INTRA-AUTOMATION

MESS- UND REGELINSTRUMENTE / MEASUREMENT AND CONTROL

Certified according to ISO 9001; PED 97/23/EC; ATEX 2014/34/EU

ORIFICE PLATES & FLANGES

Types: BLS & MBL

Technical Information

02/2016

FLOW

THE EXPERT IN LEVEL AND FLOW

Intra-Automation
Technical Information
02/2016

Technical details subject to be changed without notice.

For comments regarding this brochure, please contact:
info@intra-automation.de

Types: BLS & MBL
ORIFICE PLATES & FLANGES

List of contents

1 Differential pressure and pressure loss

When a throttle element is interposed in a closed passage of fluid in piping, a difference is produced between the pressure upstream and downstream the throttle element as illustrated in fig 1. This difference ($h=p_1-p_2$) is called differential pressure. The fluid passing through the section 2 gradually regains its pressure as it flows downstream, but the downstream pressure cannot be recovered up to the upstream pressure, part of the pressure being lost. This loss is called pressure loss (permanent pressure loss= p_1-p_3).
The extent of this pressure loss depends on the type of throttle elemnts and their open area ratio, as shown in fig 2.
The relation between the flow rate and the differential pressure is given by:

$$V = k * \sqrt{\frac{\Delta p}{\rho_1}} \qquad (1)$$

$$V_N = k * \sqrt{\frac{\Delta p * \rho_1}{\rho_N}} \qquad (2)$$

$$M = k * \sqrt{\Delta p * \rho_1} \qquad (3)$$

with:

$\dot{V}$	[m³/h]	: volume rate of flow at density under operating conditions
$\dot{V}_N$	[Nm³/h]	: volume rate of flow at density under standard conditions
$\dot{M}$	[kg/h]	: mass flow
Δp	[kg/m²]	: differential pressure
ρ_1	[kg/m³]	: density under operating conditions
ρ_N	[kg/Nm³]	: density under standard conditions
k	[ ]	: coefficient (determined by type and size of throttle element.

From the above, the relation between the flow rate and the differential pressure where the density ist constant but the flow is rate is variable is as listed in Table 1. In other words, the flow rate is obtainable by measuring the differential pressure. When the density is variable (when pressure and temperature are variable), the true flow rate can be given by compensating the varate of the density by the above equations (this, however, is not applicable when the density varies to a great extent).

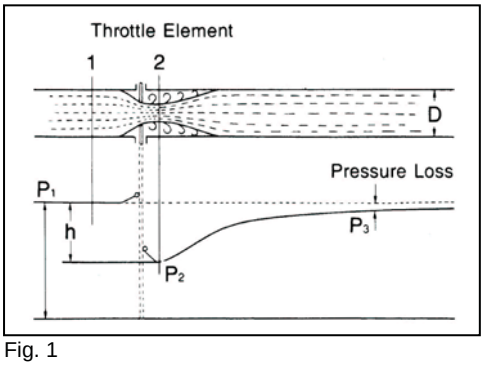


Fig. 1

Flow [%]	Dp [%]
100	100
90	81
80	64
70	49
60	36
50	25
40	16
30	9
20	4
10	1
0	0

Table 1

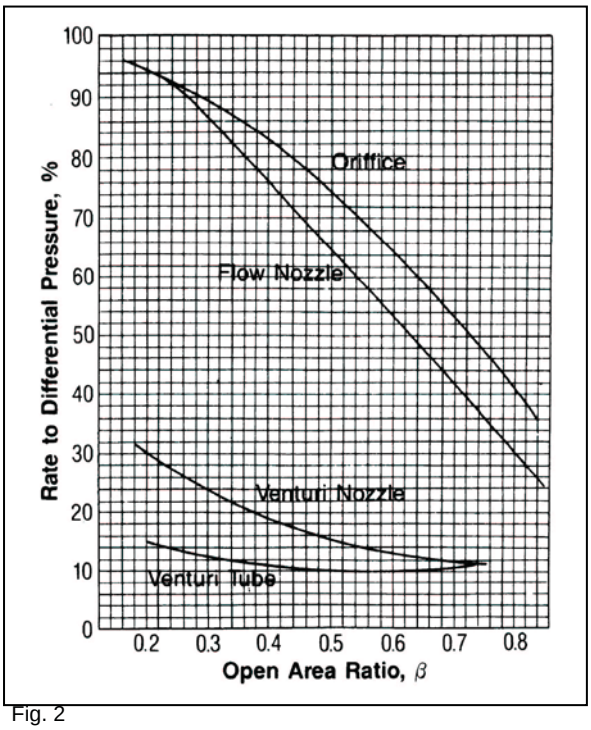


Fig. 2

2 Orifice plate, type: BLS-100-RF

2.1 Description

Orifice plates have a disadvantage of permitting a greater pressure loss than other throttle elements (flow nozzles, venturi tubes, ITABAR, etc.) but are most popularly used because of their simpler shape, easier manufacturability, lower cost and higher reliability.
The types of orifice plates include concentric, eccentric, segmental, quarter-circle and square orifice plate, etc..

2.2 Specification

- ***orifice bore type:***
  concentric square edged orifices
  quadrant edged orifices
  eccentric orifices
  segmental orifices
  minimum quadrant edged orifice diameter 4.5 mm
- ***flow calculation standards:***
  concentric square edged orifices:
  ISO-5167-1991; ASME-1991; JIS Z 8762-1988
  1D-1/2D (radius) tap and 2.5D-8D (pipe) tape are per “ASME Fluid Meters, Their Theory and Application, 5th Edition, 1959”
  eccentric orifices/ segmental orifices:
  ASME Fluid Meters, Their Theory and Application, 5th Edition, 1959
  Note: ASME-1991, JIS Z 8762-1988 flow data used to calculate orifice bore is identical to that of ISO-5167-1991
- ***flange ratings:***
  ANSI Class 150: 300, 600 and 900 (RF)
  DIN PN16, 40, 63
- ***pressure taps:***
  flange tap
  corner tap
  1D and 1/2D (Radius) tap
- ***plate thickness:***
  3, 6, 9, 12mm, etc.
- ***tab handle:***
  welded to orifice plate
- ***materials:***
  plate DIN 1.4571, 1.5415, etc.
  ASTM 304, 316SS, 316Ti, etc.
- ***drain and vent hole :***
  per ISA-RP3.2 recommendations. Not drilled for orifice bore smaller than 25.4 mm
- ***markings:***
  Upstream side of tab handle stamped “+” and with bore type and size, line size, TAG no., quadrant edge radius and flange rating, orifice material and serial number.
  Downstream side of tab handle stamped with “-“.
- ***Special markings:***
  special marking may be furnished to meet specific requirements

2.3 Types

- ***concentric***
  This has special features such as simple structure, high accuracy, easy mounting and dismounting. The orifice plates are correctly finished to the dimensions, surface roughness and flatness to the applicable standard.
  Differential pressure is measured through flange, vena contracta, radius or corner taps.
- ***Eccentric***
- For liquids containing solid particles that are likely to sediment or for vapors likely to deposit water condensate, this orifice plate is used with its eccentric bore bottom flush with the bottom of the piping surface so that the sedimentation of such inclusions is avoided. Likewise, for gases or vapors, it may be installed with its eccentric bore top flush with with the bore top of the piping to avoid the stay of gas or vapor in its vicinty. Flange taps or vena contracta taps are used for the orifice plate.
- ***Segmental***
  The bore of the orifice plate is a semicircle to perform the same function as the eccentric orifice plate. This is used for similar purposes.
  Flange taps or vena contracta taps are employed to take out fluid pressures.
- ***Quarterant***
  The inlet edge of the bore of this orifice plate is rounded to a quarter circle. This orifice plate is principally used for measuring flow rates of low Reynolds numbers.
  Flange taps or corner taps are used.

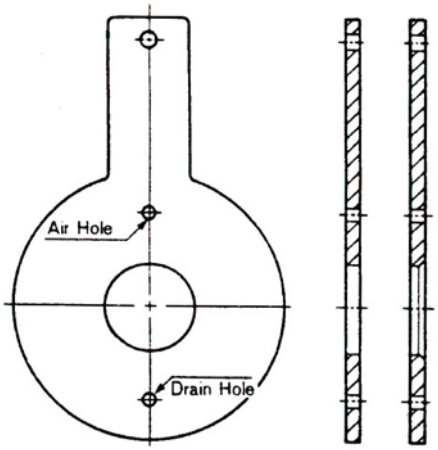


Fig 3

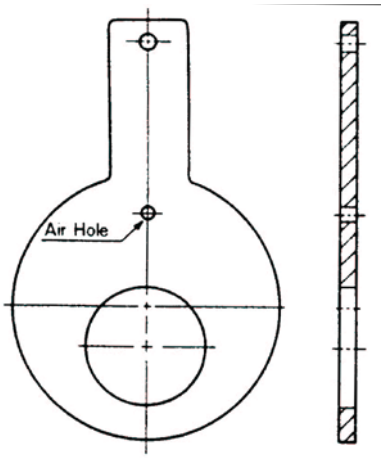


Fig 4

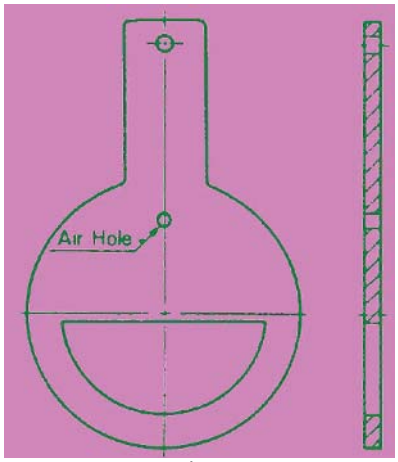


Fig 5

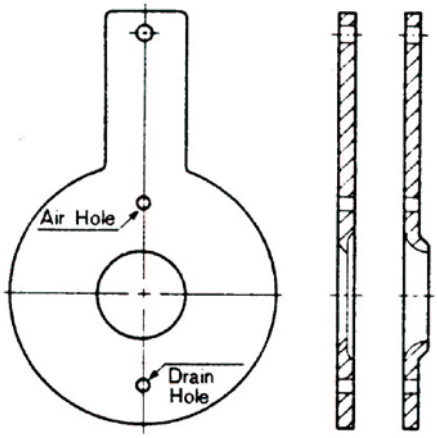


Fig 6

2.4 Ordering codes

Code	Description						
BLS	Orifice plate acc. EN ISO 5167-1						
	1. Installation between DIN / ANSI flanges Form C/RF						
	100	Standard					
		2. Flanges					
		D	acc. to DIN with flange facing form C				
		A	acc. to ANSI with flange facing RF				
			3. Orifice calculation by Intra				
			0	without			
			M	with			
				4. Documentation			
				0	without		
				1	Material certificates acc. DIN EN 10204-2.2		
				2	Material certificates acc. DIN EN 10204-3.1		
					5. Connection dimension		
					PN10-16/150 lbs, mat. 316L	**PN10-16/150 lbs, mat. 316Ti**	
					A1 DN50 / 2”	**B1** DN50 / 2”	
					A2 DN65 / 2 ½”	**B2** DN65 / 2 ½”	
					A3 DN80 / 3”	**B3** DN80 / 3”	
					A4 DN100 / 4”	**B4** DN100 / 4”	
					A5 DN125 / 5”	**B5** DN125 / 5”	
					A6 DN150 / 6”	**B6** DN150 / 6”	
					A7 DN200 / 8”	**B7** DN200 / 8”	
					A8 DN250 / 10”	**B8** DN250 / 10”	
					A9 DN300 / 12”	**B9** DN300 / 12”	
					A10 DN350 / 14”	**B10** DN350 / 14”	
					A11 DN400 / 16”	**B11** DN400 / 16”	
					A12 DN500 / 20”	**B12** DN500 / 20”	
					A13 DN600 / 24”	**B13** DN600 / 24”	
					A14 DN700 / -	**B14** DN700 / -	
					A15 DN800 / -	**B15** DN800 / -	
					PN40/300 lbs, mat. 316L	**PN40/300 lbs, mat. 316Ti**	
					C1 DN50 / 2”	**D1** DN50 / 2”	
					C2 DN65 / 2 ½”	**D2** DN65 / 2 ½”	
					C3 DN80 / 3”	**D3** DN80 / 3”	
					C4 DN100 / 4”	**D4** DN100 / 4”	
					C5 DN125 / 5”	**D5** DN125 / 5”	
					C6 DN150 / 6”	**D6** DN150 / 6”	
					C7 DN200 / 8”	**D7** DN200 / 8”	
					C8 DN250 / 10”	**D8** DN250 / 10”	
					C9 DN300 / 12”	**D9** DN300 / 12”	
					C10 DN350 / 14”	**D10** DN350 / 14”	
					C11 DN400 / 16”	**D11** DN400 / 16”	
					C12 DN500 / 20”	**D12** DN500 / 20”	
					C13 - / 24”	**D13** - / 24”	
					PN64-100/600 lbs, mat. 316L	**PN64-100/600 lbs, mat. 316Ti**	
					E1 DN50 / 2”	**F1** DN50 / 2”	
					E2 DN65 / 2 ½”	**F2** DN65 / 2 ½”	
					E3 DN80 / 3”	**F3** DN80 / 3”	
					E4 DN100 / 4”	**F4** DN100 / 4”	
					E5 DN125 / 5”	**F5** DN125 / 5”	
					E6 DN150 / 6”	**F6** DN150 / 6”	
					E7 DN200 / 8”	**F7** DN200 / 8”	
					E8 DN250 / 10”	**F8** DN250 / 10”	
					E9 DN300 / 12”	**F9** DN300 / 12”	
					E10 DN350 / 14”	**F10** DN350 / 14”	
					E11 DN400 / 16”	**F11** DN400 / 16”	
					E12 - / 20”	**F12** - / 20”	
					E13 - / 24”	**F13** - / 24”	
					Special materials		
					G1-G.. Hastelloy		
					H1-H.. Other special materials		
BLS	**100**						
BLS	**100**	**A**	**M**	**2**	**D8**	**example**	

3 Orifice plate with ring, type BLS-200

3.1 Description

Orifice ring assemblies are used for flow measurement of smaller or medium sized pipes at lower pressures. Each assembly consists of one orifice plate and two orifice rings. Differential pressures are taken out in a corner tap system.
Orifice blocks, which are of a unit-construction type and provide higher pressure ratings than the orifice ring assemblies, also are available. Differential pressures are taken out in a corner tap system.

3.2 Specification

- ***orifice bore type:***
  concentric square edged orifices
  quadrant edged orifices
  minimum quadrant edged orifice diameter 4.5 mm
  minimum quadrant edge radius 0.5 mm
- ***flow calculation standards:***
  concentric square edged orifices:
  ISO-5167-1991; ASME-1991; JIS Z 8762-1988
  1D-1/2D (radius) tap and 2.5D-8D (pipe) tape are per “ASME Fluid Meters, Their Theory and Application, 5th Edition, 1959”
  Note: ASME-1991, JIS Z 8762-1988 flow data used to calculate orifice bore is identical to that of ISO-5167-1991
- ***flange ratings:***
  ANSI (or JPI) Class 150
  DIN PN16
  Note: ANSI and JPI ring dimensions are identical.)
- ***pressure taps:***
  corner tap
- ***plate thickness:***
  3, 6, 9, 12mm, etc.
- ***tab handle:***
  welded to orifice plate
- ***pressure tap handle:***
  15 mm (½”) Sch80
  length 150 mm
  tap connections ½”-NPT-male, socket weld, butt weld or flange (Flange rating to be the same as the of the process pipeline.)
- ***materials:***
  ring and pressure tap nipple : carbon steel, ASTM 304SS, 316SS; DIN 1.4571, etc.
  plate : ASTM 304, 316SS, 316Ti ; DIN 1.4571, 1.5415, etc.
  tab handle : ASTM 304, 316SS, 316Ti ; DIN 1.4571, 1.5415, etc.
- ***drain and vent hole :***
  per ISA-RP3.2 recommendations. Not drilled for orifice bore smaller than 25.4 mm
- ***markings:***
  Upstream side of tab handle stamped “+” and with bore type and size, line size, TAG no., quadrant edge radius and flange rating, orifice material and serial number.
  Downstream side of tab handle stamped with “-“.
- ***Special markings:***
  special marking may be furnished to meet specific requirements
- ***Gasket:***
  non-asbestos with 1.5mm thickness

3.3 Ordering codes

Code	Description							
BLS	Orifice plate with ring acc. EN ISO 5467-1							
	1. Installation between smooth DIN / ANSI flanges Form C/RF							
	200	Standard						
		2. Flanges						
		D	Flange face acc. DIN					
		A	Flange face acc. ANSI					
			3. Orifice calculation by Intra					
			0	without				
			M	with				
				4. Documentation				
				0	without			
				1	Material certificates acc. DIN EN 10204-2.2			
				2	Material certificates acc. DIN EN 10204-3.1			
					5. Material orifice plate			
					1	316L		
					2	316Ti		
						6. Pressure rating / Flange face		
							acc. to DIN	**acc. to ANSI**
						1	PN10 / Form C	150# / RF
						2	PN16 / Form C	150# / RF
						3	PN40 / Form C	300# / RF
						4	PN64 / Form E	
						5	PN100 / Form E	600# / RF
						6	PN160 / Form E	900# / RF
							7. Connection dimension / material ring and tap	
							A1	DN50 / 2” HII
							A2	DN50 / 2” CS
							A3	DN50 / 2” 316Ti
							B1	DN65 / 2 ½” HII
							B2	DN65 / 2 ½” CS
							B3	DN65 / 2 ½” 316Ti
							C1	DN80 / 3” HII
							C2	DN80 / 3” CS
							C3	DN80 / 3” 316Ti
							D1	DN100 / 4” HII
							D2	DN100 / 4” CS
							D3	DN100 / 4” 316Ti
							E1	DN125 / 5” HII
							E2	DN125 / 5” CS
							E3	DN125 / 5” 316Ti
							F1	DN150 / 6” HII
							F2	DN150 / 6” CS
							F3	DN150 / 6” 316Ti
							G1	DN200 / 8” HII
							G2	DN200 / 8” CS
							G3	DN200 / 8” 316Ti
							H1	DN250 / 10” HII
							H2	DN250 / 10” CS
							H3	DN250 / 10” 316Ti
							J1	DN300 / 12” HII
							J2	DN300 / 12” CS
							J3	DN300 / 12” 316Ti
							K1	DN350 / 14” HII
							K2	DN350 / 14” CS
							K3	DN350 / 14” 316Ti
							L1	DN400 / 16” HII
							L2	DN400 / 16” CS
							L3	DN400 / 16” 316Ti
							M1	DN500 / 20” HII
							M2	DN500 / 20” CS
							M3	DN500 / 20” 316Ti
							N1	DN600 / 24” HII
							N2	DN600 / 24” CS
							N3	DN600 / 24” 316Ti
							P1	DN700 / 28” HII
							P2	DN700 / 28” CS
							P3	DN700 / 28” 316Ti
							Q1	DN800 / 32” HII
							Q2	DN800 / 32” CS
							Q3	DN800 / 32” 316Ti

BLS	**-200**							
BLS	**-200**	**A**	**M**	**2**	**2**	**1**	**E1**	**Example**

4 Orifice plate with integral ring, type: BLS-250

4.1 Description

Orifice plate with integral ring is a different pressure type primary device used to produce a fluid flow restriction in a pipeline. The differential pressure across the orifice plate is proportional to the square of the fluid velocity. The differential pressure is applied to the integral pressure taps through single holes in the corner formed by the ring wall and the orifice plate.
The orifice plate with ring is cut and shaped from on block of metal. The pressure tap nipples are welded to the orifice plate and ring.
Orifice plate with integral ring is suitable for high pressure and temperature service applications and similar to the orifice plate with ring.

4.2 Specification

- ***orifice bore type:***
  concentric square edged orifices
  quadrant edged orifices
- ***flow calculation standards:***
  concentric square edged orifices:
  ISO-5167-1991; ASME-1991; JIS Z 8762-1988
  Note: ASME-1991, JIS Z 8762-1988 flow data used to calculate orifice bore is identical to that of ISO-5167-1991
- ***flange ratings:***
  ANSI (or JPI) Class 300, 600 and 900 (RF)
  DIN PN40, 63, 100
  Note: ANSI and JPI ring dimensions are identical.)
- ***pressure taps:***
  single hole type corner taps. Annular chamber type corner taps
- ***nominal pipe sizes:***
  15 to 400 mm (½" to 16")
- ***pressure tap nipple***
  15mm (½ ") Sch80, length 150 mm
- ***tap connections:***
  ½"-NPT-male, socket weld, butt weld or flange (Flange rating to be the same as the of the process pipeline.). Angle between two taps is a straight angle.
- ***materials:***
  plate and nipple: ASTM 304SS, 316SS; DIN 1.4571, etc.
- ***markings:***
  ring rim stamped with TAG no., bore size, flow direction, material, line size, flange rating and serial number.

4.3 Ordering codes

Code	Description							
BLS	Orifice plate with ring acc. EN ISO 5467-1							
	1. Installation between smooth DIN / ANSI flanges Form C/RF							
	200	Standard						
		2. Flanges						
		D	Flange face acc. DIN					
		A	Flange face acc. ANSI					
			3. Orifice calculation by Intra					
			0	without				
			M	with				
				4. Documentation				
				0	without			
				1	Material certificates acc. DIN EN 10204-2.2			
				2	Material certificates acc. DIN EN 10204-3.1			
					5. Material orifice plate			
					1	316L		
					2	316Ti		
						6. Pressure rating / Flange face		
							acc. to DIN	**acc. to ANSI**
						1	PN10 / Form C	150# / RF
						2	PN16 / Form C	150# / RF
						3	PN40 / Form C	300# / RF
						4	PN64 / Form E	
						5	PN100 / Form E	600# / RF
						6	PN160 / Form E	900# / RF
							7. Connection dimension / material ring and tap	
							A1	DN50 / 2” HII
							A2	DN50 / 2” CS
							A3	DN50 / 2” 316Ti
							B1	DN65 / 2 ½” HII
							B2	DN65 / 2 ½” CS
							B3	DN65 / 2 ½” 316Ti
							C1	DN80 / 3” HII
							C2	DN80 / 3” CS
							C3	DN80 / 3” 316Ti
							D1	DN100 / 4” HII
							D2	DN100 / 4” CS
							D3	DN100 / 4” 316Ti
							E1	DN125 / 5” HII
							E2	DN125 / 5” CS
							E3	DN125 / 5” 316Ti
							F1	DN150 / 6” HII
							F2	DN150 / 6” CS
							F3	DN150 / 6” 316Ti
							G1	DN200 / 8” HII
							G2	DN200 / 8” CS
							G3	DN200 / 8” 316Ti
							H1	DN250 / 10” HII
							H2	DN250 / 10” CS
							H3	DN250 / 10” 316Ti
							J1	DN300 / 12” HII
							J2	DN300 / 12” CS
							J3	DN300 / 12” 316Ti
							K1	DN350 / 14” HII
							K2	DN350 / 14” CS
							K3	DN350 / 14” 316Ti
							L1	DN400 / 16” HII
							L2	DN400 / 16” CS
							L3	DN400 / 16” 316Ti
							M1	DN500 / 20” HII
							M2	DN500 / 20” CS
							M3	DN500 / 20” 316Ti
							N1	DN600 / 24” HII
							N2	DN600 / 24” CS
							N3	DN600 / 24” 316Ti
							P1	DN700 / 28” HII
							P2	DN700 / 28” CS
							P3	DN700 / 28” 316Ti
							Q1	DN800 / 32” HII
							Q2	DN800 / 32” CS
							Q3	DN800 / 32” 316Ti

BLS	**-200**							
BLS	**-200**	**A**	**M**	**2**	**2**	**1**	**E1**	**Example**

5 Orifice plate with holding ring, type BLS-100-RTJ

5.1 Description

The holding ring assembly is a combination of a holding ring and an orifice plate designed for ring-type-joint (RTJ) flanges of ANSI or JPI specifications. The holder ring has a function of holding the orifice plate and also a function as a gasket to prevent leakage of the process fluid. This metallic sealing system is applicable to a fluid of high temperature and high pressure. The pressure tapping system normally is of the flange tap type.

5.2 Specifications

- ***orifice bore type:***
  concentric square edged orifices
  quadrant edged orifices
- ***flow calculation standards:***
  concentric square edged orifices:
  ISO-5167-1991; ASME-1991; JIS Z 8762-1988
  Note: ASME-1991, JIS Z 8762-1988 flow data used to calculate orifice bore is
  identical to that of ISO-5167-1991
- ***flange ratings:***
  ANSI (or JPI) Class 300, 600 and 900 (RF)
  DIN PN40, 63, 100
  Note: ANSI and JPI ring dimensions are identical.)
- ***pressure taps:***
  flange taps
- ***plate thickness:***
  3, 6, 9, 12 mm etc.
- ***tab handle:***
  welded to ring
- ***holding ring:***
  riveted to plate, octagonal or oval
- ***drain and vent hole:***
  per ASME recommendations. No drill for orifice bores smaller than 25.4 mm
- ***materials:***
  plate: ASTM 304SS, 316SS; DIN 1.4571, etc.
  holding ring: ASTM 304SS, 316SS; DIN 1.4571, etc.
- ***markings:***
  Upstream side of tab handle stamped “+” and with bore type and size, line size, TAG no., quadrant edge radius and flange rating, orifice material and serial number.
  Downstream side of tab handle stamped with “-“.
- ***Special markings:***
  special marking may be furnished to meet specific requirements.

Nominal pipe size available:

Orifice bore type	***Pipe size***	***Pipe diameter given in the applicable standards***
Concentric square edge	1 ½“ to 14“	50 to 760 mm
Quadrant edge	1 ½“ to 6”	25 to 150 mm

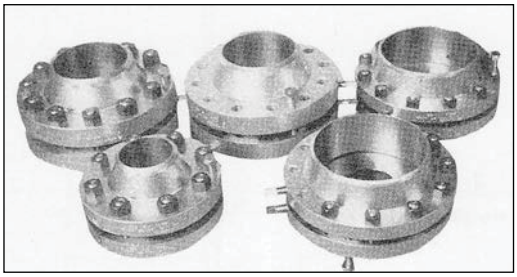
5.4 Ordering codes

Code	Description						
BLS	Orifice plate acc. EN ISO 5167-1						
	1. Installation between DIN / ANSI flanges Form RTJ (only on request)						
	100	Standard					
		2. Flanges					
		A	acc. to ANSI				
			3. Orifice calculation by Intra				
			0	without			
			M	with			
				4. Documentation			
				0	without		
				1	Material certificates acc. DIN EN 10204-2.2		
				2	Material certificates acc. DIN EN 10204-3.1		
					5. Connection dimension		
					PN10-16/150 lbs, mat. 316L	**PN10-16/150 lbs, mat. 316Ti**	
					A1	DN50 / 2”	**B1** DN50 / 2”
					A2	DN65 / 2 ½”	**B2** DN65 / 2 ½”
					A3	DN80 / 3”	**B3** DN80 / 3”
					A4	DN100 / 4”	**B4** DN100 / 4”
					A5	DN125 / 5”	**B5** DN125 / 5”
					A6	DN150 / 6”	**B6** DN150 / 6”
					A7	DN200 / 8”	**B7** DN200 / 8”
					A8	DN250 / 10”	**B8** DN250 / 10”
					A9	DN300 / 12”	**B9** DN300 / 12”
					A10	DN350 / 14”	**B10** DN350 / 14”
					A11	DN400 / 16”	**B11** DN400 / 16”
					A12	DN500 / 20”	**B12** DN500 / 20”
					A13	DN600 / 24”	**B13** DN600 / 24”
					A14	DN700 / -	**B14** DN700 / -
					A15	DN800 / -	**B15** DN800 / -
					PN40/300 lbs, mat. 316L	**PN40/300 lbs, mat. 316Ti**	
					C1	DN50 / 2”	**D1** DN50 / 2”
					C2	DN65 / 2 ½”	**D2** DN65 / 2 ½”
					C3	DN80 / 3”	**D3** DN80 / 3”
					C4	DN100 / 4”	**D4** DN100 / 4”
					C5	DN125 / 5”	**D5** DN125 / 5”
					C6	DN150 / 6”	**D6** DN150 / 6”
					C7	DN200 / 8”	**D7** DN200 / 8”
					C8	DN250 / 10”	**D8** DN250 / 10”
					C9	DN300 / 12”	**D9** DN300 / 12”
					C10	DN350 / 14”	**D10** DN350 / 14”
					C11	DN400 / 16”	**D11** DN400 / 16”
					C12	DN500 / 20”	**D12** DN500 / 20”
					C13	- / 24”	**D13** - / 24”
					PN64-100/600 lbs, mat. 316L	**PN64-100/600 lbs, mat. 316Ti**	
					E1	DN50 / 2”	**F1** DN50 / 2”
					E2	DN65 / 2 ½”	**F2** DN65 / 2 ½”
					E3	DN80 / 3”	**F3** DN80 / 3”
					E4	DN100 / 4”	**F4** DN100 / 4”
					E5	DN125 / 5”	**F5** DN125 / 5”
					E6	DN150 / 6”	**F6** DN150 / 6”
					E7	DN200 / 8”	**F7** DN200 / 8”
					E8	DN250 / 10”	**F8** DN250 / 10”
					E9	DN300 / 12”	**F9** DN300 / 12”
					E10	DN350 / 14”	**F10** DN350 / 14”
					E11	DN400 / 16”	**F11** DN400 / 16”
					E12	- / 20”	**F12** - / 20”
					E13	- / 24”	**F13** - / 24”
						Special materials	
						G1-G.. Hastelloy	
						H1-H.. Other special materials	

BLS	**100**					
BLS	**100**	**A**	**M**	**2**	**D8**	**example**

6 Orifice flange assemblies, type: BLS-300

6.1 Description



Orifice flange assemblies are used in conjunction with orifice plates for flow measurement of smaller or medium size pipes at lower or medium pressure ranges. The flange connection is of a RF type and the differential pressure tapping system is with flange taps.

6.2 Specification

- ***orifice flange types:***
  slip-on
  welding neck
  ring-joint welding neck
- ***nominal diameters:***
  25 mm (1") to 500 mm (20")
- ***flange rating:***
  ANSI (or JPI) 150, 300, 600, 900, 1500, 2500 lbs (RF, RTJ)
- ***flange material***
  carbon steel, ASTM 316SS, 316TI, DIN 1.4571
- ***materials of bolts and nuts:***
  stud bolts: A193-B7, B8, etc.
  nuts: A194-2H, 8, etc.
  jack bolts and nuts: A193-B7, B8 etc.
- ***gaskets:***
  sheet gaskets 1.5 mm
  spiral wounded gasket 4.5mm
- ***piping connection method:***
  ANSI and JPI: butt welding type (welded neck)

6.3 Flange ratings and facings:

Mounting	***Standard***	***Pressure ratings/ facing***
Slip-on	ANSI	Class 150 and 300 (RF)
Welding neck	ANSI	Class 150, 300, 600 and 900(RF)
	ANSI	Class 150, 300, 600, 900 and 1500 ring-joint (RJ)
	ANSI	Class 150, 300, 600, 900, 1500 and 2500 (RF, RTJ)

6.4 Types

- ***Slip-on flanges***
  The slip-on flange has a low hub because the pipe slips into the flange prior to welding. It is welded both inside and outside to provide sufficient strength and prevent leakage. Slip-on flanges are all bored slightly larger than the O.D. of the matching pipe. They are preferred over welding neck flanges by many users due to their lower initial cost, but final installation cost is probably not much less than that of the welding neck flange because of the additional welding involved.

- ***Socket welding flanges***
  The socket welding flange is similar to the slip-on flange except it has a bore and a counter bore dimension. The counter bore is slightly larger than O.D. of the matching pipe, allowing the pipe to be inserted into the flange similar to a slip-on flange. The diameter of the smaller bore is the same as the I.D. of the matching pipe. A restriction is built into the bottom of the bore which sets as a shoulder for the pipe to the rest on. This eliminates any restriction in the flow when using a socket welding flange.

- ***Welding neck flanges***
  The welding neck-flange is normally referred to as the “high hub” flange. It is designed to transfer stresses to the pipe, thereby reducing high stress concentrations at the base of the flange. The welding neck flange is the best designed butt-welded flange of those currently available because of its inherent structural value. It is expensive because of the design.

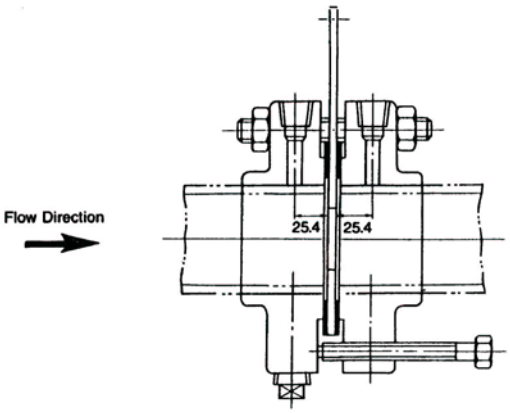


Fig 7: SO-RF

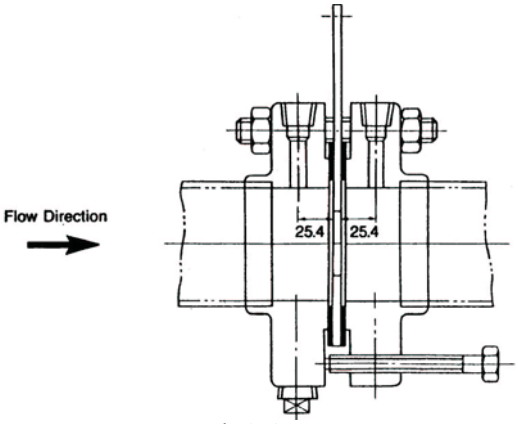


Fig 8: SW

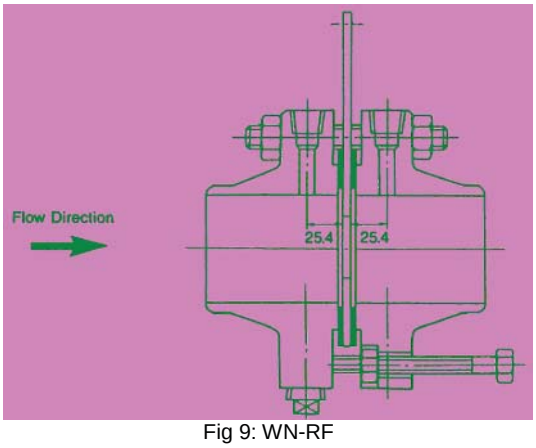


Fig 9: WN-RF

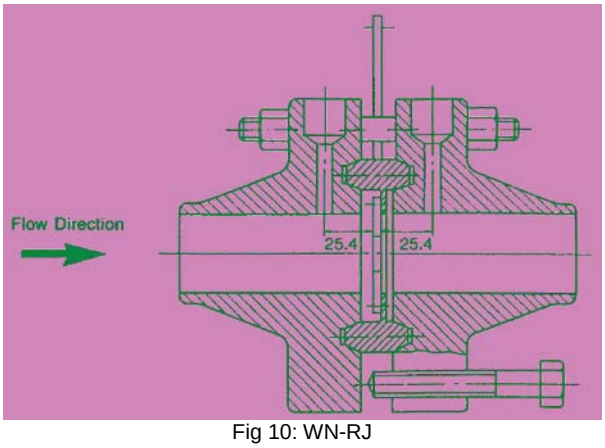


Fig 10: WN-RJ

6.5 Orifice flange dimensions

- *class 300 orifice flanges*

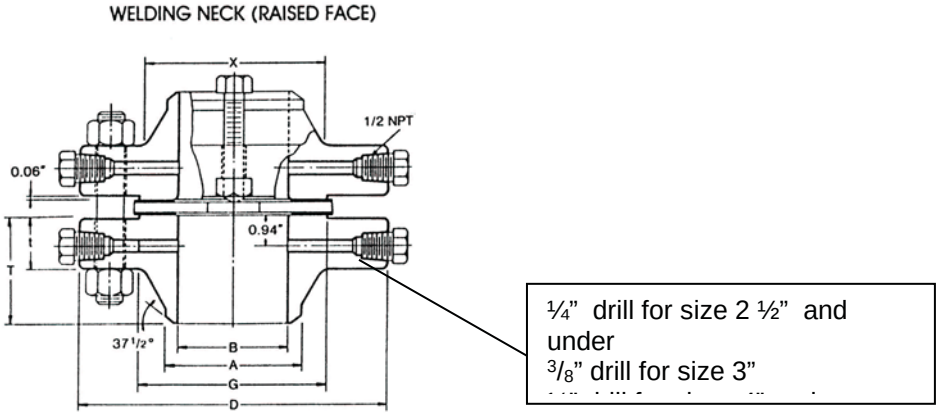


fig. 1

ANSI B16.36 forged flanges dimensions in inches

Nominal pipe size	Outside diam. of flange	Thickness of flange t	Diam. of Hub at base	Diam. of Raised face	Diam. of Hub at bevel	Length thru hub T		Bore B	
						Welding neck	Slip-on & threaded	Welding neck	Slip-on
	D	Raised face	X	G	A	Raised face	Raised face		
1	4.88	1.50	2.12	2.00	1.32	3.25	1.81	1.05	1.36
1 ¼	5.25	1.50	2.50	2.50	1.66	3.31	1.88	1.38	1.70
1 ½	6.12	1.50	2.75	2.88	1.90	3.38	1.88	1.61	1.95
2	6.50	1.50	3.31	3.62	2.38	3.38	1.94	2.07	2.44
2 ½	7.50	1.50	3.94	4.12	2.88	3.50	2.00	2.47	2.94
3	8.25	1.50	4.62	5.00	3.50	3.50	2.06	3.07	3.57
4	10.00	1.50	5.75	6.19	4.50	3.62	2.12	4.03	4.57
5	11.00	1.50	7.00	7.31	5.56	3.94	2.12	5.05	5.66
6	12.50	1.50	8.12	8.50	6.63	4.00	2.12	6.07	6.72
8	15.00	1.62	10.25	10.62	8.63	4.38	2.44	7.98	8.72
10	17.50	1.88	12.62	12.75	10.75	4.62	2.62	10.02	10.88
12	20.50	2.00	14.75	15.00	12.75	5.12	2.88	12.00	12.88
14	23.00	2.12	16.75	16.25	14.00	5.62	3.00	13.25	14.14
16	25.50	2.25	19.00	18.50	16.00	5.75	3.25	15.25	16.16
18	28.00	2.38	21.00	21.00	18.00	6.25	3.50	17.25	18.18
20	30.50	2.50	23.12	23.00	20.00	6.38	3.75	19.25	20.20
24	36.00	2.75	27.62	27.25	24.00	6.62	4.19	23.25	24.25

Notes:
(1) for the bore "B" of welding neck flanges other than standard wall thickness ask customer
(2) Class 300 WN flanges of size 24" and smaller will be bored to match Standard Wall Pipe unless otherwise specified.(3) Class 300 orifice flanges will be furnished with 0.06" raised face, which is included in 'Thickness' t and 'length through Hub' T.(4) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24.

Slip-on

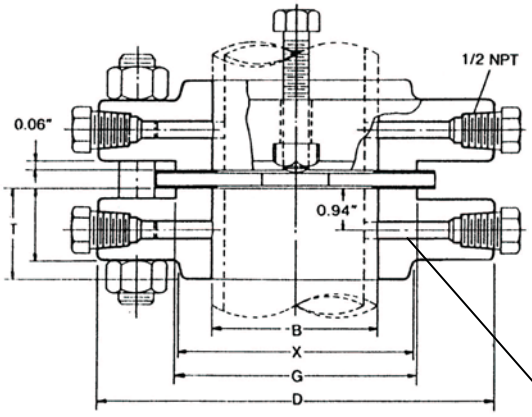


fig. 2

Threaded

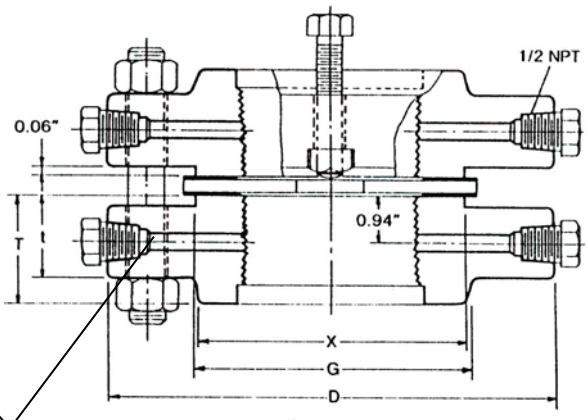


fig. 3

¼" drill for size 2 ½" and under $^3/_8$" drill for size 3"
½" drill for sizes 4" and over

dimensions in inches

Pitch diam. of ring and groove	Ring number	Depth of jack screw slot	Jack screw size	Drilling template					Nominal pipe size
								Length of stud bolts	
P		Raised face	Raised face	Diam. of bolts circle	Number of bolts	Diam. of stud bolts	Diam. of bolt holes	Raised face	
2.000	R16	0.38	Jack screw sizes for 1" thru 24" are those as shown for length and diameter of bolts	3.50	4	$^5/_8$	0.69	5.50	1
2.375	R18	0.38		3.88	4	$^5/_8$	0.69	6.00	1 ¼
2.688	R20	0.50		4.50	4	$^3/_4$	0.88	6.00	1 ½
3.250	R23	0.38		5.00	8	$^5/_8$	0.69	6.00	2
4.000	R26	0.50		5.88	8	$^3/_4$	0.88	6.00	2 ½
4.875	R31	0.50		6.62	8	$^3/_4$	0.88	6.00	3
5.875	R37	0.50		7.88	8	$^3/_4$	0.88	6.00	4
7.125	R41	0.50		9.25	8	$^3/_4$	0.88	6.00	5
8.312	R45	0.50		10.62	12	$^3/_4$	0.88	6.00	6
10.625	R49	0.62		13.00	12	$^7/_8$	1.00	5.25	8
12.750	R53	0.75		15.25	16	1	1.12	6.50	10
15.000	R57	0.88		17.75	16	$1\ ^1/_8$	1.25	7.00	12
16.500	R61	0.88		20.25	20	$1\ ^1/_8$	1.25	7.25	14
18.500	R65	1.00		22.50	20	$1\ ^1/_4$	1.38	7.75	16
21.000	R69	1.00		24.75	24	$1\ ^1/_4$	1.38	8.00	18
23.000	R73	1.00		27.00	24	$1\ ^1/_4$	1.38	8.50	20
27.250	R77	1.25		32.00	24	$1\ ^1/_2$	1.62	9.50	24

(5) unless otherwise specified, unions of 1" thru 24" furnished with carbon steel regular square headed bolts with hex nuts.

- *class 600 orifice flanges*

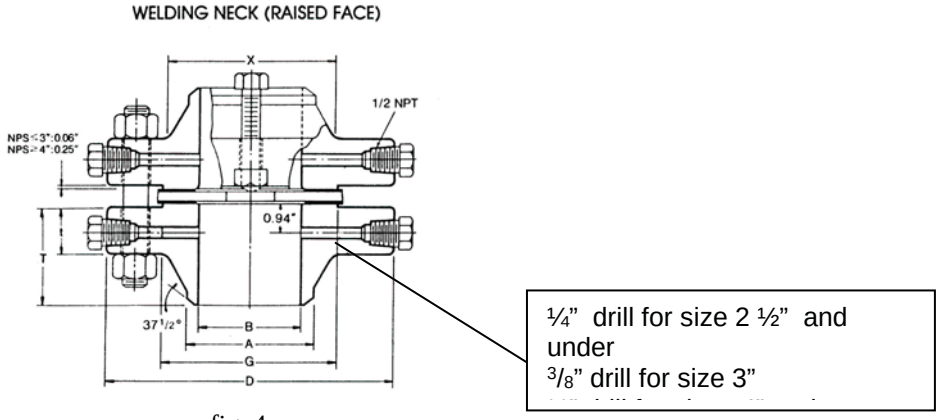


fig. 4

ANSI B16.36 forged flanges dimensions in inches

Nominal pipe size	Outside diam. of flange	Thickness of flange t		Diam. of Hub at base	Diam. of Raised face	Diam. of Hub at bevel	Length thru hub T				Bore B	
							Welding neck		Slip-on & threaded		Welding neck	Slip-on
	D	Raised face	Ring joint	X	G	A	Raised face	Ring joint	Raised face	Ring joint		
1	4.88	1.50	1.25	2.12	2.00	1.32	3.25	3.00	1.88	1.62	See note (1) To be specified by purchaser	1.36
1 ¼	5.25	1.50	1.25	2.50	2.50	1.66	3.31	3.06	1.81	1.56		1.70
1 ½	6.12	1.50	1.25	2.75	2.88	1.90	3.38	3.12	1.88	1.62		1.95
2	6.50	1.50	1.25	3.31	3.62	2.38	3.38	3.12	1.94	1.69		2.44
2 ½	7.50	1.50	1.25	3.94	4.12	2.88	3.50	3.25	2.00	1.75		2.94
3	8.25	1.50	1.25	4.62	5.00	3.50	3.50	3.25	2.06	1.81		3.57
4	10.75	1.50	1.50	6.00	6.19	4.50	4.00	4.00	2.12	2.12		4.57
5	13.00	1.75	1.75	7.44	7.31	5.56	4.50	4.50	2.28	2.38		5.66
6	14.00	1.88	1.88	8.75	8.50	6.63	4.62	4.62	2.62	2.62		6.72
8	16.50	2.19	2.19	10.75	10.62	8.63	5.25	5.25	3.00	3.00		8.72
10	20.00	2.50	2.50	13.50	12.75	10.75	6.00	6.00	3.38	3.38		10.88
12	22.00	2.62	2.62	15.75	15.00	12.75	6.12	6.12	3.62	3.62		12.88
14	23.75	2.75	2.75	17.00	16.25	14.00	6.50	6.50				
16	27.00	3.00	3.00	19.50	18.50	16.00	7.00	7.00				
18	29.25	3.25	3.25	21.50	21.00	18.00	7.25	7.25				
20	32.00	3.50	3.50	24.00	23.00	20.00	7.50	7.50				
24	37.00	4.00	4.00	28.25	27.25	24.00	8.00	8.00				

Notes:
(1) For the inside diameter of pipes (corresponding to 'Bore' B of welding neck flanges).
(2) Class 600 flanges of sizes 3" and smaller will be furnished with 0.06" raised face, which is included in 'Thickness' t and 'Length through 'Hub' T. The 0.25" raised face for sizes 4" and larger is not included in t and T.
(3) Each union includes two carbon steel jack screw bolts with hex nuts.
(4) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

Welding neck (ring-type joint)

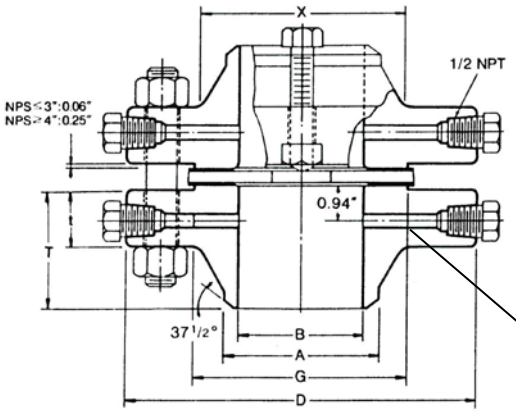


fig. 5

¼" drill for size 2 ½" and under
$^3/_8$" drill for size 3"

dimensions in inches

Pitch diam. of ring and groove	Ring number	Depth of jack screw slot		Jack screw size		Drilling template						Nominal pipe size
										Length of stud bolts		
P		Raised face	Ring joint	Raised face	Ring joint	Diam. of bolts circle	Number of bolts	Diam. of stud bolts	Diam. of bolt holes	Raised face	Ring joint	
2.000	R16	0.38	0.25	$^5/_8$x4.0	$^5/_8$x4.75	3.50	4	$^5/_8$	0.69	5.00	5.75	1
2.375	R18	0.38	0.25	$^5/_8$x4.0	$^5/_8$x4.75	3.88	4	$^5/_8$	0.69	5.00	5.75	1 ¼
2.688	R20	0.50	0.25	$^3/_4$x4.25	$^3/_4$x5.00	4.50	4	$^3/_4$	0.81	5.25	6.00	1 ½
3.250	R23	0.38	0.25	$^5/_8$x4.0	$^5/_8$x4.75	5.00	8	$^5/_8$	0.69	5.00	6.00	2
4.000	R26	0.50	0.25	$^3/_4$x4.25	$^3/_4$x5.00	5.88	8	$^3/_4$	0.81	5.25	6.25	2 ½
4.875	R31	0.50	0.25	$^3/_4$x4.25	$^3/_4$x5.00	6.62	8	$^3/_4$	0.81	5.25	6.25	3
5.875	R37	0.25	0.62	$^3/_4$x3.0	$^3/_4$x4.00	8.50	8	$^3/_4$	1.00	6.00	6.50	4
7.125	R41	0.25	0.62	$^3/_4$x3.5	$^3/_4$x4.50	10.50	8	1	1.12	5.50	7.00	5
8.312	R45	0.50	0.88	1x4.0	1x4.50	11.50	12	1	1.12	7.00	7.50	6
10.625	R49	0.50	0.88	1x4.0	1x4.75	13.75	12	1 $^1/_8$	1.25	7.75	8.25	8
12.750	R53	0.50	0.88	1x4.0	1x5.00	17.00	16	1 $^1/_4$	1.38	8.75	9.25	10
15.000	R57	0.50	0.88	1x4.5	1x5.00	19.25	16	1 $^1/_4$	1.38	9.00	9.50	12
16.500	R61	0.50	0.88	1x5.0	1x5.50	20.75	20	1 $^3/_8$	1.50	9.50	10.00	14
18.500	R65	0.50	0.88	1x5.0	1x5.50	23.75	20	1 $^1/_2$	1.62	10.25	10.75	16
21.000	R69	0.50	0.88	1x5.0	1x5.75	25.75	24	1 $^5/_8$	1.75	11.00	11.50	18
23.000	R73	0.50	0.88	1x6.0	1x6.25	28.50	24	1 $^5/_8$	1.75	11.75	12.50	20
27.250	R77	0.50	0.88	1x6.0	1x7.00	33.00	24	1 $^5/_8$	2.00	13.25	13.50	24

Notes:

(5) Unless otherwise specified, raised face unions are furnished with alloy bolt studs per ASTM A 193 Grade B7 With heavy series hex nuts ASTM class 2H.

(6) On ring joint flanges a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When the depth of groove is 0.438" or greater, changes in drill size or method of drilling are necesarry.

- *class 900≈1500 orifice flanges*

welding neck (raised face)

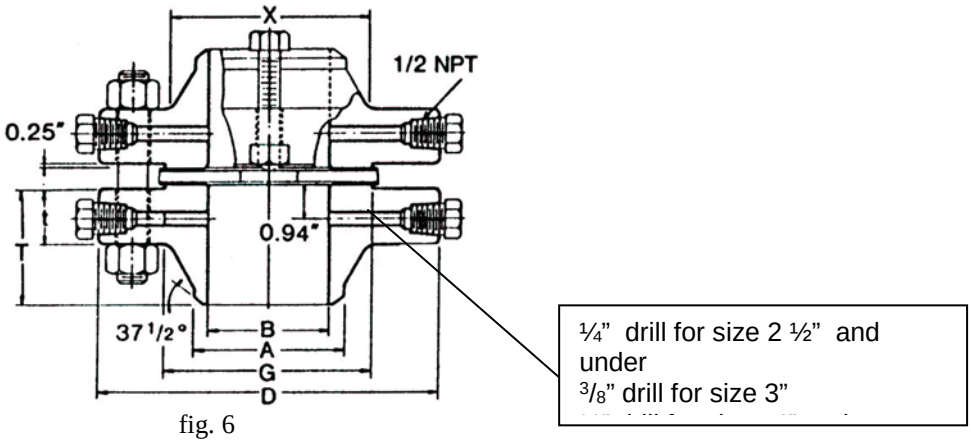


fig. 6

ANSI B16.36 forged flanges dimensions in inches

Nominal pipe size	Outside diam. of flange	Thickness of flange t		Diam. of Hub at base	Diam. of Raised face	Diam. of Hub at bevel	Length thru hub T				Bore B	
							Welding neck		Slip-on & threaded		Welding neck	Slip-on
	D	Raised face	Ring joint	X	G	A	Raised face	Ring joint	Raised face	Ring joint		
CLASS 900												
3	9.50	1.50	1.50	5.00	5.00	3.50	4.00	4.00	2.12	2.12	To be specified by purchaser	3.57
4	11.50	1.75	1.75	6.25	6.19	4.50	4.50	4.50	2.75	2.75		4.57
5	13.75	2.00	2.00	7.50	7.31	5.56	5.00	5.00	3.12	3.12		5.66
6	15.00	2.19	2.19	9.25	8.50	6.63	5.50	5.50	3.38	3.38		6.72
8	18.50	2.50	2.50	11.75	10.62	8.63	6.38	6.38	4.00	4.00		8.72
10	21.50	2.75	2.75	14.50	12.75	10.75	7.25	7.25	4.25	4.25		10.88
12	24.00	3.12	3.12	16.50	15.00	12.75	7.88	7.88	4.62	4.62		12.88
14	25.25	3.38		17.75	16.25	14.00	8.28					
16	27.75	3.50		20.00	18.50	16.00	8.50					
18	31.00	4.00		22.25	21.00	18.00	9.00					
20	33.75	4.25		24.50	23.00	20.00	9.75					
24	41.00	5.50		29.50	27.25	24.00	11.50					
CLASS 1500												
1	5.88	1.50	1.50	2.06	2.00	1.32	3.25	3.25	1.88	1.75	To be specified by purchaser	1.36
1 ¼	6.25	1.28	1.28	2.50	2.50	1.66	2.88	2.88	1.88	1.75		1.70
1 ½	7.00	1.50	1.50	2.75	2.88	1.90	3.50	3.50	1.88	1.75		1.95
2	8.50	1.50	1.50	4.12	3.62	2.38	4.00	4.00	2.25	2.25		2.44
2 ½	9.62	1.62	1.62	4.88	4.12	2.88	4.12	4.12	2.50	2.50		2.94
3	10.50	1.88	1.88	5.25	5.00	3.50	4.62	4.62	2.88	2.88		3.57
4	12.25	2.12	2.12	6.38	6.19	4.50	4.88	4.88	3.56	3.56		4.57
5	14.75	2.88	2.88	7.75	7.31	5.56	6.12	6.12	4.12	4.12		5.66
6	15.50	3.25	3.25	9.00	8.50	6.63	6.75	6.75	4.69	4.69		6.72
8	19.00	3.62	3.62	11.50	10.62	8.63	8.38	8.38	5.62	5.62		8.72
10	23.00	4.25	4.25	14.50	12.75	10.75	10.00	10.00	6.25	6.25		10.88
12	26.50	4.88	4.88	17.75	15.00	12.75	11.12	11.12	7.12	7.12		12.88
14	29.50	5.25		19.50	16.25	14.00	11.75					
16	32.50	5.75		21.75	18.50	16.00	12.25					
18	36.00	6.38		23.50	21.00	18.00	12.88					
20	38.75	7.00		25.25	23.00	20.00	14.00					
24	46.00	8.00		30.00	27.25	24.00	16.00					

Notes:
(1) For the inside diameter of pipes (corresponding to 'Bore' B of welding neck flanges)
(2) Class 900 dimensions of size 1" through 2 ½ " are the same as for Class 1500.
(3) Class 900 and 1500 is not included in 'thickness' t and 'length through hub' T.
(4) Each union includes two carbon steel jack screw bolts with hex nuts.

welding neck (ring-type joint)

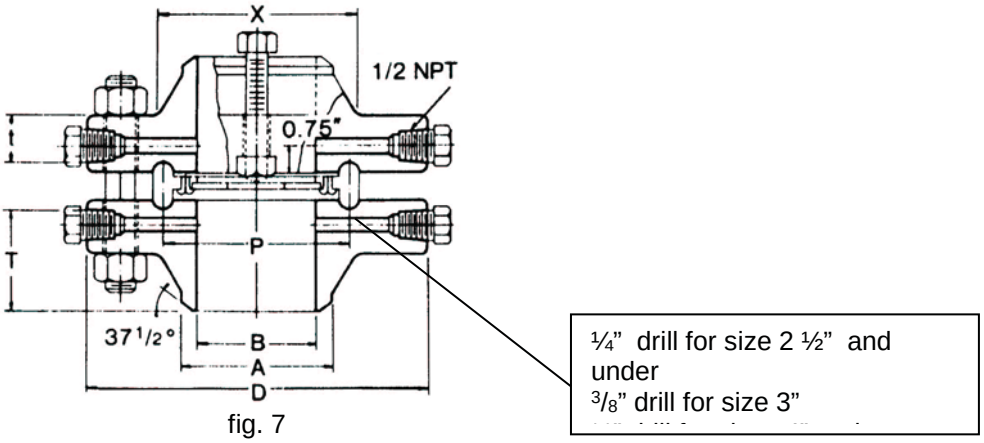


fig. 7

dimensions in inches

Pitch diam. of ring and groove	Ring number	Depth of jack screw slot		Jack screw size		Drilling template						Nominal pipe size
										Length of stud bolts		
P		Raised face	Ring joint	Raised face	Ring joint	Diam. of bolts circle	Number of bolts	Diam. of stud bolts	Diam. of bolt holes	Raised face	Ring joint	
CLASS 900												
4.875	R31	0.38	0.62	3/4x3.5	3/4x4.00	7.50	8	7/8	1.00	6.00	6.50	3
5.875	R37	0.38	0.62	3/4x3.5	3/4x4.50	9.25	8	1 1/8	1.25	7.00	7.50	4
7.125	R41	0.38	0.62	3/4x3.5	3/4x4.50	11.00	8	1 1/4	1.38	7.50	8.00	5
8.312	R45	0.62	0.88	1x4.5	1x4.75	12.50	12	1 1/8	1.25	7.75	8.25	6
10.625	R49	0.62	0.88	1x4.5	1x5.00	15.50	12	1 3/8	1.50	9.00	9.50	8
12.750	R53	0.62	0.88	1x4.5	1x5.25	18.50	16	1 3/8	1.50	9.50	10.00	10
15.000	R57	0.62	0.88	1x4.5	1x5.50	21.00	20	1 3/8	1.50	10.25	10.75	12
						22.00	20	1 1/2	1.62	11.00		14
						24.25	20	1 5/8	1.75	11.50		16
						27.00	20	1 7/8	2.00	13.00		18
						29.50	20	2	2.12	14.00		20
						35.50	20	2 1/2	2.62	17.50		24
CLASS 1500												
2.000	R16	0.25	0.50	5/8x3.0	5/8x3.50	4.00	4	7/8	1.00	6.00	6.25	1
2.375	R18	0.25	0.50	5/8x3.0	5/8x3.50	4.38	4	7/8	1.00	5.50	5.75	1 ¼
2.688	R20	0.25	0.50	5/8x3.0	5/8x3.50	4.88	4	1	1.12	6.25	6.50	1 ½
3.750	R24	0.25	0.50	5/8x3.0	5/8x4.00	6.50	8	7/8	1.00	6.00	6.50	2
4.250	R27	0.25	0.50	5/8x3.0	5/8x4.00	7.50	8	1	1.12	6.50	7.00	2 ½
5.375	R35	0.38	0.62	5/8x3.5	3/4x4.50	8.00	8	1 1/8	1.25	7.25	7.75	3
6.375	R39	0.38	0.62	3/4x3.5	3/4x4.50	9.50	8	1 1/4	1.38	8.00	8.50	4
7.625	R44	0.38	0.62	3/4x3.5	3/4x4.50	11.50	8	1 1/2	1.62	9.75	10.25	5
8.312	R46	0.62	0.88	1x6.0	1x6.50	12.50	12	1 3/8	1.50	10.50	11.00	6
10.625	R50	0.62	0.88	1x6.5	1x6.50	15.50	12	1 5/8	1.75	11.75	12.50	8
12.750	R54	0.62	0.88	1x6.5	1x7.00	19.00	12	1 7/8	2.00	13.50	14.25	10
15.000	R58	0.62	0.88	1x6.5	1x8.00	22.50	16	2	2.12	15.00	1 5/8	12
						25.00	16	2 1/4	2.38	16.25		14
						27.75	16	2 1/2	2.62	17.75		16
						30.50	16	2 3/4	2.88	19.75		18
						32.75	16	3	3.12	21.50		20
						39.00	16	3 1/2	3.62	24.5		24

Notes:

(5) Unless otherwise specified, raised face unions are furnished with alloy bolt studs per ASTM A 193 Grade B7 with heavy series hex nuts ASTM class 2H.

(6) On ring joint flanges a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When the depth of groove is 0.438" or greater, changes in drill size or method of drilling are necesarry.

(7) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24. Bolt lengths for ring type joint flanges include allowance of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

Class 2500 orifice flanges

welding neck (raised face)

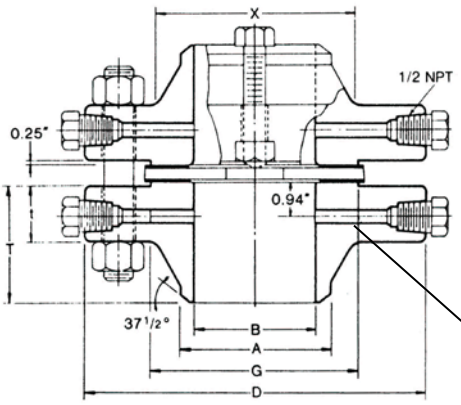


fig. 8

welding neck (ring-type joint)

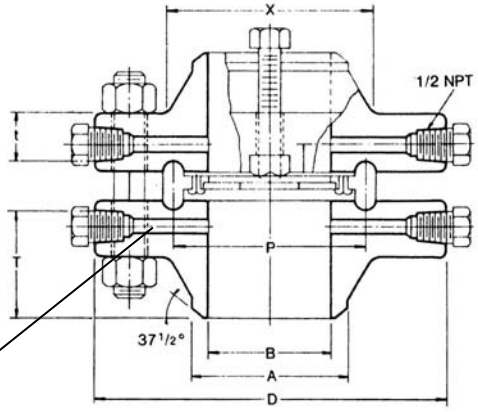


fig. 9

¼" drill for size 2 ½" and under
3/8" drill for size 3"

ANSI B16.36 forged flanges dimensions in inches

Nom. Pipe size	O.D. of Flange face	O.D. of raised flange	THK's of Hub min.	Length thru	Diam. of hub	Diam. of hub at bevel	Bore	Ring type joint	Ring num-ber	Drilling template				Length of stud bolts	
								Pitch diam.		Diam. of bolt circle	Number of holes	Diam. of holes	Diam. of bolts	Raised face	Ring joint
	D	G	t	T	X	A	B	P							
1	6.25	2.00	1.50	3.62	2.25	1.32	See note (1) to be spec. by purchaser	2.375	R18	4.25	4	1.00	7/8	6.00	6.25
1 ½	8.00	2.88	1.75	4.38	3.12	1.90		3.250	R23	5.75	4	1.25	1 1/8	7.00	7.50
2	9.25	3.62	2.00	5.00	3.75	2.38		4.000	R26	6.75	8	1.12	1	7.25	7.75
2 ½	10.50	4.12	2.25	5.62	4.50	2.88		4.375	R28	7.75	8	1.25	1 1/8	8.00	8.50
3	12.00	5.00	2.62	6.62	5.25	3.50		5.000	R32	9.00	8	1.38	1 1/4	9.00	9.50
4	14.00	6.19	3.00	7.50	6.50	4.50				10.75	8	1.62	1 1/2	10.25	
6	19.00	8.50	4.25	10.75	9.25	6.63				14.50	8	2.12	2	13.75	
8	21.75	10.62	5.00	12.50	12.00	8.63				17.25	12	2.12	2	15.25	
10	26.50	12.75	6.50	16.50	14.75	10.75				21.25	12	2.62	2 1/2	19.25	
12	30.00	15.00	7.25	18.25	17.38	12.75				24.38	12	2.88	2 3/4	21.25	

Notes:
(1) For the inside diameter of pipes (corresponding to ‚Bore' B of welding neck flange)
(2) Class 2500 flanges will be furnished with 0.25" raised face, which is not included in 'Thickness' t and 'Length throug hub' T
(3) Each union includes two carbon steel jack screw bolts with hex nuts.
(4) Unless otherwise specified, raised face unions are furnished with allow bolt studs per ASTM A193 Grade B7 with hex nuts ASTM A194 Class 2H.
(5) On ring joint flanges having a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When the depth of groove is 0.438" or greater, changes in drill size or method of drilling are necessary.
(6) Class 2500 slip-on flanges are not covered by ANSI B16.5.
(7) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24. Bolt lengths for ring type joint flanges include allowance of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

6.5 Ordering codes

Code	Description								
BLS	Throttle devices with flange taps – **PN10/PN16**								
	1. Measuring flanges acc. to DIN 19214, flange face Form C								
	300	Standard							
		2. Flanges							
		D	Flange face acc. to DIN						
			3. Orifice calculation by Intra						
			0	without					
			M	with					
				4. Documentation					
				0	without				
				1	Material certificate DIN EN 10204-2.2				
				2	Material certificate DIN EN 10204-3.1				
					5. Orifice plate material				
					1	316L			
					2	316Ti			
						6. Pressure rating acc. to DIN / flange face			
						V	PN10 / Form C		
						W	PN16 / Form C		
							7. Material gaskets		
							A	Klingersil-C4400, 3 mm	
							B	Stainless steel/Graphite, 4,5 mm	
								8. Bolts & Nuts	
								1	A193 B7 / A194 2H – CS
								2	A193 B8 / A194 8M – SS
									9. Connection dimension / material flanges
									A1 DN50 CS
									A2 DN50 316Ti
									B1 DN65 CS
									B2 DN65 316Ti
									C1 DN80 CS
									C2 DN80 316Ti
									D1 DN100 CS
									D2 DN100 316Ti
									E1 DN125 CS
									E2 DN125 316Ti
									F1 DN150 CS
									F2 DN150 316Ti
									G1 DN200 CS
									G2 DN200 316Ti
									H1 DN250 CS
									H2 DN250 316Ti
									J1 DN300 CS
									J2 DN300 316Ti
									K1 DN350 CS
									K2 DN350 316Ti
									L1 DN400 CS
									L2 DN400 316Ti
									M1 DN500 CS
									M2 DN500 316Ti
									N1 DN600 CS
									N2 DN600 316Ti
									P1 DN700 CS
									P2 DN700 316Ti
									Q1 DN800 CS
									Q2 DN800 316Ti

To be continued on page 23

Continuation page 22

										10. Pressure taps				
										1	½" NPT inside flanges			
										2	Pipe stud 21,3x3,2x100 mm, welding ends			
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)			
											11. Condensate pots (pair) (max. saturated steam temperature: 220 °C @ PN40)			
											K0	without		
											K1	with welding end 21,3 mm		
											K2	with ½" NPT (M)		
												12. Material condensate pots		
												H	HII	
												S	Stainless steel 316L	
													13. Shut-off valves	
													A00	without
													A55	see table below
													A56	
													A61	
													A62	
													A81	
													A82	
														Example

Code	Description
A55	Ball valve PN 40, mat. CS, conn. ½" NPT (M) [not together with K1, K2]
A56	Ball valve PN 40, mat. 316L, conn. ½" NPT (M) [not together with K1, K2]
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **PN40**									
	1. Measuring flanges acc. to DIN 19214, flange face Form C									
	300	Standard								
		2. Flanges								
		D	Flange face acc. to DIN							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	316L				
					2	316Ti				
						6. Pressure rating acc. to DIN / flange face				
						X	PN40 / Form C			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	DN50 CS
									A2	DN50 316Ti
									B1	DN65 CS
									B2	DN65 316Ti
									C1	DN80 CS
									C2	DN80 316Ti
									D1	DN100 CS
									D2	DN100 316Ti
									E1	DN125 CS
									E2	DN125 316Ti
									F1	DN150 CS
									F2	DN150 316Ti
									G1	DN200 CS
									G2	DN200 316Ti
									H1	DN250 CS
									H2	DN250 316Ti
									J1	DN300 CS
									J2	DN300 316Ti
									K1	DN350 CS
									K2	DN350 316Ti
									L1	DN400 CS
									L2	DN400 316Ti
									M1	DN500 CS
									M2	DN500 316Ti
									N1	DN600 CS
									N2	DN600 316Ti
									P1	DN700 CS
									P2	DN700 316Ti
									Q1	DN800 CS
									Q2	DN800 316Ti

To be continued on page 23

Continuation page 22

										10. Pressure taps				
										1	½" NPT inside flanges			
										2	Pipe stud 21,3x3,2x100 mm, welding ends			
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)			
											11. Condensate pots (pair) (max. saturated steam temperature: 220 °C @ PN40)			
											K0	without		
											K1	with welding end 21,3 mm		
											K2	with ½" NPT (M)		
												12. Material condensate pots		
												H	HII	
												S	Stainless steel 316L	
													13. Shut-off valves	
													A00	without
													A55	see table below
													A56	
													A61	
													A62	
													A81	
													A82	
														Example

Code	Description
A55	Ball valve PN 40, mat. CS, conn. ½" NPT (M) [not together with K1, K2]
A56	Ball valve PN 40, mat. 316L, conn. ½" NPT (M) [not together with K1, K2]
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **PN64**									
	1. Measuring flanges acc. to DIN 19214, flange face Form E									
	300	Standard								
		2. Flanges								
		D	Flange face acc. to DIN							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	316L				
					2	316Ti				
						6. Pressure rating acc. to DIN / flange face				
						Y	PN64 / Form E			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	DN50 CS
									A2	DN50 316Ti
									B1	DN65 CS
									B2	DN65 316Ti
									C1	DN80 CS
									C2	DN80 316Ti
									D1	DN100 CS
									D2	DN100 316Ti
									E1	DN125 CS
									E2	DN125 316Ti
									F1	DN150 CS
									F2	DN150 316Ti
									G1	DN200 CS
									G2	DN200 316Ti
									H1	DN250 CS
									H2	DN250 316Ti
									J1	DN300 CS
									J2	DN300 316Ti
									K1	DN350 CS
									K2	DN350 316Ti
									L1	DN400 CS
									L2	DN400 316Ti
									M1	DN500 CS
									M2	DN500 316Ti
									N1	DN600 CS
									N2	DN600 316Ti
									P1	DN700 CS
									P2	DN700 316Ti
									Q1	DN800 CS
									Q2	DN800 316Ti

To be continued on page 25

Continuation page 24

										10. Pressure taps			
										1	½" NPT inside flanges		
										2	Pipe stud 21,3x3,2x100 mm, welding ends		
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)		
											11. Condensate pots (pair) (max. saturated steam temperature: 280 °C @ PN64)		
											K0	without	
											K1	with welding end 21,3 mm	
											K2	with ½" NPT (M)	
												12. Material condensate pots	
												H	HII
												S	Stainless steel 316L
													13. Shut-off valves
													A00 without
													A61 see table below
													A62
													A81
													A82

Code	Description
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **PN100**									
	1. Measuring flanges acc. to DIN 19214, flange face Form E									
	300	Standard								
		2. Flanges								
		D	Flange face acc. to DIN							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	316L				
					2	316Ti				
						6. Pressure rating acc. to DIN / flange face				
						Z	PN100 / Form E			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	DN50 CS
									A2	DN50 316Ti
									B1	DN65 CS
									B2	DN65 316Ti
									C1	DN80 CS
									C2	DN80 316Ti
									D1	DN100 CS
									D2	DN100 316Ti
									E1	DN125 CS
									E2	DN125 316Ti
									F1	DN150 CS
									F2	DN150 316Ti
									G1	DN200 CS
									G2	DN200 316Ti
									H1	DN250 CS
									H2	DN250 316Ti
									J1	DN300 CS
									J2	DN300 316Ti
									K1	DN350 CS
									K2	DN350 316Ti
									L1	DN400 CS
									L2	DN400 316Ti
									M1	DN500 CS
									M2	DN500 316Ti
									N1	DN600 CS
									N2	DN600 316Ti
									P1	DN700 CS
									P2	DN700 316Ti
									Q1	DN800 CS
									Q2	DN800 316Ti

To be continued on page 27

Continuation page 26

										10. Pressure taps			
										1	½" NPT inside flanges		
										2	Pipe stud 21,3x3,2x100 mm, welding ends		
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)		
											11. Condensate pots (pair) (max. saturated steam temperature: 220 °C @ PN100)		
											K0	without	
											K1	with welding end 21,3 mm	
											K2	with ½" NPT (M)	
												12. Material condensate pots	
												H	HII
												S	Stainless steel 316L
													13. Shut-off valves
													A00 without
													A61 see table below
													A62
													A81
													A82

Code	Description
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **150 lbs**									
	1. Measuring flanges acc. to ANSI B16.5, 150 lbs									
	300	Standard								
		2. Flanges								
		E	Flange face acc. to ANSI							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	304L				
					2	316Ti				
						6. Pressure rating acc. to ANSI / flange face				
						V	150 lbs / RF			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	2”	A105
									A2		316L
									B1	2 ½”	A105
									B2		316L
									C1	3”	A105
									C2		316L
									D1	4”	A105
									D2		316L
									E1	5”	A105
									E2		316L
									F1	6”	A105
									F2		316L
									G1	8”	A105
									G2		316L
									H1	10”	A105
									H2		316L
									J1	12”	A105
									J2		316L
									K1	14”	A105
									K2		316L
									L1	16”	A105
									L2		316L
									M1	20”	A105
									M2		316L
									N1	24”	A105
									N2		316L

To be continued on page 29

Continuation page 28

										10. Pressure taps			
										1	½" NPT inside flanges		
										2	Pipe stud 21,3x3,2x100 mm, welding ends		
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)		
											11. Condensate pots (pair) (max. saturated steam temperature: 200 °C @ 150#)		
											K0	without	
											K1	with welding end 21,3 mm	
											K2	with ½" NPT (M)	
												12. Material condensate pots	
												H	HII
												S	Stainless steel 316L
													13. Shut-off valves
													A00 without
													A55
													A56
													A61 see table below
													A62
													A81
													A82

Code	Description
A55	Ball valve PN 40, mat. CS, conn. ½" NPT (M) [not together with K1, K2]
A56	Ball valve PN 40, mat. 316L, conn. ½" NPT (M) [not together with K1, K2]
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **300 lbs**									
	1. Measuring flanges acc. to ANSI B16.5, 300 lbs									
	300	Standard								
		2. Flanges								
		E	Flange face acc. to ANSI							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	304L				
					2	316Ti				
						6. Pressure rating acc. to ANSI / flange face				
						W	300 lbs / RF			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	2”	A105
									A2		316L
									B1	2 ½”	A105
									B2		316L
									C1	3”	A105
									C2		316L
									D1	4”	A105
									D2		316L
									E1	5”	A105
									E2		316L
									F1	6”	A105
									F2		316L
									G1	8”	A105
									G2		316L
									H1	10”	A105
									H2		316L
									J1	12”	A105
									J2		316L
									K1	14”	A105
									K2		316L
									L1	16”	A105
									L2		316L
									M1	20”	A105
									M2		316L
									N1	24”	A105
									N2		316L

To be continued on page 31

Continuation page 30

										10. Pressure taps			
										1	½" NPT inside flanges		
										2	Pipe stud 21,3x3,2x100 mm, welding ends		
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)		
											11. Condensate pots (pair) (max. saturated steam temperature: 240 °C @ 300#)		
											K0	without	
											K1	with welding end 21,3 mm	
											K2	with ½" NPT (M)	
												12. Material condensate pots	
												H	HII
												S	Stainless steel 316L
													13. Shut-off valves
													A00 without
													A55
													A56
													A61 see table below
													A62
													A81
													A82

Code	Description
A55	Ball valve PN 40, mat. CS, conn. ½" NPT (M) [not together with K1, K2]
A56	Ball valve PN 40, mat. 316L, conn. ½" NPT (M) [not together with K1, K2]
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **600 lbs**									
	1. Measuring flanges acc. to ANSI B16.5, 600 lbs									
	300	Standard								
		2. Flanges								
		E	Flange face acc. to ANSI							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	304L				
					2	316Ti				
						6. Pressure rating acc. to ANSI / flange face				
						X	600 lbs / RF			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	2”	A105
									A2		316L
									B1	2 ½”	A105
									B2		316L
									C1	3”	A105
									C2		316L
									D1	4”	A105
									D2		316L
									E1	5”	A105
									E2		316L
									F1	6”	A105
									F2		316L
									G1	8”	A105
									G2		316L
									H1	10”	A105
									H2		316L
									J1	12”	A105
									J2		316L
									K1	14”	A105
									K2		316L
									L1	16”	A105
									L2		316L
									M1	20”	A105
									M2		316L
									N1	24”	A105
									N2		316L

To be continued on page 33

Continuation page 32

										10. Pressure taps			
										1	½" NPT inside flanges		
										2	Pipe stud 21,3x3,2x100 mm, welding ends		
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)		
											11. Condensate pots (pair) (max. saturated steam temperature: 275 °C @ 600#)		
											K0	without	
											K1	with welding end 21,3 mm	
											K2	with ½" NPT (M)	
												12. Material condensate pots	
												H	HII
												S	Stainless steel 316L
													13. Shut-off valves
													A00 without
													A61 see table below
													A62
													A81
													A82

Code	Description
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **900 lbs**									
	1. Measuring flanges acc. to ANSI B16.5, 900 lbs									
	300	Standard								
		2. Flanges								
		E	Flange face acc. to ANSI							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	304L				
					2	316Ti				
						6. Pressure rating acc. to ANSI / flange face				
						Y	900 lbs / RF			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	2”	A105
									A2		316L
									B1	2 ½”	A105
									B2		316L
									C1	3”	A105
									C2		316L
									D1	4”	A105
									D2		316L
									E1	5”	A105
									E2		316L
									F1	6”	A105
									F2		316L
									G1	8”	A105
									G2		316L
									H1	10”	A105
									H2		316L
									J1	12”	A105
									J2		316L
									K1	14”	A105
									K2		316L
									L1	16”	A105
									L2		316L
									M1	20”	A105
									M2		316L
									N1	24”	A105
									N2		316L

To be continued on page 35

Continuation page 34

										10. Pressure taps			
										1	½" NPT inside flanges		
										2	Pipe stud 21,3x3,2x100 mm, welding ends		
										3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)		
											11. Condensate pots (pair) (max. saturated steam temperature: 275 °C @ 900#)		
											K0	without	
											K1	with welding end 21,3 mm	
											K2	with ½" NPT (M)	
												12. Material condensate pots	
												H	HII
												S	Stainless steel 316L
													13. Shut-off valves
													A00 without
													A61 see table below
													A62
													A81
													A82

Code	Description
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

Code	Description									
BLS	Throttle devices with flange taps – **1500 lbs**									
	1. Measuring flanges acc. to ANSI B16.5, 1500 lbs									
	300	Standard								
		2. Flanges								
		E	Flange face acc. to ANSI							
			3. Orifice calculation by Intra							
			0	without						
			M	with						
				4. Documentation						
				0	without					
				1	Material certificate DIN EN 10204-2.2					
				2	Material certificate DIN EN 10204-3.1					
					5. Orifice plate material					
					1	304L				
					2	316Ti				
						6. Pressure rating acc. to ANSI / flange face				
						Z	1500 lbs / RF			
							7. Material gaskets			
							A	Klingersil-C4400, 3 mm		
							B	Stainless steel/Graphite, 4,5 mm		
								8. Bolts & Nuts		
								1	A193 B7 / A194 2H – CS	
								2	A193 B8 / A194 8M – SS	
									9. Connection dimension / material flanges	
									A1	2”	A105
									A2		316L
									B1	2 ½”	A105
									B2		316L
									C1	3”	A105
									C2		316L
									D1	4”	A105
									D2		316L
									E1	5”	A105
									E2		316L
									F1	6”	A105
									F2		316L
									G1	8”	A105
									G2		316L
									H1	10”	A105
									H2		316L
									J1	12”	A105
									J2		316L
									K1	14”	A105
									K2		316L
									L1	16”	A105
									L2		316L
									M1	20”	A105
									M2		316L
									N1	24”	A105
									N2		316L

To be continued on page 37

Continuation page 36

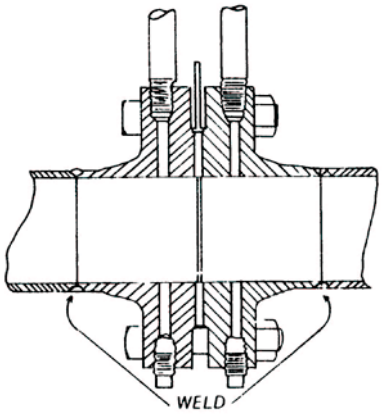
10. Pressure taps	
1	½" NPT inside flanges
2	Pipe stud 21,3x3,2x100 mm, welding ends
3	Pipe stud 21,3x3,2x100 mm – with ½" NPT (M)
13. Shut-off valves	
A00	without
A61	see table below
A62	
A81	
A82	

Code	Description
A61	Shut-off valve PN400, mat. CS, conn. ½" NPT (M) [together with K1, K2]
A62	Shut-off valve PN400, mat. 316L, conn. ½" NPT (M) [together with K1, K2]
A81	ANSI gate valve 800 lbs, mat. A105, conn. ½" NPT (M) [together with K1, K2]
A82	ANSI gate valve 800 lbs, mat. 316L, conn. ½" NPT (M) [together with K1, K2]

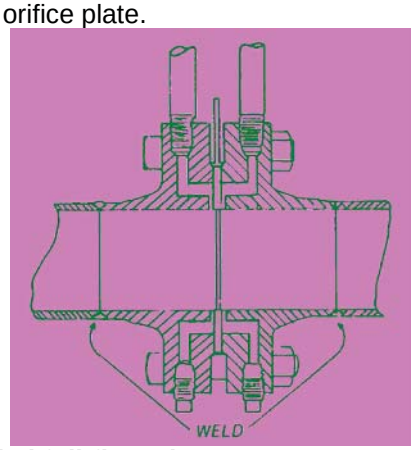
7 Pressure tap connections

Pressure connection holes in the pipe should be 1/2" for 4" and larger lines, 3/8" for 3" lines and 1/4" for 2" lines. When flange taps are used, insert a drill of the proper size through the connection holes in the flanges and drill through the pipe. When connections in the pipe are used, weld half-couplings to the pipe at the proper locations, insert a drill through them, and drill through the pipe. Round off the edges of the holes slightly to be sure that no burrs remain in the pipe.

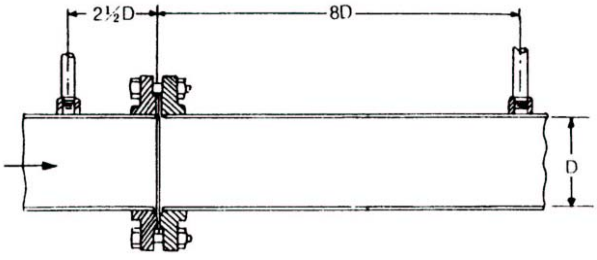
- **Flange taps**
  Pressure connection holes are located in the flanges 1" upstream and 1" downstream from the corresponding orifice plate faces (see fig. 4 and fig. 5)



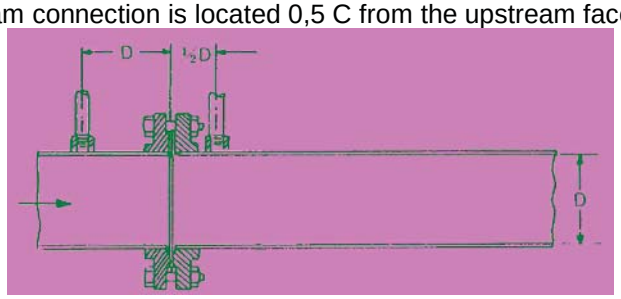
- **Corner taps**
  On lines smaller than 2", the orifice flange union shown in fig. 6 is used. The effect is that the pressure taps are right at the orifice plate.



- **2,5 D and 8 D taps, also called full-flow pipe taps**
  Connections are installed 2,5 pipe-diameters upstream from the upstream face of the orifice plate and 8 pipe diameters downstream from the upstream face of the orifice plate.

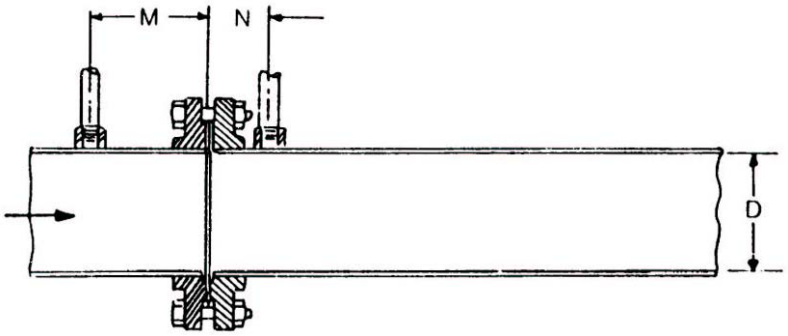


- **1 D and 0,5 D taps, also called radius taps**
  This type of connection is modification of and has largely replaced the Vena Contracta taps. It yields equally accurate results and has the advantage that the downstream connection is easier to locate. The upstream connection should be at 1 D above the upstream face of the orifice plate, but location of the upstream connection anywhere between 0,5 and 2 D introduces only negligible error. The downstream connection is located 0,5 C from the upstream face of the orifice plate.



- **"Vena Contracta" taps**
  The upstream connection (dimension M) may be located anywhere between 0,5 and 2 pipe diameters above the upstream face of the orifice plate. The downstream connection (dimension N) is made at the point of maximum flow constriction and is given by the table below:

Orifice to pipe Diameter ratio d/D	Location of downstream Pressure Tap (N) (pipe diameters)		
	min	mean	max.
0,2	0,37	0,85	1,30
0,3	0,44	0,80	1,15
0,4	0,47	0,73	1,00
0,5	0,47	0,66	0,84
0,6	0,42	0,57	0,70
0,7	0,35	0,45	0,55
0,8	0,25	0,33	0,41



8 Orifice meter runs, type: MBL-500

8.1 Description

Orifice meter runs are used for measuring the flow at higher accuracy.
The orifice meter runs are therefore, not the ones simply weld pipes to upstream and downstream sides or an orifice assembly, but the ones welding smaller inside diameter pipes to smaller diameter of flanges, then, finish inside diameter or the pipe / flange assembly by boring or honing to the specified dimensions with the required tolerances and surface roughness (see fig. 20 and fig. 21).

8.2 Type and drawing

♦ Orifice meter run (both sides fanged):

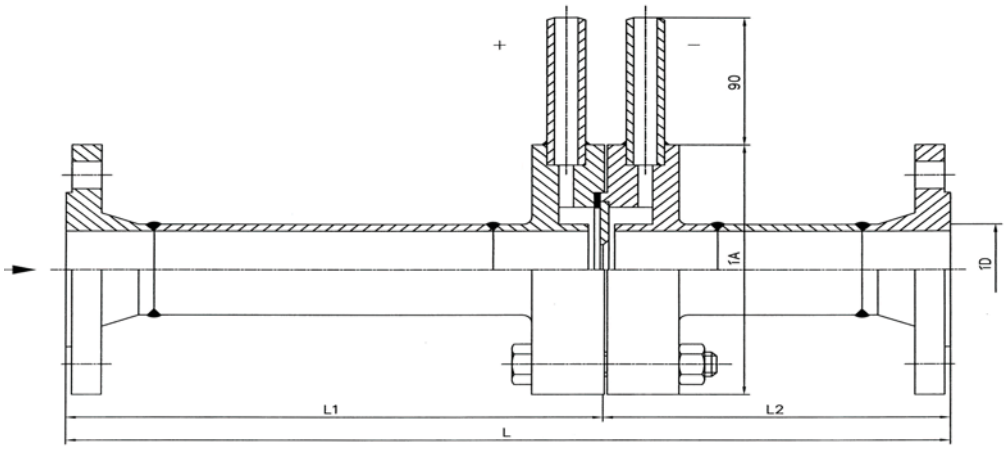


fig. 20

♦ Orifice meter run (butt welding ends)

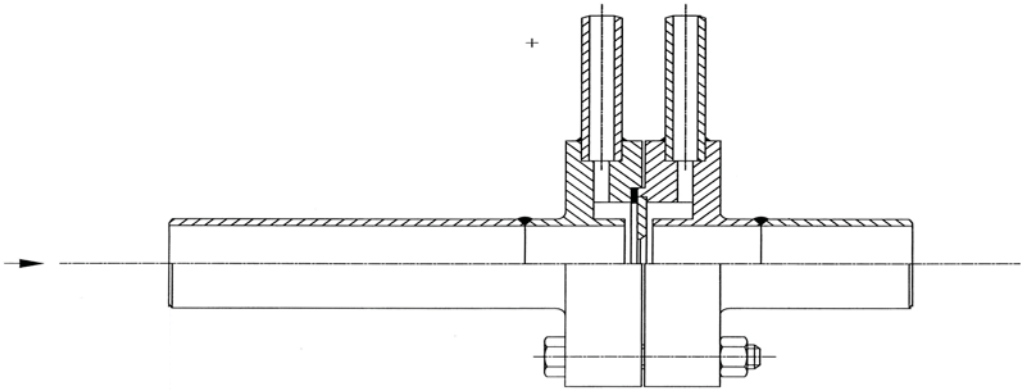


Fig. 21

8.3 Order Codes

Code	Description				
MBL500	Measuring section with integral concentric square edge orifice plate (material orifice plate: 316L) with flange connection acc. ANSI Upstream length: 250 mm Downstream length: 200 mm				
	Flange face				
	SA	RF – 125 RAAH	**150 lbs**		
	SJ	RTJ			
	Materials of construction				
		Flange	**Body**	**Size and rating**	
	R12	A105	A106A234WPA	1/2” 150 lbs	
	SR12	A105	316L		
	S12	316L	316L		
	R13	A105	A106A234WPA	3/4” 150 lbs	
	SR13	A105	316L		
	S13	316L	316L		
	R14	A105	A106A234WPA	1” 150 lbs	
	SR14	A105	316L		
	S14	316L	316L		
	R15	A105	A106A234WPA	1 1/2” 150 lbs	
	SR15	A105	316L		
	S15	316L	316L		
	R16	A105	A106A234WPA	2” 150 lbs	
	SR16	A105	316L		
	S16	316L	316L		
	Flange face				
	SA	RF – 125 RAAH	**300 lbs**		
	SJ	RTJ			
	Materials of construction				
		Flange	**Body**	**Size and rating**	
	R17	A105	A106A234WPA	1/2” 300 lbs	
	SR17	A105	316L		
	S17	316L	316L		
	R18	A105	A106A234WPA	3/4” 300 lbs	
	SR18	A105	316L		
	S18	316L	316L		
	R19	A105	A106A234WPA	1” 300 lbs	
	SR19	A105	316L		
	S19	316L	316L		
	R20	A105	A106A234WPA	1 1/2” 300 lbs	
	SR20	A105	316L		
	S20	316L	316L		
	R21	A105	A106A234WPA	2” 300 lbs	
	SR21	A105	316L		
	S21	316L	316L		
	Flange face				
	SA	RF – 125 RAAH	**600 lbs**		
	SJ	RTJ			
	Materials of construction				
		Flange	**Body**	**Size and rating**	
	R22	A105	A106A234WPA	1/2” 600 lbs	
	SR22	A105	316L		
	S22	316L	316L		
	R23	A105	A106A234WPA	3/4” 600 lbs	
	SR23	A105	316L		
	S23	316L	316L		
	R24	A105	A106A234WPA	1” 600 lbs	
	SR24	A105	316L		
	S24	316L	316L		
	R25	A105	A106A234WPA	1 1/2” 600 lbs	
	SR25	A105	316L		
	S25	316L	316L		
	R26	A105	A106A234WPA	2” 600 lbs	
	SR26	A105	316L		
	S26	316L	316L		
MBL500					

To be continued on page 42

Continuation page 41

MBL500		

Flange face					
SA	RF – 125 RAAH	**1500 lbs**			
SJ	RTJ				
	Materials of construction				
		Flange	**Body**	**Size and rating**	
	R27	A105	A106A234WPA	1/2” 1500 lbs	
	SR27	A105	316L		
	S27	316L	316L		
	R28	A105	A106A234WPA	3/4” 1500 lbs	
	SR28	A105	316L		
	S28	316L	316L		
	R29	A105	A106A234WPA	1” 1500 lbs	
	SR29	A105	316L		
	S29	316L	316L		
	R30	A105	A106A234WPA	1 1/2” 1500 lbs	
	SR30	A105	316L		
	S30	316L	316L		
	R31	A105	A106A234WPA	2” 1500 lbs	
	SR31	A105	316L		
	S31	316L	316L		
Flange face					
SA	RF – 125 RAAH	**2500 lbs**			
SJ	RTJ				
	Materials of construction				
		Flange	**Body**	**Size and rating**	
	R32	A105	A106A234WPA	1/2” 2500 lbs	
	SR32	A105	316L		
	S32	316L	316L		
	R33	A105	A106A234WPA	3/4” 2500 lbs	
	SR33	A105	316L		
	S33	316L	316L		
	R34	A105	A106A234WPA	1” 2500 lbs	
	SR34	A105	316L		
	S34	316L	316L		
	R35	A105	A106A234WPA	1 1/2” 2500 lbs	
	SR35	A105	316L		
	S35	316L	316L		
	R36	A105	A106A234WPA	2” 2500 lbs	
	SR36	A105	316L		
	S36	316L	316L		

Flange plate to direct mount a manifold		
0	without	
A06	Flange plate for 3-way-manifold, material 316Ti	
A80	2 off shut off valve type A7-2PT-SZ14x4,5, PN400, complete with flange plate for 3-way-manifold	
Instrument connection		
0	without	
A66	direct mount, with 3-way-manifold, PN400, housing: 316L / packing: PTFE (only with A06 or A80)	

MBL500				

ROOM FOR YOUR NOTES

Besides the products covered by this brochure, Intra-Automation GmbH also manufactures other high-quality and high precision instruments for industrial measurement tasks. For more information, please contact us (contact details on the backside of this brochure).

Flow measurement

Itabar®-Flow Sensor

IntraSonic IS210 Ultrasonic Flow Meter

Level measurement

ITA-mag. Level Gauge

MAGLINK Level Indicator

Other Measurement Tasks:

DigiFlow Flow and Level Computers

IntraCon Digital Controllers

IntraDigit Digital Indicators / Meters

INTRA-AUTOMATION

MESS- UND REGELINSTRUMENTE / MEASUREMENT AND CONTROL

International Headquarters:
Intra-Automation GmbH
Otto-Hahn-Str. 20
41515 Grevenbroich
GERMANY

☎ +49 – (0) 21 81 / 7 56 65-0
🖷 +49 – (0) 21 81 / 6 44 92

🖱 info@intra-automation.de

Sales Office for the BENELUX:
B.V. Intra-Automation HTP
PO Box 10
4730 AA Oudenbosch
THE NETHERLANDS

☎ +31 – (0)165 – 32 22 01
🖷 +31 – (0)165 – 32 29 70

🖱 info@intra-automation.nl

💻 www.intra-automation.com