LVT Test Report:

MIL-STD-981 Class S (+ Augmentation)

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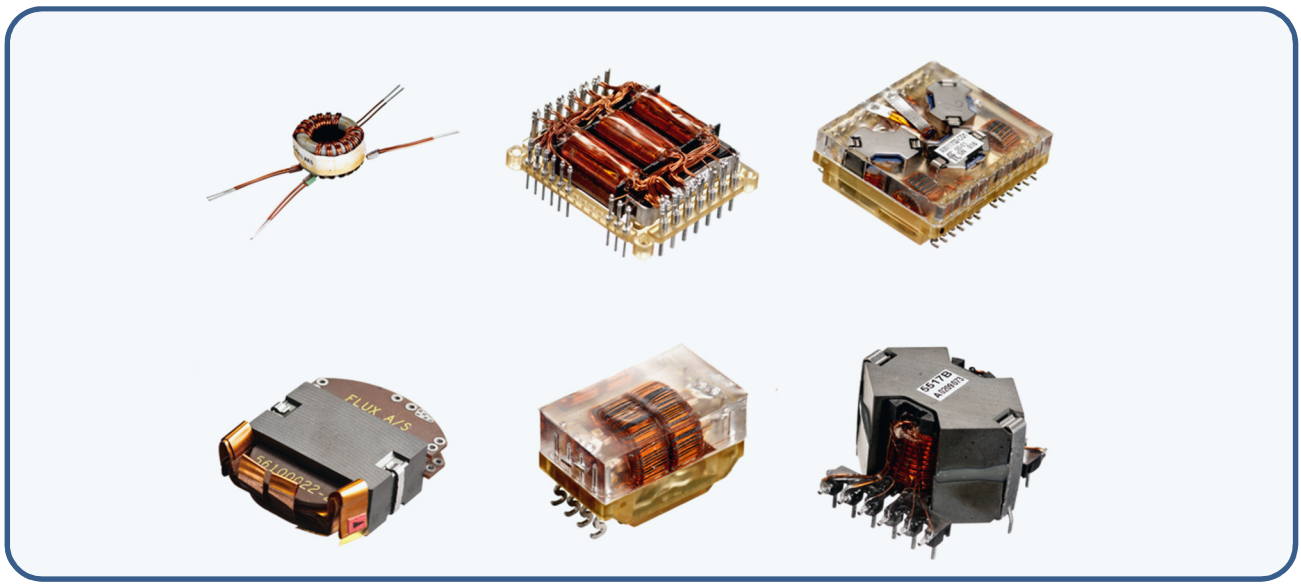

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DOCUMENT CHANGE LOG

Change No.	Date	Initiator	Pages Affected	Short Description of Change
2	16/06/20	MS		Addition of Test Data

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1. INTRODUCTION

This document reports the LOT Verification Testing (LVT) as per FT 08699014[RD9] of critical Flight Parts (CLASS S) components as defined MIL-STD-981[RD3], this testing has been augmented in agreement with ESA. The components under test are defined in section 3.1

2. REFERENCE DOCUMENTS

Ref.	Document	Title
RD1	MIL-PRF-27	General Specification for Transformers and Inductors
RD2	MIL-STD-202	Test Method Standards – Electronic and Electrical Component Parts
RD3	MIL-STD-981	Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications
RD4	FT 08690020	Generic Specification Magnetic Components for Space Applications
RD5	FT 08690019	Process Identification Document
RD6	FT 08711502	Screening Test Procedure for Transformers and Inductors
RD7	FT 08783001	Nonconforming Product
RD8	ECSS-Q-ST-70-08	Manual soldering of high-reliability electrical connections
RD9	FT 08699014	LVT Test procedure

3. SAMPLES DEFINITION

3.1 Range of component families for testing

The magnetic components covered by this lot acceptance test procedure are:

Evaluation Sample	Flux Part No	Description	Quantity
L1	14413001-1-S	ESA 5Kw Transformer	6
L2	12391005-1-S	ESA 5Kw Inductor	4
L3	12781001-1-M	Encapsulated power inductor	4
L4	12781002-1-M	Encapsulated power inductor	4
L5	12781003-1-M	Encapsulated power inductor	4
L6	12781004-1-M	Encapsulated power inductor	4
L7	12781005-1-M	Encapsulated power inductor	4
L8	12781006-1-M	Encapsulated power inductor	4
L9	12781007-1-M	Encapsulated power inductor	4

Table 3-1 LAT Samples

4. TEST METHODS AND REQUIREMENTS

4.1 Screening

Screening shall be performed in accordance with FT 08711502(RD6), prior to the start of LAT testing.

