HITZINGER®

Power. Anytime. Anywhere.

YOU GOT THE
POWER.

DYNAMIC DIESEL
UPS SYSTEMS
PURE SINE WAVE 24/7/365

→ www.hitzinger.at

Agenda

UPS-SYSTEMS

- Company History, Organisation, Profile and Global Network
- NBDK – IT Power Systems
  Mechanical, Features and Benefits
- NBDK – IT Power Systems
  Electrical Operation and Energy Flow
- NBDK – IT Power Systems
  Control and Monitoring
- NBDK – IT Power Systems
  System configuration
- NBDK – IT Power Systems
  Hitzinger & On site service / maintenance / repair
- NBDK – IT Power Systems
  Summary and References

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NBDK – IT Power Systems

Company History, Organisation, Profile, Global Network

UPS-SYSTEMS

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History

UPS-SYSTEMS

In June 1946, Dipl. Ing. Walter Hitzinger, Dipl. Ing. Hans Schäcke founded Dipl. Ing. Hitzinger & Co. for electrical installations and repairs located in Linz.

Dipl. Ing. Walter HITZINGER

Dipl. Ing. Hans SCHÄCKE

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History

UPS-SYSTEMS

Today, more than 230 highly skilled employees develop and produce high tech products in state-of-the-art technology in 3 production plants with a total area of 18.000 m² .

TÜV CERT
EN ISO 9001:2000
Zertifikat Nr. 20 100 5157

Hitzinger Products are:

- Synchronous- and Asynchronous Alternators
- Rotary Frequency Converters
- Dynamic Diesel UPS Systems
- Airport Ground Power Systems
- Diesel Generating Sets

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HITZINGER GLOBAL NETWORK

UPS-SYSTEMS

A reliable & competent partner
for more than 60 years !

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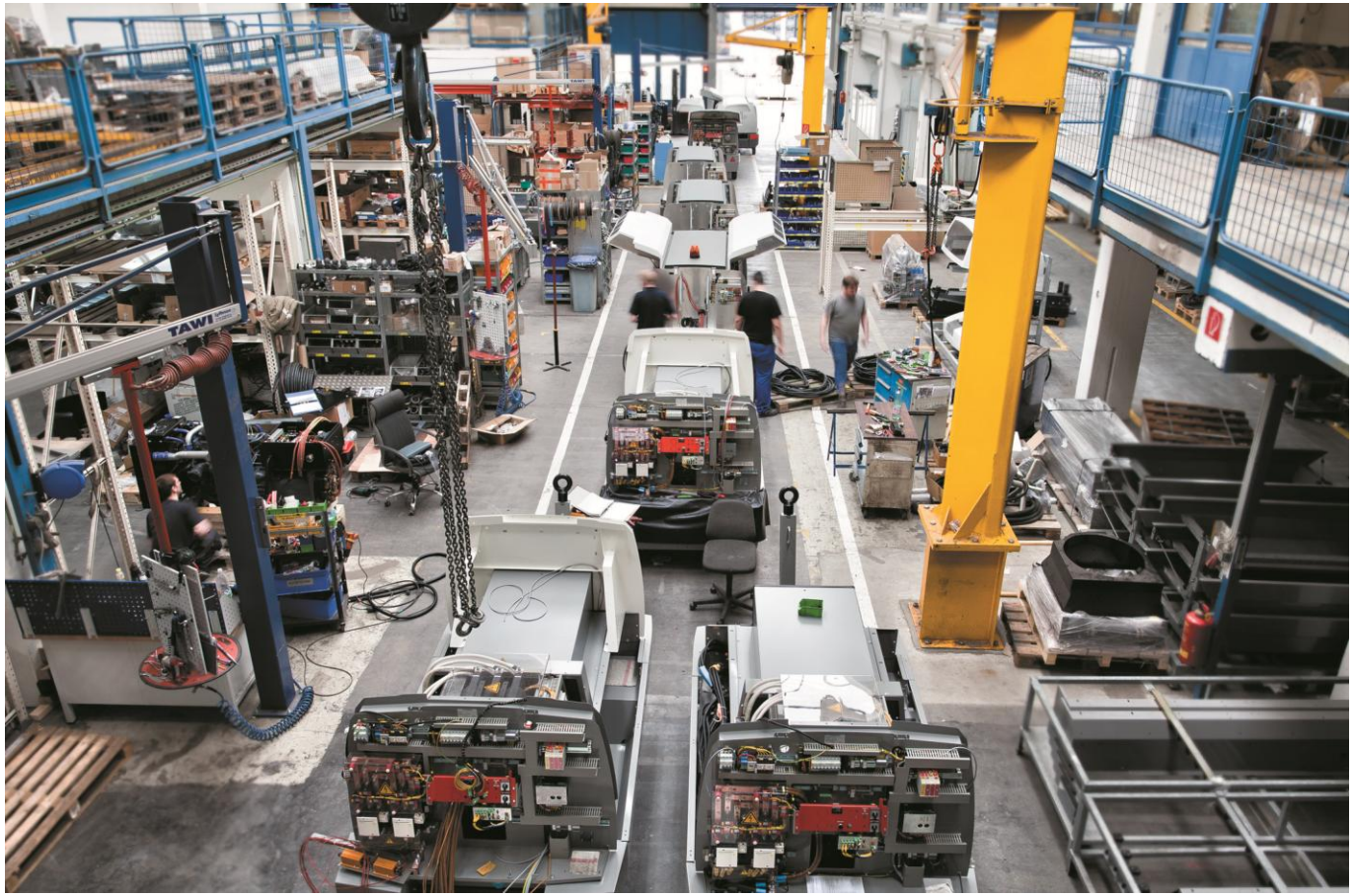
Production Facilities

UPS-SYSTEMS



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Production Facilities

UPS-SYSTEMS

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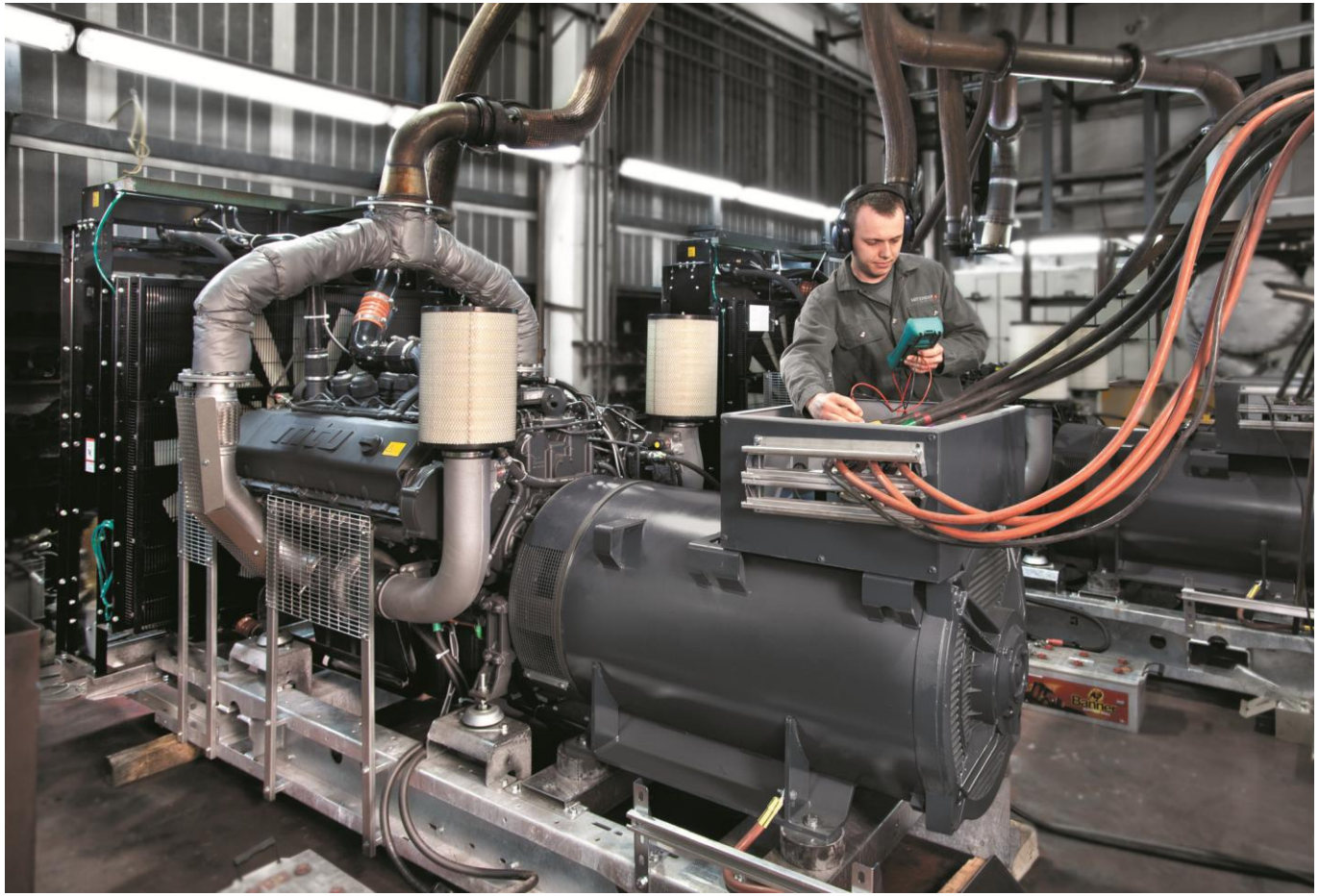
Production Facilities

UPS-SYSTEMS



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Production Facilities

UPS-SYSTEMS

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Production Facilities

UPS-SYSTEMS

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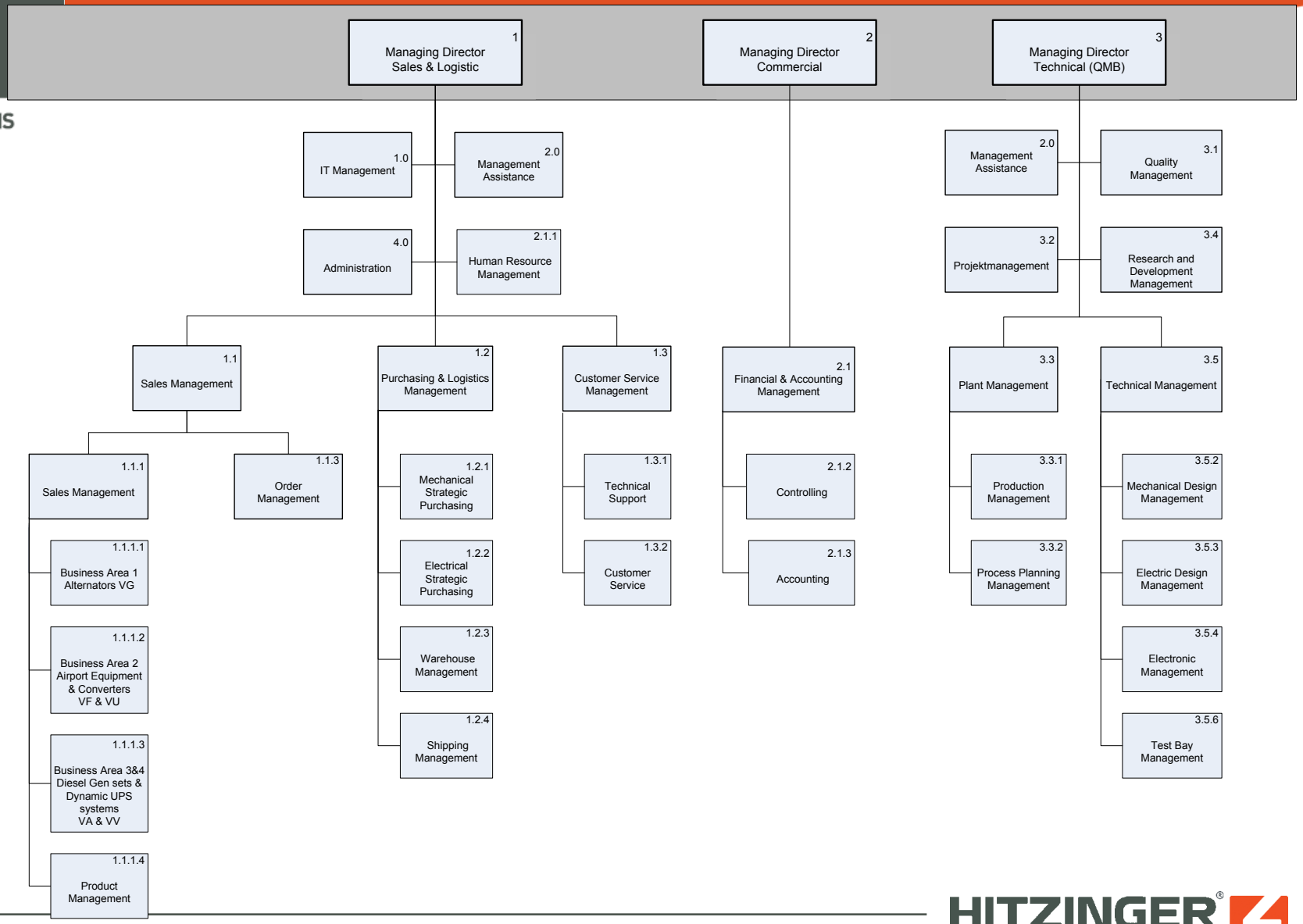
Company Organisation

UPS-SYSTEMS



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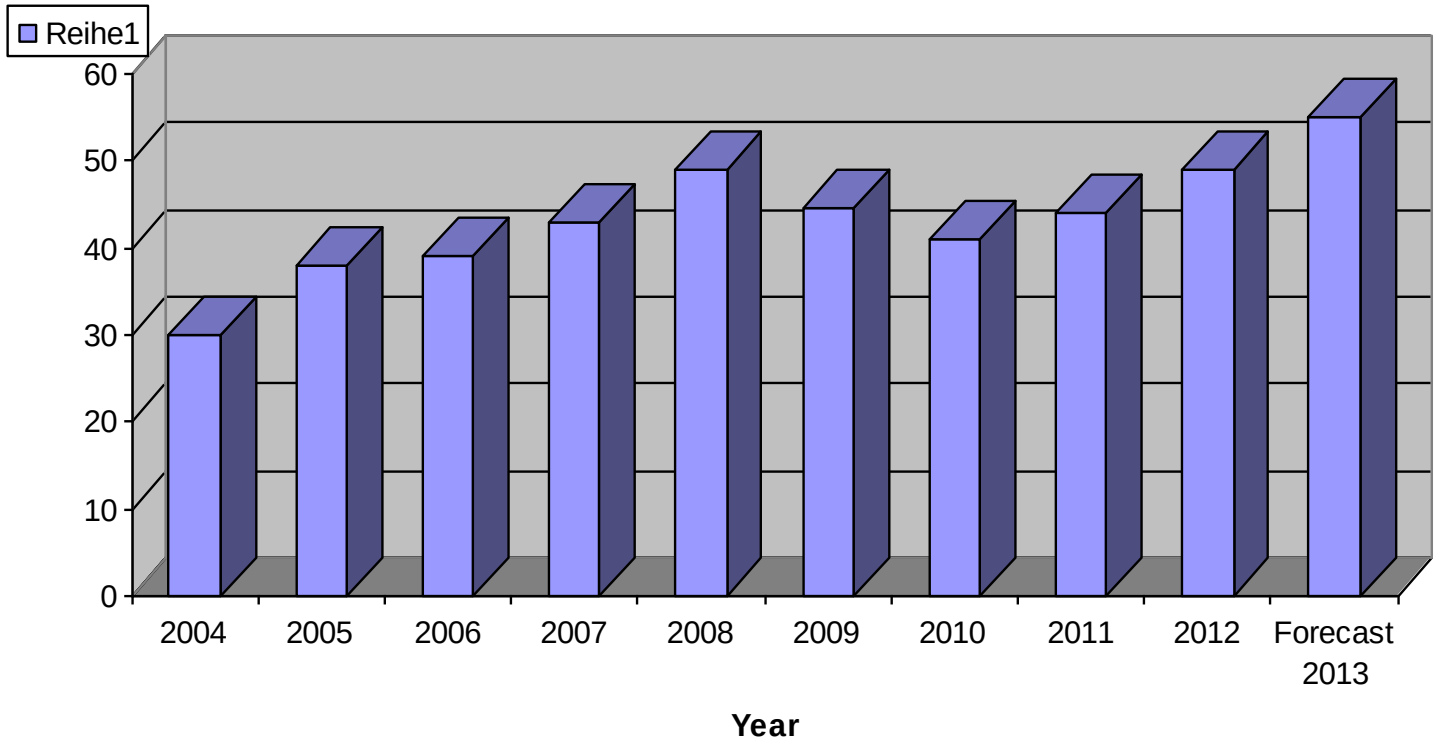
Turnover 2004 - 2013

UPS-SYSTEMS



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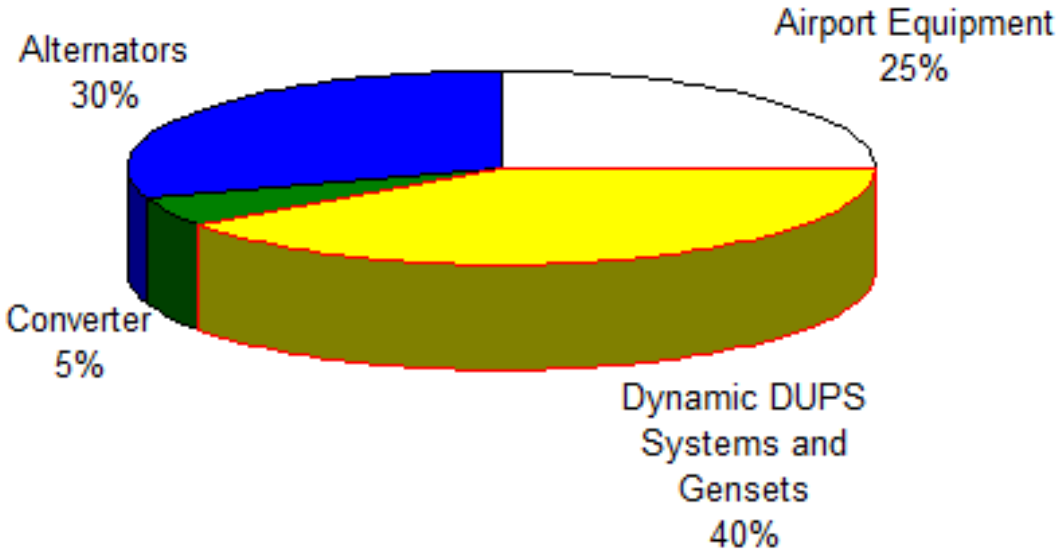
Products

UPS-SYSTEMS



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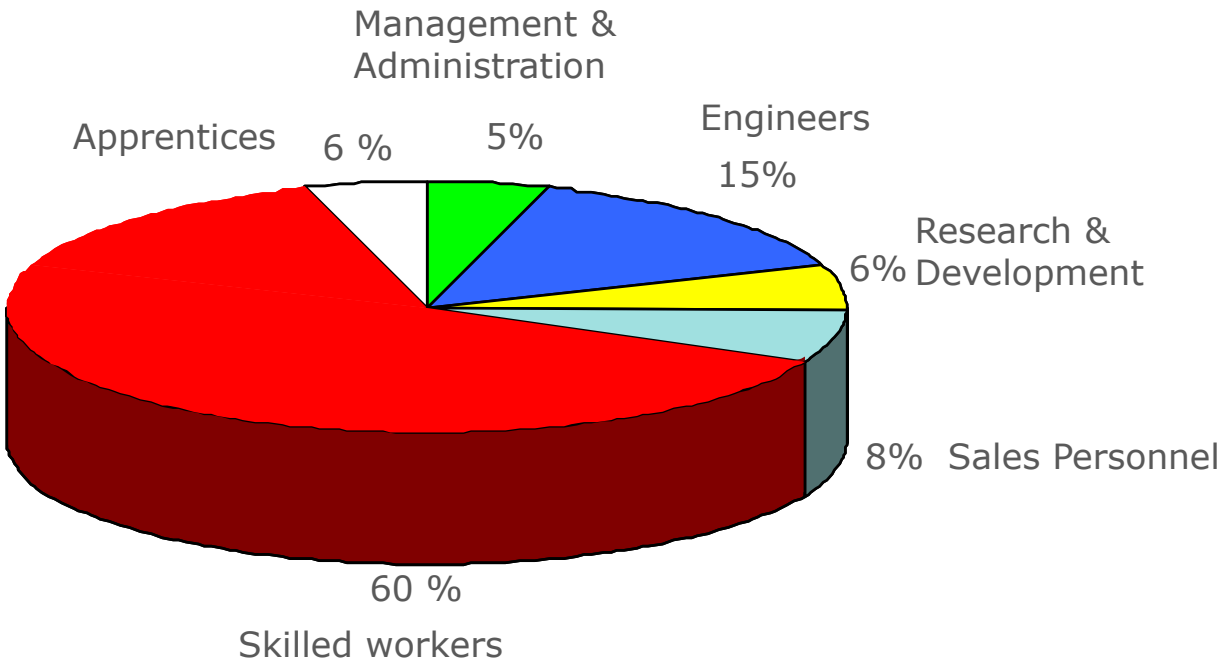
Employees

UPS-SYSTEMS



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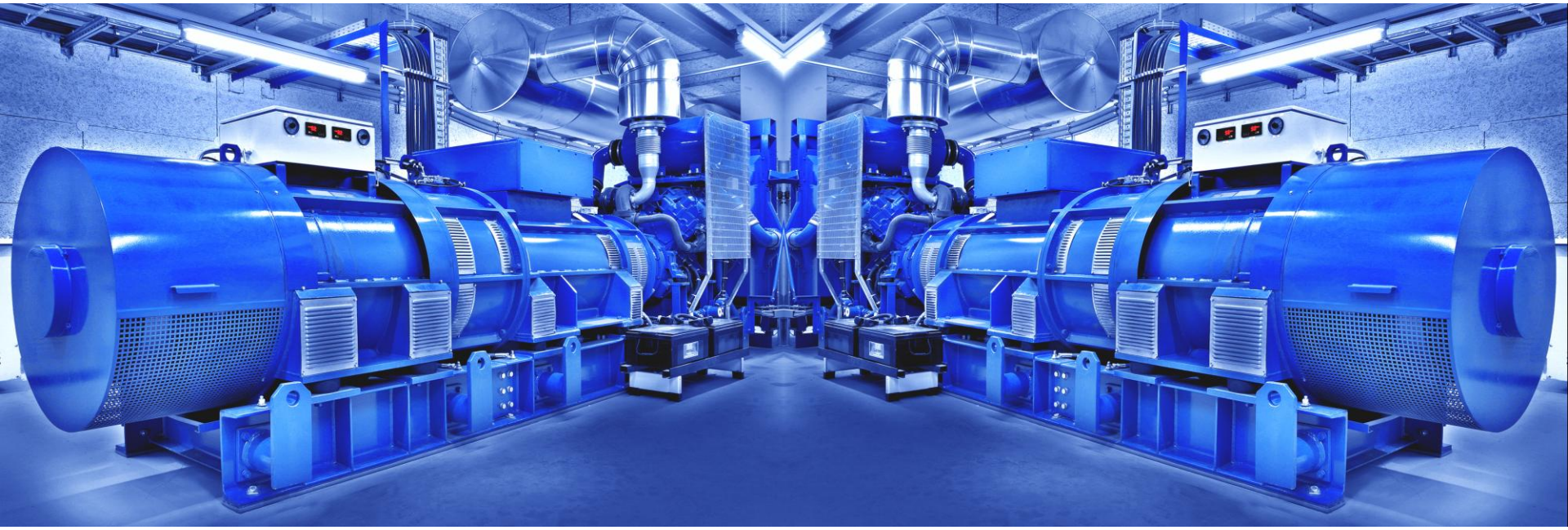
NBDK – IT Power Systems

Mechanical, Features and Benefits

UPS-SYSTEMS



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Why DDUPS?

