

ENGINEERING REPORT

Number PCL/C/1264

Title Short circuit testing of 370BA07 2 shot at
0.1m centres with 0.6m spacing a test
value of 71kA in accordance with BS EN
61914:2016
Clause 9.5

Date 05 / 05 / 2021

TYPE TEST REPORT

Test object: Cable cleats for electrical installations

Designation: Cable cleat type 370BA07

Manufacturer: Prysmian Cables & Systems Ltd.
Oak Road, Wrexham Industrial Estate
WREXHAM – LL13 9PH
UNITED KINGDOM

Tested for: Prysmian Cables & Systems Ltd.

Date of tests: 05th and 07th May, 2021

Project ID: NTL-21/2021

Order/Contract: PO.: 4501441725; 09th March, 2021

Test specification: IEC 61914:2015, Sub-Clause 9.5

Tests performed: The test objects, constructed in accordance with the description, drawing and photographs incorporated in this report, have been subjected to two tests for resistance to electromechanical force according to the requirements of Manufacturer and the Sub-clause 9.5 of the referred specification.

Test results: The test objects passed the tests for resistance to electromechanical force, withstanding two short-circuits according to the requirements of Manufacturer and the **Sub-clause 9.5.3** of the referred specification.


This document has been issued by VEIKI-VNL Electric Large Laboratories Ltd. Testing Laboratory in accordance with above mentioned test specification.

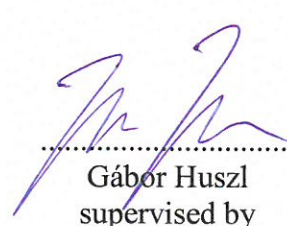
This document applies only to the test object. The responsibility for conformity of any product having the same designations with that tested rests with the Manufacturer.

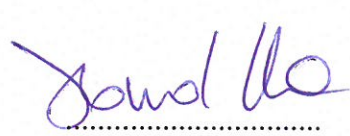
This document comprises 19 pages in total (13 numbered pages, 2 oscillogram(s) 1 drawing(s) and 3 pages Annex).



Budapest,
30th June, 2021


Károly Gecse
responsible for the test


Gábor Huszl
supervised by


Balázs Varga
head of laboratory

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TEST CERTIFICATES OR REPORTS ISSUED BY VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD. AS TESTING LABORATORY

1 STL Type Test Certificate of ... Performance

VEIKI-VNL as a STL Member organization with its own testing laboratories (Member Laboratories) is entitled to issue *STL Type Test Certificate of...Performance* if the product to be tested is inside the STL scope, all STL rules are fulfilled and the proven tests fully comply with the applicable IEC Standard and the corresponding STL Guide.

About STL

*The **Short-Circuit Testing Liaison (STL)** provides a forum for voluntary international collaboration between testing organisations. The basic aim is the harmonised application of IEC and Regional/National Standards for type testing of electrical high-voltage power equipment, and unified evaluation then presentation (reporting) of the test results.*

Certificates

STL as a collaboration does not itself issue Certificates. Each STL Member issuing a STL Type Test Certificate is responsible for the validity and contents of that Certificate. A STL Type Test Certificate is issued by STL Members based on tests performed by a STL Member Laboratory within their accredited scope to ISO/IEC 17025.

A detailed description of Certificate documents is available at www.stl-liaison.org.

STL Guides

All STL Members pledge that, when testing for certification to a Standard in respect of which an STL Guide has been issued, they will test only in accordance with the agreed interpretation of the Standard as given in the STL Guide. In addition, the STL Members have agreed to present STL Type Test Certificates in the form given in the STL General Guide. For further information contact us or visit the STL website at www.stl-liaison.org.

2 Type Test Report / Certificate

Type Test Report provides the verification of the rated characteristics of the equipment as assigned by the manufacturer, by means of the performance of the appropriate (type) tests specified by the standard. This report/certificate can be issued if the test object is completely prepared for testing, test circumstances and results fully comply with one or more (type) tests or test series defined by the applicable standard and all drawings serving the identification of the sample were submitted prior testing and approved by the laboratory. In case of special request Type Test Certificate can be issued which is equal in status, meaning and content requirement of the Type Test Report.

3 Prototype Test Report

Prototype tests are required to verify the suitability of the materials and method of manufacture for composite insulators defined by relevant ANSI standards.

4 Design Test Report

According to IEC standard: The design tests are intended to verify the suitability of the design, materials and method of manufacture (technology) of composite insulators.

According to ANSI standard: The design tests are intended to verify the insulators electrical and mechanical characteristics that depend on its size and shape.

5 Test Report

Test report is issued in all cases not listed above, e.g.:

- Test(s) were carried out according to instructions of the Client or Technical Specification.
- The test sample, test circumstances, required test parameters and evaluation method of the results do not or partially comply with the prescriptions of the standard.
- The submitted technical documents and drawings are not suitable for the clear identification of the tested object.
- Tests and test series were carried out according to the standard, but the test object failed.

