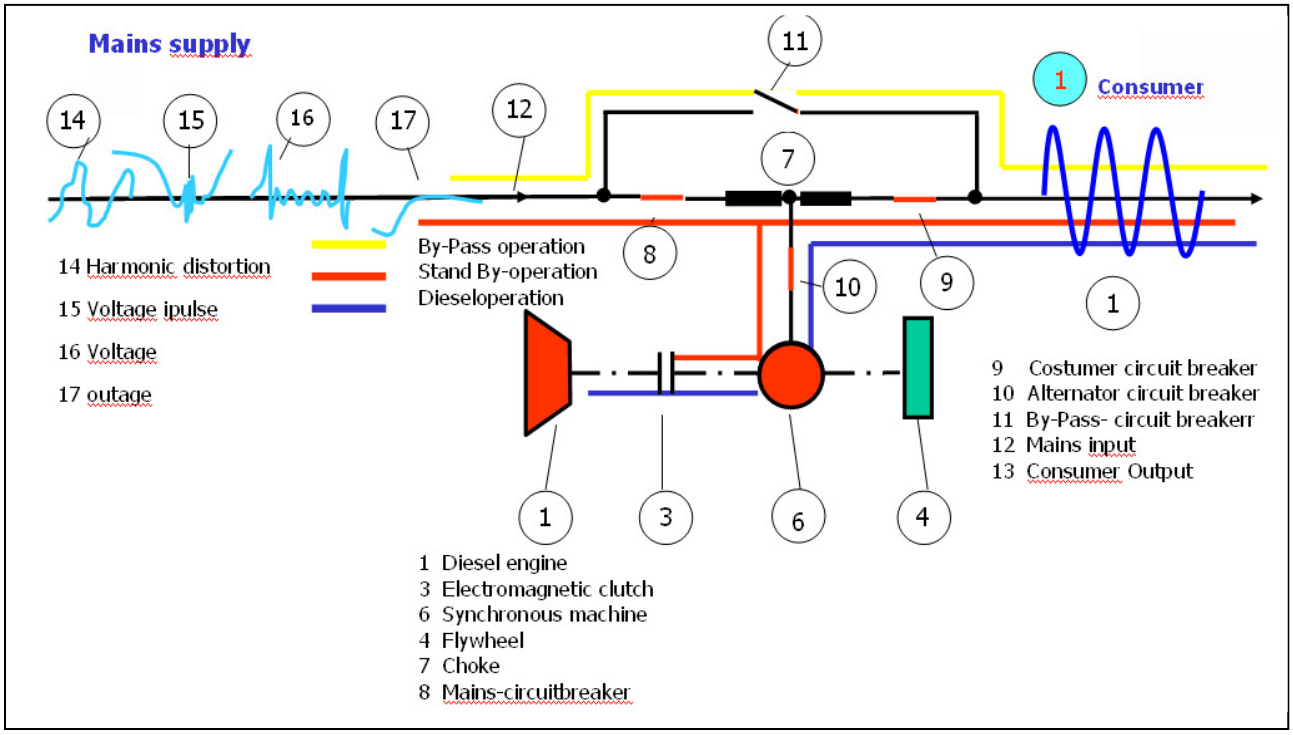
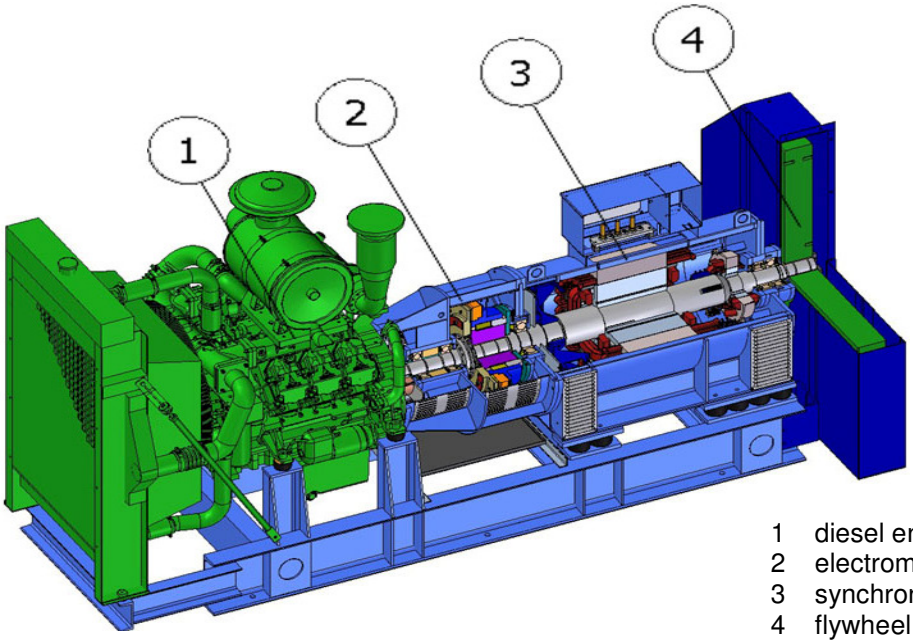
2 NBDD Diesel UPS System with Flywheel

