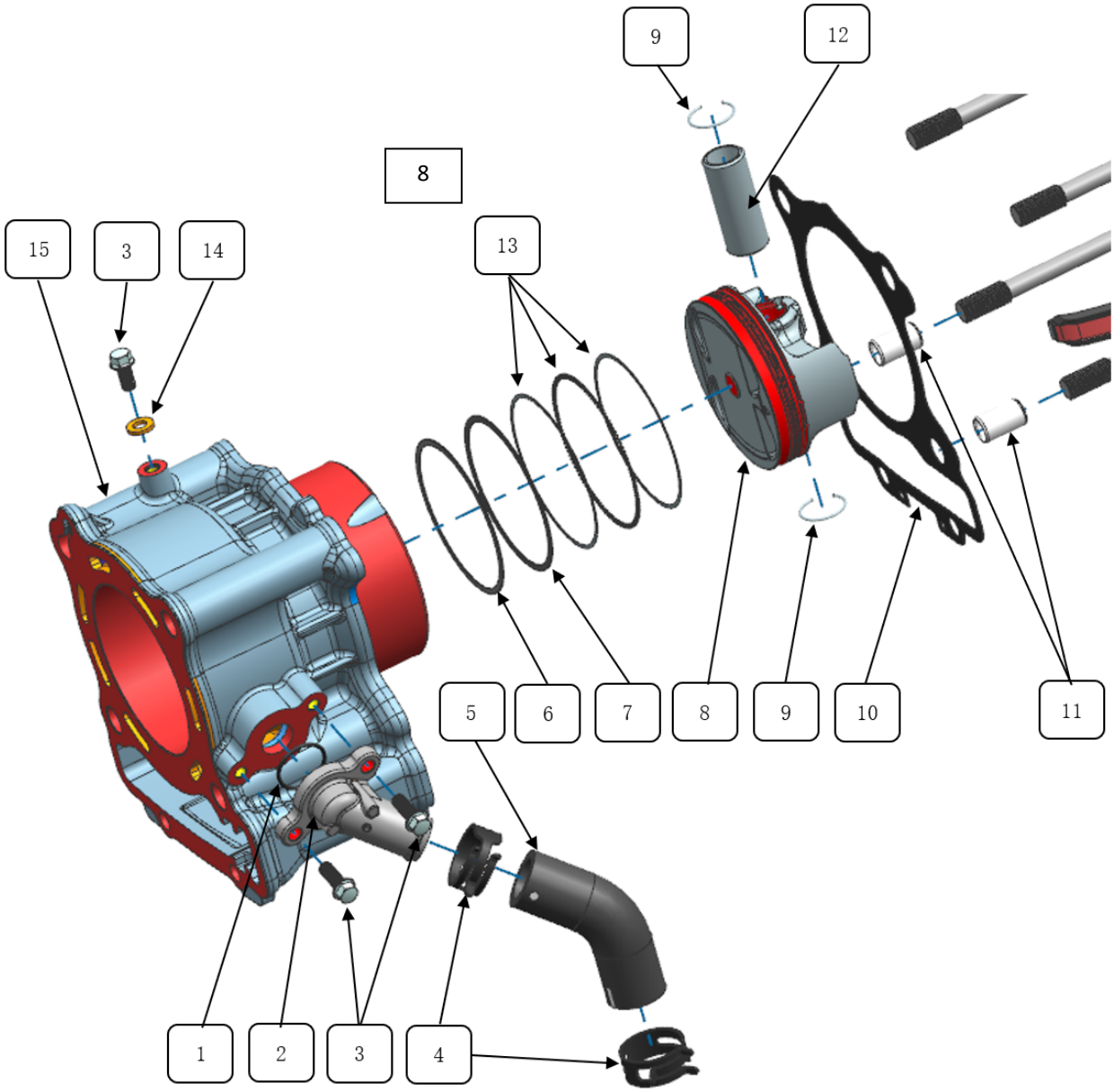
Cylinder, piston

1. System components



Parts information

Serial number	Part Name	Quantity	Serial number	Part Name	Quantity
1	ϕ20.7×ϕ1.9 EPDM O-ring	1	9	21×1.2 piston pin retaining ring	2
2	ZT1P77MP cylinder water inlet pipe joint	1	10	ZT1P77MP cylinder body box gasket B	1
3	GB16674 M6×16 Hexagon flange bolts (9.8 grade/environmental color Zinc)	3	11	ϕ 12×20 hollow positioning pin	2
4	ZT310 water pipe clamp(ϕ26)	2	12	18.5×45×11.5 piston pin	1
5	ZT1P79MP water pump cover outlet pipe	1	13	ZT1P79MP oil ring combination	1
6	ZT1P77MP oil ring combination	1	14	6.3×12×1.6 copper gasket	1
7	ZT1P77MP second gas ring	1	15	ZT1P79MP cylinder block	1
8	ZT1P77MP piston	1			

2. Maintenance information

General information

·This chapter introduces the maintenance of cylinder and piston.
·The maintenance of cylinder and piston needs to remove the engine from the vehicle.
. Remove the cylinder head cover. **(Refer to ZT1P79MP engine maintenance manual for disassembly and assembly--cylinder head cover)**
·Remove the tensioner. **(Refer to ZT1P79MP engine maintenance manual for disassembly and assembly--cylinder head cover, cylinder head-tensioner)**
·Remove the cylinder head sub-assembly. **(Refer to ZT1P79MP engine maintenance manual for disassembly and assembly--cylinder head cover)**
When disassembling the cylinder, avoid scratching the joint surface of the cylinder and the box to cause damage.
·When the cylinder is separated from the piston, pay attention to protect the piston and connecting rod to prevent damage caused by the collision between the piston connecting rod and the box.
·After removing the piston, clean up the carbon deposition and dirt on the top, and be attention not to drop it into the box.
·Clean and dry the disassembled parts before checking.

