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**YAMAHA**

**2008**

**SERVICE MANUAL**

**XT660Z**

**TENERE**

**11D-F8197-E0**

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**XT660Z (2008)  
SERVICE MANUAL**  
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## NOTICE

This manual was produced by the Yamaha Motor Italia S.p.A. primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to include all the knowledge of a mechanic in one manual. Therefore, anyone who uses this book to perform maintenance and repairs on Yamaha vehicles should have a basic understanding of mechanics and the techniques to repair these types of vehicles. Repair and maintenance work attempted by anyone without this knowledge is likely to render the vehicle unsafe and unfit for use.

Yamaha Motor Italia S.p.A. is continually striving to improve all of its models. Modifications and significant changes in specifications or procedures will be forwarded to all authorized Yamaha dealers and will appear in future editions of this manual where applicable.

### NOTE:

Designs and specifications are subject to change without notice.

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## IMPORTANT MANUAL INFORMATION

Particularly important information is distinguished in this manual by the following.



The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

### **⚠ WARNING**

Failure to follow WARNING instructions could result in severe injury or death to the motorcycle operator, a bystander or a person checking or repairing the motorcycle.

### **CAUTION:**

A CAUTION indicates special precautions that must be taken to avoid damage to the motorcycle.

### NOTE:

A NOTE provides key information to make procedures easier or clearer.

# HOW TO USE THIS MANUAL

This manual is intended as a handy, easy-to-read reference book for the mechanic. Comprehensive explanations of all installation, removal, disassembly, assembly, repair and check procedures are laid out with the individual steps in sequential order.

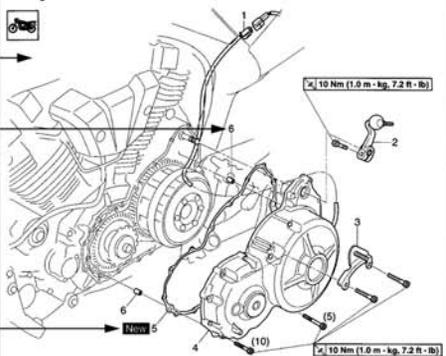
- The manual is divided into chapters and each chapter is divided into sections. The current section title “1” is shown at the top of each page.
- Sub-section titles “2” appear in smaller print than the section title.
- To help identify parts and clarify procedure steps, there are exploded diagrams “3” at the start of each removal and disassembly section.
- Numbers “4” are given in the order of the jobs in the exploded diagram. A number indicates a disassembly step.
- Symbols “5” indicate parts to be lubricated or replaced. Refer to “SYMBOLS”.
- A job instruction chart “6” accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc.
- Jobs “7” requiring more information (such as special tools and technical data) are described sequentially.

**1**

**CLUTCH**

**CLUTCH**

Removing the clutch cover



Order	Job/Parts to remove	Qty	Remarks
	Engine oil		Drain. Refer to 'CHANGING THE ENGINE OIL' on page 3-11.
	Battery box/Air duct		Refer to 'GENERAL CHASSIS' on page 4-1.
	Oil tank/Shift rod		Refer to 'ENGINE REMOVAL' on page 5-1.
1	Crankshaft position sensor coupler	1	Disconnect.
2	Shift arm	1	
3	Oil tank bracket	1	
4	Clutch cover	1	
5	Clutch cover gasket	1	
6	Dowel pin	2	

**CLUTCH**

**REMOVING THE CLUTCH**

1. Loosen:

- Clutch boss nut "1"

**NOTE:**  
While holding the clutch boss "2" with the universal clutch holder "3", loosen the clutch boss nut.

Universal clutch holder  
90890-04086  
YM-91042



2. Remove:

- Clutch boss nut "1"
- Washer "2"
- Clutch boss assembly "3"

**NOTE:**  
There is a built-in damper between the clutch boss and the clutch plate. It is not necessary to remove the wire circlip "4" and disassemble the built-in damper unless there is serious clutch chattering.

Sheave holder  
90890-01701  
Primary clutch holder  
YS-01880-A



**CHECKING THE FRICTION PLATES**

The following procedure applies to all of the friction plates.

1. Check:

- Friction plate

Damage/wear → Replace the friction plates as a set.

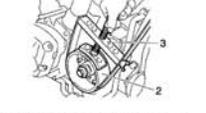
2. Measure:

- Friction plate thickness

Out of specification → Replace the friction plates as a set.

**NOTE:**  
Measure the friction plate at four places.

Friction plate thickness  
2.92-3.08 mm (0.11-0.12 in)  
Wear limit  
2.82 mm (0.1110 in)



**REMOVING THE PRIMARY DRIVE GEAR**

1. Remove:

- Primary drive gear bolt "1"

**NOTE:**  
While holding the generator rotor "2" with the sheave holder "3", loosen the primary drive gear bolt.



5-47

5-56

## SYMBOLS

The following symbols are used in this manual for easier understanding.

**NOTE:**

The following symbols are not relevant to every vehicle.

1. Serviceable with engine mounted
2. Filling fluid
3. Lubricant
4. Special tool
5. Tightening torque
6. Wear limit, clearance
7. Engine speed
8. Electrical data
9. Engine oil
10. Gear oil
11. Molybdenum disulfide oil
12. Wheel bearing grease
13. Lithium-soap-based grease
14. Molybdenum disulfide grease
15. Apply locking agent (LOCTITE®)
16. Replace the part with a new one.

