International Standard

ISO 13351

Fans — Dimensions

Ventilateurs — Dimensions

Third edition
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 117, *Fans,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 156, *Ventilation for buildings,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 13351:2009), which has been technically revised.

The main changes are as follows:

— added to the sizes of the heavy-duty fans in Table 3;

— aligned definitions and symbols to ISO 13349-1;

— clarified Figure 3 for mixed flow fan.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document gives dimensional details of circular and rectangular flanges of fans in addition to specifying the fan size designation. For circular flanges, the values specified in ISO 6580[1)] have been retained for light-duty fans, in parallel with those values given in Tables 3 and 4 for medium- and heavy-duty fans.

While it does not constrain the manufacturer's choice of flange details, this document facilitates interchangeability, thereby helping reduce technical barriers to trade.

Throughout this document, the principal dimensions are based on the rounded values of preferred numbers given in ISO 497.

1) Cancelled and replaced by ISO 13351.

Fans — Dimensions

1 Scope

This document specifies the dimensions of the circular and rectangular flanges of general-purpose fans, as well as the fan size designations. It is not applicable to cross-flow fans or to fan appliances used for individual household or similar applications.

For circular flanges, it provides for three different flange series: one for light-duty casing thicknesses, another for medium-duty fans and the third for heavy-duty fans as used on sea-going vessels or in heavy industry.

In order not to restrict fan design unduly, only the pitch diameter, hole numbers and hole diameters are specified. Flange thickness, as well as internal and external flange diameters, can be chosen freely within the limits of good engineering practice.

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 3, *Preferred numbers — Series of preferred numbers*

ISO 13349-1, *Fans — Vocabulary and definitions of categories — Part 1: Vocabulary*

ISO 13349-2, *Fans — Vocabulary and definitions of categories — Part 2: Categories*

3 Terms, definitions and symbols

For the purposes of this document, the terms and definitions given in ISO 13349-1, ISO 13349-2 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1
light-duty fan
fan suitable for air that is non-toxic, not saturated, non-corrosive, non-flammable, free from abrasive particles, and not exceeding a temperature of 80 °C, or 40 °C if the motor or the fan bearings are in the air stream, and for pressures up to 2 kPa

Note 1 to entry: See Table 1.

3.1.2
medium-duty fan
fan designed for pressures up to 10 kPa

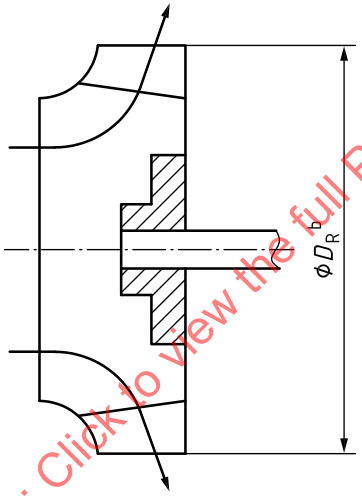
Note 1 to entry: Applications that require a robust design can be referred to as "medium duty", such as in marine applications.

3.1.3
heavy-duty fan
fan designed for pressures up to 40 kPa

Note 1 to entry: Applications that require a more robust design can be referred to as "heavy duty", such as in industrial applications.

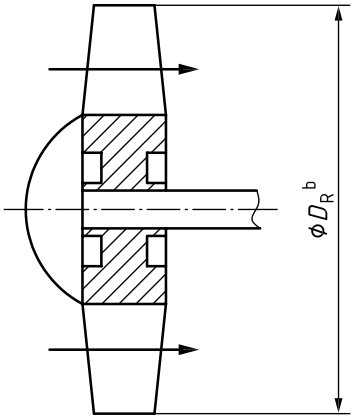
3.1.4
nominal impeller tip diameter
D
diameter of the impeller tip on which the design of the fan is based

Note 1 to entry: See Figures 1 to 3.



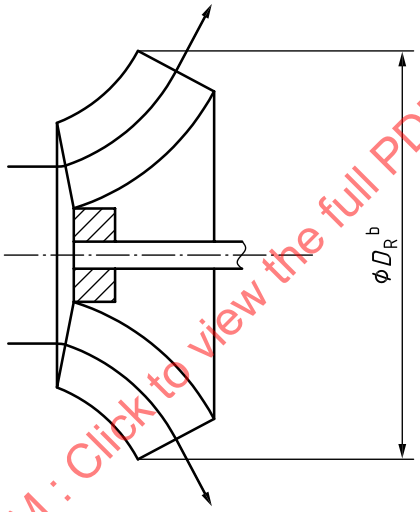
[b] *D* may be smaller than, larger than or equal to D_R.

