FOGO®
FOCUS ON GREAT OPTION

Portable engine-generators

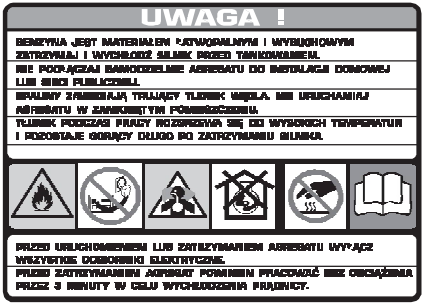
HONDA

BRIGGS & STRATTON®

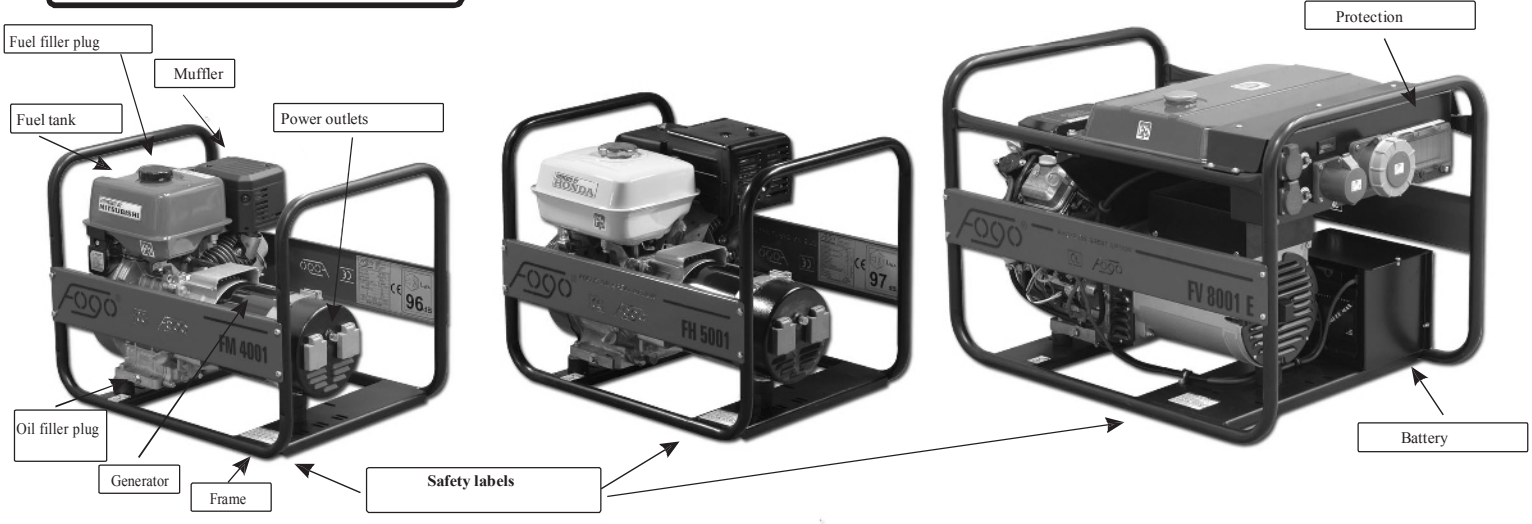
MITSUBISHI

Operation manual

Location of safety labels



Maintain caution when using the engine-generator. Labels with pictograms have been placed on the genset to remind the operator that caution must be kept. Their meaning is explained below. The labels are an integral part of the genset. If they are worn or destroyed contact an authorized dealer of FOGO Sp. z o.o. in order to replenish or replace them. We recommend that safety rules in this manual be carefully read.



Dear Customer

Thank you for trusting us and purchasing a high quality FOGO® engine-generator. We believe that cooperating with top worldwide manufacturers of subassemblies and using innovative technological solutions we have developed a product which sets the standards in terms of safety and reliability. We do hope that you will be satisfied from its day-to-day use, and the large reserve of power will guarantee long life and reliability.

Read the operation manual before first starting the engine-generator!!

Safety of the user and all people present in the vicinity of the device is of paramount importance. There is information in the manual and on the genset which must be familiarized with in order to avoid accidents and ensure correct operation and maintenance, thus increasing the genset life.

Agregaty FOGO sp. z o.o.

