Technology Flow:

PID and Domain for Customised Magnetics (Public Extract)

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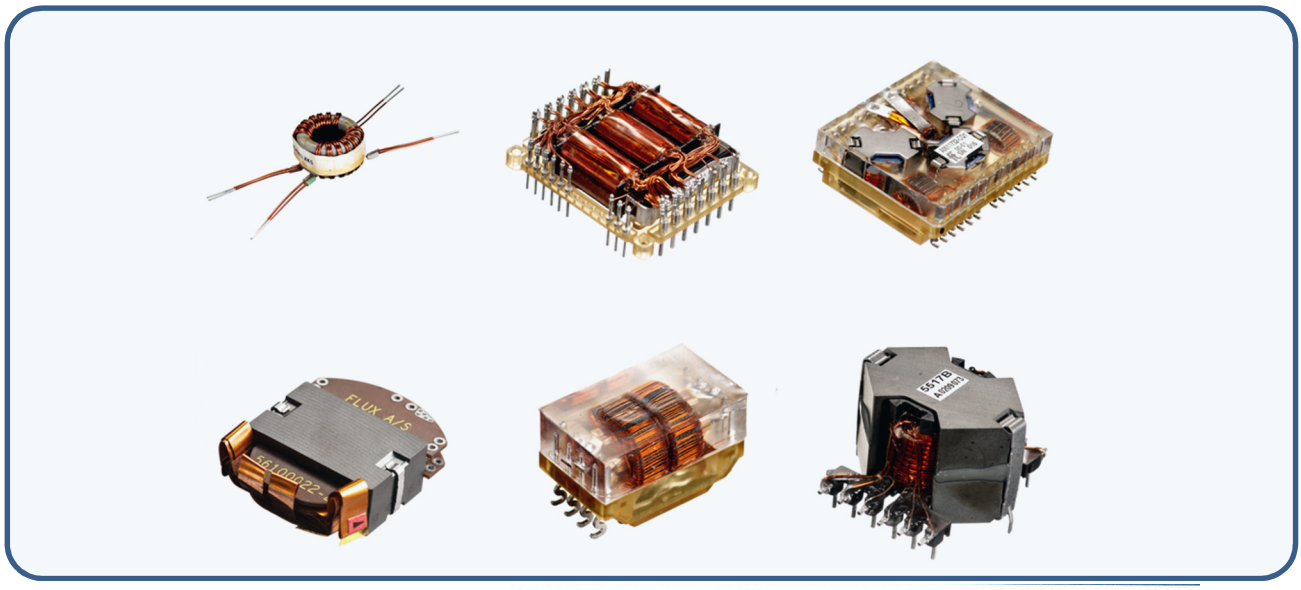


Prepared by

Deputy Chief Inspector
Quality Engineer

Approved By

Chief Inspector
QHSE Manager

Approved By

Head of TRB
Business Director Defence and Space

Approved By

ESCC Executive

DOCUMENT CHANGE LOG

Change No.	Date	Initiator	Pages Affected	Short Description of Change
2	05/02/20	MS	6	Addition of part marking
3	27/10/20	MS	5, 7 & 9	Addition of section (Data Transmission) Change to signature page Change to maximum ratings Change to electrical rule set

TABLE OF CONTENTS

1. INTRODUCTION

The document describes the domain of the custom magnetics produced by Flux A/S

2. REFERENCE DOUMENTS

Ref.	Document	Title
RD1	ESCC 3201	ESCC Generic Specification Coils, RF and Power, Fixed
RD2	ESCC 3201/013	ESCC Basic Specification
RD3	FT 08699003-1	DML for ESCC approved parts
RD4	FT 08699004-1	DPL for ESCC approved parts
RD5	FT 08700000	Flux A/S Quality Management System
RD6	FT 08742201	Flux A/S Quality Manual
RD6	FT 08754205	Technology Review Board
RD7	FT 08699016	Qualification, Periodic Testing and LOT Validation
RD8	FT 08711502	Screening
RD9	MIL-PRF-27	General Specification for Transformers and Inductors
RD10	MIL-STD-202	Test Method Standards – Electronic and Electrical Component Parts
RD11	MIL-STD-981	Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications
RD12	ECSS-Q-ST-70-71	Material, Processes and their data selection

