Metal-Asia

Commercial Proposal for Supply

In-Situ Consolidation and NDT Quality Control Equipment for Composite Manufacturing

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Executive Summary

In-situ consolidation is the critical process step in thermoplastic composite manufacturing using LATP, AFP, and LATW methods — achieving layer bonding during placement through localized heating and pressure. Consolidation quality directly determines the mechanical performance of the finished part: interlaminar strength, porosity level, and fiber distribution uniformity. Metal-Asia.pw supplies in-situ consolidation equipment and comprehensive non-destructive testing (NDT) systems for composite quality assurance, including ultrasonic testing (UT), thermography, geometry control, and layup zone temperature profile monitoring — all delivered through our **Global Procurement Solutions** with **Direct Factory Access** and **Full Supply Chain Transparency**.

Integrated in-situ consolidation and NDT quality control system for composite component manufacturing

Process Capabilities

In-Situ Consolidation

The in-situ consolidation process involves local heating of thermoplastic tape to matrix melting temperature (250-450 degC depending on polymer type) with simultaneous pressure application through a compaction roller. This drives molecular interdiffusion (healing) at the interface, forming a monolithic structure without subsequent autoclave processing.

NDT Quality Control for Composites

Non-destructive testing of composite components encompasses multiple methods for detecting internal defects: delaminations, porosity, incomplete consolidation, foreign inclusions, geometry deviations, and

thickness variations. NDT systems integrate directly into the production line or operate as standalone inspection stations.

Technical Specifications

Parameter	In-Situ Consolidation	NDT Quality Control
Consolidation temperature	250-450 degC (matrix dependent)	Monitoring: 20-450 degC
Compaction force	100-3000 N	—
Consolidation pressure	0.5-5 MPa	—
Process speed	0.1-1.0 m/s	up to 2 m/s (in-line)
Detectable defect types	—	Delaminations, porosity, incomplete consolidation, inclusions
Minimum detectable defect size	—	1-2 mm (UT), 5-10 mm (thermography)
Inspection methods	—	UT, thermography, X-ray, optical
Thickness measurement accuracy	—	+/- 0.05 mm
Geometry measurement accuracy	—	+/- 0.1 mm

Complete Equipment Scope of Supply

In-Situ Consolidation Equipment

Item	Description	Technical Specifications	Qty	Unit
1	NIR laser source for consolidation	Fiber laser 2-6 kW, 980-1080 nm, efficiency > 35%, power modulation	1	pcs.
2	Optical beam delivery system	Collimator, scanning head, protective window, air purge	1	set
3	Compaction roller	Width 50-150 mm, diameter 60-120 mm, silicone/steel coating, replaceable	2-4	pcs.
4	Pneumatic compaction drive	Force 100-3000 N, adjustable pressure 0.5-10 bar, response < 50 ms	1	set
5	IR thermal monitoring system	2-channel IR pyrometer, range 150-1200 degC, response < 5 ms, accuracy +/- 2 degC	1	set
6	Thermal imaging system	IR camera 640x480, range -20 to 1500 degC, frame rate 30-60 Hz	1	set

Item	Description	Technical Specifications	Qty	Unit
7	Closed-loop temperature control system	PID controller, automatic laser power correction, data logging	1	set
8	Laser chiller	5-15 kW cooling, temperature 18-22 degC, glycol circuit	1	pcs.
9	Consolidation zone exhaust system	500-2000 m3/h, vapor filtration, local extraction	1	set
10	Laser zone safety enclosure	Shading panels per IEC 60825, indicators, interlocks	1	set

NDT Quality Control Equipment

Item	Description	Technical Specifications	Qty	Unit
11	Ultrasonic flaw detector (manual)	Frequency range 0.5-25 MHz, A-scan/B-scan/C-scan, thickness measurement	1	pcs.
12	Automated UT system	Multi-channel, 1-10 MHz, CNC scanning system, C-scan imaging	1	set
13	Active thermography system	IR camera 640x512, heating flashes, defect analysis software	1	set
14	Passive thermography system	IR camera for layup zone temperature profile monitoring	1	set
15	X-ray inspection system	Voltage 160-450 kV, detector resolution 100-200 um, CT mode	1	set
16	Optical geometry control system	3D scanner, accuracy +/- 0.05 mm, CAD model comparison	1	set
17	Laminate thickness measurement system	UT thickness gauge, accuracy +/- 0.05 mm, multi-point	1	set
18	Interlaminar adhesion control system	UT wedge peel method, acoustic microscopy (optional)	1	set
19	Porosity control — pycnometry	Gas pycnometer per Archimedes, accuracy 0.01%	1	pcs.
20	Data logging and analytics system	Database, trending, process parameter-to-quality correlation	1	lic.

