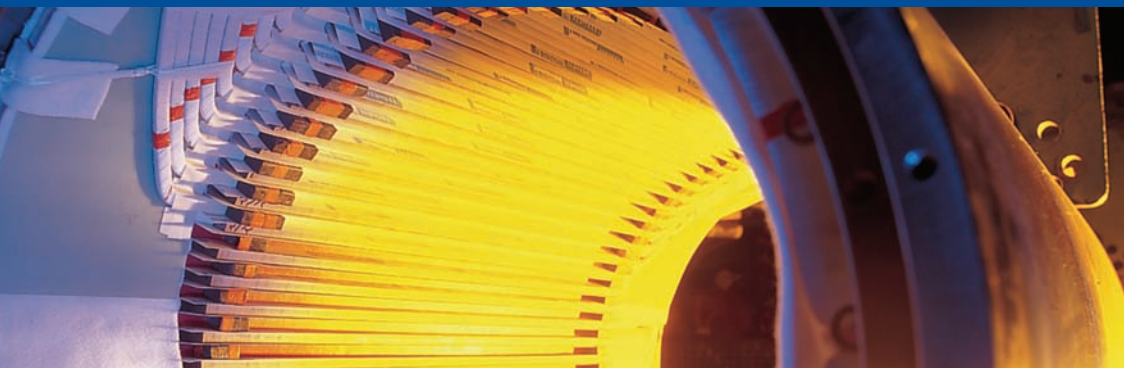
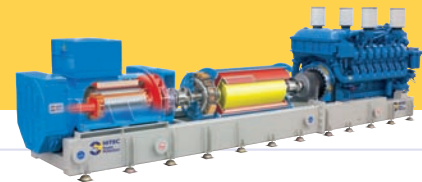


# Diesel UPS/CPS systems

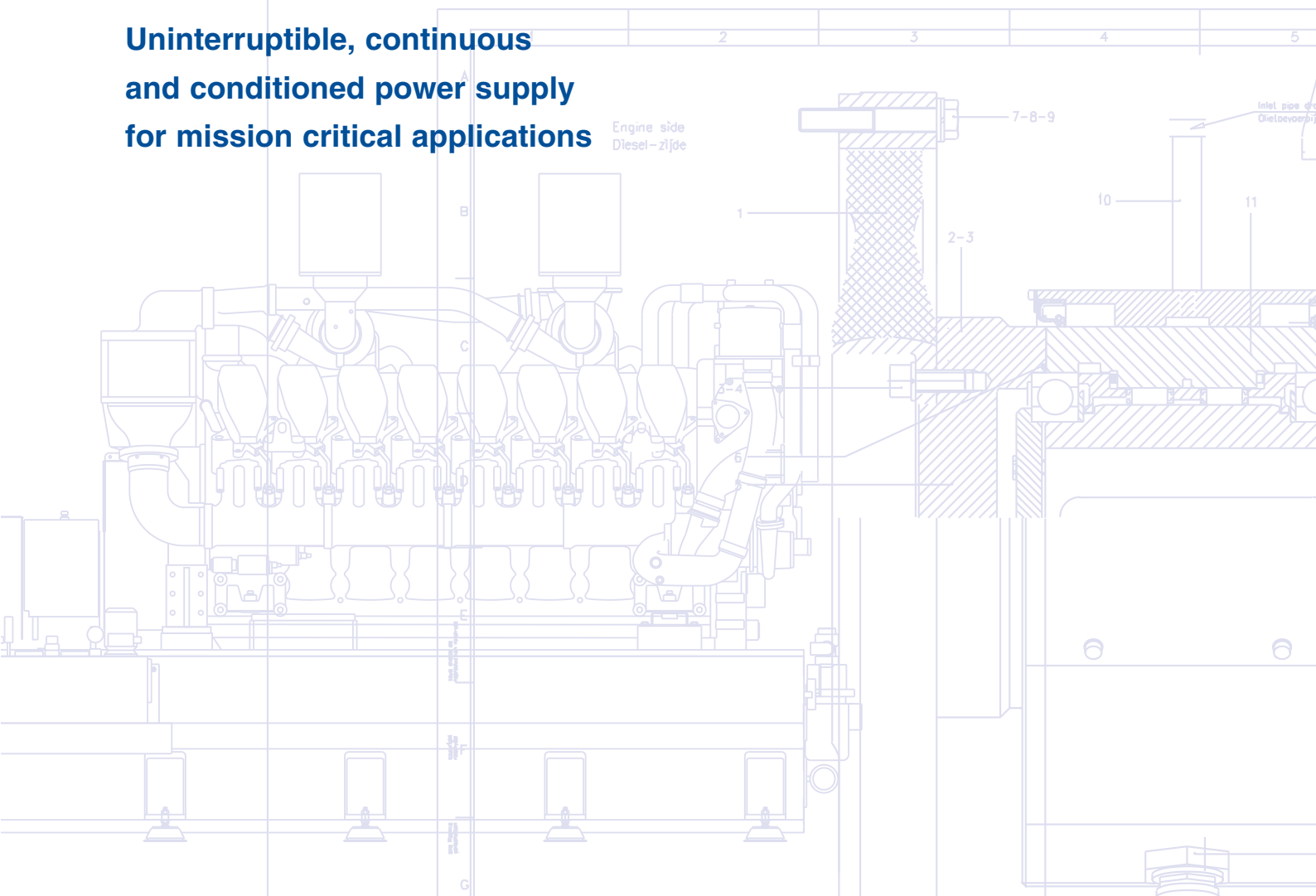
## Continuous power



**POWER  
TO RELY ON**



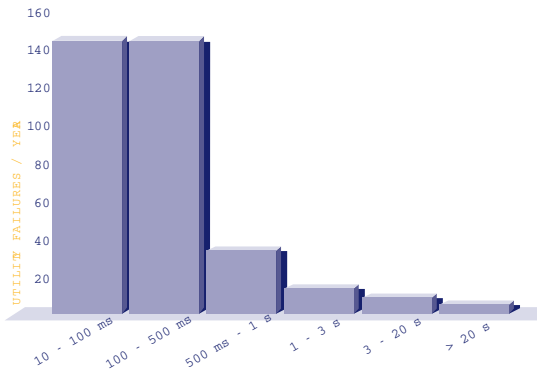
**Uninterruptible, continuous  
and conditioned power supply  
for mission critical applications**



## Introduction

Power quality and reliability for mission critical infrastructures are an ongoing challenge in today's new economy. Complex systems and processes need continuous and clean power to maximize uptime and profitability. Uninterruptible power is a variable in our new economy that some have taken for granted. However, the reality of continuous and clean power is significantly different from that perception.

Power provided by the utilities can be poor and unreliable. This is clearly demonstrated by the numerous power outages every year that can damage sensitive equipment, cause financial loss



Over 280 utility failures occur each year in every industrial country

and even endanger lives. Sudden interruptions of power can lead to serious consequences and often irreparable damage. Consider losing data on a bank's computer, scrapping a batch of wafers in a semiconductor plant, dropping a phone network system for a metropolitan area: these are all examples of power interruptions that are unacceptable.

For critical applications, a continuous power supply is a necessity. This is the world of Hitec Power Protection. Our challenge is to provide customers with a solution for their power quality problems before any losses occur.

As a global supplier of uninterruptible power supply (UPS) systems, Hitec Power Protection has become an industry leader in providing power quality solutions to mission critical infrastructures and processes. Our commitment to excellence has created an unmatched reputation and allows companies to partner with us more easily for their long term and ongoing power solutions.

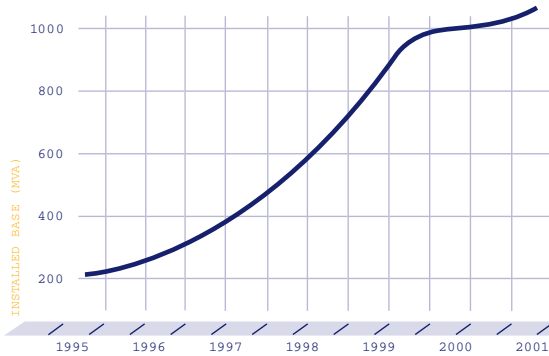
From data centers to semiconductor fabrication, from telecommunication sites to processing plants, Hitec Power Protection ensures that these types of processes and infrastructures maintain their power reliability from the shortest interruption to even the longest power outages.

**Hitec Power Protection:**  
Security that goes without saying!



## The first, the best

For 50 years, Hitec Power Protection has been a market leader in providing durable and reliable UPS/CPS systems. In 1956, we first used the combination compound generator and reactor (choke) as our rotating filter concept, which is at the heart of every Hitec UPS/CPS. Today we manufacture single module systems rated up to 3,000 kVA, which can be configured to a variety of UPS/CPS systems.



In the meantime we have installed over 1,100,000 kVA of UPS/CPS systems. Our quality standards and workmanship attest to our years of experience. This experience has also led Hitec Power Protection to be the market leader in providing reliable power quality solutions.

