NISSAN

H15
H20II
H25

# Engine

# Operation Manual

1995

# For your safety and comfort

Read this manual before using the unit.

This manual explains points that require caution when handling the engine unit.

Please also follow the points in this manual that require caution when mounting the engine unit on the forklift and other units.

To prevent problems, strictly follow the instructions pertaining to these cautionary points.

Pre-work Check

Please conduct a pre-work check to ensure safety.

Periodic Inspection

Carefully inspect the engine at the specified inspection intervals to keep the engine running safely and without problems.

These inspections are important for preventing breakdowns, ensuring safety and extending the life of the engine.

About Genuine Parts

Some engine parts need to be replaced periodically owing to wear or deterioration in quality. When it comes time to replace those parts, use only NISSAN genuine parts (including lubricants) for which NISSAN has guaranteed performance and safety.

**Note:**

1. Engine oils have a useful range that depends on temperature. Call your NISSAN service plant for details.

**When Stopping and Parking the folklift**

Always stop the forklift in a level area, set the parking brake and stop the engine. Don't forget to remove the key.
Lower the forks to the ground when parking for long periods of time.

**Note:**
Do not leave the vehicle when the engine is running or when the key is in the ignition.

**About Running the Engine in Warehouses and Garages**

[1] Exhaust gases may reach a toxic level if the engine is run for a long time within a closed garage or warehouse.

[2] When operating the engine, including to warm it up, be sure to provide sufficient ventilation.

[3] If the forklift's exhaust pipes are situated near a wall of the garage or warehouse, do not rev the engine or run it at high revolutions, as the exhaust gas may blacken or burn the wall.

**When Starting the Engine....**

Pull the hand brake lever all the way up before starting the engine, and make sure the forward/reverse drive lever (in forklifts with a clutch) or the selector lever (in forklifts with a torque converter) is in neutral.

[1] Before starting the engine, push the accelerator all the way down once and then slowly release it to set the automatic choke.
[2] After starting the engine, let it warm up.

**Note:**
For vehicles whose engine runs on both LPG and gasoline, set the fuel shift switch to whichever fuel is being used.

**Overheating Procedures**

Take the following measures should the engine overheat:
[1] Stop the forklift in a safe spot and let the engine idle.
[2] Open the top hatch to ventilate the engine compartment.
[3] Turn off the engine after it has cooled down.
[4] Check the coolant water once the engine is cool enough and add water if needed.

Steam may spew out and burn you if you rush to remove the radiator cap without following the above procedure.

## Starting a Gasoline Engine (including ones that use both LPG and gasoline)

Gasoline engines are equipped with a fully automatic choke, so take the following steps to start them.
For folklift trucks whose engine runs on both LPG and gasoline, set the fuel shift switch to whichever fuel is being used.

[1] Pull the hand brake lever all the way up and make sure the forward/reverse drive lever (in forklifts with a clutch) or the selector lever (in forklifts with a torque converter) is in neutral.
[2] Before starting the engine, push the accelerator pedal all the way down once and then slowly release it. This is not necessary if the engine is already warmed up.
[3] Turn the key to start the engine, keeping your foot off the accelerator.

**Note:**
Do not keep the starter turned for more than ten seconds. Stop turning, wait ten seconds to let the battery recharge and then turn it again.

[4] After starting the engine, give it a little time to warm up. Tap the accelerator pedal after about a minute. If the weather is warm, tapping the pedal then releasing it immediately after starting the engine should lower the revolutions, enabling a quieter warm-up and fuel savings.

**Note:**
1. Directly after start up, the engine will be cold so do not rev it or run it at high rpms.
2. Do not turn the key to the start position while the engine is running or you might damage the starter motor.
3. When using LPG in an LPG/gasoline engine, start the engine with gasoline during extremely cold weather. After the engine has warmed up, convert to LPG following the normal fuel switching procedure and restart the engine.
4. The revolutions will be high after restarting the engine, so use caution in running the vehicle or carrying out loading operations.

