AJ Stellans Holistic Solutions

Drive for Success

TUBE FITTINGS INSTALLATION PROCEDURE

In installations that may require occasional disassembly or partial removal for maintenance purpose, Ferrule fittings plays key functional role here. As these joints can be broken and remade without affecting the integrity of the joint.

As the ferrule(s) moves axially into the fitting body, the body's angled shape radially compresses the end of the ferrule onto the outer diameter of the tubing. It is this radial compression that creates the leak tight seal between the fitting, ferrule and tubing.

TECHNICAL STANDARDS

The following two standards applicable for Single Compression Fittings, can also be used for Double Compression Fittings,

(a). BS 4368; Part IV, 1984

(b). IS 10103: 1982;

as because there is no seperate standard for Double Ferrules Compression.

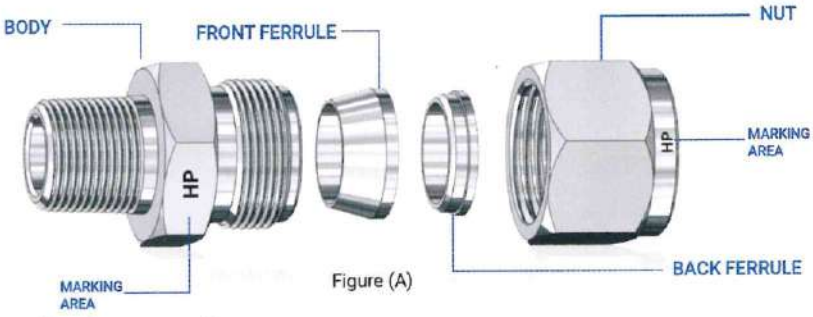


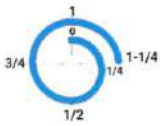
Figure (A)

In the above fig.(A) we have Body, Front Ferrule, Back Ferrule & Nut to show the assembly the tube, nut & ferrules into the body of the fitting and hold the fitting in a rigid vice then tighten the nut upto hand tight as per fig.(C) to fig.(F)

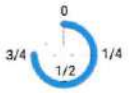
A. Mark 6'o clock position on the nut using a marker

B. Using a wrench tighten the nut as described in the fig.(B)

C. If the nut is overtightened the ferrule will deform improperly causing the joint to fail (so tighten the nut as per the given parameters)



1&1/4 Turns of the nut is required for 1/4" (6mm) and higher



3/4 Turns of the nut is required for 3/16" (4mm) and lower.

Figure (B)

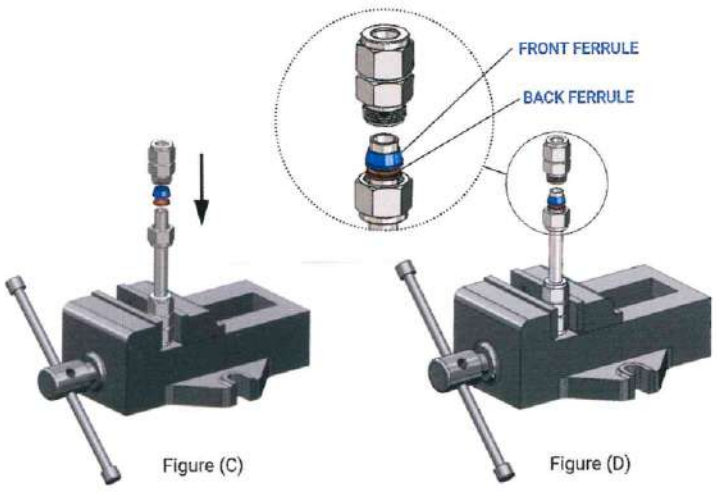


Figure (C)

Figure (D)

1-1/4 Turns of nut required for 1/4" and higher
3/4 Turns of nut required for 3/16" and lower

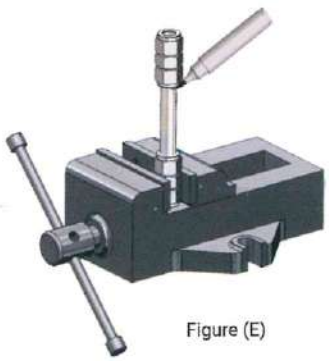


Figure (E)

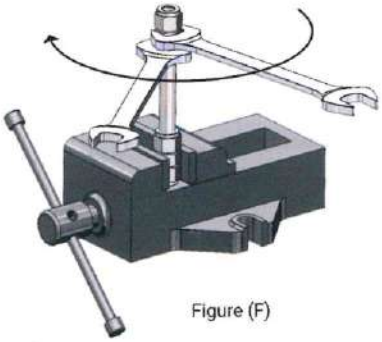


Figure (F)

DISASSEMBLY & REASSEMBLY

The ease of assembly and disassembly is one of the reasons why compression fittings are so widely used. Disassembly involves simply loosening the compression nut. Reassembly can be accomplished in a similar manner to the initial assembly, although typically fewer turns of the nut are required, since the ferrule is already swaged to the tubing.

TUBE SELECTION

Tube OD & wall thickness should be as given in ASTM A269/213 standard. Tube End should be squarely cut, to allow the tubing to sit symmetrically in the fitting body & remove burr using burr tool Fig.(G). Hardness of tube should not be more than Rockwell HRB 90 for SS316 MOC for other MOC contact to HP Valves.

Note : The hardness & the required fittings varries with respect to change in MOC & its hardness of tube.

