BRITISH STANDARD

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14201:2004

Blinds and shutters — Resistance to repeated operations (mechanical endurance) — Methods of testing

The European Standard EN 14201:2004 has the status of a British Standard

ICS 91.060.50

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National foreword

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The UK participation in its preparation was entrusted by Technical Committee B/538, Doors, windows, shutters, hardware and curtain walling, to Subcommittee B/538/3, Domestic shutters and blinds, which has the responsibility to:

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Summary of pages

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EUROPEAN STANDARD

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EN 14201

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English version

Blinds and shutters - Resistance to repeated operations (mechanical endurance) - Methods of testing

Fermetures pour baies équipées de fenêtres stores intérieurs et stores extérieurs - Résistance aux manoeuvres répétées (endurance mécanique) - Méthodes d'essai

Abschlüsse und Läden - Widerstand gegen wiederholte Bedienungen (mechanische Lebensdauer) - Prüfverfahren

This European Standard was approved by CEN on 11 December 2003.

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Foreword

This document (EN 14201:2004) has been prepared by Technical Committee CEN/TC 33 “Doors, windows, shutters, building hardware and curtain walling”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2004, and conflicting national standards shall be withdrawn at the latest by August 2004.

It is part of a series of standards dealing with blinds and shutters for buildings as defined in EN 12216.

The methods of testing are linked to the performances requirements for internal blinds, external blinds and shutters, as specified in prEN 13120, prEN 13561 and prEN 13659.

No existing European Standard is superseded.

Annex A is normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies the tests to be carried out to determine the mechanical endurance of products comprising :

— internal blinds,

— external blinds,

— shutters,

according to a defined number of extension/retraction cycles of the curtain and tilting of the laths (for blinds and shutters with tilting laths).

It applies to complete products e.g. those equipped with their hardware and operating mechanisms in normal operating conditions.

Manual override mechanisms for use in case of mechanical breakdown are excluded when they form part of motorized blinds and shutters.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 12216:2002, *Shutters, external blinds, internal blinds - Terminology, glossary and definitions.*

prEN 13120:1997, *Internal blinds - Performance requirements.*

EN 13527:1999*, Shutters and blinds - Measurement of operating force - Test methods.*

prEN 13561:1999, *External blinds - Performance requirements including safety.*

prEN 13659:1999, *Shutters – Performance requirements including safety.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12216:2002, prEN 13120:1997, prEN 13561:1999, prEN 13659:1999 and the following apply.

3.1
override operation
manual operation available on power operated shutters and blinds in the case of power failure

3.2
reference velocity
according to the product :
— speed of the operating mechanism :
- speed of rotation in the case of rotation of the operating mechanism, expressed in rpm ;
- linear speed in the case of one direction or endless operation of the operating mechanism, expressed in m/min ;
- speed of rotation of drive for power operated operation, expressed in rpm .

— speed of movement of the closing "edge" of the curtain or the bottom lath or tilting lath in the case of direct operation :
- tangential speed of pivoting products (wing shutter, venetian shutter, lever), expressed in m/min ;
- linear speed for products extending or retracting in a plane (concertina shutter, flat closing concertina shutter, sliding shutter, panel shutter and awning), expressed in m/min.

3.3
effect of inertia
effect obtained with linear operations of the operating mechanism allowing the curtain by its inertia, to complete its travel after stopping the operation before reaching the fully extended or retracted position

3.4
phase (retraction / extension)
movement of the curtain from a fully extended or retracted position to a fully opposing retracted or extended position

3.5
rest time
period of immobilisation between phases and / or cycles

NOTE The rest time is given in second(s).

3.6
retraction / extension cycle
consists of a retraction phase, of an extension phase and of the rest times. The operations of locking and unlocking when these are not automatic are excluded from the cycle

3.7
tilting laths cycle
full cycle of the mechanism for tilting the laths from an extreme position (laths closed) then returning to the extreme position. In the case of operation by monocommand, the tilting lath cycle is included in the cycle of retraction / extension

3.8
drive
motor and other components which control the movement of the curtain

NOTE Examples of components are gears, controls and brakes.