Important notice

Reports and Certificates are issued usually in minimum two original copies. These sealed and bound copies are the original reports. Electronic reports in pdf format may be available and shall be considered as 'for information only'. In case of doubt with respect to the authenticity of the electronic version, please ask for the original sealed and bound version or send the entire electronic report to us for checking its authenticity. Please send this request to our e-mail address: VEIKI-info@dekra.com

Ratings/characteristics assigned by the manufacturer:

Test object:	Cable cleats for electrical installations
Designation:	Cable cleat type 370BA07
Manufacturer:	Prysmian Cables & Systems Ltd.
Type:	370BA07
Steady-state short-circuit current (I_k):	32.3 kA
Peak short-circuit current (I_p):	71.0 kA
Duration of short-circuit current (t_{sc}):	100 ms
Type of applied cables*:	Prysmian BS 7889 Cu 1x500 mm ² 600/1000 V
Cross-section of applied cables:	500 mm ²
External diameter of applied cables:	37 mm
Insulation thickness of applied cables:	2.2 mm
Cable formation:	Flat
Cable centre spacing:	100 mm
Linear spacing of the cleats:	600 mm
Test sample length:	4.5 m
Material of cable cleat:	Aluminium alloy

* Datasheet (3 pages) is attached to the report as an annex.

The test(s) were carried out in accordance with the following standard(s):

IEC 61914:2015 Cable cleats for electrical installations

Requirements of manufacturer or purchaser:

- Test arrangement
- To apply the highest current peak to the cable marked with Y in Figure 2

List of manufacturer's drawings for identification of the test object:

370BA07-SD Rev.: 1

The drawing(s) is(are) enclosed to the report.

Present at the test in charge of manufacturer or purchaser:

-

TESTS PERFORMED ON THE TEST OBJECT

No.	Description	Relevant clauses of the standard
1	Test for resistance to electromechanical force	9.5

DESCRIPTION OF THE TESTS

1 Test circumstances

The test objects (Photos 1-2) were subjected to two tests for resistance to electromechanical force in cable arrangement as can be seen on Photo 3. The drawing, serving the identification of the tested cleat, was provided by the Manufacturer and is enclosed to this report.

The three-phase test circuit was supplied from 50 Hz network. The supply connections between the test circuit and the test arrangement can be seen on Photo 4. The scheme of the test and measuring circuits is shown in Figure 1. The test arrangement was constructed based on the parameters and further requirements detailed on Page 3 and in Figure 2.

2 The test(s) carried out

The test(s) was(were) performed on new test samples and cables in the order indicated below:

Name of the test		Figures, photos
1	Short-circuit test with parameters of 32.3 kA _{rms} – 71 kA _{peak} / 100 ms	Figures 1-2
2	Visual examination	Photos 3-10
3	Short-circuit test with parameters of 32.3 kA _{rms} – 71 kA _{peak} / 100 ms	Figures 1-2
4	Visual examination	Photos 11-16
5	After having the cable jackets and the mounting frame pre-wetted for 2 minutes, voltage withstand test was performed on the arrangement with 1000 V _{AC} voltage maintained for 60 seconds between the cable cores connected together, and the mounting frame (cable ladder).	-

3 The test results

The test objects were subjected to visual inspection after finishing the test(s). All cleats withstood the mechanical effects of the applied short-circuit currents without any functional damages. After the electromechanical tests, voltage withstand test under pre-wetted condition was performed with successful result.

The test parameters and results are collected in Table 1.

The condition of the tested cleats is shown on Photos 11-16.

The test objects passed the tests for resistance to electromechanical force, withstanding two short-circuits according to the requirements of Manufacturer and the **Sub-clause 9.5.3** of the referred specification.

4 The recorded quantities taken during the test(s)

During the test(s) oscillogram(s) was(were) taken. The quantities were recorded by transient recorder with sampling rate of 50 μ s. The meaning of the symbols on the enclosed oscillogram(s) and in Figure 1 is the following:

I_a	-	current flowing in phase a
I_b	-	current flowing in phase b
I_c	-	current flowing in phase c
U_a	-	voltage of phase a
U_b	-	voltage of phase b
U_c	-	voltage of phase c

