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Choke Valves - CC-Series API 6A Certified

| Punched Disk Stack X[iks]-trim Application Choke Valve |

CC-Series API 6A Certified

Choke Valves / CC - Series

Control valves for the production and processing of crude oil & natural gas.
Punched Disk Stack X[iks]-trim technology for severe service application choke valves, are almost always Angle type valves.

BFS Severe Service Choke Valve Philosophy

Velocity trim control labyrinth technology (water-jet cutting design) provides for trim velocity of 1/4 or less that of conventional chokes.
- Hardest of trim materials,
- Entire trim set made of C.V.D Treatment or Tungsten Carbide(TC).
  (HRC Hardness/ TC-Max.70deg. C.V.D Treat.-85deg.)

Contents

Model Numbeering System

Body Type	Trim	Actuator	Actuator Size	Body Rating
CC Angle Choke Valve Series	**Design** 1-unbalanced 2-balanced **Type** 1-Contoured 2-Conven. cage 3-multi-hole cage 4-punched X-trim	MH - Manual CS - Spring Cylinder CD - Double Cylinder SM - Step Motor RA - Reverse Action DA - Direct Action	**Cylinder** 12-12", 14-14" 16-16", 20-20" XX-others option. **Diaphragm** 25-250, 29-290 37-370, 48-480 55-550 XX-Option	06-600# 09-900#(PN150) 15-1500#(PN250) 25-2500#(PN420) 50-5000PSI 1Z-10000PSI 1F-15000PSI 2Z-20000PSI XX-Option

BFS Choke Valve Design Concept

Severe Service C.V.D Treatment X[iks]-trim Choke Valve delivers precise wellhead pressure control with superior reliability and life.

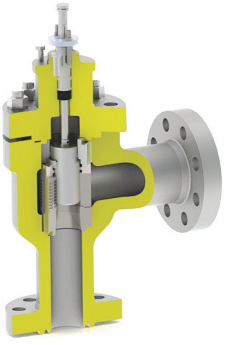
Body Design

Choke valves selection is often based on early life production process data and capital expenditure valve price. However, choke valves are critical elements in production facilities. Malfunction or failure of a choke valve can seriously affect safety the environment and production rates. Valve selection should be based on sound technical and economic arguments and long-term perspectives. BFS's CC-series Choke valves have a proven reliability in terms of performance and will reduce costly maintenance and production loss.

Punched X[iks]-trim Cage

Trim Materials

- Solid Cobalt Alloy + C.V.D Treatment. Labyrance Multi-Stage Let-down, all stages made from C.V.D Treatment. Solid Tungsten Carbide
- Solid Cobalt Alloy + C.V.D Treatment. Prevents undermining of stainless steel retaining members, helps protect balance seal from abrasion.
- Solid Tungsten Carbide application at customer requirement.



CC-series Section body

Trim Design

- Punched C.V.D Treatment disk stack.
- C.V.D Seat & Long Venturi throat. Protects body & seat in critical expansion area.
- Dual plug wiper rings. Protect balance seal from entrained solids.
- Redundant pressure boundary seals. Two different type of seals for optimum pressure boundary integrity.

X[iks]-trim parts

What is C.V.D

BFS Solution is C.V.D Treatment for Trim for CC-Series.

C.V.D / Chemical Vapor Deposition

Using the CVD process to improve the wear life of metal component. This is not for simple coating on the material surface, but for a surface penetration.
So, the CVD treated material has no flaking which usually takes place in the coated material such as in Titanium Carbide and Tungsten Carbide etc.

What is "C.V.D"

CVD is thermo-chemical surface treatment in which metal atoms are diffused into the surface of a work piece to from CVD layer with base material. CVD has been proven more than several the wear life of metal parts that were previously solid tungsten and titanium carbide coating, carburized, nitride, nitro-carburized or hard chrome plated in numerous applications.

Features

Excellent wear resistance from surface hardness of 1700 – 2300HV achieved on steel and nickel, cobalt alloys, tungsten carbide, titanium carbide. Proven to more than several the wear life of money components. Hardness is retained at high service temperature 650deg.C. CVD increase acid corrosion resistance Hydrochloric, Sulfuric and Phosphuric acids in particular.

