Multi-Rifled Tubes

Multi-Rifled Seamless Cold Drawn Boiler Tubes for Power Generation

ISO 14001:2004
VEXIL BPS MS
E9100811

OHSAS 18001:2007
VEXIL BPS MS
H9100825

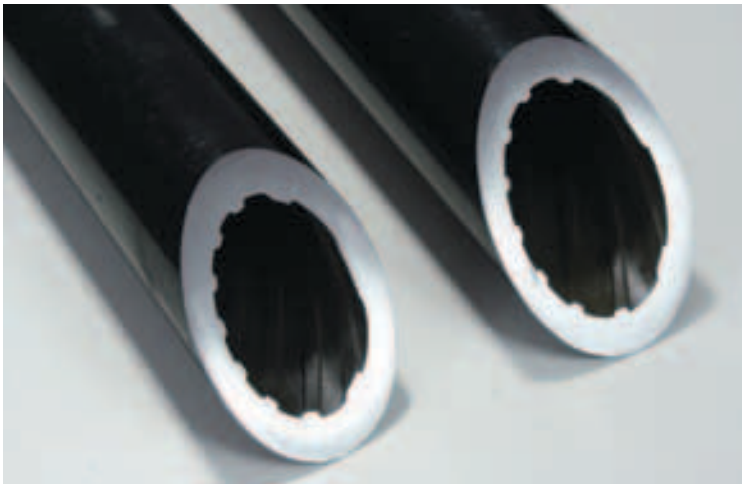
BSI REGISTERED
ISO/TS 16949 : 2002

ISMT LIMITED

Solutions You Can Trust

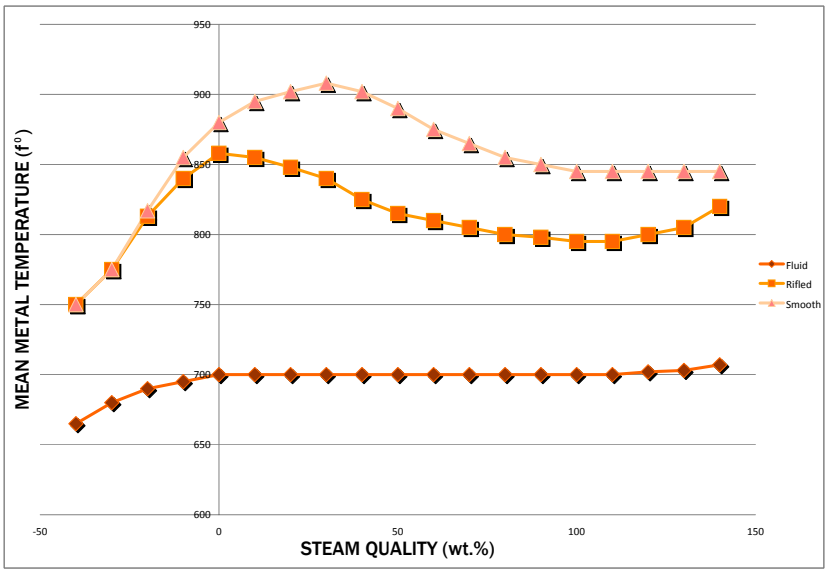
Multi-Rifled Tubes

Multi-Rifled Seamless Cold Drawn Boiler Tubes for Power Generation and Energy Industry



IMPROVED BOILER EFFICIENCY

Rifled tubes are used in heat exchangers and boilers to provide highly energy efficient means of heat transfer. The presence of the internal rifling induces centrifugal forces in the mass flow thereby separating the water from the steam fraction and forcing the water towards the tube wall. As a result of this phenomenon and the increase in internal surface the following advantages accrue:



- Improved heat transfer rate even at higher steam quality levels
- Very good heat transfer even at low mass flux levels
- Reduction in mean metal temperature of the tube wall
- Ability to increase heat transfer rate by optimizing rifling geometry

CUSTOMIZED RIFLE GEOMETRIES

As described above the heat transfer rate can be optimized by varying the rifling geometry based on operation conditions. In addition to the standard rifle tubes (covered in this brochure), ISMT manufactures rifled tubes to suit any customized geometry and in all boiler steel grades. We regularly manufacture and deliver such customized solutions at short notice.

ASSURED QUALITY

With over 25 years of experience in the production of precision seamless tubes for the Powergen industry we can guarantee the quality of all our tubes. The entire production process, the melting of steel, the manufacture of the hot-finished tube, the cold drawing, and the final heat treatment to obtain the desired metallurgical properties is carried out in-house. Each and every tubes is then ultrasonically and/or eddy current tested to ensure quality.

SPECIFICATIONS AND GRADES

Rifle Tubes can be supplied against ASTM, ASME, A/SA 192, 209, 210 and 213 specifications and all associated grades.

Tubes can be supplied against equivalent specifications like EN 10216, DN 17175, BS 3059, JIS 3461 – 3462.