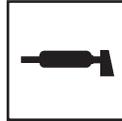
1



2



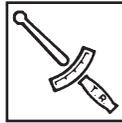
3



4



5



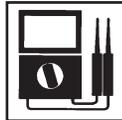
6



7



8



9



10



11



12



13



14



15



16

**New**

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## GENERAL INFORMATION

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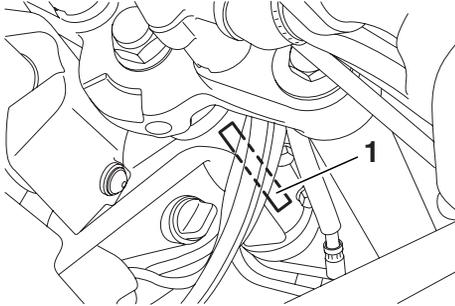
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## IDENTIFICATION

EAS00170

### VEHICLE IDENTIFICATION NUMBER

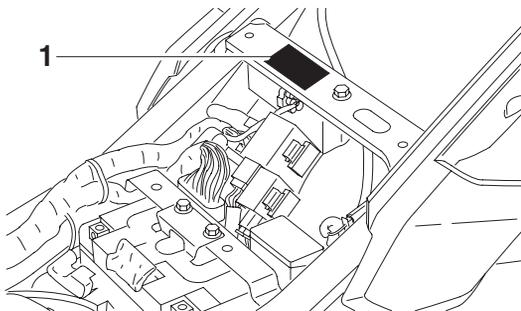
The vehicle identification number “1” is stamped into the right side of the steering head pipe.



EAS00180

### MODEL LABEL

The model label “1” is affixed to the frame under the seat. This information will be needed to order spare parts.



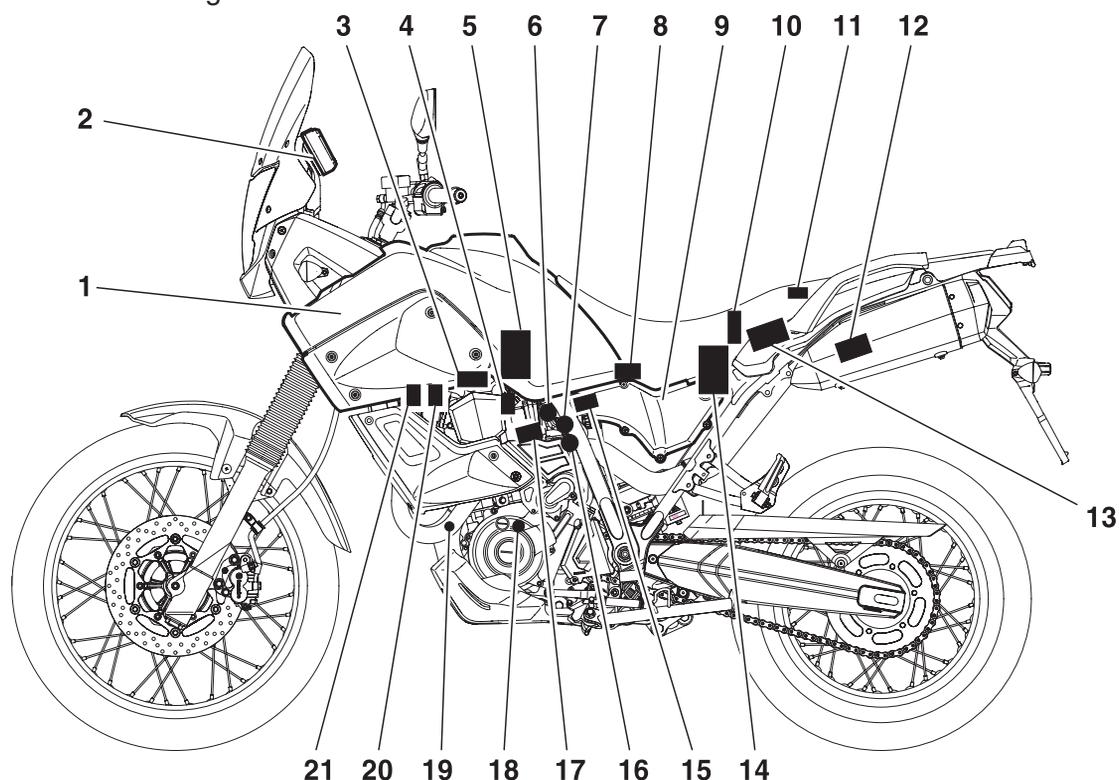
EAS00019

## FEATURES

EAS00896

### OUTLINE OF THE FI SYSTEM

The main function of a fuel supply system is to provide fuel to the combustion chamber at the optimum air-fuel ratio in accordance with the engine operating conditions and the atmospheric temperature. In a conventional carburetor system, the air-fuel ratio of the mixture that is supplied to the combustion chamber is created by the volume of the intake air and the fuel that is metered by the jet used in the respective chamber. Despite the same volume of intake air, the fuel volume requirement varies with the engine operating conditions, such as acceleration, deceleration, or operation under a heavy load. Carburetors that meter the fuel through the use of jets have been provided with various auxiliary devices, so that an optimum air-fuel ratio can be achieved to accommodate the constant changes in the operating conditions of the engine. As the requirements for engines to deliver more performance and cleaner exhaust gases increase, it becomes necessary to control the air-fuel ratio in a more precise and finely tuned manner. To accommodate this need, this model has adopted an electronically controlled fuel injection (FI) system in place of a conventional carburetor system. This system can achieve an optimum air-fuel ratio required by the engine at all times by using a microprocessor that regulates the fuel injection volume according to the engine operating conditions detected by various sensors. Adoption of the FI system has resulted in a highly precise fuel supply, improved engine response, better fuel economy, and reduced exhaust emissions. Furthermore, the air induction system (AI system) has been placed under computer control together with the FI system in order to realize cleaner exhaust gases.



