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Installation and Use manual



INTRODUCTION

This handbook is intended to supply you with information and basic instructions for a correct installation, use and maintenance of the generating genset.

All the activities linked with the internal operation of the generating genset should be accomplished by proficient, specialised person, experienced in diesel engines and in mechanical, hydraulic and electrical power generation installations. This handbook and the other reference documentation are indispensable for said specialists.

We are concerned about your safety, and for this reason we strongly recommend reading carefully all the warnings and safety procedures before operating the generating genset. Only in this way will we be able to make sure you an optimum service, in perfect reliability and safety conditions.

We have the obligation to inform you that the validity of the information in this handbook is referred to date of emission of the same, since aspects such as technological advance, current regulation or updates in the models compel us to accomplish changes without previous do notice, which may do not be reflected upon this manual.

This handbook and the rest of reference documentation are an essential part of the generating genset that you have just acquired, and should be preserved and protected against any agent that could deteriorate them. This documentation must accompany the equipment when it is transferred to other users or a new owner.

Though the information given in this handbook has been thoroughly verified, we refuse any responsibility driven from contingent calligraphic, typographical or transcription mistakes

Pursuant to the EEC 85/374 Executive and later modification 99/34, we remains excluded of any responsibility, as derived from defective facilities, inappropriate usage of the machine, and non-fulfilment of the procedures contained in the present manual.

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SAFETY RULES

1. SAFETY RULES

Please read carefully the following safety instructions before operating the machine, and find out about local regulations on safety matters.

The installation, operation, maintenance and repairs must only be carried out by proficient authorised personnel.

The owner is responsible for keeping of the generating genset in safety conditions. The pieces and accessories must be replaced if they are do not in safe operating condition.

1.1. General safety cautions

- ✖ Do not allow unauthorised personnel in site.
- ✖ Due to possible electromagnetic interference, entry must be denied to persons with heart-stimulating appliances or pacemakers.
- ✖ Do not approach G.S. carrying wide clothes or objects that could be attracted by the air flow or by the mobile parts of the engine.
- ✖ It is prohibited to exclude and/or dismantle the safety devices.
- ✖ Do not lean on G.S. or place objects on it.

In the case of **automatic action** gensets, it is necessary to:

- ✖ Locate red warning light, which lights up when the genset is operating, in a visible position.
- ✖ Locate caution sign warning about possible unexpected automatic starts of the machine.
- ✖ Locate obligation sign indicating, "All maintenance operations must be done with the genset in BLOCKAGE position".
- ✖ For emergency stop, press the "emergency stop" button, located on the genset, or the emergency button outside the machine room.

1. SAFETY RULES

1.2. Safety in receipt, storage and unpacking operations.

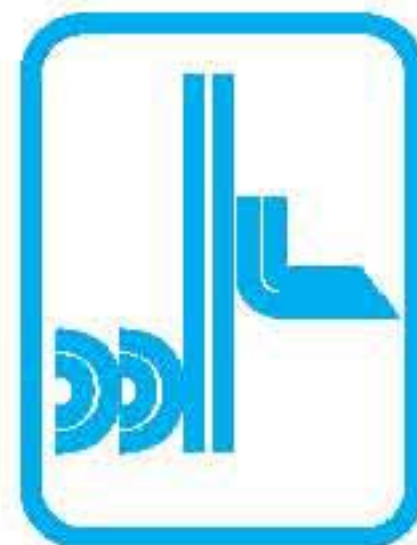
- ✘ On receipt of G.S., check that the material received matches the bill of delivery, and that the merchandise is in perfect condition.
- ✘ Elevating appliances of sufficient capacity must be used for the elevation and transportation of the genset. All loose or pivoting parts must be secured before elevating the genset.
- ✘ When moving the G.S., and especially at the time of elevating, it is recommended to address the G.S. at points specifically outlined for this function. (Fig. 1-2)

The use of other elevation points, located on the engine, alternator or other components is strictly forbidden.

- ✘ If the G.S. is damaged, for whatever reason, during transportation, storage, and/or assembly, do not start it before a monitoring effected by our specialised personnel.
- ✘ If the G.S. is to remain stored for future use, it is advisable to have the premises duly protected from chemical agents, which may deteriorate its components.
- ✘ Unpack with care, avoiding damages to the material during such operation, especially when using levers, saws or other metallic utensils.

1.3. Safe installation and first running.

- ✘ Specialised personnel should effect the installation of the G.S. and corresponding accessories. For whatever difficulties during installation, please contact us or our local agent.
- ✘ You must know the emergency procedures related to the installation.
- ✘ Always wear a helmet, adequate footwear and safety gloves, protection eyewear and dry, tight clothes.



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1. SAFETY RULES

- ✘ Do not modify the original protections, located in all the exposed rotary parts, on hot surfaces, air inlets, in the belts and in the parts in tension.
- ✘ Do not place dismantled parts, tools or any other accessory on the engine, its surroundings or in the generating genset room.
- ✘ Never leave fuel liquids or rags soaked in fuel liquid near the genset, electrical appliances or parts of the electrical installation (including lamps).
- ✘ Take all possible cautions to avoid fulguration risks; make sure that there is a land connection according to Procedures.
- ✘ Locate a sign, which reads, "DO NOT MANEUVER" in all sectioning organs insulating the parts on which works must be done.
- ✘ Install all necessary safety protections in the parts that complete the installation.
- ✘ Insulate all connections and disconnected wires. Do not leave the power terminals of the generating genset uncovered.
- ✘ Earth-connect all relative connection terminals in the generating genset and their accessories.
- ✘ Verify that the electrical connections and auxiliary services are correctly accomplished.
- ✘ Check that the cyclical direction of the phases matches the network.
- ✘ Individualise the location of emergency stop buttons, quick-stop fuel valves, switches and other emergency systems present in the installation.
- ✘ Verify the perfect functionality of the stop devices of the genset. Especially the following devices (if they are standard supply): over-speed stop, low oil pressure, high water temperature in the engine, and the emergency stop commonly installed by the user outside the premises.
- ✘ Verify the correct ventilation of the premises. Check that gas leaks are exhaust into the atmosphere, at a safety distance from doors, windows and air inlets.
- ✘ Verify that pipelines and silencers are installed in an adequate way, that they have expansion unions and that they are protected against accidental contact.



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- ✘ Check that there are leaks in the oil, fuel pipes and water pipes.
- ✘ Before starting the genset, verify that it has the right amount of lubricant oil, coolant and fuel.
- ✘ Individualise the position of the fire-extinguishers and of other protection and emergency devices and learn how to operate them.
- ✘ Individualise the sources of danger, for example leaks of fuel, lubricant oil or acid solutions, condensation of dripping, high pressures and other dangers.
- ✘ Verify that the genset is clean, that the surrounding zone and the emergency exits are clean and without obstacles. Check that there are no obstructions in the openings or in the inlet and outlet conduits.
- ✘ Watch out for persons working around other equipment in the zone: are such labours dangerous? Can they affect the installation operation?

1.4. Safety in the operation

- ✘ Do not grant access to persons or animals in the operative zone of the G.S.
- ✘ Do not touch the generating genset, especially the cables and connections of the alternator, while the genset is on, because they are under tension.
- ✘ Avoid touching parts in movement until the generating genset may have come to a complete stop.
- ✘ When in operation, the G.S. will reach high temperatures in some parts of the engine, in conduit/s, and in the exhaust: avoid touching these until they cool down.
- ✘ During the operation of the generating genset, wear ear protection to avoid hearing lesions.
- ✘ Safety-related labels must be kept clean and in the places pre-genset by the manufacturer.
- ✘ Fuels and lubricants can be fuel, toxic, explosive and corrosive. We recommend maintaining them in their original containers and storing them in protected places.

1. SAFETY RULES

1.5. Safety in maintenance

- ✘ Specialised personnel must always accomplish any checking and/or maintenance works in the generating genset.
- ✘ The maintenance interventions should be effected with the engine inactive.
- ✘ Before operating on any component of the electrical installation, disconnect the poles of the battery.
- ✘ Before opening the electrical connections panel, authorised personnel must take the following cautions:
 - Stop the genset if it is in operation, and fix the connections panel on OFF position.
 - Disconnect the battery or batteries.
 - Disconnect the panel service wires.
- ✘ Periodically verify that the connections are tight and well insulated.
- ✘ Other operations and/or maintenance procedures, not specifically indicated in the handbooks, will have to be notified to the manufacturer for approval.
- ✘ Do not modify the product without notification to and explicit authorisation from our technical department.
- ✘ Observe the characteristics recommended by the manufacturer for oil change and fuel replenishment. Do not use oil or fuel other than those specified by the manufacturer.
- ✘ Spare parts should correspond to the requirements defined by the manufacturer. Use exclusively original spares. For spare parts contact exclusively authorised part distributors or workshops within our assistance network. For a correct identification of the parts, always specify the data indicated on the plate of the genset, the type of engine and/or alternator and their respective registration numbers.
- ✘ Periodically inspect the state of the different components of the G.S., in particular the silencer blocks, which may cause vibrations and/or noise increase.
- ✘ Periodically verify that there are no leaks of oil, fuel or battery acid.
- ✘ Do not adjust the engine or other G.S. components to obtain a different performance from the anticipated by the manufacturer.





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- ⚠ Do not clean the fuel deposit or feed conduits when the engine is hot or in operation.
- ⚠ Wear protective gloves and goggles:
 - When using pressured air;
 - During the maintenance of the batteries;
 - During the supply of inhibitors or antifreeze products;
 - During the substitution or the supply of the lubricant oil (hot oil from the engine can cause burns during emptying. Let oil cool down below 60 center degree);
- ⚠ Wear protective helmet when at work in a zone with hanging weights or with equipment at head level.
- ⚠ Always wear safety shoes and tight clothes.
- ⚠ To work on parts that may be in tension, always verify that your hands and feet are dry. We recommend the use of insulating platforms upon effecting the manoeuvres.
- ⚠ Immediately change clothes if they are wet.
- ⚠ Keep soaked rags in fire-proof containers.
- ⚠ Do not place rags on the engine.
- ⚠ Upon starting a engine after a repair, take cautions to stop the air intake if an excess of revolutions occurs at the moment of the start-up.
- ⚠ Always keep engine clean, eliminating possible oil, gas-oil and/or coolant liquid stains.
- ⚠ Never start the engine with the revolution control lever unattached.
- ⚠ Do not carry out group tasks individually, especially operations on moving parts such as: switches, section blocks, fuses and/or other appliances in tension.

■ Refrigeration circuit.

- ⚠ Never add coolant to a reheated engine; let it cool down first.

1. SAFETY RULES

- ⚠ Check the level of the refrigeration liquid periodically and, if necessary, add product until reaching correct level, using exclusively liquid recommended in the handbook for use and maintenance.
- ⚠ Gently remove the cap from the radiator. Refrigeration circuits are usually under pressure, so hot liquid may exit violently if the pressure is released very quickly.
- ⚠ Periodically check the tension and the wear state of the pump / fan belts.

■ Lubricating circuit.

- ⚠ Periodically check oil level in the oil case (with cold engine) and add oil if necessary, following the instructions in the handbook.
- ⚠ Do not smoke or light fires during the supply of oil.

■ Fuel circuit.

- ⚠ Do not smoke or light fires during the supply of fuel.
- ⚠ When re-fuelling: do not smoke and be careful do not to spill fuel on the generating genset.

■ Exhaust circuit.

- ⚠ Check visually the circuit. If gas leaks are detected, proceed to immediate repair, since they may cause accidental fires.
- ⚠ Careful: very hot surfaces. The installation parts pre - assembled in the factory are protected against accidental contacts. The installer must isolate and/or protect the complement parts, gas evacuation pipelines of the premises, the silencer (supplied separately), etc.

■ Electrical start system.

- ⚠ To avoid accidental starts, disconnect the negative pole of the battery or batteries before working on the engine. Check that the self-starting system of the engine will not accidentally start the engine while working.
- ⚠ Keep joints firmly tightened and check that the insulation of the cables is satisfactory.
- ⚠ To avoid the danger of sparkouts, it is advisable to always connect first the positive terminal to the battery and then the negative terminal (generally to mass).





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■ Synchronous Alternator

- ⚠ Do not effect interventions with the genset operations. Before intervening, place the genset on OFF position.
- ⚠ Make sure that the air intake to ventilate the alternator is clean and cool, in some models, lubricate the bearings. Specially, check that the tightening and the position of the electrical connections are correct.

■ Control panel

- ⚠ Before operate control panel, disconnect the mains feed and place the genset on OFF position.
- ⚠ Electrical control panels, like all electrical appliances, are exposed to dampness and dirt. Verify the correct operation of the anti-condensation heaters, when present, and the cleaning of the air income for ventilation.
- ⚠ Periodically check that the bolts holding the electrical connections are firmly tight.

1.6 Environmental Safety.






- ⚠ Do not effect implementation of the G.S. in closed premises, without the installation of the exhaust pipe with exits to the outside. Leak gas are harmful and may be lethal.
- ⚠ Respect laws and other regulations on acoustics equipment.
- ⚠ Substitute the exhaust pipe and / or silencer of the engine if the noise emitted is superior that permitted by the corresponding regulations.
- ⚠ Maintenance operations (oil changes, cleaning of the fuel tank, cleaning of the radiator, washes, battery change/s, etc.), storage and waste disposal will have to be effected pursuant to the regulation of the country in use.

1.7 Safety and information stickers

Stickers containing important information about safety can be found on the generating genset. Their exact location and a short explanation about each one of them follows:

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1. SAFETY RULES

PICTURE	LOCATION	INFORMATION
1 	Located next to the connections of the alternator with the engine. Where there are drive belts or propeller shafts.	The sticker warns about the risk of strange objects interfering with drive belts or propeller shafts, or with the moving elements connected by them.
2 	Located in those parts of the generating genset which heat up during operation.	They indicate which zones are not to be touched while the genset is working, or shortly after stopping it.
3 	Located on the coolant tank cap.	This sticker informs about the risk of suffering serious burns if the cap is removed when the coolant liquid is still hot and under pressure.
4 	Located on the cover, next to the lifting hook.	This sticker indicates the exact point where the genset must be connected to the elevating device, in case of transport.
5 	Located next to the fuel tank cap. Depending on the model, the sticker may be found on the base frame or next to the engine.	They indicate the exact location of the filling cap of the fuel tank.