Figure 1 — Impeller — Centrifugal fan



b D may be smaller than, larger than or equal to D_R.

Figure 2 — Impeller — Axial-flow fan



b D may be smaller than, larger than or equal to D_R.

Figure 3 — Impeller — Mixed-flow fan

3.2 Symbols

Symbol	Parameter	Unit
D	nominal impeller tip diameter	mm
D_R	impeller tip diameter[a]	mm (see Figures 1 to 3)
d_0	internal duct diameter	mm
d_1	pitch circle diameter	mm
d_2	hole diameter	mm
d_3	bolt diameter	mm
d_4	washer diameter	mm
e	casing thickness	mm
g	hole offset	mm

a Reference ISO 13349-1:2022, 3.7.4 i.e. maximum diameter measured over the tips of the blades of the impeller.

Symbol	Parameter	Unit
l	arc length between bolt holes	mm
N	number of holes	
P	pitch	mm
α	angle between bolt holes	degrees
[a] Reference ISO 13349-1:2022, 3.7.4 i.e. maximum diameter measured over the tips of the blades of the impeller.		

4 Requirements

4.1 General

This document adopts the Renard R 20 series, according to ISO 17, and preferred numbers in ISO 497 as the nominal dimensions (D) for impeller tip diameters, the inside diameters of circular flanges and the inside lengths of the sides of rectangular flanges. It takes into account the maximum casing thicknesses likely to be used for general-purpose fans, as well as typical manufacturing tolerances representative of engineering "good practice".

The smallest practical pitch circle diameter can be related to the inside diameter of the casing, the casing thickness, the size of the weld fillet or bend radius at the junction of the flange and the casing, and the normal washer diameter. Light-duty circular flanges might not be suitable for the use of open-ended spanners in all cases.

This document accepts that the number and diameter of bolts or screws cannot be established on a theoretical basis. Practical experience of satisfactory service, optimum cost of installation and manufacture, as well as dimensional tolerances of production are the most important considerations.

The dimensions of circular and rectangular flanges are given in sizes corresponding to nominal diameters from 100 mm to 2 000 mm (3 550 mm for heavy duty fans, Table 3). In the smaller sizes (below about 200 mm) flange details may be determined by the customer's specification. However, where this is not the case, then the specifications of this document are to be applied.

4.2 Circular flanges

The number of flange holes is divisible by four to permit the orientation of cylindrical cased fans at positions of 90°. The holes are disposed equally on each side of the centrelines of the fan. This permits a flange to be divided in half if a split casing is required. It also allows better access to the fixings on the remote side of a fan in a confined installation.

When an intermediate fan size is required, the R 40 series in accordance with ISO 3 shall be used to obtain the nominal inside diameter. The flange details shall be interpreted from the next larger R 20 size.

In exceptional circumstances, when even smaller increments of fan size are required, it is recommended that the R 80 series be used.

See Figure 4.

