



DIESEL GENERATOR INSTRUCTION & MAINTENANCE MANUAL

**ETT-GENERATOR
2016**



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1- PREFACE

Thank you for choosing ETT generator.

Our company manufactures generator sets between 10 kVA and 2.250 kVA powers with fully automatic control panels, sound proof canopies, trailers and synchronization systems and provides technical service and spare parts support.

This instruction and maintenance manual is prepared to be used your generator in the best way and to help the installation of it.

General safety rules and technical informations are in the content.

We wish you healthy and beautiful days.


2- INTRODUCTION

Generators are delivered to our customers as ready for operation, motor oil and antifreeze coolant are filled, the battery is charged.

After the generator exhaust system and electrical connections are made in the supervision of authorized service, can be operated immediately after refueling.

All informations about your generator are declared on the product label as the following example. Product label is located on the automatic control panel of open the generator or the sound proof canopy of canopied generator.

3- PRODUCT LABEL

	
Genset Model	ETT-55E
Genset Serial No	CE-15085158
Engine Model	K4100ZDS
Engine Serial No	15085158
Alternator Model	WHI224D
Alternator Serial No	1545085
Standby Power (kVA)	55
Standby Current (A)	79
Voltage (V)	400 / 230
Frequency (Hz)	50
Speed (rpm)	1500
Power Factor	0,8
Phase	3
Dimensions LxWxH (mm)	2250x1000x1500
Weight (kg)	1100
Fuel tank capacity (L)	140
Manufacturing Year	2016
Output rating based on ISO8528 standards	
Made in TURKEY www.ett.com.tr 	
T: +90 212 438 3 825 F: +90 212 438 3 856	

The generator model contains the infromations below:

	ETT	-	55	E
* Generator Brand	_____			
* Generator Standby Power (kVA)			_____	
* Serial Code				_____

4- WARNINGS



- * If the danger occurs when the generator is running, primarily press the emergency stop button which located on the control panel or canopy. After eliminating dangerous situation, open button by turning back.
- * If your generator does not run automatically despite electrical power shortage, the emergency stop button could have stayed down. Please check it.



- * Generator is very important device due to it's usage purpose, supplies electrical energy for critical facilities like airports, hospitals, fire suppression systems, elevators, ventilation systems etc. need uninterrupted power. For this reason, the generator's production, transportation, installation, inspection and maintenance, training of personnel etc. are issues that need to be very careful.
- * Because the generator is a device which is activated automatically, when the mains fails, electrical systems in the generator and the building should not be interfered.
- * Before operating the generator, this instruction manual and engine, alternator and control module manuals must be read.
- * If the control module indicates the failure alarm, never start the generator without eliminating entirely the fault.



- * Do not connect the generator directly to the load without using transfer panel or selection switch with generators and mains positions.
- * While assembling power cables, the load must be distributed in a balance to each phase.
- * If the generator used in accordance with the information and security measures in this instruction manual, is designed to be safe device.

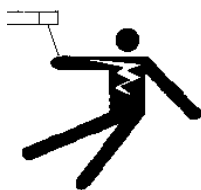


- * If you think in any way occurs a dangerous situation at generator, press the emergency stop button, disconnect the battery 's negative (-) terminal, do not use the generator until the dangerous situation eliminated.
- * The load and control cables of generator must be passed through the cable channel. The same channel must not be used for fuel pipes of an external fuel tank.
- * Before starting to maintenance or cleaning of generator, certainly the battery negative (-) terminal must be disconnected.



- * Staff will use the generator must wear thick rubber soled shoes and if possible, should work on rubber mat. The hand tools used must be insulated.

- * For a safe operation of electrical equipment, they must be installed and used properly.



- * Generator's control and load cable connections must be performed by an experienced electrician necessarily. Mistakes to be made in a cable connections of generator may occurs danger, as well as it will cause severe damage to your generator.

- * Wiring between the generator and the load must be used according to the power of generator. The use of unsuitable materials may cause a fire or electric shock.



- * When installing and removing the generator's load connections, make sure that the ground is not wet.
- * No one should touch the electrical parts of generator except the authorized electrician.
- * Connect the generator to the load which has and appropriate power and electrical characteristics.



* Generator's electrical connections must be made in accordance with the electrical standards and generator must be grounded by making the connection to the grounding bolt on the chassis of the generator. All metal surfaces including doors of the generator is electrically connected to the grounding bolt.



* Engine exhaust gas is extremely harmful to human health . When using a generator indoors, exhaust gas must be thrown out through pipes in compliance with related standards. Exhaust gases must be continuously checked whether the leak.

* Flammable material should not be placed on the exhaust system .

* Generator exhaust system must not be touched during operation. Flammable materials and objects should not be approached to the exhaust system.



* Engine should not be touched while the engine is hot and should not open the radiator cap.

* Check the exhaust system output and rain cover are open while the generator is running .

* Generator fuel can ignite or explode improper use. Therefore, should certainly have fire extinguishers around the generator and fire fighting personnel should be given training.



* Generator room must be airy. Fuel, oil, antifreeze and electrolytes should not be poured on floor.

* Do not keep flammable liquids near the engine.

* Generator should not be near the fire burning , smoking should be avoided .

* Do not fill the fuel while generator running



* While open-type generator is running, must be avoided from rotating parts.

* While generator is running, do not fill fuel, oil and radiator cooling water.

* While generator is running, do not make maintenance and cleaning. Do not forget that generator radiator fan can pull lightweight materials such as cleaning cloth into the radiator.