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PICTURE	LOCATION	INFORMATION
6 	Located on both sides of the base frame skids.	This sticker indicates the recommended points for transportation of the genset by means of lifting trucks or stackers.
7 	Located near the oil dipstick and the oil filling cap.	This sticker indicates the exact location for add oil.
8 	Next to the tappings of the earth connections.	This sticker shows the points by means of which the user is protected against possible electrical shocks.
9 	Near the magnetic thermal circuit breaker.	Show the right phase connect.
10 	On the emergency stop.	This sticker indicates the exact location of this device, intended for the sudden stop of the genset.
11 	On the control panel.	This sticker warns against voltage risks.

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PICTURE	LOCATION	INFORMATION
12 	Always located on the thermal magnetic circuit breaker switch.	This sticker prohibits all manual operations when the switch is on.
13 	Located on the muffler area.	Protect hot muffler hurt.
14 	Located on the fuel tank.	Protect for firing.

2

WARNINGS IN THE EVENT OF IMPROPER USE

2. WARNINGS IN THE EVENT OF IMPROPER USE

The Generating genset that we supplied is intended for electrical energy production according to the conditions and operative and environmental limits indicated or contractually agreed. All modifications of such conditions and limits must be communicated to the manufacturer directly or by the procedure of the organisation of authorised workshops, to obtain optimum operational conditions and, if necessary, to provide the genset with modifications and/or new calibrations.

The Generating genset is a machine that transforms potential thermal energy, contained in the fuel, into electrical energy and it is intended to feed distribution facilities run by specialists in accordance with current legislation. Even though the powers at stake will be very inferior to those of a public supply mains the dangerousness of electrical energy is the same. The generating genset is a production centre which combines the dangers of the public electrical supply mains adds with those derived from flammable fuel substances (fuel or lubricant oil), rotating parts and waste by products (gas and heat from refrigeration and irradiation).

Even though it is possible to exploit the heat contained in the leak gases and in the refrigeration circuit to increase the thermal efficiency of the process, this application must be done by specialised technicians to obtain an installation that is reliable and safe for persons and things, and to avoid the expiration of the guarantee.

Any other use not previously agreed must be considered inappropriate, and therefore not acceptable.

3

WORK CONDITIONS

3. WORK CONDITIONS

3.1. Standard environmental reference conditions

Diesel engine

Important: the powers of the Diesel engine for stationary applications are referred to the following environmental conditions, according to ISO 3046/1:

- Environmental temperature: 25°C
- Ambient pressure: 1000 mbars (750 mm/Hg)
- Relative dampness: 30%

Synchronous alternator

Environmental reference conditions for alternators, for stationary applications according to procedures IEC 34 - I, ISO 8528-3 and CEI 2-3 are the following:

- Environmental temperature: 40°C (30°C according to NEMA)
- Altitude 1,000m a.s.l. (674 mm/Hg)

3.2. Derating for Operative Environmental Conditions

For environmental installation conditions and operations which differ from those which are indicated in the previous paragraph, it is necessary to anticipate power losses or "derating" of the engine and attached alternator and, therefore, a reduction in the electrical power delivered by the genset.

The User/Client must establish with clarity upon accomplishing the offer request, the effective environmental conditions in which the Generating genset is going to work, since derating and de-classifying must be fixed by the time of validating the contract, so that both the engine and the alternator are adequately sized.

Especially the User/Client must supply the following data on environmental conditions in which the generating genset is going to work:



3. WORK CONDITIONS

✧ Maximum and minimum air temperature.

✧ Altitude above sea level or, preferably, the minimal and maximum barometric values in the place of installation; in the case of mobile gensets, the minimal and maximum altitude limits.

✧ Humidity with relation to temperature and pressure in the place of the installation, with special attention to dampness related to maximum temperature.

✧ For gensets provided with water/water heat exchangers instead of a radiator (only by order) : maximum and minimum temperatures of the refrigeration water

✧ Any other special environmental condition that may require special solutions or shorter maintenance cycles, such as:

- Dusty and/or sandy environments
- Sea air
- Pollution
- Radiation
- Operative conditions under important vibrations (for example, earthquake areas or additional external vibrations generated by near machinery).

If effective operative conditions were not specified during the contract phase, genset performance will be considered as referred to the standard conditions for the Diesel engine, as specified above.

If the effective environmental conditions change subsequently, it will be necessary to contact LOGENpower for a calculation of the new power loss, and to perform the necessary calibrations.

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3. WORK CONDITIONS

For the Diesel engine, the determination of these derating or losses of power is established in the Norm ISO 3046/I. It is possible to determine special derating on the ground of effective conditions of use.

Further information:

■ Derating figures for aspiration engines (Table 1)

altitude	atmospheric pressure	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
0	760	111	110	108	106	104	102	100	97	95	92	89	111	109	107	105	103	100	98	95	92	88	84
100	751	110	108	106	104	102	100	98	96	93	91	88	110	108	106	104	101	99	96	93	90	87	83
200	742	108	107	105	103	101	99	97	95	92	89	87	108	106	104	102	100	97	95	92	89	86	81
300	733	107	105	104	102	100	98	96	93	91	88	85	107	105	103	101	98	96	94	91	88	84	80
400	725	106	104	102	100	98	96	94	92	90	87	84	105	103	102	99	97	95	92	89	86	83	79
500	716	104	103	101	99	97	95	93	91	88	86	83	104	102	100	98	96	94	91	88	85	82	77
600	708	103	101	99	98	96	94	93	89	87	85	82	103	101	99	97	95	92	90	87	84	81	76
700	699	101	100	98	96	94	92	90	88	86	83	80	101	99	97	95	93	91	88	86	83	79	75
800	691	100	98	97	95	93	91	89	87	85	82	79	100	98	96	94	92	90	87	84	81	78	74
900	682	99	97	95	94	92	90	88	86	83	81	78	98	97	95	93	91	88	86	83	80	77	73
1000	674	97	96	94	92	90	89	87	84	82	80	77	97	95	93	91	89	87	85	82	79	76	71
1100	666	96	94	93	91	89	87	85	83	81	79	76	96	94	92	90	88	86	83	81	78	74	70
1200	658	95	93	91	89	88	86	84	82	80	77	74	94	93	91	89	87	85	82	80	77	73	69
1300	650	93	92	90	88	87	85	83	81	79	76	73	93	91	90	88	86	85	81	78	75	72	68
1400	642	92	91	89	87	86	84	82	80	77	75	72	92	90	88	86	84	82	80	77	74	71	67
1500	634	91	89	88	86	84	82	81	78	76	74	71	91	89	87	85	83	81	79	76	73	70	66
1600	626	90	88	86	85	83	81	79	77	75	73	70	89	88	86	84	82	80	77	75	72	69	65
1700	618	88	87	85	84	82	80	78	76	74	72	69	88	86	85	83	81	79	76	74	71	67	63
1800	611	87	86	84	82	81	79	77	75	73	70	68	87	85	83	82	80	77	75	72	70	66	62
1900	604	86	84	83	81	80	78	76	74	72	69	67	86	84	82	80	78	76	74	71	69	65	61
2000	596	85	83	82	80	79	77	75	73	71	68	66	84	83	81	79	77	75	73	70	67	64	60
2100	589	84	82	81	79	77	76	74	72	70	68	65	83	82	80	78	76	74	72	69	66	63	59
2200	582	83	81	79	78	76	74	73	71	68	66	63	82	80	79	77	75	73	71	68	65	62	58
2300	574	82	80	78	77	75	73	71	69	67	65	62	81	79	77	76	74	72	69	67	64	61	57
2400	567	81	78	77	75	74	72	70	68	66	64	61	80	78	76	75	73	71	68	66	63	60	56
2500	560	79	77	76	74	73	71	69	67	65	63	60	78	77	75	73	72	69	67	65	62	59	55
2600	553	78	76	75	73	72	70	68	66	64	62	59	77	76	74	72	71	68	66	64	61	58	54
2700	546	76	75	74	72	71	69	67	65	63	61	58	76	75	73	71	69	68	65	63	60	57	53
2800	539	75	74	73	71	70	68	66	64	62	60	57	75	73	72	70	68	66	64	62	59	56	52
2900	532	74	73	71	70	68	67	65	63	61	59	56	74	72	71	69	67	65	63	61	58	55	51
3000	526	73	72	70	69	67	66	64	62	60	58	55	73	71	70	68	66	64	62	60	57	54	50
3100	519	72	71	69	68	66	65	63	61	59	57	54	72	70	69	67	65	63	61	59	56	53	49
3200	513	71	70	68	67	65	64	62	60	58	56	53	71	69	68	66	64	62	60	58	55	52	48
3300	506	70	69	67	66	64	63	61	59	57	55	52	70	68	67	65	63	61	59	57	54	51	47
3400	500	69	68	66	65	63	62	60	58	56	54	52	69	67	66	64	62	60	58	56	53	50	46
3500	493	68	67	65	64	62	61	59	57	55	53	51	67	66	65	63	61	59	57	55	52	49	45
3600	487	67	66	64	63	61	60	58	57	55	52	50	66	65	64	62	60	58	56	54	51	48	44
3700	481	66	65	63	62	60	59	57	56	54	51	49	65	64	63	61	59	57	55	53	50	47	44
3800	474	65	64	62	61	59	58	56	55	53	51	48	64	63	62	60	58	56	54	52	49	46	43
3900	468	64	63	61	60	59	57	56	54	52	50	47	63	62	61	59	57	55	53	51	49	46	42
4000	462	63	62	60	59	58	56	54	53	51	49	46	62	61	60	58	56	55	52	50	48	45	41
4100	456	62	61	59	58	57	55	54	52	50	48	45	61	60	59	57	55	54	52	49	47	44	40
4200	451	61	60	58	57	56	54	53	51	49	47	45	61	59	58	56	55	53	51	49	46	43	39
4300	445	60	59	58	56	55	53	52	50	48	46	44	60	58	57	55	54	52	50	48	45	42	38
4400	439	59	58	57	55	54	53	51	49	48	46	43	59	57	56	55	53	51	49	47	44	41	38
4500	433	58	57	56	54	53	52	50	49	47	45	42	58	56	55	54	52	50	48	46	43	41	37
4600	427	57	56	55	53	52	51	49	48	46	44	41	57	55	54	53	51	49	47	45	43	40	36
4700	421	56	55	54	53	51	50	48	47	45	43	40	56	54	53	52	50	48	46	44	42	39	35
4800	415	55	54	53	52	50	49	48	46	44	42	40	55	53	52	51	49	48	45	43	41	38	34
4900	410	54	53	52	51	50	48	47	45	43	41	39	54	53	51	50	49	47	45	42	40	37	33
5000	405	53	52	51	50	49	47	46	44	42	40	38	53	52	51	49	48	46	44	42	39	36	33

TABLE 1



3. WORK CONDITIONS

■ Curves for turbocharged engines (Table 2)

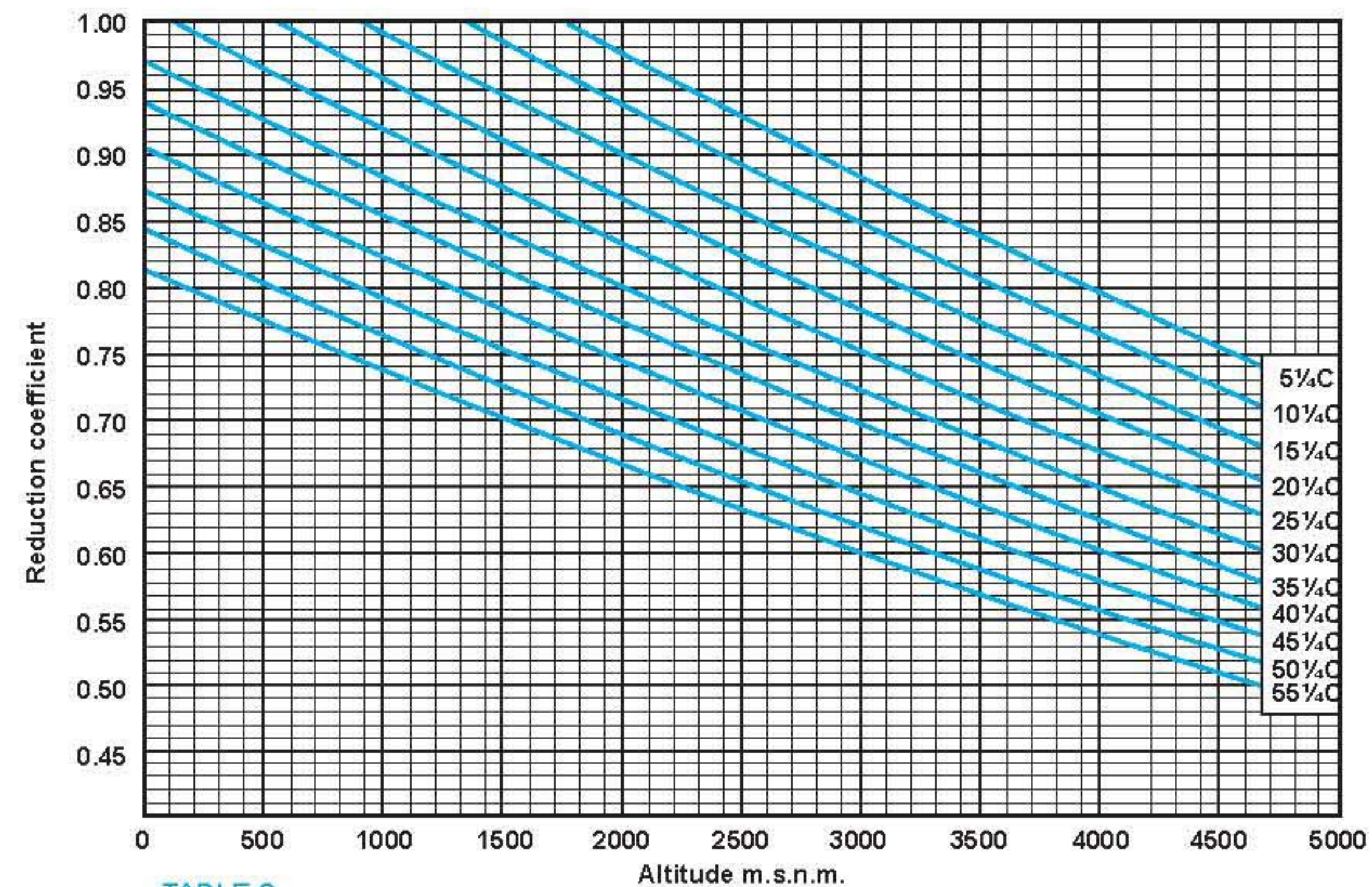


TABLE 2

3. WORK CONDITIONS

■ Curves for turbocharged engines with after-cooler (Table 3)

