



General Manufacturing Equipment Specification

Global Common

SD-001

ISSUED
REVISED

March 1, 1993
December 05, 2024

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1. Scope

This General Manufacturing Equipment Specification defines Nexteer Automotive's requirements for the quotation and purchase of machine(s) or equipment. It also explains the objective of Nexteer's proposal requests, as well as the sequence of transactions between the Supplier and Nexteer Automotive during and after signing of the order.

Nexteer Automotive specifications were developed without patent considerations. The Supplier assumes all patent liabilities.

Note: Changes since the last revision are highlighted.

2. General Project Requirements

- 2.1 All approvals and project direction shall be communicated through the Nexteer Equipment Manufacturing Engineer.
- 2.2 In the case of any conflict between any of the specifications the Supplier shall contact the Nexteer Equipment Manufacturing Engineer for clarification.
- 2.3 Conformance to these specifications does not relieve the Supplier from designing and supplying a reliable and quality piece of equipment.
- 2.4 Refer to Appendix A for a Schedule of Events and Requirements.

3. General Equipment Requirements

- 3.1 Machine shall be designed and constructed:

- for ease of service, flexibility, maintainability and changeover, and
- to prevent contamination of production parts by machine components and fluids.

Examples of potential contamination include fasteners, pins, paint, lubrication, etc. that may unintentionally affect the quality of the production part. When machine fasteners are required and are located in an area of risk to production parts / assemblies, fasteners should have redundant retention features, such as wired head bolts, lock washers or torque prevailing features.

- 3.2 All machines shall include leveling pads. Vibration isolation pads shall be included in the base price of the machine when required by the application.
- 3.3 Refer to the T-Spec and the Nexteer Equipment Manufacturing Engineer for part load/unload requirements.

- 3.4 Refer to the T-Spec and the Material Applications Chart (MAC) for part material dispensing requirements. This includes but is not limited to grease, RTV, and gap fill applications. Additional requirements include:

- 3.4.1 Material purging. Certain materials (ex. RTV, gap fill) may require material purging at certain idle time intervals. Refer to T-Spec or contact Nexteer Equipment Manufacturing Engineer for specific purge time intervals.

- 3.4.2 When material purging is required, the amount of material to be purged shall equal the material amount between the outlet port of the dispensing valve and the final point where material is delivered to the product. Example: the entire length of mixing tube. This includes the volume within nozzles and tubing extensions.
- 3.4.3 All materials shall pass weight audits before continuing production. These weight audits shall at a minimum be performed at the following intervals:
1. Start of every shift
 2. After every 4 hours of production
 3. After every model changeover
 4. After every material container replacement
- 3.5 The machine is to have a 200-hour lubrication system, when lubrication is required. This system shall include a provision to shut the machine down due to high or low-pressure failures.
- 3.6 All wear surfaces shall be hardened.
- 3.7 All slides, gibs, etc., shall be adjustable to make up for normal wear and to maintain high machine capability. Exact step-by-step procedures to check, adjust, and maintain the above shall be documented in all service manuals provided with the equipment. Linear slides (rails) are permitted; they must comply with the requirements outlined in SD-007, and lubrication must be assessable from outside the guarding of the machine.
- 3.8 All positive stops, guide pins, etc., shall be the most capable arrangement possible to maintain "high" machine and process capabilities. Exact step-by-step procedures to check, adjust, and maintain the positive stops shall be documented in all service manuals and on documentation provided with the equipment i.e. tool layouts.
- Moveable stops (clamp rings) are discouraged due to risk of the stop migrating from its position and causing a part defect. In the event that a moveable stop is used, it must have positive location ensured by use of spacers or be secured by use of a dowel or through bolt.
- 3.9 Refrigerant equipment, primary or auxiliary, shall not contain CFC-11, CFC-12 or any other class I chemical. All refrigerant equipment must be designed to use low ozone depleting potential (ODP) class II regulated (such as HFC-134a or HCFC-123) or unregulated refrigerant substances with equipment designed to optimize the refrigeration cycle efficiently with these substitute refrigerant substances. Flammable or toxic refrigerants, for example CO₂ or NH₃, may be used only if prior approval is received from the Divisional Hazardous Materials Control Committee. Refrigerant, compatible lubricant and leak rates over lifetime of the equipment must be specified in quote.
- 3.10 Threaded holes shall be left soft whenever possible.
- 3.11 All non-steel threads shall have Heli-coil or equivalent inserts.
- 3.12 If gaging is included as part of the purchase order, Nexteer Automotive must approve the design and the final reproducibility and repeatability studies. See Nexteer Automotive General Gage Specification, SD-005.
- 3.13 Set up procedures and gages shall be provided for all probes and monitoring devices.

- 3.14 Setup and Error Proofing Masters shall be provided and must have an associated drawing so they can be readily duplicated.
- 3.15 The supplier shall take into consideration and retain the capability of running all new and existing models. All model changeovers shall occur at the equipment fixture, tooling, or changeover detail. Model changeovers shall not be done in the electrical panel. This requirement applies to new machines, rebuilds, and retools.
- 3.16 Machine Logic shall be incorporated to test error proofing masters without damage to the machine or processing the part.
- 3.17 Supplier to provide operator and maintenance training.
- 3.18 The Supplier shall provide all tools, peripherals, and software to support the equipment on the Supplier's floor and during startup in Nexteer Automotive's facility. This requirement applies to new machines, rebuilds, and retools.
- 3.19 Where controls support peripherals and/or software to support programmable devices not referenced in SD-007, the Supplier is to quote as a line-item option. When purchased by Nexteer Automotive, it shall be the property of and registered to Nexteer Automotive.
- 3.20 All supporting software provided with the machine shall be registered to Nexteer Automotive. For proprietary machines, sufficient software will be provided to allow a complete recovery of machine programs in the event of a catastrophic failure (i.e.: passwords; system backups; ghost files of hard drives, etc.).
- 3.21 Supplier is responsible for providing Standard Work Instructions (in Nexteer format) for startup, shutdown, machine calibration, and change-over. These instructions can be re-used in the machine manual.
- 3.22 Tag requirements:
 - 3.22.1 Nexteer Automotive will translate verbiage to the language of the country of destination. For all device tags and HMI screens, the Supplier shall provide an English verbiage list in a Microsoft Excel file to the Nexteer Equipment Manufacturing Engineer. The Supplier shall allow a minimum of 2 weeks to complete the translation.
 - 3.22.2 Operator Interface:
 - 1. The HMI shall have a set of screens in English and a set in the language of the country of destination. The language shall be selectable on the HMI directory screen. Refer to Nexteer Automotive HMI templates on the Nexteer Data Exchange website at www.nexteerdatabexchange.com.
 - 2. For devices on the operator interface (Example: push buttons, pilot lights, selector switches) the tags shall be bilingual in English and the language of the country of destination.
 - 3.22.3 All other device tags (Example: proximity switches, position sensors, valve solenoids, pressure switches, fluid requirements, replacement elements, etc.) shall be provided by the supplier and meet the following requirements:
 - 1. Include the device ID (Example: I2.3PRX, I1.2PS, O2.0CR) that matches the approved drawings.

2. Indicate the functional description in English (valve - advance clamp; sensor - clamp advanced) and should include the language of the country of machine's destination.
3. Mounted adjacent to the device they are identifying, or in a manner which clearly identifies the individual device.

4. Utilities and Facilities

- 4.1 The machine shall be self-contained and provide single point utility connections. The following are utilities available at Nexteer Automotive global sites:

Location	Power	Air Pressure	Cooling Water
North America USA	60Hz, 3 Phase 480VAC $\pm 10\%$ Receptacles: 120VAC 4 Wire Supply	70 PSI (4.8 Bar)	45°F (7°C) / 90°F (32°C) 60 PSI (4.1 Bar)
Mexico Queretaro Juarez Sabinas	60Hz, 3 Phase 480VAC $\pm 10\%$ Receptacles: 120VAC 4 Wire Supply	70 PSI (4.8 Bar)	Check Availability Check Availability Not Available
South America Brazil	60Hz, 3 Phase 380VAC $\pm 10\%$ Receptacles: 220VAC 5 Wire Supply	70 PSI (4.8 Bar)	Not Available
Europe Poland	50Hz, 3 Phase 400VAC $\pm 10\%$ Receptacles: 230VAC 5 Wire Supply	70 PSI (4.8 Bar)	Not Available
Asia / Pacific Australia	50Hz, 3 Phase 415VAC $\pm 10\%$ Receptacles: 240VAC 5 Wire Supply	70 PSI (4.8 Bar)	Not Available
China	50Hz, 3 Phase 380VAC $\pm 10\%$ Receptacles: 220VAC 5 Wire Supply	70 PSI (4.8 Bar)	Check Availability
India	50Hz, 3 Phase 415VAC $\pm 10\%$ Receptacles: 240VAC 5 Wire Supply	70 PSI (4.8 Bar)	45°F (7°C) / 90°F (32°C) 60 PSI (4.1 Bar)
Africa Morocco	50Hz, 3 Phase 380VAC $\pm 10\%$ Receptacles: 220VAC 5 Wire Supply	70 PSI (4.8 Bar)	Check Availability
Middle East Turkey	50Hz, 3 Phase 400VAC $\pm 15\%$ Receptacles: 230VAC 4 Wire Supply	87 PSI (6 Bar)	45°F (7°C) / 90°F (32°C) 60 PSI (4.1 Bar)

Note: The number of incoming supply conductors that will be provided are based on the following facility information:

1. TN-S 5-wire system, three phase wires plus a separate PE (ground) and Neutral.
2. TN-C 4-wire system, three phase wires plus a combined PE (ground) and Neutral.
3. TN-C-S 5-wire system (*Morocco only*), three phase wires plus a separate PE (ground) and Neutral.

- 4.2 Pneumatic components shall be able to withstand 125 PSI.
- 4.3 The machine is to be floor mounted. If pit mounting is absolutely required, hydraulics and controls shall be floor mounted. In addition, certified foundation drawings are required.

5. Safety

- 5.1 Safety for the process and equipment shall comply with requirements as specified in the Nexteer Automotive Design-In Health and Safety Specification, (SD-012). Also, the Supplier shall be involved in a formal Machine Risk Assessment process during the equipment design phase as a function of the Design-In Health and Safety Specification.
- 5.2 Supplier shall provide lockout placards per Nexteer Automotive Specification SD-012, Design-In Health and Safety Specification.
- 5.3 Supplier shall comply with all local, state, and federal safety regulations.
- 5.4 Supplier shall supply a total machine guarding and containment system to ensure complete dry floor operation in accordance with Nexteer Automotive Specification SD-012, Design-In Health and Safety Specification.
- 5.5 For Europe: The machine or equipment is to be designed and constructed in accordance with the "European Machinery Directive" and is to have the CE Mark. A declaration of conformity shall be provided with the equipment and is to include the list of standards in which the machine has been evaluated against.

6. Coolant Systems

- 6.1 The coolant system shall be self-contained and piped complete.
- 6.2 The coolant piping shall include all necessary lines to facilitate coolant and chip flow from the cutting tools, parts, work area, and to flush chips from moving and stationary slide interfaces.
- 6.3 Self-contained coolant systems shall include a circulation method to prevent odor and bacteria from forming during extended shut down periods. Compressed air shall not be used as the circulation method.
- 6.4 All coolants, fluids, and lubricants shall be approved by the Nexteer Equipment Manufacturing Engineer. Every effort to use existing approved chemicals for the destination facility must be a high priority.
- 6.5 An in-line filter shall be provided to ensure that the coolant lines do not plug. The machine is to sense any drop-in pressure or a dirty filter condition, shut down the machine at cycle stop position, and indicate the reason.
- 6.6 Splashguards shall contain the coolant and chips in such a manner as to provide safety and cleanliness but not to restrict the flow of chips. Tooling fixture and machine surfaces to be designed to facilitate coolant and chip flow.

7. Paint

- 7.1 Rust preventative coating shall be provided on all machines, fixtures, and tooling where rust may cause alignment, set-up or location problems. Paint shall not be allowed on locating or mounting surfaces. Fixture plates shall be black oxide coated.
- 7.2 Paint shall be even and not peel, blister, or fade. Nexteer Automotive prefers an epoxy based or equivalent performance paint.
- 7.3 Paint colors shall be as follows:
- | | |
|-----------------------|---|
| Machine | RAL 9001 or FID 27780 |
| Guarding | Safety Yellow, RAL 1021 |
| | NOTE: Aluminum extrusions are permitted for guarding; they can be RAL1021 or natural aluminum. |
| Mesh or Wire Guarding | Black, RAL 9011 |

8. Tooling and Fixtures

- 8.1 The machine shall be completely tooled including 3 sets, or as described in the Manufacturing Engineering Equipment Specification (T-Spec) of all-perishable tooling and tool holders, shipped with the machine.,
- 8.2 Tool holders, if required, shall be approved by the Nexteer Equipment Manufacturing Engineer and rigidly mounted to the tool slides or heads. They shall be designed to allow positioning of tools to a known location. Adjustable type holders shall have a built-in indication of actual adjustment made.
- 8.3 Where coolant is used, tool holders shall have holes to direct the correct amount of coolant to the proper location. If this is not possible, rigidly mounted permanent lines are required.
- 8.4 Tooling and fixtures shall be designed to provide minimal downtime, tool setup, required adjustments and have all dimensions on mean or at new tool starting dimension points. Fixtures shall have clearly indicated and positively located setup positions and enable changing equipment over without the use of hand tools. This is possible through workplace organization and the use of clamps, toggles, lock pins, etc. Model changeover should be less than the cycle time (see Nexteer Specification SD-015 for further information).
- 8.5 Part clamping/holding systems are to be designed to prevent distortion or surface defects to the part.
- 8.6 Part clamping/holding systems are to be error proofed to prevent wrong or miss-oriented part.

9. Quote

- 9.1 The quotation shall contain the statement, "We agree to conform to Nexteer Automotive Specifications outlined in the Manufacturing Engineering Equipment Specifications (i.e. T-Spec)"; or if this is not possible, an itemized list of deviations shall be included.
- 9.2 It shall be the responsibility of the Supplier to discuss these requirements with the Nexteer Equipment Manufacturing Engineer if there are any questions in order to fully understand all details of these specifications before the proposal is submitted.
- 9.3 The quote shall be in the English language; quoted both to US dollars (\$) and the local Supplier currency.
- 9.4 Quotations shall be submitted on the form provided by Purchasing for quotation responses.
- 9.5 Sketches or drawings showing any fixture concepts, chucking, tools, material handling, and machine layout considerations shall accompany the quotation.

10. Warranty

The Supplier's warranty on the equipment shall be a minimum of the following:

- 10.1 Purchased parts: Manufacturer's warranty
- 10.2 Workmanship and material: Minimum one year after start of production on the machine.
- 10.3 Check with purchasing for Nexteer Automotive standard terms and conditions requirements.

11. Qualification and Acceptance

Machine qualification shall be per Nexteer Automotive *Manufacturing Equipment Statistical Qualification Requirements*, SD-002.

- 11.1 Machine acceptance procedure (i.e. runoff) will be initiated only after the appropriate approvals have been received from the Nexteer Equipment Manufacturing Engineer.
- 11.2 Shipping approval will be given after a satisfactory machine runoff has been approved by the Chief Manufacturing Engineer, and conditional corrections on the Supplier's floor.
- 11.3 Final acceptance of the equipment will be made upon completion of a duplicate acceptance test run at Nexteer Automotive producing parts to the production rates specified in the purchase order and receipt of all documentation.

12. Commercial Issues

- 12.1 Payment and shipping terms as specified by purchasing.
- 12.2 Alteration-changes-additions that impact delivery and/or cost will only be conducted after Supplier receives an official P.O. or confirmation by the Purchasing Department.

A. Appendix A – Schedule of Events and Requirements

- A.1 Specification / Quote process.
- A.2 Submission of quote.
- A.3 Analysis of quote by Nexteer Automotive Engineering.
- A.4 Nexteer Automotive Purchasing review.
- A.5 Final analysis by Nexteer Automotive Engineering.
- A.6 Pre-award meeting (when applicable):
 - The Pre-Award meeting will confirm all requirements and terms of the quotation before a purchase order is given.
 - The Supplier must specify at the Pre-Award meeting the individual in organization who is to serve as project coordinator for this project.
- A.7 Issue purchase order.
- A.8 Supplier project scheduling. Supplier must submit, within two (2) weeks after receipt of purchase order, and update monthly, the following schedule to Nexteer's Purchasing, Equipment Manufacturing Engineer, and the assigned Controls and Automation Engineer(s):
 - Initial design review
 - Start date for engineering
 - Finish date for engineering
 - Submittal dates for controls approval
 - Expected approval timetable
 - Date of certified floor plan print submittal to Nexteer Automotive
 - Date at which manufactured and purchased parts must be ordered and received
 - Assembly start date
 - Debug start date
 - The date and quantity of Nexteer Automotive supplied components and gages required for runoff, both initial samples and final runoff parts
 - Runoff date
 - Shipping date
- A.9 Design reviews as needed, including the Machine Risk Assessment:
 - Supplier to provide outline of proposed fixture concepts, tools, tool layout, machine layout, machine major component Suppliers, components generally being considered in controls, robots, AMR's, hydraulics, pneumatics, lubrication, coolant, and chip handling for review with the Nexteer Equipment Manufacturing Engineer and within one month of issuance of P.O. for concurrence.
 - After this first step in component and concept approval, completion of the Design-In Ergonomics Checklist and a Machine Risk Assessment (per the Nexteer Automotive Specification SD-012, Design-In Health and Safety Specification), the Supplier will then proceed with necessary design.
- A.10 Engineering approvals. All engineering approvals shall be provided in writing by the Nexteer Equipment Manufacturing Engineer with input from the assigned Controls, Automation, and Industrial Engineers:
 - Design approval – The Supplier must receive written concept and design approval before ordering components, robots, AMR's, material or tooling.
 - Concept approval – Long lead time components may be approved at the concept review if specific component detail is available.

- Design Review – Complete machine and tooling layouts must be approved by the Nexteer Equipment Manufacturing Engineer.
- Controls and Automation Approvals:

Designs shall be submitted to the assigned Controls and Automation Engineer(s) and the Nexteer Equipment Manufacturing Engineer. The Supplier shall include the Nexteer MQ Workflow number (MQ-xxxxxx) and the machine asset number (SD-xxxxxx) when submitting designs.

Hardware Design

- Complete electrical hardware, fluid power hardware, and robot configuration documentation shall be submitted for approval in accordance with the supplier submitted project timeline.
- Final documentation shall be entered into Nexteer Automotive's storage system; Teamcenter Manufacturing (TcM). Reference Nexteer Automotive Specification SD-003, General Drawing and Manuals Specification.

Software Design

- Initial PLC and HMI software programs shall be submitted for preliminary structure review and approval within 30 days of hardware design submittal.
- Initial robotic programs and simulation shall be submitted for preliminary structure review and approval within 30 days of hardware design submittal.
- PLC, HMI, and robotic software programs shall be submitted prior to MQ1 for approval.

Construction

- Prior to machine runoff (MQ1), the construction of the control equipment shall be approved by the assigned Controls and Automation Engineer(s). Construction approval includes, but not limited to, the control enclosure(s), electrical field wiring, and fluid power machine construction.
- Ten (10) working days shall be allowed for review of each mechanical and controls design set submitted. After approval, any modifications made by the equipment builder shall have advanced written approval of the Nexteer Automotive Engineer.
- Nexteer approval of design documentation shall neither constitute waiver of responsibility for proper operation of the equipment, nor relieve the industrial equipment supplier of conformance to Industry Standards or Nexteer Automotive Specifications that are part of the purchase order.
- Machine layout drawing to include $\frac{1}{4}" = 1'$ scale plan view of machine in right hand corner of drawing for layout purposes. Layout is to show all auxiliary equipment locations.
- Machine layout drawings are to show the location of the electrical panel, push buttons, operator stand, incoming utility inlets, overhead clearance, coolant equipment, etc. This should be a plan view and front view of machine.

A.11 Progress reviews.

A.12 Verification of machine cycle and pre-qualification on Supplier floor (reference Nexteer Automotive Specification SD-002, Manufacturing Equipment Statistical Qualification Requirements).

A.13 Approval checklists.

A.14 Qualification for shipping approval, MQ1 (reference SD-002 and Equipment Runoff Checklist, DS3392):

- After review of runoff summary with the Supplier, the Supplier will provide appropriate correction timetable and shipping information.
- Written approval shall be given by the Nexteer Equipment Manufacturing Engineer after all items in the New Equipment Runoff Checklist (Runoff Book) have been satisfactorily completed.

A.15 Shipping:

- Supplier shall prepare, package including protective cover, and load machine onto carrier. Individual units or packages to be identified with P.O. number and package number of total (i.e., 1 of 8, 2 of 8, etc.)
- All control drawings and a software backup of all programmable devices shall be in control panel when shipped.

A.16 Approved drawings and manuals shipped to Nexteer Automotive.**A.17 Payment with invoice and approved receipt of equipment.****A.18 Installation:**

- Supplier shall supply knowledgeable technical / service personnel, familiar with the machine, for installation runoff and training in the Nexteer Automotive Plant.
- This person or persons shall be present at runoff on Suppliers' floor.
- Personnel shall be present with the machine until specified production rates, machine and part quality requirements are met and approved by the Nexteer Equipment Manufacturing Engineer.

A.19 Verification of machine cycle and pre-qualification on Nexteer Automotive floor (reference SD-002).**A.20 Short term qualification by Nexteer Automotive, MQ2 (reference SD-002).****A.21 Training in Nexteer Automotive facility.****A.22 Final Documentation Delivery**

- All final documentation shall be entered into Nexteer Automotive's storage system; Teamcenter Manufacturing (TcM). Reference Nexteer Automotive Specification SD-003, General Drawings and Manuals Specification.

Final documentation shall include all drawings and documentation, including, but not limited to the following:

- Equipment drawings
- Tool drawings
- Operation and service manuals
- Controls documentation

- Final Software – All final software programs shall be provided to the Nexteer Equipment Manufacturing Engineer.

Final software shall include all programs, including, but not limited to the following:

- PLC
- HMI
- Robot Program
- Robot Factory Program
- AMR Program
- Vision Systems
- Bar Code Readers
- Electric Presses
- Screw Drivers

A.23 Final acceptance - final payment.

RECORD OF REVISIONS

Revision No	Date	Section	Description
001	01MR93	ALL	Original approval & issue date
002	01AU99	ALL	General document revision
003	01MR03	3, 6, 12	Remove Y2K compliance, change equipment color, update payment terms, update appendix A / remove appendix D per revised procedure 100.
004	15SE06	3, 4	Country of destination language requirements, support software issues and fault current detail added.
005	31MY09	ALL	Revised as global common specification and replaces SD-001 and all SD-001-xxx specifications.
006	06NO09	ALL	Company name updated and "GC" removed from specification number. All SD documents are global common. Sections 2.4, 3.19, 5.4 and Appendix A have been updated.
007	15OC12	3, 4	Sections 3.5 and 4.1 have been revised.
008	01NO13	5	Section 5.2 has been added.
009	28JU18	ALL	Reformatted entire document. Added Section 3.19 for software requirements, updated Section 4 for Morocco Facility utilities.
010	12NO18	3.2	Added Environmental Statement.
011	15NO19	4, 5	Corrected voltage requirements for Europe, updated inconsistency with Section 5.4, reformatted entire document to stay consistent with all Specifications.
012	04JN20	ALL	Updated Specification per highlights within the document. Removed Appendix B and C.
013	14DE20	4 8.4	Updated utilities to include the Middle East (Turkey). Updated to align with other Specifications.
014	22JA21	A.10, A22	Updated per removal within SD-004.
015	19MY21	3.1, 3.7	Added fastener retention and positive stop requirements. Changed "Nexteer Manufacturing Engineer in charge" to "Nexteer Equipment Manufacturing Engineer" to align with the CPI Process Map.
016	05DE22	A.10, A22	Updated for controls & robotics software approvals.
017	17OC24	3.14	Added requirement for model change over
018	05DE24	3.4	Added requirements for material dispensing
019			
020			