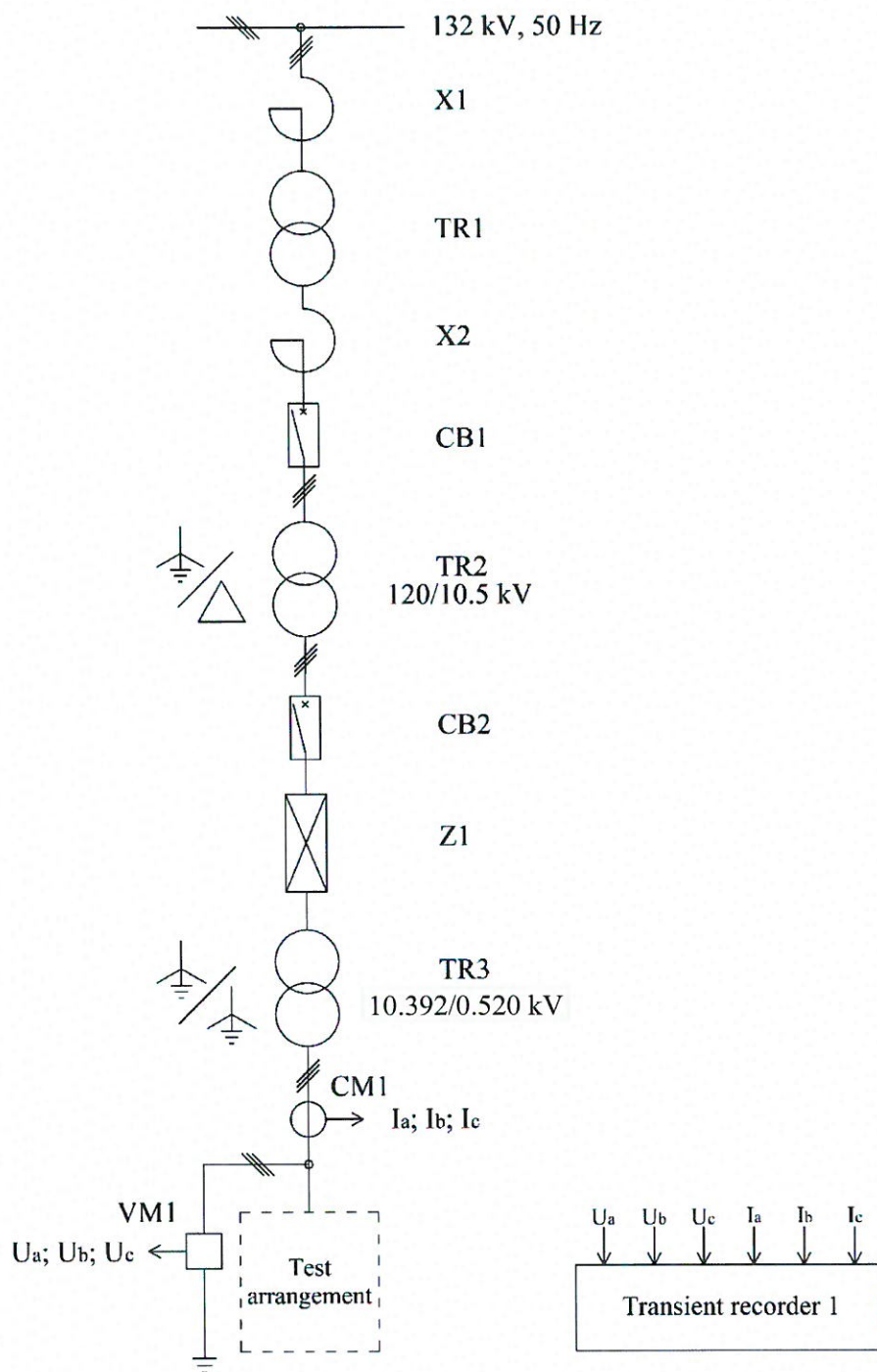
5 Uncertainty of measurements

Measured parameter	Uncertainty
Voltage measurement:	$\pm 0.59 \%$
Current measurement:	$\pm 1.20 \%$

The uncertainty values given in this report are the standard deviation values multiplied by $k=2$. Measurement uncertainty was estimated according to the method described in the EA-4/02 document.

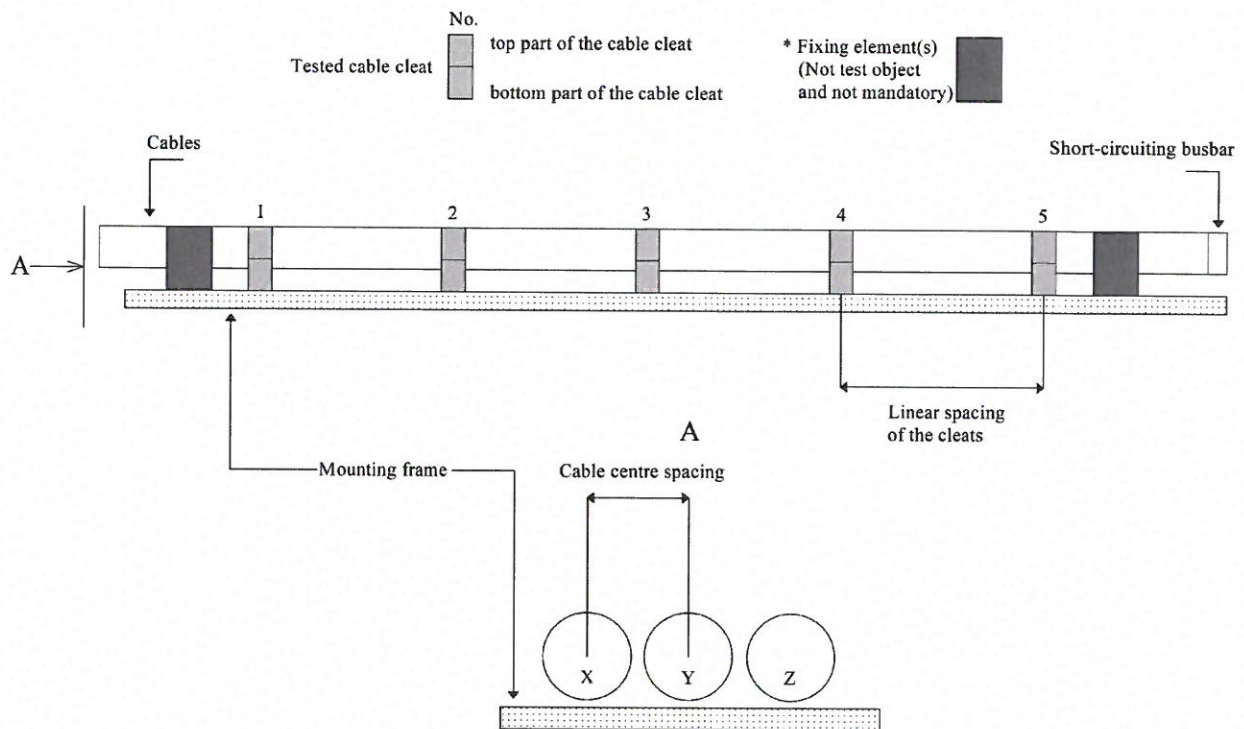
6 Measuring devices used for the test(s)

