?

当然记得，石村先生。近来好吗？

Of course, Mr. Shi Cun. How are things going these days?

很好！你再也用不着费心为我寻找额外的钱了！去年我们赚了近 25 万！

Better than ever! You won't have to worry about "finding" extra money for me

anymore! We made nearly a quarter of a million in profit last year!

棒极了! 听到这消息真高兴! 这会使平账变得容易得多了!

Congratulations! I'm really glad to hear it! That should make balancing the books a lot easier!

早上好。销售部。我是马力。

Good morning. Sales Division. Ma Li speaking.

马力, 我是市场部的林龙。我有好消息给你。

Ma Li, it's Lin Long over in Marketing. I've got some good news for you.

噢, 是吗? 我想我用得上。什么好消息?

Oh yeah? I could use some. What's up?

李富强先生对你帮他做的销售工作十分高兴, 他把这事一直提到头儿那里去了。他就此事给方伯言先生写了信。

Mr. Lifuqiang was so pleased with your sales work on his account that he went straight to the top with it. He wrote a letter about it to Mr. Fangboyan!

你是这儿的经理吗? 这两天我一直在设法解决我账户上的一些小问题。我已经感觉这里没人懂得什么是服务了!

Are you the manager here? I have been trying to get some simple problems straitened out on my account for the last two days. I'm beginning to think nobody understands service here!

我真诚为此向您道歉, 先生。您能告诉我您的账号吗? 我来看看我能否为您解决问题。

I do apologize for that, sir. Would you tell me your account number, and I'll see if I can straighten things out for you.

谢谢。我的账号是 FZR66668888。我名字是方明。

Thank you. My account number is FZR66668888. My name is Fang Ming.

谢谢您, 方明先生。我来看看我能做什么。

Thank you, Mr. Fang Ming. Let me see what I can do.

早上好, 马力先生。我能帮您吗?

Good morning, Mr. Ma Li. May I help you?

没事, 谢谢你。仅想告诉你我非常感谢那天你对我的帮助。我知道我给你添了麻烦。

No, thank you. I just wanted to tell you how much I appreciated your help the other day. I know I gave you a bit of trouble.

一点没有，先生。能帮助您我很高兴。现在事事都好吗？

Not at all, sir. I'm glad I could help. Is everything all right, now?

很好。一切顺利，谢谢。

Yes. Everything's worked out fine, thanks.

好，首先我来向你们概述一下要点。我们开始先在报纸上打小型广告，看看有什么反应。根据反应我们再决定是否作整版广告。如果报纸广告反应不理想，我们将作些广播广告。最后，我们打算策划两个30秒的广告在电视黄金时间播出。

Okay, let me run the main points by you first. We plan to start out with small newspaper ads. Then we'll see what kind of response we get. Based on that we'll decide whether to run full-page ads. If we don't get a positive response from the newspaper ads, we'll do some radio spots. Finally, we plan to put together two 30-second prime-time TV ads.

好的，诸位，我们下星期就着手这项工作。我想在周四前见到一份草案。

All right, people, we'll begin work on this next week. I want to see a rough design by Thursday.

成品的最后期限是什么时候？

What's our deadline for the finished product?

我计划最终的设计应在11月11日前送到林龙办公室。我们行动必须得快。

I intend to have the final designs in Mr. Linlong's office by November 11th.

你打算安排多少人做这项工作？

How many people are you putting on this?

使用电池和一个遥控器，不过它会比市场上大多数产品速度更快，更自如。

It uses batteries and a remote control, but it'll be a lot faster and fine-tuned than most of what's on the market.

总体说来情况是好的，但是还有几处问题。

Generally, things look pretty good, but there are a few trouble spots.

告诉我们主要问题是什么。

Give us an idea of the main problems.

是这样，销售状况很好，但生产速度下来了，结果我们跟不上市场需求。

Well, sales are doing pretty well, but production has slowed down, and as a result, we're not keeping up with demand.

这会造成订单积压，让我们付出代价的。你安排了谁来解决这个问题？

That's going to create a backlog that could cost us. Who do you have working on that?

杜邦先生?我想提个建议。

Mr. Du Bang? I'd like to make a suggestion.

什么, 林宁女士?

Yes, Ms. Lin Ning?

是这样,我想我们应在销售方面投入更多的精力。我们有着雄厚的客户基础,可随着大批新公司的建立,我们有丢掉生意。

Well. I think we ought to be putting more energy into sales. We've got a strong client base, but with so many new companies opening up, we could lose business.

感谢你告诉我,林宁女士。我将考虑这个问题。

I appreciate your talking to me, Ms. Lin Ning. I'll give some thought to it.

对不起,杜邦先生?抱歉打扰您。

Excuse me, Mr. Dubang? I'm sorry to trouble you.

一点没有,华银。请进。你有什么事?

Not at all, Hua Yin. Come in, please. What's on your mind?

我有个想法希望你能支持。我在想为我们的辰明电脑客户做一张整版的彩色广告。

I'd like to get some input from you on an idea I've had. I was thinking of doing a full-page color ad. for the Chenming Computer account.

他们准备花那么多钱吗,华银?这是我唯一担心的问题。

Are they prepared to put out that kind of money, Huayin? That's the only thing that would worry me.

好了,陈红。这就可以了。谢谢。

All right, Chenhong. That should do it. Thanks.

不用谢,金宝先生。金宝先生?我想在表里再加些内容。

You're welcome, Mr. Jinbao. Mr. Jinbao, I just wanted to add something to the list.

什么内容,陈红?我想它已经很完整了。

What's that, Chenhong? I thought it was pretty complete.

是这样,我认为我们应该为电脑系统添置一台激光打印机、一台扫描仪和一个调制解调器了,现在我还得把需要特殊打印的东西拿到外面做。这样我们会大大省钱省力的。

Well. I think it's time we added a laser printer and a scanner and a modem to our computer system. Right now, I still have to do our special printing jobs outside of the office. It would save us a lot of time and money.

谢谢您派我去参加那个研讨会，金宝先生。很令人振奋。事实上，我带回了一些新想法。

Thanks for sending me to that seminar, Mr. Jinbao. It was really fascinating. In fact, I came back with a few ideas.

噢，是吗？比如说？

Oh, yeah? Like what?

比如，他们讨论了许多协作精神问题，我想我们在这方面也需要更加努力。

Well. They talked a lot about teamwork, and I was thinking we ought to do more with that around here.

这想法不坏，陈红。他们有什么建议吗？

That wouldn't be a bad idea, Chenhong. Did they have any suggestions?

在第一个镜头，我们展示产品的图像，周围亮光烘托，然后渐入我们主角的镜头。

In the first frame, we'll show a picture of the product surrounded by a bright light. Then we'll fade into a shot of our presenter.

我想我知道你的思路。用的是什么妙语呢？

I think I see where you're headed. What's the punch line?

我们打算用这个产品的镜头结束，口号是：“使用如意堪可信赖”。

We plan to finish up with this shot of the product and the line: "You can count on us to be wherever your using needs are!"

这句话能简练些吗？另外我还希望你能换一个结尾。

Can you shorten that line? And I'd like you to finish up with a different image.

想象一下，金宝先生。开幕式那天我们用5,000个气球和成千条彩带簇拥着大门入口。

Picture this, Mr. Jinbao. We'll have 5,000 balloons and thousands of ribbons surrounding the entrance on opening day.

你采取什么措施控制人群？

What are you going to do about crowd control?

我们把门卫布置在大门口和主要入口周围。但我想不会有问题的。主要的目的是要吸引注意力。

We'll have guards posted at the entrances and near the main gate. But I don't anticipate much of a problem. The main point is to attract attention.

这倒是真的。好吧，这事交给你了！

That's true. All right. I'll leave it in your hands!

形势十分明显，金宝先生。你需要用你资金的一半投资债券，另一半投资房地产。

It's a pretty straight forward situation, Mr. Jin Bao. You'll need to invest half of your funds in securities and the other half in real estate.

我对此时投资房地产比较担心。

I'm a bit worried about real estate at the moment.

我向你保证，眼下没有比这更好的生意了！相信我！

I promise you, right now there couldn't be a better deal! Trust me!

好吧，你过去一直是对的。这买卖你做成了！

Well, you've always been right, before. You've got a deal!

这个计划我们已经做了几个星期了。金宝先生，我想您对结果会满意的。

We've been working on this project for a couple of weeks now, Mr. Jinbao.

I think you'll be pleased with the results.

好哇，咱们就来瞧瞧。

Well, let's have a look.

我们这样开始，然后用一些电脑生成的产品照片来结束。您以为如何？

This is how we'll begin, and then we'll finish with some computer generated photographs of the product. What do you think?

我想你的主意不错。只是还有些细节要做。

I think you've got the right idea. There are just a few details to work out.

这张图表展示了我们去年的利润，这一张能让您了解今年到目前的利润。

This graph represents our profits from last year, and this one will give you an idea of the profits so far this year.

下半年你有什么计划吗？

Do you have any projections for the next six months?

有，陈红。这第三幅图标明了到今年年底的预计利润。我想你们都会同意我们有些问题等待解决。

Yes, Chenhong. This third one charts the expected profits through the end of the year. I think you'll all agree that we have some problems to deal with.

我同意。但它并不像我们想象得那么坏。

Agreed. But, it's still not as bad as we had anticipated.

方宁女士，请在这签字。

Ms. Fangning. Please sign here.

谢谢你，林龙先生。我想我们会共创一个长久兴旺的未来。

Thank you, Mr. Linlong. I think we'll have a long and prosperous future together.

我同意。作为合作伙伴，我们日后可以一起干很多事情。

I agree. There's a lot we can do in the future as partners.

咱们为此干杯吧，林龙先生。我知道城里有个好去处。

Let's have a drink on it, Mr. Linlong. I know a good place in the city.

好的，陈红女士。我立刻把详细材料传真给你。

All right, Ms. Chenhong. I'll fax the details to you right away.

好，明天上午我就能把签好字的合同给你传真回去。

Fine, I should be able to get a signed contract faxed to you by tomorrow morning.

好消息。我们越早结束这些手续，就能越早上马。

Good news! The sooner we get this out of the way, the sooner we can get going.

这没有问题。好，我将把详细材料传过去。

No argument there! All right, I'll get those details over there!

雷刚先生，梦露女士刚刚送来这些合同请您签字。

Mr. Leigang, Ms. Menglu just sent these contracts over for you to sign.

咱们的法律人员看过了吗？

Has the legal staff looked at them?

看过了，先生。他们说没问题。诸事妥当。

Yes, sir. They don't see any problem. Everything's in order.

那好，我的笔呢？然后把这些合同传回给方宁。

All right. Where's my pen? Then, fax these back to Fangning.

是的，梦露女士说过我对你的工作会满意的，她说得对。

Well, Ms. Menglu said I would be pleased with your work, and she was right.

你这么说我很高兴，金宝先生。我期待着能再次同你工作。这是你的那份合同。

Glad to hear it, Mr. Jinbao. I look forward to working with you again.

Here's your copy of the contract.

谢谢。如果我有问题，我再回来找你。

Thanks. If I have any questions, I'll get back to you.

请一定找我。你随时可以给我的秘书留个口信。

Please do. You can always leave a message with my secretary.

这么说来我们是在谈论一个平均每年要做四五个项目的工作计划，对吧？

So, we're talking about an average workload of 4 to 5 jobs a year, huh?

是这样。这么多工作你有问题吗？

That's right. Can you handle that load?

不成问题。咱们把它形成文字吧。

That won't be a problem. Let's put it in writing.

好，我来叫我的秘书。

Fine. Let me call my secretary.

