



Data Requirements for Power Factor Correction and / or Harmonic Filter Design

PF Correction – Provide the following data:

1. Target value desired for corrected PF.
2. Bus Voltage where capacitor is to be placed.
3. Wiring configuration (3 Ph 3 Wire, 3 Ph 4 Wire). Cable entry location desired.
4. Description of load, indicating if load is steady or highly fluctuating, and period of fluctuation.
5. Is a significant part of plant load composed of harmonic producing equipment such as Variable Frequency, Adjustable Speed or DC drives, Rectifiers, ARC Furnaces, Induction Furnaces, etc. If so, see Harmonic Filter Design data requirements.
6. Utility rate schedule for each metered account PF correction is to be applied.
7. Utility bills showing any two of the following (KW, KVAR, PF and KVA) on a monthly basis for at least a year or longest available period if less than a year. If new loads are to be added, a good estimate of the increased KW and KVAR or PF of the new load.
8. If the load fluctuates and capacitor steps will need to be switched in and out to maintain the necessary PF, provide a 15 or 30 minute monthly summary of at least two of the following: KW, KVAR, PF or KVA.
9. Load data formatted in a CSV (comma separated variable) format, if possible, suitable for loading into a spreadsheet.

Harmonic Filter Design

Provide the following data:

1. A one-line diagram of the system. It should show the following data or the data should be provided separately.
2. The 3 phase short circuit current or MVAsc, and X/R ratio (or utility impedance – specify if per unit or percent, and the base voltage and base MVA) at the utility side of the incoming transformer(s) or at the point the capacitor bank will be connected to the utility line if no transformer is between the utility line and the capacitors.
3. Rated transformer voltages, KVA, impedance in percent or per unit and X/R ratio and winding types.
4. Existing or planned capacitor banks or harmonic filters. For existing units provide rated capacitor KVAR and rated capacitor voltage and if a filter, give tuned harmonic frequency or reactor inductance, specify units of inductance and clarify if milliHenry or microHenry.
5. Significant harmonic sources, rated KVA, KW, PF and whether it is a 6 pulse or 12 pulse system.
6. Harmonic and fundamental **currents** if known. If harmonic current is given as a percent of fundamental, we must also have fundamental **amperes**. Significant harmonic currents and harmonic number for all harmonics present should be provided.
7. Is it necessary to satisfy IEEE 519-1992 limits? The answer is usually yes at the PCC, point of common coupling between the customer and the utility but not necessarily so at buses in the plant power system.
8. Maximum plant load KW and PF to allow calculation of the SCR, short circuit ratio, which governs which IEEE 519 current limits must be met.
9. Ratings of large ac motors which may be in the system including X''d impedance if available. Specify if induction or synchronous. Typical values for X''d will be assumed if not available.
10. If generator operation is required, provide data on the generator(s). Rated voltage, KW or KVA, PF, X''d impedance, KVAR versus KW capability curve or data indicating the maximum capacitive KVAR the generator can tolerate.

PSS Measurement Requirements

To be useful, measurements should provide the necessary data in a usable format and be properly documented so that it can be properly interpreted by others not present at the measurements.

1. Identify the purpose of the measurements: harmonic filter design, power factor correction, both, or whatever.
2. Measurements should include the following data for all 3 phases and simultaneous 3 phase measurements are preferred.

Fundamental: Magnitude and angle for Amps, Volts. (VL-N preferred)
Applicable CT and PT ratios.
Watts, Vars, KVA, PF
The above should be measured and verified against existing panel meters if available to insure proper instrument connections and ratios are used. Note any discrepancies.

Harmonics: Percent of fundamental (must include amps and volts of fundamental) or harmonic amps and volts.

PT and CT ratios: Should be programmed into the instrument if possible to Provide readout in actual units.

3. Documentations of Measurements
 - A) Provide a written log of measurements identifying each by time and date (a unique measurement ID) using instrument clock if available.
 - B) Identify measurement location (bus and feeder names) in such a way they can be related to the system one-line or sketch.
 - C) Mark measurements points on one-line diagram or sketch.
 - D) Provide nameplate data for loads for each measurement and estimate of percent of rated full load. Describe type of load.
 - E) Provide nameplate data for transformers upstream of measurement location (Voltages, KVA, impedance, connection).
 - F) Provide capacitor bank (and step) data for all capacitors connected to a Bus or its feeders (rated capacitor voltage and rated KVAR). If filters, Indicate reactor inductance and clearly specify if (milli) or (micro) Henry.
 - G) Record KVAR that is online / energized from Line Item F during survey.
 - H) Obtain harmonic current measurements directly from source if possible. De-energize any capacitors on the bus or feeder which could affect measurements, if possible.