UDC 621.882.215.3

# DEUTSCHE NORMEN

June 1970



## Slotted Countersunk (Flat) Head Screws
## (Countersunk Heads according to ISO)

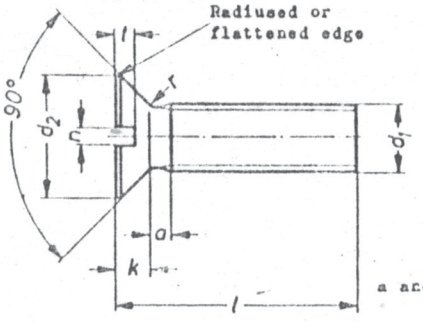
**DIN 963**

Senkschrauben mit Schlitz (Senkköpfe nach ISO)

For connection with an ISO Recommendation in preparation, see Explanations.

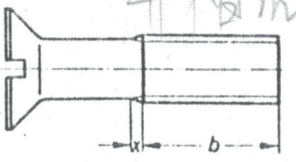
Dimensions in mm

Countersunk (flat) head screw threaded to head
(above the stepped line)




a and x to DIN 76

Countersunk (flat) head screw with shank
(below the stepped line)
Shank diameter ≈ effective diameter




Other dimensions and data as in left-hand Diagram

Designation of a countersunk (flat) head screw with thread $d_1$ = M6, length $l$ = 20 mm and strength category 5.8[1]):

Countersunk (flat) head screw M6 x 20 DIN 963 - 5.8

| $d_1$ | M1 | M1,2 | M1,4 | M1,6 | (M1,8) | M2 | M2,5 | M3 | (M3,5) | M4 | M5 | M6 | M8 | M10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $b$ | [2] | [2] | [2] | 15 | 15 | 16 | 18 | 19 | 20 | 22 | 25 | 28 | 34 | 40 |
| $d_2$ | 1,9 | 2,3 | 2,6 | 3 | 3,4 | 3,8 | 4,7 | 5,6 | 6,5 | 7,5 | 9,2 | 11 | 14,5 | 18 |
| perm. var. | h13 | | | | | h14 | | | | | | | | |
| $k$ max. | 0,6 | 0,72 | 0,84 | 0,96 | 1,08 | 1,2 | 1,5 | 1,65 | 1,93 | 2,2 | 2,5 | 3 | 4 | 5 |
| $n$ | 0,25 | 0,3 | 0,3 | 0,4 | 0,4 | 0,5 | 0,6 | 0,8 | 0,8 | 1 | 1,2 | 1,6 | 2 | 2,5 |
| $r$ max. | 0,1 | 0,12 | 0,14 | 0,16 | 0,18 | 0,2 | 0,25 | 0,3 | 0,35 | 0,4 | 0,5 | 0,6 | 0,8 | 1 |
| $t$ min. | 0,2 | 0,25 | 0,28 | 0,32 | 0,35 | 0,4 | 0,5 | 0,6 | 0,7 | 0,8 | 1 | 1,2 | 1,6 | 2 |
| $t$ max. | 0,3 | 0,35 | 0,4 | 0,45 | 0,5 | 0,6 | 0,7 | 0,85 | 1 | 1,1 | 1,3 | 1,6 | 2,1 | 2,6 |
| $l$ | Weight (7,85 kg/dm³) kg/1000 pieces ≈ | | | | | | | | | | | | | |
| 2 | 0,014 | 0,023 | 0,033 | 0,046 | 0,063 | | | | | | | | | |
| 3 | 0,019 | 0,030 | 0,042 | 0,058 | 0,079 | 0,100 | 0,175 | | | | | | | |
| 4 | 0,023 | 0,037 | 0,051 | 0,069 | 0,094 | 0,119 | 0,206 | 0,290 | 0,434 | | | | | |
| 5 | 0,027 | 0,043 | 0,060 | 0,081 | 0,109 | 0,137 | 0,236 | 0,335 | 0,494 | 0,676 | | | | |
| 6 | | 0,050 | 0,069 | 0,093 | 0,124 | 0,156 | 0,266 | 0,379 | 0,554 | 0,754 | 1,21 | | | |
| 8 | | | 0,087 | 0,116 | 0,155 | 0,193 | 0,326 | 0,467 | 0,673 | 0,910 | 1,45 | 2,19 | | |
| 10 | | | 0,105 | 0,139 | 0,185 | 0,231 | 0,386 | 0,555 | 0,792 | 1,06 | 1,70 | 2,54 | 5,03 | |
| 12 | | | | | 0,216 | 0,268 | 0,446 | 0,643 | 0,911 | 1,22 | 1,95 | 2,89 | 5,67 | 9,59 |
| (14) | | | | | 0,246 | 0,306 | 0,507 | 0,731 | 1,03 | 1,37 | 2,19 | 3,25 | 6,30 | 10,6 |
| 16 | | | | | 0,277 | 0,343 | 0,567 | 0,820 | 1,15 | 1,53 | 2,44 | 3,60 | 6,94 | 11,6 |
| (18) | | | | | | 0,381 | 0,627 | 0,908 | 1,27 | 1,68 | 2,69 | 3,95 | 7,57 | 12,6 |
| 20 | | | | | | | 0,687 | 0,996 | 1,39 | 1,84 | 2,94 | 4,31 | 8,21 | 13,6 |
| (22) | | | | | | | 0,747 | 1,08 | 1,51 | 1,99 | 3,18 | 4,66 | 8,84 | 14,6 |
| 25 | | | | | | | 0,838 | 1,22 | 1,69 | 2,22 | 3,55 | 5,19 | 9,79 | 16,1 |
| (28) | | | | | | | | 1,35 | 1,87 | 2,46 | 3,93 | 5,72 | 10,7 | 17,6 |
| 30 | | | | | | | | 1,44 | 1,99 | 2,61 | 4,16 | 6,08 | 11,4 | 18,6 |
| 35 | | | | | | | | | 2,29 | 3,00 | 4,65 | 6,96 | 13,0 | 21,1 |
| 40 | | | | | | | | | | 3,38 | 5,40 | 7,84 | 14,6 | 23,6 |
| 45 | | | | | | | | | | | 6,02 | 8,73 | 16,2 | 26,1 |
| 50 | | | | | | | | | | | 6,65 | 9,61 | 17,8 | 28,6 |
| 55 | | | | | | | | | | | | | 19,4 | 31,1 |
| 60 | | | | | | | | | | | | | | 33,7 |

