

HONDA

ENGINES

GX240
GX270
GX340
GX390
UT2/RT2

TECHNICAL MANUAL



Preface

This manual covers engine selection, engine installation design and engine installation testing, so the combination of a Honda engine and your equipment will make the best possible product.

Please feel free to contact your Honda Engine Distributor at any time for additional technical information or to discuss your engine application needs.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at anytime without notice.

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INTRODUCTION

Honda engines are designed for minimal maintenance. When maintenance is required, the task is kept simple by providing convenient maintenance access and procedures.

Honda engines use proven engine technology and design innovations to make them highly reliable engines.

DESIGN FEATURES

High Performance

OHV design reduces thermal distortion of the cylinder. This helps maintain the optimum seal between the piston rings and cylinder, which minimizes oil and fuel consumption. Power is also maintained in extreme operating conditions.

Smooth and Quiet Operation

OHV design provides a reduced reciprocating mass and balanced weight distribution. The 25° inclined cylinder produces a low center of gravity for the moving parts, which further reduces vibration for quiet operation. These features, and the compact design result in extremely smooth operation.

Use of proven design technologies reduces noise from internal engine components. The hardness of reciprocating parts, the helical cut gears on the crankshaft and camshaft and the use of select materials makes these engines exceptionally quiet. The large muffler is designed to further reduce noise.

Durability/Reliability

Honda engines are built with quality that provides proven durability and reliability. Proven features such as OHV design and cast iron cylinder sleeve provide long life in all types of operating conditions. To further enhance the reliability of these engines, a 2-stage air cleaner system, digital electronic ignition system, mechanical centrifugal governor and proven side-draft carburetor are standard features.

EMISSION REGULATIONS

The Honda GX390 engines meet U.S. Environmental Protection Agency and the California Air Resources Board regulations.

Honda engine distributors and equipment manufacturers that use Honda engines are required by regulation to follow this OEM technical manual. Correct engine matching ensures that the engine will be durable (and emission durable) in use.



RECOMMENDED POWER RANGE

Maximum Operation

Operate the engine at not more than 90% of the maximum horsepower available at a given rpm.

Recommended maximum operating hp = 0.9 x maximum hp

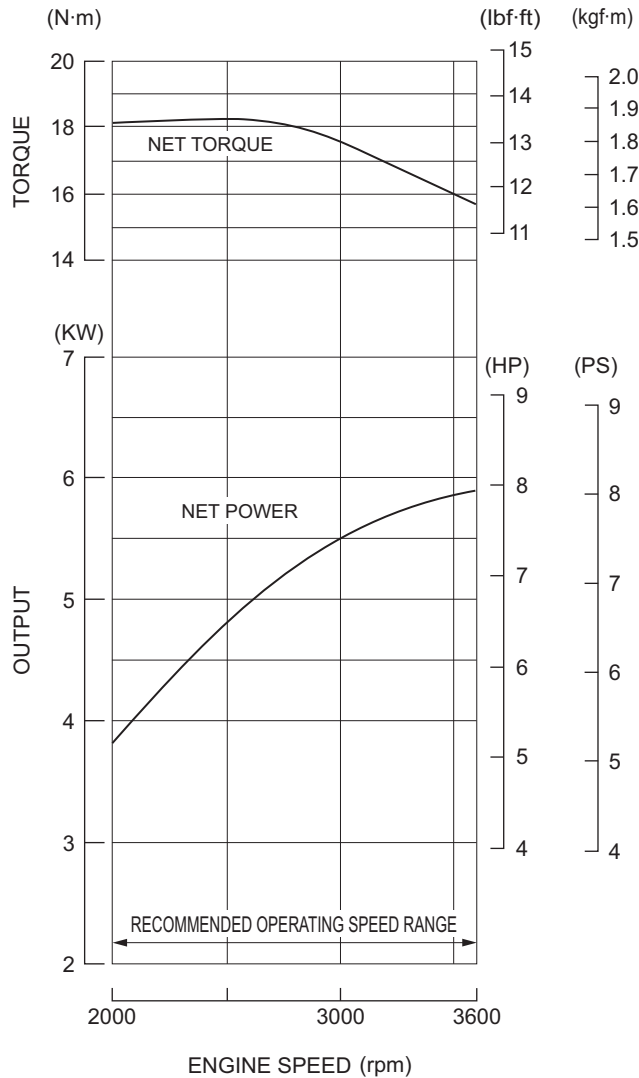
Continuous Operation

For continuous operation (more than 30 minutes), operate the engine at not more than 80% of the maximum horsepower available at a given rpm.

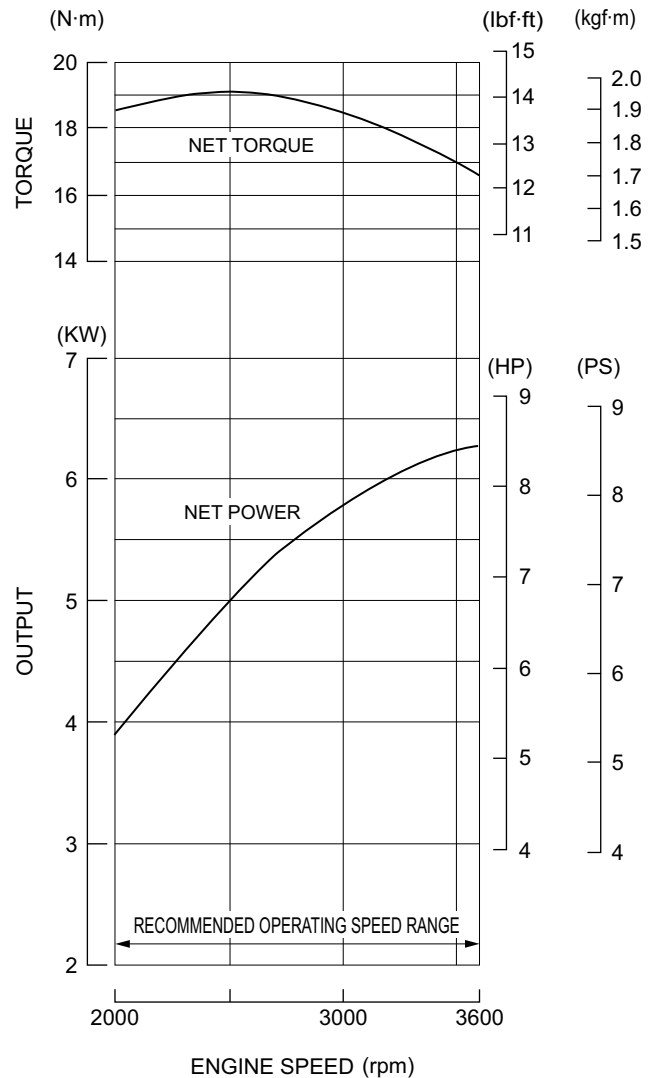
Continuous recommended operating hp = 0.8 x maximum hp

Power Curve

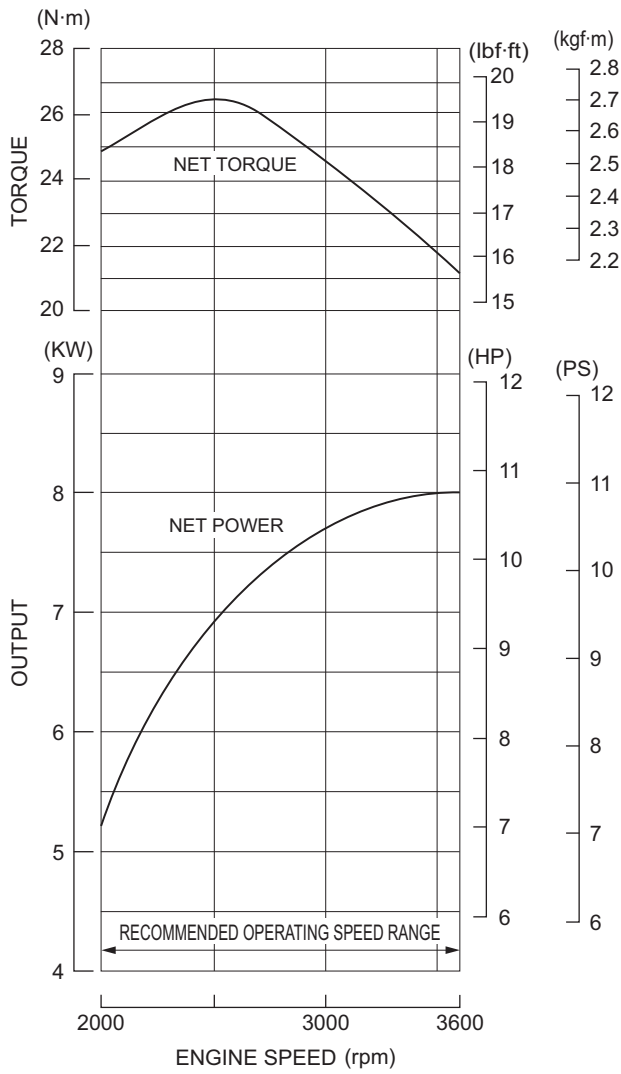
GX240



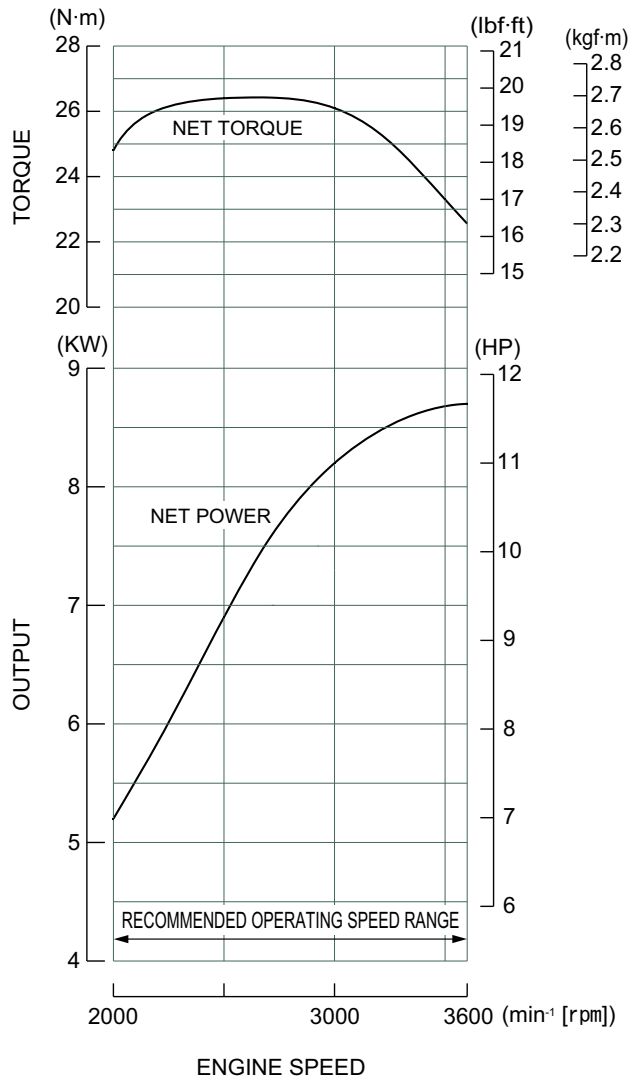
GX270



GX340



GX390

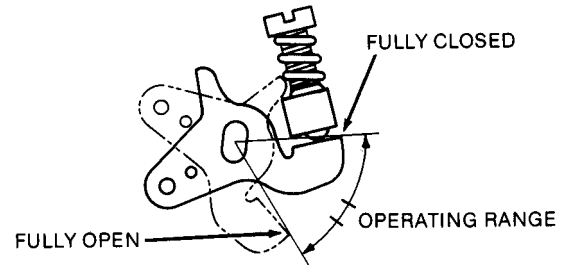


Output Confirmation Methods

Governor Rod Measurement

When the engine is properly matched and operating at its continuous rated load, the carburetor throttle angle should be approximately half way between full open and full closed positions.

Bring the engine to normal operating temperature and then apply the expected continuous load. If the throttle is more than halfway open, the engine is being overloaded resulting in overheating and shortened engine life.



Tachometer RPM Measurement

Normal governor droop can also be used to measure engine load.

At rated speed:

$$\left(1 - \frac{\text{rpm with load}}{\text{rpm without load}}\right) 100\% \leq 5\%$$

Engine is operating within the continuous recommended power range.

COOLING

Minimum Cooling Air Flow Requirement

Engine enclosure must have the minimum cooling air flow listed below.

GX240/GX270: 7 m³ (247 ft³) per minute at 3,600 rpm

GX340/GX390: 8 m³ (282 ft³) per minute at 3,600 rpm

Ambient Temperature Limits

-15 to +40°C (+5 to +104°F)

Testing

- Use thermocouple temperature probes at the specified locations.
- Operate the engine under worst-case conditions
- An electronic data logger is required for the temperature data collection
- Set up the data logger to take multiple readings per minute. If data is being taken manually, a reading every 5 minutes is adequate.
- Take readings until the engine oil temperature is stabilized at continuous rated load
- Run the application for one hour of continuous operation; the temperatures should be stabilized in that time. If the application is used only for short intervals, note the normal run time in the application document.
- Shut the engine down and continue to take readings. Attempt to restart the engine after heat soaking for 5 minutes.
- For enclosed applications, fuel bowl temperature should be monitored after testing until the maximum is reached - this may take several minutes

Maximum Operating Temperatures

Spark plug Seat	270 °C (482 °F)
Engine Oil	140 °C (284 °F)
Gasoline at Carburetor Float Bowl	60 °C (140 °F)
Gasoline at Carburetor Float Bowl (after 5 min. hot soak)	<70 °C (158 °F)
Gasoline at Fuel Tank	60 °C (140 °F)

These temperatures are based on an ambient temperature of 40°C (104°F). Compensate for any deviation linearly; i.e., if the ambient temperature is 20°C (68°F), the maximum acceptable oil temperature is 120°C (248°F).

Adjusted oil temperatures of less than 40°C will require more frequent oil changes.

Engine Enclosures

When the engine installation in the equipment obscures the emission label, a duplicate label must be applied. In this case, as part of the engine matching process, it will be necessary to establish a process for the OEM to obtain duplicate labels. EPA requires full documentation, control, and record keeping of the duplicate label process.

Cool Air Intake

The engine must be provided with a cooling duct so that fresh air can be drawn directly from outside the enclosure cover. Install the cooling air duct with the intake port in a place free from dust and dirt. The cooling air volume changes according to the shape of the duct and screen and the engine installation conditions. Operate the engine under the normal operating conditions and be sure that the engine meets all temperature requirements.

The cooling air duct must have a cross-sectional area of at least 300 cm² (46.5 sq in).

When the engine is operated in dusty areas, install a filter at the enclosure inlet for the cooling air. This will reduce the effective area, so you must increase the size of the inlet accordingly. Increase the size of the inlet to the point where the maximum operating temperatures are not exceeded when operated under maximum load.

Install the cooling air duct and filter so that the filter can be easily checked, and dust, dirt and foreign material removed.

Hot Air Discharge

Hot air must be discharged directly outside the enclosure. Provide a discharge duct if necessary. The minimum cross section of the hot air discharge opening must be larger than that of the cooling air inlet.

Locate the discharge port so the hot discharge air does not flow back into the enclosure. Provide sufficient ventilation to prevent the engine compartment temperature from rising above ambient temperature limits after the engine has been stopped.

Exhaust Discharge

The exhaust system becomes hot during operation and remains hot for a while after operation. Separate the exhaust system from the engine compartment with a partition wall and locate the exhaust system in the discharged cooling air flow.

Be sure the exhaust gas is directly discharged outside the enclosure without being blocked or restricted by any obstacles. The exhaust gas must not flow back or be drawn back into the enclosure.

Provide the engine with an exhaust deflector or exhaust pipe extension if necessary.

If an extension pipe is used:

- Keep the length of the pipe as short as possible to keep exhaust backpressure within limits (see page 10).
- The extension pipe must have an ID larger than the OD of the muffler outlet.
- Verify the exhaust pipe extension does not create excessive vibration at any given engine rpm. If necessary, use an exhaust pipe holder to support the exhaust pipe extension.

Grass Cutting Applications

When the engine is operated on grass cutting equipment, install a rotary screen grid on the cooling air intake port to prevent the accumulation of large clippings.

Do not allow the grass clippings shredded by the rotary screen grid to accumulate around the intake port.

FUEL SYSTEM

If the engine is supplied with an incomplete fuel system (no fuel tank, no fuel hose, etc.), the OEM is responsible for ensuring evaporative emission requirements/regulations are met, including certification.

Fuel Tank Position

If a remote fuel tank is used, it must be installed so that its maximum gasoline level is within 50 cm (19.5 in) above the carburetor gasoline level. If a fuel pump is used, the maximum fuel level should be within 50 cm (19.5 in) above or below the carburetor gasoline level.

Fuel Line

Use a low permeation fuel line (displaying an Executive Order number) rated for use with gasoline. The fuel line should have an inside dimension of 5.5 mm (0.22 in). Keep the fuel line as short as possible. Install the fuel line so it will not rest against any sharp objects or make sharp bends that can restrict the flow of fuel. If the fuel line passes through an enclosure wall, protect the line with a rubber grommet. Route the fuel line away from hot engine and exhaust system components and away from electrical wiring. Secure the fuel line to prevent sagging and bending.

Fuel Valve Installation

If a remote fuel tank is used, a fuel valve should be installed so it is easily accessible. Install the fuel valve at the outlet of the fuel tank and use an easily read label to indicate valve location and operation. If under the fuel tank is not the ideal location, securely install the fuel valve in-line with the fuel tube in a cool location, so that engine heat cannot cause vapor lock.

Fuel Pump

A fuel pump should be selected that provides a maximum operating pressure of 0.1 kgf/cm² (1.4 psi) and delivers 15 liters/hr (4.0 US gal/hr). If a secondary fuel pump is used, to prevent carburetor flooding, its operating pressure must not exceed the standard fuel pump's operating pressure.

Fuel Tank Filter Installation

It is recommended that a fuel tank strainer with a mesh rating of #80 be installed at the fuel tank inlet to catch debris when refueling. It is also recommended that a fuel tank sump be provided at the fuel tank outlet to reduce the chance of contaminants entering the fuel system.

CONTROLS

Engine Switch

Use a three-position engine switch with continuity between its terminals as shown.

Wire Color Switch Position	EXT+ (Red)	EXT – (Black)	ST (Black/White)	BAT (White)
OFF				
ON	○ ——— ○	○ ——— ○		
START	○ ——— ○	○ ——— ○	○ ——— ○	○ ——— ○

Carburetor Controls

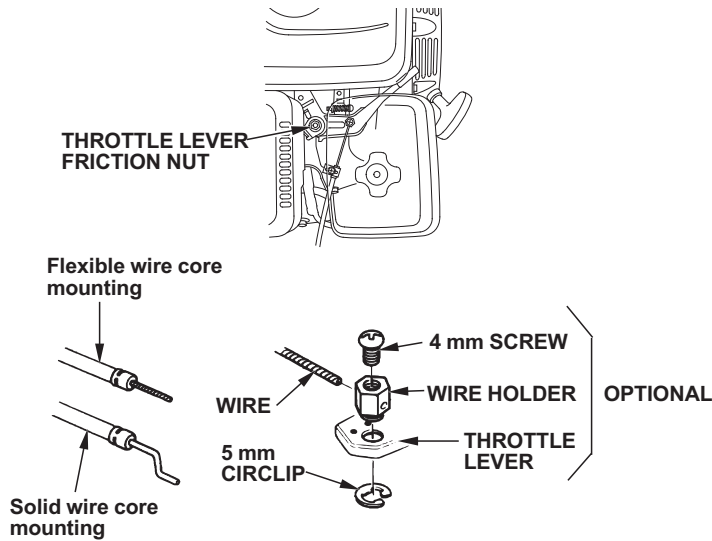
Types of cable:

Two types can be used, flexible wire core or solid wire.

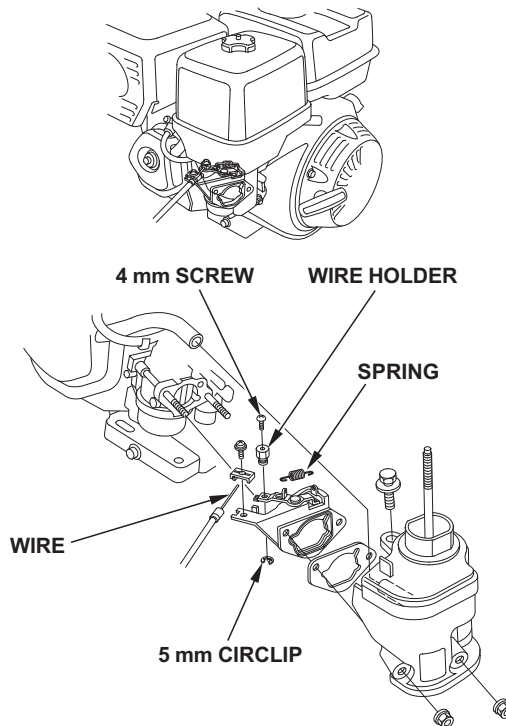
Installation:

The throttle and choke control levers are provided with holes for optional cable attachment. The following illustrations show installation examples for a solid wire cable and for a flexible, braided wire cable. If using a flexible, braided wire cable, add a return spring as shown. It is necessary to loosen the throttle lever friction nut when operating the throttle with a remote-mounted control.

