电能质量服务解决方案
Power Quality Service Solution

施耐德电气
善用其效 尽享其能

全球能效管理专家施耐德电气为世界100多个国家提供整体解决方案，其中在能源与基础设施、工业过程控制、楼宇自动化和数据中心与网络等市场处于世界领先地位，在住宅应用领域也拥有强大的市场能力。致力于为客户提供安全、可靠、高效的能源，施耐德电气2009年的销售额为158亿欧元，拥有超过100,000名员工。施耐德电气助您——善用其效，尽享其能！

施耐德电气在中国

1987年，施耐德电气在天津成立第一家合资工厂梅兰日兰，将断路器技术带到中国，取代传统保险丝，使得中国用户用电安全性大为增强，并为断路器标准的建立作出了卓越的贡献。90年代初，施耐德电气旗下品牌奇胜率先将开关面板带入中国，结束了中国使用灯绳开关的时代。

施耐德电气的高额投资有力地支持了中国的经济建设，并为中国客户提供了先进的产品支持和完善的技术服务，中低压电器、变频器、接触器等工业产品大量运用在中国国内的经济建设中，促进了中国工业化的进程。

目前，施耐德电气在中国共建立了77个办事处，26家工厂，6个物流中心，1个研修学院，3个研发中心，1个实验室，500家分销商和遍布全国的销售网络。施耐德电气中国目前员工数近22,000人。通过与合作伙伴以及大量经销商的合作，施耐德电气为中国创造了成千上万个就业机会。

施耐德电气 EcoStruxure™ 能效管理平台

凭借其对五大市场的的深刻了解、对集团客户的悉心关爱，以及在能效管理领域的丰富经验，施耐德电气从一个优秀的产品和设备供应商逐步成长为整体解决方案提供商。今年，施耐德电气首次集成其在建筑楼宇、IT、安防、电力及工业过程和设备等五大领域的专业技术和经验，将其高质量的产品和解决方案融合在一个统一的架构下，通过标准的界面为各行业客户提供一个开放、透明、节能、高效的EcoStruxure™能效管理平台，为企业客户节省高达30%的投资成本和运营成本。

目录

前言
Foreword

关注您的电能质量，维护您的生产安全
Take Power Quality into consideration,Guarantee your production safety

当电能质量问题导致生产停顿、经济损失，甚至危及到设备及生命安全的时候，我们还能继续坐视不管吗?
Can we still stay regardless, when power quality problems result in production stop, economical losses, and even threatening the safety on equipment or personnels ?

您的电气系统是否正受到以下问题的困扰：
Is your power system suffering the below troubles?

- 功率因数低，电费帐单高
  Low power factor brings high energy bills;
- 无功补偿电容器频繁故障：无法正常工作，甚至过热、变形、爆炸 .....
  The frequent accidents on compensation capacitors: malfunction, overheating, expansion, explosion .....;
- 变压器噪音不正常偏大
  Big noise of transformers;
- 变压器及电缆 N 线过电流、过热，而三相负荷并非严重不平衡
  Overload and overheating of neutral conductors of transformers or cables, not due to the load unbalance;
- 断路器无故跳闸
  Nuisances tripping of circuit breakers
- PLC 通讯或过程控制器工作受干扰
  Disturbance on PLC communication or process controllers;
- 供电连续性难以保证，突然断电或电压波动造成生产损失 .....
  The power supply continuity is not reliable, the suddenly happening power shutdown or voltage disturbance often takes production losses.....;
- .....

电容补偿柜事故照片
Capacitor bank after an accident

您可能苦苦思索却得不到答案。所有这些，都说明您的电气系统可能存在电能质量问题！
Perhaps you are thinking it over but can not find the answer. All this phenomenon indicates probably there is power quality problems in your system !

作为全球电气领域的领导者，施耐德电气的专家将为您排忧解难！
As the global leader in Electricity, Schneider Electric will help you to solve the problems !

施耐德电气电能质量服务解决方案

Power Quality Service Solution by Schneider Electric

您可能面临的问题 Customers' Painpoints	谐波与电压畸变类 Category: Harmonic & Voltage Distortion			电容补偿类 Category: Power Factor Correction		电能质量监控类 Category: PQ Monitoring & Control	电磁兼容类 Category: EMC
	电能质量检测与咨询服务 Power Quality Measurement & Consulting	谐波治理改造 Harmonic Filtering Retrofit Solution	电压治理改造 Voltage Improving Retrofit Solution	电容器检测与维护 Cap. Test & Maintenance	无功补偿系统升级改造 PFC System Retrofit	增加电能质量监视仪表与监控系统改造 PQ Metering & Control System Modernization	电磁兼容咨询与解决方案 EMC Study & Solution
无功补偿 / 功率因数 / 电容器类问题 **Power Factor Compensation / Capacitor Related Issues**							
电容器频繁故障（过热、爆炸 .....） Capacitors are easily subject to accident	建议			需要	建议		
快速变化的特殊感性负载造成补偿困难 Fast varing reactive load results in low PF					需要		
功率因数低，电费罚款 Low Power Factor and extra engery bill for penalty				需要	可能需要		
谐波类问题 **Harmonic Related Issues**							
异常状况（自动化系统通讯故障、断路器异常跳闸、N 线过热、变压器噪音大、电子设备烧坏 ....）频发，可能和谐波有关？ Strange problems,such as PLC communication failure, CB nonsuance tripping, N phase overheating, noise of transformer, electronic devices damagged...) may be due to harmonic?	需要	可能需要		可能需要		建议	可能需要
电压类问题 **Voltage Related Issues**							
电压变化和波动 Voltage variations & fluctuation	需要		需要			建议	
电压跌落和瞬断 Voltage digs & short interruptions	需要		需要			建议	
电压不平衡 Voltage unbalance	需要		需要	建议		建议	
过电压 Overvoltage	需要		需要	建议		建议	
经常发生关键负荷供电电压中断 Long interruption of voltage for critical loads offen happens;	需要		需要				
电磁兼容类问题 **EMC Related Issues**							
无线电干扰造成电子设备如 PLC、仪表、变频器等工作异常； Radiofrequency interference resulting in malfunctioning of PLC, meters etc.;	建议	可能需要					需要
电子调速装置造成电话系统干扰、无线电接受噪音、差动保护动作等异常现象； Electronic speed controllers bring interference to telephone system, radio receivers, differential protection devices etc.							需要
雷电或操作冲击干扰造成静态元件或电子保护装置等功能异常； Malfunction of static devices, electronic protection relays etc. due to lighting or switching interference;				建议			需要
电能质量监控类问题 **Power Quality Monintoring & Control Related Issue**							
无法获知我的电能质量现状，但很关心 Not know the situation about my system, but I really hope to know	需要					建议	
希望能长期监视电能质量 Hope to permanently monitor the PQ						需要	
希望对电能质量实现自动监控功能 Hope to have the intelligent control & monitoring system for PQ						需要	

施耐德电气电能质量服务解决方案
The Power Quality Service Solution by Schneider Electric

谐波与电压畸变类
Category: Harmonic & Voltage Distortion

我们可以为您做到！
Schneider Electric is ready to help you!

电能质量检测与咨询服务
Power Quality Measurement & Consulting

专业检测，专家分析，帮您找到问题答案
Professional measurement and expertise analysis, to help you to find the answer to questions

什么是电能质量检测与咨询服务？
What is a Power Quality Measurement & Consulting ?