INSTYTUT ZAAWANSOWANYCH TECHNOLOGII WYTWARZANIA
ZAKŁAD CERTYFIKACJI
Jednostka notyfikowana nr 1455

CERTYFIKAT BADANIA TYPU WE (EC)
NR 044/CE/R/1455/2008

Nazwa, adres posiadacza certyfikatu: (producent) — AGREGATY Spółka z o.o. ul. Święciechowska 36 Wilkowice 64-115 Święciechowa

Nazwa wyrobu: Agregat prądotwórczy przenośny

Typ wyrobu (seria, typowielkość odmiany, opis wyrobu): FH 7000 EC; FH 7000 ERC; FH 7001 EC; FH 7001 ERC; FH 7540 ERC; FH 7541 ERC; FH 6540 EC zał. Nr 044/CE/R/1455/2008

Nazwa i adres producenta: AGREGATY Spółka z o.o. ul. Święciechowska 36 Wilkowice 64-115 Święciechowa

Symbol PKWiU: 31.10.32

Wyrób spełnia wymagania zawarte w Rozporządzeniu MG:
- z dnia 20.12.2005 r. (Dz. U. Nr 259 poz. 2170) - Dyrektywa Maszynowa 98/37/EC
- z dnia 21.08.2007 r. (Dz. U. Nr 155 poz. 1089) - Dyrektywa Niskiego Napięcia 2006/95/EEC
- z dnia 21.12.2005 r. (Dz. U. Nr 263 poz. 2202) - Dyrektywa dotycząca emisji hałasu do środowiska przez urządzenia używane na zewnątrz pomieszczeń 2000/14/EC

oraz Ustawa o kompatybilności elektromagnetycznej
- z dnia 13.04.2007 r. (Dz. U. Nr 82 poz. 556) - Dyrektywa Kompatybilności Elektromagnetycznej 2004/108/EC

oraz norm zał. Nr 044/CE/R/1455/2008

Zgodnie z oceną zgodności przeprowadzoną przez: ZC-SOZ-049/08 Zakład Certyfikacji IZTW
Zgodnie ze sprawozdaniem z badań przeprowadzonych przez: SB-09-041/08 Laboratorium IZTW

Umowa o stosowanie certyfikatu nr: ZC/010/2008 + Aneks 02/2008

KIEROWNIK ZAKŁADU CERTYFIKACJI — Adam Cup

DYREKTOR INSTYTUTU — dr Maria Zybura – Skrabalak

Kraków, 15 kwietnia 2008

Producent, jego upoważniony przedstawiciel lub importer jest zobowiązany informować Zakład Certyfikacji o każdych zmianach, modyfikacjach, które zostały wprowadzone lub które planuje wprowadzić do typu maszyny, której egzemplarz przebadano – Rozporządzenie MG z dnia 20.12.2005 (Dz. U. Nr 259, poz. 2170, § 123, pkt 5.).

Dotyczy wyłącznie egzemplarzy wyrobu posiadających identyczne właściwości (parametry) jak przedstawiony do badań wzór (wzory) i odpowiadających wymaganiom określonym powyżej.

Instytut Zaawansowanych Technologii Wytwarzania
Zakład Certyfikacji: ul. Wrocławska 37a, 30-011 Kraków

In order to prove that our engine-generator comply with the UE safety requirements, they have been evaluated for conformity by an external Notification Body.

The FOGO® engine-generators conform to all European Standards and other specialist requirements in the area of design, safety, operation and environmental protection.

Each genset is supplied with the EC Declaration of Conformity, the measurement report and technical specification.

Contents

A genset converts mechanical energy produced by the internal combustion engine into electrical energy produced by the generator which is connected to the engine. The genset can be used as an emergency source of power in case of a blackout or as a substitute source of power on a construction site, allotment, in home or in a workshop. Combined with an automatic start system, it provides a perfect protection of private or public facilities against uncontrolled power outages.

The technical specification of gensets is for altitude of 0 m a.s.l., ambient temperature of 20°C and 60% relative humidity. If the operating conditions are worse, the genset parameters deteriorate: altitude – efficiency drops by 1% every 100m, temperature – efficiency drops by 2% every 5°C. The genset can be adapted to continuous operation at high altitudes (above 1830 m a.s.l.) by means of necessary modifications made by an authorized service centre.

DESIGN

In basic version, the genset comprises an internal combustion engine and a single- or three-phase generator which are bolted together and placed on a metal frame with vibration dampers.

As a standard, the genset is equipped with necessary protections for correct operation, such as oil level or pressure sensor, two-or four-pole overcurrent circuit breaker, electric starter with a battery. Optional equipment includes a motor-hour meter, earthing kit, transport kit, exhaust gas removal hose, welding cables (gentset with welding module), automatic start panel with an automatic transfer switch (genset with electric starter).

