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Testing of DB type snare

Reference number TTI-IMLR-2021-5825-1

Date	Rev.	Description	Prepared by	Authorised by
28/12/21	0	For issue to customer	IMLR	REH

Distribution:	**Attention:**
TTI Testing Ltd (author, file)	IMLR, REH
National Anti-Snaring Campaign (NASC)	Simon Wild

Contents

1 Introduction

The National Anti-Snaring Campaign (**NASC**) have approached **TTI Testing** for assistance in measuring the force required to break the "breakaway clip" or "weak link" of snares of various designs and manufacturers. Previously the force required to free Glen Waters Breakaway snares has been measured [**1**]. This report describes the test methodology and presents the results of testing undertaken by **TTI Testing** on a second type of snare: the "DB snare" as manufactured and sold by Perdix, the original concept of which was designed by the Game & Wildlife Conservation Trust (**GWCT**) [**2**].

2 DB type snare

The focus of this study was the "DB snare", samples of which were supplied by **NASC** for testing. It is noted that the name DB snare was originally applied to a snare developed by DB Design Ltd [**2**], and incorporated a breakaway clip formed of a NiTi alloy wire (manufactured by Ultimate NiTi Technologies, USA [**3**], with breaking load of 33.51kgf ± SD 4.05 [**2**]). The snares tested in the work reported here had clips formed of stainless steel wire [**4**], which appeared to be geometrically similar, but the wire diameter and material properties are not known. Thus, for the work reported here the snares will be referred to as a "DB type snare". Figure 2.1 shows a general overview of the snare. Figure 2.2 shows the central and ground swivels, and Figure 2.3 a detail view of the running eye hardware and breakaway clip.

The wire ropes shown in Figure 2.1 were both Ø2 mm, with 7×7 construction.

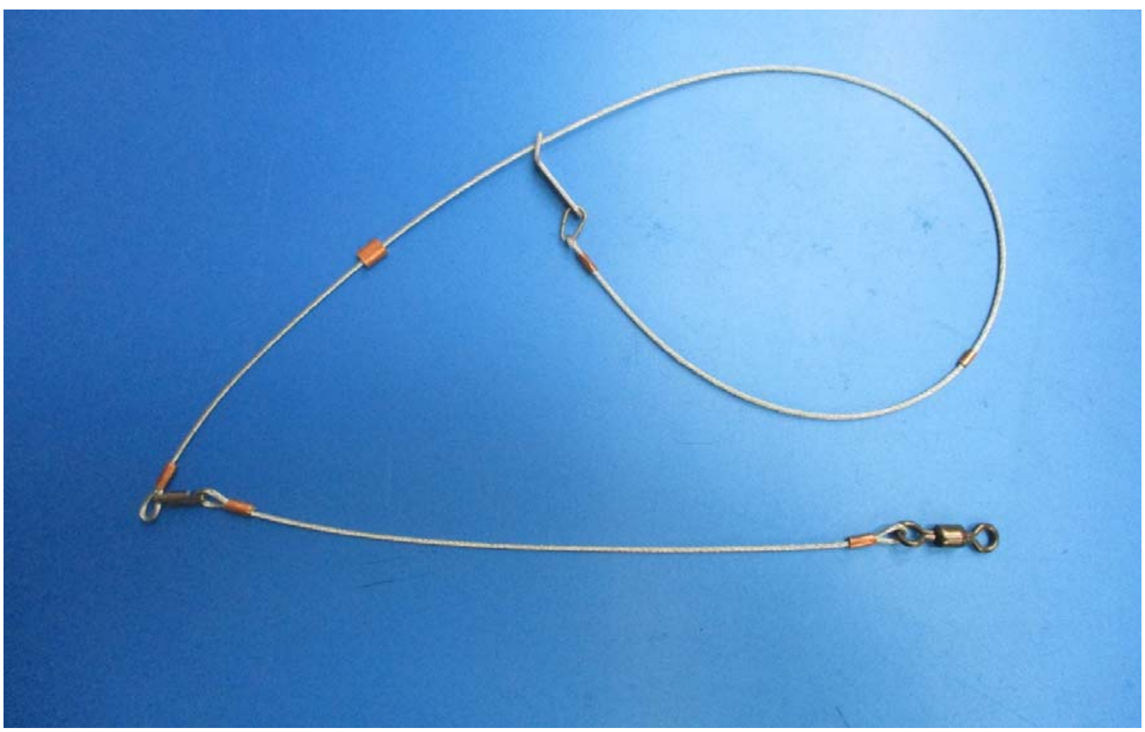
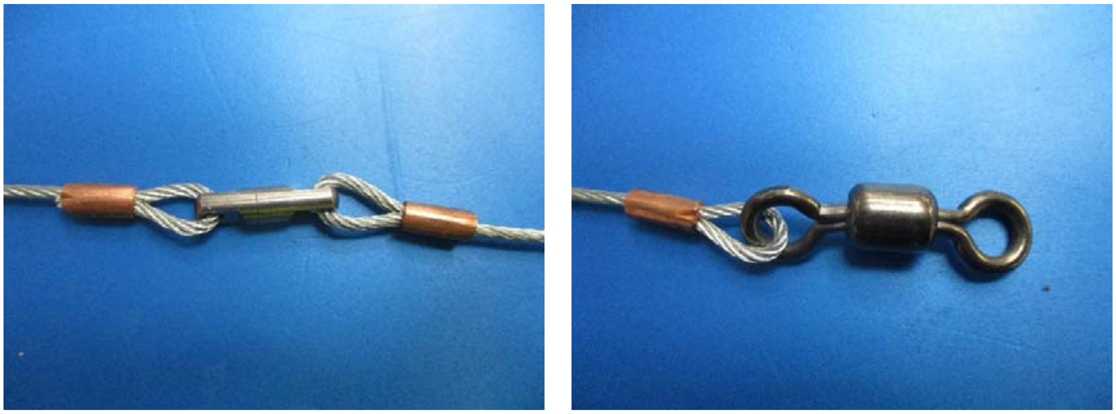