4.2 Visual Inspection

4.2.1 Visual Inspection Method

Visual inspection shall be aided by magnification appropriate to the size of inspection item, between 4x to 10x magnifications. Additional magnification shall be used to resolve suspected anomalies or defects.

4.2.2 Visual Inspection Requirements

4.2.2.1 External

The components shall be examined to verify that the materials, external design and construction, physical dimensions, marking and workmanship are in accordance with the requirements defined in the relevant procedures and the reference documents given in section 2 of this procedure

4.2.2.2 Post-test

No more than 10% of the surface shall have pooling, flaking, chipping, cracking, crazing or other impairment of the protective coating. There shall be no leakage of the filling material, no evidence of other physical damage, such as cracks, bursting, or bulging of the case or corrosion affecting the mechanical or electrical operation of the samples in accordance with MIL-PRF-27 (RD2), section 3.24.

4.3 Solderability

Solderability shall be performed on samples with PCB terminals. Solderability is not applicable for flying leads.

4.3.1 Solderability method

Solderability shall be tested by the "Soldering iron method", specified in MIL-STD-202 (RD2) , method 208. By using the "Soldering iron method" no separate test for resistance to soldering heat will be performed, and the purpose of this test will be:

a) Qualification of the component resistance to heat when soldered with a soldering iron.

b) Qualification of the solderability of the component terminals.

Practical test method to be applied:

- Minimum two of each type of terminals shall be tested
- A standard soldering iron shall be used. Tip temperature shall be 320 °C +/- 10 °C
- Solder alloy shall be Sn63Pb37 and flux shall be type RMA.
- The solder tip shall be held on the middle of the terminal for 2 Sec +/- 0,5 sec
- Solder iron tip shall be calibrated to reach 280°C on the calibration wire in 2 sec

4.3.2 Solderability requirements

The pins shall be visually inspected. Any termination that has less than 5% of the examination area dewetted, nonwetted or with pinholes will be accepted. Inspection is in accordance with MIL-STD-202 (RD2), method 208.

4.4 Terminal strength

Up to a maximum of 4 identical terminals per sample are to be subjected to terminal strength testing. Terminal strength is not applicable for flying leads.

4.4.1 Terminal strength method

Terminal strength shall be performed by applying a force in the direction of the axis of the termination. The force shall be gradually applied up to 10N and this force shall be held for between 5 to 10 seconds in accordance with MIL-PRF-27 (RD1), section 4.7.7.

4.4.2 Terminal strength requirements

There shall be no evidence of loosening or rupturing of terminals, or other mechanical damage, in accordance with MIL-PRF-27 (RD1), section 4.7.7.

4.5 Induced Voltage

4.5.1 Induced voltage method

Wound toroids manufactured on a winding machine shall be subjected to a voltage sufficient to cause twice the rated voltage across any winding or 300V for wires <0.250mm and 500V for wires ≥ 0.250mm whichever is greater

This test will be performed as surge test with 10 pulses.

4.5.2 Induced voltage requirements

During this test the magnetic device shall be inspected for evidence of continuous arcing, flashover, breakdown of insulation, and abrupt changes in the input current in accordance with MIL-PRF-27 (RD1), section 4.7.10. Means shall be provided to indicate fluctuations of input current.

4.6 Dielectric withstanding voltage

4.6.1 Dielectric withstanding voltage method

The dielectric withstanding voltage test, serves to determine whether insulating materials and spacing between different parts in the magnetic component are adequate.

