

Digital Diesel Test

The diagnostic devices of the KTS-Series by Bosch allow workshop experts to quickly zero in on defects in diesel engines by performing a series of functional tests. Count on quantity comparisons, compression tests and idle-speed comparisons, for example, to yield precise diagnostic results.



The functional tests of the KTS Diagnosis Testers make it possible for workshop experts to troubleshoot problems in Common Rails with little effort
Photos: Bosch

Common Rail troubleshooting would be inconceivable today without self-diagnoses. Reading and deleting fault stores, or actual-value displays and actuator tests are all familiar functions. They form the preliminaries, as it were, for all service jobs involving diesel engines. At the same time, they point workshop experts in the right direction whenever they're troubleshooting some problem. What's more, though, is that the functional tests offered by the software of the KTS Diagnosis Testers by Bosch enable workshop experts to precisely pinpoint problems without any need for complex measuring and testing work. Simply using the respective functions

of the control unit makes it possible to test engines for their mechanical systems, injectors, overall air tightness and high-pressure pumps, to name just a few.

Combining Functional Tests in a Sensible Way

Of course, not every functional test automatically leads to the source of a problem. After all, the cause and effect of a problem can't always be traced back to a single part in Common Rails either. That's why the workshop expert has to use a number of functional tests and logical combinations to pinpoint the root of the problem.

For example, if a customer complains about uneven idle, sluggish performance or excessive fuel consumption, the workshop expert would begin by applying the functional test "Quantity comparison". The smooth-running control of the EDC systems detects which cylinder runs stronger and which one runs weaker based on the engine speed signal. To ensure the kind of idle that's as stable and vibration-free as possible, the smooth-running control balances out the difference in performance between the cylinders by adjusting the amount of fuel being injected into them. In other words, if one cylinder is underperforming, it receives more

fuel. On the other hand, if a cylinder outperforms the others, its fuel injection amount is reduced. In order not to influence idle speed, however, the balance amount of one cylinder either has to be taken from or added to the other cylinders. The mechanic's way to control this is by adding together the balance amounts of all cylinders. The sum of the balance amounts has to equal zero.

During active smooth-running control, the software function of KTS Tester "Quantity comparison" displays the specific values of the individual cylinders. A cylinder receiving excessive amounts may be due to poor compression or a dirty injector. In the reverse case – a cylinder receiving insufficient amounts – may be due to excessive compression on that particular cylinder or to a leaking injector. Thus, the quantity comparison function offers an initial glimpse of whether all cylinders are running in synch or whether the quantity needs to be balanced for whatever reason.

Additional tests are required if the balance amount exceeds the manufacturer-specified maximum value (standard value: 2.8 mg/H) on one or more cylinders.

Electronic Compression Test

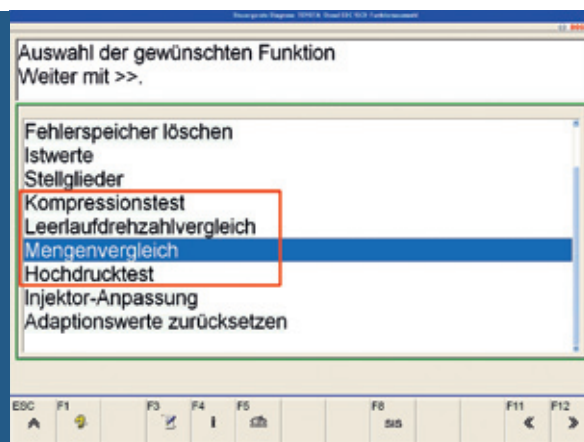
If the quantity comparison shows the fuel amount being overcorrected on one or more cylinders then the next step is to check compression. This allows the workshop expert to determine whether the quantity correction is caused by a mechanical problem in the engine. As a way of avoiding cumbersome mounting work for this step, the software of the KTS diagnostic devices comes with the engine test function "Compression Test". This test is performed at cranking speed. In order to prevent the engine from starting during a compression test, the tester deactivates fuel injection. At the same time, the software captures the specific speed of the individual cylinders and displays it after the test. The user then has to

subtract the lowest cylinder speed from the highest one. If the difference exceeds the permissive value (standard value: 7/min; see repair guidelines), then it's safe to assume there is a mechanical engine problem, which has to be located using standard compression and pressure loss tests.