Bracketed sizes are to be avoided wherever possible.

Continuation of Table on page 2

[1]) and [2]) see page 2

Continued on page 2
Explanations on page 3





Alleinverkauf der Normen durch Beuth Verlag GmbH, Berlin 30 und Köln 1

DIN 963 engl. Preisgr. 4

11 78

Vertr.-Nr. 0104

| $d_1$ | M 12 | (M 14) | M 16 | (M 18) | M 20 |
|---|---|---|---|---|---|
| $b$ | 46 | 52 | 58 | 64 | 70 |
| $d_2$ | 22 | 25 | 29 | 33 | 36 |
| $d_2$ perm. var. | h14 | | | | |
| $k$ max. | 6 | 7 | 8 | 9 | 10 |
| $n$ | 3 | 3 | 4 | 4 | 5 |
| $r$ | 1,2 | 1,4 | 1,6 | 1,8 | 2 |
| $t$ min. | 2,4 | 2,8 | 3,2 | 3,6 | 4 |
| $t$ max. | 3 | 3,5 | 4 | 4,5 | 5 |
| $l$ | Weight (7,85 kg/dm³) kg/1000 pieces ≈ | | | | |
| 20 | 20,8 | | | | |
| (22) | 22,2 | 31,9 | | | |
| 25 | 24,4 | 34,9 | 47,7 | | |
| (28) | 26,6 | 37,9 | 51,7 | 68,0 | |
| 30 | 28,1 | 39,9 | 54,4 | 72,3 | 90,5 |
| 35 | 31,7 | 44,9 | 61,1 | 80,6 | 101 |
| 40 | 35,3 | 49,8 | 67,8 | 88,9 | 111 |
| 45 | 39,0 | 54,8 | 74,5 | 97,2 | 122 |
| 50 | 42,6 | 59,8 | 81,1 | 105 | 132 |
| 55 | 46,2 | 64,7 | 87,8 | 114 | 143 |
| 60 | 49,8 | 69,7 | 94,4 | 122 | 153 |
| 70 | 57,1 | 79,7 | 108 | 138 | 174 |
| 80 | 64,4 | 89,7 | 121 | 155 | 195 |
| 90 | | | 134 | 171 | 216 |
| 100 | | | 148 | 188 | 237 |

Bracketed sizes are to be avoided wherever possible.

Technical conditions of delivery according to DIN 267

Strength category (material): preferred: 4.8 or 5.8 } according to DIN 267 Sheet 3
permissible: 8.8 or 10.9 }

Ms = Copper-zinc-alloy (brass) according to DIN 17672, grade at manufacturer's choice

Other strength categories or materials by agreement

Finish: m according to DIN 267 Sheet 2

If surface protection is required, the designation must be augmented according to DIN 267 Sheet 9.

Intermediate lengths should as far as possible be avoided. Lengths over 100 mm should be arranged in 10 mm steps.

Normally these screws are manufactured in the sizes characterized by the quoted weight.

If the screws are to be supplied with captive washer components, an addition is made to the designation according to DIN 6900.

