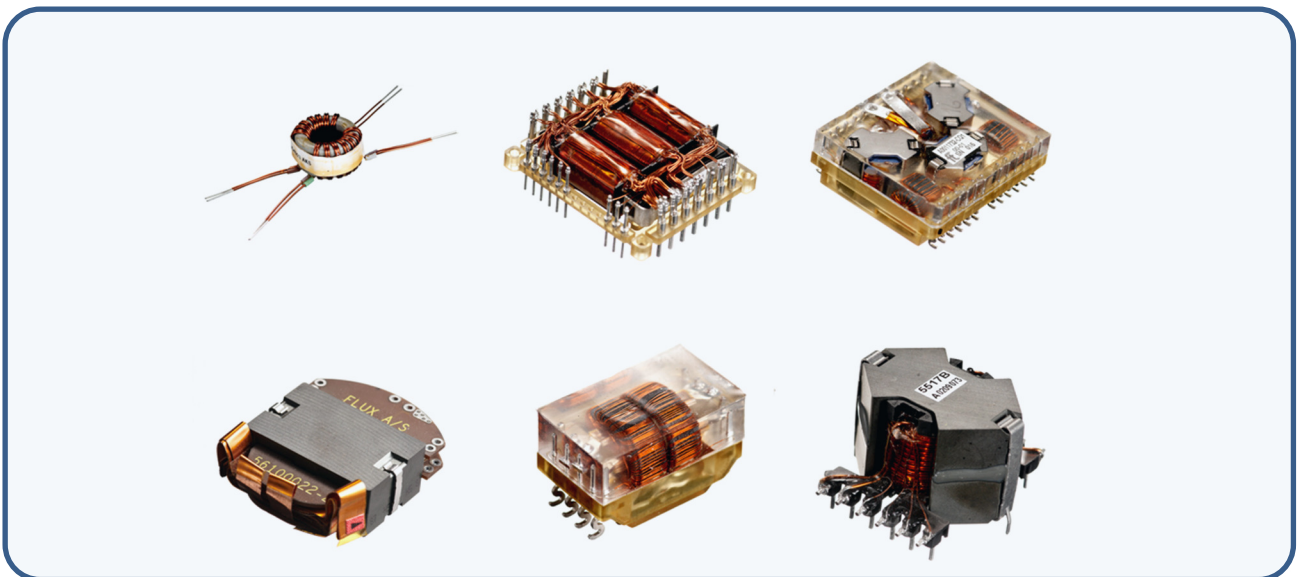


Process Identification Document: Magnetic Components for Space Applications

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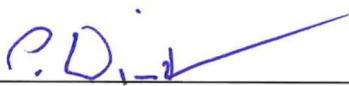
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DOCUMENT CHANGE LOG

Change No.	Date	Initiator	Pages Affected	Short Description of Change
Issue 11	07-06-12	-	all	The document has been reformatted and rewritten. For details of earlier versions please refer to issue 06
Issue 12	25-01-15	MS	-	2.1 Change of applicable documents to reference documents 2.2 addition of generic documents 3.2 Addition of MFP for planar components 4. Change to contact personnel 6.1 Clarification of training records 7.1 Clarification of restricted area
Issue 13	15-11-16	MS	-	6.4 Addition of repair
Issue 14	22-08-22	MS	-	Fig 4.1 Change of wording 7.2 Removed 8.1 Addition of manufacturing equipment 8.2 Addition of test equipment

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1. INTRODUCTION

1.1 Scope

This document details all necessary documentation and references for the manufacturing and testing of magnetic components for Space Applications

2. APPLICABLE DOCUMENTS

2.1 Reference Documents

Ref.	Document	Title
RD1	FT08742201	Flux A/S Quality Manual
RD2	ECSS-Q-ST-10	Product Assurance
RD3	ECSS-Q-ST-10-09	Non-conformance control system
RD4	ECSS-Q-ST-70B	Materials, mechanical parts and processes
RD5	ECSS-Q-ST-70-08	Manual soldering of high-reliability electrical connections
RD6	MIL-PRF-27F	General Specification for Transformers and Inductors
RD7	MIL-STD-202	Test Method Standards – Electronic and Electrical Component Parts
RD8	MIL-STD-981	Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications

2.2 Generic Space Documents

Ref.	Document	Title
GD1	FT 08690020	Generic Specification
GD2	FT 08690027	Declared Materials List
GD3	FT 08690028	Declared Processes List

3. PRODUCTION FLOW (MANUFACTURING FLOW PLAN(MFP))

The Production Flow Charts are detailed in figure 4-1 and 4.2. All operations, inspections, and tests are specified with the applicable status in accordance with Declared Processes List^(GD3), MIPs are likewise identified.

Status

Standard	Sensitive	Critical
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3.1 General Magnetic Components

TOROID ON CARRIER OR COUPELLE	TOROID	COMBINED MAGNETICS and SMT	RM / EFD etc.	IM
Kitting				
Pure tin removal FT.09.001	Material inspection FT.17.006	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> Completed Toroids, RMs or EFDs are included in kitting </div> <div style="font-size: 2em; margin-top: 10px;">↓</div>	Modification of coil former FT.14.003	Modification of coil former FT.14.003
Material inspection FT.17.006			Grinding of cores (optional) FT.16.001	Grinding of cores (optional) FT.16.001
Bonding of cores FT.14.001			Pure tin removal FT.09.001	Pure tin removal FT.09.001
Winding FT.07.007			Material inspection FT.17.006	Material inspection FT.17.006
Tempering of wire FT.13.001			Bonding of cores FT.14.001	Winding FT.07.006
Manufacturing test FT.17.005			Winding FT.07.007	Tempering of wire FT.13.001
Visual inspection FT.17.007			Tempering of wire FT.13.001	Tempering of wire FT.13.001
Stripping FT.07.001 to FT.07.004 ⁽²⁾			Manufacturing test FT.17.005	Visual inspection FT.17.007
Pretinning FT.09.002			Visual inspection FT.17.007	Visual inspection FT.17.007
Impregnation (optional) FT.03.001 or FT.03.002			Stripping FT.07.001 to FT.07.004 ⁽²⁾	Stripping FT.07.001 to FT.07.004 ⁽²⁾
Bonding of coil to carrier or coupelle FT.14.001			Pretinning FT.09.002	Pretinning FT.09.002
Soldering of wires FT.08.001			Destressing of carrier FT.13.002	Destressing of carrier FT.13.002
Marking & serialisation FT.15.001			Insertion of pins FT.14.002	Insertion of pins FT.14.002
Visual inspection FT.17.007			Visual inspection FT.17.007	Visual inspection FT.17.007
MIP 1 ⁽¹⁾ FT.17.002	Visual inspection FT.17.007	Visual inspection FT.17.007		
Potting FT.16.002	Marking & serialisation FT.15.001	Marking & serialisation FT.15.001		
Visual inspection FT.17.007	Bonding to socket FT.14.001	Bonding to socket FT.14.001		
	Visual inspection FT.17.007	Visual inspection FT.17.007		
	Soldering to pins FT.08.002	Soldering to pins FT.08.002		
	Visual inspection FT.17.007	Visual inspection FT.17.007		
	Manufacturing test FT.17.005	Soldering to pins FT.08.001		
	MIP 1 ⁽¹⁾ FT.17.002	Manufacturing test FT.17.005		
	Potting FT.16.002	MIP 1 ⁽¹⁾ FT.17.002		
	Visual inspection FT.17.007	Impregnation FT.03.001		
	Visual inspection FT.17.007	Visual inspection FT.17.007		
	Visual inspection FT.17.007	Core assembly FT.14.001		
Screening test FT.17.004				
Final inspection FT.17.008				
MIP 2 ⁽¹⁾ FT.17.002				
Delivery FT.16.003				