电能质量检测的目的是检测并记录下配电系统及其关键回路上的主要电气参数，从而评估其用电效率、系统可靠性和危险程度。

The aim of the Power Quality Measurement is to record the main electrical parameters of the distribution system, at key points of the installation, in order to evaluate its efficiency, reliability and criticality.

电能质量专家对采集的数据进行分析并提出建议，从而优化电能消耗水平，提高电源可用性、系统可靠性、供电连续性……

Power quality experts analyze the recorded data and provide recommendations for possible improvements on energy consumption, availability, reliability, continuity, …

配电系统将得到哪些改善？
What can be the system benefits ?

- 安装无功补偿电容组将改善功率因数，并进而削减电费，并减少变压器和电缆过载风险……
  Implement capacitor banks will improve power factor and then decrease electricity bill and transformer or cables overloads, …
- 安装谐波滤波器能够降低波形畸变率，减少线路损耗，避免意外跳闸，令系统达到国家标准或行业规定要求……
  Install harmonic filters, will decrease distortion, reduce losses, avoid uncontrolled tripping, comply with standards and regulation, …
- 使用UPS 或备用发电系统将保证对敏感用电设备的持续供电
  Use UPS or genset systems will guaranty permanent energy supply of sensitive loads
- 加装防电涌避雷器和/或电容组将防止设备在浪涌过电压情况下（例如闪电）受到损坏……
  Add voltage surge arresters and/or capacitors will prevent from damages due to surge over-voltage (lightning for example), …

使用哪些专业设备?
Which equipment we use ?

我们的高级服务专家在以下方面具有长期经验及丰富知识：

Our advanced services specialists, have long experience and deep knowledge in following aspects

电气网络稳定性、配电系统元件和结构、电气现象诸如谐波、瞬态、谐振、电压跌落等……
Electrical network stability, electrical distribution components and architectures, electrical phenomena such as harmonics, transients, resonance, sags, etc ..

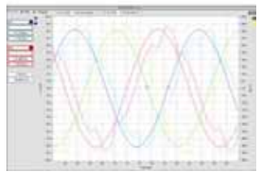
利用高级电力仪表和电能质量分析仪，来捕捉并记录中／低压系统以下的主要电气参数和现象
Use of power meters and power analyzers capable to catch the main electrical parameters and phenomenon of MV and LV systems

- 功率(S, P, Q)、电压、电流、频率
  Power (S, P, Q), voltage, current, frequency
- COSϕ及功率因数、谐波和电压/电流畸变率
  COSϕ and PF, harmonics and THD U / I
- 瞬态、闪变、三相不均衡以及电压跌落和失电……
  Transients, Flicker, unbalance and voltages sags/outages, …

专业设备可以记录有效值和峰值，并可进行波形捕捉，波形捕捉可以是短时点内的捕捉，也可以进行长时段（几天／周）的连续记录。

Record of rms and peak values, waveform captures during spot measurement as well as for long duration recordings (several days /weeks).

专业分析仪
Network Analyzer



电压／电流波形捕捉示例
Voltage / Current Wave Capture Example

EN50160	Power quality all parameters as per EN50160	
Day Long Interval 10 Min	1 day average values Free intervall (1 min – 1 day) 10 minute average values: voltage, current, frequency, Flicker, power values, symmetrical components	
Events	Events, triggers Dips, swells, interruptions	
3 s	3 sec average values: Harmonics, THD	
RMS	Rms values Averaging time adjustable between 10 ms – 1 day	
Oscilloscope	Sample rate: 10,24 kHz / channel	
Transients	Transients: 100 kHz – 10 MHz / channel	
Transients	Ripple control signals on phases and N-conductor Voltage, current active power	
	Online mode	oscilloscope transients events

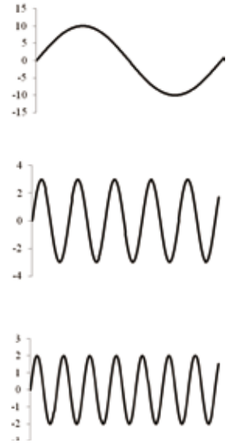
谐波治理改造
Harmonics Filtering Retrofit Solution

最大程度消除谐波，还您一个干净的用电系统
To eliminate the harmonic utmostly, and return you a clean power system

什么是谐波和间谐波?
What are harmonics and interharmonics?

- 谐波是指电压或电流中所含有的频率为基波的整数倍的电量，一般是指对周期性的非正弦电量进行傅里叶级数分解，其余大于基波频率的电流产生的电量
  Harmonics in voltage or current are the periodic waves whose frequencies are integer multiples of the fundamental frequency. They are current wave, drawn by the non-linear loads, and decomposed into a series of simple sinusoids by Fourier series analysis.

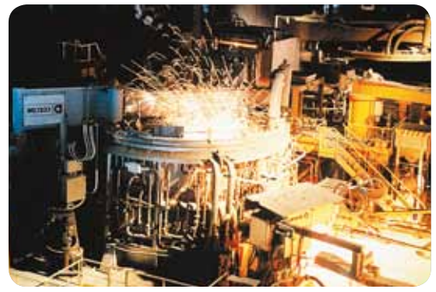
- 间谐波是频率在各次谐波之间的电压和电流。例如：140Hz
  Interharmonics are the voltage or current whose frequencies are between one harmonic and another.



谐波和间谐波产生的原因?
The causes of harmonics and interharmonics

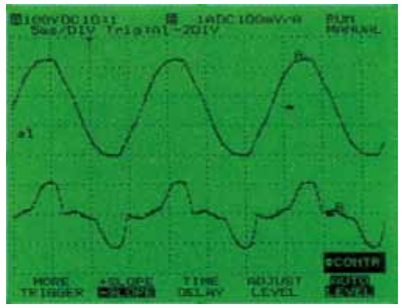
- 谐波由于正弦电压加压于非线性负载，基波电流发生畸变产生谐波。主要非线性负载有UPS、开关电源、整流器、变频器、逆变器等
  When a non-linear load, such as a rectifier, UPS, VSD, invertors, etc, is connected to the system, it draws a current that is not necessarily sinusoidal. It can be decomposed into harmonics.

- 间谐波往往由非周期性的非线性负荷（如周波变换器，电弧焊）所引起
  Iterharmonics are produced by the non-periodic and non-linear loads, such as welding machined, cycloconverters.



谐波和间谐波的危害
The effects of harmonics and interharmonics

- 大量 3 次倍谐波将导致中性线过电流、过热甚至引发火灾；
  Overheating of neutral conductor happens due to multiple of three times harmonics. It may lead to fire.
- 降低配电设备（如变压器、电缆）的有效承载能力；
  Degrading the actual transmission capability of distribution equipment, such as transformers, cables etc.
- 额外的能耗损失：谐波次数越高，谐波热损耗 (I^2Rt) 越高。10A 的 5 次谐波电流所产生的热量为 10A 的基波电流热量的 5 倍。
  Extra energy loss: the more times of the harmonic, the more thermal loss made. The thermal loss by a 10A 5th harmonic is 5 times of which 10A fundamental.
- 额外的过零点将导致时钟误差并影响频率敏感的设备（过程控制设备）
  More zero-crossing by harmonics voltage will lead to erratic operation of clock and sensitive process control equipment.
- 间谐波会导致发电机轴由于压力而发生断裂。
  The interharmonics may lead to vibration and break of axis of Genset.
- 引起断路器误跳闸；
  Nuisance tripping of circuit breakers
- 造成功率因数补偿电容器的过电流、过电压；
  Over-stressing of power factor correction capacitors
- 集肤效应；
  Skin effect
- .....