Figure 2.1: Overview of example DB type snare supplied for testing.



(a) central swivel (b) end (ground) swivel

Figure 2.2: Detailed views on the central and end swivels forming part of the DB type snare.

Figure 2.3: Detailed view on the DB type snare loop showing assembly of the oval breakaway clip and "Relax-A-Lock" tab.

3 Equipment

Testing was undertaken in **TTI Testing's** INSTRON 5967 tensile testing machine using the 30 kN load cell, a calibration certificate for which is presented in Appendix A.

As before, the whole snare assembly was tested (Figure 3.1), secured at one end through the ground swivel by a M6 bolt (Figure 3.2). At the other end of the assembly, the loop at the end of the snare was mounted on a plastic spool (Ø67 mm), Figure 3.3, which was intended to approximate to the diameter of an animal's neck.

Figure 3.1: INSTRON tensile testing machine with DB snare mounted ready for testing.

Figure 3.2: Ground swivel mounted on the 30 kN load cell by M6 steel bolt.

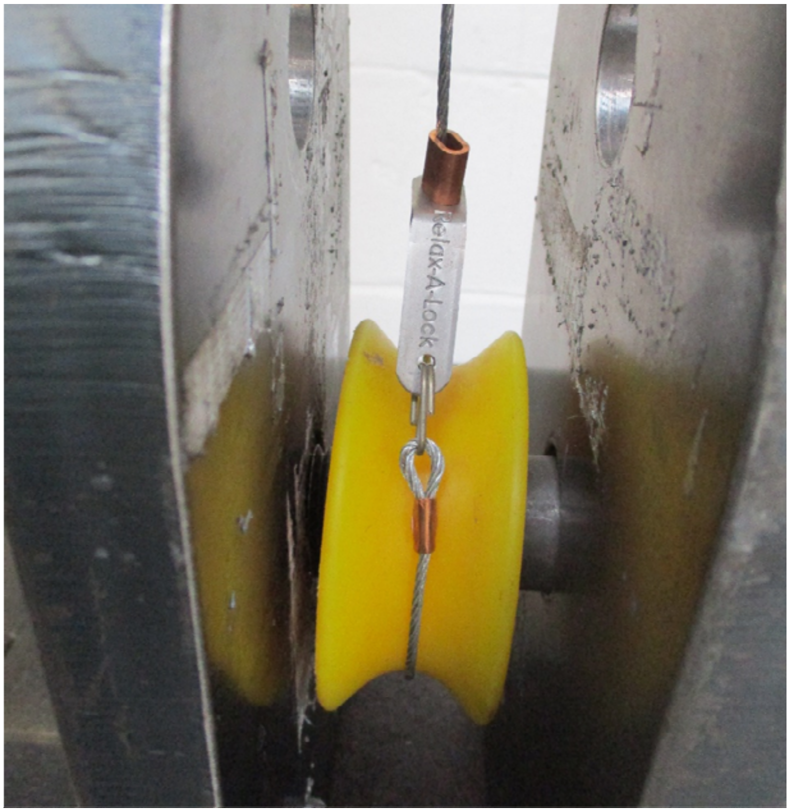


Figure 3.3: Snare loop on plastic spool mounted in clevis arrangement.