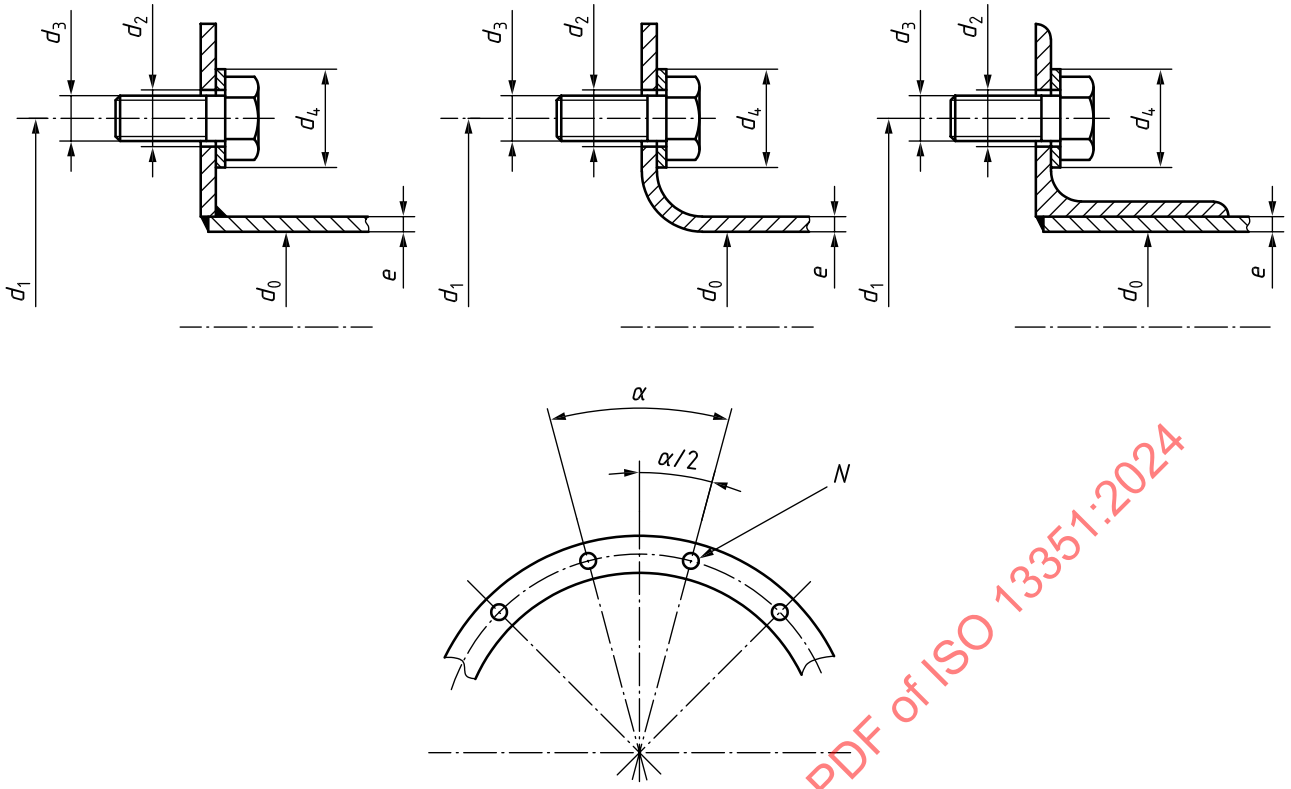


Figure 4 — Dimensions — Circular flanges

Table 1 — Dimensions — Circular flanges — Light-duty fans

Dimensions in millimetres

D	d_1	$\frac{d_1 - D}{2}$	N	α	d_2	d_3	d_4	$e_{max.}$
100	120	10	4	90	7	M6	12,5	1,6
112	137	12,5	4	90	7	M6	12,5	2
125	150	12,5	4	90	7	M6	12,5	2
140	165	12,5	4	90	7	M6	12,5	2
160	185	12,5	4	90	7	M6	12,5	2
180	205	12,5	4	90	7	M6	12,5	2
200	225	12,5	4	90	7	M6	12,5	2
224	254	15	4	90	7	M6	12,5	2
250	280	15	4	90	10	M8	17	2,5
280	320	20	4	90	10	M8	17	2,5
315	355	20	8	45	10	M8	17	3
355	395	20	8	45	10	M8	17	3
400	450	25	8	45	12	M10	21	3
450	500	25	8	45	12	M10	21	3
500	560	30	12	30	12	M10	21	3,5
560	620	30	12	30	12	M10	21	3,5
630	690	30	12	30	12	M10	21	5
710	770	30	16	22,5	12	M10	21	5
800	860	30	16	22,5	12	M10	21	5
900	970	35	16	22,5	15	M12	24	6

Table 1 *(continued)*

D	d_1	$\frac{d_1 - D}{2}$	N	α	d_2	d_3	d_4	$e_{max.}$
1 000	1 070	35	16	22,5	15	M12	24	6
1 120	1 190	35	20	18	15	M12	24	6
1 250	1 320	35	20	18	15	M12	24	6
1 400	1 470	35	20	18	15	M12	24	6
1 600	1 680	40	24	15	19	M16	30	8
1 800	1 880	40	24	15	19	M16	30	8
2 000	2 080	40	24	15	19	M16	30	8
NOTE Table 1 is similar to the withdrawn ISO 6580.								

