



STAINLESS STEEL
TUBES & PIPES

REVOL CORPORATION CO.,LTD





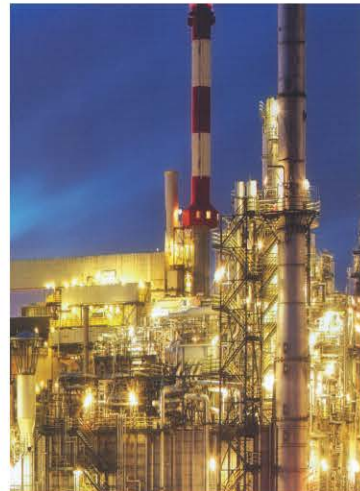
Revol Corporation Scope

Outstanding Product Standards

We supply stainless steel tubes & pipes which produced by advanced technologically process and envolved system that confirm to highest manufacturing standard such as ASTMA-249,A-269,A-270,A-312,A-554,A-688,A-778,A-213, among others.The company supply both Welded and Seamless Pipes and Tubes in TP 304,304L,316,316L,409L and other specialized grades.

At the core of all Revol Corporation Products is a zealously acquired expertise powered with modern innovative techniques,to deliver products confirming to the customers specifications.





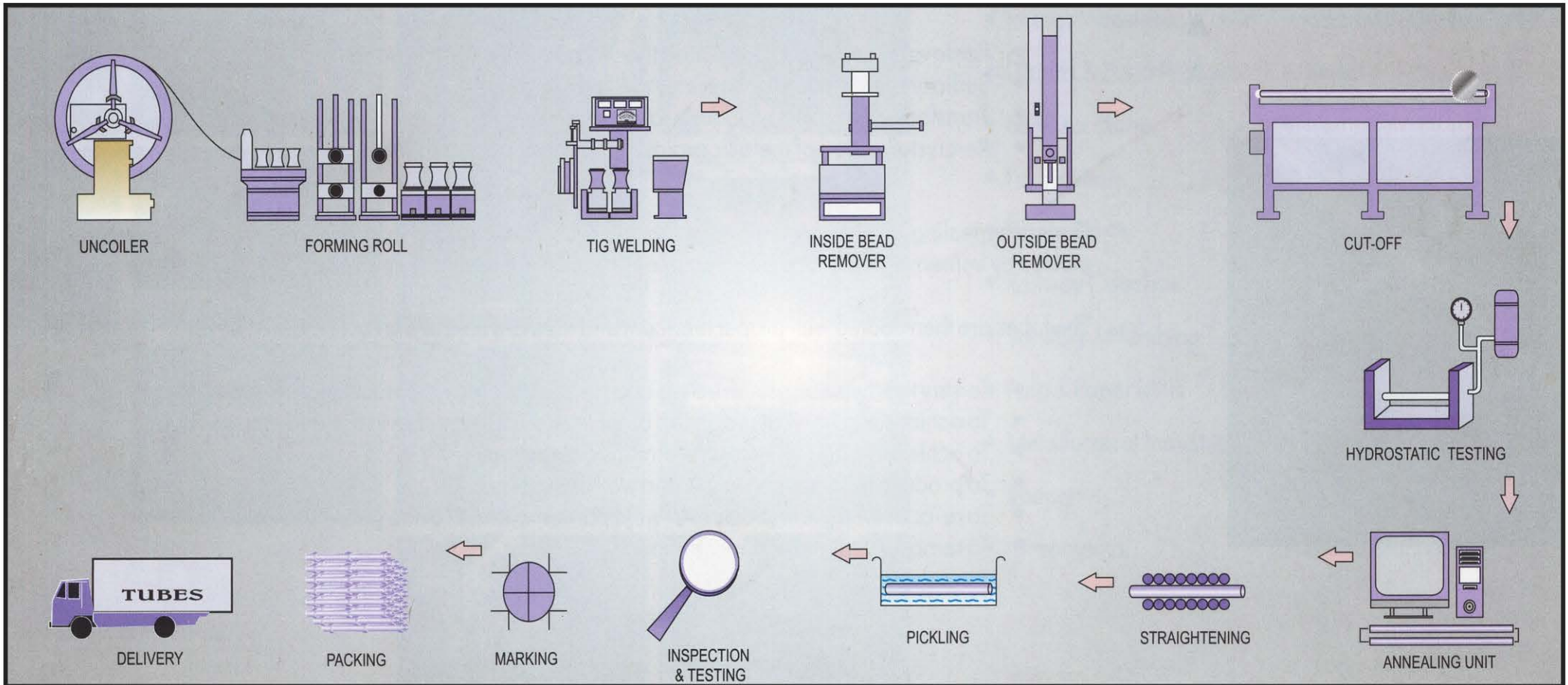
SS Pipes & Tube Application Area :

