
APPLICATION NOTE

Electrostatic Discharge Protection on QuickStick Systems

Purpose

This application note presents both the Electro-static Discharge (ESD) rating of the QuickStick (QS) system and methods to prevent the motors from experiencing discharges that exceed this rating.

Introduction

As in any system with electrically isolated moving components, there is the possibility that the vehicle on a QuickStick system will build up a static charge. Alternately, a charge can be placed on the vehicle while the system is interacting with other machinery. If not dissipated, the potential difference between the vehicle and ground can eventually build to the point where electricity will arc from the vehicle into the nearest grounded object. In many cases, this is the grounded case of the QuickStick motor.

If a motor is hit with an electrostatic discharge, there is a chance that this can trigger abnormal operating conditions such as resetting one or more of the internal processors. The vehicle will not be able to continue forward when it reaches the region of the track controlled by that processor. The motor must be reset to reload the configuration into the processors in order to allow them to be used again.

Regular electrostatic discharges into the motor for a prolonged period of time can reduce the life of the motor and will interrupt line operation.

Component ESD Rating

The QS100 is CE compliant and the pertinent Electrostatic Discharge (ESD) levels can be found in EN61000-6-2:2005 Immunity for industrial environments. The heavy industrial limits were used when testing. This testing verifies that the unit tested was not reset by an 8 kV non-contact discharge (arcing through the air) or by a 4 kV contact discharge.

Component Protection

Electricity will take the path of least resistance from the point where the charge has built up to ground. To protect a component from ESD, that component must not be the shortest route to ground. In Figure 1, the image on the left depicts a system where the path of least resistance is through the QS motor. The figure on the right depicts the ideal situation where the vehicle is

grounded via a path that does not include the motor.

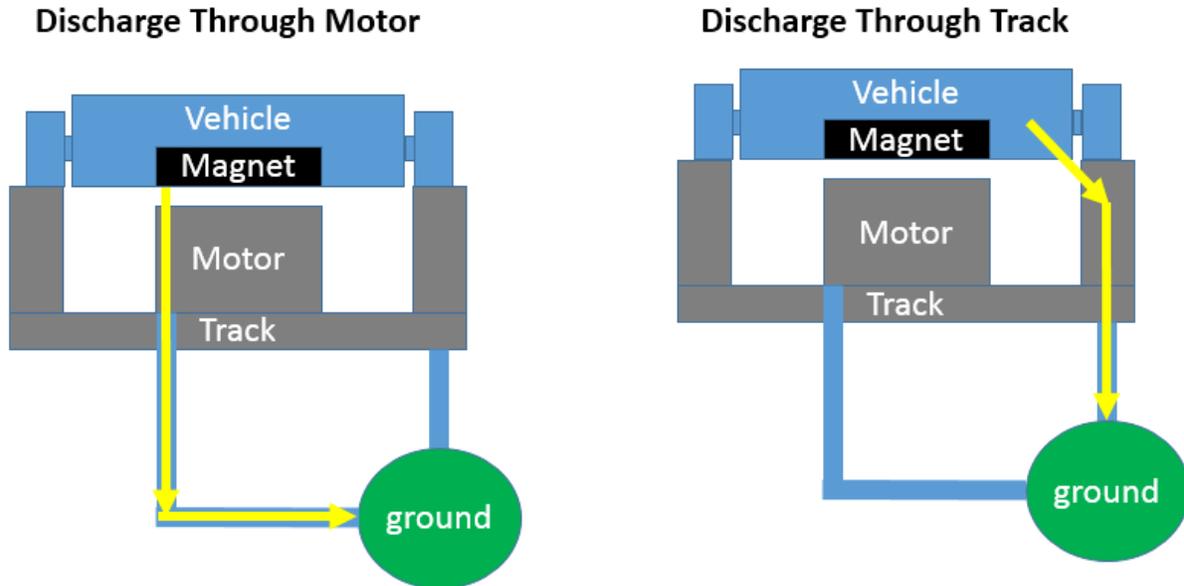


Figure 1: Possible Discharge Paths from the Vehicle

Discharging the Vehicle

In order to cross the air gap between the vehicle and the motor, the potential difference between the vehicle and ground must be great enough to allow it to overcome the resistance of the air between the motor and vehicle. To prevent the vehicle from discharging into the motor, provide an alternate discharge path that will trigger at a lower potential difference. Ideally, a vehicle would be constantly grounded, which would prevent any charge from building as it would immediately go to ground.

Static Brushes

This is MagneMotion’s recommended method for preventing static discharges into the motor. A static brush is a conductive brush mounted to the vehicle that is preferably constantly in contact with the grounded track. The brush can either act as a permanent connection to ground or as a discharge point with an extremely low resistance. This method will keep static from building appreciably, preventing any arcing to the motors or track. All parts of the vehicle that can retain a charge must be electrically connected to this brush to prevent isolated components from building up a charge. Figure 2 displays one example of a guiderail system using a static brush. Please note that some coatings, such as anodizing, on surfaces contacting the static brushes are insulating and can break the discharge path.



Figure 2: An Example Use of a Static Brush

Favorable Discharge Point

An alternative to using a static brushes would be to establish an extremely favorable discharge point where arcing is allowed to occur. This can be done by modifying the vehicle such that there is a point on the vehicle closer to the track than to the motor with more favorable electrical conductivity on both the vehicle and track at the gap. Sharp points are preferred discharge points. The goal of this method is to create a point where the electricity will arc at a lower potential level than is required to arc to the motors. This method allows a much larger charge to build than using a static brush, but does not require the additional rubbing contact between the brush and track.

