TEST REPORT

Test object:	Heat shrink tube
Designation:	Thermo Tube 6/2 mm type heat shrink tube
Manufacturer:	**Tech-Masters Hungary Kft.** Porcelán u. 2., 1106 Budapest, **HUNGARY**
Tested for:	**Tech-Masters Hungary Kft.**
Date of tests:	08th September, 2021
Project ID:	NFL-23/2021
Order/Contract:	according to quotation of 0642/2021 dated 05.08.2021
Test specification:	**IEC 60243-1:2013 Sub-Clauses 5.2.4 and 10.1**
Tests performed:	The test object, constructed in accordance with the description, drawings and photographs incorporated in this report has been subjected to **electric strength test**.
Test results:	**The test results can be seen in Page 4.**

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

The 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 8 pages in total (7 numbered pages and 1 page document).

Budapest,
15th September, 2021

Dorián Irinyi	Csaba Homok	Balázs Varga
responsible for the test	supervised by	head of laboratory

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NAH-1-1251/2019
TESTING LABORATORY

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

1 STL Type Test Certificates 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 was 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

Valid from 03Feb2020

Ratings/characteristics assigned by the manufacturer:

Designation:	Heat shrink tube
Type:	Thermo Tube 6/2 mm
Manufacturer:	Tech-Masters Hungary Kft.
Temperature resistance:	-55 °C - +125 °C
Dielectric resistance:	$\geq 10^{13}$ Ω
Shrinking temperature:	110 °C
Shrinking ratio:	3/1

The tests were carried out in accordance with the following standards:

IEC 60243-1:2013	Electric strength of insulating materials – Test methods – Part 1: Tests at power frequencies
IEC 60060-1:2010	High voltage test techniques. – Part 1: General definitions and test requirements

Requirements of manufacturer or purchaser:

The test was carried out according to Sub-Clause of 5.2.4 of IEC 60243-1:2013.
The average breakdown voltage value shall be higher than 12 kV/mm regarding the Client's request.

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

*Technical data sheet (1 page) REV.: - Date: -

*This drawing is attached to this document.

Present at the tests in charge of manufacturer or purchaser:

-

TESTS PERFORMED ON THE TEST OBJECT

No.	Description	Relevant clauses of the standard
1	Electric strength test	Sub-Clause 5.2.4 of IEC 60243-1:2013

DESCRIPTION OF THE TESTS

The electric strength test was performed on ten 30-30 mm long Thermo Tube 6/2 mm type shrink tubes using the test method prescribed by Sub-Clause 5.2.4 of IEC 60243-1:2013 according to the Client's request. The marking of 6/3 mm on the test object is not correct based on the Manufacturer's information.

1 Electric strength test

The test object can be seen in Photos 1-2 and the test arrangement is shown in Photo 3.

1.1 Test method and parameters

During the test a 25 mm wide band of copper foil was used as an outer electrode while the inner electrode was a copper rod with 3.88 mm in diameter. The tested shrink tubes were 30 mm long and were well shrunk to the inner electrode. The thickness of the shrink tube on the copper rod was measured in five points in case of each test object. Ten fully prepared test objects were tested one by one immersed into an oil tank. During the test the rate of voltage rise was 500 V/s until breakdown occurred. Each breakdown voltage was recorded, and the average of these values was calculated.

According to the Client's request the average value shall be higher than 12 kV/mm.

1.2 Test results

The results of the electrical strength test can be seen in Table 1.

It can be stated that the individually measured values and the average of the measured breakdown voltage values are also higher than the specified acceptance criteria, therefore the test objects passed the test.

Table 1
Results of the tests

No. of the samples	Measured breakdown voltage value [kV_{rms}]	Average thickness of the prepared shrink tube [mm]	Calculated electric strength [kV_{rms}/mm]
1st	23.8	0.809	29.42
2nd	23.4	0.825	28.36
3rd	23.0	0.837	27.48
4th	25.0	0.809	30.90
5th	22.8	0.815	27.98
6th	21.1	0.818	25.79
7th	23.3	0.823	28.31
8th	24.2	0.823	29.40
9th	26.5	0.809	32.76
10th	24.4	0.836	29.19
		Average:	**28.96**

2 Uncertainty of measurements

Measured parameter	Uncertainty
Power-frequency voltage	± 1.0 %

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.

