

World Best

Forged Fittings Wrought Fittings Flanges

Keonsae

Effort to Satisfy Customer's Demand and to Become a
Number One All Over the World



PRODUCT CATALOGUE

The Best Solution of Fittings!



KEONSAE

KEONSAE HIGH PRESSURE CO., LTD.





The Best Forged Fitting Manufacturer Since 1978

KEONSAE HIGH PRESSURE

Leading the van of fittings industry in the 21st century



CEO's **M**essage

Keonsae High Pressure Co., Ltd. has been growing as one of the best forged fitting manufacturer since 1978. The accumulated technology and eco-friendly business value in over 40 years are proved through getting ISO 14001, ISO 45001, ISO 9001. PED MMA, BV, INNO-BIZ, and we have executed the World-wide projects with the major Korean and overseas EPC companies.

We've tried our best to improve the technology with active research of R&D department, and we've run of ERP(Enterprise Resource Planning) system to set up the product traceability. So this system can be controlled by the electronic data processing management from raw material stage to the finished products. We expect to get a higher customer's satisfaction with our PMS(Project Management System) which can have a smooth and intimate communication with customers in their position.

Human Centered Management

We, Keonsae High Pressure Co., Ltd. will try to produce the best quality products and our efforts for making the value re-creation will be carried on.

Sincerely yours.

Y. K. Yang

CEO
Keonsae High Pressure Co., Ltd.



History

- 1978. 03 Establishment
- 1992. 05 Approved Vendor of K.H.I.C (Now Doosan Heavy Industries & Construction)
- 1995. 04 Approved Vendor of Hyundai E&C
- 1995. 06 Approved Vendor of DL E&C
- 1995. 07 Approved Vendor of GS E&C
- 1996. 05 Approved Vendor of Hyundai Heavy Industries Co., Ltd.
- 1996. 10 Approved Vendor of Samsung Engineering Co., Ltd.
- 1997. 06 Approved Vendor of SK Ecoplant
- 1997. 08 Approved Vendor of KEPIC CODE (Korea Electric Power Industry) - NUCLEAR MN
- 2000. 03 QGPC (Qatar General Petroleum Corporation) Forged Fitting Supplier
- 2000. 12 **Approved Vendor of KNPC (Kwait National Petroleum Company)**
- 2003. 06 **ISO 9001:2000/KSA 9001:2001 Quality System Achieved**
- 2003. 06 **BV(Bureau Veritas) (Cert No SMS.W.II/22819 A.I) Achieved**
- 2003. 08 Expansion of Manufacturing Range - COPPER ALLOY Fitting & Flanges
- 2005. 11 PIC K.S.C (Petrochemical Industries Company) Forged Fitting Supplier
- 2006. 02 **Approved Vendor of KOC (Kuwait Oil Company)**
- 2008. 02 ADMA U.A.E (Umm Shaif PJT) Forged Fitting Supplier
- 2008. 10 **ISO 14001:2004 KSA 14001:2004 Environmental Management System**
- 2009. 01 **Approved Vendor of SAIPEM Italy**
- 2009. 08 Approved Vendor of RELIANCE Infrastructure Ltd.
- 2009. 10 **Approved Vendor of TECHNIP France**
- 2009. 11 **Approved Vendor EIL India**
- 2009. 12 Awarded "Support of Real Economy" from Ministry of Knowledge Economy
- 2010. 03 **Approved Vendor of TAKREER QP (Qatar Petroleum)**
- 2010. 03 Approved Vendor of DESCON (Pakistan)
- 2010. 06 **Approved Vendor of TAKREER U.A.E**
- 2010. 06 **Approved Vendor of GASCO U.A.E**
- 2011. 01 Approved Vendor of ENPPI Egypt
- 2011. 09 **Approved Vendor of Petrofac U.A.E**
- 2011. 09 Approved Vendor of Larsen & Toubro India
- 2011. 11 Approved Vendor of ESSAR India
- 2011. 11 **Approved Vendor of JGC Japan**
- 2011. 11 **Approved Vendor of Chiyoda Japan**
- 2012. 01 **Approved Vendor of PDO Oman**
- 2012. 01 PED-MMA Acquired from DNV
- 2016. 12 Expansion of Facility / Factory Site
- 2018. 03 **Approved Vendor of FLUOR U.S.A**
- 2018. 04 **Approved Vendor of ADNOC U.A.E**
- 2018. 12 **Approved Vendor of BP, United Kingdom**
- 2019. 12 **Approved Vendor of MCDERMOTT**
- 2019. 12 Awarded a Prize of '\$10 Million Export Tower' from Korean Government
- 2020. 10 ISO 45001:2018 Occupational Health and Safety (OH&S) Management System Achieved

Applicable

Materials & Standards

ASME II	Part A, Ferrous Materials / Part B, Nonferrous Materials
ASTM I	A53, A106, A105, A182, A234, A312, A333, A350, A403, A420, A694, A815 Duplex and Super Duplex(UNS S31803, S32760), etc...
ASTM II	<ul style="list-style-type: none"> • Nickel Alloy Forgings : ASTM B564, Alloy 20(N08020), Monel 400(N04400), Inconel 600, 625(N06600, N06625), Incoloy 800, 825(N08800, N08825), Hastelloy(UNS N10276) • Copper and Copper Alloy : ASTM B124(C11000), B111(C12200) • Copper - Nickel - Zinc Alloy and Copper - Nickel ASTM B151, B466, B150 : Cu-Ni 90/10(C70600), Cu-Ni 70/30(C71500), Ai-Bronze(C60600) • Lead Yellow Brass : UNS C85400 • Bronze Casting : B61, B62(UNS C92200, C83600) • Titanium and Titanium Alloy etc...
JIS	H3300(C7060T, C7150T) / Copper - Nickel(C6870T, C6871T, C6872T) / Al - Brass H3250 / Copper H5120 CAC202(YBsC2) / Lead Yellow Brass BC1 - BC7 / Cast Bronze
KEPIC	KEPIC MDF
DIN	17660, 17671(CuZn20A12) / Al - Brass 7664, 17671, 86019 / Copper - Nickel
BS	BS2781 CN102, CN107, CZ110
MIL-T	16420K C70600

ASME Standards

- B 16.5** : Pipe Flanges and Flanged Fittings
- B 16.9** : Factory - Made Wrought Butt welding Fittings
- B 16.11** : Forged Fittings, Socket - Welding and Threaded
- B 16.15** : Cast Copper Alloy Threaded Fittings
- B 16.24** : Cast Copper Alloy Pipe Flanges and Flanged Fittings
- B 16.25** : Butt welding Ends
- B 31.1** : Power Piping
- B 31.3** : Process Piping
- B 36.10** : Welded and Seamless Wrought Steel Pipe
- B 36.19** : Stainless Steel Pipe
- B 1.20.1** : Pipe Threads, General Purpose

MSS Standard

- MSS** : Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
- MSS SP.25** : Standard Marking System for Valves, Fittings, Flanges and Unions
- MSS SP.79** : Socket - Welding Reducer Inserts
- MSS SP.83** : Class 3000 and 6000 Pipe Unions, Socket Welding and Threaded
- MSS SP.95** : Swage(d) Nipples and Bull Plugs
- MSS SP.97** : Intergally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded, and Butt welding Ends

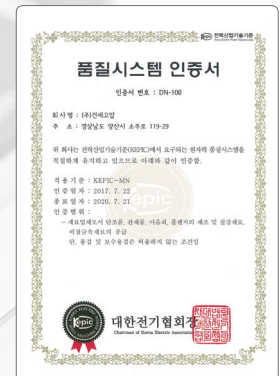
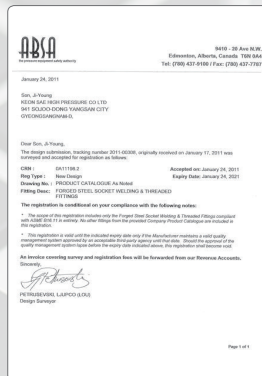
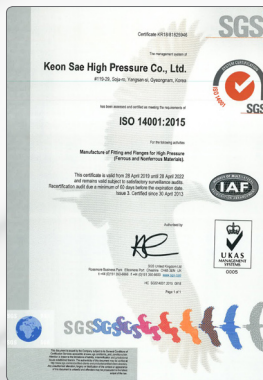
Other

- API** : American Petroleum Institutes
- API 5L** : Seamless and Welded Steel Line - Pipe
- EEMUA** : The Engineering Equipment and Materials Users Association (234 Incorporating EEMUA 144, 145 and 146)
- BS 3799** : Steel Pipe Fittings, Screwed and Socket - Welding for the Petroleum Industry
- NACE MR0175 / ISO 15156** : Petroleum, Petrochemical, and Natural Gas Industries - Materials for use in H₂S-Containing Environments in Oil and Gas Production
- NACE MR0103 / ISO 17945** : Petroleum, Petrochemical, and Natural Gas Industries - Metallic Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
- ISO** : International Organization of Standardization

※ Other standards or drawings specified by customer can be available for manufacturing.

Quality Assurance

KEONSAE has maintained Quality System Management is recognized through the acquisition of certificates such as ISO 14001, ISO 45001, ISO 9001, INNO-BIZ, BV, PED MMA and our products have been performed by international authorized organizations such as LLOYD, DNV, BV, ABS, MOODY, S.G.S, KR etc.



Certification

Certificates	Scope	Cert No.
ISO 14001	Manufacture of fitting, pipe and flanges for high pressure (Ferrous and nonferrous materials)	KR18 / 81825946
ISO 45001	Manufacture of fitting, pipe and flanges for high pressure (Ferrous and nonferrous materials)	KR20 / 81826467
ISO 9001	Manufacture of fitting, pipe and flanges for high pressure (Ferrous and nonferrous materials)	KR18 / 81825945
INNO-BIZ	Grade A	R151101-00223
BV	Alloy and non-alloy pipe fittings and flanges (1/8" to 24")	SMS.W.II / 22819 / E.O
PED MMA	Manufacturing of forged fittings and flanges	01 202 ROK / Q-20 0105

Process



Manufacturing Process

Inspection / Test Report

Report Process

Material Receive

Dimension

Mill Certificate Review

Cutting

Dimension

Forging (JINKWANG)
Forming (KEONSAE)

Visual Dimension

Forging : Sub-contractor JINKWANG
Forming : KEONSAE

Heat Treatment (H/T)

CODE Requirement Kind of H/T
Time / Temperature

Record

In house : KEONSAE

Mechanical Test

CODE Requirement Tensile
Test Hardness Check

Mechanical Test Report

In house : KEONSAE (TS,YS,ELRA,Hardness)
Sub-contractor : HYUN TECH (Impact Test)

Machining

Visual Dimension

N.D.E.

CODE Reference
UT / MT / PT / RT

N.D.E. Report Film

Sub-contractor : KMI (MT, PT, UT, RT)
KTE (MT, PT, UT, RT)

Marking

Symbol, Heat No.
Material Code Size

Final Inspection

Cert & Report Review
Dimension / Visual

Inspection Certificate

In house : EN10204 3.1
TPI : EN10204 3.2

Products

KEONSAE HIGH PRESSURE Co.,Ltd has a manufacturing ability for most of ranges of forged fittings which are used in industrial piping system for oil & gas plant, petrochemical plant, power & desalination plant, shipbuilding instrument etc. Through the standardization of the molding and manufacturing process, we've executed the domestic and abroad major projects under the over 40 years history.





Flanges



Forged Fittings



Forged Fittings (C 70600)



Wrought Fittings



World Best Global KEONSAE

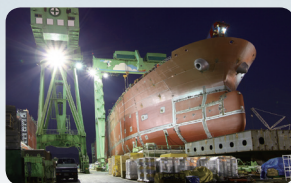
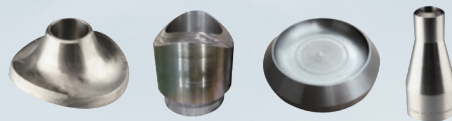


Value Recreation to
Make the Future

KEONSAE HIGH PRESSURE Co.,Ltd has taken major role
in providing the best forged fittings all over the world.