Remote Control Throttle



Remote Control Choke.



EXHAUST SYSTEM

Recommended Muffler

The recommended muffler and exhaust pipe are matched to the engine in terms of emissions performance, exhaust backpressure, sound level, and durability.

Consider the following:

- Discharge the exhaust gas directly to the open air. Do not install flammable parts or any parts with poor heat resistance properties around the exhaust system or near the discharge port.
- The exhaust gas must not enter the cooling-air intake port. Be especially careful when using the exhaust deflector to change the discharge direction.
- The muffler and exhaust pipe become very hot during operation and remain hot after the engine has been shut off. Install the muffler and exhaust pipe so the fuel system and other heat-sensitive components are isolated from the exhaust heat.

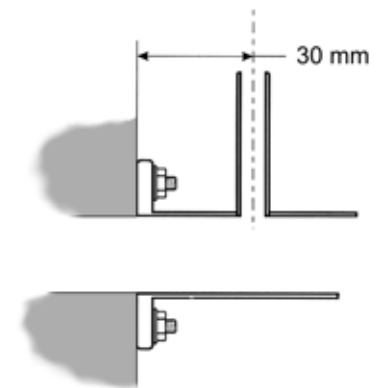
Fabricated Exhaust Systems

The muffler type and the shape and length of the exhaust pipe(s) affect emissions performance and engine power. If you use a muffler other than a recommended Honda muffler, observe the following precautions to maintain the engine's peak performance:

- The shape (bends and elbows) of the exhaust pipe can affect exhaust backpressure. If exhaust backpressure is excessive, it can affect emissions performance and/or cause detonation.
- The exhaust pipe inside diameter must be the same size as the exhaust port diameter. There must be no gap between the port inside diameter and the exhaust pipe ID.
- The exhaust backpressure increases if the diameter is less than specified. If the diameter is larger than specified, the effective width of the exhaust gasket is reduced which could cause an exhaust leak.
- When the exhaust pipes are connected together before the muffler, make sure that the exhaust pipe length is as short as possible to reduce backpressure.
- Muffler volume and design will affect exhaust backpressure. Increase the volume of the muffler if exhaust backpressure is higher than specified.

Exhaust Back Pressure Measurement

Measure the exhaust back pressure at the exhaust pipe with the engine under continuous load (WOT), 30 mm (1.2 in) from the exhaust pipe mounting flange as shown (make sure the test nipple does not extend beyond the inner wall of the exhaust pipe).



		3000 rpm		3600 rpm	
		Min.	Max	Min.	Max
GX240 GX270	kPa	4.2	9.0	4.9	11.0
	mmH ₂ O	428	918	500	1122
GX340 GX390	kPa	4.6	10.5	6	12.5
	mmH ₂ O	469	1071	612	1275

Rigid Engine Mount Muffler Installation.

The frame must be rigid to prevent cracking when the exhaust pipe and muffler are connected. The muffler should be installed securely with bolts and nuts.

The muffler should be supported at two points (or more) using special rubber mounts designed for muffler support applications.

Check to see muffler vibration does not increase at any given engine speed, causing an abnormal increase in resonance.

Rubber Engine Mount Muffler Installation

A flexible pipe should be used between the muffler and exhaust pipe when the engine is mounted to the engine bed with rubber mounts. The flexible pipe ID must be the same as the exhaust pipe OD or larger.

The muffler should be supported at two points (or more) and should be installed securely with bolts and nuts to prevent muffler cracking from vibration during starting and stopping.

Check to see muffler vibration does not increase at any given engine speed, causing an abnormal increase in resonance.

ENGINE MOUNTING

Use an engine bed or frame with enough rigidity to allow maximum durability of the engine and attachment installation.

The engine must not wobble on the engine bed. Use an engine bed or frame that provides a flat surface for the engine to be mounted on. If there is a gap between the engine and the engine bed, the engine-mounting surface may be damaged.

Inclination

Horizontal mounting and operation of the engine is recommended. If the engine must be operated on a slope, the incline position of the engine must not exceed 20° in any direction.

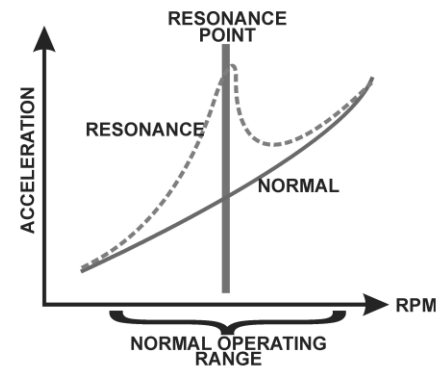
Resonance Check

There must be no resonance when the engine and attachment are operated within the designated speed range. Slowly raise the engine speed from idle to maximum and check for resonance at any engine speed.

General Methods for Preventing Resonance

When engine accessories or a part of the attachment is resonating, increase the rigidity of the resonating part to bring the resonance point higher than the working engine speed range.

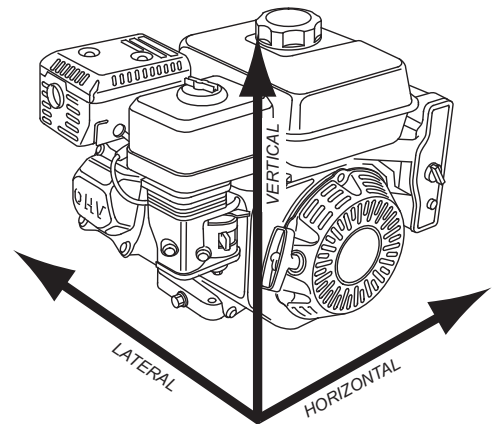
- Increase the rigidity of the engine bed and frame to bring the resonance point higher than the working engine speed range.
- Install the muffler on the engine body, using a rigid stay to prevent resonance of the muffler when the engine speed is within the specific operating speed range.



Engine Acceleration/Vibration

Using a vibration meter, measure the vibration amplitude at the base on three axis (vertical, lateral and horizontal).

Direction	Allowable G value	
	(Peak)	(RMS)
Vertical	10 (98 m/s ²)	6.9 (68 m/s ²)
Horizontal	5.9 (58 m/s ²)	4.2 (41 m/s ²)
Lateral	6.9 (68 m/s ²)	4.9 (48 m/s ²)



ELECTRICAL SYSTEM

Battery

Use a 12 V battery with a minimum capacity of 24AH.

Fuse

Recommended fuse size:

Charging system (A)	Fuse (A)
1.0	5
3.0	15
10.0	
18.0	25

Battery Cables

Select battery cables to avoid greater than 0.5 volt drop in the cable during starter motor operation.

Battery cable size and length: (Gauge x Length)

Positive cable: AWG No. 4 x 1.5 m (5.0 ft) maximum

Negative cable: AWG No. 4 x 2.3 m (7.5 ft) maximum

Engine Switch

Electric start

Use a three-position engine switch with continuity between its terminals as shown.

Wire Color Switch Position	EXT+ (Red)	EXT – (Black)	ST (Black/White)	BAT (White)
OFF				
ON	○ ——— ○			
START	○ ——— ○		○ ——— ○	
Vdc/A (rated)	AC300V, 220mA (PEAK)		12/15A	
Dia. (recommended)	AV0.5	AV0.5	AV2.0*	AV0.75


* In combination with 1A/3A/10A charge coil, AV1.25 is acceptable.

AV0.5 = Automotive Vinyl, 0.5 mm² cross-sectional area

Do not run the starter motor for more than 5 seconds at a time. Always allow resting for 10 seconds before each starting attempt.

Manual start

Use a two-position engine switch with continuity between its terminals as shown.

Wire Color	EXT+ (Red)	EXT – (Black)
Switch Position		
OFF		
ON		

Charging Coil Selection

Four types of coils are available:

Coil	Output (A)	Regulated	RPM
1A	0.9	No	3,600
3A	2.7	No	
10A	9.5	Yes	
18A	17.0	Yes	

The 1A and 3A coils are only suitable for recharging a starting battery. Use the 10A or 18A coils when powering accessories.

Lamp Coil Kit (optional)

Three types of lamp coils are available: 6v –25w, 12v –15w, 12v –25w. Two coils can be installed in parallel to provide 12V-50W, if no charging coils are applied. Use parallel connector (No. 32105-ZE1-000) to connect two coils in parallel. A single coil (12v-25w) can be used in combination with the 3A charge coil as required.

Oil Alert[®] System (optional)

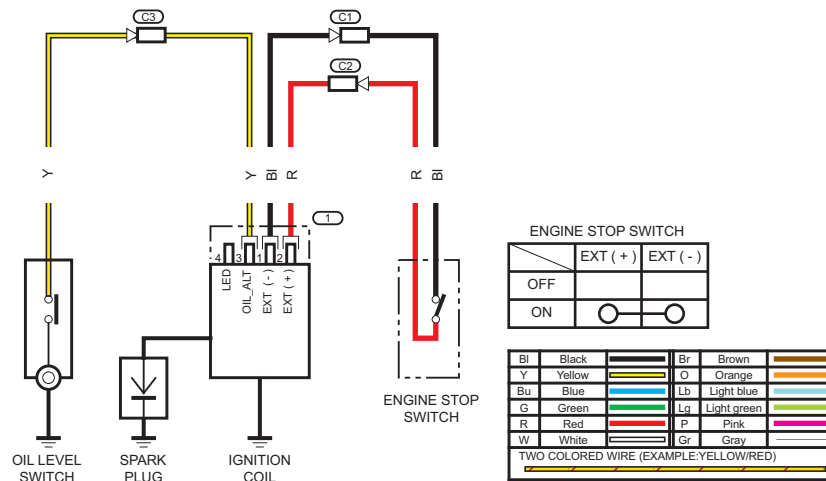
The Oil Alert System uses a float type switch located inside the crankcase. When the engine oil level falls below a safe operating level, the float falls and the circuit is completed through the control box, grounding the primary side of the ignition coil. The Oil Alert System is only recommended for use on equipment that is stationary while operating.

Wiring Precautions

- Connect the battery positive (+) cable to the positive terminal of the starter solenoid.
- Connect the battery negative (–) cable to the engine crankcase or engine frame mounting bolt.
- Do not route the battery cables on or near any hot, moving, or rotating parts, or sharp edges. Keep the battery cables and electrical wires away from the fuel line.
- Protect positive electrical connections with a cover or insulation.

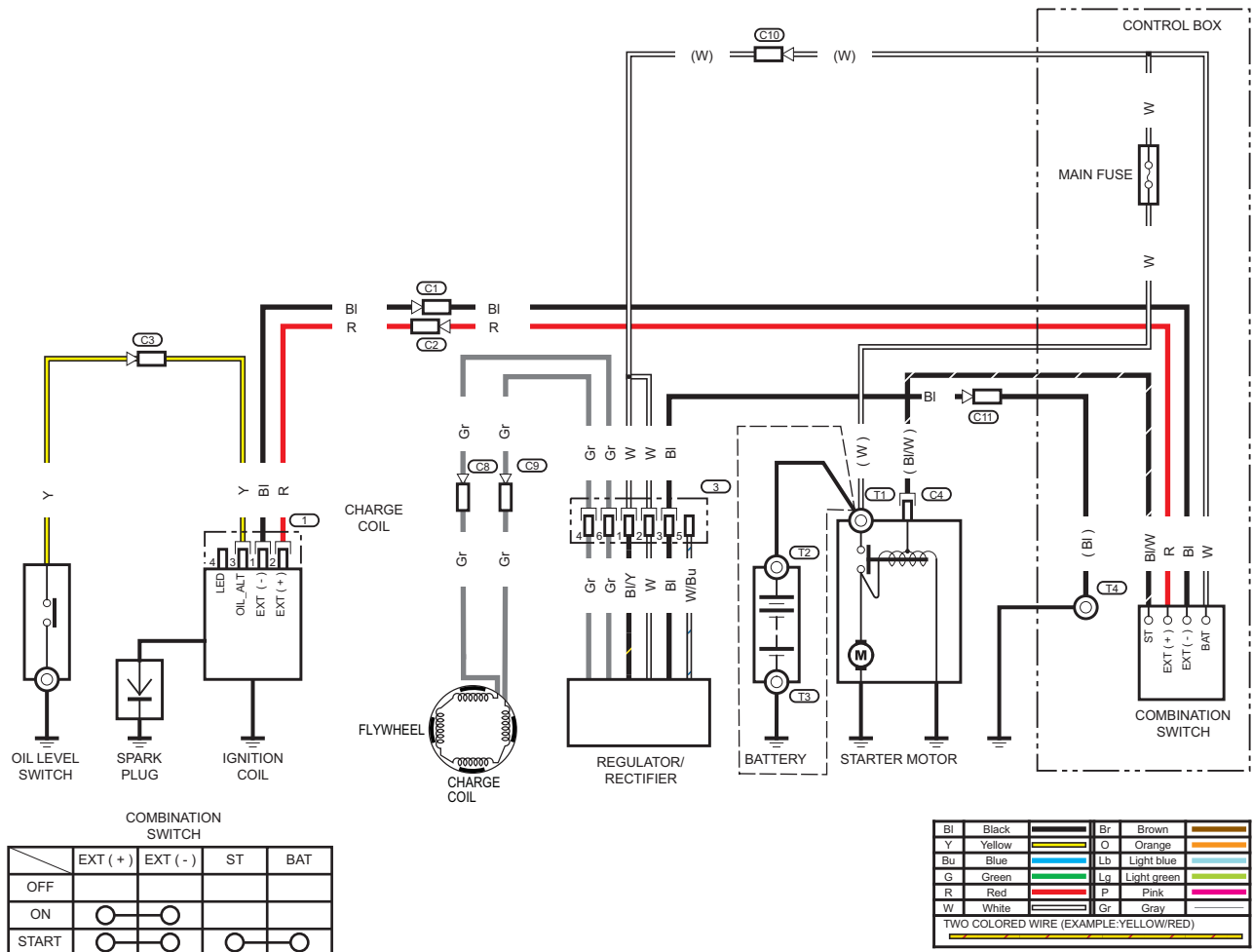
WIRING DIAGRAMS

No Charge Coil Models

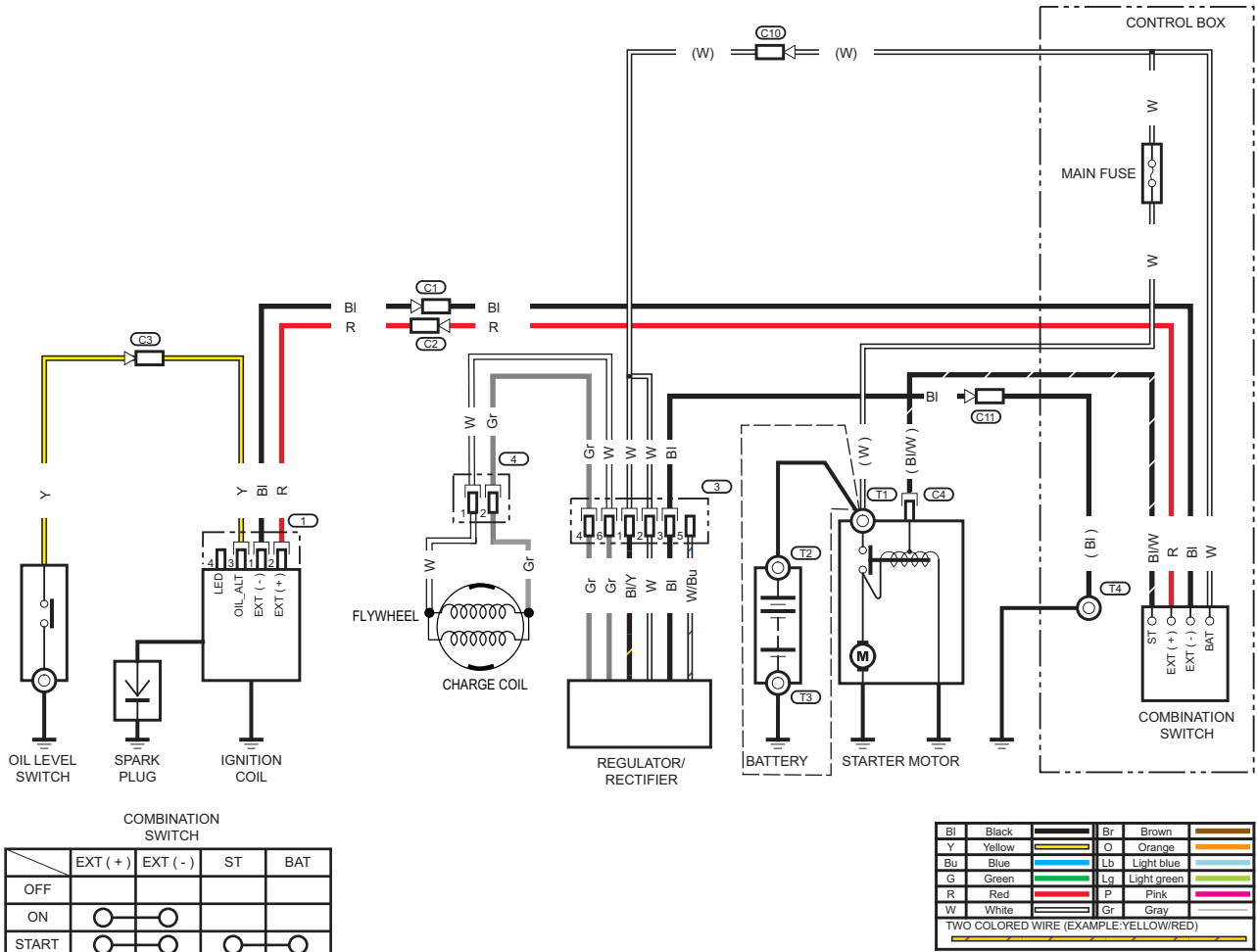


Electric Start Models

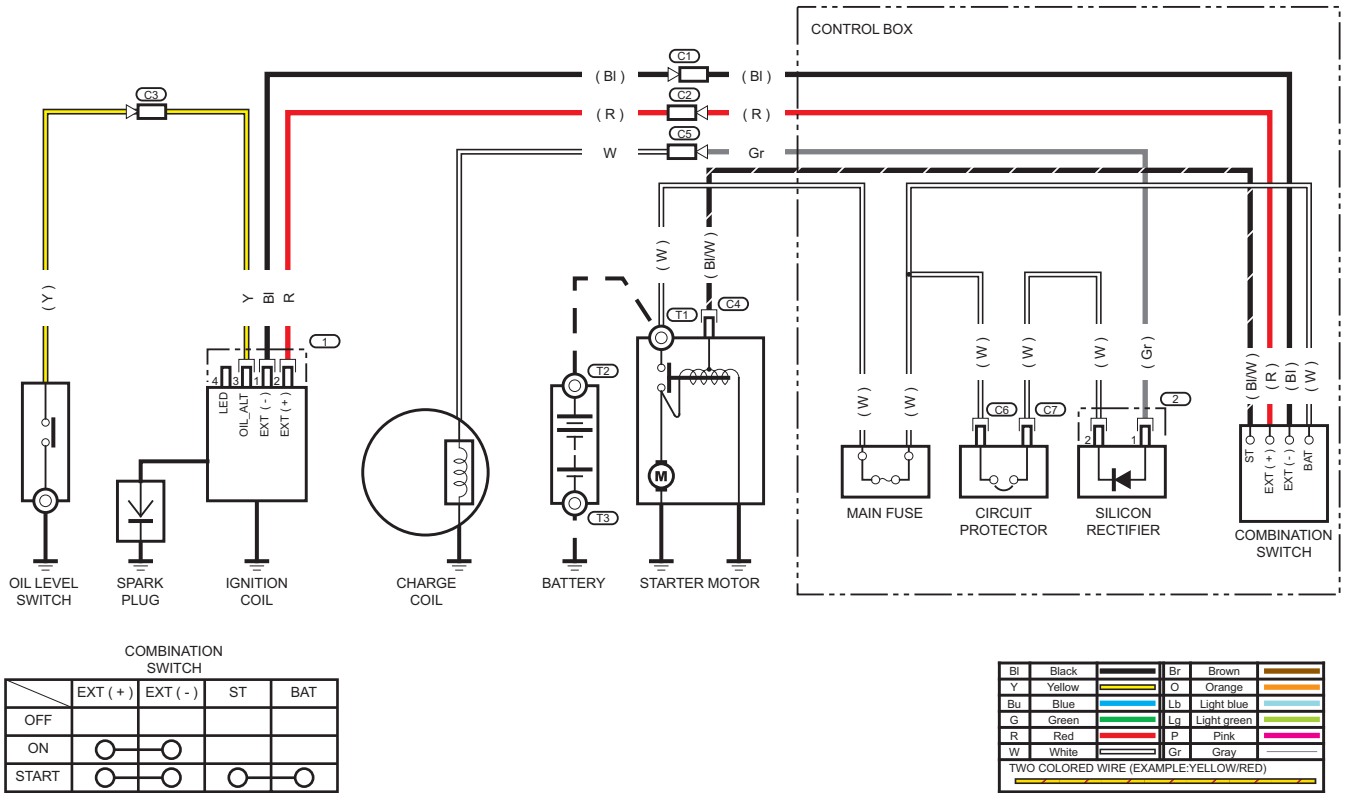
18A Charging System



10A Charging System



1A/3A Charging System

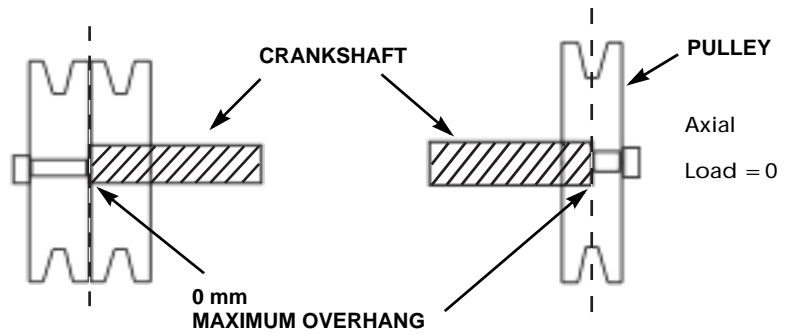


POWER TRANSMISSION

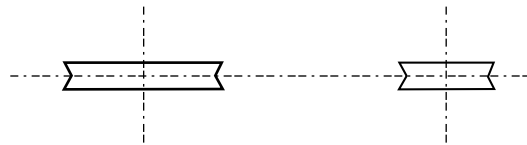
V-Belt Connections

Be sure there is no static axial load applied to the crankshaft.

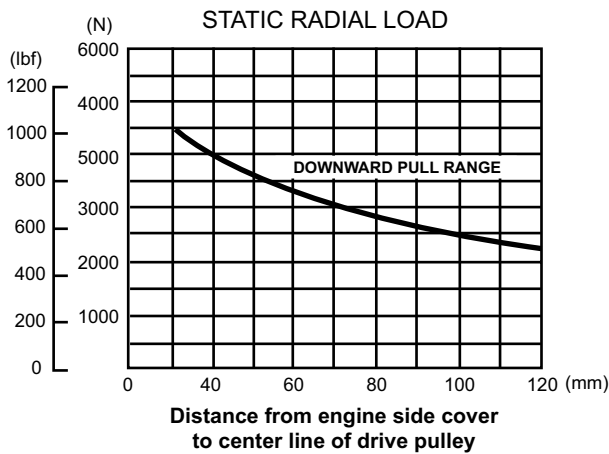
Install the pulley as close to the base of the PTO shaft as possible. When installing the pulley at the end of the PTO shaft, be sure there is no overhang.



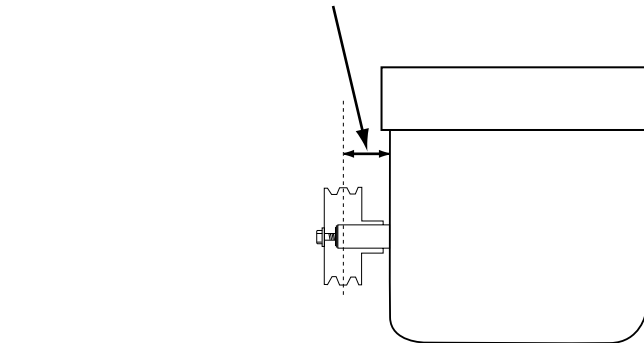
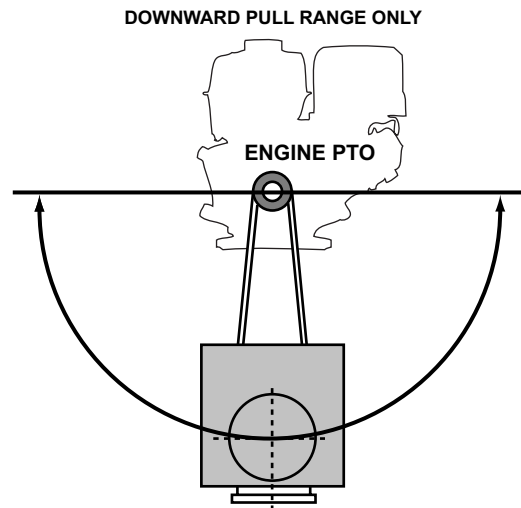
Before securing the engine and attachment to the engine bed, verify that the V-groove of the engine pulley and attachment pulley are aligned and that the engine PTO shaft and attachment driven shaft are parallel.



When high load, high inertia exists, we recommend using a tapered shaft pulley for added security.

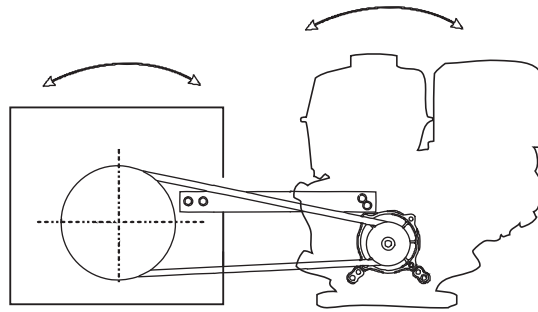


Keep static radial load below the pull limit indicated in the chart on the left.



The frame or engine bed must be rigid enough to prevent belt resonance in the working speed range of the engine. Size the pulleys so they do not cause resonance of the belt(s).

To reduce resonance, install a stay between the engine and attachment as shown below.



Starting Performance

The engine must be able to start with the attachment at the lowest recommended ambient temperature.

If the starting load of the attachment is too large when operating the starter motor, provide a clutch so you can separate the load from the engine when operating the starter.

Due to changes in oil viscosity, there will be an increased drag in attachments such as hydraulic pumps or gear cases as temperature drops. Start the engine with the ambient temperature at the lowest temperature recommended for operating the attachment. Verify that the attachment, as well as the engine, can start and operate normally.

Select the proper oil viscosity for the attachment according to the attachment's working temperature.

Minimum engine cranking voltage	10.2 Vdc
Minimum engine cranking rpm	474 rpm
Maximum engine cranking amperage	50 A

INSTALLATION CONSIDERATIONS

Maintenance Points Accessibility

When the engine is installed in an enclosure, provide an access panel or use an engine enclosure that can be opened and closed easily. See also Serviceability page 40.

The emission control information label on the engine must be visible when the engine is installed in the equipment. If it is not visible by removing a panel, lifting a hood, or other means not using tools, you must attach a supplemental (duplicate) label. See 40 CFR part 90.114 (<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=40:20.0.1.1.4&idno=40#40:20.0.1.1.4.2.1.14>). Contact your Engine Distributor for supplemental labels.

Left Side

Recoil

Air cleaner cover

Engine oil drain
(Crankcases tapped for
NPT drain extensions are
available.)

Spark plug

Valve cover

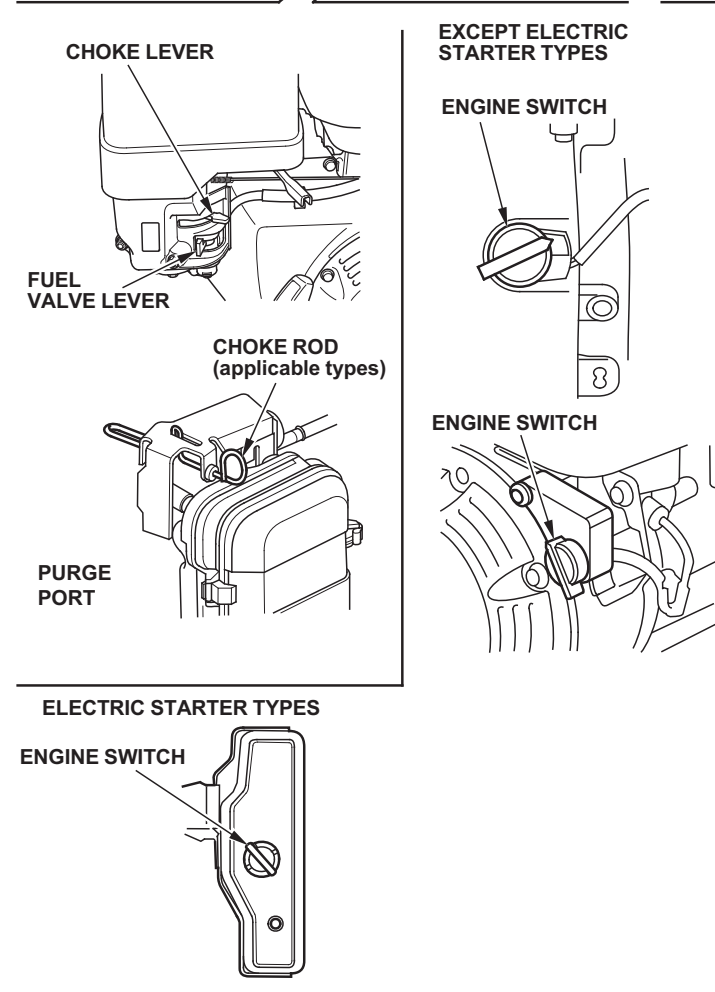
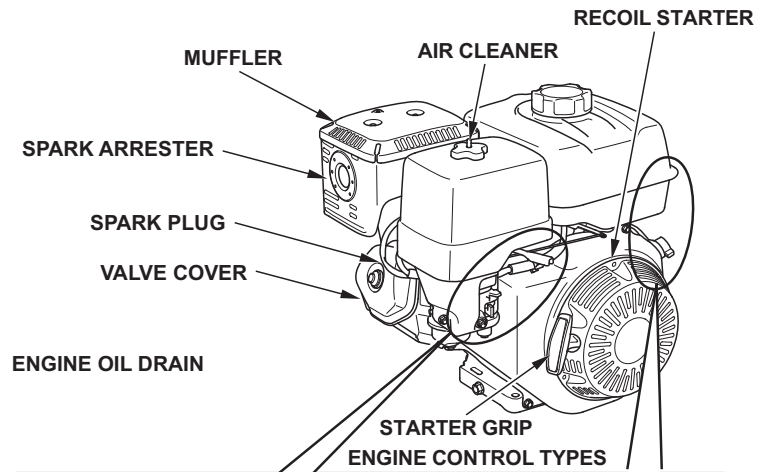
Choke lever

Throttle lever

Spark Arrester

Engine switch

Emission label



Right Side

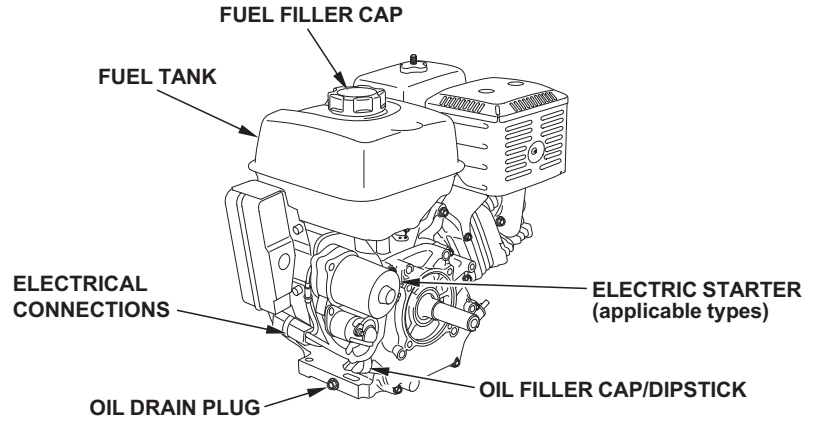
Fuel cap

Oil filler/cap dipstick

Engine oil drain plug

Electric starter

Electrical connections

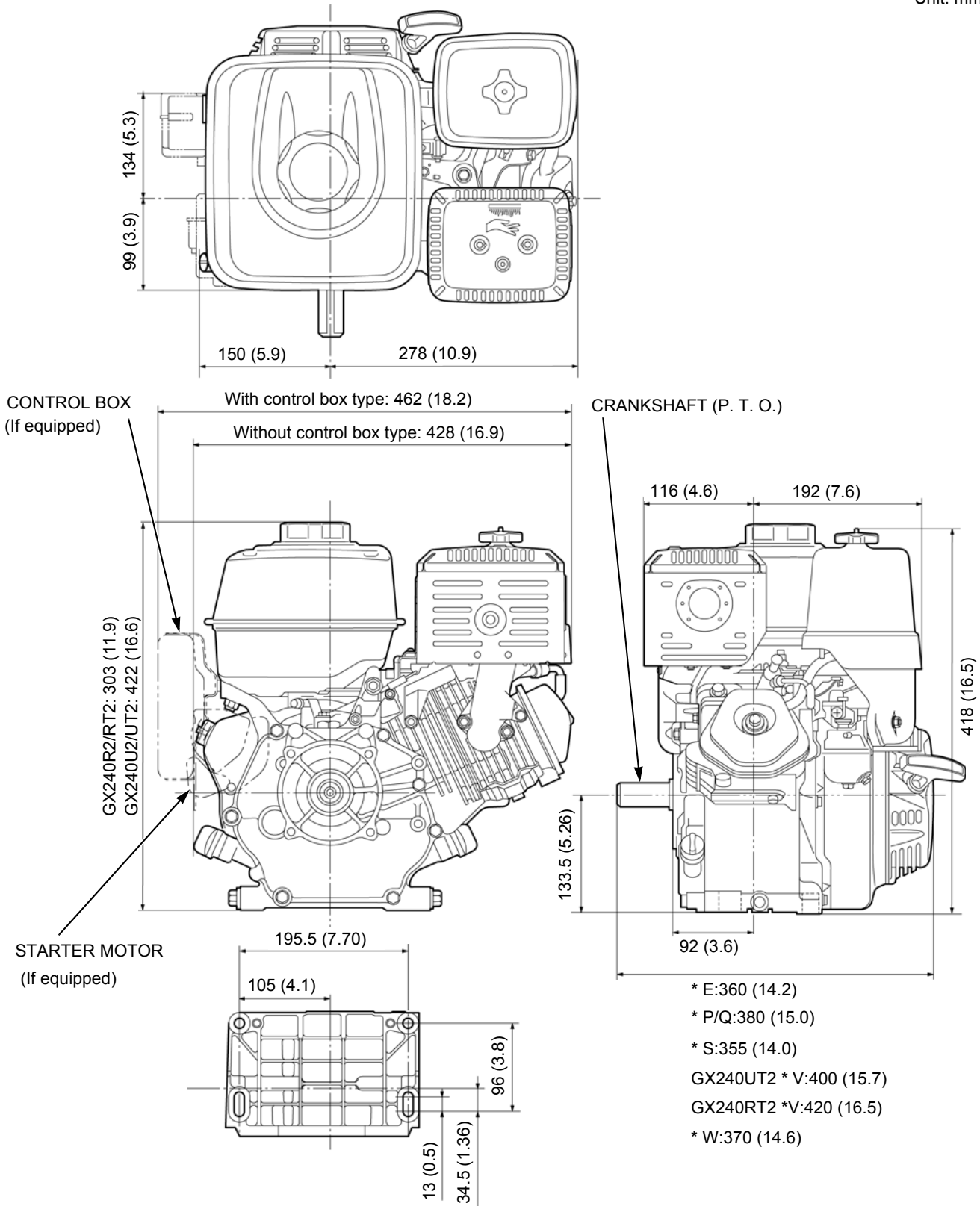


DIMENSIONAL DRAWINGS

GX240-270

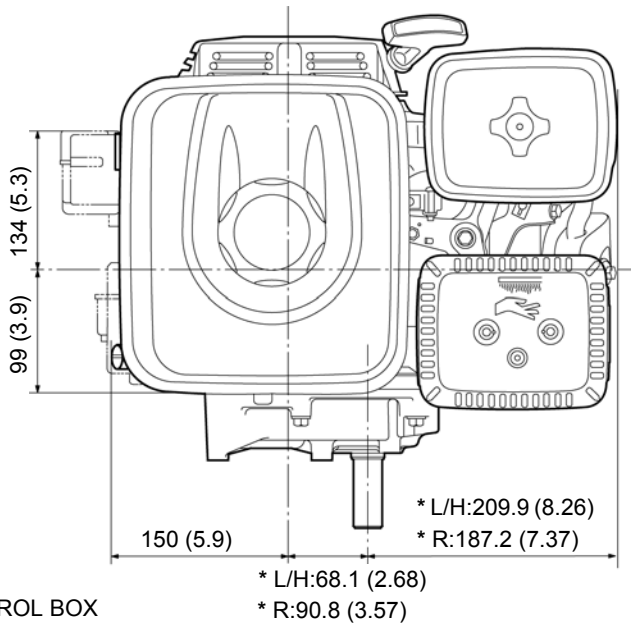
Without Reduction

Unit: mm (in)



With Reduction

Unit: mm (in)



CONTROL BOX
(If equipped)

With control box type: 462 (18.2)

Without control box type: 428 (16.9)

P. T. O. SHAFT

GX240U2/UT2: 422 (16.6)

STARTER MOTOR
(If equipped)

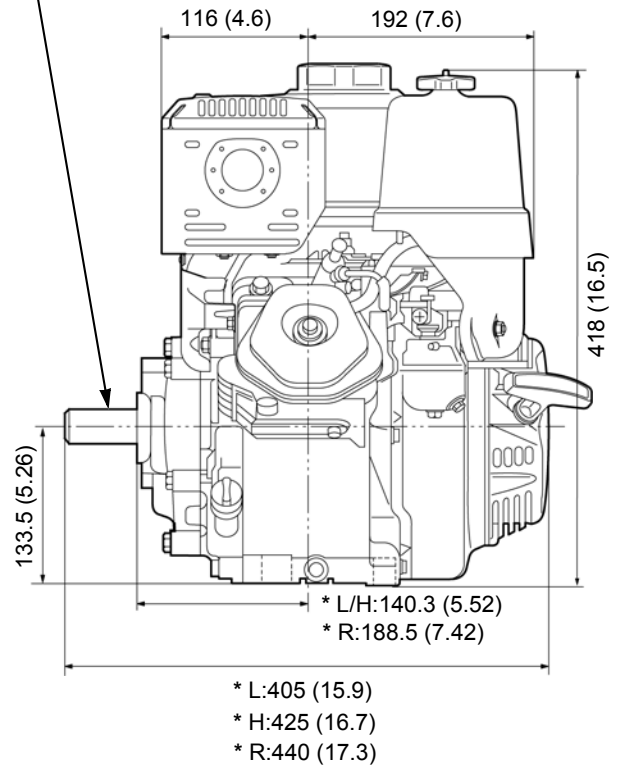
REDUCTION UNIT

195.5 (7.70)

105 (4.1)

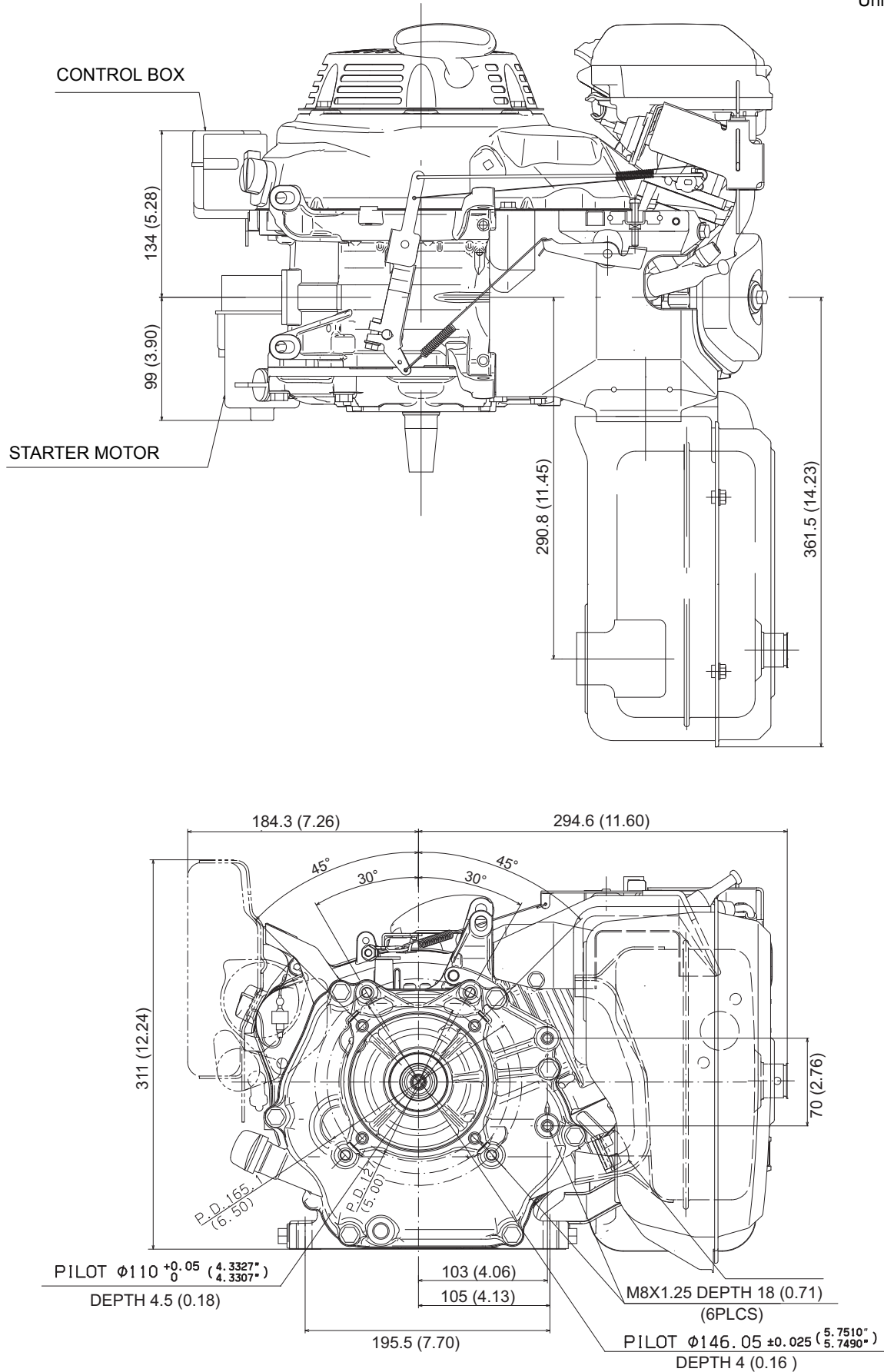
96 (3.8)