4 Test procedure

Once mounted in the test machine as shown in §3 above, any slack was removed before the start of the test. As with the previous testing [**1**], the sample was then loaded at a rate of 0.5 mm/s until it was unable to support any further increase in load.

It is noted that this is not how a snare would be loaded in practice, with the animal struggling to free itself, but in terms of measuring the breaking load was considered acceptable.

5 Results

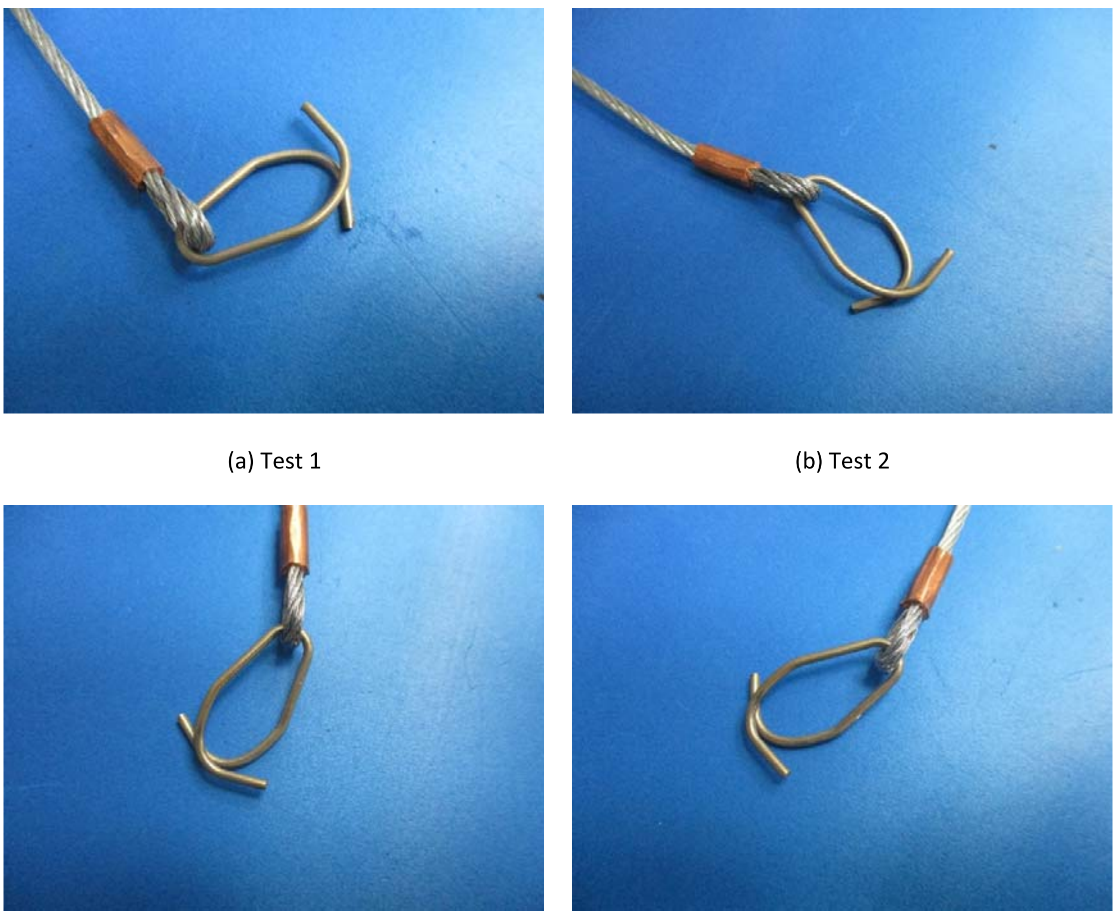
Table 5.1 summarises the results of the tensile tests on the snares. The force sustained at failure is measured in Newtons, N. For ease of reference, 9.81 N is equivalent to the force applied by 1 kg, so for example, 703 N equates to 71.7 kg force [kgf].

In all tests, the failure of the snare was of the breakaway clip, which flexed and pulled open to release the end of the Relax-A-Lock tab. An average failure load of 730.6 N or 74.5 kgf was measured. Figure 5.1 shows the appearance of the breakaway clip failures, which have a degree of elastic recovery after pulling free.

Figure 5.2 shows a comparison of the shape of the breakaway clip before and after testing.