3.9
rated torque
torque assigned to the drive by the manufacturer of the drive

NOTE The torque is expressed in Nm.

3.10
juddering
movement of the curtain in a series of small jerks when the operation is continuous

4 Test conditions

4.1 Definition of test samples

For testing a range, the samples tested are those specified in tests measuring the operating effort in EN 13527: dimensions of the test sample, exit positions of the operating mechanism.

4.2 Test preparation

The sample is set up for the test in its operating position, fully equipped, with all necessary operating mechanisms including handle, guide rails for the curtain, etc., and projection mechanism if exists. This is mounted on the test rig according to the conditions described in 4.2 of EN 13527:1999.

Curtains which can be projected (roller shutter, venetian shutter, etc.) are in the projected position with their projection mechanisms locked or blocked.

If the product cannot be extended or retracted when in the projected position, the manufacturer shall provide a warning.

If fitted, non automatic locks or bolts to secure the curtain are left unlocked or left in place when the locking / unlocking is automatic.

4.3 Test equipment

4.3.1 General

All parts of the test rig and operating mechanisms shall ensure that the curtain and the slats are operated as they would be in reality. They complement the operating mechanisms for test purpose, e g hydraulic, pneumatic or electric motors and linear pistons, or all other mechanisms which are compatible with:

— the operating speeds and rest periods ;

— the mass of the curtain to put into motion ;

— the forces of friction incurred ;

— the operating force ;

— the inertia effect if it occurs in the case of linear operation by the operating mechanism ;

— the duration of the test.

The equipment for operation may be an automation reproducing human movements.

4.3.2 Types of operation (reminder)

4.3.2.1 Operation by rotation of the mechanism

— gear with crank handle,

— winch with handle (cord, cable belt, chain),

— wand or rod (specifically for tilting of the laths in the case of an internal blind).

4.3.2.2 Operation of the mechanism producing movement in one direction

— Open operating mechanism:

pull by belt, cord, with or without reel;

— Endless operating mechanism:

pull by cord or chain;

— Direct pull:

pull with hand, wand or rod, lever (only in the case of tilting laths in wing shutters).

4.3.2.3 Power operation

The equipment for operation consists of the drive provided with the product.

4.4 Measuring equipment

— Measuring devices :

- to measure force and torque, accurate to ± 3%,
- to determine widths, accurate to ± 1 mm,
- to measure angles, accurate to ± 2°;

— cycles counter.

5 Principle of the test

5.1. Extension and retraction test

5.1.1 General

Carrying out of the retraction and extension cycles specified for the particular class aimed (or until failure occurs) departing from the fully extended position with the help of suitable test equipment in the conditions described in 5.1.2 to 5.1.5 and complying with the reference velocity and rest times at the end of phases given in 5.3.

5.1.2 Product operated by direct pull and endless mechanism

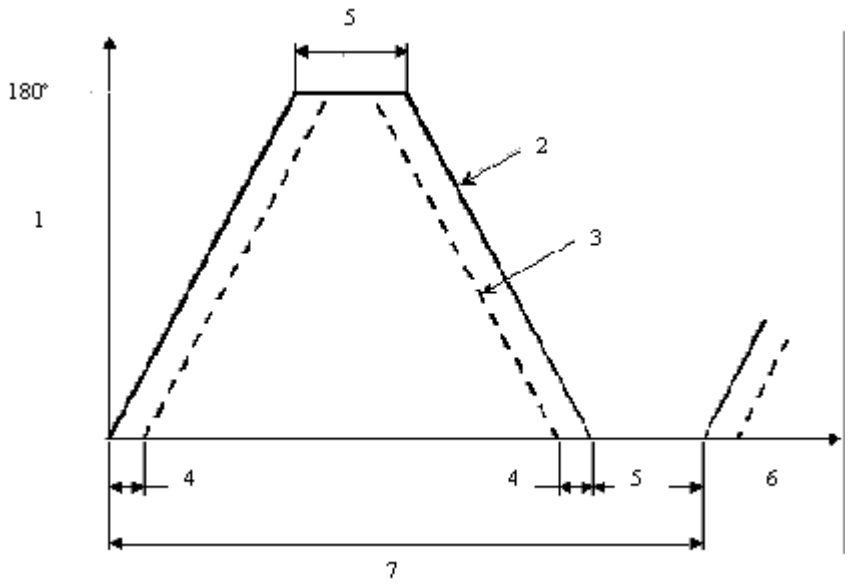
The test equipment stops the movement of the curtain when it reaches a position of 20 mm from the end of the phase allowing the eventual overcoming of the effect of inertia.

