



INDUSTRIAL SOLUTION SYSTEMS



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电能质量整合解决方案

Comprehensive Power Quality Solutions



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集团业务 Group Business

集团专注于中低压电力行业的系统集成、EPC工程总包服务及核心产品的研发、生产与销售。在电力设备领域，我们深耕智能电气成套产品、高端电力元器件、先进电能质量治理产品、智能控制仪表与控制系统。基于人工智能与大数据分析的技术积累，我们提供变电站与输电线路的气象灾害预防设备与安全运行综合解决方案。在新技术领域，我们聚焦小区域低空气象高精度预测技术，为低空经济发展提供综合性的产品与服务。



The Group specializes in system integration, EPC turnkey services, and the R&D, production, and sales of core products within the medium and low-voltage power industry. In the field of power equipment, we have deep expertise in intelligent electrical switchgear system, high-end power components, advanced power quality management products, intelligent control instruments, and control systems. Leveraging accumulated expertise in artificial intelligence and big data analytics, we provide comprehensive solutions for meteorological disaster prevention equipment and the safe operation of substations and transmission lines. In the domain of new technologies, we focus on small-area, low-altitude meteorological high-precision prediction technology, offering integrated products and services to support the development of the low-altitude economy.



集团理念 Group Vision

纳图电气集团源自德国，立足中国，服务全球。自1956年成立以来，集团以德国技术为基础，深度融合中国智慧与全球视野，依托强大的中国研发与制造团队，精准响应全球市场需求，为各行业客户提供智慧电力的专业解决方案。集团坚持以客户为中心，致力于创新产品、可靠技术与精益制造，携手全球用户共同构建更智能、高效、可持续的电力能源未来。



Natus Electric Group originates from Germany, is firmly rooted in China, and serves the global market. Since its establishment in 1956, the group has built upon German technology deeply integrating Chinese expertise and a global perspective. Supported by a robust Chinese R&D and manufacturing team, we precisely respond to global market demands, delivering professional intelligent power solutions for clients across various industries. Adhering to a customer-centric approach, the group is committed to innovative products, reliable technology, and lean manufacturing.

Working hand-in-hand with global users to build a smarter, more efficient, and sustainable future for the power and energy sector.

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在现代精密制造业里, 超 85% 的电能质量问题由暂态电压扰动引发, 这类问题造成的生产损失愈发严重。它不仅影响精密制造产线, 导致产线宕机、成品报废, 给客户带来经济损失; 在机场、地铁等公共设施及医疗检测场景中, 还会造成安全隐患与不良体验。

电压扰动成因复杂随机, 电网侧、用户侧、自然因素、人为因素都可能导致其发生, 且难以预测、不可避免。

为解决这一难题, 纳图电气联合电力电子技术骨干企业, 成功研发电压扰动治理设备。该设备性能卓越, 能快速响应、精确补偿、无缝退出, 低压设备工作电流达 6300A, 中压设备容量达 20MVA, 是治理电压扰动最可靠、先进、节能且性价比高的方案。围绕此设备推出的高可靠电源系统解决方案, 可有效填补电网与应急电源供电切换间隙的电源缺失, 保障高端制造业产线供电稳定。

针对电能质量问题, 纳图电气还推出系列解决方案:

- DVR (动态电压恢复器): 专为短时电压扰动设计, 毫秒级恢复电压, 保护敏感设备。
- AVC (有源电压调节器): 适用于长时间电压扰动, 通过系统侧取能连续调节电压, 稳定在 $\pm 5\%$ 以内。
- DVRC (电压扰动综合治理装置): 融合 DVR 与 AVC 功能, 应对短时突发与长时间低幅度扰动。
- UPQC (全功能电能质量治理装置): 集成电压补偿、谐波抑制与功率因数校正, 提供全面治理方案。

纳图电气的产品与解决方案广泛应用于半导体、石油化工、汽车制造、民生、精密制造、冶金、机场/地铁基础设施及数据中心等多个领域, 能根据不同行业需求提供定制化方案, 助力客户实现绿色化、智能化转型。

In modern precision manufacturing, over 85% of power quality issues stem from transient voltage disturbances, causing increasingly severe production losses. These disturbances not only disrupt precision manufacturing lines, leading to downtime and scrap products that result in financial losses for customers, but also pose safety hazards and create negative experiences in public facilities like airports and subways, as well as in medical diagnostic settings.

Voltage disturbances arise from complex and random causes, stemming from grid-side, user-side, natural factors, and human factors. They are difficult to predict and unavoidable.

To address this challenge, Natus Electric has collaborated with leading power electronics technology enterprises to successfully develop voltage disturbance mitigation equipment. This device delivers exceptional performance with rapid response, precise compensation, and seamless disengagement. It supports low-voltage equipment operating currents up to 6300A and medium-voltage equipment capacities up to 20MVA, representing the most reliable, advanced, energy-efficient, and cost-effective solution for voltage disturbance mitigation. The high-reliability power system solution built around this equipment effectively bridges the power gap during grid-to-emergency power supply switching, ensuring stable power supply for high-end manufacturing production lines.

To address power quality issues, Natus Electric also offers a series of solutions:

- DVR (Dynamic Voltage Restorer): Specifically designed for short-duration voltage disturbances, it restores voltage within milliseconds to protect sensitive equipment.
- AVC (Active Voltage Regulator): Designed for prolonged voltage disturbances, it continuously adjusts voltage by drawing power from the system side, maintaining stability within $\pm 5\%$.
- DVRC (Disturbance Voltage Regulation and Control): Integrates DVR and AVC functions to address both short-term sudden disturbances and long-term low-amplitude disturbances.
- UPQC (UNIFIED POWER QUALITY CONDITIONER): Integrates voltage compensation, harmonic suppression, and power factor correction to deliver a comprehensive solution.

Natus Electric's products and solutions are widely applied across multiple sectors including semiconductors, petrochemicals, automotive manufacturing, consumer goods, precision manufacturing, metallurgy, airport/subway infrastructure, and data centers. We provide customized solutions tailored to diverse industry needs, empowering clients to achieve green and intelligent transformation.



■ 电压补偿的响应速度

几十毫秒的电压扰动就会对敏感设备产生影响, 因此补偿电压的迅速响应是衡量设备性能的重要参数, 纳图电气产品通过独有的共振阻尼检测法感知电网侧电压的细微变化, 采用基于主备双回路半导体电荷控制技术快速有效地实现回路柔性切换, 使高敏感负荷零感知电压扰动的发生。

■ 补偿精度

基于CPU双核调整芯片的硬件架构及高速软硬件采样计算频率构建的超强抗干扰的控制系统, 可实现对补偿电压的精确控制, 补偿精度高达99%。

■ 电压补偿的允许范围

通过不同解决方案可解决客户现场长时间电压扰动 (AVC)、短时电压中断的补偿 (DVR), 并针对130% 电压暂升补偿。

■ 满足各种现场电压扰动需求

根据客户不同应用环境的需求, 储能型补偿装置DVR产品可以提供 500ms~12s及更长(可定制)补偿时间。系统连续取能型产品AVC适用于现场供电电压需要长期在线实时调整的场景, 且针 $\pm 20\%$ 内的窄范围电压扰动提供长时间保护。

■ 完备的自我诊断功能

设备快速开关、逆变器等各关键元部件具备自诊断功能, 确保设备发生故障提前预警, 保证设备长期稳定运行, 不会因设备自身原因给主回路运行带来潜在威胁。

● Response speed of voltage compensation

Voltage disturbances lasting mere tens of milliseconds can impact sensitive equipment, making rapid response to compensation voltage a critical performance metric. Natus products employ a proprietary resonant damping detection method to sense minute fluctuations in grid-side voltage. Utilizing a primary-standby dual-circuit semiconductor charge control technology, they achieve swift and effective circuit switching, ensuring high-sensitivity loads experience zero perceptible voltage disturbances.