Test no.	Failure load [N]	Failure location
1	703.4	Failure at breakaway clip
2	729.1	Failure at breakaway clip
3	745.6	Failure at breakaway clip
4	744.1	Failure at breakaway clip
	730.6	**Average (74.5 kgf)**

Table 5.1: Summary of measured failure loads of snare assemblies.



(a) Test 1

(b) Test 2

(c) Test 3

(d) Test 4

Figure 5.1: Appearance of the breakaway clips following testing.

Figure 5.2: Appearance of the breakaway clip failures (top) compared with untested clip (bottom).

6 Discussion of initial results and further testing

The initial work reported here has detailed the testing of four DB type snares manufactured by Perdix and supplied to **TTI Testing** by **NASC**. In order to facilitate comparison, the snares were tested in the same configuration as previously employed in the testing of Glen Waters snares [**1**], that is with the snare looped around a plastic spool which was intended to approximate to the diameter of an animal's neck.

Thus, for these initial tests, the whole snare assembly was tested. The results from these tests were very consistent: in all cases the breakaway clip failed, by deforming and releasing the end of the Relax-A-Lock tab. The average breaking load was 74.5 kgf.

It is immediately noted that the Perdix website [**4**] states a mean breaking load of 35.3kgf (with range 33 – 38 kgf) based on a sample of 30 tests. The reason for this apparent inconsistency is that the Perdix data is based on testing the clip in a straight configuration (Figure 6.1), whilst, as just mentioned above, the whole snare was tested in the work reported here.

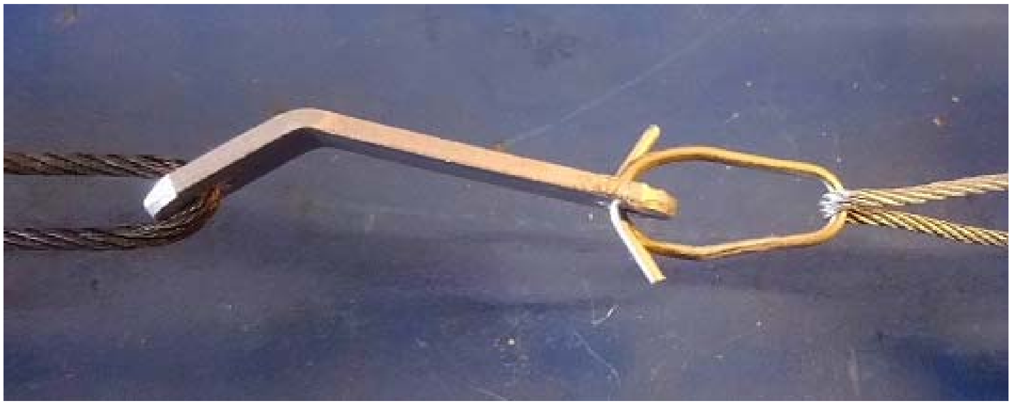


Figure 6.1: Configuration employed in the tests to measure the breaking strength of the breakaway clip undertaken for Perdix (from [**4**]).

Figure 6.2 shows the Instron test machine with the clevis fitting modified in order to visually assess the geometry of the snare around the plastic spool when under load. One side of the clevis has been removed and the spool held in place by the central bolt in a cantilever arrangement. A sheet of graph paper has been stuck to the face of the remaining side plate to aid clarity. Figure 6.3 shows a photograph taken with a vertical load of approximately 650 N applied to the upper part of the snare. It may be seen that the breakaway clip on the right hand side has started to spring open.

