



**STAINLESS
STEEL
PIPE, TUBE &
FITTINGS**

FELKER PIPING PRODUCTS

A DIVISION OF FELKER BROTHERS CORPORATION



FELKER PIPING PRODUCTS

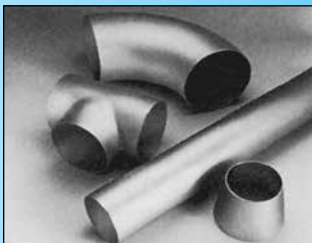
A DIVISION OF FELKER BROTHERS CORP.



Highest Quality Corrosion Resistant Stainless Steel Products



PIPE



TUBE



MISCELLANEOUS



SPECIFICATIONS

ABOUT FELKER

SINCE 1903: A COMMITMENT TO COMPLETE CUSTOMER SATISFACTION

The origin of Felker Brothers Corporation began in 1903 when brothers Louis and Albert Felker established a sheet metal shop in the small, but rapidly growing, central Wisconsin community of Marshfield. At this early time the company produced and patented a variety of designs for galvanized well casings, stock tanks and culverts—all of which, in these early days of the company, were highly sought after products and the business prospered.



The personal commitment of Louis and Albert, as well as their employees, to provide quality and reliable products quickly led to a sincere and dedicated commitment to customer satisfaction. Felker Brothers Corporation is proud of this important "family tradition" and extends its personal commitment to all customers utilizing quality products produced in the Marshfield and Glasgow facilities. Felker Brothers is well known and respected for manufacturing the highest quality, corrosion resistant, stainless steel products and fabricated pipe systems in the industry.

FELKER BROTHERS TODAY: SERVING NATIONAL AND INTERNATIONAL MARKETS

Currently Felker Brothers Corporation serves and provides quality stainless steel products and fabricated pipe systems to major industries throughout the United States, Canada and Mexico. Servicing industry demands from manufacturing facilities in Marshfield, WI and Glasgow, KY, the Corporation provides an extensive product offering of the highest quality, corrosion resistant, stainless steel and fabricated pipe systems continuing the "family tradition" of superior customer service.

Today, Felker Brothers Corporation is segmented into two divisions to better serve the needs of a diversified customer base. These divisions are:

- **Felker Piping Products:** Piping Products Division offers welded stainless steel pipe, tube, fittings and a variety of miscellaneous pipe accessories.
- **Felker Fabrication:** The Fabrication Division offers customized prefabricated pipe systems, wall sleeves, inserts, custom transitions, venture elbows and headers as solutions for clientele with specific and unique needs.

Recognized as a "premier" source of stainless steel pipe and fabricated products, Felker Brothers Corporation is committed to customer satisfaction.



WHY FELKER

FELKER BROTHERS CORPORATION

Felker Brothers Corporation is your single source for the highest quality stainless steel piping, tubing and fabricated products. Historically, our industry indicates that the highest returns on any business investments are realized when any given supplier delivers a complete combination of value, products, services and personal performances. Due to a strong commitment to this critical and primary belief, this has been the Felkers Brothers' business philosophy for more than 100 years. Today, Felker Brothers is recognized as the leading supplier of the highest quality, corrosion resistant, stainless steel pipe, tube, fittings, accessories and fabricated pipe systems.



Some of the unique qualities and values of Felker Brothers' stainless steel pipe products include:

- **Commitment to complete customer satisfaction:** Our customers are *always* the primary reason and purpose for everything we do. Total and complete customer satisfaction in terms of our products, services and punctuality is our bottom line. Prompt and reliable customer service is our goal.
- **Complete product selection:** With more than 100 years of specialized experience and product knowledge, no other manufacturer produces the variety of stainless steel pipe products and size as those provided by Felker Brothers.
- **ISO 9001 Certified:** Felker Brothers' quality management system is registered to the ISO 9001 standard. Our manufacturing quality is also consistently higher than industry standards and specifications.
- **Strong distributor network:** Felker Brothers' pipe products are primarily made to stock, sold and serviced via a distributor network strategically located throughout the United States, Canada, and Mexico. With our uniquely developed distributor network, working and doing business with us can be as easy as a telephone call or an e-mail.
- **Comprehensive catalog and technical information:** Our product catalog provides the most complete product, application and capabilities information available to the industry. All information is designed to be user-friendly; helping you select and order products you need with ease and accuracy. For further information, please visit us at: www.felkerbrothers.com.
- **Competitive pricing:** So how can a company, such as Felker Brothers, offer such a comprehensive combination of value with the highest quality, corrosion resistant, stainless steel pipe products at competitive pricing?



The answer is twofold. First, we are fortunate to have a large number of long-time customers whose high and steady volume allows us to purchase our raw materials directly from the steel mills. This direct volume buying gives Felker Brothers the highest quality raw material at the lowest possible price. This represents the extreme quality and cost savings which we can then pass along to our valued customers. Second, Felker Brothers has always been a family owned and operated company. From its early origin in 1903, this family ownership has been committed to pioneering and implementing the most modern manufacturing facilities, diversified product capabilities and information technologies possible.

SPECIALTY PRODUCTS

CUSTOM FABRICATIONS AND SPECIALTY FITTINGS

Felker Brothers Corporation manufactures a variety of custom fabrications and specialty fittings to suit customer's needs. Fittings can be manufactured to unique specifications, alloys and dimensions.

Examples:

- Long and Short Radius Mitered Elbows
- Mitered Reducing Elbows
- Reducing Tees, Wyes and Laterals
- Crosses
- Reducers
- Stub Ends
- Extruded Outlets



FABRICATED PRODUCTS

Felker Brothers Corporation is your single source for fabricated pipe systems—all ISO 9001 certified and in accordance with PFI Standard ES-3.

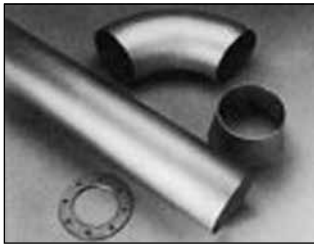
Examples:

- Prefabricated Pipe Systems
- Wall Sleeves and Inserts
- Custom Transitions
- Venturi Elbows
- Headers



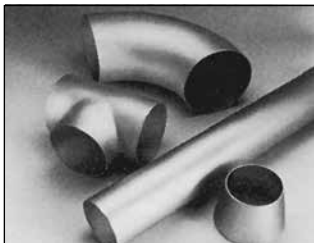
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MISCELLANEOUS



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SPECIFICATIONS

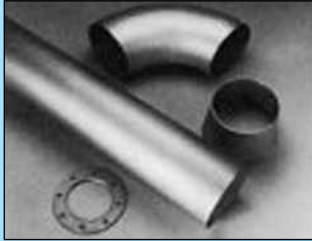


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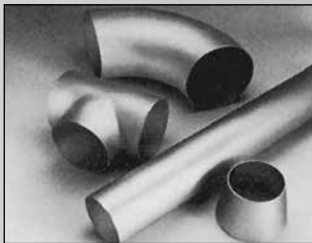




PIPE



PIPE



TUBE



MISCELLANEOUS



SPECIFICATIONS

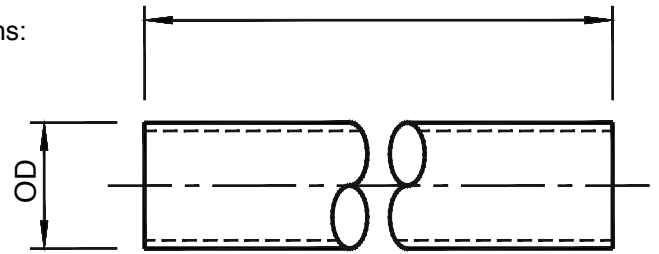
304L & 316L STAINLESS STEEL

Felker furnishes pipe in accordance with the following specifications:

- ASTM A-312/ASME SA-312 2" through 24"*
- ASTM A-358/ASME SA-358 3" through 24"*
- ASTM A-778 3" and larger*

- Sizes larger than 48" available upon request.
- OD and wall thickness are given in inches.
- Wall thickness is nominal.
- Available end configurations are described in the specifications section on page 46.
- ASTM A-312 pipe 3" and larger qualifies to ASME B31.1 90% joint efficiency requirements.
- ASTM A-312 pipe certified to Supplementary Requirement S5 radiographic examination is available upon request.

(See note below for length specifications.)



- Stock sizes in 21 foot random lengths through 12". 14" through 42" stock in 20 foot random lengths. Sizes larger than 42" are in 10 foot lengths. Special lengths are available upon request.
- Other alloys are available upon request.

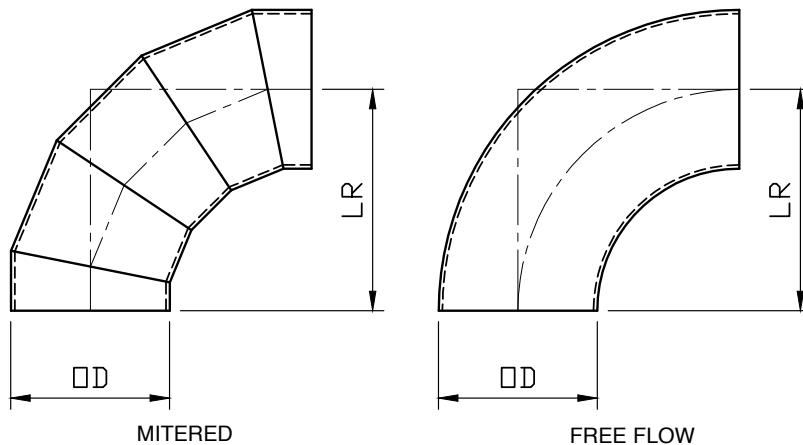
NOMINAL PIPE SIZE	OD	A-312/A-778 SCHEDULE PIPE			A-778 GAUGE PIPE									
		SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	.065 1.62	.109 2.66	.154 3.69	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	.083 2.50	.120 3.56	.203 5.85	-	-	-	-	-	-	-	-	-	-
3	3.500	.083 3.06	.120 4.37	.216 7.65	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
3 1/2	4.000	.083 3.50	.120 5.02	.226 9.91	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4	4.500	.083 3.95	.120 5.67	.237 10.89	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5	5.563	.109 6.41	.134 7.84	.258 14.75	4.61	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	.109 7.66	.134 9.38	.280 19.15	5.50	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
8	8.625	.109 10.01	.148 13.52	.322 28.82	7.19	SEE SCH5S	11.45	SEE SCH10S	-	22.57	-	-	-	-
10	10.750	.134 15.34	.165 18.83	.365 40.86	8.97	12.50	SEE SCH5S	16.01	21.41	28.30	-	-	-	-
12	12.750	.156 21.18	.180 24.39	.375 50.03	10.66	14.85	17.01	19.03	SEE SCH10S	33.69	SEE SCH40S	-	-	-
14	14.000	.156 23.28	.188 27.99	.375 55.08	11.71	16.32	18.70	20.92	SEE SCH10S	37.06	SEE SCH40S	-	-	-
16	16.000	.165 28.17	.188 32.05	.375 63.16	13.39	18.67	21.39	23.94	SEE SCH10S	42.45	SEE SCH40S	-	-	-
18	18.000	.165 31.72	.188 36.10	.375 71.25	15.07	21.02	24.09	26.95	SEE SCH10S	47.84	SEE SCH40S	82.92	-	-
20	20.000	.188 40.15	.218 46.49	.375 79.33	16.75	23.37	26.78	29.97	SEE SCH5S	53.23	SEE SCH40S	105.11	-	-
24	24.000	.218 55.89	.250 64.01	.375 95.50	20.11	28.07	32.17	36.01	48.26	SEE SCH10S	SEE SCH40S	142.00	-	-
30	30.000	.250 80.18	.312 99.85	.375 119.76	25.16	35.12	40.26	45.06	60.42	SEE SCH5S	SEE SCH40S	159.01	197.91	-
36	36.000	-	-	-	30.20	42.17	48.34	54.12	72.58	96.35	144.01	189.57	236.13	-
42	42.000	-	-	-	35.25	49.22	56.43	63.18	84.74	112.52	168.27	223.69	278.76	-
48	48.000	-	-	-	40.29	56.27	64.51	72.23	96.90	128.69	192.52	256.03	319.19	-

BLUE = WALL THICKNESS
BLACK = POUNDS PER FOOT (LBS/FT)

90° ELBOWS LR

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 specifications.
- Sizes larger than 48" are available upon request.
- Elbows **shown in bold number** are (5) pc mitered construction.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	LR	A-403/A-774 90° ELBOWS			A-774 GAUGE 90° ELBOWS									
			SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	3.00	.065 1.00	.109 1.10	.154 1.60	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	3.75	.083 1.24	.120 1.80	.203 3.20	-	-	-	-	-	-	-	-	-	-
3	3.500	4.50	.083 2.40	.120 2.70	.216 5.00	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4	4.500	6.00	.083 4.10	.120 4.60	.237 9.00	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5	5.563	7.50	.109 6.60	.134 8.40	.258 15.50	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	9.00	.109 10.50	.134 12.00	.280 24.50	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
8	8.625	12.00	.109 17.00	.148 21.60	.322 50.00	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-	-
10	10.750	15.00	.134 32.60	.165 35.50	.365 88.00	-	25.60	SEE SCH5S	32.60	35.50	-	-	-	-	-
12	12.750	18.00	.156 50.50	.180 57.60	.375 125.00	-	36.40	41.10	46.40	SEE SCH10S	-	SEE SCH40S	-	-	-
14	14.000	21.00	.156 62.20	.188 80.00	.375 155.00	-	-	52.90	59.50	SEE SCH10S	-	SEE SCH40S	-	-	-
16	16.000	24.00	.165 84.60	.188 104.00	.375 208.00	-	-	69.10	77.70	SEE SCH10S	-	SEE SCH40S	-	-	-
18	18.000	27.00	.165 115.00	.188 133.00	.375 264.00	-	-	85.30	98.30	SEE SCH10S	-	SEE SCH40S	-	-	-
20	20.000	30.00	.188 163.60	.218 189.40	.375 323.00	-	-	110.00	123.00	SEE SCH5S	-	SEE SCH40S	-	-	-
24	24.000	36.00	.218 275.00	.250 315.40	.375 470.00	-	-	158.00	178.00	240.44	SEE SCH10S	SEE SCH40S	-	-	-
30	30.000	45.00	.250 490.30	.312 610.00	.375 732.00	-	-	-	276.00	373.14	SEE SCH5S	SEE SCH40S	-	-	-
36	36.000	54.00	-	-	-	-	-	-	400.00	534.85	704.10	1052.00	1536.00	1920.00	-
42	42.000	63.00	-	-	-	-	-	461.00	512.00	725.60	869.00	1501.00	2098.00	2622.00	-
48	48.000	72.00	-	-	-	-	-	602.00	670.00	945.37	1137.00	1963.00	2723.00	3404.00	-

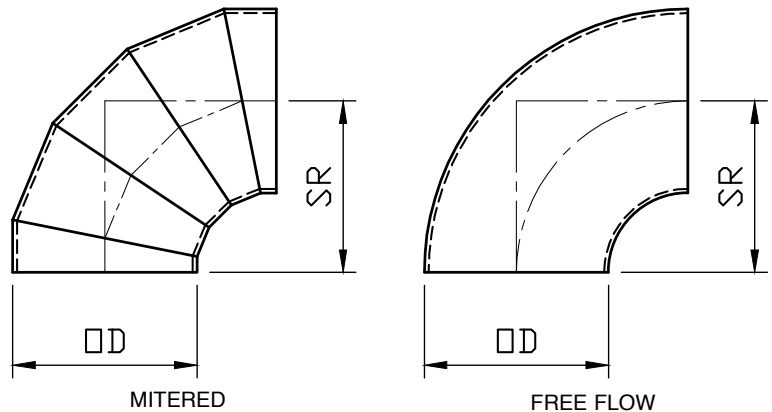
BLUE = WALL THICKNESS
BLACK = POUNDS



90° ELBOWS SR

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 specifications.
- Sizes larger than 48" are available upon request.
- Elbows **shown in bold number** are (5) pc mitered construction.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	SR	SCH10S	SCH40S	1/2 .500	5/8 .625
2	2.375	2.00	.109 .815	.154 1.12	-	-
2 1/2	2.875	2.50	.120 1.37	.203 2.25	-	-
3	3.500	3.00	.120 2.17	.216 3.31	-	-
4	4.500	4.00	.120 3.79	.237 6.88	-	-
5	5.563	5.00	.134 6.13	.258 11.64	-	-
6	6.625	6.00	.134 9.15	.280 17.50	-	-
8	8.625	8.00	.148 14.12	.322 37.60	-	-
10	10.750	10.00	.165 24.64	.365 63.00	-	-
12	12.750	12.00	.180 38.18	.375 80.00	-	-
14	14.000	14.00	.188 51.28	.375 101.00	-	-
16	16.000	16.00	.188 67.04	.375 131.00	-	-
18	18.000	18.00	.188 84.80	.375 175.00	-	-
20	20.000	20.00	.218 121.43	.375 215.00	-	-
24	24.000	24.00	.250 200.69	.375 302.00	-	-
30	30.000	30.00	.312 397.32	.375 476.55	-	-
36	36.000	36.00	-	-	1047.00	1309.00
42	42.000	42.00	-	-	1405.00	1756.00
48	48.000	48.00	-	-	1839.00	2298.00

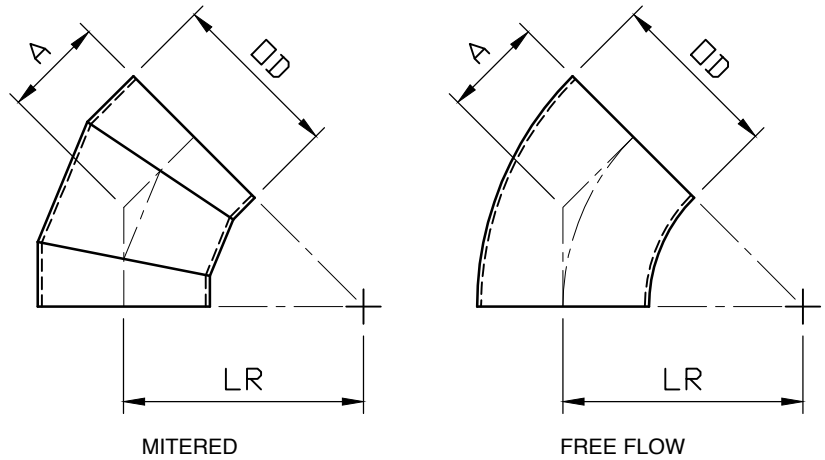
BLUE = WALL THICKNESS
BLACK = POUNDS



45° ELBOWS LR

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 specifications.
- Sizes larger than 48" are available upon request.
- Elbows **shown in bold number** are (3) pc mitered construction.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.



