Table 22 — Wheel/tyre assembly – Concentricity and lateral tolerance

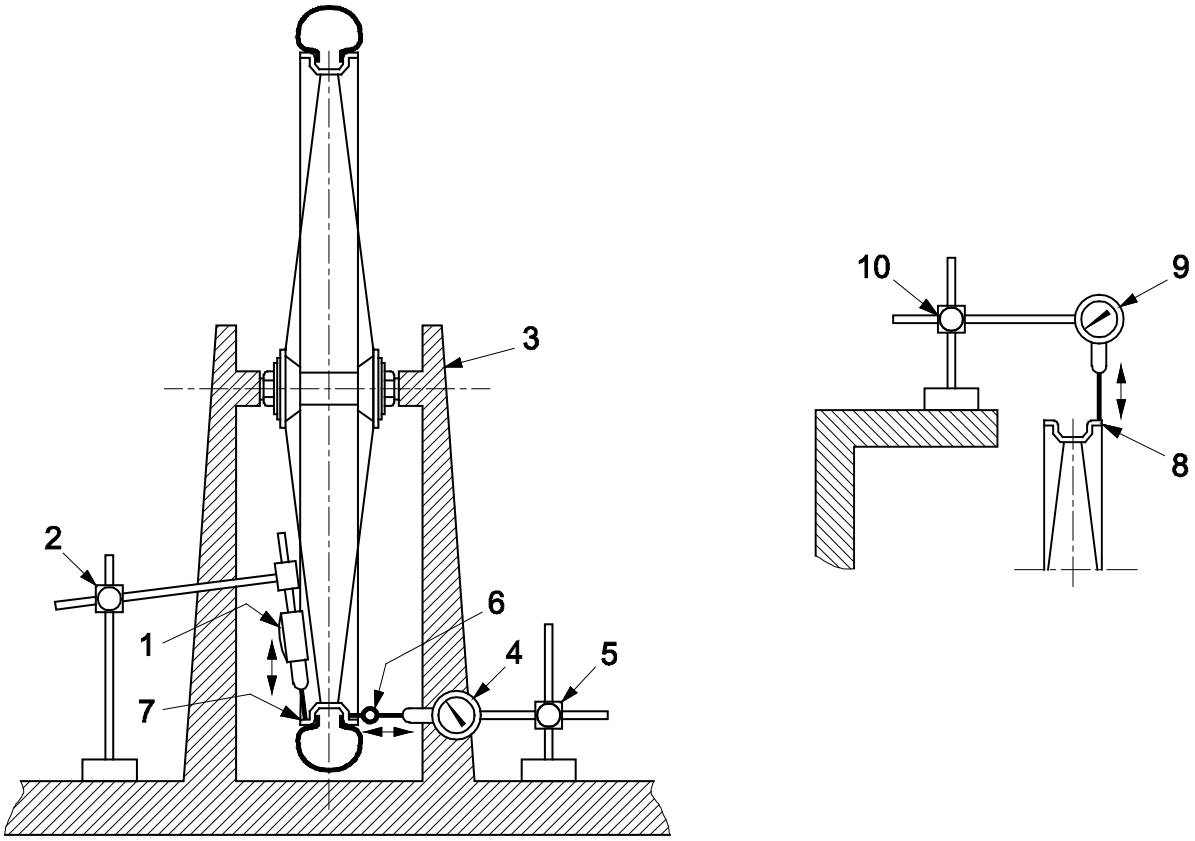
Dimensions in millimetres

	Intended for rim-brakes	Not intended for rim-brakes
Concentricity and lateral tolerance	1	2

4.3.9.1.2 Test method

The run-out tolerances represent the maximum variation of position of the rim when measured perpendicular to the axle at a suitable point along the rim (see Figure 31) (i.e. full indicator reading) of a fully assembled and adjusted wheel during one complete revolution about the axle without axial movement. Both sides of the rim shall be measured and the maximum value shall be taken as result.

