International Standard ISO 3266

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Eyebolts for general lifting purposes

Anneaux à tige pour applications de levage général

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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.

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.

International Standard ISO 3266 was prepared by Technical Committee ISO/TC 111, *Round steel link chains, lifting hooks and accessories*.

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Eyebolts for general lifting purposes

1 Scope and field of application

This International Standard specifies the basic dimensions, material, lifting capacity and conditions of use of lifting eyebolts. These eyebolts may be used for vertical and inclined lifting (see the annex).

Eyebolts with and without recessed collar are included in this International Standard (see figure 1) i.e. :

a) type 1, eyebolt with recessed collar, suitable for use with chamfered or unchamfered holes;

b) type 2, eyebolt without recessed collar, suitable for use with chamfered holes only.

This International Standard excludes eyebolts which are not forged in one piece.

The dimensions of the eyes of eyebolts covered by this International Standard are such that they are normally capable of permitting direct engagement with eyehooks of the same lifting capacity (working load limit) for use with grade T (8) chain (see ISO 7597).

In the case of eyehooks for use with grade M (4) chain (see ISO 4779), it may be necessary to use an intermediate component such as a shackle to make the connection.

2 References

ISO 261, *ISO general purpose metric screw threads — General plan.*

ISO 643, *Steels — Micrographic determination of the ferritic or austenitic grain size.*

ISO 965, *ISO general purpose metric screw threads — Tolerances.*

ISO 4779, *Forged steel lifting hooks with point and eye for use with steel chains of grade M (4).*[1]

ISO 7597, *Forged steel lifting hooks with point and eye for use with steel chains of grade T (8).*[1]

3 Nominal size (Thread dimension, d)

Eyebolts are identified according to their basic thread dimensions. The maximum axial lifting capacity (WLL) for each eyebolt is given in table 2.

4 Dimensions and tolerances

The form and basic dimensions of eyebolts shall be in accordance with figure 1 and table 2. They are formulated on the basis of the available threads listed in ISO 261.

A symmetrical tolerance on ovality of + 5 % is permitted in respect of the internal diameter, E.

A symmetrical tolerance of ± 5 % on the diameter, F, is permitted.

5 Material

The steel shall be produced by the open hearth process, the electrical process or by an oxygen blown process.

In its finished state, as supplied to the eyebolt maker, the steel shall meet the following requirements as determined by a cast or product analysis on the bar or on the finished eyebolt.

It shall be fully killed, shall be suitable for forging and shall be capable of being heat-treated to obtain the mechanical properties required by this International Standard.

The proportions of sulfur and phosphorus shall be limited as shown in table 1.

Table 1 — Proportions of sulfur and phosphorus

			Cast analysis	Product analysis
Maximum proportions of	sulfur	%	0,045	0,050
	phosphorus	%	0,040	0,045

1) At present at the stage of draft.

The steel shall be made in conformity with a suitable deoxidization practice in order to obtain an austenitic grain size of 5 or finer when tested in accordance with ISO 643.

This could be accomplished, for example, by ensuring that it contains sufficient aluminium or equivalent element to permit the manufacture of eyebolts stabilized against strain-age embrittlement. A minimum of 0,02 % of metallic aluminium is quoted for guidance.

Within the above limitations or as otherwise agreed with the purchaser, it is the responsibility of the eyebolt maker to select the steel so that the finished eyebolt, suitably heat-treated, meets the mechanical properties required by this International Standard.

6 Manufacture

Each eyebolt, including the shank, shall be forged in one piece.

7 Machining

The eyebolts shall be machined to ensure that :

a) the threads of the shanks comply with ISO 261. Unless otherwise specified the coarse series thread form of ISO 261 shall be used and the tolerance of the thread shall be to class 8 g of ISO 965;

b) dimension $d_{g,\,max}$ equals the maximum minor diameter of the thread and $d_{g,\,min}$ equals the minimum minor diameter of the thread minus 0,3 mm;

c) the machined face of the collar and the axis of the threaded shank are at right angles, subject to a tolerance of 30';

d) the axes of the cylindrical part of the collar and the threaded shank are the same.