我们什么时候可以开始。我真是迫不及待了。

When can we get started? I'm really eager to get going on this!

我也一样。关于怎么做我有很多想法。我想你会很满意的。

So am I. We have got a lot of ideas on how to go with this. I think you're going to be pleased!

肯定会。我们听到过许多对你们公司的褒奖。

I'm sure I will! We've heard a lot of good things about your company.

我希望我们能名副其实。我的确相信我们的调查手段属于全城最好的。

Well, I hope we live up to our reputation! I do think our research techniques are among the best in the city.

好的，林龙先生。这么说你星期四下午把那两台施乐复印机送来？

All right, Mr. Linlong. So, you'll bring the two Xerox Copiers over Thursday afternoon?

对。然后我们进行试机检查。以后我们每隔六个月来做一次常规检查。

That's right. Then we'll do an initial maintenance check on them. After that, we'll come by every six months for a routine checkup.

否则，我们如果有任何问题，我们直接给你办公室打电话，对吧？

Otherwise, if we have a problem, we can just call your office, right?

对。这是我的名片。上面有我的呼机号和 E-mail 地址。

That's right! Here's my card. There's a beeper number and a E-mail address on this as well.

好，陈红。再过一星期我们就准备好可以开始了。

Well, Chenhong. We should be ready to start in another week or so.

我真是兴奋。

I am really excited about this.

我想你会对最终结果感到满意的。我们可以在一个月之内完工。

I think you're going to be very pleased with the final product. We should be able to get it done in under a month.

很好。把账单寄给我让我来安排付款。我们最终谈妥的价钱是 \$12,000，对吧？

Great! Send me your bill, and I'll arrange the payment. We settled on \$12,000 as the final cost, right?

感谢你远道而来和我一起工作，方先生。

Thank you for traveling so far to work with me, Mr. Fang.

是的，当我找到了理想的公司，我是不会在乎要走多远的。

Well, when I find the right company, I don't care what length I have to go to!

我希望我们能继续共创佳绩。合同打印好我会立即和你取得联系。

I hope we can continue to do good work together. I'll contact you as soon as the contract is typed up.

好极了。我们到时再谈。

Wonderful! I'll speak to you then.

根据你写的规格要求我们重写了标书，林龙先生，我想你会满意的。

We've rewritten the bid based on your specifications, Mr. Linlong. I think you'll be pleased.

是的，不错，方宁女士，感谢你的努力。

Yes. It looks fine, Ms. Fangning. Thank you for your hard work!

这是应该的。林龙先生，请在这儿签字。我让我的秘书去复印。

That's to be expected, Mr. Linlong. If you could sign here, I'll give these to my secretary to copy.

当然。给，方宁女士。

Certainly. Here you are, Ms. Fangning.

好，杜邦先生，就这些了。你还有其他问题吗？

Fine, Mr. Dubang, that's that. Do you have any other questions?

没有，陈红女士。所有的事情都清楚了。你什么时候能开始工作呢？

No, Ms. Chenhong. Everything's clear. When can you begin work?

我想下月初开始。我们还需要再最后打几个电话。

I'd like to get started by the beginning of next month. We just need to make a few last minute calls.

但你不认为会有什么問題吧?

But you don't anticipate any problems, right?

和你一起工作的确令人愉快,林龙先生。我想我们会共有一个美好未来的。

It's been a real pleasure working with you, Mr. Lin Long. I think we'll have a good future together.

我同意,方宁女士。我非常满意事事进展得如此顺利。希望你们能保持下去。

I agree, Ms. Fangning. I've been very pleased with how smoothly everything has gone. Hope you can keep up the good work!

我们正在努力。林龙先生!什么时候再需要我们帮助请通知我们。

We intend to, Mr. Linlong! Please let us know when we can help you out again.

我一定会的。再次感谢。

I certainly will. Thanks again.

好,陈红女士。我想我们已经消除了前嫌。依我看我们已成交。

Well. Ms. Chenhong. I think we've ironed out all the wrinkles. As far as I'm concerned, we've got a deal.

完全正确,杜邦先生。从现在开始应该一帆风顺了。

Absolutely, Mr. Dubang. Everything should be smooth from here on.

真令人高兴。我们保持联络?

Glad to hear it. You'll keep in touch?

当然,杜邦先生。

Certainly, Mr. Dubang.

哇,你又做成了,金贝!你总能在最后一刻设法解决问题。

Well, you've done it again, Jinbei! You always manage to work things out at the last minute.

这正是我来此的目的。银座先生,这么说这笔生意成了?

That's what I'm here for, Mr. Yinzuo. So, we have a deal?

你讲对了。明天一早我会把签好的合同送过去。

You bet! I'll send the signed contracts over tomorrow morning.

很好!咱们吃点午饭怎样?

Great! Shall we get some lunch?

再次谢谢你，马良。跟你合作很愉快。

Thanks again, Maliang. It's been good working with you.

别客气，随时乐意，杜邦先生。希望能保持联系并告诉我们事情的进展情况。

My pleasure, as always, Mr. Dubang. I hope you'll keep in touch and let us know how things are proceeding.

一定会的，马良。我下星期给你打电话告诉你我们什么时候开始。

Absolutely, Maliang. I'll give you a call next week and let you know when we'll be breaking ground.

好，林龙先生。我期待着你的消息。

Fine, I look forward to hearing from you, Mr. linLong.

好吧，方宁女士。我会在这周内把这些合同写好。

All right, Ms. Fangning, I'll have the contract drawn up this week.

好的。我希望我们下周早点会面签合同，再过一遍最后这几个细节。

Good. And, I think we should try to meet early next week to sign the contracts and go over a few final details.

这没问题。我让我的秘书这周末打电话给你商定个会晤时间。

That would be fine. I'll have my secretary give you a call at the end of the week to set up an appointment.

好。谢谢。那么，下周见。

Fine, thanks. Then, I'll speak to you next week.

这就行了，金贝。咱们成交了！

That'll do it, Jinbei. We're in business!

这事完成了真是太好了。现在我们可以着手工作了。

It's good to have that out of the way. Now, we can get down to work!

我同意。既然所有的事都已形成文字了，该不会再有问题了。你想喝点什么庆祝一下吗？

I agree. Now that it's all down on paper, there shouldn't be any problems. You want to have a quick drink and celebrate?

行，当然。我拿上大衣。

Sure, why not? Let me grab my coat.

好的，我看这很好，银杏女士。我可以签字了。

Well, this looks fine to me, Ms. Yinxing. I'm ready to sign.

很好! 就签在虚线上, 这样我们就妥了。我叫我的秘书来作证。

Great! Just put your name on the dotted line and we'll be set. I'll get my secretary to witness it.

行。如果可能也给我留一份附件存档用。

All right. And then, if we could just make a copy for me to keep in my records.

当然可以, 林云女士。我今天就会准备好让你带走的。

Of course, Ms. Linyun. I'll have that for you to take home today.

你还有别的问题吗, 银杏女士?

Do you have any more questions, Ms. Yinxing?

没有了, 先生。我想您已回答了我的所有问题。我只是不清楚您想什么时候让我开始工作。

No, sir. I believe that you've answered all my questions. I'm just not certain when you'll need me to start work.

我在考虑如果你能新年之后上班最好, 1月4号行吗?

I was thinking that it would be best if you started after the new year, maybe January 4th?

这很好, 金贝先生。有培训吗?

That would be fine, Mr. Jinbei. Will training be provided, sir?

嗯, 陈红女士。我们对你这两年辛勤的工作十分满意。

Well, Ms. Chenhong, we have been very pleased with your hard work these two years.

非常感谢, 林龙先生。我也十分喜欢在这里工作。

Thank you very much, Mr. Linlong. I've really enjoyed working here as well.

我想一旦你接手财务部副经理的工作你会更喜欢的。

I think you'll enjoy it even more when you take over as assistant manager in the accounting department.

我也这么认为。我期待着这天。

I think so, too. I'm really looking forward to it.

银杏, 我们成啦! 看一眼这个!

Yinxing, we did it! Take a look at this!

这是什么?

What is it?

金贝先生刚签了一份做三个整页报刊广告和两个30秒钟电视广告的合同。

Mr. Jinbei's just signed a contract for three full-page ads and two 30 second TV spots.

太好了！你是怎么说服他的？

Great! How did you talk him into it?

我简直不能相信！

I can't believe it!

什么，金贝？出什么事了？

What, Jinbei? What's wrong?

什么事也没有！我刚刚和 Delta 国际公司签了一笔合同。他们打算从我们这里购买价值 100 万美元的设备！

Nothing's wrong! I just signed a deal with Delta International.

They're going to buy one million dollars' worth of equipment from us!

太棒了！我给你买杯啤酒。

Fantastic! Let me buy you a beer.

这么说我们谈妥了，银杏女士？

So, are we set then, Ms. Yinxing?

对，合同达成这样我很满意。

Yes, I'm satisfied with the contract as it stands.

太好了。那么如果你能在这里签字，我们就没问题了。我们一着陆，我就和设计师联系。

Excellent. Then, if you'll sign here, please. We'll be finished. As soon as we land, I'll contact the architect.

很好。我们可以坐在一起谈论规划。

Good. We can all get together to discuss the plans.

我们已经修改完了标书。您能过目吗，林龙先生？

We've revised the bid. Would you look it over, Mr. Linlong?

我看不错。我所提出的改动全写进去了。

Looks fine. The changes I asked for are all here.

好的。如果没有新的改动的话，接下来我们就签署协议吧。

Good. If there are no other changes to be made, let's go ahead and sign the agreement.

好，你能递给我你的笔吗？

All right, can you pass me your pen?

你让你的律师看过协议了吗，金贝先生？

Did you have your lawyers look at the agreement, Mr. Jinbei?

是的，我们决定就保持这样，我只想把日期作一点点改动变成 14 号。

Yes. We decided to keep it as it is, except for one small change on the date here. I'd like to make it the 14th.

我可以把它写进去，金贝先生。还有其他修改吗？

I can write that in, Mr. Jinbei. Any other revisions?

没有了。这就行了。我来找笔。

No, that'll do it. Let me just find my pen.

我只需要再核实几件事，雷刚。首先，你打算什么时候投产？

I just want to go over a few things, Leigang. First of all, when are you planning to start production?

我们打算最晚不超过明年的头一个月。

We'd like to begin no later than the first month of the year.

是这样。这不会成问题的。照我看，所有的活儿我们可以 100 万以内完成，你看如何？

I see. That shouldn't pose any problem. The way I see it, we can do it all for under one million - What do you think?

跟我们考虑的差不多。咱们起草个协议吧。

That's about what I was thinking. Let's draw up an agreement.

这是最底线，林龙先生。这能接受吗？

This is the bottom line, Mr. Linlong. Is that going to be acceptable?

可以。我想我们的人对此不会有问题的。

Yes. I don't think my people will have any problem with that.

你认为我们什么时候可以签合同了呢？

When do you think we can sign the contract?

我们到达后给我们一两天的时间。最多不会超过三天的。

Give me a couple of days after we arrive. It shouldn't take more than three days max.

我们的法律人员已经看过这个了，有几处措辞我们想作点改动。

Our legal team has taken a look at this, and there are a couple of word changes we'd like to make.

好吧，方宁女士。我们尽力吧。第一处在哪？

All right, Ms. Fangning. Let's see what we can do. What's the first change?

这里，看协议的第六页。找到第四行了吗？

Well, take a look at page 6 of the agreement. See line 4?

找到了。你想怎么改呢？

Yes, I've got it here. What would you like to change?

这些加在一起是每件 60 美分。总共要有多少件？

This adds up to 60 cents per unit. How many units are there going to be all together?