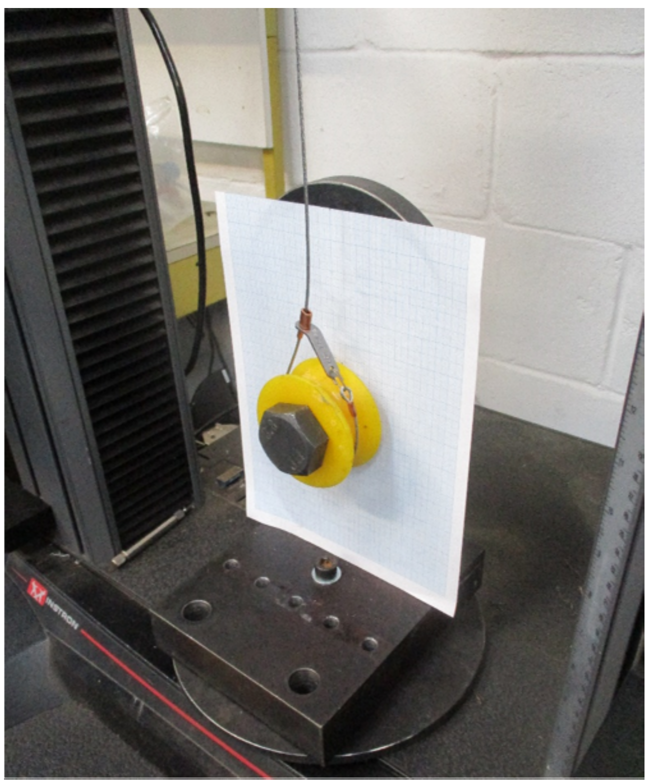


Figure 6.2: Modified clevis arrangement to permit visual assessment of the behaviour of the snare over the spool when under load (at the start of the test before any load has been applied).

Figure 6.3: Photograph showing the geometry of the snare over the spool when under a vertical load of approximately 650 N.

The angles adopted by the two legs of the snare loop have been measured using CAD software. As the Relax-A-Lock tab is stopped by the copper stop, the system is in equilibrium, and simple resolution of forces may be used to determine the load in each leg. For the geometry shown in Figure 6.3, at a measured failure load of 903 N the load in the breakaway clip is 390.5 N or 39.8 kgf. It is noted that in this test the measured failure load of 903 N was higher than the average failure load measured presented in Table 5.1 (730.5 N). The reason for this may be that a different batch of snares were tested, or possibly that the spool was not as free to rotate in the cantilevered configuration as compared with the simple pin and there were some frictional effects involved.

A set of three tests was also undertaken on the breakaway clip in a similar configuration to that employed in the tests reported on the Perdix website (compare Figure 6.1 and Figure 6.4).

The measured average breaking load was 382.4 N (Table 6.1), or 39.0 kgf, which is in good agreement with the 39.8 kgf reported above.

Figure 6.4: Measuring the strength of the breakaway clip in the straight configuration.

Test no.	Failure load [N]	Failure location
6	385.68	Failure at breakaway clip
7	381.70	Failure at breakaway clip
8	379.69	Failure at breakaway clip
	382.4	**Average (39.0 kgf)**

Table 6.1: Summary of measured failure loads of breakaway clips in the straight test configuration.

7 Discussion and Conclusions

This report has described testing of DB type snares with breakaway clips. The snare was tested in two configurations: initially with the snare looped over a plastic spool which was intended to approximate to the diameter of an animal's neck; and, secondly testing just the breakaway clip. The initial configuration provided a direct comparison of the failure load for the DB type snare with the Glen Waters snare tested in a previous programme.

The DB type snare on the spool gave very consistent results in both failure mode and failure load (at the breakaway clip at an average of 74.5 kgf). This finding was in contrast to the results for the Glen Waters snares which tended to fail at slightly lower loads and at one of the various swaged fittings on the wire ropes [**1**].

As well as providing breaking load data for a direct comparison with the Glen Waters snare, the testing on the DB type snare did highlight the effect on the required line pull required to fail the breakaway clip when configured as in operation.

Table 7.1 summarises the results of straight pull tests on the clips as reported by the **GWCT** [**2**] and in the independent tests undertaken by Perdix and those reported here. It may be seen that the obtained results are all fairly similar. The results obtained in this programme of work are a little higher, but generally speaking consistent. So it may be said that the performance of the Perdix snares might be expected to be similar to that of the DB snare tested by **GWCT**.

Manufacturer or Programme of work	Measured breaking load [kgf]
Ultimate Smart Link 80-100 lb model [**2**]	33.51 ± SD 4.05
Perdix website [**4**]	35.3 (range 33 – 38.0)
TTI Testing	39.0 (range 38.7 – 39.3)

Table 7.1: Summary of measured failure loads of breakaway clips in the straight test configuration obtained in different tests.

It is again noted that in the tests reported here the complete snares and breakaway clips were loaded at fairly low rates. They were also loaded in a very specific manner, i.e., straight or positioned over the spool. The results reported here do not assess the effect of any dynamic loading which might be experienced by the animal struggling to free itself, or indeed any effect on performance should the snare become entangled in (for example) vegetation.

8 References

[**1**] **Ridge, IML,** *Testing of Glen Waters Breakaway snare*, TTI Testing report TTI-IMLR-2021-5825, 16th November 2021.

[**2**] **Short, MJ., Weldon, AW., Richardson, SM. and Reynolds, JC.** *Selectivity and injury risk in an improved neck snare for live-capture of foxes*, Wildlife Society Bulletin, 36, 2 2012, 208-219.