3 Measuring devices used for the tests

No.	Designation	Manufacturer	Type	S/N
[1]	Voltage divider	TUR	MCF 120/150P	859840
[2]	Termination	TUR	H 90	890708
[3]	Voltmeter	SIEMENS	MU-15	880019

PHOTOS

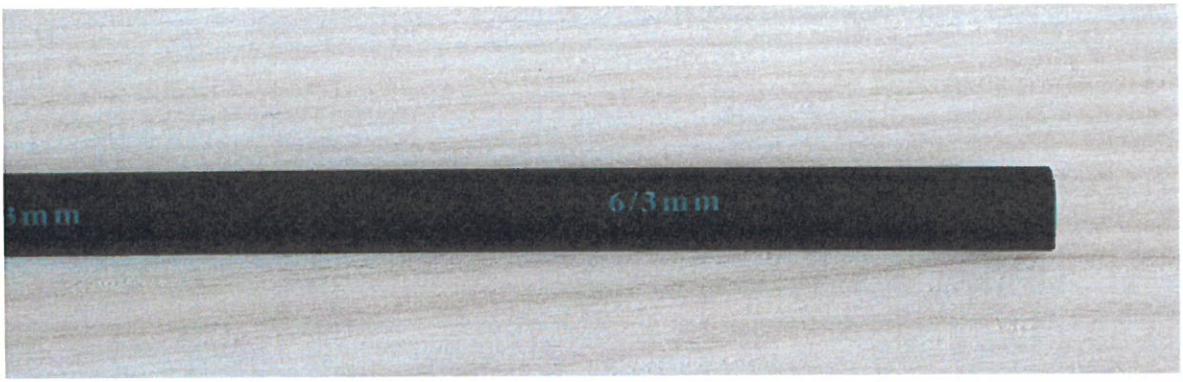


Photo 1
The test object

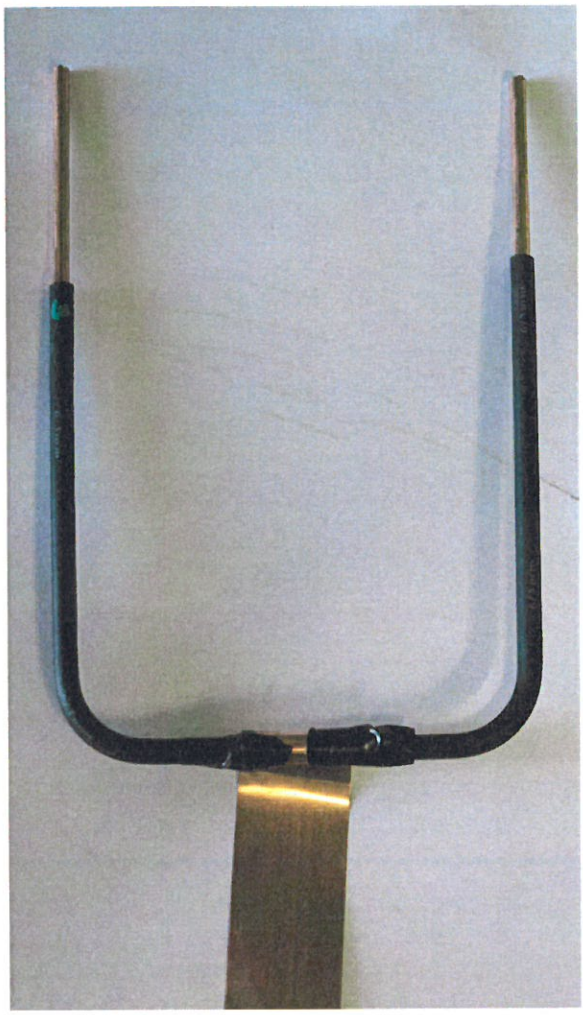


Photo 2
The test object prepared for the test

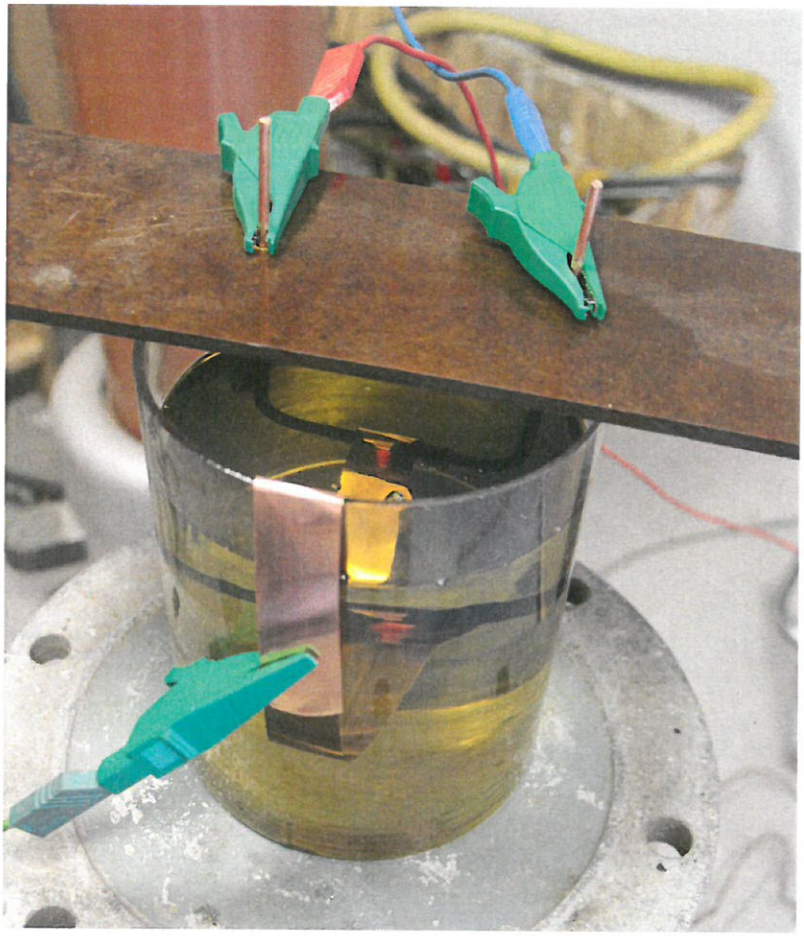


Photo 3
Test arrangement

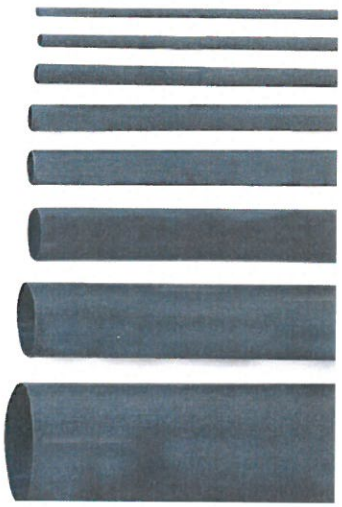
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TTU

THERMO TUBE

CSÚCSTECHNOLÓGIÁJÚ KETTŐSFALÚ RUGALMAS ZSUGORCSŐ

- Az olvadóragasztónak köszönhetően tömíti és védi a kapcsolódó elemeket
- Víz- és párazáró kötést hoz létre
- Zsugorodás után is flexibilis marad
- Közvetlenül használható réz, alumínium, acél, egyéb fémeken, műanyagokon (PE)
- Mindenfajta formához kiválóan alkalmazkodik
- Alacsony zsugorodási hőmérséklet
- Lángálló
- Magas UV állóság
- Magas kémiai ellenállás
- Rágcsáló elleni védekezéshez is
- RoHS megfelelőség



