

## Test report

**No.:** 14\_379-2

**Version:** 2/2

**Customer** : Nexans Italia S.p.A.  
Contrada Tesino 181/B  
63073 Offida (AP) Italy

**Test object** : Heat shrinkable indoor termination 18/30 (36) kV

**Type** : 3x36MONOi1.240  
**Manufacturer** : Nexans Italia S.p.A.  
**Date of receipt** : 19.03.2015

**Date of test** : 20.03.2015 – 21.09.2015

**Applied test regulations** : DIN VDE 0278-629-1:2009-07 (HD 629.1 S2:2006)


**Test carried out** : Type test according to DIN VDE 0278-629-1(HD 629.1 S2):2009-07,  
table 3, test series A1 and A3.

**Test result** : The heat shrinkable indoor terminations 18/30 (36) kV, type  
3x36MONOi1.240 manufactured by Nexans Italia.S.p.A. passed the  
type test according to DIN VDE 0278-629-1(HD 629.1 S2):2009-07,  
table 3, test series A1 and A3.

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Dortmund, 22.10.2015

  
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Report No. 14\_379-2 contains 9 pages and 4 annexes.

\*) not in scope of accreditation. Scope of accreditation and type of documentation see overleaf.  
Test results in this report are only valid for the tested objects. A partly duplication or publication is not allowed without written permission by RWE Eurotest. The authenticity of this report is only ensured with RWE-coinage on the first page.

## Summary

RWE Eurotest GmbH performed type tests according to DIN VDE 0278-629-1 (HD 629.1 S2):2009-07, table 3, test series A1 and A3 on a heat shrinkable indoor termination 18/30 (36) kV, type 3x36MONOi1.240 manufactured by Nexans Italia.S.p.A.

The heat shrinkable indoor termination 18/30 (36) kV, type 3x36MONOi1.240 manufactured by Nexans Italia.S.p.A. passed the type test according to DIN VDE 0278-629-1 (HD 629.1 S2):2009-07, table 3, test series A1 and A3.

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**Annex:**

01 Installation instruction of the indoor termination	(6 pages)
02 Test at increased temperature (calibration)	(1 page)
03 Electrical heat cycling in air	(1 page)
04 Impulse withstand voltage test	(2 pages)

## 1. Applied test regulations

### **DIN VDE 0278-629-1 (VDE 0278-629-1):2009-07**

Test requirements on accessories for use on power cables of  
rated voltage from 3.6/6 (7.2) kV up to 20.8/36 (42) kV

Part 1: Cables with extruded insulation;  
German version HD 629.1 S2:2006-02 + A1:2008

## 2. Technical data of the test object

### **Heat shrinkable indoor termination:**

Manufacturer:	Nexans Italia.S.p.A.
Type:	36MONOi1.240
Nominal voltage $U_0/U$ :	18/30 (36) kV
Nominal frequency:	50 Hz
Number of phases:	1
Cross section of conductor:	185 mm <sup>2</sup>
Installation instructions:	See annex 01

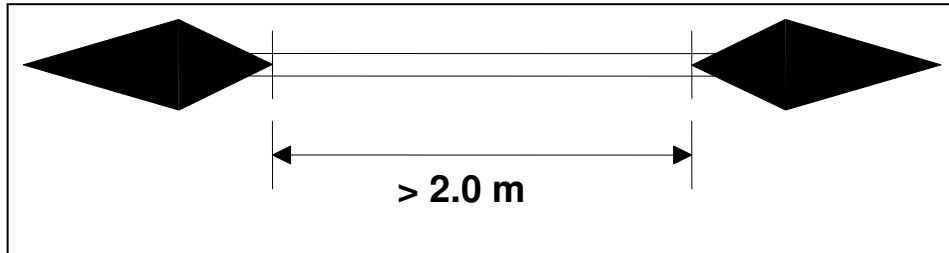
### **Test cable:**

Manufacturer:	NEXANS
Cable type:	ARE4H1RX 18/30 kV
Rated voltage $U_0/U$ :	18/30 kV
Construction:	1-core
Conductors:	Aluminum, stranded, round, 185 mm <sup>2</sup>
Insulation:	XLPE
Year of manufacture:	2012

**Structure of the test lengths**

The test objects for the test series A1 were mounted by the client. A total of 2 test lengths were mounted (see figure 1).

Test sequence A1, 2 test loops with 4 samples (indoor terminations)



*Figure 1: Structure of the test lengths*

The test objects for the test series A3 were mounted by the client. A total of 2 test lengths were mounted (see figure 1).

Test sequence A3, 2 test loops with 4 samples (indoor terminations)

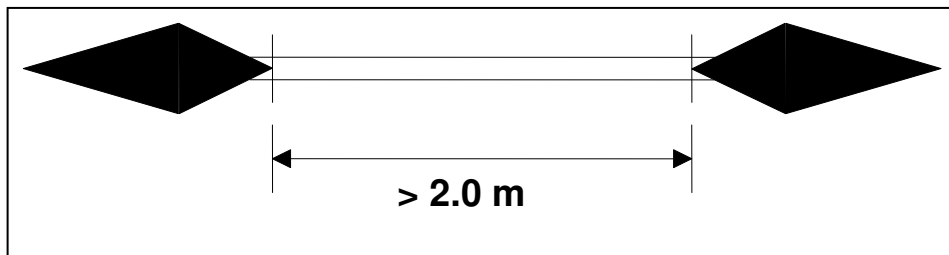


Figure 2: Structure of the test lengths



Figure 3: Test set up of the humidity test

### 3. Test and measuring equipment

Equip.-No.	cal.	Equipment	Type	Manufacturer
ET-107		High voltage transformer	WOF	Fischer
ET-113		Variable transformer	LT/ R	Fischer
ET-120		DC voltage system	T 26/ 110	HDW- Elektronik
ET-399	*	DC voltmeter	DGM	Messwandler Bau
ET-444		High current actuator coil	EREH	Ruhrstrat
ET-462	*	Load cycle test bay control unit	70 KV/2000A	VEW EUROtest
ET-463	*	Salt spray test bay control unit	30 KV/2000A	VEW EUROtest
ET-513	*	Partial discharge impulse calibrator	CAL1A	Power Diagnostix System
ET-740	*	1200 kV impulse voltage test system	1200 kV-Stoßteiler&MIA 100-14/	HIGHVOLT Prüftechnik Dresden
ET-741	*	600 kV AC voltage test system	Obersp.-teil/MC 2720-4/MU 18	HIGHVOLT Prüftechnik
ET-835	*	Digital PD Measuring System	PD-Smart / PD-Smart UHF	Doble Lemke
ET-095		Impulse generator	Stoßspannungsgenerator	Micafil
ET-462-Strom	*	Current measurement system (Load cycle test bay 2)	70 KV/2000A	VEW EUROtest

\*) Measuring equipment is calibrated based on national and international reference standards. Calibration certificates can be inspected on request.

*Table 1: Test and measuring equipment*

The measurement uncertainty of the measuring instruments has been calculated and is archived by RWE Eurotest. Documents can be inspected on request.

#### 4. Tests carried out and results

##### Tests at increased temperature (calibration)

The heating current for tests at increased temperature (see annex 02) was ascertained at a cable length of 6 m.

The calibration was carried out according to DIN EN 61442 (VDE 0278-442):2006-01 annex A, section A 3.2 method 2: "Tests based on measurement of the external surface temperature". The application and arrangement of the thermocouples were realized according to DIN EN 61442 (VDE 0278-442):2006-01 annex A, figures A1 and A2.

The tests on the heat shrinkable indoor terminations were performed in order given by DIN VDE 0278-629-1, table 3. The results are summarized in table 2 (test series A1) and in table 3 (test series A3).

DIN VDE 0278-629-1, table 3, test series A1					
	Test	<sup>1)</sup>	Test requirement	Test requirement met	Annex
1	DC voltage dry withstand	5	15 min at $6 U_0$ <sup>2)</sup>	No breakdown	
2	AC voltage dry withstand	4	5 min at $4.5 U_0$ <sup>2)</sup>	No breakdown	
3	Partial discharge at ambient temperature	7	max 10 pC at $2 U_0$ <sup>2)</sup>	ok	
4	Impulse voltage at increased temperature	6	10 impulses of either polarity with 170.0 kV	No breakdown	
5	Electrical heat cycling in air	9	126 cycles at $2.5 U_0$ <sup>2)</sup> (90 °C +0 to 5 K)	No breakdown	03
6a	Partial discharge at ambient temperature	7	max 10 pC at $2 U_0$ <sup>2)</sup>	ok	
6b	Partial discharge at increased temperature	7	max 10 pC at $2 U_0$ <sup>2)</sup>	ok	
10	Impulse voltage at ambient temperature	6	10 impulses of either polarity with 170.0 kV	No breakdown	04
11	AC voltage dry withstand	4	15 min at $2.5 U_0$ <sup>2)</sup>	No breakdown	
13	Examination		Carried out	No corrosion No humidity	