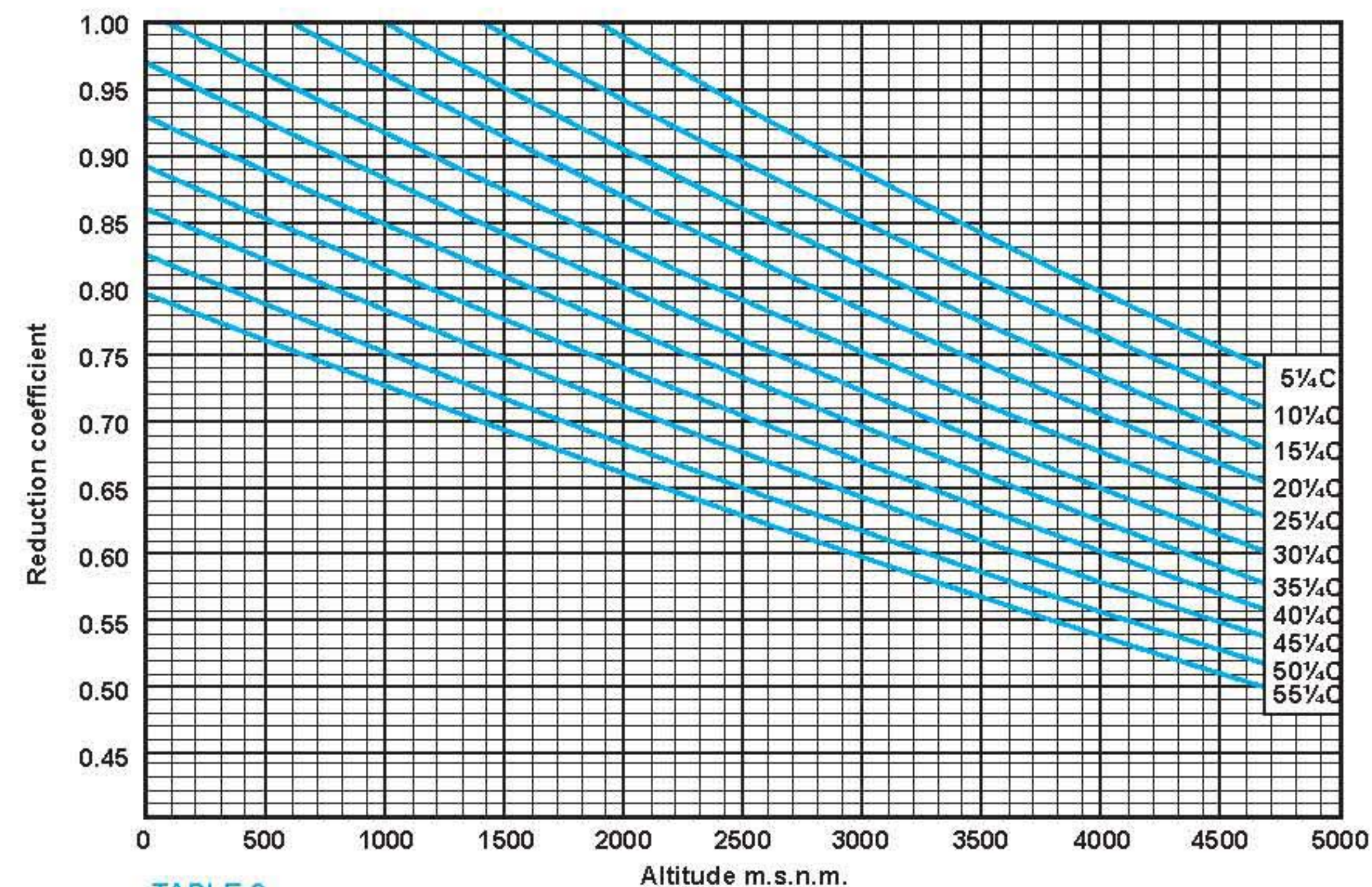


TABLE 3



3. WORK CONDITIONS

3

The derating of the alternator is not as critical as that of the Diesel engine; therefore, the derating of the generating genset coincides, as a rule, with the derating of the engine.

Table 4 is only a generalisation for the determination of alternator deratings. Manufacturer documentation must be referred to for greater accuracy.

Environmental temperature ;C	30	35	40	45	50	55	60
Reduction coefficient K1	1,05	1,03	1,00	0,96	0,92	0,88	0,84
Altitude - meters above sea level	1000	1500	2000	2500	3000	3500	4000
Reduction coefficient K2	1,00	0,97	0,95	0,92	0,89	0,86	0,83

Table 4

Indicative reduction coefficients of the power of an air-cooled, self-ventilated IP21 alternator, operating in various environmental conditions.

Both K1 and K2 coefficients should be applied to the nominal power of the alternator to obtain the power in environmental conditions different from standard.

3. WORK CONDITIONS

3

Example: alternator sizing.

A 64 kW (80kVA) generating genset in standard conditions of 25°C, 100m above sea level and a 30% relative dampness.

The genset is formed by:

- 72kW turbocharged engine at 25°C, 100m. a.s.l. and 30% R.D.
- Alternator ($S_r = 80\text{kVA}$) at 40 °C and 1,000m. a.s.l.; supposing alternator performance at 89%.

We want to verify the maximum power that the genset can deliver at an altitude of 1,500m and 45°C temperature.

The derating coefficient of the engine obtained from table 2 is 0.75. Therefore, the power of the engine, in the indicated conditions, will be $0.75 \times 72 = 54\text{kW}$. Taking into account the alternator, the power of the genset will be of $54 \times 0.89 = 48\text{kW}$.

We verify that the alternator will be suitable. The derating for the alternator is given by the two coefficients, K1 and K2, as drawn from table 4. The apparent power is given by $K1 \times K2 \times S_r$, that is to say:

$K1=0.96$; $K2=0.97$ the apparent max. power will be $0.96 \times 0.97 \times 80 = 74.4\text{kVA}$ and the active power with $\cos\phi$ 0.8 will be: $74.4 \times 0.8 = 59.2\text{ kW}$. Therefore, the alternator results abundantly sized with respect to the power that the genset can deliver (48kW)

3.3. Operative limits

The User/Client must communicate, in the phase of offer request, all the operative conditions that may affect the operation of the generating genset. In addition to the environmental conditions indicated in the previous point, special attention must be given to the characteristics of the charges that it will have to feed, power, voltage and power factor. The connection sequence of the charges must be determined and indicated precisely.

■ Power

The power of the generating genset is the active power, (expressed in kW), delivered in the alternator terminals, at nominal tension and frequency and in the established environmental conditions. The powers fulfil the Procedures ISO 8528 - I and 3046/I. Here are the definitions:



3. WORK CONDITIONS

3

Net performance at flywheel with tolerance of $\pm 3\%$ and available after aprox. 50 hours running.

Continuous Power (COP)- ISO 8528 - I PARR. 13.3.1

It is the continuous power that the generating genset can deliver continuously during an unlimited number of hours, between the maintenance intervals prescribed by the manufacturer and in the established environmental conditions.

Prime Power (PRP)- ISO 8528 - I PARR. 13.3.2

It is the maximum power available for a cycle with variable power that the generating genset can deliver during an unlimited number of hours per year between the maintenance intervals prescribed by the manufacturer and in the established environmental conditions. The average power delivered during a 24-hour period must not to surpass 80% of the PRP.

A 10% overload is admitted only with the purpose of regulation.

Limited-time Running Power (LTP)- ISO 8528 - I PARR 13.3.3

It is the maximum power that the generating genset can deliver in the established environmental conditions for a maximum of 500 hours per year, with a maximum of 300 hours between the maintenance intervals prescribed by the manufacturer. It is accepted that operation in these power conditions will affect the duration of the genset.

A 10% overload is admitted only with the purpose of regulation.

Max. Stand-By Power (ISO 3046 FUEL STOP POWER)

It is the available maximum power for a variable charge during a limited number of hours per year (500 hours), in the established environmental conditions and within the following maximum operation limits:

100% with the load during 25h/year;

90% with the load during 200h/year.

No overload admitted.

3. WORK CONDITIONS

3



Frequency

LOGEN POWER GENERATORS generating gensets are generally expected to operate at 1.500 or 1.800 r.p.m. and a frequency of 50 or 60 Hz respectively.

The corresponding engines include a mechanical revolutions regulator in the injection pump; this is normally genset to a statism of 5% and therefore the exit frequency will be of 52,5 Hz in empty conditions and 50 Hz at full charge.

In static conditions, the standard mechanical revolutions regulator supplies, generally, a precision of +05%.

This performance corresponds to Procedures ISO 3046/IV - Class AI and 8528-5 Class G2.

For special requirements, the medium Φ high range power include as standard, an electronic regulator which allows isochronus operation with a precision of + 0.25, pursuant to 8528-5 normative, Class G3/G4. Under request on some engines we can charge the mechanical regulator for an electronic one.

Voltage

The tension regulator is usually ELECTRONIC-TYPE, arranged in such a way that voltage in the terminals is controlled according to Norm 8528-5.

In the case of turbocharged engines, it is possible to apply an instant load equivalent to 80% of the nominal load with a transient speed reduction within 10%.

Obviously, the figures indicated for natural aspiration and turbocharged engines may vary depending on the type of speed regulator and alternator used.

Power factor

The power of the gensets is the active power, expressed in kW, delivered in the terminals of the alternator. The nominal power factor is $\cos\phi = 0.8$; therefore, the Nominal Apparent Power will be 1.25 times the Nominal Active Power.

The power factor is a datum dependent on the characteristics of the charge; Longen power gensets, equipped with an alternator, can deliver the active power as well as the reactive power required by the load but, while active power

3. WORK CONDITIONS

3

is delivered by the Diesel engine (transforming the mechanical power into electrical power by means of the alternator) reactive power is delivered by the alternator.

Therefore, for operation at values other than $\cos\phi = 0.8$, the following aspects should be taken into consideration:

Load with $\cos\phi$ between 0.8 and 1.

At normal active power, the alternator operates perfectly for $\cos\phi$ between 0.8 and 1. In order not to overrun the engine, the normal active power must not be exceeded.

Load with $\cos\phi < 0.8$.

For a certain plate value with reference $\cos\phi = 0.8$, the alternator is overload more when $\cos\phi$ tends to zero. Therefore, reactive power to deliver increases upon reducing the $\cos\phi$. The alternator will have to be disqualified according to the indications provided by the manufacturer.

In these conditions the Diesel engine shows, as a rule, luxuriant power.

Table 5 is only a generalisation for the determination of alternator deratings. Manufacturer documentation must be referred to for greater accuracy.

Power factor $\cos\phi$	1	0,8	0,7	0,6	0,5	0,3	0
Reduction coefficient	1,00	1,00	0,93	0,88	0,84	0,82	0,80

Table 5 Alternator power coefficients as a function of $\cos\phi$.

3. WORK CONDITIONS

3

Single-phase charge

The gensets may be loaded with unbalanced load reaching, as maximum, the normal current in each phase.

This means that between two phases (for example between L1 and L2) no more than 0.58 of the nominal three-phase power of the genset may be introduced: similarly, between a phase and neutral (for example between L3 and neutral) no more than one third (that is to say, 33%) of the three-phase plate power may be introduced.

We must bear in mind that, during single-phase operation or with unbalanced charges, the voltage regulator cannot support the expected voltage tolerances.

Load intakes

When a load is applied to a generating genset, some transient voltage and frequency variations are caused. The extent of such deviations depends on the value on the power, both active (kW) and reactive (kVAR) of the load variations, depending on the characteristics of the genset (power and dynamic characteristics). The characteristics of the genset are the result of the combination of the characteristics of the Diesel engine and of the alternator.

$$\sqrt{3/3}=0.58$$

When load intake capacity is an important requirement, the Client/User must clearly indicate it and must provide LONGEN power with all the information related to the various load to be fed; their possible load distribution in gensets and the connection sequence. All this is intended to consent the best-genset sizing and to avoid both over-sizing (not Economy) and under-sizing (dangerous).

LONGEN power gensets fulfil all regulations in Procedures of the series ISO 8528. The possibilities of load intakes depend on the effective average pressure (P_{me}) of the Diesel engine. The values of the P_{me} are indicated in the genset Data Sheet with relation to the standard powers.

3. WORK CONDITIONS

In this regard, [table 6](#) represents a table drawn from norm 8525-5

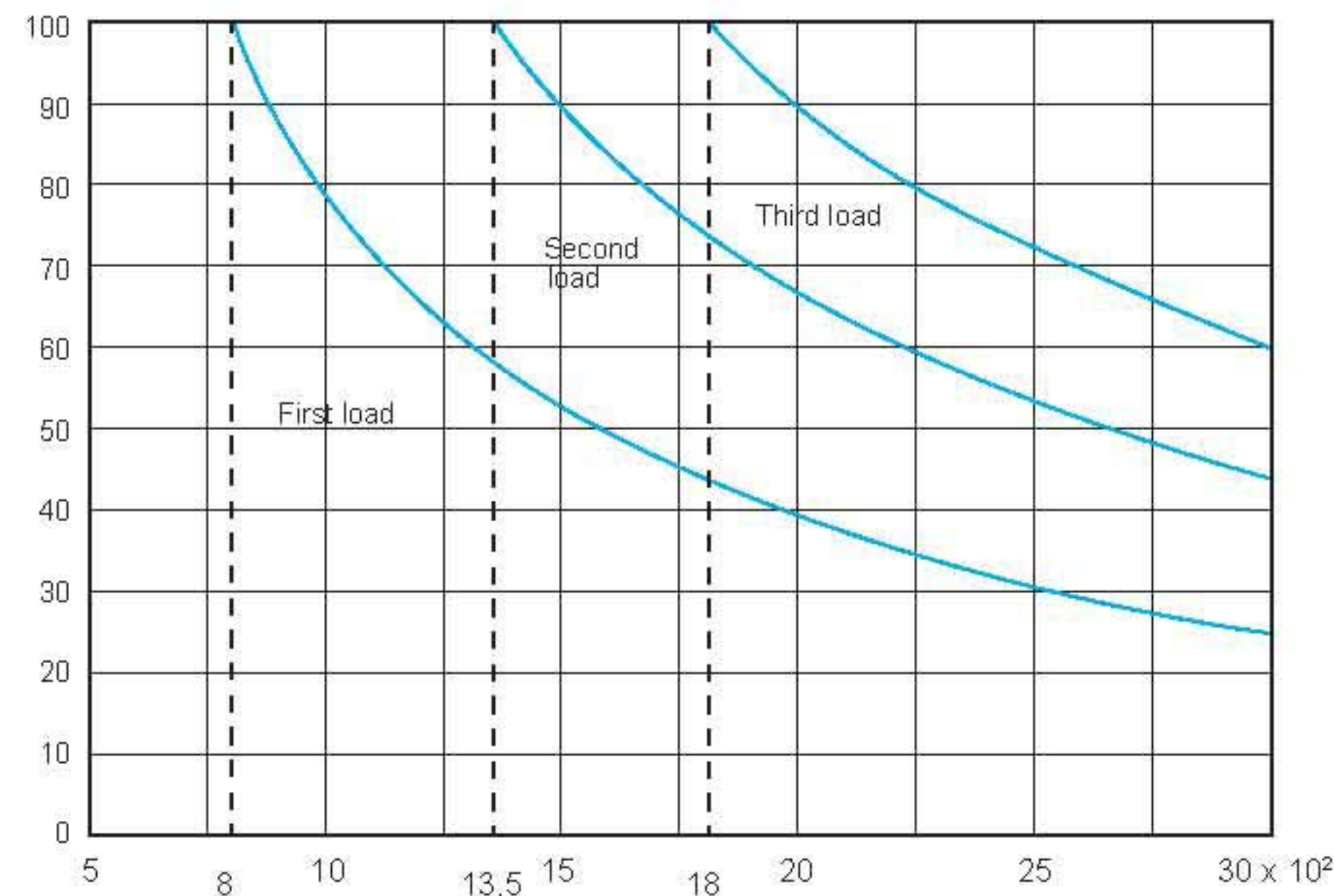


Table 6 Reference values for the possible maximum increases with suddenly applicable charge, as a function of the Pme to the declared power (valid for 4-stroke engines).

