Seal Group Safety Guide

Parker Safety Guide for Selecting and Using Parker Seals, Isolation Devices, EMI Shielding Materials, Thermal Management Materials and Related Accessories

WARNING: Failure or improper selection or improper use of Parker seals, isolation devices, EMI shielding, thermal management materials, or related accessories can cause equipment failure or damage, personal injury or death. Possible consequences of such failure, improper selection or improper use include, but are not limited to:

- Contamination of systems and environments from leaking fluids or gases.
- Ingress of dust, fluids or other substances.
- High velocity fluid discharge.
- Physical contact with released fluids or gases that may be hot, cold, toxic or otherwise injurious.
- Contact with suddenly moving, falling or suddenly halted objects that are to be held in position or moved in part or fully by the function of the product.
- Improper function or failure of host devices or equipment, or connected devices or equipment.
- Burn-inducing temperatures smoke or flame from overheated devices or equipment.
- Injuries resulting from inhalation, ingestion or physical exposure to solvent-based systems.

Before selecting or using any Parker seals, isolation devices, EMI shielding, thermal management materials, or related accessories, it is important that you read and follow the following instructions:

1.0 GENERAL INSTRUCTIONS

1.0.1 Scope

This safety guide provides instructions for selecting and using (including designing, assembling, installing and maintaining) **seals** (including all elastomer and/or plastic products commonly called 'seals'); **isolation devices** (including elastomer and/or thermoplastic boots, bellows, bushings, grommets, and vibration isolation mounts); **EMI (electromagnetic interference) shielding** (including all conductive elastomers, metal-based materials, conductive fabrics and conductive fabric-based materials, conductive paints, conductive adhesives and caulks, metal/plastic laminates, and/or conductively coated or plated substrates commonly referred to as 'EMI shielding '); and **thermal management materials** (including thermally conductive elastomer or acrylic-based interface materials, thermally conductive adhesive tapes, metal or ceramic-based heat spreaders, thermally conductive adhesives and caulks, and/or solder/film-based thermally conductive assemblies). It also includes **related accessories** (including mounting hardware, surface preparation solvents, protective liners, application systems, containers and packaging materials). All such devices are collectively referred to as **"Products"** in this safety guide. This safety guide is a supplement to and is to be used with the specific Parker publications for the specific seals, isolation devices, EMI shielding, thermal management materials, and related accessories that are being considered for use.

1.0.2 Fail-Safe

Products can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of the Products will not endanger persons or property.

1.0.3 Distribution

Provide a copy of this safety guide to each person who is responsible for designing, specifying, selecting, purchasing or these Products. Do not select these Products without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the products considered or selected.

1.0.4 User Responsibility

Due to the wide variety of operating conditions and uses for these Products, Parker and its distributors do not represent or warrant that any particular Product is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The users, through their own analyses and testing, are solely responsible for:

- Making the final selection of the seal, isolation device, EMI shielding product or thermal management material.
- Assuring that the users' requirements are met and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on and with the equipment on which the seals, isolation devices, EMI shielding or thermal management materials are used.

1.0.5 Additional Questions

Contact the appropriate Parker technical service department or your Parker representative if you have any questions or require any additional information. See the Parker publication or web pages for the product being considered or used, for telephone numbers and/or e-mail addresses of the appropriate technical service department.

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2.0 SEALING PERFORMANCE

2.0.1 Sealing Performance: Seals

In general, seals are used to maintain an unbroken sealing line separating adjoining volumes of media or fluid, under all normal operating conditions. Some seals may be designed to provide other functions (e.g., mechanical check valves). Maintaining the sealing line may be necessary when that line is formed on a surface that remains stationary relative to the seal (i.e., static sealing). Or, the sealing line may be formed against a surface that moves (i.e., dynamic sealing). Numerous criteria are involved in typical sealing designs, including choice of sealing material, gland design, and/or other seal retention and mating features, etc. Specific sealing requirements and the performance of any related sealing system must be clearly defined for every given application in order to select the best sealing solution. The user should provide these definitions, ideally in partnership with applications support from Parker at the earliest possible stages of the design process.

