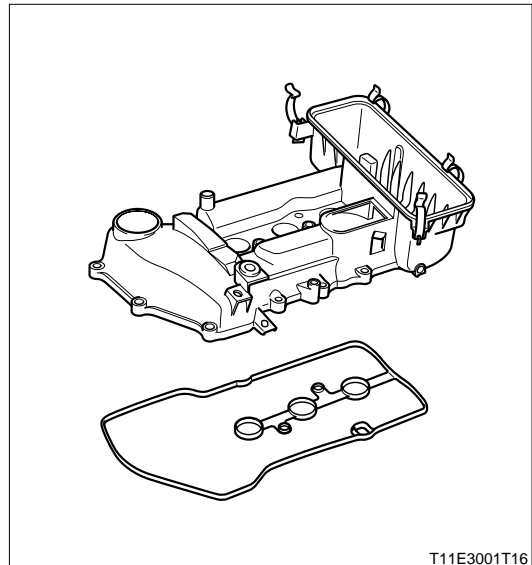


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POWER TRAIN (1KR) 1 CONSTRUCTION AND OPERATION 1-1 CYLINDER HEAD COVER

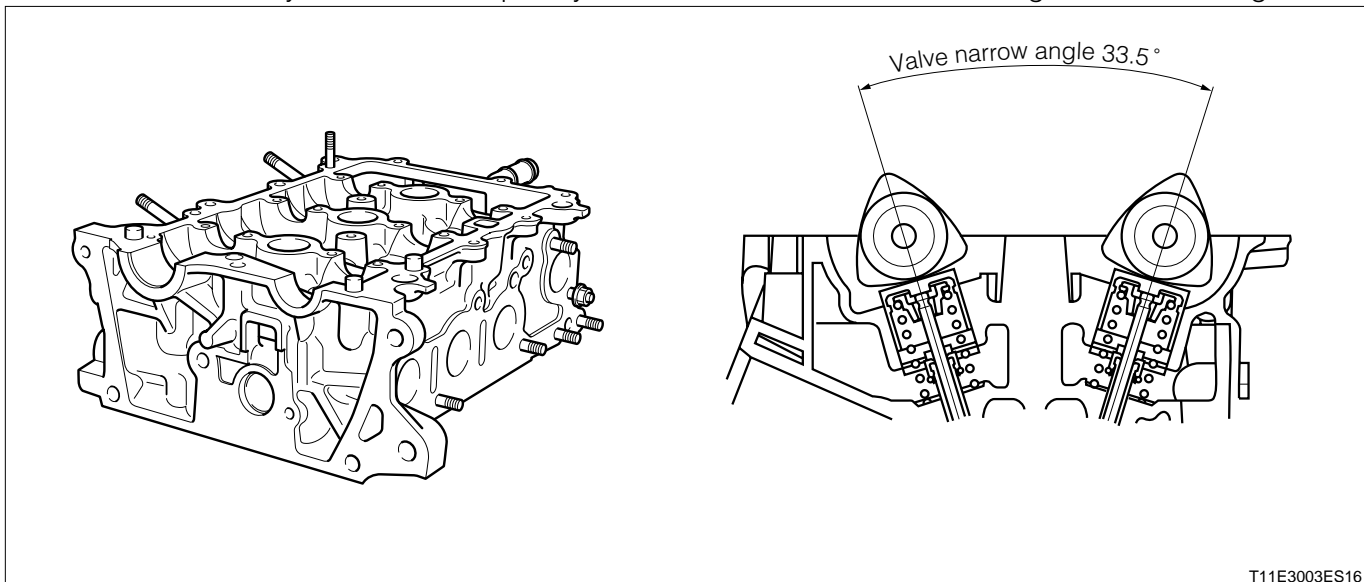
In order to achieve a light weight, a resin cylinder head cover integral with the air cleaner case has been employed. The blow-by chamber and PCV chamber are provided. Furthermore, as for the cylinder head cover gasket, for easier servicing, the gasket for the outer periphery has been integrated with the gasket at the plug tube section.



1-2 CYLINDER HEAD

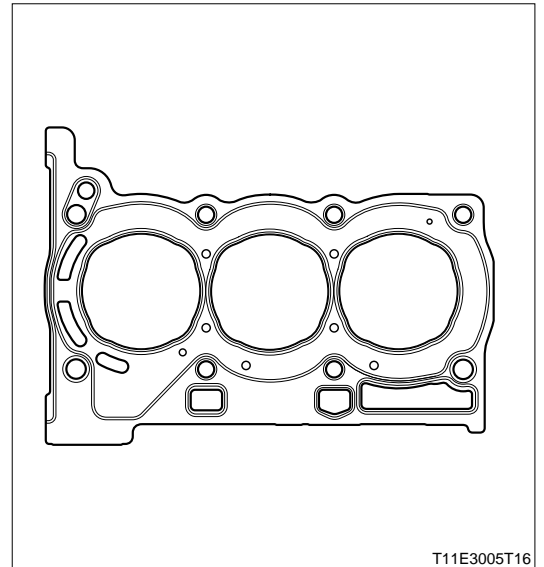
A compact combustion chamber featuring an excellent S/V ratio has been employed and an oblique squish is adopted. Moreover, for improved knock limit, long reach plugs have been employed, thus conforming to the shape of the water jacket of the cylinder head. Furthermore, for enhanced combustion due to the generation of an optimum tumble in the combustion chamber, the shape of the intake port in the cylinder head has been optimized. In order to improve fuel consumption, a passage for EGR gas is provided at the rear of the cylinder head in such a way that it is in contact with the water jacket, thus lowering the EGR gas temperature.

For enhanced auxiliary resonance frequency characteristics, an alternator flange has been integrated.



1-3 CYLINDER HEAD GASKET

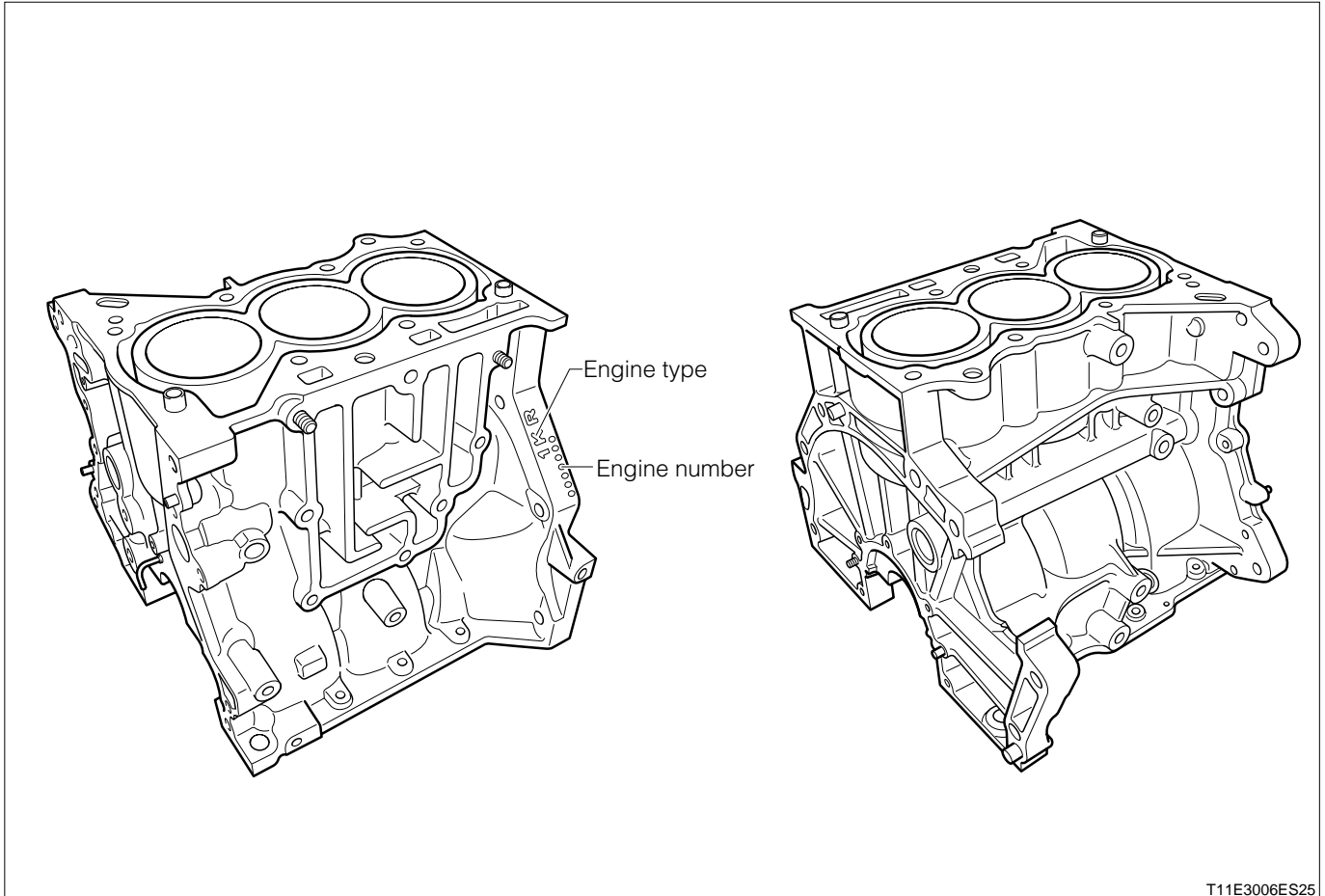
A stainless cylinder head gasket is adopted. The surface of the gasket is coated with NBR rubber. For improved sealing ability, the bead shape at each section has been optimized, thus ensuring the surface pressure.



T11E3005T16

1-4 CYLINDER BLOCK

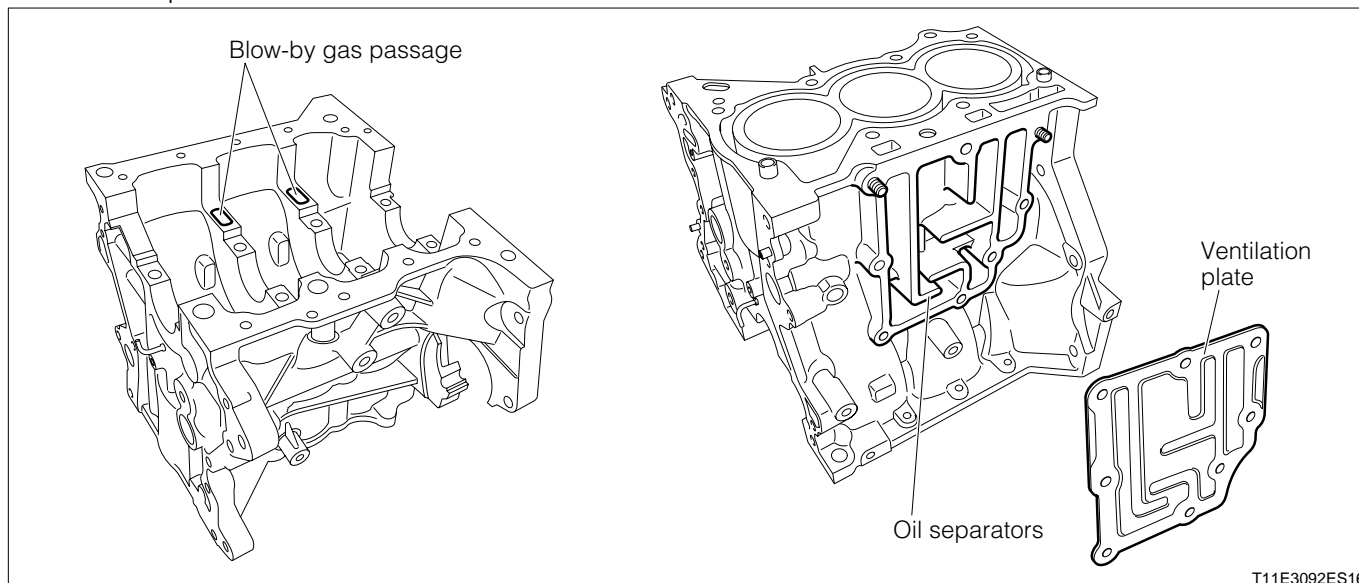
In order to achieve a lighter weight, an aluminum cylinder block has been employed, featuring a compact shape with a bore-to-bore distance of 7 mm. For reduced friction around the piston, the roundness of the bore has been improved by using a spiral liner. For enhanced rigidity, the starter flange has been integrated with the cylinder block, thus improving the joint of the chain cover.



T11E3006ES25

B2-3

The oil separator is provided to the cylinder block in order to improve the ventilating ability in the crank case and to prevent oil deterioration.



T11E3092ES16

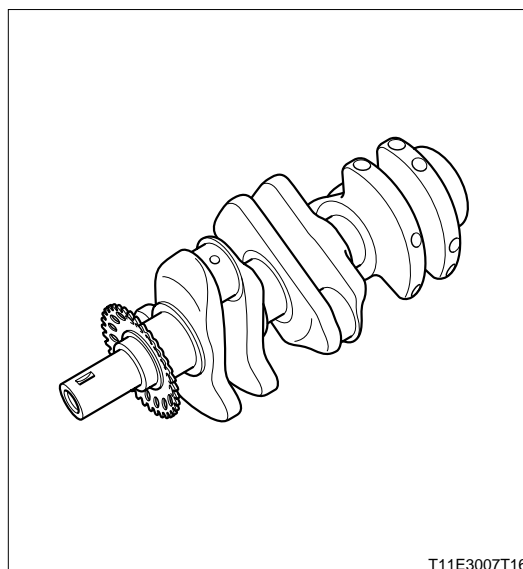
1-5 CRANKSHAFT

For reduced tapping sound and bending vibration, forged (steel) individually balanced crankshaft has been employed. Furthermore, an offset crankshaft is adopted in which the crankshaft center is in offset position toward the cylinder bore center. As a result, the thrust load and friction have been reduced. Moreover, for enhanced heat efficiency, the piston speed has been changed between the compression stroke and the expansion stroke.

The crankshaft drives the oil pump built in the chain cover.

Specifications

Journal diameter(mm)	44.0 Dia.	
Journal width(mm)	#1J	17.5
	#2J	21.4
	#3J	21.8
	#4J	21.4
Crank pin diameter(mm)	40.0 Dia.	
Crank pin width(mm)	18.1	



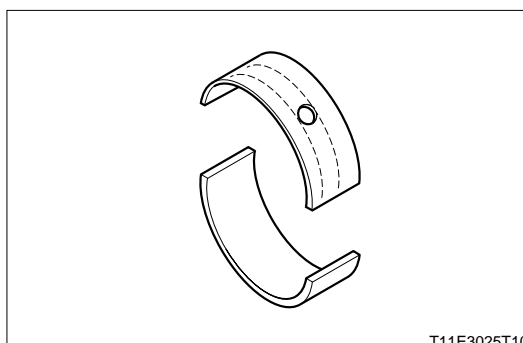
T11E3007T16

1-6 CRANKSHAFT BEARING

For improved initial bedding-in and retention of oil, the striation treatment (referring to treatment in which linear treatment is made on the bearing sliding surface) has been made on the lining surface. Consequently, the oil clearance has been shortened and the metal tapping sound has been reduced. Moreover, the pawl for positioning has been abolished.

Crankshaft bearing specifications

Identification code	Bearing thickness (mm)
2	1.992 – 1.995
3	1.995 – 1.998
4	1.998 – 2.001
5	2.001 – 2.004



T11E3025T10

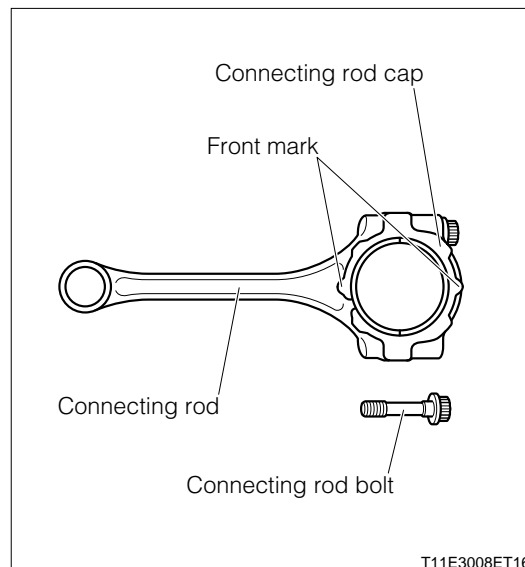
1-7 CONNECTING ROD

For lighter weight, the high-strength vanadium steel is employed.

