DIVERSE

SQUEEZE ANALYSER SQA2

RESISTANCE WELDING FORCE MONITOR

OPERATING INSTRUCTIONS

UK/US VERSION
2012

CONTENTS

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PREFACE

Thank you for purchasing Squeeze Analyser. Before using the unit, please read these instructions carefully. If you are uncertain about any aspect of its operation, please contact Diverse for clarification.

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INTRODUCTION TO RESISTANCE WELDING

Resistance welding is a term used to describe a group of processes that involve the joining of two or more metal parts by the local application of heat and force. Heat is generated in the components by resistive heating caused by passing an electric current whilst the parts are held together under a pre-set force. Choice of welding current and electrode force is dictated by the materials being joined and their fit-up.

In resistance welding, it is necessary to apply a welding current and force not only of the right magnitude, but also at the correct time to maintain weld quality and productivity. The timing of resistance welding is absolutely critical. For simple resistance welding there are three time periods which must be understood and controlled. These time periods are normally

programmed by the operator into a weld controller, either in terms of cycles (of mains) or
seconds. The three time periods are sequential and make up a complete weld.

RESISTANCE WELD CYCLE

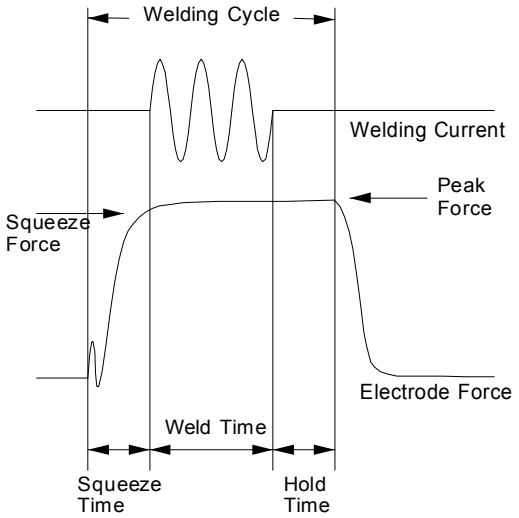

Fig. 1. Relationship between the electrode current and the electrode force in a resistance spot weld.

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Squeeze Time The period of time from the onset of force to the workpiece until the initiation of the welding current.

Weld Time The period of time for which the welding current operates.

Hold (Forge) Time The period of time from cessation of welding current to release of electrode force.

These three time periods jointly make up a single welding cycle such as depicted in figure 1.

Squeeze Analyser enables both the electrode force and squeeze time to be correctly set with minimum disruption to production. The unit measures and displays the electrode force when the welding current is initiated (the squeeze force), and also the peak welding force
in the cycle. This measurement is carried out on a live welding gun under

full welding current. No additional connections to the welding controller are required.

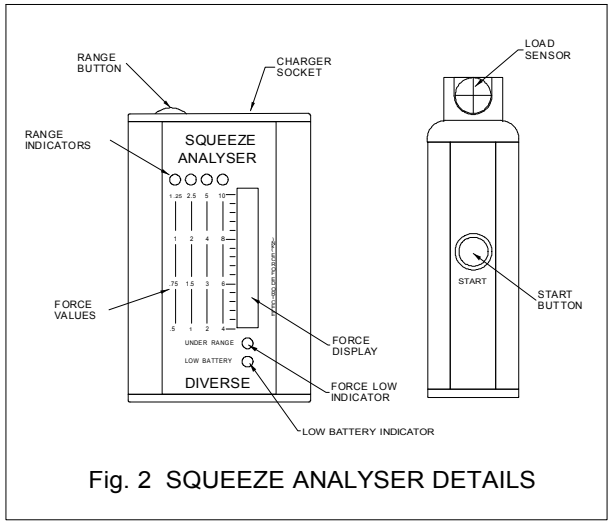

Fig. 2 SQUEEZE ANALYSER DETAILS

SQUEEZE ANALYSER DESCRIPTION

The Squeeze Analyser comprises a hand held display unit and probe joined by a coiled cable. The unit is powered

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by Nickel - metal hydride (NiMH) cells, recharged using the battery charger supplied.

With reference to the front facia of the display unit shown in figure 2, a thirty segment LED bar graph is used to display the measured electrode force. To the left of the bar graph are four force ranges. The required force range is selected by pressing the button located on the cable end of the display housing. LED indicators immediately above the four ranges inform the operator of the selected range. Below the bar graph are located a further two LED indicators. The first gives a warning that the monitored force is under range. The second provides a low battery warning.

On the cable end of the display unit is located the range selection button and the socket for connecting the battery charger.

The power on button is located on the force probe.

