

Regulation 90 Approval

TMD Friction

Sherburn Proving Ground UK



Introduction

The *Regulation 90* or *ECE homologation* approval system has been in place since 2001. The regulation is under the direction of UNECE (United Nations Economic Commission for Europe – hence ECE). UNECE is primarily concerned with trade and economic issues and the purpose of *Regulation 90* is to ensure fair trade as well as road traffic safety.

Purpose of the Test

The main purpose of the test is to compare the aftermarket pad to the original equipment pad to ensure that they are of similar performance.

AM pad performance must be within $\pm 15\%$ of the OEM pad.

Physical properties of the AM pad must meet set criteria.

Which replacement pads are concerned?

In the UK for all vehicles, for which an ECE type approval has been granted and manufactured after 1 October 1999.

Since 1 April 2001 all concerned replacement pads have to be tested and approved to regulation ECE-R90.

Not all EU countries apply the regulations in the same way. In Germany all AM pads must be approved to *Regulation 90* or the similar *ABE* approval.

If R90 approval is not obtained, the pads cannot legally be sold.

In the UK complaints of non-compliance to *Regulation 90* are handled by local authority trading standards officers.

Vehicle Selection

The choice of a suitable test vehicle can sometimes be quite difficult as the same brake lining assembly may be used on several models from several manufacturers. A pad may be used with a solid disc on a light vehicle (e.g. VW Polo) and with a vented disc on a heavier vehicle (e.g. Audi A6). In most cases it is necessary to test the vehicle with the highest mass and highest speed.

Sometimes it is necessary to conduct more than one test with a pad as different manufacturers use the same pad design but use different OE materials. In some cases a manufacturer may use different OE materials within their own vehicle range.

There may be a possibility of obtaining approval by a "read across" from another reference previously tested on a similar vehicle to one in the required application range. The OE materials must be the same, the aftermarket material must be the same.

These suggestions can be made to the test agency (TÜV or VCA) and they will make the final decision on whether to approve the "read across".

In some cases because of the large application range it may be necessary to use more than one previous test to obtain full approval.

Test Requirements

Vehicle Measurements

When the test vehicle has been obtained, various details must be recorded:

- Chassis number and vehicle identification (incl. "e" number).

- Maximum laden weight and axle split (from chassis plate).

- Make, model, engine size and power.

- Piston diameter front and rear.

- Disc or drum diameter and thickness front and rear.

- Rear pressure reduction method (pressure valve, load valve, EBD, etc.).

- OE quality front and rear (make and type).

- Wheel and tyre size.

- Is ABS fitted ?

Instrumentation

The vehicle must be fitted with instruments capable of the following:

- Measuring stopping distance – (e.g. Datron Sensor)

- Calculating MFDD (mean fully developed deceleration) – (e.g. Datron Sensor)

- Measuring pedal effort and line pressure

- Means of isolating axles

- At least one temperature sensor for at least one disc/drum from each axle

- Where required a means of measuring handbrake force

Once the instrumentation is complete a pedal effort versus line pressure curve is done up to and including 500N in 100N stages, with and without booster power (either brake vacuum servo or electric pump system). The vehicle is then loaded to the specified test weight.



Top: Datron control Interface
Bottom: Pressure and temperature displays

Above: Datron Sensor

Test procedure

Fit and bed OE in accordance with the pad manufacturer's specification.

OE 6 point curve 70-0 km/h fronts only or 45-0km/h ears only (depending on the axle to be tested)

The data are then plotted on a pressure (x axis) versus deceleration (y axis) graph. A best fit straight line is drawn through the points and limits of $\pm 15\%$ are determined (see diagram below).

Fit and bed aftermarket in accordance with the pad manufacturer's specification.

AM 6 point curve 70-0 km/h fronts only or 45-0km/h rears only (depending on the axle tested). The data are then plotted on the same graph as the OE and the upper two thirds of the line must lie within the $\pm 15\%$ limits.

Speed sensitivity fronts only or rears only (depending on axle the axle tested).