For lighter weight and stabilized big end shape, the connecting rod bolt uses no nut and is tightened in the plastic area.

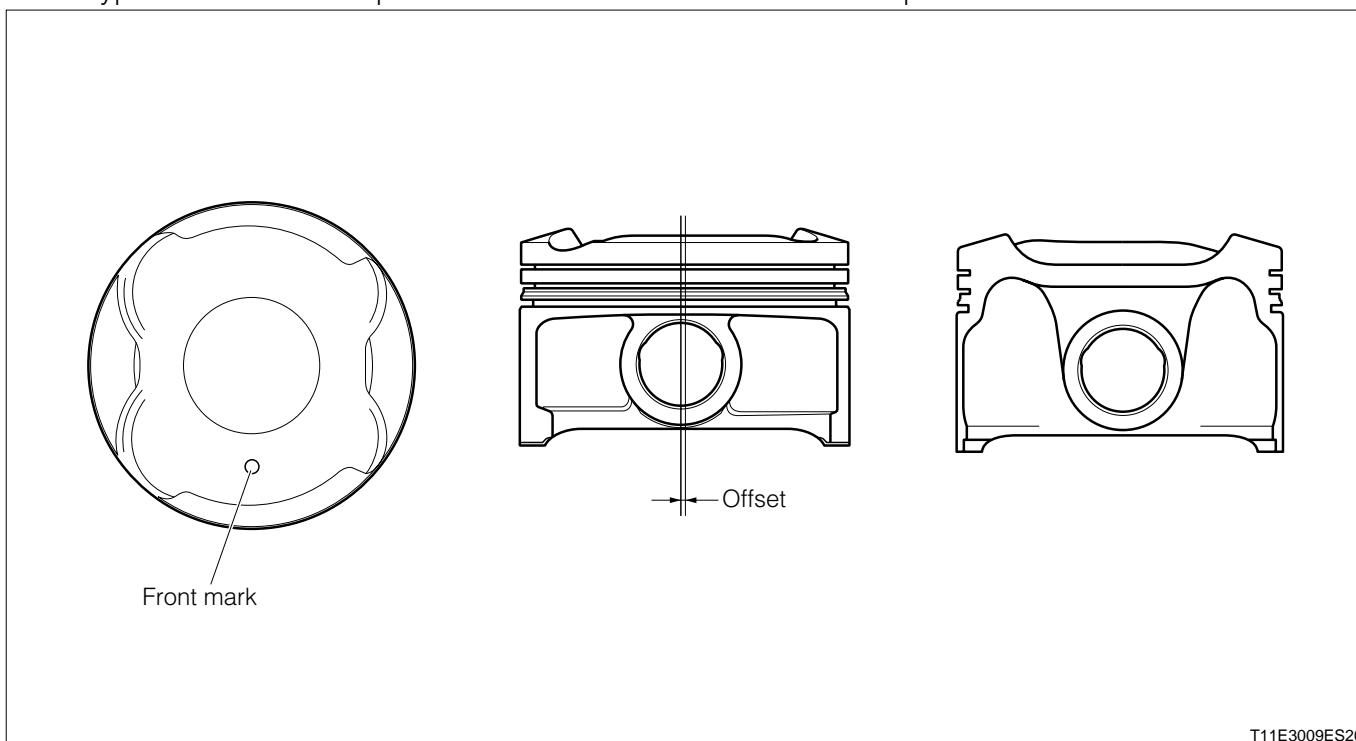
Specifications

Small end inner diameter (mm)	18.0 Dia.
Big end inner diameter (mm)	43.0 Dia.
Center-to-center distance of the big and small ends (mm)	140.88



1-8 PISTON

A new type resin coat is adopted. The external diameter size of the piston is available in one rank.



1-9 CONNECTING ROD BEARING

The bearing is selected for use in accordance with the big end diameter of the connecting rod.

Connecting rod bearing specifications

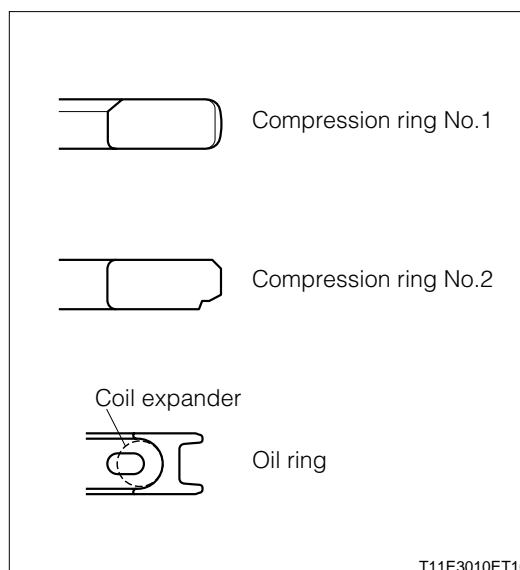
Identification code	Bearing thickness (mm)
1	1.492 - 1.495
2	1.495 - 1.498
3	1.498 - 1.501

1-10 PISTON RING

For reduced friction and enhanced fuel consumption, a low-tension piston ring has been adopted.

Piston ring specifications

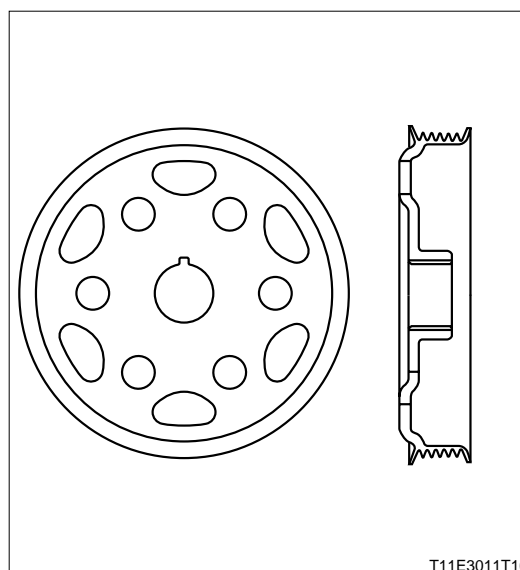
Compression ring No.1	Material	Steel
	Thickness (mm)	2.3
	Width (mm)	1.0
	Top surface code	T1
Compression ring No.2	Material	Steel
	Thickness (mm)	2.3
	Width (mm)	1.0
	Top surface code	T2
Oil ring	Material	Steel
	Thickness (mm)	1.65 (Combined thickness is 2.05)
	Width (mm)	1.5
	Top surface code	—



1-11 CRANKSHAFT PULLEY

A 6-groove pulley is adopted to correspond to the 6-rib belt. By achieving a lighter weight, the torsional resonance frequency characteristics of the crank system have been improved.

Moreover, the timing mark for checking the ignition timing is provided. A yellow paint is applied to the mark.



1-12 V BELT

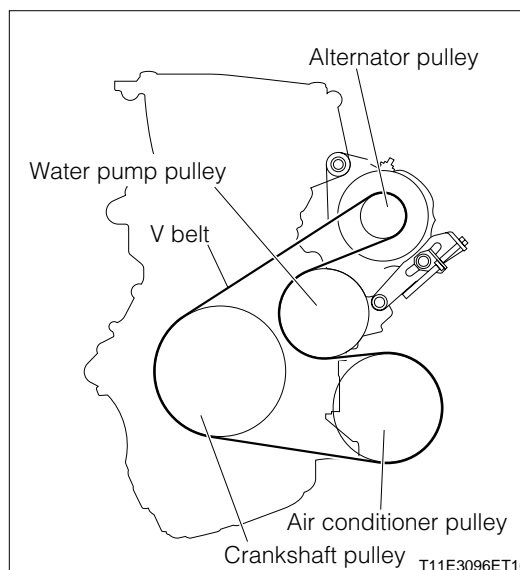
For easier servicing during the belt check and tension adjustment, the serpentine drive layout has been adopted, in which one belt drives the auxiliary machine.

Pulley specifications

Pulley	Pulley diameter (mm)
Crankshaft	139 mm Dia.
Alternator	52.5 mm Dia.
Water pump	95 mm Dia.(Back face)
Air conditioner compressor	108 mm Dia.

Belt specifications

	Belt length (mm)	The number of ribs
with A/C	1200	6
without A/C	860	6



POWER TRAIN (K3)

1 CONSTRUCTION AND OPERATION

1-1 CYLINDER HEAD COVER

For reduced weight, a thin aluminum die cast (general wall thickness is 2mm) has been employed. The spark plug tube section is integrated with the head cover to simplify the structure.

For enhanced sealing performance, the installation is performed by tightening at the outer periphery section and center section. Constant dimension tightening is performed for the outer periphery.

Furthermore, as for the cylinder head cover gasket, for easier servicing, the gasket for the outer periphery has been integrated with the gasket at the plug tube section. As regards the material, a heat-proof acrylic rubber featuring an excellent heat-proof is adopted.

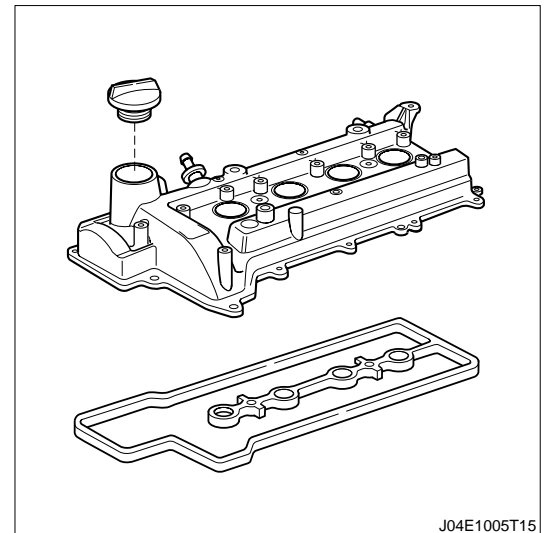
1-2 CYLINDER HEAD

For enhanced anti-knocking performance and combustion efficiency, a combustion chamber shape featuring an excellent S/V ratio has been employed.

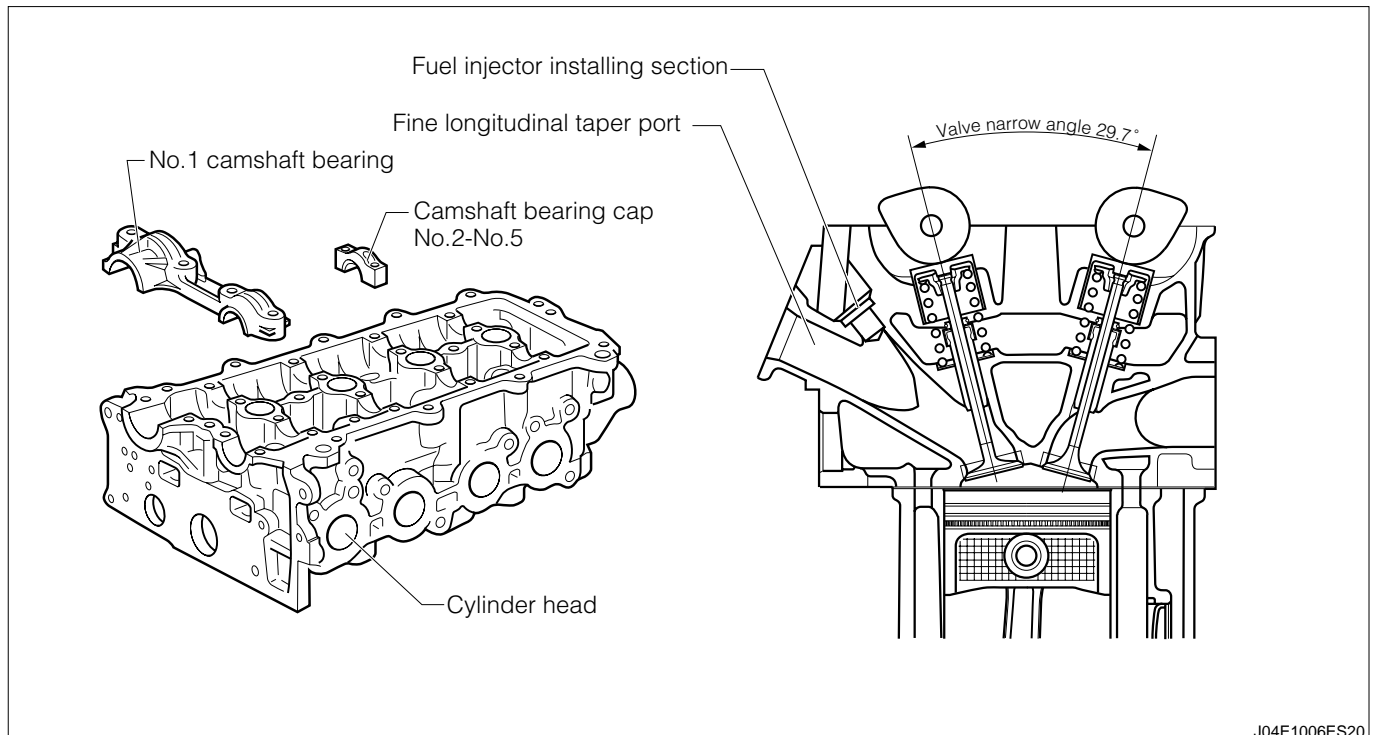
The intake and discharge layout is of a cross flow type. A narrow longitudinal tapered port is adopted to improve the air intake efficiency.

Moreover, the fuel injector is installed at the intake port of the cylinder head, thus preventing the fuel from adhering to the wall. Consequently, HC emission amount has been reduced.

As for the flow of cooling water in the cylinder head, the intake precedence cooling system is adopted, in which the water flows from the intake side. As a result, the intake temperature is lowered, thus improving the filling efficiency and anti-knocking ability.



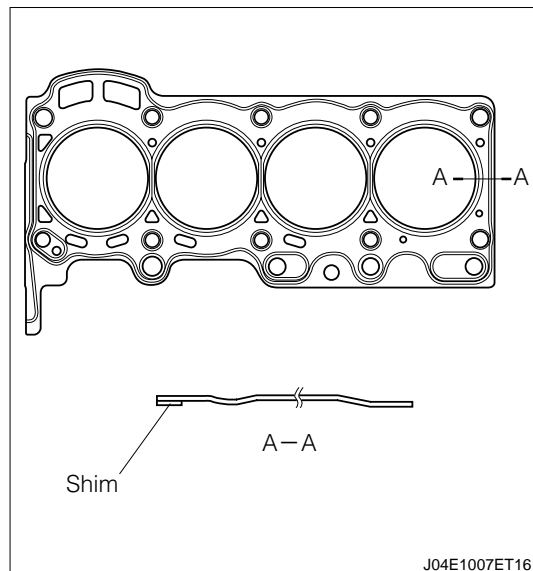
J04E1005T15



J04E1006ES20

1-3 CYLINDER HEAD GASKET

A metal single-layer type is adopted. A shim with seal surface width is welded by laser to the cylinder bore section. In this way, the surface pressure is stabilized, thus ensuring the sealing ability and durability.



