

DUPLEX

SUPER
DUPLEX

U-TUBES

KRYSTAL

NICKEL
ALLOY
TUBES

PIPES

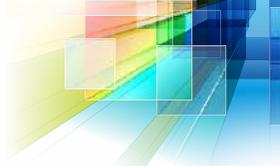
SEAMLESS
STAINLESS

MANUFACTURER OF

- ✧ Seamless Tubes & U Tubes
- ✧ Seamless Pipes
- ✧ Seamless Coil Tubes
- ✧ Finned Tubes
- ✧ Corrugated Tubes
- ✧ Electropolished Tubes

MATERIAL GRADES

- ✧ Exotic Nickel Alloys
- ✧ Austenitic Stainless Steel
- ✧ Super Austenitic Stainless Steel
- ✧ Duplex & Super Duplex Steel
- ✧ Ferritic & Martensitic



Vision

- ✦ We aspire to be a Happily Successful Process Driven Progressive Organization with a CAGR of 20% + Y-O-Y Growth in Revenues & Profits for Empowering & Upgrading Peoples, Partners & The Nation.

Mission

- ✦ We shall achieve the revenue milestone of USD 60 Million (INR 500 Crores) by the 31st of March 2027.
- ✦ We shall successfully list, Krystal Global Engineering Limited on the National Stock Exchange (NSE) Main Board by the 31st of December 2027.
- ✦ We shall achieve the revenue milestone of INR USD 120 Million (INR 1000 Crores) by the 31st of March 2030 with EBITDA >20% & 200% + growth for all People, Partners and Investors.
- ✦ We shall create employment opportunities for 1000+ families by the 31st of December 2030.
- ✦ We shall progressively reduce our carbon footprint each year by a minimum of 5%.

Values & Behaviours

- ✦ **Customer Value:** We shall demonstrate a proactive customer-first and customer-delight mindset. We shall proactively listen to customer feedback and inputs to continuously improve our products and customer experience.
- ✦ **Excellence in Execution:** Always thinking in terms of ROTI - Return on Time Investment. Time is a scarce resource; we must invest time and not spend it. We must keep the main thing and do the first things first. We shall always commit to the highest standards of safety and environment. We shall conduct ourselves to the highest standards of corporate citizenship.
- ✦ **Being Proactive:** Being proactive, doing the right thing right. We shall prioritise and align our work keeping the larger purpose of the organization in mind. Being proactive in communication and in building interpersonal relationships.
- ✦ **Ownership Mindset:** We shall operate with a personal stake and an ownership mindset and play to win. We shall always remain agile and anticipate what will make a difference to our stakeholders and make it happen with speed.
- ✦ **Harmonious teamwork:** We shall collaborate seamlessly, seeking, and offering help as one team, one family. We shall take accountability of our own actions and also that of our team.