6,688 件。我们也许今后还要增加。

Six thousand, six hundred and eighty-eight. We may add more later.

那好，一共是 \$4,012.80。加上其他费用和税，最后可能是 \$6,000 左右。

All right, that works out to \$4,012.80. Once we figure in other expenses and tax, it'll probably read about \$6,000.

这没问题。我们开始先定这么多，以后再看进行的怎么样。

That's fine. We'll start with that order and see where it goes.

这是合同，林龙先生。

Here are the contracts, Mr. Linlong.

谢谢，方宁。让我看看，看样子没问题。

Thank you, Fangning. Let me see. This looks all right.

请您看一眼第二页的第 15 行。我们稍微改动了付款时间。

You might want to take a quick look at page 2, line 15. We made one small change in the payment schedule.

嗯。我看到了。这没有问题。

Hmm. I see. That's not a problem.

按我的看法，这里面还有三点小问题，陈红女士。一是最后一段的措辞。

There are three small trouble spots, as far as I see it, Ms. Chenhong.

One is the wording of this last paragraph.

你希望如何措辞呢，方宁女士？

How would you like to word it, Ms. Fangning?

嗯，我希望能够删掉这个句子，改写成“在交货日期前”。

Well, I'd like to take out this phrase here, and replace it with "prior to the date of delivery".

我明白。这不会产生任何问题。其他问题是什么呢？

I see. That shouldn't create any problems. What are the other trouble spots?

如果你看看这里，金贝先生，你会看到我所说的改动。

If you'll take a look here, Mr. Jinbei, you'll see the changes I was talking about.

嗯。是的，我看见了。我对此无异议。不过请看一眼12页的第六段。

Hmm. Yes, I see. I don't have a problem with that. But take a quick look at paragraph six on page twelve.

好，我找到了。

All right. I've got it.

这里我们可否重新措辞以反映出第三个公司的参与。我们公司不想承担全部责任。

I was wondering if we could re-word this to reflect the third company's involvement. Our company doesn't want to be held fully responsible.

咱们再来最后核实一遍细节，金贝。

Let's go over the details one last time, Jinbei.

好。工程将于2月5日开始，完工日期应是次年1月。

Fine. Construction will begin on the 5th of February, and we should be finished by the following January.

这点没问题。预算为350万。这里包括培训员工和招聘费用吗？

That's right. And the budget is set at 3.5 million. Does that include staff-training and recruitment costs?

不，包括这些会超过基本预算的。记得吗，我们上次讨论了这个问题。我们为此另做了一笔50万的预算。

No, those will be over and above the initial budget. You remember, we discussed that last time. We have a \$500,000 budget set aside for that.

这是修改过的合同，金贝先生。

Here's the revised contract, Mr. Jinbei.

谢谢，银杏女士。Delta公司怎么说？

Thanks, Ms. Yinxing. What did Mr. Delta's office have to say?

他们对合同很满意，可以签字了。

They're satisfied with the contract now and ready to sign.

很好！我会看一眼的。如果没有问题，我们到后就安排与他们会晤。

Great! I'll take a look at it. If everything's okay, we'll arrange to meet with them when we arrive.

这是陈红女士公司起草的协议，林龙先生。

This is the agreement drawn up by Ms. Chenhong's office, Mr. Linlong.

谢谢你，方宁。你看过了吗？

Thank you, Fangning. Have you looked at it yet?

我浏览了一遍。看样子不错。可是得等您的看法。

I glanced at it. It looks pretty good, But see what you think?

好吧。等我有空看过之后我们再谈。

All right. We'll talk after I've had a chance to review it.

好了，那么，林龙先生。如果您能在这两份文件上签字，我们就都解决了。

Well — then, Mr. Linlong. If you'll just sign these two copies, we'll be all set.

好啦。这是你要的。我留着这份。

All right — there you go. I'll keep this copy.

是的，先生。很好。和您一起工作很愉快，林龙先生。

Yes, sir. That's fine. It's been good working with you, Mr. Linlong.

谢谢你，方宁。感谢你诸事办得如此迅速。

Thank you, Fangning. I appreciate your getting everything done so quickly.

这很好，林龙。我对结果非常满意。

This is fine, Linlong. I'm very satisfied with the results.

听你这么讲我很高兴，陈红女士。那我们新年前就开始动工了。

I'm glad to hear it, Ms. Chenhong. Then we'll begin construction before the new year.

好极了。请尽可能不要超出预算。这是我唯一担心的事情。

That sounds great. Just try to keep it within budget. That's the only thing I'm worried about.

请放心，陈红女士。这对于我们不会成问题。

Rest assured, Ms. Chenhong. That won't be a problem with us.

附录 A

中英文版变压器试验报告



出厂序号：200707056

电力变压器试验报告

变压器种类：电力变压器

产品型号：SFZ10 -370000/400TH

用户：印度 LANCO 发电厂

项目：主变压器 (2号)

山东电力设备厂

中国

2007年7月12日



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1 说明

用户名称: 印度 LANCO 发电厂

产品种类: 主变压器 (2号)

产品型号: SFZ10-370000/400TH

产品代号: 1DS.711.0667

工厂序号: 200707056

制造厂家: 中国山东电力设备厂

出品日期: 2007年7月12日

2 额定参数

额定容量: 370/370 MVA

额定电压: $(420 \pm 8 \times 1.25\%) / 20\text{kV}$

额定电流: 508.6/10681.0A

额定频率: 50Hz

分接范围: $(420 \pm 8 \times 1.25\%) \text{ kV}$

联结组标号: YNd1

冷却方式: ONAN/ONAF/OFAF

使用方式: 户外

绝缘水平: SI1050LI1300AC570-LI185AC85/LI125AC55

器身重量: 189700kg

绝缘油重量: 91900kg

上节油箱吊重: 18000kg

运输重量: 219800kg (充氮)

总重: 371700kg

3 相关标准

GB 1094.1~1094.2—1996 《电力变压器》

GB 1094.10—2003 《电力变压器》

GB/T 6451—1999 《三相油浸式电力变压器技术参数和要求》

GB 311.1—1997 《高压输变电设备的绝缘配合和高电压试验技术》

GB/T 16927.1—1997 《高电压试验技术》

IS: 2026—1994: 电力变压器

4 试验项目和结果

4.1 绝缘特性测定

油温: 32℃

测定部分	绝缘电阻 (MΩ)			吸收比和极化指数	
	R_{15s}	R_{60s}	R_{10min}	R_{60s}/R_{15s}	R_{10min}/R_{60s}
高压 - (低压 + 地)	20500	21400	39600	1.044	1.85
低压 - (高压 + 地)	21300	32400	53800	1.52	1.66
(高压 + 低压) - 地	17000	23400	33400	1.38	1.43
铁心 - 地	1000MΩ		夹件 - 地	1000MΩ	

测试仪器: JD2705A 高压兆欧表

4.2 介损 $\tan\delta$ 和直流泄漏测量

油温: 32℃

测定部分	介损 $\tan\delta$		直流泄漏	
	$\tan\delta$	C (pF)	电压 (kV)	电流 (μ A)
高压 - (低压 + 地)	0.00239	18150	50	18
低压 - (高压 + 地)	0.00238	38030	10	1
(高压 + 低压) - 地	0.00248	38100		

测试仪器: AI-6000 介损 $\tan\delta$ 测试系统
ZGS-Q60/3 直流高压发生器

4.3 绝缘油试验

介损 $\tan\delta$ (90℃): 0.0007;

击穿电压: 73.6kV;

微水: 10.1mg/L

油气相色谱分析

 $\mu\text{L/L}$

成分	H ₂	CO	CO ₂	CH ₄	C ₂ H ₆	C ₂ H ₄	C ₂ H ₂	总烃
冲击试验前	6.5	6.72	184	0.41	0	0	0	0.41
冲击试验后	5.96	5.92	189	0.44	0	0	0	0.44

12 小时空载试验

 $\mu\text{L/L}$

成分	H ₂	CO	CO ₂	CH ₄	C ₂ H ₆	C ₂ H ₄	C ₂ H ₂	总烃
试验前	5.96	5.92	189	0.44	0	0	0	0.44
试验后	6.15	5.21	176	0.49	0	0	0	0.49

4.4 电压比测量和联结组标号检定

高压线圈		低压线圈	电压比 K	误差 (%)			联结组 标号
分接	电压 (V)	电压 (V)		AB/ab	BC/bc	CA/ca	
1	462000	20000	23.100	0.25	0.25	0.25	YNd1
2	456750		22.837	0.22	0.22	0.22	
3	451500		22.575	0.24	0.19	0.19	
4	446250		22.312	0.21	0.21	0.21	
5	441000		22.050	0.18	0.18	0.13	
6	435750		21.788	0.14	0.19	0.14	
7	430500		21.525	0.16	0.11	0.16	
8	425200		21.263	0.12	0.08	0.08	
9	420000		21.000	0.09	0.04	0.04	
10	414750		20.738	0.06	0.06	0.06	
11	409500		20.475	0.02	0.07	0.02	
12	404250		20.212	0.03	-0.01	-0.01	
13	399000		19.950	0.00	-0.05	-0.05	
14	393750		19.687	-0.08	-0.03	-0.03	
15	388500		19.425	-0.07	-0.07	-0.12	
16	383250		19.163	-0.16	-0.16	-0.16	
17	378000		18.900	-0.10	-0.15	-0.15	

测试仪器：3628D 全自动电压比测试仪

精度：0.1 级

4.5 线圈电阻测定

油温: 32℃

线圈	分接	测量值 (Ω)			最大不平衡率 (%)
		A ~ N	B ~ N	C ~ N	
高压	1	0.3907	0.3901	0.3928	0.74
	2	0.3846	0.3843	0.3869	
	3	0.3786	0.3782	0.3810	
	4	0.3728	0.3726	0.3752	
	5	0.3668	0.3668	0.3694	
	6	0.3610	0.3611	0.3636	
	7	0.3554	0.3553	0.3578	
	8	0.3496	0.3494	0.3520	
	9	0.3431	0.3430	0.3453	
	10	0.3495	0.3496	0.3522	
	11	0.3555	0.3555	0.3581	
	12	0.3613	0.3611	0.3641	
	13	0.3673	0.3672	0.3697	
	14	0.3729	0.3730	0.3755	
	15	0.3788	0.3789	0.3813	
	16	0.3845	0.3846	0.3868	
	17	0.3904	0.3907	0.3928	
低压		a ~ b	b ~ c	c ~ a	0.82
		0.001220	0.001217	0.001227	

测试仪器: JD2520 线圈电阻测试仪

精度: 0.1 级

4.6 外施耐压试验

施加于	电压 (kV)	时间 (s)	结果
高压, 高压中性点 - (低压 + 地)	85	60	通过
低压 - (高压 + 地)	55	60	

测试仪器: TAWG400 多功能峰值电压表和分压器

精度: 1 级

4.7 空载损耗和空载电流测量

 $f = 50\text{Hz}$

电压	平均值 (kV)	有效值 (kV)	空载电流 (A)	空载电流 百分比	空载损耗 (kW)	
					测量值	校正值
90%	18.0	18.0	10.2	0.10	140.4	140.4
100%	20.0	20.1	17.8	0.17	180.5	179.6
110%	22.0	22.4	30.0	0.28	230.4	226.2