UPS-SYSTEMS

To save money!

Mains failures – even for milliseconds – can cause production and supply outages and subsequent financial problems. These sectors are plastic industry and semiconductor production, data centers, airports, hospitals and so on.

To prevent standstill or losses of production!

The increasing percentage of automation in modern production processes demands more than ever high-quality and absolute reliable and uninterruptible power supply to avoid production outages.

To be independent from extern influences!

Nowadays, a high-quality power supply system often has to be more than what can be provided by local grid providers. Certain sensitive economical fields need, more than ever, a constant mains supply quality.

These fields are, for example: hospitals, airports, semi-conductor production plants, the chemical industry, data processing centers, telecommunications, plastics-technology, computer-controlled industrial plants,…

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NBDK – IT Power systems

UPS-SYSTEMS

A Hitzinger DDUPS system is a high-quality and permanent solution concerning clean power supply of your consumers.
Hitzinger Diesel UPS systems enable you to prevent production outages and financial losses.

A Hitzinger UPS system is a tailor made solution and guarantees a fast ROI.

- Ratings up to 2500 kVA
- Voltage up to 11 kV
- Low maintenance costs
- High alternator efficiency
- High MTBF value (1.000.000 + hours)
- Power factor regulation
- High quality of components
- High overload capacity
- Proper mains failure supervision
- In-house developed PLC control system
- Tier complaint

That‘s why we are sure that our no-break systems NBDK & NBDD are the best solution for our costumer‘s power supply problems .

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NBDK – IT Power systems

UPS-SYSTEMS

TECHNOLOGY SHIFT:

Away from:
- Lead acid batteries
- Power Electronics

Towards:
- Kinetic Energy Storage
- Rotating Electric Machines (Alternators or Generators)

Diesel remains the common component

Redundant Power feeds are prone to common mode failure and thus offer inadequate protection

NBDK – IT Power systems

UPS-SYSTEMS

Why these Technologies?

Kinetic energy storage:

- clean
- Simple
- Reliable
- efficient

Alternators and Generators:

- Achieve levels of dynamic electrical performance, which power electronics struggle to match.

NBDK – IT Power systems

UPS-SYSTEMS

Solution Class	Power Circuit Components		Ride through Energy Storage		Power Generation
	Power electronics	Rotating Electric Machine	Batteries	Kinetic Energy	Diesel
Dynamic	**No**	**Yes**	**No**	**Yes**	**Yes**
Hybrid (Rotary)	**Yes**	**Yes**	**No***	**Yes**	**Yes**
Static	**Yes**	**No**	**Yes**	**Yes**	**Yes**

* Optional
** Depending on power capacity

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Product Description

UPS-SYSTEMS

Hitzinger Dynamic Diesel UPS systems

- Hitzinger Dynamic UPS systems are a complete critical power solution in one product.
- Hitzinger Dynamic UPS employ kinetic energy to provide protection against short duration disturbances or outages.
- And an integrated diesel motor to provide protections against prolonged disturbances or outages.

Hitzinger delivers the smallest foot print 2500 kVA unit on the market.

Product Description

UPS-SYSTEMS

KIN module operation

WHY USE A KIN MODULE?

- Inductive coupling allows precise speed regulation of inner rotor
- Rapid Discharge and Recharge without capacity degradation
- Reliability through a completely brushless design
- Reliability through integrated vibration monitoring.

Standard Ratings 50 Hz / 60 Hz

UPS-SYSTEMS

More Scalability: Solutions for all size applications

Choose from a wide range of capacities and performance

Rating (kVA)	Model
150	NBDK 1/10-150
250	NBDK 1/10-250
350	NBDK 1/10-350
500	NBDK 1/10-500
625	NBDK 1/10-625
800	NBDK 1/10-800
1000	NBDK 1/10-1000
1250	NBDK 1/10-1250
1500	NBDK 1/10-1500
1750	NBDK 1/10-1750
2000	NBDK 1/10-2000
2500	NBDK 1/10-2500

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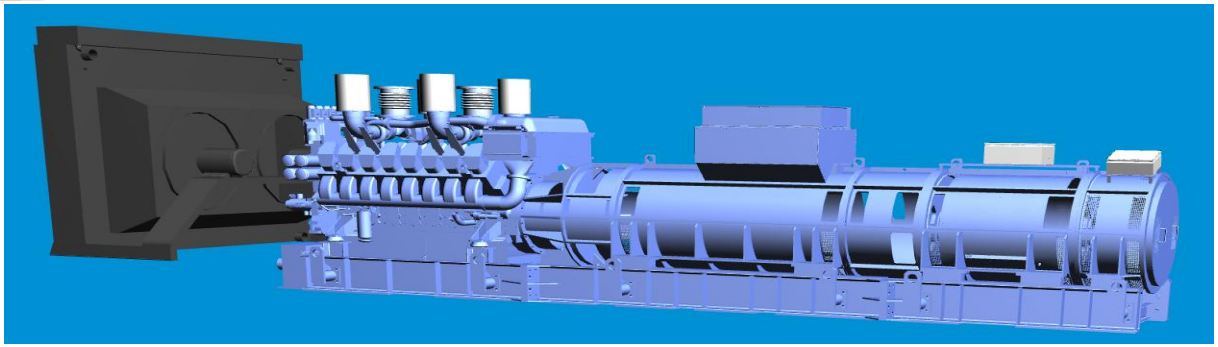
NBDK 150kVA - 2500kVA

UPS-SYSTEMS



Guaranteed values

Voltage

Operation	Tolerance
Static	+/- 1%
Dynamic	
At change of nominal load, cos φ = 0,8	+/- 10%
Voltage recovery time	0,3 s
Short circuit at the input	+/- 10%
After short circuit shutdown	< 10%
Voltage recovery time	0,3 s
Mains shutdown at nominal voltage	+/- 10%
Voltage recovery time	0,3 s

Other tolerance values are available on demand!

Frequency

Operation	Tolerance
During mains operatior	= mains frequency
Changing from mains to diesel operation Load transfer 100%	+/- 1%
Static during diesel engine operation	+/- 0,5%

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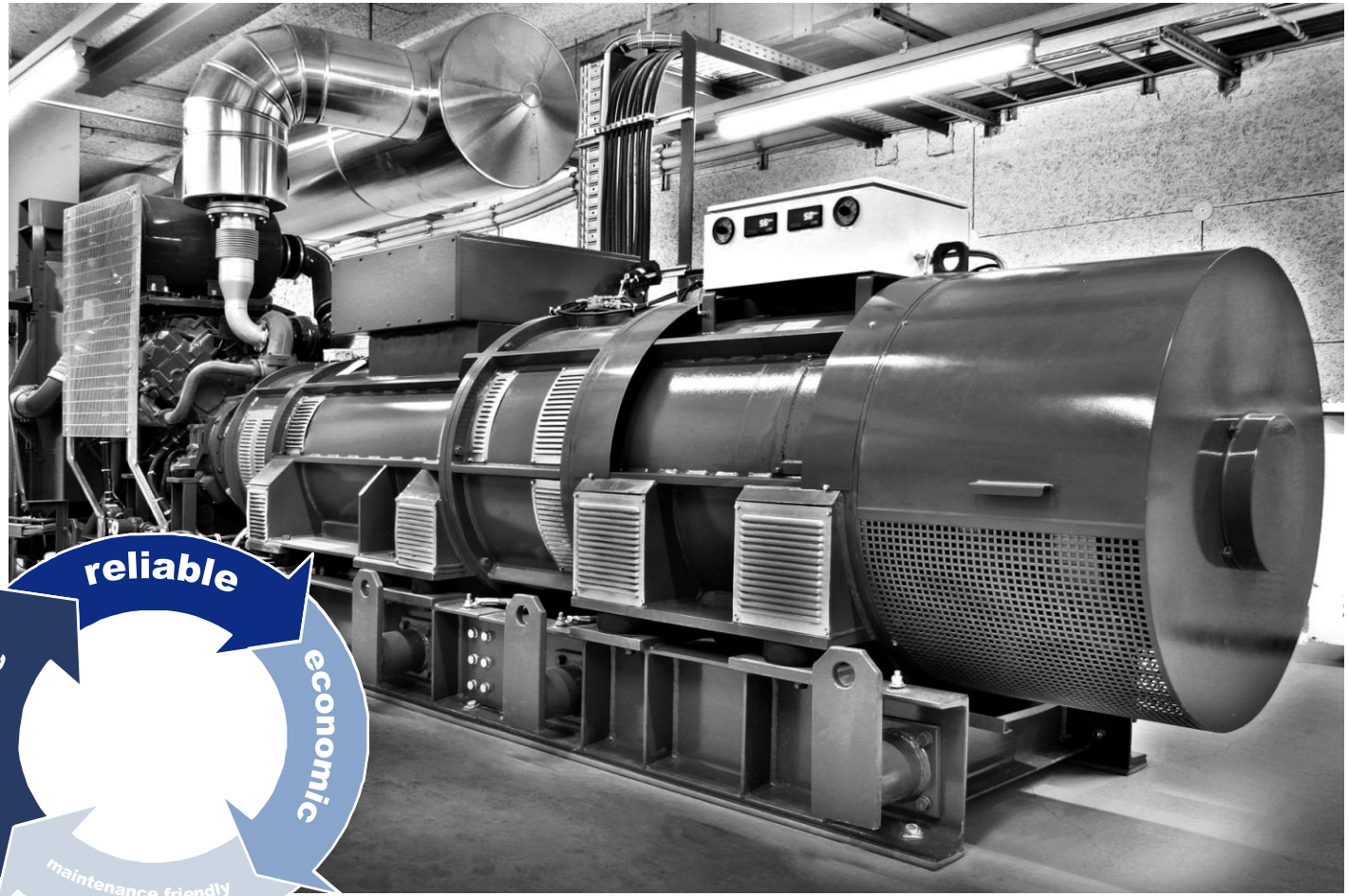
NBDK – IT Power Systems

Advantages

UPS-SYSTEMS



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NBDK – IT Power Systems

Advantages

UPS-SYSTEMS

Reliable…

… usage:

- Redundant operation possible
- High dynamic overload capacity
- Uninterruptible bypass for maintenance works
- Accurate mains failure supervision
- 100% load acceptance

… handling:

- Simple operation
- POWERCON - PLC control system (also for multiple units)
- Remote monitoring and surveillance (optional)

… design:

- Brushless technology of all components
- Robust in view of environment
- EMC Certification according to EN 300386-2

Hitzinger UPS systems are worldwide in operation for more than 40 years.

NBDK – IT Power Systems

Advantages

UPS-SYSTEMS

Economic…

- Optimized quality of system components, available wordwilde
- Low losses due to tailor-made machines
- Low maintenance costs Short maintenance time
- High MTBF value (1.000.000 + hours)
- High life time of all parts and components
- High efficiency
- Low TCO

NBDK – IT Power Systems

Advantages

UPS-SYSTEMS

Maintenance friendly…

- Withdraw able type circuit breakers (optional)
- Remote diagnosis via modem (optional)
- Brushless technology in all system components
- Automatic regreasing unit (optional)
- Easy access to all maintainable parts (e.g. friction linings)
- KIN Module on the end of the machine
- Training program for users on site

NBDK – IT Power Systems

Advantages

UPS-SYSTEMS

Extremely available…

- High quality of system components
- Maintenance and service during operation
- Choke with natural cooling and integrated harmonic filter
- Torque limiting design for flywheel and electromagnetic clutch
- Worldwide accepted diesel engines with local services, spares and maintenance availability

Features and Benefits

UPS-SYSTEMS

Less Waste: Environmental impact

REDUCING HAZARDOUS WASTE

EXAMPLE 1: Typical waste of a 2000 kVA UPS after 20 years

Static UPS

3 x 33,000 kg batteries
(15 minutes autonomy time)
- Plus power electronic components

Dynamic UPS

< 100 kg of steel
(bearing material)

A much GREENER Alternative!

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Features and Benefits

UPS-SYSTEMS

Less Waste: Environmental impact

REDUCING HAZARDOUS WASTE

EXAMPLE 2: Typical waste of a 8 MVA UPS after 20 years

Static UPS

3 x 100 tonnes batteries
- Plus power electronic components

Dynamic UPS

< 400 kg of steel
(bearing material)

A much GREENER Alternative!

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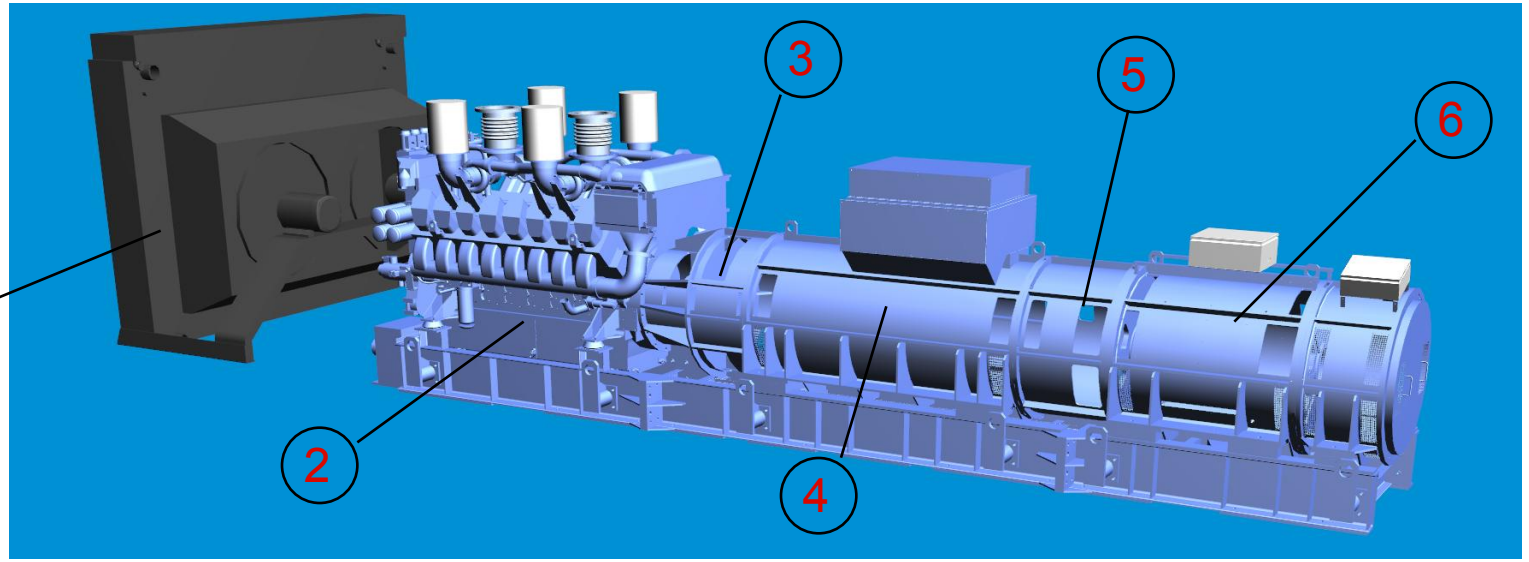
NBDK – Mechanical Design

UPS-SYSTEMS



1. Radiator
2. Diesel engine
3. Flexible Coupling & Electromagnetic clutch
4. Synchronous machine
5. Flexible coupling
6. Kinetic module

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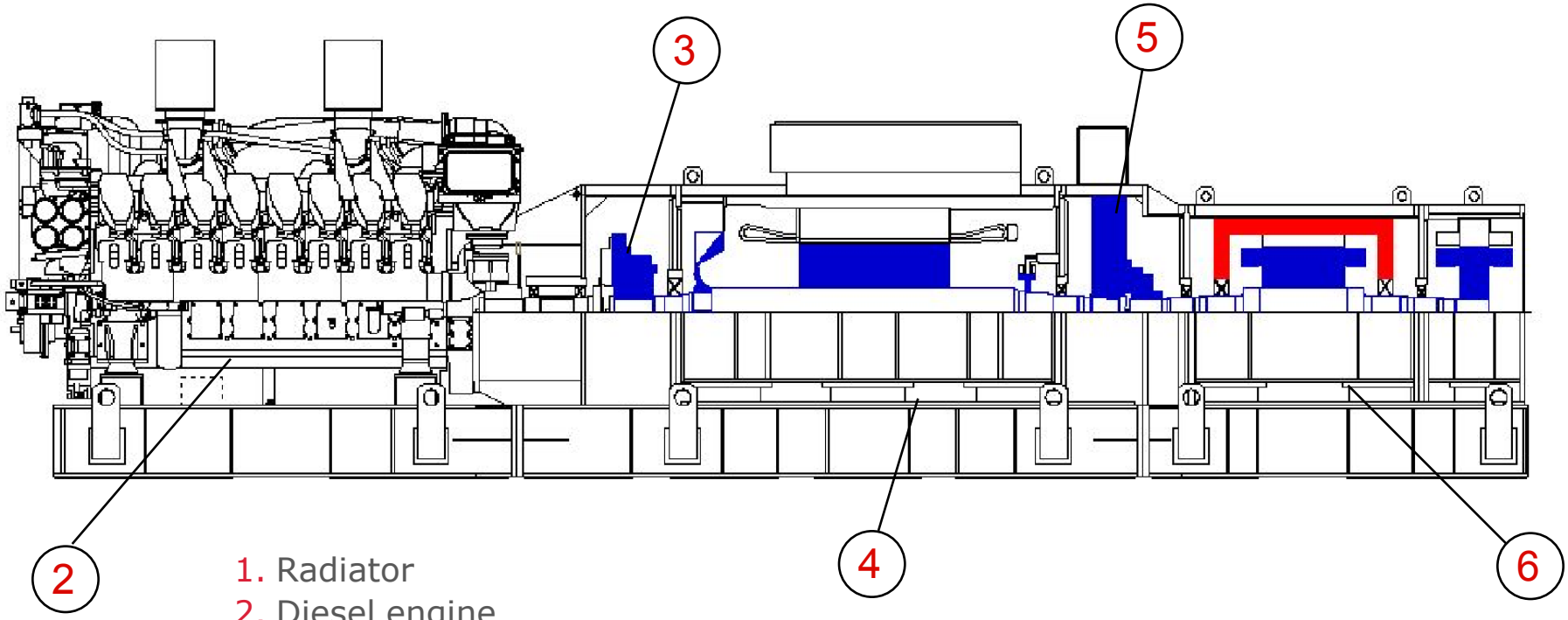
NBDK – Mechanical Design

UPS-SYSTEMS



1. Radiator
2. Diesel engine
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4. Synchronous machine
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6. Kinetic module

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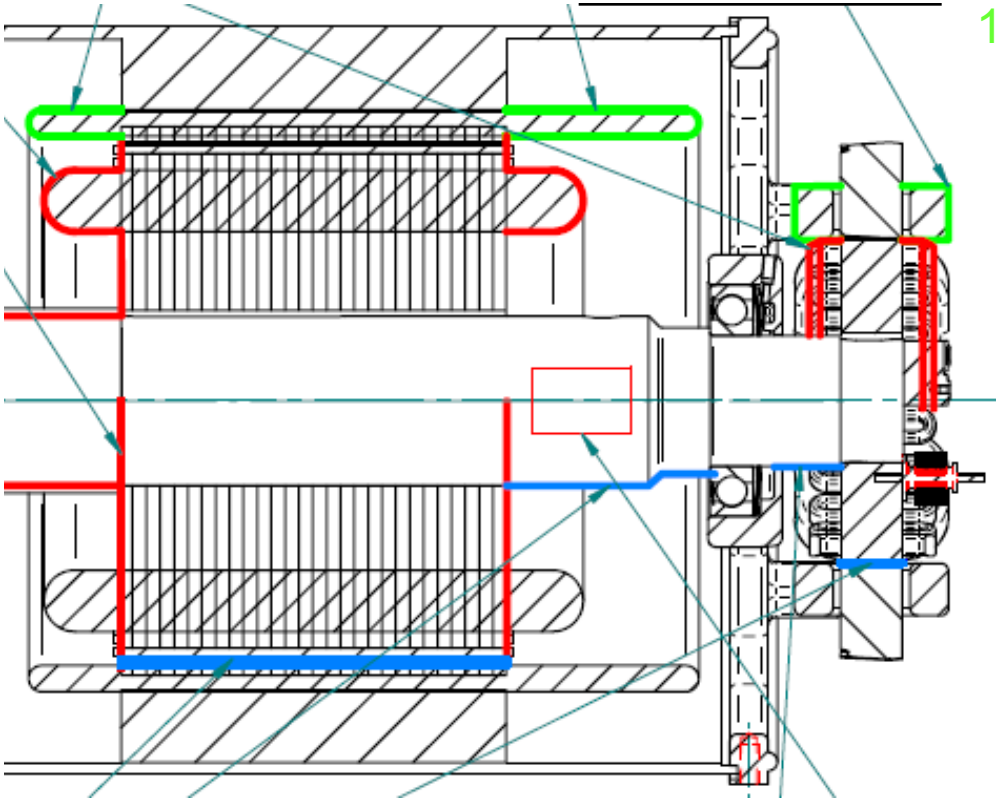
NBDK – Corrosion Protection