Figure (G)

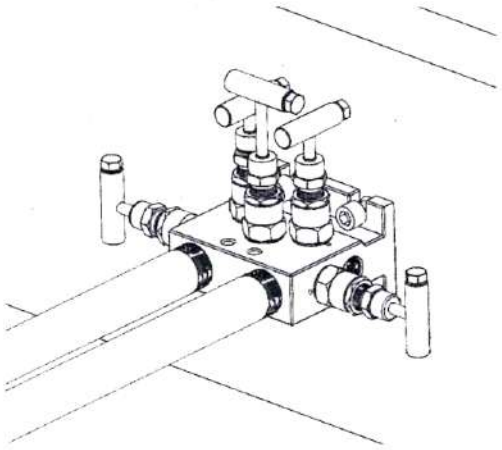
VALVES INSTALLATION PROCEDURE

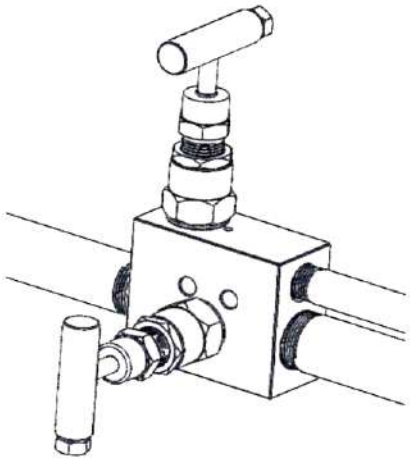
THE FOLLOWING POINTS MUST BE OBSERVED BEFORE INSTALLATION:

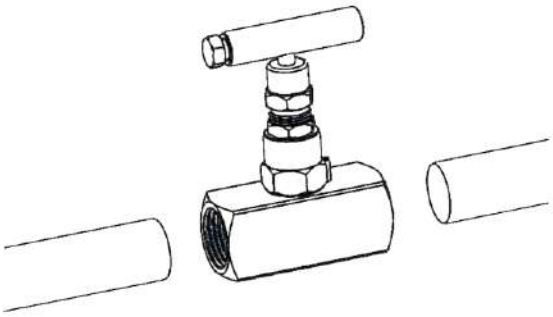
- Pipe must be strong enough safely bear the valve and its accessories. Pipework must be cleaned before installation.
- There must be sufficient clearance above and to the side of the valve and/or attachments to permit maintenance, inspection or repair work without any risk.
- Extension and attachments that used for heat removal or heating must be insulated.

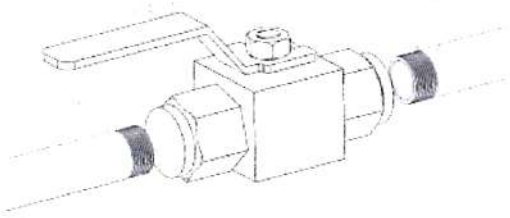
THE FOLLOWING POINTS MUST BE OBSERVED DURING INSTALLATION:

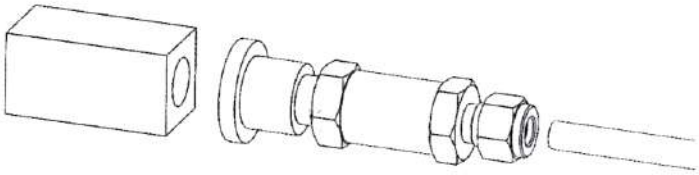
- Remove the protective caps.
- Clean the pipework end, connection-sealing surfaces.
- Tighten the pipe in clockwise direction.

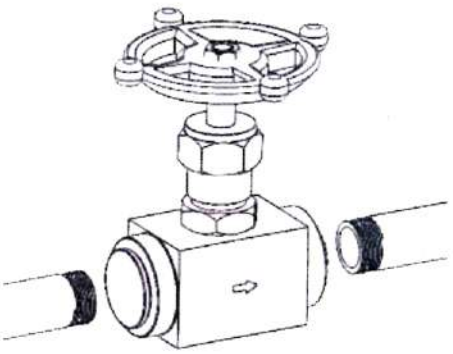












PIPE FITTINGS INSTALLATION PROCEDURE

PIPE

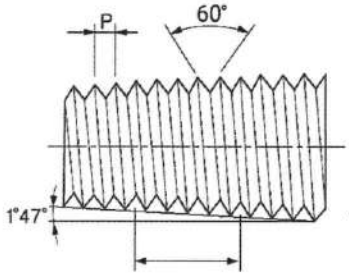
Pipe, is a hollow elongated metallic structure used to carry fluids. Wall thickness of pipe is designated by a Schedule Number. The greater the wall thickness, the higher the schedule number and the higher the pressure rating of the pipe. The most common method of joining pipe with threads. There are in general only two primary types of thread, Straight Thread and Taper Thread

Taper

Straight

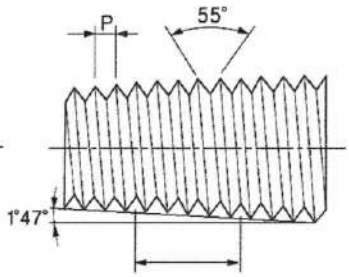
IDENTIFYING THREAD

ISO 7-1 Tapered Pipe Thread



60° Thread Angle
Taper Angle 1° 47'

NPT - Pipe Thread



55° Thread Angle
Taper Angle 1° 47'

BSPT - Pipe Thread

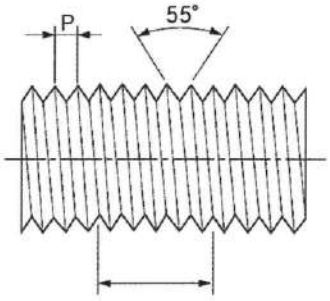
TAPERED THREAD

Tapered threads are the most common type of thread used in Pipe Fittings and Tube Fittings. As the name implies, they have a slight taper. When mated together and tightened, the threads compress and may form a seal with the application of thread sealant. The most widely used pipe taper threads are NPT and BSPT.

STRAIGHT THREAD

Straight Threads are used for joining purpose only. Sealing is accomplished by means of a gasket or O-Ring. As the name implies, they are Straight or parallel. The most widely used pipe parallel threads are BSPP, Metric and UNF.