4.8 交流 415V 下空载电流测量

 $f = 50\text{Hz}$

施加于	电压 (V)			电流 (A)		
	ab	bc	ca	a	b	c
abc	415	415	415	0.54	0.55	0.54

4.9 短路阻抗和负载损耗测量

 $f = 50\text{Hz}$

项目 线圈	分接	施加 电流 (A)	测得 电压 (V)	短路阻抗 (%)			负载损耗 (kW)			参考 容量 (MVA)
				测量值 $t = 33^\circ\text{C}$	校正值		测量值 $t = 33^\circ\text{C}$	校正值		
					I_r (A)	$t = 75^\circ\text{C}$		I_r (A)	$t = 75^\circ\text{C}$	
HV-LV	1	232.2	36654	15.80	462.4	15.80	726.9	462.4	763.9	370
HV-LV	9	274.2	34512	15.24	508.6	15.24	750.2	508.6	788.8	370
HV-LV	17	304.4	31401	15.42	565.1	15.42	801.8	565.1	865.6	370

4.10 有载分接开关试验

操作试验:

- 变压器无励磁, OLTC 在额定辅助电压下完成 8 个操作循环;
- 变压器无励磁, OLTC 在 85% 额定辅助电压下完成 1 个操作循环;
- 变压器在额定励磁下, 做空载试验时, OLTC 完成 1 个操作循环;
- 做负载试验时, OLTC 在主分接 ± 2 级范围内, 完成 10 个分接变换。

以上操作试验合格。

辅助回路绝缘试验：工频耐压，2kV/1min

试验通过。

4.11 空载电流谐波测量

基波电压：20kV

谐波分量	谐波电压 (%)			谐波电流 (%)		
	U_{ab}	U_{bc}	U_{ca}	I_a	I_b	I_c
1 次	100	100	100	100	100	100
2 次	0.035	0.051	0.034	0.356	0.338	0.337
3 次	0.355	0.711	0.397	15.69	17.48	14.82
4 次	0.022	0.030	0.019	0.230	0.220	0.260
5 次	1.300	1.319	1.471	31.96	31.58	32.53
6 次	0.018	0.023	0.015	0.044	0.064	0.081
7 次	0.814	0.873	0.864	10.78	10.82	8.450
8 次	0.012	0.016	0.011	0.124	0.127	0.066
9 次	0.040	0.024	0.086	0.182	0.186	0.513
10 次	0.015	0.017	0.007	0.124	0.134	0.117
11 次	0.022	0.034	0.148	0.120	0.122	0.106
12 次	0.011	0.019	0.009	0.060	0.080	0.015
13 次	0.018	0.015	0.013	0.068	0.0710	0.053
14 次	0.004	0.006	0.007	0.113	0.113	0.123
15 次	0.035	0.015	0.013	0.051	0.049	0.054

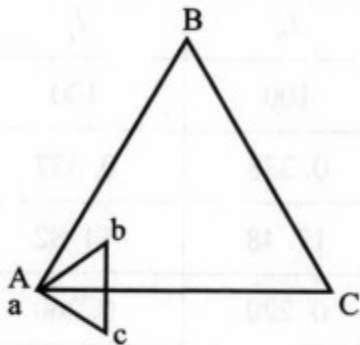
4.12 磁平衡试验

一相励磁 其他相测量	A - 中性点	B - 中性点	C - 中性点
	280	164	116
电压 (V)	144	272	136
	124	160	275

4.13 联结组标号试验 (双电压表法)

连接 A - a

施加端子	电压值 (V)	测量端子	电压值 (V)	Bb/Bc	Cb/Bc
A - B	404	B - b	388	388/408 =0.95	388/408 =0.95
B - C	404	C - b	388		
C - A	404	B - c	408		



$$Bb = Cb = \sqrt{(K - \sqrt{3}/2)^2 + (1/2)^2} / K = \sqrt{K^2 - \sqrt{3}K + 1} / K = 0.96$$

$$Bc = \sqrt{K^2 + 1} / K = 1.00$$

$$K = 420/20 = 21$$

结论：联结组标号为 YNd1。

4.14 带局放测量的相对地短时感应耐压试验

施加电压 (kV)	ACSD (kV)	感应倍数	频率 (Hz)	时间 (s)	结果
低压	高压 (17分接)				
34.8	570	1.74	250	24	通过

4.15 局部放电测量

试验电压		时间 (min)	视在放电量 (pC)		
kV	施加电压		A	B	C
424.9	$1.6U_m/\sqrt{3}$	5	90	70	90
478.0	$1.8U_m/\sqrt{3}$	0.4	90	70	90
424.9	$1.6U_m/\sqrt{3}$	5	90	70	90
424.9	$1.6U_m/\sqrt{3}$	10	90	70	90
424.9	$1.6U_m/\sqrt{3}$	15	90	70	90
424.9	$1.6U_m/\sqrt{3}$	20	90	70	90
424.9	$1.6U_m/\sqrt{3}$	25	90	70	90
424.9	$1.6U_m/\sqrt{3}$	30	90	70	90
424.9	$1.6U_m/\sqrt{3}$	35	90	70	90
424.9	$1.6U_m/\sqrt{3}$	40	90	70	90
424.9	$1.6U_m/\sqrt{3}$	45	90	70	90

续表

试验电压		时间 (min)	视在放电量 (pC)		
kV	施加电压		A	B	C
424.9	$1.6U_m/\sqrt{3}$	50	90	70	90
424.9	$1.6U_m/\sqrt{3}$	55	90	70	90
424.9	$1.6U_m/\sqrt{3}$	60	90	70	90

测试仪器: JF2002 局放仪

精度: 0.1 级

4.16 操作冲击试验

试验条件和方法

大气条件

大气压: 101332Pa; 温度: 32℃

试验项目和电压

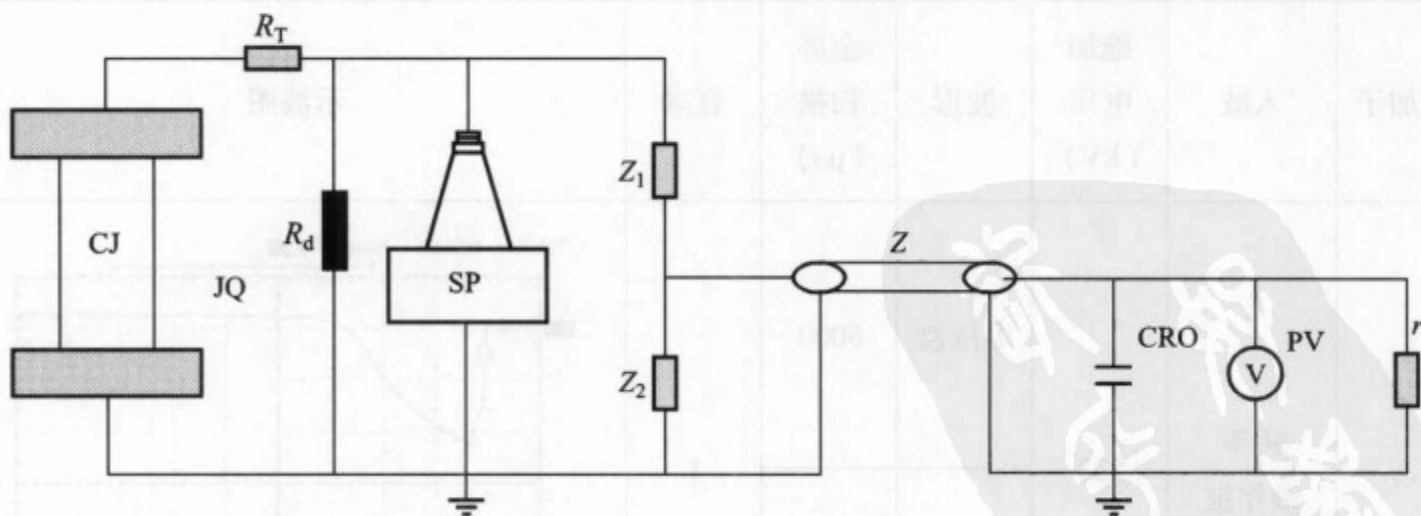
施加于	额定耐受电压 (kV)	结论
	操作冲击	
A, B, C	1050	通过

试验程序:

1 次 50% 电压操作波

3 次 100% 电压操作波

试验回路图:



CJ: 冲击电压发生器

SP: 试品

R_T : 调波电阻

R_d : 阻尼电阻

Z_1, Z_2 : 分压器阻抗

Z: 高频传输电缆

r: 匹配电阻

CRO: 高压数字记忆示波器

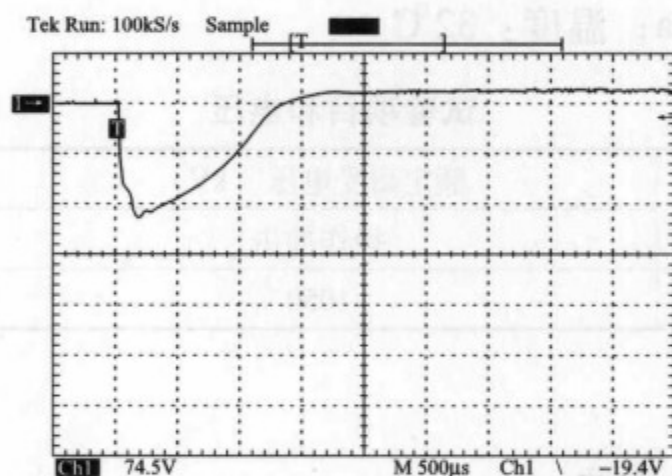
PV: 峰值电压表

测试仪器: TDS340 双通道数字记忆示波器

高压线端

操作冲击

T_1 (μs)	$\mu\text{s}/\text{div}$	T_2 (μs)	$\mu\text{s}/\text{div}$
230	310	2580	500



(仅提供 A 相示波图)

施加于	入波	施加电压 (kV)	波形	全屏扫描 (μs)	衰减	示波图
A	50% 操作波	523	电压波	5000	1	
			电流波	5000		

续表

施加于	入波	施加电压 (kV)	波形	全屏扫描 (μs)	衰减	示波图
A	100% 操作波	1049	电压波	5000	2	
			电流波	5000		
	100% 操作波	1047	电压波	5000	2	
电流波	5000					
	100% 操作波	1046	电压波	5000	2	
电流波	5000					

4.17 雷电冲击试验

试验条件和方法

大气条件

大气压：101346Pa；温度：32℃

试验项目和电压

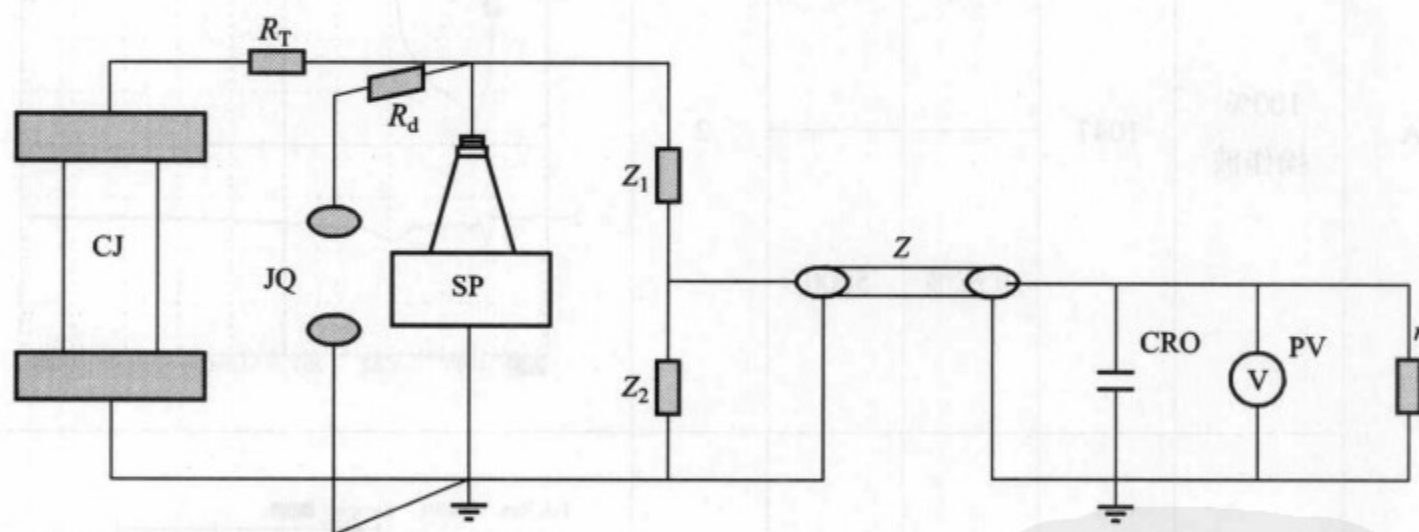
施加于	额定耐受电压 (kV)	分接	结论
	雷电全波		
A, B, C	1300	1 (A), 9 (B), 17 (C)	通过
a, b, c	125		通过

