ISTA system version	4.14.14.17050	Data version	R4.14.14	Programming data	-
VIN	TT07533	Vehicle	MINI/R56/HAT/Cooper/N12/MANUAL/ECE/RL/2007/03		
Int.lev.works	-	Int.lev.(cur.)	-	Int.lev.(tar.)	-
Mileage	-				

Valve gear

The Valvetronic consists of the fully variable valve lift timing control and the variable camshaft timing control (double VANOS), which enable a free choice of closing time for the intake valve. Valve lift timing only takes place on the intake side; camshaft control takes placed on the intake and exhaust side. Throttle-free load control is only possible if the following variables can be controlled:

- Valve lift of the intake valve
- Camshaft adjustment of the intake and exhaust camshafts

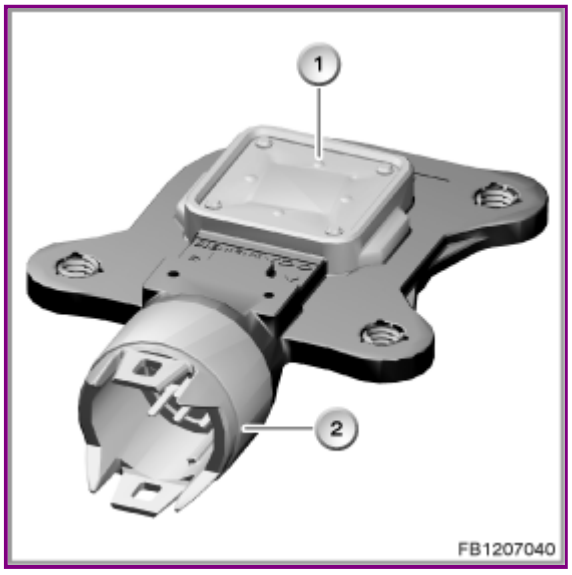
Result: The opening period of the intake valve is freely definable.

Brief component description

The following components are described for the valve gear:

Eccentric shaft sensor

The eccentric shaft sensor works according to the magneto-resistive principle. Specifically, a ferromagnetic conductor changes its resistance due to the influence of a magnetic field. The sensor is designed with redundancy. Both sensor elements are contained in a single housing.



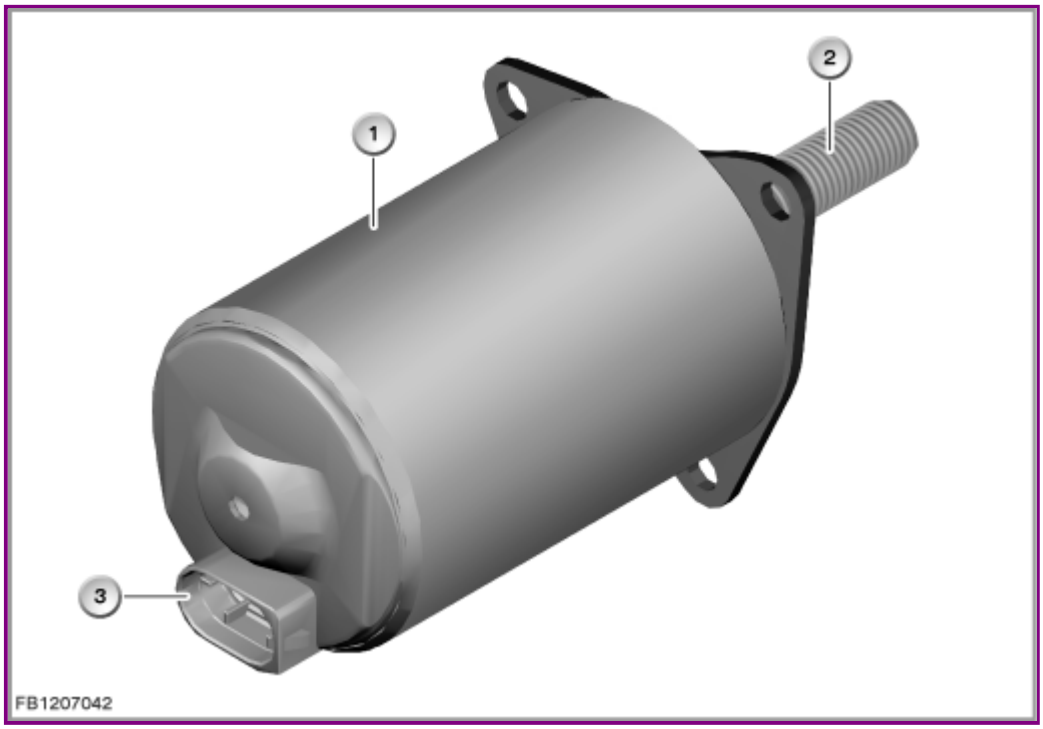
Item	Explanation	Item	Explanation
1	Eccentric shaft sensor	2	9-pin plug connection

