

Test Report

ANSI Z359.13-2013 (R2022)

Personal Energy Absorbers and Energy Absorbing Lanyards

Report no: 2.24.08.26

Customer: Frontline Fall Protection Inc.
6 Lee Blvd.
Malvern
PA 19355
U.S.A

Manufacturer: Frontline Fall Protection Inc.
as advised by the Customer

Customer order: T/0739 and T/1361A

Order received: 12 March 2020 and 5 July 2024 respectively

Model: LIS61S-AM

Dates of tests: 19 Mar. 2020 to 21 May 2020 and 30 July 2024

Signed:



Steven Sum, Laboratory Manager

Issued: 3 August 2024

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Conditions

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Specimens will be disposed of four weeks from the date of this report, unless otherwise instructed.

Opinions, comments and interpretations expressed in this report are shown in italics.

Copies of INSPEC interpretations referenced in this report are available upon request.

Tests marked are not included in our ANAB Scope of Accreditation.

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Summary of assessment *

| Clause | Requirement | Assessment (See Key) |
|---------------|---|---------------------------------|
| 3.1.5 | Deployment indicator | Pass |
| 3.1.6 | Activation force | Pass |
| 3.2 | Energy absorber | Ltd |
| 3.2.1 | Material | NAs |
| 3.2.2 | Terminations | Ltd |
| 3.2.3 | Connectors | |
| 3.2.4 | Dynamic performance – ambient dry | Pass |
| 3.2.5 | Dynamic performance – ambient wet | Pass |
| | Dynamic performance – cold dry | Pass |
| | Dynamic performance – hot dry | Pass |
| 3.2.6 | Static strength | |
| 3.2.7 | Static test for wrap-around lanyards (3600 lbs - abraded) | |
| 3.2.8 | Static test for wrap-around lanyards (5000 lbs) | |
| 3.2.9 | Static test for Y-lanyards | |
| 3.2.10.1 | Dynamic test for Y-lanyards (Single connection) | |
| 3.2.10.2 | Dynamic test for Y-lanyards (Dual connection) | |
| 3.2.10.3 | Dynamic test for Y-lanyards (Hip connection) | |
| 5.1 / 5.2 | Marking | Ltd |
| 5.3 / 5.4 | Instructions | Ltd |

Key

| | |
|-------------|---|
| | Shading shows the clauses requested. Any other clauses were not requested. |
| Pass | Requirement satisfied. |
| Ltd | Testing requested was insufficient completely to verify compliance with the clause. Refer to the “Result details” section for more information. |
| Fail | Requirement not satisfied. Refer to the “Result details” section for more information. |
| NAs | Assessment not carried out. |
| NAp | Requirement not applicable. |
| NT | Requested but not tested due to early termination following failure. |

* Assessment relates only to those specimens which were tested and are the subject of this report.

Submission details

| Product | Quantity | Dates received | INSPEC specimen no. |
|--|-----------------|-----------------------|----------------------------|
| 6 ft Free Fall Twin leg energy absorbing lanyard, model 1858020Y | 21 | 16 October 2018 | 2F15001 to 2F15021 |
| 6 ft Free Fall Energy absorbing lanyard, model 1858020 | 01 | | 2F14902 |
| 6 ft Free Fall Shock absorber lanyard, model LIS61S-AM | 02 | 20 January 2020 | 2H03801 to 2H03802 |

Procedures

The specimens detailed within the submission above were used for the tests covered by this report.

Testing was performed in accordance with ANSI Z359.13-2013 unless otherwise specified below. Reference should be made to the standard when reading this report.

Unless stated otherwise, specimens were tested in the condition as received by INSPEC.

Testing was performed at INSPEC's laboratory in Kunshan, China.

The manufacturer made the following declarations:

- 1) Model 1858020 is a single leg variant of twin leg energy absorbing lanyards 1858020Y
- 2) Models 1858020 and LIS61S-AM are identical products. Model 1858020 incorporates forged connectors. Model LIS61S-AM incorporates pressed connectors.

To avoid duplicate testing, performance testing results of model 1858020Y are shared across to model LIS61S-AM.

Result details**3.1.5 Deployment indicator**

Subsequent to the testing of specimen 2F15013 to clause 3.2.10.1, it became obvious that the energy absorber had been activated. **Pass**

3.1.6 Activation force

Specimens 2F15001, 2F15002 and 2F15003 were assessed.

The specimens showed no signs of activation when subjected to the 450 pounds static force.

The permanent elongation of the specimens, following the tests were:

2F15001 - 0.51 inches.

2F15002 - 0.47 inches

2F15003 - 0.39 inches

Pass**Pass****Pass**

These are less than the maximum 2 inches permitted.

3.2 Personal Energy Absorbing Lanyard Component

Specimen 2F14902 was assessed.

The specimen had an energy absorbing ability that satisfied the design and testing requirements of this standard. **Ltd**

3.2.1 Materials

Specimen 2F14902 was assessed.

Tubular webbing was used on the construction of the energy absorbing lanyard.

The materials used in the construction of this energy absorbing lanyard, and their characteristics, were not assessed. Manufacturer to certify. **NAs**

3.2.2 Terminations

Specimen 2F14902 was assessed.

The energy absorbing lanyard was constructed of webbing.

The end terminations satisfied 3.2.2.2, as appropriate (see below). **Ltd**

3.2.2.2 Webbing terminations

Specimen 2F14902 was assessed.

- | | | |
|----|--|-------------|
| a) | Lock stitches sewn on all stitched eye termination straps were not assessed. Manufacturer to certify. | NAs |
| b) | The material and characteristics of thread used was not assessed. Manufacturer to certify. | NAs |
| | Threads used for sewing the lanyard were white colour. This contrasted with the black colour of the webbing. | Pass |
| c) | Webbings were protected from concentrated wear at interfaces with load-bearing connector elements. The method used was looped webbing. | Pass |
| d) | The ends of the webbing were hot-cut so as to prevent unravelling. | Pass |

3.2.4 Dynamic performance test - Ambient dry condition

Specimens 2F15013, 2F15014 and 2F15015 were assessed.

During the dynamic performance tests, the average arrest force were:

| | |
|-----------------------|-------------|
| 2F15013 - 809 pounds. | Pass |
| 2F15014 - 802 pounds. | Pass |
| 2F15015 - 805 pounds. | Pass |

These values are less than the maximum 900 pounds (4kN) permitted.
See Annex 1 for the plot of force versus time.

During the dynamic performance tests, the maximum arrest force were:

| | |
|-----------------------|-------------|
| 2F15013 - 898 pounds. | Pass |
| 2F15014 - 890 pounds. | Pass |
| 2F15015 - 887 pounds. | Pass |

These values are less than the maximum 1,800 pounds (8kN) permitted.
See Annex 1 for the plots of force versus time.

During the dynamic performance tests, the deployment distance were:

| | |
|------------------------|-------------|
| 2F15013 – 36.8 inches. | Pass |
| 2F15014 – 36.2 inches. | Pass |
| 2F15015 – 37.0 inches. | Pass |

These values are less than the maximum 48 inches (1.2m) permitted.

3.2.5 Dynamic performance test - Ambient wet condition

Specimens 2F15004, 2F15005 and 2F15006 were assessed.

During the dynamic performance tests, the average arrest force were:

2F15004 - 865 pounds.

Pass

2F15005 - 848 pounds.

Pass

2F15006 - 833 pounds.

Pass

These values are less than the maximum 1,125 pounds (5kN) permitted.
See Annex 1 for the plot of force versus time.

During the dynamic performance tests, the maximum arrest force were:

2F15004 - 1043 pounds.

Pass

2F15005 - 1024 pounds.

Pass

2F15006 - 982 pounds.

Pass

These values are less than the maximum 1,800 pounds (8 kN) permitted.
See Annex 1 for the plots of force versus time.

During the dynamic performance tests, the deployment distance were:

2F15004 - 36.2 inches.

Pass

2F15005 - 34.4 inches.

Pass

2F15006 - 34.1 inches.

Pass

These values are less than the maximum 48 inches (1.2m) permitted.