- * Sugar Industries
- * Energy Industries
- * Dairies & Food Products
- * Fertilizer Plants
- * Fabrication
- * Power Plants
- * Railway Coaches
- * Sanitary / Plumbing
- * Pulp & Paper Mills
- * Metallurgical Industries
- * Ornamental
- * Textile Machinery
- * Steam Transformer(Re-boiler)
- * Space
- * Decoratives
- * Pharmaceutical
- * Ships
- * Boiler
- * Automobile Industries
- * Heat Exchangers
- * Refrigeration
- * Food Industries
- * Oil & Gas Industries
- * Instrumentation
- * Chemical Plants



Manufacturing Process

Drawing is followed by subsequent annealing and pickling to restore the properties of the entire tube to that of the parent material. The tubes are then passivated to impart corrosion resistance. Thereafter every tube is electrically marked with material grade, size and manufacturing standards.





The Manufacturing



We supply Stainless steel tubes & pipes both welded and seamless. The process commences with the formation of welded mother tube on the tube mill from imported and tested prime quality stainless steel strips. The latest TIG multi electrode welding technique is employed for superior weld quality and 100% fusion, with argon purging and no filler metal is added.

These mother tubes are solution annealed at 1060 C to 1100 C in continuous annealing furnace followed by immediate quenching to prevent chromium carbide precipitation

Annealing of mother tuber ensure :

- ✱ Removal of stress induced during tube forming and cold drawing
- ✱ Sufficient ductility and softness for cold drawing
- ✱ Transformation of the weld zone to austentic nature
- ✱ Re-crystallization of metallic grains to original form and there by improving corrosion resistance

During annealing, scales are formed on the surface of the tubes. In order to remove these, the tubes are pickled by immersing into hot pickling solutions made of nitric acid, sulphuric acid and hydrofluric acid.

The tubes are then coated with proper lubricant and then are cold drawn over a drew bench :

- ✱ To vary the metallurgical structure and restore the properties to the parent material
- ✱ To achieve mechanical properties other than those available in annealed condition
- ✱ To achieve a tube having closer dimensional tolerance
- ✱ To produce tube of smaller size and wall thickness
- ✱ To re-orient the grain structure of weld portion with that of the parent material
- ✱ To remove/minimize the internal bead





Testing & Quality Control

Eddy-Current Testing : It is conducted to detect and sub surface defect etc. This test is carried out by using Techno four flaw marking detective system on the entire length of the tubes as per the E426 with hole or notch standard.

Mechanical Testing : Tensile testing Hardness, Flaring, Flanging, Flattening, Reverse bend test, according to the ASTM Standard are regularly carried out.

Hydro Test : 100% hydro testing on a hydraulic test bench is carried out using a high-pressure pumps on all pipes & tubes as per the ASTM A249/13316-1992

Air Under Water Test/Pneumatic Test : Even though this is a supplementary requirement the company has made a point to test all the tubes coming out of a factory to be tested under compressed air to determine any leakage ensuring ultimately that there is no incomplete weld penetration.

Ultrasonic Testing : The company can arrange an off-line Ultrasonic Testing facility having four-probe water emulsion system with a microprocessor unit to detect special process flow. In addition to above, the system can mark the defect by spraying. The company can arrange facility to measure the ferrite content. Micro structure examination for grain size determination to satisfy the customer for their various needs as per the specification of the users.

Chemical Testing : As per the ASTM requirement chemical analysis is carried out on optical Emission Spectrometers.