Note 1: As determined by project requirements
 Note 2: Dependent upon wire type and thickness

Figure 4-1 MFP for General Magnetic Components

3.2 Planar Components

Planar coil	Planar Multilayer PCB	Planar Stacked PCB	Planar Stacked & Foil	IM
Kitting				
Modification of coil former FT.14.003	Grinding of cores (optional) FT.16.001	Grinding of cores (optional) FT.16.001	Grinding of cores (optional) FT.16.001	Winding FT.07.006
Grinding of cores (optional) FT.16.001	Material inspection FT.17.006	Material inspection FT.17.006	Material inspection FT.17.006	Stripping FT.07.001 to FT.07.004 ⁽²⁾
Pure tin removal FT.09.001	Winding FT.07.006	Winding FT.07.006	Foil preparation FT.16.006	Pretinning FT.09.002
Material inspection FT.17.006	Stripping FT.07.001 to FT.07.004 ⁽²⁾	Stripping FT.07.001 to FT.07.004 ⁽²⁾	Visual inspection FT.17.007	Visual inspection FT.17.007
Winding FT.07.006	Pretinning FT.09.002	Pretinning FT.09.002	Foil folding FT.16.006	MIP ⁽¹⁾ FT.17.002
Tempering of wire FT.13.001	Visual inspection FT.17.007	Visual inspection FT.17.007	Visual inspection FT.17.007	Mounting thread
Visual inspection FT.17.007	Washing and Out baking of PCBs FT.16.005	Washing and Out baking of PCBs FT.16.005	Foil stacking FT.16.006	PCB stacking FT.16.004
Stripping FT.07.001 to FT.07.004 ⁽²⁾	Soldering FT.08.002	Soldering FT.08.002	Visual inspection FT.17.007	Washing and Out baking of PCBs FT.16.005
Pretinning FT.09.002	MIP ⁽¹⁾ FT.17.002	MIP ⁽¹⁾ FT.17.002	MIP ⁽¹⁾ FT.17.002	Soldering FT.08.002
Soldering to pins FT.08.001	Visual inspection FT.17.007	Visual inspection FT.17.007	Impregnation (optional) FT.03.001	Washing and Out baking of PCBs FT.16.005
Manufacturing test FT.17.005	Washing and Out baking of PCBs FT.16.005	Washing and Out baking of PCBs FT.16.005	Visual inspection FT.17.007	Visual inspection FT.17.007
Visual inspection FT.17.007	Insertion of pins incl. PCB assy FT.14.002	Insertion of pins incl. PCB assy FT.14.002	Washing and Out baking of PCBs FT.16.005	Gluing with Scotchweld EC2216 FT.01.002
MIP ⁽¹⁾ FT.17.002	Washing and Out baking of PCBs FT.16.005	Washing and Out baking of PCBs FT.16.005	Washing and Out baking of PCBs FT.16.005	Visual inspection FT.17.007
Impregnation FT.03.001	Core assembly FT.14.001	Core assembly FT.14.001	Insertion of pins incl. PCB assy FT.14.002	Washing and Out baking of PCBs FT.16.005
Visual inspection FT.17.007	Manufacturing test FT.17.005	Manufacturing test FT.17.005	Washing and Out baking of PCBs FT.16.005	Soldering FT.08.002
Core assembly FT.14.001	MIP ⁽¹⁾ FT.17.002	MIP ⁽¹⁾ FT.17.002	Stacking of PCB and foil FT.16.007	Washing and Out baking of PCBs FT.16.005
Marking & serialisation FT.15.001	Gluing with Scotchweld EC2216 FT.01.002	Gluing with Scotchweld EC2216 FT.01.002	Core assembly FT.14.001	Gluing with Scotchweld EC2216 FT.01.002
Bonding of cores FT.14.001	Mounting mechanical fixture	Mounting mechanical fixture	Manufacturing test FT.17.005	Mounting mechanical fixture
Visual inspection FT.17.007	Marking & serialisation FT.15.001	Marking & serialisation FT.15.001	MIP ⁽¹⁾ FT.17.002	Manufacturing test FT.17.005
	Visual inspection FT.17.007	Visual inspection FT.17.007	Gluing with Scotchweld EC2216 FT.01.002	MIP ⁽¹⁾ FT.17.002
			Mounting mechanical fixture	Core assembly FT.14.001
			Marking & serialisation FT.15.001	Marking & serialisation FT.15.001
			Visual inspection FT.17.007	Visual inspection FT.17.007
Screening test FT.17.004				
Final inspection FT.17.008				
MIP 2 ⁽¹⁾ FT.17.002				
Delivery FT.16.003				