ENGINE

The FOGO® portable generator sets use the four-stroke overhead valve petrol engines from HONDA, MITSUBISHI, BRIGGS & STRATTON (VANGUARD COMMERCIAL POWER line)

The engine speed is mechanically stabilized at 3000 rpm, independently of the load, which ensures optimum parameters for the generators. All engines are air-cooled and can be effectively operated outdoors up to ambient temperature of 40°C.

If the engines are used indoors, provide fresh air supply of at least 100 m3/h (exact value depends on the genset type – to provide an adequate ventilation please contact the service department of Agregaty Fogo Sp. z o.o.). The engines feature their own exhaust systems with mufflers which are compatible with hoses for removal of exhaust gases.

The user can choose from two types of starters: manual recoil starter and electric starter (can be combined with automation system). The engines with electric starter feature a system which ensures correct battery charging.

SINGLE-CYLINDER ENGINES (HONDA, MITSUBISHI)

The lubrication system depends on the engine type. Single-cylinder engines feature splash lubrication. In each case the engine is protected against insufficient oil level.

The single-cylinder engines have their own fuel tanks from which the fuel falls by gravity to the combustion chamber.

TWO-CYLINDER ENGINES (BRIGGS & STRATTON (COMMERCIAL POWER line)

V-twin engines feature the pressure lubrication. Such engines have an oil pump which forces the oil to circulate; stopping engine can cause the oil pressure to drop.

The two-cylinder engines are equipped with vacuum fuel pumps which enable taking the fuel from external tanks. The FOGO® gensets with two-cylinder engines have 16-litre tanks mounted on the frame above the engine. All fuel tanks used in the FOGO® gensets have fuel strainers to protect the engine against ingress of dust particles or other contaminants into the carburettor.

GENERATOR

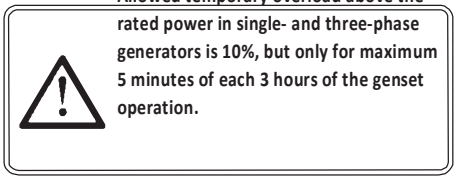
The FOGO® gensets feature single- and three-phase synchronous and asynchronous AC generators with varying IP protection rating.

The single-phase generators feature a voltage control system provided by connecting the internal winding with a capacitor. The system keeps the voltage within the 10% tolerance at even load. The voltage control system in three-phase generators keeps the voltage within the 6% tolerance at even load.

Maximum allowed unbalanced phase loading in three-phase generators is 10%, and maximum load on single-phase outlets in three-phase generators is 40% of the generated rated power. It is allowed to take more than 40% of power from single-phase outlets in some models (see technical specification). If such values are exceeded the electrical parameters of the generator can deteriorate, the windings can overheat and burn as a result.

Allowed temporary overload above the rated power in single- and three-phase generators is 10%, but only for maximum 5 minutes for each 3 hours of the genset operation.

A single-bearing design and flange connection with the engine ensure a quiet and safe operation. The drive from the engine is transmitted by a taper joint and a stud bolt.



The generator enclosure is made of light alloys.

An asynchronous generator gives active power, but takes reactive power necessary to magnetize the machine. Capacitors are connected at the generator output in order to compensate the consumption of inductive reactive power. The constant generator speed is maintained by the combustion engine. When load changes, the speed changes only within limits of machine slipping. Its characteristic feature is quite large voltage instability at the generator terminals. Some generators have an additional winding to support the generator excitation which is connected with the capacitor. These generators are cooled by forced air flow in grooves on the generator outside.

Generator with the IP23 welding module

In some models, the generators are equipped with welding modules which allow to use any type of electrodes of max. diameter 5 mm (F 7220 S / F 7220 SE) and 6 mm (F 10300 SE) in the 35% cycle, i.e. 3.5 minutes during each 10 minutes of operation.