Specification

unit：mm (in)

<table>
<tr><th colspan="3">Project</th><th>Standard value</th><th>Maintenance Limit Value</th></tr>
<tr><td rowspan="4">Cylinder</td><td colspan="2">Inner diameter</td><td>79.000-79.015 (3.1102-3.1108)</td><td>Cylinder</td></tr>
<tr><td colspan="2">Outer roundness</td><td>-</td><td>0.05 (0.002)</td></tr>
<tr><td colspan="2">Taper</td><td>-</td><td>0.05 (0.002)</td></tr>
<tr><td colspan="2">Flatness</td><td>-</td><td>0.05 (0.002)</td></tr>
<tr><td rowspan="10">Piston
piston ring
Piston pins</td><td colspan="2">Piston outer diameter</td><td>78.970-78.985 (3.1090-3.1096)</td><td>Piston
piston ring
Piston pins</td></tr>
<tr><td colspan="2">Piston outer diameter measuring point</td><td>From the bottom of the skirt at 8 (0.3150)</td><td>-</td></tr>
<tr><td colspan="2">Piston pin bore inner diameter</td><td>18.502-18.510 (0.7284-0.7287)</td><td>18.538 (0.7298)</td></tr>
<tr><td colspan="2">Piston pin outer diameter</td><td>18.491-18.498 (0.7280-0.7283)</td><td>18.475 (0.7274)</td></tr>
<tr><td colspan="2">The gap between the piston pin bore and the piston pin</td><td>0.004-0.019 (0.00016-0.00075)</td><td>-</td></tr>
<tr><td rowspan="2">The gap between the piston ring and the ring groove</td><td>First ring</td><td>0.02-0.06 (0.0008-0.0024)</td><td>The gap between the piston ring and the ring groove</td></tr>
<tr><td>The second ring</td><td>0.02-0.06 (0.0008-0.0024)</td><td>0.115 (0.0045)</td></tr>
<tr><td rowspan="3">Piston ring end clearance</td><td>First ring</td><td>0.12-0.25 (0.0047-0.0098)</td><td>Piston ring end clearance</td></tr>
<tr><td>The second ring</td><td>0.35-0.48 (0.0138-0.0189)</td><td>0.85 (0.0335)</td></tr>
<tr><td>Oil Rings (Side Rails)</td><td>0.20-0.70 (0.008-0.028)</td><td>-</td></tr>
<tr><td colspan="3">The gap between the cylinder and the piston</td><td>0.025-0.035 (0.00098-0.0014)</td><td>0.15 (0.0059)</td></tr>
<tr><td colspan="3">Connecting rod small end inner diameter</td><td>18.510-18.517 (0.7287-0.7290)</td><td>18.56(0.7307)</td></tr>
<tr><td colspan="3">The gap between the connecting rod and the piston pin</td><td>0.012-0.026 (0.00047-0.0010)</td><td>0.06(0.0024)</td></tr>
</table>

Tool

1. Clamp pliers
2. Needle nose pliers
3.Vernier calipers
4.Plug gauge
5.Roundness meter
6.ruler
7.T-sleeve-8#
8.T-sleeve-10#
9.Torque wrench, socket-8#, socket-10#

3. Troubleshooting

1. The compression pressure is too low when the engine is running at low speed, it is difficult to start or the performance is not good

·The cylinder wall is worn, the top of the piston is cracked or the wall of the cylinder block is scratched.

·Piston rings are worn or cracked.

·The connecting rod is bent.

·Cylinder head valve leakage.

2. The pressure is too high during the compression process of the engine, and there is a knocking sound during operation

· Excessive carbon deposit on the top of the piston or in the combustion chamber.

3. Engine abnormal sound

· The piston ring is broken.

· Piston ring wear or cylinder wall scratches.

· Piston ring carbon deposition or piston ring groove wear.

· Piston pin or piston pin hole wear.

· Piston ring sticks to the piston ring groove.

4. The engine produces obvious smoke

·Cylinder and piston pull the cylinder, the piston is damaged or the coating of the cylinder falls off.

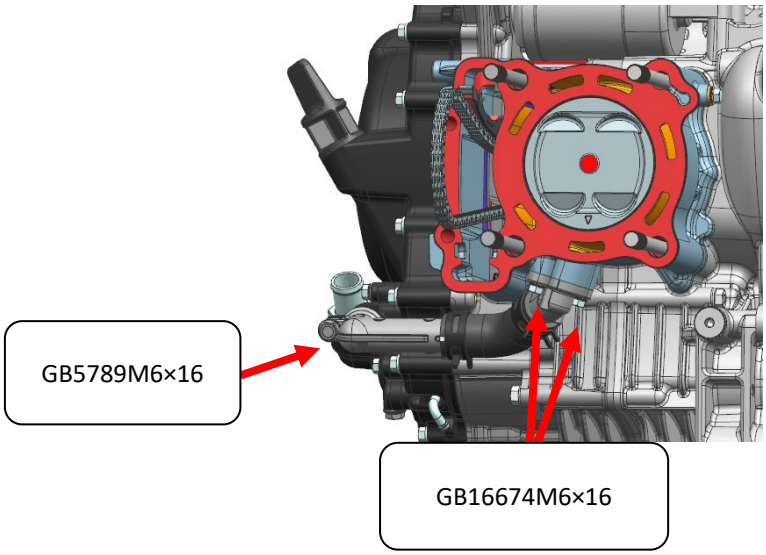
· Cylinder, piston or piston rings are worn.

·The installation position of the piston ring is not correct.