● Compensation accuracy

The control system, featuring a hardware architecture based on a dual-core CPU-adjusted chip and high-speed hardware/software sampling calculation frequency, delivers exceptional anti-interference capabilities. It enables precise control of compensation voltage with an accuracy rate as high as 99%.

● Permissible Range for Voltage Compensation

Various solutions can address prolonged voltage disturbances (AVC) and short-term voltage interruptions (DVR) at customer sites, while also compensating for 130% voltage transients.

● Meet various on-site voltage disturbance requirements

Depending on the specific application environment requirements of customers, the DVR energy storage compensation device can provide compensation times ranging from 500ms to 12 seconds and longer (customizable). The AVC continuous energy harvesting system is suitable for scenarios where the on-site supply voltage requires long-term online real-time adjustment, and it provides extended protection against voltage disturbances within a narrow range of $\pm 20\%$.

● Comprehensive self-diagnostic capabilities

Key components such as the rapid switch and inverter feature self-diagnostic capabilities, ensuring early warning of equipment failures and guaranteeing long-term stable operation. This prevents potential threats to the main circuit's operation arising from equipment malfunctions.

关于电压暂态扰动：
Regarding Voltage Transient Disturbances:

诱因：

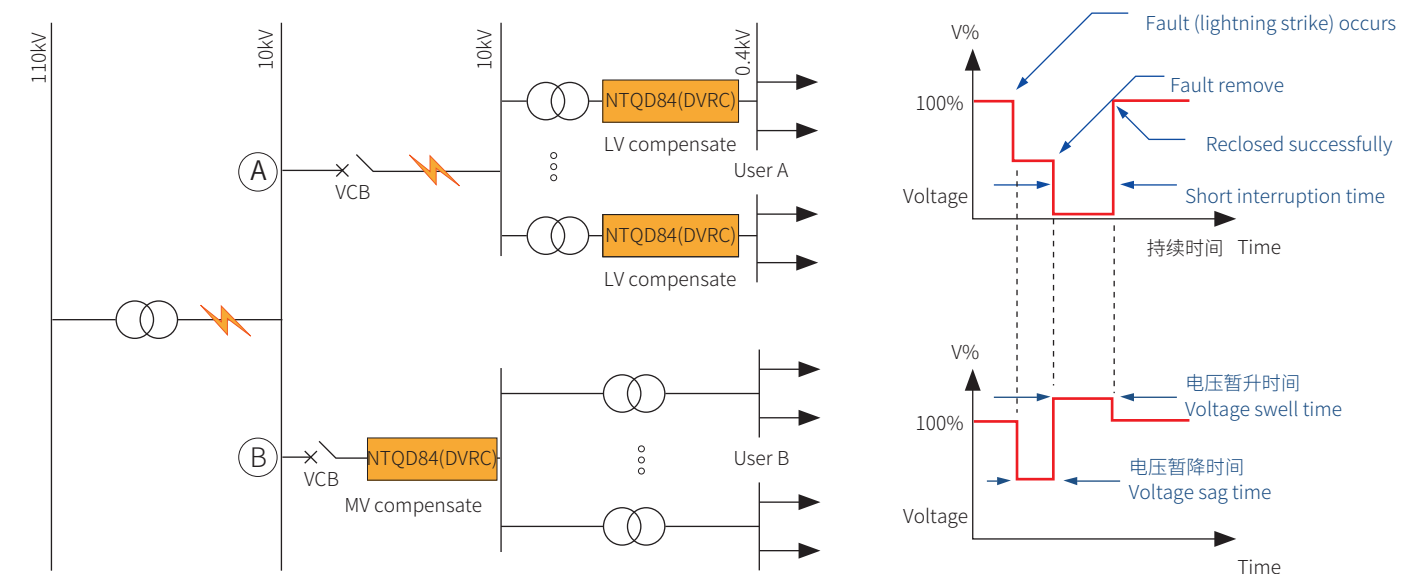
Causes:

- 电压暂降是由于雷击、短路、接地、重合闸、大功率电机启动、误操作等因素造成的。
 - 单相对地故障，大容量负荷切除，大容量电容器组投入都可能会引起电压暂升。
 - 双供电回路倒闸及重合闸可能引起电压短时中断。
- Voltage sag is caused by lightning, short circuit, grounding, re-closing of circuit breakers, high-power motor start, and misuse, etc.
 - When single-phase grounding fault, the voltage of non-fault phase will rise for a short time; while a large capacity load outthitting off or in large capacity capacitor group switching on will cause voltage swell. Circuit breaker r-e-loser may cause short-term interruption of voltage.

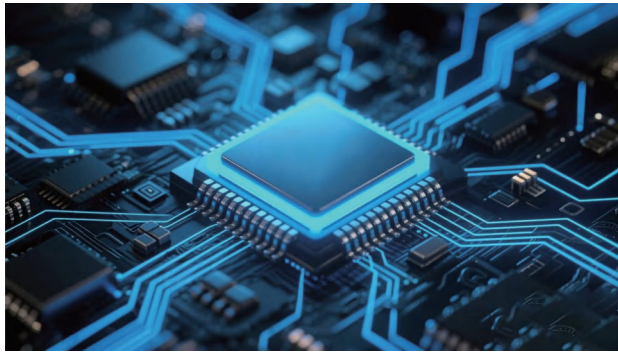
危害：

Hazards:

- 电压波动导致设备故障，连续性生产停止等状况，直接或间接造成重大经济损失。因其发生原因、时间、严重程度不可控制，国际电工委员会 (IEC) 特指出：一定数量的暂态电压质量问题是无法避免的，用户设备应具备一定的承受能力。因此，采用电压暂态扰动治理势在必得。
- Voltage swell causes equipment failure, continuous production stop, and results in significant economic losses. IEC specifi cally points out that a certain number of transient voltage quality problems can't be avoided, and the user equipment should have certain bearing capacities. User A re-closes automatically, the fault is cleared and the power is restored, and then the of voltage of User A and B restores normal. When the system uses NTQD83(DVR) / NTQD82 (AVC) / NTQD84 (DVRC) / NTQD85 (UPQC) device for transient voltage disturbance control, both User A and B won't be aff ected by the above-mentioned voltage fluctuations.



- 暂态电压扰动时间由于故障所发生的位置、供电系统架构、保护装置设置不相同，发生暂降、暂升、短时中断及持续时间也不尽相同。A 用户供电线路故障，造成电网电压扰动，A、B 用户均受影响，发生电压暂降事件。持续时间为 A 线路保护装置动作时间，通常在 200ms 之内。A 用户供电线路保护装置切断故障回路，A 用户发生电压中断，此时 B 用户电压恢复，但由于电力系统的电磁耦合作用，B 用户可能会发生电压暂升事件。A 用户供电线路保护装置自动重合闸后，通常为 1-1.5s，故障清除，供电恢复，此时 A、B 用户电压恢复正常供电。当系统采用 NTQD83 (DVR) / NTQD82 (AVC) / NTQD84 (DVRC) / NTQD85 (UPQC) 装置进行暂态电压扰动治理，则 A、B 用户完全不受以上电压波动影响。
- Transient voltage disturbance time varies according to the location of the fault, power supply system architecture and settings of protection device, and the voltage sag, swell, short interruption and duration also vary. The fault in power supply line to User A caused voltage disturbance in the grid, both User A and B are aff ected, and voltage sag event occurs. The duration is the operating time of the protection device, which is usually within 200ms. The protection device of power supply line of User A cuts off the faultcircuit, User A has voltage interruption and the voltage of User B restores, but User B may have voltage swell due to electromagnetic coupling of the power system. The duration is the auto re-closing time of the protection device, which is usually 1-1.5s. When the protection device of power supply line of User Are-closes automatically, the fault is cleared and the power is restored, and then the of voltage of User A and B restores normal. When the system uses NTQD83 (DVR) / NTQD82 (AVC) / NTQD84 (DVRC) / NTQD85 (UPQC) device for transient voltage disturbance control, both User A and B won't be aff ected by the above-mentioned voltage fluctuations.



