

Council Directive 93/14/EEC of 5 April 1993 on the
braking of two or three-wheel motor vehicles (repealed)

Status: *This is the original version (as it was originally adopted).*

ANNEX

Appendix 1

Braking tests and performance of braking devices

1. BRAKING TESTS

1.1. General

1.1.1. The performance prescribed for braking devices is based on the stopping distance. The performance of a braking device is determined either by measuring the stopping distance in relation to the initial speed or by the response time of the device and the mean fully-developed deceleration.

1.1.2. The stopping distance is the distance covered by the vehicle from the moment when the driver begins to actuate the control of the device until the moment when the vehicle stops. The initial speed is the speed at the moment when the driver begins to actuate the control of the device. In the formula given below, for measurement of braking performance:

V = initial speed in kilometres per hour, and
S = stopping distance, in metres.

1.1.3. For component type-approval, the braking performance must be measured during road tests conducted under the following conditions:

1.1.3.1. the vehicle's condition as regards its mass must be as prescribed for each type of test and must be specified in the test report;

1.1.3.2. the test must be carried out at the speed and in the manner prescribed for each type of test: if the maximum speed of the vehicle does not conform to the speed prescribed, the test must be carried out under the special alternative conditions provided;

1.1.3.3. the prescribed performance must be obtained without locking of the wheel(s), without deviation of the vehicle from its course, and without any abnormal vibration;

1.1.3.4. during the tests the force applied to the brake control in order to obtain the prescribed performance must not exceed the maximum laid down for the test vehicle's category.

1.1.4. Test conditions

1.1.4.1. The service braking tests must be carried out under the following conditions:

1.1.4.1.1. at the start of the test or any series of tests the tyres must be cold and at the pressure prescribed for the load actually borne by the wheels when the vehicle is stationary;

1.1.4.1.2. the vehicle must be loaded, when required to be tested in the laden condition, with the load distributed in accordance with the manufacturer's prescription;

1.1.4.1.3. for all the type-0 tests the brakes must be cold: a brake is deemed to be cold when the temperature measured on the disc or on the outside of the drum is less than 100 °C;

1.1.4.1.4. the driver must shall be seated on the saddle as for normal driving and must maintain the same position throughout the test;

1.1.4.1.5. the test area must be level, dry and have a surface affording good adhesion;

1.1.4.1.6. the test must be performed when there is no wind liable to affect the test result.

1.2. Type-0 test (performance test with brakes cold)

1.2.1. General

1.2.1.1. The limits prescribed for service braking performance are as laid down for each category of vehicle.

1.2.2. Type-0 test with engine disconnected

1.2.2.1. The test must be carried out at the speed prescribed for the category to which the vehicle belongs, the figures prescribed in this connection being subject to a certain margin of tolerance.

In the case of vehicles where the two service brakes can be applied separately, the braking devices must be tested separately. The minimum performance for each braking device for each category of vehicle must be attained.

1.2.2.1.1. In the case of a vehicle with a manual gearbox or an automatic transmission where the gearbox can be disengaged manually, the tests must be carried out with the gearbox inoperative and/or the engine disconnected by clutch disengagement or otherwise.

1.2.2.1.2. In the case of a vehicle with other types of automatic transmission, the tests must be carried out under the normal operating conditions.

1.2.3. Type-0 test with engine connected for motorcycles (with or without sidecar) and tricycles

1.2.3.1. Tests must be carried out in the unladen condition at various speeds, the lowest being equal to 30 % of the maximum speed of the vehicle and the highest being equal to 80 % of that speed or 160 km/h, whichever is the lower.

The maximum practical performance figures are measured and together with the behaviour of the vehicle must be recorded in the test report. In the case where two service braking devices can be applied separately, both devices must be tested together and simultaneously, with the vehicle unladen.

1.2.4. Type-0 test with engine disconnected: with wet brakes

1.2.4.1. This test must (subject to the exemption contained in 1.3.1) be carried out on mopeds and motorcycles (but not tricycles). The test procedure is identical to that for the type-0 test with engine disconnected, except for the provisions for wetting the brakes described in 1.3.

1.3. Special provisions relating to testing with wet brakes

1.3.1. Enclosed brakes: it is not necessary to carry out this series of type-0 tests on vehicles equipped with conventional drum brakes or with fully enclosed brakes which are not subject to water penetration under normal running conditions.

1.3.2. The test with brakes subject to wetting must be carried out under the same conditions as the test with dry brakes. There must be no adjustment or alteration of the braking device other than fitting the equipment to allow brake wetting.

1.3.3. The test equipment must continuously wet the brakes for each test run at a flow rate of 15 l/h for each brake. Two disc brakes on one wheel will be considered as two brakes.