3.2.5 Dynamic performance test - Cold dry condition

Specimens 2F15007, 2F15008 and 2F15009 were assessed.

During the dynamic performance tests, the average arrest force were:

2F15007 - 895 pounds.

Pass

2F15008 - 919 pounds.

Pass

2F15009 - 915 pounds.

Pass

These values are less than the maximum 1,125 pounds (5kN) permitted.
See Annex 1 for the plot of force versus time.

During the dynamic performance tests, the maximum arrest force were:

2F15007 - 1002 pounds.

Pass

2F15008 - 995 pounds.

Pass

2F15009 - 995 pounds.

Pass

These values are less than the maximum 1,800 pounds (8kN) permitted.
See Annex 1 for the plot of force versus time.

During the dynamic performance tests, the deployment distance were:

2F15007 – 29.3 inches.

Pass

2F15008 – 29.9 inches.

Pass

2F15009 – 30.7 inches.

Pass

These values are less than the maximum 48 inches (1.2m) permitted.

3.2.5 Dynamic performance test - Hot dry condition

Specimens 2F15010 to 2F15012 were assessed.

During the dynamic performance tests, the average arrest force were:

2F15010 - 780 pounds.

Pass

2F15011 - 773 pounds.

Pass

2F15012 - 775 pounds.

Pass

These values are less than the maximum 1,125 pounds (5kN) permitted.
See Annex 1 for the plot of force versus time.

During the dynamic performance tests, the maximum arrest force were:

2F15010 - 883 pounds.

Pass

2F15011 - 846 pounds.

Pass

2F15012 - 879 pounds.

Pass

These values are less than the maximum 1,800 pounds (8kN) permitted.
See Annex 1 for the plot of force versus time.

During the dynamic performance tests, the deployment distance were:

2F15010 – 40.2 inches.

Pass

2F15011 – 40.2 inches.

Pass

2F15012 – 38.2 inches.

Pass

These values are less than the maximum 48 inches (1.2m) permitted.

3.2.6 Static strength

Specimens 2F15013, 2F15014 and 2F15015 were assessed.

The specimens withstood the tensile tests of 5,000 pounds applied for 1-minute without breaking.

Pass

5 Marking and Reference Literature

5.1 General Marking Requirements

- 5.1.1 Markings shall be in English. **Pass**
- 5.1.2 The legibility and attachment of required markings shall endure for the life of the component, subsystem or system being marked was not assessed. **NAs**
- Marking labels provided electronically were used for assessment.*
- When pressure sensitive labels are used, they shall comply with the applicable provision of reference 8.5.1. This requirement was not assessed. Manufacturer to certify. **NAs**
- 5.1.3 Equipment shall be marked with the following:
- part number and model designation; [LIS61S-AM] **Pass**
 - year of manufacture; **Pass**
 - manufacturer's name or logo; [FRONTLINE] **Pass**
 - capacity rating; [130-310 lbs] **Pass**
 - serial number; **Pass**
 - standard number; [ANSI Z359.13] **Pass**
 - warning to follow the manufacturer's instructions included with the equipment at time of shipment from the manufacturer. **Pass**

5.2 Specific Marking Requirements

5.2.1 Personal Energy Absorbers and Energy Absorbing Lanyards

Personal energy absorbers and energy absorbing lanyards shall be marked to identify:

- the fiber used in the material of construction; [Polyester] **Pass**
 - the length; [6 feet] **Pass**
 - the need to avoid contact with sharp edges and abrasive surfaces; **Pass**
 - the need to make only compatible connections; **Pass**
 - the maximum elongation; [48 inches] **Pass**
 - restriction, if any, on the types of components, subsystems, or systems with which the energy absorber is designed to be used; **NAp**
 - the average arrest force, maximum free fall distance and capacity of the energy absorber on a separate label identical in size, color and content as figure 16a and 16b of the standard; [only the texts were assessed] **Ltd**
 - 6 ft FF personal energy absorbers shall be in black print on a contrasting white background; **Pass**
 - 12 ft FF personal energy absorbers shall be in white print on a contrasting black background; **NAp**
- 5.2.2 · In addition to 5.2.1, Y-lanyards that fail the Dynamic Hip Test detailed in 3.2.10, must include a warning label on both connecting ends of the lanyard specifically directing users how to safely store the unused leg of the lanyard. **NAp**

5.3 General Instruction Requirements

User Instructions in English were provided electronically and used for assessment.

The instructions to users have been assessed as detail below, with reference only to the relevant requirements of the Standard.

INSPEC Technical Services has not assessed these instructions with respect to claims made by the manufacturer outside of these requirements, and therefore accepts no responsibility for the legitimacy of any such claims.

| | | |
|--------------|---|-------------|
| 5.3.1 | Instructions shall be provided to the user, printed in English, and affixed to the equipment at the time of shipment from the manufacturer. | NAs |
| 5.3.2 | Instructions shall contain the following information: | |
| | · a statement that the manufacturer's instructions shall be provided to users; | Pass |
| | · manufacturer's name, address, and telephone number; | Pass |
| | · manufacturer's part number and model designation for the equipment; | Pass |
| | · intended use and purpose of the equipment; | Pass |
| | · proper method of use and limitation on use of the equipment; | Pass |
| | · illustrations showing locations of markings on the equipment; | Pass |
| | · reproduction of printed information on all markings; | Pass |
| | · inspection procedures required to assure the equipment is in serviceable condition and operating correctly; | Pass |
| | · anchorage requirements; | Pass |
| | · an illustration of how to calculate free fall distances; | Pass |
| | · criteria for discarding equipment which fails inspection; | Pass |
| | · procedures for cleaning, maintenance, and storage; | Pass |
| | · reference to the ANSI/ASSE Z359.13, <i>Personal Energy Absorbers and Energy Absorbing Lanyards</i> , standard and applicable regulations governing occupational safety. | Pass |
| 5.3.3 | Instructions shall require that only the equipment manufacturer, or persons or entities authorized in writing by the manufacturer, shall make repairs to equipment. | Pass |
| 5.3.4 | Instructions shall require the user to remove equipment from field service if it has been subjected to the forces of arresting a fall. | Pass |

5.4 Specific Instruction Requirements

5.4.1 Personal Energy Absorbers

In addition to general instruction the requirements, written instructions for personal energy absorbers shall include:

- the material used in the personal energy absorber construction; **Pass**
- the need to make only compatible connections and limitations of compatibility; **Pass**
- proper method of coupling the personal energy absorber to adjacent components of the system; **Pass**
- the maximum arrest force of the personal energy absorber when dynamically tested in accordance with the requirements of this standard; **Pass**
- the maximum elongation of the personal energy absorber when dynamically tested in accordance with the requirements of this standard. **Pass**
- a reference chart that indicates the deployment distance of the personal energy absorber according to the user weight and free fall distance; **NAs**
- a statement that indicates information necessary in designing fall protection systems shall be made available from the manufacturer. **Pass**
- Manufacturers may provide designers of fall protection systems a representative graph(s) of the time history plot of the loading from a drop test. **NAs**

Estimates of the uncertainty of measurement

| Clause | Test | Uncertainty | |
|----------|---|---------------------|------------|
| 3.1.5 | Deployment indicator | Not applicable | |
| 3.1.6 | Activation force | See Note 1 | |
| | Permanent elongation | ±0.5% | |
| 3.2 | Personal Energy Absorber Component, if fitted | See INSPEC report | |
| 3.2.1 | Materials | Not applicable | |
| 3.2.2 | Terminations | Not applicable | |
| 3.2.3 | Connectors | See INSPEC report | |
| 3.2.4 | Dynamic performance (ambient dry) | Force | ±3% |
| | | Deployment distance | ±1mm |
| 3.2.5 | Dynamic performance (various conditions) | Force | ±3% |
| | | Deployment distance | ±1mm |
| 3.2.6 | Static test (single lanyard) | Strength | See Note 1 |
| | | Slippage | ±2.1% |
| 3.2.7 | Abrasion test (wrap-around energy absorbing lanyards) | See Note 1 | |
| 3.2.8 | Static strength (wrap-around energy absorbing lanyards) | See Note 1 | |
| 3.2.9 | Static strength (Y-lanyards) | See Note 1 | |
| 3.2.10.1 | Dynamic test, Y-lanyards (Single connection) | Force | ±3% |
| | | Deployment distance | ±1mm |
| 3.2.10.2 | Dynamic test, Y-lanyards (Dual connection) | Force | ±3% |
| 3.2.10.3 | Dynamic test, Y-lanyards (Hip connection) | See Note 1 | |
| 5 | Marking and Reference Literature | Not applicable | |

Note 1. The acceptance criterion for this test is a straightforward "Pass/Fail", rather than a numerical value. Consequently, as there is no value to be reported, uncertainty has not been reported either.