PROTECTION RATING IP 23 OR IP 54

First digit - protection against ingress of foreign objects and access to hazardous parts: 0 – no protection, 2 – foreign objects > 12, mm, 1 – foreign objects > 50 mm, 3 -

Protection rating IP23 or IP54

First digit Protection against foreign objects and access to	Second digit Protection against ingress of water.
0- no protection	0 - no protection
1 – foreign objects > 50mm	1 - vertically falling water drops
2 - foreign objects > 12mm	2 – dripping water when tilted up to 15°
3 - foreign objects >2.5mm	3 – spraying water at up to 60°
4 - foreign objects > 1 mm	4 – water splashing from any direction
5 – dust protected	5 – water jets from any direction

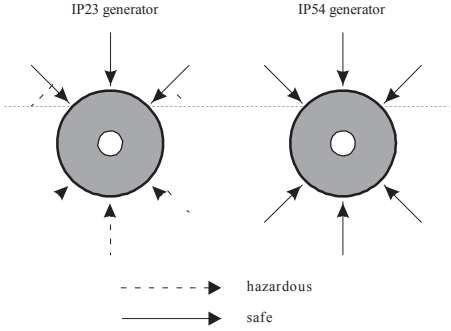


Fig.1 Description of IP rating

SAFETY RULES

Safety of the user and all people present in the vicinity of the device is of paramount importance. There is information in the manual and on the genset which must be read very carefully as it warns about potential hazards for the user and other people.

- Before starting the genset read the manual and make sure you understand all recommendations included in it.

- Do not start the genset indoors without sufficient ventilation. The exhaust gases contain large amounts of odourless toxic gas (CO – carbon monoxide) – **HAZARD OF POISONING OR EVEN DEATH!!!**

- Do not refuel when the engine is running – **EXPLOSION HAZARD!!!**

- Do not start the genset if the fuel is spilled. Restart the genset only when the spilled fuel is removed – **FIRE HAZARD!!!**

- Do not start the genset in the environment of escaping gases, vapours of paints, thinners or other flammable materials – **EXPLOSION HAZARD!!!**

- Do not smoke or use open fire in the vicinity of fuel can or tanks – **EXPLOSION HAZARD!!!**

- Do not start the genset in a forest or similar areas without a spark arrester – **FIRE HAZARD!!!**

- Do not start the genset when wet or damp – **HAZARD OF ELECTROCUTION OR EVEN DEATH!!!**

- Before starting work check the technical condition of the genset, particularly protections and cable insulation.

- Do not touch the rotating parts when the genset is running – **HAZARD OF LIMB OR GENERAL INJURY!!!**

- When the genset is running pay attention to children and animals in its vicinity.

- Do not transport the genset and do not leave it indoors immediately after the end of operation – **FIRE HAZARD!!!**

- Do not put any objects on the genset when it is running – **SELF-IGNITION HAZARD!!!**

- Do not touch the exhaust system with muffler when the genset is running and for a long time after it is stopped – **BURN HAZARD!!!**

- Do not start or stop the genset under load – **DAMAGE HAZARD!!! (to the genset and connected electrical loads)**

- Do not adjust the engine speed – **HAZARD OF ELECTROCUTION OR GENERATOR DAMAGE** (disintegration of windings or generation of high voltage) .

- Do not use unsuitable consumables, fuel or oil (check the oil level every day or after each 8 hours of operation; top up if necessary using the oil of identical parameters) – **HAZARD OF DAMAGE AND INVALIDATION OF WARRANTY!!!**

- Make sure that during operation or transport the genset is not tilted by more than 20 deg. Greater inclination may result in fuel leakage or improper engine lubrication – **HAZARD OF DAMAGE!!!**

- Do not use unoriginal spare parts and fuel and oils of unknown origin – **HAZARD OF DAMAGE AND INVALIDATION OF WARRANTY!!!**

- Close the fuel valve after completion of operation. Open valve may cause fuel to leak into the oil sump and as a result the oil will lose its lubricating properties – **HAZARD OF ENGINE DAMAGE OR SEIZURE!!!**

- Do not overload the genset or power supply cable. Avoid contact between the supply cable and sources of heat, oils, sharp edges and moving parts. Damage of power cable increases the **HAZARD OF ELECTROCUTION**.

- If working outdoors use extension cables designed for outdoor operation. Using a proper extension cable reduces the **HAZARD OF ELECTROCUTION**.

- Immediately stop the genset in case of changes of engine speed, overheating of devices connected to the genset, sparking, smoke or flame coming from the equipment, undesirable vibrations.

- Remember that prolonged and frequent contact with used engine oil can cause skin cancer. After any contact wash the skin thoroughly.


Read the manual


Wear protective goggles

Wear ear protection

NOTE!!! All operations on electrical wiring can be performed only by **qualified electricians** with suitable licences of Society of Polish Electrical Engineers. **Unauthorized personnel must not perform any operations on the junction box**.

SELECTING THE GENSET FOR A LOAD

Equipment with electric motors

Star connection: genset power rating up to 3 times greater than the load rated power

Delta connection: genset power rating up to 9 times greater than the load rated power

Star/delta connection (soft start) : genset power rating up to 3 times greater than the load rated power. With frequency inverter: genset power rating up to 1.5 times greater than the load rated power

Commutator equipment (power tools): genset power rating up to 1.2 times greater than the load rated power

Heating equipment

Genset power rating up to 1.5 times greater than the load rated power.

Lighting

Incandescent: genset power rating up to 1.2 times greater than the rated power of lamp

Sodium: genset power rating up to 5 times greater than the rated power of lamp.

UPS

Genset power rating up to 1.7 times greater than the rated power of connected loads.

Electronic equipment

Genset power rating up to 1.2 times greater than the rated power of loads.

NOTE: In order to accurately select the genset for a load qualified electricians should make electrical measurements in distribution switchboard during the start-up.

The generator off-load voltage is max. 253 V. At rated load the voltage should not drop below 207 V.

NOTE: Loads sensitive to excessive or insufficient voltage can be damaged when supplied from the engine-generators.

ENVIRONMENTAL PROTECTION

The symbol indicates a selective collection of used electric and electronic equipment. Used electric equipment is recyclable

Because it contains substances hazardous to human health and life it must not be put in the containers with domestic waste!

Please support the economical management of natural resources and protection of the environment by delivering the waste equipment to electric waste collection facilities. Recycling or other type of recovery is necessary in order to reduce the amount of removed waste.

Use

STARTING THE GENSET

① Fill the tank with fresh fuel (unleaded petrol PB 95 / 98). Refuel in well ventilated rooms, when the engine is off. Smoking or using open flame or sparking devices is prohibited in the place of refuelling or in the vicinity of fuel storage. Do not overfill the tank (the fuel level below 2 cm from the top edge of the tank). After each refuelling check if the tank is properly closed.

②

Fill the genset with oil, or check the oil level and top up if necessary. Check the oil level when the genset is levelled. Unscrew the oil filler plug, or pull out the dipstick, wipe it and insert again, then pull out once more to check the oil level.

In case of screwed plug, just place it in the opening without turning and read the oil level. If the level is too low top up the oil to reach the maximum level. Never overfill above the maximum level.

Fig. 1 Checking the oil level in single-cylinder Honda and Mitsubishi engines

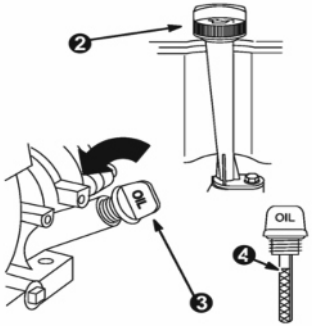


Fig. 2 Checking the oil level in single-cylinder Honda and Mitsubishi engines

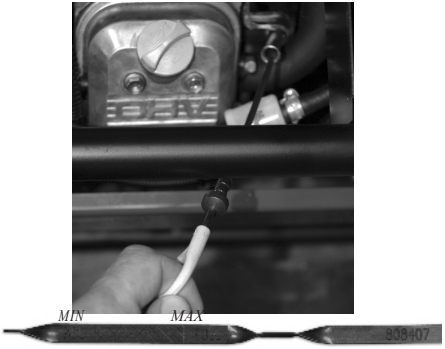


Fig. 2 Checking the oil level in two-cylinder B&S engine

In the **Honda and Mitsubishi** engines use the oil SG, SF, CC or CD (SAE10W30) tab.1 according to API.

The oils listed in the table can be used if average air temperature in an area is within the indicated range.

In the **Briggs & Stratton** "Vanguard" use the SE, SF, SG (SAE30) tab. 2.

Depending on the temperature, in the Vanguard engines it is recommended to use oils from table 2.

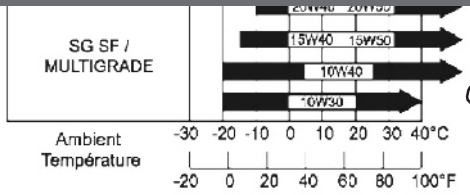
The SAE 30 oil used below 4°C can make it difficult to start the engine and cause the cylinder damage due to insufficient lubrication. The air-cooled engines heat up more than liquid-cooled ones. Using synthetic multigrade oils (5W-30, 10W-30, etc.) at temperatures above 4° C will result in increased oil consumption and can lead to the engine damage. If you are using oils of that type, check the oil level more frequently.