When the effect of inertia does not exist (ie. the mass in motion is too weak) the pull stops equally at 20 mm from the end of extension and retraction.

Case of wing shutter (see Figure 1)

Each leaf has a full opening of about 180°, the end of the phase is effectively free at 20 mm.

In the case of two leaves, in retraction, the "closing" leaf is operated first, then the secondary leaf ; when extending the operation is carried out in the reverse order using the 20 mm rule, the timing of the phases being determined to allowing freedom of movement of the two leaves.



Key
1 Opening angle
2 Primary leaf or closing leaf
3 Secondary leaf
4 Timing of phase
5 Rest time
6 Time
7 One cycle

Figure 1 — Operating sequence for double wing shutter

Case of venetian shutter

Operation is carried out panel by panel on the articulation axis between the panel at the extreme edge maintained in the plane of extension and the second panel onto which the others are folded.

5.1.3 Open operating mechanism

In order to take into account the inertia effect, the test equipment is furnished with a mass M applied to the test motor and to the curtain as shown in Figure 2. The same type of belt (or cord) shall be used for operating the curtain (belt 1) and for the reel (belt 2). The mass is calculated according to the following equation :

$$M = \frac{\text{Mass curtain}}{10} + 2 \text{ kg} \qquad (1)$$

NOTE The test described requires the use of a belt longer than that used to operate the curtain.

In the case of use of an inertial reel not activated during the test, the test is carried out with the inertial reel de-activated. The test of the internal reel is carried out separately according to the test method specified in annex A.

Each cycle is made up in the following manner :

— blind or shutter retracted,

— extension phase of the curtain;

- the reel permits a sufficient unrolling of the belt or cord,

- the bottom end stop determines the fully extended position of the curtain and slows down the motor to allow belt 1 to allow about 100 mm more than the necessary travel. At the full extension of the curtain, mass M comes to a rest on an intervening surface or on the ground;