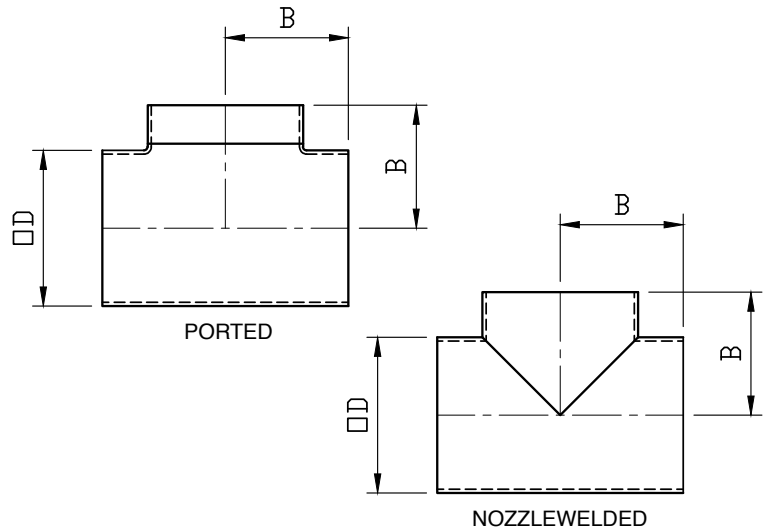
NOMINAL PIPE SIZE	OD	LR	A	A-403/A-774 45° ELBOWS			A-774 GAUGE 45° ELBOWS									
				SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	3.000	1.375	.065 .31	.109 .56	.154 .88	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	3.750	1.750	.083 .75	.120 1.06	.203 1.69	-	-	-	-	-	-	-	-	-	-
3	3.500	4.500	2.000	.083 1.10	.120 1.40	.216 1.76	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4	4.500	6.000	2.500	.083 1.50	.120 2.31	.237 4.50	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5	5.563	7.500	3.125	.109 3.30	.134 4.77	.258 7.50	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	9.000	3.750	.109 4.70	.134 6.00	.280 12.00	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
8	8.625	12.000	5.000	.109 8.50	.148 10.80	.322 23.00	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-	-
10	10.750	15.000	6.250	.134 16.90	.165 17.70	.365 43.00	-	13.30	SEE SCH5S	16.90	-	-	-	-	-	-
12	12.750	18.000	7.500	.156 25.30	.188 28.80	.375 62.00	-	18.70	21.10	23.80	SEE SCH10S	-	SEE SCH40S	-	-	-
14	14.000	21.000	8.750	.156 32.40	.188 40.00	.375 77.00	-	-	27.30	30.70	SEE SCH10S	-	SEE SCH40S	-	-	-
16	16.000	24.000	10.000	.165 42.30	.188 52.00	.375 100.95	-	-	35.50	39.90	SEE SCH10S	-	SEE SCH40S	-	-	-
18	18.000	27.000	11.250	.165 53.50	.188 67.00	.375 133.00	-	-	42.60	50.80	SEE SCH10S	-	SEE SCH40S	-	-	-
20	20.000	30.000	12.500	.188 82.00	.218 94.80	.375 162.00	-	-	55.00	61.50	SEE SCH5S	-	SEE SCH40S	-	-	-
24	24.000	36.000	15.000	.218 137.50	.250 158.00	.375 236.00	-	-	79.00	89.00	124.25	SEE SCH10S	SEE SCH40S	-	-	-
30	30.000	45.000	18.500	.250 245.00	.312 305.00	.375 366.00	-	-	-	138.00	191.61	SEE SCH5S	SEE SCH40S	-	-	-
36	36.000	54.000	22.250	-	-	-	-	-	-	200.00	273.48	352.00	526.00	785.00	982.00	-
42	42.000	63.000	26.000	-	-	-	-	-	230.00	256.00	369.85	433.00	750.00	1079.00	1349.00	-
48	48.000	72.000	30.000	-	-	-	-	-	301.00	335.00	480.75	607.00	981.00	1396.00	1745.00	-

BLUE = WALL THICKNESS
BLACK = POUNDS



304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 CR specifications.
- Sizes larger than 48" are available upon request.
- Tees **shown in bold number** are nozzle welded construction.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	B	A-403 CR/ A-774			A-774 GAUGE TEES									
			SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	2.500	.065 1.07	.109 1.80	.154 3.50	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	3.000	.083 2.07	.120 3.00	.203 6.00	-	-	-	-	-	-	-	-	-	-
3	3.500	3.375	.083 2.20	.120 3.10	.216 6.50	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4	4.500	4.125	.083 3.40	.120 4.70	.237 7.00	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5	5.563	4.875	.109 6.00	.134 7.10	.258 10.50	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	5.625	.109 8.40	.134 10.30	.280 15.70	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
8	8.625	7.000	.109 13.40	.148 18.10	.322 27.90	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-	-
10	10.750	8.500	.134 24.30	.165 29.80	.365 46.10	-	20.50	SEE SCH5S	24.30	29.70	58.80	-	-	-	-
12	12.750	10.000	.156 31.90	.180 42.70	.375 64.90	-	26.00	27.90	34.90	SEE SCH10S	71.10	SEE SCH40S	-	-	-
14	14.000	11.000	.156 44.70	.188 53.60	.375 88.00	-	31.40	35.90	43.80	SEE SCH10S	86.80	SEE SCH40S	-	-	-
16	16.000	12.000	.165 57.40	.188 65.30	.375 107.20	-	38.30	43.80	53.40	SEE SCH10S	110.00	SEE SCH40S	-	-	-
18	18.000	13.500	.165 72.60	.188 82.80	.375 130.60	-	48.50	55.40	67.70	SEE SCH10S	135.80	SEE SCH40S	-	-	-
20	20.000	15.000	.188 102.20	.218 118.10	.375 165.60	-	59.90	68.50	83.50	SEE SCH5S	145.70	SEE SCH40S	-	-	-
24	24.000	17.000	.218 156.10	.250 179.40	.375 203.15	-	79.10	90.40	101.70	213.16	SEE SCH10S	SEE SCH40S	-	-	-
30	30.000	22.000	.250 296.00	.312 368.70	.375 443.15	-	125.82	143.34	167.70	342.40	SEE SCH5S	SEE SCH40S	-	-	-
36	36.000	26.500	-	-	-	-	182.28	207.68	243.00	492.96	654.22	977.76	1423.00	1778.00	-
42	42.000	30.000	-	-	-	-	237.00	270.00	301.00	649.62	843.90	1262.02	1833.00	2291.00	-
48	48.000	35.000	-	-	-	-	320.00	364.00	405.00	864.06	1039.10	1716.70	2444.00	3055.00	-

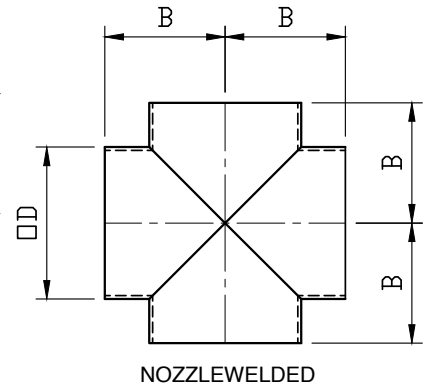
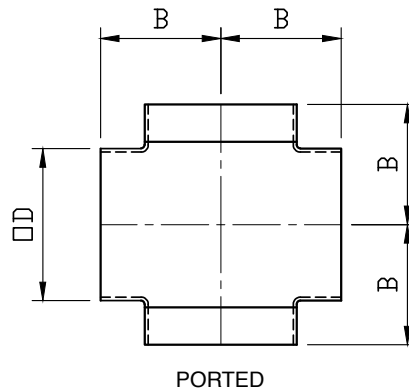
BLUE = WALL THICKNESS
BLACK = POUNDS

Reducing tees, long tangent tees, branchless tees and crosses are available upon request.
Tees and crosses shown in bold numbers are nozzle welded construction.
Manufactured to MSS dimensions through 24". Sizes above 24" B dimensions are equal for tees and crosses.

CROSSES

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 CR specifications.
- Sizes larger than 48" are available upon request.
- Crosses **shown in bold number** are nozzle welded construction.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	B	A-403 CR/ A-774			A-774 GAUGE CROSSES									
			SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	2.500	.065 1.34	.109 2.00	.154 4.25	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	3.000	.083 2.59	.120 3.00	.203 6.00	-	-	-	-	-	-	-	-	-	-
3	3.500	3.375	.083 2.75	.120 4.10	.216 10.80	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4	4.500	4.125	.083 4.25	.120 6.50	.237 18.70	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5	5.563	4.875	.109 7.50	.134 7.10	.258 10.50	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	5.625	.109 10.50	.134 14.50	.280 43.20	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
8	8.625	7.000	.109 16.75	.148 25.00	.322 77.00	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-	-
10	10.750	8.500	.134 30.38	.165 41.00	.365 132.50	-	20.50	SEE SCH5S	24.30	29.70	58.80	-	-	-	-
12	12.750	10.000	.156 39.88	.180 90.00	.375 183.20	-	26.00	27.90	34.90	SEE SCH10S	71.10	SEE SCH40S	-	-	-
14	14.000	11.000	.156 91.19	.188 109.47	.375 215.75	-	31.40	35.90	43.80	SEE SCH10S	86.80	SEE SCH40S	-	-	-
16	16.000	12.000	.165 119.69	.188 136.18	.375 268.37	-	38.30	43.80	53.40	SEE SCH10S	110.00	SEE SCH40S	-	-	-
18	18.000	13.500	.165 150.64	.188 171.44	.375 338.37	-	48.50	55.40	67.70	SEE SCH10S	135.80	SEE SCH40S	-	-	-
20	20.000	15.000	.188 210.75	.218 244.03	.375 424.12	-	59.90	68.50	83.50	SEE SCH5S	145.70	SEE SCH40S	-	-	-
24	24.000	17.000	.218 330.70	.250 378.75	.375 575.72	-	79.10	90.40	101.70	285.55	SEE SCH10S	SEE SCH40S	-	-	-
30	30.000	22.000	.250 608.09	.312 757.26	.375 908.26	-	125.82	143.34	167.70	458.23	SEE SCH5S	SEE SCH40S	-	-	-
36	36.000	26.500	-	-	-	-	182.28	207.68	243.00	659.32	875.24	1308.10	1423.00	1778.00	-
42	42.000	30.000	-	-	-	-	237.00	270.00	301.00	688.50	1153.22	1724.60	1833.00	2291.00	-
48	48.000	35.000	-	-	-	-	320.00	364.00	405.00	1154.76	1388.69	2294.26	2444.00	3055.00	-

BLUE = WALL THICKNESS
BLACK = POUNDS

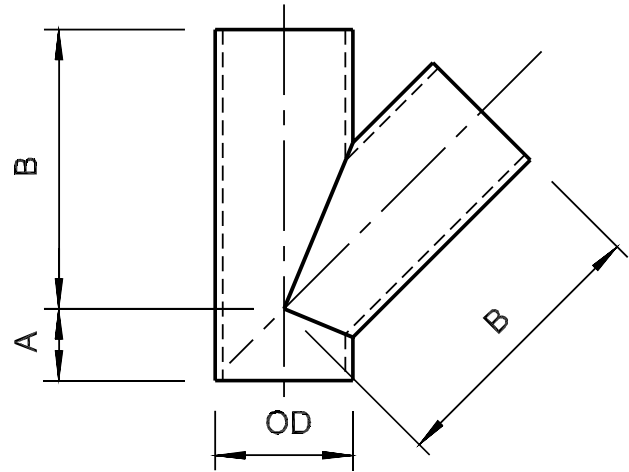
Reducing long tangent and branchless crosses are available upon request.
Manufactured to MSS dimensions through 24". Sizes above 24" B dimensions are equal for crosses.



45° LATERALS

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 CR specifications.
- Sizes larger than 48" are available upon request.
- OD and wall thickness are given in inches.
- Reducing laterals are available upon request.
- Available end configurations are described in the specifications section on page 46.



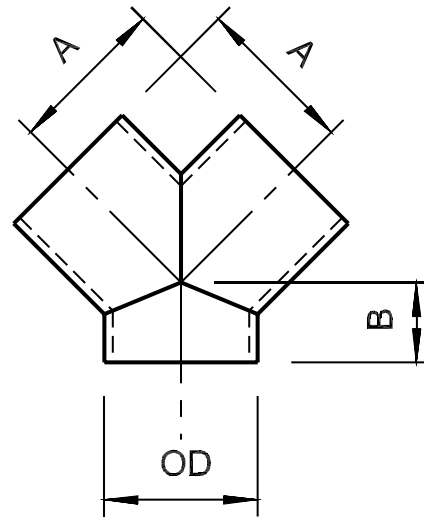
NOMINAL PIPE SIZE	OD	A	B	A-403 CR/ A-774			A-774 GAUGE 45° LATERALS									
				SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	2.50	8.00	.065 2.30	.109 3.70	.154 5.20	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	2.50	9.50	.083 3.80	.120 5.80	.203 9.80	-	-	-	-	-	-	-	-	-	-
3	3.500	3.00	10.00	.083 4.90	.120 7.60	.216 13.70	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4	4.500	3.00	12.00	.083 7.30	.120 11.30	.237 22.30	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5	5.563	3.50	13.50	.109 13.80	.134 17.00	.258 32.70	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	3.50	14.50	.109 17.20	.134 21.80	.280 44.20	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
8	8.625	4.50	17.50	.109 26.80	.148 34.10	.322 77.00	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-	-
10	10.750	5.00	20.50	.134 48.80	.165 52.90	.365 132.00	-	38.30	SEE SCH5S	48.80	60.20	85.00	-	-	-	-
12	12.750	5.50	24.50	.156 74.60	.180 84.90	.375 187.00	-	54.00	61.20	68.70	SEE SCH10S	121.00	SEE SCH40S	-	-	-
14	14.000	6.00	27.00	.156 97.00	.188 110.00	.375 220.00	-	65.40	74.10	83.20	SEE SCH10S	146.00	SEE SCH40S	-	-	-
16	16.000	6.50	30.00	.165 121.00	.188 139.00	.375 276.00	-	82.20	93.20	104.70	SEE SCH10S	184.00	SEE SCH40S	-	-	-
18	18.000	7.00	32.00	.165 144.00	.188 164.00	.375 327.00	-	97.20	110.30	123.90	SEE SCH10S	218.00	SEE SCH40S	-	-	-
20	20.000	8.00	35.00	.188 200.00	.218 232.00	.375 399.00	-	118.00	134.00	151.00	SEE SCH5S	266.00	SEE SCH40S	-	-	-
24	24.000	9.00	40.50	.218 318.00	.250 365.00	.375 547.00	-	162.00	184.00	207.00	369.96	SEE SCH10S	SEE SCH40S	-	-	-
30	30.000	10.00	49.00	.250 540.00	.312 675.00	.375 811.00	-	-	-	306.00	533.01	540.00	SEE SCH40S	-	-	-
36	36.000	11.00	58.00	-	-	-	-	-	-	438.00	780.24	1035.76	1548.00	2252.00	2810.00	-
42	42.000	26.00	69.00	-	-	-	-	-	-	390.00	1172.21	1556.49	2327.68	3380.00	4226.00	-
48	48.000	27.00	77.00	-	-	-	-	-	-	485.00	1477.73	1777.08	2935.93	4259.00	5324.00	-

BLUE = WALL THICKNESS
BLACK = POUNDS



304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 CR specifications.
- Sizes larger than 48" are available upon request.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	A	B	A-403 CR/ A-774			A-774 GAUGE WYES									
				SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2	2.375	4.00	2.50	.065 1.40	.109 2.20	.154 3.10	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	4.63	2.50	.083 2.20	.120 3.30	.203 5.40	-	-	-	-	-	-	-	-	-	-
3	3.500	5.50	3.00	.083 3.10	.120 4.40	.216 7.60	SEE SCH5S	SEE SCH10S	4.80	-	-	-	-	-	-	-
4	4.500	6.50	3.00	.083 4.50	.120 6.40	.237 12.10	SEE SCH5S	SEE SCH10S	7.00	-	-	-	-	-	-	-
5	5.563	7.50	3.50	.109 8.80	.134 11.10	.258 20.40	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6	6.625	8.00	3.50	.109 10.50	.134 12.20	.280 25.40	-	SEE SCH5S	SEE SCH10S	13.70	-	-	-	-	-	-
8	8.625	9.00	4.50	.109 15.90	.148 20.30	.322 44.20	-	SEE SCH5S	18.00	SEE SCH10S	-	-	-	-	-	-
10	10.750	11.00	5.00	.134 30.20	.165 32.80	.365 72.60	-	23.70	SEE SCH5S	30.20	37.30	53.00	-	-	-	-
12	12.750	12.00	5.50	.156 41.80	.180 47.50	.375 99.00	-	30.20	34.20	38.40	SEE SCH10S	68.00	SEE SCH40S	-	-	-
14	14.000	14.00	6.00	.156 57.00	.188 65.00	.375 130.00	-	38.70	43.80	49.20	SEE SCH10S	87.00	SEE SCH40S	-	-	-
16	16.000	15.00	6.50	.165 69.00	.188 79.00	.375 158.00	-	46.80	53.00	59.60	SEE SCH10S	105.00	SEE SCH40S	-	-	-
18	18.000	16.50	7.00	.165 85.00	.188 97.00	.375 194.00	-	57.30	65.00	73.10	SEE SCH10S	129.00	SEE SCH40S	-	-	-
20	20.000	18.00	8.00	.188 118.50	.218 137.00	.375 236.00	-	69.90	79.30	89.10	SEE SCH5S	158.00	SEE SCH40S	-	-	-
24	24.000	22.00	9.00	.218 199.00	.250 228.00	.375 343.00	-	101.00	115.00	129.00	223.20	SEE SCH10S	SEE SCH40S	-	-	-
30	30.000	25.00	10.00	.250 315.00	.312 393.00	.375 473.00	-	-	-	178.00	314.67	SEE SCH5S	SEE SCH40S	-	-	-
36	36.000	28.00	11.00	-	-	-	-	-	-	233.00	420.31	557.96	833.90	1213.00	1516.00	-
42	42.00	31.00	26.00	-	-	-	-	-	-	517.00	639.02	848.51	1228.92	1843.00	2303.00	-
48	48.00	34.00	27.00	-	-	-	-	-	-	644.00	787.31	946.81	1564.23	2269.00	2836.00	-

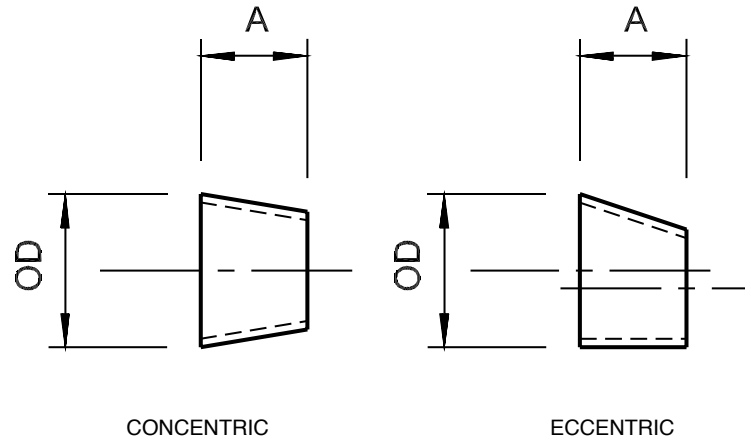
BLUE = WALL THICKNESS
BLACK = POUNDS



REDUCERS

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 and A-403 specifications.
- Felker furnishes both Concentric and Eccentric Reducers.
- Sizes larger than 48" and multiple step reducers are available upon request. Multiple step reducers are manufactured to the same length as standard reducers using the large OD dimension.
- Weights for Concentric and Eccentric Reducers are the same.
- OD and wall thickness are given in inches.
- Long tangent reducers are available upon request.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	A	A-403/A-774 REDUCERS			A-774 GAUGE REDUCERS									
			SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	3/8 .375	1/2 .500	5/8 .625
2 x 1 1/2	2.375	3.00	.065 .38	.109 .85	.154 .90	-	-	-	-	-	-	-	-	-	-
2 1/2 x 2	2.875	3.50	.083 .62	.120 1.18	.203 1.50	-	-	-	-	-	-	-	-	-	-
3 x 2 1/2	3.500	3.50	.083 .76	.120 1.53	.216 2.00	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
4 x 3	4.500	4.00	.083 1.19	.120 2.28	.237 3.40	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-	-
5 x 4	5.563	5.00	.109 2.50	.134 2.70	.258 6.00	1.50	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
6 x 4	6.625	5.50	.109 3.20	.134 4.10	.280 8.20	2.30	SEE SCH5S	SEE SCH10S	4.10	-	-	-	-	-	-
8 x 6	8.625	6.00	.109 4.80	.148 6.10	.322 13.20	3.50	SEE SCH5S	5.40	SEE SCH10S	-	-	-	-	-	-
10 x 8	10.750	7.00	.134 9.00	.165 9.60	.365 22.00	5.10	7.10	SEE SCH5S	9.00	11.10	16.10	-	-	-	-
12 x 10	12.750	8.00	.156 13.30	.180 15.20	.375 36.67	7.00	9.80	11.10	12.40	SEE SCH10S	22.00	SEE SCH40S	-	-	-
14 x 12	14.000	13.00	.156 26.30	.188 30.40	.375 73.62	12.70	17.70	20.10	22.60	SEE SCH10S	40.40	SEE SCH40S	-	-	-
16 x 14	16.000	14.00	.165 29.50	.188 36.80	.375 82.92	-	21.50	24.40	27.40	SEE SCH10S	48.90	SEE SCH40S	-	-	-
18 x 16	18.000	15.00	.165 35.50	.188 44.80	.375 99.20	-	26.10	29.60	33.20	SEE SCH10S	59.60	SEE SCH40S	-	-	-
20 x 18	20.000	20.00	.188 69.10	.218 92.70	.375 151.00	-	38.70	43.90	49.30	SEE SCH5S	92.70	SEE SCH40S	-	-	-
24 x 20	24.000	20.00	.218 94.20	.250 108.00	.375 173.00	-	44.70	50.70	57.00	83.27	SEE SCH10S	SEE SCH40S	-	-	-
30 x 24	30.000	24.00	.250 159.00	.312 199.00	.375 237.00	-	-	-	84.10	124.14	SEE SCH5S	SEE SCH40S	-	-	-
36 x 30	36.000	24.00	-	-	-	-	-	-	95.60	152.78	194.00	291.00	436.00	545.00	-
42 x 36	42.000	24.00	-	-	-	-	-	-	113.00	181.85	182.00	334.00	510.00	637.00	-
48 x 42	48.000	28.00	-	-	-	-	-	-	152.00	211.35	247.00	386.00	588.00	735.00	-

