BRITISH STANDARD

BS EN
14203:2004

Blinds and shutters — Capability for use of gears with crank handle — Requirements and test methods

The European Standard EN 14203:2004 has the status of a British Standard

ICS 91.060.50

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 14203:2004.

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:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 24, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 March 2004

ISBN 0 580 43437 0

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14203

February 2004

ICS 91.060.50

English version

Blinds and shutters - Capability for use of gears with crank handle - Requirements and test methods

Fermetures pour baies équipées de fenêtres, stores intérieurs et extérieurs - Aptitude à l'emploi des treuils avec manivelle à tige oscillante - Exigences et méthodes d'essai

Abschlüsse und Läden - Gebrauchstauglichkeit von Getrieben mit Kurbel - Anforderungen und Prüfverfahren

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

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of 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.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14203:2004: E

Contents

page

Foreword

This document (EN 14203:2004) 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.

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 functional performances of mechanical drive systems with crank handle for shutters, external blinds and internal blinds and the supply conditions of these systems between blinds and shutters manufacturers on one hand, and operating systems manufacturers on the other, for the following four families of use :

— roller shutters
— venetian blinds
— folding arm awnings
— other awnings and blinds

Excluded from this standard are gears with crank handle fitted to power operated products and used as manual override actuators.

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, *Internal blinds — Performance requirements*.

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

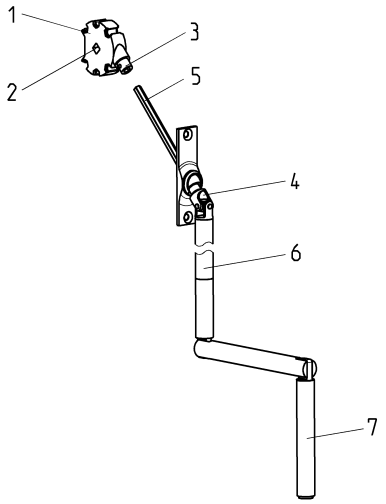
prEN 13561, *External blinds — Performance requirements including safety*.

prEN 13659, *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 and the following apply.

drive system with a crank handle — Main components (see Figure 1)
they are made up of the :
— gear ;
— joint, single or double ;
— drive-shaft ;
— crank, extendable, detachable or not, with or without torque limitation, etc. ;
— operating handle, detachable or not, without curved lower part, articulated, etc. ;
— limit stop systems if they exist, incorporated or not in the gear ;
— crank handle clip.



Key

1	Gear	5	Crank (rotation rod)
2	Output	6	Crank handle/operating
3	Input	7	Handle
4	Joint		

Figure 1 — Description of a gear with crank handle

4 Characteristic parameters of gear with a crank handle

They are as follows :

a) Nominal torque on the output shaft of the gear, M_S. This feature, expressed in Nm, is guaranteed by the gear manufacturer through the tests specified in this standard, and for one of the four following families of products:

— roller shutter ;
— folding arm awning : M_S is then specified by 2 values ;
— venetian blind ;
— other types of awnings and blinds.

b) Reduction ratio r of the gear:

$$r = \frac{N_1}{N_2} \text{ and } r < 1 \qquad (1)$$

where

— N_1, is the number of revolutions on the gear output
— N_2, is the number of revolutions on the gear input

c) Different efficiencies $_1$, ..., $_k$ of the components of the gear,

d) Force *F* to be applied to the crank handle for generating the output torque M_S.
F, expressed in N, shall be lower than the maximum values of the operating efforts specified in prEN 13120, prEN 13561 and prEN 13659.

e) The arm of the crank handle R, expressed in m, with R 0,20 m.

These characteristics are linked by the formula :

$$M_s = \frac{F \ R \ _1 \cdots \ _k}{r} = \frac{F \ R}{r} \qquad (2)$$

5 Principle of the tests

Checking the functional properties of the different components after a forced operation test and an endurance test consisting of cycles, raising and lowering movements, of a nominal load *P* that corresponds to the nominal torque M_S given by the gear manufacturer, under the conditions in clause 6.

6 Test rig

6.1 Test rig characteristics

The test rig consists of a cross beam (frame) with width over or equal to 0,9 m and sufficient height to enable the test load to hang freely during the whole test. The transverse beam and its fixings shall be sufficiently rigid to withstand the forces and without deformations that could affect the results.

6.2 Gear with crank handle for roller shutter

6.2.1 Test equipment

The transverse beam is made of the roller tube of the smallest diameter D_t from the roller tubes specified by the gear manufacturer in his technical instructions for the tested gear with crank handle.

On that roller tube two drums are fitted with diameter D_e = 2,5 x D_t respectively located at the 1/3 and at the 2/3 of the cross-beam width (see Figure 2).

The drums shall be wide enough to allow the cords or cables supporting the load to coil round the constant diameter D_e.

6.2.2 Nominal test load

The nominal test load *P* is determined by the following formula :

$$P = \frac{2\ M_s}{D_e + D_c} \quad [\text{N}] \tag{3}$$

where

— M_S , in Nm, is the output torque given by the gear manufacturer
— D_e ,in m, is the diameter defined in 6.2.1
— D_c ,in m, is the diameter of the coiling cord or cable measured when loaded

The test load *P* is applied equally ($\frac{P}{2}$) to each third of the test rig frame.

The travel of the testing load is 2 m minimum.

