

## 1 Scope

This European Standard specifies, together with EN 14399-1 and EN 14399-2, hardened and tempered chamfered plain washers with chamfer intended for bolting assemblies with large series hexagon high-strength structural bolts and nuts with thread sizes from M12 to M36 inclusive.

Washers according to this standard are not intended to be used in direct contact with oversized or slotted holes.

**NOTE** Attention is drawn to the importance of ensuring that the washers are correctly used if satisfactory results are to be obtained. For recommendations concerning proper application, reference to EN 1090-2 is made.

## 2 Normative references

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

EN 14399-1, *High-strength structural bolting assemblies for preloading - Part 1: General requirements*

EN 14399-2, *High-strength structural bolting assemblies for preloading - Part 2: Suitability for preloading*

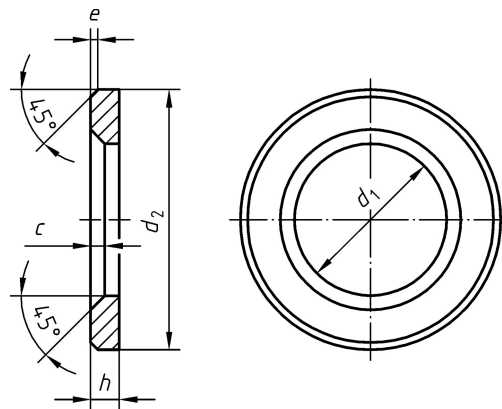
EN ISO 3269, *Fasteners - Acceptance inspection (ISO 3269)*

EN ISO 4759-3, *Tolerances for fasteners - Part 3: Plain washers for bolts, screws and nuts - Products grades A and C (ISO 4759-3)*

EN ISO 10684, *Fasteners - Hot dip galvanized coatings (ISO 10684)*

## 3 Dimensions

See Figure 1 and Table 2.



**Figure 1 — Dimensions**

For coated washers the above dimensions apply prior to coating.

Table 2 — Dimensions

Dimensions in millimetres

| Nominal size          |   | 12    | (14) <sup>a</sup> | 16    | (18) <sup>a</sup> | 20    | 22    | 24    | 27    | 30    | 36    |
|-----------------------|---|-------|-------------------|-------|-------------------|-------|-------|-------|-------|-------|-------|
| <i>d</i>              | (nominal thread diameter of associated bolts) |       |                   |       |                   |       |       |       |       |       |       |
| <i>d</i> <sub>1</sub> | min.  | 13    | 15                | 17    | 19                | 21    | 23    | 25    | 28    | 31    | 37    |
|                       | max.  | 13,27 | 15,27             | 17,27 | 19,33             | 21,33 | 23,33 | 25,33 | 28,52 | 31,62 | 37,62 |
| <i>d</i> <sub>2</sub> | min.  | 23,48 | 27,48             | 29,48 | 33,38             | 36,38 | 38,38 | 43,38 | 49,00 | 54,80 | 64,80 |
|                       | max.  | 24    | 28                | 30    | 34                | 37    | 39    | 44    | 50    | 56    | 66    |
| <i>h</i>              | nom.  | 3     | 3                 | 4     | 4                 | 4     | 4     | 4     | 5     | 5     | 6     |
|                       | min.  | 2,7   | 2,7               | 3,7   | 3,7               | 3,7   | 3,7   | 3,7   | 4,4   | 4,4   | 5,4   |
|                       | max.  | 3,3   | 3,3               | 4,3   | 4,3               | 4,3   | 4,3   | 4,3   | 5,6   | 5,6   | 6,6   |
| <i>e</i>              | nom. = min.                                   | 0,5   | 0,5               | 0,75  | 0,75              | 0,75  | 0,75  | 0,75  | 1     | 1     | 1,25  |
|                       | max.  | 1,0   | 1,0               | 1,5   | 1,5               | 1,5   | 1,5   | 1,5   | 2,0   | 2,0   | 2,5   |
| <i>c</i>              | min.  | 1,6   | 1,6               | 1,6   | 2,0               | 2,0   | 2,0   | 2,0   | 2,5   | 2,5   | 2,5   |
|                       | max.  | 1,9   | 1,9               | 1,9   | 2,5               | 2,5   | 2,5   | 2,5   | 3,0   | 3,0   | 3,0   |

<sup>a</sup> Sizes in brackets are non-preferred sizes.

#### 4 Specification and reference standards

Table 3 — Specifications and reference standards

| Material                      | Steel   |                           |
|-------------------------------|---|---------------------------|
| General requirements          | EN 14399-1 and EN 14399-2   |                           |
| Mechanical properties         | Hardness range  | 300 HV to 370 HV          |
| Tolerances                    | Product grade   | A                         |
|                               | European Standard   | EN ISO 4759-3             |
| Finish — Coating <sup>a</sup> | Uncoated  | as processed <sup>b</sup> |
|                               | Hot dip galvanized  | EN ISO 10684              |
|                               | Others  | to be agreed <sup>c</sup> |
| Workmanship                   | Parts shall be uniform and free of irregularities or detrimental defects. No protruding burrs shall appear on the washer. |                           |
| Acceptability                 | For acceptance procedure, see EN ISO 3269.  |                           |

<sup>a</sup> Attention is drawn to the need to consider the risk of hydrogen embrittlement when selecting an appropriate surface treatment process (e.g. cleaning and coating), see the relevant coating standards.

<sup>b</sup> "As processed" means the normal finish resulting from heat treatment with a light coating of oil.

<sup>c</sup> Other coatings may be negotiated between the purchaser and the manufacturer provided they do not impair the mechanical properties or the functional characteristics. Coatings of cadmium or cadmium alloys are not permitted.