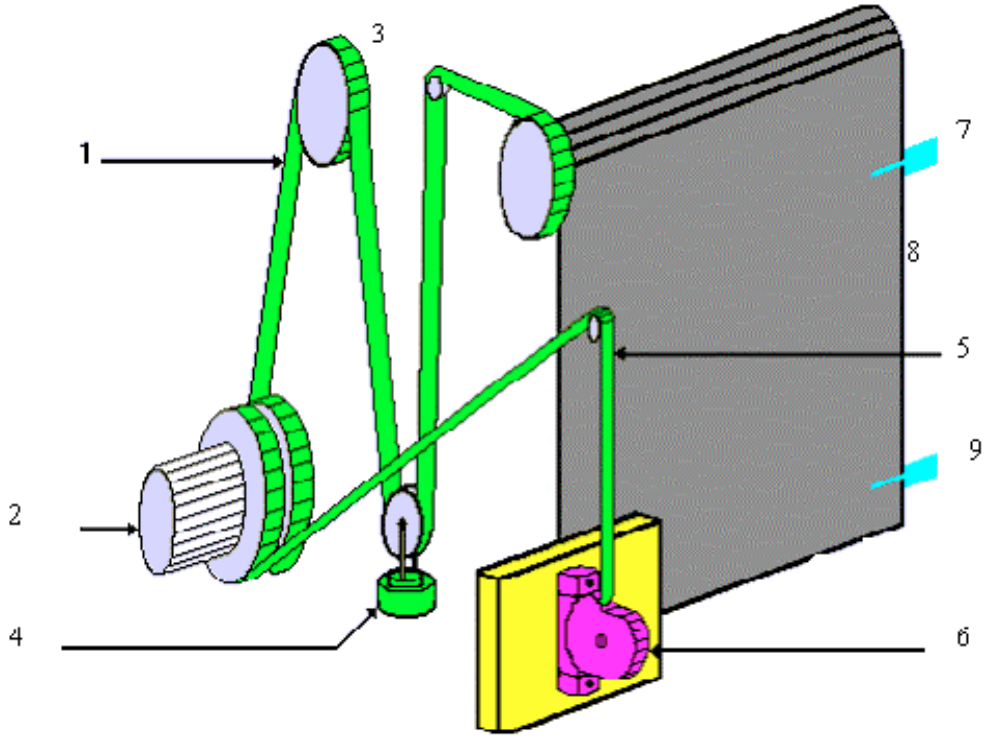
— stop,

— retraction phase of the curtain;

- allow the reel to achieve the accumulation of belt 2,

the top end stop determines the full retraction position of the curtain and delays the stopping of the motor so that the mass raises itself at least 100 mm;

— stop.



Key

1 Belt 1	6 Reel
2 Drive	7 End stop-top
3 Guide belt	8 Curtain
4 Mass M	9 End stop-bottom
5 Belt 2	

Figure 2 — Principle of the test for operation by open operating mechanism with reel

Alternative test method

Use of a mechanical device (automaton) to reproduce human action in alternative to that described by Figure 2.

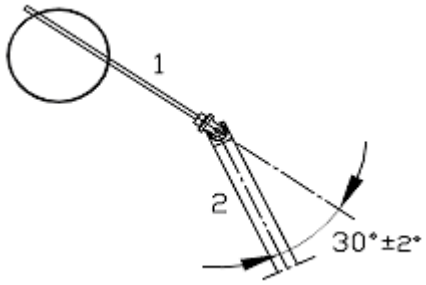
5.1.4 Operation by rotation of the mechanism

The test equipment is linked to the handle specified by the manufacturer.

The exit position of the joint makes an angle with the axis of the crank of :

— 30° in the case of a single universal joint gear (see Figure 3a) ;

— 60° in the case of a double universal joint gear (see Figure 3b).



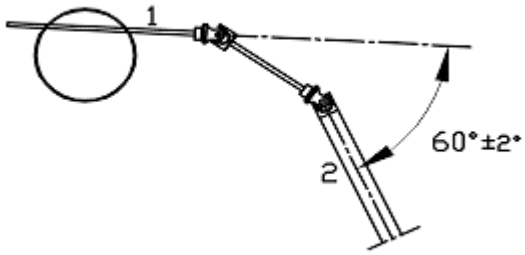
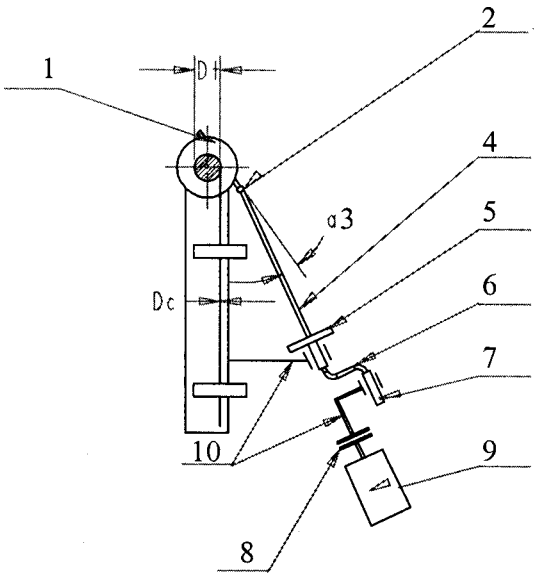


Figure 3a - Single universal joint gear **Figure 3b - Double universal joint gear**

Key
1 Input axis of gear
2 Crank

Figure 3 — Installation of the gear with crank handle illustrating gear exits

The operating motor is set at the end of the crank handle with an adapter so that the shaft of the motor is colinear with the axis of the crank. The adapter allows the rotation of the operating handles (see Figure 4).