Properties of C.V.D Layers

The hardness of layers on steel ranges between 1700 and 2300HV (77-88HRC). Hardness of layers varies with base material, layers also retain hardness up to subcritical temperature 650deg.C. Layers depths range from 20 to 150micron depending on base materials and application with the layer depth being matched to the intended application.

Resistance to Acids

C.V.D can increase the resistance of low alloy steel to acids such as sulfuric, phosphoric and hydrochloric, C.V.D austenitic stainless steel has excellent resistance to hydrochloric acid.

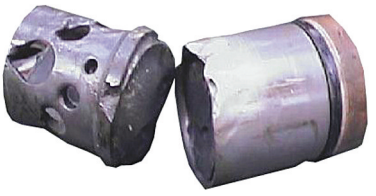
Material Selection

C.V.D can be applied to a wide range of steel alloys including carbon steel, low alloy steel, tool steel and stainless steel, especially base materials such as nickel based alloys, cobalt based alloys and molybdenum can be treated. Nickel alloy, cobalt-alloy can be treated without sacrificing corrosion resistance, as well as producing extreme hard surface wear resistance. The wear resistance of sintered carbide such as tungsten carbide, titanium carbide, is excellent.

Punched X[iks]-trim Technology

Water-Jet Cutting with C.V.D Treatment X[iks]-trim Technology

Now's gas field environment means higher wellhead pressure with aggressive fluids with entrained sand and other solid particles. A conventional multi-hole single-stage choke valve is not suitable for this kind of severe service. The need to maintain production rates means that frequent choke repair or replacement is no longer acceptable. BFS has responded to this need by developing the world best true severe service choke valve.
Based on 30 year field experience and with a new material treatment technology of CVD treatment applied, BFS has succeeded to develop an innovative choke valve with its life span dramatically extended and is able to supply the advanced choke valve with a fastest delivery lead-time.



Damage of choke valve trim

Experienced Gas processing
up-stream & down stream.

Features

Custom-designed valve, trim and actuator for each unique choke application
Wide variety of liquid, gas and X[iks]-trim in linear and EQ-% execution.
Water-jet cutting large hole trim for dirty well clean-up service and high capacity trim for minimized pressure loss at well depletion stage.
Full range of matching BFS pneumatic, electric and electro-hydraulic actuators with tailored control arrangements is available .

BFS Choke Valves / CC-Series

- Improves well production time.
- Enhances control at wellhead
- Reduces costs associated with maintenance and repair.
- Improves ability to accommodate change in well operating conditions.
- Enhances the safety and reliability of production facility.
- X[iks]-trim outperforms single stage average of 5time longer life.
- Reduce the risk of needing replace & maintenance for worn valves.

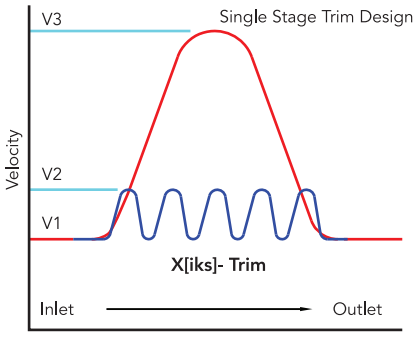
Punched disk stack X[iks]-trim

BFS's Total Velocity Control Concept

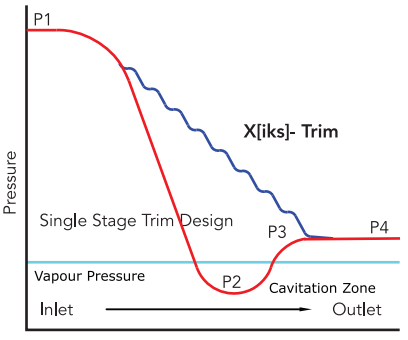
BFS's Total Velocity Control Concept

Local high fluid velocities due to preferential flow faths are the prime source of noise, erosion vibration and malfunction resulting from unbalanced forces. Prevention is better than a cure.
BFS's X[iks]-trim punched disk stack controls flowing velocities throughout the valve trim by forcing the process fluid to follow a tortuous path of right angle turns. The resistance to flow provided by these turns limits the trim exit velocity to a safe level, regardless of the pressure drop. The X[iks]-trim choke valve eliminates problems resulting from excessive fluid velocities such as trim and body erosion, noise, vibration and poor process control. The fluid velocities within the trim of BFS choke valves are typically 1/3 to 1/5 that of multi-hole-single-stage chokes. Velocity control protects the trim from erosion and increase the trim life many fold.

