

P650

OPERATING & SERVICE MANUAL



Read Manual Before Operating Machine

408302 Rev B



DECLARATION OF CONFORMITY

Name and address of the manufacturer:

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Declares under its own responsibility that the new machine.

Model

P650

Serial No.

See nameplate

Year of construction

See nameplate

Conforms to the following Directive:

Est conforme aux Directives:

Es conforme a las siguientes Directivas:

Esta conforme as seguintes Diretivas:

È conforme alle seguenti Direttive:

Machinery Directive 2006/42/EC and subsequent amendments

Direttiva Macchine 2006/42/CE e successive modifiche

Direttiva Bassa Tensione 2014/35/UE e successive modifiche

Direttiva Compatibilità Elettromagnetica 2014/30/UE e successive modifiche

Direttiva RoHS II 2011/65/CE e successive modifiche

And moreover it is built in accordance with the following norms:

Et est fabriquées, en outre, conformément aux normes:

Y que ademas ha sido fabricada en conformidad con las normas:

E além disso são fabricadas com respeito as normas:

Ed inoltre sono fabbricate nel rispetto delle norme:

UNI EN ISO 12100: 2010;

UNI ISO/TR 14121-2 ;

CEI EN 60204-1: 2018 ;

CEI EN 61000-6-3.

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OPERATOR SAFETY INSTRUCTIONS



This manual includes important information for the use and safe operation of this machine. Failure to read this book prior to operating or attempting any service or maintenance procedure to your machine could result in injury and could be dangerous to you or other people. Damage to your machine or other property could occur. All instructions are as viewed from the operator's position at the rear of the machine.

DO NOT USE this machine without reading this manual. This manual has important information for the use and safe operation of this machine. Failure to read and observe all DANGER and/or WARNING statements could result in severe injury or death. Read and observe all WARNING statements found in your OWNER'S MANUAL and on your machine.

DANGER: Failure to read and observe all WARNING statements could result in injury to you or to other personnel. Property damage could occur as well. Read and observe all WARNING statements found in your OWNER'S MANUAL and on your machine.

DANGER: Failure to read and observe all WARNING statements could result in damage to the machine or to other property. Read and observe all WARNING statements found in your OWNER'S MANUAL.

DANGER: Operating with a machine that is not completely or fully assembled could result in injury or property damage. DO NOT USE this machine until it is completely assembled. Inspect the machine carefully before operating it. Use only as described in this manual. Use only recommended attachments.

DANGER: Operating a machine without all labels could result in injury or damage. READ all machine labels before attempting to operate the machine.

DANGER: Electrical machines can cause an explosion when operating near inflammable materials and vapors. DO NOT USE this machine with or near fuels, grain dust, solvent, thinners or other inflammable materials.

DO NOT lift or pull the machine by any of the operating triggers. Use the main handle.

DANGER: DO NOT unplug the machine by pulling on the cord. Grasp the plug not the cord. Electrocutation could occur if you handle the plug or appliance with wet hands.

DANGER: Do not handle the plug or appliance with wet hands.

DANGER: DO NOT attempt machine maintenance or cleaning unless the plug has been removed from the electric supply outlet.

DANGER: Electrical components may 'short-out' if exposed to water or moisture. KEEP the electrical components of the machine dry. Always store the machine in a dry place.

WARNING: Use of this machine to move other objects or to climb on could result in injury to the operator or damage to the machine. DO NOT use the machine as a step or furniture. Pay extremely close attention if it is necessary to use the machine near children. Keep the machine out of reach of children and/or animals.

WARNING: Moving parts of this machine can cause injury and/

or damage. KEEP hands, feet, loose clothing, hair, fingers, and all parts of the body away from machine openings and moving parts.

DANGER: The machine may 'short-out' or burn-out' if openings and/or cooling vents are blocked. DO NOT put any object into the openings.

WARNING: In case of danger immediately press the emergency button.

WARNING: Damage could occur to the machine if openings are blocked. DO NOT use the machine with any openings blocked. KEEP FREE from dust, lint, hair and anything that may reduce air flow. DO NOT insert any foreign objects into any machine openings.

WARNING: Use tools specifically recommended by the manufacturer. Use of other tools may cause unintended detachment and result in damage to persons and/or property.

WARNING: Ensure tools are correctly inserted and fully tightened. Incorrect tool mounting can cause damage to persons and/or property.

WARNING: Injury could occur to the operator and/or damage to the machine could occur when cleaning stairs, unless extra caution is used. Use extra caution when cleaning stairs or difficult areas.

DANGER: DO NOT operate the machine while upside down. Dust particles could go inside the machine and cause electrocution.

WARNING: Ensure that there are no protrusions or any discontinuities on the flooring surface. Remove these before working with the machine, to avoid the machine jumping resulting in injury to the operator, other people, or property. Work at a safe distance away from floor anchor studs or any other rough edges.

WARNING: If you observe functional abnormalities and unusual noises, stop, leave the machine in safe state, and contact NFE technical services.

WARNING:

-DO NOT clean by spraying water.

-DO NOT immerse into water or moisture.

-KEEP your machine clean.

-KEEP your brushes or any accessories in good condition.

-REPLACE any worn or damaged parts immediately.

-ENSURE that the working area is clear of obstructions and/or people.

-ENSURE that the working area is sufficiently illuminated to work well.

DANGER: Components used in packaging (i.e., plastic bags) can be dangerous. KEEP away from children and animals.

THE MANUFACTURER CANNOT BE HELD RESPONSIBLE for any damage/injury caused to persons or property, because of the incorrect use of the machine or due to procedures being used which are not specified in this instruction manual.

USE OF THE MACHINE for anything not specified in this manual may be dangerous and must be avoided. The manufacturer is not liable to any responsibility if the machine

is used for purposes other than those specified in this manual.

TUBES AND ACCESSORIES should be kept away from the body, especially delicate areas such as the eyes, ears and mouth.

DANGER: Do not use the machine without filters properly installed. Improper use and lack of filters may result in injury to the operator or damage to the machine and property.

DO NOT LEAVE the equipment unattended whilst in use.

DANGER: the machine is intended for professional use.

DANGER: When using the equipment always ensure that all necessary precautions are taken to guarantee the safety of the operator and any other person who may be affected.

Wear protective clothing such as safety glasses, gloves, non-slip footwear, respiratory mask when working in dusty and/or unventilated areas, ear protection.

SPECIFIC OPERATOR SAFETY INSTRUCTIONS

WARNING: the use of propane requires that specific safety precautions are understood and followed for safe operation. The following provides the basics of using propane gas. It is strongly recommended that employees or users who operate propane-powered equipment are aware of the safety aspects inherent with propane use.

As a suggestion, for training in the use of devices that use propane fuel, please refer to your local regulatory authorities and with the requirements contained within NFPA 58, which are available through their website www.NFPA.org.

DANGER: Propane is a flammable gas whose vapors are heavier than air. As is the case with gasoline, propane can explode if the proper cautions are not heeded. Propane is odorized with an agent having a distinct odor that is recognizable at very low concentrations. This helps in identifying leaks, even when they are small.

Awareness and basic safety precautions are required when working with propane. As long as these precautions are followed, risk is negligible.

The two greatest hazards with propane powered floor care machines are:

Carbon Monoxide Poisoning: This is the most frequently reported incident associated with propane powered floor care machines and is caused by excessive exhaust emissions. The symptoms are headache, dizziness and nausea. A major cause involves engines with poor preventive maintenance practices, usually those with dirty air filters and machines operated in confined areas without adequate ventilation. Another cause may be substandard, inexpensive machines with no emissions control technology and improperly set carburetion.

Overfilled Fuel Cylinders: Nearly all fire related incidents reported result from bringing a cylinder into a building without first checking for overfill. This action is dangerous, unwise, and unnecessary.

Emissions

All propane-powered floor care machines produce emissions. Most are harmless, but some are dangerous and can be fatal. Carbon monoxide (CO) poses the greatest risk, since CO can be lethal within as little as 30 minutes with exposure levels of 3,000 parts per million (ppm) concentration. Carbon monoxide is an invisible, odorless, colorless gas created when fossil fuels (such as gasoline, wood, coal, propane, oil and methane) combust incompletely. Any internal combustion engine not properly maintained can also produce harmful levels of CO.

DANGER: Working in a closed area that is not well ventilated may cause illness, injury, or death by poisoning due to exposure to carbon monoxide (CO).

DANGER: Propane-powered equipment emits CO, which is a colorless, odorless gas. Early symptoms of exposure to CO include headache, drowsiness, dizziness and nausea. If any of these occur while operating the machine, switch off the machine and seek fresh air. Have the machine tested for CO emissions by a specialist before using the machine again.

DANGER: high or prolonged exposure to CO can cause vomiting, confusion, loss of consciousness and muscle weakness. If you experience these symptoms, call emergency medical assistance. If you have experienced these symptoms, do not use the propane machine until you have received medical care and ruled out possible CO poisoning. Excessive exposure to CO can cause death.

Fire Safety

Be aware of the potential dangers of fire or explosion when using propane, and take normal fire-safety precautions.

- Fire: There is a possibility of fire from LPG vapor leaking or venting from fuel cylinders or carburetion equipment.
- Explosion: LPG vapor concentrated or confined to a small, restricted space may explode or ignite.
- Propane may experience a BLEVE, a boiling liquid expanding vapor explosion.

DANGER: propane is highly flammable and carries a slight health risk. Propane is odorized and is easily detected at levels of just a few parts per million. If you smell propane, do the following:

1. Stop the engine: turn the key switch to the off position. Do not touch any electrical switches.
2. Shut off the service valve on the propane cylinder.
3. Move the floor machine to a well-ventilated area.
4. Remove the cylinder from the machine and take it outside the building.
5. If the cylinder is leaking, contact a DOT approved repair shop to determine the cause of the leak and have the shop, not you, repair it.

DANGER: If fire occurs while the machine is being operated do the following:

1. Stop the engine: turn the key switch to the off position.
2. Shut off the service valve on the propane cylinder if possible, but avoid any risks of being burned.
3. If possible, move the machine outside. If not possible, move it to a well-ventilated area away from flammable materials.
4. Do not attempt to extinguish the flame from a gas leak. If you do, the gas will build up in the area and could re-ignite. Starve the fire by shutting off the supply of gas.
5. Have the machine and cylinder inspected before using them again.

DO NOT smoke near the propane machine.

DANGER: Do not store or use gasoline or other flammable gases and liquids near the machine.

DANGER: This machine has moving parts. Severe injury can occur if these parts are contacted while in use.

DO NOT allow any part of the body or clothing to come in contact with these parts while they are moving.

DO NOT try to change attachments while the machine is operating.

DO NOT allow other people to come near the machine while it is in operation.

DO NOT allow the machine to run unattended

DO NOT leave the machine in a place where unauthorized or untrained personnel could use the machine.

DO NOT run machine with unsecured guards and shields.

DO NOT operate the machine if the machine has damaged or loose parts.

WARNING: Do not tamper with the engine.

The following acts are alleged to constitute tampering:

- Tampering with the throttle body;
- Tampering with magneto or electronic ignition system;
- Tampering with spark plug;
- Tampering with the filter elements;
- Tampering with the regulator;
- Tampering with the fuel valve lock-off;
- Tampering with the crankcase;
- Tampering with the breather chamber;
- Tampering with the intake.

The EnviroGard Emissions Monitoring System.

The Engines are equipped with the EnviroGard Emissions Monitoring System.

This system provides a unique, state-of-the-art, fail-safe means for ensuring emissions safety to operators and other personnel in environments where propane equipment is used.

EnviroGard employs a sensor in the exhaust path between the engine and the catalytic muffler to detect the oxygen content of the exhaust before it is passed through the catalyst. The oxygen sensor neither reacts to nor measures the CO content of the exhaust. It responds only to oxygen content. The oxygen sensor produces an electrochemical signal that is sent to the EnviroGard Control Module. If the magnitude of this signal is not within the preset control limits, the Control Module will activate the shut down sequence and the engine will stop running.

The control limits are preset in the control module at the Onyx factory. The air-fuel ratio is then adjusted prior to shipment and the CO content at the exhaust, measured by a digital CO detector. The control module is set to ignore the readings from the oxygen sensor during the first three minutes the engine is running. This period allows:

1. The sensor to reach a stable operating temperature.
2. The catalyst in the muffler to reach the temperature necessary to reduce the levels of CO, nitrogen oxides (NOx) and hydrocarbons (HC) in the exhaust.

The most common event in which the Control Module shuts down an engine is when the air filter becomes dirty enough to restrict the air intake flow, which changes the air-fuel ratio such that the oxygen sensor signal is outside the control limits. Once the air filter is properly cleaned, operation of the machine can be resumed.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Always wear safety shoes when working with the machine.

All personnel in the immediate work area must wear safety glasses with side shields.

Always wear safety gloves when changing the tools.

Always wear clothes suitable for the work environment.

Always wear Carbon Monoxide Indicator badges.

Testing

A number of instruments are available to test for toxic gases. Those capable of read carbon monoxide concentration resulting from combustion engines are acceptable for testing exhaust emissions from propane powered floor machines.

In generally, units capable of reading in ppm (parts per million), at ranges from 0 to 1000 are adequate for checking ambient air

(air in the breathing zone of the operator). Instruments capable of testing carbon monoxide in the exhaust should be able to read from 0 to at least 2000 ppm and should be certified by the manufacturer for that purpose.

LOCAL AGENCIES AND REGULATIONS

NFPA

Operating a propane powered floor care machine requires compliance with certain safety regulations. The National Fire Protection Agency (NFPA) Standard for Storage and Handling of LP Gas is the appropriate authority for safe propane use. A copy of this publication is available through the NFPA in Quincy, MA (1- 800-334-3555).

Among its regulations, NFPA #58 requires that all personnel employed in the handling of propane gas be trained in its proper handling and operating procedures. It also requires them to carry a written certification from their employer or training supervisor to attest to such training. Although this is directed mainly to those who fill and transport liquid propane gas, Onyx Environmental Solutions recommends that operators of propane powered floor care machines in public places be trained and certified as well.

CARB / EPA

The California Air Resource Board (CARB) and Environmental Protection Agency (EPA) also set limits for propane powered engines used outdoors, but CARB/EPA approval does not signify that the engine is safe to use indoors.

CGA

The Canadian Gas Association (CGA) has set a limit of 1500 ppm CO in exhaust flow.

OSHA

For propane powered machines used indoors, the Occupational Health and Safety Administration (OSHA) has established a limit of 50 ppm CO for 8-hour time weighted average (TWA) in ambient air and is considering a limit of 800 ppm CO in exhaust flow.

DOT

The Department of Transportation (DOT) has established regulations regarding the safety of fuel cylinders including the ones used on propane powered floor care machines.

Local Agencies

Local law enforcement agencies such as the local Fire Marshall also rely on independent testing labs such as UL and CGA before giving their approval of the use of some equipment. These labs thoroughly test equipment and submit their stamp of approval only after rigorous testing. While not being required by all law enforcement agencies, the stamp of approval by these agencies further assures the operator that he or she is working with and around safe equipment.

MACHINE SPECIFICATIONS

Product Specifications						
Width	Length (Min/Max)	Height (Min/Max)	Working Width	Tool Speed	Tool Size	Engine Power
25.6" (65 cm)	61/91" [55/231cm]	49.5/65.25" [26/166cm]	25.6" (65cm)	700-1400 RPM	3x 0.375" 3x 9.5mm	27 HP
Full Weight	Removeable Weight	Base Machine Weight	Engine Speed	Sound Pressure	Sound Power	Hand-Arm Vibration
974 lbs 442 kg	100 lbs [45.5 kg]	874 lbs [396 kg]	1800-3600 RPM	N/A	N/A	N/A

Machine Variants		
Region	Serial Number	Fuel Source
Domestic (North America)	P650-10XXXX	Propane
	P650-45XXXX	Propane

Recommended Dust Collectors*

NFE Models: DL3000, DL3000P, DL4000P

*Consult your technical sales associate to discuss matching your dust collection performance requirements with the appropriate model.

PROPANE CYLINDERS

The propane cylinder (or tank) used on this machine is classified as a 4B240 DOT cylinder. Its rated capacity is 20 lbs [9.1 kg]. DOT cylinders are not the same as common 20-lb propane outdoor BBQ cylinders and cannot be used on this machine.

A vapor draw cylinder is used on this machines. The vacuum generated by the engine draws in propane vapor through the fuel delivery system. As a precaution, engine oil is routed through the regulator to heat the propane to ensure all fuel is vaporized within the regulator.

REFUELING CYLINDERS

WARNING: Overfilled cylinders can damage the fuel system and create a fire hazard. Do not overfill cylinders.