OPERATION

Step 1 Power On

Depress the start button on the force probe. An LED will be illuminated on the display unit to indicate the force range which was previously selected.

Step 2 Select Range

Use the range select button on the display unit to change the force range if required.

Step 3 Position on electrodes

Locate the probe device between the electrode tips of the resistance welding gun. The probe should be aligned so that the gun electrodes will clamp squarely and securely onto the machine's receptacles. Most guns have one fixed and one moving electrode. It is normally best to locate the device on the fixed electrode.

Note 1: Care must be taken to ensure that no damage or injury can befall the operator during this operation.
Note 2: Personnel using this equipment must be familiar with the operation and hazards of welding guns.

Step 4 Activate Weld

Activate the resistance welding equipment. Allow the resistance welding gun to complete a welding cycle with the Squeeze Analyser in place.

The results of the measurement may be viewed on the display unit's bar graph on the front panel. During the welding cycle, a solid illuminated bar should appear on the LED bar graph display. This indicates the force measured at the moment when the welding current was initiated (squeeze force). A single LED segment should also appear representing the peak welding force. It

is the position of this single LED segment with respect to the solid illuminated bar which provides information on the programmed squeeze conditions.

Step 5 Squeeze Analysis

Three possible outcomes are possible. Examples of these are shown on the rear facia of the display unit shown in figure 3.

A. Squeeze Time too short

Result: The display shows a solid illuminated bar plus a single LED segment separated by a gap of two or more segments.

Meaning: The squeeze force is significantly lower than the peak welding force.

Symptom: Possible reduction in weld quality, arc splashing, and premature wear of the electrodes.

Cure: Increase the squeeze time on the welding controller and re-test.

B. Squeeze Time too long

Result: Display shows a solid illuminated bar only. The single additional segment showing the peak force does not register and no gap can be seen in the illuminated display.

Meaning: The squeeze force is equal to the peak force. This may indicate that the squeeze time is unnecessarily long.

Symptom: Weld quality is likely to be unaffected, but productivity may be low because of the extended squeeze time.

Cure: Reduce squeeze time and re-test.

C. Squeeze time just right*

Result: Display shows a continuous illuminated bar separated from a single illuminated segment by a single segment gap.

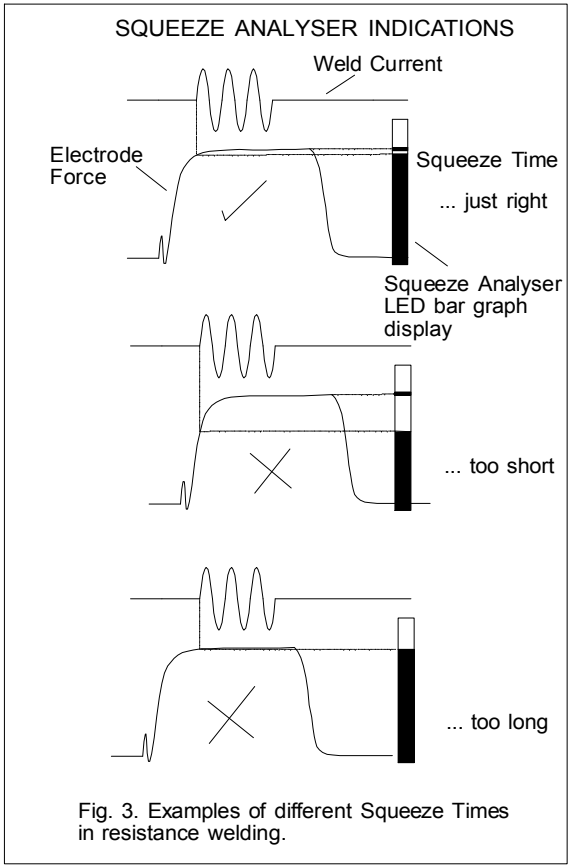

Fig. 3. Examples of different Squeeze Times in resistance welding.

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Meaning: The squeeze force is just slightly less than the peak welding force.

Symptom: The squeeze time set for the resistance welder provides the optimum compromise in terms of weld quality, electrode wear and productivity.

Cure: Re-check at regular intervals to maintain optimum performance.

*These 'optimised' squeeze conditions have been determined during practical trials in a high volume production environment. They offer a practical compromise in terms of weld quality, electrode life and productivity. Diverse Technologies & Systems Ltd. can provide no guarantee that this will always result in successful welding and under these circumstances, the most appropriate values should be determined by the user.

Note: Pressing the start button powers the unit. A built in delay timer maintains power for approximately 30 seconds after the start button is released. Loss of power causes any information previously captured by the unit to be lost. Pressing the start button causes the Squeeze Analyser to reset itself ready for the next measurement. Holding the button down will extend the monitoring period.