Note 2. The uncertainty value is based on a standard uncertainty multiplied by a coverage factor $k = 2$, which provides for a confidence level of approximately 95%. Values expressed as a percentage (%) are relative.

Note 3. It should be noted that the above values have not been taken into account when making assessments against the pass/fail criteria.

ANNEX

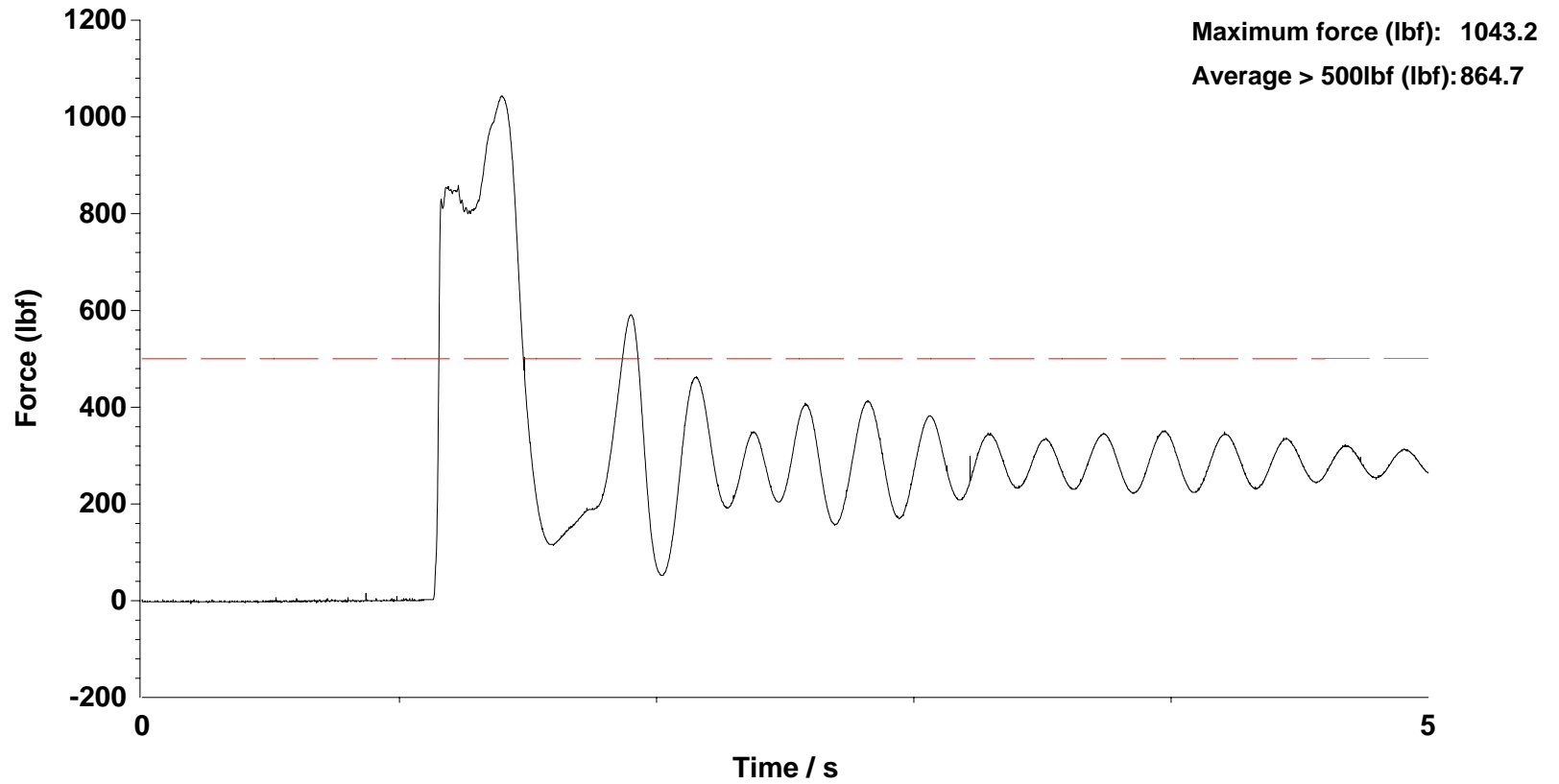
This Annex comprises two sections.

1. Plots of arrest force versus time. (12 pages)
2. Photograph of the product tested. (1 page)

END OF REPORT

INSPEC Technical Services

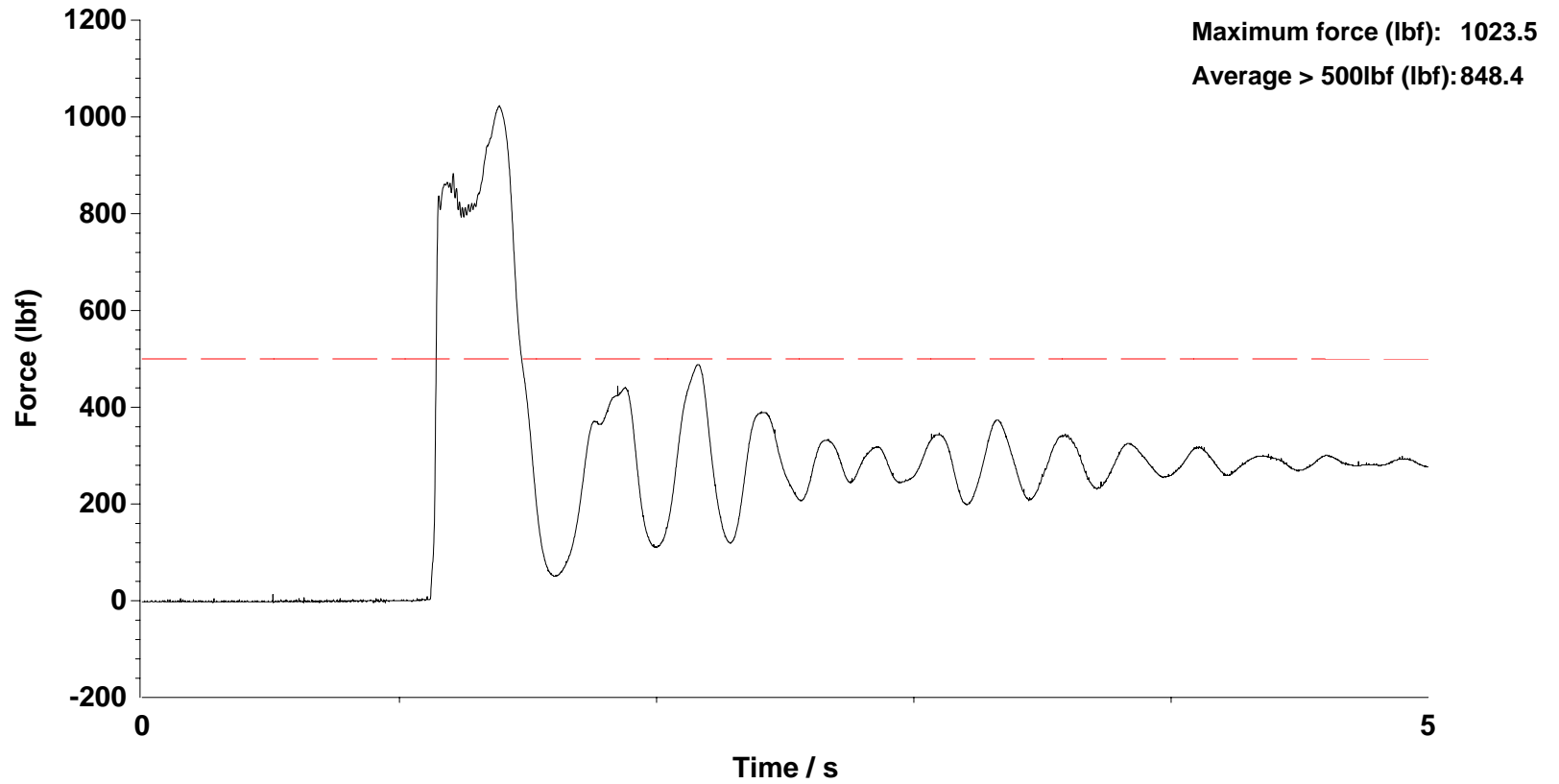
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Time and Date of Test: 19:01 06/11/18



Results do not achieve full ANAB status until a formal test report has been issued.