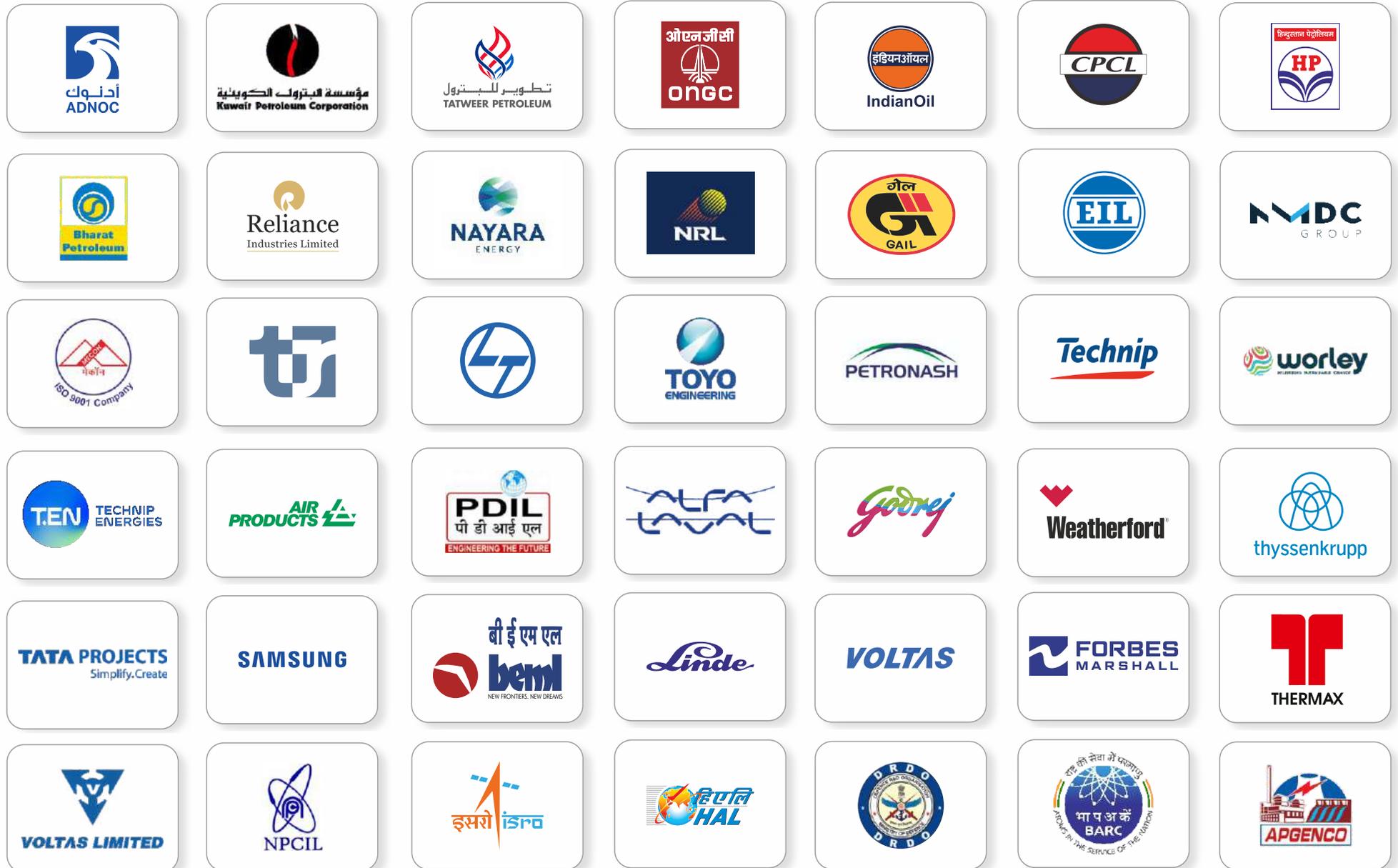


KRYSTAL@TODAY

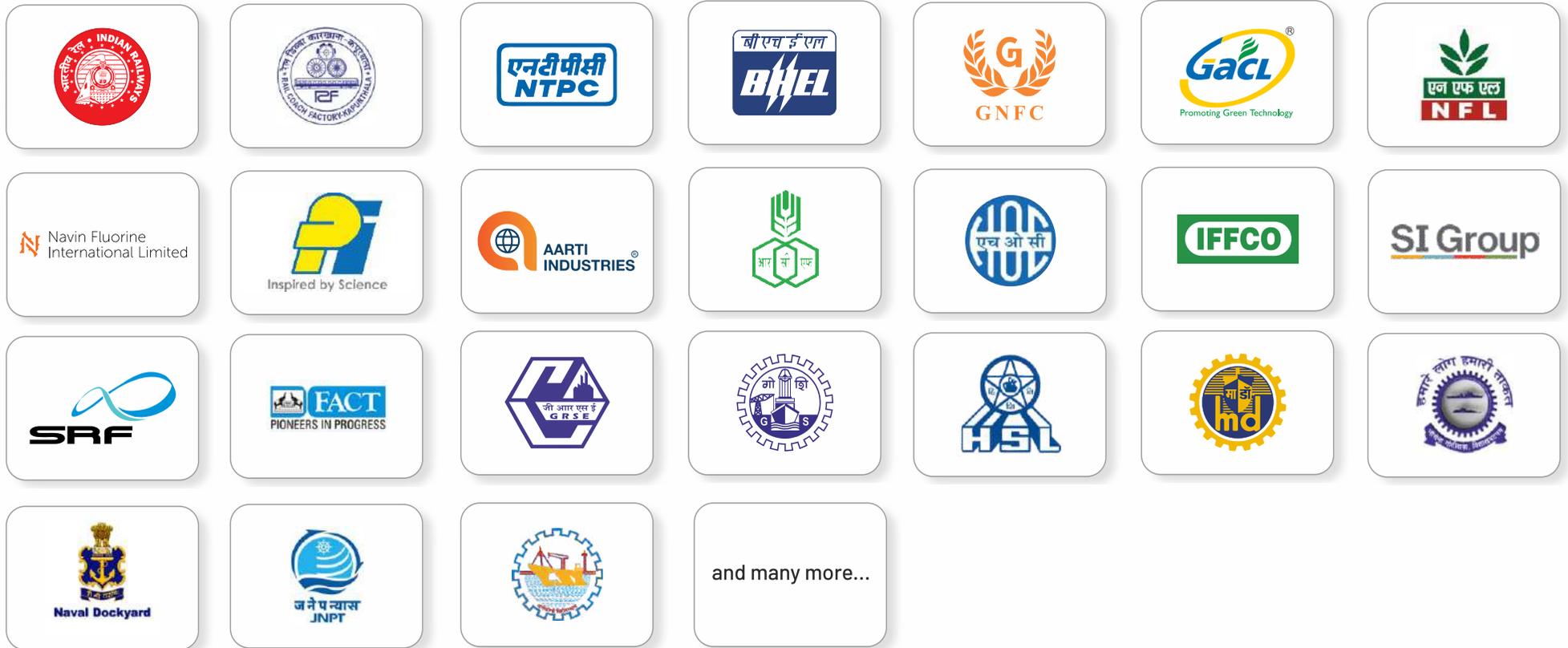
- ❖ Envisioned by a team of dynamic Entrepreneurs with the support of > 250 dedicated, committed people driven by an ownership mindset; striving relentlessly with the prime motto of **"Quality First..... Customer Always"**.
- ❖ QMS (ISO 9001:2015, ISO 14001:2015, ISO 45001:2018) certified company.
- ❖ Pressure Equipment Directive (PED) 2014/68/EU & AD 2000 Merkblatt W0/ W2 / W10 approved manufacturer.
- ❖ NORSOK M-650 & VD TUV certified products.
- ❖ More than 300 happily satisfied and delighted customers in more than 32 Countries.
- ❖ Specialised in the production of high-performance exotic Alloy Tubes & super bright Annealed Electropolished Tubes with a Ra < 0.4 Microns.
- ❖ Multiple Radius Bends in a single Tube without any Weld Joints, especially for Cryogenic and Power Applications.
- ❖ Continuous Improvement Plan (CIP), Continuous R&D for new product developments and Continuous T&D (training and development) for enabling, empowering, engaging, and upgrading our people is a way of life at Krystal.
- ❖ We believe that society and our nation have played a crucial, pivotal role in our growth. As a token of appreciation, expressing our gratitude we have and will always remain committed to serving our society and our nation by way of our CSR spending. For us, it is just not a corporate responsibility, it is our moral responsibility.



APPROVALS & ACCEPTANCE



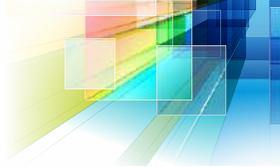
APPROVALS & ACCEPTANCE



CERTIFICATES



MATERIAL GRADES



EXOTIC NICKEL ALLOYS
Nickel 2200 / 2.4066 / Alloy 200
Nickel 2201 / 2.4068 / Alloy 201
Monel 4400 / 2.4360 / Alloy 400
6600 / 2.4816 / Alloy 600
6625 / 2.4856 / Alloy 625
8020 / 2.4660 / Alloy 20
8028 / 1.4563 / Alloy 28
8800 / 1.4876 / Alloy 800
8810 / 1.4876 / Alloy 800H
8811 / 1.4876 / Alloy 800HT
8825 / 2.4858 / Alloy 825
6022 / 2.4602 / Hatelloy C-22
10276 / 2.4819 / Hatelloy C-276