8 Mechanical properties

8.1 Minimum axial breaking force

The minimum axial breaking force of eyebolts of each specified working load limit shall be as given in table 3 (column 4).

8.2 Deformation

NOTE — If tests for deformation are carried out, the force shall be applied by exerting an in-line pull between the threaded shank and the eye using a freely rotating round section pin of diameter not exceeding 50 % of the eye diameter. The force should be applied steadily until the specified proof force is reached and gradually reduced to zero.

In the case of eyebolts in inclined loading the force is applied at an angle of 45° to their axes, such that the axial load on the two eyebolts is equal to the value indicated in table 4 (column 4).

8.2.1 Deformation in axial loading

Each eyebolt shall be capable of withstanding the axial force specified in table 3 (column 3) without permanent deformation exceeding 0,5 % of the external diameter of the eye, and without permanent deformation of the shank.

8.2.2 Deformation in inclined loading

Eyebolts when used in pairs shall be capable of sustaining the force specified in table 4 (column 4), when loaded at 45° to their axes, without permanent deformation exceeding 0,5 % of the external diameter of the eye, and without permanent deformation of the shank.

NOTE — National regulations may impose certain requirements regarding usage in non-axial loading.

8.3 Maximum lifting capacities

8.3.1 Capacity in axial loading

The maximum lifting capacity in axial loading (WLL) shall be as specified in table 3 (column 2).

8.3.2 Capacity in inclined loading

The maximum lifting capacity in non-axial loading (C), for a pair of eyebolts, when the angle between sling branches and the vertical is less than or equal to 45°, shall be as specified in table 4 (column 3).

9 Proof loading

When it is required by the purchaser or is necessary to comply with statutory regulations, each eyebolt after manufacture and subsequent heat treatment shall be subjected to an axial proof force as specified in table 3 (column 3).

After removal of the proof force, each eyebolt shall be examined by a competent person and shall be accepted only if found free from visible flaw or defect.

NOTE — The force shall be applied by exerting an in-line pull between the threaded shank and the eye using a freely rotating round section pin of diameter not exceeding 50 % of the eye diameter The force should be applied steadily until the specified proof force is reached and gradually reduced to zero.

10 Identification marking

Each eyebolt shall be legibly and permanently identified in the zone bounded by the shoulder and the horizontal axis of the eye with the following markings:

a) such marks or symbols as will allow identification with the manufacturer's certificate;

b) nominal size, i.e. thread dimension (see column 1 of table 2);

c) maximum axial lifting capacity (WLL) in general service (see column 2 of table 2).

11 Additional tests

If the purchaser requires tests or chemical analysis of the material, or any additional tests on the finished eyebolts, these requirements shall be clearly stated in the enquiry and order and, if so desired, the samples shall be selected by a person representing or approved by the purchaser.