- |                                 |                                   |
|---------------------------------|-----------------------------------|
| 1. Fuel tank                    | 12. Catalytic converter           |
| 2. Engine trouble warning light | 13. Fuel injection system relay   |
| 3. Ignition coil                | 14. Battery                       |
| 4. Spark plug                   | 15. Intake air temperature sensor |
| 5. Fuel pump                    | 16. Coolant temperature sensor    |
| 6. Idling adjustment screw      | 17. Fuel injector                 |
| 7. Throttle position sensor     | 18. Crankshaft position sensor    |
| 8. Intake air pressure sensor   | 19. O <sub>2</sub> sensor         |
| 9. Air filter case              | 20. Air induction system solenoid |
| 10. ECU                         | 21. Air cut-off valve             |
| 11. Lean angle cut-off switch   |                                   |

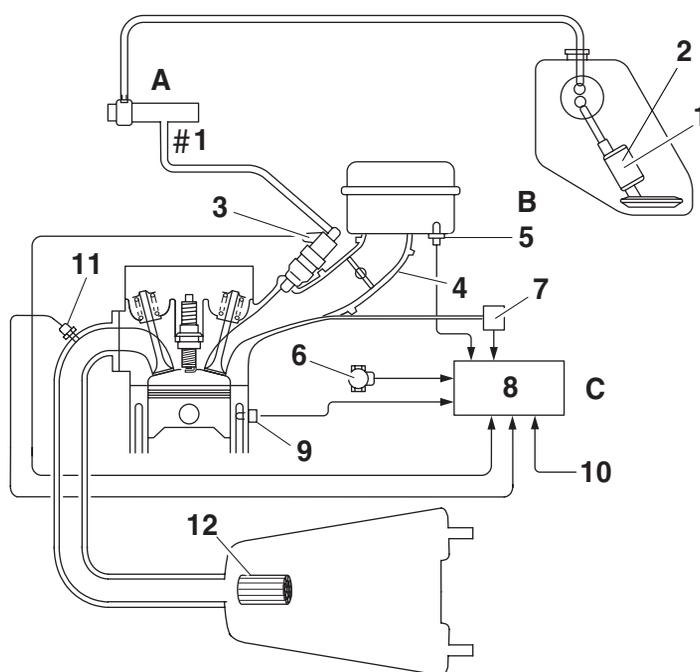
EAS00897

## FI SYSTEM

The fuel pump delivers fuel to the injector via the fuel filter. The pressure regulator maintains the fuel pressure that is applied to the injector at 324 kPa (3.24 kg/cm<sup>2</sup>, 46.1 psi) higher than the intake manifold pressure. Accordingly, when the energizing signal from the ECU energizes the injector, the fuel passage opens, causing the fuel to be injected into the intake manifold only during the time the passage remains open. Therefore, the longer the length of time the injector is energized (injection duration), the greater the volume of fuel that is supplied. Conversely, the shorter the length of time the injector is energized (injection duration), the lesser the volume of fuel that is supplied.

The injection duration and the injection timing are controlled by the ECU. Signals that are input from the throttle position sensor, crankshaft position sensor, intake air pressure sensor, intake air temperature sensor, coolant temperature sensor and O<sub>2</sub> sensor enable the ECU to determine the injection duration. The injection timing is determined through the signal from the crankshaft position sensor. As a result, the volume of fuel that is required by the engine can be supplied at all times in accordance with the driving conditions.

**Illustration is for reference only.**



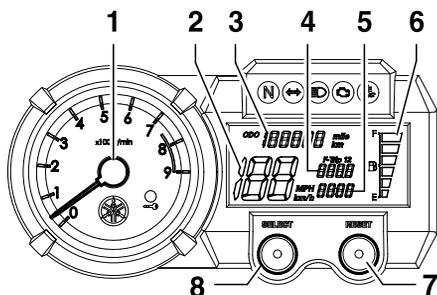
1. Fuel pump
2. Pressure regulator
3. Fuel injector
4. Throttle body
5. Intake air temperature sensor
6. Throttle position sensor
7. Intake air pressure sensor
8. ECU
9. Coolant temperature sensor
10. Crankshaft position sensor
11. O<sub>2</sub> sensor
12. Catalytic converter

- A. Fuel system
- B. Air system
- C. Control system

## INSTRUMENT FUNCTIONS

EAUB1500

### Multi-function display



1. Tachometer
2. Speedometer
3. Odometer
4. Tripmeters/Fuel reserve tripmeter
5. Clock
6. Fuel meter
7. "RESET" button
8. "SELECT" button

EWA12311

### **⚠ WARNING**

**Be sure to stop the vehicle before making any setting changes to the multi-function display.**

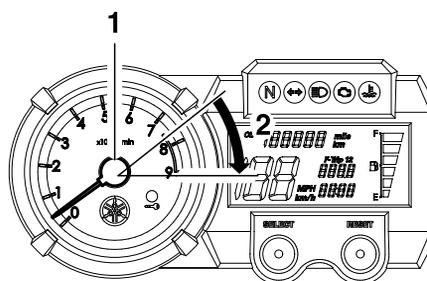
The multi-function display is equipped with the following:

- a speedometer (which shows the riding speed)
- a digital tachometer (which shows engine r/min)
- an odometer (which shows the total distance traveled)
- two tripmeters (which show the distance traveled since they were last set to zero)
- a fuel reserve tripmeter (which shows the distance traveled since the bottom segment of the fuel meter started flashing)
- a clock
- a fuel meter
- a self-diagnosis device

### NOTE:

- Be sure to turn the key to "ON" before using the "SELECT" and "RESET" buttons.
- For the U.K. only: To switch the speedometer and odometer/tripmeter displays between kilometers and miles, push the "SELECT" and "RESET" buttons together and turn the key to "ON". When the digits start flashing on the display push the "SELECT" button to choose kilometers or miles.

### Tachometer



1. Tachometer
2. Red zone

The tachometer allows the rider to monitor the engine speed and keep it within the ideal power range.

When the key is turned to "ON", the tachometer needle will sweep once across the r/min range and then return to zero r/min in order to test the electrical circuit.