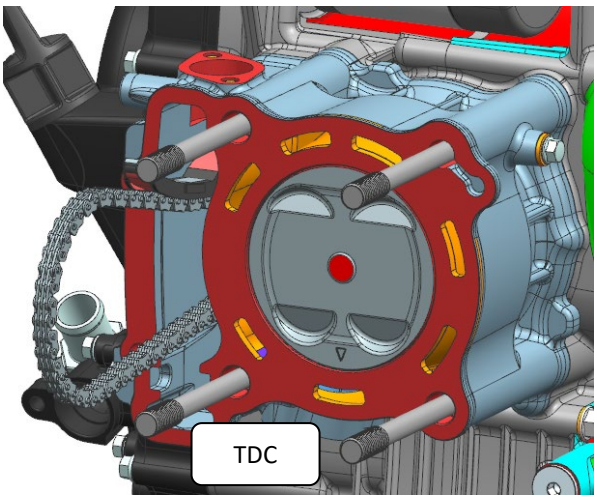
4. Cylinder

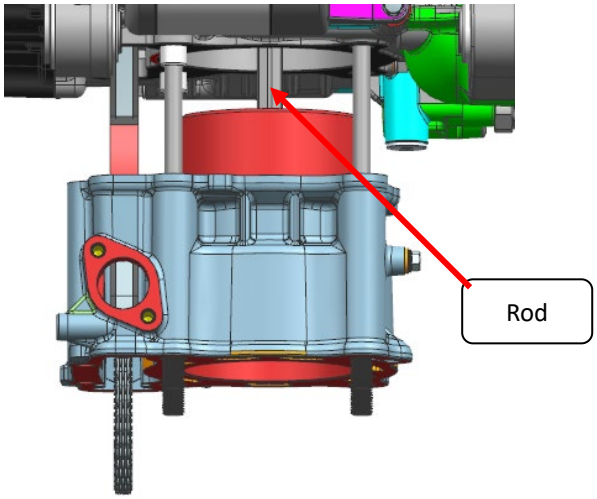
Disassemble

1. As shown in the figure, use the T-sleeve-10# to remove the GB5789M6×16 (environmental color) bolt on the water pump cover and remove the water pump cover outlet pipe joint, and slowly pull it out vertically when removing the outlet pipe joint to prevent the O-shaped rubber ring inside from cutting the edge. Use the T-sleeve-8# to remove the two GB16674M6×16 bolts (environmental protection color zinc) on the cylinder, and remove the cylinder water inlet pipe joint, pay attention to the O-ring at the joint surface of the water inlet pipe joint when removing.

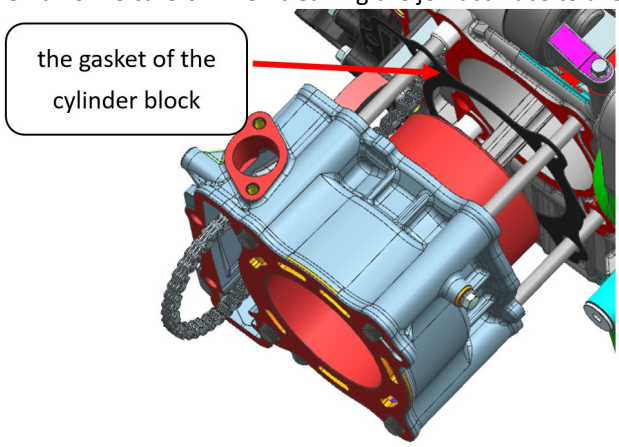


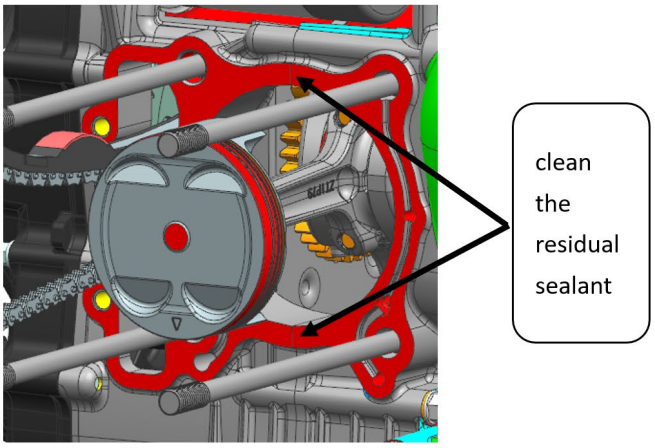
2. Remove the cylinder.
Remarks:
① Turn the piston to the top dead center before disassembly, and fix the crankshaft when pulling out the cylinder.
② Do not drop the timing chain into the crankcase.
③ When the cylinder is pulled out of the piston, fix the piston and connecting rod by hand or other auxiliary tools to avoid collision with the box and cause damage.





3. Remove the gasket of the cylinder block and clean the residual sealant on the joint surface of the cylinder block.
Remarks: Be careful when cleaning the joint surface to avoid scratches on the joint surface.