FERRITIC & MARTENSITIC
TP 405 / 1.4002
TP 410 / 1.4006

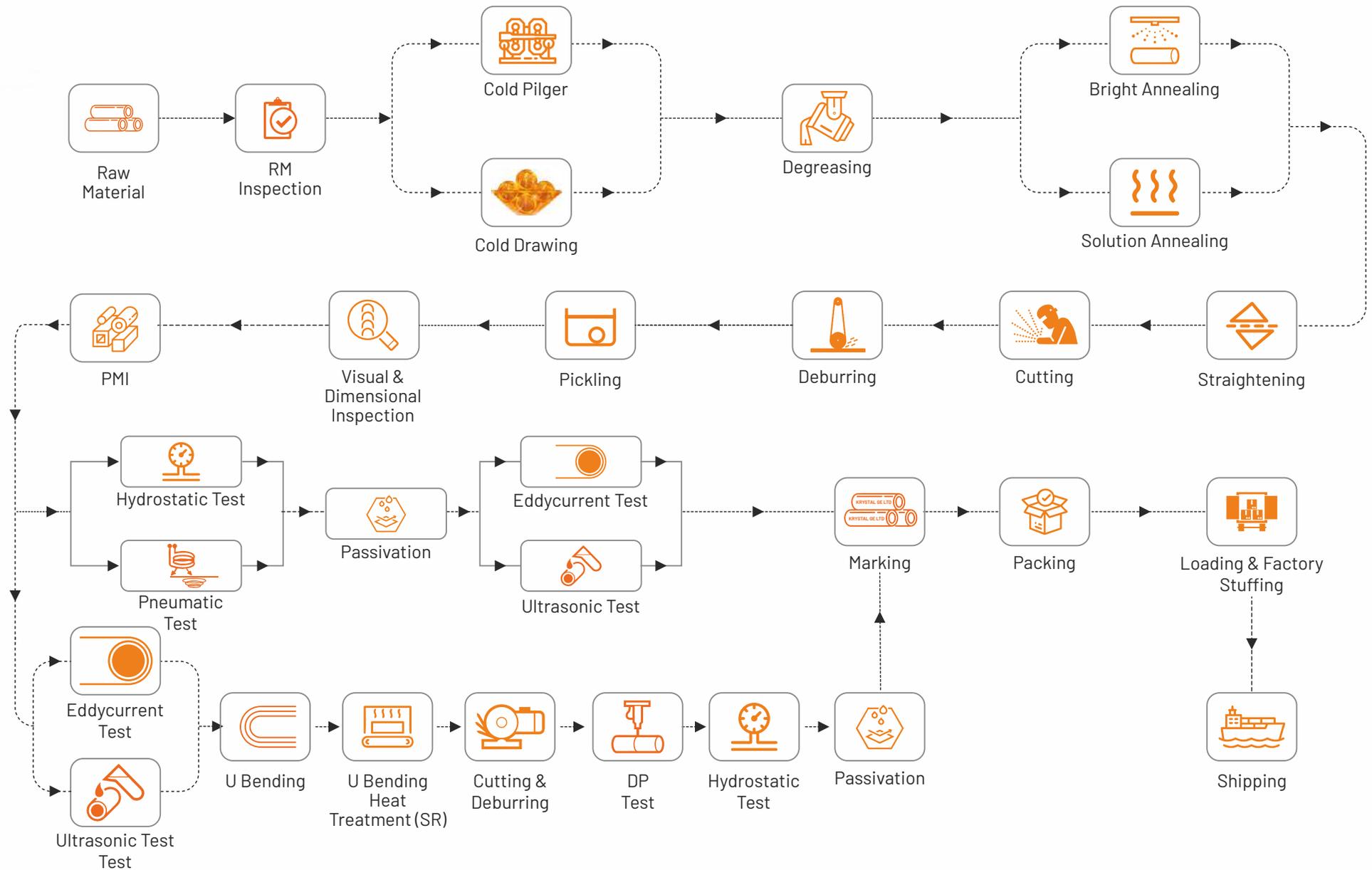
AUSTENITIC
TP 304 / TP 304L / 1.4301 / 1.4307
TP 304H / 1.4948
TP 1.4306
TP 309 / 1.4828
TP 310 / TP 310S / 1.4845
TP 314 / 1.4841
TP 316 / TP 316L / 1.4401 / 1.4404
TP 316 / 316L (MIN. 2.5% mo)
TP 316H / 1.4918
TP 316Ti / 1.4571
TP 317 / TP 317L / 1.4438
TP 321 / TP 321H / 1.4541 / 1.4878
TP 347 / TP 347H / 1.4550 / 1.4912

SUPER AUSTENITIC
UNS S31254 / 1.4547 / Alloy 6MO
TP 904L / UNS N08904 / 1.4539
UNS N08926
UNS S30815 / 1.4835
UNS S31603 / EN 1.4435
UNS S31002 / EN 1.4335
TP 304LN / 1.4311
TP 314 / 1.4841
TP 316LN / 1.4406
TP 317LMN / 1.4439

DUPLEX & SUPER DUPLEX
UNS S31803
UNS S32205 / 1.4462
UNS S32304 / EN 1.4362
UNS S32750 / 1.4410 / Super Duplex F53
UNS S32760 / 1.4501 / Super Duplex 25CR

- We Manufacture Products as per ASTM, ASME, DIN EN (GERMAN), NF (AFNOR), JIS (JAPAN) & Other Equivalent Standards.

SEAMLESS TUBES & PIPES PRODUCTION PROCESS



Seamless Heat Exchanger (HX) Straight Tubes:

Krystal manufactures High Performance Heat Exchanger Tubes serving all industries and applications across the Globe. Our heat exchanger tubes are efficiently used for the cooling, heating or re-heating of fluids, gases, air in a diverse range of industries.

Krystal Tubes are highly efficient having very high working life being produced with very stringent production and quality norms.

