

Shielding Quality Data of Spira Gaskets

Why We Use Transfer Impedance Testing

There are two industry-accepted methods for testing the shielding capability of EMI gaskets. These are: (1) Shielding Effectiveness (as defined in MIL-G-83528), and (2) Transfer Impedance as defined in SAE ARP-1705 Rev A.

The Shielding Effectiveness test was designed by one of the EMI gasket manufacturers where there exists built in test anomalies, which provide extremely high levels of shielding for the products under test. As an example, tests performed at 2 GHz illustrated "Shielding Effectiveness" test results in excess of 120 dB using no gasket between the enclosure and cover specified in the test procedure. Placing a sheet of non-conductive newspaper as a gasket between the cover and shielded enclosure provided 93 dB of shielding.

"Transfer Impedance" as a method of testing EMI gasket was derived from the academic community. Transfer Impedance measures the impedance of a gasket and gasketed joint. The procedure for measuring transfer impedance of gaskets (or gasketed joints) is detailed in SAE, ARP-1705 Rev A dated January 1, 2006.

The test data that follows has been done using Spira's ZT-1000 Transfer Impedance Test Fixture, a spectrum analyzer, and a printer.

Shielding Quality

Shielding quality as defined in SAE, ARP-1705 Rev A is the theoretical "Shielding Effectiveness" of the gasket and gasketed joint using the conditions and constraints of shielding theory and MIL-STD-285. The definition as listed in ARP-1705 Rev A is illustrated below. The shielding quality data illustrated in the pages that follow assume that the incident wave is a plane wave having an impedance of 377 ohms.

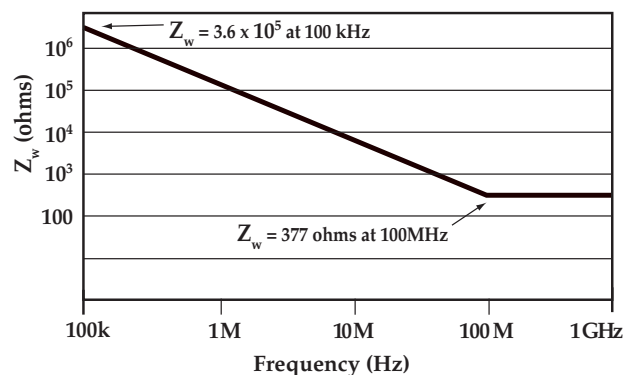
$$\text{Shielding Quality (SQ)} = 20 \log Z_w / Z_T$$

$$\begin{aligned} \text{where } Z_w &= 377 \lambda / 2\pi R & R < \lambda / 2\pi \\ &= 377 & R \geq \lambda / 2\pi \end{aligned}$$

$$\lambda = c / f$$

$$c = 3 \times 10^8 \text{ meters/sec} \\ \text{(speed of light)}$$

$$f = \text{frequency (Hertz)}$$



Z_w using constraints consistent with MIL-STD-285

Joint Surfaces Are Important

In the data shown on the following pages we have illustrated the transfer impedance (and subsequent Shielding Quality) of the gaskets against two surfaces: tin plated aluminum and 6061-T6 aluminum. This is presented to illustrate the importance of selecting a gasket that will provide the required shielding using the specific joint surfaces of concern.

To access the shielding quality for our gaskets using applicable joint surfaces please visit our website: www.spira-emi.com/quality.

