Parameter	Target value	Comment
Sample parameters		
Sample thickness	200 nm … 1 µm	
Sample temperature	300 K	
Electron beam parameters		
Electron energy	1…5 MeV	
Electron beam diameter — for crystallography — for single molecule diffraction	 1 µm 10…30 nm	
Electron beam divergence at the sample	<< 100 µrad	Needs to be smaller than the diffraction angle (assuming a particle energy of 5 MeV and a lattice constant of 50 Å)
This corresponds to a normalized emittance of: — for crystallography — for single molecule diffraction	 << 1 nm << 10…30 pm	assuming a particle energy of 5 MeV, $\gamma = 10.8$
Relative energy spread	$\leq 10^{-4}$	
Pulsed electron beam		
Strobe rate	up to 20 kHz	
Electron beam burst duration	≤ 1 ns	Required to stop Brownian motion of molecules
Number of electrons per burst	10^4 … 10^6	Motivated by radiation damage on sample
Further requirements on the instrument		
Scan coil controls		Positioning of the beam on the sample with 10 nm accuracy
Change of beam current		Performed by changing photocathode laser rate
Sample positioning		Stable goniometer is key to getting good data. Present systems are limited, and often cannot rotate the sample by 180º.
Control drift		Drift in present systems is limiting the measurement time

Detector		
Noise-free readout		achieved through identification of single electrons
Quantum efficiency	> 0.5	
Number of pixels	≥ 10^6	
Frame rate	20 kHz	
Software		
Pattern recognition of known structures		Reduce background
Phase reconstruction		
3D reconstruction		