2.1 Schematic Diagram NBDD System



Picture 1: Schematic Diagram NBDD System

2.2 Mechanical Assembly of the NBDD Machine Set



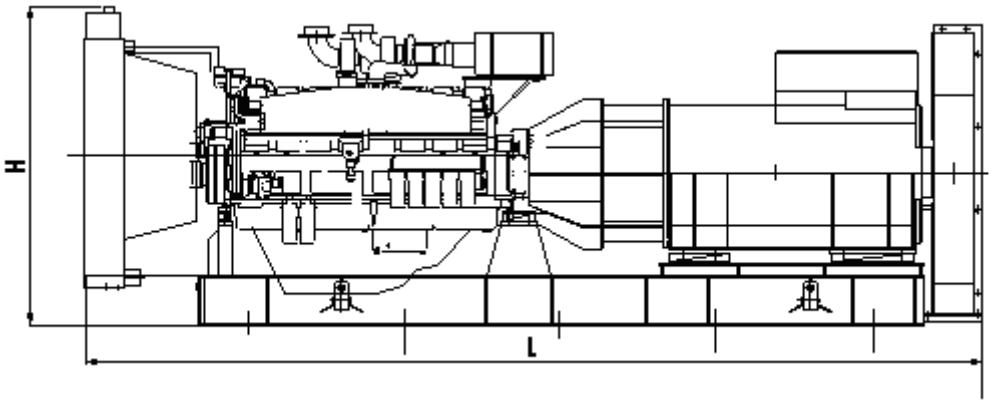
1 diesel engine
2 electromagnetic clutch
3 synchronous machine
4 flywheel

Picture 2: Mechanical design NBDD

2.3.5 Dimension and Weight of NBDD Systems

Rating [kVA]	Length (L) [mm]	Width (W) [mm]	Height (H) [mm]	Width incl. Flywheel [mm]	Weight [kg]
100	3750	800	1714	1300	3700
150	3750	880	1750	1500	4700
250	4550	980	1850	1600	5500
325	4500	1100	2000	1700	6200
425	5000	1300	2100	1800	6500

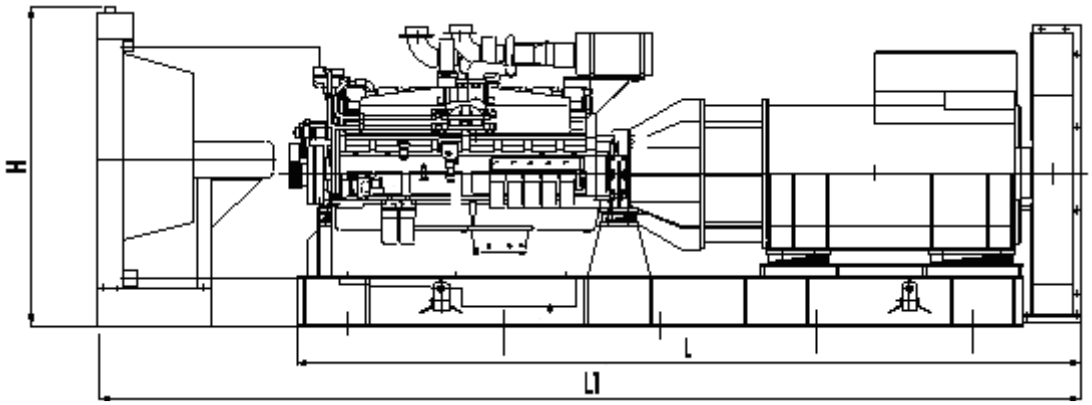
Table 2: NBDD Dimensions and Weight up to 425 kVA