The test consists of the application of an AC voltage higher than rated voltage for a specific time between mutually insulated portions of a component part or between insulated portions and ground.

The test shall be applied between each winding and shield, and all of the other windings and shields connected to the core (if accessible). Alternatively the test shall be applied between each winding and shield, and each of the other windings, shields and core (if accessible).

Atmospheric pressure applies

Voltage	*500 V rms.*
Max. Current	*0.10 mA ± 0.02 mA*
Ramp Time	*Max. 1 s*
Dwell Time	*Min. 5 s*
Frequency	*50 Hz*

4.6.2 Dielectric withstanding voltage requirements

During and post test the magnetic device shall be inspected for evidence of arcing, flashover, breakdown of insulation, and damage in accordance with MIL-PRF-27 (RD1), section 4.7.9.1.

4.7 Electrical Characteristics

4.7.1 Electrical Charateristics Test Method

The applicable electrical measurements as specified in the detail specification, shall be measured in accordance with FT 08711502 (RD6) and as agreed in the baseline for each part.

4.7.2 Electrical Charactristics Requirements

The measured electrical characteristics shall fall within the limits specified in the detail specification, including any formally agreed deviation. Drift shall be calculated with reference to the first measurement after production screening

4.8 Resistance to solvent

4.8.1 Resistance to solvent method

Components shall be tested in accordance with MIL-PRF-27 (RD1), using the methods detailed MIL-STD-202 (RD2), method 215.

The following shall reply:

- The marked portion of the components shall be brushed.
- The solvents tested shall be:
  - Demineralized water
  - 2-propanol

4.8.2 Resistance to solvent requirements

There shall be no evidence of mechanical damage and the markings shall remain legible. The paint or exterior finish shall not soften, peel, or show other signs of deterioration.

4.9 Vibration

MIL-PRF-27(RD1) states that MIL-STD-202(RD2) method 201 or 204 be used. Flux feels that these two options form an unrealistic scenario, therefore we elected to increase the vibration testing and use method 214. The purpose of which is:

'This test is conducted for the purpose of deteremining the ability of the component parts to withstand the dynamic stress exerted by random vibration applied between upper and lower frequency limits to simulate the vibration experienced in various service field environments'

4.9.1 Vibration test method

The components shall be mounted on a PCB and a vibration fixture and exposed to random vibration according to MIL-STD-202 (RD2), method 214, condition H.

Test conditions are as follows: random vibration

- Vibration level: 30 g rms.
- Duration: 5 minutes per axis.
- Level applied to fixture.

Axis	Frequency Range (Hz)	Level	G rms. Acceleration	Duration per axis
X,Y,Z	20 -100	+ 6 dB/oct	30	300 sec.
	100-1600	0.5 g²/Hz		
	1600-2000	- 12 dB/oct		

Table 4-3 Vibration test level

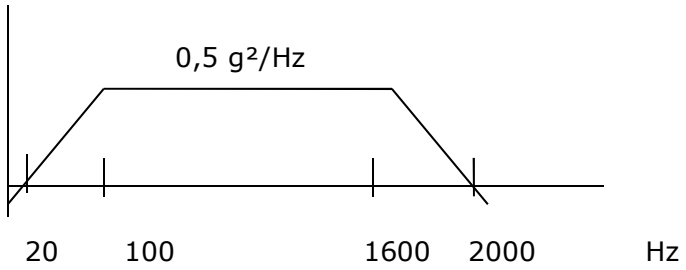

Figure 9-4 Vibration test PSD spectrum

4.9.2 Vibration test requirements

There shall be no evidence of physical damage in accordance with MIL-PRF-27(RD1), section 4.7.16. Visual inspection shall be performed after vibration testing.

4.10 Mechanical Shock

4.10.1 Mechanical shock method

The components shall be mounted on a PCB and a vibration fixture. The components shall be exposed to three shocks in each direction of the three perpendicular axes.

