amf metals

API METALS AND FORGE

- Forged Thermowell
- Metal Bright Bars
- Valve Components
- CNC Machine Components
- Flanges
- Fasteners
- Forged Bar
- Forged Rings

www.apimetals.com
info@apimetals.com

Aspiring Growth Through Technological Advancement

API METALS & FORGE (AMF) is fast growing Forging Flanges, Fittings, Open Forged Components & CNC Machined Components manufacturing Company.

Our company certified with ISO 9001:2015, PED 2014/68/EU & NORSOK M-650 Approved.

The perfect blend of deep domain knowledge, technology experience & quality Material has enabled us to become leader in Flanges, Forgings and Metals industry. The Company has set up state of art Manufacturing plant in Ambernath, MIDC located near to Mumbai, In India. For meeting the requirements of its customers globally.

AMF always believes in satisfying its customers by providing quality products, meeting growing demand of our customers globally, timely and continuous improvements in the products to meet the quality expectations of the international market.

We have supplied materials globally to Middle East, Europe & Africa. The plant infrastructure comprises of highly efficient Forging and Machining Facilities with high level of quality aspects. It covers all the business process like Sales, Design & Development, Procurement, Planning, Manufacturing, Quality, Store, Dispatch, HR and Finance.

Company always takes interest for up-gradation of technology, Infrastructure & continuous improvement of its manufacturing process to achieve quality products, Cost effective Products to Cater the Customer requirement from Diverse Sectors Namely: Oil & Gas, Chemical & Petrochemical, Valve industry, Power, Fertilizers, Fabrications and Marine industries etc.

AMF also follow the safety, health and environment policies as per national & international norms. AMF believes in ethical business practices and in achieving the company goals by Providing appropriate training and development to enhance the skills of its employees.

QUALITY

At “Amf Metals “Products Manufactured Conforms To The Highest Quality Standards Which Starts Right From The Sourcing Of Raw Materials Till The Final Product Is Dispatched To The Customer.

Excellence is Our Standard

- Customer Focused Approach
- Timely Delivery Schedule
- Well-equipped Testing Lab
- Zero Percent Rejection
- Continuous Process Improvements
- Training & Development of Employees

Certification

TÜVINDIA

Certificate

Management system as per

ISO 9001:2015

The Certification Body TUV INDIA PVT. LTD. hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

API METALS & FORGE PRIVATE LIMITED
Plot No – B-45, Ambernath MIDC, Anand Nagar,
Ambernath Dist. Thane – 421 506,
Maharashtra,
India

operates a management system in accordance with the requirements of ISO 9001 : 2015 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

1. Manufacture, Sales & Dispatch of Forged & Machined Flanges, Circles. Rings, Pipe Fittings, Thermowell & Valve Parts.
2. Procurement & Supply of Metal Bright Bars.

Certificate Registration No. IND 100 24395145 Valid from 04.06.2024
Audit Report No. Q13509/2024 Valid until 03.06.2027
Initial certification 04.06.2024

Mumbai, 04.06.2024

Certification Body at TUV INDIA PVT. LTD.

Visit our database to verify the validity of this certificate.

TUV INDIA PVT. LTD.
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Ghatkopar (W) Mumbai – 400 086,
India
www.tuv-nord.com/in

NABCB QM 002

TÜV®

TUVNORDGROUP

PED Approved

PED certified

Product Grades

Stainless Steel	SS316/316L, SS304/304L, SS321, SS316Ti, 6Mo, F44 (UNS S31254)
Duplex Steel Super Duplex	F51, F53, F55, F60
Nickel Alloy	Alloy 625 (UNS N06625), Alloy 825 (UNS N08825) Monel-400 (UNS N04400), Hastelloy C-276
Titanium Forgings	B381: F2, F1
DIN/EN	1.4404, 1.4401, 1.4541, 1.4571,1.4306, 1.4307, 1.4301,1.0460, 1.4462
Carbon Steel	A105/SA266, C22/C22.8, A694 Gr.F60
Low Temp Steel:	SA 350 LF2

SPECTROMETER

UTS MACHINE

IMPACT TEST

Flanges

High-performance flanges conforming to ANSI, API, DIN, and JIS standards.

Types

Weld Neck (WN)
Slip-On (SO)
Socket Weld (SW)
Blind (BL)
Threaded (TH)
Lap Joint (LJ)
Orifice & Custom Flanges

Flanges – Detailed Specification

Types & Dimensions (per ANSI B16.5 & B16.47)

Flange Type	Typical Sizes	Pressure Class	Face Type
Weld Neck (WN)	½" to 60"	150# – 2500#	RF, RTJ, FF
Slip On (SO)	½" to 48"	150# – 900#	RF, FF
Blind (BL)	½" to 60"	150# – 2500#	RF, RTJ, FF
Socket Weld (SW)	½" to 4"	150# – 1500#	RF
Threaded (TH)	½" to 4"	150# – 600#	RF, FF
Lap Joint (LJ)	½" to 24"	150# – 600#	Flat Face
Orifice	2" to 24"	150# – 900#	With tapped holes/drain