12 Manufacturer's certificate

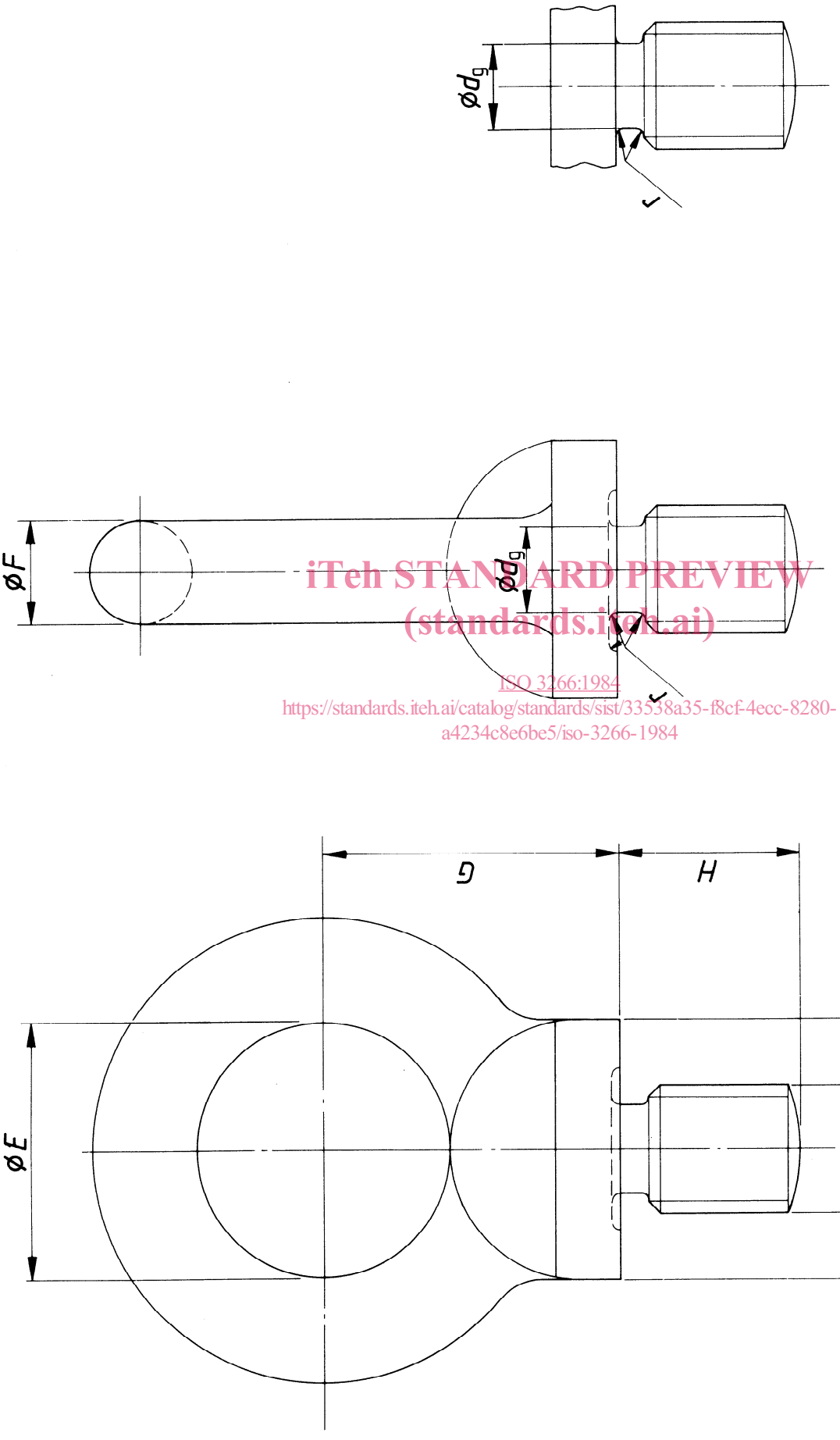
When it is required by the purchaser or is necessary to comply with statutory regulations, the manufacturer shall provide a certificate with each consignment of eyebolts giving the following information :

a) nominal size, i.e. thread dimension (see clause 4);

b) proof force applied (see clause 9);

c) maximum axial lifting capacity (WLL) (see table 2);

d) manufacturer's identification.



NOTE — These drawings illustrate the specified dimensions only and not the actual form of the eyebolt which is left to the manufacturer's discretion.

