Commercial Proposal No. CP-2026/FLANGE/SS

Global Procurement of Low-Temperature Flanges ASTM A350, Stainless Steel AISI 304/316 & Pipeline Fittings from China

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From: Metal-Asia (metal-asia.pw) — Direct-source pipeline components and stainless steel procurement
To: Oil & gas operators, chemical processing plants, power generation companies, shipyards, food processing facilities, pipeline contractors
Date: April 2026
Format: B2B — Project supply with full material certification and inspection

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1. ASTM A350 — The Standard That Saves Lives at –46°C

Eight years of specialized procurement in low-temperature pipeline components has demonstrated one fundamental truth: selecting the wrong steel grade for sub-zero flange operation is not merely a leak risk. It is a pipeline rupture risk, an explosion risk, a fatality risk, and a multi-million dollar liability.

Standard **ASTM A350 / ASME SA350** was developed specifically for forged pipeline components operating at temperatures to **–50°F (–46°C)** and below. Flanges, fittings, valves, and piping components manufactured to this standard retain impact toughness and ductility at conditions where standard carbon steel (e.g., ASTM A105) becomes as brittle as glass.

Full metals catalog

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2. Supply Chain Risk Matrix — Flange & Pipeline Component Procurement

Risk 1: Grade Substitution — "Ordered A350 LF2, Received Painted A105"

Manifestation: The flange appears correct, markings are present. But at first startup below –20°C, brittle fracture occurs. Root cause: carbon steel A105 substituted for low-temperature A350 LF2.

Compliance Solution: Every batch with MTC per EN 10204 3.1 or 3.2. Mandatory nickel content verification (Ni ≥ 0.40% for LF2) — nickel provides the low-temperature toughness. Impact testing at –46°C (minimum 27 J for LF2 Class 1). Individual heat number stamping on every flange.

Risk 2: Pressure Class Mismatch

Manifestation: A 150# flange ordered for a 2.5 MPa system results in flange deformation, gasket blowout, and emergency shutdown.

Compliance Solution: Pre-order project document audit. Pressure-temperature rating verification per ASME B16.5 for every flange class (150#, 300#, 600#, 900#, 1500#, 2500#). Temperature-pressure correlation tables provided with every quotation.

Risk 3: Dimensional Non-Conformance — "Flange Won't Fit the Pipe"

Manifestation: An NPS 6" (DN 150) flange arrives with actual bore of 161.5 mm instead of the specified 157.1 mm (ASME B16.5 tolerance for weld neck flange). The result: weld root gap, defective joint, rejection.

Compliance Solution: Pre-shipment dimensional inspection with caliper and micrometer on critical dimensions: flange OD, flange thickness, bore diameter, bolt hole spacing and diameter. Measurement report provided to client.

Risk 4: Customs Classification Exposure

Product	HS Code	Duty Range	Documentation
Forged flanges ASTM A350 LF2	**7307.21**	EU: 0–8%*	Material certificate
Stainless flanges ASTM A182 F316	**7307.21**	EU: 0–8%*	Declaration or certificate
Forged fittings ASTM A350 LF2	**7307.93**	EU: 0–8%*	Per ASME B16.11
Stainless pipe AISI 316	**7304.41**	EU: 0–8%*	ASTM A312
Stainless plate AISI 304	**7219.33**	EU: 0–8%*	ASTM A240
Bolts/nuts ASTM A193 B7	**7318.15**	EU: 0–5.5%	For flange assemblies

*Rates vary by destination and trade agreements. BTI available pre-shipment.

Risk 5: Regulatory Body Documentation Gaps

Manifestation: Flanges for pressure equipment require PED 2014/68/EU conformity assessment in the EU, or equivalent national pressure equipment directives. Absence blocks commissioning.

Compliance Solution: Full compliance package: PED Module D1 (production quality assurance), material certificates per EN 10204 3.2, mechanical test reports, manufacturer's ISO 9001 scope certificate.