半导体行业

半导体行业上下游产线是精密制造的典型代表。比如为加工工艺提供基础保障的工艺冷却水系统，其水泵因电压暂降意外停机，则会造成半导体制造机台因不能及时得到冷却水进行降温而损坏；厂务系统中的排气风机变频器会因低压保护而跳闸，从而导致腐蚀性气体无法及时排出洁净室；半导体制作过程被迫停止，大量产品报废。产线上的工艺机台则更是需要晃电保护的重要设备，因为任何微小的电压扰动都会导致严重的生产中中断事故，给客户造成巨大损失。

Semiconductor Industry

If the water pumps in process cooling water system of semiconductor plant shut down unexpectedly due to voltage sag, the semiconductor manufacturing machines may be damaged due to cooling failure. The exhaust fan inverter in facility system will trip out due to low voltage protection, and the corrosive gas can't be vented out of the clean room in time; the semiconductor manufacturing has to be stopped and results in large amount of scrapped products. The economic losses of an accident may reach millions or even tens of millions dollars.



石油化工行业

石化生产和煤化工是典型的流程工业，其显著特点是装置多、工艺生产过程复杂，工作条件苛刻，各工艺装置间联系十分紧密，对电力系统的暂态电能质量依赖程度非常高。电压暂降会引起生产工艺中的敏感负荷如润滑油泵、液氧泵、高压煤浆泵、给煤机等变频器停机、接触器释放，进而引起连锁反应，工厂停产，原材料报废，严重时危害人身安全。且恢复生产时间长，直接和间接经济损失巨大。

Petro Chemical Industry

Petrochemical production and coal chemical industry features numerous devices, complicated production process, harsh working conditions, tight relation-ship of inter service material sand high degree of dependence on the transient power quality of the power system. Voltage sag will cause sensitive loads in the production process such as lubricating oil pump, liquid oxygen pump, high pressure coal slurry pump, coal feeder and other inverters to stop and contactor to release, resulting in chain reactions such as plant shutdown and material scrapping, and even endanger personal safety. Moreover, it requires long time to restore.



汽车制造行业

在汽车生产过程中涉及冲压、焊装、涂装等自动化程度高、生产连续性强，而这些工序中 PLC、变频器、脱扣器、直流电源、传感器、机器控制系统等都为电压敏感设备，受到电压暂降影响造成一处停机，会影响整个生产流程。除直接的原料工件损失外，时间损失同样不容忽视，生产紧张时造成的工作日损失是无法挽回的。

Auto Industry

Automobile manufacturing process involves stamping, welding and painting, which requires high automation and strong production continuity. In these processes. PLC, inverter, tripper, DC power supply, sensor and machine control system are all voltage sensitive, and the shutdown of one part due to voltage sag will affect the entire production process. In addition to direct work piece material loss, time loss also can't be ignored, and the loss of working days during tight production is irreparable.

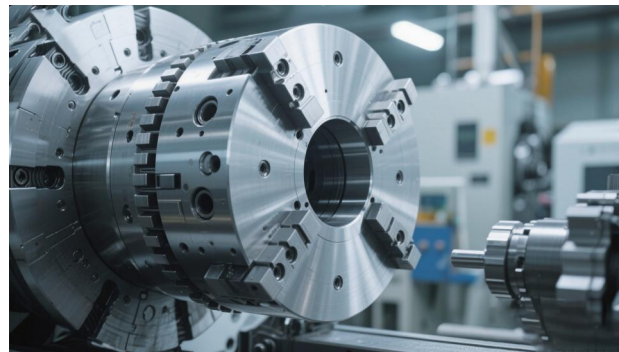


民生行业

食品饮料加工、制药、化纤等民生产业中同样存在电压敏感设备需要保护。例如在牛奶加工行业，最后一一定要经过一道工序：灭菌消毒，需要把半成品奶加热至 72℃ -75℃或 82℃ -85℃，之后保持15s-20s，然后进行冷却。毫秒级的晃电导致消毒治理中断，其上下游关联工艺会因联锁控制而相继停机，重启需要几个小时的时间，有时还会花几个小时清理消毒罐或造成产成品或半产成品损失。另外，诸多轻工业快速包装线对供电连续性要求极高，电压扰动导致的短时间供电中断会极大影响生产效率。

Livelihood Industry

Sterilization is the most important process of the dairy industry, as well as for other food and beverage industry. A few millisecond power disturbance may cause a large economic loss due to semi-finished raw material scripted or a process interruption which need a hours of time to restart. At the meanwhile, the fast pack- ing line in a lot of light industry is very sensitive to the voltage disturbance.



精密制造

航空航天业对机加工产品要求高精度、工件的单次加工时间长, 生产线高度自动化, 特别是德日进口加工机床对电压扰动的敏感度极高, 一次电压暂降造成的生产线停机, 严重影响生产进度, 造成工件报废, 甚至使昂贵的精密设备本身受损。

Precision Machining

Aerospace industry machinery line requires high precision, long processing time and automatic production lines and thus requires extremely high power quality. The production line shutdown caused by voltage sag may need several hours to restore. The processed parts and machine tools may be damaged during shutdown and that may cause great losses.



冶金行业

冶金矿产行业的原料粉碎工艺通常部署在靠近矿山区域, 电网供电质量差, 时有发生的电压扰动使得对电压扰动敏感的磨机设备宕机。此外, 在加热送风系统、轴机润滑系统等对连续性要求高的场合, 也亟需引入电压扰动治理技术。

Metallurgical & Mineral Industry

The crushing machine systems in M&M industry are normally located far from cities, and the grid power supply is not as good as developed areas. Voltage disturbance may cause process interruption. Other utility systems, like ventilation and lubrication systems, highly need voltage sag compensation equipment.



机场 / 地铁基础设施

机场及航站楼、城铁及站台等场所的自动扶梯存在电压扰动隐患可能导致人身伤害。行李分拣系统、廊桥电源系统中的电压扰动也会极大影响系统运行质量, 降低客户舒适度。DVR 将为规避这些潜在风险提供有效保护。

Infrastructure

Escalators in airports terminal buildings and railway platforms have potential voltage disturbances that may cause personal injury. Voltage disturbances in package sorting systems and conveyor belt systems will also greatly affect the quality of system operation and reduce customer comfort. DVR will be the best solution to avoid that kind of potential risk.



数据中心

数据中心中大量运算及存储设备的全天候高速运行引起的发热现象, 导致 IDC 中心动环系统需消耗大量电能为 IT 设备提供其正常工作温湿度。在多回路冗余供电条件下, IDC 已基本杜绝了电源长时间中断的可能, DVR/AVC 作为一种针对短时间电压扰动治理的设备会逐渐显现其高速动态响应的卓越性能及极低功耗的节能优势, 这种优势在高等级的 IDC 中针对动环系统中冷水机组和风机的抗晃电保护将更加明显。

Internet Data Centre

The heating of IDC is a well-recognized phenomenon related to the high-speed computing operations. As a result, a considerable amount of electrical energy has to be consumed by the IDC environment system to maintain the normal working temperature and humidity of the IT infrastructure. Under the condition of the redundant power supply, IDC has basically eliminated the possibility of long-term power interruption but only short time voltage disturbance, DVR/AVC will show its advantage of high-speed dynamic response and extremely low power consumption to solve the problem of short-term voltage disturbance. This high energy efficiency advantage will be more obvious in the high Tier IDC for the anti-voltage sag protection of chillers and ventilation system.