Dimensions in m

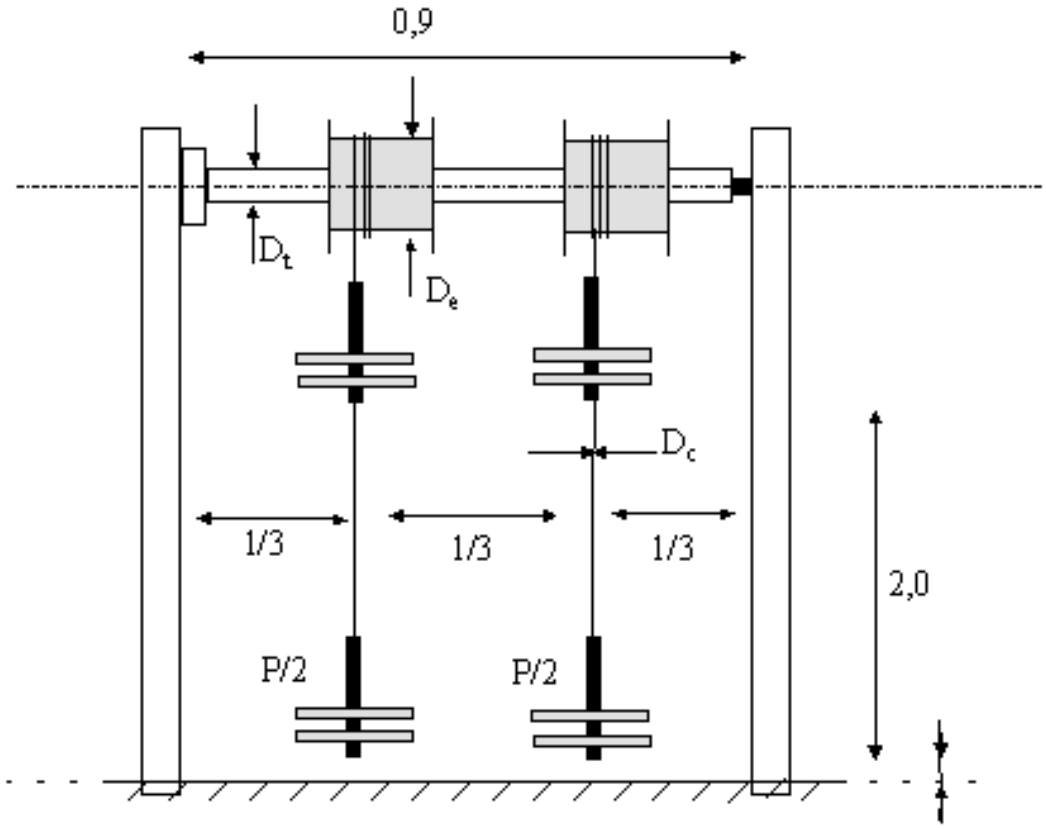


Figure 2 — Test rig for gear with crank handle for roller shutter

6.3 Gear with crank handle for venetian blinds

6.3.1 Test equipment

The transverse beam is made of a U profile in which the gear to be tested and its bracket can be inserted. The profile is designed to resist torsions and lateral pressures created during the test (see Figure 3).

Cords and cables supporting the load coil during the test round a roller tube of diameter D_t.

Diameter D_t is equal to the diameter of the circle inscribed in a square, the side of which being equal to the largest size of the smallest of the brackets specified by the gear manufacturer fit for use with the gear fitted in the test gear with crank handle, multiplied by the factor 0,6.

6.3.2 Nominal test load

The nominal test load P is applied by means of two elastic devices placed respectively at the 1/3 and 2/3 of the frame (see Figures 3, 4 and 5).

These devices allow the reaching of a load with a linear variation from 0 to the value P with :

$$P = \frac{2\ M_s}{D_t + D_c} \quad [\text{N}] \tag{4}$$

where

— M_S, in Nm, is the output torque given by the gear manufacturer
— D_t, in m, is the diameter as defined in 6.3.1
— D_c, in m, is the diameter of the coiling cord or cable measured when loaded

The travel of the pulleys is 1 m minimum.

Dimensions in m

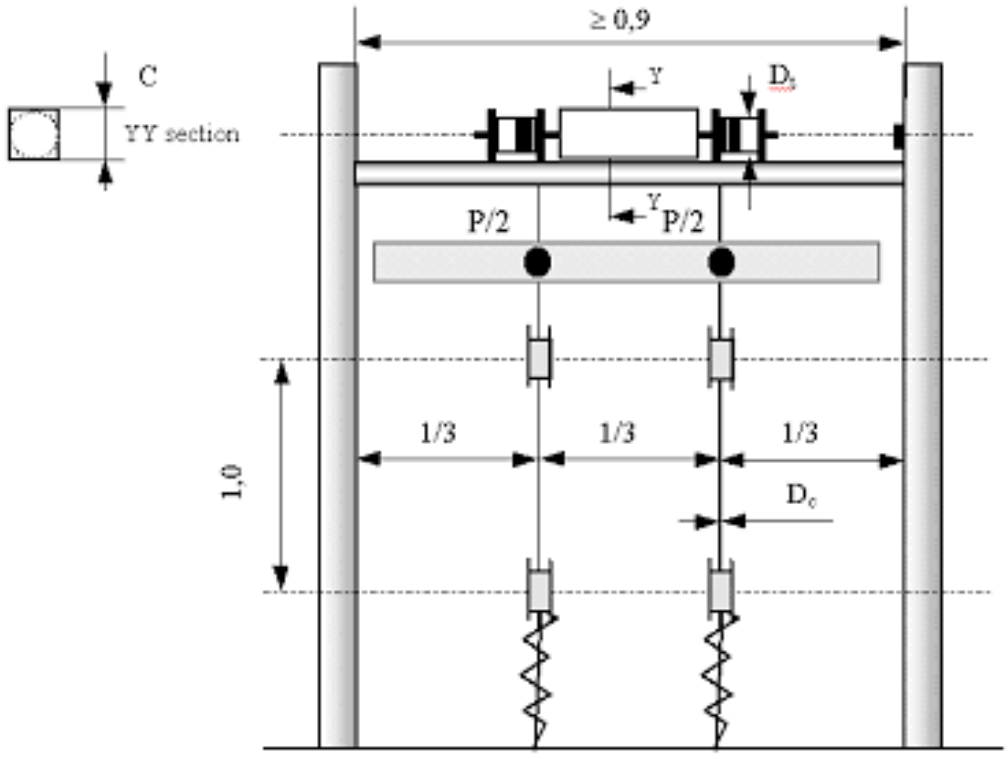
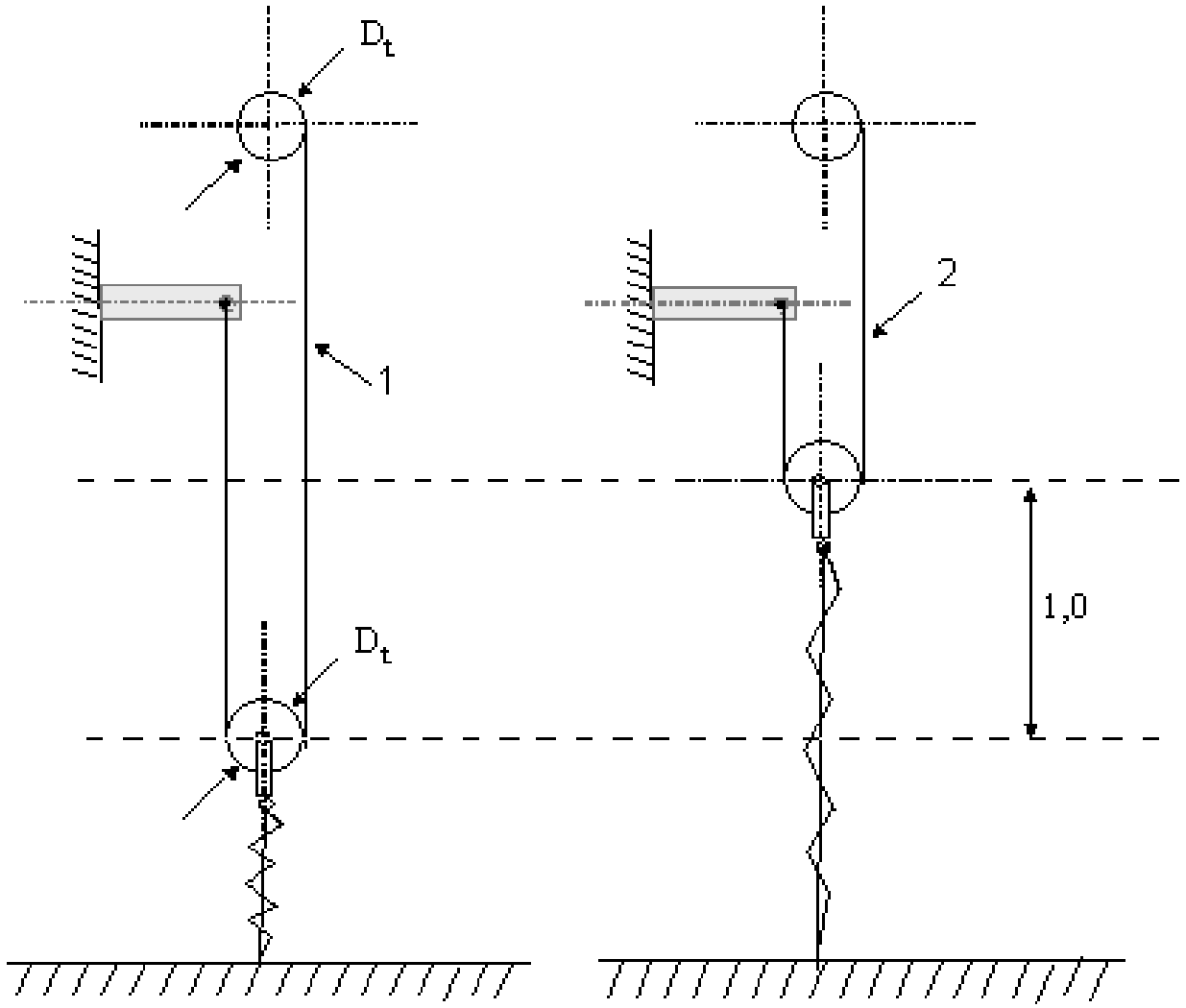