ÁLTALÁNOS TUDNIVALÓK

A THERMO TUBE egy univerzális, csúcstechnológiás, koextrudált poliolefin alapú, dupla falú zsugorcső, olvadó ragasztóval és tömítőanyaggal kombinálva. A THERMO TUBE az alkalmazások széles skáláját kínálja, ahol az alkatrészek és összeköttetések mechanikai védelmére, vagy nedvességállóságára van szükség.
A THERMO TUBE melegítés hatására 3/1 arányban zsugorodik. A hő hatására a ragasztó megolvad és tömítőanyaggá alakul, amely így megvédi az alkatrészt a víztől, nedvességtől és a vegyi anyagoktól.
Alacsony zsugorodási hőmérsékletének köszönhetően a THERMO TUBE könnyen alkalmazható. Magas hőállósággal rendelkezik. A magas zsugorodási aránya miatt nyolc különböző átmérő mérettel szinte az összes alkalmazást lefedi.

TECHNIKAI ADATOK

Hőmérséklet ellenállás: -55°C-tól +125°C-ig
Zsugorodási hőmérséklet: 110°C
Zsugorodási arány: 3/1
Hosszirányú zsugorodás (ASTM D 2671): ≤5%
Szakítószilárdság (ASTM D 638): ≥12 MPa
Zsugorodás utáni szakítószilárdság (158°C, 168 óra): ≥90%
Szakadási nyúlás: ≥400%
Zsugorodás utáni szakadási nyúlás (158°C, 168 óra): ≥300%
Hősokk ASTM D 2671: nincs károsodás
Alacsony hőmérsékletű rugalmasság (-55°C, 4 óra): nincs károsodás
Rugalmasság: hajlékony
Dielektromos erősség ASTM D 2671: 2500 V, 60 sec. (nincs meghibásodás)
Dielektromos ellenállás: $\geq 10^{13}$ Ohm
Tűzállóság UL 224: megfelelt
Rézkorrózió: nem korrodál
Folyadék ellenállás ISO 37 alámerítés 23°C, 24 óra:
- Hidraulika folyadék (H-525): kiváló
- Kenőolaj (O 149): jó
- Dízel folyadék (F54): jó

ALKALMAZÁSI TERÜLETEK ÉS HASZNÁLAT

- Minden elektromos alkalmazásnál (kábelek - kábelek összekötése - csatlakozások) használható szigetelésre, védelemre és tömítésre. Vegyszerek érintkezésekor is megfelelő védelmet biztosít. Nem ellenálló az alkáliföldfémekkel szemben.
- Védi a fém csöveket a korróziótól és a kopásoktól.
- Vezetékek és alkatrészek szigetelése és védelme.
- Vezetékek lezárása.
- Vezetékhasadások megerősítése.
- Elektrolitikus korrózió megelőzése.
- Gépjárművek elektromos alkatrészeinek szigetelése és védelme.
- Koaxiális kábelcsatlakozók védelme.
- Rágcsálók elleni védekezés.
- Szintetikus folyadék-, üzemanyag- és hidraulikaolajálló alkalmazások.

Cikkszám	Termék neve	Kiszerelés	Anyagtípus
T800030	Thermo Tube 3/1 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800045	Thermo Tube 4,5/1,5 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800060	Thermo Tube 6/2 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800090	Thermo Tube 9/3 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800120	Thermo Tube 12/4 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800190	Thermo Tube 19/6,3 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800240	Thermo Tube 24/8 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK
T800400	Thermo Tube 39/13 mm	1220 mm	ELEKTROMOS SZERELŐANYAGOK

FIGYELMEZTETÉS

Az itt szereplő információkat, a képeket is beleértve, a legnagyobb gondossággal adtuk meg. A felhasználónak a termék alkalmasságát az adott felhasználási területen ki kell próbálni. Az adott információkat csak útmutatónak szánjuk a biztonságos kezeléshez, felhasználáshoz, tároláshoz, szállításhoz és hulladék-megsemmisítéshez, nem tekinthető garanciának/minőségi specifikációnak. Az információk csak a fenti termékre vonatkoznak, és nem érvényesek, ha az anyagot más anyaggal kombinálva, más eljárás szerint használják, mint amit megadtunk, továbbá cégünk nem felel a helytelen használat során keletkezett károkért.

12123 VNL 2021 SZEPT 15.



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