针对不同现场需求合理选用治理设备

Select appropriate treatment equipment based on specific site requirements

根据电压扰动深度和扰动时间的不同, 合理选择功能:
Select appropriate functions based on the depth and duration of voltage disturbances:

- NTQD82
(AVC)

- 适用于电网电压扰动时间长、扰动幅度浅的供电环境。
针对外网正常供电电压稳压性要求高，需要长时间将电压稳定 ±5% 以内的特种精密设备，选择 NTQD82(AVC)设备进行治理。
 - NTQD82(AVC) is suggested to be used to compensate the voltage disturbance that is relatively long time and shallow amplitude.
When the protected equipment need a very stable voltage(±5% of rating voltage), NTQD82(AVC) is applicable.
- NTQD83
(DVR)

- 适用于电网电压扰动时间短、扰动幅度深的工况。
 - NTQD83(DVR) is proposed to be used to solve the problems of short time voltage disturbance and deep sag.
- NTQD84
(DVRC)

- 针对电网电压扰动时间短、扰动幅度深的工况，且现场有需要长时间将电压稳定 ±5%以内的特种精密设备，选择NTQD84(DVRC)设备进行治理。
 - NTQD84(DVRC)is proposed to solve the site voltage problems of short time voltage disturbance and deep sag, and load equipment need a very stable voltage(±5% of rating voltage).
- NTQD85
(UPQC)

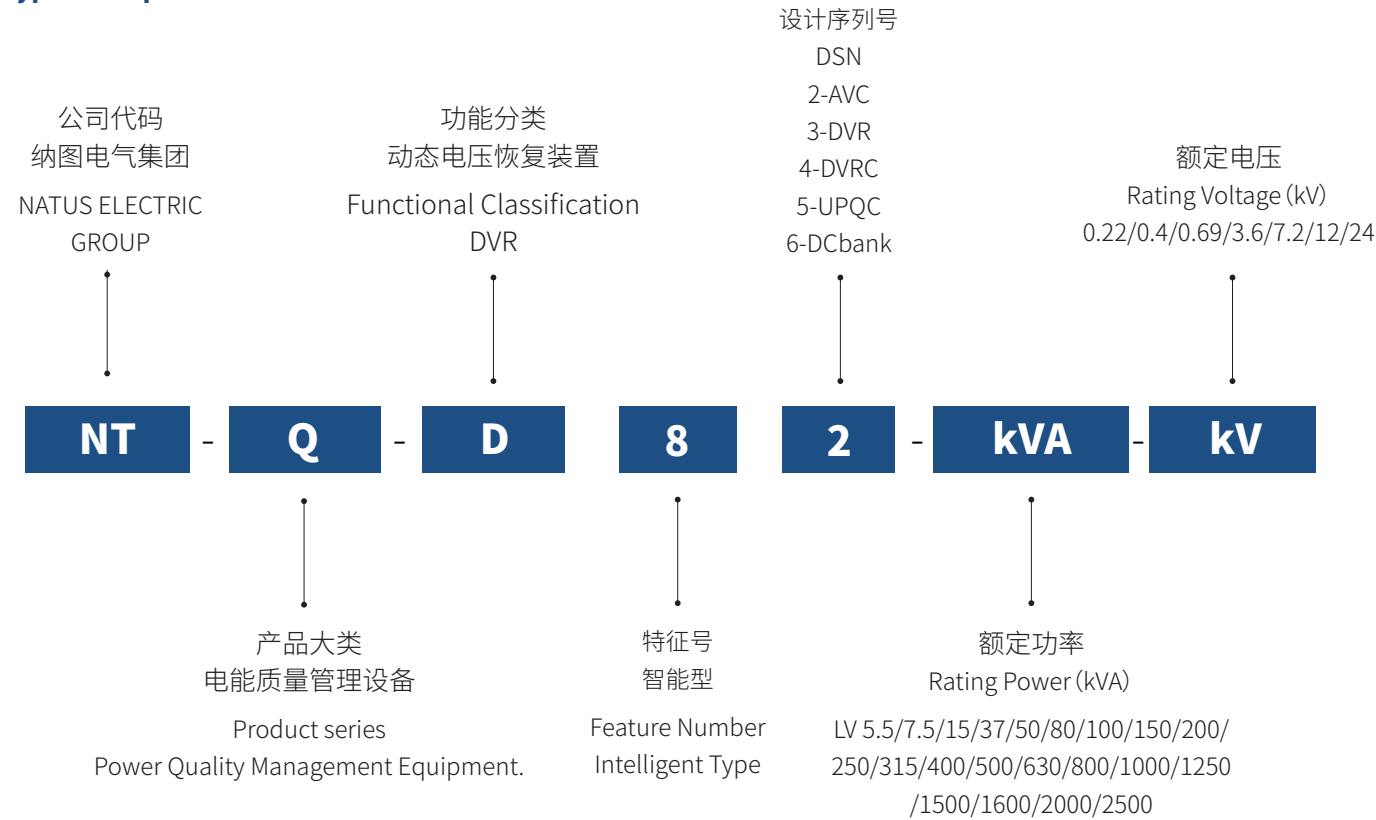
- 在电网可能有各种电压扰动情况发生，且现场谐波较高场合，采用NTQD85(UPQC)进行治理。
 - When the protected equipment need a very stable voltage(±5% of rating voltage) and distribution system has higher harmonics, the NTQD85(UPQC) is applicable.
- NTQD86
(DCbank)

- 在系统电压正常时，NTQD86(DCbank)处于热备状态减少损耗；在系统电压跌落时，NTQD86(DCbank) 能够迅速为负荷支路提供动态有功支撑，确保后级用电负荷能够穿越低电压，保持正常工作。
 - Inverter work in voltage source mode and protects the load device when the main power grid is subject to voltage sag, short interruption.
In case a voltage sag occurs, the NTQD86(DCbank) will outputs through inverter a standard DC voltage to support the DC-bus of the VSD that the load will not suffer from input voltage disturbance.

根据系统供电及负载情况合理选择功率:
Select power appropriately based on system power supply and load conditions:

- 根据系统电压选择适用的 DVR/AVC/DVRC/UPQC 设备电压等级：110V/230V/400V/12kV/24kV
 - 根据需保护设备功率选择NTQD83(DVR) / NTQD82 (AVC) / NTQD84 (DVRC) / NTQD85 (UPQC): 按照 1:1 比例选用相应 DVR/AVC/DVRC/UPQC 设备的容量
 - 储能型补偿装置合理选择补偿时间：(详见 P15)
- Choose rating voltage of DVR/AVC/DVRC/UPQC upon grid system voltage: 110V/230V/400V/12kV/24kV
 - Choose NTQD83(DVR) / NTQD82 (AVC) / NTQD84 (DVRC) / NTQD85 (UPQC) upon load rating(kVA)
 - Choose compensation time reasonably: please fi nd the detail information in P15.

型号说明:
Type Description



选型方案 Selection Solution

NTQD82(AVC)

动态电压调节装置(系统侧取能型)

ACTIVE VOLTAGE CONDITIONER

可选工作模式:

Working Mode Options:

在线工作模式:

Online Work Model:

■ Bypass-CB 和 Bypass-SCR 分断，逆变器通过注入变压器对系统电压实时调节，将输出电压补偿至精度 $\pm 2\% \cdot U_n$ (典型应用可达 $\pm 1\% \cdot U_n$)。

● Bypass-CB and Bypass-SCR disconnect, with the inverter adjusting system voltage in real time by injecting into the transformer, compensating the output voltage to an accuracy of $\pm 2\% \cdot U_n$ (typical applications can achieve $\pm 1\% \cdot U_n$).