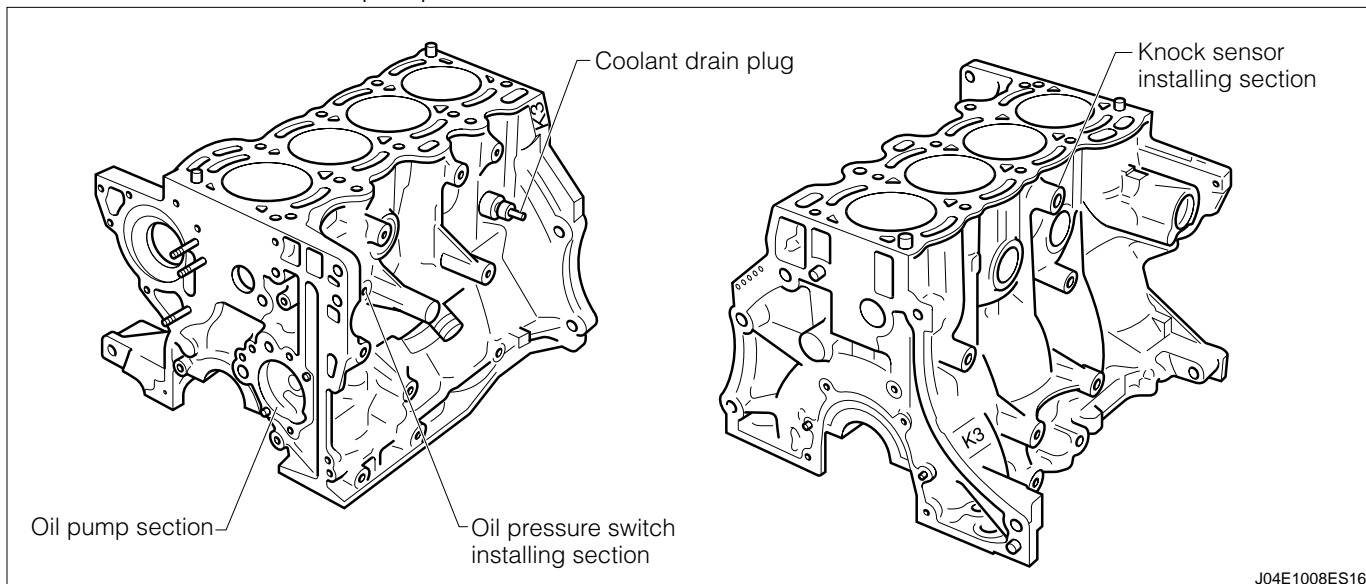
1-4 CYLINDER BLOCK

For reduced weight and highly-rigid cylinder block, a high accuracy cast iron block with the cold box method (referring to a method to form a casting mold by chemical reaction or hardening reaction with catalytic gas at a normal temperature, not performing heat treatment for cast molding) has been adopted. The Siamese water jacket construction has been adopted. Drilled passage process is added between the bores. In this way, durability has been ensured.

For lower fuel consumption, the bore center has been arranged (off-set) toward the exhaust side in relation to the center of crank shaft, thus reducing the transmission loss of the combustion pressure to the piston.

For reduced weight and compact design, parts have been integrated with or built in the block as much as possible.

- Vortex chamber of water pump and water passage to the pump
- Rotor chamber of the oil pump and the relief valve

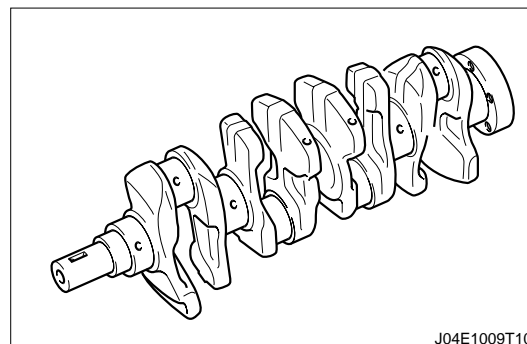


1-5 CRANKSHAFT

For higher strength and enhanced rigidity, steel is adopted. Eight balances are adopted to achieve low vibration.

Specifications

Journal diameter(mm)	46.0 Dia.
Journal width(mm)	21.8
Crank pin diameter(mm)	40.0 Dia.
Crank pin width(mm)	18



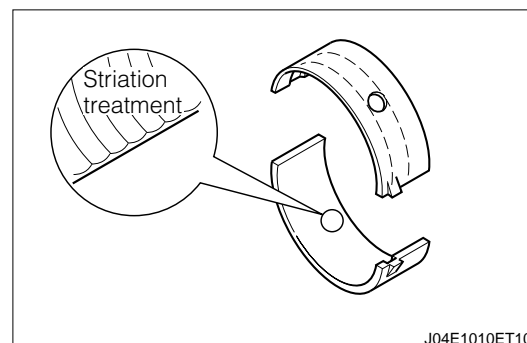
J04E1009T10

1-6 CRANKSHAFT BEARING

For improved initial bedding-in and retention of oil, the striation treatment (referring to treatment in which linear treatment is made on the bearing sliding surface) has been made on the lining surface. Consequently, the oil clearance has been shortened and the metal tapping sound has been reduced.

Crankshaft bearing specifications

Identification code	Bearing thickness (mm)
2	1.989 – 1.992
3	1.992 – 1.995
4	1.995 – 1.998
5	1.998 – 2.001



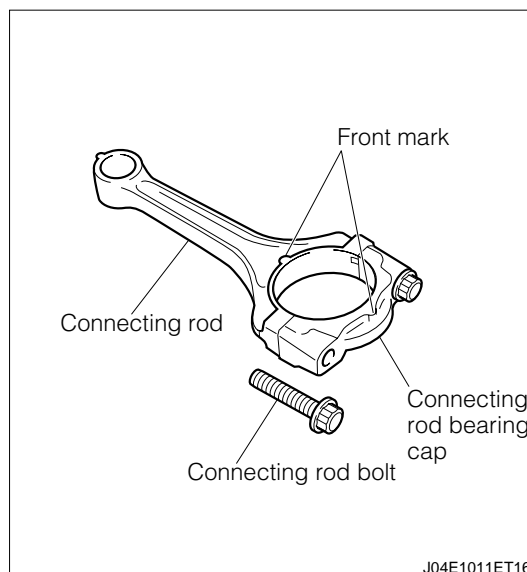
J04E1010ET10

1-7 CONNECTING ROD

For reduced weight, high-strength vanadium steel is adopted. Double shot (after coining, shot peening is conducted again to add residual stress) is performed on the surface to increase the surface hardness and to reduce weight further. Moreover, for reduced weight and friction loss, the small end, big end width and big end diameter have been downsized. For lighter weight and stabilized big end shape, the connecting rod uses no nut and is tightened in the plastic area.

Specifications

Small end inner diameter (mm)	18.0 Dia.
Big end inner diameter (mm)	43.0 Dia.
Center-to-center distance of the big and small ends (mm)	129.5



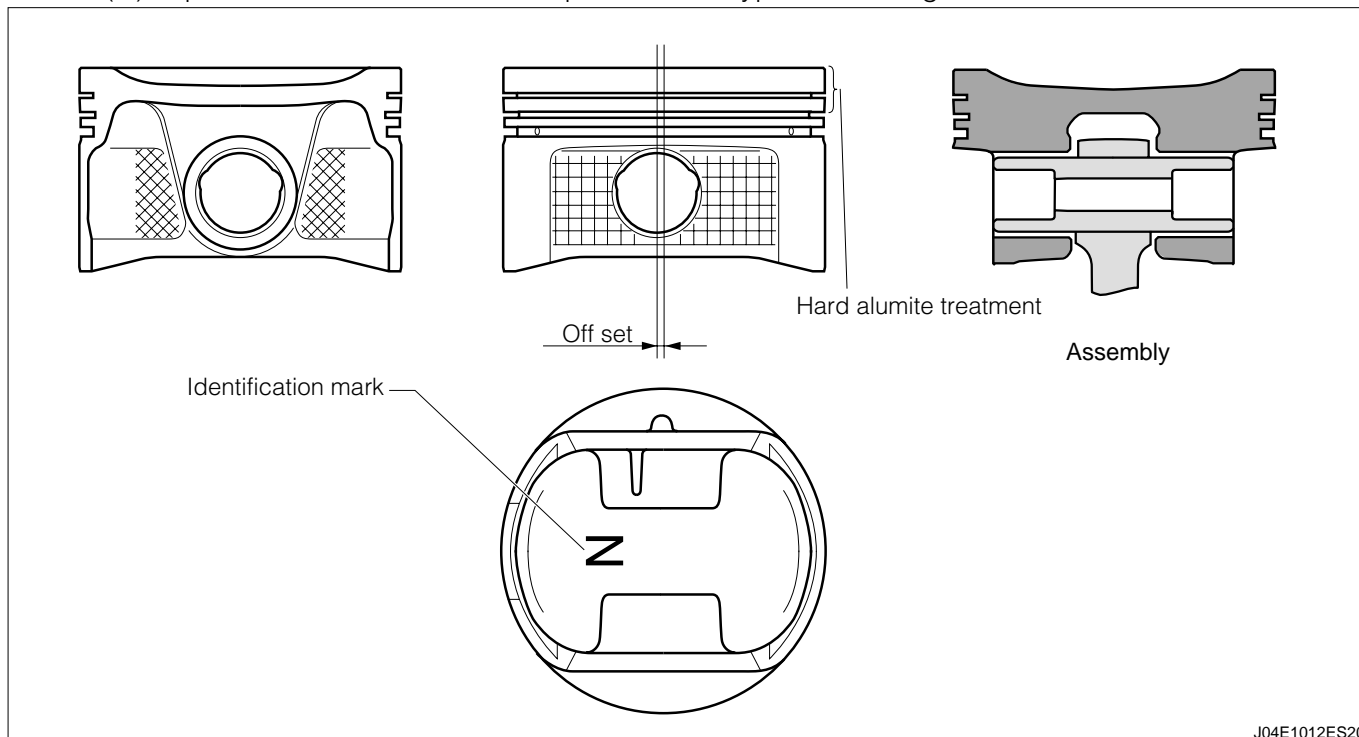
J04E1011ET16

1-8 PISTON

For reduced weight and friction loss, the compression height has been shortened, and the narrow-width, short skirt has been employed. Moreover, the rigidity at the skirt section has been enhanced, thus making the rigidity of the entire piston uniform. As a result, the oil consumption has been reduced and the reliability has been improved. Furthermore, hard alumite treatment is performed to the upper side from the 2nd land in order to increase the abrasion resistance.

It is in the one rank due to the improvement of the processing accuracy of the piston and cylinder bore. In order to achieve a lighter weight and higher rigidity, the total length of the piston pin has been shortened and the stepped pin shape has been employed. Connection with the connecting rod is the press-fit method in which the piston pin is fixed by press-fitting.

A mark (N) is provided to indicate that the piston is for Type K3-VE engine.



J04E1012ES20

1-9 CONNECTING ROD BEARING

For improved durability and reliability, the striation treatment has been made on the lining surface.

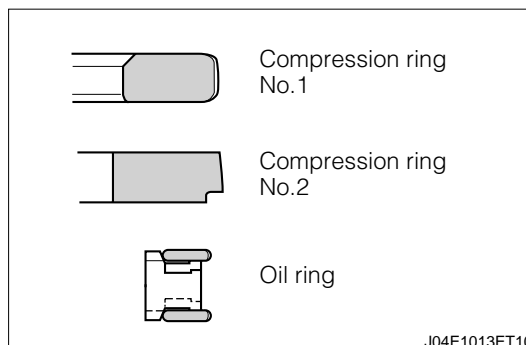
It is in the one rank due to the improvement of the processing accuracy of the crankshaft and connecting rod.

1-10 PISTON RING

The thin B size ring is adopted to improve oil consumption performance.

Piston ring specifications

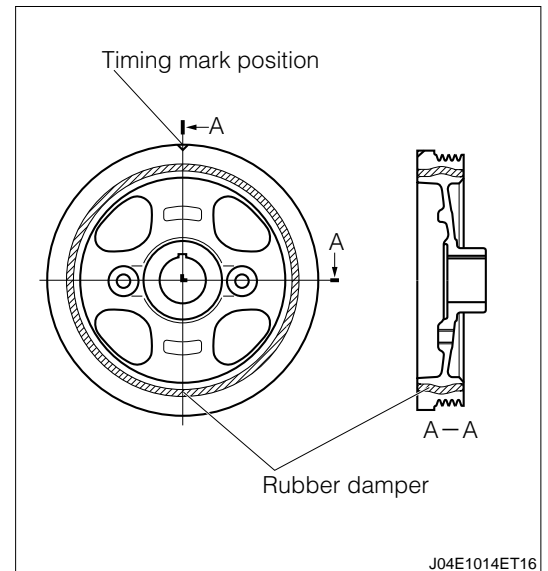
Compression ring No.1	Material	Steel
	Thickness (mm)	2.6
	Width (mm)	1.2
	Top surface code	T
Compression ring No.2	Material	Cast iron
	Thickness (mm)	2.6
	Width (mm)	1.2
	Top surface code	T
Oil ring	Material	Steel
	Thickness (mm)	2.25
	Width (mm)	2.0
	Top surface code	—



J04E1013ET10

1-11 CRANKSHAFT PULLEY

For reduced torsional vibration of the crankshaft, the crankshaft pulley has employed a cast iron with rubber damper. Moreover, a mark for checking the ignition timing is provided on the crank pulley side.



1-12 V BELT

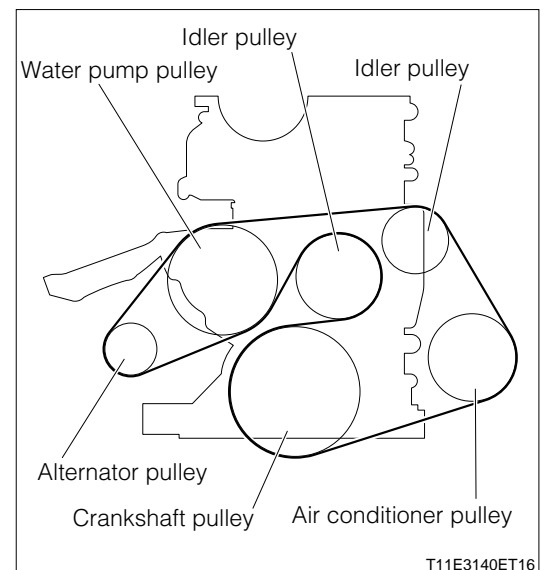
For easier servicing during the belt check and tension adjustment, the serpentine drive layout has been adopted, in which one belt drives the auxiliary machine. Moreover, for easier servicing, the belt tension adjustment has employed an alternator adjusting type.

Pulley specifications

Pulley	Pulley diameter (mm)
Crankshaft	139 mm Dia.
Alternator	55 mm Dia.
Water pump	116 mm Dia.
Air conditioner compressor	93 mm Dia.
Fixed idler (large)	88 mm Dia.
Idler (small)	70 mm Dia.

Belt specifications

	Belt length (mm)	The number of ribs
with A/C	1590	4
without A/C	1470	4

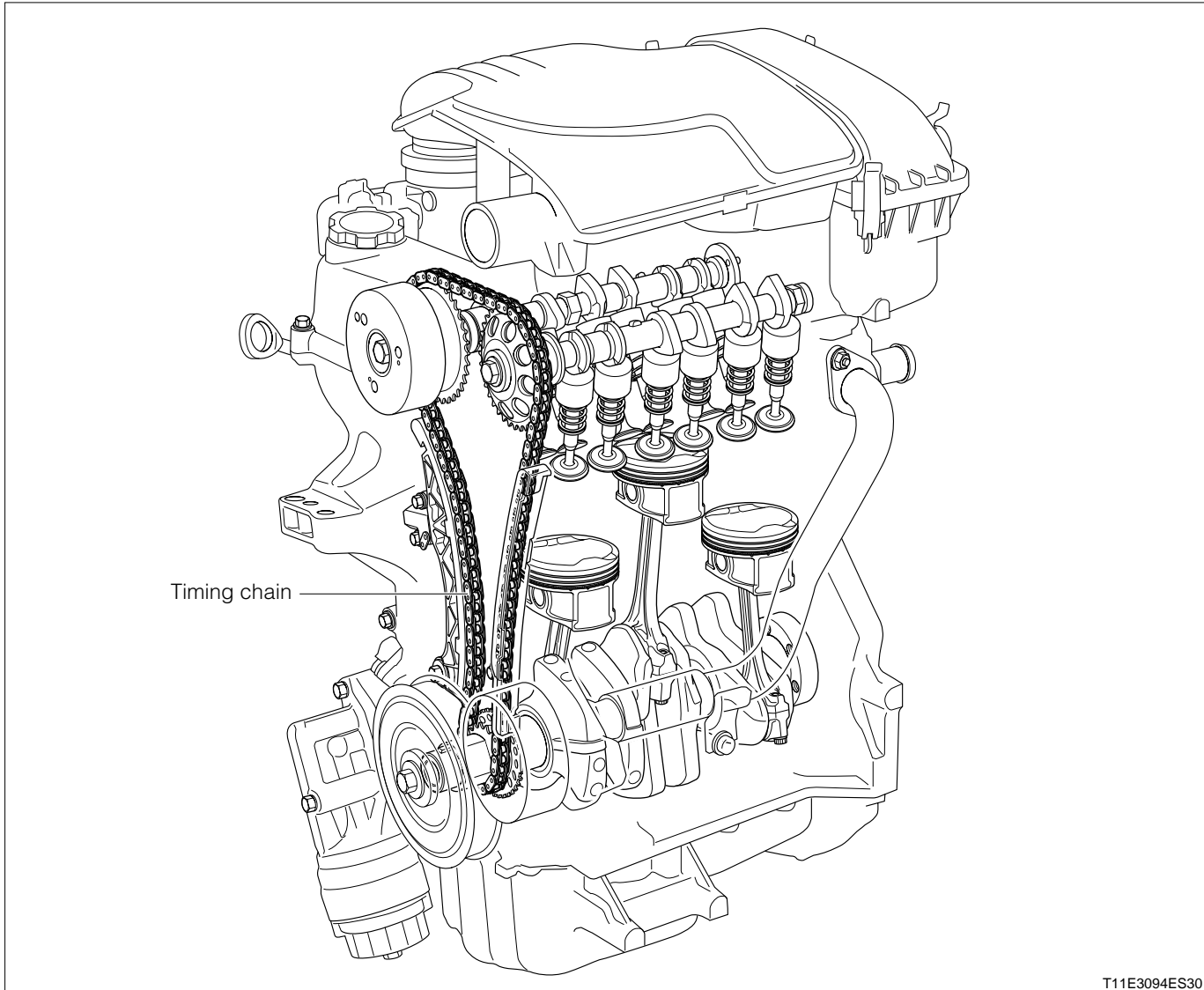


CAM, VALVE MECHANISM (1KR)

1 OUTLINE

1-1 DESCRIPTION

A single stage chain is used, in which a single chain drives the intake and exhaust cam shafts. Direct valve actuating, DOHC, 4-valve (two intake valves, two exhaust valves) has been employed. Also, DVVT (Dynamic Variable Valve Timing) mechanism has been adopted, in which the valve timing is controlled to an optimum timing according to the operating condition of the engine.