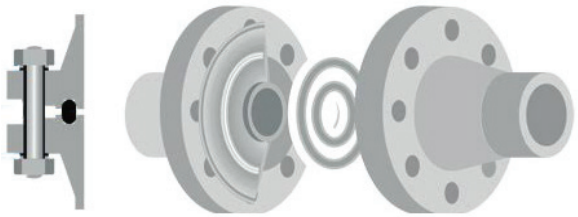
Materials by Grade

Material Type	Common Grades	Key Applications
Carbon Steel	ASTM A105, A350 LF2	General service, cryogenic (LF2)
Stainless Steel	304, 304L, 316, 316L, 321	General service, cryogenic (LF2)
Duplex SS	UNS S31803, S32205	General service, cryogenic (LF2)
Super Duplex	UNS S32750, S32760	Chloride-rich media
Carbon Steel	ASTM A105, A350 LF2	General service, cryogenic (LF2)
Stainless Steel	304, 304L, 316, 316L, 321	General service, cryogenic (LF2)
Duplex SS	UNS S31803, S32205	General service, cryogenic (LF2)
Super Duplex	UNS S32750, S32760	Chloride-rich media

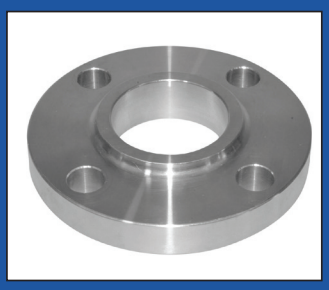
RTJ Dimensions (Ring-Type Joint)

(For high-pressure sealing – Class 600 to 2500)

NPS	Ring No.	OD	Width (in)	Height (in)
2"	R-23	2.875	0.388	0.195
4"	R-27	4.875	0.456	0.248
6"	R-31	7.000	0.500	0.277
12"	R-39	13.250	0.625	0.344



Welding Neck Flange



Slip On Flange

BLRTJ

Lap Joint Flange

Socket Weld Flange

Threaded Flange

WNRTJ

Blind Flange

Thermowells

Reliable protection for sensors in high-pressure or corrosive media.

Types

Threaded

Flanged

Weld-In

Van Stone

Thermowells – Detailed Engineering Specification

Bore	Stem Length	Process Connection	Material	Std
6mm 20mm	Upto 1000mm	NPT/BSP, ANSI Flange	SS316Inconel Monel	ASME PTC 19.3

Thermowells protect temperature sensors from harsh flow, pressure, and corrosive environments.

Optional Features

- Helical Strakes (to reduce vortex-induced vibration)
- Radiography & Hydrostatic Testing
- Weld Traceability & NDT
- Custom insertion length & reduced tip diameter

Dimensional Standards

Bore (mm)	Stem Length (mm)	Tip Type	Immersion Depth	Wake Frequency Compliant
6, 8 10,12	Up to 1000mm	Straight Tapered	As per application	Yes (ASME PTC 19.3 TW-2016)

Special Material Grade

Material	Grade	Max Temp	Corrosion Resistance	Notes
SS316/316L	AISI 316/316L	870°C	Excellent	Standard choice
Inconel 600 /625	UNS N06600 / N06625	1093°C	Excellent in acids	Chemical plants
Hastelloy C-276	UNS N10276	1040°C	Resistant to oxidizers	Acid recovery
Monel 400	UNS N04400	1000°C	Seawater & alkali resistant	Marine use
Duplex SS	UNS S31803	600°C	High strength & corrosion	Offshore platforms
Super Duplex	UNS S32750	600°C	Pitting & crevice resistant	Chloride-rich systems
Titanium Gr.2/Gr.5	ASTM B348	500°C	Outstanding in seawater	Desalination plants
Tantalum / Zirconium	R05200 / Zr702	500–700°C	Superior chemical resistance	High-end pharma, nuclear

Pipe Fittings – Complete Range (Standard & Exotic Alloys)

We supply seamless and welded pipe fittings in a wide range of sizes & exotic materials, designed for high pressure, high temperature, and highly corrosive environments.

Types

Elbows	Crosses
Reducers	Couplings
Tees	Swage Nipples
Caps	Unions
Stub Ends	Outlets (Olets)

Types of Pipe Fittings

Category	Fitting Type	Description
Elbows	45°, 90°, 180° – LR/SR	Directional change
Reducers	Concentric / Eccentric	Size transitions
Tees	Equal / Reducing	Branching lines
Caps	End Sealing	Closing pipes
Stub Ends	Short & Long	For Lap Joint Flanges
Crosses	Equal / Unequal	Four-way connections
Couplings	Full / Half / Reducing	Small pipe joints
Swage Nipples	Concentric / Eccentric	Reducing or transition
Unions	Threaded / Socket Weld	Removable joints
Outlets (Olets)	Weldolet, Sockolet, Threadolet	Branch connections

Size Range & Standards

Size (NPS/DN)	Range	Schedule / Thickness
NPS	½" to 48"	Sch 10 to Sch 160, XXS
DN	DN15 to DN1200	PN6 to PN160
Standards	ASME B16.9, B16.11, MSS SP-75, DIN 2605, EN 10253	

Materials & Typical Applications

Materials

Stainless Steel (SS)

Grades: 304, 304L, 316, 316L, 321, 347
Use: General chemical & water services, moderate corrosion
Temp Range: 196°C to 870°C

