CLAIMS:

1. A method for producing a monocrystalline silicon ingot having a neck and a main body suspended from the neck, the method comprising:

contacting a seed crystal with a silicon melt held within a crucible;

pulling a neck from the silicon melt, wherein pulling the neck comprises:

sensing the diameter of the neck by a diameter sensor;

relaying a signal related to the diameter of the neck to a control unit; and

regulating the diameter of the neck by sending a signal from the control unit to the pulling mechanism to increase or decrease the pull rate;

measuring a pull rate at which the neck is pulled from the silicon melt, the measured pull rate being a pull rate calculated by the control unit;

calculating a moving average from the measured pull rate;

comparing the moving average of the measured pull rate to a target range to determine if dislocations were not eliminated during growth of the neck; and

pulling an ingot main body from the melt if the moving average is within the target range, the main body being suspended from the neck, neck growth being terminated and the main body not being grown from the melt if the moving average is outside of the target range during neck

growth which indicates that the neck may include dislocations, wherein a control unit regulates the pull rate of the seed crystal and initiates termination of ingot growth if the moving average is outside of the target range during neck growth.

2. The method as set forth in claim 1 wherein the neck is lowered into the melt if the moving average is outside the target range.

3. The method as set forth in claim 1 or claim 2 wherein the neck is a first neck, the method further comprising:

pulling a second neck from the silicon melt if the main body is not grown from the first neck;

measuring a pull rate at which the second neck is pulled from the silicon melt;

calculating a moving average from the measured pull rate of the second neck;

comparing the moving average of the measured pull rate of the second neck to the target range; and

pulling an ingot main body from the melt if the moving average of the measured pull rate of the second neck is within the target range, the main body being suspended from the second neck.

4. The method as set forth in any one of claims 1 to 3 wherein the moving average is time-averaged.

5. The method as set forth in claim 4 wherein the calculated moving average is a moving average over at least the previous 5 seconds of neck growth.

6. The method as set forth in any one of claims 1 to 5 wherein the moving average is length-averaged.

7. The method as set forth in claim 6 wherein the moving average is a moving average over at least about the previous 0.2 mm of neck grown.

8. The method as set forth in any one of claims 1 to 7 wherein comparing the moving average of the measured pull rate to a target range is performed for only a portion of the neck.

9. The method as set forth in any one of claims 1 to 8 wherein comparing the moving average of the measured pull rate to a target range is performed for the entire length of the neck.

10. The method as set forth in any one of claims 1 to 9 wherein the ingot main body has a resistivity of less than about 20 mohm-cm.

11. A method for controlling the quality of a neck used to support an ingot main body, the method comprising:

pulling the neck from a silicon melt by a pulling mechanism, wherein pulling the neck comprises:

sensing the diameter of the neck by a diameter sensor;

relaying a signal related to the diameter of the neck to a control unit; and

regulating the diameter of the neck by sending a signal from the control unit to the pulling mechanism to increase or decrease the pull rate;

measuring a pull rate at which the neck is pulled from the silicon melt, the measured pull rate being a pull rate calculated by the control unit;

calculating a moving average of the pull rate from the measured pull rate;

comparing the moving average of the measured pull rate to a target range to determine if dislocations were not eliminated during growth of the neck; and

sending a signal to terminate neck growth if the moving average falls outside of the target range.

12. The method as set forth in claim 11 wherein neck growth is terminated by lowering the neck into the melt.

13. The method as set forth in claim 11 wherein neck growth is terminated by increasing a pull rate of the neck to form an end cone and removing the neck from an ingot puller in which the neck was formed.

14. The method as set forth in any one of claims 11 to 13 wherein the moving average is time-averaged.

15. The method as set forth claim 14 wherein the calculated moving average is a moving average over at least the previous 1 minute of neck growth.

16. The method as set forth in any one of claims 11 to 15 wherein the moving average is length-averaged.

17. The method as set forth in claim 16 wherein the moving average is a moving average over at least about the previous 2 mm of neck grown.

18. A system for producing a monocrystalline silicon ingot comprising:

a crystal puller in which the silicon ingot is pulled;

a crucible for holding a polycrystalline silicon melt within the crystal puller;

a seed crystal chuck that secures a seed crystal for contacting the silicon melt;

a pulling mechanism for raising and lowering the seed crystal; and

a control unit for controlling growth of a neck from which an ingot main body is suspended, the control unit regulating the pull rate of the neck by sending a signal to the pulling mechanism to increase or decrease the pull rate to achieve a desired neck diameter, the control unit being configured to calculate a moving average of the pull rate and compare the moving average to a target moving average to determine if dislocations were not eliminated during growth of the neck, the control unit terminating neck growth when the pull rate is outside of the target moving average.

19. The system as set forth in claim 18 further comprising a termination mechanism for terminating neck growth, the termination mechanism being communicatively connected to the control unit.

20. The system as set forth in claim 19 wherein the termination mechanism produces a warning signal for alerting a technician.

21. The system as set forth in claim 19 wherein the warning signal causes an alarm to alert the technician.