Picture 4: GA - NBDD up to 425 kVA

Rating [kVA]	Length (L1) [mm]	Length (L) [mm]	Width (W) [mm]	Height (H) [mm]	Width incl. Flywheel [mm]	Weight [kg]
550	6000	5200	1300	2200		7000
700	6300	5400	1500	2400		10000
850	6800	5800	1772	1900		11000
1000	7100	6100	1772	2300		14800

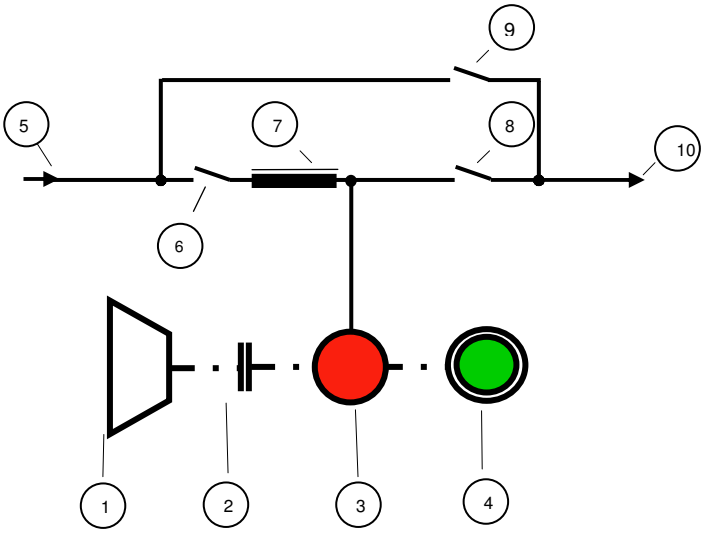
Table 3: NBDD dimensions and weights from 550 to 1000 kVA



Picture 5: GA - NBDD from 550 to 1000 kVA

2.4 NBDK Diesel UPS System with KIN Module

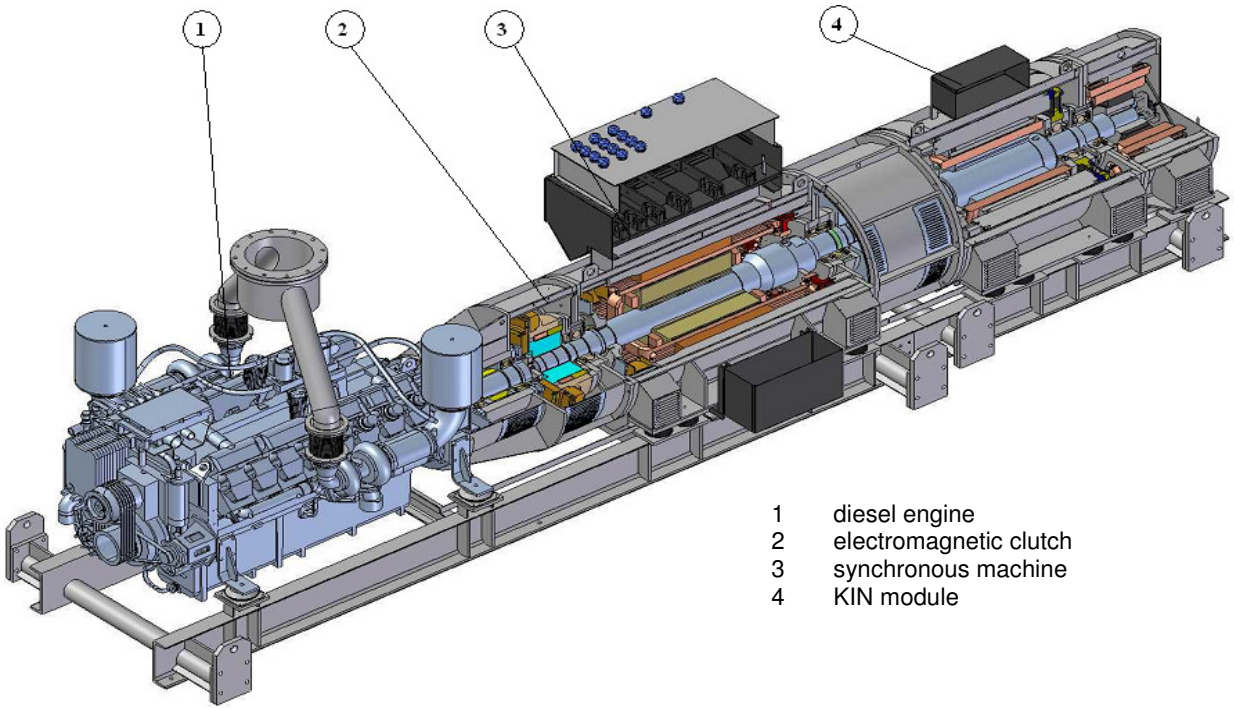
2.4.1 Single Line Diagram NBDK System



1 diesel engine
2 electromagnetic clutch
3 synchronous machine
4 KIN module
5 mains bus bar
6 mains CB
7 choke
8 Consumer CB
9 by-pass CB
10 consumer bus bar