## Fuel Switch (only for LPG/Gasoline Vehicles)

When Switching from LPG to Gasoline...
1. With the fuel switch at neutral, lightly depress the accelerator and continue revving the engine until it dies.
2. After the engine stops, turn the fuel switch to gasoline and restart the engine.

**When Switching from Gasoline to LPG...**
1. With the conversion switch at neutral, lightly depress the accelerator and continue revving the engine until it dies.

2. After the engine stops, open the removal valve on the tank (the red valve), turn the fuel switch to LPG and restart the engine.

**Note:**

1. Always turn off the engine before switching fuels.
2. Drive the forklift at least a few kilometers once every two weeks to maintain the gasoline quality.
3. Do not switch fuels immediately after starting the engine. Do it after the engine has warmed up.

## Utilizing the automatic choke (in gasoline-powered forklifts)

We have equipped all gasoline-powered engines with an automatic choke to help start them in cold weather.

### Distinguishing Features

- The optimum choke setting enables you to start the engine in a single try.
- Because you cannot forget to push the choke back in, carbon does not build up on the spark plugs; the equipment does not emit black, sooty smoke; and the engine runs cleaner to help maintain the environment.
- The electrically regulated choke automatically slows down engine revolutions after the engine is warmed up, so there is no fuel waste.

### Points requiring caution during operations

- Tap the accelerator pedal once before starting.
- Releasing the choke by lightly tapping the accelerator pedal during warm-up (about one minute after startup) is also possible.

**Verification of Automatic Choke Operations**

Engine revolutions will automatically slow down five to ten minutes after the engine is started.

# Pre-work Check

This check should be conducted daily to keep the engine running safely, without any problems. If you find any irregularities during the check, send the vehicle to the NISSAN service plant for service.

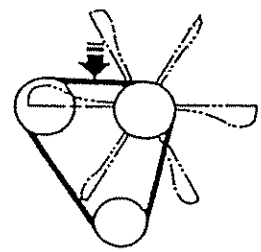
**Items to check**

With the engine turned off:
- Is the amount of engine oil appropriate?
- Is there enough coolant water in the radiator reserve tank?
- Is the fan belt tension correct? Is the fan belt damaged?

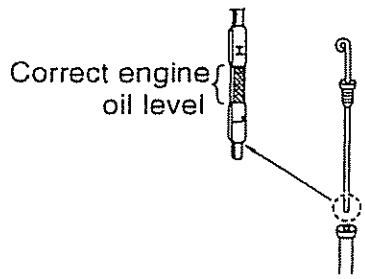
With the engine running:
- Is the color of the exhaust normal?
- Are there any oil or water leaks?

**Checking the fan belt**
The amount of fan belt flex when pushed down with one finger is shown below. Also check the belt for scratches and tears.

(About 10kg)
11-13mm flex



H15, H20, H25 Type




**Checking the engine oil**
With the forklift resting on level ground, check the engine oil either before starting the engine or at least five minutes after shutting it off. Remove the level gauge, wipe it with a clean cloth, and reinsert it. Remove it again. The oil level should be between the L and the H.

If the oil is low, pour NISSAN genuine motor oil into the oil filler cap.

Replace the engine oil when it is extremely dirty or the color has changed greatly.

**Note:**
1. Properly affix the level gauge and the oil filler cap. Failing to affix them properly or forgetting to do so may cause engine problems.
2. Adding oils of different quality or engine oil additives may cause problems with engine operation.

List of Engine Oils

| Item | Type of oil | When to replenish or replace oil | | | |
|---|---|---|---|---|---|
| | | Every 200 hours (every month) | Every 600 hours (every 3 months) | Every 1200 hours (every 6 months) | Every 2400 hours (every 12 months) |
| Engine (gasoline) | NISSAN motor oil | ● | | | |
| Oil filter | Oil filter or element | | ● | | |
| Fuel strainer or filter | Fuel strainer or element | | | | ● |
| Air cleaner | Element | | | ● | |

Water and oil quantities

| Item | Type | Quantity (l) |
|---|---|---|
| Engine oil | H15 engine | about 3.8 |
| | H20 engine | about 3.8 |
| | H25 engine | about 3.8 |
| Coolant water, including in the reserve tank | H15 engine | about 11 |
| | H20 engine | about 9 |
| | H25 engine | about 8 |

# Inspections and Servicing

## Periodic Servicing Specifications

Periodically inspecting the engine is necessary to keep it running smoothly and to prevent break-downs. The table below summarizes the items that should be inspected each time the forklift is used and at every recommended inspection interval.

