

Tab 3 – Estimating Flicker – Repetitive Load

This section describes the various user inputs and parameters that are related to computing the flicker contribution from loads that are repetitive in nature with known duty cycle. The screenshot of the corresponding tab of the interface is shown in Figure 1. The limits corresponding to those calculated in the Flicker Limits tab are re-shown here for comparison. When the flicker of the repetitive load exceeds that of the flicker limits, the value is highlighted red. When below limits, the value is highlighted green.

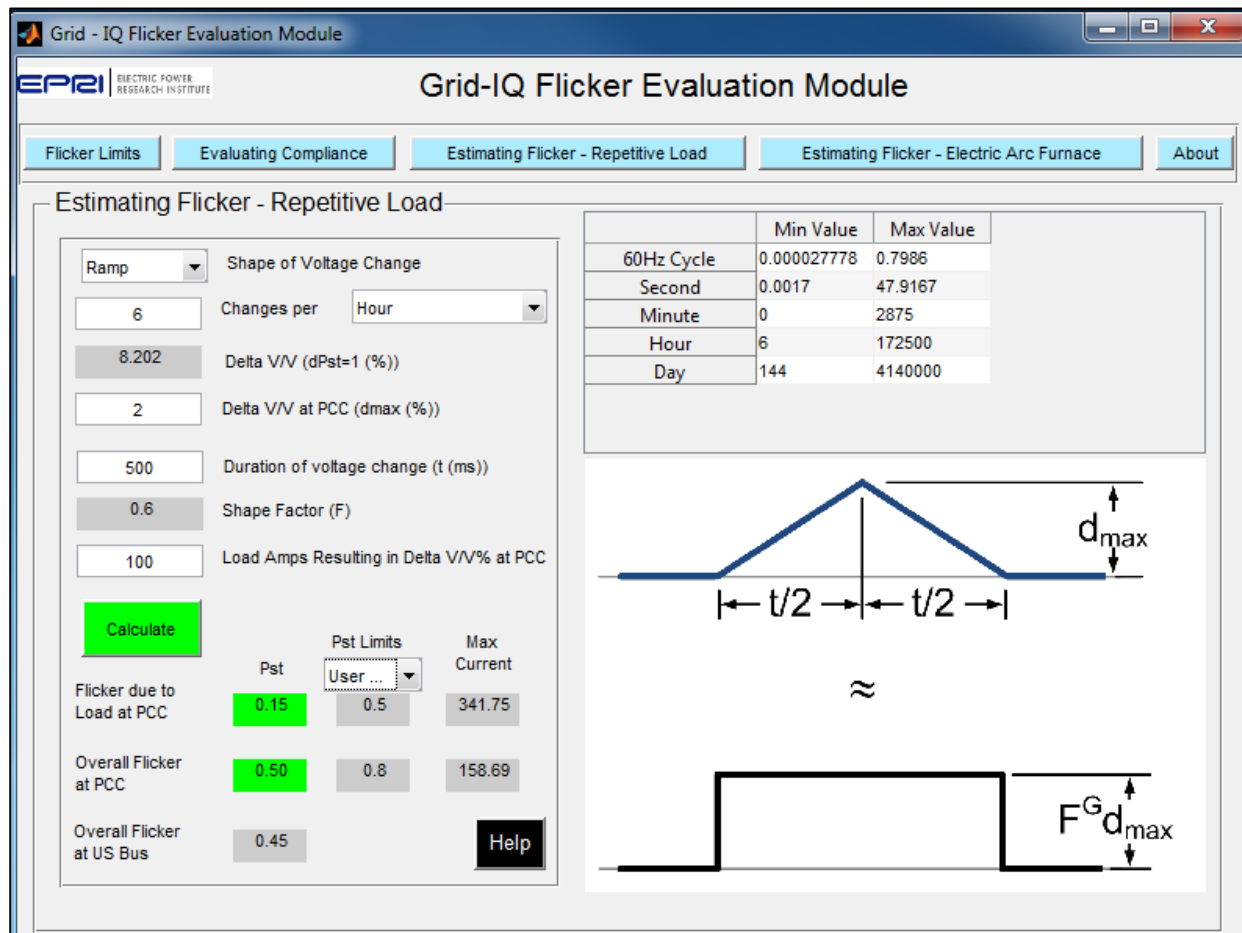


Figure 1
Estimating flicker – Repetitive Load tab

Various fields are explained here:

- Shape of voltage changes: The shape of changes in RMS voltage at PCC due to load operation. The shape change options are as follows and illustrated in Figure 2 through Figure 5:
 - Rectangular
 - Pulse
 - Ramp
 - Double-Pulse

- Double-Ramp
- Sinusoidal
- Triangular
- Aperiodic
- Number of changes per selected interval. Note: To avoid error message, select an interval before entering number of changes. This selection is disabled for aperiodic shape of voltage change. Otherwise, the selectable interval options are:
 - 60HzCycle
 - Second
 - Minute
 - Hour
 - Day
- Delta V/V (dPst=1(%)) (from Pst=1 curve): Rectangular shape voltage change that would result in Pst of 1 corresponding to the changes per minute specified above. This value can be manually read from the plot in Figure 1. However, this module computes this value and populates this field automatically. This selection is disabled for Aperiodic shape of voltage change.
- Delta V/V at the PCC (dmax (%)): Actual voltage change as % of Nominal voltage that is expected at the PCC due to the load operation.
- Duration of voltage change (ms): The time it takes for rms voltage to change its level. This field is only available for the following shapes of voltage change:
 - Pulse
 - Ramp
 - Double-Pulse
 - Double-Ramp
- t_1 (sec): The duration of the initial voltage sag due to an aperiodic load. This selection is only available for an aperiodic shape of voltage change.
- t_2 (sec): The remaining duration of an aperiodic load after time t_1 . This selection is only available for an aperiodic shape of voltage change and is not defined for durations longer than 100 seconds. Use the value of 100 for t_2 when t_2 is greater than 100 seconds.
- Shape Factor: A factor that can be used to translate typical modulation waveforms into equivalent square wave modulating waveform in order to make use of “Pst=1” curve. These can be manually read using plots in Figure 2 through Figure 5. However, the module computes this factor based on the other field values and auto-populates this field.
- Load Amps Resulting in Delta V/V% at PCC is the current of the fluctuating load that causes the resulting Delta V/V% at PCC. This value is used to support the calculation of the “Max Current” values. Max Current describes how much larger the fluctuating load could be before flicker violations occur. For example, if the load is a rolling mill, the load current might change from 50 A to 150 A, causing the DeltaV/V of 2%. The value placed in the “Load Amps Resulting in Delta V/V% at PCC” would be 100 (= 150 A – 50 A).

- Flicker due to Load at PCC: This field gets computed once the user clicks on the “Compute” button. It is an estimate of the flicker contribution at the PCC from the load based on the user inputs above. To the right of this value is the associated “Flicker Limits” value established in the “Flicker Limits” section discussed earlier.
- Overall flicker at PCC: This field also gets computed once the user clicks on the “Calculate” button. It is the combination of flicker contribution of the load and any background flicker that has been specified in the “Flicker Limits” section.
- Pst Limits: This selection window allows the user to select Flicker Limits defined in the “Flicker Limits” section discussed earlier. The selection window allows either the “Calculated” limits to be used, or the “User Defined” limits may be selected. Once this selection is defined, the resulting limits are presented in the fields below the selection box to be used to support “Max Current” calculations when the “Calculate” button is activated.
- Max Current describes an estimate of how much larger the fluctuating load could be before exceeding the Flicker Limit value immediately to the left of the term.
- Overall Flicker at the US Bus is an estimation of the overall flicker at the upstream bus resulting from the overall flicker at the PCC as influenced by the PCC to Upstream System Transfer Coefficient (Tpst-US).