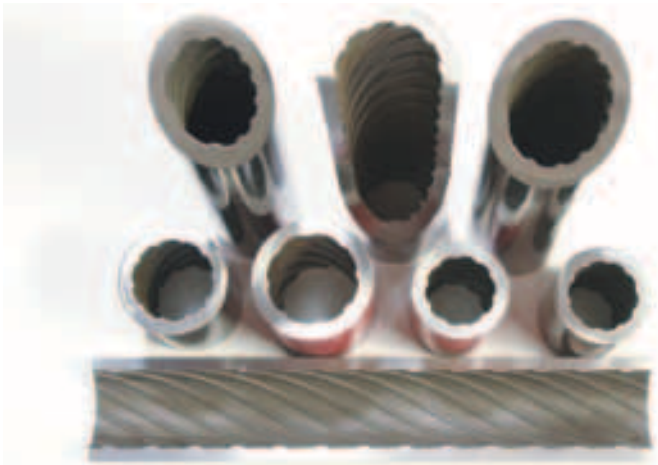
Tubes can be supplied to bath A and B type profiles. Detailed dimensions for each profile are given in the table.

FULL RANGE OF MATERIALS

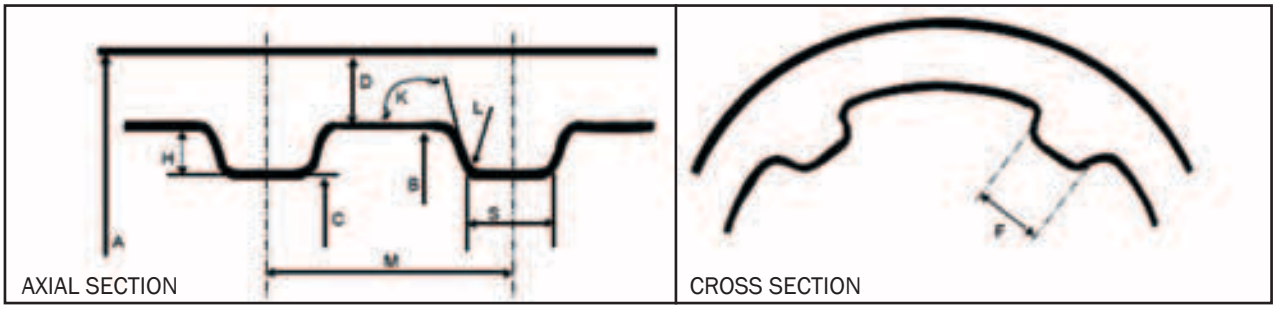
We manufacture tubes in every possible boiler grade steel. All our steel is melted in-house through electric arc furnace route, than is ladle refined, 100% vacuum degassed, continuous cast and rolled.

APPROVALS

ISMT is ISO 14001, ISO/TS 16949:2002, and OHSAS 18001 approved. In addition we hold approvals from all major national and international official authorities, customers, and third party certification agencies.



“A” Type Profile



AXIAL SECTION

CROSS SECTION

O.D.(mm)	28.58	to	40.64	to	50.80	to	63.50	to	76.20
α (mm)		0.15		0.20		0.25		0.30	
O.D.(in.)	1.125	to	1.600	to	2.000	to	2.50	to	3.000
α (in.)		0.006		0.008		0.010		0.012	

	Item	Value		Tolerances	
A	Tube outside diameter	-	-	α	α
B	Major inside diameter	B=A-(1.11xDx2)	B=A-(1.11xDx2)	α	α
C	Min. inside diameter	-	-	-	-
D	Min. wall thickness	-			
E	Number of ribs	-	-	-	-
F	Rib width at the top (circumferiential)	4.78 mm	0.188 in.	Nominal value	Nominal value
H	Specified rib height			+/- 0.30 mm	+/- 0.012 in.
K	Rib side angle (both sides of the rib)	55°	55°	+/- 15°	+/- 15°
L	Rib radius (top and bottom of the rib)	from 0.4 to 2 mm	1/64 to 5/64 in.		
M	Pitch (rib lead)	-		+/- 3.18 mm	+/- 0.125 in.
N	Lead			+/- 3.18 x E mm	+/- 0.125 x E in.
P	Lead angle	30°	30°	Nominal value	Nominal value
S	Rib width at top(longitudinal)	8.28 mm	0.326 in.	+/- 1.27 mm	+/- 0.050 in.