2.0.2 Sealing Performance: Isolation Devices

Many isolation devices are used to prevent ingress of environmental contaminants, including moisture, grease and dirt under normal operating conditions, while isolating noise, vibration and harshness. Other isolation products are used for absorbing shock, reducing equipment noise and insulating against vibration. Performance safety concerns should include the ability of the Parker isolation device to prevent contaminant ingress, and/or isolate noise, vibration, and shock depending on the application requirements. The user should provide Parker application engineers with the isolation performance criteria early in the design stages to optimize material choices and overall design/use of the isolation device. Certain isolation device solutions may be designed to incorporate separate and distinct sealing systems. For these applications, the specific sealing performance should also adhere to the goals described in Section 2.0.1.

2.0.3 Sealing Performance: EMI Shielding

EMI shielding materials are used to reduce the transmission of electromagnetic energy. While many EMI shielding materials may also provide some level of sealing, any specific sealing performance requirements should adhere to the goals described in Section 2.0.1 above. Certain EMI shielding solutions may be designed to incorporate separate and distinct sealing systems. For these applications, the specific sealing performance should also adhere to the goals described in Section 2.0.1. Other types of EMI shielding materials provide no sealing performance, inconsequential sealing performance, or widely varied sealing properties. Finally, EMI shielding materials, like other materials used in a given design, may affect the performance of proximate sealing systems. The above factors should be considered in the design stages and specification of EMI shielding (and seals), ideally in partnership with applications support from Parker at the earliest possible stages of the design process.

2.0.4 Sealing Performance: Thermal Management Materials

Thermal management materials are used to assist in the transmission of heat energy. Some thermal management products may also provide some level of sealing, but any specific sealing performance should adhere to the goals described in Section 2.0.1 above. Certain thermal management solutions may be designed to incorporate separate and distinct sealing systems. For these applications, specific sealing performance should also adhere to the goals described in Section 2.0.1. Other types of thermal management materials provide no sealing performance, inconsequential sealing performance, or widely varied sealing properties. Finally, thermal management materials, like other materials used in a given design, may affect the performance of proximate sealing systems. The above factors should be considered in the design stages and specification of thermal management materials (and seals), ideally in partnership with applications support from Parker at the earliest possible stages of the design process.

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2.1 ELECTRICAL CONDUCTIVITY

2.1.1: Electrical Conductivity: Seals

Extreme care must be exercised when selecting seals for applications in which electrical conductivity or non-conductivity is a factor. Parker seals designed for sealing against liquids and gases may be developed with electrically conductive properties to meet specific application requirements. Conversely, non-conductive seals can be provided for applications prohibiting electrical conductivity.

The electrical conductivity or non-conductivity of Parker seals is dependent upon many factors and may be susceptible to change. These factors include, but are not limited to, the materials used to make the seal and/or related parts (including seal-bearing assemblies provided by Parker), how and where the seals and/or related parts are installed, moisture content of the seal at any particular time, and other factors. Users should be aware of any safety-related issues with using electrically conductive, or insulating, seals in a given application. These concerns should be documented and discussed with Parker before or during the seal selection process.

2.1.2: Electrical Conductivity: Isolation Devices

Most isolation device materials are made from non-conductive rubber, thermoplastics or thermoplastic elastomers. However, some isolation devices are fabricated with conductive features, e.g., metal frames, threaded fasteners, etc. Users should be aware of any safety-related issues with using electrically conductive, or insulating, isolation devices in a given application. These concerns should be documented and discussed with Parker before or during the isolation device selection process.

2.1.3: Electrical Conductivity: EMI Shielding

Parker EMI shielding materials are inherently electrically conductive, which is essential to providing shielding performance. Levels of conductivity vary by product type and factors of application. Thus, care should be used when selecting these materials. EMI shielding products can be designed with non-conductive elements, (e.g., mounting features) depending on the application requirements.

The electrical performance of Parker EMI shielding is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the EMI shielding and/or related parts (including shielding assemblies provided by Parker), how and where the EMI shielding and/or related parts are installed, moisture content of the shielding at any particular time, and other factors.

2.1.4: Electrical Conductivity: Thermal Management Materials

Extreme care must be used when selecting thermal management products in which electrical conductivity or non-conductivity is a factor. Certain Parker thermal management materials are designed to be electrically non-conductive, i.e., electrical insulators, while others are specifically designed to be electrically conductive. And other thermal management materials are inherently electrically non-conductive only below certain current levels.