[**3**] http://www.ultimateniti.com/NiTi_SMA_TECH/Material_Characteristics/Ultimate_SmartLink_Lure_System_Story/

[**4**] https://perdixwildlifesupplies.com/product/db-snare/

Appendix A – Calibration certificate for INSTRON machine

CERTIFICATE OF CALIBRATION

ISSUED BY: INSTRON CALIBRATION LABORATORY

DATE OF ISSUE: 18-Oct-2021

CERTIFICATE NUMBER: **E323101821092801**

CALIBRATION
NVLAP Lab Code 200301-0

Instron
825 University Avenue
Norwood, MA 02062-2643
Telephone: +44 (0) 1494 456815
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Email: Calibration_Europe@Instron.com

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APPROVED SIGNATORY

Ryan Whitney

Digitally signed by Ryan Whitney
DN: c=US, st=MA, l=Norwood, o=Instron, ou=Europe - UK, ou=Calibration Laboratory, ou=A division of Illinois Tool Works, Inc. (ITW, Inc.), cn=Ryan Whitney, email=ryan_whitney@instron.com
Reason: I attest to the accuracy and integrity of this document
Date: 2021.10.22 09:43:29 +01'00'

Type of Calibration: Force
Relevant Standard: ISO 7500-1:2018
Date of Calibration: 18-Oct-2021

* * * VERIFICATION RESULTS * * *

System ID: 5967B10738 — **Customer Asset No.:** 000444
Transducer ID: 2580-202/303243 — **Customer Asset No.:** 000498

Indicator 1. - Service Port: Bluehill Universal v4.23.27859 (kN)

PASSED Class 0.5: 100% Range in Tension mode (0.6006502 to 30.06431)
PASSED Class 0.5: 100% Range in Compression mode (-0.6015678 to -30.04814)

System Class for a range is derived from assessment of the following: error, repeatability, return to zero, resolution, proving device classification, and reversibility if applicable.

Customer

Name: TTI Testing Ltd
Address: Unit 2, Hithercroft Road, Wallingford, Oxfordshire, OX10 9DG, United Kingdom
Contact: Rob Carr
Email: carr@tensiontech.com
P.O./Contract No.: SV2110010012

Temperature

Minimum Temperature: 21.2 °C
Maximum Temperature: 21.6 °C

Machine

Manufacturer: Instron
Type: Electro-Mechanical Single Range
Year of Mfg.: 2015

Transducer

Manufacturer: Instron
Capacity: 30 kN
Type: Tension/Compression

Methodology

The assessment of the testing machine was conducted on site at the above customer location in accordance with ISO 7500-1:2018 "Metallic materials -- Calibration and verification of static uniaxial testing machines -- Part 1: Tension/compression testing machines -- Calibration and verification of the force-measuring system" using Instron procedure ICA-8-19.

The system was calibrated in the 'As Found' condition with no adjustments or repairs carried out. This is also the 'As Left' condition.

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The results indicated on this certificate and the following report relate only to the items calibrated. If there are methods or data included that are not covered by the NVLAP accreditation it will be identified in the comments. Any limitations of use as a result of this calibration will be indicated in the comments. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government. This report shall not be reproduced, except in full, without the approval of the issuing laboratory.

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CERTIFICATE NUMBER:
E323101821092801

Prior to verification, a pre-calibration inspection was conducted in accordance with the guidelines of section 5 and Annex A of ISO 7500-1. During the inspection, the testing system was found to be in Good condition.

No mechanically linked accessories were fitted while performing this calibration.

System Classification

The calibration and equipment used conform to a controlled Quality Assurance program which meets the specifications outlined in ANSI/NCSL Z540.1-1994, ISO 10012:2003, ISO 9001:2015, ISO/IEC 17025:2017.

The force-measuring system has been verified for the forces indicated using equipment calibrated within the requirements of ISO 7500-1:2018.

The Simple Acceptance decision rule has been agreed to and employed in the determination of conformance to the identified metrological specification.