No.	Designation	Manufacturer	Type	Serial No.
[1]	Voltage divider	VEIKI-VNL Kft.	FO-100/5-2018	1; 2; 3
[2]	Rogowski current measuring system	3D-Motion Control Mérnökiroda Kft.	VNL-SC1 (Integrator unit)	2010-IU-001
			DCM-R2 (Rogowski coil)	2010-RC-001 2010-RC-002 2010-RC-003
[3]	Transient recorder	VEIKI-VNL Kft.	VoNaL VF1	see on oscillogram(s)
[-]	AC withstand voltage tester	KIKUSUI	TOS9200	MK005183



- X1, X2 - Reactors (Fo1, Fo2+Fo3)
- TR1 - Regulating transformers (Szo2+Szo3)
- CB1, CB2 - Circuit-breakers (K4, T6)
- TR2, TR3 - Short-circuit transformers (DZTV 25002, KNTZ 4000)
- Z1 - Resistor, reactors (R3, F2+F3)
- VM1 - Voltage dividers [1]
- CM1 - Rogowski current measuring system [2]
- Transient recorder 1 - Transient recorder [3]

Figure 1
Test and measuring circuits



Notes:

- * - 2 pcs cable cleat at the supply connection side and 2 pcs cable cleat at the short-circuited side of the arrangement
- X - cable connected to **phase a** of the test circuit
- Y - cable connected to **phase b** of the test circuit
- Z - cable connected to **phase c** of the test circuit

Figure 2
Test arrangement

Tests for resistance to electromechanical force on cable cleats					
Osc. No.	Phases	Parameters of the test(s)			
		Highest current peak	RMS value of the A.C. component	Duration	Joule-integral
		[kA]	[kA]	[ms]	[MA ² s]
BME 0503	a	56.85	31.25	106.7	103.1
	b	73.78	32.30		130.5
	c	60.40	31.35		108.4
BME 0504	a	57.83	31.27	106.5	103.5
	b	73.63	32.33		129.9
	c	58.89	31.30		106.9
Comments, remarks:					
The ambient temperature was 19.2 °C during the test(s).					

Table 1

PHOTOS



Photos 1-2
Test object

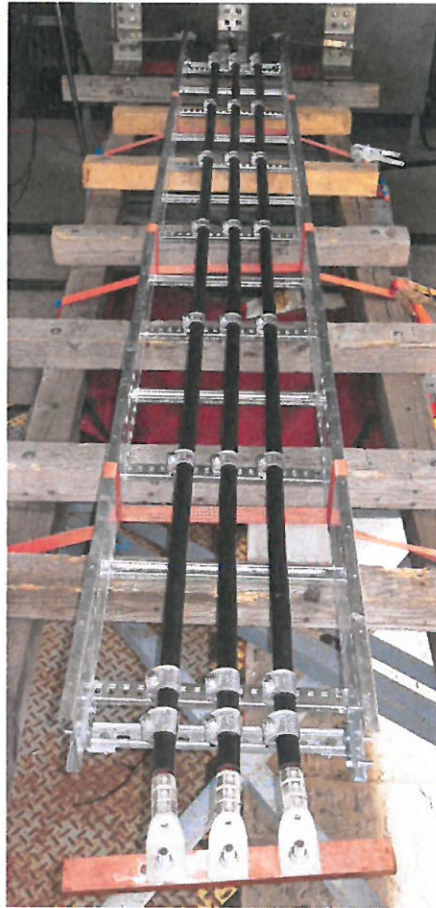
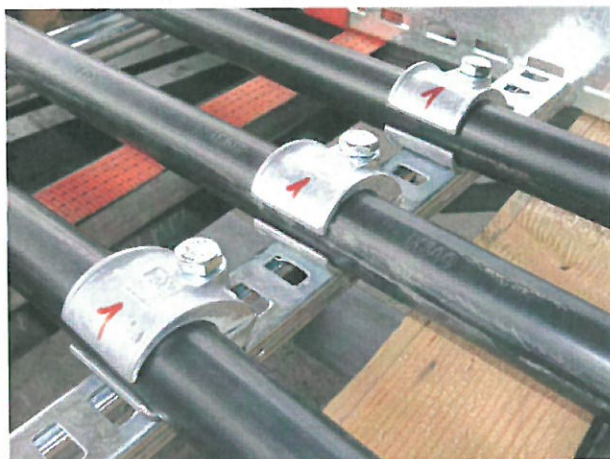


