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Textile machinery and accessories — Beams for winding —

Part 4: Test methods and quality classification of flanges for weaver's beams, warper's beams and sectional beams

Matériel pour l'industrie textile — Ensouples pour enroulement —

Partie 4: Méthodes d'essai et classes de qualité pour les joues d'ensouples de tissage, d'ourdissoirs et sectionnelles

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Foreword

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ISO 8116-4 was prepared by Technical Committee ISO/TC 72, *Textile machinery and accessories*, Subcommittee SC 3, *Machinery for fabric manufacturing including preparatory machinery and accessories*.

This third edition cancels and replaces the second edition (ISO 8116-4:1995), which has been technically revised.

ISO 8116 consists of the following parts, under the general title *Textile machinery and accessories — Beams for winding*:

— *Part 1: General vocabulary*

— *Part 2: Warper's beams*

— *Part 3: Weaver's beams*

— *Part 4: Test methods and quality classification of flanges for weaver's beams, warper's beams and sectional beams*

— *Part 5: Sectional beams for warp knitting machines*

— *Part 6: Beams for ribbon weaving and ribbon knitting*

— *Part 7: Beams for dyeing slivers, rovings and yarns*

— *Part 8: Definitions of run-out tolerances and methods of measurement*

— *Part 9: Dyeing beams for textile fabrics*

Textile machinery and accessories — Beams for winding —

Part 4:
Test methods and quality classification of flanges for weaver's beams, warper's beams and sectional beams

1 Scope

This part of ISO 8116 specifies the test procedure for flanges for weaver's beams, warper's beams and sectional beams and the quality classes in this respect.

2 Normative references

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

ISO 8116-1, *Textile machinery and accessories — Beams for winding — Part 1: General vocabulary*

ISO 8116-2:2008, *Textile machinery and accessories — Beams for winding — Part 2: Warper's beams*

ISO 8116-3, *Textile machinery and accessories — Beams for winding — Part 3: Weaver's beams*

ISO 8116-5:2008, *Textile machinery and accessories — Beams for winding — Part 5: Sectional beams for warp knitting machines*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8116-1 and the following apply.

3.1
quality class
classification of beam flanges according to their deformation behaviour under load

3.2
maximum test load
F_{max}
maximum value of load applied to the beam flange during testing according to its quality class

4 Quality classification

Beam flanges are classified according to four quality classes. The designation of the quality classes is Q1, Q2, Q3 or Q4.

Depending on the quality class, the beam flanges are loaded with different ultimate loads. These limit values are given in Clause 6.

For examples of application by quality class, see Annex A.

5 Test methods

5.1 Principle

The beam flange is subjected to a test load and the resulting deformation is measured.

For weaver’s beams, the test load is applied to the flange via a beam barrel. For warper’s beams and sectional beams, the load is applied to the beam flange via a pressure plate. A pressure ring with a defined inner diameter is used as an anvil.

The permanent deformation and the plastic deformation of the flange shall not exceed the defined limit values when the maximum load is applied.

5.2 Apparatus

5.2.1 Press device, with indications for the application of the test load.

5.2.2 Three dial gauges, for determination of deformation of the flange with an accuracy of 0,01 mm.

5.2.3 Measurement device, for joint installation of the three dial gauges on the bearing device, in an angle of 120° each.

5.2.4 Steel pressure ring.

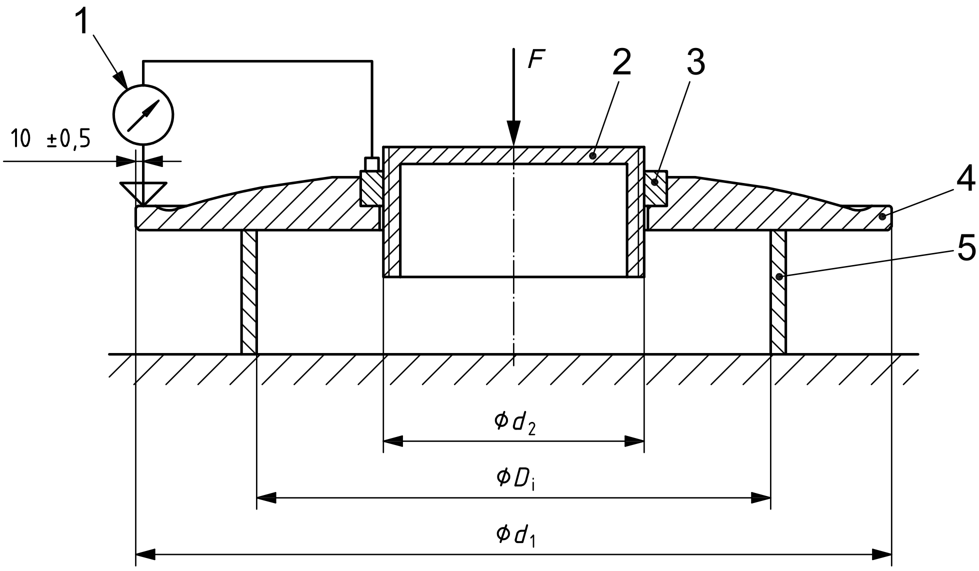
5.2.5 Beam barrel, for load application (for weaver’s beams).