POWER PLANT Thermal & Nuclear



SHIPBUILDING



ON/OFF SHORE OIL



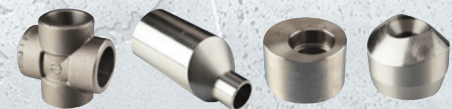
INSTRUMENTS



CONSTRUCTION FIELDS



GAS PLANT



PETROCHEMICAL



OIL REFINERY





RECRUIT CREATIVE TALENT

Business activities & cultivation of globalized members

Contents

16 FORGED FITTINGS (ASME B16.11, MSS-SP)

- ELBOW (90°, 45°)
- TEE (STRAIGHT, REDUCING, CROSS)
- COUPLING (FULL, HALF)
- UNION
- CAP
- BOSS
- REDUCER (CONCENTRIC, ECCENTRIC)
- PLUG (ROUND HEAD, SQUARE HEAD, HEX HEAD)
- BUSHING (HEX HEAD, FLUSH)
- NIPPLE (PIPE, HEX)
- SWAGE
- BRANCH OUTLET NIPPLE
- BRANCH OUTLET BUTT WELD
- BRANCH OUTLET SOCKET
- BRANCH OUTLET THREADS
- BRANCH OUTLET FLANGE
- 45D BRANCH OUTLET



42 FORGED FITTINGS (JIS B2316-1997)

- ELBOW (90°, 45°)
- TEE (STRAIGHT, REDUCING, CROSS, 45D Y-TEE)
- SERVICE TEE
- COUPLING (FULL, HALF)
- UNION
- CAP
- REDUCER (CONCENTRIC, ECCENTRIC)

50 FLANGES

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58 ASME FLANGES

- CLASS 150 FLANGE
- CLASS 300 FLANGE
- CLASS 400 FLANGE
- CLASS 600 FLANGE
- CLASS 900 FLANGE
- CLASS 1500 FLANGE
- CLASS 2500 FLANGE

73 RING JOINT FLANGES

- CLASS 150 FLANGE
- CLASS 300, 400, 600 FLANGE
- CLASS 900 FLANGE
- CLASS 1500 FLANGE
- CLASS 2500 FLANGE

81 ORIFICE FLANGES

- ASME ORIFICE FLANGE
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- CLASS 400 ORIFICE FLANGE
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92 LONG WELDING NECKS FLANGES (STRAIGHT HUB WELDING FLANGES)

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- CLASS 2500 FLANGE

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- APPROX WEIGHT LIST
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- COMPARISON OF ASTM SPECIFICATIONS
- AND SIMILAR STANDARDS
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- JIS MATERIAL SPECIFICATIONS
- WALL THICKNESS OF WELDED AND SEAMLESS PIPE
- INTERNATIONAL STANDARDS



KEONSAE HIGH PRESSURE Co., Ltd.

World Best

Products Line-up

FORGED FITTINGS

ASME B16.11, MSS-SP

- ELBOW (90°, 45°)
- TEE (STRAIGHT, REDUCING, CROSS)
- COUPLING (FULL, HALF)
- UNION
- CAP
- BOSS
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- PLUG (ROUND HEAD, SQUARE HEAD, HEX HEAD)
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- NIPPLE (PIPE, HEX)
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- BRANCH OUTLET FLANGE
- 45D BRANCH OUTLET



Forged Steel Fittings Socket -Welding and Threaded

Pressure Ratings

These fittings shall be designated as pressure class 2000, 3000 and 6000 fittings for threading and pressure class 3000, 6000, and 9000 for socket-welding. This designation identifies the fittings with their ratings as follow Table 1.

Table 1 : Correlation of Fittings Class with Schedule Number or Run/Branch Wall Designation of Pipe for Calculation of Ratings.

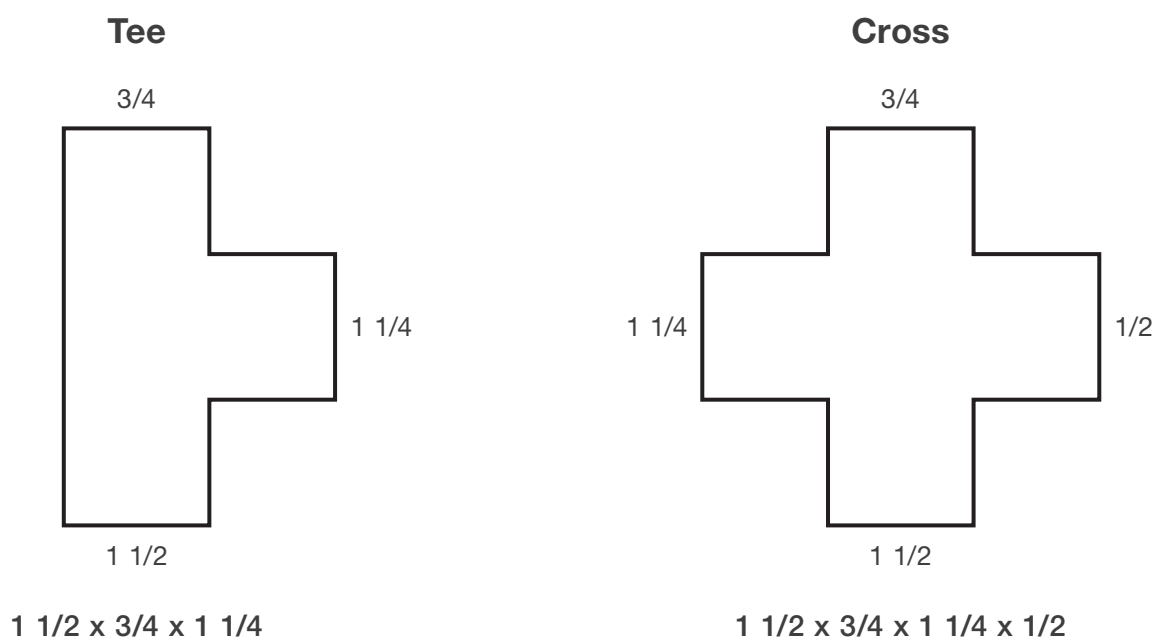
Class of Fitting	Type	Branch Size		Run Pipe Wall for Ratings Basis ^(a)	Branch Pipe Wall for Ratings Basis ^(a)
		NPS	DN		
Standard	Buttwelding	1/8 - 24	6 - 600	Standard	Standard
Extra Strong	Buttwelding	1/8 - 24	6 - 600	Extra Strong	Extra Strong
Schedule 160	Buttwelding	1/2 - 6	15 - 150	Schedule 160	Schedule 160
Double Extra Strong	Buttwelding	1/2 - 6	15 - 150	Double Extra Strong	Double Extra Strong
3000	Threaded	1/8 - 4	6 - 100	Extra Strong	Extra Strong
6000	Threaded	1/8 - 2	6 - 50	Schedule 160	Schedule 160
9000	Threaded	1/8 - 2	6 - 50	Double Extra Strong	Double Extra Strong
3000	Socket Welded	1/8 - 4	6 - 100	Extra Strong	Extra Strong
6000	Socket Welded	1/8 - 2	6 - 50	Schedule 160	Schedule 160
9000	Socket Welded	1/2 - 2	15 - 50	Double Extra Strong	Double Extra Strong

Note : (a) The use of run or branch pipe wall thickness either thinner or thicker than shown in Table 1 constitutes a deviation from this Standard Practice and is provided for in Section 1.3. of MSS SP-97.

Size Identification

The size of a fitting is identified by nominal pipe size.

For reducing fittings, the size of the largest run opening is to be given first, followed by the size of the opening opposite of the same run. The branch size of a Tee is given last. Where the case is a Cross, the largest side-outlet is thirdly, then the opening opposite.



Threads

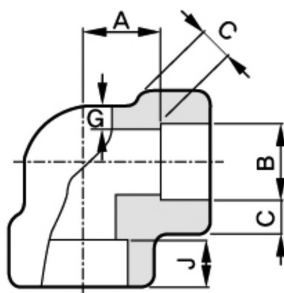
Unless otherwise specified in inquiry, all threaded fittings are supplied with NPT threads (ASME B1.20.1 American Standard Taper Pipe Thread) for reference, other available threads are :

- ISO/R7 pipe threads for gas list tubes and screwed fittings where pressure-tight joints are made on the threads (BS 21 & JIS B0203 PT Thread).
- API 5B, line pipe threads.
- KS B0222 taper pipe threads.

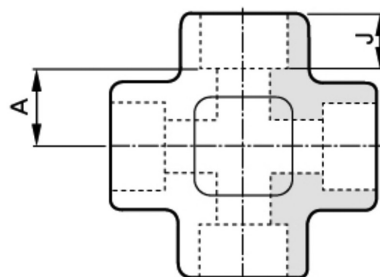
Forged Steel Socket Welding Fittings

90° Elbow, 45° Elbow, Tee, Cross, Coupling

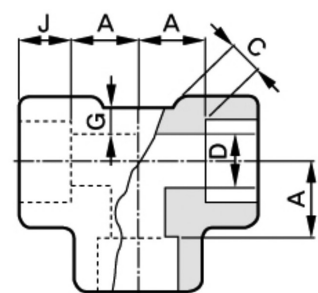
Class 3000, 6000, 9000



90° Elbow



Cross



Tee

ASME B16.11

(mm)

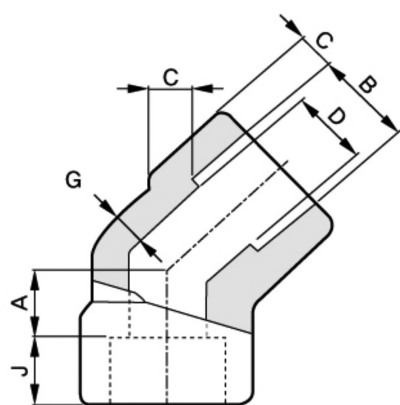
Nominal Pipe Size	Socket Bore Diameter B	Bore Diameter of Fitting, D			Socket Wall Thickness, C						Body Wall, G		
		Class Designation			Class Designation						Class Designation		
		3000	6000	9000	3000		6000		9000		3000	6000	9000
					Avg	Min	Avg	Min	Avg	Min	Min	Min	Min
1/8	10.8~11.2	6.1~7.6	3.2~4.8		3.18	3.18	3.96	3.43			2.41	3.15	
1/4	14.2~14.6	8.5~10.0	5.6~7.1		3.78	3.30	4.60	4.01			3.02	3.68	
3/8	17.6~18.0	11.8~13.3	8.4~9.9		4.01	3.50	5.03	4.37			3.20	4.01	
1/2	21.8~22.2	15.0~16.6	11.0~12.5	5.6~7.2	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47
3/4	27.2~27.6	20.2~21.7	14.8~16.3	10.3~11.8	4.90	4.27	6.96	6.04	9.78	8.56	3.91	5.56	7.82
1	33.9~34.3	25.9~27.4	19.9~21.5	14.4~16.0	5.69	4.98	7.92	6.93	11.38	9.96	4.55	6.35	9.09
1 1/4	42.7~43.1	34.3~35.8	28.7~30.2	22.0~23.5	6.07	5.28	7.92	6.93	12.14	10.62	4.85	6.35	9.70
1 1/2	48.8~49.2	40.1~41.6	33.2~34.7	27.2~28.7	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15
2	61.2~61.7	51.7~53.3	42.1~43.6	37.4~38.9	6.93	6.04	10.92	9.50	13.84	12.12	5.54	8.74	11.07
2 1/2	73.9~74.4	61.2~64.2			8.76	7.67					7.01		
3	89.8~90.3	76.4~79.4			9.52	8.30					7.62		
4	115.2~115.7	100.7~103.8			10.69	9.35					8.56		

※ For approx weight see page 125.