Due to the high demands of space industry,Flux has elected to increase the demands specified by MIL-PRF-27(RD1), which states the units be tested accordance with MIL-STD-202(RD2), method 213 condition I which has a peak value of 100G shock with a sawtooth shape.

To this end, Flux has decided that the peak value of the shocks is to be 500G with a half sine shape in accordance with MIL-STD-202(RD2), method 213 condition D Mechanical shock requirements.

4.11 Life Test

4.11.1 Life Test Method

Life testing based on that specified in MIL-PRF-27 (RD1). The testing detailed below is based on the units being temperature class S.

4.11.1.1 Accelerated +2 Temperature classes

Components be tested in accordance with MIL-STD-202(RD2) . Life test shall be performed by exposing the components to 5 cycles a week for 6 weeks (Total 1008 Hours). Four of the cycles consist of 20 hours at 125°C ±5ºC with operating conditions applied and 3 hours at room temperature.

The fifth cycle consist of 68 hours at 85 °C±5ºC with operating conditions applied and 3 hours at room temperature.

The transition times are to be 30 min ± 5 min each. During transition the samples shall be applied with operating conditions.

4.11.2 Life Test Requirements

There shall not be any evidence of physical damage in accordance with MIL-PRF-27(RD2).

4.12 Insulation Resistance

4.12.1 Insulation Resistance method

At specified voltage with insulation resistance (IR) of 7,500 megohms minimum.

4.12.2 Insulation Resistance requirements

There shall not be any evidence of physical damage in accordance with MIL-PRF-27(RD2).

4.13 Internal Mechanical Examination (Destructive Physical Analysis(DPA))

4.13.1 DPA Method

Components are to be moulded into adequate material, and cut and polished. The cut planes shall include solderings if any, and the core. Multiple cutplanes may be necessary. The components are to be visually inspected, and photographed.

4.13.2 DPA Requirements

There shall not be any evidence of physical damage of core, wires, coilformer, solderings, and insulation materials or impregnation material.

4.14 Partial Discharge

Transformer only

4.14.1 Partial Discharge Method

a. Magnitude of test voltage: 533Vac peak
b. Frequency: 50Hz
c. Test duration: 10 minutes min (after ramp up / before ramp down)
d. Background noise: <2pC
e. Pressure: <2Pa
f. Pass criteria: no pulse (≥ 5pC) during the test duration shall be observed

4.15 Moisture resistance

4.15.1 Moisture resistance method

Moisture resistance is to be performed by exposing the components to a number of temperature and humidity cycles as specified in MIL-STD-202 (RD2), method 106F. The components are not to be polarised or loaded during humidity cycles. Cycle steps 7a (-10°C conditioning) and 7b (vibration) are not applicable.

4.15.2 Moisture resistance requirements

There shall be no evidence of physical damage, or corrosion affecting the mechanical or electrical operation of the component, in accordance with MIL-PRF-27(RD1), section 4.7.20.

4.16 Overload

4.16.1 Overload method

Overload test have been performed by applying operating conditions as specified for each component, with the following exceptions:

- Power is to be at 112% of nominal power
- Temperature: Increase 1 temperature class

The operating conditions were applied for at least 48h in accordance with in accordance with MIL-PRF-27(RD1), section 6.11.

4.16.2 Overload requirements

There shall be no evidence of physical damage in accordance with MIL-PRF-27(RD1), section 3.24.

4.16.3 Overload step test

Overload test have been performed by applying operating conditions as specified for each component, with the following exceptions:

- Power is to be at 110% of nominal power, increasing in 10% increments every 30 minutes upto 180% and the 5% increments upto 200%
- Temperature: Normal temperature class

4.16.4 Overload step test requirements

This test may be destructive, units are to be examined post test.

4.17 Thermal Shock

4.17.1 Thermal shock method

Thermal shock shall be performed using an environmental chamber. The following test conditions shall be used; if not otherwise specified in the Order Baseline Matrix.

