# CALIBRATION & REPAIR TECHNICAL INFORMATION

## New Load Cell System Calibrations

**Internally Amplified Load Cells:** Dependent on option code. Standard internally amplified load cells such as a low profile load cell receive a standard calibration with applied load vs. voltage calibration points. A2LA/ ISO17025 accredited calibrations are available for voltage outputs. Current (mA) outputs are not within our ISO17025 accredited scope.

**Load Cell w/ External Amplifier:** A load cell/amplifier system level calibration can be accomplished in one of two ways:

A) The first option is a system calibration using applied loads, this entails pairing the load cell and amplifier and performing the calibration under applied loads in the test machine. This method of system calibration (or 'in-rig' calibration) provides a single traceable calibration certificate for the load cell and amplifier combination. Calibration points are expressed as applied load points versus VDC/mA output. A2LA/ISO17025 accredited calibrations are available for voltage outputs. Current (mA) outputs are not within our ISO17025 accredited scope.

B) The second option (referred to commonly as the standard Interface SYS-CAL1) is to calibrate/span the amplifier with a NIST traceable precision mV/V transfer standard using the load cells mV/V calibration data. As the amplifier is typically spanned to the capacity of the sensor, standard practice is to use the SEB output of the load cell to span the amplifier. If applicable, a shunt calibration is then be performed with the load cell and amplifier connected and the corresponding output recorded. This calibration method provides two separate calibration certificates, one for the load cell with mV/V calibration data and one for the load cell and amplifier with the calculated output and shunt calibration (RCAL) data. A2LA/ISO17025 accredited calibrations are available for the load cell but are not available for the indicator/amplifier certificate.

**Load Cell w/ Indicator:** A load cell and indicator system level calibration can be accomplished in one of two ways:

A) System calibration using applied loads: This entails pairing the load cell and indicator and performing the calibration under applied loads in the test machine. This method of system calibration (or 'in-rig' calibration) provides a single traceable calibration certificate for the load cell and indicator combination. Calibration points are expressed as applied load points versus indicated reading. A2LA/ ISO17025 accredited calibrations are available.

B) The second option (referred to commonly as the standard Interface SYS-CAL1) is to calibrate the indicator with a NIST traceable precision mV/V transfer standard using the load cell mV/V calibration data. As the indicator is typically calibrated to the capacity of the sensor, standard practice is to use the SEB output of the load cell to calibrate the indicator.

**TEDS Load Cells w/Indicator:** Standard load cells with TEDS chips installed have the standard mV/V calibration certificate for its respective model as well as a TEDS data sheet to report what data is stored on the TEDS chip per IEEE 1451.4, template 33. To provide system level traceability, any indicator to be paired with a TEDS load cell should have a traceable internal mV/V calibration performed. A2LA/ISO17025 accredited calibrations are available for the both the internal mV/V indicator calibration and the load cell calibration. An in-rig system calibration using applied loads can also be performed to verify and record system performance.

## System Recalibrations

**Internally Amplified Load Cells:** Dependent on option code. Standard internally amplified load cells such as a low profile load cell receive a standard calibration with applied load vs. voltage calibration points. If the amplifier span or zero does not require adjustment, a combined "As-Found and Final" calibration certificate is provided. If the amplifier is adjusted, separate "As-Found" and "Final" certificates are provided. The "As-Found" certificate reports the calibration results before adjustment, the "Final" certificate reports the

condition after final adjustment. A2LA/ISO17025 accredited calibrations are available for voltage outputs. Current (mA) outputs are not within our ISO17025 accredited scope.

**Load Cell w/ External Amplifier:** A load cell/amplifier system level recalibration is most commonly performed using method (A) described below. Method (B) can also be used, but would not document the as-found condition of the system.

A) The first option is a system recalibration using applied loads, this entails pairing the load cell and amplifier and performing the calibration under applied loads in the test machine. This method of system calibration (or 'in-rig' calibration) provides a single traceable calibration certificate for the load cell and amplifier combination. Calibration points are expressed as applied load points versus VDC/ mA output. If the amplifier span or zero does not require adjustment, a combined "As-Found and Final" calibration certificate is provided. If the amplifier is adjusted, separate "As-Found" and "Final" certificates are provided. The "As-Found" certificate reports the calibration results before adjustment, the "Final" certificate reports the condition after final adjustment. A2LA/ISO17025 accredited calibrations are available for voltage outputs. Current (mA) outputs are not within our ISO17025 accredited scope.

B) The second option (referred to commonly as the standard Interface SYS-CAL1) is be to calibrate/ span the amplifier with a traceable precision mV/V transfer standard. This option requires the load cell to first be calibrated independently of the amplifier in mV/V. This calibration data is then used to calculate the correct scaling and the mV/V transfer standard is used to calibrate/span the amplifier. As the amplifier is typically spanned to the capacity of the sensor, standard practice is to use the SEB output of the load cell to span the amplifier. If applicable, the shunt calibration is then be performed with the load cell and amplifier connected. This calibration method provides two separate calibration certificates, one for the load cell with mV/V calibration data and one for the amplifier with the calculated output and shunt calibration (RCAL) data. A2LA/ISO17025 accredited calibrations are available for the load cell but are not available for the indicator/amplifier certificate.