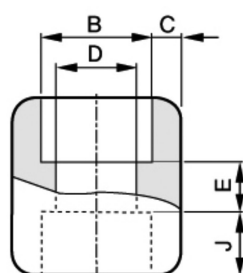
Forged Steel Socket Welding Fittings

90° Elbow, 45° Elbow, Tee, Cross, Coupling

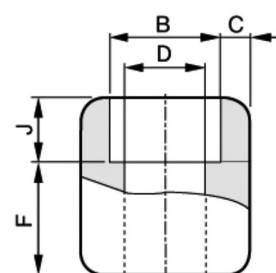
Class 3000, 6000, 9000



45° Elbow



Coupling



Half Coupling

ASME B16.11

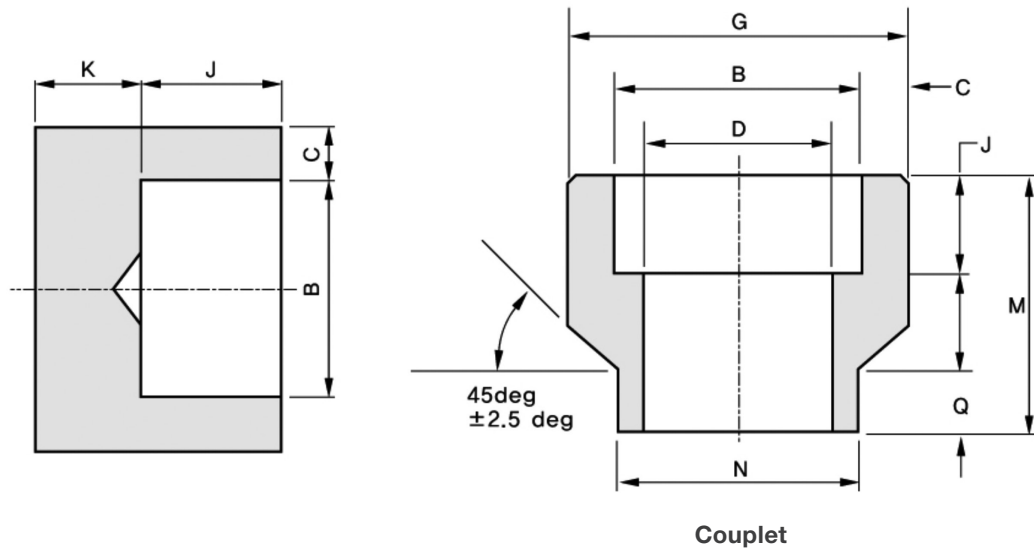
(mm)

Nominal Pipe Size	Min. Depth of Socket J	Center Bottom of Socket, A						Laying Lengths		Tolerances, ±		
		90° Elbows, Tees and Cross			45° Elbows			Couplings E	Half Couplings F	A	E	F
		Class Designation			Class Designation							
		3000	6000	9000	3000	6000	9000					
1/8	9.5	11.0	11.0		8.0	8.0		6.5	16.0	1.0	1.5	1.5
1/4	9.5	11.0	13.5		8.0	8.0		6.5	16.0	1.0	1.5	1.5
3/8	9.5	13.5	15.5		8.0	11.0		6.5	17.5	1.5	3.0	3.0
1/2	9.5	15.5	19.0	25.5	11.0	12.5	15.5	9.5	22.5	1.5	3.0	3.0
3/4	12.5	19.0	22.5	28.5	13.0	14.0	19.0	9.5	24.0	1.5	3.0	3.0
1	12.5	22.5	27.0	32.0	14.0	17.5	20.5	12.5	28.5	2.0	4.0	4.0
1 1/4	12.5	27.0	32.0	35.0	17.5	20.5	22.5	12.5	30.0	2.0	4.0	4.0
1 1/2	12.5	32.0	38.0	38.0	20.5	25.5	25.5	12.5	32.0	2.0	4.0	4.0
2	16.0	38.0	41.0	54.0	25.5	28.5	28.5	19.0	41.0	2.0	4.0	4.0
2 1/2	16.0	41.0			28.5			19.0	43.0	2.5	5.0	5.0
3	16.0	57.0			32.0			19.0	44.5	2.5	5.0	5.0
4	19.0	66.5			41.0			19.0	48.0	2.5	5.0	5.0

Forged Steel Socket Welding Fittings

Cap, Couplet

Class 3000, 6000, 9000



ASME B16.11

(mm)

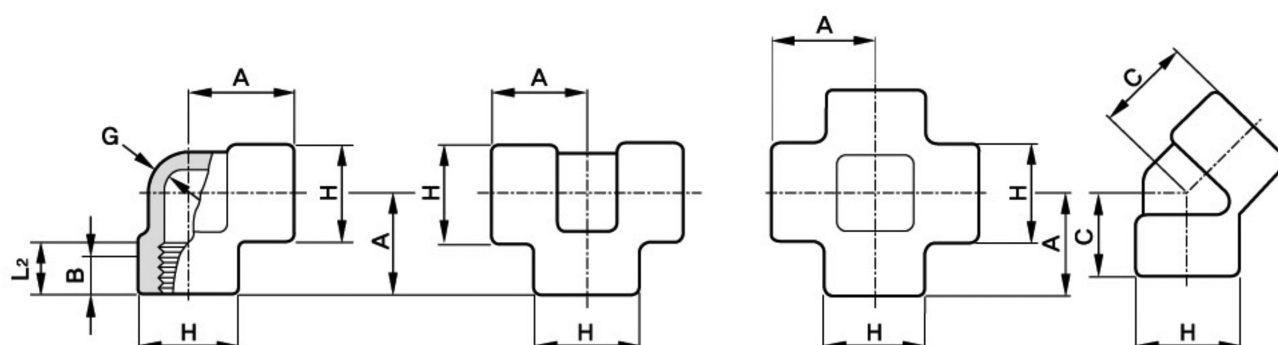
Nominal Pipe Size	Socket Bore Dia B	Socket Wall Thickness C (Min)			Depth of Socket J (Min)	K (Min)			Bore Diameter of Fitting D		Outside Dia Couplet			End to End Couplet M	Weld Ring Diameter N	Weld Ring Length Q
		Class Designation				Class Designation			Class Designation		G		Tol	Tol	Tol	Tol
		3000	6000	9000		3000	6000	9000	3000	6000	3000	6000	±	±	±	3000/9000 ±
1/8	10.8~11.2	3.18	3.43		9.5	4.8	6.4		6.1 ~7.6	3.2 ~4.8			±1.5/-0.0			
1/4	14.2~14.6	3.30	4.01		9.5	4.8	6.4		8.5 ~10.0	5.6 ~7.1	23.8	25.4	±1.5/-0.0	30.2 ±0.8	17.5 ±1.5	9.5 ±0.8
3/8	17.6~18.0	3.50	4.37		9.5	4.8	6.4		11.8 ~13.3	8.4 ~9.9	27.0	31.8	±1.5/-0.0	30.2 ±0.8	20.7 ±1.5	9.5 ±0.8
1/2	21.8~22.2	4.09	5.18	8.18	9.5	6.4	7.9	11.2	15.0 ~16.6	11.0 ~12.5	33.4	38.1	±1.5/-0.0	33.4 ±0.8	23.8 ±1.5	9.5 ±0.8
3/4	27.2~27.6	4.27	6.04	8.56	12.5	6.4	7.9	12.7	20.2 ~21.7	14.8 ~16.3	38.1	44.5	±1.5/-0.0	34.9 ±0.8	27.0 ±1.5	9.5 ±0.8
1	33.9~34.3	4.98	6.93	9.96	12.5	9.6	11.2	14.2	25.9 ~27.4	19.9 ~21.5	46.1	57.2	±1.5/-0.0	42.9 ±0.8	33.4 ±1.5	9.5 ±0.8
1 1/4	42.7~43.1	5.28	6.93	10.62	12.5	9.6	11.2	14.2	34.3 ~35.8	28.7 ~30.2	55.6	63.5	±1.5/-0.0	47.6 ±0.8	42.9 ±1.5	9.5 ±0.8
1 1/2	48.8~49.2	5.54	7.80	11.12	12.5	11.2	12.7	15.7	40.1 ~41.6	33.2 ~34.7	63.5	76.2	±1.5/-0.0	50.8 ±0.8	49.2 ±1.5	9.5 ±0.8
2	61.2~61.7	6.04	9.50	12.21	16.0	12.7	15.7	19.0	51.7 ~53.3	42.1 ~43.6	79.4	92.1	±1.5/-0.0	57.2 ±1.5	61.9 ±1.5	9.5 ±0.8
2 1/2	73.9~74.4	7.67			16.0	15.7	19.0		61.2 ~64.2		92.1	108.0	±1.5/-0.0	63.5 ±1.5	73.0 ±1.5	9.5 ±0.8
3	89.8~90.3	8.30			16.0	19.0	22.4		76.4 ~79.4		111.1	127.0	±1.5/-0.0	69.9 ±1.5	88.9 ±1.5	9.5 ±0.8
4	115.2~115.7	9.35			19.0	22.4	28.4		100.7 ~103.8		141.3	158.8	±1.5/-0.0	76.2 ±1.5	114.3 ±1.5	9.5 ±0.8

※ For approx weight see page 125.

Forged Steel Threaded Fittings

90° Elbow, 45° Elbow, Tee, Cross

Class 2000, 3000, 6000



ASME B16.11

(mm)

Nominal Pipe Size	Center to End Elbows, Tee, Crosses A			Center to End 45° Elbows C			Outside Diameter of Band H			Minimum Wall Thickness G			Length of Thread Min (1)	
	2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L ₂
1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
1/4	21	25	28	17	19	22	22	25	33	3.18	3.30	6.60	8.1	10.2
3/8	25	28	33	19	22	25	25	33	38	3.18	3.51	6.98	9.1	10.4
1/2	28	33	38	22	25	28	33	38	46	3.18	4.09	8.15	10.9	13.6
3/4	33	38	44	25	28	33	38	46	56	3.18	4.32	8.53	12.7	13.9
1	38	44	51	28	33	35	46	56	62	3.68	4.98	9.93	14.7	17.3
1 1/4	44	51	60	33	35	43	56	62	75	3.89	5.28	10.59	17.0	18.0
1 1/2	51	60	64	35	43	44	62	75	84	4.01	5.56	11.07	17.8	18.4
2	60	64	83	43	44	52	75	84	102	4.27	7.14	12.09	19.0	19.2
2 1/2	76	83	95	52	52	64	92	102	121	5.61	7.65	15.29	23.6	28.9
3	86	95	106	64	64	79	109	121	146	5.99	8.84	16.64	25.9	30.5
4	106	114	114	79	79	79	146	152	152	6.55	11.18	18.67	27.7	33.0

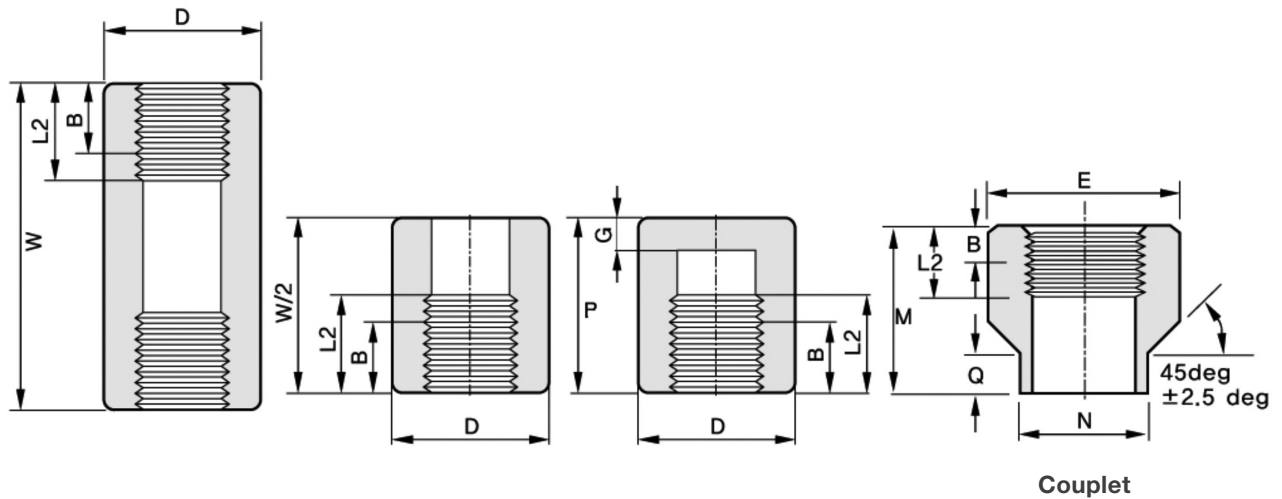
(1) Dimension B is minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L₂ (Effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1).

※ For approx weight see page 126.