ISO 228-1 Parallel Pipe Thread



55° Thread Angle

BSPP - Pipe Thread

PROCEDURE OF THREAD IDENTIFICATION

A. Determine if the thread is tapered or straight (parallel).
B. Measure the thread diameter and thread pitch
C. Determine the thread standard
D. Identify the end connection

Threads can be inspected by using thread gauges (GO & NOGO), Thread Profile Gauges and Profile Projector. Inspection by using thread gauges (GO & NOGO) is the most simple and effective method of inspection.

THREAD INSPECTION

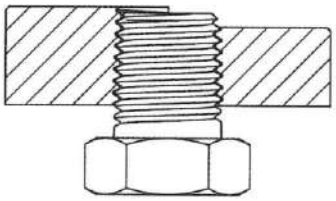
Types of Thread Gauges,

- Plug Gauge - For Female Threads
- Ring Gauge - For Male Threads

INSPECTION OF TAPER THREAD

FOR 2 STEP GAUGE

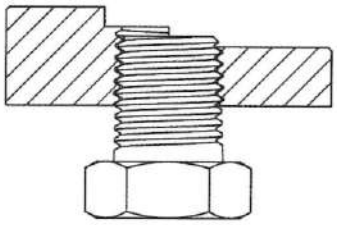
The Taper Thread can be inspected using 2 step & 3 step gauges. The initial thread level should be between the first and last step of the gauge.



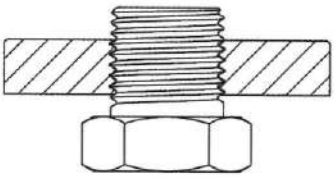
2 Step Ring Gauge

FOR 3 STEP GAUGE

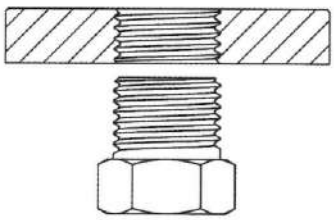
The Initail thread level should be in line with the middle step of the gauge which is the nominal position.



3 Step Ring Gauge



Ring Gauge - GO



Ring Gauge - NOGO

INSPECTION OF STRAIGHT THREAD

There are seperate GO and NO-GO Gauges. To inspect straight thread check using both GO and NO-GO Gauges. GO Gauge should mate fully and the NO-GO Gauge should not answer beyond one turn.

SEALING FOR TAPER THREAD

A sealant/lubricant is highly recommended. First, it enhances sealing by filling any gaps in the threads. Second, it reduces the potential for galling or seizing if the threads are forced together by over-tightening. If galling occurs, the threads are damaged and may not seal. This damage also prevents disassembly and reassembly. Recommended sealant/lubricants are graphite impregnated Teflon tape.

If using tape, wrap the tape in the thread direction so it does not come unwrapped during installation. Ensure, at a minimum, one complete wrap of the tape around the thread. Be sure the tapes does not overhang the first thread otherwise the tape could deteriorate and contaminate the fluid system.

TUBE FITTINGS - SINGLE FERRULE TYPE

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS / PTFE

Size : 1/8" to 2" ; 3mm to 50mm OD

End Connections : NPT / BSP / BSPT / UNF / METRIC / SW / Plain

Pressure Rating : Upto 9000 psi

MALE CONNECTOR

HPTSFMC

FEMALE CONNECTOR

HPTSFFC

BULKHEAD MALE CONN.

HPTSFMBH

BULKHEAD FEMALE CONN.

HPTSFFBH

EQUAL UNION

HPTSFEU

UNEQUAL UNION (REDUCING)

HPTSFRU

BULKHEAD UNION

HPTSFBHU

EQUAL UNION CROSS

HPTSFEUC

MALE ELBOW

HPTSFME

FEMALE ELBOW

HPTSFFE

UNION ELBOW

HPTSFUE

BULKHEAD UNION ELBOW

HPTSFBUE

45° MALE ELBOW

HPTSF45ME

45° FEMALE ELBOW

HPTSF45FE

45° UNION ELBOW

HPTSF45UE

45° BULKHEAD UNION ELBOW

HPTSF45BUE

EQUAL TEE

HPTSFET

UN EQUAL TEE

HPTSFUET

MALE BRANCH TEE

HPTSFMBT

FEMALE BRANCH TEE

HPTSFFBT

MALE RUN TEE

HPTSFMRT

FEMALE RUN TEE

HPTSFFRT

MALE ADAPTOR

HPTSFMA

FEMALE ADAPTOR

HPTSFFA

TUBE ADAPTOR

HPTSFAD

PLAIN CONNECTOR

HPTSFPC

TUBE CAP

HPTSFCA

TUBE PLUG

HPTSFPL

DIELECTRIC UNION

HPTSFDEU

NUT

HPTSFN

SINGLE FERRULE

HPTSF

TUBE FITTINGS - DOUBLE FERRULES TYPE

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS / PTFE

Size : 1/8" to 2" ; 3mm to 50mm OD

End Connections : NPT / BSP / BSPT / UNF / METRIC / SW / Plain

Pressure Rating : Upto 9000 psi

MALE CONNECTOR

HPTDFMC

FEMALE CONNECTOR

HPTDFFC

BULKHEAD MALE CONN.

HPTDFMBH

BULKHEAD FEMALE CONN.

