The development of quantum cascade lasers operating at terahertz frequencies is proceeding at a very rapid pace. For their successful practical implementation, specific requirements have now to be addressed, particularly concerning the properties of the emitted radiation. Single-mode THz lasers with distributed feedback resonators have been achieved and a new technique involving surface plasmon gratings has been demonstrated to improve performances and allow the realization of vertically emitting devices. Solutions for broad tuneability are examined, either relying on external cavity set-ups or more unconventional external electrical control. THz quantum cascade amplifiers will also be discussed.