2 CONSTRUCTION AND OPERATION

2-1 VALVE AND VALVE SPRING

The valves have employed heat-resistant steel for both the intake side and exhaust side. The nitriding treatment has been performed for all surfaces (except the valve face section). Furthermore, for reduced mechanical loss, a smaller diameter of the stem section has been employed.

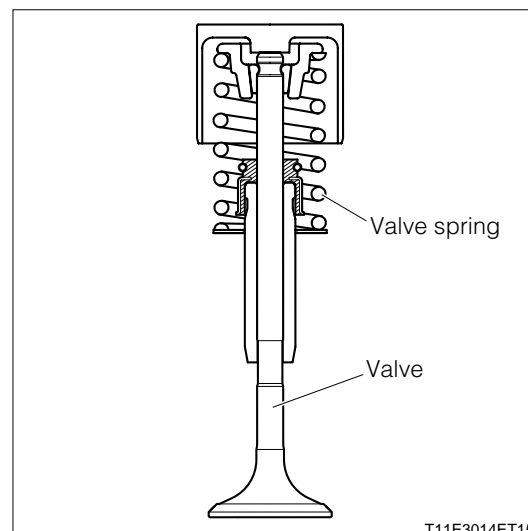
For the valve spring, special carbon steel for the valve spring has been used and it has undergone the shot peening. The common parts have been used for both the intake side and exhaust side and the valve spring has adopted a variable pitch spring featuring an excellent valve following-up characteristics. For reduced friction loss, the maximum load has been reduced by decreasing the equivalent mass of the valve system.

Valve specifications

	Intake valve	Exhaust valve
Overall length (mm)	88.39	89.11
Diameter of head section (mm)	27.5 Dia.	23.6 Dia.
Diameter of stem section (mm)	5 Dia.	5 Dia.

Valve spring specifications

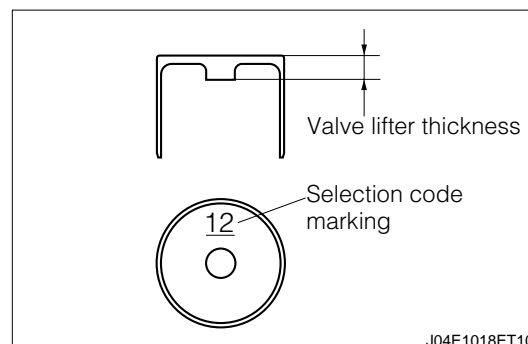
Coil diameter (mm)	2.5 Dia.
Coil inner diameter (mm)	16.0
Total winding number	8.84
Free length (mm)	51.63



T11E3014ET15

2-2 VALVE LIFTER AND VALVE ADJUSTING SHIM

For reduced weight, shim-less lifters have been adopted. The valve clearance is adjusted by changing the surface thickness at the top of the lifter. The surface thickness at the top of the lifter comes in 29 kinds between 5.12 mm and 5.68 mm in increments of 0.02 mm. The lifter thickness is identified by the number stamped on the back of the lifter. The stamped number indicates the dimension of the top surface thickness below the decimal point.



J04E1018ET10

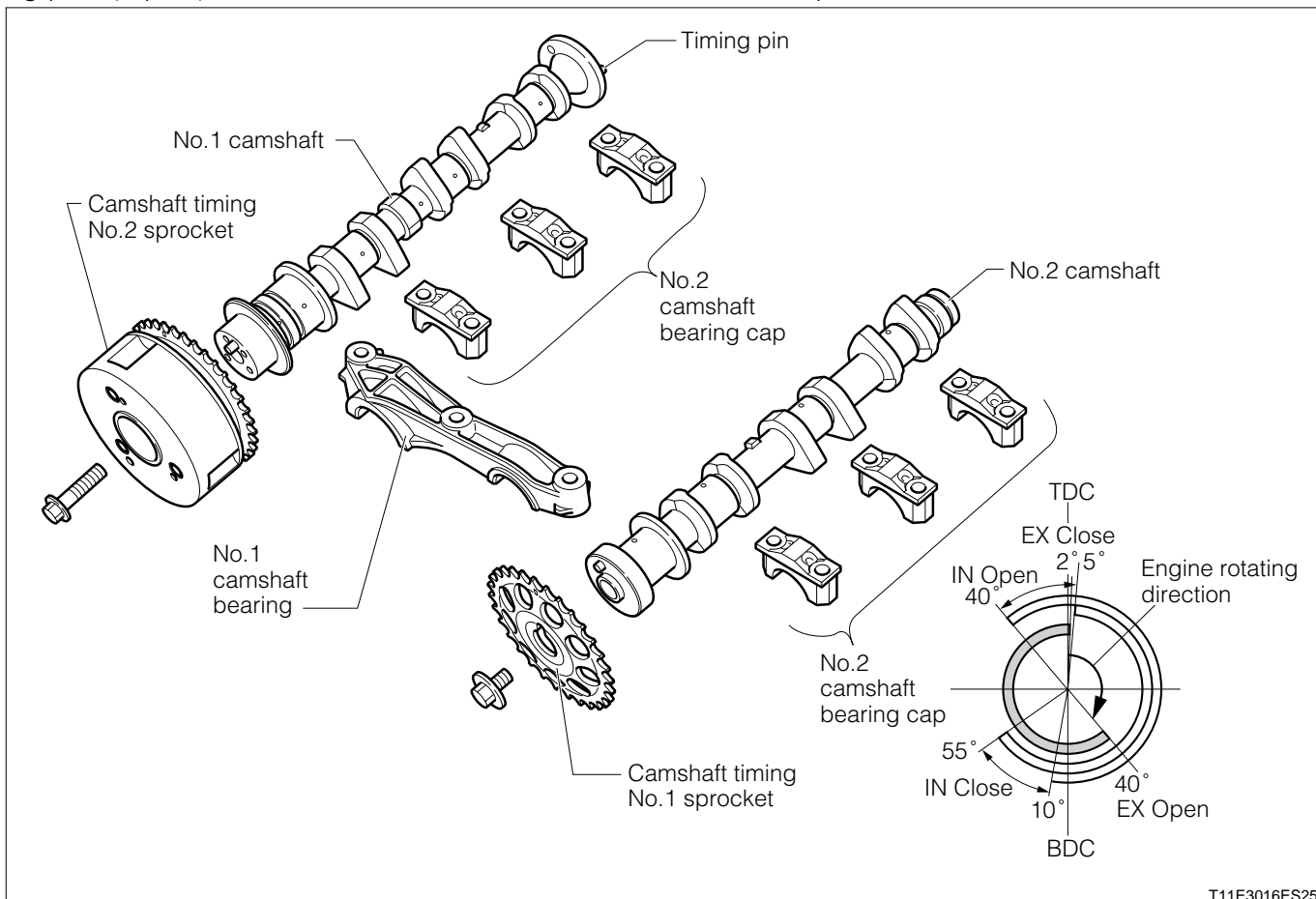
B2-13

2-3 CAMSHAFT

It is made of alloy cast iron. The camshaft No.1 (intake side) and camshaft No.2 (exhaust side) are hollow.

To obtain compact design of the cylinder head, the camshaft is driven by the chain.

The DVVT controller integral with the sprocket is mounted to the front end of camshaft No.1. Also, the timing pins (3 pins) are mounted to the rear end to detect the cam position of the DVVT.

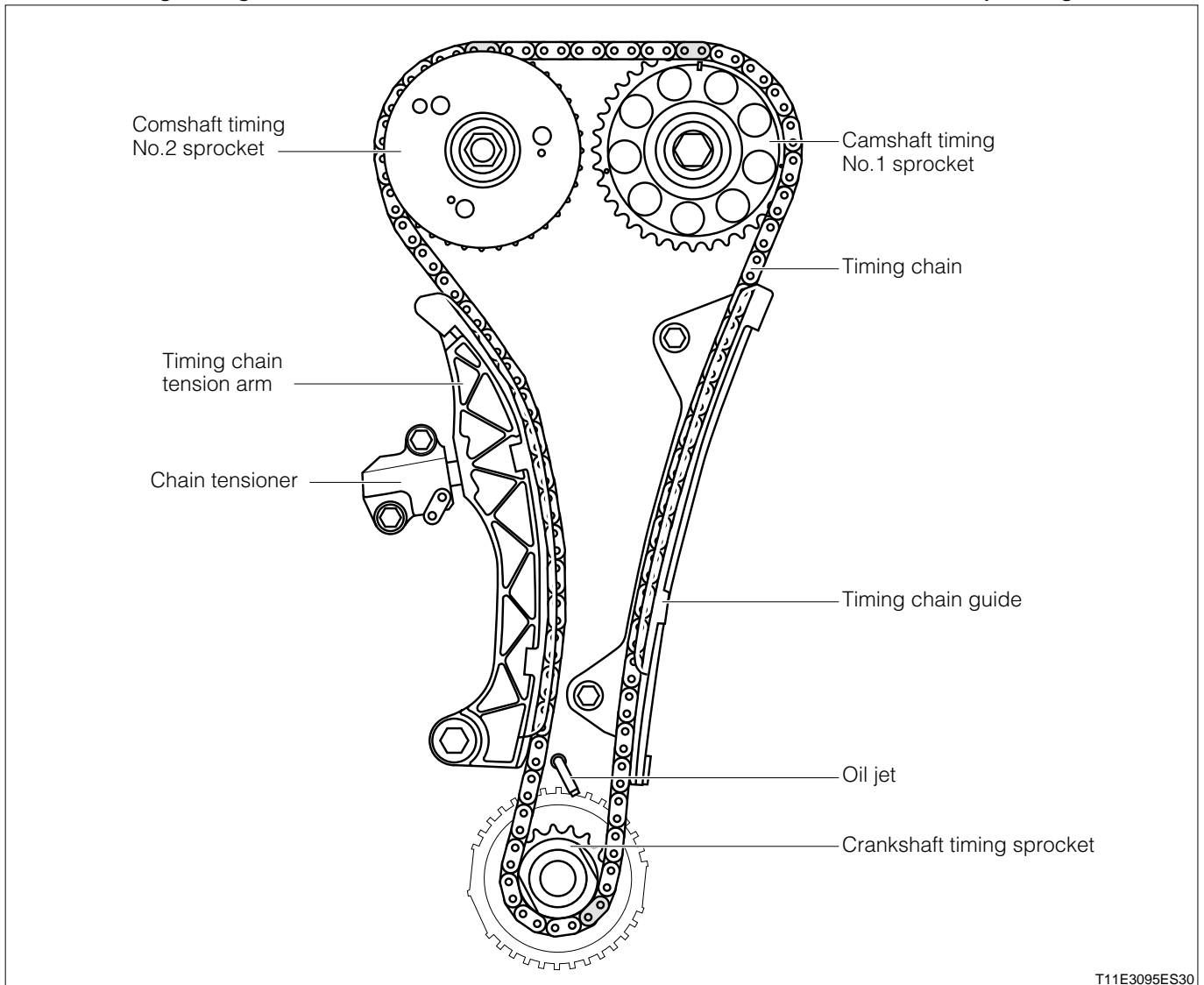


T11E3016ES25

2-4 TIMING CHAIN MECHANISM

2-4-1 DESCRIPTION

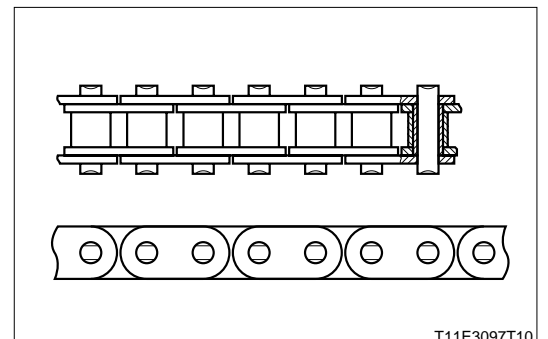
This is the single-stage chain in which the intake and exhaust camshafts are driven by a single chain.



T11E3095ES30

2-4-2 TIMING CHAIN

A roller chain with a pitch of 8.00 mm is adopted. As the marks for assembling the chain, a yellow mark plate and 2 orange mark plates are provided.



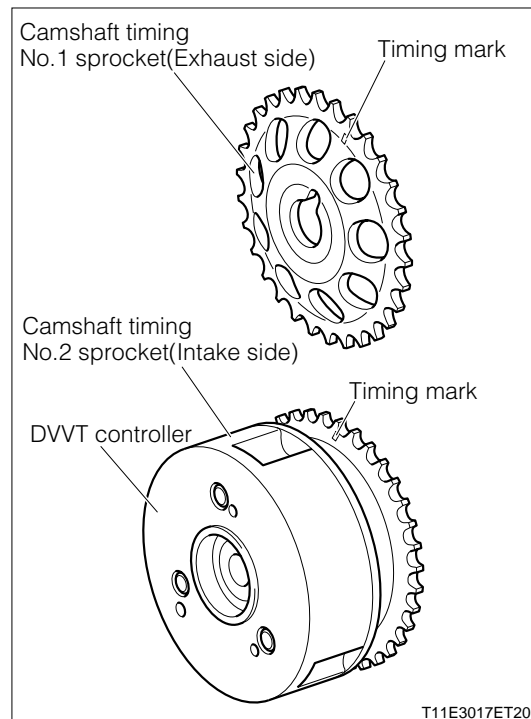
T11E3097T10

2-4-3 CAMSHAFT TIMING NO.1 SPROCKET,CAMSHAFT TIMING NO.2 SPROCKET

A timing mark is provided as a mating mark for assembling the timing chain.

Sprocket specifications

	Camshaft timing No.1 sprocket	Camshaft timing No.2 sprocket
Material	Hot-rolled steel	Sintered alloy
Tooth profile	Involute	Involute
Number of teeth	36	36
Pitch (mm)	8.00	8.00
Pitch circle diameter (mm)	91.98 Dia.	91.98 Dia.
Roller diameter (mm)	5.65	5.65
Width (mm)	4.2	4.2

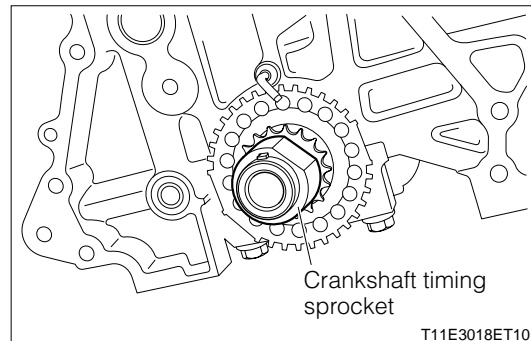


2-4-4 CRANKSHAFT TIMING SPROCKET

A timing mark is provided as a mating mark for assembling the timing chain.