## Assured quality

Our complete business process, from engineering and manufacturing to commissioning and customer support, follows strict quality requirements and is ISO 9001 certified. Our UPS/CPS systems comply with guidelines as set forth in IEC (BS, VDE, EN, etc.), ANSI, UL or equivalent. Additionally, we test each UPS/CPS system prior to shipping. We possess the largest test facilities for UPS/CPS systems in the world, with a total capacity of 20 MVA (50 & 60Hz)!



ANSI IEC

## History

1956



First battery rotating UPS/CPS system

1963

**HOLEC** 

Merger of major dutch electrical companies to form Holec

1969



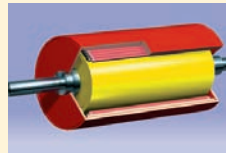
First diesel UPS/CPS system (300kVA)

1974



500 kVA diesel UPS/CPS system

1991



First induction coupling with free rotating inner rotor

1998



Company name changed to Hitec Power Protection

2006



50 years dedication to customers around the world

## System description

A UPS/CPS from Hitec Power Protection is synonymous with reliability. It filters the utility power continuously and protects against power interruptions in a simple and effective manner. The unique concept and design of Hitec Power Protection UPS/CPS' maximizes its reliability and provides the customer with the highest available uptime. Depending upon the size of its available fuel resource the UPS/CPS can provide power for an indefinite time period.



The UPS/CPS system can be supplied with the associated SWITCHGEAR. Hitec can offer switchgear from the manufacturer of your choice.



In utility mode, the GENERATOR acts as a synchronous condenser (no-load over-excited AC motor) that maintains the speed of the outer rotor (red) of the induction coupling. It supplies reactive power to the load and works together with the reactor as an active filter. In the event of a utility power failure, the generator, first driven by the induction coupling, then by the diesel engine, supplies power to the critical load.

The FREE-WHEEL CLUTCH is the mechanical interface between the induction coupling/generator and the diesel engine. The clutch allows the shaft of the induction coupling to rotate, while the diesel engine is at standstill.

When the diesel engine starts and the speed of the diesel engine reaches the speed of the induction coupling/generator, the clutch engages automatically and the diesel engine starts to drive the induction coupling/generator. As a result, the diesel engine starts and ramps up completely without load. This ensures a fast and reliable start.

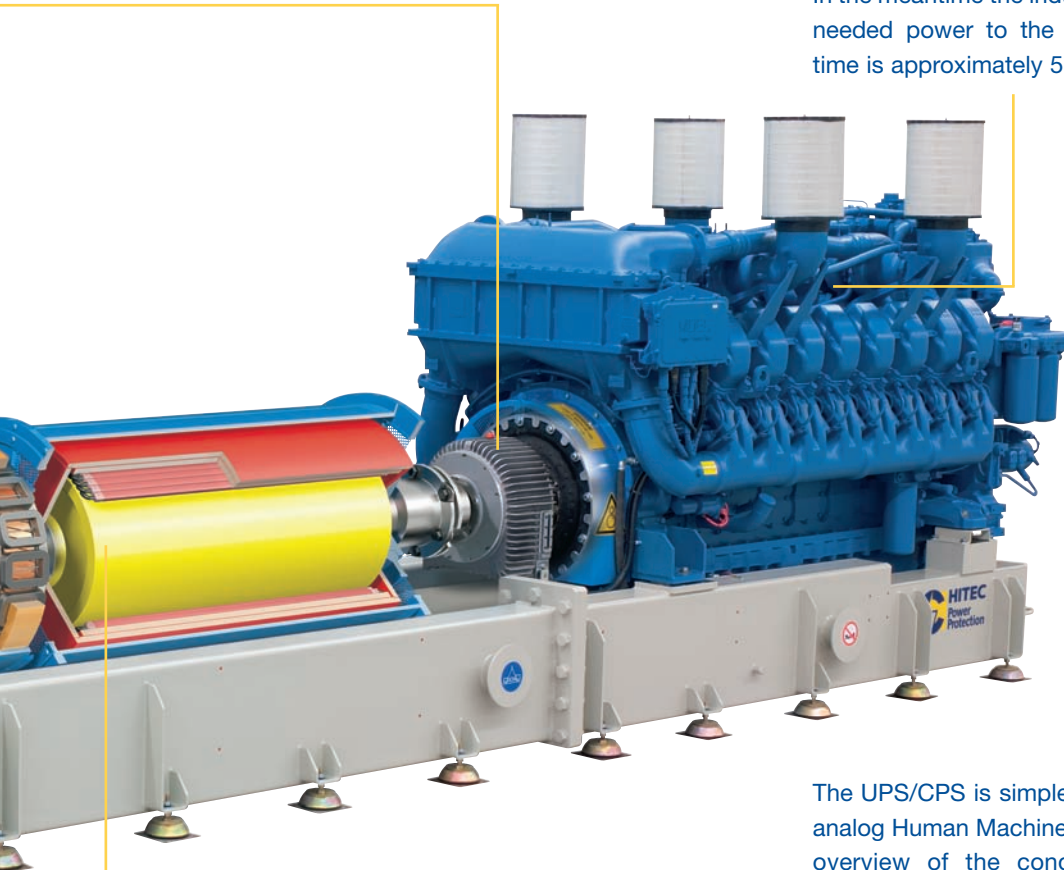


The INDUCTION COUPLING is Hitec Power Protection's distinctive concept and is the heart of the UPS/CPS. The outer rotor (red) contains a two-pole three-phase winding that accelerates the free-spinning inner rotor (yellow) during utility mode. When utility fails, the UPS/CPS retrieves power from the kinetic energy of the inner rotor by energizing the DC winding of the outer rotor. The amount of energy available from the inner rotor is more than adequate to bridge the time required for the diesel engine to start and ramp up to full speed and power.



The DIESEL ENGINE sits idle in utility mode. The engine is pre-heated and pre-lubricated to assure a fast and reliable start. Once utility power fails or falls outside of its tolerance, the diesel is issued a start command and ramps up to full speed and power.

In the meantime the induction coupling supplies the needed power to the critical load. Total transfer time is approximately 5...10 seconds.



The UPS/CPS is simple to operate by the digital or analog Human Machine Interface (HMI). A complete overview of the condition of the UPS/CPS is provided. Remote access can be established either through hard wiring, serial links or via Internet.



The REACTOR (CHOKE) uncouples the utility power from the load. The reactor, in conjunction with the generator, acts as a continuous filter that allows the UPS/CPS to maintain the output voltage within the strictest tolerances.



The microprocessor-based controller DiCon performs the CONTROL of the UPS/CPS. The DiCon is a universal controller for generator voltage, active and reactive power, diesel speed and induction coupling control. Its universal design is configured by software to match all possible systems and configurations.

## Four basic principles

Hitec Power Protection's unique concept for assuring uninterruptible, continuous and clean power rests on four basic principles. Each of them contributes to the unprecedented advantages of our UPS/CPS system over traditional static UPS systems with batteries.

### 1. UPS/CPS = static UPS + standby generator

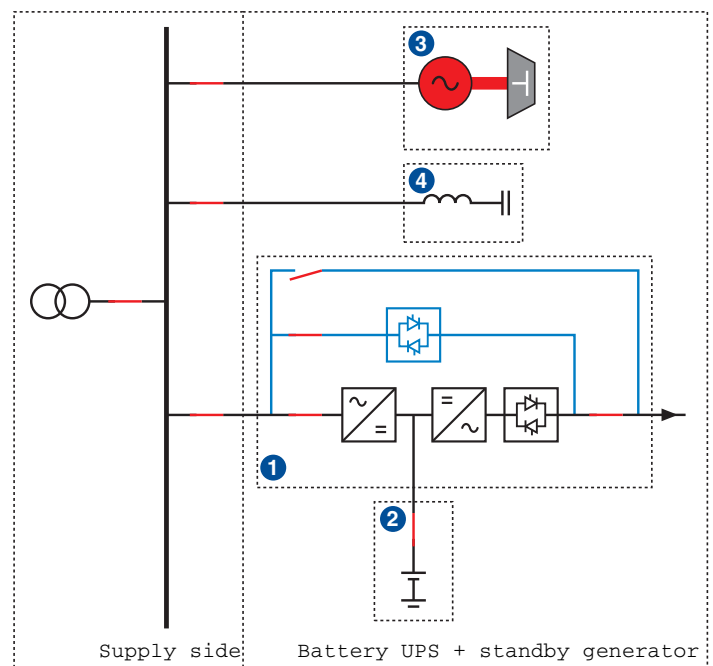
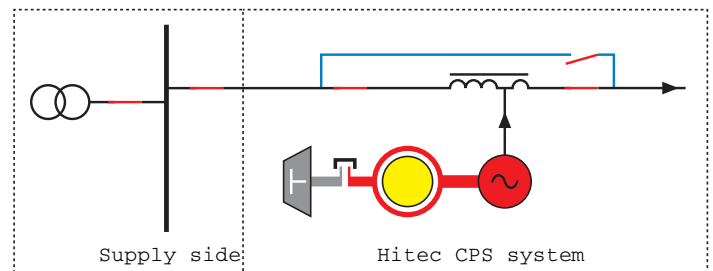
A traditional battery UPS system is composed of a rectifier, batteries and inverter. The UPS provides temporary power via its batteries and then transfers the critical load to a standby generator that supplements power for longer outages.