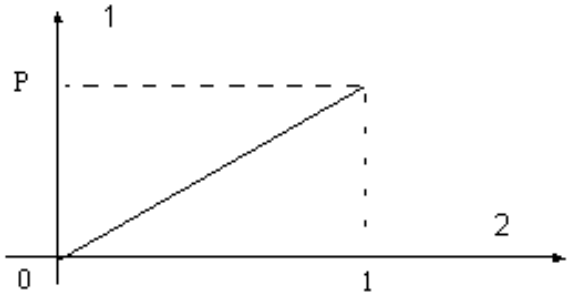
Figure 3 — Test rig of gear with crank handle for venetian blind

Dimensions in m



Key
1 Load = 0 N
2 Load = P/2 N on each cable

Figure 4 — Half test rig of gear with crank handle for venetian blind



Key
1 Load value
2 Travel of the pulley in m

Figure 5 — Variation of the load P for testing gear with crank handle for venetian blind

6.4 Gear with crank handle for folding arm awning

6.4.1 General

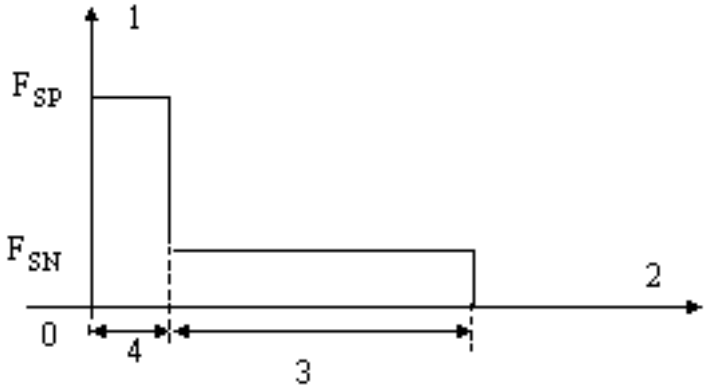
Gear with crank handle intended to operate a folding arm awning is defined by the following parameters (see Figure 6).

a) Nominal torque

— M_{SN}, in Nm, is the output torque, applied during 90% of the travel.
— M_{SP}, in Nm, is the "peak" output torque, applied during 10 % of the travel, needed to unlock the arms.

b) Effort in the crank handle

— F_{SN} in N, is the maximum value of the effort, needed to operate during 90% of the travel.
— F_{SP}, in N, is the maximum value of the "peak" effort, during 10 % of the travel, needed to unlock the arms.



Key
1 Output value torque
2 Travel of the awning
3 90% of the travel
4 10% of the travel

Figure 6 — Diagram of the variation of the output torque during the operation of a folding arm awning from the totally extended position

6.4.2 Test equipment

The transverse beam is made of the roller tube of the smallest diameter D_t from the roller tube specified by the gear manufacturer in his technical instructions for the gear with crank handle.

6.4.3 Test loads

The test loads are equally distributed to each third of the test rig frame (see Figure 7 and Figure 8).

Test loads are applied in the following manner :

— a nominal load P_N with a total travel of 2 m minimum **;**
— an overload (P_P-P_N) allowing to simulate the peak of torque applied during the last 0,2 m of the travel of load P_N .