Corrosion Testing : To find out the susceptibility of the material to intergranular corrosion attack or to measure rate of corrosion, IGS test as per A-262 practice A B C or E is carried in the NABL Accredited laboratory or at the third party laboratory.

Visual Inspection : For surface finish, dimension, checks on edges & the length are carried out on 100% tubes. Test ensure the straightness of the tubes as per the ASTM Standard.

VISUAL INSPECTION



EDDY CURRENT TEST



SPECTRO TESTING



HARDNESS TEST



MECHANICAL TEST



STAINLESS STEEL TUBING SERIES

Wall Thickness In mm/ Wall	0.711 22 Swg	0.914 20 Swg	1.219 18 Swg	1.626 16 Swg	1.829 15 Swg	2.032 14 Swg	2.612 12 Swg	3.251 10 Swg
Thickness In mm/ Bwg	0.711 22 Bwg	0.889 20 Bwg	1.245 18 Bwg	1.651 16 Bwg	1.829 15 Bwg	2.108 14 Bwg	2.769 12 Bwg	2.769 12 Bwg
O.D. in mm	Weight in kg / mt.							
6.32	0.100	0.124	0.155	0.191	0.205			
6.32	0.100	0.121	0.158	0.193	0.205			
10.00	0.165	0.208	0.268	0.340	0.374	0.405	0.482	0.549
10.00	0.165	0.202	0.272	0.340	0.374	0.416	0.501	0.561
12.70	0.213	0.269	0.350	0.450	0.497	0.542	0.659	0.768
12.70	0.213	0.262	0.357	0.456	0.497	0.558	0.687	0.791
15.87	0.270	0.342	0.447	0.579	0.642	0.703	0.866	1.026
15.87	0.270	0.333	0.455	0.587	0.642	0.726	0.907	
19.05	0.326	0.414	0.543	0.708	0.787	0.865	1.073	
19.05	0.326	0.404	0.554	0.718	0.787	0.893	1.127	
23.00		0.505	0.664	0.869	0.968	1.065	1.331	
23.00		0.491	0.677	0.881	0.968	1.101	1.400	
25.40		0.560	0.737	0.966	1.078	1.187	1.488	
25.40		0.545	0.752	0.980	1.078	1.227	1.567	
31.75			0.930	1.225	1.368	1.510	1.903	
31.75			0.949	1.242	1.368	1.562	2.006	
38.10			1.124	1.483	1.658	1.832	2.317	
38.10			1.147	1.504	1.658	1.897	2.446	
45.00			1.334	1.763	1.974	2.183	2.768	
45.00			1.362	1.789	1.974	2.260	2.923	
50.80			1.512	1.999	2.239	2.477	3.147	
50.80			1.544	2.029	2.239	2.566	3.325	
63.50			1.900	2.518	2.820	3.123	3.976	
63.50			1.940	2.555	2.820	3.123	3.976	
76.20				3.035	3.404	3.768	4.805	
76.20				3.080	3.404	3.905	5.083	
88.90				3.551	3.986	4.413	5.635	
88.90				3.605	3.986	4.574	5.962	
101.60				4.068	4.567	5.058	6.464	
101.60				4.130	4.567	5.243	6.842	



STAINLESS STEEL PIPE SERIES (ANSI B36.10;B36.19)