热备工作模式:

Hot Standby Mode:

■ 外电源正常时 Bypass-SCR 导通，逆变器无输出。当外电源发生电压扰动超过10%(可设定),SCR 关断，逆变器通过注入变压器对系统电压实时调节，将输出电压补偿至精度 $\pm 2\% \cdot U_n$ (典型应用可达 $\pm 1\% \cdot U_n$)。

● When the external power supply is normal, the Bypass-SCR conducts and the inverter has no output. When the external power supply voltage disturbance exceeds 10% (configurable), the SCR turns off. The inverter then injects voltage into the transformer to dynamically regulate the system voltage, compensating the output voltage to an accuracy of $\pm 2\% \cdot U_n$ (typically achievable at $\pm 1\% \cdot U_n$ in practical applications).

选型方案 Selection Solution

NATUS

INDUSTRIAL SOLUTION SYSTEMS

检修 / 旁路模式:

By Pass/Maintenance:

■ 装置检修时, Bypass-CB 闭合，输入输出开关断开，负载设备由电网供电，NTQD82(AVC) 本体完全处于电气隔离状态，进行检修维护工作。

● Close the Bypass-CB before maintenance and disconnect the disconnecting switches at both incoming and outgoing ends. The grid power will supply the load device and main body of NTQD82(AVC) is completely electrically isolated.

电气参数			
Electrical parameters			
额定电压(线)	0.22kV/0.4kV/0.48kV/0.69kV/		
Rated voltage(phase to phase)	3.6kV/7.2kV/12kV/24kV		
频率	50Hz/60Hz		
Frequency			
技术指标			
Technical specifications			
装置整机响应时间	<2ms		
Fullresponding time			
补偿能力	电网电压	NTQD82(AVC)	补偿持续时间
	Grid voltage	output voltage	Time of duration
	3P>=50%*Un	100%	30s
	2P>=40%*Un	100%	30s
	1P>=30%*Un	95%	30s
	1P缺相	1P60%*Un	30s
1P missing	2P 90%*Un		
3P	100%	长时间连续	
(80%~120%)*Un		Continuily	
电压不平衡度	<3%		
Voltage unbalance			
频率跟踪误差	<±0.2Hz		
Frequency tracking error			
输出电压总谐波	<2.5%		
Output voltage harmonic			
损耗	<2%		
Operation Loss			
电压补偿误差	<±2%*Un(典型应用Critical application:<±1%*Un)		
Voltage compensation error			
电压损失	<2%		
Volage loss			

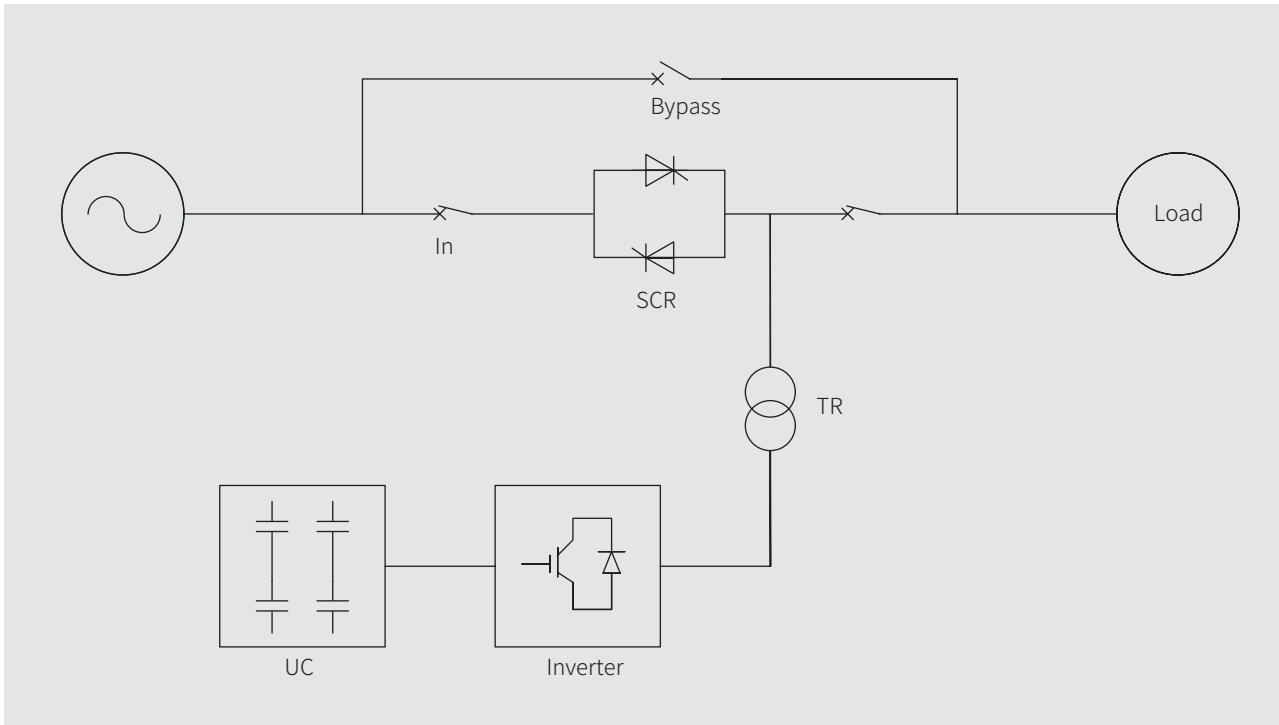
11 / NTQD8 SERIES

NTQD8 SERIES / 12

NTQD83(DVR)

动态电压恢复装置(储能型)

DYNAMIC VOLTAGE RESTORER (With Energy Storage)



工作模式:

Working Mode:

电压补偿模式:

Voltage Compensation Method:

- NTQD83(DVR)逆变器工作在电压源模式，在主电网突发电压暂降、电压暂升、短时中断等情况超过设定限值时 (可根据用户要求设定), 超级电容经过逆变器输出，晶闸管关断，系统进入孤岛运行模式向负载供电，总切换时间不超过 1ms。
- The NTQD83(DVR) inverter operates in voltage source mode. When sudden voltage dips, voltage surges, or short interruptions in the main grid exceed preset thresholds (configurable per user requirements), the supercapacitor discharges through the inverter output. The thyristor shuts off, and the system enters island operation mode to supply power to the load. The total switching time does not exceed 1 millisecond.

检修 / 旁路模式:

By pass/main tenance:

- 装置检修时，旁路断路器闭合，进出线断路器断开，负载设备供电正常，NTQD83(DVR) 本体完全处于电气隔离状态，此时可进行检修维护工作。
- During device maintenance, the bypass circuit breaker is closed, the incoming and outgoing circuit breakers are open, and power supply to the load equipment remains normal. The NTQD83 (DVR) unit is completely in an electrically isolated state, allowing maintenance work to proceed.