One sensor element performs the executive function, while the second monitors. The sensor elements are designed to deliver opposing values. When the eccentric shaft moves from minimum to maximum stroke, the executive sensor delivers rising angle

values while the reference sensor delivers falling angle values. The sensor elements are supplied with a 5 V voltage and ground by the DME. All lines to the sensor are shielded separately.

Valvetronic servomotor

The air mass to the engine during throttle-free operation is adjusted by the variable valve lift and not the throttle valve. Valvetronic is driven by an electric motor. The Valvetronic servomotor is mounted on the cylinder head. The Valvetronic servomotor uses a worm gear to drive the eccentric shaft in the cylinder head oil chamber. The eccentric shaft sensor provides the DME control unit with an indication of the position of the eccentric shaft.



Item	Explanation	Item	Explanation
1	Valvetronic servomotor	2	Drive shaft
3	2-pin plug connection		

The Valvetronic servomotor is a 12 V direct current motor. The servomotor is activated at a frequency of 15.6 kHz. The direction of rotation is reversed by the DME changing the polarity of the activation. The Valvetronic servomotor is connected by 2 cables to the DME. The maximum power consumption can be up to 40 Amperes.
The Valvetronic relay ensures the voltage supply for the Valvetronic servomotor. The Valvetronic relay is fed with vehicle voltage via terminal 87 and is actuated by the ground section of the DME.The Valvetronic relay is located in the relay carrier in the engine compartment.

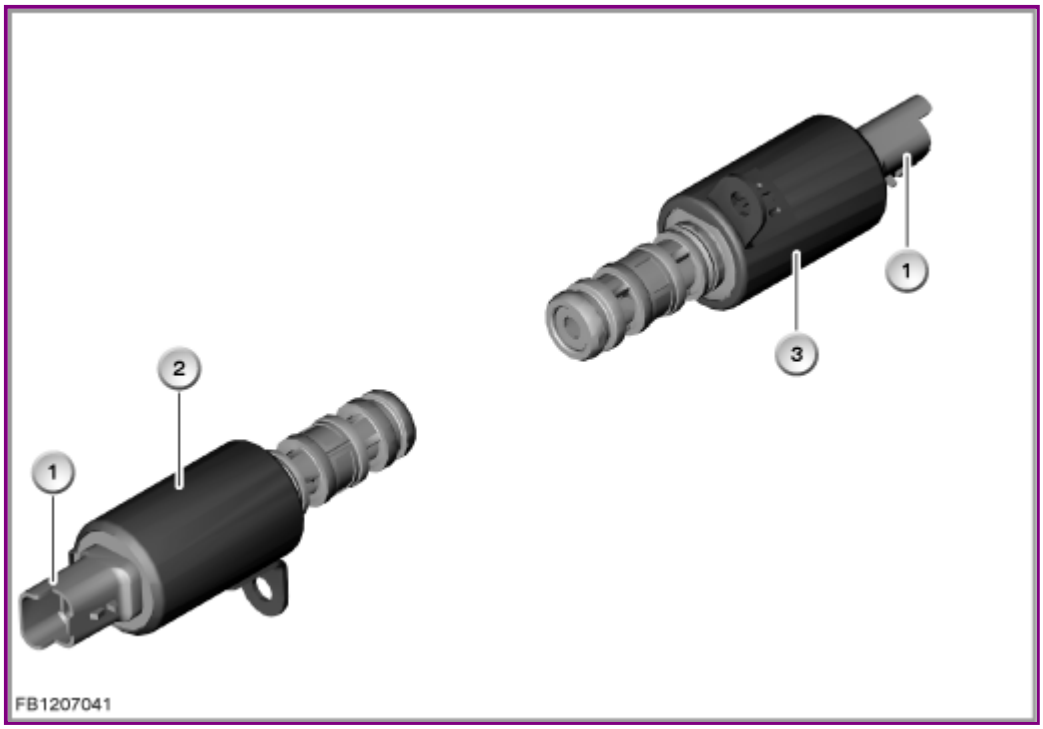
Intake camshaft sensor and exhaust camshaft sensor