This type of system requires large areas of interior space that are very costly. Additionally, the energy losses generated in the battery UPS need extensive room ventilation and the batteries require location in a conditioned room at constant temperature. These dedicated cooling systems contribute heavily to the life cycle costs.

Our UPS/CPS system integrates this traditional system into one. The advantages are clear. Fewer components mean lower installation costs and inherently higher reliability. A Hitec UPS/CPS has a considerably smaller footprint than a battery UPS system with standby generator. This offers tremendous space and weight savings.

When utility power is lost, the UPS/CPS retrieves stored kinetic energy from its induction coupling to support the critical load until the diesel engine takes over. This principle eliminates environmentally unfriendly and unreliable battery systems.

### Hitec UPS/CPS: Simple, sure and reliable

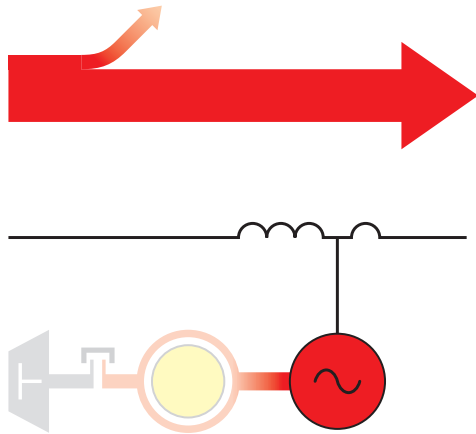


The simplicity of our UPS/CPS vs. a battery UPS configuration

- ① Double conversion power converter (static UPS)
- ② Batteries (VRLA)
- ③ Standby generator
- ④ Harmonic filter

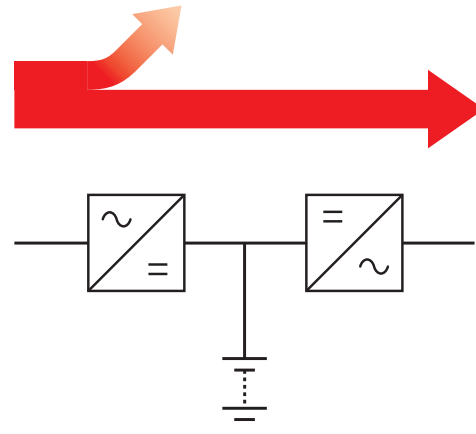
## 2. Line-interactive system

Hitec Power Protection UPS/CPS systems are line-interactive and run in parallel with the utility power, a logical choice since, paradoxically, for the majority of time the utility supply is of a high quality and reliability. A line-interactive system takes advantage of these qualities by connecting the UPS/CPS in parallel, as opposed to series, with the utility supply.



The highly efficient line-interactive system...

A traditional battery UPS continuously converts electrical energy through rectifiers and inverters that provide a common point of failure and reduce its efficiency. When factoring in the energy needed to operate a battery UPS' airconditioning requirement, a true realization of energy savings associated with the UPS/CPS system can be derived and realized throughout the life of your project.



...compared to the traditional double conversion concept

The UPS/CPS is like a lifeguard that is always alert and ready to jump in if necessary when utility power fails or falls outside specified tolerances. There is no conversion of electrical energy flowing from utility to the critical load, making our UPS/CPS the most efficient and reliable system available.

### Line-interactive: Life guarding your mission critical applications



### 3. Active filter

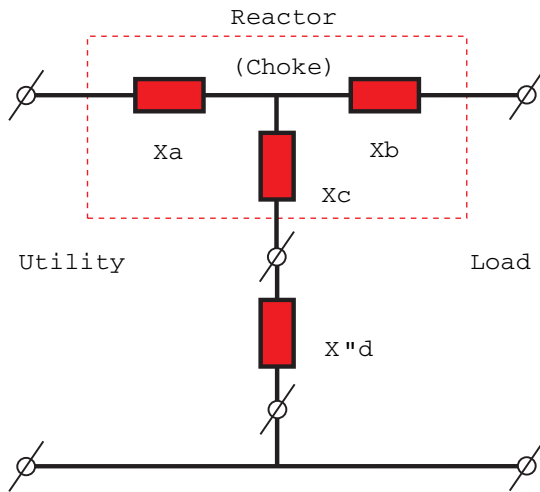
The combination of the reactor (choke) and synchronous generator acts as a filter to clean the incoming utility supply. This is achieved by setting the position of the tapping so that the equivalent circuit impedances of the generator and the reactor give a zero impedance path ( $X''d + X_c = 0$ ).

Hitec's UPS/CPS system does not utilize any power electronics to generate, condition or convert the output voltage, so it does not produce any harmonics itself, unlike conventional UPSs. Instead it acts as a harmonic filter to both supply and load borne harmonics. Additionally, the generator supplies the reactive power drawn by the load. The result is that the utility power factor is always close to unity.

#### Outstanding qualities of the active filter:

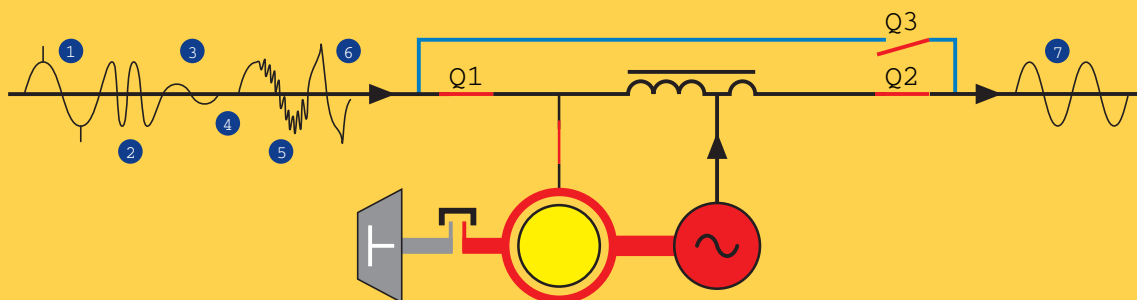
- Compensation of utility voltage deviations
- Filtering of utility borne harmonic voltages
- Filtering of load borne harmonic currents
- No UPS/CPS borne harmonic currents / voltages
- Input power factor close to unity (>0.98)

#### Rotating filter: No load - utility interdependencies



Electrical equivalent diagram of the active filter

## A Hitec UPS/CPS acts as a filter for all sorts of utility disturbances



- |                              |                                 |
|------------------------------|---------------------------------|
| 1 Voltage peaks              | 5 Radio frequency interferences |
| 2 Frequency variations       | 6 Harmonic distortions          |
| 3 Brown-outs / voltage drops | 7 Continuous quality power      |
| 4 Black-outs / outages       |                                 |

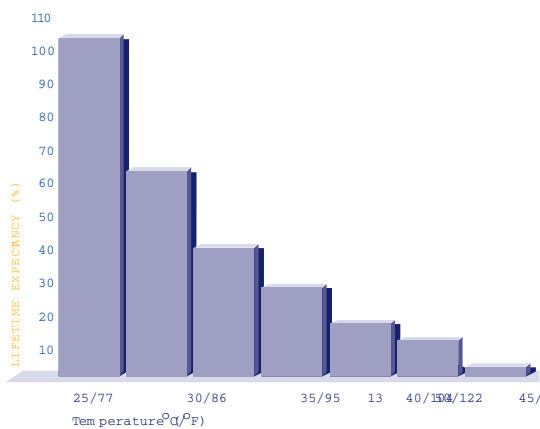


#### 4. Battery-free solution

The UPS/CPS system from Hitec Power Protection uses stored kinetic energy to bridge the diesel start time upon a utility power failure. It is a battery-free concept, which was invented and patented by Hitec Power Protection in 1969 and continues to be in successful commercial operation throughout the world.

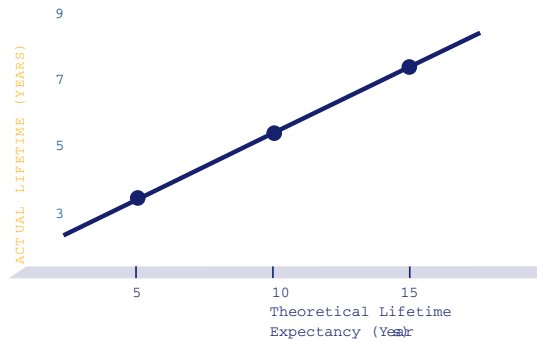
The heart of a battery UPS is also its weak link. The huge batteries required constitute a sizeable problem that, to the user's frustration, only becomes apparent after several years of operation.