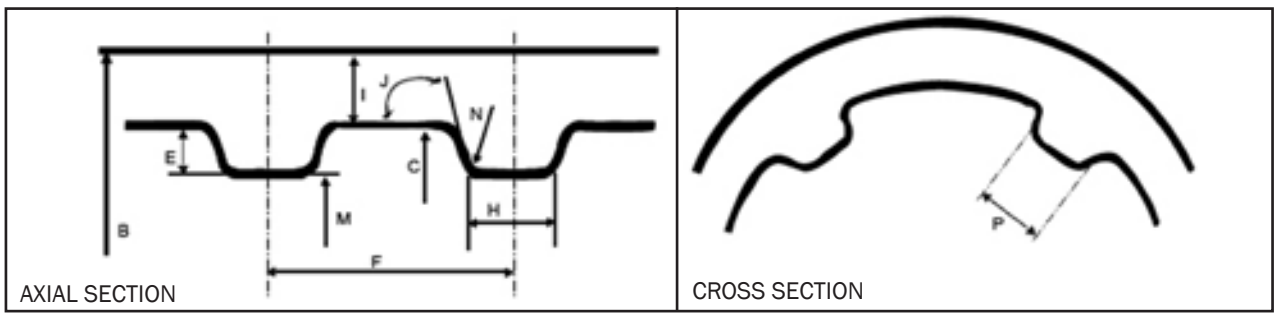
OUTSIDE DIAMETER

	Minimum Wall Thickness		No. of RIBS	Major I.D.		RIB Heignt		Lead		Mean Weight		Flow Section		Wet Internal Perimeter	
	mm	in.		mm	in.	mm	in.	mm	in.	Kg/m	Lb/ft	mm2	Sq in.	mm	in.
31.75 mm 1.250 in.	3.96	0.156	6	22.95	0.904	0.88	0.035	124.9	4.918	3.18	2.137	387	0.612	79.30	3.18
	4.19	0.165	6	22.45	0.884	0.88	0.035	122.1	4.809	3.32	2.232	369	0.584	77.60	3.11
	4.57	0.180	6	21.60	0.850	0.87	0.034	117.5	4.624	3.55	2.384	340	0.538	74.90	3.00
38.10 mm / 1.500 in	4.19	0.165	6	28.80	1.134	0.96	0.038	156.7	6.169	4.07	2.735	622	0.977	98.20	3.93
	4.70	0.185	6	27.67	1.089	0.94	0.037	150.5	5.924	4.46	2.996	572	0.899	94.65	3.78
	5.08	0.200	6	26.82	1.056	0.93	0.037	145.9	5.745	4.74	3.185	536	0.844	91.80	3.67
41.28 mm / 1.625 in.	4.19	0.165	6	31.97	1.259	1.00	0.039	173.9	6.849	4.44	2.987	772	1.211	108.50	4.34
	4.65	0.183	6	30.96	1.219	0.98	0.039	168.4	6.631	4.84	3.249	722	1.133	105.20	4.21
	5.08	0.200	6	30.00	1.181	0.97	0.038	163.2	6.425	5.19	3.489	677	1.062	102.10	4.08
	5.59	0.220	6	28.87	1.137	0.96	0.038	157.1	6.185	5.60	3.762	625	0.982	98.40	3.94
44.45 mm / 1.750 in.	4.19	0.165	6	35.15	1.384	1.04	0.041	191.2	7.529	4.82	3.239	938	1.468	118.80	4.74
	4.57	0.180	6	34.30	1.350	1.03	0.040	186.6	7.344	5.18	3.480	892	1.396	116.10	4.63
	5.08	0.200	6	33.17	1.306	1.01	0.040	180.5	7.105	5.64	3.793	833	1.305	112.40	4.49
	5.59	0.220	6	32.05	1.262	1.00	0.039	174.5	6.865	6.09	4.095	775	1.216	108.70	4.35
	6.10	0.240	6	30.92	1.217	0.98	0.039	168.2	6.620	6.53	4.387	720	1.129	105.10	4.20
47.63 mm / 1.875 in.	4.57	0.180	8	37.48	1.475	1.06	0.042	203.9	8.024	5.67	3.811	1059	1.660	129.20	5.17
	5.08	0.200	8	36.35	1.431	1.05	0.041	197.7	7.785	6.18	4.154	994	1.560	125.50	5.03
	5.59	0.220	6	35.22	1.387	1.04	0.041	191.6	7.545	6.59	4.428	942	1.475	119.00	4.75
	6.10	0.240	6	34.09	1.342	1.02	0.040	185.5	7.300	7.07	4.750	881	1.379	115.40	7.61
	6.60	0.260	6	32.96	1.298	1.01	0.040	179.3	7.061	7.53	5.061	822	1.288	111.70	4.46