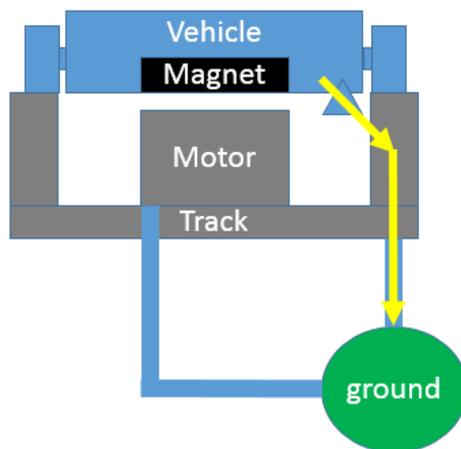


Figure 3: Discharge through a Favorable Point

Conductive Wheels and Bearings

The vehicle can also be grounded using the existing contact points between the wheels and track. If conductive wheels and bearings are used, then the vehicle will be grounded through the wheels and unable to build up charge. All components capable of holding a charge must be electrically tied to the wheels for this method to be effective. Most bearings have packing grease which may lead to an intermittent conductive path from the vehicle to the guideway. Ideally, the bearing selected should have conductive lubrication. A bearing that is made out of conductive materials may not conduct energy between its inner and outer race if there is no path between them.

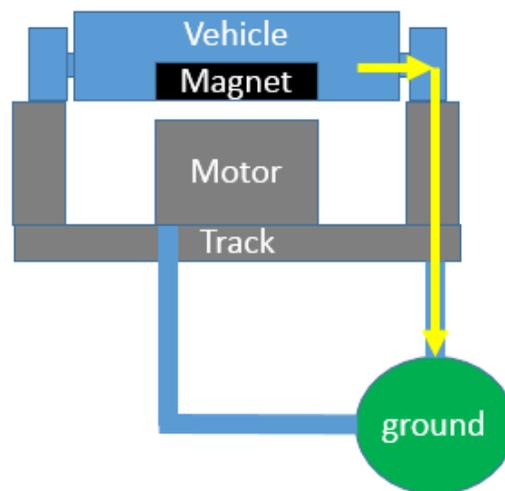


Figure 4: Discharge Through a Wheel

Protecting the Motor

Instead of preventing discharges from the vehicle through the motor, it is possible to instead redirect the discharge around the motor. By tying the upper surface of the motor directly to ground through the use of conductive tape or wires, the charge has an alternative path of less resistance than through the internal components on the way to ground.

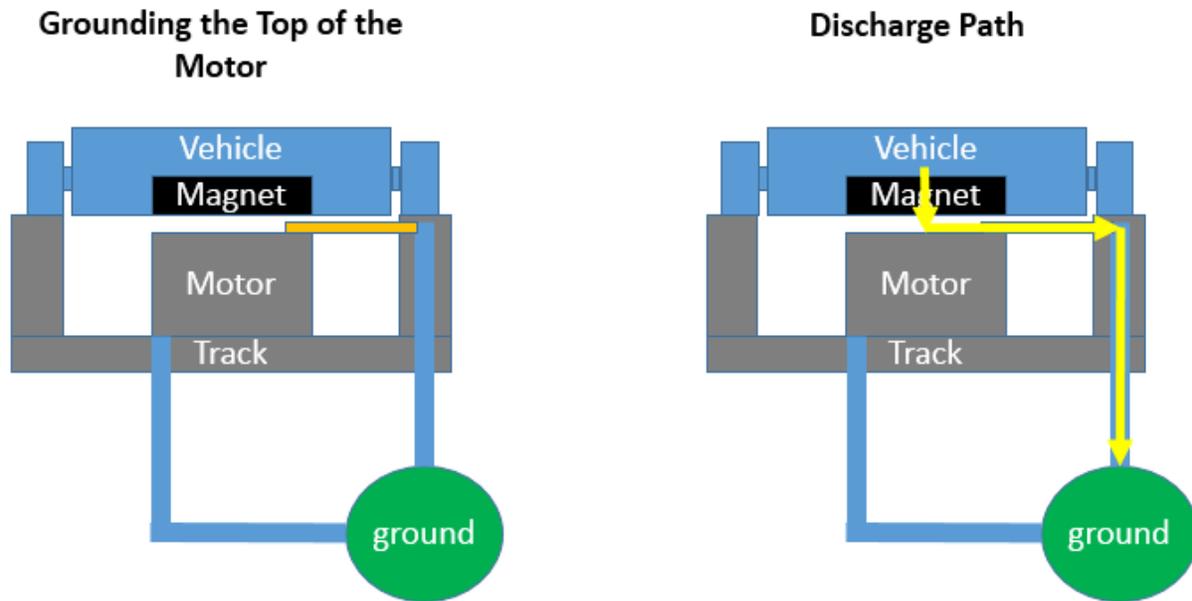


Figure 5: Protecting the Motor from Discharge

Summary

By providing the electrical energy a route to ground other than through the motor, sudden system stoppages due to a static discharge can be prevented. Any one of the above methods should be sufficient to prevent the discharge of static through the motor. Multiple methods can be used to create redundancy.

TECHNICAL SUPPORT NOTICE

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Rev. A

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Related Documents:

990000460 – QuickStick 100 User’s Manual

990000496 – QuickStick HT User’s Manual

More Information

MagneMotion Website: www.magnemotion.com

Questions & Comments: www.magnemotion.com/about-magnemotion/contact.cfm

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Revision History

| Rev. | Change Description |
|-------------|---------------------------|
|-------------|---------------------------|

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| A | Initial release |
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