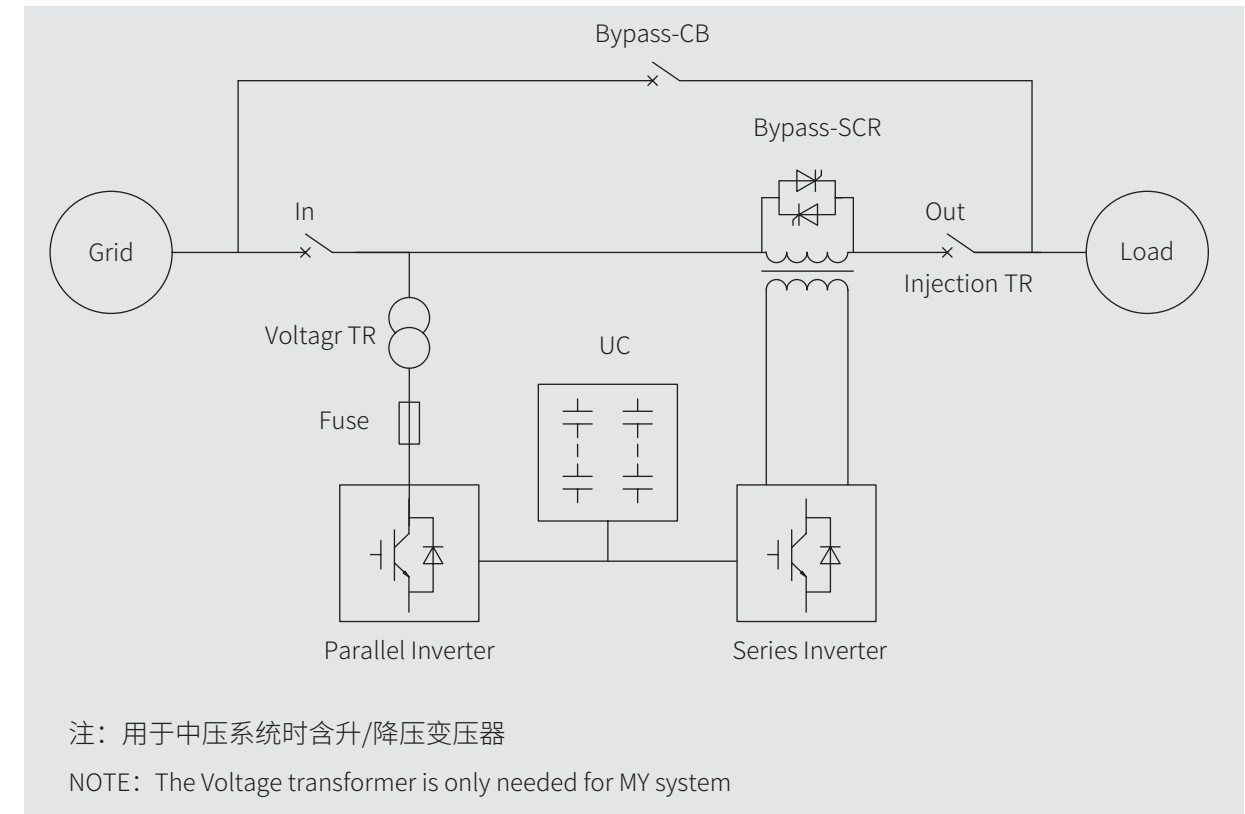
电气参数 Electrical parameters	
额定电压(线) Rated voltage(phase to phase)	0.22kV/0.4kV/0.48kV/0.69kV/ 3.6kV/7.2kV/12kV/24kV
频率 Frequency	50Hz/60Hz
技术指标 Techni parameters	
装置整机响应时间 Full responding time	<1ms
补偿范围 Compensation range	0~130%*Un/3P
额定补偿时间 Rated compensation time	500ms~1min(可选),其它时间可定制 500ms-1min(option):longer time can be customized
电压不平衡度 Voltage unbalance	<3%
频率跟踪误差 Frequency tracking error	<±0.1Hz
输出电压总谐波 Output voltage harmonic	<2%
损耗 Operation Loss	<1%
电压补偿误差 Voltage compensation error	<±1%*Un
电压损失 Voltage loss	<1%

合理选择补偿时间：

Select compensation time appropriately

- 用户的用电系统中可能发生的电压扰动所持续的时间，由于其供电系统的架构不同、保护的逻辑设置不同、故障发生的位置不同，被保护的负载重要性不同等因素而需求不同。因此合理选择NTQD83(DVR) 的补偿时间是十分重要的，NTQD83(DVR) 为客户提供 500ms-1min 可配置的电压补偿时间。（更长补偿时间请咨询本公司）
- 线路远端短路故障或邻近用户短路故障时，引起电压暂降，其持续时间等于继电保护装置切除故障回路的时间，通常不超过 200ms。
- 我国 110kV 以下单侧电源线路采用三相一次重合闸方式。电源处于瞬间中断状态。重合闸延时根据负载与线路情况具体设置，通常为延时 1-1.5s。
- 对于某些电网，需要考虑电网长时间停电故障，在该工况下可以根据负载设备安全停机时间选择电压补偿时间。其他特殊应用场合，可按客户要求定制。
- The duration of voltage disturbances that may occur in a user's electrical system varies based on factors such as the architecture of the power supply system, the configuration of protection logic, the location of faults, and the criticality of protected loads. Therefore, selecting an appropriate compensation time for the NTQD83(DVR) is crucial. The NTQD83(DVR) provides customers with a configurable voltage compensation time ranging from 500ms to 1 minute. (For extended compensation times, please consult our company.)
- A voltage dip occurs when a remote short-circuit fault or a short-circuit fault at a neighboring user's location occurs. Its duration equals the time required for the relay protection device to clear the faulty circuit, typically not exceeding 200 milliseconds.
- In China, single-source power lines below 110kV employ a three-phase primary reclosing method. The power supply experiences a momentary interruption. Reclosing delay times are configured based on load and line conditions, typically set at 1-1.5 seconds.
- For certain power grids, extended power outages must be considered. Under such conditions, the voltage compensation duration can be selected based on the safe shutdown time of the load equipment. For other special applications, customization is available upon customer request.

NTQD84(DVRC) 电压扰动综合治理装置 COMPREHANSIVE VOLTAGE DISTURBANCE CONDITIONER



综合了系统取能型 AVC 技术优势并配备相应储能设施，实现针对低幅度扰动的长时间治理，并可应对短时突发的电压缺失。

Combine AVC and DVR functions in one solution.

工作模式：

Working Mode:

稳压工作模式

Voltage conrrction mode

- Bypass-CB、Bypass-SCR保持分断状态,当外电源发生电压扰动在 $\pm 20\%$ (可设定)内，串联变流器通过注入变压器对系统电压实时调节，将输出电压补偿至精度 $\pm 2\% \cdot U_n$ (典型应用可达 $\pm 1\% \cdot U_n$)。
- Bypass-CB and Bypass-SCR keep open, even when grid disturbance within $U_n \pm 20\%$, the inverter outputs through the injection transformer. The system voltage real-time regulation the output compensation with an accuracy $\pm 2\% \cdot U_n$ (Critical application can be $\pm 1\% \cdot U_n$).

电压补偿工作模式

Voltage compensation mode

- 当外电源发生电压扰动超过 $\pm 20\%$ (可设定) 时, 超级电容经过并联变流器输出, 负载转由NTQD84(DVRC) 的储能装置供电, 总切换时间不超过 2ms。
- When grid disturbance exceeds $Un \pm 20\%$, the ultracapacitor outputs through inverter, the load is powered by islet. The total transfer duration time will not exceed 2ms.

检修/旁路模式

By Pass/Maintenance

- 装置检修时, 旁路断路器闭合, 进出线断路器断开, 负载设备供电正常, NTQD84(DVRC)本体完全处于电气隔离状态, 此时可进行检修维护工作。
- Close the by pass switch before maintenance and disconnect the disconnecting switches at both incoming and outgoing ends. The grid power will supply the load device and main body of PSTN-AVC is completely electrically isolated.