WARNING: Propane cylinders should only be filled by qualified propane dealers. Only use only safety fill cylinders that guard against overfilling with a safety stop fill valve that limits content to 80% capacity. The remaining 20% capacity, is used as the vapor space or headspace.

WARNING: If there is inadequate headspace to allow for fuel expansion, the pressure relief valve will open, releasing propane gas into the atmosphere.

This is a dangerous and volatile situation as there is a risk that vented gas could come in contact with a pilot light or other source of ignition. DO NOT release or bleed propane inside a building.

WARNING: The boiling point, or temperature at which liquid propane changes into a gas, is -44° F (-42° C). Exposing unprotected skin to propane gas or liquid could result in frostbite injury. Always wear gloves when filling a propane cylinder.

STORING CYLINDERS

WARNING: Turn off cylinder to stop propane machine. Remove propane cylinder when not in use.

WARNING: All new cylinders should be vented and purged of air per manufacturer's instructions before use. Never bleed propane cylinders indoors.

WARNING: When not in use, it is recommended that propane cylinders be stored outdoors in an upright position in a secure, tamper-proof, steel mesh storage cabinet. This cabinet may be located next to buildings but should have at least five feet (1.5 m) of space between the cabinet and the nearest building opening (door or window).

WARNING: Do not store cylinders full or empty inside a building or inside a vehicle. Do not smoke or use a device with an open flame when handling or transporting propane cylinders.

TRANSPORTING CYLINDERS

WARNING: When transporting cylinders to a propane dealer or to a job, make sure the cylinders are securely fastened and standing in an upright position with the service valve closed.

WARNING: Avoid dropping or banging cylinders against

sharp objects.

WARNING: Please note that any cylinder that has been filled is always considered full, no matter how little propane gas remains in it. This is because even when all liquid has evaporated into vapor there is still some propane gas vapor left in the cylinder. Because this remaining fuel is flammable, an empty cylinder should be treated with the same careful procedures as one that is filled to the 80% level with liquid propane. The only time that a cylinder is considered empty is when it is new, before it has been filled with propane.

WARNING: For transportation, the propane cylinder MUST be removed from the machine and securely attached to the vehicle. The cylinders must always be secured in an upright position.

WARNING: Modifications or alterations to this machine can lead to personal injury or damage to the machine. Do not make unauthorized modifications or alterations to this machine.

WARNING: the muffler and engine become hot while the machine is in operation, and remain hot for a long time after the machine has been turned off, with the risks of severe burns. Do not touch these parts of the machine.

WARNING: Injury to the eyes and body when using the machine may occur. While the machine is in operation, the use of safety glasses, safety footwear, and safety clothing are recommended.

WARNING: continuous exposure to high levels of noise can cause hearing loss. Use suitable protections while the machine is running.

WARNING: the vibration of the machine can cause tingling or numbness in the fingers or hands. The use of gloves is recommended to reduce the effect of vibrations. If the tingling or numbness persists, turn off the machine. If the vibration of the machine is caused by incorrect installation of tools or other machine parts, tighten or adjust the utensils or various parts before using the machine again.

CAUTION: If the motor filter is dirty it can cause overheating. Check and replace air filters according to the recommended maintenance schedule.

CAUTION: Overheating can be caused by a low or insufficient oil level. Before using the machine, check the oil level, and add or change the oil if needed.

CAUTION: Do not overfill the engine with oil. Excessive levels of oil in the engine could cause irreparable damage.

CAUTION: Overheating can be caused by running with dirty oil. Check the oil before each use of the machine and regularly change the oil according to the maintenance schedule.

CAUTION: Do not crank the engine for more than 5 seconds. In cases of starting failure, wait 10 seconds before subsequent attempts to allow cooling.

CAUTION: Undertake recommended maintenance. Regular maintenance is necessary to keep the machine in good working condition.

CAUTION: DO NOT operate machine unless you have read and understand the operation manual. DO NOT operate machine in flammable or explosive areas.

CAUTION: Before switching on the machine make sure that all safety devices are in place and working correctly.

CAUTION: When using the machine, avoid use on ramps and slippery surfaces. Use caution when operating the machine in reverse.

CAUTION: When servicing, stay away from moving parts. Do not wear loose clothing when working on the machine. Disconnect the connections to the battery before doing maintenance on the machine. Wear safety goggles when using compressed air or pressurized water.

CAUTION: When loading or unloading machine onto or off a truck or trailer, turn machine OFF. Only use a truck or trailer that will support the weight of the machine to transport. Block machine wheels when transporting. Tie the machine down securely to truck or trailer when transporting.

CAUTION: These machines should not be used:

- In occupied nursing homes, hospitals, day-care centers, and similar settings;
- In areas at risk of explosion;
- In areas with high concentration of dust;
- By unqualified or untrained personnel;
- On areas with obstructions such as thresholds, floor outlet boxes, etc.;
- In areas where loose debris or other objects are present;
- In rooms and areas without proper ventilation.

This machine is designed for professional use.

This machine is designed to burnish most modern types of floors including composition tile, stone, marble, terrazzo, resilient floor covering and some coated wood floors.

CAUTION: The use of floor maintenance machines in buildings frequented by the public, including the times when such buildings are occupied by the public, shall require the approval of the authority having jurisdiction.

WARNING: The operator is responsible for performing the recommended daily maintenance and checkups of the machine to keep it in good working condition. Keep your machine regularly maintained by following the maintenance information in this manual. During and after operation, perform the recommended daily and hourly procedures outlined in the Maintenance Chart.

CANADIAN SAFETY REQUIREMENTS

1. A sign indicating "NO SMOKING " shall be permanently displayed at the storage area. The sign shall be in accordance with the sign required in Clause 10.12.3 of CAN/CGA-B149.2-M91, Propane Installation Code.
2. When the cylinder is attached to the floor maintenance machine for use, the operator shall not leave the unit unattended except for short periods of time such as rest stops, washroom, or meal stops.
3. The requirements of 1.10.1(e) and (g) do not apply in industrial buildings.
4. A floor maintenance machine shall only be used in buildings:
 - a. Provided with continuous mechanical ventilation that removes products of combustion to the outdoors of not less than 300 CFM for each 10,000 BTU-hr or fraction thereof.

b. Provided with natural ventilation of not less than 300 CFM for each 10,000 BTU-hr input or fraction thereof, based on a maximum of one-quarter-air exchange per hour for the net building volume.

5. The owner of a floor maintenance machine shall ensure that the unit is maintained in accordance with the manufacturer's recommended maintenance procedures in a safe operating condition and the owner shall maintain a record of the maintenance.

6. Before transporting a floor maintenance machine, the propane cylinder shall be securely fastened with the system valve closed, and the cylinder shall be located in a well-ventilated space.

APPENDIX 1: GLOSSARY

AIR-FUEL RATIO: The % of air combined with the % of fuel to make the combustible gas. If the mixture is heavy with propane it is termed “rich”. If it is heavy with air it is said to be “lean”.

AMBIENT AIR: [1] The air in the environment of the operator and/or others. [2] The air in the “breathing zone” of the operator.

CARB (CALIFORNIA AIR RESOURCE BOARD): CARB has recommended and the State of California has passed legislation that limits emission levels for the outdoor power equipment industry. At present these are the most restrictive limits set by any controlling organization.

CO (CARBON MONOXIDE): Carbon Monoxide is a colorless/odorless gas. It replaces oxygen in the blood. The blood then cannot deliver oxygen to the cells in the body. The symptoms of Carbon Monoxide Poisoning are headaches, dizziness, and nausea. It can lead to asphyxiation and death. The OSHA limits for CO are 50 ppm TWA.

CATALYTIC MUFFLER: Muffler containing a catalyst to promote the reaction required to reduce the CO, HC and NO_x to levels that are safe.

EPA (ENVIRONMENTAL PROTECTION AGENCY): This federal agency is charged with enforcing the federal clean air act, which applies to outdoor air quality.

EXHAUST EMISSIONS: Total amount of gases exhausted from internal combustion engines while running. 94.5% of the emissions are non-toxic. 5.5% of the emissions are toxic and are composed of 0.1% Oxides of Nitrogen (NO_x); 0.1% Hydrocarbons (HC); 5.3% Carbon Monoxide (CO).

HC (HYDROCARBONS): Some Hydrocarbons have a narcotic effect. Some cause irritation to mucous membranes. Some could be classified as cancer causing. Others react with NO_x in sunlight forming smog, which can irritate the eyes and respiratory tract.

INDOOR AIR QUALITY: The quality of the air inside enclosures, (rooms or buildings). Indoor air quality may be degraded by the presence of engine exhaust, dust, sewer gases, contaminated air conditioning, chlorine, cellulose, chemical processing odors, etc.

NO_x (OXIDES OF NITROGEN): Oxides of Nitrogen forms smog and acids, which are irritants to the respiratory system and can cause lung tissue damage. The OSHA limit for NO_x is

25 ppm TWA.

OSHA (OCCUPATIONAL SAFETY & HEALTH ACT): Inspectors for OSHA are responsible for monitoring general air quality indoors where people are employed.

OUTDOOR AIR QUALITY: The quality of air outside of enclosures. Outdoor air quality maybe degraded by the presence of smog, exhaust from internal combustion engines, factory smokestacks, home heating systems, etc.

OXYGEN SENSOR: A sensor placed in the exhaust stream which generates an output signal from an electrochemical reaction that is dependent on the concentration of oxygen in the exhaust.

TWA (TIME WEIGHTED AVERAGE): The average exposure over a specified period. EXAMPLE: OSHA TWA limit for CO is 50 ppm exposure for 8 continuous hours.

TWA is difficult to measure but can be easily calculated from the CO reading in ambient air using the following formula: $TWA = (173.6 \times C \times D \times R \times N \times T) / (A \times H)$ Where C = % CO in ambient air; D = engine size in cubic inches; R = engine RPM while operating; N = number of cylinders; T = operating time in hours; A = area of store in square feet; H = ceiling height of store in feet. Example: A store has 25,000 sq. ft. area and 10-foot ceilings with the ventilation turned off and doors closed. A 30.1 cubic inch, 2 cylinder propane powered buffer is used for 2 hours at 3600 rpm engine speed. The CO reading is 0.01% (100 ppm) which is the average of the reading taken after the first hour of operation and that taken after the second hour of operation. $TWA = 3.0$ ppm, which is far below the 50 ppm OSHA limit.

APPENDIX 2: SUGGESTED GUIDELINES FOR PROPANE USE

PURPOSE

To ensure the safety of all persons occupying or visiting buildings in which propane powered floor care machines are being used to maintain floors, the following guidelines will be followed by all floor care contractors.

PROPANE POWERED FLOOR CARE MACHINES

1. Each propane powered floor care machine will be maintained in a "Safe" condition at all times.
2. To assure compliance, the following is required of each propane powered floor care machine used.
 - a. Each machine will be serviced monthly or after every 100 hours of use.
 - b. A "Machine Maintenance Record" will be kept on each machine listing:
 - Serial number
 - Service performed
 - Hour meter reading
 - Condition of the machine and fuel system
 - PPM (parts per million) of carbon monoxide as recorded IN the exhaust muffler or tail pipe at full throttle before any adjustments have been made.
 - PPM of carbon monoxide as recorded in the muffler or tail pipe at full throttle after any adjustments have been made (CARBON MONOXIDE READINGS AT THIS POINT WILL NEVER EXCEED 1500 PPM).
3. Dust and air filters must be inspected and cleaned before each operation of the machine. At no time is the machine to be operated with dirty filters or without the filters in place.

APPENDIX 3: IAQ AND TESTING

SAFETY IAQ (INDOOR AIR QUALITY)

1. Propane powered floor care machines are not to be operated in any buildings unless the air conditioning/heating ventilation system is in operation.
2. Carbon monoxide readings of ambient air (at the operator's breathing level) while operating the propane powered floor care machine will be taken once each month and recorded on a logbook provided by the building/store manager. Each test session shall be no less than 60 seconds in length and shall be done while operating the propane powered floor care machine during a routine work period.
3. Periodic, unannounced tests of ambient air should be made by the building management with a "Data-Logger" designed to read and log the carbon monoxide in ppm (parts per million) at 1 (one) minute intervals with a range of 0 to 1000 ppm. Each test session shall be no less than 15 minutes in length and shall be done while operating the propane powered floor care machine during a routine work period. Air sampling should be done in the "breathing range" of the operator.
4. If find any readings of ambient air carbon monoxide greater than 24 ppm at any time it will be necessary to discontinue the use of the propane powered floor care machine until it has been properly serviced and certified as complying with the guidelines.

TESTING EQUIPMENT REQUIREMENTS

There is a great number of instruments offered on the market to test for toxic gases. Only those designed to read carbon monoxide resulting from combustion of propane gas in an internal combustion engine are considered acceptable for testing exhaust emissions from propane powered floor care machines. Some instruments are used to read "ambient air" and may be damaged if used to take readings in the muffler or tail pipe. Selecting the proper instrument is an important part of meeting the testing requirements.

LABELS AND SYMBOLS

IDENTIFICATION PLATE

This machine is labeled with a nameplate. Machines without nameplates must not be used and the manufacturer declines all responsibility for them. Any product without a nameplate must be considered potentially hazardous.



NATIONAL FLOORING EQUIPMENT

Made in America Since 1968

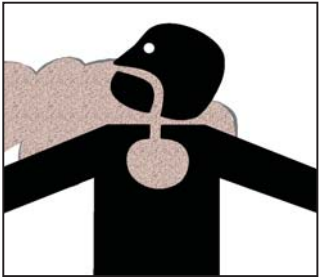
National Flooring Equipment, Inc.
9250 Xylon Avenue North,
Minneapolis, MN 55445
Telephone: (800) 245-0267

Manufactured in Italy
by Hyper Grinder, Pescara, Italy



Serial Number	
Model Number	###-###
System Voltage	##VDC
Fuel	Propane
Weight	### lbs (### kg)
Ingress: IP54	Working Grade: ##% 

408314 Rev A



USING THE MACHINE

The machine is intended for preparing or grinding flat or leveled surfaces up to a 2% slope. Preparation is understood as a roughing sanding of the surface, made in order to flatten a floor but with a marked roughness. The roughing is performed with aggressive tools and aims to remove the material needed to get this surface, further steps are made with less aggressive tools (gradually finer grits). Surfaces are understood as flat horizontal surfaces made of sufficiently hard stone. Grinding is understood as the process that starts from the initial roughing through the polishing steps. These steps are meant to decrease the surface roughness in order to obtain the mechanical polish of the surface. These processes can be performed dry or with water or by combining dry steps with wet steps. Contact National Flooring Equipment for questions based on your unique application.

Operating mode of the machine

Instructions are provided from the operator's perspective at the rear of the machine. The operator must position himself to keep the machine under control in the work-space around of the machine.

Intervention Procedures

Anytime during operation the operator can stop the machine by pressing the E-Stop (red mushroom) on the control pad, located on the handle. During maintenance or tool change it is mandatory to disconnect the machine from propane. Avoid the intermediate positions of the handle due to instability. In cases where it

is necessary to service the machine in an intermediate positions, properly block and support the machine to fully stabilize.

Operator features

This is a machine for professional use for which the operator that is working it must be a professional in the field. Carefully read the instruction booklet before using the machine.

PREDICTABLE INCORRECT USE

Do not operate the grinding deck while the machine in transport position. Disconnect power source when changing tools. Do not use the machine as a forklift or for transporting materials. Use the machine only with tooling specifically approved by the manufacturer. Use the machine only for indicated materials and avoid or remove any foreign hazards (e.g., studs, drain covers, etc.).

TREATED MATERIAL

Stone materials in general, concrete.

