

Commercial Supply Proposal

Titanium Shapes, Forgings, and Profiled Products

Global Supply Regions: North America (USA, Canada, Mexico), European Union & UK (Germany, France, Italy, Netherlands, Poland, Spain), Asia-Pacific (Japan, South Korea, Singapore, Australia, India), Middle East (UAE, Saudi Arabia, Qatar, Turkey), Latin America (Brazil, Argentina, Chile)

Target Industries: Aerospace & Space Systems, Marine & Offshore (Propellers, Rudders, Stabilizers), Power Generation (Turbines, Compressors), Medical Technology (Premium Joint Replacement Implants), Chemical Process Equipment (Reactor Heads, Flanges), Mining & Drilling (BHA Components), Sporting Goods (Bicycle Frames, Climbing Hardware)

1. Product Description and Technical Parameters

Titanium shapes and forgings represent semi-finished products of complex geometry manufactured by open-die and closed-die forging, hot die forging, isothermal forging, and ring rolling. This product category includes disks, rings, hubs, flanges, shafts, crankshafts, rotors, casings, shells, and other components requiring high metal density and isotropic mechanical properties.

1.1. Types of Forgings and Shaped Products

Product Type	Manufacturing Method	Dimensions	Alloy Grades	Standard	Application
Open-die forgings	Hammer or press forging	Weight 5-5000 kg	VT1-0/Gr2, VT3-1, VT5, VT5-1, VT6/Gr5, VT8, VT9, VT14, VT20, VT22, VT25, OT4, OT4-0, OT4-1, PT-3V	ASTM B381, AMS 4921, OST 1-90007-73, OST 1-90008-73	Machining blanks, flanges, heads
Closed-die forgings	Hot die forging on mechanical press	Up to 500 kg	VT6/Gr5, VT16, VT20, VT22, OT4	ASTM B381, AMS 4928, OST 1-90010-73, OST 1-90011-73	Aerospace components, blades, compressor disks

Product Type	Manufacturing Method	Dimensions	Alloy Grades	Standard	Application
Rolled rings	Radial-axial ring rolling	OD 200-3000 mm, height 50-500 mm	VT3-1, VT6/Gr5, VT8, VT9, VT14, VT20	ASTM B381, AMS 4921, OST 1-90009-73, TU 1-5-401	Bearing housings, flanges, casings
Turbine disks	Isothermal forging + forging	Diameter 200-1500 mm, thickness 50-300 mm	VT3-1, VT6/Gr5, VT8, VT9, VT25	AMS 4921, TU 398-2008, ASTM B381	Gas turbine engines, aero-engines
Rectangular-section forgings	Forging with roll flattening	Side 100-600 mm, length 1000-4000 mm	VT1-0/Gr2, VT6/Gr5, VT20, OT4	ASTM B381, OST 1-90007-73	Frames, beams, press platens
Hexagonal-section forgings	Forging + calibration	Side 50-300 mm, length 500-2000 mm	VT1-0/Gr2, VT6/Gr5, OT4	ASTM B381, OST 1-90008-73	Nuts, hydraulic fittings
Casing forgings	Closed-die forging	Per client drawing	VT6/Gr5, VT20, VT14	ASTM B381, TU 1-805-239	Gearbox housings, reactor vessels
Medical implant forgings (blanks)	Protective-atmosphere forging	Per drawing, weight 0.1-5 kg	Ti-6Al-4V ELI, Ti-6Al-7Nb	ASTM F136, ASTM F1295, ISO 5832-3	Hip joints, knee endoprotheses
Deep-subsea forgings	Forging + special heat treatment	Weight 200-2000 kg	PT-3V, VT6/Gr5, VT23	ASTM B381, OST 1-92062-90, TU 1-805-132	Deep-subsea vehicles, pressure hulls
Cryogenic forgings	Forging + special heat treatment	Per specification	VT6S/Gr5 ELI, VT1-00/Gr1	ASTM B381, TU 1-92-131	LNG vessels, cryostats

1.2. Alloy Grades for Forgings

Grade	UTS, MPa	Yield (sigma_0.2), MPa	Elongation, %	Impact KCU, J/cm ²	Key Features
VT1-0 / Grade 2	>= 343	>= 294	>= 25	>= 80	Maximum corrosion resistance, excellent forgeability
VT3-1	>= 932	>= 833	>= 8	>= 40	Heat resistance to 450°C, fatigue strength
VT6 / Grade 5	>= 900	>= 830	>= 8	>= 35	Universal applicability, forgeable at 900-950°C
VT8	>= 932	>= 833	>= 8	>= 35	Service to 500°C, creep resistance
VT9	>= 1079	>= 981	>= 6	>= 30	Compressor blades, high fatigue
VT14	>= 883	>= 785	>= 8	>= 40	Good forgeability, section stability
VT20	>= 931	>= 833	>= 6	>= 30	Gas turbine components, thermal fatigue resistance
VT22	>= 1079	>= 980	>= 6	>= 25	Ultra-high strength, minimum weight
VT25	>= 980	>= 880	>= 6	>= 30	Creep-resistant fasteners to 550°C
VT16	>= 833	>= 735	>= 10	>= 45	Fastener alloy, excellent hot heading
OT4	>= 588	>= 441	>= 15	>= 60	Excellent forgeability and weldability
PT-3V	>= 686	>= 588	>= 12	>= 50	Marine corrosion and fatigue resistance
VT23	>= 1100	>= 1000	>= 5	>= 25	Extruded parts, high specific strength