The electrical conductivity of Parker thermal management products is dependent upon many factors and may be susceptible to change. These factors include the various materials used to make the thermal management materials and/or related parts (including thermal management assemblies provided by Parker), how and where the thermal management parts and/or related parts are installed, moisture content of the thermal products at any particular time, and other factors.

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2.2 TEMPERATURE RANGE AND FLAMMABILITY

2.2.1 Temperature Range and Flammability: Seals

Temperatures can affect seal performance, including occurrences such as heat hardening and oxidation. The temperature range of a given seal application, and the expected performance of any sealing system within this range, must be clearly defined in order to select the best sealing solution. Temperature at the seal itself may vary widely from the ambient condition, sometimes by hundreds of degrees. The user should provide the temperature range, ideally in partnership with applications support from Parker at the earliest possible stages of the design process. Temperature range is generally defined as the maximum and minimum temperature limits within which a seal compound is expected to function properly in a given application.

Virtually all Parker sealing materials feature a recommended use temperature range, which should be regarded in the seal selection process. This information can normally be found on related Parker web pages, product literature or from Parker Seal Group technical services departments. In addition, temperature range should be considered for all integral seal elements (e.g., fasteners, adhesives, plastics, metals, etc.) and for application features such as gland dimensions, fluid temperatures, dynamic or static operation, etc. For example, temperature, or the range of temperature, for a given operation may require some modification of the gland dimensions.

Changing the fluids a seal is exposed to will change the temperature limits of the seal. This is because some chemical reactions take place at higher temperatures, but not at lower temperatures. The temperature limit in a particular sealing application cannot be properly determined without knowing what specific fluids or other media the seal will be exposed to. Flammability information is available for most Parker seal materials. Certain materials are available with various UL (Underwriters Laboratories) ratings for flammability/flame resistance. When Parker seal materials are integrated with other materials (e.g., plastic frames), the user, or Parker, may need to determine the flammability data for these other materials.

For more safety information on temperature and flammability, consult with Parker Seal Group technical service departments.

2.2.2 Temperature Range and Flammability: Isolation Devices

Most Parker isolation devices are produced from materials that perform over a broad temperature range, e.g., -40 to +200 degrees F. Some materials are better suited for wider temperature ranges, or for higher or lower temperature extremes. Temperature range data is available for most of these materials and should be considered in the overall selection process. Users should also determine whether flammability issues are of concern to their application. When Parker isolation devices are integrated with other materials (e.g., plastic frames), the user, or Parker, may also need to determine the flammability data for these other materials. Consult with Parker engineers on available flammability data, e.g., UL ratings, required for a choice of an isolation device.

2.2.3 Temperature Range and Flammability: EMI Shielding

Temperatures can affect EMI shielding performance to the extent they may affect electrical continuity within a shielding design. This could result from physical changes to electrically conductive shielding components (conductive panels, coatings, platings, flanges, compounds, gaskets, fasteners, adhesives, etc.) due to temperature extremes, changes, etc. In addition, while some shielding materials such as conductive compounds (paints, adhesives, caulks, inks) should be applied at specific temperature ranges (e.g., ambient), they will provide shielding performance over a broader temperature range. Other shielding materials such as compounds may require curing at elevated temperatures, which may in turn affect substrates or other exposed components. Temperature ranges for effective shielding performance are available for most Parker EMI shielding materials, including integral attachment systems (e.g., pressure sensitive adhesives). Consult Parker's literature or web pages, and consult with Parker applications engineers to review shielding material selection relevant to temperature range.

Flammability information is available for many Parker shielding materials. Certain materials are available with various UL (Underwriters Laboratories) ratings for flammability/flame resistance. When Parker shielding products are integrated with other materials (e.g., plastic frames), the user, or Parker, may need to determine the flammability data for these other materials.

For more safety information on temperature and flammability, consult with Parker Seal Group technical service departments.

2.2.4 Temperature Range and Flammability: Thermal Management Materials

Temperature range is defined as the maximum and minimum temperature limits within which a thermal management material or product will function properly in a given application. Normally, the key feature of these products is their ability to conduct thermal energy (heat), particularly within a target temperature range and in specific design configurations. However, temperature extremes can affect the performance of these thermal management materials or systems.