OPERATING GUIDELINES

Machine Inspection

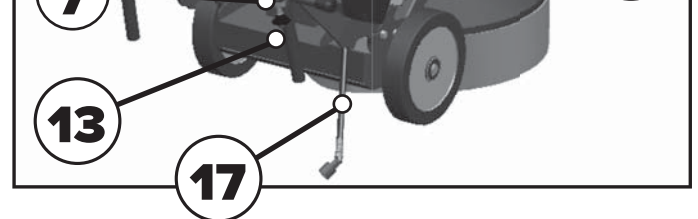
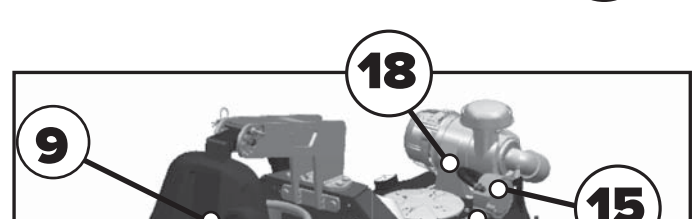
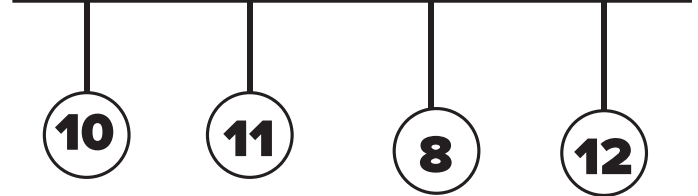
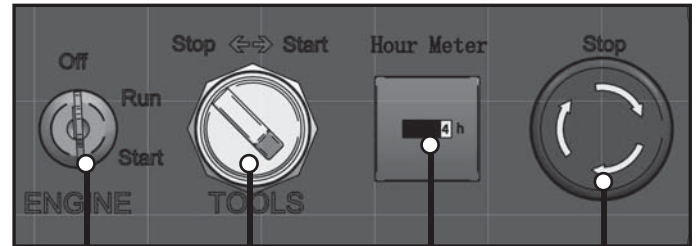
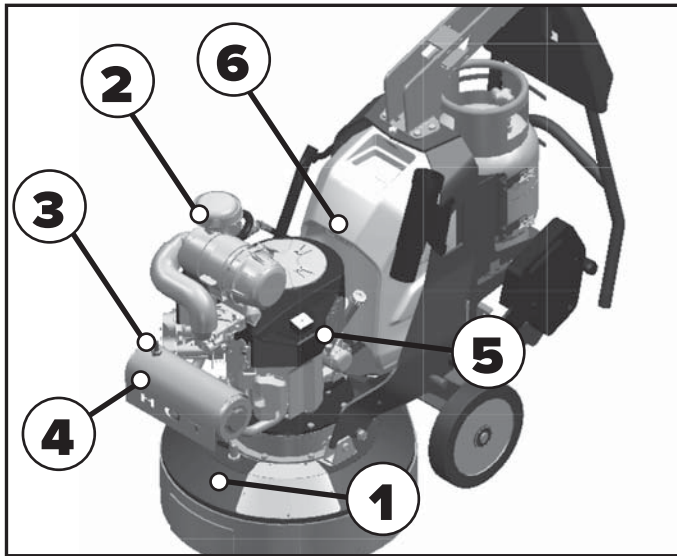
Regular maintenance of propane machines is a must to keep them in good, safe working condition. Every time the machine is used, the following checkout procedure should be followed.

1. Check for overfilled cylinders. Check cylinders, and vent if necessary. Do this before taking the cylinder inside to use. Never take an overfilled cylinder inside.
2. Check the air filter. The air filter should be cleaned after each

use of the machine and after each hour of continuous operation. If neglected, the engine will overheat and carbon monoxide emissions will elevate.

3. Check the oil level. The oil level should always be within the safe levels indicated on the dipstick. Add oil if necessary, but never overfill. Overfilling could cause irreparable damage to the engine.
4. Enter checks in a daily maintenance log to maintain a detailed record for the machine.

MACHINE OVERVIEW



- [1] Planetary
- [2] Engine
- [3] O2 Sensor
- [4] Catalytic Muffler
- [5] EcoSense Module
- [6] Water Tank
- [7] Battery
- [8] Hour meter
- [9] Control Panel with inside the Electrical Panel
- [10] Key Switch
- [11] Switch Start/Stop Clutch
- [12] Emergency Stop (E-Stop)
- [13] Engine Throttle
- [14] LP Tank, Vapor
- [15] Pressure Regulator
- [16] Fuel Lockout valve
- [17] High Pressure Fuel Hose
- [18] Low Pressure Fuel Hose
- [19] Master Battery Connection

STARTING UP

GUIDELINES FOR CONNECTING AND DISCONNECTING PROPANE TANK

Place the Propane tank [A] on the platform [B] at the back of the machine. Connect the fuel hose fitting [C] at the service valve [D]. Tighten the fitting sleeve by hand, and verify there are no leaks by verifying there is no smell of propane immediately after the connection to the tank. Secure the tank to the machine with

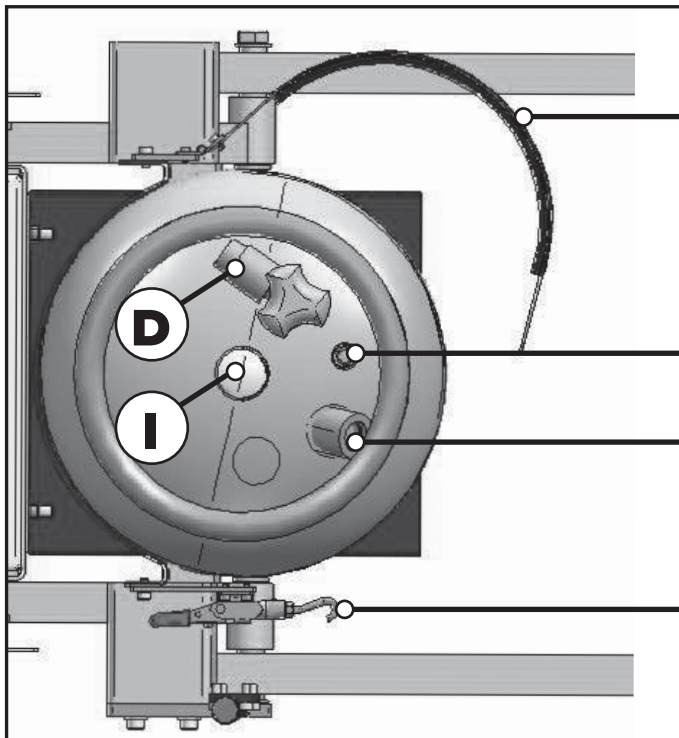
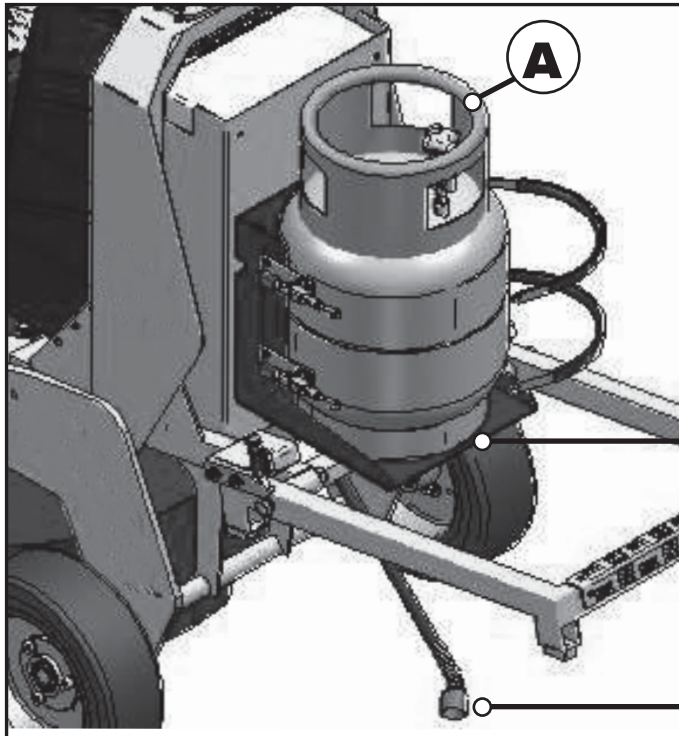
the two metal straps [E] through the two hooks [F], and finally, check that the tank is firmly tightened on the platform of the machine. Ensure the vapor port is selected for tanks with options for vapor or liquid.

CAUTION: Open the service valve SLOWLY to allow proper pressure balancing.

To disconnect the propane tank reverse the described procedure. It is recommended to connect and disconnect the propane tank only in a well-ventilated area.

In addition to the service valve the tank includes:

- Pressure relief valve [G];
- Bleeder valve [H];
- Level indicator [I]



STARTING THE MACHINE

PRELIMINARY CHECKS

Before using the machine and starting the engine:

- Check the oil level in the engine. Add oil if necessary.
- Check the fuel level;
- Check the air filter, clean or change as necessary.
- Check that there is no leakage of grease and oil from the machine and all parts of the machine are tight.
- Check the wear state of the tools.
- Inspect propane hose and connections for damage.

STARTING THE ENGINE

1. Ensure sure that the clutch [1] is set to “STOP”.

WARNING! If the selector is on the “START” position, rotate the clutch and take it to the “STOP” position.

WARNING! Starting the machine with the clutch engaged could overload and damage the engine.

2. Open the service valve on the propane tank turning slowly [3].

3. With the throttle [4] positioned half-way between maximum speed and minimum speed, operate the starter motor by turning the ignition key [2] to START position for no more than 5 seconds.

CAUTION! If the engine does not start, turn the ignition key [2] in the OFF position and wait 10 seconds before reattempting. This permits sufficient cooling time.

4. After the engine starts, release the ignition key to the RUN position.

5. Allow the engine to warm up for at least 30 seconds, while keeping the throttle [4] approximately half-way between maximum speed and minimum speed.

WARNING! Catalytic converters must reach temperature before they effectively remove harmful emissions. During this period of heating, ensure adequate ventilation.

6. The engine speed is controlled by adjusting the throttle [4]. Pushing the knob forward increases engine RPM, and likewise pulling the knob back reduces engine RPM.

STOPPING THE ENGINE

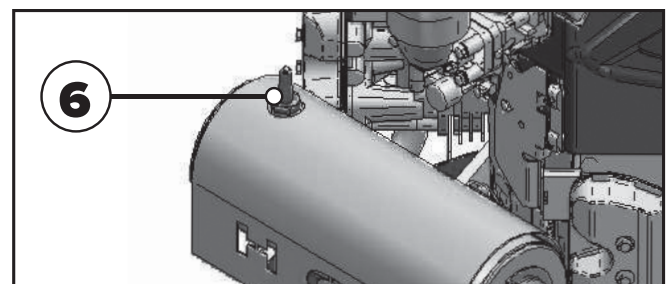
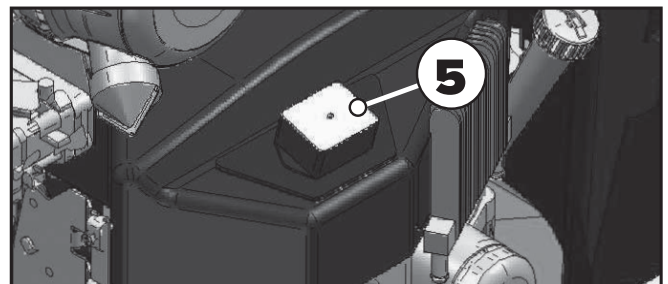
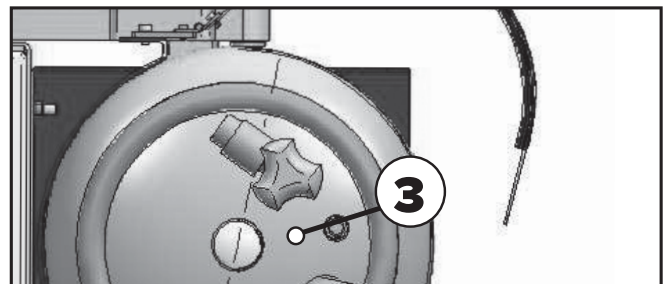
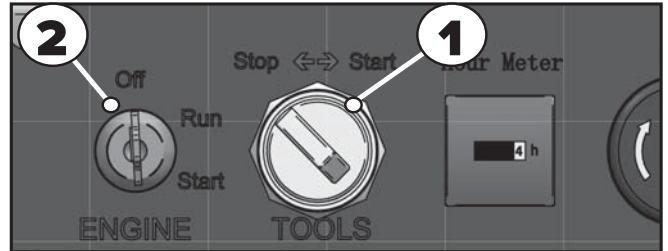
1. To stop the engine, turn the key from the “RUN” position to the “OFF” position.

WARNING! Close the propane tank valve when the engine is turned off.

NOTE! This machine is equipped with “EcoSense Emissions Monitoring System” [5].

Ecosense is a exhaust gas monitoring module which switches off the engine if the emission levels are too high or too low. Ecosense performs calculation based on information received from the oxygen sensors [6] placed before and after the catalytic converter.

WARNING! As a precaution, it is recommended that operators of propane powered equipment wear carbon monoxide indicator badges.



MAINTENANCE INSTRUCTIONS

ENGINE OIL INSPECTION

Check the engine oil level daily and before starting engine.

WARNING! Operating the engine without the proper amount of oil can cause permanent damage.

CHECKING OIL LEVEL

1. Place the machine on a horizontal surface.
2. Stop the engine, close the propane tank valve, and remove the tank.
3. Wipe any debris surrounding the area around the oil fill tube [2];
4. Remove the dipstick [3] and wipe the oil from the dipstick with a rag.
5. Wait 10 seconds and then insert the dipstick [3] into the fill tube [2] without TIGHTENING;
6. Remove and check the oil level. The oil on the dipstick should be between "ADD" and "FULL";
7. Reinsert the dipstick [3] and tighten.

If the oil level is near or below the "ADD" mark, add enough engine oil to bring oil level up to the mark "FULL".

If the oil level is too high, remove the excess oil by loosening the oil drain valve [1].

OIL GRADE

SAE 30

WARNING! Do not exceed the "FULL" mark. Excess oil will cause the engine to overheat.

OIL CHANGE

Replace the engine oil after the first 8 hours of work and after every 50 hours of operation.

1. Start and warm the engine so that the oil drains easily and completely;
2. Place the machine on a horizontal surface;
3. Stop the engine, close the propane tank valve and remove it.
4. Remove the cap from the end of the oil drain hose [1].
5. Place a suitable container under the drain hose;

WARNING! Hot motor oil can cause burns. Wear protective gloves to prevent burns.

6. Turn the engine drain valve slowly [1] until the oil starts to flow. It may be necessary to loosen the filler cap to allow the draining of oil;

7. Close the drain valve. Replace the cap on the end of the hose.

NOTE: See OIL FILTER CHANGE as required.

8. Remove the oil dipstick and add oil.

OIL CAPACITY

2.2 US quarts (2.1 L) when the oil filter is not replaced.

2.4 US quarts (2.3 L) when the oil filter is replaced.

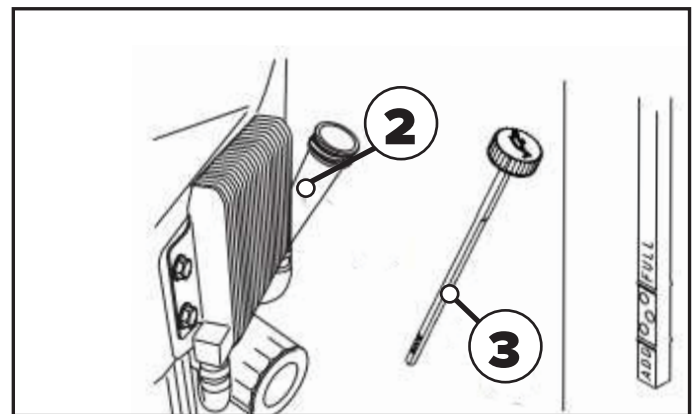
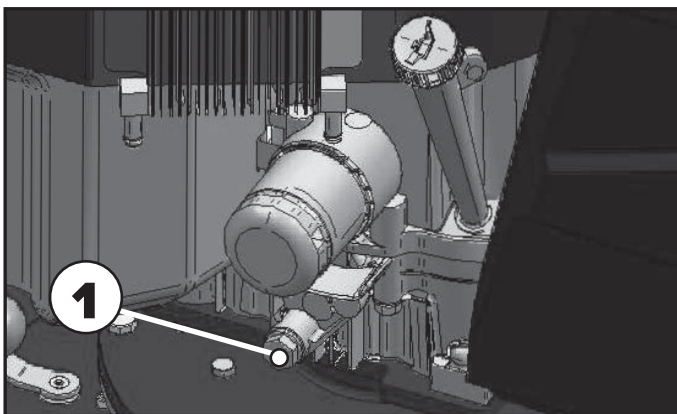
9. Wipe the oil from the dipstick, replace the oil dipstick, pull out and verify proper oil level.

10. Reconnect the propane tank to the fuel line.

11. Start and operate the engine at minimum speed for 2 minutes, while checking for oil leaks around the engine.

12. Stop the engine. Verify the oil level.

DANGER! Engine oil is a toxic substance. Dispose of used oil properly. Contact the appropriate local government agency for proper disposal methods.