WARNINGS

1. Low Battery

If the low battery indicator lights, then the batteries require charging. Connect the charger supplied to the charger socket and charge for approximately 8 hours. It is also possible to exchange the batteries for a charged set. If the supplied batteries are replaced with conventional dry cells, it is recommended that a suitable warning label be placed over the charging socket to prohibit accidental charging.

Note: On no account should conventional dry cell batteries be used in conjunction with a battery charger.

2. Under Range

If the under range indicator lights during the weld cycle, the measured electrode force is too low to register on the selected range. A lower range may be selected using the range switch and the measurement should then be repeated.

SPECIFICATION

UK/European Units

Measurement Ranges:
1. 0.5-1.25kN
2. 1-2.5 kN
3. 2-5 kN
4. 4-10 kN

Resolution:
1. +/-0.025kN
2. +/-0.05 kN
3. +/-0.1 kN
4. +/-0.2 kN

Accuracy (of full range): +/-2%

Display: Squeeze force & peak force
Min. electrode gap: 6mm
Max. electrode gap: 20mm
Weight (cased): 1.5 kg
Dimensions: (height x width x depth)
Display Unit: 160 x 100 x 50mm
Probe: 200 x 50 x 50 mm
Power: 4 rechargeable AA NiMH cells
Charger Input: 230V 50/60Hz
Charger Output: 9VDC 75mA

USA Units

Measurement Ranges:
1. 100 - 250 lbf
2. 200 - 500 lbf
3. 400 - 1000 lbf
4. 800 - 2000 lbf

Resolution:
1. +/-5 lbf
2. +/-10 lbf
3. +/-20 lbf
4. +/-40 lbf

Accuracy (of full range): +/-2%

Display: Squeeze force and peak force
Min. electrode gap: 0.25 in.
Max. electrode gap: 0.75 in.
Weight (cased): 3.3 lb
Dimensions (height x width x depth)
Display Unit: 6.3 x 4 x 2 in
Probe: 8 x 2 x 2 in
Power:4 rechargeable AA NiMH cells
Charger Input: 115V 50/60Hz
Charger Output: 9VDC 75mA

HAZARD ASSESSMENT

1. Charging

The battery charger is intended for use with NiMH rechargeable batteries as supplied with the Squeeze Analyser. The battery charger should not be used if dry cells or other types of rechargeable batteries are fitted to the unit. The use of the battery charger

with batteries other than the NiMH type may cause the batteries to explode.

2. Measurement of Squeeze Force

The probe used to measure the force between the resistance welding electrodes is designed to be inserted by hand whilst the resistance welding machine is made to carry out a spot weld. This operation should only be carried out by personnel approved to work with resistance welding guns. The hand should be kept away from the electrodes due to the considerable force which occurs between them during a weld cycle. Any part of the human body which is located between the electrodes during a weld could sustain serious injury.

The Squeeze Analyser is used during a weld with live resistance welding electrodes. The voltage on such electrodes is normally low and harmless. If there is any doubt about

the voltage on the electrodes or it is known that this voltage is greater than 6 volts, then clearance to proceed with a measurement of the squeeze force should be approved by a qualified electrician.

LIABILITY

Diverse Technologies & Systems Ltd. accepts no responsibility for the consequential losses arising from the ability or inability to use the equipment supplied.

The limit of warranty is the repair or replacement of any faulty components, directly attributable to manufacturing defects, arising during the period of 12 months following purchase. This does not include damage resulting from incorrect operation of the unit.

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TROUBLE SHOOTING

Problem: Low Battery Indicator on

The yellow low battery indicator is illuminated on the display unit. The batteries need to be recharged or replaced. See the note in Warnings section.

Problem: Under Range Indicator on

The measured electrode force is too low to register on the selected force range. A lower force range should be selected using the range switch and the squeeze force re-measured. If the under range indicator is illuminated after measuring the electrode force when the Squeeze Analyser is on the lowest force range, then check the capacity of the welding gun.

Problem: Illuminated bar does not remain on after weld.

The illuminated bar graph rises during the measurement of the electrode force, but does not remain on when the welding cycle is completed. The Squeeze Analyser has not detected the weld initiation. Check that the weld current has been selected on the welding equipment.

Problem: Only a single LED segment appears on the display

Check that the squeeze time is not excessively short. Try selecting a lower force range and repeat the measurement.

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Problem: During measurement, a single illuminated LED segment moves from one position on the display to the next.

This can occur if the peak electrode force falls between two discrete segments. Keep the start button depressed and allow the unit to settle before determining the force value from the display.

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