OUTSIDE DIAMETER

	Minimum Wall Thickness		No. of RIBS	Major I.D.		RIB Heignt		Lead		Mean Weight		Flow Section		Wet Internal Perimeter	
	mm	in.		mm	in.	mm	in.	mm	in.	Kg/m	Lb/ft	mm2	Sq in.	mm	in.
50.80 mm / 2.000 in.	5.08	0.200	8	39.52	1.556	1.08	0.042	215.0	8.465	6.63	4.457	1182	1.851	135.80	5.44
	5.59	0.220	8	38.40	1.512	1.07	0.042	208.9	8.225	7.17	4.819	1113	1.746	132.10	5.29
	6.10	0.240	8	37.27	1.467	1.06	0.042	202.7	7.980	7.69	5.170	1047	1.641	128.50	5.15
	6.60	0.260	8	36.14	1.423	1.05	0.041	196.6	7.741	8.20	5.511	982	1.542	124.80	5.00
53.98 mm / 2.125 in.	5.59	0.220	8	41.57	1.637	1.10	0.043	226.1	8.905	7.67	5.152	1311	2.054	142.40	5.70
	6.10	0.240	8	40.44	1.592	1.09	0.043	220.0	8.660	8.23	5.533	1239	1.940	138.80	5.55
	6.60	0.260	8	39.31	1.548	1.08	0.042	213.9	8.421	8.78	5.903	1169	1.832	135.10	5.41
	7.11	0.280	8	38.19	1.503	1.07	0.042	207.7	8.176	9.32	6.263	1101	1.725	131.50	5.26
57.15 mm / 2.250 in.	5.59	0.220	8	44.75	1.762	1.12	0.044	243.4	9.585	8.16	5.485	1525	2.386	152.70	6.11
	6.10	0.240	8	43.62	1.717	1.11	0.044	237.3	9.340	8.77	5.895	1448	1.263	149.00	5.96
	6.60	0.260	8	42.69	1.673	1.10	0.043	231.1	9.101	9.37	6.295	1372	2.147	145.40	5.82
	7.11	0.280	8	41.36	1.628	1.09	0.043	225.0	8.856	9.95	6.685	1298	2.031	141.70	5.67
	7.62	0.300	8	40.23	1.584	1.08	0.043	218.9	8.617	10.51	7.064	1226	1.920	138.10	5.53
	8.13	0.320	8	39.11	1.540	1.07	0.042	212.7	8.378	11.06	7.432	1156	1.813	134.40	5.38
60.33 mm / 2.375 in.	5.59	0.220	8	47.92	1.887	1.15	0.045	260.7	10.256	8.66	5.818	1755	2.743	163.00	6.51
	6.10	0.240	8	46.79	1.842	1.14	0.045	254.5	10.020	9.31	6.258	1672	2.611	159.30	6.37
	6.60	0.260	8	45.66	1.798	1.13	0.045	248.4	9.781	9.95	6.688	1590	2.486	155.70	6.22
	7.11	0.280	8	44.54	1.753	1.12	0.044	242.3	9.536	10.58	7.107	1511	2.361	152.00	6.08
	7.62	0.300	8	43.41	1.709	1.11	0.044	236.1	9.297	11.18	7.515	1433	2.242	148.40	5.93
	8.13	0.320	8	42.28	1.665	1.10	0.043	230.0	9.085	11.78	7.913	1358	2.126	144.70	5.79
	8.59	0.338	8	41.27	1.625	1.09	0.043	224.5	8.840	12.30	8.262	1292	2.023	141.40	5.66
63.50 mm / 2.500 in.	6.10	0.240	8	49.97	1.967	1.17	0.046	271.8	10.700	9.85	6.621	1912	2.984	169.60	6.77
	6.60	0.260	8	48.84	1.923	1.16	0.046	265.7	10.461	10.54	7.080	1825	2.850	165.90	6.63
	7.11	0.280	8	47.71	1.878	1.15	0.045	259.5	10.216	11.20	7.529	1740	2.716	162.30	6.48
	7.62	0.300	8	46.58	1.834	1.14	0.045	253.4	9.977	11.86	7.967	1657	2.588	158.60	6.34
	8.13	0.320	8	45.46	1.790	1.13	0.044	247.3	9.738	12.49	8.395	1575	2.464	155.00	6.20
	8.59	0.338	8	44.44	1.750	1.12	0.044	241.8	9.520	13.05	8.771	1504	2.353	151.70	6.07
	9.14	0.360	8	43.20	1.701	1.11	0.044	235.0	9.253	13.72	9.218	1419	2.221	147.70	5.91
	9.53	0.375	8	42.35	1.667	1.10	0.043	230.4	9.068	14.16	9.516	1363	2.131	145.00	5.80

“B” Type Profile



O.D.(mm)	28.58	to	40.64	to	50.80	to	63.50	to	76.20
α (mm) β (mm)		0.15 0.18		0.20 0.20		0.23 0.25		0.28 0.30	
O.D.(in.)	1.125	to	1.600	to	2.000	to	2.50	to	3.000
α (in.) β (mm)		0.006 0.007		0.008 0.008		0.010 0.009		0.012 0.010	

	Item	Value		Tolerances	
B	Tube outside diameter	-	-	α	α
C	Major inside diameter	C=B-(1.11x1x2)	C=B-(1.11x1x2)	α	α
D	Number of ribs	-	-	-	-
E	Specified rib height	-	-	β(1)	β(1)
F	Pitch (rib lead)	-	-	+/- 3.18mm	+/- 0.125 in.
G	Lead			+/- 3.18 x D mm	+/- 0.125 x D in.
H	Rib width at top(longitudinal)	5.59 mm	0.220 in.	+/- 1.27 mm	+/- 0.050 in.
I	Min. wall thickness	-	-	-	-
J	Rib side angle (both sides of the rib)	50°	50°	+/- 15°	+/- 15°
M	Min. inside diameter	-	-	-	-
N	Rib radius (top and bottom of the rib)	from 0.4 to 2 mm	1/64 to 5/64 in.		
O	Lead angle	30°	30°	Nominal value	Nominal value
P	Rib width at the top (circumferiential)	3.23 mm	0.127 in.	-	-

(1.) The average rib height of all the ribs should fall without the proper value of +/- tolerance in the following table.
The maximum deviation on any rib height from specified value should not exceed the +/- tolerance by more than 0.003 in.

