

Appendix B: Problem specifications

Table A.1: Design specifications for the baseline Flywheel Energy Storage System

| Parameter | Value |
|---|---|
| Housing temperature | 30 C |
| Flywheel axial length | 1000 mm |
| Flywheel diameter | 430 mm |
| Motor axial length | 250 mm |
| Shaft and PM diameter | 84 mm |
| Magnet thickness | 6 mm |
| AMB rated force | 5780 N |
| Max rotational speed | 40,000 r/min |
| Current controller transfer function | $\frac{v(s)}{\epsilon(s)} = G_{ci}(s) = 345 + \frac{2149}{s}$ |
| Position controller transfer function x | $\frac{F_{ocx}(s)}{\epsilon_{ocx}(s)} = k_{px} + \frac{k_{ix}}{s} + \frac{sk_{dx}}{1+s/\omega_{px}}$ $k_{px} = 1.2639 \times 10^8$ $k_{ix} = 1.16868 \times 10^9$ $k_{dx} = 252790$ $\omega_{px} = 3770 \text{ rad/s}$ |
| Tilting position controller transfer function | $\frac{F_{dcx}(s)}{\epsilon_{dcx}(s)} = k_{p\alpha} + \frac{k_{ia}}{s} + \frac{sk_{da}}{1+s/\omega_{p\alpha}}$ $k_{p\alpha} = 7.6992 \times 10^7$ $k_{ia} = 1.18953 \times 10^9$ $k_{da} = 80294$ $\omega_{p\alpha} = 6283 \text{ rad/s}$ |