管道差壓流量計與整流器結構匯總

ISO5167

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泵浦媒體圖書館

1.孔口板流量計

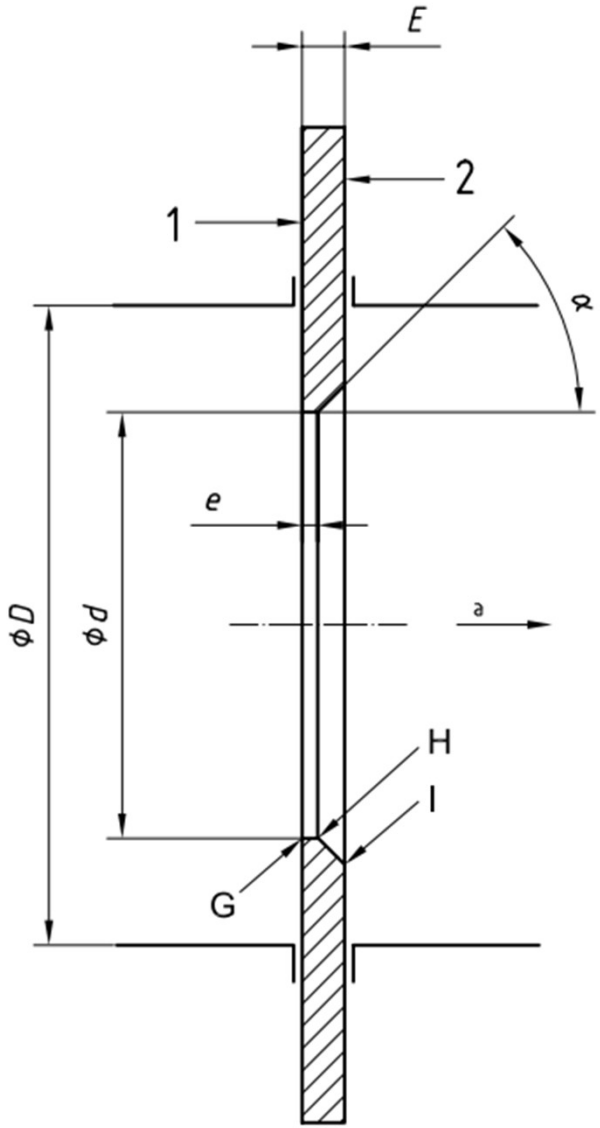
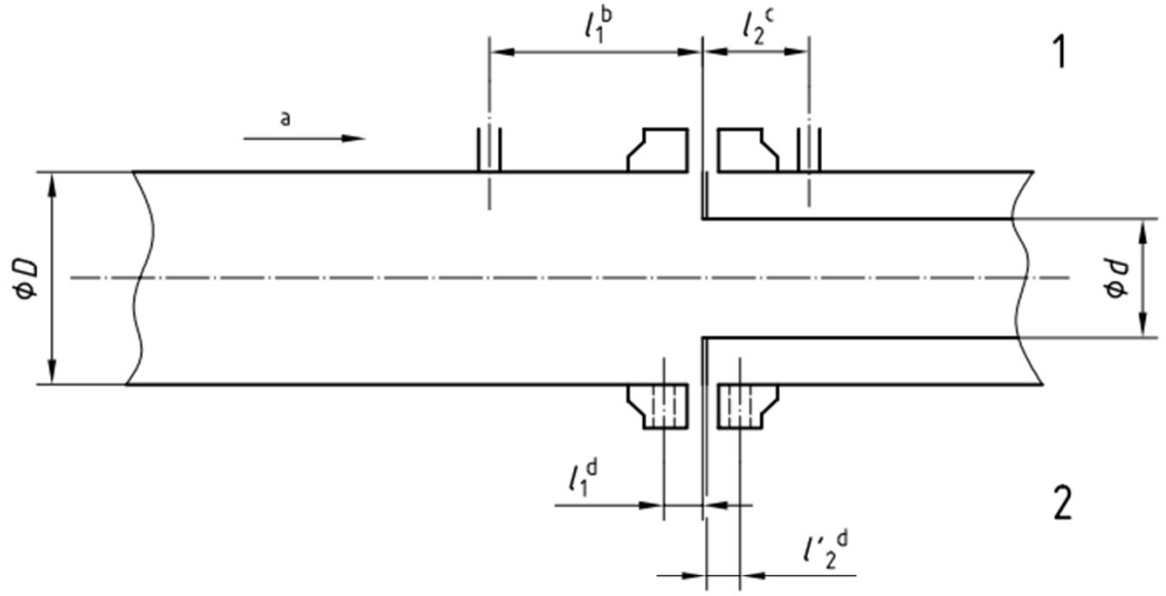


Figure 1 — Standard orifice plate



Key

1 D and $D/2$ pressure tappings

2 flange tappings

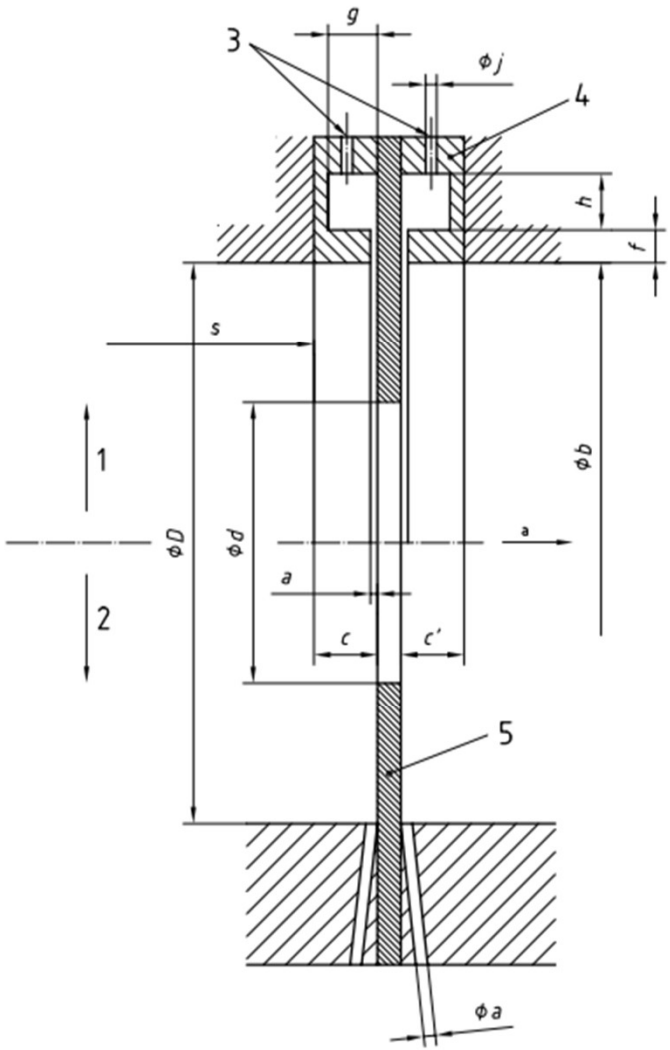
a Direction of flow.