The values P_P and P_N are determined using the following formulas :

$$P_N = \frac{2\ M_{SN}}{D_t + D_c} \quad [N] \tag{5}$$

$$P_P = \frac{2\ M_{SP}}{D_t + D_c} \quad [N] \tag{6}$$

where

— M_{SN}, in Nm, is the output torque, given by the gear manufacturer
— M_{SP}, in Nm, is the "peak" output torque, given by the gear manufacturer
— D_t, in m, is the diameter as defined in 6.2.1
— D_c, in m, is the diameter of the coiling cord or cable measured when loaded

F_{SN} and F_{SP}, in N, are the operating efforts to be applied to the crank handle needed to lift respectively the load P_N and the load P_P, measured according to EN 13527 on the test rig shown in Figure 7.

Dimensions in m

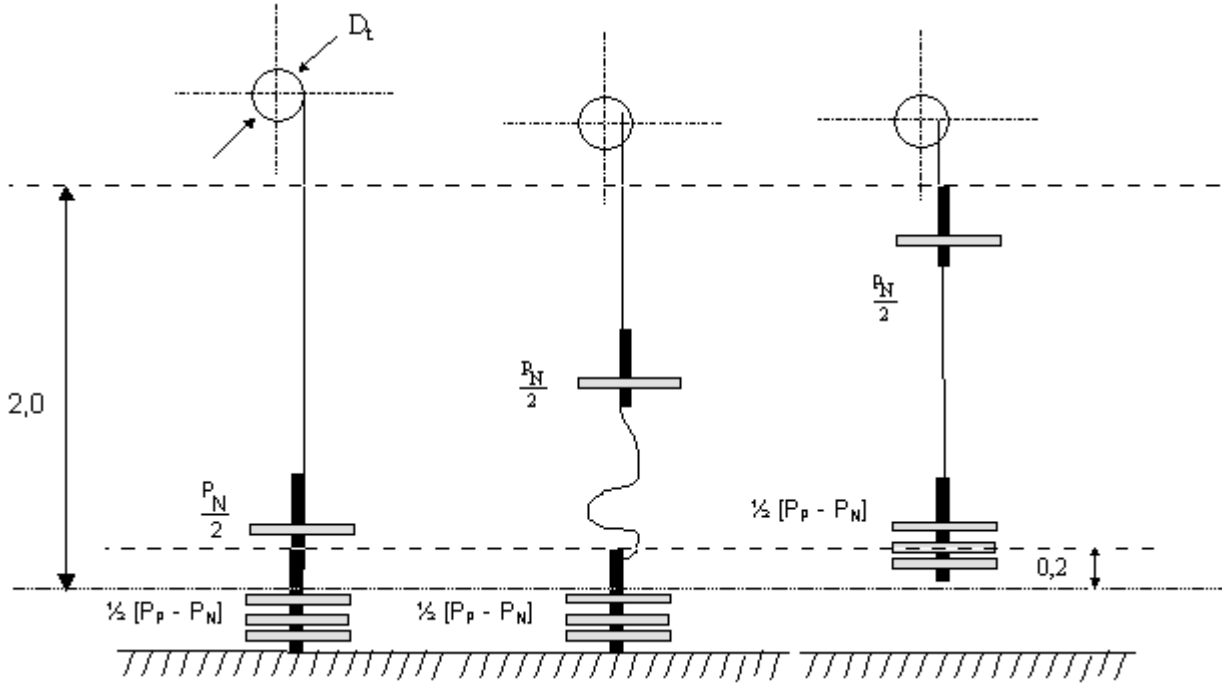
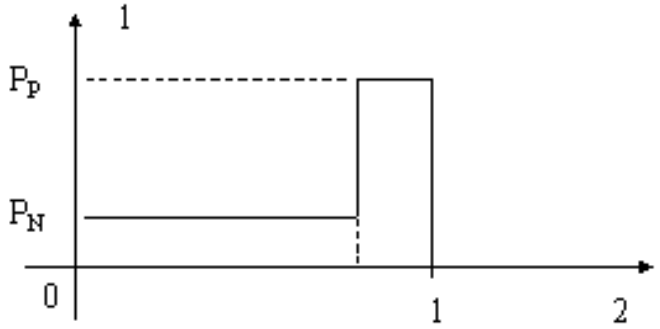


Figure 7 — Half test rig of gear with crank handle for folding arm awning



Key
1 Load value
2 Travel of load P_N

Figure 8 — Variation of the load *P* (P_N , P_P) for testing gear with crank handle of folding arm awning

6.5 Gear with crank handle for other types of awnings and blinds

6.5.1 Test equipment

The transverse beam is made of the roller tube of the smallest diameter D_t from the roller tubes specified by the gear manufacturer in his technical instruction for the gear with crank handle.

6.5.2 Nominal test load

The nominal test load *P* is determined by the following formula:

$$P = \frac{2\ M_s}{D_t + D_c} \quad [N] \qquad (7)$$

where

— M_S, in Nm, is the output torque given by the gear manufacturer
— D_t, in m, is the diameter as specified in 6.5.1
— D_c, in m, is the diameter of the coiling cord or cable measured when loaded

The test load *P* is distributed equally to each third of the test rig frame (see Figure 9).
The travel of the testing load is 2 m minimum.