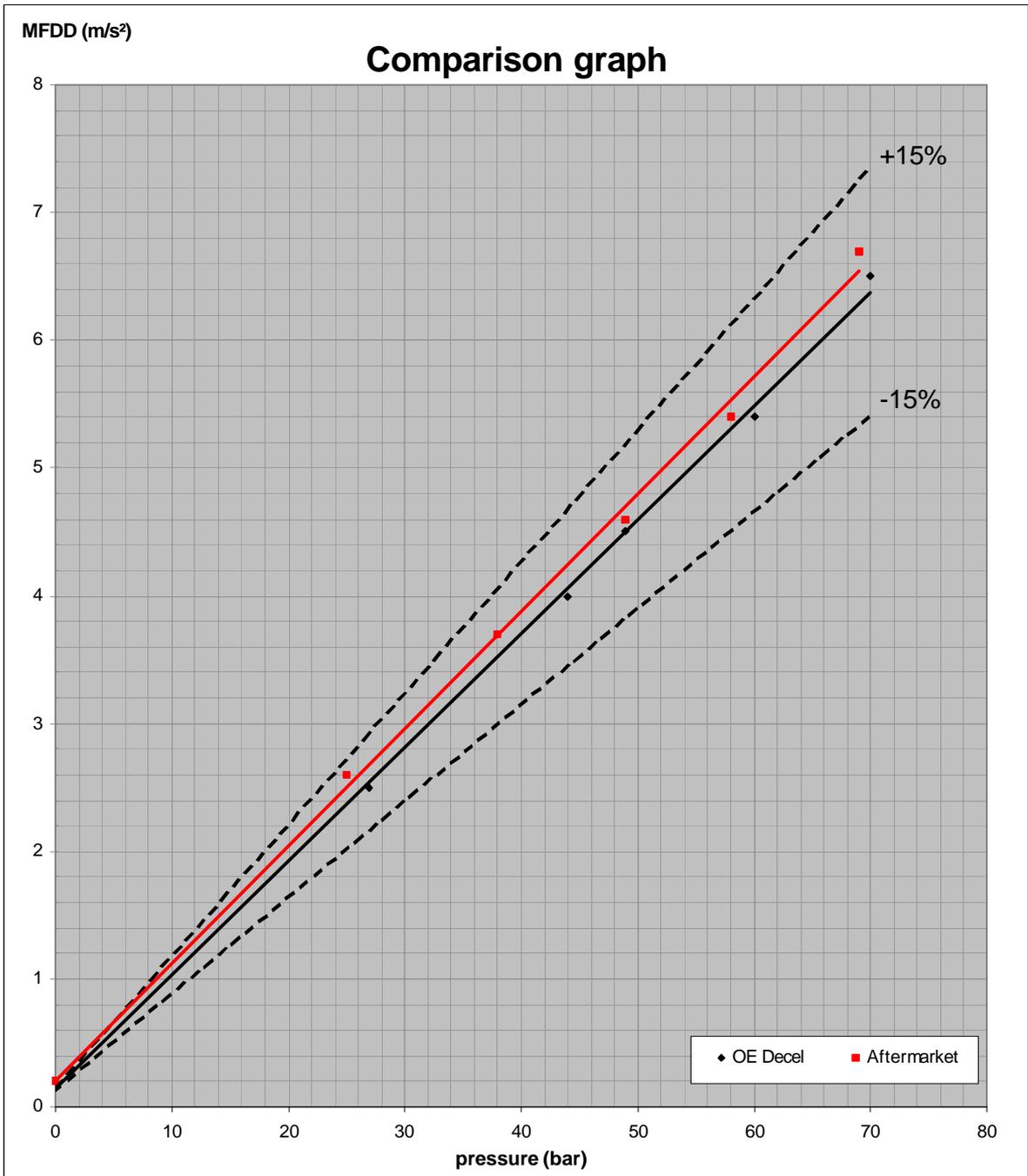
80-0km/h All Brakes 4 point Curve

If the front or rear lining acts as a parking brake a dynamic stop and also a hill hold test must be performed

80% Vmax, maximum deceleration stop (laden)

Heating Cycle followed by "hot stop"

80% Vmax, maximum deceleration stop (unladen)



Physical test requirements

1. Shear

A minimum Shear strength of 250N/cm² must be achieved, tested in accordance with ISO6312 (1981). This is completed for every reference and each material requiring approval.

2. Compressibility

A compressibility limit of 2% at ambient temperature and 5% at 400°C for disc pads must be achieved, tested in accordance with ISO6310 (1981). This is completed for every reference and each material requiring approval.

3. Friction (*Krauss*) testing

A test conducted on a constant speed dynamometer, it is used to determine the friction value for the pad assembly. The friction level is declared when the assembly is approved and the subsequent COP (conformity of production) tests on the material have to fall within set tolerance of this value.

Application Procedure for TMD UK

The procedure TMD UK uses when applying for a *Regulation 90* approval can vary depending on the technical service (e.g. TÜV, VCA) and the company making the application. There are, however, some basic requirements that must be met:

After the test has been completed an application letter containing the part number and material of the assembly reference will be sent to the relevant technical service that is to prepare the technical report.

The vehicle range required in the approval is extracted from the TMD database and is sent with the application letter. The approved range is eventually agreed between the technical service and TMD.

A drawing of each component pad which must include the functional dimensions this must contain marking instructions for the pad assembly.

A definition of the pad set, wear indicators, screech clips, slots, etc.

Friction (*Krauss*) test results for the material type.

Completed compressibility test results for the pad assembly.

Completed shear test results for the pad assembly.

After the technical service has received all these criteria they will complete a test report and then forward all the information to the legal authority (e.g. KBA, VCA, RDW) who will in-turn complete an approval document containing all the test work, vehicle specifications, physicals, drawings, ink drawing, vehicle ranges covered, and the all important approval number and part reference number.

If in the future a change to the vehicle range is required a new test must be performed or a read across may be possible to include the additional vehicles. Then an extension to the existing approval can be applied for to cover the new vehicle range.

The Technical Service will then issue a new test report with an updated list of approved vehicles. The issuing authority issues an extension to the existing approval document. The same R90 number is retained and subsequent extensions can be issued as required.

Packaging

Packaging and marking requirements:

Pad assembly packed in axle sets and the packaging must be sealed.

The pack shall be marked with the following information:

- i. quantity of assemblies in the pack
- ii. manufacturer's name or trademark
- iii. make and type of assembly
- iv. the vehicles/axles/brakes for which the contents are approved
- v. the approval mark
- vi. representative drawing of the lining profile

Each package shall have fitting instructions in an official ECE language and the language of each country in which the package will be sold.

The parts to be marked with approval mark, date of manufacture and make and type of lining material.

Examples of a Pagid box and label:

