

SECTION EM

MODIFICATION NOTICE:

- YD25DDTi and ZD30DDT engine information have been added.
For information not included here, refer to information for YD25DDTi and ZD30DDT engines in NISSAN model D22 series SERVICE MANUAL Supplement-VI 1st Revision (Publication No. SM1E-1D22FG1).

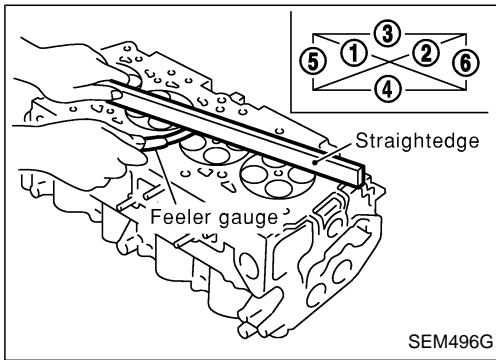
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Inspection

CYLINDER HEAD DISTORTION

Clean surface of cylinder head. Use a reliable straightedge and feeler gauge to check the flatness of cylinder head surface. Check along six positions shown in the figure.

Head surface flatness: Limit 0.1 mm (0.004 in)

If beyond the specified limit, resurface or replace it.

The limit for cylinder head resurfacing is determined by the cylinder block resurfacing.

Resurfacing limit:

Amount of cylinder head resurfacing is "A".

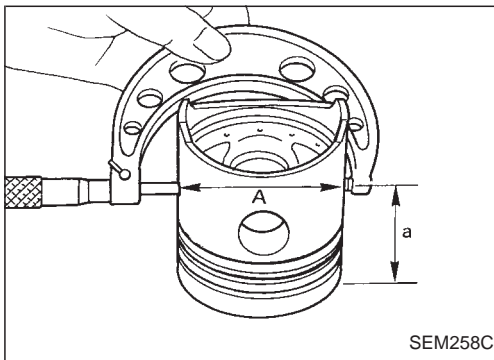
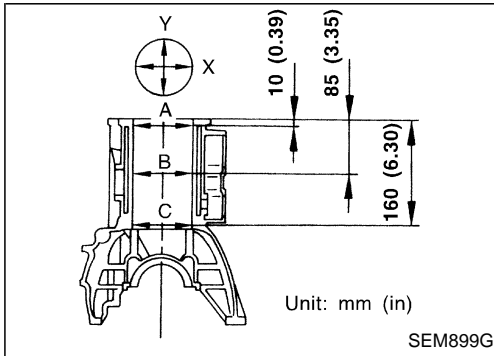
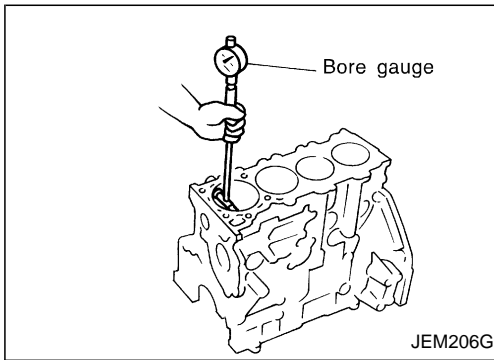
Amount of cylinder block resurfacing is "B".

The maximum limit: $A + B = 0.07 \text{ mm (0.0028 in)}$

After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

153.9 - 154.1 mm (6.059 - 6.067 in)



Inspection

PISTON-TO-BORE CLEARANCE

- Using a bore gauge, measure cylinder bore in X and Y directions at A, B and C for wear, out-of-round and taper.

Cylinder bore inner diameter:

Standard

89.000 - 89.030 mm (3.5039 - 3.5051 in)

Wear limit

0.07 mm (0.0028 in)

If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

Out-of-round (Difference between X and Y):

Limit 0.015 mm (0.0006 in)

Taper (Difference between A and C):

Limit 0.010 mm (0.0004 in)

- Check for scratches and seizure. If seizure is found, hone it.

- Measure piston skirt diameter.

Piston diameter "A":

Standard

88.925 - 88.955 mm (3.5010 - 3.5022 in)

Measuring point "a" (Distance from the top):

59.0 mm (2.323 in)

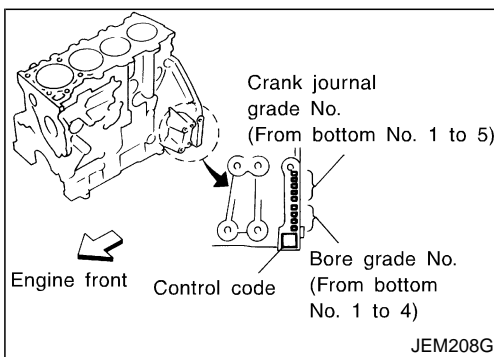
- Check that piston-to-bore clearance is within specification.
 - Calculate the clearance by using outer diameter at piston skirt and inner diameter of cylinder (direction of X, point B):

Piston-to-bore clearance = Cylinder bore - Piston diameter "A"

Standard [at room temperature 20°C (68°F)]:

0.065 - 0.085 mm (0.0026 - 0.0033 in)

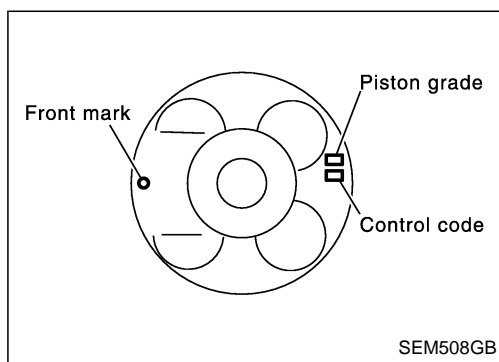
- If the value is out of the specified range, replace piston and piston pin assembly.