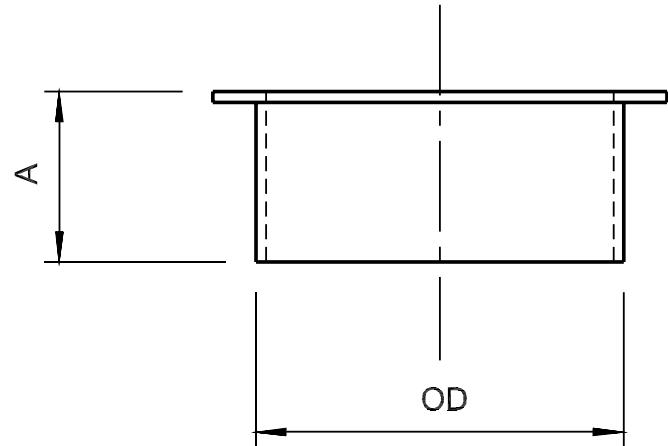
BLUE = WALL THICKNESS
BLACK = POUNDS



STUB ENDS-STANDARD

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- Sizes larger than 48" and special lengths are available upon request.
- OD and wall thickness are given in inches.
- Manufactured to MSS dimensions.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	A	A-774 STUB ENDS-STANDARD			A-774 GAUGE STUB ENDS-STANDARD								
			SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	1/2 .500	5/8 .625
2	2.375	2.500	.065 .66	.109 .87	.154 1.09	-	-	-	-	-	-	-	-	-
2 1/2	2.875	2.500	.083 .87	.120 1.09	.203 1.58	-	-	-	-	-	-	-	-	-
3	3.500	2.500	.083 1.02	.120 1.29	.216 1.97	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
4	4.500	3.000	.083 1.58	.120 2.01	.237 3.31	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
5	5.563	3.000	.109 2.41	.134 2.77	.258 4.50	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-
6	6.625	3.500	.109 3.18	.134 3.69	.280 6.54	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-
8	8.625	4.000	.109 4.54	.148 5.71	.322 10.81	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-
10	10.750	5.000	.134 7.89	.165 9.35	.365 18.53	-	6.71	SEE SCH5S	8.00	9.50	-	-	-	-
12	12.750	6.000	.156 13.19	.180 14.80	.375 27.62	-	10.05	11.30	12.35	SEE SCH10S	-	-	-	-
14	14.000	6.000	.156 16.94	.188 19.30	-	-	-	14.85	16.00	SEE SCH10S	-	-	-	-
16	16.000	6.000	.165 20.09	.188 22.03	-	-	-	16.90	18.25	SEE SCH10S	-	-	-	-
18	18.000	6.000	.165 22.56	.188 24.76	-	-	-	19.00	20.50	SEE SCH10S	31.05	-	-	-
20	20.000	6.000	.188 27.50	.218 30.65	-	-	-	21.05	22.75	SEE SCH5S	-	-	-	-
24	24.000	6.000	.218 36.75	.250 40.81	-	-	-	25.20	27.25	31.65	SEE SCH10S	-	-	-
30	30.000	6.000	.250 55.00	.312 64.63	-	-	-	-	32.75	43.30	SEE SCH5S	-	-	-
36	36.000	6.000	-	-	-	-	-	-	45.10	51.75	66.50	122.00	148.00	-
42	42.000	6.000	-	-	-	-	-	-	54.00	64.00	78.00	142.00	172.00	-
48	48.000	6.000	-	-	-	-	-	-	62.00	73.00	89.00	162.00	197.00	-

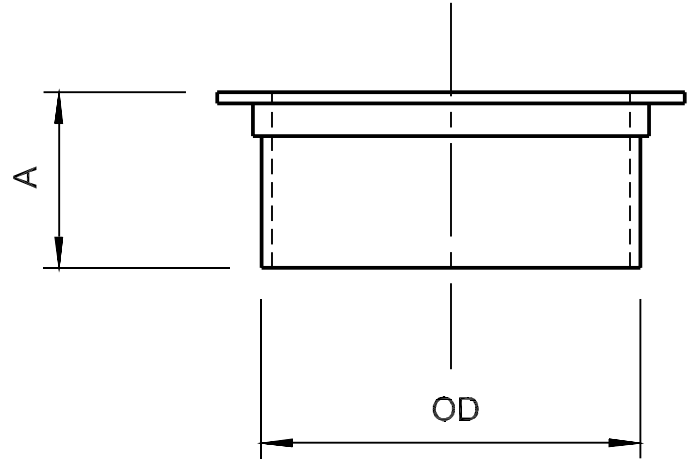
BLUE = WALL THICKNESS
BLACK = POUNDS



STUB ENDS-ANGLE

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- Sizes larger than 48" and special lengths are available upon request.
- OD and wall thickness are given in inches.
- Manufactured to MSS dimensions.
- Available end configurations are described in the specifications section on page 46.



NOMINAL PIPE SIZE	OD	A	A-774 STUB ENDS-ANGLE			A-774 GAUGE STUB ENDS-ANGLE								
			SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172	3/16 .188	1/4 .250	1/2 .500	5/8 .625
2	2.375	2.500	.065 .70	.109 .91	.154 1.13	-	-	-	-	-	-	-	-	-
2 1/2	2.875	2.500	.083 1.03	.120 1.25	.203 1.74	-	-	-	-	-	-	-	-	-
3	3.500	2.500	.083 1.34	.120 1.61	.216 2.29	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
4	4.500	3.000	.083 1.89	.120 2.32	.237 3.62	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-	-
5	5.563	3.000	.109 2.90	.134 3.26	.258 5.00	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-
6	6.625	3.500	.109 3.73	.134 4.24	.280 7.09	-	SEE SCH5S	SEE SCH10S	-	-	-	-	-	-
8	8.625	4.000	.109 6.24	.148 7.41	.322 17.50	-	SEE SCH5S	-	SEE SCH10S	-	-	-	-	-
10	10.750	5.000	.134 11.00	.165 12.45	.365 21.60	-	9.80	SEE SCH5S	11.10	12.70	-	-	-	-
12	12.750	6.000	.156 19.00	.180 20.60	.375 33.40	-	15.85	17.10	18.15	SEE SCH10S	-	-	-	-
14	14.000	6.000	.156 21.00	.188 23.40	-	-	-	18.95	20.10	SEE SCH10S	-	-	-	-
16	16.000	6.000	.165 25.00	.188 27.00	-	-	-	21.70	23.05	SEE SCH10S	-	-	-	-
18	18.000	6.000	.165 27.50	.188 30.00	-	-	-	23.80	25.30	SEE SCH10S	-	-	-	-
20	20.000	6.000	.188 33.00	.218 36.00	-	-	-	26.70	28.35	SEE SCH5S	-	-	-	-
24	24.000	6.000	.218 49.00	.250 60.09	-	-	-	37.50	39.50	44.00	SEE SCH10S	-	-	-
30	30.000	6.000	.250 66.00	.312 84.00	-	-	-	-	49.00	54.50	SEE SCH5S	-	-	-
36	36.000	6.000	-	-	-	-	-	-	59.00	65.50	81.00	136.00	162.00	-
42	42.000	6.000	-	-	-	-	-	-	74.00	79.00	98.00	162.00	192.00	-
48	48.000	6.000	-	-	-	-	-	-	84.00	89.00	112.00	184.00	219.00	-

BLUE = WALL THICKNESS
BLACK = POUNDS



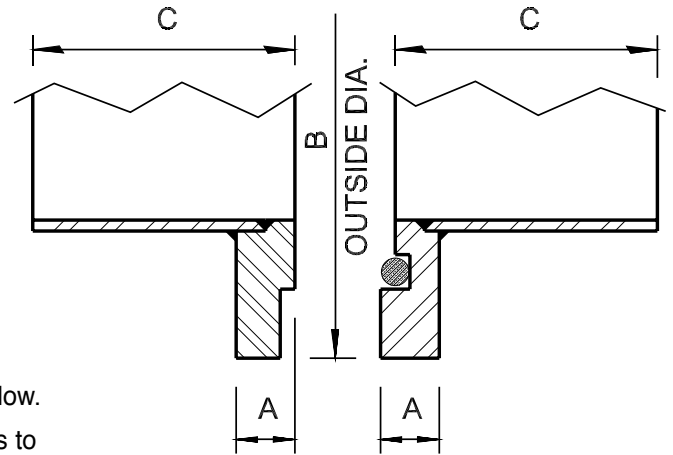
METAL TO METAL CONNECTORS

304L & 316L STAINLESS STEEL

A Metal to Metal Connector consists of one pair of stub ends (one male and one female) and a 1/8" diameter 60 durometer neoprene o-ring.

Metal to Metal Connectors can be joined by means of a Felker Metal to Metal Clamp or by using two standard Felker Back-Up Flanges.

- Manufactured in accordance to ASTM A-774 specifications.
- OD and wall thickness are given in inches.
- Sizes larger than 48" and special lengths are available upon request.
- Manufactured to MSS stub end length dimensions.
- METAL TO METAL SEATING - No gasket protrusion to restrict flow.
- ADAPTERS AVAILABLE - Convert flanges on pumps and valves to mate with metal to metal connectors.



NOMINAL PIPE SIZE	OD	A	B	C	A-774 METAL TO METAL CONNECTORS			A-774 GAUGE METAL TO METAL CONNECTORS				
					SCH5S	SCH10S	SCH40S	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
1	1.315	.312	2.500	2.000	.065 .45	.109 .55	.133 1.20	-	-	-	-	-
1 1/2	1.900	.312	3.250	2.000	.065 .65	.109 .80	.145 1.80	-	-	-	-	-
2	2.375	.312	3.750	2.500	.065 .90	.109 1.10	.154 1.90	-	-	-	-	-
2 1/2	2.875	.312	4.750	2.500	.083 1.00	.120 1.90	.203 2.00	-	-	-	-	-
3	3.500	.312	4.750	2.500	.083 1.30	.120 1.60	.216 2.30	SEE SCH5S	SEE SCH10S	-	-	-
4	4.500	.312	5.750	3.000	.083 1.90	.120 2.30	.237 3.60	SEE SCH5S	SEE SCH10S	-	-	-
5	5.563	.312	6.750	3.000	.109 2.50	.134 3.15	.258 4.90	-	SEE SCH5S	SEE SCH10S	-	-
6	6.625	.312	7.750	3.500	.109 3.40	.134 3.75	.280 6.60	-	SEE SCH5S	SEE SCH10S	-	-
8	8.625	.312	10.000	4.000	.109 5.15	.148 6.15	.322 11.25	-	SEE SCH5S	5.60	SEE SCH10S	-
10	10.750	.437	12.000	5.000	.134 8.90	.165 10.25	.365 19.40	-	7.71	SEE SCH5S	9.20	10.70
12	12.750	.437	14.250	6.000	.156 14.15	.180 15.65	.375 28.50	-	10.96	12.00	13.10	SEE SCH10S
14	14.000	.560	16.500	6.000	.156 19.50	.188 22.70	.375 36.20	-	15.99	17.20	18.30	20.70
16	16.000	.622	18.500	6.000	.165 23.80	.188 25.65	.375 41.20	-	19.00	20.40	21.70	24.40
18	18.000	.740	20.500	6.000	.165 27.20	.188 29.30	.375 57.00	-	21.80	23.40	24.80	27.90
20	20.000	.740	22.500	6.000	.188 35.50	.218 38.30	.375 62.00	-	27.10	28.80	30.40	33.80
24	24.000	.740	26.500	6.000	.218 45.10	.250 57.50	.375 72.50	-	31.00	33.10	35.00	39.10
30	30.000	.810	33.500	6.000	.250 77.50	.312 87.10	.375 112.00	-	54.90	57.50	59.90	65.00
36	36.000	.810	39.500	6.000	-	-	-	-	-	-	75.00	85.00
42	42.000	1.000	45.500	6.000	-	-	-	-	-	-	131.00	145.00
48	48.000	1.000	51.500	6.000	-	-	-	-	-	-	149.00	166.00

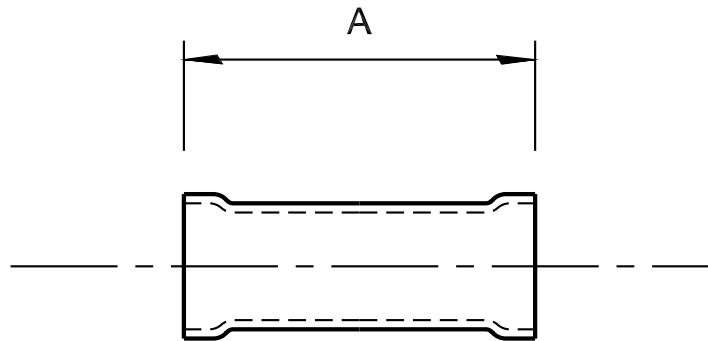
BLUE = WALL THICKNESS
BLACK = POUNDS



BELLED CONNECTORS

316L STAINLESS STEEL

- Manufactured from ASTM A-778 pipe.
- OD and wall thickness are given in inches.
- Gauge sizes are available upon request through 36".



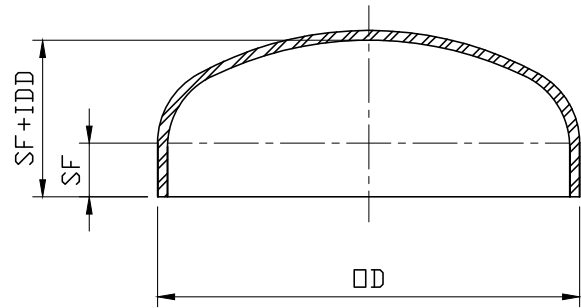
NOMINAL PIPE SIZE	OD	A	BELLED CONNECTORS	
			SCH5S	SCH10S
3	3.500	3.000	.083	.120
			.77	1.10
4	4.500	3.000	.083	.120
			.99	1.42
5	5.563	3.000	.109	.134
			1.61	1.96
6	6.625	3.000	.109	.134
			1.92	2.35
8	8.625	3.000	.109	.148
			2.51	3.38
10	10.750	3.000	.134	.165
			3.84	4.71
12	12.750	3.000	.156	.180
			5.30	6.10
14	14.000	3.000	.156	.188
			5.82	7.00
16	16.000	3.000	.165	.188
			7.05	8.02
18	18.000	3.000	.165	.188
			7.93	9.03
20	20.000	3.000	.188	-
			10.04	

BLUE = WALL THICKNESS
BLACK = POUNDS

WELD CAPS

316L STAINLESS STEEL

- Dimensions are given in inches.

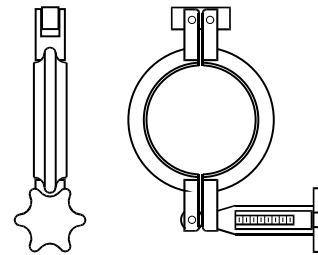


NOMINAL PIPE SIZE	OD	THICKNESS	SF & IDD	SF	LBS
2	2.375	.109	.875	.500	.30
2 1/2	2.875	.120	1	.500	.40
3	3.500	.120	1.125	.500	.72
4	4.500	.120	1.375	.500	1.30
6	6.625	.134	2	.750	3.30
8	8.625	.148	2.5	.750	5.50
10	10.750	.165	3	.750	11.00
12	12.750	.180	3.5	.750	14.50

QUICK CLAMPS

304L STAINLESS STEEL

- Face rings are 316L stainless steel.
- Dimensions are given in inches.



NOMINAL PIPE SIZE	CLAMPS	FACE RINGS				DISC
	LBS	ID	OD	THICKNESS	LBS	LBS
3	2.83	3.520	4.560	10GA	.25	.58
4	3.02	4.520	5.500	10GA	.28	.84
6	3.37	6.650	7.750	10GA	.45	1.66
8	3.76	8.650	9.940	10GA	.67	2.72
10	4.16	10.780	11.840	10GA	.78	3.86
12	4.41	12.780	14.000	10GA	.94	5.28
14	4.80	14.060	15.280	10GA	1.07	6.10
16	5.25	16.060	17.280	10GA	1.21	7.02
18	5.85	18.060	19.280	10GA	1.36	8.20

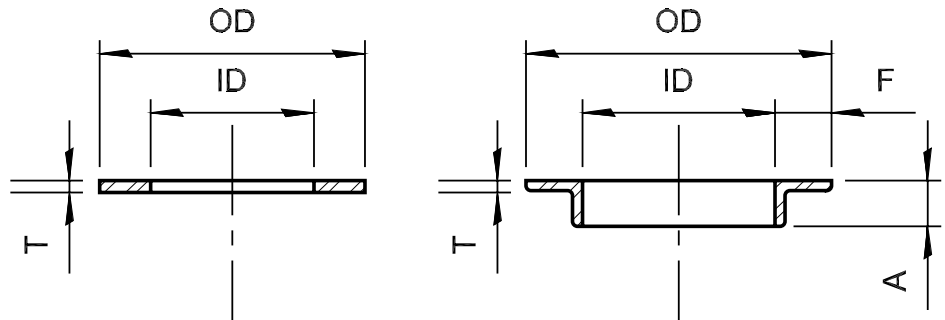
Felker Stainless Steel Quick Clamps were designed for low pressure service applications. They have been used successfully in food, dairy, paper, chemical, and sewage treatment plants for several years. Quick Clamps are used for connecting pipe and fittings or are used with a solid disc for blanking the end of pipe. 1/8" thick neoprene gaskets are furnished with clamps. Two special face rings are required and must be ordered separately per the chart above.



FACE RINGS

316L STAINLESS STEEL

- Dimensions are given in inches.
- Sizes larger than 48" are available upon request.
- **Cast angle ring information in blue.**
- 8" Diameter are rolled angle.
6" Diameter and smaller are pressed rings.