These items apply to normally operated engines. If you operate your forklift under vastly different conditions, adjust the items of inspection accordingly.

- ○ Inspect, service, clean
- ⊗ Replace
- ◎ Ask your nearest NISSAN service plant to inspect and service the vehicle.
- ☆ This symbol indicates that it is time to replace those parts that require period replacement.

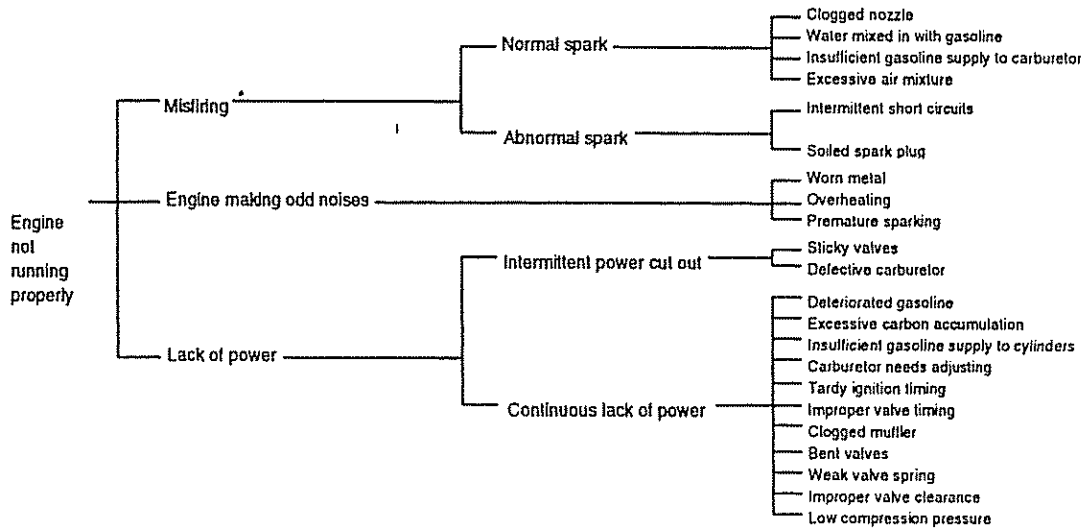
| Inspection or servicing item | | | Time for inspection or servicing | | | | | Inspection standards | Remarke |
|---|---|---|---|---|---|---|---|---|---|
| | | | Each time the forklift is used | Every 200 hours (every month) | Every 600 hours (every 3 months) | Every 1200 hours (every 6 months) | Every 2400 hours (every 12 months) | | |
| Engine | Body | Engine startup and odd noises | ○ | | | | | | |
| | | Check the condition of the air cleaner element | | | ○ | ⊗ | | | |
| | | Check to make sure the cylinder head and manifold are tightened | | | | ◎ | | Tightening torque<br>Cylinder head.....7.0 to 8.5 kg-m<br>Rocker bracket attachment bolt.....5.0 to 6.0 kg-m<br>Manifold attachment bolts.....1.6 to 1.9 kg-m | |
| | | Check the compression pressure | | | | ◎ | | 11 kg/cm$^2$ or higher (H15)<br>105 kg/cm$^2$ or higher (H20)<br>11 kg/cm$^2$ or higher (H25) | 300 rpm<br>300 rpm<br>300 rpm |
| | | Check the valve clearance | | ◎ | | | | Intake and exhaust valves<br>0.38 mm (when engine is warmed up) | |
| | Lubrication system | Check for oil leaks | ○ | | | | | | |