* While generator is running, if an adjustment needs to be made should be very careful.



* Noise level of open type generator may be greater than 105 dBA and long-term exposure to more than 85 dBA, may harm your hearing.

* When you are next to the open type generator, absolutely ear protection must be used.



* Open and canopied type generators must be lifted from signed lifting points.

* While lifting generator, appropriate lifting equipments must be used in compliance with weight indicated on product lable.

* While lifting generator, around lifting equipment should not be staff with the exception of the operator.



* Generator should be interfered by authorized repair service.

* Automatic generator may be runned suddenly, please prevent the intervention of unexperienced people.



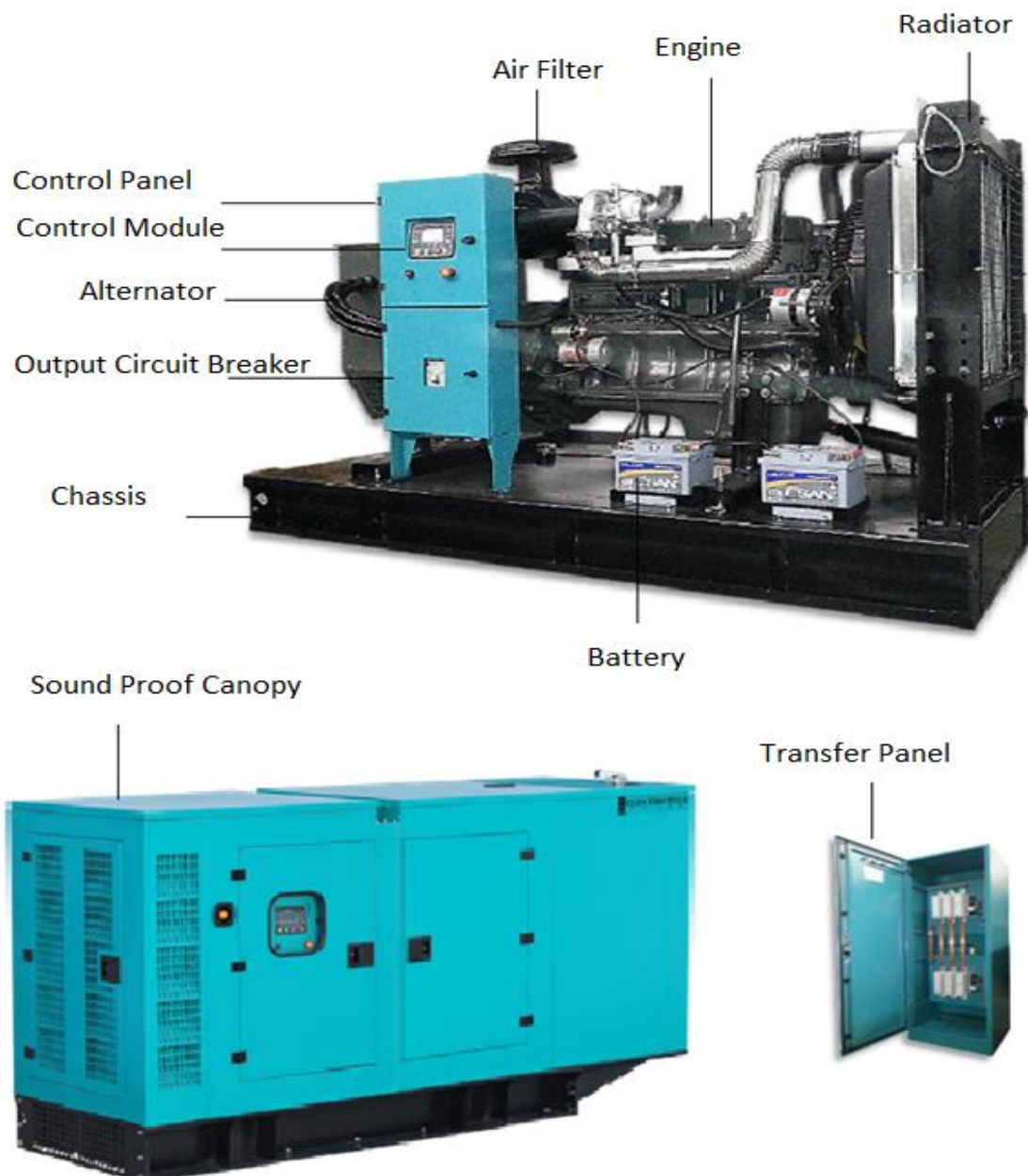
* Generator must be protected against water and humidity as possible to that of an electrical device.

* Open type generators and transfer switches must be protected against weather environment. There is not such a need for canopied type generators.

5- GENERATOR AND IT'S PARTS

5.1- Definition: Generator is a system which is mainly consist of diesel engine that produces rotational movement and alternator that is coupled to diesel engine and generates electrical energy. Generator can be used in the regions where there is not electricity (mining, road construction, suburban sites, movie sets, border patrol etc.) as permanently and can be used in applications where electricity usage is critical (airports, hospitals, schools, factories, rail, etc.) as a network (mains) backup.

Generally, generator is a device which generates the alternating current at 400/230 V - 50 Hz or 480/277 V - 60 Hz or 380 /220 V - 60 Hz or 220/127 V - 60 Hz voltages and frequencies.



