This aperture area may be defined by opaque tape if there is no frame to eliminate the possibility of the module collecting current outside the defined aperture area by multiple internal reflections or light piping.

The most common performance rating method for modules is the PV power conversion efficiency under SRC (Table 16.1). The power or peak watt rating on the module's nameplate is usually given with respect to SRC, as shown in Table 16.1 using a 25°C module temperature. Unfortunately, prevailing conditions under natural sunlight do not commonly match nameplate conditions. The nameplate rating that the manufacturer assigns to a given module model number is often higher than the measured power output in the field [31–33]. If the nameplate rating is determined at 25°C, then the actual power produced is often less than this because the module will typically run at 40° to 60°C. The temperature coefficient for the peak power is usually negative. The nameplate rating also does not include long-term degradation or system losses. System losses include the power-conditioning unit's efficiency, ability of the power conditioner to operate at the maximum PV power point, orientation, shading, resistance losses in the wiring, and mismatch in the power of different modules.

The nominal operating cell temperature (NOCT) is a rating designed to give information about the thermal qualities of a module and a more realistic estimate of the power in the field on a sunny day at solar noon. The NOCT of a module is a fixed temperature that the module would operate at if it is exposed to the nominal thermal environment (20°C air temperature, 800 $\mathrm{Wm^{-2}}$ total irradiance, and a wind speed of 1 $\mathrm{ms^{-1}}$) [7, 34]. The term "standard operating conditions" or SOC is sometimes used for flat-plate or concentrator-terrestrial modules operating at NOCT. The actual determination of the NOCT of a module with an uncertainty of less than ±2°C has proved difficult because of difficulties in measuring the temperature of cells in an encapsulated module, uncertainties in the total irradiance, and secondary environmental effects such as wind direction, ground reflections, mounting, and electrical loading [34, 35]. The installed NOCT is up to 15°C warmer for roof-mounted applications than a free-standing module depending on the stand off distance between the module and the roof [34, 35]. The module temperature can be calculated from the NOCT or installed NOCT and air temperature using

$$T = T_{\mathrm{air}} + (\mathrm{NOCT} - 20^{\circ}\mathrm{C})E_{\mathrm{tot}}/800\ \mathrm{Wm^{-2}}. \tag{16.2}$$

A wind speed correction can also be applied to equation (16.2) [7, 34].

For a fair and meaningful comparison of efficiencies between technologies, the measurements should be performed after any initial degradation. Commercial silicon modules have shown small changes in performance after the first few hours of operation [36, 37]. At the present time, all amorphous silicon PV technologies degrade when exposed to sunlight. Fortunately, this degradation stabilizes at a level of 80% to 90% of the initial value (see Chapter 12). Partial recovery occurs in the field during the summer when the higher module temperature leads to partial annealing or when amorphous silicon modules are annealed in the laboratory at 60° to 70°C [38, 39]. The efficiency continues to decrease after 500 h of light exposure at lower temperatures even if the light level is reduced [38–40]. For a fair and meaningful comparison of improvements in amorphous silicon module development, the performance at SRC is now reported after illumination