Shipping & customs services

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3. Complete Technical Specification — ASTM A350 Flanges

3.1. ASTM A350 Steel Grades

Grade	Operating Temperature	Min. Impact Toughness	Application
LF1	To –36°C	20 J at –18°C	Moderate low-temp, refrigeration
LF2 Class 1	To –46°C	16 J at –46°C	LNG, oil refining, cryogenics (standard)
LF2 Class 2	To –18°C	20 J at –18°C	Medium loads, moderate temperatures
LF3	To –101°C	20 J at –101°C	Liquid nitrogen, oxygen, LNG terminals

Grade	Operating Temperature	Min. Impact Toughness	Application
LF5 Class 1	To –59°C	20 J at –59°C	Special cryogenic systems
LF5 Class 2	To –48°C	20 J at –48°C	Low-temperature hydrocarbon gas
LF6	To –62°C	20 J at –62°C	High-strength cryogenic construction
LF9	To –73°C	20 J at –73°C	Nuclear energy, special applications

3.2. Chemical Composition — ASTM A350 LF2

Element	Content, %	Metallurgical Function	Substitution Detection
Carbon (C)	≤ 0.30	Strength; weldability	A105: C ≤ 0.35 — analysis required
Manganese (Mn)	0.60–1.35	Strength and toughness	Key indicator: A105 Mn 0.60–1.05
Silicon (Si)	0.15–0.30	Deoxidation	Overlap with A105: Si 0.10–0.35
Phosphorus (P)	≤ 0.035	Brittleness control	LF2 stricter: P ≤ 0.035 vs A105 ≤ 0.040
Sulfur (S)	≤ 0.040	Weldability	LF2: S ≤ 0.040 vs A105 ≤ 0.050
Chromium (Cr)	≤ 0.30	Corrosion resistance	—
Molybdenum (Mo)	≤ 0.12	Elevated temp resistance	—
Nickel (Ni)	**≤ 0.40**	**Low-temperature toughness**	**A105: Ni ≤ 0.30; Ni ≥ 0.35 = LF2**
Vanadium (V)	≤ 0.08	Grain refinement	—
Copper (Cu)	≤ 0.40	Atmospheric corrosion	—

Key LF2 vs. A105 identifier: Nickel content ≥ 0.35% confirms LF2. Standard A105 contains Ni < 0.30%. Carbon equivalent CE = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15 ≤ 0.48 for thickness > 2 inches.

3.3. Mechanical Properties — ASTM A350 LF2

Property	LF2 Class 1	LF2 Class 2	Test Method
Tensile strength	485–655 MPa	485–655 MPa	ASTM A370
Yield strength (0.2%)	≥ 250 MPa	≥ 250 MPa	ASTM A370
Elongation	≥ 22% (in 4D)	≥ 22% (in 4D)	ASTM A370

Property	LF2 Class 1	LF2 Class 2	Test Method
Reduction of area	≥ 30%	≥ 30%	ASTM A370
Brinell hardness	≤ 197 HB	≤ 197 HB	ASTM E10
Charpy V-notch impact	≥ 16 J at –46°C	≥ 20 J at –18°C	ASTM E23
Heat treatment	Normalize or normalize + temper	Quench + temper	—

3.4. Flange Types per ASTM A350

Type	Code	Size Range	Pressure Class	Application
Weld Neck	WN	1/2" – 48" (DN 15–1200)	150# – 2500#	High pressure, critical systems
Slip-On	SO	1/2" – 60" (DN 15–1500)	150# – 1500#	Medium pressure, general piping
Blind	BL	1/2" – 48" (DN 15–1200)	150# – 2500#	Pipeline isolation, testing
Lap Joint	LJ	1/2" – 48" (DN 15–1200)	150# – 2500#	Stub end assemblies, frequent dismantling
Socket Weld	SW	1/2" – 4" (DN 15–100)	150# – 1500#	Small bore, high pressure
Threaded	TH	1/2" – 6" (DN 15–150)	150# – 900#	Non-welded connection
Orifice	OR	1" – 24" (DN 25–600)	150# – 2500#	Flow measurement, orifice plates

