**BS EN ISO 4210-8:2014**

*Incorporating corrigendum November 2014*

BSI Standards Publication

# Cycles — Safety requirements for bicycles

## Part 8: Pedal and drive system test methods (ISO 4210-8:2014)

**National foreword**

This British Standard is the UK implementation of EN ISO 4210-8:2014. Together with BS EN ISO 4210-1:2014, BS EN ISO 4210-2:2014, BS EN ISO 4210-3:2014, BS EN ISO 4210-4:2014, BS EN ISO 4210-5:2014, BS EN ISO 4210-6:2014, BS EN ISO 4210-7:2014, BS EN ISO 4210-9:2014 it supersedes BS EN 14764:2005, BS EN 14766:2005 and BS EN 14781:2005, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GME/25, Cycles.

A list of organizations represented on this committee can be obtained on request to its secretary.

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July 2014

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English Version

# Cycles - Safety requirements for bicycles - Part 8: Pedal and drive system test methods (ISO 4210-8:2014, Corrected version 2014-11-01)

Cycles - Exigences de sécurité des bicyclettes - Partie 8: Méthodes d'essai des pédales et du pédalier (ISO 4210-8:2014, Version corrigée 2014-11-01)

Fahrräder - Sicherheitstechnische Anforderungen an Fahrräder - Teil 8: Prüfverfahren für Pedal und Antriebssystem (ISO 4210-8:2014, korrigierte Fassung 2014-11-01)

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# Foreword

This document (EN ISO 4210-8:2014) has been prepared by Technical Committee ISO/TC 149 "Cycles" in collaboration with Technical Committee CEN/TC 333 “Cycles” the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by July 2015.

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**Endorsement notice**

The text of ISO 4210-8:2014 , Corrected version 2014-11-01 has been approved by CEN as EN ISO 4210-8:2014 without any modification.

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# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The committee responsible for this document is ISO/TC 149, *Cycles*, Subcommittee SC 1, *Cycles and major sub-assemblies*.

This first edition of ISO 4210-8, together with ISO 4210-1, ISO 4210-2, ISO 4210-3, ISO 4210-4, ISO 4210-5, ISO 4210-6, ISO 4210-7, and ISO 4210-9 cancels and replaces ISO 4210:1996, which has been technically revised.

ISO 4210 consists of the following parts, under the general title *Cycles — Safety requirements for bicycles*:

— *Part 1: Terms and definitions*

— *Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

— *Part 3: Common test methods*

— *Part 4: Braking test methods*

— *Part 5: Steering test methods*

— *Part 6: Frame and fork test methods*

— *Part 7: Wheels and rims test methods*

— *Part 8: Pedals and drive system test methods*

— *Part 9: Saddles and seat-post test methods*

This corrected version of ISO 4210-8:2014 incorporates a modification in the key of Figure 6, item 4.



# Introduction

This International Standard has been developed in response to demand throughout the world, and the aim has been to ensure that bicycles manufactured in compliance with this International Standard will be as safe as is practically possible. The tests have been designed to ensure the strength and durability of individual parts as well as of the bicycle as a whole, demanding high quality throughout and consideration of safety aspects from the design stage onwards.

The scope has been limited to safety considerations, and has specifically avoided standardization of components.

If the bicycle is to be used on public roads, national regulations apply.

# Cycles — Safety requirements for bicycles —

# Part 8:
# Pedal and drive system test methods



## 1 Scope

This part of ISO 4210 specifies pedal and drive system test methods for ISO 4210-2.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4210-1, *Cycles – Safety requirements for bicycles – Part 1: Terms and definitions*

ISO 4210-3:2014, *Cycles – Safety requirements for bicycles – Part 3: Common test methods*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