Table 2 — Dimensions — Circular flanges — Medium-duty fans

Dimensions in millimetres

D	d_1	$\frac{d_1 - D}{2}$ [a]	N	α [a]	l [a]	d_2 [a, b]	d_3	d_4 [a, c]	e [a]
100	139	19,5	4	90	109	10	M8	16	$1,5 \leq e \leq 6$
112	151	19,5	4	90	119	10	M8	16	$1,5 \leq e \leq 6$
125	165	20	4	90	130	10	M8	16	$1,5 \leq e \leq 6$
140	182	21	8	45	71	12	M10	20	$1,5 \leq e \leq 6$
160	200	20	8	45	79	12	M10	20	$1,5 \leq e \leq 6$
180	219	19,5	8	45	86	12	M10	20	$1,5 \leq e \leq 6$
200	241	20,5	8	45	95	12	M10	20	$1,5 \leq e \leq 6$
224	265	20,5	8	45	104	12	M10	20	$1,5 \leq e \leq 6$
250	292	21	8	45	115	12	M10	20	$1,5 \leq e \leq 6$
280	332	26	8	45	130	12	M10	20	$1,5 \leq e \leq 6$
315	366	25,5	8	45	144	12	M10	20	$1,5 \leq e \leq 6$
355	405	25	8	45	159	12	M10	20	$1,5 \leq e \leq 6$
400	448	24	12	30	117	12	M10	20	$1,5 \leq e \leq 6$
450	497	23,5	12	30	130	12	M10	20	$1,5 \leq e \leq 6$
500	551	25,5	12	30	144	12	M10	20	$1,5 \leq e \leq 6$
560	629	34,5	16	22,5	124	14,5	M12	24	$2 \leq e \leq 6$
630	698	34	16	22,5	137	14,5	M12	24	$2 \leq e \leq 6$
710	775	32,5	16	22,5	152	14,5	M12	24	$2,5 \leq e \leq 6$
800	861	30,5	24	15	113	14,5	M12	24	$2,5 \leq e \leq 6$
900	958	29	24	15	125	14,5	M12	24	$3 \leq e \leq 6$
1 000	1 067	33,5	24	15	140	14,5	M12	24	$3 \leq e \leq 6$
1 120	1 200	40	32	11,25	118	18,5	M16	30	$4 \leq e \leq 6$
1 250	1 337	43,5	32	11,25	131	18,5	M16	30	$4 \leq e \leq 6$
1 400	1 475	37,5	32	11,25	145	18,5	M16	30	$5 \leq e \leq 6$

[a] Given for information only.

[b] ISO 273 coarse suggested.

[c] ISO 7089 suggested.

NOTE The pitch diameter d_1 is similar to the withdrawn DIN 24154-2: 1990–07.

Table 2 *(continued)*

D	d_1	$\frac{d_1 - D}{2}$ [a]	N	α [a]	l [a]	d_2 [a, b]	d_3	d_4 [a, c]	e [a]
1 600	1 675	37,5	40	9	132	18,5	M16	30	$5 \leq e \leq 6$
1 800	1 875	37,5	40	9	147	18,5	M16	30	6
2 000	2 073	36,5	40	9	163	18,5	M16	30	6

[a] Given for information only.

[b] ISO 273 coarse suggested.

[c] ISO 7089 suggested.

NOTE The pitch diameter d_1 is similar to the withdrawn DIN 24154-2: 1990–07.

Table 3 — Dimensions — Circular flanges — Heavy-duty fans

Dimensions in millimetres

D	d_1	$\frac{d_1 - D}{2}$ [a]	N	α [a]	l [a]	d_2 [a, b]	d_3	d_4 [a, c]	e [a]
250	325	37,5	12	30	85	14,5	M12	24	$8 \leq e \leq 10$
280	355	37,5	12	30	93	14,5	M12	24	
315	390	37,5	12	30	102	14,5	M12	24	
355	430	37,5	16	22,5	84	14,5	M12	24	
400	475	37,5	16	22,5	93	14,5	M12	24	
450	525	37,5	20	18	82	14,5	M12	24	
500	575	37,5	20	18	90	14,5	M12	24	
560	650	45	20	18	102	18,5	M16	30	
630	720	45	20	18	113	18,5	M16	30	
710	800	45	20	18	126	18,5	M16	30	
800	890	45	24	15	117	18,5	M16	30	
900	990	45	24	15	130	18,5	M16	30	
1 000	1 090	45	28	12,86	122	18,5	M16	30	
1 120	1 230	55	28	12,86	138	24	M20	37	
1 250	1 360	55	28	12,86	153	24	M20	37	
1 400	1 510	55	32	11,25	148	24	M20	37	
1 600	1 710	55	36	10	149	24	M20	37	
1 800	1 910	55	40	9	150	24	M20	37	
2 000	2 118	59	44	8,18	151	24	M20	37	10
2 240	2 368	64	48	7,5	155	24	M20	37	10
2 500	2 630	65	48	7,5	172	24	M20	37	10
2 800	2 930	65	56	6,43	164	24	M20	37	10
3 150	3 330	90	64	5,63	163	24	M20	37	10
3 550	3 735	92,5	64	5,63	183	28	M24	44	10

[a] Given for information only.

