

B 3 Engine Performance and Exhaust Gas Test

Preliminary work:
Engine Test, Adjustment 07-1100

Operation No. of Text Description and Time
Allowance 07-1203 or 07-1206

Test Steps

- 1 Front wheels block, place chocks approx. 4" in front of front wheels.
- 2 Tire pressure on rear wheels check, adjust to specified pressure.
- 3 Trunk check, remove heat sensitive and heavy objects.
- 4 Engine/drivetrain at partial load in selector lever position "S"
(approx. 34 hp) bring to operating temperature, engine oil temperature approx. 80 °C. Do not exceed 120 °C.
- 5 Vehicles with ASR/ETS/ABS
 - a) Working **without** Hand-Held Tester (HHT):
Ignition: **OFF**, bridge socket 6 and 1 (ground) on data link connector (DTC readout) (X11/4). Use adaptor. ASR/ETS/ABS MIL will light while driving. With multifunction indicator the text "Slipping, ASR, Control" appears on the display. Before disconnecting, the ignition must be: **OFF**.
 - b) Working **with** Hand-Held Tester (HHT):
Ignition: **OFF**, Disconnect connector on ABS/ASR hydraulic unit. ASR/ETS/ABS MIL lights! With multifunction indicator the text "Slipping, ASR, Control" appears on the display. Reconnect connector after test and erase DTC memory.
- 6 Engine with blower cool, direct air stream to radiator and underside of vehicle (oil pan, exhaust system, catalytic converter, tires). Maintain a distance of approx. 3 ft. between blower and vehicle.
- 7 Start of delivery or GI value check (Test and Adjustment Data, section A).

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Test Steps

- | | | |
|----|--------------------------------------|---|
| 8 | Wide open throttle performance | check, drive at WOT only as long as required to read instruments. Compare indicated performance values with Test and Adjustment Data, section A. Observe barometric pressure, engine coolant temperature and intake air temperature for this purpose. |
| 9 | Injection quantity | check, only possible using HHT (Test and Adjustment Data, section A). |
| 10 | Intake manifold pressure | check, only possible using HHT (Test and Adjustment Data, section A). |
| 11 | Engine coolant temperature | check, only possible using HHT (Test and Adjustment Data, section A). |
| 12 | Intake air temperature | check, only possible using HHT (Test and Adjustment Data, section A). |
| 13 | Fuel rack travel | check, only possible using HHT (Test and Adjustment Data, section A). |
| 14 | Opacity | check (Test and Adjustment Data, section A). |

Note:

Check speedometer with signal generator only in case of complaints if maximum speed can not be obtained.

B 3 Dynamometer Precautions/Test Conditions

Limit test duration to the absolute minimum required to read the instruments (approx. 5 seconds for performance test; approx. 20 seconds for emission test).

B 3 Use of Correction Tables**General Information**

The local barometric reading should agree with broadcast weather reports.

The measured performance value must be corrected with correction factors.

There are 2 correction factors:

- Altitude correction factor
- Performance correction factor

Determining performance relative to normal operating conditions:

1. Determine the local barometric pressure, altitude and intake air temperature.
2. Determine performance on the dynamometer.
3. Read the altitude correction factor in the altitude correction table according to the local altitude.
4. Local barometric pressure minus the altitude correction factor equals the barometric pressure (p) in mbar.
5. Determine the performance correction factor (K_H) with the calculated barometric pressure (p) according to the present intake air temperature (t).
6. Calculate the performance relative to normal operating conditions with the performance correction formula:

Performance correction formula

$$Ne_o = Ne \times K_H$$

Ne_o = Performance relative to normal operating conditions in kW

Ne = Measured performance on dynamometer in kW

K_H = Correction for local intake air temperature, barometric pressure and altitude.

B 3 Calculation Example for Correction Table

1. Determine local barometric pressure, altitude and intake air temperature.
For example:
Local barometric pressure = 955 mbar
Local altitude = 400 m
Local intake air temperature = + 20 °C
2. Determine performance output on dynamometer = 100 kW.
3. The local altitude = 400 m, gives an altitude correction factor of 46 mbar in the altitude correction table.
4. The local barometric pressure minus the altitude correction factor equals the barometric pressure value (p):
 $955 \text{ mbar} - 46 \text{ mbar} = 909 \text{ mbar}$.
This barometric pressure value (p) must be rounded off to 910 mbar in order to use the table.
5. The performance correction table gives for a barometric pressure (p) = 910 mbar and an intake air temperature of 20 °C, a correction factor (K_H) of 1.0787
6. The performance output relative to normal operating conditions is:
 $Ne_o = Ne \times K_H$
 $Ne_o = 100 \text{ kW} \times 1.0787 = 108 \text{ kW}$

Note:

The values for this example are marked in the correction tables.