Picture 6 NBDK Single Line Diagram

2.4.2 Mechanical Assembly of the NBDD Machine Set



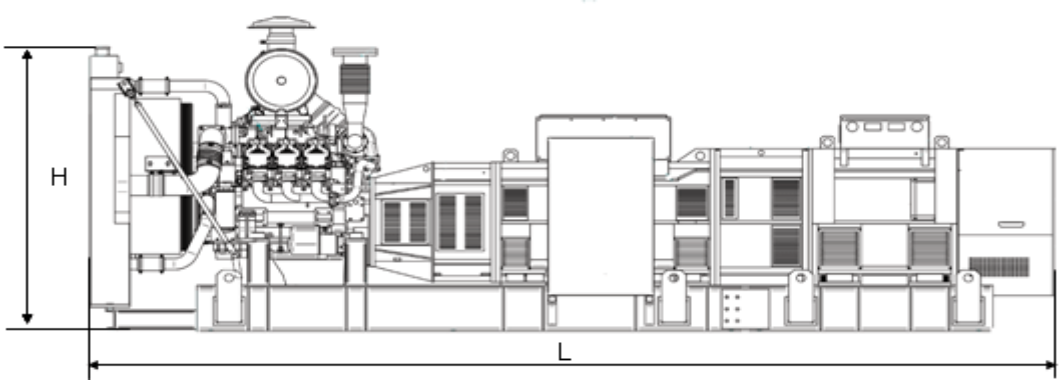
1 diesel engine
2 electromagnetic clutch
3 synchronous machine
4 KIN module

Picture 7 Mechanical design NBDK 1500kVA with MTU 12V4000 diesel engine

2.4.8 Dimensions and Weights of NBDK Systems

Rating [kVA]	Length (L) [mm]	Width (W) [mm]	Height (H) [mm]	Weight [kg]
150	5300	1010	1690	6100
250	5500	1010	1690	7600
350	5800	1200	1780	8500
500	6100	1200	1890	12900

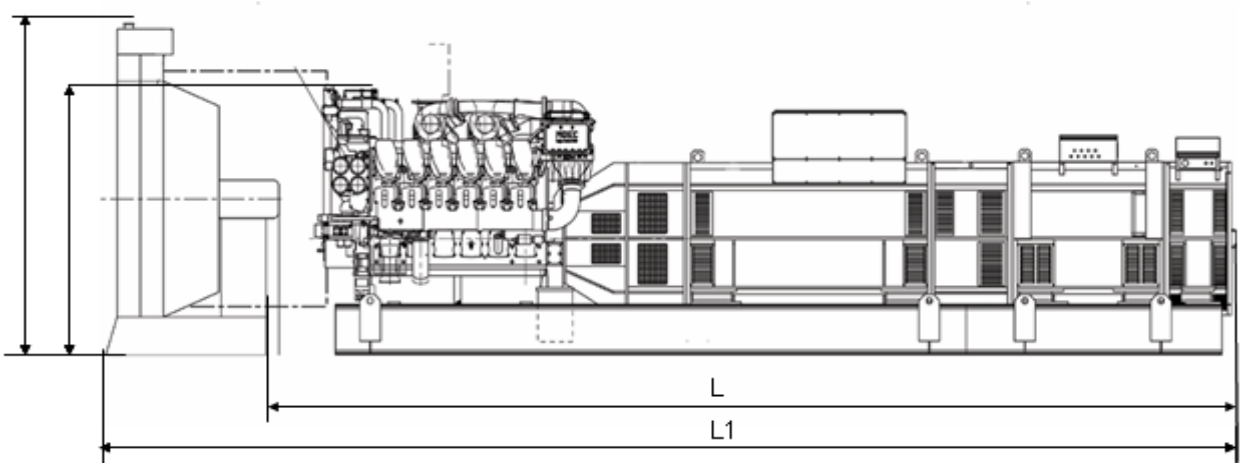
Table 4: Dimensions and weights NBDK up to 475 kVA