OUTSIDE DIAMETER

	Minimum Wall Thickness		No. of RIBS	Major I.D.		RIB Heignt		Lead		Mean Weight		Flow Section		Wet Internal Perimeter	
	mm	in.		mm	in.	mm	in.	mm	in.	Kg/m	Lb/ft	mm2	Sq in.	mm	in.
28.58 mm / 1.125 in.	3.76	0.184	4	20.23	0.796	0.95	0.037	110.1	4.330	2.62	1.761	307	0.476	68.3	2.69
	3.96	0.156	4	19.78	0.779	0.94	0.037	107.6	4.238	2.73	1.835	293	0.455	66.9	2.63
	4.19	0.165	4	19.27	0.759	0.93	0.037	104.8	4.129	2.85	1.917	278	0.431	65.2	2.57
	4.57	0.180	4	18.43	0.725	0.92	0.036	100.2	3.944	3.05	2.048	253	0.392	62.5	2.46
31.75 mm / 1.250 in.	3.76	0.148	6	23.41	0.921	0.99	0.039	127.3	5.010	3.01	2.023	408	0.632	81.0	3.19
	3.96	0.156	6	22.95	0.904	0.98	0.039	124.9	4.918	3.14	2.109	392	0.608	79.5	3.13
	4.19	0.165	6	22.45	0.884	0.98	0.039	122.1	4.809	3.28	2.204	374	0.580	77.9	3.07
	4.57	0.180	6	21.60	0.850	0.97	0.038	117.5	4.624	3.51	2.356	345	0.534	75.1	2.96
34.92 mm / 1.375 in.	3.76	0.148	6	26.58	1.046	1.03	0.041	144.6	5.690	3.35	2.248	532	0.824	91.3	3.59
	3.96	0.156	6	26.13	1.029	1.03	0.040	142.1	5.598	3.49	2.346	513	0.796	89.8	3.54
	4.19	0.165	6	25.62	1.009	1.02	0.040	139.4	5.489	3.65	2.454	493	0.764	88.2	3.47
	4.57	0.180	6	24.78	0.975	1.01	0.040	134.8	5.304	3.91	2.629	460	0.712	85.4	3.36
	4.78	0.188	6	24.32	0.958	1.00	0.039	132.3	5.212	4.05	2.720	442	0.686	84.0	3.31
	5.16	0.203	6	23.48	0.924	0.99	0.039	127.7	5.027	4.29	2.886	411	0.636	81.2	3.20
	5.59	0.220	6	22.52	0.887	0.98	0.039	122.5	4.825	4.56	3.067	377	0.584	78.1	3.08
37.31 mm / 1.469 in.	3.76	0.148	8	28.97	1.140	1.06	0.042	157.6	6.202	3.66	2.459	627	0.972	101.6	4.00
	3.96	0.156	8	28.52	1.123	1.05	0.041	155.1	6.109	3.82	2.565	607	0.942	100.2	3.94
	4.19	0.165	6	28.01	1.103	1.05	0.041	152.4	6.000	3.93	2.624	593	0.919	95.9	3.78
	4.57	0.180	6	27.16	1.069	1.04	0.041	147.8	5.815	4.22	2.834	556	0.862	93.1	3.67
	4.78	0.188	6	26.71	1.052	1.03	0.041	145.3	5.723	4.37	2.934	537	0.833	91.7	3.61
	5.16	0.230	6	25.87	1.018	1.02	0.040	140.7	5.538	4.64	3.116	503	0.779	88.9	3.50
	5.59	0.220	6	24.91	0.981	1.01	0.040	135.5	5.337	4.94	3.316	465	0.721	85.8	3.38
	6.10	0.240	6	23.78	0.936	1.00	0.039	129.4	5.092	5.27	3.542	422	0.654	82.2	3.24
38.1 mm / 1.500 in.	3.76	0.148	8	29.76	1.171	1.07	0.042	161.9	6.370	3.74	2.515	663	1.027	104.2	4.10
	3.96	0.156	8	29.30	1.154	1.06	0.042	159.4	6.278	3.91	2.624	643	0.997	102.7	4.05
	4.19	0.165	8	28.80	1.134	1.06	0.042	156.7	6.169	4.09	2.745	620	0.961	101.1	3.98
	4.57	0.180	6	27.95	1.100	1.05	0.041	152.0	5.948	4.32	2.901	590	0.914	95.7	3.77
	4.78	0.188	6	27.50	1.083	1.04	0.041	149.6	5.892	4.47	3.004	571	0.885	94.2	3.71
	5.16	0.203	6	26.65	1.049	1.03	0.041	145.0	5.707	4.75	3.192	535	0.983	91.5	3.60
	5.59	0.220	6	25.70	1.012	1.02	0.040	139.8	5.505	5.06	3.399	496	0.769	88.4	3.48
	6.10	0.240	6	24.57	0.967	1.01	0.040	133.6	5.260	5.40	3.632	452	0.700	84.7	3.34
	6.35	0.250	6	24.00	0.945	1.00	0.039	130.6	5.141	5.57	3.744	430	0.667	82.9	3.26
41.28 mm / 1.625 in.	3.76	0.148	8	32.93	1.296	1.10	0.043	179.1	7.050	4.08	2.741	818	1.268	114.5	4.51
	3.96	0.156	8	32.48	1.279	1.10	0.043	176.7	6.958	4.26	2.862	795	1.234	113.1	4.45
	4.19	0.165	8	31.97	1.259	1.09	0.043	173.9	6.849	4.46	2.997	770	1.194	111.4	4.39
	4.57	0.180	8	31.13	1.225	1.08	0.043	169.3	6.664	4.79	3.216	728	1.128	108.7	4.28

