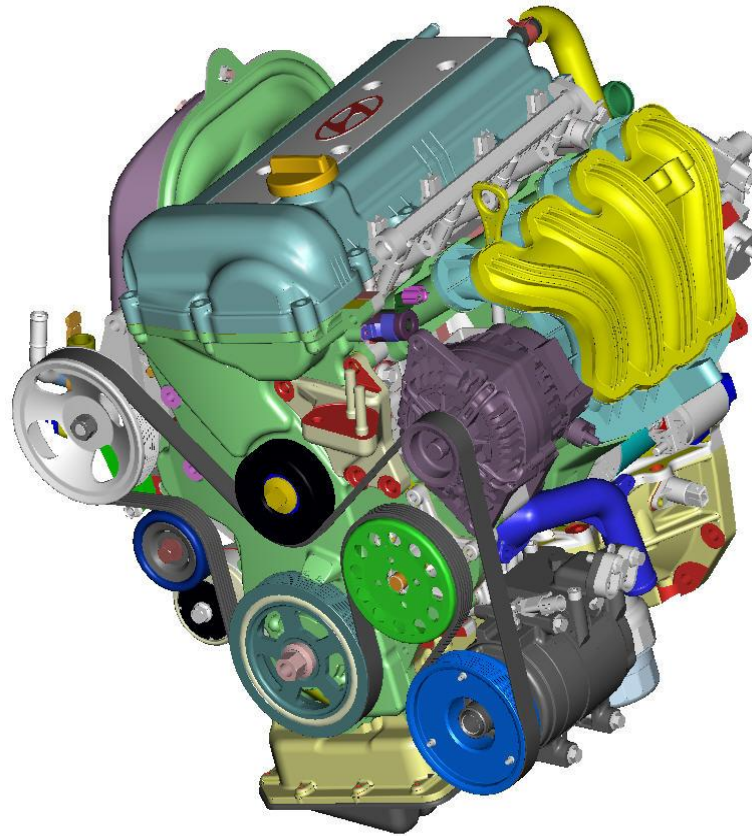


HD Engine





Engine Line-up

HD : Full model change of XD Elantra

Powertrain Lineup

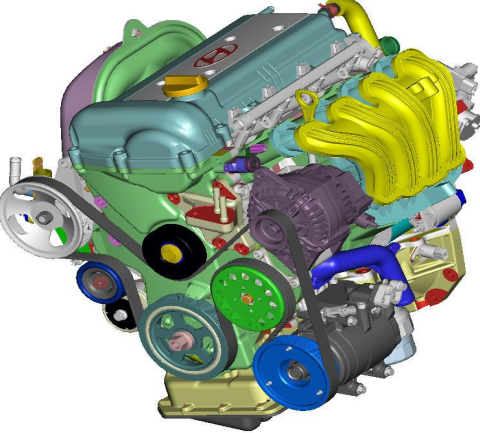
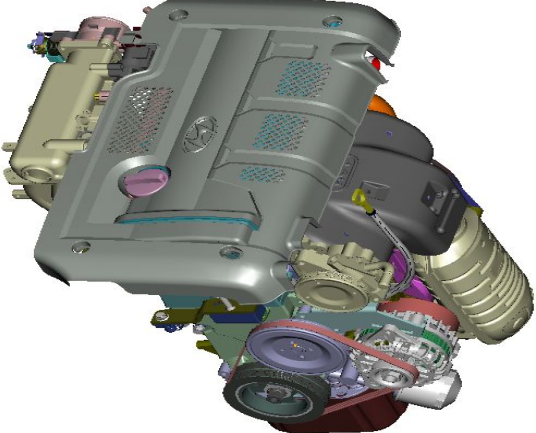
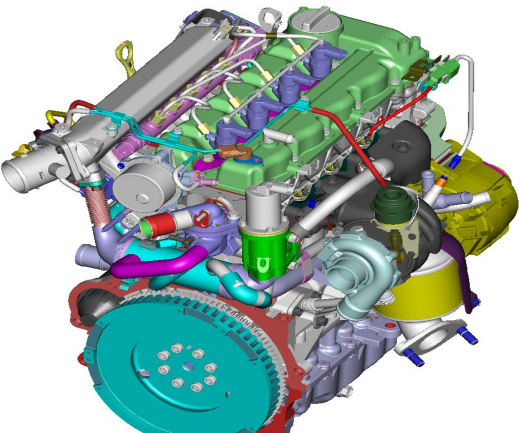
Engine	T/M		Max. Power (PS) - Target value	GEN (May, '06)	* East Europe (Aug, '06)	Korea (May, '06)	NA (July, '06)
Gamma 1.6	M/T	M5CF1	118	●	●	●	-
	A/T	A4CF1					
Beta 2.0	M/T	M5CF2	143	●	●	●	●
	A/T	A4CF2					
U-1.6	M/T	M5CF3	117	●	●	●	-
	A/T	A4CF2					

Gamma 1.6L : Newly developed 4 cylinder gasoline engine

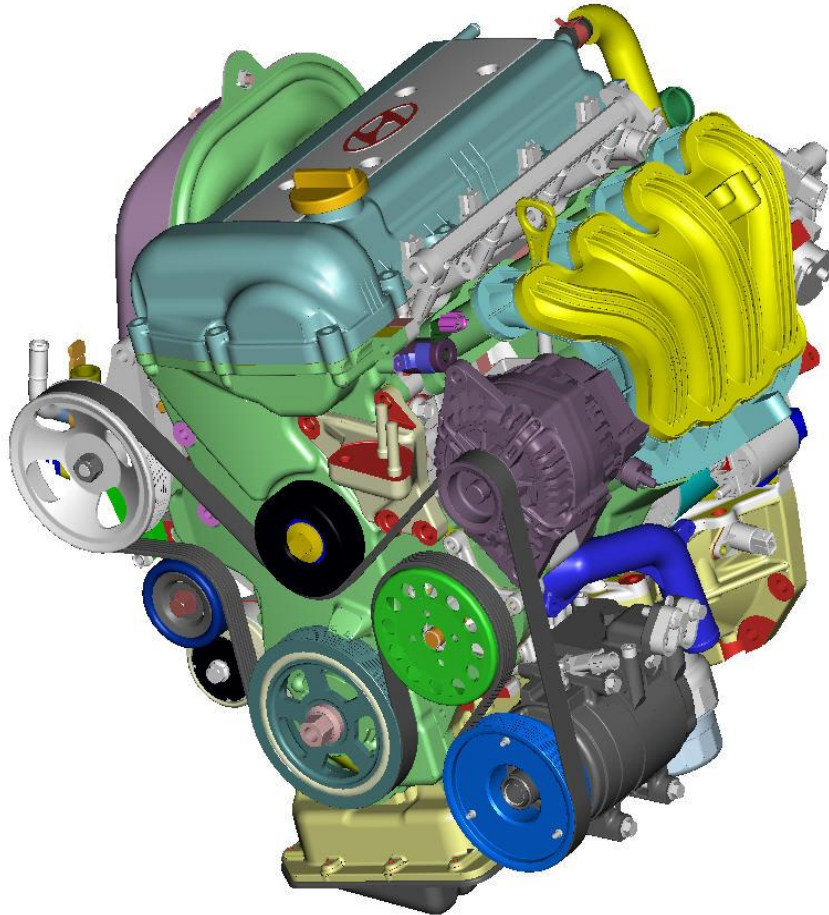
A4CF1, 2 : New Alpha Automatic Transaxle

Not applied in West EU market □ FD will be launched from April, 07.

***: East Europe: 3 countries only (Russia, Ukraine, Kazakhstan)**

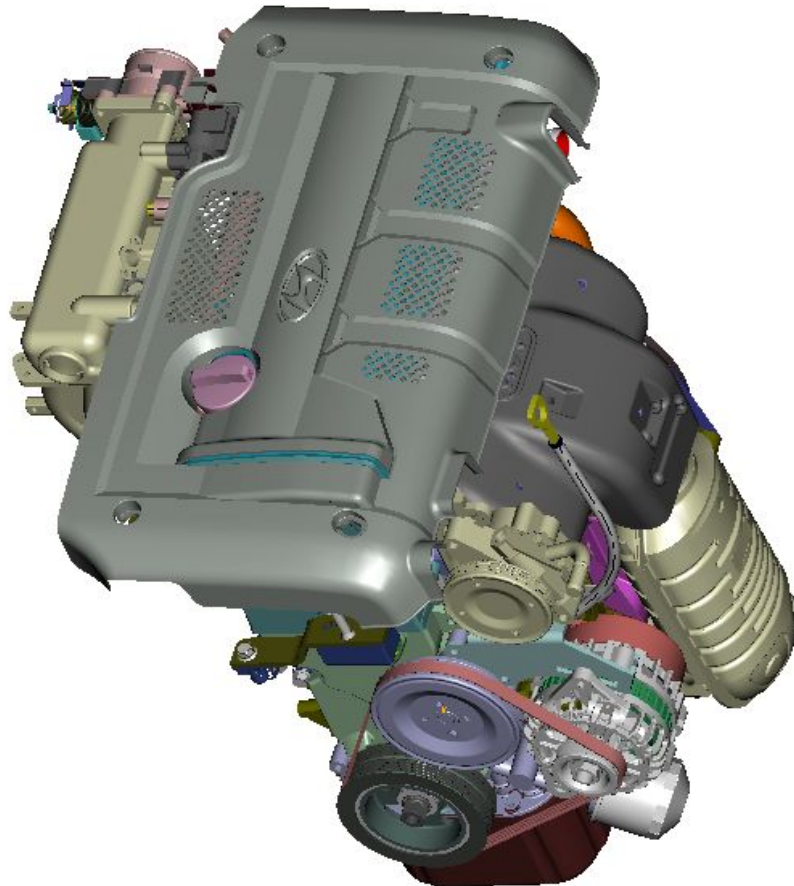
Engine	γ 1.6 CVVT	β 2.0 CVVT	U-1.6 VGT
Overview			
displacement	1,591 cc	1,975 cc	1,582 cc
H/P	118 PS	143 PS	117 PS
Torque	15.4 kg·m	19.0 kg·m\	26.5 kg·m
Feature	<ul style="list-style-type: none"> Timing Chain Individual Ignition Shimless MLA CVVT standard Plastic Intake manifold BOSCH PCM 	<ul style="list-style-type: none"> ULEV Emission 2 layer metal head gasket Timing belt auto tensioner CVVT Siemens PCM CAN Diagnosis 	<ul style="list-style-type: none"> VGT Turbo Charger Euro 4 Emission Swirl Control Valve Timing Chain Electrical EGR & EGR cooler

Gamma 1.6L engine (`Alias Alpha-III`)



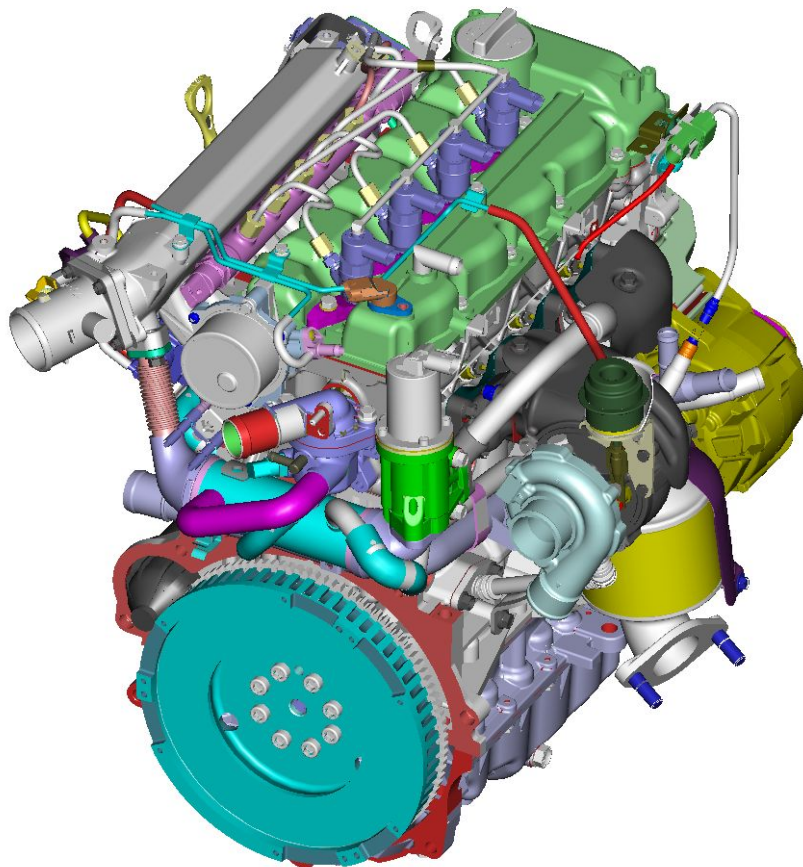
1. Reverse position for intake, exhaust manifold
2. Offset crank shaft applied by 10mm
3. High pressure casting aluminum block and ladder frame
4. Serpentine belt
5. Timing chain
6. CVVT
7. Direct driven valve train [solid tappet]
8. Plastic intake manifold
9. Stainless steel exhaust manifold

Beta 2.0L engine



1. Engine 3° tilting at forward
2. Aluminum oil pan
3. Dual layer metal cylinder head gasket
4. CVVT
5. Timing belt auto tentioner
6. SULEV

U 1.6L engine



1. DOHC I type 4valve Cylinder Turbo intercooler
2. CRDi system (1600bar)
3. Electrical EGR & EGR cooler
 - VGT (Variable Geometry Turbo)
 - Timing chain
 - Serpentine belt
 - Bed plate
 - SCV (Swirl control Valve)
 - Throttle flap
 - Lambda sensor



Gamma 1.6L engine main feature

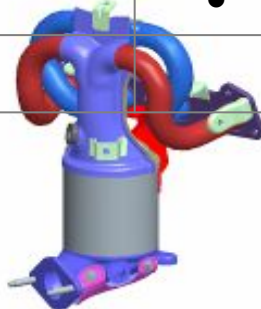
Item	Effect						Remark
	Performance	Emission	NVH	Weight	Cost	Endurance	
Al cylinder block	•			•			
Reverse In/Ex Mani	•	•	•	•			
CVVT	•	•					
Solid Tappet	•				•		
Timing Chain						•	
Serpentine belt			•	•		•	
Integrated ECM/TCM					•		
SUS Ex/Mani	•	•				•	
Ladder Frame			•				
Offset crank							