5.2- Chassis: All equipment of the generator is mounted on the steel chassis, inside of it the fuel tank is available. Diesel suction and return hoses, fuel filler cap, fuel level indicator float, lifting holes located on the generator chassis (frame). The fuel tank is designed to feed to the generator at least eight hours of continuous operation. External fuel tank is provided for the generators above 1100 kVA power. Engine and alternator are mounted on chassis with anti- vibration mounts .

5.3- Engine: Diesel engine that rotates the alternator to generate electricity. Diesel engines used in our generators are long-life industrial type, 4-stroke, water cooled, 3-4-6-8-10-12-16 cylinders, in-line or V-type cylinder and with mechanical or electronic governor.

Electrical system: According to the model and power of the engine, electrical system voltage is 12 V or 24 V DC. Starter that provides the first movement to engine, charging alternator, stop solenoid ,actuator, fuel solenoid, electronic voltage regulator, control panel, control module, protection and alarm devices, sesors, switches, etc, are parts of electrical systems.

Lubrication system: Oil pump, oil filter and oil cooler are the parts of lubrication system. Changing engine oil and filter on time ensures efficiency and long lasting of engine.

Recommended lubrication oil for diesel engines quality level API is CH / CI-4. SAE values of the oil to be used according to the ambient temperature are,

* Every Season

- 15 °C / + 50 °C degrees ambient temperature ----- SAE: 5W40 - 15W40
- 20 °C / + 40 °C degrees ambient temperature ----- SAE: CI-4 10W30

* Winter Season

- 30 °C / + 20 °C degrees ambient temperature ----- SAE: 5W30
- 40 °C / + 0 °C degrees ambient temperature ----- SAE: 0W30

Cooling system: Our generator's engines are water-cooled engines . Cooling system is consist of radiator, fan, recirculating pump and a thermostat . When the engine hot, the radiator cap should not be opened.

Jacket water heater: While the engine is not working that is used to keep the engine body at a constant temperature in summer and winter. This type heaters work with the external electricity. Where the absence of network (electricity), heaters working with diesel fuel are used as option. When the cooling system is emty, the engine jacket water heater must not be operated .

Filters: Our generator's engines have changeable air filter, oil filter, fuel filter and water filter (opsion).

Sensor and alarm switches: OLCUSAN VDO brand oil and temperature sensor / alarm switches are used in our generators.

Battery: The battery feeds the starter that provide the first movement of the engine. That's why the battery is one of the most important part of generator.

If the battery has been discharged does not start the generator. Therefore it must be checked frequently.

While generator is not running, the battery is charged by charger which is located in automatic control panel.

While generator is running, the battery is charged by charge alternator which is a part of the engine.

The batteries are being used in our generators, are lead-acid type and have different amperage and voltage (12 V or 24 V DC) depending on the generator's power and model . Two units of 12 V batteries are used in 24 V systems. When connecting the battery cables, firstly the positive (+) terminal and seconly the negative (-) terminal must be connected. When disconnecting the battery cables, firstly the negative (-) terminal and secondly the positive (+) terminal must be disconnected.

Batteries emit explosive gas while charging . This is why approaching to the battery with fire is dangerous.

Generator efficiency: To use generator efficiently with low fuel consumption required to do the followings:

- * Timely maintenance
 - * Quality fuel and oil use
 - * Engine fuel injectors must be clean and regulated.
 - * Having been the engine valve timing.
 - * Not using generator in overload.
 - * Replacing worn parts on the time.
 - * Not using the generator below 35 % of the standby power.
- * Please read the engine manual for more information.

5.4- Alternator: The alternator is an equipment which generates electrical energy. Our alternators having an IP21 protection class, self excited, self regulated and brushless.

- * Please read the alternator manual for more information.

5.5- Control Panel: The control panel execute the followings: provides start and stop of the generator, controls the mains and generator voltages, protect the generator, display technical information to user.

The control panel consists of control module, battery charger, emergency stop button, an audible and visible alarm, fuses, electrical wirings, etc.

Control Module:

Our products are used as standard DATAKOM DKG309 control module .
General features and usage of these modules are described below.



The unit is a control and protection panel used in gensets. It shows the measured values on its displays. The unit is designed to provide user friendliness for both the installer and the user. Programming is usually unnecessary, as the factory settings have been carefully selected to fit most applications. However programmable parameters allow the complete control over the generating set. Programmed parameters are stored in a Non Volatile Memory and thus all information is retained even in the event of complete loss of power.

The measured parameters are:

Mains voltage phase L1 to neutral
Mains voltage phase L2 to neutral
Mains voltage phase L3 to neutral

Gen voltage phase L2-L3
Gen voltage phase L3-L1
Gen current phase L1

Gen pf phase L1
Gen pf phase L2
Gen pf phase L3

Mains voltage phase L1-L2
Mains voltage phase L2-L3
Mains voltage phase L3-L1
Mains frequency

Gen current phase L2
Gen current phase L3
Gen frequency
Engine speed (rpm)
Gen KW phase L1
Gen KW phase L2
Gen KW phase L3
Gen total KW

Gen total pf
Battery voltage,
Coolant temperature
Oil pressure
Oil temperature
Fuel level

Led Displays:

The unit has 12 LEDs, divided in 3 groups:

Grup_1: Operating mode: This group indicates the genset function.

Grup_2: Mimic diagram: This group indicates the current status of the mains and genset voltages and contactors.

Grup_3: Warnings and alarms: This group indicates the existence of abnormal conditions encountered during operation.