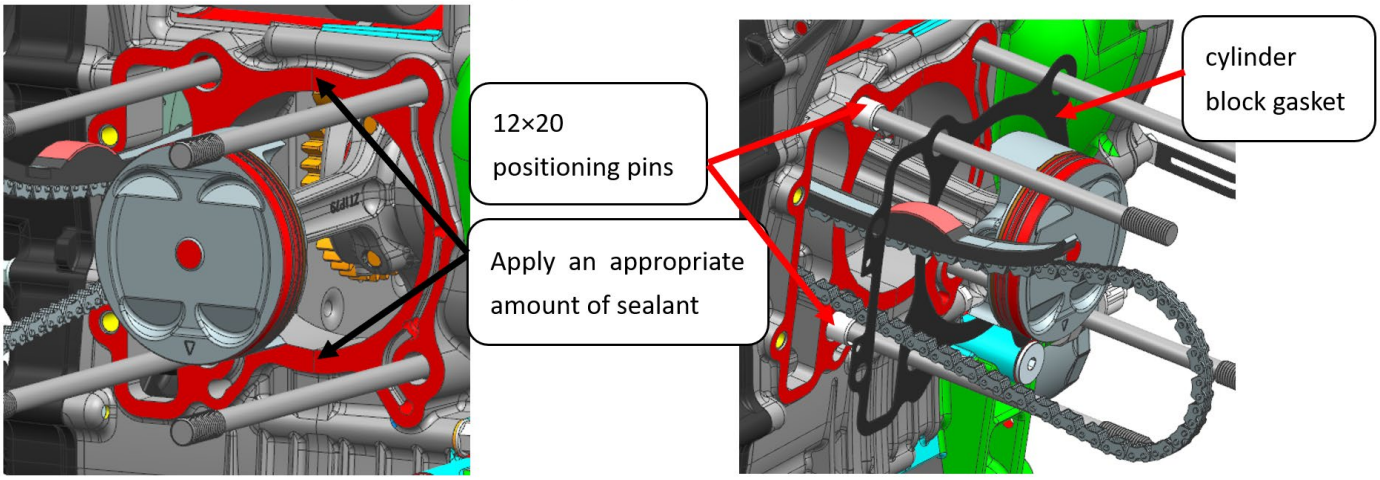


Examine

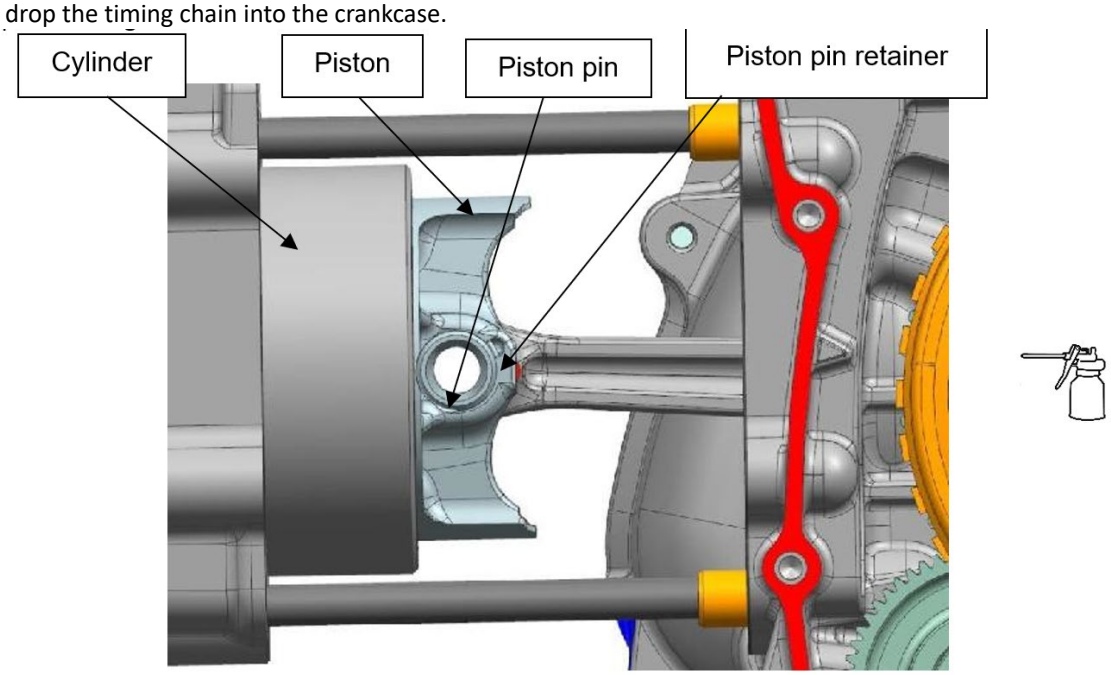
Check whether there are scratches and wear on the inner wall of the cylinder. If there are obvious scratches and wear, the defective parts must be replaced.

Install

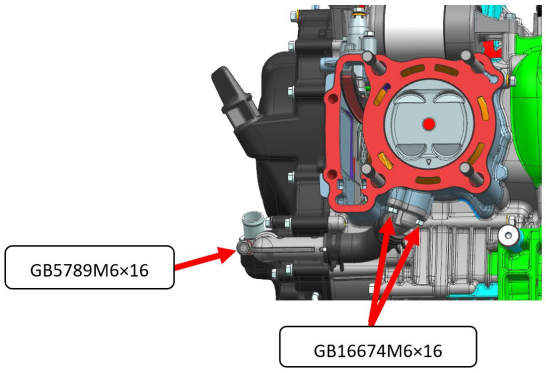
1. Apply an appropriate amount of sealant to the corresponding position of the joint surface of the cylinder block, install a new cylinder block gasket, and two 12×20 positioning pins.



2. Install the cylinder block, press the piston ring by hand to fit it into the cylinder block; stagger the openings of the piston ring, install the cylinder in place, and wipe off excess oil.
Remarks:
① Before installing the cylinder block, apply an appropriate amount of engine oil evenly on the inner wall of the cylinder block.
② Apply proper amount of engine oil to the piston skirt and piston ring.
③ Do not drop the timing chain into the crankcase.