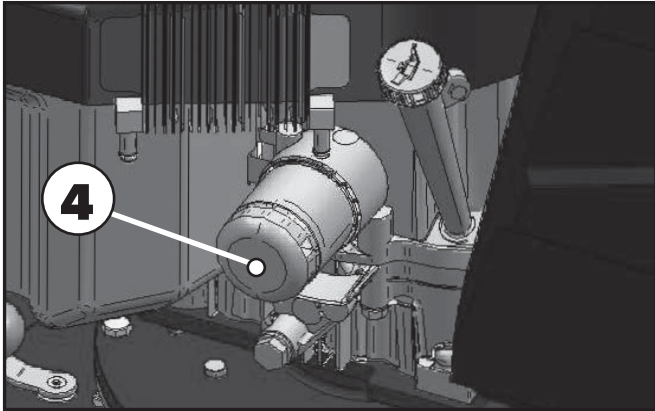


FILTER MAINTENANCE

OIL FILTER CHANGE

Change the oil filter every 200 hours of operation.

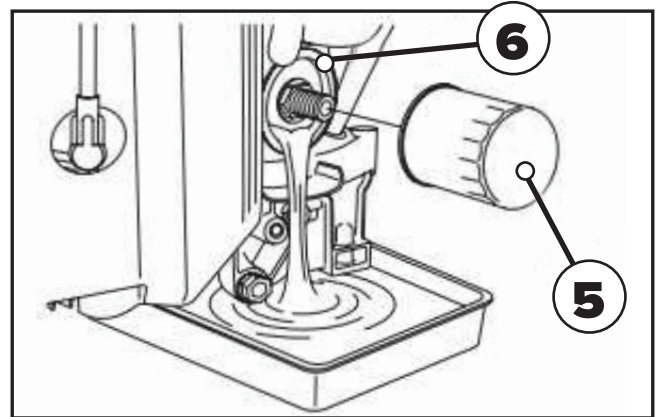
1. Follow the **OIL CHANGE** procedure to step 7.
2. Place a suitable container underneath the oil filter [4] to catch oil.
3. Turn the filter counterclockwise to remove it.
4. Apply a thin layer of fresh oil to the seal of the new oil filter [5];
5. Install the new filter by turning it clockwise until the seal touch-



es the mounting surface [6]. Then turn the filter another 2/3rds of a turn by hand. Do not over tighten.

6. Reconnect the propane tank to the fuel line.

7. Resume the **OIL CHANGE** procedure at step 8.



AIR FILTER

WARNING! Never operate the engine with the air filter removed. Damaging engine wear may occur.

WARNING! Do not use compressed air to clean the air filter elements. Breathing airborne particles is hazardous.

WARNING! Do not wash the air filter elements.

WARNING! Operating in working condition with significant dust production may require more frequent inspections and/or replacements.

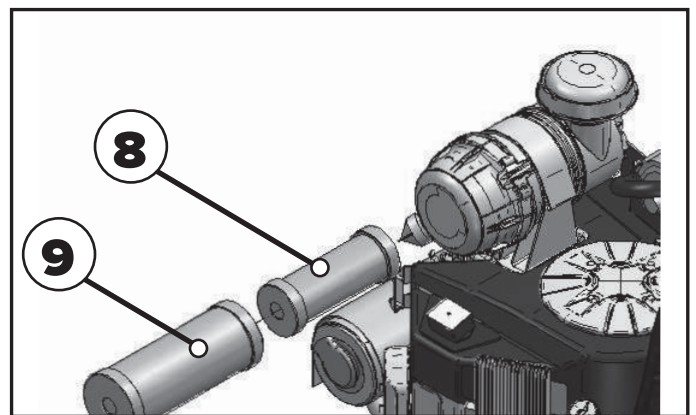
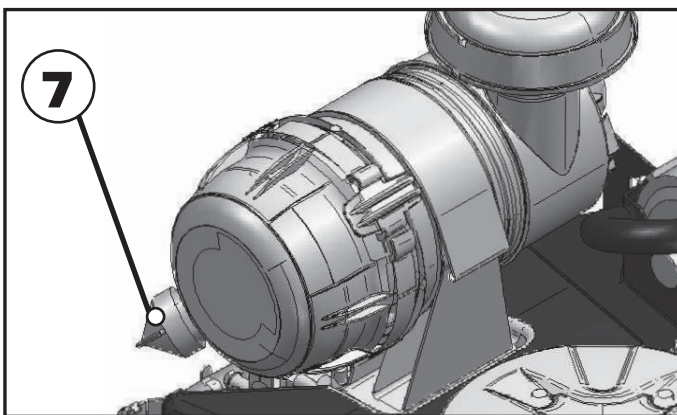
Maintenance Schedule

Replace the primary filter element [9] every 250 hours.

Replace the secondary element [8] every 400 hours.

Replacement Procedure

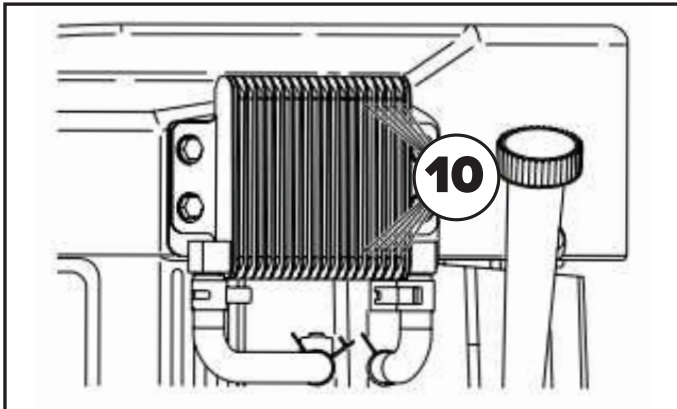
1. Push and open the duckbill valve cap [7] on the case of the air filter body to expel the dust and/or water accumulated inside.
2. Unfasten the retaining clips and remove the cover from the air cleaner housing body.
3. Remove the primary and secondary element from the housing body;
4. Clean any residual debris within the air filter housing.
5. Install new air filter elements into the housing body;
4. Reinstall the cover and the duckbill valve cap, then securely fasten the two retaining clips.



OIL COOLER MAINTENANCE

OIL COOLER

Check and clean the external oil cooler fins [10] with a stiff brush and vacuum every 1000 hours.



INSPECTING THE FUEL LINE AND CONNECTIONS

1. Bring the machine to a horizontal surface.
2. Stop the engine, close the propane tank valve.
3. Check the fuel line for signs of abrasion and/or wear. Replace all worn or damaged parts.
4. Check for gas leaks using a soapy water solution by applying it to all connections while the propane tank is connected and the service valve is open;
5. If a leak is detected, turn off the propane tank valve. If the leak is in a fuel line, replace it. If the leak is at a connection, loosen it, and clean it. Apply a sealant pipe sealing and tighten;
6. Check again for leaks using a soapy water solution. If the leaks persist in the connections, replace them, and check again with a soapy water solution.

BATTERY MAINTENANCE

The machine uses a 12 Volt AGM maintenance-free battery.

Battery replacement:

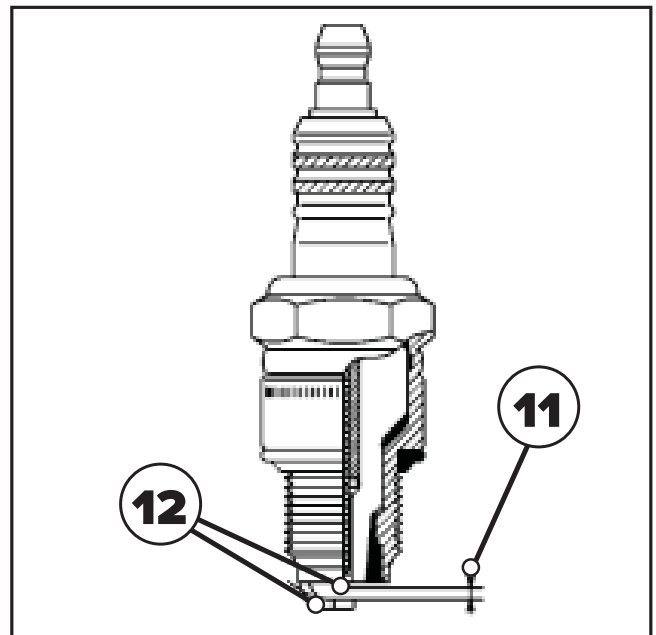
1. Place the machine on a horizontal surface.
2. Stop the engine, close the propane tank valve.
3. Disconnect the negative cable (BLACK) of the battery and then disconnect the positive (RED) battery cable.
4. Unscrew the mounting plate, pull out the old battery, and replace with a new one.
5. Connect the positive cable (RED) first and then the negative cable (BLACK). Secure the battery pack with the clamping plate.

CAUTION! Properly dispose of old batteries.

INSPECTION AND REPLACEMENT OF THE SPARK PLUGS

1. Stop the engine, close the propane tank valve.
2. Remove the spark plug cap boot;
3. Remove the spark plug by turning it counterclockwise and inspect.
4. Clean the electrodes [12] using a wire brush or a suitable tool to remove any oil or carbon deposits.
5. Inspect the porcelain body (insulating) of the spark plug and check for cracks, wear, or other damage. Replace the spark plug with a new one if necessary.
6. Check the gap between the electrodes [11] with a feeler gauge and restore if necessary. The gap should be .030" (0.75 mm). To change the gap, gently bend the outer electrode using a spark plug tool;
7. Install and tighten the spark plugs to 16 lb-ft (22 Nm);
8. Reinstall securely and firmly the spark plug cap boot.
9. Gently pull the spark plug caps to ensure correct installation.

Spark plug: NGK BPR4ES



TOOLS ASSEMBLY

FAST CHANGE TOOLING:

1. Recline machine to access the tooling plate.
2. Insert the fast change wedge lock tooling into the openings.
3. Tap with a hammer to fully seat.
4. Tap to release.



DUAL CUT TECH

This grinder introduces the exclusive DCT transmission feature. While engaged, this feature locks rotation of the main plate and limits rotation to the tooling satellites. With the DCT engaged (DCT ON), the machine achieves higher tooling speeds resulting in more aggressive and effective grinding.

The DCT ON system is ideal for glue and resin removal work, surface preparation, and floor leveling. Disengaging the DCT

(DCT OFF) will cause the main plate to rotate in the direction of the tools. In DCT OFF mode, the planetary is counter-rotating for general polishing, marble polishing, natural stone and concrete.

DCT ON:

Permits rotation of only the tool holder satellites.

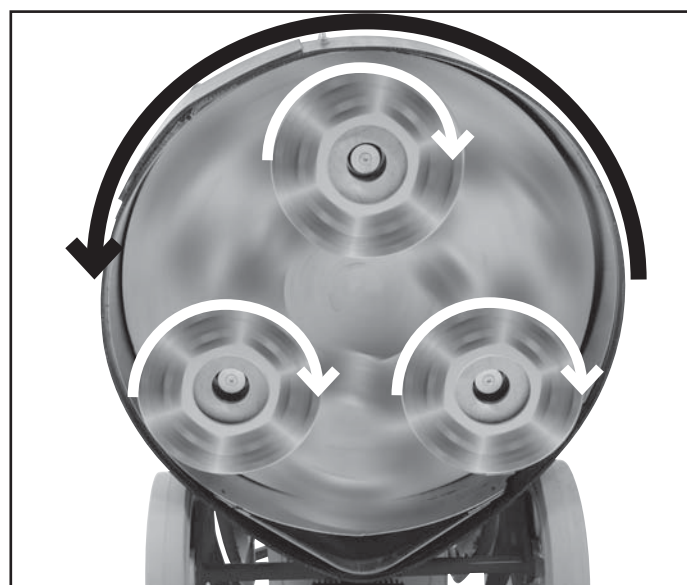
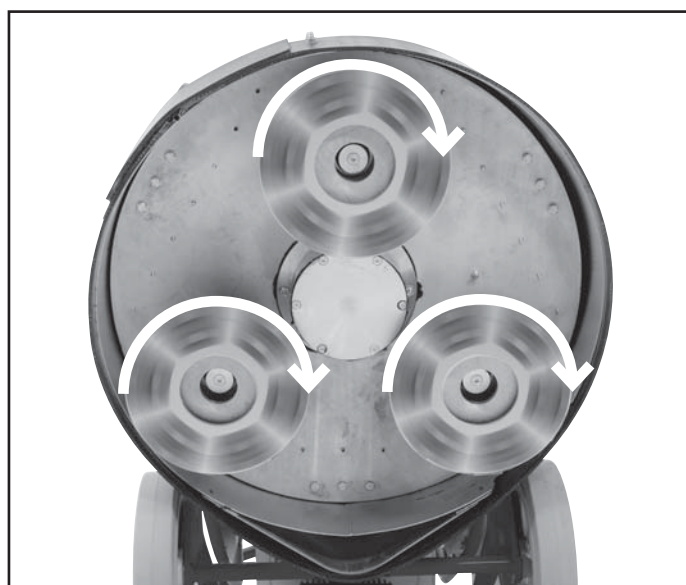
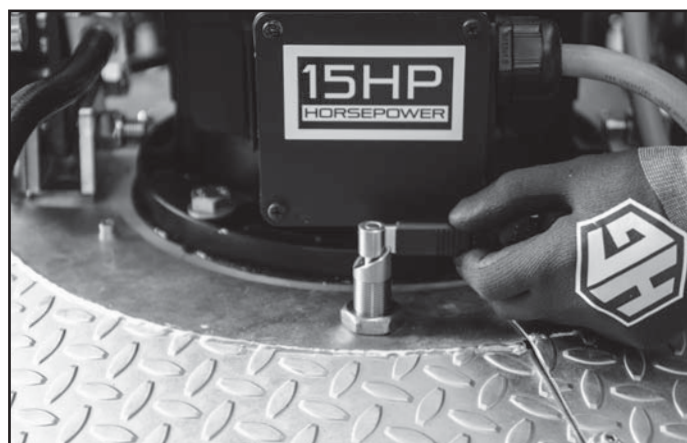
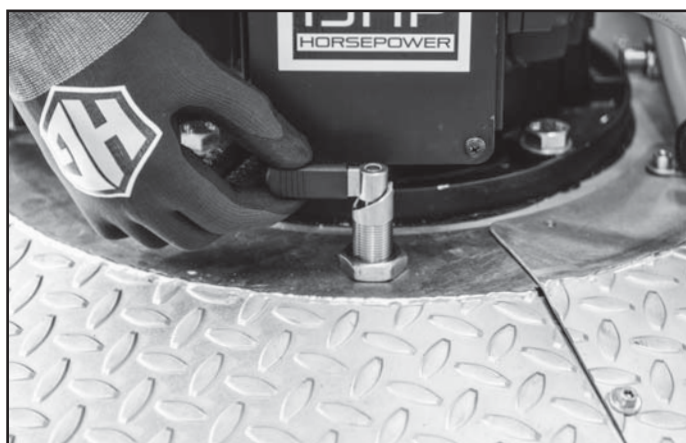
Applications: Aggressive and effective preparation, removal of glues and resins, leveling of surfaces, and for rapid exposure of the concrete aggregate.

DCT OFF:

Permits rotation of the planetary in counter-rotational mode.

Applications: Ideal for sanding and polishing of concrete, marble, and natural stone floors.

Note: Appearance of mechanism may vary.



MACHINE TRANSPORTATION

When transporting the machine with the fuel tank installed, it must be fastened securely with the service valve closed and the machine must be securely fastened in the vehicle used for transportation.

Any fuel tanks not installed must be securely attached to avoid their movement and their damage. Never store the machine with the tank installed or spare tanks in a van or closed trailers. It's a good idea to check the propane tanks to test their overfilling before transportation. If Overfilled, just before loading it in the

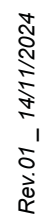
vehicle pull excess propane outside and in a secure area using the release valve.

The machine must be strictly turned off when it is loaded or unloaded from a truck or trailer. Use only a vehicle capable of supporting the weight of the machine

TECHNICAL SPECIFICATIONS

Engine:	Kawasaki LX900, propane
Max Power:	27 HP (20 kW) at 3600 RPM
Displacement:	852 CC
Engine Speed:	Min. speed = 1800 - 2000 RPM
	Max. speed = 3400 - 3600 RPM
Battery:	12 Volt AGM Battery, 240 CCA min.
Motor Oil:	SAE 30
Oil Capacity:	2.2 US quarts (2.1 L) when oil filter is not replaced.
	2.4 US quarts (2.3 L) when oil filter is replaced.
Fuel:	Propane (Vapor)
Water tank:	50 L

Wiring Schematic LX Propane Engine _ HGE 800P - HRC 650P - Titan 530P



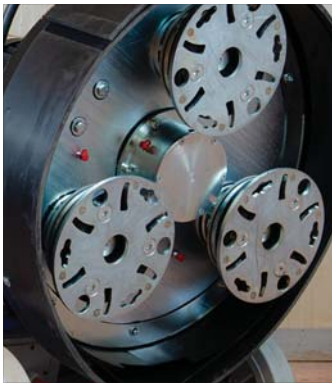
ROUTINE MAINTENANCE

REGULAR MAINTENANCE EVERY 50 HOURS

Note: It is recommended to **thoroughly clean the machine** at the end of each operation to remove any sludge before it solidifies. This will make maintenance easier and less frequent.