OUTSIDE DIAMETER

Minimum Wall Thickness		No. of RIBS	Major I.D.		RIB Heignt		Lead		Mean Weight		Flow Section		Wet Internal Perimeter	
mm	in.		mm	in.	mm	in.	mm	in.	Kg/m	Lb/ft	mm2	Sq in.	mm	in.
41.28 mm / 1.625 in.														
4.78	0.188	8	30.67	1.208	1.08	0.042	166.9	6.572	4.96	3.331	707	1.096	107.2	4.22
5.16	0.203	8	29.83	1.174	1.07	0.042	162.3	6.387	5.27	3.541	667	1.033	104.4	4.11
5.59	0.220	8	28.87	1.137	1.06	0.042	157.1	6.185	5.61	3.772	623	0.966	101.3	3.99
6.10	0.240	6	27.74	1.092	1.04	0.041	150.9	5.940	5.94	3.993	581	0.900	95.0	3.74
6.35	0.250	6	27.18	1.070	1.04	0.041	147.8	5.821	6.13	4.120	557	0.863	93.2	3.67
6.60	0.260	6	26.61	1.048	1.03	0.041	144.8	5.701	6.32	4.245	533	0.827	91.4	3.60
7.21	0.284	6	25.26	0.995	1.01	0.040	137.4	5.413	6.75	4.534	479	0.742	87.0	3.43
44.45 mm / 1.750 in.														
3.76	0.148	8	36.11	1.421	1.14	0.045	196.4	7.730	4.41	2.967	989	1.533	124.8	4.91
3.96	0.156	8	35.65	1.404	1.13	0.045	194.0	7.638	4.61	3.100	964	1.495	123.4	4.86
4.19	0.165	8	35.15	1.384	1.13	0.044	191.2	7.529	4.83	3.248	936	1.452	121.7	4.79
4.57	0.180	8	34.30	1.350	1.12	0.044	186.6	7.344	5.19	3.489	890	1.379	119.0	4.68
4.78	0.188	8	33.85	1.333	1.11	0.044	184.1	7.252	5.38	3.616	866	1.344	117.5	4.63
5.16	0.203	8	33.00	1.299	1.10	0.043	179.5	7.067	5.73	3.848	822	1.274	114.8	4.52
5.59	0.220	8	32.05	1.262	1.09	0.043	174.3	6.865	6.11	4.105	774	1.200	111.6	4.40
6.10	0.240	8	30.92	1.217	1.08	0.043	168.2	6.620	6.54	4.397	718	1.113	108.0	4.25
6.35	0.250	8	30.35	1.195	1.08	0.042	165.1	6.501	6.75	4.539	691	1.720	106.1	4.18
6.60	0.260	8	29.79	1.173	1.07	0.042	162.1	6.381	6.96	4.678	665	1.310	104.3	4.11
7.21	0.284	8	28.44	1.120	1.05	0.041	154.7	6.093	7.44	5.002	604	0.936	99.9	3.93
7.62	0.300	6	27.53	1.084	1.04	0.041	149.8	5.897	7.69	5.168	572	0.887	94.3	3.71
7.95	0.313	6	26.80	1.055	1.03	0.041	145.8	5.739	7.93	5.332	541	0.838	92.0	3.62
50.80 mm / 2.000 in.														
3.96	0.156	10	42.00	1.654	1.20	0.047	228.5	8.998	5.39	3.623	1340	2.078	147.0	5.79
4.19	0.165	10	41.50	1.634	1.19	0.047	225.7	8.889	5.65	3.797	1370	2.027	145.3	5.72
4.57	0.180	10	40.65	1.600	1.18	0.047	221.1	218.7	6.08	8.704	1253	4.083	142.6	5.61
4.78	0.188	10	40.20	1.583	1.18	0.046	218.7	8.612	6.30	4.233	1224	1.899	141.1	5.56
5.16	0.203	10	39.35	1.549	1.17	0.046	214.1	8.427	6.71	4.510	1172	1.816	138.3	5.44
5.59	0.220	10	38.40	1.512	1.16	0.046	208.9	8.225	7.17	4.416	1114	1.729	135.2	5.32
6.10	0.240	10	37.27	1.467	1.15	0.045	202.7	7.980	7.69	5.167	1047	1.623	131.5	5.18
6.35	0.250	10	36.70	1.445	1.14	0.045	199.7	7.861	7.94	5.339	1015	1.573	129.6	5.10
6.60	0.260	8	36.14	1.423	1.14	0.045	196.6	7.741	8.13	5.462	991	1.567	124.9	4.92
7.21	0.284	8	34.79	1.370	1.12	0.044	189.2	7.453	8.72	5.857	916	1.422	120.6	4.75
7.62	0.300	8	33.88	1.334	1.11	0.044	184.3	7.257	9.10	6.112	868	1.346	117.6	4.63
7.95	0.313	8	33.15	1.305	1.11	0.044	180.3	7.099	9.40	6.314	830	1.286	115.2	5.54
8.13	0.320	8	32.76	1.290	1.10	0.043	178.2	7.018	9.56	6.421	810	1.256	114.0	4.49
8.64	0.340	8	31.63	1.245	1.09	0.043	172.1	6.773	10.00	6.720	753	1.167	110.3	4.34
53.98 mm / 2.125 in.														
3.96	0.156	12	45.18	1.779	1.23	0.048	245.8	9.678	5.82	3.910	1547	2.398	160.4	6.32
4.19	0.165	12	44.67	1.759	1.22	0.048	243.0	9.567	6.10	4.098	1511	2.343	158.7	6.25
4.57	0.180	10	43.83	1.725	1.22	0.048	238.4	9.384	6.48	4.357	1462	2.265	152.9	6.02
4.78	0.188	10	43.37	1.637	1.21	0.048	236.0	9.292	6.72	4.519	1431	2.220	151.4	5.96
5.16	0.203	10	42.53	1.708	1.20	0.047	231.4	9.107	7.17	4.818	1375	2.130	148.7	5.85
5.59	0.220	10	41.57	1.674	1.19	0.047	226.1	8.905	7.66	5.150	1312	2.034	145.6	5.73
6.10	0.240	10	40.44	1.592	1.18	0.047	220.0	8.660	8.23	5.531	1240	1.921	141.9	5.58
6.35	0.250	10	39.88	1.570	1.18	0.046	216.9	8.541	8.51	5.517	1204	1.867	140.0	5.51
6.60	0.260	10	39.31	1.548	1.17	0.046	213.9	8.421	8.78	5.901	1169	1.813	138.2	5.44
7.21	0.284	10	37.96	1.495	1.16	0.046	206.5	8.133	9.42	6.331	1088	1.687	133.8	5.27
7.62	0.300	10	37.06	1.459	1.15	0.045	201.6	7.937	9.83	6.609	1035	1.605	130.8	5.15
7.95	0.313	8	36.33	1.430	1.14	0.045	197.6	7.779	10.10	6.785	1002	1.553	125.6	4.94
8.13	0.320	8	35.93	1.415	1.14	0.045	195.5	7.698	10.27	6.902	980	1.519	124.3	4.89
8.64	0.340	8	34.80	1.370	1.12	0.044	189.3	7.543	10.76	7.230	917	1.422	120.6	4.75
9.14	0.360	8	33.68	1.326	1.11	0.044	183.2	7.213	10.23	7.548	857	1.329	116.9	4.60
57.15 mm / 2.250 in.														
4.19	0.165	12	47.85	1.884	1.25	0.049	260.3	10.249	6.47	4.351	1740	2.698	169.2	6.66
4.57	0.180	12	47.00	1.850	1.24	0.049	255.7	10.604	6.97	4.681	1678	2.599	166.4	6.55
4.78	0.188	12	46.55	1.833	1.24	0.049	253.2	9.927	7.22	4.855	1645	2.551	164.9	6.49
5.16	0.203	12	45.70	1.799	1.23	0.049	248.6	9.787	7.70	5.18	1584	2.454	1584	6.38
5.59	0.220	12	44.75	1.762	1.22	0.048	243.4	9.585	8.23	5.53	1516	2.351	1516	6.26
5.84	0.230	10	44.18	1.739	1.22	0.048	240.3	9.460	8.47	5.69	1487	2.303	1487	6.06