5.2.6 Pressure plate, for load application (for warper’s beams and sectional beams).

5.3 Testing configuration

For measurement of flange deformation, three dial gauges are installed on the bearing device by means of the measurement device. These are used to measure the relative path between the outer diameter of the beam barrel d_2 and the circle diameter $d_1 - 20$ mm. The dial gauges are staggered by 120°. The testing configuration for weaver’s beams is given in Figure 1. The testing configurations for warper’s beams are given in Figure 2 and Figure 3. The testing configuration for sectional beams is given in Figure 4.

Dimensions in millimetres



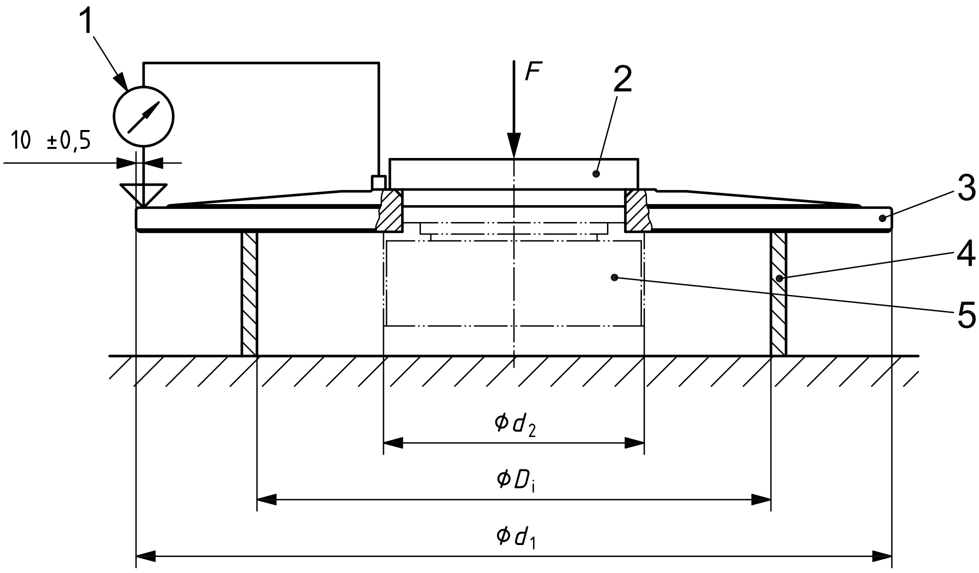
Key

1 dial gauge (schematic representation)
2 beam barrel
3 threaded ring
4 weaver's beam
5 steel pressure ring

d_1 outer diameter of weaver's beam flange
d_2 outer diameter of weaver's beam barrel
D_i inner diameter of pressure ring

Figure 1 — Testing configuration for weaver's beam

Dimensions in millimetres



Key

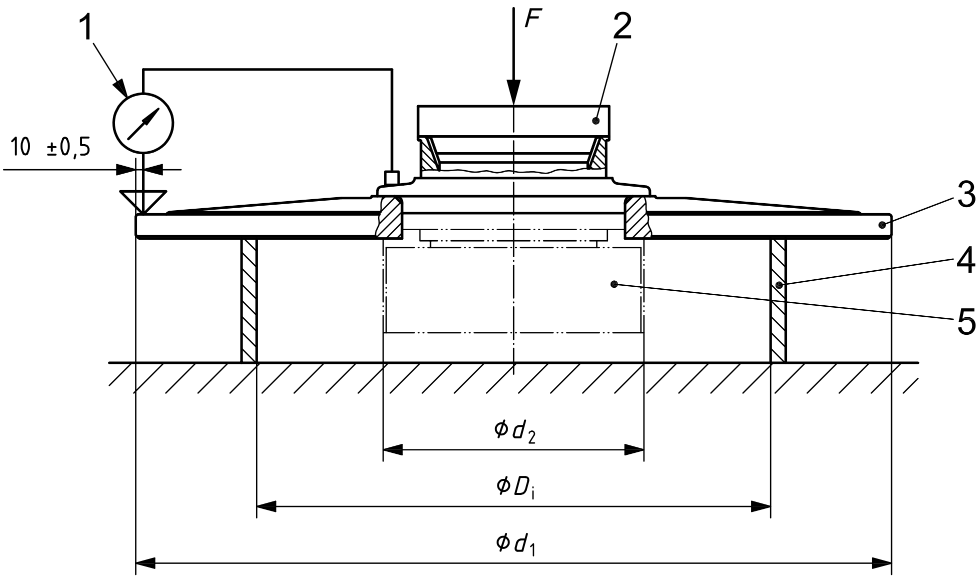
1 dial gauge (schematic representation)
2 pressure plate
3 warper's beam
4 steel pressure ring
5 warper's beam barrel (not required for pressure test)