Data Summary - Indicator 1. - Service Port: Bluehill Universal v4.23.27859 (kN)

TENSION

% of Range	Relative error of (%) Indication Run 1	Run 2	Run 3	Repeatability Error (%)	Error Class	Resolution (+/- kN)	Standard Class
100% Range (30 kN)							
0 Return	-0.005	-0.008	-0.006		0.5	0.000075	
2	-0.083	-0.095	-0.058	0.037	0.5	0.000075	0.5
4	-0.052	-0.062	-0.088	0.036	0.5	0.000075	0.5
7	-0.053	-0.078	-0.049	0.029	0.5	0.000075	0.5
10	-0.061	-0.063	-0.069	0.008	0.5	0.000075	0.5
20	-0.037	-0.045	-0.046	0.009	0.5	0.000075	0.5
20	0.188	0.177	0.229	0.052	0.5	0.000075	0.5
40	0.236	0.241	0.243	0.007	0.5	0.000075	0.5
60	0.239	0.223	0.244	0.021	0.5	0.000075	0.5
80	0.239	0.220	0.239	0.019	0.5	0.000075	0.5
100	0.241	0.243	0.247	0.006	0.5	0.000075	0.5

Data Summary - Indicator 1. - Service Port: Bluehill Universal v4.23.27859 (kN)

COMPRESSION

% of Range	Relative error of (%) Indication Run 1	Run 2	Run 3	Repeatability Error (%)	Error Class	Resolution (+/- kN)	Standard Class
100% Range (30 kN)							
0 Return	-0.007	-0.004	-0.009		0.5	0.000075	
2	-0.128	-0.144	-0.130	0.016	0.5	0.000075	0.5
4	-0.131	-0.108	-0.105	0.026	0.5	0.000075	0.5
7	-0.149	-0.134	-0.071	0.078	0.5	0.000075	0.5
10	-0.143	-0.128	-0.063	0.080	0.5	0.000075	0.5
20	-0.117	-0.114	-0.035	0.082	0.5	0.000075	0.5
20	-0.145	-0.136	-0.170	0.034	0.5	0.000075	0.5
40	-0.046	-0.037	-0.041	0.009	0.5	0.000075	0.5
60	-0.003	0.003	-0.017	0.020	0.5	0.000075	0.5
80	0.001	-0.016	0.002	0.018	0.5	0.000075	0.5
100	0.018	0.019	0.017	0.002	0.5	0.000075	0.5

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Worst Resolution Class: 0.5 for 100% Range (Indicator 1: Tension), 0.5 for 100% Range (Indicator 1: Compression).

Data - Indicator 1. - Service Port: Bluehill Universal v4.23.27859 (kN)

TENSION

% of Range	Run 1 Indicated (kN)	Run 1 Applied (kN)	Run 2 Indicated (kN)	Run 2 Applied (kN)	Run 3 Indicated (kN)	Run 3 Applied (kN)	Uncertainty of Measurement* Relative %	Uncertainty of Measurement* (+/- kN)
100% Range (30 kN)								
0 Return	-0.0014		-0.0025		-0.0018			
2	0.6028	0.60330096	0.6012	0.60177168	0.6003	0.60065020	0.19	0.0011
4	1.2044	1.20502166	1.2056	1.20634704	1.2035	1.20456288	0.19	0.0023
7	2.1041	2.10520684	2.1006	2.10225024	2.1025	2.10352464	0.19	0.0040
10	3.0028	3.00462739	3.0064	3.00829766	3.0084	3.01048963	0.19	0.0057
20	6.0041	6.00629817	6.0054	6.00813331	6.0003	6.00308668	0.19	0.011
20	6.0100	5.99871129	6.0220	6.01134654	6.0094	5.99567883	0.19	0.012
40	12.0050	11.97670077	12.0993	12.07020162	12.0939	12.06464211	0.19	0.023
60	18.0558	18.0128124	18.0323	17.99209059	18.0072	17.96328222	0.19	0.034
80	24.0957	24.03831042	24.0492	23.99636139	24.0268	23.96957466	0.19	0.046
100	30.0217	29.94958578	30.0164	29.94352086	30.1386	30.06431385	0.19	0.057

Data - Indicator 1. - Service Port: Bluehill Universal v4.23.27859 (kN)