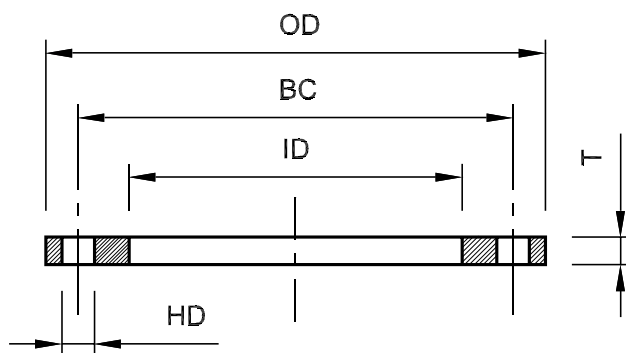
NOMINAL PIPE SIZE	ID	FLAT FACE RINGS				ANGLE FACE RINGS				
		T 10GA (.140)		T 1/4" (.250)		T	F	A	OD	LBS
		OD	LBS	OD	LBS					
1/2	.875	1.688	.05	-	-	1/8	3/8	1/2	1.625	.10
3/4	1.070	2.000	.07	-	-	1/8	1/2	1/2	2.000	.13
1	1.335	2.500	.09	-	-	1/8	9/16	1/2	2.500	.20
1 1/4	1.688	2.500	.11	-	-	1/8	1/2	1/2	2.750	.22
1 1/2	1.920 1.975	3.000	.17	-	-	1/8	5/8	7/16	3.180 3.225	.26
2	2.400 2.450	4.000	.32	-	-	1/8	11/16	7/16	3.810 3.825	.36
2 1/2	2.895 2.950	4.500	.35	-	-	1/8	3/4	1/2	4.500 4.450	.51
3	3.550 3.575	5.000	.38	-	-	1/8	3/4	3/4	5.000 5.075	.70
4	4.550 4.575	6.250	.59	-	-	1/8	7/8	3/4	6.250 6.325	.90
5	5.610 5.638	7.500	.81	-	-	9/64	1	1	7.680 7.638	1.30
6	6.650 6.700	8.620	.95	-	-	9/64	1	1	8.650 8.700	1.50
8	8.690 8.700	10.750	1.20	-	-	3/16	1	1	10.650 10.700	2.90
10	10.840	12.750	1.50	-	-	3/16	1 1/4	1 1/4	13.270	4.60
12	12.840	14.750	2.60	-	-	1/4	1 1/2	1 1/2	15.780	8.40
14	14.090	-	-	17.060	5.30	1/4	1 1/2	1 1/2	17.060	9.40
16	16.090	-	-	19.060	6.00	1/4	1 1/2	1 1/2	19.060	10.80
18	18.125	-	-	21.060	6.70	1/4	1 1/2	1 1/2	21.060	11.50
20	20.125	-	-	23.125	7.40	1/4	1 1/2	1 1/2	23.125	13.00
24	24.125	-	-	27.125	8.80	1/4	2	2	28.125	21.10
30	30.160	-	-	34.160	14.70	1/4	2	2	34.160	25.90
36	36.160	-	-	40.160	17.40	1/4	2	2	40.160	30.90
42	42.160	-	-	46.160	20.00	1/4	2	2	46.160	40.00
48	48.160	-	-	52.160	22.00	1/4	2	2	52.160	44.00



DUCTILE IRON BACK-UP FLANGES

DUCTILE IRON

- Dimensions are given in inches.
- Prime Painted or Hot Dipped Galvanized.
- OD and drilling are 150# class.
- AFR and FFR flanges have a bevel on one side of ID.
- Sizes larger than 48" are available upon request as carbon steel A36.



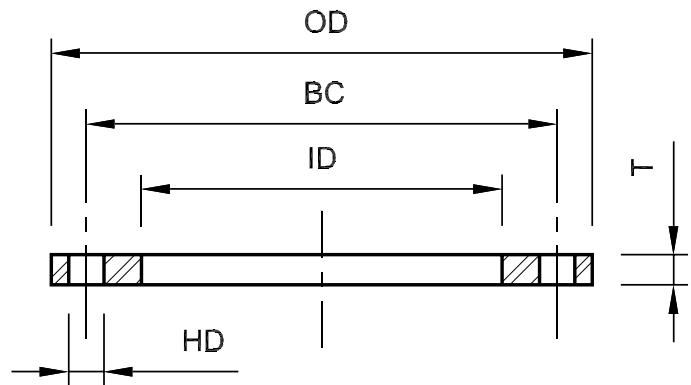
NOMINAL PIPE SIZE	ID		OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
	AFR	FFR			BC	HD	NUMBER OF BOLT HOLES		
1/2	1.250	1.000	3 1/2	1/2	2 3/8	5/8	4	1/2	1.00
3/4	1.440	1.180	3 7/8	1/2	2 3/4	5/8	4	1/2	1.40
1	1.750	1.440	4 1/4	1/2	3 1/8	5/8	4	1/2	1.70
1 1/4	2.060	1.810	4 5/8	1/2	3 1/2	5/8	4	1/2	1.80
1 1/2	2.375	2.060	5	1/2	3 7/8	5/8	4	1/2	2.00
2	2.880	2.630	6	1/2	4 3/4	3/4	4	5/8	3.00
2 1/2	3.380	3.130	7	1/2	5 1/2	3/4	4	5/8	3.90
3	4.000	3.750	7 1/2	1/2	6	3/4	4	5/8	4.00
4	5.125	4.750	9	1/2	7 1/2	3/4	8	5/8	6.50
5	6.100	5.750	10	1/2	8 1/2	7/8	8	3/4	7.00
6	7.250	6.880	11	5/8	9 1/2	7/8	8	3/4	8.00
8	9.375	8.880	13 1/2	5/8	11 3/4	7/8	8	3/4	11.50
10	11.440	11.000	16	5/8	14 1/4	1	12	7/8	15.00
12	13.630	13.000	19	3/4	17	1	12	7/8	26.00
14	14.880	14.250	21	3/4	18 3/4	1 1/8	12	1	34.00
16	16.910	16.250	23 1/2	3/4	21 1/4	1 1/8	16	1	37.00
18	18.910	18.250	25	3/4	22 3/4	1 1/4	16	1 1/8	42.00
20	20.910	20.250	27 1/2	7/8	25	1 1/4	20	1 1/8	51.00
24	24.910	24.250	32	1	29 1/2	1 3/8	20	1 1/4	76.00
30	30.910	30.375	38 3/4	1	36	1 3/8	28	1 1/4	104.00
36	36.910	36.500	46	1 1/8	42 3/4	1 5/8	32	1 1/2	150.00
42	42.910	42.280	53	1 1/8	49 1/2	1 5/8	36	1 1/2	208.00
48	48.910	48.280	59 1/2	1 1/8	56	1 5/8	44	1 1/2	246.00



STAINLESS STEEL BACK-UP FLANGES

304L & 316L STAINLESS STEEL

- Dimensions are given in inches.
- OD and drilling are 150# class.
- AFR and FFR flanges have a bevel on one side of ID.
- Sizes larger than 48" are available upon request.
- Material substitution of one thickness heavier may be used at manufacturer's discretion. Standard A240 mill plate tolerances to apply.



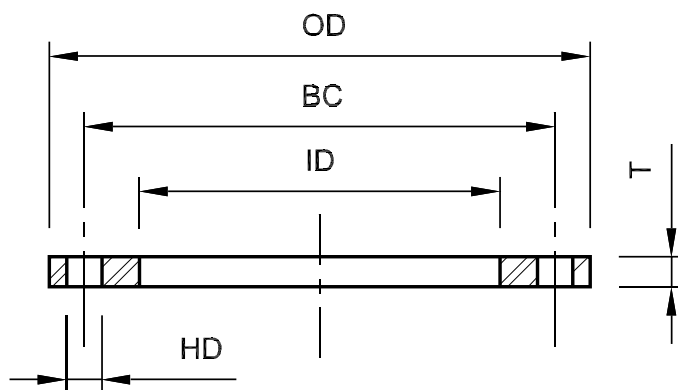
NOMINAL PIPE SIZE	ID		OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
	AFR	FFR			BC	HD	NUMBER OF BOLT HOLES		
1/2	1.310	1.120	3 1/2	1/2	2 3/8	5/8	4	1/2	1.55
3/4	1.500	1.300	3 7/8	1/2	2 3/4	5/8	4	1/2	1.86
1	1.750	1.560	4 1/4	1/2	3 1/8	5/8	4	1/2	2.17
1 1/4	2.120	1.930	4 5/8	1/2	3 1/2	5/8	4	1/2	2.45
1 1/2	2.460	2.180	5	1/2	3 7/8	5/8	4	1/2	2.79
2	2.940	2.740	6	1/2	4 3/4	3/4	4	5/8	3.84
2 1/2	3.440	3.240	7	1/2	5 1/2	3/4	4	5/8	5.09
3	4.060	3.870	7 1/2	1/2	6	3/4	4	5/8	5.50
4	5.060	4.870	9	1/2	7 1/2	3/4	8	5/8	7.51
5	6.160	5.870	10	1/2	8 1/2	7/8	8	3/4	8.61
6	7.250	7.000	11	1/2	9 1/2	7/8	8	3/4	9.50
8	9.240	9.000	13 1/2	1/2	11 3/4	7/8	8	3/4	13.18
10	11.440	11.120	16	5/8	14 1/4	1	12	7/8	21.36
12	13.680	13.120	19	5/8	17	1	12	7/8	29.92
14	14.970	14.370	21	5/8	18 3/4	1 1/8	12	1	36.76
16	16.970	16.370	23 1/2	3/4	21 1/4	1 1/8	16	1	44.31
18	18.970	18.370	25	3/4	22 3/4	1 1/4	16	1 1/8	54.11
20	20.970	20.370	27 1/2	1	25	1 1/4	20	1 1/8	63.86
24	24.970	24.370	32	1	29 1/2	1 3/8	20	1 1/4	106.79
30	30.970	30.375	38 3/4	1	36	1 3/8	28	1 1/4	142.90
36	36.970	36.375	46	1 1/4	42 3/4	1 5/8	32	1 1/2	242.51
42	42.970	42.375	53	1 1/4	49 1/2	1 5/8	36	1 1/2	308.24
48	48.970	48.375	59 1/2	1 1/4	56	1 5/8	44	1 1/2	364.19



STAINLESS STEEL PLATE FLANGES

304L & 316L STAINLESS STEEL

- Dimensions are given in inches.
- All plate flanges are flat face.
- Drilling is 150# class.
- Sizes larger than 48" are available upon request.
- Material substitution of one thickness heavier may be used at manufacturer's discretion. Standard A240 mill plate tolerances to apply.



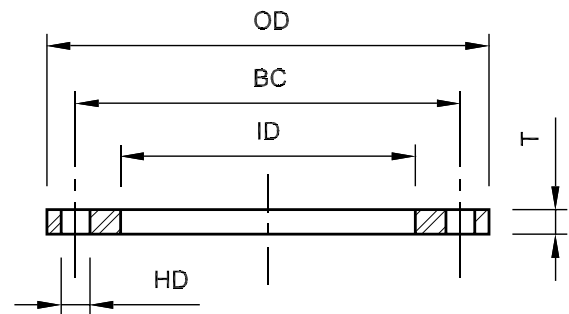
NOMINAL PIPE SIZE	ID	OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
				BC	HD	NUMBER OF BOLT HOLES		
1/2	0.880	3 1/2	1/2	2 3/8	5/8	4	1/2	1.55
3/4	1.090	3 7/8	1/2	2 3/4	5/8	4	1/2	1.86
1	1.360	4 1/4	1/2	3 1/8	5/8	4	1/2	2.17
1 1/4	1.700	4 5/8	1/2	3 1/2	5/8	4	1/2	2.45
1 1/2	1.950	5	1/2	3 7/8	5/8	4	1/2	2.79
2	2.440	6	1/2	4 3/4	3/4	4	5/8	3.84
2 1/2	2.940	7	1/2	5 1/2	3/4	4	5/8	5.09
3	3.570	7 1/2	1/2	6	3/4	4	5/8	5.50
4	4.570	9	1/2	7 1/2	3/4	8	5/8	7.51
5	5.660	10	1/2	8 1/2	7/8	8	3/4	8.61
6	6.720	11	1/2	9 1/2	7/8	8	3/4	9.50
8	8.720	13 1/2	1/2	11 3/4	7/8	8	3/4	13.18
10	10.880	16	5/8	14 1/4	1	12	7/8	21.36
12	12.880	19	5/8	17	1	12	7/8	29.92
14	14.140	21	5/8	18 3/4	1 1/8	12	1	36.76
16	16.160	23 1/2	3/4	21 1/4	1 1/8	16	1	44.31
18	18.180	25	3/4	22 3/4	1 1/4	16	1 1/8	54.11
20	20.200	27 1/2	1	25	1 1/4	20	1 1/8	63.86
24	24.250	32	1	29 1/2	1 3/8	20	1 1/4	106.79
30	30.250	38 3/4	1	36	1 3/8	28	1 1/4	142.90
36	36.250	46	1 1/4	42 3/4	1 5/8	32	1 1/2	242.51
42	42.250	53	1 1/4	49 1/2	1 5/8	36	1 1/2	308.23
48	48.250	59 1/2	1 1/4	56	1 5/8	44	1 1/2	364.19



AWWA CLASS B & D PLATE FLANGE

STAINLESS STEEL FLANGES 304L & 316L STAINLESS STEEL

- Dimensions are given in inches.
- All plate flanges are flat face.
- Machined face
- OD and Drilling is 150# class.
- Dimensions shown are for slip-on application (weld on).

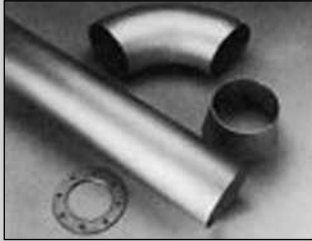


NOMINAL PIPE SIZE	CLASS STYLE	ID	OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
					BC	HD	NUMBER OF BOLT HOLES		
2	B D	2.44	6.00	5/8	4 3/4	3/4	4	5/8	4
2 1/2	B D	2.94	7.00	5/8	5 1/2	3/4	4	5/8	5
3	B D	3.57	7.50	5/8	6	3/4	4	5/8	6
4	B D	4.57	9.00	5/8	7 1/2	3/4	8	5/8	8
5	B D	5.66	10.00	5/8	8 1/2	.875	8	3/4	9
6	B D	6.72	11.00	11/16	9 1/2	.875	8	3/4	11
8	B D	8.72	13.50	11/16	11 3/4	.875	8	3/4	15
10	B D	10.88	16.00	11/16	14 1/4	1	12	7/8	19
12	B D	12.88	19.00	11/16 13/16	17	1	12	7/8	28 33
14	B D	14.19	21.00	11/16 15/16	18 3/4	1 1/8	12	1	34 47
16	B D	16.19	23.50	11/16 1	21 1/4	1 1/8	16	1	41 60
18	B D	18.19	25.00	11/16 1.062	22 3/4	1 1/4	16	1 1/8	42 64
20	B D	20.19	27.50	11/16 1 1/8	25	1 1/4	20	1 1/8	49 79
24	B D	24.19	32.00	3/4 1 1/4	29 1/2	1 3/8	20	1 1/4	67 114
30	B D	30.25	38.75	7/8 1 3/8	36	1 3/8	28	1 1/4	104 163
36	B D	36.25	46.00	1 1 5/8	42 3/4	1 5/8	32	1 1/2	160 259
42	B D	42.25	53.00	1 1/8 1 3/4	49 1/2	1 5/8	36	1 1/2	233 362
48	B D	48.25	59.50	1 1/4 1 7/8	56	1 5/8	44	1 1/2	305 457

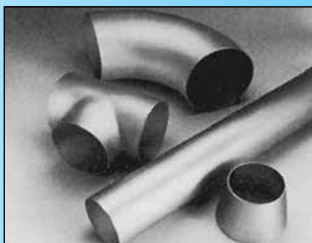




■ TUBE



PIPE



TUBE



MISCELLANEOUS



SPECIFICATIONS

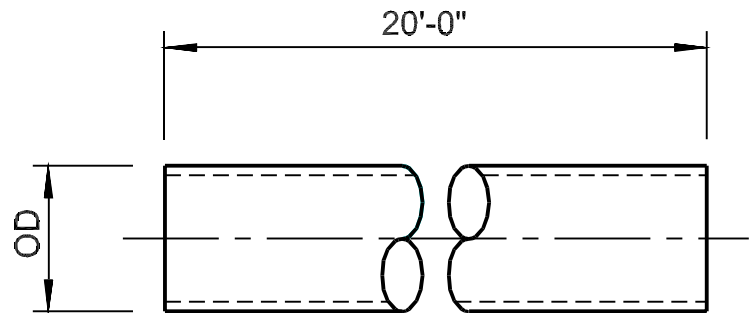
304L & 316L STAINLESS STEEL

Felker furnishes tube in accordance with the following specifications:

ASTM A-778 3" through 12"

ASTM A-269/ASME SA-249 3" through 8"

- Stock sizes in 20 foot lengths. Special lengths are available upon request.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.
- For 14" and larger product, please refer to the appropriate pipe size section in the front of the catalog.



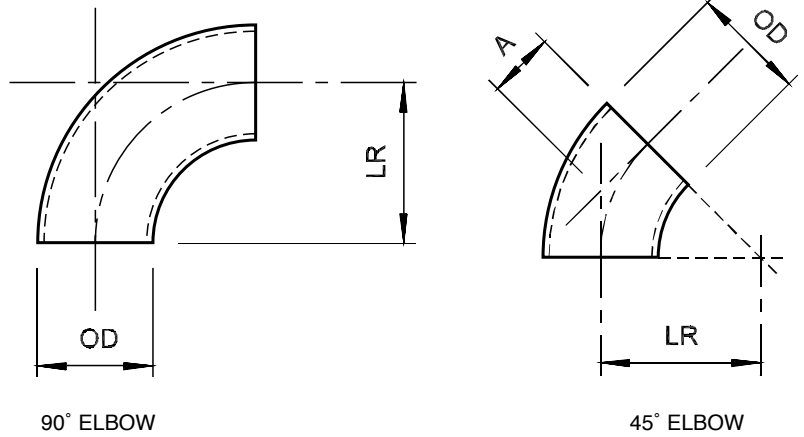
NOMINAL TUBE SIZE	OD	ASTM A-778 TUBE					
		16GA .062	14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	1.96	2.46	3.40	3.87	4.32	5.24
4	4.000	2.76	3.30	4.57	5.22	5.83	7.10
5	5.000	3.30	4.14	5.75	6.57	7.33	8.95
6	6.000	4.16	5.29	6.92	7.92	8.84	10.81
8	8.000	5.31	6.66	9.27	10.61	11.86	14.51
10	10.000	6.64	8.34	11.62	13.31	14.88	18.22
12	12.000	7.98	10.02	13.97	16.00	17.90	21.93

NOMINAL TUBE SIZE	OD	ASTM A-249/SA-249 AND A-269 TUBE			
		16GA .065	14GA .083	12GA .109	11GA .120
3	3.000	2.06	2.61	3.40	3.73
3 1/2	3.500	2.41	3.06	3.98	4.37
4	4.000	2.76	3.50	4.57	5.02
4 1/2	4.500	3.11	3.95	5.16	5.67
5	5.000	3.46	4.40	5.75	6.31
6	6.000	4.16	5.29	6.92	7.61
8	8.000	-	-	9.27	10.61

90° & 45° ELBOWS LR

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.
- For 14" and larger product, please refer to the appropriate pipe size section in the front of the catalog.



90° ELBOW

45° ELBOW

NOMINAL TUBE SIZE	OD	LR	A-774 90° ELBOWS	
			14GA .078	12GA .109
3	3.000	4.500	1.50	2.20
4	4.000	6.000	2.70	3.50
5	5.000	7.500	3.40	6.00
6	6.000	9.000	6.20	8.60
8	8.000	12.000	10.90	15.30
10	10.000	15.000	17.10	23.80
12	12.000	18.000	24.60	34.30

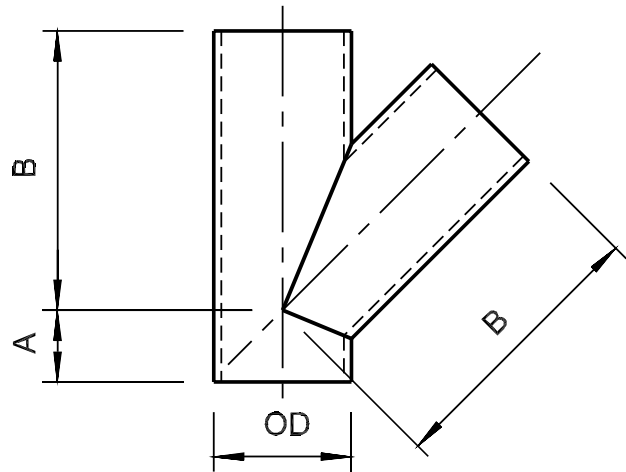
NOMINAL TUBE SIZE	OD	LR	A	A-774 45° ELBOWS	
				14GA .078	12GA .109
3	3.000	4.500	2.000	.77	1.10
4	4.000	6.000	2.500	1.40	1.90
5	5.000	7.500	3.125	2.10	3.00
6	6.000	9.000	3.750	3.10	4.30
8	8.000	12.000	5.000	5.50	7.60
10	10.000	15.000	6.250	9.00	12.40
12	12.000	18.000	7.500	12.60	17.60



45° LATERALS

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.
- For 14" and larger product, please refer to the appropriate pipe size section in the front of the catalog.