UPS-SYSTEMS

finishing varnish
1 layer



finishing varnish
1 layer

2-component varnish
2 layers

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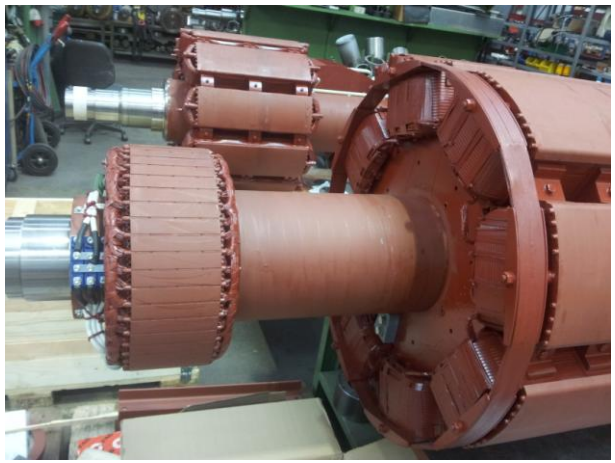
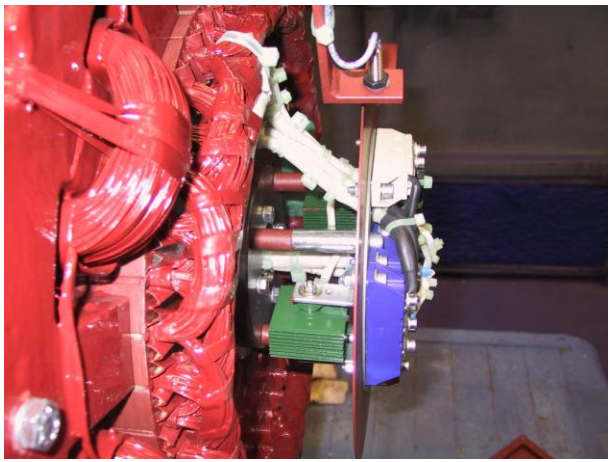
NBDK – Corrosion Protection

UPS-SYSTEMS





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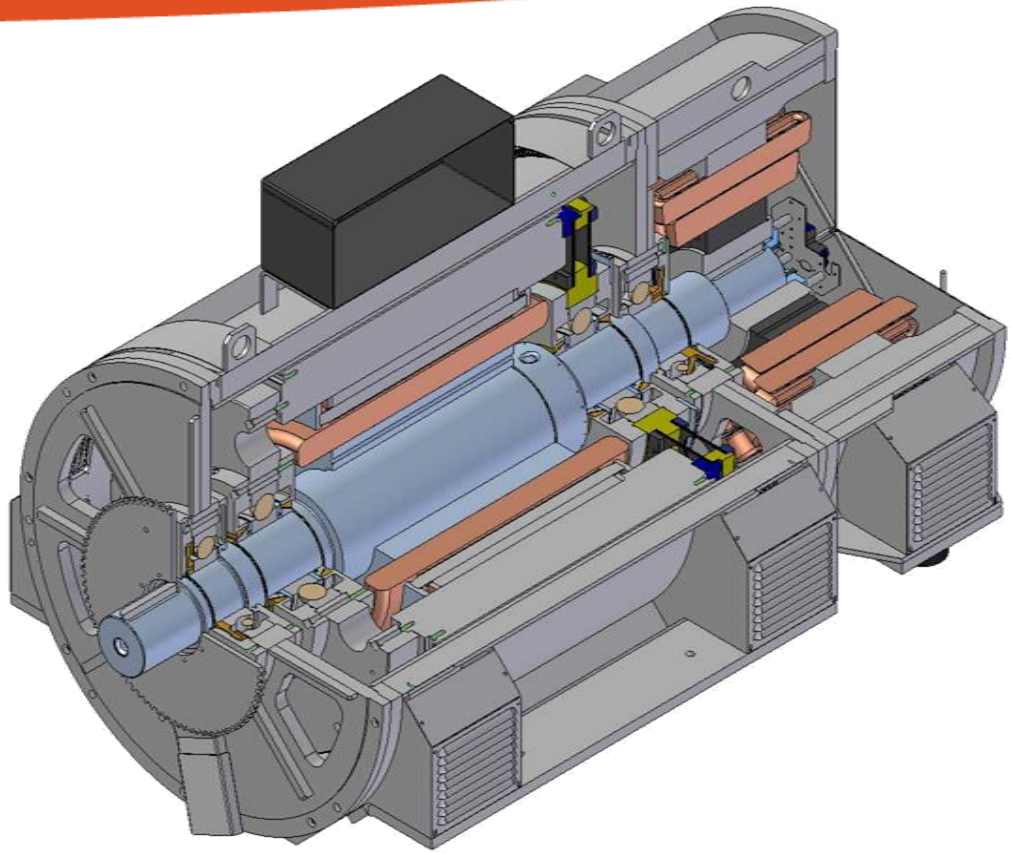
Kinetic Energy Module

UPS-SYSTEMS



KINETIC ENERGY STORAGE MODULE (KIN) for UPS-Systems with a frequency variation of max. 1 %!

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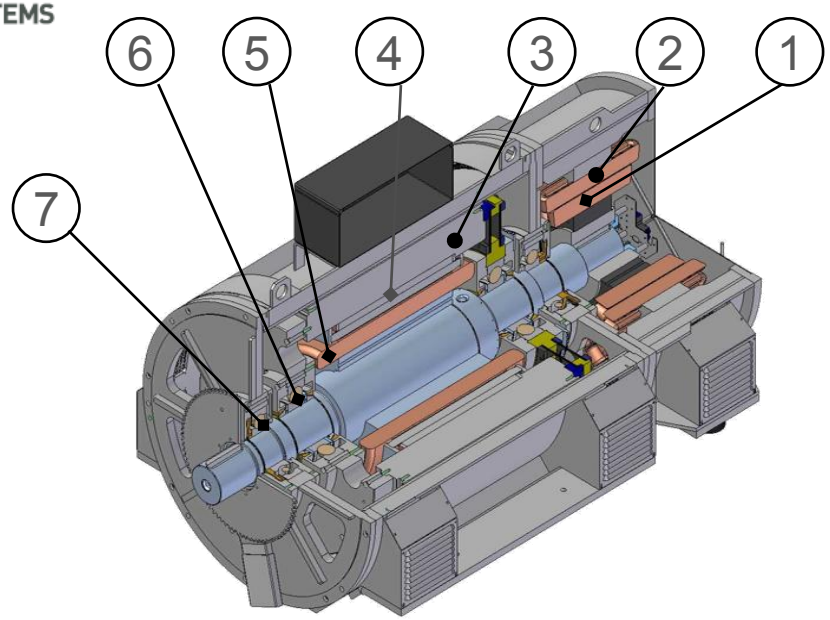
Kinetic Energy Module

UPS-SYSTEMS



1) AC / DC exciter machine
2) Stator winding of the exciter machine
3) Outer rotor mass
4) Squirrel cage
5) Inner rotor with AC / DC winding
6) Inner KIN bearing
7) Outer KIN bearing

In case of mains failure, the kinetic energy stored in the KIN provides the UPS load until the supply via the diesel engine can be assured.

Maximum frequency deviation **: +/- 1%**
Maximum voltage deviation : +/- 10 %

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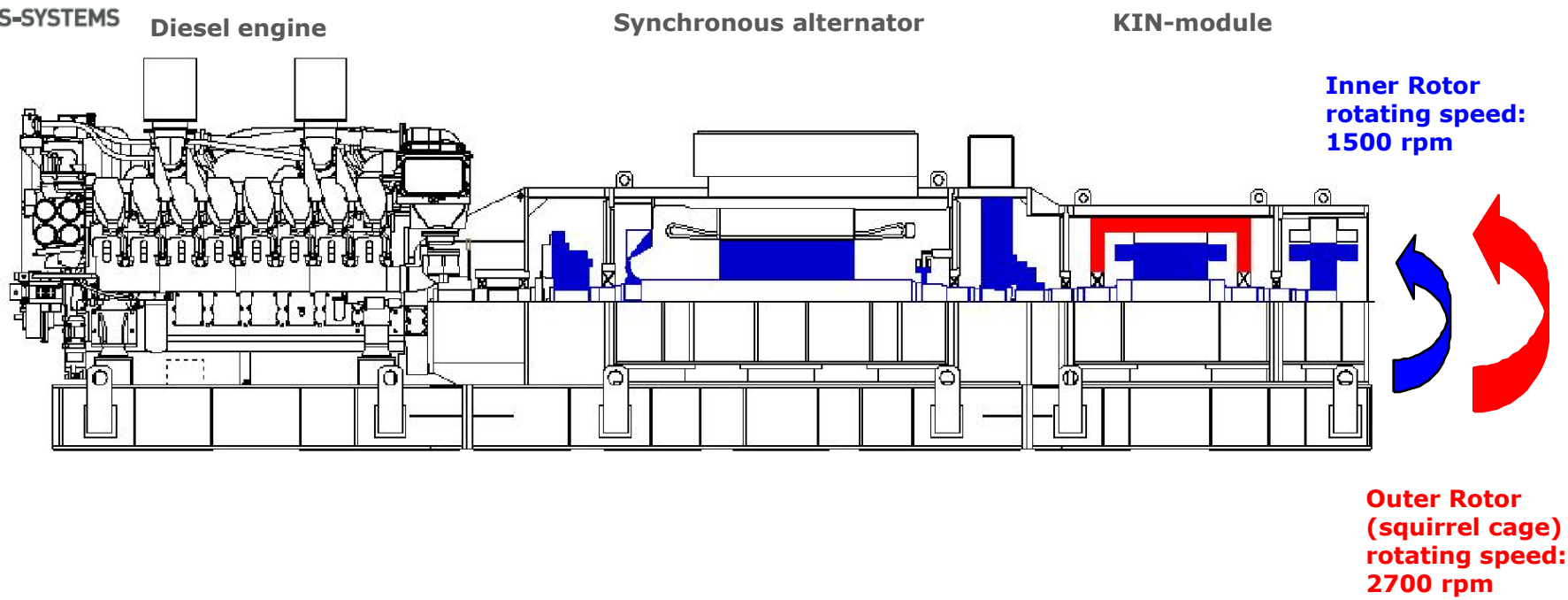
Kinetic Energy Module

UPS-SYSTEMS



In case of mains failure, the inner rotor's magnetic field brakes the outer rotor and keeps the synchronous alternator's rotating speed constant.

Advantages:

- Brushless
- Low maintenance
- High reliability
- High MTBF

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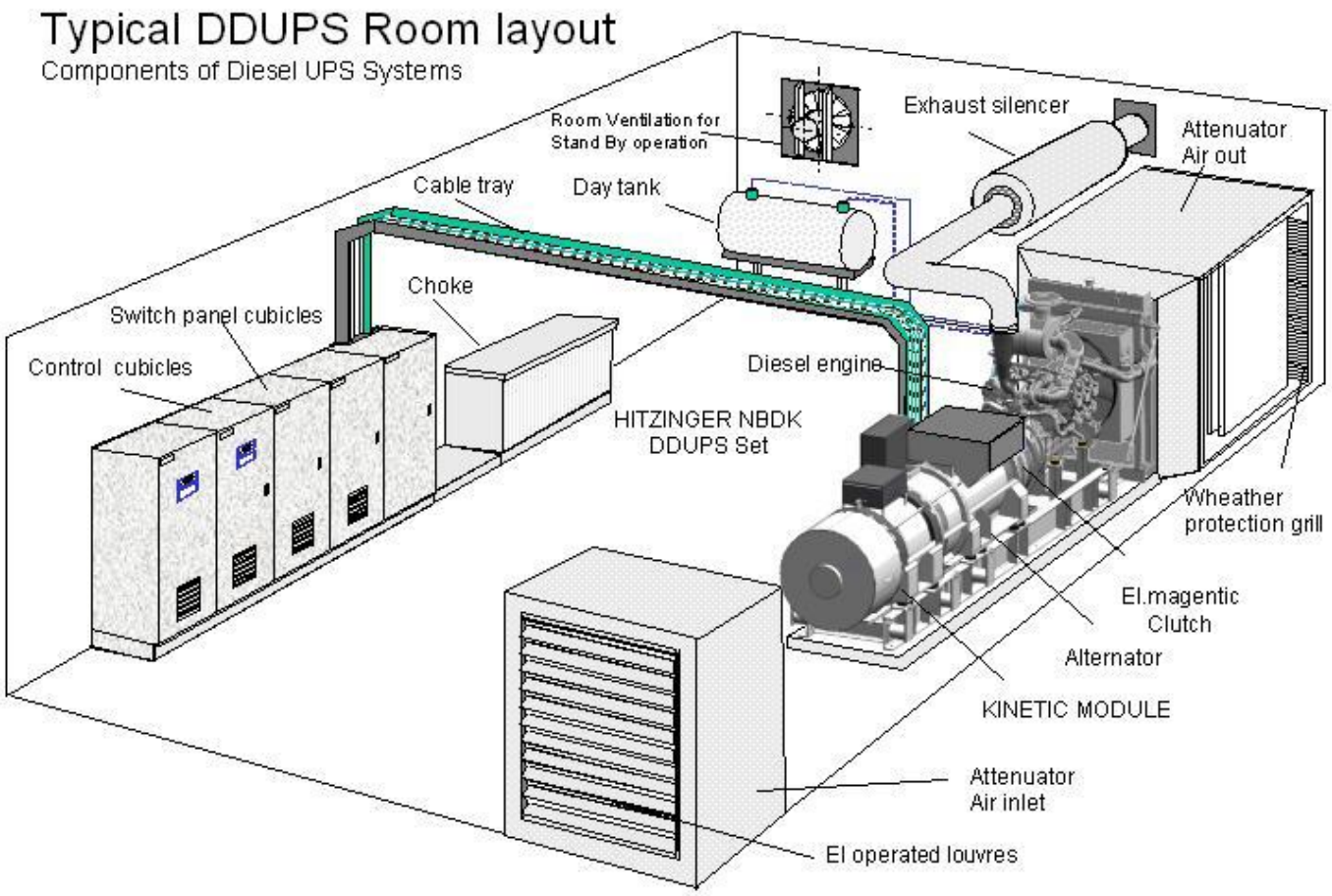
DDUPS Room Layout

UPS-SYSTEMS



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NBDK – IT Power Systems

Electrical Operation and Energy Flow

UPS-SYSTEMS

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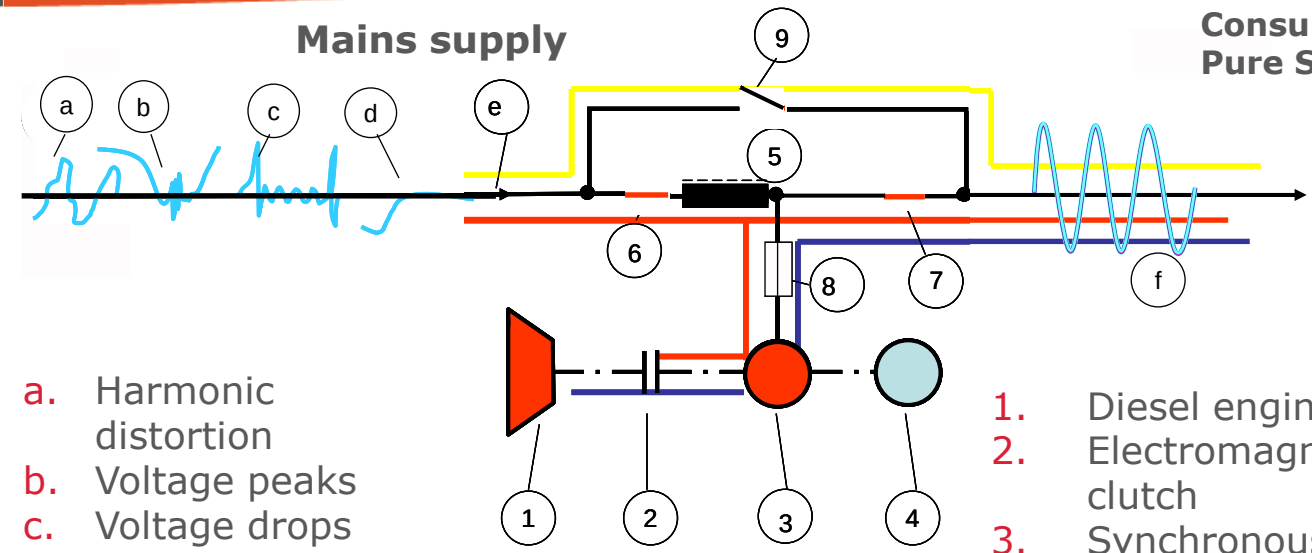
NBDK Principle Diagram

UPS-SYSTEMS



a. Harmonic distortion
b. Voltage peaks
c. Voltage drops
d. Power loss
e. Mains supply
f. Load output of UPS

1. Diesel engine
2. Electromagnetic clutch
3. Synchronous alternator
4. Kinetic module
5. Choke
6. Mains CB
7. Consumer CB
8. Alternator protection
9. By-Pass CB

By-Pass operation
Stand-by operation
Diesel operation

Frequency deviation: ≤ 1%

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The Magic Choke

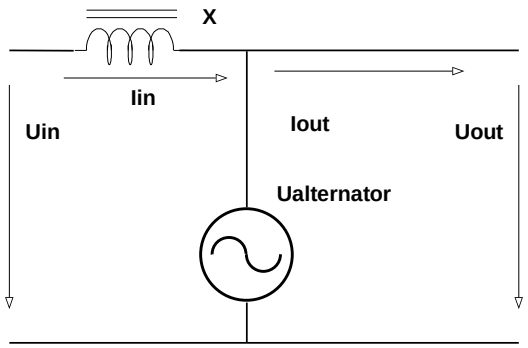
UPS-SYSTEMS

In a UPS system, the coupling choke connects the incoming grid with the UPS output supply, that has to meet highest quality requirements.

The choke‘s and the alternator‘s special design guarantees a high degree of decoupling between the grid and the UPS output.

The choke…

- Supports static and dynamic voltage decoupling on the UPS collecting bar
- Decouples fluctuations and harmonics on the grid
- Upper harmonics filter
- Balancing of dynamic loads
- Restriction of current in case of short circuit



I_{in}	= line current
I_{out}	= consumer current
U_{in}	= line voltage
U_{out}	= consumer voltage
$U_{alternator}$	= alternator voltage

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The Magic Choke

UPS-SYSTEMS

This configuration‘s output voltage is completely independent from the input side. The fundamentals (50Hz or 60Hz) are only determined by the alternator. Either the choke (since the reactance of the choke depends on the frequency) or the alternator blocks possible upper harmonics and transients.

The connection between the terms Uchoke = I . Xchoke and Xchoke = 2 . π . f . L shows, that the choke is a determining component for higher frequencies while the alternator with its special configuration of the stator winding eliminates lower frequencies’ upper harmonics (e.g. 3rd, 5th, 7th,…harmonics)

Short circuits:

In case of a short circuit on the input (equals a total mains failure in which the load is transferred from the input to the alternator via the choke), the choke limits the fault current until the cutoff of the input. The voltage drop on the choke’s short circuit is added to the alternator’s voltage via the choke’s circuit. Therefore, the UPS’s voltage equals approximately the alternator’s voltage: ΔU = -10% to -15% (depending on the choke‘s position)

Inverse operation of the input‘s current transducer:

As the inverse operation of the input‘s current transducer depends on the temporary short circuit between two phases during the commutation period, the choke can avoid the influences on the not-affected power unit (UPS-mains), following the same principle.

