

# **Semelab Limited**

## **High Reliability and Screening Options**

# Contents

- 1. Introduction..... 1
- 2. Quality Approvals ..... 2
- 3. Material Qualification ..... 3
  - 3.1 Header/Cap/Wire Approval Procedures..... 3
  - 3.2 Die Approval Procedure..... 4
- 4. CECC (Discrete Products)..... 5
  - 4.1 Inspection Levels for CECC Fully Assessed Devices..... 5
  - 4.2 CECC Screening Options ..... 7
  - 4.3 CECC processed devices (QR208, QR209) ..... 8
- 5. BS (Linear Products) ..... 9
  - 5.1 Inspection Levels for BS Fully Assessed Devices..... 9
  - 5.2 BS Screening Options (Linear IC's)..... 11
- 6. BS & CV (Discrete Products) .....12
  - 6.1 BS and CV processed devices (Bipolar) ..... 12
- 7. DSCC / 883B (Linear Products) .....13
  - 7.1 Inspection Levels for DSCC SMD listed Devices ..... 13
  - 7.2 Screening Sequence for DSCC SMD listed devices ..... 15
  - 7.3 MIL-883B Processed Integrated Circuits (QR214, QR215) ..... 16
- 8. MIL-PRF-19500 - QR205, QR204 (Aerospace)..... 17
  - 8.1 QR205 - Inspection levels: 'Mil Processed' Quality Conformance ..... 18
  - 8.2 QR204 - Screening Sequences 'Mil Processed' Components ..... 20
- 9. MIL-PRF-19500 - QR216, QR217 (Space) ..... 21
  - 9.1 Space Level Processed Discrete Semiconductors (QR216, QR217) ..... 21
  - 9.2 QR217 - Inspection levels: 'Space Level Processed' Conformance ..... 22
  - 9.3 QR216 - Screening: Space Level Processed' Components ..... 24
- 10. ESA - ESCC (Space) ..... 25
  - 10.1 Chart F2 - Production Control ..... 26
  - 10.2 Chart F3 - Screening Tests ..... 27
  - 10.3 Chart F4 - Qualification and Periodic Tests..... 28
- 11. Screening & Approval Comparison Tables ..... 29
  - 11.1 Comparison of Space Level Screening Options ..... 29
  - 11.2 Comparison of Space Level Die Lot Approval..... 30
  - 11.3 Comparison of Hi-Rel Screening options ..... 31

# 1. Introduction

## Experience and Innovation In Semiconductor Technology

At SEMELAB, we research, design, manufacture and distribute an innovative range of semiconductor products throughout the world.

Our R&D teams have an excellent track record for developing imaginative electronic solutions. Our design engineers have created a wealth of high performance products. Our manufacturing divisions have ensured supreme quality and reliability. And our sales teams and distribution partners have opened international markets to some of the best electronics solutions available.

We hold the necessary Qualification Approvals needed to serve the Military and Hi-Rel Industries now including **QML** Approval for a series of **Linear Integrated Circuits** and **QML** Approval for our laboratory test house capabilities. The test facilities are available to qualify and screen third party products, including Hybrid products not made by the Group. We have the ability and considerable experience of most test methods currently demanded.

We specialise in the fabrication of very high quality products especially intended for use in high reliability applications. We have supplied many millions of discrete and linear integrated circuits into all forms of high reliability equipment such as:

- Space
  - Satellite Vehicles
  - Launchers
  - Support & defence
  - Military
- Aircraft
  - Civil
  - Air Traffic Control
  - Secure Communication Links
  - Military links
- Communications
  - Naval Links
  - Broadcast Transmitters
  - Underwater Repeaters
  - Guided weapons
  - Electronic Counter Measures
  - Command & Control
  - Radar
- Defence
  - Railway Signalling Systems
  - Traction Systems
  - Automatic Signalling Systems
  - Oil Rig Installations
  - Drill Head Sensors
  - Atomic Event Detectors
- Transportation
- Harsh Environment

--- everywhere, when there is a need for cost effective ultra reliable products.

This is SEMELAB: design innovation, backed by numerous approvals and manufacturing strength and **led by a total commitment to quality.**

## 2. Quality Approvals

SCHEME	Description	SML Facilities Approval (Y/N)	SEMELAB Approval Number	SML Devices Types Approved	Remarks
<b>Current Schemes</b>					
BS9000	British Standards for Linear ICs and Discrete Semiconductors	Y detailed approval for many products	1360/M	Linear ICs and Discrete Semiconductors	Replaced in many areas by CECC or DSCC. Approved suppliers and products listed in PD9002
BS EN ISO 9001:2000	International Standard for Quality Assurance management of all phases in the provision of goods and services. Replaces most old "national" systems.	Y	FM36235	refers to all product types	The whole Semelab facility and all Products conform to these norms.
CECC 50000	European Military Quality Approval system for Discrete Semiconductors	Y detailed approval for many products	M1040 IECQ iss2	Small signal discretes, Power discretes	European QPL. Generally in decline
CECC 90000	European Military Quality Approval system for ICs.	Y detailed approval for many products	M1040 IECQ iss2	Linear ICs.	European QPL. Generally in decline
DSCC QPL approval	US Manufacturing approval accepted everywhere	Y detailed approval for large range of linear ICs.	Cage NO. U3158	Linear ICs	Detailed product approval by DSCC (commonly called MIL/883B for linear ICs)
DSCC QML approval	US Manufacturing approval accepted everywhere	Y	DSCC -VQ-03-003050 & DSCC-VQ-03-003049	Linear ICs (Ivl Q certification) Laboratory Suitability	Will generally replace many of the older approval systems on International Military Systems.
ESCC 5000, ESCC 9000	European Space Components Coordination	Y	QPL No 253	2N2880 - more to follow	Product built & supplied in accordance with generic ESCC specifications
STANAG 4093	General reciprocal listing arrangement	Y		All product types	Reciprocal QPL listing between Europe and North America
<b>Schemes being phased out</b>					
AQAP-1	Applies in UK and related areas. Replaced Defence Standard 05/21	Y	MOD Registration No.2M8S02		Being superseded by BS/EN/ISO 9001
GAMT1	French Military approved products list	Y detailed approval for many products		A large number	French Market - should be replaced by BS/EN/ISO9001
MUAHAG	European - Military users and Harmonisation Advisory Group	Y detailed approval for many products		Discretes (vol 7) Linears (vol 9)	Components generally for European Military equipment makers - should be replaced by BS/EN/ISO9001
NATO	NATO system – applies to NATO systems	Y listed for many products	Manufacturer Code 3158	Several hundred discrete products	Tending towards being a legacy system now
<b>Legacy Schemes</b>					
CV	Very early UK approvals system for Military and GPO types	some parts replaced by BS types, CECC or CVxxxx-0 parts			Legacy system – generally replaced by BS or CECC types
DEF Specs	Precursor of Defence Standard Specifications	Many types all built to order.			Replaced by Defence Standard Specifications. Generally already phased out.
Defence Standards (many)	Relate to materials, components and processes for UK Military use	Y for many products but under ISO9001:2000		Discrete products	Legacy system little used now. The most common DEF Stan relating to Semiconductors is DEF STAN 05/21 - replaced by ISO 9001:2000
RRE, RSRE & SRDE Specifications	Specifications drawn up in support of MOD projects	Y for many types		Discrete products	Legacy system little used now.

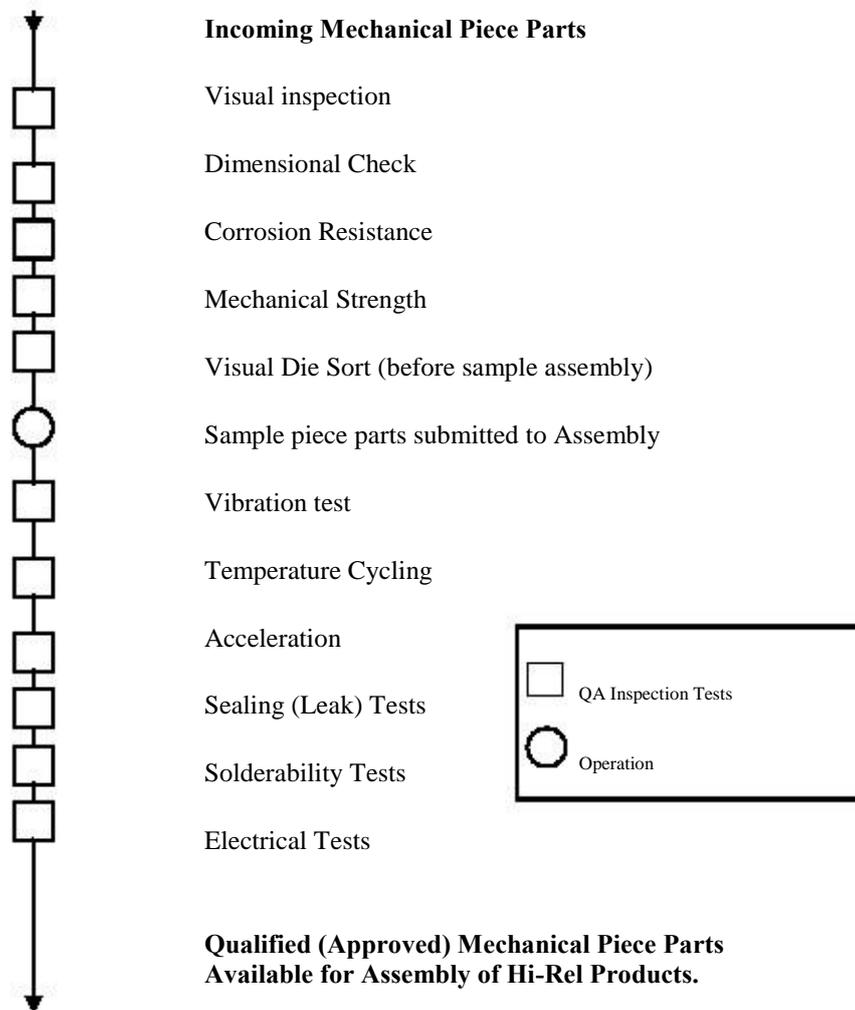
### 3. Material Qualification

#### Piece Part – Qualification and pre-assembly approval process flow.

Before contemplating the assembly of any qualified semiconductor product, it is essential that all the materials used in the construction of the parts be obtained from fully qualified and trustworthy suppliers - those with a long continuous and successful supply history. Little used or untried or suspect materials are thoroughly checked and qualified as being suitable for their intended application before use.

In this case, mechanical piece parts are subject to an exhaustive series of tests culminating in sample assemblies being built to establish lack of flaws and lack of unwanted difficulties during assembly.

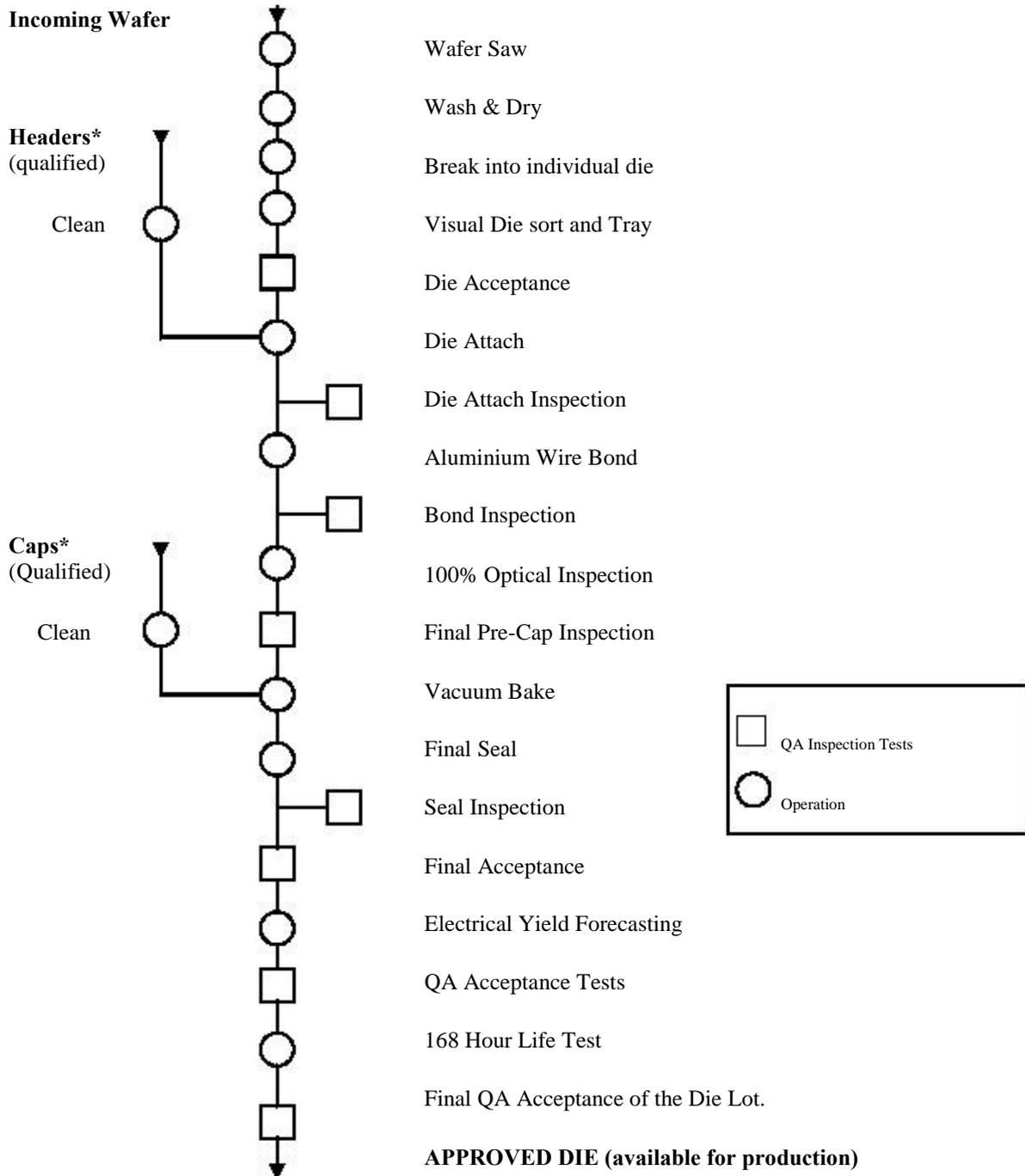
#### 3.1 Header / Cap / Wire Approval Procedures



Notes: Approval procedures are performed on samples to approve each single lot of material.

Each batch of assembled piece parts carries its own unique “date” code. Traceability to each incoming batch of materials (all mechanical batches and die lots) is guaranteed from this unique number.

### 3.2 Die Approval Procedure



All assembled batches carry full traceability back to all incoming materials used via a unique Lot ID assigned at the beginning of the manufacturing stage

Qualification can include an additional 1000 hour or 2000 hour electrical endurance test if required. One of the major objectives is to ensure that the die lot's performance stabilises rapidly during the initial portion of this period and then remain unchanged throughout the remainder of the test (and life). All die lots assigned for space use have 2000 hours electrical endurance as standard

Die and mechanical piece parts intended for use in Ultra-Reliable applications e.g. Space Vehicles are subject to more rigorous evaluation.

## 4. CECC (Discrete Products)

### Registration: M1040 IECQ iss2

SEMELAB offers one of the largest ranges of CECC approved products in Europe, including small signal and power devices. These devices have undergone approval for use in new applications as well as providing continuing support for existing applications.

All piece parts used in the manufacture of CECC released products undergo stringent qualification procedures before they can be used. For further details contact our Quality Manager (qa@semelab.co.uk).

Full forward and backward traceability is maintained on all CECC released devices

All CECC fully assessed devices are subject to groups A, B and C inspection carried out in the Quality Assurance Department in Lutterworth. Assessment is available to levels E, F & L.

### Ordering Information (example):-

BDS18CECC                      full assessment level (without additional screening)  
 BDS18CECC-B                CECC full assessment level + sequence B screen

### 4.1 Inspection Levels for CECC Fully Assessed Devices

#### Group A - Lot by lot inspection

IL = inspection levels  
 AQL = Acceptable Quality Level (%)

Examination or test	Levels of Quality Assessment					
	Level E			Level F & Level L		
	IL	AQL	Observations	IL	AQL	Notes
<b>SUB-GROUP A1</b> Visual Inspection	I	0.65		I	0.65	
<b>SUB-GROUP A2a</b> Non operatives	II	0.15		II	0.15	
<b>SUB-GROUP A2b</b> Electrical Measurements	II	0.40	primary dc characteristics	II	0.65 1.0	if < 4 tests if ε 4 tests
<b>SUB-GROUP A3</b> Electrical Measurements	II	0.65	other dc characteristics	I I	2.5 4	if < 4 tests if ε 4 tests
<b>SUB-GROUP A4</b> Electrical Measurements	S4	1	ac characteristics	S4 S4	4 6.5	if < 4 tests if ε 4 tests

# CECC (Discrete Products)

(continued)

## Group B - Lot by lot inspection

IL = inspection level amb = ambient rated case = case rated  
AQL in %c = acceptance criterion n = sample size

Examination or test	Levels of Quality Assessment					
	Level E	Level F		Level L		Notes
	n/c	IL	AQL	IL	AQL	
<b>SUB-GROUP B1</b> Dimensions	15/0 or 25/1	S2	2.5	S2	2.5	
<b>SUB-GROUP B2c</b> Verification of ratings	15/0 or 25/1	S4	4	NA	NA	see C2c
<b>SUB-GROUP B3</b> Lead bending if applicable	15/0 or 25/1	S3	2.5	S2	4	
<b>SUB-GROUP B4</b> Solderability	22/0 or 38/1	S4	2.5	S4	2.5	
<b>SUB-GROUP B5</b> Temperature Cycle. Acceleration. Seal test or Damp Heat test	15/0 or 25/1	S4	2.5	NA	NA	see C5 see (1) below
<b>SUB-GROUP B8</b> Electrical endurance	38/1 or 52/2	S4	1.5	NA	NA	see C8
<b>SUB-GROUP CTR</b>	Unless otherwise stated in detail specification: attributes information for B3, B4, B5, B8 in CECC specifications					

## Group C - Periodic Inspection

P = periodicity (months) na= not applied

Examination or test	Levels of Quality Assessment						
	E (p = 3 months)		F (p = 3 months)		L		Notes
	n/c	notes	n/c	notes	P	n/c	
<b>SUB-GROUP C1</b> Dimensions	8/0 or 13/1		8/1		3	8/1	
<b>SUB-GROUP C2a</b> Electrical Measurements	15/0 or 25/1		13/1		3	13/1	
<b>SUB-GROUP C2b</b> Complementary characteristics	32/0 or 55/1 15/0 or 25/1	versus T versus I,V	18/1		3	18/1	
<b>SUB-GROUP C2c</b> Verification of ratings	15/0 or 25/1		13/1	when not in B2c	3	8/1	
<b>SUB-GROUP C3</b> Tensile / Torque (if applicable)	15/0 or 25/1		8/1		6	8/1	
<b>SUB-GROUP C4</b> Soldering heat	22/0 or 38/1		18/1		NA	NA	
<b>SUB-GROUP C5</b> Temperature Cycle. Acceleration. Seal test or Damp Heat test	NA	see B5 in CECC	NA	see B5 in CECC	3	13/1	See (1) below
<b>SUB-GROUP C6</b> Shock acceleration vibration	15/0 or 25/1		8/1		6	8/1	
<b>SUB-GROUP C7</b> Damp heat (if applicable)	15/0 or 25/1		18/1		NA	NA	
<b>SUB-GROUP C8</b> Electrical endurance	38/1 or 52/1		43/3 34/2	amb case	3 3	32/3 25/2	amb case
<b>SUB-GROUP C9</b> Storage at high temp	38/1 or 52/2		43/3 34/2	amb case	NA	NA	
<b>SUB-GROUP CTR</b>	Unless otherwise stated in detail specification: attributes information for C3, C5, C6, C9. Measurement information before and after C8						

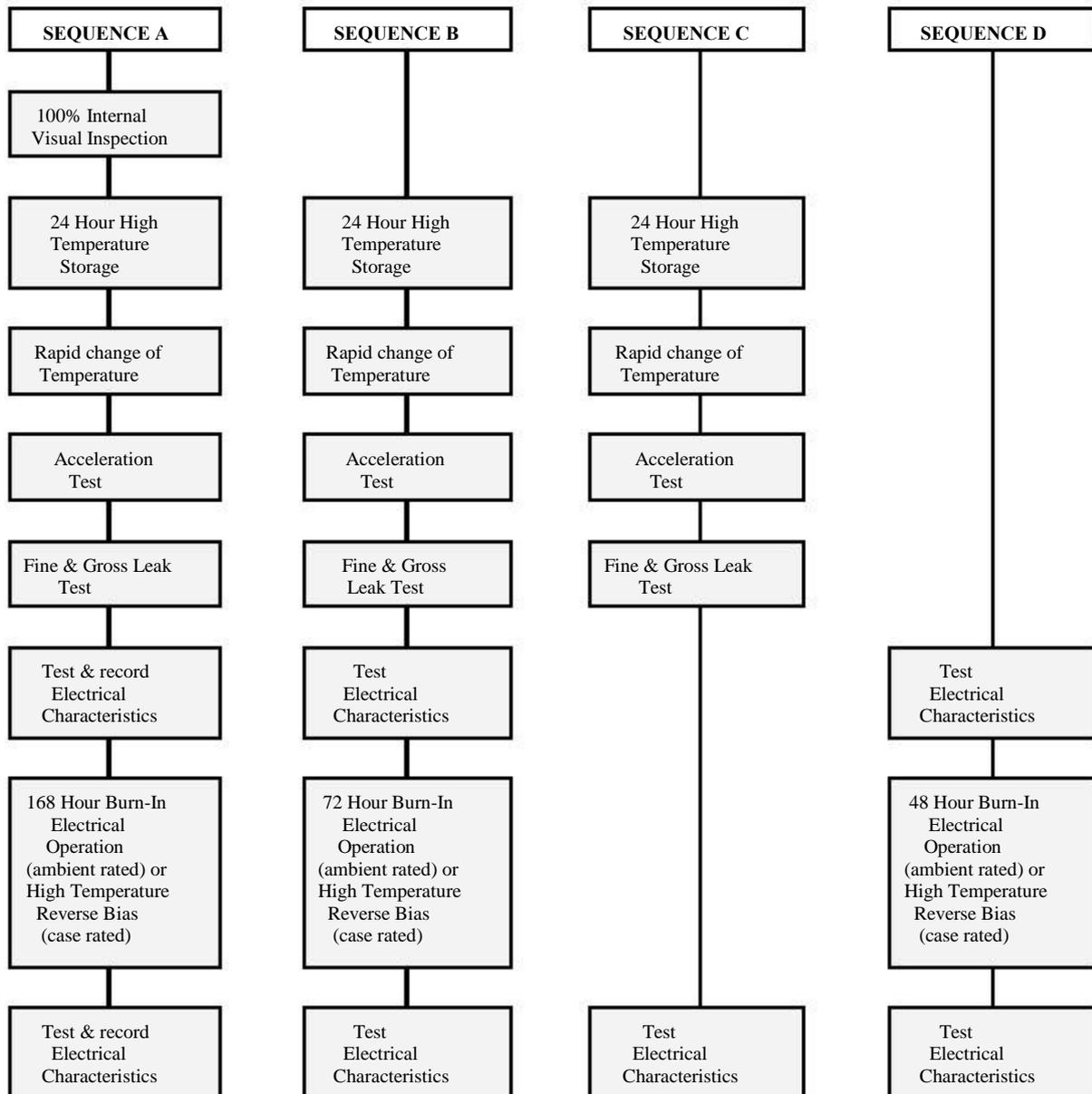
(1) 2 chamber method. T=30 mins, 5 cycles. At maximum and minimum rated storage temperatures

**4.2 CECC Screening Options**

All CECC approved devices can be supplied as a standard full assessment level part or with additional 100% screening to any of the four levels (A, B, C, D) in accordance to CECC 50000 Appendix VI

In addition, SEMELAB can supply screening on products where the full device approval does not exist or is not held. Screening is again carried out in accordance with any of the four levels within CECC 50000 Appendix VI and is carried out at our factory in Lutterworth.

Screening sequences are as laid out below:-



**4.3 CECC Processed Devices**

**QR208: Conformance to the requirements of CECC 50000**

**QR209: Screening to the requirements of CECC 50000 App VI**

QR208 and QR209 are based entirely on CECC 50000 quality conformance inspection requirements and screening options.

By working to these specifications SEMELAB are able to supply full CECC “look alike” products, where no CECC specification exists, released under the company’s ISO9001:2000 approval. Standard processing is done in accordance with Group A (electrical) and Group B (environmental) tests to full assessment level F. Group C tests and level E assessment levels are optional and are available on customer request.

Part numbers for products processed to QR208 and QR209 have -QR added (and a letter corresponding to the screening level if required). The marking for the device has the suffix ‘-O’ added (and a letter corresponding to the screening level if screened).

Semelab are also able to process devices to existing CECC specifications where we have not undergone an approval exercise. This is particularly useful when Semelab want to supply products in a smaller volume that does not justify the cost of the full approval exercise.

Part numbers for parts processed to detailed specifications will have the suffix ‘-O’ added to the original part number (and a letter corresponding to the screening level if required). The marking for the device has the suffix ‘-O’ added (and a letter corresponding to the screening level if screened).

**Ordering Information (when no CECC specification exists):-**

<b>Part Number</b>	<b>Description</b>	<b>Marking (*)</b>
2N5153-QR	QR208 gps A, B level F Processed to CECC full assessment level F, Groups A, B	2N5153-O
2N5153-QR-B	QR208 gps A, B level F + QR209 sequence B Processed to CECC full assessment level F, Groups A, B with screening in accordance with CECC 50000 App VI seq B	2N5153-O/B
2N5153-QR-EB	QR208 gps A, B level E + QR209 sequence B Processed to CECC full assessment level E, Groups A, B with screening in accordance with CECC 50000 App VI seq B	2N5153-O/B
2N5153-QR-EBC	QR208 gps A, B, C level E + QR209 sequence B Processed to CECC full assessment level E, Groups A, B, C with screening in accordance with CECC 50000 App VI seq B	2N5153-O/B

\* Where space permits

## 5. BS (Linear Products)

### Registration 1360/M.

SEMELAB offers a range of BS approved Linear IC's including Voltage regulators, PWM's and Control IC's. These families of devices have undergone approval for use in new applications in addition to providing continuing support for existing applications.

Full forward and backward traceability is maintained on all BS released devices

All BS fully assessed devices are subject to groups A,B,C and D inspection carried out in the Quality Assurance Department in Lutterworth. Screening is available to any of the four levels defined in BS9400 (S1, S2, S3, S4)

The generic specifications for these devices are as follows:

<b>BS9400</b>	IC's - Generic Data & Methods of Test
<b>BS9430</b>	Linear Voltage Regulators
<b>BS9493</b>	PWM and Control IC's

### Ordering Information (example):-

IP117K-BSS2 BS full assessment level + category S2 screening

## 5.1 Inspection Levels for BS Fully Assessed Devices

### Group A - Lot by lot inspection

IL = inspection levels  
AQL = Acceptable Quality Level (%)

Examination or test	Levels of Quality Assessment			
	IL	AQL	BS9400	Observations
<b>SUB-GROUP A1</b> Visual Inspection	I	1.5	1.2.2	
<b>SUB-GROUP A2</b> Non operatives	II	0.15		
<b>SUB-GROUP A3a</b> Electrical Measurements	II	1.5		Static Characteristics Tamb=25°C
<b>SUB-GROUP A3b</b> Electrical Measurements	II	1.5		Static Characteristics Tamb = Tmax
<b>SUB-GROUP A3c</b> Electrical Measurements	II	1.5		Static Characteristics Tamb = Tmin
<b>SUB-GROUP A4a</b> Electrical Measurements	S4	4%		Dynamic Characteristics Tamb = 25°C

## BS (Linear Products)

(continued)

### Group B - Lot by lot inspection

IL = inspection levels  
AQL = Acceptable Quality Level (%)

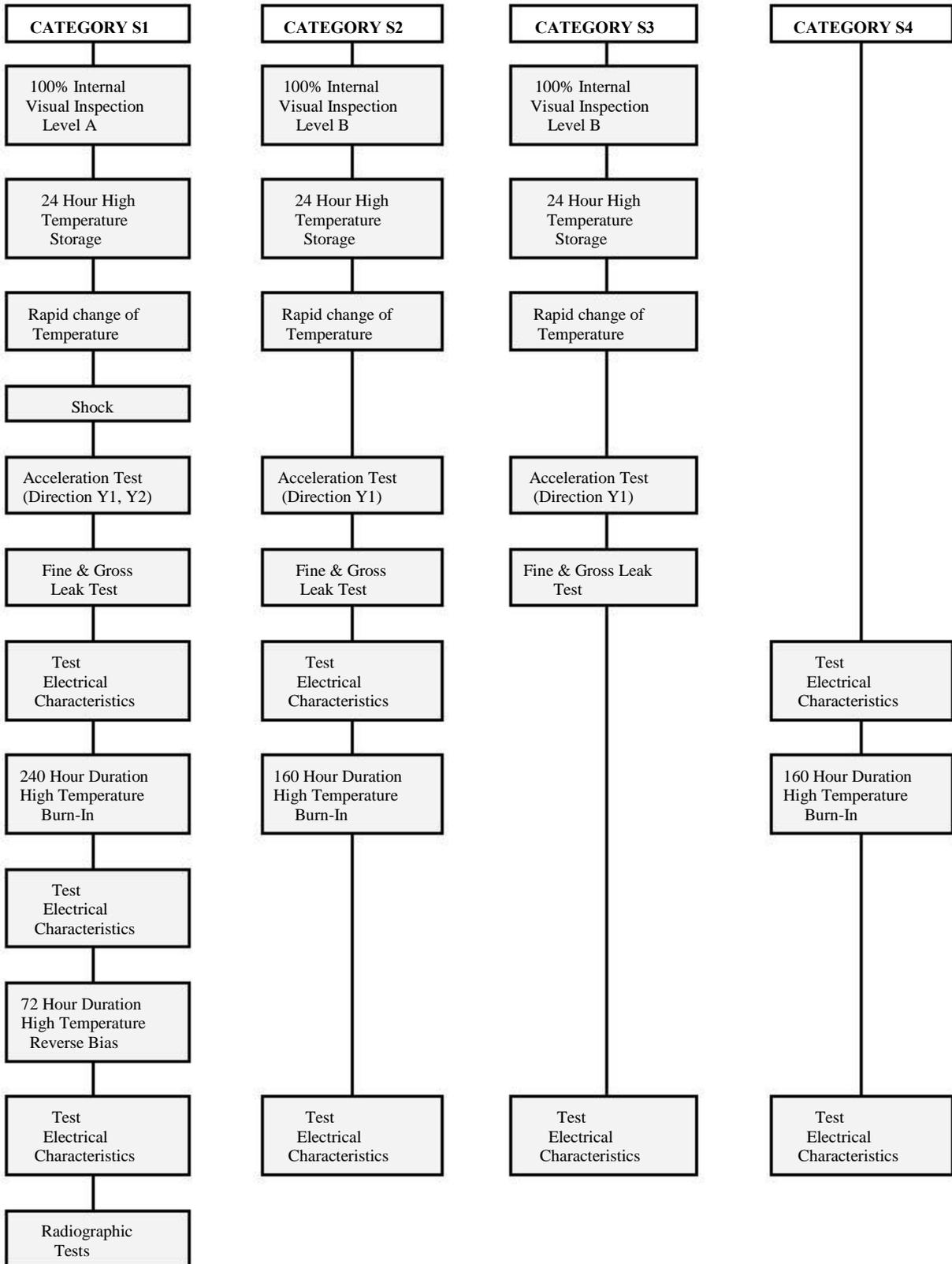
Examination or test	Levels of Quality Assessment			
	IL	AQL	BS 9400	Observations
<b>SUB-GROUP B1</b> Dimensions	S2	6.5	1.2.3	
<b>SUB-GROUP B2a</b> Solderability	S4	4.0	1.2.6.15.1	
<b>SUB-GROUP B2b</b> Change of temp followed by sealing	S4	4.0	1.2.6.13 1.2.6.14.1/2	
<b>SUB-GROUP B3</b> Lead bending	S3	6.5	1.2.6.16.2	
<b>SUB-GROUP B6</b> Acceleration steady state	S4	4.0	1.2.6.9	
<b>SUB-GROUP B7</b> Electrical Endurance	S4	1.5	1.2.7.2.2	
<b>SUB-GROUP B8</b> CTR Information			Unless otherwise stated in detail specification: attributes information for B2a, B2b, B6, B7	

### Group C - Periodic inspection

IL = inspection levels  
AQL = Acceptable Quality Level (%)

Examination or test	Levels of Quality Assessment			
	IL	AQL	BS 9400	Observations
<b>SUB-GROUP C1</b> Dimensions	S2	6.5	1.2.3	
<b>SUB-GROUP C3</b> Vibration followed by Shock followed by Damp Heat Cycle	S2	6.5	1.2.6.8.1 1.2.6.6 1.2.6.5	
<b>SUB-GROUP C5</b> Electrical Endurance	S3	4.0	1.2.7.2.2	Duration = 2000 hrs
<b>SUB-GROUP C6</b> CTR Information	S3	6.5	1.1.11	Unless otherwise stated in detail spec: attributes information for C3 & C5

**5.2 BS Screening Options (Linear IC's)**



(Accept / reject criteria at every stage strictly as defined by the BS Specifications).

## 6. BS and CV (Discrete Products)

### 6.1 BS and CV processed devices (Bipolar)

Semelab is committed to the ongoing supply of a wide range of product types. This includes many products where the original manufacturer has ceased production, which is the case on many discrete products originally supplied against BS specifications.

Semelab can provide 'look-alike' devices against most BS specifications, processing devices as shown below. Semelab can also supply many of the old type CV devices which have been converted into the BS system.

Product is processed to the requirements of Group A (electrical) and Group B (mechanical and environmental) tests of BS detail device specifications. Parts processed in accordance with these specifications are marked with the suffix '-O' added to the original part number.

Screening can also be carried out against the BS sequences A,B,C,D if required

#### Ordering Information (example):

Part Number	Description	Marking (*)
BFT69-O	Requirements of BS9365-F005 Groups A & B	BFT69-O
BFT69-O-B	Requirements of BS9365-F005 Groups A & B With screening in accordance with BS sequence B	BFT69-0/B
CV7xxx-0	Requirements of BS 9300 Cxxx Groups A,B	CVxxx-O

\* Where space permits

## 7. DSCC / 883B (Linear Products)

### Built on Semelab's QML Qualified Production Lines

#### Cage Number U3158

SEMELAB offers a range of DSCC SMD listed and 883B processed voltage regulators, PWM's and Control IC's. All manufacturing is carried out on our QML qualified lines in our Lutterworth factory to the appropriate MIL-STD-883 specifications (5005 - Processing and 5004 - Screening).

### 7.1 Inspection Levels for DSCC SMD Listed Devices

#### Method 5005: Table I Group A electrical tests for class level B

Examination or test	Quality/accept	Observations
<b>SUB-GROUP 1</b> Static Tests	116/0	Tamb = 25°C
<b>SUB-GROUP 2</b> Static Tests	116/0	Tamb = Tmax
<b>SUB-GROUP 3</b> Static Tests	116/0	Tamb = Tmin
<b>SUB-GROUP 4</b> Dynamic Tests	116/0	Tamb = 25°C
<b>SUB-GROUP 5</b> Dynamic Tests	116/0	Tamb = Tmax
<b>SUB-GROUP 6</b> Dynamic Tests	116/0	Tamb = Tmin
<b>SUB-GROUP 7</b> Functional Tests	116/0	Tamb = 25°C
<b>SUB-GROUP 8a</b> Functional Tests	116/0	Tamb = Tmax
<b>SUB-GROUP 8b</b> Functional Tests	116/0	Tamb = Tmin
<b>SUB-GROUP9</b> Switching tests	116/0	Tamb = 25°C
<b>SUB-GROUP10</b> Switching tests	116/0	Tamb = Tmax
<b>SUB-GROUP11</b> Switching tests	116/0	Tamb = Tmin

- 1) The specific parameters to be included for tests in each subgroup shall be as specified in the applicable acquisition document. Where no parameters have been identified in a particular subgroup or tests within a subgroup, no group A testing is required for that subgroup or test to satisfy group A requirements.
- 2) When the (sub)lot size is less than the required sample size, each and every device in the (sub)lot shall be inspected and all failed devices removed from the (sub)lot for final acceptance of that test, subgroup, or set of tests/subgroups.

#### Method 5005: Table IIb Group B tests for class level B

Test	note	MIL-STD-883 method	Condition	Quantity/accept or sample size/accept
<b>Subgroup 2</b> Resistant to solvents	(3)	2015		3/0
<b>Subgroup 3</b> Solderability	(4)	2003	temp 245° ± 5°C soldering	sample size number = 22, c = 0
<b>Subgroup 3</b> Bond strength 1) Thermo-compression 2) Ultrasonic / Wedge 3) Flip-chip 4) Beam lead	(5)	2011	1) Test Condition C or D 2) Test Condition C or D 3) Test Condition F 4) Test Condition H	sample size number = 15, c = 0

- 3) Resistance to solvents testing required only on devices using inks or paints as the marking or contrast.
- 4) Devices submitted for solderability shall be in the same lead finish as shipped product and must have been through the temp/time exposure of burn in except for devices which have been hot solder dipped or have lead-tin fusing after burn-in.
- 5) Unless otherwise specified the sample size number for condition C or D is the number of bond pulls selected from a minimum number of 4 devices and for condition F or H is the number of dice (not bonds).

**Method 5005: Table III Group C (Die related tests) for class level B**

Test	MIL-STD-883 method	Condition	Quantity/accept or sample size/accept
<b>Subgroup 1</b> a) Steady-state life test  b) End-point electrical parameters	1005	Test condition to be specified (1000 hours at 125° or equivalent inC accordance with table 1)  As specified in the applicable device specification	sample size number = 45, c = 0

**Method 5005: Table IV Group D (package related tests) for class level B**

Test (1)	MIL-STD-883 method	Condition	Quantity/accept or sample size/accept
<b>Subgroup 1 (2)</b> Physical Dimensions	2016		sample size number = 15, c = 0
<b>Subgroup 2</b> a) Lead Integrity (3) b) Seal - Fine & Gross leak (5)	2004 1014	Test Condition B (lead fatigue) As applicable	sample size number = 45, c = 0
<b>Subgroup 3 (4)</b> a) Thermal Shock b) Temp Cycle c) Moisture resistance d) Visual Examination  e) Seal - Fine & Gross leak f) End Point Electricals	1011 1010 1004  1014	Test condition B - 15 cycles min Test Condition C. 100 cycles min  In accordance with visual criteria method 1004 and 1010 As applicable As specified in the applicable device specification	sample size number = 15, c = 0
<b>Subgroup 4 (4)</b> a) Mechanical Shock b) Vibration, variable frequency c) Constant Acceleration d) Seal - Fine & Gross leak e) Visual examination f) End point Electricals (6)	2002 2007 2001 1014	Test condition B minimum Test condition A minimum Test condition E minimum (Y1 only)  In accordance with meth 1010 or 1101 As specified in applicable device specification	sample size number = 15, c = 0
<b>Subgroup 5 (2)</b> a) Salt Atmosphere b) Visual Examination c) Seal - Fine & Gross leak	1009 1014	Test condition A minimum In accordance with method 1009	sample size number = 15, c = 0
<b>Subgroup 6 (2)</b> a) Internal water-vapour content			
<b>Subgroup 7 (2)</b> a) Adhesion of Lead finish (12)	1018	5000ppm max water content at 100°C	3/0 or 5/1
<b>Subgroup 8 (2)</b> a) Lid Torque	2025		sample size number = 15, c = 0
	2024		5/0

- 1) In line monitor data may be substituted for subgroups D1,D2,D6,D7 and D8 upon approval by the qualifying activity. The monitors shall be performed by package type and to the specified subgroup test method.
- 2) Electrical reject devices from the same inspection lot may be used for samples.
- 3) The sample size number of 45, C=0 for lead integrity shall be based on the number of leads or terminals tested and shall be taken from a minimum of 3 devices.
- 4) Seal tests need only be performed on packages having leads exiting through a glass seal.
- 5) Devices used in subgroup 3 can be used in subgroup 4.
- 6) End point electrical parameters may be performed after moisture resistance and prior to seal test.
- 7) Sample size based on number of leads.

7.2 Screening Sequences for DSCC SMD Listed Devices

Method 5004: Table 1 Class level B screening

Screen	MIL-STD-883 method	Condition	Requirement
Internal Visual (1)	2010	Test Condition B	100%
Stabilisation Bake	1008	24hrs @ condition C minimum	100%
Temperature Cycling (2)	1010	Test Condition C	100%
Constant Acceleration	2001	Test condition E minimum Y1 orientation only	100%
Visual Inspection			100%
Initial (pre-burn-in) (3) electrical Parameters		In accordance with applicable device specification	100%
Burn-In Test	1015	160 hours at 125° minimumC	100%
Interim (Post Burn-In) Electrical Parameters		In accordance with applicable device specification	100%
Percentage Defect Allowable			5% all lots
Final Electrical Test a) Static tests 1) 25°C subgroup 1 table 1 5005 2) Maximum and Minimum rated operating temperature subgroup 2,3 table 1 5005  b) Dynamic or functional tests 1) 25°C subgroup 4,7 table 1 5005 2) Minimum and Maximum rated operating temperature subgroup 5,6,8 table 1 5005  c) Switching tests at 25°C subgroup 9 table 1 5005		In accordance with applicable device specification	100%  100%  100%  100%  100%
Seal (4) a) Fine b) Gross	1014		100%
Qualification or quality (5) conformance inspection test sample selection	5005	In accordance with applicable device specification	sample
External Visual	2009		100%

- 1) Test samples for group B, bond strength may be selected prior to or following internal visual, prior to sealing provided all other specification requirements are satisfied. Test method 2010 applies in full except when method 5004, alt 1 or 2 is in effect.
- 2) This may be replaced with thermal shock method 1111, test condition A, minimum.
- 3) When specified in the applicable device specification, 100% of devices shall be tested for parameters requiring deltas.
- 4) Fine & Gross leak tests shall be performed separately or together between constant acceleration and external visual. All device lots having any physical processing steps performed following seal shall be retested for hermeticity and visual defects.
- 5) Samples shall be selected for testing in accordance with the specific device class and lot requirement of method 5005.

### 7.3 MIL883B Processed Integrated Services (QR214, QR215)

#### **QR215: 'MIL Processed /883B' Full Quality Conformance Inspection for Linear Integrated Circuits A and B, C and D optional)**

#### **QR214: 'MIL Processed /883B' Linear Integrated Circuit Component Screening**

Semelab are able to supply additional non SMD listed linear products fully processed in accordance with the MIL-STD-883B specification flow and methods. Semelab's QR214 and QR215 are based on MIL-STD-883E, METHOD 5005 quality conformance, inspection requirements and METHOD 5004 screening methods.

Semelab QR215 (quality conformance) covers the control procedures for group A (electrical), group B (environmental), group C (die related) and group D (package related) tests. It is based on METHOD 5005 conformance procedures and MIL-STD-883E test methods

Semelab QR214 (screening) is based on METHOD 5004 screening procedures and MIL-STD-883E test methods.

#### **Ordering Information:**

Devices screened in accordance with Semelab QR214 and QR215 are identified using the standard product part number with the addition of the suffix "-8QRB".

Example: LM117H built and screened to the MIL883B flows Method 5005 and Method 5004 in accordance with QR214 and QR215 is: LM117H-8QRB

#### **Device Marking:-**

xxx-8QRB for products equivalent to MIL883B parts - e.g. LM117H-8QRB + SML + DC

## 8. MIL-PRF-19500 – QR205, QR204 (Aerospace)

### QR205: ‘Mil Processed’ Full Quality Conformance Inspection (MIL-PRF-19500)

### QR204: ‘Mil Processed’ Discrete Component Screening (MIL-PRF-19500)

SEMELAB’s QR205 and QR204 processing specifications, in conjunction with the company’s ISO 9001:2000 approval present a viable alternative to the American MIL approved parts from a European manufacturer.

Semelab QR205 (quality conformance) is based on the quality conformance inspection requirements of MIL-PRF-19500 groups A (table V), B (table VIb), C (table VII).

Semelab QR204 (screening options) is based on the screening options and requirements of MIL-PRF-19500 (table IV).

Full details of Semelab QR205 and QR204 are included in the following pages, showing sample sizes and test methods used.

All manufacture and processing is carried out on our approved High-Rel assembly line in our Lutterworth factory and product is released under the company’s ISO 9001:2000 defence standard approval.

The table below shows part number examples and corresponding processing options and marking. The device marking will also contain the SEMELAB identifier (SML) plus the date code where space permits.

### Ordering Information: (examples)

Part Number	Description	Marking (*)
2N2369-JQR	QR205 groups A,B	2N2369-JQR
2N2369-JQRB	QR205 groups A,B Screening to QR204 level B	2N2369-JQRB
2N2369-JQRA	QR205 groups A,B Screening to QR204 level A	2N2369-JQRA

\* Where space permits

### Additional options:

Group C charge	-GRPC	
Group C destructive electrical samples	-GCDE	(12 pieces)
Group C destructive mechanical samples	-GCDM	(6 pieces)

#### Notes:

- 1) All ‘Additional Options’ are chargeable and must be specified at order stage.
- 2) When Group C is required, additional electrical and mechanical destructive samples must be ordered.
- 3) All destructive samples are marked the same as other production parts unless otherwise requested.

8.1 Inspection Levels: ‘Mil Processed’ Quality Conformance (ref: MIL-PRF-19500)

**QR205: Group A - Electrical Tests**

\* small lot conformance

Subgroup	Description	LTPD	Sample*	Reject
1	Visual + mechanical Inspection	5	45	0
2	DC electrical tests at 25°C	5	116	0
3	DC electrical tests. Hot & Cold temps as per device datasheet	30	45	0
4	AC electrical tests at 25°C	30	45	0
5	Safe Operating Area (Power Transistors) a) DC b) Clamped Inductive c) Unclamped Inductive Endpoint electrical measurements	30	45	0

The specified parameters to be included in each subgroup shall be as per the detail specification. Where no parameters are specified in a particular subgroup or test within a subgroup, no Group A testing is required for that subgroup or test to satisfy Group A requirements. A single sample may be used for all subgroup testing. These tests are considered non-destructive.

**QR205: Group B - Short term Environmental & Endurance Tests** \* small lot conformance

Test	Note	MIL-STD-750 method	Condition	Sample* d=destructive	Reject
<b>Subgroup 1</b> Solderability Resistant to solvents	(1) (3)	2026 1022	(minimum 3 devices) (separate samples can be used)	4 <sup>d</sup> leads 3 <sup>d</sup> devices	1
<b>Subgroup 2</b> Temperature Cycling (air to air)		1051	No dwell required at 25° TestC. condition C1 (45 cycles including screening), temp extreme, ±10µ	6	0
hermetic seal (a) Fine Leak (b) Gross leak Electrical Measurements		1071	Test condition H. <0.01cc. max = 5 x 10 atm <sup>-9</sup> cc/s, >0.01cc. max = 1 x 10 atm <sup>-8</sup> cc/s		
<b>Subgroup 3 &amp; 4</b> Steady-state operation life or Intermittent operation life or Blocking life Electrical Measurements	(4)	1027 1037 -	340hrs at specified bias conditions  As specified	12	0
Bond Strength Internal visual design verification	(6) (5,6)	2037 2075	(3 devices minimum) Visual criteria in accordance with qualified design.	11 wires <sup>d</sup> 3 <sup>d</sup>	0
<b>Subgroup 5</b> Thermal Resistance		3131 3101	For Transistors For Diodes	6	0
<b>Subgroup 6</b> High temperature life (non operating) Electrical Measurements		1032	340hrs high temperature storage  As specified	12	0

(Minimum qty of destructive samples required is 6.  
(Full notes for numbered references are at the end of group C table)

**QR205: Group C - Periodic Inspection** (chargeable option on request) \* **small lot conformance**

Test	Note MIL-STD-750 method	Condition	Sample * d=destructive	Reject
<b>Subgroup 1</b>				
Physical dimensions	2066	Dimensions per case outline specified	6	0
<b>Subgroup 2 &amp; 3</b>				
Thermal shock (glass strain)	1056	Test condition A, except for devices > 10W at T=25 which is condition B	6 <sup>d</sup>	0
Temperature Cycling (air to air)	1051	Test condition C or max stg temp, whichever is less (25 cycles)		
Shock	2016	Non-operating, 1500G, 0.5ms, 5 blows in each orientation, X1, Y1, Z1		
Vibration (variable frequency)	2056			
Constant acceleration	2006	1 minute min. in X1,Y1,Z1 orientation Y1 at 20000G min except at 10000G min if device ε15Ω at Tc=25°C		
Hermetic Seal		Test condition H.		
(a) Fine Leak	1071	<0.01cc. max = 5 x 10 atm <sup>-9</sup> cc/s, >0.01cc. max = 1 x 10 atm <sup>-8</sup> cc/s		
(b) Gross leak		b) Test condition C		
Moisture resistance	1021	Omit initial conditioning		
Terminal strength	2036	As specified		
Electrical Measurements		As specified		
<b>Subgroup 4</b>	(2)			
Salt atmosphere (corrosion)	1041	Covered by MIL883 ongoing group D programme		
<b>Subgroup 5</b>				
Thermal Resistance	3131 3101	For Transistors For Diodes	6	0
<b>Subgroup 6</b>	(4)			
Steady-state op life or Intermittent operation life or Blocking life	1026 1036	1000hrs at max operating junction temp As specified	12 <sup>d</sup>	0
Electrical Measurements				
<b>Subgroup 7</b>	(2)			
Internal Gas Analysis		Covered by MIL883B ongoing Group D programme		

(Quantity of Destructive samples that must be ordered is 18 devices)

- 1) Electrical reject devices from the same inspection lot may be used for all subgroups when electrical end point measurements are not required.
- 2) Group C subgroup 4 and 7 are covered by MIL883B ongoing group D programme. These are not available on specific batches under QR205. If required, see QR217
- 3) The LTPD for solderability test applies to the number of leads inspected except in no case shall less than three devices be used to provide the number of leads required.
- 4) If a given inspection lot undergoing Group B inspection has been selected to satisfy Group C inspection requirements, the 340 hour life test may be continued to 1000 hours in order to satisfy the Group C life test requirements. In such cases, either the 340 hour end point measurements must be made as a basis for Group B lot acceptance or the 1000 hour end point measurement shall be used as the basis for both Group B and Group C acceptance.
- 5) Internal Design Verification may be omitted if the devices have been manufactured by Semelab as sample pre-cap visual inspection will have been performed.
- 6) Samples from Subgroup 1 can be used.

8.2 Screening Sequences: ‘Mil Processed’ Products (MIL-PRF-19500)

QR204: Discrete Component Screening (with reference to MIL-STD-750)

	Description	MIL-STD-750 method	Conditions	JQR-A	JQR-B
1	Internal Visual (Precap) Inspection	2069 2070 2072		100%	N/A
2	High temperature stabilisation bake	1032	24 hrs min at rated maximum storage temperature	100%	100%
3	Temperature Cycling	1051	20 cycles at -55° to +175° or CC max storage temp (whichever is lower) with a minimum cycle time of 16 minutes	100%	100%
4	Constant acceleration	2006	20,000G force in Y1 axis for 1 min duration (see note 2)	100%	100%
8	Device Serialisation		(for drift calculations only)		
9	Interim electrical			100%	100%
10	High temperature reverse bias				
	a) Bipolar	1039	Test Condition A		
	b) Power MOSFET	1042	Test Condition B	100%	100%
	c) Diodes	1038	Test Condition A		
11	Interim electrical		Group A (read & record)	100%	100%
12	Power burn-in				
	a) Bipolar	1039	Test Condition B - 160 hrs min		
	b) Power MOSFET	1042	Test Condition A - 160 hrs min		
	c) Diodes	1038	Test Condition B - 96 hrs min	100%	100%
	d) Case mounted Rectifiers	1038	Test Condition A – 48 hrs min		
13	Final electrical		Group A Read & Record +Drift check (1)	100%	100%
14	Hermeticity	1071	Test condition H.		
	a) Fine		<0.01cc. max = 5 x 10 <sup>9</sup> atm cc/s, >0.01cc. max = 1 x 10 <sup>8</sup> atm cc/s	100%	100%
	b) Gross	1071	Condition C	100%	100%

Notes:

- 1) Group A end point tests are DC functional / parametric at 25° (subgroup 2) of QR205.C
- 2) 10000G force for devices with power rating >10 watts at T<sub>c</sub>=25°C.
- 3) PDA (percentage defects allowable) is 10% between steps 9 & 11 and 11 & 13.

## 9. MIL-PRF-19500 – QR216, QR217 (Space)

### 9.1 Space Level Processed Discrete Semiconductors (MIL-PRF-19500)

#### QR217: ‘Space Level’ Full Quality Conformance Inspection.

#### QR216: ‘Space Level’ Discrete Component Screening

SEMELAB’s QR217 and QR216 processing specifications, in conjunction with the company’s ISO 9001:2000 approval present a viable alternative to American MIL-PRF-19500 space level parts supplied from a European manufacturer.

QR217 (quality conformance) is based on the quality conformance inspection requirements of MIL-PRF-19500 groups A (table V), B (table VIa), C (table VII) and also ESA / ESCC 5000 (chart F4) lot validation tests.

QR216 (screening) is based on the screening requirements of MIL-PRF-19500 (table IV) and also ESA /ESCC 5000 (chart F3). Details of QR217 and QR216 are included in the following pages.

All manufacture and processing is carried out on our approved High-Rel assembly line in Lutterworth and product is released under our ISO 9001:2000 defence standard approval.

The ‘standard’ JQRS part is processed to the Semelab data sheet, screened to QR216 and has conformance testing to Q217 groups A and B. Available options and the associated part number extensions are shown below. These are chargeable and must be specified at order stage. The extensions on the Semelab part numbers used reflect these additional items.

#### Ordering Information: (example)

Part Number	Description	Marking (*)
2N2369-JQRS	QR217 groups A,B      Screening to QR216	2N2369-JQRS

\* Where space permits

#### Additional options:

Customer Pre-Cap Visual Inspection	<b>-CVP</b>	
Customer Buy-Off visit	<b>-CVB</b>	
Data Pack	<b>-DA</b>	
Group B charge	<b>-GRP</b>	
Group B destructive mechanical samples	<b>-GBDM</b>	(12 pieces)
Group C charge	<b>-GRPC</b>	
Group C destructive electrical samples	<b>-GCDE</b>	(12 pieces)
Group C destructive mechanical samples	<b>-GCDM</b>	(6 pieces)
Solderability Samples	<b>-SS</b>	
Scanning Electron Microscopy	<b>-SEM</b>	
Radiography (X-ray)	<b>-XRAY</b>	
Total Dose Radiation Test	<b>-RAD</b>	

#### Notes:

- 1) All ‘Additional Options’ are chargeable and must be specified at order stage.
- 2) When Group B or C is required, additional electrical and mechanical destructive samples must be ordered
- 3) All destructive samples are marked the same as other production parts unless otherwise requested.

9.2 QR217 Inspection Levels for ‘Space Level Processed’ Products

QR217: Group A - Electrical Tests

\* small lot conformance

Subgroup	Description	Sample*	Reject
1	Visual + mechanical Inspection	20	0
2	DC electrical tests at 25°C	20	0
3	DC electrical tests. Hot & Cold temps as per device datasheet	45	0
4	AC electrical tests at 25°C	45	0
5	Safe Operating Area (Power Transistors) Endpoint electrical measurements	8	0

The specified parameters to be included in each subgroup shall be as per Semelab Data Sheet. Where no parameters are specified in a particular subgroup or test within a subgroup, no Group A testing is required for that subgroup or test to satisfy Group A requirements. A single sample may be used for all subgroup testing. These tests are considered non-destructive.

QR217: Group B - Short term Environmental & Endurance Tests \* small lot conformance

Test	note	MIL-STD-750 method	Condition	Sample* d=destructive	Reject
<b>Subgroup 1</b> Physical Dimensions		2066	As per specification	8	0
<b>Subgroup 2</b> Solderability Resistant to solvents	(3) (3)	2026 1022	(minimum 3 devices) (Separate samples can be used)	6 <sup>d</sup> leads 6 <sup>d</sup> devices	0
<b>Subgroup 3</b> Thermal shock (liquid to liquid) Temperature Cycling (air to air) Hermetic seal (a) Fine Leak (b) Gross leak Electrical Measurements Internal visual design verification bond strength Die Shear	(4)	1056 1051 1071 2075 2037 2017	Test condition B (25 cycles), (glass diodes only) Test condition C or max stg temp, whichever is less. 100 cycles. Test condition H. <0.01cc. max = 5 x 10 <sup>-9</sup> cc/s, >0.01cc. max = 1 x 10 <sup>-8</sup> cc/s Visual criteria in accordance with qualified design. (minimum 6 devices) Parts from bond strength (min=6)	6 <sup>d</sup>   6 <sup>d</sup> 12 wires <sup>d</sup> 6 <sup>d</sup>	0   0 0 0
<b>Subgroup 4 / 5</b> Steady-state operation life or Intermittent operation life or Blocking life Electrical Measurements	(5)	1027 1037	340hrs at specified bias conditions  As specified	12	0
<b>Subgroup 6</b> Thermal resistance		3131 3101	For Transistors For Diodes	6	0
<b>Subgroup 7</b> High temperature life (non operating) Electrical Measurements		1032	340hrs high temperature storage As specified	12	0

(Minimum quantity of destructive samples required is 12 pieces)  
(Full notes for numbered references are at the end of group C table)

**QR217: Group C - Periodic Inspection** (chargeable option on request ) \* small lot conformance

Test	note	MIL-STD-750 method	Condition	Sample * d=destructive	Reject
<b>Subgroup 1</b>					
Physical dimensions		2066	Dimensions per case outline specified	6	0
<b>Subgroup 2 &amp; 3</b>					
Thermal shock (glass strain)		1056	Test condition B (25 cycles),	6 <sup>d</sup>	0
Temperature Cycling (air to air)		1051	Test condition C or max storage temperature, whichever is less (45 cycles including screening)		
Shock		2016	Non-operating, 1500G, 0.5ms, 5 blows in each orientation, X1, Y1, Z1 (Y1 only for axial glass diodes)		
Vibration (variable frequency)		2056			
Constant acceleration		2006	1 minute min. in X1,Y1,Z1 at 20000G min except at 10000G min if device ε10Ω at Tc=25°C		
Hermetic Seal			Test condition H.		
(a) Fine Leak		1071	<0.01cc. max = 5 x 10 atm <sup>-9</sup> cc/s, >0.01cc. max = 1 x 10 atm <sup>-8</sup> cc/s		
(b) Gross leak			b) Test condition C		
Moisture resistance		1021	Omit initial conditioning		
Terminal strength		2036	As specified		
Electrical Measurements			As specified		
<b>Subgroup 4</b>	(2)			see (2)	
Salt atmosphere (corrosion)		1041	Covered by MIL883 ongoing group D programme	6 <sup>d</sup>	0
<b>Subgroup 5</b>					
Thermal Resistance		3131 3101	For Transistors For Diodes	6	0
<b>Subgroup 6</b>	(5)				
Steady-state op life or Intermittent operation life or Blocking life		1026 1036	1000hrs at max operating junction temp As specified	12 <sup>d</sup>	0
Electrical Measurements					
<b>Subgroup 7</b>	(2)			see (2)	
Internal Gas Analysis			Covered by MIL883B ongoing Group D programme	3 <sup>d</sup> 5 <sup>d</sup>	0 1

(Minimum quantity of destructive samples required is 18 pieces)

- 1) Individual subgroups may be performed on representative parts from the same package family.
- 2) Group C subgroup 4 and 7 are covered by MIL883B ongoing group D programme. If customers require these subgroups to be done on the specific batch being covered, an additional 'Grp C extra' charge applies and an additional 11 destructive samples must be ordered. This must be specified at order stage.
- 3) Electrical reject devices from the same inspection lot may be used for all subgroups when electrical end point measurements are not required.  
Post burn-in electrical rejects may be used.
- 4) If a given inspection lot undergoing Group B inspection has been selected to satisfy Grp C inspection requirements,
- 5) the 340 hour life test may be continued to 1000 hrs to satisfy the Group C life test requirements. In such cases, either the 340 hour end point measurements must be made as a basis for Group B lot acceptance or the 1000 hour end point measurement shall be used as the basis for both Group B and Group C acceptance.  
Internal Visual Design Verification may be omitted if the devices have been manufactured by Semelab as sample pre-cap visual inspection will have been performed.
- 6)

## 9.3 QR216: ‘Space Level’ Discrete Component Screening

## QR216: Discrete Component Screening (with reference to MIL-STD-750)

	Description	MIL-STD-750 method	Conditions	JQR-S
1	Internal Visual Inspection (Pre-cap)	2069, 2070 2072		100%
2	Customer Pre Cap Visual Inspection	2069, 2070 2072	Customer specified option (chargeable)	100%
3	High temperature stabilisation bake	1032	24 hrs min at rated maximum storage temperature	100%
4	Temperature Cycling	1051	20 cycles at -55° to +175° or max storageCC temp (whichever is lower) with minimum 10 minutes dwell time	100%
5	Constant acceleration	2006	20,000G force in Y1axis for 1 min duration (see note 2)	100%
6	Particle Impact Noise Detection (PIND)	2052	(full yielded quantity)	100%
7	Device Serialisation		Device serialisation is carried through to shipping.	
8	Interim electrical		Read & Record	100%
9	High temperature reverse bias			
	a) Bipolar	1039	Test Condition A	100%
	b) Power MOSFET	1042	Test Condition B	
c) Diodes	1038	Test Condition A		
10	Interim electrical (note 3)		Read & Record, Drift Check	100%
11	Power burn-in			
	a) Bipolar	1039	Test Condition B - 240 hrs min	100%
	b) Power MOSFET	1042	Test Condition A - 240 hrs min	
c) Diodes	1038	Test Condition B - 240 hrs min (4)		
12	Final electricals (note 3)		Read & Record, Drift check (1)	100%
13	a) Hermeticity – Fine	1071	Test condition H.	100%
	b) Hermeticity - Gross	1071	<0.01cc. max = 5 x 10 atm <sup>-9</sup> cc/s, >0.01cc. max = 1 x 10 atm <sup>-8</sup> cc/s Condition C	100%
14	Radiographic tests (X-Ray)	2076	(May be performed at any time after serialization)	100%
15	External Visual Inspection	2071		

## Notes:

- 1) QR217 Group A subgroups 2 and 3 end point tests as per device detail spec.
- 2) C.10000G force for devices with power rating >10 watts at T<sub>c</sub>=25°
- 3) PDA (percentage defects allowable) is 5% between steps 8 & 10 and 10 & 12.
- 4) Zener diodes shall be subjected to high temperature reverse bias at 80 - 85 percent of nominal VZ for VZ > 10 V. Omit test for devices with VZ ≤ 10 V. For JQRS case mounted rectifiers condition A is required.

## 10. ESA/ESCC - Space Level Product

Semelab's **Space Quality Level Products** are based on the testing procedures specified in the generic **ESCC 5000 issue 3** and in the corresponding **Detail Specifications**.

All manufacture and processing is carried out on our approved High-Rel assembly line in our Lutterworth factory and product is released under our ISO 9001:2000 defence standard approval.

The table below shows the additional options which may be required by the customer. All items must be agreed and specified at order stage.

The following pages show the generic chart F2 (component lot manufacturing), chart F3 (screening) and chart F4 (Validation) requirements.

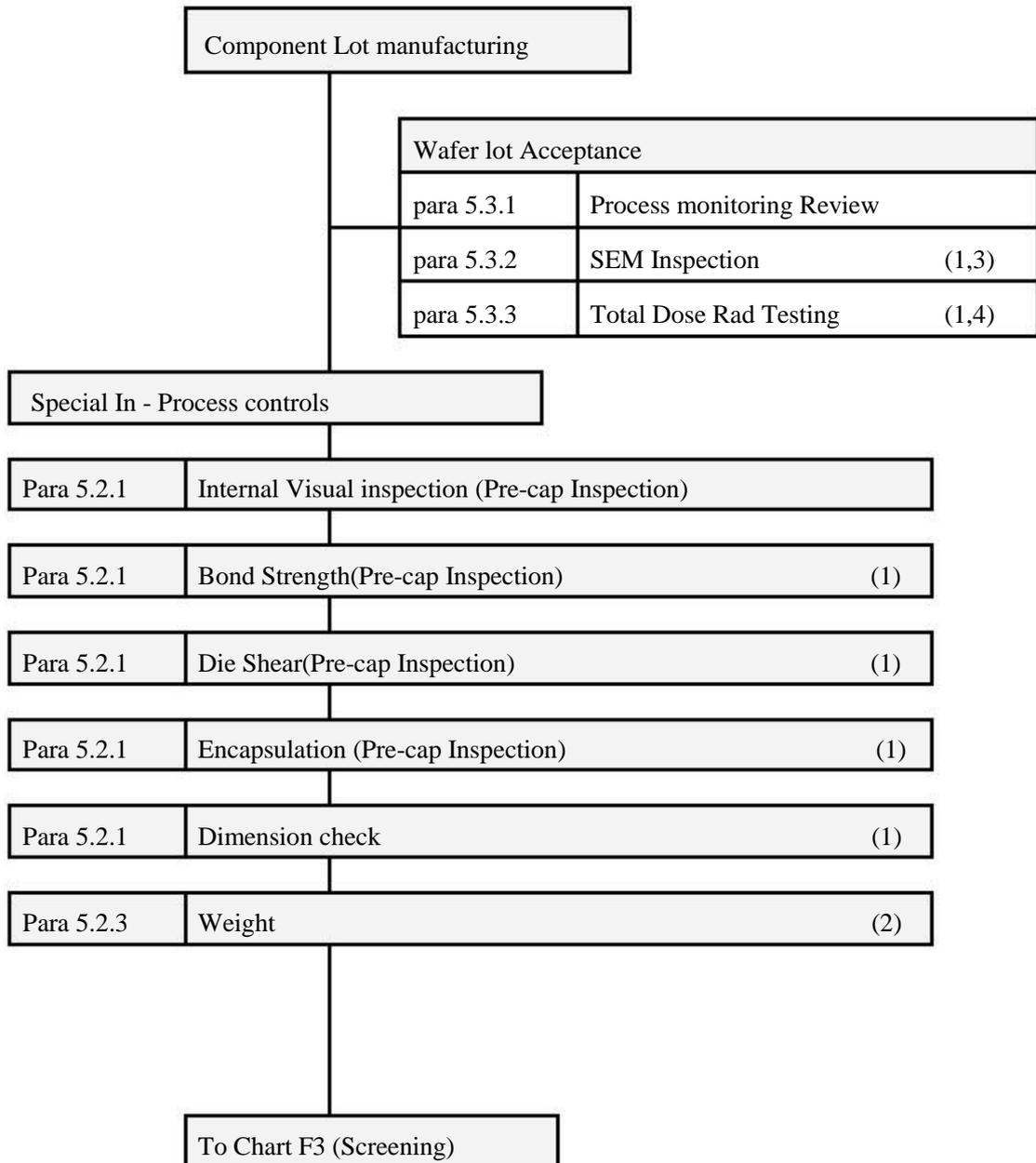
### Additional options:

Customer Pre-Cap Visual Inspection	<b>-CVP</b>	
Customer Buy-Off visit	<b>-CVB</b>	
Data Pack	<b>-DA</b>	
Lot Validation Testing (subgroup 1) charge	<b>-LVT1</b>	
LVT1 destructive samples (electrical)	<b>-L1DE</b>	(normally 15 pieces)
LVT1 destructive samples (mechanical)	<b>-L1DM</b>	(normally 15 pieces)
Lot Validation Testing (subgroup 2) charge	<b>-LVT2</b>	
LVT2 destructive samples (electrical)	<b>-L2D</b>	(normally 15 pieces)
Lot Validation Testing (subgroup 3) charge	<b>-LVT3</b>	(normally 5 pieces)
LVT3 destructive samples (mechanical)		
Scanning Electron Microscopy (SEM)	<b>-SEM</b>	
Radiography (X-ray)	<b>-XRAY</b>	
Total Dose Radiation tests	<b>-RAD</b>	

#### Notes:

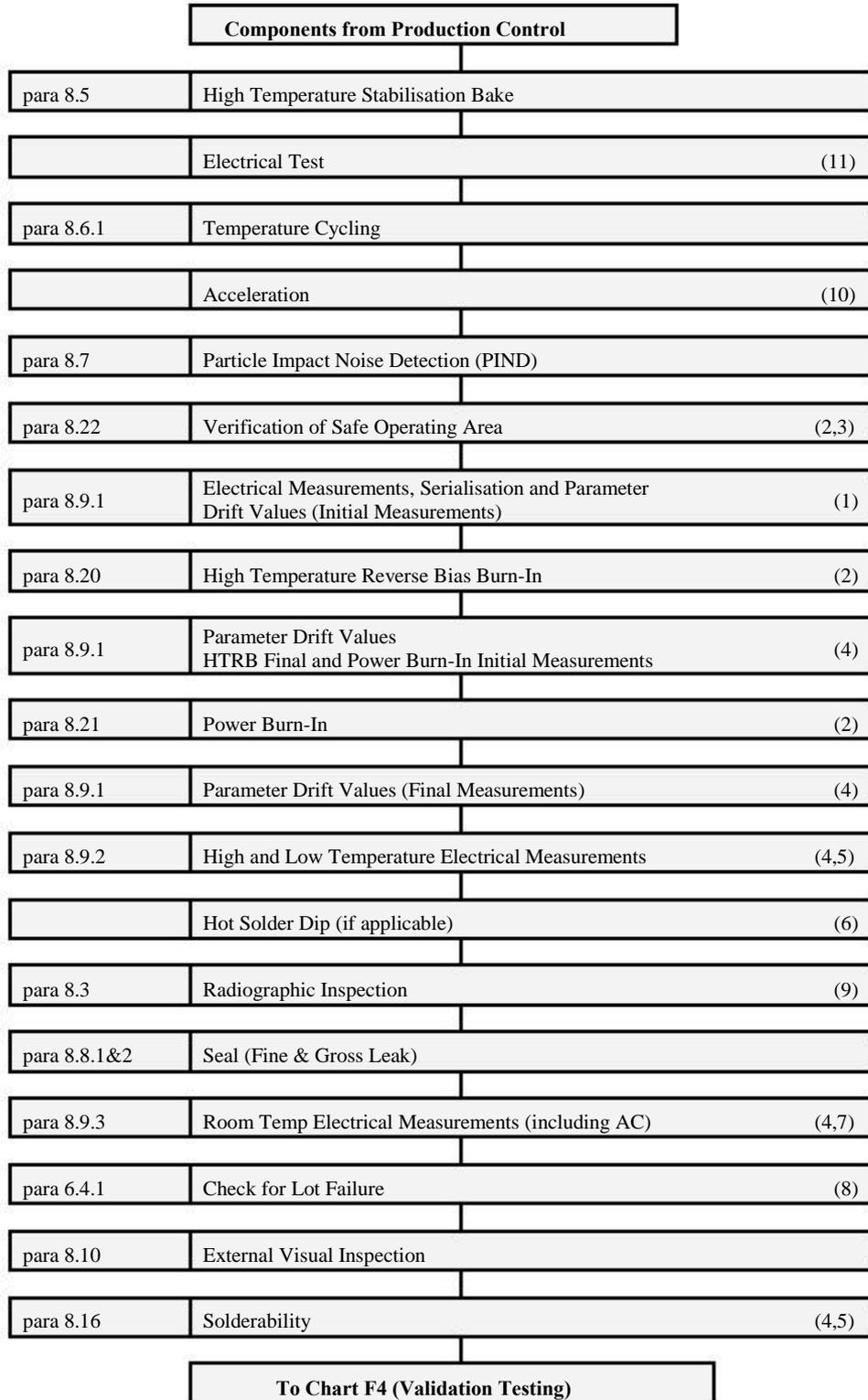
- 1) All 'Additional Options' must be specified at order stage
- 2) All 'Additional Options' are chargeable
- 3) All destructive samples are marked the same as other production parts unless otherwise requested.

10.1 Chart F2 - Production Control (ESCC 5000 issue 3)



- Notes:**
- 1) Performed on a sample basis.
  - 2) Guaranteed but not tested.
  - 3) If specified in the detail specification.
  - 4) If specified in the detail specification and required in the Purchase Order.

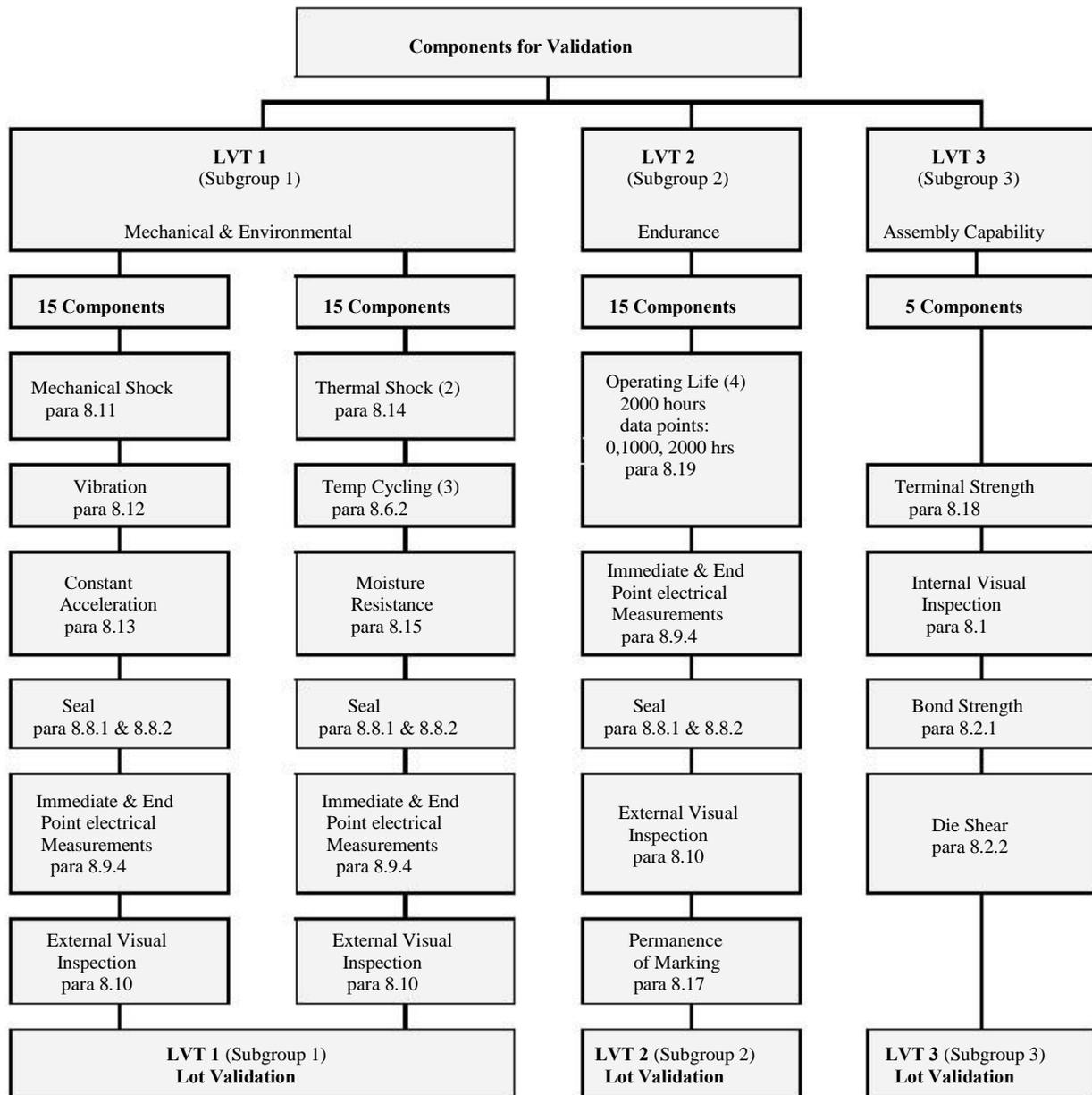
## 10.2 ESA/ESCC - Chart F3 Screening (ESCC 5000 issue 3)



**Notes:**

- 1) All components shall be serialised prior to Initial Electrical Measurement.
- 2) If specified in detail spec.
- 3) Can be performed at any time prior to initial measurements of Parametric Drift values.
- 4) The Lot Failure criteria of paragraph 6.4 applies to this test.
- 5) Performed on a sample basis.
- 6) Can be performed at any time prior to Room Temp Electrical Measurements during screening (prior to Seal test).
- 7) Measurements of parametric Drift Values need not be repeated in Room Temperature Electrical measurements.
- 8) Check for Lot Failure shall take into account all electrical parameter failures that may occur during screening.
- 9) Radiographic Inspection may be performed at any point during Screening Tests.
- 10) Not specified in ESCC 5000 iss 3, but performed by Semelab to MIL-STD-750 method 2006.
- 11) Not specified in ESCC 5000 iss 3, but performed by Semelab as a process monitor.

10.3 Chart F4 - Validation Testing (ESCC Generic Specification 5000 issue 3)



Notes:

- 1) ESCC 5000 iss 3 table F4 - Qualification & Periodic Testing becomes 'Validation Testing' for non qualified parts.
- 2) Only applicable to axial diodes.
- 3) Not applicable to axial lead glass diodes.
- 4) Variance in Test method based on product type.

Ordering Information:

- 1) Order for Subgroup 1 (includes subgroups 2 & 3) requires order for 50 (30+15+5) destructive samples.
- 2) Order for Subgroup 2 (includes subgroup 3) requires order for 20 (15+5) destructive samples.
- 3) Order for Subgroup 3 requires order for 5 destructive samples.
- 4) Other Ordering Options are available - please contact Semelab Sales.

# 11. Screening & Approval Comparison Tables

## 11.1 Comparison of Space Level Screening Options

Space Level Flow Comparison Table	GENERIC		QR216
	ESCC	JANS*	JORS
<b>Screening Stage:</b>			
Pre-cap Visual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customer pre-cap Visual	OPT	OPT	OPT
High Temp Storage (Stabilization Bake)	24 hrs	24 hrs	24hrs
Temperature cycling	20 cycles	20 cycles	20 cycles
Thermal impedance	OPT		-
Constant Acceleration	■	<input type="checkbox"/>	<input type="checkbox"/>
PIND	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fine/Gross Leak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Serialization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interim Electrical Measurements	-	-	-
Interim Electrical Measurements (Read and Record / Drift)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HTRB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Measurements	-	-	-
Parametric Drift measurements (Read and Record / Drift)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burn-In	min 168 hrs max 264 hrs	240 hrs	240hrs
Electrical Measurements	-	-	-
Parameter Drift Measurements (Read and Record)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PDA Calculations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read and Record Test Data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Electrical Parameters (Temp, Dynamic)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fine/Gross Leak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiography	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External Visual Inspection			

\*JANS part not available from Semelab.

Notes:                   if specified in detail specification.

■ not specified in ESCC 5000 iss 3, but performed by Semelab.

## Screening & Approval Comparison Tables

### 11.2 Comparison of Space Level die lot approval procedures.

The table below shows a comparison of operations carried out for die approval within the generic approval systems (MIL-PRF-19500 space level and ESA / ESCC 5000. It must be noted that SEM and RHA total dose evaluation are options which must be specified if required carry an additional charge

**Space Level/ Die Lot Acceptance Table**

Die Lot Acceptance	GENERIC		SML
	ESCC	JANS	JQR-S
Selected Wafer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Probe Test (100%)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glassivation / Metalisation Inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visual Inspection (100%)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample Assembly (10 pcs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stabilization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temperature Cycling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Test (read/record)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HTRB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Test (read/record)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Steady State Life (1000 hrs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Test (read/record)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wire Bond Evaluation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Shear Evaluation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SEM	OPT	OPT	OPT
RHA Total Dose Evaluation	OPT	OPT	OPT

# Screening & Approval Comparison Tables

## 11.3 Comparison of High-Rel Screening Options (Discrete Devices)

The table below shows the comparison of screening options available within the CECC, BS and MIL approvals. Comparison is also shown with Semelab's in-house QR204 options.

	CECC / QR209				BS 9300				QR204		MIL	
	A	B	C	D	A	B	C	D	JQRA	JQRB	JAN*TX	JAN*TX
Pre-cap Visual	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	
High Temp Storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temperature Cycle	555 cycles				1010 cycles		10 cycles		20 cycles	20 cycles	20 cycles	20 cycles
Constant Acceleration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Particle impact noise detection (PIND)												
Fine Leak test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gross Leak Test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Device Serialisation												
Variables Electrical test	<input type="checkbox"/>				<input type="checkbox"/>				±	±	±	±
Attributes Electrical tests		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>						
Burn-In (HTRB)	168 hrs*	72 hrs*		48 hrs*	160 hrs*	72 hrs*	48 hrs*	48 hrs*				
Variables Electrical test									±	±	±	±
Attributes Electrical tests									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burn-In (Power)	168 hrs*	72 hrs*		48 hrs*	160 hrs*	72 hrs*	48 hrs*	48 hrs*	160 hrs	160 hrs	160 hrs	160 hrs
Variables Electrical test	<input type="checkbox"/>				<input type="checkbox"/>				±	±	±	±
Attributes Electrical tests		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>						
Radiographic tests					<input type="checkbox"/>							

Test Performed

± Test Performed if required by device detail specification

24 hours for PNP devices. 48 hours for NPN devices

High Temp Reverse Bias for Case rated devices

Power Burn-in for Ambient rated Devices

CECC / QR209 : Screening carried out in accordance with CECC 50000 Appendix 6

BS : Screening carried out in accordance with BS9300 section 1.2.10

QR216 : Screening carried out in accordance with Semelab QR216

QR204 : Screening carried out in accordance with Semelab QR204

MIL : Screening carried out in accordance with MIL-PRF-19500 (Table 2)

\* full JANTX, JANTXV not available from Semelab