- 1.3.4. For exposed or partly exposed disc brakes, the prescribed amount of water must be directed on to the rotating disc in such a manner that it is equally distributed on the surface or surfaces of the disc swept by the friction pad or pads.
- 1.3.4.1. For fully exposed disc brakes, the water must be directed on to the surface(s) of the disc 45° in advance of the friction pad(s).
- 1.3.4.2. For partly exposed disc brakes, the water must be directed on to the surface(s) of the disc 45° in advance of the shield or baffle.
- 1.3.4.3. The water must be directed on to the surface(s) of the disc(s) in a continuous jet, in a direction perpendicular to the surface of the disc, from single jet nozzles so positioned as to be between the inner extremity and a point two-thirds of the distance from the outer extremity of that part of the disc swept by the friction pad(s) (see Figure 1).
- 1.3.5. For fully enclosed disc brakes, where the provisions of 1.3.1 do not apply, the water must be directed on to both sides of the shield or baffle at a point and in a manner corresponding with that described in 1.3.4.1 and 1.3.4.3. Where the nozzle would be coincident with a ventilation or inspection port, the water must be applied one quarter of a revolution in advance of the said port.
- 1.3.6. Where in 1.3.3 and 1.3.4, it is not possible to apply the water in the position specified owing to the presence of some fixed part of the vehicle, the water must be applied at the first point, exceeding 45° where uninterrupted application is possible.
- 1.3.7. For drum brakes, where the requirements of 1.3.1 do not apply, the prescribed amount of water must be distributed equally on either side of the braking device (that is, on the stationary back plate and the rotating drum) from nozzles so positioned as to be two-thirds of the distance from the outer circumference of the rotating drum to the wheel hub.
- 1.3.8. Subject to the requirements of 1.3.7 and to the requirement that no nozzle shall be within 15° of or coincident with a ventilation or inspection port on the stationary back plate, the test equipment for drum brakes shall be so positioned as to obtain the optimum uninterrupted application of water.
- 1.3.9. To ensure the correct wetting of the brake(s), the vehicle must be driven, immediately before the commencement of the test series:
- with the wetting equipment functioning continuously, as prescribed in this Appendix,
 - at the prescribed test speed,
 - without the operation of the braking device(s) to be tested,
 - for a distance of no less than 500 m prior to the point at which the test is to be carried out.
- 1.3.10. For rim brakes, as fitted to some mopeds with a maximum speed of 25 km/h or lower, the water must be directed on to the wheel rim as shown in Figure 2.