13 (0.5)
34.5 (1.36)

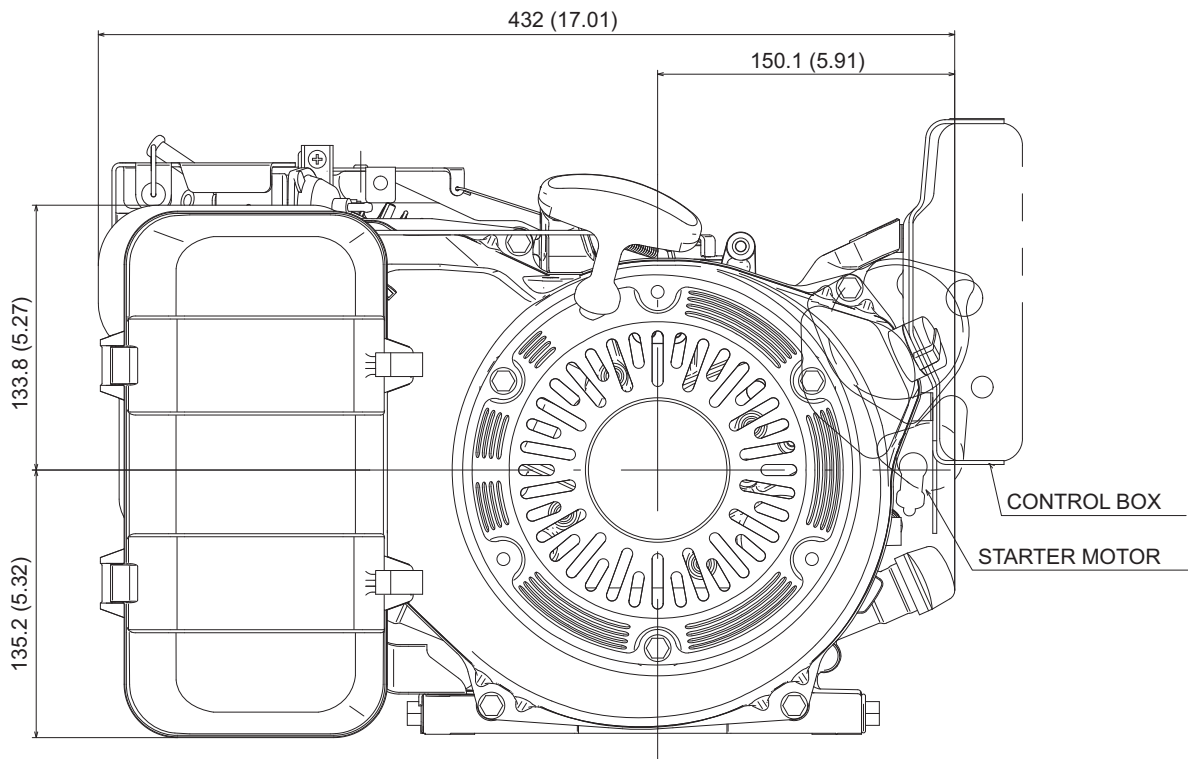
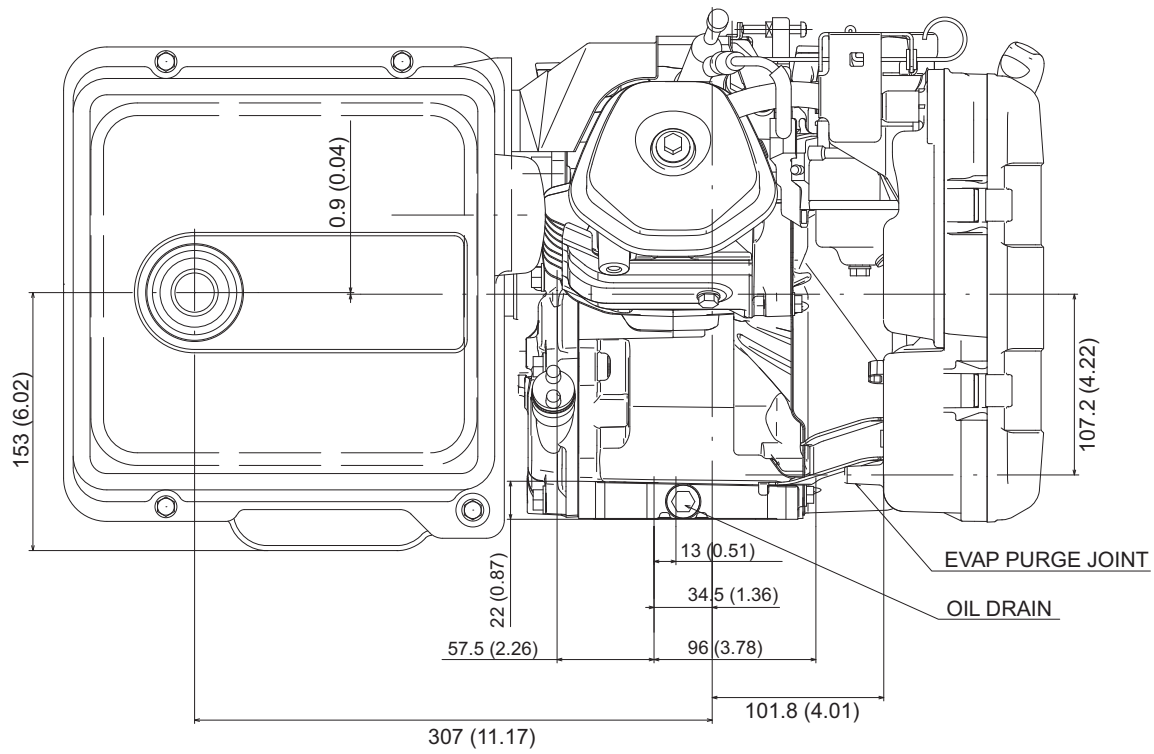


Without Fuel Tank

Unit: mm (in)



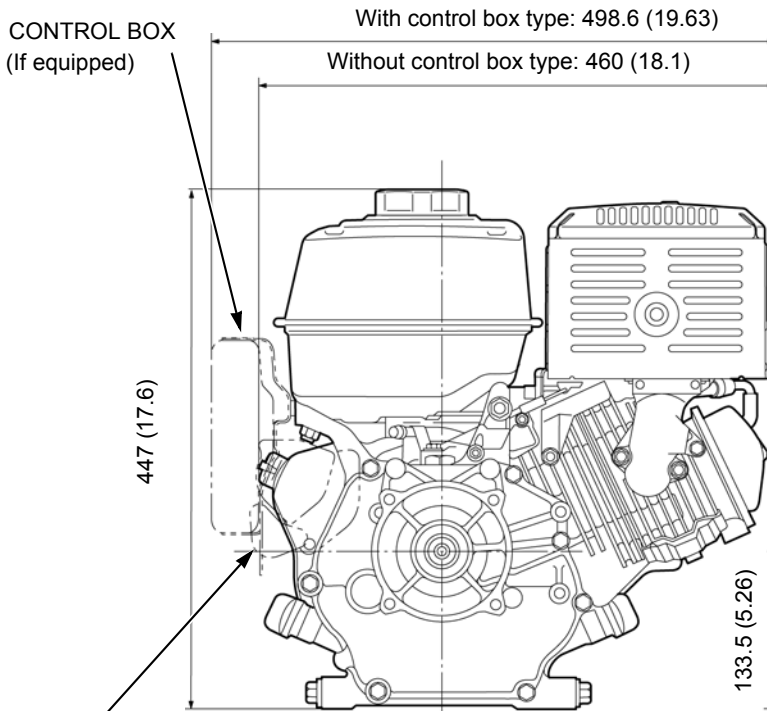
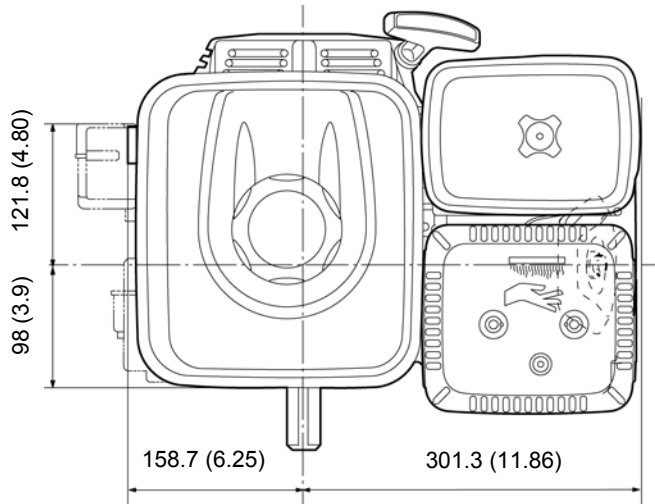
Unit: mm (in)



GX340-390

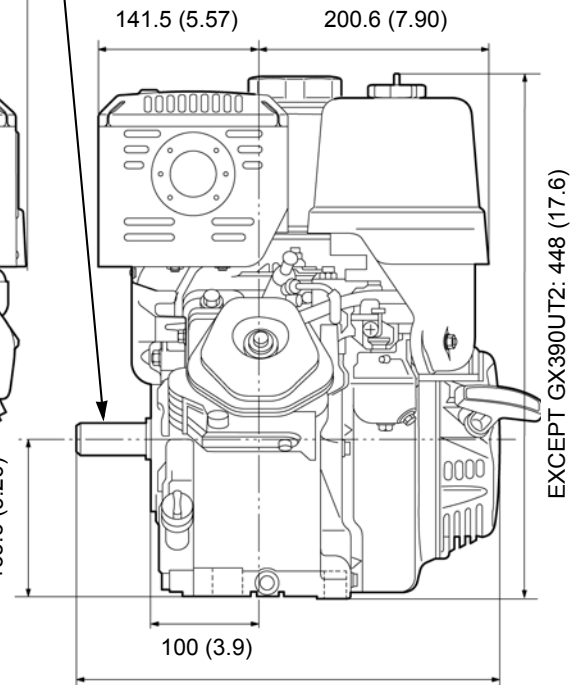
Without Reduction

Unit: mm (in)

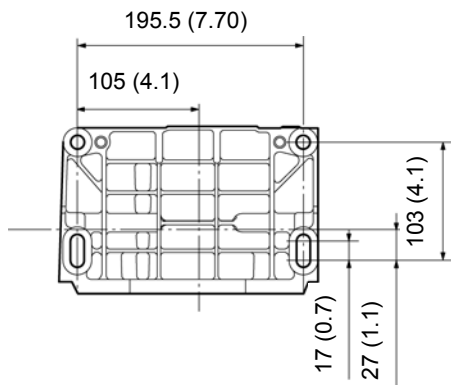


With control box type: 498.6 (19.63)
Without control box type: 460 (18.1)

CRANKSHAFT (P. T. O.)

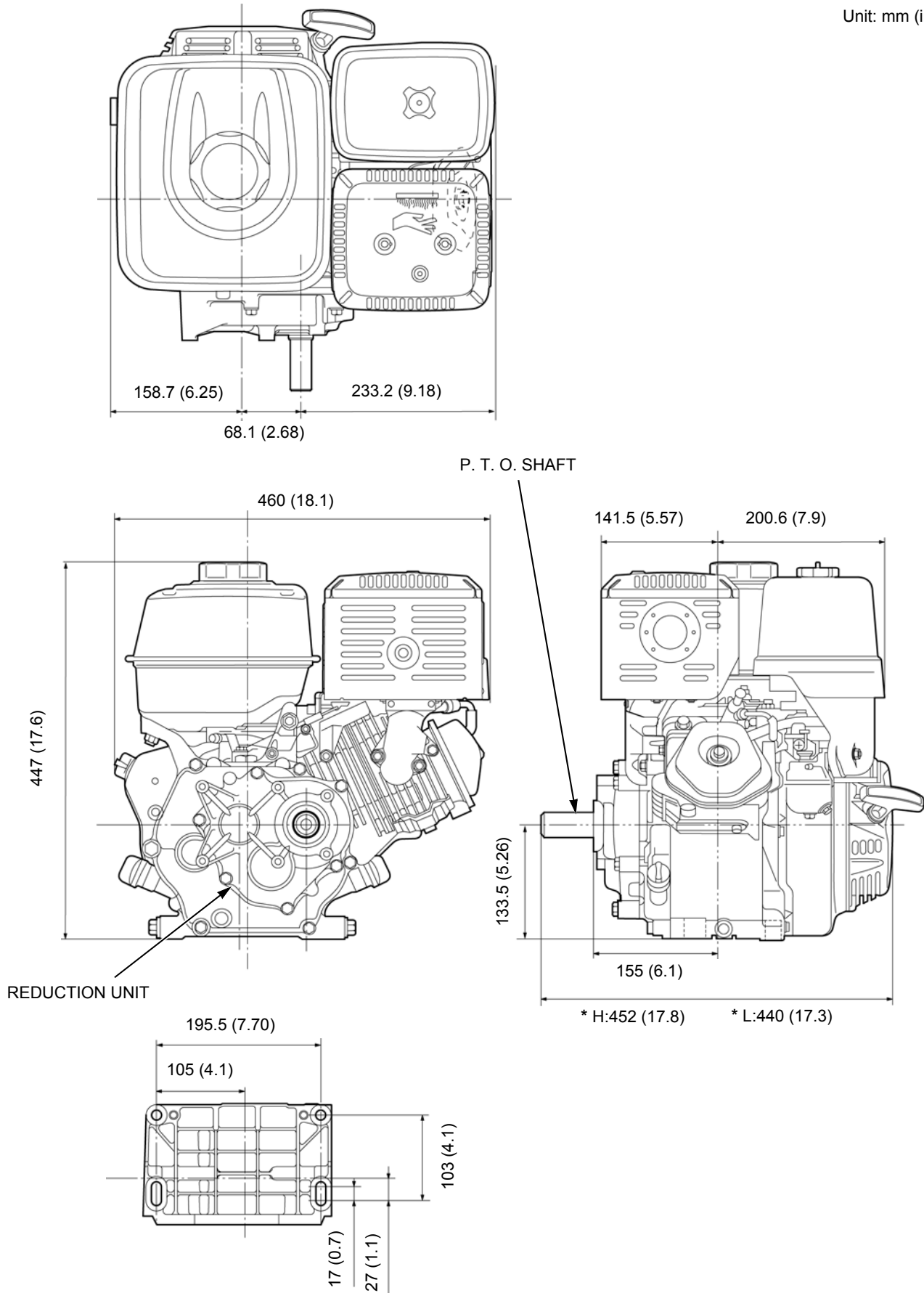


- * P/Q:405 (15.9)
- * S:380 (15.0)
- * V:425 (16.7)



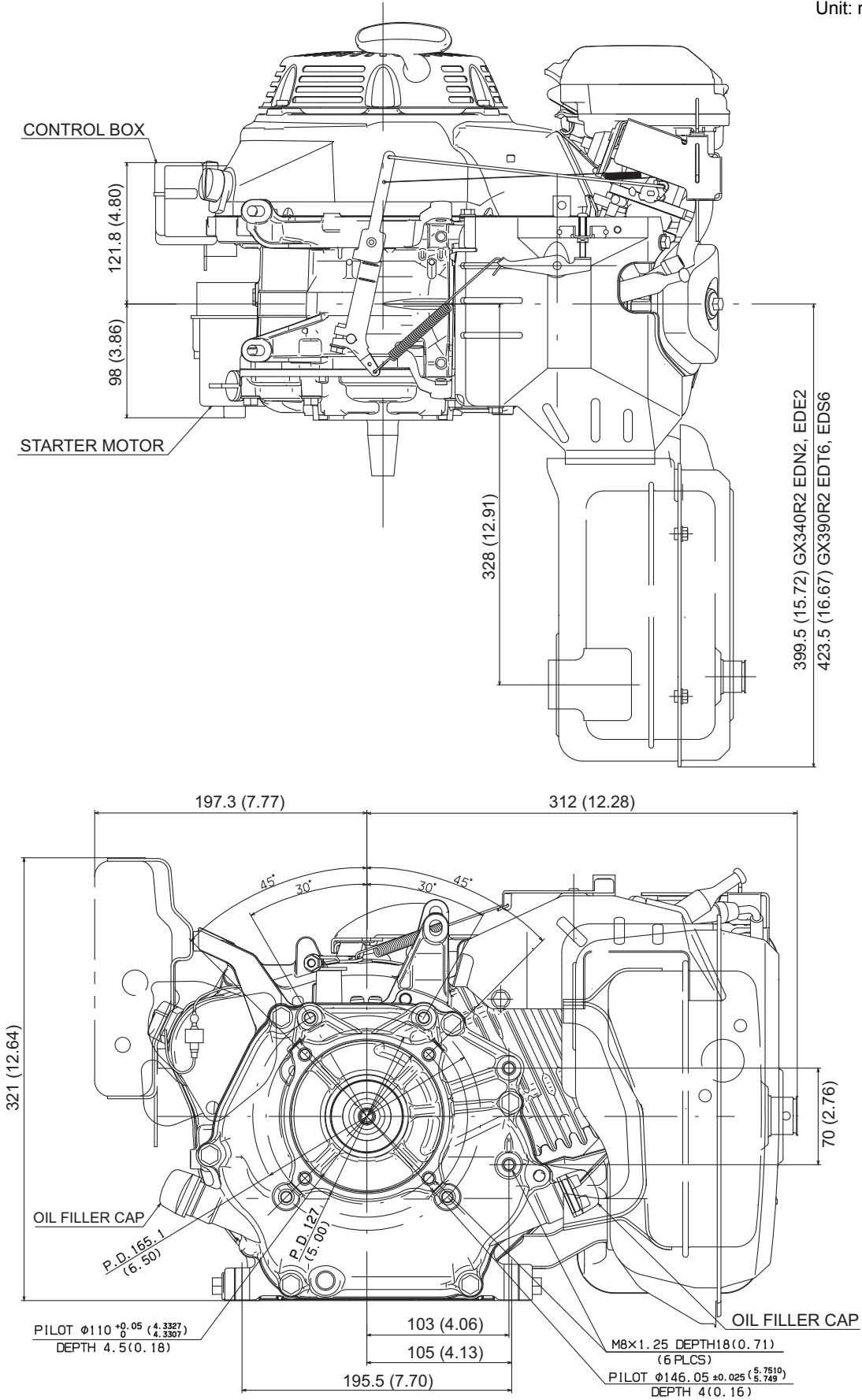
With Reduction Unit

Unit: mm (in)