#### Some typical battery associated weaknesses illustrated



A battery's lifetime expectancy drops fast at higher ambient temperatures

#### Battery-free: Problem-free



The difference between theoretical and actual battery lifetime!

### Battery related issues you won't face with a Hitec UPS/CPS:

#### Lifetime expectancy

Battery lifetime theoretically is 5 to 15 years; practically they last for 3 to 5 years. Economic lifetime of a battery UPS is 10-15 years; a Hitec UPS/CPS last for 25 years!

#### Environmental effects

Batteries contain environmentally harmful materials; used batteries are chemical waste. Disposal costs are high!

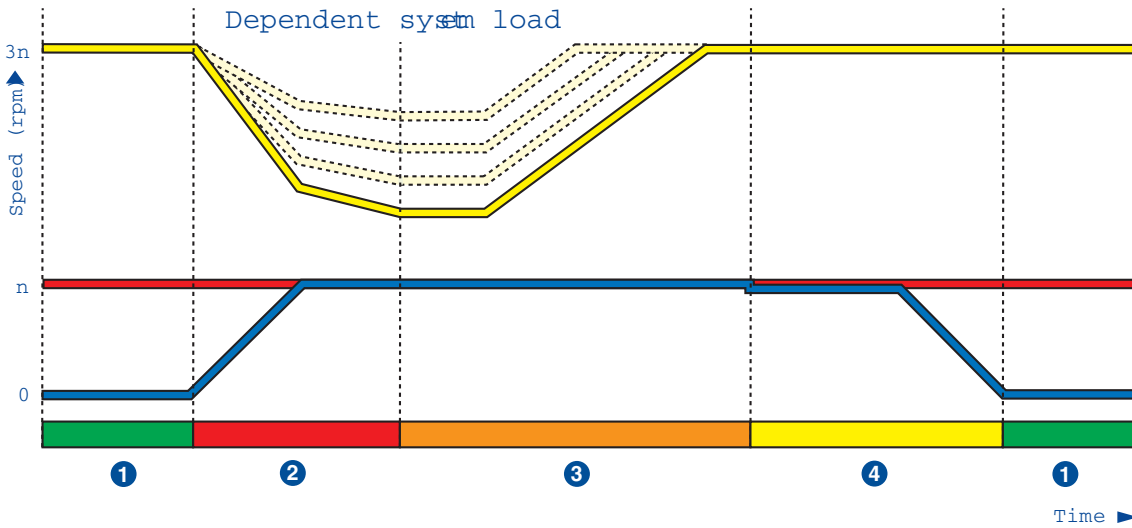
#### Temperature sensitivity

Battery capacity decreases significantly at low temperatures, while lifetime halves every 10°C (18°F) above 20°C (68°F). Installation in conditioned rooms is a must!

#### Maintenance

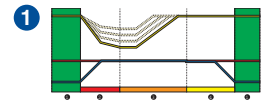
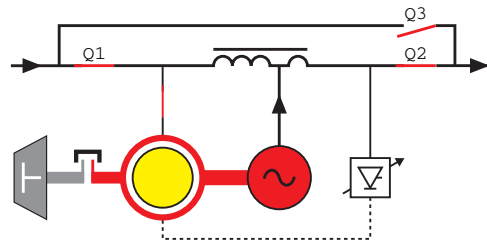
The only sound method to monitor battery capacity is discharge testing, which is time consuming (battery must be disconnected from the UPS)!

# System operation



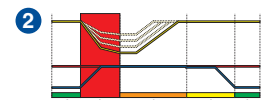
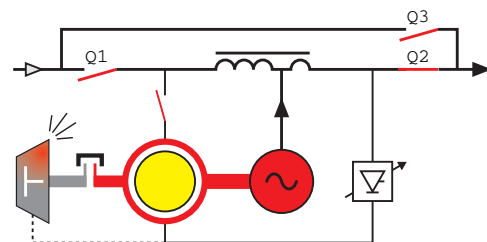
## 1 Utility mode

In utility mode, the reactor and the generator function as an active filter that prevents any disturbance from the utility reaching the critical load. The generator runs as a motor and drives the outer rotor of the induction coupling at a speed of 1500/1800 rpm. Through excitation of the two pole three-phase winding in the outer rotor, the inner rotor reaches a speed of 3000/3600 rpm relative to the outer rotor. As a result, kinetic energy is stored in the inner rotor. The outer rotor of the induction coupling is isolated from the standby diesel engine by the free-wheel clutch.



## 2 Change-over to diesel mode

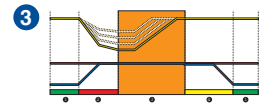
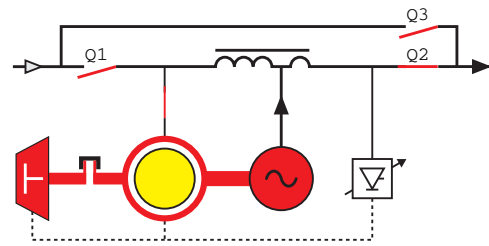
In case of a power interruption or an unacceptable deviation in the supply of utility power, the circuit breaker Q1 opens. The induction coupling's DC windings are then excited, thus allowing a transfer of stored kinetic energy from the inner rotor to the outer rotor. The speed of the generator remains constant at 1500/1800 rpm.



Simultaneously, the diesel engine starts and ramps up to 1500/1800 rpm in less than 2 seconds, after which the free-wheel clutch engages automatically. For the next few seconds the diesel engine together with the induction coupling drive the generator to ensure a proper supply of power to the critical load. Within 5..10 seconds the diesel engine is the sole provider of power to the load.

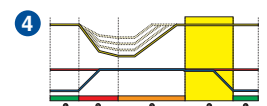
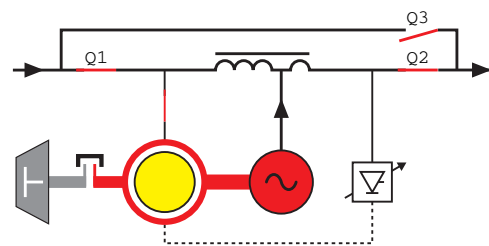
### 3 Diesel mode

When in diesel mode, the three-phase winding of the outer rotor is re-energized causing the inner rotor to ramp up to 3000/3600 rpm again. The speed of the diesel engine is monitored and digitally controlled to ensure a constant output frequency. While in diesel mode, the output frequency remains within narrow tolerances, even if the system encounters high load steps, since the induction coupling will be utilized to support the diesel engine.



### 4 Back to utility mode

After utility power has stabilized, the UPS/CPS synchronizes with utility power and closes Q1. The diesel engine then ramps down to 1450/1750 rpm, and as a result the free-wheel clutch disengages. Simultaneously, the generator returns to its motor operation and maintains the speed of the outer rotor of the induction coupling at 1500/1800 rpm. The diesel engine will continue to run for a short time in a no-load condition to cool down. After the diesel has completed its cool-down run it will shut down and return to standby mode.



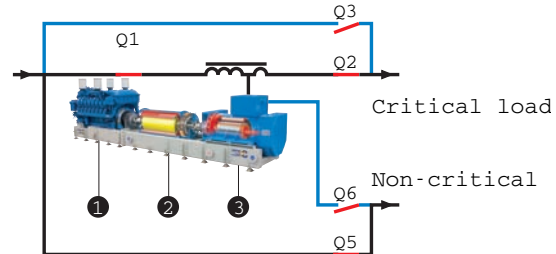
## Critical and non-critical load

A single brief utility power failure can have disastrous consequences for many mission critical applications, i.e. data center computers, Internet servers, etc. Other components that make up these critical environments can be without power for several seconds, i.e., airconditioning, lighting, etc. One single UPS/CPS system can provide power to both types of loads in our dual output configuration.

The generator of a Hitec UPS/CPS system is always sufficiently overrated to ensure adequate short circuit capacity to clear any downstream faults quickly, while also being able to regulate the output voltage closely during a utility brown-out. When in diesel mode this excess power can be utilized to supply non-critical loads. To enable this option, the diesel engine rating is increased to supply both the critical and non-critical loads. This configuration is known as dual output.

The non-critical load is not typically connected to the UPS/CPS output. When utility fails, the UPS/CPS supplies uninterrupted clean power to the critical load while the diesel engine ramps up.

Once the diesel engine has reached normal operating conditions, the non-critical load will be switched to the output of the UPS/CPS system by closing Q6 (Q5 has opened in the meantime). Within approximately 10 seconds the non-critical load will be energized again.



A dual output system optimally capitalizes UPS/CPS' capacity  
 1 Total power rating 2 Critical load rating 3 Total power rating

With the dual output configuration you can optimize your reliability, design and achieve a reduced footprint. Our dual output configuration is the most common design manufactured for our UPS/CPS systems.

**Dual output:  
 Optimal use of resources!**

## The unprecedented advantages of UPS/CPS

The simplicity of the UPS/CPS design offers unique characteristics and numerous advantages. As the exclusive worldwide supplier, Hitec Power Protection is able to bundle several critical aspects together into one reliable system that distinguishes itself from the traditional battery UPS / standby generator combination. Therefore, a UPS/CPS system from Hitec Power Protection is the first and only choice!