Complete Choke Valve / CC-series



Velocity Characteristic



Pressure Characteristic

Improved Flow Path Design

The basic rules to min. erosion in valves are:
- Minimize the velocity of the medium.
- Minimize abrupt changes in flow direction.
- Select erosion resistant materials.

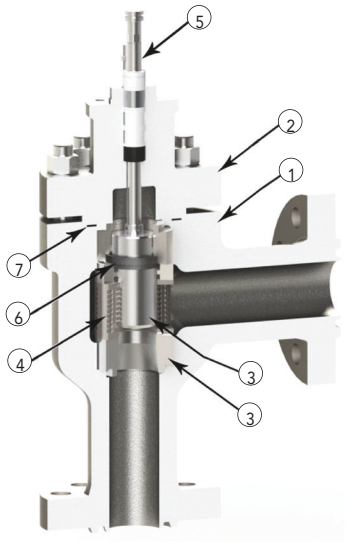
Proven Materials of Construction for Superior Water Resistance

BFS chokes utilize solid cobalt alloy with CVD treatment trim. The punched disk stack provides for multi-stage let down and is made from solid cobalt alloy with CVD treatment, in industry first. The seat ring is provided with a solid cobalt alloy and CVD treatment venture., allowing for a controlled, erosion resistant expansion into the choke outlet and downstream piping.

Technical Specification and Materials

Technical Specification and Materials

No	Component	Standard	NACE MR0175-2005	Remark
		NACE MR0175-2002	ISO 15156-2 2003	
		NACE MR0103-2005	Cor.2.2005 / Note 3.	
1	**Body**	ASTM A958-SC4130	ASTM A958-SC4130	Note 1
		ASTM A352-LCB	ASTM A352-LCB	
		ASTM A216-WCC	ASTM A216-WCC	
		A995-4A (Duplex)	A995-4A (Duplex)	
2	**Bonnet**	AISI 4130 / F51	AISI 4130 / F51	
		S31803 / A350-LF2	S31803 / A350-LF2	
3	**Plug & Seat**	Cobalt Alloy + C.V.D	Cobalt Alloy + C.V.D	Note 4
4	**Punched Stack**	Cobalt Alloy + C.V.D	Cobalt Alloy + C.V.D	Note 4
5	**Stem**	17-4PH	Inconel 718	Note 2
6	**Balance Seal**	Teflon	Teflon	
7	**Bonnet Seal**	17-4PH	Inconel 625	



(1) ASTM A958-SC4130, A352-LCB, and A216-WCC are available with or without an Inconel 625 inlay for corrosion resistance.
(2) Inconel 718 is selected for stem material when API material classes FF or HH is specified.
(3) Certification to NACE is dependant on fluid composition and temperature.

Valve Range

Our range of choke valve designs covers the ASME and API rating that are commonly applied in the gas and oil industry, up to API 15000(1035bar design pressure) with related temperature ratings. For the -100deg.C to 200deg.C (-148deg.F to 390deg. F) temperature range we offer special sealing solutions. The choke valves can be supplied with a variety of inlet and outlet connections such as flanges and clamp connectors and size up to and including 12" in the ASME rating and 13-5/8" in the API ratings.