Many Parker thermal management materials feature a recommended application temperature range, which should be regarded in the seal selection process. This information can normally be found on related Parker web pages, product literature or from Parker technical services departments.

In addition, temperature range should be considered for all integral elements of a thermal management system (e.g., fasteners, adhesives, plastics, metals, etc.) and for various other application features, such as mounting surfaces, etc. The temperature range of a given thermal management system, and the expected performance of any thermal management system within this range, must be clearly defined in order to select the best solution. The user should provide the temperature range, ideally in partnership with applications support from Parker at the earliest possible stages of the design process.

Flammability information is available for most Parker thermal management materials. Certain materials are available with various UL (Underwriters Laboratories) ratings for flammability/flame resistance. When Parker thermal management materials are integrated with other materials (e.g., plastic frames), the user, or Parker, may need to determine the flammability data for these other materials. For more information, consult with Parker Seal Group technical service departments.

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2.3 COMPRESSION AND PRESSURE

Most Products require some level of compression to function properly. Different materials and configurations will have varying compression characteristics, including resilience, and diverse compressive force requirements. Product materials may undergo compression set or other compression-related changes depending on the specific application. Fluids and other media may physically affect a Product and cause changes to the Product's compression characteristics in an application. Compression (and decompression) qualities of materials, compression force requirements, and related compression requirements should be considered for a given application in order to select the best Product solution. This also includes the number of pressure cycles to which the Product will be exposed, and the number of times a Product will be disassembled. Compression data is available on most Parker Product materials, and users should consult with Parker applications services early in their design and Product selection processes.
Pressure has a bearing on Product design and selection, as it may affect the choice of compound hardness and other properties. Proper selection may require the choice of higher or lower durometer materials to accommodate more severe pressure situations. Compatibility with the medium should be of concern e.g., excessive swell in an application can generate extremely high pressures. If not considered in the design and selection stages, high pressures in an application can affect mating assemblies and lead to Product failure, e.g., by extrusion of the Product material. Pressure data should be provided as part of the selection process, as well as the choice of interface design and materials. This includes maximum and minimum pressures and cycling conditions.

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2.4 FLUID AND OTHER MEDIA COMPATIBILITY

2.4.1 Compatibility: Seals

This is a critical aspect of proper seal selection, based on the number of fluids or other media with which seals are expected to interact. All media that may come in contact with the seal and retainer should be considered. For example, if the system is to be cleaned or purged periodically, be sure to anticipate what cleaning fluids will be used. Also, consider any lubricants, e.g., friction reducers, which may be affected by the sealed media. These secondary fluids are as important to selecting the most compatible seal material as the principal operating media selects.
Any increase in seal mass (volume) due to exposure to the sealed fluid, must be a design consideration. Excessive swell in an application can generate extremely high pressures and affect the seal function. Conversely, any decrease in seal volume, caused by a reaction to the sealed fluid can also degrade performance by reducing compression force or causing other severe dimensional changes resulting in possible loss of the sealing interface. Seals exposed to atmosphere, including ozone and air pollutants, or to vacuum may experience some types of degradation. Corrosion issues should also be considered, particularly of metallic mating or seal mounting hardware (see 2.6.1). In all cases, fluid and gas compatibility should be a major consideration for every sealing application, and fully discussed with Parker Seal Group engineering services.

2.4.2 Compatibility: Isolation Devices

Many isolation devices are designed to retain or seal petroleum- and/or water-based fluids across a variety of industrial applications, while also protecting against contaminants (see 2.6.2). Others are designed exclusively to control noise, vibration, shock or motion. Users should assess the nature, volume, etc., of all fluids and gases that will be contact with the isolation devices in their applications. These assessments should be discussed with Parker engineers in selecting and designing the appropriate isolation device solution.