Dimensions in m

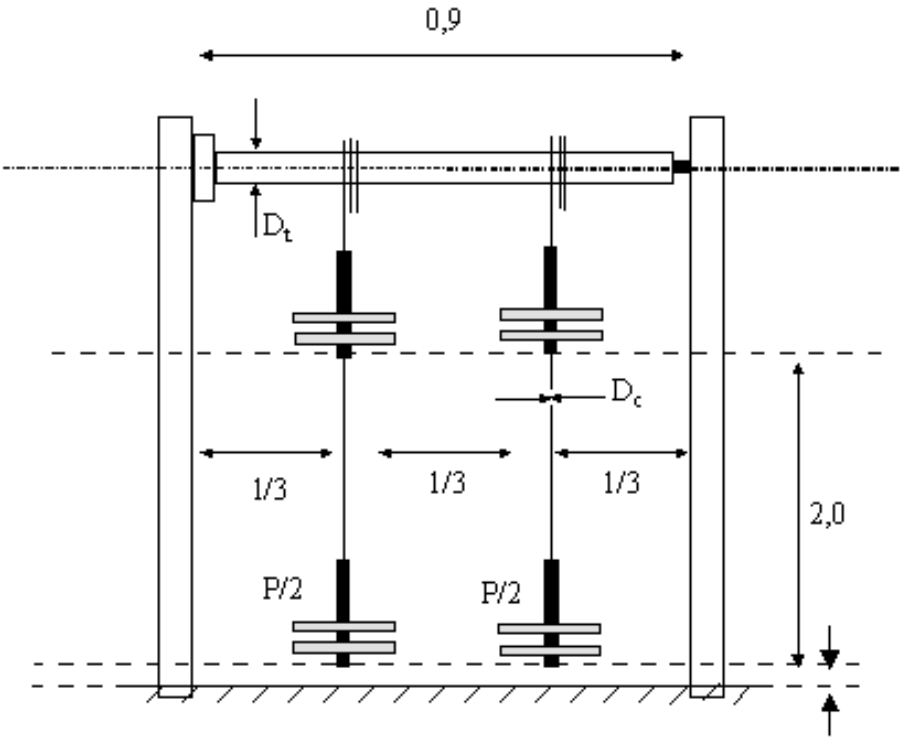


Figure 9 — Test rig of gear with crank handle for other types of awning and blinds

6.6 Installation of the gear

The gear with crank handle is installed according to the manufacturer's installation instructions. The gear is mounted at one end of the beam (roller tube or U profile). The exit position of the joint makes an angle with the axis of the crank of :

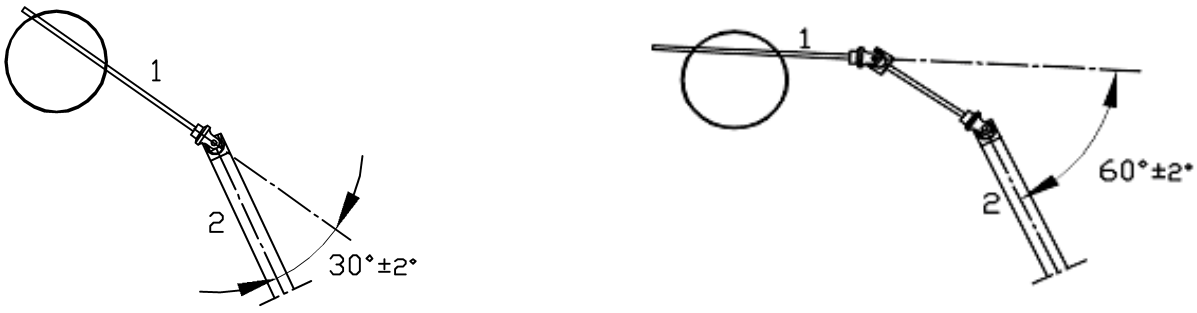
— 30° 2° in the case of a single universal joint gear (see Figure 10 a) ;
— 60° 2° in the case of a double universal joint gear (see Figure 10 b).

The test motor is set at the end of the crank handle with an adapter so that the shaft of the motor is collinear with the axis of the crank. The adapter allows the rotation of the operating handles.

The crank is operated :

either in the plane made by the output of the driving axis and the crank, orthogonal to the plane of the frame (see Figure 11 a) ;

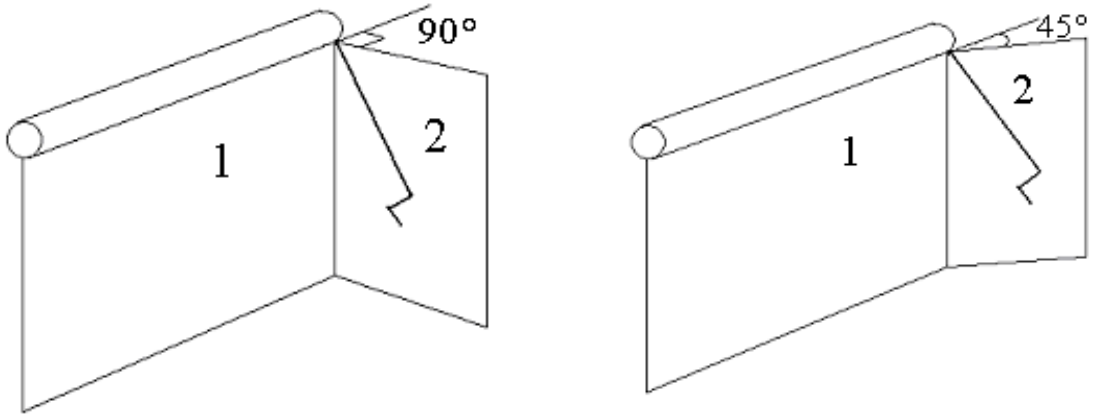
or in the plane making an angle of $(45\ ^{+4}_{0})°$ with the plane of the frame (see Figure 11 b).



a) Case of a single universal joint gear **b) Case of a double universal joint gear**

Key
1 Drive shaft
2 Crank handle

Figure 10 — Installation of the gear with crank handle illustrating of gear exits



a) Orthogonal to the plane of the frame **b) In the plane making an angle of 45° with the plane of the frame**

Key
1 Plane of the frame
2 Plane of the crank handle

Figure 11 — Installation of the gear with crank handle illustrating the two operation planes of the crank

A mass of 3 kg is applied to the lower part of the crank through the upper portion of the crank handle.

6.7 Conditions of testing

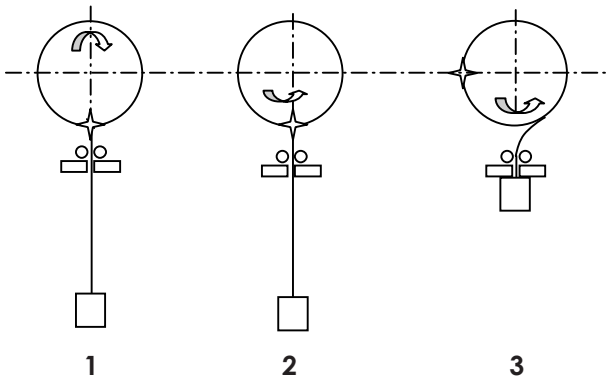
Tests are carried out at an ambient temperature 23°C 5°C.