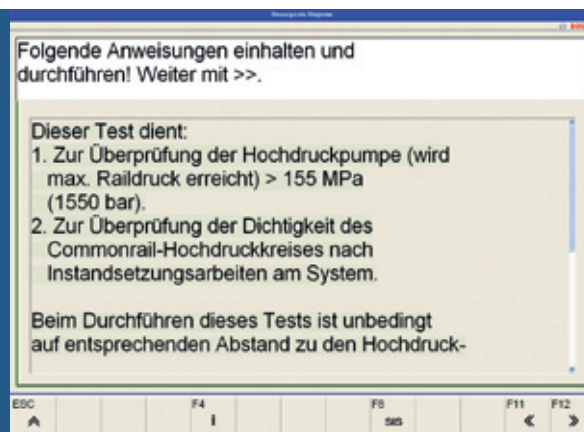
Idle-speed Comparison

If the engine compression is good, the next step is to use the software function "Idle-speed Comparison" to determine which injector is causing excessive or insufficient balance amounts. During the idle-speed comparison, the KTS Diagnosis Tester deactivates the smooth-running control, displaying the specific idle speeds of the individual cylinders on the screen. If the difference in idle speed of one or more cylinders exceeds the permissive value (standard value: 30/min; see repair guidelines), then the injector is either leaking or dirty. In this case, a leak-fuel quantity comparison test should be performed for the purpose of confirming the results of the software test.

Combining the test results of multiple function tests allows the workshop expert to pinpoint the cause of a problem in no time.



The software of the KTS instruments walks workshop experts through all the functional tests with its detailed information.



Software-aided Component Testing

Another helpful test tool for underperforming engines is the software function "High-pressure Test". It allows workshop experts to determine whether a high-pressure pump generates maximum system pressure. In this case, the tester automatically activates multiple speed levels, boosting system pressure to the maximum value in the process. During the actual test, the user can monitor whether the pressure in the Common Rail is being properly increased or decreased. This functional test is also great for air tightness checks following work on the high-pressure circuit. Then there is the metering unit test enabling workshop experts to determine whether a metering unit is functioning properly on a high-pressure pump. This functional test involves the metering unit being slowly opened at idle speed. The system



The software of the KTS testers helps mechanics specifically replace only those components that are truly defective, saving time and costs.

pressure then has to increase at the same rate. A stuck valve is distinctly indicated by a “blip” in the pressure increase.

If one of the cylinders is suspected of being out of sync, then there’s also the “Run-up Test”. Here the software of the KTS tester drives up engine speed while automatically deactivating one cylinder after another in order to subsequently display the differences in speed. The function “Single-plunger deactivation” allows users to obtain similar results in manual mode. This function also comes in very handy when it comes to finding diesel knocks – say, the kind caused by a faulty pilot injection.

To make a long story short, all these functional tests offer workshop experts ample ways of locating defective components amongst complex fault readouts even if the fault store doesn’t show any entries. At the end of the day, however, suspicions will still need to be confirmed by means of conventional component testing.

New Functional Tests

Ventilation Check

Automobile manufacturers are working hard to produce ever-increasing amounts of power from diesel engines. At the same time, they have to cut pollutant emissions in order to comply with the emissions values of today and tomorrow. To make that happen, they’re increasingly relying on systems that influence internal gas flow in engines. Components affected include turbochargers, swirl flap timing, exhaust return, valve timing and exhaust gas treatment systems such as OxiKAT, particle filters, etc. Interferences in the ventilation have the same negative effects on performance and fuel efficiency as those in the common-rail system. To improve the troubleshooting process for workshop experts even more, Bosch enhances the KTS Series diagnosis testers by developing new function tests for systems affecting the ventilation of diesel engines. In ECUs that support these tests, these new functions are steadily being integrated into the Esitronic system.