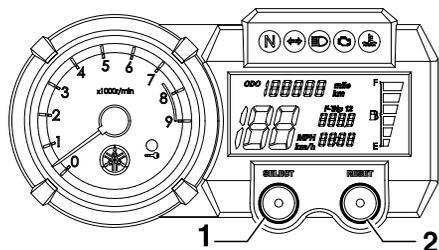
ECA10030

### **CAUTION:**

**Do not operate the engine in the tachometer red zone.**

**Red zone: 7,500 r/min and above.**

## Tripmeter and tachometer modes



1. "SELECT" button
2. "RESET" button

Pushing the "SELECT" button switches the display between the tripmeter modes "TRIP 1" and "TRIP 2" in the following order:

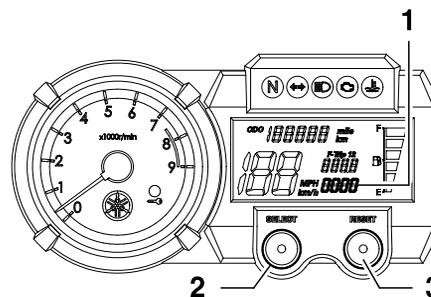
TRIP 1 → TRIP 2 → TRIP 1

When the fuel amount in the fuel tank decreases to 6.7 L (1.77 US gal) (1.47 Imp.gal), the bottom segment of the fuel meter will start flashing, and the tripmeter display will automatically change to the fuel reserve tripmeter mode "F-TRIP" and start counting the distance traveled from that point. In that case, pushing the "SELECT" button switches the display between the various tripmeter modes in the following order:

F-TRIP → TRIP 1 → TRIP 2 → F-TRIP

To reset a tripmeter, select it by pushing the "SELECT" button, and then push the "RESET" button for at least four seconds. If you do not reset the fuel reserve tripmeter manually, it will reset itself automatically and the display will return to the prior mode after refueling and traveling 5 km (3 mi).

## Clock mode



1. Clock
2. "SELECT" button
3. "RESET" button

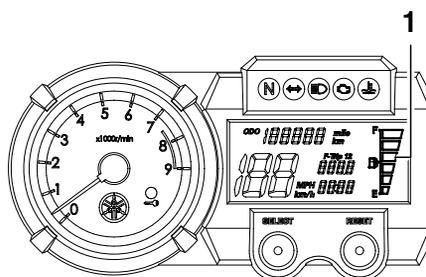
### NOTE:

The clock is displayed even when the key is turned to "OFF".

### To set the clock

1. Push the "SELECT" button for at least four seconds.
2. When the hour digits start flashing, push the "RESET" button to set the hours.
3. Push the "SELECT" button, and the minute digits will start flashing.
4. Push the "RESET" button to set the minutes.
5. Push the "SELECT" button and then release it to start the clock.

## Fuel meter



1. Fuel meter

With the key in the "ON" position, the fuel meter indicates the amount of fuel in the fuel tank. When the key is turned to "ON", all of the display segments of the fuel meter will appear one after the other and then disappear in order to test the electrical circuit. The display segments of the fuel meter disappear towards "E" (Empty) as the fuel level decreases. When only one segment is left near "E" (Empty), refuel as soon as possible.

**NOTE:**

This fuel meter is equipped with a selfdiagnosis system. If the electrical circuit is defective all the segments will start flashing.

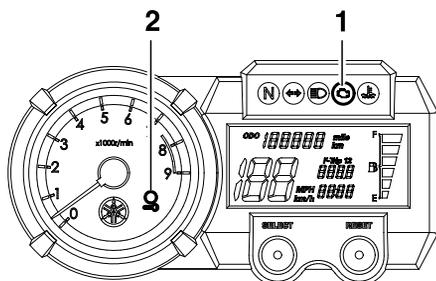
If the multifunction display indicates an error code, note the code number, and then check the vehicle. Refer to “IMMOBILIZER SYSTEM” on page 8-29.

ECA11590

**CAUTION:**

If the display indicates an error code, the vehicle should be checked as soon as possible in order to avoid engine damage.

**Self-diagnosis devices**



1. Engine trouble warning light “

This model is equipped with a self-diagnosis device for various electrical circuits.

If any of those circuits are defective, the engine trouble warning light will start flashing.

Refer to “FUEL INJECTION SYSTEM” on page 7-16. This model is also equipped with a self-diagnosis device for the immobilizer system.

Turn the key to "ON". If any of the immobilizer system circuits are defective, the immobilizer system indicator light will flash, and it will indicate an error code. Refer to “IMMOBILIZER SYSTEM” on page 8-29. However, if the indicator light slowly flashes five times, and then quickly flashes two times repeatedly, this error could be caused by signal interference. If this occurs, try the following.

1. Use the code re-registering key to start the engine.

**NOTE:**

Make sure there are no other immobilizer keys close to the main switch, and do not keep more than one immobilizer key on the same key ring! Immobilizer system keys may cause signal interference, which may prevent the engine from starting.

2. If the engine starts, turn it off and try starting the engine with the standard keys.
3. If one or both of the standard keys do not start the engine, re-register the standard keys.

# IMPORTANT INFORMATION

EAS20180

## IMPORTANT INFORMATION

EAS20190

### PREPARATION FOR REMOVAL AND DISASSEMBLY

1. Before removal and disassembly, remove all dirt, mud, dust and foreign material.



2. Use only the proper tools and cleaning equipment. Refer to "SPECIAL TOOLS" on page 1-10.
3. When disassembling, always keep mated parts together. This includes gears, cylinders, pistons and other parts that have been "mated" through normal wear. Mated parts must always be reused or replaced as an assembly.



4. During disassembly, clean all of the parts and place them in trays in the order of disassembly. This will speed up assembly and allow for the correct installation of all parts.
5. Keep all parts away from any source of fire.

EAS20200

### REPLACEMENT PARTS

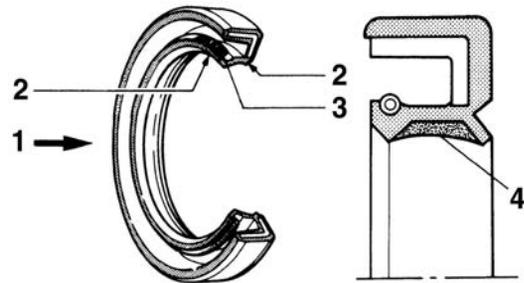
Use only genuine Yamaha parts for all replacements. Use oil and grease recommended by Yamaha for all lubrication jobs. Other brands may be similar in function and appearance, but inferior in quality.



EAS20210

### GASKETS, OIL SEALS AND O-RINGS

1. When overhauling the engine, replace all gaskets, seals and O-rings. All gasket surfaces, oil seal lips and O-rings must be cleaned.
2. During reassembly, properly oil all mating parts and bearings and lubricate the oil seal lips with grease.

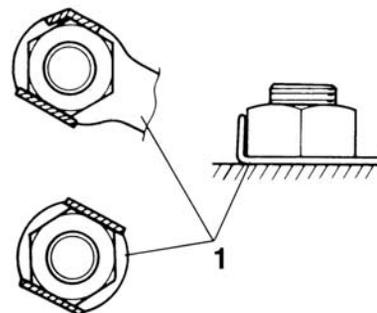


1. Oil
2. Lip
3. Spring
4. Grease

EAS20220

### LOCK WASHERS/PLATES AND COTTER PINS

After removal, replace all lock washers/plates "1" and cotter pins. After the bolt or nut has been tightened to specification, bend the lock tabs along a flat of the bolt or nut.



EAS20230

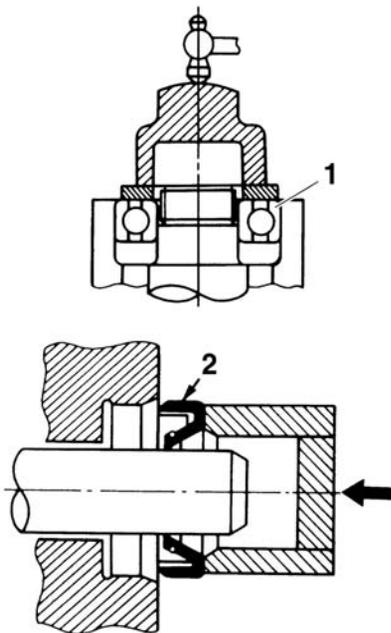
## BEARINGS AND OIL SEALS

Install bearings "1" and oil seals "2" so that the manufacturer's marks or numbers are visible. When installing oil seals, lubricate the oil seal lips with a light coat of lithium-soap-based grease. Oil bearings liberally when installing, if appropriate.

ECA13300

### CAUTION:

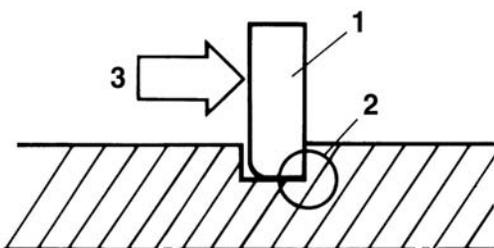
**Do not spin the bearing with compressed air because this will damage the bearing surfaces.**



EAS20240

## CIRCLIPS

Before reassembly, check all circlips carefully and replace damaged or distorted circlips. Always replace piston pin clips after one use. When installing a circlip "1", make sure the sharp-edged corner "2" is positioned opposite the thrust "3" that the circlip receives.



# CHECKING THE CONNECTIONS

EAS20250

## CHECKING THE CONNECTIONS

Check the leads, couplers, and connectors for stains, rust, moisture, etc.

### 1. Disconnect:

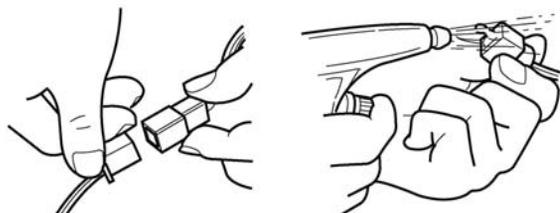
- Lead
- Coupler
- Connector

### 2. Check:

- Lead
- Coupler
- Connector

Moisture → Dry with an air blower.

Rust/stains → Connect and disconnect several times.

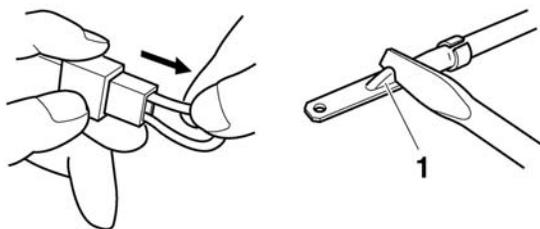


### 3. Check:

- All connections
- Loose connection → Connect properly.

### NOTE:

If the pin "1" on the terminal is flattened, bend it up.



### 4. Connect:

- Lead
- Coupler
- Connector

### NOTE:

Make sure all connections are tight.

### 5. Check:

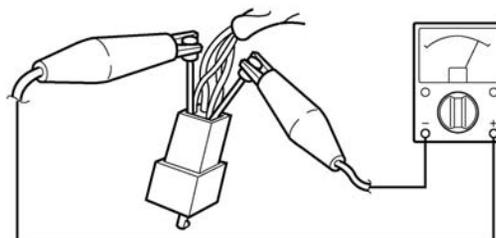
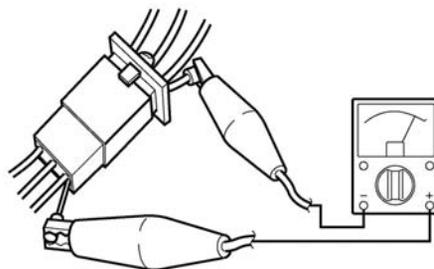
- Continuity  
(with the pocket tester)



Pocket tester  
90890-03112

### NOTE:

- If there is no continuity, clean the terminals.
- When checking the wire harness, perform steps (1) to (3).
- As a quick remedy, use a contact revitalizer available at most part stores.