1.3. Macro and Microstructural Requirements

Parameter	Requirement per ASTM B381 / GOST 26492-85	Inspection Method
Macroporosity	Max Grade 5 per GOST 1020 / ASTM reference standards	Macro-etch inspection
Non-metallic inclusions	Max 3.5 grade	Microscopic examination

Parameter	Requirement per ASTM B381 / GOST 26492-85	Inspection Method
Grain size	ASTM 3-7 / GOST 21058.1-75 Grade 3-7	Optical microscopy
Phase ratio (alpha+beta)	Alpha/Beta 70/30 to 85/15	Microscopy, X-ray diffraction
Mechanical property uniformity	UTS variation <= 5% across section	Tensile testing from multiple zones
Soundness	No cracks, cavities, or laminations	UT per ASTM E2375 / GOST 14782-86

1.4. Forging Tolerances

Forging Size, mm	Size Tolerance, mm	Weight Tolerance, %
Up to 100	+3 / -2	+/- 5
100-250	+5 / -3	+/- 5
250-500	+8 / -5	+/- 6
500-1000	+12 / -8	+/- 7
1000-2000	+20 / -12	+/- 8
Over 2000	Per agreement	+/- 10

2. Buyer Pain Points: Direct Procurement in China

Pain Point	Detail	Operational-Financial Impact
Anisotropic Properties	VT6/Grade 5 disk forging shows UTS of 950 MPa axially but only 780 MPa radially due to incorrect thermomechanical processing	Rotor vibration, imbalance, blade-row failure, catastrophic event
Shrinkage Cavities and Porosity	Internal shrinkage in center of >1000 kg forging only detected after preliminary machining	Total loss of blank, machining costs sunk, schedule slippage
Incorrect Forging Temperature	Forging alpha+beta alloys below beta-transus temperature results in non-uniform deformation and residual stresses	Machining distortion, additional stress-relief required, increased machining allowances
No UT Capability for Large Forgings	Chinese producer lacks ultrasonic testing equipment for forgings exceeding 500 kg	Soundness unverifiable, incoming inspection rejection, return logistics
Heat Treatment Errors	Forging delivered without strengthening heat treatment (aging), resulting in	Rework, additional annealing/aging cycle, cutting

Pain Point	Detail	Operational-Financial Impact
	excessive yield strength and unmachinable condition	parameter revision
Worn Die Non-Conformance	Forging produced on worn tooling results in flash, misalignment, and laps	Additional cleanup machining, increased stock allowance, safety hazard
Documentation Gaps	Absence of heat treatment chart, forging log, furnace certification	Traceability failure, inability to meet NADCAP or nuclear QA audit
Logistic Constraints for Oversize Cargo	2000 kg forging does not fit standard container, requiring open-top or flat-rack	40-60% logistics cost increase, special transport permitting required

3. Metal-Asia.pw Integrated Solution

3.1. Forging Quality Control

- **Ultrasonic Testing (UT):** Forgings up to 5000 kg, defect detection depth to 1000 mm.
- **Macro-etch:** End-face evaluation per GOST 1020 / ASTM macro-etch standards.
- **Microstructural Control:** Grain photography, phase ratio assessment for alpha+beta alloys.
- **Mechanical Testing:** Specimens from multiple forging zones (rim, radius, bore) with isotropy evaluation.
- **Aerospace forgings:** Residual stress analysis by X-ray diffraction, acoustic emission testing.

3.2. Technical Support Services

- Forging and heat treatment process mapping for specific component geometry.
- Alloy selection consulting based on operating temperature, load conditions, and weight targets.
- Machining allowance calculation accounting for heat treatment distortion.
- Certification package preparation for FAA, EASA, Rosaviatsiya, Rosatom, and Roscosmos qualification.

3.3. Oversize and Heavy Freight Logistics

- Open-top container, flat-rack, and low-bed truck coordination.
- Oversize transport permitting for all destination jurisdictions.
- Full-value cargo insurance covering loading/unloading damage risk.