7 Forced operation test of gears (see Figure 15)

The forced operation test is carried out in the following conditions :

— application of the effort of forced operation P_F of 60 N – 120 N for gear with crank handle for folding arm awning – on the crank handle in both rotating directions of the gear. The crank handle is the maximum length R of the range specified by the gear manufacturer in his technical instructions ;
— Actuation of the limit stop systems (if they exist) : the travel up and down of the load *P* is adjusted so that the limit stop systems are actuated, in the following conditions, according to the type of limit stop system.

a) Mechanical limit stop system enclosed in the gear (see Figure 12)

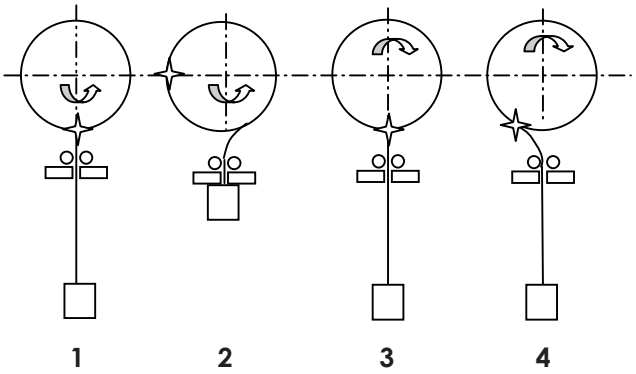


Key
1 Stop at the bottom limit stop system
2 Raising
3 Stop at the fully raised position produced by entry plate of the box

Figure 12 — Mechanical limit stop system enclosed in the gear

In case of gear for roller shutter, the load shall be laid down before the limit stop is activated.

b) Limit stop system by disengagement built in the gear (see Figure 13)

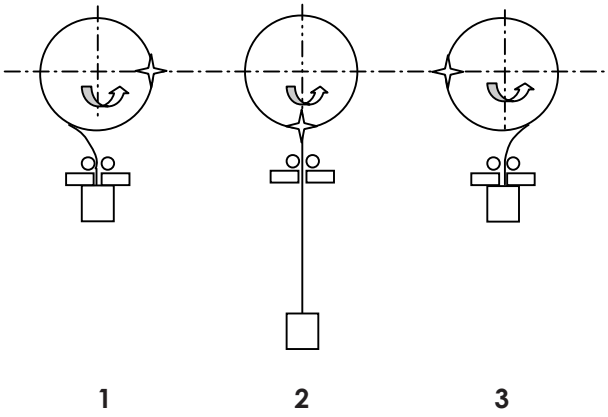


Key
1 Raising
2 Stop at the fully position produced by entry plate of the box
3 Lowering
4 Disengagement during a number of revolutions equivalent to a half revolution of the roller tube

Figure 13 —limit stop system by disengagement

In case of gear for roller shutter, the load shall be laid down before the limit stop is activated.

c) Limit stop system not enclosed in the gear (see Figure 14)



Key
1 At the fully raised position produced by entry plate of the box
2 At an intermediate position before full raising
3 Stop at the fully raised position produced by entry plate of the box

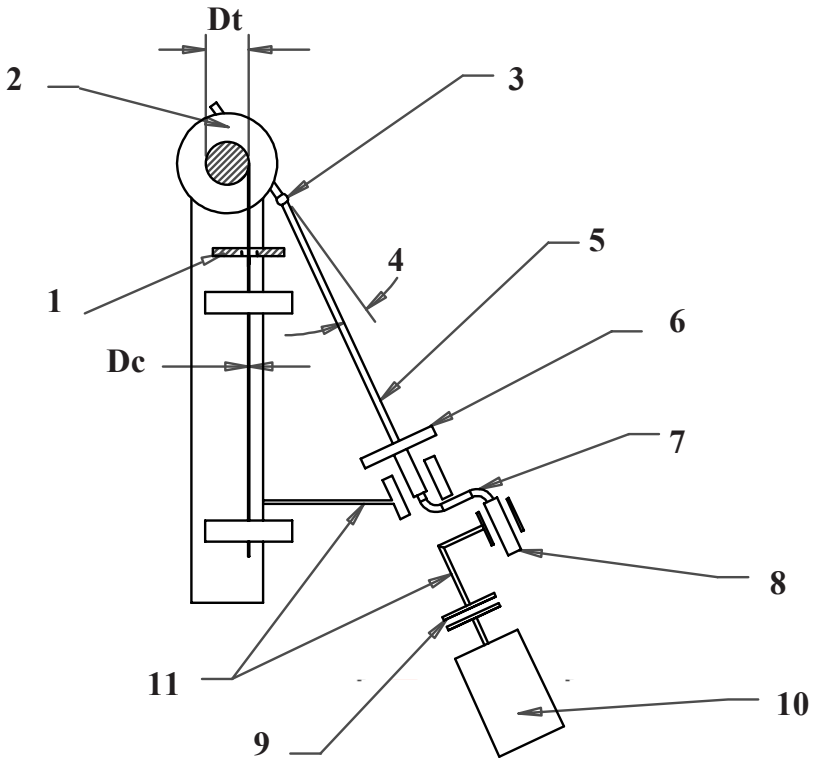
Figure 14 — Limit stop system by automatic lock

— Installation of the torque limitation system set at the value $M_F = P_F$ x R

If the gear with crank handle has an overload protection for limiting the operating force to a pre-defined fixed value (a gear, a joining piece, etc., allowing disengagement), the forced operation tests are carried out at the overload protection torque.
— motor speed : 60 rpm $\pm$ 10 rpm ;
—rest period : defined by the manufacturer ;

—number of revolutions under forced load *P* : 0,5 % of the number of cycles corresponding to the endurance class expected by the gear manufacturer (see prEN 13120, prEN 13561 and prEN 13659).

A cycle consists of an raising movement, a rest period, a lowering movement, a rest period.