谐波存在下的电流电压波形示意
The voltage and current wave when harmonic existing

施耐德电气为客户提供的谐波治理改造服务，包括以下步骤：
Schneider Electric provides our customers the harmonics filtering retrofit service, including the below steps:

- 了解掌握客户运行记录、故障历史、设备状况等信息；
  Acknowledge the customers' system operation histories, equipment status, faulty records, etc.
- 采用先进仪器，进行现场电能质量检测及分析；
  By using our advanced instruments, our experts visit the site and made the power quality tests and analysis.
- 专家组提出几种可行的治理方案；
  After the site investigation and analysis, our experts team will raise out several optional solutions.
- 同用户进行技术经济分析比较，确定最优化方案
  Compare all the optional solutions with the customer, by analyzing them form the technical and economical aspects. Then find out the optimized solution.
- 优化方案的现场实施；
  Execute the site retrofit as per the optimized solution.
- 改造后对电能质量跟踪检测，对治理效果提供报告
  Follow up and evaluate the result of site retrofit, and provide the report for the solution.

我们的治理改造方案是从系统角度出发的，并结合我们的先进产品。它可能包括以下内容：
Our harmonics filtering retrofit solutions are more system oriented, and combined with our advanced products. It may include:

- 谐波源（非线性负载）的定位、特性分析及优化建议
  Harmonics source tracking out, their characteristic analysis, and proposal for improving;
- 特殊谐波源的隔离
  Isolation measures for some special harmonics source;
- 无功补偿系统改造，防止其对谐波的放大
  Retrofit for reactive power compensation system, to avoid its amplification effect on harmonics;
- 专门设计的无源滤波器
  Special designed passive filters;
- 有源滤波器
  Active filters;
- 专门设计的混合滤波器
  Special designed hybrid filters;
- .....

低压隔离变压器 Trihal
LV Isolation transformer Trihal

中压无源滤波器
MV passive filter

低压混合滤波器
LV Hybrid filter

低压有源滤波器
Accusine

施耐德电气公司在电能质量领域拥有超过 30 年的经验。我们的专家致力于理论研究、标准制定、产品开发、综合治理方案实践等，积累了行业领先的丰富知识，拥有大量成功案例。
Schneider Electric has over 30 years' rich experience in the field of harmonic improving solution. Our experts are dedicated in the theory study, standard establishment, products R&D, solution practice etc, they have accumulated the leading knowledge and have plenty of successful stories.

电压治理改造
Voltage Improving Retrofit Solution

维护电压质量，减少经济损失。电压治理改造可以帮您！
To maintain the voltage quality and reduce the losses, our retrofit solution can help!

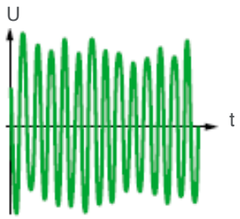
电压质量的重要性
The importance of the voltage quality

电压是电能质量的一项基本指标。供电电压是否稳定、偏差的大小关系到供用电设备的安全和经济运行。
Voltage is one of the basic index which are used to evaluate the power quality. Whether the supplied voltage is stable, and how much the deviation is compared with standard, does concern the safety and efficiency of power distribution and consumption equipment.

而目前在工业企业、商业建筑或基础设施中，电压扰动问题广泛存在，每年由此造成的经济损失惊人。
（据统计仅美国因供电电压质量问题造成的损失每年高达 260 亿美元）
However it is a truth that nowadays in the industries, commercial buildings or infrastructures, the problems of voltage disturbance exist widely, and every year they cause an amazing economic loss.
（Based on the statistics, the economical loss in US due to the voltage disturbance every year has reached 26 billion USD ）

涉及电压的电能质量问题主要涵盖以下方面
The main kinds of voltage disturbances includes

问题 1：电压变化和波动
Problem 1: Voltage variations and fluctuation



定义：电压变化是指幅度小于额定电压的有效值或幅值的 10%的电压改变。
Definition: Voltage variations are variations in the rms value or the peak value with an amplitude of less than 10% of the nominal voltage.

电压波动是一系列的、循环的或随机的电压波形包络线的变化。
Voltage fluctuations are a series of voltage changes or cyclical or random variations in the voltage envelope which are characterised by the frequency of variation and the magnitude

危害：灯光亮度闪烁（闪变），带来生理疲劳（视觉或神经）。
Harms: Luminance of lamps (flicker), the physiological strain (visual and nervous fatigue)

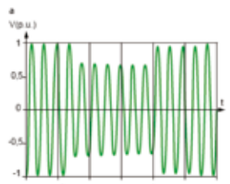
可能原因：
Possible causes:

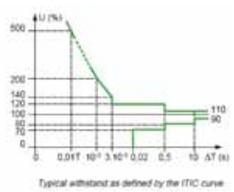
- 缓慢的电压变化是由于连接在系统中的负载缓慢变化造成的
  Slow voltage variations are caused by the slow variation of loads connected to the network.
- 电压波动主要是由于快速变化的工业负荷，如电焊机、、电弧炉或轧钢机等
  Voltage fluctuations are mainly due to rapidly varying industrial loads such as welding machines, arc furnaces or rolling mills.

解决方案：
Solution:

- 更换照明设备。荧光灯较白炽灯低敏感；
  Changing the type of lighting. Fluorescent lamps are less sensitive than incandescent lamps;
- 安装 UPS;
  Installing an uninterruptible power supply;
- 改造产生扰动的负载 . 如改变频繁启动的电机启动方式 , 可以减少过电流；
  Modify the device generating the disturbance Changing the starting mode of motors which have to start frequently, for example, can reduce overcurrents;
- 网络改造：如将照明回路连接在近电源侧；
  Modify the network: Increase the short-circuit power by connecting lighting circuits to the nearest power supply point.
- 增加扰动负荷与照明回路之间的电气距离，如通过采用单独变压器给扰动负荷供电；
  Increase the "electrical distance" between the disturbance-generating load and lighting circuits by powering the disturbance-generating load from an independent transformer.
- 采用无功补偿装置：通过给每一相提供实时无功补偿（HVC）, 闪变可以减少 25% 到 50%;
  Use a reactive compensator. This device provides real time reactive compensation for each phase. Flicker can be reduced from 25 % to 50 %;
- 连接串联电抗器。通过串联电抗器减少启动电流的方式，可以使电弧炉产生的闪变降低 30%。
  Connect a reactance in series By reducing the inrush current, a reactance downstream from the connection point of an arc furnace can reduce flicker by 30 %

问题 2：电压跌落、瞬断
Problem 2: Voltage digs and interrupions





计算机系统的电压耐受曲线

定义：电压跌落是指电力系统中某一点的电压的突然降低，紧接着在很短的时间（几个周波到几秒）内又得以恢复的情况。电压瞬断是电压跌落到额定值的 1%-10% 的一种特殊情况 (IEC 61050-161)。电压跌落和瞬断是最常见的电能质量问题。
Definition: A voltage dig is a sudden reduction of the voltage at a point in an electrical power system followed by voltage recovery after a short period of time from a few cycles to a few seconds (IEC 61050-161).The voltage interruption is a kind of special voltage dig,in which case the voltage amplitude falls to 1%-10% of the nominal value.

