



Resistance Weld Equipment Calibration

INTRODUCTION:

Today's resistance weld equipment – both small scale and large scale - often incorporate integrated monitoring sensors (current, voltage, force, and displacement) that provide real-time process feedback during the weld cycle. Like all measurement devices, weld power supplies and heads must be regularly calibrated to ensure the welder meets manufacturer's specifications. A calibrated weld system is the first step to improving weld quality and achieving weld consistency.

CALIBRATION BENEFITS:

Calibrating weld controllers that incorporate built in monitoring functionality provides manufacturing organizations the following benefits:

1. Ensures valid data used to develop the weld process
2. Enables statistical process control and correlation with destructive test data
3. Eliminates the need for separate monitor hardware
4. Allows comparison between multiple weld controllers and heads
5. Satisfies ISO 9001, AS9100, ISO 13485, and GMP standards

The first four benefits allow the organization to realize the cost savings and quality improvements associated with today's six sigma initiatives. The cornerstone to quality control is process data measurement and analysis. Data must be valid, since it is the foundation to modern statistical control techniques (DOE's, gage R&R's, AQL, SPC, etc).

CALIBRATION STANDARDS:

Calibration, by definition, is ensuring a measurement device satisfies its accuracy specifications. Calibrating a measurement sensor requires the use of a known standard, one that is at least 2 times more accurate than the device being calibrated. NIST, the US Department of Commerce's National Institute of Standards and Technology is a federal agency responsible for certifying

the measurement standard and is based on ISO/IEC 17025. The purpose of NIST is to certify standard reference materials and provide calibration services for dimensional, mechanical, electronic, magnetic, and radiation measurements. In order to satisfy NIST traceability, all the measurement devices and materials used to calibrate the weld system must be fully traceable.

For example, techMatrix sends its precision, high power wire wound resistors used to calibrate small scale resistance weld controllers to a third party to certify the manufacturer's accuracy specification. See Figure 1.



Figure 1 – Precision, High Power Resistor (foreground)

Similarly, electronic devices used to calibrate a weld power supply, such as an oscilloscope, must be calibrated to ensure the oscilloscope manufacturer's voltage, current, and frequency specifications are met over its measurement range. Once all the measurement systems are tested and calibrated, techMatrix follows the manufacturers' procedure to conduct weld equipment calibration.

**PROCEDURE:**

In practice, calibration typically involves corrections to allow the weld power supply to fall within a specified range. Resistance weld controllers can easily be cycled tens of thousands of times throughout the year, often in harsh manufacturing environments.

Repeated use often produces linearity errors, temperature drift, and hysteresis on the power supply and sensors that require an offset adjustment. Periodic calibration sets the electronics back to a known reference point. Reliable weld monitoring, and by extension quality control, is only possible when regular calibration and maintenance schedules are performed.

Similarly, mechanical devices used to control electrode force (springs, electro-pneumatic regulators, load cells, etc.) experience wear and fatigue over time. Therefore, it's important to calibrate and test the weld head's mechanical performance. Figure 2 shows the linearity correction used to calibrate a techMatrix RSX series weld head.

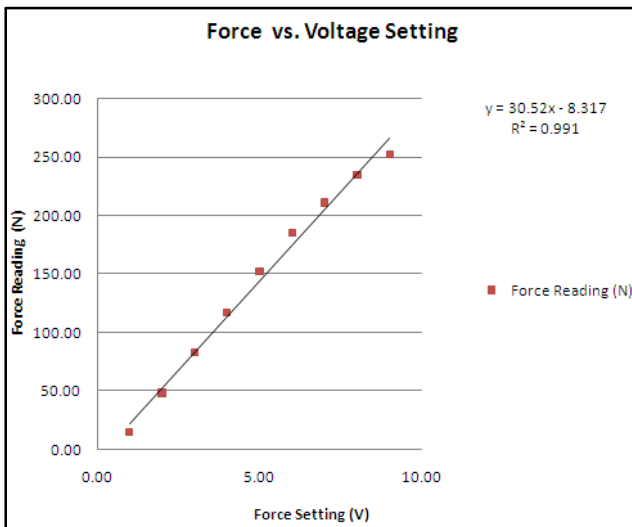


Figure 2 – Electrode Force vs. Load Cell Voltage Linearity

Once the best fit line equation is found (using linear regression), the information is entered into the WeldWorks software to provide dynamic force correction.

Calibration and measurement validation is particularly important if the system is uses an “open-loop” power

supply, such as capacitive discharge or AC power source. The same is true for weld heads that use preloaded springs, or pneumatics to set the electrode force. In either case, there may be no sensor to compensate for changes in device output.

CALIBRATION FREQUENCY:

Resistance weld equipment calibration is often done on an annual basis as required by most regulatory guidelines, but may need to be done more frequently under the following situations:

After major controller or head maintenance. Resistance welding involves the use of precision electrical power and electrode force control to create a reliable joint. Anytime there are part replacements or adjustments to critical weld components, a recalibration should be performed to ensure equipment accuracy.

If weld equipment is dropped, moved, or believed to be “out of calibration”, it is worthwhile to recalibrate. Even large scale resistance weld equipment is not immune to inaccuracies if it is dropped, tipped or bumped.

CONCLUSION:

techMatrix provides calibration services for all major resistance weld manufacturing equipment. Whether the calibration is performed on your factory floor or in our laboratory, you'll be taking the first step toward improving weld quality. Periodic equipment calibration allows you to get the most out of your resistance weld system and maximizes your six sigma initiatives.



techMatrix, LLC
St. Paul, MN 55108
www.techMatrixLLC.net
Phone: 612-605-8312