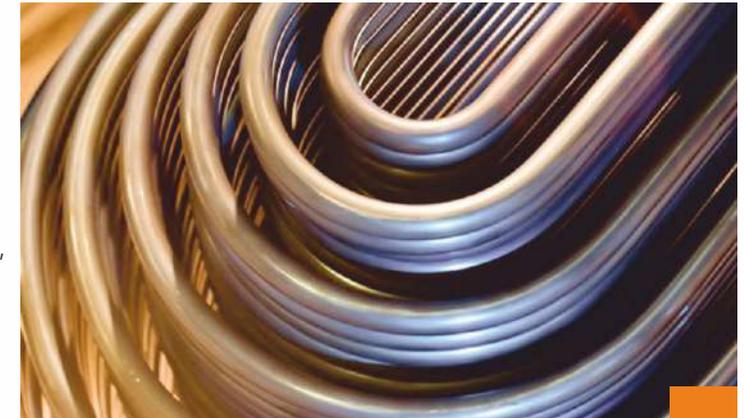
- ✧ **Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- ✧ **Outside Diameter** : 9.53 mm to 76.2 mm
- ✧ **Wall Thickness** : 0.7 mm to 4.00 mm
- ✧ **Specification** : SB 163, SB 167, SB 407, SB 423, SB 444, ASTM A-213, A-268, A-789, EN 10216-5
- ✧ **Length** : As per Requirement, maximum up to 24 Meters long
- ✧ **Surface Finish** : Bright Annealed (CFA), Solution Annealed (CFD), OD Polished
- ✧ **End Cut** : Plain End



Seamless Heat Exchanger (HX) U Tubes:

Krystal has dedicated facility to manufacture U Tubes with developed lengths upto 24 meters in U bend, Multiple U Bend, C Bend (Two Bend) and Different shapes of Bending.

- ✧ **Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- ✧ **Outside Diameter** : 9.53 mm to 88.9 mm
- ✧ **Wall Thickness** : 1.00 mm to 6.00 mm
- ✧ **Specification** : SB 163, SB 167, SB 407, SB 423, SB 444, ASTM A-213, A-268, A-789, EN 10216-5, TEMA 'RCB' 2.3 & ASTM A-688
- ✧ **Length** : As per Customer's Drawing, Developed length up to 24 Meter
- ✧ **Surface Finish** : Bright Annealed (CFA), Solution Annealed (CFD), OD Polished
- ✧ **Special Process** : Full Length Stress Revealing (SR), In Situ Metallography, Dye Penetrant Test (DPT), Ball Pass test
- ✧ **End Cut** : Plain End

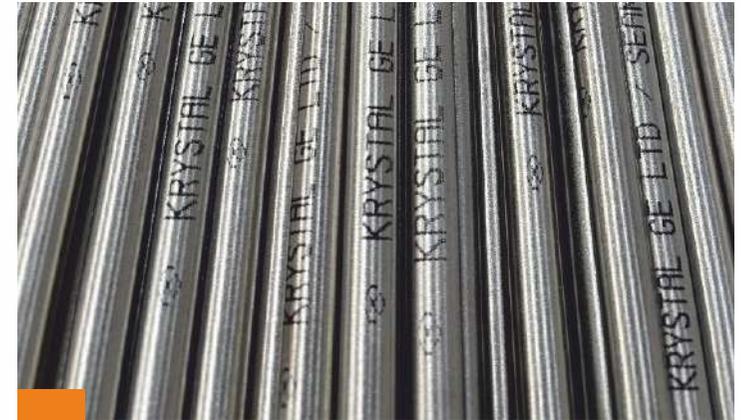


We manufacture Products as per ASTM, ASME, DIN EN (GERMAN), NF (AFNOR), JIS (JAPAN) & Other Equivalent Standards.

Seamless Hydraulic & Instrumentation (H&I) Tubes:

Krystal is one of the renowned manufacturer and supplier of a qualitative range of Instrumentation Tubes that are being designed as per the national and international standards and specifications. Krystal Tubes are a perfect fit for the ferrule fittings in all range with smooth biting, turning and clamping.

- Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- Outside Diameter** : 3.17 mm to 101.6 mm
- Wall Thickness** : 0.4 mm to 8.00 mm
- Length** : 6 Meter Fixed Length or as per Requirement. Maximum up to 24 Meter long
- Specification** : SB 163, SB 167, SB 407, SB 423, SB 444, ASTM A-269, A-268, A-789, EN 10216-5
- Surface Finish** : Bright Annealed (CFA), Solution Annealed (CFD), OD & ID Polished upto 1200 Grits.
- End Cut** : Plain End
- Special Process** : Ball Pass Test, PVC / TPU Outer Jacket, Pre - Insulated, Hydro test up to 10000 PSI



Seamless Process Pipes:

Cold Finished Seamless Pipes are produced from Hot Extruded as well as Hot Pierced Mother hollows in different alloys meeting the national and international standards.

- Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- Range** : 6 NB to 300 NB
- Outside Diameter** : 1/8" NPS (10.3) up to 12" NPS (323.90 mm)
- Wall Thickness** : up to 17.50 mm
- Specification** : EN10216-5, ASTM A312/A312M, ASME SA312/SA312M, ASTM A790 / A790M
- Length** : Single Random Length 5 to 7 Meter or Double Random Length 10 - 12 Meter or Cut Length
- Surface Finish** : Solution Annealed(CFD), Mechanical Polished, Sand Blasting
- End Cut** : Plain End or Beveled End



We manufacture Products as per ASTM, ASME, DIN EN (GERMAN), NF (AFNOR), JIS (JAPAN) & Other Equivalent Standards

Seamless Bright Annealed Electropolished (SBA-EP) Tube

Krystal understands the importance of end to end smooth flow of material. Krystal Tubes with Inside and Outside Mechanical polish as well as Electro Polish provides super smooth surface for the transfer of material without stagnancy in the flow.

Krystal Super Bright Annealed (SBA) tubes are well established High Performance Tubes for the Pharmaceutical, Dairy, Breweries, Biotechnology & Semiconductor Industries.

- ✦ **Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- ✦ **Outside Diameter** : 3.18 mm to 88.9 mm
- ✦ **Wall Thickness** : 0.89 mm to 2.77 mm
- ✦ **Specification** : ASTM A213 / ASTM A269
- ✦ **Length** : 6 Meter Fixed Length or as per customer requirements
- ✦ **Roughness** : $Ra \leq 0.25\mu\text{m}$ (Internal), $Ra \leq 0.50\mu\text{m}$ (External)
- ✦ **Packing** : Each tube purged with N2 gas, capped on both ends, packed in clean double-layer of bags and final into wooden case.
- ✦ **End Cut** : Plain End

Coil Tube

Krystal manufacture stainless steel and nickel alloy tubing for high-performance applications where corrosion resistance, tolerance and purity are critical. Our coiled tubing - supplied in one continuous length - prevents the impurities associated with welding sections of tubing together, and it is available in both loose & bulk wound into coils or level wound onto various reel sizes.