Performance Data

No	Component	Specification / Option Available
1	Pressure Rating	ANSI 600, ANSI 900, ANSi1500, ANSI 2500, API 5000-10000.
2	Actuator Type	Manual-Hand-wheel, Pneumatic-Diaphragm or Cylinder, Step-Motor Electric, Hydraulic
3	Standard Quality Level	API6A PSL1
4	Optional Quality Level	PSL2 and NACE MR0175
5	Standard Temp. Ratings	-50deg.F to +250deg.F (-45deg.C to +121deg.C), (API 6A temperature classifications L,P,R,S,T,U)
6	Trim Characteristic	Modified Equal Percent
7	Seat leakage Class	ANSI B16.104/FCI-70-2) Standard / Class IV, Optional / Class V
8	Industry Standard	ANSI B16.34 / API 6A / ISO 9000. 9001 / Governmental Agencies Customer Spec.

Technical Specification and Materials

NO	Component	Standard	NACE MR0175-2005	Remarks
		NACE MR0175-2002	ISO 15156-2 2003	
		NACE MR0103-2005	Cor.2.2005 / Note 3.	
1	**Body**	ASTM A958-SC4130	ASTM A958-SC4130	Note 1
		ASTM A352-LCB	ASTM A352-LCB	
		ASTM A216-WCC	ASTM A216-WCC	
		A995-4A (Duplex)	A995-4A (Duplex)	
2	**Bonnet**	AISI 4130	AISI 4130	
		F51 / S31803	F51 / S31803	
		A350-LF2	A350-LF2	
3	**Plug, Seat & Venturi**	Cobalt Alloy + C.V.D	Cobalt Alloy + C.V.D	Note 4
4	**Cage / X[iks]-trim**	Cobalt Alloy + C.V.D	Cobalt Alloy + C.V.D	Note 4
5	**Stem**	17-4PH	Inconel 718	Note 2
6	**Balance Seal**	Teflon	Teflon	
7	**Bonnet Seal**	17-4PH	Inconel 625	

(1) ASTM A958-SC4130, A352-LCB and A216-WCC are available with or without an Inconel 625 inlay for corrosion resistance.
(2) Inconel 718 is selected for stem material when API material classes FF or HH is specified.
(3) Certification to NACE is dependant on fluid composition and temperature.
(4) Optional trim Materials / Solid Tungsten Carbide Plug, Seat, Cage & Venturi throat.

Valve Range

Our range of choke valve designs covers the ASME and API rating that are commonly applied in the gas and oil industry, up to API 15000(1035bar design pressure) with related temperature ratings. For the -100deg.C to 200deg.C (-148deg.F to 390deg.F) temperature range we offer special sealing solution. The choke valves can be supplied with a variety of inlet and outlet connections such as flanges and clamp connectors and size up to and including 12" in the ASME rating and 13-5/8" in the API ratings.

Performance Data

No	Component	Specification / Option Available
1	Pressure Rating	ANSI 600, 900,1500, 2500, API 5000-10000
2	Actuator Type	Manual Hand-wheel, Pneumatic Diaphragm or Cylinder, Step-Motor, Hydraulic.
3	Standard Quality Level	API 6A PSL1
4	Optional Quality Level	PSL2 and NACE MRo175
5	Standard Temp. Ratings	-50deg.F to +250deg.F (-45deg.C to +121deg.C), (API 6A temperature classifications L,P,R,S,T,U)
6	Trim Characteristic	Modified Equal Percent
7	Seat leakage Class	ANSI B16-104/FCI 70-2 Standard Class IV, Option Class V.
8	Industry Standard	ANSI B16.34 / API 6A / ISA 9000, 9001 / Covernmental Agencies Customer Spec.

ANSI B16.34 / API 6A / ISA 9000, 9001 / Covernmental Agencies Customer Spec. request to technical sales dept. of BFS's