Key

1 Fully raised position
2 Gear
3 Joint
4 Angle of the joint with crank axis
5 Crank
6 Mass of 3 kg
7 Handle
8 Grip
9 Limitation torque
10 Motor
11 Adapter

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

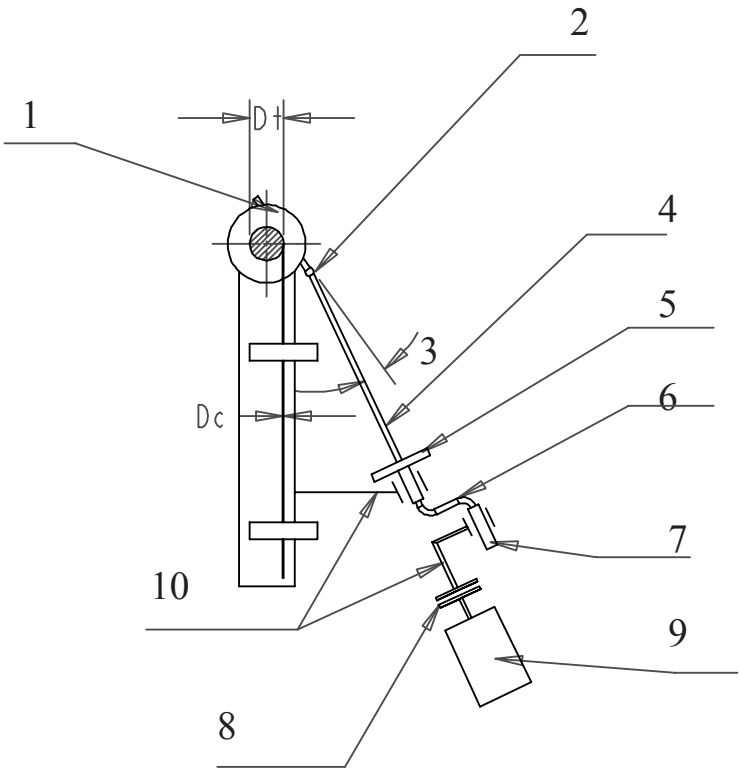
Figure 15 — Test rig for forced operation test (cross section)

8 Endurance test (see Figure 16)

The endurance test is made at the completion of the forced operation test. This consists of the carrying out, under the test load *P* corresponding to one of the four families of products, the number of cycles corresponding to the endurance class aimed (see prEN 13120, prEN 13561 and prEN 13659) :

— travel of the load *P* : 1 m or 2 m according to the family of product ;
— motor speed : 60 rpm 10 rpm ;
— rest period : specified by the manufacturer ;
— the travel of the load is adjusted so that the limit stop systems are not actuated.

A cycle consists of a raisingmovement, a rest period, a lowering movement, a rest period.



Key

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

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

Figure 16 — Test rig for endurance test (cross section)

9 Performance requirements

9.1 Before testing

Elasticity of the crank : after jamming of the joint, the elastic angular displacement of the crank, measured at the operating handle level, shall be less than 15° under the application of a force equal to 15 N or 30 N according to the operating effort class aimed, then released.

9.2 After testing

9.2.1 General

After performing the forced operation and endurance tests, the following performances shall be checked.

9.2.2 General requirements

— no visible leakage of lubricant from the gear,
— smooth operation in both rotating direction (having taken up free play),
— the operating effort remains the same,
The value F of the force to be applied to the operating handle for generating the nominal torque M_S, measured before testing, shall remain the same (tolerance of +10 % allowed),
— angular play of the gear with crank handle.
The angular play of the gear with crank handle, measured at the operating handle level, at the initiation of the movement, shall be less than 120°,
— resistance to separation.
All the fixing and articulating elements, joint fixings, links drive-in axis/joint/crank (operating handle)/handles, shall resist to a "separation" force of 200 N applied in the direction of the axis of the crank.

9.2.3 Requirements on the gear with crank handle components

9.2.3.1 Gear

— irreversibility of the gear

The action of an overload of 0,15 *P* shall not bring about a rotation of the crank.

9.2.3.2 Joint plate

The joint plate shall resist to a compression force of 80 N applied in the direction of the drive shaft.

9.2.3.3 Crank

— Staying rectilinear : the maximum deflexion of the crank shall be less than $L \ 1/100$ where *L* is the crank length,

— there shall not be any permanent torsional deformation,

— case of the extendable crank.

The crank shall be extended applying a maximum force of 50 N.

9.2.3.4 **Articulated operating handle** (see Figure 17)

The handles situated at both ends of the middle piece shall be situated inside two solid angles of 7°, not included the initial play, when the operating handle is placed in the extended position.

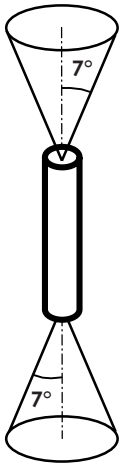


Figure 17 — Articulated operating handle in the extended position

9.2.3.5 Handles

The handles shall rotate freely, i.e. no resistance against operation.

9.2.3.6 Limit stop systems

Check that they are in working order.

9.2.3.7 Overload protection

When an overload protection exists, the value of the initial torque shall not have varied from 20 %.

10 Test report

The test report shall include the following :

a) name and address of testing laboratory and 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 report and of each page, and the total number of pages of the report ;
d) name and address of the client ;
e) date of test ;
f) details necessary for identifying the components of the gear with crank handle ;
g) conformity of the gear with crank handle with technical data provided by the manufacturer ;
h) type of joint tested (single or double universal joint), and the angles at which the joint has been tested ;
i) values of the operating handle arm R used, the nominal torque M_S (or M_{SN} , M_{SP}) and the forced operation P_F, the reduction ratio r of the gear, and the different efficiencies $_1$,... $_k$ of the components of the gear with crank handle ;
j) product family (roller shutter, venetian blind, folding arm awning or other types of awnings and blinds);
k) class of the gear with crank handle, defined by the endurance class obtained.

11 Capability for use of the components of gears with crank handle

11.1 General

The current chapter specifies the tests to be carried out on the gears, the box exits and the limit stop systems that can be used as components of gears with crank handle.

11.2 Gear test

11.2.1 General

The purpose of the tests is to validate the parameters that characterize the gear, and that are guaranteed by the gear manufacturer (nominal output torque *M*s, efficiency, irreversibility, etc.) for one of the four product families, after carrying out cycles of forced operation and endurance.

11.2.2 Dynamic efficiency of the gear

The dynamic efficiency of the gear is determined by the input torque M_E corresponding to the output torque M_S (nominal torque), and guaranteed by the manufacturer.