Crankshaft timing sprocket specifications

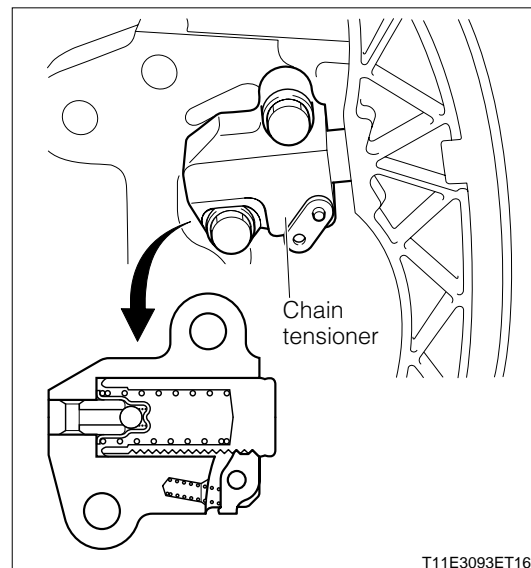
Material	Sintered alloy
Tooth profile	Involute
Number of teeth	18
Pitch (mm)	8.00
Pitch circle diameter (mm)	46.07 Dia.
Roller diameter (mm)	5.65
Width (mm)	4.2



2-4-5 CHAIN TENSIONER PLUNGER

In order to assure the durability and quietness, an optimum tension is always given to the timing chain, using the hydraulic pressure in combination with the spring force.

Moreover, the service holes have been provided on the timing chain cover, so that the initial setting can be performed for the ratchet mechanism during the servicing.

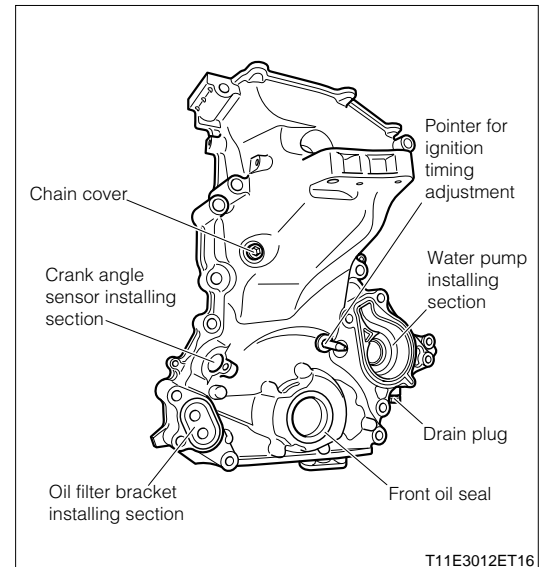


2-4-6 OIL JET

An oil jet is provided to lubricate the meshing section of the crank shaft timing sprocket and the chain.

2-4-7 TIMING CHAIN COVER

It is made of aluminum and incorporates an oil pump, and it is so constructed that the oil strainer, water pump, and oil filter bracket are mounted. Moreover, for reduced mount vibration, the mount bracket (right) has been integrated. Furthermore, service holes for adjusting the chain tension and pointers for adjusting the ignition timing are provided.



2-5 DVVT SYSTEM

2-5-1 DESCRIPTION

1. The DVVT (Dynamic Variable Valve Timing) capable of controlling the valve timing to an optimum condition at all times from the idling to the high-speed driving has been employed. Thus, low fuel consumption and high output have been achieved.

(1) During the idling period, mixture is prevented from passing through to exhaust gas by eliminating the valve overlap. As a result, fuel economy is enhanced.

(2) When the valve overlap is expanded, the inner EGR amount increases and the negative pressure in the intake manifold is reduced. Consequently, the pumping loss of the piston is reduced and fuel consumption enhances. Furthermore, by this inner EGR effect, inactive gas is inhaled again, thus lowering the combustion temperature. Consequently, NO_x emission is reduced. Moreover, since unburnt gas is combusted again, the HC emission is reduced.

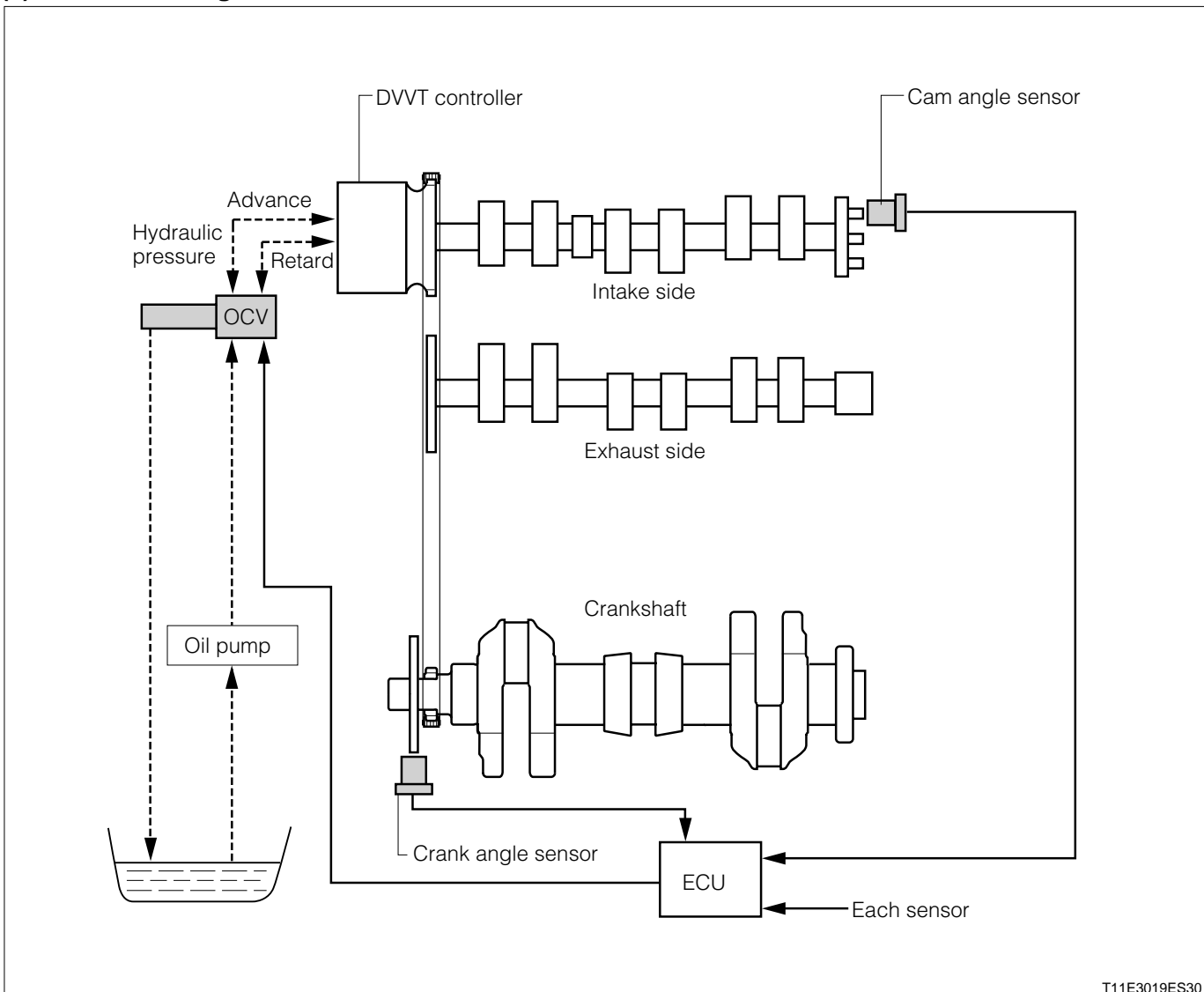
(3) In the high-load driving range, the output and torque are increased through the valve timing according to the required air amount.

2-5-2 SYSTEM

(1) Description

The engine control computer controls the OCV (oil control valve) according to the engine speed, pressure in the intake manifold, etc. In this way, the phase of the camshaft No.1 (intake side) is controlled to an optimum condition by applying the engine hydraulic pressure to the front and rear of the vane of the DVVT controller mounted to the camshaft No.1 (intake side).

(2) Schematic diagram



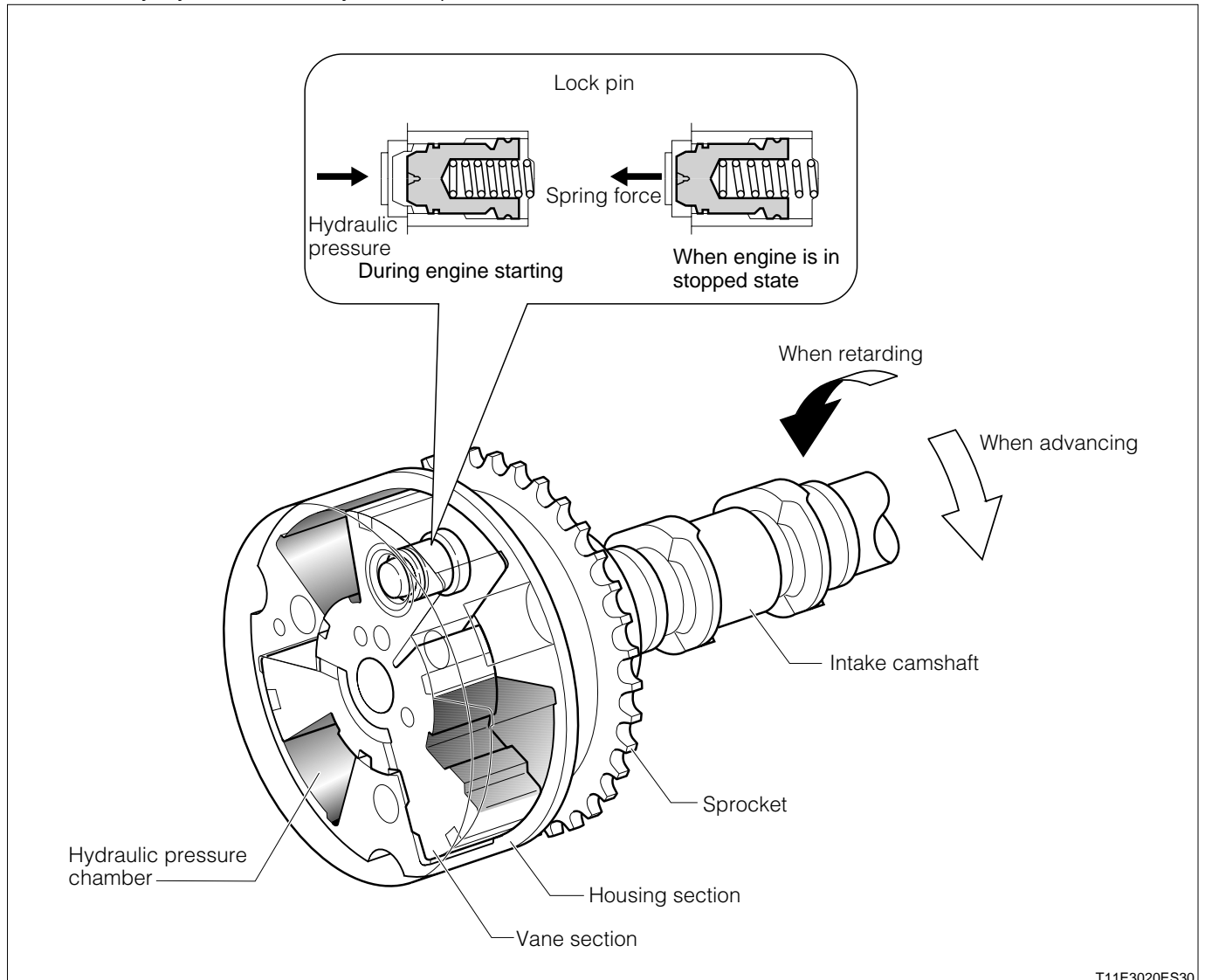
2-5-3 COMPONENTS

(1) DVVT Controller

It consists of the housing section secured on the sprocket driven by the timing chain and the vane section secured on the camshaft No.1 (intake side).

The vane section rotates in the circumference direction in relation to the housing by controlling the hydraulic pressure of the two hydraulic pressure chambers (advance chamber and retard chamber) consisting of the housing and vane. Thus, the phase of the camshaft No.1 is varied continuously. Consequently, the valve timing is controlled optimally.

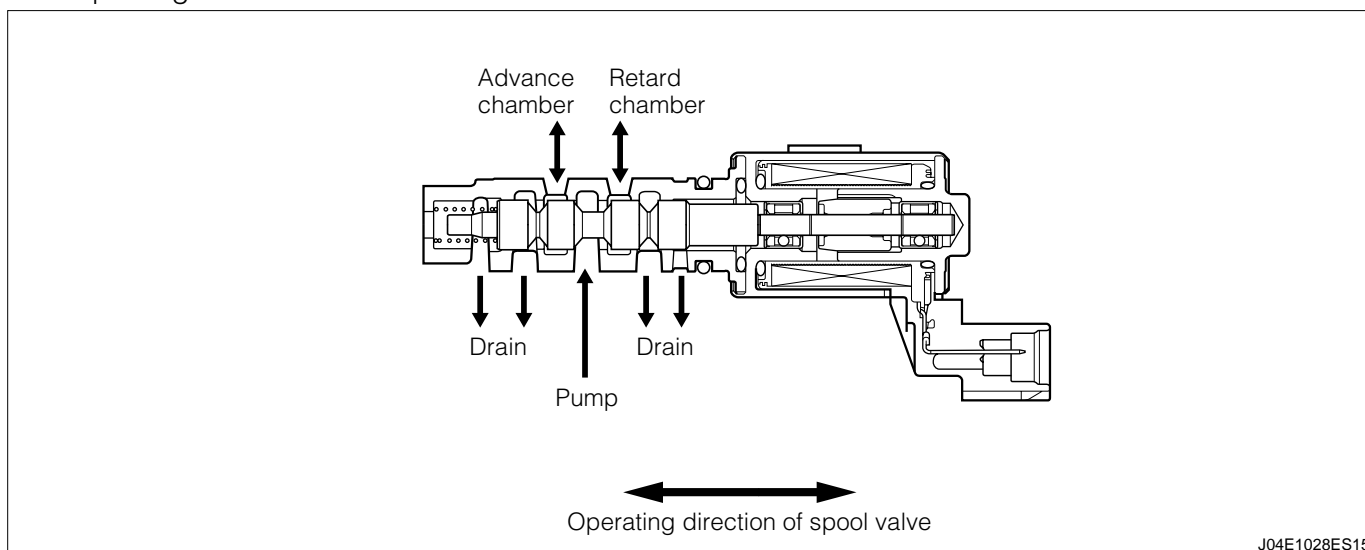
During the engine starting period, the vane is pushed against the most retard angle side by the turning of the housing. Then, the vane is locked by the pin. After the engine has started, the pin will be released automatically by the control hydraulic pressure.



B2-19

(2) OCV(Oil Control Valve)

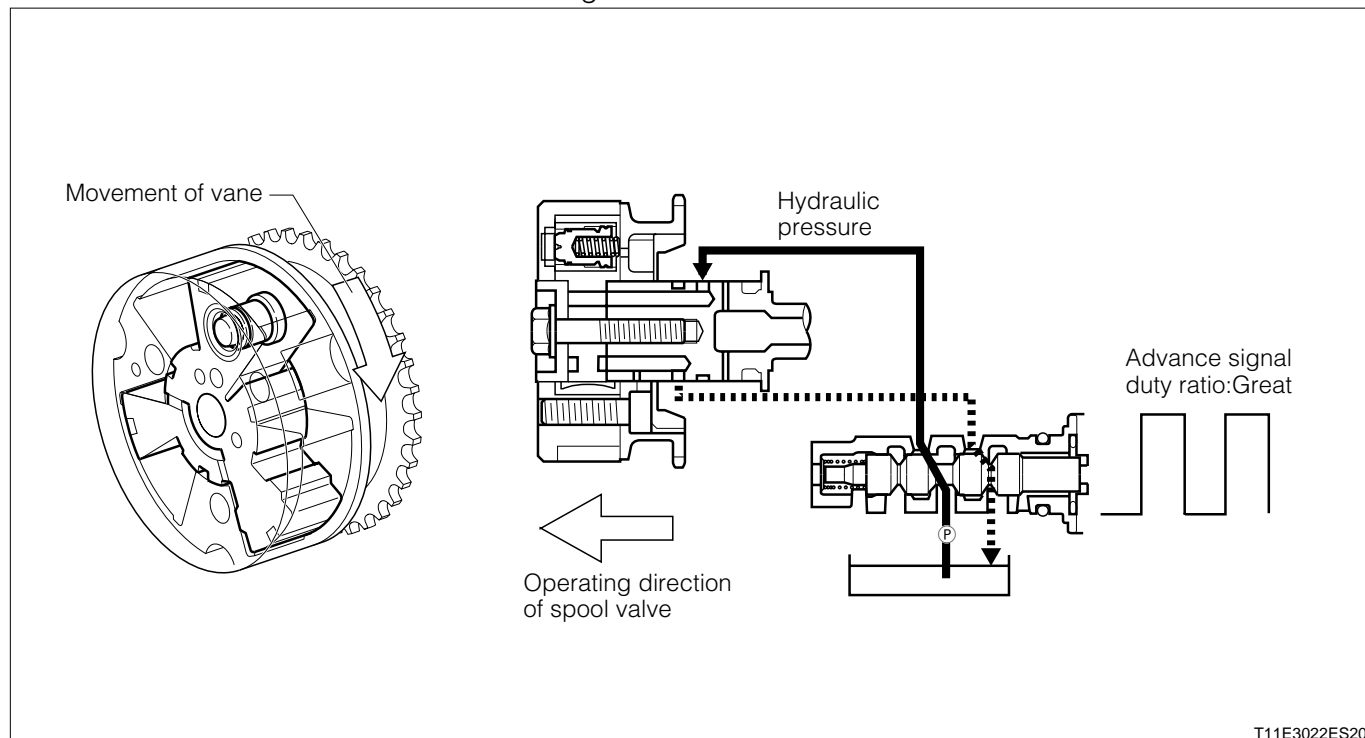
The spool valve position is moved by means of the duty signal from the engine control computer. Thus, the oil passage to the DVVT controller is switched.