[b] ISO 273 coarse suggested.

[c] ISO 7089 suggested.

4.3 Rectangular flanges

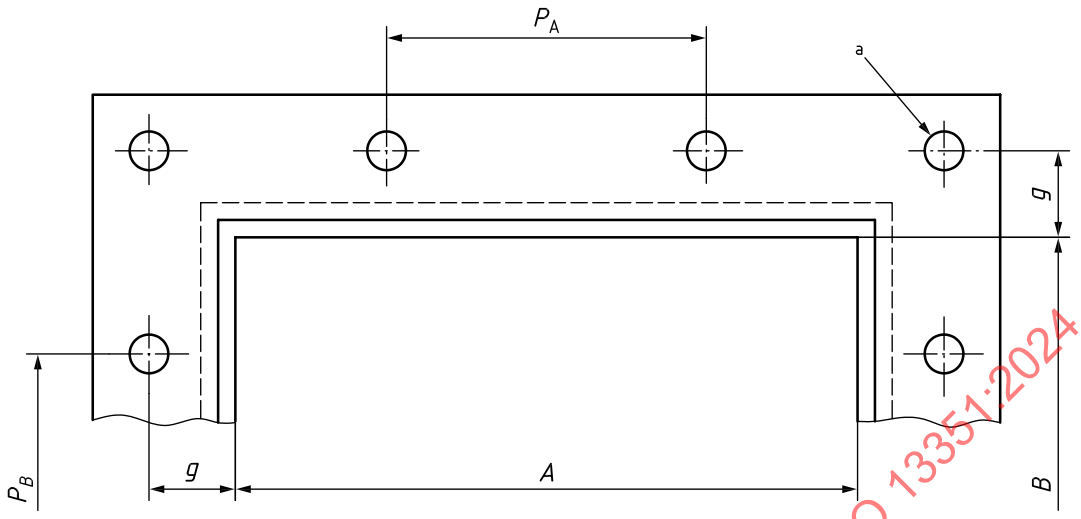
The objective of the system is to provide the maximum freedom of choice for rectangular dimensions, using standardized flange dimensions and standardized locations and sizes of bolt holes, throughout the range of

fan outlet sizes. The system is applied by selecting standard bolt hole locations from Table 4 for each of the two dimensions of the fan outlet.

Tables 5 and 6 specify a series of rectangular outlets based on the R 20 series for two alternative methods of determining aspect ratio.

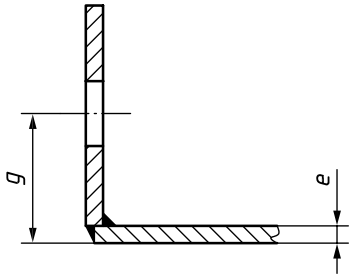
No recommendations are given for the size of angle to be used in the lap-welded design, the choice being determined by the hole offset, *g*, and the ability to apply a tightening spanner to the nut and bolt specified. For certain aspect ratios other than 1, there are selections where unequal flanges could result from the system (see also explanatory text to Figure 5). If unequal flanges are undesirable, then equal flange dimensions and bolt sizes may be selected to correspond with the dimensions for the longer of the two sides, but retaining the pitch between the bolt holes so that it corresponds to each outlet side dimension. The hole offset must remain unaltered if the dimensional integrity of the hole positions are to be maintained.

See Figure 5.