### 1. Battery-free solution!

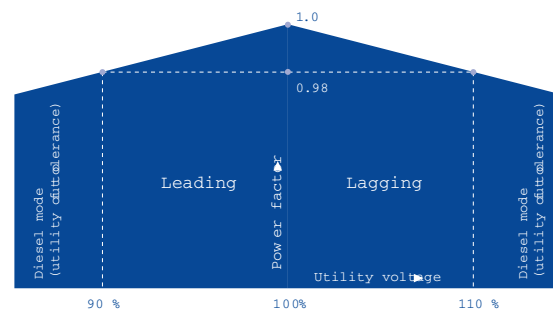
No batteries are used in a Hitec UPS/CPS system; instead kinetic energy is used to bridge diesel start time. The system is not sensitive to the variety of problems associated with the use of batteries.

### 2. UPS/CPS = static UPS + standby generator

Hitec Power Protection's UPS/CPS concept is simple and efficient when compared to the battery UPS + standby generator concept: harmonic filters, rectifiers, battery banks, inverters, static switches, standby generator, etc ... The Hitec Power Protection UPS/CPS integrates all these functions into one system.

### 3. Line-interactive without power electronics

The unique line-interactive concept of a Hitec Power Protection UPS/CPS leads to significant benefits. The CPS does not perform a double energy conversion that battery UPS' must execute even when reliable utility power is available. No power electronics are utilized; instead Hitec incorporates a synchronous generator to supply the load.



Power factor is always close to unity (>0.98)

## Features & benefits

### Battery-free solution

- No re-investments every 3-5 years for new batteries
- No need for a dedicated climate controlled battery room
- Reduced floor space requirements
- No battery disposal costs every 3-5 years (chemical waste!)
- No need for costly spill containment systems

### UPS/CPS = Static UPS + standby generator

- Fewer components thus inherently more reliable design
- Higher MTBF and availability figures
- Lower installation and commissioning costs
- Smaller overall dimensions and floor space requirements
- Only 1 output ACB required at your supply switchboard
- Simplicity; easier to operate and maintain

### Line-interactive without power electronics

- No double energy conversion; higher efficiency
- No power conversion; higher MTBF and availability figures
- No generation of harmonic currents / voltages
- Long technical lifetime compared to systems with power electronics (25 compared to 15 years)

### Reactor + generator = active filter

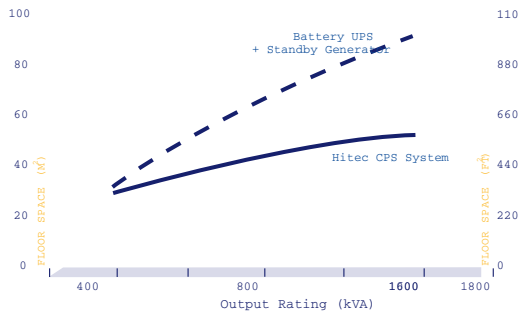
- High short circuit output capacity. The system does not need to go to by-pass (use the utility) to clear an output fault
- Reactive output power supplied by generator (pf > 0.98)
- Dips and spikes on the utility voltage are blocked
- Compensation of prolonged deviations of the utility voltage
- Filtering of utility borne harmonic voltages
- Filtering of load side borne harmonic currents

#### 4. Reactor + generator = active filter

The magnetically coupled tapped reactor (choke) and generator act as an active filter, efficiently cleaning the utility voltage from all disturbances before reaching the load.

Additionally, our generator is able to provide a high short circuit current of up to 14x its nominal output current. This is another key advantage over traditional based systems. If a short circuit occurs downstream from the UPS/CPS, the UPS/CPS will

clear the fault while remaining in utility mode. Traditional battery UPS systems are forced to transfer to bypass and hope the utility clears the fault. If utility power is not available during this event, the load will be unprotected and susceptible to a load loss. The fact that a Hitec UPS/CPS does not transfer to bypass in this situation should not be underestimated.



Floor space requirement of a Hitec UPS/CPS versus a battery UPS

#### Conclusion

Hitec Power Protection's UPS/CPS has various advantages over traditional UPS systems. These advantages include reduced footprint, lower installation costs, annual utility savings, elimination of climate control systems, elimination of environmentally unfriendly batteries, reduced structural weight on your building, elimination of compatibility problems with standby generators, higher reliability and elimination of large capital expenditures associated with battery replacements.

## Lowest life cycle cost - guaranteed!

Higher output, smaller footprint, no battery replacements, less structural weight, higher efficiency and elimination of airconditioning requirements result in the Hitec UPS/CPS' lower life cycle cost.

#### Price estimation model

Hitec Power Protection has developed a model to estimate the life cycle cost for both a Hitec UPS/CPS system as well as for a battery UPS + standby generator. The model not only considers the initial investment, but also re-investments and yearly operating costs. We would be more than pleased to show you the difference!

#### Various lease options

To substantiate our statement of lowest life cycle cost even further, we can offer you a variety of lease options.

#### Operational lease:

Electrical energy ensured by Hitec Power Protection up to the highest reliability at a fixed price. We supply, install, and maintain the UPS/CPS system. You pay us per month and leave your worries to us!

	HITEC	B-UPS-GENSET
1 INITIAL INVESTM.	195.000	212.000
8 REINVESTM.	28.000	56.000
9 OPERATION. CST	200.000	275.000
	<u>423.000</u>	<u>543.000</u>

#### Financial lease:

Hitec Power Protection can offer you a tailored financial lease option. For a fixed amount per year, we can install a Hitec UPS/CPS system at your facility. Leave the responsibility of maintenance and service to us. They can all be included in the lease contract!

With the variety of options to obtain a Hitec Power Protection UPS/CPS, coupled with lower life cycle costs, it is easier than ever to address your power protection needs at the highest possible return on your investment!

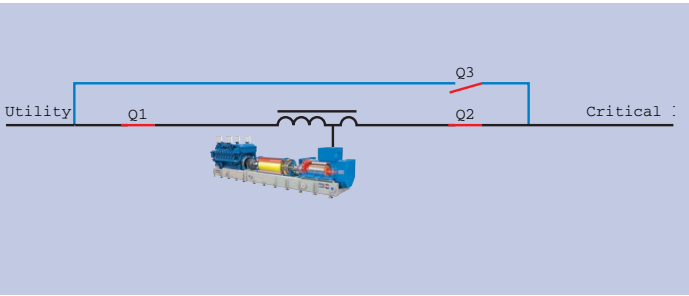


## Unit configuration features

UPS/CPS systems can be delivered in a variety of configurations. Each configuration can be tailored to your specific needs; from a single module UPS/CPS to a distributed redundant dual output configuration.

### Single Systems

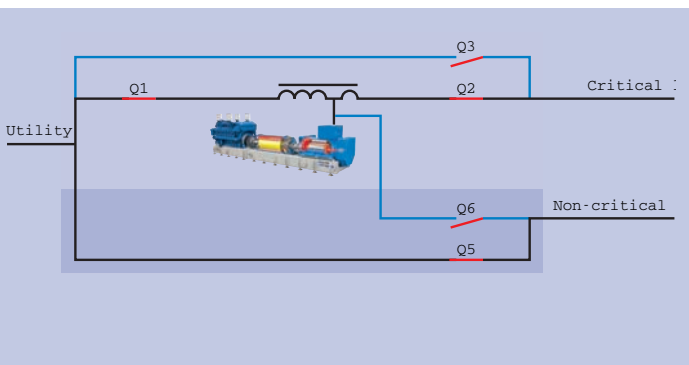
#### Single Output UPS/CPS System



In a single output configuration all components (generator, induction coupling, diesel engine and reactor) are rated to provide continuous and clean power to the critical load.

#### Dual Output UPS/CPS System

To ensure sufficient short circuit capacity and guaranteeing narrow voltage tolerances, the UPS/CPS' generator is overrated. This excess power can be used to supply non-critical loads. The diesel engine's rating must then be increased to supply both the critical and non-critical loads. This configuration is known as the dual output system. When the utility fails, the UPS/CPS will protect the critical load. As soon as the diesel engine has started and has stabilized the critical load, the UPS/CPS then assumes the non-critical load by closing Q6. Virtually no additional cost or space is required.