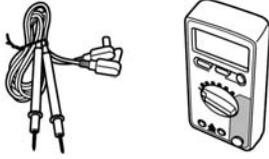
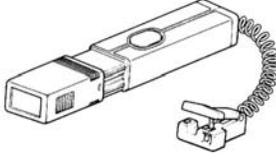
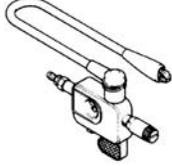
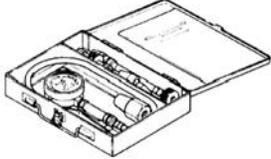
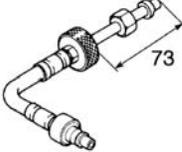


# SPECIAL TOOLS

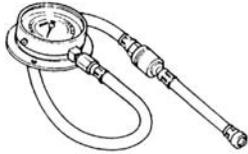
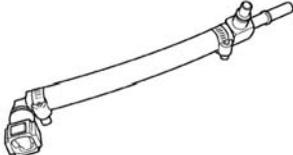
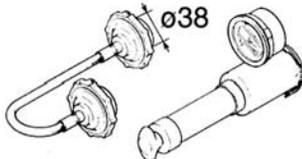
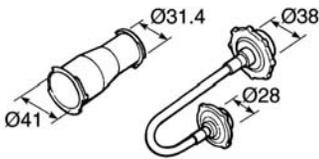
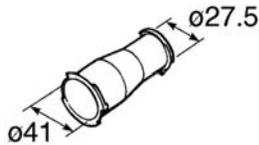
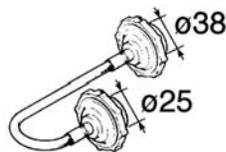
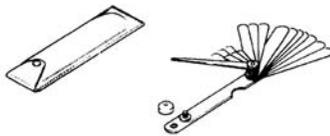
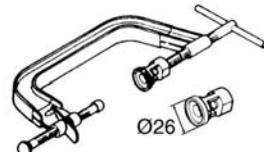
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## SPECIAL TOOLS

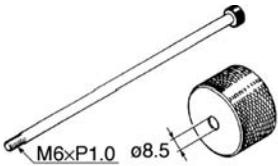
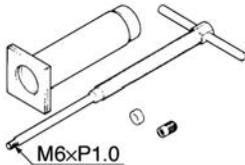
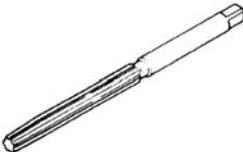
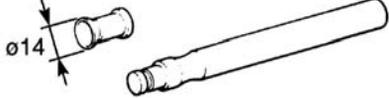
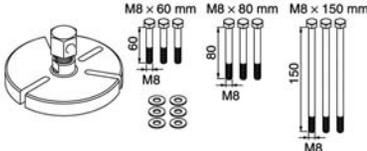
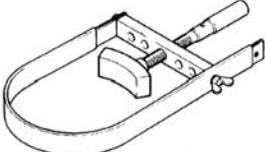
The following special tools are necessary for complete and accurate tune-up and assembly. Use only the appropriate special tools as this will help prevent damage caused by the use of inappropriate tools or improvised techniques. Special tools, part numbers or both may differ depending on the country. When placing an order, refer to the list provided below to avoid any mistakes.

Tool name/Tool No.	Illustration	Reference pages
Pocket tester 90890-03112		5-58, 8-45, 8-46, 8-47, 8-48, 8-52, 8-53, 8-54, 8-55, 8-56, 8-57, 8-58, 8-59, 8-60
Digital circuit tester 90890-03174		7-10
Fuel injection system tester 90890-03182		7-23
Timing light 90890-03141		3-7
Ignition checker 90890-06754		8-55
Compression gauge 90890-03081		3-8
Adaptor (Compression gauge) 90890-04082		3-8

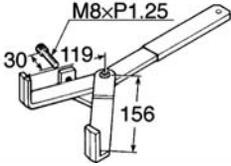
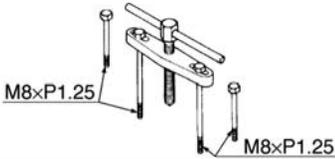
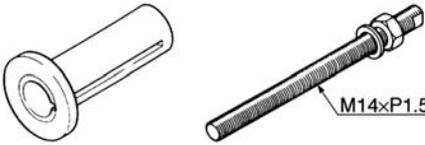
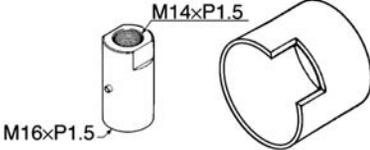
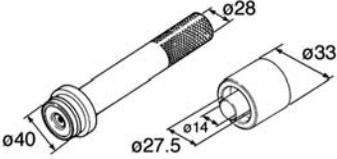
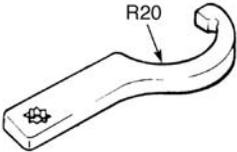
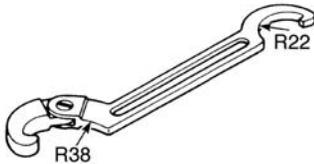
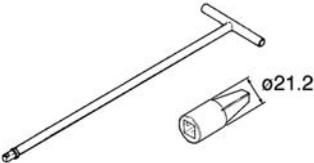
## SPECIAL TOOLS

Tool name/Tool No.	Illustration	Reference pages
Pressure gauge 90890-03153		7-8
Fuel pressure adapter 90890-03176		7-8
Radiator cap tester 90890-01325		6-2, 6-3
Radiator cap tester adaptor 90890-01352		6-2
Radiator cap tester adapter 90890-01497		6-2
Radiator tester adapter 90890-01496		6-3
Thickness gauge 90890-03079		3-4
Valve spring compressor attachment 90890-01243 Valve spring compressor 90890-04019		5-20, 5-25

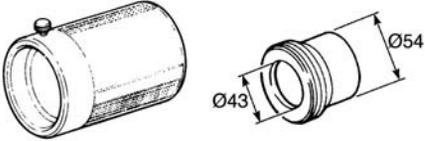
## SPECIAL TOOLS

Tool name/Tool No.	Illustration	Reference pages
Slide hammer bolt 90890-01083 Weight 90890-01084		5-15, 5-17
Piston pin puller set 90890-01304		5-27
Valve guide remover (ø 6) 90890-04064		5-21
Valve guide installer (ø 6) 90890-04065		5-21
Valve guide reamer (ø 6) 90890-04066		5-21
Valve lapper 90890-04101		-
Flywheel puller 90890-01362		5-53
Sheave holder 90890-01701		5-53, 5-55