Key
1 Gear
2 Joint
3 Angle α of the joint outlet with crank axis
4 Crank
5 Mass of 3 kg
6 Handle
7 Grip handle
8 Limitation torque
9 Motor
10 Adapter

∝ = 30° : joint with universal single joint
∝ = 60° : joint with universal double joint

Figure 4 — Test rig for endurance test

The crank is operated :

— either in the plane made by the output of the driving axis and the crank, at right angles to the plane of the curtain (see Figure 5a),

— or in the plane making an angle of $(45\ ^{+4}_{0})°$ in the case of a lateral exit (see Figure 5b).

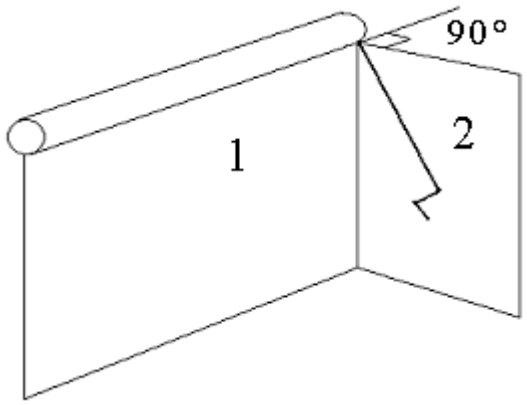


Figure 5a : At right angles to the plane of the curtain

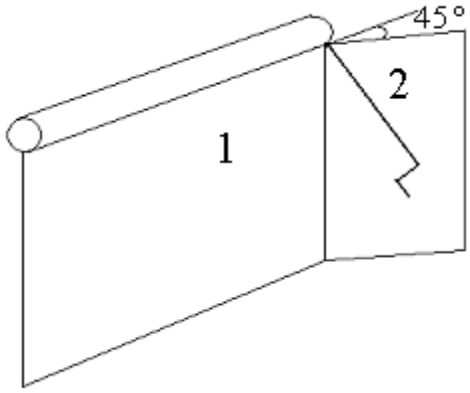


Figure 5b : In a plane making an angle of 45° with the plane of the curtain

Key
1 Plane of the curtain
2 Operating plane of the crank

Figure 5 — Installation of the gear with crank handle illustrating the two operating planes of the crank

A mass of $(3\ ^{+0,1}_{0})$ kg is applied to the lower part of the crank through the upper portion of the crank handle.

In the case of end stops external to the product, the test equipment requires a system allowing to apply to the end stop a force corresponding to the maximum effort of the class obtained by the product.

The positions of the end of extension and of the end of retraction are defined by using the technical instructions of the manufacturer.

5.1.5 Power operated operation

The test equipment consists of the drive with which the shutter or blind is equipped.

The phases of extension / retraction are set in order to activate the end stop devices (of necessity part of the power operated product) taking into account possible drift of the end stops.

5.2 Test for tilting the laths

5.2.1 General

With the product in the fully extended position, the test objective is to reach the number of cycles for tilting the laths as prescribed for the class aimed or until failure.

5.2.2 Carrying out of the phases

The phases of opening and closing the laths are carried out at the reference velocity.

The test equipment requires a system allowing application at the end of the opening and closing of a force corresponding to the maximum effort of the class obtained by the product.

In the case of monocommand, for a aimed class, half of the cycles are carried out during the extension / retraction test, the half remaining are carried out afterwards, the curtain being in a position allowing the carrying out only of these tilt cycles.