Description of Operation

UPS-SYSTEMS

- By-pass circuit breaker closed
- Diesel engine starts
- KIN module charging
- Synchronization to mains (“Make before Break”)
- Diesel engine shut down

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Description of Operation

UPS-SYSTEMS

- Supply of the consumer load via choke from mains, synchronous machine in motor operation
- Synchronous machine acts as an filter and provides stable voltage and reactive power to the consumers
- Filtering of harmonics and balancing of asymmetric loads
- Distortion factor < 3%

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Description of Operation

UPS-SYSTEMS

- Mains circuit breaker opens
- KIN module keeps load uninterruptedly supplied
- Simultaneous start of diesel engine
- Electromagnetic clutch closes
- Load transfer from KIN module to diesel engine
- Diesel engine provides the UPS supply and charges the KIN module

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Description of Operation

UPS-SYSTEMS

- Mains within permitted tolerances for a certain period
- Synchronization of the consumer load back to mains
- Electromagnetic clutch opens
- Shut down of diesel engine after cooling period

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Description of Operation

UPS-SYSTEMS

- Bypass circuit breaker closes
- Mains and consumer CB's opens
- Machine runs down (energy consumption due to internal losses)

- Alternative:
- Electromagnetic clutch closes
- Diesel engine ignition is blocked
- Diesel engine compression is used to increase the energy consumption → fast run down

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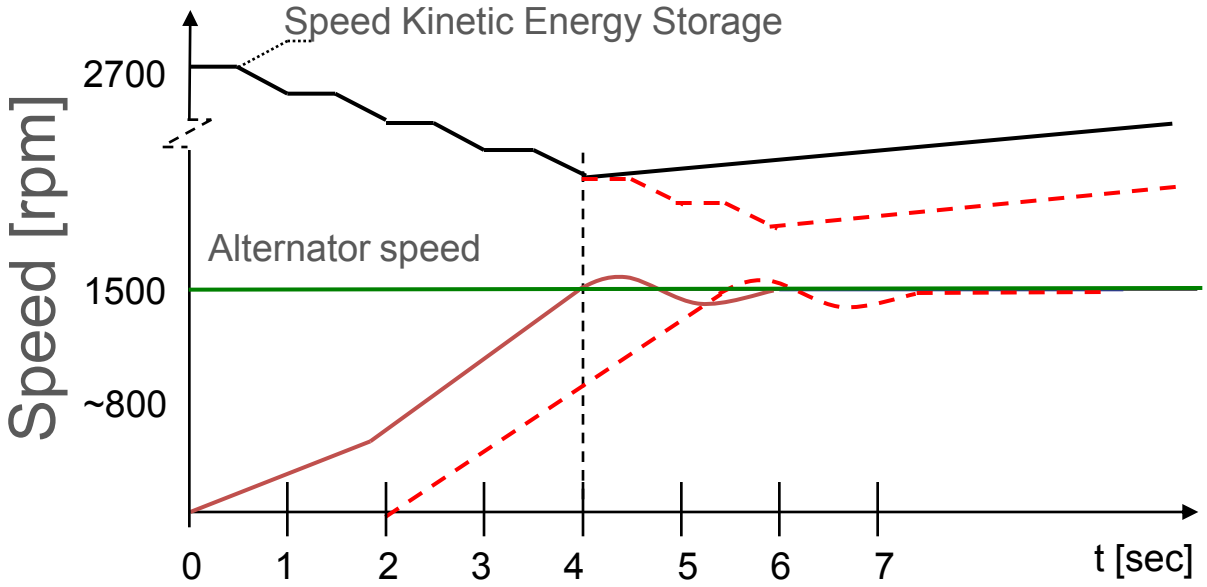
Alternate redundant Diesel Engine Start

UPS-SYSTEMS



Standard Starting Procedure:

- Diesel engine starts via electrical starter
- Electromagnetic clutch closes at ~800rpm
- Additional acceleration by KIN module

Redundant Starting Procedure:

- Electromagnetic clutch closes
- Diesel engine acceleration by KIN module to nominal speed

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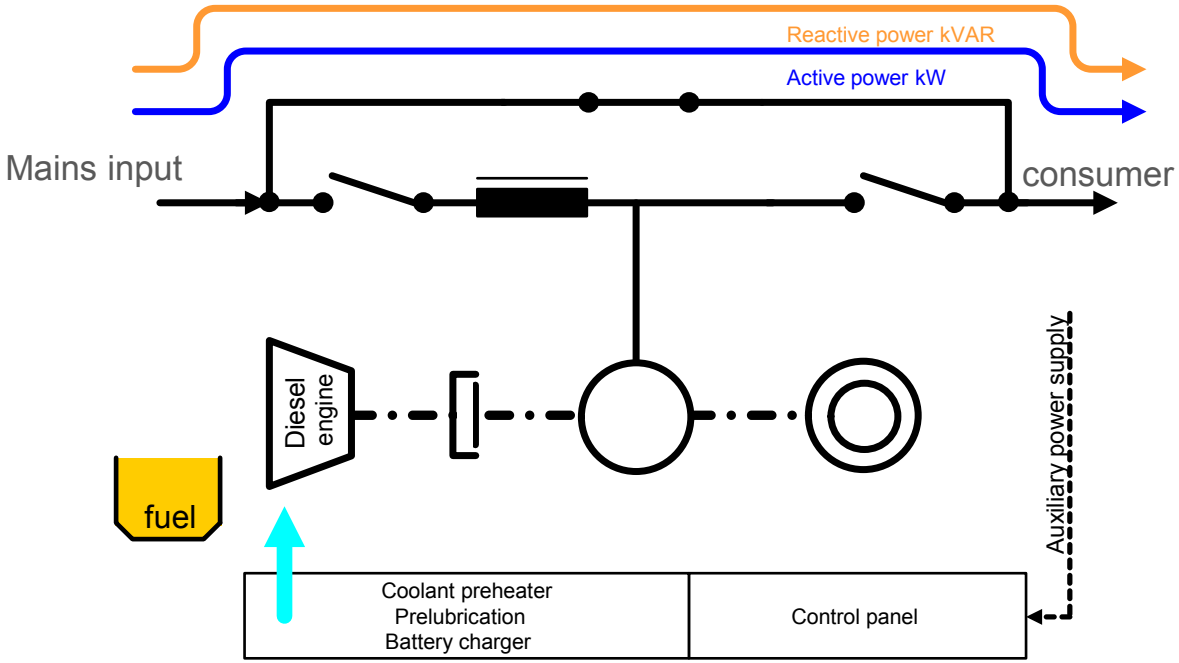
NBDK – Energy Flow Diagram

UPS-SYSTEMS

By-pass Operation



- Supply of the UPS load via the by-pass power switch directly from the mains
- NBDK‘s auxiliary power supply is taken from the UPS‘s consumer bar

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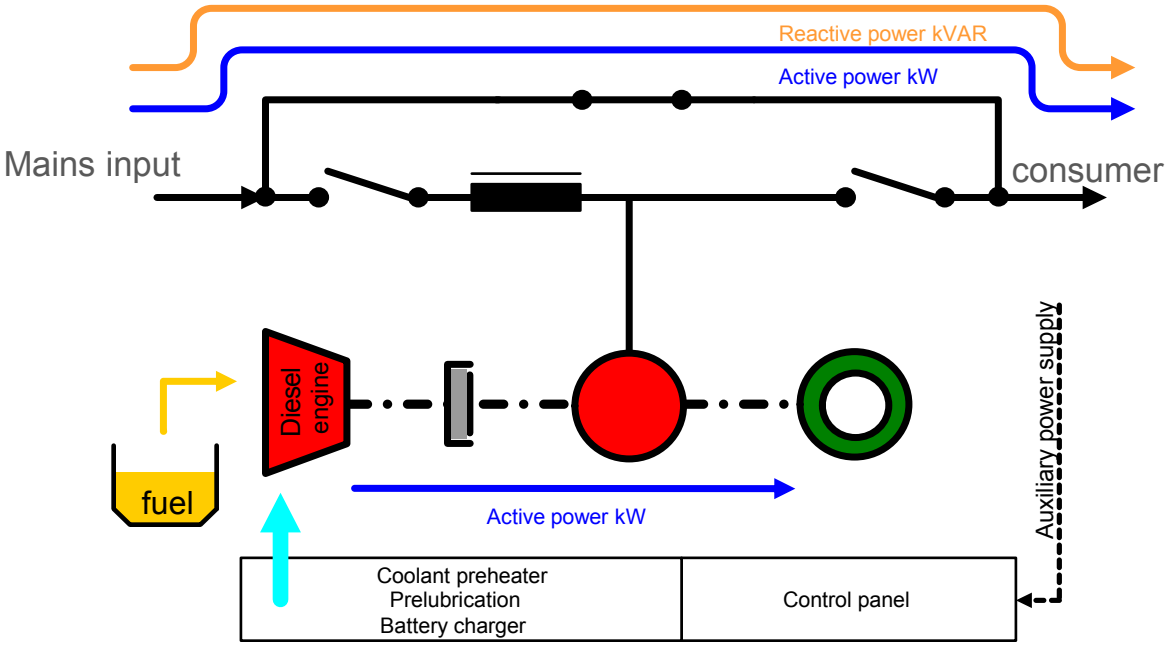
NBDK – Energy Flow Diagram

UPS-SYSTEMS

Start up



- Supply of the UPS load via the by-pass power switch directly from the mains
- The diesel engine accelerates the synchronous machine and the KIN module up to nominal speed
- Storage of the kinetic energy (needed for providing the UPS load) in the KIN module

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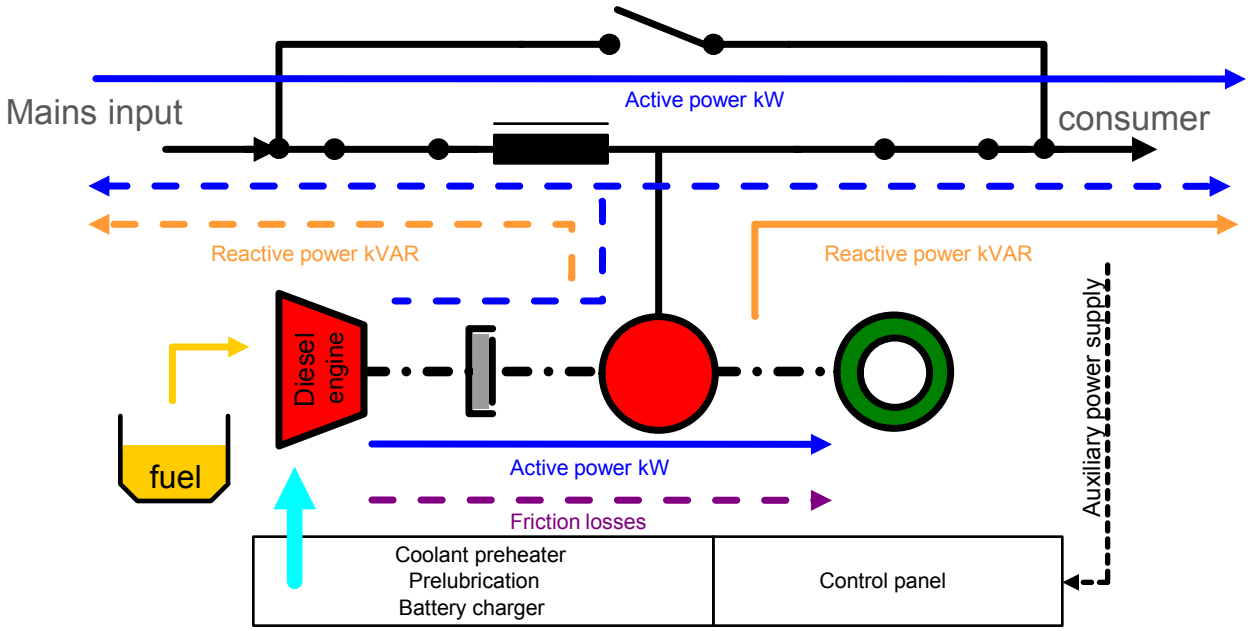
NBDK – Energy Flow Diagram

UPS-SYSTEMS

Synchronization



- Synchronization is performed with a slightly positive beat frequency compared to the mains
- After the synchronization, the alternator delivers the reactive power
- Reactive power flows back to the mains due to choke magnetization

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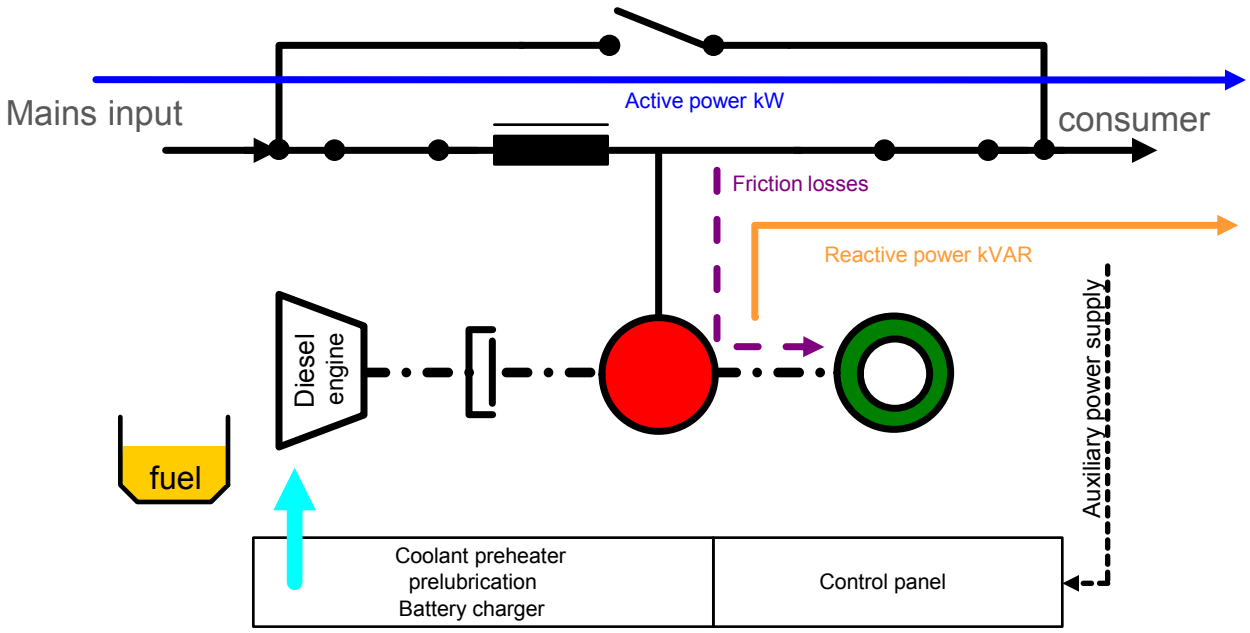
NBDK – Energy Flow Diagram

UPS-SYSTEMS

Stand-by Operation



- Consumers of the UPS load are supplied directly by the mains
- The choke suppresses voltage interference caused by static discharge, commutation fall-off, overvoltage or upper harmonics
- Equalizes unbalanced load
- Diesel engine stops, synchronous machine runs as a motor

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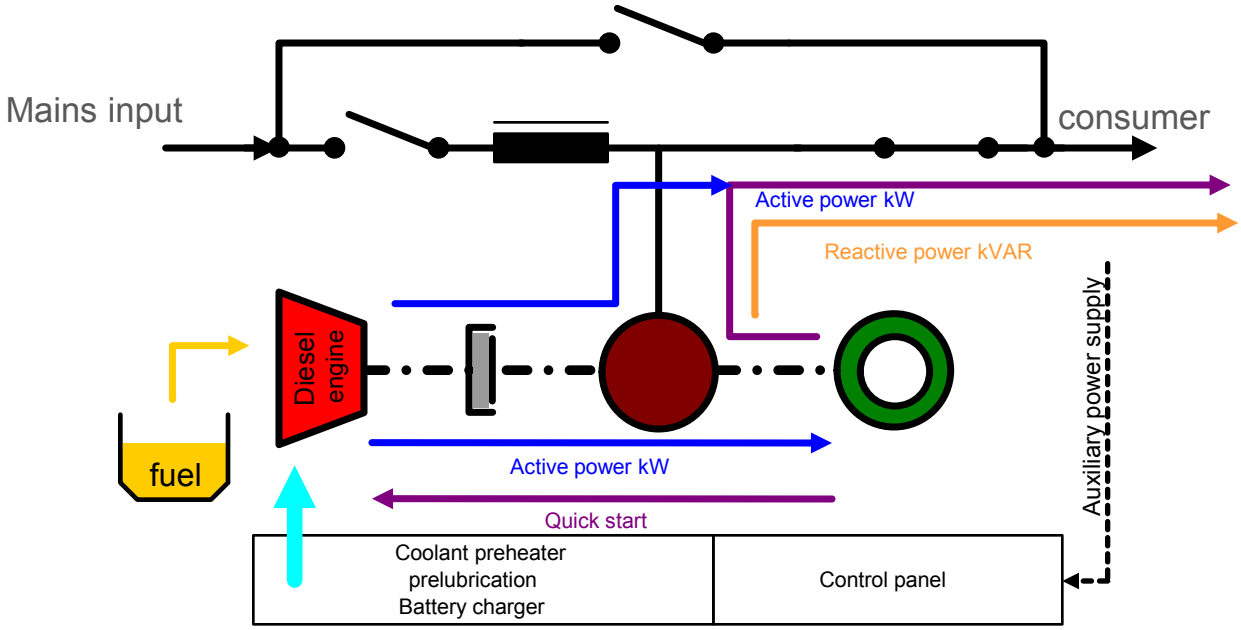
NBDK – Energy Flow Diagram

UPS-SYSTEMS

Mains Failure



- The UPS alternator supplies the consumer load via the stored kinetic energy until the diesel engine has reached the nominal speed and can deliver full load
- Diesel engine is accelerated via quick start
- KIN module starts to charge

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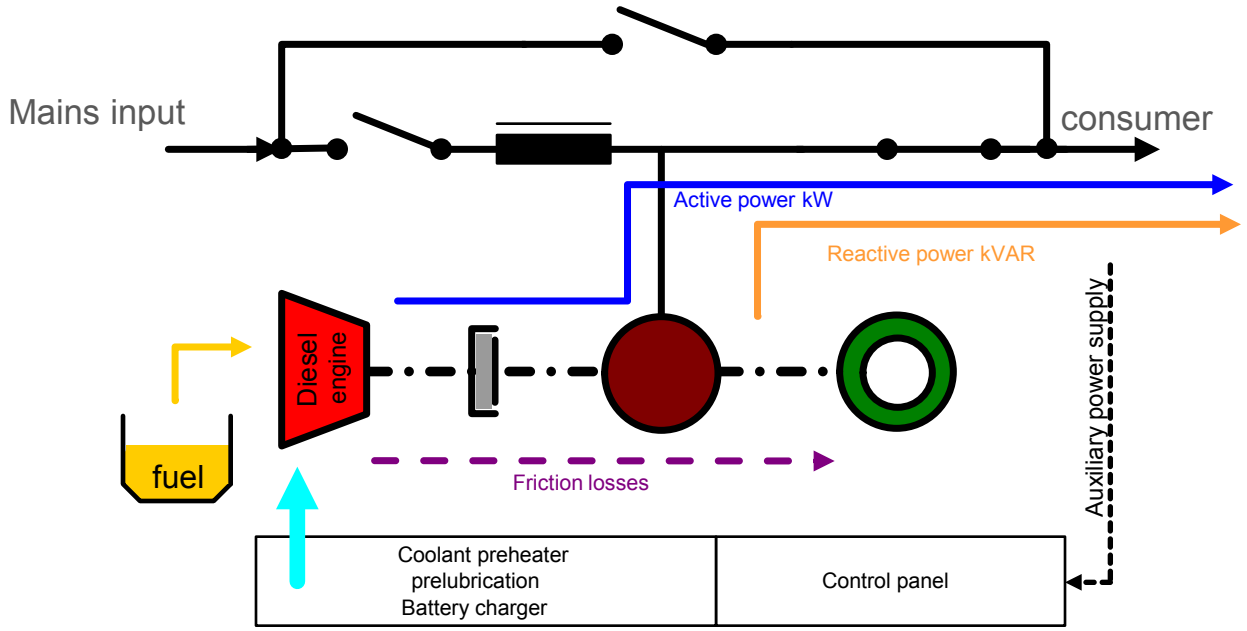
NBDK – Energy Flow Diagram

UPS-SYSTEMS

Diesel Operation



- The diesel engine supplies the UPS load via the alternator
- Energy is also transferred to the kinetic module (to charge the KIN module and compensate the losses)

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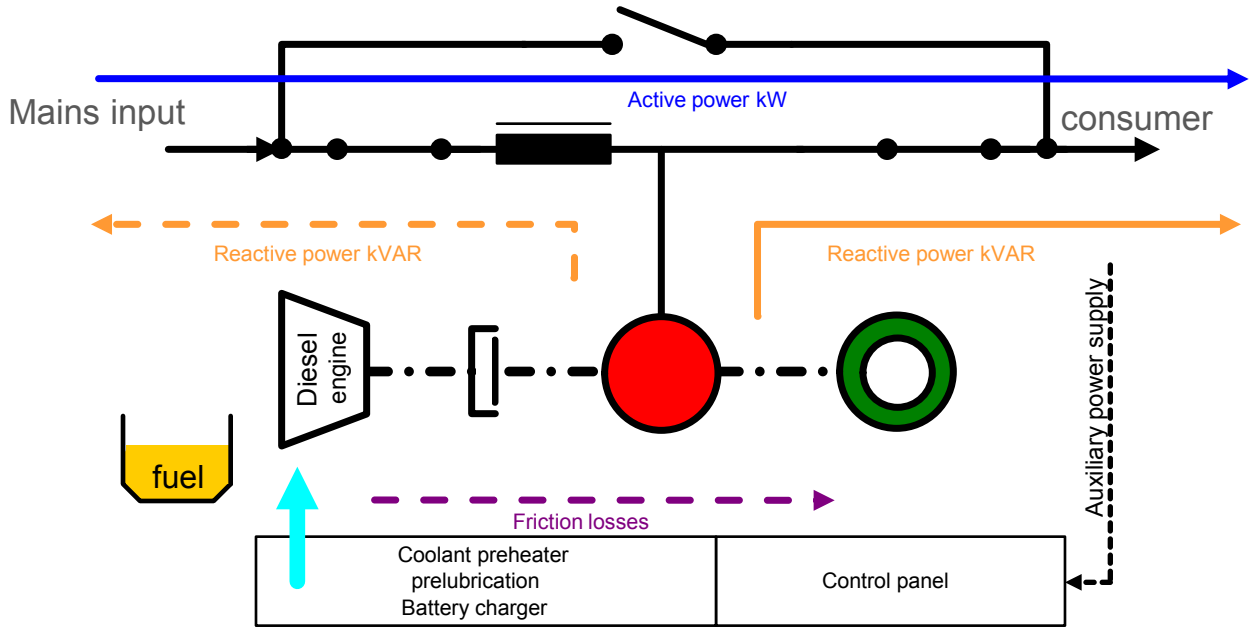
NBDK – Energy Flow Diagram

UPS-SYSTEMS

Mains Return



- Synchronization to the mains frequency
- Transfer of the UPS load via the choke to the synchronized mains
- Shutdown of the diesel engine after a cooling-down period
- Machine returns to stand-by operation