<u>Function</u>	<u>Color</u>	<u>Description</u>
MAINS ON	Green	The LED will turn on when all 3 mains phase voltages are within the limits.
MAINS OFF	Red	The LED will turn on when at least one of the mains phase voltages is outside limits.
LOAD MAINS	Green	It turns on when the mains contactor is activated.
LOAD GENERATOR	Yellow	It turns on when the generator contactor is activated.
GENERATOR	Yellow	The LED will flash when the engine is running. It will turn on steadily when all 3 generator phase voltages are within the programmed limits.
TEST	Yellow	It turns on when the related operation mode is selected. One of these LEDs is always on and indicates which operation mode is selected. If the operation of the genset is disabled by the weekly operation schedule, then the AUTO led will flash.
RUN	Yellow	
STOP	Yellow	
AUTO	Green	
ALARM	Red	If a fault condition resulting to the engine shutdown has occurred, the alarm led turns on steadily. If a load dump condition occurs, this led will flash. Alarms work on a first occurring basis. The occurrence of a fault will disable other faults of lower or equal priority.
WARNING	Red	If a warning condition has occurred, this led turns on steadily. The warnings work on a first occurring basis. The occurrence of a warning will disable other warnings, however shutdown and load dump alarms are still allowed.
SERVICE REQUEST	Red	Engine periodic maintenance request indicator. It turns on when the preset engine hours or time duration after previous service has elapsed.

Alarms and Warnings:

Alarms indicate an abnormal situation in the generating set are divided into 3 priority levels:

1- ALARMS: These are the most important fault conditions and cause:

- * The ALARM led to be on steadily,
- * The genset contactor to be released immediately,
- * The engine to be stopped immediately,
- * The genset contactor to be released immediately,
- * The Horn, Alarm, Alarm+Load_dump and Alarm+Load_dump+Warning digital outputs to operate, (if selected via programming menu)

2- LOAD_DUMPS: These fault conditions cause:

- * The ALARM led to flash,
- * The genset contactor to be released immediately
- * The engine to be stopped after Cooldown period,
- * The Horn, Alarm+Load_dump and Alarm+Load_dump+Warning digital outputs to operate, (if selected via programming menu)

3-WARNINGS: These conditions cause:

- * The WARNING led to be on steadily,
- * The Horn and Alarm+Load_dump+Warning digital outputs to operate, (if selected via programming menu)

If the ALARM MUTE button is pressed, the Horn output will be deactivated; however the existing alarms will persist and disable the operation of the genset.

Alarms operate in a first occurring basis:

- * If an alarm is present, following alarms, load_dumps and warnings will not be accepted,
- * If a load_dump is present, following load_dumps and warnings will not be accepted,
- * If a warning is present, following warnings will not be accepted.

Alarms may be of LATCHING type following programming. For latching alarms, even if the alarm condition is removed, the alarms will stay on and disable the operation of the genset. The existing alarms may be canceled by pressing one of the operating mode buttons (LOAD TEST / TEST / OFF / AUTO).

Most of the alarms have programmable trip levels. See the programming chapter for adjustable alarm limits.

Low Oil Pressure: Set if a signal is detected at the Low Oil Pressure Switch input or the oil pressure value measured from the sender is below the programmed limit. Warning and alarm limits are separately programmable for the oil pressure sender input. This fault will be monitored with Holdoff Timer delay after the engine is running. Also if the oil pressure switch is open at the beginning of a start attempt, then the engine will not be started and "Oil Pressure Exists!" information is displayed. When the oil pressure switch closes, normal operation will be resumed.

High Temperature: Set if a signal is detected at the High Temperature Switch input or the coolant temperature value measured from the sender is above the programmed limit. Warning and alarm limits are separately programmable for the temperature sender input.

Low Temperature (warning) : Set if the coolant temperature value measured from the sender is below the Engine Heating Temperature limit.

Low Fuel: Set if a signal is detected at the low fuel level input or the the fuel level measured from the sender is below the programmed limit. Warning and alarm limits are separately programmable for the fuel level sender input.

Low Coolant Level: Set if a signal is detected at the low coolant level input.

Rectifier Fail: Set if a signal is detected at the rectifier fail input. This input is only monitored when mains voltages are present.

Emergency Stop: Set if a signal is detected at the emergency stop input.

Spare-1 / Spare-2: Set if a signal is detected from the related spare fault input.

Low Speed / High Speed: Set if the generator frequency is outside programmed limits. These faults will be monitored with Holdoff Timer delay after the engine is running. Low and high limits for warning and alarm are separately programmable. Another high frequency shutdown limit which is 12% above the high limit is always monitored and stops the engine immediately.

Start Fail (alarm): Set if the engine is not running after programmed number of start attempts.

Stop Fail (warning): Set if the engine has not stopped before the expiration of the Stop Timer.

Overload (load dump): Set if at least one of the genset phase currents goes over the Overcurrent Limit for Overload Timer. If currents goes below the limit before expiration of the timer then no alarm will be set.

Excess Power (load dump): Set if the genset power (KW) supplied to the load goes over the Excess Power limit for Overload Timer. If the power goes below the limit before expiration of the timer then no alarm will be set.

Genset Low Voltage: Set if any of the generator phase voltages goes outside programmed limits for Overload Timer. This fault will be monitored with holdoff timer delay after the engine is running.

Genset High Voltage: Set if any of the generator phase voltages goes outside programmed limits for Overload Timer. This fault will be monitored with holdoff timer delay after the engine is running.

Low Battery Voltage (warning): Set if the battery voltage goes below the programmed limit. During engine cranking this fault is not monitored.