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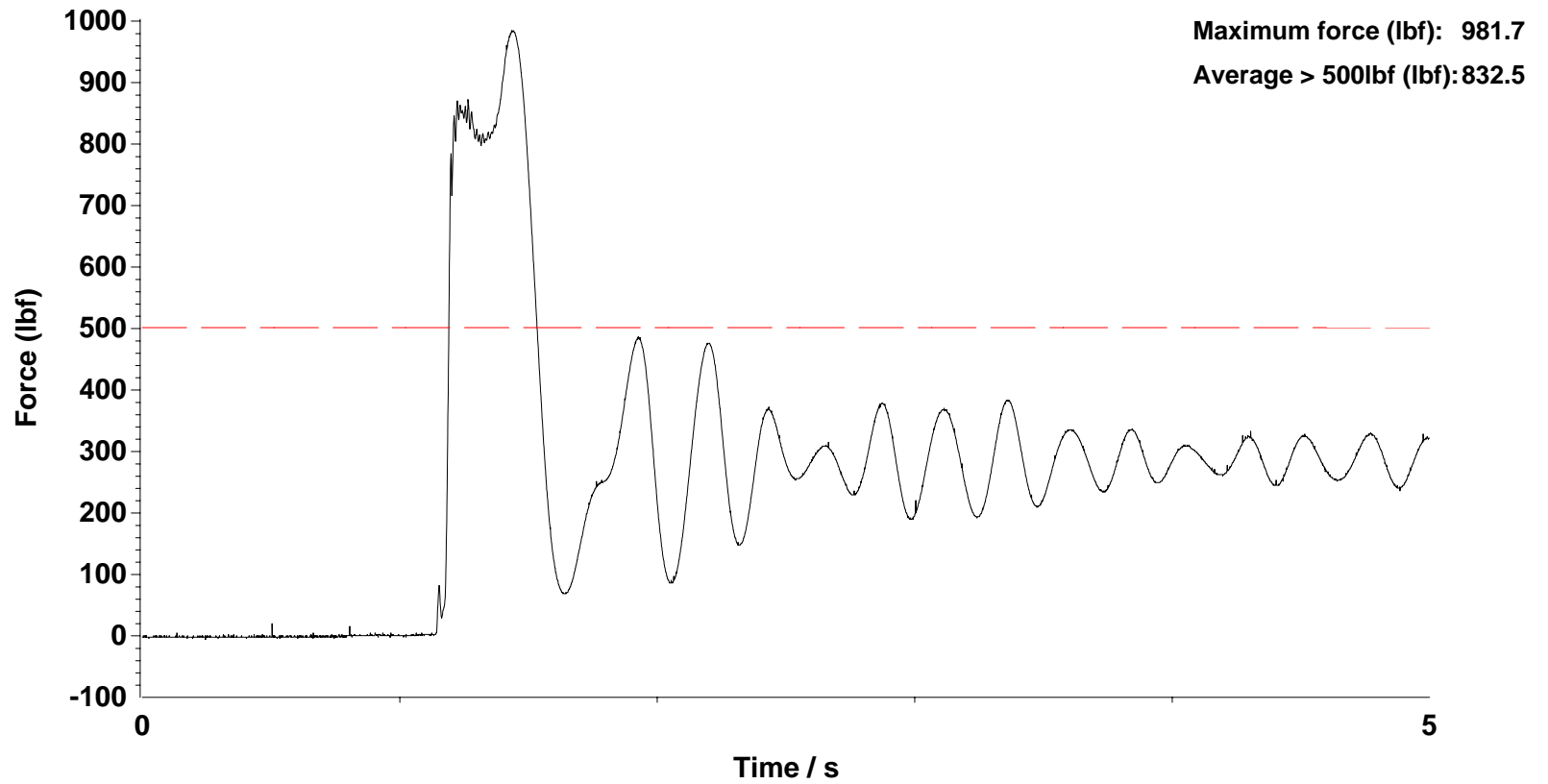
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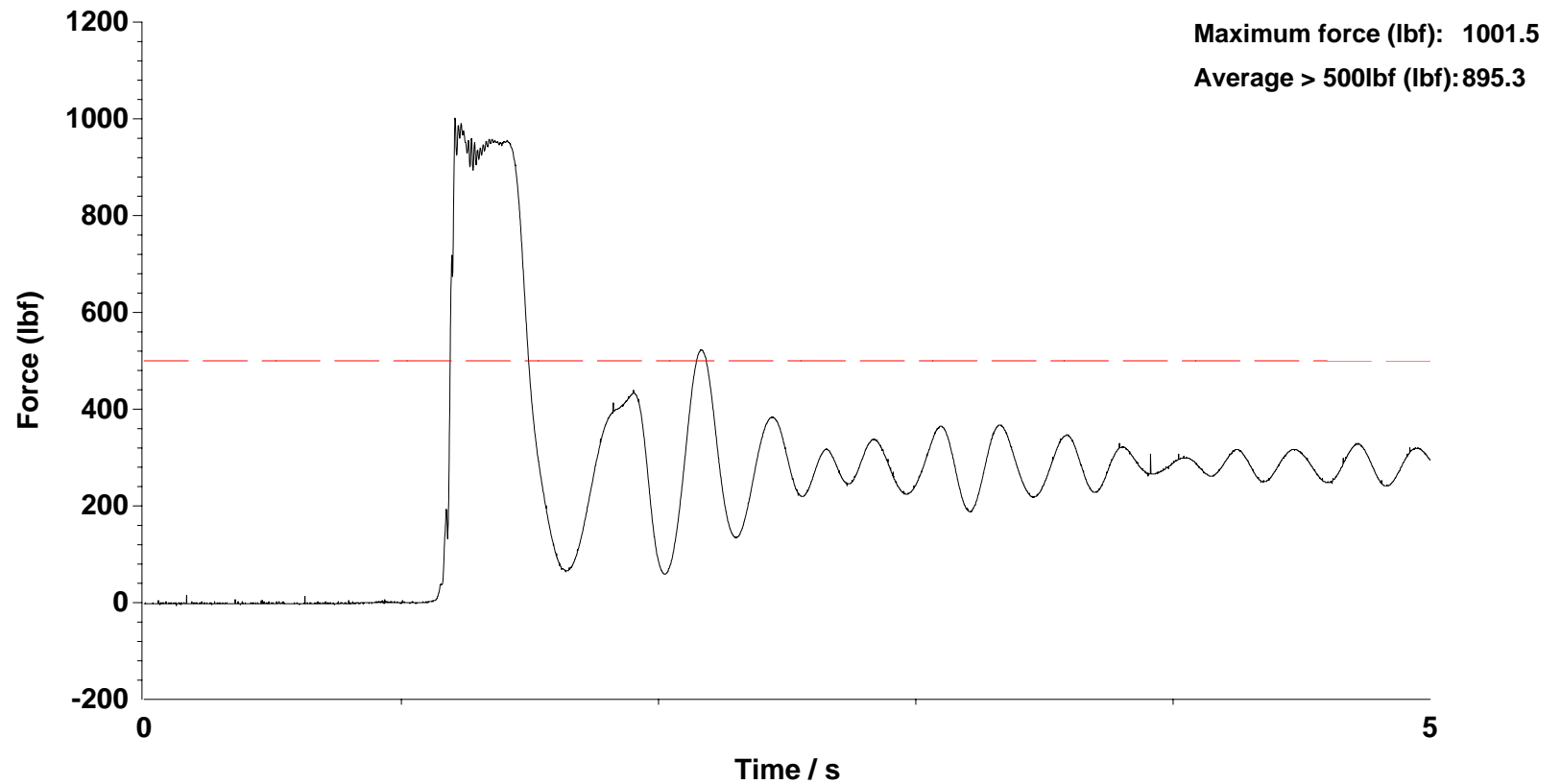
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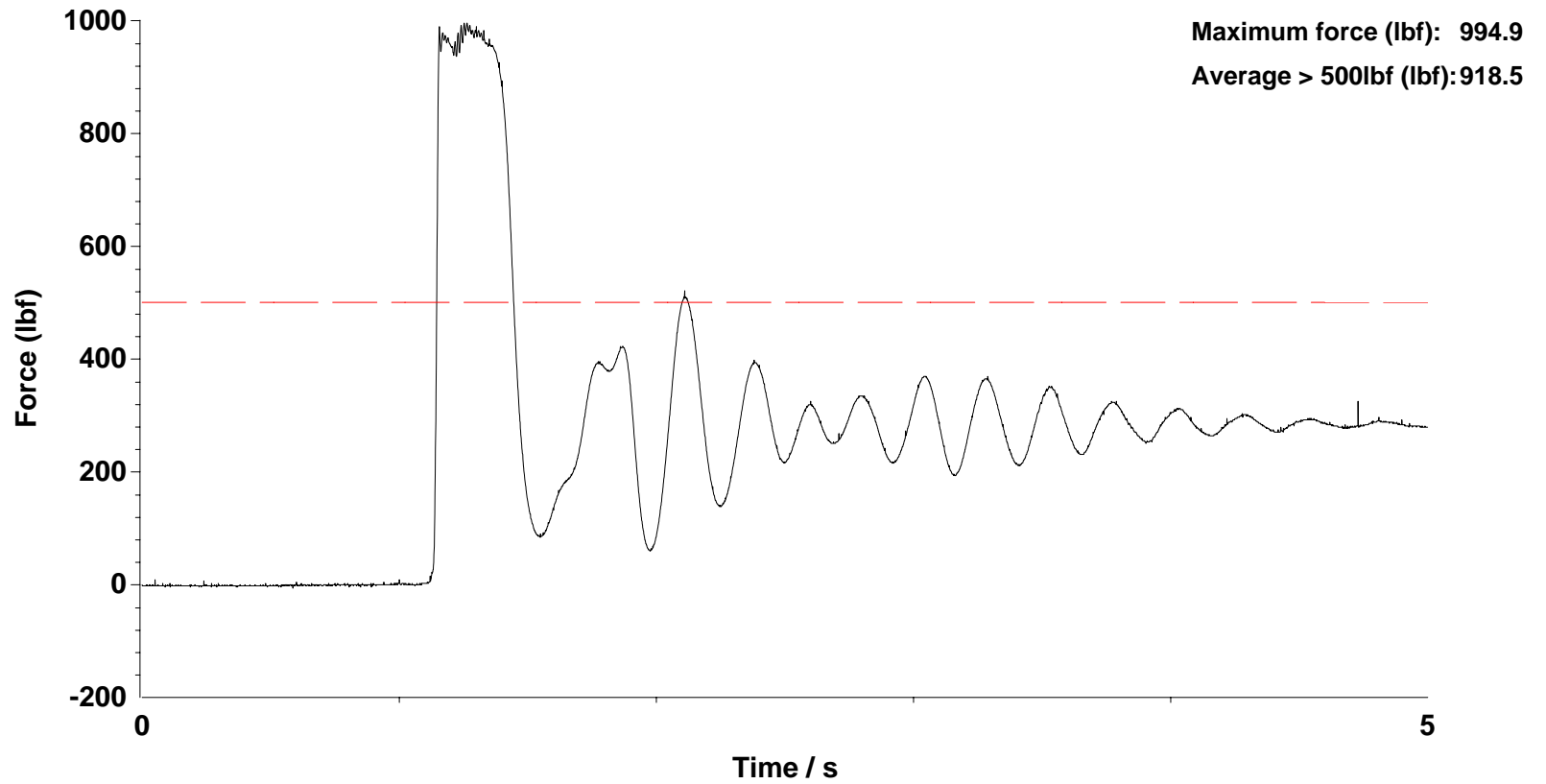
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Results do not achieve full ANAB status until a formal test report has been issued.