2.4.3 Compatibility: EMI Shielding

Fluid and gas compatibility concerns in EMI shielding applications include the potential effects on electrical conductivity, corrosion, and issues related to shielding materials that also provide environmental sealing. Consider ALL media that may come in contact with the shielding components. For example, if the system is to be cleaned or purged periodically, be sure to anticipate what cleaning fluids will be used. Exposure to fluids and gases may effect shielding performance (immediately and long term) and the application conditions should be discussed with Parker engineers. Occurrence of galvanic corrosion should be a major concern where metal or metal-filled shielding materials are used in the presence of fluids or humidity. This includes metallic parts used for attaching shielding gaskets or other shielding components. Consult with Parker applications engineers to optimize the shielding design and/or choice of shielding materials to address corrosion issues. Many EMI gasket forms will provide little or no barrier to fluids or gases, unless they include an integrated sealing system. The environmental seal, such as a non-conductive rubber, will feature its own fluid and gas compatibility issues. (Refer to 2.4.1 when considering non-conductive and/or conductive elastomers for use in an EMI shielding system.) In all cases, fluid and gas compatibility should be addressed in each EMI shielding application, and fully discussed with Parker Seal Group engineering services.

2.4.4 Compatibility: Thermal Management Materials
Fluid and gas concerns in thermal management applications include the potential effects on thermal performance, and safety-related effects such as corrosion occurring to the Parker thermal product or associated hardware. Consider ALL media that may come in contact with the thermal components. For example, if the system is to be cleaned or purged periodically, be sure to anticipate what cleaning fluids will be used. Exposure to fluids and gases may effect thermal performance (immediately and long term) and the application conditions should be discussed with Parker engineers. Fluid or gas exposure may also affect integral portions of the supplied thermal management product, such as pressure sensitive adhesives. Occurrence of corrosion should be a concern where metal or metal-filled thermal materials are used in the presence of fluids or humidity. This also includes metallic parts used for attaching thermal management components. Consult with Parker applications engineers to optimize the thermal design and/or choice of materials to address corrosion issues. In all cases, fluid and gas compatibility should be addressed in each application, and fully discussed with Parker Seal Group engineering services.

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2.5 CORROSION AND ENVIRONMENT

2.5.1 Corrosion and Environment: Seals
Seal corrosion is not seen with rubber-based sealing materials, but corrosion of integrated metal seal components, mounting devices and mating hardware can be a safety-related factor when choosing sealing solutions. Corrosion of these materials can compromise the integrity, proper function and normal results of the seal design. As such, potential corrosion opportunities should be determined and accounted for in the seal design process (e.g., using coated or plated metals). Similarly, environmental issues should be considered when developing sealing designs and specifying seal materials. Environmental conditions, e.g., weather, temperature, salt spray, dust, etc. can affect the sealing material, sealing hardware and/or the media being sealed, which in turn can affect the sealing properties. Consult with Parker Seal specialists on seal design in respect to corrosion and environmental issues.

2.5.2 Corrosion and Environment: Isolation Devices
Corrosion issues should factor into selecting elastomeric and thermoplastic-based isolation devices. Isolation devices with integral metal plates, flanges, screws, fasteners and other metallic features may experience corrosion under certain conditions. Further, corrosion can affect the integrity of other component parts in an isolation system. Corrosion control should be part of the design and selection process when choosing isolation devices.
Some types of isolation devices, such as boots and bellows, are typically designed for preventing ingress of environmental dust and dirt, water, fuel and other fluids, grease and other potential contaminants. Users should carefully review potential environmental conditions and contaminants to which an isolation device or system may be exposed. Some isolation materials may also be affected by exposure to ultraviolet (UV) light, e.g. reflected solar energy. Selection of the materials, attachment systems and overall design should have the primary goal of keeping out contamination from the environment. Review corrosion and environmental issues with Parker engineers as part of the selection process.

2.5.3 Corrosion and Environment: EMI Shielding
Corrosion issues must be considered in the design and selection of EMI shielding. The metals used in providing a conductive pathway, enclosure, etc. and ultimately an effective EMI shield can be subject to corrosion that can affect shielding performance. The level of this corrosion is determined by the metals used and by their exposure to corrosion-supporting environments. For example, galvanic corrosion can occur when conductive shielding materials experience battery-like physical conditions. As such, potential corrosion opportunities should be determined and accounted for in the EMI shielding design process (e.g., choice of EMI gasket type, use of corrosion inhibiting coatings, weather seals, etc.). Similarly, environmental factors should be considered when developing EMI shielding designs and selecting shielding materials. Environmental situations, e.g., weather, temperature, radiation, salt spray, dust, etc. can affect the shielding material, integrated hardware and other components of a system’s overall shielding design. Consult with Parker Seal specialists on shielding design in respect to corrosion and environmental issues.