High Battery Voltage: Set if the battery voltage goes above programmed limits. Both warning and alarm levels for high battery voltage are programmable.

Charge: Set if a charge alternator failure (or broken belt) occurs. This fault condition may result to a **warning** or alarm following programming.

Mains Phase Order Fail (warning): Set if the mains phase order checking is enabled, mains phases are present and mains phase order is reversed. This fault prevents the Mains Contactor to close.

Ecu Fail (warning): Set when an engine fault code is received from the ECU of the electronic engine. This fault will not cause an engine stop. If necessary, the engine will be stopped by the ECU.

Ecu Fail (alarm): Set if no information has been received during 3 seconds from the ECU of the electronic engine. This fault condition is only controlled if fuel is on.

Modes of Operation:

The modes of operation are selected by pushing the front panel keys. Changing the operation mode while the genset is running will result into a behavior suitable for the new operating mode. For example, if the LOAD TEST mode is selected when genset is running at TEST mode, then the genset will take the load.

STOP: In this mode, the mains contactor will be energized if mains phase voltages are within the programmed limits. The engine will be stopped.

AUTO: It is used for genset and mains automatic transfer. If at least one of the mains phase voltages is outside limits, the mains contactor will be deactivated. The diesel will be started for programmed times after the preheat timer. When the engine runs, the crank relay will be immediately deactivated. The engine will run without load during engine heating period. After this, if alternator phase voltages and frequency are within limits, then the unit will wait for the generator contactor period and the generator contactor will be energized. When all the mains phase voltages are within the limits, the engine will continue to run for the mains waiting period. At the end of this period the generator contactor is deactivated and the mains contactor will be energized. If a cooldown period is given, the generator will continue to run during cooldown period. At the end of the period, the fuel solenoid will be de-energized and the diesel will stop. The unit will be ready for the next mains failure. If the operation of the genset is disabled by the weekly schedule, then the AUTO led will flash, and the operation of the genset will be as in the OFF mode.

RUN: It is used to test the generator when the mains are on, or keep the generator running in the emergency backup mode. The operation of the generator is similar to the AUTO mode, but the mains contactor will not be deactivated if the mains are not off. If the mains are off, mains contactor will be deactivated and the generator contactor will be activated. When the mains are on again, a changeover to the mains will be made, but the engine will be kept running unless another mode is selected. To stop the engine, select AUTO or OFF mode.

TEST: It is used to test the genset under load. Once this mode is selected, the engine will run and the load will be transferred to the genset. The genset will feed the load indefinitely unless another mode is selected.

* Daha detaylı bilgi için kontrol modülü el kitabını okuyunuz.

Battery Charger:

The battery charger is an electronic device which charges the battery with energy received from the network / mains in cases where long-term non operation of the generator. It keep the appropriate value of the battery voltage.

5.6- Circuit Breaker Panel: It is located at the bottom of the control panel. Thermal-magnetic circuit breaker prevents damage to the alternator by opening the circuit, in case of excessive current drawing from the generator.

Thermal-magnetic circuit breaker can cut energy of the power cables manually by setting to the OFF position . Power and control cable connections are made between the circuit breaker panel and the transfer panel.

5.7- Transfer Panel: It allows to transfer the electrical load from the grid / mains to the generator under the control of control panel. Thus, when electricity came, running generator is prevented conflicts with the network. Two contactors or motorized circuit breaker are located in transfer panel. Power and control cable wiring connections are made between generator and transfer panel.

5.8- Exhaust System: Used for the purpose of ejecting the gases and the heat comes from engine to the outside and reducing the engine noise. Muffler and fittings are industrial type for open generators and are given as disassembled together with the generator. Residential exhaust system is used in canopied generators and is mounted inside the canopy.

5.9- Sound Proof Canopy: Used for to protecting the generator from external factors and reducing the sound of generator. Our canopies has been designed to ensure the safe and efficient operation of the generator and also is aimed at ease of use and maintenance. Against corrosion and painted with electrostatic powder paint.

5.10- Heaters: In addition to the jacket water heater is described in the engine section, if requested by our customers as options, the anti-humidity heater for alternator, engine oil sump heater and fuel tank heaters can be fitted to our generators.

5.11- Fuel Transfer Pump: Used with the aim of transferring the fuel from the external fuel tank to the generator's own fuel tank automatically. Control of the fuel transfer pump is made by control panel.

6- STARTING UP THE GENERATOR

Before starting up the generator:

- * Please check the generator by eye. Make sure that there is no fuel, oil, water leaking and broken, cracked, loose parts. Any warnings and alarms should not be displayed on the control module. If you think you have a problem related with generator, do not operate the generator without eliminating the problem.
- * There should be no foreign substances around and on the generator that may be fall down and taken by radiator fan.
- * Please check the oil level. The oil level should be close to the maximum level.
- * Please check the coolant level. Water level should be 2 cm from the radiator cover.
- * Please check the coolant antifreeze ratio which shall be in accordance with the winter conditions.
- * Please check that there is not a situation that will prevent the generator air intake and outlet .
- * Please be sure that air filter is clean.
- * Make sure the battery cable is tightened.
- * For the generators will be used in automatic mode, the output circuit breaker must be in the ON position.
- * For the generator will be used in manual mode, while starting the generator output circuit breaker should be in the OFF position after that it should be brought to the ON position before loading the generator.
- * Check that the emergency stop button is not pressed . If it is pressed, unscrew the hold.