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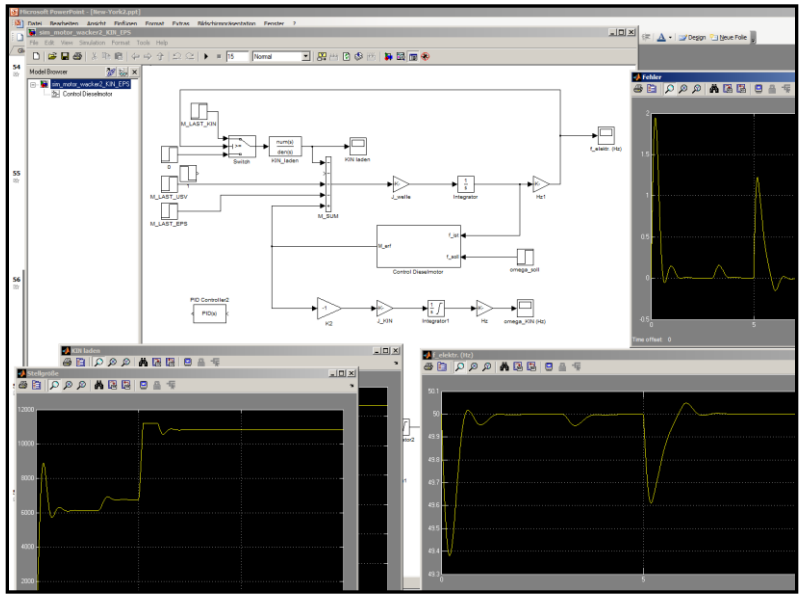
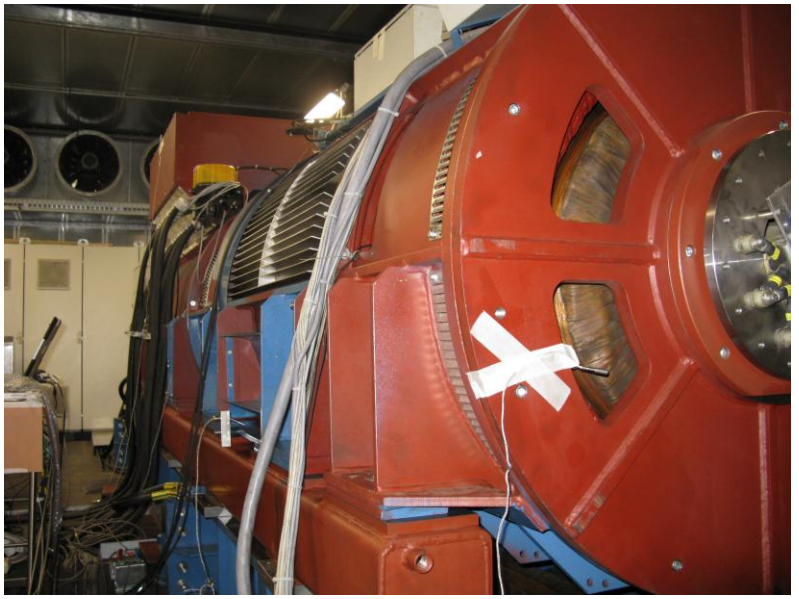
NBDK – Performance Tests

UPS-SYSTEMS

Software - Simulations



Test Cabine - Measurements



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NBDK – Performance

UPS-SYSTEMS

Mains Failure Simulation

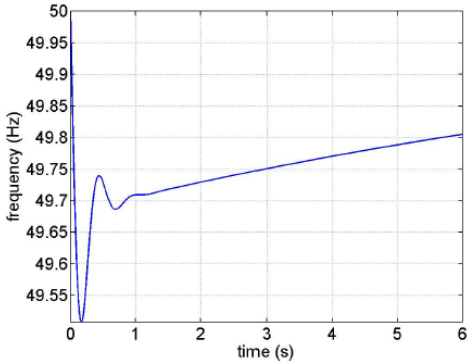
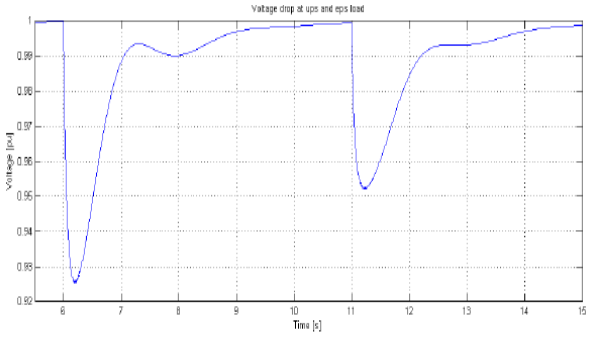
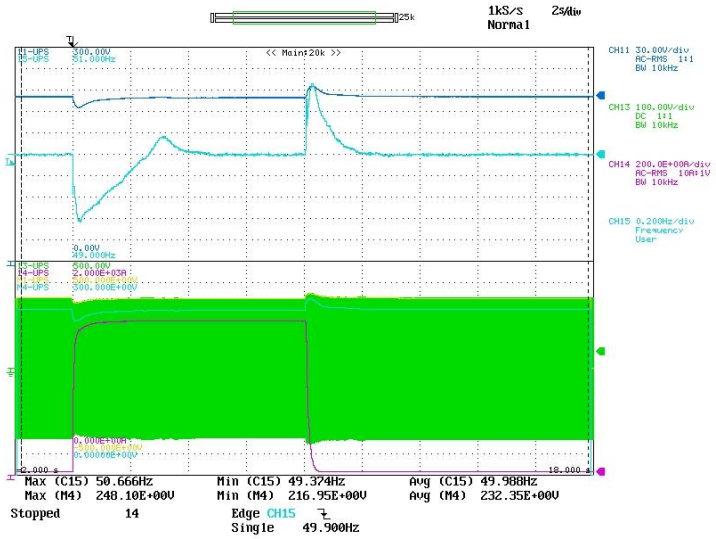


Figure 1: Frequency curve during mains failure



Tolerances NBDK:
Frequency: ± 1%
Voltage: ± 10%

Mains Failure Measurement



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NBDK – IT Power Systems

Control and Monitoring

UPS-SYSTEMS

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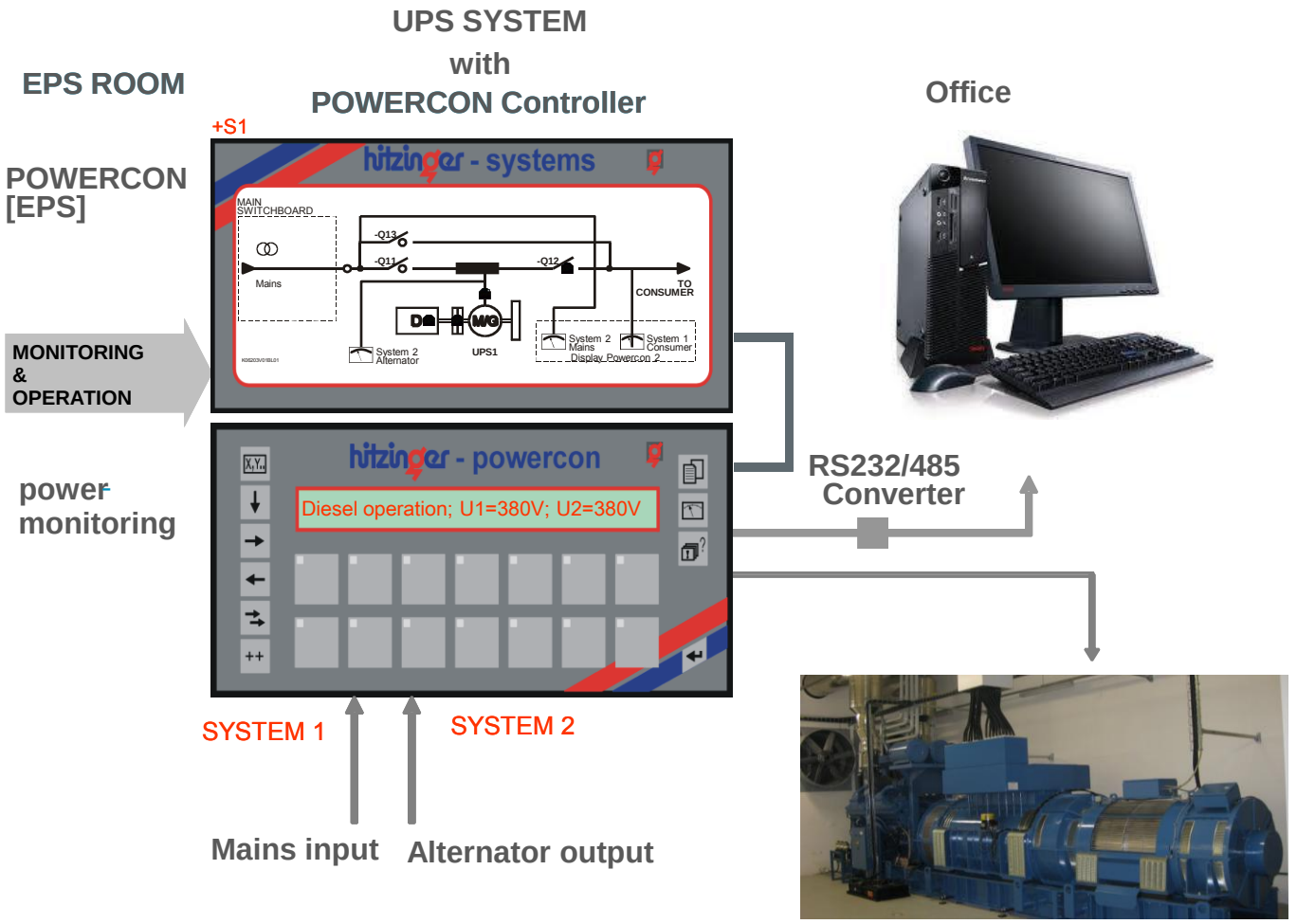
Control and Monitoring

UPS-SYSTEMS



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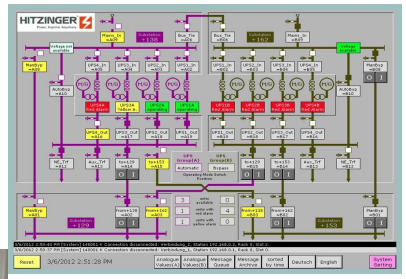
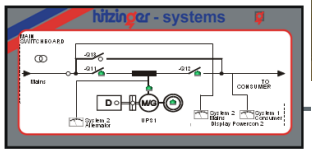
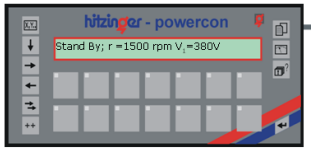
Control and Monitoring

UPS-SYSTEMS







DDUPS -> Local PLC -> Master PLC -> Office

Communication via Modbus / Profibus

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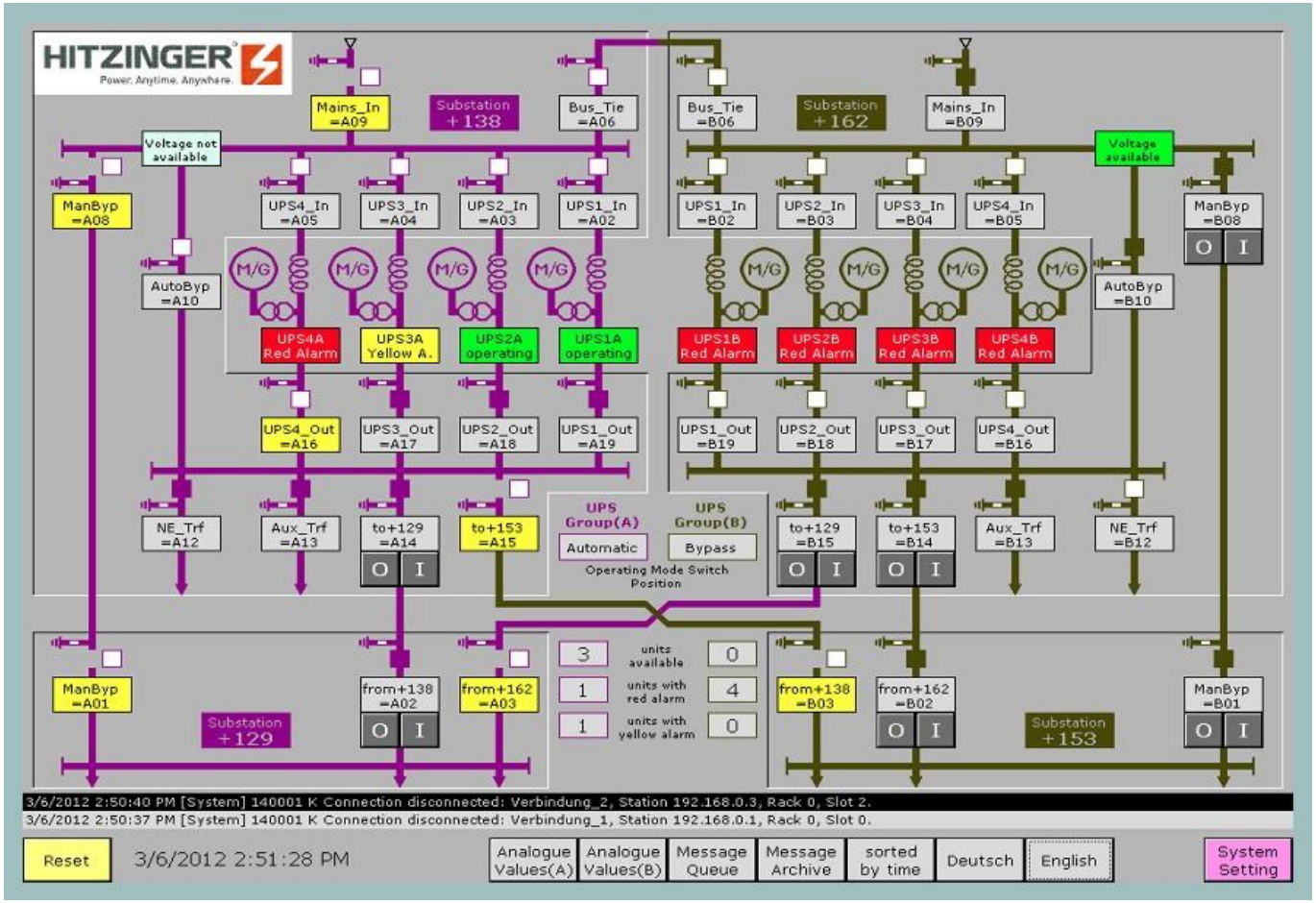
Control and Monitoring

UPS-SYSTEMS



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NBDK – IT Power Systems

System Configurations

UPS-SYSTEMS

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System Configurations

TIER Requirements Summary

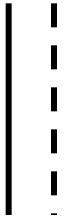
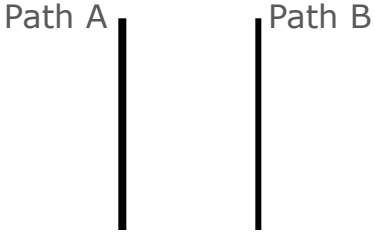
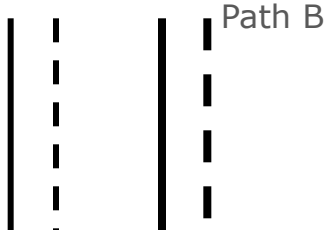
UPS-SYSTEMS

	TIER I	TIER II	TIER III	TIER IV
Active Capacity Components to Support IT Load	N	N+1	N+1	N after any failure
Distribution Paths	1	1	1 active and 1 alternative	2 simultaneously active
Concurrently Maintainable	No	No	Yes	Yes
Fault Tolerance (single event)	No	No	No	Yes
Compartmentalization	No	NO	No	Yes
Continuous Cooling	Load density dependent	Load density dependent	Load density dependent	Yes (class A)

System Configurations

TIER Requirements Summary

UPS-SYSTEMS

TIER I	TIER II	TIER III	TIER IV
Single source No redundancy	Single source After „N+1“	Double source 2 x „N“ „A-B“-supply	Double source Each N+1
			
Enduser availability 99,67 %	Enduser availability 99,75 %	Enduser availability 99,98 %	Enduser availability 99,99 %
Enduser downtime 28,8 h	Enduser downtime 22,0 h	Enduser downtime 1,6 h	Enduser downtime 0,8 h
First introduced 1960-1970	First introduced 1960-1990	First introduced since 1990	First introduced Since 1994

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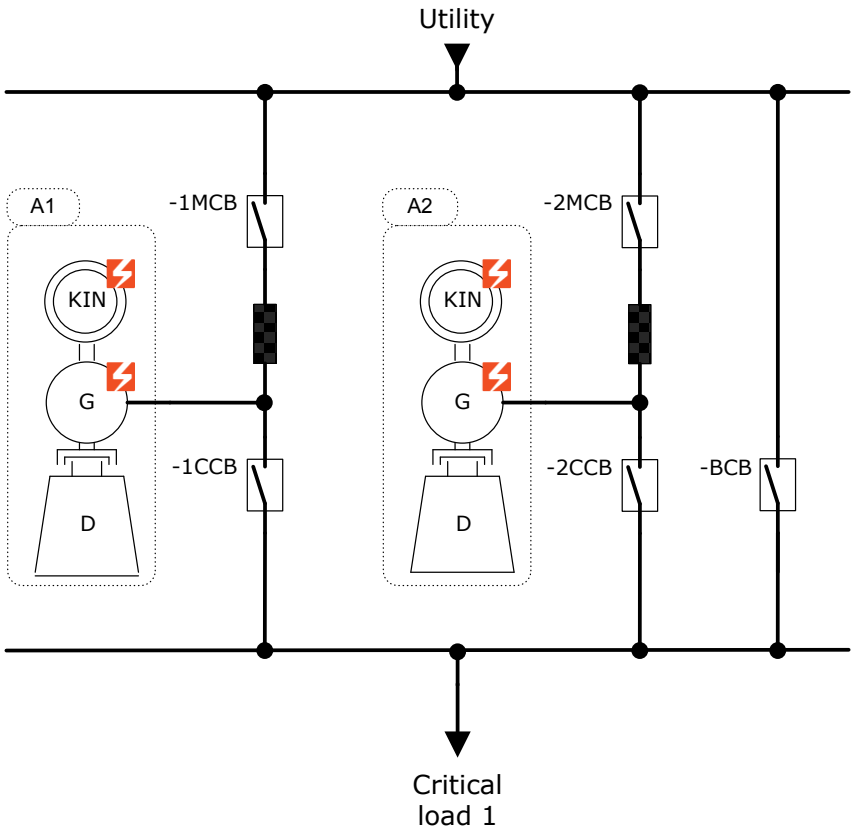
System Configurations

Example: Parallel Configuration

UPS-SYSTEMS



- Example:
  Two single units paralleled , one Bypass- CB
- System configuration:
  Parallel
- System components:
  (N+I)
  2 + 0
- Number of paths:
  (P)
  1
- Description:
  N… number of UPS needed to supply the load

  I… number of redundant units

  P.. number of paths

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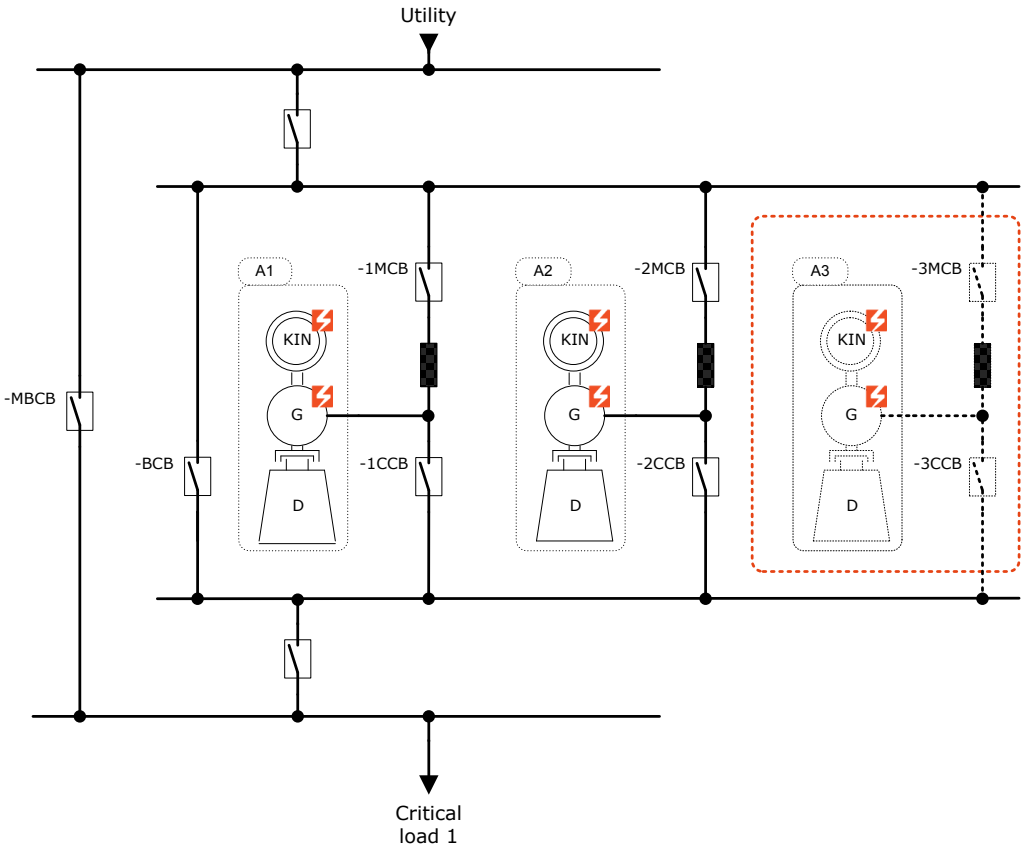
System Configurations

Parallel Configuration, N

UPS-SYSTEMS



- Parallel Configuration
  To achieve a higher level of output availability in N or N+1 configuration

  N:
  System components ; paths
  3 ; 1 ; (Tier1)
  (unit A1+A2+A3 needed to supply the load)

- Number of units:
  Low voltage- limited due short-circuit power (8MWconfiguration)
  Middle voltage- nearby unlimited

- Further Configuration:
  Further configurations are simplified without manual Bypass-CB`s or additional switching devices