Performance output on dynamometer:	Ne	=	100kW
Local barometric pressure:	p	=	955 mbar
Local intake air temperature:	t	=	+ 20 °C
Local altitude:			400 m above sea level

Conversion factors:	1 in Hg	=	33.8638 mbar
	1 ft	=	0.3048 m
	1 hp	=	0.7457 kW

B 3 Correction Table

Performance correction on dynamometer for diesel engines

mbar correction factor

1040	0.911	0.9194	0.9277	0.9358	0.9439	0.9519	0.9599	0.9678	0.9756	0.9833	0.9910
1035	0.9155	0.9239	0.9321	0.9403	0.9485	0.9565	0.9645	0.9724	0.9803	0.9881	0.9958
1030	0.9200	0.9284	0.9367	0.9449	0.9531	0.9612	0.9692	0.9772	0.9851	0.9929	1.0007
1025	0.9245	0.9329	0.9412	0.9495	0.9577	0.9659	0.9739	0.9819	0.9899	0.9977	1.0056
1020	0.9290	0.9375	0.9458	0.9542	0.9624	0.9706	0.9787	0.9867	0.9947	1.0026	1.0105
1015	0.9336	0.9421	0.9505	0.9589	0.9672	0.9754	0.9835	0.9916	0.9996	1.0076	1.0155
1010	0.9382	0.9467	0.9552	0.9636	0.9719	0.9802	0.9884	0.9965	1.0046	1.0126	1.0205
1005	0.9428	0.9514	0.9600	0.9684	0.9768	0.9851	0.9933	1.0015	1.0096	1.0176	1.0256
1000	0.9476	0.9562	0.9648	0.9732	0.9817	0.9900	0.9983	1.0065	1.0146	1.0227	1.0307
995	0.9523	0.9610	0.9696	0.9781	0.9866	0.9950	1.0033	1.0115	1.0197	1.0278	1.0359
990	0.9571	0.9659	0.9745	0.9831	0.9916	1.0000	1.0084	1.0166	1.0249	1.0330	1.0411
985	0.9620	0.9708	0.9795	0.9881	0.9966	1.0051	1.0135	1.0218	1.0301	1.0383	1.0464
980	0.9669	0.9757	0.9845	0.9931	1.0017	1.0102	1.0186	1.0270	1.0353	1.0436	1.0517
975	0.9719	0.9807	0.9895	0.9982	1.0068	1.0154	1.0239	1.0323	1.0406	1.0486	1.0571
970	0.9769	0.9858	0.9946	1.0033	1.0120	1.0206	1.0291	1.0376	1.0460	1.0543	1.0626
965	0.9819	0.9909	0.9998	1.0085	1.0173	1.0259	1.0345	1.0430	1.0514	1.0598	1.0681
960	0.9870	0.9960	1.0050	1.0138	1.0226	1.0313	1.0399	1.0484	1.0569	1.0653	1.0736
955	0.9922	1.0013	1.0102	1.0191	1.0279	1.0366	1.0453	1.0539	1.0624	1.0709	1.0793
950	0.9974	1.0065	1.0155	1.0245	1.0333	1.0421	1.0508	1.0594	1.0679	1.0765	1.0849
945	1.0027	1.0119	1.0209	1.0299	1.0388	1.0476	1.0564	1.0651	1.0737	1.0822	1.0907
940	1.0080	1.0172	1.0263	1.0354	1.0443	1.0532	1.0620	1.0707	1.0794	1.0880	1.0965
	0	5	10	15	20	25	30	35	40	45	50