Figure 1

Method of water application for disc brakes

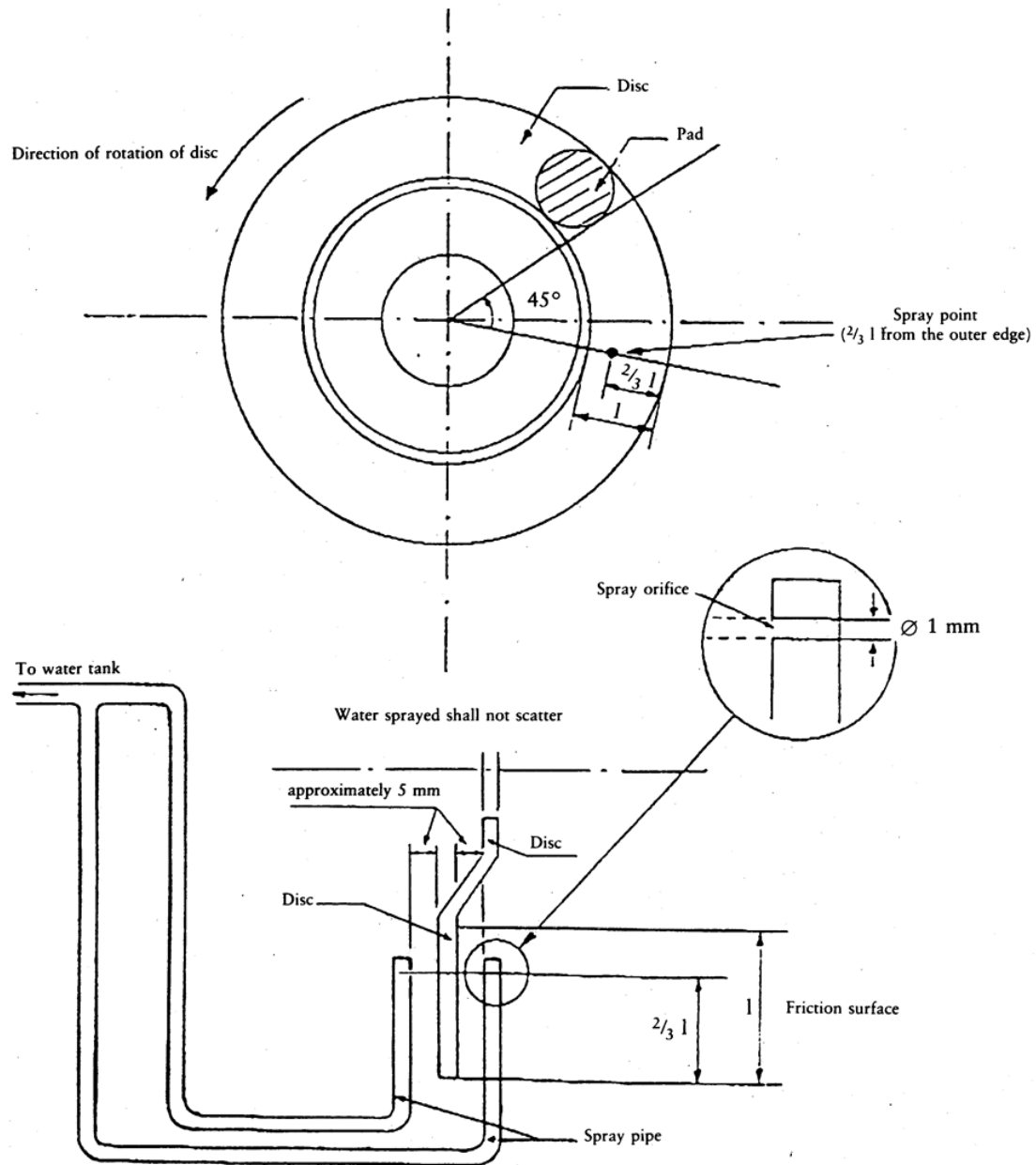
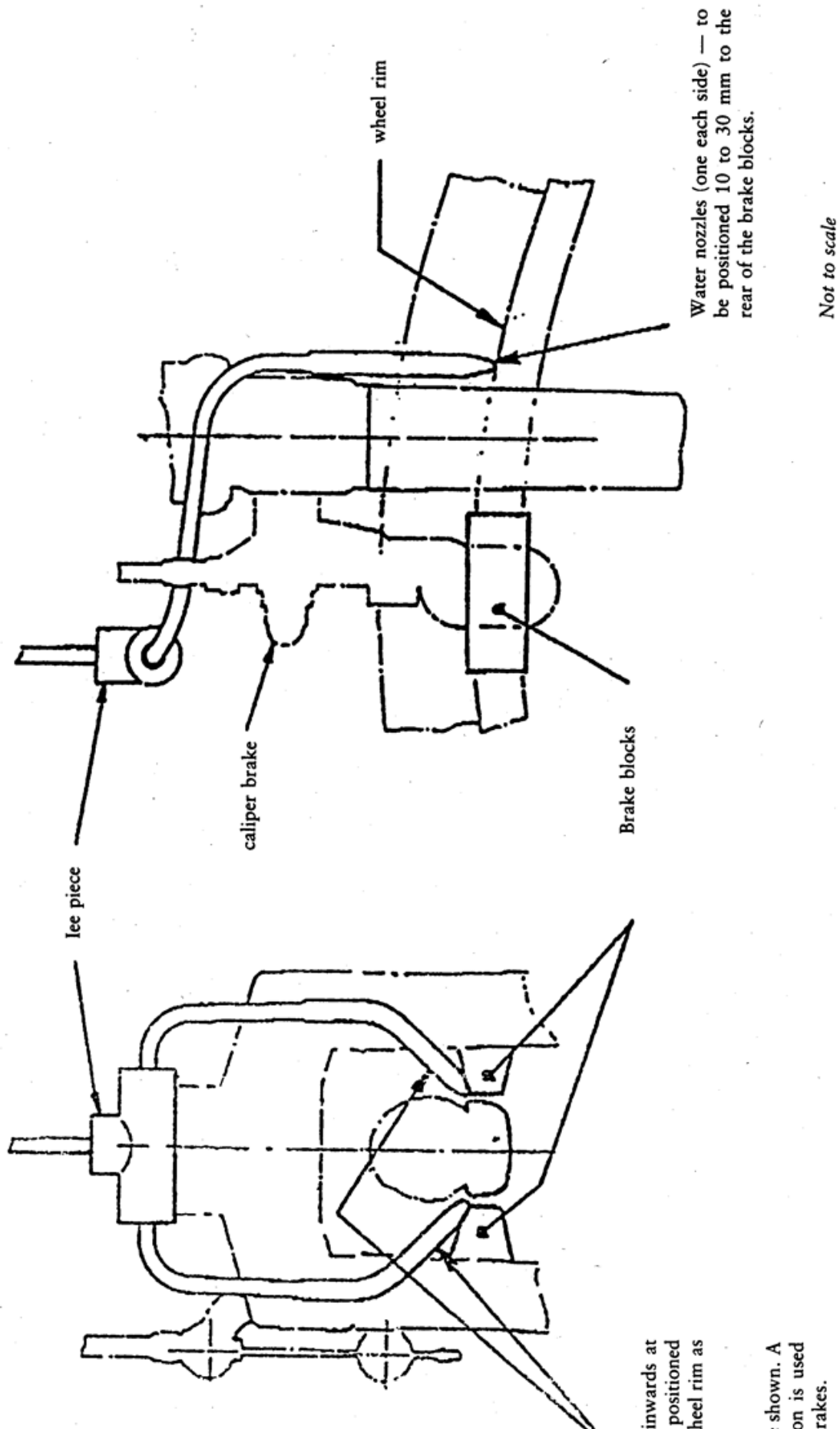