1. Tilt the machine into the maintenance/tool change position.

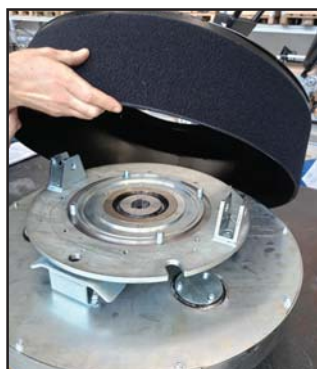
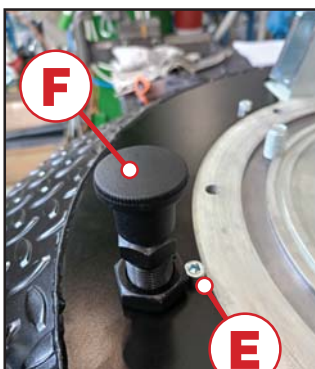
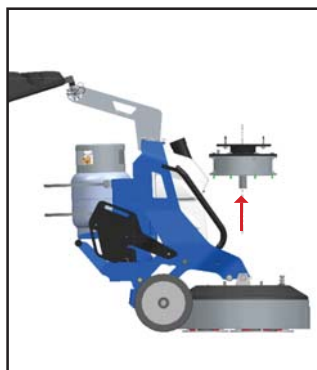
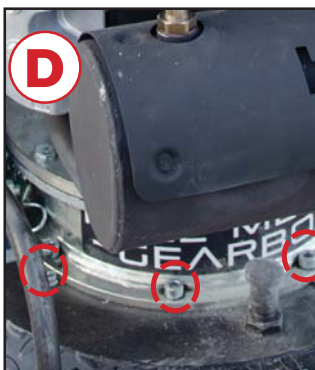
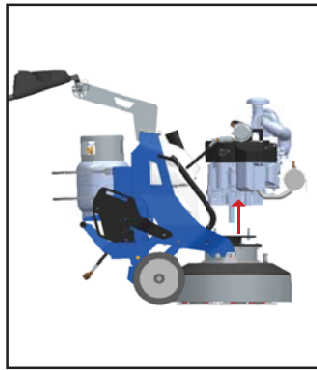
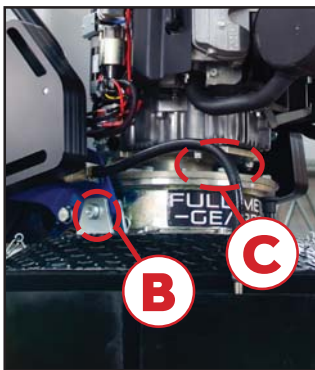
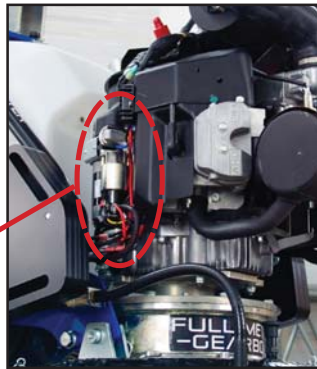


2. Apply grease using **3 pumps** for each of the **grease fittings** located at the base of the planetary and on the satellite groups .

Note: It is recommended to use **NILEX EP2 grease** both **for routine maintenance and after replacing the bearings** as described in this manual, to ensure optimal performance and extended component life.

BEARING REPLACEMENT – PRELIMINARY OPERATIONS

Note: It is recommended to work on a suitable and stable work surface, using only appropriate tools, to ensure a professional operation carried out in complete safety.



To replace the bearings inside the planetary system of the NFE 650 model, it is **necessary to detach the head from the rest of the machine body and then remove the motor.**

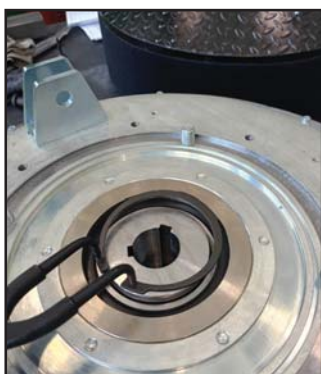
Proceed with the following steps:

1. Disconnect all power supply cables **(A)** connecting the head to the rest of the machine.
2. Detach the head from the rest of the machine body by removing the pin **(B)** on both sides.
3. Remove the motor by unscrewing the 4 mounting bolts **(C)**.
4. Remove the clutch assembly by loosening the 8 M10×30 screws **(D)**.

5. Proceed by first removing screw **(E)**, followed by the DCT pin (MAN216) **(F)**.

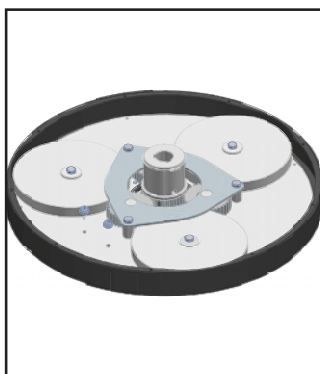
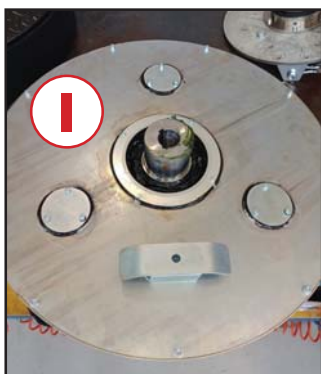
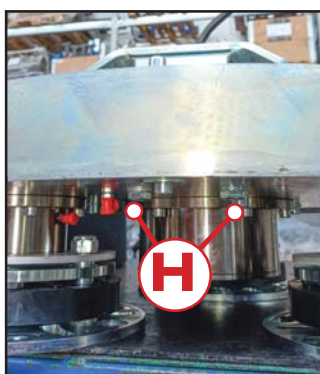
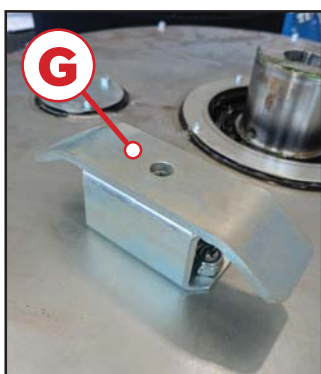
6. Unscrew the remaining 5 screws and remove the cover.

REPLACEMENT OF THE BEARINGS IN THE SATELLITE CARRIER SUPPORT KIT (HG154301)

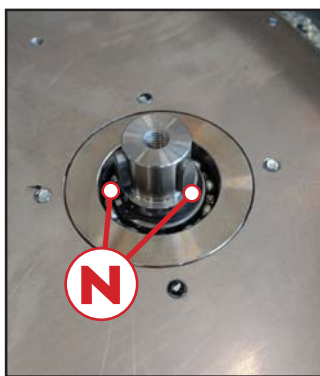
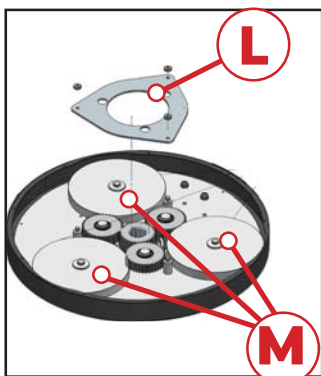


Once the cover has been removed, proceed with removing the circlip and the upper support kit (HG174001).

7. Next, remove the DCS block base (HG1087902) **(G)**, making sure to also unscrew the bolts located underneath **(H)**.



9. Remove the Gear Protection Kit **(I)** (HG144201) and clean out all the old grease.



10. Remove the plate (HG1189901) **(L)**, the three planetary gears (HG1072701) **(M)**, and the keys **(N)**.



11. At this stage, turn the planetary unit over, unscrew the locking bolt of each tool holder plate, and remove the plates.



12. Remove the Satellite Holder Support Kit (HG154301).



13. Proceed by removing:

- the Seal Ring (HG1117101) **(O)**,
- the oil seal (GUA116) **(P)**,
- the first circlip **(Q)**,
- the Satellite Shaft **(R)**,
- and the second circlip **(S)**.



14. At this point, you can proceed with the replacement of the two bearings

- 6007 2RS1 (35-62-14) and
- 6007 (35-62-14)

included in the Satellite Carrier Support Kit.





NB. Pay close attention to the bearing installation order:

- First, insert the 6007 (35-62-14) bearing, open on both sides.



- Then insert the two spacers.



- Finish by inserting the 6007 2RS1 (35-62-14) bearing, removing the seal on the inner side while keeping the outer seal in place.

REPLACEMENT OF THE BEARINGS IN THE UPPER SUPPORT KIT (HG174001)



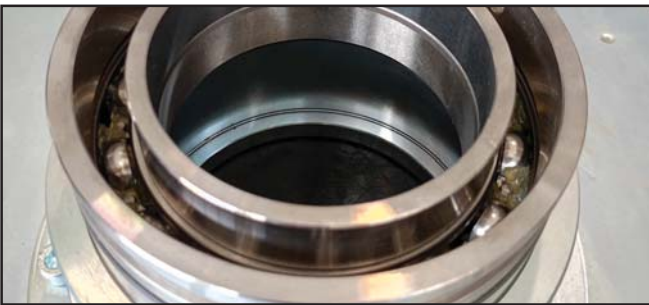
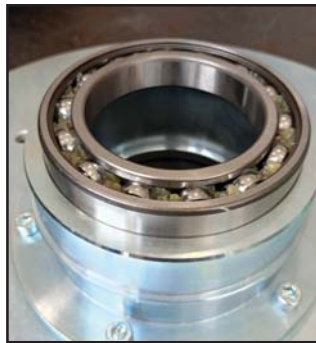
- The Upper Support Kit includes two 6217_Z bearings and the V-Ring 150 A 1 (GUA124) as consumable parts.



1. Replace the V-Ring 150 A 1 (GUA124).

Pay close attention to the bearing installation order:

- First, insert the 6217_Z bearing, removing the seal on the inner side while keeping the outer seal in place.

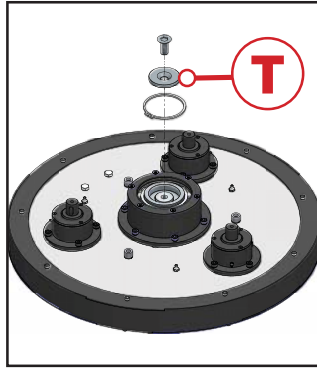
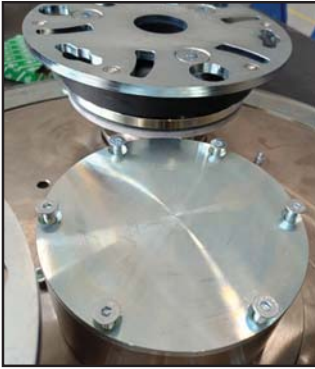


- Then insert the two spacers.



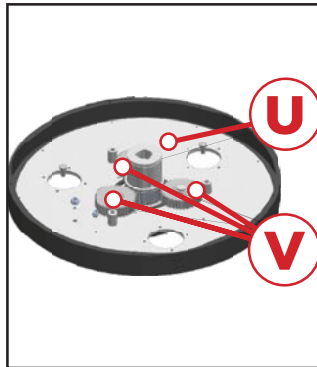
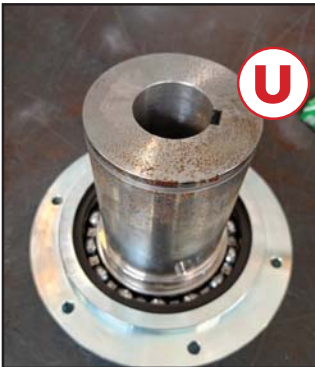
- Finish by inserting the 6217_Z bearing, open on both sides.

REPLACEMENT OF THE LOWER SUPPORT KIT BEARINGS



1. Remove the lower support cap by unscrewing the 6 fixing screws.

2. Proceed to remove the retaining seeger ring and the cup spacer (HG1190301) **(T)**.



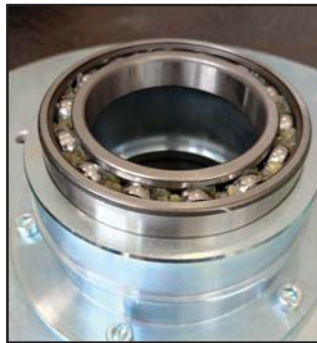
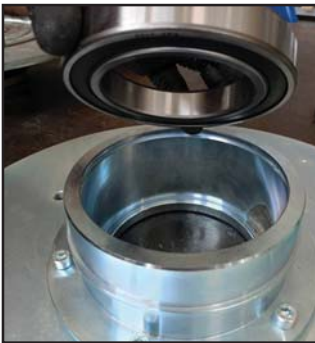
3. Remove the upper planetary shaft (HG1189701) and pinion (HG1189801) **(U)** and the three idler gears (HG1190001) **(V)**.

4. Remove the retaining ring and then extract the bearings to be replaced.



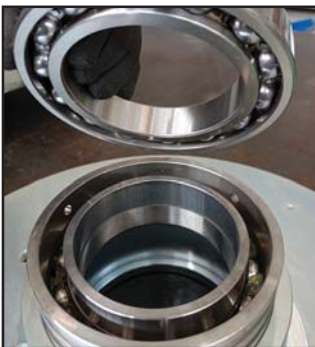
NB. Pay close attention to the bearing installation order:

- First, insert the 6217_Z bearing, removing the seal on the inner side while keeping the outer seal in place.



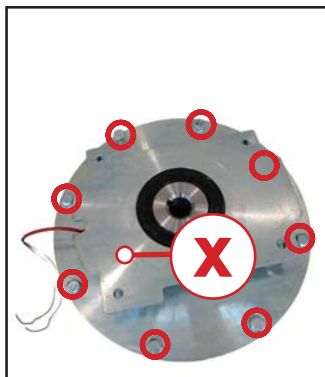
- Then insert the two spacers.

- Finish by inserting the 6217_Z bearing, open on both sides.

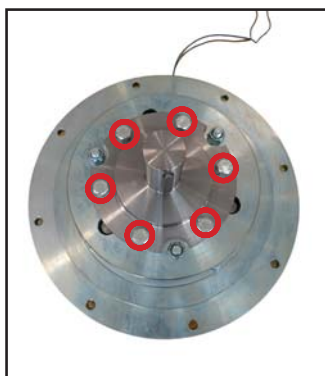
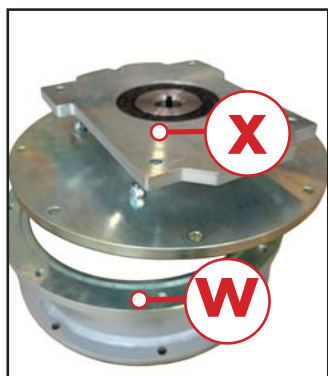


REPLACEMENT OF THE CLUTCH GROUP BEARINGS

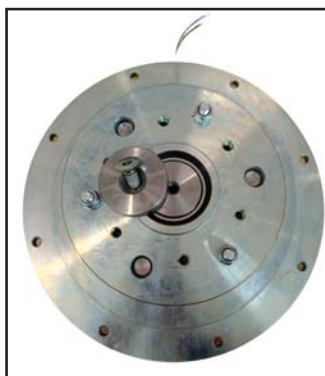
Note: The operations described below are extraordinary maintenance procedures and should be carried out only when strictly necessary.



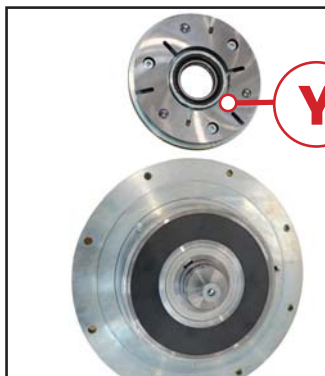
1. Remove the 8 UNI 5739 M10x30 bolts and then remove the Flange Spacer (HG1114202) **(W)** from the engine interface flange (HG1190701) **(X)**.



