# International Standard ISO 8116/4

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## Textile machinery and accessories — Beams for winding — Part 4: Quality classification of flanges for weaver's beams, warper's beams and sectional beams

*Matériel pour l'industrie textile — Ensouples pour enroulement — Partie 4: Classes de qualité pour les joues d'ensouples de tissage, d'ourdissoirs et sectionnelles*

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## Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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# Textile machinery and accessories — Beams for winding — Part 4: Quality classification of flanges for weaver's beams, warper's beams and sectional beams

## 1 Scope and field of application

In order to be able to compare the different types of beam flanges and their behaviour under load, it is necessary to specify characteristics and load ranges according to which the flanges may be classified after undergoing acceptance testing.

This part of ISO 8116 explains the theoretical relationships and gives directives for practical use.

## 2 References

ISO 1025, *Textile machinery and accessories — Sectional beams for warp knitting machines — Terminology and main dimensions.*

ISO 5241, *Textile machinery and accessories — Weaver's beams — Terminology and main dimensions.*

ISO 8116/1, *Textile machinery and accessories — Beams for winding — Part 1: Vocabulary.*

ISO 8116/2, *Textile machinery and accessories — Beams for winding — Part 2: Warper's beams — Terminology and main dimensions.*

## 3 Principle

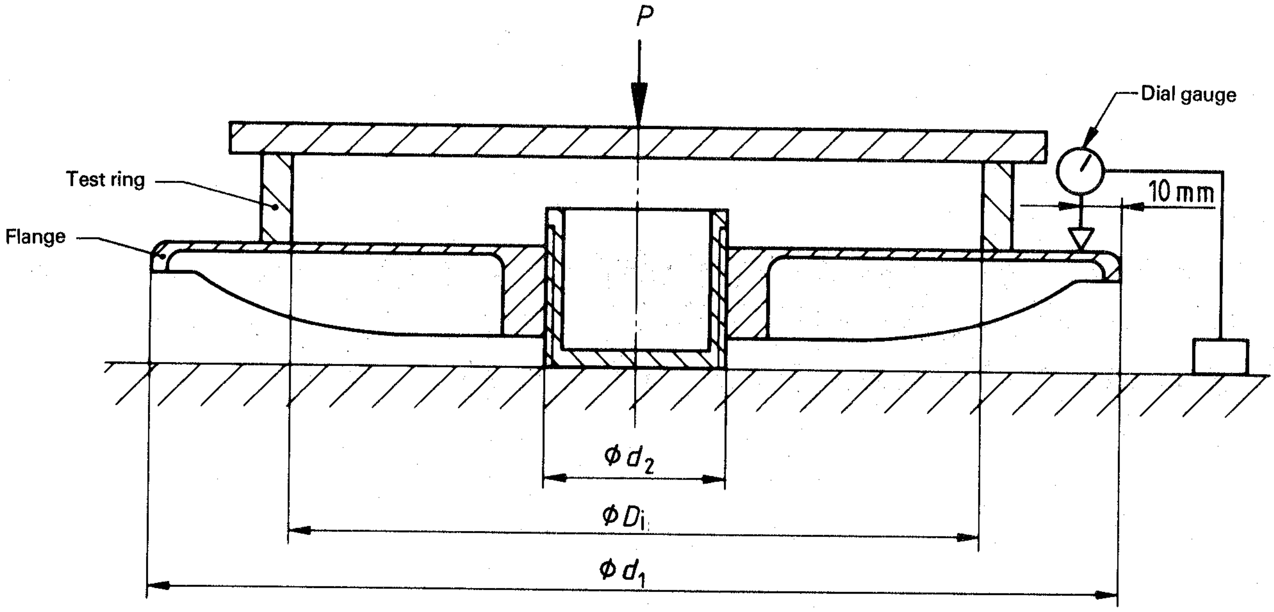
In order to ascertain the quality class of a beam flange, it is subjected to a force test.

For this purpose the flange is centrally loaded by means of a press and using a test ring with a defined diameter. The bending is determined from the average of the observations (readings) taken from three dial gauges set at 120° to each other and supported on the outer edge of the flange by means of a holding device. The bending under load is thereby determined.

The loading should preferably occur in steps for the reading of intermediate values; this permits determination of the way the deflection behaviour changes with increase of load.

It is also possible to unload the flange after each load step in order to ascertain the degree of permanent deformation. However the dial gauges should not be turned back to zero until maximum load is ascertained.

## 4 Terminology and dimensions




$P$ = test load, in kilonewtons

$d_1$ = outer flange diameter

$d_2$ = outer barrel diameter

$D_i$ = inner diameter of the test ring, calculated according to the formula

$$D_i = 0,6 (d_1 + d_2)$$

$D_f$ = measuring diameter; $D_f = d_1 - 20$ mm

$f$ = deflection of the flange under load (bending)

$f_{max}$ = maximum admissible deflection value (maximum admissible bending), calculated according to the formula

$$f_{max} = 4 \times (d_1 - d_2) \times 10^{-3}$$

NOTE — For the bending $f$ the deflection of the flange is fixed according to a certain angle. The same assessment is therefore valid for all quality classes.