b $l_1 = D \pm 0{,}1D$

c $l_2 = 0{,}5D \pm 0{,}02D$ for $\beta \leqslant 0{,}6$
$0{,}5D \pm 0{,}01D$ for $\beta > 0{,}6$

d $l_1 = l'_2 = (25{,}4 \pm 0{,}5)$ mm for $\beta > 0{,}6$ and $D < 150$ mm
$(25{,}4 \pm 1)$ mm for $\beta \leqslant 0{,}6$
$(25{,}4 \pm 1)$ mm for $\beta > 0{,}6$ and 150 mm $\leqslant D \leqslant$ 1 000 mm

Figure 3 — Spacing of pressure tappings for orifice plates with D and $D/2$ tappings or flange tappings



Key

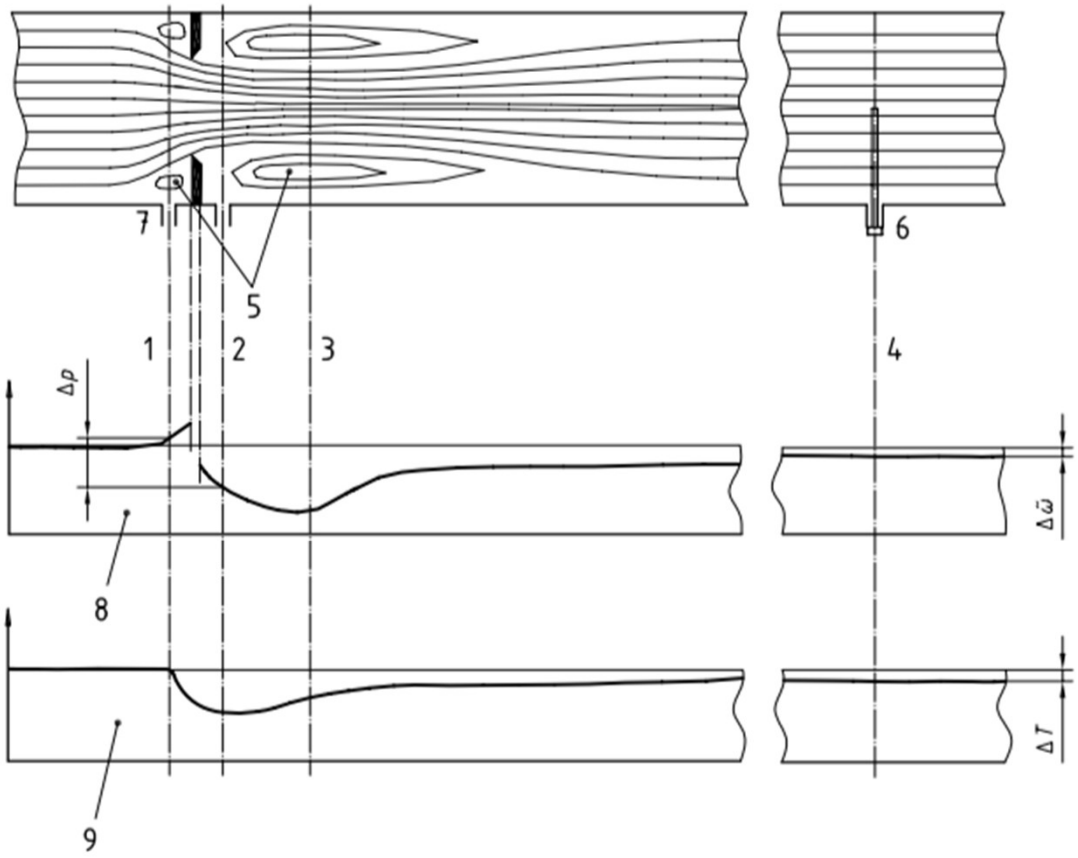
1	carrier ring with annular slot	f	=	thickness of the slot
2	individual tappings	c	=	length of upstream ring
3	pressure tappings	c'	=	length of the downstream ring
4	carrier ring	b	=	diameter of the carrier ring
5	orifice plate	a	=	width of annular slot or diameter of single tapping
		s	=	distance from upstream step to carrier ring
[a]	Direction of flow.	g, h	=	dimensions of the annular chamber
		$\varnothing j$	=	chamber tapping diameter

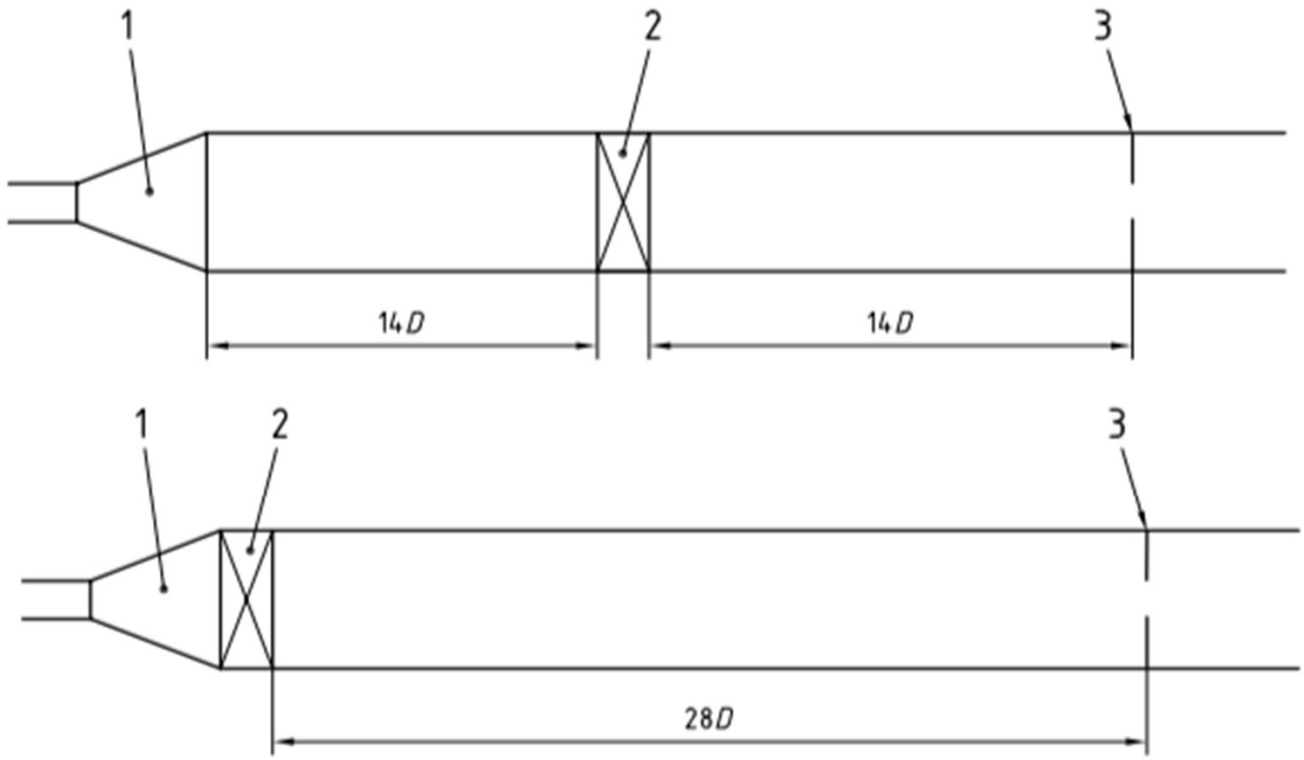
Figure 4 — Corner tappings

Figure 5 — Approximate profiles of flow, pressure and temperature in an orifice metering system