3. WORK CONDITIONS

■ Asynchronous motor start

The start of the asynchronous motors by means of a generating genset presents problems, since the engines with cage rotor present start currents eight times the nominal intensity of the genset ($st\ I_n = 8 \cdot I_n$), and a low power factor.

In these conditions, the current absorbed by the asynchronous motor (or by the motors which start simultaneously) for starting should not exceed the maximum current that the alternator can deliver in short times, bearing in mind a fall of bearable voltage and without exceeding the overheating limits.

To avoid excessive oversizing of the generating genset, the following systems can be used:

In the case of several engines; distribute them in several gensets to introduce, each one, according to a pre-established sequence, at 30-60 seconds intervals.

In the case of an only engine; when the attached operating machine allows, use a reduce voltage start system (star/triangle or compensator) or, for greater powers, engine with coiled rotor and rheostat starter.

In the case of star / triangle start, the voltage in each phase is reduced and the start current ($st\ I_n$) is reduced in the same proportion

$$1/\sqrt{3}=0.58$$

Obviously, in the case of a engine with $st\ I_n = 6 \cdot I_n$ in direct start, with star / triangle start, $st\ I_n$ is reduced to approximately $3.5 \cdot I_n$, with the consequence of a power requested to the generating genset inferior to the ratio 6/3.5.

In all cases, with direct start as well as with reduced-tension start, it is necessary to control the appliances and users connected to the user circuit to avoid failures (for example the opening of contactors) due to the transient fall of tension at the moment of start.

4

GENERAL DESCRIPTION

4. GENERAL DESCRIPTION

The gensets are used for two mains types of services:

Continuous service gensets. Used for electrical energy production in zones where no other production source exists, and application to several purposes (drive force, light, heating, etc.).

Emergency service gensets. Use to solve energy interruptions which may cause serious personal problems, material and/or financial damage, (hospitals, industrial facilities, airports, etc.) or to face consumption peaks.

According to the assigned destination, the gensets are subdivided in:

Gensets for land use

Gensets for marine use

There are two mains types of land gensets, according to the use to which they are destined:

Stationary gensets (fixed installation)

Mobile gensets (mobile installation)

The two models may be subdivided in a wide range of versions according to the modalities and operation requirements:

Manual operation gensets.

Automatic operation gensets.

Continuity genset.



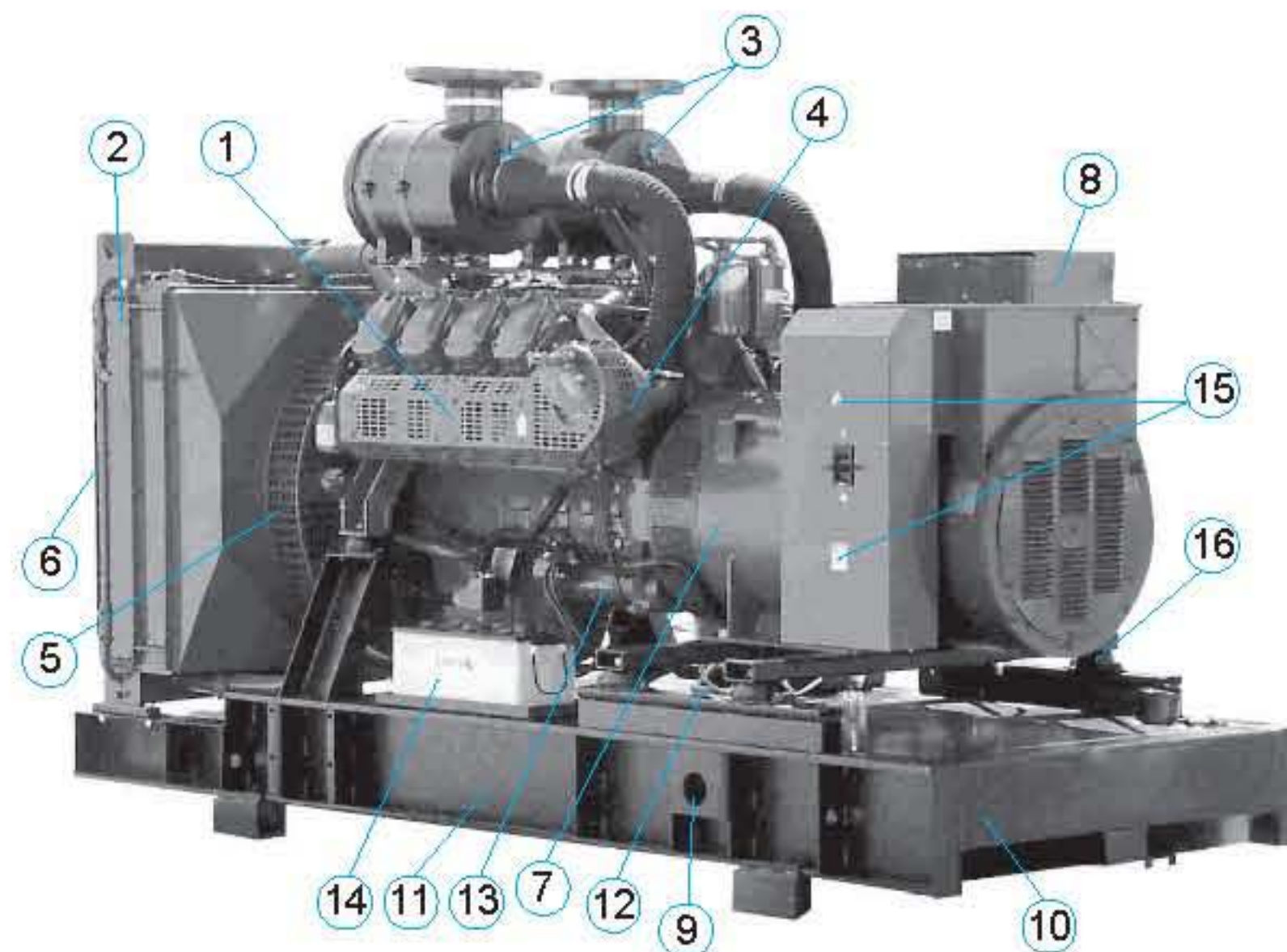
4. GENERAL DESCRIPTION

This handbook provides general information for the installation and use of the LONGEN POWER/HYUNDAI GENERATOR of the series both manual and automatic operation.

The generating genset shown is that of a standard static series, although it must be pointed out that each generating genset offers a different image due to the various sizes and configurations of each of the mains components.

An open skid genset is generally composed of:

1. Diesel engine
2. Radiator
3. Dry air filter
4. Turbo compressor protection (,not for all model)
5. Fan protection
6. Front radiator protection
7. Single-bearing alternator
8. Electrical control panel
9. Lifting hole
10. Bed-frame
11. Chassis-integrated fuel tank
12. Components earth connection
13. Motor starter
14. Start batteries
15. Identification sticker
16. Silent blocks.



4. GENERAL DESCRIPTION

In addition to the parts described for the open skid genset, the bodywork of a soundproofed static genset has also:

1. Control panel
2. Output terminal
3. Emergency stop
4. Air intake
5. Door
6. Lock
7. hinge
8. Lifting point





4. GENERAL DESCRIPTION

4.1. Diesel engine

Operates on a 4-stroke, direct injection, natural aspiration diesel cycle, Nature inspired and/or turbocharged and/or after-cooling. The cylinder arrangement depends on the engine model, it can be inline or V type. The engine is water-cooled. or air cooled

4.2. Alternator

Self-excited, self-regulated horizontal shaft synchronous alternator with brushless. It comes complete with an automatic tension regulator, which includes potentiometers to adapt the operation to the various utilisation conditions of the genset. some type with STC alternator, it is brush type alterator, separate excitation, with AVR.

4.3. Coupling Union

The engine and the alternator, in the case of two-bearing alternators, are rigidly coupled by means of a union shed, which guarantees correct coaxiality of the assembly.

With single-bearing alternators, instead of an elastic junction, coupling is accomplished by means of flexible disks fixed directly to the engine wheel.

4.4. Support bed-frame

The chassis formed by a folded sheet structure of adequate rigidity which uses elastic supports (silent blocks) to eliminate vibrations in the genset, and consequently ground vibration. Fixation to foundations is generally a problem-free bolting.

The fuel tank is usually found on the top. The tank includes filling nozzle with built-in filter (according to models), electrical meter (with one or two signals), emptying nozzle, fuel return (from the injection pump and injectors drainage) and vent. It is connected to the aspiration pipelines of the feed pump by means of flexible elements.

Separately, we can supply custom-made tanks of great capacity; although only the tanks on the bed-frame are described in this handbook. Battery housing and clamps can also be found inside the bed-frame. we provide the base fuel tank for the big power generators upper than 50KW.

4

4. GENERAL DESCRIPTION

4.5. Soundproofed cover

For particular requirements and applications of our clients. It is made of sheet steel of adequate thickness, duly treated to perfect finish. The interior of the cover is lined with sound-absorbent, fireproof material classified M-0.

In the air entry and exit zones, the cover is provided with the corresponding conduct, designed to avoid the usual forced-air conduct reverberations.

The exhaust includes a high extenuating power silencer, which guarantees the adequate reduction of sound emission level.

The cover doors are also perfectly soundproof and sheathed with fireproof fiber. The locks have a key, which guarantees non-operability by alien persons, even in the genset control area.

4.6. Manual operation panel

Designed to gather the electrical instruments of control, the general protections of engine and alternator, the alarms and measure / control instruments.

4.7. Automatic-operation panel

Automatic panels are connected to the power mains and to the genset. When the electrical supply is suitable, the mains contactors are closed and the equipment is fed by the mains. When the electrical supply is deficient, the mains contactors will be open and the generating genset will start automatically. The contactors detect tension in the terminals and commute the service of the generating genset.

4





4. GENERAL DESCRIPTION

4.9. Trailer Generator Set, mobile Generator Set, lighting Plant

DRAGON POWER Generating Sets can be supplied in the mobile version, low or high speed. Trailer gen-sets, and lighting plant

The slow-speed mobile generating genset may be operated inside private areas.

The high-speed mobile generating genset is supplied with a mobile kit approved for operation in public spaces.

The mobile kit will include one or two shafts, depending on the power of the generating genset. It consists of a strong structure of steel profiles and:

- brake shaft,
- Elastic suspension,
- Hooking lance with height-adjustable support, front wheel to facilitate movement and rear wheels with bumpers.
- Signalling reflectors.



5

INSTALLATION

5. INSTALLATION

5.1. Important cautions:

Material control.

On receipt of G.S., it is advisable to check that the materials received match order and enclosed bill of delivery, and that the merchandise has arrived in perfect condition. Eventually, open the crates.

In case of verifying damages, immediately notify the transportation agency for the fact of insurance.

LONGEN POWER hereby states that all deliveries are accomplished to complete risk of the client".

Prior to installation of automatic G.S.

During the preliminary operations for the installation of gen gensets of automatic intervention, specially during the electrical connections and to avoid accidental starts, etc., the following cautions should be taken:

The battery or batteries must be disconnected.

The switch in the control panel must be in the disconnected position.

Safety procedures for diesel G.S.

The machine room and genset attachments (foundations, air entry, gas exhaust) must be in accordance with the "Safety Procedures" of the country in which the genset is installed.

Installation

For the stationary gensets two types of installation can be considered:

Outside assembly.

Inside assembly.



5. INSTALLATION

5.2. Outside facilities

Gensets assembled outdoors (except soundproofed gensets, which are designed for such application), must be protected against weather , dust, etc. Direct solar exposition, which may cause abnormal heating of the generating genset, must be avoided.

For provisional facilities, it is sufficient with supporting the genset on a well levelled area. For more permanent facilities, it is advisable to construct foundations according to established dimensions and ordinances.

5.3. Inside facilities

■ Location room

For a correct installation of a genset in closed premises, the dimensions of the location room must allow:

- ¥ the regular operation of the genset,
- ¥ easy access to its components, for eventual maintenance and repairs,
- ¥ the possibility of introducing the genset with the available means of transportation. The entry door must be in a central position, so that the genset remains centred without the need to further move it once inside,
- ¥ the existence of openings to allow oil change,
- ¥ the installation of the exhaust pipe with as few angles as possible,
- ¥ the location of the genset in the centre, with respect to perimeter walls, to facilitate access,
- ¥ the arrangement of the command panel (automatic genset) in a position that provides the operator with complete visibility on the instruments when working.