Picture 11: GA - NBDK up to 500 kVA

Rating [kVA]	Length (L1) [mm]	Length (L) [mm]	Width (W) [mm]	Height (H) [mm]	Height (H1) [mm]	Weight [kg]
625	8550	7200	1500	2400	2700	16500
800	9120	7550	1772	2400	2700	18500
900	9120	7550	1772	2600	2700	22000
1225	9120	7550	1722	26000	2700	22000
1500	10270	8500	1905	2790	2790	24510
1750	10570	8800	1905	2790	2790	26435
2000	10570	8800	1905	2790	2790	27730

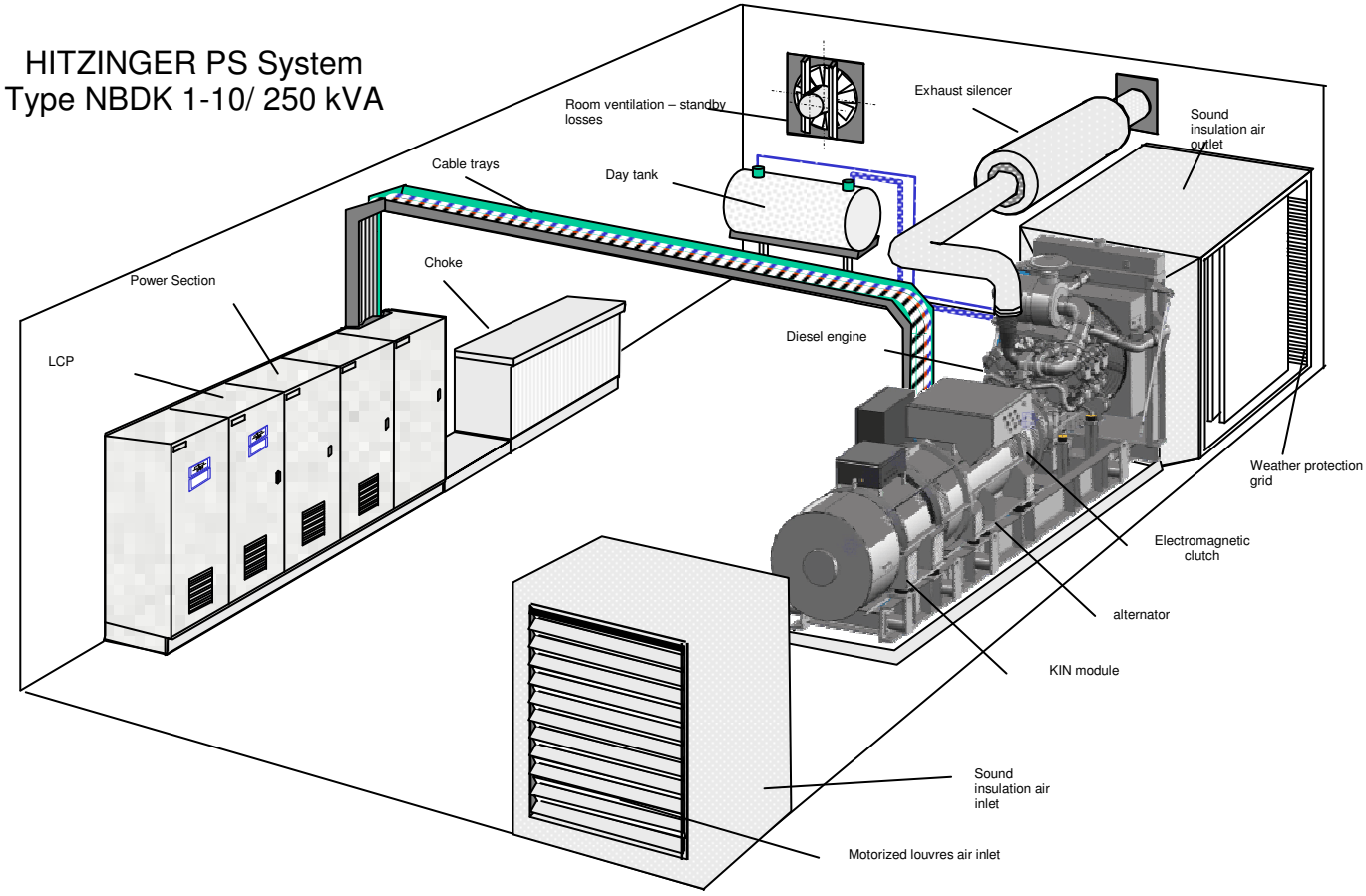
Table 5 Dimensions and weights NBDK from 600 kVA to 2000 kVA



