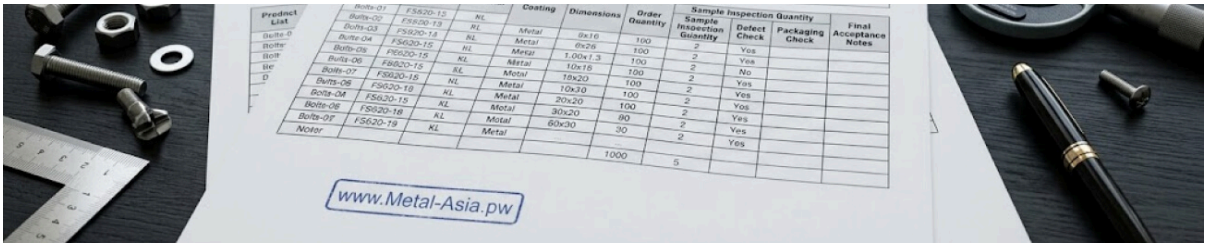
Metal-Asia

Supply Chain Compliance: Stud Bolts and Washers Inspection in China



Technical control of stud bolts and washers from China manufacturing

Introduction

Stud bolts and washers are critical elements of flange connections, pipelines, supports, and foundations. Engineering audit for complex orders identifies that stud bolts for oil and gas equipment and high-load structures are the highest-risk fastener group — failure can lead to structural collapse. B2B procurement services from China ensures supply with mandatory full inspection package and laboratory verification.

Customs and logistics from China includes HS codes: threaded rods (7318 15), flat washers (7318 21), spring washers (7318 22), high-strength washers (7318 21). Technical specification guidelines for Chinese manufacturers helps formulate thread requirements for stud bolts.

Client Requirements for Inspection Cost Calculation

Table 1. Stud Bolt and Washer Specification

No.	Parameter	Examples	Cost Impact
1	Type	Threaded rod DIN 975, Flange stud DIN 2510, Flat washer DIN 125	Determines methods
2	Standard	DIN 975, DIN 976, ASME B16.5, DIN 125, DIN 127, DIN 7989	Tolerances
3	Strength class	4.8-12.9, B7, B8, B8M, L7	Hardness tester, laboratory
4	Material	Steel 35CrMo, 42CrMo, 30CrMnSiA, stainless AISI 316	Spectral analysis
5	Coating	Hot-dip galvanizing, DACROMET, Geomet, Xylan, phosphate	Thickness gauge, salt spray
6	Thread type	Metric (M), imperial (UNC/UNF), trapezoidal (Tr)	Gauges
7	Stud length	100-3000 mm	Measuring instruments
8	Batch	500 pcs, 2000 kg, 10 pallets	Time, sampling
9	Packaging	Bundles 10-50 pcs, crates, pallets	Verification

Table 2. Supplier Information

No.	Parameter	Required Details
1	Factory name	Full name
2	Address	Hebei (Yongnian), Shandong (Jinan), Jiangsu (Suzhou)
3	Certificates	API, ISO 9001, ASTM, ASME
4	Stage	PPI / DUPRO / PSI
5	Dates	Time window

Table 3. Scope of Work for Cost Calculation

No.	Service	Description	Pricing
1	PPI — raw material	Rods, steel grade, factory certificates	Base rate
2	DUPRO — sample control	Thread, straightness, machine setup	Base rate
3	PSI — full control	Visual, dimensional, mechanical	Base rate
4	Visual inspection	Cracks, rust, coating, straightness	Included
5	Dimensional control	Length, diameter, thread pitch, straightness	+ Gauges
6	Hardness	HRC/HV for high-strength	+ Hardness tester
7	Tensile strength	Ultimate load	+ Laboratory
8	Impact toughness	For low-temperature applications	+ Laboratory
9	Coating thickness	Hot-dip zinc, DACROMET, Geomet	+ Thickness gauge
10	Salt spray	240-1000 hours	+ Laboratory
11	Chemical composition	Spectral analysis	+ Laboratory
12	Marking and packaging	Stamp, weight, crates	Included
13	CLS — loading control	Container loading	Separate rate
14	Packing list with HS codes	Codes 7318 15, 7318 21, 7318 22	Documentation

Recommended Inspection Package

Table 4. Optimal "Stud Bolts and Washers — Turnkey" Package

No.	Stage	Scope	Tool
1	PPI	Rods: steel grade 35CrMo, 42CrMo, AISI 316; factory certificates	Documents
2	PPI	Threading machine condition, calibration	Visual