2-5-4 OPERATION

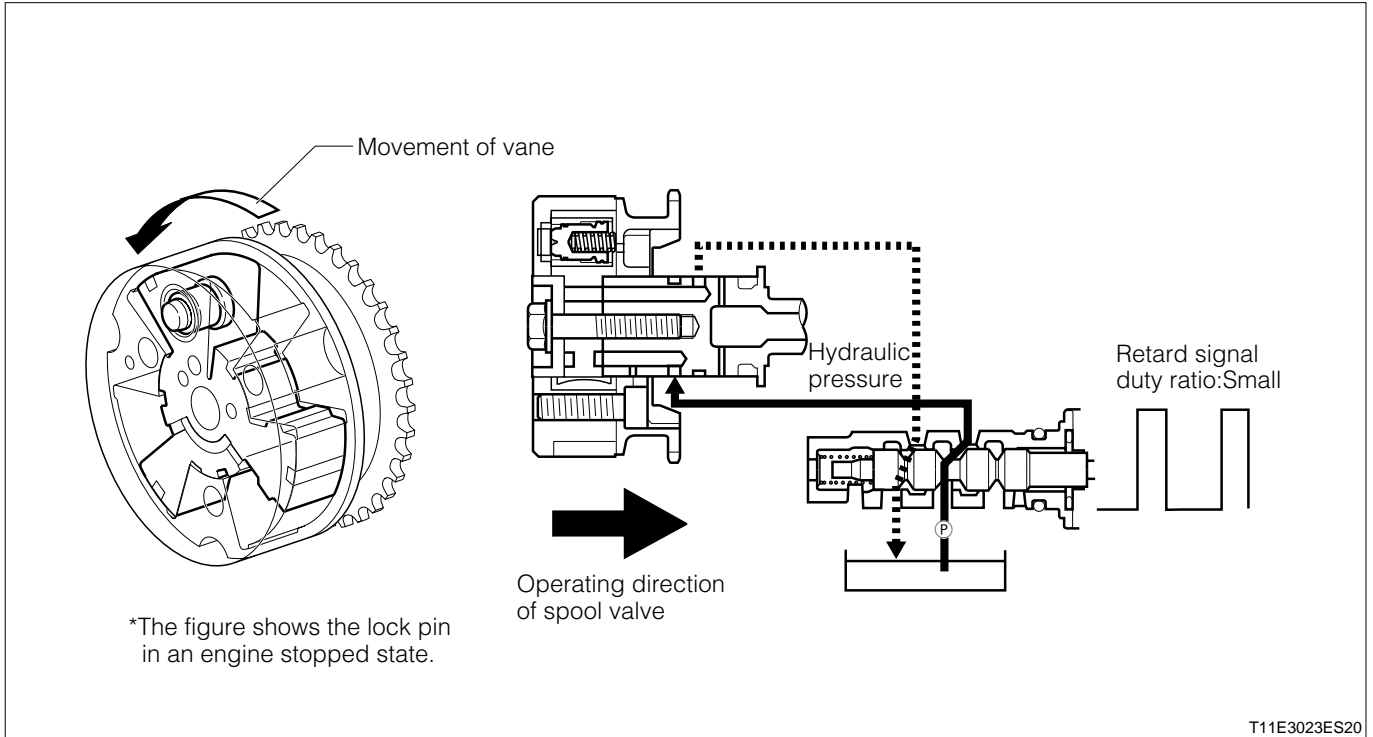
(1) Timing advance operation

The OCV operates by the signal sent from the engine control computer so that the engine hydraulic pressure may be applied to the vane chamber at the advance side. As a result, the camshaft No.1 is turned to the advance side in relation to the housing.



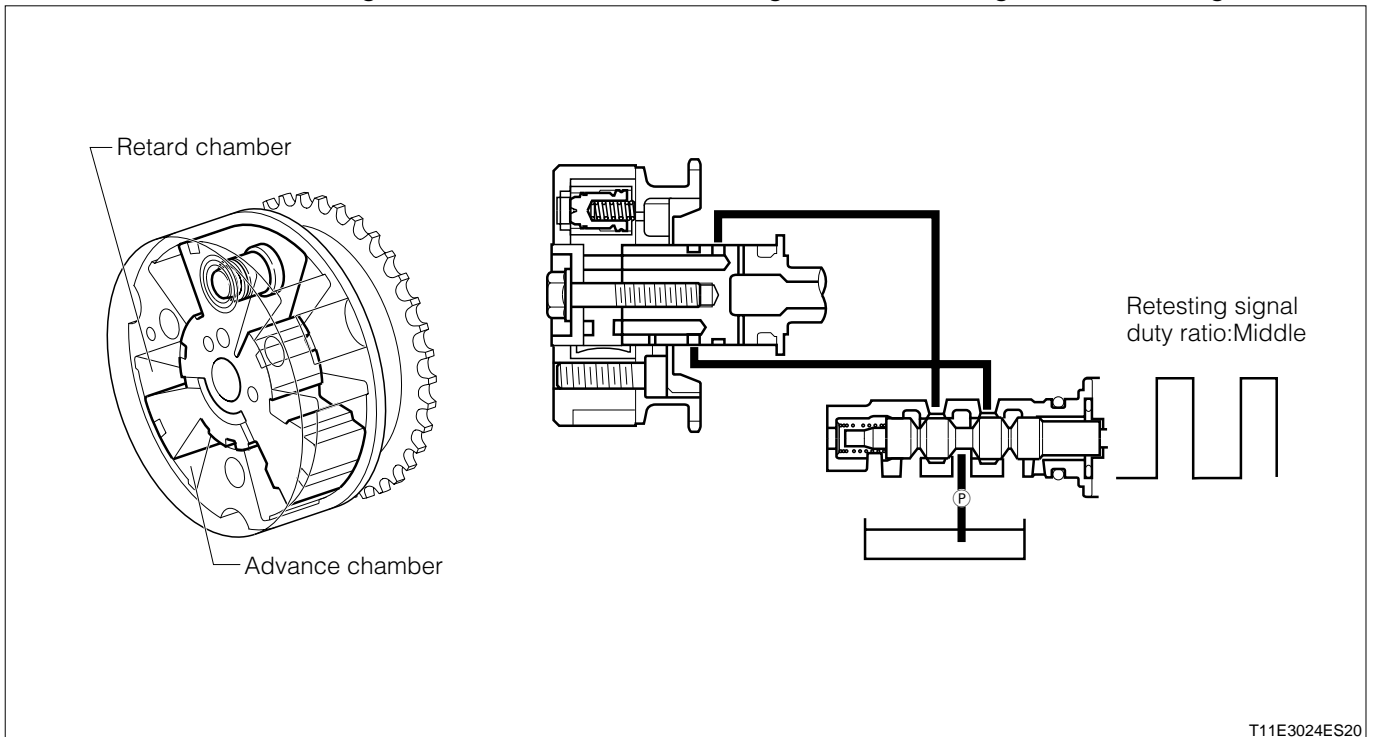
(2) Timing retard operation

The OCV operates by the signal sent from the engine control computer so that the engine hydraulic pressure may be applied to the vane chamber at the retard side. As a result, the camshaft No.1 is turned to the retard side in relation to the housing.



(3) Retention operation

After completion of the control of the target timing, the OCV shuts off the oil passages leading to the DVVT controller, unless the running condition of the vehicle changes, thus retaining the valve timing.



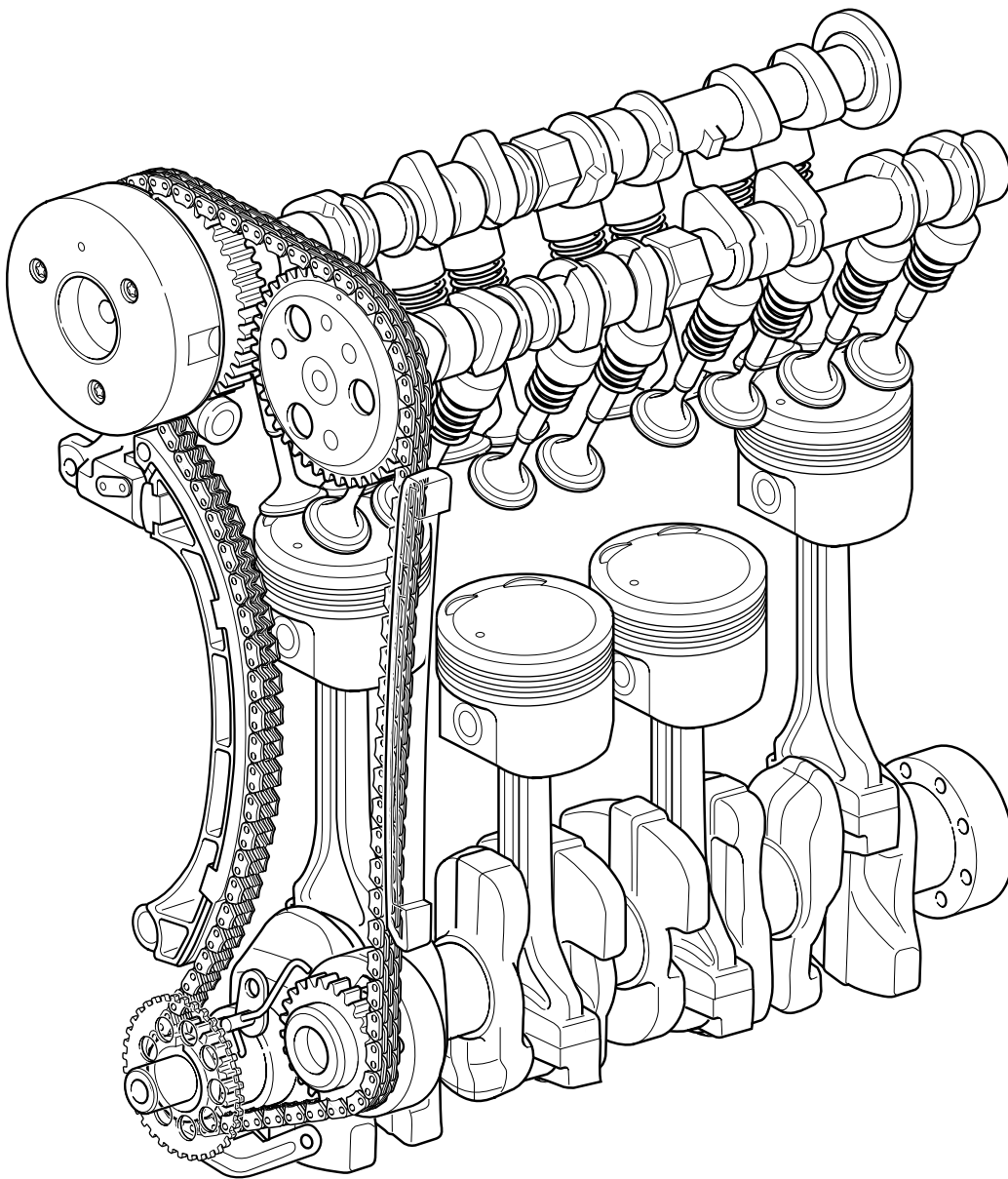
CAM, VALVE MECHANISM (K3)

1 OUTLINE

1-1 DESCRIPTION

A single stage chain is used, in which a single chain drives the intake and exhaust cam shafts and oil pump. Also, the overall length is shortened. Moreover, for reduced noise, a silent chain has been adopted for the chain to prevent tapping sound caused by the meshing of the chain.

Direct valve actuating, DOHC, 4-valve (two intake valves, two exhaust valves) has been employed. Also, DVVT (Dynamic Variable Valve Timing) mechanism has been adopted, in which the valve timing is controlled to an optimum timing according to the operating condition of the engine.



2 CONSTRUCTION AND OPERATION

2-1 VALVE AND VALVE SPRING

The valves have employed heat-resistant steel for both the intake side and exhaust side. The nitriding treatment has been performed for all surfaces (except the valve face section). Furthermore, for reduced mechanical loss, a smaller diameter of the stem section has been employed.

For the valve spring, special carbon steel for the valve spring has been used and it has undergone the shot peening. The common parts have been used for both the intake side and exhaust side and the valve spring has adopted a variable pitch spring featuring an excellent valve following-up characteristics. For reduced friction loss, the maximum load has been reduced by decreasing the equivalent mass of the valve system.

Valve specifications

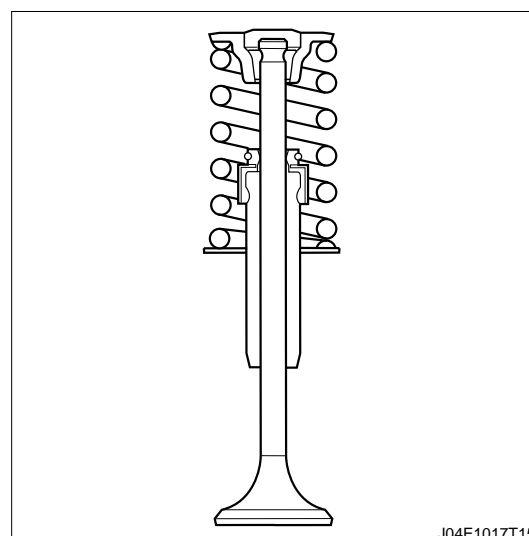
	Intake Valve	Exhaust Valve
Overall length(mm)	88.15	89.10
Diameter of head section (mm)	26.0 Dia.	22.6 Dia.
Diameter of stem section (mm)	5.0 Dia.	5.0 Dia.

Two manufactures are furnishing each spring

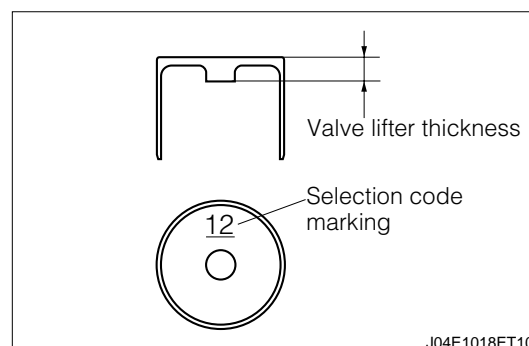
Identification color	—	Orange
Coil outer diameter (mm)	22.9 Dia.	22.9 Dia.
Total winding number	9.16	9.16
Free length (mm)	45.55	45.53

2-2 VALVE LIFTER AND VALVE ADJUSTING SHIM

For reduced weight, shim-less lifters have been adopted. The valve clearance is adjusted by changing the surface thickness at the top of the lifter. The surface thickness at the top of the lifter comes in 29 kinds between 5.12 mm and 5.68 mm in increments of 0.02 mm. The lifter thickness is identified by the number stamped on the back of the lifter. The stamped number indicates the dimension of the top surface thickness below the decimal point.