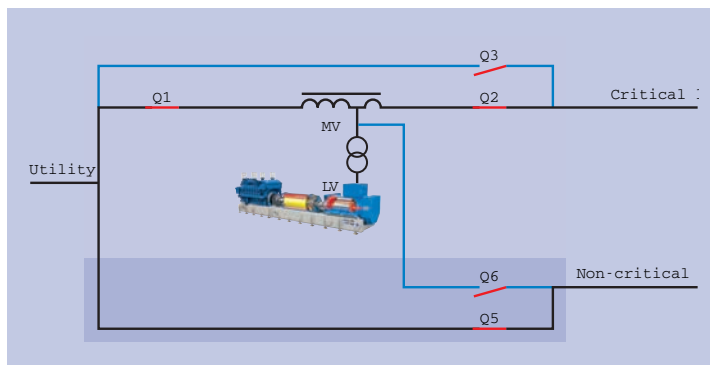
■ CPS ■ Dual output

<b>Low voltage (LV) UPS/CPS units:</b>	Simplest means of providing complete conditioning and protection to all critical loads.
<b>Medium voltage (MV) UPS/CPS units:</b>	Simple means of providing complete conditioning and protection to large loads where LV solutions are not ideal.
<b>Dual output UPS/CPS units (LV and MV):</b>	Removes the need for separate gensets for non-critical loads.

#### Medium Voltage System

For higher power ratings, medium voltage (MV) systems can be offered. Hitec Power Protection offers two types of medium voltage configurations. The first option incorporates a low voltage power module with an additional step up transformer; the other incorporates a MV power module. Circuit breakers and the reactor will always be configured at the medium voltage level.

Single output, dual output and MV systems are available in a variety of configurations.

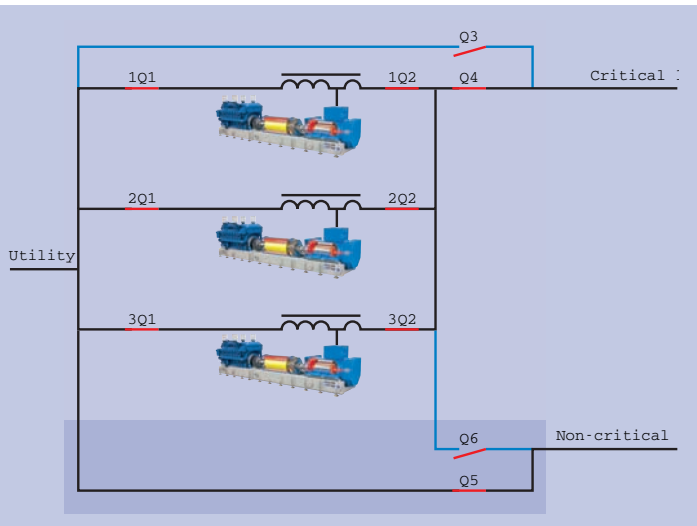


## Parallel / Parallel Redundant Configurations

### Parallel Configuration

For load requirements over our largest single module unit (3,000 kVA) parallel configurations can be designed for increased output. Paralleling units is also considered when redundancy is required. The most common redundant configuration is 'N + 1'.

When two units are required to supply the critical load, another unit will be installed to provide back up should a unit fail. The total number of units, which can be installed in parallel, is limited by the total output current/short circuit current. Currents over 6,000 A are not practical, i.e. total output power is limited to approx. 4,000/5,000 kVA at 380/480 V.

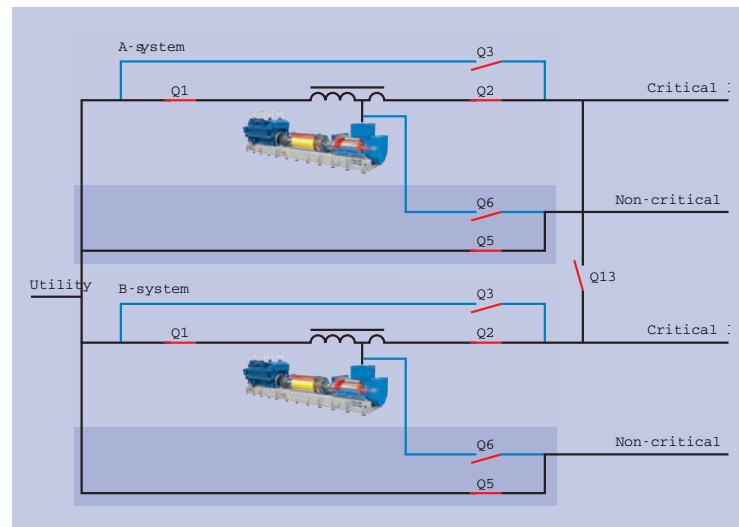


Parallel configuration

■ CPS    ■ Dual output

## Master-Slave Configuration

An alternative configuration for two parallel units is the master-slave configuration. This option is more appropriate if two groups of critical outputs are separated without a common point of coupling. The control system maintains synchronization between both units ensuring that the tying breaker (Q13) can be closed at any time due to failure or maintenance. No common point of failure is present.



Master-slave configuration

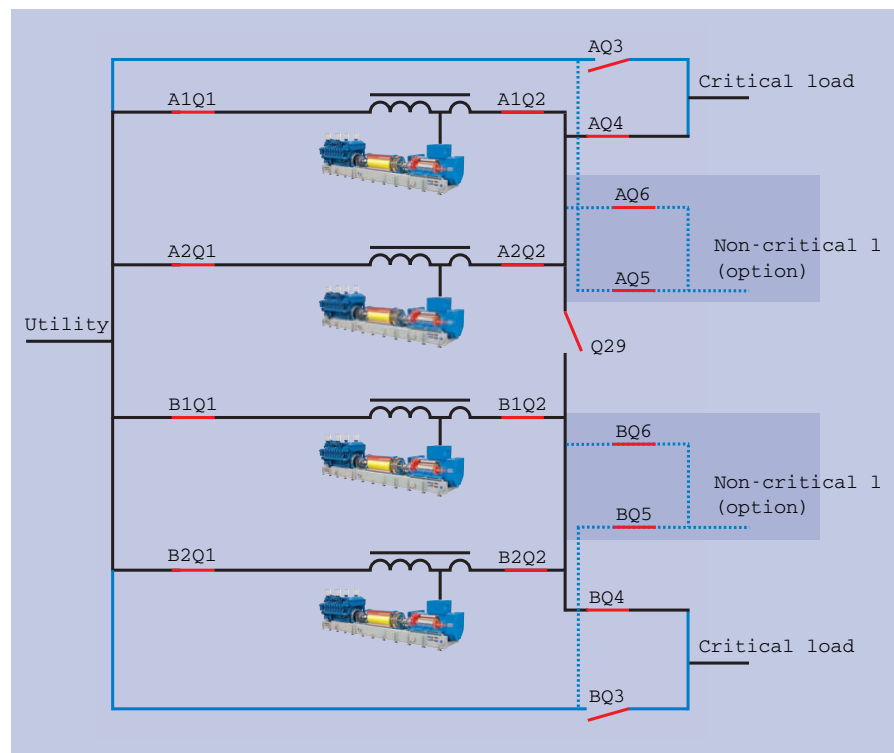
## Cross-Link Configuration

In the parallel configuration, the total critical load is connected to one output bus. In situations where there are two separate independent loads a cross-link (or Q29) configuration can be used. As in a parallel system the redundancy is N+1 over the total amount of units, but during normal operation the system acts as two independent parallel systems. The redundancy however is shared between the two systems and in case one of the two parallel systems is overloaded closing the Q29 breaker will make use of the surplus of power available in both of the systems. When in Q29 mode a output bus failure occurs it will be limited to the bus causing the fault; the other system will be disconnected by opening Q29.

Redundancy is only shared between critical loads; non-critical loads do not have a cross-link connection.

The cross-link therefore virtually eliminates single points of failure in the bus-structure.

The limitations of the system are equal to that of a parallel system.



Cross-link configuration

## Systems configurations features:

### Advantages

System configuration	Characteristics
Parallel Redundant (PR)	Simplest and most compact means of achieving redundancy between UPS units and of supporting very large or multiple loads.
Master - Slave (MS)	Eliminates a common UPS output bus-bar.
Cross - Link (CL)	Virtually eliminates the common output bus-bar. On multi-UPS unit systems, far less UPS units required to achieve required redundancy than in an MS system.
Isolated - Parallel (IP)	No common output bus-bar due to additional tie breakers and isolating chokes. Efficient and flexible use of the system redundant capacity.
Isolated - Redundant (IR)	No common output bus-bar due to separation of loads and UPS unit outputs. Fewer breakers and chokes required than in an IP system.
Distributed Redundant (DR)	No common output bus-bar due to separation of loads and UPS unit outputs. Fewer breakers and chokes required than in an IP system. Efficient and flexible use of the system redundant capacity.



## Isolated Parallel System Configuration

The isolated parallel system configuration combines the fault-tolerance of redundant systems with the load sharing capabilities of a parallel system.

The isolated parallel configuration connects multiple units together, thereby creating redundancy, while maintaining isolation between units at the same time. Active power can then be shared between units, while load faults will be kept isolated from each other. A fault on one load will therefore not influence other loads.