Note 1: As determined by project requirements
 Note 2: Dependent upon wire type and thickness

Figure 4-2 MFP for Planar Components

4. CONTACT PERSONNEL

See Flux's Generic Specification^(GD1)

5. MATERIALS AND PROCESSES

Unless agreed otherwise, all materials and processes shall be in accordance with the Declared Materials List^(GD2) and Declared Processes List^(GD3) respectively.

6. WORKMANSHIP

6.1 Training

All work will be carried out by competent trained personnel. Training records and skill matrices are available for review onsite.

6.2 Recording of work

All work performed shall be in accordance with the work control sheet (WCS) in the production file. Each operation shall be signed and dated upon completion. Should any deviation/modification to the WCS be required it shall be red-lined and subjected to technical review.

6.3 Rework

Rework shall be performed in accordance with the requirements of the Flux A/S Quality Management System^(AD1) and recorded in the Assembly/Inspection Record (AIR).

6.4 Repair

Repairs will be agreed with the customer prior to commencement.

7. MANUFACTURING LINE LAY-OUT

All manufacturing will be performed in a restricted area; or in clean room facilities upon request.

7.1 Restricted Areas

Manufacturing areas with a proper and clean setup, admittance is for authorised personnel only.

8. LIST OF EQUIPMENT

Each instrument and tool is provided with a unique ID and labelled accordingly. The label also displays the calibration details.

It is each operator's responsibility to verify the validity of calibration prior to using the equipment.

8.1 Manufacturing equipment

This is a list of equipment typically used during the manufacturing process

Machine	Use
Meteor M01B	Linear winding machine for winding of magnetic components with coilformers.
Flux-model	Linear winding machine for winding of magnetic components with coilformers.
RUFF	Toroidal winding machine for winding of magnetic components on toroids.
Gorman Model 920	Toroidal winding machine for winding of magnetic components on toroids.
Gorman Productor B	Toroidal winding machine for winding of magnetic components on toroids.
RUFF RW75	Winding head for toroidal winding machine
RUFF RW100	Winding head for toroidal winding machine
RUFF RW100C	Winding head for toroidal winding machine
ERASER L2	Mechanical wire stripping machine, for wire diameters $\geq 0.6\text{mm}$.
HUGHES VTA-67	Reflow Soldering Head
HUGHES HTT 1000	Thermocouple controlled PSU for VTA-67
WELLER	Temperature controlled soldering stations
ELECTRO WÄRME Model VRTE	Vacuum oven
Gardner Denver vacuum pump	Impregnation and encapsulation

8.2 Test Equipment

This is a list of equipment typically used for testing

Machine	Use
WAYNE KERR 3245	Inductance Analyzer
WAYNE KERR 3220	20A Bias Unit
RE Instruments IM6	Insulation Resistance Tester
Voltech AT3600	Transformer/inductor Tester
Voltech AT5600	Transformer/inductor Tester

9. FAILURE REPORTING

Any Non-Conformance shall be processed in accordance with the quality assurance requirements of the Flux A/S Quality Management System^(RD1). See Generic Specification^(GD1) section 5.5 for further details.



10. RECORD OF LOTS

Unless specified otherwise, all "as-built-documentation", i.e. original production files and test reporting sheets are retained and will be available for review in accordance with the requirements of the Flux A/S Quality Management System^(RD1).