The advisable dimensions of the room are represented in the following figures:

5

5. INSTALLATION

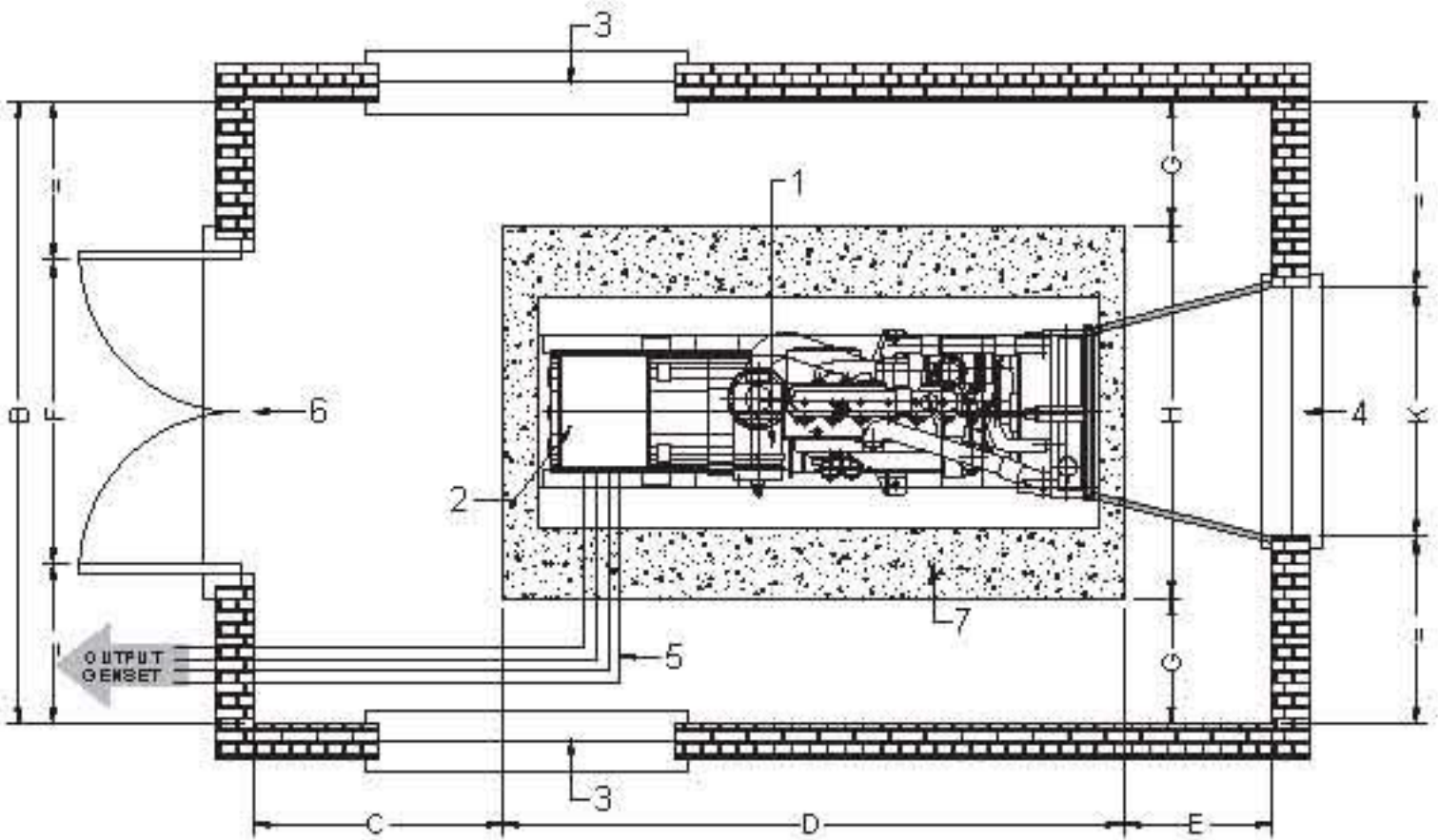
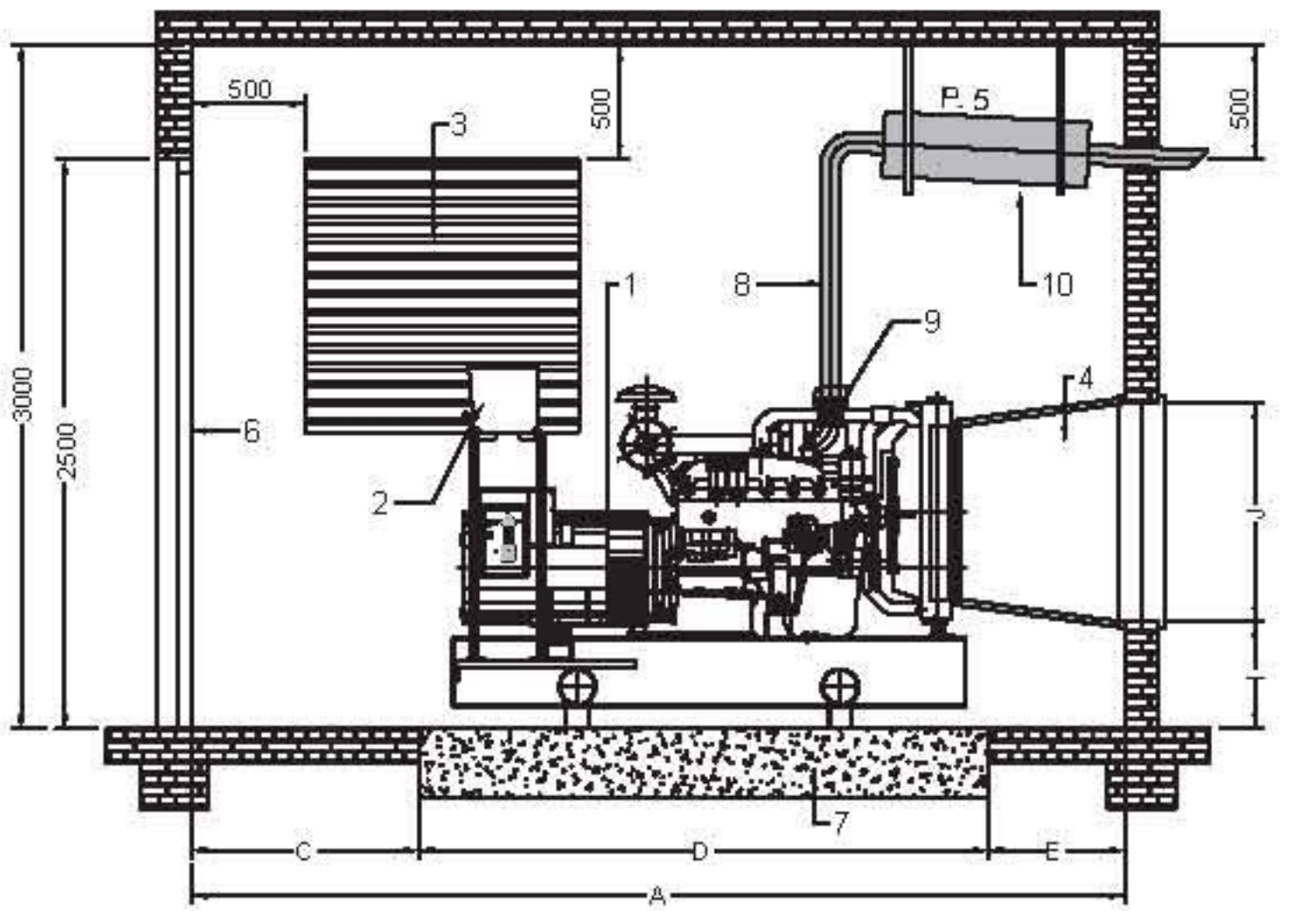
Open skid genset with manual panel.

NOMENCLATURE

- 1.- GENERATING SET.
- 2.- CONTROL PANEL.
- 3.- AIR INTAKE HOLLOW.
- 4.- AIR EXHAUST.
- 5.- CABLE WIREWAY.
- 6.- ACCESS DOOR.
- 7.- REINFORCED CONCRETE BASE, H-175
- 8.- EXHAUST PIPE.
- 9.- FLEXIBLE PIPE.
- 10.- SILENCER.

Location room dimensions												
POWER	A	B	C	D	E	F	G	H	I	J	K	NO FLOW SECTION AIR INTAKE
30 KVA	3500	2500	1000	1700	800	1200	750	1000	500	600	800	2 x 0,60 m ²
40 KVA	3500	2500	800	1900	800	1200	750	1000	500	700	900	2 x 0,80 m ²
60 KVA	4100	2500	800	2500	800	1500	650	1200	550	800	900	2 x 1,00 m ²
70 - 80 KVA	4500	2500	1000	2700	800	1500	650	1200	500	800	1000	2 x 1,00 m ²
100-125-130-150	4500	2700	1000	2700	800	1500	650	1400	500	900	1300	2 x 1,00 m ²
210 KVA	5000	2700	900	3300	800	1800	650	1400	500	1100	1500	2 x 1,20 m ²
250-300-350-380	5000	3000	700	3500	800	1800	650	1700	500	1300	1600	2 x 2,50 m ²
400-450 KVA	6000	3000	1000	4200	800	1800	650	1700	350	1500	2000	2 x 3,00 m ²
Dimensions (mm)												

Remark: Other rang gen-set please consulate with factory or local agent.