Starting up the generator:

- * For the generator will be used in automatic mode, press the AUTO button on the control module and observe that the LED on the button is lighting. After the this procedure, the generator is ready to run and will be operated automatically when electricity fails. The generator will stop automatically when electricity comes back. There is no need for further action.
- * For the generator will be used in manual mode, firstly be sure that generator is not connected to the load, press the RUN button on the control module and observe that the LED on the button is lighting and generator is running. After warming up the generator, bringing the output output circuit breaker in the ON position and power the load.

After starting up the generator:

- * Please check whether there is a strange noise except the sound of the engine.
- * Please check whether excessive vibration on generator.
- * Please check that there are no leaks in the fuel, oil and cooling system.
- * Please check for leaks in the exhaust system. (At the first runing, black smoke could be out for 2-3 seconds)
- * Please check that the output voltages of the generator are phase - phase as 400 V, phase - neutral as 230 V and the frequency as 50 Hz (+ - 2%). Please stop the generator and call the service, if an extreme deviation can be read in one of the phase voltage or absence of voltage or abnormal frequency.

7- PERIODIC MAINTENANCE TABLE

Please follow the instructions in the periodic maintenance table for reliability and longevity of your generator. Please record the procedures and history.

Daily or every 25 hours controls and procedures :

- * Please visually check the automatic control and transfer panels, if you determine the followings, inform the technical service which was installed the generator: a burning smell, color change at the cables, abnormal sounds .
- * Please check that there is no fuel, oil, and coolant leakages from engine. Please add the oil and cooling water, if they are insufficient.
- * Please check the engine fan blades, the tension of the fan belt and charge alternator belt.
- * Please check the battery charge level.
- * Please check the fuel level. If necessary fill the fuel. While generator is in operation, running out of fuel makes the engine suck the air and stop. Even after refilling the generator may run harder. For this reason, please check the fuel level frequently.
- * Please check that jacket water heater is on and no water leakage.
- * Please check the alternator output voltage between phases is about 400/230 V - 50Hz.
- * Please check frequently whether exhaust gas leakage where the generator is running in closed environments.
- * Please check that the doors of sound proof canopy and transfer panel are locked.
- * Please check whether control module gives alarm. Do not operate the generator before removing the reason of the alarm.

Weekly or every 50 hours controls and procedures :

- * Please do the following checks in addition to the daily checks.
- * Please check for leakages in the fuel suction and return hoses, if needed, tighten clamps.
- * Please check for leakages in the cooling system hoses, if needed, tighten clamps.
- * Please check the air filter connections. Be sure that front of the air intake and outlet louvers of canopy or generator room is not closed by foreign things / materials etc.
- * Please check for leakages in the exhaust system. Be sure that when generator running, exhaust rain cover could be open and after stopping, should be closed.
- * Please check for the alternator, intake vents are open and no an abnormal noise coming.
- * Please observe the operation of the transfer panel under load. Check whether an unusual sound, a color change and a smell at cables.

Each 3 months or every 100 hours controls and procedures :

- * Please do the following checks in addition to the weekly checks.
- * Please check air filter pollution indicator (if available).
- * Please check the tightness of the bolts which connect the engine, alternator and radiator to the chassis.
- * Please check the tightness of the canopy lifting eyebolts.

Each 6 months or every 200 hours controls and procedures :

- * Please do the following checks in addition to the 3 months checks.
- * Please change the engine oil and oil filter.
- * Please change the fuel filter and drain the contaminated fuel and water accumulated at the bottom of the fuel tank.
- * Please check the ratio of the coolant antifreeze .
- * Please change the water filter (if any) .
- * Please check the fan blades, lubricate bearings, and tighten the screws.
- * Please check the tightness of bolts of the vibration dampers which connects the generator to the chassis.
- * Please check the exhaust system fasteners .
- * Please clean the engine and alternator with pressurized air.
- * Please check the control and transfer panel control wirings.

Each 12 months or every 1000 hours controls and procedures :

- * Please do the following checks in addition to the 6 months checks.
- * Please check the valve adjustments.
- * Please check the injector adjustments.
- * Please check the water pump.
- * Please replace the air filter.
- * Please check the suction and discharge sections of the radiator and clean the pads with pressurized air.
- * Please check the magnetic pick up (if available) and it's connections.

Each 24 months or every 2000 hours controls and procedures :

- * Please do the following checks in addition to the 12 months checks.
- * The following settings can be made by technical service.
- * Please check the turbocharger .
- * Please make the controls and adjustments described in engine instruction manual.
- * Please make the controls and adjustments described in alternator instruction manual.

8- FAILURES AND CAUSES

Engine failures and causes:

* The starter rotates slowly or does not rotate.	* Voltage of the battery is low or the battery is faulty. * Loose connection of battery cables. * The starter is defective.
* The diesel engine is running hard, does not have enough power or does not run at all.	* There is no fuel. * Proper fuel is not used. * Jacket water heater does not work, the engine is cold . * Starter can not rotate the diesel engine. * Fuel circuit hoses or elements have air in. * The fuel filter is dirty. * Stop solenoid does not work or loose cable connections. * Fuel solenoid does not work or loose cable connections. * Fuel transfer pump does not work (if any) or loose cable connections. * The oil pressure is too low. * Oil sensor or switch are defective or loose wiring. * The injector is defective. * The fuel tank vent is clogged. * The air filter is dirty or clogged. * There is leakage at aftercooler or intercooler's pipe connections. * The diesel engine temperature is too high or low. * Clogged exhaust system.
* The oil pressure is too low.	* Not enough oil in the diesel engine. * Oil viscosity wrong. * Oil pressure sensor or indicator is faulty. * Oil filter is clogged.
* Black exhaust smoke. (At the begining, diesel engines can produce black smoke. After heated, color of smoke should be transparent).	* Appropriate fuel is not used. * Jacket water heater does not work, the engine is cold . * Injectors and valves are defective or unregulated. * Engine running on overload.