Serpentine belt



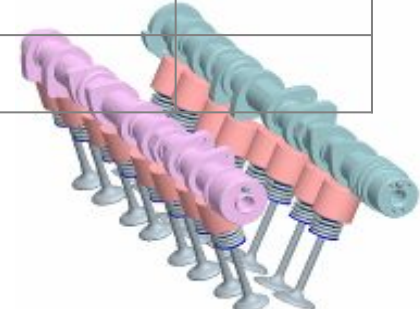
Timing chain



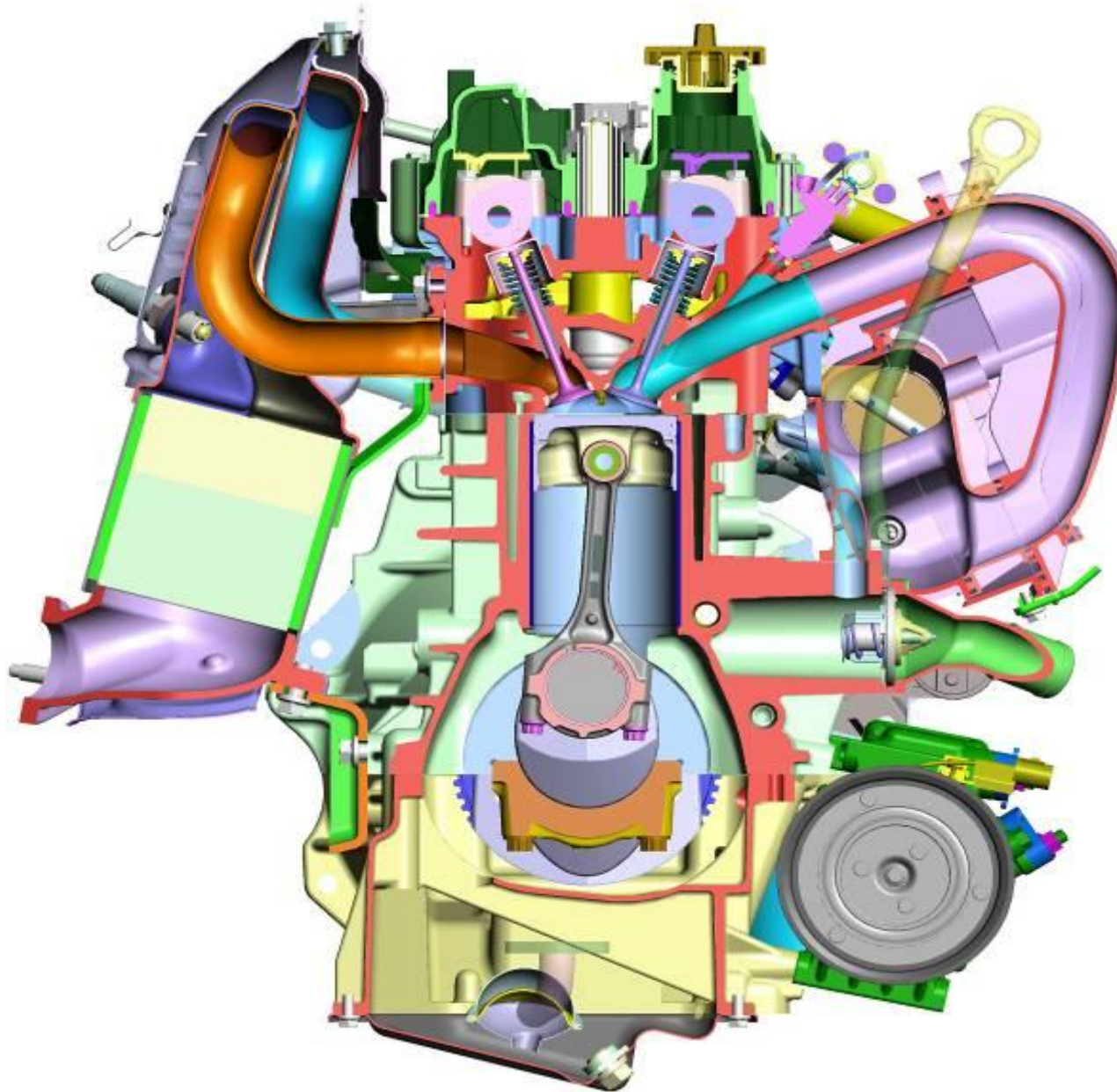
EX manifold



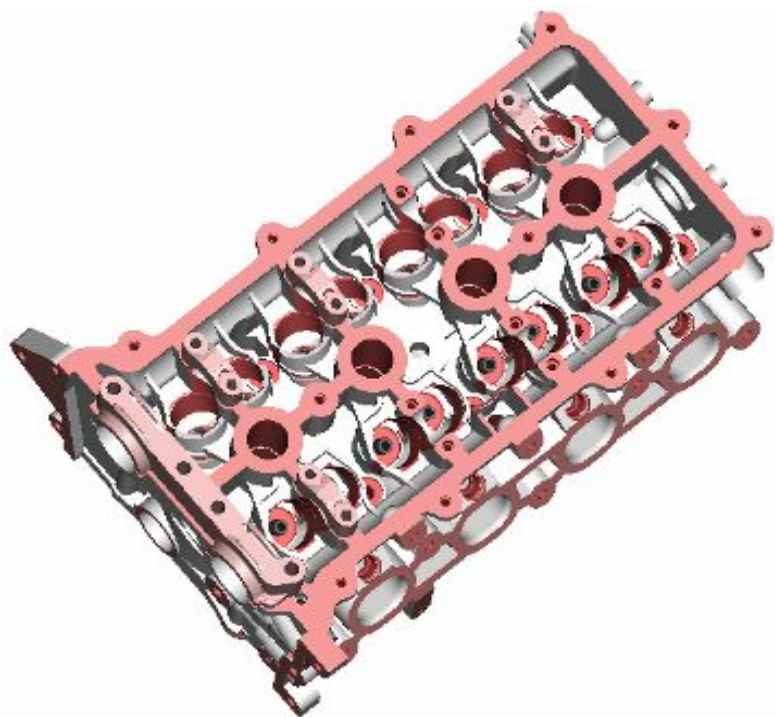
CVVT



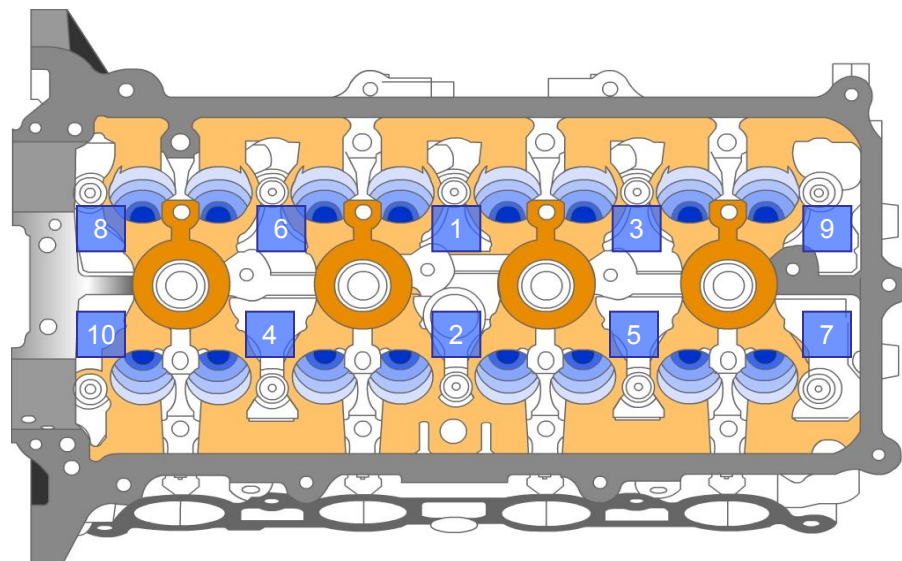
HLA (Shim-less type)



Cylinder head



- CYLINDER HEAD
 - AC2B-T7 aluminum
 - Weight : 9.5kg



<Tightening sequence>

Tightening torque : 2.0kgf-m + 90° + 100°

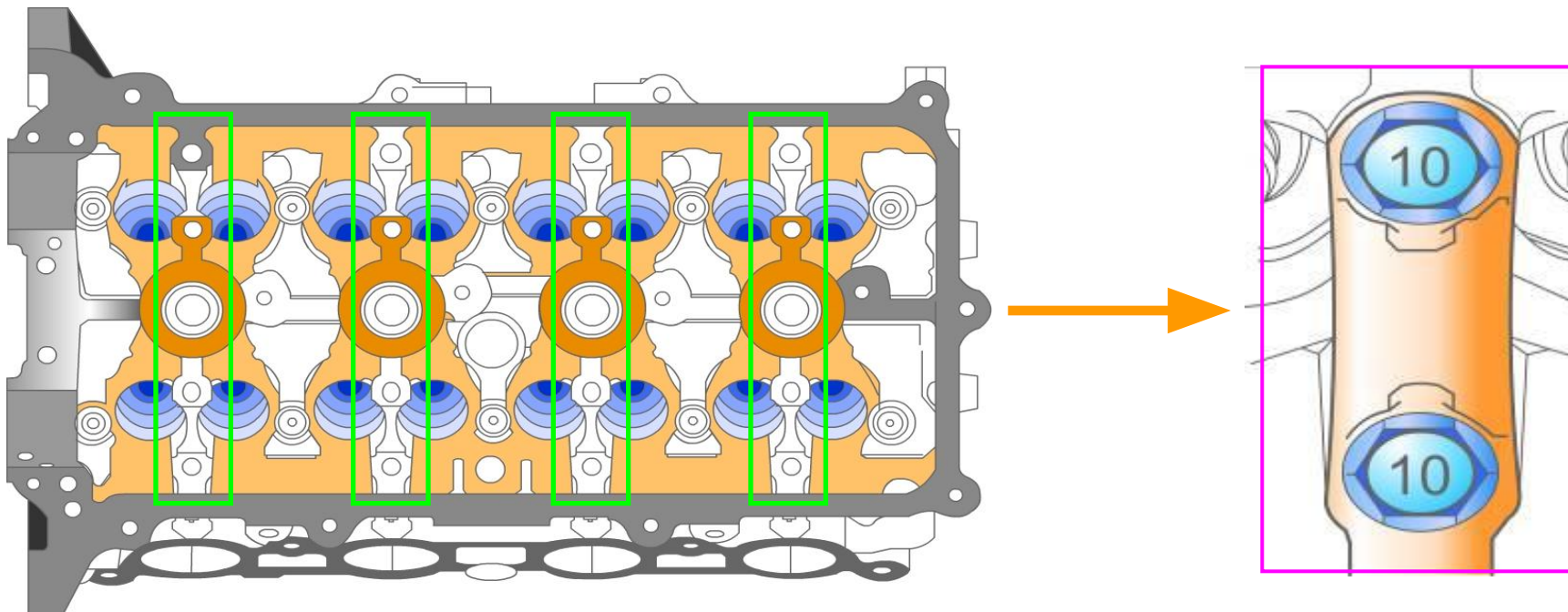




Tightening torque : 2.0kgf-m + 90° + 100°



Camshaft cap direction



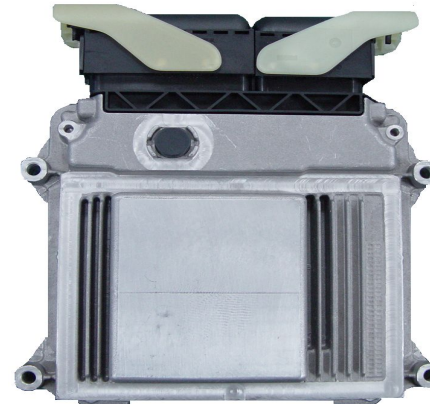
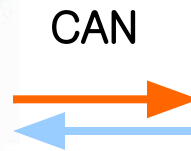
Cap marking

NO	IN	EX
1	I1	E1
2	I2	E2
3	I3	E3
4	I4	E4



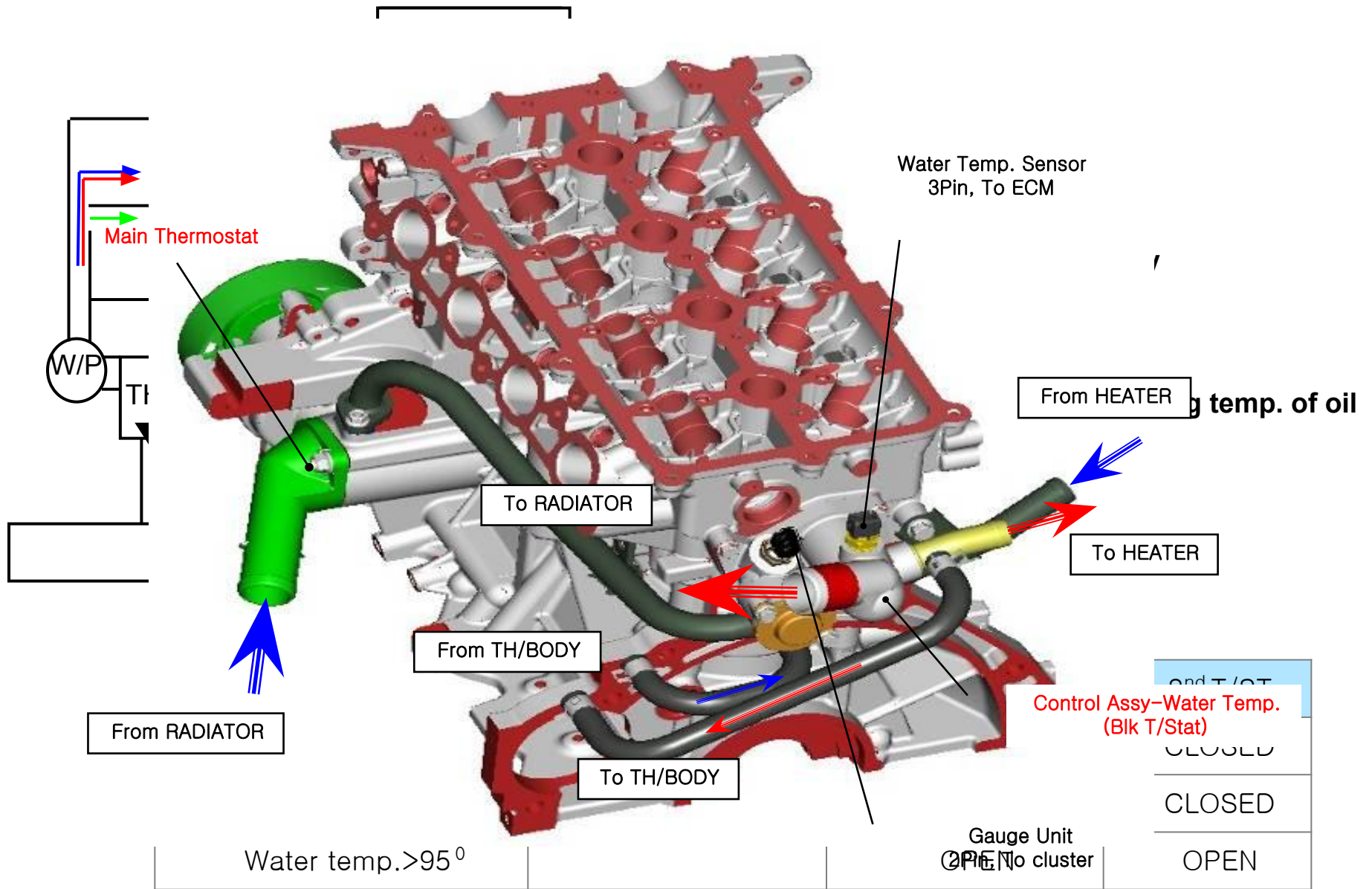
PCM (M 7.9.8)

- Memory:
 - Flash EEPROM: 768 Kbyte / External EEPROM: 2Kbyte
 - RAM: 36 Kbyte
 - CAN & KW2000 Communication
 - Integrated Unit: ECM + TCM
 - Watchdog CPU
 - Internal Igniter
 - Pin : 154 pin (94 + 60 Pin)
 - Waterproof Connector
 - Aluminum Cast Housing & Plate
 - Weight: 0.92Kg
 - Operation voltage : 6.3 V ~ 16 V
 - CAN communication
- HD PCM is BOSCH M7.9.8 same as alpha-II (MC).