Nominal	Nominal Pipe Size	Outside Diameter	Wall Thickness and weight							
			Sch. 5 S		Sch. 10 S		Sch. 40 S		Sch. 80 S	
Inches	mm	mm	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m
1/8	6	10.29	-	-	1.24	0.281	1.73	0.370	2.041	0.475
1/4	8	13.72	-	-	1.65	0.498	2.24	0.643	3.02	0.808
3/8	10	17.15	-	-	1.65	0.639	2.31	0.857	3.20	1.116
1/2	15	21.34	1.65	0.812	2.11	1.014	2.77	1.286	3.73	1.642
3/4	20	26.67	1.65	1.032	2.11	1.296	2.87	1.708	3.91	2.225
1	25	33.40	1.65	1.310	2.77	2.121	3.38	2.537	4.55	3.282
1.1/4	32	42.16	1.65	1.671	2.77	2.728	3.56	3.435	4.85	4.524
1.1/2	40	48.26	1.65	1.923	2.77	3.150	3.68	4.101	5.08	5.484
2	50	60.33	1.65	2.421	2.77	3.986	3.91	5.515	5.54	7.588
2.1/2	65	73.03	2.11	3.741	3.05	5.336	5.16	8.755	7.01	11.570
3	80	88.90	2.11	4.578	3.05	6.546	5.49	11.448	7.62	15.484
3.1/2	90	101.6	2.11	5.248	3.05	7.514	5.74	13.756	8.08	18.891
4	100	114.30	2.11	5.918	3.05	8.483	6.02	16.296	8.56	22.628
5	125	141.30	2.77	9.593	3.40	11.722	6.55	22.065	9.52	31.364
6	150	168.28	2.77	11.462	3.40	14.015	7.11	28.648	10.97	43.142
8	200	219.08	2.77	14.979	3.76	20.240	8.18	43.129	12.70	65.526
10	250	273.05	3.40	22.920	4.19	28.163	9.27	61.131	12.70	82.661
12	300	323.85	3.96	31.669	4.57	36.478	9.52	74.811	12.70	98.790
14	350	355.60	3.96	34.812	4.78	41.923	9.53	82.451	12.70	108.871
16	400	406.40	4.19	42.131	4.78	47.994	9.53	94.554	12.7	125.000
18	450	457.20	4.19	47.453	4.78	54.064	9.53	106.657	12.7	141.129
20	500	508.00	4.78	60.135	5.54	69.591	9.53	118.760	12.7	157.258
22	550	558.8	4.78	66.205	5.54	76.627	9.53	130.864	12.7	173.387
24	600	609.6	5.54	83.662	6.35	95.766	9.53	142.967	12.7	189.516

