ECSO®

environmental complex solution

Diesel Power Plants ECSO

backup power supply for
data centers and communication centers

ECSO DGS application as backup electric power supply of IT-infrastructure facilities

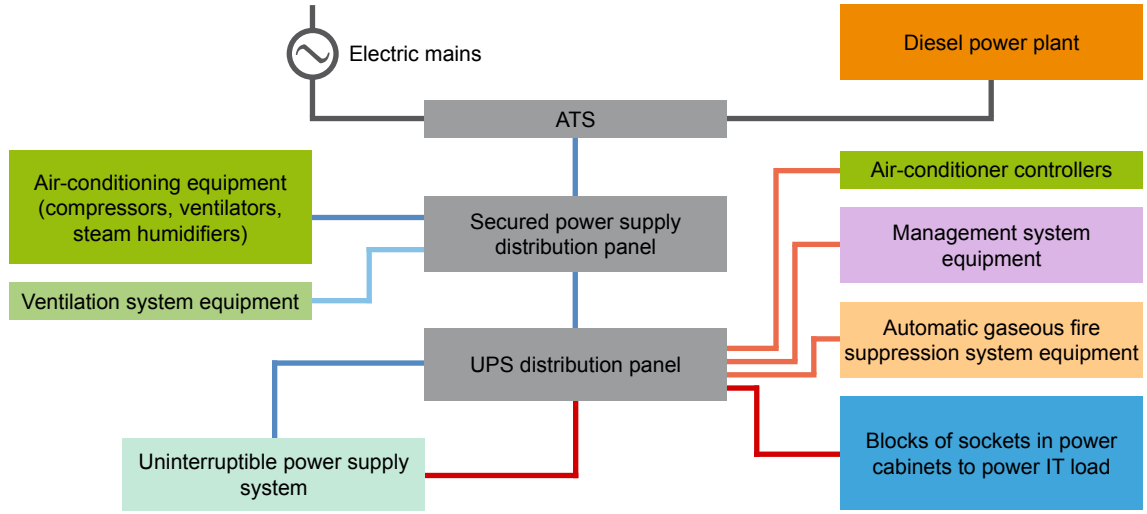
TYPICAL CIRCUIT CONNECTION

Backup Electric Power Supply System
is a set of equipment that supplies power to the facility during the mains outage for a time that is longer than the offline operation time provided by an uninterruptible power supply system. Ensuring backup power supply of IT equipment and the equipment of the supporting utility systems is key to maintaining the required fail-safety level of the whole facility.

The most widespread and well-developed backup power supply solution for IT-infrastructure facilities is a diesel power plant. A diesel power plant consists of both the diesel generator set that produces electricity and all the supporting equipment, e.g. container, ventilation system, exhaust system with muffler, additional fuel tank, fuel supply system, etc.

In case of power outage, the following operational sequence is carried out:

- After the voltage drops in the mains, electric power supply of IT equipment is ensured by uninterruptible power supply system.
- Diesel power plant is automatically started and its engine achieves rated rpm.
- Automatic Transfer Switch automatically switches the uninterruptible power supply system and other load (e.g. air-conditioning system) to be powered by diesel power plant.
- During the whole mains outage, the power supply for the IT equipment (via the uninterruptible power supply systems), air-conditioning and other systems comes from the diesel power plant.
- When the mains voltage is restored, the Automatic Transfer Switch automatically switches to the mains power supply and the diesel power plant is stopped.



The chart shows a typical example of a power supply organization for IT equipment and utility systems in a data centre with a diesel power plant as a backup source of electricity.

SPECIFICS OF DIESEL POWER PLANTS APPLICATION

Application of diesel power plants for IT systems power supply has its specifics that need to be considered as early as at the stage of technical specification development. Generally, most customers have a good understanding of what DGS they prefer to choose, yet, besides choosing the diesel generator set itself, it is necessary to consider quite a lot of points related to the list of equipment, location and consequent operation of the diesel power plant as a backup power supply source.

The main features of a diesel power plant that need to be considered while planning a backup power supply system are:

- DGS capacity;
- DGS list of equipment;
- DGS location: equipped room or container;
- availability of DGS monitoring system and the possibility to integrate it into the overall management system;
- noise level tolerance for the whole diesel power plant;
- maximum permissible concentrations (MPC) of emissions;
- fuel consumption and the running time on the currently available fuel;
- running time before overhaul.