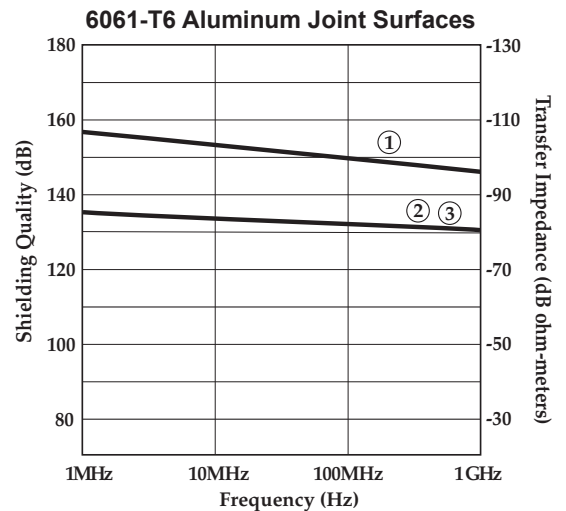
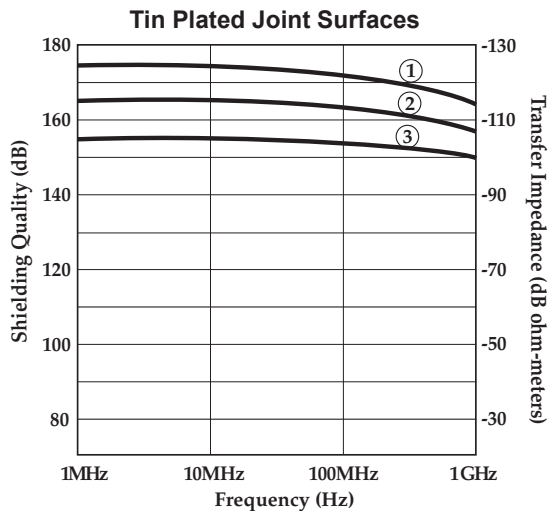
Test Conditions

All test data consists of new gaskets and freshly cleaned joint surfaces in a controlled temperature, low humidity office environment. Aging and/or environmental conditions may deteriorate the level of shielding provided by a gasket in conjunction with specific joint surfaces.

Shielding Quality of Spira-Shield Gaskets

This data applies to *Spira-Shield* tin plated beryllium copper gaskets, or other gaskets which include it, such as the following standard configurations:

- Spira-Strip
- “D” Multi-Seal
- Basic Multi-Seal
- EMI & Environmental Connector-Seal
(see graph, line 1)

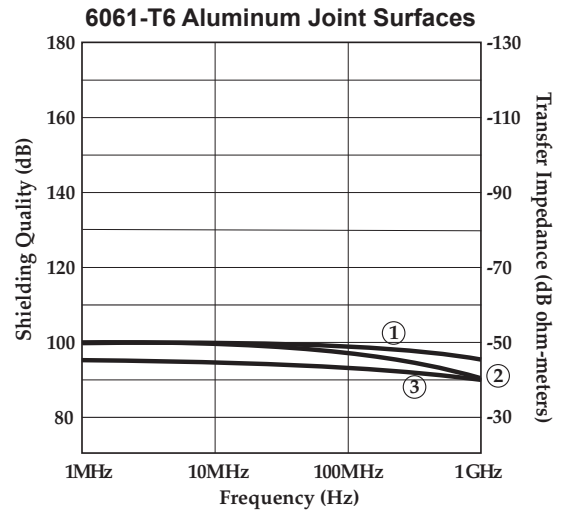
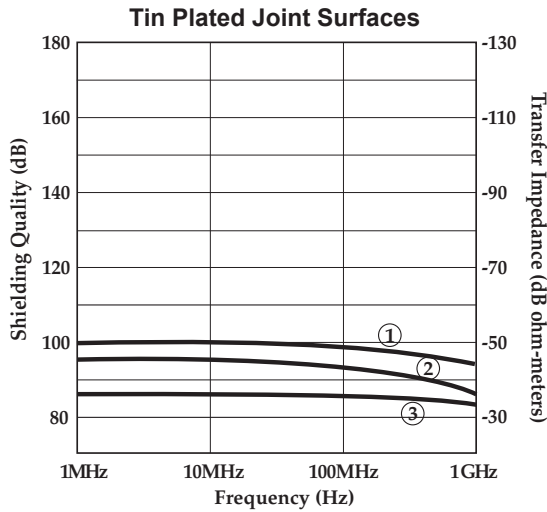


This data is representative of the test data we have obtained. Your results will vary depending on the applicable variables.

1. Standard Force Spira-Shield, Tin Plated Beryllium Copper Gasket, Example: SS-04, IWSS-04
2. Moderate Force Spira-Shield, Tin Plated Beryllium Copper Gasket, Example: MS-04, IWMS-04
3. Low Force Spira-Shield, Tin Plated Beryllium Copper Gasket, Example: LS-04, IWLS-04

Shielding Quality of Quick-Shield Gaskets

This data applies to *Quick-Shield* stainless steel gaskets, or other gaskets which include it, such as Quick-Strip.