* White exhaust smoke.	* Fuel circuit's hoses or components have air in. * Oil viscosity wrong.
* Knocking noise coming from the engine and the engine is not running smoothly.	* Injector defective. * Unadjusted valves. * Poor quality fuel. * Jacket water heater is defective. * Fuel circuit's hoses or components have air in. * Fuel hose clogged. * The fuel filter is dirty. * Dirty or clogged air filter. * Engine temperature is too high. * The fuel tank vent is clogged.
* The diesel engine temperature is too high.	* The thermostat is faulty. * Injector defective. * The air filter is dirty or clogged. * Jacket water heater is defective. * The radiator fan is damaged or clogged radiator cores. * The cooling system is damaged or inadequate. * The exhaust system is clogged. * The oil level is too high .
* The oil pressure is too high.	* Crankcase ventilation pipe clogged.

9- TECHNICAL TABLES

Fuel, Oil, Cooling Water Capacities:

Generator Model	Fuel Tank Capacity (lt)	Fuel Consumption Full Load (lt/saat)	Oil Capacity (lt)	Cooling Water Capacity (lt)
ETT-15E	260	2,4	7	10
ETT-18E	260	3,3	7	10
ETT-22E	260	4,0	7	10
ETT-30E	260	5,4	13	13
ETT-35E	260	6,4	13	13
ETT-40E	260	7,4	13	13
ETT-55E	260	10,0	13	13
ETT-70E	350	14,0	13	13
ETT-85E	350	15,4	16	16
ETT-110E	435	20,0	17	23
ETT-125E	435	22,7	17	23
ETT-140E	435	25,4	17	23
ETT-155E	435	28,2	17	23
ETT-170E	435	31,0	17	23
ETT-220E	435	40,0	17	23
ETT-300E	675	54,5	27	39
ETT-350E	675	63,6	27	39
ETT-385E	675	70,0	27	39

Power Cable Selection Table:

Generator Model	Standby Power (kVA)	Maximum Current (A) - 400 V	Single Core Power Cable	
			Current Capacity (A)	Area (mm2)
ETT-15E	15	22	25	2,5
ETT-18E	18	26	33	4
ETT-22E	22	32	33	4
ETT-30E	30	43	57	10
ETT-35E	35	51	57	10
ETT-40E	40	58	76	16
ETT-55E	55	79	101	25
ETT-70E	70	101	123	35
ETT-85E	85	123	155	50
ETT-110E	110	159	191	70
ETT-125E	125	180	228	95
ETT-140E	140	202	267	120
ETT-155E	155	224	267	120
ETT-170E	170	245	305	150
ETT-220E	220	317	382	2 x 70
ETT-300E	300	433	456	2 x 95
ETT-350E	350	505	534	2 x 120
ETT-385E	385	556	610	2 x 150

10- ELECTRICAL DRAWINGS

Electrical drawings are provided together with generator and located in control panel.

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ETT-E SERIES DIESEL GENERATOR SETS



ISO 9001:2008, OHSAS 18001, ISO 14001:2004

OUTPUT RATINGS

Model		ETT-15	ETT-18	ETT-22	ETT-30	ETT-35	ETT-40	ETT-55	ETT-70	ETT-85
Standby Power (ESP)	kVA / kW	15 / 12	18 / 14,4	22 / 18	30 / 24	35 / 28	41 / 33	55 / 44	70 / 56	85 / 68
Prime Power (PRP)	kVA / kW	14 / 11	16,3 / 13	20 / 16	27 / 22	32 / 25	37 / 30	50 / 40	64 / 51	77 / 62
Current (ESP)	A	21,6	25,9	31,7	43,2	50,4	59	79,2	100	122
Voltage - Frequency	V - Hz	400 / 230 V - 50 Hz								
Phase Qty - P.F.	Unit - Cosφ	3 Phase - Cosφ 0,8								

ENGINE

Engine Make & Model	RICARDO	YD480BD	YD480BD	Y485BD	K4100D	K4100D	K4102D	K4100ZD	N4105ZD	R4105ZLD
Mechanical Prime Power	kW / (HP)	14 / 19	14 / 19	17 / 23	30 / 41	30 / 41	33 / 45	42 / 57	56 / 76	66 / 90
Air Intake System		Natural	Natural	Natural	Natural	Natural	Natural	Turbocharged	Turbocharged	Turbocharged
Cylinder Volume	L	1,81	1,81	2,04	3,61	3,61	3,61	3,61	4,15	4,33
Cylinder Qty / Type		4 / Line	4 / Line	4 / Line	4 / Line	4 / Line	4 / Line	4 / Line	4 / Line	4 / Line
Bore & Stroke	MM x MM	80 x 90	80 x 90	85 x 90	100 x 115	100 x 115	102 x 115	100 x 115	105 x 120	105 x 125
Compression Ratio		18:1	18:1	18:1	19 : 1	19 : 1	19 : 1	19 : 1	18 : 1	17 : 1
Governing Type						Mechanical				
Engine Speed	D / DK.					1500				
Cooling Method						Water				
Cooling Sys. Capacity	L	10	10	10	13	13	13	13	13	16
Oil Capacity	L	7	7	7	13	13	13	13	13	16
Electrical System	V DC	12	12	12	12	12	12	12	12	24
Fuel Consumption										
100 % Prime Load	L / H	2,4	3,3	4,0	5,4	6,4	7,4	10,0	14,0	15,4
75 % Prime Load	L / H	1,8	2,4	3,0	4,1	4,8	5,6	7,5	10,5	11,5
50 % Prime Load	L / H	1,4	1,6	2,0	2,7	3,2	3,7	5,0	7,0	7,7
Fuel tank Capacity	L	260	260	260	260	260	260	260	350	350