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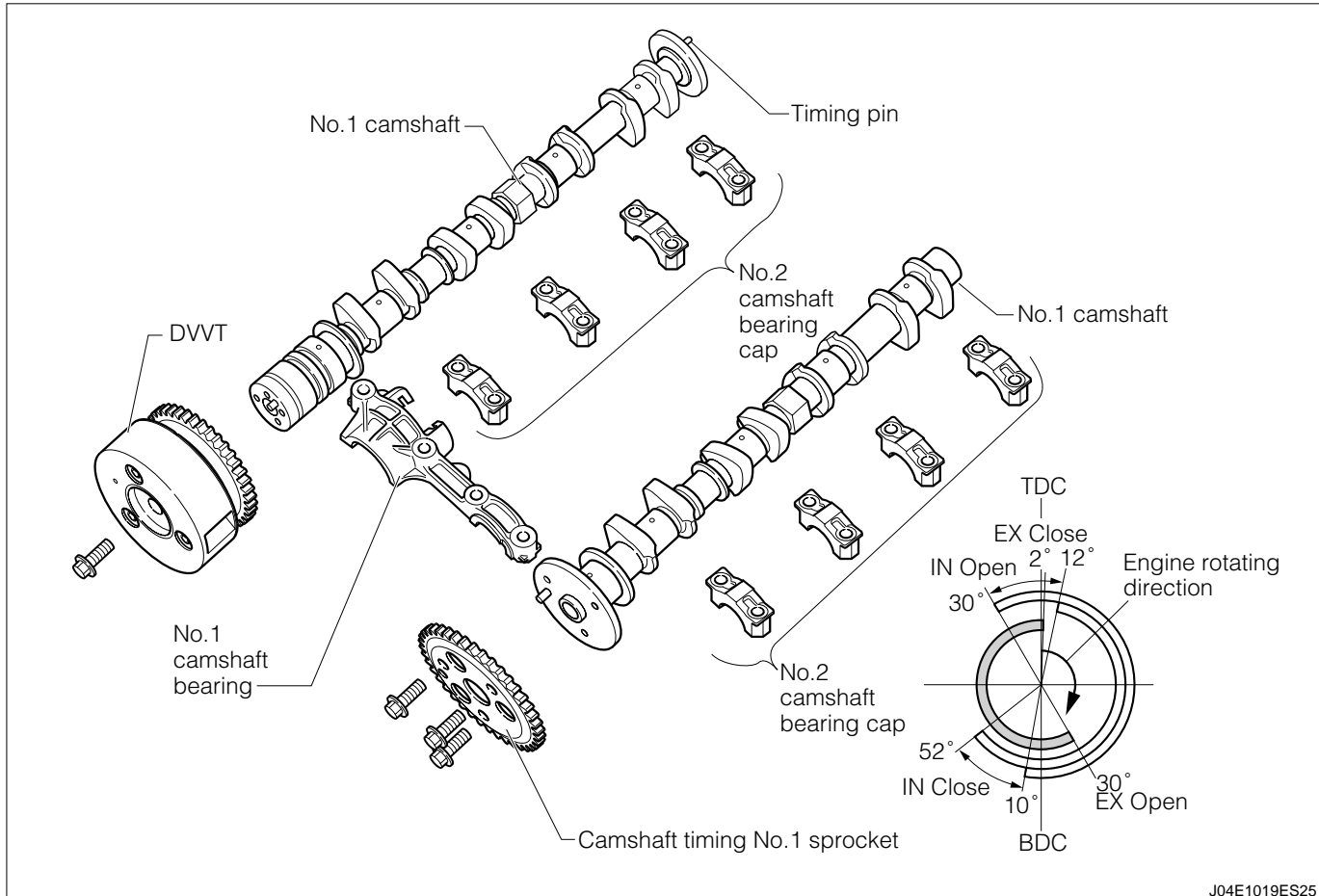
B2-23

2-3 CAMSHAFT

It is made of alloy cast iron. The camshaft No.1 (intake side) and camshaft No.2 (exhaust side) are hollow.

For compact design of the cylinder head, the camshaft is driven by the single-stage silent chain.

The DVVT controller integral with the sprocket is mounted to the front end of camshaft No.1. Also, the timing pins (3 pins) are mounted to the rear end to detect the cam position of the DVVT.

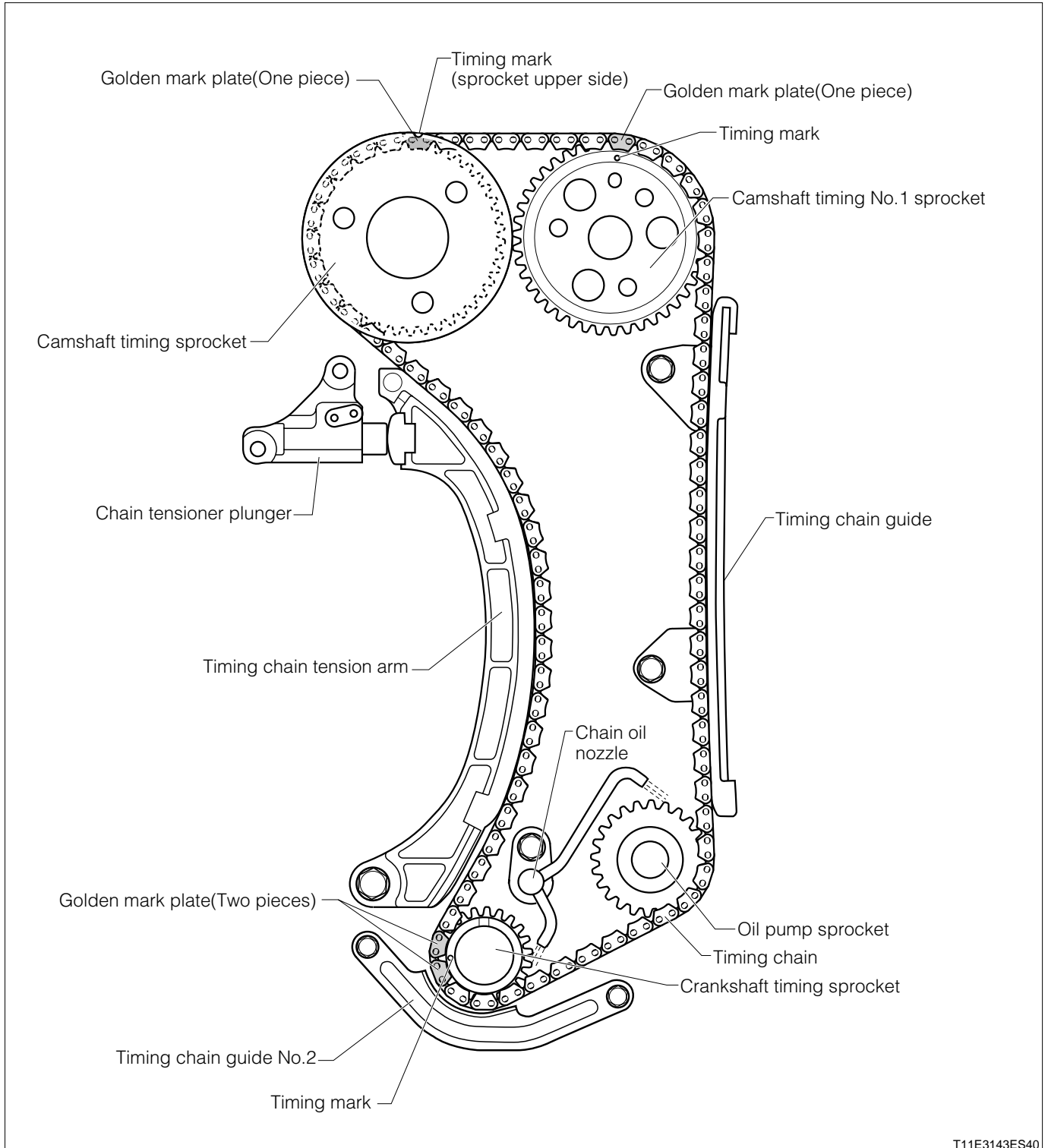


2-4 TIMING CHAIN MECHANISM

2-4-1 DESCRIPTION

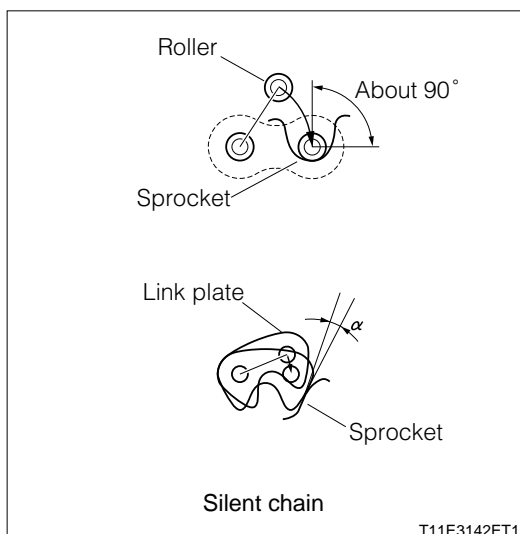
The camshaft is driven by the silent chain with a pitch of 6.35 mm. For reduced chain driving noise, the tooth shape of each sprocket has employed an involute shape. The oil pump is also driven by the same timing chain. Thus, the overall length of the engine has become shortened.

Furthermore, as a result of the employment of a chain, heat radiation from the timing chain cover becomes effective, thus lowering the oil temperature and enhancing the reliability.



2-4-2 TIMING CHAIN

The silent chain of 6.35 mm is adopted. Furthermore, a golden marking plate incorporated in the chain is provided as a mating mark to be used at the time of assembling the chain. In the case of the silent chain, the link plate meshes with the sprocket with an involute teeth profile, as if it is sliding-in, thereby resulting in a small impact force.



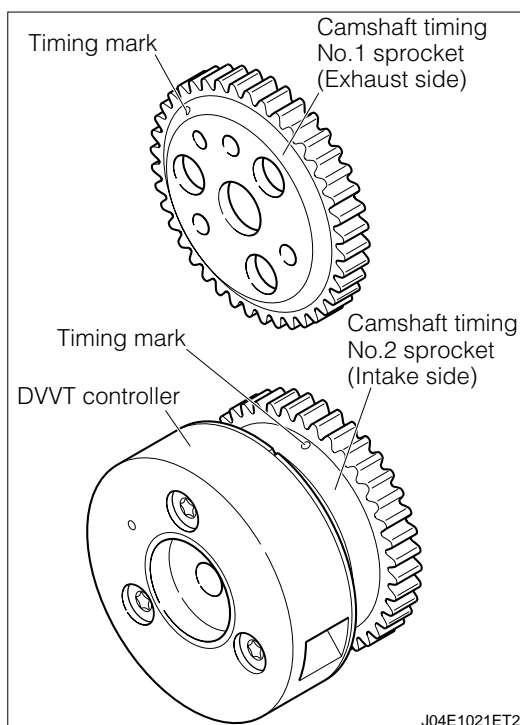
T11E3142ET15

2-4-3 CAMSHAFT TIMING NO.1 SPROCKET, CAMSHAFT TIMING NO.2 SPROCKET

A timing mark is provided as a mating mark for assembling the timing chain.

Sprocket specifications

	Camshaft timing No.1 sprocket	Camshaft timing No.2 sprocket
Material	Sintered alloy	Sintered alloy
Surface treatment	Induction hardening and tempering	Induction hardening and tempering
Tooth profile	Involute	Involute
Number of teeth	42	42
Pitch (mm)	6.35	6.35
Pitch circle diameter (mm)	84.97 Dia.	84.97 Dia.
Tooth width (mm)	8.4	8.4



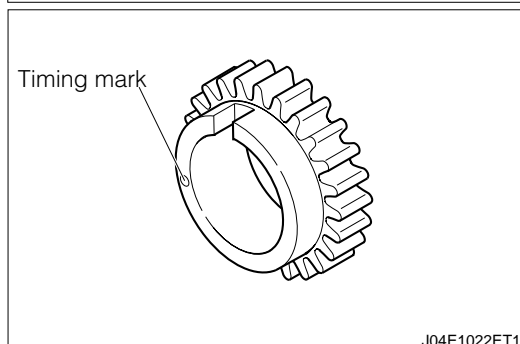
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2-4-4 CRANKSHAFT TIMING SPROCKET

A timing mark is provided as a mating mark for assembling the timing chain.

Crankshaft timing sprocket specifications

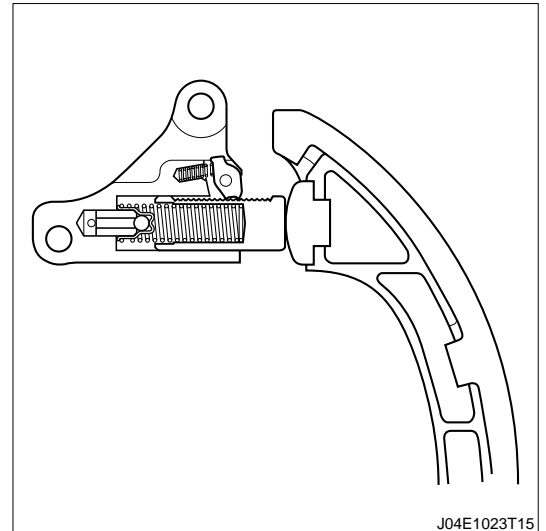
	Steel
Material	Steel
Surface treatment	Induction hardening and tempering
Tooth profile	Involute
Number of teeth	21
Pitch (mm)	6.35
Pitch circle diameter (mm)	42.61 Dia.
Width (mm)	8.4



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2-4-5 CHAIN TENSIONER PLUNGER

In order to assure the durability and quietness, an optimum tension is always given to the timing chain, using the hydraulic pressure in combination with the spring force. Moreover, the service holes have been provided on the timing chain cover, so that the initial setting can be performed for the ratchet mechanism during the servicing.



2-4-6 CHAIN OIL NOZZLE

For longer life and enhanced quietness, an oil jet for lubrication is provided, aiming at the crank sprocket and chain, where the contact pressure becomes the highest.

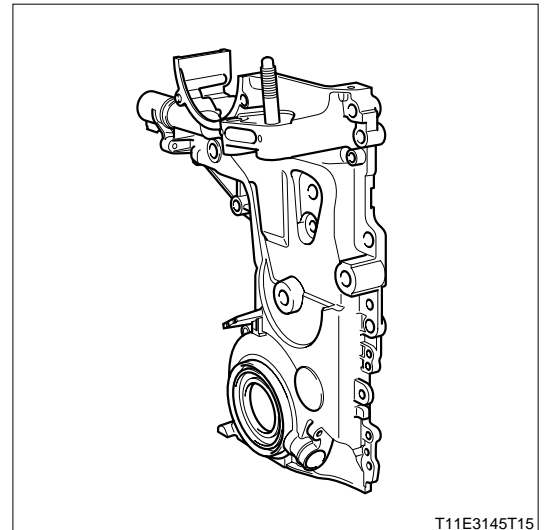
2-4-7 TIMING CHAIN COVER

For reduced weight, an aluminum die-cast with a thin stock thickness (general thickness 2 mm) has been employed. Furthermore, the mating surface between the cylinder head and cylinder block has employed the unmatching type which is advantageous to the casting porosity.

As regards the sealing section construction of the three-surface mating section of the cylinder head, cylinder block and timing chain cover, for enhanced sealing performance, liquid sealing material (FIPG) has been applied to the upper and lower surfaces of the cylinder head gasket so that the thermal expansion of each part may be absorbed.

An OCV is installed at the top end, thereby controlling the oil from the cylinder head and supplying oil to the DVVT.

Moreover, for reduced mount vibration, the mount bracket (right) has been integrated.



2-5 DVVT SYSTEM

2-5-1 DESCRIPTION

1. The DVVT (Dynamic Variable Valve Timing) capable of controlling the valve timing to an optimum condition at all times from the idling to the high-speed driving has been employed. Thus, low fuel consumption and high output have been achieved.

(1) D71AEKB02_0420

(2) In the medium-load driving range, the valve overlap is expanded, thus increasing the inner EGR amount. As a result, the negative pressure in the intake manifold is reduced. Consequently, the pumping loss of the piston is reduced and the fuel consumption enhances. Furthermore, by this inner EGR effect, inactive gas is inhaled again, thus lowering the combustion temperature. Consequently, NO_x emission is reduced. Furthermore, since unburnt gas is combusted again, the HC emission is reduced.