Other sizes can be made on request

STAINLESS STEEL TUBING SERIES

CONDENSED ASTM SPECIFICATIONS FOR STAINLESS STEEL TUBING AND PIPING									
Specification	Allowable Outside Diameter variations in mm			Allowable wall		Exact Length		Testing	
	Nominal Diameter		Over	Under	Over%	Under%	Over%	Under%	
ASTM A-213 Seamless Boiler Super heater and Heat Exchanger tubes	Under 25.4		.1016	.1016	+20	-0	3.175	0	Tension Test
	25.4-	38.1 incl.	.1524	.1524	+20	-0	3.175	0	Flattening Test
	38.1-	50.8 excl.	.2032	.2032	+22	-0	3.176	0	Flaring Test
	50.8-	63.5 excl.	.254	.254	+22	-0	3.76	0	Hardness Test
	63.5-	76.2 excl.	.3048	.3048	+22	-0	4.76	0	100% Hydrostatic Test
76.2-	101.6 incl.	.381	.381	+22	-0	4.76	0	Refer to ASTM-450	
ASTM A-249 Welded Boiler Super heater and Heat Exchanger Condenser tubes	Under 25.4		.1016	.1016	+10	-10	3.175	0	Tension Test
	25.4-	38.1 incl.	.1524	.1524	+10	-10	3.175	0	Flattening Test
	38.1-	50.8 excl.	.2032	.2032	+10	-10	3.176	0	Flaring Test
	50.8-	63.5 excl.	.254	.254	+10	-10	3.76	0	*Reverse Bend Test
	63.5-	76.2 excl.	.3048	.3048	+10	-10	4.76	0	Hardness Test
76.2-	101.6 incl.	.381	.381	+10	-10	4.76	0	100% Hydrostatic Test	
							Minimum Wall tubes +18%-0 available on request		*Reverse Flattening test refer to ASTM-450 *Wherever applicable
ASTM-A269 Seamless & Welded Tubing for General Service	Up to 12.7		.13	.13	+15	-15	3.2	0	Flare Test(Seamless Tube)
	12.7-	38.1 incl.	.13	.13	+10	-10	3.2	0	Flange Test(Welded only)
	38.1-	88.9 excl.	.25	.25	+10	-10	4.8	0	Hardness Test
	88.9-	139.7 excl.	.38	.38	+10	-10	4.8	0	Reverse Flattening test 100% Hydrostatic Test
	139.7-	203.2 excl.	.76	.76	+10	-10	4.8	0	Refer to ASTM-450
ASTM A-270 Seamless & Welded Sanitary Tubing	25.4		.05	.20	+12.5	-12.5	3.2	0	Reverse Flattening Test
	38.1		.05	.20	+12.5	-12.5	3.2	0	100 Hydrostatic Test
	50.8		.05	.28	+12.5	-12.5	3.2	0	External Polish on all
	63.5		.05	.28	+12.5	-12.5	3.2	0	Tubes Refer to ASTM-450
	76.2		.08	.30	+12.5	-12.5	3.2	0	
101.6		.08	.38	+12.5	-12.5	3.2	0		
ASTM A-312 Seamless & Welded Pipe	13.7-	48.3 incl.	.4	.8	Minimum Value		6.4	0	Tension Test
	48.3-	114.3 incl.	.8	.8	12.5% under		6.4	0	Flattening Test
	114.3-	219.18 incl.	1.6	.8	Nominal wall Specified		6.4	0	100% Hydrostatic Test
							(Normally Random Length ordered)		Refer to ASTM A-450
ASTM A-268 Seamless & Welded Ferritic Stainless Steel Tubes	Under 12.7		.13	.13	+15	-15	3.2	0	Tension Test
	12.7	38.1 incl.	.13	.13	+10	-10	3.2	0	Flaring Test,Flange Test
	38.1	88.9 incl.	.25	.25	+10	-10	4.8	0	(ERW only) hardness test reverse flattening test
	88.9-	168.3 incl.	.38	.38	+10	-10	4.8	0	100% hydrostatic test,Refer to ASTM-A450
ASTM A-358 For Welded big Diameter Pipe	For all sizes 5" NB&Above		+0.5%	-0.5%	-	-0.3 min	Customer's Specification		Transverse tension test Transverse guided bend test Hydrostatic test radiographic Examination(as specified) dye penetrant(optional)
ASTM A-668 For Welded feed Water heater 'U' tubes	Under 25.4 mm.		.1016	.1016	+20 +10	-0 -10	3 to 13	0	Tension,Hardness,Corrosion,Reversebend,Flange, Flattening,Hydrostatic Test,Pneumatic Test, Non Destructive Test
ASTM A-409 Welded Large Diameter Austenitic Steel pipe	Wall thickness		0.2%	0.2%	0.46	0.46	Less than	9to1	Bend Test
	<4.8mm+0.2%		0.4%	0.4%	mm	mm	<NPS22"	2'	Hydro Test
	>4.8mm+0.2%		<1.5%				_NPS22"	Min 5'ft	
ASTM A-778 Austenitic Stainless Steel Tubuler Product	As per table1 Welded Unannealed of ASTM A-530				12.5%	12.5%	R10ft> Fl6meter -0mm	3met er+6 mm	Transverse Tension Test Transverse guided bend.