3.5. Dimensional Table — WN RF ASTM A350 LF2, Class 150#

NPS	DN	Flange OD, mm	Disc Thickness, mm	Bore Diameter, mm	Neck Length, mm	Bolt Holes (qty × Ø)	Weight, kg
1/2"	15	88.9	11.2	21.3	47.8	4 × 15.9	0.4
3/4"	20	98.6	12.7	26.7	52.3	4 × 15.9	0.6
1"	25	108.0	14.2	33.4	56.4	4 × 15.9	0.8
1 1/2"	40	127.0	17.5	48.3	60.5	4 × 15.9	1.3
2"	50	152.4	19.1	60.3	63.5	4 × 19.1	2.1
3"	80	190.5	23.9	88.9	69.1	4 × 19.1	3.9

NPS	DN	Flange OD, mm	Disc Thickness, mm	Bore Diameter, mm	Neck Length, mm	Bolt Holes (qty × Ø)	Weight, kg
4"	100	228.6	23.9	114.3	76.2	8 × 19.1	5.5
6"	150	279.4	25.4	168.3	88.9	8 × 22.3	9.2
8"	200	342.9	28.5	219.1	101.6	8 × 22.3	15.0
10"	250	406.4	30.2	273.0	108.0	12 × 25.4	21.0
12"	300	482.6	31.8	323.8	114.3	12 × 25.4	29.5
16"	400	596.9	36.6	406.4	127.0	16 × 28.6	49.0
20"	500	698.5	42.9	508.0	139.7	20 × 31.8	78.0
24"	600	812.8	47.8	609.6	152.4	20 × 34.9	112.0

Stainless steel catalog

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4. Stainless Steel AISI 304 & AISI 316

4.1. Grade Selection Guide

Operating Condition	Recommendation	Rationale
Fresh water, ambient temperature	AISI 304	Adequate corrosion resistance, 20–25% cost saving
Seawater, coastal environment	**AISI 316**	Mo (2–3%) protects against chloride pitting
Chlorinated water (pools)	**AISI 316**	304 fails at Cl^- > 200 mg/L
Food processing (acids)	AISI 316L (low carbon)	Resists organic and dilute mineral acids
Temperatures above 450°C	AISI 316Ti (Ti-stabilized)	Prevents sensitization and intergranular corrosion
Cryogenic (–196°C)	AISI 316L	Retains ductility at liquid nitrogen temperatures

4.2. AISI 304 / 304L Technical Specification

Parameter	AISI 304 (1.4301)	AISI 304L (1.4307)	Standard
Chromium (Cr)	18.0–20.0%	18.0–20.0%	ASTM A240
Nickel (Ni)	8.0–10.5%	8.0–12.0%	ASTM A240
Carbon (C)	≤ 0.08%	≤ 0.03%	ASTM A240
Yield strength	≥ 205 MPa	≥ 170 MPa	ASTM A240

Parameter	AISI 304 (1.4301)	AISI 304L (1.4307)	Standard
Tensile strength	≥ 515 MPa	≥ 485 MPa	ASTM A240
Elongation	≥ 40%	≥ 40%	ASTM A240
Hardness HB	≤ 201	≤ 201	ASTM A240
Max. temperature	+870°C	+870°C	—
Density	7.93 g/cm³	7.93 g/cm³	—

4.3. AISI 316 / 316L / 316Ti Technical Specification

Parameter	AISI 316 (1.4401)	AISI 316L (1.4404)	AISI 316Ti (1.4571)	Standard
Chromium (Cr)	16.0–18.0%	16.0–18.0%	16.0–18.0%	ASTM A240
Nickel (Ni)	10.0–14.0%	10.0–14.0%	10.0–14.0%	ASTM A240
Molybdenum (Mo)	2.0–3.0%	2.0–3.0%	2.0–3.0%	ASTM A240
Carbon (C)	≤ 0.08%	≤ 0.03%	≤ 0.08%	ASTM A240
Titanium (Ti)	—	—	5×C–0.70%	ASTM A240
Yield strength	≥ 205 MPa	≥ 170 MPa	≥ 205 MPa	ASTM A240
Tensile strength	≥ 515 MPa	≥ 485 MPa	≥ 515 MPa	ASTM A240
Elongation	≥ 40%	≥ 40%	≥ 40%	ASTM A240
Hardness HB	≤ 217	≤ 217	≤ 217	ASTM A240
Max. temperature (continuous)	+925°C	+425°C	+800°C	—
Density	8.00 g/cm³	8.00 g/cm³	8.00 g/cm³	—