- If cylinder block or pistons are replaced with new ones, select piston as follows:

When using a new cylinder block:

- Identify the cylinder bore grade (No. 1, 2, or 3) on LH surface at the rear of cylinder block and select a piston of the same grade.
- The part No. of piston is specified together with the piston pin as an assembly.



Inspection (Cont'd)

When re-using a removed cylinder block:

- Measure the inner diameter of the cylinder block bore.
- Determine the bore grade by comparing the measurement with the values under "Cylinder bore ID" of the table below. Choose a piston of the same grade.

Selective fitting for piston:

Unit: mm (in)

Grade (punched)	1	2	3
Cylinder bore ID	89.000 - 89.010 (3.5039 - 3.5043)	89.010 - 89.020 (3.5043 - 3.5047)	89.020 - 89.030 (3.5047 - 3.5051)
Piston OD	88.925 - 88.935 (3.5010 - 3.5014)	88.935 - 88.945 (3.5014 - 3.5018)	88.945 - 88.955 (3.5018 - 3.5022)

- Determine piston oversize according to amount of cylinder wear.
- **For oversize pistons, 0.25 and 0.5 OS [0.25 mm (0.0098 in), 0.5 mm (0.0197 in) oversize] are available as service parts. Refer to SDS, EM-15. When using an oversize piston, hone cylinder so that the clearance between piston and cylinder becomes the specified value. Be sure to use appropriate oversize piston ring for the oversize piston.**
- Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

Rebored size calculation: $D = A + B - C$

where,

D: Bored diameter

A: Piston diameter as measured

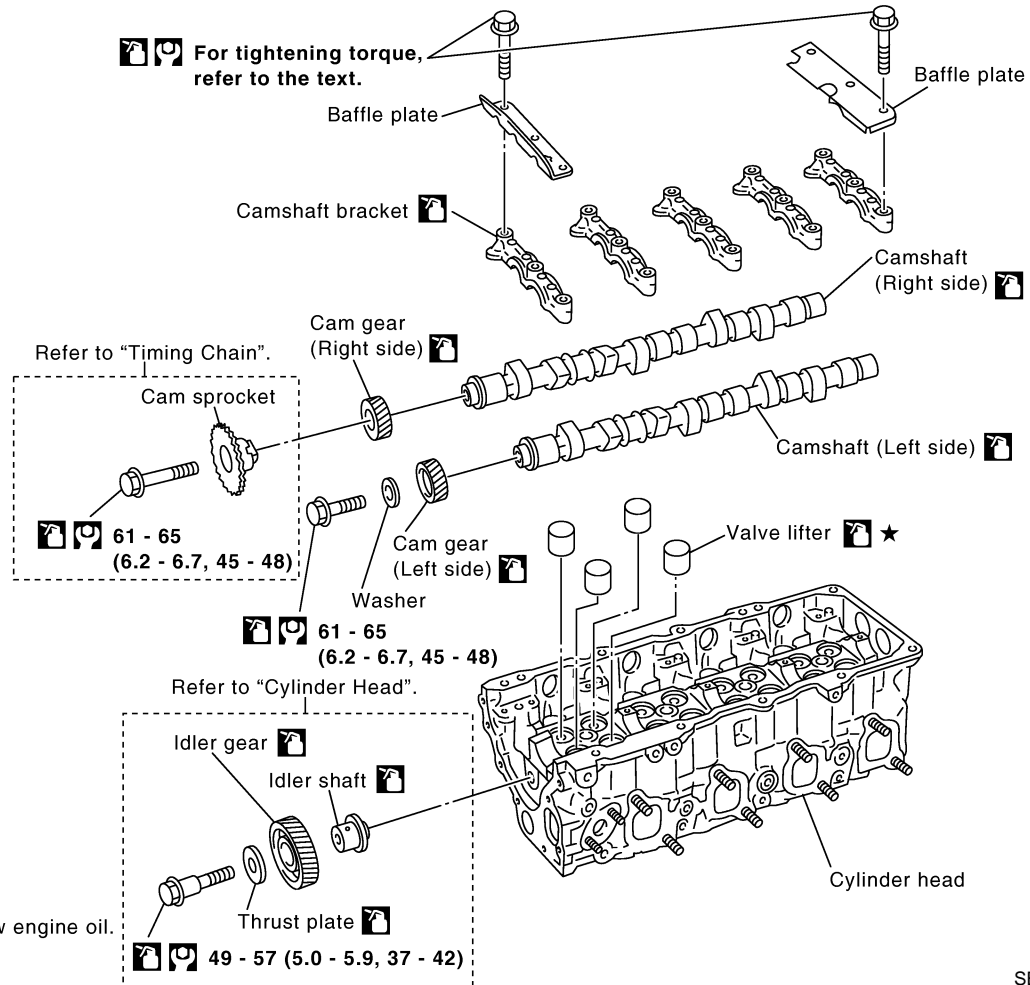
B: Piston-to-bore clearance

C: Honing allowance 0.02 mm (0.0008 in)