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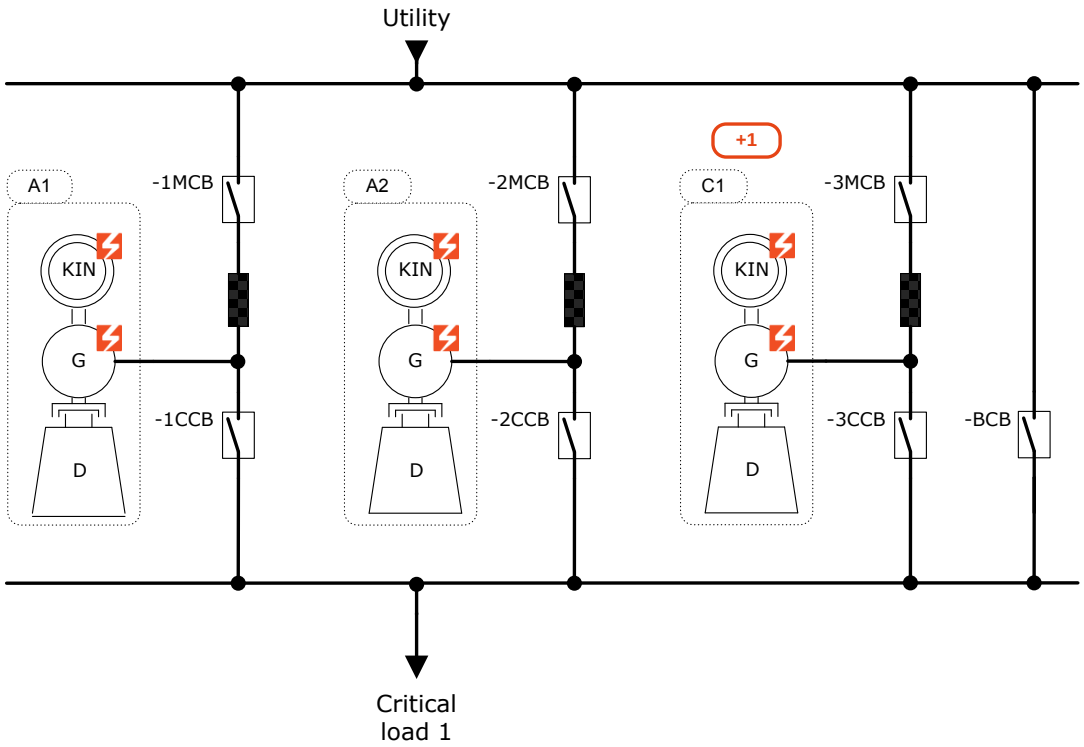
System Configurations

Parallel Configuration, N+I

UPS-SYSTEMS



- Parallel Configuration
  To achieve a higher level of output availability in N or N+1 configuration

  N+I:
  System components ; paths
  2+1 ; 1 ; (Tier2)
  A1+A2 >= load,
  A1+C1 >= load,
  A2+C1 >= load,

- Key benefits:
  -Simple design
  -Small number of components
  -Easy Expandable

- Drawbacks:
  -Single point of failure, failure on the common bus bar affects the consumers/load

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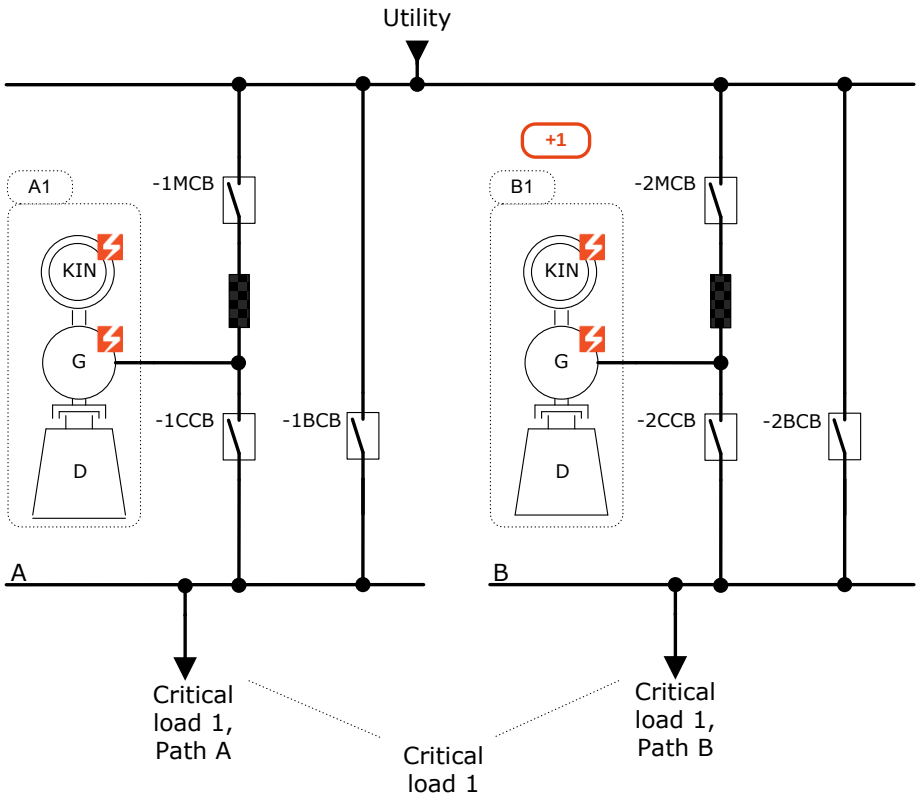
System Configurations

Isolated Configuration

UPS-SYSTEMS



- Isolated Configuration
  There is a higher level of output availability possible, due independent/individual load supply

  N+I:
  System components ; paths
  1+1 ; 2 ; (Tier3)
  A1 >= load,
  A2 >= load,

- Key benefits:
  -This kind of system configuration eliminates the single point of failure
  -Higher number of components

- Drawbacks:
  -Higher Acquisition costs
  -Higher Operating costs

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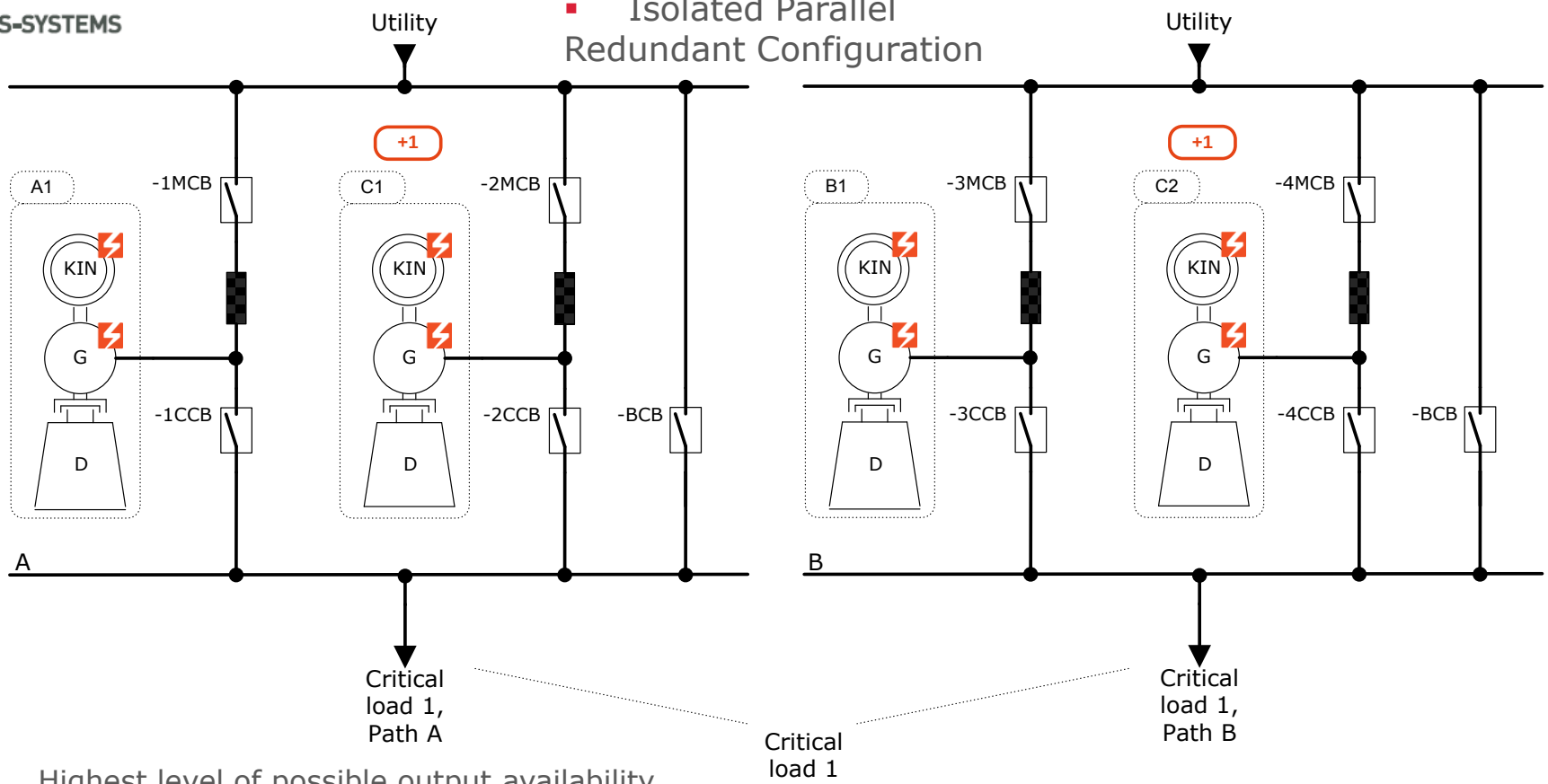
System Configurations

Isolated Parallel Redundant Configuration

UPS-SYSTEMS

- Isolated Parallel Redundant Configuration



Highest level of possible output availability
(N+I)+(N+I):
System components ; paths | (1+1)+(1+1) ; 2 ; (Tier4)
Shown in this special configuration - each unit (A1,C1,B1,C2) able to supply the load.

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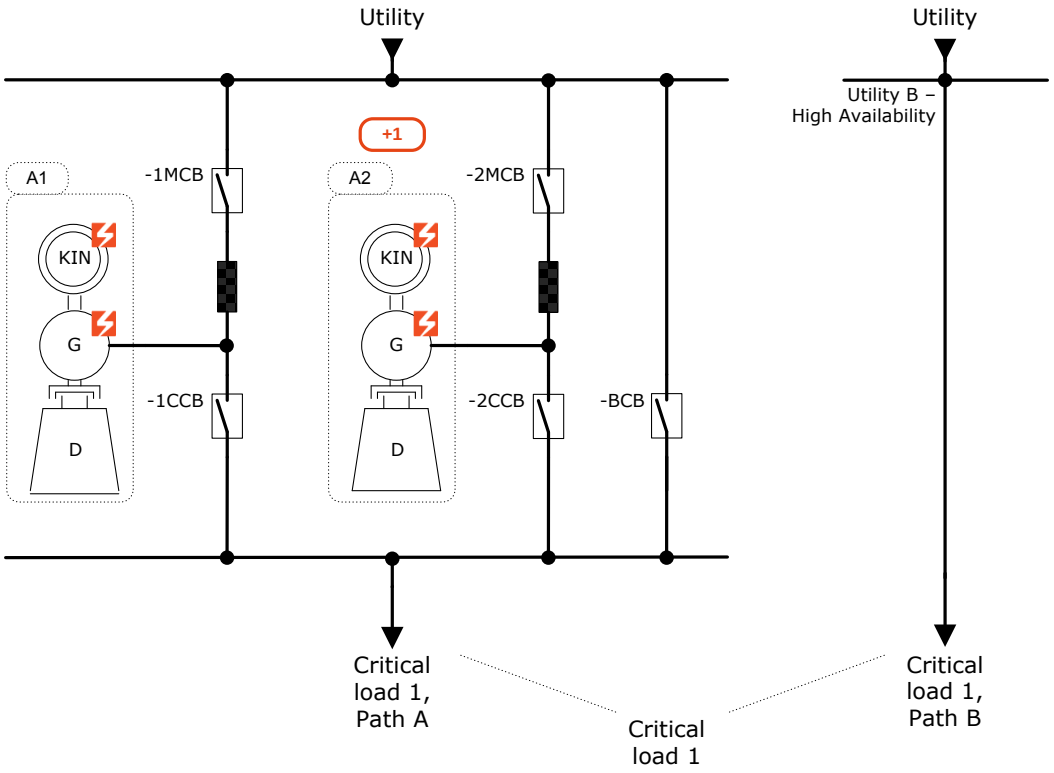
System Configurations

Isolated Parallel Configuration

UPS-SYSTEMS



- Isolated Parallel Configuration

  N+I:
  System components ; paths
  1+1 ; 2 ; (Tier3)
  A1 >= load,
  A2 >= load,

- Key benefits:
  - -This kind of system uses the high availability of a second Utility
  - -This kind of system configuration eliminates the single point of failure
  - -Higher number of components
  - -If there are two independent grid's available it is a really Operating costs optimized solution

- Drawbacks:
  - -High Acquisition costs
  - -High Operating costs

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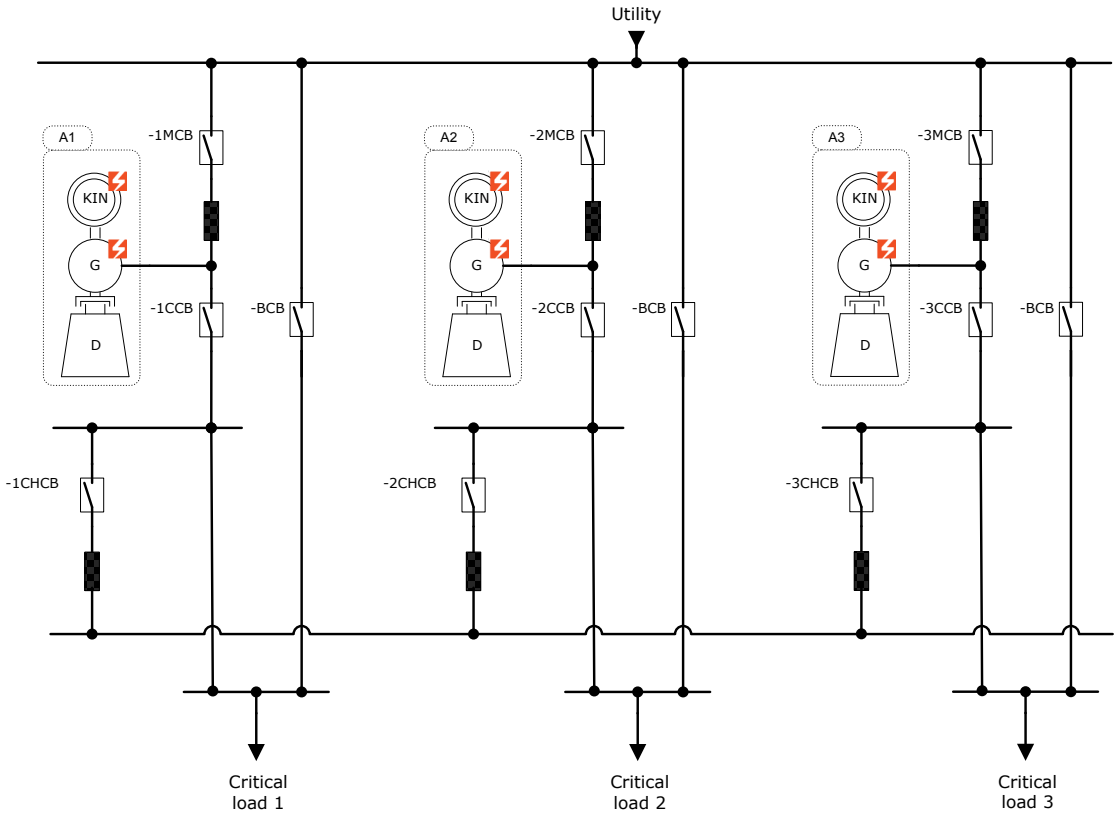
System Configurations

Isolated Parallel Configuration

UPS-SYSTEMS



- Isolated Parallel Configuration
  All units are connected to a common bus (IP-Bus) by isolation chokes
  In case of short-circuit on the bus or unit failure, this chokes minimize fault currents to an acceptable level

  N+I:
  System components ; paths
  1+1 ; 1 ; (Tier2)

  power outage of two units
  >= total load,

- Key benefits:
  -Load management for better efficiency possible, this depends on the systems load configuration.

- Drawbacks:
  -High Acquisition costs
  -not comparable to a totally isolated system configuration, small influences in case of bus bar failure

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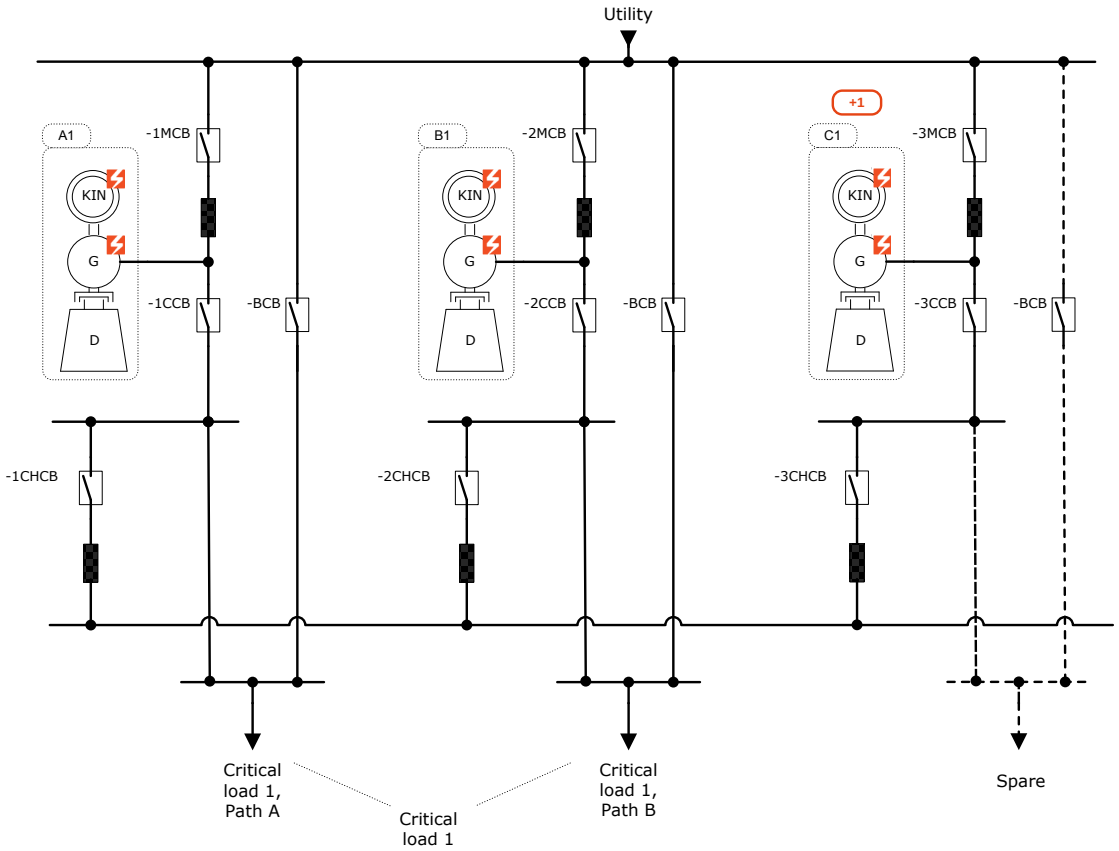
System Configurations

Isolated Parallel Configuration

UPS-SYSTEMS



- Isolated Parallel Configuration
  All units are connected to a common bus (IP-Bus) by isolation chokes
  In case of short-circuit on the bus or unit failure, this chokes minimize fault currents to an acceptable level

  N+I:
  System components ; paths
  1+1 ; 2 ; (Tier3)

  power outage of two units
  >= total load,

- Key benefits:
  -Load management for better efficiency possible, this depends on the systems load configuration.

- Drawbacks:
  -High Acquisition costs
  -not comparable to a totally isolated system configuration, small influences in case of bus bar failure

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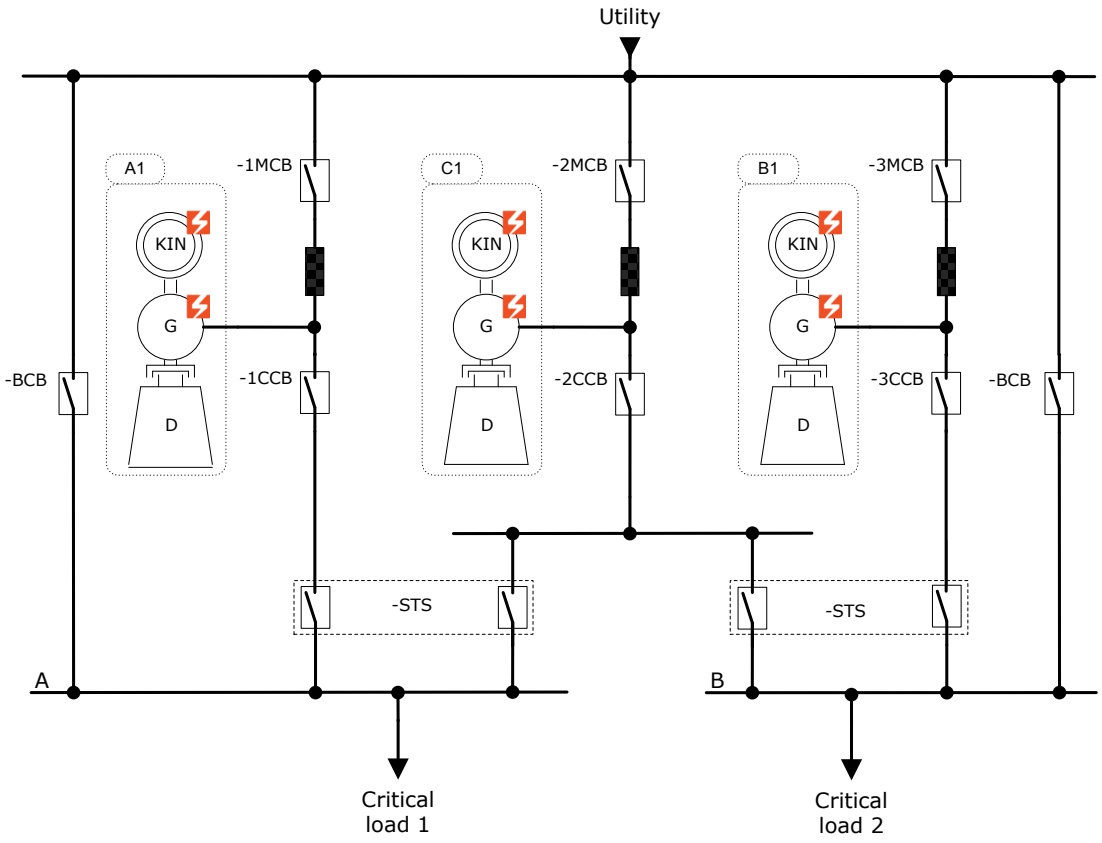
System Configurations

Parallel Configuration, 3units, STS

UPS-SYSTEMS



- Parallel Configuration
  Additional unit is operating parallel to the 2 load bus bars, they are connected due Static Load Transfer Switches.
  In case of unit failure the static transfer switches to the remaining available supply.