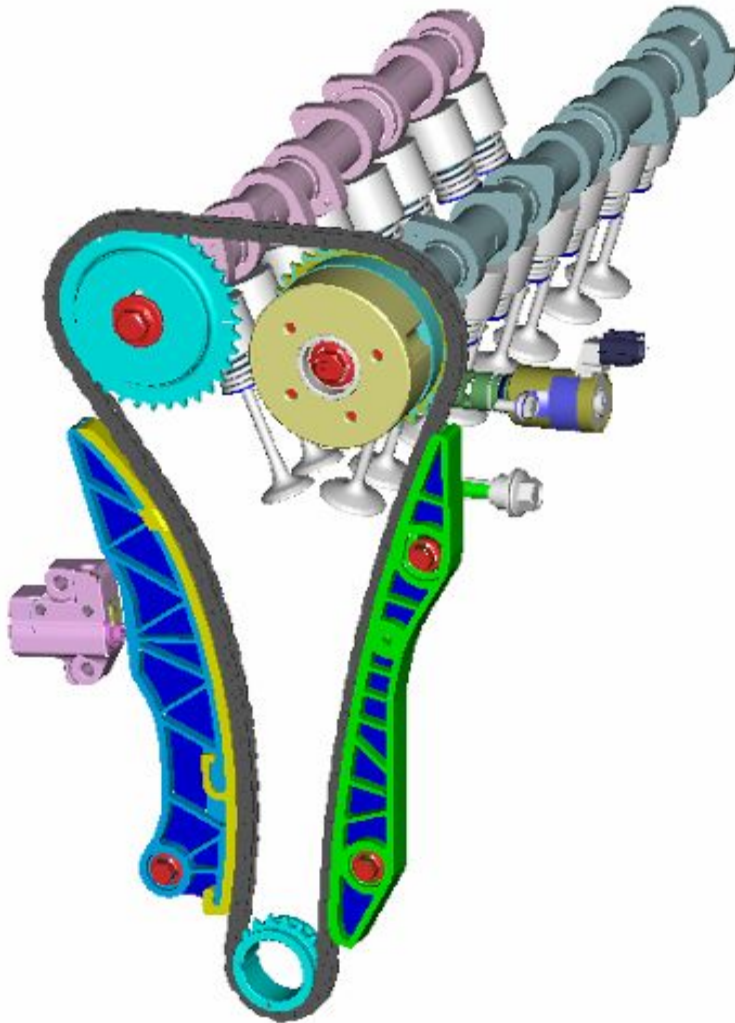




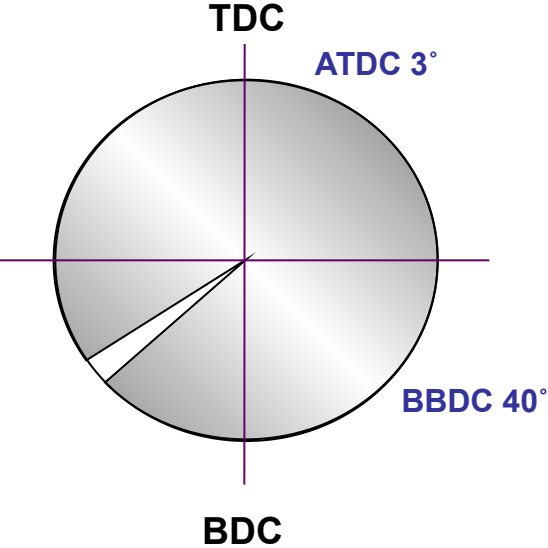
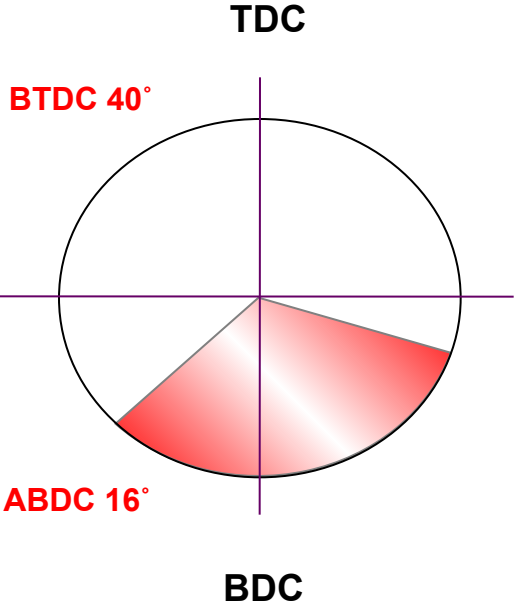
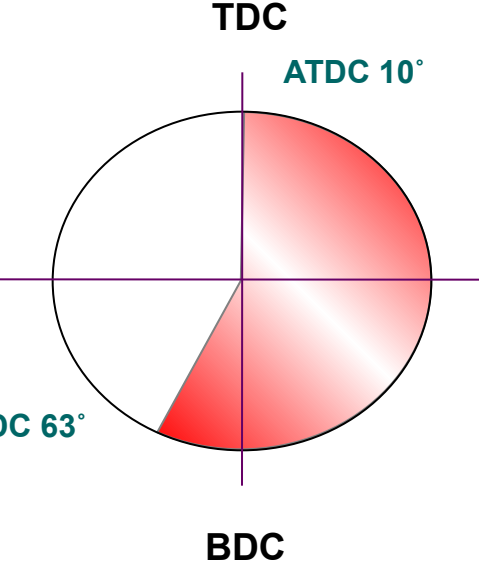
Split cooling system



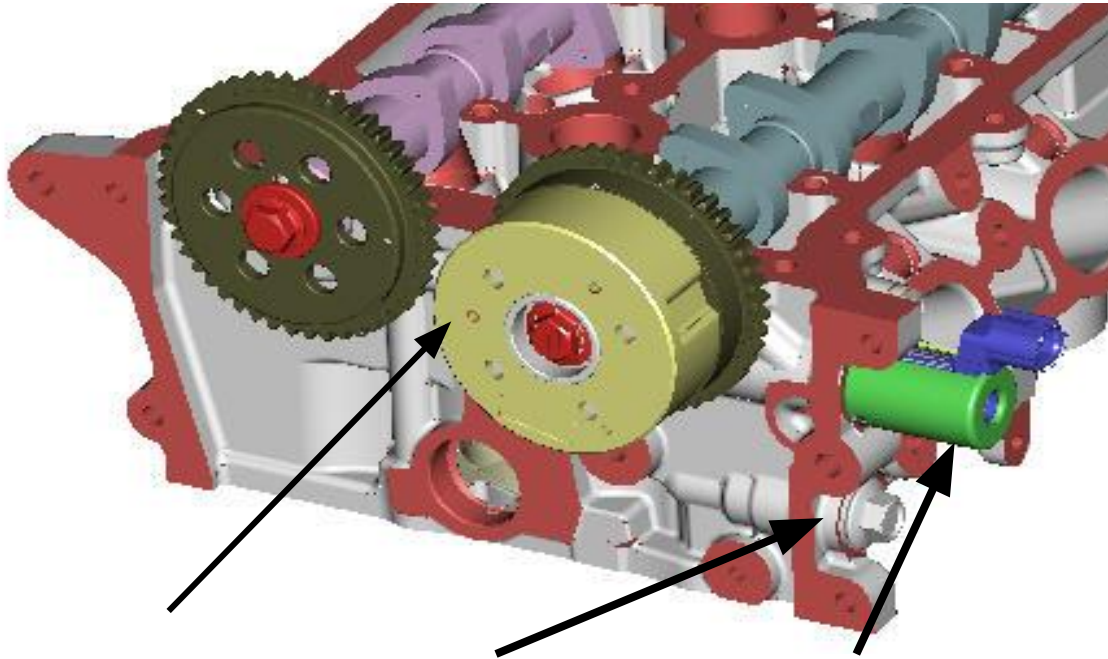
and T/OT
CLOSED
CLOSED
OPEN



- CVVT
 - Type : vane type
 - Angle : 50° (Retard ~ Advanced)
 - CVVT common using (alpha, beta, Theta)
- TIMING DRIVE
 - Timing chain
 - (Bush chain, pitch:8mm)
 - Ratchet type oil pressure auto tensioner
- CAMSHAFT
 - Weight : 1.700kg (Intake)
 - Hollow camshaft
- TAPPET
 - Shim-less mechanical tappet

Exhaust Valve	Intake Valve	
Duration : 223°	Duration : 236°	
	Full Advance	Full Retard
 <p>Diagram showing Exhaust Valve timing. The circle is divided into four quadrants by a vertical axis (TDC at top, BDC at bottom) and a horizontal axis. The valve opens 3° before TDC (ATDC 3°) and closes 40° after BDC (BBDC 40°). The shaded area represents the valve's open duration.</p>	 <p>Diagram showing Intake Valve timing at Full Advance. The circle is divided into four quadrants by a vertical axis (TDC at top, BDC at bottom) and a horizontal axis. The valve opens 40° before TDC (BTDC 40°) and closes 16° after BDC (ABDC 16°). The shaded area represents the valve's open duration.</p>	 <p>Diagram showing Intake Valve timing at Full Retard. The circle is divided into four quadrants by a vertical axis (TDC at top, BDC at bottom) and a horizontal axis. The valve opens 10° after TDC (ATDC 10°) and closes 63° after BDC (ABDC 63°). The shaded area represents the valve's open duration.</p>





CVVT

Filter

OCV



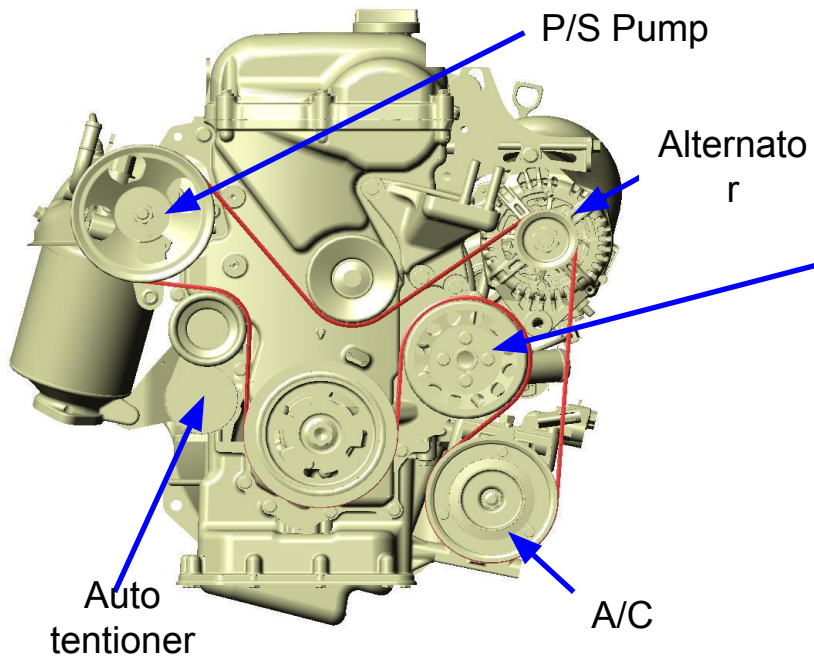
OCV (Oil Control Valve)