COMPRESSION

% of Range	Run 1 Indicated (kN)	Run 1 Applied (kN)	Run 2 Indicated (kN)	Run 2 Applied (kN)	Run 3 Indicated (kN)	Run 3 Applied (kN)	Uncertainty of Measurement* Relative %	Uncertainty of Measurement* (+/- kN)
100% Range (30 kN)								
0 Return	0.0020		0.0012		0.0028			
2	-0.6008	-0.60156777	-0.6036	-0.60447340	-0.6017	-0.60248534	0.19	0.0011
4	-1.2178	-1.21939689	-1.2029	-1.20420604	-1.2007	-1.20196310	0.19	0.0023
7	-2.1034	-2.10653222	-2.1008	-2.10362659	-2.1056	-2.10709296	0.19	0.0040
10	-3.0019	-3.00620764	-3.0249	-3.02879001	-3.0146	-3.0165048	0.19	0.0057
20	-6.0146	-6.02164195	-6.0087	-6.01557580	-6.0116	-6.01368969	0.19	0.011
20	-6.0334	-6.04217655	-6.0254	-6.03358458	-6.0450	-6.05531721	0.19	0.012
40	-12.0894	-12.09496671	-12.0759	-12.08030982	-12.0940	-12.09900999	0.19	0.023
60	-18.0098	-18.01028535	-18.0022	-18.00169338	-18.0674	-18.07042914	0.19	0.035
80	-24.0967	-24.09643257	-24.0088	-24.01253451	-24.0979	-24.09744339	0.19	0.046
100	-30.0165	-30.0112458	-30.0059	-30.00012678	-30.0531	-30.04814073	0.19	0.058

**The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.*

The uncertainty stated refers to values obtained during the calibration and makes no allowances for factors such as long-term drift, temperature and alignment effects - the influence of such factors should be taken into account.

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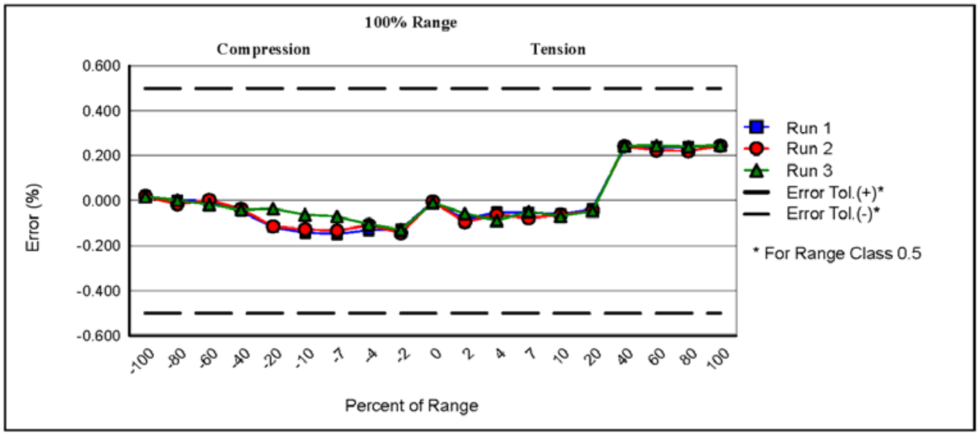
Graphical Data - Indicator 1. - Service Port: Bluehill Universal v4.23.27859 (kN)



Calibration Equipment

The measurement results produced with Instron standards are traceable to the SI (The International System of Units) through internationally recognized National Metrology Institutes (NIST, NPL, PTB, Inmetro, etc.).

Equipment ID	Description	Capacity	Cal Date	Cal Due	Certificate Ref.
N122-100K	load cell	100000 N	01-Dec-2020	02-Dec-2022	E327120120152924
N122-10K	load cell	10000 N	16-Nov-2020	17-Nov-2022	E258111620155545
N122-READOUT	force indicator	NA	07-Jun-2021	07-Jun-2023	E258060721165002
N6B-T	temp. indicator	NA	03-Jan-2020	03-Jan-2022	20200103A

The class of the calibration equipment was equal to or better than the class to which this testing machine has been calibrated.

Calibration Equipment Usage

Range Full Scale (%)	Mode	Equipment ID	Percent(s) of Range	Accuracy (+/-)
100	Tension	N122-10K	2/ 4/ 7/ 10/ 20	0.16% of reading
		N122-100K	20/ 40/ 60/ 80/ 100	0.16% of reading
100	Compression	N122-10K	2/ 4/ 7/ 10/ 20	0.16% of reading
		N122-100K	20/ 40/ 60/ 80/ 100	0.16% of reading
All	Tension-Compression	N6B-T	All	1 °C

The accuracy of the force indicator used with an elastic device is incorporated into the device's stated accuracy.

The accuracy of the calibration equipment used was equal to or better than the accuracy indicated in the table above.

Comments

No comments

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CERTIFICATE NUMBER:
E323101821092801

Verified by: Witek Sulikowski
Field Service Engineer

NOTE: Clause 9 of ISO 7500-1 states; The time between verifications depends on the type of testing machine, the standard of maintenance and the amount of use. Unless otherwise specified, it is recommended that verification be carried out at intervals not exceeding 12 months. The machine shall in any case be verified if it is moved to a new location necessitating dismantling or if it is subject to major repairs or adjustments.