The measurement of both axial run-out (lateral) and radial run-out (concentricity) shall be done with a tyre fitted and inflated to the maximum inflation pressure, but for rims where concentricity cannot be measured with the tyre fitted, it is permissible to make measurements with the tyre removed.



a) Rim with tyre **b) Rim without tyre**

Key

1	dial-gauge (concentricity)	7	rim with tyre
2	instrument stand	8	rim without tyre
3	hub axle support	9	dial-gauge (concentricity) (alternative position)
4	dial-gauge (lateral run-out)		
5	instrument stand	10	instrument stand
6	roller indicator		

Figure 31 — Wheels/tyre assembly: rotational accuracy

4.3.9.2 Wheel/tyre assembly – Clearance

Alignment of the wheel assembly in EPAC shall allow not less than the clearance values given in Table 23 between the tyre and any frame or fork element or a front mudguard and its attachment bolts.

Table 23 — Wheel/tyre assembly – Clearance

Dimensions in millimetres

Clearance	6

NOTE Where EPAC has a frame or a fork with a suspension system, the values in Table 23 apply to the suspension system in its uncompressed state. Clearance requirements for the frame or fork under a load are specified in 4.3.8.3.1.

4.3.9.3 Wheel/tyre assembly – Static strength test

4.3.9.3.1 Requirement

When a fully assembled wheel fitted with a tyre inflated to the maximum inflation pressure is tested by the method described in 4.3.9.3.2, there shall be no failure of any of the components of the wheel, and the permanent deformation, measured at the point of application of the force on the rim, shall not exceed the values which are given in Table 24.

Table 24 — The values of permanent deformation

Dimensions in millimetres

Permanent deformation	1,5

4.3.9.3.2 Test method

Clamp and support the wheel suitably as shown in Figure 32. Apply a pre-load of 5 N on the rim at one spoke perpendicular to the plane of the wheel as shown in Figure 32. Record the zero position of the rim at the point of load application as shown. Then apply a static force of F_{13} given in Table 25 for a duration of 1 min. Reduce the load to 5 N and allow a 1 min settling time. After this settling time and with the 5 N load still applied, re-measure the position of the rim.

The wheel shall be fitted with the appropriate size tyre and inflated to the maximum pressure, determined by the lowest value between maximum inflation pressures recommended on the rim or the tyre.

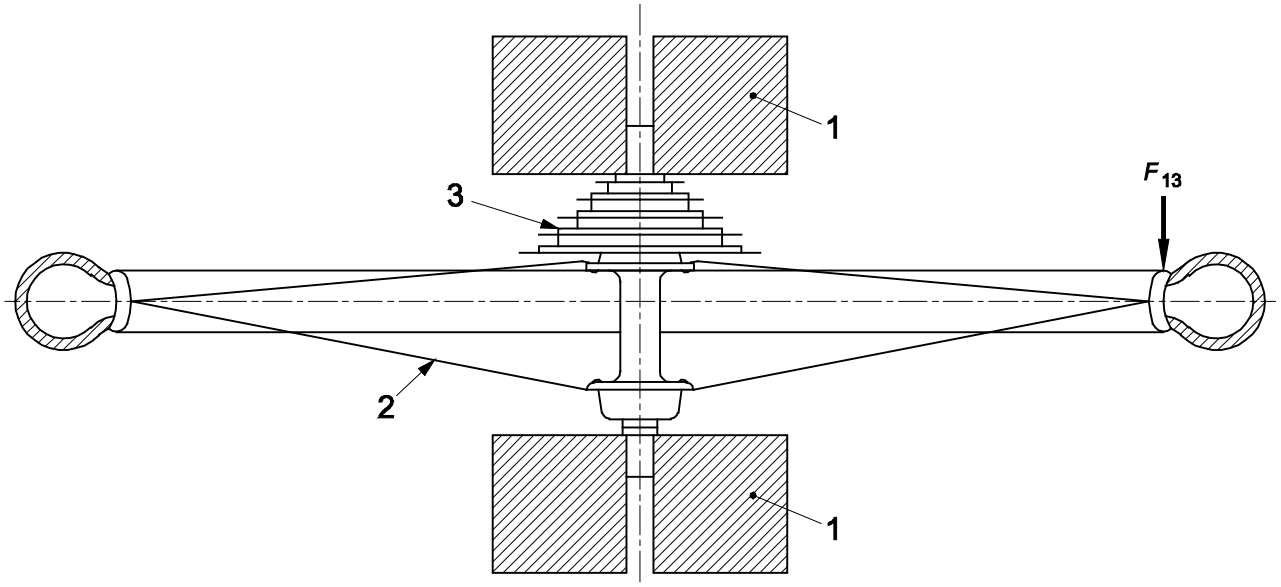
In the case of a rear wheel, apply the force from the sprocket side of the wheel as shown in Figure 32.