Duplex Stainless Steel

Grades: UNS S31803 (F51), S32205 (F60)
Use: Chloride-rich media, offshore platforms
Strength: 2x that of 316L
Temp Range: -50°C to 300°C

Super Duplex Stainless Steel

Grades: UNS S32750 (F53), S32760 (F55)
Use: Subsea, desalination, high-pressure pipelines
Properties: Excellent pitting & crevice corrosion resistance
Temp Range: -50°C to 300°C

Inconel®

Grades: 600, 625, 718 (Alloy 625 is most common)
Use: High-temperature and aggressive acid service (H_2SO_4, HCl, seawater)
Temp Range: -100°C to 980°C
Fittings: Seamless elbows, tees, reducers, unions, forged fittings

Monel®

Grades: 400, K500

Use: Saltwater, alkali, and hydrofluoric acid resistance

Applications: Marine, nuclear, heat exchangers

Temp Range: S-200°C to 500°C

Hastelloy® (Available on request)

Grades: C-276, C-22

Use: Highly corrosive acids and oxidizers

Applications: Pharmaceuticals, chemical reactors

Fabrication Methods

Seamless (up to 24")

Welded
(above 24" or custom sizes)

Forged
(small sizes, high strength)

Machined from bar stock
for high alloys

Quality Assurance & Testing

Dimensional & visual
inspection (100%)

Hydro, PMI, UT, RT (on request)

Certifications: EN 10204 3.1
/ 3.2, NACE MR0175, ISO 15156

Flushing Rings - Oil and Gas & Industrial Applications

Flushing Rings are installed between diaphragm seals and process flanges to allow flushing, draining, or sampling of the process media without removing the instrument. They are essential in oil & gas, refining, chemical, and pharmaceutical industries where viscous, corrosive, or slurry media are present.

Flushing Ring Overview

- Used with diaphragm seal pressure transmitters
- Allows flushing of process media to prevent clogging or deposition
- Permits sampling, draining, or cleaning without disassembly

Types of Flushing Rings

Type	Description
Standard Single-Pass Ring	With 2 side ports (opposite or 90°), used for flushing media through the cavity.
Multi-Port Flushing Ring	Used when simultaneous flushing & draining are required.
Drip Ring / Spacer Ring	Used as a separator/spacer in high-temperature or viscous fluid applications.
Custom Machined Designs	With extended hubs, offset ports, or jack screw holes for alignment or cleaning.
Orifice Flushing Ring	Includes a small orifice or bore to control flow into the diaphragm cavity.

Standard Sizes & Dimensions

Process Connection	Nominal Size (NPS/DN)	Typical OD (mm)	Thickness	Port Size / Type
ASME B16.5	½" to 4" (DN15 to DN100)	90 – 230 mm	3 mm to 10 mm	¼", ½" NPT or BSPP
Custom	Up to 12" (DN300)	Custom	As required	Flanged or threaded
Port Connection	2x threaded ports (180° or 90° apart)	Custom	As required	Standard ¼" or ½"

Can be supplied to match RF, RTJ, FF, or custom flange facings per ASME B16.5, B16.47, API 6A.

Materials for Oil & Gas & Harsh Applications

Material	Grade / UNS	Applications
Stainless Steel	304 / 316 / 316L (S31603)	General service, moderate corrosion
Duplex Steel	S31803 / F51	Offshore, sour gas, chloride environments
Super Duplex	S32750 / S32760	Subsea, HPHT, high chloride & sour service
Monel®	400 / K500	Seawater, acids, alkali
Inconel®	625 / 718	High temperature, oxidizing environments
Hastelloy®	C276 / C22	Highly corrosive chemicals
Titanium	Gr.2 / Gr.5	Seawater, lightweight, highly inert
Carbon Steel	A105 / A350 LF2	Non-corrosive media, utility service (with or without coating)

All exotic materials can be certified to NACE MR0175 / ISO 15156 for sour service.

Pressure & Temperature Ratings

Ring Rating	Matching Flange Class	Pressure Rating	Temp Rating
PN16 – PN160	DIN/EN flanges	Up to 250 bar	-50°C to 400°C
150# – 1500#	ASME B16.5 flanges	Up to 2500 psi (172 bar)	Up to 500°C (material dependent)
API 6A Rated	Up to 20,000 psi	High-pressure wellheads	HPHT wells

Design Features

Side Ports: ¼" or ½" NPT(F) or BSPP for flushing or sampling lines

Gasket Surface: Raised face (RF), ring-type joint (RTJ), flat face (FF)

Mounting: Matches standard flanges or instrument diaphragm seal

Machining Tolerance: ±0.1 mm, custom OD/ID configurations

Markings: Material grade, heat number, port orientation

Testing & Certification

Hydrostatic Pressure Testing: Optional for ring body

Dimensional Inspection

Positive Material Identification (PMI)

Hardness, Tensile, and Impact Testing (on request)

Certifications: EN 10204 3.1 / 3.2, NACE MR0175, ISO 15156, ISO 9001

Typical Applications

Oil & Gas: Offshore platforms, chemical injection skids, separator vessels

Petrochemical Plants: Aggressive media in diaphragm seal systems

Marine / Subsea: Saltwater-resistant installations for pressure transmitters

Refineries & Power Plants: Steam and process fluid instrumentation

Chemical & Pharma: Flushing to avoid media crystallization in small-bore tubing

Industrial Rings - Oil & Gas & Engineering Applications

Rings are critical components used in flange connections, seals, gaskets, bearing supports, pipe spacers, and rotating equipment. Our rings are manufactured from high-performance alloys and meet stringent quality standards for use in high-pressure, high-temperature, and corrosive environments.