HPTDFFBH

EQUAL UNION

HPTDFEU

UNEQUAL UNION (REDUCING)

HPTDFRU

BULKHEAD UNION

HPTDFBHU

EQUAL UNION CROSS

HPTDFEUC

MALE ELBOW

HPTDFME

FEMALE ELBOW

HPTDFFE

UNION ELBOW

HPTDFUE

BULKHEAD UNION ELBOW

HPTDFBUE

45° MALE ELBOW

HPTDF45ME

45° FEMALE ELBOW

HPTDF45FE

45° UNION ELBOW

HPTDF45UE

45° BULKHEAD UNION ELBOW

HPTDF45BUE

EQUAL TEE

HPTDFET

UN EQUAL TEE

HPTDFUET

MALE BRANCH TEE

HPTDFMBT

FEMALE BRANCH TEE

HPTDFFBT

MALE RUN TEE

HPTDFMRT

FEMALE RUN TEE

HPTDFFRT

MALE ADAPTOR

HPTDFMA

FEMALE ADAPTOR

HPTDFFA

TUBE ADAPTOR

HPTDFAD

PLAIN CONNECTOR

HPTDFPC

TUBE CAP

HPTDFCA

TUBE PLUG

HPTDFPL

DIELECTRIC UNION

HPTDFDEU

NUT

HPTDFN

DOUBLE FERRULES

HPTDFFF & HPTDFBF

MANIFOLD VALVES

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM

Size : 1/4" to 1/2"

End Connections : NPT / BSP / BSPT / SW / METRIC

Pressure Rating : 3000 / 6000 / 9000 psi

2 VALVE MANIFOLD

2 VALVE "F" TYPE WITH DRAIN (BLOCK & BLEED)

2VM/F HPMF201BB

2 VALVE "T" TYPE WITH DRAIN (INTEGRAL MOUNTING)

2VM/T HPMF202DM

2 VALVE ANGLE TYPE WITH DRAIN

2VM/A HPMF204AT

2 VALVE - GAUGE TYPE WITH DRAIN (F)X(F)

2VM/G HPMF203GV

2 VALVE - GAUGE TYPE WITH DRAIN (F)X(M)

2VM/G HPMF205GV

2 VALVE - GAUGE TYPE WITH DRAIN (M)X(F)

2VM/G HPMF206GV

3 VALVE MANIFOLD

3 VALVE "F" TYPE WITHOUT DRAIN (SEPARATE MOUNTING)

3VM/F HPMF301RM

3 VALVE "F" TYPE WITH DRAIN (SEPARATE MOUNTING)

3VM/F HPMF302RM

3 VALVE "T" TYPE WITHOUT DRAIN (INTEGRAL MOUNTING)

3VM/T HPMF303DM

3 VALVE "T" TYPE WITH DRAIN (INTEGRAL MOUNTING)

3VM/T HPMF304DM

3 VALVE - 'H' TYPE WITHOUT DRAIN (INTEGRAL MOUNTING)

3VM/H HPMF305FF

5 VALVE MANIFOLD

5 VALVE "F" TYPE WITH DRAIN (SEPARATE MOUNTING)

5VM/F HPMF501RM

5 VALVE "T" TYPE WITH DRAIN (INTEGRAL MOUNTING)

5VM/T HPMF502DM

5 VALVE "H" TYPE WITH DRAIN (INTEGRAL MOUNTING)

5VM/H HPMF503FF

COPLANAR MANIFOLD VALVES
Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM

End Connections : NPT / BSP / BSPT

Size : 1/4" to 1/2"

Pressure Rating : 3000 / 6000 / 9000 psi

3 VALVE - COPLANAR TYPE WITHOUT DRAIN

3VM/C HPMF306CP

3 VALVE - COPLANAR TYPE WITH DRAIN

3VM/C HPMF307CP

5 VALVE - SLANT TYPE WITHOUT DRAIN

5VM/C HPMF503CP

5 VALVE - COPLANAR TYPE WITH DRAIN

5VM/C HPMF504CP

5 VALVE - BAR TYPE WITH DRAIN

5VM/C HPMF505CP

MONOFLANGE MANIFOLD VALVES
Technical Information

SINGLE BLOCK & BLEED TYPE

HPMFL601

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL/ HASTELLOY / INCONEL / TITANIUM / TANTALUM

End Connections : NPT / BSP / BSPT

Size : 1/2" to 3"

Pressure Rating : Class 800# to 2500#

DOUBLE BLOCK & BLEED (BONNET-OS & Y TYPE)

HPMFL602

MONOFLANGE SINGLE ISOLATION

HPMFL603

MONOFLANGE BLOCK & BLEED

HPMFL604

MONOFLANGE DOUBLE BLOCK & BLEED

HPMFL605

DOUBLE BLOCK & BLEED VALVES
Technical Information

KEY BLOCK FLANGE TO THREAD TYPE

HPDBB401

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM

Size : 1/2" to 2"

End Connections : NPT / BSP / BSPT / SW / Flange End

Pressure Rating : Class 800# to 2500#

KEY BLOCK FLANGE TO FLANGE TYPE

HPDBB402

KEY BLOCK FLANGE TO THREAD (NEEDLE VALVE TYPE)

HPDBB403

KEY BLOCK FLANGE TO FLANGE NEEDLE VALVE TYPE

HPDBB404

MODULAR TYPE FLANGE TO THREAD

HPDBB405

NEEDLE VALVES
Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS
Size : 1/8" to 2" ; 1/8" to 1" OD & 4mm to 25mm OD (Suitable for Tube Conn.)
End Connections : NPT / BSP / BSPT / SW / Tube OD / UNF / METRIC
Pressure Rating : Upto 10000 psi

F X F TYPE

HPNV101

M X F TYPE

HPNV102

F X F TYPE WITH DRAIN

HPNV103

OD X OD TYPE

HPNV104

M X M TYPE

HPNV105

F X F TYPE (HEX BODY)

HPNV107

M X F TYPE (HEX BODY)

HPNV108

OD X OD (ANGLE TYPE)

HPNV110

INTEGRAL BONNET (T - BAR)

HPNV116

INTEGRAL BONNET (TOGGLE LEVER)

HPNV117

OD X FEMALE TYPE

HPNV118

HIGH PRESSURE NEEDLE VALVES
Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM
End Connections : NPT / BSP / BSPT
Size : 1/8" to 3/4"
Pressure Rating : Upto 40000 psi