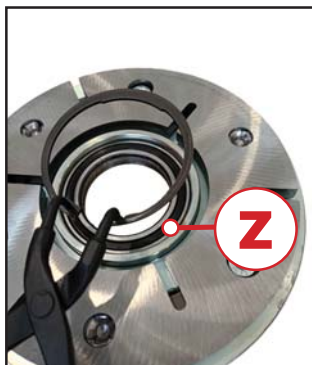
2. On the opposite side, remove the 6 UNI 5739 M10x20 screws and disengage the output shaft clutch (HG1140801).



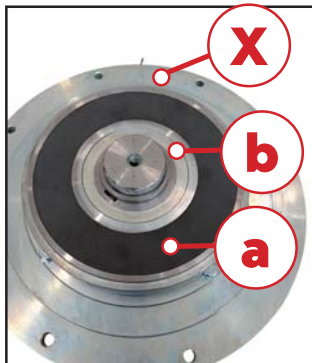
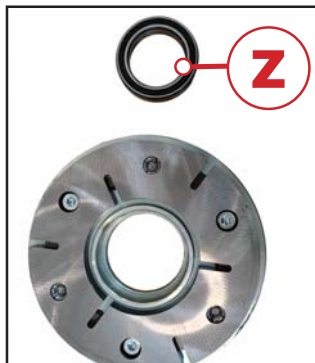
3. Remove the M12x25 UNI 5933 screw and the spacer 62 x H12 (HG1140901).



4. Now remove the armature (HG1140601) **(Y)**, using a puller or other suitable tools.



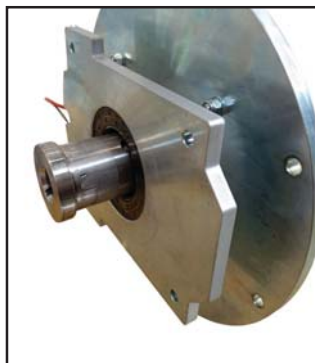
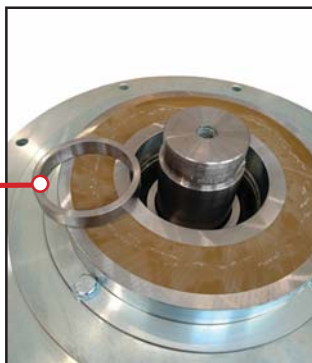
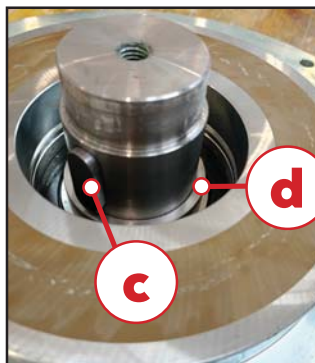
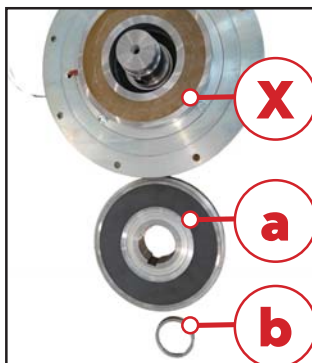
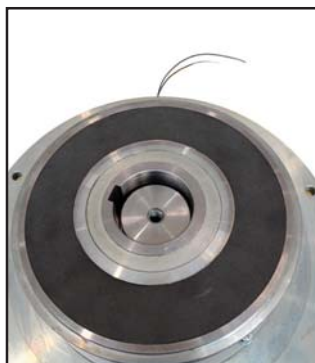
5. Once the armature (HG1140601) has been removed, remove the circlip and the 61911-2RS1 bearing **(Z)** to be replaced.



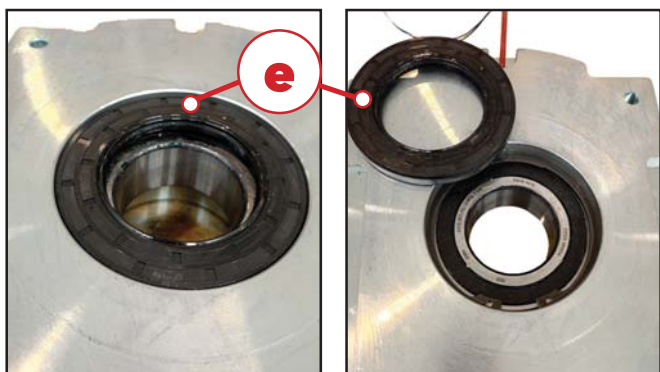
6. At this point, separate the single-plate electromagnetic clutch – model DSM 230-12V (CEG301) **(a)** from the engine interface flange (HG1190701) **(X)**.

Proceed as follows:

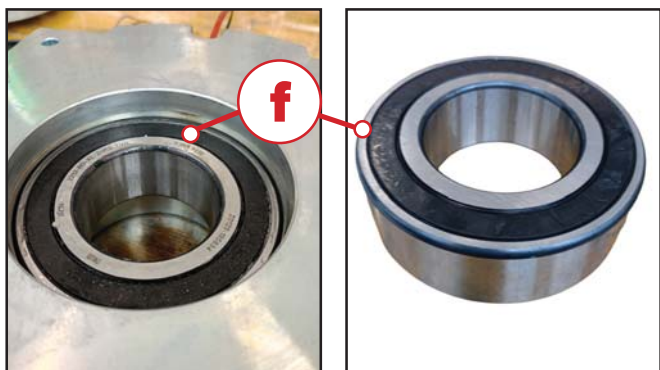
- remove the 55 × 65 × H 7 spacer (HG1140501) **(b)**;
- extract the single-plate electromagnetic clutch – model DSM 230-12V (CEG301) **(a)**;
- remove the 14 × 9 × 36 UNI 6604-A key **(c)**;
- remove the 60 × 70 × H 12.5 spacer (HG1190601) **(d)**.



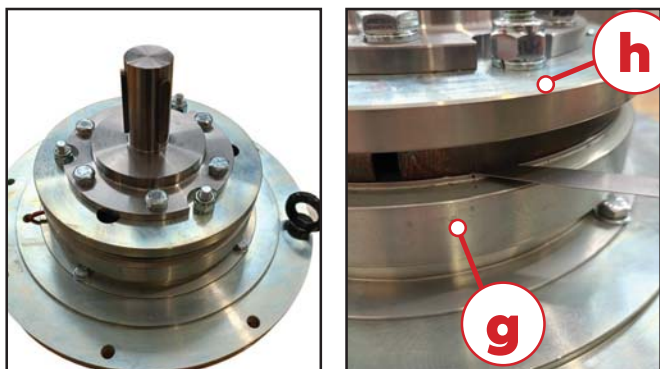
7. Now remove the central shaft (HG1190501) from the engine interface flange (HG1190701).



8. From the engine interface flange (HG1190701), remove the 70×110×10 oil seal **(e)**, which will be replaced during reassembly.

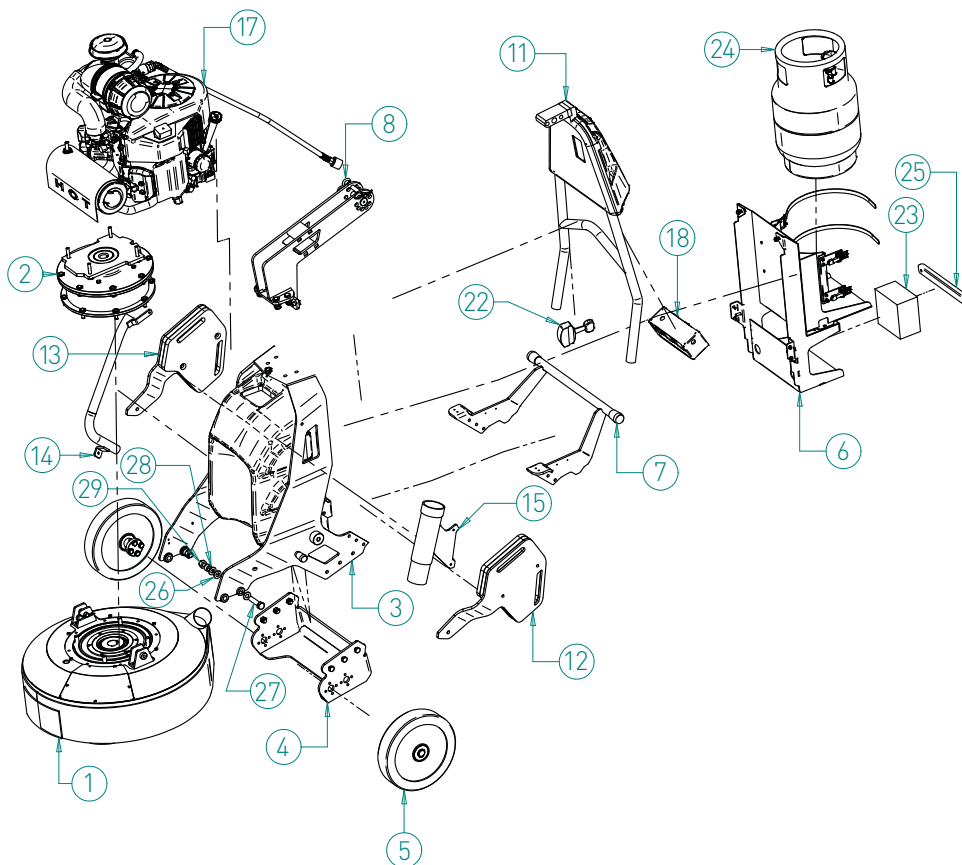


9. Remove the circlip and replace the double-row angular contact bearing 3212 A-2RS1**(f)**.



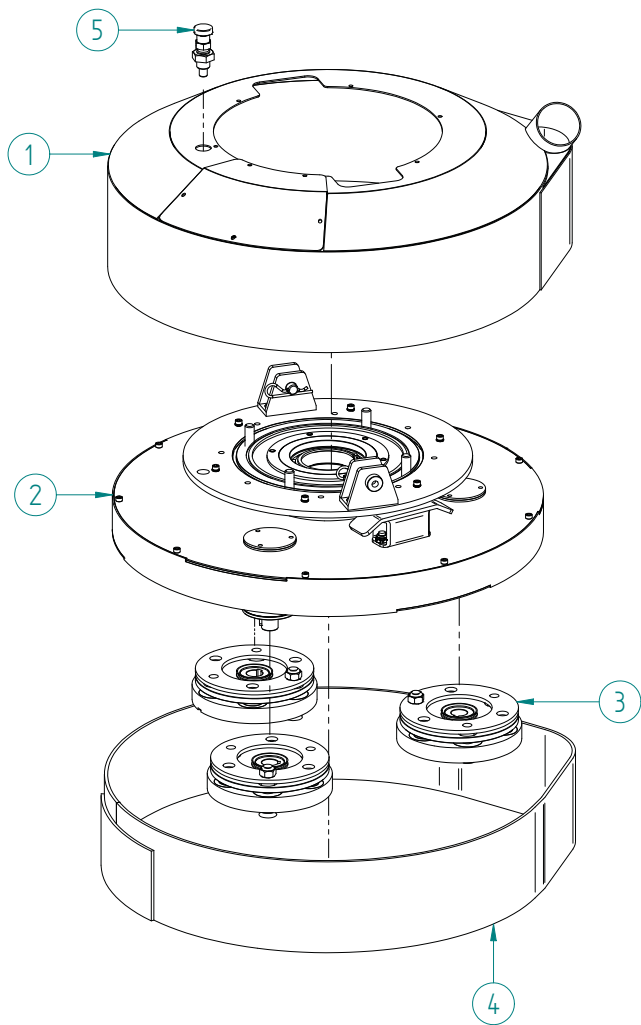
Note: Once the complete clutch assembly (HG174101) has been reinstalled, check that it rotates freely and that a minimum clearance of 0.5 mm is present between the motor side **(g)** and the driven side **(h)** of the clutch.

PARTS DIAGRAMS

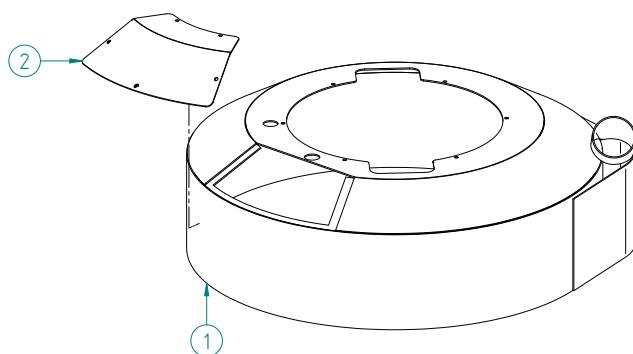


NFE 650 Propane				
Item	Part Number	NFE#	Description	QTY
1	HG173701		Head Assembly HRC 650 Propane	1
2	HG174101		Angular Contact Bearing Clutch Assembly	1
3	HG101501		Frame HRC 650/750/880	1
4	HG174201		Trolley HRC 650 Propane	1
5	HG174401		Wheel Assembly HRC 650 Propane	2
6	HG174502		Rear Frame HRC 650 Propane	1
7	HG175101		Propane Stand Kit	1
8	HG104601		RX Handle Base Kit	1
11	HG101003		Machine Control with Cover	1
12	HG103701		Left Weight	1
13	HG103801		Right Weight	1

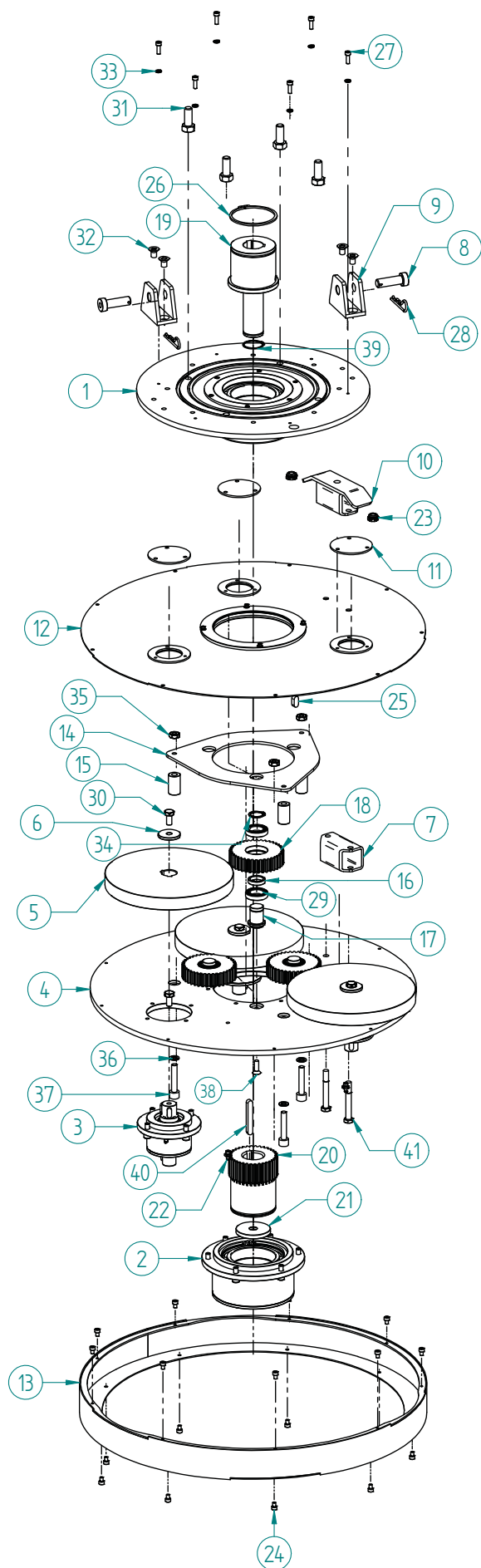
14	HG1001504		Water Hose	1
15	HG1192701		Vacuum Hose D70 HRC 650 Propane	1
17	MOT376		Kawasaki FX852V LP Engine	1
18	HG1192101		Control Panel HRC 650 Propane	1
22	MANHG040		Engine Throttle	1
23		408298	AGM Battery 12V 12Ah	1
24		402139	Tank, Propane, Vapor, 20-lbs.	1
25	HG1209201		Battery Bracket	1
26			Washer M16 DIN 125	6
27			Bolt M16x65 UNI 5737	2
28	HG1020802		Spacer	2
29			Nut M16 DIN 982	2