ALTERNATOR

Alternator Make & Model		ETT								
Alternator Type		Electronic AVR - Brushless								
Standby Power (ESP)	kVA	15	18	22	30	35	41	55	70	85
Voltage Regulation		+/- 1.0								
Insulation / Protection		H / IP 21								
Pole Quantity		4								

DIMENSIONS AND WEIGHTS

Open Type	LxWxH - M.		1,5 x 1 x 1,3		1,5 x 1 x 1,3		1,65 x 1 x 1,3		2 x 1 x 1,4	
Weight	KG.	510	530	590	680	700	775	800	975	1050
Soundproof canopy Type	LxWxH - M.		1,75 x 1 x 1,5		2 x 1 x 1,5		2,25 x 1 x 1,5		2,75 x 1 x 1,75	
Weight	KG.	660	680	740	930	950	1025	1050	1255	1325

Standby Power (ESP): Emergency power under varying electrical load. Overload is not permitted.

Prime Power (PRP): Nominal power under varying electrical load for unlimited hours. 10 % overload is available for a period of 1 hour within 12 hours.

ETT-E SERIES DIESEL GENERATOR SETS



ISO 9001:2008, OHSAS 18001, ISO 14001:2004

OUTPUT RATINGS

Model		ETT-110	ETT-125	ETT-140	ETT-155	ETT-170	ETT-220	ETT-300	ETT-350	ETT-385
Standby Power (ESP)	kVA / kW	110 / 88	125 / 100	140 / 112	155 / 124	170 / 136	220 / 176	300 / 240	350 / 280	385 / 308
Prime Power (PRP)	kVA / kW	100 / 80	114 / 91	127 / 102	141 / 113	155 / 124	200 / 160	273 / 218	318 / 255	350 / 280
Current (ESP)	A	158	180	202	223	245	317	432	504	554
Voltage - Frequency	V - Hz	400 / 230 V - 50 Hz								
Phase Qty - P.F.	Unit - Cosφ	3 Phase - Cosφ 0,8								

ENGINE

Engine Make & Model	RICARDO	R6105ZLD	R6105ZLD	R6105AZLD	R6105BZLD	R6105BZLD	R6110ZLD	R6126A-260D	R6127A-275	WT12D-308
Mechanical Prime Power	kW / (HP)	100 / 136	100 / 136	110 / 149	132 / 179	132 / 179	170 / 231	260 / 353	275 / 374	288 / 391
Air Intake System		Turbocharged and intercooler								
Cylinder Volume	L	6,49	6,49	6,75	7,01	7,01	7,69	10,09	10,09	11,60
Cylinder Qty / Type		6 / Line	6 / Line	6 / Line	6 / Line	6 / Line	6 / Line	6 / Line	6 / Line	6 / Line
Bore & Stroke	MM x MM	105 x 125	105 x 125	105 x 130	105 x 135	105 x 135	110 x 135	126 x 135	127 x 135	126 x 155
Compression Ratio		17 : 1	17 : 1	17 : 1	17 : 1	17 : 1	17 : 1	17 : 1	17 : 1	19 : 1
Governing Type		Mechanical								
Engine Speed	D / DK.	1500								
Cooling Method		Water								
Cooling Sys. Capacity	L	23	23	23	23	23	23	39	39	39
Oil Capacity	L	17	17	17	17	17	17	27	27	27
Electrical System	V DC	24	24	24	24	24	24	24	24	24
Fuel Consumption										
100 % Prime Load	L / H	20,0	22,7	25,4	28,2	31,0	40,0	54,5	63,6	70,0
75 % Prime Load	L / H	15,0	17,0	19,0	21,1	23,2	30,0	41,0	47,7	52,5
50 % Prime Load	L / H	10,0	11,4	12,7	14,1	15,5	20,0	27,0	31,8	35,0
Fuel tank Capacity	L	435	435	435	435	435	435	675	675	675

ALTERNATOR

Alternator Make & Model		ETT								
Alternator Type		Electronic AVR - Brushless								
Standby Power (ESP)	kVA	110	125	140	155	170	220	300	350	385
Voltage Regulation		+/- 1.0								
Insulation / Protection		H / IP 21								
Pole Quantity		4								

DIMENSIONS AND WEIGHTS

Open Type	LxWxH - M.	2,5 x 1 x 1,5						3 x 1,2 x 1,7		
Weight	KG.	1325	1350	1375	1400	1450	1575	2025	2175	2325
Soundproof canopy Type	LxWxH - M.	3,25 x 1 x 1,75						3,75 x 1,2 x 2		
Weight	KG.	1675	1700	1725	1750	1800	1900	2525	2675	2825

Standby Power (ESP): Emergency power under varying electrical load. Overload is not permitted.

Prime Power (PRP): Nominal power under varying electrical load for unlimited hours. 10 % overload is available for a period of 1 hour within 12 hours.