危害：
Harms:

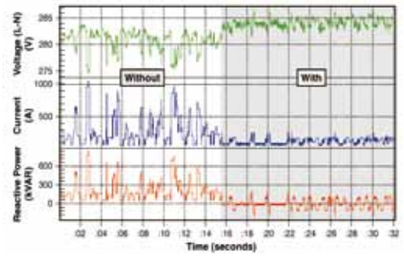
- 电机停车后突然重启，带来生产工艺混乱、过电流及安全问题；
  Motor stops then re-accelerate may lead to problems in process, overcurrent or safety;
- 接触器或断路器的失压跳开；
  Undervoltage tripping of contactors or circuit breakers;
- 计算机系统的中断；
  Shutdown of computer system;
- 变频调速装置故障；
  Malfunction of variable speed machines;
- 荧光灯和白炽灯寿命缩短
  Premature aging of incandescent lamps and fluorescent tubes, etc
- ……

可能原因：

Possible causes:

大电流现象引起，如短路、大型负载的投切（异步电动机、电弧炉、电焊机等）、电容器投入的瞬间、熔断器或瞬动断路器切除故障的瞬间等。

Mainly caused by phenomena leading to high currents, such as short circuit, switching of large loads (asynchronous motors, arc furnaces, welding machines, boilers, etc.); energisation of capacitor banks; the isolation of a fault by a fuse or a fast LV circuit breaker, etc.



就地无功补偿装置投入前后电焊机电压电流及无功需量变化

解决方案：

Solution:

- 降低大型负载投入时的消耗功率（采用就地补偿、变频调速等技术手段）；

  To reduce their apparent power demand when heavy load operating (by using local reactive power compensation, VSD starting up etc.)
- 增加敏感设备的抗干扰能力（负载分类供电、控制回路直流供电等）；

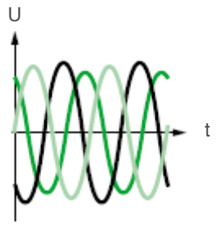
  To improve the immunity capability of sensitive devices (by using independent power supply, DC power supply for control circuits etc.)
- 关键设备增加 UPS 应急电源；

  Add the UPS for critical loads.
- 增加双电源转换装置等

  Add the Auto Transferring Switches for critical loads;

问题 3：电压不平衡

Problem 3: Voltage unbalance



定义：三相电压不平衡是指每相邻两相间的电压有效值或相角不相等。

Definition: A 3-phase system is unbalanced if the rms value of the phase voltages or the phase angles between consecutive phases are not equal.

危害：异步电机过热

Harms: The main effect is the overheating of 3-phase asynchronous machines.

可能原因：单相或两相间不平衡负载的存在

Possible causes:There are big unblance sigle phase or phase to phase loads

解决方案：

Solution :

- 平衡单相负载；

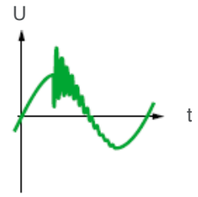
  Balancing single phase loads on all three phases；
- 增加系统短路容量（增加变压器容量或电缆截面积）；

  Increase the Scc by reducing the power system impedance upstream of the devices causing the unbalance by increasing the transformer rated power and the cable cross-section
- 电机安装适当的保护装置；

  Fitting the appropriate protective device for the machines

问题 4：过电压

Problem 4: Overvoltage



定义：过电压是指施加于设备的电压峰值超过标准限定值。包括暂时过电压、操作过电压和雷击过电压三种类型。

Definition: Where voltage is applied to a device and the peak value exceeds the limits defined in a standard or specification, this is an overvoltage. Overvoltages are of three types: temporary overvoltage, switching overvoltage, and lighting overvoltage.

危害：

Harms:

- 造成绝缘降低，从而对设备（电子元件）产生损害；

  Dielectric breakdown, causing significant permanent damage to equipment (electronic components, etc.).;
- 设备老化；

  Degradation of equipment through aging (repetitive rather than destructive overvoltages);
- 设备故障带来的长时间断电；

  Long time interruptions caused by the destruction of equipment
- 控制系统或通讯回路干扰；

  Disturbance in control system and low current communication circuits;
- 雷击或操作过电压带来的电动力破坏和热影响（火灾）；

  Electrodynamic and thermal stress (fire) caused by lighting or switching overvoltages.

可能原因：

Possible causes:

- 暂时过电压：绝缘故障、铁磁谐振、中性线导体断开、调压器或变压器故障、无功功率过补偿

  Temporary overvoltages, they have various origins, including insulation fault, Ferroresonance, break of the neutral conductor, faults on alternator regulators or tap changer transformer, overcompensation of reactive power.
- 操作过电压：分合正常负载、感性电流或电容回路造成；

  Switching overvoltages, including switching overvoltages at normal load, overvoltages produced by the switching on and off of low inductive currents, vervoltages produced by the switching of capacitive circuits (no-load lines or cables, capacitor banks);
- 雷击过电压：雷电直击线路或设施带来的直接雷击过电压、雷电感应过电压或地电位升高

  Lighting overvoltages, including direct lightning strike (on a line or structure) and the indirect effects of lightning (induced overvoltages and increase in earth potential)

解决方案：

Solution:

- 暂时过电压：低负荷时退出部分或全部电容器；系统参数修正避免铁磁谐振；

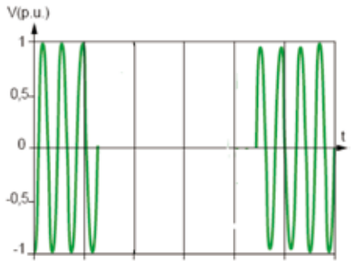
  The temporary overvoltage: Switching off part or all compenstion capacitors when low load level; Configue the system parameters to avoid the ferromagnetic resonance. phenomenon.
- 操作过电压：限制补偿电容器投入时的暂态过程（安装串联电抗器和阻尼电阻）；变频器加装串联电抗器；使用具有选择性的漏电断路器，防止当雷电和操作过电压时，或当对地具有电容效应的回路上电时带来的意外跳闸；

  The operating overvoltage: Limit the transient process when capacitors switching in (by adding the damper resistors); Add the reactors for VSD; Choose the residual protection devices with selectivity function, to avoid the nuisance tripping.
- 雷击过电压：建筑物及其结构的建筑防雷设施（避雷针、法拉第笼、架空接地线等）；安装避雷器；

  Lighting overvoltage: Add the lighting protection devices, such as surge arrestors, Faraday cage, overhead grounding line etc.

问题 5：电压长时间中断 / 意外失电

Problem 5: Voltage long interruption / accidental outage



定义：持续时间大于 1 分钟的电压中断

Definition: loss of voltage with duration longer than 1 minute.

危害：关键设备突然停运造成的生产停顿、数据丢失、设备损坏甚至人员伤亡 .....

Harms: Production stop due to critical equipment shut down; data loss, equipment damage, human injury.....