5. INSTALLATION

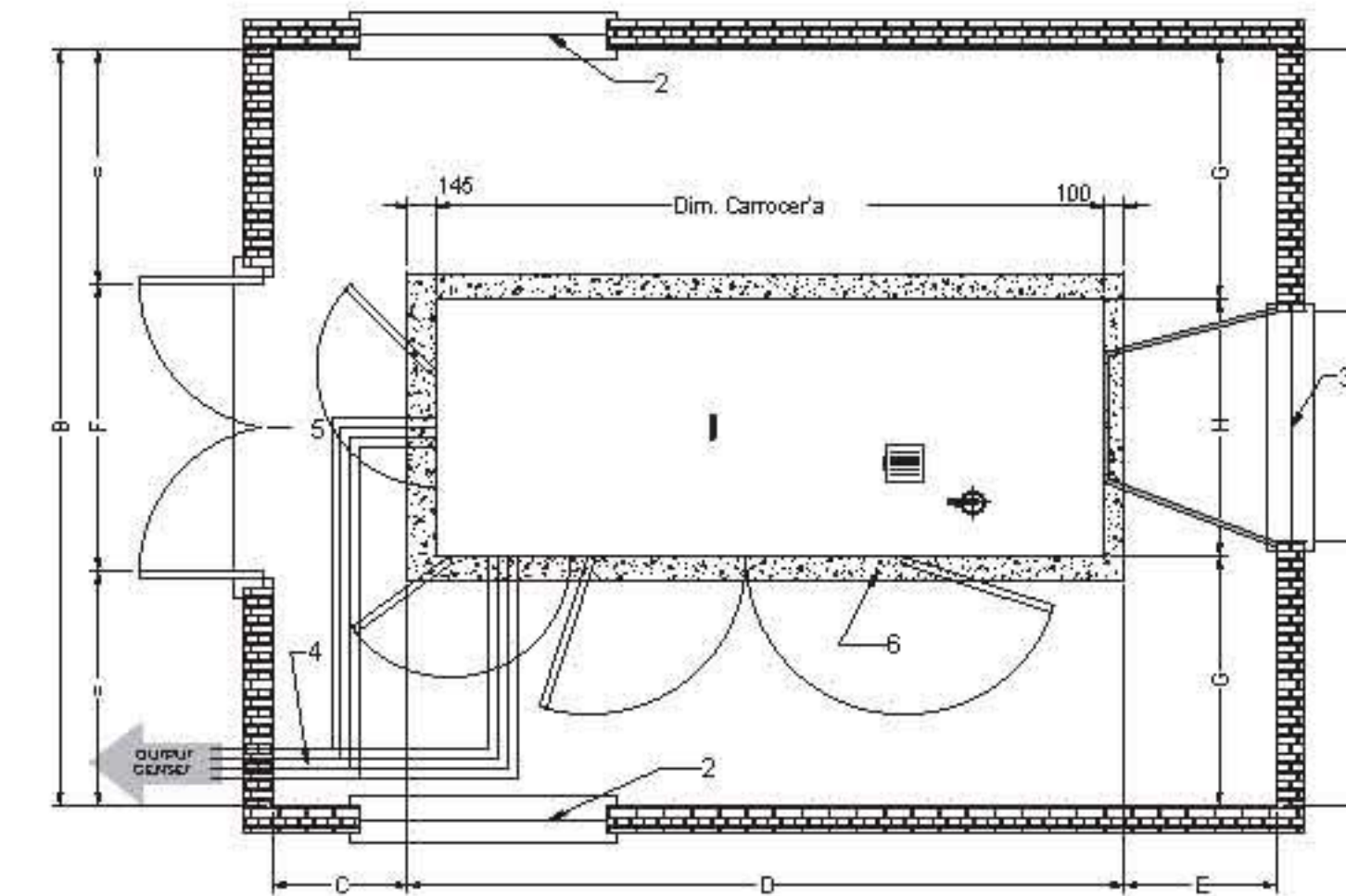
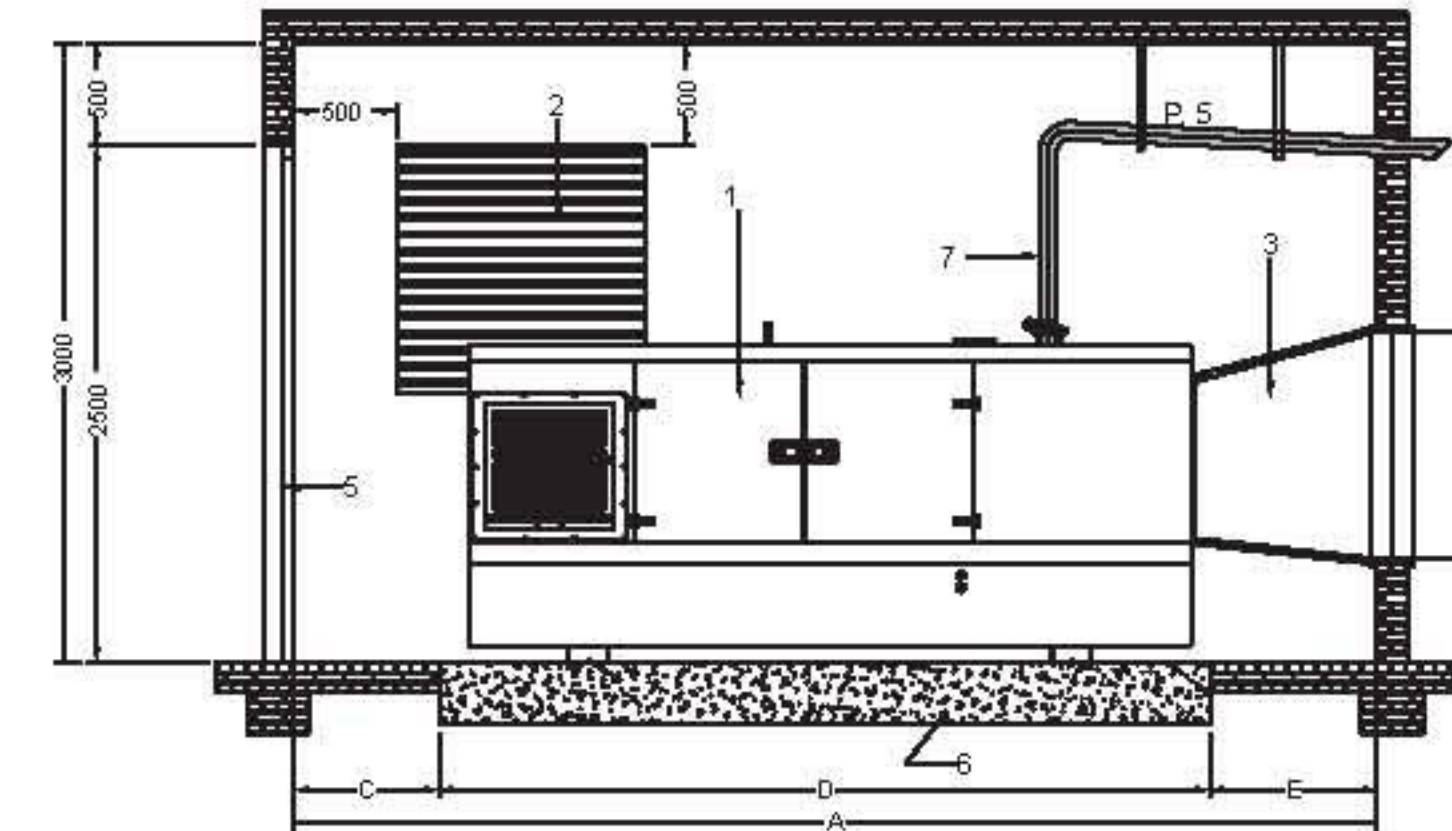
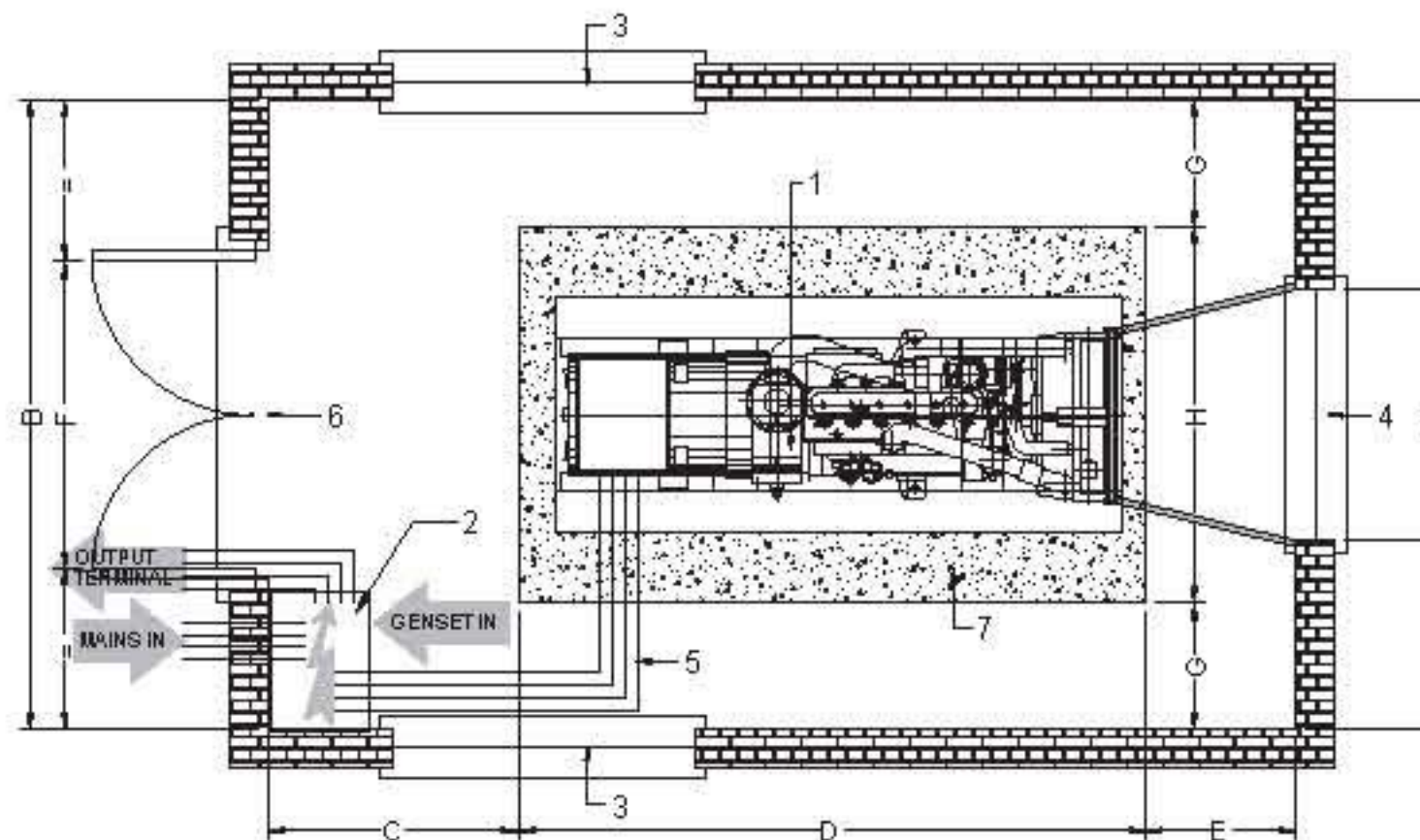
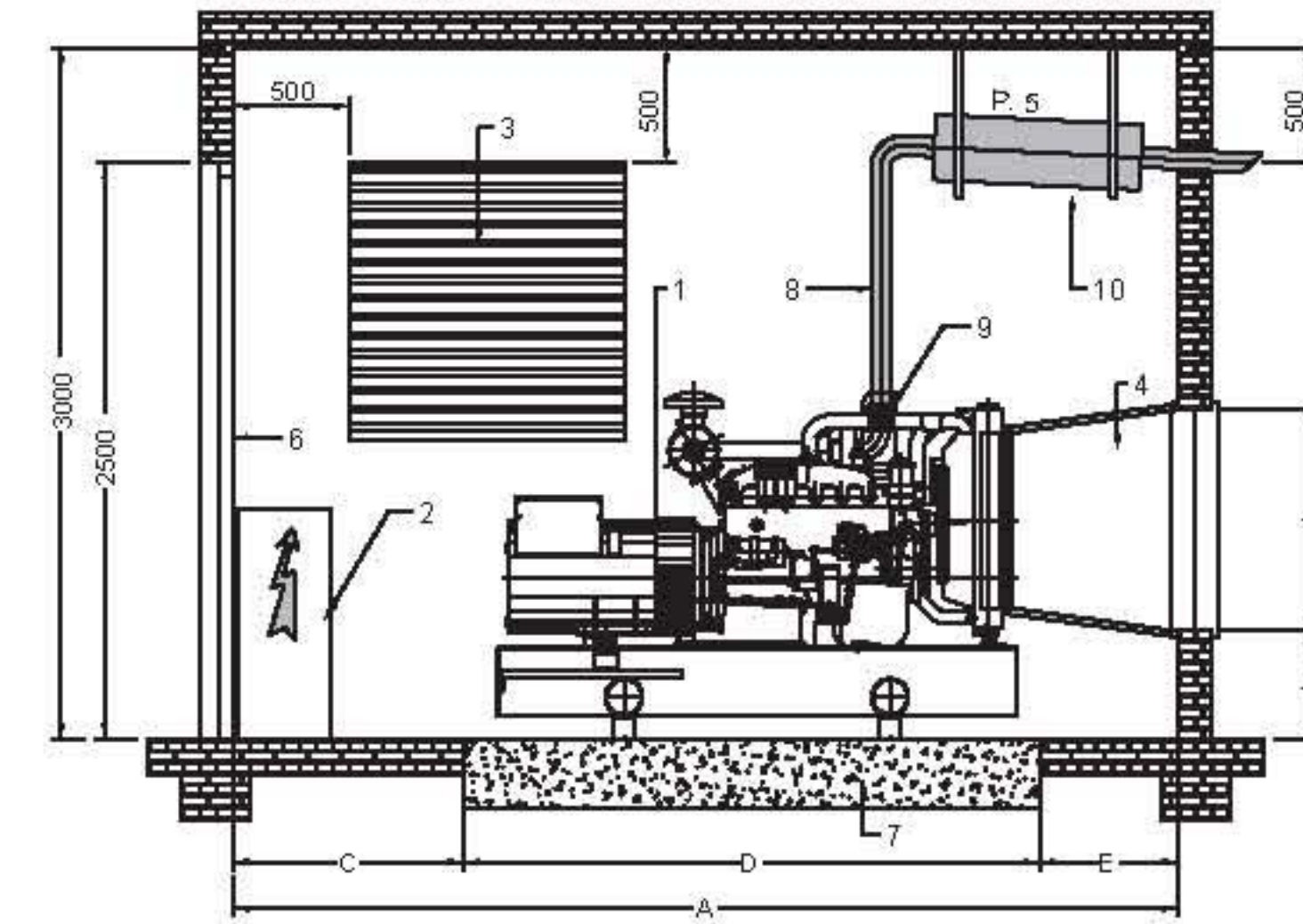
Open skid genset with wall-cabinet panel.

NOMENCLATURE

- 1.- GENERATING SET.
- 2.- CONTROL PANEL.
- 3.- AIR INTAKE HOLLOW.
- 4.- AIR EJECTION TUNNEL.
- 5.- CABLE WIREWAY.
- 6.- ACCESS DOOR.
- 7.- REINFORCED CONCRETE BASE, H-175.
- 8.- EXHAUST PIPE.
- 9.- FLEXIBLE PIPE.
- 10.- SILENCER.

Location room dimensions												
POWER	A	B	C	D	E	F	G	H	I	J	K	HOLLOW SECTION AIR INTAKE
30 kVA	3500	2500	1000	1700	800	1200	750	1000	800	600	700	2 x 0,50 m ²
40 kVA	3500	2500	800	1900	800	1200	750	1000	800	700	800	2 x 0,60 m ²
60 kVA	4100	2500	800	2500	800	1500	650	1200	850	800	800	2 x 0,80 m ²
70 - 80 kVA	4100	2500	800	2500	800	1500	650	1200	800	800	800	2 x 0,90 m ²
100-125-130-150	4100	2500	800	2500	800	1500	650	1200	800	900	900	2 x 1,00 m ²
210 kVA	4500	2500	700	3000	800	1500	650	1200	800	1100	1000	2 x 1,20 m ²
250-300-350-380	5000	3000	700	3500	800	1800	650	1700	800	1300	1300	2 x 2,50 m ²
400-450 kVA	5000	3000	600	3600	800	1800	650	1700	350	1500	1500	2 x 3,00 m ²
Dimensions (mm)												

Remark: Other rang gen-set please consultate with factory or local agent.



Soundproofed static genset.

NOMENCLATURE

- 1.- GENERATING SET.
- 2.- AIR INTAKE HOLLOW.
- 3.- AIR EJECTION TUNNEL.
- 4.- CABLE WIREWAY.
- 5.- ACCESS DOOR.
- 6.- REINFORCED CONCRETE BASE, H-175.
- 7.- EXHAUST PIPE.

Location room dimensions												
POWER	A	B	C	D	E	F	G	H	I	J	K	HOLLOW SECTION AIR INTAKE
40 kVA	4245	3200	800	2645	800	1200	1100	1000	450	750	860	2 x 0,80 m ²
60 kVA	4845	3600	800	3245	800	1500	1200	1200	450	900	1100	2 x 1,00 m ²
70 - 80 kVA	4845	3600	800	3245	800	1500	1200	1200	450	900	1100	2 x 1,10 m ²
100-125-130-150	4845	3600	800	3245	800	1500	1200	1200	450	900	1100	2 x 1,20 m ²
210 kVA	5245	3950	700	3745	800	1800	1300	1350	500	1100	1200	2 x 1,40 m ²
250-300-350-380	5995	4600	850	4345	800	2100	1500	1600	645	1250	1550	2 x 2,80 m ²
400-450 kVA	5995	4800	850	4345	800	2100	1500	1800	725	1200	1800	2 x 3,00 m ²
Dimensions (mm)												

5. INSTALLATION

The basic elements to consider are:

- ¥ Foundations
- ¥ Exhaust facilities
- ¥ Ventilation
- ¥ Fuel installation
- ¥ Electrical connections
- ¥ Land connection
- ¥ Pre-heating

■ Foundations

Foundation must be calculated and sized by civil engineering specialists. It will have to avoid vibrations and noise transmission to other parts of the building.

The surface on which the genset is placed must be well levelled to allow correct operation.

For cleaning reasons, it is convenient to place foundation approximately 10cms above floor level, and covered with industrial sandstone tiles.