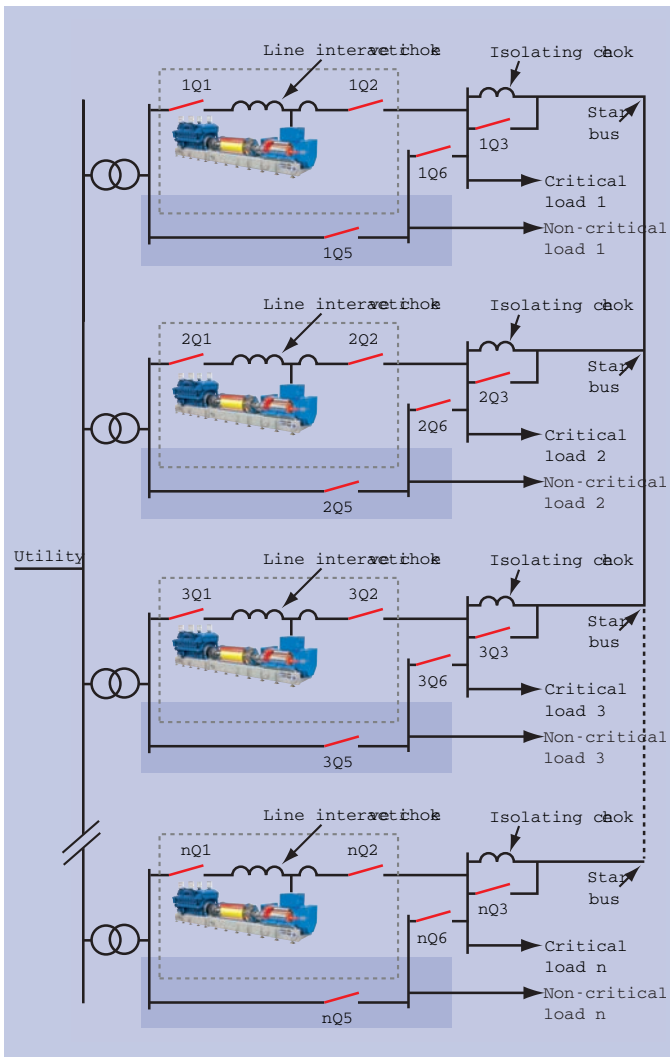
## Isolated Redundant Configuration

Traditionally, a parallel redundant configuration would be used if redundancy were required. With an isolated redundant configuration, redundancy is created on the basis of standard single units.

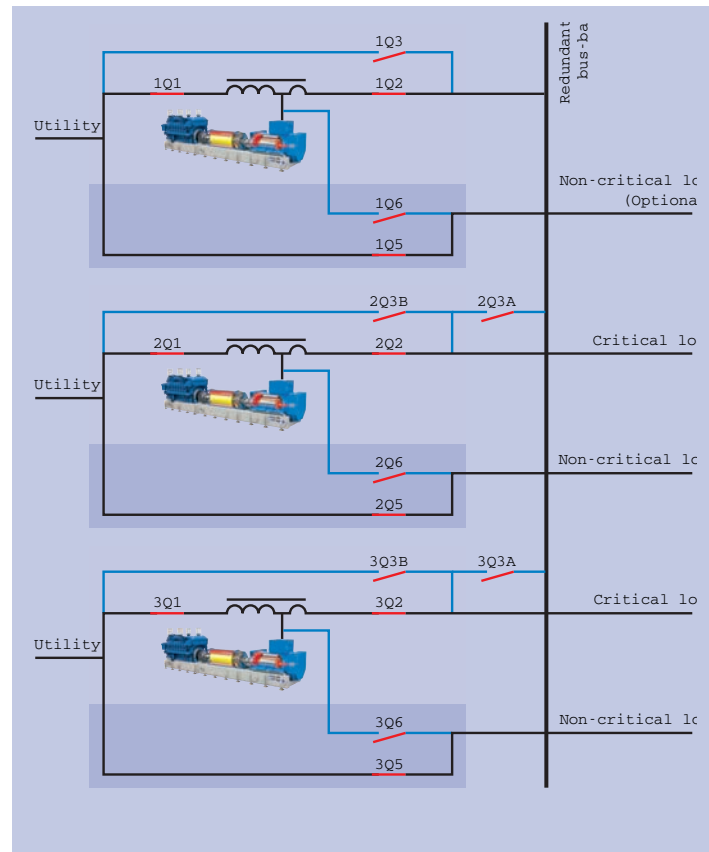
All individual units support their individual critical loads. In an 'N+1' configuration, these systems have one redundant unit as a backup. The backup unit normally operates in a no-load condition. In the event that one unit fails or is taken off-line, the critical loads are automatically transferred to the redundant unit (closing Q3A) via closed transition instead of going to bypass.

Additionally, the non-critical load can be connected to the redundant unit utilizing the available UPS/GPS power. In case of maintenance or failure of one module, the non-critical load will be transferred back to the utility supply and your critical load will be maintained.

Isolated parallel system configuration



Isolated redundant configuration



All circuit breakers in this configuration need to be rated to each unit's nominal output current. This configuration can be used for much higher power ratings as compared to the parallel redundant configurations.



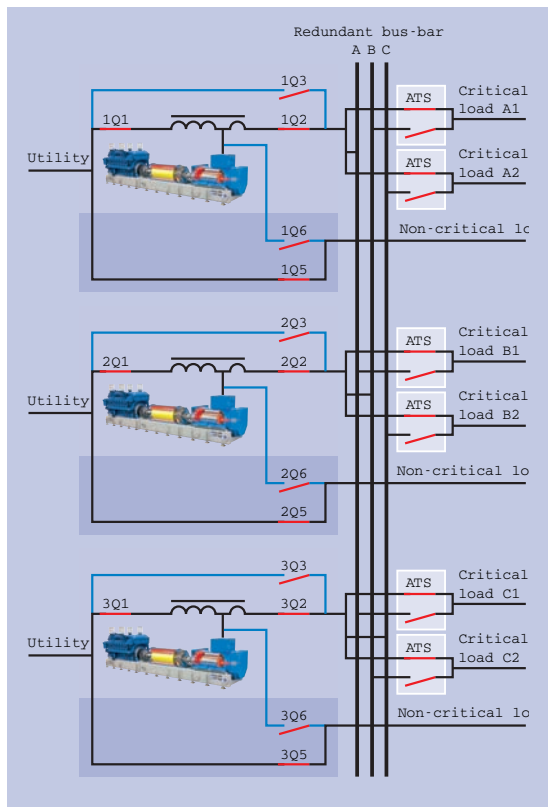
## Distributed Redundant Configuration

In the isolated redundant configuration, the redundant unit is normally supplementing a non-critical load or running at no load at all. This can be overcome with the distributed redundant design.

Distributed redundant systems are normally designed for 'N+1' redundancy. No single module is assigned as a redundant unit. Instead, this role is shared equally among all modules.

In the event of a single unit failure, its load will be shared proportionately over the remaining units. The load transfers are accomplished through automatic transfer switches (ATS). The advantages are the elimination of single point failures and equal load sharing among all units.

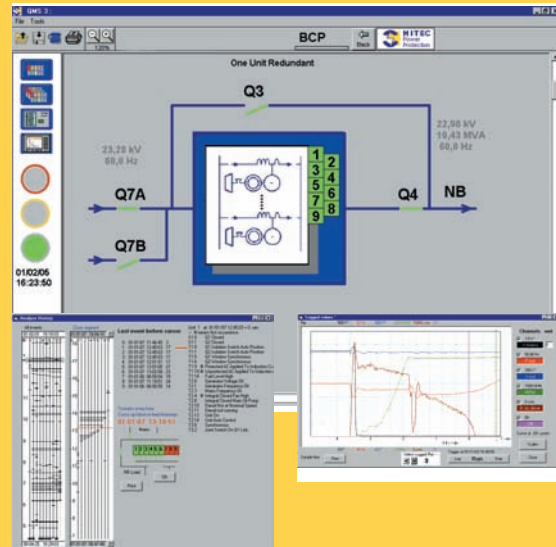
Distributed redundant configuration



■ CPS   ■ Dual output

## QMS remote monitoring

Hitec Power Protection offers QMS, a powerful software tool for the monitoring, supervision and maintenance support of UPS/CPS systems. QMS is a multi-purpose user-friendly software tool that runs on a pc with Windows®. The status, event history and electrical parameters are gathered, stored and conveniently arranged on the pc screen for easy reading and printing.



Monitoring your UPS/CPS systems at a glance with QMS software

### Easy access

The pc running the QMS software can be connected to the UPS/CPS system either at site through a dedicated serial link, remotely through a modem connection, or over the Internet.

### Detailed information

The program provides detailed information on the UPS/CPS' status to make supervision easier. Voltage and current readings, circuit breaker status, operating hours, number of diesel starts, diesel running time, and various other data are shown.

The software not only provides the user with real time information but also provides a historical overview of state changes and events over the last half year. This overview is shown either as a list of events, or as a "mimic movie." The software is a very powerful tool to help users and technicians understand the UPS/CPS operation and thereby greatly extends the operational, service and maintenance possibilities of your UPS/CPS system.

Many of these readings can also be displayed as a strip chart of events, which is especially useful when viewing multi-module systems.

## Installation & commissioning

To install and commission a Hitec UPS/CPS system is relatively easy and simple. It is very similar to installing a standby generator.