Parameter	Requirement
Minimum temperature	- 55°C ±3°C
Maximum temperature	+120°C ±3°C
Transition temperature	Room Temperature
Dwell time at min. and max. temperature	30 min.
Dwell time at transition temperature	4 min.
Transfer time	< 5 min.
Number of cycles	100

The first five cycles shall run continuously. After five cycles, the test may be interrupted after the completion of any full cycle, and the components allowed to return to ambient room temperature before testing is resumed.

4.17.2 Thermal shock requirement

The components shall be examined for evidence of leakage and other visible damage according to MIL-PRF-27(RD1) section 3.24.

5. TEST FLOW

Test performed based the requirements of MIL-STD-981(RD3), several tests have been augmented above those specified. This LOT Acceptance Testing is destructive and the samples are not suitable for flight use.

	Group and Test	14413001-1-S						12391005-1-S				12781001-1-M				12781005-1-M				12781006-1-M			
		004	005	011	002	013	012	006	007	003	004	A	B	C	D	A	B	C	D	A	B	C	D
Group 1	Electrical characteristics	✓	✓	✓	✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Resistance to soldering heat	N/A		N/A				N/A				✓	✓			✓	✓			✓	✓		
	Terminal Strength	N/A		N/A				N/A				N/A				N/A				N/A			
	Moisture Resistance	✓	✓					✓	✓			✓	✓			✓	✓			✓	✓		
	Vibration	✓	✓					(1)	(1)			✓	✓			✓	✓			✓	✓		
	Mechanical Shock	✓	✓					(1)	(1)			✓	✓			✓	✓			✓	✓		
	Electrical characteristics	✓	✓					✓	✓			✓	✓			✓	✓			✓	✓		
	Thermal Cycling (100 cycles)	✓	✓					✓	✓			✓	✓			✓	✓			✓	✓		
	Overload			(1)	✓																		
	Overload – Step test				✓																		
	Induced Voltage	✓	✓		✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Dielectric Withstanding Voltage (at atmospheric pressure)	✓	✓		✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Insulation Resistance	✓	✓		✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Electrical characteristics	✓	✓		✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Visual Inspection	✓	✓		✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Partial Discharge (Transformer only)	✓	✓		✓			N/A				N/A				N/A				N/A			
	Dielectric Withstanding Voltage (60seconds) ?	✓	✓		✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Visual and Mechanical Inspection (internal)	✓						✓				✓				✓				✓			
Group 2	Solderability					✓	✓			✓	✓			✓	✓			✓	✓			✓	✓
	Resistance to solvents					✓	✓			✓	✓			✓	✓			✓	✓			✓	✓
	Electrical characteristics					(1)	✓			✓	✓			✓	✓			✓	✓			✓	✓
	Temperature Rise	To be calculated								N/A				N/A				N/A				N/A	
	Life (1000 + temperature classes)			✓			✓			✓	✓			✓	✓			✓	✓			✓	✓
	Induced Voltage			✓			✓			✓	✓			✓	✓			✓	✓			✓	✓
	Dielectric Withstanding Voltage (at reduced voltage)			✓			✓			✓	✓			✓	✓			✓	✓			✓	✓
	Electrical characteristics			✓			✓			✓	✓			✓	✓			✓	✓			✓	✓
	Partial Discharge (Transformer only)			✓			✓			N/A				N/A				N/A				N/A	
	Visual Inspection			✓			✓			✓	✓			✓	✓			✓	✓			✓	✓
Sample Size = 4 +2																						Failures Allowed = 0	

Key:

Pass	Passed with comments See section 6.1	Fail See section 6.2	This test is required, however it is Not Applicable for this part type	In accordance with Test procedure this test is not required for this S/N