The maximum deflection ($f_{max}$) was fixed on the basis of the experimental values of filament yarns with fine titer. For coarser yarns a greater deflection angle may be chosen and agreed upon in practice. These types of yarn normally have lower loading forces and therefore cause smaller deflections.

For this reason the quality class is determined according to the preceding formula.

**Table 1 — Weaver's beams according to ISO 5241**

Dimensions in millimetres

| $d_1$ | $d_2$ | $D_i$ | $f_{max}$ |
|---|---|---|---|
| 500 | 150 | 390 | 1,4 |
| 600 | | 450 | 1,8 |
| 700 | | 510 | 2,2 |
| 750 | | 540 | 2,4 |
| 800 | | 570 | 2,6 |
| 850 | 216 | 640 | 2,5 |
| 900 | | 670 | 2,7 |
| 950 | | 700 | 2,9 |
| 1 000 | | 730 | 3,1 |

**Table 2 — Warper's beams — Types A and B, according to ISO 8116/2**

Dimensions in millimetres

| $d_1$ | $d_2$ | $D_i$ | $f_{max}$ |
|---|---|---|---|
| 815 | 300 (320) | 669 | 2,1 |
| | | (681) | 2,0 |
| 915 | | 729 | 2,5 |
| | | (741) | 2,4 |
| 1 015 | | 789 | 2,9 |
| | | (801) | 2,8 |
| 1 100 | | 840 | 3,2 |
| | | (852) | 3,2 |
| 1 200 | | 900 | 3,6 |
| | | (912) | 3,6 |

**Table 3 — Warper's beams — Type C, according to ISO 8116/2**

Dimensions in millimetres

| $d_1$ | $d_2$ | $D_i$ | $f_{max}$ |
|---|---|---|---|
| 800 | 300 (320) | 660 | 2,0 |
| | | (672) | 2,0 |
| (900) | | 720 | 2,4 |
| | | (732) | 2,4 |
| 1 000 | | 780 | 2,8 |
| | | (792) | 2,8 |
| (1 100) | 360 | 876 | 3,0 |
| 1 200 | 400 | 960 | 3,2 |

**Table 4 — Sectional beams according to ISO 1025**

Dimensions in millimetres

| $d_1$ | $d_2$ | $D_i$ | $f_{max}$ |
|---|---|---|---|
| 355 | 110 | 279 | 1,0 |
| 535 | 185 | 432 | 1,4 |
| 765 | 250 | 609 | 2,1 |
| 815 | | 639 | 2,3 |
| 915 | 295 | 726 | 2,5 |
| 1 015 | 360 | 825 | 2,6 |

NOTE — For a more exact definition of the quality classes, the theoretical behaviour of a centre-bored plate on deflection by bending may be taken as a basis.

This gives:

$$\frac{P}{f} = \frac{4Eh^3}{cd_1^2} = k$$

where

$E$ is the modulus of elasticity of the material used for the beam flange;

$c$ is a correlation factor dependent on $\frac{d_2}{d_1}$;

$h$ is the thickness of the flange near the barrel;

$k$ is a constant.

The formula shows the linearity of the specific values $\frac{P}{f}$ by which the quality classes according to clause 5 are fixed. Any load test thus allows a clear grading according to one of the quality classes.

A comparable evaluation and interpretation of measurements may be made from this basis.

## 5 Quality classes

The field of quality classes is fixed by specific values according to

$$\text{Quality class} \triangleq \frac{\text{Loading } P \text{ (kN)}}{\text{Deflection } f \text{ (mm)}}$$

The diagram of the quality classes is given in the annex.

**Table 5 — Quality classes**

| Quality class | | Application recommended | Limiting values, $k$ kN/mm |
|---|---|---|---|
| 1 | light | Yarns from natural fibres except for silk, spun yarns from regenerated cellulosic fibres, mixed yarns from natural and man-made fibres having a proportion of mixture up to 67/33 | $20 < k \leqslant 50$ |
| 2 | medium | Filament yarns from regenerated cellulosic fibres (e.g. viscose, acetate, etc.) as well as textile glass yarns and silk yarns | $50 < k \leqslant 125$ |
| 3 | strong | Man-made filament yarns (e.g. polyamide, polyacrylonitrile, polyolefin, etc.) which are relaxed after the thread forming spinning operation | $125 < k \leqslant 200$ |
| 4 | extra-strong | Filament yarns as in quality class 3, but unrelaxed | $k > 200$ |

For the grading into one of the quality classes the deflection ($f$) for a certain loading ($P$) is determined by test. Therefore

$$\text{Test value } X = \frac{\text{Test load } P \text{ (kN)}}{\text{Deflection of the flange } f \text{ (mm)}}$$

The value is compared with the limiting values according to table 5. The grading into one of the quality classes can then be determined.

## 6 Admissible loading capacity of flanges

By means of the test value $X$ for the determination of the quality class, the maximum admissible loading ($P_{max}$) of the beam flange can be ascertained according to

$$P_{max} = Xf_{max}$$