2.5.4 Corrosion and Environment: Thermal Management Materials
Corrosion should be addressed when designing and choosing thermal management products. Those products containing metals as thermal conductors or as part of an integral thermal management assembly can be subject to corrosion that may affect thermal performance. The level of this corrosion is determined by the metals used and by their exposure to corrosion-supporting environments. Potential corrosion opportunities should be determined and accounted for in the thermal management design process (e.g., choice of thermally conductive materials, integrated fasteners or other components, use of corrosion inhibiting coatings, weather seals, etc.). Similarly, environmental issues should be considered when designing and selecting thermal management systems. Environmental situations, e.g., weather, temperature, radiation, salt spray, dust, etc. can affect the thermal transfer material, integrated hardware (fasteners, clips, heat sinks, etc.), and other components of a system's overall thermal management design. Consult with Parker Seal specialists on thermal management design in respect to corrosion and environmental issues.

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2.6 LEAKAGE

2.6.1 Leakage: Seals
Leakage control and leakage rates are fundamental to the design of any efficient seal. When properly used in sealing liquids there should be no detectable leakage of a liquid over a given period of time.
Gases, on the other hand, will typically diffuse through the rubber at some very low rate that can be detected by a leak detector, a mass spectrometer or other very sensitive measuring device. The leakage rate depends primarily on the temperature, the pressure differential, the type of gas and the type of elastomer used. Out-gassing is a vacuum phenomenon wherein a substance spontaneously releases volatile constituents in the form of vapors or gases. In rubber compounds, these constituents may include water vapor, plasticizers, air, inhibitors, etc. To identify and address safety concerns, consult with Parker Seal applications specialists on leakage issues relevant to all seal designs and selections.

2.6.2 Leakage: Isolation Devices
When properly designed and installed, isolation devices for preventing ingress of contaminants should demonstrate either no leakage or an ingress level well within the user-provided specifications. This need for properly selecting isolation devices may also pertain to preventing or minimizing 'leakage', or egress, of noise, vibration, shock or other phenomena. Leakage problems can lead to system malfunctions, breakdowns, and safety hazards to equipment, operators and other personnel. User-specifications must address any and all safety concerns over leakage. These should be reviewed with Parker engineers early in the selection process.

2.6.3 Leakage: EMI Shielding
Leakage in an EMI shielding design can refer to the flow of fluids and gases, as well as the passage of potentially interfering electromagnetic energy through the shield. This latter issue can be addressed by working with Parker design engineers to develop an EMI shielding system that meets the application's shielding performance requirements. Some Parker EMI shielding products will provide a certain barrier level to fluid and gas leakage, e.g., shielded windows, conductive elastomer gaskets, but only a limited number of these products are specifically designed for this feature, e.g., conductive sealants. Other Parker shielding products e.g., shielded vents, are actually designed to facilitate airflow. Conductive elastomers and other kinds of conductive shielding materials may also experience out-gassing. This is a vacuum phenomenon wherein a substance spontaneously releases volatile constituents in the form of vapors or gases. In rubber compounds, these constituents may include water vapor, plasticizers, air, inhibitors, etc. In addition, improperly installed shielding products, as well as gaps throughout a device's shielding system, may lead to leakage and resulting safety problems. This includes any leakage of improperly cured shielding compounds, e.g., coatings, inks, epoxies, etc. To identify and address safety concerns, consult with Parker Seal applications specialists on leakage issues relevant to all EMI shielding designs and selections.

