We applied a recently developed magnetic bead micro-rheometer (Magnetic Tweezers) to investigate the influence of actin on the properties of the cell membrane of endothelial cells (HUVEC). Superparamagnetic beads of a diameter of 4.5 µm are coated with different integrin-binding proteins (e.g. fibronectin, collagen IV, invasin) and thus linked to the actin cortex. Via an external magnetic coil we can apply forces of up to 5 nN to these beads. The displacement is measured in real time by a single particle tracking algorithm. To characterize the properties of the actin cortex we additionally analyzed the strain field, which we visualize by non-magnetic beads attached to the cell membrane and by fluorescence staining of the mitochondria inside the cell.