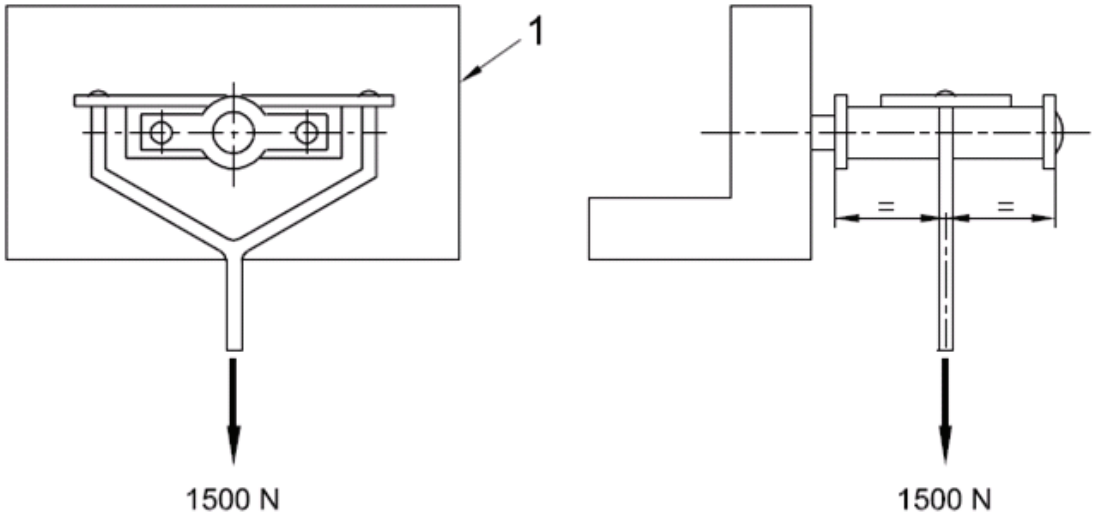
## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4210-1 apply.

## 4 Test methods

### 4.1 Pedal — Static strength test

Screw the pedal-spindle securely into a suitable rigid fixture with its axis horizontal, as shown in Figure 1, and apply a vertically downward force of 1 500 N for 1 min to the centre of the pedal as shown in Figure 1. Release the force and examine the pedal assembly and the spindle.




**Key**
1 rigid mount

**Figure 1 — Pedal/pedal-spindle assembly — Static strength test**

## 4.2 Pedal — Impact test

Screw the pedal-spindle securely into a suitable rigid fixture with its axis horizontal as shown in Figure 3 and release a striker of the design shown in Figure 2 and mass of 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.

NOTE See ISO 4210-3:2014, Annex B.