Types of Rings

- Seamless Rolled Rings
- Precision Machined Rings
- Spacer Rings
- Welded Rings
- Gasket Rings
- Bearing rings

Types of Rings

Type	Description
Seamless Rolled Rings	Formed by hot forging and ring rolling – strong grain structure, ideal for critical applications.
Welded Rings	Formed by rolling and welding plate or bar – suitable for non-critical or large-diameter rings.
Precision Machined Rings	CNC-turned to close tolerances from forged or bar stock – used in rotating and sealing systems.
Spacer Rings	Used between flanges, pipes, and valves for spacing or alignment.
Gasket Rings (RTJ / BX / RX)	Used between flanges, pipes, and valves for spacing or alignment.
Support / Backup Rings	Used in O-ring and sealing systems to prevent extrusion in HPHT environments
Bearing Rings	Used in mechanical systems such as compressors and pumps

Size Range

Ring Type	Outer Diameter (OD)	Inner Diameter (ID)	Thickness (T)
Seamless Rolled Rings	100 mm – 2500 mm	As required	5 mm – 250 mm
Welded Rings	300 mm – 4000 mm	Custom	5 mm – 100 mm
Gasket Rings (RTJ/BX)	Per API 6A / ASME B16.20	Per spec	As per type (R, RX, BX)
Backup/Spacer Rings	25 mm – 1000 mm	As per design	Custom machined

Custom sizes and profiles (square, rectangular, dovetail) available upon request

Materials & Grades

Carbon Steel & Low Alloy

Material	Grade	Use
Carbon Steel	ASTM A105, A516 Gr.70	General service rings
Alloy Steel	ASTM A182 F11, F22	High temp/pressure flanges

Stainless Steel

Grade	UNS	Use
304 / 304L	S30400 / S30403	Water, air, moderate corrosion
316 / 316L	S31600 / S31603	Offshore, marine, chlorides
321 / 347	S32100 / S34700	High-temp, anti-sensitization

Duplex & Super Duplex

Grade	UNS	Use
Duplex	S31803	High strength, offshore, FPSO
Super Duplex	S32750, S32760	Sour service, subsea, HPHT

Nickel Alloys

Material	Grade/UNS	Use
Inconel	600, 625, 718	High temp, oxidation, sour gas
Monel	400, K500	Seawater, alkali, hydrocarbons
Hastelloy	C-276, C-22	Corrosive acids, oxidizers
Titanium	Grade 2 / 5	Chloride, seawater, low weight

Applications

Industry	Applications
Oil & Gas	RTJ gaskets, riser flanges, wellhead seals, spacer rings
Petrochemical	Heat exchanger tube support rings, vessel flange joints
Power Generation	Turbine casing rings, generator seal rings
Mechanical	Compressor bearing rings, pump shaft collars, thrust rings
Subsea	Metal-to-metal seal rings, subsea connector rings
Aerospace/Defense	Lightweight high-strength titanium rings

Testing & Certifications

Dimensional Inspection (±0.01 mm)

Material Testing: PMI, UT, Hardness, Tensile, Microstructure

Certifications: EN 10204 3.1 / 3.2, NACE MR0175, PED 2014/68/EU, ISO 15156

API 6A, ASME B16.20 (For RTJ, BX, RX rings)

Elbows – Oil & Gas and Engineering Applications

Elbows are essential pipe fittings used in pipelines to change the direction of flow. They are critical components in various industries, including Oil & Gas, Power Generation, Chemical Processing, Refining, and Marine, among others. Elbows are available in various angles, sizes, materials, and pressure ratings, and can be designed for different types of welded, threaded, or flanged connections. Below is a detailed technical overview.

Types of Elbow

Long Radius (LR) Elbows

Short Radius (SR) Elbows

Reducing Elbows

90° Elbows

45° Elbows

180° Return Bends

Standard Sizes & Dimensions

Pipe Size (Inches)	Bend Radius (mm)	Standard Angle	Pressure Rating (psi/bar)
1/2" – 24"	1.5D – 3D	90° (Standard)	Up to 2,500 psi / 172 bar
1" – 12"	1.0D – 1.5D	45°, 90°	Up to 1,500 psi / 103 bar
2" – 16"	1.5D – 2.5D	180°	High pressure up to 5,000 psi
Custom Sizes	As required	45°, 90°, 180°	Up to 20,000 psi / 1,379 bar (for critical service)

Note: Elbow sizes and dimensions can be customized based on specific project requirements & applicable standards.