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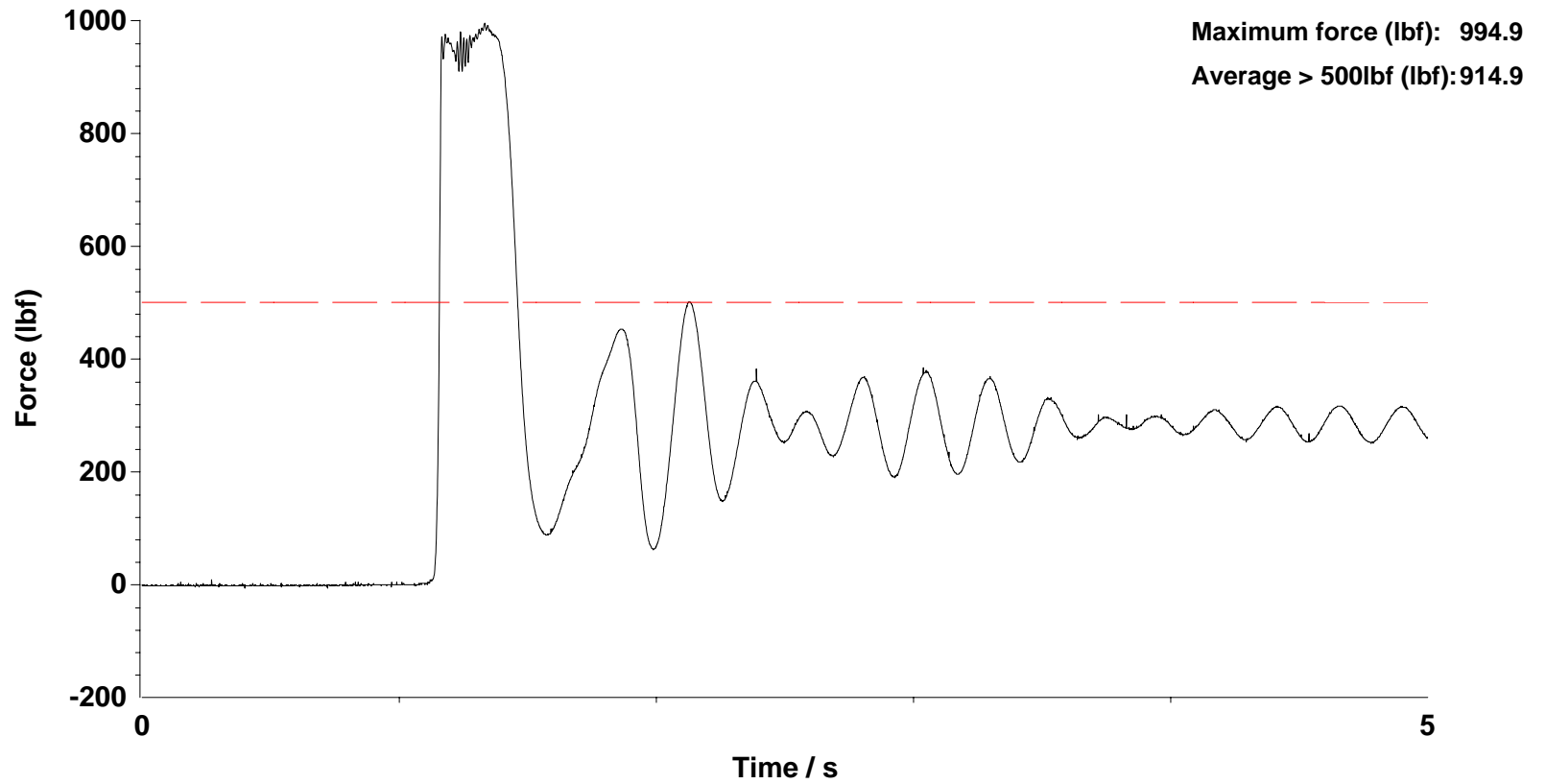
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INSPEC Technical Services