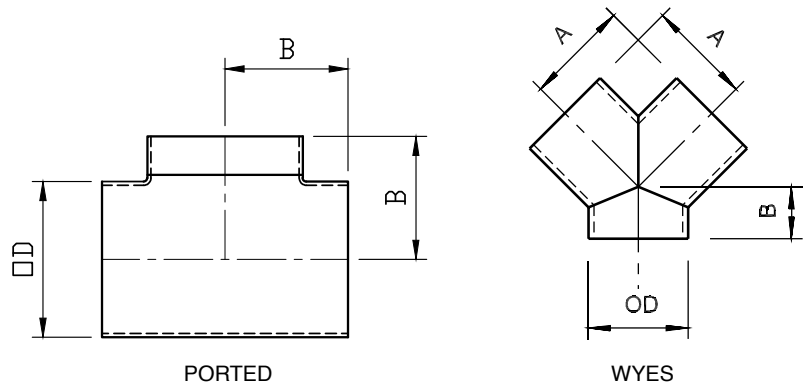
NOMINAL TUBE SIZE	OD	A	B	A-774 45° LATERALS				
				14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	3.000	10.000	4.30	5.90	-	-	-
4	4.000	3.000	12.000	6.60	9.10	-	-	-
5	5.000	3.500	13.500	9.20	12.60	-	-	-
6	6.000	3.500	14.500	11.50	15.90	-	-	-
8	8.000	4.500	17.500	18.30	25.30	28.70	32.20	-
10	10.000	5.000	20.500	26.20	36.30	41.20	46.20	52.00
12	12.000	5.500	24.500	37.20	51.60	58.50	65.70	81.20



TEES & WYES

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- OD and wall thickness are given in inches.
- Crosses are available upon request.
- Available end configurations are described in the specifications section on page 46.
- For 14" and larger product, please refer to the appropriate pipe size section in the front of the catalog.



TUBE

NOMINAL TUBE SIZE	OD	B	A-774 TEES				
			14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	3.375	1.80	2.50	-	-	-
4	4.000	4.125	2.90	3.10	-	-	-
5	5.000	4.875	3.90	-	-	-	-
6	6.000	5.625	5.80	7.90	-	-	-
8	8.000	7.000	-	12.90	13.60	-	-
10	10.000	8.500	-	19.10	20.50	22.80	-
12	12.000	10.000	-	25.10	28.70	31.90	37.70

Reducing tees, branchless tees and crosses are available upon request. Tees and crosses **shown in bold numbers** are nozzle welded construction.

Manufactured to MSS dimensions. Long tangent tees are also available upon request.

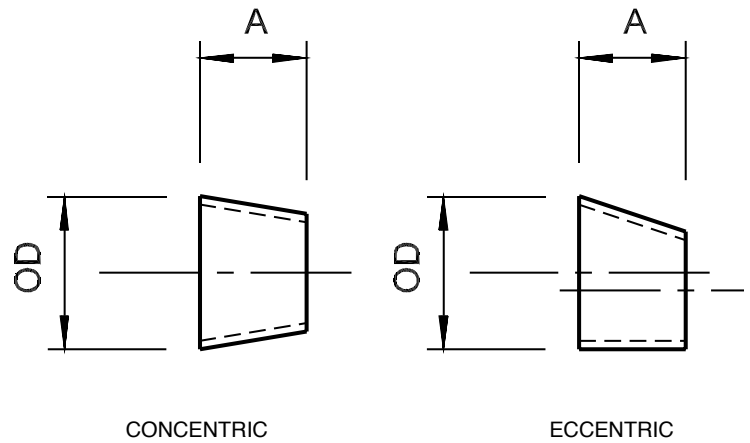
NOMINAL TUBE SIZE	OD	A	B	A-774 WYES				
				14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	5.500	3.000	2.70	3.70	-	-	-
4	4.000	6.500	3.000	4.00	5.40	-	-	-
5	5.000	7.500	3.500	5.80	8.00	-	-	-
6	6.000	8.000	3.500	7.20	10.00	-	-	-
8	8.000	9.000	4.500	10.80	15.00	17.00	19.10	-
10	10.000	11.000	5.000	16.10	22.40	25.30	28.50	35.20
12	12.000	12.000	5.500	20.70	28.80	32.60	36.70	45.30



REDUCERS

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- Multiple step and long tangent reducers are available upon request.
- Weights for Concentric and Eccentric Reducers are the same.
- OD and wall thickness are given in inches.
- Available end configurations are described in the specifications section on page 46.
- Multiple step reducers are manufactured to the same length as standard reducers using the same OD dimensions.
- For 14" and larger product, please refer to the appropriate pipe size section in the front of the catalog.



TUBE

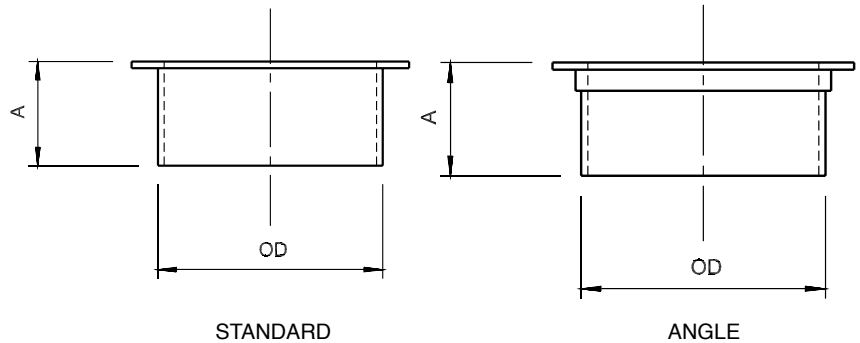
NOMINAL TUBE SIZE	OD	A	A-774 REDUCERS			
			14GA .078	12GA .109	11GA .125	10GA .140
2 x 1 1/2	2.000	3.000	-	-	-	-
2 1/2 x 2	2.500	3.500	-	-	-	-
3 x 2 1/2	3.000	3.500	.66	.93	-	-
4 x 3	4.000	4.000	.98	1.40	-	-
5 x 4	5.000	5.000	1.60	2.20	-	-
6 x 4	6.000	5.500	2.10	2.90	-	-
8 x 6	8.000	6.000	-	4.10	4.70	5.30
10 x 8	10.000	7.000	-	6.10	7.00	7.90
12 x 10	12.000	8.000	-	8.60	9.80	11.00
14 x 12	14.000	13.000	-	16.40	18.60	21.00



STUB ENDS

304L & 316L STAINLESS STEEL

- Manufactured in accordance to ASTM A-774 specifications.
- OD and wall thickness are given in inches.
- Manufactured to MSS dimensions.
- Available end configurations are described in the specifications section on page 46.
- For 14" and larger product, please refer to the appropriate pipe size section in the front of the catalog.



STANDARD

ANGLE

NOMINAL TUBE SIZE	OD	A	A-774 STUB ENDS-STANDARD				
			14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	2.500	1.00	1.20	1.30	-	-
4	4.000	3.000	1.60	1.70	2.00	-	-
5	5.000	3.000	2.00	2.20	2.40	2.80	-
6	6.000	3.500	2.70	3.20	3.50	4.10	-
8	8.000	4.000	4.00	4.80	5.20	5.80	-
10	10.000	5.000	5.50	6.70	7.20	8.20	10.20
12	12.000	6.000	7.50	9.30	10.50	11.50	14.70

NOMINAL TUBE SIZE	OD	A	A-774 STUB ENDS-ANGLE				
			14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	2.500	1.20	1.40	1.60	-	-
4	4.000	3.000	1.80	2.10	2.40	-	-
5	5.000	3.000	2.30	2.70	3.00	3.10	-
6	6.000	3.500	2.90	3.40	3.80	4.00	-
8	8.000	4.000	5.10	5.90	6.30	6.80	-
10	10.000	5.000	8.20	9.40	10.20	10.90	12.40
12	12.000	6.000	13.70	15.50	16.70	17.70	19.90



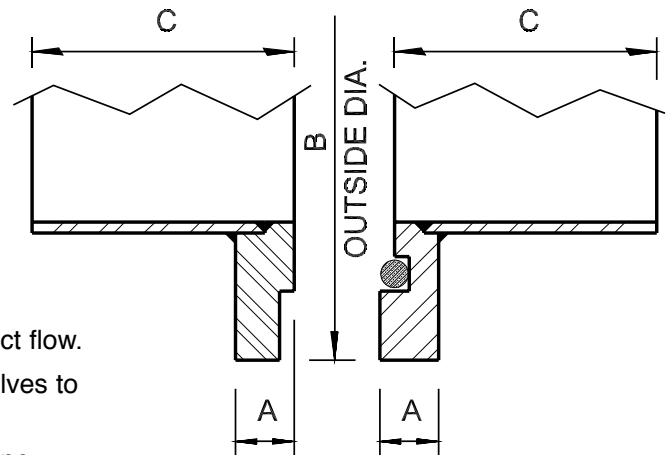
METAL TO METAL CONNECTORS

304L & 316L STAINLESS STEEL

A Metal to Metal Connector consists of one pair of stub ends (one male and one female) and a 1/8" diameter 60 durometer neoprene o-ring.

Metal to Metal Connectors can be joined by means of a Felker Metal to Metal Clamp or by using two standard Felker Back-Up Flanges.

- Manufactured in accordance to ASTM A-774 specifications.
- OD and wall thickness are given in inches.
- Manufactured to MSS dimensions.
- METAL TO METAL SEATING - No gasket protrusion to restrict flow.
- ADAPTERS AVAILABLE - Convert flanges on pumps and valves to mate with metal to metal connectors.
- For 14" and larger product, please refer to the appropriate pipe section in the front of the catalog.



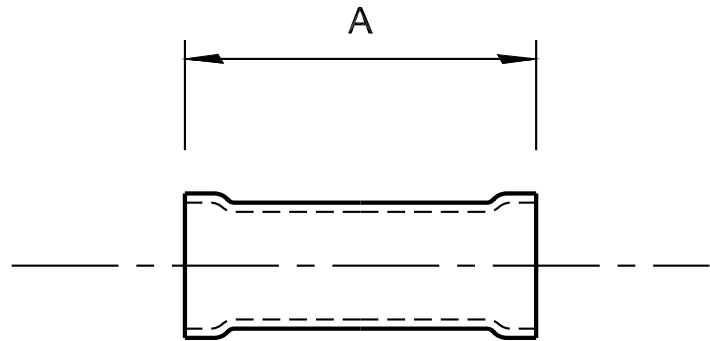
NOMINAL TUBE SIZE	OD	A	B	C	A-774 GAUGE METAL TO METAL CONNECTORS				
					14GA .078	12GA .109	11GA .125	10GA .140	8GA .172
3	3.000	.312	4.750	2.500	1.40	1.60	-	-	-
4	4.000	.312	5.750	3.000	1.95	2.25	-	-	-
5	5.000	.312	6.750	3.000	2.60	3.30	-	-	-
6	6.000	.312	7.750	3.500	3.05	3.55	3.90	4.20	-
8	8.000	.312	10.000	4.000	4.65	5.45	5.90	6.35	-
10	10.000	.437	12.000	5.000	7.70	8.95	9.75	10.45	11.95
12	12.000	.437	14.250	6.000	10.75	12.50	13.70	14.70	16.85



BELLED CONNECTORS

316L STAINLESS STEEL

- Manufactured from ASTM A-778 tube.
- OD and wall thickness are given in inches.



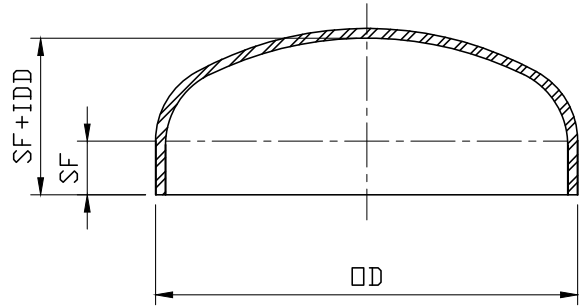
NOMINAL TUBE SIZE	OD	A	BELLED CONNECTORS	
			14GA .078	12GA .109
3	3.000	3.000	.61	.85
4	4.000	3.000	.82	1.14
5	5.000	3.000	1.03	1.44
6	6.000	3.000	1.24	1.73
8	8.000	3.000	1.67	2.32
10	10.000	3.000	-	2.91
12	12.000	3.000	-	3.49



WELD CAPS

316L STAINLESS STEEL

- Dimensions are given in inches.



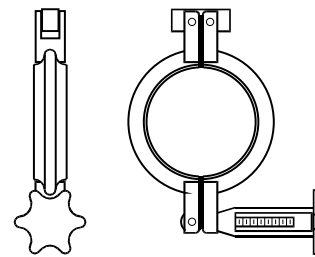
NOMINAL TUBE SIZE	OD	SF & IDD	SF	GAUGE	LBS
2	2.000	.875	.500	12GA	.21
2 1/2	2.500	1	.500	12GA	.32
3	3.000	1.125	.500	11GA	.54
4	4.000	1.375	.500	11GA	.80
6	6.000	1.75	.500	10GA	1.90
8	8.000	2.5	.750	10GA	3.00
10	10.000	3	.750	10GA	4.90
12	12.000	3.5	.750	10GA	7.40

TUBE

QUICK CLAMPS

304L STAINLESS STEEL

- Face rings are 316L stainless steel.
- Dimensions are given in inches.



NOMINAL TUBE SIZE	CLAMPS	FACE RINGS				DISC
	LBS	ID	OD	THICKNESS	LBS	LBS
3	2.71	3.020	4.220	10GA	.25	.49
4	2.90	4.020	5.090	10GA	.28	.72
6	3.25	6.020	7.190	10GA	.44	1.43
8	3.64	8.020	9.340	10GA	.64	2.40
10	4.01	10.030	11.250	10GA	.73	3.48
12	4.27	12.030	13.250	10GA	.88	4.83

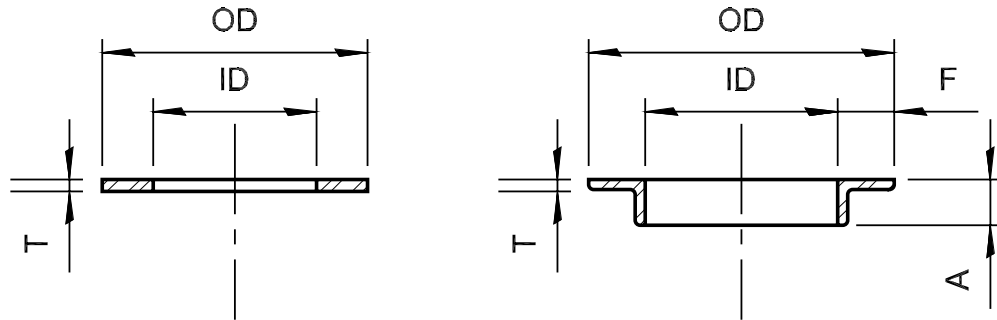
Felker Stainless Steel Quick Clamps were designed for low pressure service applications. They have been used successfully in food, dairy, paper, chemical and sewage treatment plants for several years. Quick Clamps are used for connecting pipe and fittings or are used with a solid disc for blanking the end of pipe. 1/8" thick neoprene gaskets are furnished with clamps. Two special face rings are required and must be ordered separately per the chart above.



FACE RINGS

316L STAINLESS STEEL

- Dimensions are given in inches.
- For 14" and larger product, please refer to the appropriate pipe section in the front of the catalog.



NOMINAL TUBE SIZE	ID	FLAT FACE RINGS		ANGLE FACE RINGS				
		T 10GA (.140)		T	F	A	OD	LBS
		OD	LBS					
1 1/2	1.520	3.000	.38	1/8	3/4	1/2	3.180	.27
2	2.020	4.000	.58	1/8	15/16	1/2	3.810	.38
2 1/2	2.520	4.500	.35	1/8	7/8	3/4	4.250	.55
3	3.050	5.000	.38	1/8	1	11/16	5.000	.65
4	4.050	6.250	.59	1/8	1 1/8	3/4	6.250	.93
5	5.050	7.500	.99	9/64	1	1	7.000	1.20
6	6.050	8.630	1.20	9/64	1	1	8.000	1.40
8	8.060	10.750	1.60	3/16	1	1	10.020	2.60
10	10.090	12.750	2.00	3/16	1 1/4	1 1/4	12.530	4.20
12	12.090	14.750	2.50	1/4	1 1/2	1 1/2	15.030	7.90

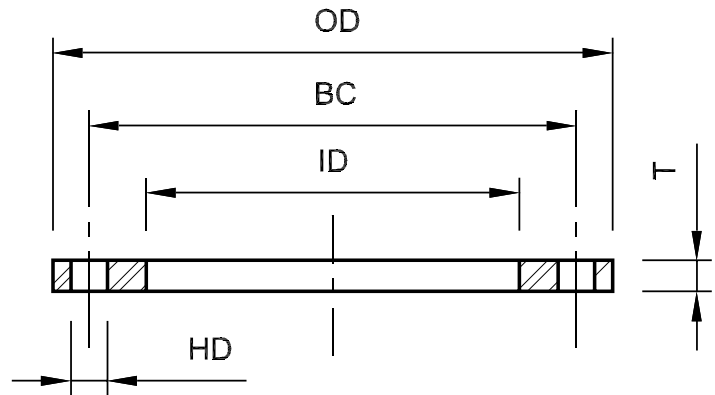


TUBE

DUCTILE IRON BACK-UP FLANGES

DUCTILE IRON

- Dimensions are given in inches.
- Prime Painted or Hot Dipped Galvanized.
- OD and drilling are 150# class.
- AFR and FFR flanges have a bevel on one side of ID.
- For 14" and larger products, please refer to the appropriate pipe section in the front of the catalog.



NOMINAL TUBE SIZE	ID		OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
	AFR	FFR			BC	HD	NUMBER OF BOLT HOLES		
1	1.380	1.130	4 1/4	1/2	3 1/8	5/8	4	1/2	1.70
1 1/4	1.630	1.380	4 5/8	1/2	3 1/2	5/8	4	1/2	1.80
1 1/2	1.880	1.630	5	1/2	3 7/8	5/8	4	1/2	2.00
2	2.500	2.250	6	1/2	4 3/4	3/4	4	5/8	3.00
2 1/2	3.000	2.750	7	1/2	5 1/2	3/4	4	5/8	3.90
3	3.500	3.250	7 1/2	1/2	6	3/4	4	5/8	4.00
4	4.500	4.250	9	1/2	7 1/2	3/4	8	5/8	6.50
5	5.440	5.250	10	1/2	8 1/2	7/8	8	3/4	7.00
6	6.440	6.250	11	5/8	9 1/2	7/8	8	3/4	8.00
8	8.630	8.250	13 1/2	5/8	11 3/4	7/8	8	3/4	11.50
10	10.700	10.250	16	5/8	14 1/4	1	12	7/8	15.00
12	12.880	12.250	19	3/4	17	1	12	7/8	26.00

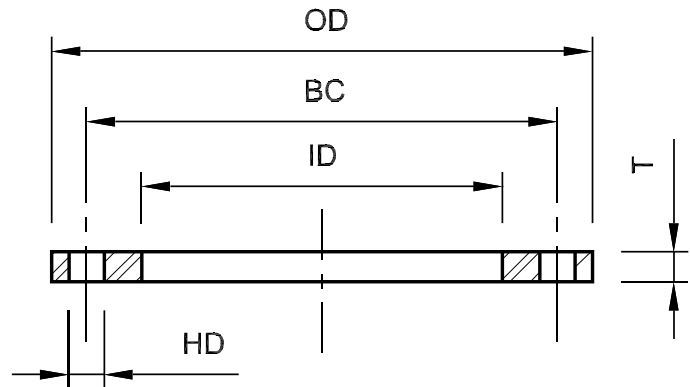
TUBE



STAINLESS STEEL BACK-UP FLANGES

304L & 316L STAINLESS STEEL

- Dimensions are given in inches.
- OD and drilling are 150# class.
- AFR and FFR flanges have a bevel on one side of ID.
- Material substitution of one thickness heavier may be used at manufacturer's discretion. Standard A240 mill plate tolerances to apply.