Relying on one continuous length of tubing reduces installation time, as it doesn't require welding multiple tube sections. The tubing seamless construction also improves its performance since the entire coil has the same dimensions and durability properties.

- ✦ **Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- ✦ **Outside Dimension** : 4.76 mm to 25.4 mm
- ✦ **Wall thickness** : 0.5 mm to 2.11 mm
- ✦ **Specification** : ASTM A269 / ASTM A213
- ✦ **Length** : Up to 300 Meter (1000 Feet) in coil Length with respect to dimensions.
- ✦ **End Cut** : Plain Cut
- ✦ **PVC** : 1 mm or 2 mm PVC coated



Finned Tubes

Krystal Finning Division is solely focused on producing the largest variety and most complete solutions for finned tubing. Finned Tubes increase the Performance and Heat Transfer.

-  **Base Tube Material** : Stainless Steel, Duplex and Nickel Alloys
-  **Fin Type** : Extruded, Embedded (G Type), wrap-on (L, LL, KL), Integral low finned tubes, Welded finned tubes, Studded finned tubes, Crimped finned tubes.
-  **Base Tube Diameter** : 12.00 mm to 38.00 mm
-  **Fin Material** : Aluminum and other materials
-  **Fin Thickness** : 0.35 mm to 0.45 mm
-  **Fin Height** : 8 mm to 15.8 mm
-  **Fin Pitch Inch** : 6 FPI to 12 FPI
-  **Length** : As per Customer Requirement, Maximum up to 18 Meters
-  **Testing** : Fin Tubes will be supplied duly Hydro Tested after finning
-  **End** : Plain portion at both end, Sleeves



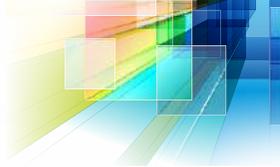
Corrugated Tubes

Krystal offers Single Corrugation as well as Cross Corrugation in Seamless Tubes by indenting plain tube with smooth and spiral projections, which generate turbulence in both outside and inside media increasing value for money and life of the tubes.

Corrugated tubes have variety of application such as Absorption type Refrigerator, Turbo Refrigerators and Screen Refrigerators Distillation Facility with multiple effects, for various effluent water, Dye-house effluent, Digestion Sludge, Food, Grain Slurry, Fruit Pulps, etc.

-  **Metallurgy** : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
-  **Range** : 6.35 mm To 50.8 mm OD
-  **Thickness** : 0.50 mm TO 6.0 mm
-  **Length** : As per Customer requirement, Maximum upto 22 Meter Long.
-  **Specifications** : ASTM A213, ASTM A269
-  **Packing** : Sleeved, Ends Capped, Wooden Box
-  **End Cut** : Plain Cut





PRODUCTION @ GLANCE

- ✳ Product Metallurgy :Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic & Exotic Grades.
- ✳ Product : Seamless Tubes, Pipes, U Tubes, Coil Tubes, Finned Tubes, Corrugated Tubes and Electropolished Tubes (EP).
- ✳ Bright Annealed Small Dia x Thin Wall Tubes in Straight & Coil Form.
- ✳ U Bend Tubes for Pressure Equipment with Leg - Length up to 14 Meters.
- ✳ Tubes & Pipes with Superior Corrosion Resistance up to 12 MPY in Acc. to ASTM A 262- IGC Pr. B & C, EN ISO 3651 / 2 Method A, B, C.
- ✳ Detection of Transfer & Longitudinal Imperfections in Accordance to EN 10246, 2,4,6,7 & 13 & as per ASTM E 213 & E 246.
- ✳ ID - Electropolished (Ra - up to 0.2 µm) & OD - Mechanical Polished up to 800 Grits.
- ✳ In House Testing Facilities - Water Leak (Hydro) Test, Air Underwater (Pneumatic) Test, Eddy Current Testing, Ultrasonic Testing, IGC Pr. A & E to Assure & Certify the right Product Quality in line with our Prime motto of **"Quality First..... Customer Always"**.

LIST OF MACHINERIES

List of Machineries	Units	Size Range / Capacity
Hot Piercing*	1	up to 110 mm Bars
Pilger Mills	11	Min OD - 12.7 mm, Max OD - 114.3 mm
Draw Benches	6	Min OD - 3 mm, Max OD - 323 mm
Solution Annealed Furnace	1	up to 355 mm OD / 25 tons per day
Bright Annealed Furnace with Ammonia Cracker	1	up to 76 mm / 5 tons per day
Straightening Machines	5	up to 323 mm
Swaging Machines	5	up to 150 mm + Welding Set up for bigger OD

* Associated Set up with full Mfg. and Quality Control

List of Machineries	Units	Size Range / Capacity
Surface Treatment Plant (STP) - Coating, Degreasing, Pickling, Passivation	15	up to 22 meters long
Polishing Machines	3	up to 323 mm
U Bending Setup (Including SR/DP)	1	12.7 mm to 88.9 mm with R1 = 1.25D onwards
DG Set	1	40 KVA + Outsourced
Overhead Cranes	9	max 10 tons
RO Water Plant	1	6 kLPH with Zero Liquid Discharge Plant (ZLDP)**
Roof Top Solar Power	Full	200 KW expandable upto 500 KW**

** Under advance planning stage

QUALITY @ GLANCE

Customer Always is the way of working at Krystal. To have Continuous Progress, we adhere to strict Quality Control Measures at Order Planning stage to Raw Material Indent to Raw Material inspection and so on until Packing and dispatch.

We are providing continuous training to the operators & supervisors to be the process owners and experts to always produce First Time Right Quality. To have added assurance we have in process inspection team with full knowledge about the order and specification requirements.

At Krystal, all inspection and testing equipment are available inhouse with all necessary certifications and calibrations to give right results every time.