可能原因：

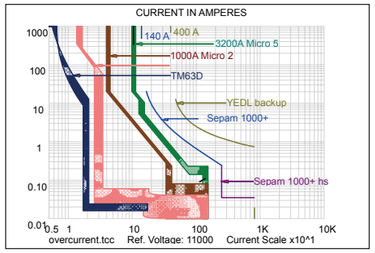
Possible causes:

- 保护装置动作以便对永久故障的隔离；
  Isolation of a permanent fault by a protection device;
- 无效的选择性带来的越级跳闸；
  Non-selective tripping due to wrong discrimination calculation
- 系统可靠性水平低；
  Low reliability of power system;
- 关键负荷缺乏 UPS
  Lack of UPS for critical loads
- ……

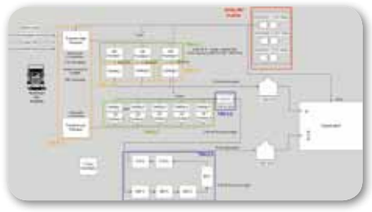
解决方案：

Solution:

- 系统与设备定期维护；
  Periodical maintenance for equipment and system;
- 系统选择性分析咨询；
  Selectivity study;
- 系统可靠性分析咨询；
  Reliability study;
- 增加不间断电源；
  Add UPS;



施耐德电气选择性分析软件
Selectivity study software by Schneider Electric



施耐德电气可靠性分析软件
Reliability study software by Schneider Electric

施耐德电气 Galaxy 9000 UPS
Galaxy 9000 UPS by Schneider Electric

施耐德电气为客户提供的电压治理改造服务，包括以下步骤

Schneider Electric provides our customers the voltage improving retrofit service, including the below steps

- 访问客户现场，根据客户反映的电压质量问题展开调研（查看运行记录、故障报告、设备状况等信息）
  Visit the customer site, and start to make the audit according to the related voltage problems (including check the system operation histories, equipment status, faulty records, etc.)
- 采用先进仪器，进行现场电压波形进行实时录波及分析
  By using our advanced instruments, our experts will make the voltage wave acquisition in real time and make analysis on site
- 找到问题原因，专家组提出几种可行的治理方案
  Find out the original causes for the problems, then our experts team will raise out several optional solutions.

- 同用户进行技术经济分析比较，确定最优化方案
  Compare all the optional solutions with the customer, by analyzing them form the technical and economical aspects. Then find out the optimized solution.
- 优化方案的现场实施
  Execute the site retrofit as per the optimized solution.
- 改造后对电压质量进行跟踪检测，对治理效果提供报告
  Follow up and evaluate the result of site retrofit, and provide the report for the solution.

施耐德电气公司在电能质量领域拥有超过 30 年的经验，我们的专家在理论研究、参与标准制定、产品开发、综合治理方案等各方面积累了丰富的经验。

Schneider Electric has over 30 years’ rich experience in the field of harmonic improving solution. Our experts are dedicated in the theory study, standard establishment, products R&D, solution practice etc, they have accumulated the leading knowledge and have plenty of successful stories.

施耐德电气电能质量服务解决方案
The Power Quality Service Solution by Schneider Electric

电容补偿类
Category: Power Factor Correction

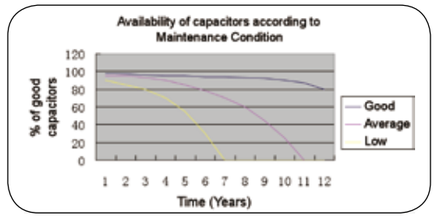
我们可以为您做到！
Schneider Electric is ready to help you!

电容器检测与长期维护合同
Capacitor Test & Long Term Maintenance Contract

防患于未然，电容器安全与效率的同步提升
Take preventive measures，Let us improve the capacitor safety and efficiency together.

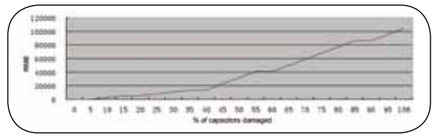
一定要对电容器进行维护与保养吗？如果不做的话，将会怎样？
Do I need to maintain the capacitors? If not, what will happen then?

- 由于缺乏有效的检测与维护，长期受安装及运行条件的影响，会导致电容器使用寿命缩短，为此您可能需要提前支付重置电容器的费用。
  The impact of installing and operating conditions will shorten the service life of capacitor; you may need to pay the cost of replacement capacitors in advance.



不同维护条件下的电容器寿命曲线

- 电容器在未优化使用的状态下运行而导致的能源加倍损耗，为此您可能需要支付更多的能源成本。
  Let the capacitor operate under poor conditions will lead to energy consumption increasing., you may need to pay more for energy costs.



1000KVA 变压器，配 300KVar 补偿电容器，
电容器损坏带来的年电费额外支出
Yearly extra electrical energy cost when capacitors malfunction, (exampled by a 1000KVA transformer with 300KVar capacitor)

- 由于选型错误、柜体结构设计不当、运行环境影响（谐波、过电压 .....）等，大量用户的电容器存在泄漏、着火甚至爆炸的风险！为此您可能需要应对因此而产生的一系列的经济及运营损失。
  The capacitor may be leakage, fire or explosion without maintenance performed on this type of equipment after long-time use; you may need to deal with the resulting economic and operating losses.

电容器过热引发的配电柜火灾事故照片
LV switchboard after a fire accident caused by capacitors' overheating

对电容器的定期的检测与维护，将会帮助我们避免因为电容器的故障而带来的效率与经济上的损失，以及避免因此而产生的更大的安全风险。
Regular maintenance of the capacitor will help us to avoid the productivity losses and economic loss and therefore be far away from the greater risk may caused.

施耐德电气可以为您提供电容器的专业检测与长期维护合同服务
Schneider Electric will provide you with excellent products and long term capacitor maintenance contract service.

- **专业维护保养**

  Professional maintenance actions and tests

  设备及元件的清洁

  Cleaning of equipment and components

  元件的目检

  Visual inspection of components

  容量测量

  Measure capacitance

  接触器运行检测及 PF 性能检测

  Check contactors operation and PF performance

  串联电抗器谐波负载水平检测

  Check reactors harmonic load level

  控制器设置，信息及报警记录监控

  Check controller settings, information and alarm records

  连接处牢固性检测

  Check connections tightening

  通风系统的运行及效率

  Operation and efficiency of ventilation system

  ……

- **专家咨询服务**

  Expertise and advices

  红外记录与分析

  Infrared record and analysis

  电能质量记录与分析

  Power Quality record and analysis

  远程温控及过载警报

  Remote temperature / overload alarming

  ……

- **提供解决方案**

  Curative actions

  问题电容器及其元器件的及时更换

  Replacement of defective capacitors or components

  现场维修更换服务

  On call site intervention

  ……

施耐德电气的专业技术团队，将在 7*24 小时之内为您提供专业快速的现场服务，提升电容器使用性能，保障电容器使用安全，优化您的电能使用，降低您的用电成本。

Experienced technology experts from Schneider Electric are ready at any time to provide you speedy and professional locale service within 7*24hours which may help you optimize the capacitor’s operation performance, make the capacitor safety, improve the energy efficiency and reduce your electric cost.

因为，安全、效率，我们的承诺

Our promise: Make your capacitor be safety and efficiency

无功补偿系统升级改造
Power Factor Correction System Retrofit

消除隐患，提升性能

您的无功补偿系统可能需要升级改造，

To eliminate the risk, improve the performance – Your old PFC system needs the retrofit !

补偿电容器可能是配电系统中最薄弱、最危险的元件，因为：
The reactive power compensation capacitors may be the most weak, but at the same time also the most dangerous components, because:

- 产品内部为电介质填充，故障情况下可能膨胀或燃烧

  They are filled with dielectric materials inside, which in case of faulty may lead to expansion, explosion or fire;

- 运行过程容易发热，同时寿命受环境温度影响明显（加速老化）

  They are easier to subject to overheating, and their life time is affected seriously by the temperature;

- 对电压波动敏感，在冲击或瞬态过电压下极易损坏

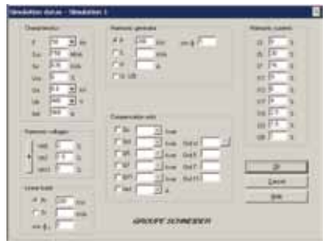
  They are sensitive to the voltage disturbance, so very easy to be destroyed by the transient overvoltage;

- 在系统存在谐波的情况下将引起过电流甚至谐振，从而引发发热、膨胀、爆炸等事故

  When the system is polluted by harmonic, the over current or resonance phenomenon often occurs for compensation capacitors. They will become overheating, expansion or explosion.