# SPECIAL TOOLS

Tool name/Tool No.	Illustration	Reference pages
Universal clutch holder 90890-04086		5-35, 5-37
Crankcase separating tool 90890-01135		5-67
Crankshaft installer pot 90890-01274 Crankshaft installer bolt 90890-01275		5-68
Adapter 90890-04130 Spacer (crankshaft installer) 90890-04144		5-68
Middle driven shaft bearing driver 90890-04058 Mechanical seal installer 90890-04132		6-10
Steering nut wrench 90890-01403		3-24, 4-59, 4-60
Ring nut wrench 90890-01268		4-59
T-handle 90890-01326 Damper rod holder 90890-01460		4-51, 4-53

## SPECIAL TOOLS

Tool name/Tool No.	Illustration	Reference pages
Fork seal driver weight 90890-01367 Fork seal driver attachment (ø 43) 90890-01374		4-53, 4-54
Yamaha bond No. 1215 90890-85505		5-55, 5-62, 5-64, 6-10

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## SPECIFICATIONS

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# GENERAL SPECIFICATIONS

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## GENERAL SPECIFICATIONS

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### Model

Model code	11D1 (EUR)
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### Dimensions

Overall length	2246 mm (88.42 in)
Overall width	864 mm (34.01 in)
Overall height	1477 mm (58.14 in)
Seat height	896 mm (35.27 in)
Wheelbase	1500 mm (59.05 in)
Ground clearance	260 mm (10.23 in)
Minimum turning radius	1958 mm (77.08 in)

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### Weight

With oil and fuel	208.5 kg (459 lb)
Maximum load	190 kg (419 lb)

# ENGINE SPECIFICATIONS

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## ENGINE SPECIFICATIONS

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### Engine

Engine type	Liquid-cooled, 4-stroke, SOHC
Displacement	660 cm <sup>3</sup> (40.27 cu-in)
Cylinder arrangement	Forward-inclined single cylinder
Bore x stroke	100.0 x 84.0 mm (3.94 x 3.31 in)
Compression ratio	10.00 : 1
Engine idling speed	1,400-1,600 r/min
Water temperature	80 °C (176 °F)
Oil temperature	55-65 °C (131-152 °F)
Standard compression pressure	650 kPa/800 r/min (6.5 kg/cm <sup>2</sup> /800 r/min, 92.4 psi/800 r/min)
Starting system	Electric starter

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### Fuel

Recommended fuel	Premium unleaded gasoline only
Fuel tank capacity	23.0 L (5.06 Imp gal, 6.07 US gal)
Fuel reserve amount	6.7 L (1.46 Imp gal, 1.76 US gal)

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### Engine oil

Lubrication system	Dry sump
Oil type	SAE10W30 or SAE10W40 or SAE15W40 or SAE20W40 or SAE20W50
Recommended engine oil grade	API service SG type or higher, JASO standard MA

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### Engine oil quantity

Total amount	2.90 L (2.55 Imp qt, 3.07 US qt)
Without oil filter element replacement	2.50 L (2.19 Imp qt, 2.64 US qt)
With oil filter element replacement	2.60 L (2.26 Imp qt, 2.73 US qt)

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### Oil filter

Oil filter type	Paper
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### Air filter

Air filter element	Dry element
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### Oil pump

Oil pump type	Trochoid
Inner-rotor-to-outer-rotor-tip clearance	0.025 mm (0.00098 in)
Limit	0.20 mm (0.00079 in)
Outer-rotor-to-oil-pump-housing clearance	0.090-0.150 mm (0.0035-0.0059 in)
Limit	0.22 mm (0.0087 in)
Oil pump housing-to-inner-rotor and outer-rotor clearance	0.03-0.08 mm (0.0012-0.0031 in)
Limit	0.15 mm (0.0059 in)
Bypass valve opening pressure	40.0-80.0 kPa (5.8-11.6 psi) (0.40-0.80 kg/cm <sup>2</sup> )
Pressure check location	Oil filter chamber

# ENGINE SPECIFICATIONS

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## Cooling system

Radiator capacity (including all routes)	1.20 L (1.25 US qt) (1.06 Imp.qt)
Coolant reservoir capacity (up to the maximum level mark)	0.50 L (0.52 US qt) (0.44 Imp.qt)
Radiator cap opening pressure	110.0-140.0 kPa (16.0-20.3 psi) (1.10-1.40 kg/cm <sup>2</sup> )

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## Radiator core

Width	332.0 mm (13.07 in)
Height	158.0 mm (6.22 in)
Depth	23.0 mm (0.91 in)

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## Water pump

Water pump type	Single suction centrifugal pump
Reduction ratio	27/28 (0.964)
Maximum impeller shaft tilt	0.15 mm (0.006 in)

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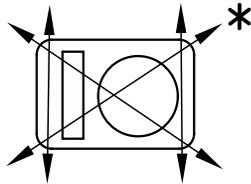
## Spark plug

Manufacturer/Model	NGK/CR7E
Spark plug gap	0.7-0.8 mm (0.028-0.031 in)

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## Cylinder head

Volume	59.10-60.50 cm <sup>3</sup> (3.61-3.69 cu-in)
Maximum warpage*	0.03 mm (0.0012 in)




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## Camshaft

Drive system	Chain drive (left)
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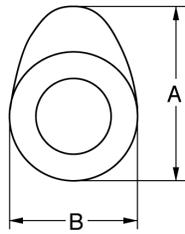
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## Camshaft lobe dimensions

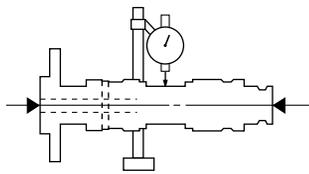
Intake A	43.488-43.588 mm (1.7121-1.7161 in)
Limit	43.338 mm (1.7062 in)
Intake B	36.959-37.059 mm (1.4551-1.4590 in)
Limit	36.859 mm (1.4511 in)
Intake (depth)	6.538 mm (0.2574 in)
Exhaust A	43.129-43.229 mm (1.6980-1.7019 in)
Limit	43.029 mm (1.694 in)