NOMINAL TUBE SIZE	ID		OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
	AFR	FFR			BC	HD	NUMBER OF BOLT HOLES		
1	1.380	1.130	4 1/4	1/2	3 1/8	5/8	4	1/2	2.24
1 1/4	1.630	1.380	4 5/8	1/2	3 1/2	5/8	4	1/2	2.59
1 1/2	1.880	1.630	5	1/2	3 7/8	5/8	4	1/2	2.95
2	2.500	2.250	6	1/2	4 3/4	3/4	4	5/8	4.03
2 1/2	3.000	2.750	7	1/2	5 1/2	3/4	4	5/8	5.33
3	3.500	3.250	7 1/2	1/2	6	3/4	4	5/8	5.87
4	4.500	4.250	9	1/2	7 1/2	3/4	8	5/8	8.00
5	5.440	5.250	10	1/2	8 1/2	7/8	8	3/4	9.21
6	6.440	6.250	11	1/2	9 1/2	7/8	8	3/4	10.42
8	8.630	8.250	13 1/2	1/2	11 3/4	7/8	8	3/4	14.39
10	10.700	10.250	16	5/8	14 1/4	1	12	7/8	23.60
12	12.880	12.250	19	5/8	17	1	12	7/8	32.59

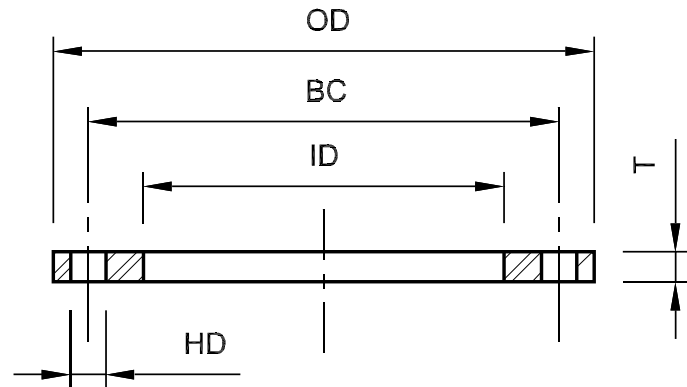


TUBE

STAINLESS STEEL PLATE FLANGES

304L & 316L STAINLESS STEEL

- Dimensions are given in inches.
- All plate flanges are flat face.
- Lap Joint application (as back-up) for use with flat or angle type face rings can be furnished upon request.
- Drilling is 150# class.
- For 14" and larger products, please refer to the appropriate pipe section in front of the catalog.
- Material substitution of one thickness heavier may be used at manufacturer's discretion. Standard A240 mill plate tolerances to apply.



NOMINAL TUBE SIZE	ID	OD	T	DRILLING PATTERN - 150#			BOLT SIZE	LBS
				BC	HD	NUMBER OF BOLT HOLES		
1	1.04	4 1/4	1/2	3 1/8	5/8	4	1/2	2.24
1 1/4	1.29	4 5/8	1/2	3 1/2	5/8	4	1/2	2.59
1 1/2	1.55	5	1/2	3 7/8	5/8	4	1/2	2.95
2	2.06	6	1/2	4 3/4	3/4	4	5/8	4.03
2 1/2	2.56	7	1/2	5 1/2	3/4	4	5/8	5.33
3	3.07	7 1/2	1/2	6	3/4	4	5/8	5.87
4	4.07	9	1/2	7 1/2	3/4	8	5/8	8.00
5	5.09	10	1/2	8 1/2	7/8	8	3/4	9.21
6	6.09	11	1/2	9 1/2	7/8	8	3/4	10.42
8	8.09	13 1/2	1/2	11 3/4	7/8	8	3/4	14.39
10	10.13	16	5/8	14 1/4	1	12	7/8	23.60
12	12.13	19	5/8	17	1	12	7/8	32.59

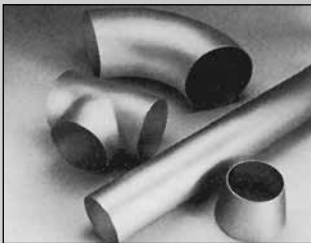




MISCELLANEOUS



PIPE



TUBE



MISCELLANEOUS



SPECIFICATIONS

DIAMOND CLEAN OUT AND INSPECTION PORT

316L STAINLESS STEEL

The Felker patented Diamond Clean Out and Inspection Port allows easy and immediate access to the interior of fluid and pneumatic pipe transport systems – without tools. This quick access minimizes costly downtime and improves product quality.

The Clean Out Consists of the Following Parts:

- Safety chain to prevent loss of components.
- Nickel bronze wing nut to ensure easy operation and prevent galling of thread.
- Nickel bronze cast yoke.
- Stainless steel cover and stud complete with nitrile “O” ring.
- Stainless steel mounting frame.

Diamond Clean Out Features:

- Smooth inner surface.
- Direct access in both directions.
- High sealing strengths (the higher the pressure the tighter the cover seals).
- Permits quick flushing when installed on both sides of pumps and valves without removing bolted connections.
- Quick and easy visual access into pipe systems, tanks, and vessels.
- No special tools required to open.
- Saves time in trouble-shooting pipe systems and locating plugged areas.
- All components made of corrosion resistant material.
- A variety of gaskets are available.

The Stainless Steel Diamond Clean Out is certified under ASME Section VIII, Division I (unfired vessels only) as an unclassified fitting for a rating of 150 PSI operation at 500° F, subject to certain restrictions.

Deluxe Model Features:

- Jacking arrangement to force cover down to facilitate opening action in the event of an obstruction directly behind cover.

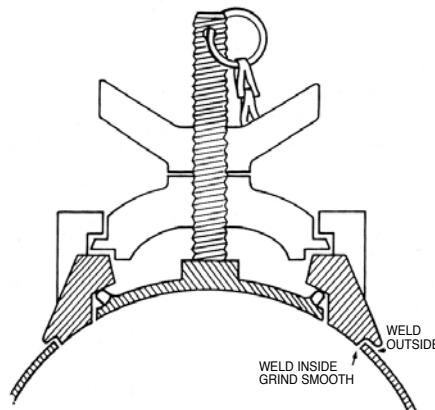


SIZE	FOR INSTALLATION IN			
	90° ELLS	45° ELLS	REDUCERS	TUBE & PIPE
No. 4 Fits*	4	4	–	6
No. 6 Fits	6	6	–	8 & 10
No. 8 Fits	8	8	12 thru 16	12 thru 16
No. 10 Fits	10	10	18 thru 22	18 thru 22
No. 12 Fits	12 thru 18	12 thru 18	24 & Larger	24 & Larger

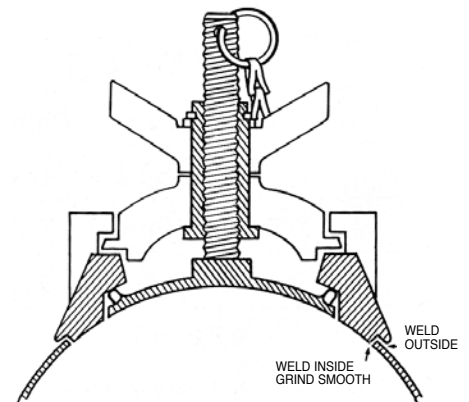
Approximate opening all sizes 4 3/4" x 2 3/4".

Approximate shipping weight 6 pounds.

* No. 4 size requires special trimming on all items except 4" tube size elbows. We suggest you let Felker Brothers install when possible.



CROSS SECTION - STANDARD CLEANOUT



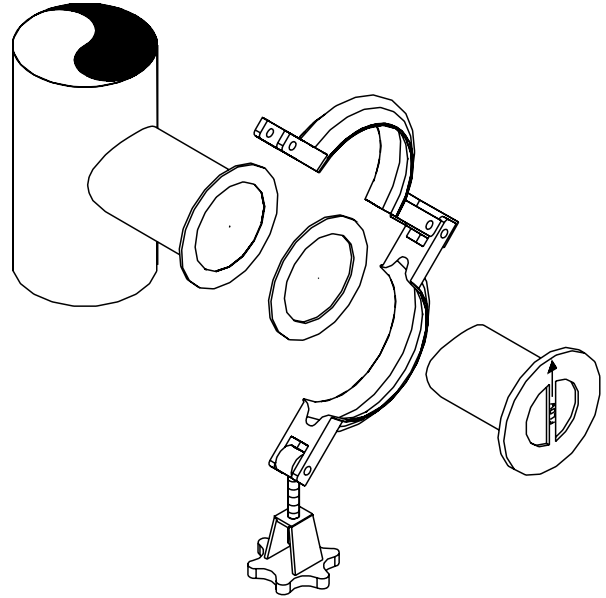
CROSS SECTION - DELUXE CLEANOUT

PLUG TYPE CLEAN OUT

316L STAINLESS STEEL

The Felker Plug Type Clean Out offers a flush and smooth inner surface that can be contoured to fit Pipe, Tube or Fittings as specified.

- Supplied in 12 gauge 316L Stainless Steel.
- Size opening selection is 3" OD, 4" OD, 6" OD, 8" OD and 10" OD.
- 304L Stainless Steel Felker Quick Clamp.
- Specify the product, location, outside diameter and wall thickness of product to be installed on.
- With Neoprene Gasket.



METAL TO METAL CLAMPS

304L STAINLESS STEEL

- Tube and Pipe size.
- Larger sizes available upon request.



NOMINAL SIZE	TYPE	LBS
1 & 1 1/4 Tube & Pipe	Worm Gear Type	.5
1 1/2 Tube & Pipe	Worm Gear Type	.6
2 Tube & Pipe-2 1/2 Tube	WormGear Type	.7
2 1/2 Pipe-3 Tube & Pipe	Bolt Type	1.2
4 Tube & Pipe	Bolt Type	1.3
6 Tube & Pipe	Bolt Type	1.4
8 Tube & Pipe	Bolt Type	1.5
10 Tube & Pipe	Bolt Type	1.6

MISCELLANEOUS



BLIND FLANGES

TUBE AND PIPE SIZE

- Dimensions are given in inches.
- OD and drilling are 150# class.
- Material substitution of one thickness heavier may be used at manufacturer's discretion. Standard A240 mill plate tolerances to apply.



**SOLID CARBON STEEL
PRIMED PAINTED**



**SOLID STAINLESS STEEL
304L OR 316L**



**CARBON STEEL CLAD
10GA 316L STAINLESS STEEL**

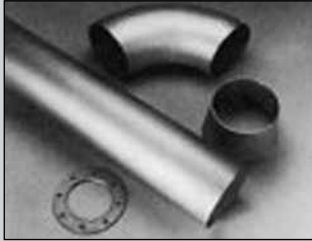
NOMINAL SIZE	DIMENSIONS					LBS		
	THICKNESS OF FLANGE	OUTSIDE DIAMETER OF FLANGE	BOLT CIRCLE	NUMBER OF BOLT HOLES	SIZE OF HOLES	SOLID CARBON STEEL	SOLID STAINLESS STEEL 304L OR 316L	CARBON STEEL CLAD 10GA 316L
1/2	1/2	3 1/2	2 3/8	4	5/8	1.1	1.3	1.3
3/4	1/2	3 7/8	2 3/4	4	5/8	1.5	1.6	1.7
1	1/2	4 1/4	3 1/8	4	5/8	1.8	2.0	2.0
1 1/4	1/2	4 5/8	3 1/2	4	5/8	2.2	2.3	2.5
1 1/2	1/2	5	3 7/8	4	5/8	2.6	2.8	2.9
2	1/2	6	4 3/4	4	3/4	3.8	4.0	4.2
2 1/2	1/2	7	5 1/2	4	3/4	5.2	5.5	5.7
3	1/2	7 1/2	6	4	3/4	6.0	6.4	6.8
4	1/2	9	7 1/2	8	3/4	8.5	9.0	9.8
5	1/2	10	8 1/2	8	7/8	10.5	11.1	12.3
6	1/2	11	9 1/2	8	7/8	12.8	13.6	15.2
8	1/2	13 1/2	11 3/4	8	7/8	19.6	20.8	23.3
10	3/4	16	14 1/4	12	1	40.8	42.8	46.4
12	3/4	19	17	12	1	58.3	61.2	66.3
14	3/4	21	18 3/4	12	1 1/8	71.1	74.6	80.5
16	3/4	23 1/2	21 1/4	16	1 1/8	88.9	93.2	102.0
18	1	25	22 3/4	16	1 1/4	134.0	140.0	149.0
20	1	27 1/2	25	20	1 1/4	162.0	169.0	180.0
24	1	32	29 1/2	20	1 3/8	220.0	230.0	245.0
30	1 1/4	38 3/4	36	28	1 3/8	404.0	418.0	440.0
36	1 1/2	46	42 3/4	32	1 5/8	679.0	701.0	730.0

MISCELLANEOUS

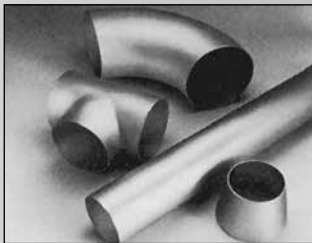




SPECIFICATIONS



PIPE



TUBE



MISCELLANEOUS



SPECIFICATIONS

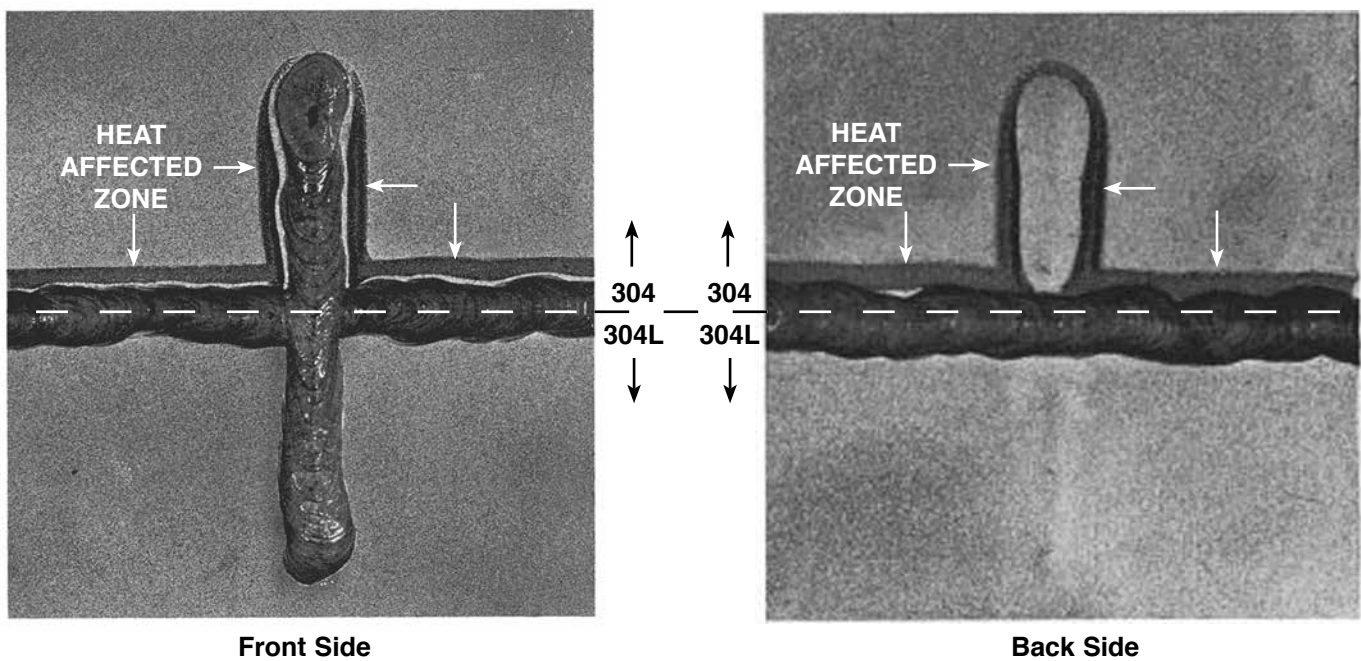
EXTRA LOW CARBON STAINLESS

Felker furnishes only mill annealed ELC (.03 max. carbon) sheet and plate properly welded with ELC stainless steel.

Extra Low Carbon Stainless Steel was developed to protect welded products against corrosion in the heat affected zone adjacent to the welds. The problem known as "carbide precipitation" (in which chromium corrosion protection is reduced through the formation of chromium carbide) is overcome in types 304L, 316L and 317L containing a maximum of .03 percent carbon. This low carbon content is not enough to cause corrosion in the heat affected zone.

Many fabricated items such as pipe and fittings must be welded in the field during original installation or later when making revisions. **When straight grade materials are welded in the field without subsequent annealing, they lose their resistance to carbide precipitation.** The higher the carbon content the more susceptible to carbide precipitation.

WHY CHANCE THE POSSIBILITY OF REDUCED CORROSION RESISTANCE – SPECIFY ELC (.03 MAX. CARBON) ALLOYS.



SPECIFICATIONS

The above illustration consists of two pieces of 12 gauge stainless which were arc-welded under normal shop conditions. The top half is type 304 (.08 max. carbon) and the bottom half type 304L (.03 max. carbon). Type 308L welding electrode, size 5/32 inch was used to join the two pieces and a 1/8" electrode for the cross bead deposited on the back.

The weld sample was then immersed for about six hours in a hot solution of 10% nitric and 3% hydrofluoric acids. Note the severe attack in the heat affected zone adjacent to the weld area on the type 304 section (top half). Compare this to the complete protection in the weld area provided by type 304L (bottom half).

SPECIFICATIONS

Material

All Stainless Steel Sheet and Plate shall be extra low carbon (.03% max) and meet ASTM/ASME standards.

Test Reports

Chemical and physical reports on material will be furnished upon request at time of order shipment.

Finish

Standard finish for material greater than .100 thick is No. 1 Hot-Rolled Annealed and Pickled. After all shop operations have been completed, all stainless steel material shall be pickled and passivated (completely immersed for a minimum of 15 minutes in 10% nitric acid and 3% hydrofluoric acid at 125°F, followed by a neutralizing rinse).

Wall Thickness

Thickness may vary by the allowable limits of ASTM/ASME standards. Weight calculations based on Felker average thickness.

Welding

All welding is done using the GTAW, GMAW and plasma arc welding processes. Felker uses ASME qualified welders and ASME procedures designed to provide full penetration welds. Automatic or semi-automatic positioning fixtures are used on pipe, tube and fittings. Interior surfaces are smooth, even and uniform.

ASTM Pipe and Tube

All Felker pipe and tube conform to ASTM A-778, A-312, A-358, A-269 or A-249 specifications unless otherwise specified. Various lengths can be ordered upon request to meet your needs.

ASTM Fittings

All Felker pipe and tube fittings conform to ASTM A-403 or A-774 specifications unless otherwise specified. Felker fittings conform to ANSI B16.9/MSS SP 43 requirements.

Polishing

Suitability for polishing - unless specifically stated on our quotation, we do not warrant that our products are suitable for polishing and will not accept back charges or returns for this reason.

Marking

All pipe, tube and fittings are marked in accordance with the requirements of the pertinent ASTM/ASME standard.

Certifications

Felker Brothers' quality system is registered to the ISO 9001 standard. Our IAS accredited third party auditor is Hartford Steam Boiler Registration Services. Our quality program utilizes the following inspection and test methods: liquid penetrant, eddy current, x-ray and hydrostatic.

Felker Brothers Corporation is a European Union, PED 2014/68/EU Annex 1 Par. 4.3/EN 10204 3.1 certified.

All Felker pipe, tube and fittings are product certified to NSF/ANSI Standard 61, Drinking Water System Components-Health Effects and NSF/ANSI Standard 372-Drinking Water System Components-Lead Content

Shipping

Material is shipped uncrated unless specified. When requested, all plain ends shall be plugged, flanged ends shall be wired to protect lap ring surface.

Routing

Please state your choice of routing or delivery carrier when ordering.

TAPPI Specification

All Felker products are produced as outlined in this catalog and conform, unless otherwise noted, to the recommended specifications for stainless steel piping, fittings and accessories of the Technical Association of the Pulp and Paper Industry.

MSS Specification

Felker manufactures to MSS dimensions where noted in this catalog.

END CONFIGURATIONS

Our standard A778/A774 product is provided with square cut plain ends. With your special request, we will provide the following End Configurations:

- Flanged Ends: All sizes can be furnished flanged with either flat or angle face rings and back-up flanges (ductile iron, carbon or stainless steel). A full range of metal to metal connectors, through 36" and larger, is also available for use with either metal to metal clamps or back-up flanges. Sizes of 3" and 4" long radius 45° elbows require long tangent to be flanged.
- Belled Ends: All sizes 2" through 36" (maximum .188 wall thickness) can be belled.
- Roll Grooved End: Our standard roll grooving capabilities are described in the chart on the right and are suitable for use with victaulic couplings and others. Victaulic Advanced Groove System (AGS) available upon request.
- Beveled Ends.

ROLL GROOVE CAPABILITIES

NOMINAL PIPE/TUBE SIZE	WALL THICKNESS
3/4" - 24"	through Sch10S
2" - 24"	through Sch40S

NOTE: All elbows and cone reducers must have 2" long tangents to accommodate roll grooving.

COMPARISON OF SPECIFICATIONS

	A-778/774	A-312/403	A-249/269
PRODUCT AFFECTED	Pipe/Tube/Fittings	Pipe/Fittings	Tube Only
SIZE RANGE	3"-48"	1/8"-24" (A-312) 1/2"-24" (A-403)	1/4" and Larger
DIMENSIONAL TOLERANCE	A-778 and A-312 both refer to A-999 for their requirements. A-774 and A-403 CR both refer to MSS SP-43 for their requirements. A-403 WP-W refers to ASME/ANSI B16.9 for their requirements.		A-249/269 both refer to A-1016 for their requirements.
APPLICATION	Low and Moderate ^{2,4}	General Corrosive Service ¹ (includes high heat applications)	High Temp Service (A-249) General (A-269)
TEMPERATURE RANGE	Low and Moderate	High ^{3,4}	High ⁴ Temp Service (A-249) General (A-269)
FORMING METHODS	Hot or Cold	Hot or Cold	Hot or Cold
WELDING-FILLER METHOD	Allowed	Not Allowed (A-312) Allowed (A-403)	Not Allowed (A-249) Allowed (A-269)
HEAT TREATMENT (ANNEALING)	Not Required	Annealed Min. 1900°F & Rapidly Cooled	Annealed Min. 1900° & Rapidly Cooled
PHYSICAL TESTING	Weld zone physical testing (destructive) required		
	Transverse Tensile (70,000 psi min.) Face Bend (no cracks) Root Bend (no cracks)	Transverse Tensile (70,000 psi min.) Face Bend or Flattening (no cracks)	Transverse Tensile (70,000 psi min.) Flattening Test Flange Test Reverse Bend Test Hardness Test
	Weld zone physical testing (nondestructive) Although not required by ASTM/ASME A-778 and A-312 pipe standards, Felker eddy current tests every inch of weld in conformance with nondestructive testing standard ASTM E426 and E309 requirements.		
HYDROSTATIC TESTING	Not required but may be requested as supplementary requirement	Hydro Test or Eddy Current Test (A-312) Not Required (A-403)	Hydro Test or Eddy Current Test
CLEANING REQUIREMENTS	Clean and Free of Scale (Felker standards include pickling)	Pickling per ASTM A-380 (Felker standards include pickling) Free of scale and contaminating iron particles. Pickling, blasting, or surface finishing is not mandatory when pipe is bright annealed. The purchaser is permitted to require that a passivating treatment be applied to the finished product.	Pickled free of scale. When bright anneal is used, pickling is not necessary.

1 – A-403 fittings service application requirements fall under ANSI B 16.9 & MSS SP-43.

2 – 400°F maximum when the service environment is known to be capable of causing intergranular corrosion.

3 – Above 400°F.

4 – For applications where temperatures range over 800°F, grades of stainless other than 304L and 316L may need to be considered.

ASTM A-778 AND A-774

WHY ASTM A-778?

The old and familiar ASTM A-312 pipe spec was originally published in 1948 before the advent and popular acceptance of the ELC stabilized grades of the austenitic 300 series of stainless steel, (see previous page on ELC). At that time, high temperature heat treating (annealing) after welding operations on Type 304 and Type 316 grades was the only practical available procedure that would eliminate the potential of intergranular corrosion failure in the heat-affected zones adjacent to the welds.

However, the intergranular corrosion protection provided by annealing is:

- Lost in the heat affected zones when field welding or thermal cutting is required without annealing (i.e., installation, field modification and repair).
- An additional manufacturing cost incurred in fabrication.

With the development of extra low carbon stainless alloys, a cost effective means of stabilizing against the harmful effects of heating above the sensitizing range was established in the industry. As a result:

- Costly post-weld heat (annealing) was no longer required for all but high temperature applications.
- Installation, field modification and repair no longer required expensive post-heat field annealing to preserve corrosion protection.

ASTM A-778 and A-774 were developed in 1980 long after the use of ELC as a stabilizer had been well established. The spec included only grades of stainless steel which were stabilized, this later spec does not call for annealing after welding.

As the comparison chart on the next page shows, A-778 and A-774 have some clear user advantages:

1. They include a greater range of diameters.
2. They include tube as well as pipe size.
3. They require the same dimensional tolerances as A-312, although Felker standard tolerances are tighter.
4. They allow the use of filler metal additions thereby permitting ferrite control in welds.
5. They include only the stabilized (ELC) grades of the 300 series of austenitic stainless steel which are the appropriate grades to be used for materials fabricated by welding when post-weld annealing is not practical.

Therefore it is difficult, if not impossible to justify the additional cost of finished product annealing (A-312) when further welding operations will be performed to:

- Accomplish installation at jobsite.
- Field modify or repair.
- Factory-fabricate either custom systems or desired end configurations.

Standard industry practice does not include post-weld annealing after fabrication. The result of this is product being placed in service with an unannealed weld.

A-774 VS. A-403

ASTM A-774

- Specification covers:
 - Five grades of stainless
 - 3" - 48"
 - Wall thickness from .062 - .500
- Does not require annealing
- Specification is for low pressure piping and is intended for low and moderate temperatures and general corrosive service

ASTM A-403

- Specification covers:
 - Wrought stainless steel fittings and pressure applications
 - Many types of stainless steel
- Two major grades: A-403 CR and A-403 WP

GRADE CR <ul style="list-style-type: none"> • MSS-SP43 • 24" Diameter & Smaller 	Product does not require non-destructive examination of welds produced with the addition of filler metal. <ul style="list-style-type: none"> • Pressure rating - Sch10S = 275 PSI @ 100°F • Taper boring to match pipe • No crosses
GRADE WP CLASS W <ul style="list-style-type: none"> • B16.9 • 48" Diameter & Smaller 	Product produced with the addition of filler metal to be examined with either the radiographic or ultrasonic methods. If made from pipe that has not had filler metal added, additional examination not required. <ul style="list-style-type: none"> • Pressure rating - 105% of pipe bursting pressure • Taper boring defined in specification • No fabricated fittings (i.e., branch welded tees) • Cross accepted - buldge formed
GRADE WP CLASS S <ul style="list-style-type: none"> • B16.9 • 48" Diameter & Smaller 	Seamless
GRADE WP CLASS WU <ul style="list-style-type: none"> • B16.9 • 48" Diameter & Smaller 	Requires all welds to be ultrasonic examination.
GRADE WP CLASS WX <ul style="list-style-type: none"> • B16.9 • 48" Diameter & Smaller 	Requires all welds to be radiographic examined.

STANDARD TOLERANCES

FOR PIPE, TUBE AND FITTINGS

NOMINAL PIPE, TUBE AND FITTING SIZE (IN.)	ALL PIPE, TUBE AND FITTINGS			ALL PIPE AND TUBE			ALL FITTINGS		90° ELLS 45° ELLS LATERALS TEE'S, Y'S	REDUCERS STUB ENDS CONNECTORS	BELLED ENDS	WELD CAPS				
	WALL THICKNESS (2) (3)	OUTSIDE DIAMETER (IN.) (1)	OFF ANGLE (SQUARENESS) (IN.) (5)	OVALITY (IN.) (1) (6)	SPECIFIED LENGTHS (IN.) (2) (4)	STRAIGHTNESS (IN./FT.) (2)	OVALITY AT WELD END (IN.) (1) (6)	OFF PLANE (IN.) (5)	CENTER TO END DIMENSION (IN.) (3)	OVERALL LENGTH (IN.) (3)	ID OF BELL TO BE NOM. OD +0.03 (IN.)	OVERALL LENGTH (IN.) (3)				
1/2-1"	NOT LESS THAN 87 1/2% OF NOMINAL THICKNESS	+0.016 -0.031	0.031	0.047	+0.250 -0.000	0.025	0.047	0.063	+/-0.063	+/-0.063	+0.031 -0.000	+/-0.125				
1 1/2"		+/-0.031		0.063			0.063						0.063	0.063	0.125	+0.063 -0.000
2"							0.094						0.188	0.250		
3"			+0.063 -0.031	0.063				0.094		0.125	+0.063 -0.000					
4"							+0.094 -0.031					0.094	0.094	0.188	+/-0.125	+/-0.125
5"		0.125 (t≥5/16) 0.150 (t<5/16)	0.125 (t≥3/8) 0.180 (t<3/8)	1.5% OF NOMINAL DIAMETER				0.375		+/-0.188	+/-0.188		+0.188 -0.000			
6"							0.188					0.188		0.5000	+/-0.188	+/-0.188
8"		+0.125 -0.031	0.125	1.5% OF NOMINAL DIAMETER				0.375		+/-0.125	+/-0.125		+0.156 -0.000			
10"							+0.156 -0.031					0.188		1.5% OF NOMINAL DIAMETER	0.375	+/-0.125
12"		+0.188 -0.031	0.188	1.5% OF NOMINAL DIAMETER				0.375		+/-0.125	+/-0.125		+0.156 -0.000			
14"							+0.220 -0.031					0.5% OF NOMINAL DIAMETER		1.5% OF NOMINAL DIAMETER	0.375	+/-0.125
16"		+0.220 -0.031	0.5% OF NOMINAL DIAMETER	1.5% OF NOMINAL DIAMETER				0.375		+/-0.125	+/-0.125		+0.156 -0.000			
18"							+0.220 -0.031					0.5% OF NOMINAL DIAMETER		1.5% OF NOMINAL DIAMETER	0.375	+/-0.125
20"		+0.220 -0.031	0.5% OF NOMINAL DIAMETER	1.5% OF NOMINAL DIAMETER				0.375		+/-0.125	+/-0.125		+0.156 -0.000			
24"							+0.220 -0.031					0.5% OF NOMINAL DIAMETER		1.5% OF NOMINAL DIAMETER	0.375	+/-0.125
30"		+0.220 -0.031	0.5% OF NOMINAL DIAMETER	1.5% OF NOMINAL DIAMETER				0.375		+/-0.125	+/-0.125		+0.156 -0.000			
36"							+0.220 -0.031					0.5% OF NOMINAL DIAMETER		1.5% OF NOMINAL DIAMETER	0.375	+/-0.125
>36" - 96"	+0.220 -0.031	0.5% OF NOMINAL DIAMETER	1.5% OF NOMINAL DIAMETER	0.375	+/-0.125	+/-0.125		+0.156 -0.000								
							+0.220 -0.031		0.5% OF NOMINAL DIAMETER	1.5% OF NOMINAL DIAMETER	0.375	+/-0.125	+/-0.125	+0.156 -0.000		

- (1) Tolerances per ASTM A-999 (as referred by A-778 & A-312 specifications).
- (2) Tolerances per ASTM A-778 & A-312 specifications.
- (3) Tolerances per MSS SP-43 (as referenced by A-774 & A-403). NOTE: MSS only covers fitting sizes through 24".
- (4) The tolerances for random 21 foot lengths on continuous mill products are +1"/-0.250". The tolerances for random 20 foot lengths on non-continuous mill products are +1"/-0.500".
- (5) Tolerances per ANSI B16.9.
- (6) Felker Brothers uses the same ovality tolerances as given for pipe & tube fittings 8" and larger.

NOTE: These are industry standard tolerances, in most cases Felker Brothers can meet more exacting tolerances that may be required by either the customer or the governing specification.



PIPE SUPPORT DATA

STIFFENING RING SPACING

For full vacuum service

304L & 316L Stainless at 100°F Temperature

- Stiffening rings are not required for sizes smaller than 8" if 16GA or heavier wall.
- Data is based on ASME standards.

CODE: S = Use Felker Standard 10GA Flat Face Ring

A = Use Felker Angle Face Ring

B = Use 1/4" x 2 1/2" Flat Bar

= Distance in inches between stiffening rings

NOMINAL THICKNESS GAUGE	PIPE AND TUBE SIZES												
	8	8 5/8	10	10 3/4	12	12 3/4	14	16	18	20	24	30	36
16	68S	62S	49S	44S	37S	34S	29S	24S	20S	17S	13S	10A	7A
14	96S	85S	68S	61S	52S	47S	41S	34S	28S	24S	18S	13A	10A
12	No stiffening rings required regardless of length				123S	112S	97S	80S	67S	57S	43S	31A	24A
11					138S	113S	95S	81S	61S	44A	33A		
10					151S	126S	108S	82S	58A	44A			
9					198S	166S	142S	108S	77A	58A			
8					200S	152A	108A	82A					
3/16					210A	150A	114A						
1/4					307B	234B							
3/8													

HANGER SPACING

Recommended for Felker Stainless Tube/Pipe based on 16,700 PSI allowable stress at 100°F.

- Data is based on supported span with uniform load.
- Although figures are calculated for OD pipe size, they may be safely used for OD tube size.
- Figures are based on pipe full of water.

Nominal Thickness NPS	16GA		14GA		12GA		11GA		10GA		8GA		3/16"		1/4"		3/8"		1/2"		5/8"	
	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.	Spacing ft.	Deflec. in.
2	16	0.491	17	0.559	17	0.488	18	0.586	18	0.567	18	0.540	-	-	-	-	-	-	-	-	-	-
3	19	0.563	20	0.602	20	0.506	21	0.578	21	0.551	21	0.511	-	-	-	-	-	-	-	-	-	-
4	21	0.601	21	0.516	23	0.608	23	0.566	23	0.535	24	0.579	24	0.559	-	-	-	-	-	-	-	-
6	23	0.529	24	0.529	26	0.578	26	0.530	27	0.576	28	0.594	28	0.567	-	-	-	-	-	-	-	-
8	25	0.538	27	0.609	28	0.549	29	0.574	30	0.610	31	0.611	31	0.580	32	0.565	-	-	-	-	-	-
10	27	0.566	28	0.540	30	0.547	31	0.564	32	0.590	33	0.580	33	0.548	35	0.585	37	0.596	-	-	-	-
12	28	0.538	30	0.583	32	0.575	33	0.585	33	0.537	35	0.586	35	0.551	37	0.573	39	0.566	-	-	-	-
14	29	0.557	31	0.597	33	0.581	34	0.587	35	0.604	36	0.581	37	0.609	38	0.561	41	0.602	-	-	-	-
16	30	0.550	32	0.582	34	0.559	35	0.561	35	0.513	38	0.609	38	0.570	39	0.519	43	0.599	-	-	-	-
18	31	0.551	33	0.576	36	0.612	37	0.609	37	0.556	39	0.583	40	0.604	41	0.542	45	0.607	-	-	-	-
20	32	0.558	34	0.578	37	0.605	38	0.599	39	0.605	40	0.588	41	0.585	43	0.572	46	0.572	-	-	-	-
24	34	0.584	36	0.594	39	0.607	40	0.596	41	0.598	43	0.609	43	0.567	46	0.595	49	0.575	52	0.609	-	-
30	36	0.578	38	0.579	41	0.578	42	0.564	43	0.561	45	0.563	46	0.571	49	0.582	53	0.587	56	0.602	58	0.603
36	38	0.592	40	0.585	43	0.573	45	0.607	46	0.599	48	0.592	49	0.595	52	0.594	56	0.581	59	0.582	62	0.612
42	39	0.559	42	0.604	45	0.582	47	0.611	48	0.599	50	0.587	51	0.587	54	0.577	59	0.592	62	0.581	65	0.600
48	41	0.594	43	0.577	47	0.601	48	0.575	50	0.610	52	0.592	53	0.590	56	0.573	61	0.575	65	0.593	68	0.604

Span chart is based on Piping Office Pipe Span Calculations with B31.3 data, calculation Method "A".

CHEMICAL ANALYSES

STAINLESS STEEL WROUGHT ALLOYS

- Felker supplies ELC grades 304L and 316L standard.
- Other alloys including 317L available on request.

TYPE	UNS DESIGNATION	ASTM MAT'L. SPEC.	CARBON % MAX.	MANGANESE % MAX.	PHOSPHORUS % MAX.	SULFUR % MAX.	SILICON % MAX.	MOLYBDENUM %	CHROMIUM %	NICKEL %	OTHER ELEMENTS %
304	S30400	A240	.08	2.00	.045	.030	1.00	–	18.00-20.00	8.00-10.50	N.10 max
304L	S30403	A240	.030	2.00	.045	.030	1.00	–	18.00-20.00	8.00-12.00	N.10 max
304H	S30409	A240	.04-.10	2.00	.045	.030	1.00	–	18.00-20.00	8.00-10.50	–
309S	S30908	A240	.08	2.00	.045	.030	1.00	–	22.00-24.00	12.00-15.00	–
310S	S31008	A240	.08	2.00	.045	.030	1.00	–	24.00-26.00	19.00-22.00	–
316	S31600	A240	.08	2.00	.045	.030	1.00	2.00-3.00	16.00-18.00	10.00-14.00	N.10 max
316L	S31603	A240	.030	2.00	.045	.030	1.00	2.00-3.00	16.00-18.00	10.00-14.00	N.10 max
316H	S31609	A240	.04-.10	2.00	.045	.030	1.00	2.00-3.00	16.00-18.00	10.00-14.00	–
317	S31700	A240	.08	2.00	.045	.030	1.00	3.00-4.00	18.00-20.00	11.00-15.00	N.10 max
317L	S31703	A240	.030	2.00	.045	.030	1.00	3.00-4.00	18.00-20.00	11.00-15.00	N.10 max
321	S32100	A240	.08	2.00	.045	.030	1.00	–	17.00-19.00	9.00-12.00	Ti=5xC to .70
321H	S32109	A240	.04-.10	2.00	.045	.030	1.00	–	17.00-19.00	9.00-12.00	Ti=4xC to .70
347	S34700	A240	.08	2.00	.045	.030	1.00	–	17.00-19.00	9.00-12.00	Cb+ta=10xc to 1.10
347H	S34709	A240	.04-.10	2.00	.045	.030	1.00	–	17.00-19.00	9.00-12.00	Cb+tc=8xc to 1.00

STAINLESS STEEL CAST ALLOYS

ACI TYPE	WROUGHT EQUIVALENT	CARBON % MAX.	MANGANESE % MAX.	PHOSPHORUS % MAX.	SULFUR % MAX.	SILICON % MAX.	CHROMIUM %	NICKEL %	OTHER ELEMENTS %
CF8	304	.08	1.50	.040	.040	2.00	18.0-21.0	8.0-11.0	Mo .50 max.
CF3	304L	.03	1.50	.040	.040	2.00	17.0-21.0	8.0-12.0	Mo .50 max.
CH20	309	.20	1.50	.040	.040	2.00	22.0-26.0	12.0-15.0	Mo .50 max.
CK20	310	.20	1.50	.040	.040	1.75	23.0-27.0	19.0-22.0	Mo .50 max.
CF8M	316	.08	1.50	.040	.040	1.50	18.0-21.0	9.0-12.0	Mo 2.0-3.0
CF3M	316L	.03	1.50	.040	.040	1.50	17.0-21.0	9.0-13.0	Mo 2.0-3.0
CG8M	317	.08	1.50	.040	.040	1.50	18.0-21.0	9.0-13.0	Mo 3.0-4.0
CG3M	317L	.03	1.50	.040	.040	1.50	18.0-21.0	9.0-13.0	Mo 3.0-4.0
CF8C	347	.08	1.50	.040	.040	2.00	18.0-21.0	9.0-12.0	–

THERMAL EXPANSIONS OF AUSTENITIC STAINLESS STEEL

A = Mean Coefficient of Thermal Expansion x 10⁻⁶ (In./In./°F) from 70°F to Indicated Temperature.

B = Linear Thermal Expansion (In./100 Ft.) from 70°F to Indicated Temperature.