In the Honda and Mitsubishi engines use the SAE 10W30 or SAE10W40 oil which is recommended for common usage in the widest range of temperatures.

The oil amount for each engine is given in the technical specification. Do not use oils for two-stroke engines and insoluble oils as this adversely affects the engine life and can lead to the engine damage.

An insufficient or excessive oil level in the sump can trigger the oil level or oil pressure sensors which will stop the engine or prevent its starting.

The oil sensor in the engine does not relieve the user from the obligation to check the oil level every day.



④ silnika.

Table 1. Engine oil selection: HONDA and MITSUBISHI

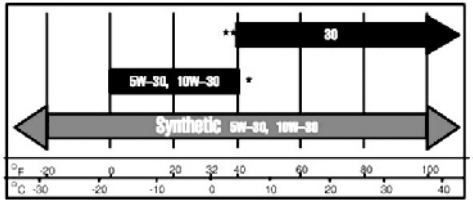


Table 1. Engine oil selection: BRIGGS & STRATTON

③ Check the air filer and clean if dirty. Using a dirty air filter causes an incorrect proportion of the air-fuel mixture and as a result the engine surges, splutters, emits black smoke and sometimes completely stalls. This is particularly dangerous in case of gensets because the reduction of the engine speed changes the current frequency in the power outlet. Using other forms of filtration or operation of the genset without the air filter can lead to its failure or even serious damage (e.g. scratching the cylinder walls, polluting the carburettor, etc.). Do not start the engine without an air filter as this leads to a premature engine wear.

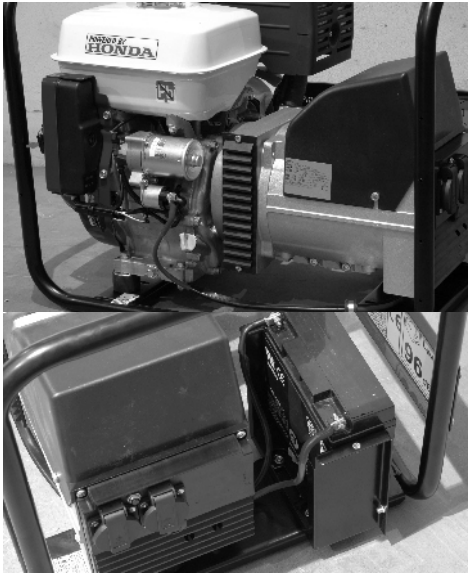
WARNING
The battery produces explosive gases. Using open flame or sparking devices and smoking is forbidden in the vicinity of the battery.

④ CONNECTING THE BATTERY
(*Only the engines with electric starter*)

The battery rated voltage should be 12V and capacity 18Ah.

Before connecting the battery make sure that the genset will not start unintentionally. To prevent this close the engine fuel valve and put the key in the ignition in the "STOP / 0 /OFF" position.

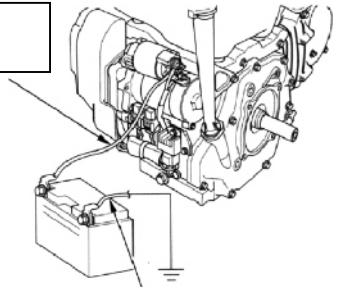
Connect the cables as follows:
First connect the "+" terminal of the starter (red cable) with the "+" pole of the battery.
Then, connect the ground cable, connected with the engine body or the whole genset housing, to the "-" pole of the battery. Tighten the terminals firmly so they will not loosen during operation.
Check the lead ends for corrosion. Remove possible signs of corrosion and grease slightly using petroleum jelly.



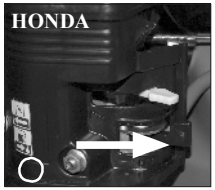
Use

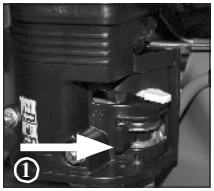
NOTE!!!
Do not connect cables with unknown polarity.

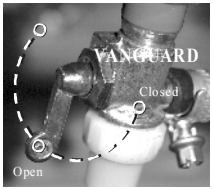
NOTE!
All engines with electric starter feature the battery charging control system. A short-circuit in the wiring or connecting the battery with incorrect (reversed) polarity triggers the circuit breaker (in the Honda engines). The green indicator in the circuit breaker means that it is off. Remove the reason for triggering and reset the circuit breaker by pressing it.