PANEL MOUNTING TYPE

HPNV106

F X F TYPE (15000 PSI)

HPNV109

F X F TYPE (15000 PSI)

HPNV111

F X F TYPE (10000 PSI)

HPNV112

ANGLE TYPE - M X F

HPNV113

INTEGRAL MOUNTING TYPE

HPNV114

PANEL MOUNTING TYPE - M X M

HPNV115

HIGH PRESSURE TYPE

HPNV119

SNUBBER & GAUGE COCK
Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS
End Connections : NPT / BSP / BSPT / SW
Size : 1/4" to 1/2"
Pressure Rating : Upto 6000 psi for Snubber ; Upto 3000 psi for Gauge Cock

SNUBBER M X F

HPSR109

SNUBBER F X F

HPSR110

GAUGE COCK M X F

HPGC109

GAUGE COCK F X F

HPGC110

BALL VALVES

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS / IC

Size : 1/4" to 2"

Pressure Rating : Upto 6000 psi (Upto 1000 psi For IC BV)

End Conn. : NPT / BSP / BSPT / Tube OD & SW

2 PC DESIGN

HPBV201

3 PC DESIGN

HPBV202

4 WAY TYPE

HPBV203

OD TYPE

HPBV204

BOLTED TYPE

HPBV205

2 PC DESIGN (OD X TH)

HPBV206

1 PC DESIGN (IC) (WITH LOCK OPEN)

HPBV207

2 PC DESIGN (IC)

HPBV208

2 PC DESIGN (M X F)

HPBV217

3 WAY TYPE

HPBV218

FLANGE END TYPE

HPBV219

1 PC DESIGN

HPBV221

ERMETO TYPE

HPBV222

ORBITAL WELD TYPE

HPBV223

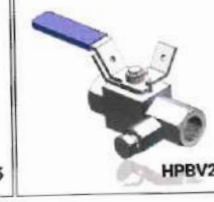
3 PC DESIGN (IC)

HPBV224

3 WAY TYPE (IC)

HPBV225

DRAIN/BLEED TYPE



HPBV226

HIGH PRESSURE BALL VALVES

Technical Information

2 PC DESIGN

HPBV209

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS

Presure Rating : Upto 10000 psi

Size : 1/4" to 2"

End Conn. : NPT / BSP / BSPT / SW

3 PC DESIGN

HPBV210

PANEL MOUNTING BALL VALVES

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / BRASS

End Connections : NPT / BSP / BSPT / Tube OD & SW

Size : 1/4" to 1"

Pressure Rating : Upto 3000 psi

3 PC DESIGN

HPBV211

T - PORT

HPBV212

L - PORT (OD TYPE)

HPBV213

3 PC DESIGN (OD TYPE)

HPBV214

T - PORT (OD TYPE)

HPBV215

L - PORT

HPBV216

T - PORT (OD TO TH)

HPBV220

AIR DISTRIBUTION HEADERS

Technical Information

M.O.C : Stainless Steel / Carbon Steel
Inlet Size : 1/4" to 2" Threaded / Socket Welded / Flanged - Needle Valve / Ball Valve
Outlet Size : 1/4" to 1" Threaded / Socket Welded - Needle Valve / Ball Valve
Drain Size : 1/4" to 2" Threaded / Socket Welded / Flanged - Needle Valve / Ball Valve with Plug
Pipe Schedule : SCH 40 to SCH XXS **No.of Ways**: 4 to 24 ways.

BAR STOCK

HPADH901

PIPE LINE

HPADH902

CONDENSATE POT / SAMPLING POT

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM
Size : 2" to 6"
End Connections : NPT / BSP / BSPT / SW
Pipe Schedule : SCH 40 to SCH XXS

THREE PORT

HPCP601

FOUR PORT

HPCP602

SAMPLING POT

HPSP603

SYPHONS

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY tt/ INCONEL / TITANIUM / TANTALUM
End Connections : NPT / BSPT / BSP / PL / SW
Size : 1/4" to 1/2"
Pipe Schedule : SCH 40 to SCH XXS

PL X M TYPE

HPSY701

M X F TYPE

HPSY702

PIG TAIL TYPE

HPSY703

"U" TYPE

HPSY704

F X F TYPE

HPSY705

AIR FILTER REGULATOR

Technical Information

Ranges : 0 to 150 psi (30, 60, 100, 150)
End Size : 1/4" / 1/2" / 3/4" / 1"
End Connections : NPT(F) / BSP(F)
Body & Bowl Mtrl. : Aluminum Die Cast
Filterization : 5 to 40 micron
Bowl Capacity : 130cc (Approx.)
Drain : Manual Type
Accuracy : ± 5% FSR

HPAFR

FLUSHING RINGS

Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM
Size : 1/2" to 3"
Pr. Rating : Upto 2500#

HPFR

Products

Condensate Pots

- Condensate Pots are available in SS 316 & Carbon Steel Materials.
- Variety of end connections - Threaded, Flanged, Socket Weld.
- Maximum working pressure up to 6000 psig. (414 bar).
- Size ranging from 1/2 to 2" - Class 150 to 2500.
- All NPT thread will be as per ANSI B 2.1 & Socket weld will be as per ANSI B 16.11.
- Radiography testing & liquid penetrate testing of butt-welding joints as per ASME BPVC section V.
- NACE certification available upon request.
- Heat code traceability.

Flange Adapters

- Flange Adapters are available in SS 316, Monel, Duplex & Hastalloy Materials.
- Variety of end connections - Threaded, Flanged, Socket Weld.
- Maximum working pressure up to 10,000 psig. (689 bar).
- Available in **PANAM**® tube fitting end connection up to 50mm in metric sizes & 2" in imperial sizes.
- Flange type meet ASME, DIN, EN and JIS standards. Full range of sealing faces including Flat Face, Rised Face, RTJ and Tongue and Groove.
- EN 10204 type 3.1B test certificates are supplied with materials.
- Heat code traceability.

