Detecting mechanical faults quickly and reliably

### Identifying faulty injectors

**Ensuring optimum performance**
Injectors play an essential role in modern engines, ensuring performance, economical running and low emissions. Malfunctions can lead to serious engine damage – which is why faulty injectors have to be recognized and replaced as quickly as possible.

**Prerequisite for injector diagnosis:**
- The engine mechanics (e.g. compression) and the ignition system must be in good working order.
- The intake system must be leakproof and must not draw in any unfiltered air.

**Electrical faults**
Electrical faults in injectors mostly lead to cylinder failure.
- **Causes are:**
  - Faulty ignition coil
  - Short circuit or open circuit in the wiring harness
  - Corroded connections or loose contacts

**Mechanical faults**
Mechanical faults are difficult to detect at first glance. They mostly lead to rough running, poor throttle response and, ultimately, cylinder failure. Furthermore, they can result in increased exhaust emissions.
- **Causes are:**
  - Leaky injector
  - Incorrect injection pattern
  - Varying flow rates through injectors

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#### Checking for leaks

**Symptoms:**
- Cold-start problems
- Hot-start problems
- Increased fuel consumption
- Increased exhaust emissions
- Catalytic-converter damage
- Major engine damage due to diluted oil

If the injector isn’t leaking, the HC value drops during the HC measurement and stabilizes between 80 and 220 ppm (see diagram). If the injector is leaking, the HC value falls during measurement until a drop of fuel escapes. After that, it quickly rises again.

Injectors must be tested for leaks while installed, and the test must be performed for all cylinders.

**Test steps:**
1. Step 1: Perform a rough-running analysis with the diagnostic tester or engine tester
2. Step 2: Identify the faulty cylinder
3. Step 3: Check ignition components and compression
4. Step 4: If ignition components and compression are in perfect order, the injector is faulty
5. Step 5: Replace injector with a new one

#### Checking the injection pattern and flow rate

**Symptoms:**
- Misfiring
- Rough running
- Loss of power

The rough-running analysis (see diagram) provides information about the cylinders that are the origin of the problem. The white line indicates the tolerance threshold. In the example shown here, cylinders 2 and 4 are above the tolerance threshold.

#### Don’t compromise: replace, don’t clean

Many injector testers have a cleaning function. This can eliminate some deposits. But for both multipoint and high-pressure injectors, the following applies:
- Cleaning helps to conceal danger.
- Therefore, Bosch urgently advises against cleaning injectors.

**The dangers of cleaning:**
- Failure of the injector due to thermal damage to the solenoid as a result of incorrect triggering currents
- Aggressive additives in the cleaning fluid can attack the injector. This can lead to injector failure
- Warranty claims cannot be accepted for cleaned injectors!