Intake air temperature t °C

B 3 Correction Table

mbar correction factor

935	1.0134	1.0227	1.0318	1.0409	1.0499	1.0588	1.0677	1.0764	1.0851	1.0938	1.1023
930	1.0189	1.0282	1.0374	1.0465	1.0555	1.0645	1.0734	1.0822	1.0910	1.0997	1.1083
925	1.0244	1.0337	1.0430	1.0522	1.0613	1.0703	1.0792	1.0881	1.0969	1.1056	1.1143
920	1.0300	1.0393	1.0487	1.0579	1.0670	1.0761	1.0851	1.0940	1.1028	1.1116	1.1203
915	1.0356	1.0450	1.0544	1.0637	1.0729	1.0820	1.0910	1.1000	1.1089	1.1177	1.1264
[910]	1.0413	1.0508	1.0602	1.0695	[1.0787]	1.0879	1.0970	1.1060	1.1150	1.1238	1.1326
905	1.0470	1.0566	1.0660	1.0754	1.0847	1.0939	1.1031	1.1121	1.1211	1.1300	1.1389
900	1.0528	1.0624	1.0720	1.0814	1.0907	1.1000	1.1092	1.1183	1.1273	1.1363	1.1452
895	1.0587	1.0684	1.0779	1.0874	1.0968	1.1061	1.1154	1.1246	1.1336	1.1427	1.1516
890	1.0647	1.0744	1.0840	1.0935	1.1030	1.1124	1.1217	1.1309	1.1400	1.1491	1.1581
885	1.0707	1.0805	1.0901	1.0997	1.1092	1.1186	1.1280	1.1373	1.1465	1.1556	1.1646
880	1.0768	1.0855	1.0963	1.1060	1.1156	1.1250	1.1344	1.1437	1.1530	1.1621	1.1712
875	1.0829	1.0928	1.1026	1.1123	1.1219	1.1314	1.1409	1.1503	1.1596	1.1688	1.1779
870	1.0892	1.0991	1.1089	1.1187	1.1283	1.1379	1.1474	1.1569	1.1662	1.1755	1.1847
865	1.0954	1.1054	1.1153	1.1251	1.1349	1.1445	1.1541	1.1636	1.1730	1.1823	1.1915
860	1.1018	1.1119	1.1218	1.1317	1.1415	1.1512	1.1608	1.1703	1.1798	1.1892	1.1985
855	1.1083	1.1184	1.1284	1.1383	1.1481	1.1579	1.1676	1.1772	1.1867	1.1961	1.2055
850	1.1148	1.1249	1.1350	1.1450	1.1549	1.1647	1.1744	1.1841	1.1937	1.2032	1.2126
845	1.1214	1.1316	1.1417	1.1518	1.1617	1.1716	1.1814	1.1811	1.2007	1.2103	1.2198
840	1.1281	1.1383	1.1485	1.1586	1.1686	1.1786	1.1884	1.1982	1.2079	1.2175	1.2270
	0	5	10	15	[20]	25	30	35	40	45	50

Intake air temperature t °C

[] Calculation example, page 31/4

B 3 Correction Table

Performance correction on dynamometer for diesel engines

mbar correction factor

835	1.1348	1.1452	1.1554	1.1656	1.1756	1.1856	1.1955	1.2054	1.2151	1.2248	1.2344
830	1.1416	1.1521	1.1624	1.1726	1.1827	1.1928	1.2027	1.2126	1.2224	1.2321	1.2418
825	1.1486	1.1590	1.1694	1.1797	1.1899	1.2000	1.2100	1.2200	1.2298	1.2396	1.2493
820	1.1556	1.1661	1.1765	1.1869	1.1971	1.2073	1.2174	1.2274	1.2373	1.2472	1.2569
815	1.1627	1.1733	1.1838	1.1942	1.2045	1.2147	1.2249	1.2349	1.2449	1.2548	1.2647
810	1.1698	1.1805	1.1911	1.2015	1.2119	1.2222	1.2324	1.2426	1.2526	1.2626	1.2725
805	1.1771	1.1878	1.1985	1.2090	1.2195	1.2298	1.2401	1.2503	1.2604	1.2704	1.2804
800	1.1845	1.1953	1.2060	1.2166	1.2271	1.2375	1.2478	1.2581	1.2683	1.2784	1.2884
795	1.1920	1.2028	1.2135	1.2242	1.2348	1.2453	1.2557	1.2660	1.2762	1.2864	1.2956
790	1.1994	1.2104	1.2212	1.2320	1.2426	1.2532	1.2636	1.2740	1.2843	1.2945	1.3047
785	1.2071	1.2181	1.2290	1.2398	1.2505	1.2611	1.2717	1.2821	1.2925	1.3028	1.3130
780	1.2148	1.2259	1.2369	1.2478	1.2585	1.2692	1.2798	1.2904	1.3008	1.3111	1.3214
	0	5	10	15	20	25	30	35	40	45	50

Intake air temperature t °C

Altitude Correction

m	mbar	m	mbar	m	mbar	m	mbar	m	mbar
0	0	300	36	600	69	900	104	2000	221
50	6	350	41	650	75	950	109	2100	230
100	12	[400]	[46]	700	81	1000	115	2200	239
150	18	450	52	750	86	1100	126	2300	250
200	24	500	58	800	92	1200	137	2400	259
250	30	550	63	850	98	1300	148	2500	268

[] Calculation example, page 31/4