# ENGINE SPECIFICATIONS

Exhaust B	37.007-37.107 mm (1.4570-1.4609 in)
Limit	36.907 mm (1.4530 in)
Exhaust (depth)	6.179 mm (0.2432 in)



Camshaft runout limit	0.030 mm (0.0012 in)
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## Valve timing

Intake - open (B.T.D.C.)	25°
Intake - closed (A.B.D.C.)	55°
Exhaust - open (B.B.D.C.)	60°
Exhaust - closed (A.T.D.C.)	20°
Overlap angle "A"	45°

## Timing chain

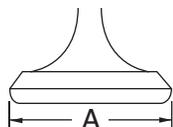
Model/number of links	98 x RH2010/126
Tensioning system	Automatic

## Rocker arm/rocker arm shaft

Rocker arm inside diameter	12.000-12.018 mm (0.4724-0.4731 in)
Limit	12.036 mm (0.4739 in)
Rocker arm shaft outside diameter	11.981-11.991 mm (0.4717-0.4721 in)
Limit	11.955 mm (0.4707 in)
Rocker-arm-to-rocker-arm-shaft clearance	0.009-0.037 mm (0.0004-0.0015 in)
Limit	0.081 mm (0.0032 in)

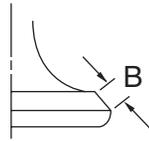
## Valves, valve seats, valve guides

Valve clearance (cold)	
Intake	0.09-0.13 mm (0.0035-0.0051 in)
Exhaust	0.16-0.20 mm (0.0063-0.0079 in)
Valve dimensions	
Valve head diameter A (intake)	37.90-38.10 mm (1.4921-1.5000 in)
Valve head diameter A (exhaust)	31.90-32.10 mm (1.2559-1.2638 in)

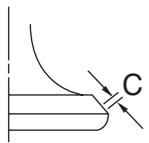


# ENGINE SPECIFICATIONS

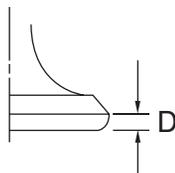
Valve face width B (intake)	1.910-2.620 mm (0.075-0.103 in)
Valve face width B (exhaust)	1.910-2.620 mm (0.075-0.103 in)



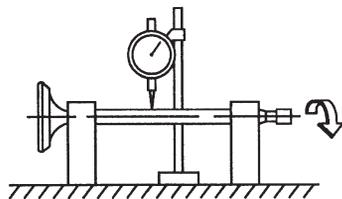
Valve seat width C (intake)	1.00-1.20 mm (0.0394-0.0472 in)
Limit	1.6 mm (0.06 in)
Valve seat width C (exhaust)	1.00-1.20 mm (0.0394-0.0472 in)
Limit	1.6 mm (0.06 in)



Valve margin thickness D (intake)	0.80-1.20 mm (0.0315-0.0472 in)
Valve margin thickness D (exhaust)	0.80-1.20 mm (0.0315-0.0472 in)



Valve stem diameter (intake)	5.975-5.990 mm (0.2352-0.2358 in)
Limit	5.945 mm (0.2341 in)
Valve stem diameter (exhaust)	5.960-5.975 mm (0.2346-0.2352 in)
Limit	5.930 mm (0.2335 in)
Valve guide inside diameter (intake)	6.000-6.012 mm (0.2362-0.2367 in)
Limit	6.05 mm (0.2382 in)
Valve guide inside diameter (exhaust)	6.000-6.012 mm (0.2362-0.2367 in)
Limit	6.05 mm (0.2382 in)
Valve-stem-to-valve-guide clearance (intake)	0.010-0.037 mm (0.0004-0.0015 in)
Limit	0.08 mm (0.0031 in)
Valve-stem-to-valve-guide clearance (exhaust)	0.025-0.052 mm (0.0010-0.0020 in)
Limit	0.10 mm (0.0039 in)
Valve stem runout	0.010 mm (0.0004 in)

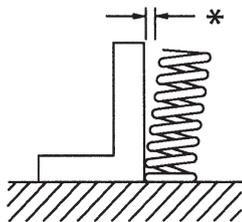


# ENGINE SPECIFICATIONS

Cylinder head valve seat width (intake)	1.00-1.20 mm (0.0394-0.0472 in)
Limit	1.6 mm (0.06 in)
Cylinder head valve seat width (exhaust)	1.00-1.20 mm (0.0394-0.0472 in)
Limit	1.6 mm (0.06 in)
Valve face material	Stellite
Valve seat material (intake)	PB6
Valve seat material (exhaust)	PB1W

## Valve springs

Free length (intake)	40.38 mm (1.59 in)
Limit	38.36 mm (1.51 in)
Free length (exhaust)	40.38 mm (1.59 in)
Limit	38.36 mm (1.51 in)
Installed length (valve closed) (intake)	35.00 mm (1.38 in)
Installed length (valve closed) (exhaust)	35.00 mm (1.38 in)
Spring rate (K1) (intake)	34.18 N/mm
Spring rate (K2) (intake)	44.14 N/mm
Spring rate (K1) (exhaust)	34.18 N/mm
Spring rate (K2) (exhaust)	44.14 N/mm
Installed compression spring force (intake)	171.00-197.00 N (38.44-44.29 lb) (17.44-20.09 kg)
Installed compression spring force (exhaust)	171.00-197.00 N (38.44-44.29 lb) (17.44-20.09 kg)
Spring tilt (intake)*	2.5°/1.8 mm
Spring tilt (exhaust)*	2.5°/1.8 mm



Winding direction (top view) (intake)	Clockwise
Winding direction (top view) (exhaust)	Clockwise

## Cylinder

Bore	100.000-100.010 mm (3.9370-3.9374 in)
Limit	100.080 mm (3.9402 in)
Maximum taper	0.050 mm (0.0020 in)
Maximum out-of-round	0.050 mm (0.0020 in)