■ Exhaust installation

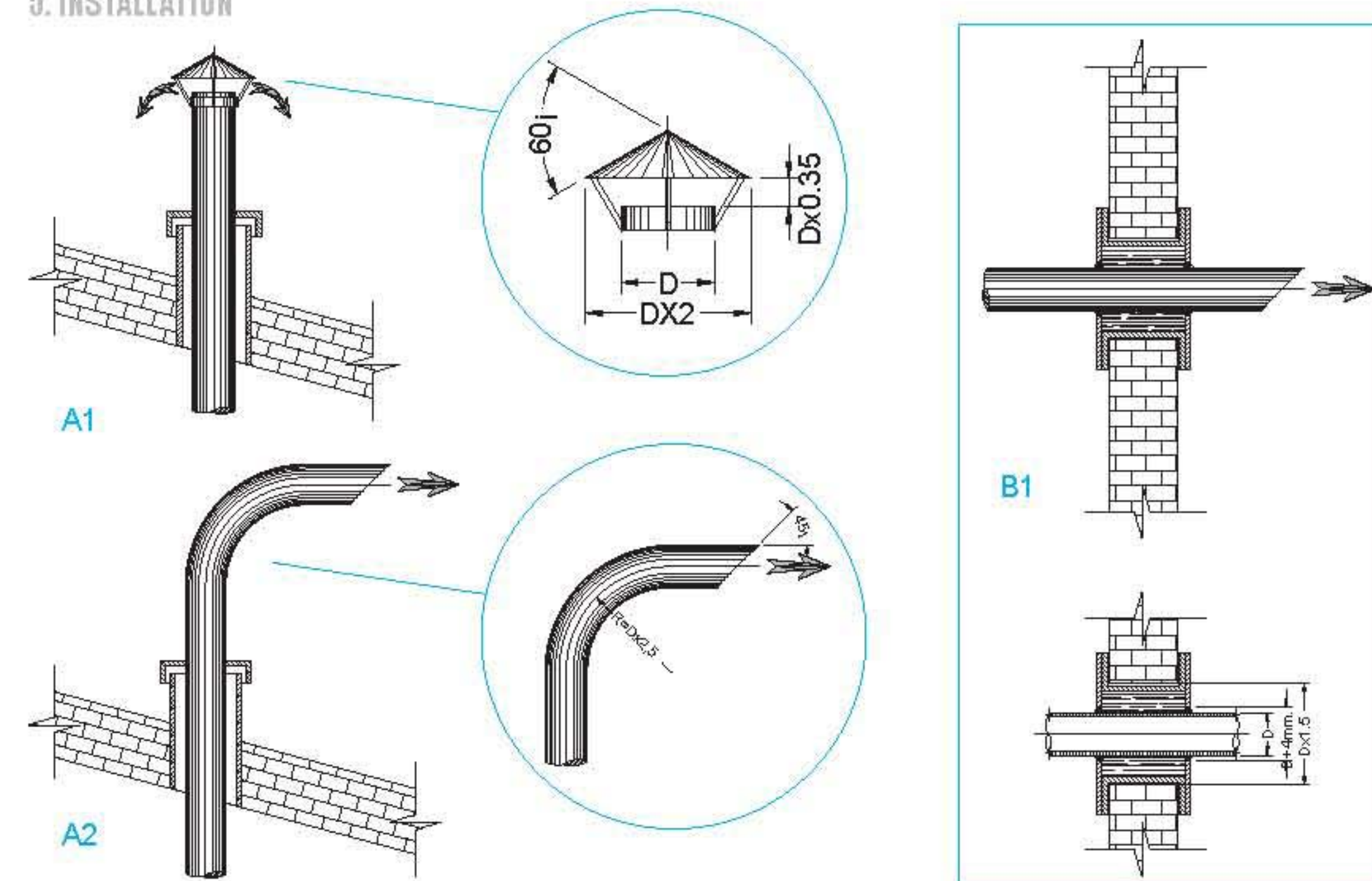
Exhaust pipes

Gas exhaust pipes are generally made of smooth steel pipes, without welding, or, in special cases, with asbestos-cement pipes.

Pipes must evacuate gases to areas where no disturbance or damage is produced, and must include a terminal hood or equivalent protection method to keep water from entering the system. (Fig. A1-A2)

5

5. INSTALLATION



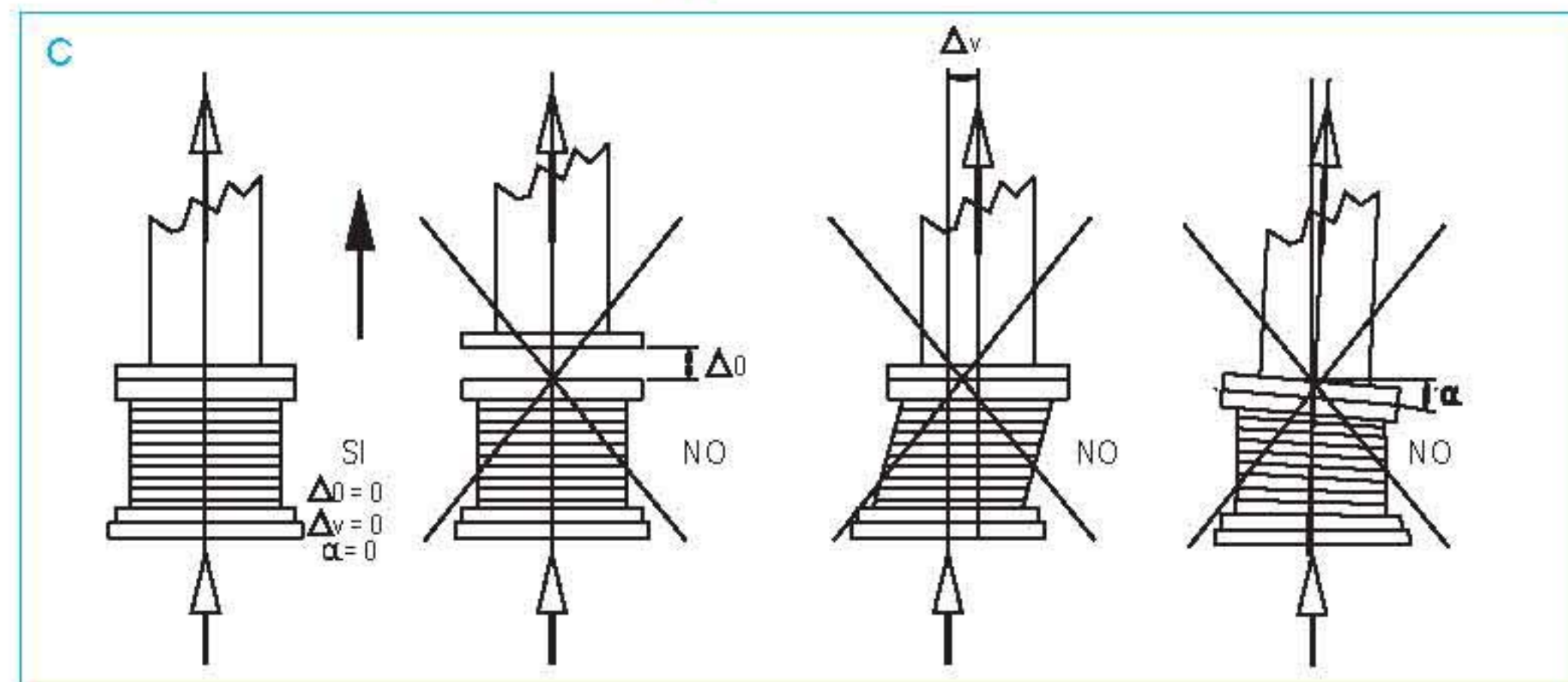
At points where walls are crossed, it is convenient to accomplish the thermal insulation of the pipelines, to prevent heat dispersion in the walls. (Fig B1)

The unions between the various spans of the pipeline must be perfectly tight, so that no gas leaks occur. The gasket-and-gasket junction is the most suitable one. Furthermore it is convenient to place a condensation collector, with faucet, on the bottoms point of the pipelines.

5

5. INSTALLATION

The connection between the exhaust collector of the engine (or of the turbo blow exhaust, in turbocharged models) and the pipe must be a flexible pipe, so that the actions induced by the engine, and the thermal expansions of the pipe are absorbed without damaging any element. (Fig C) 



To implement the flexible element, gaskets must be attached to the exhaust pipe, independently from the generating genset. Therefore, pipelines must be fixed to the walls or ceiling of the machine room with supports which can bear the full weight of the pipeline at the point closest to the engine, and not resting on any other parts of it (collector, turbo blower), and allowing for dilatation.

When very long pipelines are to be used, expansion joints, made of flexible, leak-proof material, will be necessary at regular intervals.

When designing the exhaust route, it is advisable to stay away from the surroundings of the air filters of the engines, to prevent the machine from aspirating hot air. Otherwise, it will be necessary to insulate it thermally.

5. INSTALLATION

In the case of several gensets, it is recommended not to make all the exhausts merge in a single pipeline: problems may arise if one or more gensets operate and others don't. Exhaust gases produced in the operating pipes may penetrate the inoperative conduits and cause damages.

A. Sizing of exhaust pipes in Open Skid Gensets.

The engine exhaust counter-pressure has a remarkable influence on the power delivered by it and on the thermal charge.

Excessive counter-pressure values (measured at exit point of the exhaust collector in aspiration engines, and at the exit point of the turbine in the case of turbocharged engines) provokes power reductions, increase in temperature of the exhaust gases, fumes, high fuel consumption, overheating of the refrigeration water, degradation of the lubricant and the corresponding consequences on the parts of the engine.

The critical limits (referred to terms of delivery of maximum power at the maximum operating range) in HIMOINSA gensets of the TOR range are:

- ¥ 150 mbar (1,500 mm H₂O) for aspiration engine
- ¥ 50 mbar (500 mm H₂O) for turbocharged engine.

Such limits can be observed by giving appropriate dimensions to the exhaust installation, that is to say, diameter of the pipe and type of silencer.

Pipes must be as short as possible, and with a small number of angles or curves. If angles are indispensable, they will have to be accomplished with a very wide curvature radio (2.5 to 3 times the pipe diameter).

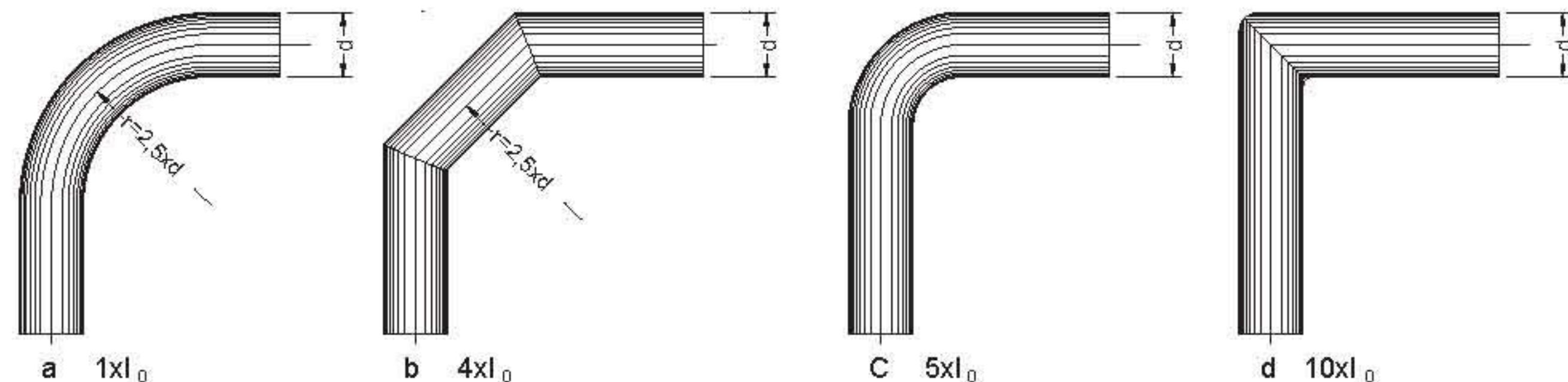
Solutions with curve radio under 2.5 times the diameter present difficulties, so they should be avoided.

5. INSTALLATION

For the **calculation of the total length of the pipe** (which is essential for the exhaust counter-pressure), the following considerations should be taken into account:

One must determine the rectified length of the angles, according to table and drawings

Interior diameter of the exhaust pipe (mm)	40	50	65	80	100	125	150	200	250	300
Equivalent rectified length L_0	0.5	0.7	0.9	1.2	1.7	2.2	2.8	4.0	5.4	6.7



The values of the counter-pressure due to the **exhaust silencers** may vary widely, according to the type of construction, dimensions and extenuation characteristics:

✎ if it is supplied by HIMOINSA, its length must be multiplied by a safety coefficient, so that the total length to consider for the counter-pressure will be: $L=2 \times l$.

✎ if it is supplied additionally by a distributor, it is recommended to consult them about the value of the counter-pressure due to the silencer.

5. INSTALLATION

► Example:

The parts listed below form the exhaust pipe:

- 5 meters of straight sections
- Two type a) elbows
- Three type c) elbows
- A 1-meter-long silencer

If the internal diameter of the exhaust pipe of the engine is 80 mm, the total length of the exhaust pipe is calculated in the following manner:

- a) for interior diameter of the exhaust pipe 80 mm, according to table, $l_0=1.2$ m
- b) the total length of the type a) elbows is $1 \times l_0 = 1 \times 1.2 = 1.2$ m
as there are two elbows, $2 \times 1.2 = 2.4$ m
- c) the total length of the type c) elbows is $5 \times l_0 = 5 \times 1.2 = 6$ m
as there are three elbows, $3 \times 6 = 18$ m
- d) the total length of the silencer of leak is, $L=2 \times l = 2 \times 1 = 2$ m
- e) the total length of the exhaust pipe is: $5+2.4+18+2= 27.4$ meters



5. INSTALLATION

5

The diameter of the exhaust pipe must never be smaller than that of the exhaust collector and furthermore, the straight section should have a certain slope to avoid the return of condensation, according to indications in the location plan of the genset in the room.

When the pipe diameter is bigger, the attachment to the engine will be a conical junction element with cone angle under 30¼, to avoid excessive charge losses.

B. Sizing of the exhaust pipes in Soundproofed Static Gensets

Please inquire LONGEN POWER Engineering Department. Counter-pressure at the exit point of the genset there is due to the inside pipes, and it is necessary to know this value so as not to exceed the recommended counter-pressure upon designing the rest of the installation.

■ Exhaust silencer

The exhaust silencer is normally in the pipeline section that is inside the location room of the genset. When possible, it must be detachable.

The silencer used in industrial applications produces an extenuation of the noise of about 15 - 20 decibels.

To attenuate the noise produced by the resonance of gas pulsation in the pipelines, the position of the silencer may be varied, reducing the length of the pipe reaching the engine. For example, for a 10-meter pipe, the optimum position would be at half the distance from the exit point.

In special premises, such as hospitals residential areas, where greater noise extenuation is needed, special silencers, with extenuation of 25 to 30 decibels, can be used and, when possible, special calm chambers must be added.

■ Ventilation

The ventilation of the machine room is installed has a significant importance for the correct operation and duration of the G.S. installed in it.

5. INSTALLATION

5



The machine room must have the following characteristics:

- ¥ Allow dissipation of emitted heat during the operation of the genset by irradiation and convection.
- ¥ Guarantee the correct flow of the feed air, and in the necessary quantity for the combustion of the engine.
- ¥ Permit the refrigeration of the engine by means of the radiator, keeping environment operation temperature within safety limits to guarantee good aspiration of feed air.

A ventilation solution valid for most of the cases it is the one indicated in tables in the installation paragraphs, in which the engine fan aspires the refrigeration air from the machine room, while hot air is expelled through the expulsion tunnel located between the radiator and the room window.