Repeat the above measurement once between two spokes.

Table 25 — Forces on rim

Force in N

Force, F_{13}	250



Key

1 clamping fixture
2 wheel/tyre assembly
3 drive sprockets

Figure 32 — Wheel/tyre assembly: static strength test

4.3.9.4 Wheels – Wheel retention

4.3.9.4.1 General

Wheel retention safety is related to the combination of wheel, retention device, and drop-out design.

Wheels shall be secured to EPAC frame and fork such that when adjusted to the manufacturer's instructions they comply with 4.3.9.4.2, 4.3.9.4.3 and 4.3.9.5.

Wheel nuts shall have a minimum removal torque of 70 % of the manufacturer's recommended tightening torque.

Where quick-release axle devices are used they shall comply with 4.3.9.5.

4.3.9.4.2 Wheel retention – Retention devices secured

4.3.9.4.2.1 Requirement

When tested by the method described in 4.3.9.4.2.2, there shall be no relative motion between the axle and the front fork/frame.

4.3.9.4.2.2 Test method

Apply a force of 2 300 N distributed symmetrically to both ends of the axle for a period of 1 min in the direction of the removal of the front and rear wheel independently.

4.3.9.4.3 Front wheel retention – Retention devices unsecured

EPAC shall be equipped with secondary retention system that retains the front wheel in the dropouts when the primary retention system is in the open (unlocked) position and wheel off the ground.

Where threaded axles and nuts are fitted, and the nuts are unscrewed by at least 360° from the finger tight condition and the brake system disconnected or released, the wheel shall not detach from the front fork when a force of 100 N is applied radially outwards, in line with the drop-out slots, and maintained for 1 min.

Where quick-release is fitted, and the quick-release lever is fully open and the brake system is disconnected or released, the wheel shall not detach from the front fork when a force of 100 N is applied to the wheel radially outwards, in line with the drop-out slots, and maintained for 1 min.

4.3.9.5 Wheels – Quick-release devices – Operating features

Any quick-release device shall have the following operating features:

a) it shall be adjustable to allow setting for tightness;

b) its form and marking shall clearly indicate whether the device is in the open or locked position;

c) if adjustable by a lever, the force required to close a properly set lever shall not exceed 200 N and, at this closing force there shall be no permanent deformation of the quick-release device;

d) the releasing force of the clamping device when closed shall not be less than 50 N;

e) if operated by a lever, the quick-release device shall withstand without fracture or permanent deformation a closing force of not less than 250 N applied with the adjustment set to prevent closure at this force;

f) the wheel retention with the quick-release device in the clamped position shall be in accordance with 4.3.9.4.2, 4.3.9.4.3;

g) the front wheel retention with the quick-release device in the open position shall be in accordance with 4.3.9.4.3.

If applied to a lever, the forces specified in c), d), and e) shall be applied 5 mm from the tip end of the lever.

4.3.10 Rims, tyres and tubes

4.3.10.1 General

Non-pneumatic tyres are excluded from the requirements of 4.3.10.2 and 4.3.10.3.