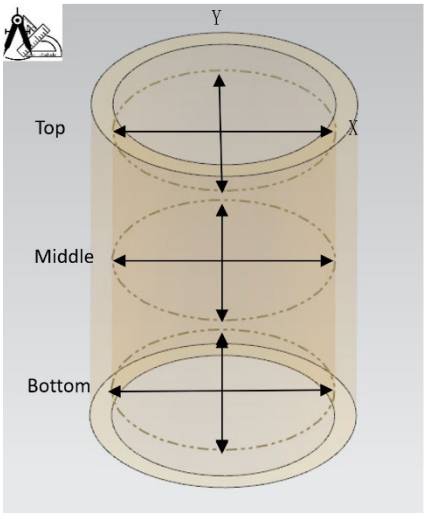


3. Use the sleeve-8# and two GB16674M6×16 (environmental color zinc) bolts to fix the inlet pipe joint on the cylinder, and the fixed torsion is 12±1.5 N.m. Install the outlet pipe joint of the water pump cover to the water pump cover, and keep the two combinations [supplementary translation] surface fit, pay attention to the O-ring needs to be installed in place, can not be missed, cut the edge, and then use a 10# sleeve to tighten the GB5789M6×16 (environmental color) bolt, the fixed twist is 12±1.5 N.m.



Examine

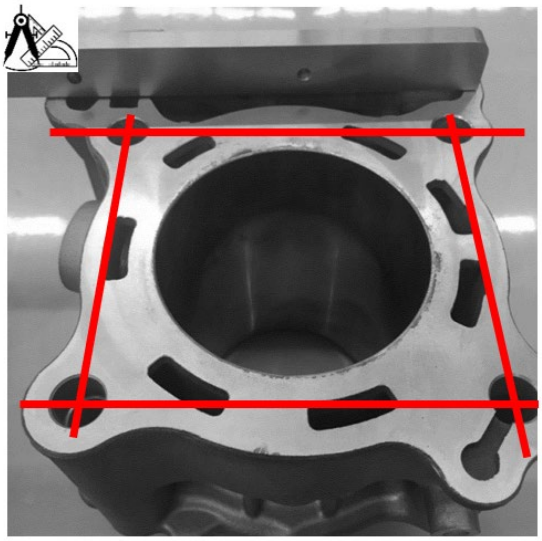
1. Check whether there are scratches and wear on the wall of the cylinder body.
Measure and note the cylinder bore in the three horizontal planes in the X and Y directions, respectively.
The maximum reading is used to determine if the cylinder is worn. Maintenance Limit Value：79.065mm（3.1128 in）



2. Measure and note the cylinder bore in the three horizontal planes in the X and Y directions, respectively.
Take the maximum reading to judge the roundness of the cylinder。
Maintenance Limit Value:
Flatness：0.05mm（0.002in）
Outer roundness：0.05mm（0.002in）
Note: If the cylinder block exceeds the maintenance limit value, the new cylinder block must be replaced, such as replacing the new cylinder block, please calculate the fitting

clearance between the piston and the new cylinder block, if the fitting clearance between the old piston and the new cylinder exceeds the maintenance limit value, the piston also needs to be replaced.
Piston and cylinder block maintenance limit value：0.15 mm (0.0059 in)

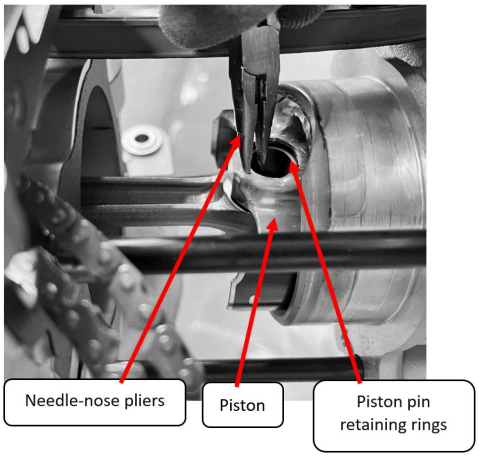
3. Place a ruler and plug gauge between the two holes of the cylinder as shown to check the cylinder for twisting.
Maintenance Limit Value：0.05mm（0.002in）

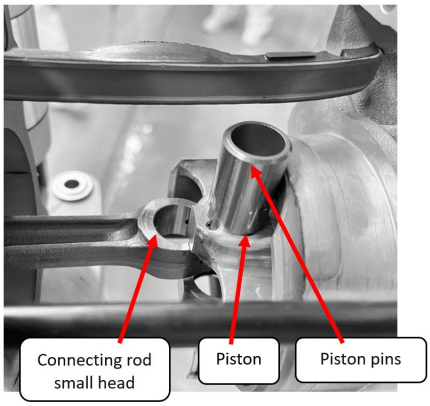


5. Piston

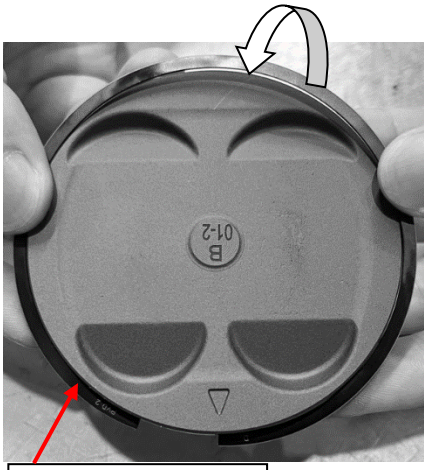
Disassemble

1. After the cylinder is removed, use needle-nose pliers to remove the piston pin retaining ring, push the piston pin out of the piston and connecting rod, and then remove the piston.
Remarks:
① Do not scratch the piston and piston ring when removing the piston pin retaining ring.
② Use cloth or other objects to block the opening of the crankcase to prevent the piston pin retaining ring from falling into the casing during disassembly.





