$$egin{aligned} \mathbf{v}_k' = & \mathbf{\Gamma}^+[\mathbf{v}_k;\,\zeta_v] \equiv & \mathbf{v}_k\odot\exp\left(rac{arepsilon_{\mathbf{v}}^k}{2}s_{\mathbf{v}}^k(\zeta_{\mathbf{v}_k})
ight) - rac{arepsilon_{\mathbf{v}}^k}{2} & \left[\partial_x S(x_k)\odot\exp\left(arepsilon_{\mathbf{v}}^k q_{\mathbf{v}}^k(\zeta_{\mathbf{v}_k})
ight) + t_{\mathbf{v}}^k(\zeta_{\mathbf{v}_k})
ight] \ & \mathbf{v}_k' = & \mathbf{m}^k\odot\mathbf{x}_k + & \mathbf{\bar{m}}^k\odot\mathbf{\Lambda}^+\left[\mathbf{ar{x}}_k;\,\zeta_{ar{\mathbf{x}}}
ight] \equiv & \mathbf{ar{x}}_k\odot\exp\left(arepsilon_{ar{\mathbf{x}}}^k s_{\mathbf{x}}^k(\zeta_{ar{\mathbf{x}}_k})
ight) + & arepsilon_{\mathbf{x}}^k\left[v_k'\odot\exp\left(arepsilon_{\mathbf{x}}^k q_{\mathbf{x}}^k(\zeta_{ar{\mathbf{x}}_k})
ight) + & t_{\mathbf{x}}^k(\zeta_{ar{\mathbf{x}}_k})
ight] \end{aligned}$$

X scaling

force scaling

v scaling

translation

translation

v scaling