Materials Used for Elbows

Elbows in the Oil & Gas and engineering sectors are manufactured using high-strength, corrosion-resistant materials to withstand extreme temperatures, pressures, and chemical exposure. Some of the common materials used include:

Pipe Size	Grade/UNS	Application
Carbon Steel	A105, A234 WPB	Oil & gas pipelines, general process applications
Stainless Steel	304, 316, 316L	Corrosive environments, offshore applications, water systems
Duplex Stainless Steel	S31803, S32205	High-strength, corrosion-resistant in marine & subsea environments
Super Duplex Stainless Steel	S32750, S32760	HPHT, subsea, and sour service
Inconel®	625, 718	High-temperature & corrosion-resistant environments
Monel®	400, K500	Seawater, marine, and chemical processing
Titanium	Grade 2, Grade 5	Seawater, marine, and chemical processing
Monel®	400, K500	Seawater, marine, and chemical processing
Alloy Steel	A182 F5, F9	High-temperature and pressure service
Hastelloy®	C-276, C-22	Aggressive chemical environments, acid service

Pressure & Temperature Ratings

The pressure and temperature ratings of elbows are determined by the material grade and design, with some elbow types capable of withstanding extreme conditions:

Material	Temperature Rating	Pressure Rating
Carbon Steel	-29°C to 400°C	Up to 2,500 psi (172 bar)
Stainless Steel	-196°C to 600°C	Up to 1,500 psi (103 bar)
Duplex SS	-50°C to 300°C	Up to 2,000 psi (137 bar)
Inconel®	-200°C to 1,000°C	High-pressure services (up to 5,000 psi or more)
Monel®	-100°C to 400°C	Up to 3,000 psi (207 bar)
Titanium	-100°C to 600°C	Up to 3,000 psi (207 bar)
Hastelloy®	-100°C to 450°C	High-pressure chemical services (up to 5,000 psi)

Applications of Elbows

Oil & Gas Industry

Subsea Pipelines: Long-radius elbows are commonly used for smooth fluid flow in subsea oil pipelines.

Offshore Platforms: Elbows made from Duplex and Super Duplex steels are used for their corrosion resistance in harsh marine environments.

Refineries: Short-radius elbows are used in refinery pipelines that handle gases and liquids at varying pressures and temperatures.

Wellhead Equipment: Elbows used for pipe connections and flow control lines.

FPSO: Elbows made from Alloy Steel or Inconel® are used in high-pressure riser systems.

Chemical Processing

- **Corrosive Chemicals:** Elbows in Hastelloy® or Monel® are used for transferring corrosive fluids.
- **Pharmaceutical:** Stainless Steel elbows are widely used for sanitary applications where cleanliness is critical.

Power Generation

- **Steam Lines:** High-temperature elbows in Alloy Steel for steam transfer between boilers and turbines.
- **Cooling Systems:** Titanium elbows are used in cooling systems that deal with saltwater in power plants.

Marine and Offshore

- **Sea Water Lines:** Elbows made of Monel® or Titanium for seawater piping systems.
- **Marine Gas Systems:** Elbows in Stainless Steel and Duplex Steel used in natural gas transportation.

Comprehensive Details on Elbows for Oil & Gas & Engineering Applications

Elbows are crucial components in piping systems, used to change the direction of flow. In industries such as Oil & Gas, Petrochemical, Power Generation, and Marine, elbows are subjected to high pressures, temperatures, and corrosive environments. Therefore, selecting the right type of elbow is essential for ensuring safe and efficient operations.

Here's a more detailed overview of elbows focusing on materials, design features, manufacturing standards, and usage across various industries.

Types of Elbows

1.1 Standard 90° Elbow

» **Description:** The most common type of elbow, used to change the flow direction by 90°. Can be long radius (LR) or short radius (SR).

Long Radius (LR): A 1.5 times the pipe diameter centerline radius. Ideal for low-pressure systems and smoother flow.

Short Radius (SR): A 1.0 times the pipe diameter centerline radius. Used in tight spaces & less critical applications, but creates higher turbulence and pressure loss.

1.2 45° Elbow

» **Description:** These elbows change the flow direction by 45° & are used to minimize the turbulence & fluid friction compared to 90° elbows.

Application: Common in fluid systems where a moderate directional change is needed and where the space is limited.

1.3 180° Return Bends

» **Description:** Used to reverse the flow direction completely.

Application: Typically found in high-temperature or high-pressure applications like chemical reactors, oil refineries, & gas processing plants.

1.4 Reducing Elbow

» **Description:** These elbows are used to change the pipe size while altering the direction. A reducing elbow has different sizes on both ends and can connect pipes of different diameters.

Application: Used in distribution systems, HVAC, oil & gas pipeline systems, and chemical processing.

1.5 Custom Elbows

» **Description:** Elbows can be custom-designed to fit particular specifications such as special angles (e.g., 30° or 60°), large radii,& complex material grades.

Applications: Tailored for specific engineering solutions, critical systems, & unconventional applications.

Materials for Elbows

The material chosen for elbows depends on the pressure, temperature, and chemical properties of the transported medium. Below are some of the most commonly used materials for elbows in oil & gas, industrial, and engineering applications.

2.1 Carbon Steel

» Grades: ASTM A105, ASTM A234 WPB, A333
» Applications: General-purpose elbows used for moderate temperature and pressure systems, non-corrosive fluids, and utility piping.
» Advantages: Cost-effective, readily available, and strong.
» Limitations: Prone to corrosion in aggressive environments, and not ideal for high-temperature applications beyond 400°C.