4.3.10.2 Tyre inflation pressure

The maximum inflation pressure recommended by the manufacturer shall be permanently marked on the side wall of the tyre so as to be readily visible when the latter is assembled on the wheel. If the rim manufacturer recommends a maximum tyre inflation pressure, it shall be clearly and permanently marked on the rim and also specified in the manufacturer's instructions.

It is recommended that the minimum inflation pressure specified by the tyre manufacturer also be permanently marked on the side wall of the tyre.

4.3.10.3 Tyre and rim compatibility

Tyres that comply with the requirements of ISO 5775-1 and rims that comply with the requirements of ISO 5775-2 are compatible. The tyre, tube and tape shall be compatible with the rim design. When inflated to 110 % of the maximum inflation pressure, determined by the lower value between maximum inflation pressures recommended on the rim or the tyre, for a period of not less than 5 min, the tyre shall remain intact on the rim.

NOTE In the absence of suitable information from the above-mentioned International Standards, other publications are allowed to be used. See Bibliography [32], [30].

4.3.10.4 Rim-wear

In the case where the rim forms part of a braking system and there is a danger of failure due to wear, the manufacturer shall make the rider aware of this danger by durable and legible marking on the rim, in an area not obscured by the tyre, (see also Clause 6 z) and 5.1).

NOTE A symbol referring to the instruction manual is an acceptable marking for rims for wear.

Where the rim is made of composite materials, the manufacturer shall include in the manufacturer's instructions warnings of the danger of rim failure caused by wear of the braking surfaces.

4.3.10.5 Greenhouse effect test for composite wheels

4.3.10.5.1 General

This requirement is to ensure wheels made from composite materials that are subjected to high temperature conditions (i.e. such as car storage in direct sunlight) do not suffer concealed damage that could subsequently affect the safety performance of the wheel during normal use.

4.3.10.5.2 Requirement

When a fully assembled wheel made of composite material, fitted with the appropriate size tyre and inflated according to the lowest value between maximum inflation pressure recommended on the rim or the tyre, is tested by the method described as 4.3.10.5.3, there shall be:

— no failure of any of the components of the wheel;

— no tyre separation from the rim during the test;

— no increase in rim width greater than 5 % of the initial maximal width value;

— compliance of lateral and concentricity tolerance according to 4.3.9.1;

— compliance of tyre and rim compatibility according to 4.3.10.3;

— compliance of static strength according to 4.3.9.3.

4.3.10.5.3 Test method

A fully assembled wheel, fitted with the appropriate size tyre and inflated according to the lowest value between minimum and maximum inflation pressure recommended on the rim or the tyre, shall be used for the test. Lateral run-out shall be in accordance with 4.3.9.1 and maximum width of the rim shall be recorded.

A specific bench as shown in Figure 34 could be used to measure the maximum width all around the rim with tyre and pressure (continuous measuring).

The wheel is laid down on the ground of a climate chamber pre heated at 80 °C, leant on axle and tyre support points, sprocket side of the wheel as shown in Figure 33, during 4 h. At the end of the 4 h, the wheel should be taken out of the climate chamber and let cool down at room temperature during 4 h to re-measuring the rim width and its conformance to 4.3.10.5.1 and 4.3.10.5.2.