Photo 3
The test arrangement prepared for the tests



Photo 4
Supply connections



Photos 5-9
The test samples after the first test

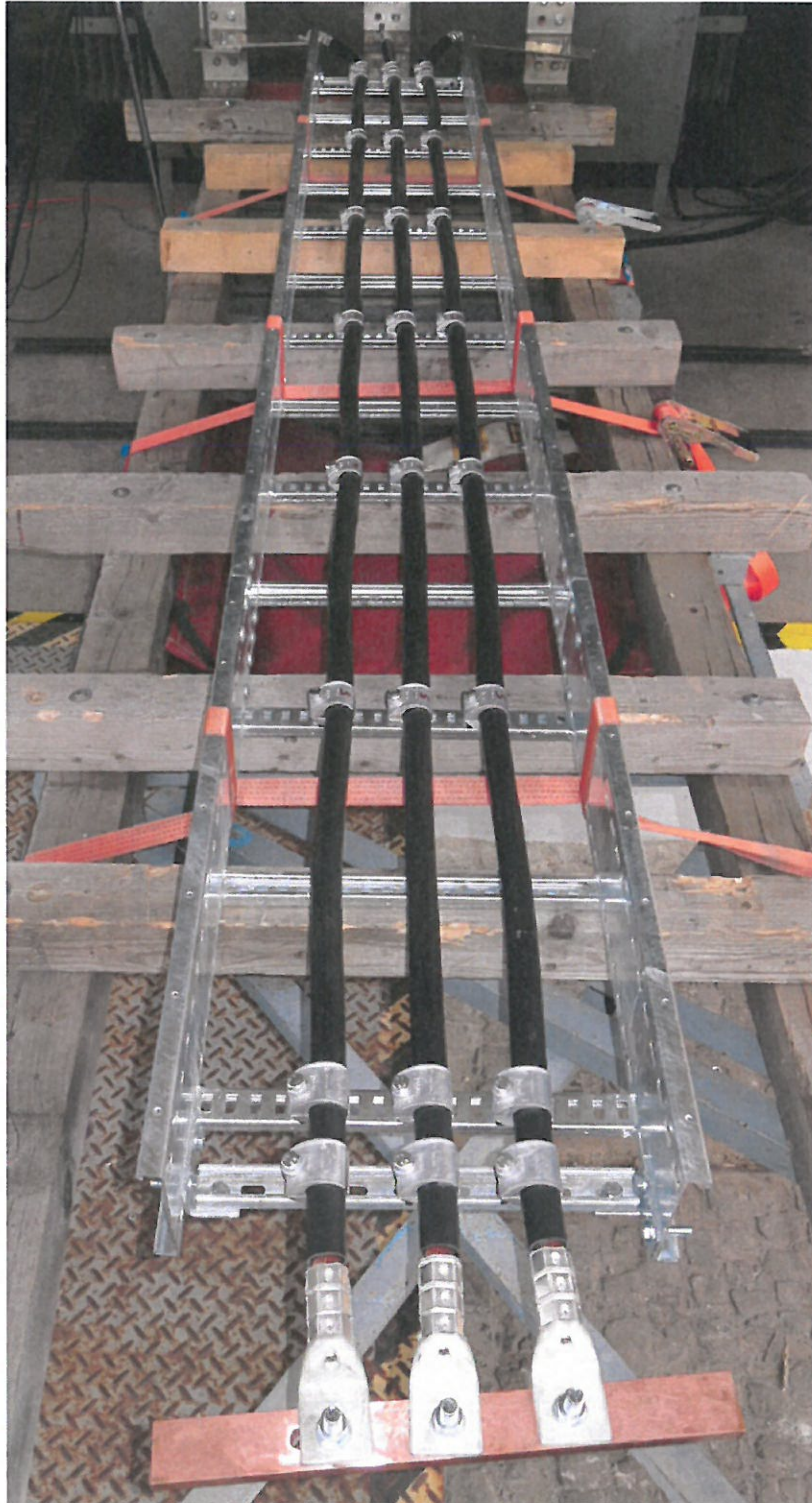


Photo 10
