॥ श्री गणेशाय नमः ॥

BUTTWELD FITTINGS

Products & Technical Guide

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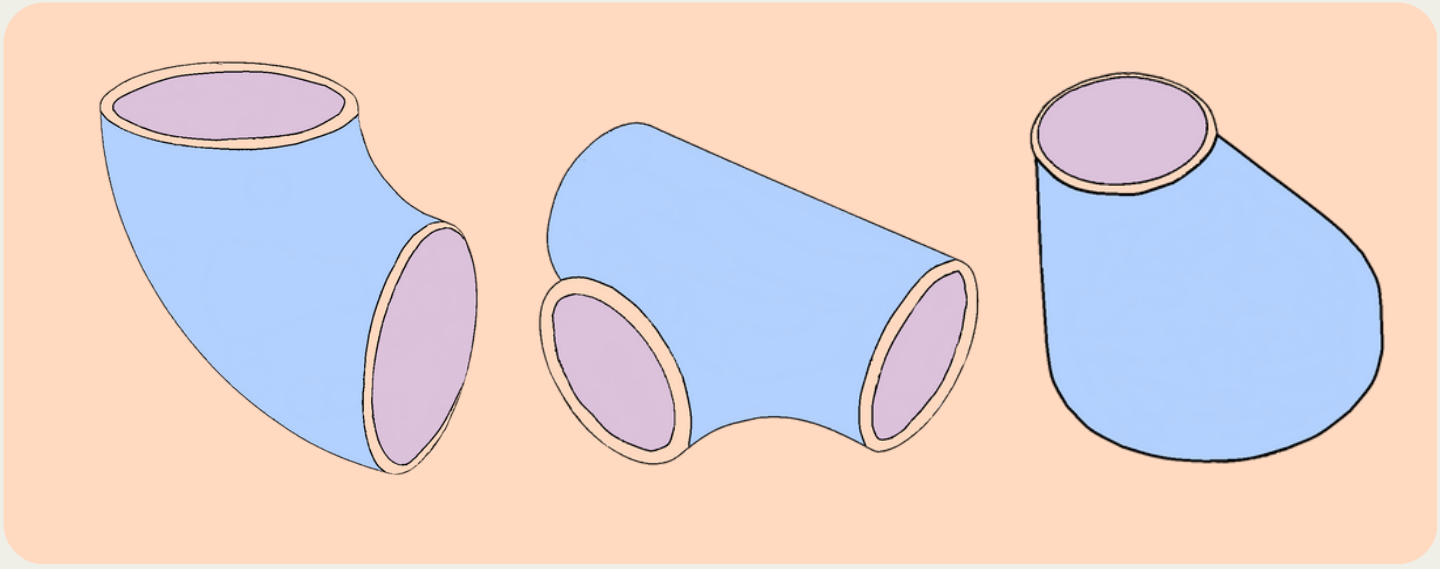
BUTTWELD FITTINGS OVERVIEW:

Let’s explore the world of butt weld fittings — those trusty components that keep our piping systems flowing smoothly. They ensure tight, seamless **connections**, making sure liquids and gases go where they’re supposed to. They **connect pipes without external threads** or flanges, **ensuring tight, seamless joints.**

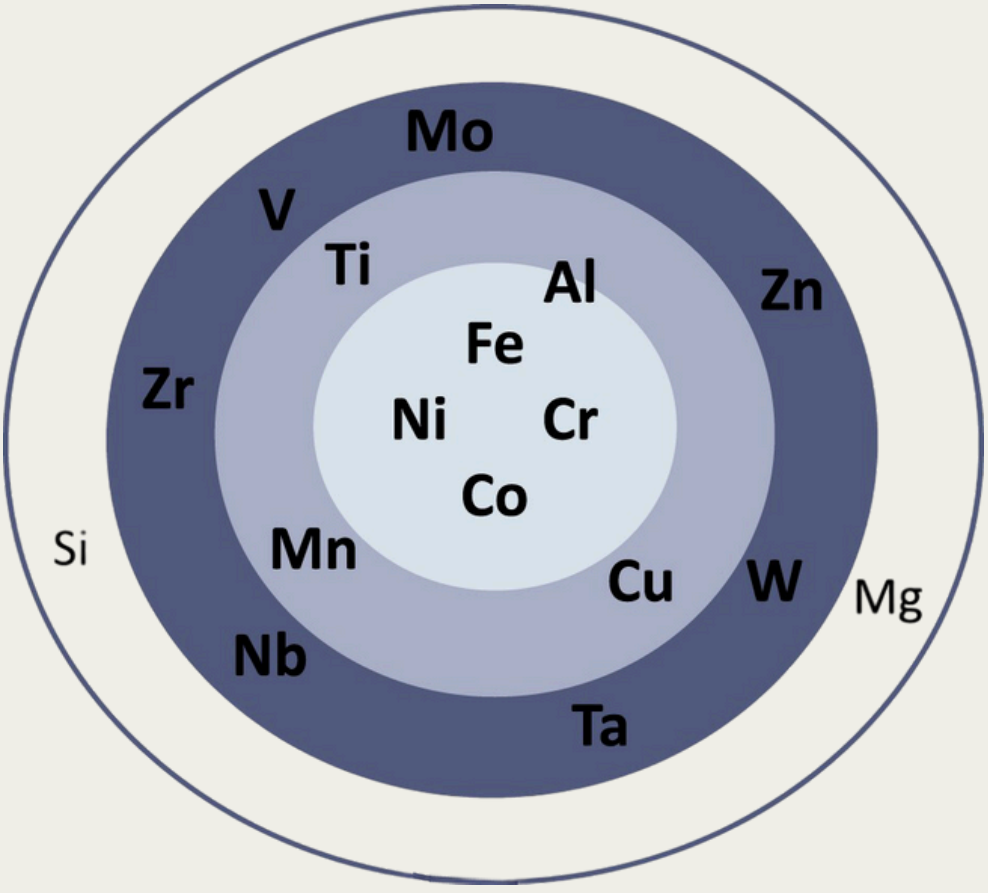
Proper manufacturing, installation, and welding techniques ensure that buttweld fittings deliver the performance and longevity required in demanding environments. Whether it's **changing the direction of flow**, **branching off a main line,** or **reducing pipe sizes**, buttweld fittings play a critical role in the functionality and efficiency of piping systems.These fittings are **versatile, cost-effective,** and applicable to various metals.



MATERIAL OF CONSTRUCTION:

Depending on the application's requirements, common materials include:

- **Stainless Steel:** Resistant to corrosion, ideal for applications involving corrosive environments.
- **Nickel Alloys:** Extremely resistant to corrosion and high temperatures, used in specialized applications.
- **Duplex Stainless Steel:** Combines the properties of austenitic and ferritic stainless steel, providing excellent strength and corrosion resistance.
- **Alloy Steel:** Provides enhanced mechanical properties, suitable for high-temperature and high-pressure applications.
- **Carbon Steel:** Known for its strength and durability, suitable for high-pressure applications.
- **Titanium:** A strong, lightweight metal known for its high resistance to corrosion and remarkable strength-to-weight ratio.



MANUFACTURING PROCESS:

Let's explore the manufacturing process for Buttweld fittings:

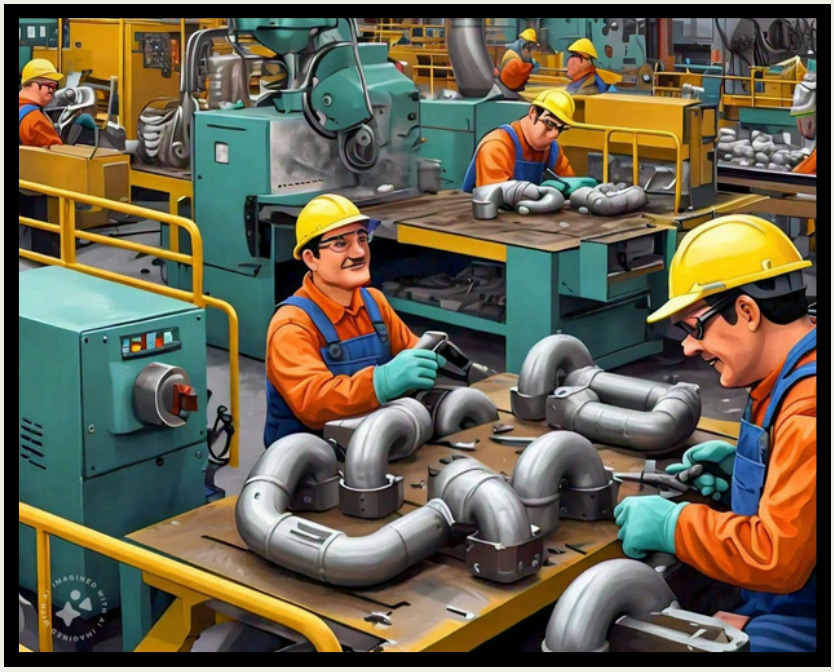
Buttweld Pipe Fittings:

- Raw Material Selection: Starts with seamless or welded pipes.
- Cutting and Beveling: Precisely cut and smooth the edges for easy welding.
- Shaping and Fitting: Bend or thread the pipes into desired shapes (elbows, tees, etc.)
- Welding: Join pipes using heat and pressure.
- Polishing and Marking: Polish for a smooth finish and mark with relevant info.
- Quality Checks: Inspect welds for defects.

Buttweld Pressed Fittings:

- Raw Material: One or Two pieces of raw material plates are cut out symmetrically.
- Press Forming: Each piece is press-formed (hydraulic) to create the desired shape of the fitting.
- Welding: The two halves of the fitting are welded together.
- Finishing Steps: After welding, the fitting undergoes several steps: Trimming ,Machine beveling ,Bead blasting, Stenciling
- Types Produced: Pressed fittings include tees, concentric reducers, eccentric reducers, and elbows.
- Advantages: Efficient for large sizes, cost effective, Smooth inner surfaces reduce pressure losses.

Voilà! Butt weld fittings — crafted with precision.



BUTTWELD ELBOW:

		
45° ELBOW	90° ELBOW	180° ELBOW

Buttweld elbows are a type of pipe fitting used to change the direction of flow in a piping system. They're crucial for redirecting the flow smoothly, avoiding sharp bends which can cause turbulence and pressure drops.

Angles:

- **45° Elbow:** Provides a gentle turn, often used in piping systems where a slight change of direction is needed.
- **90° Elbow:** Offers a right-angle turn, the most common type.
- **180° Elbow:** Used where a U-turn is required, making the pipe loop back in the opposite direction.

Radius Types:

- **Long Radius (LR) Elbows:** The centerline radius is 1.5 times the nominal pipe size. These are used for smoother flow with less pressure drop.
- **Short Radius (SR) Elbows:** The centerline radius is equal to the nominal pipe size, used where space is tight but can cause more turbulence.

BUTTWELD TEE:

	
EQUAL TEE	REDUCING TEE

Buttweld tees are essential components in piping systems, designed to allow the division of flow in a pipeline. They help create branch lines and connect different sections of a pipeline. Here's an overview: Types of Buttweld Tees

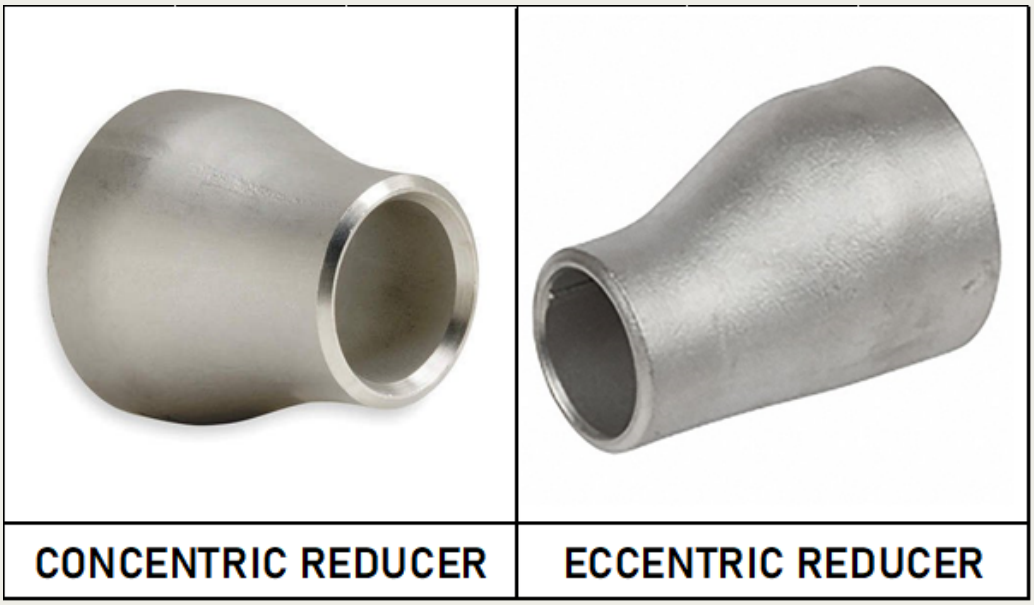
Equal Tees:

- All three ends of the tee have the same diameter.
- Used when the branching pipe needs to maintain the same size as the main line.
- Common in applications where a uniform flow is required.

Reducing Tees:

- The branch end has a smaller diameter than the main line ends.
- Allows for a reduction in the pipe size at the branching point.
- Useful in systems where the flow rate needs to be adjusted or where smaller diameter pipes are required downstream.

BUTTWELD REDUCERS:



CONCENTRIC REDUCER	ECCENTRIC REDUCER

Buttweld reducers are critical fittings in piping systems, designed to change the diameter of the pipe. They ensure a smooth transition from one pipe size to another, minimizing turbulence and potential pressure drop.
Types of Buttweld Reducers

Concentric Reducers:

- **Design:** Symmetrical and shaped like a cone. The centerline of both ends remains aligned, forming a uniform taper.
- **Use:** Ideal for vertical piping systems where maintaining a consistent flow path is crucial. Commonly used in pump suction lines to avoid cavitation.

Eccentric Reducers:

- **Design:** Offset centerlines, one side of the reducer is flat while the other side slopes.
- **Use:** Commonly used in horizontal piping systems. The flat side allows for proper drainage and prevents air pockets, especially important in applications dealing with corrosive fluids.

BUTTWELD STUB END, CAP, CROSS:

STUB END

Buttweld stub ends are specialized fittings used in combination with lap joint flanges. They offer a unique way to connect pipes, allowing for easy disassembly and reassembly, which is particularly useful in applications that require frequent maintenance.

CAP

Buttweld caps are used to seal the ends of pipes, protecting the piping system from damage, debris, or contamination. They're crucial for maintaining the integrity of a pipeline when it's not connected to anything.

CROSS

A buttweld cross, also known simply as a cross fitting, is used in piping systems to create a branch at right angles from the main line. These fittings are essential when a pipeline needs to split into four directions.

SIZES & DIMENSIONS:

Buttweld fittings come in a variety of sizes and thicknesses to suit different piping systems. Here's a quick overview:

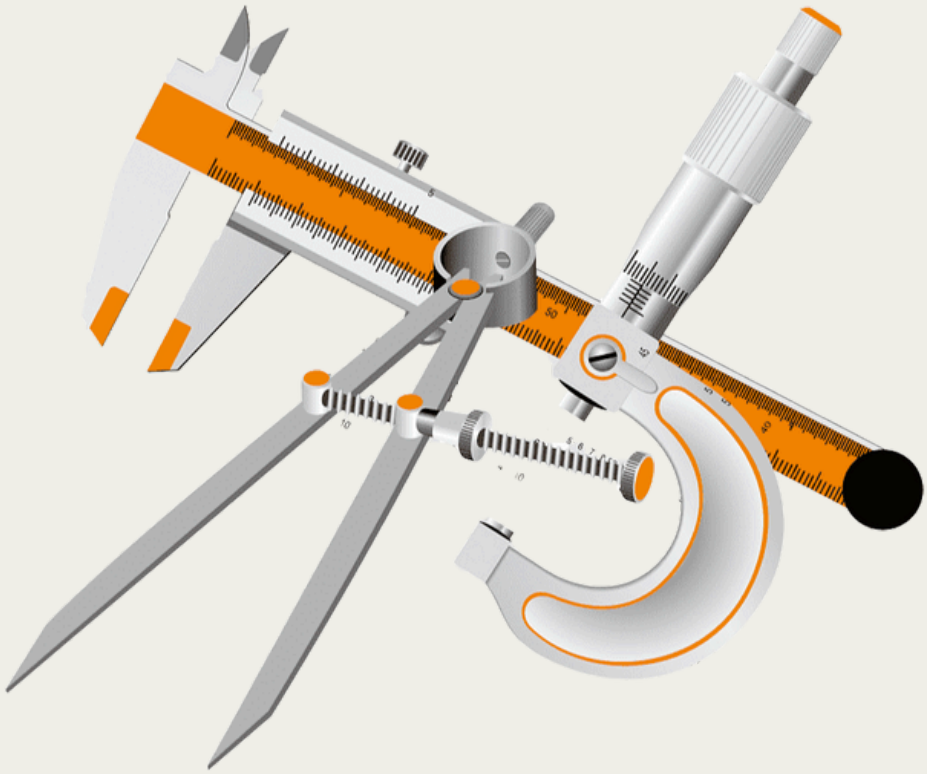
Sizes

Buttweld fittings are available in nominal pipe sizes (NPS) ranging from **1/2 inch to 72 inches (NB 15 to NB 1800).** Common sizes include:

Thicknesses

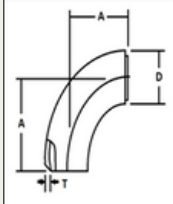
The thickness of buttweld fittings is determined by the **Schedule (SCH) of the pipe**, which indicates the wall thickness.

Each schedule has a different wall thickness, which affects the pressure rating and strength of the fitting1. For example, Schedule 40 fittings have a standard wall thickness, while Schedule 80 fittings have a thicker wall for higher pressure applications.

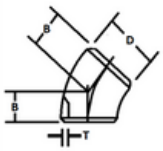


BUTTWELD FITTINGS DIMENSIONS:

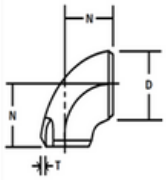
BUTT WELDING PIPE FITTING DIMENSIONAL STANDARD ANSI B-16.9, B-16.28 & MSS SP 43



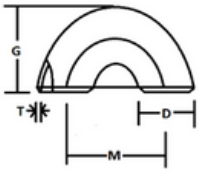
90° Elbow Long Radius



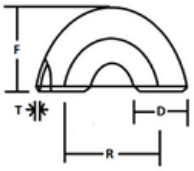
45° Elbow



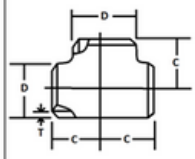
90° Elbow Short Radius



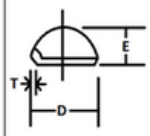
180° Elbow Short Radius



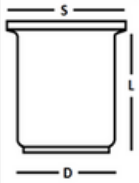
180° Elbow Long Radius



Equal Tee



Caps



Stub-End

Nominal Pipe Size		Outside Diameter	Center To Face				Back To Face			Center To Center			Length MSSSP43	Length B16.9
Inch.	mm	D	A	B	C	N	E	F	G	R	M	S	L	L
1/2	15	21.3	19.05	7.94	25.4	-	25.4	47.63	-	76.2	-	34.93	50.8	76.2
3/4	20	26.7	28.58	14.29	28.58	-	25.4	42.86	-	57.15	-	42.86	50.8	76.2
1	25	33.4	38.1	22.23	38.1	25.4	38.1	55.56	41.28	76.2	50.8	50.8	50.8	101.6
1 1/4	32	42.2	47.63	25.4	47.63	31.75	38.1	69.85	52.39	95.25	63.5	63.5	50.8	101.6
1 1/2	40	48.3	57.15	28.53	57.15	38.1	38.1	82.55	61.91	114.3	76.2	73.2	50.8	101.6
2	50	60.3	76.2	34.93	63.5	50.8	38.1	106.36	80.96	152.4	101.6	92.08	63.5	152.4
2 1/2	65	73	95.25	44.45	76.2	63.5	38.1	131.76	100.01	190.5	127	104.78	63.5	152.4
3	80	88.9	114.3	50.8	85.73	76.2	50.8	158.75	120.65	228.6	152.4	127	63.5	152.4
3 1/2	90	101.6	133.35	57.15	95.25	88.9	63.5	184.15	139.7	266.7	177.8	139.7	76.2	152.4
4	100	114.3	152.4	63.5	104.78	101.6	63.5	209.55	158.75	304.8	203.2	157.16	76.2	152.4
5	125	141.3	190.5	79.37	123.83	127	76.2	261.94	196.85	381	254	185.74	76.2	203.2
6	150	168.3	228.6	95.25	142.88	152.4	88.9	312.74	236.54	457.2	304.8	215.9	88.9	203.2
8	200	219.1	304.8	127	177.8	203.2	101	414.34	312.74	609.6	406.4	269.88	101.6	203.2
10	250	273.1	381	158.7	215.9	254	127	514.34	390.53	762	508	323.85	127	254
12	300	323.9	457.2	190.5	254	304.8	152.4	619.13	466.73	914.4	609.5	381	152.4	254
14	350	355.6	533.4	222.25	279.4	355.6	165.1	711.2	533.4	1066.8	711.2	412.85	152.4	304.8
16	400	406.4	609.6	254	304.8	406.4	177.8	812.8	609.8	1219.2	812.8	469.9	152.4	304.8
18	450	457.2	685.8	285.75	342.9	457.2	203.2	914.4	685.8	1371.6	914.4	533.4	152.4	304.8
20	500	508	762	317.5	381	508	228.6	1016	762	1524	1016	584.2	152.4	304.8
22	550	559	838.2	342.9	419.1	558.8	254	1117.6	838.2	1676.4	1117	614.4	152.4	304.8
24	600	610	914.4	381	431.8	609.6	266.7	1219.2	914.4	1828.8	1219.2	692.15	152.4	304.8

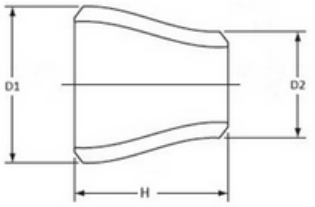
Thickness as per Schedule (refer Pipe Dimension)

(Dimensions in mm)

Dimensions and other specifications as per customers requirements are available on request

BUTTWELD REDUCER DIMENSIONS:

BUTTWELD REDUCER DIMENSIONS AS PER ANSI B16.9 / MSS SP-75



Pipe made Concentric Reducer

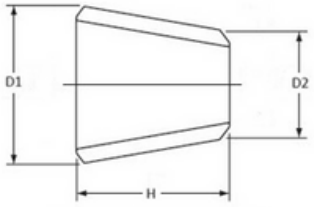
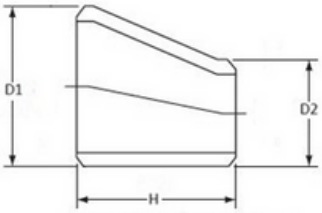


Plate pressed Concentric Reducer



Pipe made Eccentric reducer

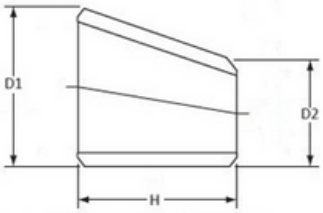


Plate Pressed Eccentric Reducer

Concentric Reducer

Nominal Pipe Size (NPS)			Outside Diameter at Bevel		End-to-end (H)
			Large End (D1)	Small End (D2)	
3/4	x	1/2	26.7	21.3	38.1
3/4	x	3/8		17.3	
1	x	3/4	33.4	26.7	50.8
1	x	1/2		21.3	
1-1/4	x	1	42.2	33.4	50.8
1-1/4	x	3/4		26.7	
1-1/4	x	1/2		21.3	
1-1/2	x	1-1/4	48.3	42.2	63.5
1-1/2	x	1		33.4	
1-1/2	x	3/4		26.7	
1-1/2	x	1/2		21.3	
2	x	1-1/2	60.3	48.3	76.2
2	x	1-1/4		42.2	
2	x	1		33.4	
2	x	3/4		26.7	
2-1/2	x	2	73.0	60.3	88.9
2-1/2	x	1-1/2		48.3	
2-1/2	x	1-1/4		42.2	
2-1/2	x	1		33.4	
3	x	2-1/2	88.9	73.0	88.9
3	x	2		60.3	
3	x	1-1/2		48.3	
3	x	1-1/4		42.2	
3-1/2	x	3	101.6	88.9	101.6
3-1/2	x	2-1/2		73.0	
3-1/2	x	2		60.3	
3-1/2	x	1-1/2		48.3	
3-1/2	x	1-1/4		42.2	
4	x	3-1/2	114.3	101.6	101.6
4	x	3		88.9	
4	x	2-1/2		73.0	
4	x	2		60.3	
4	x	1-1/2		48.3	
5	x	4	141.3	114.3	127.0
5	x	3-1/2		101.6	
5	x	3		88.9	
5	x	2-1/2		73.0	
5	x	2		60.3	
6	x	5	168.3	141.3	139.7
6	x	4		114.3	
6	x	3-1/2		101.6	
6	x	3		88.9	
6	x	2-1/2		73.0	

Eccentric Reducer

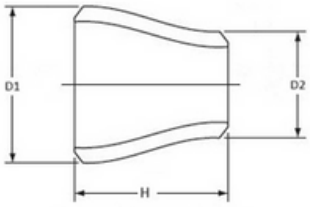
Nominal Pipe Size (NPS)			Outside Diameter at Bevel		End-to-end (H)
			Large End (D1)	Small End (D2)	
8	x	6	219.1	168.3	152.4
8	x	5		141.3	
8	x	4		114.3	
8	x	3-1/2		101.6	
8	x	3		88.9	
8	x	2-1/2		73.0	
10	x	8	273.1	29.1	177.8
10	x	6		168.3	
10	x	5		141.3	
10	x	4		114.3	
12	x	10	323.9	273.1	203.2
12	x	8		219.1	
12	x	6		168.3	
12	x	5		141.3	
14	x	12	355.6	323.9	330.2
14	x	10		273.1	
14	x	8		219.1	
14	x	6		168.3	
16	x	14	406.4	355.6	355.6
16	x	12		323.9	
16	x	10		273.1	
16	x	8		219.1	
18	x	16	457.2	406.4	381.0
18	x	14		355.6	
18	x	12		323.9	
18	x	10		273.1	
18	x	8		219.1	
20	x	18	508.0	457.2	508.0
20	x	16		406.4	
20	x	14		355.6	
20	x	12		323.9	
20	x	10		273.0	
22	x	20	558.8	508.0	508.0
22	x	18		457.2	
22	x	16		406.4	
22	x	14		355.6	
22	x	12		323.8	
24	x	22	609.6	558.8	508.0
24	x	20		508.0	
24	x	18		457.2	
24	x	16		406.4	
24	x	16		355.6	
24	x	16		323.8	

Thickness as per Schedule (refer Pipe Dimension) (Dimensions in mm)

Dimensions (eg- Smaller size in D1) and other specifications as per customers requirements are available on request,

BUTTWELD REDUCER DIMENSIONS:

BUTTWELD REDUCER DIMENSIONS AS PER ANSI B16.9 / MSS SP-75



Pipe made Concentric Reducer

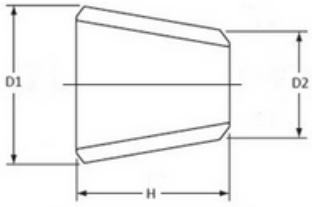
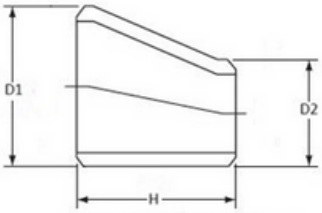


Plate pressed Concentric Reducer



Pipe made Eccentric reducer

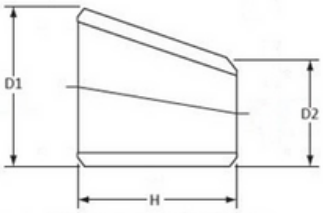


Plate Pressed Eccentric Reducer

Concentric Reducer

Nominal Pipe Size (NPS)			Outside Diameter at Bevel		End-to-end
			Large End (D1)	Small End (D2)	(H)
26	x	24	660.4	609.6	609.6
26	x	22		558.8	
26	x	20		508.0	
26	x	18		457.2	
26	x	16		406.4	
26	x	14		355.6	
28	x	26	711.2	660.4	609.6
28	x	24		609.6	
28	x	22		559.0	
28	x	20		508.0	
28	x	18		457.2	
28	x	16		406.4	
28	x	14		355.6	
30	x	28	762.0	711.2	609.6
30	x	26		660.4	
30	x	24		609.6	
30	x	22		559.0	
30	x	20		508.0	
30	x	18		457.0	
30	x	16		406.4	
30	x	14		355.6	
32	x	30	813.0	762.0	609.6
32	x	28		711.0	
32	x	26		660.0	
32	x	24		610.0	
32	x	22		559.0	
32	x	20		508.0	
34	x	32	863.6	812.8	609.6
34	x	30		762.0	
34	x	28		711.0	
34	x	26		711.2	
34	x	24		660.4	
34	x	22		559.0	
36	x	34	914.0	864.0	609.6
36	x	32		813.0	
36	x	30		762.0	
36	x	28		711.0	
36	x	26		660.0	
36	x	24		610.0	
36	x	22		559.0	
38	x	36	965.0	914.0	609.6
38	x	34		864.0	
38	x	32		813.0	
38	x	30		762.0	
38	x	28		711.0	
38	x	26		660.0	
38	x	24		610.0	

Eccentric Reducer

Nominal Pipe Size (NPS)			Outside Diameter at Bevel		End-to-end
			Large End (D1)	Small End (D2)	(H)
40	x	38	1016.0	965.0	609.6
40	x	36		914.0	
40	x	34		864.0	
40	x	32		813.0	
40	x	30		762.0	
40	x	28		711.0	
42	x	40	1067.0	1016.0	609.6
42	x	38		965.0	
42	x	36		914.4	
42	x	34		863.6	
42	x	32		812.8	
42	x	30		762.0	
42	x	28		711.0	
44	x	42	1117.6	1066.8	609.6
44	x	40		1016.0	
44	x	38		965.2	
44	x	36		914.4	
44	x	34		864.0	
44	x	32		813.0	
46	x	44	1168.4	1117.6	711.2
46	x	42		1066.8	
46	x	40		1016.0	
46	x	38		965.2	
46	x	36		914.0	
46	x	34		864.0	
48	x	46	1219.2	1168.4	711.2
48	x	44		1117.6	
48	x	42		1066.8	
48	x	40		1016.0	
48	x	38		965.0	
48	x	36		914.0	
52	x	48	1321.0	1219.0	711.2
52	x	46		1168.0	
52	x	44		1118.0	
52	x	42		1067.0	
52	x	40		1016.0	
56	x	52	1422.0	1321.0	711.2
56	x	48		1219.0	
56	x	44		1118.0	
52	x	40		1016.0	
60	x	56	1524.0	1422.0	711.2
60	x	52		1321.0	
60	x	48		1219.0	
60	x	44		1118.0	

Thickness as per Schedule (refer Pipe Dimension) (Dimensions in mm)

Dimensions (eg- Smaller size in D1) and other specifications as per customers requirements are available on request,

PIPE DIMENSIONS:

STAINLESS STEEL PIPE DIMENSION AS PER ASTM (ANSI B36.19)								
Nominal Bore		Outside Diameter	Sch-5S	Sch-10S	Sch-40S	Sch-80S	Sch-160S	Sch-XXS
mm	inch	mm	Wt. (mm)	Wt. (mm)	Wt. (mm)	Wt. (mm)	Wt. (mm)	Wt. (mm)
3	1/8	10.3	1.24	1.24	1.73	2.41	-	-
6	1/4	13.7	1.24	1.65	2.24	3.02	-	-
10	3/8	17.1	1.24	1.65	2.31	3.20	-	-
15	1/2	21.3	1.65	2.11	2.77	3.75	4.75	7.47
20	3/4	26.7	1.65	2.11	2.87	3.91	5.54	7.82
25	1	33.4	1.65	2.77	3.38	4.55	6.35	9.09
32	1 1/4	42.2	1.65	2.77	3.58	4.85	6.35	9.70
40	1 1/2	48.3	1.65	2.77	3.68	5.08	7.14	10.16
50	2	60.3	1.65	2.77	3.91	5.54	8.74	11.07
65	2 1/2	73.0	2.11	3.05	5.16	7.01	9.53	14.20
80	3	88.9	2.11	3.05	5.49	7.62	11.10	15.24
100	4	114.3	2.11	3.05	6.02	8.56	13.49	17.12
125	5	141.3	2.77	3.40	6.55	9.53	15.88	19.05
150	6	168.3	2.77	3.40	7.11	10.97	18.20	21.96
200	8	219.1	2.77	3.76	8.18	12.70	23.00	22.23
250	10	273.1	3.40	4.19	9.27	12.70	28.60	25.40
300	12	323.9	3.96	4.57	9.52	12.70	33.32	25.40
350	14	356.6	3.96	4.78	11.13	19.05	35.71	-
400	16	406.4	4.19	4.78	12.70	21.41	40.46	-
450	18	457.2	4.19	4.78	14.27	23.80	45.71	-
500	20	508.0	4.78	5.54	15.09	28.19	49.90	-
600	24	609.6	5.54	6.35	17.48	30.96	50.54	-

CHEMICAL COMPOSITION:

CHEMICAL COMPOSITION OF STAINLESS STEEL

	GRADE	Chemcal Analysis (%) Specified									
		C	Si	Mn	P max	S	N	Cr	Mo	Ni	Other
AUSTENITIC	201	≤ 0.15	≤ 1.00	5.50-7.50	0.045	≤ 0.015	0.05-0.25	16.00-18.00	-	3.50-5.50	
	202	≤ 0.15	≤ 1.00	7.50-10.50	0.045	≤ 0.015	0.05-0.25	17.00-19.00	-	4.00-6.00	
	301	0.05-0.15	≤ 2.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	16.00-19.00	≤ 0.80	6.00-9.00	
	302	≤ 0.15	≤ 0.75	≤ 2.00	0.045	≤ 0.030	≤ 0.10	17.00-19.00	-	8.00-10.00	
	303	≤ 0.10	≤ 1.00	≤ 2.00	0.045	0.15-0.35	≤ 0.11	17.00-19.00	-	8.00-1.00	Cu: ≤ 1.00
	304	≤ 0.07	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	17.50-19.50	-	8.00-10.50	
	304L	≤ 0.030	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	17.50-19.50	-	8.00-10.50	
	304H	0.04-0.08	≤ 1.00	≤ 2.00	0.035	≤ 0.015	≤ 0.11	17.00-19.00	-	8.00-11.00	
	309S	≤ 0.15	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	22.00-24.00	-	12.00-14.00	
	310S	≤ 0.10	≤ 1.50	≤ 2.00	0.045	≤ 0.015	≤ 0.11	24.00-26.00	-	19.00-22.00	
	316	≤ 0.07	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	16.50-18.50	2.00-2.50	10.00-13.00	
	316L	≤ 0.030	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	16.50-18.50	2.00-2.50	10.00-13.00	
	316Ti	≤ 0.08	≤ 1.00	≤ 2.00	0.045	≤ 0.015	-	16.50-18.50	2.00-2.50	10.50-13.50	Ti: 5xC- 0.70
	317L	≤ 0.030	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.11	17.50-19.50	3.00-4.00	13.00-16.00	
	321	≤ 0.08	≤ 1.00	≤ 2.00	0.045	≤ 0.015	-	17.00-19.00	-	9.00-12.00	Ti: 5xC- 0.70
	347	≤ 0.08	≤ 1.00	≤ 2.00	0.045	≤ 0.015	-	17.00-19.00	-	9.00-12.00	Nb: 10xC -1.00
	904L	≤ 0.020	≤ 0.70	≤ 2.00	0.030	≤ 0.010	≤ 0.15	19.00-21.00	4.00-5.00	24.00-26.00	Cu:1.20-2.00
	253MA	0.05-0.10	1.10-2.0	≤ 0.80	0.040	≤ 0.030	0.14-0.20	20.00-22.00		10.00-12.00	Ce: 0.03-0.08
DUPLEX	2205	≤ 0.030	≤ 1.00	≤ 2.00	0.035	≤ 0.015	0.10-0.22	21.00-23.00	2.50-3.50	4.50-6.50	
	2304	≤ 0.030	≤ 1.00	≤ 2.00	0.035	≤ 0.015	0.05-0.20	22.00-24.00	0.10-0.60	3.50-5.50	Cu:0.10-0.60
	2507	≤ 0.030	≤ 1.00	≤ 2.00	0.035	≤ 0.015	0.24-0.35	24.00-26.00	3.00-4.50	6.00-8.00	
	255	≤ 0.030	≤ 0.70	≤ 2.00	0.035	≤ 0.015	0.20-0.30	24.00-26.00	3.00-4.00	6.00-8.00	Cu:1.00-2.50
	2207	≤ 0.030	≤ 1.00	≤ 1.00	0.035	≤ 0.015	0.20-0.30	24.00-26.00	3.00-4.00	6.00-8.00	Cu:0.50-1.00, W-0.50-1.00
FERRITIC	409	≤ 0.030	≤ 1.00	≤ 1.00	0.040	≤ 0.015		10.50-12.50			Ti:6x(C+N)-0.65
	430	≤ 0.08	≤ 1.00	≤ 1.00	0.040	≤ 0.015		16.00-18.00			
	430F	≤ 0.12	≤ 1.00	≤ 1.25	0.060	≤ 0.015					
	434	≤ 0.08	≤ 1.00	≤ 1.00	0.040	≤ 0.015		16.00-18.00	0.90-1.40		
MARTENSITC	410	0.08-0.15	≤ 1.00	≤ 1.50	0.040	≤ 0.015		11.5-13.5		≤ 0.75	
	420	0.16-0.25	≤ 1.00	≤ 1.50	0.040	≤ 0.015		12.00-14.00			
	431	0.16-0.25	≤ 1.00	≤ 1.50	0.040	≤ 0.015		15.00-17.00		1.25-2.50	
PH	630	≤ 0.07	≤ 0.70	≤ 1.50	0.040	≤ 0.015		15.00-17.00	≤ 0.60	3.00-5.00	Cu:3.00-5.00, Nb:5xC-0.45
	631	≤ 0.09	≤ 0.70	≤ 1.00	0.040	≤ 0.015		16.00-18.00		6.50-7.80	Al:0.70-1.50

CHEMICAL COMPOSITION OF NICKEL ALLOYS

	GRADE	Chemcal Analysis (%) Specified									
		C	Si	Mn	Fe	S	Cu	Cr	Mo	Ni	Other
99% Ni	Nickel 200	≤ 0.15	≤ 0.35	≤ 0.35	≤ 0.40	≤ 0.010	≤ 0.25	-	-	≥ 99	
	Nickel 201	≤ 0.020	≤ 0.35	≤ 0.35	≤ 0.40	≤ 0.010	≤ 0.25	-	-	≥ 99	
Ni-Cu	Monel 400®	0.3 max	0.5 max	2 max	2.5 max	0.024	28-34	-	-	Balance	
	Monel R405®	0.3 max	0.5 max	2.00 max	2.50 max	0.025-0.060	28-34	-	-	Balance	
	Monel K500®	0.25 max	0.5 max	1.50 max	2.00 max	0.10 max	Balance	-	-	63-70	Al:2.30-3.15, Ti:0.35-0.85
Ni-Cr	Inconel 600®	0.15 max	0.50 max	1.00 max	6.0-10.0	0.015 max	0.50 max	14.0-17.0		72.0 min	
	Inconel 601®	0.10 max	0.50 max	1.00 max	Balance	0.015 max	1.00 max	21-25		58-63	Al:1.00-1.70
	Inconel 617®	0.15 max	1.00 max	1.00 max	3.00 max	0.010 max	0.50 max	20.0-24.0	8.00-10.00	48.85-62	Co:10.00-15.00
	Inconel 625®	0.10 max	0.50 max	0.50 max	5.00 max	0.015 max		20.00-23.00	8.00-10.00	58.0 min	Nb+Ta:3.15-4.15
	Inconel 718®	0.08 max	0.35 max	0.35 max	Balance	0.015 max	0.30 max	17.00-21.00	2.80-3.30	50.00-55.00	Nb:4.75-5.50, Ti:0.65-1.15
Ni-Cr	Inconel X750®	0.08 max	0.50 max	1.00 max	Balance	0.015 max	0.50 max	14.00-17.00		70.00 min	Nb:0.70-1.20, Ti:2.25-2.75
	Incoloy 800®	0.10 max	0.50 max	1.50 max	39.50 min	0.015 max		19.00-23.00		30.00-35.00	
	Incoloy 825®	0.05 max	0.50 max	1.00 max	22.00 min	0.030 max	1.50-3.00	19.50-23.50	2.50-3.50	38.00-46.00	Al:0.20 max, Ti:0.60-1.20
Ni-Cr-Mo	Hastelloy C22®	0.015 max	0.08 max	0.50 max	2.00-6.00	0.020 max		20.00-22.50	12.50-14.50	Balance	W:2.50-3.50, Co:2.50 min
	Hastelloy C276®	0.010 max	0.08 max	1.00 max	4.00-7.00	0.010 max		14.50-16.50	15.00-17.00	57.00 min	W:3.40-5.00, Co:2.50 min
	Hastelloy B2®	0.020 max	0.10 max	1.00 max	2.00 max	0.030 max		1.00 max	26.00-30.00	Balance	
	Hastelloy X®	0.15 max	1.00 max	1.00 max	17.00-20.00	0.030 max	0.50 max	20.50-23.00	8.00-10.00	Balance	Co:0.50-2.50