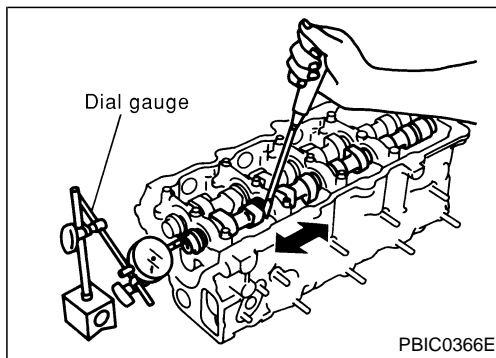
- Cut cylinder bores.
 - **When any cylinder needs boring, all other cylinders must also be bored.**
 - **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
- Hone cylinders to obtain specified piston-to-bore clearance.
- Measure finished cylinder bore for out-of-round and taper.
 - **Measurement should be done after cylinder bore cools down.**

Removal and Installation

SEC. 130



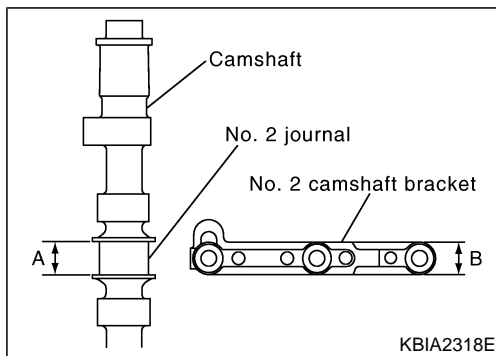
SEM186H



Inspection

CAMSHAFT END PLAY

- Set the dial gauge to the front end of the camshaft. Measure the end play by moving the camshaft in the direction of the axle.
Standard: 0.065 - 0.169 mm (0.0026 - 0.0067 in)
Limit: 0.2 mm (0.0079 in)



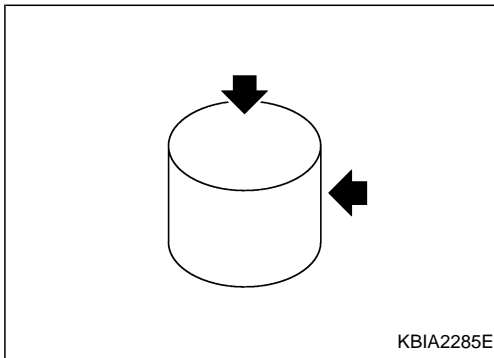
- Replace the following parts if outside the limit.
 - Dimension A for camshaft (No. 2 journal)
Standard: 19.455 - 19.507 mm (0.7659 - 0.7680 in)
 - Dimension B for No. 2 camshaft bracket
Standard: 19.338 - 19.390 mm (0.7613 - 0.7634 in)
- Replace camshaft and/or cylinder head referring to the standards above.

NOTE:

It is impossible to replace only the camshaft bracket as the camshaft bracket is manufactured with the cylinder head.

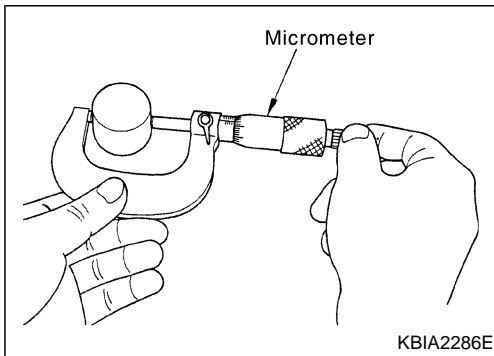
Inspection (Cont'd)**VISUAL INSPECTION OF VALVE LIFTER**

- Check if surface of valve lifter has any wear or cracks.
- Replace valve lifter if necessary.
- Select the thickness of the head so that valve clearance is the standard when replacing. Refer to EM-117, "Inspection" in NISSAN model D22 series SERVICE MANUAL SUPPLEMENT-VI 1st Revision (Publication No. SM1E-1D22FG1).

**VALVE LIFTER OUTER DIAMETER**

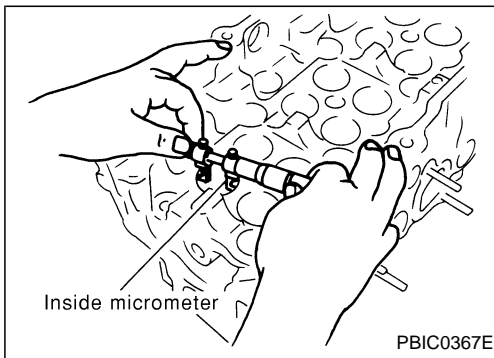
Measure the outer diameter of the valve lifter with a micrometer.

Standard: 34.455 - 34.465 mm (1.3565 - 1.3569 in)

**LIFTER GUIDE INNER DIAMETER**

Measure the lifter guide inner diameter of the cylinder head with an inside micrometer.