FLANGES
Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM

PR. Rating : Class 150#, 300#, 600#, 900#, 1500# & 2500#

Size : 1/2" NB to 24" NB

End Connection : NPT / BSP / BSPT / UNF / METRIC / SW / BW / TUBE OD.

WELD NECK FLANGE

HPFLWN

SLIP ON FLANGE

HPFLSO

SOCKET WELD FLANGE

HPFLSW

BLIND FLANGE

HPFLB

THREADED FLANGE

HPFLT

FLANGE CONNECTOR (OD TYPE)

HPFLO

TUBES
Technical Information


HPSTUBE

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM / COPPER / PP / PU / PTFE

Size : 1/8" to 2" (Seamless) & 6mm OD to 50mm OD

Pressure : Upto 9000 psi

Type : Seamless

PIPES
Technical Information

M.O.C : CS / AS / SS / DSS / SDSS / SASS / MONEL / HASTELLOY / INCONEL / TITANIUM / TANTALUM

Size : Upto 24" NB

Pipe Schedule : SCH 10 to SCH XXS

Type : Seamless


HPSPIPE

PIPE / TUBE / 'U' CLAMP
Technical Information

Clamps are available in sizes ranging from 1/8" to 2" & 6mm to 50mm which eliminate vibrations with its unique construction. HDPE body with top and bottom steel plates are supplied in SS & CS plated.

SINGLE PORT CLAMP

HPCLSP

DOUBLE PORT CLAMP

HPCLDP

MOUNTING RAIL CLAMP

HPCLMR

'U' CLAMP

HPCLUC

FORGED STEEL FITTINGS

Standard	:	**ASME B 16.11**
Types	:	Socketweld &Threaded (NPT & BSPT)
Pressure Rating	:	2000#, 3000#, 6000#, 9000#.
Product	:	90° & 45° Elbows, Tee, Hex Head Bushing, Cap, Cross, Full & Half Couplings, Hex, Round & Square Head Plugs, 90° Street Elbows etc.
Material	:	Stainless Steel, Carbon Steel, Alloy Steel, Duplex Steel & Nickel Alloys etc.
Size	:	1/4" to 4" (8 NB to 100 NB)

NIPPLES, UNIONS, PLUGS, BOSS AND INSERTS

Standard	:	**ASTM A733-03, MSS SP-79, MSS SP-83, MSS SP-95.**
Types	:	Socketweld &Threaded
Pressure Rating	:	SCH 40 to XXS, 3000#, 6000#.
Product	:	Pipe Nipples, Boss, Hex Nipples, Unions, Bull Plug, Reducer Insert, Swaged Nipples
Material	:	Stainless Steel, Carbon Steel, Alloy Steel, Duplex Steel & Nickel Alloys etc.
Size	:	1/4" to 4" (8 NB to 100 NB)

- 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(ISO9001:2015,ISO14001:2015,ISO45001:2018)certified company.
- PED 2014/68/EU & AD 2000 Merkblatt WO/ W2 / W10 approved manufacturer.
- NORSOK & VD TUV-certified products.
- More than 200 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.

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 / ALLO Y 825
6022 / 2.4602 / Hatelloy C-22
10276 / 2.48 19 / Hatelloy C-276

FERRITIC & MARTENSITIC
TP 405 / 1.4002
TP 410 / 1.4006

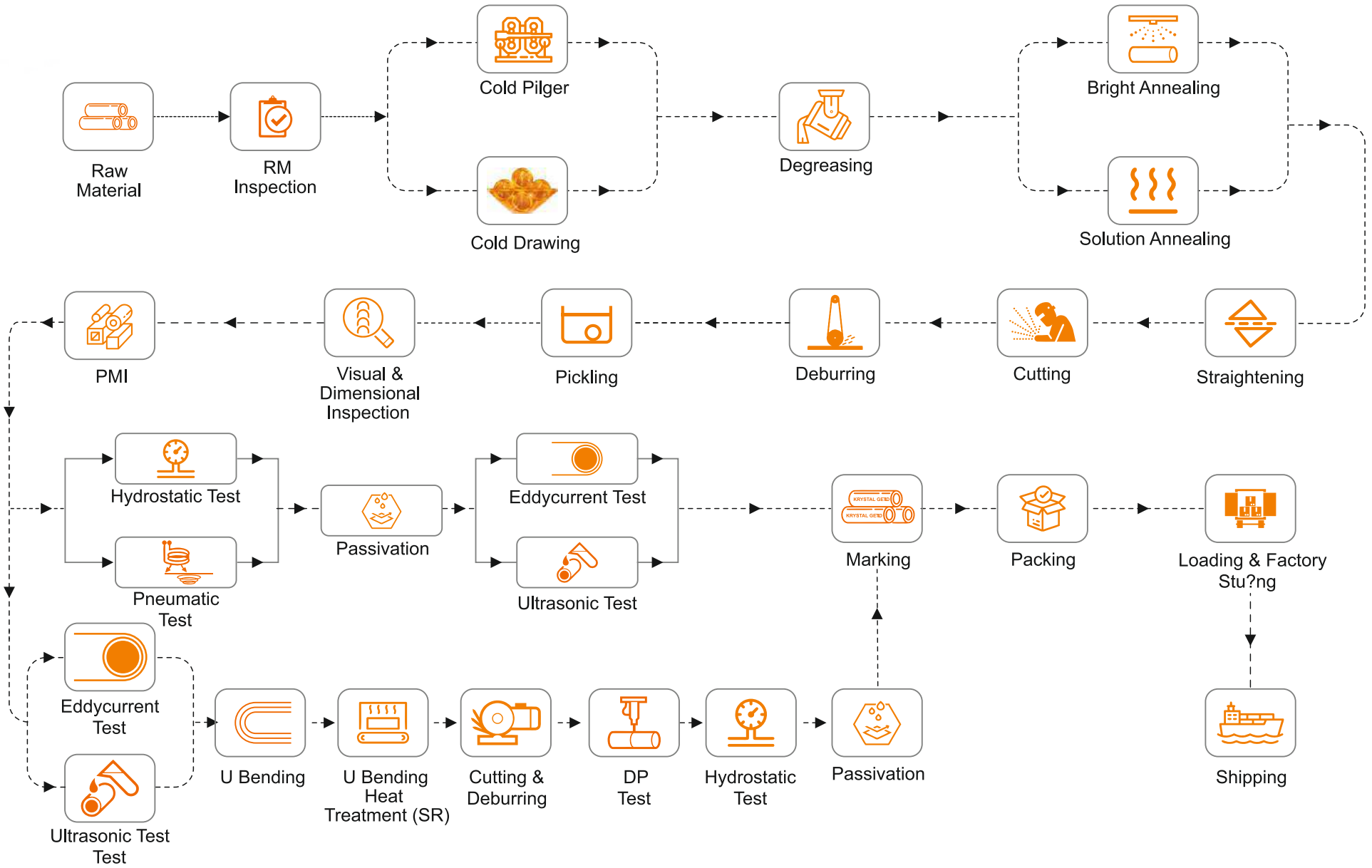
AUSTENITIC
TP 304 / TP 304L / 1.4301 / 1.4307
TP 304H / 1.4948
TP 1.4306
TP 309 / 1.4828
TP 310 / TP 310S / 1.4845
TP 314 / 1.4841
TP 316 / TP 316L / 1.440 1 / 1.4404
TP 316 / 316L (MIN. 2.5% MO)
TP 316H / 1.4918
TP 316Ti / 1.4571
TP 317 / TP 317L / 1.4438
TP 321 / TP 321H / 1.4541 / 1.4878
TP 347 / TP 347H / 1.4550 / 1.4912