Control System and Software

Item	Description	Technical Specifications	Qty	Unit
21	Control cabinet with PLC	Industrial PLC, analog modules, 15" HMI	1	set

Item	Description	Technical Specifications	Qty	Unit
22	Consolidation process control software	Closed-loop temperature, force, speed control, data logging	1	lic.
23	NDT data analysis software	Defect visualization, 3D reconstruction, reporting, MES integration	1	lic.
24	Marking and traceability system	Part marking, process parameter linkage, database	1	set

Customs Classification and HS Codes

HS Code	Product Description
8515.11.00	Laser equipment for thermal processing
9024.10.00	Machines for physical analysis (UT, thermography)
9027.80.00	Other instruments for physical analysis
9031.49.00	Automatic control and regulation instruments
8479.89.97	Other machines with individual functions
9022.19.00	X-ray apparatus
8479.60.00	Heat treatment machines
8419.39.80	Equipment for thermal processing
8466.20.00	Parts and accessories
9031.80.00	Other measuring and control instruments

Engineering Audit and Project Design

Metal-Asia.pw engineers conduct an engineering audit of existing or planned LATP/AFP/LATW lines to determine in-situ consolidation and NDT control requirements. The audit covers part type analysis, defect criticality assessment, applicable standard requirements (ASTM, ISO, DIN, EN), and technical specification preparation.

Technical Documentation Package

- Technical specification for in-situ consolidation and NDT system
- Equipment technical datasheets
- Quality control process card
- UT, thermography, and optical inspection procedures
- Operation and maintenance manuals in English

Factory and Site Acceptance Testing

- FAT at manufacturer's facility

- Thermal monitoring system calibration on reference specimens
- UT and thermography sensitivity verification on specimens with artificial defects
- SAT at your facility

Installation Supervision and Commissioning

Installation supervision for in-situ consolidation and NDT equipment includes mounting, electrical connection, calibration, integration with existing lines, and personnel training.

Commissioning Sequence

1. Laser source, optics, and cooling system installation
2. Compaction assembly and pneumatic drive mounting
3. IR pyrometer and thermal imager installation
4. Temperature loop calibration on reference specimens
5. UT and thermography equipment installation
6. Analysis and logging software configuration
7. Quality control operator training (24-40 hours)
8. NDT procedure qualification
9. Trial production run and acceptance

Integrated Service Portfolio

Metal-Asia.pw provides comprehensive procurement services from China with worldwide delivery.

- Engineering audit — requirements analysis, technical specification
- Equipment sourcing — optimal configuration
- Customs and logistics — global delivery and customs clearance
- Manufacturer audit — reliability verification
- Integrated engineering systems — auxiliary equipment
- Installation and commissioning — full handover
- Composite production lines — full catalog
- NDT quality control (UT, RT), chemical composition verification to ASTM/ISO/DIN
- Documentation for customs clearance and regulatory compliance

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Why Metal-Asia.pw: Compliance, Transparency, Direct Access

Criteria	Direct Procurement from China	Metal-Asia.pw Turnkey Delivery
Manufacturer verification	No on-site audit	In-person factory visit
FAT at factory	Difficult to organize	Full oversight
Documentation	Chinese language only	Complete English package
Customs clearance	Classification risks	Accurate HS codes

Criteria	Direct Procurement from China	Metal-Asia.pw Turnkey Delivery
Installation	Separate contract	Included in scope
Service	Long lead times	Regional inventory, 72-hour response
Compliance	No certification support	CE/UL support, ASTM/ISO documentation
Training	Not provided	Included in commissioning

Frequently Asked Questions (FAQ)

Q1: What is in-situ consolidation and why is it important?

In-situ consolidation is the process of bonding thermoplastic tape layers during placement through localized heating and pressure. It eliminates the need for autoclave or press post-processing, reducing manufacturing cycle time by 40-60% and lowering energy consumption. Consolidation quality determines interlaminar strength and finished part porosity.

Q2: What NDT methods are used for composite quality control?

Primary methods include: ultrasonic testing (UT) for detecting delaminations, porosity, and incomplete consolidation; infrared thermography (active and passive) for heating uniformity monitoring and defect detection; X-ray computed tomography for detailed 3D internal structure analysis; and optical inspection for geometry and surface quality verification.

Q3: What is the typical porosity of parts after in-situ consolidation?

With proper process parameter settings (temperature, speed, pressure), finished part porosity is below 1-2%, meeting aerospace industry requirements. For porosity below 0.5%, post-consolidation in a hot press may be required.

Q4: Can NDT systems be integrated directly into the layup line?

Yes, passive thermography and optical inspection systems can operate inline in real-time during the layup process. UT inspection is typically performed offline at a dedicated inspection station after layup completion. X-ray inspection is applied on a sampling basis for critical components.

Q5: How frequently do quality control systems require calibration?

IR pyrometers are calibrated annually or as needed when readings drift. UT equipment is calibrated quarterly on reference specimens. Thermal imaging cameras are calibrated every 12 months. Optical inspection systems require calibration when changing part types.

Q6: What standards govern composite quality assessment?

Primary standards: ASTM D7136 (impact resistance), ASTM D2344 (interlaminar shear strength), ASTM D792 (density/porosity), ASTM E2582 (thermography), ISO 14171 (UT). Metal-Asia.pw ensures all equipment meets applicable ASTM, ISO, DIN, and EN standard requirements.

Q7: What are the equipment delivery lead times?

Standard manufacturing lead time is 12-18 weeks. International shipping takes 4-6 weeks. Installation supervision and commissioning requires 2-3 weeks. Total project timeline from contract to operation: 4-6 months.

Q8: What warranty coverage is provided?

Warranty period is 12 months from commissioning or 18 months from shipment. Coverage includes: component replacement, engineer dispatch, remote support. Post-warranty service is available under a service agreement.

Contact Information

For in-situ consolidation and NDT equipment supply inquiries:

- **Official Website:** www.metal-asia.pw
- **Client Relations:**
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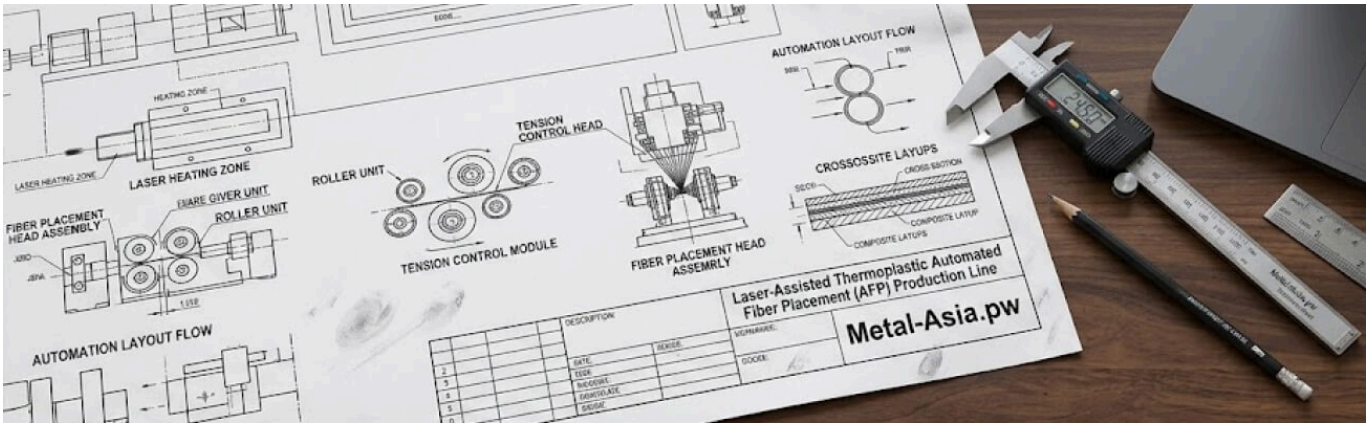
For our full service portfolio, visit Metal-Asia.pw.



Turnkey in-situ consolidation and NDT equipment from China with worldwide delivery and commissioning support