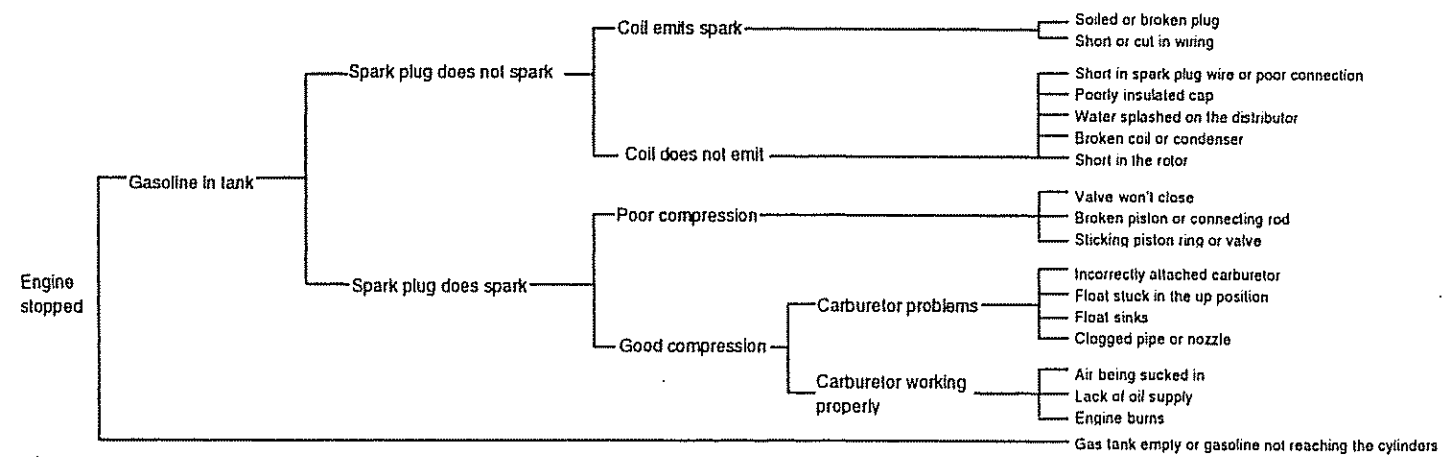
| Inspection or servicing item | | | Time for inspection or servicing | | | | | Inspection standards | Remarke |
|---|---|---|---|---|---|---|---|---|---|
| | | | Each time the forklift is used | Every 200 hours (every month) | Every 600 hours (every 3 months) | Every 1200 hours (every 6 months) | Every 2400 hours (every 12 months) | | |
| Engine | Lubrication system | Oil stain | ○ | | | | | | |
| | | Check the oil level | ○ | | | | | | |
| | | Change the engine oil | | ⊗ | | | | | After 10 hours the first time |
| | | Replace the oil filter | | | ⊗ | | | | Cartridge type |
| | Fuel system | Check for fuel leaks | ○ | | | | | | |
| | | Check the condition of the carburetor parts | | ○ | | | | | |
| | | Replace the fuel strainer element | | | | | ⊗ | | |
| | | Check the functioning of the fuel pump | | | | ◎ | | | |
| | | Replace the fuel hoses | | | | | | | Every two years |
| | | Check the fuel level | ○ | | | | | | |
| | | Clean the inside of the fuel tank | | | ○ | | | | |
| | Cooling equipment | Check for coolant water leaks | ○ | | | | | | |
| | | Check the water level | ○ | | | | | | |
| | | Clean the radiator | | | | ◎ | | | |
| | | Check the fit of the radiator cap | | | | ◎ | | | |
| | | Replace the water and wash the inside of the radiator | | | | | | | Every six months |
| | | Check for loosening of or damage to the fan belt | | ○ | | | | When about 10 kg of force is applied to the belt between the fan pulley and alternator pulley, the flex should be 11 to 13 mm. | 12 to 14 mm (high fan) |