Condition of the test arrangement after the first test



Photos 11-15
The test samples after the tests

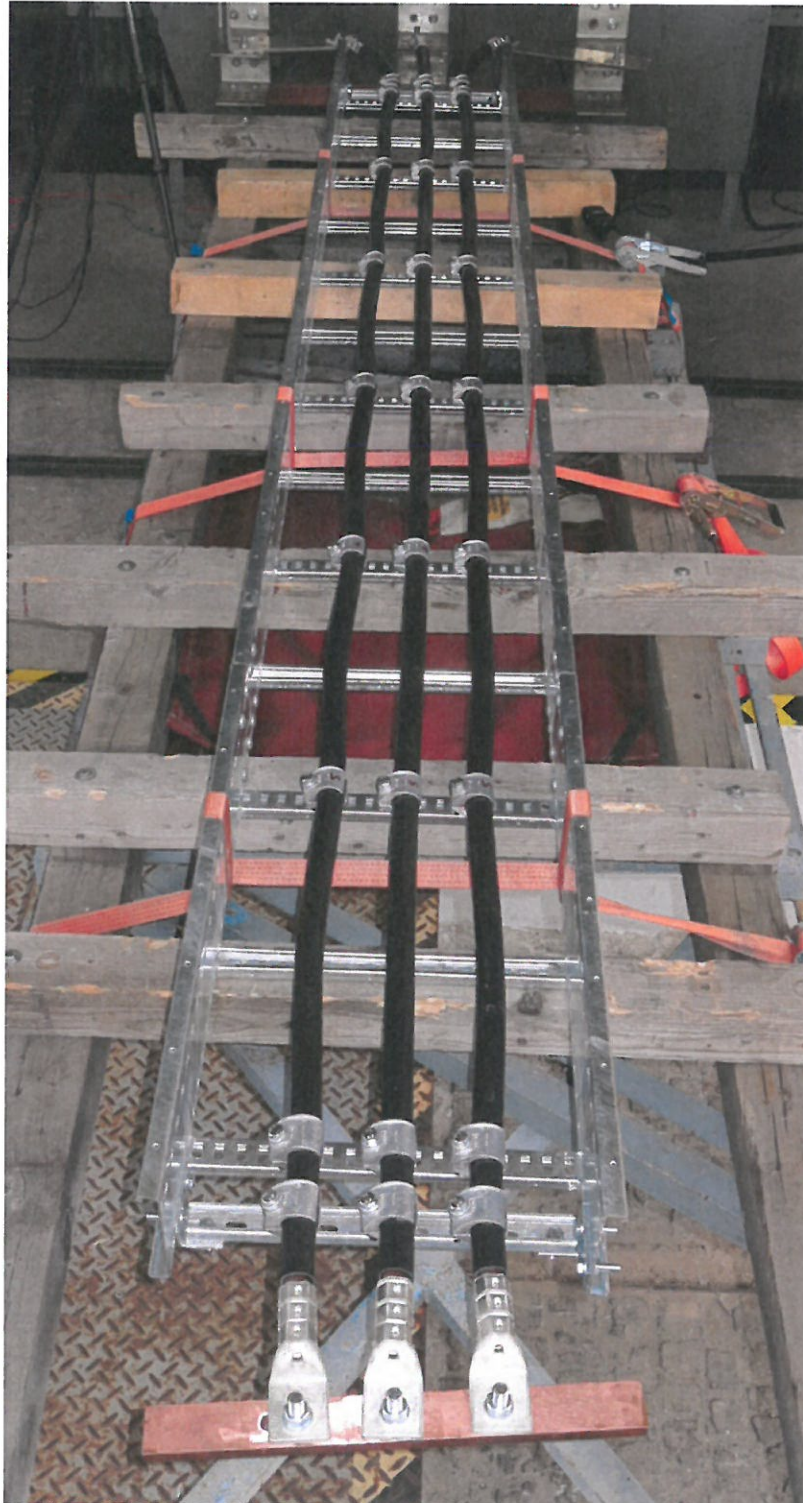
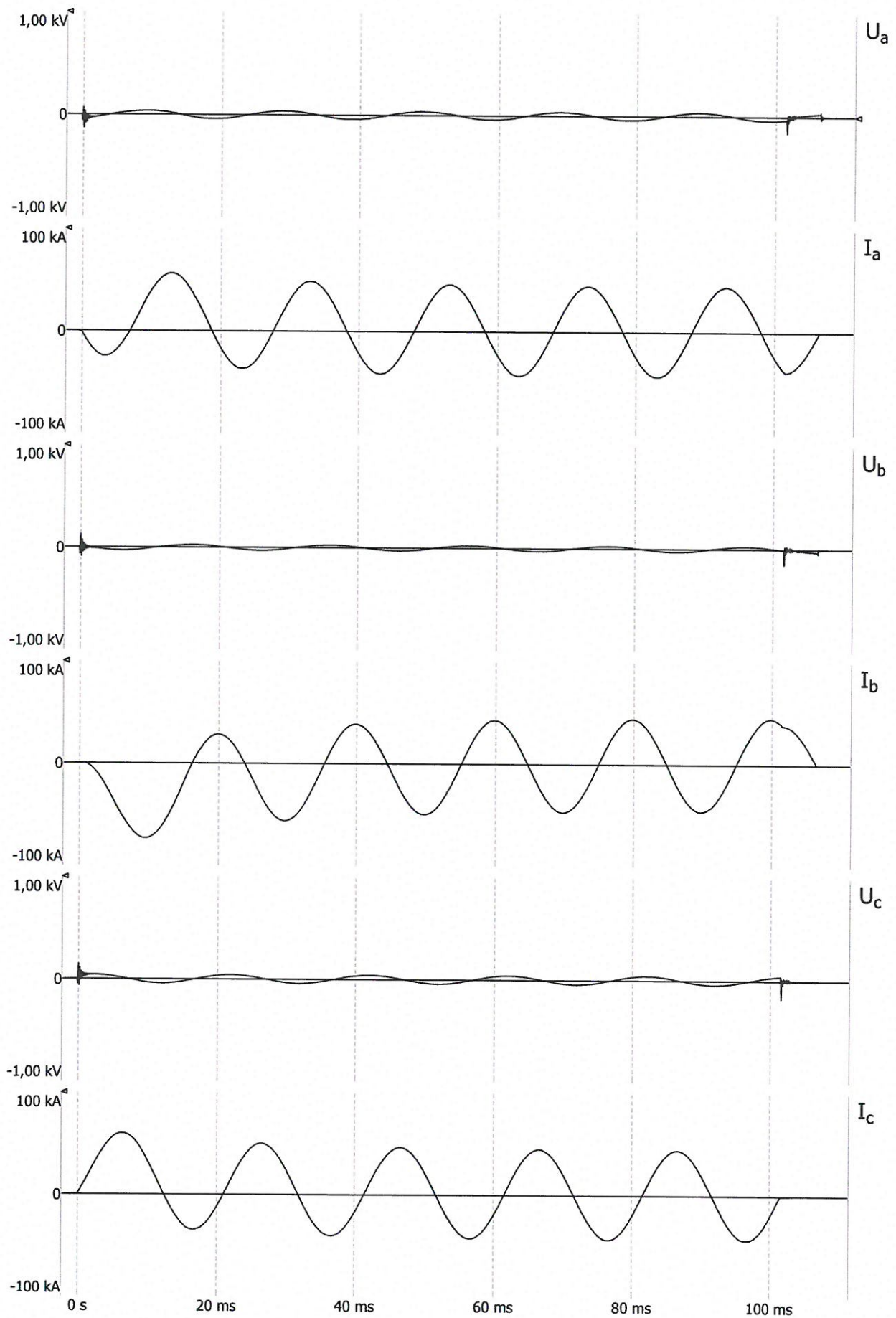