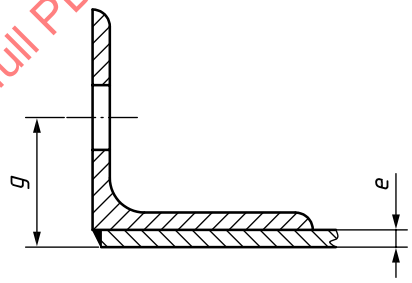


Lap-weld design

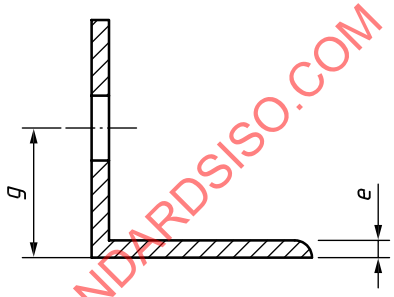
a) Hole locations



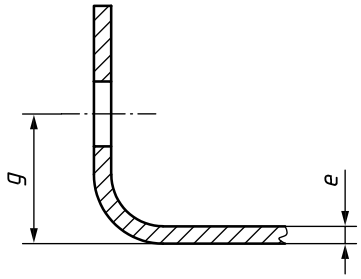
Fabricated flange design



Lap-weld design



Butt flange design



Rolled flange design

b) Alternative mounting designs

a Optional corner holes: position is defined by hole offset, *g*.

Figure 5 — Dimensions — Rectangular flanges

For certain aspect ratios other than 1, there are selections where unequal-sized holes would result from the system. If unequal-sized holes are undesirable, then equal hole and bolt sizes may be selected to correspond with the dimensions of the longer of the two sides, while retaining the pitch between the bolt so that it corresponds to each outlet side dimension.

Table 4 — Dimensions — Rectangular flanges

Dimensions in millimetres

Fan outlet Inside casing A or B	**Pitch** P_A or P_B	**No. of holes per side** N With corner holes	Without corner holes	d_3	d_2	g	$e_{max.}$ [a]
100	71	4	2	M6	7	19	2
112	71	4	2	M6	7	19	2
125	71	4	2	M6	7	19	2
140	71	4	2	M6	7	19	2
160	100	4	2	M6	7	19	2
180	100	4	2	M6	7	19	2
200	100	4	2	M6	7	19	2
224	100	4	2	M6	7	19	2
250	125	4	2	M8	10	19	3
280	125	4	2	M8	10	19	3
315	125	5	3	M8	10	19	3
355	125	5	3	M8	10	19	3
400	125	5	3	M8	10	19	3
450	125	6	4	M10	12	32	5
500	125	6	4	M10	12	32	5
560	125	7	5	M10	12	32	5
630	125	7	5	M10	12	32	5
710	125	8	6	M10	12	32	5
800	125	9	7	M10	12	32	5
900	125	9	7	M10	12	32	5
1 000	125	10	8	M12	14	32	5
1 120	125	11	9	M12	14	37	5
1 250	125	12	10	M12	14	37	5
1 400	125	12	10	M12	14	37	5
1 600	125	13	11	M12	14	37	5
1 800	125	15	13	M12	14	37	5
2 000	125	16	14	M12	14	37	5

[a] Given for information.

Table 5 — Series of rectangular outlets based on R 20 series — Aspect ratios, k_p

		Short side, mm												
		100	112	125	140	160	180	200	224	250	280	315	355	400 [a]
		k_p												
Long side mm	100	1												
	112	0,9	1											
	125	0,8	0,9	1										
	140	0,71	0,8	0,9	1									
	160	0,63	0,71	0,8	0,9	1								
	180	0,56	0,63	0,71	0,8	0,9	1							
	200	0,5	0,56	0,63	0,71	0,8	0,9	1						
	224	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1					
	250	0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1				
	280		0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1			
	315			0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1		
	355				0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1	
	400					0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1
	450	1					0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9
	500	0,9	1					0,4	0,45	0,5	0,56	0,63	0,71	0,8
	560	0,8	0,9	1					0,4	0,45	0,5	0,56	0,63	0,71
	630	0,71	0,8	0,9	1					0,4	0,45	0,5	0,56	0,63
	710	0,63	0,71	0,8	0,9	1					0,4	0,45	0,5	0,56
	800	0,56	0,63	0,71	0,8	0,9	1					0,4	0,45	0,5
	900	0,5	0,56	0,63	0,71	0,8	0,9	1					0,4	0,45
	1 000	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1					0,4
	1 120	0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1				
	1 250		0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1			
	1 400			0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1		
	1 600				0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1	
	1 800					0,4	0,45	0,5	0,56	0,63	0,71	0,8	0,9	1
		k_p												
		450 [b]	500	560	620	710	800	900	1 000	1 120	1 250	1 400	1 600	1 800
		Short side, mm												

$$k_p = \frac{\text{Short side}}{\text{Long side}}$$

Approximations are based on the usual "rounded" sizes.

[a] Continued on bottom line, "Short side".

[b] Continued from top line, "Short side".