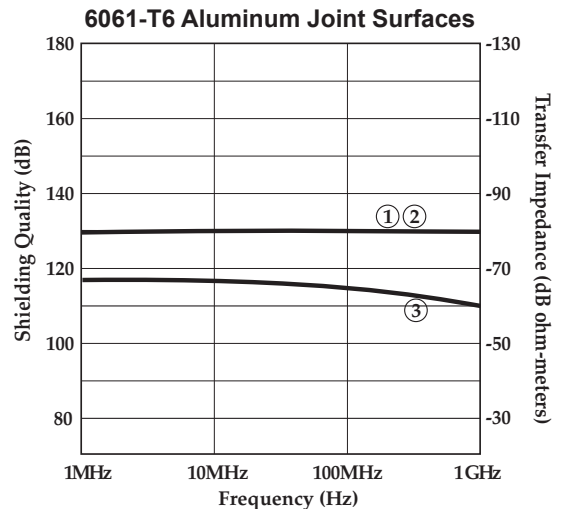
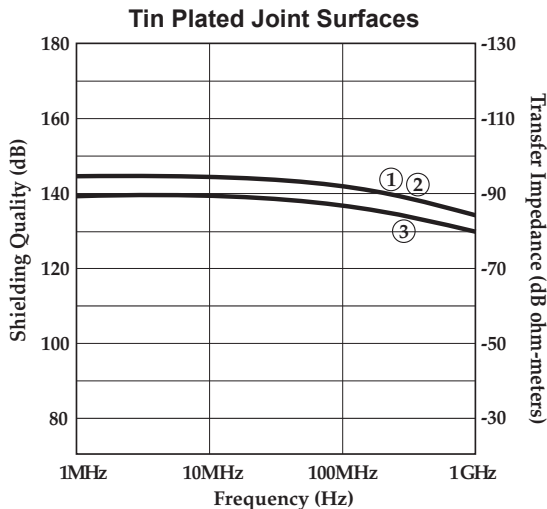


This data is representative of the test data we have obtained. Your results will vary depending on the applicable variables.

1. Standard Force Quick-Shield, Stainless Steel Gasket, Example: NI-04
2. Moderate Force Quick-Shield, Stainless Steel Gasket, Example: NM-04
3. Low Force Quick-Shield, Stainless Steel Gasket, Example: NL-04

Shielding Quality of Ultra Quick-Shield Gaskets

This data applies to *Ultra Quick-Shield* tin plated stainless steel gaskets, or other gaskets which include it, such as Quick-Strip with Ultra Quick-Shield.

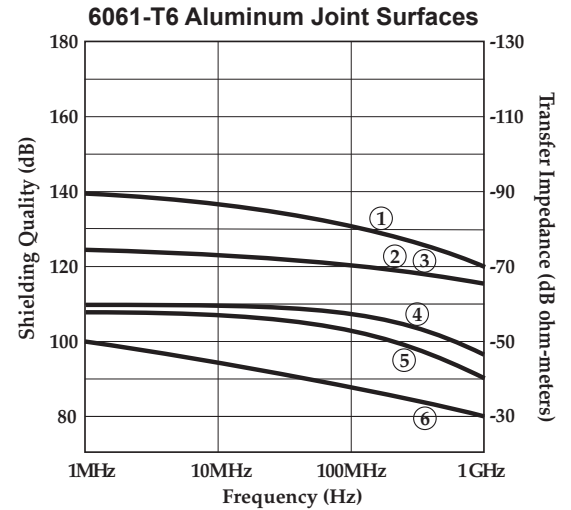
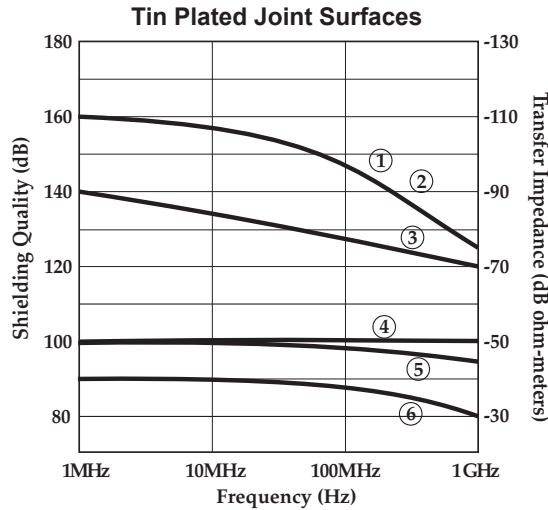


This data is representative of the test data we have obtained. Your results will vary depending on the applicable variables.