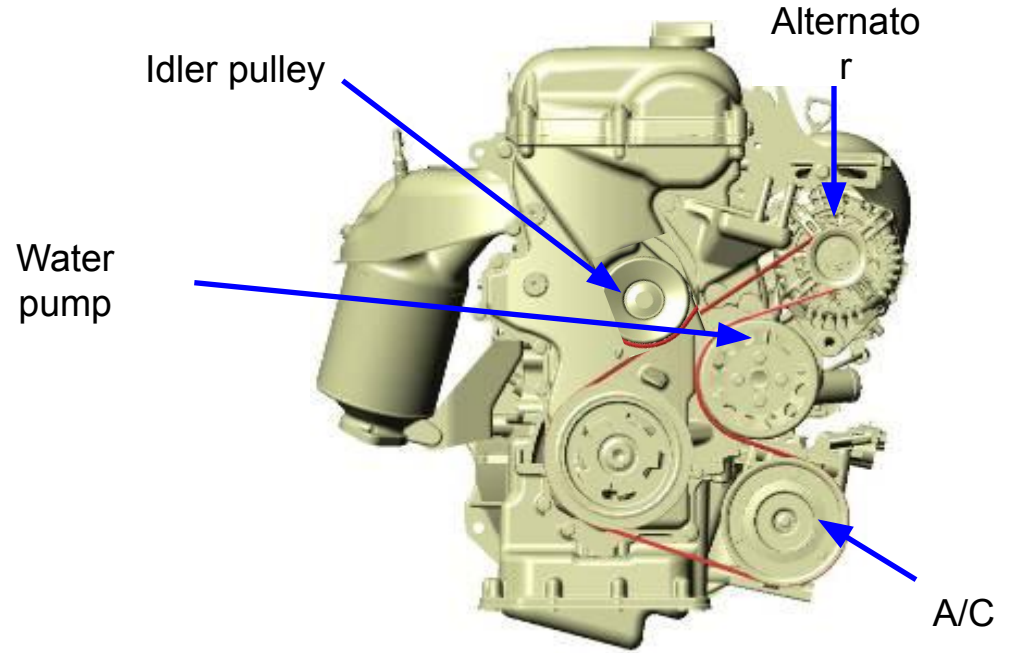
Filter



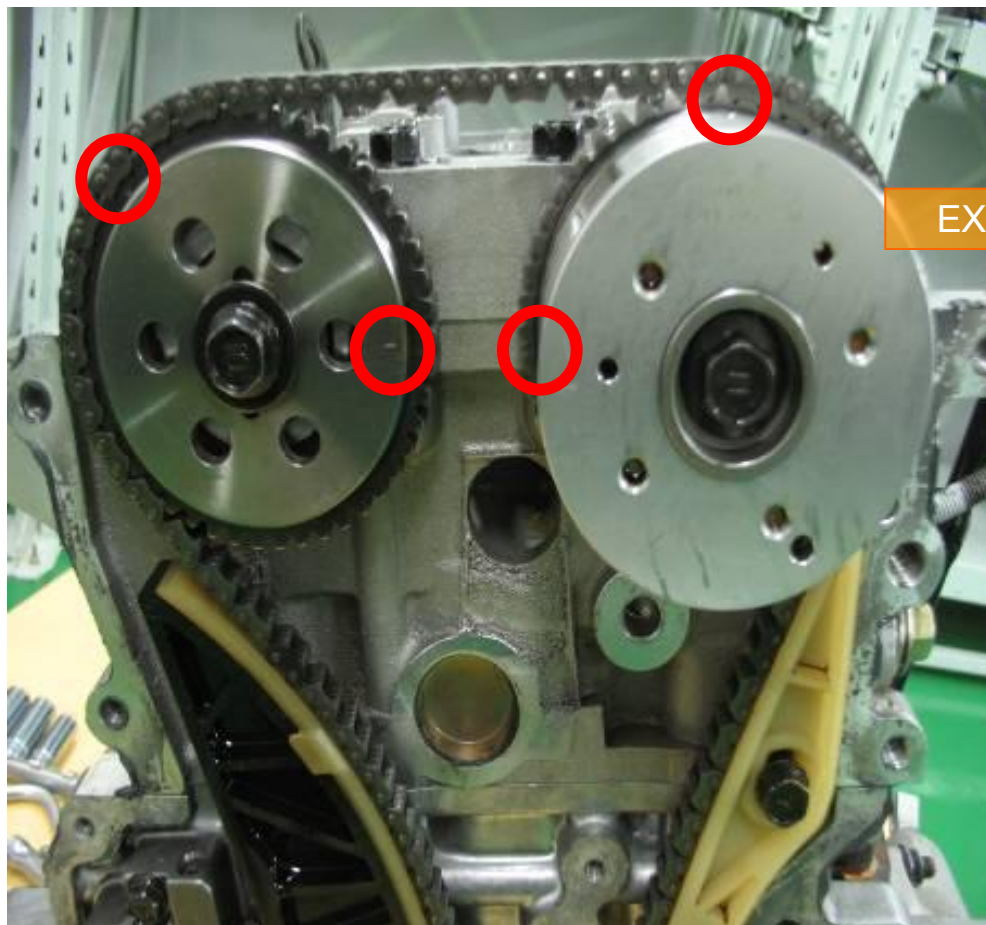
Driving belt



Without MDPS



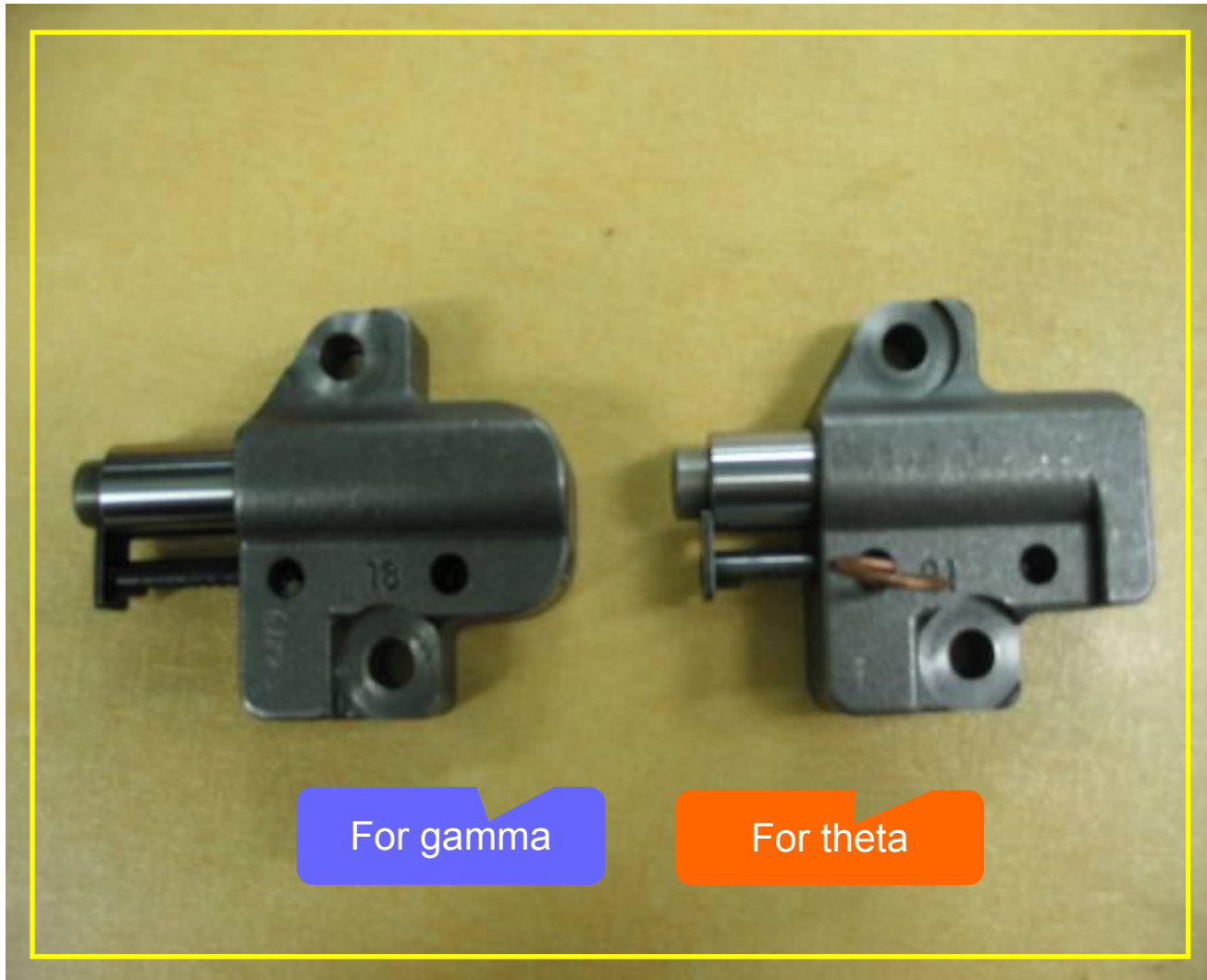
With MDPS



EX camshaft

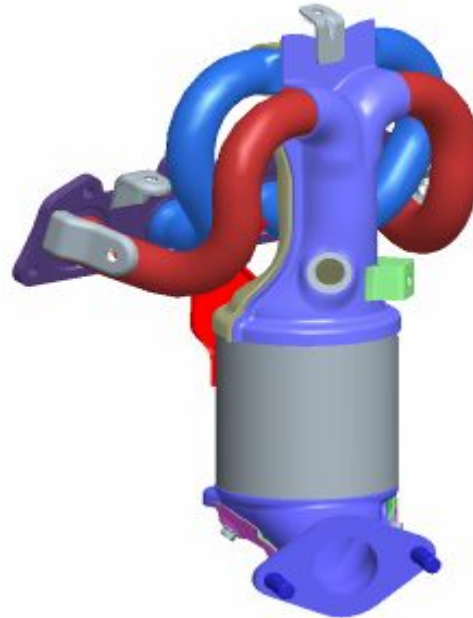
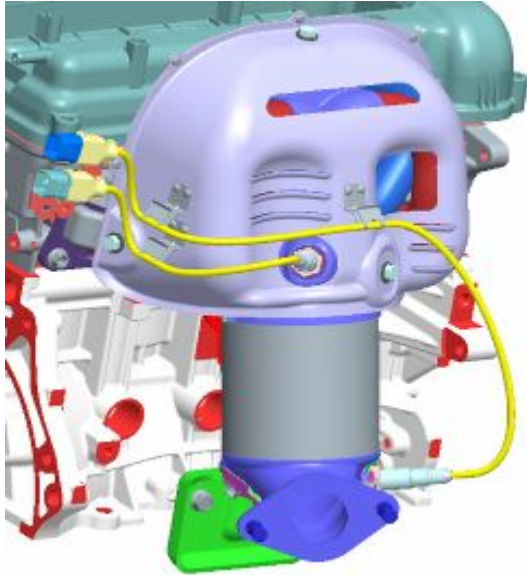


Aligning is same as theta timing aligning.



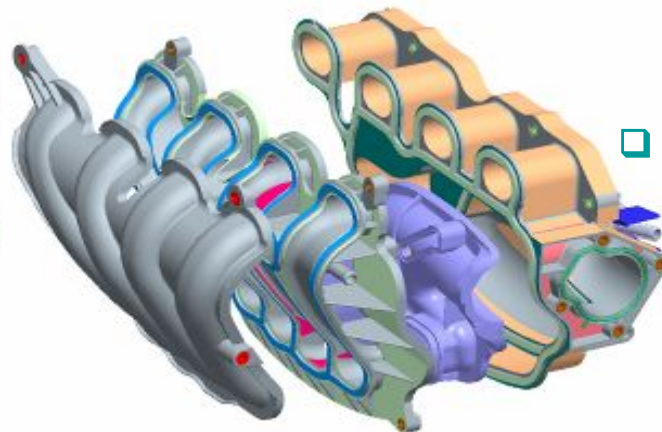
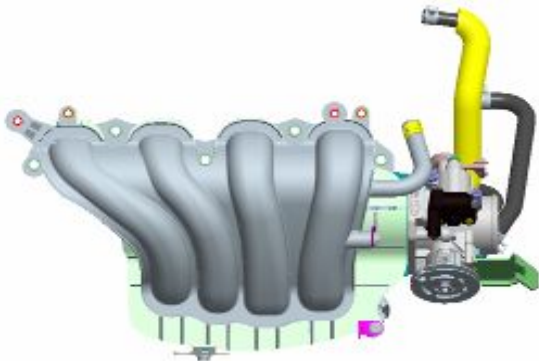
In theta and gamma engine timing system ratchet type auto tensioner is used. Right is for theta and left is for gamma. Mounting position is same but length of piston is different.

Intake and Exhaust manifold



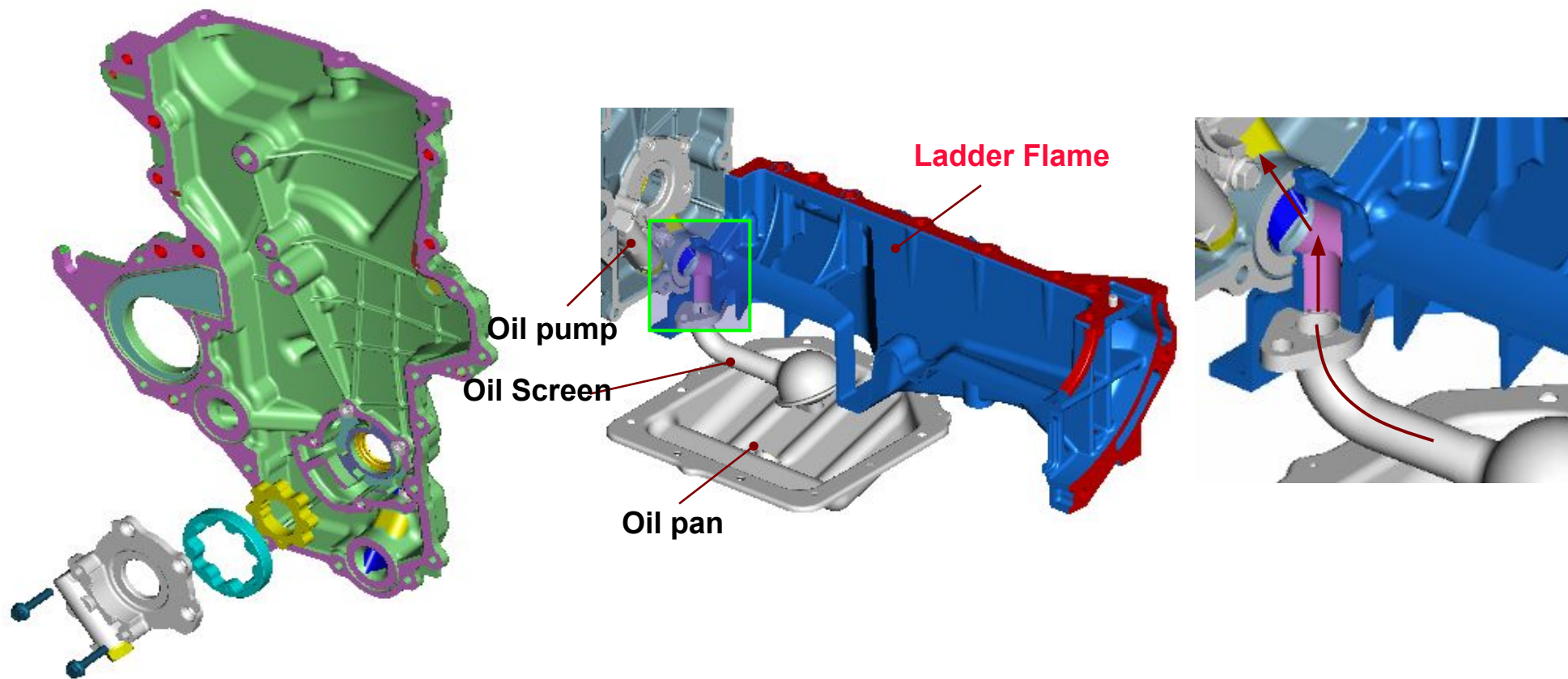
- ❑ Reversed intake manifold
 - Decreasing intake air temp.
 - Easy to repair injector
 - Increasing Impact absorb area

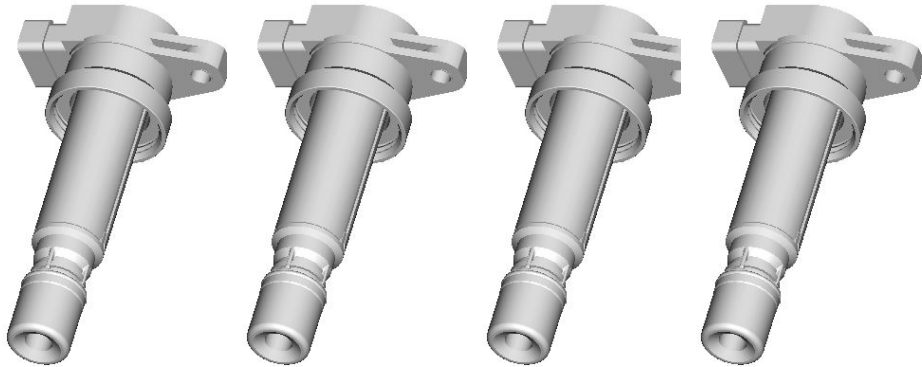
- ❑ Intake Manifold
 - Plastic Intake Manifold
(improve flow resistance)
 - Intake resonator
(reduce pulsation resistance, noise)



- ❑ Exhaust Manifold
 - Type : 4-1
 - WCC
 - SUS

Oil pump





□ Individual ignition control

□ Throttle Body

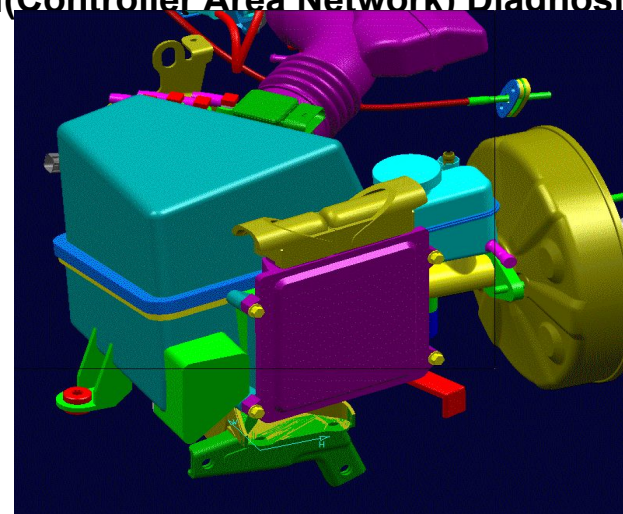
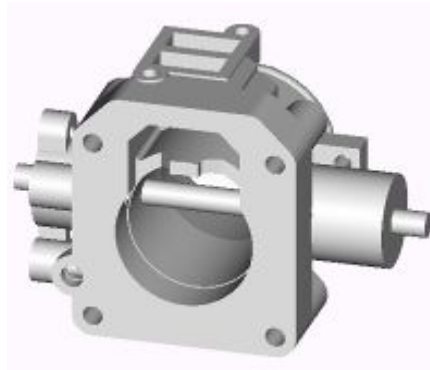
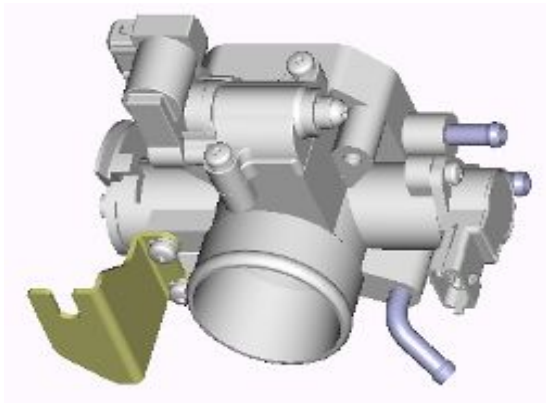
- Combined I.S.C.A and Throttle Body

□ Computer Assembly

- Integrated PCM (Power train Control Unit)

- Waterproof computer Assembly

- CAN(Controller Area Network) Diagnosis

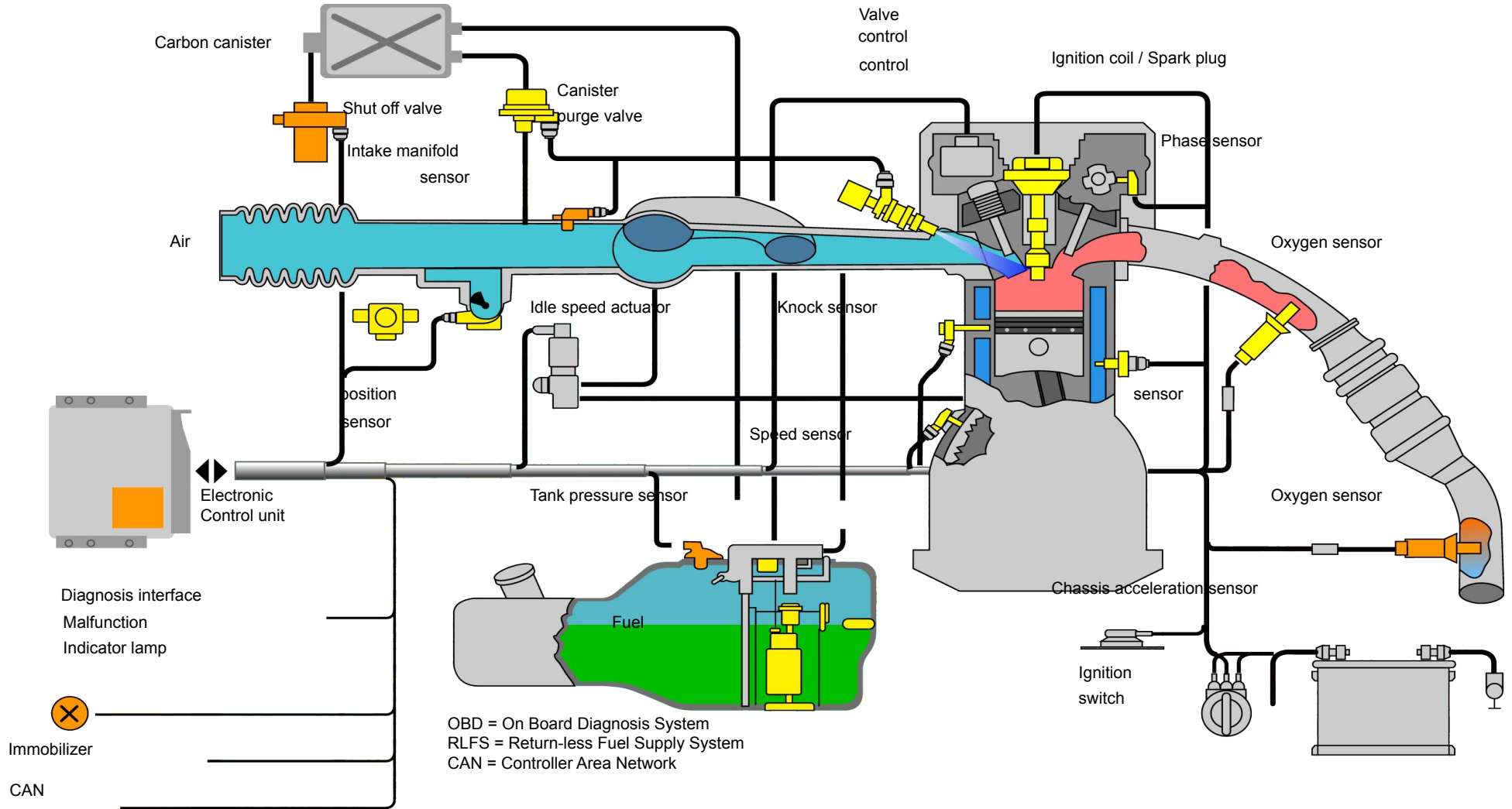




EMS parts list

	Part	Content
1	Ignition coil	-Cigar type, Individual ignition
2	Condenser	-250V, 0.47 _μ F
3	Spark Plug	-Projection type (2.0mm projection)
4	MAP sensor	-Combined air temperature sensor
5	Purge Control Solenoid Valve	-TEV5 type, built-in filter
6	Throttle body	-Bore : $\varnothing 53$
7	Idle Speed Actuator	_Rosa type, 250Hz
8	Throttle Position Sensor	-Lever type
9	Fuel Injector	-EV6 long type
10	PCM	-Waterproof M(G)7.9.8
11	Crankshaft position Sensor	-VR type
12	Camshaft Position Sensor	-Hall IC type
13	Water Temperature Sensor	
14	Oxygen Sensor	-LSF type (binary type)
15	Knock Sensor	-KS-4 (non-resonating)
16	Oil Pressure Switch	-waterproof type

Power train Management System Overview





Frnt. Right side WSS

M/T		Input Variable	ECM PIN NO.
With OBD-II	With ABS	ABS Signal	K 64
	Without ABS	Wheel Speed Sensor	K 79, K 58 (K 64 open)
Without OBD-II	With ABS	Vehicle Speed Sensor	K 64
	Without ABS		K 64
Auto		Input Variable	PCM PIN NO.
With OBD-II	With ABS	ABS Signal	K 20
	Without ABS	Wheel Speed Sensor	A 60, A 45
Without OBD-II	With ABS	Vehicle Speed Sensor	K 20
	Without ABS		K 20

Vehicle sensor signal recognition is a little different. When ABS or OBD system are applied to the vehicle, there isn't any vehicle speed sensor in T/M side. Wheel speed sensor is used for vehicle speed instead of VSS. This sensor is also used for misfiring detection like typical acceleration.