COEFFICIENT	TEMPERATURE RANGE 70°F TO:															
	-150	-50	70	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
A	8.0	8.2	8.5	8.9	9.2	9.5	9.7	9.8	10.0	10.1	10.2	10.3	10.5	10.6	10.7	10.8
B	-2.1	-1.2	0	1.4	2.5	3.7	5.0	6.3	7.5	8.8	10.2	11.5	12.9	14.3	15.7	17.2

Ref: ASME B31.1-2007

TYPICAL PROPERTIES OF TYPE 304L AND 316L STAINLESS STEEL

Mechanical Properties:

Ref: ASME Section II, Part A

Design Guidelines for the Selection and Use of Stainless Steel, A.I.S.I.

YIELD STRENGTH		TENSILE STRENGTH		ELONGATION		MODULAS OF ELASTICITY IN		ROCKWELL B	IMPACT VALUE	POISSON'S
NOMINAL	MINIMUM	NOMINAL	MINIMUM	NOMINAL	MINIMUM	TENSION	TORSION	HARDNES (MAX)	MINIMUM	RATIO
39 KSI	25 KSI	81 KSI	70 KSI	50.0/55.0	40.0	28,000 KSI	12,500 KSI	88-95	80 ft. - lb.	0.29
42 KSI				(% IN 2")						

Physical Properties:

DENSITY = 0.29 LB/IN³

THERMAL CONDUCTIVITY (212° F) = 9.4 BTU/FT²/HR/°F/FT



THEORETICAL BURSTING PRESSURE

Schedule 5

Schedule 10

Schedule 40

NOMINAL SIZE PIPE TUBE	OUTSIDE DIA. OD	16 GA. (.062)		14 GA. (.078)		12 GA. (.109)		11 GA. (.125)		10 GA. (.140)		9 GA. (.156)	
		.062	.065	.078	.083	.109	.113	.120	.125	.134	.140	.148	.156
1/2	.840	-	10,833	-	13,833	18,166	-	-	-	-	-	-	-
1	1.000	8,750	-	-	-	-	-	-	-	-	-	-	-
3/4	1.050	-	8,666	-	11,066	-	15,066	-	-	-	-	-	-
1 1/4	1.250	7,000	-	-	-	-	-	-	-	-	-	-	-
1	1.315	-	6,920	-	-	11,604	-	-	-	14,266	-	-	-
1 1/2	1.500	5,833	-	-	-	-	-	-	-	-	-	-	-
1 1/4	1.660	-	5,481	-	-	9,192	-	-	-	-	11,807	-	-
1 1/2	1.900	-	4,759	-	-	8,031	-	-	-	-	-	10,905	-
2	2.000	4,350	-	-	-	-	-	-	-	-	-	-	-
2	2.375	-	3,831	-	-	6,425	-	-	-	-	-	-	9,195
2 1/2	2.50	3,500	-	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	-	-	-	4,041	-	-	5,843	-	-	-	-	-
3	3.000	2,916	-	3,640	-	5,087	-	-	5,833	-	-	-	-
3	3.500	2,500	-	3,120	3,320	4,360	-	4,800	5,000	-	-	-	-
4	4.000	2,187	-	2,730	-	3,815	-	-	4,375	-	-	-	-
4	4.500	1,944	-	2,426	2,582	3,391	-	3,733	3,888	-	-	-	-
5	5.000	1,750	-	2,184	-	3,052	-	-	3,500	-	3,920	-	-
5	5.563	1,573	-	1,963	-	2,743	-	-	3,146	3,372	3,523	-	-
6	6.000	1,458	-	1,820	-	2,543	-	-	2,916	-	3,267	-	-
6	6.625	1,320	-	1,648	-	2,303	-	-	2,642	2,832	2,958	-	-
8	8.000	1,093	-	1,365	-	1,907	-	-	2,187	-	2,450	-	-
8	8.625	1,014	-	1,267	-	1,769	-	-	2,029	-	2,272	2,402	-
10	10.000	875	-	1,091	-	1,526	-	-	1,750	-	1,960	-	-
10	10.750	813	-	1,016	-	1,420	-	-	1,628	1,745	1,823	-	-
12	12.000	729	-	910	-	1,271	-	-	1,458	-	1,633	-	-
12	12.750	686	-	857	-	1,197	-	-	1,373	-	1,537	-	1,713
14 14	14.000	625	-	780	-	1,090	-	-	1,250	-	1,400	-	1,560
16 16	16.000	546	-	683	-	954	-	-	1,094	-	1,225	-	-
18 18	18.000	486	-	606	-	848	-	-	972	-	1,089	-	-
20 20	20.000	437	-	546	-	763	-	-	875	-	980	-	-
24 24	24.000	364	-	455	-	636	-	-	729	-	817	-	-
30 30	30.000	292	-	364	-	509	-	-	583	-	653	-	-
36 36	36.000	243	-	303	-	424	-	-	486	-	544	-	-

SPECIFICATIONS

THEORETICAL BURSTING PRESSURE

- Based on an ultimate strength of $s=70,000$ PSI.
- Using Barlow's formula where:

$$P = \frac{t2S}{OD}, \quad t = \text{wall thickness}$$

- When establishing a working pressure a safety factor of 4 or 5 to 1 is typically used, the joint efficiency is in the 70% range and wall thickness variations are 12.5% of nominal.
- Factors were calculated at ambient temperatures.

NOMINAL SIZE PIPE TUBE	OUTSIDE DIA. OD	8 GA. (0.172)											
		.165	.180	.203	.218	.250	.280	.312	.322	.365	.375		
1/2	.840	-	-	-	-	-	-	-	-	-	-	-	-
1	1.000	-	-	-	-	-	-	-	-	-	-	-	-
3/4	1.050	-	-	-	-	-	-	-	-	-	-	-	-
1 1/4	1.250	-	-	-	-	-	-	-	-	-	-	-	-
1	1.315	-	-	-	-	-	-	-	-	-	-	-	-
1 1/2	1.500	-	-	-	-	-	-	-	-	-	-	-	-
1 1/4	1.660	-	-	-	-	-	-	-	-	-	-	-	-
1 1/2	1.900	-	-	-	-	-	-	-	-	-	-	-	-
2	2.000	-	-	-	-	-	-	-	-	-	-	-	-
2	2.375	-	-	-	-	-	-	-	-	-	-	-	-
2 1/2	2.50	-	-	-	-	-	-	-	-	-	-	-	-
2 1/2	2.875	-	-	-	-	9,885	-	-	-	-	-	-	-
3	3.000	-	-	-	-	-	-	-	-	-	-	-	-
3	3.500	-	-	-	-	-	8,720	-	-	-	-	-	-
4	4.000	-	-	-	-	-	-	-	-	-	-	-	-
4	4.500	-	-	-	-	-	-	7,778	-	-	-	-	-
5	5.000	-	-	-	-	-	-	-	-	-	-	-	-
5	5.563	-	-	-	-	-	-	6,292	-	-	-	-	-
6	6.000	-	-	-	-	-	-	-	-	-	-	-	-
6	6.625	-	-	-	-	-	-	-	5,917	-	-	-	-
8	8.000	-	-	-	-	-	-	-	-	-	-	-	-
8	8.625	-	2,792	-	3,052	-	-	4,058	-	-	5,227	-	-
10	10.000	-	2,408	-	2,632	-	-	3,500	-	-	-	-	-
10	10.750	2,149	2,240	-	2,448	-	-	3,256	-	-	4,753	4,884	-
12	12.000	-	2,007	-	2,193	-	-	2,917	-	-	-	-	4,375
12	12.750	-	1,889	1,976	2,064	-	-	2,745	-	-	-	-	4,118
14 14	14.000	-	1,720	-	1,880	-	-	2,500	-	-	-	-	3,750
16 16	16.000	1,444	1,505	-	1,645	-	-	2,188	-	-	-	-	3,281
18 18	18.000	1,283	1,338	-	1,462	-	-	1,944	-	-	-	-	2,917
20 20	20.000	-	1,204	-	1,316	-	1,526	1,750	-	-	-	-	2,625
24 24	24.000	-	1,003	-	1,097	-	1,272	1,458	-	-	-	-	2,187
30 30	30.000	-	803	-	877	-	-	1,167	-	1,458	-	-	1,750
36 36	36.000	-	669	-	731	-	-	972	-	1,215	-	-	1,458

SPECIFICATIONS

TERMS AND CONDITIONS OF SALE

1. OFFER, GOVERNING PROVISIONS AND CANCELLATIONS.

This writing constitutes an offer or counter offer by Felker Brothers Corporation ("Seller") to sell the products and/or services described herein in accordance with these terms and conditions. This writing is not an acceptance of any offer made by Buyer, and acceptance of this offer is expressly conditioned upon Buyer's assent to these terms and conditions. Buyer will be deemed to have assented to these terms and conditions when:

- (a) Buyer signs and delivers to Seller an acknowledgement copy of any of Seller's quotation, order acknowledgement or invoice forms;
- (b) at Seller's option, Buyer shall have given to Seller (orally or in writing) specifications of quantity, quality and/or type of goods, assortments thereof, delivery dates, shipping instructions, instructions to bill, or the like as to all or any part of the merchandise herein described;
- (c) Buyer has received delivery of the whole or any part thereof, or
- (d) Buyer has otherwise assented to the terms and conditions hereof.

No additional or different terms or conditions will be binding upon Seller unless specifically agreed to in writing by an officer of Seller at Marshfield, Wisconsin; no other representative has any authority to waive, alter, vary or add to the terms hereof. Seller hereby objects to any such additional or different provisions contained in any purchase order or other communication heretofore or henceforth received from Buyer. THIS CONTRACT AND THESE TERMS AND CONDITIONS SHALL CONSTITUTE THE ENTIRE AGREEMENT BETWEEN SELLER AND BUYER, AND SHALL BE GOVERNED BY AND SHALL BE CONSTRUED ACCORDING TO THE INTERNAL LAWS OF THE STATE OF WISCONSIN, INCLUDING ITS PROVISIONS OF THE UNIFORM COMMERCIAL CODE, THE RIGHTS AND OBLIGATIONS OF BUYER AND SELLER SHALL NOT BE GOVERNED BY THE PROVISIONS OF THE UNITED NATIONS CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS. No order may be cancelled or altered by the Buyer except upon terms and conditions acceptable to Seller, as evidenced by Seller's written consent. In the event of such an approved cancellation by Buyer, Seller shall be entitled to payment of the full price, less the amount of any expense saved by Seller by reason of the cancellation.

2. PRICES. As explained on the face of this form, the prices of the goods and/or services set forth thereon are Seller's prices for such goods and/or services with all the terms in this form, including the exclusive warranty and the various disclaimers and limitations of liability enforceable against the Buyer. If Buyer desires for Seller to provide a greater, or additional warranty, and/or to be liable for some or all of the disclaimed or limited liability, the prices set forth in this offer are not available, and the Buyer must notify Seller before Buyer accepts this offer (or is deemed to accept it) pursuant to paragraph 1 above. Seller will then make a new offer containing prices reflecting that additional exposure. In the absence of such a new offer, all of the terms in this form shall be enforceable. By accepting this offer, Buyer understands that it is foregoing the possibility of, among other things, recovery of consequential damages from Seller and of indemnity for tort liability in exchange for Buyer obtaining a lower sales price for the goods and/or services.

All prices listed are payable in United States Dollars, Except as otherwise provided on the face of this form, all prices are subject to change without notice; and the price of products on order but unshipped will be adjusted to the price in effect at the time of shipment. Payment is due net 30 days from the date of Seller's invoice upon approved credit, unless otherwise specified in this form. If, during the period of performance of an order, the financial position of Buyer does not justify the terms of payment specified herein, Seller may require payment in

advance. Interest may be charged at the rate of 18% per year from the date of invoice (but not more than the highest rate permitted by applicable law) on accounts past due. The Buyer further agrees that if any or all of the purchase price or accrued interest or any other sum due Seller is collected by a collection agency, attorney or legal procedure of any kind, these costs will also be due Seller and paid by Buyer.

3. SECURITY INTEREST. Title to the equipment sold hereunder, and all additions or accessions to any substitutions for such equipment, shall remain in the Seller as a security interest, and Buyer hereby grants to Seller a security interest in the goods sold hereunder, until the Buyer has completed payment of the purchase price, plus accrued interest, and fully performed all of the other terms and conditions hereof, at which time the Seller's security interest is satisfied.

The equipment covered hereby shall remain strictly personal property, irrespective of the mode of its attachment to realty, the consequences of its being disturbed or removed, or the use made of it. The Buyer shall maintain the equipment covered hereby in good condition and repair and not permit its value to be impaired. The Buyer shall not sell, mortgage, pledge or otherwise deal in or encumber the equipment or any part of it or permit it to be removed from the place where first installed (so long as any portion of the purchase price or accrued interest or any other sum due Seller under these terms of sale remains unpaid), without the Seller's prior written consent. The Seller is authorized to inspect the equipment wherever located at any reasonable time or times. The equipment shall be insured by the Buyer at its own expense in an amount not less than the balance due to the Seller under this agreement, with loss, if any, payable to the Seller. Seller has no duty to protect, insure or realize upon the equipment.

4. TAXES AND OTHER CHARGES. Any manufacturer's tax, occupation tax, use tax, sales tax, excise tax, value-added tax, duty, custom, inspection or testing fee, or any other tax, fee or charge of any nature whatsoever imposed by any governmental authority, on or measured by the transaction between Seller and the Buyer shall be paid by the Buyer in addition to the prices quoted or invoiced. In the event the Seller is required to pay any such tax, fee or charge, the Buyer shall reimburse Seller therefore.

5. DELIVERY, CLAIMS AND FORCE MAJEURE. Delivery of products to a carrier at Seller's plant or other loading point shall constitute delivery to Buyer, and regardless of shipping terms or freight payment, all risk of loss or damage in transit shall be borne by Buyer. Seller reserves the right to make delivery in installments, unless otherwise expressly stipulated herein, all such installments to be separately invoiced and paid for when due per invoice, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Buyer of its obligations to accept remaining deliveries.

Claims for shortages or other errors in delivery must be made in writing to Seller within ten (10) days after receipt of shipment. Failure to give such notice shall constitute unqualified acceptance of all shipments made prior to Seller's receipt of Buyer's notice of claim, and shall constitute a waiver of all such claims by Buyer. Claims for loss or damage to goods in transit should be made to the carrier and not to Seller.

All delivery dates are approximate. Seller shall not be liable for any damage as a result of any delay or failure to deliver due to any act of God, act of the Buyer, embargo or other governmental act, regulation or request, fire, accident, strike, slowdown or other labor difficulties, war, riot, delay in transportation, defaults of common carriers, inability to obtain necessary labor materials or manufacturing facilities or, without limiting the foregoing, any other delays beyond the Seller's control. In the event of any such delay the date of delivery shall be extended for a period equal to the time lost because of the delay. Buyer's exclusive remedy for other delays and for Seller's inability to deliver for any reason, shall be rescission of this agreement.

TERMS AND CONDITIONS OF SALE

6. EXCLUSIVE WARRANTY. Seller warrants products manufactured by it and supplied hereunder to be free from defects in materials and workmanship for a period of twelve (12) months from the date of shipment. If within such period any such product shall be proved to Seller's satisfaction to be defective, Seller shall, at Seller's option, either repair or replace such defective product or issue a credit or refund for that part of the purchase price of such product which is equitably allocable to the part or parts of such product which gives rise to such claim. Seller shall not be liable for the costs of removing defective products or reinstalling repaired or replaced products. Such repair or replacement shall be Seller's sole obligation and Buyer's exclusive remedy hereunder and shall be conditioned on Seller's receiving written notice of any alleged defect within ten (10) days after its discovery and, at Seller's option, return of such products to Seller, F.O.B. its factory. This warranty is only applicable to products properly maintained and used according to Seller's instructions. This warranty does not apply to products damaged by misuse, neglect, improper operation, accident or alteration, as determined by Seller. Products supplied by Seller hereunder which are manufactured by someone else are not warranted by Seller in any way, but Seller agrees to assign Buyer any warranty rights in such products that Seller may have from the original manufacturer.

THE WARRANTY CONTAINED IN THIS SECTION 6 IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS AND WARRANTIES, EXPRESSED OR IMPLIED, AND SELLER EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. If Buyer desires for Seller to provide a warranty greater than that which is stated above, then Seller will adjust upward the prices for goods and/or services listed on the face of this offer to reflect the additional expense to Seller which a warranty obligation would cause. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as Seller is willing and able to repair or replace defective products or issue a credit or refund within ninety (90) days after the date on which Seller determines a defect to exist.

Any description of the products, whether in writing or made orally by Seller or Seller's agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar materials used in connection with Buyer's order are for the sole purpose of identifying the products and shall not be construed as an express warranty. Any suggestions by Seller or Seller's agent regarding use, application or suitability of the products shall not be construed as an express warranty unless confirmed to be such in writing by Seller.

7. COMPLIANCE WITH LAWS. Seller strives to comply with the provisions of all federal, state and local laws, standards and regulations for which liability may accrue to Buyer for violation thereof. Seller certifies that these goods were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act, as amended, and all regulations and orders of the United States Department of Labor issued under section 14 thereof. However, Seller does not warrant that any equipment and features meet the requirements of any local, state or federal laws or regulations, including those issued under OSHA. The equipment described herein is provided only with the safety devices and features shown in the applicable specifications. Should the customer require any additional devices or features, they should be specifically identified, and Seller will amend this quotation accordingly.

8. RETURNS. Products may be returned to Seller only when Seller's written permission, signed by duly authorized personnel of Seller, shall be obtained by Buyer in advance. Goods may not be returned unless they are in marketable condition. Returned products must be securely packaged and reach Seller without damage. Return transportation charges must be prepaid by Buyer. Stock items, when returned, will be

credited at lowered prevailing price, and subject to a charge for handling and restocking. Non-standard or special items are not subject to cancellation, change, reduction in amount, nor returned for credit without written consent and upon terms which indemnify Seller against loss. Any cost incurred by Seller to put products in marketable condition will be charged to Buyer.

9. EXCLUSION OF CONSEQUENTIAL DAMAGES AND DISCLAIMER OF LIABILITY; BUYER'S INDEMNITY. Seller's liability with respect to breaches or warranty shall be limited as provided in Section 6 hereof. With respect to other breaches of this contract, Seller's liability shall in no event exceed the contract price. SELLER SHALL NOT BE SUBJECT TO AND DISCLAIM; (1) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY; (2) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY SELLER, OR ANY UNDERTAKINGS, ACT OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER. Without limiting the generality of the foregoing, Seller specifically disclaims any liability for penalties (including administrative penalties), special or punitive damages, damages for lost profits or revenues, loss of use of products or any associated equipment, cost of capital, facilities or services, downtime, shut-down or slow-down costs, spoilage of material, or for any other types of economic loss. All the limitations and disclaimers contained in this paragraph and in the rest of this contract shall apply to claims of Buyer's customers or any third party asserted by Buyer against Seller for indemnity or contribution, as well as direct claims of Buyer against Seller.

Buyer shall indemnify Seller against any and all losses, liabilities, damages and expenses (including, without limitation, attorney's fees and other costs of defending any action) which Seller may incur as a result of any claim by Buyer or others arising out of or in connection with the products and/or services sold hereunder and based on product or service defects not proven to have been caused solely by Seller's negligence.

10. BUYER'S PROPERTY. Any property of the Buyer placed in Seller's custody for performance for this contract is not covered by insurance, and no risk is assumed by Seller in the event of loss or damage to such property by fire, water, burglary, theft, civil disorder or any accident beyond the reasonable control of the Seller.

11. ADDITIONAL DOCUMENTS; POWER OF ATTORNEY. At the request of Seller, Buyer will join with Seller in executing one or more Financing Statements, pursuant to the Uniform Commercial Code in form satisfactory to seller and will pay the cost of filing the same in public offices whenever filing is deemed by Seller to be necessary or desirable. If Buyer fails to promptly execute and file such Financing Statements, then Buyer hereby appoints any officer, employee, or agent of Seller as Buyer's attorney-in-fact for purposes of signing and filing such Financing Statements, and hereby authorizes such officer, employee or agent to execute and file such Financing Statements in the name of the Buyer.

12. SEVERABILITY. If any provisions of these terms and conditions of sale shall be deemed illegal or unenforceable, such illegality or unenforceability shall not affect the validity and enforceability of any legal and enforceable provision hereof, which shall be construed as if such illegal and unenforceable provision(s) had not been inserted herein.



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