Picture 12: GA - NBDK 600 kVA to 2000 kVA

12 Plant Layout

12.1 Standard-Layout of a UPS Installation

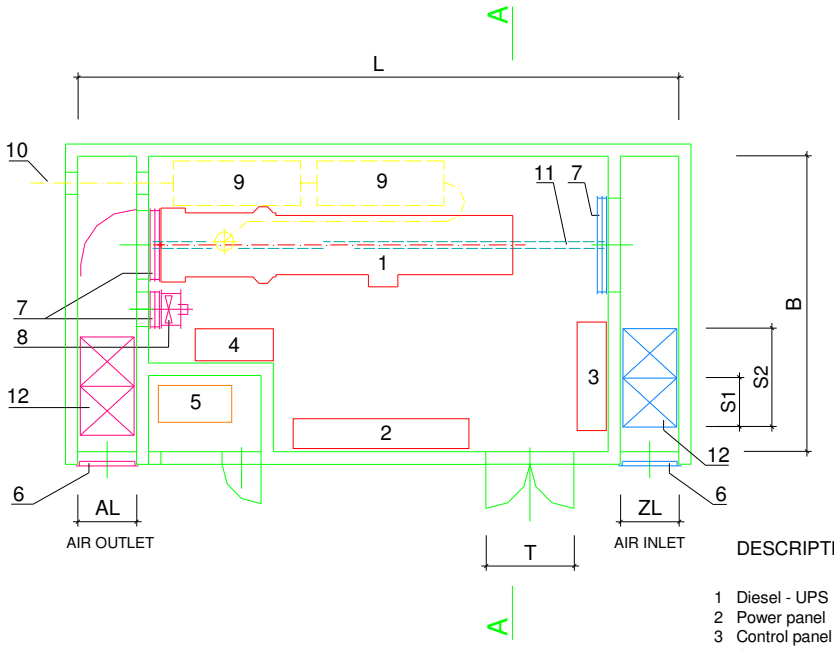


Picture 51: Standard layout of a UPS Installation

12.2 Problems of Installations in Existing Buildings

Certain criterions have to be considered if an UPS system is planned to be installed in an existing building. A check of these criterions during tender stage is mandatory.
In case of any doubts the evaluation of our engineering and R&D department is required.

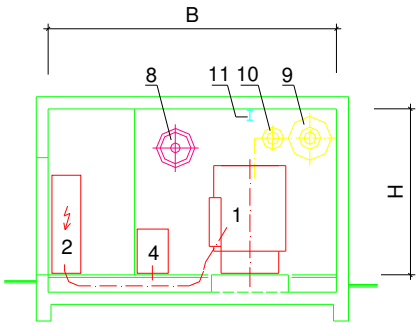
Example 2: UPS room with a max. sound level 70 dB(A) in 1m



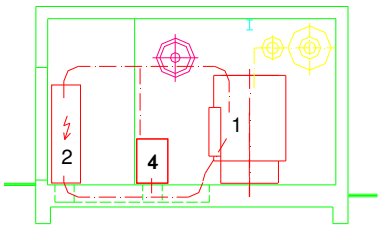
DESCRIPTION

1 Diesel - UPS
2 Power panel
3 Control panel
4 Choke
5 Fuel tank (content 8 hours full load)
6 Weather protection grills
7 Electrical driven louvres
8 Air outlet fan (operation during standby mode)
9 Exhaust silencer
10 Exhaust pipe system
11 Crane rail
12 Sound attenuator

SECTION A - A



Alternative 1 : Cable installation within false floor



Alternative 2 : Cable installation in cable ducts or tranches

UPS - Rating		L	B	H	T	ZL	AL	Fuel tank	Sound pressure level in 10 m
475 kVA		1100	560	320	150 / 220	2,0 m²	2,0 m²	1100 lit	with S1 : 70 dB(A) with S2 : 50 dB(A)
600 kVA	Cummins	1290	600	340	180 / 240	4,8 m²	4,8 m²	1400 lit	
	MTU	1230				3,4 m²	3,4 m²		
1000 kVA	Cummins	1510	610	360	200 / 280	6,0 m²	6,0 m²	2200 lit	
	MTU	1630				7,0 m²	7,0 m²		

All measures in CM !