Forged Steel Threaded Fittings

Coupling, Half Coupling, Cap, Couplets

Class 3000, 6000



ASME B16.11

(mm)

Nominal Pipe Size	Outside Diameter D		Outside Diameter Couplet E			End to End Coupling W	End to End Caps P		End to End Couplet M		Minimum End Will Thickness G		Weld Ring Length Q		Weld Ring Diameter N		Minimum Length of Thread [Note (1)]	
	3000	6000	3000	6000	Tol	3000 6000	3000	6000	3000 6000	Tol	3000	6000	3000 6000	Tol	3000 6000	Tol	3000	6000
					±					±				±		B		
1/8	16	22				32	19	22			4.8	6.4					6.4	6.7
1/4	19	25	23.8	25.4	±1.5/-0.0	35	25	27	30.2	±0.8/-0.0	4.8	6.4	9.5	0.8	17.5	±1.5/-0.0	8.1	10.2
3/8	22	32	27.0	31.8	±1.5/-0.0	38	25	27	30.2	±0.8/-0.0	4.8	6.4	9.5	0.8	20.7	±1.5/-0.0	9.1	10.4
1/2	28	38	33.4	38.1	±1.5/-0.0	48	32	33	33.4	±0.8/-0.0	6.4	7.9	9.5	0.8	23.8	±1.5/-0.0	10.9	13.6
3/4	35	44	38.1	44.5	±1.5/-0.0	51	37	38	34.9	±0.8/-0.0	6.4	7.9	9.5	0.8	27.0	±1.5/-0.0	12.7	13.9
1	44	57	46.1	57.2	±1.5/-0.0	60	41	43	42.9	±0.8/-0.0	9.7	11.2	9.5	0.8	33.4	±1.5/-0.0	14.7	17.3
1 1/4	57	64	55.6	63.5	±1.5/-0.0	67	44	46	47.6	±0.8/-0.0	9.7	11.2	9.5	0.8	42.9	±1.5/-0.0	17.0	18.4
1 1/2	64	76	63.5	76.2	±1.5/-0.0	79	44	48	50.8	±0.8/-0.0	11.2	12.7	9.5	0.8	49.2	±1.5/-0.0	17.8	18.4
2	76	92	79.4	79.4	±1.5/-0.0	86	48	51	57.2	±1.5/-0.0	12.7	15.7	9.5	0.8	61.9	±1.5/-0.0	19.0	19.2
2 1/2	92	108	92.1	92.1	±1.5/-0.0	92	60	64	63.5	±1.5/-0.0	15.7	19.0	9.5	0.8	73.0	±1.5/-0.0	23.6	28.9
3	108	127	111.1	111.1	±1.5/-0.0	108	65	68	69.9	±1.5/-0.0	19.0	22.4	9.5	0.8	88.9	±1.5/-0.0	25.9	30.5
4	140	159	141.3	141.3	±1.5/-0.0	121	68	75	76.2	±1.5/-0.0	22.4	28.4	9.5	0.8	114.3	±1.5/-0.0	27.7	33.0

General Notes :

(a) Dimensions are in millimeters.

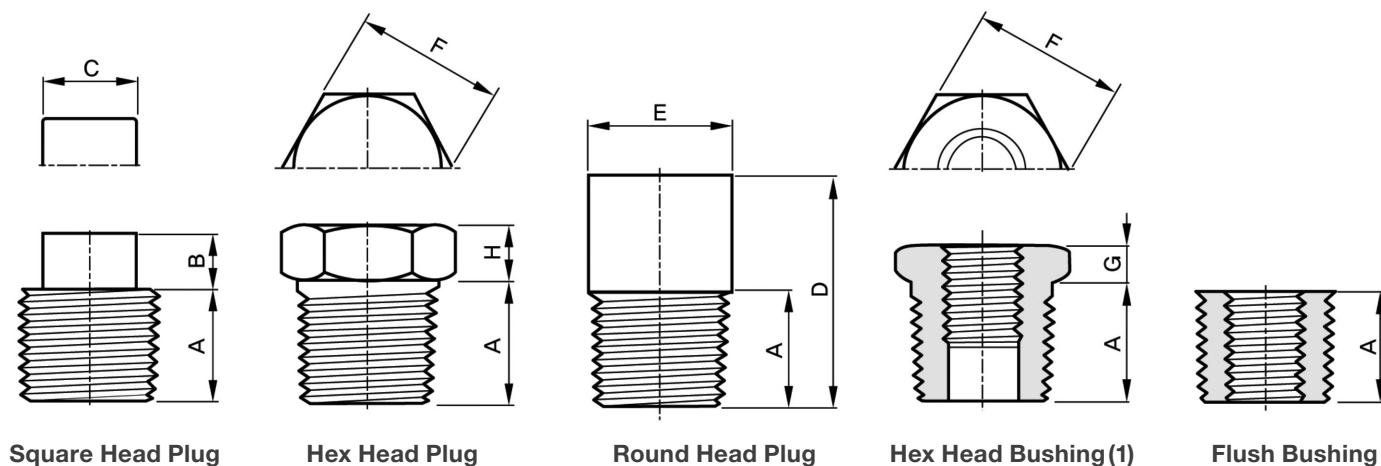
(b) The wall thickness away from the threaded ends shall meet the minimum wall thickness requirements of Table 1-2 for the appropriate NPS and Class Designation fitting.

Note : (1) Dimension B is minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L2 (Effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1).

※ For approx weight see page 126.

Forged Steel Threaded Fittings

Plug, Bushing



ASME B16.11

(mm)

Nominal Pipe Size	Length (Min) A	Plugs Square Head		Plugs Round Head		Hex Plugs & Bushing		
		Height of Squard (Min) B	Width Flats (Min) C Note (2)	Nominal Diameter of Head E	Length (Min) D	Width Flats (Nom) F Note (2)	Hex Height (Min)	
							Bushing G	Plug H
1/8	10	6	7.15	10	35	11.11		6
1/4	11	6	9.55	14	41	15.88	3	6
3/8	13	8	11.11	18	41	17.46	4	8
1/2	14	10	14.29	21	44	22.23	5	8
3/4	16	11	15.88	27	44	26.99	6	10
1	19	13	20.64	33	51	34.93	6	10
1 1/4	21	14	23.81	43	51	44.45	7	14
1 1/2	21	16	28.58	48	51	50.80	8	16
2	22	18	33.27	60	64	63.50	9	18
2 1/2	27	19	38.10	73	70	76.20	10	19
3	28	21	42.86	89	70	88.90	10	21
4	32	25	63.50	114	76	117.48	13	25

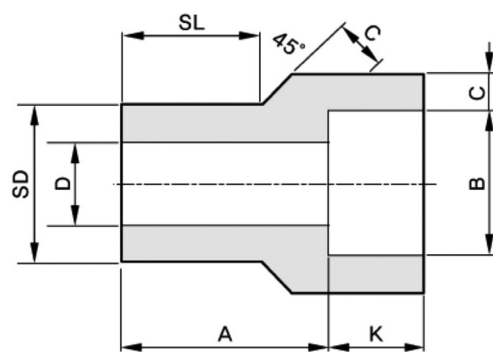
(1) Cautionary Not Regarding Hex Bushings, Hex Head Bushings of one-size reduction should not be used in services wherein they might be subject to harmful loads and forces other than internal pressures.

(2) Manufacturer's applied tolerance shall ensure dimension will fit U.S. Customary tooling.

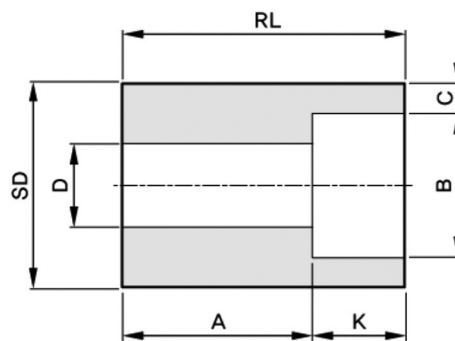
Forged Steel Socket Welding Fittings

Reducer Insert

Class 3000, 6000



Type 1



Type 2⁽¹⁾

MSS SP-79

(mm)

Nominal Pipe Size	Type		Socket		Shank Dia SD	Laying Lenght A		Bore D		Wall Min C		Length Min			
			Dia B	Depth Min K		SL						RL			
	3M	6M						3M	6M	3M	6M	3M	6M	3M	6M
3/8 X 1/4	1	1	14.35	10	17.15	19	21	9.0	6.5	3.78	4.60	14	16		
1/2 X 3/8	1	1	17.78	10	21.34	21	23	12.5	9.0	4.01	5.03	16	16		
X 1/4	1	1	14.35	10	21.34	21	21	9.0	6.5	3.78	4.60	16	16		
3/4 X 1/2	1	1	21.97	10	26.67	22	25	16.0	11.5	4.67	5.97	17	19		
X 3/8	2	1	17.78	10	26.67	16	22	12.5	9.0	4.01	5.03		19	27	
X 1/4	2	2	14.35	10	26.67	18	22	9.0	6.5	3.78	4.60			27	32
1 X 3/4	1	1	27.31	13	33.40	24	28	21.0	15.5	4.90	6.96	19	21		
X 1/2	2	1	21.97	10	33.40	16	28	16.0	11.5	4.67	5.97		21	28	
X 3/8	2	2	17.78	10	33.40	18	22	12.5	9.0	4.01	5.03			28	33
X 1/4	2	2	14.35	10	33.40	19	24	9.0	6.5	3.78	4.60			28	33
1-1/4 X 1	1	1	34.04	13	42.16	25	30	26.5	20.5	5.69	7.92	21	22		
X 3/4	2	2	27.31	13	42.16	18	21	21.0	15.5	4.90	6.96			32	35
X 1/2	2	2	21.97	10	42.16	19	22	16.0	11.5	4.67	5.97			32	35
X 3/8	2	2	17.78	10	42.16	21	24	12.5	9.0	4.01	5.03			32	35
X 1/4	2	2	14.35	10	42.16	22	25	9.0	6.5	3.78	4.60			32	35
1-1/2 X 1-1/4	1	1	42.80	13	48.26	28	35	35.0	29.5	6.07	7.92	22	25		
X 1	2	2	34.04	13	48.26	18	29	26.5	20.5	5.69	7.92		25	33	
X 3/4	2	2	27.31	13	48.26	19	25	21.0	15.5	4.90	6.96			33	40
X 1/2	2	2	21.97	10	48.26	21	27	16.0	11.5	4.67	5.97			33	40
X 3/8	2	2	17.78	10	48.26	22	28	12.5	9.0	4.01	5.03			33	40

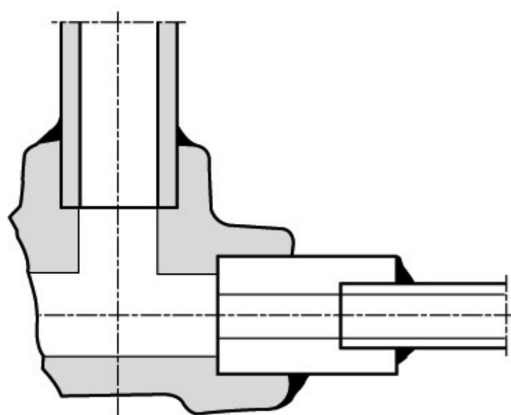
(1) At the option of the manufacturer Type 2 reducers may be furnished in Type 1 configuration.

(2) 3M and 6M symbols denote 3000 and 6000 classes.