Valve Size & Cv Chart

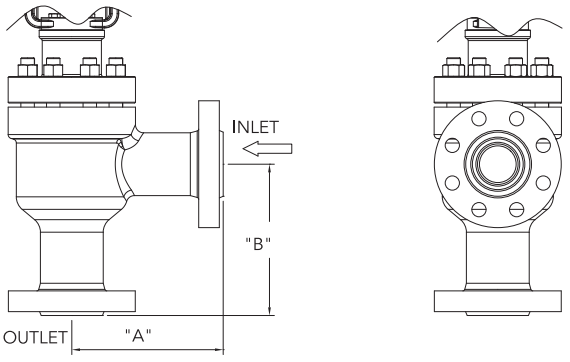
No	Body Size				Cv				Valve Travel	Connect.
	Pressure Rating				Hi-Capa. X[iks]-trim		Severe X[iks]-trim			
	1500#	2500#	API5000	API10000	trim size	Rated Cv	trim size	Rated Cv	(mm)	
1	1.5"	1.5"	2. 1/16	1. 13/16	1"	18	1"	9	40	RF. RTJ
	2"	2"	2. 9/16	2. 1/16	1"	18	1"	9	40	RF. RTJ
	3"	3"	3. 1/8	2. 9/16	1"	18	1"	9	40	RF. RTJ
	-	-	-	3. 1/16"	1"	18	1"	9	40	RF. RTJ
2	3"	3"	2. 9/16"	2. 9/16"	1.75"	50	1.75"	24	65	RF. RTJ
	4"	4"	3. 1/8"	3. 1/16"	1.75"	50	1.75"	24	65	RF. RTJ
	-	-	4. 1/16"	4. 1/16"	1.75"	50	1.75"	24	65	RF. RTJ
3	4"	4"	3. 1/8"	3. 1/16"	2.5"	100	2.5"	31	65	RF. RTJ
	6"	6"	4. 1/16"	4. 1/16"	2.5"	100	2.5"	31	65	RF. RTJ
	-	-	5. 1/8"	5. 1/8"	2.5"	100	2.5"	31	65	RF. RTJ
4	4"	4"	4. 1/16"	4. 1/16"	3.25"	160	3.25"	50	90	RF. RTJ
	6"	6"	5. 1/8"	5. 1/8"	3.25"	160	3.25"	50	90	RF. RTJ
	-	-	7. 1/16"	7. 1/16"	3.25"	160	3.25"	50	90	RF. RTJ
5	6"	6"	5. 1/8"	5. 1/8"	4"	250	4"	60	90	RF. RTJ
	8"	8"	7. 1/16"	7. 1/16"	4"	250	4"	60	90	RF. RTJ
	-	-	9"	9"	4"	250	4"	60	90	RF. RTJ
6	6"	6"	-	-	5"	335	5"	105	120	RF. RTJ
	8"	8"	7. 1/16"	7. 1/16"	5"	335	5"	105	120	RF. RTJ
	10"	10"	9"	9"	5"	335	5"	105	120	RF. RTJ

- Larger Size and Higher pressure rating consult technical engineering team of factory.

BFS Choke Valve CC-series Summary

Trim Size	1" through 5"
Process Connection Size	1'5" to 10"
Pressure Rating	ANSI 600, 900, 1500, 2500, API 5000, 10000, 15000, 20000.
Standard Cv Range	up to 340.
Application	Oil & Gas Production (Multi-phase), Water & Gas Injection, Gas Lift. Standard Severe & Severe Service application X[iks]-trim.
Trim Materials	Cobalt Alloy + C.V.D Treatment
Body Materials	LCC, Duplex, Inconel 625 Available.
Actuator	Full range of actuation available.