The valve gear is equipped with variable camshaft timing control (double VANOS) for the inlet and exhaust camshaft. Both camshaft sensors record camshaft adjustment. To this end, a camshaft sensor wheel is fixed to the camshaft. The camshaft sensor works according to the Hall effect. Voltage is supplied to the sensor by the DME with 5 Volts and ground. The sensor delivers a digital signal via the signal line to the DME.

Item	Explanation	Item	Explanation
1	Intake camshaft sensor	2	3-pin plug connection
3	Exhaust camshaft sensor		

VANOS_Magnetventil inlet and VANOS solenoid valve exhaust

The variable camshaft timing control serves to enhance the torque in the lower and middle engine speed range. The VANOS solenoid valve activates a VANOS unit on the intake side. The VANOS solenoid valves are controlled by the DME control unit.



Item	Explanation	Item	Explanation

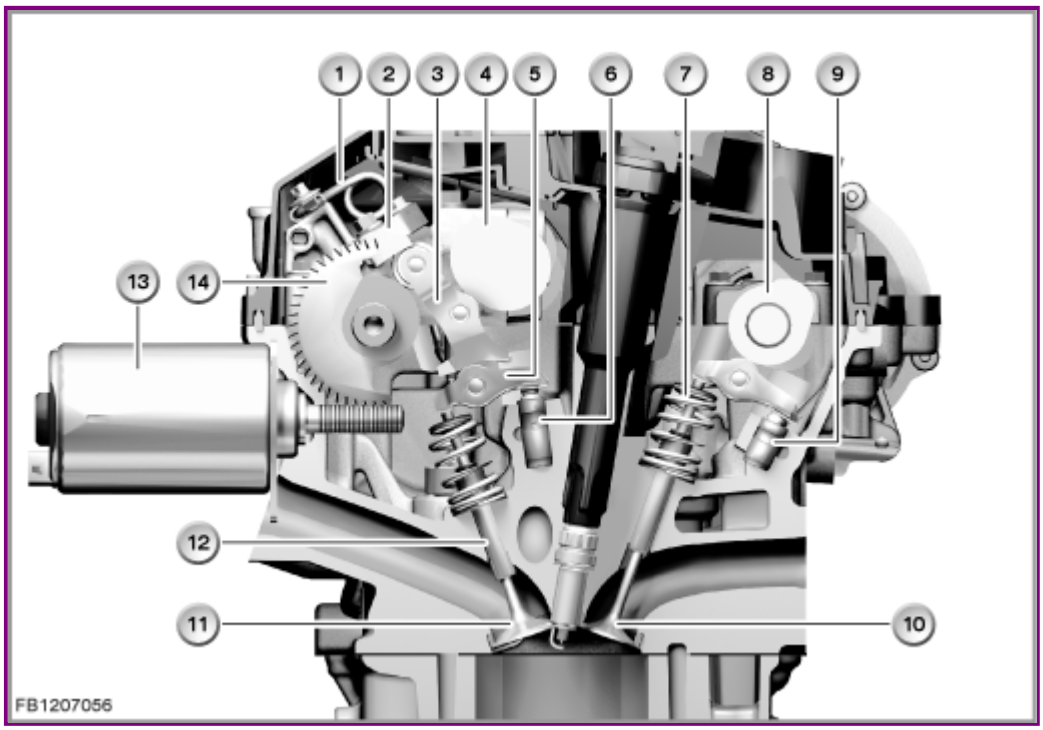
1	2-pin plug connection	2	VANOS solenoid valve, inlet
3	VANOS solenoid valve, exhaust		