2. Pull off each piston ring and remove it by lifting it to a position directly above the gap, use an old piston ring that has been used or other suitable objects to remove the carbon deposits on the piston ring groove.



Piston ring

Install

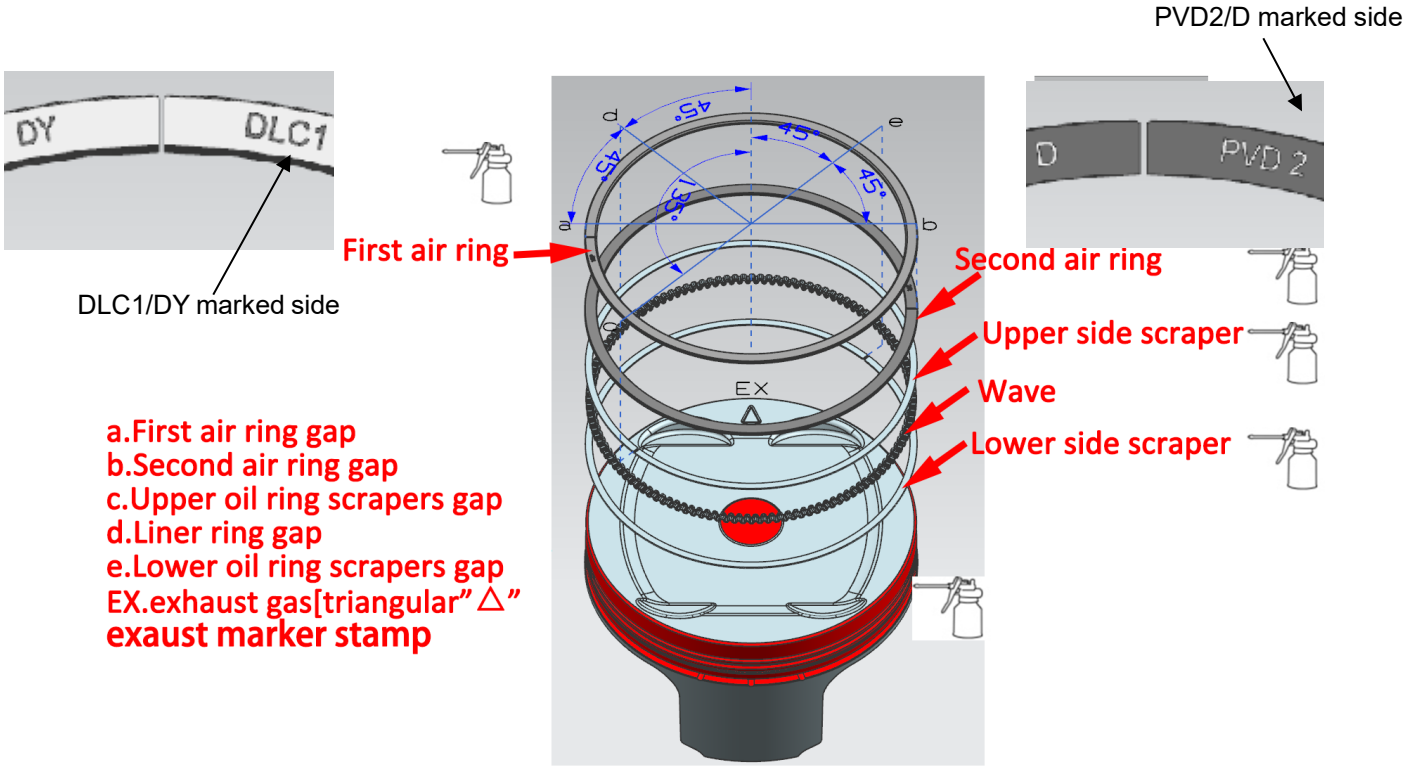
1. Apply an appropriate amount of engine oil to each piston ring and piston ring groove, and install the piston ring to the corresponding groove.

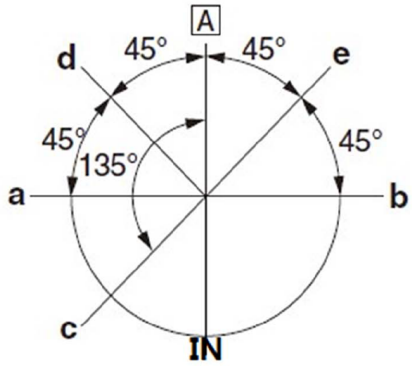
Remarks: ① Do not use the first air ring and the second air ring interchangeably.

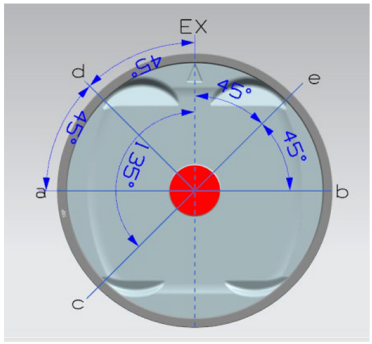
② When installing the gas ring, the side with the marked face faces up (piston top).

③ Install the oil ring assembly, first install the corrugated lining ring, then install the lower side scraper ring, and finally install the side scraper ring.

④ The notch " a " of the first ring is on the left side of the "△" EX mark, along the axial direction of the piston pin; the notch " b " of the second ring is on the right side of the "△" EX mark, and the angle with " a " is 180 °; the notch " e " of oil ring scraper of the lower side is at 45 ° between "△" EX and " b " ; the angle between " c " and " e " of upper oil ring scraper is 180 °; the notch " d " of oil ring backing is a "△" on the left side of EX , perpendicular to the line connecting " c " and " e ". (As shown in the picture below)







2. Insert the piston pin into the piston and install it on the connecting rod, and install the piston pin retaining ring into the ring groove with needle-nose pliers.