Body Face to Face Dimension



In x out size	Trim Size (inch)	ANSI 1500 Class				ANSI 2500 Class			
		A / unit-inch		B / unit-inch		A / unit-inch		B / unit-inch	
		RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ
1.5 x 1.5	1	8	8	8	8	9.13	9.19	9.13	9.19
1.5 x 2	1	8	8	8.75	8.81	9.13	9.19	9.73	9.81
2 x 2	1	8.75	8.81	8.75	8.81	9.75	9.81	9.75	9.81
2 x 3	1	8.75	8.81	9.38	9.44	9.75	9.81	11.38	11.5
3 x 3	1	9.38	9.44	9.38	9.19	11.38	11.5	11.38	11.5
3 x 3	1.75	10.12	10.19	10.12	10.19	12.12	12.25	12.12	12.25
3 x 4	1.75	10.12	10.19	10.38	10.44	12.12	12.25	13	13.19
4 x 4	1.75	10.38	10.44	10.38	10.44	13	13.19	13	13.19
4 x 4	2.5	11.62	11.69	11.82	11.89	14.25	14.44	14.25	14.44
4 x 4	2.5	11.62	11.69	13.5	13.62	14.25	14.44	17.5	17.75
6 x 6	2.5	13.5	13.62	13.5	13.62	17.5	17.75	17.5	17.75
4 x 4	3.25	11.62	11.69	11.82	11.89	14.25	14.4	14.25	14.44
4 x 6	3.25	11.62	11.69	13.5	13.62	14.25	14.44	17.5	17.75
6 x 6	3.25	13.5	13.62	13.5	13.62	17.5	17.75	17.5	17.75
6 x 6	4	14.5	14.62	14.5	14.82	18.5	18.75	18.5	18.75
6 x 8	4	14.5	14.62	18.12	18.31	18.5	18.75	22.25	22.56
8 x 8	4	18.12	18.31	18.13	18.31	22.25	22.56	22.25	22.56
6 x 6	5	15.5	16.62	16.5	16.62	20.5	20.75	20.5	20.75
6 x 8	5	16.5	16.62	18.12	18.31	20.5	20.75	22.25	22.56
8 x 8	5	18.12	18.31	18.12	18.31	22.25	22.56	22.25	22.56
8 x 10	5	18.12	18.31	21.5	21.69	22.25	22.56	28	28.44
10 x 10	5	21.5	21.69	21.5	21.69	28	28.44	28	28.44