Signal input lines are also quite different by vehicle specification. Refer to above table for input pin assignment.

- Direction : same as MC

GAMMA-Engine Fault Code(DTC) & MIL List

2005.12.16

- : MIL ON & Fault Code Memory
- ▲ : MIL OFF & Fault Code Memory
- * : MIL ON & Fault Code Memory for Option
- ▲* : MIL OFF & Fault Code Memory for Option

		GAMMA Engine Fault Code(DTC) & MIL List				Remarks	
		EURO	DOM	GEN	LEADED		
			KOBD				
CVVT	P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance	●	●	▲	▲	
CVVT	P0012	"A" Camshaft Position-Timing Over-Retarded	●	●	▲	▲	
CMP	P0016	Crankshaft Position – Camshaft Position Correlation(Bank 1 Sensor A)	▲	▲	▲	▲	
O2 Sensor	P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)		●			
O2 Sensor	P0031	HO2S Heater Circuit low (Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0032	HO2S Heater Circuit high (Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0036	HO2S Heater Control Circuit (Bank 1 Sensor 2)	●	●			
O2 Sensor	P0037	HO2S Heater Circuit low (Bank 1 Sensor 2)	●	●			
O2 Sensor	P0038	HO2S Heater Circuit high (Bank 1 Sensor 2)	●	●			
TPS	P0068	MAP/MAF – Throttle Position Correlation	▲				
CVVT	P0075	Intake Valve Control Solenoid Circuit	●	●	▲	▲	
CVVT	P0076	Intake Valve Control Solenoid Circuit Low	●	●	▲	▲	
CVVT	P0077	Intake Valve Control Solenoid Circuit High	●	●	▲	▲	
MAP	P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	●	●			
MAP	P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	●	●	●	●	
MAP	P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	●	●	●	●	
ATS	P0111	Intake Air Temperature Sensor1 Circuit Range/Performance		●			
ATS	P0112	Intake Air Temperature Sensor1 Circuit Low Input	●	●	▲	▲	
ATS	P0113	Intake Air Temperature Sensor1 Circuit High Input	●	●	▲	▲	
WTS	P0115	Engine Coolant Temperature Circuit					
WTS	P0116	Engine Coolant Temperature Circuit Range / Performance	●	●			
WTS	P0117	Engine Coolant Temperature Circuit Low Input	●	●	●	●	
WTS	P0118	Engine Coolant Temperature Circuit High Input	●	●	●	●	
TPS	P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	●	●			
TPS	P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	●	●	●	●	
TPS	P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	●	●	●	●	



DTC lists

- : MIL ON & Fault Code Memory
- ▲ : MIL OFF & Fault Code Memory
- * : MIL ON & Fault Code Memory for Option
- ▲* : MIL OFF & Fault Code Memory for Option

GAMMA Engine Fault Code(DTC) & MIL List

Item	DTC	Description	GAMMA Engine Fault Code(DTC) & MIL List				Remarks
			EURO	DOM	GEN	LEADED	
				KOBD			
TPS	P0124	Throttle/Pedal Position Sensor/Switch "A" Circuit Intermittent	▲				
WTS	P0128	Coolant Thermostat (Coolant Temp. below Thermostat Regulating Temp.)		●			
O2 Sensor	P0130	O2 Sensor Circuit(Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0131	O2 Sensor Circuit Low Voltage(Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0132	O2 Sensor Circuit High Voltage(Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0133	O2-Sensor Circuit Slow Response (Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0135	O2 Sensor Heater Circuit(Bank 1 Sensor 1)	●	●	▲		
O2 Sensor	P0136	O2 Sensor Circuit(Bank 1 Sensor 2)	●	●			
O2 Sensor	P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	●	●			
O2 Sensor	P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	●	●			
O2 Sensor	P0139	O2 Sensor Circuit Slow Response	●	●			
O2 Sensor	P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	●	●			
O2 Sensor	P0141	O2 Sensor Heater Circuit(Bank 1 Sensor 2)	●	●			
Fuel Trim	P0171	System Too Lean (Bank 1)	●	●	▲		
Fuel Trim	P0172	System Too Rich (Bank 1)	●	●	▲		
Injector	P0201	Injector Circuit/Open – Cylinder 1	●	●	●	●	
Injector	P0202	Injector Circuit/Open – Cylinder 2	●	●	●	●	
Injector	P0203	Injector Circuit/Open – Cylinder 3	●	●	●	●	
Injector	P0204	Injector Circuit/Open – Cylinder 4	●	●	●	●	
Fuel Pump	P0230	Fuel Pump Primary Circuit	▲	▲	▲	▲	
Fuel Pump	P0231	Fuel Pump Secondary Circuit Low	▲	▲	▲	▲	
Fuel Pump	P0232	Fuel Pump Secondary Circuit High	▲	▲	▲	▲	
Injector	P0261	Cylinder 1 - Injector Circuit Low	●	●	●	●	
Injector	P0262	Cylinder 1 - Injector Circuit High	●	●	●	●	
Injector	P0264	Cylinder 2 - Injector Circuit Low	●	●	●	●	
Injector	P0265	Cylinder 2 - Injector Circuit High	●	●	●	●	
Injector	P0267	Cylinder 3 - Injector Circuit Low	●	●	●	●	



DTC lists

- : MIL ON & Fault Code Memory
- ▲ : MIL OFF & Fault Code Memory
- * : MIL ON & Fault Code Memory for Option
- ▲* : MIL OFF & Fault Code Memory for Option

GAMMA Engine Fault Code(DTC) & MIL List

Item			GAMMA Engine Fault Code(DTC) & MIL List				Remarks
			EURO	DOM	GEN	LEADED	
Injector	P0268	Cylinder 3 - Injector Circuit High	●	●	●	●	
Injector	P0270	Cylinder 4 - Injector Circuit Low	●	●	●	●	
Injector	P0271	Cylinder 4 - Injector Circuit High	●	●	●	●	
Misfire	P0300	Random/Multiple Cylinder Misfire Detected	●	●			
Misfire	P0301	Cylinder 1 - Misfire detected	●	●			
Misfire	P0302	Cylinder 2 - Misfire detected	●	●			
Misfire	P0303	Cylinder 3 - Misfire detected	●	●			
Misfire	P0304	Cylinder 4 - Misfire detected	●	●			
Knock Sensor	P0326	Knock Sensor 1 Circuit Range/Performance	▲	▲	▲		
Knock Sensor	P0327	Knock Sensor 1 Circuit Low Input	▲	▲	▲		
Knock Sensor	P0328	Knock Sensor 1 Circuit High Input	▲	▲	▲		
CKP	P0335	Crankshaft Position Sensor A Circuit	●	●	▲	▲	
CKP	P0336	Crankshaft Position Sensor A Circuit Range/Performance	●	●	▲	▲	
CKP	P0337	Crankshaft Position Sensor A Circuit Low Input	●	●	▲	▲	
CKP	P0338	Crankshaft Position Sensor A Circuit High Input	●	●	▲	▲	
CMP	P0340	Camshaft Position Sensor A Circuit Malfunction(Single Sensor)	●	●	▲	▲	
CMP	P0341	Camshaft Position Sensor A Circuit Range/Performance(Single Sensor)	●	●	▲	▲	
CMP	P0342	Camshaft Position Sensor A Circuit Low Input	●	●	▲	▲	
CMP	P0343	Camshaft Position Sensor A Circuit High Input	●	●	▲	▲	
Catalyst Aging	P0420	Catalyst System Efficiency below Threshold (Bank 1)	●	●			
Evap.	P0442	Evap. Emission System - Leak detected (small leak)		●			
Evap.	P0444	Evap. Emission System - Purge Ctrl. Valve Circuit Open	●	●			
Evap.	P0446	Evap. Emission System - Vent Control circuit		●			
Evap.	P0449	Evap. Emission System - Vent valve / Solenoid circuit		●			
Evap.	P0450	Evaporative Emission System Pressure Sensor/Switch		●			
Evap.	P0451	Evap. Emission System - Pressure Sensor Range / Performance		●			
Evap.	P0452	Evap. Emission System - Pressure Sensor Low Input		●			
Evap.	P0453	Evap. Emission System - Pressure Sensor High Input		●			



Current data

1.2 CURRENT DATA		01/64
TRANSAXLE RANGE SW	P, N	▲
A/C ON CONDITION	OFF	■
A/C SWITCH	OFF	
MALFUNCTION IND.LAMP	OFF	
A/C COMPRESSOR	OFF	
FAN-LOW SPEED	OFF	
FAN-HIGH SPEED	OFF	
IGNITION SWITCH	ON	▼

FIX SCRN FULL PART GRPH HELP

1.2 CURRENT DATA		16/64
IDLE STATUS	ON	▲
WIDE OPEN THROTTLE	OFF	■
FUEL-CUT OFF STATUS	OFF	
START SIGNAL	OFF	
FUEL PUMP RELAY	ON	
MFI CONTROL RELAY	ON	
SYNCHRO.STATUS-CKP/CMP	ON	
A/F CLOSED LOOP	ON	▼

FIX SCRN FULL PART GRPH HELP

1.2 CURRENT DATA		24/64
KNOCKING DETECTED	OFF	▲
ENGINE RUNNING DETECT	ON	■
CVT STATUS	ON	
O2S OPERATION-B1/S1	ON	
CANISTER PURG ACT	OFF	
CANISTER PURG ON	OFF	
IDLE CONTROL STATE	ON	
ENGINE LOAD	25.0 %	▼

FIX SCRN FULL PART GRPH HELP

1.2 CURRENT DATA		32/64
THROTTLE P.SNSR(V)	0.4 V	▲
THROTTLE POSI.SENSOR	0.0 %	■
ADAPTED THROTTLE ANGLE	7.8 %	
ENGINE SPEED	1080.rpm	
BATTERY VOLTAGE	14.3 V	
BATTERY CHARGING	0.0 %	
WATER TEMPERATURE	32.2 °C	
INTAKE AIR TEMPERATURE	19.5 °C	▼

FIX SCRN FULL PART GRPH HELP

1.2 CURRENT DATA		40/64
PURGE CONTROL VALVE	0.0 %	▲
NO.1 INJ.DURATION	4.1 mS	
NO.2 INJ.DURATION	4.1 mS	
NO.3 INJ.DURATION	4.1 mS	
NO.4 INJ.DURATION	4.0 mS	
INDICATED ACTUAL TORQU	20.9 %	■
TORQUE REQUEST FROM TC	99.9 %	
O2 SNSR VOLT.(B1/S1)	0.1 V	▼

1.2 CURRENT DATA		48/64
TARGET IDLE RPM	1020.rpm	▲
ISC ACTUATOR DUTY	37.4 %	
ENGINE SPEED-FINE	1017.rpm	
ENG. OIL TEMPERATURE	29.3 °C	
CALCULATE OIL TEMPERAT	23.6 °C	
IGNITION TIMING - CYL1	7.5 °	
IGNITION TIMING - CYL2	6.8 °	■
IGNITION TIMING - CYL3	5.3 °	▼

1.2 CURRENT DATA		56/64
IGNITION TIMING - CYL4	3.8 °	▲
VEHICLE SPEED	0.0 Km/h	
SHORT TERM FUEL	-1.1 %	
LONG TERM FUEL-IDLE	0.1 %	
LONG TERM FUEL-P/LOAD	1.4 %	
KNOCK ADAPTATION-CYL1	0.0 °	
KNOCK ADAPTATION-CYL2	0.0 °	
KNOCK ADAPTATION-CYL3	0.0 °	■

1.2 CURRENT DATA		64/64
KNOCK ADAPTATION-CYL4	0.0 °	▲
CAMSHAFT ADAPT.ANGLE#1	155.0°	
CAMSHAFT ADAPT.ANGLE#2	523.8°	
CAMSHAFT ADAPT.ANGLE#3	660.0°	
CAMSHAFT ADAPT.ANGLE#4	660.0°	
CAMSHAFT CONTROL	523.5°	
CAMSHAFT POSITION	26.6 °	
CAMSHAFT POS.-TARGET	26.8 °	■



ID check and resetting adaptive values

1.7 . IDENTIFICATION CHECK

MODEL : ELANTRA(HD)06-
SYSTEM : ENGINE(GASOLINE)

CAL NO: GHD-7D6CQQ

BOOT S/W NUM : 14901001

ECU S/W NUM : 9030930960

SYS SUP S/W NUM : M98C340F

1.6. RESETTING ADAPTIVE VALUES

RESET ALL ADAPTIVE VALUES

CONDITION	
	IG.KEY ON
	ENGINE STOP

PRESS [REST], IF YOU ARE READY !

REST



Changed items (HD 2.0 vs XD F/L 2.0)

			XD F/L	HD Beta 2.0	Supplier	Remark
ECM/PCM			SIMK 43 (inside) SIEMENS	SIM2K-47 (Engine room) SIEMENS	SIEMENS	
Injector	SULEV		Multi hole (DENSO)	Multi hole short (DENSO)	DENSO	
	-SULEV		EV6(KEFICO)	←	KEFICO	
Knock sensor			KS-2(KEFICO)	KS-4(KEFICO)	KEFICO	
Spark plug	Korea GEN		Nickel	←	Scrim, Woojin	
	NAS,CHN		Pt	←	Scrim, Woojin	
	SULEV		Iridium (NGK)	Iridium + projection (NGK)	Woojin	
PCSV			TEV-2;3cc (KEFICO)	←	KEFICO	
CKP			ATS3610(SIEMENS VDO)	←	SIEMENS	
CMP			ATS631(SIEMENS VDO)	←	SIEMENS	
TPS			Shaft type	Lever type	KEFICO	
MAF			With CVVT	NAS	SIEMENS	
MAP			Without CVVT	Except NAS	SIEMENS	
Throttle body			A/C lever – TH/lever	A/C lever – TH/lever separately	MORTONIC	
02 Sensor	NAS	FR	UEGO sensor	← (Length changed)		
		RR	LSF 4.2 D4	←		
	-NAS	FR	LSF 4.2 D4	←		
		RR	LSF 4.2 D4	←		



Current data

1.2 CURRENT DATA		01/63
TRANSAXLE TYPE	MT	▲
A/C PRESSURE SWITCH	ON	■
A/C SWITCH	OFF	
ELEC.LOAD INPUT 1	ON	
MALFUNCTION IND.LAMP	ON	
A/C COMPRESSOR	ON	
IGNITION SWITCH ON	OFF	
SUPP. POWER FAIL	OFF	▼

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		09/63
IDLE STATUS	OFF	▲
WIDE OPEN THROTTLE	OFF	■
FUEL-CUT OFF STATUS	ON	
START STATUS	ON	
FUEL PUMP RELAY	ON	
MFI CONTROL RELAY	OFF	
SYNCHRO.STATUS-CKP/CMP	ON	
A/F CLOSED LOOP(UP)-B1	OFF	▼

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		23/63
A/F CLOSED LOOP(UP)-B1	OFF	▲
KNOCKING DETECTED	OFF	
O2S UP CATAL.READY-B1	OFF	■
O2S DN CATAL.READY-B1	OFF	
CANISTER PURGE STATE	OFF	
IDLE CONTROLLER ACT.	OFF	
DRIVE STATE	ON	
MAF SENSOR(V)	248.4V	▼