Picture 53: Layout UPS room sound level 70 dB(A) in 1m

13 UPS Systems in a Sound Insulating Canopy

It is always mandatory to get technical approval of Hitzinger's R&D department before planning / installing a sound insulating canopy.

13.1 Canopy - NBDD

No special requirements for NBDD UPS systems, only the standby losses need to be considered during standby operation.

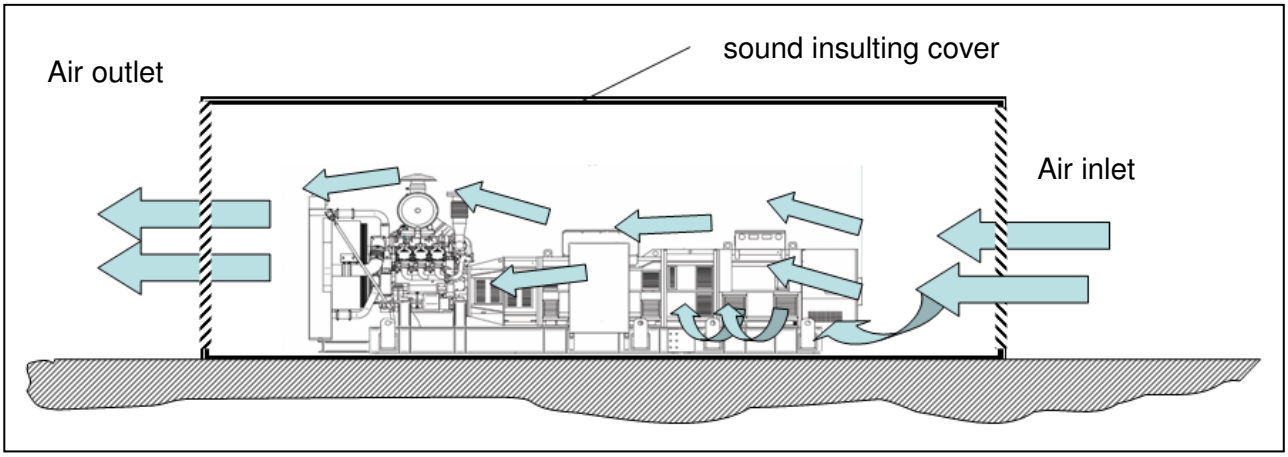
13.2 Canopy - NBDK

Sound insulating covers need to be easy dismountable, easy accessibly, and with an proper design air flow to guarantee a proper cooling air flow over the KIN module.

Due to the fact that the bearings of the KIN module need to be replaced after latest 5 years it must be guaranteed that KIN module can be deployed from the canopy / room in an easy and quick way. That means that all canopy covers (side walls, roof) in the area of the KIN module must be screwed or fixed with snap closures elements. It is required that the single cover elements can be dismounted by a single person.

13.3 Heat Dissipation KIN078 and KIN085 modules

KIN078 and KIN085 module canopies require fans that have enough pressure reserve to realize metal sheet ducts from the canopy to an external air outlet opening. The air flow needs to flow through the machine (inlet at exciter housing) and overflow the KIN module housing.



