

How To Select a VLF Model

There are several vendors of VLF products, all with several models. When selecting a VLF model, careful consideration should be given to not only the specifications required, voltage, power, etc., but also to the output waveform, physical design, and the vendor. The criteria for selecting the right VLF are:

Voltage Output - uF Load Rating - uF Rating at 0.1Hz

Waveform Output - Physical Design - Vendor

Voltage: What is the voltage rating of the cables to be tested? Most VLF models are designed around cable ratings: 15kV, 25kV, 35kV, etc. Below is a table from the IEEE400.2 standard showing the test voltages for medium voltage cable. If 90% of your testing is on 15kV cable, then buy the 28kV model from HVI and rent the 60kV model for occasional 35kV cable tests. All the major rental companies offer several HVI models. HVI offers VLF models from 28kV to 200kV.

Cable Rating	Installation	Acceptance	Maintenance
phase to phase	phase to ground	phase to ground	phase to ground
kVms	kVms (kVpk)	kVms (kVpk)	kVms (kVpk)
5	9 (12)	10 (14)	7 (10)
8	11 (16)	13 (18)	10 (14)
15	18 (25)	20 (28)	16 (22)
25	27 (38)	31 (44)	23 (33)
35	39 (55)	44 (62)	33 (47)

uF Rating: VLF hipots are rated by the capacitance of the loads they can test. A cable or generator is a high capacitance load, hence the need to use low frequency output hipots rather than 60Hz designs. To select the uF, or power rating of the VLF, the maximum cable lengths encountered must be known. The $uF/1000'$ of cable is known. Look it up and multiply by the length. Many VLF models offer frequencies of 0.1Hz – 0.01Hz. The lower the frequency, the longer the cable can be tested. For instance, a typical HVI model offers 1.1uF of load capability at 0.1Hz, 2.2uF at 0.05Hz, and 5.5uF at 0.02Hz. At 1.1uF, approximately 2 miles of 15kV cable can be tested, or all three phases at once of a 3000' cable run. Some models can test up 50uF of load.

uF Rating at 0.1Hz: The above paragraph is for when using the VLF to perform a withstand, or proof/hipot test. All frequencies can be used effectively. However, Tan Delta and Partial Discharge cable diagnostic testing are also performed, using the VLF as the voltage source. These tests are typically performed at 0.1Hz. These diagnostic tests are now being performed and certainly will be by all in the future. Hence, the uF rating of the VLF at 0.1Hz is very important. It is recommend that when selecting a VLF model, choose one with a high uF rating at 0.1Hz. There are some VLF units designed for testing 15kV cable that have a 0.5uF rating at 0.1Hz while the VLF-4022CM from HVI offers 1.1uF, capable of testing more than twice the cable length. It may be heavier and larger but is still portable by one person. The small one piece HVI VLF-28CM can test up to 0.4uF, or about 3000' of 15kV cable.

Waveform Output: There are two waveform outputs available:

the sine wave output of the HVI VLF models and those from several other vendors, and the cosine-rectangular waveform from another vendor. While the c-r waveform works well for hipoting cables, its waveform output is not favored as a voltage source for performing tan delta and partial discharge testing. Also, a VLF must produce a sine wave output to be used for testing rotating machinery per IEEE433. Stick with a sine wave VLF.

Physical Design: Four issues: durability, ease of service, ease in use, and portability. Durability - The HVI VLF design incorporates a conventional oil immersed high voltage power supply whose output is controlled by a motor driven variable transformer,

er, not an all electronic, more fragile design as supplied by others. Hence, it is extremely reliable and durable and will last for years, just like oil filled utility transformers. Ease of service

- The mechanical non electronic design of HVI VLF units make service far more easily performed than is the case with highly complicated solid state designs. Numerous calibration and repair houses around the country can do most any work necessary. Ease in use - A VLF hipot test is a simple go/no-go test. All HVI VLF units are manual in control, not computer controlled, needing programming using cumbersome touch screen control interfaces. Turn the unit on and turn up the variac – that's it. However, even though the HVI VLF units are simple, manual controlled designs, they still offer complete data logging capability to produce the comprehensive test reports needed. Portability - The HVI VLF units are extremely portable: most are far smaller and lighter than all others. The 40kV and 60kV models are designed as a two piece system, making transporting and carrying by one person possible.

Vendor: As with anything you buy, the choice of vendor is critical. HVI has been the leader in VLF marketing and production since the late '90s, with over 800 units now operating in 54 countries. There is no vendor with more knowledge and experience in this area than HVI. In addition to shipping over 100 VLF units per year, HVI now produces over 900 other high voltage instruments a year for the utility industry. HVI is also known to offer the most complete and responsive after sales service possible. There is no better manufacturer and/or service provider than HVI. All HVI products are made in the USA.