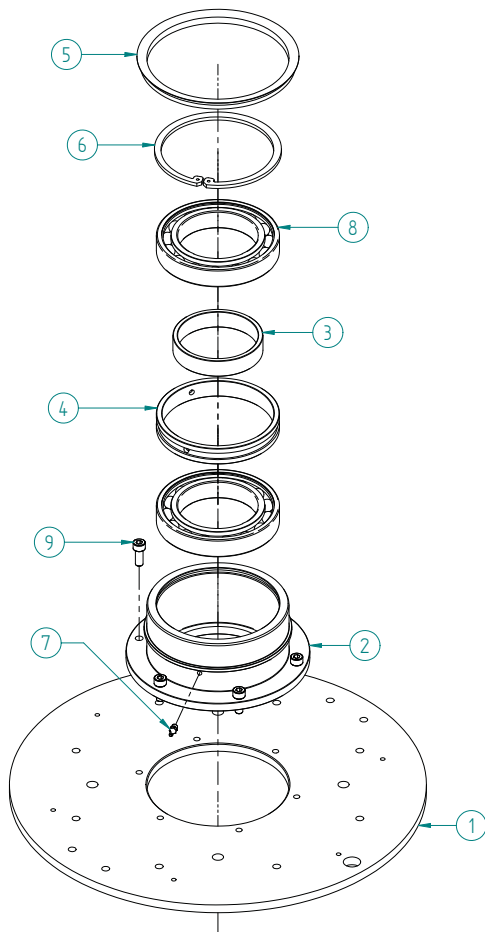
Planetary Head				
HG173701				
Item	Part Number	NFE#	Description	QTY
1	HG173801		Crankcase Kit	1
2	HG173901		Planetary Gear	1
3	HG147901		240 QA/Ready Look HRC Tool Holder (with Safety)	3
4	HG1011901		NFE 650 Splash Guard Ring	1
5	GUAHG003		M12X1.5 Collar CPL Pin	1



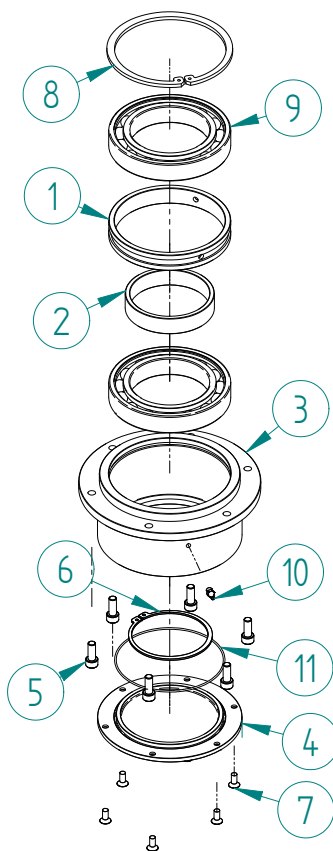
Drum Housing				
HG173801				
Item	Part Number	NFE#	Description	QTY
1	HG1189301		650 Propane Crankcase	1
2	HG1189401		650 Propane Cap	1



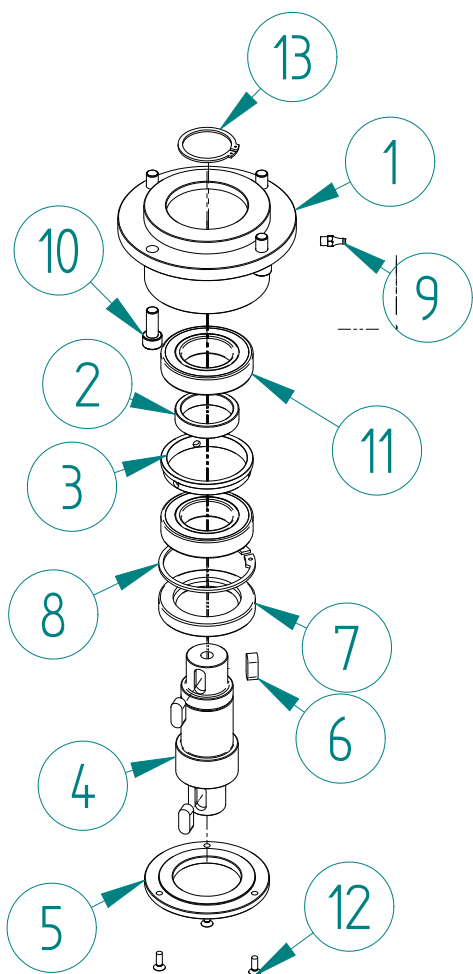
Planetary				
HG173901				
Item	Part Number	NFE#	Description	QTY
1	HG174001		Propane Upper Support Kit	1
2	HG154501		650 Lower Support Kit	1
3	HG154301		Satellite Carrier Support Kit	3
4	HG1189601		Propane Satellite Carrier	1
5	HG1072701		Satellite Gear Z=95 m=2.5 H=25 Straight	3
6	HG1118701		Spacer 42 x 10.2 x 5	3
7	HG1087902		DCS 650 Base Block	1
8	HG1119401		Pin with Head 16x50	2
9	HG1194001		Propane Frame Hinge Support	2
10	HG1088003		DCS 650 Block	1
11	HG1083701		Cap	3
12	HG144201		Gear Protection Kit	1
13	HG1087601		650 Gear Guard	1
14	HG1189901		650 Idler Gear Holder	1
15	HG1190201		Upright	3
16	HG1190401		Spacer 25 x 32 x 7	3
17	HG1190101		650 Idler Pin	3
18	HG1190001		Idler Gear Z=39 m=2.5 H=25	3
19	HG1189701		HRC 650 Propane Planetary Upper Shaft	1
20	HG1189801		Pinion Z=35 m=2.5	1
21	HG1190301		Cup Spacer	1
22			Grease Nipple TSD M8 UNI7663-A	3
23			Nut DIN 985 M10	2
24			Socket Head Cap Screw M6 x 14 UNI5931	18
25			Tab 10x8x22 UNI 6604-A	2
26			Circlip Shaft 85 UNI 7435	1
27			Screw M6x18 UNI5931	6
28			Elastic Cotter Pin UNI 8833-A4	2
29			Bearing 61905 2RS1	6
30			Screw UNI 5739 M10x20	5
31			Screw M14x35 UNI5739	4
32			Hex Socket Screw M10x16 UNI5933	4
33			Lock Washer M6 UNI 1751-A	6
34			Circlip UNI 7435 25	3
35			Nut M10 UNI 5587	3
36			Lock Washer M10	3
37			Screw UNI 5931 M10x55	3
38			Hex Socket Screw M8x35 UNI5933	3
39			Circlip UNI 7435 38	1
40			Tab 8x7x18 UNI 6604	1
41			Screw UNI 5737 M10x75	2



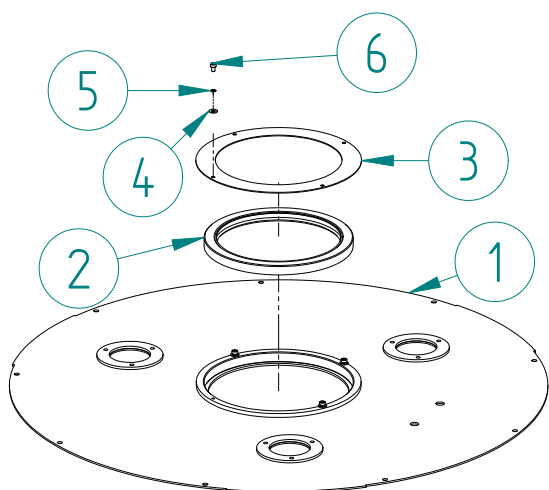
Upper Support Kit				
HG174001				
Item	Part Number	NFE#	Description	QTY
1	HG1189501		Engine Support Flange	1
2	HG1118801		Upper Central Support	1
3	HG1119201		Spacer 95 x 85 x 20	1
4	HG1119101		Spacer 130 x 126 x 20	1
5	GUA124		V-Ring seal	1
6			Circlip for 130 Hole UNI7437	1
7			Grease Nipple TSD M6 UNI7663-A	1
8			Bearing 6217 Z	2
9			Screw UNI5931 M8 x 20	6



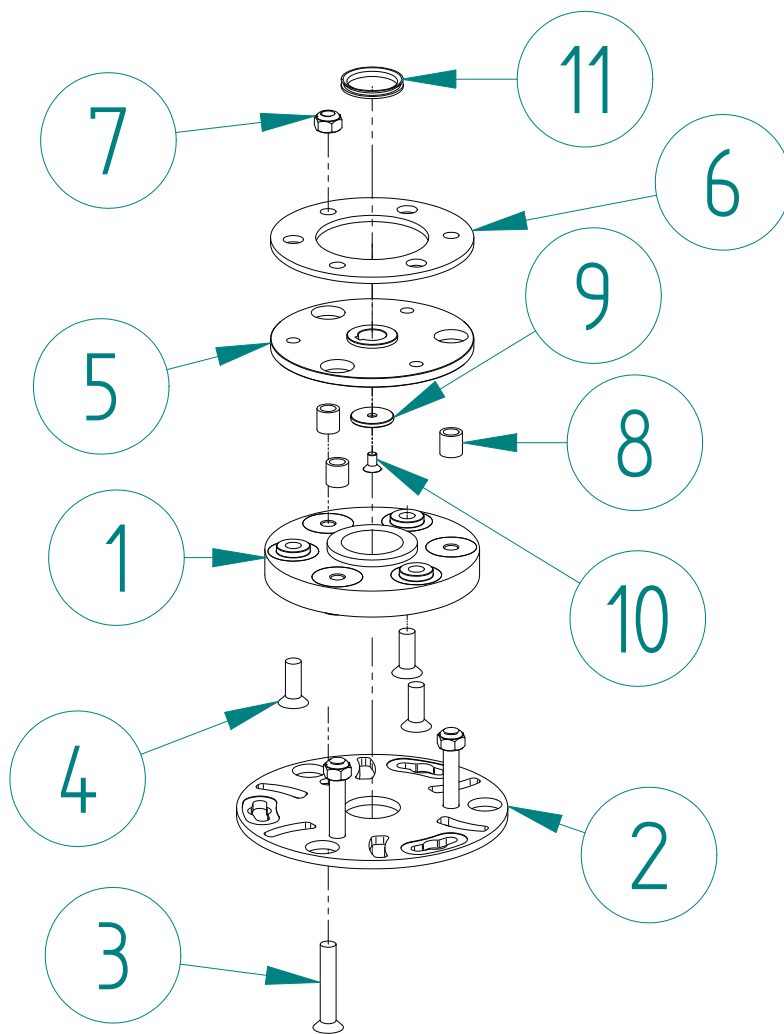
Lower Support Kit				
HG154501				
Item	Part Number	NFE#	Description	QTY
1	HG1119101		Spacer 95 x 85 x 20	1
2	HG1119201		Lower Central Support	1
3	HG1118901		Lower Support Cap	1
4	HG1119001		Screw UNI5931 M8 x 20	1
5			Ring UNI7435 85	6
6			Screw TS M6x14 UNI5933	1
7			Seeger Ring Hole 130 UNI7437	6
8			Bearing 6217 Z	1
9			Grease Nipple TSD M6 UNI7663-A	2
10			O-Ring 2450 (114.02 x 117.58 x 1.78)	1
11	ORG032		Spacer 95 x 85 x 20	1



Satellite Carrier Support Kit				
HG154301				
Item	Part Number	NFE#	Description	QTY
1	HG1117301		Satellite Carrier Support	1
2	HG1117201		Spacer 43 x 35 x 10	1
3	HG1117401		Spacer 62 x 54 x 10	1
4	HG1117001		Satellite Carrier Shaft	1
5	HG1117101		Seal ring	1
6			Tab 8x7x20 UNI6604-A	3
7	GUA116		Oil Seal (Sealing Ring 42 x 65 x 10)	1
8			Circlip 62 UNI7437 (for Hole)	1
9			Grease Nipple TSD M6 UNI7663-A	1
10			Screw UNI5931 M8 x 20	4
11			Bearing 6007 2RS1	2
12			Socket Head Screw M4x12 UNI5933	3
13			Circlip UNI 7435 35	1

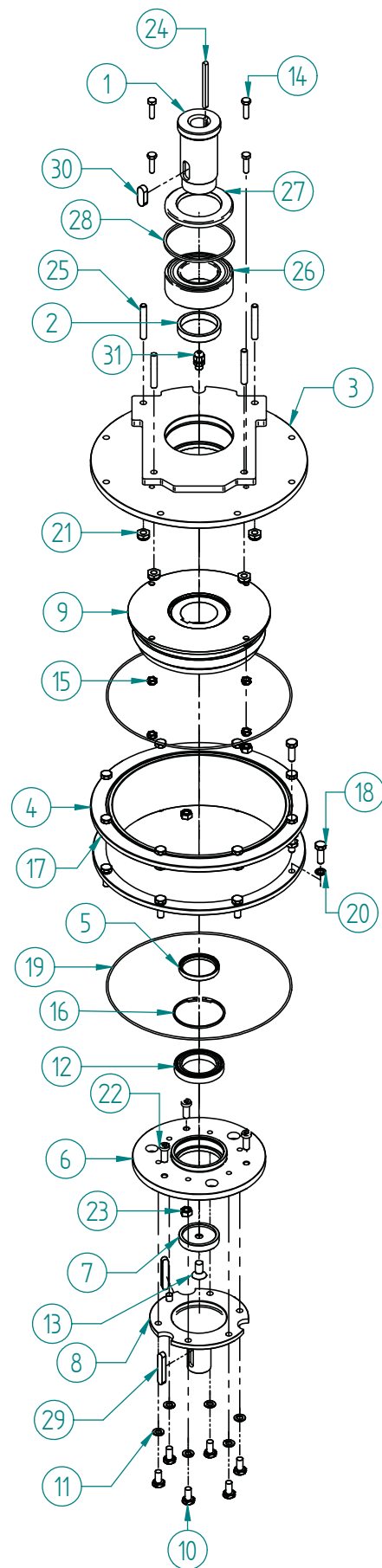


Gear Protection Kit				
HG144201				
Item	Part Number	NFE#	Description	QTY
1	HG1087801		650 Gear Protection	1
2	GUA041		Oil Seal with Dust Lip 150x180x12	1
3	HG1119601		Baffle for V-Ring ERK 650	1
4			Washer M4 UNI 6592	4
5			Lock Washer M4 UNI 1751	4
6			Socket Head Cap Screw M4x6 UNI5931	4

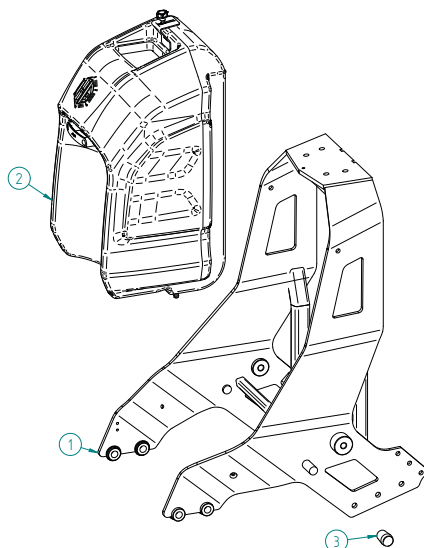


240 Wedge-lock tool holder (with safety lock)				
HG293801				
Item	Part Number	NFE#	Description	QTY
1	HG1048701		Large Shock-Absorbing Coupling	1
3			Screw UNI5933 M14 x 80	3
4			Screw UNI5933 M14 x 40	3
5	HG1116301		Upper Satellite Quick-Lock with Safety	1
6	HG1033901		Safety Disc	1
7			Nut, M14, UNI 5588	3
8	HG1116401		Spacer	3
9	HG1112301		Lock Washer	1
10			Screw, Flat Head Cap, M8x15, UNI5933	1
11	GUA098		V-Ring V-45 A	1
12	HG1284001		Lower Satellite 240, Wedge Lock	1
13			Wedge Base	3
14			Screw, Flat Head Cap, M6x20, UNI5933	18