SUPER AUSTENITIC
UNS S32154 / 1.4547 / ALLOY 6 MO
TP 904L / UNS N08904 / 1.4539
UNS S30815 / 1.4835
EN 1.4435
EN 1.4335
TP 304LN / 1.4311
TP 314 / 1.4841
TP 316LN / 1.4406
TP 317LMN / 1.4439

DUPLEX & SUPER DUPLEX
UNS S3 1803
UNS S32205 / 1.4462
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:

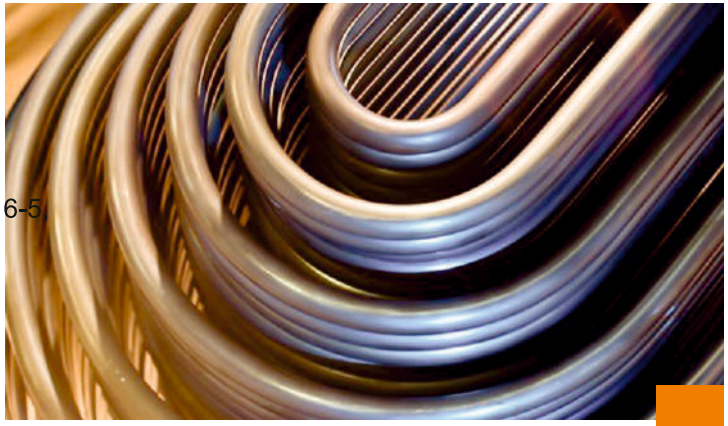
Krystal manufactures High Performance Heat Exchanger Tubes serving all industries and applications across the Globe. Our heat exchanger tubes are e?ciently used for the cooling, heating or re-heating of fluids, gases, air in a diverse range of industries.

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

- Metallurgy : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic
- 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)
- 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 and Different shapes of Bending.

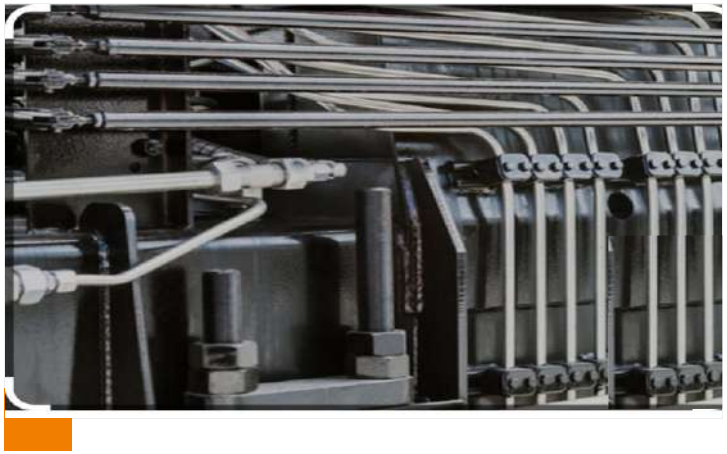


- Metallurgy : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic
- Outside Diameter : 9.53 mm to 88.9 mm
- Wall Thickness : 1.00 mm to 6.00 mm
- Specification : SB 163, SB 167, SB 407, SB 423, SB 444, ASTM A-213, A-268, A-789, EN 10216-5, TEMA RCB 2.3 & ASTM A-688
- Length : As per Customer's Drawing, Developed length up to 24 Meter
- Surface Finish : Bright Annealed (CFA), Solution Annealed (CFD)
- 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 (J APAN) & Other Equivalent Standards.