System functions

The following system functions are described for the valve gear:

Variable valve gear: Valvetronic

Valvetronic was developed to reduce fuel consumption. The control unit for Valvetronic is now integrated into the DME control unit. The amount of air supplied to the engine when Valvetronic is active is adjusted by the variable valve lift on the intake valve and not the electromotive throttle actuator.An electrically-adjustable eccentric shaft changes the action of the camshaft on the roller cam follower via an intermediate lever. The result of this is variable valve lift.



Item	Explanation	Item	Explanation
1	Torsion spring	2	Support
3	Intermediate lever	4	Intake camshaft
5	Roller cam followers	6	Hydraulic valve clearance compensation, intake
7	Valve spring	8	Exhaust camshaft
9	Hydraulic valve clearance compensation, exhaust	10	Exhaust valve
11	Intake valve	12	Valve guide
13	Valvetronic servomotor	14	Eccentric shaft

With Valvetronic, the electromotive throttle actuator is activated for the following functions:

- Engine start (warm-up)
- Idle speed control
- Full load operation
- Emergency operation

In all other operating conditions, the throttle valve only remains open far enough to induce a slight vacuum. This vacuum is required to ventilate the tank, for example. The DME control unit calculates the associated setting of Valvetronic using the position of the accelerator pedal and other variables. The DME control unit activates the Valvetronic servomotor on the cylinder head. The Valvetronic servomotor uses a worm gear to drive the eccentric shaft in the cylinder head oil chamber.
Both signals from the eccentric shaft sensors are continuously monitored by the DME control unit. Checks are made as to whether the signals are plausible in their own right and also in relation to one another. The signals may not differ. Where a short circuit or fault develops, the signals lie outside the measuring range. The DME control unit continuously checks whether the actual position of the eccentric shaft corresponds with its desired position. This makes it possible to determine when a valve is sticking. In the event of a fault, the valves are opened as wide as possible. The air supply is controlled by the throttle valve. If the actual position of the eccentric shaft cannot be detected, the valves are opened to the maximum extent without regulation (controlled emergency operation). In order to achieve the correct valve opening, an adaptation must be made to balance all tolerances in the valve gear. During this adaptation process, the mechanical limit positions on the eccentric shaft are adjusted.
The positions registered are subsequently saved. These positions are used as the basis for calculating the actual valve lift at any point during operation. The adaptation process is automatic: Each time the engine is restarted, the position of the eccentric shaft is compared with the values registered. If following a repair, for example, a different position of the eccentric shaft is detected, the adaptation process is carried out. In addition, the adaptation can be initiated via the BMW diagnosis system.

Variable camshaft timing control VANOS

The variable camshaft timing control improves the torque in the lower and middle engine speed range. A greater valve overlap results in lower amounts of residual gas at idle speed. A recirculation of internal exhaust-gas in the partial load range reduces the volume of nitrogen oxide.The following is also achieved:

- faster heating of the catalytic converters
- lower pollutant emissions after a cold start
- reduction in the fuel consumption

A controlled VANOS unit is fitted at both intake and exhaust camshafts. A VANOS solenoid valve activates the VANOS unit. The required position of the intake and exhaust camshaft is calculated using the engine speed and load signal (dependent on intake air temperature and engine temperature). The DME control unit activates the VANOS unit accordingly.
The control of the intake and exhaust camshaft is variable within their maximum adjustment range. Once the correct camshaft position has been reached, the VANOS solenoid valves ensure that the oil volume in the positioning cylinders in both chambers remains constant. This keeps the camshafts in this position.
To perform the adjustment, the variable camshaft timing control requires a feedback signal on the current position of the camshaft. Camshaft sensors on the intake and exhaust side record the position of the camshafts. When the engine is started, the intake camshaft is in the end position ("retarded" position). When the engine is started, the exhaust camshaft is pretensioned by a spring and held in the ”advanced” position.