试验程序：

1 次 50% 电压雷电全波（负极性）

3 次 100% 电压雷电全波（负极性）

试验回路图：



CJ：冲击电压发生器

JQ：截波球隙

SP：试品

R_T ：调波电阻

R_d ：阻尼电阻

Z_1, Z_2 ：分压器阻抗

Z：高频传输电缆

r：匹配电阻

CRO: 高压数字记忆示波器

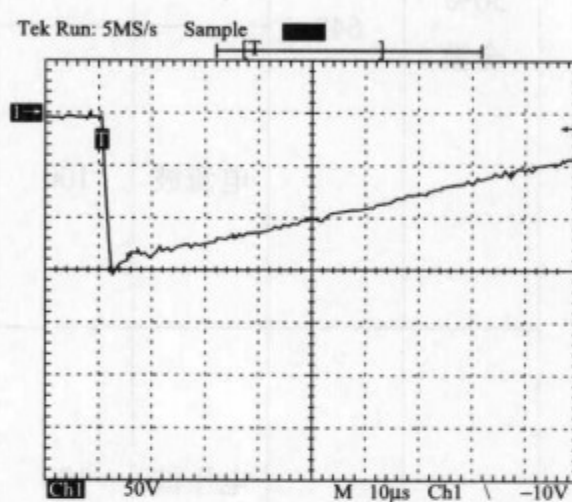
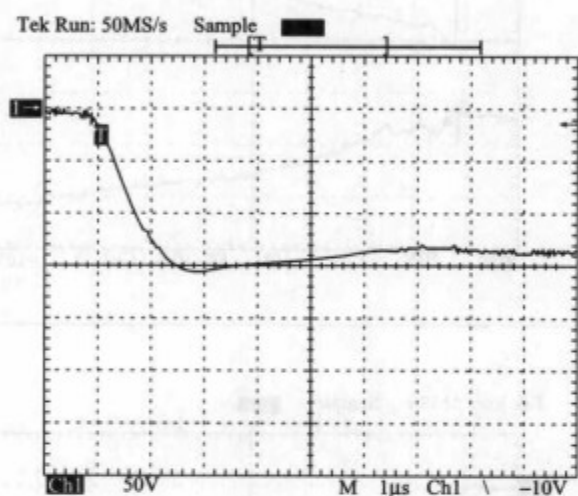
PV: 峰值电压表

测试仪器: TDS340 双通道数字记忆示波器

高压线端

雷电全波

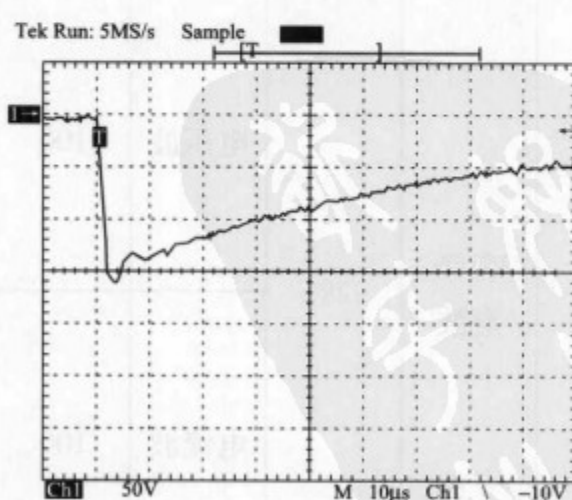
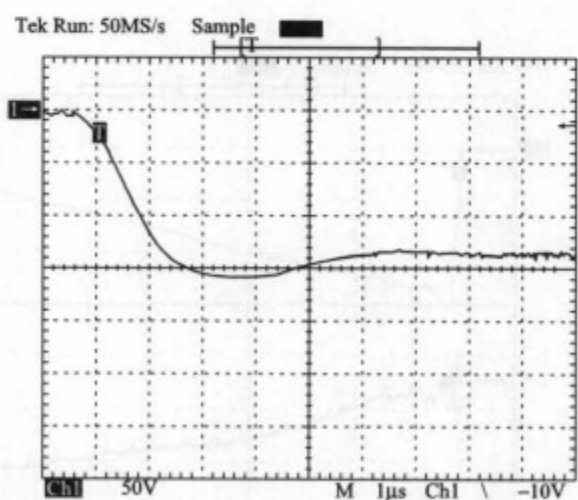
T_1 (μs)	$\mu\text{s}/\text{div}$	T_2 (μs)	$\mu\text{s}/\text{div}$
2.0	1.0	52	10



低压线端

雷电全波

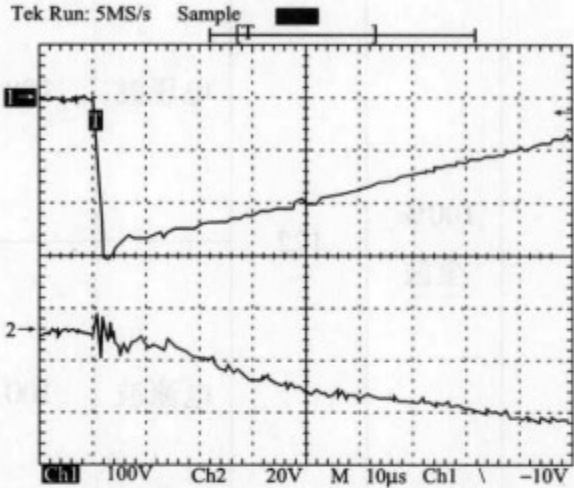
T_1 (μs)	$\mu\text{s}/\text{div}$	T_2 (μs)	$\mu\text{s}/\text{div}$
2.0	1.0	54	10



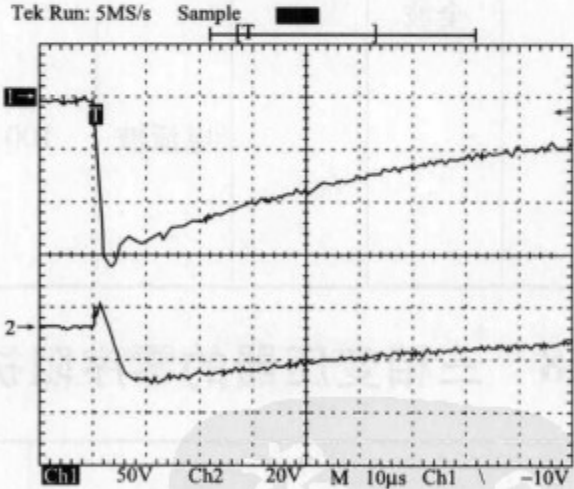
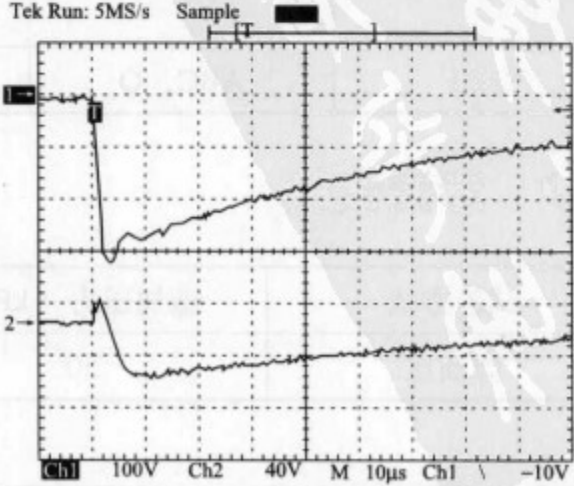
(仅提供 A 相示波图)

施加于	入波	施加电压 (kV)	波形	全屏扫描 (μs)	衰减	示波图
A	50% 全波	648	电压波	100	1	
			电流波	100		
	100% 全波	1298	电压波	100	2	
电流波	100					
	100% 全波	1297	电压波	100	2	
	电流波	100				

续表

施加于	入波	施加电压 (kV)	波形	全屏扫描 (μs)	衰减	示波图
A	100% 全波	1296	电压波	100	2	
			电流波	100		

(仅提供 a 相示波图)

施加于	入波	施加电压 (kV)	波形	全屏扫描 (μs)	衰减	示波图
a	50% 全波	62	电压波	100	1	
			电流波	100		
	100% 全波	124	电压波	100	2	
			电流波	100		

续表

施加于	入波	施加电压 (kV)	波形	全屏扫描 (μs)	衰减	示波图
a	100% 全波	122	电压波	100	2	
			电流波	100		
a	100% 全波	123	电压波	100	2	
			电流波	100		

4.18 三相变压器的零序阻抗测量 (特殊试验)

联结组标号	施加端子	电流 (A)	电压 (V)	阻抗 (Ω)
YNd1	ABC, O	20.25	488	72.30

4.19 渗漏试验

试验方法	施加压力 (kPa)	时间 (h)	结果
静油压	50	72	合格

4.20 套管试验

油温: 32℃

绝缘电阻 (用 2500V 兆欧表)			电压 10kV	
电压 (kV)	工厂序号	绝缘电阻 (MΩ)	tanδ	C _x (pF)
550	070197	10000	0.00293	555.5
550	070196	10000	0.00316	560.2
550	070195	10000	0.00289	548.6
72.5	071346	10000	0.00291	349.3
40.5	070363	10000	0.00307	982.1
40.5	070362	10000	0.00314	1031
40.5	070302	10000	0.00323	1010

4.21 油箱机械强度试验 (型式试验)

项目	施加压力	时间 (min)	最大弹性变形 (mm)	最大永久变形 (mm)
正压	98kPa	5	+13	+4
负压	真空残压 133Pa	5	-13	-3

4.22 声级测定 (特殊试验)

测量的环境条件

试验现场的总面积 S _v (m ²)	平均吸收因数 a	面积因数 A (m ²)	到主发射面 距离 (m)	测量表面面积 S (m ²)	环境修正值 K [dB (A)]
5432	0.15	815	0.3	115.6	1.95

测量结果

冷却器状态	变压器 声级平均值 (L _{PA'})	背景噪声 平均值 dB (A)	变压器和背景 的噪声差 dB (A)	背景噪声修正值 (X)
关闭	75.3	56	19.95	0

计算结果

冷却器状态	最终声压级水平	最终声功率级水平
	$L_{PA} = (\overline{L_{PA'}}) - X - K$	$L_{WA} = L_{PA} + 10\log S$
	dB (A)	dB (A)
关闭	73.4	94.0