Forged Steel Socket Welding Fittings

Reducer Insert

Class 3000, 6000



Application of Reducer Insert

Tolerances

Laying Length A	Sizes 3/8" thru 3/4"	+1.5mm / -0.0mm
	Sizes 1" thru 2"	+2.0mm / -0.0mm
	Sizes 2-1/2" thru 4"	+2.5mm / -0.0mm
Socket Dia. B	Sizes 1/4" thru 2"	±0.25mm
	Sizes 2-1/2" thru 3"	+0.40mm / -0.25mm
	Sizes 1/4" thru 2"	±0.8mm
Bore D	Sizes 1/4" thru 2"	±0.8mm
	Sizes 2-1/2" thru 3"	±1.5mm
	Sizes 3/8" thru 1-1/2"	±0.25mm
Shank Dia. SD	Sizes 2" thru 3"	±0.50mm
	Sizes 4"	±0.75mm
	Sizes 3/8" thru 3/4"	+0.00mm / -1.50mm
Shank Length SL	Sizes 1" thru 2"	+0.00mm / -2.00mm
	Sizes 2-1/2" thru 4"	+0.00mm / -2.50mm

MSS SP-79

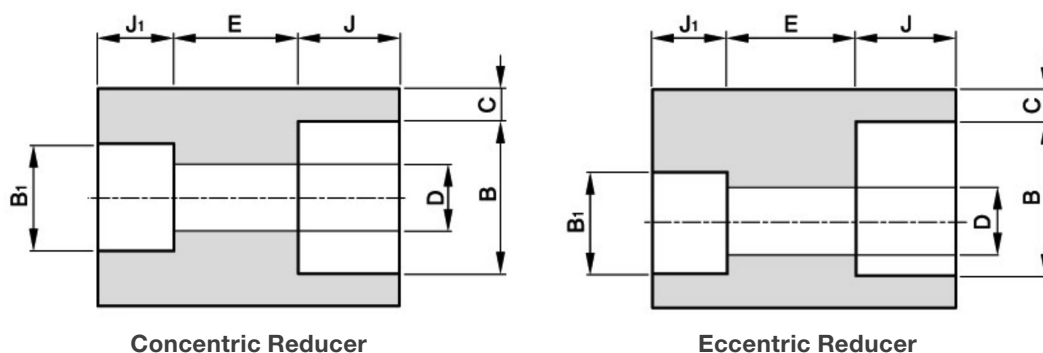
(mm)

Nominal Pipe Size	Type		Socket		Shank Dia SD	Laying Lenght A		Bore D		Wall Min C		Length Min			
			Dia B	Depth Min K		SL						RL			
	3M	6M						3M	6M	3M	6M	3M	6M	3M	6M
2 X 1-1/2	1	1	48.90	13	60.32	32	39	41.0	34.0	6.35	8.90	25	28		
X 1-1/4	2	2	42.80	13	60.32	21	24	35.0	29.5	6.07	7.92			38	41
X 1	2	2	34.04	13	60.32	22	25	26.5	21.0	5.69	7.92			38	41
X 3/4	2	2	27.31	13	60.32	24	27	21.0	15.5	4.90	6.96			38	41
X 1/2	2	2	21.97	10	60.32	25	28	16.0	11.5	4.67	5.97			38	41
2-1/2 X 2	1	1	61.37	16	73.02	46	43	52.5	43.0	6.93	10.92	38	32		
X 1-1/2	2	2	48.90	13	73.02	35		41.0		6.35				54	
X 1-1/4	2	2	42.80	13	73.02	37		35.0		6.07				54	
X 1	2	2	34.04	13	73.02	38		26.5		5.69				54	
X 3/4	2	2	27.31	13	73.02	40		21.0		4.90				54	
3 X 2-1/2	1		74.07	16	88.90	38		62.5		8.76		32			
X 2	2		61.37	16	88.90	25		52.5		6.93				48	
X 1-1/2	2		48.90	13	88.90	29		41.0		6.35				48	
X 1-1/4	2		42.80	13	88.90	30		35.0		6.07				48	
X 1	2		34.04	13	88.90	32		26.5		5.69				48	
4 X 3	2		90.04	16	114.30	33		78.0		9.50				60	
X 2-1/2	2		74.07	16	114.30	38		62.5		8.76				60	
X 2	2		61.37	16	114.30	38		52.5		6.93				60	
X 1-1/2	2		48.90	13	114.30	42		41.0		6.35				60	
X 1-1/4	2		42.80	13	114.30	43		35.0		6.07				60	

Forged Steel Socket Welding Fittings

Concentric Reducer / Eccentric Reducer

Class 3000, 6000, 9000



ASME B16.11 & KEONSAE STANDARD

(mm)

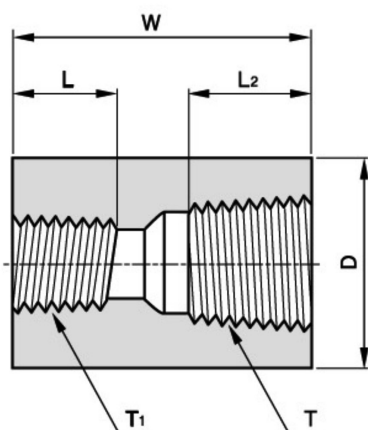
Nominal Pipe Size	Socket Bore Dia (Min) (1)		Bore Diameter of Fitting - D (1)			Socket Wall Thickness (Min) - C			Depth Min		Laying Lengths E
	B	B ₁	3000	6000	9000	3000	6000	9000	J	J ₁	
1/4 X 1/8	14.2	10.8	6.8	4.0		3.30	4.01		9.5	9.5	6.5
3/8 X 1/4	17.6	14.2	9.0	6.5		3.50	4.37		9.5	9.5	6.5
1/2 X 1/4	21.8	14.2	9.0	6.5		4.09	5.18	8.18	9.5	9.5	9.5
X 3/8		17.6	12.5	9.0		4.09	5.18	8.18	9.5	9.5	9.5
3/4 X 1/4	27.2	14.2	9.0	6.5		4.27	6.04	8.56	12.5	9.5	9.5
X 3/8		17.6	12.5	9.0		4.27	6.04	8.56	12.5	9.5	9.5
X 1/2		21.8	16.0	11.5	6.4	4.27	6.04	8.56	12.5	9.5	9.5
1 X 3/8	33.9	17.6	12.5	9.0		4.98	6.93	9.96	12.5	9.5	12.5
X 1/2		21.8	16.0	11.5	6.4	4.98	6.93	9.96	12.5	9.5	12.5
X 3/4		27.2	21.0	15.5	11.0	4.98	6.93	9.96	12.5	12.5	12.5
1-1/4 X 1/2	42.7	21.8	16.0	11.5	6.4	5.28	6.93	10.62	12.5	9.5	12.5
X 3/4		27.2	21.0	15.5	11.0	5.28	6.93	10.62	12.5	12.5	12.5
X 1		33.9	26.5	20.5	15.2	5.28	6.93	10.62	12.5	12.5	12.5
1-1/2 X 3/4	48.8	27.2	21.0	15.5	11.0	5.54	7.80	11.12	12.5	12.5	12.5
X 1		33.9	26.5	20.5	15.2	5.54	7.80	11.12	12.5	12.5	12.5
X 1-1/4		42.7	35.0	29.5	22.7	5.54	7.80	11.12	12.5	12.5	12.5
2 X 1	61.2	33.9	26.5	20.5	15.2	6.04	9.50	12.12	16.0	12.5	19.0
X 1-1/4		42.7	35.0	29.5	22.7	6.04	9.50	12.12	16.0	12.5	19.0
X 1-1/2		48.8	41.0	34.0	27.9	6.04	9.50	12.12	16.0	12.5	19.0
2-1/2 X 1-1/4	73.9	42.7	35.0	29.5	22.7	7.67			16.0	12.5	19.0
X 1-1/2		48.8	41.0	34.0	27.9	7.67			16.0	12.5	19.0
X 2		61.2	52.5	43.0	38.1	7.67			16.0	16.0	19.0
3 X 1-1/2	89.9	48.8	41.0	34.0	27.9	8.30			16.0	12.5	19.0
X 2		61.2	52.5	43.0	38.1	8.30			16.0	16.0	19.0
X 2-1/2		73.9	62.5	54.1		8.30			16.0	16.0	19.0
4 X 2	115.2	61.2	52.5	43.0		9.35			19.0	16.0	19.0
X 2-1/2		73.9	62.5	54.1		9.35			19.0	16.0	19.0
X 3		89.8	78.0	66.8		9.35			19.0	16.0	19.0

Note : (1) Tolerance is according to coupling at ASME B16.11

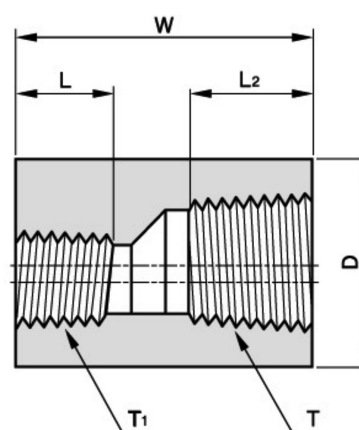
Forged Steel Threaded Fittings

Concentric Reducer / Eccentric Reducer

Class 3000, 6000



Concentric Reducer



Eccentric Reducer

ASME B16.11 & KEONSAE STANDARD

(mm)

Nominal Pipe Size	Outside Diameter D		End to End W	Length of Thread (Min)	
	3000	6000		L ₂	L
1/4 X 1/8	19	25	35	8.1	6.4
3/8 X 1/4	22	32	38	9.1	8.1
1/2 X 1/4	28	38	48	10.9	8.1
X 3/8	28	38	48	10.9	9.1
3/4 X 1/4	35	44	51	12.7	8.1
X 3/8	35	44	51	12.7	9.1
X 1/2	35	44	51	12.7	10.9
1 X 3/8	44	57	60	14.7	9.1
X 1/2	44	57	60	14.7	10.9
X 3/4	44	57	60	14.7	12.7
1-1/4 X 1/2	57	64	67	17.0	10.9
X 3/4	57	64	67	17.0	12.7
X 1	57	64	67	17.0	14.7
1-1/2 X 3/4	64	76	79	17.8	12.7

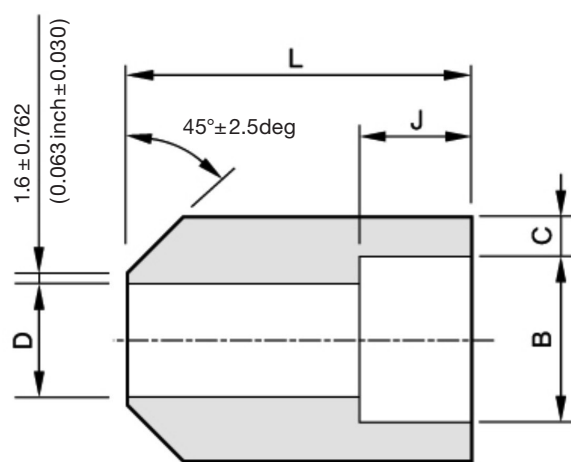
Nominal Pipe Size	Outside Diameter D		End to End W	Length of Thread (Min)	
	3000	6000		L ₂	L
1-1/2 X 1	64	76	79	17.8	14.7
X 1-1/4	64	76	79	17.8	17.0
2 X 1	76	92	86	19.0	14.7
X 1-1/4	76	92	86	19.0	17.0
X 1-1/2	76	92	86	19.0	17.8
2-1/2 X 1-1/4	92	108	92	23.6	17.0
X 1-1/2	92	108	92	23.6	17.8
X 2	92	108	92	23.6	19.0
3 X 1-1/2	108	127	108	25.9	17.8
X 2	108	127	108	25.9	19.0
X 2-1/2	108	127	108	25.9	23.6
4 X 2	140	159	121	27.7	19.0
X 2-1/2	140	159	121	27.7	23.6
4 X 3	140	159	121	27.7	25.9

Note : (1) Tolerance is according to coupling at ASME B16.11

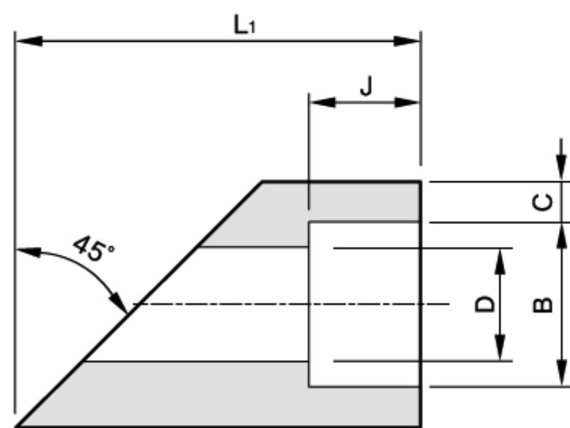
Forged Steel Socket Welding Fittings

Boss

Class 3000, 6000, 9000



Type 1



Type 2

ASME B16.11 & KEONSAE STANDARD

(mm)