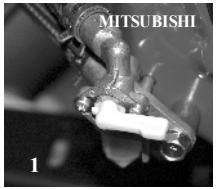


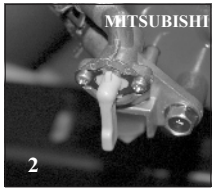
⑤ **Turn the fuel valve to the "ON" position or the "R" position in the enlarged tank**.



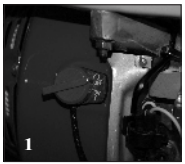


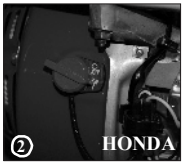


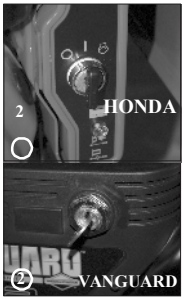


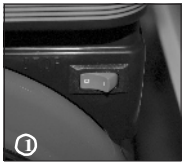


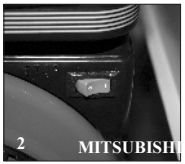
Put the ignition switch in the "1" position ("ON")









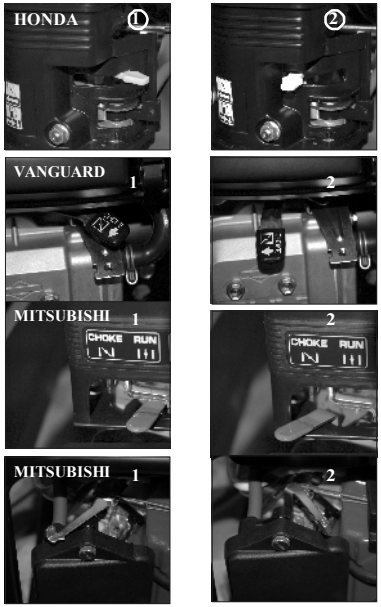



2


1

When the engine is cold turn on the CHOKE.

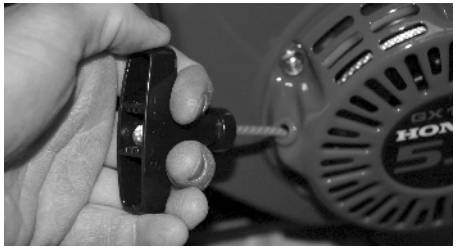
Never use the choke when the engine is warm. If the engine cannot stabilize its revs after starting and starts to surge then the air-fuel mixture is too rich and the choke should be turned off.



Before starting the engine make sure the connected electrical loads are off, or disconnect them.

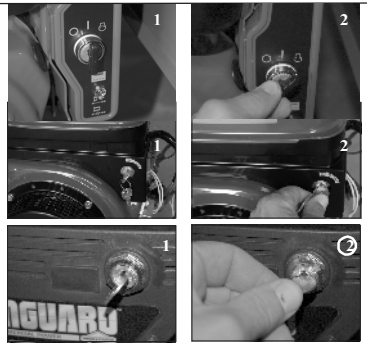
⑥ RECOIL STARTER

Pull the starter grip lightly until you feel resistance (then the starter clutch engages the pawl mounted on the engine flywheel). Pull briskly. If the engine will not start, repeat the attempts until it starts. If the starter rope is jerked by the engaging clutch, the clutch parts will hit the pawl hard and as a result the rope or the clutch parts may break. Pulling the rope to its end may damage the starter recoil spring.



After starting the engine do not let go of the grip, but return it gently and gradually, controlling the rope recoil. Letting go of the grip will violently recoil the rope and the grip will snap against the housing.

NOTE: when the genset is already warm, the recommended minimum load should be 30% of the rated value. The load on the genset should be even on all 3 phases.



⑦ ELECTRIC STARTER

In gensets equipped with electric starters:
- insert the key in the ignition and turn it to (1) or ON
- turn the key to the START position or
- when the engine starts, release the key allowing it to return to the (1) or ON position in which it will remain as long as the genset is running.

NOTE! If the engine fails to start within 5 seconds, release the key and wait about 10 seconds before trying again.

NOTE! Never start the engine that is running or is not fully stopped. Hazard of starter damage (breaking the starter and flywheel teeth).

When the engine starts to run smoothly put the CHOKE in the initial position. When the engine revs have stabilized you can turn the electrical loads on.