Photo 16
Condition of the test arrangement after the tests



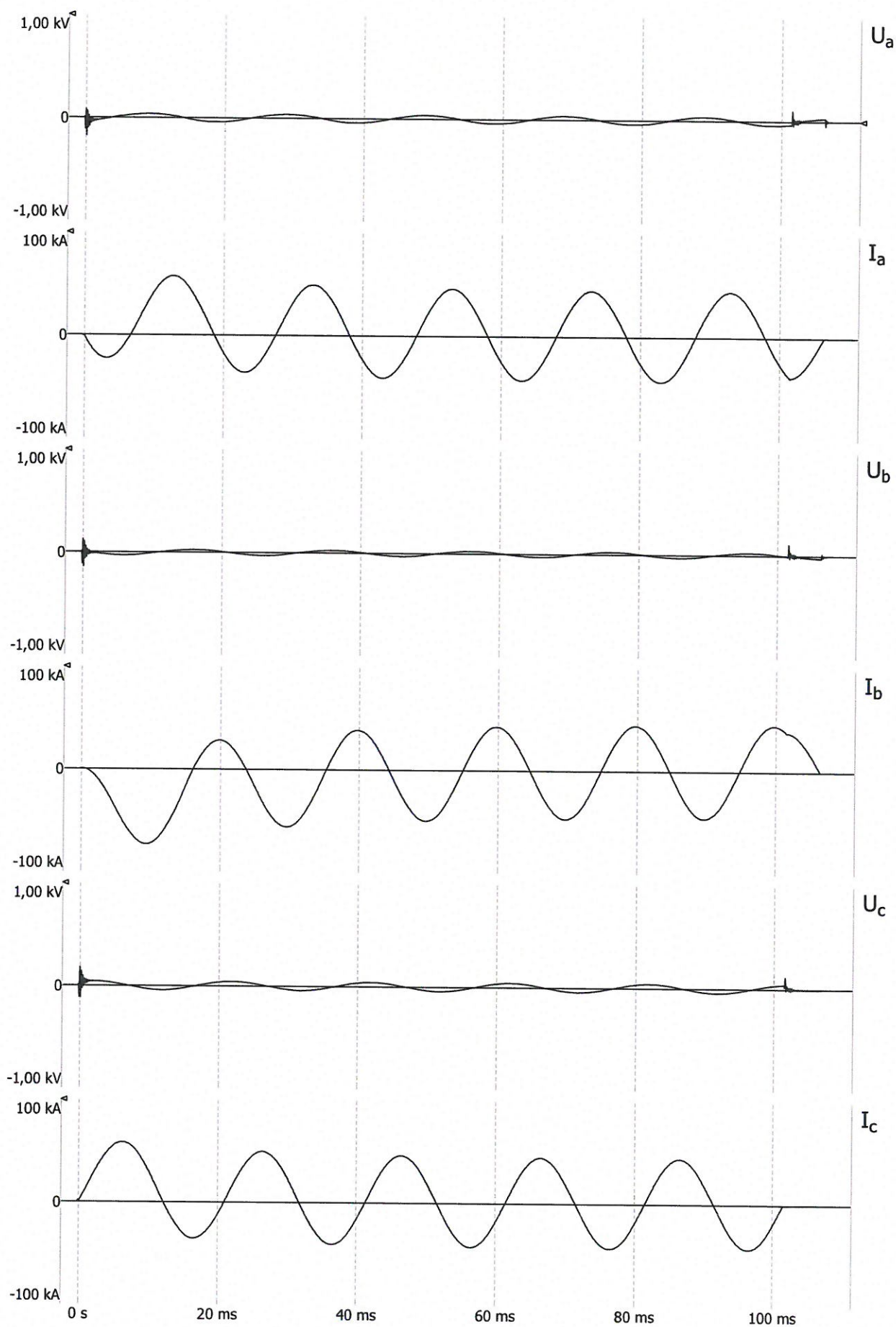
S/N(U_a):VF 0036; S/N(I_a):VF 0056; S/N(U_b):VF 0028
 S/N(I_b):VF 0057; S/N(U_c):VF 0052; S/N(I_c):VF 0058

Sample rate: 50 μ s
 Date: 05. 05. 2021.

VEIKI-VNL Ltd.
 HUNGARY - Budapest
 www.vnl.hu



Osc.No.: BME 0503
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S/N(U_a):VF 0036; S/N(I_a):VF 0056; S/N(U_b):VF 0028
 S/N(I_b):VF 0057; S/N(U_c):VF 0052; S/N(I_c):VF 0058

Sample rate: 50 μ s
 Date: 05. 05. 2021.

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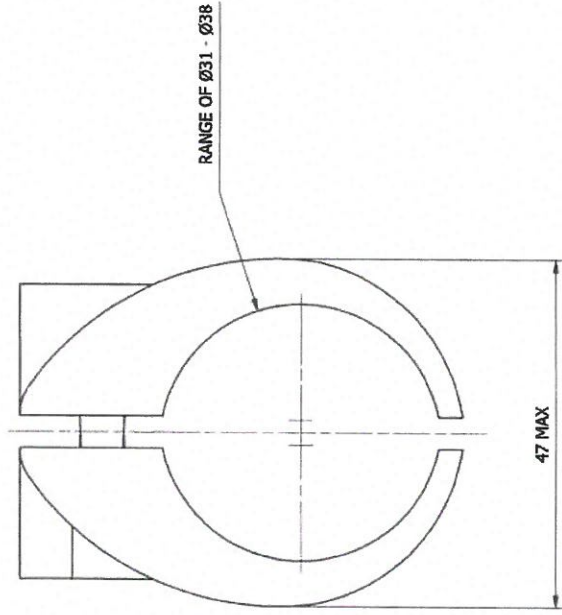
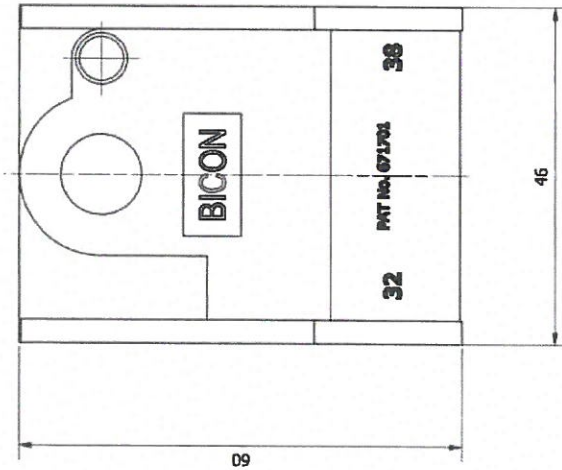