CHEMICAL COMPOSITION

	Grade	USA-Canada/AISI-ASTM-ASME	%C (Max)	%Mn Max	%P (Max)	%S (Max)	%SI (Max)	%CR	%Ni	%Mo	%N Max	%CU Max	% OTHERS
AUSTENITIC	304	304	0.080	2.00	0.045	0.030	0.75	18.00-20.00	8.00-10.50	-	0.10	-	-
	304H	304H	0.04-0.10	2.00	0.045	0.030	0.75	18.00-20.00	8.00-10.50	-	-	-	-
	304L	304L	0.030	2.00	0.045	0.030	0.75	18.00-20.00	8.00-12.00	-	0.10	-	-
	304LN	304LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	8.00-12.00	-	0.10-0.16	-	-
	309	309	0.20	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	-	-	-	-
	309S	309S	0.08	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	-	-	-	-
	310	310	0.025	2.00	0.045	0.030	0.75	24.00-26.00	19.00-22.00	-	-	-	-
	310S	310S	0.08	2.00	0.045	0.030	0.75	24.00-26.00	19.00-22.00	-	-	-	-
	316	316	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10	-	-
	316L	316L	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10	-	-
	316LN	316LN	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10-0.16	-	-
	316Ti	316Ti	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10	-	Ti=5X(C+N)Min.,0.70 Max.
	317	317	0.08	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	0.10	-	-
	317L	317L	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	0.10	-	-
	317LN	317LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	0.10-0.22	-	-
	321	321	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-12.00	-	0.10	-	Ti=5X(C+N)Min.,0.70 Max.
347	347	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-13.00	-	-	-	Cb=10XC Min.,1.00 Max.	
FERRITIC + MARTENSITIC	409	409	0.080	1.00	0.040	0.020	1.00	10.50-11.75	0.50max	-	0.030	-	Ti=6X(C+N)Min.,0.70 Max.
	409RC	-	0.02	1.00	0.040	0.030	1.00	10.50-11.75	0.50max	-	0.020	-	Ti=5X C Min., 0.75 Max.
	409M	-	0.03	0.8-1.5	0.03	0.030	1.00	10.80-12.50	1.50max	-	0.030	-	Ti=0.75 Min.,
	410	410	0.15	1.00	0.040	0.030	1.00	11.50-13.50	0.75max	-	-	-	-
	410S	410S	0.08	1.00	0.040	0.030	1.00	11.50-13.50	0.60max	-	-	-	-
FERRITIC	405	405	0.80	1.00	0.04	0.030	1.00	11.50-14.50	0.60	-	-	-	Al=0.10-0.30
	430	430	0.12	1.00	0.04	0.030	1.00	16.00-18.00	0.75 max	-	-	-	-
	430Ti	430	0.030	1.00	0.04	0.030	1.00	16.00-19.00	-	-	-	-	Ti=0.10-1.0
	436	436	0.12	1.00	0.040	0.030	1.00	16.00-18.00	-	0.75-1.25	-	-	Cb=5X C Min., 0.80 max.
	439	439	0.07	1.00	0.04	0.03	1.0	17.00-19.00	0.5	-	0.04	-	Al=0.15, Ti=0.2-1.0