2.2 Stainless Steel

- Grades: 304, 316, 316L, 321, 347
- Applications: Elbows for corrosive environments, offshore applications, chemical handling, and food processing.
- Advantages: Excellent corrosion resistance, can withstand high temperatures (up to 800°C), and offers great strength.
- Limitations: More expensive than carbon steel.

2.3 Duplex & Super Duplex Stainless Steel

- Grades: S31803, S32750, S32760
- Applications: Used in applications where high strength, resistance to pitting corrosion, and high-pressure systems are required (e.g., offshore platforms, subsea pipelines, and HPHT wells).
- Advantages: Stronger than regular stainless steel, superior corrosion resistance in chloride environments.
- Limitations: Higher cost than regular stainless steel.

2.4 Nickel Alloys

- Grades: Inconel® 625, Inconel® 718, Monel® 400, Hastelloy® C276
- Applications: High-temperature, high-pressure, and highly corrosive environments. Used in applications involving steam, sulfuric acid, and chloride-rich environments.
- Advantages: Exceptional resistance to high-temperature oxidation and corrosion. Inconel® and Monel® are ideal for harsh environments like offshore, refinery, and chemical plants.
- Limitations: Expensive compared to stainless steel and carbon steel.

2.5 Titanium

- Grades: Gr. 2, Gr. 5 (Ti-6Al-4V)
- Applications: Offshore, subsea pipelines, seawater cooling systems, and aerospace. Titanium is often used when weight reduction and corrosion resistance are paramount.
- Advantages: Extremely corrosion-resistant, especially in seawater and chemical environments.
- Limitations: High cost and requires specific welding techniques.

2.6 Alloy Steel

- Grades: ASTM A182 F5, F9, F11, F22
- Applications: High-temperature and high-pressure applications like steam, gas, and oil lines.
- Advantages: Resistant to thermal fatigue, oxidation, and scaling. Strong under high-pressure conditions.
- Limitations: May not perform well in extremely corrosive environments without coatings or additional protection.

Pressure & Temperature Ratings

The pressure & temperature ratings of elbows depend on both the material & design (i.e., radius, angle). Below are typical ratings for the most common materials used in elbow applications:

Material	Temperature Range	Pressure Rating
Carbon Steel (A105)	-29°C to 400°C	Up to 2,500 psi (172 bar)
304 Stainless Steel	-196°C to 800°C	Up to 1,500 psi (103 bar)
Duplex Stainless Steel (S31803)	-50°C to 300°C	Up to 2,500 psi (172 bar)
Inconel® 625	-200°C to 1,000°C	Up to 5,000 psi (345 bar)
Monel® 400	-100°C to 400°C	Up to 3,000 psi (207 bar)
Titanium (Gr.2)	-100°C to 600°C	Up to 3,000 psi (207 bar)

Note: Pressure and temperature ratings should be verified according to the specific application and manufacturer's guidelines.

Elbow Applications

Oil & Gas

- **Subsea Pipelines**
- **Refineries**
- **Offshore Platforms**
- **Oil & Gas Wellheads**

Power Generation

- **Steam Piping**
- **Cooling Systems**

Chemical & Petrochemical

- **Chemical Reactors**
- **Pharmaceutical**
- **Seawater Systems**

Manufacturing Standards

Elbows are designed & manufactured according to a variety of industry standards to ensure quality, performance, and safety.

Standard	Description
ASME B16.9	Standard for factory-made wrought steel buttwelding fittings
ASME B16.28	Standard for short-radius elbows
API 6A	Standard for wellhead equipment elbows
ISO 9001	Quality management system certification
NACE MR0175	Standard for materials used in sour service environments

Customization

Elbows can be customized to meet specific needs, including:

- Special Material Grades: Materials like Inconel®, Hastelloy®, and Super Duplex for extreme conditions.
- Specialized Angles: Angles other than 45° and 90°, such as 30° or 60° for specialized flow control.
- Non-Standard Radii: Custom radii based on space constraints or fluid flow requirements.

Ferrules – Technical Overview for Oil & Gas & Industrial Use

Ferrules are precision-engineered components used in instrumentation, process control, hydraulic systems, and high-pressure tubing. They are critical in achieving leak-proof, corrosion-resistant, and vibration-safe connections

Types

Single Ferrule

Double Ferrule (Twin Ferrule)

Swagelok-type

Cone & Thread Ferrules

Hygienic Ferrules

Weld Ferrules

Single Ferrule	A single-compression ring – typically used in standard instrumentation systems
Double Ferrule (Twin Ferrule)	Two-piece system: front ferrule creates the seal, back ferrule provides grip – preferred for high-integrity gas/oil sealing
Swagelok-type	Equivalent ferrules for twin-ferrule compression fittings
Cone & Thread Ferrules	For high-pressure systems up to 60,000 psi (used in oilfield instrumentation)
Hygienic Ferrules	Used in sanitary piping systems (tri-clamp fittings for food, pharma, biotech)
Weld Ferrules	Butt-weld or socket-weld to process pipe ends for hygienic or industrial use

Standard Size Range

Tube OD (inch)	Tube OD (mm)	Wall Thickness (in/mm)	Pressure Rating (psi/bar)
1/8" – 2"	3mm – 50mm	0.028" – 0.120" (0.7 – 3mm)	Up to 10,000 psi / 690 bar
Cone & Thread	1/16" – 1"	As per pressure system	Up to 60,000 psi / 4,137 bar
Tri-Clamp Ferrule Sizes	1/2" to 12"	NA	PN10 – PN40

