SOLID SEALING TECHNOLOGY, INC.

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Title: MHV & SHV High Voltage Test Procedure

Scope: This document describes the test procedure and results for the voltage rating verification of the coaxial MHV and SHV style high voltage connectors and associated end items. The ceramic to metal feedthrough portion of the connector is designed to mate with an industry standard MHV or SHV plug on the atmosphere side and to operate with a system pressure of not greater than $1x10^{-4}$ torr on the vacuum side.

Assembly #'s tested:

SST Part #	Description
KT11269	MHV:Recessed style on KF16 flange with plug
KT14513	SHV-5: Recessed style on KF16 flange with plug
KT17212	SHV-10: Recessed style on KF25 flange with plug
KT16647	SHV-20: Recessed style on KF25 flange with plug

Equipment: Diffusion Pumped Hot wall Vacuum Furnace
High Voltage Portable DC test set **(see Figure 1)**
Granville Phillips 340 Vacuum Gauge Controller **(see Figure 2)**

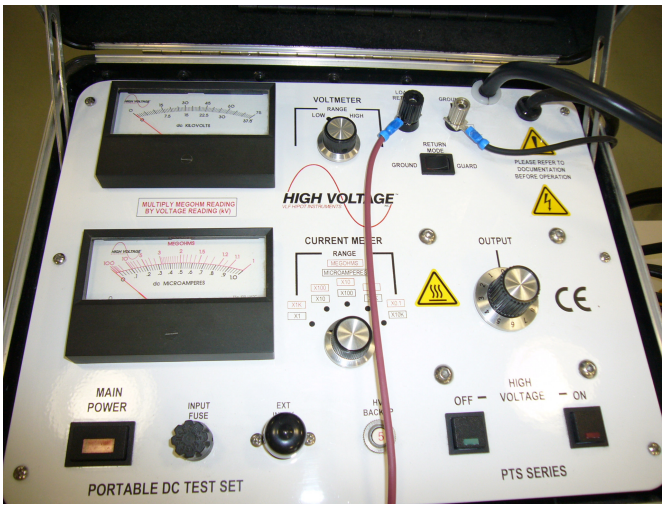

Figure 1: High Voltage DC test set

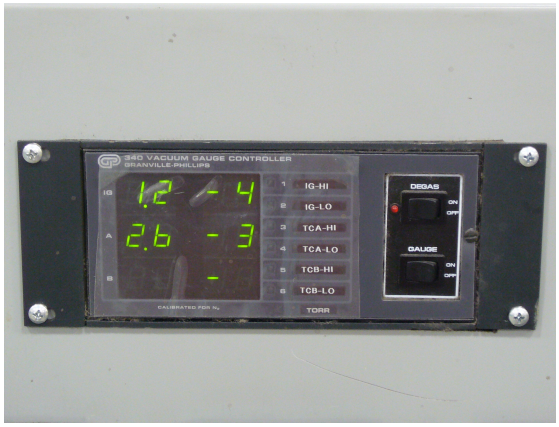

Figure 2: Vacuum Gauge Controller (top value ion gauge during test)

Set-up:

1. Recessed versions of the MHV and SHV receptacles were welded into flanges for mounting on a vacuum system. The "recessed" versions were chosen because they have the shortest vacuum arc gap and would exhibit the worst case condition during electrical testing.
2. SST supplied plugs were outfitted with cables per assembly instructions. **(see Figure 3**) The "free" end of the cable was stripped back to accommodate the test voltage. The following cables were used:

Table 1: Plug Type & Cable attachment

Plug Type	Cable Description
MHV	RG 59/U (Consolidated AWM style 1354)
SHV 5	RG 59/U (Consolidated AWM style 1354)
SHV 10	RG 58C/U
SHV 20	RG 213/U Mil Type Davis RF Co.

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Figure 3: HV Receptacles with Plugs/Cables

Test Procedure:

1. The vacuum system was vented and the flange mounted HV receptacle was mounted to a vacuum port. The system was pumped down to a vacuum level of $1x10^{-4}$ torr.
2. The appropriate HV plug/cable assembly was engaged onto the HV receptacle.
3. The ground cable of the High Voltage DC test set was attached to the flange clamp for appropriate grounding. The "high lead" of the test set was attached to the exposed copper conductor which had been stripped back at the end of the cable. **(See Figure 4)**

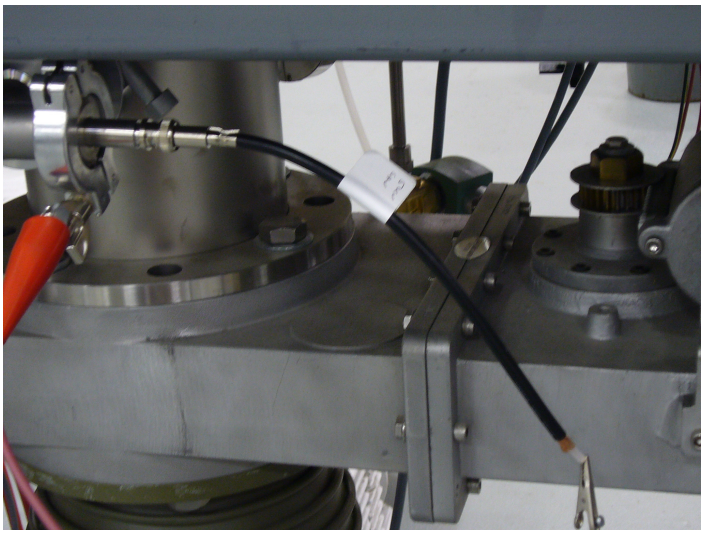

Figure 4: SHV 5 Assembly attached to System for test

4. The high voltage switch was turned on and the applied voltage was increased directly to the rated voltage of each plug/receptacle. The applied voltage was held for at least 1 minute and the leakage current at the rated voltage was recorded. The voltage was then increased to an over-voltage condition and held for 30 seconds to ensure there was a safety margin. **(See Table 2)**

Table 2: Voltage Test results

HV Assembly	Rated Voltage	Measured Leakage Current @ rated voltage	Over-voltage level
MHV 5	5 KV DC	.18 micro amps	7.5 KV
SHV 5	5 KV DC	.16 micro amps	7.5 KV
SHV 10	10 KV DC	.26 micro amps	13 KV
SHV 20 (1)	20 KV DC	.46 micro amps	23 KV
SHV 20 (2)	20 KV DC	.50 micro amps	23 KV

Two plug/cable assemblies were made for the SHV 20 and tested. SHV 20 (1) was a plug supplied by SST and SHV 20 (2) was a comparison plug from Kings.

Conclusions and Recommendations:

All assemblies passed the electrical test and their voltage ratings have been validated for the appropriate operating conditions. (ie. dry atmospheric conditions on the air side & a pressure of less than 1 x 10^{-4} torr on the vacuum side). Care should be taken when assembling the plug and cable assemblies because there

is inherently more variation in this assembly procedure compared to the mating ceramic, high vacuum brazed receptacle. It was determined that the majority of the leakage current recorded was coming from the plug/cable and not from the brazed receptacle.