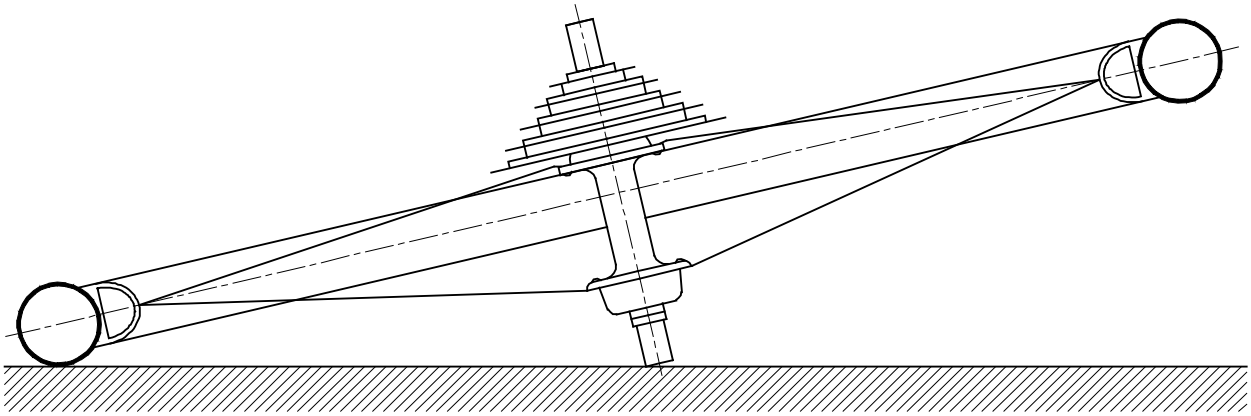


Figure 33 — Wheel laid down on tire and axle

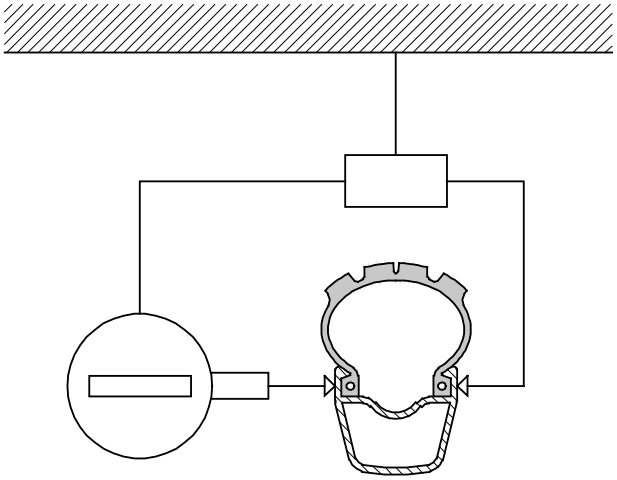


Figure 34 — Maximum rim's width measuring

4.3.11 Front mudguard

4.3.11.1 Requirements

If front mudguard is fitted, when tested by the method described in the two-stage tests in 4.3.11.2 (for mudguard with stays) or 4.3.11.3 (for mudguard without stays), the front mudguard shall not prevent rotation of the wheel or obstruct steering.

4.3.11.2 Front mudguard with stays test methods

4.3.11.2.1 Stage 1: Test method – Tangential obstruction

Insert a 12 mm diameter steel rod between the spokes, in contact with the rim and below the front mudguard stays as shown in Figure 35, and rotate the wheel to apply a tangentially-upward force of 160 N, against the front mudguard stays and maintain this force for 1 min.

Remove the rod and determine whether or not the wheel is free to rotate and whether or not any damage to the front mudguard adversely affects wheel rotation (blocking of the wheel) and the steering.

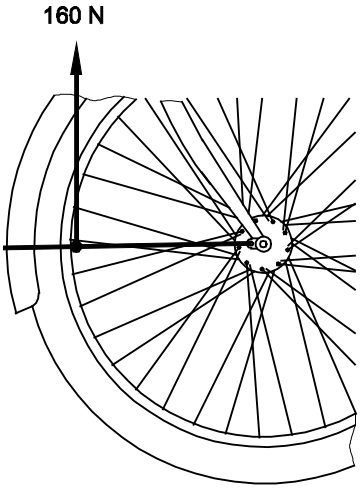


Figure 35 — Front mudguard: tangential obstruction test

4.3.11.2.2 Stage 2: Test method – Radial force

Press the front mudguard at a distance of 20 mm from its free end (not taking the flap into consideration) with a 20 mm diameter, flat-ended tool radially towards the tyre with a force of 80 N as shown in Figure 36.