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		31/63
MAF SENSOR	1305.Kg/h	▲
MAP SENSOR(VOLT)	0.00 V	
MAP SENSOR	0.00 hPa	
ENGINE LOAD	0.00 %	■
THROTTLE P.SNSR(V)	0.00 V	
THROTTLE P.SENSOR	0.00 %	
ADAPTED THROTTLE	5161.°	
ENGINE SPEED	40.0 rpm	▼

FIX SCRNM FULL PART GRPH HELP



Current data

1.2 CURRENT DATA		39/63
BATTERY VOLTAGE	17.23V	▲
COOLANT TEMP. SENSOR	-48.0°C	
TARGET COOL. TEMP.	-48.0°C	
INT. AIR TEMP. SENSOR	-48.0°C	
EVAP. PURGE VALVE	0.00 %	
INJ. DURATION-CYL1	0.00 mS	■
INJ. DURATION-CYL2	20552mS	
INJ. DURATION-CYL3	0.00 mS	

▼

FIX SCRIN FULL PART GRPH HELP

1.4 ACTUATION TEST 01/21	
DIAGNOSTIC LAMP(MIL)	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	

1.4 ACTUATION TEST 02/21	
CANISTER CLOSE VALVE-CLOSED	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	

1.4 ACTUATION TEST 03/21	
FUEL PUMP RELAY	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	

1.4 ACTUATION TEST 04/21	
A/C COMPRESSOR RELAY	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	

1.4 ACTUATION TEST 05/21	
FUEL PUMP CONTROL	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
STRT	

1.4 ACTUATION TEST 06/21	
IMMOBILIZER LAMP	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
STRT	

1.4 ACTUATION TEST 07/21	
CANISTER CLOSE VALVE-LOCK	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
STRT	

1.4 ACTUATION TEST 08/21	
FAN-HIGH SPEED	
DURATION	2 SECONDS
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
STRT	



Actuation test

1.4 ACTUATION TEST		09/21
FAN-LOW SPEED		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/>		

1.4 ACTUATION TEST		10/21
MAIN RELAY		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/>		

1.4 ACTUATION TEST		11/21
CANISTER PURGE VALVE		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/>		

1.4 ACTUATION TEST		12/21
IDLE SPEED ACTUATOR		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/>		

1.4 ACTUATION TEST		13/21
OIL CONTROL VALVE		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
[STRT]		

1.4 ACTUATION TEST		14/21
IGNITION COIL - #1		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
[STRT]		

1.4 ACTUATION TEST		15/21
IGNITION COIL - #2		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
[STRT]		

1.4 ACTUATION TEST		16/21
IGNITION COIL - #3		
DURATION	2 SECONDS	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
[STRT]		

1.4 ACTUATION TEST 17/21**IGNITION COIL - #4**

DURATION	2 SECONDS
-----------------	------------------

METHOD	ACTIVATION
---------------	-------------------

CONDITION	IG.KEY ON ENGINE OFF
------------------	---------------------------------

**PRESS [STRT], IF YOU ARE READY ?
SELECT TEST ITEM USING UP/DOWN KEY**

STRT**1.4 ACTUATION TEST 18/21****NO.1 INJECTOR**

DURATION	2 SECONDS
-----------------	------------------

METHOD	ACTIVATION
---------------	-------------------

CONDITION	IG.KEY ON ENGINE RUNNING
------------------	-------------------------------------

**PRESS [STRT], IF YOU ARE READY ?
SELECT TEST ITEM USING UP/DOWN KEY**

STRT**1.4 ACTUATION TEST 19/21****NO.2 INJECTOR**

DURATION	2 SECONDS
-----------------	------------------

METHOD	ACTIVATION
---------------	-------------------

CONDITION	IG.KEY ON ENGINE RUNNING
------------------	-------------------------------------

**PRESS [STRT], IF YOU ARE READY ?
SELECT TEST ITEM USING UP/DOWN KEY**

STRT**1.4 ACTUATION TEST 20/21****NO.3 INJECTOR**

DURATION	2 SECONDS
-----------------	------------------

METHOD	ACTIVATION
---------------	-------------------

CONDITION	IG.KEY ON ENGINE RUNNING
------------------	-------------------------------------

**PRESS [STRT], IF YOU ARE READY ?
SELECT TEST ITEM USING UP/DOWN KEY**

STRT

1.4 ACTUATION TEST

21/21

NO.4 INJECTOR

DURATION 2 SECONDS

METHOD ACTIVATION

CONDITION IG.KEY ON
ENGINE RUNNING

PRESS [STRT], IF YOU ARE READY ?
SELECT TEST ITEM USING UP/DOWN KEY

STRT

Gasoline EMS :

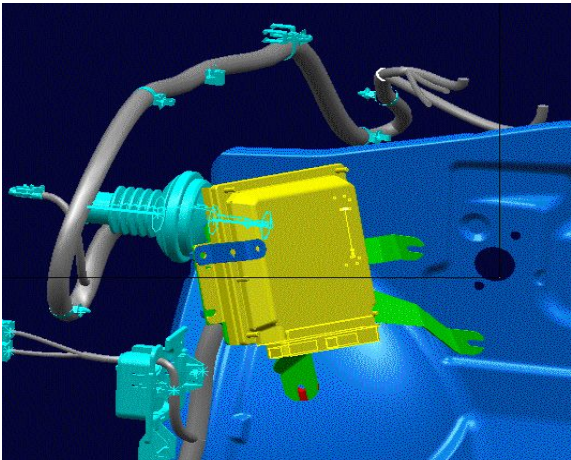
γ/β -ENG

Item	Contents	XD	HD		
			Korea	GEN	N/A
PCM	<ul style="list-style-type: none"> •Water proof •Air cleaner side located 		•	•	•
Air flow sensor type (CVVT)	<ul style="list-style-type: none"> •Direct→ Indirect detecting (AIR FLOW SENSOR → MAP SENSOR) 		•	•	

ECM / PCM

XD

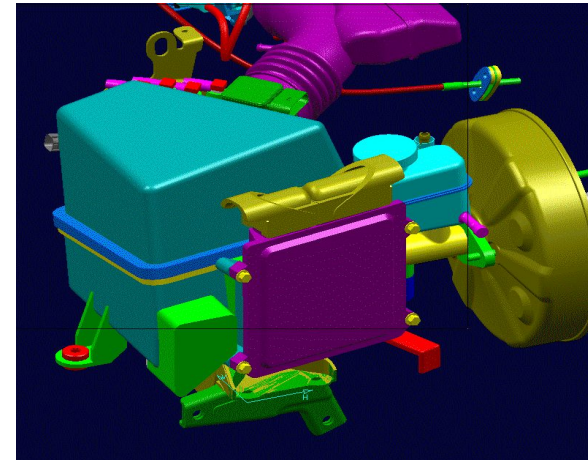
- Inside type



(WHEEL HOUSING)

HD

- Engine room type



(A/CLEANER SIDE)

Air volume detection sensor (γ/β -ENG)

XD

AIR FLOW sensor



Direct detecting type

HD

MAP sensor



Indirect detecting type



type.ppt

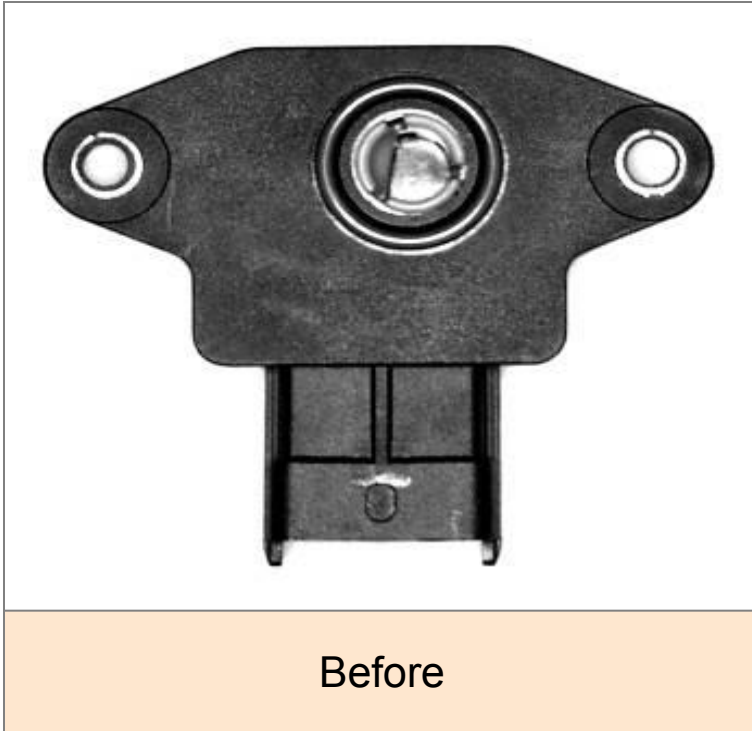


connector.ppt



service
ability.ppt

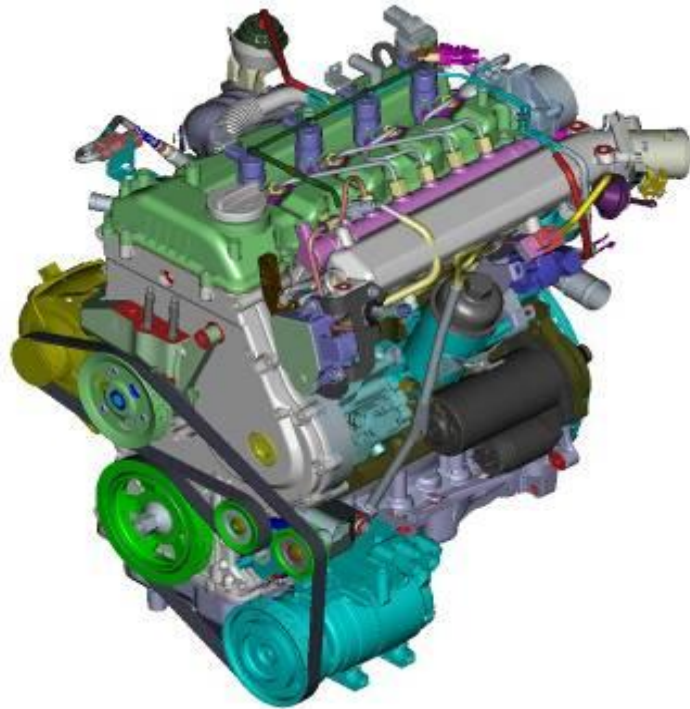
(Insert shaft type → Lever type)



Lever type is better than shaft type for engine vibration.