d_1 outer diameter of warper's beam flange
d_2 outer diameter of warper's beam barrel
D_i inner diameter of pressure ring

Figure 2 — Testing configuration for warper's beam flange with shaft (Type A) and cylindrical hole (Type B)

The diameter of the pressure plate for load application for warper's beams of Type A and Type B is defined as d_2 – 20 mm (see Figure 2).

Dimensions in millimetres



Key

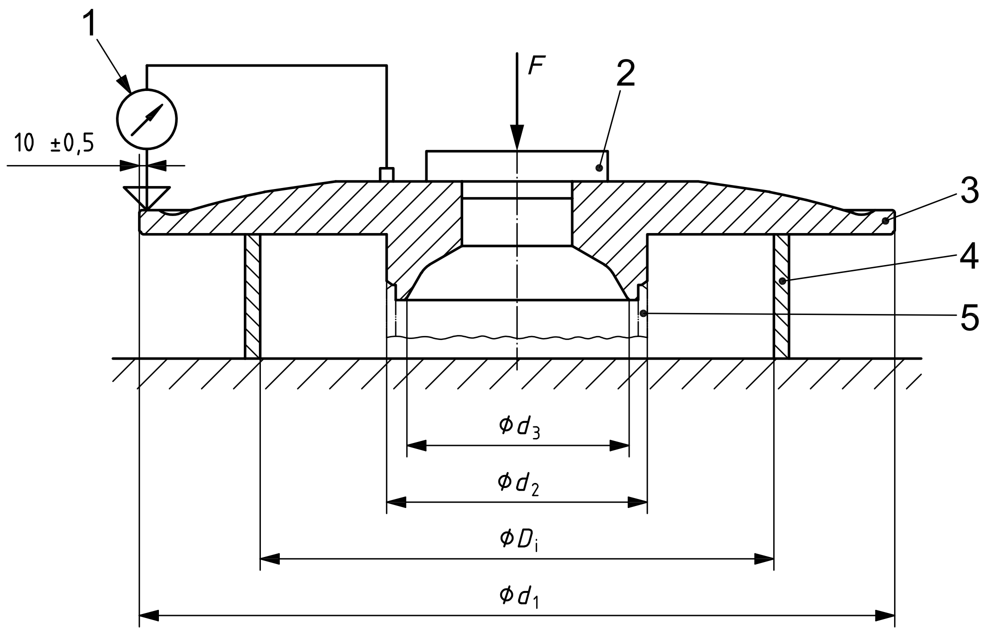
1 dial gauge (schematic representation)
2 pressure plate
3 warper's beam flange
4 steel pressure ring
5 warper's beam barrel (not required for pressure test)

d_1 outer diameter of warper's beam flange
d_2 outer diameter of warper's beam barrel
D_i inner diameter of pressure ring

Figure 3 — Testing configuration for warper's beam flange with tooth cone — Type C

The diameter of the pressure plate for load application for warper's beams with tooth cone (Type C) is defined using d_5 in accordance with ISO 8116-2:2008, Table 2.

Dimensions in millimetres



Key

1 dial gauge (schematic representation)

2 pressure plate

3 sectional beam flange

4 steel pressure ring

5 sectional beam barrel (not required for pressure test)

d_1 outer diameter of sectional beam flange

d_2 outer diameter of sectional beam barrel

d_3 bore diameter of flange (see also ISO 8116-5:2008, Figure 1)

D_i inner diameter of pressure ring

Figure 4 — Testing configuration for sectional beams

The diameter of the pressure plate for load application for sectional beams of knitting machines is defined using d_3 + 40 mm.

5.4 Performance

The measurement device is installed as described in 5.3. The beam flange, the pressure ring and the pressure plate, if required, are aligned centrally below the press loading pad.

Stepwise loading of the flange shall occur in steps to be chosen usefully.