ESTIMATING THE DGS RATING FOR IT-INFRASTRUCTURE FACILITIES

Diesel generator set capacity is determined by the total capacity of the load connected to the backup power supply system. In order to make a correct estimation, it is necessary to analyse the load types considering the power factors and total harmonic distortions THDi and their change in normal operation mode, input current distortions, starting currents, etc. As it is sometimes impossible to make a full estimation due to lack of sufficient baseline data, it is sensible to consider an estimation based on the parameters of the most significant loads. At IT-infrastructure facilities such load is the uninterruptible power supply and air-conditioning equipment.

In case of UPS it is, first of all, necessary to consider the harmonic distortion factor of the input current, for air-conditioning systems the important parameter is the value of starting currents for compressors and pumps. A high harmonic distortion factor may cause serious functional problems on DGS by introducing additional instability into the voltage and frequency regulation, which has to be compensated for by increased DGS rating. Modern UPS systems built on IGBT technology exert virtually no impact on power supply, whether it is external electric mains or a diesel generator set, as their harmonic distortion factor of the input current does not exceed 3%. Also, when the UPS battery charging mode is on while it is powered by the generator set, it is necessary to estimate the DGS rating considering the additional power used for charging the batteries.

An important parameter for estimating the DGS rating is also the minimum load capacity, as DGS operation at capacities below 25-30% of its rating seriously affects the performance of the set and causes its rapid wear.

While planning the DGS rating, one should also remember that the DGS ratings are given for a certain, usually low altitude and specific ambient temperature. Depending on the location of installation site, the higher the altitude and ambient temperature, the more powerful generator is necessary to achieve the target performance.

CONTAINERS FOR DIESEL POWER PLANTS

In order to install a diesel generator set within a building, it is necessary to have a specially prepared and equipped allocated room. The room for installing the DGS should be prepared and equipped to meet the following basic requirements:

- sufficient size for DGS mounting considering the requirements on the distance between the DGS and the walls;
- foundation for DGS;
- ventilation system;
- exhaust system;
- room sound attenuation;
- fuel supply system.

As a rule, it is problematic to allocate and correctly equip such a room in a building that is already constructed and being used, and consequently a diesel power plant has to be placed outside the building. Two placement options are possible in this case: within a sound-attenuated enclosure or a special container. Container placement of a diesel power plant is more preferable, especially in the case of backup generator for data centre or communications centre, as this solution ensures a more reliable protection both from weather influence and all kinds of tampering.

Container for installing the ECSO DGS diesel generator set is equipped with all the systems necessary for reliable operation as an IT-infrastructure facility backup power supply, namely:

- Thermal insulation of the enclosure with fire-proof thermal-insulation materials
- Sound attenuation of container
- Container internal heating system;
- Ventilation system with louvers and protective guards;
- Exhaust system and muffler;
- Primary and emergency lighting system;
- Fire alarm and fire-extinguishing system;
- Electric equipment, including the local distribution panel, primary and emergency lighting;
- Cable gland for power, control, and plant load cables.

If longer time of continuous diesel power plant operation is required, the container may be fitted with an additional fuel tank.

ECSO diesel generating set with AKSA engine

These diesel generating sets were designed for the generation of AC power with frequency of 50 Hz and an output voltage of 400/230V. They can be used as a backup or primary power sources. Can be supplied as open set on the base frame and in the soundproofed canopy that provides protection against weather.