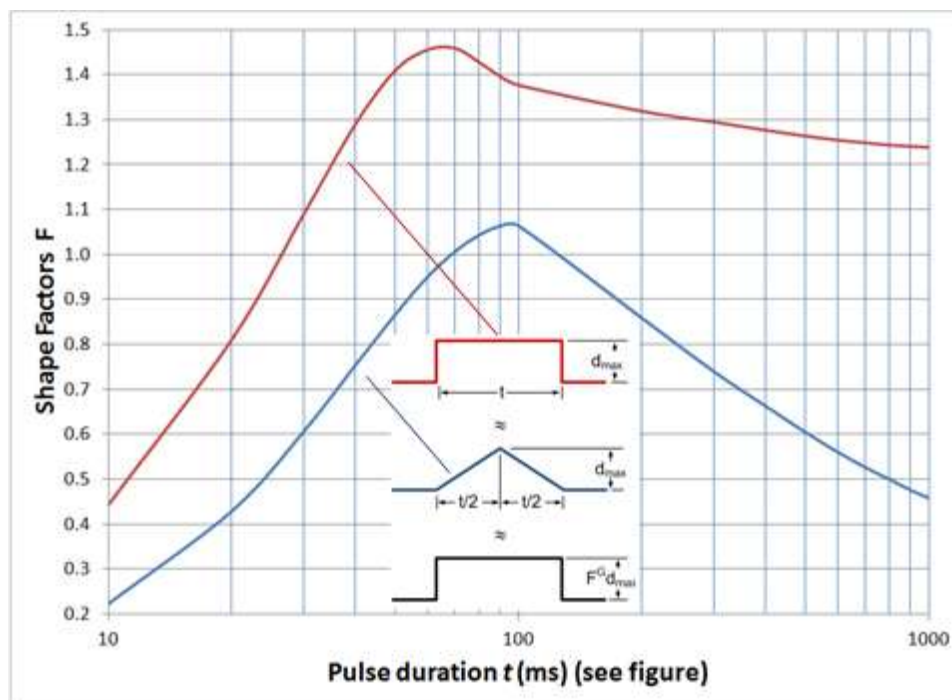


Figure 2
Shape factor for pulse and ramp changes

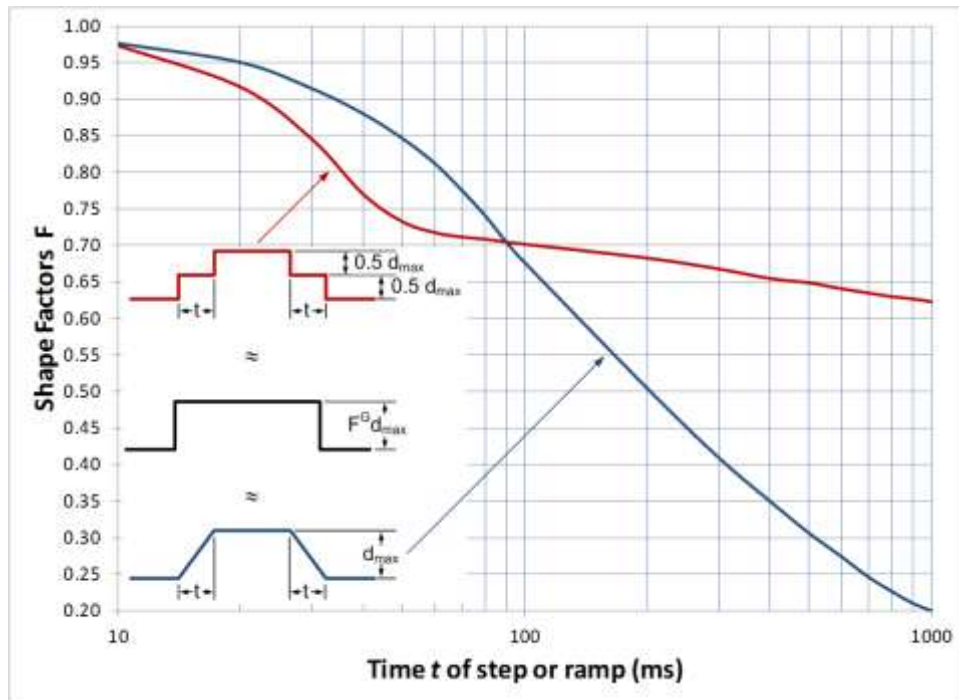


Figure 3
Shape factor for double step and double ramp changes

