$$
\begin{aligned}
\dot{\mathbf{x}} &= f(\boldsymbol{x}, \nu) + \boldsymbol{\omega_s} = \begin{bmatrix} \phi x_2 \\ -x_1 \\ \nu x_1 - x_3 \end{bmatrix} + \boldsymbol{\omega_x} \\
s &= g(\boldsymbol{x}) + \omega_s \quad = x_3 + \omega_s \\
\nu &= \nu + \omega_\nu \\
\\
\boldsymbol{x} &\rightarrow \boldsymbol{x} + dt\dot{\boldsymbol{x}} - \eta\frac{\partial F}{\partial \boldsymbol{x}} \\
\dot{\boldsymbol{x}} &\rightarrow \dot{\boldsymbol{x}} - \eta\frac{\partial F}{\partial \dot{\boldsymbol{x}}} \\
a &\rightarrow a - \eta\frac{\partial F}{\partial a} \\
\nu &\rightarrow \nu - \eta\frac{\partial F}{\partial a}
\end{aligned}
$$