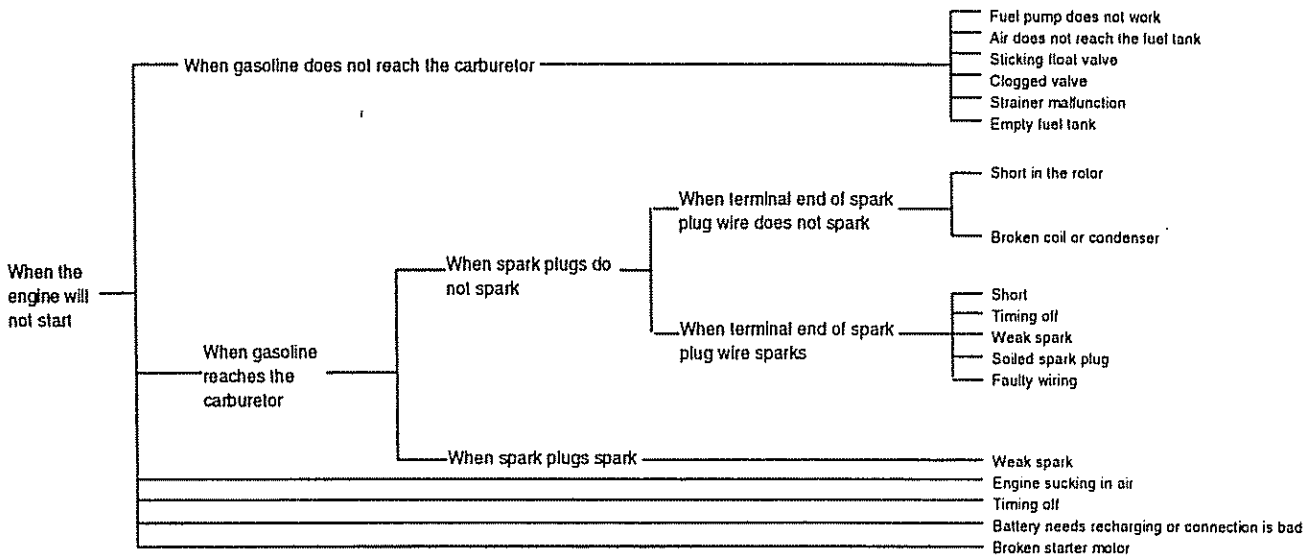
| Inspection or servicing item | | | Time for inspection or servicing | | | | | Inspection standards | Remarke |
|---|---|---|---|---|---|---|---|---|---|
| | | | Each time the forklift is used | Every 200 hours (every month) | Every 600 hours (every 3 months) | Every 1200 hours (every 6 months) | Every 2400 hours (every 12 months) | | |
| Engine | Other | Check the operating condition of the governor | | ○ | | | | | |
| | | Check for looseness in the attachment areas of the engine and accessory parts | | ○ | | | | | After 10 hours the first time |
| | | Check for loosening of or damage to the attachment areas of the exhaust manifold and muffler | | ○ | | | | | |
| Electrical system | Ignition system | Check the condition of the distributor cap | | ○ | | | | | |
| | | Check the distributor supply of oil | | ○ | | | | | |
| | | Check the ignition plug | | ○ | | | | Clearance between electrodes 0.8 to 0.9 mm | |
| | | Check ignition timing | | ○ | | | | Before top dead center<br>6º (H15) (700 rpm)<br>4º (H20)<br>4º (H25) | |
| | | Check functioning of the spark advance equipment | | ○ | | | | | |
| | Battery | Check battery fluid level | | ○ | | | | | |
| | | Measure specific gravity of fluid | | | ○ | | | 1.20 to 1.27 at a fluid temperature of 20ºC | |
| | Wiring system | Check for damage to and loosening of the connections | | ○ | | | | | |
| | Instruments | Check operation of all meters, pilot lamps and switches | ○ | | | | | | |

# List of Breakdowns

Use this chart to discover the area of mechanical trouble and take the necessary measures accordingly. We recommend that following that, repairs be made at any NISSAN service plant.