Group and Test		12781007-1-M				12781002-1-M				12781003-1-M				12781004-1-M			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Group 1	Electrical characteristics	✓	✓			✓	✓			✓	✓			✓	✓		
	Resistance to soldering heat	✓	✓			✓	✓			✓	✓			✓	✓		
	Terminal Strength	N/A				N/A				N/A				N/A			
	Moisture Resistance	✓	✓			✓	✓			✓	✓			✓	✓		
	Vibration	✓	✓			✓	✓			✓	✓			✓	✓		
	Mechanical Shock	✓	✓			✓	✓			✓	✓			✓	✓		
	Electrical characteristics	✓	✓			✓	✓			✓	✓			✓	✓		
	Thermal Cycling (100 cycles)	✓	✓			✓	✓			✓	✓			✓	✓		
	Overload																
	Overload – Step test																
	Induced Voltage	✓	✓			✓	✓			✓	✓			✓	✓		
	Dielectric Withstanding Voltage (at atmospheric pressure)	✓	✓			✓	✓			✓	✓			✓	✓		
	Insulation Resistance	✓	✓			✓	✓			✓	✓			✓	✓		
	Electrical characteristics	✓	✓			✓	✓			✓	✓			✓	✓		
	Visual Inspection	✓	✓			✓	✓			✓	✓			✓	✓		
	Partial Discharge (Transformer only)	N/A				N/A				N/A				N/A			
	Dielectric Withstanding Voltage (60seconds) ?	✓	✓			✓	✓			✓	✓			✓	✓		
	Visual and Mechanical Inspection (internal)	✓															
Group 2	Solderability			✓	✓			✓	✓			✓	✓			✓	✓
	Resistance to solvents			✓	✓			✓	✓			✓	✓			✓	✓
	Electrical characteristics			✓	✓			✓	✓			✓	✓			✓	✓
	Temperature Rise			N/A				N/A				N/A				N/A	
	Life (1000 + temperature classes)			✓	✓			✓	✓			✓	✓			✓	✓
	Induced Voltage			✓	✓			✓	✓			✓	✓			✓	✓
	Dielectric Withstanding Voltage (at reduced voltage)			✓	✓			✓	✓			✓	✓			✓	✓
	Electrical characteristics			✓	✓			✓	✓			✓	✓			✓	✓
	Partial Discharge (Transformer only)			N/A				N/A				N/A				N/A	
	Visual Inspection			✓	✓			✓	✓			✓	✓			✓	✓

Key:

Pass	Passed with comments See section 6.1	Fail See section 6.2	This test is required, however it is Not Applicable for this part type	In accordance with Test procedure this test is not required for this S/N

5.1 Test Facilities

All testing except for vibration and mechanical shock was performed at Flux's facilities in Asnaes, Denmark, Vibration and mechanical shock was performed at Force's facilities in Horsholm, Denmark.

6. OBSERVATIONS

6.1 Minor Observations

1. Life Test – Due to a fault in the setup of the life test one unit was overheated and shorted. As a result one of the units scheduled for overload testing was redirected to subgroup 2.

6.2 Major / Critical Observations

1. Vibration – the 12391005-1-S that were subjected to vibration and shock showed damage. .

6.3 Failure Analysis

As a result of the failure detailed in section 6.2(1) the part was analyzed. The analysis showed that due to the design of the housing and the coil being fixed at only 1 end of the unit the ferrite core and coil moved within the housing.

6.3.1.1 Correction Action

The design of the inductor has been updated to include a recessed area in which the core is seated. This will eliminate the lateral travel of the core

7. CONCLUSION

With the exceptions detailed in section 6.2 and in accordance FT 08699314[RD9], the LOT verification testing is complete.

The following parts have been selected for formal ESCC qualification using FT08699016

Flux Part No	Description	Quantity	Description
14413001-1-S	ESA 5Kw Transformer	5	
12391005-1-S	ESA 5Kw Inductor	5	Updated design (See 6.3.1.1)
12781001-1-M	Encapsulated power inductor	5	
12781007-1-M	Encapsulated power inductor	5	

8. TEST DATA

8.1 L1 – 14413001-1-S

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max; 66,1					Max; 66,1			
	Min: 44,1	5000				Min: 44,1	5000		
S/N 004	32,5	✓	✓	✓	✓		✓	✓	
S/N 005	32,7	✓	✓	✓	✓		✓	✓	
S/N 011	34,5	✓							(1)
S/N 002	47,6	✓							✓
S/N 013									
S/N 012									