OUTSIDE DIAMETER

Minimum Wall Thickness		No. of RIBS	Major I.D.		RIB Heignt		Lead		Mean Weight		Flow Section		Wet Internal Perimeter	
mm	in.		mm	in.	mm	in.	mm	in.	Kg/m	Lb/ft	mm2	Sq in.	mm	in.
57.15 mm / 2.250 in.														
6.10	0.240	10	43.62	1.717	1.21	0.048	237.3	9.340	8.77	5.89	1448	2.244	1448	5.99
6.35	0.250	10	43.05	1.695	1.21	0.048	234.2	9.221	9.07	6.10	1410	2.185	1410	5.92
6.60	0.260	10	42.49	1.673	1.20	0.047	231.1	9.101	9.37	6.29	1372	2.127	1372	5.85
6.73	0.265	10	42.21	1.662	1.20	0.047	229.6	9.041	9.51	6.39	1353	2.099	1353	5.81
7.21	0.284	10	41.14	1.620	1.19	0.047	223.8	8.813	10.06	6.76	1284	1.991	1284	5.68
7.62	0.300	10	40.23	1.584	1.18	0.046	218.9	8.617	10.51	7.06	1227	1.901	1227	5.56
7.95	0.313	10	39.50	1.555	1.17	0.046	214.9	8.459	10.87	7.30	1181	1.830	1181	5.46
8.13	0.320	10	39.11	1.540	1.17	0.046	212.7	8.378	11.06	7.43	1157	1.794	1157	5.41
8.64	0.340	10	37.98	1.495	1.16	0.046	206.6	8.133	11.59	7.79	1089	1.689	1089	5.27
63.50 mm / 2.500 in.														
4.19	0.165	14	54.20	2.134	1.31	0.052	294.8	11.609	7.31	4.91	2236	3.467	2236	7.61
4.57	0.180	14	53.35	2.100	1.30	0.051	290.2	11.424	7.86	5.28	2165	3.355	2165	7.50
4.78	0.188	14	52.90	2.083	1.30	0.051	287.8	11.332	8.16	5.48	2128	3.299	2128	7.44
5.16	0.203	12	52.05	2.049	1.29	0.051	283.2	11.147	8.62	5.79	2068	3.205	2068	7.20
5.33	0.210	12	51.66	2.034	1.29	0.051	281.0	11.065	8.87	5.96	2037	3.157	2037	7.15
5.59	0.220	12	51.10	2.012	1.28	0.050	278.0	10.945	9.23	6.20	1191	3.088	1191	7.08
5.84	0.230	12	50.53	1.989	1.28	0.050	274.9	10.820	9.58	6.48	1947	3.016	1947	7.00
5.97	0.235	12	50.25	1.978	1.27	0.050	273.4	10.760	8.75	6.56	1924	2.982	1924	6.97
6.10	0.240	12	49.97	1.967	1.27	0.050	271.8	10.700	9.93	6.67	1902	2.984	1902	6.93
6.22	0.245	12	49.69	1.565	1.27	0.050	270.3	10.641	10.10	6.79	1880	2.914	1880	6.90
6.35	0.250	12	49.40	1.945	1.27	0.050	268.8	10.581	10.27	6.90	1859	2.881	1859	6.86
6.48	0.255	12	49.12	1.934	1.26	0.050	267.2	10.521	10.44	7.02	1837	2.847	1837	6.82
6.60	0.260	12	48.84	1.923	1.26	0.050	265.7	10.461	10.61	7.13	1815	2.814	1815	6.79
6.73	0.265	12	48.56	1.912	1.26	0.050	264.2	10.401	10.78	7.24	1794	2.781	1794	6.75
6.86	0.270	12	48.28	1.901	1.26	0.049	262.6	10.341	10.95	7.36	1773	2.749	1773	6.72
6.99	0.275	12	47.99	1.889	1.25	0.049	261.1	10.276	11.11	7.47	1751	2.713	1751	6.68
7.11	0.280	12	47.71	1.878	1.25	0.049	259.5	10.216	11.28	7.58	1730	2.681	1730	6.64
7.21	0.284	12	47.49	1.870	1.25	0.049	258.3	10.173	11.41	7.67	1714	2.657	1714	6.61
66.68 mm / 2.625 in.														