Dimensions in millimetres

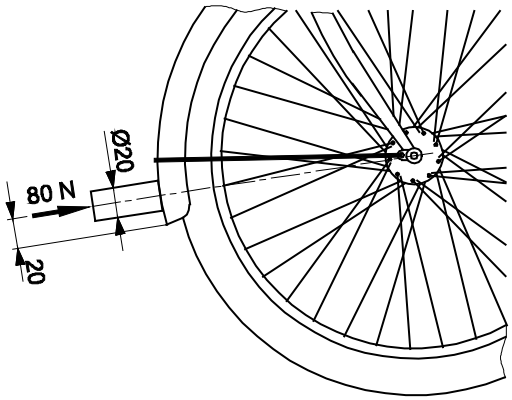


Figure 36 — Front mudguard: radial force test

While the force is maintained, rotate the wheel manually in the direction of forward movement of the bicycle and determine whether or not the wheel is free to rotate, and whether or not any damage to the front mudguard adversely affects wheel rotation (blocking of the wheel) and the steering.

4.3.11.3 Front mudguard without stays test methods

Press the front mudguard at a distance of 20 mm from its free end with a 20 mm diameter, flat-ended tool radially towards the tyre with a force of 80 N as shown in Figure 36.

While the force is maintained, rotate the wheel manually in the direction of forward movement of the bicycle and determine whether or not the front mudguard is rolled up the wheel, and whether or not any damage to the front mudguard adversely affects wheel rotation (blocking of the wheel) or obstructs the steering. Contact between tyre and mudguard is allowed.

4.3.12 Pedals and pedal/crank drive system

4.3.12.1 Pedal tread

4.3.12.1.1 Tread surface

The tread surface of a pedal shall be secured against movement within the pedal assembly.

4.3.12.1.2 Toe Clips

Pedals intended to be used without toe-clips, or for optional use with toe-clips, shall have:

a) tread surfaces on the top and bottom surfaces of the pedal; or

b) a definite preferred position that automatically presents the tread surface to the rider's foot.

Pedals designed to be used only with toe-clips or shoe-retention devices shall have toe-clips or shoe-retention devices securely attached and need not comply with the requirements of 4.3.12.1.2 a) and b).

4.3.12.2 Pedal clearance

4.3.12.2.1 Ground clearance

With EPAC un-laden, the pedal at its lowest point and the tread surface of the pedal parallel to the ground and uppermost where it has only one tread surface, EPAC shall be capable of being leaned over at an angle of θ from the vertical before any part of the pedal touches the ground. The values are given in Table 26.

When EPAC is equipped with a suspension system, this measurement shall be taken with the suspension adjusted to the softest condition and with EPAC depressed into a position such as would be caused by a rider weighing 90 kg.