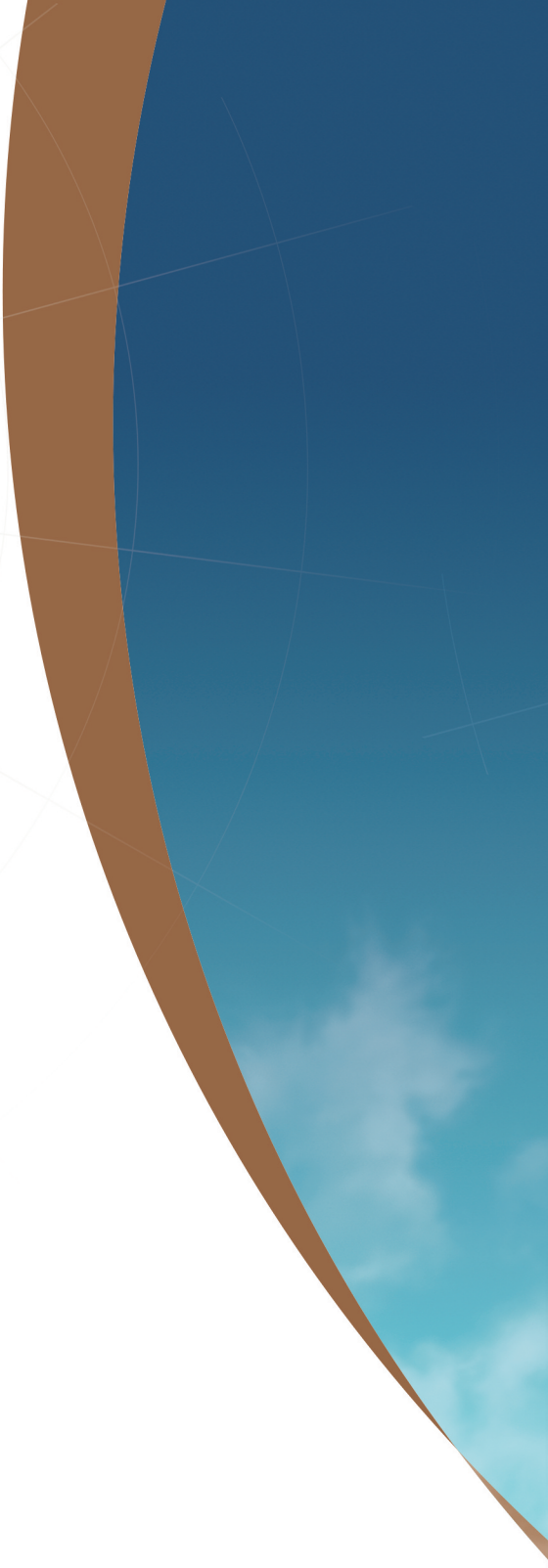
Body Face to Face Dimension

API 5000/6B			
In x out Size	Trim Size	A RTJ	B RTJ
2-1/16 x 2-1/16	1	8.81	8.81
2-1/16 x 2-9/16	1	8.81	8.94
2-9/16 x 2-9/16	1	8.94	8.94
2-9/16 x 3-1/8	1	8.84	9.44
3-1/8 x 3-1/8	1	9.44	9.44
2-9/16 x 2-9/16	1.75	9.69	9.69
2-9/16 x 3-1/8	1.75	9.69	10.19
3-1/8 x 3-1/8	1.75	10.19	10.19
3-1/8 x 4-1/16	1.75	10.19	10.44
4-1/16 x 4-1/16	1.75	10.44	10.44
3-1/8 x 3-1/8	2.5	10.19	10.19
3-1/8 x 4-1/16	2.5	10.19	11.69
4-1/16 x 4-1/16	2.5	11.69	11.69
4-1/16 x 5-1/8	2.5	11.69	12.94
5-1/8 x 5-1/8	2.5	12.94	12.94
4-1/16 x 4-1/16	3.25	11.69	11.69
4-1/16 x 5-1/8	3.25	11.69	12.94
5-1/8 x 5-1/8	3.25	12.94	12.94
5-1/8 x 7-1/16	3.25	12.94	13.62
7-1/16 x 7-1/16	3.25	13.82	13.62
5-1/8 x 5-1/8	4	13.94	13.94
5-1/8 x 7-1/16	4	13.94	14.62
7-1/16 x 7-1/16	4	14.62	14.62
7-1/16 x 9	4	14.62	18.31
9 x 9	4	18.31	18.31
7-1/16 x 7-1/16	5	16.62	16.62
7-1/16 x 9	5	16.62	18.31
9 x 9	5	18.31	18.31

API 10000 / 6BX			
In x out Size	Trim Size	A RTJ	B RTJ
1-13/16 x 1-13/16	1	8.25	8.25
1-13/16 x 2-1/16	1	8.25	8.81
2-1/16 x 2-1/16	1	8.81	8.81
2-1/16 x 2-9/16	1	8.81	9.38
2-9/16 x 2-9/16	1	9.38	9.38
2-9/16 x 3-1/16	1	9.38	10.75
3-1/16 x 3-1/16	1	10.75	10.75
2-9/16 x 2-9/16	1.75	11.38	11.38
2-9/16 x 3-1/16	1.75	11.38	12
3-1/16 x 3-1/16	1.75	12	12
3-1/16 x 4-1/16	1.75	12	13
4-1/16 x 4-1/16	1.75	13	13
3-1/16 x 3-1/16	2.5	12	12
3-1/16 x 4-1/16	2.5	12	13
4-1/16 x 4-1/16	2.5	13	13
4-1/16 x 5-1/8	2.5	13	14.81
5-1/8 x 5-1/8	2.5	14.81	14.81
4-1/16 x 4-1/16	3.25	14	14
4-1/16 x 5-1/8	3.25	14	14.81
5-1/8 x 5-1/8	3.25	14.81	14.81
5-1/8 x 7-1/16	3.25	14.81	18.75
7-1/16 x 7-1/16	3.25	18.75	18.75
5-1/8 x 5-1/8	4	14.74	14.74
5-1/8 x 7-1/16	4	14.74	16.18
7-1/16 x 7-1/16	4	16.18	16.18
7-1/16 x 9	4	16.18	20.38
9 x 9	4	20.38	20.38
7-1/16 x 7-1/16	5	18.18	18.18
7-1/16 x 9	5	18.18	20.38
9 x 9	5	20.38	20.38

Industry Standards

- API 6A.
- ANSI B16.34.
- ISO9000/9001./ Govenmental agencies./ Customer Specifications.



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