1. Standard Force Ultra Quick-Shield, Tin Plated Stainless Steel Gasket, Example: TNI-04, IWNI-04
2. Moderate Force Ultra Quick-Shield, Tin Plated Stainless Steel Gasket, Example: TNM-04, IWNM-04
3. Low Force Ultra Quick-Shield, Tin Plated Stainless Steel Gasket, Example: TNL-04, IWLS-04

Shielding Quality of Flexi-Shield Gaskets

This data applies to *Flexi-Shield* or other gaskets which include it, such as Flexi-Shield O-Rings (see graph, line 1).



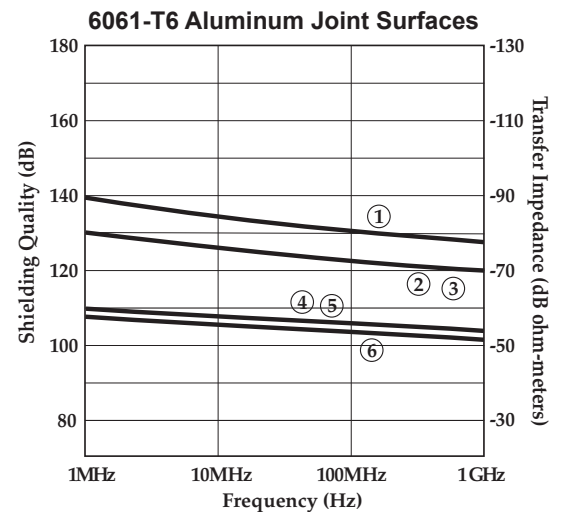
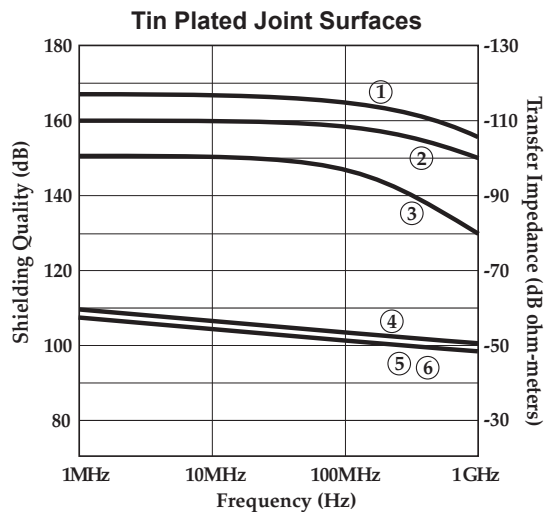
This data is representative of the test data we have obtained. Your results will vary depending on the applicable variables.

1. Standard Force Flexi-Shield, Tin Plated Beryllium Copper Gasket, Example: ST-06, IWST-06
2. Moderate Force Flexi-Shield, Tin Plated Beryllium Copper Gasket, Example: MT-06, IWMT-06
3. Low Force Flexi-Shield, Tin Plated Beryllium Copper Gasket, Example: LT-06, IWLT-06
4. Standard Force Flexi-Shield, Stainless Steel Gasket, Example: SQ-06
5. Moderate Force Flexi-Shield, Stainless Steel Gasket, Example: MQ-06
6. Low Force Flexi-Shield, Stainless Steel Gasket, Example: LQ-06

Shielding Quality of Endur-o-Shield Gaskets

This data applies to *Endur-o-Shield* or other gaskets which include it, such as the following standard configurations:

- Spira-Seal O-Rings (see graph, line 1)
- EMI Connector-Seal, SSCG series (see graph, line 2)



This data is representative of the test data we have obtained. Your results will vary depending on the applicable variables.

1. Standard Force Enduro-Shield, Tin Plated Beryllium Copper Gasket, Example: SISS-04, IWSISS-04
2. Moderate Force Enduro-Shield, Tin Plated Beryllium Copper Gasket, Example: SIMS-04, IWSIMS-04
3. Low Force Enduro-Shield, Tin Plated Beryllium Copper Gasket, Example: SILS-04, IWSIMS-04
4. Standard Force Enduro-Shield, Stainless Steel Gasket, Example: SINI-04
5. Moderate Force Enduro-Shield, Stainless Steel Gasket, Example: SINM-04
6. Low Force Enduro-Shield, Stainless Steel Gasket, Example: SINL-04