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Pages 1 to 28

CHECKLIST FOR WAVEGUIDE DEVICES

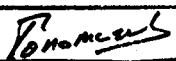
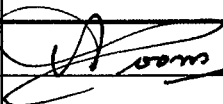
MANUFACTURER AND LINE SURVEY

ESA/SCC Basic Specification No. 2023102

Manufacturer :
Location :
Survey Team Leader :
Date of Survey :
Waveguide Device Type(s) :



space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 1	November 1994		



SCC

ESA/SCC Basic Specification
No. 2023102

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ISSUE 1

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.

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**1. INTRODUCTION**

This checklist is intended for use during the initial survey of a Manufacturer's ability to produce high quality articles, his management organisation, production facilities, test facilities and technical know-how. When completed, this checklist should enable the party interested in procurement of the subject components to assess the ability of the Manufacturer concerned to successfully execute a contract for the supply of high reliability space hardware.

2. SURVEY CHECKLIST**2.1 INTERVIEW ON ARRIVAL OF SURVEY TEAM**

(a) Introductory Remarks by Team Leader (Explanation of purpose of survey, procedures to be followed, time limitations, etc.):-



(b) Notes (Atmosphere during reception, willingness to co-operate, interest shown, comments on personnel, general remarks):-

2.2 MANUFACTURER AND SURVEY TEAM INFORMATION

(a) Survey requested by :
Survey Team Leader :
Team Members :

(b) Key personnel of Manufacturer interviewed:-

	<u>Name</u>	<u>Function</u>	<u>Tlph. Ext.</u>
1.			
2.			
3.			
4.			
5.			

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(c) Type of Company (Private company, limited company, etc.)

Affiliated with any other company? If so, which:

No. of employees:

- Total number :
- Production :
- Quality Assurance :
- Q.A. Inspection :
- Prod. Engineering :
- Design Engineering :
- Reliability Control :
- Other :

(d) Number of shifts :

(e) Plant area :

(f) General production line :

(1) Device types manufactured:

(2) Will flow diagrams of steps to produce waveguide devices be available to Survey Team?
YES NO

Are specifications, if any, referenced in the flow diagrams?
YES NO

(g) Principal Government and industrial customers:-

- 1.
- 2.
- 3.
- 4.
- 5.

(h) The Manufacturer's Quality System is organised in accordance with:

Comments

(i) Manufacturer's Government Service Inspection:

DCAS Inspector, resident/non-resident

(j) National Inspectorate:

(k) Is the Manufacturer's waveguide production

(1) Continuous?	YES	NO
(2) Pilot production?	YES	NO
(3) Advanced R&D, limited?	YES	NO

(l) The Manufacturer has adequate experience in the production of the following hi-rel parts:-

2.3 MANAGEMENT ORGANISATION

- (a) What is general policy/attitude of the Management regarding quality/reliability programme?



- (b) Which level of Management participates actively in orientating policy towards space component production?

- (c) Which organisation, if any, reviews and monitors all work involved in space component production?

- (d) Is work related to space components (contracts) regarded as "normal business" or as belonging to the "unique order" category?

- (e) What is the general policy concerning proprietary rights?

- (f) Has the "Reliability" department the same authority from Management as the "Engineering" and "Production" departments? Does this mean direct responsibility for reliability of products in the line?

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(g) Has the Q.A. Manager direct authority for implementation of quality policy and actions related to the line?

(h) Does a system exist for the regular supply of quality report summaries to Management?

Does this system lead to (corrective) actions being taken in respect of the production line?

(i) Are key management staff notified of persistent out-of-control conditions?

(j) What is length of service and experience of key management personnel (Q.A., Reliability, Production, Engineering Design)?

(k) How would contract for space components be organised?

(l) How can original requirements from Orderer (Space Agency or end-user) be assumed to be correctly translated into internal instructions?

(m) How can information necessary to the Orderer (corrective actions, deviations, notification of inspections and/or problem areas) be assumed to be issued and channelled to the Orderer?

2.4 QUALITY ASSURANCE SYSTEM AND ORGANISATION

- (a) To whom does Q.A. Manager report?

- (b) Does the company reflect a positive attitude towards Quality Assurance? YES NO
_____ _____
Comments

- (c) Has the Q.A. group sufficient authority in relation to its position within the company's organisation (see organigram)? _____ _____
Comments

- (d) Are areas of responsibility within the Q.A. group clearly defined? _____ _____
Comments

- (e) Are corrective actions to which Q.A. management is committed delegated to responsible staff or does Q.A. management have direct authority regarding the line? _____ _____
Which?

- (f) Is there a periodic and comprehensive quality data reporting system which covers all operational phases? _____ _____
Comments

- (g) What is the relationship between Q.A. and Reliability?

- (h) Is a Q.A. manual or equivalent document supplied to all levels of appropriate supervisory personnel? _____ _____
Is such document kept updated? _____ _____
Comments

	YES	NO
(i) Are written procedures available for identification and positive control of accepted/rejected materials?	___	___
Comments		
(j) What is ratio Q.A. inspectors : personnel directly involved in production?		
(k) Is inspection (acceptance sampling or sorting) performed by Q.A. personnel:-		
On receipt? Sampling ___ Sorting ___ None ___		
During processing? Sampling ___ Sorting ___ None ___		
During final testing? Sampling ___ Sorting ___ None ___		
Comments		
(l) Are written procedures kept and used in areas for:-		
Receiving inspection?	___	___
In-process inspection?	___	___
Fabrication processing?	___	___
Final testing?	___	___
Comments		
(m) Does Q.A. maintain a system of written procedures for statistic controls (control chart, lot plot, etc.) in any of the following areas?		
In-process inspection?	___	___
Fabrication processing?	___	___
Final inspection?	___	___
Comments		
(n) Is Q.A. responsible for determination of need for, and the conducting of, quality training?	___	___
Comments		
(o) Are training programmes provided for special process personnel?	___	___
Comments		



	YES	NO
(p) Do employees have to pass tests:-		
After training?	___	___
Periodically?	___	___
Comments		
(q) Are production operators provided with visual aids and working instructions?	___	___
Comments		

2.5 CALIBRATION

(a) Does Manufacturer maintain calibration facilities and standards?	___	___
Is this service purchased?	___	___
If so, from whom?		
(b) Do calibration personnel have written procedures for control and a time schedule for measurement frequency?	___	___
Comments		
(c) Is there an effective calibration record control system?	___	___
(d) Are calibration procedures adhered to and up-to-date?	___	___
Comments		
(e) Are decals used for equipment identification to show that units have been calibrated; when next calibration date is due and calibrator identification?	___	___
Are decals up-to-date?	___	___
(f) Are adjustments of calibrated equipment required to be sealed and tamper-proof?	___	___
(g) Who is in charge of initiating calibration steps?		
User	___	___
Calibration personnel	___	___
Q.A.	___	___



	YES	NO
(h) Do calibration procedures provide for removal of any equipment not maintained or calibrated according to established schedules? Comments	___	___
(i) Have calibrating personnel up-to-date certification records reflecting date, traceability to NBS and identification of calibrator? (1) Mechanical standard? (2) Electrical standard?	___ ___ ___	___ ___ ___
(j) Is modified and/or repaired equipment calibrated prior to release?	___	___

2.6 DRAWING AND CHANGE CONTROL

(a) Has Manufacturer adequate written procedures for control of specification and contract changes? Comments	___	___
(b) Does Manufacturer's system provide for documented change control guaranteeing availability of required drawing at relevant manufacturing or inspection step? Do flow documents show current revisions? Comments	___ ___	___ ___
(c) Are drawings furnished by ESTEC and contract changes adequately controlled? Comments	___	___
(d) Does Q.A. review all drawings and changes therein prior to their becoming effective? Comments	___	___
(e) Has Manufacturer established a procedure for notifying his Supplier of changes in drawings? Comments	___	___
(f) Are current specification revisions shown on prints of drawings?	___	___



2.7 RELIABILITY

YES NO

(a) Is structure of Reliability organisation clearly defined? _____

Has Reliability same authority in respect of the line as Production or Engineering management? _____

Comments

(b) Is there a direct feed-back of information between Reliability, Design Engineering and Q.A. groups to ensure timely notification of all relevant data? _____

Comments

(c) Does Reliability respond promptly and efficiently to unexpected and/or newly detected failure modes? _____

Comments

(d) Are line failures (types and causes) analysed and reported to those responsible for corrective actions? _____

(e) Are corrective actions resulting from failure analysis agreed with the Q.A. group involved or Reliability if parts or process changes must be made?

Q.A. Group _____

Reliability _____

Comments

(f) Has Reliability right to approve test specifications, data tabulation, parts or process changes? _____

(g) Is there a system for in-process failure analysis? _____

End-item failure? _____

Reporting? _____

Comments



	YES	NO
(h) Are following items submitted to failure analysis as a matter of routine?		
- Production line rejects	___	___
- Lots with a high rejection rate	___	___
Define:-		
- Items returned by Orderer	___	___
- Items returned by Orderer with special request for failure analysis	___	___
(i) Has Manufacturer a failure analysis laboratory or an equivalent facility?	___	___
Comments		
(j) Are failure analysis procedures:-		
(1) Available?	___	___
(2) In use?	___	___
(3) Adequate?	___	___
Comments		
(k) Is failure analysis equipment:-		
(1) Available?	___	___
(2) In use?	___	___
(3) Adequate?	___	___
Comments		
(l) Are there special personnel for failure analysis?	___	___
Comments		
(m) Are failure analysis reports:-		
(1) Available?	___	___
(2) Adequate?	___	___
Comments		
(n) Has Reliability a programme to ensure reliability of discrete device designs prior to release thereof?	___	___
Comments		



	YES	NO
(o) Has Reliability access to all pertinent development and production data of discrete devices for analysis purposes? Comments	—	—
(p) Is reliability data available of discrete devices from the line(s) which the Manufacturer wishes to be approved? Comments	—	—
(q) Has Manufacturer an evaluation laboratory for determination of product characteristics? Comments	—	—
(r) If Manufacturer has an evaluation laboratory: - Does it operate according to an established programme? or - According to special requests? Comments	— —	— —
(s) Give examples of problems investigated by evaluation laboratory		
(t) Are laboratory results available on request?	—	—
(u) Are data sheets based on these results?	—	—

2.8 CONTROL OF PROCUREMENT SOURCES

(a) Has Manufacturer adequate written procedures for purchase control of materials, components and services? Comments	—	—
(b) Has Manufacturer an effective vendor rating system? Comments	—	—



	YES	NO
(c) Does rating system provide for effectiveness of written corrective actions received from Suppliers?	—	—
Comments		
(d) Do purchase documents require delivery of test reports if such reports are specified in the relevant ESA contract?	—	—
Comments		
(e) Is there a means of channelling information when specification changes require modification of current purchase orders?	—	—
Is "Receiving Inspection" notified of changes in purchase orders?	—	—
Comments		
2.9 <u>CONTROL OF INCOMING MATERIALS</u> (Performed in situ)		
(a) Are Manufacturer's written standard inspection procedures adequate for control of incoming materials and services received?	—	—
Do inspectors know how and when to apply these procedures?	—	—
Comments		
(b) Are materials received in a controlled area from which removal prior to inspection is impossible?	—	—
Comments		
(c) Are materials properly handled and protected during the receiving process?	—	—
Comments		
(d) Does Receiving Inspection use drawings and purchase orders?	—	—
If so, do these documents show Quality Control review?	—	—
Comments		
(e) Are test reports from Suppliers being reviewed?	—	—
Comments		



	YES	NO
(f) Are accepted materials adequately identified? Do documents show evidence of acceptance? Comments	___ ___	___ ___
(g) Are rejected materials adequately identified and segregated? Comments	___	___
(h) Which materials are subject to limited shelf life limitations? Comments		
(i) Are shelf life and cure date materials properly identified and controlled? Comments	___	___
(j) Do records indicate traceability of units, lots and sublots to applicable documents (specification, revision letter - if any - and inspection record)? Comments	___	___
(k) Are materials stored in a controlled area under the responsibility of an authorised Custodian? Comments	___	___
(l) Are suitable inspections and tests, including physical and chemical tests, performed on raw materials? Comments	___	___
(m) Are such tests performed: - In-house? - At other locations? Comments	___ ___	___ ___

	YES	NO
(n) Are storage containers, racks, bins, etc. adequate for type of material stored?	—	—
Comments		

(o) Is lot traceability maintained?	—	—
Comments		

(p) Is "first in/first out" method applied?	—	—
---	---	---

2.10 IN-PROCESS INSPECTIONS AND TESTS

(a) To whom does In-process Q.A. Inspection report?		
---	--	--

(b) Are inspection and/or operation travellers used sequential to performance and control of all operations and processes?	—	—
Comments		

(c) Do travellers refer to inspection procedures?	—	—
Do inspectors know how and when to use them?	—	—
Comments		

(d) Do travellers refer to controlled <u>specifications</u> ?	—	—
Do specifications show <u>current</u> revision status?	—	—
Comments		

(e) Does Q.A. have written in-process procedures to control acceptance of products?	—	—
Comments		

(f) Is type and quantity of available inspection equipment adequate for type of work being accomplished?	—	—
Comments		



	YES	NO
(g) Are documentation and instruments used by inspectors subject to calibration control?	—	—
Is calibration evident and up-to-date?	—	—
Comments		
(h) Is there a specific material review procedure?	—	—
Comments		
(i) Do in-process Q.A. inspectors summarise quality experience on the basis of specific process stages?	—	—
Do they issue quality reports on a regular basis?	—	—
Do reports result in assistance and/or action?	—	—
Comments		
(j) Are requests for corrective action issued in writing?	—	—
Are such requests answered?	—	—
Does corrective action ensue?	—	—
Comments		
(k) Does Q.A. maintain any statistic controls (X&R, etc.) in the in-process area?	—	—
Are these controls up-to-date and at individual process stations?	—	—
Comments		
(l) Is lot identification maintained throughout processing?	—	—
Comments		
(m) Are there documents describing in-process manufacturing procedures and controls?	—	—
Comments		

	YES	NO
(n) Are there documents describing in-process inspections?	—	—
Do inspectors know how and when to use them?	—	—
Comments		
(o) Are there specific standards for handling, cleanliness and care of materials, parts and equipment?	—	—
Comments		
(p) Are calibrations evidenced and up-to-date?	—	—
(q) Has Q.A. authority to stop production flow in case of out-of-control conditions?	—	—
Is a written material review procedure in use?	—	—
Comments		
(r) Are records maintained of training and competence of operators for welding, soldering, radiography, radiflo and plating?	—	—
Comments		
(s) Are certified operators identifiable by means of a card or badge on their clothing?	—	—
Comments		

2.11 SURVEY OF MANUFACTURING LINE

This review shall be performed in 2 phases:-

- (1) Identification of the various steps listed in the flow chart to define the corresponding operations and collect all relevant information.
- (2) Actual line survey (indicate if inspection was performed).

If different technologies are applied, the inspection results shall be supplied on separate sheets.

	YES	NO
2.11.1 <u>Machined Parts</u>		
(a) What material and plating is used for:-		
(1) Waveguide parts?		
(2) Assembly/fixing/tuning etc. hardware?		
(b) Is the machining done in-house?	—	—
If not, where?		
(c) How is quality controlled?		
(d) Is the plating done in-house?	—	—
If not, where?		
(e) How is the quality controlled?		
2.11.2 <u>Assembly</u>		
(a) What joining process is used?		
(b) Is the joining done in-house?	—	—
If not, where?		
(c) How is the quality controlled?		
(d) How is the position of the elements defined?		
(e) How is the quality of the assembly controlled?		

YES NO

(f) What inspection criteria are applied:-

(1) During assembly?

(2) On the completed unit?

2.11.3 Tuning

(a) How are the devices tuned?

(b) If tuning screws are used, how are they locked in position?

(c) How is the quality of the locking material ensured and controlled?

2.11.4 Final Test Area and Screening Facility

(a) Are they separate operations?

(b) Are final production tests (see ESA/SCC specification) performed by personnel under Q.A. monitoring? or

Are they performed by Q.A. personnel?

Comments

(c) Are written inspection and test procedures for product classes on the line available for the final test (Q.A.)?

Comments

(d) Do inspectors use assigned stamps to indicate inspection status on materials and accompanying documents?

Comments



	YES	NO
(e) Are requests for corrective action made in writing?	___	___
Are such requests answered?	___	___
Comments		
(f) Are rejected devices identified and segregated in a controlled area?	___	___
Comments		
(g) Are records of accepted and rejected material maintained?	___	___
Are these records identifiable with such materials?	___	___
Comments		
(h) Are device failures analysed?	___	___
Are device failure analyses summarised and reported by final Q.A.?	___	___
Comments		
(i) Is a summary inspection and test report sent regularly to quality management (lot acceptance, percentage of defects, types of failure)?	___	___
Comments		
(j) Is a testing laboratory or equivalent facility available for quality assurance purposes?	___	___
Which of the following tests are performed in the laboratory or facility?		
(1) Electrical tests	___	___
(2) Mechanical tests	___	___
(3) Chemical tests	___	___
Comments		
(k) Are statistical controls of device parameter distribution maintained?	___	___
Are they reported to Q.A. or Reliability?	___	___
Comments		



	YES	NO
(l) Is an environmental test facility maintained in-house?	---	---
If not, state where:		
Are the following tests performed at this facility?		
(1) Temperature (high, low, cycle)	---	---
(2) Shock (mechanical, thermal)	---	---
(3) Acceleration	---	---
(4) Vibration (fixed, variable)	---	---
(5) Moisture resistance	---	---
(6) Altitude	---	---
(7) Radiographic	---	---
(8) Hermeticity tests	---	---
(a) Fine leak, if applicable	---	---
(b) Gross leak or penetrant dye	---	---
(9) Lead fatigue	---	---
(10) Life tests - operating	---	---
Comments		
(m) Is available equipment used:		
- For production?	---	---
- In R&D?	---	---
- For Quality Control on a sample basis?	---	---
- For screening?	---	---
(n) Are charts provided for the monitoring of environmental test equipment?	---	---
Comments		
(o) Is test equipment adequate for fulfilment of specification requirements?	---	---
Comments		



	YES	NO
(p) Is final external visual inspection performed on 100% of the devices? Comments	___	___
(q) Are devices stored in a limited access area? Comments	___	___
(r) Are devices adequately identified to Customer requirements? Comments	___	___
(s) Are there provisions for lot identification? Comments	___	___
(t) How many burn-in positions are available: - At room ambient temperature? - At specified ambient temperature? - At specified case temperature (cooled hot plate)?		
(u) Does burn-in require soldering of leads? Comments	___	___
(v) What precautions are taken to maintain solderability of leads after burn-in? Comments		

- | | YES | NO |
|---|-----|----|
| (w) How does Manufacturer ensure that failed devices are separated from processed lots of: <ul style="list-style-type: none"> - SCC Level 'B'
 - SCC Level 'C' | | |
| (x) Has Manufacturer all test equipment necessary to perform all qualification tests: <ul style="list-style-type: none"> - In-house? _____ - In nearby facility? _____ Specify equipment and its location:

<ul style="list-style-type: none"> - In remote location _____ Specify equipment and its location: | | |

2.12 PRESERVATION, PACKING AND SHIPPING

- | | | |
|---|-------|-------|
| (a) Are there adequate written procedures for control of shipping?
Comments | _____ | _____ |
| (b) Are materials designated for shipment properly identified, handled and protected?
Comments | _____ | _____ |
| (c) Do copies of Customer's purchase order and evidence of inspection acceptance accompany materials from end of final test up to the time of shipment?
Comments | _____ | _____ |
| (d) Do Q.A. personnel perform audits of all outgoing lots?
Comments | _____ | _____ |



	YES	NO
(e) Do shipping documents reflect inspection status or evidence of inspection, identification and similar shipping requirements?	___	___
Comments		
(f) Does Manufacturer verify conformity of devices and invoices with purchase order?	___	___
Comments		
(g) Does Manufacturer implement special packaging methods for hi-rel devices?	___	___
If so, which of following methods is used?		
- Individual packages	___	___
- Mechanical protection	___	___
- Environmental protection	___	___
- Special warning labels	___	___
(h) Is shipping method designed to allow official inspection by Customs without actual removal of protective material?	___	___
Comments		
(i) Do instructions prohibit the use of substandard packaging methods for shipment of hi-rel devices?	___	___

2.13 SUMMARY OF INSPECTION RESULTS

Indicate inspection results per manufacturing and testing area, whereby:

- V = Adequate.
- O = Insufficient or non-adequate.
- = Not checked or not applicable.

	1	2	3	4	5	6	7	8	9	10
--	---	---	---	---	---	---	---	---	---	----

Environmental conditions:

- Cleanliness
- Temperature control
- Humidity control
- Occupancy

Procedures available:

- Travellers
- Calibration
- Segregation of rejects
- Inspection evidence

Area No.

- 1 =
- 2 =
- 3 =
- 4 =
- 5 =
- 6 =
- 7 =
- 8 =
- 9 =
- 10 =



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2.14 GENERAL OBSERVATIONS (Not to exceed 2 pages)