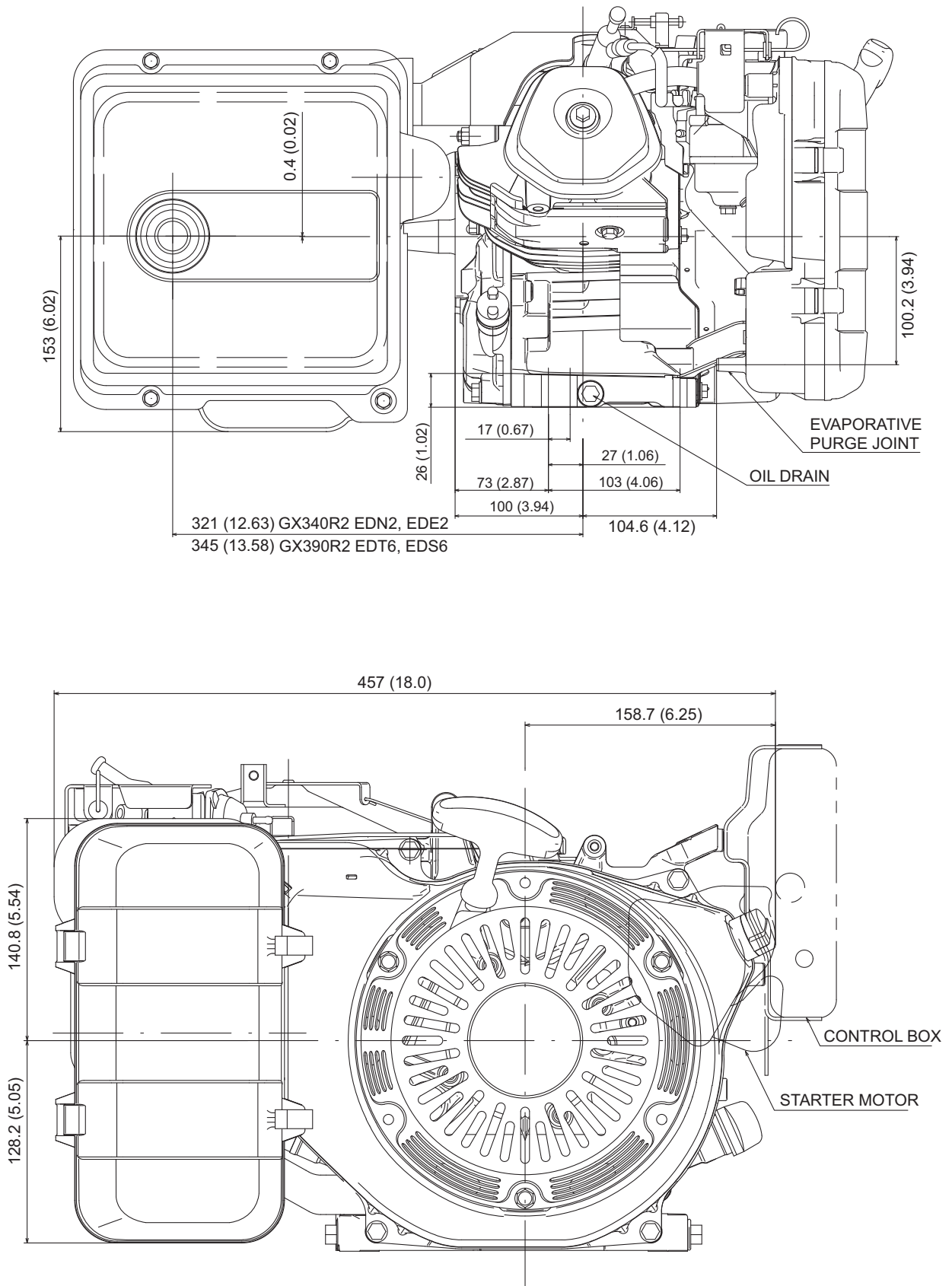


Without Fuel Tank

Unit: mm (in)



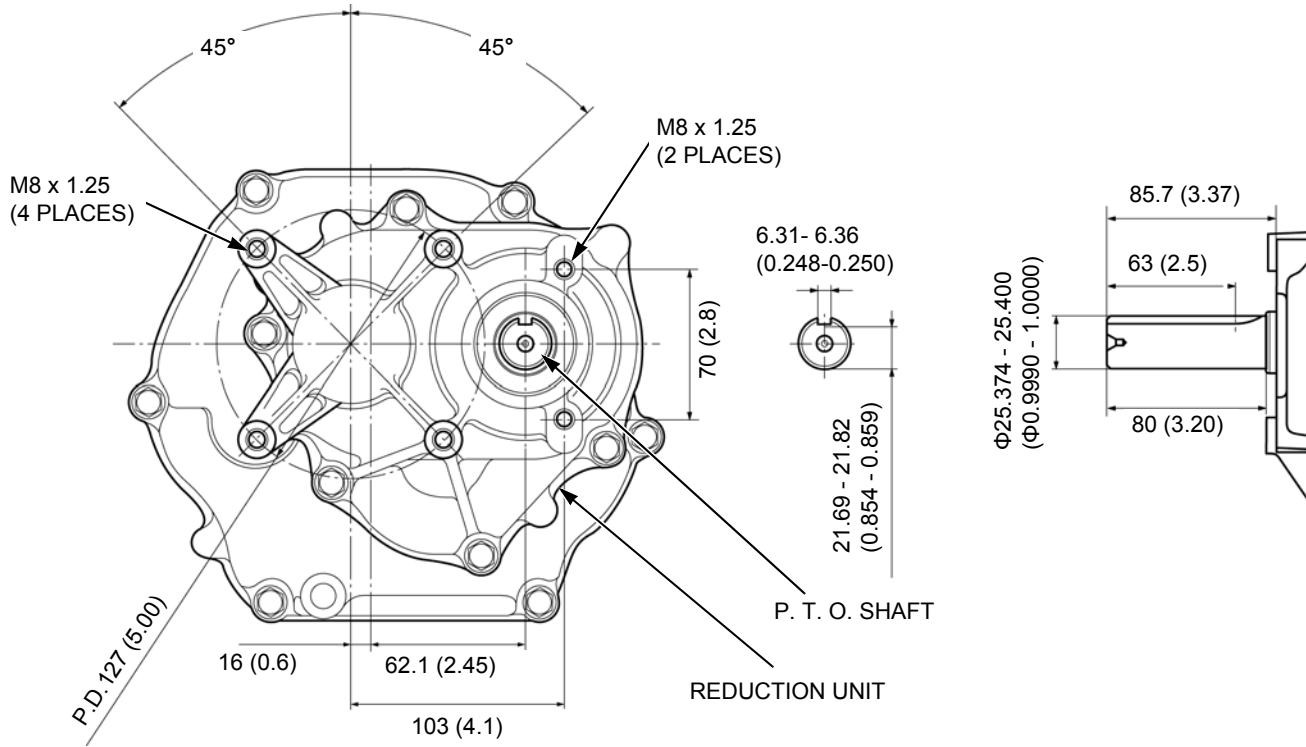
Unit: mm (in)



PTO DIMENSIONAL DRAWINGS

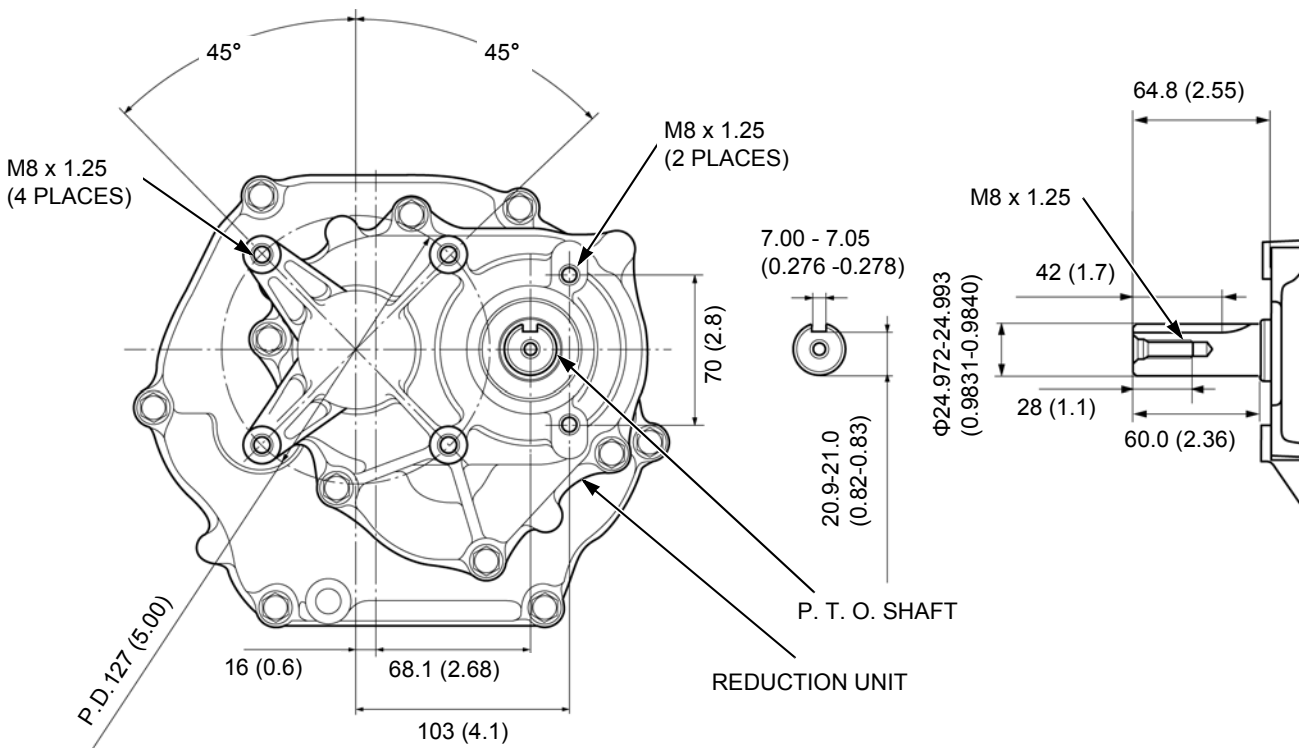
H Type (with reduction)

Unit: mm (in)



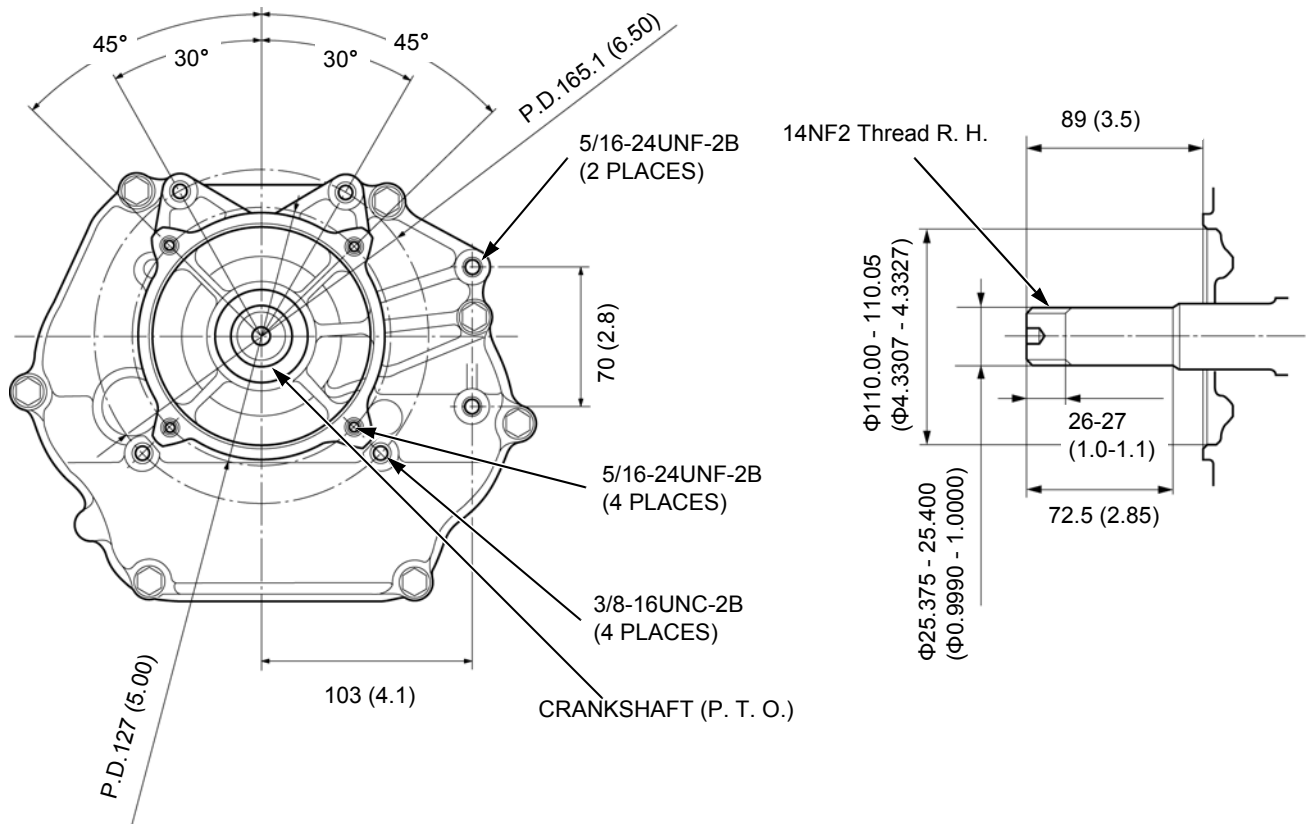
L Type (with reduction)

Unit: mm (in)



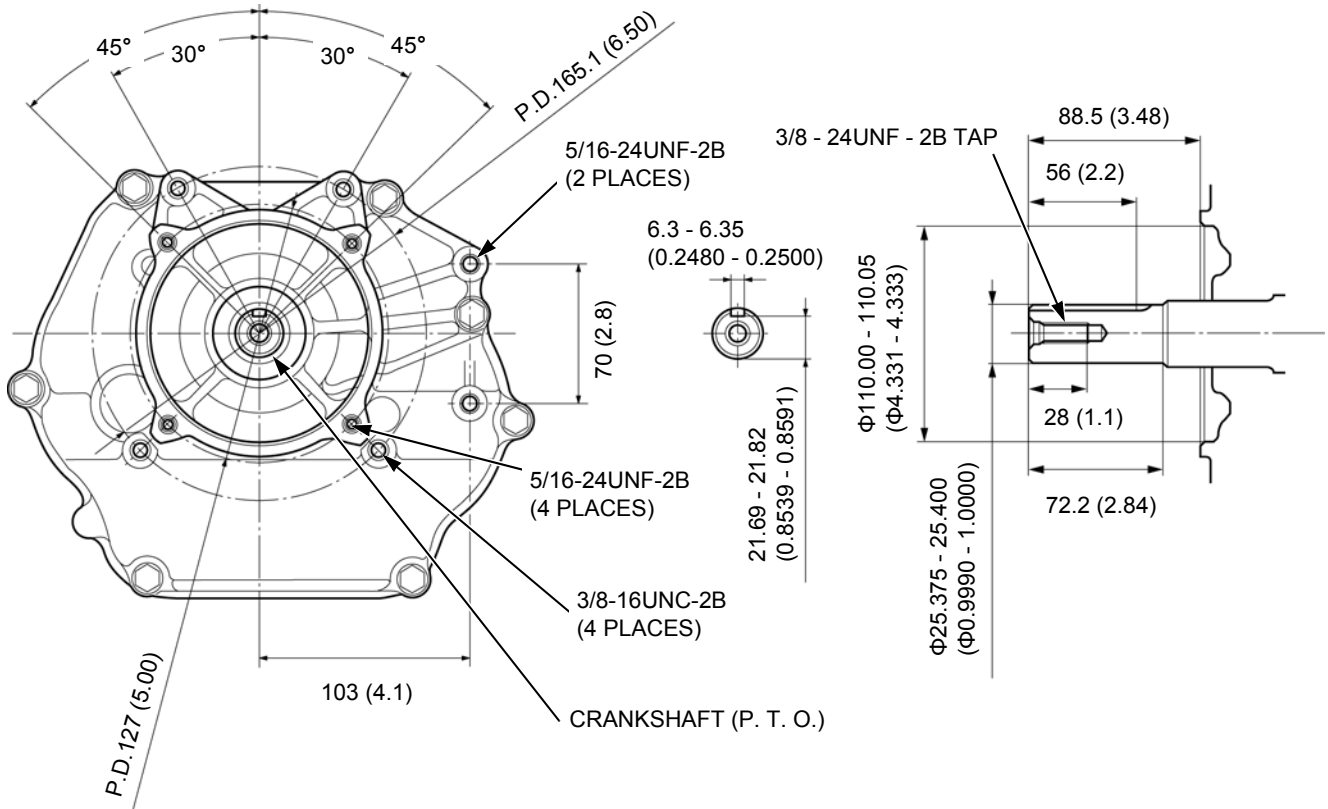
P Type

Unit: mm (in)



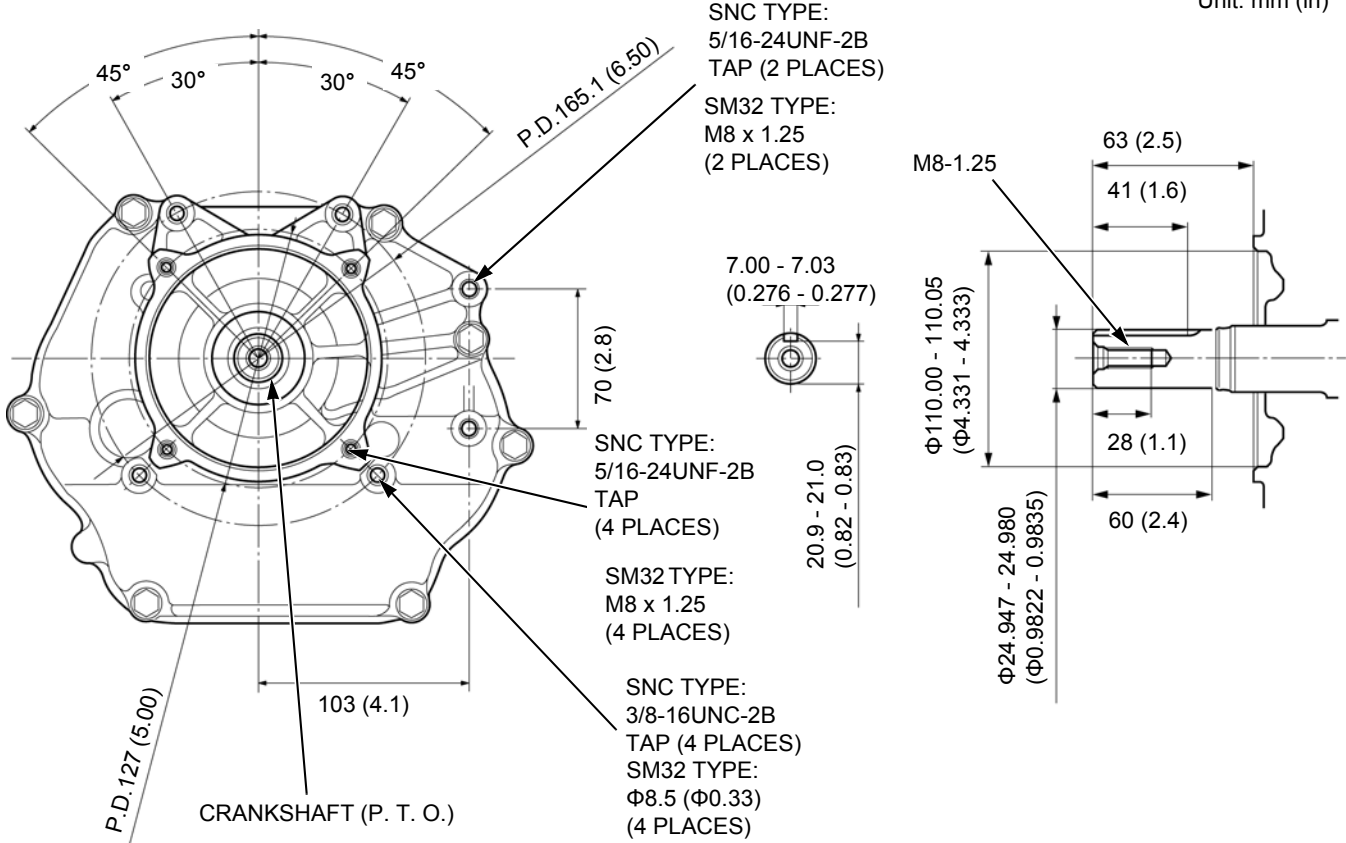
Q Type*

Unit: mm (in)