The load applied and the deformation are determined at the test area for each loading step. The value of the total deformation is calculated from the average of the three measurement values. After each load step, unloading of the flange is optional.

After unloading, the values indicated are read with the dial gauge. The values for the plastic deformation are calculated from the average of the three measurement values.

Then loading is applied with the next higher load value.

This procedure is repeated until the defined maximum test load of the corresponding quality class as given in Equation (2) and Table 1 is reached.

The beam flange corresponds to the quality class if the value measured for the total deformation and the value measured for the plastic deformation are below the values obtained when using Equation (3) and Equation (4).

Once the given maximum load has been achieved, the plastic deformation shall be measured after unloading. Subsequently, the dial gauges are set to “zero”. The maximum test load shall again be applied. After unloading, only an insignificantly low residual deformation value shall be read.

6 Pressure ring diameter, maximum test load and limit values of deformation

The diameter of the pressure ring, maximum test load and limit values of deformation shall be calculated using Equations (1), (2) or (3) for any flange geometry:

- for weaver’s beams in accordance with ISO 8116-3, the values are given in Table 2;
- for warper’s beams in accordance with ISO 8116-2, the values are given in Table 3;
- for sectional beams in accordance with ISO 8116-5, the values are given in Table 4.

6.1 Pressure ring diameter

The diameter of the pressure ring is calculated, depending on the inner and outer diameter of the beam flange, using Equation (1):

$$D_\mathrm{i} = \frac{2}{3} \times \frac{d_1^3 - d_2^3}{d_1^2 - d_2^2} \qquad (1)$$

where

D_i is the inner diameter of the pressure ring, in millimetres;

d_1 is the outer diameter of the beam flange, in millimetres;

d_2 is the outer diameter of the beam barrel, in millimetres.

The tolerance for the diameter of the pressure ring, D_i, may not exceed ± 1 mm.

NOTE Equation (1) corresponds to the centre of the diameter of a circular ring segment on the condition that the angle of the circular ring segment reaches zero. In practice, the actual load on the beam flange is different, depending on the winding.

6.2 Maximum test load

Depending on the quality class, the maximum test load is calculated from the maximum test load given in Table 1 multiplied by the maximum winding area of the beam flange, using Equation (2).

$$F_\mathrm{max} = A_\mathrm{max} \times p_\mathrm{i} \qquad (2)$$

where

F_max is the maximum test load, in kilonewtons;

A_max is the maximum winding area of the beam flange, in square millimetres;

$$A_\mathrm{max} = \frac{\pi}{4} \times (d_1^2 - d_2^2)$$

p_i is the maximum test load, in megapascals.

Table 1 — Limit loads of quality classes

Quality class	Maximum test load p_i MPa
Q1	0,08
Q2	0,2
Q3	0,5
Q4	0,8

6.3 Limit value of deformation

The limit value of total deformation at maximum test load is calculated, depending on the geometry of the flange, using Equation (3):

$$f_{\text{tot-lim}} = \frac{4 \times (d_1 - d_2)}{1\,000} \quad (3)$$

where

$f_{\text{tot-lim}}$ is the admissible total flange deformation, in millimetres;

d_1 is the outer diameter of the beam flange, in millimetres;

d_2 is the outer diameter of the beam barrel, in millimetres.

The limit value of the plastic deformation at maximum test load amounts to a quarter of the limit value of total deformation in the case of initial loading of the beam flange.

If the maximum test load is again applied to the beam flange, as shown in Equation (4), the proportion of plastic deformation shall be insignificantly low.

$$f_{\text{plast-lim}} = \frac{f_{\text{tot-lim}}}{4} = \frac{(d_1 - d_2)}{1\,000} \quad (4)$$

where

$f_{\text{plast-lim}}$ is the admissible plastic flange deformation, in millimetres;

$f_{\text{tot-lim}}$ is the admissible total flange deformation, in millimetres;

d_1 is the outer diameter of the beam flange, in millimetres;

d_2 is the outer diameter of the beam barrel, in millimetres.

6.4 Values for weaver's beams

The values for the pressure ring diameter, the maximum test load and the limit values of deformation for weaver's beams in accordance with ISO 8116-3 are given in Table 2.