Table 26 — The values of ground clearance

Angle in degrees

Lean angle θ	25

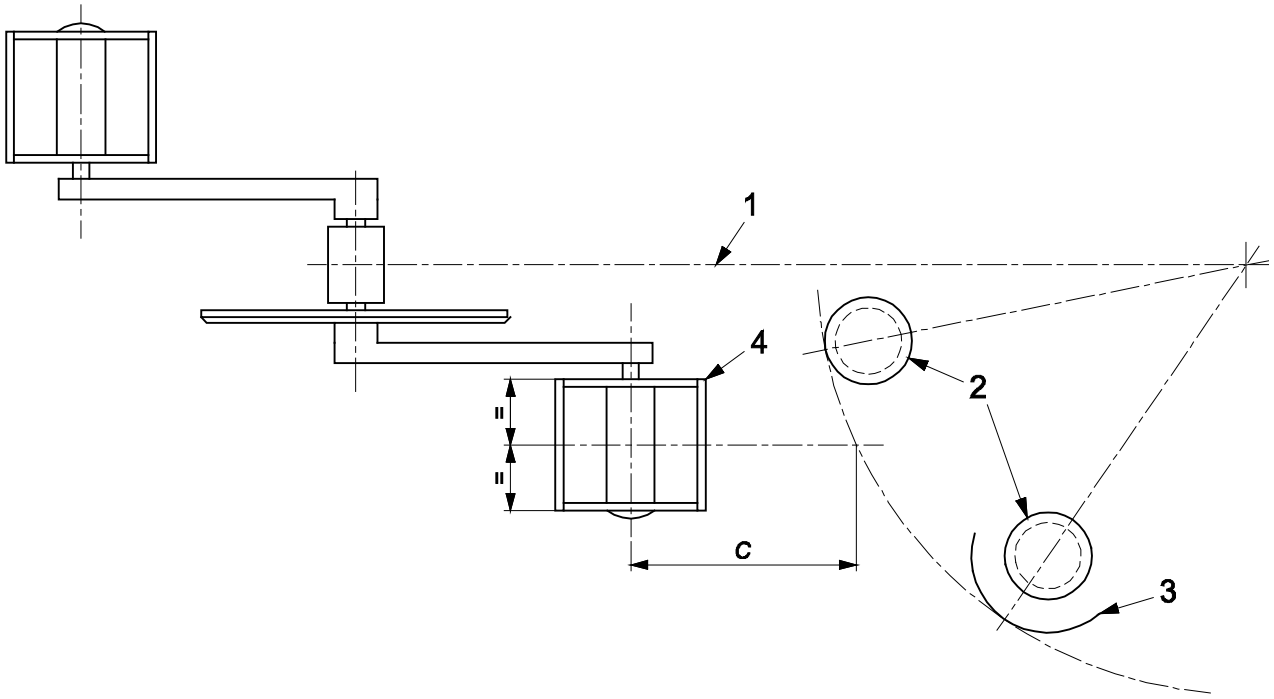
4.3.12.2.2 Toe clearance

EPACs shall have at least C clearance between the pedal and front tyre or mudguard (when turned to any position). The clearance shall be measured forward and parallel to the longitudinal axis of EPAC from the centre of either pedal-axle to the arc swept by the tyre or mudguard, whichever results in the least clearance (see Figure 37). The values are given in Table 27.

Table 27 — The values of toe clearance

Dimensions in millimetres

Toe clearance C	without foot retention	100
	with foot retention	89
NOTE Foot retention system, e.g. quick-release pedal or toe-clip.		



Key

C clearance
1 longitudinal axis
2 front tyre
3 mudguard
4 pedal

Figure 37 — Pedal to wheel/mudguard: toe clearance

4.3.12.3 Pedal – Static strength test

4.3.12.3.1 Requirement

When tested by the method described in 4.3.12.3.2, there shall be no fractures, visible cracks, or distortion of the pedal or spindle that could affect the operation of the pedal and pedal-spindle.

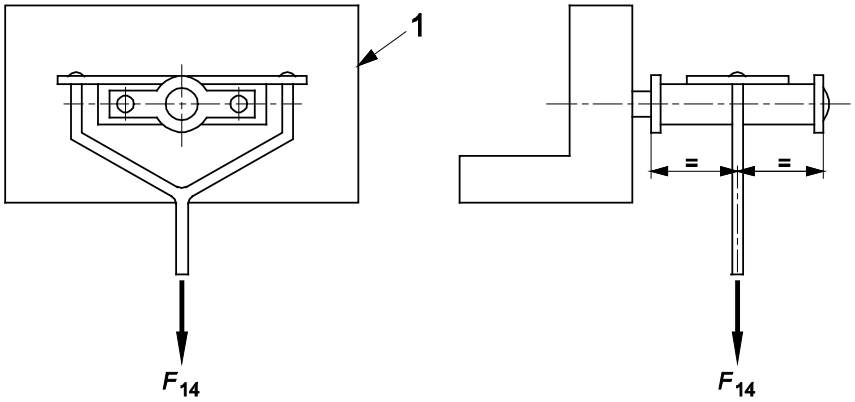
4.3.12.3.2 Test method

Screw the pedal-spindle securely into a suitable rigid fixture with its axis horizontal, as shown in Figure 38, and apply a vertically-downward force F_{14} according to Table 28 for 1 min to the centre of the pedal as shown in Figure 38. Release the force and examine the pedal assembly and the spindle.