Ferrule Materials & Engineering Applications

Ferrules must withstand pressure, vibration, temperature, & corrosion. Below are the recommended materials by industry & media compatibility:

Material	Grade/UNS	Key Features	Application Areas
Stainless Steel	304, 304L, 316, 316L	Good corrosion resistance, economical	General plant utility, water, air, low-corrosion fluids
Duplex SS	UNS S31803	High strength, Cl- resistance	Marine & offshore hydraulic control lines
Monel®	400 / K500	Seawater & alkali resistant	Marine, nuclear, chloride-rich oil fields
Inconel®	625 / 718 / 600	High temp & oxidation resistance	Oil & gas offshore topside, acid gas service
Titanium	Grade 2 / Grade 5	Lightweight, seawater resistant	Subsea umbilicals, hydrogen service
Hastelloy®	C276, C22	Exceptional in oxidizers & mixed acids	Chemical plants, acid processing
Brass / Copper	C36000, C12200	Easy to form, non-magnetic	Instrument air, general low-pressure gas systems
PTFE / PVDF	NA	Non-metallic, inert	Aggressive chemical systems (pharma, lab)

Features & Options

High-Precision Machining (±0.01 mm tolerances)
Leak-Free Assembly with standard tube nuts
Material Traceability: Each ferrule marked with heat number
NACE MR0175 Compliant (for Inconel, Duplex, Super Duplex, etc.)
Testing: PMI, Hardness, Microstructure (on request)
Certifications: EN 10204 3.1/3.2, ISO 9001, API Spec Q1

Types of Flushing Rings

Standard	Description
ASTM A276 / A479	Bar stock for ferrule production
ASME B31.3	Process piping compatibility
ISO 8434 / DIN 2353	Tube fitting standards
SAE J514 / J1453	Industrial hydraulic connections
3A / DIN 32676 / BS 4825	Sanitary clamp ferrules

Application Industries

Oil & Gas (Instrumentation, pressure measurement, offshore piping)
Chemical Processing Plants
Hydraulic & Pneumatic Systems
Pharmaceutical & Biotech (Tri-Clamp Ferrules)
Marine & Desalination
Nuclear Reactors / Power Plants
Process Skids & Control Panels
Food & Beverage Pipelines

Customized - Oil & Gas & Industrial Applications

Overview

We supply precision-engineered fasteners tailored to critical applications requiring corrosion resistance, high mechanical strength, and long-term reliability in aggressive environments. These include custom dimensions, coatings, and special grades for subsea, topside, high-pressure vessels, rotating equipment, and structural joints.

Types of Fasteners

- Bolts
- Studs
- Washers
- Screws
- Nuts
- Anchor & U-Bolts

Category	Types
Bolts	Hex Head, Heavy Hex, Socket Head, Flange Bolts, Eye Bolts
Studs	Full Thread, Tap End, Double End, Threaded Rods
Nuts	Hex, Heavy Hex, Jam, Cap, Lock, Slotted Nuts
Washers	Flat, Spring, Belleville, Hardened, Special Profile
Screws	Cap, Socket, Machine, Countersunk, Set Screws
Anchor & U-Bolts	Foundation & structural applications

Custom-Engineered Components

We manufacture tailor-made components for extreme environments in oil & gas, petrochemical, aerospace, and marine sectors.

Component	Customization	Certification
Blocks, Inserts, Couplers	To drawing/spec	EN10204 3.1/3.2, NACE, ISO 9001

Custom Capabilities

Precision Machining: CNC, turned, rolled threads

Testing & Certification: PMI, UT, MPI, Hardness, Tensile, Impact

Coatings & Treatments: PTFE (Xylan), Zinc Flake, Black Oxide, Molybdenum

Documentation: EN 10204 3.1 / 3.2, NACE MR0175, ISO 15156, PED, API 20E / 20F

Packaging: VCI wrap, labeled kits, export crates with part traceability

Applications in Oil & Gas

Subsea equipment (wellheads, trees, manifolds)
Topside modules (heat exchangers, pumps, valves)
Drilling systems (BOPs, mud manifolds)
Refineries (hydrocrackers, reactors)
FPSO units (turret moorings, flanged joints)
High-pressure pipe connections
Cathodic protection interfaces

Material Grades & Engineering Data

Material	Grades / UNS	Temp Range	Applications
Inconel®	600, 625, 718 / N06625, N07718	Up to 980°C	Subsea bolting, valve body studs
Monel®	400, K500 / N04400, N05500	Up to 480°C	Saltwater exposure, marine flanges
Titanium	Gr.2 (CP), Gr.5 (6Al-4V)	Up to 450°C	Riser flanges, offshore clamps
Stainless Steel	304, 316, 321, 347	Up to 870°C	Pumps, turbines, piping
Duplex SS	UNS S31803	Up to 600°C	High Cl⁻ resistance
Super Duplex	UNS S32750, S32760	Up to 600°C	Subsea manifolds, well-heads