[1]) The countersunk (flat) head screws illustrated threaded to head and with shank represent the normal type for the ranges delimited by the stepped line in the Table. At the choice of the manufacturer they may be supplied with or without point and also, instead of having shank diameter ≈ effective diameter, with shank diameter = thread diameter. If by way of exception a particular shape or a different thread length is required, the appropriate letter for the shape or the thread length should be quoted in the designation. For examples of designation see DIN 962.

[2]) Only threaded to head

For countersinks for countersunk head screws, see DIN 74 Sheet 1 (at present circulating as draft)

## Explanations

The present Standard agrees as regards factual content with ISO draft

Draft ISO Recommendation No 2009
Slotted countersunk (flat) head screws, metric series
Vis à tête fendue fraisée, série métrique

In the preparation of this ISO draft, the Technical Committee ISO/TC 2 "Bolts, nuts and accessories" did not accept the previous German practice for countersunk head screws (small countersunk head DIN 63 and DIN 91, large countersunk head DIN 87 and DIN 88). Countersunk heads to these standards were described as not rational from an engineering point of view and objection was raised to the illogical structure of the standards. The Committee approved countersunk heads having dimensions related to the thread diameter. For this purpose, initially provision was made for what was termed an envelope profile ($d_2 = 2\ d_1$, $k = 0.5\ d_1$). On the basis of tests however it was found that this envelope profile also could not be obtained with smaller countersunk head screws for engineering reasons in manufacture. For this reason, ISO/TC 2 accepted head dimensions in accordance with the following equations:

$d_2$ (theoretical) $= d_1 + 2\ k$ (max.)
$d_2$ (min.) $= 1.75\ d_1$
$k$ (max.) $= 0.6\ d_1$ to M2.5
$= 0.55\ d_1$ for M3 to M4
$= 0.5\ d_1$ from M5
$k$ (min.) $= k$ (max.) $- 0.04\ d_1 + 0.1$ mm for M1 to M10
$= k$ (max.) $- 0.05\ d_1$ from M12

Standards DIN 963 and DIN 964 were prepared on this basis. Since countersunk heads in accordance with the above equations are not in principle interchangeable with the previous types according to DIN 63, DIN 87, DIN 88 and DIN 91, new standard sheet numbers were selected for the ISO countersunk head screws. After an appropriate transition period, standards DIN 63, DIN 87, DIN 88 and DIN 91 shall be replaced by DIN 963 and DIN 964.
It is therefore strongly recommended to use from now on only countersunk head screws according to DIN 963 and DIN 964 particularly for new designs.
In the ISO drafts for countersunk head screws, for the head diameter $d_2$ only the minimum dimensions ($1.75\ d_1$) and the theoretical maximum dimensions ($d_1 + 2\ k$ max.) are stipulated. For engineering reasons in press forming the latter cannot be attained. Since however from the point of view of the countersinks also, a more precise determination of the maximum (possible) dimensions is desirable on a national basis, in standards DIN 963 and DIN 964 values have been introduced which were calculated from the ISO minimum permissible dimension $1.75\ d_1$, i.e. the head diameters $d_2$, taking into account tolerance zones h13 and h14 are always greater than $1.75\ d_1$ and are thus within the limits of the ISO drafts.
The dimensions of the countersunk heads in DIN 963 and DIN 964 are identical. The height of the raised portion in DIN 964 is approximately $0.25\ d_1$ and is thus greater than in DIN 91 and DIN 88. The greater height of the raised portion was approved internationally so that it would be possible with the same head dimensions to have either a slotted head or a recessed head.
In DIN 963 the minimum dimensions for the slot depths correspond to $\approx 0.2\ d_1$, in DIN 964 on the other hand, because of the relatively high raised portion, they are $\approx 0.4\ d_1$. Here again the maximum dimensions are determined in such a manner as to guarantee a minimum base thickness between the bottom of the slot and the screw shank adequate to ensure the strength of the head.
At the instance of the precision engineering industry, the thread M1.8 was adopted in DIN 963. For the same pitch, this thread is more suitable as a replacement for M1.7 than M1.6. In addition, for precision engineering, the step from M1.6 to M2 is too great so that for design purposes it was necessary to have M1.8. This does not however apply to raised countersunk head screws according to DIN 964 since countersunk head screws with a raised head are only required in precision engineering in exceptional cases if at all. The M1.8 size is not included in the ISO drafts. These however do include the M2.2 and M4.5 sizes which are not required in Germany. This applies also to raised countersunk head screws M12 to M20 which were not adopted from the ISO draft.
It may further be noted that, for the head heights, the minimum dimensions given in the ISO drafts were not adopted since there would then have been a redundancy in dimensioning of the countersunk heads.

The maximum dimensions for the transition radii r or $r_2$ correspond to $0.1\ d_1$. They are larger than the approximate dimensions for transition radii in the ISO drafts and were selected in accordance with previous practice and also to maintain strength. Countersinks for these screws are stipulated in DIN 74 Sheet 1 (at present circulating as draft).