⑧ **STOPPING THE GENSET**

- Unplug the load from the genset outlet or turn the load off,
- After disconnecting the loads leave the genset to idle for 3 minutes to cool it down,
- In petrol gensets put the ignition switch in the 0/OFF position; in gensets with electric starters, turn the key in ignition to 0/OFF,

- Close the fuel valve. If the valve is left open in single-cylinder engines the fuel may get to the carburettor, overfilling it. Excess fuel flows down to the combustion chamber and from there to the oil sump where it mixes with oil. Such mixture loses its lubricating properties, causing a slow seizure of the engine (connecting rod, crankshaft, rings and cylinder). As the engine features a splash lubrication, the excess oil-fuel mixture can get above the piston and stop the engine. In such cases unscrew the spark plug, drain the oil, clean the combustion chamber using compressed air and change the oil.

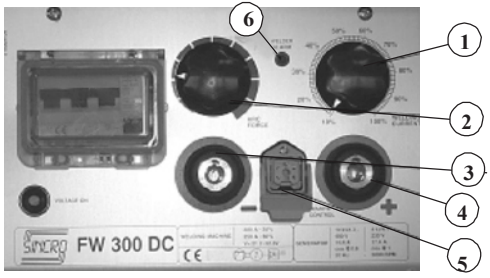
NOTE! When the piston is turned with plug removed the oil collected above the piston squirts with substantial force and at a significant distance.

- Drain the fuel tank completely if the genset is not to be used for longer than 30 days. Drain the fuel from the tank (do not turn the genset over) and then the burn rest of the fuel that remains in the tank by starting the engine and waiting until it stops for lack of fuel.
-Wait until the genset cools down completely.
- Store the genset in a dry, well ventilated room.
- In an emergency when the genset needs to be stopped immediately, put the ignition switch in the 0/OFF position.
- After a long stoppage with fuel in the carburettor drain the stale fuel by removing the bolt in the lower part of the float chamber (the bolt is always placed at an angle).

GENSET WITH WELDING MODULE

DESCRIPTION OF CONTROL PANEL:

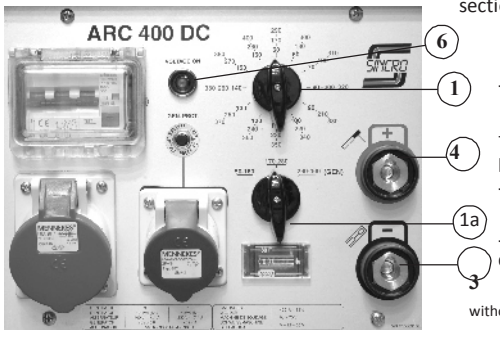
1. Welding current control
1a. Selector of welding current range
2. Arc force control
3. Negative welding socket
4. Positive welding socket
5. Remote control socket. 6. Welding module overload alarm



NOTE!!! Do not weld and use the generator simultaneously.

To use the device as a genset:

- Put the switch 1a to GEN
- Proceed according to the "Starting the genset" section



To use the device as a welder:

- Plug the earthing cable to the socket 3.
- Connect the earthing cable to the welded part
- Plug the electrode cable to the socket 4
- Use the selector switch 1 , 1a, 2 to set the current
- Proceed according to the "Starting the genset" section without connecting the loads. - Start welding

NOTE: Do not use the welding current selectors (1 and 1a) when welding is in progress.

NOTE: The power outlets are live during welding, but the voltage is low and unstable. It is recommended to disconnect the loads from the outlet to ensure their safety.

NOTE: The welder can provide the maximum welding current only for a few minutes, and then it must be left to cool down (see table on the control panel). If the thermal protection is triggered during high-voltage welding (welding is stopped, a so-called electrode sticking occurs) operate the genset for a few minutes without load to cool the generator down.

Recommended diameters of welding cables:

TAB.1 Recommended diameters of welding cables			
Length	Welding current		
	30-100 A	100-200 A	200-300 A
15-30 m	25 mm^2	35 mm^2	50 mm^2
15-30 m	25 mm^2	50 mm^2	70 mm^2
30-60 m	35 mm^2	70 mm^2	90 mm^2

Typical welding currents:

TAB.2	Welding current				
Electrodes	Acid	Rutile	Cellulose	Basic	Semi-basic
1,5 mm		20-50A			20-30A
2,0 mm		40-65A		20-50A	30-60A
2,5 mm	60-110A	60-100A	50-90A	70-100A	50-80A
3,25 mm	90-150A	70-130A	70-130A	90-130A	60-100A
4,0 mm	140-210A	120-160A	90-170A	110-170A	100-140A
5,0 mm	200-290A	190-250A	140-210A	175-220A	130-180A