Note 1: Units out of inductance during screening

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	Partial Discharge	DWV
					Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	§ 5,14	500Vac 60s
LIMITS					Max; 66,1				
					Min: 44,1	5000			
S/N 004		✓	✓	✓		✓	✓	✓	✓
S/N 005		✓	✓	✓		✓	✓	✓	✓
S/N 011									
S/N 002	✓	✓	✓	✓	47,15	✓	✓		
S/N 013									
S/N 012									

Note 1: Units out of inductance during screening

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Temperature Rise	Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm				
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V		§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 66,1					
				Min: 44,1	5000				
S/N 004	✓	✓							
S/N 005	✓								
S/N 011							✓	✓	✓
S/N 002	✓								
S/N 013		✓	✓	34,2	✓	To be calculated	(1)		
S/N 012		✓	✓	37,8	✓		✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Partial Discharge	Visual Inspection
	Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,14	§ 5,2
LIMITS	Max; 66,1			
	Min: 44,1	5000		
S/N 004				
S/N 005				
S/N 011	34,5	✓	✓	✓
S/N 002				
S/N 013				
S/N 012	37,3	✓	✓	✓

Note 1: Units out of inductance during screening

8.2 L2 – 12391005-1-S

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max; 27,3					Max; 27,3			
	Min: 24,7	5000				Min: 24,7	5000		
S/N 006	32,6	✓	✓	(1)	(1)	32,7	✓	✓	
S/N 007	31,8	✓	✓	(1)	(1)	31,9	✓	✓	
S/N 003									
S/N 004									

Note 1: Units out of inductance during screening

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	Partial Discharge	DWV
					Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	§ 5,14	500Vac 60s
LIMITS					Max; 27,3				
					Min: 24,7	5000			
S/N 006		✓	✓	✓	32,7	✓	✓		✓
S/N 007		✓	✓	✓	31,9	✓	✓		✓
S/N 003									
S/N 004									

Note 1: Units out of inductance during screening

12391005-1-S

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS	0,250V 100kHz N1(1-2)			Max; 27,3				
				Min: 24,7	5000			
S/N 006	✓	✓						
S/N 007	✓							
S/N 003			✓	32,4	✓	✓	✓	✓
S/N 004			✓	32,5	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max; 27,3		
	Min: 24,7	5000	
S/N 006			
S/N 007			
S/N 003	32,4	✓	✓
S/N 004	32,5	✓	✓

Note 1: Units out of inductance during screening

8.3 L3 – 12780101-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	1,58	✓	✓	✓	✓	1,63	✓	✓	
Sample B	1,59	✓	✓	✓	✓	1,62	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	1,66	✓	✓	✓
Sample B		✓	✓	✓	1,64	✓	✓	✓
Sample C								
Sample D								

12780101-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓	✓						
Sample B	✓							
Sample C			✓	1,55	✓	✓	✓	✓
Sample D			✓	1,56	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	1,57	✓	✓
Sample D	1,59	✓	✓

Note 1: Units out of inductance during screening

8.4 L4 – 12780102-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	3,14	✓	✓	✓	✓	3,17	✓	✓	
Sample B	3,15	✓	✓	✓	✓	3,17	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	3,18	✓	✓	✓
Sample B		✓	✓	✓	3,20	✓	✓	✓
Sample C								
Sample D								

12780102-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓							
Sample B	✓							
Sample C			✓	3,13	✓	✓	✓	✓
Sample D			✓	3,10	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	3,21	✓	✓
Sample D	3,15	✓	✓

Note 1: Units out of inductance during screening

8.5 L5 – 12780103-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	3,54	✓	✓	✓	✓	3,59	✓	✓	
Sample B	3,60	✓	✓	✓	✓	3,61	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	3,67	✓	✓	✓
Sample B		✓	✓	✓	3,63	✓	✓	✓
Sample C								
Sample D								

12780103-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓							
Sample B	✓							
Sample C			✓	3,61	✓	✓	✓	✓
Sample D			✓	3,62	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	3,65	✓	✓
Sample D	3,65	✓	✓