Standard: 34.495 - 34.515 mm (1.3581 - 1.3589 in)

**VALVE LIFTER CLEARANCE CALCULATIONS**

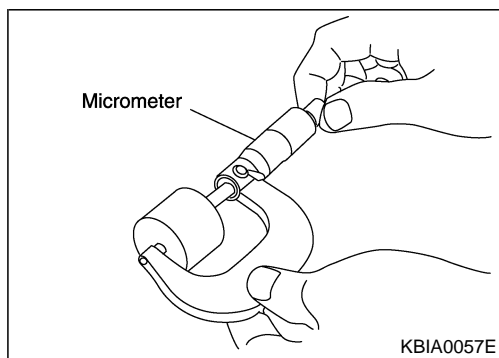
Clearance = Lifter guide inner diameter – Valve lifter outer diameter

Standard: 0.030 - 0.060 mm (0.0012 - 0.0024 in)

If it exceeds the standard value, refer to the outer diameter and bore diameter standard values and replace valve lifter and/or cylinder head.

Adjustments

- Perform adjustment depending on selected head thickness of valve lifter.
- 1. Remove camshaft. Refer to EM-111, "Removal" in NISSAN model D22 series SERVICE MANUAL SUPPLEMENT-VI 1st Revision (Publication No. SM1E-1D22FG1).
- 2. Remove valve lifters at the locations that are outside the standard.



3. Measure the center thickness of the removed valve lifters with a micrometer.

4. Use the equation below to calculate valve lifter thickness for replacement.

- Valve lifter thickness calculation:

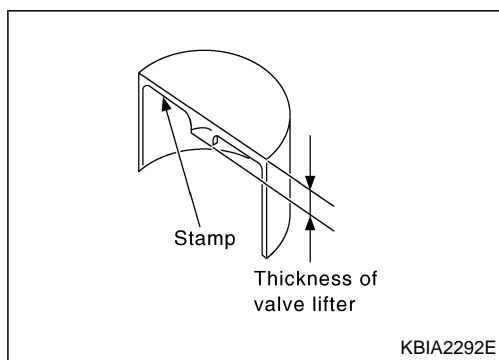
$$\text{Thickness of replacement valve lifter} = t1 + (C1 - C2)$$

$$t1 = \text{Thickness of removed valve lifter}$$

$$C1 = \text{Measured valve clearance}$$

$$C2 = \text{Standard valve clearance:}$$

When engine is cool [Approximately 20°C (68°F)]
Intake and exhaust: 0.35 mm (0.014 in)



- Thickness of a new valve lifter can be identified by stamp marks on the reverse side (inside the cylinder).

Stamp mark 535 indicates 5.35 mm (0.2106 in) in thickness.
 Available thickness of valve lifter: 15 sizes with range 5.35 to 6.05 mm (0.2106 to 0.2382 in) in steps of 0.05 mm (0.0020 in) (when manufactured at factory). Refer to EM-17, "AVAILABLE VALVE LIFTER".

5. Install the selected valve lifter.
6. Install camshaft. Refer to EM-114, "Installation" in NISSAN model D22 series SERVICE MANUAL SUPPLEMENT-VI 1st Revision (Publication No. SM1E-1D22FG1).
7. Manually turn crankshaft pulley a few turns.
8. Make sure that valve clearances for cold engine are within specifications by referring to the specified values.

Valve clearance:

When engine is cool [Approximately 20°C (68°F)]
Intake and exhaust
0.30 - 0.40 mm (0.012 - 0.016 in)

2 idler gears are shown in this chapter. Idler gear (A) has scissors gear, and idler gear (B) does not.

SEC. 11 • 11 • 120 • 130 • 135 • 186 • 223

Vacuum pipe

25 - 28 (2.5 - 2.9, 18 - 20)

25 - 28 (2.5 - 2.9, 18 - 20)

Spacer

O-ring

Fuel injection pump

Gasket

Oil jet *1

Keys

Front plate

Seal washer

45 - 53 (4.5 - 5.5, 33 - 39)

Fuel injection pump gear

Fuel injection pump sprocket

36 - 40 (3.6 - 4.1, 26 - 29)

Balancer shaft (Right)

21 - 23 (2.1 - 2.4, 16 - 17)

Crank gear

Balancer shaft (Left)

21 - 23 (2.1 - 2.4, 16 - 17)

36 - 40 (3.6 - 4.1, 26 - 29)

Idler shaft

Idler gear (A)

Thrust plate

Idler shaft

Idler gear (B)

Thrust plate

29 - 33 (2.9 - 3.4, 21 - 24)

29 - 33 (2.9 - 3.4, 21 - 24)

O-ring

O-ring

O-ring

O-ring

Tensioner pulley

Bracket

25 - 28 (2.5 - 2.9, 18 - 20)

25 - 28 (2.5 - 2.9, 18 - 20)

68 - 77 (6.9 - 7.9, 50 - 57)

Washer

Spacer

Bushing

Washer

Damper unit *2

Crankshaft pulley

373 - 402 (38 - 41, 275 - 296)

Front oil seal

7.9 - 9.8 (0.8 - 1.0, 70 - 86)

Plug

Bracket

25 - 28 (2.5 - 2.9, 18 - 20)

TDC sensor

Gear case

O-ring

O-ring

O-ring

O-ring

UP

*1

Engraved line

*2

UP

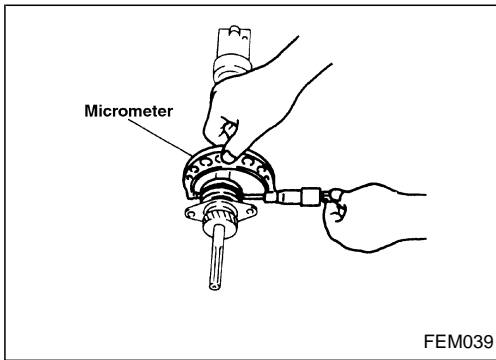
⊗ : Always replace after every disassembly.