2.6.4 Leakage: Thermal Management Materials
Leakage potential of fluids or gases through thermal management materials should be addressed by consulting with Parker Seal design engineers before or during the material selection process. Some Parker thermal management products will provide a certain barrier level to fluid and gas leakage, but only a limited number of these products are specifically designed for this feature, e.g., thermal potting compounds. Elastomers and other types of thermally conductive materials may also experience out-gassing. This is a vacuum phenomenon wherein a substance spontaneously releases volatile constituents in the form of vapors or gases. In rubber compounds, these constituents may include water vapor, plasticizers, air, inhibitors, etc. In addition, improperly installed thermal

management products, as well as gaps throughout a thermal management system, may lead to leakage and resulting safety problems. This includes any leakage of improperly cured thermally compounds, e.g., adhesives, caulks, etc. To identify and address safety concerns, consult with Parker Seal applications specialists on leakage issues relevant to all thermal management designs and selections.

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2.7 AGING

Selection should consider both the shelf life and the installed life. Parker maintains cure date records for many Products. For some Products, Parker also follows established industrial, customer, United States or other global age control standards. Certain materials, e.g. conductive coatings, inks, adhesives, etc. have a relatively limited shelf life and use life. Integral materials, e.g., pressure sensitive adhesives; on Products may have aging properties different from the main Product material. Users should consult available Parker data, and consult with Parker specialists to determine shelf life standards and installed seal life standards, and relevant procedures, when selecting seals for their applications.

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2.8 SYSTEM WEIGHT

Product selection should include considerations related to Product weight, hardware/peripherals weight, and total system weight. Material weights are available from Parker web sites, literature, or from Parker applications services. When weight is critical to achieving a proper application, this should be addressed as early as possible with Parker design engineers.
Parker can often provide technical prediction of Product performance via finite element analysis and other tools. Successful results are best accomplished by working closely with Parker applications engineers beginning early in the design stages.

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3.0 HANDLING

Safe handling of Products refers to the safety of the handlers and to the security of the seal parts. Any safety concerns relative to the safety of Product assemblers; inspectors, maintenance personnel, etc. should be addressed with Parker before the Products enter the handling stages. Though not usually required, Parker can provide available Material Safety Data Sheets and other safe handling and storage documents for certain Products. Consult with Parker on the need and availability of this form of documentation. The Products should always be handled in ways that will not cause physical (visible or not) changes to the materials that could affect performance in their intended application. It is recommended that Parker applications services be consulted on best practices for safe storage and handling of these Products
Safe operation of automated handling, assembly, insertion, storage, etc. equipment used with the Products, should be optimized for safe use by operators, maintenance personnel, etc. Automated or manual equipment, used for handling seal products, should not affect the Products in any way that can alter their attributes and result in unsafe conditions. It is recommended that Parker applications services be consulted on best practices for safe handling of the Products.

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3.1 PRE-INSTALLATION INSPECTION

Prior to installation, a careful examination of the Product must be performed. This includes checking for correct size, style, quantity, and part number. The Product should be examined for cleanliness, abrasion and any other visible defects. Faulty Products should be properly discarded or carefully stored away from other inventories. Quality assurance testing programs for the Products should be established in consultation with Parker quality engineers or other authorized personnel.

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3.2 PREPARING THE INSTALLATION AREA

Cleanliness of the Product and its installation area are key to successful installation and performance. Every precaution must be taken to insure that all parts are clean at assembly. Cleanliness is important for proper Product functions. Foreign particles in the installation area, including dirt, metal debris etc. can damage the Product or impede function. Remove all sharp edges near mounting surfaces. When required, use lubricants on the isolation parts and/or contacting surfaces only after discussion with Parker Seal engineers. Cleaning solvents can cause swelling or other damage of some Products. Thus, cleaning solvents should be cleaned off thoroughly. Some Products may require priming of installation surfaces. These processes should be done according to instructions from Parker. EMI gaskets may have specific installation requirements depending on their construction and composition. Consult with Parker applications engineers for specific gasket application needs and to review installation requirements for all Parker EMI shielding.

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3.3 ASSEMBLY

3.3.1 Assembly: SEALS AND ISOLATION DEVICES

Seal and isolation devices typically do not have assembly requirements beyond normal installation into a system or a system sub-assembly.

3.3.2 Assembly: EMI Shielding and Thermal Management Materials

While most Parker EMI shielding and thermal management materials are provided ready to install, some types require minor assembly, sizing, mixing or other preparatory operations prior to installation. Assembly may include customer-performed integration of attachment systems, i.e. adding hardware or adhesive. Sizing operations include customer-performed trimming or other fabrication. Mixing operations are often required of customers using Parker conductive coatings and adhesive products. In all cases, customers should use good safety procedures and equipment used in performing these functions. Consult with Parker Seals applications engineers with any questions or concerns regarding the safe assembly, sizing or mixing of EMI shielding and thermal management materials.