When comparing a UPS/CPS system to the installation and commissioning of a battery UPS + standby generator, a Hitec UPS/CPS eliminates the installation of a battery UPS, batteries, harmonic filters and all the inter-connecting electrical wiring and synchronizing equipment.

- The power module comes pre-mounted on a robust base frame. As an option, split frames can be supplied to aid any site-specific difficulties with lifting and installing.
- Mounting engine exhaust, fuel and cooling systems are identical to the installation works required for a standby generator.
- Room ventilation is similar for a Hitec UPS/CPS system as for a standby generator.
- The associated switchgear is standard equipment, avoiding any special installation and commissioning procedures.
- The human machine interface provides easy and clear access to all system parameters. It is a powerful information tool for a simple & fast commissioning of the UPS/CPS system.

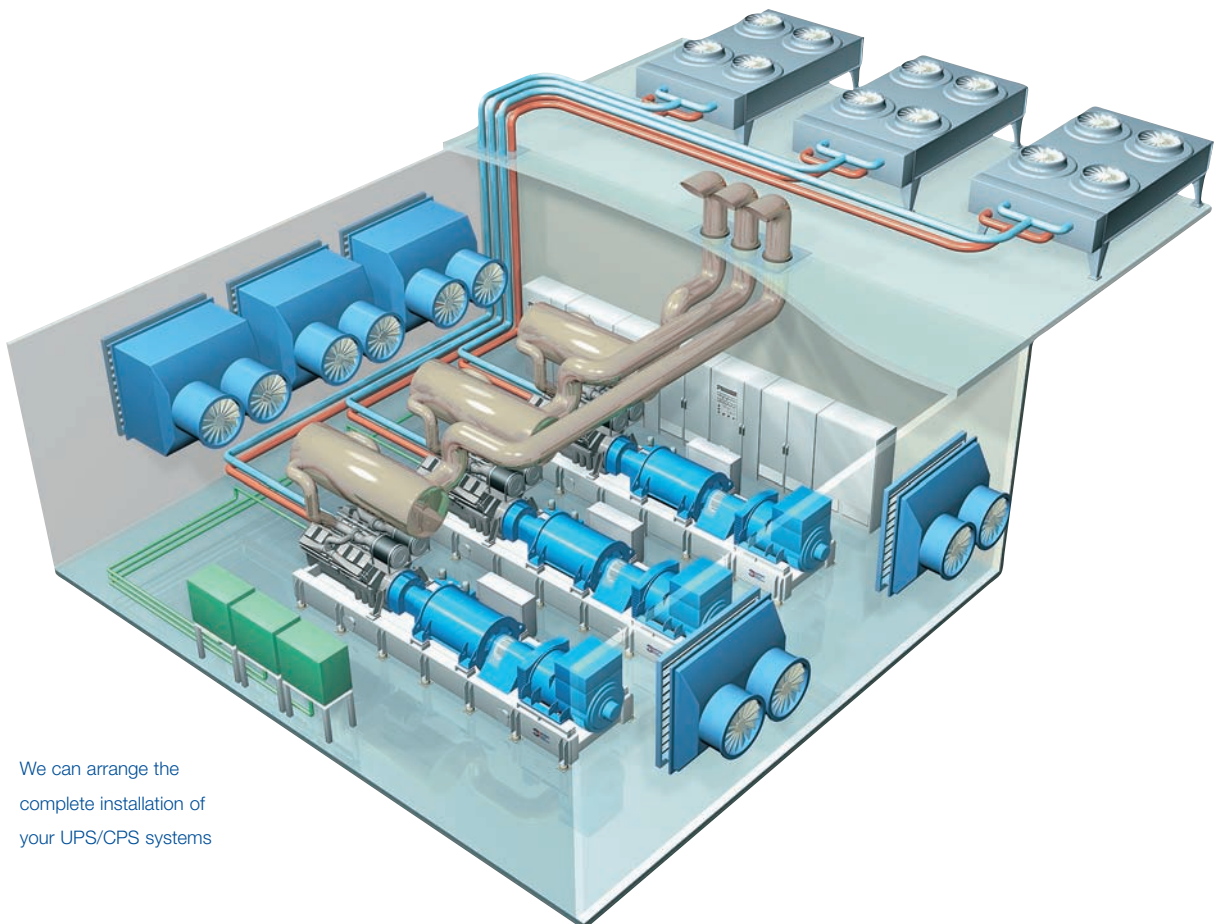
## Customer support

The Hitec Power Protection name is synonymous with reliability, quality and excellent service. We believe that the best technology is only as good as the service that supports it.

We have therefore established a network of qualified service organizations.

### The main service organizations can

- Provide Help Desk Services - available 24 x 7 x 365 - for operational questions, remote monitoring / support, troubleshooting, etc.
- Provide remote monitoring and diagnostic support. Our service department can access your UPS/CPS system through the Internet or a modem connection, thus assisting with operational issues, offering maintenance advice, providing troubleshooting, etc.
- Provide training programs at various skill levels for the operation and maintenance of our systems.
- Rent containerized UPS/CPS units up to 1,000 kVA for disaster recovery, high-risk maintenance periods, temporary power needs, etc.



We can arrange the complete installation of your UPS/CPS systems

## Technical specifications

### Input:

Input voltage:	LV	380...480 V 50/60 Hz
	MV	Up to 24 kV 50/60 Hz
Voltage tolerance:		+/- 10%
Power factor:		> 0.98

### Output:

Output voltage:	LV	380...480 V 50/60 Hz
	MV	Up to 24 kV 50/60 Hz
Voltage deviation:		+/- 1%
Voltage asymmetry:		< 2%
Harmonic distortion:		< 3.5% (with linear load)
Harmonic filtering:		> 95% (in both directions)
Frequency deviation:		< 0.5% ... 2.5%
Short circuit current:		Up to 14x Nominal Current
Nominal power factor:		0.8

### System:

Efficiency:	Up to 97%
Crest factor:	≥ 3
RFI level:	Class A (EN 55.011)

### Other:

Color scheme:	
RAL 7032 (Light Grey):	Base frame & panels
RAL 5012 (Blue):	Induction coupling & generator
Diesel engine:	Manufacturers' standard

### Environmental (standard):

Degree of protection:	IP21 (or higher as option)
Operating altitude:	< 150 m above sea level
Ambient temperature:	0...40 °C (32 ... 104 °F)

### Options:

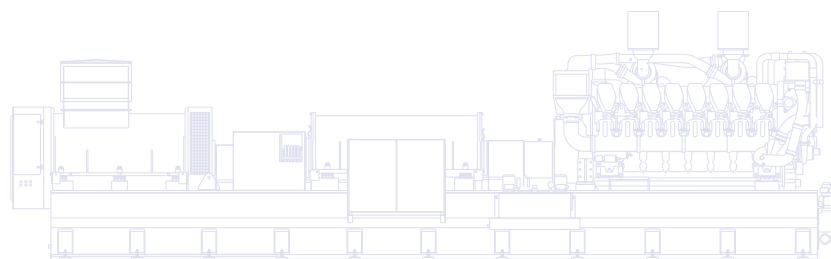
- Remote monitoring via Internet or modem connection
- Other non-standard environmental conditions, power ratings, voltages etc.
- Silencing canopies
- Medium voltage configurations
- Containerized designs
- Vibration monitoring
- Bearing vibration monitoring

Contact Hitec for other options

## Some examples of available models

Type UPS/CPS	Max. output rating (kVA)				Approx. dimensions*	Approx. weight)*
	Critical load		Critical + non-critical load		l x w x h	
	50 Hz	60 Hz	50 Hz	60 Hz	mm (inch)	kg (lbs)
600	500	600	1.000	1.200	5,900 x 1,600 x 2,100 (230 x 65 x 85)	8.000 (17.700)
1200	1.000	1.200	2.000	2.400	7,200 x 1,900 x 2,100 (285 x 75 x 85)	13.000 (28.700)
1800	1.700	1.800	2.250	2.500	8,600 x 1,900 x 2,400 (340 x 75 x 95)	21.500 (47.400)
2200	2.000	2.200	2.900	3.000	8,600 x 1,900 x 2,400 (340 x 75 x 95)	24.750 (54.600)

\* Dimensions and weights for power module; excluding switchgear and control panel



## A global partner you can rely on

Hitec Power Protection has its worldwide headquarters and production & test facilities in Almelo, The Netherlands.

Our sales and service offices are in North America (Houston, Texas), the UK (Birmingham), Spain (Barcelona), China (Beijing, Shanghai), Singapore, Malaysia and Australia. We maintain a regional support office in Taiwan, as well as numerous representatives and agents strategically placed throughout the world.

Our efforts begin with a thought out technical recommendation targeted to your power quality and reliability need.

If desired, we can take care of the complete electrical and mechanical installation and commissioning. Our commitment continues with training, instruction and maintenance. In case of emergency, our service organisation is 24x7 stand by to assist you with your needs.



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