🔧 : Lubricate with new engine oil.

🔧 : Apply Genuine Liquid Gasket or equivalent.

🔧 : N•m (kg-m, ft-lb)

🔧 : N•m (kg-m, in-lb)



Inspection

BALANCER SHAFT OIL CLEARANCE

Outer diameter of balancer shaft journal

Measure the outer diameter of the balancer shaft journal with a micrometer.

Standard:

Front side

50.875 - 50.895 mm (2.0029 - 2.0037 in) dia.

Rear side

50.675 - 50.695 mm (1.9951 - 1.9959 in) dia.

Inner diameter of balancer shaft bearing

Measure the inner diameter of the balancer shaft bearing using a bore gauge.

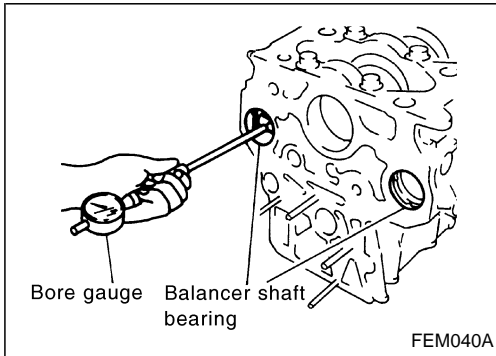
Standard:

Front side

50.955 - 50.980 mm (2.0061 - 2.0071 in) dia.

Rear side

50.755 - 50.780 mm (1.9982 - 1.9992 in) dia.



Oil clearance calculations

Oil clearance = Bearing inner diameter – Journal outer diameter

Standard: 0.060 - 0.105 mm (0.0024 - 0.0041 in)

Limit: 0.180 mm (0.0071 in)

Replace the balancer shaft and/or cylinder block if it exceeds the limit.

NOTE:

It is impossible to replace only balancer shaft bearing because balancer shaft bearing is manufactured with cylinder block.

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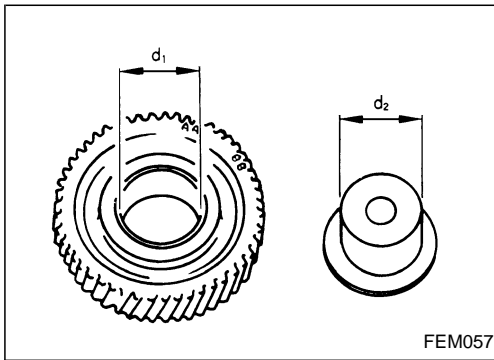
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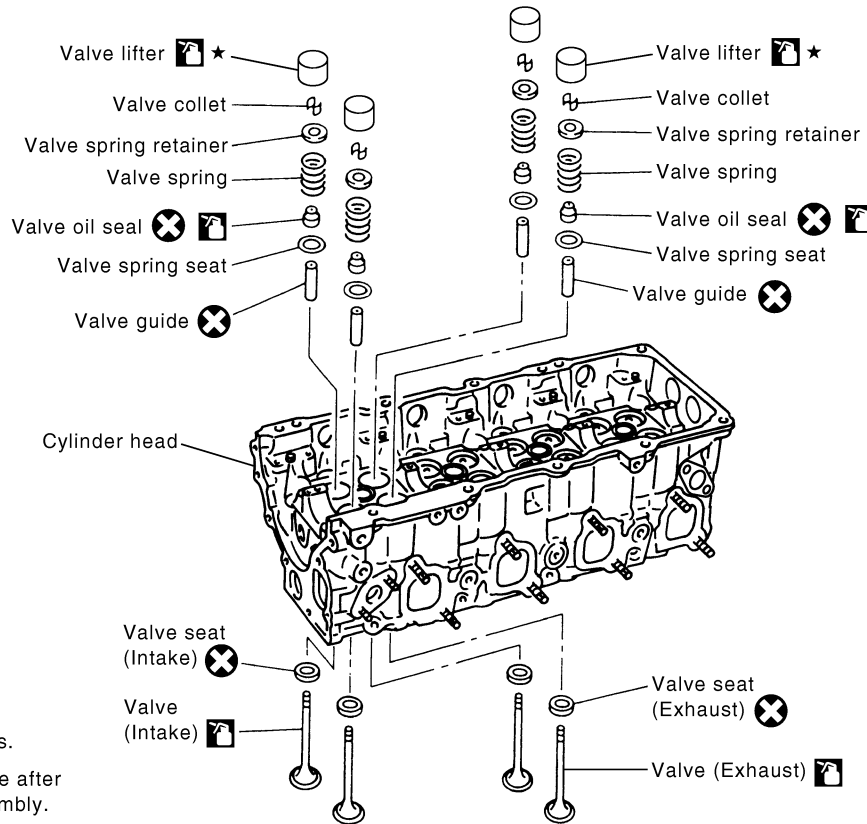
Inspection

IDLER GEAR OIL CLEARANCE

- Measure the inner diameter (d_1) of idler gear shaft hole.
Standard: 26.000 - 26.020 mm (1.0236 - 1.0244 in)
- Measure the outer diameter (d_2) of idler shaft.
Standard: 25.967 - 25.980 mm (1.0223 - 1.0228 in)
- Calculate gear clearance.
 $\text{Clearance} = d_1 - d_2$
Standard: 0.020 - 0.053 mm (0.0008 - 0.0021 in)
- Replace idler gear and/or idler shaft if it is outside the limit.