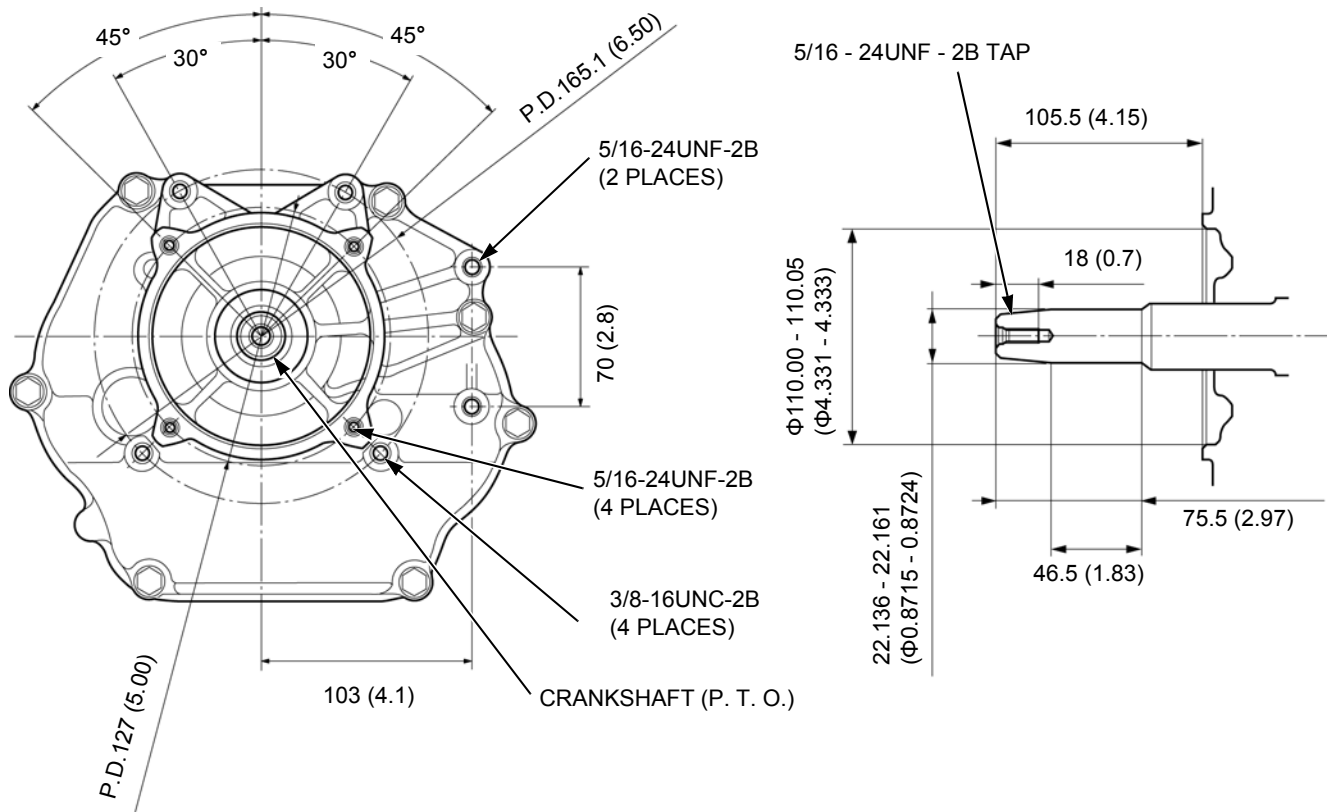
S Type

Unit: mm (in)



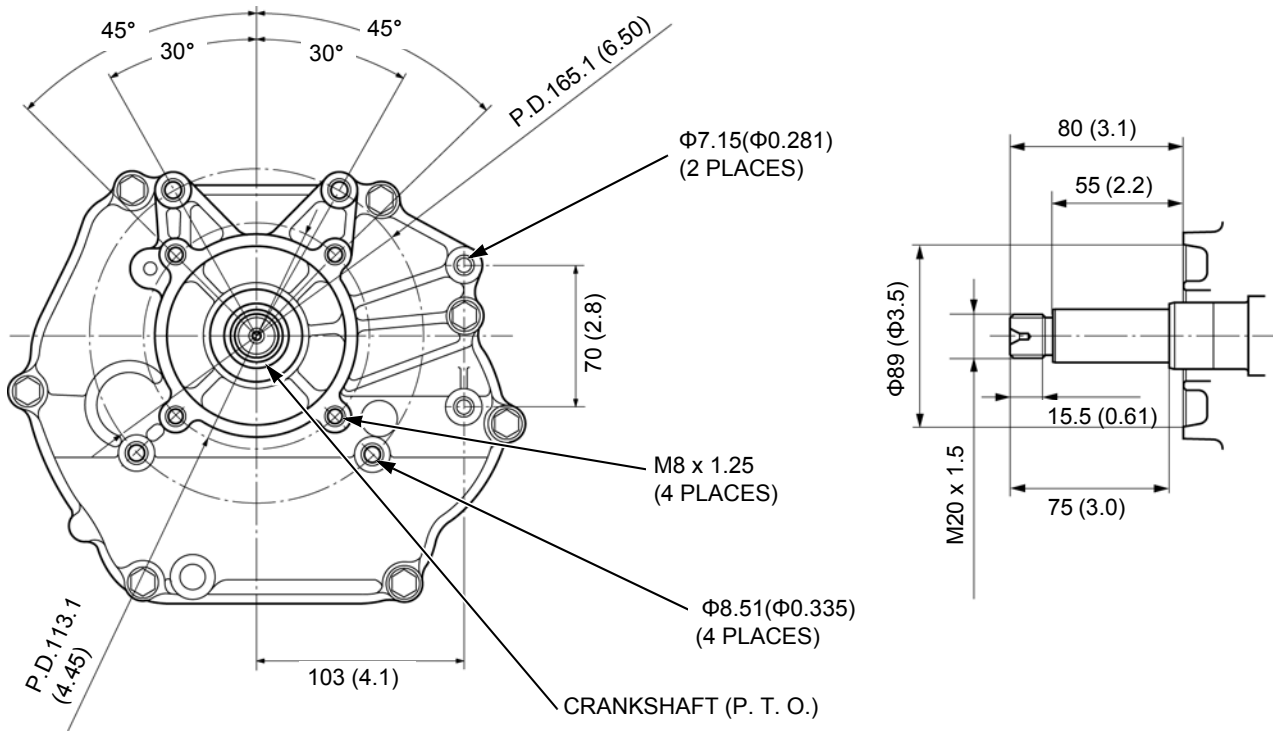
V Type

Unit: mm (in)



W Type

Unit: mm (in)



DIMENSIONS AND WEIGHTS

GX240

P.T.O. VARIATION

Model	P.T.O.	GX240R2	GX240RT2	GX240U2	GX240UT2
Overall length	E type	360 mm (14.2 in)	-	-	-
	H type	-	-	-	425 mm (16.7 in)
	L type	-	-	405 mm (15.9 in)	405 mm (15.9 in)
	P type	-	-	-	380 mm (15.0 in)
	Q type	-	-	-	380 mm (15.0 in)
	R type	-	-	-	440 mm (17.3 in)
	S type	-	-	-	355 mm (14.0 in)
	V type	-	420 mm (16.5 in)	-	400 mm (15.7 in)
	W type	-	-	-	370 mm (14.6 in)
Overall width	E type	428 mm (16.9 in)	-	-	-
	H type	-	-	-	428 mm (16.9 in)
	L type	-	-	428 mm (16.9 in)	428 mm (16.9 in)
	P type	-	-	-	428 mm (16.9 in)
	Q type	-	-	-	428 mm (16.9 in)
	R type	-	-	-	428 mm (16.9 in)
	S type	-	-	-	428 mm (16.9 in)
	V type	-	428 mm (16.9 in)	-	428 mm (16.9 in)
	W type	-	-	-	428 mm (16.9 in)
Overall height	E type	303 mm (11.9 in)	-	-	-
	H type	-	-	-	422 mm (16.6 in)
	L type	-	-	422 mm (16.6 in)	422 mm (16.6 in)
	P type	-	-	-	422 mm (16.6 in)
	Q type	-	-	-	422 mm (16.6 in)
	R type	-	-	-	422 mm (16.6 in)
	S type	-	-	-	422 mm (16.6 in)
	V type	-	303 mm (11.9 in)	-	422 mm (16.6 in)
	W type	-	-	-	422 mm (16.6 in)
Dry weight	E type	21.4 kg (47.2 lbs)	-	-	-
	H type	-	-	-	26.5 kg (58.4 lbs)
	L type	-	-	26.5 kg (58.4 lbs)	26.5 kg (58.4 lbs)
	P type	-	-	-	25.8 kg (56.9 lbs)
	Q type	-	-	-	25.8 kg (56.9 lbs)
	R type	-	-	-	30.1 kg (66.1 lbs)
	S type	-	-	-	25.8 kg (56.9 lbs)
	V type	-	21.4 kg (47.2 lbs)	-	25.8 kg (56.9 lbs)
	W type	-	-	-	25.8 kg (56.9 lbs)
Operating weight	E type	26.1 kg (57.5 lbs)	-	-	-
	H type	-	-	-	31.5 kg (69.4 lbs)
	L type	-	-	31.5 kg (69.4 lbs)	31.5 kg (69.4 lbs)
	P type	-	-	-	30.5 kg (67.2 lbs)
	Q type	-	-	-	30.5 kg (67.2 lbs)
	R type	-	-	-	35.0 kg (77.2 lbs)
	S type	-	-	-	30.5 kg (67.2 lbs)
	V type	-	26.1 kg (57.5 lbs)	-	30.5 kg (67.2 lbs)
	W type	-	-	-	30.5 kg (67.2 lbs)

EQUIPMENT VARIATION

Indicates the difference compared with values of P. T. O. variation above.

Variation	No balancer type	Cyclone air cleaner type	Starter motor type	Control box type	Low profile type *1
Overall length difference	-	-	-	-	+ 20 mm (0.8 in)
Overall width difference	-	+ 96 mm (3.8 in)	-	+ 34 mm (1.3 in)	-
Overall height difference	-	-	-	-	- 119 mm (4.7 in)
Dry weight difference	- 0.9 kg (2.0 lbs)	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)
Operating weight difference	- 0.9 kg (2.0 lbs)	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)

*1: No fuel tank, muffler, and low profile type air cleaner.

GX270

P.T.O. VARIATION

Model	P.T.O.	GX270UT2
Overall length	E type	340 mm (13.4 in)
	H type	425 mm (16.7 in)
	P type	380 mm (15.0 in)
	Q type	
	S type	355 mm (14.0 in)
	V type	400 mm (15.7 in)
	R type	440 mm (17.3 in)
Overall width	E type	428 mm (16.9 in)
	H type	
	P type	
	Q type	
	S type	
	V type	
	R type	
Overall height	E type	422 mm (16.6 in)
	H type	
	P type	
	Q type	
	S type	
	V type	
	E type	
Dry weight	E type	25.0 kg (55.1 lbs)
	H type	26.5 kg (58.4 lbs)
	P type	25.8 kg (57.0 lbs)0
	Q type	
	S type	
	V type	30.0 kg (66.1 lbs)
	R type	
Operating weight	E type	29.7 kg (65.5 lbs)
	H type	31.5 kg (69.4 lbs)
	P type	30.5 kg (67.0 lbs)
	Q type	
	S type	
	V type	35.0 kg (77.2 lbs)
	R type	

EQUIPMENT VARIATION

Indicates the difference compared with values shown in the table of P. T. O. variation on (page 28).

Variation	No balancer type	Cyclone air cleaner type	Starter motor type	Control box type	Low profile type *1
Overall length difference	-	-	-	-	+ 20 mm (0.8 in)
Overall width difference	-	+ 96 mm (3.8 in)	-	+ 34 mm (1.3 in)	-
Overall height difference	-	-	-	-	- 119 mm (4.7 in)
Dry weight difference	- 0.9 kg (2.0 lbs)	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)
Operating weight difference	- 0.9 kg (2.0 lbs)	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)

*1: No fuel tank, muffler, and low profile type air cleaner.

GX340

P.T.O. VARIATION

Model	P.T.O.	GX340R2	GX340RT2	GX340U2	GX340UT2
Overall length	E type	365 mm (14.4 in)	-	-	-
	H type	-	-	-	452 mm (17.8 in)
	L type	-	-	-	440 mm (17.3 in)
	P type	-	-	-	405 mm (15.9 in)
	Q type	-	-	405 mm (15.9 in)	405 mm (15.9 in)
	S type	-	-	-	380 mm (15.0 in)
	V type	-	430 mm (16.9 in)	-	425 mm (16.7 in)
Overall width	E type	460 mm (18.1 in)	-	-	-
	H type	-	-	-	460 mm (18.1 in)
	L type	-	-	-	460 mm (18.1 in)
	P type	-	-	-	460 mm (18.1 in)
	Q type	-	-	460 mm (18.1 in)	460 mm (18.1 in)
	S type	-	-	-	460 mm (18.1 in)
	V type	-	460 mm (18.1 in)	-	460 mm (18.1 in)
Overall height	E type	313 mm (12.3 in)	-	-	-
	H type	-	-	-	448 mm (17.6 in)
	L type	-	-	-	448 mm (17.6 in)
	P type	-	-	-	448 mm (17.6 in)
	Q type	-	-	448 mm (17.6 in)	448 mm (17.6 in)
	S type	-	-	-	448 mm (17.6 in)
	V type	-	313 mm (12.3 in)	-	448 mm (17.6 in)
Dry weight	E type	27.3 kg (60.2 lbs)	-	-	-
	H type	-	-	-	35.2 kg (77.6 lbs)
	L type	-	-	-	35.2 kg (77.6 lbs)
	P type	-	-	-	31.7 kg (69.9 lbs)
	Q type	-	-	31.7 kg (69.9 lbs)	31.7 kg (69.9 lbs)
	S type	-	-	-	31.7 kg (69.9 lbs)
	V type	-	27.3 kg (60.2 lbs)	-	31.7 kg (69.9 lbs)
Operating weight	E type	33.4 kg (73.6 lbs)	-	-	-
	H type	-	-	-	41.2 kg (90.8 lbs)
	L type	-	-	-	41.2 kg (90.8 lbs)
	P type	-	-	-	37.8 kg (83.3 lbs)
	Q type	-	-	37.8 kg (83.3 lbs)	37.8 kg (83.3 lbs)
	S type	-	-	-	37.8 kg (83.3 lbs)
	V type*	-	33.4 kg (73.6 lbs)	-	37.8 kg (83.3 lbs)

EQUIPMENT VARIATION

Indicates the difference compared with values of P. T. O. variation above.

Variation	Cyclone air cleaner type	Starter motor type	Control box type	Low profile type *1
Overall length difference	-	-	-	+ 6 mm (0.2 in)
Overall width difference	+ 93 mm (3.7 in)	± 5 mm (0.2 in)	+ 39 mm (1.5 in)	-
Overall height difference	-	-	-	- 135 mm (5.3 in)
Dry weight difference	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)
Operating weight difference	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)

*1: No fuel tank and muffler, use low profile type air cleaner.

GX390

P.T.O. VARIATION

Model	P.T.O.	GX390RT2/R2	GX390T2	GX390UT2/T2
Overall length	H type	-	-	452 mm (17.8 in)
	L type	-	-	440 mm (17.3 in)
	P type	-	-	405 mm (15.9 in)
	Q type	405 mm (15.9 in)		
	S type	-	-	380 mm (15.0 in)
	V type	425 mm (16.7 in)	-	425 mm (16.7 in)
Overall width	H type	-	-	460 mm (18.1 in)
	L type	-	-	460 mm (18.1 in)
	P type	-	-	460 mm (18.1 in)
	Q type	458 mm (18.0 in)	460 mm (18.1 in)	460 mm (18.1 in)
	S type	-	-	460 mm (18.1 in)
	V type	458 mm (18.0 in)	-	460 mm (18.1 in)
Overall height	H type	-	-	447 mm (17.6 in)
	L type	-	-	448 mm (17.6 in)
	P type	-	-	448 mm (17.6 in)
	Q type	447 mm (17.6 in)	448 mm (17.6 in)	448 mm (17.6 in)
	S type	-	-	448 mm (17.6 in)
	V type	447 mm (17.6 in)	-	448 mm (17.6 in)
Dry weight	H type	-	-	35.2 kg (77.6 lbs)
	L type	-	-	35.2 kg (77.6 lbs)
	P type	-	-	31.7 kg (69.9 lbs)
	Q type	29.9 kg (65.9 lbs)	31.7 kg (69.9 lbs)	31.7 kg (69.9 lbs)
	S type	-	-	31.7 kg (69.9 lbs)
	V type	29.9 kg (65.9 lbs)	-	31.7 kg (69.9 lbs)
Operating weight	H type	-	-	41.2 kg (90.8 lbs)
	L type	-	-	41.2 kg (90.8 lbs)
	P type	-	-	37.8 kg (83.3 lbs)
	Q type	31.4 kg (69.2 lbs)	37.8 kg (83.3 lbs)	37.8 kg (83.3 lbs)
	S type	-	-	37.8 kg (83.3 lbs)
	V type	31.4 kg (69.2 lbs)	-	37.8 kg (83.3 lbs)

EQUIPMENT VARIATION

Indicates the difference compared with values of P. T. O. variation above.

Variation	Cyclone air cleaner type	Starter motor type	Control box type	Low profile type *1
Overall length difference	-	-	-	+ 6 mm (0.2 in)
Overall width difference	+ 93 mm (3.7 in)	± 5 mm (0.2 in)	+ 39 mm (1.5 in)	-
Overall height difference	-	-	-	- 135 mm (5.3 in)
Dry weight difference	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)
Operating weight difference	+ 0.2 kg (0.4 lbs)	+ 2.5 kg (5.5 lbs)	+ 3.2 kg (7.1 lbs)	- 4.4 kg (9.7 lbs)

*1: No fuel tank and muffler, use low profile type air cleaner.

SPECIFICATIONS

GX240

Model	GX240R2	GX240RT2	GX240U2	GX240UT2
Description code	GCBPK	GCBJT	GCBPK	GCBJT
Type	4 stroke, overhead valve, single cylinder, inclined by 25°			
Displacement	270 cm ³ (16.5 cu-in)			
Bore x stroke	77.0 x 58.0 mm (3.0 x 2.3 in)			
Net power (SAE J1349)*1	5.9 kW (7.9 HP) / 3,600 min-1 (rpm)*2			
Continuous rated power	4.6 kW (6.1 HP) / 3,600 min-1 (rpm)			
Maximum net torque (SAE J1349)*1	18.3 N·m (1.86 kgf·m, 13.4 lbf·ft) / 2,500 min-1 (rpm)			
Compression ratio	8.5: 1			
Fuel consumption (at continuous rated power)	2.2 Liters (0.58 US gal, 0.48 Imp gal) / h			
Ignition system	C.D.I.(Capacitor Discharge Ignition) type magneto ignition			
Ignition timing	B.T.D.C. 10° / 1,400min-1 (rpm)			
Spark advancer performance	B.T.D.C. 10°- 20°			
Spark plug	BPR6ES (NGK) / W20EPR-U (DENSO)			
Lubrication system	Forced splash			
Oil capacity	1.1 Liters (1.16 US qt, 0.97 Imp qt)			
Recommended oil	SAE 10W-30 API service classification SJ or later			
Cooling system	Forced air			
Starting system	Recoil, Recoil and Starter motor			
Stopping system	Ignition exciter coil circuit open			
Carburetor	Horizontal type, butterfly valve			
Air cleaner	Dual element type, Cyclone type, Oil bath type, Low profile type			
Governor	Mechanical centrifugal			
Breather system	Reed valve type			
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher			
Reduction case oil capacity (1/2 reduction with clutch)	0.3 Liters (0.32 US qt, 0.26 Imp qt)			
Clutch (1/2 reduction with clutch)	Type	Centrifugal		
	Engagement start	1,800 min-1 (rpm)		
	Lock	2,200 min-1 (rpm)		

*1: The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (net power) and at 2,500 rpm (max net torque). Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

*2: Base type includes a balancer, dual type air cleaner, and standard type muffler.

GX270

Model	GX270R2	GX270RT2	GX270U2	GX270UT2
Description code	GCBMK	GCBGT	GCBMK	GCBGT
Type	4 stroke, overhead valve, single cylinder, inclined by 25°			
Displacement	270 cm ³ (16.5 cu-in)			
Bore x stroke	77.0 x 58.0 mm (3.0 x 2.3 in)			
Net power (SAE J1349)*1	6.3 kW (8.4 HP) / 3,600 min-1 (rpm)			
Continuous rated power	5.1 kW (6.8 HP) / 3,600 min-1 (rpm)			
Maximum net torque (SAE J1349)*1	19.1 N·m (1.94 kgf·m, 14.1 lbf·ft) / 2,500 min-1 (rpm)			
Compression ratio	8.5: 1			
Fuel consumption (at continuous rated power)	2.4 Liters (0.63 US gal, 0.53 Imp gal) / h			
Ignition system	C.D.I.(Capacitor Discharge Ignition) type magneto ignition			
Ignition timing	B.T.D.C. 10° / 1,400min-1 (rpm)			
Spark advancer performance	B.T.D.C. 10°- 20°			
Spark plug	BPR6ES (NGK) / W20EPR-U (DENSO)			
Lubrication system	Forced splash			
Oil capacity	1.1 Liters (1.16 US qt, 0.97 Imp qt)			
Recommended oil	SAE 10W-30 API service classification SJ or later			
Cooling system	Forced air			

Starting system	Recoil, Recoil and Starter motor	
Stopping system	Ignition exciter coil circuit open	
Carburetor	Horizontal type, butterfly valve	
Air cleaner	Dual element type, Cyclone type, Oil bath type, Low profile type	
Governor	Mechanical centrifugal	
Breather system	Reed valve type	
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher	
Reduction case oil capacity (1/2 reduction with clutch)	0.3 Liters (0.32 US qt, 0.26 Imp qt)	
Clutch (1/2 reduction with clutch)	Type	Centrifugal
	Engagement start	1,800 min-1 (rpm)
	Lock	2,200 min-1 (rpm)

*1: The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (net power) and at 2,500 rpm (max net torque). Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

GX340

Model	GX340R2	GX340RT2	GX340U2	GX340UT2
Description code	GCBKK	GCBET	GCBKK	GCBET
Type	4 stroke, overhead valve, single cylinder, inclined by 25°			
Displacement	389 cm ³ (23.7 cu-in)			
Bore x stroke	88.0 x 64.0 mm (3.5 x 2.5 in)			
Net power (SAE J1349)*1	8.0 kW (10.7 HP) / 3,600 min-1 (rpm)*2			
Continuous rated power	6.3 kW (8.4 HP) / 3,600 min-1 (rpm)			
Maximum net torque (SAE J1349)*1	26.4 N·m (2.69 kgf·m, 19.5 lbf·ft) / 2,500 min-1 (rpm)			
Compression ratio	8.2: 1			
Fuel consumption (at continuous rated power)	3.1 Liters (0.82 US gal, 0.68 Imp gal) / h			
Ignition system	C.D.I.(Capacitor Discharge Ignition) type magneto ignition			
Ignition timing	B.T.D.C. 10° / 1,400min-1 (rpm)			
Spark advancer performance	B.T.D.C. 10°- 22°			
Spark plug	BPR6ES (NGK) / W20EPR-U (DENSO)			
Lubrication system	Forced splash			
Oil capacity	1.1 Liters (1.16 US qt, 0.97 Imp qt)			
Recommended oil	SAE 10W-30 API service classification SJ or later			
Cooling system	Forced air			
Starting system	Recoil, Recoil and Starter motor			
Stopping system	Ignition exciter coil circuit open			
Carburetor	Horizontal type, butterfly valve			
Air cleaner	Dual element type, Cyclone type, Oil bath type, Low profile type			
Governor	Mechanical centrifugal			
Breather system	Reed valve type			
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher			

*1: The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (net power) and at 2,500 rpm (max net torque). Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

*2: Base type includes a balancer, dual type air cleaner, and standard type muffler.