电气参数 Electrical parameters			
额定电压(线) Rated voltage(phase to phase)	0.22kV/0.4kV/0.48kV/0.69kV/ 3.6kV/7.2kV/12kV/24kV		
频率 Frequency	50Hz/60Hz		
技术指标 Technical specifications			
装置整机响应时间 Fullresponding time	<2ms		
补偿能力 Compensating capacity	电网电压 Grid voltage	NTQD84(DVRC) output voltage	补偿持续时间 Time of duration
	3P (0%~80%)*Un	100%	3s(可定制) Customizable
	3P (80%~120%)*Un	100%	长时间连续 Continuily
电压不平衡度 Voltage unbalance	<3%		
频率跟踪误差 Frequency tracking error	<±0.2Hz		
输出电压总谐波Output voltage harmonic	<2.5%		
损耗 Operation Loss	<2%		
电压补偿误差 Voltage compensation error	<±2%*Un(典型应用Critical application:<±1%*Un)		
电压损失 Volage Loss	<2%		

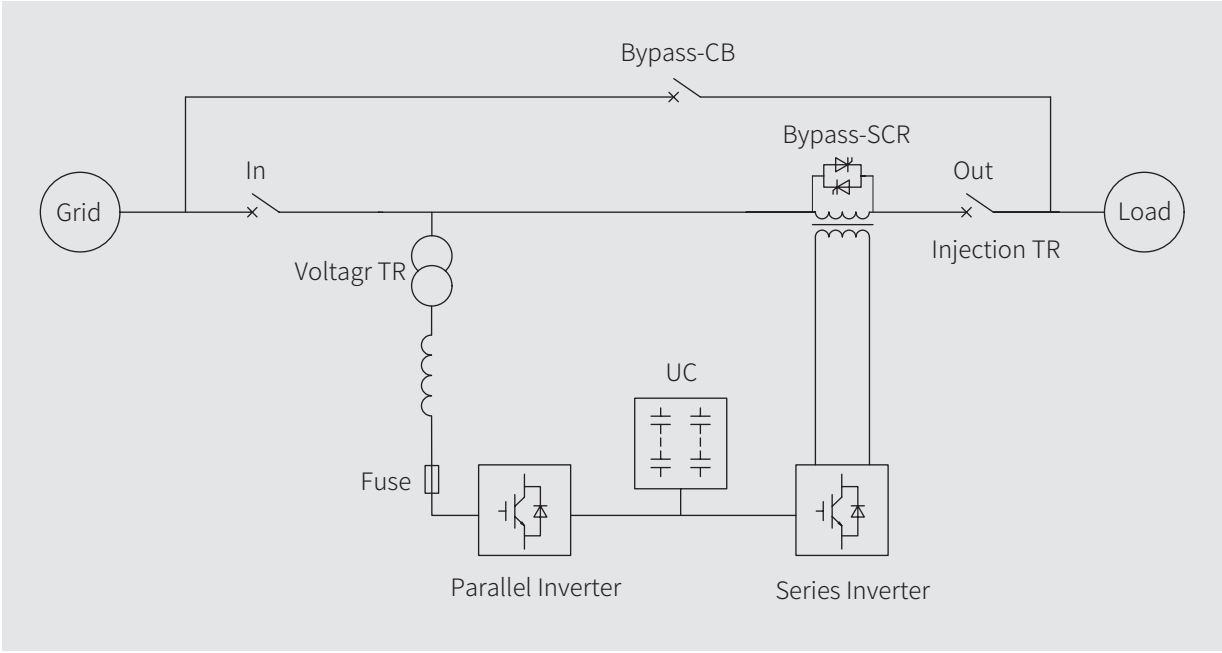
NTQD85(UPQC) 全功能电能质量治理装置 UNIFIED POWER QUALITY CONDITIONER

NTQD85(UPQC) 综合了串、并联补偿装置的特点, 具有对电压、电流统一补偿的功能, 其核心部分为两个背靠背的 PWM 变流器。

NTQD85 (UPQC) combines the characteristics of series and parallel compensation devices and has the function of uniformly compensating voltage and current. Its core part consists of two back-to-back PWM converters.

- 其中, 串联侧补偿单元呈现电压源的特性, 相当于一个电压注入装置, 在串联变压器上产生与畸变电压大小相等、方向相反的补偿电压来抵消电压源中的各种畸变分量, 使系统电压趋于正弦, 从而提高电源侧的电能质量, 并能够在一定电压范围内长时间调节负载电压, 使其负载电压波动维持在精度 $\pm 2\% \cdot Un$ (典型应用可达 $\pm 1\% \cdot Un$) 内;
- 并联侧补偿单元表现出电流源的特性, 相当于一个谐波电流注入装置, 它跟踪电流中的谐波分量, 产生与谐波电流大小相等、方向相反的补偿电流, 从而抑制非线性负荷产生的谐波, 将电源侧电流补偿为近似正弦波, 同时还可补偿无功, 起到提高功率因数的作用;
- 直流测配备储能器件, 能够在电压发生扰动时, 起到治理电压扰动的作用。
- Among these, the series-connected compensation unit exhibits voltage source characteristics, functioning as a voltage injection device. It generates a compensating voltage on the series transformer that is equal in magnitude but opposite in direction to the distortion voltage. This counteracts various distortion components within the voltage source, restoring the system voltage to a sinusoidal waveform. Consequently, power quality at the supply side is enhanced, and load voltage can be regulated over extended periods within a defined voltage range. This maintains load voltage fluctuations within an accuracy of $\pm 2\% \cdot Un$ (typical applications achieve $\pm 1\% \cdot Un$). Un (typical applications achieve $\pm 1\% \cdot Un$).
- The parallel-connected compensation unit exhibits current-source characteristics, functioning as a harmonic current injection device. It tracks the harmonic components within the current and generates a compensating current equal in magnitude but opposite in direction to the harmonic current. This suppresses harmonics generated by nonlinear loads, compensating the power supply-side current to approximate a sine wave. Simultaneously, it compensates reactive power, thereby improving the power factor.
- DC measurement systems equipped with energy storage devices can mitigate voltage disturbances when they occur.





功能特点:

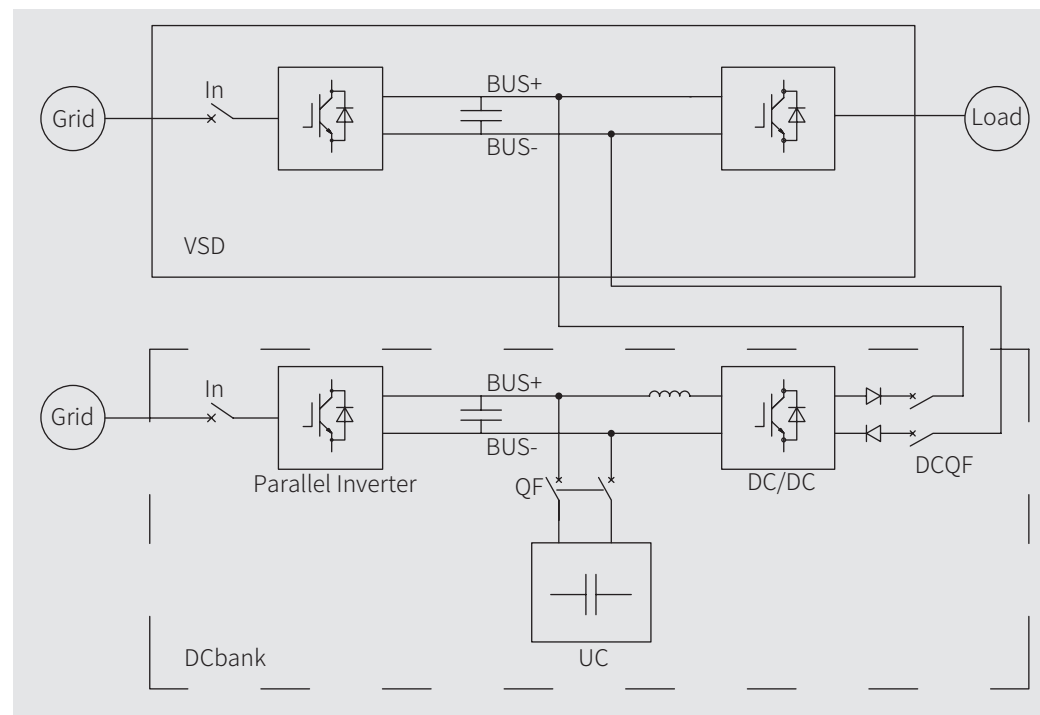
Functional Characteristic:

电压补偿 Voltage compensation	补偿电压畸变和电压扰动, 确保负荷正常工作 To protect sensitive loads not interrupted by voltage disturbance;
抑制谐波 Harmonic suppression	就地抑制负荷谐波, 有源滤波效果完美 APF function;
功率调节 Power factor compensation	有功、无功连续动态调节, 实时跟踪控制效果好 Use the same inverter to actively correct power factor;
功能扩展 Flexible function expansion	可方便加装储能器件进行功能扩展, 实现不间断连续供电。 Uninterrupted power supply by combine energy storage.