5.3 Test speed and rest time between the phases

The test speed called reference velocity shall be reached within the first 20 % of the travel and is maintained until the end of phases conditions are achieved :

— direct pull and endless mechanism : stop the motorization at 20 mm from the end of the phase ;

— open operating mechanism : stop the motorization in the conditions described in 5.1.3 ;

— operation by rotation of the mechanism : stop the motorization in order to obtain the stop effect at the end of the phases as described in 5.1.4 ;

— power operated operation : stop the motorization at the end stops ;

— tilting the laths : stop the motorization in order to obtain the stop effect at the end of the phases as described in 5.2.2.

Table 1 specifies the reference velocities by type of operation.

Table 1 — Reference speeds

Operation of curtain or laths	Reference speed
Gear with crank handle winch with handle wand or rod	60 rpm ± 10 rpm
Cord or belt (open)	15 m/min ± 5 m/min
Cord or chain (endless)	15 m/min ± 5 m/min
Direct operation hand, wand or cord, lever	15 m/min ± 5 m/min
Power operated	That of the drive

The rest time per phase is specified by the manufacturer of the product.

6 Test

6.1 General

Unless otherwise specified, samples shall be tested in its as-received condition, a temperature of 23°C ± 5°C. Carry out, if required, lubrication as specified by the manufacturer.

6.2 Pre-test

In order to validate the test equipment, carry out five operating cycles of the curtain and, when suitable, five cycles of tilting the laths ; the installation shall not impede the movement of the curtain or the laths or hardware involved.

Reset the cycles counter to zero.

6.3 Initial measurements

The following measurements shall be taken :

a) the travel of the curtain or the tilting of the laths in degrees or millimetres for angular or linear movement ;

b) the marking of special points called datum points allowing the pointing of out changes after the repeated operation cycles with particular attention to deterioration of the belt / tape, cord, in relation to the brake ;

c) for the operating mechanisms other than power operated, the operating force, measured in accordance with EN 13527.

6.4 Testing

Carry out the sequence of extension / retraction cycles, including the tilting of the laths cycles in totality or remaining in the case on monocommand.

The number of cycles the class aimed is defined in prEN 13120, prEN 13561, prEN 13659.

Examine periodically the conditions of the test sample. If specified, carry out lubrication.

The test is completed either when failure occurs or when the specified number of cycles of the class aimed has been carried out. If the manufacturer wishes it, the test can be continued until the product breaks.

6.5 Final measurements

Repeat the measurements in 6.3 a), b), c) .

7 Expression of results

Record :

— the number of cycles completed and the class obtained ;

— the travel of the curtain or the tilting of the laths ;

— all the displacements of the curtain or of the laths, of the operating mechanism at the datum points (especially any slipping of the belt type, cord at the level of the brake) ;

— the operating forces measured before (Pi) and after (Pe) the test including the class obtained ;

— the variation in percentage of the operating force (V) calculated as follows:

$$V(\%) = 100\left(\frac{Pe}{Pi} - 1\right) \qquad (2)$$

8 Test report

The test report shall include the following :

a) name and address of the testing laboratory and the location where the test was carried out when different from the address of the testing laboratory ;

b) number, title and date of issue of this standard ;

c) identification of the test report and of each page, and the total number of pages of the report ;

d) name and address of the client ;

e) date(s) of test ;

f) details of the test method and any deviation from this standard ;

g) all necessary details to identify the blind or shutter ;

h) all relevant details concerning the type, specified dimensions, materials, form and construction of the blind or shutter, and its conformity with drawings provided by the manufacturer ;

i) full details, hardware, fittings and fixings of the test sample ;

j) locking conditions (whether automatic or not) ;

k) frequency of lubrication and the importance of any adjustments carried out during the test ;

l) laboratory storage and testing conditions ;

m) results expressed as in clause 7 ;

n) details of wear or failure of the test sample and when observed including the coming of juddering of the curtain.