施耐德 VARSET Fast 快速无功补偿装置，内置静态开关和快速响应控制器

The fast PFC products VARSET Fast, integrated with static switches and fast controller



施耐德电气专业电容器设计软件 Harena

Professional software Harena by Schneider Electric

- 投入退出控制必须考虑自放电间隔，否则可能引起短路爆炸

  The self-discharge interval must be considered when the capacitors are re-energized, otherwise it may take the risk of explosion;

- 瞬间投入系统可能会引起数十倍冲击过电流

  The inrush current at the moment of the capacitors connection can reach to tens of times of rated value;

- 对运行环境要求高，要求补偿电容柜柜体结构设计合理、运行维护正确

  The specific operation condition is strictly required for the capacitors. The structure of the capacitors cubicle must be designed reasonably, and maintained correctly.

- ……

而在当初在补偿电容器的原始设计时，往往无法掌握或忽略了实际系统运行的情况，从而使您的补偿系统存在隐患！

However, the original design of your capacitor banks always neglects, or can not know, the real system operation parameters in future. Thus it has put your reactive power compensation system in potential risks!

这些隐患包括：

The risks includes:

- 受上述各种因素影响，电容器容易发生火灾、爆炸，危机配电系统设备安全 .；
  The fire, explosion of the capacitors due to the above reasons will threaten the safety of whole distribution equipment.
- 火灾引发供电中断，带来生产损失；
  The fire of capacitors may result in power shutdown, and bring the loss of production.
- 火灾与爆炸威胁运行人员安全；
  The fire or explosion will threaten the safety of operators;
- 电容器失效，无法有效补偿，带来电费罚款；
  The malfunction of the capacitors will lead to low power factor, then bring the penalty for energy bills.
- 无法有效补偿带来配电设备（变压器、电缆等）过负荷；
  The over load of distribution equipment, such as transformers, cables, may happen due to the malfunction of capacitors and low power factor.
- 无法有效补偿带来能源损耗增加；
  Extra energy consumption due to non-effective reactive power compensation.
- .....

电容器过热引发的配电柜火灾事故照片
LV switchboard after a fire accident caused by capacitors' overheating

施耐德电气公司提供的无功补偿系统改造服务，可以帮助用户彻底消除上述隐患，使您的系统恢复到经济和安全的运行状态。我们的改造服务包括以下内容：

Schneider Electric provides our customers the service of Power Factor Correction System Retrofit, which can help you to eliminate the above risks thoroughly, and take your power system back to safety and economical operation status. Our retrofit service may includes the below content:

- 根据我们提供的“无功补偿系统设计咨询”服务的报告，与客户讨论确定改造方案
  Discuss with the customer about our retrofit solution, based on our report of Power Factor System Design Consulting service. Then define the final retrofit scheme.
- 我们提供改造方案的现场施工
  We provide the on-site retrofit engineering.
- 改造后系统的调试与上电
  System commissioning and energizing supervision, after the retrofit engineering;
- 新补偿系统的性能测试
  Test and evaluation of the new PFC system;
- 提交改造效果评估报告
  Provide the performance evaluation report for the system retrofit;
- 运行人员的安全、维护、故障处理等技术培训
  Provide the training for customer operators, about safety, maintenance, trouble shooting etc.;
- 备品备件支持、技术热线等后续服务保证
  Provide the later on support, such as spare parts, technical hotline, etc.

配电系统将得到哪些改善？

What can be the system benefits ?

- 安装无功补偿电容组将改善功率因数，并进而削减电费，并减少变压器和电缆过载风险……
  Implementation of capacitor banks will improve power factor and then decrease electricity bill and transformer or cables overloads, …
- 在系统中存在谐波的情况下，正确地选择带消谐电抗器的电容器组的方案，可以避免电容器对谐波的放大，并降低谐波畸变率。对于一些对暂态过程敏感的客户现场，选择无暂态电容器组的方案可以实现平滑的功率因数自动调节
  In case some harmonics flow in the system, capacitor banks with detuning reactors will avoid amplification and attenuate distortion.
  For sensitive site, transient free capacitor banks will allow soft automatic Power Factor Correction
- 加装电容器组同时可以降低损耗，从而帮助系统节能
  Capacitor banks also decrease losses and improve system efficiency

中压电容组 / MV Capacitor Bank

我们有哪些优势？

How do we do it ?

我们的高级服务专家在以下方面具有长期经验及丰富知识：
Our advanced services specialists have long experience and deep knowledge in:

功率因数校正理论、电容器元件技术、功率因数校正系统和解决方案。
Power factor correction principles, capacitor technologies and power factor correction systems and solutions.

依靠施耐德电气专家对于各种电气现象如谐波、暂态、谐振现象等的深入理解，将帮助您消除电容器接入配电系统所带来的风险。
Their perfect knowledge of electrical phenomenon such as harmonics, transients, resonance, etc … prevents risks linked to the connection of capacitors in an electrical system.

拥有专业的软件，用于功率因数校正计算及解决方案的确定。
Specialized software are used to make PFC calculation and definition of the PFC solutions.

拥有行业领先的全系列产品，与设计方案完美结合
Schaeider Electric has the advanced PFC products family , which can comply with the design schemes perfectly.

施耐德电气电能质量服务解决方案
The Power Quality Service Solution by Schneider Electric

电能质量监控类
Category: Power Quality Monitoring & Control

我们可以为您做到！
Schneider Electric is ready to help you!

增加电能质量监视仪表与监控系统改造
PQ Metering & Control System Modernization

明察秋毫，电能质量完全掌控
Modernizing your system, power quality can be clearly under supervision and control

实现电能实时监控的重要性
The importance of Power Quality Monitoring & Control in real time

- 由于电能质量问题可能导致安全隐患、生产中断、经济损失等，其重要性日益突出，也越来越受到用户的重视。

  The power quality issues may lead to safety risks, production stop, economical losses etc, so they have become more and more important and drawn customers' high attention.

- 如果能在日常运行中随时掌握与电能质量相关的各种电气参数，并实现进行波形记录，扰动捕捉，越限报警、保护及控制等功能，将会使用户对异常变化做到提前预知，从而方便运行管理，大大降低电能质量问题可能带来的一系列风险。

  If the customers can not only master all the related parameters concerning power quality at any moment during their daily operation, but also realize the functions such as wave record, disturbance capture, over threshold alarming, protection and control etc., it will be very helpful to them to anticipate the abnormal PQ variation, so to facilitate their operation management, lower down the potential risks due to pure PQ.

施耐德电气公司拥有 Powerlogic 和 Ion 系列电能质量智能监视仪表，多种型号、多种功能组合，满足用户的各种需求。

Schneider Electric provides the Powerlogic and Ion series of intelligent power meters, with different models and function combination, to meet the customers' different requirement.

另外，我们还拥有 Ion Enterprise 电能质量管理软件，帮助用户实现整个配电系统的信息集中管理、电能成本控制、系统运行状态监控、对系统电能质量和供电可靠性进行分析、实现快速报警响应，严防故障发生等功能。

Besides, we also provide the professional power quality management software Ion Enterprise, to help the customer to realize the system information central management, power energy cost control, operation status monitoring, PQ and reliability analysis, incident alarming, etc., to prevent the accident happening.