Note 1: Units out of inductance during screening

8.6 L6 – 12780104-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	4,58	✓	✓	✓	✓	4,64	✓	✓	
Sample B	4,72	✓	✓	✓	✓	4,80	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	4,69	✓	✓	✓
Sample B		✓	✓	✓	4,77	✓	✓	✓
Sample C								
Sample D								

12780104-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓							
Sample B	✓							
Sample C			✓	4,55	✓	✓	✓	✓
Sample D			✓	4,68	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	4,52	✓	✓
Sample D	4,60	✓	✓

Note 1: Units out of inductance during screening

8.7 L7 – 12780105-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	5,66	✓	✓	✓	✓	5,68	✓	✓	
Sample B	5,83	✓	✓	✓	✓	5,81	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	5,75	✓	✓	✓
Sample B		✓	✓	✓	5,88	✓	✓	✓
Sample C								
Sample D								

12780105-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓	✓						
Sample B	✓							
Sample C			✓	5,72	✓	✓	✓	✓
Sample D			✓	5,75	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	5,77	✓	✓
Sample D	5,78	✓	✓

Note 1: Units out of inductance during screening

8.8 L8 – 12780106-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	30,2	✓	✓	✓	✓	29,4	✓	✓	
Sample B	29,4	✓	✓	✓	✓	28,5	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	28,4	✓	✓	✓
Sample B		✓	✓	✓	27,8	✓	✓	✓
Sample C								
Sample D								

12780106-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓	✓						
Sample B	✓							
Sample C			✓	29,8	✓	✓	✓	✓
Sample D			✓	29,5	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	30,2	✓	✓
Sample D	29,7	✓	✓

Note 1: Units out of inductance during screening

8.9 L9 – 12780107-1-M

TEST	Electrical Characteristics		Moisture Resistance	Vibration	Mechanical Shock	Electrical Characteristics		Thermal Cycling	Overload
	Inductance (1) µH	Insul MOhm				Inductance (1) µH	Insul MOhm		
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,15	§5,9	§ 5,10	0,250V 100kHz N1(1-2)	500V	§ 5,17	§ 5,16
LIMITS	Max;					Max;			
	Min:	5000				Min:	5000		
Sample A	63,4	✓	✓	✓	✓	63,9	✓	✓	
Sample B	62,9	✓	✓	✓	✓	62,3	✓	✓	
Sample C									
Sample D									

TEST	Overload Step Test	Induced Voltage	DWV	Insulation Resistance	Electrical Characteristics		Visual Inspection	DWV
					Inductance (1) µH	Insul MOhm		
CONDITIONS	§ 5,16	§ 5,5 500V 10 pulses	500Vac 5s	RD6	0,250V 100kHz N1(1-2)	500V	§ 5,2	500Vac 60s
LIMITS					Max;			
					Min:	5000		
Sample A		✓	✓	✓	64,2	✓	✓	✓
Sample B		✓	✓	✓	63,2	✓	✓	✓
Sample C								
Sample D								

12780107-1-M

TEST	Visual Inspection	DPA	Resistance to Solvents	Electrical Characteristics		Life Test	Induced Voltage	DWV (reduced voltage)
				Inductance (1) µH	Insul MOhm			
CONDITIONS	§ 5,2	§ 5,13	§ 5,18	0,250V 100kHz N1(1-2)	500V	§ 5,11	§ 5,5	375Vac 5s
LIMITS				Max; 27,3				
				Min: 24,7	5000			
Sample A	✓	✓						
Sample B	✓							
Sample C			✓	61,9	✓	✓	✓	✓
Sample D			✓	62,2	✓	✓	✓	✓

Note 1: Units out of inductance during screening

TEST	Electrical Characteristics		Visual Inspection
	Inductance (1) µH	Insul MOhm	
CONDITIONS	0,250V 100kHz N1(1-2)	500V	§ 5,2
LIMITS	Max;		
	Min:	5000	
Sample A			
Sample B			
Sample C	62,5	✓	✓
Sample D	63,0	✓	✓

Note 1: Units out of inductance during screening