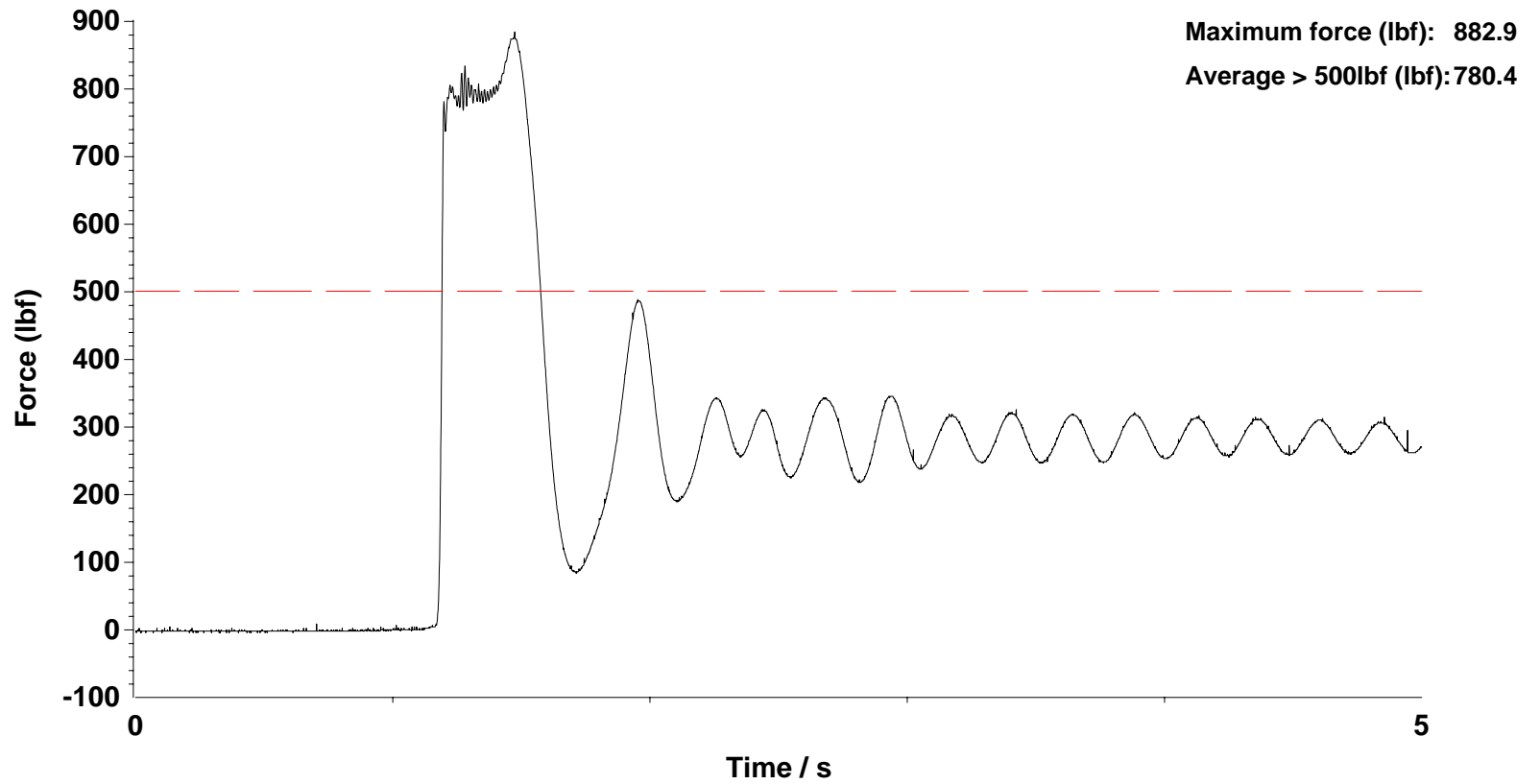
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Results do not achieve full ANAB status until a formal test report has been issued.

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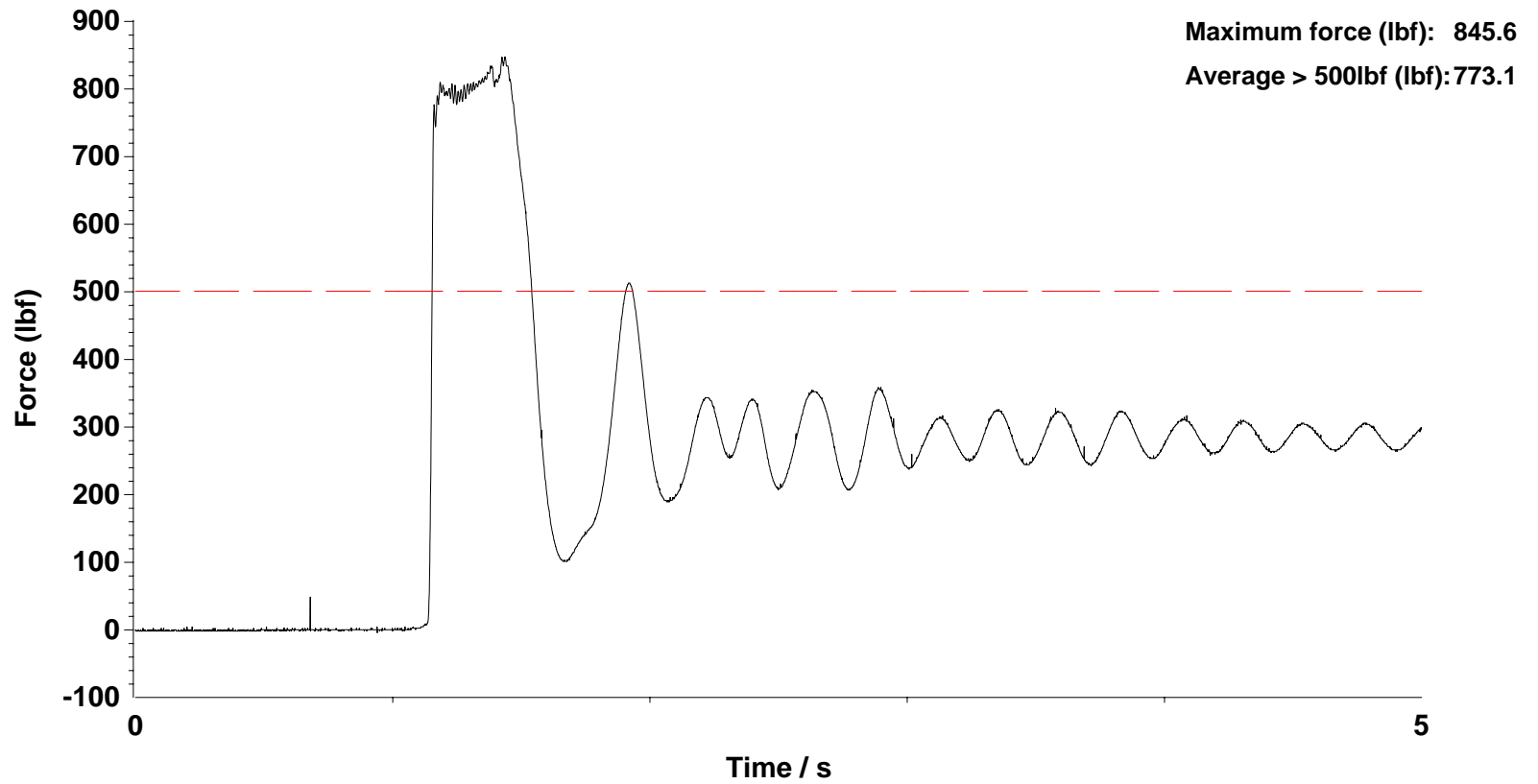
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INSPEC Technical Services