Annex A
(normative)

Suitability for use of inertial reels for belt, tape or cord

A.1 General

This annex defines the tests to be carried out on brakes of the reels for belt, tape or cord when used on open operating mechanisms if not carried out during the endurance test.

A.2 Principle of the test

Carrying out cycles of functioning of the brake of reel with the help of the test equipment illustrated in Figure A.1, namely :

— 20000 cycles with an effort of traction of 90 N applied to the belt, tape or cord.

A.3 Test rig (See Figure A.1)

— Characteristics of the spring : its spring ratio and its length allow reaching of an effort of traction of 90 N at the end of zone B,

— Characteristics of the belt, tape or cord : those specified by the manufacturer of shutters or blinds or those provided with the reel,

— Non accumulated length of belt, tape or cord : in between 200 mm and 400 mm, (taking into account the angle α of locking of the brake, the characteristics of the roller spring of the reel and the length of the spring selected).

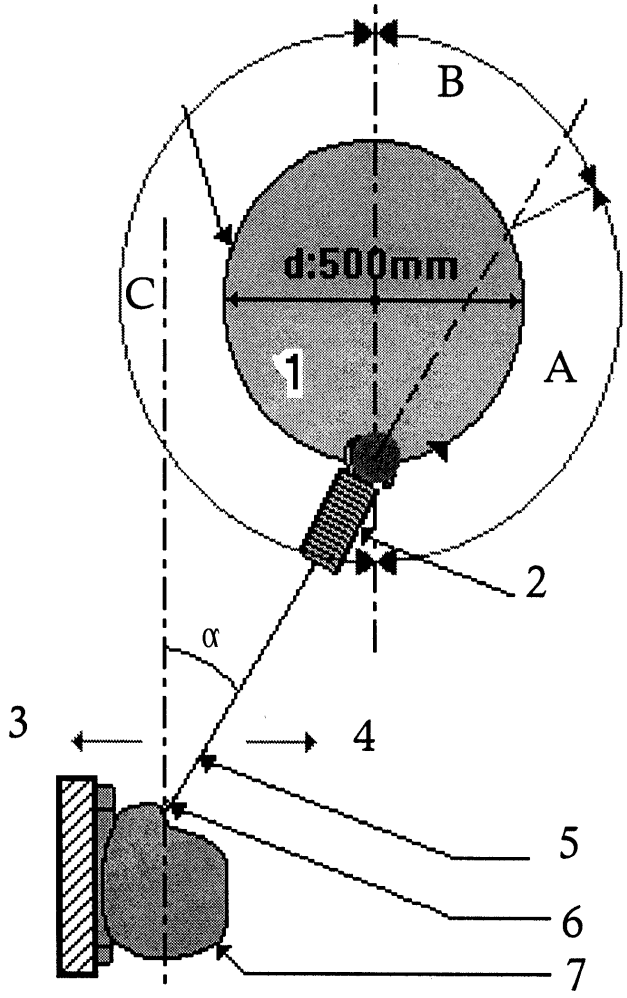
A.4 Testing

— Tests are carried out at the ambient temperature 23°C $\pm$ 5°C,

— Rotating speed of the disc : 60 rpm $\pm$ 5 rpm,

— Carrying out of sequence of 20 cycles minimum continuously. The rest time between two sequences is defined by the manufacturer or according the operating instructions,

— Change of belt, tape or cord : every 5000 cycles.



Key

1	Motorized disk	5	Belt, tape or cord
2	Tensile spring	6	Reel brake
3	Unlocking the brake	7	Reel
4	Locking the brake		

α is the angle of locking the brake

zone A is the unlocking the brake area 200 mm to 400 mm of belt

zone B is the locking the brake area + tension of spring

zone C is the release of spring and reeling of belt area

Figure A.1 - Test rig for reel brake

A.5 Result of the test

After 20000 cycles :

— the brake device shall allow the blocking of the belt, tape or cord, without slippage ;

— the reel being reinstalled on the shutter, it is verified by manual operation if it is possible to carry out a complete cycle of extension/retraction of the curtain.

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