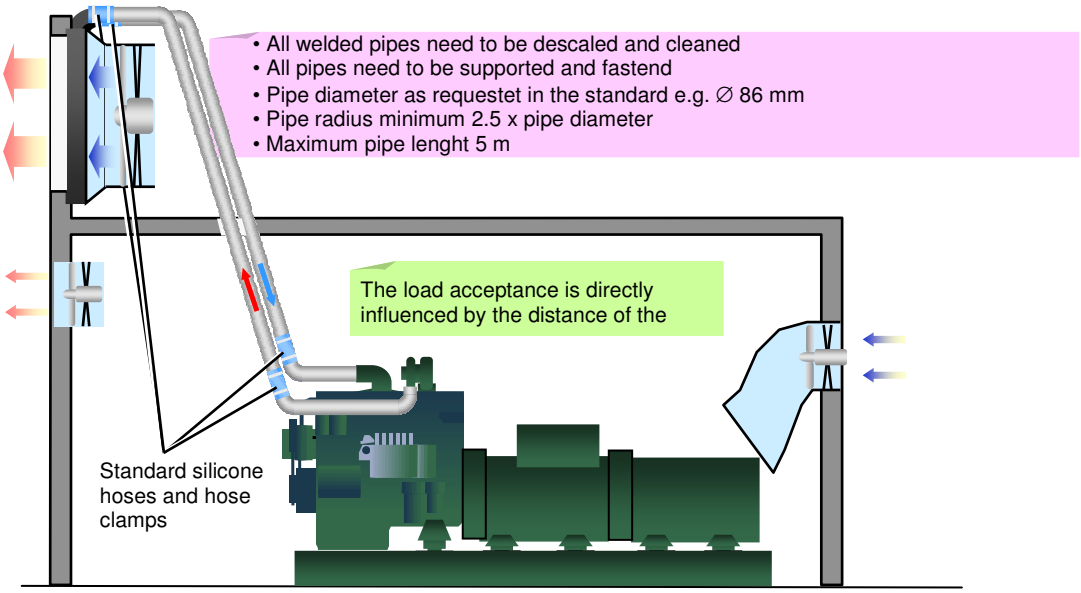
Picture 54: schematic air flow NBDK system

Following data are necessary for a proper air flow dimension:
heat dissipated by alternator (standby losses), KIN module, Cooling water heating, switch gear, choke, …

Calculation:

$$air\_quantity = \frac{3600 * P_V[kW]}{\delta t * \varsigma}$$

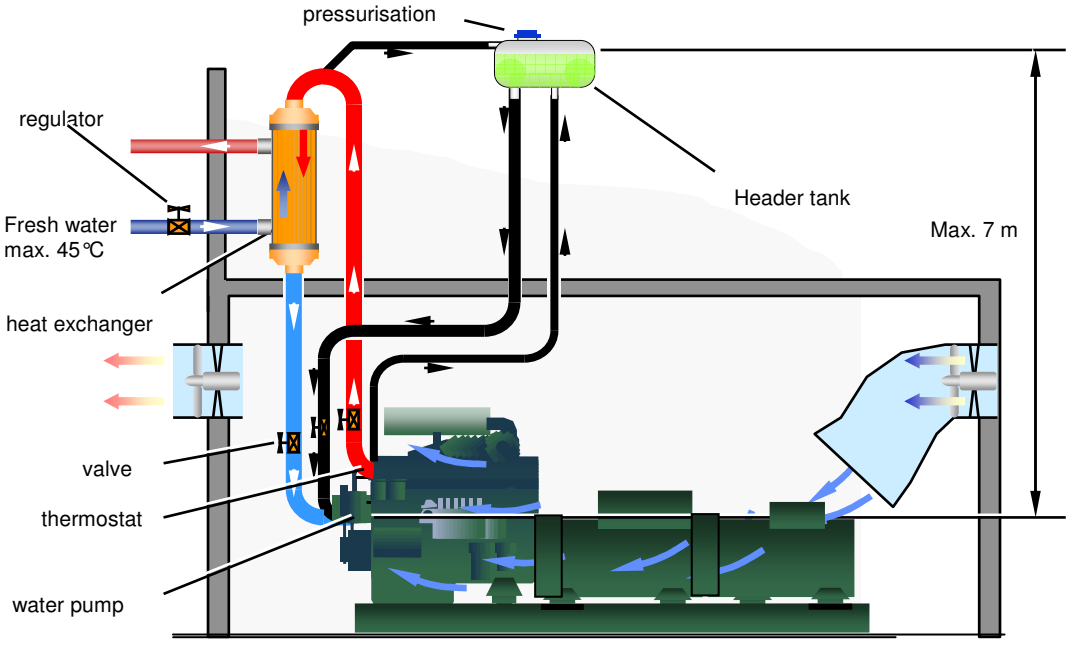
Pv= total losses in kW
δt= allowed temperature rise in the canopy
ς = (ro) = air density



Picture 55: Installation of a UPS with air – air radiator

14.2.3 Installation with Water - Water Heat Exchanger

In case of too small air in-/outlet openings it is possible to cool the diesel engine via water-water heat exchanger. In this installation only the radiated heat of the diesel engine, alternator, and Kin module has to be dissipated by the air flow openings. Room temperatures above 40°C should be avoided. During diesel operation it must be guaranteed that the max. room temperature is not higher than 30°C. Otherwise a performance reduction of the diesel engine has to be considered.



Picture 56: Installation UPS diesel engine with water –water heat exchanger