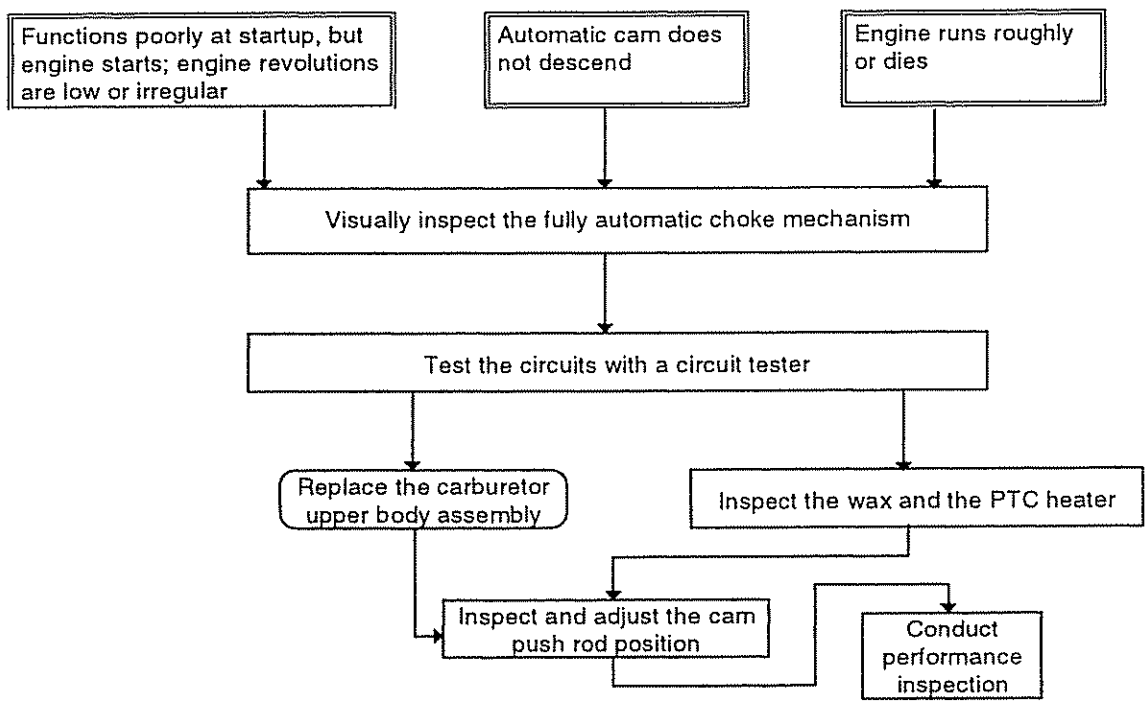

When the engine will not start
When gasoline does not reach the carburetor
Fuel pump does not work
Air does not reach the fuel tank
Sticking float valve
Clogged valve
Strainer malfunction
Empty fuel tank
When gasoline reaches the carburetor
When spark plugs do not spark
When terminal end of spark plug wire does not spark
Short in the rotor
Broken coil or condenser
When terminal end of spark plug wire sparks
Short
Timing off
Weak spark
Soiled spark plug
Faulty wiring
When spark plugs spark
Weak spark
Engine sucking in air
Timing off
Battery needs recharging or connection is bad
Broken starter motor

# Engine (H Series)

## [2] Mechanical Problem and Probable Cause

| Problem | | Probable Cause |
|---|---|---|
| Functions poorly at startup | Choke valve left open and throttle valve left closed | Plunger sticking |
| Engine starts, but revolutions are low or irregular | | Choke valve sticking |
| | | Improper bimetal setting |
| | | Improper adjustment of fast idle cam |
| Engine revolutions do not slow down after engine is warmed up (automatic cam does not descend) | Choke valve opens, but throttle valve does not close | Wax puncture |
| | | PTC heater wiring disconnection |
| | | Automatic choke link deformation |
| | Choke valve does not open | Choke valve sticks |
| | | Broken wire in bimetal heater |
| Engine runs roughly or dies | Cam descends too quickly | Improper adjustment of fast idle opening |

## Inspection and adjustment procedures



Requirements when mounting the engine unit

1. Dangers posed by the engine unit and sections that need protection

[1] Safety measures that must be taken when using products equipped with the engine unit
(1) Protection against dangerous sections of the engine unit
(2) Affixing warning labels