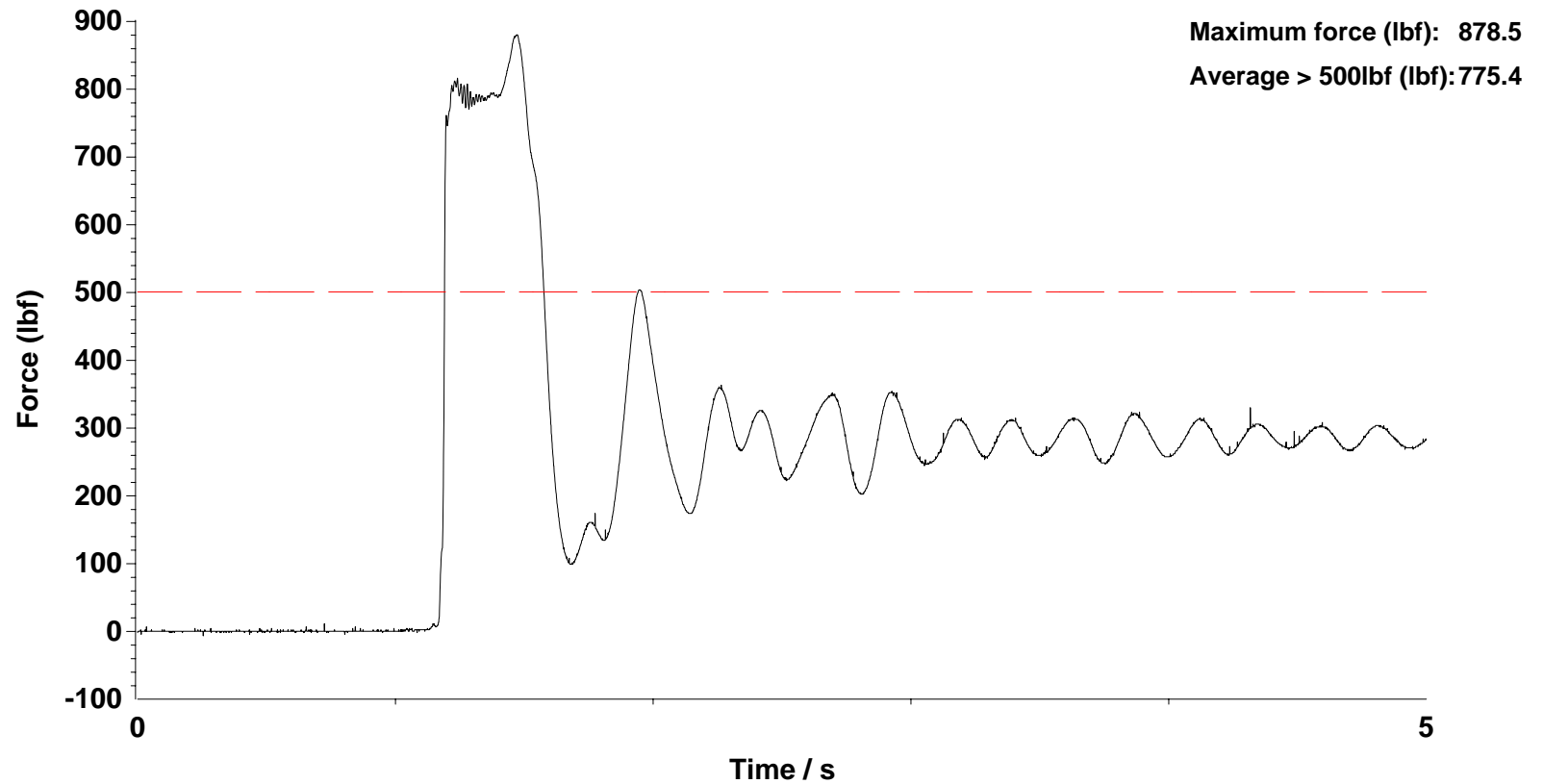
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Results do not achieve full ANAB status until a formal test report has been issued.

INSPEC Technical Services

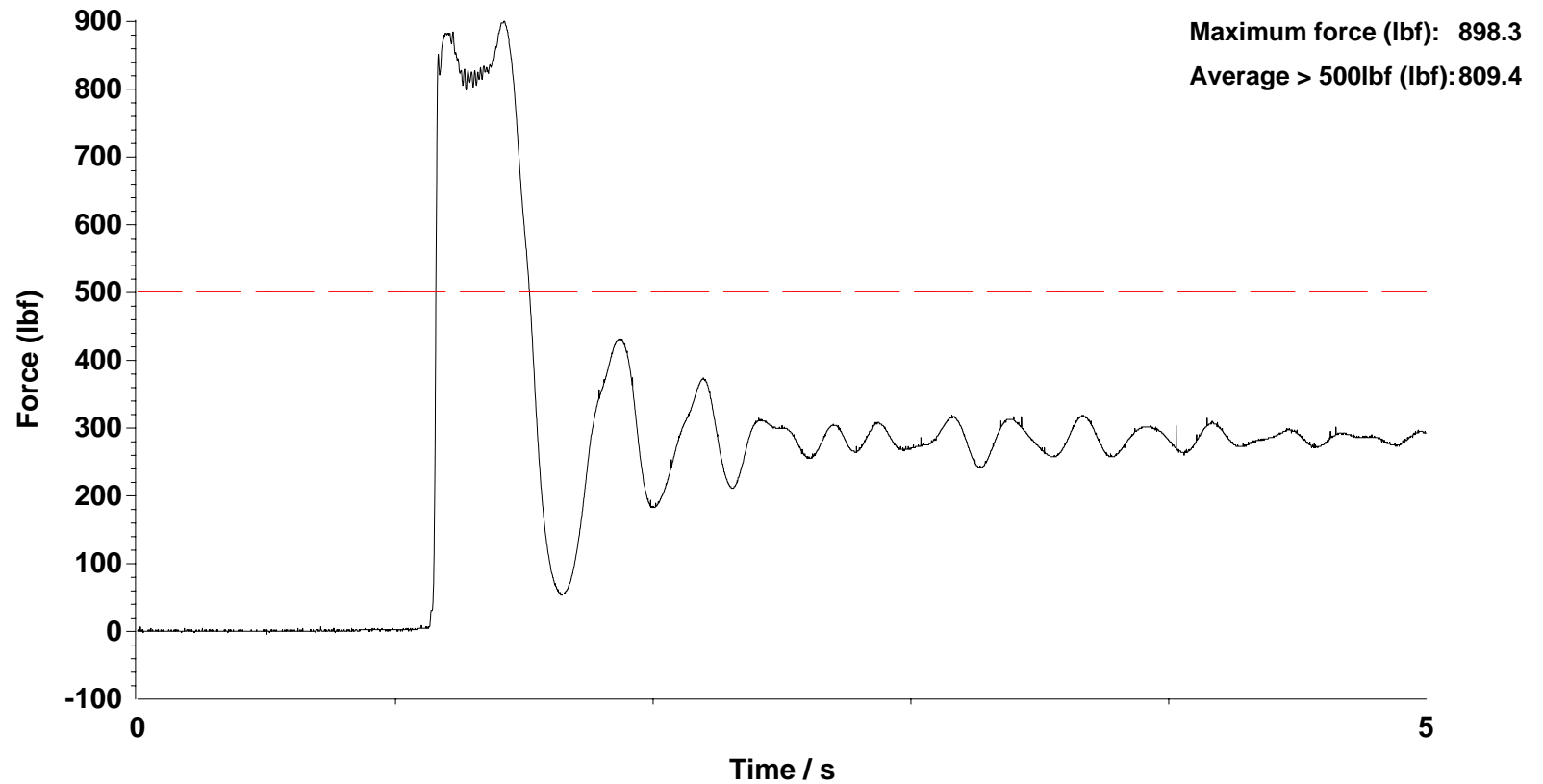
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Results do not achieve full ANAB status until a formal test report has been issued.