**Load Cell w/Indicator:** A load cell/Indicator system level recalibration is most commonly performed using method (A) described below. Method (B) can also be used, but the as-found condition of the system would not be documented. Load cells used with the Interface Gold Standard System or with the Interface 9840 are addressed in method (C).

A) The first option is a system calibration using applied loads, this entails pairing the load cell and indicator and performing the calibration under applied loads in the test machine. . This method of system calibration (or 'in-rig' calibration) provides a single traceable calibration certificate for the load cell and indicator combination. Calibration points are expressed as applied load points versus indicated reading. If the indicator does not require adjustment, a combined "As-Found and Final" calibration certificate is provided. If the indicator is adjusted, separate "As-Found" and "Final" certificates are provided. The "As-Found" certificate reports the calibration results before adjustment, the "Final" certificate reports the condition after final adjustment. A2LA/ISO17025 accredited calibration is available.

B) The second option (referred to commonly as the standard Interface SYS-CAL1) is to calibrate the indicator with a traceable precision mV/V transfer standard. This option requires the load cell to first be calibrated independently of the indicator in mV/V. This calibration data is then used to calculate the correct scaling and the mV/V transfer standard is used to calibrate/span the indicator. As the indicator is typically calibrated to the capacity of the sensor, standard practice is to use the SEB output of the load cell to calibrate the indicator. If applicable, the shunt calibration is then performed with the load cell and amplifier connected. This calibration method provides two separate calibration certificates, one for the load cell with mV/V calibration data and one for the indicator with the calculated indicated reading and shunt calibration (RCAL) data. A2LA/ISO17025 accredited calibration is available for the load cell but is not be available for the indicator/amplifier certificate.

C) Gold Standard and 9840- multi load cell indicators.

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**TEDS Load Cells:** Standard load cells with TEDS chips installed have the standard mV/V "As-Found and Final" calibration certificate for its respective model as well as a TEDS data sheet to report what data was stored on the TEDS chip per IEEE 1451.4, template 33. To provide system level traceability, any indicator to be paired with a TEDS load cell(s) should have a NIST traceable internal mV/V calibration performed. A2LA/ISO17025 accredited calibrations are available for the internal mV/V Interface indicator calibrations.

**TEDS Load Cells w/Indicator:** System level recalibration of TEDS enabled load cell with a compatible indicator has the below steps performed:

1) System level "As-Found" calibration performed with the load cell paired to the indicator, calibration performed using applied loads and reported as applied load vs. indicated reading. Dependent on customer requirements, if no adjustment is required or performed an "As-Found and Final" may be issued with no further steps (not Interface recommended).
2) Standard mV/V calibration performed per the load cell model, TEDS chip reprogrammed with updated calibration data. "As-Found and Final" mV/V calibration certificate issued for the load cell as well as a TEDS data sheet to report what data is stored on the TEDS chip per IEEE 1451.4, template 33. A2LA/ISO17025 accredited calibrations are available.
3) NIST traceable internal mV/V calibration of indicator performed. If no adjustment is required or performed an "As-Found and Final" certificate is issued. If adjustments are performed separate "As-Found" and "Final" certificates are issued to report the as-received condition and the condition after adjustment. A2LA/ISO17025 accredited calibrations are available for the internal mV/V indicator calibration.
4) System level "Final" calibration performed with the load cell paired to the indicator with the updated TEDS programming and indicator internal mV/V calibration. System calibration performed using applied loads and reported as applied load vs. indicated reading. A2LA/ISO17025 accredited calibration is available.

**Shunt Calibration Data:** Where applicable, shunt calibration readings or outputs are recorded as part of the load cell or load cell and amplifier system calibration. The shunt calibration data provides a means for the user in the field to verify system scaling, and as many instruments can be scaled using this data it provides a means to temporarily restore a calibration in the field.

A) System level shunt calibration: Readings or outputs for a load cell and indicator or amplifier system are most commonly taken at the conclusion of the calibration. The load cell is placed into an unloaded condition and the RCAL (alternatively referred to as a shunt cal) is activated, the indicated reading (indicator) or output voltage/current indicator is then recorded.

B) Load cell shunt calibration: Shunt outputs for a load cell are taken at the conclusion of the calibration with the load cell in an unloaded condition, if applicable readings are taken for both tension and compression. As seen in the below example, the applicable connections are also noted. A straight line conversion is also provided, this is the calculated force equivalent to the shunt output and is calculated using the SEB or best fit straight line output.

**SHUNT CALIBRATION**

| | Shunt (+/- 0.01%) | Output | Straight Line Conversion | Connections* |
|---|---|---|---|---|
| TENSION | 60.0 KOhm | 1.45393 mV/V | 1817.7 N | - Out to - Exc |
| COMPRESSION | 60.0 KOhm | - 1.45464 mV/V | 1818.1 N | - Out to + Exc |

*For models wired with + Sense, - Sense or - SCal leads, resistor connections are actually to these leads in place of + Exc, - Exc, or - Out respectively.

Addenda:
Cal type descriptions
E74 and TEDS

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