4.4. Stainless Steel Product Range

Sheets & Plates

Grade	Standard	Thickness, mm	Sheet Size, mm	Finish	HS Code
AISI 304	ASTM A240 / EN 10088	0.5–3.0 (cold rolled)	1,000×2,000; 1,250×2,500; 1,500×3,000	2B, BA, brushed	7219.33
AISI 304	ASTM A240 / EN 10088	3.0–50 (hot rolled)	1,250×2,500; 1,500×3,000; 1,500×6,000	No.1	7219.21
AISI 304L	ASTM A240 / EN 10088	0.5–50	1,000×2,000; 1,250×2,500; 1,500×3,000	2B, BA, No.1	7219.33
AISI 316	ASTM A240 / EN 10088	0.5–3.0 (cold rolled)	1,000×2,000; 1,250×2,500; 1,500×3,000	2B, BA, brushed	7219.33
AISI 316	ASTM A240 / EN 10088	3.0–50 (hot rolled)	1,250×2,500; 1,500×3,000; 1,500×6,000	No.1	7219.21
AISI 316L	ASTM A240 / EN 10088	0.5–50	1,000×2,000; 1,250×2,500; 1,500×3,000	2B, BA, No.1	7219.33
AISI 316Ti	ASTM A240 / EN 10088	0.5–20	1,000×2,000; 1,250×2,500	2B, BA	7219.33
AISI 321	ASTM A240 / EN 10088	0.5–30	1,000×2,000; 1,250×2,500	2B, BA, No.1	7219.33
AISI 310S	ASTM A240 / EN 10088	1.0–20	1,000×2,000; 1,250×2,500	No.1	7219.21
AISI 904L	ASTM A240 / EN 10088	1.0–20	1,000×2,000; 1,250×2,500	2B, No.1	7219.33

Seamless & Welded Tubes

Grade	Standard	Type	OD, mm	Wall Thickness, mm	HS Code
AISI 304	ASTM A312 / EN 10216	Seamless	6–426	0.5–40	7304.41
AISI 304	ASTM A312 / EN 10217	Welded (TIG)	6–3,048	0.5–50	7304.22
AISI 316	ASTM A312 / EN 10216	Seamless	6–426	0.5–40	7304.41
AISI 316	ASTM A312 / EN 10217	Welded (TIG)	6–3,048	0.5–50	7304.22
AISI 316L	ASTM A312 / EN 10216	Seamless	6–426	0.5–40	7304.41
AISI 321	ASTM A312 / EN 10216	Seamless	6–426	0.5–30	7304.41

Grade	Standard	Type	OD, mm	Wall Thickness, mm	HS Code
AISI 310S	ASTM A312 / EN 10216	Seamless	6–325	1.0–30	7304.41
AISI 904L	ASTM A312 / EN 10216	Seamless	10–219	1.0–20	7304.41

Bars & Profiles

Grade	Standard	Profile	Sizes, mm	HS Code
AISI 304	ASTM A276 / EN 10088	Round	Ø5–350	7222.20
AISI 304	ASTM A276 / EN 10088	Square	5×5–100×100	7222.20
AISI 304	ASTM A276 / EN 10088	Hexagonal	S5–S100	7222.20
AISI 316	ASTM A276 / EN 10088	Round	Ø5–350	7222.20
AISI 316	ASTM A276 / EN 10088	Square	5×5–100×100	7222.20
AISI 316L	ASTM A276 / EN 10088	Round	Ø5–300	7222.20

Stainless Fittings

Grade	Standard	Type	OD, mm	Schedule	HS Code
AISI 304/316	ASTM A403 / EN 10253	Elbow 90°	13–610	SCH 5S–SCH 160	7307.23
AISI 304/316	ASTM A403 / EN 10253	Elbow 45°	13–610	SCH 5S–SCH 160	7307.23
AISI 304/316	ASTM A403 / EN 10253	Equal tee	13–610	SCH 5S–SCH 160	7307.23
AISI 304/316	ASTM A403 / EN 10253	Concentric reducer	13–610	SCH 5S–SCH 160	7307.23
AISI 304/316	ASTM A182 / EN 1092	Flat flange	DN 15–1,200	PN 6–PN 400	7307.21