GX390

Model	GX390R2	GX390RT2	GX390U2	GX390UT2	GX390T2
Description code	GCBHK	GCBCT	GCBHK	GCBCT	GCBDT
Type	4 stroke, overhead valve, single cylinder, inclined by 25°				
Displacement	389 cm ³ (23.7 cu-in)				
Bore x stroke	88.0 x 64.0 mm (3.5 x 2.5 in)				
Net power (SAE J1349)*1	8.7 kW (11.7 HP) / 3,600 min ⁻¹ (rpm)				
Continuous rated power	7.0 kW (9.4 HP) / 3,600 min ⁻¹ (rpm)				
Maximum net torque (SAE J1349)*1	26.5 N·m (2.7 kgf·m, 19.5 lbf·ft) / 2,500 min ⁻¹ (rpm)				
Compression ratio	8.2 ± 0.2: 1				
Fuel consumption (at continuous rated power)	3.5 Liters (0.92 US gal, 0.77 Imp gal) / h				
Ignition system	C.D.I.(Capacitor Discharge Ignition) type magneto ignition				
Ignition timing	B.T.D.C. 10° / 1,400 min ⁻¹ (rpm)				
Spark plug	BPR6ES (NGK) / W20EPR-U (DENSO)				
Lubrication system	Forced splash				
Oil capacity	1.1 Liters (1.16 US qt, 0.97 Imp qt)				
Recommended oil	SAE 10W-30 API service classification SJ or later				
Cooling system	Forced air				
Starting system	Recoil, Recoil and Starter motor				
Stopping system	Ignition primary circuit open				
Carburetor	Horizontal type, butterfly valve				
Air cleaner	Dual element type, Cyclone type, Low profile type				
Governor	Mechanical centrifugal				
Breather system	Reed valve type				
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher				

* The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (Net power) and at 2,500 rpm (Max. net torque). Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance and other variables.

SERVICEABILITY

The following Maintenance section is **duplicated from the applicable shop manual** and is accurate at the time of publication of this manual. Page number cross references refer to the shop manual it was copied from. It is provided for your reference in considering serviceability issues.

Maintenance Schedule

REGULAR SERVICE PERIOD (2)						
ITEM	Perform at every indicated month or operating hour interval, whichever comes first.	Each use	First month or 20 hrs.	Every 3 months or 50 hrs.	Every 6 months or 100 hrs.	Every year or 300 hrs.
Engine oil	Check level	○				
	Change		○		○	
Air cleaner	Check	○				
	Clean			○ (1)	○ (*) (1)	
	Replace			(Cyclone type) Every 6 months or 150 hours		○ (**)
						(Cyclone type) Every 2 years or 600 hours
Sediment cup	Clean				○	
Spark plug	Check-adjust				○	
	Replace					○
Spark arrester (If equipped)	Clean				○	
Idle speed	Check-adjust					○
Valve clearance	Check-adjust					○
Combustion chamber	Clean	After every 1000 hours				
Fuel tank and filter	Clean				○	
Fuel tube	Check	Every 2 years (Replace if necessary)				

(1) Service more frequently when used in dusty areas.

(2) For commercial use, log hours of operation to determine proper maintenance intervals.

(*) Internal vent carburetor with dual element type only.

(**) Replace paper element type only.

Engine Oil Level Check

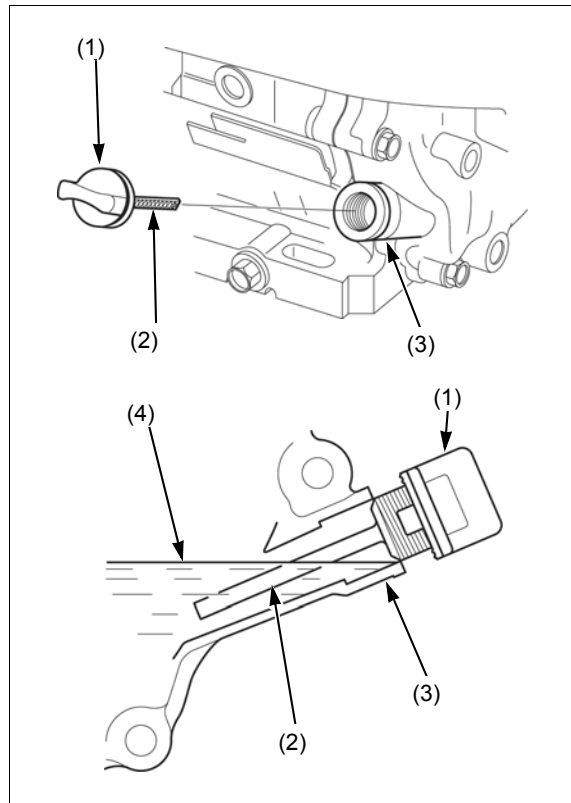
Place the engine on a level surface.

Remove the oil filler cap (1), and wipe the oil level gauge (2) clean.

Insert the oil filler cap without screwing it into the oil filler neck (3).

Remove the oil filler cap and check oil level shown on the oil level gauge.

If the oil level is low, fill with recommended oil to the upper level (4) of the oil filler neck.

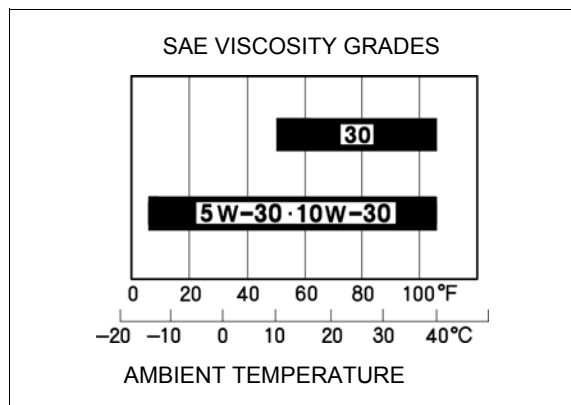


SAE 10W - 30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended range.

RECOMMENDED OIL:

SAE 10W-30 API service classification SJ or later

Tighten the oil filler cap securely.



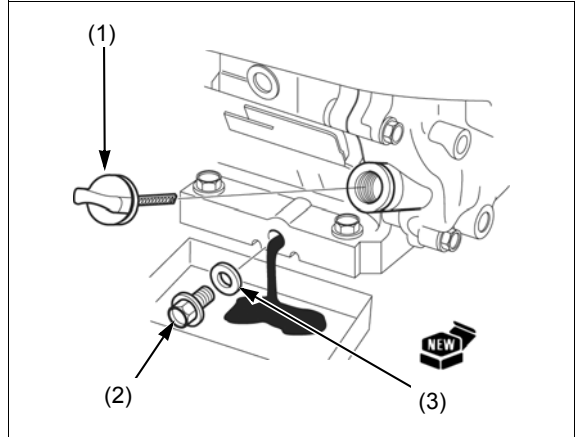
Engine Oil Change

Drain the oil in the engine while the engine is warm. Warm oil drains quickly and completely.

Place the engine on a level surface, and place a suitable container under the drain plug bolt.

Remove the oil filler cap (1), drain plug bolt (2), and drain plug washer (3) to drain the oil into the suitable container.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground, or pour it down a drain.



⚠ CAUTION

Used engine oil contains substances that have been identified as carcinogenic. If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer. Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

Install a new drain plug washer (3) and tighten the drain plug bolt (2) to the specified torque.

TORQUE: 22.5 N·m (2.25 kgf·m, 17 lbf·ft)

Fill with recommended oil to the upper level mark of the oil level dipstick.

Engine oil capacity: 1.1 ℓ (1.16 US Qt, 0.97 Imp Qt)

Tighten the oil filler cap securely.

Air Cleaner Check/Cleaning and Replacement

Dual Element Type:

A dirty air filter will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE.

Operating the engine without the air filters or with the filters installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air filters securely.

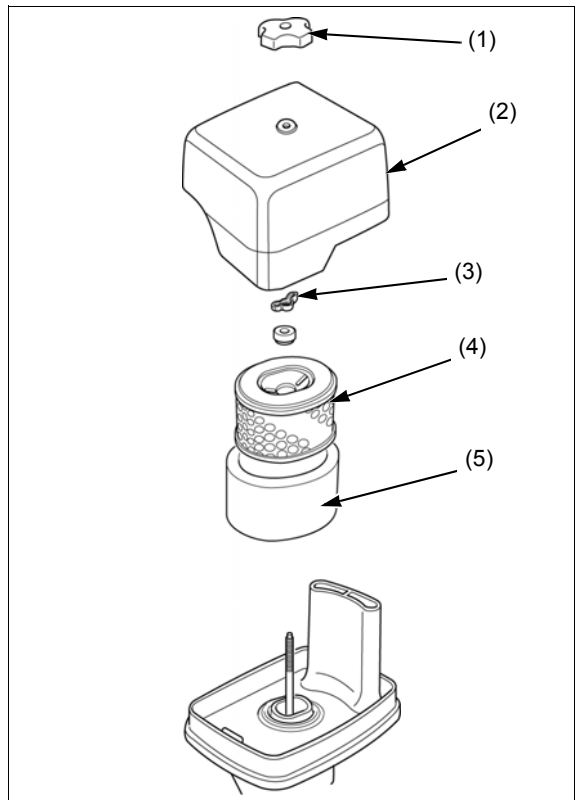
Remove the nut (1) and the air cleaner cover (2).

Remove the wing nut (3) and air filter assembly (4)(5).

Separate the inner filter (Paper) (4) from the outer filter (Foam) (5). Carefully check both filters for holes or tears and replace if damaged.

Clean the filters if they are to be reused.

Install the elements in the reverse order of removal.



Cyclone Type:

A dirty air filter will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE.

Operating the engine without the air filters or with the filters installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air filters securely.

Remove the wing nut (1) and the air cleaner cover (2).

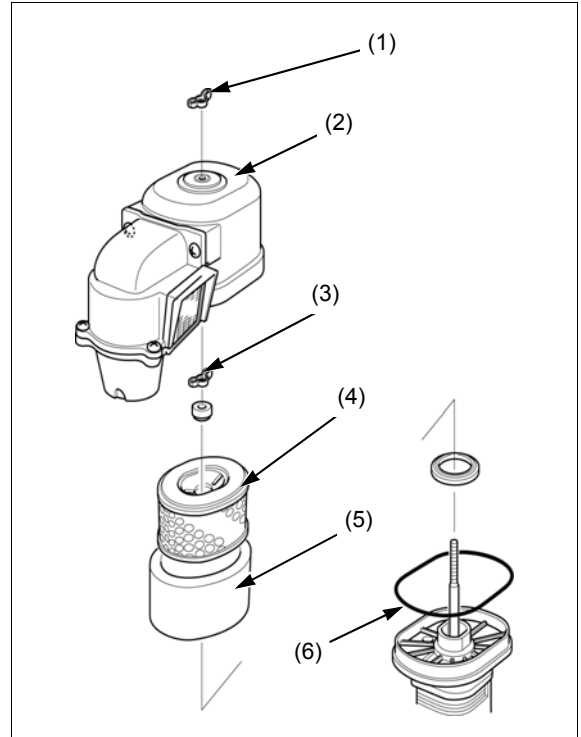
Remove the wing nut (3) and air filter assembly (4)(5).

Separate the inner filter (Paper) (4) from the outer filter (Foam) (5). Carefully check both filters for holes or tears and replace if damaged.

Check the packing (6) for damage.

Clean the filters if they are to be reused (see below).

Install the elements in the reverse order of removal.



Low Profile Type:

A dirty air filter will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE.

Operating the engine without the air filter or with the filter installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air filter securely.

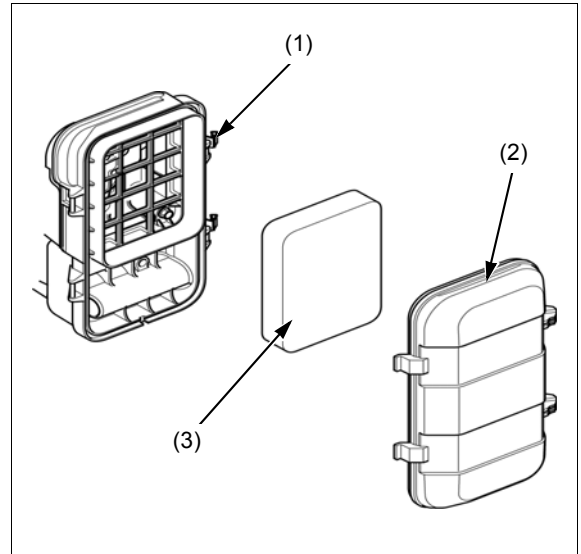
Remove the air cleaner case lid spring (1) and air cleaner cover (2).

Remove the air cleaner element (3).

Carefully check the air cleaner element and replace if damaged.

Clean the filter if it is to be reused (see below).

Install the element in the reverse order of removal.



Filter (foam) Type:

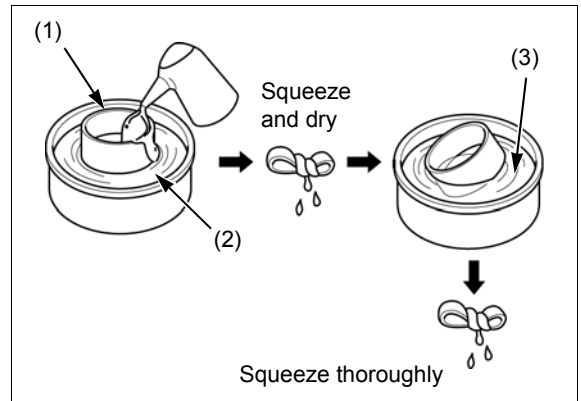
Clean the filter (1) in warm soapy water (2), rinse, and allow to dry thoroughly, or clean with a non-flammable solvent and allow to dry thoroughly.

Dip the filter in clean engine oil (3), and squeeze out all the excess oil.

Excess oil will restrict air flow through the foam element and may cause the engine to smoke at startup.

Check the air cleaner case packing for deterioration or damage. Make sure the air cleaner packing is installed securely.

Install the cleaner in the reverse order of removal.



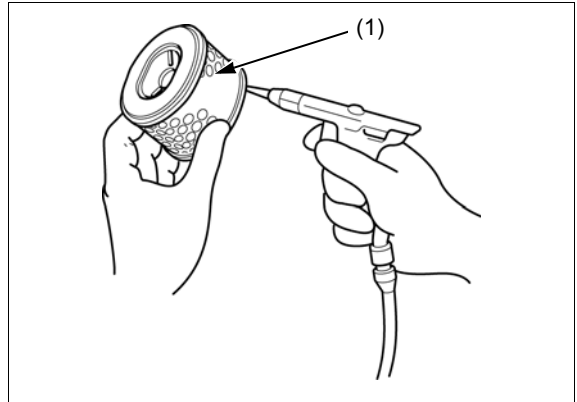
Inner Filter (paper) Type:

Tap the inner filter (1) lightly several times on a hard surface to remove excess dirt, or blow compressed air lightly (207 kPa (2.11 kgf/cm², 30 psi) or less) through the paper filter from the inside out. Never try to brush the dirt off; brushing will force dirt into the fibers.

Wipe dirt from the inside of the air cleaner case and the air cleaner cover, using a rag.

Check the air cleaner case packing for deterioration or damage. Make sure the air cleaner packing is installed securely.

Install the cleaner in the reverse order of removal.



Sediment Cup Cleaning

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

Turn the fuel valve lever (1) to the OFF position.

Remove the sediment cup (2) and the O-ring (3).

Release the tabs (5) and remove the cup filter (4).

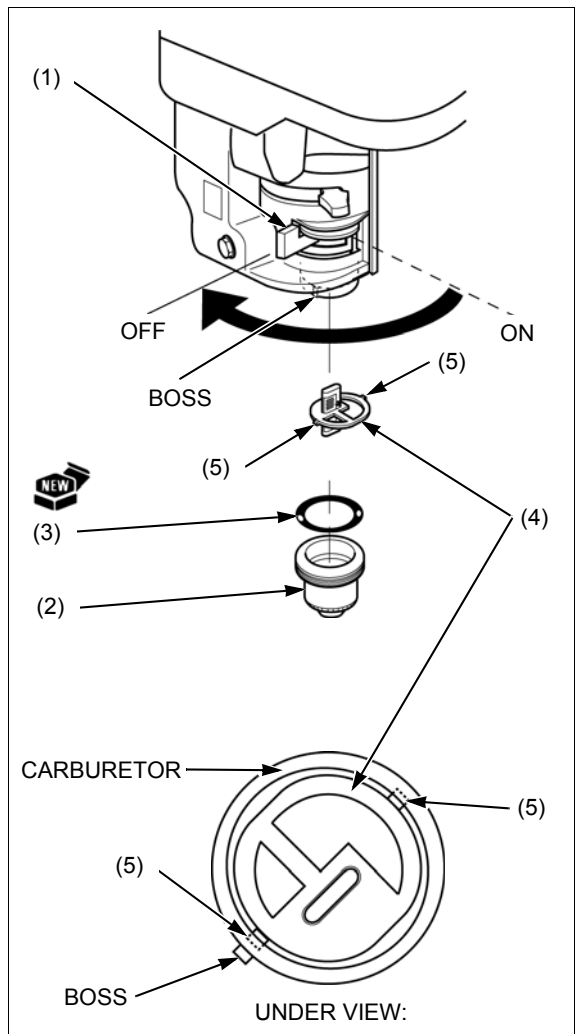
Clean the sediment cup and the cup filter with non-flammable solvent and allow them to dry thoroughly.

Install the cup filter as the direction shown in the illustration.

Install a new O-ring and tighten the sediment cup to the specified torque.

TORQUE: 3.9 N·m (0.40 kgf·m, 2.9 lbf·ft)

Check the sediment cup for any sign of fuel leakage.

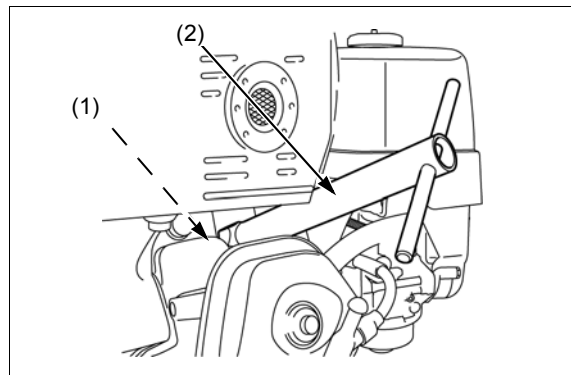


Spark Plug Check/Adjustment

⚠ CAUTION

If the engine has been running, the engine will be very hot. Allow it to cool before proceeding.

Remove the spark plug cap, and then remove the spark plug (1) using a spark plug wrench (2).

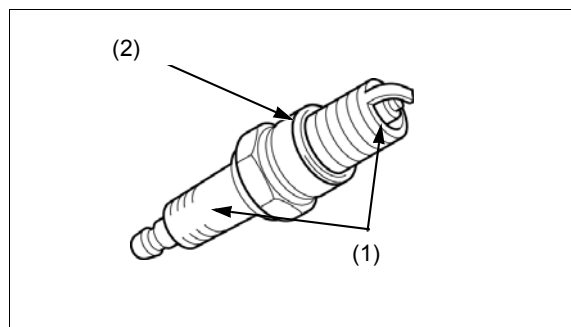


Visually check the spark plug. Replace the plug if the insulator (1) is cracked or chipped.