Key

1 plane of upstream pressure tappings
2 plane of downstream pressure tappings
3 plane of "vena contracta" (highest velocities)
4 plane of temperature probe
5 secondary flow regions
6 thermometer pocket or well
7 pressure tappings
8 pressure distribution on the wall
9 mean temperature distribution





Key

1 expander
2 full bore ball valve or gate valve fully open
3 orifice plate

Figure 6 — Layout including a full bore valve for $\beta = 0{,}6$

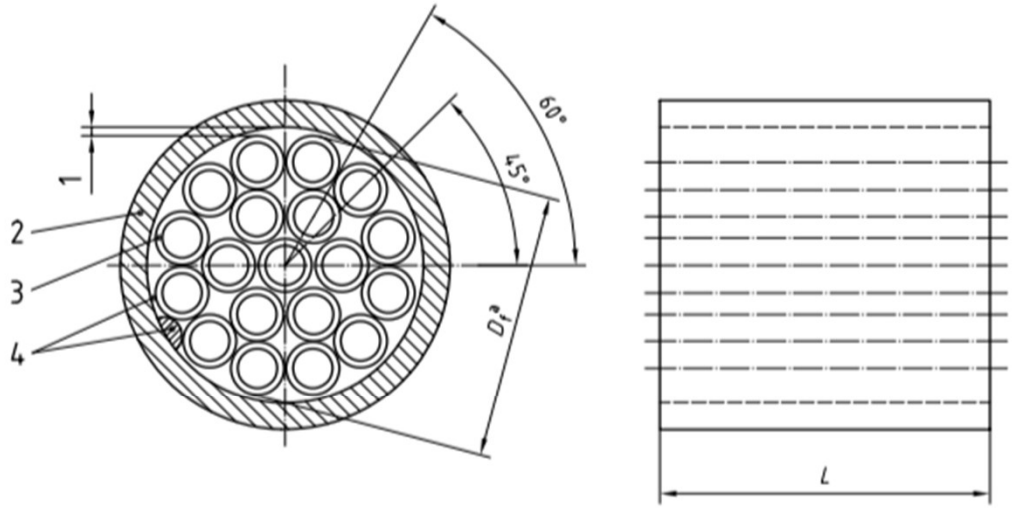
Table 4 — Permitted range of straight lengths between an orifice plate and a 19-tube bundle flow straightener (1998) downstream of fittings located at a distance, L_f, from the orifice plate

Values expressed as multiples of internal diameter, D

Diameter ratio β	Single 90° bend [b]				Two 90° bends [b] in perpendicular planes ($2D \geqslant S$) [a]				Single 90° tee				Any fitting			
	$30 > L_f \geqslant 18$		$L_f \geqslant 30$		$30 > L_f \geqslant 18$		$L_f \geqslant 30$		$30 > L_f \geqslant 18$		$L_f \geqslant 30$		$30 > L_f \geqslant 18$		$L_f \geqslant 30$	
1	2		3		4		5		6		7		8		9	
—	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]
$\leqslant 0{,}2$	5 to 14,5	1 to n [e]	5 to 25	1 to n [e]	5 to 14,5	1 to n [e]	5 to 25	1 to n [e]	5 to 14,5	1 to n [e]	1 to 25	1 to n [e]	5 to 11	1 to n [e]	5 to 13	1 to n [e]
0,4	5 to 14,5	1 to n [e]	5 to 25	1 to n [e]	5 to 14,5	1 to n [e]	5 to 25	1 to n [e]	5 to 14,5	1 to n [e]	1 to 25	1 to n [e]	5 to 11	1 to n [e]	5 to 13	1 to n [e]
0,5	11,5 to 14,5	3 to n [e]	11,5 to 25	3 to n [e]	9,5 to 14,5	1 to n [e]	9 to 25	1 to n [e]	11 to 13	1 to n [e]	9 to 23	1 to n [e]	[f] [g]	3 to n [e]	11,5 to 14,5	3 to n [e]
0,6	12 to 13	5 to n [e]	12 to 25	5 to n [e]	13,5 to 14,5	6 to n [e]	9 to 25	1 to n [e]	[f] [h]	7 to n [e]	11 to 16	1 to n [e]	[f]	7 to n [e]	12 to 16	6 to n [e]
0,67	13	7 to n [e]	13 to 16,5	7 to n [e]	13 to 14,5	7 to n [e]	10 to 16	5 to n [e]	[f]	8 to n [e]	11 to 13	6 to n [e]	[f]	8 to 10	13	7 to n-1,5 [e]
0,75	14	8 to n [e]	14 to 16,5	8 to n [e]	[f]	9,5 to n [e]	12 to 12,5	8 to n [e]	[f]	9 to n [e]	12 to 14	7 to n [e]	[f]	9,5	[f]	8 to 22
Recommended	13 for $\beta \leqslant 0{,}67$	13 for $\beta \leqslant 0{,}75$	14 to 16,5 for $\beta \leqslant 0{,}75$	14 to 16,5 for $\beta \leqslant 0{,}75$	13,5 to 14,5 for $\beta \leqslant 0{,}67$	13,5 to 14,5 for $\beta \leqslant 0{,}75$	12 to 12,5 for $\beta \leqslant 0{,}75$	12 to 12,5 for $\beta \leqslant 0{,}75$	13 for $\beta \leqslant 0{,}54$	13 for $\beta \leqslant 0{,}75$	12 to 13 for $\beta \leqslant 0{,}75$	12 to 13 for $\beta \leqslant 0{,}75$	9,5 for $\beta \leqslant 0{,}46$	9,5 for $\beta \leqslant 0{,}75$	13 for $\beta \leqslant 0{,}67$	13 for $\beta \leqslant 0{,}75$

NOTE The straight lengths given in the table are the permitted lengths between the downstream end of a 19-tube bundle flow straightener (1998) (as described in 6.3.2.1) and the orifice plate given that a particular fitting is installed upstream of the 19-tube bundle flow straightener (1998) at a distance L_f from the orifice plate. The distance L_f from the orifice plate is measured to the downstream end of the curved portion of the nearest (or only) bend or of the tee or the downstream end of the curved or conical portion of the reducer or expander. The recommended values give tube bundle locations that are applicable over a specified range of β.

2.整流器



Key

1 minimized gap
2 pipe wall
3 tube wall thickness
4 centring spacer options (typically four places)

[a] D_f is the flow straightener outside diameter.

Figure 8 — 19-tube bundle flow straightener (1998)

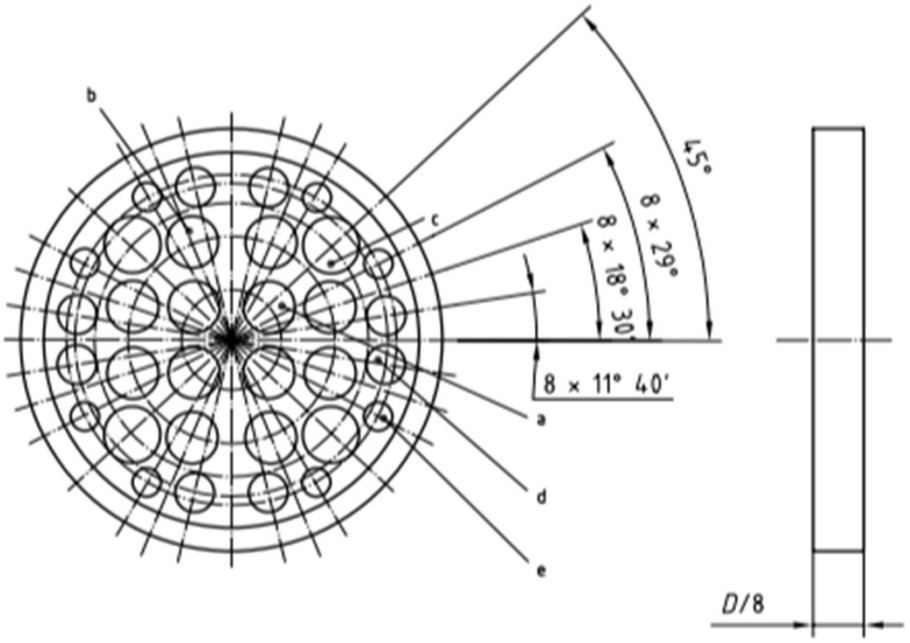
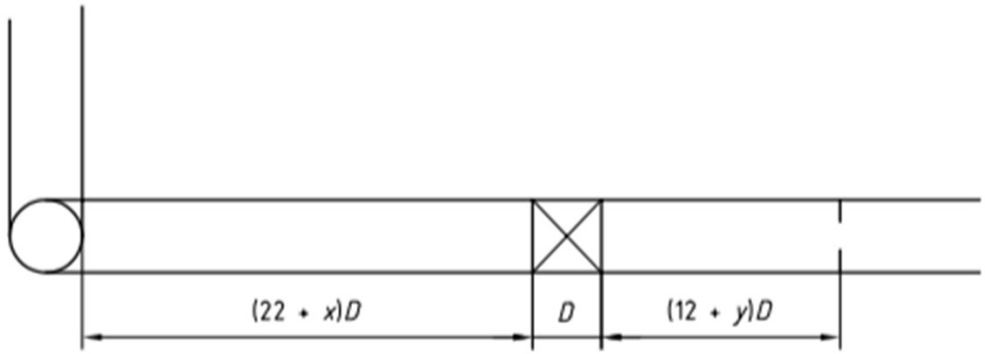
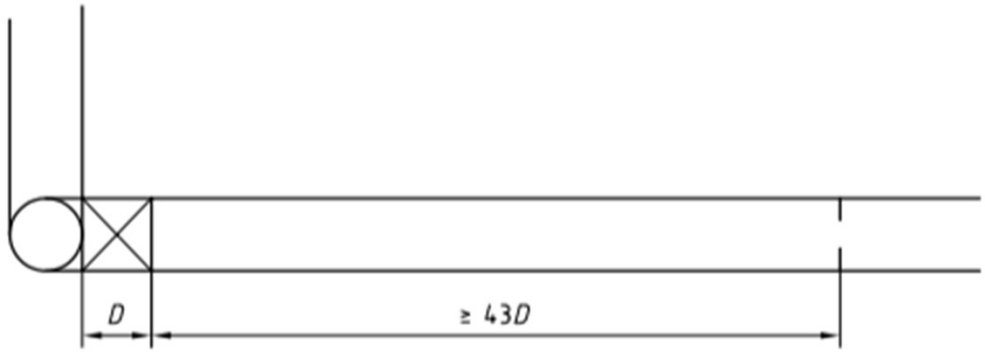


Figure 10 — Drawing of the Zanker flow conditioner plate



a) $x \geqslant 0, y \geqslant 0, x + y \geqslant 9$



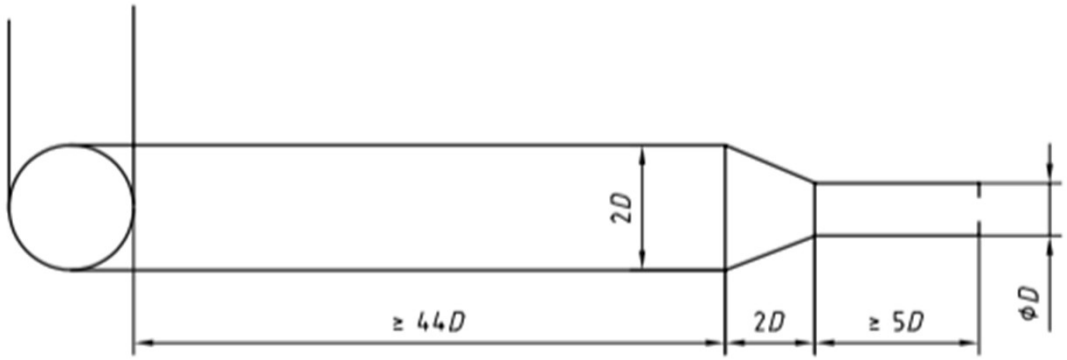
b)

Key

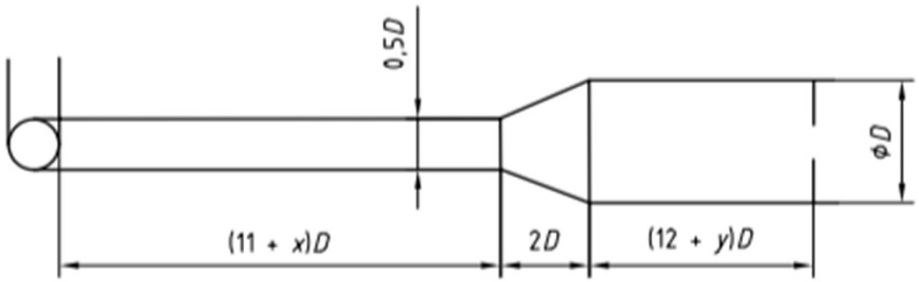
1 position of any fitting placed at any distance upstream of the single bend

2 position of previous fitting placed before straight length upstream of the single bend

Figure 9 — Examples of installations with a 19-tube bundle flow straightener (1998) downstream of a single bend

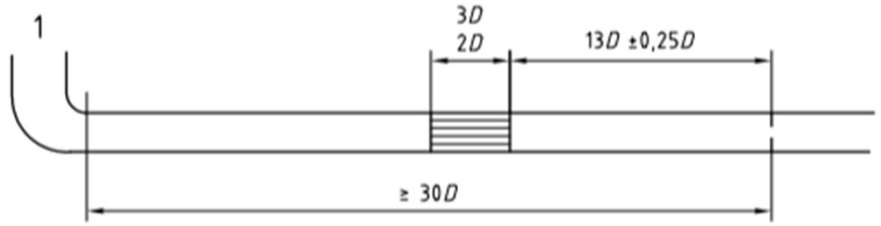


c)

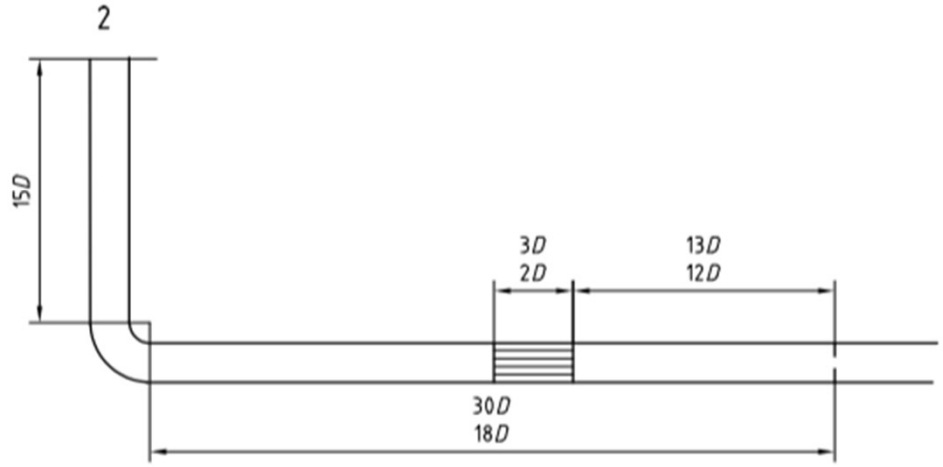


d) $x \geqslant 0, y \geqslant 0, x + y \geqslant 19$

Figure 7 — Examples of acceptable installations (see 6.2.9)



a) Installation using 6.3.2.2.2



b) Installation using Table 4

Key

1 position of any fitting placed at any distance upstream of the single bend

2 position of previous fitting placed before straight length upstream of the single bend

Figure 9 — Examples of installations with a 19-tube bundle flow straightener (1998) downstrea of a single bend

6.3.2.2.2 The 19-tube bundle flow straightener (1998) shall be installed so that there is at least $30D$ between the orifice plate and any upstream fitting. The 19-tube bundle flow straightener (1998) shall be installed so that the distance between the downstream end of the 19-tube bundle flow straightener (1998) and the orifice plate is equal to $13D \pm 0{,}25D$.

Table 4 provides the permitted location range and the recommended location for the 19-tube bundle flow straightener (1998) for two ranges of L_f:

— $30D > L_f \geqslant 18D$, and

— $L_f \geqslant 30D$.

L_f shall be greater than or equal to $18D$. The locations for the 19-tube bundle flow straightener (1998) are described in Table 4 in terms of the straight lengths between the downstream end of the 19-tube bundle flow straightener (1998) and the orifice plate.

6.3.3.3 Installation

L_f, the distance between the orifice plate and the nearest upstream fitting, shall be at least equal to $17D$. The Zanker flow conditioner plate shall be installed so that L_s, the distance between the downstream face of the conditioner plate and the orifice plate, is such that

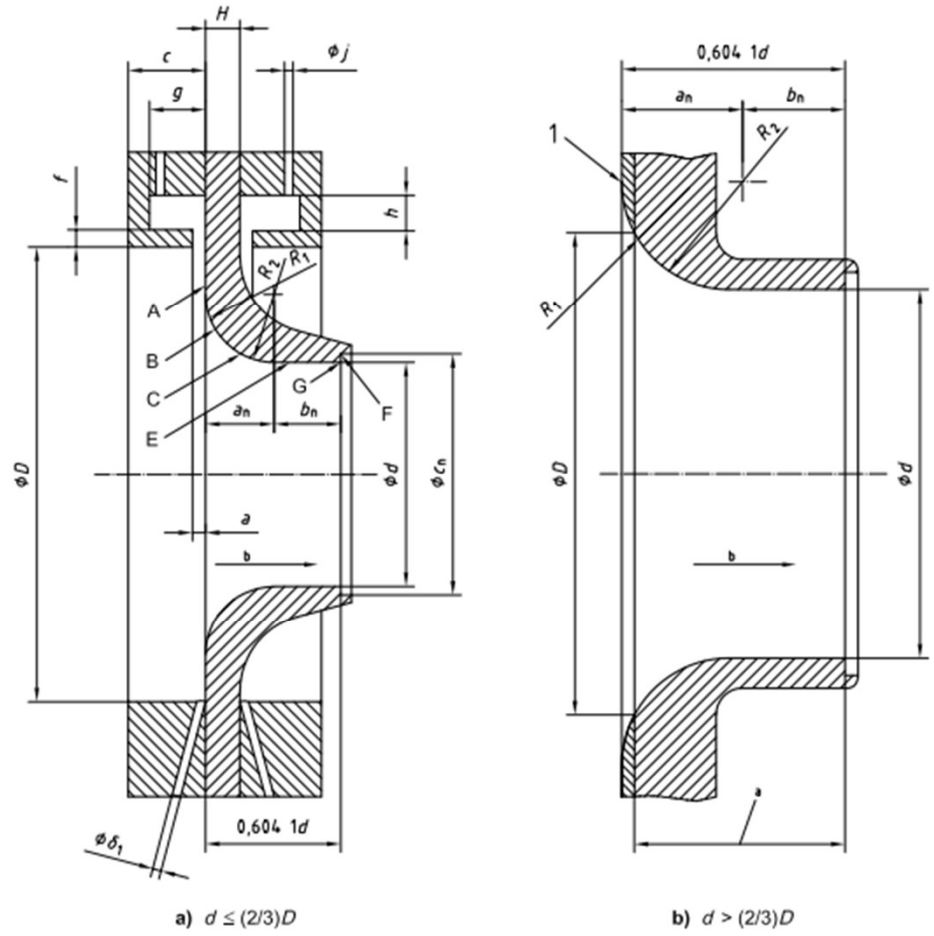
$$7{,}5D \leqslant L_s \leqslant L_f - 8{,}5D$$

The Zanker flow conditioner plate can be used for $\beta \leqslant 0{,}67$.

The distance to a bend (or bend combination) or a tee is measured to the downstream end of the curved portion of the nearest (or only) bend or of the tee. The distance to a reducer or expander is measured to the downstream end of the curved or conical portion of the reducer or the expander.

The locations in this subclause are acceptable downstream of any fitting. A wider range of locations for the Zanker flow conditioner plate is permissible if the range of upstream fittings is restricted or the overall length between the upstream fitting and the orifice plate is increased or the diameter ratio of the orifice plate is reduced. These locations are not described here.

3.噴嘴流量計



a) $d \leq (2/3)D$

b) $d > (2/3)D$

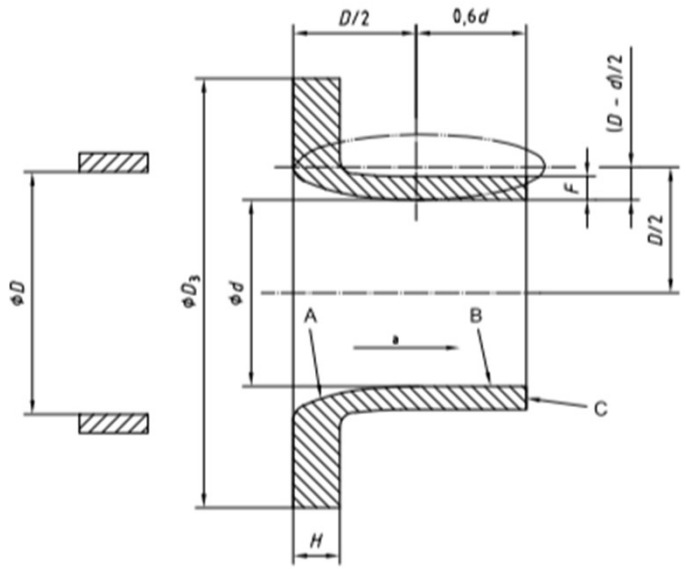
Key

1 portion to be cut off

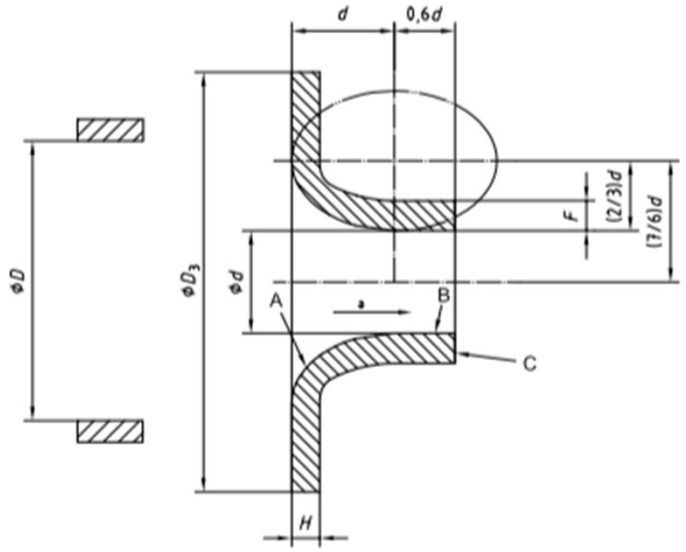
a See 5.1.2.7.

b Direction of flow.

Figure 1 — ISA 1932 nozzle

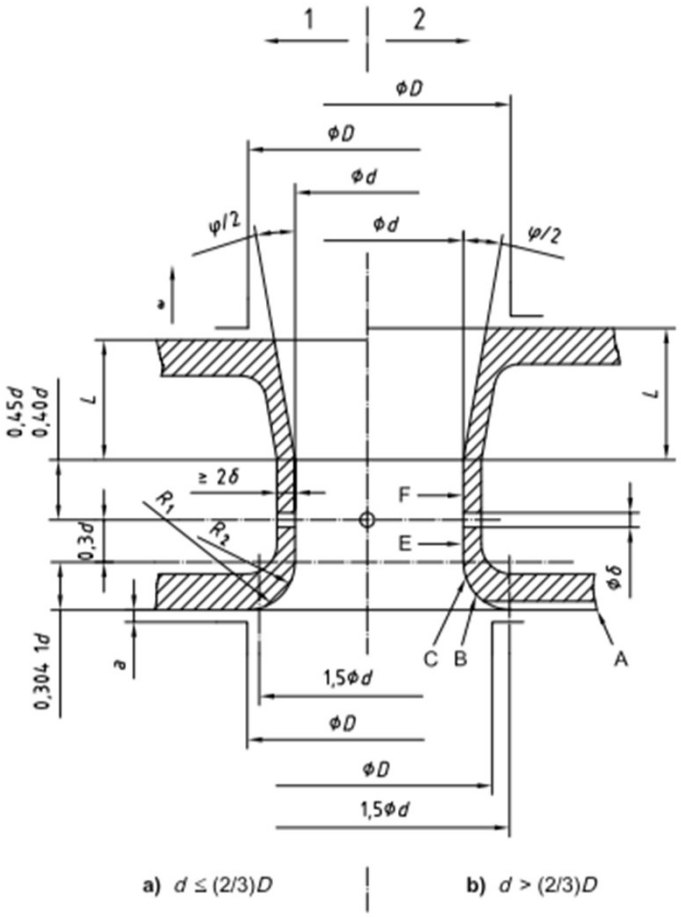


a) **High ratio** $0,25 \leqslant \beta \leqslant 0,8$



b) **Low ratio** $0,2 \leqslant \beta \leqslant 0,5$

Figure 2 — Long radius nozzles



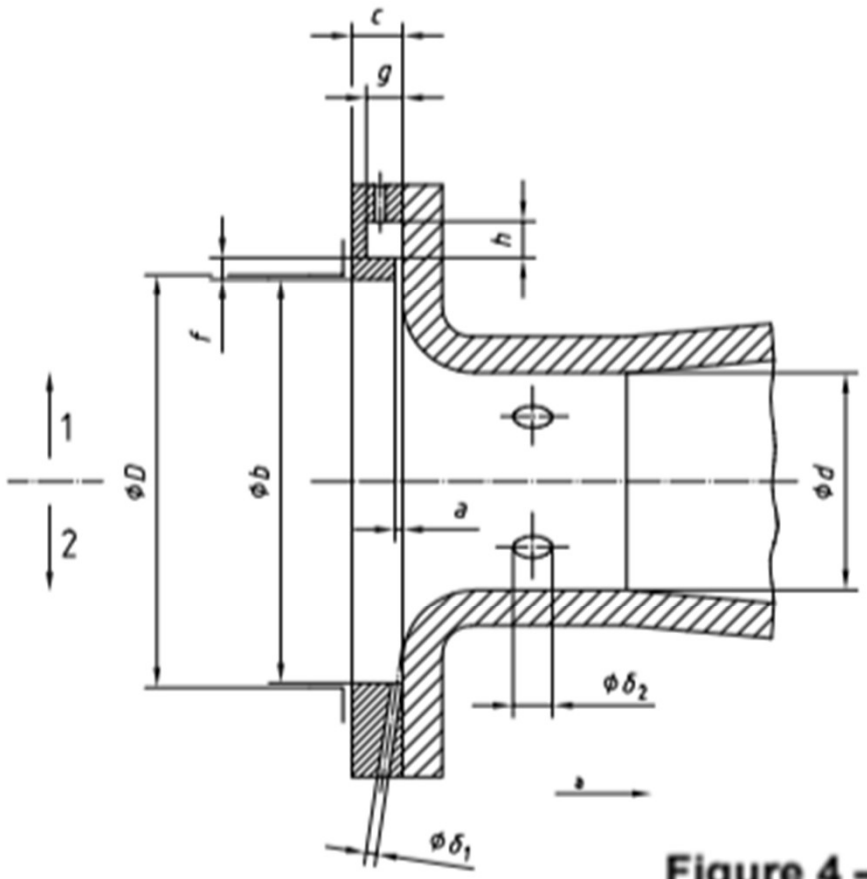
Key

1 truncated divergent section

2 non-truncated divergent section

[a] Direction of flow.

Figure 3 — Venturi nozzle



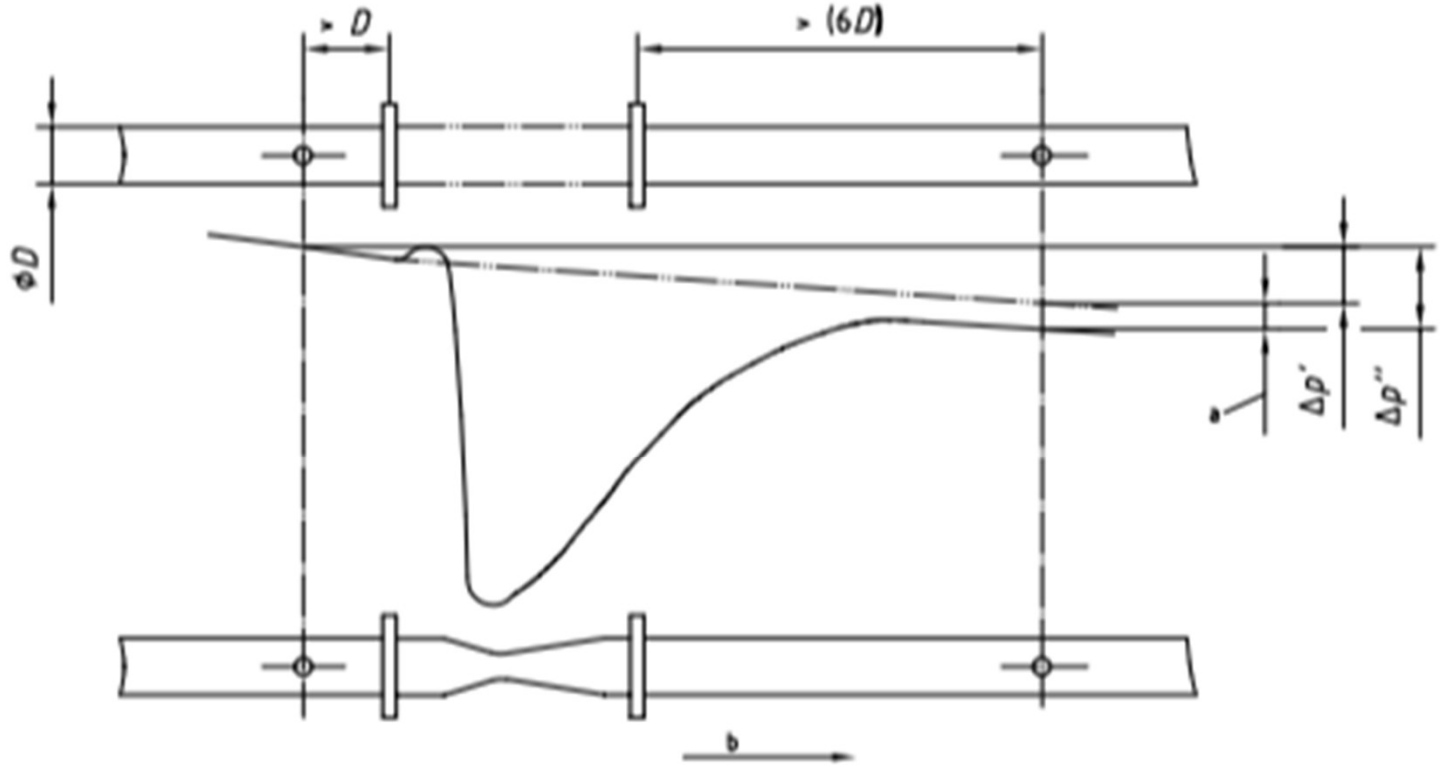
Key

1 with annular slot

2 with individual corner tappings

[a] Direction of flow.

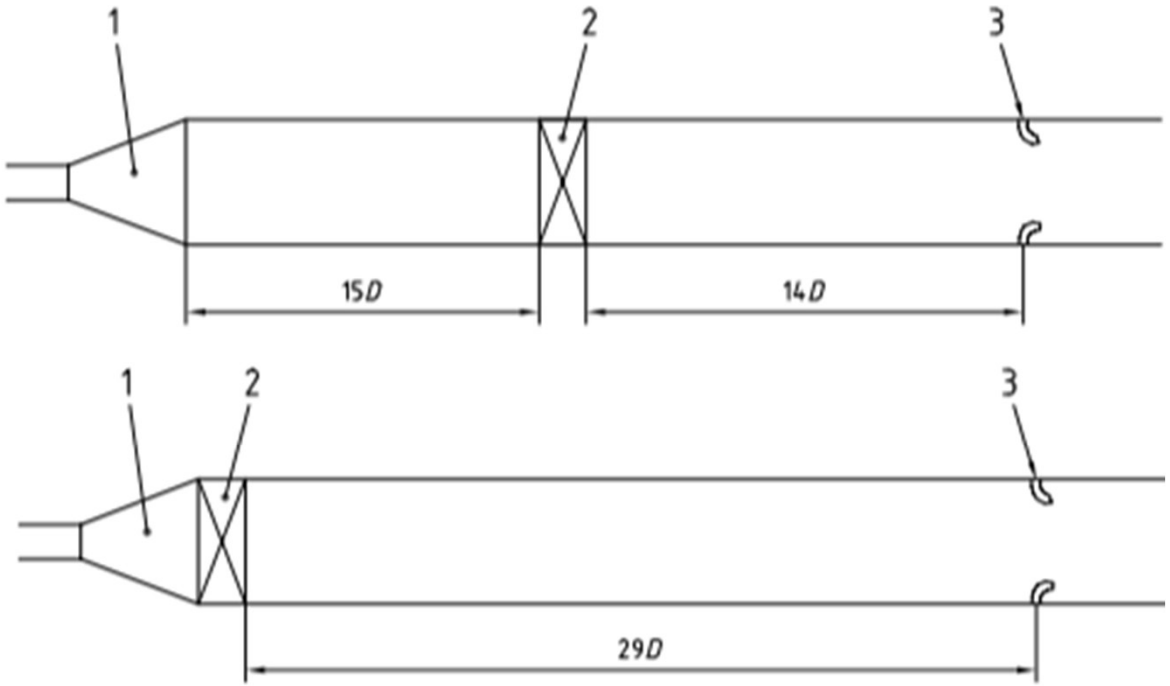
Figure 4 — Venturi nozzle — Pressure tappings



a Pressure loss.

b Direction of flow.

Figure 5 — Pressure loss across a Venturi nozzle

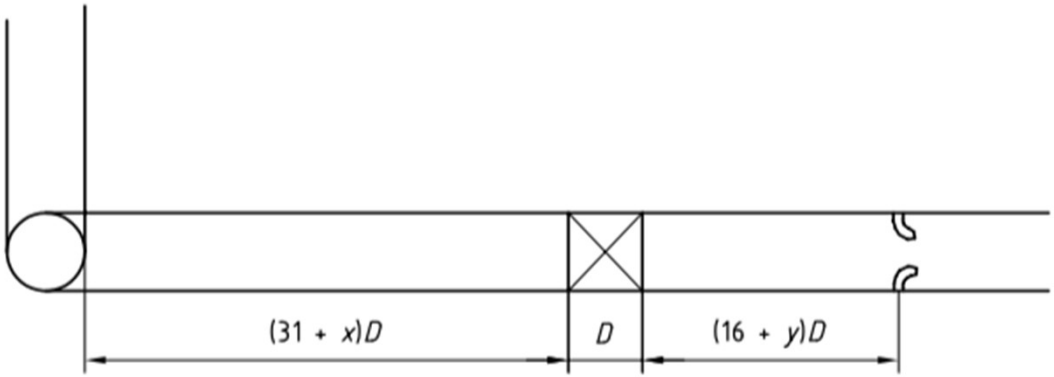


Key

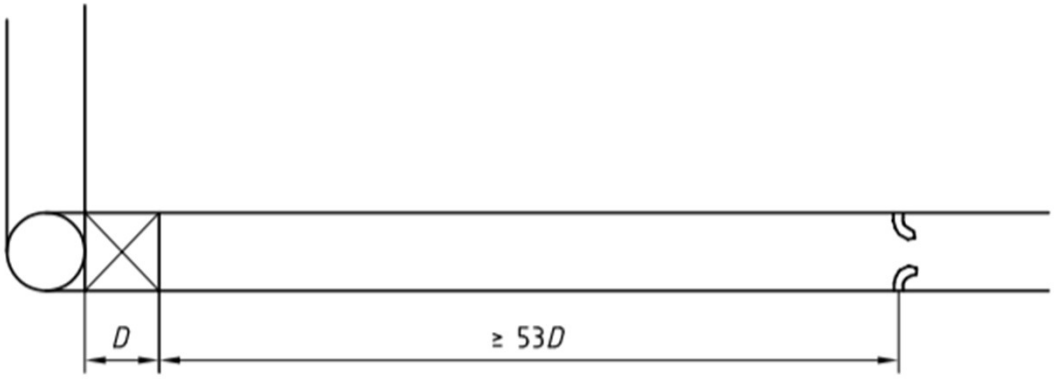
1 expander
2 full bore ball valve or gate valve fully open
3 nozzle

Figure 6 — Layout including a full bore valve for $\beta = 0{,}6$

1.孔口板流量計



a) $x \geqslant 0, y \geqslant 0, x + y \geqslant 6$



b)

Table 3 — Required straight lengths for nozzles and Venturi nozzles

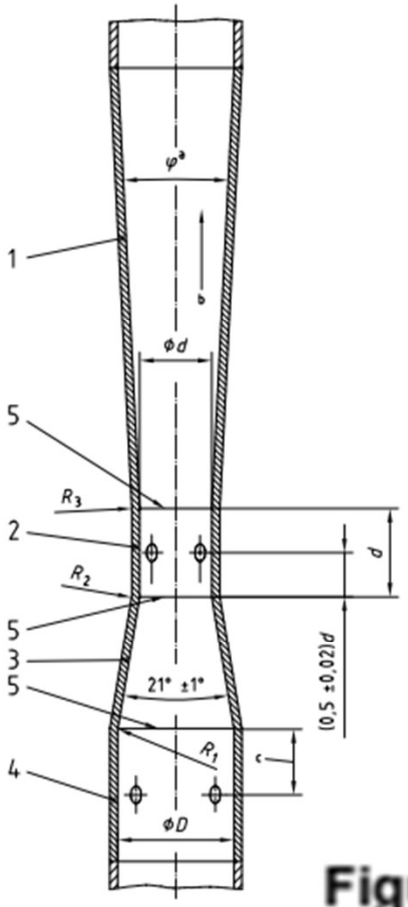
Values expressed as multiples of internal diameter, D

Diameter ratio β [a]	Upstream (inlet) side of the primary device																		Downstream (outlet) side of the primary device	
	Single 90° bend or tee (flow from one branch only)		Two or more 90° bends in the same plane		Two or more 90° bends in different planes		Reducer $2D$ to D over a length of $1,5D$ to $3D$		Expander $0,5D$ to D over a length of D to $2D$		Globe valve fully open		Full bore ball or gate valve fully open		Abrupt symmetrical reduction		Thermometer pocket or well [b] of diameter $\leqslant 0,03D$		Thermometer pocket or well [b] of diameter between $0,03D$ and $0,13D$		Fittings (Columns 2 to 8)	
1	2		3		4		5		6		7		8		9		10		11		12	
	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]	A [c]	B [d]
0,20	10	6	14	7	34	17	5	[e]	16	8	18	9	12	6	30	15	5	3	20	10	4	2
0,25	10	6	14	7	34	17	5	[e]	16	8	18	9	12	6	30	15	5	3	20	10	4	2
0,30	10	6	16	8	34	17	5	[e]	16	8	18	9	12	6	30	15	5	3	20	10	5	2,5
0,35	12	6	16	8	36	18	5	[e]	16	8	18	9	12	6	30	15	5	3	20	10	5	2,5
0,40	14	7	18	9	36	18	5	[e]	16	8	20	10	12	6	30	15	5	3	20	10	6	3
0,45	14	7	18	9	38	19	5	[e]	17	9	20	10	12	6	30	15	5	3	20	10	6	3
0,50	14	7	20	10	40	20	6	5	18	9	22	11	12	6	30	15	5	3	20	10	6	3
0,55	16	8	22	11	44	22	8	5	20	10	24	12	14	7	30	15	5	3	20	10	6	3
0,60	18	9	26	13	48	24	9	5	22	11	26	13	14	7	30	15	5	3	20	10	7	3,5
0,65	22	11	32	16	54	27	11	6	25	13	28	14	16	8	30	15	5	3	20	10	7	3,5
0,70	28	14	36	18	62	31	14	7	30	15	32	16	20	10	30	15	5	3	20	10	7	3,5
0,75	36	18	42	21	70	35	22	11	38	19	36	18	24	12	30	15	5	3	20	10	8	4
0,80	46	23	50	25	80	40	30	15	54	27	44	22	30	15	30	15	5	3	20	10	8	4

NOTE 1 The minimum straight lengths required are the lengths between various fittings located upstream or downstream of the primary device and the primary device itself. All straight lengths shall be measured from the upstream face of the primary device.

NOTE 2 These lengths are not based on modern data.

4.文氏管流量計



Key

1	conical convergent E
2	cylindrical throat, C
3	conical convergent B
4	entrance cylinder A
5	connecting planes
a	$7° \leqslant \varphi \leqslant 15°$
b	Flow direction
c	See 5.4.7

Figure 1 — Geometric profile of the classical Venturi tube