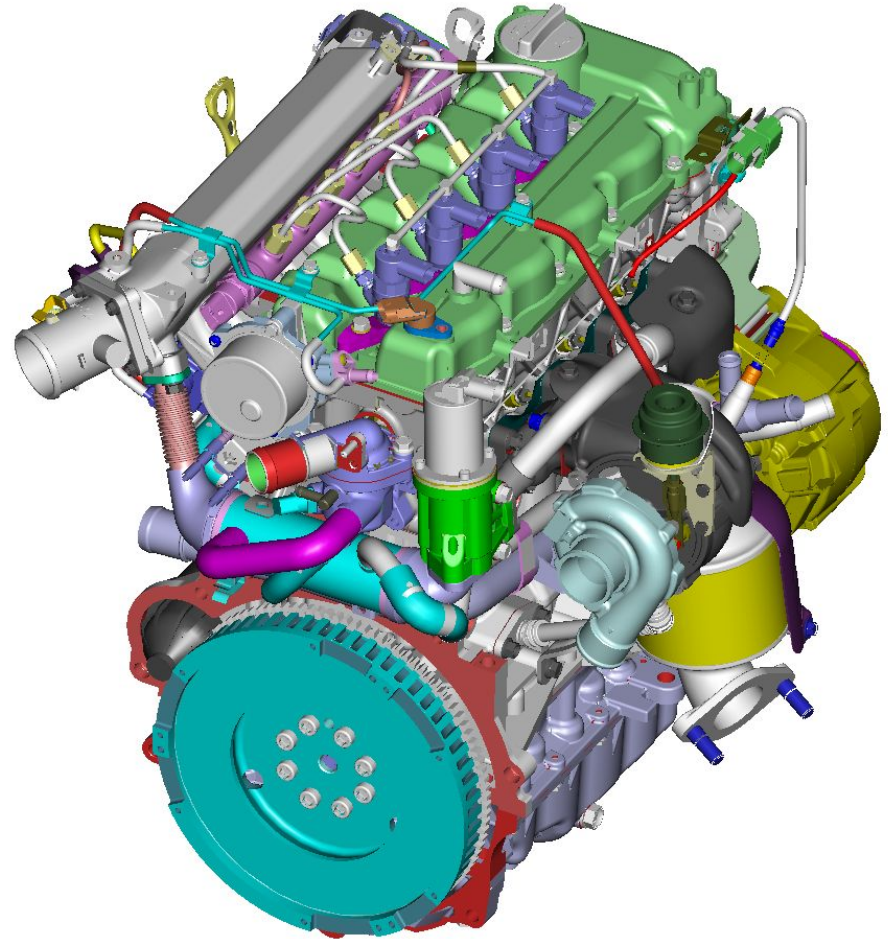


U 1.6L Specification

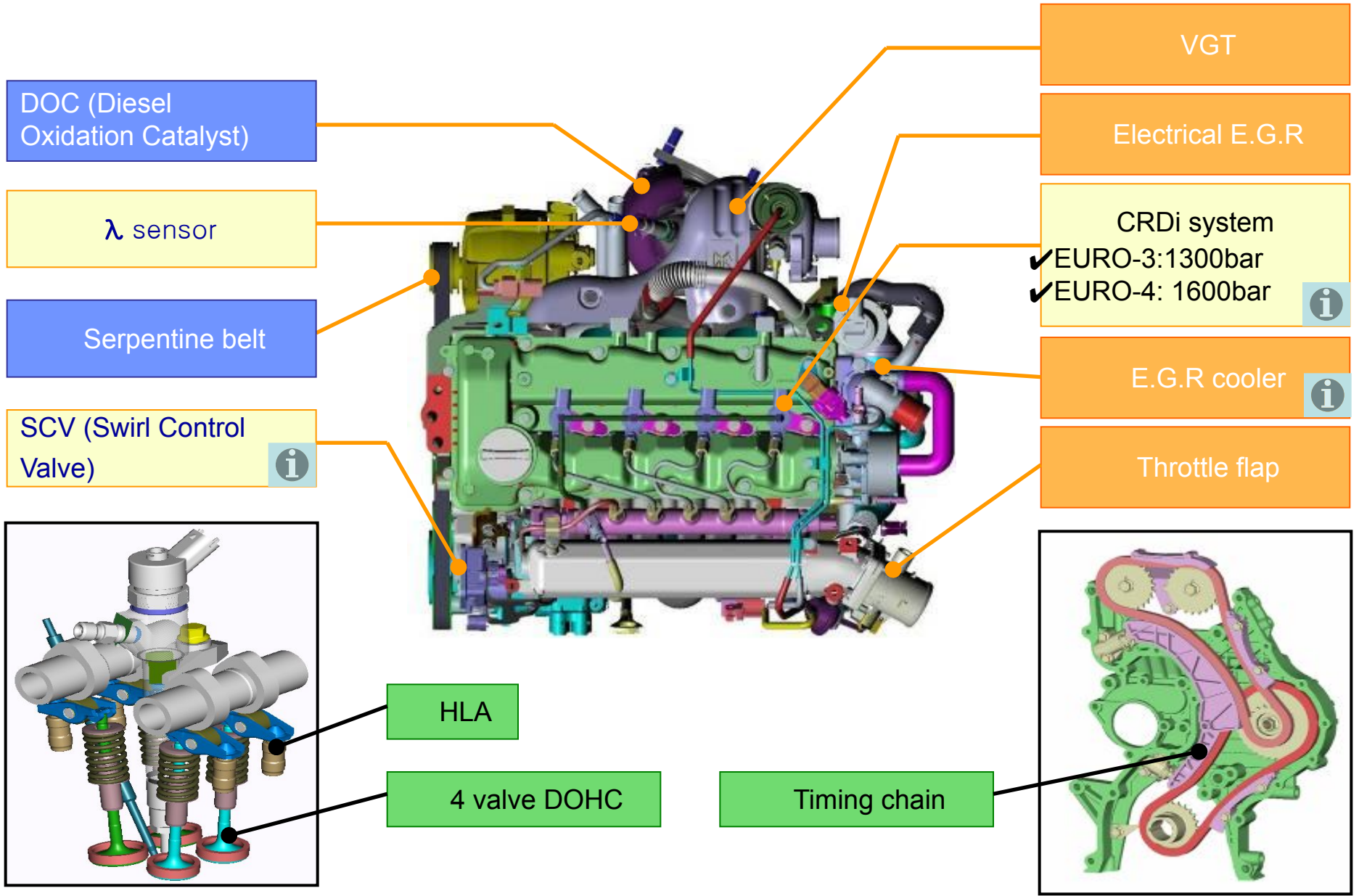


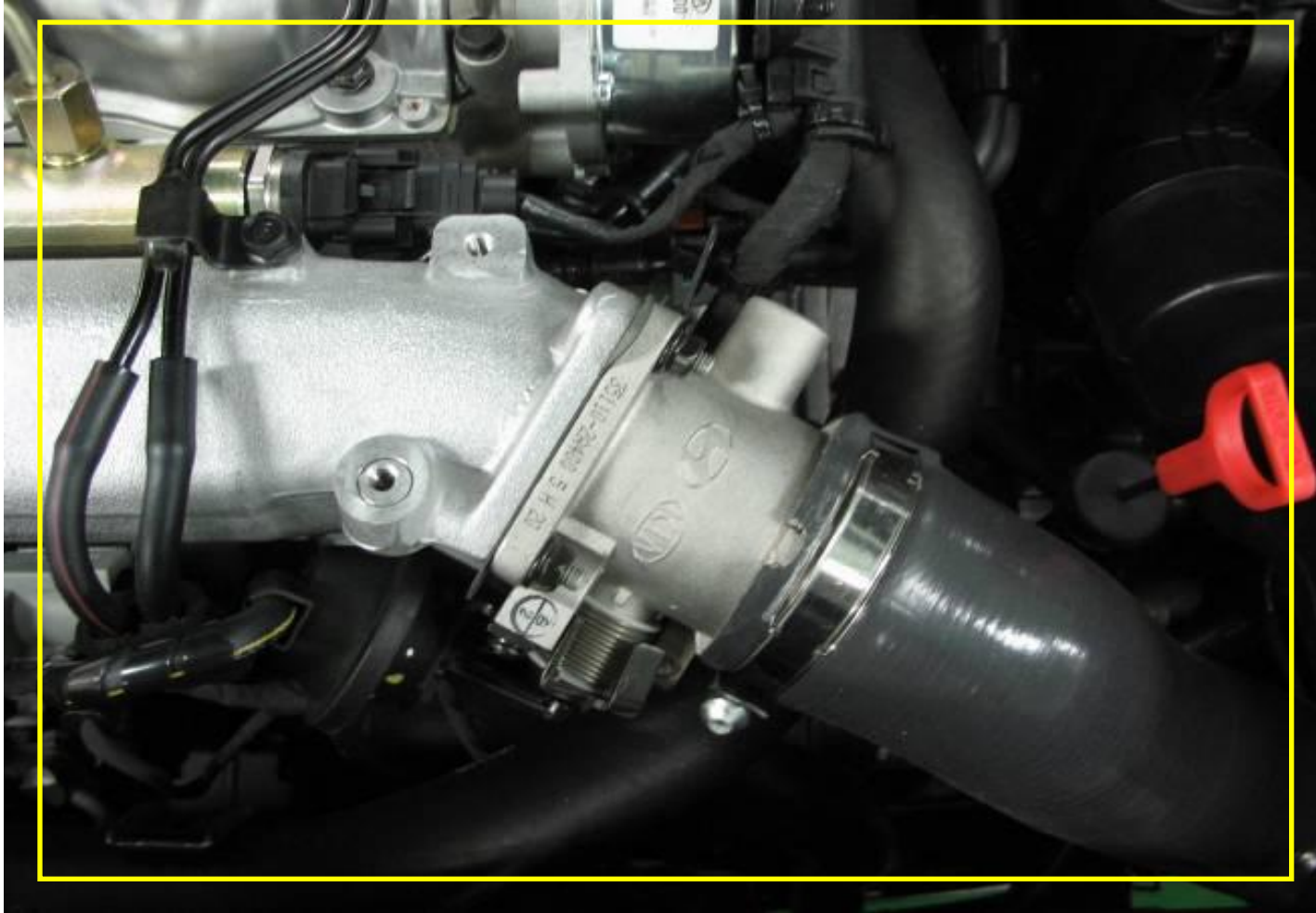
Engine		U-1.5	U-1.6
		(EURO 4)	(EURO 4)
Main feature	Cylinder	4 cylinder	
	Displacement (cc)	1,493	1,582
	Bore (mm)	75	77.2
	Stroke (mm)	84.5	
	Valve type	DOHC-4 valve	
	Cam operating	Chain	
	Injection	CRDi (1600bar)	
Max. output (PS)		112	117
Max. torque (kg.m)		24.5	26.5

- ▶ DOHC I type 4valve Cylinder Turbo intercooler
- ▶ CRDi system (1600bar)
- ▶ Electrical EGR & EGR cooler
- ▶ VGT (Variable Geometry Turbo)
- ▶ Timing chain
- ▶ Serpentine belt
- ▶ Bed plate
- ▶ SCV (Swirl control Valve)
- ▶ Throttle flap
- ▶ Lambda sensor



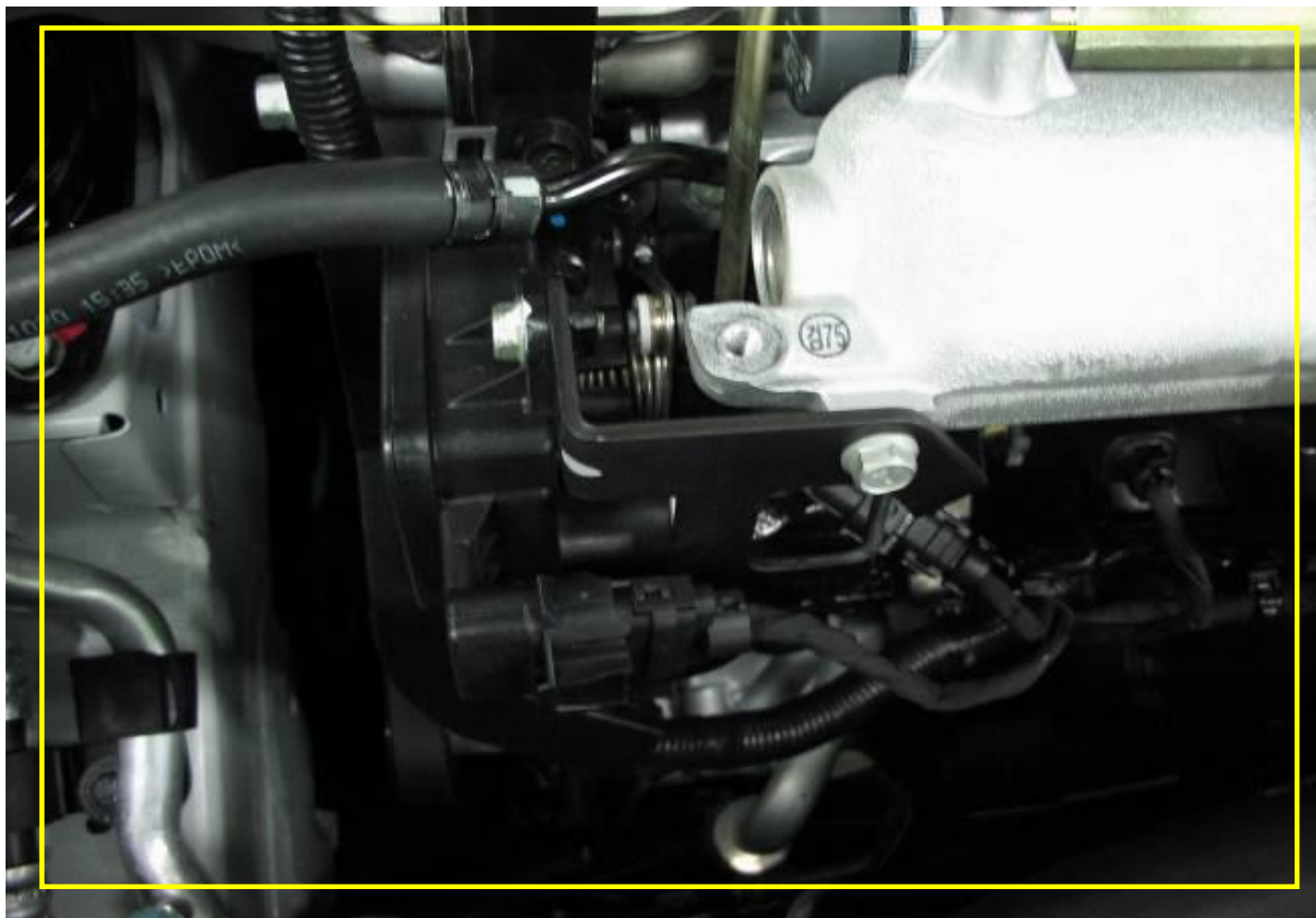
Main components



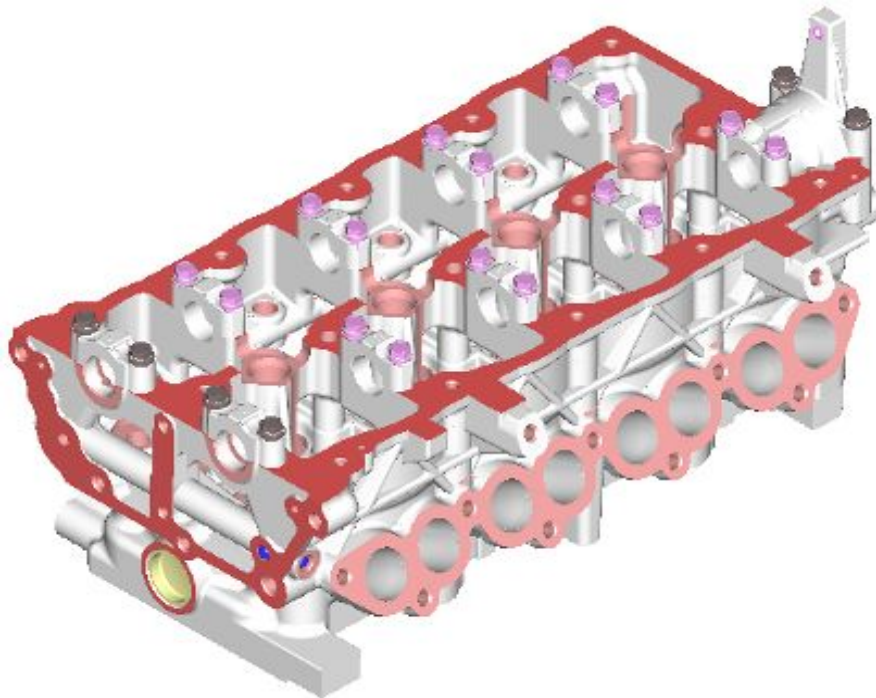
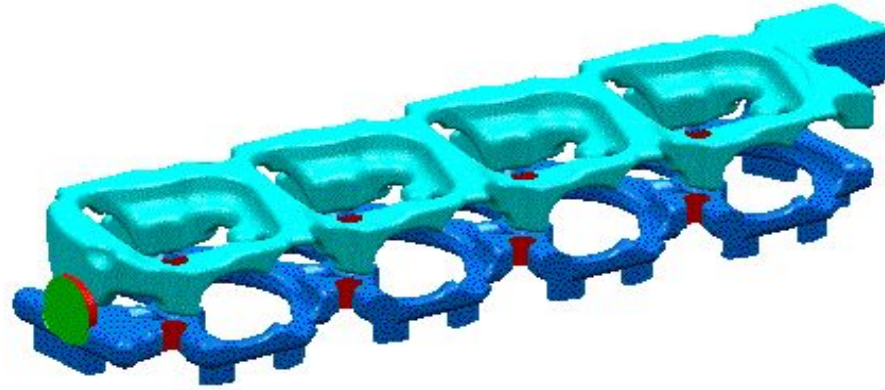




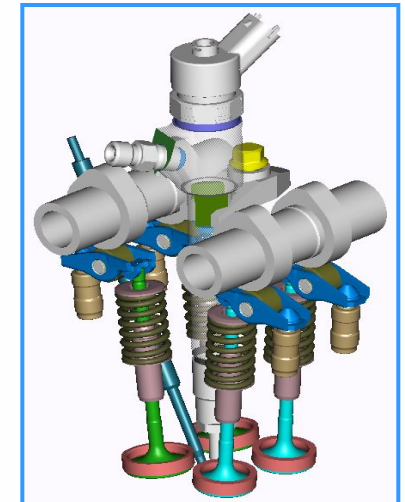
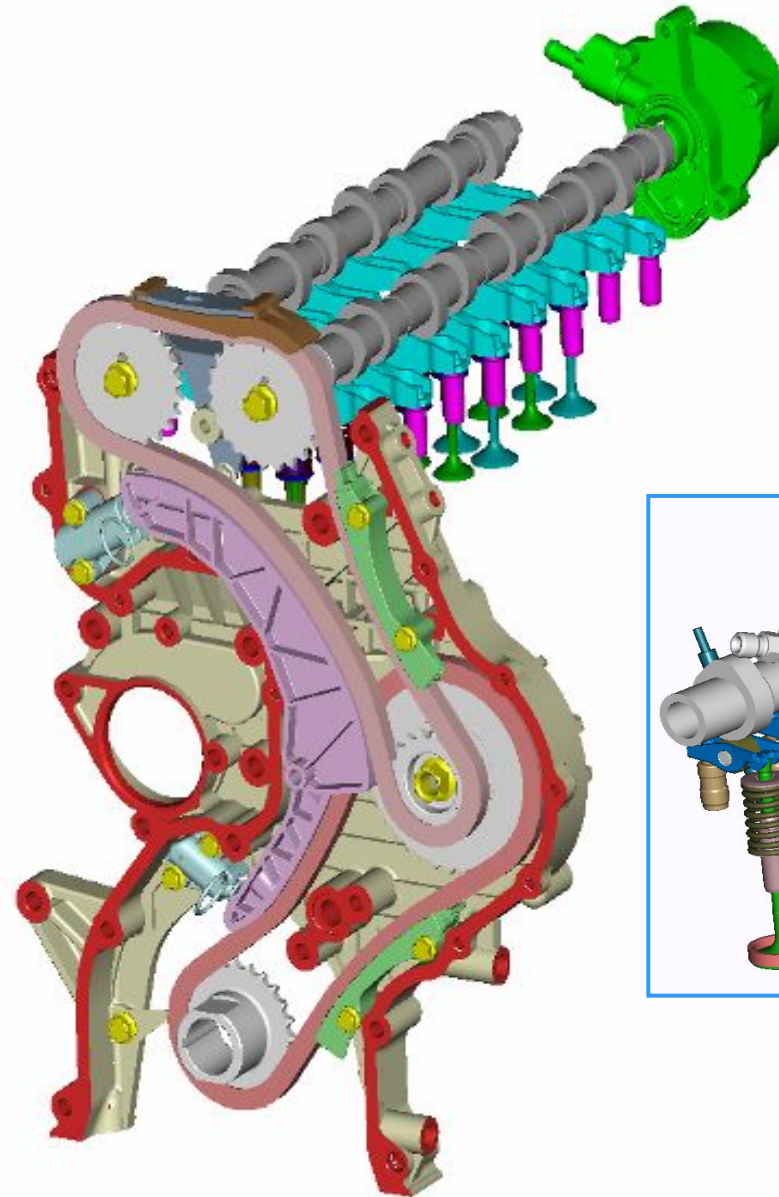
SCV (Swirl Control Valve)