Check the sealing washer (2) for damage.

Replace the spark plug if the sealing washer is damaged.

SPARK PLUG: BPR6ES (NGK) W20EPR-U(DENSO)



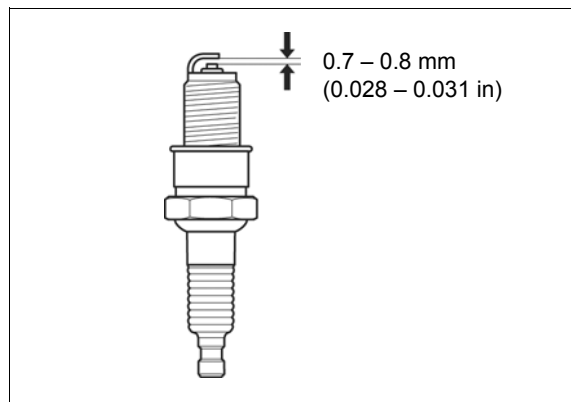
Measure the plug gap with a wire-type feeler gauge. If the measurement is out of the specification, adjust by bending the side electrode.

PLUG GAP: 0.7 – 0.8 mm (0.028 – 0.031 in)

Install the spark plug finger-tight to seat the washer, and then tighten 1/8 – 1/4 turn with a spark plug wrench.

A loose spark plug can become very hot and can damage the engine. Overtightening can damage the threads in the cylinder block.

Install the spark plug cap securely.



Spark Plug Replacement

⚠ CAUTION

If the engine has been running, the engine will be very hot. Allow it to cool before proceeding.

Remove the spark plug cap, and then remove the spark plug (1) using a spark plug wrench (2).

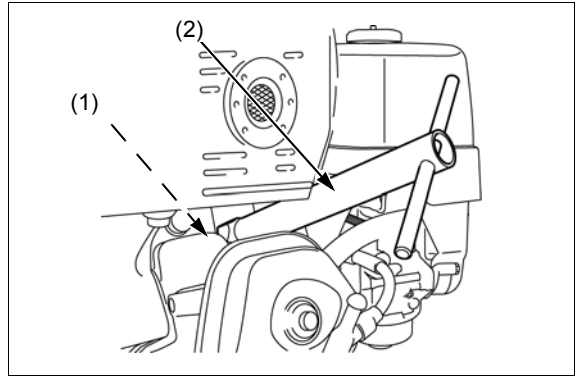
Verify the new spark plug gap is correct.

Install a new spark plug finger-tight to seat the washer, and then tighten 1/2 turn with a spark plug wrench.

SPARK PLUG: BPR6ES (NGK) W20EPR-U(DENSO)

A loose spark plug can become very hot and can damage the engine. Overtightening can damage the threads in the cylinder block.

Install the spark plug cap securely.



Spark Arrester Cleaning (if equipped)

⚠ CAUTION

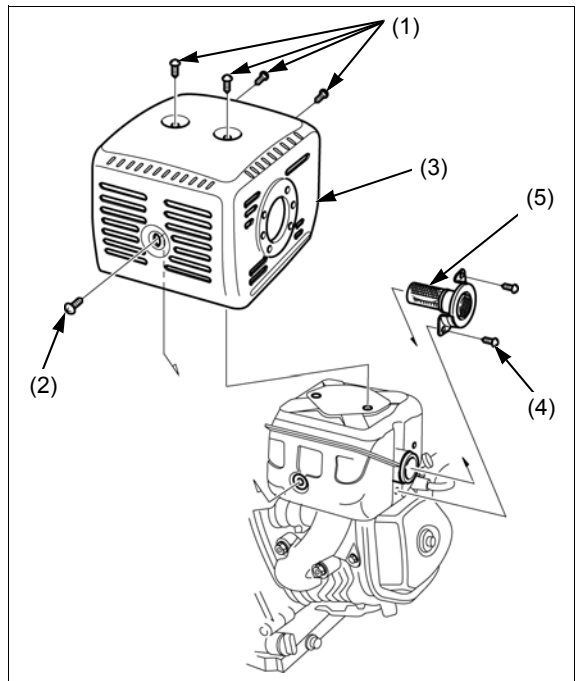
The engine and the muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot. Allow it to cool before proceeding.

Solid Protector type

Remove the muffler cover, if equipped.

Remove the 5 x 8 mm tapping screws (1), 6 x 10 mm tapping screw (2), and muffler protector (3).

Remove the 5 x 8 mm tapping screws (4) and spark arrester (5).



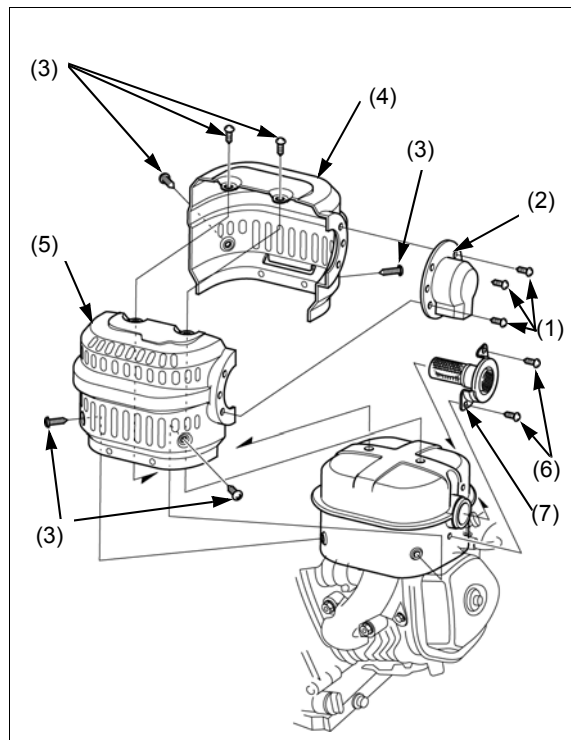
Separated Protector Type

Remove the muffler cover, if equipped.

Remove the 4 x 6 mm tapping screws (1), and exhaust deflector (2), if equipped.

Remove the 5 x 8 mm tapping screws (3), R. muffler protector (4), and L. muffler protector (5).

Remove the 5 x 8 mm tapping screws (6) and spark arrester (7).



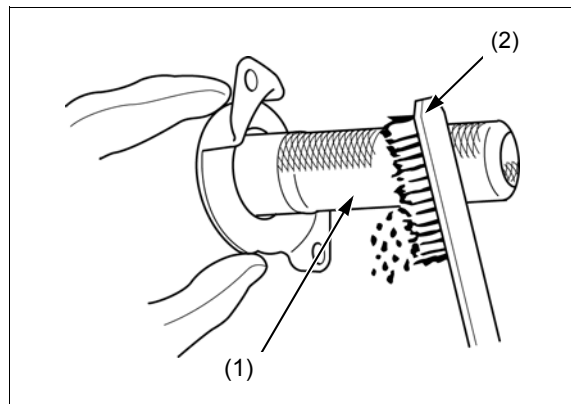
Cleaning

Be careful to avoid damaging the screen.

Clean the carbon deposits from the spark arrester screen (1) with a soft wire brush (2).

Check the spark arrester screen for damage. If the screen is damaged, replace the spark arrester.

Install the spark arrester in the reverse order of removal.

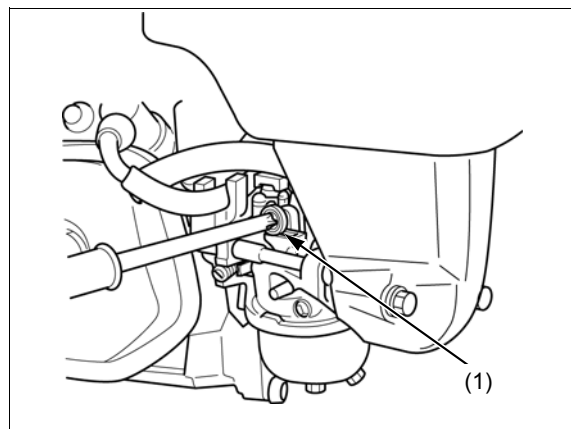


Idle Speed Check/Adjustment

Start the engine and allow it to warm up to normal operating temperature.

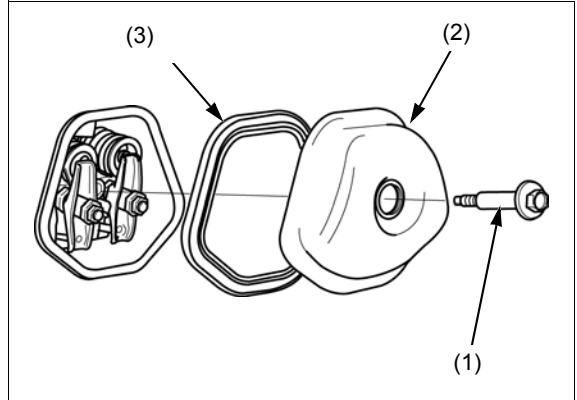
Turn the throttle stop screw (1) to obtain the specified idle speed.

IDLE SPEED: 1,400 ± 150 min⁻¹ (rpm)



Valve Clearance Check/Adjustment

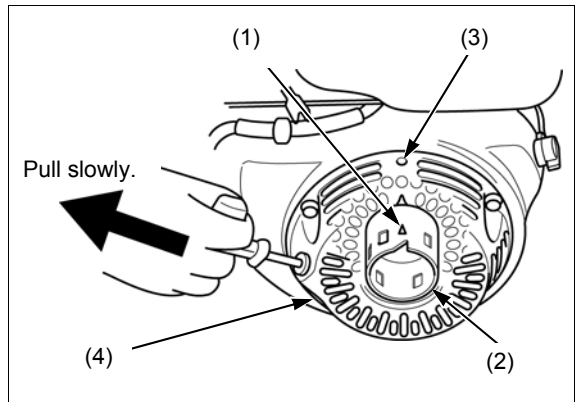
Remove the head cover bolt (1), the head cover (2), and the head cover packing (3).



Disconnect the spark plug cap from the spark plug.

Set the piston near top dead center of the cylinder compression stroke (both valves fully closed) by pulling the recoil starter slowly. When the piston is near top dead center of the compression stroke, the triangle mark (1) on the starter pulley (2) will align with the top hole (3) on the recoil starter case (4).

If the exhaust valve is open, use the recoil starter to turn the crankshaft one additional turn and align the triangle mark on the starter pulley with the top hole on the recoil starter case again.



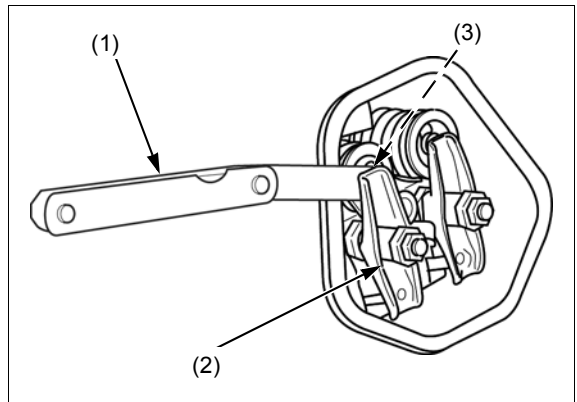
Insert a thickness gauge (1) between the valve rocker arm (2) and valve stem (3) to measure the valve clearance.

VALVE CLEARANCE:

IN: 0.15 ± 0.02 mm

EX: 0.20 ± 0.02 mm

If adjustment is necessary, proceed as follows.



Hold the rocker arm pivot (1) and loosen the pivot adjusting nut (2).

Turn the rocker arm pivot to obtain the specified clearance.

VALVE CLEARANCE:

IN: 0.15 ± 0.02 mm

EX: 0.20 ± 0.02 mm

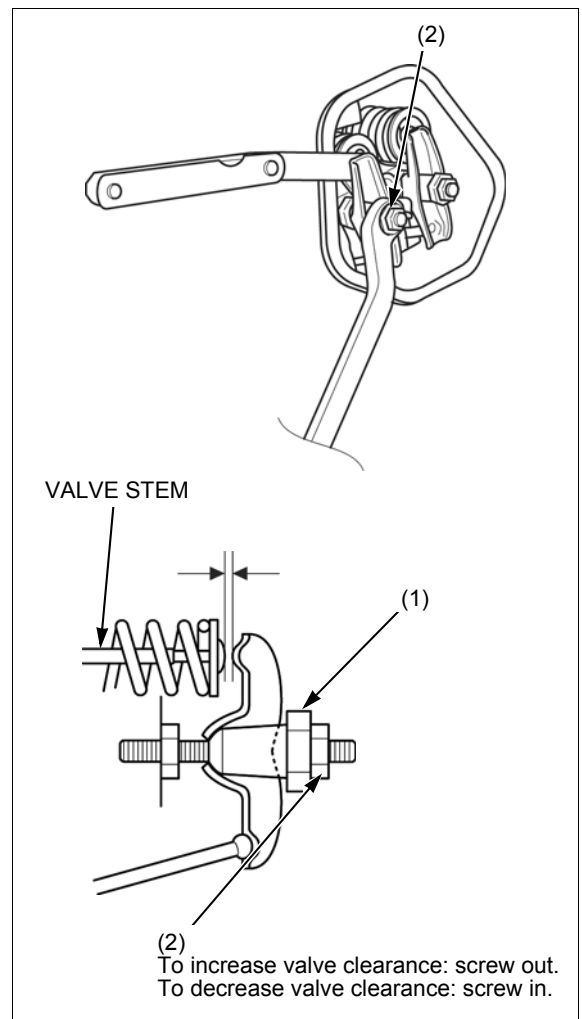
Hold the rocker arm pivot and retighten the pivot adjusting nut to the specified torque.

TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)

Recheck the valve clearance, and if necessary, readjust the clearance.

Check the head cover packing for damage or deterioration, and install it to the head cover.

Attach the cylinder head cover to the cylinder head, and tighten the head cover bolt securely.



Fuel Tank and Filter Cleaning

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

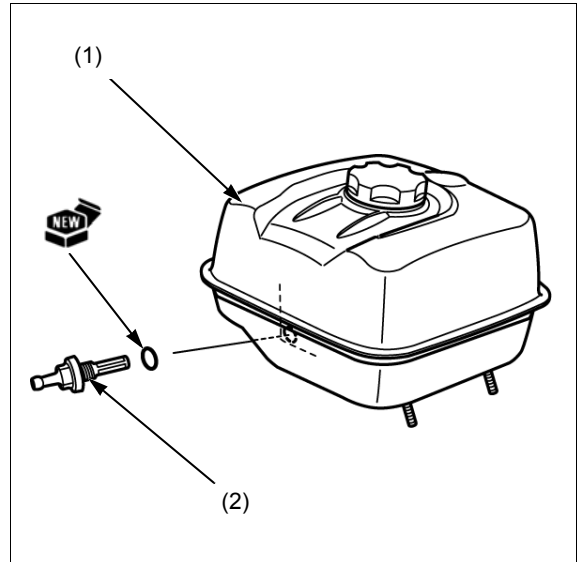
Drain the fuel into a suitable container.

Remove the fuel tank (1) and fuel tank joint (2).

Clean the fuel tank joint and fuel tank with non-flammable solvent, and allow them to dry thoroughly.

Install the fuel tank.

Check the installation part of the fuel tank for any sign of fuel leakage.



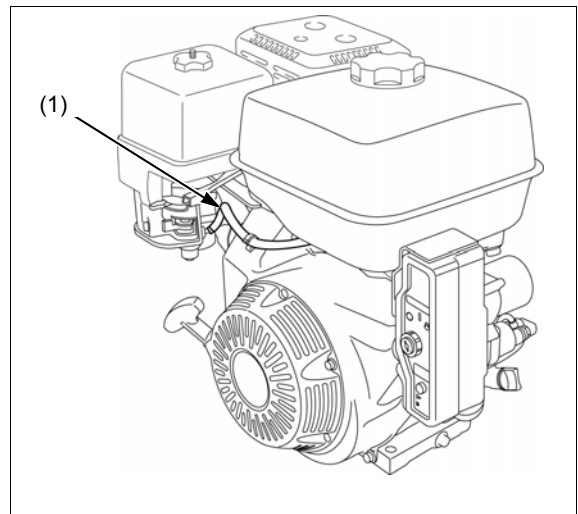
Fuel Tube Check

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

Check the fuel tube (1) for deterioration, cracks, or signs of leakage.

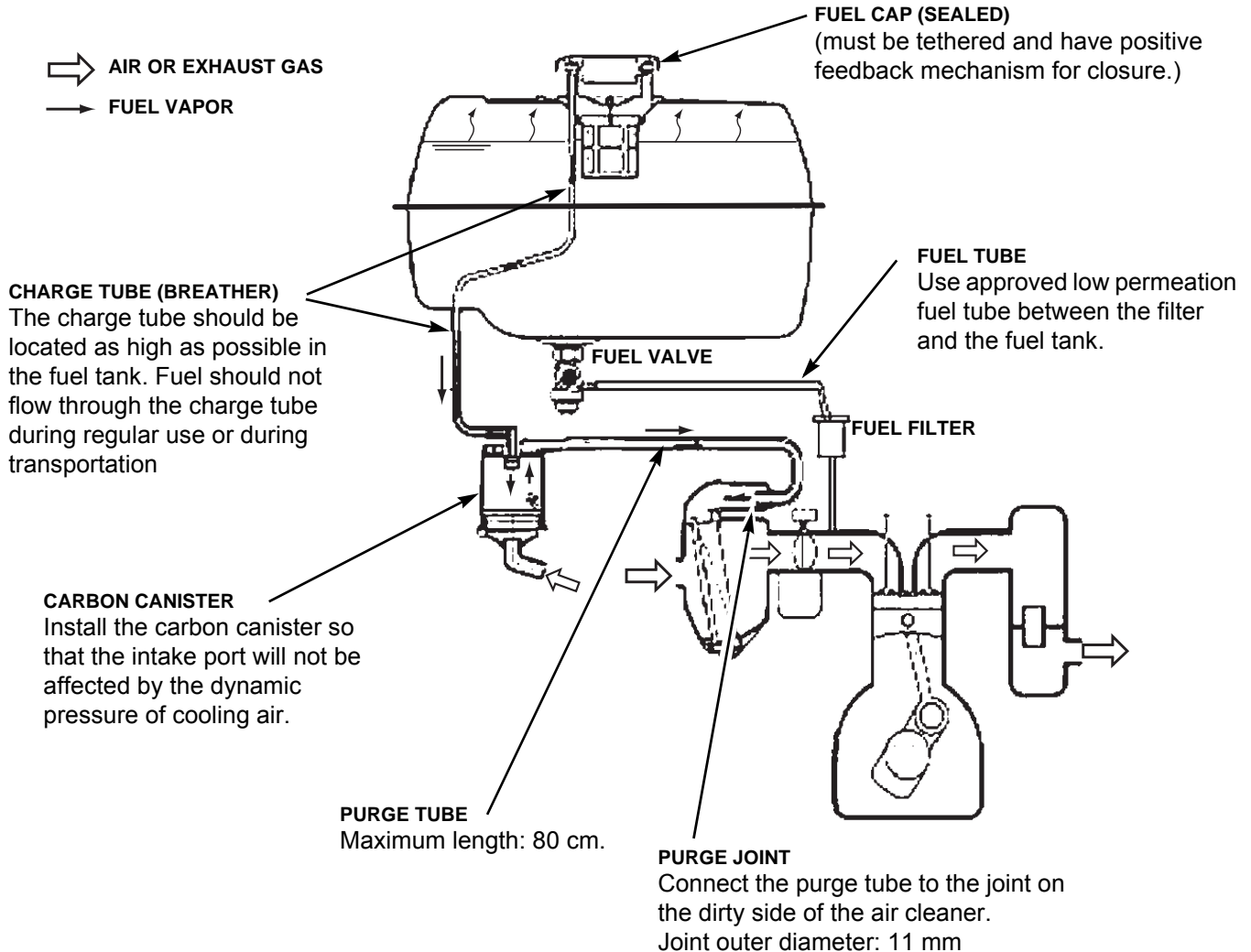


EVAPORATIVE EMISSIONS

Types with OEM provided fuel tanks

The OEM is responsible for meeting the EVAP emissions regulations for products sold in California (California Air Resources Board) and the 49 states (U.S. Environmental Protection Agency). This regulations concern evaporative emissions from the fuel system.

Shown below is a simplified overview of required components.



Additional information regarding manufacturers of CARB certified fuel system components can be found at:
<http://www.arb.ca.gov/msprog/offroad/sore/sorecomponent/sorecomponent.htm#>.

California Air Resources Board information is available at the following website:
www.arb.ca.gov/msprog/OFFROAD/sore/sorectp/sorectp.htm

U.S. Environmental Protection Agency information is available at the following website:
<http://edocket.access.gpo.gov/2008/pdf/E8-21093.pdf>

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