High-Tensile Alloy Steel Grades

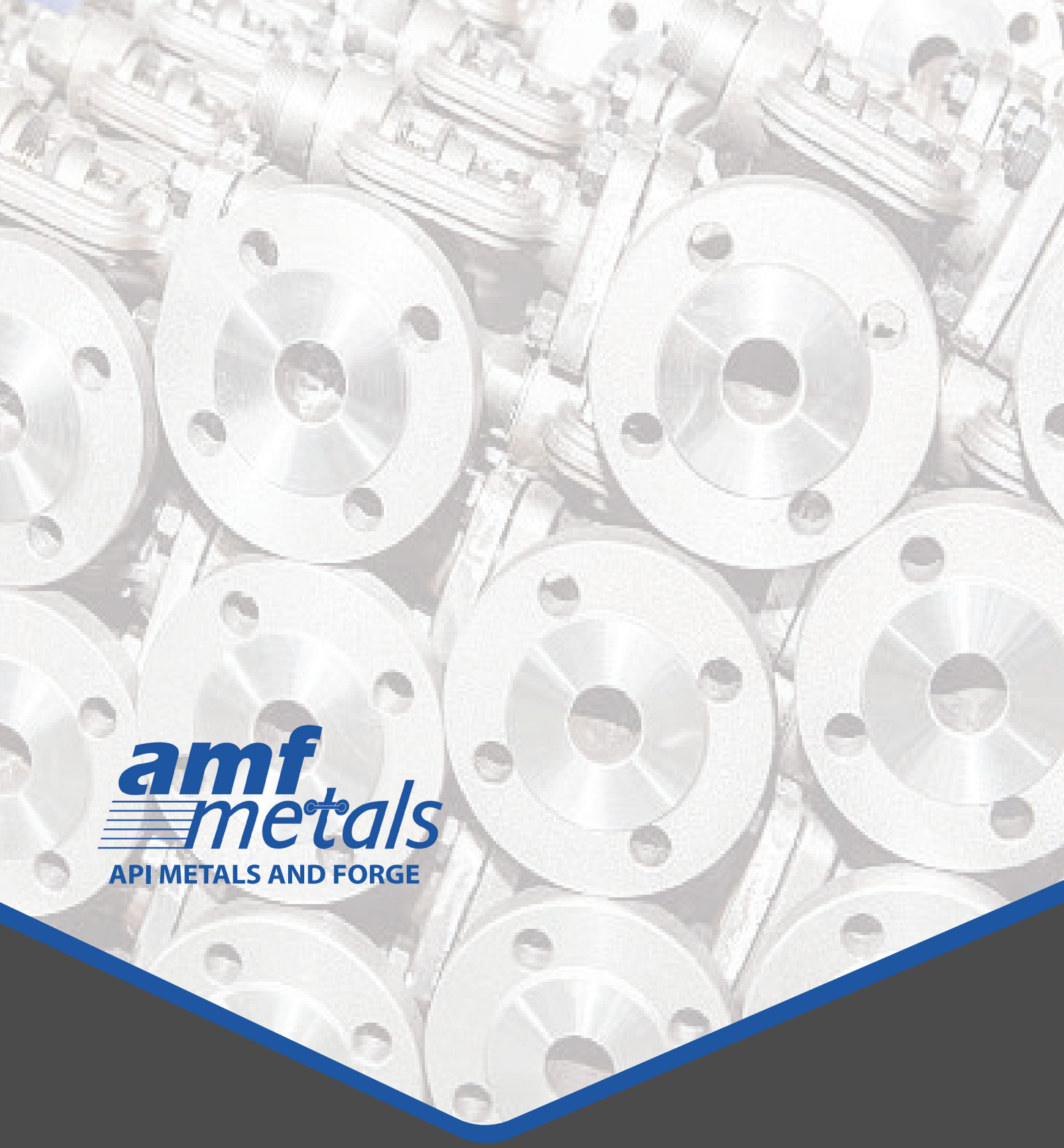
Material	Grades / UNS	Tensile Strength	Standards	Typical Use
Alloy Steel	ASTM A193 B7	≥ 860 MPa	ASME / ASTM / DIN	Pressure vessels, flanged joints
Quenched & Tempered Steel	ASTM A320 L7, B8	≥ 750 MPa – 1035 MPa	Cryogenic & high strength	Subsea well-heads, flanges
8.8 / 10.9 / 12.9 Grades	ISO 898-1	Up to 1220 MPa	ISO / EN / DIN 931–933	Structural steel-work, pipeline skids

Size & Thread Standards

Property	Range / Spec
Diameter	M6 – M100 / ¼" – 4"
Length	Up to 3000 mm (Custom Lengths)
Thread Forms	UNC, UNF, 8UN, ISO Metric, BSF, BSPT, NPT
Fit Class	2A/2B, 3A/3B (per ASME B1.1)
Surface Finish	0.8 – 3.2 µm Ra (machined)

Common Standards Supported

Standards	Description
ASTM A193 / A194	Bolting for high temperature & pressure service
ASTM B166, B574, B348	Nickel & Titanium fastener stock materials
ISO 898-1 / ISO 3506	Mechanical properties of fasteners
ASME B18.2.1 / B1.1	Bolt and thread geometry
API 20E / 20F	Bolting for wellhead & subsea service
NACE MR0175 / ISO 15156	Sour service compliance



amf metals

API METALS AND FORGE

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