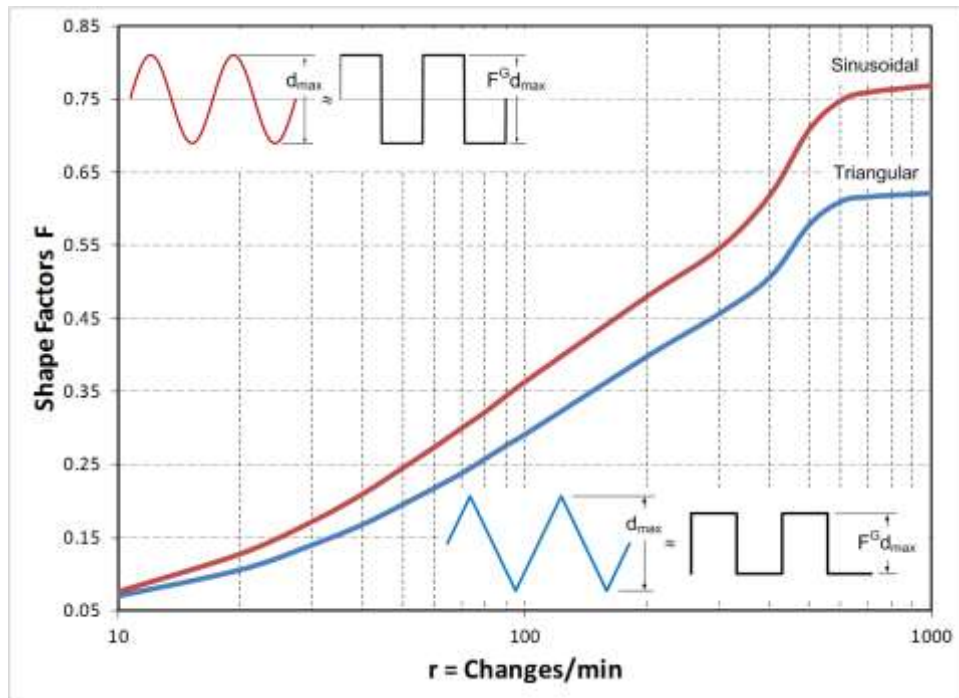


Figure 4
Shape factor for sinusoidal and triangular pulses

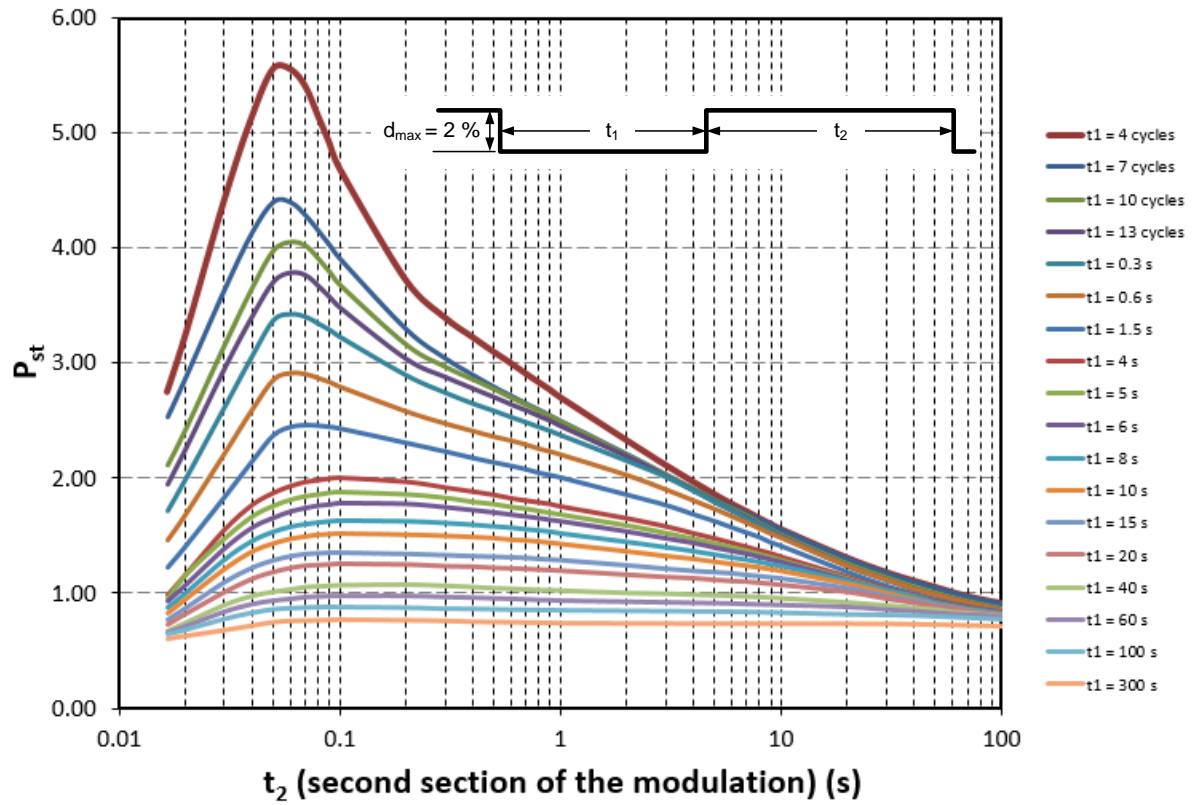


Figure 5
Shape factor curves for aperiodic changes