Steam Transformer

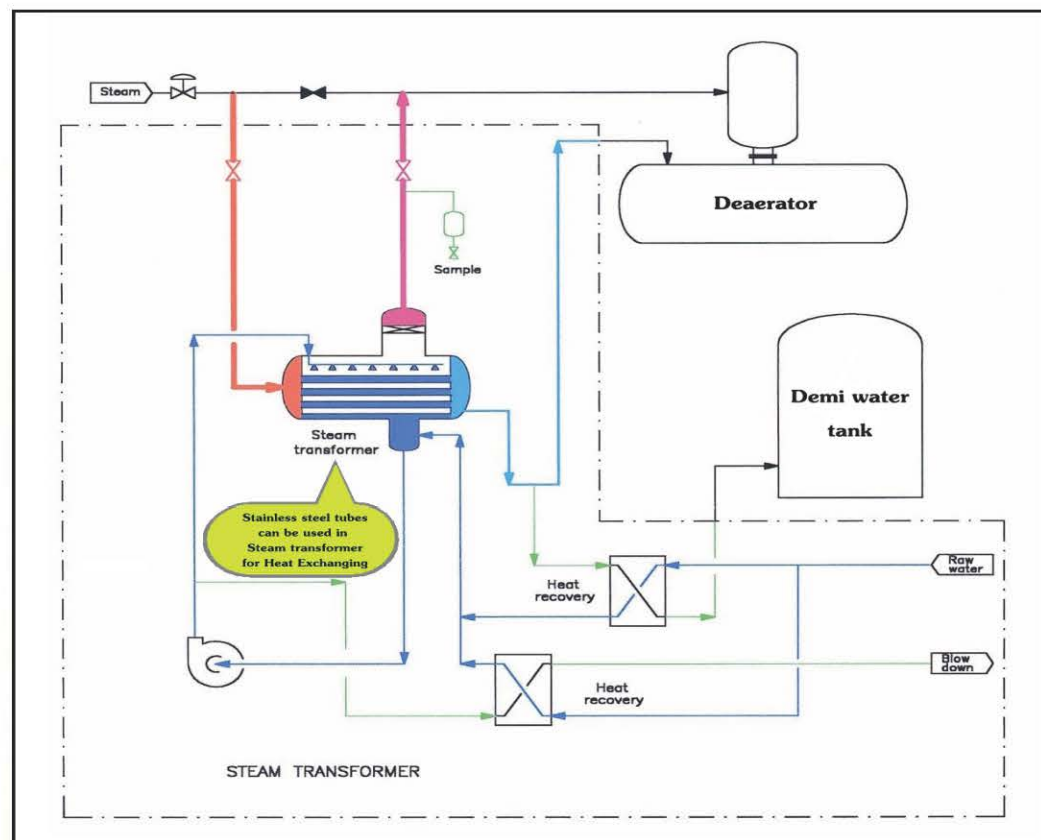
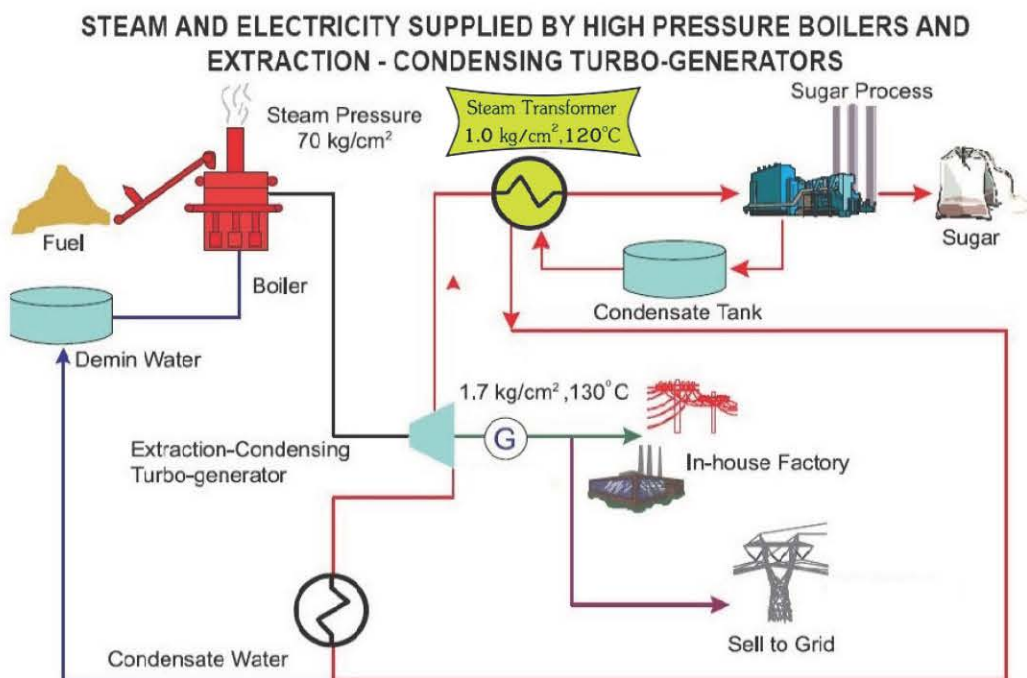
a heat-exchange device used to vaporize water. It is a type of evaporator but differs from an evaporator in that the end product of its operation is steam, not a distillate (feed water).

Steam converters are used to conserve the pure condensate in heat-and-electric power plants with high-pressure boilers when heat is used by devices that do not return the condensate obtained from the steam to the plant's cycle; this happens if the condensate is either used up or polluted in the technological process. (High-pressure boilers require very pure feed water.)

Live steam or steam withdrawn from turbines (primary steam) vaporizes the water fed into a steam converter and generates secondary steam at a lower pressure. The secondary steam is then supplied to steam-operated devices, but the pure condensate from the heating primary

steam remains without loss in the cycle of the steam electric power plant. Thus, a steam converter is essentially a steam-steam boiler with a possible evaporative capacity of 75 to 100 tons per hour.

Use of Steam Transformer





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