Table 2 — Test values for weaver's beams in accordance with ISO 8116-3

Flange geometry		Pressure ring inner diameter	Maximum test load of quality Class Q1				Limit values of flange deformations	
d_1 mm	d_2 mm	D_i mm	F_{maxQ1} kN	F_{maxQ2} kN	F_{maxQ3} kN	F_{maxQ4} kN	$f_{tot-lim}$ mm	$f_{plast-lim}$ mm
500	150	356	14	36	89	143	1,4	0,4
600	150	420	21	53	133	212	1,8	0,5
700	150	484	29	73	184	294	2,2	0,6
750	150	517	34	85	212	339	2,4	0,6
800	150	549	39	97	242	388	2,6	0,7
800	216	564	37	93	233	373	2,3	0,6
850	216	596	42	106	265	425	2,5	0,6
900	216	628	48	120	300	480	2,7	0,7
950	216	660	54	134	336	538	2,9	0,7
1 000	269	705	58	146	364	583	2,9	0,7
1 250	269	865	94	234	585	936	3,9	1,0
1 400	269	962	119	297	741	1 186	4,5	1,1
1 500	269	1 027	137	342	855	1 368	4,9	1,2

6.5 Values for warper's beams

The values for the pressure ring diameter, the maximum test load and the limit values of deformation for warper's beams in accordance with ISO 8116-2 are given in Table 3.

Table 3 — Test values for warper's beams in accordance with ISO 8116-2

Flange geometry		Pressure ring inner diameter	Maximum test load of quality class Q1				Limit values of flange deformations	
d_1 mm	d_2 mm	D_i mm	F_{maxQ1} kN	F_{maxQ2} kN	F_{maxQ3} kN	F_{maxQ4} kN	$f_{tot-lim}$ mm	$f_{plast-lim}$ mm
800	300	588	35	86	216	346	2,0	0,5
800	320	594	34	84	211	338	1,9	0,5
815	300	597	36	90	225	361	2,1	0,5
815	320	603	35	88	221	353	2,0	0,5
900	300	650	45	113	283	452	2,4	0,6
900	320	656	44	111	278	445	2,3	0,6
915	300	659	47	117	293	469	2,5	0,6
915	320	665	46	115	289	462	2,4	0,6
1 000	300	713	57	143	357	572	2,8	0,7
1 000	320	718	56	141	352	564	2,7	0,7
1 015	300	722	59	148	369	591	2,9	0,7
1 015	320	728	58	146	364	583	2,8	0,7
1 100	360	793	68	170	424	679	3,0	0,7
1 250	300	872	93	231	578	925	3,8	1,0
1 250	320	877	92	229	573	917	3,7	0,9
1 250	400	898	88	220	551	881	3,4	0,9
1 400	450	1 006	110	276	690	1 104	3,8	1,0
NOTE To achieve the quality classes Q3 and Q4, deviations from the geometric provisions given in ISO 8116-2 are possible.								

6.6 Values for sectional beams for knitting machines

The values for the pressure ring diameter, the maximum test load and the tolerances of deformation for sectional beams of knitting machines in accordance with ISO 8116-5 are given in Table 4.

Table 4 — Test values for sectional beams in accordance with ISO 8116-5

Flange geometry		Pressure ring inner diameter	Maximum test load of quality class Q1				Limit values of flange deformations	
d_1 mm	d_2 mm	D_i mm	F_{maxQ1} kN	F_{maxQ2} kN	F_{maxQ3} kN	F_{maxQ4} kN	$f_{tot-lim}$ mm	$f_{plast-lim}$ mm
355	110	254	7	18	45	72	1,0	0,2
532	196	390	15	14	34	55	0,6	0,2
762	298	564	31	77	193	309	1,9	0,5
1 000	360	730	55	137	342	547	2,6	0,6

Annex A
(informative)

Examples of application by quality class

A.1 Choice of quality class

In using beam flanges, the quality class is chosen depending on the load. See Table A.1 for examples of quality class for different yarn types and mean winding parameters

A.2 Effect of winding parameters on the loading

The following winding parameters have a decisive effect on the loading of the beam flanges:

— yarn characteristics (e.g. type, winding, titre, E-module, filament titre, lateral strain);

— parameter during winding process (warp traverse, winding stress);

— conditioning behaviour (e.g. relaxation, resulting winding density);

— winding diameter;

— barrel geometry.

Table A.1 — Examples of quality class for different yarn types and mean winding parameters

Quality class	Yarn type
Q1	Staple fibre yarns
Q2	Filament yarns from regenerated cellulosic fibres and silk
Q3	For synthetic multifilament yarns which are completely relaxed after the thread-forming spinning operation (FDY) [a], e.g. polyamide, polyacrylonitrile, polyolefin
Q4	For synthetic multifilament yarns which are not completely relaxed after the thread-forming spinning operation (POY) [b], e.g. polyamide, polyacrylonitrile, polyolefin, polyurethane

[a] Fully drawn yarn.
[b] Pre-oriented yarn.

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