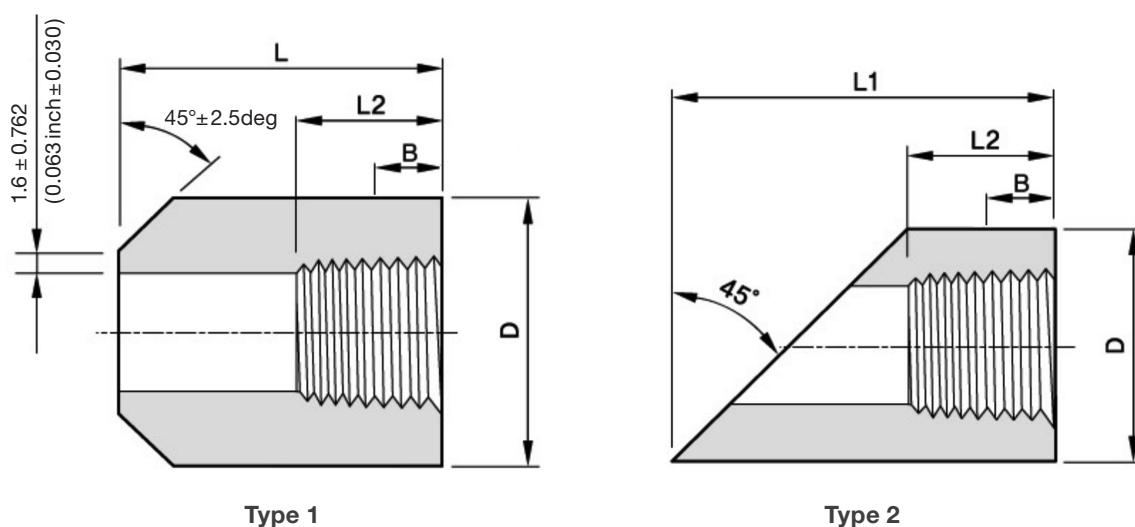
Nominal Pipe Size	Socket Bore Dia (Min) B	Bore Diameter of Fitting - D			Socket Wall Thickness Min - C			Depth Min J	End to End	
		3000	6000	9000	3000	6000	9000		L	L ₁ (2)
1/4	14.2~14.6	8.5~10.0	5.6~7.1		3.30	4.01		9.5	25.5	62
3/8	17.6~18.0	11.8~13.3	8.4~9.9		3.50	4.37		9.5	27	66
1/2	21.8~22.2	15.0~16.6	11.0~12.5	5.6~7.2	4.09	5.18	8.18	9.5	32	82
3/4	27.2~27.6	20.2~21.7	14.8~16.3	10.3~11.8	4.27	6.04	8.56	12.5	36.5	88
1	33.9~34.3	25.9~27.4	19.9~21.5	14.4~16.0	4.98	6.93	9.96	12.5	41	96
1-1/4	42.7~43.1	34.3~35.8	28.7~30.2	22.0~23.5	5.28	6.93	10.62	12.5	42.5	105
1-1/2	48.8~49.2	40.1~41.6	33.2~34.7	27.2~28.7	5.54	7.80	11.12	12.5	44.5	112
2	61.2~61.7	51.7~53.3	42.1~43.6	37.4~38.9	6.04	9.50	12.12	16.0	57	125

Note : (1) Weld connection 45° Bevel operation.
(2) KEONSAE Standard.

Forged Steel Threaded Fittings

Boss

Class 3000, 6000, 9000



ASME B16.11 & KEONSAE STANDARD

(mm)

Nominal Pipe Size	Outside Diameter - D		End to End		Length of Thread (Min)	
A	3000	6000	L	L1 (2)	B	L2 (3)
1/4	19	28	17.5	62	8.1	10.2
3/8	22	32	19	66	9.1	10.4
1/2	28	38	24	82	10.9	13.6
3/4	35	44	25.5	88	12.7	13.9
1	44	54	30	96	14.7	17.3
1-1/4	57	64	33.5	105	17.0	18.4
1-1/2	64	76	39.5	112	17.8	18.4
2	76	92	43	125	19.0	19.2

Note : (1) Weld connection 45° Bevel operation.

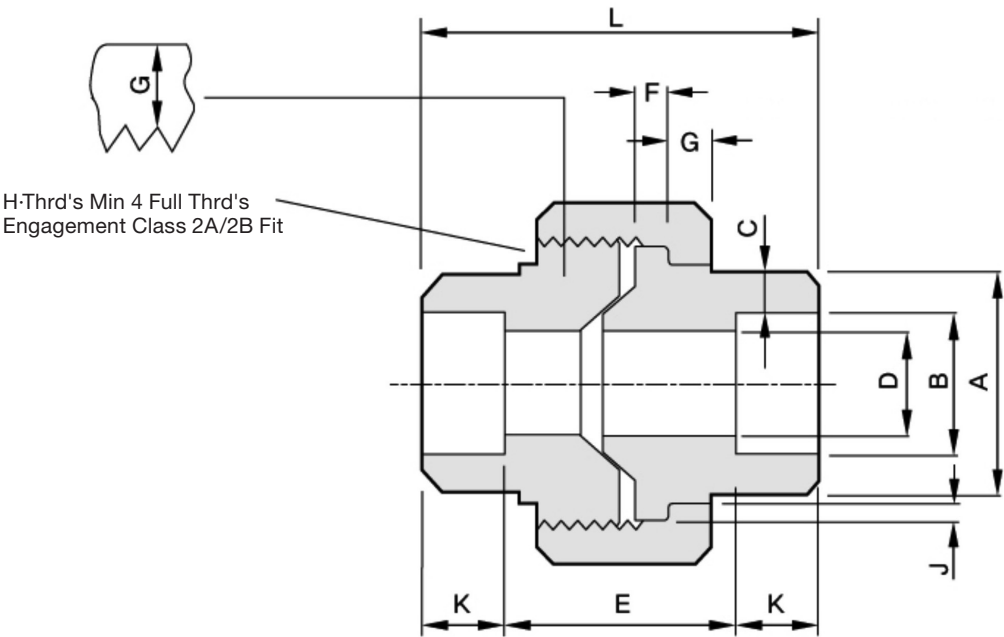
(2) KEONSAE Standard.

(3) Dimension B is minimum length of perfect thread. The length of useful thread [B plus threads with fully formed roots and flat crests] shall not be less than L2 [Effective length of external thread] required by American National Standard for Pipe Threads [ASME B1.20.1; see para.6.3].

Forged Steel Socket Fittings

Union

Class 3000



MSS SP-83

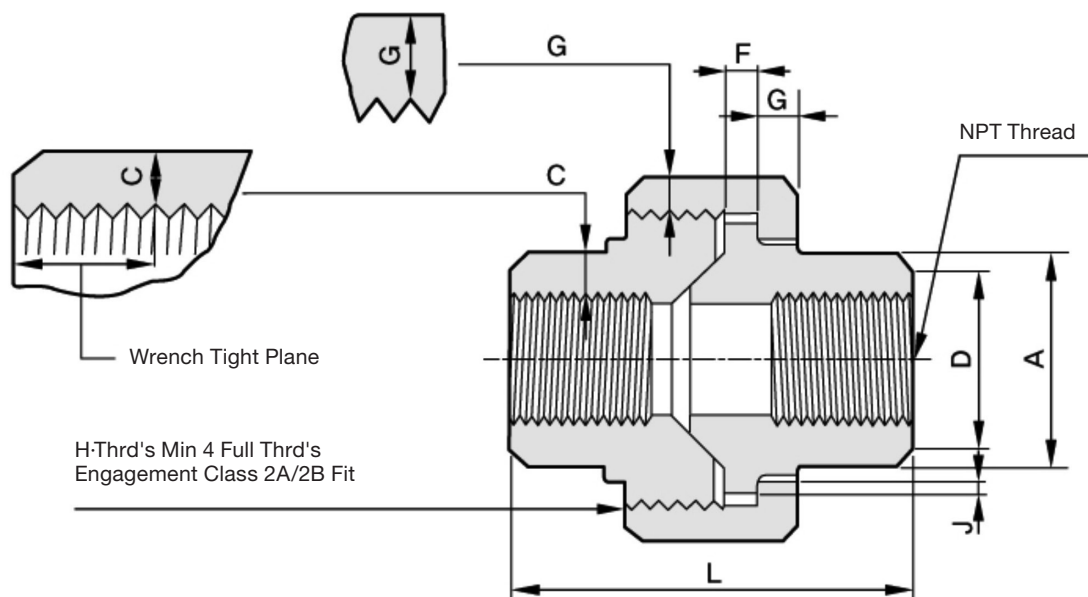
(mm)

Nominal Pipe Size	Pipe End Min	Socket Bore Dia	Socket Wall Min	Water Way Bore	Laying Length	Male Flange Min	Nut Min	Threads Par 25.4mm Max	Bearing Min	Depth of Socket Min	Length Assem Nom
	A	B	C	D	E	F	G	H	J	K	L
1/8	21.8	10.67~11.12	3.17	6.07~7.59	19.0~22.4	3.17	3.17	16	1.24	9.6	41.4
1/4	21.8	14.10~14.61	3.30	8.48~10.01	19.0~22.4	3.17	3.17	16	1.24	9.6	41.4
3/8	25.9	17.53~18.03	3.51	11.76~13.51	20.6~26.9	3.43	3.43	14	1.37	9.6	46.0
1/2	31.2	21.72~22.23	4.09	15.04~16.56	20.6~26.9	3.68	3.68	14	1.50	9.6	49.0
3/4	37.1	27.05~27.56	4.27	20.16~21.69	25.4~31.8	4.06	4.06	11	1.68	12.7	56.9
1	45.5	33.78~34.29	4.98	25.88~27.41	26.2~34.3	4.57	4.44	11	1.85	12.7	62.0
1-1/4	54.9	42.55~43.05	5.28	34.29~35.81	32.5~40.6	5.33	5.21	10	2.13	12.7	71.1
1-1/2	61.5	48.64~49.15	5.54	40.13~41.66	34.0~42.2	5.84	5.59	10	2.31	12.7	76.5
2	75.2	61.11~61.62	6.05	51.74~53.26	37.3~45.5	6.60	6.35	10	2.69	15.8	86.1
2-1/2	91.7	73.81~74.45	7.67	61.19~64.24	52.1~61.7	7.49	7.11	8	3.07	15.8	102.4
3	109.2	89.79~90.42	8.31	76.40~79.45	53.6~63.8	8.25	8.00	8	3.53	15.8	109.0

Forged Steel Threaded Fittings

Union

Class 3000



MSS SP-83

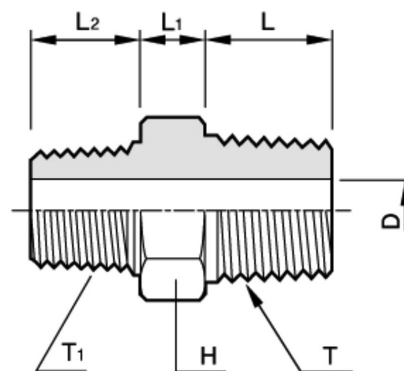
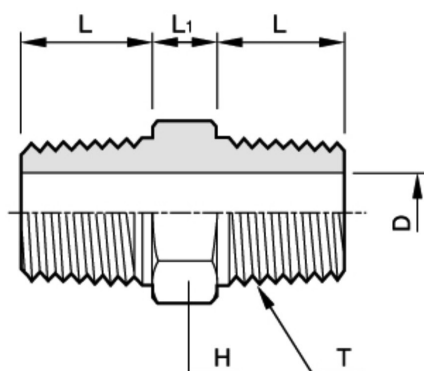
(mm)

Nominal Pipe Size	Pipe End Min	Wall Min	Water Way Bore	Male Flange Min	Nut Min	Threads Par 25.4mm Max	Bearing Min	Length Assem Nominal
	A	C	D	F	G	H	J	L
1/8	14.7	2.41	6.43~8.43	3.17	3.2	16	1.24	41.4
1/4	19.0	3.02	9.45~11.13	3.17	3.2	16	1.24	41.4
3/8	22.9	3.20	13.51~14.28	3.43	3.4	14	1.37	46.0
1/2	27.7	3.73	17.07~17.86	3.68	3.7	14	1.50	49.0
3/4	33.5	3.91	21.39~23.01	4.06	4.1	11	1.68	56.9
1	41.4	4.55	27.74~28.98	4.57	4.4	11	1.85	62.0
1-1/4	50.5	4.85	35.36~37.69	5.33	5.2	10	2.13	71.1
1-1/2	57.2	5.08	41.20~43.54	5.84	5.6	10	2.31	76.4
2	70.1	5.54	52.12~55.58	6.60	6.4	10	2.69	86.1
2-1/2	85.3	7.01	64.31~66.27	7.49	7.1	8	3.07	102.4
3	102.4	7.62	77.27~82.55	8.25	8.0	8	3.53	109.0

Forged Steel Threaded Fittings

HEX Nipple

Class 3000, 6000



Reducing Nipple

KEONSAE STANDARD

Nominal Size T	D	H*	L	L ₁
1/8	4	12	10	6
1/4	7	17	14	8
3/8	9	19	15	8
1/2	12	22	19	9
3/4	16	27	21	10
1	20	35	24	11
1-1/4	28	46	27	12
1-1/2	32	50	27	14
2	40	65	31	16
2-1/2	55	80	36	18
3	65	95	39	20

H* : Size 2" and smaller are Hexagonal Bodies, size over 2 1/2" is Octagonal body.