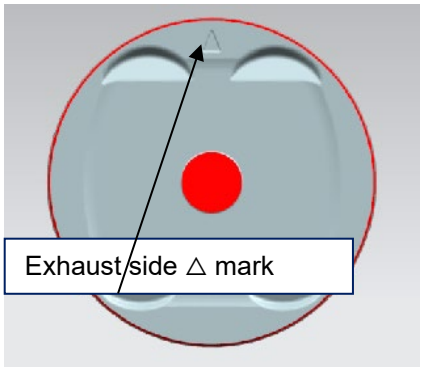
Remarks:

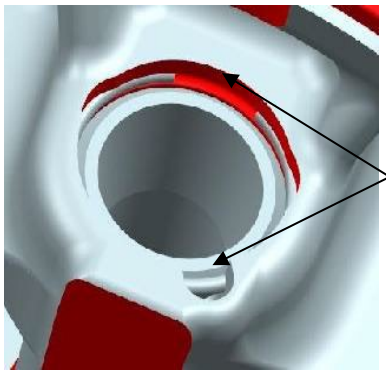
① Apply an appropriate amount of engine oil to the piston pin hole and the small end hole of the connecting rod.

② The opening of the piston pin retaining ring should be staggered with the circular arc groove of the piston.

③ Piston pin retaining ring is installed in place.

④ The direction of the arrow on the top of the piston points to the exhaust side, do not install it backwards.





Note: The cylinder and piston are divided into three groups: A, B and C. To ensure proper cylinder clearance, the cylinder and piston must be in the same group.

Examine

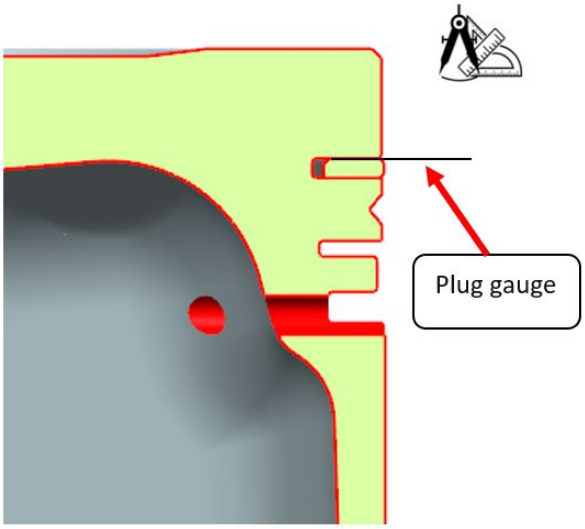
1. Turn the piston ring, check the rotation of the piston ring, the piston ring should be able to rotate freely in the groove, there is no feeling of stuck.

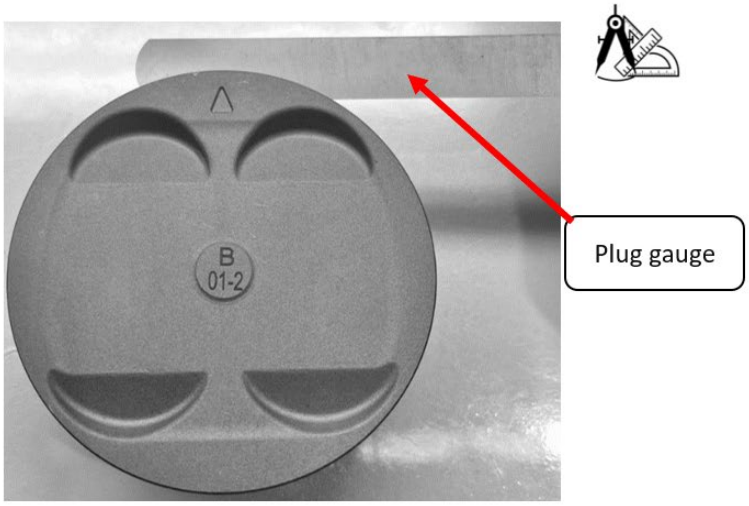
Press the piston ring to the outer surface [supplementary translation] almost flush with the piston and measure the gap between the piston ring and the inside of the ring groove.

Note: Before measuring the piston ring clearance, remove carbon deposits from the piston ring groove and piston ring. When the gap between the piston ring and the piston ring groove exceeds the maintenance limit value, replace the piston and piston ring with a new one.

Maintenance Limit Value:

First Ring/Second Ring：0.115 mm (0.0045in)