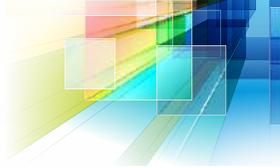
The process is carefully documented to ascertain consistent and high-quality batches of each product lot. At Krystal, we use the best available testing facilities for conducting Physical, Electrical, Mechanical & other kinds of tests that are required to assure superior quality products.



NDE Automatic Ultrasonic Test (UT)	6.00 mm OD to 323.90 mm OD-Rota & Probe Type Automatic water Immersion Ultrasonic Testing Machine.
NDE Manual Ultrasonic Test (UT)	15.88 mm OD to 323.9 mm OD up to 20 mm Thickness
NDE	OD ECT (Encircling Coil) 6 mm to 76.2 mm
NDE	ID ECT (Robin Probe) 14 mm to 34 mm ID
Hydrostatic Test	3.175 mm OD to 323.90 mm OD up to 10,000 PSI
Pneumatic Test (Air Under Water)	6 mm OD to 50.8 mm OD upto max 200 PSI
Spectroscope	Spectromax
Positive Material Identification (PMI)	Niton + 1
Ultrasonic thickness Gauges	Upto 15 mm (Digital)
ID Boroscope	14 mm to 34 mm ID
Dimensional Checking.	Digital Vernier Caliper, Flat & Ball Micrometer etc. Mitutoyo make
Micro Structure Analysis & Grain Examination	Polishing Machine Electro Etching Machine Inverted Metallurgical Microscope with Optics & CCD Camera
Hardness Test	Twin Hardness Tester, RAB-SAROJ make
Tensile Flange / Flare / Flattening / Reverse Flattening Bend Test Corrosion	UTE 40-FIE Make with (Extensio Meter)
Testing	Laboratory Glassware to test IGC Pr. A & E according to all ASTM & EN Specs like ASTM A 262 & EN ISO 3651/2
Surface Roughness Tester	Mitutoyo



NOMINAL WALL THICKNESS SCHEDULE



Nominal Pipe Size		Outside Diameter (mm)	Nominal Wall Thickness Schedule (as per ANSI B316.19 Standard)																
NPS	DN	OD	SCH 5s	SCH 10s	SCH 10	SCH 20	SCH 30	SCH 40s	SCH STD	SCH 40	SCH 60	SCH 80s	SCH XS	SCH 80	SCH 100	SCH 120	SCH 140	SCH 160	SCH XXS
1/8	6	10.29	-	1.24	-	-	-	1.73	1.73	1.73	-	2.41	2.41	2.41	-	-	-	-	-
1/4	8	13.72	-	1.65	-	-	-	2.24	2.24	2.24	-	3.02	3.02	3.02	-	-	-	-	-
3/8	10	17.15	-	1.65	-	-	-	2.31	2.31	2.31	-	3.20	3.20	3.20	-	-	-	-	-
1/2	15	21.30	1.65	2.11	-	-	-	2.77	2.77	2.77	-	3.73	3.73	3.73	-	-	-	4.78	7.47
3/4	20	26.70	1.65	2.11	-	-	-	2.87	2.87	2.87	-	3.91	3.91	3.91	-	-	-	5.56	7.82
1	25	33.40	1.65	2.77	-	-	-	3.38	3.38	3.38	-	4.55	4.55	4.55	-	-	-	6.35	9.09
1 1/4	32	42.20	1.65	2.77	-	-	-	3.56	3.56	3.56	-	4.85	4.85	4.85	-	-	-	6.35	9.70
1 1/2	40	48.30	1.65	2.77	-	-	-	3.68	3.68	3.68	-	5.08	5.08	5.08	-	-	-	7.14	10.15
2	50	60.30	1.65	2.77	-	-	-	3.91	3.91	3.91	-	5.54	5.54	5.54	-	-	-	8.74	11.07
2 1/2	65	73.00	2.11	3.05	-	-	-	5.16	5.16	5.16	-	7.01	7.01	7.01	-	-	-	9.53	14.02
3	80	88.90	2.11	3.05	-	-	-	5.49	5.49	5.49	-	7.62	7.62	7.62	-	-	-	11.13	15.24
3 1/2	90	101.60	2.11	3.05	-	-	-	5.74	5.74	5.74	-	8.08	8.08	8.08	-	-	-	-	-
4	100	114.30	2.11	3.05	-	-	-	6.02	6.02	6.02	-	8.56	8.56	8.56	-	11.13	-	13.49	17.12
5	125	141.30	2.77	3.40	-	-	-	6.55	6.55	6.55	-	9.53	9.53	9.53	-	12.70	-	15.88	19.05
6	150	168.30	2.77	3.40	-	-	-	7.11	7.11	7.11	-	10.97	10.97	10.97	-	14.27	-	18.26	21.95
8	200	219.08	2.77	3.76	-	6.35	7.04	8.18	8.18	8.18	10.31	12.70	12.70	12.70	15.09	18.26	20.62	23.01	22.23
10	250	273.50	3.40	4.19	-	6.35	7.80	9.27	9.27	9.27	12.70	12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40
12	300	323.85	3.96	4.57	-	6.35	8.38	9.53	9.53	10.31	14.27	12.70	12.70	17.48	21.44	25.40	28.58	33.32	25.40
14	350	355.60	3.96	4.78	6.35	7.92	9.53	-	9.53	11.13	15.09	-	12.70	19.05	23.83	27.79	31.75	35.71	-