4. Product Range: Titanium Shapes and Forgings

Product Description	Alloy Grades	Dimensions / Weight	Standard	Industry
Open-die round forging	VT1-0/Gr2, VT6/Gr5, VT20, OT4	Diameter 100-600 mm, weight 50-3000 kg	ASTM B381, AMS 4921, OST 1-90007-73	General engineering, energy

Product Description	Alloy Grades	Dimensions / Weight	Standard	Industry
Rectangular forging	VT1-0/Gr2, VT6/Gr5, VT14	Side 100-600 mm, length to 4000 mm, weight to 5000 kg	ASTM B381, OST 1-90008-73	Press tooling, dies
Compressor disk (closed-die)	VT3-1, VT6/Gr5, VT8, VT9	Diameter 200-1500 mm, thickness 50-300 mm	AMS 4921, TU 398-2008, OST 1-90010-73	Gas turbine, aero-engines
Rolled ring (shell)	VT6/Gr5, VT8, VT20	OD 300-3000 mm, height 50-500 mm	ASTM B381, AMS 4921, OST 1-90009-73	Casings, flanges
Stepped forged shaft	VT6/Gr5, VT14, VT20	Diameter 50-400 mm, length to 3000 mm	ASTM B381, OST 1-90007-73	Shafts, axles, drives
Titanium flange	VT1-0/Gr2, VT6/Gr5, OT4	Diameter 100-1000 mm, thickness 20-150 mm	ASTM B381, TU 1-5-401	Pipelines, pressure vessels
Medical implant forging (blank)	Ti-6Al-4V ELI, Ti-6Al-7Nb	Per drawing, weight 0.1-5 kg	ASTM F136, ASTM F1295, ISO 5832-3	Joint replacement
Deep-subsea forging	PT-3V, VT23	Weight 200-2000 kg	ASTM B381, OST 1-92062-90	Subsea technology
Cryogenic forging	VT6S/Gr5 ELI, VT1-00/Gr1	Per specification	ASTM B381, TU 1-92-131	Cryogenics
Forged hexagonal bar	VT1-0/Gr2, VT6/Gr5, OT4	Side 50-300 mm, length 500-2000 mm	ASTM B381, OST 1-90008-73	Nuts, connectors
Forged plate	VT6/Gr5, VT20	300x300x50 to 1000x2000x200 mm	ASTM B381, TU 1-805-239	Tooling, bases
Forged rectangular frame	VT1-0/Gr2, VT6/Gr5, OT4	Section 100x200 mm, length to 3000 mm	ASTM B381, OST 1-90007-73	Frames, structures
Bicycle frame forging blank	VT6/Gr5, Ti-3Al-2.5V / Grade 9	Variable-section tubular blanks	AMS 4928, ASTM B337	Sporting goods
Drill string component blank	VT6/Gr5, VT22	Diameter 100-300 mm, length 500-1500 mm	ASTM B381, TU 1-805-132	Oil & gas drilling

5. Customs Classification and HS Codes

HS Code	Description	Duty Rate	VAT/GST	Notes
8108.90.30.10	Forgings, bars for aero-engines	0% with export license	Exempt	ITAR/EAR license
8108.90.30.80	Forgings, other	Per destination tariff	Per local regulation	Conformance certificate
8108.90.50.80	Shaped titanium plates	Per destination tariff	Per local regulation	Conformance certificate
8108.90.90.80	Other titanium articles	Per destination tariff	Per local regulation	Declaration of conformity

6. Processing Recommendations

Forging:

- VT6/Grade 5 forging temperature: Start 950-1000°C, finish \geq 800°C.
- Cross-forging for isotropic property development.
- Forge reduction ratio: Disks 3-5:1; shafts 1.5-2.5:1.

Heat Treatment:

- VT6/Grade 5 anneal: 850-900°C, hold 1-2 h, furnace cool.
- VT6/Grade 5 STA: Solution 880°C water quench + age 500-550°C.
- Stress-relief: 550-650°C, hold 2-4 h.

Machining:

- Allowances: 2-5 mm radial for forgings to 250 mm; 5-10 mm for forgings over 500 mm.
- Cutting parameters consistent with bar stock guidelines adjusted for blank rigidity.

7. Terms of Supply and Contact Information

Standard Supply Terms:

- MOQ: 1 forging (weight from 20 kg).
- Lead times: 30-60 days (stock items); 60-120 days for mill production (including forging and heat treatment).
- Packaging: Corrosion inhibitor coating, timber skids, stretch-wrap.
- Incoterms 2020: EXW, FCA, CPT, DAP, DDP (select destinations).

Contact Information:

- Client Services Department:
- WhatsApp: +86 132 50100874
- Telegram: @China_metal_supply
- Email: zakaz@metal-asia.pw
- Official Website: www.metal-asia.pw

Author: [Milosh Kovachevi](#) -- Technical Director for Metallurgical Procurement, Metal-Asia.pw.

Metal-Asia.pw provides integrated procurement of titanium alloy products from China, including RFQ/RFP response support for government and defense contracts, full Supply Chain Compliance management (ITAR/EAR/REACH/DFARS), Pre-Shipment Inspection (NDT, UT, chemical verification), and turnkey customs clearance. For a comprehensive overview of our service portfolio, visit www.metal-asia.pw.

This commercial supply proposal is provided for informational purposes and does not constitute a binding offer.