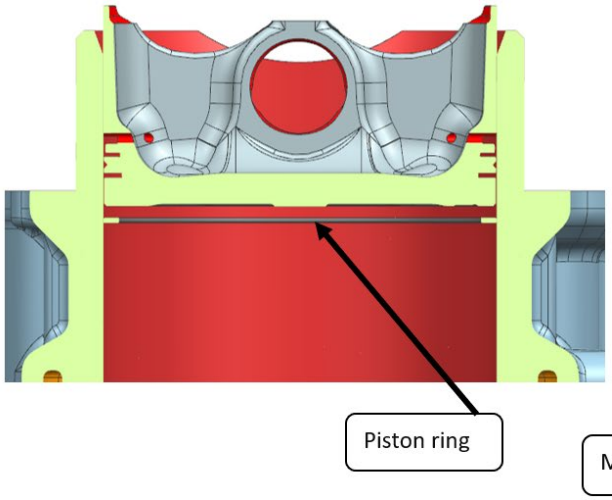


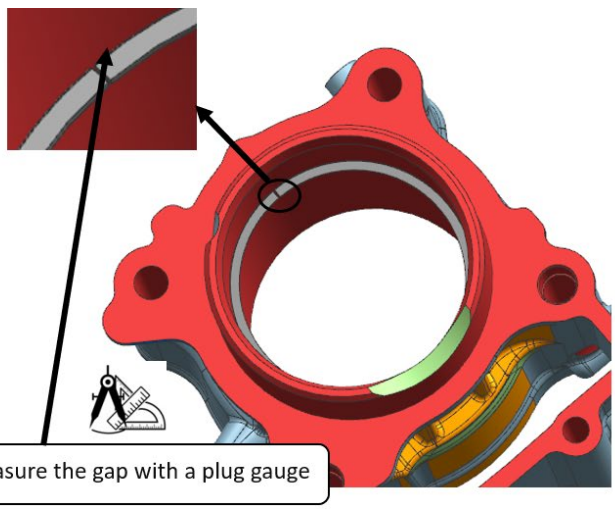
2. Use the piston to push the piston ring firmly and flush into the cylinder and measure the end clearance using the plug gauge.

Maintenance limit value:

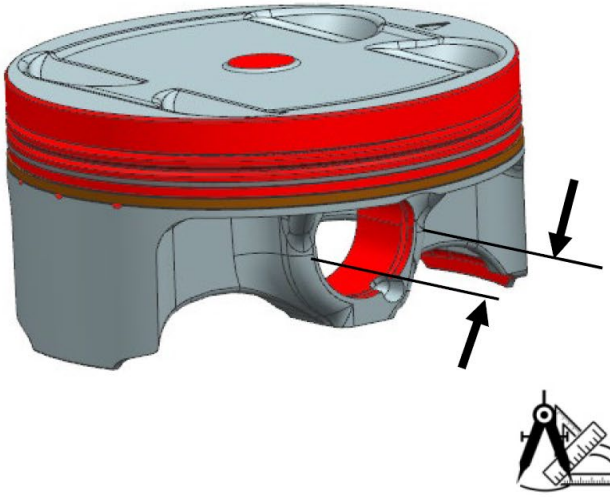
First ring：0.50 mm (0.0197in)

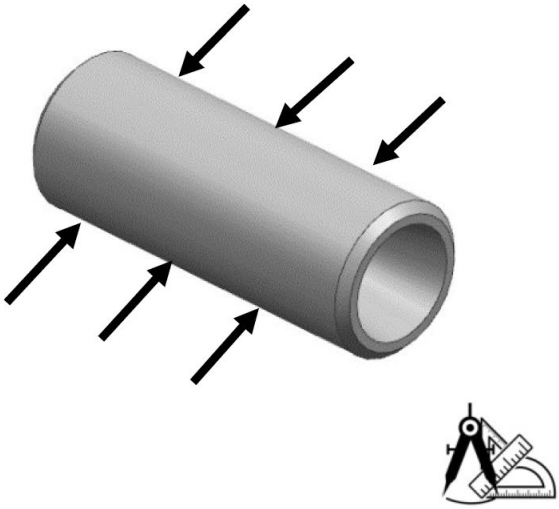
The second ring：0.85 mm (0.0335in)



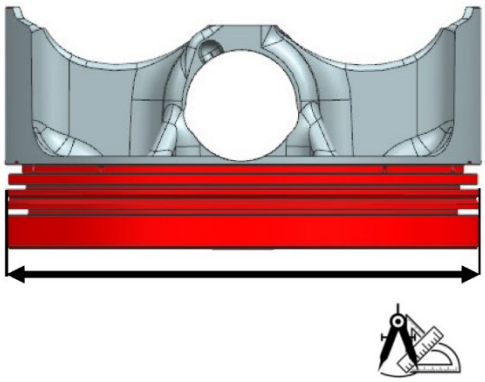


3. Inspect the outer surface of the piston for scratches or other damage. Measure the bore diameter of the piston pin and take the maximum reading to determine the bore.
Maintenance Limit Value：18.538mm (0.7298in)
The outer diameter of the piston pin is measured between the sliding surface of the piston pin and the connecting rod.
Maintenance Limit Value：18.475mm (0.7274 in)
Calculate the gap between the inner diameter of the piston pin bore and the outer diameter of the piston pin.
Standard value：0.004-0.019 mm
Note: When the fitting clearance of the piston pin hole and piston pin exceeds the standard value, please evaluate and replace the parts with a large amount of wear.
Judge whether the fitting clearance is within the maintenance limit value, if yes, replace the corresponding parts, if not, you need to replace new piston pins and pistons.





4.The outer diameter of the piston is measured 8 mm (0.3150 in) from the bottom of the piston and 90° perpendicular to the pin hole.
Maintenance Limit Value：**78.90mm (3.1063in)**
Calculate the mating clearance between cylinder and piston.
Maintenance Limit Value：**0.15 mm (0.0059 in)**
Note: When the fitting clearance between the piston and the cylinder block exceeds the maintenance limit value, please evaluate and replace the parts with a large amount of wear to determine whether the fitting clearance is within the maintenance limit value, if yes, replace the corresponding parts, if not, replace the new cylinder and piston.



5. Measure the inner diameter of the small tip of the connecting rod.
Maintenance Limit Value：18.56 mm (0.7307 in)
Calculate the mating clearance of the small end of the connecting rod and the piston pin.
Standard value：0.012-0.026 mm （0.00047-0.0010 in）
Maintenance Limit Value：0.06 mm (0.0024 in)
Concentrate：When the connecting rod small head inner diameter and piston pin sliding surface outer diameter of the mating clearance If it is greater than the maintenance limit, evaluate and replace the parts with a large amount of wear.
Determine whether the fit clearance is within the maintenance limit value, and if so, replace it
parts, if not, replace the new connecting rod and piston pin.