4.19	0.165	14	57.37	2.259	1.34	0.053	312.1	12.289	7.68	5.16	2513	3.896	204	8.02
4.57	0.180	14	56.53	2.225	1.33	0.052	307.5	12.104	8.27	5.56	2437	3.777	201	7.91
4.78	0.188	14	56.07	2.208	1.32	0.052	305.0	12.012	8.59	5.77	2398	3.718	199	7.85
5.16	0.203	14	55.23	2.174	1.32	0.052	300.4	11.827	9.16	6.16	2324	3.602	197	7.74
5.59	0.220	14	54.27	2.137	1.31	0.052	295.2	11.625	9.81	5.59	2242	3.477	194	7.62
6.10	0.240	14	53.14	2.092	1.30	0.051	289.1	11.380	10.55	7.09	2148	3.329	190	7.47
6.35	0.250	12	52.58	2.070	1.29	0.051	286.0	11.261	10.83	7.28	2111	3.273	185	7.27
6.60	0.260	12	52.01	2.048	1.29	0.051	283.0	11.141	11.20	7.52	2065	3.202	183	7.20
69.85 mm / 2.750 in.														
4.57	0.180	14	59.70	2.350	1.35	0.053	324.8	12.784	8.68	5.84	2726	4.223	211	8.32
4.78	0.188	14	59.25	2.333	1.35	0.053	322.3	12.692	9.01	6.06	2684	4.161	210	8.26
5.16	0.203	14	58.40	2.299	1.34	0.053	317.7	12.507	9.62	6.47	2606	4.038	207	8.15
5.33	0.210	14	58.01	2.284	1.34	0.053	315.6	12.425	9.91	6.66	2570	3.984	206	8.10
5.59	0.220	14	57.45	2.262	1.34	0.053	312.5	12.305	10.30	6.92	2519	3.906	204	8.03
5.84	0.230	14	56.88	2.239	1.33	0.052	309.4	12.180	10.70	7.19	2469	3.825	202	7.95
6.10	0.240	14	56.32	2.217	1.33	0.052	306.4	12.060	11.09	7.45	2419	3.749	200	7.88
6.22	0.245	14	56.04	2.206	1.32	0.052	304.8	12.001	11.28	7.58	2394	3.711	199	7.85
6.35	0.250	14	55.75	2.195	1.32	0.052	303.3	11.941	11.48	7.71	2370	3.673	198	7.87
6.60	0.260	14	55.19	2.173	1.32	0.052	300.2	11.821	11.86	7.97	2321	3.598	197	7.47
75.41 mm / 2.969 in.														
4.57	0.180	16	65.26	2.569	1.40	0.055	355.0	13.975	9.49	6.38	3258	5.048	233	9.18
4.78	0.188	16	64.81	2.552	1.40	0.055	352.6	13.883	9.85	6.62	3212	4.980	232	9.12
5.16	0.203	16	63.97	2.518	1.39	0.055	348.0	13.698	10.52	7.07	3127	4.845	229	9.01
5.33	0.210	16	63.57	2.503	1.39	0.055	345.8	13.616	10.82	7.27	3088	4.787	228	8.96
5.59	0.220	16	63.01	2.481	1.38	0.054	342.8	13.497	11.26	7.57	3032	4.701	226	8.88
5.84	0.230	16	62.44	2.458	1.38	0.054	339.7	13.372	11.70	7.86	2977	4.612	224	8.81
76.20 mm / 3.000 in.														
5.16	0.203	16	64.75	2.549	1.39	0.055	352.3	13.867	10.63	7.14	3206	4.968	231	9.11
5.33	0.210	16	64.36	2.534	1.39	0.055	350.1	13.785	10.94	7.35	3166	4.909	230	9.06
5.59	0.220	16	63.80	2.512	1.39	0.055	347.0	13.665	11.39	7.65	3110	4.822	228	8.99
5.84	0.230	16	63.23	2.489	1.38	0.054	344.0	13.540	11.82	7.95	3054	4.732	226	8.91

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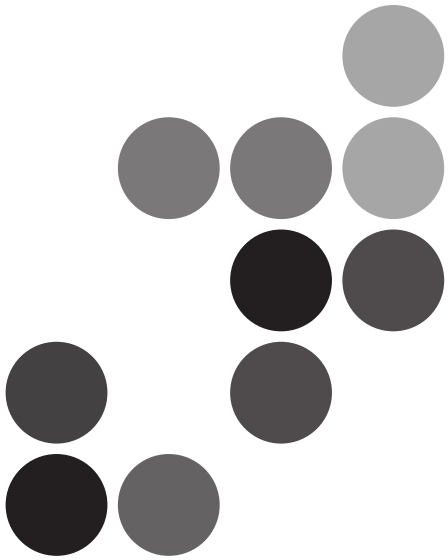

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