基于我们长期的专业经验，以及上述先进的产品支持，施耐德电气公司可以帮助用户对原配电系统进行改造，增加电能质量智能仪表与监控系统功能。

Base on our long term's experience, as well as the above mentioned advanced products, Schneider-electric can help the customers to modernize their installation, to have the power quality monitoring and control function.

施耐德 Powerlogic 系列产品及软件
Powerlogic meters and software

增加电能质量智能监视仪表改造
Power Quality Metering Modernization

- 根据对客户系统电能质量的检测分析，提出增加智能仪表的改造建议；
  Based on the measurement and analysis of power quality in the customer’s system, we make the proposals about the metering retrofit;
- 与用户讨论确定改造方案；
  Discuss and define the retrofit proposal with the customer;
- 改造方案的详细设计
  Detailed design for the retrofit scheme;
- 现场进行改造施工、调试
  On site retrofit engineering and commissioning;
- 改造后的验收与报告
  Acceptance test and reporting after the retrofit.

我们的相关产品：Our related products

回路	方案		监控要求	备注
进线回路	电能质量监测装置 	ION7650	遥测、遥信、遥控 最高511次谐波监视，骤升/骤降监视、电压扰动监视、扰动方向判定、闪变监视，采样频率1024点/周波 报警，波形捕捉（可调）	大屏幕液晶显示 可定制显示屏界面 可选以太网口、光纤接口
		CM4250	遥测、遥信、遥控 最高255次谐波监视，电压骤升/骤降监视、扰动监视，采样频率512点/周波 报警，波形捕捉（自适应、扰动、稳态）	可选附件: CMDLC液晶显示器 ECC21 以太网卡 IOC44 输出/输出卡等
重要出线回路	PM750 电力参数测量仪 	PM750	测量: 电流、电压、功率、电度、功率因数、频率、谐波等，具备1个RS485通讯接口/Modbus协议，2DI，1DO，越限报警 有功电能 IEC62053-22，class0.5s	适用于重要出线回路中需全电量测量，但不需要遥控电操分合的回路。
	PM800系列 电力参数测量仪 	PM810	遥测: 电流、电压、功率、电度、功率因数、频率、谐波、最大/最小值等 遥信: 断路器分合闸状态 遥控: 远程控制断路器分闸	同时适用于中压进出线、低压进线及带电操的重要馈出线回路，可实现较全面的监控功能。 PM800系列均具备: RS485接口/Modbus协议 I/O: 1 DI, 1 DO
		PM820	具备PM810的全部功能 单次谐波分析，数据记录、报警记录，80K内存，内部时钟	
		PM850	具备PM820的全部功能 波形捕捉（固定模式），800K内存，趋势预测	
		PM870	具备PM850的全部功能 可调模式波形捕捉，电压骤升/骤降监视	
一般出线回路	MC系列多回路监控单元 	MC09	遥测: 母排电压、9个单相电流或3个三相电流	功能简单，造价低； 单台设备监视多条回路； RS485接口/Modbus协议
		MC18	18路遥信（18个DI），干节点输入无需辅助电源， 遥信：9台断路器的分合闸	
		MC08	8路遥信和8路遥控 (8DI和8DO)。 遥信：4台断路器的分合闸状态和故障状态 遥控：4台断路器的远程分合闸	
无功补偿回路	功率因数控制器 	NRC12	遥测: 电压、电流、功率因数、谐波、柜内温度 遥信: 投切步数、报警功能 控制: 就地自动投切	RS485接口/Modbus协议

增加电能质量监控系统改造
Power Quality Monitoring and Control System Modernization

- 对整个配电系统结构进行分析
  Analysis on the customer’s system architecture;
- 软件整体方案设计
  General design for the software system;
- 现场增加电能质量监控仪表及相关通讯、控制元件的改造
  On site retrofit for metering instruments and other related components such as communication, control modules etc.;
- 软件编程
  Programming for the system software;
- 通讯系统现场布线，元件、仪表与软件调试
  On site wiring and commissioning for the communication system and instruments;
- 监控系统投入试运行
  Operation test after the retrofit;
- 对系统性能进行评估，并提供最终报告
  Evaluate the system performance, and provide the final report.

我们的相关产品：Our related product

PowerLogic ION Enterprise 软件

PowerLogic ION E 软件可以应用于：

PowerLogic ION E software can be applied in:

- 实时监视电力系统的运行状况
  Supervise the operation status of the power system in real time
- 企业级电能消耗管理
  Enterprise Energy comsumption management
- 电能质量监视和可靠性分析
  Power quality monitoring and reliability study
- 成本分配及子计费
  Cost analysis and allocation
- 需量控制和功率因数控制
  Demand control and PF control
- 负荷特性分析和线路优化
  Load characteristic analysis and feeders optimizing
- 预防性维护
  Preventive maintenance
- 设备的监视和控制
  Equipment supervision and control

功能
Function

ION E 的功能包括：
ION E software function includes

数据采集
Data acquisition

报警和事件
Events alarming and logging

手动和自动控制
Manual and auto control

实时监视
Mornitoring in real time

报表
Reporting

趋势分析
Trend analysis

电能质量分析
Power quality analysis

施耐德电气电能质量服务解决方案
The Power Quality Service Solution by Schneider Electric

电磁兼容类
Category: EMC

我们可以为您做到！
Schneider Electric is ready to help you!

电磁兼容咨询与解决方案
EMC Study & Solution

关注电磁兼容问题，保障设备运行安全与稳定
Take EMC into consideration,guarantee installation safety and availability

“电磁兼容”相关术语
The technical terms related to EMC

电磁兼容：设备或系统可以在其所处的电磁环境中正常工作，同时不给该环境中其他设备带来无法忍受的电磁干扰的一种能力。

Electromagnetic compatibility, EMC: The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

（电磁）干扰：任何会导致装置、设备或系统性能降低的电磁现象。它可能是出线在传输媒介中的电磁噪音、多余信号或变化。

(Electromagnetic) disturbance : Any electromagnetic phenomenon which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter. An electromagnetic disturbance may be an electromagnetic noise, an unwanted signal or a change in the propagation medium.

施耐德电气电磁兼容实验室
Schneider Electric EMC Laboratory

“电磁兼容”问题的重要性
The importance of the EMC issues

在很多行业领域，系统电磁干扰现象在电气设备、电子设备（PLC，变频器等），或者信息处理设备中均有发生，可能导致功能异常并带来如下风险：

In many areas of activity, electromagnetic disturbance occuring in installations containing electrical, electronic (PLCs, variable speed drives,…) or information processing (technology) equipment, can lead to malfunctioning likely to generate risks:

- 性能或品质损失；
  Loss of performance/quality,
- 设备停止工作（工作异常，停机，损坏）；
  Unavailability of equipment (malfunctioning, breakdown, destruction),
- 安全水平下降；
  Deterioration of the safety level, ...

为降低这些风险，电磁兼容技术和规范必须在设计、安装和改造阶段得以贯彻应用。

To minimize these risks, EMC know-how and rules must be applied from the design stage, during installation and whenever the installation is modified.