INSPEC Technical Services

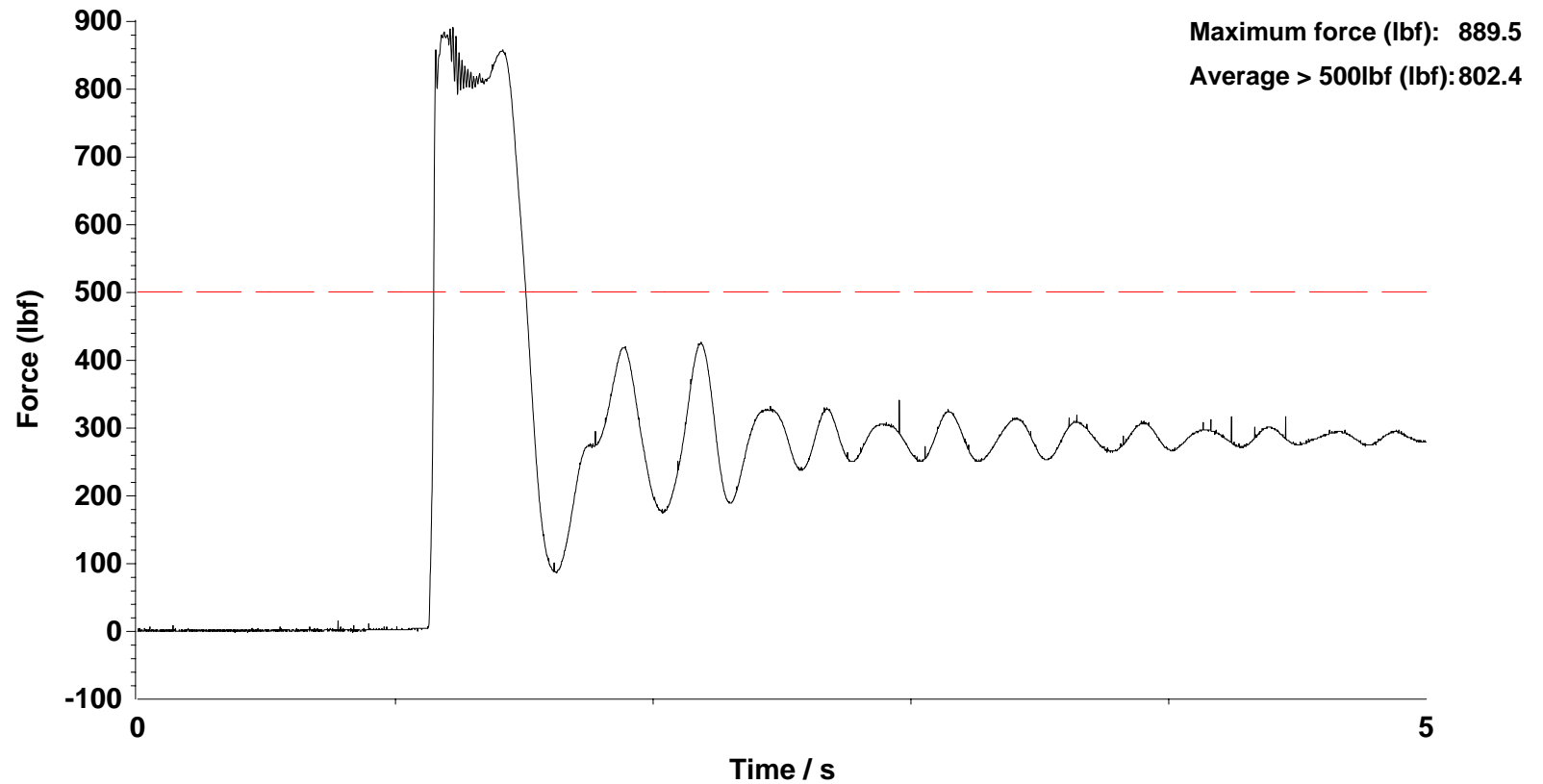
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INSPEC Technical Services

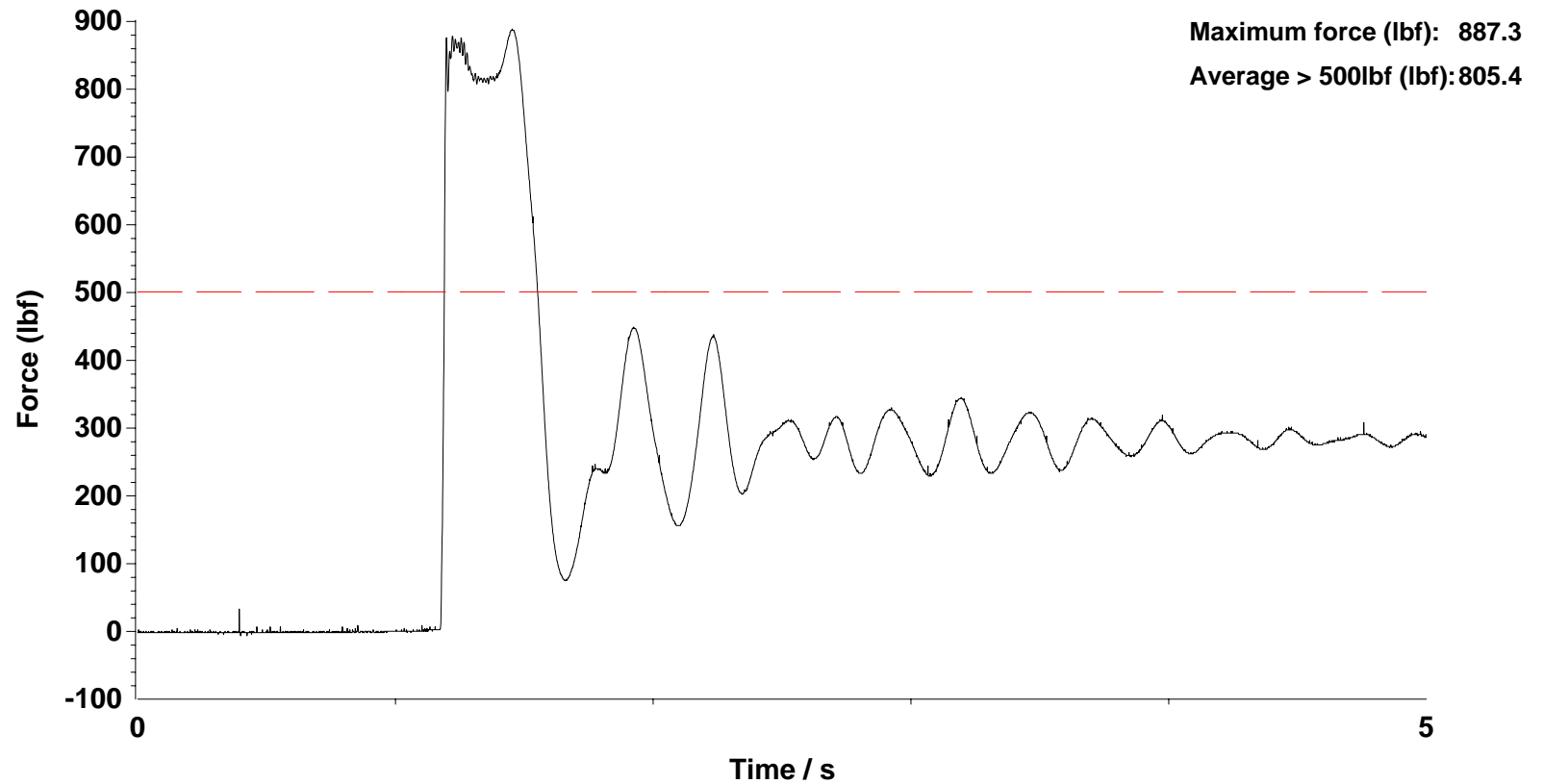
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Time and Date of Test: 17:39 06/11/18



Results do not achieve full ANAB status until a formal test report has been issued.

INSPEC Technical Services

Technician: SS
Standard ANSI Z359.13:2013 EA Lanyard
Sample / File name: 2F15015
Drop item Drop weight, US-128 kg
Orientation/Attachment Point: Centre eyebolt
Time and Date of Test: 17:46 06/11/18



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Frontline Fall Protection Inc. –
Shock absorber lanyard, model LIS61S-AM