We leave it up to your company to omit or modify the matters stated in this section. You will be responsible for such omissions or modifications. Please also consider affixing cautionary notes and labels.

| Section | Warning or protection | Location of warning label | Type of label | Examples of warning label indication |
|---|---|---|---|---|
| Fuel | Open flames prohibited during filling | Near the fuel tank filler tube | Caution | ◎ Flames prohibited<br>★ Igniting a flame near the fuel tank filling spout may cause a fire.<br>★ Turn off the engine when filling. |
| Radiator | Burns caused by high temperatures | Near the radiator cap | Caution | ◎ Caution against high temperature<br>★ Do not remove the cap when the temperature is high.<br>★ Boiling water may spout out. |
| Exhaust gas | Caution against breathing in exhaust gas | Near the dashboard | Caution | ◎ Caution against exhaust gas<br>★ Poisonous exhaust gases will accumulate inside buildings or any place that is poorly ventilated. |
| Revolving parts<br>• Fan<br>• Belts<br>• Pulleys<br>• Output shaft<br>• PTO output shaft | Breakage caused by the rotating area<br>• Place a guard over rotating areas.<br>• Attach a warning label if it is impossible to cover the area. | In all visible locations<br><br>Affix the label on the back of the cover when the section is covered. | Warning | ◎ Caution against rotating area<br>★ Do not place fingers or hands in the rotating area.<br>★ Bodily injury may result. |

| Section | Warning or protection | Location of warning label | Type of label | Examples of warning label indication |
|---|---|---|---|---|
| High-temperature areas<br>* Exhaust manifold<br>* Exhaust catalyst<br>* Exhaust pipe<br>* Muffler | Burn caused by high temperature<br>* Cover the high temperature area with adiabatic material.<br>* Affix a warning label when it is difficult to cover the area. | Near the external exhaust pipe | Caution | ◎ Caution against high temperatures<br>★ Touching the exhaust pipe or any part of the exhaust system may cause burns. |
| Service Manuals | Carefully read the service manual and be conscious of driving safely. | Near the dashboard | Caution | ◎ Caution<br>★ Carefully read the manual before using the equipment. |
| Caution against running the engine uncovered | Caution against running the engine with the hood up: consider this point depending on the model. | Near the knob for opening/closing the engine cover | Caution | ◎ Caution against running the engine uncovered<br>★ Do not open the hood while the engine is running<br>★ Touching a hot area may cause burns.<br>★ The rotating components may cause bodily injury. |

## 2. Requirements when mounting the engine unit (cautionary points)

Please ensure the reliability and safety of the final products for engine units that are mounted when sold. Please give consideration to the cautionary points when using the engine unit as well as to the warning label.

| Item | Content | Reason |
|---|---|---|
| Oil and water temperature | ○ Use the oils and water at the recommended temperature<br>• Oil temperature (oil pan)<br>• Water temperature (engine outlet)<br>• Timing belt atmospheric temperature<br>• Ensure that the running engine does not overheat by sufficiently ventilating it when the engine compartment is covered. | Prevent damage from overheating and burning |
| Engine inclination when loading | ○ Load the engine into the vehicle within the specified angle. Confer with NISSAN prior to loading the engine at a steeper angle. | Prevent poor lubrication and damage from burns (during continuous operation) |
| Permissible angle of inclination during vehicle use | ○ An engine loaded into a vehicle may be run within the recommended incline (non-continuous operation).<br><br>Confer with NISSAN prior to running the engine at a steeper angle. | Using the engine at a steeper than recommended incline may result in damage from burning due to air being sucked into the oil pump or failure to properly supply fuel. This may cause a malfunction. |
| Cooling fan | ○ Use the recommended products to maintain oil and water temperatures.<br>Confer with NISSAN prior to using products with different than recommended specifications. | Related to the strength of the support bearings and the cooling performance. |
| Cooling-water pipes - water pipe to the radiator | ○ Install the pipe in such a manner that air does not accumulate inside (so that they do not move up or down). | The engine may overheat if air accumulates inside the pipe during filling. |