电气参数 Electrical parameters					
额定电压(线) Rated voltage(phase to phase)		0.22kV/0.4kV/0.48kV/0.69kV/ 3.6kV/7.2kV/12kV/24kV			
频率 Frequency		50Hz/60Hz			
技术指标 Technical specifications					
装置整机响应时间 Full responding time		<2ms			
电压不平衡度 Voltage unbalance		<3%			
频率跟踪误差 Frequency tracking error		<±0.2Hz			
输出电压总谐波 Output voltage harmonic		<2.5%			
损耗 Operation Loss		<2%			
电压补偿误差 Voltage compensation error		<±2%*Un(典型应用Critical application:<±1%*Un)			
电压损失 Volage Loss		<2%			
系列选择 Function option					
产品选择 Product option	滤波 Harmonic	±20%稳压 Voltage correction	电压扰动 Voltage compensation		
			0%~80%	50%-80%	110%~120%
全功能电能质量治理装置 NTQD85(UPQC)	●	●	●	●	●
调节型电能质量治理装置 NTQD85(UPQC)-A	●	●		●	●
储能型电能质量治理装置 NTQD85(UPQC)-D	●		●		●

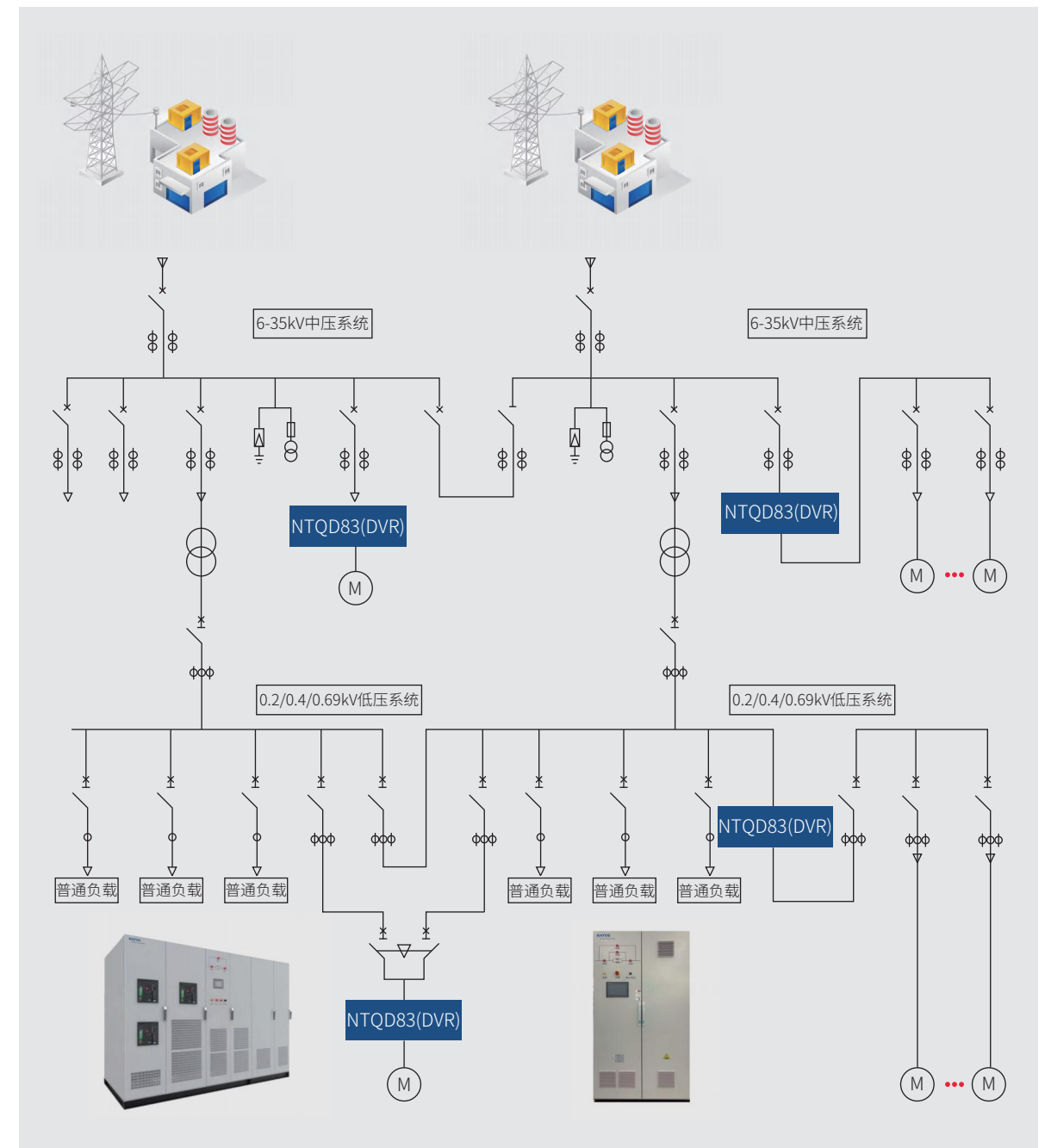
NTQD86(DCbank) 应用于变频器类负载电压扰动治理装置 VOLTAGE SAG PROTECTOR FOR VSD LOAD

- NTQD86(DCbank) 采用并联方式安装于供电电源与变频器负载之间。在系统电压正常时，DC-bank 处于热备状态减少损耗；在系统电压跌落时，DC-bank 能够迅速为负荷支路提供动态有功支撑，确保后级用电负荷能够穿越低电压，保持正常工作；在电网电压恢复后再次进入热备状态。
- The NTQD86(DCbank) is installed in parallel between the power supply and the inverter load. When system voltage is normal, the DC-bank remains in hot standby mode to minimize losses. Upon a voltage dip, the DC-bank rapidly provides dynamic active power support to the load circuit, ensuring downstream electrical loads can ride through the low voltage and maintain normal operation. Once grid voltage recovers, it returns to hot standby mode.



电气参数 Electrical parameters	
交流输入电压(线) Input AC voltage(phase to phase)	0.22kV/0.4kV/0.48kV/0.69kV
频率 Frequency	50Hz/60Hz
直流输出电压 Output DC voltage	0.3~1kV(可调、可定制) customized
技术指标 Technical specifications	
响应速度 Responding time	<1ms,无扰动切换
补偿精度误差 Voltage compensation error	<±1%*Un
损耗 Operation Loss	<1%

- 建议客户综合考虑用电设备对电压波动的敏感程度和设备在工业流程中的重要程度，以及关键设备在配电系统中的排列方式、数量和安放的位置不同，选择补偿设备在系统中的安装位置和路径。
NTQD83(DVR)/NTQD82(AVC)/NTQD84(DVRC)/NTQD85(UPQC)/NTQD86(DCbank)为您提供了在负载侧治理和母线侧集中治理的灵活接入方式。
- Customers are advised to comprehensively consider the sensitivity of electrical equipment to voltage fluctuations, the criticality of equipment within industrial processes, and the arrangement, quantity, and placement of key equipment within the power distribution system when selecting the installation location and path for compensation equipment within the system. NTQD83(DVR)/NTQD82(AVC)/NTQD84(DVRC)/NTQD85(UPQC)/NTQD86(DCbank) provide flexible access options for both load-side management and bus-side centralized management.





PRECISION IN DETAIL