



## ATTACHMENT "Q", QUALITY ASSURANCE REQUIREMENTS

### *General Requirements applicable to all Purchase Orders*

#### **A. SURVEILLANCE**

LightWorks Optical Systems (LWOS) Quality Assurance representative reserves the right to conduct periodic audits of Seller's Quality Assurance inspection system, and to witness and/or conduct inspections and tests to assure materials or supplies satisfactorily meet procurement document requirements; review corrective action activities and other records that reflect on hardware or service quality.

#### **B. CHANGES**

Supplier shall not accept verbal changes to the specifications, drawings or Purchase Orders Requirements.

#### **C. DISCREPANCIES**

Any deviations from established drawing or specifications intended for shipment must be reported to the LightWorks Optical Systems buyer immediately. No deviations will be considered approved without written confirmation from the buyer. Repairs are not to be undertaken without prior written approval from the buyer. Unless otherwise specified in this Purchase Order, the Supplier and/or any of their Suppliers/Subcontractors do not have authority to process "USE-AS-IS", "REPAIR", "STANDARD REPAIR PROCEDURES (SRPS)" or "NON-SRPS" via their Material Review Board (MRB). These dispositions, as well as deviations and request for waivers, requiring MRB disposition shall be submitted to LightWorks Optical Systems for approval. This does not include REWORK or SCRAP. The Supplier/Subcontractor shall utilize its appropriate nonconforming material disposition form and submit it to the Buyer of Record for LightWorks Optical Systems' approval.

#### **D. CORRECTIVE ACTION**

Acceptance of this Purchase Order obligates the supplier to perform, upon request, a corrective action investigation when discrepant material is received at LightWorks Optical Systems. A written report shall be furnished, within a stipulated time period, which is specific and conclusive to prevent a recurrence of the discrepancy.

#### **E. DOCUMENTATION**

LightWorks Optical Systems shall not accept items delivered under the purchase order if the supplier fails to submit certifications or other documentation specified in the purchase order.

#### **F. PRESERVATION AND PACKAGING**

Unless special packaging requirements are referenced in the purchase order, the supplier shall use best commercial practices for preservation and packaging of articles supplied to LightWorks Optical Systems, and shall identify each package with the purchase order number, date shipped and packing sheet number.

#### **G. (LWO "G") COUNTERFEIT PART PREVENTION**

A. Definition - "Counterfeit work" means work that is, or contains, items deliberately misrepresented as having been designed and/or produced under an approved system and/or acceptable method. The term also includes approved work that has reached a design life limit or has been damaged beyond possible repair, but is altered and deliberately misrepresented as acceptable.

B. Prohibition - **Seller shall not deliver products that contain counterfeit items** (such as, but not limited to, software, material, electrical/mechanical parts /assemblies, etc.). SAE AS5553 provides guidance for counterfeit prevention.

C. Prevention - Seller shall only purchase products to be delivered or incorporated as work to LWOS directly from the original component manufacturer (OCM), original equipment manufacturer (OEM), or through an OCM/OEM authorized distributor chain. Work shall not be acquired from independent distributors or brokers unless approved in advance, in writing, by LWOS.



D. Notification - Seller shall immediately notify LWOS with the pertinent facts if seller becomes aware, or suspects, that it has furnished counterfeit work. When requested by LWOS, seller shall provide OCM/OEM documentation that authenticates traceability of the affected items to the applicable OCM/OEM.

E. Remedies - In the event that work delivered under the contract/purchase order constitutes or includes counterfeit work, seller shall, at its expense, promptly replace such counterfeit with genuine parts conforming to the requirements of the contract/purchase order. Seller shall be liable for all costs relating to the removal and replacement of counterfeit work, including, without limitation, LWOS's costs of removing counterfeit works, of re-installation of replacement work, and of any testing necessitated by the re-installation of work after counterfeit parts have been exchanged.

#### **H. STANDARDS SPECIFICATION REVISION LEVEL**

For any military, industrial, commercial, and/or other national standard which may be referenced within drawings/specifications applicable to the contract/purchase order, seller shall use the latest revision at time of the contract/purchase order unless otherwise indicated.

When a military specification and/or other national standard has been cancelled and/or replaced, the approved replacement specification shall be used. Contact the LWOS buyer to determine applicable specification and revision if there is any question.

#### **I. (LWO SQC - 23) Flow Down Requirements)**

This clause mandates that all applicable requirements that are invoked or applied in LightWorks Optical Systems purchasing document, including this clause, are flowed down to the Seller and the Seller's sub-tier suppliers

### **QUALITY ASSURANCE CLAUSES**

**The following clauses become a part of the purchase order when specified by number or letter code on the Purchase Order.**

1. **(LWO SQC - 01, 02, 02A, 03) SUPPLIER INSPECTION/QUALITY SYSTEM**

The supplier shall provide and maintain a system that complies with:

- A. Option Deleted
- B. MIL-I-45208A, "Inspection System Requirements"
- C. ISO 9001 or AS9100, "Quality Management System"
- D. Supplier shall maintain an inspection system acceptable to LightWorks Optical Systems, subject to inspection and approval at all times by LightWorks Optical Systems Quality Assurance.

2. **(LWO SQC - 04, 04A, 04B) CALIBRATION REQUIREMENTS**

The supplier shall maintain a calibration system in accordance with the intent of ANSI/ASQC M1-1996, Calibration Systems.

- A. (LWO SQC-04) The Supplier shall maintain a calibration system in accordance with the requirements of ANSI/NCSL-Z540-1, ISO 10012:2003.
- B. (LWO SQC-04A) The Seller shall provide a certificate of calibration with each shipment. This document shall include:  
Standard(s) used for calibration and a statement as to their traceability (NIST).
- C. (LWOS SQC-04B) Test Facility Requirements - The suppliers test facility shall comply with ISO/IEC 17025:2005, General Requirements for Testing and Calibration Laboratories. Third party registration by an accredited registrar is acceptable. The suppliers system will be subject to review and approval by LightWorks Optical Systems.

3. (LWO SQC - 15) INSPECTION DATA SHEETS AND SPECIAL TEST REPORTS

With each shipment the supplier shall submit inspection reports, data sheets or special test results, as applicable, and as described in A through G below. Data sheets or test results shall be identified with the applicable drawing and/or specification number, revision, LightWorks Optical Systems purchase order number and the supplier's lot identification number.

- A. (LWOS SQC – 15A) Inspection reports shall cover all physical and dimensional characteristics for the item as called out on the drawing, or in the applicable specification. The supplier shall report the actual dimensions of each part inspected and inspect all parts manufactured. The inspection results shall be traceable by serial number or other identification method to the actual part inspected.
- A1. Inspection reports shall cover all physical and dimensional characteristics for the item as called out on the drawing, or in the applicable specification. The supplier shall report the dimensional range of parts inspected, and inspect all parts manufactured. The inspection results shall be traceable to the lot of parts inspected.
- B. Inspection reports shall list the physical and dimensional characteristics of the items. Sample inspection shall be performed to verify critical dimensional characteristics of the lot of parts are within drawing specification limits. Actual dimensions do not have to be reported except where specific dimensions are requested.
- C. (LWO SQC – 15C) Test reports for special tests such as vibration, shock, rain, sand and dust, pressure, environmental, EMI, ATP and others shall be supplied by the seller.
- D. Destructive Testing Analysis (DTA) report is required. The supplier is to permanently identify the parts that have gone through DTA and are no longer suitable for intended use. The tested parts shall be delivered to LightWorks Optical Systems.
- E. (LWO SQC – 15B) Interferograms are required with each shipment. Interferograms are to be identifiable to individual parts by serial number.
- F. Mesh coating (grid) Data Sheet is required with each coating run.
- G. Test reports for material properties, such as index of refraction, absorption, modulus of rupture, and others as noted on the purchase order, shall be submitted with shipment.

NOTE: Out of tolerance dimensions shall be identified on an inspection report. The supplier shall not deliver parts that are out of tolerance to LightWorks Optical Systems without approval from LightWorks Optical Systems Quality Assurance Department.

4. GOVERNMENT INSPECTION

Government inspection is required prior to shipment from your plant. Upon receipt of this order, promptly notify the Government Representative who normally services your plant so that the appropriate planning for Government Inspection can be accomplished.

If no Government Representative normally services your plant, contact LIGHTWORKS OPTICAL SYSTEMS Purchasing Agent and/or Quality Assurance Representative immediately. Evidence of Government Inspection must be shown on the shipping documents.

5. USE OF LIGHTWORKS OPTICAL SYSTEMS DRAWINGS

Supplier shall thoroughly check LightWorks Optical Systems drawing prior to use in manufacturing of item(s) described therein. Any inaccuracies or incompleteness of the drawing will be reconciled with the Buyer's Procurement Representative before proceeding with production.

6. (LWO SQC - 12) CERTIFICATE OF CONFORMANCE

- A. Seller shall submit with each shipment a Certificate of Conformance, signed by its Quality Assurance Manager, or authorized designee, stating the product supplied is in full conformance with all physical configuration and functional test specifications; that all raw material used conforms to applicable specifications. Inspection and test data, physical and chemical analysis, and in-process inspection data are on file at Seller's plant subject to review by LightWorks Optical Systems upon request.

Material or process specifications listed on an LWOS purchase order must be referenced on the supplier's Certificate of Compliance. In addition, C of C shall include:

- Contract Purchase Order number
- Part number and revision level
- Quantity, and if applicable, serial number(s)
- Manufacturer's name and, if applicable, manufacturer's part number
- Applicable date code and/or lot number
- Country of origin
- Date

B. A legible copy of Certification of Conformance from original manufacturer of product supplied shall accompany each shipment from the seller. C of C shall include:

- Contract Purchase Order number
- Part number and revision level
- Quantity, and if applicable, serial number(s)
- Manufacturer's name and, if applicable, manufacturer's part number
- Applicable date code and/or lot number
- Country of origin
- Date

C. Other certification(s), as specified herein are required.

7. (LWO SQC - 17) SHELF LIFE DATA

The supplier shall furnish the date of manufacturer, useable shelf life, expiration date of useable shelf life, any special storage conditions, and any safety warnings for each item shipped. Material safety data sheet must be included with each shipment. Items will not be accepted by LightWorks Optical Systems where shelf life remaining is less than 75% of total shelf life as calculated by the formula shown below:

**Formula for obtaining 75% remaining shelf life of ACS (Age Controlled Substance)**

**Formula:**

$$X\% = (1 - a/b) * 100$$

**Where b= total months between DOM (Date of Manufacture) and DOE (Date of Expiration)**

**Where a= total months between DOM (Date of Manufacture) and Receiving**

**Where X= % of remaining shelf life of the product**

**Example (assume a=3 months & b=12 months):**

$$X\% = (1 - a/b) * 100 = (1 - 3/12) * 100 = (1 - .25) * 100 = .75 * 100 = 75\% \text{ Remaining Shelf Life}$$

8. (LWO SQC – 07) TRANSMISSION CURVES/REFLECTANCE CURVES/MELT DATA

Each shipment must be accompanied by:

- A. Transmission curves
- B. Reflectance curves
- C. (LWO SQC – 14C) Melt data

Coating transmission or reflectance curves shall be identified with coating run number, and the angle of incidence.

(LWO SQC – 14) Seller Records, Raw Material

When required by Purchase Order, the Seller shall:

- D. Submit certifications for raw material used in the production of parts supplied to LightWorks Optics.
- E. Submit copies of actual chemical and physical test reports identifiable with the material submitted.

9. (LWO SQC - 13, 25) WITNESS SAMPLE/TEST BARS/ SPECIMENS

The supplier shall submit with each shipment, witness samples, test bars, specimens in accordance with the following:

- A. Optical coatings. Supplier shall submit a minimum of three (3) witness samples per run coated with the item(s) being processed. One (1) sample shall be used for environmental and durability tests, one (1) sample shall be used for reflectance/transmission tests, and on (1) sample shall not be tested. Inspection and tests results must be traceable to the samples tested.
- B. (LWO SQC – 25) Test Bars. Supplier shall submit test bars representative of original material. Testing and quantity of test bars required shall be in accordance with the applicable specification, to LightWorks Optical System's drawing LWOET-MCH-017-0X, or as detailed in the Purchase Order. Appropriate inspection/test results are required and must be traceable to the sample tested.
- C. Specimens. Specimens representing plating, painting, heat treating, or as specified in the applicable specification or Purchase Order, shall be supplied with each shipment. Appropriate inspection/test results are required and must be traceable to the sample tested.
- D. Mesh Resistivity/Gridded Samples. Supplier shall submit as a minimum one (1) mesh resistivity witness sample per run with the part(s) being processed. Gridded witness samples(s), which are provided by LWOS, shall be returned with each shipment.

10. (LWO SQC - 05, 06) SPECIAL PROCESSES DATA

Seller and any Sub-Contractor engaged in Special Processes, such as soldering, cleaning, welding, heat treating, plating, anodizing, chemical-film coating, etc., shall have Special Processes approval by LIGHTWORKS OPTICAL SYSTEMS and/or its Customer.

When required, and as noted on the Purchase Order, special processing shall **ONLY** be performed by suppliers approved for special process by LWOS's customers.

Certificate of Conformance stating batch or lot number, date manufactured, specification or material control number shall be submitted with material.

11. (LWO SQC - 10) SOURCE INSPECTION

Source Inspection shall be conducted by LightWorks Optical Systems at the Supplier's facility or where designated in the Purchase Order prior to shipment. Inspection/test of the items shall be performed by the Seller, and shall be subjected to witness by LightWorks Optical Systems Quality Assurance Representative. LightWorks Optical Systems Quality Representative shall elect to do 100% or sample of the units. If sample is elected, the sample will be selected by LightWorks Optical Systems Representative. Seller shall have available and present upon request, documented evidence of in-process and/or final inspection/test data. Required documentation for shipment must be completed and signed by signed by its Quality Assurance Manager, or authorized designee, and available for LightWorks Optical Systems Quality Representative's review.

12. (LWO SQC -11) FIRST ARTICLE INSPECTION

On the First Initial Production and the First Article produced, the Seller shall perform and document a comprehensive inspection and test of the article to assure the items conform to all blueprint and specification requirements. First article inspections shall be performed in accordance with aerospace standard AS9102.

- FAI performed by suppliers shall include:
  - A. First article inspection report.
  - B. Documentation of the verification of the engineering against the manufacturing work instructions.
  - C. Documentation of the verification of all process steps performed by the operator.

- Witnessing of the acceptance test procedure (ATP) will also become a part of the FAI when applicable.
- PARTIAL OR COMPLETE RE-ACCOMPLISHMENT OF FAI:  
Changes, as defined in AS9102, paragraph 5.3 or a break in production of one (1) year or more shall require a new FAI.
- FAI RESULTS DOCUMENTATION:  
Inspection results shall be documented by recording variable data whenever possible. Attribute data will be recorded only when variable data is not available.

The Seller's report shall include: Purchase Order Number, Part Number, Revision Level, Part Name, Seller's Name, Drawing Requirements (including tolerance), method used to obtain results and actual results of each measurement. Part(s) used for the inspection shall be identified when shipped to LightWorks Optical Systems as "First Article Inspection Sample". First Article Data shall be accompanied the shipment, Attention: Quality Engineering – Vendor Control. First article data sheets may be in Seller's format as long as the format follows the AS9102 standards.

**13. (LWO SQC - 8) IDENTIFICATION AND CONTROL BY SERIAL NUMBERS**

Seller shall identify individual serial numbers, to all items shipped to LightWorks Optical Systems and shall appear on the certification. Serial numbers shall be assigned by to LightWorks Optical Systems. The method of marking will be specified in the Purchase Order or on a furnished manufacturing drawing. The Seller shall maintain traceability of each serialized item to raw materials used in its manufacturing processes.

**14. (LWO SQC - 9) IDENTIFICATION AND CONTROL BY LOT**

Traceability of items shall be by lot number rather than individual serial number. Seller shall assign a common lot number to all items in a specific manufactured lot.

**15. (LWO SQC - 16) APPROVED SUPPLIER**

Supplier must be approved by LightWorks Optical Systems Quality Assurance prior to purchase order or contract award. The supplier must have completed an audit questionnaire or an on-site physical survey by LightWorks Optical Systems Quality Assurance Representative. The supplier must be on an approved vendor list prior to release of purchase order or contract to the supplier.

**16. (LWO SQC - 20) CHANGES TO WORK**

The Supplier shall make no changes to Work under this Purchase Order or Contract including any change in design, manufacturing process, materials, or otherwise which may affect form, fit, or function of the Work without prior notification to and approval by the LightWorks Optical Systems Procurement Representative. Such notification shall consist of detailed drawings clearly defining such changes and the date such changes are proposed to be effective. Such notification shall not constitute approval of the proposed change nor relieve the Supplier of the obligation to comply with requirements contained in the Purchase Order or Contract. If the proposed change is approved, the change approval shall be documented.

**17. (LWO SQC - 20) MOVEMENT OF WORK**

The Supplier agrees that the manufacturing and/or fabrication of Work being delivered under this Purchase Order will not be moved to another production facility without the express written approval of LightWorks Optical Systems.

**18. DFAR FLOWDOWN REQUIREMENTS:**

Pursuant to DFARS 252.225-7014, specialty metals incorporated in articles delivered to LightWorks Optical Systems must be: (1) melted in the United States, its possessions or Puerto Rico; (2) melted in a "qualifying country" as defined in DFARS 225.872-1; or, (3) incorporated in an article manufactured in a "qualifying country."



19. NAS 412 FLOWDOWN REQUIREMENTS:

Supplier shall comply with NAS412 to prevent Foreign Object Damage (FOD) to manufactured products.

20. (LWO SQC - 24) RECORDS RETENTION:

The supplier shall generate and maintain records as required by the purchase order. All records shall be made available upon request to the Buyer or Government Representative. Records shall provide evidence that the required inspections and tests have been performed, including part, component, or system identification, inspection or tests involved, number of items accepted or rejected. The records shall be suitable in format, accuracy, and completeness to permit analysis. Certifications, test reports and records shall be retained **for a minimum of seven years** and shall not be destroyed without specific approval from LightWorks Optical Systems.

21. LOCKHEED COMMON PROCESSES REVISION STATUS

When Lockheed Martin specifications beginning with, 799, 79C, 79E, 79M, 79P and 79T, are referenced within drawings/specifications applicable to the contract/purchase order, seller shall use the latest revision at the time of the contract/purchase order unless otherwise stated. If there is any question then contact the LWOS buyer to determine applicable revision.

22. (LWO SQC-18) Electronic Assemblies

Electronic assemblies shall be manufactured and inspected in accordance with the requirements of ANSI/J-STD-001 and IPC-A-610. Product specific requirements related to classification will be specified on the drawing or purchase order.

23. (LWO SQC-18A) Electrostatic Sensitive Devices

Devices delivered under this Contract are Electrostatic Sensitive. The Seller shall assure that devices delivered are packaged to provide electrostatic protection and are identified as ESD in accordance with applicable specifications.

24. (LWO SQC-19) Special Process Suppliers

LightWorks Optical Systems approved suppliers shall be used for all special processes called out in specifications or drawings.

- A. The following special processes shall only be performed by suppliers that have received Nadcap® accreditation.

|              |                                        |
|--------------|----------------------------------------|
| MIL-DTL-5541 | Chemical Conversion Coatings           |
| MIL-A-8625   | Anodic Coatings                        |
| ASTM A967    | Passivation                            |
| ASTM A 380   | Cleaning, Descaling, Passivation of SS |
| AMS-QQ-P-35  | Passivation                            |
| AMS 2700     | Passivation of CRES                    |

25. (LWO SQC - 21) Acceptance Test Procedures

The Seller shall prepare separate detailed test procedures encompassing tests required for acceptance. Each item of hardware, or part thereof, which requires acceptance testing, shall be covered by an Acceptance Test Procedure. Acceptance Test Procedures require LightWorks Optical Systems approval prior to the delivery of the first unit of hardware. Subsequent changes are subject to LightWorks Optical Systems approval prior to incorporation.

Where these tests are performed utilizing equipment controlled by computer software or firmware, the software or firmware associated with, or affecting, those tests require LightWorks Optical Systems approval at the same time(s) as the Acceptance Test Procedure.

26. (LWO SQC - 22) Contamination Control

Articles ordered under this Contract shall be cleaned by the Seller to the level specified on the procurement drawing or specification. Cleaning and/or testing of the articles shall be performed in facilities with procedures and equipment approved by LightWorks Optical Systems. Each article shall be identified with a "Cleaning Status Certification and Identification Label." The label shall document the cleanliness level and be attached in a prominent location.

27. (LWO SQC - 26) Ozone Depleting Substances

Class 1 ODSs as defined by the US EPA shall not be used in the design, test, manufacture, integration and assembly, handling, transportation, or other operations associated with flight hardware.

Use of Class II ODSs shall be either eliminated or minimized.

Subcontractors, suppliers, and manufacturers should abide by the Clean Air Act Amendments Title VI established ODS production phase-out schedules.

28. (LWO SQC - 27) Restriction of Hazardous Substances (RoHS) Directive

The RoHS Directive restricts the use of the following six substances:

1. Lead (Pb)
2. Cadmium (Cd)
3. Mercury (Hg)
4. Hexavalent chromium (Hex-Cr),
5. Polybrominated biphenyls (PBB)
6. Polybrominated diphenyl ethers (PBDE).

Parts delivered under this category require certification with each shipment that the parts meet the directive.

The maximum permitted concentrations of all substances, except for cadmium, are 0.1% or 1000 ppm by weight of homogenous material. Cadmium concentrations are limited to 0.01% or 100 ppm by weight of homogeneous material.

Unless otherwise specified in LightWorks Optical procurement documents, the latest RoHS directive shall be the governing document.

29. (LWO SQC - 28) Certified Fasteners

All certifications supplied with each shipment shall be legible from each raw material, manufacture and test facility. The certifications will include the following information:

1. Name and address of the supplier facility.
2. Part number, applicable lot numbers, applicable specifications, and revision levels.
3. Raw material data:
  - a. Material specification.
  - b. Alloy class, type, or grade.
  - c. Raw material, heat, lot, or melt number.
  - d. Name of raw material producer.
4. As required testing/treatments to specifications:
  - a. Chemical analysis report.
  - b. Mechanical/physical properties test report.
  - c. Metallurgical examination report, e.g. microstructure and/or macrostructure.
  - d. NDT test results: dye penetrant, magnetic particle, torque, etc.



e. As required special processes certifications: e.g. plating, anodizing, passivation, chemical films etc.

If Seller is not the manufacturer, Seller's name and Customer's purchase order/contract number will be referenced on the manufacturer's certification.

Packaging shall be done in a manner to prevent damage, corrosion, and contamination to threads during shipment.

On steels harder than RC 33, plating shall be applied by a process that is not embrittling to the steel. Substitutions of raw stock types are **NOT** permitted when controlled by specifications. All fasteners shall be manufactured/tested with qualified materials, people, processes, and equipment.