No.	Stage	Scope	Tool
3	DUPRO	First studs: thread, straightness, stamp	Caliper, gauges
4	PSI	Visual: cracks, rust, coating uniformity	Magnifier, visual
5	PSI	Dimensional: length, diameter, thread Go/No-Go	Caliper, gauges
6	PSI	Straightness: deviation ≤1 mm per 1 m	Ruler, flat surface
7	PSI	Hardness: HRC for B7 (32-38), HV for AISI 316	Hardness tester
8	Laboratory	Tensile strength: minimum per ASTM A193	Tensile machine
9	Laboratory	Impact toughness: for L7 at -100°F (-73°C)	Pendulum impact tester
10	Laboratory	Chemical composition: C, Cr, Ni, Mo, Mn	Spectrometer
11	Laboratory	Salt spray: 500 hours for DACROMET, 1000 for Geomet	Salt chamber
12	CLS	Loading: stacking, securing, marking	Visual

Table 5. Critical Checkpoints for Stud Bolts and Washers

No.	Risk	Detection Method	Consequence
1	Steel grade substitution (35CrMo to 20#)	Spectral analysis	Fracture under load
2	Incorrect thread (pitch, profile)	Go/No-Go gauges	Flange assembly impossible
3	Stud bend >1 mm/m	Ruler, flat surface	Uneven tightening
4	Insufficient hot-dip zinc thickness	Thickness gauge	Pipeline corrosion
5	Missing B7/L7 marking	Visual inspection	Identification impossible

Stud Bolts and Washers Nomenclature

Table 6. Stud Bolts — Full Range

No.	Description	Standard	Strength	Material	Coating	Sizes
1	Metric threaded rod full thread	DIN 975	4.8-10.9	Steel 35CrMo	Zn, DACROMET	M6-M36
2	Metric threaded rod close tolerance	DIN 976	8.8-12.9	Alloy steel	Zn, Geomet	M8-M36
3	Flange stud bolt (tap end)	DIN 2510	10.9	Steel 35CrMo	Geomet, Xylan	M12-M36
4	Flange stud bolt (nut end)	DIN 2510	10.9	Steel 35CrMo	Geomet	M12-M36

No.	Description	Standard	Strength	Material	Coating	Sizes
5	ASTM A193 B7 stud bolt	ASME B16.5	B7	Steel 4140	Geomet, Xylan	1/2"-4"
6	ASTM A193 B8 stud bolt	ASME B16.5	B8	AISI 304	Passivation	1/2"-4"
7	ASTM A193 B8M stud bolt	ASME B16.5	B8M	AISI 316	Passivation	1/2"-4"
8	ASTM A320 L7 stud bolt	ASME B16.5	L7	Hardened 4140	Geomet	1/2"-4"
9	Foundation anchor bolt	—	3.6-5.8	Steel 09G2S	Primer, paint	M12-M72
10	Stainless threaded rod	DIN 976 A4	A4-80	AISI 316	Passivation	M6-M24

Table 7. Washers — Full Range

No.	Description	Standard	Material	Coating	Sizes
1	Flat washer standard	DIN 125	Steel	Zn, Ni	M3-M36
2	Flat washer oversized	DIN 9021	Steel	Zn	M3-M36
3	Spring lock washer (split)	DIN 127	Steel 65Mn	Zn, phosphate	M3-M30
4	Disc spring washer	DIN 6796	Steel 60Si2Mn	Zn, phosphate	M6-M30
5	High-strength washer for steel structures	DIN 7989	Steel	Zn	M12-M36
6	Taper washer for I-beams	DIN 434 / DIN 435	Steel	Zn	M12-M24
7	Stainless flat washer	DIN 125 A2	AISI 304	Passivation	M3-M24
8	Stainless spring washer	DIN 127 A2	AISI 304	Passivation	M3-M20
9	Brass flat washer	DIN 125	Brass	Uncoated	M3-M12
10	Copper flat washer	DIN 7603	Copper	Uncoated	M6-M20

Inspector Checklist: Stud Bolts and Washers

Table 8. Visual Inspection — Stud Bolts

No.	Parameter	Criteria	Method
1	Thread cracks	None	10x magnifier, UT
2	Thread burrs	None	Visual, finger
3	Coating uniformity	No skips, runs	Visual
4	Strength class stamp	Legible, correct	Visual
5	Rust traces	None	Visual
6	Straightness	No visible bend	Flat surface

Table 9. Dimensional Inspection — Stud Bolts

No.	Parameter	Tool	Tolerance
1	Overall length	Caliper or tape	js15
2	Shank diameter	Micrometer	h13
3	Thread pitch	Go/No-Go gauges	6g
4	Thread length each end	Caliper	±2 mm
5	Straightness	Ruler over 1 m	≤1 mm/m
6	Nut chamfer	Caliper	0.5-1 mm