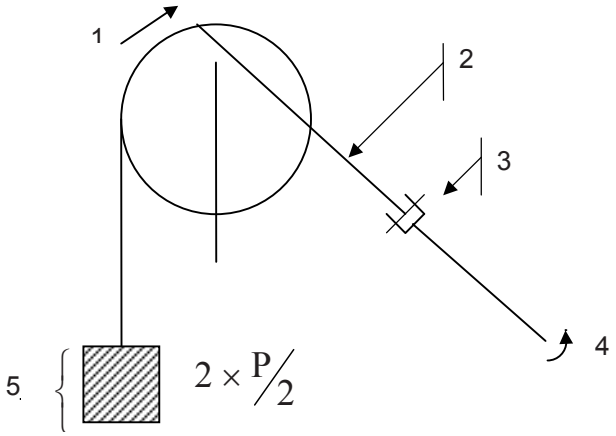
The gear is set on the appropriate test rig as defined in 6.2, to 6.5, according to one of the four product families stated.

The nominal load *P* is determined as indicated in these same paragraphs according to M_S given by the gear manufacturer.

The testing motor is directly linked to the driving axis of the gear (see Figure 18).

A device allows the measurement of the input torque M_E of the gear (the input torque M_{EN} and M_{EP} "normal" and "peak" in the case of gears for folding arm awning) when the motor rotational speed is 60 rmp $\pm$ 10 rmp.

$$M_S = P \frac{D_t + D_c}{2}$$



Key
1 Output torque M_S
2 Input torque M_S
3 Joint
4 Torque exerted by the motor
5 According to the family intended

Figure 18 — Gear testing — Principle of the test

Calculate the efficiency of the gear at the nominal output torque M_S with the formula :

$$= \frac{M_s \quad r}{M_e} \qquad (7)$$

where

r is the reduction ratio of the gear (see clause 4)

11.2.3 Forced operation and endurance tests

Forced operation and endurance tests are carried out in the conditions specified in clause 7 and clause 8 for the endurance class planned, with the load *P* corresponding to the product family stated.

The driving motor has a torque limiter fitted to the input torque M_E, for the endurance test and $M_F = P_F$ x R for the forced operation test.

After the tests, check the following :

— the irreversibility of the gear (as defined in 11.2.4),
— the good working order of the limit stop systems (when existing).

The clearance of the gear at the driving axis is noted.

11.2.4 Testing the irreversibility of the gear

The test is performed as specified in 9.2.3.1, i.e. the action of an overload of 0,15 *P* shall not bring about a rotation of the crank.

11.2.5 Test report

The test report shall include the following:

a) name and address of testing laboratory and 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 of test ;
f) reference of the gear and the details necessary for identifying it ;
g) description of the tests carried out (endurance class, values of M_S and of M_F) ;
h) efficiency of the gear at the nominal output torque M_S ;
i) product family (roller shutter, venetian blind, folding arm awning, other roller blinds) ;
j) class of the gear with crank handle defined by the endurance class obtained.

The test report describes the behaviour of the gear (irreversibility, limit stop systems if any, clearance).

11.23 Test of the joints

11.3.1 General

The purpose of the tests is to validate specific parameters of joints (efficiency), and their good working order for one of the four product families after cycles of forced operation and endurance.

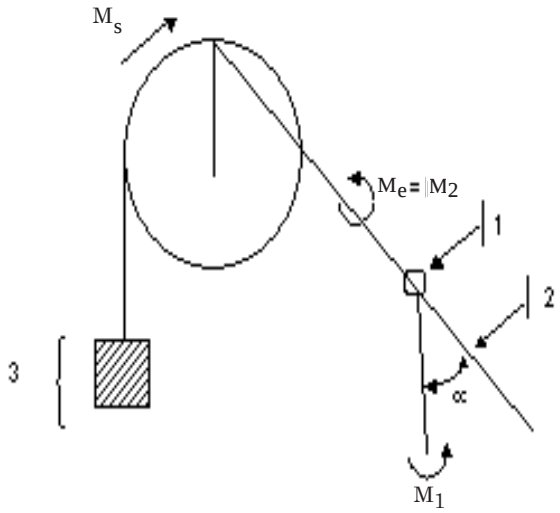
11.3.2 Dynamic efficiency of the joint

The joint is installed with a testing gear whose characteristics are known, (nominal output torque M_S, efficiency $_t$, stated product family). The gear is installed on the test rig appropriate specified in 6.1, the angle μ being equal to 30° in the case of a single universal joint, 60° in the case of the double universal joint (see Figure 10).

A device allows the measurement of the input torque of the joint M_1 when the motor rotating speed is 60 rpm $\pm$ 10 rpm. The link input of the gear/exit of the joint is made rigid for the test (input torque of the gear M_E = output torque of the joint M_2).

The efficiency of the joint $_a$ is calculated from the efficiency of the joint of the complete system joint and gear and of the efficiency $_t$ of the gear.

$$_a = \frac{}{_t}$$



Key
1 Joint
2 μ = 30° or 60°
3 According to the family intended

Figure 19 — Test of joint — Test principle

11.3.3 Forced operation and endurance tests

Forced operation and endurance tests are performed in the conditions specified in clauses 7 and 8, for the endurance class aimed. The driving motor has a torque limiter fitted to the input torque M_E for endurance test, and torque $M_F = P_F$ x R for the forced operation test.

11.3.4 Test report

The test report shall include the following :

a) name and address of testing laboratory and 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 of test ;
f) reference of the joint and the details necessary for identifying it ;
g) characteristics of the testing gear, nominal torque M_S efficiency $_t$, family of products stated ;
h) description of the tests, value of M_F chosen for the forced operation test carried out ;
i) efficiency of the joint $_a$ obtained and the operational class obtained defined by its endurance class ;
j) various angles under which the joint is tested.

The test report describes the behaviour of the joint and gives the angular clearance obtained.

11.4 Test of limit stop systems not enclosed in the gear

11.4.1 Forced operation test

The test consists in the actuation of the stopping system under the action of forced operation cycles at the chosen torque M_F for the nominal output torque M_S given and the product family stated according to the aimed endurance class.

The travel of the load during the raisingmovement and during the lowering movement is set so that the limit stop system is actuated.

11.4.2 Test report

The test report shall include the following:

a) name and address of the testing laboratory and 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 the address of client ;
e) date of test ;
f) reference to the limit stop system tested and the details necessary for identifying it ;
g) product family stated ;
h) endurance test conditions (load P corresponding to the torque M_S chosen, the torque M_F chosen) ;
i) operational class obtained.

The test report describes the behaviour of the limit stop system.

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL