	<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE</b> Space Science and Technology Department	
	<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV: 0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>	

<b>SUBJECT:</b>	<b>COMBINED DECLARED PROCESS LIST</b>	
<b>PREPARED BY:</b>	E A Clark	
<b>DOCUMENT No:</b>	SPIRE-RAL-PRJ-0001093	
<b>APPROVED BY:</b>	<b>Name</b>	<b>Signature &amp; Date</b>
<b>Project Manager</b>	K.J. King	
<b>Instrument Development Manager</b>	E. Sawyer	
<b>Product Assurance Manager</b>	Eric Clark	

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<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>		
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV:</b>	<b>0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>		

**CHANGE RECORD**

<b>ISSUE</b>	<b>DATE</b>	<b>CHANGE</b>
1	25 Jan 2002	First Issue
2	15 <sup>th</sup> May 2003	Updated for the IHDR 07/03
3	06 November 04	Updated for the IQR & CQM EIDP

	<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE Space Science and Technology Department</b>	
	<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>
	<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b> <b>REV: 0</b>
	<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>

## INDEX

**COMBINED DECLARED PROCESS LIST.... ERROR! BOOKMARK NOT DEFINED.**

**DISTRIBUTION..... 1**

**CHANGE RECORD ..... 2**

**INDEX ..... 3**


**DOCUMENT LIST..... 4**

**INTRODUCTION..... 5**

**SCOPE ..... 5**

**CONTENT OF THE DECLARED PROCESS LIST (DPL) ..... 7**

**APPENDIX A ..... 9**

	<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE Space Science and Technology Department</b>	
	<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV: 0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>	

## DOCUMENT LIST


### Note 1

Where a Sub-Systems / Institutes has combined some or all of their Declared lists and / or EEE parts etc into one document, that documents details are recorded below. Only the applicable pages are included in this document.

### Note 2

The IFSI combined List DPU: "DCL + DML+ DPL" updated to SPIRE-IFS-DOC-001031 Iss 2: has been sent to ESA for approval, however CGS have subsequently issued these as individual documents, and it is this Declared List that replace the IFSI one in this document

Sub-System	Document	
	Institute	Title
ATC	BSM DECLARED PROCESS LIST	SPIRE-ATC-PRJ-000708 Iss 1.6
CEA/SAp	DRCU DECLARED PROCESS LIST	SPIRE-SAP-PRJ-001608 Iss 1.0
CEA/SBT	SPIRE & PACS Sorption Coolers DPL HSO-SBT-LI-005 Iss 1.1	SPIRE-SBT-PRJ-000688 iss 1.1
CGS (IFSI)	DPU DECLARED PROCESS LIST	SPIRE-CGS-DOC-002197 iss Draft
CSA/USK	NOT APPLICABLE	NOT APPLICABLE
JPL	DECLARED PROCESS LIST	
LAM (LAS)	SMEC DECLARED PROCESS LIST SPI.PFM.00.LD.02.A	SPIRE-LAM-PRJ-000938 Iss 1.0
	FTS DECLARED PROCESS LIST LAM/ELE/FTS/011009.01	SPIRE-LAM-PRJ-000919 Iss 01
MSSL	SPIRE – DECLARED PROCESSESS MSSL/SPIRE/SP004.02	SPIRE-MSS-PRJ-001121 Iss 5.0
UCF	DECLARED PROCESS LIST	

		<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE</b> <b>Space Science and</b> <b>Technology Department</b>	
<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>		
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV:</b>	<b>0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>		

## INTRODUCTION


Processes used by RAL Space Science Technical Department (SSTD) ) and co-producers / sub-system suppliers are listed on spreadsheets,

## SCOPE

This document lists the “Declared Processes” used in the provision of the supplied parts of **Spire** Instrument from the following sub system suppliers. See Table 1.

**Table 1**


<b>Sub-System / Institute</b>		<b>List Supplied</b>
<b>Acronym</b>	<b>Name</b>	<b>Yes / No / NA</b>
ATC	Astronomy Technology Centre	<b>Yes</b>
CEA/Sap	CEA, Service d'Astrophysique Saclay	<b>YES</b>
CEA/SBT	(CEA) Service du Basse Temperatures Grenoble	<b>Yes</b>
CGS (IFSI)		<b>Yes</b>
CSA/USK	Canadian Space Agency (CSA) University of Saskatchewan Canada	<b>N/A</b>
JPL	JPL/Caltech, Pasadena	<b>No</b>
LAM (LAS)	Laboratoire d'Astronomie Spatiale, Marseille	<b>Yes</b>
MSSL	Mullard Space Science Lab Surrey	<b>Yes</b>
UCF	Department of Physics and Astronomy, University of Wales, Cardiff,	<b>No</b>

		<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE</b> <b>Space Science and Technology Department</b>	
<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>		
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV:</b>	<b>0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>		

**Appendix A** to this document is a printout from that spreadsheet showing the Processes used on the RAL hardware provided for **Spire** by the above sub-system suppliers

The spreadsheet printout is compliant with ESA: PSS-01-700 Issue 2, each process has an individual identification number, the first digit being the group type as follows.

1. Adhesive Bonding
2. Composite Manufacture
3. Encapsulation/Moulding
4. Painting/Coating
5. Cleaning
6. Welding
7. Crimping/Stripping/Wire Wrapping
8. Soldering/Brazing
9. Surface Conversion Treatment
10. Plating
11. Machining
12. Forming
13. Heat Treatment
14. Special Fabrication: Processes developed specifically for the programme
15. Marking
16. Miscellaneous Processes
17. Inspection Procedures

		<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE</b> <b>Space Science and Technology Department</b>	
<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>		
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV:</b>	<b>0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>		

## CONTENT OF THE DECLARED PROCESS LIST (DPL)

Extract from **ESA PSS -01-700 Issue 2 (August 1993)**

The process list consists of 10 columns, which shall be completed as indicated below. If a particular item does not apply, write N.A (Not Applicable).

Processes which apply to only one material (one Declared Material List item) and which are sufficiently defined in column 5 of the Declared Materials List should not appear in the Declared Processes List (unless they are critical).

### **COLUMN 1** : Item Number

Sequential item number in each group of the Declared Processes List. One only per process type. Does not change during the life of the processes list.

### **COLUMN 2** : Process Identification

Process name, title, clear identification, etc. Correct and standard identification

### **COLUMN 3** : Specification

Specification number (whether national, ESA, company in house etc.) and issue status. Only the contractor's/subcontractor's specifications that can be physically transmitted to ESA for review purposes list.

### **COLUMN 4** : Process Description

Brief description of the process.

### **COLUMN 5** : Use and Location

Define location in the spacecraft/equipment, uses, and purpose of process for the spacecraft.

### **COLUMN 6** : Manufacture's Name

Name/abbreviation (the one who applies the process).


### **COLUMN 7** : Item in Materials List or Mechanical Parts List

Corresponding materials list or mechanical parts items number.

### **COLUMN 8** : Criticality of Process

Indicate here whether process is critical or non critical. In the case of a critical process, add reasons for criticality (see the definition in Annex A).

**NOTE** : For Critical Processes other than those performed exactly to an ESA PSS- 01-7XX series specification, this form is to be supplemented by a **Process Request for Approval** ( RFA /Process) (in the same Annex).

		<b>COMBINED DECLARED PROCESS LIST</b>		<b>PRODUCT ASSURANCE Space Science and Technology Department</b>	
<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>		
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV:</b>	<b>0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>		

**SUBCOLUMN 9.1** : Justification for Approval

**ESA PSS -01-700 Issue 2 (August 1993)**

The purpose of this is to enter any additional information that may be necessary in order to achieve customer's approval. This information comprise reference and issue of the RFA / approval, process justification file, evaluation reports and waivers. These documents must be made available to ESA on request.

**SUBCOLUMN 9.2** : Contractor's Approval

The prime contractor shall complete this subcolumn and by doing so confirms that:

- the line indications are correct and complete
- the process has passed all applicability test (including quality control testing)

A = Approved - The Validation is approved by the contractor

W = Approved with a waiver - The use of such process shall be reduced to a minimum. All the waivers shall be approved by ESA. The waiver number shall be entered in Subcolumn 9.1.

P = Pending a decision - processes for which a validation report or a waiver is awaiting the contractors decision.

O = Open - New process or process for which investigation and qualifications are in progress.

D = Deleted - This classification is used for a process which is no longer used.

Where no approval can be granted, the Process Request for Approval (RFA / process) shall be submitted to ESA for approval if not yet available. ESA may request a copy of the process specification and an audit of the process.

**COLUMN 10** : ESA Approval

This column will be completed by ESA in accordance with the standard comments listed in Annex G.





**COMBINED DECLARED PROCESS LIST**

**PRODUCT ASSURANCE  
Space Science and  
Technology Department**

<b>Spacecraft/Project:</b>	<b>HERSCHEL</b>	<b>Document No:</b>	<b>SPIRE RAL PRJ 001093</b>		
<b>Instrument/Model:</b>	<b>SPIRE</b>	<b>Issue No:</b>	<b>3</b>	<b>REV:</b>	<b>0</b>
<b>Subsystem:</b>		<b>Date:</b>	<b>06 November 2004</b>		

**APPENDIX A**

# Herschel/SPIRE

MULLARD SPACE SCIENCE LABORATORY

UNIVERSITY COLLEGE LONDON Author: C Brockley-Blatt

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## SPIRE – STRUCTURE DECLARED PROCESSESS LIST

Document Number: MSSL/SPIRE/PA004.05 June 2004

**Distribution:**

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**Author:**

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## **Change Record**

ISSUE	DATE	
0.1	September 2001	New document
2	22 November 2002	Issued
3	January 2003	Updated with Silver Soldering
4	March 2003	Updated to remove processes not used
5	June 2004	Updated to include new processes, 6 – 10.

## **Table of Contents**

1. Scope of Document
2. Applicable and Reference Documents
3. Declared Processes List

## **Glossary**

All terms are listed in the CIDL.

### **1 Scope of Document**

This document presents all the processes to be used all along the design, development and manufacture of the structure for SPIRE.

### **2. Applicable and Reference Documents**

All documents are listed in Figure 3.2 of the CIDL.

### 3 Declared Processes List

The Structure Declared Processes List, which consists of multiple arrays of 10 columns which shall be completed as indicated in AD04, is presented here below:

Processes should be grouped in the table below:

<i>Group Type</i>	<i>Used</i>
1. Adhesive Bonding	✓
2. Composite Manufacturing	✓
3. Encapsulation/Molding	N/A
4. Painting/Coating	✓
5. Cleaning	✓
6. Welding/Brazing	✓
7. Crimping/Stripping/Wire Wrapping	✓
8. Soldering	N/A
9. Surface Treatment	N/A
10. Plating (Allo-chroming)	✓
11. Machining	✓
12. Forming	✓
13. Heat Treatment	✓
14. Special Fabrication	N/A
15. Marking	✓
16. Miscellaneous Processes	N/A
17. Inspection Procedure	✓

Issue No 5		<u>DECLARED PROCESSES LIST</u>									
<b>PROJECT:</b>		<b>HERSCHEL</b>									
<b>EXPERIMENT:</b>		<b>SPIRE</b>									
<b>EXPERIMENTERS:</b>		<b>MULLARD SPACE SCIENCE LABORATORY (MSSL)</b>									
<b>PREPARED BY:</b>		<b>C Brockley-Blatt</b>									
Item No	Process	Specification	Description/identification	Use and location	User code	Associated DML items	Criticality of process	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Stycast 2850 FT Black	Commercial 2 part epoxy adhesive for cryogenics		Internal and external wiring harness supports	MSSL	10-02	Non-critical				
2.	Crimp connections	ECSS-Q-70-26	Fabrication of wiring harnesses	Internal and external wiring harnesses	MSSL	19-01	Non-critical				
3.	Alocrom 1200	MOD 03-18	Chromating - Commercial process	Various	MSSL	01-01,02,01-03	Non-critical				
4.	Heat Treatment T 73	Mil-H-6088-F	Thermal treatment	Treatment for aluminium	SNL	01-01	Non-critical				
5	Silver Soldering	MSSL In-House Procedure	Brazing using a 55% silver solder (rest is zinc, copper and Tin)	Thermal joints on the thermal bus bar	MSSL	07-01	Non-critical				

Issue No 5		<b><u>DECLARED PROCESSES LIST</u></b>									
<b><u>PROJECT:</u></b>		<b>HERSCHEL</b>									
<b><u>EXPERIMENT:</u></b>		<b>SPIRE</b>									
<b><u>EXPERIMENTERS:</u></b>		<b>MULLARD SPACE SCIENCE LABORATORY (MSSL)</b>									
<b>PREPARED BY:</b>		<b>C Brockley-Blatt</b>									
Itm No	Process	Specification	Description/ identification	Use and location	User code	Associated DML items	Criticality of process	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
6.	Goldplating	British Telecom spec. M468A and MIL spec G45204B type 1C		Thermal Straps and 300mK busbar	Walton Plating, Woking	10-02	Non-critical				
7.	Composite Manufacture	In-house Procedure	Fabrication of FPU and detector box mounts	FPU and detector box mounts	B3 Technologies Shalford	15-01, 15-02	Non-critical				
8.	Compression welding	In-House Procedure	Welding under pressure and heat (nominally 900 deg C)	Level 0 Thermal Straps	EMS, Germany	02-01, 02-02	Non-Critical				
9.	Electron Beam Welding	In House Procedure	Stake welds at 1mm wide by 13.5mm	Level 0 Thermal straps	EBP, Woking	02-01, 02-02	Non-critical				
10.	Glue Joint Isolation	In house-procedure - MSSL-MEG-PRC-2003-01.	Electrical isolation	Thermal Straps	MSSL	02-01, 02-02 10-01	Non-critical				







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# HERSCHEL DPU<sub>s</sub>/ICU

Tipo Doc.: <i>Doc. Type:</i>		N° DRD: <i>DRD N°:</i>	
N° Doc.: <i>Doc. N°:</i> SPIRE-CGS-DOC-002197	Ediz.: <b>DRAFT</b> <i>Issue:</i>	Data: <i>Date:</i>	Pagin a <b>1</b> Di Of <b>25</b> <i>Page</i>
Titolo :      HERSCHEL DPU <sub>s</sub> /ICU SPIRE DPU UNIT DECLARED PROCESSES LIST <i>Title :</i>			

	Nome & Funzione <i>Name &amp; Function</i>	Firma <i>Signature</i>	Data <i>Date</i>	LISTA DI DISTRIBUZIONE <i>DISTRIBUTION LIST</i>	N	A	I
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# HERSCHEL DPUs/ICU

HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**2**

di  
of

**25**

## REGISTRAZIONE DELLE MODIFICHE / *CHANGE RECORD*

EDIZIONE <i>ISSUE</i>	DATA <i>DATE</i>	AUTORIZZAZIONE <i>CHANGE AUTHORITY</i>	OGGETTO DELLA MODIFICA E SEZIONI AFFETTE <i>REASON FOR CHANGE AND AFFECTED SECTIONS</i>
DRAFT			



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# HERSCHEL DPU<sub>s</sub>/ICU

HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA  
FT**

Data:  
Date:

Pagina  
Page

**3**

di  
of

**25**

## LISTA DELLE PAGINE VALIDE / LIST OF VALID PAGES

PAGINA PAGE	EDIZIONE ISSUE	PAGINA PAGE	EDIZIONE ISSUE	PAGINA PAGE	EDIZIONE ISSUE	PAGINA PAGE	EDIZIONE ISSUE	PAGINA PAGE	EDIZIONE ISSUE
1 - 25	DRAFT								



CARLO GAVAZZI SPACE SpA

# HERSCHEL DPU<sub>s</sub>/ICU

HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**4**

di  
of

**25**

## TABLE OF CONTENT

<b>1. SCOPE.....</b>	<b>5</b>
<b>2. APPLICABLE &amp; REFERENCE DOCUMENTS.....</b>	<b>5</b>
2.1 APPLICABLE DOCUMENTS.....	5
2.2 REFERENCE DOCUMENTS.....	5
<b>3. RESPONSIBILITY.....</b>	<b>6</b>
<b>4. METHODOLOGY FOR THE COMPILATION OF THE DPL.....</b>	<b>6</b>
<b>5. DECLARED PROCESSES LIST .....</b>	<b>8</b>
5.1 GROUP N° 1 – ADHESIVE BONDING .....	9
5.2 GROUP N° 2 – COMPOSITE MANUFACTURE .....	10
5.3 GROUP N° 3 – ENCAPSULATION/MOULDING.....	11
5.4 GROUP N° 4 – PAINTING/COATING.....	12
5.5 GROUP N° 5 – CLEANING .....	13
5.6 GROUP N° 6 – WELDING.....	14
5.7 GROUP N° 7 – CRIMPING/STRIPPING/WIRE WRAPPING.....	15
5.8 GROUP N° 8 – SOLDERING/BRAZING .....	16
5.9 GROUP N° 9 – SURFACE CONVERSION TREATMENTS .....	17
5.10 GROUP N° 10 – PLATING .....	18
5.11 GROUP N° 11 – MACHINING.....	19
5.12 GROUP N° 12 – FORMING.....	20
5.13 GROUP N° 13 – HEAT TREATMENT.....	21
5.14 GROUP N° 14 – SPECIAL FABRICATION.....	22
5.15 GROUP N° 15 – MARKING.....	23
5.16 GROUP N° 16 – MISCELLANEOUS PROCESSES.....	24
5.17 GROUP N° 17 – INSPECTION PROCEDURES.....	25



CARLO GAVAZZI SPACE SpA

# HERSCHEL DPUs/ICU

HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**5**

di  
of

**25**

## 1. SCOPE

The scope of this document is to define all processes to be used in the SPIRE DPU Unit for HERSCHEL DPU/ICU Program.

This document is based on the SPIRE DPU Unit architecture defined for the Critical Design Review.

## 2. APPLICABLE & REFERENCE DOCUMENTS

### 2.1 APPLICABLE DOCUMENTS

AD	DOC. N.	ISSUE	TITLE
1	HERS-GEN-PL-CGS-002	DRAFT	HERSCHEL DPU/ICU Product Assurance Plan

### 2.2 REFERENCE DOCUMENTS

RD	DOC. N.	ISSUE	TITLE
1	ESA PSS-01-700	2	The technical reporting and approval procedure for materials, mechanical parts and processes



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# HERSCHEL DPUs/ICU

HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**6**

di  
of

**25**

### 3. RESPONSIBILITY

CGS shall be responsible that all listed processes are in accordance with the applicable documents.

### 4. METHODOLOGY FOR THE COMPILATION OF THE DPL

The processes list consist of 11 columns which shall be completed as indicated below in according to [RD 1] document. Furthermore, the processes shall be classified as specified in table:

GROUP	PROCESSES
1	Adhesive bonding
2	Composite manufacture
3	Encapsulation/moulding
4	Painting/coating
5	Cleaning
6	Welding
7	Crimping/stripping/wire wrapping
8	Soldering/brazing
9	Surface conversion treatments
10	Plating
11	Machining
12	Forming
13	Heat treatment
14	Special fabrication: processes developed specifically for the programme
15	Marking
16	Miscellaneous processes
17	Inspection procedures

Column 1:Item number

Sequential item number in each group. One only per process type.

Column 2:Process identification

Process name, title, standard identification.

Column 3:Specification Issue/Rev

Specification number with issue/revision status relevant the process.

Column 4:Process description

Brief description of the process.

Column 5:Use and location

Define location and use of process in the spacecraft/equipment.


Column 6:Manufacturer's name

This identifies the abbreviated name of the manufacturer and name of the supplier if different (the one who applies the process).

Column 7:Associated items in materials list


Corresponding materials list or mechanical parts list item number.

Column 8:Criticality of the process

 CARLO GAVAZZI SPACE SpA	<h1>HERSCHEL DPUs/ICU</h1>	N° Doc: <i>Doc N°:</i>		
	HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST	Ediz.: <b>DRA</b> Data: <i>Issue:</i> <b>FT</b> <i>Date:</i>		
		Pagina <b>7</b> di <b>25</b> <i>Page</i> <i>of</i>		

Indicate here whether process is critical or noncritical. In the case of a critical process, add reason for criticality (see the definition in [RD 1] document annex A)



 CARLO GAVAZZI SPACE SpA	<h1>HERSCHEL DPU<sub>s</sub>/ICU</h1>	N° Doc: Doc N°:	
	HERSCHEL SPIRE DPU UNIT DECLARED PROCESSES LIST	Ediz.: <b>DRA</b> Data: Issue: <b>FT</b> Date:	
		Pagina <b>8</b> di Page            of <b>25</b>	

Column 9:Justification for validation approval

The purpose of this column is to enter any additional information that may be necessary in order to achieve customer's approval. This information comprises reference and issue of the RFA/Approval, processes justification file, evaluation reports and waivers.

Column 10:Contractor's approval (Prime val.)

The Prime contractor shall complete this subcolumn and by doing so confirms that:

- the line indications are correct and complete
- the process has passed all applicability tests (including quality control testing)

A=Approved. The validation is approved by the Contractor.

W=Approved with a waiver. The use of such processes shall be reduced to a minimum. The waiver number shall be entered in column 9.

P=Pending a decision . Processes for which a validation report or a waiver is awaiting the Contractor's decision.

O=Open. New process or process for which investigations and qualification are in progress.

D=Deleted. This classification is used for a process which is no longer use.

Column 11:Customer approval (Customer val.)

This column will be completed by Customer in accordance with the standard comments listed in [RD 1] document annex G.

## 5. DECLARED PROCESSES LIST

In the following pages are listed the processes envisaged during the manufacturing phase.



CARLO GAVAZZI SPACE SpA

# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**9**

di  
of **25**

## 5.1 GROUP N° 1 – ADHESIVE BONDING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Adhesion of non-structural parts	PA072 Is.1	Adhesion of non-structural parts with epoxide adhesive Eccobond 285 cat.11. Mixing ratios (by weight): 4,5% of cat.11, cured 8h-82°C 50%R.H.	Adhesion of non-structural parts	CGS	DML:10/01	Not Critical	NASA/MSFC MAPTIS: 05475		
02	Adhesion of identification label and non-structural parts	3M Technical bulletin of manufacturer	Adhesion of identification label and non-structural parts with Scotch-weld EC-2216B/A. Mixing ratios (by weight): 7pbw A: 5pbw B. cured 2h-70°C 50%R.H.	Adhesion of identification label and non-structural parts	CGS	DML:10/03	Not Critical	ESA PSS-01-701: S-7, NASA/MSFC MAPTIS: 05066		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**10**

di  
of **25**

## 5.2 GROUP N° 2 – COMPOSITE MANUFACTURE

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**11**

di  
of **25**

## 5.3 GROUP N° 3 – ENCAPSULATION/MOULDING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									



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# HERSCHEL DPU<sub>s</sub>/ICU

HERSCHEL DPU<sub>s</sub>/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**12** di **25**  
of

## 5.4 GROUP N° 4 – PAINTING/COATING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Conformal coating	CIBA, HUNTSMAN Technical Data Sheets	Conformal coating on assembled PCBs with ARATHANE (Uralane) 5750 A/B (LV) clear. Mixing ratios(by weight):18 parts of A and 100 parts of B (LV). Cured 7 days 25°C or 9 h 65°C 50% R.H.	Conformal coating of PCBs	CGS	DML:10/02	Not Critical	NASA/MSFC MAPTIS: 20209		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**13**

di  
of **25**

## 5.5 GROUP N° 5 – CLEANING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Cleaning	PA071 Is.1	Cleaning of PCBs	PCBs of the electronic box	CGS	DML:20/01 and 20/02	Not Critical	PA071 is.1		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**14**

di  
of

**25**

## 5.6 GROUP N° 6 – WELDING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**15** di **25**  
of

## 5.7 GROUP N° 7 – CRIMPING/STRIPPING/WIRE WRAPPING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Crimping	ECSS-Q-70-26A	Crimping of high reliability electrical connections	Wires crimping on connector contacts	CNR-IFSI, CGS	DML:19/01 to 19/03, 19/05	Critical for reliability	PA082 Is.1, ECSS-Q-70-26A		





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# HERSCHEL DPU<sub>s</sub>/ICU

HERSCHEL DPU<sub>s</sub>/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**16** di **25**  
of

## 5.8 GROUP N° 8 – SOLDERING/BRAZING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Soldering	GD-PL-CGS-016, ECSS-Q-70-08A	Soldering of high reliability electrical connections	Electrical components on PCBs of the electronic box	CNR-IFSI, CGS	DML: 19/01 to 19/05, 20/01 and 20/02	Critical for reliability	GD-PL-CGS-016, ECSS-Q-70-08A		
02	SMT Soldering	GD-PL-CGS-016, ESA PSS-01-738 is.1	High-reliability soldering for surface-mount and mixed-technology printed-circuit boards	Electrical components on PCBs of the electronic box	CGS	DML:20/01 and 20/02	Critical for reliability	GD-PL-CGS-016, ESA PSS-01-738 is.1 SMT ESA approval ref.: QM/02-440/BD Tables 1 and 2		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**17** di **25**  
of

## 5.9 GROUP N° 9 – SURFACE CONVERSION TREATMENTS

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Chemical conversion coating on aluminum alloy with Alodine 1200	MIL-C-5541C class 3	Surface treatment of aluminum alloy to prevent corrosion	Mechanical parts	CNR-IFSI	DML:01/01 to 01/06	Critical	MIL-C-5541C class 3		
02	Anodic coating on aluminum alloy	MIL-A-8625 class 2 type III	Surface treatment of aluminum alloy to prevent corrosion	Mechanical parts	CNR-IFSI	DML:01/01 to 01/06	Critical	MIL-A-8625 class 2 type III		
03	Passivation treatment for corrosion-resistant steel	QQ-P-35C	Surface Passivation treatment for corrosion-resistant steel	Mechanical parts	CNR-IFSI	DML:06/01 and 06/02	Critical	QQ-P-35C		



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HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**18** di **25**  
of

## 5.10 GROUP N° 10 – PLATING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Nickel plating (electro deposited)	QQ-N-290 A	Surface plating of copper alloy to prevent corrosion	Thermal dissipators on PCBs and/or conductor bridge on PCBs	CNR-IFSI	DML:02/01 and 02/02	Not critical	QQ-N-290 A		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**19** di **25**  
of

## 5.11 GROUP N° 11 – MACHINING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Mechanical parts machining		Construction of mechanical parts	All mechanical parts	CNR-IFSI	DML:01/01 to 01/06, 02/01 and 02/02, 06/01 and 06/02	Not critical			
02	PCBs manufacturing	ECSS-Q-70-10A, ECSS-Q-70-11A	Manufacturing of double side and multilayer PCBs	PCBs of electronic box	PRINTCA Denmark, ZINCOCELERE DIVISION CSI Italy	DML:20/01 and 20/02	Not critical	ECSS-Q-70-10A, ECSS-Q-70-11A		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**20**

di  
of **25**

## 5.12 GROUP N° 12 – FORMING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									



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HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**21** di **25**  
of

## 5.13 GROUP N° 13 – HEAT TREATMENT

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**22**

di  
of **25**

## 5.14 GROUP N° 14 – SPECIAL FABRICATION

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**23**

di  
of **25**

## 5.15 GROUP N° 15 – MARKING

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
	NONE									





CARLO GAVAZZI SPACE SpA

# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**24** di **25**  
of

## 5.16 GROUP N° 16 – MISCELLANEOUS PROCESSES

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Repair and modification of PCB and solder joints	PA063 Is.1, ECSS-Q-70-28A	See column 2	PCBs of Electronic box	CGS	DML:20/01 and 20/02	Critical for reliability	PA063 Is.1, ECSS-Q-70-28A		
02	Flight electronic equipment production and inspection control plan	GD-PL-CGS-016 Is.1	Flight electronic equipment production and inspection control plan	Equipment production and inspection control plan	CGS	All items	Not critical	GD-PL-CGS-016 Is.1		
03	Cabling	ECSS-Q-70-26A, Technical cabling doc.	Electrical Isolation of connection by mean shrinkable tubes THERMOFIT RT876	Cabling inside of the box	CNR-IFSI	DML:19/01 to 19/03	Not critical	ECSS-Q-70-26A		



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# HERSCHEL DPUs/ICU

HERSCHEL DPUs/ICU SPIRE DPU UNIT DECLARED PROCESSES LIST

N° Doc:  
Doc N°:

Ediz.:  
Issue:

**DRA**  
**FT**

Data:  
Date:

Pagina  
Page

**25** di **25**  
of

## 5.17 GROUP N° 17 – INSPECTION PROCEDURES

1	2	3	4	5	6	7	8	9	10	11
ITEM N°	PROCESS IDENTIFICATION	SPECIFICATION ISSUE/REV.	PROCESS DESCRIPTION	USE AND LOCATION	MANUFACTURER NAME	ASSOCIATED ITEMS IN MATERIAL LIST	CRITICALITY OF THE PROCESS	JUSTIFICATION FOR VALIDATION APPROVAL	PRIME VAL.	CUSTOMER VAL.
01	Incoming inspection procedure	GD-PR-CGS-070 Is.1	Incoming inspection of HI-REL parts	Electronic box	CGS	All items	Not Critical	GD-PR-CGS-070 Is.1		
02	MIP and KIP inspection plan	GD-PL-CGS-003 Is.1	MIP and KIP inspection	Electronic box	CGS	All items	Not Critical	GD-PL-CGS-003 Is.1		
03	Inspection on assembled PCBs	PA005 Is.1	See column 2	PCBs of Electronic box	CGS	DML:20/01 and 20/02	Not Critical	PA005 Is.1		
04	Ultrasonic inspection on mechanical parts	MIL-STD-2154	See column 2	Semimanufactured mechanical materials	CNR-IFSI	DML:01/01 to 01/06	Not Critical	MIL-STD-2154		
05	NDI inspection on mechanical parts	ASTM-E-1417	See column 2	Mechanical critical parts	CNR-IFSI	DML:01/01 to 01/06	Not Critical	ASTM-E-1417		

<b>DECLARED PROCESS LIST</b>		<b>ORIGINATOR: UK ATC</b>	
<b>SPACECRAFT / PROJECT:</b>		<b>Herschel</b>	<b>Doc. Number</b>
			<b>SPIRE-ATC-PRJ-708</b>
<b>SYSTEM / EXPERIMENT:</b>		<b>SPIRE</b>	<b>Sheet No</b>
			<b>Page 1 of 4</b>
<b>SUB-SYSTEM:</b>		<b>BSM</b>	<b>Issue: (last CTD – 0324)</b>
			<b>1.6</b>
			<b>Date:</b>
			<b>15-Jun-04</b>

Process ID	Process	Specification	Description / Identification	Use and Location	User Code	Associated DML Items	Criticality of Process	Approval / Status	Project Approval	ESA Approval
1.	Adhesive bonding	SPI-BSM-NOT-0712 Author: BG	Bonding of sensors into mounts and potting of wiring	Jiggle frame & structure & motor terminations	N/A	Eccobond 285 + catalyst 24LV, G-10,	medium	Identical to ID#17		
2.	Adhesive bonding	SPI-BSM-NOT-0715 Author: BG	Bonding of flex-pivots into sleeves	Chop and Jiggle stage	N/A	inconel, Eccobond 285 + catalyst 24LV, aluminium 6082	high	Confirmed by DM-1 warm shake		
3.	Adhesive bonding	N/A	Bonding of sleeves into housings	Chop and Jiggle stage	N/A	N/A	N/A	NOT USED		
4.	Adhesive bonding	SPI-BSM-NOT-0720 Author: BG	Harness tie-down	Back of BSM	N/A	Eccobond 285 + catalyst 24LV, aluminium 6082	low	Standard RAL practice. Used on BSM STM		
5.	Adhesive bonding	SPI-BSM-NOT-0718 Author: BG	fastener locking,	applied in visible location, eg under heads	N/A	Eccobond 285 + catalyst 24LV, aluminium 6082, stainless steel	medium	Standard RAL practice . Used as repair scheme on STM chop mirror screw		
6.	Adhesive bonding	SPI-BSM-NOT-0716 Author: BG	Bonding of magnets into pockets	Chop and Jiggle stage	N/A	Eccobond 285 + catalyst 24LV, aluminium 6082/6061, magnet	medium	Confirmed by DM-1 warm shake		
7.	Adhesive bonding	SPI-BSM-NOT-0717 Author: BG	Bonding of sensor actuators into pockets	Chop and Jiggle stage	N/A	Eccobond, aluminium 6082/6061, soft iron	medium	Similar process used on ISOPhot		
8.	Thermal stabilization	SPI-BSM-NOT-003 Author IP	Mirror stability cycling	Chop stage	N/A	Aluminium 6061	high	ATC standard, adopted from NASA practice.		

<b>DECLARED PROCESS LIST</b>		<b>ORIGINATOR: UK ATC</b>	
<b>SPACECRAFT / PROJECT:</b>	<b>Herschel</b>	<b>Doc. Number</b>	<b>SPIRE-ATC-PRJ-708</b>
<b>SYSTEM / EXPERIMENT:</b>	<b>SPIRE</b>	<b>Sheet No</b>	<b>Page 2 of 4</b>
<b>SUB-SYSTEM:</b>	<b>BSM</b>	<b>Issue: (last CTD – 0324)</b>	<b>1.6</b>
		<b>Date:</b>	<b>15-Jun-04</b>

Process ID	Process	Specification	Description / Identification	Use and Location	User Code	Associated DML Items	Criticality of Process	Approval / Status	Project Approval	ESA Approval
9.	Electro-forming copper	Waveform Electroforming Ltd procedure EP/003-C iss2	Manufacturing technique (sub-contract process)	Motor thermal shields	N/A	Electro formed Copper	medium	Confirmed by inspection and DM-1 warm shake		
10.	Gold plating 2-10 um	MOD DEF STAN 03-17/iss2 5 um thick	Plating (sub-contract process)	thermal contact, Emmisivity control	N/A	Gold, copper, nickel plate	medium	Accepted RAL and ESA process.		
11.	Niobium plating	N/A	Plating	Magnetic shielding	N/A	N/A	N/A	Not used		
12.	Alochrome	MOD DEF STAN: 03-18.iss2 To a light yellow appearance	Alocrom 1200 AL Alloy Surface Conversion	Corrosion control	N/A	Aluminium components where specified	low	Accepted RAL and ESA process.		
13.	Varnish application	Zeiss process	Coating	Insulation/ corrosion control	N/A	Not used	high	Zeiss motor coils have polyimide coating, but these are treated as bought-in components (see DCL)		
14.	Soldering	<b>SPI-BSM-NOT-0723</b> Author BCG	Soldering	Connectors	N/A	Wiring, connectors, sensors, motors	high	ESA approved soldering practice		

<b>DECLARED PROCESS LIST</b>				<b>ORIGINATOR: UK ATC</b>					
<b>SPACECRAFT / PROJECT:</b>			<b>Herschel</b>		<b>Doc. Number</b>		<b>SPIRE-ATC-PRJ-708</b>		
<b>SYSTEM / EXPERIMENT:</b>			<b>SPIRE</b>		<b>Sheet No</b>		<b>Page 3 of 4</b>		
<b>SUB-SYSTEM:</b>			<b>BSM</b>		<b>Issue: (last CTD – 0324)</b>		<b>1.6</b>		
				<b>Date:</b>		<b>15-Jun-04</b>			

Process ID	Process	Specification	Description / Identification	Use and Location	User Code	Associated DML Items	Criticality of Process	Approval / Status	Project Approval	ESA Approval
15.	Crimping	N/A	Crimping	Connectors	N/A	Wiring, connectors	high	Not used		
16.	Fastener Assembly	SPI-BSM-NOT-0018 V1.0 Author IP	Screw thread lubrication and torque control for BSM	BSM	N/A	All bolted components	High	Confirmed by DM-1 warm shake		
17.	Bond Motors into housing	SPI-BSM-NOT-0714 Author BG	Potting / bonding	Motor coils and their wires into G10 and Al housing, and	N/A	Eccobond 285 + catalyst 24LV Wiring, Zeiss coils, Aluminium 6082, G-10	High	Confirmed by DM-1 warm shake		
18.	Cleaning before assembly	SPI-BSM-NOT-0029 Author BG	Clean with ultrasound, IPA, tap water	After machining and before clean room acceptance	N/A	All	Medium	Similar to RAL cleaning process		
19.	Optical Surface cleaning	N/A	Clean with 'opti-clene'	BSM mirror, if required	N/A	BSM mirror	High	Not used		
20.	Optical Surface cleaning	N/A	Clean with IPA or acetone	BSM mirror, if required	N/A	BSM mirror	High	Not used		
21.	Optical Surface polishing	N/A	Abrasive clean with fine diamond paste	BSM mirror, if required (repair technique)	N/A	BSM mirror	High	Not Used		
22.	Wiring routing	SPI-BSM-NOT-0724 Author BCG	Wiring routing and tie down	BSM wiring harness	N/A	Wiring, connectors, P-Cips, lacing tape	Medium	Confirmed by DM-1 warm shake		
23.	Annealing	N/A	Annealing of Brass P-clips	BSM wiring harness	N/A	Wiring	Low	Not Used		

<b>DECLARED PROCESS LIST</b>		<b>ORIGINATOR: UK ATC</b>	
<b>SPACECRAFT / PROJECT:</b>	<b>Herschel</b>	<b>Doc. Number</b>	<b>SPIRE-ATC-PRJ-708</b>
<b>SYSTEM / EXPERIMENT:</b>	<b>SPIRE</b>	<b>Sheet No</b>	<b>Page 4 of 4</b>
<b>SUB-SYSTEM:</b>	<b>BSM</b>	<b>Issue: (last CTD – 0324)</b>	<b>1.6</b>
		<b>Date:</b>	<b>15-Jun-04</b>

Process ID	Process	Specification	Description / Identification	Use and Location	User Code	Associated DML Items	Criticality of Process	Approval / Status	Project Approval	ESA Approval
24.	Magnet Removal	SPI-BSM-NOT-0719 Author TB/BG	Removing motor magnets from holder	Chop & Jig Stage	N/A	Stripper 93	High	Verified with dummy mirror		



**SPIRE & PACS**  
**Sorption Coolers**  
***Declared Processes List***

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : 1.1  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : i

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

***SPIRE & PACS Sorption Coolers***  
***DECLARED PROCESSES LIST***  
***(D.P.L.)***

SBT internal ref : SBT/CT/2001-20

	Name & Function	Date	Signature
<b>Prepared</b>	P. Dupont – Cooler PA manager		
<b>SBT PA Check</b>	P. Dupont – Cooler PA manager		
<b>SPIRE Approval</b>			
<b>PACS Approval</b>			
<b>PA Approval</b>	F. Loubere – PA manager		
<b>Project Approval</b>	J.L Augueres - SAp HSO project manager		
<b>Project Approval</b>	L. Duband - Cooler project manager		

Service des Basses Températures (SBT)  
Département de Recherche Fondamentale sur la Matière Condensée (DRFMC)  
COMMISSARIAT A L'ENERGIE ATOMIQUE - GRENOBLE (CEA-Grenoble)  
17, rue des Martyrs 38054 GRENOBLE Cédex 9, France.



**SPIRE & PACS**  
**Sorption Coolers**  
***Declared Processes List***

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : 1.1  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : ii

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

**Document Status**

Issue	Revision	Date	Nb of Pages	Modifications
Draft		April 4 <sup>th</sup> , 2001		First draft – released for comments
0	0	April 25 <sup>th</sup> , 2001	20	First Issue
1	0	October 29 <sup>th</sup> , 2001	20	Update of the document (see marking bar on the right)
1	1	december 12 <sup>th</sup> , 2001	20	Update of the document (after Sap comments)





**SPIRE & PACS**  
**Sorption Coolers**  
***Declared Processes List***

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : [1.1](#)  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : iii

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

***Table of Contents***

1.	Scope of the document.....	1
2.	Documents.....	2
2.1	Applicable documents.....	2
2.2	Reference documents .....	2
3.	Declared Processes List .....	3



# SPIRE & PACS Sorption Coolers *Declared Processes List*

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : iv

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

## List of Acronyms

AD / RD	Applicable / Reference Document		
ADP (EIDP)	Acceptance (End Item) Data Package		
AIT / (M)AIV	(Manufacturing,) Assembly, Integration & Test / Verification		
CADM	Configuration and Data Management		
CDR (DDR)	Critical (Detailed) Design Review	Revue de conception détaillée	RCD
CEA	Commissariat à l' Energie Atomique		
CIDL / ABCL	(As Built) Configuration Items Data List		
CN	Change Notice	Demande de Modification	DM
CQM	Cryogenic Qualification Model		
DML / DPL	Declared Material / Process List		
DRB	Delivery Review Board	Revue de Qualification	RQ
EM / (P)FM / FS	Engineering / (Proto)Flight / Spare Model		
ETF	Environmental Test Facility		
EV	Evaporator		
FIRST	Far Infrared and Submillimetre Telescope		
FMECA	Failure Mode Effects and Criticity Analysis		AMDEC
(M)GSE	(Mechanical) Ground Support Equipment		
H/W	Hardware		
HIFI	Heterodyne Instrument for FIrst		
HSE	Heat Switch (on evaporator)		
HSP	Heat Switch (on sorption pump)		
ICD	Interface Control Document	Dossier de Contrôle des Interfaces	DCI
KIP / MIP	Key / Mandatory Inspection Point		
MRB	Material Review Board		
N/A	Not Applicable		
NCR	Non Conformance Report	Fiche d'Anomalie	FA
PACS	Photoconductor. Array Camera and Spectrometer		
PDR	Preliminary Design Review	Revue de Définition Préliminaire	RDP
PTR	Post Test Review	Comité de Revue et d'essai	CRE
PFM	ProtoFlight Model		
QA / PA	Quality / Product Assurance	Assurance Qualité / Produit	AQ / AP



**SPIRE & PACS**  
**Sorption Coolers**  
***Declared Processes List***

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : [1.1](#)  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : v

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

RFA	Request For Approval		
SAP	Service d'Astrophysique		
SBT	Service des Basses Températures		
SCO	Sorption Cooler (full unit)		
S/C	SpaceCraft		
SP	Sorption pump		
SPIRE	Spectral & Photometric Imaging Receiver		
TRR	Test Readiness Review	Bilan Technique	BT



**SPIRE & PACS**  
**Sorption Coolers**  
*Declared Processes List*

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : 1.1  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : 1

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

## **1. SCOPE OF THE DOCUMENT**

This document lists all the processes to be used all along the SBT Sorption Coolers Project.



**SPIRE & PACS**  
**Sorption Coolers**  
***Declared Processes List***

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : 1.1  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : 2

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

## **2. DOCUMENTS**

### **2.1 Applicable documents**

All Applicable Documents are listed in the AD chapter of the CIDL (HSO-SBT-LI-010).

### **2.2 Reference documents**

	<i>Title</i>	<i>Reference</i>	<i>Iss</i>	<i>Rev</i>	<i>Date</i>
RD01	Materials, Mechanical Parts & Processes	ECSS-Q-70A			19/04/96
RD02	Guide pour les Projets Scientifiques				



**SPIRE & PACS**  
**Sorption Coolers**  
***Declared Processes List***

DOC N°: [HSO-SBT-LI-005](#)  
Iss/Rev : 1.1  
DATE : [December 12<sup>th</sup>, 2001](#)  
PAGE : 3

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

### **3. DECLARED PROCESSES LIST**

The SCO Declared Processes List, which consists of multiple arrays of 10 columns that shall be completed as indicated in doc. Ref. [RD01] & [RD02], is presented herebelow.

Processes should be grouped as explained in the table below:

<i>Group Type</i>	<i>Used</i>
1. Adhesive Bonding	✓
2. Composite Manufacturing	N/A
3. Encapsulation / Molding	N/A
4. Painting / Coating	N/A
5. Cleaning	✓
6. Welding / Brazing	✓
7. Crimping / Stripping / Wire Wrapping	✓
8. Soldering	✓
9. Surface Treatment	N/A
10. Plating	✓
11. Machining	✓
12. Forming	N/A
13. Heat Treatment	✓
14. Special Fabrication	N/A
15. Marking	✓
16. Miscellaneous Processes	✓
17. Inspection Procedure	✓



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: **HSO-SBT-LI-005**  
 Iss/Rev : **1.1**  
 DATE : **December 12<sup>th</sup>, 2001**  
 PAGE : **4**

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 1 – Adhesive Bonding										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use		1- Mech.Part 2- Material		Justif. for Approval	Status	
1-1	Use of STYCAST 2850/FT9	1- SBT 2-	HSO-SBT-PR- 033	1- Pump 2- Gluing of charcoal onto/into Pump housing	N/A	1- N/A 2- 10-1	Not Critical	Common practice @ SBT		
				1- SCO 2- Gluing of Thermal Parts	N/A		Not Critical	Common practice @ SBT Performance Test		
				1- SCO 2- Gluing of covers onto filling tubes after crimping	N/A		Not Critical	Common practice @ SBT		
				1- Pump 2- Gluing of Grid & Grid Cover	N/A		Not Critical	Common practice @ SBT		



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 5

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 5 – Cleaning										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				Justif. for Approval	Status	
5-1	Cleaning of individual items	1- SBT 2-	HSO-SBT-PR-026	1- all single items 2- Cleaning of individual items before assembly/integration	N/A	1- N/A 2- 1-1,1-2, 2-1, 2-2, 4-1, 4-2, 6-1,6-2	Not Critical			





**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 6

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 6 – Welding / Brazing										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use		1- Mech.Part 2- Material		Justif. for Approval	Status	
6-1	TIG Welding	1- SNLS 2- subcontractor specification		1- Evaporator 2- Assembly of Evaporator _ sphere (S8)	SNLS		Not Critical	LeakTightness Test		
				1- Pump 2- Assembly of Pump _ sphere (S6)	SNLS		Not Critical	LeakTightness Test		
				1- Evaporator 2- Assembly of Evaporator _ sphere (S7)	SNLS		Not Critical	LeakTightness Test		
				1- Braided Copper & Copper Ends 2- Welding of Braided Copper onto Copper Ends	SNLS		Not Critical			
6-2	Silver Soldering	1- SNLS 2- subcontractor specification	BRASV_01_11	1- Pumping Line 2- Mounting of Thermal Shunt & Crimped Tube (B3, B4 & B5)	SNLS		Not Critical	LeakTightness Test		



# SPIRE & PACS Sorptions Coolers *Declared Processes List*

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 7

## ***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

Group 6 – Welding / Brazing										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use		1- Mech.Part 2- Material		Justif. for Approval	Status	
				1- Evaporator 2- Assembly of Evaporator _ sphere (B2)	SNLS		Not Critical	LeakTightness Test		
				1- Pump 2- Assembly of Pump _ sphere (B1)	SNLS		Not Critical	LeakTightness Test		
6-3	EB Welding	1- TECHMETA 2-	FA 09001	1- Pumping Line 2- Pump & Evaporator Pre-assembly (S1, S2 & S3)	TECHMETA		Not Critical	LeakTightness Test		
				1- Cooler Heart 2- Closing of Cooler (S4, S5)	TECHMETA		Not Critical	LeakTightness Test & Pressure Test @ 200 bars		



# SPIRE & PACS Sorption Coolers *Declared Processes List*

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 8

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/GBT)***

Group 7 – Crimping / Stripping / Wire Wrapping										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use		1- Mech.Part 2- Material		Justif. for Approval	Status	
7-1	Stripping of Manganin Wires	1- SBT 2-	HSO-SBT-PR-034	1- Manganin Wires 2- Removal of protective varnish before soldering	N/A	1- N/A 2- 19-1	Not Critical			
7-2	Crimping of filling Tubes	1- SBT 2-	HSO-SBT-PR-030	1- Cooler 2- Crimping of filling Tubes after filling of Cooler with 3He	N/A		Not Critical	Common practice @ SBT Leaktightness Test		
				1- Heat Switch 2- Crimping of filling Tubes after filling of Heat Switch with 3He	N/A		Not Critical	Common practice @ SBT Leaktightness Test		



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 9

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 8 – Soldering										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use		1- Mech.Part 2- Material		Justif. for Approval	Status	
8-1	Soldering of Heaters, Thermometers & Connectors wires	1- SBT 2-	HSO-SBT-PR-034	1- Manganin Wires, Heaters, Thermometers & Connectors 2- Soldering of Heaters, Thermometers & Connectors wires	N/A	1- Mech.Part 2- Material	Not Critical	Performance Test		



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 10

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 10 - Plating										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				Justif. for Approval	Status	
10-1	Gold Plating of Copper Parts	1- TERMOCOMPACT 2- subcontractor specification		1- Copper Parts 2- Gold Plating of Copper Parts to avoid corrosion	N/A	1- Mech.Part 2- Material	Not Critical			



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 11

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 11 - Machining										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				Justif. for Approval	Status	
11-1	Machining of Mechanical Parts	1- OMG 2- subcontractor specification		1- see Drawing List 2- Machining of Mechanical Parts (wire machining, classical machining)	N/A	1- Mech.Part 2- Material	Not Critical	Dimensional Check & Certificate of Conformity		
11-2	Final Machining of Structure after welding	1- OMG 2- subcontractor specification		1- Structure 2- Removal of excess material in order to reach dimensional specification			Not Critical	Dimensional Check & Certificate of Conformity		



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 12

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 13 – Heat Treatment										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				Justif. for Approval	Status	
13-1	Baking of SCO under vacuum	1- SBT 2-	HSO-SBT-PR-035	1- SCO	N/A	1- Mech.Part 2- Material	Not Critical	Cleanliness & Contamination monitoring (TBD)		
	Baking of Vegetal Charcoal			1- Vegetal Charcoal 2- Removal of water	N/A		Not Critical			
	Baking of PROCELIT			1- PROCELIT 2- Removal of water	N/A		Not Critical			



**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: [HSO-SBT-LI-005](#)  
 Iss/Rev : 1.1  
 DATE : [December 12<sup>th</sup>, 2001](#)  
 PAGE : 13

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 15 - Marking										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				Justif. for Approval	Status	
15-1	Marking of Individual Items	1- IDLas 2	HSO-SBT-SP-039	1- all removable items 2- Marking of Individual Items	N/A	1- Mech.Part 2- Material	Not critical			





# SPIRE & PACS Sorptions Coolers *Declared Processes List*

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 14

***SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)***

Group 16 – Miscellaneous Processes										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				1- Mech.Part 2- Material	Justif. for Approval	
16-1	Assembly of Kevlar suspension system	1- SBT 2-	HSO-SBT-PR-028	2- Suspension of cooler heart into structure			Critical			
16-2	Filling of Cooler & HS with 3He	1- SBT 2-	HSO-SBT-PR-029 & 036	Filling of Cooler & HS with 3He			Not Critical			





**SPIRE & PACS**  
**Sorption Coolers**  
**Declared Processes List**

DOC N°: HSO-SBT-LI-005  
 Iss/Rev : 1.1  
 DATE : December 12<sup>th</sup>, 2001  
 PAGE : 15

**SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)**

Group 17 – Inspection Procedure										
1	2	3	4	5	6	7	8	9		10
Item #	Process Id.	Specification	Process Description	Location & Use	Subcontractor Name	Associated Item	Criticality of Process	Approval Status		Comment
		1- Manufacturer 2- Specification		1- Equipment 2- Use				Justif. for Approval	Status	
17-1	Welding Inspection	1- SBT 2- HSO-SBT-PR-025	Inspection of Pump & Evaporator after EB Welding	1- Pump & Evaporator 2- see 4	N/A	1- Mech.Part 2- Material	Not Critical	LeakTightness Test		
17-2	Verification of tension into Kevlar cords	1- SBT 2	HSO-SBT-PR-028	1- Kevlar cords 2- To verify tension into Kevlar cords	N/A	1- Mech.Part 2- Material	Critical			

	<b>DRCU / Preliminary Declared Processes List (DPL)</b>	 SAp-SPIRE-NC-0061-02 Issue: 1.0 Date: 13/02/03 Page: 1/17
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## HERSCHEL/SPIRE

### DRCU / Preliminary Declared Processes List (DPL)

**Reference:** SAp-SPIRE-NC-0061-02  
**Issue:** 1.0  
**Date:** 13/02/03

	Function	Name	Date	Visa
<b>Prepared by</b>	Mechanics Product Assurance	Nathalie Colombel	13/02/03	
<b>Verified by</b>	Mechanical Engineer	Thierry Tourrette		
<b>Approved by</b>	PA Manager			
<b>Authorized by</b>	Project Manager	Jean-Louis Auguères		

## DOCUMENT STATUS and CHANGE RECORD

Date	Issue	Affected pages
15/11/01	0.0	Draft
13/02/03	1.0	5 Purpose 8 Item 4-1 & 4-2 Specification filled out Other Various minor modifications in the formulation



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 3/17

**List of acronyms**

AD / RD	Applicable / Reference Document
ADP	Acceptance Data Package
CDR	Critical Design Review
CEA	Commissariat à l'Energie Atomique
DCU	Detector Control Unit
DML	Declared Material List
DMPL	Declared Mechanical Part List
DPL	Declared Processes List
DRCU	Detector Readout and Control Unit
EIDP	End Item Data Package
FCU	FPU Control Unit
FIRST	Far InfraRed and Sub millimeter Telescope
FM	Flight Model
FMECA	Failures Modes Effects & Criticality Analysis
FPU	Focal Plane Unit
FS	Flight Spare
GSE	Ground Support Equipment
HIFI	Heterodyne Instrument for First
ICD	Interface Control Document
LAM	Laboratoire d'Astrophysique de Marseilles
MAIV	Manufacturing, Assembly, Integration Verification
MCU	Mechanisms Control Unit
MGSE	Mechanical Ground Support Equipment
N/A	Not Applicable
PA / QA	Product / Quality Assurance
PACS	Photoconductor Array Camera & Spectrometer
PCB	Printed Circuit Board
PDR	Preliminary Design Review
PSU	Power Supply Unit
QM	Qualification Model
RFA	Request For Approval
RT	Room Temperature
S/C	SpaceCraft
SAP	Service d'Astrophysique
SCU	Subsystems Control Unit
SPIRE	Spectral & Photometric Imaging Receiver
TBC	To Be Confirmed
TBD	To Be Defined

## TABLE OF CONTENTS

1	Purpose .....	5
2	Documentation.....	5
2.1	Applicable documents.....	5
2.2	Reference documents.....	5
3	Subassembly and equipment codes.....	5
4	Process groups .....	6



# DRCU / Preliminary Declared Processes List (DPL)



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 5/17

## 1 Purpose

This document lists the process expecting to be used for the SPIRE DRCU QM2, FM,FS construction. This is a list based on our experience on previous similar devices built for SOHO / GOLF, XMM / EPIC or INTEGRAL / ISGRI.

## 2 Documentation

### 2.1 Applicable documents

The following documents will describe subsystems physically contained in the DRCU. These documents are to be written.