Stainless steel products

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5. Terms of Supply

Parameter	Terms
Incoterms 2020	FOB Qingdao/Shanghai/Wenzhou, CIF Rotterdam/Hamburg/Singapore
MOQ	1,000 kg (flanges), 500 kg (fittings), 1,000 kg (stainless stock)
Lead time	15–25 days (standard flanges), 25–40 days (non-standard)

Parameter	Terms
Payment	30% deposit, 70% against shipping documents
Certification	MTC EN 10204 3.1/3.2, chemical analysis, mechanical testing
Packing	Timber crates with partitions, VCI treatment, individual piece marking
Insurance	110% of CIF value

Indicative Pricing (FOB China, April 2026):

Product	Size	Unit Price
WN RF flange A350 LF2, 150#, 4" (DN 100)	Ø228×23.9 mm	28–35 USD/pc
WN RF flange A350 LF2, 300#, 6" (DN 150)	Ø279×31.8 mm	62–78 USD/pc
BL RF flange A350 LF2, 600#, 8" (DN 200)	Ø381×55.6 mm	145–180 USD/pc
Elbow 90°, AISI 316, SCH 40, 4" (DN 100)	Ø114×6.0 mm	18–24 USD/pc
Tube AISI 316, seamless, Ø60×3.0 mm	ASTM A312	8.5–11.0 USD/kg
Sheet AISI 316, 2B, 3.0×1,250×2,500 mm	ASTM A240	3.8–4.6 USD/kg
Sheet AISI 304, No.1, 6.0×1,500×3,000 mm	ASTM A240	2.6–3.2 USD/kg
Round bar AISI 316, Ø50 mm	ASTM A276	4.2–5.2 USD/kg

Stainless steel catalog

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6. Frequently Asked Questions

Q: Can ASTM A350 LF2 be used for steam at 250°C?
A: Yes, LF2 operates from –46°C to +425°C. However, for temperatures above +340°C, consult ASME B16.5 pressure-temperature rating tables — allowable pressure decreases with rising temperature. At +250°C, Class 150# maximum allowable pressure is approximately 1.57 MPa.

Q: What is the difference between ASTM A350 LF2 and ASTM A105?
A: The critical difference is low-temperature impact toughness. A105 does not require low-temperature impact testing and is only suitable above –20°C. LF2 Class 1 withstands –46°C due to nickel addition and strict carbon control. Visual identification is impossible — only chemical analysis and certificates can confirm grade.

Q: Why is AISI 316 1.5× the price of AISI 304?
A: The difference is in molybdenum content (2–3%) and higher nickel (10–14% vs. 8–10.5%). Molybdenum is an expensive alloying element but provides pitting corrosion resistance in chloride environments. In seawater, AISI 304 fails within 12–18 months; AISI 316 serves 15–20 years.

Q: Do you supply hydrotested flanges?
A: Yes, hydrostatic testing at 1.5× PN is included upon request at no additional charge. Test certificate with pressure, hold time, and results provided.

Q: Do you supply flanges for Arctic projects (below –46°C)?
A: Yes. Metal-Asia supplies ASTM A350 LF3 flanges (to –101°C) and Inconel 625 flanges (to –196°C). Stainless steel AISI 316L flanges are also available for cryogenic systems.

Contact for project quotation

Yours sincerely,
Metal-Asia Pipeline Components Division
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SEO Clusters: ASTM A350 flanges, A350 LF2 steel, low temperature flanges, stainless steel AISI 316, AISI 304, stainless steel pipe, pipeline fittings, LNG flanges, cryogenic flanges, sub-zero steel, stainless steel sheet, AISI 316 pipe, stainless fittings, stainless flanges, ASTM A240, ASTM A312, food grade piping, marine stainless steel, PED compliance flanges, ASME B16.5 flanges.