3. DOMAIN

3.1 Flux A/S ESCC Domain

3.1.1 Part Families

3.1.1.1 Inductors and Chokes

The component types and range of components to the inductor and Chokes are as defined herein:

Variant Number	Design Domain	Electrical Characteristics	Number of Terminals	Finish	Weight
Based on core size and type of termination 12345xxx	Note 1	Note 2	Note 3	Note 4	Note 5

3.1.1.2 Transformers

The component types and range of components to the transformers are as defined herein:

Variant Number	Design Domain	Electrical Characteristics	Number of Terminals	Finish	Weight
Based on core size and type of termination 14345xxx	Note 1	Note 2	Note 3	Note 4	Note 5

3.1.1.3 Data Transmission (Chokes, Inductors & Transformers)

The component types and range of components to the data transmission are as defined herein:

Variant Number	**Design Domain**	**Electrical Characteristics**	**Number of Terminals**	**Finish**	**Weight**
Based on core size and type of termination 15345xxx	Note 1	Note 2	Note 3	Note 4	Note 5

3.1.1.4 Notes for Part Families 3.1.1.1 to 3.1.1.3

Note 1 - Domain

The design domain for the components manufactured includes the following

- Development of customized electrical functions:
  - Single or multi-coupled inductors
  - Common mode chokes /Differential
  - Power transformers (flyback, forward, push-pull, half/full bridge, specific architectures)
  - Signal transformers
  - Pulse transformers
  - Current/voltage measurement transformer
  - Integrated Magnetics
  - Spike Killer (high frequency filter)
  - High Frequency
  - High Voltage
  - Specific magnetic function
- Temperature Range -55ºC to +125ºC or depending on temperature class
- Maximum Power - See Note 2
- Temperature rise – See Note 2
- Dielectric Strength – See Note 2

Note 2 – Electrical Characteristics

All electrical characteristics to a particular design are specified in the magnetics sheet, which is either produced or verified by the manufacturer.

Note 3 – Number of terminals

The number of terminals or leads are specified in the magnetics sheet, which is either produced or verified by the manufacturer.

Note 4 – Finishes

The finishes used specified in the magnetics sheet, which is either produced or verified by the manufactured and detailed in the DML and are in accordance with ESCC 23500

Note 5 – Weight and physical dimensions

The weight and physical dimension are specified in the magnetics sheet.

3.1.2 Part marking

Part marking will be in accordance with ESCC3201/013 and a serial number (as space permits). This will be detailed on the magnetics sheet. The entire part number will appear on both the primary packaging and the CofC

3.1.3 Technology Flow

3.1.3.1 General Features

The Technology Flow covers the design, manufacturing, assembly, in-process inspection, screening and testing of custom magnetic components at Flux A/S, Denmark.

3.1.3.2 Basic Information

Leads:	As per ECSS-Q-ST-70-08
Molding:	As specified
Wire:	As specified and listed in DML
Magnetic core:	Chosen during design phase to meet customer requirements
Formats component types:	See magnetic sheets

3.1.3.3 Technology Flow definition

3.1.3.3.1 Design

The magnetic components are designed according to design rules and following a design process

The design rules ensures operation within specified temperature class, see magnetic sheet

3.1.3.3.2 Manufacturing Process

The manufacturing process is described herein and DPL FT08699004

3.1.3.3.3 Control and testing

Control and testing are performed at Flux A/S.

They are performed according to the part specific magnetic sheet and the generic ESCC specification 3201 and the ESCC detail specification 3201/013

3.1.3.4 Radiation Characteristics

These magnetic components are not sensitive to radiation.

