We performed simulations of the core collapse of stars in the range between 5 and 39 solar masses evolved with rotation and magnetic fields and considered potential progenitors of superluminous supernovae and gamma-ray bursts. Our models, combining neutrino transport in the M1 framework and special relativistic MHD, have been run for up to several seconds. Besides explosions of different types, ranging from neutrino-driven shock revival to magnetorotational outflows, many of the stars produce stellar-mass black holes.