※ Nipple lengths tolerance according to ASTM A733.

- Up to 12" : $\pm 1/16"$ (1.6mm)
- Over 24" : $\pm 1/8"$ (3.2mm)

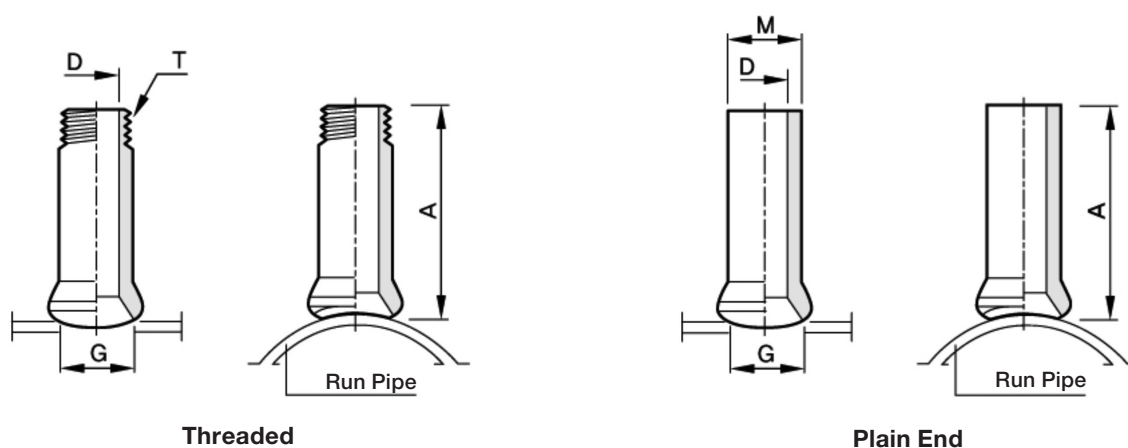
(mm)

Nominal Size T	D	H*	L	L ₁	L ₂
3/8 X 1/4	7	19	15	8	14
1/2 X 1/4	7	22	19	9	14
1/2 X 3/8	9	22	19	9	15
3/4 X 1/4	7	27	21	10	14
3/4 X 3/8	9	27	21	10	15
3/4 X 1/2	12	27	21	10	19
1 X 3/8	9	35	24	11	15
1 X 1/2	12	35	24	11	19
1 X 3/4	16	35	24	11	21
1-1/4 X 1/2	12	46	27	12	19
1-1/4 X 3/4	16	46	27	12	21
1-1/4 X 1	20	46	27	12	24
1-1/2 X 3/4	16	50	27	14	21
1-1/2 X 1	20	50	27	14	24
1-1/2 X 1-1/4	28	50	27	14	27
2 X 1	20	65	31	16	24
2 X 1-1/4	28	65	31	16	27
2 X 1-1/2	32	65	31	16	27
2-1/2 X 1-1/4	28	80	36	18	27
2-1/2 X 1-1/2	32	80	36	18	27
2-1/2 X 2	40	80	36	18	31
3 X 1-1/2	32	95	39	20	27
3 X 2	40	95	39	20	31
3 X 2-1/2	55	95	39	20	36

Forged Steel Outlet Fittings

Branch Outlet Nipple

XS, XXS



KEONSAE STANDARD

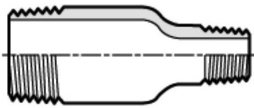
(mm)

Run Pipe Size	Outlet Size		A	D		G	
	T (Thread)	M		XS	XXS	XS	XXS
36~3/4	1/2	21	88.9	13.84	6.36	23.80	14.28
36~1	3/4	27	88.9	18.88	11.06	30.16	19.05
36~1-1/4	1	33	88.9	24.30	15.22	36.51	25.40
36~1-1/2	1-1/4	42	88.9	32.50	22.80	44.45	33.33
36~2	1-1/2	48	88.9	38.14	28.00	50.80	38.10
36~2-1/2	2	60	88.9	49.22	38.16	60.08	42.86

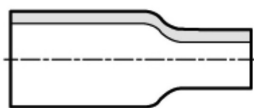
※ Each dimension of outlet part and nipple part is according to MSS SP-97 and ASME B36.10, B36.19

Forged Steel Threaded Fittings

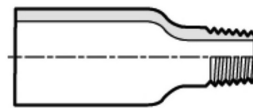
Swaged Nipple



TBE



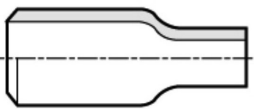
PBE



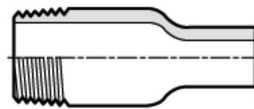
PLE / TSE



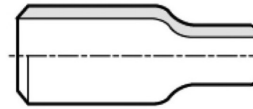
BLE / TSE



BLE / PSE



TLE / PSE



BBE

MSS SP-95

(mm)

Large end Size	Small end Size	Length	BS 3799 Length
1/4	1/8~	57 ± 2	-
3/8	1/4~1/8	64 ± 2	76 ± 2
1/2	3/8~1/8	70 ± 2	89 ± 2
3/4	1/2~1/8	76 ± 2	95 ± 2
1	3/4~1/8	89 ± 2	102 ± 2
1-1/4	1~1/8	102 ± 2	-
1-1/2	1-1/4~1/8	114 ± 2	114 ± 2
2	1-1/2~1/8	165 ± 2	165 ± 2
2-1/2	2~1/8	178 ± 2	178 ± 2
3	2-1/2~1/8	203 ± 2	203 ± 2
3-1/2	3~1/8	203 ± 2	-
4	3-1/2~1/8	229 ± 2	229 ± 2

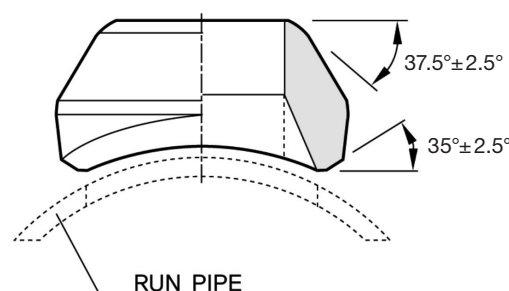
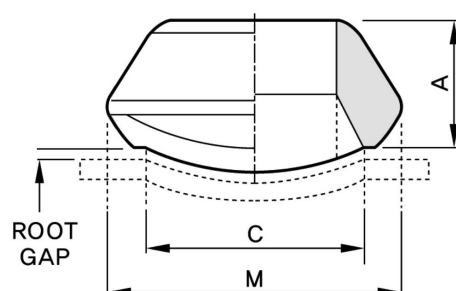
- **TBE** : Threaded Both End
- **PBE** : Plain Both End
- **BBE** : Beveled Both End
- **PLE / TSE** : Plain Large End - Threaded Small End
- **BLE / TSE** : Beveled Large End - Threaded Small End
- **TLE / PSE** : Threaded Large End - Plain Small End
- **BLE / PSE** : Beveled Large End - Plain Small End

※ Pipe schedule numbers and weight designation is according to ASME B36.10 & B36.19

Forged Steel Outlet Fittings

Branch Outlet Butt Weld

STD(Sch 5s~Sch 40), XS(Sch 60~Sch 80), Sch 100~Sch 160, XXS



MSS SP-97

(mm)

Outlet Size	A			M			C		
	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS
1/2	19.1	19.1	28.4	34.9	34.9	34.9	23.8	23.8	14.3
3/4	22.4	22.4	31.8	44.5	44.5	44.5	30.2	30.2	19.1
1	26.9	26.9	38.1	54.0	54.0	50.8	36.5	36.5	25.4
1-1/4	31.8	31.8	44.4	65.1	65.1	61.9	44.5	44.5	33.3
1-1/2	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1
2	38.1	38.1	55.4	88.9	88.9	81.0	65.1	65.1	42.9
2-1/2	41.1	41.1	62.0	103.2	103.2	96.8	76.2	76.2	54.0
3	44.4	44.4	73.2	122.2	122.2	120.7	93.7	93.7	73.0
4	50.8	50.8	84.1	152.4	152.4	152.4	120.7	120.7	98.4
5	57.2	57.2	93.7	179.4	179.4	187.3	141.3	141.3	122.2
6	60.4	77.7	104.6	215.9	225.4	220.7	169.9	169.9	146.1
8	69.8	98.6		263.5	292.1		220.7	220.7	
10	77.7	93.7		322.3	323.9		274.6	265.1	
12	85.9	103.1		377.8	379.4		325.4	317.5	
14	88.9	100.1		409.6	431.8		357.2	350.8	
16	93.7	106.2		463.6	466.7		408.0	403.2	
18	96.8	111.2		520.7	517.5		458.8	455.6	
20	101.6	119.1		571.5	582.6		508.0	509.6	
24	115.8	139.7		689.0	708.0		614.4	614.4	

※ Applicable run pipe size are from outlet size to 36".

※ Standard weight fittings are the same as schedule 40 fittings until 10" and extra strong fittings are the same as schedule 80 until 8".

※ Pipe schedule numbers and weight designations are in accordance with ASME B36.10 & B36.19

※ When ordering branch outlet butt weld, include the quantity, size (Run and outlet), description (Weldolet, Schedule number) and material.

※ 8" (Sch 100, S120, S160, XXS) and larger size available on application and see heavy wall weldolet for dimensions.

※ The dimensions in TABLE STD A, M, C from outlet size 1/2"~24" shall be applied from Sch.5S~S40 and 8" Sch.60 shall be applied with STD dimension.

※ The dimensions in TABLE STD XS A, M, C from outlet size 1/2"~24" shall be applied from Sch.S60~S80

※ The dimensions above 8" outlet size and Sch.100 shall be manufactured as per manufacturer's standard.

※ Branch bevel detail shall be as per ASME B16.25

※ Weld bevel angle on the transvers section of the fitting is based on the manufactur's specification.

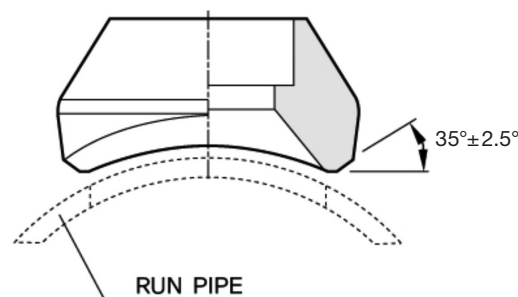
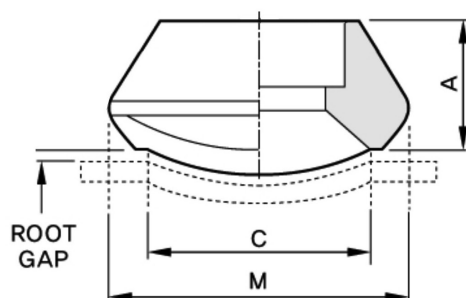
※ **Tolerances A**

1/8"~3/4" : ±0.8mm, 1"~4" : ±1.6mm, 5"~12" : ±3.2mm, 14"~24" : ±4.8mm

Forged Steel Outlet Fittings

Branch Outlet Socket Weld

Class 3000, 6000, 9000



MSS SP-97

(mm)

Outlet Size	A		M		C	
	3000	6000 / 9000	3000	6000 / 9000	3000	6000 / 9000
1/2	25.4	31.8	35.7	44.5	23.8	19.1
3/4	26.9	36.5	44.5	50.0	29.4	25.4
1	33.3	39.6	54.0	61.9	36.5	33.3
1-1/4	33.3	41.1	65.1	69.9	44.5	38.1
1-1/2	35.0	42.3	73.0	82.6	50.8	49.2
2	38.1	52.3	88.9	103.2	65.1	69.9
2-1/2	46.0		103.2		76.2	
3	50.8		122.2		93.7	
4	57.2		152.4		120.7	

※ Applicable run pipe size are from outlet size to 36".

