

DC Motor EMI Suppression Evaluation Form

Jastech EMC Consulting LLC

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Directions for Evaluation Form

- A good EMI filter on a DC motor has the following qualities:
 - Meets or exceeds EMC emissions levels
 - Doesn't affect application functionality
 - Can be manufactured cost effectively
 - Has good reliability and repeatable performance
- The purpose of this evaluation form is to provoke discussion and insight into issues and costs involved with DC motor EMI suppression from initial motor design to production.
- Not all questions need to be answered for Jastech EMC Consulting to develop a EMI filter for a DC motor; however the more information available increases the chances that cost and performance criteria can be meet.

Company and Contact Information

Name of Company	
Address	
City	
State/Prov.	
Postal Code	
Country	
Contact Name	
Job Title	
Phone Number	
Email Address	
Additional Contact Name	
Job Title	
Phone Number	
Email Address	

System Responsibility, Requirements & Program Information

Who is the motor manufacturer, module supplier, & OEM?	
Who is responsible for motor EMI suppression?	
What industry is this motor for (military, consumer, automotive, industrial etc.)?	
What is the end application?	
Is this a functional problem, compliance problem or both?	
Do you have EMC requirements? What are they?	
Have you done any EMC testing on the motor? Is it available for us to review? Who did testing?	
Are there environmental requirements (operating temperature range, corrosion testing, hermetic seal testing, pressure test, etc.)?	
Is the filter going to be a retro-fit, re-design, or new design?	

System Responsibility, Requirements & Program Information

What stage of design is the project in?

Who is going to manufacture the EMI filter (done in-house, outsourced, specified to motor/module supplier)?

What is project timing for concept prototyping, design validation, production validation and production?

What are annual EMI filter production volumes?

What is driving your EMI filter needs – cost, performance or both?

Do you need a referral for a filter assembler?

Do you need a referral to a certified EMC test lab?

Motor Operation

Is the motor AC, DC, PWM powered?

Is the motor brush commutated or electrically commutated?

Motor Operation

What is the operating voltage of the Motor?	
What is the maximum current draw of the motor? What is normal current draw of the motor?	
Does the motor application have a stall condition? What is the in-rush current of a stalled condition?	
Is the motor classified as a short, medium or long duration motor?	
Does the motor currently have EMI suppression? Physically – where is the suppression located (in motor, external, connector, harness, controller, etc.) Are circuit schematic with component values available?	
Is the motor bi-directional?	
Does the motor have multiple speeds?	
What is the RPMs of the motor?	
What is the torque of the motor? Are torque curves available?	
Does application use multiple motors in the module? Do they share the same power supply harness?	

Motor Operation

What does the motor load consist of?
How does it attach? Is it geared down?
How far does the armature extend beyond the motor housing?

Manufacturing & Assembly Process

Is grease or oil used in the manufacture/assembly of the motor?
How are they cleaned from the motor?

When in the motor assembly process is the dielectric of the armature windings tested for shorts or leakage current? (Is the test an armature-only test or is the motor partially/fully assembled?)

How are EMI filter elements inside the motor protected from carbon brush dust over life of the motor?

Are O-rings and/or gaskets used between motor housing and end-caps and/or connectors? What is the purpose (environmental, EMI, other)? What is the material of the O-rings/gaskets? Is it conductive or non-conductive?

Manufacturing & Assembly Process

Is the motor painted, E-coated, etc.?
What is the tape-off process? What is the chemical make-up of the coating?
Is it conductive or non-conductive?

Do the brushes have a “burn-in” procedure?

What kind of components can the manufacturing process handle (leaded or surface mount)? What is the soldering process?

Motor Evaluation for EMC

How many parts does the motor body consist of (enclosure, housing, end-cap, etc.)? What materials is each part made of (steel, aluminum, plastic, etc.)

Where are the brushes located (end-cap, main housing)? How many brushes are there? How are the brushes held (caged or cantilever)? Describe the brush surface that makes contact with the armature (flat, concave, grooved, etc.)?

How are the power leads/connector orientated as they exit the motor (180 degrees apart, together, etc.)?

Motor Evaluation for EMC

Do the power leads exit as wire in a grommet, connector or terminals?

Does the motor have additional leads going inside the motor for sensors, signal lines, etc.?

What other electronics or components are inside the motor?

Are the bearings electrically connected or isolated to motor housing?

Is the motor housing and any end-cap or external shell electrically connected or isolated?

Filter Prototype Requirements and Constraints

What kind of prototype are you looking for (concept, pre-production, etc.)?

How many prototypes are needed?

Do you have preferred components suppliers?

Do you have passive components manufacturing requirements (ISO-9000, AEC-Q-200, TS-16949, etc.)?

Filter Prototype Requirements and Constraints

Can a manufacturing tool change be considered?

Do you want a written report documenting prototype and EMC evaluation?

The more information that can be provided to us upfront will reduce time and cost for both Jastech EMC Consulting and the customer. If any of the items below are available, please include them with this document.

- Pictures of the motor – external, inside, brush card, module, etc.
- 3-5 motor samples (please include any variation motors – filtered, non-filtered, etc.)
- Any EMC test data and pictures of the set-up.
- Any information on the operation of the motor, operating voltage, sensor line states, etc.
- Any schematics of the motor and controller circuit.
- Any torque vs. current data.
- Any special tools needed to assemble & disassemble motor.

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Contact Information

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