- MCU DPL            Subsystem under LAM responsibility but physically contained in the FCU box.
- PSU DPL            Subsystem to be furnished by a subcontractor (with spatial experience) under SAp responsibility

### 2.2 Reference documents

- ECSS-Q-70A        Materials, mechanical parts and processes
- PSS-01-700 2.0    The technical reporting and approval procedure for materials and processes
- PSS-01-703 1.0    The black-anodising of aluminium with inorganic dyes

CNES Guide for science projects EEE, Materials, and Processes Lists

## 3 Subassembly and equipment codes

Subassembly codes		Names	Responsibility
DRCU		Detector Readout and Control Unit	SAP
	FCU	FPU (Focal Plane Unit) Control Unit	SAP
		MCU	Mechanisms Control Unit
		SCU	Subsystems Control Unit
		PSU	Power Supply Unit
DCU		Detector Control Unit	SAP

## 4 Process groups

Code	Group	Used
1	Bonding	<input checked="" type="checkbox"/>
2	Manufacture of composites	<input type="checkbox"/>
3	Encapsulation, moulding	<input type="checkbox"/>
4	Coating, application of paint	<input checked="" type="checkbox"/>
5	Cleaning	<input checked="" type="checkbox"/>
6	Welding, mechanical soldering	<input checked="" type="checkbox"/>
7	Crimping, stripping, making wire-wrapped connections	<input checked="" type="checkbox"/>
8	Electronic soldering	<input checked="" type="checkbox"/>
9	Surface treatments	<input checked="" type="checkbox"/>
10	Gilding, silver-plating, etc...	<input type="checkbox"/>
11	Machining	<input checked="" type="checkbox"/>
12	Forming	<input type="checkbox"/>
13	Heat treatments	<input type="checkbox"/>
14	Special manufacturing, processes developed specifically for the programme	<input type="checkbox"/>
15	Marking	<input checked="" type="checkbox"/>
16	Sundry processes	<input checked="" type="checkbox"/>
17	Inspection procedures	<input checked="" type="checkbox"/>





**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 7/17

**Group 1 – Bonding**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
1-1	Put seals on fasteners	1. CEA/DSM DAPNIA/SAP 2. SAP-GERES-OM-0384-98	Put a drop of Scotchweld EC 2216 at the appropriate place between the fastener and the structure Curing TBD	1. DRCU 2. Every fastener (screw, nuts bolts) in the DRCU 3. Identification of the elements tightened with defined torque	CEA/DSM DAPNIA/SAP	1. 52-x 2. 10-2	Not critical	Used for SOHO/GOLF XMM/EPIC INTEGRAL/ISGRI INTEGRAL/SPI SAP common practice for space application	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 8/17

**Group 4 – Coating, application of paint**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
4-1	Nusil conformal coating	1. TBD 2. Sap-GERES-TO-0433-99 rev0	Application of a thin or thick layer of Nusil CV-1152	1. DRCU 2. DCU electronic boards, FCU/(MCU+SCU) electronic boards 3. Protective coating		1. 61-1 or 61-2 2. 10-3	Not critical	Already used by Sap for space applications to be filled out	A	
4-2	Solithane 113 conformal coating	1. TBD 2. Sap-GERES-FM-0239-96 rev1	Application of a thin or thick layer of Solithane 113	1. DRCU 2. DCU electronic boards, FCU/(MCU+SCU) electronic boards 3. Protective coating		1. 61-1 or 61-2 2. 10-4	Not critical	SAP common practice for each electronic board for space application	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 9/17

**Group 5 – Cleaning**

Group 5 – Cleaning										
1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
5-1 (1)	Electronic parts cleaning	1. CEA/DSM DAPNIA/Sap 2. GERES-PROC-402	Wiping with isopropyl alcohol	1. DRCU 2. Each part to be assembled 3. Cleaning of single electronic parts before assembling		1. EEE parts 61-1 or 61-2 2.	Not critical	ECSS-Q-70-08A		
5-1 (2)	Electronic parts cleaning	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Wiping with isopropyl alcohol	1. DRCU 2. Each part to be assembled 3. Cleaning of single electronic parts before assembling		1. EEE parts 61-1 or 61-2 2.	Not critical	ECSS-Q-70-08A		
5-2	Mechanical parts cleaning	1. CEA/DSM DAPNIA/Sap 2. GERES-PROC-402	Wiping with isopropyl alcohol	3. Cleaning of mechanical parts			Not critical			
5-3	PCB dry out	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Bake out of bare PCB Temperature? How long?	1. DRCU 2. Each bare PCB 3. Dry out of bare PCB after cleaning		1. 61-1 or 61-2 2.	Not critical			

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAp-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 10/17

**Group 6 – Welding, mechanical soldering**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
6-1	Salt bath brazing	1. AML 2. Subcontractor procedure <b>To be filled out</b>	Brazing of the electronic boxes (EN-AW-6082) with solder alloy (EN-AW-4047)	1. DRCU 2. DCU box, FCU/(MCU+SCU) box 3. See column 4		1. 2. 1-1 7-1	Not critical	Used for SOHO/GOLF XMM/EPIC INTEGRAL/ISGRI INTEGRAL/SPI Experienced subcontractor	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAp-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 11/17

**Group 7 – Crimping, stripping, making wire-wrapped connections**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
7-1	Connector pins crimping	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Crimping of the pins of the connector	1. DRCU 2. DCU electronic boards, FCU/(MCU+SCU) electronic boards 3. see column 4		1. EEE parts 2. <b>To be filled out with the item number of the used wire</b>	Not critical	ESA-ECSS-Q-70-26 requirements applied by a subcontractor with significant space application experience	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 12/17

**Group 8 – Electronic soldering**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
8-1	SMC soldering	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Soldering of surface-mount components on PCB	1. DRCU 2. DCU electronic boards, FCU/(MCU+SCU) electronic boards 3. See column 4		1. EEE Parts 61-1 or 61-2 2. 7-3	Not critical	ESA-PSS-01-738 requirements applied by a subcontractor with significant space application experience	A	
8-2	Electronic part soldering	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Manual soldering of electronic parts on PCB	1. DRCU 2. DCU electronic boards, FCU/(MCU+SCU) electronic boards 3. See column 4		1. EEE Parts 61-1 or 61-2 2. 7-4	Not critical	ESA-ECSS-Q-70-26 requirements applied by a subcontractor with significant space application experience	A	
8-3	Electronic part soldering (SAp)	1. CEA/DSM DAPNIA/SAp 2. GERES-PROC-402	Manual soldering of electronic parts on PCB	1. DRCU 2. DCU electronic boards, FCU/(MCU+SCU) electronic boards 3. See column 4		1. EEE Parts 61-1 or 61-2 2. 7-2 or 7-4	Not critical	ESA-ECSS-Q-70-26 requirements applied by experienced personnel of SAp for corrective operation if needed	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 13/17

**Group 9 – Surface treatments**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
9-1	Black-anodising	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Black-anodising with inorganic dyes.	1. DRCU 2. DCU box, FCU/(MCU+SCU) box 3. Optical treatment		1. 2. 1-1, 1-2, 7-1	Not critical	ESA-PSS-703 requirements applied by a subcontractor with significant space application experience	A	
9-2	Alodine 1200	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Aluminium conversion using CrO <sub>3</sub> acid + HF acid bath	1. DRCU 2. DCU box, FCU/(MCU+SCU) box 3. Corrosion protective treatment		1. 2. 1-1, 1-2, 7-1	Not critical	Used to be applied widely on space equipments.	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 14/17

**Group 11 – Machining**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>i</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
11-1	Standard machining	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Machining of the elementary parts with well known and standard tools	1. DRCU 2. DCU box structure and electronic board support structures, FCU/(MCU+SCU) box structure and electronic board support structures		1. 2. 1-1, 1-2	Not critical	Only well known non specific process	A	

<sup>i</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis





**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 15/17

**Group 15 – Marking**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
15-1	Mechanical item marking	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Milling marking on mechanical parts	1. DRCU 2. DCU box structure and electronic board support structures, FCU/(MCU+SCU) box structure and electronic board support structures 3. Identification		1. 2. 1-1, 1-2	Not critical	Only well known non specific process	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 16/17

**Group 15 – Sundry processes**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
15-1	Screw tightening	1. Subcontractor 2. Subcontractor procedure <b>To be filled out</b>	Tightening and control of the applied torque of every fastener.	1. DRCU 2. Every fastener (screw, nuts bolts) in the DRCU 3. Mechanical assembly		1. 52-x 2.	Not critical	SAP common practice for space application	A	

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis



**DRCU / Preliminary  
Declared Processes List (DPL)**



SAP-SPIRE-NC-0061-02  
Issue: 1.0  
Date: 13/02/03  
Page: 17/17

**Group 17 – Inspection procedures**

1	2	3	4	5	6	7	8	9		10
Item no.	Process identification	1. Manufacturer 2. Specification Iss./ Rev.	Process description	1. Sub-system 2. Equipment 3. Use	Sub-contractor name	Related elements 1. Component 2. Material	Process criticality <sup>1</sup>	9.1	9.2	Comments ESA approval
								Approval Justification	Approval Status	
17-1	Mechanical control	1. TBD 2. TBD	Dimensional & geometrical control with respect to the specifications							

<sup>1</sup> As defined in ECSS-Q-70A §5.1.4 Criticality analysis