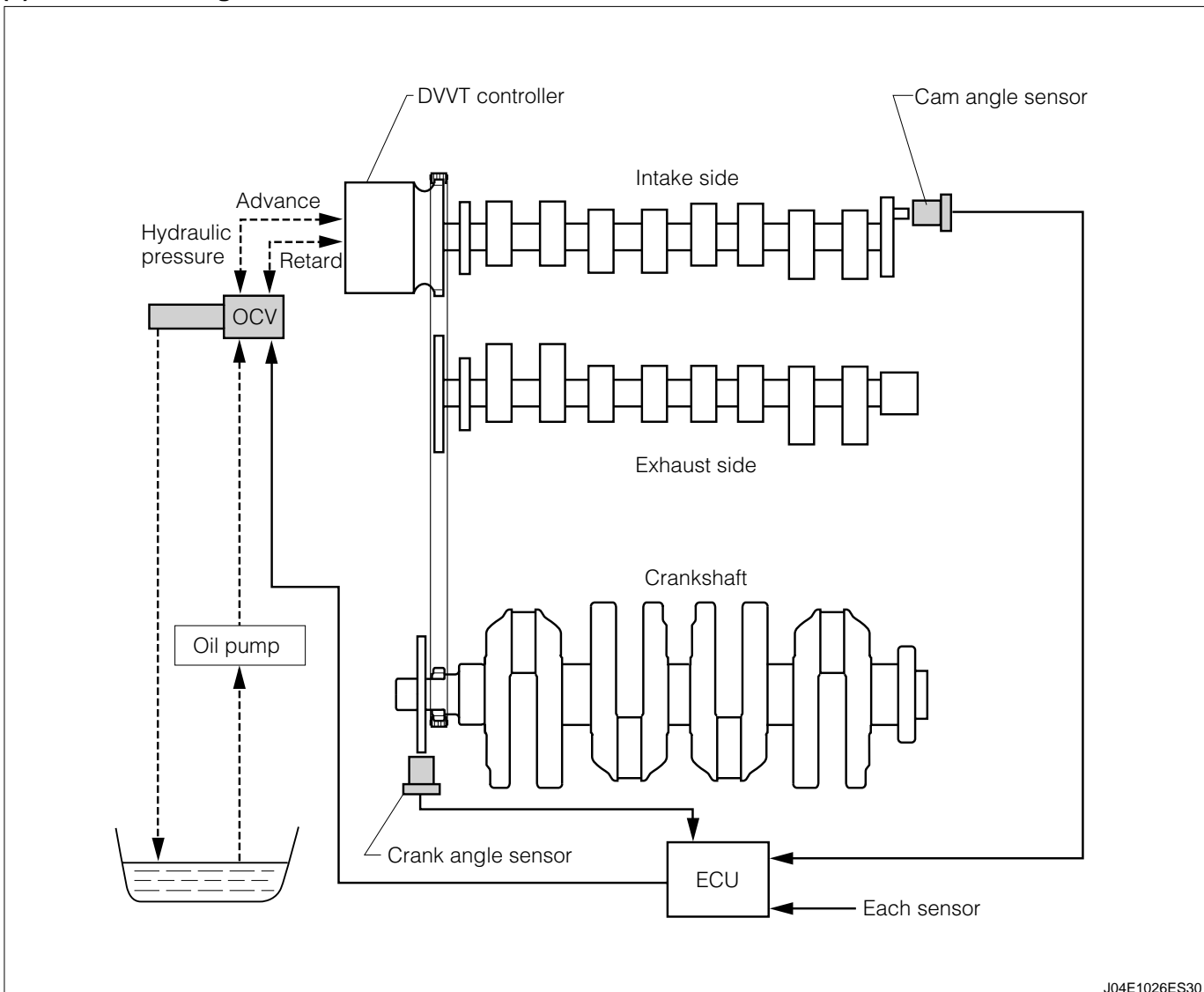
(3) In the high-load driving range, the output and torque are increased through the valve timing according to the required air amount.

2-5-2 SYSTEM

(1) Description

The engine control computer controls the OCV (oil control valve) according to the engine speed, pressure in the intake manifold, etc. In this way, the phase of the camshaft No.1 (intake side) is controlled to an optimum condition by applying the engine hydraulic pressure to the front and rear of the vane of the DVVT controller mounted to the camshaft No. 1 (intake side).

(2) Schematic diagram



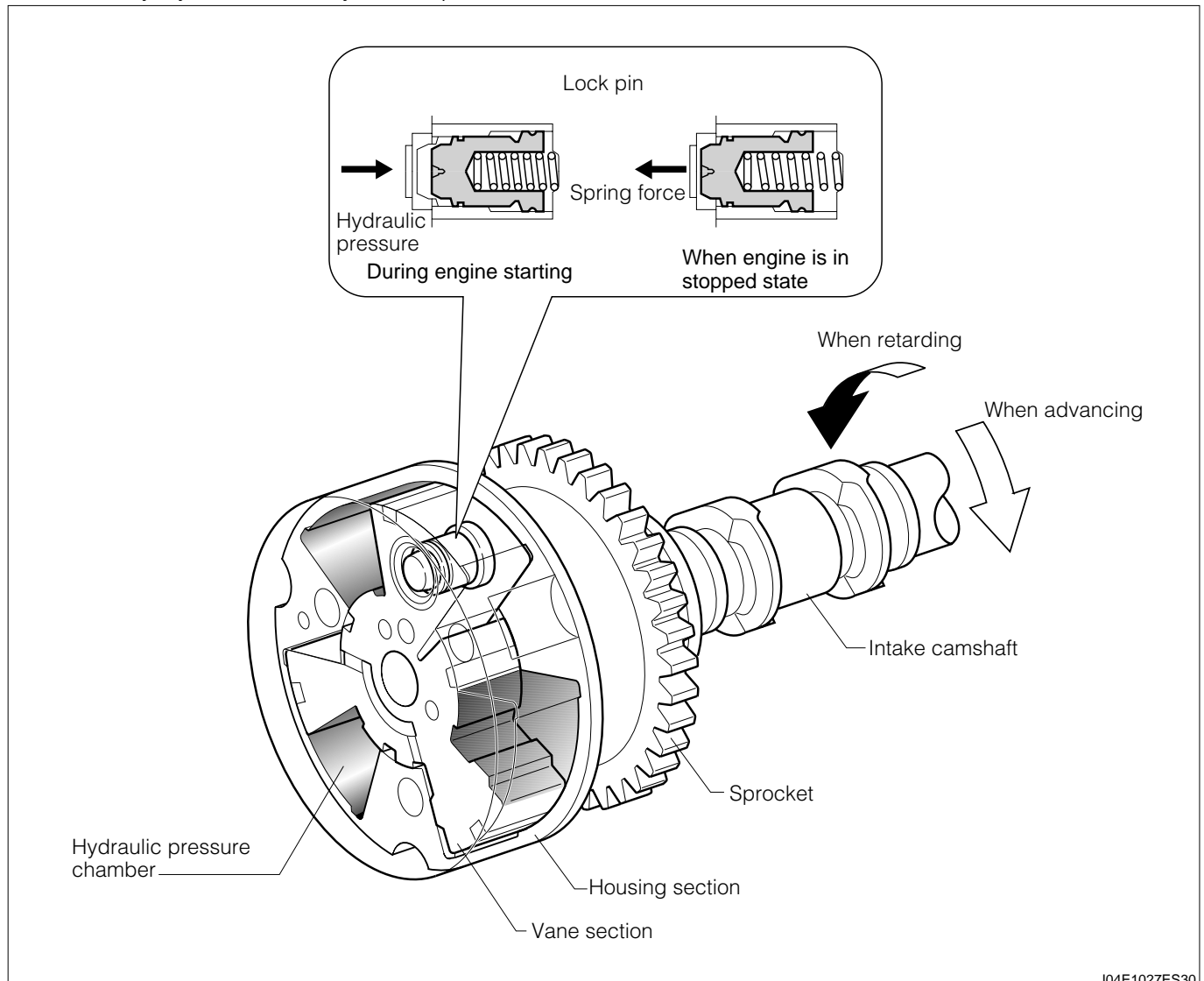
2-5-3 COMPONENTS

(1) DVVT Controller

It consists of the housing section secured on the sprocket driven by the timing chain and the vane section secured on the camshaft No.1 (intake side).

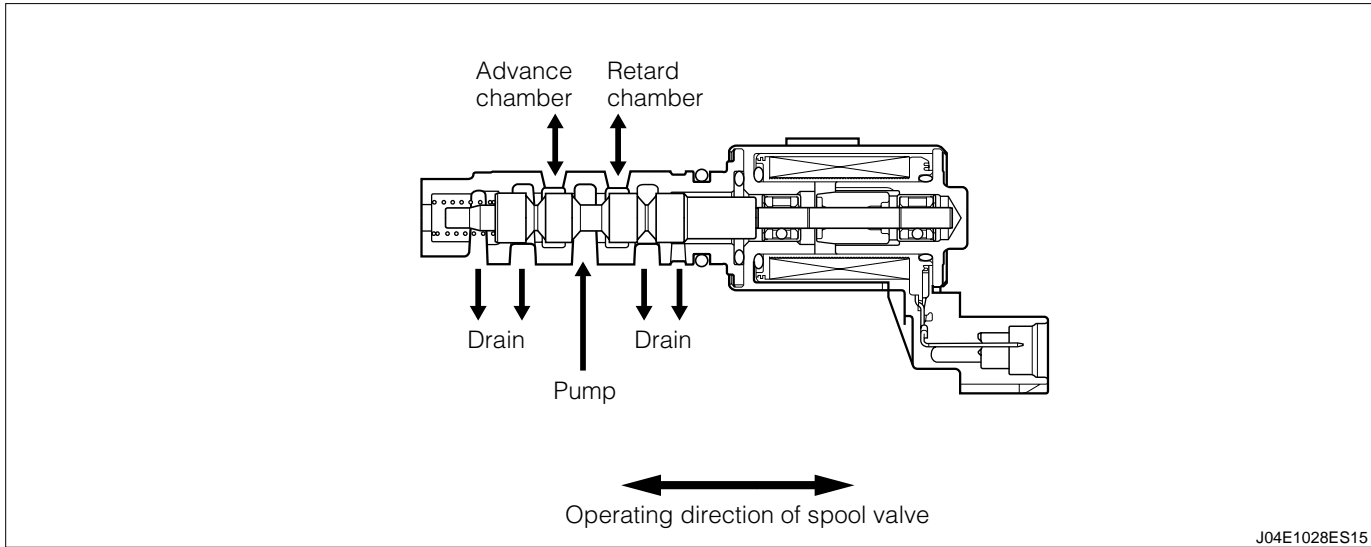
The vane section rotates in the circumference direction in relation to the housing by controlling the hydraulic pressure of the two hydraulic pressure chambers (advance chamber and retard chamber) consisting of the housing and vane. Thus, the phase of the camshaft No.1 is varied continuously. Consequently, the valve timing is controlled optimally.

During the engine starting period, the vane is pushed against the most retard angle side by the turning of the housing. Then, the vane is locked by the pin. After the engine has started, the pin will be released automatically by the control hydraulic pressure.



(2) OCV(Oil Control Valve)

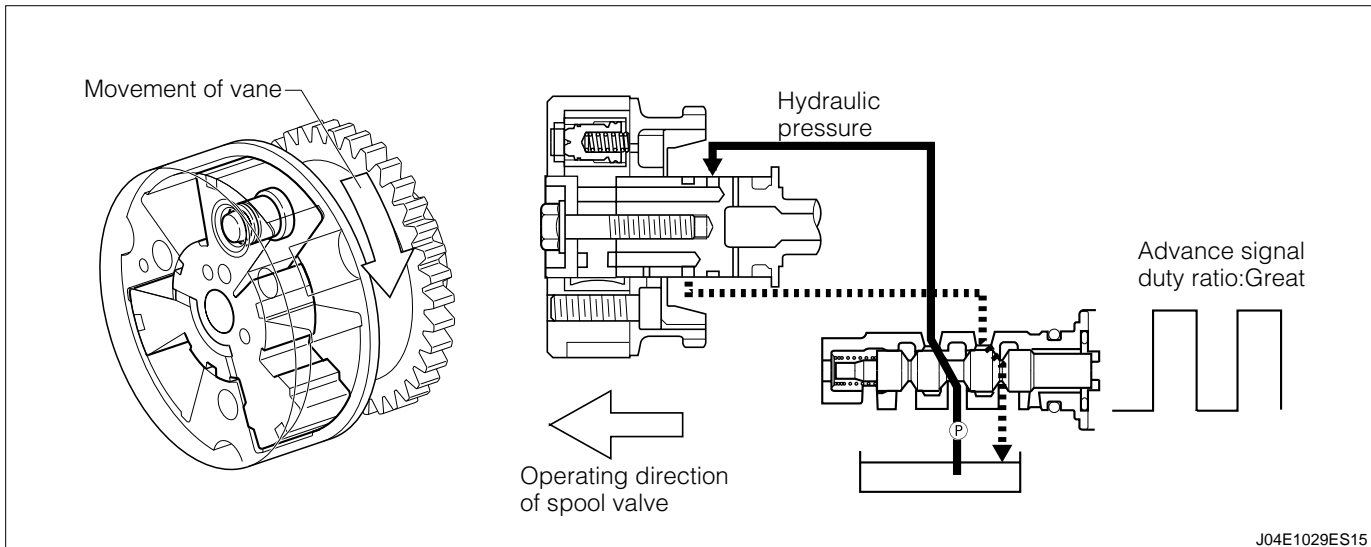
The spool valve position is moved by means of the duty signal from the engine control computer. Thus, the oil passage to the DVVT controller is switched.



2-5-4 OPERATION

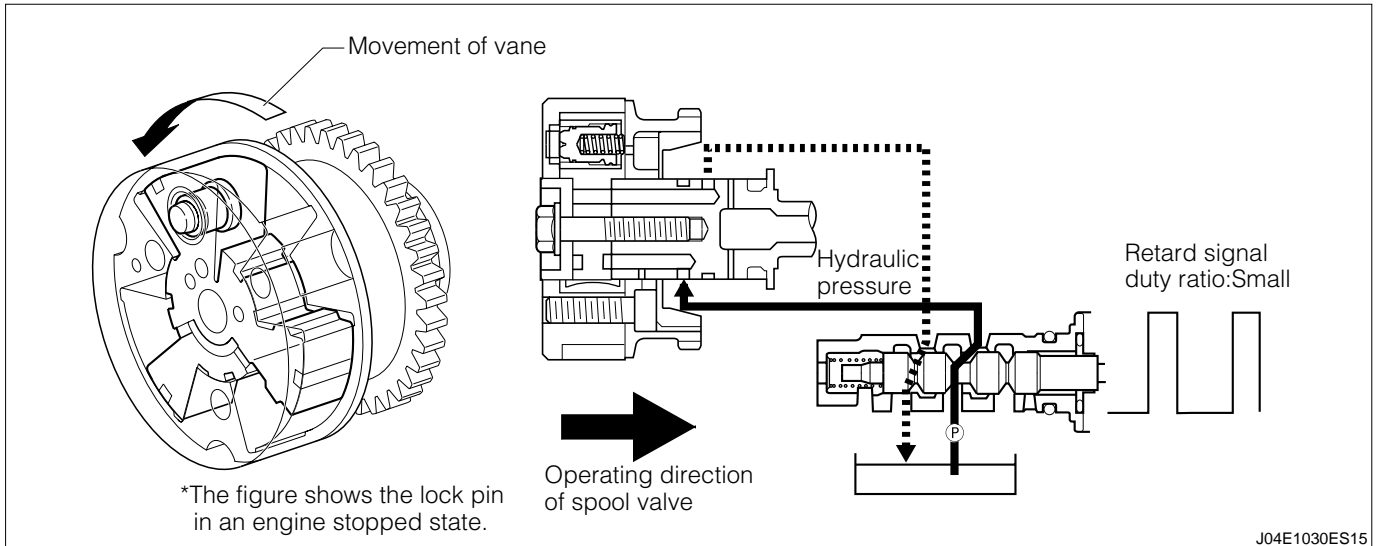
(1) Timing advance operation

The OCV operates by the signal sent from the engine control computer so that the engine hydraulic pressure may be applied to the vane chamber at the advance side. As a result, the camshaft No.1 is turned to the advance side in relation to the housing.



(2) Timing retard operation

The OCV operates by the signal sent from the engine control computer so that the engine hydraulic pressure may be applied to the vane chamber at the retard side. As a result, the camshaft No.1 is turned to the retard side in relation to the housing.



(3) Retention operation

After completion of the control of the target timing, the OCV shuts off the oil passages leading to the DVVT controller, unless the running condition of the vehicle changes, thus retaining the valve timing.