60% 至 80% 的电磁兼容相关故障在设计阶段可以避免。

60 to 80% of EMC related malfunctioning could be avoided at the design stage

我们的 EMC 专家能为您提供以下服务：
Our Experts in EMC can provide you the below service:

设计和安装技术支持
Design and installation assistance

- 分析系统配置技术档案；
  Analysis of construction technical dossiers,
- 电磁环境的特性分析；
  Characterization of the electromagnetic environment,
- 系统验收技术支持；
  Assistance with installation validation,
- 检查电磁兼容部分的设计规定；
  Checking of EMC design rules,
- 增强产品或系统功能的电磁干扰耐受能力；
  Strengthening of product or function electromagnetic withstand,
- 现场分析和特性测量；
  Site analysis and characterization measurements

现场调研和诊断
On-site audit/diagnosis

您的现场可能遇到以下问题：
You may meet the below problems in your site:

1. 您的系统工作不正常：
Your installation is malfunctioning

- 通讯中断或故障
  Faulty or loss of communication,
- 断路器无故跳闸
  Nuisance tripping of circuit breakers,
- 元件或设备损坏
  Destruction of components or equipment,
- 生产过程中断
  Loss of process,
- 无法解释的功能异常
  Unexplained untimely malfunctioning,
- …

2. 您希望了解您厂房内的无线电频率干扰信号的水平
You are wondering about the levels of radio frequency signals within your premises.

我们的专家可以帮您到现场进行测量，对这些现象进行量化和技术分析，为您提供最好的解决方案，以使您的系统恢复到正常的运行状态。
Our experts come to site to take measurements and quantify these phenomena, and provide you with the best solutions to implement in order to return to normal operation.

- 设备产生的干扰测量
  Measurement of the disturbance generated by the equipment,
- 故障后的兼容措施的技术支持
  Assistance in making compliant following malfunctioning.
- 定位干扰源
  Identify disturbance sources,
- 衡量周围电磁干扰的水平
  Measure the level of ambient electromagnetic disturbance,
- 判定故障设备的易受干扰的水平
  Determine the susceptibility level of faulty equipment,
- 鉴定电磁场的实际场强水平，并与人员防非电离辐射的相关标准所建议的此类环境的场强水平相比较。
  Quantify the levels of measured electromagnetic fields compared to those recommended by the standard concerning worker protection against non-ionizing radiation.

提供技术建议
Recommendations

- 判定各种耦合
  Determine the various couplings,
- 加强装置和系统的抗电磁干扰（闪电和强电磁场）的能力
  Electromagnetic hardening (lightning and strong fields) of devices and installations.
- …

施耐德电气公司，在电磁兼容方面有 20 年的专业经验
Schneider Electric: 20 years’ experience in EMC

- 拥有大量成功案例
  Many private and public sector references,
- 0 到 3GHZ 干扰信号的测量手段
  0 to 3 GHz measurement means,
- 欧盟电磁兼容标准委员会成员
  Member of the European Committee for Electrotechnical Standardization (CENELEC, TC215).

我们的全球经验 / Our Global Experience

汽车
Automotive

本田，米其林，电装，佛吉亚，法雷奥，博世，大众汽车

Toyota, Michelin, Denso, Faurecia, Valeo, Bosch, General Motors

石油与天然气
Oil & Gas

道达尔，英国石油

Total, BP

食品
Food & Beverage

达能，雀巢，嘉吉，保洁，联合利华

Danone, Nestle, Cargill, Procter & Gamble, Unilever

微电子
Micro-electronics

爱特梅尔，IBM

Atmel, IBM

采矿
Mining, Minerals, Metal

豪西蒙，拉法基，美铝，圣戈班

Siam City (Holcim)，Lafarge，Alcoa, Saint-Gobain

基础设施
Infrastructures

威立雅水务

Veolia

医药
Health & Pharmaceutical

赛诺菲-安万特，德国默克，葛兰素史克

Sanofi-Aventis, Merck, GSK

建筑
Building

欧尚

Auchan

施耐德电气(中国)投资有限公司

施耐德电气(中国)投资有限公司	北京市朝阳区望京东路6号施耐德电气大厦	邮编：100102	电话：(010) 84346699	传真：(010) 84501130
上海分公司	上海市漕河泾开发区宜山路1009号创新大厦第12层，15层，16层	邮编：200233	电话：(021) 2401 2500	传真：(021) 6495 7301
张江办事处	上海市浦东新区龙东大道3000号9号楼	邮编：201213	电话：(021) 61598888	传真：(021) 61598888
广州分公司	广州市珠江新城临江大道3号发展中心大厦25层	邮编：510623	电话：(020) 85185188	传真：(020) 85185195
武汉分公司	武汉市汉口建设大道568号新世界国贸大厦I 座37层01、02、03、05单元	邮编：430022	电话：(027) 68850668	传真：(027) 68850488
成都分公司	成都市科华北路62号力宝大厦南塔22楼1、2、3、5单元	邮编：610041	电话：(028) 66853777	传真：(028) 66853778
天津办事处	天津市河东区十一经路78号万隆太平洋大厦1401-1404室	邮编：300171	电话：(022) 84180888	传真：(022) 84180222
济南办事处	中国山东省济南市顺河街176号齐鲁银行大厦31层	邮编：250001	电话：(0531) 81678100	传真：(0531) 86121628
青岛办事处	青岛崂山区秦岭路18号青岛国展财富中心二号楼四层413室	邮编：266061	电话：(0532) 85793001	传真：(0532) 85793002
石家庄办事处	石家庄市中山东路303号世贸皇冠酒店办公楼12层1201室	邮编：050011	电话：(0311) 86698713	传真：(0311) 86698723
沈阳办事处	沈河区青年大街219号华新国际大厦16层F/G/H/I座	邮编：110016	电话：(024) 23964339	传真：(024) 23964296/97
哈尔滨办事处	哈尔滨南岗区红军街15号奥威斯发展大厦22层A, B座	邮编：150001	电话：(0451) 53009797	传真：(0451) 53009639/40
长春办事处	长春解放大路 2677号长春光大银行大厦1211-12室	邮编：130061	电话：(0431) 88400302/03	传真：(0431) 88400301
大连办事处	大连沙河口区五一路267号17号楼201-I室	邮编：116023	电话：(0411) 84769100	传真：(0411) 84769511
西安办事处	西安高新区科技路48号创业广场B座17层1706室	邮编：710075	电话：(029) 88332711	传真：(029) 88324697/4820
太原办事处	太原市府西街268号力鸿大厦B区1003室	邮编：030002	电话：(0351) 4937186	传真：(0351) 4937029
乌鲁木齐办事处	乌鲁木齐市新华北路5号美丽华酒店A座2521室	邮编：830002	电话：(0991) 2825888 ext. 2521	传真：(0991) 2848188
南京办事处	南京市中山路268号汇杰广场2001-2005室	邮编：210008	电话：(025) 83198399	传真：(025) 83198321
苏州办事处	苏州市工业园区苏华路2号国际大厦1711-1712室	邮编：215021	电话：(0512) 68622550	传真：(0512) 68622620
无锡办事处	无锡市太湖广场永和路28号无锡工商综合大楼17层	邮编：214021	电话：(0510) 81009780	传真：(0510) 81009760
南通办事处	江苏省南通市工农路111号华辰大厦A座1103室	邮编：226000	电话：(0513) 85228138	传真：(0513) 85228134
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长沙办事处	长沙市劳动西路215号湖南佳程酒店14层01, 10, 11室	邮编：410011	电话：(0731) 85112588	传真：(0731) 85159730
郑州办事处	郑州市金水路115号中州皇冠假日酒店C座西翼2层	邮编：450003	电话：(0371) 6593 9211	传真：(0371) 6593 9213
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邮编 : 100102
电话 : (010) 8434 6699
传真 : (010) 8450 1130

Schneider Electric Building, No. 6,
East WangJing Rd., Chaoyang District
Beijing 100102 P.R.C.
Tel: (010) 8434 6699
Fax: (010) 8450 1130

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