In this paper we derive the equations of collective Thomson scattering (CTS) for an arbitrarily drifting magnetized plasma described by a bi-Maxwellian distribution. The model allows the treatment of anisotropic plasma with different parallel and perpendicular temperatures (with respect to the magnetic field) as well as parallel and perpendicular plasma drift. As could be expected, parallel observation directions are most sensitive to the parallel temperature and drift, whereas perpendicular observation directions are most sensitive to the perpendicular temperature and the perpendicular drift along the observation direction. The perpendicular drift can be related to the radial electric field. Measurements with a spectral resolution better than 0.5 MHz are necessary for the inference of the radial electric field. This spectral resolution and the required scattering geometry are attainable with the current setup of the CTS diagnostic on Wendelstein 7-X.