Dimensions in millimetres

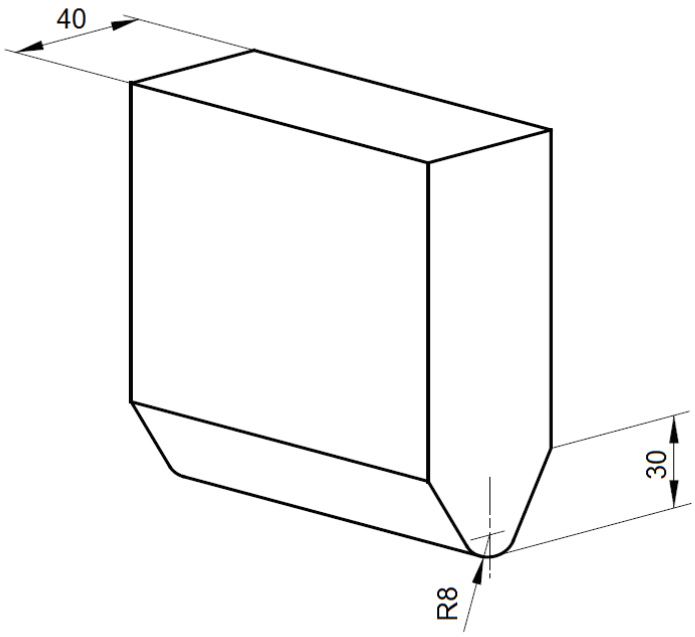



**Figure 2 — Striker dimensions**

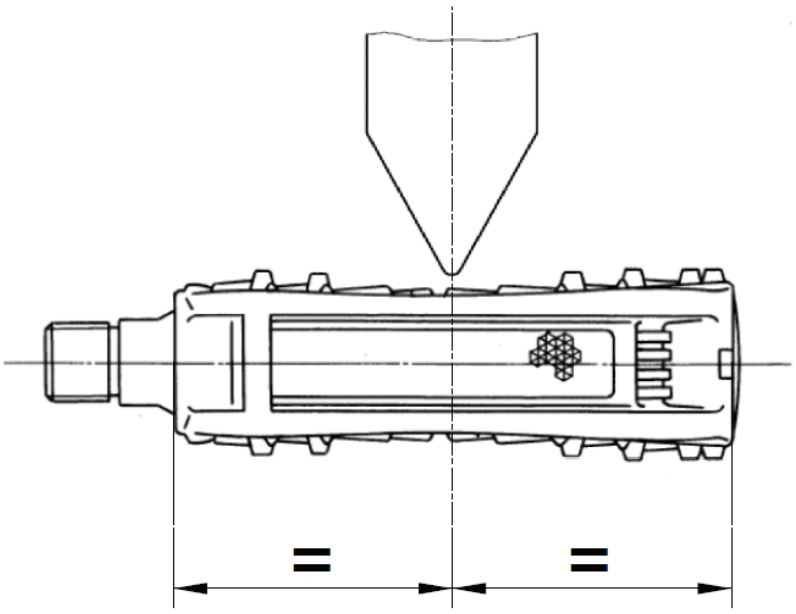


**Figure 3 — Position of impact**

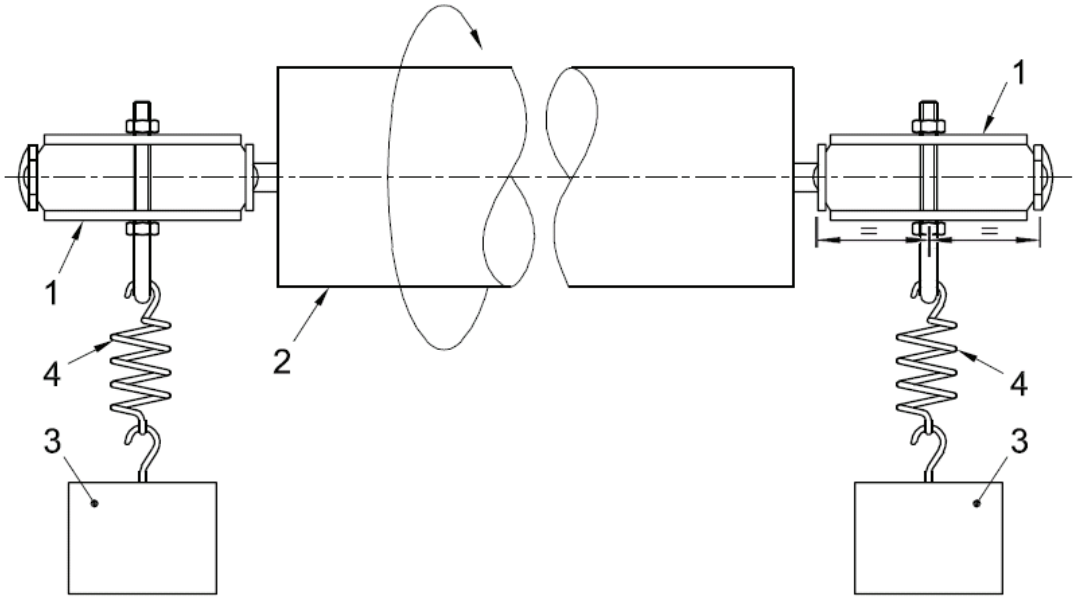
## 4.3 Pedal — Dynamic durability test

Screw each pedal securely into a threaded hole in a rotable test shaft as shown in Figure 4 and suspend a mass of *M* 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 1.

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.

**Table 1 — Masses on pedal**

| Bicycle type | City and trekking bicycles | Young adult bicycles | Mountain bicycles | Racing bicycles |
|---|---|---|---|---|
| Mass, *M*<br>kg | 80 | 80 | 90 | 90 |




**Key**

1 pedal
2 test shaft
3 mass
4 tension spring

**Figure 4 — Pedal/pedal-spindle — Dynamic durability test**

## 4.4 Drive system — Static strength test

### 4.4.1 Test method for drive system with chain

#### 4.4.1.1 General

Conduct the drive system static load test on an assembly comprising the frame, pedals, transmission system, rear wheel assembly, and, if appropriate, the gear-change mechanism. Support the frame with the central plane vertical and with the rear wheel held at the rim to prevent the wheel from rotating.