结论：按照 GB/T 1094.10—2003 的规定，完成了变压器声级测定。测定结果符合小于 75dB (A) 的合同要求。

4.23 套管 TA 试验

相序	项目	标号	电流比	极性	直流电阻 (Ω)
A	保护	1K1, 1K2	2000/1	-	7.99
	保护	2K1, 2K2	2000/1	-	7.91
	测量	3K1, 3K2	600/1	-	2.22
	测量	4K1, 4K2	600/1	-	2.18
B	保护	1K1, 1K2	2000/1	-	7.90
	保护	2K1, 2K2	2000/1	-	7.98
	测量	3K1, 3K2	600/1	-	2.17
	测量	4K1, 4K2	600/1	-	2.14
	测量	5K1, 5K2	600/1	-	2.14
C	保护	1K1, 1K2	2000/1	-	8.06
	保护	2K1, 2K2	2000/1	-	8.01
	测量	3K1, 3K2	600/1	-	2.18
	测量	4K1, 4K2	600/1	-	2.15
O	保护	6K1, 6K2	2000/1	-	2.31
	保护	7K1, 7K2	2000/1	-	9.57

4.24 温升试验 (型式试验)

短路法

分接位置：17 分接

冷却方式：ONAN

测量数据

线圈	环境温度 ($^{\circ}\text{C}$)	额定电流下 油的平均温度 ($^{\circ}\text{C}$)	总损耗下 顶层油温度 ($^{\circ}\text{C}$)	额定电流下测得的电阻 (Ω)	
				冷态电阻 R_1	热态电阻 R_2
HV	32/33.5	62.8	63.5	0.3907	0.4412
LV				0.001217	0.001374

温升计算

顶层油温升: $\tau = 63.5 - 33.5 = 30$ (K)			
额定电流下 线圈的平均温升 (K)	$\theta_2 = (234.5 + 32) R_2 / R_1 - 234.5$ $\tau_w = \theta_2 - 33.25$	HV	33.2
		LV	33.1

油气相色谱分析

项目	油气相色谱分析							总烃
	H_2	CO	CO_2	CH_4	C_2H_6	C_2H_4	C_2H_2	
温升试验前	1.82	3.84	108.6	0.17	0	0	0	0.17
温升试验后	3.48	5.62	116.5	0.20	0	0	0	0.20

结论: 温升试验合格。

4.25 绕组变形试验

见绕组变形试验报告。

5 试验结论

该 SFZ10 - 370000/400TH 电力变压器的例行试验、部分型式试验和特殊试验的试验项目、方法和结论符合 GB 1094.1 ~ 1094.2—1996、GB 1094.3—2003、GB/T 6451—1999、GB/T 1094.10—2003、GB 311.1—1997、GB/T 16927.1—1997 等标准和技术协议的要求。

产品试验合格。

6 产品试验合格章

编制：
 校核：
 批准：
 日期：2007年7月12日



Manufacturer's serial No. : 200707056

TEST REPORT FOR POWER TRANSFORMER

Kind of Product: Power Transformer

Type of Product: SFZ10 –370000/400TH

User: India LANCO Power Station

Project: Main Transformer (No. 2)

Shandong Power Equipment Company

CHINA

July 12, 2007

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1 Explanation

User: India LANCO Power Station

Kind of product: Main transformers (No. 2)

Type of product: SFZ10 - 370000/400TH

Symbol of the product: 1DS. 711. 0667

Manufacturer's serial No. : 200707056

Manufacturer's name: Shandong Power Equipment Works, CHINA

Manufactured date: July. 12, 2007

2 Rated parameter

Rated power: 370/370 MVA

Rated voltage: $(420 \pm 8 \times 1.25\%) / 20\text{kV}$

Rated current: 508.6/10681.0A

Rated frequency: 50Hz

Tapping range: $(420 \pm 8 \times 1.25\%) \text{ kV}$

Connection symbol: YNd1

Type of cooling: ONAN/ONAF/OFAF

Type of using: Outdoor

Insulation level: SI1050LI1300AC570 - LI185AC85/LI125AC55

Active part mass: 189700kg

Mass of insulating oil: 91900kg

Upper tank mass: 18000kg

Transportation mass: 219800kg (with N₂)

Total mass: 371700kg

3 Reference standard

GB 1094.1 ~ 1094.2—1996 《Power transformers》

GB 1094.10—2003 《Power transformers》

GB/T 6451—1999 《Specification and technical requirement for three-phase

oil-immersed power transformers》

GB 311.1—1997 《Insulation co-ordination for high-voltage transmission and distribution equipments》

GB/T 16927.1—1997 《High-voltage test techniques》

IS: 2026—1994: power transformers

4 Test items and results

4.1 Measurement of dielectric character

Oil temperature: 32℃

Measurement part	Insulation resistance (MΩ)			Absorption ratio and PI	
	R_{15s}	R_{60s}	R_{10min}	R_{60s}/R_{15s}	R_{10min}/R_{60s}
HV - (LV + Ground)	20500	21400	39600	1.044	1.85
LV - (HV + Ground)	21300	32400	53800	1.52	1.66
(HV + LV) - Ground	17000	23400	33400	1.38	1.43
Core - Ground	1000MΩ		clamp—Ground	1000MΩ	

Tester: JD2705A high-voltage megger

4.2 Measurement of dielectric loss tangent and DC leakage

Oil temperature: 32℃

Measurement part	Dielectric loss tangent		DC leakage	
	$\tan\delta$	C (pF)	Voltage (kV)	Current (μA)
HV - (LV + Ground)	0.00239	18150	50	18
LV - (HV + Ground)	0.00238	38030	10	1
(HV + LV) - Ground	0.00248	38100		

Tester: AI-6000 dielectric loss tangent test system

ZGS-Q60/3 DC high-voltage generator

4.3 Insulation oil test

Loss $\tan\delta$ (90℃): 0.0007;

Breakdown voltage of oil: 73.6kV;

Water content: 10.1mg/L

Gas-in-oil analyses μL/L

Components	H ₂	CO	CO ₂	CH ₄	C ₂ H ₆	C ₂ H ₄	C ₂ H ₂	Hydrocarbon
Before impulse test	6.5	6.72	184	0.41	0	0	0	0.41
After impulse test	5.96	5.92	189	0.44	0	0	0	0.44

No-load test for 12h μL/L

Components	H ₂	CO	CO ₂	CH ₄	C ₂ H ₆	C ₂ H ₄	C ₂ H ₂	Hydrocarbon
Before test	5.96	5.92	189	0.44	0	0	0	0.44
After test	6.15	5.21	176	0.49	0	0	0	0.49

4.4 Measurement of voltage ratio and check of connection symbol

HV winding		LV winding	Value of ratio K	Deviation (%)			Connection symbol
Tapping	Voltage (V)	Voltage (V)		AB/ab	BC/bc	CA/ca	
1	462000	20000	23.100	0.25	0.25	0.25	YNd1
2	456750		22.837	0.22	0.22	0.22	
3	451500		22.575	0.24	0.19	0.19	
4	446250		22.312	0.21	0.21	0.21	
5	441000		22.050	0.18	0.18	0.13	
6	435750		21.788	0.14	0.19	0.14	
7	430500		21.525	0.16	0.11	0.16	
8	425200		21.263	0.12	0.08	0.08	
9	420000		21.000	0.09	0.04	0.04	
10	414750		20.738	0.06	0.06	0.06	
11	409500		20.475	0.02	0.07	0.02	
12	404250		20.212	0.03	-0.01	-0.01	
13	399000		19.950	0.00	-0.05	-0.05	
14	393750		19.687	-0.08	-0.03	-0.03	
15	388500		19.425	-0.07	-0.07	-0.12	
16	383250		19.163	-0.16	-0.16	-0.16	
17	378000		18.900	-0.10	-0.15	-0.15	

Tester: 3628D full-automatic voltage ratio meter

accuracy: 0.1 grade

4.5 Measurement of winding resistance

Oil temperature: 32°C

Winding	Tapping	Measured value (Ω)			Max. unbalanced rate (%)
		A ~ N	B ~ N	C ~ N	
HV	1	0.3907	0.3901	0.3928	0.74
	2	0.3846	0.3843	0.3869	
	3	0.3786	0.3782	0.3810	
	4	0.3728	0.3726	0.3752	
	5	0.3668	0.3668	0.3694	
	6	0.3610	0.3611	0.3636	
	7	0.3554	0.3553	0.3578	
	8	0.3496	0.3494	0.3520	
	9	0.3431	0.3430	0.3453	
	10	0.3495	0.3496	0.3522	
	11	0.3555	0.3555	0.3581	
	12	0.3613	0.3611	0.3641	
	13	0.3673	0.3672	0.3697	
	14	0.3729	0.3730	0.3755	
	15	0.3788	0.3789	0.3813	
	16	0.3845	0.3846	0.3868	
	17	0.3904	0.3907	0.3928	
LV		a ~ b	b ~ c	c ~ a	0.82
		0.001220	0.001217	0.001227	

Tester: JD2520 winding resistance measuring instrument

accuracy: 0.1 grade

4.6 Separate source voltage withstand test

Supplied to	Voltage (kV)	Duration (s)	Result
HV, HVN - (LV + Ground)	85	60	pass
LV - (HV + Ground)	55	60	

Tester: TAWG400 multifunction peak valve voltmeter and voltage divider

accuracy: 1 grade

4.7 Measurement of no-load loss and no-load current

 $f = 50\text{Hz}$

V	Mean value (kV)	r. m. s. value (kV)	No-load current (A)	No-load current percent	No-load loss (kW)	
					Measured Value	Corrected value
90%	18.0	18.0	10.2	0.10	140.4	140.4
100%	20.0	20.1	17.8	0.17	180.5	179.6
110%	22.0	22.4	30.0	0.28	230.4	226.2

4.8 Measurement of no-load current under AC 415V

 $f = 50\text{Hz}$

Supplied to	Voltage (V)			Current (A)		
	ab	bc	ca	a	b	c
abc	415	415	415	0.54	0.55	0.54

4.9 Measurement of short-circuit impedance and load loss

 $f = 50\text{Hz}$

Items Winding	Tap- ping	App- lied cur- rent (A)	Mea- sured vol- tage (V)	Short-circuit impedance (%)			Load loss (kW)			Refe- rence capa- city (MVA)
				Mea- sured value $t = 33^\circ\text{C}$	Calibrated value		Mea- sured value $t = 33^\circ\text{C}$	Calibrated value		
					I_r (A)	$t = 75^\circ\text{C}$		I_r (A)	$t = 75^\circ\text{C}$	
HV-LV	1	232.2	36654	15.80	462.4	15.80	726.9	462.4	763.9	370
HV-LV	9	274.2	34512	15.24	508.6	15.24	750.2	508.6	788.8	370
HV-LV	17	304.4	31401	15.42	565.1	15.42	801.8	565.1	865.6	370

4.10 On-load tap-changer test

Test operation:

- a) Transformer without excitation, OLTC finish 8 operation circle at rated Assistant voltage;

b) Transformer without excitation, OLTC finish 1 operation circle at 85% rated assistant voltage;

c) Transformer under rated excitation, when doing no-load test, OLTC finish 1 operation circle;

d) When doing load test, OLTC finish 10 tap changes in the ranges of ± 2 grade of the main tap.

The above operation test is in gear.

Insulation test of assistant circuit: 2kV (r. m. s. value) /1min power frequency voltage withstand

Test, pass.