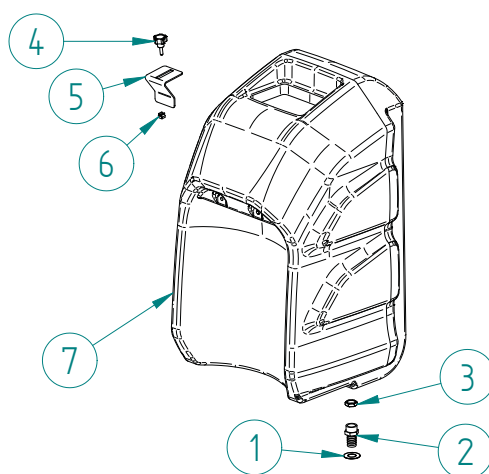
Clutch Group				
HG174101				
Item	Part Number	NFE#	Description	QTY
1	HG1190501		Main Shaft Clutch	1
2	HG1190601		Spacer 60 x 70 x H 12,5	1
3	HG1190701		Flange Interface Engine	1
4	HG1114202		Flange Spacer	1
5	HG1140501		Spacer 55 x 65 x H 7	1
6	HG1140601		Armature Clutch	1
7	HG1140901		Spacer 62 x H 12	1
8	HG1140801		Output shaft clutch	1
9	CEG301		Single plate electromagnetic clutch model DSM 230-12V	1
10			Screw UNI 5739 M10x20	7
11			Lock Washer M10	7
12			Bearing 61911-2RS1	1
13			Screw M12x25 UNI 5933	1
14			Screw M8x30 UNI5737	4
15			Nut M8 DIN985	5
16			Circlip UNI 7437 80	1
17			Nut M10 UNI 5587	9
18			Screw UNI 5739 M10x30	18
19			O-Ring 41150	2
20			Split Washer M10	8
21			Nut M10 DIN980	5
22			Low-Head Socket Cap Screw M10x25 DIN 7984	3
23			Nut M10	4
24	HG1145701		Tab 6.35x6.35x90	1
25	HG1193001		Stud M10 - 3/8-16UNC x 65	4
26			Double-Row Angular Contact Bearing 3212 A - 2RS1	1
27			Oil Seal 70x110x10	1
28			Circlip UNI 7437 110	1
29			Tab 10x8x60 UNI6604-A	2
30			Tab 14x9x36 UNI6604-A	1
31			PG7 (Cable Gland)	1

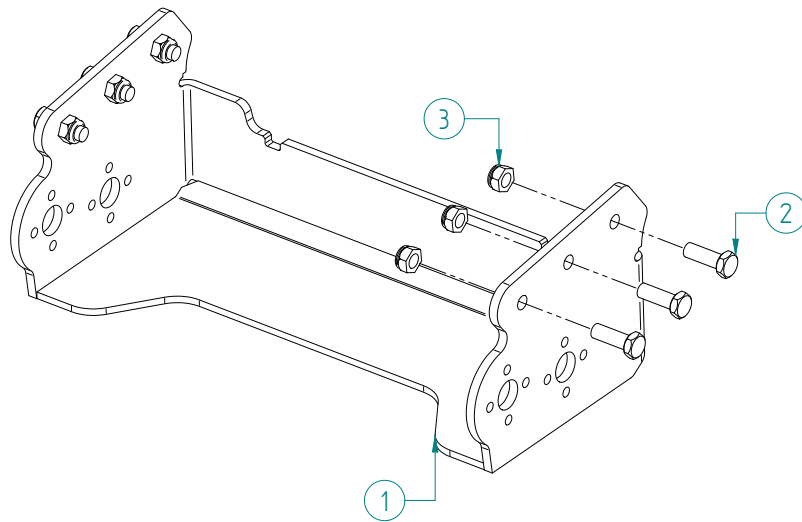


Frame NFE 650				
HG101501				
Item	Part Number	NFE#	Description	QTY
1	HG1003801		Frame	1
2	HG104401		Water Tank	1
3	MAN235		Heavy-Duty Round Bushing	2

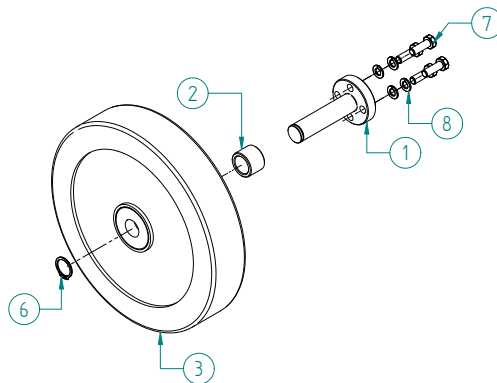


Tank				
HG104401				
Item	Part Number	NFE#	Description	QTY
1	SE00701		Washer 16-30-0.5	1
2	RCD021		3/8 10 Hose Holder	1
3	CIG003		G 3/8 Nut	1
4			Handwheel M5x16	1
5	HG1007002		Tank Support Plate	1
6			Nut with Cage	1
7	HG1011702		HG 50L Tank	1



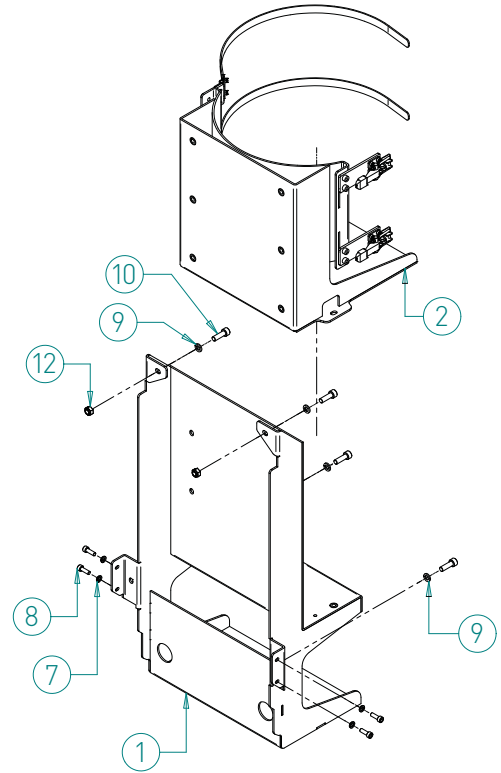


NFE 650 Propane Wheel Frame				
HG174201				
Item	Part Number	NFE#	Description	QTY
1	HG1190801		50 Propane Wheel Trolley	1
2			Socket Head Screw M12x35 UNI5739	6
3			Self-Locking Nut M12 DIN985	6

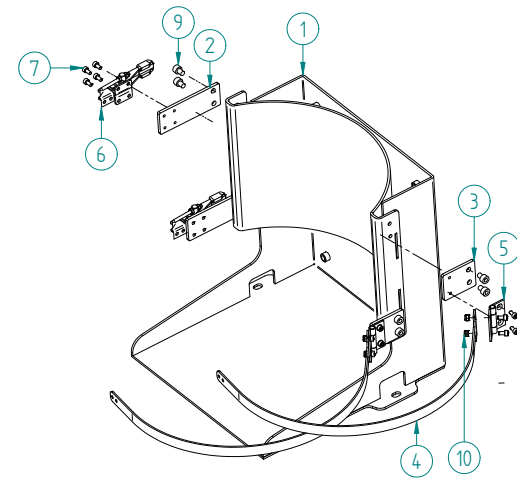


NFE 650 Propane Wheel Assembly				
HG174401				
Item	Part Number	NFE#	Description	QTY
1	HG1191001		Wheel Axle	1
2	HG1002301		Spacer	1
3	RTO0015		Wheel Ø300 Hub 25x60	1
6			Circlip UNI 7435 25	1
7			Screw UNI 5739 M10x30	4
8			Lock Washer M10	4

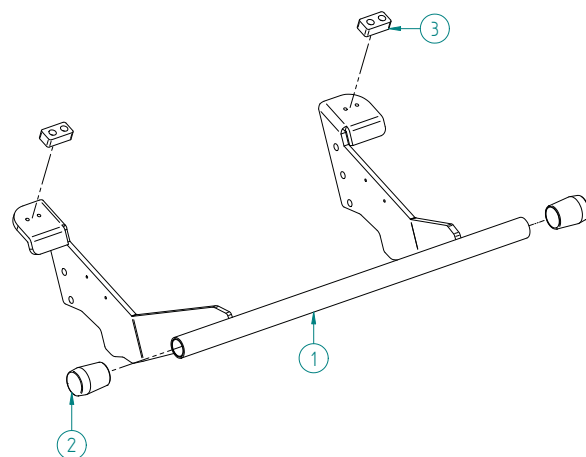
NFE 650 Propane Rear Frame				
HG174502				
Item	Part Number	NFE#	Description	QTY
1	HG1191202		Battery Support Frame	1
2	HG174601		Propane Tank Support Kit	1
7			Lock Washer M6 UNI 1751-A	4
8			Socket Head Cap Screw M6x18 UNI5931	4
9			Split Washer M8 UNI 1751-B	4
10			Socket Head Cap Screw M8x25 UNI5931	4
12			Nut DIN 985 M8	2



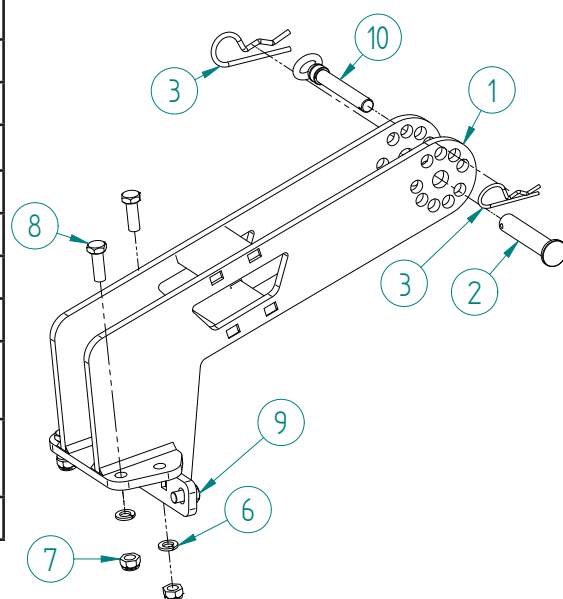
Propane Tank Support Kit				
HG174601				
Item	Part Number	NFE#	Description	QTY
1	HG1191501		Propane Tank Support	1
2	HG1191801		Hook Extension	2
3	HG1191901		Short Hinge Extension	2
4	HG1144101		Flat Tying	2
5	RCD105		Hinge	2
6	GG.AL500 (Cod. Eles)		Latch Clamps MTC.160-T2 (035)	2
7			Socket Head Screw M4x8 UNI5739	16
9			Screw UNI5931 M6x10	8
10			Self-Locking Nut M4 DIN 985	4



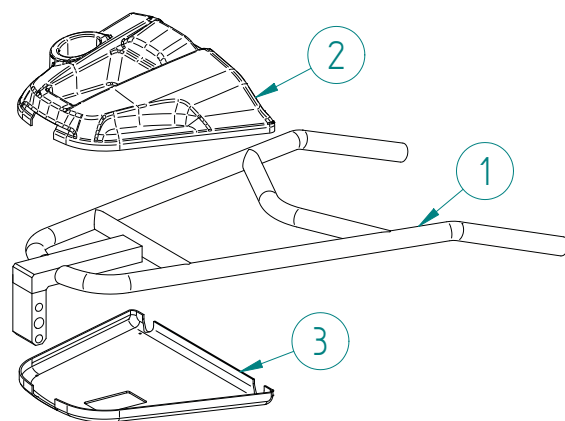
Propane Stand Kit				
HG175101				
Item	Part Number	NFE#	Description	QTY
1	HG1193901		Propane Stand	1
2	MAN235		Heavy-Duty Round Bushing	2



RX Handle Base Kit				
HG104601				
Item	Part Number	NFE#	Description	QTY
1	HG1004403		RX Handle Base	1
2	HG7311803		Central Pin	1
3		408396	Cotter Pin UNI 8833 - A5	2
6			Lock Washer M12 DIN 127	4
7			Self-Locking Nut M12 DIN985	4
8			Socket Head Screw M12x35 UNI5739	4
9			Socket Head Screw M12x25 UNI5739	2
10	HG7317801	408394	Adjustment Pin with Eyelet	1

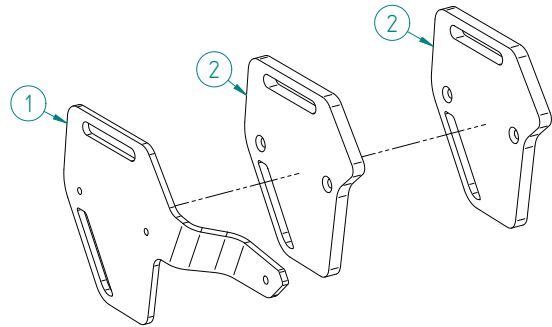


Machine Control with Cover				
HG101003				
Item	Part Number	NFE#	Description	QTY
1	HG1002102		Handle	1
2	HG1011102	408392	Upper Machine Control Housing	1
3	HG1078201	408393	Lower Housing	1

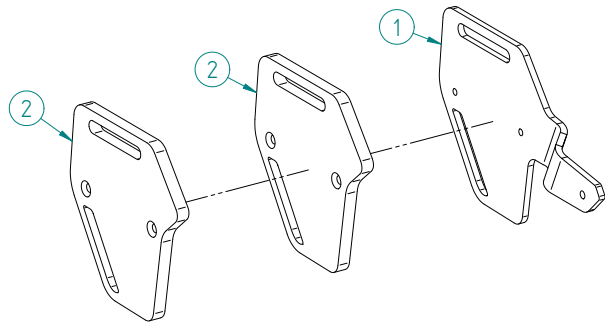


WEIGHT KIT SERIES 2 (total 43 kg)
HG105501

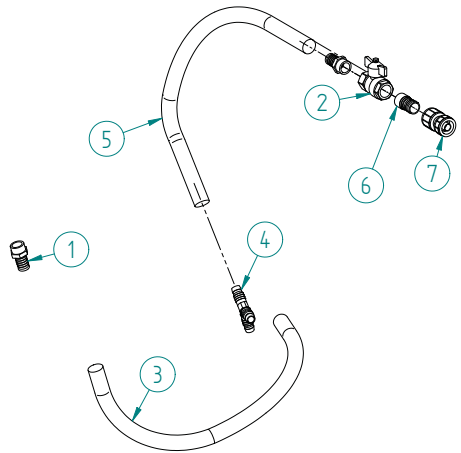
Right Weight Series 2				
HG103801				
Item	Part Number	NFE#	Description	QTY
1	HG1001302_mir		Right Weight Holder Base Series 2 (5.5 kg)	1
2	HG1001401		Weight (8 kg)	2



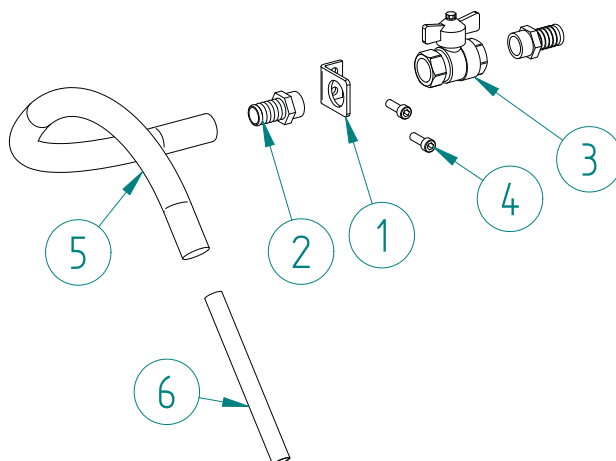
Left Weight Series 2				
HG103701				
Item	Part Number	NFE#	Description	QTY
1	HG1001302		Left Weight Holder Base Series 2 (5.5 kg)	1
2	HG1001401		Weight (8 kg)	2



Main Valve Kit				
HG110501				
Item	Part Number	NFE#	Description	QTY
1	RCD071		1/2" Hose Holder	2
2	RCD098		1/2" F/F Ball Valve	1
3	TBO020		Braided Hose 16x22	1
4	RCD100		T Fitting D16 (Nylon)	1
5	TBO019		Braided Hose 16x22	1
6	RCD099		Brass Quick Coupling M 1/2"	1
7	RCD096		Brass Quick Coupling F 1/2"	1



Valve Kit series 2				
HG110701				
Item	Part Number	NFE#	Description	QTY
1	HG1112701		Valve Support	1
2	RCD071		1/2" Hose Holder	2
3	RCD098		1/2" F/F Ball Valve	1
4			Socket Head Cap Screw M6x18 UNI5931	2
5	TBO020		Braided Hose 16x22	1
6	TE43301		Terminal Hose for Protection Connection	1



Accessories				
Item	Part Number	NFE#	Description	QTY
1	HG1020201		Water Tube 14x1,5x230	1
2	HG1020301		Water Tube 10x1,5x225	1
3	HG1020401		Water Tube 10x1,5x170	1

Service Parts				
Item	Part Number	NFE#	Description	QTY
1	CHSTAR2BX		EP2 Grease	1
2	99999-1086		Starter Motor	1
3	11013-7044		Air filter, primary	1
4	11013-7045		Air filter, secondary	1
5	NGKBPR4ES		Spark plug	1
6	49065-0734		Oil filter	1
7	CHSUP306CS		Engine Oil, SAE30	1