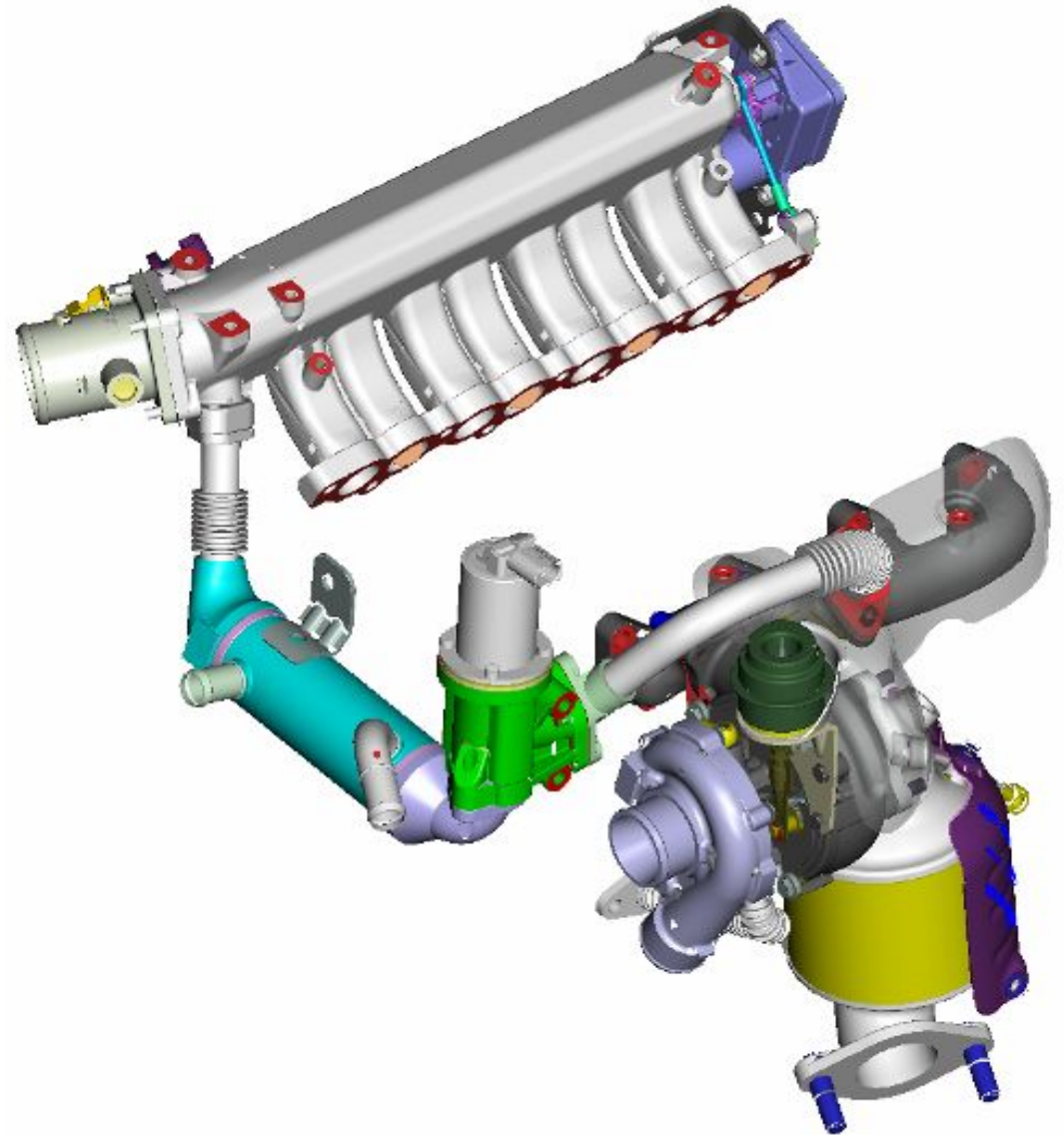
- ▶ AL cylinder head
- ▶ 4valve / cylinder

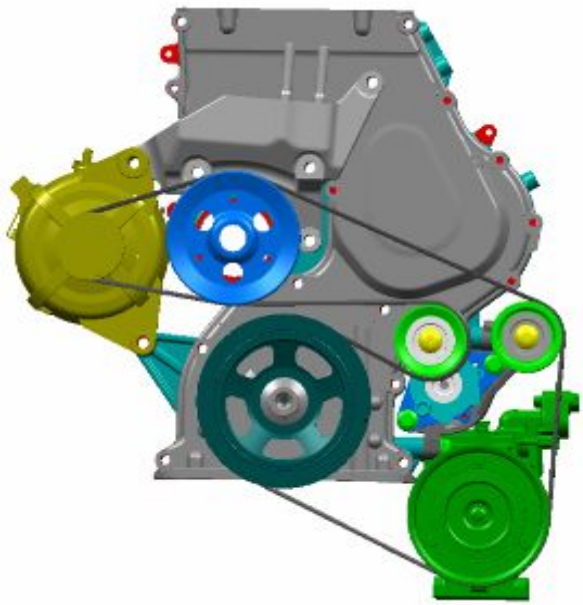
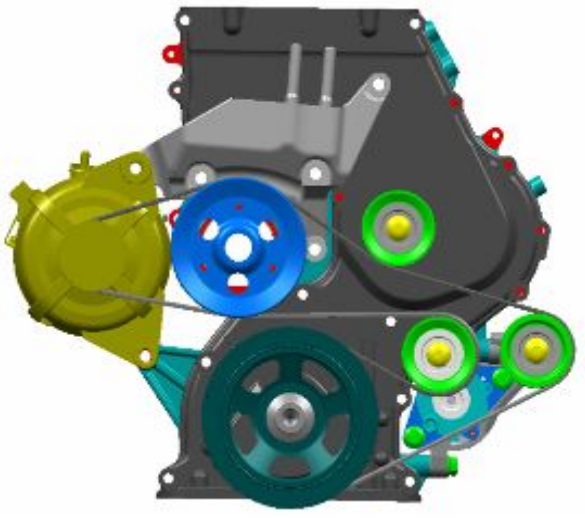


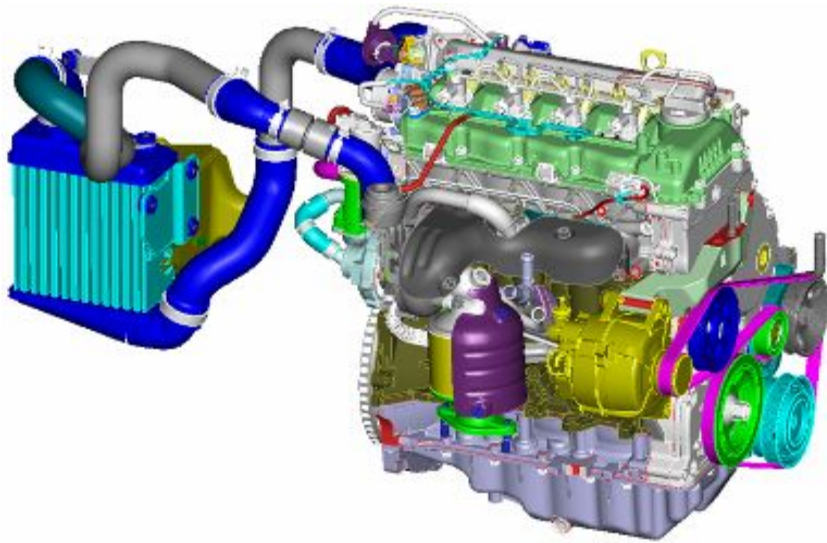
- ▶ DOHC 4 Valve
- ▶ VALVE operating type:
 - END PIVOT ROLLER SWING ARM
- ▶ CAM operating type : 2 Chains
- ▶ Hollow camshaft



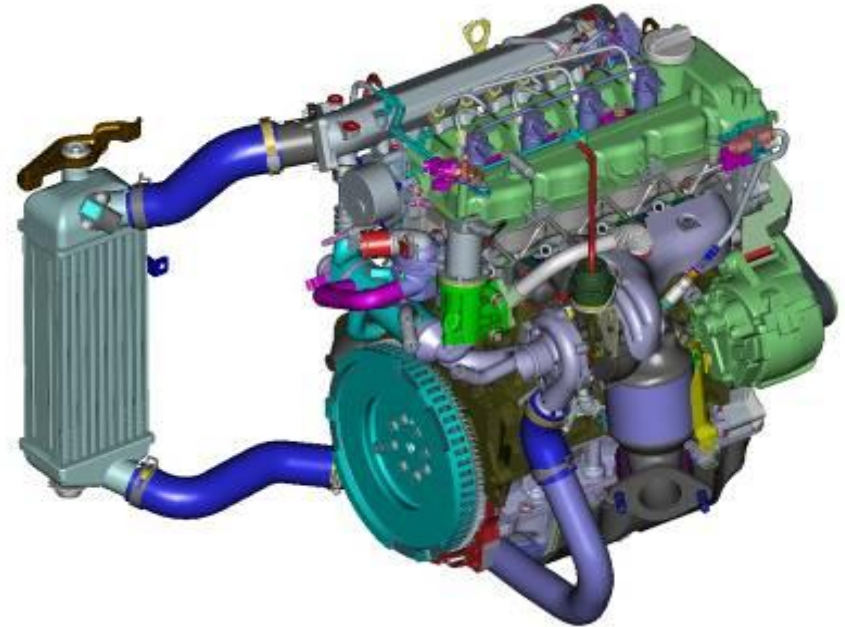
- ▶ VGT
- ▶ SCV (Swirl Control Valve)
- ▶ Electrical EGR VALVE
- ▶ WCC (Warm-up Catalytic Converter)
- ▶ EGR COOLER



	With A/C	Without A/C
Appearance	 A 3D cutaway diagram of an engine's serpentine belt system. The belt is shown in grey, looping around several pulleys. From left to right, the pulleys are: a yellow pulley (water pump), a blue pulley (alternator), a large green pulley (crankshaft), and two smaller green pulleys (idler and tensioner). A green pulley at the bottom right represents the A/C compressor. The engine block is grey.	 A 3D cutaway diagram of an engine's serpentine belt system, similar to the 'With A/C' version but without the A/C compressor. The belt is shown in grey, looping around the yellow, blue, and large green pulleys. The A/C pulley is absent. The engine block is grey.
Remark	P/S pump is not applied because of MDPS	



XD U1.5 VGT EURO-3



HD U1.6 VGT EURO-4



Changed items compared with XD U-1.5 (EURO-3)

	Item	Changed thing	Remark
Increased displacement	Cylinder block	Bore increased ($\Phi 75 \rightarrow \Phi 77.2$)	
	Cylinder head gasket	Changed shape	
	Piston	Diameter increased ($\Phi 75 \rightarrow \Phi 77.2$)	
EURO-4 (Performance, emission)	CRDi	Injection pressure increased (1350bar \rightarrow 1600bar)	U1.5 EURO-4 Common parts
	EGR cooler	Applied ($\Phi 54$)	
	SCV(Swirl Control Valve)	Applied	
	Lambda sensor	Applied	

1.2 CURRENT DATA		01/60
IGNITION SW-IG 2	ON	
BATTERY VOLTAGE	12.26V	
FUEL QUANTITY	0.00 mm ³	
FUEL PRESSURE MEASURED	0 MPa	
FUEL PRESSURE SETPOINT	24 MPa	
RAIL PRESS.REGULATOR	11.95%	
INJ.PUMP REGULATOR	0.00 %	
FUEL TEMPERATURE	34.12°C	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		16/60
FUEL TEMP.SENSOR(V)	3431 mV	
AIR MASS FLOW	0 Kg/h	
AIR MASS PER CYLINDER	0 mg/st	
AIR TEMPERATURE SNSR	20.59°C	
AIR TEMPE.VOLTAGE	3294 mV	
EGR ACTUATOR	5.98 %	
ATMOSPHERIC PRESS.SNSR	1015 hPa	
WATER TEMP. SENSOR	16.67°C	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		24/60
CLUTCH SWITCH	ON	
NEUTRAL OR 1ST GEAR	OFF	
REDUNDANT BRAKE SWITCH	OFF	
BRAKE SWITCH	OFF	
ACCEL PEDAL POS. SNSR	0.00 %	
ACCEL PEDAL VOLT-1	764 mV	
ACCEL PEDAL VOLT-2	372 mV	
STATUS OF SIG APP/BRK	GOOD	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		32/60
A/C ON SIGNAL SWITCH	OFF	
A/C COMPRESSOR RELAY	OFF	
A/C COMPRESSOR CONTROL	OFF	
A/C PRESSURE SENSOR	1019 mV	
BLOWER SWITCH	OFF	
FAN-LOW SPEED	OFF	
FAN-HIGH SPEED	OFF	
GLOW RELAY	OFF	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		40/60
GLOW CONTROL LAMP	OFF	
AUXILIARY HEATER	OFF	
BOOST PRESSURE SENSOR	1001 hPa	
BOOST PRESS.VOLTAGE	1588 mV	
UGT ACTUATOR	60.00%	
V/SWIRL ACTU.(U/D/S)	0 %	
SYNCHRONIZATION STATE	2	
AFTER RUN	2	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		48/60
INLET THROTTLE ACTU.	94.51%	
CHECK ENGINE LAMP	ON	
O2S SUBTRAC.VOLTAGE	0 mV	
LAMDA(O2S)	1.13	
O2S TEMPERATURE	574 °C	
O2S HEATER DUTY	1.96 %	
O2S STATE OF ADAPTION	ON	
VEHICLE SPEED SENSOR	0 Km/h	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		56/60
ACTUAL VEHICLE ACCELE.	0.13	
GEAR POSITION	0	
ENGINE SPEED	0 rpm	
CALCULATED LOAD VALUE	0.00 %	
ACTUAL ENGINE TORQUE	-27 Nm	
DESIRED ENGINE TORQUE	-27 Nm	
CURR.FRICTIONAL TORQUE	9.0 %	
CURRENT INNER TORQUE	0.0 %	

FIX SCRNM FULL PART GRPH HELP

1.2 CURRENT DATA		60/60
ACTUAL ENGINE TORQUE	-27 Nm	
DESIRED ENGINE TORQUE	-27 Nm	
CURR.FRICTIONAL TORQUE	9.0 %	
CURRENT INNER TORQUE	0.0 %	
DESIRED INNER TORQUE	0.0 %	
STATE OF IMMO PRESENCE	ON	
IMMOBILIZER LAMP	OFF	
AT/MT INFORMATION	MT	

FIX SCRNM FULL PART GRPH HELP



Injector correction & ID check

1. HYUNDAI VEHICLE DIAGNOSIS ▼

MODEL : ELANTRA(HD)06-
SYSTEM : ENGINE(DIESEL)

01. DIAGNOSTIC TROUBLE CODES
02. CURRENT DATA
03. FLIGHT RECORD
04. ACTUATION TEST
05. SIMU-SCAN
06. IDENTIFICATION CHECK
07. ENGINE TEST FUNCTION
08. INJECTOR SPECIFIC DATA

1.8. INJECTOR SPECIFIC DATA

INJECTOR 1	EGZRYI4
INJECTOR 2	ASHR55A
INJECTOR 3	6RPMY51
INJECTOR 4	BSIGBWC

- SELECT THE CYLINDER BY SHIFT+ARROW KEY AND INPUT THE DATA BY F1~F6 KEY AND PRESS [ENTER] KEY.

ABCD EFGH IJKL MNOP QR-U VW-Z

1.8. INJECTOR SPECIFIC DATA

INJECTOR 1	
INJECTOR 2	
INJECTOR 3	
INJECTOR 4	

- SELECT THE CYLINDER BY SHIFT+ARROW KEY AND INPUT THE DATA BY F1~F6 KEY AND PRESS [ENTER] KEY.

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1.6 . IDENTIFICATION CHECK

MODEL : ELANTRA(HD)06-
SYSTEM : ENGINE(DIESEL)

CAL NUM:HDADI4U001

ECU H/W:39100-2A700

ROM ID :70HD4A2DIP2S

1.4 ACTUATION TEST 01/15	
A/C COMPRESSOR RELAY	
DURATION	UNTIL STOP KEY
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	[STOP]

1.4 ACTUATION TEST 02/15	
MIL(ENGINE CHECK)	
DURATION	UNTIL STOP KEY
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	[STOP]

1.4 ACTUATION TEST 03/15	
AUXILIARY HEATER RELAY	
DURATION	UNTIL STOP KEY
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	[STOP]

1.4 ACTUATION TEST 04/15	
FAN-HIGH SPEED	
DURATION	UNTIL STOP KEY
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY	
[STRT]	[STOP]

1.4 ACTUATION TEST		05/15
FAN-LOW SPEED		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		06/15
CRUISE CONTROL MAIN LAMP		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		07/15
CRUISE CONTROL SET LAMP		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		08/15
GLOW LAMP		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		09/15
GLOW RELAY		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		10/15
IMMOBILIZER LAMP		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		11/15
EGR VALVE		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		12/15
INJ. PUMP REGULATOR		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		13/15
VALIABLE SWIRL CONTROL ACTUATOR		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		14/15
RAIL PRESS.REGULATOR		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		

1.4 ACTUATION TEST		15/15
LAMBDA SENSOR HEATER		
DURATION	UNTIL STOP KEY	
METHOD	ACTIVATION	
CONDITION	IG.KEY ON ENGINE OFF	
PRESS [STRT], IF YOU ARE READY ? SELECT TEST ITEM USING UP/DOWN KEY		
<input type="button" value="STRT"/> <input type="button" value="STOP"/>		