The expulsion window will be at least as big as the radiator in the case of open skid equipment, and at least as big as the expulsion grid in the case of soundproofed equipment.

Hot air leaving the radiator must re-enter the engine room. Verify that the air expel conduits are leak-proof. In this way, air is constantly renewed in the environment of the machine room, with entry openings dimensions appropriate for refrigeration and combustion.

To guarantee correct airflow, cool air must be introduced by means of openings in the lower part of the wall of the machine room. It is recommended to use the wall opposite the one, which houses the radiator, so that the air flow slips all over the genset, before being expelled through the fan.

Special attention will be given to avoid air bags in the machine room. This often happens in rooms with several engines. In such a case, and as much as possible, each genset should have its own opening for air entry.

Details on the required airflow for the different types of Longen gensets are found in the "technical data sheet" for each model.

For safety reasons, in the premises where gensets are in continuous service or in those places where the ambient temperature is high, it is advised to use an auxiliary extracting fan, with sufficient power to obtain an adequate ventilation. The location of this extracting fan must be the upper part of the room, as close to the radiator as possible.



5. INSTALLATION

Fuel installation

The genset series supplied by LONGEN POWER supplies include complete fuel installation, with the tank located in base frame of the genset or separately fuel tank.

The tank is connected to the engine by means of flexible pipes to ensure operation autonomy, according to model.

For automatic generator, and to satisfy special demands, it is necessary to use a special tank, mounted separately. It will be necessary to accomplish the connection of the engine to the new tank, and previously to accomplish the interposition of the flexible connections and new duly fixed adequate pipelines. In order to enable the injection pump of the engine to aspire fuel from the new tank, this should be located:

- ✧ Less than 10 meters from the engine, both being at the same level.

- ✧ Less than 3 meters of depth.

The usual connections are:

- ✧ Fuel entry to the injection pump.

- ✧ Excess fuel return from the injection pump.

- ✧ Drainage return of the injectors.

It is essential that such pipelines are weld-free type, made of steel, iron or molten iron. Do not to use galvanised steel pipelines.

Flexible connections must be interposed to isolate the fixed parts of the plant and the new tank, thus avoiding possible vibrations induced by the engine. According to the type of engine, this can be accomplished by means of:

Sections of adequate length, made of rubber pipe reinforced with Diesel oil resistant flexible inserts. For the connections with the terminal, rubber-holders with edges and locks with screw clappers will be used.

Flexible pipes of low-pressure type, adapted for Diesel oil, protected with metallic mesh and with the terminals threaded for hermetic close.

5

5. INSTALLATION

Avoid synthetic resin connections.

In the complementary areas of the plant, maximum attention should be given to the following points:

Fix pipes by means of holders, at regular intervals, so that vibrations and inflections due to pipe weight, especially copper pipes, are avoided.

In as much as possible, avoid joints; those necessary should be hermetically closed, especially in sections in depression conditions (fuel entry in aspiration), to avoid air infiltration that may hinder the start.

Aspiration pipes under the fuel level must be fixed some 20 to 30 mm from the bottom, to avoid the possible deactivation of the circuit by air infiltration. Furthermore, these should be adequately far apart from each other, so that the return flow of the fuel don't disturb directly the delivery because of fuel impurities from the bottom of the tank or with mixed air contribution.

Scrupulous cleaning of the used pipelines.

Avoid sharp pipe section variations, and use elbows with wide curvature radii.

Electrical connections

The gensets are already prepared to be connected to the users.

Upon effecting the connections, it is necessary to observe the conditions indicated in the plans that are supplied with the genset.

Gensets of manual type

The users' cables must be connected to the terminals of the line, which, in the case of open skid gensets, are found in the interior of the electrical panel, in the rail terminals or in the lower part of the magneto-thermal switch, either within the panel or in the moulded case (see electrical graphs included in the panel handbook). In soundproofed gensets, the connection to the line terminals is easily accessible and protected with a plate of methacrylate resin.



5

5. INSTALLATION

Gensets of automatic type

The cables from the genset, from the outside power mains and from the user, will be connected to the respective terminals in the command panel.

The power cables of the genset must be connected in the genset, directly in the terminals of the alternator.

The connection of the auxiliary services between the genset and the command panel, will be accomplished by using a multiple cable and the pegs of the multiple connectors supplied with the genset.

Dimensions of the cables

The installer is in charge of, and responsible for, the election and the sizing of the cables.

Placement of the cables.

The genset - mains junction cables, for automatic and manual gensets, must be located inside adequate channelling, tunnels or in protection conduct-holder. Do not to include 400 V cables and 12V (or ' 24V) cables in the same channelling.

■ Ground connection

The metal pieces of the installation which are exposed to contact with persons and, because of an insulation defect or other causes, could be found to be with tension, must be connected to a grounded device.

Gensets and panels have been provided with their corresponding terminals to ground.

The connection between these and the ground dispenser must be done by conductors of unjacketed copper with a minimal section of 16 mm² or, if not possible, galvanised iron of 50 mm² of section. The resistance of said conducting, including the contact resistance, must not exceed 0.15 Ohm.

5. INSTALLATION

■ Pre-heating

In the case of automatic operating gensets, the machine room in which they are installed must be appropriately conditioned, during the cold station, so that the environment temperature does not descend below 10-15¼C, necessary condition for a rapid start of the engine.

In these gensets, electrical heaters with thermostatic control of the range 700 to 1,500 w, according to the type of genset, have been included to maintain water temperature at the base of the engine in acceptable values, so that an unexpected start and charge intake do not cause any inconvenience to the engine.

Also we provide oil heater be an option to keep the oil at normal temperature.

both water and oil heater have the automatic temperature control function.

6

BEFORE OPERATION

6. BEFORE OPERATION

These operations must be done in the following situations:

- ✖ before the start of the genset
- ✖ after the installation of the genset
- ✖ after a general review
- ✖ after maintenance operations
- ✖ when the genset has remained inactive for a long time

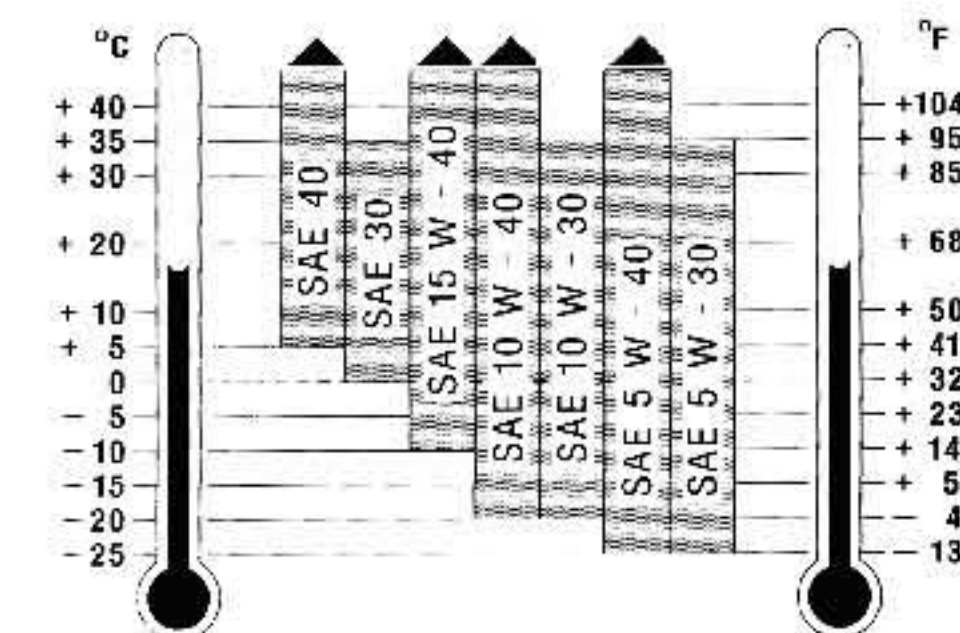
During these operations, make sure that the genset cannot start unexpectedly, that it is blocked and the start batteries disconnected.

Water level the radiator.

If water is lacking at any time, a mixture that containing a maximum of 50% of liquid antifreeze/ corrosion inhibitor type Paraflu II and the rest clean water must be refilled.

Level of lubricant oil in the oil case.

Oil refer to below sheet:





6. BEFORE OPERATION

for aspiration engines. Fill oil case with oil, until the upper mark on the graduated rod, without exceeding. With the engine, after a short operation time, verify again the level of the lubricant oil, and if necessary, add the quantity that may be needed.

Level of the fuel deposit.

If the fuel level is inferior to the necessary minimum for the start of the genset, it is necessary to add fuel until filling the deposit.

Electrical procedures.

Before operating the genset, the electrical connections, start batteries and earth connections must be verified. Fix the terminals firmly and put all switches in the open position.

Cyclical phases

In gensets intervention automatic or in those auxiliary, hand-operated ones for the external production lines, verify that the cyclical direction of the phases of the alternator correspond to the cyclical direction of the phases of the external producer to avoid rotation inversions of the engines and other inconveniences.

Check the state of the air filter.

It must not show any obstructions or porosities that prevent a good filtering of the air. In the event of deterioration, maintenance operations are necessary.

Check the state of the radiator/inter-cooler (air/air).

The air entry surface of the radiators must be free of dirt.

Check the level of the liquid in the batteries.

Once the batteries are rested and cold, verify that the liquid level is between the minimum and maximum limits.

7

OPERATION

7. OPERATION

7.1. Before start the generator, need to the follow manipulation

- Add water



Remove the rubber cap beside of the add water stiker. Then you will see the radiator cap inside, remove the radiator cap and add the water to cover the copper radiator fin.

- Add oil



Remove the rubber cap beside the ADD OIL sticker, then you will see the engine oil cap, remove the oil cap and add the oil, check the oil level in the right position.

- Add fuel (diesel)



Open the door, see the fuel tank, open the fuel cap, add the fuel to the full position. When you want to refuel it, must stop the engine, then add the fuel.



7. OPERATION

• Add FUEL PUMP OIL



For some model, Feed oil for fuel pump .That is very important, Need add the oil to the right range (Medial position of two level on the oil sticker).
Note: too much oil will cause hunting, less oil level maybe damage the fuel pump.

• Exhaust the air in the fuel stystem



Air bubble screw

Lifting pump

Pump the lifting pump, loose the air bubble screw, exhaust the air come out, screw tight it again. check the fuel return pipe (black rubber pump) to see the fuel come to the return pipe, then it is ok.

• Connect the battery cable



Connect the battery cable to the battery, some models equip a battery MINUS switch, You only need switch on it before operation.

7. OPERATION

LGC-6110 MANUAL START CONTROL PANEL



6110 manual start control panel include protection device: low oil pressure, high water temperature, over speed, over crank.

LCD display: Voltage, amps, frequency, power, power factor, speed, battery voltage, running time, general output, water temperature, oil pressure, oil temperature.


OPERATION

Manual Operation:

Start generator:

1. Turn on the DC main switch




After DC general switch on, the parameter will display; the light of the  button will on



7. OPERATION



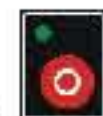
2. Press the  button. The light on the left up corner will light. Then the control panel will be in manual start position and ready for start.



3. Press  button, the engine will start after set delay time.


4. Check the voltage and frequency and related parameters, after all parameters is normal, turn on the MCCB to supply the power. MCCB in panel or in the terminal box.

Stop generator:

1. Unload the power step by step.
2. Turn off the MCCB
3. Press the  to stop the engine (It will stop after delay time)
4. Turn off the general DC switch.

Note: During the running, in case of any urgent problem, press “EMERGENCY” button to stop it. Before next start, be sure release the emergency button (Turn the button at clockwise)

7. OPERATION

Below Parameter be display in the LCD panel. Press the  button to read the all parameters.

Gen(L-L) 0 0 0V
Amp 0.0 0.0 0.0A
GensFreq: 0.0Hz
Stop mode


Fule level ++%
BAT 27.6V W/L 0.0V
TEMP ++C ++F
Stop mode

Starts 0
RunHours 0:00:00
Energy 0Kwh
Stop mode

Gen(L-N) 0 0 0V
Power 0.0KW 0.0kVar
PF 1.00 PS 0.0KVA
Stop mode

Speed 0RPM
Oil pressure +++Kpa
+++PSI +++Bar
Stop mode

No shutdown alarm
No warn

Re-set the date for protection scope, please press the  button, enter into menu to reset the data. The password is 0318

Note: Only experienced or qualified person be allowed to re-set the data, we will not responsibility for the quality problem once you changed the set data by yourself. Improper operation will cause engine control system broken.



7. OPERATION

LGC-6120 AUTO START CONTROL PANEL



6120 Auto start control panel include protection device: low oil pressure, high water temperature, over speed, over crank.

LCD display: Voltage, Amps, frequency, Power, Power factor, speed, battery voltage, running time, general output, Water temperature, oil pressure, oil temperature.

6120 control panel is a upgraded 6110, it includes city power parameters display, as well the above 6110 function.


OPERATION

Autostart Operation:


Start generator:

1. Turn on the DC main switch.



After DC general switch on, the parameter will display and the light on the  button will on




2. Press the  button. The light on the left up corner will light. Then the generator will autostart after set delay time.

3. if the generator equipped with ATS switch, then please connect the city power to the ATS, so when the city power is off, then generator will autostart, after the control mode detect all the parameter is normal, then will send signal to ATS to change over the switch.

Stop generator:

1. if you put generator in auto mode, when the city power recover, then the gen-set will auto stop.

2. Also you can press the  to stop the engine (It will stop after set delay time)

3. Turn off the general DC switch.

Note: During the running, in case of any urgent problem, press “EMERGENCY” button to stop it. Before next start, be sure release the emergency button (Turn the button at clockwise)


Below Parameter be display in the LCD panel. Press the  button to read the all parameters.





7. OPERATION

Gen(L-L) 0 0 0V Amp 0.0 0.0 0.0A GensFreq: 0.0Hz Stop mode	Fule level ++% BAT 27.6V W/L 0.0V TEMP ++C ++F Stop mode	Starts 0 RunHours 0:00:00 Energy 0Kwh Stop mode
Gen(L-N) 0 0 0V Power 0.0KW 0.0kVar PF 1.00 PS 0.0KVA Stop mode	Speed 0RPM Oil pressure +++Kpa +++PSI +++Bar Stop mode	No shutdown alarm No warn

Re-set the date for protection scope, please press the  button, enter into menu to reset the data.
The password is 0318

Note: Only experienced or qualified person be allowed to re-set the data, we will not responsibility for the quality problem once you changed the set data by yourself.Improper operation will cause engine control system broken.

