

Supplier Quality Requirements – Q Clauses

The following supplier quality requirements (Q Clauses), when specifically referenced in the Purchase Order by number, form a part of the Purchase Order. In addition drawings and specifications referenced herein shall be of the issue in effect on the date of the request for quotation (RFQ). The first clause, SQ-1 (which includes multiple parts), is intended to be standard and applies to all of the purchase orders for items used in the manufacture of EM Research products. The other clauses, SQ-2 thru SQ-16, will be applied as necessary, depending on the item being ordered. In the event that a clause cannot be met, the EM Research Buyer and Supplier Chain Management shall be notified immediately. Reference QA-0100039 for application requirements per commodity type.

SQ-1 General Supplier Quality Requirements

Application: 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, and 12.0 all apply when SQ-1 is required. Exclusions will be noted on the Purchase Order.

1.0 Quality System Requirements

The Supplier shall maintain an effective Quality System and provide inspection of their QA by EMR at a mutually agreed upon time which is adequate to insure that all materials delivered against the Purchase Order (PO) meet all specified requirements. While EM Research, Inc. (EMR) does not currently require certification to ISO 9001, Suppliers are strongly encouraged to use the ISO 9001 Standard as the basis for their quality system development. EM Research reserves the right to perform surveys and audits necessary to assure conformance to the Quality Assurance Requirements of the latest PO issue in effect unless otherwise noted. EM Research also reserves the right to request Corrective Action for Quality System or material noncompliance.

2.0 EM Research/ EM Research Customer Right of Entry

EM Research and EM Research's customers reserve the right to inspect any or all of the work in this order at the Supplier's location. In addition, the Supplier's quality and manufacturing processes are subject to review by authorized EM Research representatives at any time during production.

3.0 Approved Suppliers

EM Research maintains a list of approved Suppliers. Suppliers are monitored by purchase order performance and are subject to continuing performance measurements based on both conformance to requirements and delivery

performance. Late shipments or the shipment of discrepant (nonconforming) material will affect a Supplier's approval rating, and may cause corrective action and re-assessment of approval status.

4.0 Order of Precedence

In the event of an inconsistency or conflict between provisions of EM Research's requirements submitted, Purchase Order, documentation, drawings, etc., the Supplier shall immediately notify the EM Research Buyer. The inconsistency or conflict shall be resolved by giving precedence in the following order

1. PO and any purchase descriptions contained therein.
2. PO Standard Terms and Conditions
3. Specifications and / or drawings.
4. Other provisions when attached.

5.0 Notice of Delays

Whenever the Supplier has knowledge that any actual or potential issue, event, or circumstance is delaying or threatens to delay the timely performance of this order, the Supplier shall immediately give written notice thereof, including all relevant information with respect thereto, to the EM Research Buyer with estimated delivery date.

6.0 Change of Management / Ownership

Supplier shall notify the EM Research Buyer in writing when a significant change in management or ownership has occurred.

7.0 Quality Records and Data

Objective evidence of chemical and physical reports, certifications, inspections, test engineering changes and other quality and/or engineering data shall be retained by the Supplier for not less than seven (7) years after final payment on the procurement document, unless otherwise requested by EM Research. This objective evidence shall be subjected to review at any time by EM Research upon request:

8.0 Measuring and Test Equipment

As applicable to this procurement, the Supplier shall be responsible for validating the accuracy and stability of tools, gages, and test equipment used to demonstrate that any item conforms to the requirements specified in the procurement document. Documented schedules shall be maintained by the Supplier for periodic calibration to adequate standards. Objective evidence of calibrations shall be recorded and made available by the Supplier for EM Research's review upon request.

9.0 Packaging and Documentation

9.1 Packaging, Preservation, and Storage

The Supplier shall incorporate good commercial practices for preservation and packaging of all items that apply to the purchase order. The Supplier is responsible for assuring that all items are delivered to EM Research without damage or deterioration. The Supplier will assure that items are efficiently and economically packed appropriately to provide protection from physical and environmental damage due to method of transportation and type of handling during shipping and handling. Unit and intermediate packaging shall be employed as necessary to prevent damage or deterioration.

9.2 Basic Certificate of Compliance

Supplier shall submit with each shipment a

Certificate of Compliance, which certifies that the material or parts furnished per EM Research's procurement document have been manufactured, inspected, and tested in accordance with the requirements of the applicable specifications/drawings as specified on the procurement document. The certification must specifically contain:

1. Date of Issue.
2. EM Research Part Number/ Drawing number and revision (when applicable).
3. EM Research purchase order number and quantity.
4. Manufacturer Part Number.
5. Traceability Number (Serial Number, Batch Number, Job Number, Lot Number, or Date Code).
6. MIL-SPEC number (when applicable).
7. Approval signature from the Supplier authorized Quality Representative.

In addition, the Supplier must state in the certification that objective evidence sufficient to substantiate the Certificate of Compliance is on file and is available for EM Research review. One (1) reproducible copy of the Certification of Compliance shall be supplied to EM Research concurrently with each delivery of article(s). Materials received without a Certificate of Compliance may be rejected and returned at supplier's expense.

9.3 Identification

Each packing slip shall be identified with the following information.

1. Purchase order number
2. Part Number/Drawing Number and Revision (when applicable)
3. Quantity
4. Manufacturer name
5. Manufacture date/ date code
6. Serial number (when applicable)
7. Lot number (when applicable)
8. Cure date (when applicable)
9. Expiration dates (when applicable)
10. Warning of "Electrostatic Static Discharge (ESD) sensitive" (when applicable)
11. Cautionary Handling Instructions (when applicable)

10.0 Prohibited Practices

10.1 MRB Authority

MRB authority is not granted to the Supplier for this Purchase Order. Supplier is not authorized by EM Research to perform MRB activities on non-conforming materials without the EM Research Buyer's authorization.

10.2 Process Changes

The Supplier shall notify EM Research in writing for approvals prior to implementation of any changes that directly affect supplied product in the areas of design, fabrication method, or process. This includes but not limited to, QMS, processing, materials, fixtures/tooling, measurement/test equipment, calibration, and services.

10.3 Re-submittal of Rejected Items

Any item rejected by EM Research shall not be subsequently resubmitted by the Supplier without the item being clearly identified as a resubmitted or reworked item, indicating the procurement document number, EM Research's MDR number and Supplier's RMA number on the supplier's packing slip and/or Certificate of Conformance (CofC).

10.4 Notification of Facility Change

Supplier shall not use nor relocate any EM Research approved production, manufacturing, and/or processing facilities during performance of the work specified in the procurement document. EM Research's Buyer shall be notified in writing prior to performance against the procurement document and afforded an opportunity to examine and approve any such facility changes for compliance with procurement quality requirements.

10.5 Technical and Non Technical Requirements & Deviations

No deviations from the specified requirements are permitted by the Supplier without either a revision to the procurement document or written approval from EM Research. All technical and non-technical requirements as outlined or defined by pertinent drawings and or material specifications shall be specifically

adhered to by the approved Supplier. The Supplier shall notify in writing and obtain written approval from EM Research for proposed changes in the design or processes of their products, whenever such changes affect applicable EM Research orders.

11.0 Inspection System

11.1 Inspection

The Supplier's quality system is subject to EM Research audit verification at any time during fulfillment of this order. The Supplier shall maintain a documented inspection system adequate to assure that all materials shipped on this order meet all of the applicable inspections and tests performed and shall provide for the maintenance and availability of these records for examination and verification by EM Research upon request.

Note: EM Research's expectation of Suppliers is that all lots of products received have zero nonconformances to its requirements. The use of a statistically sound sampling plan is required (e.g., ANSI/ASQC Z1.4-1993) to achieve this.

11.2 Inspection at EM Research

All purchased material from supplier is subject to sampling or 100% inspection at EM Research. Discrepancies found within a sample can cause rejection and return of an entire shipment. Acceptance of and/or payment for incoming material does not preclude discovery and return of discrepant material at a later date.

11.3 Non-Conforming Material

EM Research may reject any product, individual item or complete lot shipment, delivered that does not conform to established requirements and specifications. Shipment of non-conforming material may cause the generation of a Supplier Corrective Action Request (SCAR), which must be answered promptly and satisfactorily. Failure to do so can cause removal from the Approved Supplier List. Responses to

Supplier Corrective Action Requests shall be timely and shall include the following information:

1. Root cause of deficiency.
2. Action taken to correct the specific deficiency.
3. Action taken to prevent recurrence of the deficiency.
4. Action taken to determine if other products are affected.
5. Effectivity date for implementation of identified corrective and preventive actions.
6. Verification that the corrective and preventive actions are effective.

As part of immediate containment of the deficiency, the Supplier shall also notify EM Research immediately of any potential nonconformances, or latent defects that may be present in the procured materials and which become apparent subsequent to EM Research accepting delivery.

12.0 Workmanship

All items on this order shall be fabricated and finished in a thorough, high quality, workmanship-like manner. Particular attention shall be given to cleaning, absence of blemishes and foreign material, identification, and general appearance.

SQ-2 RoHS And/Or Pb-Free (Lead Free)

The term Pb-free (Lead-free) is defined in JESD 97 and applies to components which the Lead (Pb) level in any of the raw materials and end product is less than or equal to 0.1% by weight and also meets any Pb-free requirements/definitions adopted by the RoHS Directive 2002/95/EC. The RoHS term is an acronym for European Directive, *Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment*. This also means a component with Pb-free termination finish compatible with Pb-free soldering processes.

When RoHS and/or Pb-free compliant is required as part of the purchase order, the following is required.

1. A Certificate of Compliance shipped with the ordered item(s) that certifies that the component(s) of parts ordered are Pb-free

under definitions in JESD97 and/or RoHS compliant under Directive 2002/95/EC of the European parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances in electrical and electronics equipment (RoHS Directives).

2. A Lead Free/RoHS indicator placed on packaging of applicable items by Supplier.

SQ-3 Material Safety Data Sheet (MSDS)

All materials which are volatile, toxic or emit fumes, which are harmful to human health, shall be properly contained in accordance with applicable health and safety requirements. Containers shall be plainly marked as to its contents with appropriate warnings, precautions, instructions, and storage conditions. Material Safety Data Sheet (MSDS) shall be included with each shipment.

SQ-4 Limited Shelf-Life Material

The supplier shall identify all materials and articles, which have definite characteristics of quality degradation with age and/or environment. The supplier shall affix this information directly on the material container or article. The supplier shall identify the container with the start date of useful life and the date on which useful life is expended. When environment is a factor in determining useful life, the identification shall include the storage conditions (i.e., temperature, humidity, etc.) required achieving the stated life. A minimum of 75% of the applicable material/article shelf life shall remain upon receipt of the material by EM Research or the material is subject to rejection and return to the supplier.

SQ-5 Special Process Certification

The supplier shall be responsible for conformance of their outside manufacturer and/or processors to the applicable specifications. Each shipment shall be accompanied by a legible and reproducible copy of certification to the applicable specifications such as those specifications regarding but not limited to, heat treat, chemical treat, plating, welding, etc. Certifications must show specification number,

revision letter, and quantities affected by this certification, also the agency performing the outside service.

SQ-6 Test and Inspection Data

Inspection measurements and/or electrical test results of items on this procurement document shall be taken and included with each procurement document shipment. Actual data to be recorded shall be as specified in the detail specification/drawing. The Supplier shall assure that products failing to meet performance requirements are not shipped to EM Research. As a minimum test data shall include:

1. EM Research Part number/ Drawing number and revision
2. EM Research procurement document number
3. Supplier Acceptance Test procedure number (as applicable) and revision date.
4. Characteristic(s) measured
5. Date and test completion
6. Evidence of test acceptance by supplier's quality function.

SQ-7 Dimensional Data

Recorded findings on all critical dimensions shall be submitted. Critical dimensions are defined as those dimensions, which would have an adverse effect on the next higher assembly if tolerances are not maintained.

SQ-8 Physical or Chemical Test Report

Each shipment must be accompanied by a legible and reproducible copy of a physical or chemical test report identifiable with specification test requirements and material submitted. These reports must contain the signature of a responsible representative of the agency performing the test and must assure conformance to specification requirements.

SQ-9 Calibration Services

The Supplier's calibration system shall conform to ISO 10012-1, ANSI/NCSL Z540-2 or equivalent.

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The Supplier of calibration services shall provide certification that such services were accomplished utilizing standards traceable to National Institute of Standards in Technology, been derived from accepted values of natural, physical constants or been derived by the ratio type of self-calibration techniques and their system is compliant to MIL-STD-45662 or ANSI Z540-1.

SQ-10 Equipment Designated for EM Research Calibration Recall System

This clause is applied to equipment that is purchased to perform an acceptance test of deliverable hardware or to measure/verify a process parameter as specified in a procedure used to manufacture deliverable hardware.

The supplier shall deliver the following information to EM Research.

1. Identification of the calibration items and parameters.
2. Certification of current calibration status of these items.
3. Methods/Procedures used for calibration of these items.
4. Recommended calibration recall intervals for these items.

SQ-11 EM Research First Article Inspection

This order is subject to the approval of a First Article sample at EM Research. Supplier should deliver one sample, which represents in all aspects, the items to be delivered, and await approval before shipping the remainder of the order. Manufacture of the remainder prior to the First Article Approval is at the risk of the supplier.

SQ-12 Supplier First Article Inspection

The supplier shall create or select a first article inspection sample, and perform a complete inspection to all drawing requirements. The First Article Inspection Report shall accompany the product upon delivery and the part the first article was performed on shall be appropriately identified in the delivery.

SQ-13 Electrostatic Discharge Control

The supplier shall provide and maintain a program for Electrostatic Discharge (ESD) control for hardware or component items to be furnished for this procurement in accordance with one or more of the following standards.

1. MIL-STD-1686 Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
2. ANSI-S20.20 For the Development of an Electrostatic Discharge Control Program for – Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
3. EIA 625 Requirements for Handling Electrostatic Discharge Sensitive Devices

Supplier's ESD control program shall be subject to review and approval by EM Research. Items shall be packaged for shipment to EM Research with ESD protective material. Unless otherwise specified in the Purchase Order, the Supplier shall package material in a manner that will assure protection against corrosion, oxidation, deterioration, and physical damage during shipment to EM Research. Bulk packaging may only be used

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if and when the component lead integrity is maintained and material is protected against damage. All packages shall be identified with a suitable precautionary label such as:

Caution Note

Observe Precautions For Handling Electrostatic Discharge Sensitive Items.

The label shall not be utilized as a sealing device. Any ESD components or assemblies received by EM Research that are not in an ESD protective material shall be subject to return to Supplier.

SQ-14 Inspection and Test Instructions

1. Supplier – Original Manufacturer

The Supplier shall prepare and maintain written instructions for inspections and tests performed for ordered item(s) on the Purchase Order. The instructions shall include identification of the item inspected or tested, measuring and test equipment used, details of inspection and test operations performed, and the criteria determined for conformance or non-conformance to manufacturer's and/or EM Research's specifications. These Quality Records shall be made available to EM Research upon request.

2. Supplier – Distributor

Supplier shall submit with each shipment a Certificate of Compliance, which states the certified traceability from the manufacturer that the material or parts furnished per the Purchase Order meets the manufacturer's acceptance specifications. This objective evidence from the manufacturer shall be made available to EM Research upon request.

SQ-15 Interchangeability

All items purchased under this Purchase Order are to be completely interchangeable. Any deviation to any of the supplier's design, processes, or procedures requires prior approval by EM Research. The supplier shall be liable for all EM Research's costs associated with the discovery and retrofit of non-interchangeable parts.

SQ-16 Certified Tin Mitigated (CTM)

The term Certified Tin Mitigated (CTM) is defined as active or passive components whose terminal plating contains $\leq 97\%$ (by weight) of the material Tin (Sn) and $\geq 3\%$ (by weight) of the material Lead (Pb).

When CTM certified active or passive parts are required as part of the purchase order, the following is required.

1. A Certificate of Compliance shipped with the ordered part(s) that certifies that the terminal plating of the part(s) has been tested and found to contain $\leq 97\%$ (by weight) of the material Tin (Sn) and $\geq 3\%$ (by weight) of the material Lead (Pb).
2. A Certificate of Compliance from the manufacturer and/or copy of the test results showing the method of analysis and acceptance shall be included with shipped part(s).