Disassembly and Assembly

SEC. 111•130

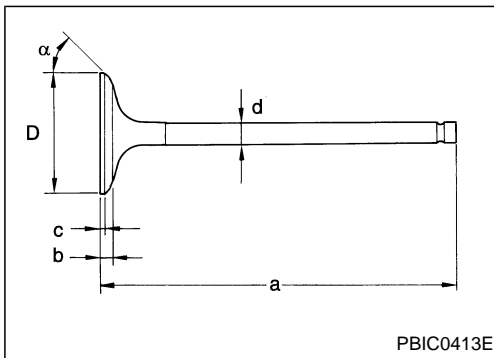


★ : Selective parts.

⊗ : Always replace after every disassembly.

🛢️ : Lubricate with new engine oil.

PBIC1749E



Inspection

VALVE DIMENSION

Using micrometer, measure the dimensions of each part.

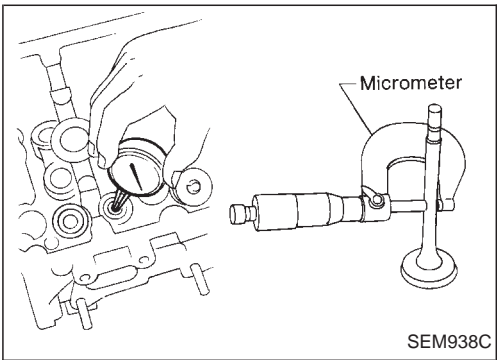
Standard

Unit: mm (in)

	Intake valve	Exhaust valve
a	113.5 (4.468)	113.5 (4.468)
b	3.8 - 4.2 (0.150 - 0.165)	3.8 - 4.2 (0.150 - 0.165)
c	1.5 (0.059)	1.5 (0.059)
d	6.962 - 6.977 (0.2741 - 0.2747)	6.945 - 6.960 (0.2734 - 0.2740)
D	31.9 - 32.1 (1.256 - 1.264)	29.9 - 30.1 (1.177 - 1.185)
α	45°00' - 45°30'	45°00' - 45°30'

Inspection (Cont'd)

VALVE GUIDE CLEARANCE



- Calculate the clearance by measuring valve stem outer diameter and valve guide inner diameter.

Unit: mm (in)

	Standard	Limit
Intake	0.023 - 0.056 (0.0009 - 0.0022)	0.18 (0.0071)
Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.10 (0.0039)

- If the measured value exceeds the limit, replace valve guide and/or valve.

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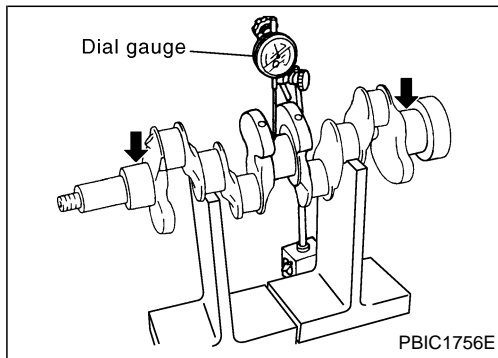
Inspection

SELECTIVE PISTON COMBINATION

Selective combination chart

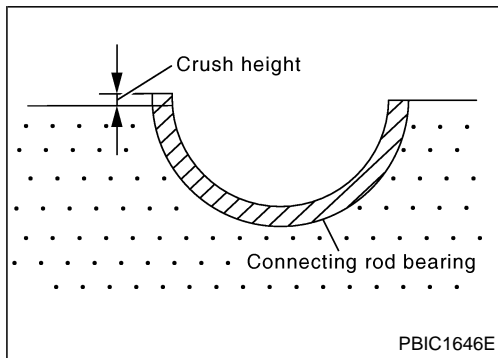
- New pistons are classified into 4 weight classes at factory. The same class pistons are used on a engine.

Weight grade symbol	Weight class g (oz)
E	615 - 620 (21.7 - 21.9)
F	620 - 625 (21.9 - 22.0)
G	625 - 630 (22.0 - 22.2)
H	630 - 635 (22.2 - 22.4)



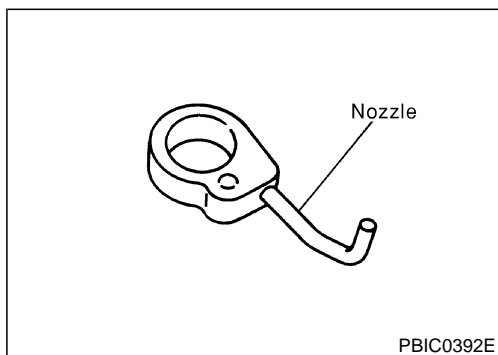
CRANKSHAFT RUNOUT

- Place V-block onto surface plate to support No. 2 and No. 4 journals.
- Position dial indicator vertically onto No. 1, No. 3 and No. 5 journals.
- Rotate crankshaft to read needle movement on dial indicator. (Total indicator reading)
Standard: Less than 0.01 mm (0.0004 in)
Limit: 0.03 mm (0.0012 in)
- Replace crankshaft if it exceeds the limit.