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3.4 INSTALLATION

The Products have various installation methods, including manual insertion, and use of hand tools and automated systems. Sharp-edged installation tools should be used with care, or avoided, to prevent Product damage. If clamping or crimping is used, avoid over clamping or over crimping. Consult with Parker to determine the issues to be addressed using whatever installation method is selected.

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3.5 CURE/SET TIME

3.5.1 Cure/Set Time: Seals and Isolation Devices

Parker seals and isolation devices are typically supplied in cured form. When using uncured seal material (or other curable products) follow the cure time instructions provided by Parker.

3.5.2 Cure/Set Time: EMI Shielding and Thermal Management Materials

Some Parker EMI shielding and thermal management materials require customer-managed cure periods. These include conductive coatings, inks, adhesives, and form-in-place compounds (e.g. caulks), as well as primers. Some adhesives (conductive or non-conductive) used for bonding may have a recommended set time. Temperature, humidity and other conditions can affect curing. Improperly cured materials may provide abnormal performance, working life, abrasion resistance, attachment, and other properties. Some curable materials are volatile and/or pose health issues in uncured form. Refer to all relevant Material Safety Data Sheets (MSDS) and consult with Parker applications engineers on the appropriate curing methods, timing and evaluation for Products requiring curing or setting periods.

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3.6 POST INSTALLATION INSPECTION AND TESTING

Installed Products should be inspected for proper fit and any damage incurred during installation. In some cases, pressure, conductivity (electrical or thermal), or impedance testing, or other procedures can help identify any performance problems. Identified problems should be documented and brought to the attention of all associates involved. Consult with Parker engineers in developing appropriate inspection and test standards and procedures.

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3.7 REMOVAL

3.7.1 Removal: Seals

Seal removal may require use of manual or automated tools. Safety procedures and training may also be necessary to ensure the safe use of removal tools, compounds, etc. Care must be taken to preserve surface finishes and other application part features. Inspect and clean/repair application parts as needed prior to installing new seals. Inspect removed seals for wear, damage and other features that may indicate conditions requiring attention. Consult with Parker regarding appropriate removal tools and procedures.

3.7.2 Removal: Isolation Devices

Many isolation devices are intended to remain in place for the life of the system, e.g. vehicle. When necessary, these parts must be carefully removed to avoid damaging material or attachment hardware; changing the part dimensions, or contaminating protected areas. Inspect removed devices for wear, damage and other features that may indicate conditions requiring attention. Consult with Parker regarding appropriate tools and procedures.

3.7.3 Removal: EMI Shielding and Thermal Management Materials

Removing EMI shielding or thermal management materials may require use of manual or automated tools, as well as the use of solvents, abrasives or other compounds. Safety procedures and training may also be necessary to ensure the safe use of removal tools, compounds, etc. Care must be taken to preserve surface finishes and other part features, particularly those comprising the shielding or thermal management system. Inspect and clean/repair application parts as needed prior to installing new Products. If possible, inspect removed materials for wear, damage, performance and other features that may indicate conditions requiring attention. Consult with Parker regarding appropriate removal tools and procedures.

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4.0 STORAGE

Storage conditions can affect Product integrity and performance, and pose safety issues. These include temperature extremes, contamination and time. Storage procedures should address these issues. Typically, the Products should be kept at room temperature, and away from temperature extremes or high humidity. Product lots and part numbers should be identified and tracked to ensure attention to shelf life and that the correct Products are always installed. Products installed on stored equipment should also be protected from potential temperature and environmental effects. Their working life must also be tracked and distinguished from typical bulk/bag storage life. Discuss proper storage procedures with Parker engineers.

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4.1 MAINTENANCE

Users of these Products should establish maintenance procedures, and these are typically determined through customer component testing. Maintenance should normally include Product inspection, correct part replacement, and for those specific Products approved by Parker, conditioning of the Product for reuse. Parker engineers can be consulted when creating maintenance procedures.