| Item | Content | Reason |
|---|---|---|
| Blow-by hose Between the cylinder block and the rocker cover | ○ Use at or below recommended oil and water temperatures<br><br>Make sure that the heat from the exhaust gas does not accumulate around the rocker cover<br>Rubber hose surface temperature: 150ºC or lower<br>Temperature of rubber seal on the rocker cover: 150ºC or lower | Damage caused by deterioration may lead to oil leaks. |
| Engine mount | ○ Use the positioning screw of the specified cylinder block to position the engine mount.<br>Do not attempt to modify the cylinder block. | Prevent breakage. |
| When attaching additional equipment | ○ PTO<br>When driving with the crank shaft at the rear end of the engine<br>* Set up so that the horizontal pulling load does not affect the PTO.<br>Confer with NISSAN prior to driving with a belt or other equipment or when the horizontal pulling load does affect the PTO. | Damage to the support bearings and damage caused by increased vibrations may harm the engine |
| | When driving from the crankshaft at the front end of the engine<br>* Use the side PTO (chain or gear drive) within the specified load range. | May damage the support bearings, the chain or the gears. |
| | ○ Floating or gasket areas<br>* Do not attach undesignated parts to the oil pan or rocker cover<br>* Do not place a load on these areas when transporting parts | May cause oil or water leaks. |
| | ○ High-temperature areas<br>* Do not place flammable materials near the exhaust manifold. | Prevents fires. |
| | ○ Parts that must be protected from oil, water and dust intrusion<br>* Take special care with the locations listed below and make sure to protect them with covers.<br>• Belts<br>• Starter motor<br>• Alternator<br>• Clutch<br>• Control link of the cap, governor, etc. | <br><br><br>Prevents slips and damage.<br>Prevents damage and ensures smooth operation.<br>Prevents damage and ensures smooth operation.<br>Prevents slips and wear.<br>Ensures smooth operation |

| Item | Content | Reason |
|---|---|---|
| Suspending the unit | ○ Use the designated hooks | Using undesignated hooks may damage the unit |
| Fuel and oil | ○ Make sure to use the designated or recommended type in the specified quantity.<br>• Oil<br>• Fuel<br>• Coolant-water (antifreeze)<br>• Oils and fats | Using undesignated products may cause burns, corrosion or freezing and may inhibit smooth operation. |
| Adjustment | ○ Do not alter the position of parts that have been adjusted or locked<br>Follow the procedures given in the adjustment manual should adjustment become necessary.<br>• Carburetor<br>• Governor<br>• Distributor | NISSAN will not take responsibility for the performance and quality of its products if the user modifies the parts NISSAN has already adjusted. |
| Replacement parts | ○ Use only recommended parts.<br>• Air filters<br>• Oil filters<br>• Fuel filters | NISSAN will not take responsibility for the performance and quality of its products if the user modifies the parts NISSAN has already adjusted. |

'Specified value for loading the engine

Use values less than the recommended ones below.
Confer with NISSAN when it is likely that the values exceed the tolerance.

| Item | | H Series |
|---|---|---|
| Oil temperature (oil pan) | continuous | 120ºC |
| | warming up | 135ºC |
| Water temperature (engine outlet) | | 110ºC |
| Permittable loading angle | (Rise from the fan +) | -2º ~ +5º |
| | (Rise to the left as seen from the fan +) | 0º |
| (Operate or use within the specified angle when the engine is the fixed type or during continuous operation.) | | |
| Permittable Angle of Incline for Use | | |
| Rise from the fan side | | 25º |
| Decline from the fan side | | 25º |
| As seen from the fan side | | |
| Left rise | | 30º |
| Left decline | | 30º |
| (The ground inclination angle at which the engine can be run or used when loaded in the vehicle) | | |
| Permittable crank | Continuous | 120 Kg |
| Permittable PTO drive torque | | |
| Side (chain and gear) | | 8.3 Kgm |
| Crank horizontal pull (air-conditioner and other drives) | | 2 Kgm |
| Tightening Strength of cylinder block through F/WHSG | | |
| Specified maximum bend moment | | 666 Kgm |

(b) Circuit Diagram of Electrical Components