4.11 Measurement of no-load harmonic

Fundamental voltage: 20kV

Harmonic component	Harmonic voltage (%)			Harmonic current (%)		
	U_{ab}	U_{bc}	U_{ca}	I_a	I_b	I_c
1st	100	100	100	100	100	100
2nd	0.035	0.051	0.034	0.356	0.338	0.337
3rd	0.355	0.711	0.397	15.69	17.48	14.82
4th	0.022	0.030	0.019	0.230	0.220	0.260
5th	1.300	1.319	1.471	31.96	31.58	32.53
6th	0.018	0.023	0.015	0.044	0.064	0.081
7th	0.814	0.873	0.864	10.78	10.82	8.450
8th	0.012	0.016	0.011	0.124	0.127	0.066
9th	0.040	0.024	0.086	0.182	0.186	0.513
10th	0.015	0.017	0.007	0.124	0.134	0.117
11th	0.022	0.034	0.148	0.120	0.122	0.106
12th	0.011	0.019	0.009	0.060	0.080	0.015
13th	0.018	0.015	0.013	0.068	0.0710	0.053
14th	0.004	0.006	0.007	0.113	0.113	0.123
15th	0.035	0.015	0.013	0.051	0.049	0.054

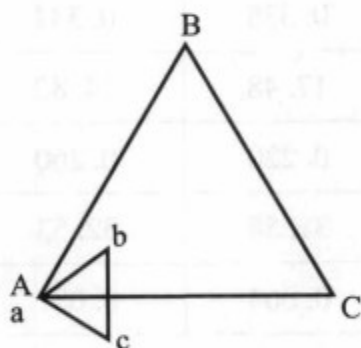
4. 12 Magnetic balance test

One phase excited, other phases measured	A-N	B-N	C-N
Voltage (V)	280	164	116
	144	272	136
	124	160	275

4. 13 Connection symbol test (two-voltmeter method)

Connecting A - a

Applied terminals	Value (V)	Measured terminals	Value (V)	Bb/Bc	Cb/Bc
A - B	404	B - b	388	388/408 = 0.95	388/408 = 0.95
B - C	404	C - b	388		
C - A	404	B - c	408		



$$Bb = Cb = \sqrt{(K - \sqrt{3}/2)^2 + (1/2)^2} / K = \sqrt{K^2 - \sqrt{3}K + 1} / K = 0.96$$

$$Bc = \sqrt{K^2 + 1} / K = 1.00$$

$$K = 420/20 = 21$$

Conclusion: connection symbol is YNd1.

4. 14 Phase-ground ACSD test with partial discharge measurement

Applied voltage (kV)	ACSD (kV)	Induced multiple	Frequency (Hz)	Duration (s)	Result
LV	HV (tap 17)				
34.8	570	1.74	250	24	pass

4. 15 Measurement of partial discharge

Test voltage		Duration (min)	Quantity of apparent discharge (pC)		
kV	Supplied voltage		A	B	C
424.9	$1.6U_m/\sqrt{3}$	5	90	70	90
478.0	$1.8U_m/\sqrt{3}$	0.4	90	70	90
424.9	$1.6U_m/\sqrt{3}$	5	90	70	90
424.9	$1.6U_m/\sqrt{3}$	10	90	70	90
424.9	$1.6U_m/\sqrt{3}$	15	90	70	90
424.9	$1.6U_m/\sqrt{3}$	20	90	70	90
424.9	$1.6U_m/\sqrt{3}$	25	90	70	90
424.9	$1.6U_m/\sqrt{3}$	30	90	70	90
424.9	$1.6U_m/\sqrt{3}$	35	90	70	90
424.9	$1.6U_m/\sqrt{3}$	40	90	70	90
424.9	$1.6U_m/\sqrt{3}$	45	90	70	90
424.9	$1.6U_m/\sqrt{3}$	50	90	70	90
424.9	$1.6U_m/\sqrt{3}$	55	90	70	90
424.9	$1.6U_m/\sqrt{3}$	60	90	70	90

Tester: JF2002 partial discharge tester

accuracy: 0.1 grade

4. 16 Switching impulse test

Test conditions and method

Atmosphere conditions

Atmospheric pressure: 101332Pa; Temperature: 32℃

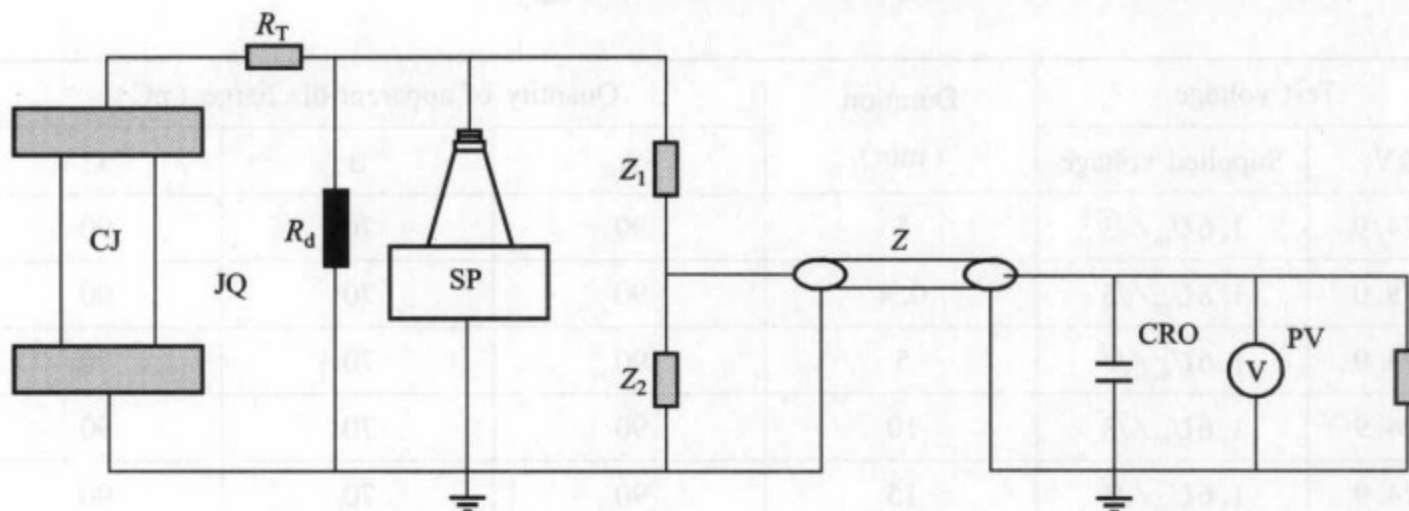
Test items and voltage		
Supplied to	Rated withstand voltage (kV)	Conclusion
	Switching impulse	
A, B, C	1050	pass

Test procedure:

1 time 50% voltage SW

3 times 100% voltage SW

Test circuit diagram:



CJ: impulse voltage generator

SP: tested article

R_T : adjusting-wave resistor

R_d : damp resistor

Z_1, Z_2 : voltage divider impedance

Z: high frequency transmission cable

r: matching resistor

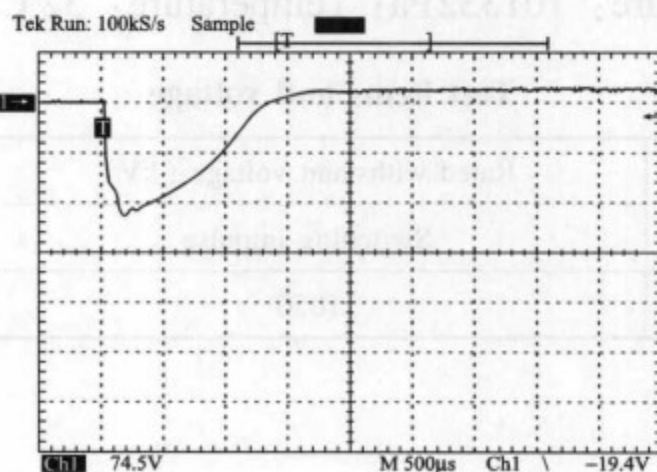
CRO: high voltage digital memory-oscilloscope

PV: peak valve voltmeter

Tester: TDS340 dual-channel digital memory-oscilloscope

HV line terminal

Switching impulse			
T_1 (μs)	$\mu s/div$	T_2 (μs)	$\mu s/div$
230	310	2580	500



(Only A-phase)

Supplied to	Input wave	Applied voltage (kV)	Wave sort	Full screen scan (μ s)	Input attenuation	Oscillogram
A	50% SW	523	Voltage wave	5000	1	
			Current wave	5000		
	100% SW	1049	Voltage wave	5000	2	
Current wave	5000					
	100% SW	1047	Voltage wave	5000	2	
	Current wave	5000				

continued

Supplied to	Input wave	Applied voltage (kV)	Wave sort	Full screen scan (μ s)	Input attenuation	Oscillogram
A	100% SW	1046	Voltage wave	5000	2	
			Current wave	5000		

4.17 Lightning impulse test

Test conditions and method

Atmosphere conditions:

Atmospheric pressure: 101346Pa; Temperature: 32°C

Test items and voltage

Supplied to	Rated withstand voltage (kV)	Tapping	Conclusion
	LI full wave		
A, B, C	1300	1 (A), 9 (B), 17 (C)	pass
a, b, c	125		pass

Test procedure:

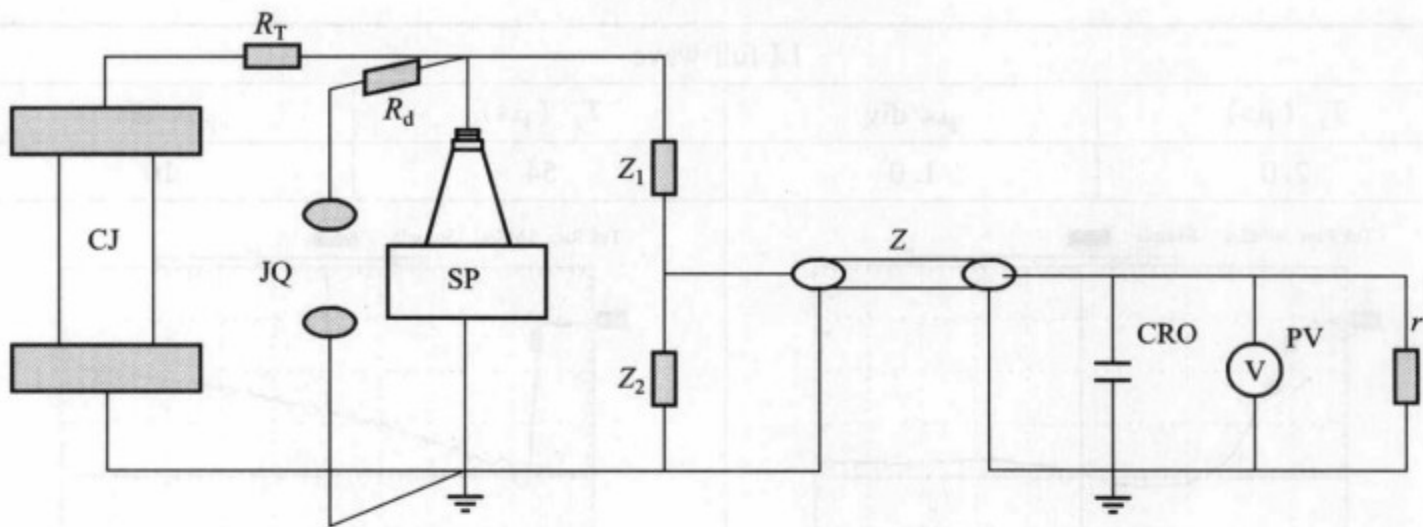
1 time 50% voltage LI full wave (negative polarity)

3 times 100% voltage LI full wave (negative polarity)

Test circuit diagram:

CJ: impulse voltage generator

JQ: chopping-wave sphere-gap



SP: tested article

R_T : adjusting-wave resistor

R_d : damp resistor

Z_1, Z_2 : voltage divider impedance

Z : high frequency transmission cable

r : matching resistor

CRO: high voltage digital memory-oscilloscope

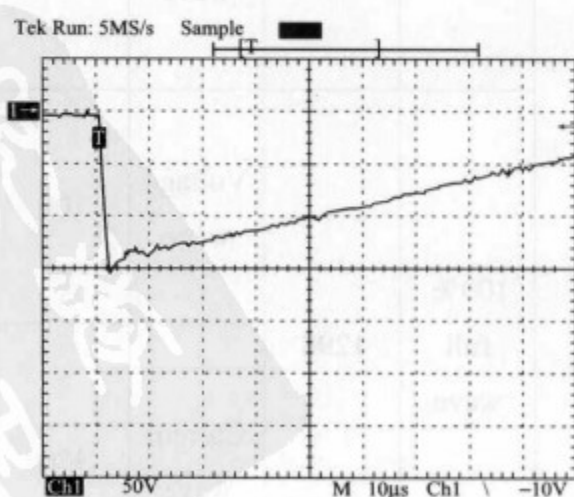
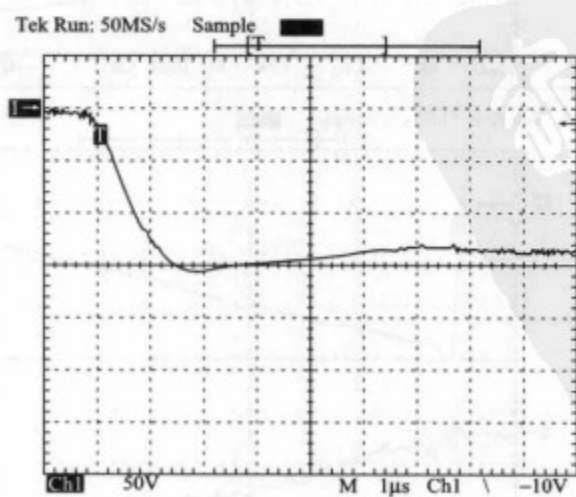
PV: peak valve voltmeter

Tester: TDS340 dual-channel digital memory-oscilloscope

HV line terminal

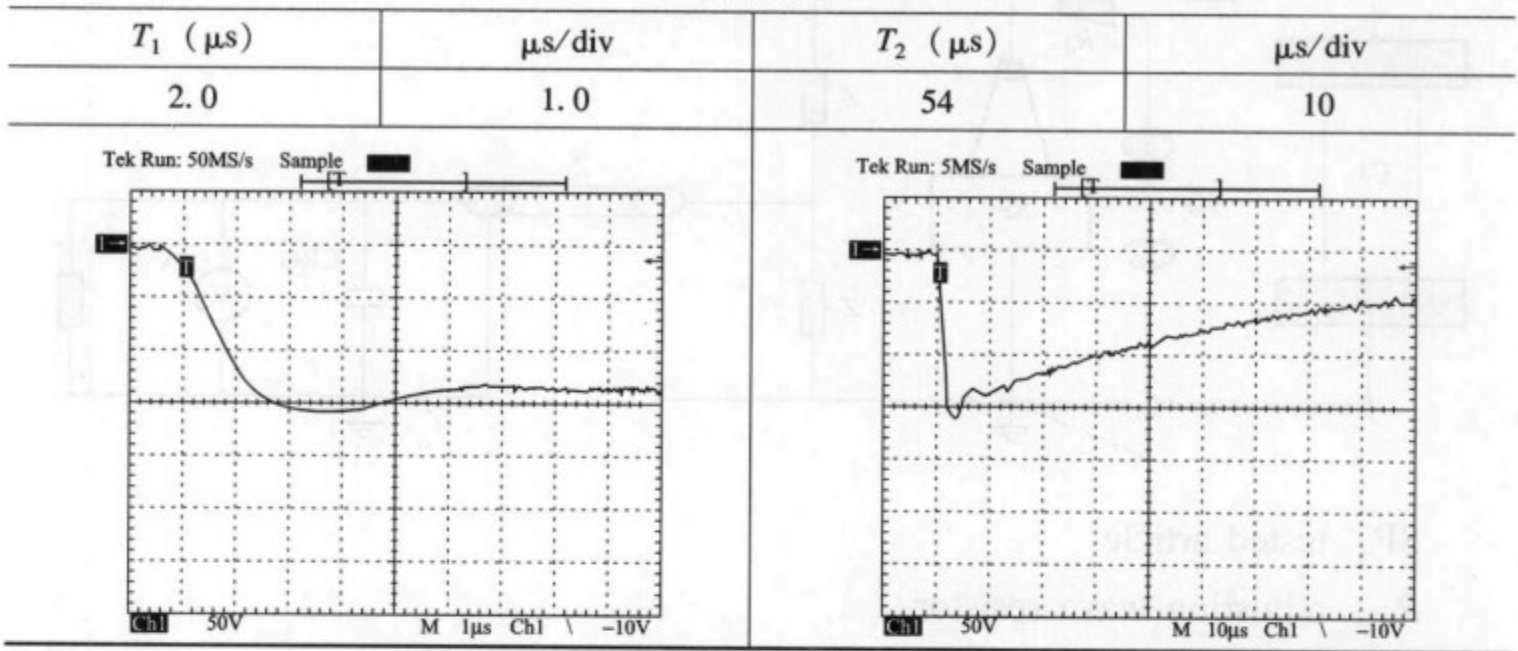
LI full wave

T_1 (μs)	$\mu\text{s}/\text{div}$	T_2 (μs)	$\mu\text{s}/\text{div}$
2.0	1.0	52	10



LV line terminal

LI full wave



(Only A-phase)

Supp- lied to	Input wave	Applied voltage (kV)	Wave sort	Full screen scan (μs)	Input attenua- tion	Oscillogram
A	50% full wave	648	Voltage wave	100	1	
			Current wave	100		
	100% full wave	1298	Voltage wave	100	2	
			Current wave	100		

continued

Supp- lied to	Input wave	Applied voltage (kV)	Wave sort	Full screen scan (μ s)	Input attenua- tion	Oscillogram
A	100% full wave	1297	Voltage wave	100	2	
			Current wave	100		
	100% full wave	1296	Voltage wave	100	2	
			Current wave	100		

(Only a-phase)

Supp- lied to	Input wave	Applied voltage (kV)	Wave sort	Full screen scan (μ s)	Input attenua- tion	Oscillogram
a	50% full wave	62	Voltage wave	100	1	
			Current wave	100		

continued

Supplied to	Input wave	Applied voltage (kV)	Wave sort	Full screen scan (μ s)	Input attenuation	Oscillogram
a	100% full wave	124	Voltage wave	100	2	
			Current wave	100		
	100% full wave	122	Voltage wave	100	2	
	100% full wave	123	Voltage wave	100	2	
			Current wave	100		

4. 18 Measurement of zero-sequence impedance on three-phase transformer (special test)

Connection symbol	Supplied terminal	Current (A)	Voltage (V)	Impedance (Ω)
YNd1	ABC, O	20. 25	488	72. 30

4. 19 Leakage test

Test means	Applied pressure (kPa)	Duration (h)	Result
Static oil pressure	50	72	Measure up

4. 20 Bushing test

Oil temperature: 32℃

Insulation resistance (by 2500V megger)			Voltage 10kV	
Voltage (kV)	Factory number	Insulation resistance (M Ω)	tan δ	C _x (pF)
550	070197	10000	0. 00293	555. 5
550	070196	10000	0. 00316	560. 2
550	070195	10000	0. 00289	548. 6
72. 5	071346	10000	0. 00291	349. 3
40. 5	070363	10000	0. 00307	982. 1
40. 5	070362	10000	0. 00314	1031
40. 5	070302	10000	0. 00323	1010

4. 21 Tank mechanical strength test (type test)

Items	Supplied pressure	Duration (min)	Max. flexibility distortion (mm)	Max. permanence distortion (mm)
Positive pressure	98kPa	5	+ 13	+ 4
Negative pressure	Vacuum residual pressure 133Pa	5	- 13	- 3

4.22 Measurement of sound level (special test)

Ambient conditions of measurement

Total area of test site's surface $S_v (m^2)$	Mean absorption factor a	Quantity of factor $A (m^2)$	Distance from principal radiating surface (m)	Area of measurement surface $S (m^2)$	Ambient correction value $K [dB(A)]$
5432	0.15	815	0.3	115.6	1.95

Result of measurement

State of cooler	Mean value of Transformer sound level $(\overline{L_{PA'}})$	Mean value of background sound level $dB (A)$	Difference between Transformer and background sound level $dB (A)$	Correction value of background sound level (X)
off	75.3	56	19.95	0

Result of calculation

State of cooler	Final sound pressure level with A-weighted $L_{PA} = (\overline{L_{PA'}}) - X - K$ $dB (A)$	Final sound power level with A-weighted $L_{WA} = L_{PA} + 10\log S$ $dB (A)$
off	73.4	94.0

Conclusion :

The transformer sound level measurement is performed in according to regulation of GB/T 1094.10—2003, the measurement result accord with the <75dB (A) requirement prescribed in contract.

4.23 Bushing CT test

Phase order	Item	Position	Current ratio	±	DC resistance (Ω)
A	Protect	1K1, 1K2	2000/1	-	7.99
	Protect	2K1, 2K2	2000/1	-	7.91
	Measure	3K1, 3K2	600/1	-	2.22
	Measure	4K1, 4K2	600/1	-	2.18
B	Protect	1K1, 1K2	2000/1	-	7.90
	Protect	2K1, 2K2	2000/1	-	7.98
	Measure	3K1, 3K2	600/1	-	2.17
	Measure	4K1, 4K2	600/1	-	2.14
	Measure	5K1, 5K2	600/1	-	2.14
C	Protect	1K1, 1K2	2000/1	-	8.06
	Protect	2K1, 2K2	2000/1	-	8.01
	Measure	3K1, 3K2	600/1	-	2.18
	Measure	4K1, 4K2	600/1	-	2.15
O	Protect	6K1, 6K2	2000/1	-	2.31
	Protect	7K1, 7K2	2000/1	-	9.57

4.24 Temperature-rise test (Type test)

Short-circuit method

Tapping position: No. 17

Cooling method: ONAN

Measured data

Winding	Ambient temperature (°C)	Average oil temperature under rated current (°C)	Top oil temperature under total losses (°C)	Measured resistance under rated current (Ω)	
				at cooling resistance R_1	at heated resistance R_2
HV	32/33.5	62.8	63.5	0.3907	0.4412
LV				0.001217	0.001374

Calculation of temperature-rise

top oil temperature-rise: $\tau = 63.5 - 33.5 = 30$ (K)

average winding temperature-rise under rated current (K)	$\theta_2 = (234.5 + 32) R_2 / R_1 - 234.5$ $\tau_w = \theta_2 - 33.25$	HV	33.2
		LV	33.1

Gas-in-oil analyses

$\mu\text{L/L}$

Item	H ₂	CO	CO ₂	CH ₄	C ₂ H ₆	C ₂ H ₄	C ₂ H ₂	Hydrocarbon
before temperature-rise test	1.82	3.84	108.6	0.17	0	0	0	0.17
after temperature-rise test	3.48	5.62	116.5	0.20	0	0	0	0.20

Conclusion: The temperature-rise test is eligible.

4.25 Winding deformation test

See report of winding deformation test.

5 Test conclusion

The test items, methods and conclusions of routine test, partial type test and special test of SFZ10 - 370000/400TH power transformer meet with the requirements of GB 1094.1 ~ 1094.2—1996, GB 1094.3—2003 GB/T 6451—1999, GB/T 1094.10—2003, GB 311.1—1997, GB/T 16927.1—1997 standard and technical agreement requirement.

The product test is eligible.

6 The product test eligibility cachet

Compiler:

Checker:

Ratifier:

Date: July. 12, 2007