  N+I:
  System components ; paths
  1+1 ; 1 ; (Tier2)

  A1 or B1 or C1 >= load1 or load2,

- Key benefits:
  -Redundant UPS is able to supply each load without influencing to the other consumers.
  -Maintenance

- Drawbacks:
  -available only in the low voltage range

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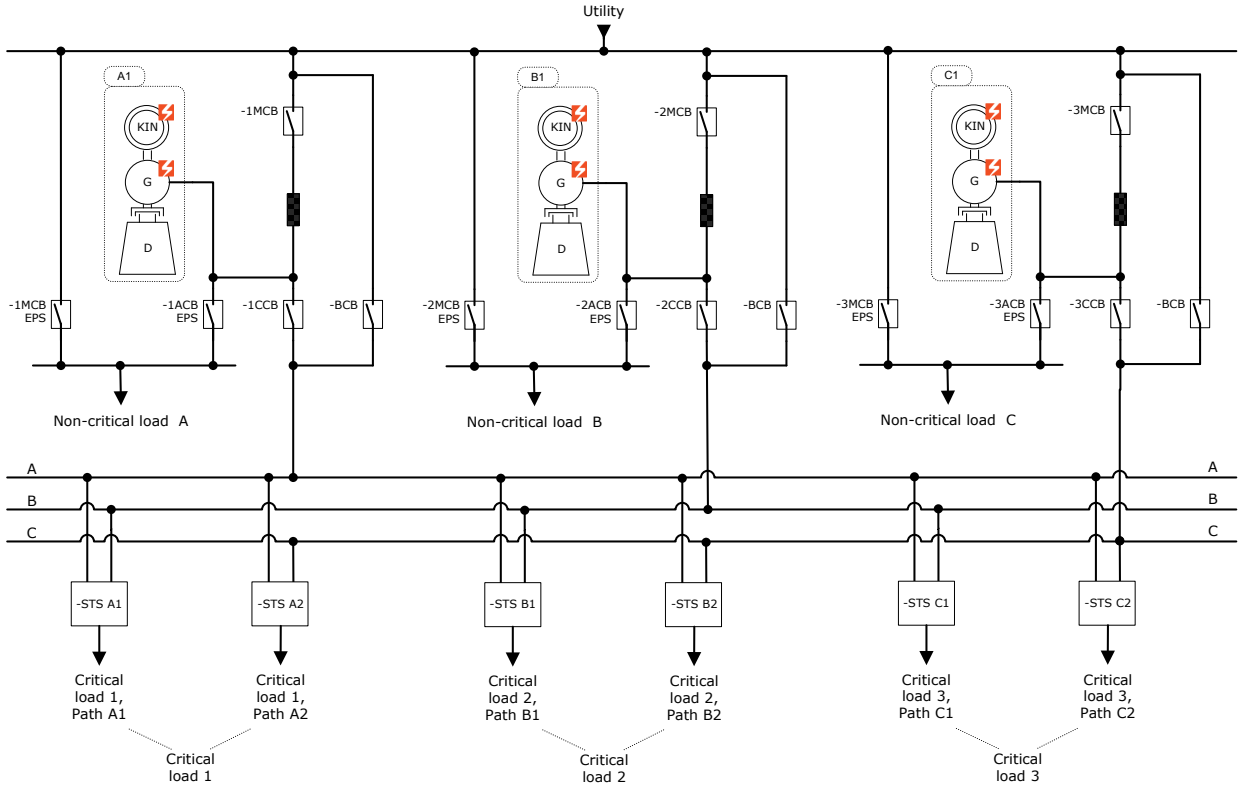
System Configurations

Parallel Configuration, STS

UPS-SYSTEMS

- Isolated Parallel Configuration



High level of possible output availability
The Availability depends from load conditions

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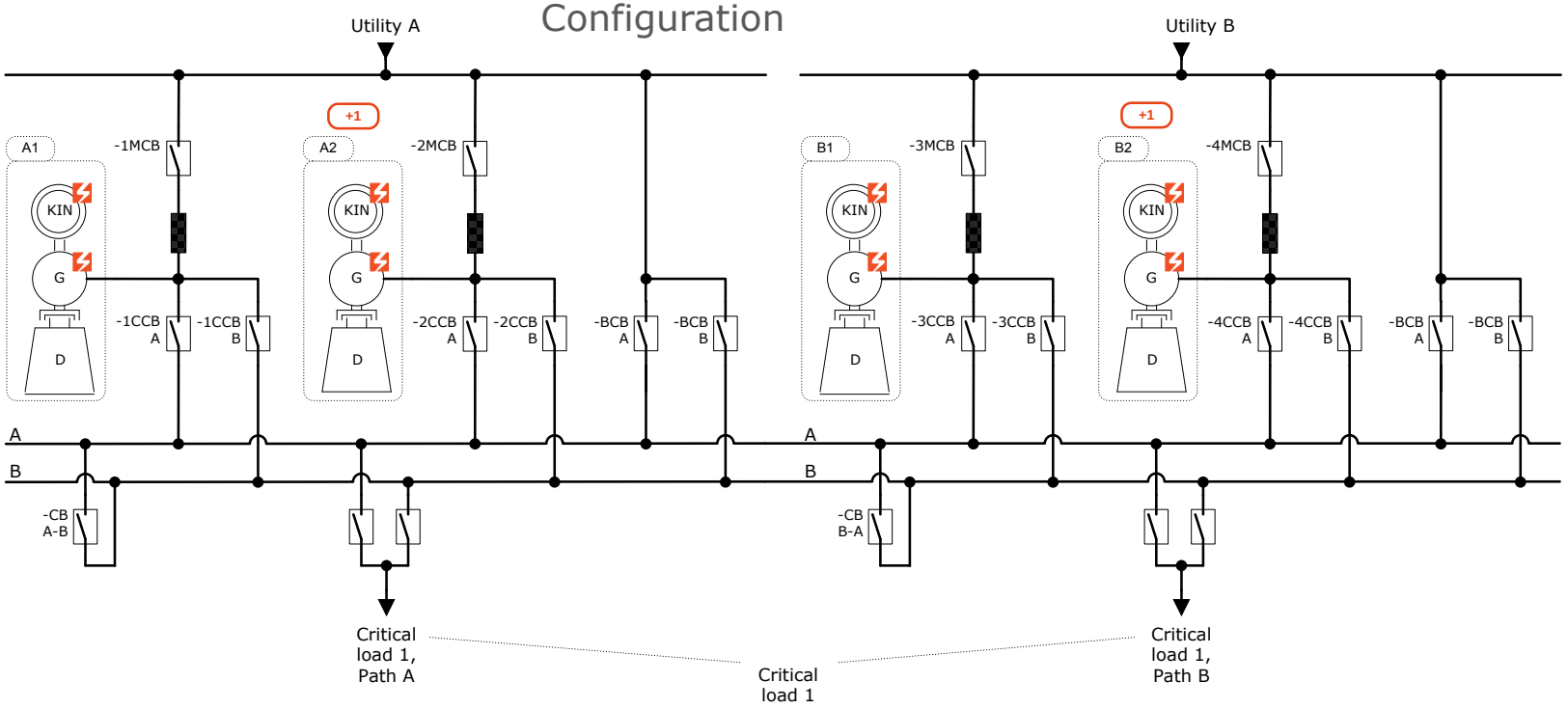
System Configurations

Parallel Configuration

UPS-SYSTEMS

- Isolated Parallel Configuration



Highest level of possible output availability
(N+I)+(N+I):
System components ; paths | (1+1)+(1+1) ; 2 ; (Tier4)

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NBDK – IT Power Systems

Hitzinger & on site service / maintenance / repair

UPS-SYSTEMS

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Hitzinger Services

UPS-SYSTEMS

- Competent and experienced service team
- 24/7/365 service hotline
- Worldwide services available through agents / representatives
- Available on site within 48 hours (in middle east countries with no visa requirements)

HITZINGER®
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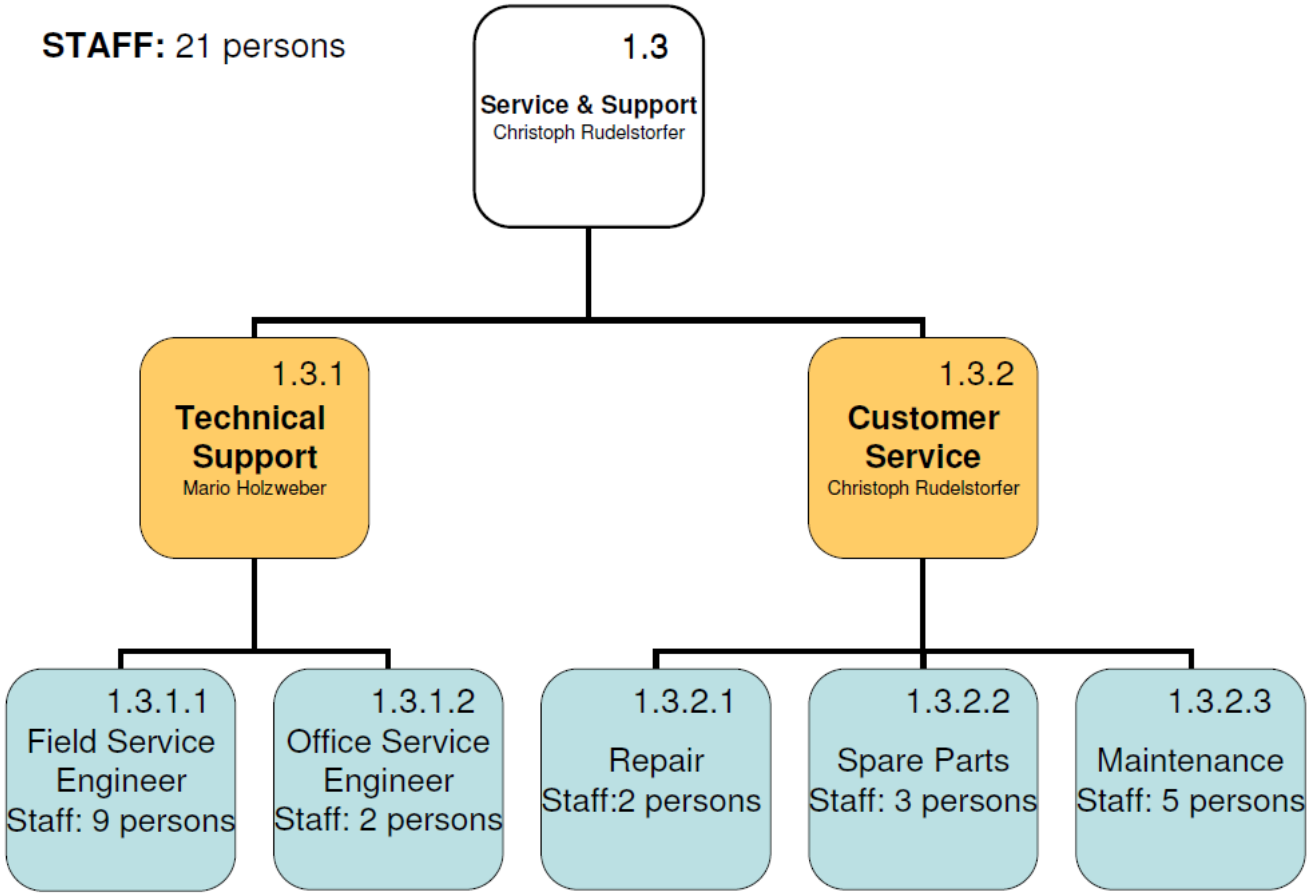
Hitzinger Maintenance

Organisation

UPS-SYSTEMS

STAFF: 21 persons



Total work experience: > 300 years!

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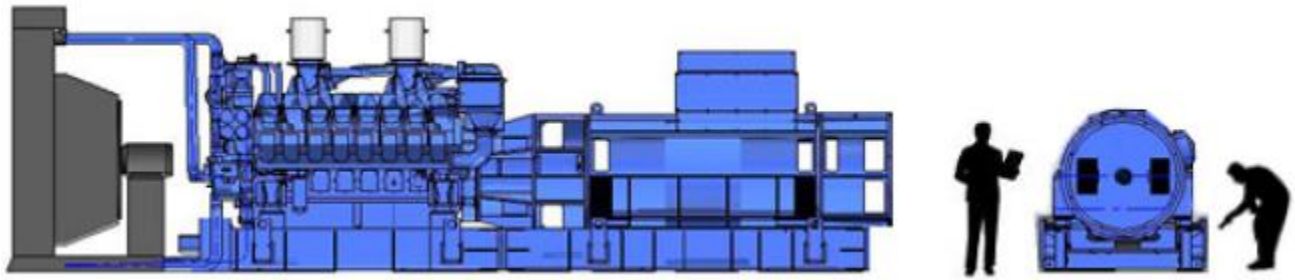
Hitzinger Maintenance

UPS-SYSTEMS

More Reliability: Less maintenance

Choose a solution which facilitates maintenance

- Low annual service requirements
- Automatic lubrication options
- Module arrangement gives better KIN module access facilitating:
  - Easier routine maintenance
  - Quicker overhauls



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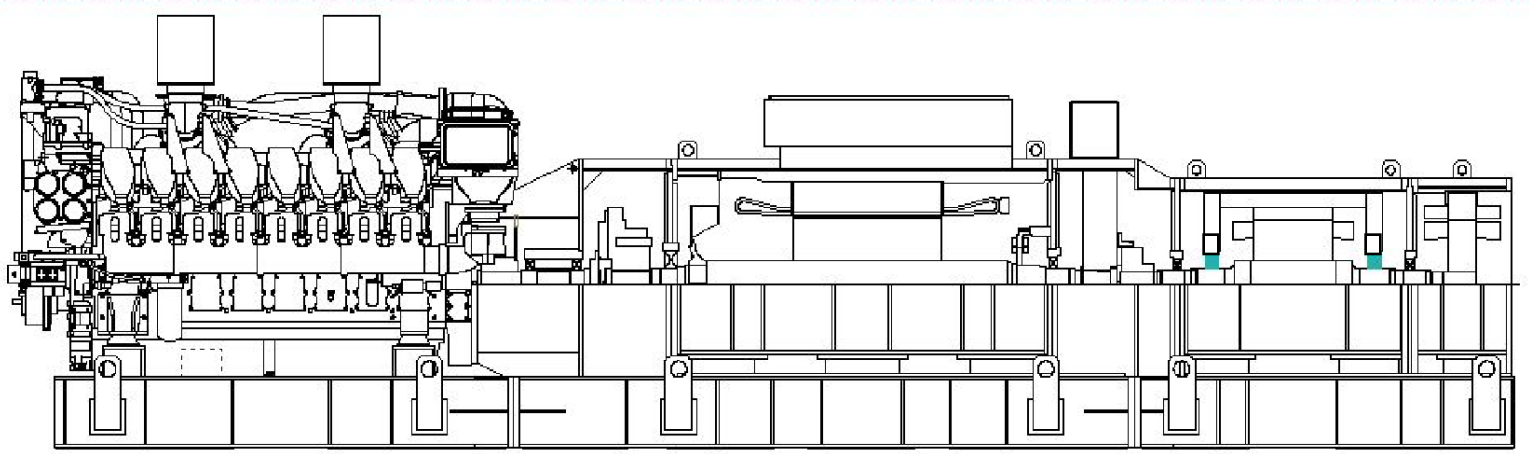
Maintenance Overview

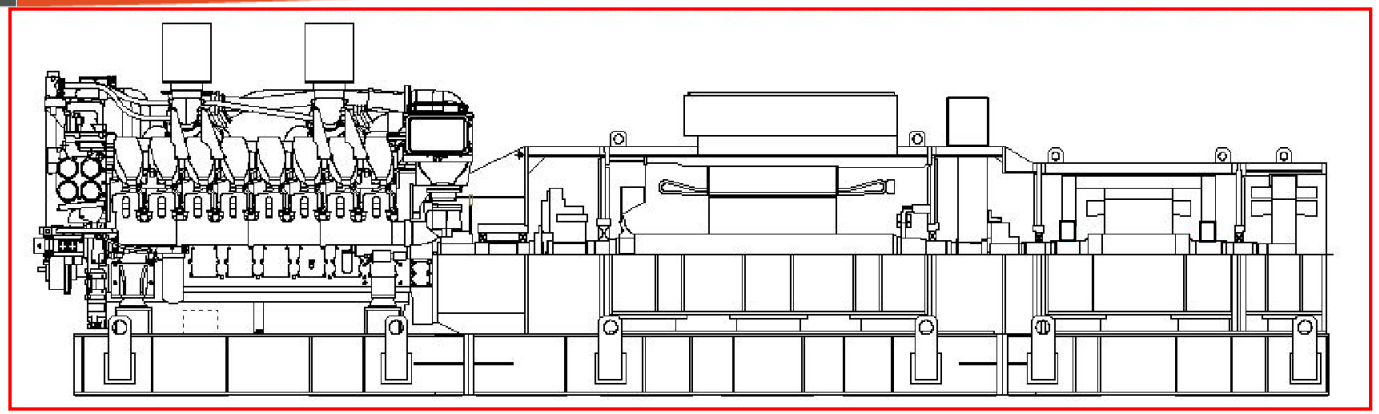


Qualification:
Level M1 … trained personal (customer operator)
Level M2 … qualified personal (Hitzinger service and maintenance partner)
Level M3 … specialist of DDUPS manufacturer and service and maintenance partner

Operation mode:
A … automatic
M … maintenance
T … test

Maintenance Schedule M1

UPS-SYSTEMS



Unit to be maintained Tasks	Qualifi-cation	Operation Mode	Daily	1 Monthly	4 Months	1 Year	Max. Years	Special period or time limitation
Visual inspections								
- alternator - kinetic energy module - re-greasing unit - cooling system - fuel system - exhaust system - ducts	M1	A		•	•	•		
Bearing re-grease								
- electromagnetic clutch - alternator - kinetic energy module (outer bearings)	M1	A						automatic

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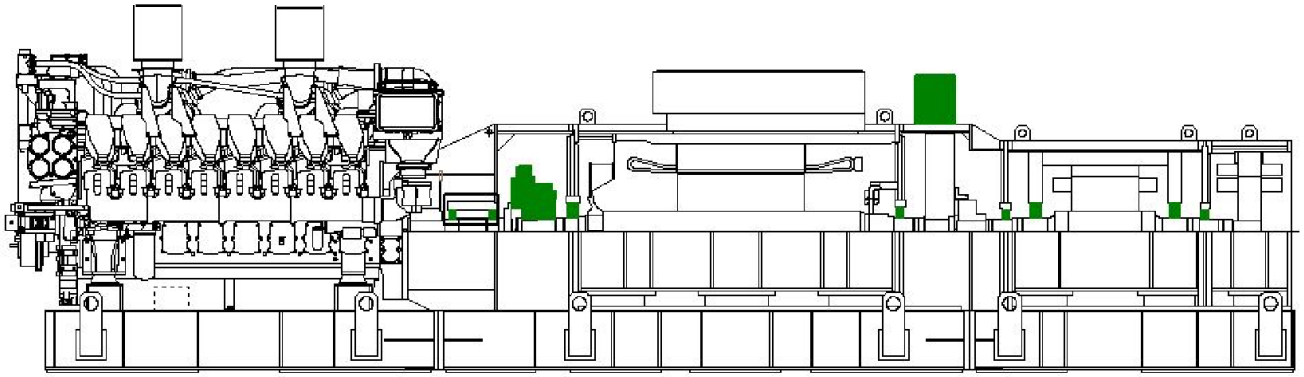
Maintenance Schedule M2

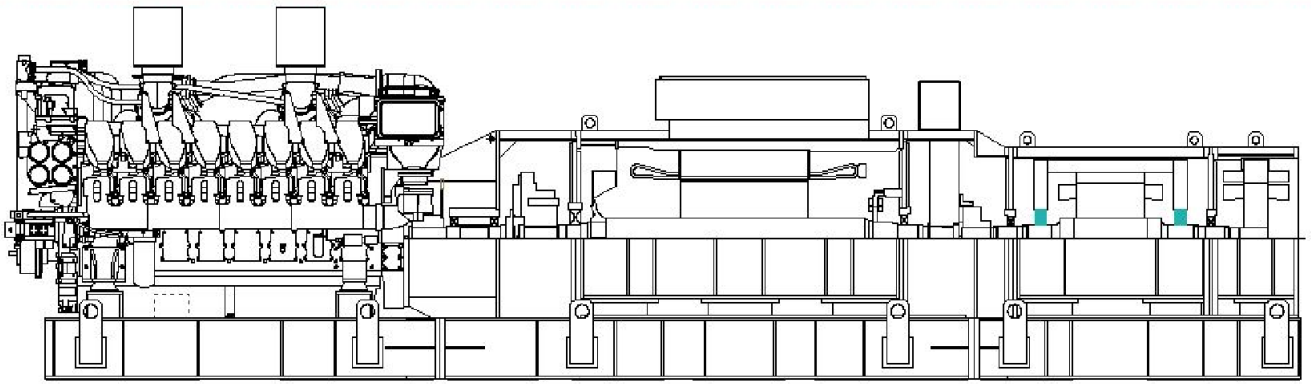
UPS-SYSTEMS



Unit to be maintained Tasks	**Qualifi-cation**	**Operation Mode**	**Daily**	**1 Monthly**	**4 Months**	**1 Year**	**Max. Years**	**Special period or time limitation**
Functional tests, visual inspection and cleaning								
- Alternator and KIN module - automatic re-greasing unit - cooling and fuel system - local and master control panels	M2	T			• •	• • • •		
Electromagnetic Clutch								
Check and re-adjust gap clearance	M2	M			•	•		Readjustment after 100 HSS
Replace friction linings	M2	M					10	Theoretical figure
Kinetic Energy Storage Unit								
Change lubrication oil of inside bearings	M2	M			•	•		Max. 3500 AWH

Maintenance Schedule M3

UPS-SYSTEMS



Unit to be maintained Tasks	Qualifi-cation	Operation Mode	Daily	1 Monthly	4 Months	1 Year	Max. Years	Special period or time limitation
Kinetic Energy Storage Unit								
Replace KIN-module inner bearings	M3	M					5	Theoretical figure

Hitzinger Services
in Turkey

UPS-SYSTEMS

- Local support through Powerelektronik
  - Powerelektronik has various UPS installations above 20KVA
  - maintenance and service team for UPS
  - highly qualified trained engineers for UPS and electronic equipments support
  - Our main office is Istanbul
  - Hitzinger has already set a training program for 3 engineers from Powerelektronik in Linz / Austria

Spare parts availability

Stock items at Powerelektronik

UPS-SYSTEMS

- Bearings
- Clutch linings
- PLC’s incl. input and output modules
- KIN control box
- AVR
- Relays
- Battery chargers
- Special tools

Hitzinger Services
in Turkey

UPS-SYSTEMS

Power Elektronik SAN.VE TIC.LTD.STI
Armağanevler Mh. Samanyolu Cd.
İpekçi Sk. No : 12 Ümraniye
ISTANBUL

Power Elektronik SAN.VE TIC.LTD.STI
ANKARA BÖLGE MÜDÜRLÜGÜ
2. Cadde 1315. Sk. No: 12/A-14
Asagi Övecler, Cankaya
ANKARA

HITZINGER®
Power. Anytime. Anywhere.