#### 4.4.1.2 Single-speed system

With the non-drive side crank in the forward position, apply a force, $F_1$, increasing gradually to 1 500 N vertically downwards to the centre of the non-drive side pedal. Maintain this force for 1 min.

Should the system yield or the drive-sprockets tighten, such that the crank rotates while under load to a position more than 30° below the horizontal, remove the test force, return the crank to the horizontal position or some appropriate position above the horizontal to take account of yield or movement, and repeat the test.

On completion of the test on the non-drive side crank, repeat the test with the drive side crank in the forward position and with the force applied to the drive side pedal.

#### 4.4.1.3 Multi-speed system

a) Conduct the tests described in 4.4.1.2 with the transmission correctly adjusted in its highest gear.

b) Conduct the tests generally as described in 4.4.1.2 with the transmission correctly adjusted in its lowest gear but, where appropriate, with the maximum force, $F_1$, adjusted to suit the particular gear ratio. Thus:

   The maximum force, $F_1$, shall be a function of the lowest gear ratio, $N_c/N_s$,

where

$F_1$ is the force applied to the pedal, expressed in newton (N);

$N_c$ is the number of teeth on the smallest chain wheel (front);

$N_s$ is the number of teeth on the largest sprocket (rear).

Where the ratio $N_c/N_s$ has a value equal to or greater than 1, the force, $F_1$, shall be 1 500 N; but where the ratio $N_c/N_s$ has a value less than 1, the force, $F_1$, shall be reduced in proportion to the lowest gear ratio. Thus:

$F_1$ is $1\,500 \times N_c/N_s$.

### 4.4.2 Test method for drive system with belt

The sample in its fully finished condition (with teeth, if any) shall be submitted to a water spray conditioning equivalent to IPX4 specified in IEC 60529:2001, 14.2.4 during 10 min. Application of the loading shall be done within 20 min after conditioning.

a) If the drive system is a single-speed system, conduct the tests as described in 4.4.1.2.

b) If the drive system is a multi-speed system, conduct the tests as described in 4.4.1.3.

## 4.5 Drive belt — Tensile strength test

Set up a fixture with two drive pulleys that are similar or identical as shown in Figure 5. At least one pulley should be free to rotate. Increase the tensile load gradually until the tension load of the belt reaches 4 000 N.

NOTE 4 000 N is the tension load within the belt and requires a load $F$ of 8 000 N to achieve this tension load.

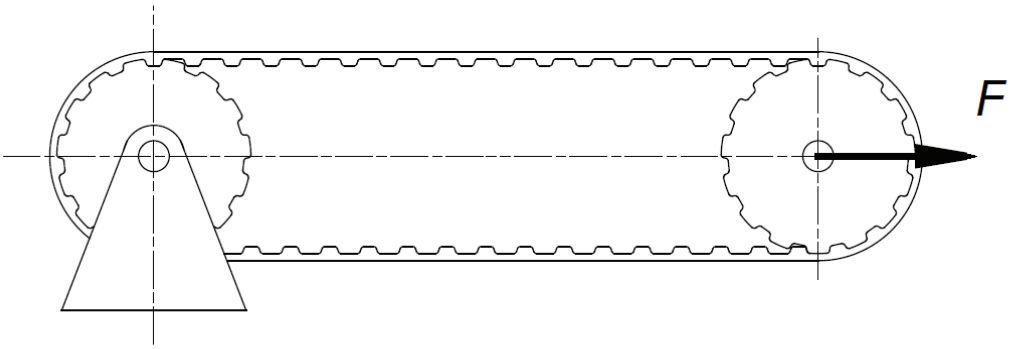



**Figure 5 — Drive belt — Tensile strength test**

## 4.6 Crank assembly — Fatigue test

### 4.6.1 General

Two types of fatigue test are specified for mountain bicycles: the first test with the cranks positioned at 45° to the horizontal to simulate the forces due to pedalling, and the second test with the cranks positioned at 30° to the horizontal, which has been found to simulate the forces due the rider standing on the pedals during the descent of hills. The two tests shall be conducted on separate assemblies.