Seamless Hydraulic & Instrumentation (H&I) Tubes:

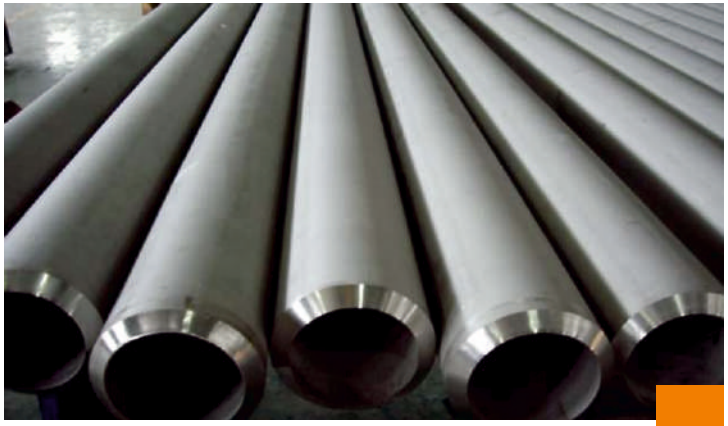
Krystal is one of the renowned manufacturer and supplier of a qualitative range of Instrumentation Tubes that are being designed as per the national and international standards and specifications. Krystal Tubes are a perfect fit for the ferrule fittings in all range with smooth biting, turning and clamping.



- Metallurgy : Nickel Alloys, Austenitic, Super Austenitic, Duplex, Super Duplex, Ferritic
- Outside Diameter : 3.17mm 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

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
- 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,ASMESA312/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),FN(AFNOR), JIS (J APAN) & Other Equivalent Standards

Super Bright Annealed Electropolished (SBA-EP) Seamless 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 : Austenitic, Super Austenitic, Duplex and Nickel Alloys
- 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 ≤ 0.25µm (Internal), Ra ≤ 0.50µm (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

We manufacture stainless steel and nickel alloy tubing for high-performance applications where corrosion resistance, tolerance and purity are critical. Our coiled tubing - supplied in on e 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's seamless construction also improves its performance since the entire coil has the same dimensions and durability properties.

- Metallurgy : Austenitic, Super Austenitic, Duplex and Nickel Alloys
- Outside Dimension : 3.175 mm to 25.4 mm
- Wall thickness : 0.5 mm to 2.11mm
- Specification : ASTM A269
- Length : Up to 200 Meter (650 Feet) in coil Length with respect to dimensions.
- End Cut : Plain Cut

Finned Tubes

Krystal Finning Division is solely focused on producing the largest variety and most complete solutions for finned tubing. These tubes are made in two typical styles.

1. Applied finned tube which helically winds metal fins onto a tube or pipe.
2. Extruded finned tubes, are made by forming fins into a base tube creating integral fins on the outside and/or inside diameter.

- Metallurgy : Austenitic, Super Austenitic, Duplex and Nickel Alloys
- Fin Type : “L” , “LL” , “‘G” EMBEDDED, Extruded
- Diameter : 12.70mm, 15.88mm, 19.05mm, 22.20mm, 25.40mm & 38.10mm
- Fin Thickness : 0.8mm up to 3.2mm
- Fin Heigh : 0.8 mm to 38 mm
- Fin Pitch : 60 FPM to 315 FPM
- Length : As per Customer Requirement, Maximum upto 20 Meters
- Testing : Fin Tubes will be supplied, duly Hydro Tested, after finning
- End : Plain portion at both end

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 e?uent water, Dye-house e?uent, Digestion Sludge, Food, Grain Slurry, Fruit Pulps, etc. Corrugated Tubes are manufactured out of various materials viz. Copper, Cupro-Nickel, Stainless Steel, Carbon Steel, etc.

- Metallurgy : Austenitic, Super Austenitic, Duplex and Nickel Alloys
- 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 Boxed
- End Cut : Plain Cut

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 l0s	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	10.3		1.24				1.73	1.73	1.73		2.41	2.41	2.41					
1/4	8	13.7		1.65				2.24	2.24	2.24		3.02	3.02	3.02					
3/8	10	17.1		1.65				2.31	2.31	2.31		3.20	3.20	3.20					
1/2	15	21.3	1.65	2.11				2.77	2.77	2.77		3.73	3.73	3.73				4.78	7.47
3/4	20	26.7	1.65	2.11				2.87	2.87	2.87		3.91	3.91	3.91				5.56	7.82
1	25	33.4	1.65	2.77				3.38	3.38	3.38		4.55	4.55	4.55				6.35	9.09
1 1/4	32	42.2	1.65	2.77				3.56	3.56	3,56		4.85	4.85	4.85				6.35	9.70
11/2	40	48.3	1.65	2.77				3.68	3.68	3.68		5.08	5.08	5.08				7.14	10.15
2	50	60.3	1.65	2.77				3.91	3.91	3.91		5.54	5.54	5.54				8.74	11.07
21/2	65	73	2.11	3.05				5.16	5.16	5.16		7.01	7.01	7.01				9.53	14.02
3	80	88.9	2.11	3.05				5.49	5.49	5.49		7.62	7.62	7.62				11.13	15.24
31/2	90	101.6	2.11	3.05				5.74	5.74	5.74		8.08	8.08	8.08					
4	100	114.3	2.11	3.05				6.02	6.02	6.02		8.56	8.56	8.56		11.13		13.49	17.12
5	125	141.3	2.77	3.40				6.55	6.55	6.55		9.53	9.53	9.53		12.70		15.88	19.05
6	150	168.3	2.77	3.40				7.11	7.11	7.11		10.97	10.97	10.97		14.27		18.26	21.95
8	200	219.1	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	273.1	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	323.9	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	355.6	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

XXH	Double Extra Heavy Wall

XS	Extra Strong Wall

XXS	Double Extra Strong Wall

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	N06022	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
SA 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	Gosudarstvenil 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											
254SMO	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
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 (6)	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 (9)	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
N3-N6	µm	µinch	µm
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

Rz
Average Roughness Depth

µm
Micrometers

µinch
Microinches

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

LETS CONQUER THE WORLD TOGETHER

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