NBDK – IT Power Systems

Summary and references

UPS-SYSTEMS

HITZINGER®
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Summary

UPS-SYSTEMS

Lower Total Cost of Ownership

- Direct savings:
  - Total system efficiency ~ 94-96%
  - No additional heat input into the facility
  - No Air Conditioning or infrastructure costs. Just ambient air.
  - No major consumables to change during service life
- Indirect savings:
  - Redefined space requirements
  - Less expensive "garage" style building
  - Reduced space requirements
- MINIMISE ENVIROMENTAL IMPACT
  - Total system efficiency minimises GHG emissions
  - Eliminate the hazardous waste of batteries
- RELIABILITY
  - Simple design low component count: System MTBF 1.000.000+ hours
  - Redundant diesel start
  - Completely brushless design
  - Designed for 25 yr service life
  - Vibration monitoring

Summary

UPS-SYSTEMS

DYNAMIC ELECTRICAL PERFORMANCE

Achieved by Hitzingers own tailored range of synchronous alternators

- Power capacities 150kVA – 2.5 MVA
- Scalability – 11 kV models
- High fault clearing / overload capability
- Mains filtering and harmonics attenuation
- Dynamic power factor correction
- Operates with leading, lagging or unity PF devices
- Completely brushless design

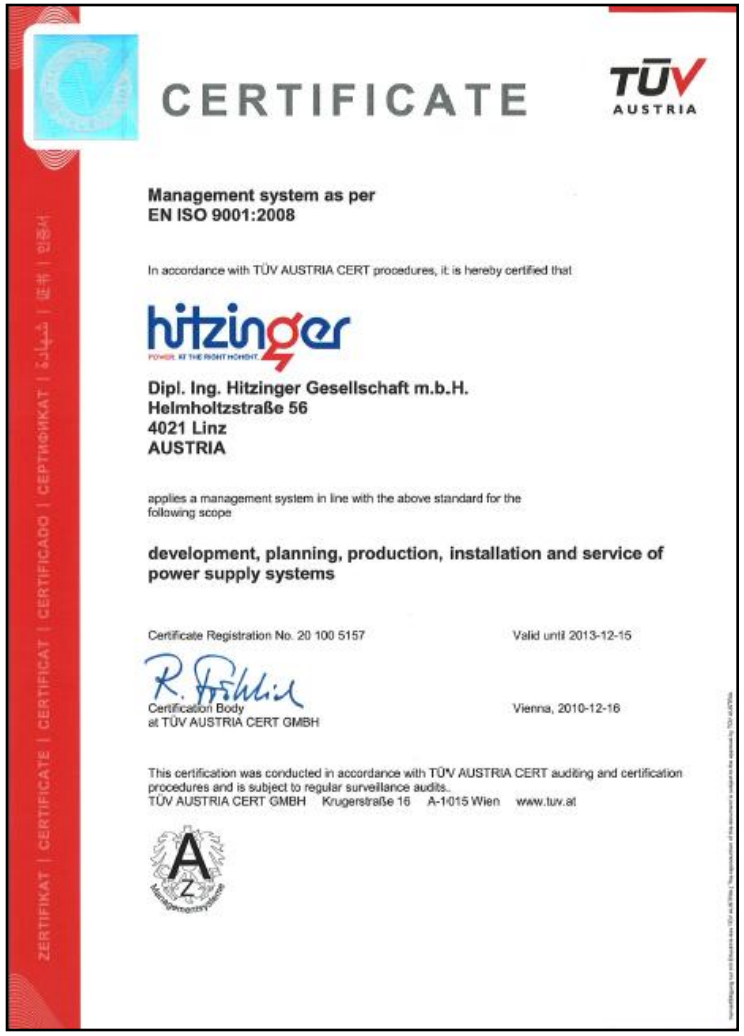
Energy Storage

Achieved by Htizingers range of KIN modules

- Wide range of power capacities 150kVA – 2.5 MVA
- Lowest RPM design increases bearing service life
- Rapid discharging and recharging without degradation
- Easy access for maintenance and overhaul
- Vibration monitoring

EN ISO 9001 Certificate

UPS-SYSTEMS



CERTIFICATE

TÜV AUSTRIA

Management system as per
EN ISO 9001:2008

In accordance with TÜV AUSTRIA CERT procedures, it is hereby certified that

hitzinger

Dipl. Ing. Hitzinger Gesellschaft m.b.H.
Helmholtzstraße 56
4021 Linz
AUSTRIA

applies a management system in line with the above standard for the following scope

development, planning, production, installation and service of power supply systems

Certificate Registration No. 20 100 5157 — Valid until 2013-12-15

Certification Body
at TÜV AUSTRIA CERT GMBH

Vienna, 2010-12-16

This certification was conducted in accordance with TÜV AUSTRIA CERT auditing and certification procedures and is subject to regular surveillance audits.
TÜV AUSTRIA CERT GMBH Krugerstraße 16 A-1015 Wien www.tuv.at

ZERTIFIKAT | CERTIFICATE | CERTIFICAT | CERTIFICADO | СЕРТИФИКАТ | شهادة | 证书 | 인증서

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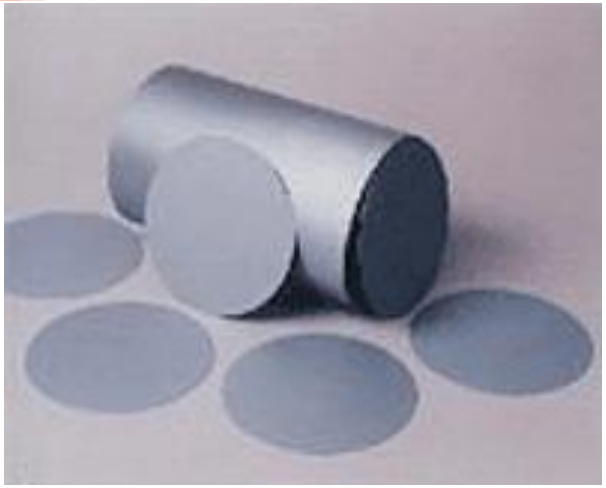
Italy

UPS-SYSTEMS



Memc - Meran:
2 x 340 kW
2 x 150 kW

Mechanical UPS – uninterrupted drive of rotating machines (e.g. pumps).

STMicroelectronics Catania:
4 x 1750kVA

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Greece

UPS-SYSTEMS

International Airport Athens:
4 x 450kVA

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Great Britain

UPS-SYSTEMS

Governmental Data Centers
2 x 2000 kVA (dual output)
2 x 2000 kVA (dual output)
2 x 475 kVA (dual output)

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Great Britain

UPS-SYSTEMS

Data Centre – Global Switch London (22MVA in parallel Operation)
11 x 2000 kVA (11kV)

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Austria

UPS-SYSTEMS

General Hospital Linz
1 x 150 kVA
1 x 450 kVA
1 x 630 KVA
1 x 800 kVA

More than 10 MVA UPS power installed all over Austria.

Hospital Braunau
1 x 350kVA

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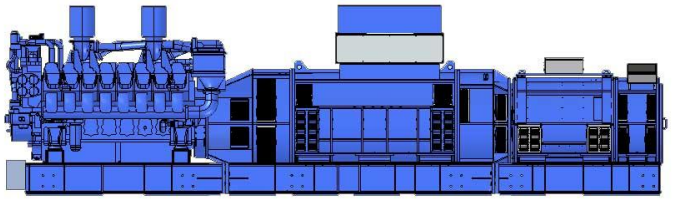
Austria

UPS-SYSTEMS

Austrian Parliament Vienna:
1 x 1225 kVA



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Switzerland

UPS-SYSTEMS

Prodor Piaget SA Geneva
1 x 850 kVA

Data Centre Bern
3 x 2000 kVA

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Northern-Cyprus & Slovenia

UPS-SYSTEMS

International Airport Lefkosa
1 x 325 kVA

International Airport Ljubljana
1 x 500 kVA

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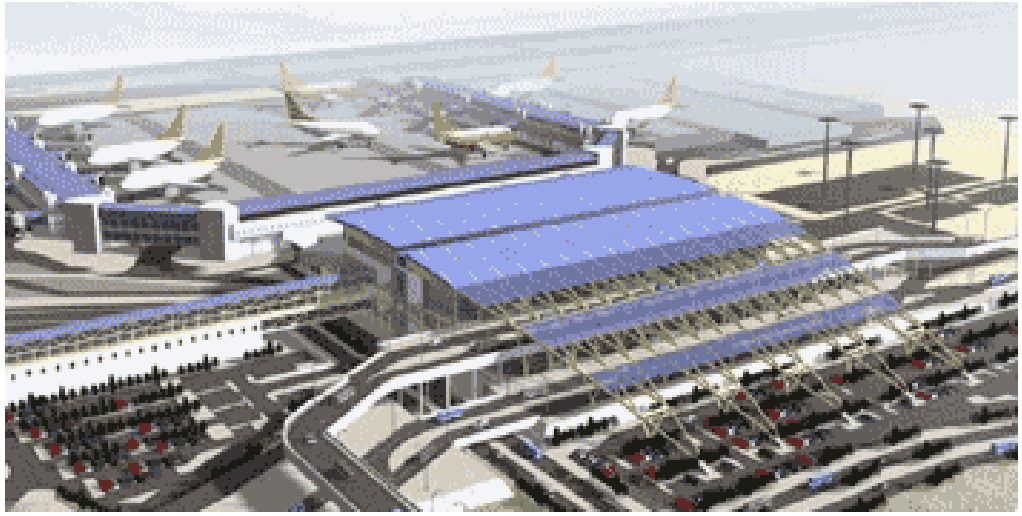
Egypt & Malawi

UPS-SYSTEMS

Reserve Bank Malawi - Blantyre
1 x 1000 kVA (dual output)

International Airport Cairo:
2 x 600 kVA
2 x 800 kVA



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Nigeria & Zimbabwe

UPS-SYSTEMS

International Airport Lagos
2 x 250 kVA

International Airports Harare and Bulawayo
2 x 200 kVA
1 x 50 kVA

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South Africa

UPS-SYSTEMS

Green Point Stadium – Cape Town
1 x 1000 kVA + Genset 1000kVA as Backup

Nelson Mandela Bay Stadium - Port Elizabeth
4 x 550 kVA (dual output)

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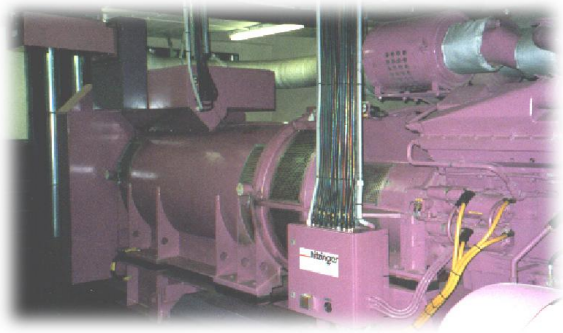
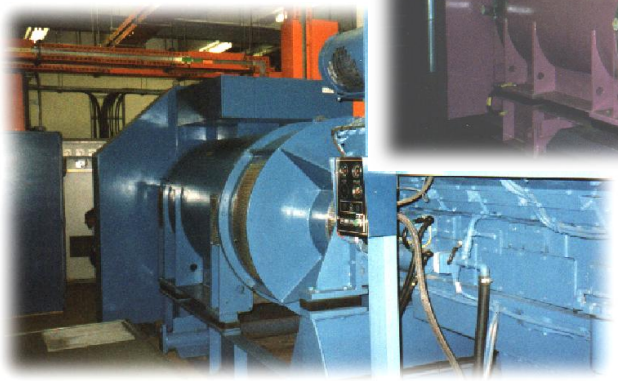
South Africa

UPS-SYSTEMS





Telkom SA – Projects:

1 x 550 kVA
1 x 1000 kVA
2 x 800 kVA
2 x 1000 kVA
2 x 1500 kVA (dual output)
2 x 1500 kVA (dual output)
1 x 660 kVA (dual output)
1 x 1000 kVA
1 x 1000 kVA (dual output)
1 x 1000 kVA
1 x 750 kVA (dual output)

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Tanzania

UPS-SYSTEMS

Bank of Tanzania
4 x 2000 kVA

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Mexico

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International Airport Cancun
1 x 290 kVA (60Hz)

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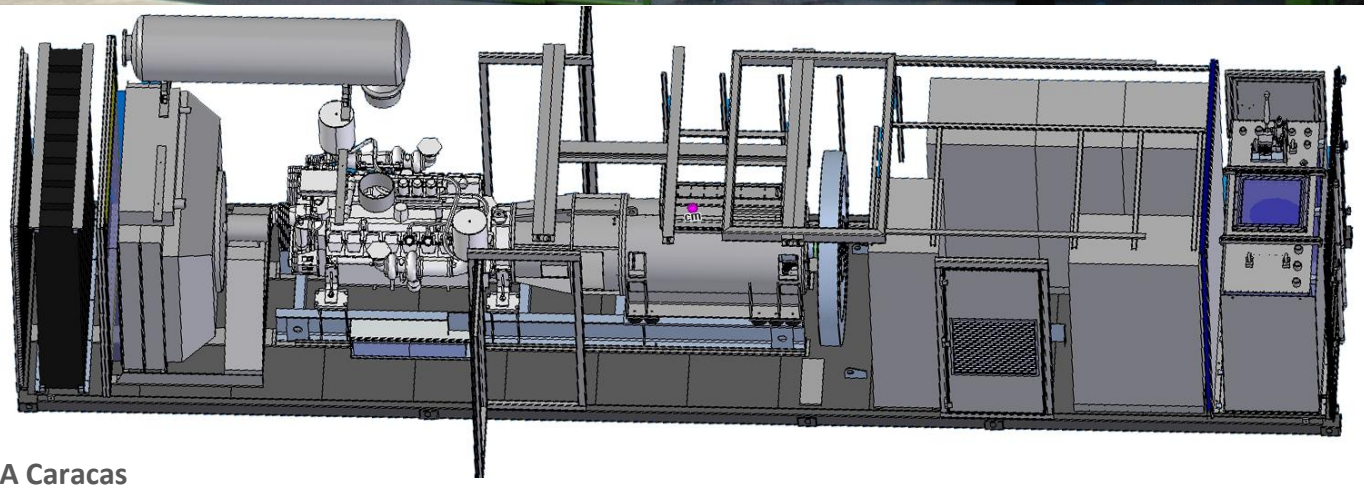
Venezuela

UPS-SYSTEMS



Venefoil C.A Caracas

1 x 1000 kVA (60Hz; dual output)

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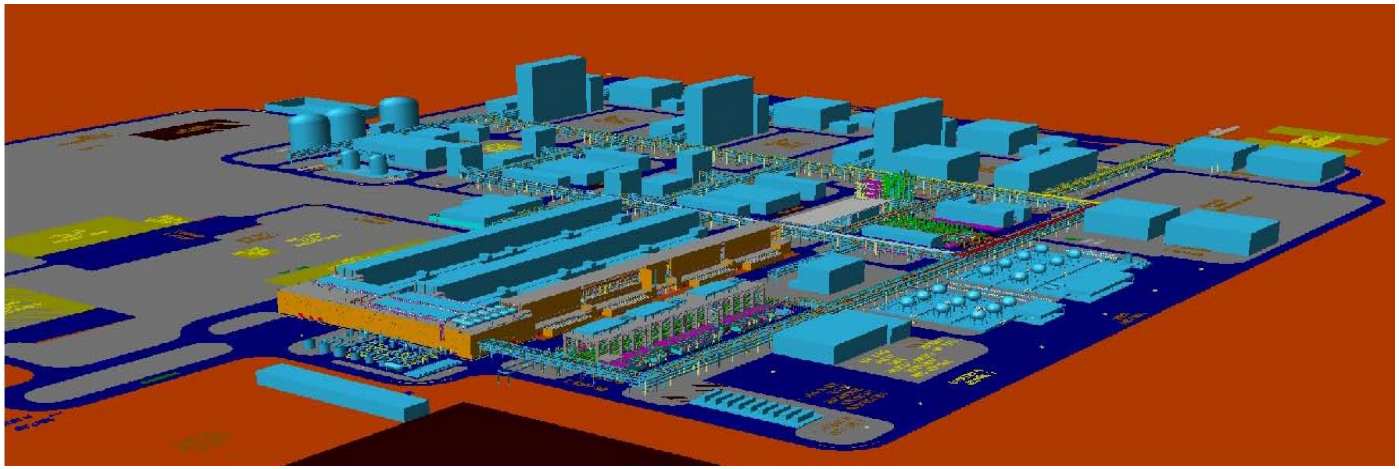
Azerbaijan

UPS-SYSTEMS

International Airports
Uch Kuduk & Baku
2 x 300 kVA

China

UPS-SYSTEMS



ITT – LDK Solar:
9 x 55 kW
9 x 90 kW
9 x 225 kW
9 x 500 kW

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India

PVD Plast Mould Industries Ltd. **Fiberweb (INDIA) Ltd:
1 x 500 kVA
1 x 1000 kVA

Iraq

UPS-SYSTEMS

Various Hospitals:

1 x 100 kVA
1 x 250 kVA
3 x 250 kVA
6 x 1000 kVA

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Power. Anytime. Anywhere.

Israel

UPS-SYSTEMS

Avgol Ltd. Barkan
1 x 975 kVA
2 x 1000 kVA
3 x 1500 kVA (dual output)
4 x 1300 kVA (dual output)

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Malaysia

UPS-SYSTEMS

X-FAB - Kuching
(previous 1St Silicon Waferfab Plant)
4 x 1500 kVA

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Malaysia

UPS-SYSTEMS

Securities Commission Building, Kuala Lumpur
2 x 150 kVA USV

Infineon Power Fab Kulim
6 x 2000 kVA USV (6,6kV)
2 x 2250 kVA ESV (6,6kV)

Prime Minister Office Putrajaya
1 x 1500 kVA (dual output)

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Pakistan

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International Airport Lahore:
1 x 200 kVA
1 x 250 kVA

Adamjee Group:
1 x 500 kVA

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Russian Federation

UPS-SYSTEMS

Moscow Government Central District:
1 x 150 kVA

Unicom Bank Moscow:
1 x 250 kVA

Moscow Interbank Currency Exchange:
1 x 500 kVA

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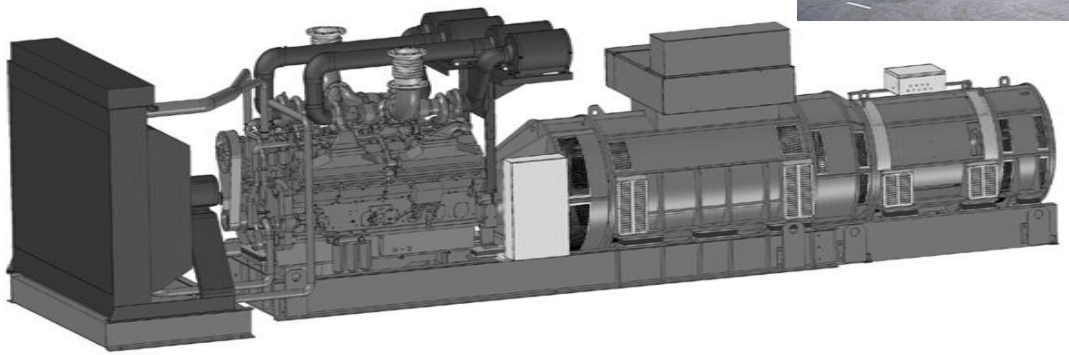
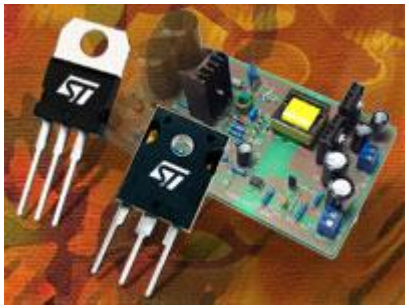
Singapore

UPS-SYSTEMS

Siltronic Samsung PTE Ltd
1 x 2000 kVA (dual output)





STMicroelectronics:
2 x 2000 kVA (dual output)
1 x 625 kVA (dual output)
2 x 1500 kVA
1 x 330 kVA (H-Vcon)

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Taiwan

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Veterans Hospital Taipei

2 x 400 kVA 60 Hz

2 x 600 kVA 60 Hz

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Thailand

UPS-SYSTEMS

Royal Thai Air Force:
1 x 120 kVA

VVIP Terminal – Suvarnabhumi Airport Bangkok:
1 x 550 kVA

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