3.1.3.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings (Note 1)	Units	Remarks
Power	P	See Magnetic Sheet	W	Upto 5kW
Rated DC Current	I_R	See Magnetic Sheet	mA	Upto 62.5A
Dielectric Withstanding Voltage	DWV	See Magnetic Sheet	Vrms	
Operating Frequency	f	See Magnetic Sheet	Hz	Upto 0.5Mhz
Operating Temperature Range	T_{op}	See Magnetic Sheet (-55 to +130ºC)	°C	T_{amb} (Note 2)
Storage Temperature Range	T_{stg}	See Magnetic Sheet (-55 to +155ºC)	°C	(Note 3)
Soldering Temperature	T_{sol}	+260 for SnPb +300 for SnAg	°C	(Note 4)

NOTES:

1. This Maximum Rating for a particular component will be specified in the Magnetic Sheet for that component
2. The maximum operating temperature shall not exceed the derated material temperature– (Temperature rise+Hotspot)
3. The maximum storage temperature shall not exceed the derated material temperature
4. Unless otherwise specified in the applicable Magnetic sheet: Duration 5 seconds maximum, the same terminal shall not be resoldered until 3 minutes have elapsed.

3.1.3.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

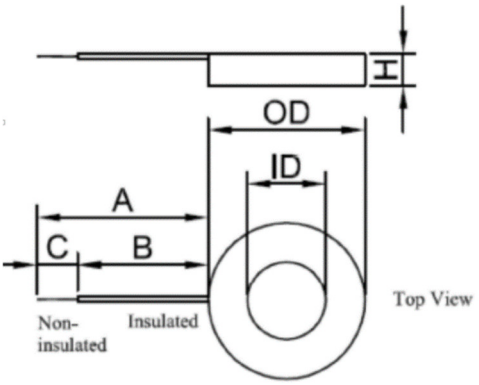
The physical dimensions and terminal identification for a particular component will be specified in the Magnetic Sheet for that component.

NOTES:

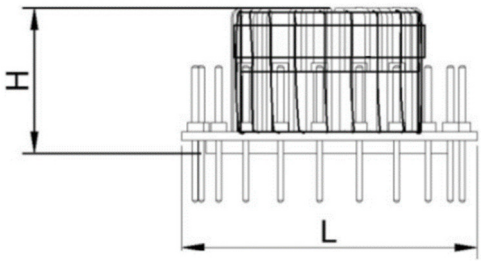
The overall dimensions for the range of cores used in components against this specification, depending on the design type used, are as follows:

- For toroid based designs: effective core (The minimum physical area which the total flux runs through the core) area of 2mm^2 to 199mm^2; see examples below:

Toroid with flying leads

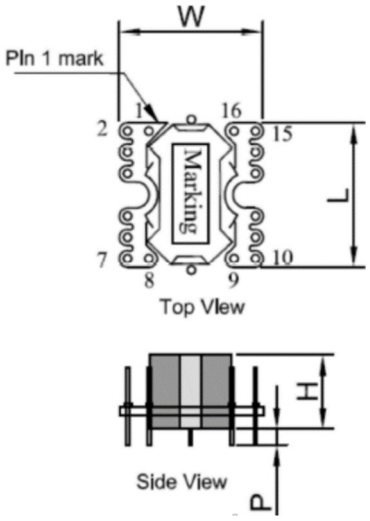


Toroid on base with pins

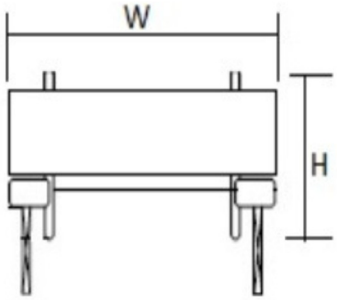


- For coil former based designs: effective core area 2.66mm^2 to 146mm^2; see examples below:

RM (Rectangular Module) based design with pins

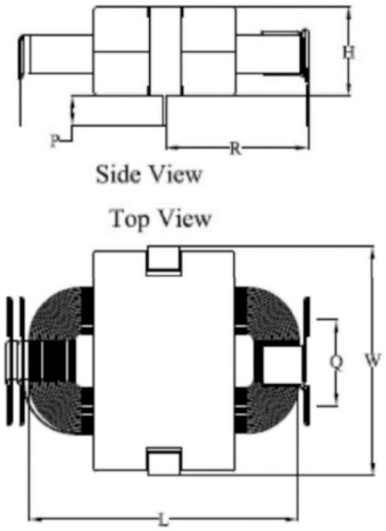


EFD (Economic Flat Design) based design with pins

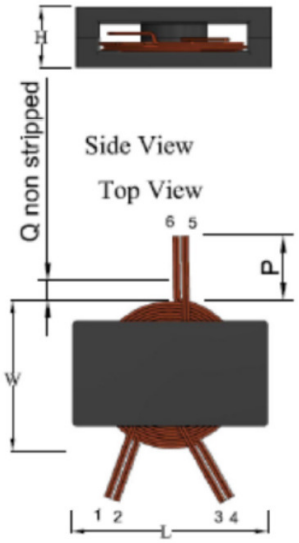


- For custom designs: effective core area 0.14mm^2 to 484mm^2; see examples below:

Planar design with foil



Planar design with wire



Unless otherwise specified in the applicable Magnetic Sheet and where applicable, terminals shall be colour coded by means

3.1.3.7 MATERIALS AND FINISHES

The minimum wire size shall be Ø0.10mm

The materials and finishes including case and terminals for a particular component will be specified in the Magnetic Sheet for that component. All materials shall meet the requirements of ECSS-Q-ST-70-71 and are detailed in FT08699003

3.2 Design process

During the electrical design the specified voltage, current, frequency, and power is ensured the design is within the domain.

With the electrical design in place the core and mechanical design is checked against the physical domain constraints.

Finally the materials and production processes are compared to the DML and DPL to ensure the complete design is within the domain.

3.3 Electrical rule set

Parameter	**Inductor**	**Transformer**
Output Power [W]	0≤P≤2,5kW	0≤P≤5kW
Voltage [V]	0≤V≤110V	0≤V≤3kV
Current [A]	0≤I≤35A	0≤I≤62.5A
Dielectrical Breakdown	950≤V≤8kV	950≤V≤8kV
Temperature [ºC]	-55≤T≤155	-55≤T≤155
Dimensions[mm^3] (Core Volume)	1≤V≤164000	2≤V≤234000

3.4 Manufacture

3.4.1 Materials & Processes

Materials and Processes have been selected by Flux from Flux's DML and DPL respectively

3.4.2 Technologies

Flux A/S manufactures customised inductors and transformers in the following topologies

- RM (Rectangular modulus)
- Toroid
- Planar
- EFD (Economic Flat Design)
- IM (Integrated Magnetics – multiple magnetic functions on the same core)
- EP (The *EP* core is halfway between a *E* and a *pot* core)
- PQ (Shaped core with an optimized ratio of volume to winding area and surface area)
- Special and Modified Cores

The packages, finishes and terminals will be determined by the magnetics sheet and agreed baseline

3.5 Mandatory Inspection Points (MIP)

Where applicable, Mandatory Inspection Points (MIP) are conducted for each lot of Transformers and Inductors as defined in the approved MFP. If MIPs are included in the Purchase Order, FLUX will notify the Customer at least 5 working days prior to the commencement. The Customer shall within 2 working days indicate in writing, whether or not the Customer intends to attend or perform the MIP, if the customer does not wish to attend or perform the MIP, the authority to conduct the MIP shall be delegated to FLUX, whereon it will be performed by qualified personnel, as agreed with the customer.

4. QUALITY MANAGEMENT SYSTEM

FLUX's general operating practices and Work Instructions are controlled by our Quality Management System FT08700000(QMS). This document summarises the general requirements for the procurement, inspection, test, delivery and documentation requirements.

Additionally it covers aspects relating to Lot Acceptance Testing (LAT), Qualification Testing and Qualification retention.

The system is run and maintained in accordance with and certified to EN9100 :2016

5. TECHNOLOGY REVIEW BOARD

The TRB is responsible for compliance of the Technology Flow Approval and all activities relevant thereto in accordance with FT08754205.

They are also responsible for the selection of test vehicles used for maintenance of qualification. The vehicle shapes shall be chosen to cover the domain, the winding, mounting and sizes may vary.

6. QUALIFICATION, PERIODIC TESTING AND LOT VALIDATION

The procedure Qualification, Periodic Testing and LOT Validation of parts within the Technology Domain of the Flux A/S Technology Flow Approval. Testing is performed in line with 3201/013