CONNECTING ROD BEARING CRUSH HEIGHT

- Tighten connecting rod caps to the specified torque with connecting rod bearings installed.
Torque: 79 - 83 N·m (8.0 - 8.5 kg-m, 58 - 61 ft-lb)
- Remove connecting rod caps. The connecting rod bearing end must then be higher than the flat surface.
Standard: Crush height must exist.
- If out of specification, replace connecting rod bearings.

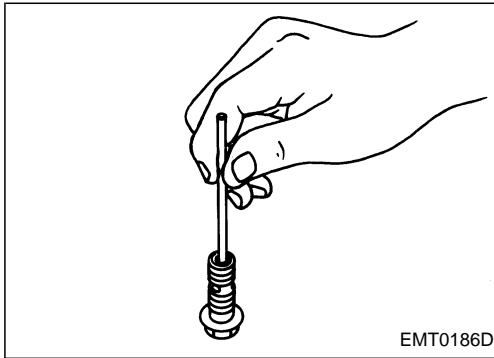


OIL JET

- Check nozzle for deformation and damage.
- Blow compressed air from nozzle, and check for clogs.
Standard: No deformation and no damage.
- Replace oil jet if it is out of the standard.

Inspection (Cont'd)

OIL JET RELIEF VALVE



- Press check valve in oil jet relief valve using a clean plastic stick. Make sure that valve moves smoothly with proper reaction force.

Standard:

Valve moves smoothly with proper reaction force.

- Replace oil jet relief valve if it is out of the standard.

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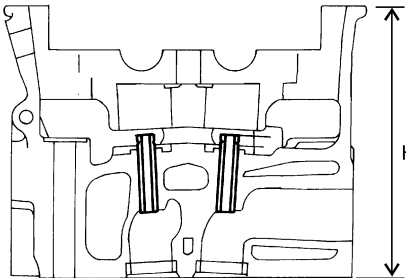
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Cylinder Head

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)

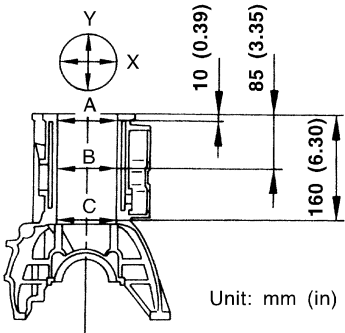


Nominal cylinder head height:
H = 153.9 - 154.1 mm (6.059 - 6.067 in)

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Cylinder Block

Unit: mm (in)



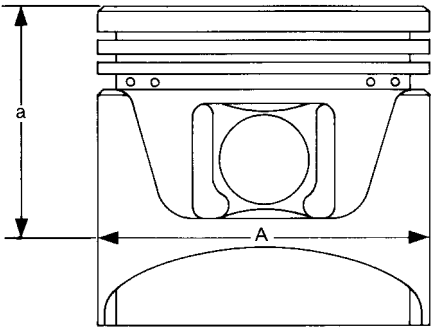
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Surface flatness	Standard			Less than 0.03 (0.0012)
	Limit			0.1 (0.004)
Cylinder bore	Inner diameter	Standard	Grade No. 1	89.000 - 89.010 (3.5039 - 3.5043)
			Grade No. 2	89.010 - 89.020 (3.5043 - 3.5047)
			Grade No. 3	89.020 - 89.030 (3.5047 - 3.5051)
		Wear limit		0.07 (0.0028)
Out-of-round (Difference between X and Y)				Less than 0.015 (0.0006)
Taper (Difference between A and C)				Less than 0.010 (0.0004)

Piston, Piston Ring and Piston Pin

AVAILABLE PISTON

Unit: mm (in)



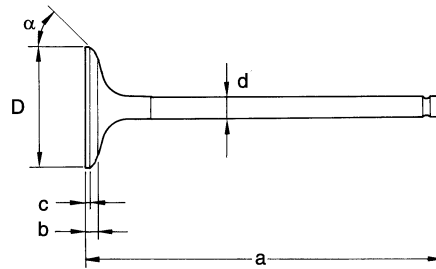
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Piston skirt diameter “A”	Standard	Grade No. 1	88.925 - 88.935 (3.5010 - 3.5014)
		Grade No. 2	88.935 - 88.945 (3.5014 - 3.5018)
		Grade No. 3	88.945 - 88.955 (3.5018 - 3.5022)
		0.25 (0.0098) oversize (Service)	89.175 - 89.205 (3.5108 - 3.5120)
		0.50 (0.0197) oversize (Service)	89.425 - 89.455 (3.5207 - 3.5218)
“a” dimension			59.0 (2.323)
Piston clearance to cylinder block			0.065 - 0.085 (0.0026 - 0.0033)

Valve

VALVE

Unit: mm (in)