STD Standard Wall

XS Extra Strong Wall

DN Diameter Nominal

XXH Double Extra Heavy Wall

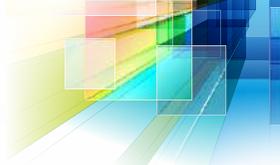
XXS Double Extra Strong Wall

NPS Nominal Pipe Size

HEAT EXCHANGER (HX) TUBE-PRINCIPAL BWG SIZES

Outside Diameter			Birmingham Wire Gauge (BWG)								
			20 (0.889 mm)	18 (1.245 mm)	16 (1.651 mm)	15 (1.829 mm)	14 (2.108 mm)	13 (2.413 mm)	12 (2.769 mm)	11 (3.048 mm)	10 (3.403 mm)
in	mm	Weight, kg/m (average wall)									
¼	0.25	6.35	0.12	0.16	0.19	-	-	-	-	-	-
⅕	0.31	7.95	0.15	0.21	0.25	0.28	-	-	-	-	-
⅜	0.37	9.52	0.19	0.25	0.31	0.34	0.39	-	-	-	-
½	0.50	12.70	0.25	0.34	0.45	0.49	0.55	0.61	0.68	0.72	-
⅝	0.62	15.87	0.33	0.45	0.58	0.64	0.71	0.80	0.89	0.97	-
¾	0.75	19.05	0.40	0.55	0.72	0.77	0.88	0.98	1.12	1.20	1.31
⅞	0.87	22.22	0.46	0.64	0.83	0.92	1.04	1.18	1.32	1.44	1.58
1	1.00	25.40	0.54	0.74	0.97	1.06	1.21	1.37	1.55	1.68	1.92
1⅛	1.12	28.57	0.61	0.83	1.10	1.21	1.37	1.56	1.76	1.92	2.11
1¼	1.25	31.75	0.68	0.94	1.23	1.35	1.53	1.76	1.96	2.16	2.40
1⅜	1.37	34.92	0.74	1.03	1.35	1.49	1.70	1.93	2.19	2.40	2.65
1½	1.50	38.10	0.82	1.13	1.49	1.64	1.87	2.17	2.40	2.63	2.92
1¾	1.75	44.45	0.97	1.32	1.74	1.92	2.20	2.50	2.84	3.10	3.44
2	2.00	50.80	-	1.52	1.99	2.20	2.53	2.89	3.27	3.59	3.97
2¼	2.25	57.15	-	1.73	2.26	2.48	2.87	3.26	3.70	4.06	4.51
2⅜	2.37	60.32	-	1.81	2.38	2.63	3.02	3.44	3.93	4.30	4.78
2½	2.50	63.50	-	1.91	2.52	2.78	3.18	3.66	4.14	4.54	5.04
2⅞	2.87	73.02	-	2.20	2.90	3.20	3.68	4.20	4.79	5.25	5.83
3	3.00	76.20	-	2.31	3.04	3.35	3.85	4.39	5.00	5.49	6.10
3½	3.50	88.90	-	2.69	3.56	3.93	4.51	5.15	5.86	6.44	7.17
4	4.00	101.60	-	-	4.11	4.54	5.21	5.95	6.80	7.47	8.30

CHEMICAL COMPOSITION



GRADE	UNS No.	EN No.	C	Mn	Si	P	S	Cr	Ni	Mo	other
Exotic Nickel Alloys											
Nickel 200	N02200	2.4066	0.01	0.35	0.35	-	0.01	-	99	-	Cu: 0.25
Nickel 201	N02201	2.4068	0.02	0.35	0.35	-	0.01	-	99	-	Cu: 0.25
Monel 400	N04400	2.4360	0.3	2	0.5	-	0.024	-	63	-	Cu: 28 - 34
Alloy 600	N06600	2.4816	0.15	1	0.5	-	0.015	14 - 17	72	-	Cu: 0.5
Alloy 625	N06625	2.4856	0.1	0.5	0.5	0.015	0.015	20 - 23	58	9	-
Alloy 800	N08800	1.4550	0.1	1.5	1	-	0.015	19 - 23.5	30 - 35	-	Cu: 0.75
Alloy 800H	N08810	1.4876	0.05 - 0.1	1.5	1	-	0.015	19 - 23.5	30 - 35	-	Cu: 0.75
Alloy 800HT	N08811	2.4602	0.01	0.5	0.08	0.02	0.02	20 - 22.50	-	12.5 - 14.5	-
Alloy 20	N08020	2.4660	0.07	2	1	0.045	0.035	19 - 21	32 - 38	2 - 3	Cu: 3 - 4
Alloy 825	N08825	2.4858	0.05	1	0.5	-	0.03	19 - 23.5	38 - 46	2.5 - 3.5	Cu: 1.5 - 3
Alloy 28	N08028	1.4563	-	≤ 2.5	-	-	-	26 - 28	30 - 34	3 - 4	-
Hastelloy C - 22	N06022	2.4602	0.015 max	0.5 max	0.08 max	0.02 max	0.02 max	20 - 22.5	50.01 - 63	12.5 - 14.5	-
Hastelloy C - 276	N10276	2.4819	0.01	1	0.08	0.04	0.03	14 - 16.5	Rest	15 - 17	-

Austenitic Stainless Steel											
TP 304	S30400	1.4301	0.07	2.00	1.00	0.045	0.015 - 2.00	17.50 - 19.50	8.00 - 10.50	-	N: 0.11
TP 304L	S30403	1.4307	0.03	2.00	1.00	0.045	0.3	18.00 - 20.00	8.00 - 12.00	-	N: 0.10
TP 304H	S30409	1.4948	0.04 - 0.08	2.00	1.00	0.035	0.015 - 2.00	17.00 - 19.00	8.00 - 11.00	-	N: 0.11
TP 309	S30900	1.4828	0.20	2.00	1.50 - 2.50	0.045	0.015	19.00 - 21.00	11.00 - 13.00	-	N: 0.11
TP 310S	S31008	1.4845	0.10	2.00	1.50	0.045	0.015	24.00 - 26.00	19.00 - 22.00	-	N: 0.11
TP 316	S31600	1.4401	0.0 - 0.07	0.00 - 2.00	0.00 - 1.00	0.00 - 0.05	0.0 - 1.00	16.50 - 18.50	10.00 - 13.00	2.00 - 2.50	N: 0.0 - 0.11
TP 316L	S31603	1.4404	0.030	2.00	1.00	0.045	0.015 - 2.00	16.50 - 18.50	10.00 - 13.00	2.00 - 2.50	N: 0.11
TP 316H	S31609	1.4918	0.04 - 0.08	2.00	0.75	0.035	0.015	16.00 - 18.00	12.00 - 14.00	2.00 - 2.50	N: 0.10
TP 316 Ti	S31635	1.4571	0.08	2.00	1.00	0.045	0.015 - 2.00	16.50 - 18.50	10.50 - 13.50	2.00 - 2.50	Ti: 5 x C to 0.70
TP 317	S31700	1.4449	0.08	2.00	1.00	0.045	0.3	19.00	13.00	3.5	Fe: 61
TP 317L	S21703	1.4438	0.030	2.00	1.00	0.045	0.015 - 2.00	17.50 - 19.50	13.00 - 16.00	3.00 - 4.00	N: 0.11
TP 321	S32100	1.4541	0.08	2.00	1.00	0.045	0.015 - 2.00	17.00 - 19.00	9.00 - 12.00	-	Ti: 5 x C to 0.70
TP 321H	S32109	1.4878	0.04 - 0.10	2.00	1.00	0.045	0.03	17.00 - 19.00	9.00 - 12.00	-	Ti: 0.35
TP 347	S34700	1.4550	0.08	2.00	1.00	0.045	0.015	17.00 - 19.00	9.00 - 12.00	-	-
TP 347H	S34709	1.4961	0.04 - 0.10	2.00	1.00	0.040	0.03	17.00 - 20.00	9.00 - 13.00	-	Fe: 62.83 - 73.64
TP 304L	S30403	1.4306	0.03	2.00	1.00	0.045	0.015	18.00 - 20.00	10.00 - 12.00	-	N: 0.11