Table 28 — Forces on pedal

Force in N

Force, F_{14}	1500



Key

1 rigid mount

Figure 38 — Pedal/pedal-spindle assembly: static strength test

4.3.12.4 Pedal – Impact test

4.3.12.4.1 Requirement

When tested by the method described in 4.3.12.4.2, there shall be no fractures of any part of the pedal body, the pedal-spindle or any failure of the bearing system.

4.3.12.4.2 Test method

Screw the pedal-spindle securely into a suitable rigid fixture with its axis horizontal as shown in Figure 40 and release a striker of the design shown in Figure 39 and mass 15 kg from a height of 400 mm to strike the pedal at the centre of the pedal. The width of the striker shall be wider than the width of the tread surface.

Dimensions in millimetres

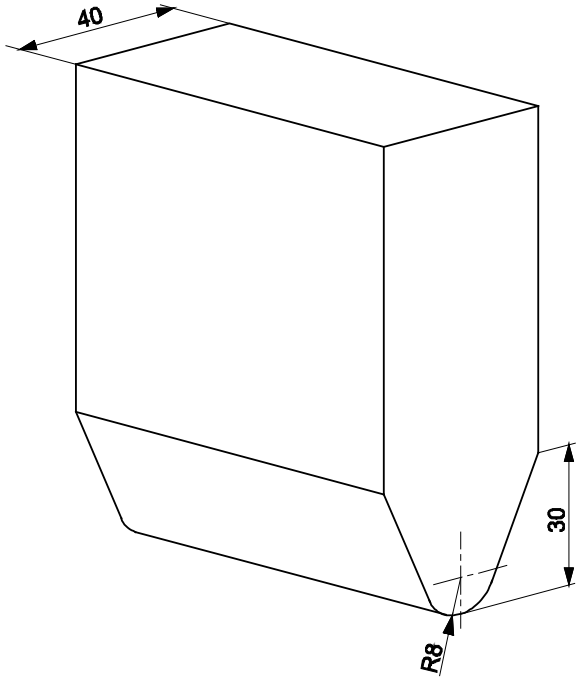


Figure 39 — Striker dimensions

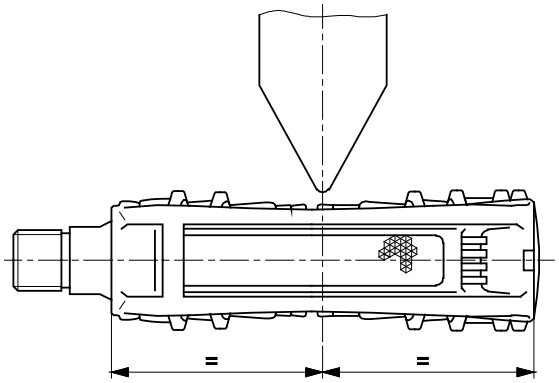


Figure 40 — Position of impact

4.3.12.5 Pedal – Dynamic durability test

4.3.12.5.1 Requirement

When tested by the method described in 4.3.12.5.2, there shall be no fractures or visible cracking of any part of the pedal, the pedal-spindle nor any failure of the bearing system.

4.3.12.5.2 Test method

Screw each pedal securely into a threaded hole in a rotable test-shaft as shown in Figure 41 and suspend a mass of M_4 at the centre of the pedal width by means of a tension-spring to each pedal, the object of the springs being to minimize oscillations of the load. The masses are given in Table 29.

Drive the shaft at a speed not exceeding 100 min−1 for a total of 100 000 revolutions. If the pedals are provided with two tread surfaces, they shall be turned through 180° after 50 000 revolutions.