PBIC0413E

Valve length "a"	Intake	113.5 (4.468)
	Exhaust	
"b"	Intake	3.8 - 4.2 (0.150 - 0.165)
	Exhaust	
Valve margin "c"	Intake	1.5 (0.059)
	Exhaust	
Valve stem diameter "d"	Intake	6.962 - 6.977 (0.2741 - 0.2747)
	Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve head diameter "D"	Intake	31.9 - 32.1 (1.256 - 1.264)
	Exhaust	29.9 - 30.1 (1.177 - 1.185)
Valve seat angle "α"	Intake	45°00' - 45°30'
	Exhaust	

VALVE CLEARANCE

Unit: mm (in)

Items	Cold*
Intake and exhaust	0.30 - 0.40 (0.012 - 0.016)

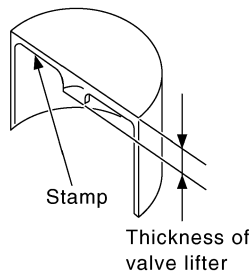
*: Approximately 20°C (68°F)

Valve (Cont'd)

AVAILABLE VALVE LIFTER

Unit: mm (in)

Identification mark	Thickness
535	5.35 (0.2106)
540	5.40 (0.2126)
545	5.45 (0.2146)
550	5.50 (0.2165)
555	5.55 (0.2185)
560	5.60 (0.2205)
565	5.65 (0.2224)
570	5.70 (0.2244)
575	5.75 (0.2264)
580	5.80 (0.2283)
585	5.85 (0.2303)
590	5.90 (0.2323)
595	5.95 (0.2343)
600	6.00 (0.2362)
605	6.05 (0.2382)



KBIA2292E

VALVE LIFTER

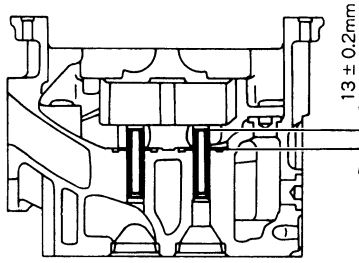
Unit: mm (in)

Valve lifter outer diameter	34.455 - 34.465 (1.3565 - 1.3569)
Lifter guide inner diameter	34.495 - 34.515 (1.3581 - 1.3589)
Clearance between lifter and lifter guide	0.030 - 0.060 (0.0012 - 0.0024)

Valve (Cont'd)

VALVE GUIDE

Unit: mm (in)



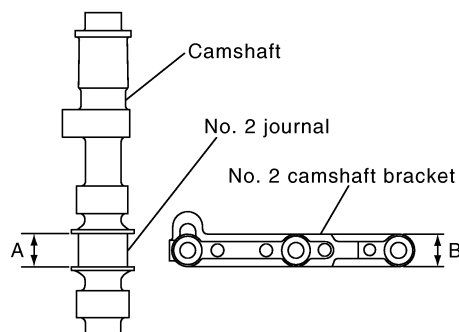
FEM071

		Standard	Limit
Valve guide	Outer diameter	11.023 - 11.034 (0.4340 - 0.4344)	—
	Inner diameter (Finished size)	7.000 - 7.018 (0.2756 - 0.2763)	—
Cylinder head valve guide hole diameter		10.996 - 10.975 (0.4329 - 0.4321)	—
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	—
Stem to guide clearance	Intake	0.023 - 0.056 (0.0009 - 0.0022)	0.18 (0.0071)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.10 (0.0039)
Projection length		12.8 - 13.2 (0.5309 - 0.5197)	—

Camshaft and Camshaft Bearing

Unit: mm (in)

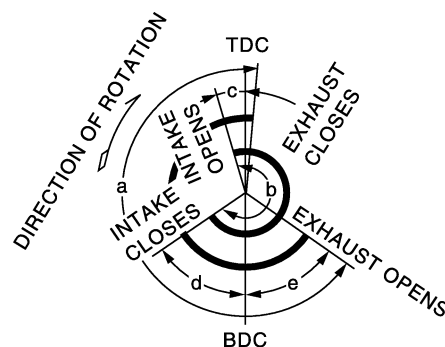
	Standard	Limit
Camshaft end play	0.065 - 0.169 (0.0026 - 0.0067)	0.2 (0.008)



KBIA2318E

Camshaft (No. 2 journal) "A" dimension	19.455 - 19.507 (0.7659 - 0.7680)
No. 2 camshaft bracket "B" dimension	19.338 - 19.390 (0.7613 - 0.7634)

Valve timing



PBIC0517E

Unit: degree

a	b	c	d	e
232	220	6	34	50

Crankshaft

Unit: mm (in)

Runout [TIR*]	Standard	Less than 0.01 (0.0004)
	Limit	0.03 (0.0012)

*: Total indicator reading

Available Connecting Rod Bearing

BALANCER SHAFT BEARING

Unit: mm (in)

Balancer shaft journal outer diameter	Front	50.875 - 50.895 (2.0029 - 2.0037)
	Rear	50.675 - 50.695 (1.9951 - 1.9959)
Balancer shaft bearing inner diameter	Front	50.955 - 50.980 (2.0061 - 2.0071)
	Rear	50.755 - 50.780 (1.9982 - 1.9992)
Balancer shaft journal oil clearance	Standard	0.060 - 0.105 (0.0024 - 0.0041)
	Limit	0.180 (0.0071)