### 4.6.2 Test method with the cranks at 45° to the horizontal

Mount the assembly of the two pedal-spindle adaptors, the drive side and non-drive side crank, the chain wheel set (or other drive component), and the bottom-bracket spindle located on its normal-production bearings in a fixture with bearing housings representative of the bottom-bracket (as shown in Figure 6). Incline the cranks at 45° to the horizontal.

Prevent rotation by locating a suitable length of drive chain around the largest or only chain wheel and securing it firmly to a suitable support, or, for any other type of transmission (e.g. belt- or shaft-drive) by securing the first stage of the transmission.

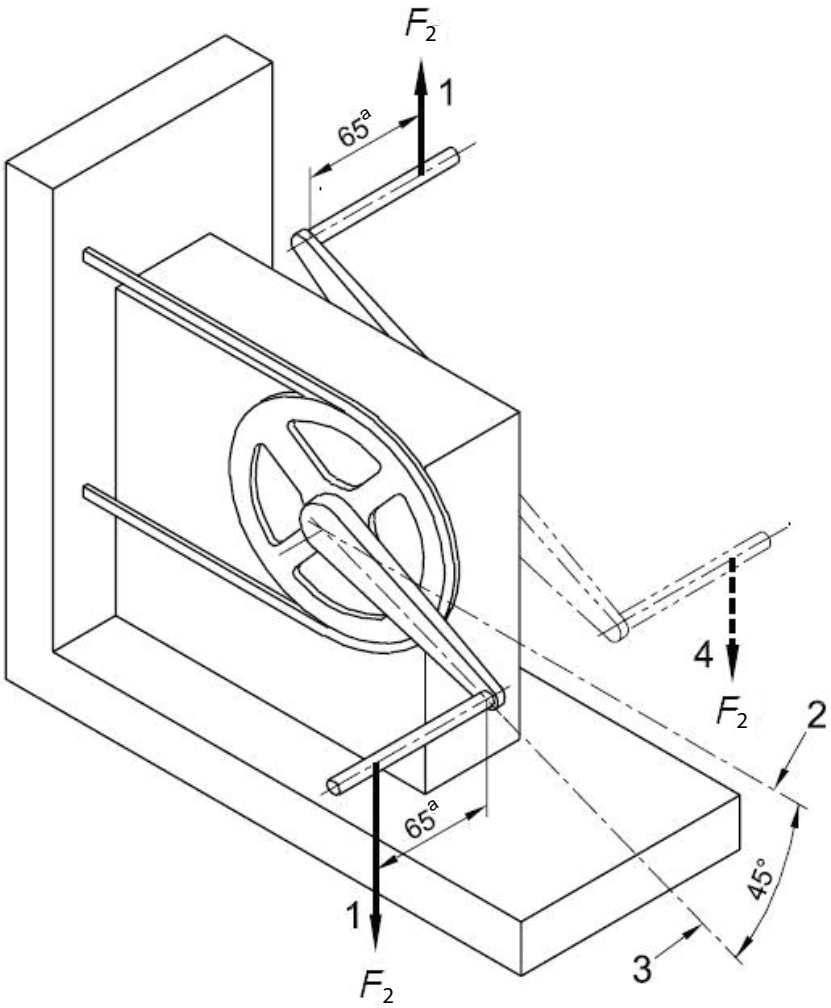
NOTE It is permissible to have the non-drive side crank in either of the two positions shown in Figure 6, provided the test force is applied in the appropriate direction as specified in the next paragraph.

Apply repeated, vertical, dynamic forces of $F_2$ alternately to the pedal-spindle adaptors of the drive side and non-drive side crank at a distance of 65 mm from the outboard face of each crank (as shown in Table 2 and Figure 6) for $C$ test cycles (where one test cycle consists of the application of the two forces). The direction of the force on the drive side crank shall be downwards and that on the non-drive side crank shall be upwards for a rearward-pointing crank, or downwards for a forward-pointing crank. During application of these test forces, ensure that the force on a pedal-spindle adaptor falls to 5 % or less of the peak force before commencing application of the test force to the other pedal-spindle adaptor. The maximum test frequency shall be maintained as specified in ISO 4210-3:2014, 4.5.