Figure 1 — Eyebolts showing recessed and non-recessed collars

Table 2 — Dimensions of eyebolts

Dimensions and tolerances in millimetres

1	2	3	4	5	6	7	8	9	
Nominal size (Thread dimension, *d*)	**Maximum axial lifting capacity (WLL)** t	*E* min.	*G* max.	*H* min.	*F* max.	*r* min.	*B* min. for unmachined collars	*B* for machined collars	tol.
M8	0,16	20	20	15	6,3	1	20	20	−0,040 −0,092
M10	0,25	24	25	17	8	1	24	24	−0,040 −0,092
M12	0,40	28	30	20	9,5	1	28	28	−0,040 −0,092
M16	0,63	34	36	24	12,5	1	34	34	−0,050 −0,112
M20	1	40	45	27	16	1	40	40	−0,050 −0,112
M24	1,6	48	53	31	19	2	48	48	−0,050 −0,112
M30	2,5	56	64	39	24	2	56	56	−0,060 −0,134
M36	4	67	75	48	28	3	67	67	−0,060 −0,134
M42	6,3	80	90	56	34	3	80	80	−0,060 −0,134
M48	8	95	100	65	38	3	95	95	−0,072 −0,159
M56	10	112	119	73	45	4	112	112	−0,072 −0,159
M64	16	125	135	85	50	4	125	125	−0,085 −0,185
M72 × 6	20	140	153	95	58	4	140	140	−0,085 −0,185
M80 × 6	25	160	165	110	63	4	160	160	−0,085 −0,185
M90 × 6	32	180	180	125	71	5	180	180	−0,085 −0,185
M100 × 6	40	200	195	140	80	5	200	200	−0,100 −0,215

Table 3 — Mechanical properties

1	2	3	4
Nominal size (Thread dimension, *d*)	Maximum axial lifting capacity (WLL)	Axial proof force	Minimum axial breaking force
	t	kN	kN
M8	0,16	3,2	6,3
M10	0,25	5	10
M12	0,40	8	16
M16	0,63	12,5	25
M20	1	20	40
M24	1,6	32	63
M30	2,5	50	100
M36	4	80	160
M42	6,3	125	250
M48	8	160	320
M56	10	200	400
M64	16	320	630
M72 × 6	20	400	800
M80 × 6	25	500	1 000
M90 × 6	32	630	1 250
M100 × 6	40	800	1 600

Annex

Guidance on the use of eyebolts in inclined loading conditions

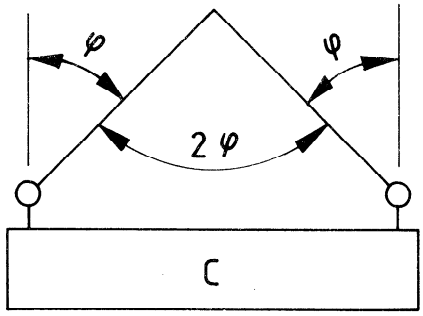


Table 4 — Maximum recommended working loads for eyebolts

1	2	3	4
Nominal size (Thread dimension, *d*)	**Maximum axial lifting capacity of single eyebolt (WLL)**	**Maximum lifting capacity (C) for a pair of eyebolts when the angle φ between each sling branch and the vertical is 0° to 45°**	**Deformation test force[1] for a pair of eyebolts, when the angle φ between each sling branch and the vertical is 45°**
	t	t	kN
M8	0,16	0,08	1,6
M10	0,25	0,125	2,5
M12	0,40	0,2	4,0
M16	0,63	0,32	6,3
M20	1	0,5	10,0
M24	1,6	0,8	16,0
M30	2,5	1,25	25
M36	4	2	40
M42	6,3	3,2	63
M48	8	4	80
M56	10	5	100
M64	16	8	160
M72 × 6	20	10	200
M80 × 6	25	12,5	250
M90 × 6	32	16	320
M100 × 6	40	20	400

1) The equivalent deformation test force, if required, to be applied to the eye of a single eyebolt at 45° to its axis is: $\frac{1}{\sqrt{2}}$ × the value given in the table.

NOTE — Without prejudice to any overriding national legislation, working loads are given for eyebolts when used in pairs for inclined loading conditions, with the collars screwed down on the faces, the eyes in the plane of the lifting sling and the axes of the eyebolts parallel to each other and to the direction of the load.

In order to achieve the necessary alignment of the eye, it may be necessary to use shims (spacing washers) or to machine the collar.

Care should be taken not to overtighten the eyebolt in an attempt to achieve the correct alignment, beyond that tightness achieved by hand without mechanical aid, as this can cause overstressing in the shank which can reduce the lifting capacity of the eyebolt.