ASTM	American Society for Testing of Materials
DIN	Deutsches Institute for Normung
GOST	Gosudarstvenny Standart

ASME	American Society for Mechanical Engineers
JIS	Japan Industrial Standards
TEMA	Tubular Exchanger Manufacturers Association

SAE	Society of Automotive Engineers
UNS	Unified Numbering System
PED	Pressure Equipment Directive

CHEMICAL COMPOSITION

GRADE	UNS No.	EN No.	C	Mn	Si	P	S	Cr	Ni	Mo	other
Super Austenitic Stainless Steel											
254 SMO / 6MO	S31254	1.4547	0.020	1.00	0.70	0.030	0.010	19.50 - 20.50	17.50 - 18.50	6.00 - 7.00	Cu: 0.50 - 1.00
TP 904L	N08904	1.4539	0.020	2.00	0.70	0.030	0.010	19.00 - 21.00	24.00 - 26.00	4.00 - 5.00	Cu: 1.20 - 2.00
253 MA	S30815	1.4835	0.05 - 0.12	1.00	1.40 - 2.50	0.045	0.015	20.00 - 22.00	10.00 - 12.00	-	N: 0.12 - 0.20
1.4435	S31603	1.4435	0.030	2.00	1.00	0.045	0.015 - 2.00	17.00 - 19.00	12.50 - 15.00	2.50 - 3.00	N: 0.11
TP 310L NAG	S31002	1.4335	0.20	2.00	0.25	0.025	0.010	24.00 - 26.00	20.00 - 22.00	0.020	N: 0.11
TP 304 LN	S30453	1.4311	0.030	2.00	1.00	0.045	0.015 - 2.00	17.50 - 19.50	8.50 - 11.50	-	N: 0.12 - 0.22
TP 314	S31400	1.4841	0.20	2.00	1.50 - 2.50	0.045	0.015	24.00 - 26.00	19.00 - 22.00	-	N: 0.11
TP 316 LN	S31653	1.4406	0.030	2.00	1.00	0.045	0.015 - 2.00	16.50 - 18.50	10.00 - 12.50	2.00 - 2.50	N: 0.12 - 0.22
TP 317 LMN	S31726	1.4439	0.030	2.00	1.00	0.045	0.015	16.50 - 18.50	12.50 - 14.50	4.00 - 5.00	N: 0.12 - 0.22

Duplex & Super Duplex Stainless Steel											
2205	S31803	1.4462	0.030	2.00	1.00	0.035	0.015	21.00 - 23.00	4.50 - 6.50	2.50 - 3.50	N: 0.10 - 0.22
2205	S32205	1.4462	0.030	2.00	1.00	0.035	0.015	22.00 - 23.00	4.50 - 6.50	2.50 - 3.50	N: 0.14 - 0.20
2304	S32304	1.4362	0.030	2.00	1.00	0.035	0.015	22.00 - 24.00	3.50 - 5.50	0.10 - 0.60	N: 0.05 - 0.20
2507	S32750	1.4410	0.030	2.00	1.00	0.035	0.015	24.00 - 26.00	6.00 - 8.00	3.00 - 4.50	N: 0.24 - 0.35
F55	S32760	1.4501	0.030	1.00	1.00	0.035	0.015	24.00 - 26.00	6.00 - 8.00	3.00 - 4.00	N: 0.20 - 0.30

Ferritic & Martensitic Steel											
TP 405	S40500	1.4002	0.08	1.00	1.00	0.040	0.015 - 2.00	12.00 - 14.00	-	-	Al: 0.10 - 0.30
TP 410	S41000	1.4006	0.08 - 0.15	1.50	1.00	0.040	0.015 - 2.00	11.50 - 13.50	0.75	-	-

Surface Roughness Chart

ISO 1302	Ra		Rz
	µm	µinch	µm
N3-N6			
N3	0.1	4	0.4
N4	0.2	8	0.8
N5	0.4	16	1.6
N6	0.8	32	3.2

Ra
Roughness Average Micrometers

µm
Micrometers

Rz
Average Roughness Depth

µinch
Microinches

ISO 1302	Ra		Rz
	µm	µinch	µm
N7-N10			
N7	1.6	63	6.3
N8	3.2	125	12.5
N9	6.3	250	25
N10	12.5	500	50

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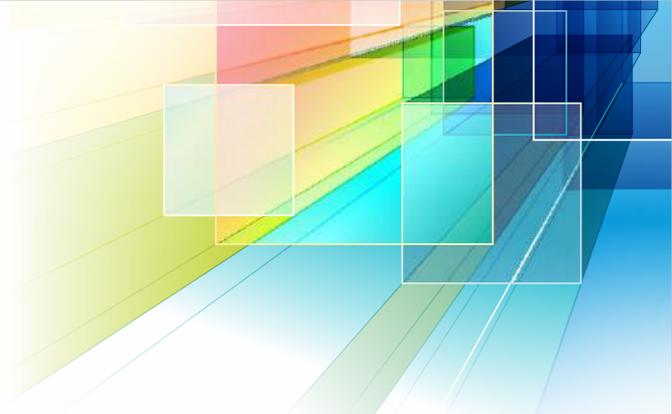
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