※ For the 3000# and 6000# / 9000# socket, inside bore, socket depth dimensions are according to ASME B16.11

※ Pipe schedule numbers and weight designation are in accordance with ASME B36.10 & B36.19

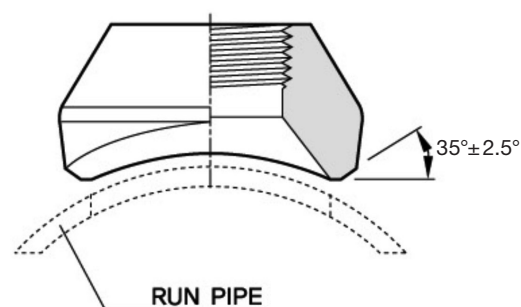
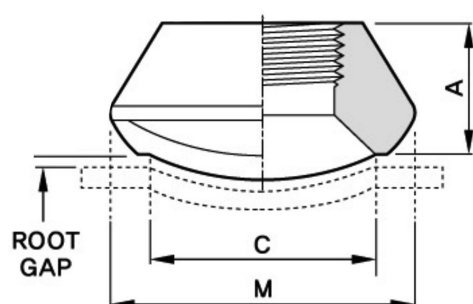
※ When ordering socketlets and throdolets, include the quantity, run and outlet size item and rating(or schedule number) and material.

※ Weld bevel angle on the transvers section of the fitting is based on the manufactur's specification.

Forged Steel Outlet Fittings

Branch Outlet Threads

Class 3000, 6000, 9000



MSS SP-97

(mm)

Outlet Size	A		M		C	
	3000	6000 / 9000	3000	6000 / 9000	3000	6000 / 9000
1/2	25.4	31.8	35.7	44.5	23.8	19.1
3/4	26.9	36.5	44.5	50.0	29.4	25.4
1	33.3	39.6	54.0	61.9	36.5	33.3
1-1/4	33.3	41.1	65.1	69.9	44.5	38.1
1-1/2	35.0	42.3	73.0	82.6	50.8	49.2
2	38.1	52.3	88.9	103.2	65.1	69.9
2-1/2	46.0		103.2		76.2	
3	50.8		122.2		93.7	
4	57.2		152.4		120.7	

※ Applicable run pipe size are from outlet size to 36".

※ For the 3000# and 6000# socket, inside bore, socket depth dimensions are according to ASME B16.11

※ Pipe schedule numbers and weight designation are in accordance with ASME B36.10 & B36.19

※ When ordering socketlets and throdolets, include the quantity, run and outlet size item and rating(or schedule number) and material.

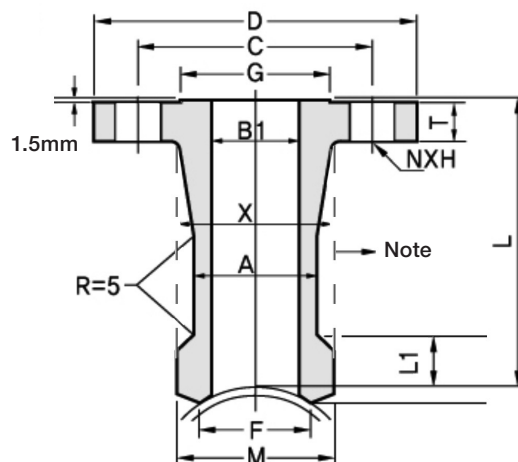
※ Weld bevel angle on the transvers section of the fitting is based on the manufactrur's specification.

※ **Tolerances A**

1/8"~3/4" : ±0.8mm, 1"~4" : ±1.6mm

Forged Steel Outlet Fittings

Branch Outlet Flange



ASME B16.5 & MSS SP-97 / Class 150

(mm)

Outlet Size	L1			M			F			L					
	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	150	300	600	900	1500	2500
1/2	19.1	19.1	28.4	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150	150
3/4	22.4	22.4	31.8	44.5	44.5	44.5	30.2	30.2	19.1						
1	26.9	26.9	38.1	54.0	54.0	50.8	36.5	36.5	25.4						
1-1/2	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1						
2	38.1	38.1	55.4	88.9	88.9	81.0	65.1	65.1	42.9						165

Class 150	D	C	G	B1	X	NXH	A	T
1/2	89	60.5	35.1	Match to Pipe I.D.	30	4 X 16	21.3	11.2
3/4	99	69.8	42.9		38	4 X 16	26.7	12.7
1	108	79.2	50.8		49	4 X 16	33.4	14.2
1-1/2	127	98.6	73.0		65	4 X 16	48.3	17.5
2	152	120.6	91.0		78	4 X 16	60.3	19.0

ASME B16.5 & MSS SP-97 / Class 300

(mm)

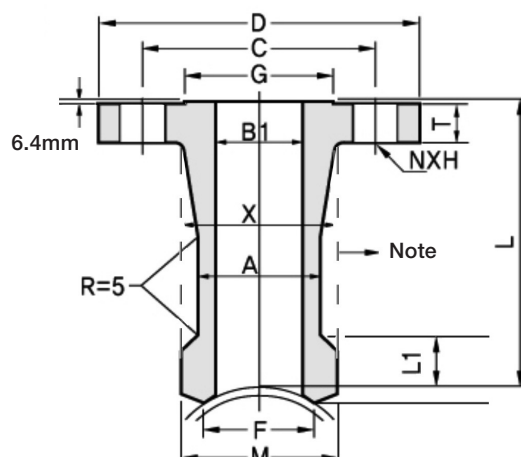
Outlet Size	L1			M			F			L					
	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	150	300	600	900	1500	2500
1/2	19.1	19.1	28.4	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150	150
3/4	22.4	22.4	31.8	44.5	44.5	44.5	30.2	30.2	19.1						
1	26.9	26.9	38.1	54.0	54.0	50.8	36.5	36.5	25.4						
1-1/2	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1						
2	38.1	38.1	55.4	88.9	88.9	81.0	65.1	65.1	42.9						165

Class 300	D	C	G	B1	X	NXH	A	T
1/2	95	66.5	35.1	Match to Pipe I.D.	38	4 X 16	21.3	12.7
3/4	117	82.6	42.9		48	4 X 19	26.7	14.2
1	124	88.9	50.8		54	4 X 19	33.5	15.7
1-1/2	155	114.3	73.0		70	4 X 22	48.3	19.0
2	165	127.0	91.9		84	8 X 19	60.5	20.6

Note : Shape only indicative, other shapes are also acceptable.

Forged Steel Outlet Fittings

Branch Outlet Flange



ASME B16.5 & MSS SP-97 / Class 600 / Class 900 / Class 1500

(mm)

Outlet Size	L1			M			F			L					
	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	150	300	600	900	1500	2500
1/2	19.1	19.1	28.4	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150	150
3/4	22.2	22.4	31.8	44.5	44.5	44.5	30.2	30.2	19.1						
1	26.9	26.9	38.1	54.0	54.0	50.8	36.5	36.5	25.4						
1-1/2	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1						
2	38.1	38.1	55.4	88.9	88.9	81.0	65.1	65.1	42.9						

Class 600	D	C	G	B1	X	NXH	A	T
1/2	95	66.5	35.1	Match to Pipe I.D	38	4 X 15.9	21.3	14.2
3/4	117	82.6	42.9		48	4 X 19.1	26.7	15.7
1	124	88.9	50.8		54	4 X 19.1	33.5	17.5
1-1/2	155	114.3	73.0		70	4 X 22.2	48.3	22.4
2	165	127.0	91.0		84	8 X 19.1	60.5	25.4

Class 900 / 1500	D	C	G	B1	X	NXH	A	T
1/2	121	82.6	35.1	Match to Pipe I.D	38	4 X 22.2	21.3	22.4
3/4	130	88.9	42.9		44	4 X 22.2	26.7	25.4
1	149	101.6	50.8		52	4 X 25.4	33.5	28.4
1-1/2	178	124.0	73.0		70	4 X 28.6	48.3	31.8
2	216	165.1	91.9		105	8 X 25.4	60.5	38.1

ASME B16.5 & MSS SP-97 / Class 2500

(mm)

Outlet Size	L1			M			F			L					
	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	Sch 5s ~ Sch 40, STD	Sch 60 ~ Sch 80, XS	Sch 100 ~ XXS	150	300	600	900	1500	2500
1/2	19.1	19.1	28.4	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150	150
3/4	22.2	22.4	31.8	44.5	44.5	44.5	30.2	30.2	19.1						
1	26.9	26.9	38.1	54.0	54.0	50.8	36.5	36.5	25.4						
1-1/2	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1						
2	38.1	38.1	55.4	88.9	88.9	81.0	65.1	65.1	42.9						

Class 2500	D	C	G	B1	X	NXH	A	T
1/2	133	88.9	35.1	Match to Pipe I.D	43	4 X 22.2	21.3	30.2
3/4	140	95.2	42.9		51	4 X 22.2	26.7	31.8
1	159	108.0	50.8		57	4 X 25.4	33.5	35.1
1-1/2	203	146.0	73.0		79	4 X 31.8	48.3	44.4
2	235	171.4	91.9		95	8 X 28.6	60.5	50.8

Note : Shape only indicative, other shapes are also acceptable.

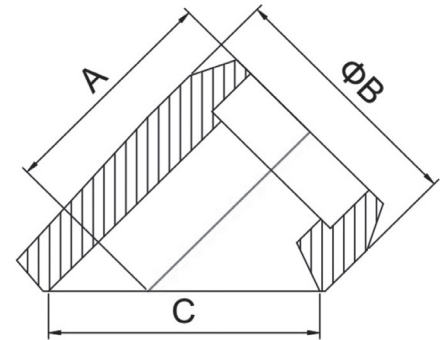
Forged Steel Outlet Fittings

45D Branch Outlet Socket Weld

Outlet Size	A		B		C	
	3000LB	6000LB	3000LB	6000LB	3000LB	6000LB
3/4	48.4	55.6	44.5	49.6	44.7	44.4
1	55.6	62.7	54	61.9	55.6	56.7
1-1/2	66.7	80.2	73	82.6	79	80.8
2	80.2	80.2	88.9	92.0	104.8	104.8

※ For the 3000# and 6000# 45D branch outlet socket weld, inside bore, socket depth dimensions are according to ASME B16.11

※ Pipe schedule numbers and weight designations are in accordance with ASME B36.10 & B36.19

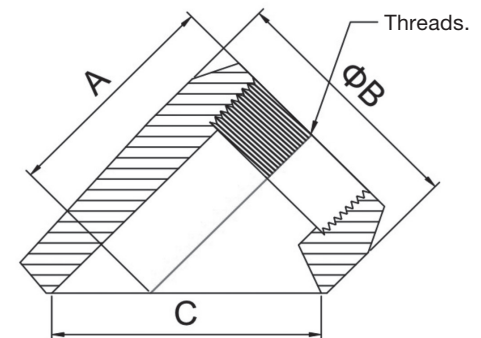


45D Branch Outlet Threads

Outlet Size	A		B		C	
	3000LB	6000LB	3000LB	6000LB	3000LB	6000LB
3/4	48.4	55.6	44.5	49.6	44.7	44.4
1	55.6	62.7	54	61.9	55.6	56.7
1-1/2	66.7	80.2	73	82.6	79	80.8
2	80.2	80.2	88.9	92.0	104.8	104.8

※ For the 3000# and 6000# 45D branch outlet threads, threads depth dimensions are according to ASME B16.11

※ Pipe schedule numbers and weight designations are in accordance with ASME B36.10 & B36.19



45D Branch Outlet Butt Weld

Outlet Size	A				B				C			
	STD	XS	S160	XXS	STD	XS	S160	XXS	STD	XS	S160	XXS
3/4	48.4	48.4	54.0		44.5	44.5	44.5	49.6	44.7	43.2	40.9	
1	55.6	55.6	62.7	62.7	54	54	50.8	50.8	55.4	53.8	48.9	45
1-1/2	66.7	66.7	80.2	80.2	73	73	69.9	69.9	79	77	71.9	67.7
2	82.6	82.6	89	89	88.9	88.9	88.9	88.9	104.8	104.8	91.6	88.2
3	98.4	102.5	125.4	126.2	122.2	122.2	120.7	120.7	140	136.9	130.9	125.1
4	122.2	122.8			152.4	152.4			178.5	174.9		
6	165.1	174.6			215.9	225.4			260.1	261.3		

※ Pipe schedule numbers and weight designations are in accordance with ASME B36.10 & B36.19

※ Butt-welding end dimensions to ASME B16.9 & B16.25