Figure 2

Method of water application for rim brakes



1.4. Type-I test (fade test)

1.4.1. Special provisions

1.4.1.1. The service brakes of all motorcycles (with or without sidecar) and tricycles must be tested by a series of repeated stops, the vehicle being in the laden condition, in accordance with the requirements set out below. For vehicles equipped with a combined braking system, it is sufficient to submit this service braking device to the type-I test.

1.4.1.2. The type-I test is carried out in three parts.

1.4.1.2.1. A single type-0 test as prescribed by 2.1.2 or 2.2.3.1.

1.4.1.2.2. A series of 10 repeated stops carried out in accordance with the requirements of point 1.4.2.

1.4.1.2.3. A single type-0 test, carried out as soon as possible after the completion of the test specified in 1.4.1.2.2 and in any case within one minute thereof, and performed under the same conditions as those used for the test in 1.4.1.2.1, in particular at a control force as constant as possible with a mean value not exceeding the mean force actually used in that test.

1.4.2. Test conditions

1.4.2.1. The vehicle and the brake(s) to be tested must be substantially free from moisture and the brake(s) cold ($\leq 100\text{ }^{\circ}\text{C}$).

1.4.2.2. The initial test speed is:

1.4.2.2.1. for testing the front brake(s), whichever is the lower of 70 % of the vehicle's maximum speed and 100 km/h;

1.4.2.2.2. for testing the rear brake(s), whichever is the lower of 70 % of the vehicle's maximum speed and 80 km/h;

1.4.2.2.3. for testing a combined braking system, whichever is the lower of 70 % of the vehicle's maximum speed and 100 km/h.

1.4.2.3. The distance between the initiation of one stop and the initiation of the next shall be 1 000 metres.

1.4.2.4. The use of the gearbox and/or clutch is as follows:

1.4.2.4.1. In the case of a vehicle with a manual gearbox or an automatic transmission where the gearbox can be disengaged manually, the highest gear, consistent with attaining the initial test speed, must be engaged during the stops.

When the vehicle speed has fallen to 50 % of the initial test speed, the engine must be disengaged.

1.4.2.4.2. In the case of a vehicle with a fully automatic transmission, the test must be carried out under the normal operating conditions for such equipment.

For the approach, the gear suitable to the initial test speed must be used.

1.4.2.5. After each stop, the vehicle must immediately be subjected to maximum acceleration to reach the initial test speed and maintained at that speed until the initiation of the

next stop. If appropriate, the vehicle may be turned round on the test track before acceleration.

- 1.4.2.6. The force applied to the control shall be so adjusted as to maintain a mean deceleration of 3 m/s^2 or the maximum deceleration achievable with that brake, whichever is the lower, at the first stop; this force must remain constant throughout the succeeding stops required by 1.4.1.2.2.

1.4.3. Residual performance

- 1.4.3.1. At the end of the type-I test the residual performance of the service braking device must be measured in the same conditions (and in particular at a control force as constant as possible with a mean value not exceeding the mean force actually used) as for the type-0 test with the engine disconnected (the temperature conditions may be different).

- 1.4.3.2. This residual performance must not be:

- 1.4.3.2.1. if expressed as a deceleration, less than 60 % of the deceleration figure achieved during the type-0 test;

or

- 1.4.3.2.2. if expressed as a stopping distance, more than the stopping distance figure, calculated in accordance with the following formula;

$$S_2 \leq 1,67 S_1 - 0,67 aV$$

where:

- | | |
|-------|---|
| S_1 | = the stopping distance achieved in the type-0 test, |
| S_2 | = the stopping distance as recorded in the residual performance test, |
| a | = 0,1, |
| V | = the initial speed at the beginning of braking as defined in 2.1.1 or 2.2.2. |