Model	Power capacity, kVA		Engine model	Displacement, l	Fuel tank capacity, l	Fuel consumption at 100% load, l /h	Oil capacity, l	Coolant dimensions, l	Canopy dimensions, mm			Weight in canopy, kg
	Standby	Primary							Length	Width	Height	
DGS-12A	11,5	10,6	**A3CRX14**	1,4	35	3,5	4,5	7	1350	770	1150	500
DGS-16A	15,5	14,5	**A4CRX18**	1,8	35	4	5	9	1510	820	1150	650
DGS-20A	20	18	**A4CRX22**	2,15	95	5	10	10	1950	970	1300	825
DGS-25A	25	23	**A4CRX25**	2,54	95	6,2	10	11	1950	970	1300	850
DGS-33A	33	30	**A4CRX25T**	2,4	95	7,6	10	11	1950	970	1300	865
DGS-40A	40	36	**A4CRX32T**	3,1	82	10,5	11	18	2260	1000	1300	1170
DGS-50A	50	45	**A4CRX47**	4,68	145	11,5	14	18	2500	970	1570	1320
DGS-70A	70	64	**A4CRX46T**	4,58	145	17	14	19	2500	970	1570	1340
DGS-90A	93	85	**A4CRX46TI**	4,58	195	22	14	26	3110	1060	1750	1640
DGS-125A	125	115	**A6CRX65TA**	6,49	360	28	16	54	3250	1160	1900	1940
DGS-150A	150	137	**A6CRX69TA**	6,87	360	32,5	16	54	3250	1160	1900	2030
DGS-250A	250	200	**A6CRX98TA**	9,72	525	52	24	46	3900	1470	2200	3440

In this line of diesel generators the diesel engine manufactured by AKSA is used. Concern AKSA Power Generation has a large industrial factory production of diesel engines. Concern is part of the «KAZANCI HOLDING», which was founded in 1984 and is among the ten largest companies in Turkey. At present time the AKSA Company has become one of the leading companies in the world industry.

Standard Open Set Features

- Water cool ed di esel engi ne 1500 rpm
- Single bearing alternator, Class H
- Cooling radiator and fan
- Auto Mains Failure control panel DSE
- Mechanical/electronic governor
- Starter battery
- Battery charger
- Jacket water heater
- Fuel tank built in the base frame
- Welded steel base frame with anti-vibration mountings
- Fitted with low coolant level shutdown
- Standard type silencer

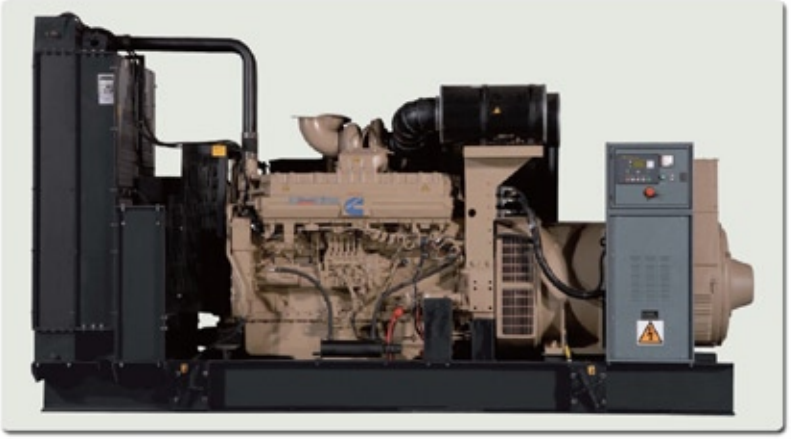
Options

- Residential silencer
- Circuit breaker
- Automatic transfer panel
- Additional fuel tank
- Automatic or manual fuel filling system
- Manual oil drain pump
- Oil heater
- Anti-condensation alternator heater
- Fuel – water separator type
- Remote monitoring system
- Tool kit for maintenance

Canopy

- Modular design (steel sheet 2 mm thickness)
- Soundproofed lit
- Anti – corrosion powder coating
- Lockable doors with key
- Protective mesh for rotating parts
- Doors on each side
- Exterior emergency stop push button
- Panel window
- Access to radiator filling or cap
- Oil drains and breather extended outside canopy
- Fuel fill and battery can only be reached via lockable access doors
- Lifting points on the top of canopy and base frame

ECSO diesel generating set with Cummins engine



These diesel generating sets were designed for the generation of AC power with frequency of 50 Hz and an output voltage of 400/230V. They can be used as a backup or primary power sources. There several optional types:

- Open set on the base frame
- In soundproofed and weather-protective enclosure
- In the container that serves as protection from environmental impact and ensuring safety operation and maintenance.

Model	Power capacity, kVA		Engine model	Displacement, l	Fuel tank capacity, l	Fuel consumption at 100% load, l /h	Oil capacity, l	Coolant dimensions, l	Canopy dimensions, mm			Weight in canopy, kg
	Standby	Primary							Length	Width	Height	
DGS-55C	55	50	**S3,8-G6**	3,8	105	9,5	11	15	1780	950	1250	870
DGS-66C	66	60	**S3,8-G7**	3,8	240	11	11	18	2150	1050	1450	950
DGS-110C	110	100	**6BTA 5,9-G5**	5,9	240	18	16,4	25	2200	1050	1600	1250
DGS-175C	175	160	**6BTAA 5,9-G5**	5,9	380	29	16,4	26	2300	1150	1700	1470
DGS-200C	200	180	**6CTA 8,3-G2**	8,3	380	30	23,8	36	2300	1150	1700	1700
DGS-250C	250	225	**6CTAA 8,3-G2**	8,3	390	38	23,8	32	2600	1150	1750	1940
DGS-350C	350	300	**QSL9-G5**	8,8	450	46	26,5	36	3000	1150	1900	2630
DGS-400C	400	360	**NTA 855 G4**	14	650	57	38,6	71	3250	1150	2000	3130
DGS-500C	500	455	**QSX 15 G6**	15	660	74,3	91	94	3560	1300	1970	4150
DGS-550C	550	500	**QSX 15 G8**	15	660	79	91	94	3560	1300	1970	4150
DGS-700C	700	638	**VTA 28 G5**	28	680	104	83	200	4000	1350	2180	5590
DGS-825C	825	750	**VTA 28 G6**	28	680	120	83	207	4000	1350	2180	5610
DGS-880C	880	800	**QSK 23 G3**	23,15	1250	121	103	160	4000	1710	2260	6060
DGS-1100C	1100	1000	**QST 30 G4**	30,48	1250	151	154	342	4400	1760	2350	7350
DGS-1410C	1410	1280	**KTA 50 G3**	50,3	2000	199	177	410	4950	2100	2500	9900
DGS-1675C	1675	1500	**KTA 50 GS8**	50,3	2000	238	204	643	5500	1950	2450	10400
DGS-2250C	2250	2000	**QSK 60 G4**	60,2	2000	291	280	682	6000	2500	3220	15500
DGS-2500C	2500	2000	**QSK 60 G13**	60,2	2000	302	280	720	6050	2600	3300	17200

Standard Open Set Features

- Water cooled diesel engine 1500 rpm
- Single bearing alternator, Class H
- Cooling radiator and fan
- Auto Mains Failure control panel DSE
- Mechanical/electronic governor
- Starter battery
- Battery charger
- Jacket water heater
- Fuel tank built in the base frame
- Welded steel base frame with anti-vibration mountings
- Fitted with low coolant level shutdown
- Standard type silencer

Options

- Residential silencer
- Circuit breaker
- Automatic transfer panel
- Additional fuel tank
- Automatic or manual fuel filling system
- Manual oil drain pump
- Oil heater
- Fuel heater
- Anti-condensation alternator heater
- Fuel – water separator type
- Remote monitoring system
- Synchronization panel
- Tool kit for maintenance

Canopy

Specially designed enclosures provide protection for diesel generator sets from atmospheric influences. The body shell is made of steel, powder-coating method is executed.

The enclosure is designed to provide easy access for maintenance and to optimize cooling efficiency of the generating set.

Container

To place an ECSO DGS outside the building, we can offer you two choices: soundproofed and weather-protective canopy or a special container. Placement of ECSO DGS in the container is more secure considering the influence of weather conditions and all sorts of possible illegal actions. The container for the installation of ECSO diesel generator is equipped with all systems necessary for its reliable operation:

- Thermal insulation of the container with fire resistant insulating material
- Soundproofing of the container
- The system of internal heating of the container
- Ventilation system with shutters and safety grills
- Exhaust residential silencer
- Standard and emergency lighting
- Electrical equipment
- Cable inlet

If there is need to increase DGS uptime, the container may include an additional fuel tank.

ECSO diesel generating set with Doosan engine

These diesel generating sets were designed for the generation of AC power with frequency of 50 Hz and an output voltage of 400/230V. They can be used as a backup or primary power sources. There several optional types:

- Open set on the base frame
- In soundproofed and weather-protective enclosure
- In the container that serves as protection from environmental impact and ensuring safety operation and maintenance.

Model	Power capacity, kVA		Engine model	Displacement, l	Fuel tank capacity, l	Fuel consumption at 100% load, l /h	Oil capacity, l	Coolant dimensions, l	Canopy dimensions, mm			Weight in canopy, kg
	Standby	Primary							Length	Width	Height	
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DGS-550C	550	500	**QSX 15 G8**	15	660	79	91	94	3560	1300	1970	4150

Doosan engines, used in our ECSO DGS, are based on well-known series of diesel MTU 183 series (joint development of MTU and MAN). This engine produced more than 30 years in Germany, the design is well developed, expendable items for a service manufactured by several independent companies. It is because of its simplicity and reliability Doosan engines are very popular among manufacturers of diesel generator sets around the world. Design features of Doosan engines and their low forcing help to reduce noise and enhance the resource. The fuel injection pump system has classic inline design, which significantly improves reliability and maintainability of the engine.

Standard Open Set Features

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- Mechanical/electronic governor
- Starter battery
- Battery charger
- Jacket water heater
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- Welded steel base frame with anti-vibration mountings
- Fitted with low coolant level shutdown
- Standard type silencer

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- Soundproofing of the container
- The system of internal heating of the container
- Ventilation system with shutters and safety grills
- Exhaust residential silencer
- Standard and emergency lighting
- Electrical equipment
- Cable inlet

If there is need to increase DGS uptime, the container may include an additional fuel tank.

ECSO diesel generating set with John Deere engine

These diesel generating sets were designed for the generation of AC power with frequency of 50 Hz and an output voltage of 400/230V. They can be used as a backup or primary power sources. There several optional types:

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- In soundproofed and weather-protective enclosure
- In the container that serves as protection from environmental impact and ensuring safety operation and maintenance.

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	Standby	Primary							Length	Width	Height	
DGS-33JD	33	28	**3029 DF**	2,9	70	5	6	12	1500	900	1250	720
DGS-45JD	44	40	**3029 TF**	2,9	105	7,5	8,5	18	1780	950	1150	830
DGS-75JD	75	68	**4045 TF**	4,5	240	12,2	13,2	21,5	2150	1050	1460	1050
DGS-90JD	90	80	**4045 TF**	4,5	240	14	12	21,5	2150	1050	1460	1120
DGS-110JD	110	100	**4045 HF**	4,5	240	16,5	12	30,3	2200	1060	1600	1200
DGS-132JD	132	120	**6068 TF**	6,8	380	18,5	19	25,5	2300	1150	1550	1380
DGS-170JD	170	155	**6068 HF**	6,8	380	25	19	34,5	2400	1150	1550	1535
DGS-200JD	200	180	**6068 HF**	6,8	380	31,5	34	40	2400	1150	1550	1620
DGS-275JD	275	250	**6081 HF**	8,1	500	40,5	32	44	2900	1150	1900	2120

John Deere (USA) is the the world-famous manufacturer of agricultural machinery, tractors and industrial diesel engines. Most of the engines produced are used in tractors, harvesting equipment, as well as on diesel power plants. Preferably, the John Deere engines are used in diesel generators from Europe and the USA. The engines are characterized by extremely high reliability and extreme ease of operation – spare parts are suitable for replacement, access to all parts is simple, even for units in the enclosure. The most popular power range for John Deere diesel engines is from 30 to 200 kW.

Standard Open Set Features

- Water cool ed di esel engi ne 1500 rpm
- Single bearing alternator, Class H
- Cooling radiator and fan
- Auto Mains Failure control panel DSE
- Mechanical/electronic governor
- Starter battery
- Battery charger
- Jacket water heater
- Fuel tank built in the base frame
- Welded steel base frame with anti-vibration mountings
- Fitted with low coolant level shutdown
- Standard type silencer

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- Automatic or manual fuel filling system
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- Anti-condensation alternator heater
- Fuel – water separator type
- Remote monitoring system
- Tool kit for maintenance

Canopy

- Modular design (steel sheet 2 mm thickness)
- Soundproofed lit
- Anti – corrosion powder coating
- Lockable doors with key
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- Doors on each side
- Exterior emergency stop push button
- Panel window
- Access to radiator filling or cap
- Oil drains and breather extended outside canopy
- Fuel fill and battery can only be reached via lockable access doors
- Lifting points on the top of canopy and base frame

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