Osc.No.: BME 0504
 11900 / VNL



11900/VNL 2021 JUN 30

CS



Pyraman Studies & Systems Ltd

Oak Road

Wrexham Industrial Estate

Wrexham

LL13 9PH

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Rawlinson Jonathan
[rawljo001]
Date: 2021.05.14
10:50:25 +01'00'

TOLERANCES, UNLESS OTHERWISE STATED
LINEAR: UP TO 150mm ± 0.4 mm
OVER 150mm ± 0.8 mm
ANGLES $\pm 0.5^\circ$
SHARP EDGES REMOVED BY 0.15mm c/s
SURFACE ROUGHNESS $\sqrt{\text{ }}$

2021
THIRD ANGLE
BS 8888
ALL DIMENSIONS IN MM
UNLESS OTHERWISE
STATED
IF IN DOUBT, ASK

MATERIAL	ALUMINIUM ALLOY	MATERIAL CODE	TREATMENT	FINISH
RESPONSIBLE DEPT.	COMPONENTS	CREATED	AI	CHECKED
LM	APPROVED	JPR	DATE APPROD	14/05/2021
DOCUMENT STATUS	RELEASED	370BA07-SD	031-038	370BA07-SD
TITLE	SALES DRAWING	370BA07-SD	031-038	370BA07-SD
REV.	ISSUE DATE	14/05/21	FORMAT	A3
1	1	1	1	1

8

7

6

5

4

3

2

1

BS 7889

XLPE Insulated, PVC Sheathed Single Core Cable. BS 7889. 600/1000 V



Prysmian BS 7889 is an unarmoured industrial single core wiring cable with cross linked polyethylene insulation and PVC sheath.

KEY APPLICATIONS

Suitable for installation in areas with reduced risk of mechanical damage; on tray, in free air or clipped direct.
Suitable also for conduit and wiring installations when mechanical protection is required.

FEATURES AND BENEFITS

- Manufactured under ISO 9001 Quality management systems

STANDARDS



BS 7889
BS EN 60332-1-2

Construction Standard
Flame Propagation - Single Cable

CONSTRUCTION

Conductor material	Copper
Conductor surface	Bare
Core insulation material	XLPE
Material outer sheath	Polyvinyl chloride (PVC)
Cable shape	Round



11900 /VNL/ 2021 JGN 30.

APPLICATIONS PROPERTIES

Nominal voltage U ₀ [V]	600
Nominal voltage U [V]	1,000
Flame retardant	In accordance with BS EN 60332-1-2
Max. conductor temperature [°C]	90
Min. Operation temperature [°C]	-15
UV resistant	Yes
Outdoor installation	Yes
Min. Installation temperature [°C]	0
Max. Installation temperature [°C]	80
Bending radius (rule)	6D

COLOURS

Insulation:
Brown or Blue
Sheath:
Black

CURRENT RATINGS

Refer to table 4E1 of BS 7671 Requirements for Electrical Installations. IET Wiring Regulations

Note: Where conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature.

CONTACT INFORMATION

Prysmian Cables & Systems Limited, Chickenhall Lane, Eastleigh, Hampshire, SO50 6YU, United Kingdom
uk.prysmiangroup.com
www.whyprysmian.co.uk

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TECHNICAL DATA

Nominal cross section conductor [mm ²]	Conductor category	Nominal thickness insulation [mm]	Nominal outer diameter [mm]	Weight [kg/km]	Conductor resistance at 20° C [Ohm/km]
1.5	Class 2 = stranded	0.7	5.9	50	12.1
2.5	Class 2 = stranded	0.7	6.4	65	7.41
4	Class 2 = stranded	0.7	6.8	80	4.61
6	Class 2 = stranded	0.7	7.5	105	3.08
10	Class 2 = stranded	0.7	8.4	150	1.83
16	Class 2 = stranded	0.7	9	200	1.15
25	Class 2 = stranded	0.9	10.6	295	0.727
35	Class 2 = stranded	0.9	11.6	390	0.524
50	Class 2 = stranded	1	13.2	520	0.387
70	Class 2 = stranded	1.1	14.9	720	0.268
95	Class 2 = stranded	1.1	16.7	1,000	0.193
120	Class 2 = stranded	1.2	18.9	1,250	0.153
150	Class 2 = stranded	1.4	21	1,550	0.124
185	Class 2 = stranded	1.6	23	1,900	0.0991
240	Class 2 = stranded	1.7	26	2,500	0.0754
300	Class 2 = stranded	1.8	29	3,100	0.0601
400	Class 2 = stranded	2	33	3,100	0.047
500	Class 2 = stranded	2.2	37	5,000	0.0366
630	Class 2 = stranded	2.4	41	6,400	0.0283
800	Class 2 = stranded	2.6	46	8,300	0.0221
1,000	Class 2 = stranded	2.8	51	10,300	0.0176



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