**Table 2 — Forces on pedal-spindle and test cycles**

| Bicycle type | City and trekking bicycles | Young adult bicycles | Mountain bicycles | Racing bicycles |
|---|---|---|---|---|
| Force, $F_2$<br>N | 1 300 | 1 300 | 1 800 | 1 800 |
| Test cycles, $C$ | 100 000 | 100 000 | 50 000 | 100 000 |

Dimensions in millimetres




**Key**

1 repeated test force
2 horizontal axis
3 axis of crank
4 alternative non-drive side crank arrangement
[a] From outboard face of crank.

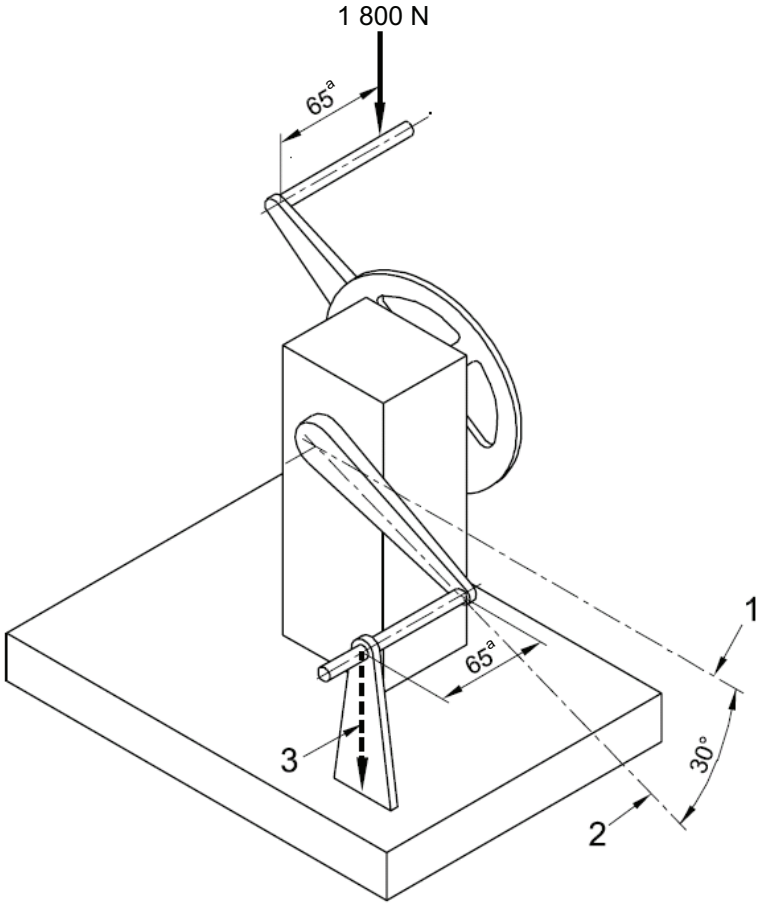
**Figure 6 — Crank assembly — Fatigue test with cranks at 45° (typical test arrangement)**

### 4.6.3 Test method with the cranks at 30° to the horizontal for mountain bicycles

Mount the assembly of the two pedal-spindle adaptors, the drive side and non-drive side crank, the chain wheel set (or other drive component), and the bottom-bracket spindle located on its normal-production bearings in a fixture with bearing housings representative of the bottom-bracket, as shown in Figure 7. Incline the cranks at 30° to the horizontal as shown in Figure 7. Restrain the non-drive side crank to the base of the test machine by a device attached to the pedal-spindle at a distance of 65 mm from the outboard face of the crank.

Apply a repeated, vertically downward, dynamic force of 1 800 N to the pedal-spindle of the drive side crank at a distance of 65 mm from the outboard face of the crank (as shown in Figure 7) for 50 000 cycles. The maximum test frequency shall be maintained as specified in ISO 4210-3:2014, 4.5.

Dimensions in millimetres




**Key**

1 horizontal axis
2 axis of crank
3 reactive force (equal and opposite to test force)
a From outboard face of crank.

**Figure 7 — Crank assembly — Fatigue test with cranks at 30° (typical test arrangement)**

# Bibliography

[1] ISO 4210-2:2014, *Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

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