Table 10. Dimensional Inspection — Washers

No.	Parameter	Tool	Tolerance
1	Outer diameter	Caliper	h14
2	Inner diameter	Caliper	H14
3	Thickness	Micrometer	js15
4	Perpendicularity	Indicator	0.05 mm
5	Flatness	Flat surface + feeler	0.05 mm

Table 11. Mechanical Testing — Stud Bolts

No.	Parameter	Method	Standard	Requirement
1	B7 hardness	Rockwell HRC	ASTM A193	32-38 HRC
2	B8/B8M hardness	Vickers HV	ASTM A193	150-220 HV
3	L7 hardness	Rockwell HRC	ASTM A320	25-35 HRC
4	B7 tensile strength	Tensile machine	ASTM A193	≥860 MPa

No.	Parameter	Method	Standard	Requirement
5	L7 impact toughness	Pendulum impact tester	ASTM A320	≥20 J at -73°C
6	Proof load test	Hydraulic press	ASTM A193	1.5 x working load

Table 12. Coating — Stud Bolts and Washers

No.	Parameter	Method	Norm
1	Hot-dip zinc thickness	Thickness gauge	50-80µm
2	DACROMET thickness	Eddy current	12-20µm
3	Geomet thickness	Eddy current	8-15µm
4	Xylan thickness	Eddy current	20-40µm
5	Salt spray hot-dip zinc	ASTM B117	500-1000 hours
6	Salt spray DACROMET	ASTM B117	500-1000 hours
7	Salt spray Geomet	ASTM B117	1000-1500 hours

Manufacturing Geography

Table 13. Production Clusters for Stud Bolts and Washers

No.	Region	Cities	Specialization
1	Hebei	Yongnian, Handan	High-strength studs B7, L7
2	Shandong	Jinan, Qingdao	Flange studs, foundation bolts
3	Jiangsu	Suzhou, Wuxi	Stainless studs AISI 316
4	Zhejiang	Ningbo, Haiyan	Standard washers, spring washers

Comprehensive sourcing and procurement selects inspectors with oil and gas equipment experience. Complex engineering systems ensures supply for pipeline projects.

FAQ: Stud Bolts and Washers Inspection

Q1: What is the difference between DIN 975 and DIN 976 threaded rods?

A: DIN 975 — threaded rod with metric thread full length, tolerance 6g. DIN 976 — threaded rod with increased tolerances (6h), used for foundation and anchor fastening. For flange connections use DIN 975 or ASTM A193 studs. DIN 976 is cheaper but unsuitable for precision connections.

Q2: Why cannot B7 stud bolts be hot-dip galvanized?

A: Hot-dip galvanizing at 450°C causes hydrogen embrittlement in 4140 steel (used for B7). This reduces impact toughness and can lead to brittle fracture under load. For B7, use DACROMET, Geomet, or Xylan — low-temperature coatings. Verify coating type in the certificate.

Q3: How to check straightness of long studs (2-3 m)?

A: Lay the stud on a flat surface (table or floor). Measure maximum gap between stud and surface with feeler gauge or ruler. Tolerance: ≤1 mm per 1 m length. For 3 m studs — maximum 3 mm. Larger deviation — reject.

Q4: Is chemical analysis required for every B7 batch?

A: Yes, mandatory. Substitution of 4140 steel with cheaper 1045 is a common scheme. Spectral analysis must confirm: C 0.36-0.47%, Cr 0.80-1.10%, Mn 0.65-1.10%, Mo 0.15-0.25%. Without these elements the stud will not withstand stated load. Check every batch.

Q5: Which washers to use with Class 10.9 and 12.9 bolts?

A: For high-strength bolts (10.9, 12.9) and studs (B7) use DIN 7989 (high-strength) or DIN 9021 (oversized) washers. Standard DIN 125 washers may deform under high tightening load. Check washer thickness — minimum 0.15d (d = bolt diameter).

Q6: What is a spring lock washer DIN 127 and when to use it?

A: DIN 127 spring lock washer — split washer creating constant force on the thread to prevent self-loosening. Used in vibration-loaded connections (engines, compressors, transport). Does not replace proper tightening. For critical connections — use together with nylon insert lock nut.

Q7: How to control hot-dip galvanizing quality on studs?

A: Check: 1) coating thickness (50-80µm, measured with gauge); 2) uniformity (no drips, runs, misses); 3) adhesion (hammer impact — coating must not flake); 4) salt spray (500-1000 hours). For studs over 1.5 m — check coating at ends where misses are common.

Q8: What documents are required for stud bolts in oil and gas?

A: Minimum package: ASTM A193/A320 compliance certificate, mill test certificate (chemical composition, mechanical properties), coating certificate, ultrasonic testing (UT) protocol, magnetic particle testing (MT) protocol for critical applications. Customs and logistics assists with full documentation.

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