1) Tests acc. to DIN EN 61442 (VDE 0278-442):2006-01 section  
2)  $U_0 = 18.0$  kV

Table 2: Test results series A1



DIN VDE 0278-629-1, table 3, test series A3					
	Test	<sup>1)</sup>	Test requirement	Test requirement met	Annex
12	Humidity test	5	300 h at 1.25 $U_0$ <sup>2)</sup>	Less than 3 breakdowns	
17	Examination		Carried out	No corrosion No humidity	
1) Tests acc. to DIN EN 61442 (VDE 0278-442):2006-01 section 2) $U_0 = 18.0$ kV					

Table 3: Test results series A3

## 5. Overall result

The heat shrinkable indoor termination 18/30 (36) kV, type 3x36MONOi1.240, manufactured by Nexans Italia.S.p.A. passed the type test according to DIN VDE 0278-629-1(HD 629.1 S2):2009-07, table 3, test series A1 and A3.

**- End of report -**

Components list N. DOM43071



36 kV SINGLE CORE HEAT SHRINKABLE INDOOR TERMINATION  
FOR XLPE, COPPER WIRE SCREEN CABLE

NEXANS type: 36MONOi1.240

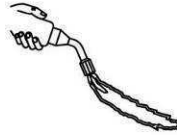
Section: 70÷240mm<sup>2</sup>

Q.ty	Description	Code
1	Component list	DOM 43071
1	Installation instruction	IM1933I
	<u>1 Kit consisting of</u>	<u>CFZ2700</u>
1	Stress relief mastic (L= 300 mm)	MACD38
1	HS mono tube (L= 420 mm)	GT12-60T
3	Red antitracking mastic tape (L= 500 mm)	MBA25-0,5
1	Abrading cloth	
1	PVC tape (L= 5 m)	NAE19-5
1	<u>OPTIONAL:</u> Mechanical lug	C70-240x12

Drawn MF	Checked GF	Date 18.08.2015	Update
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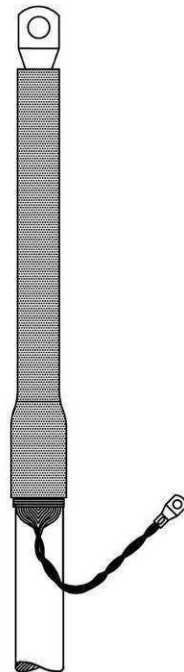
## INSTALLATION INSTRUCTION

**IMPORTANT:**  
 Adjust torch to give a soft blue flame with yellow tip.  
 Heatshrink tubes uniformly avoiding wrinkles along the surface.  
 Keep the flame moving continuously and maintain adequate distance to avoid over heating.

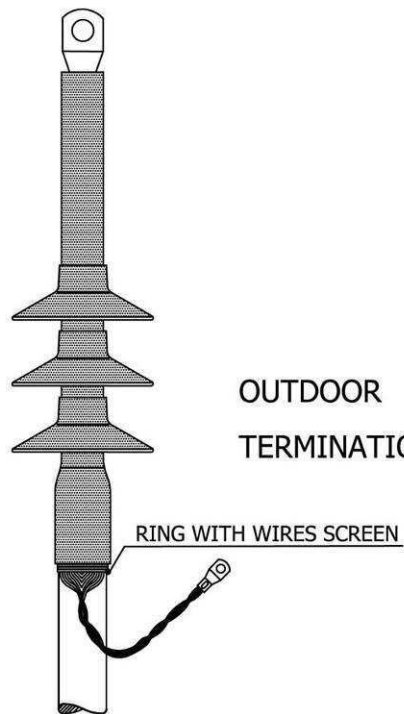


This product should be installed by competent personnel familiar with electrical equipment and safe operating practices. Parts contained in this kit should be visually inspected for possible damage and installed in accordance with these instructions. These instructions are not intended as a substitute for adequate training and experience.

**INDOOR  
 TERMINATION**

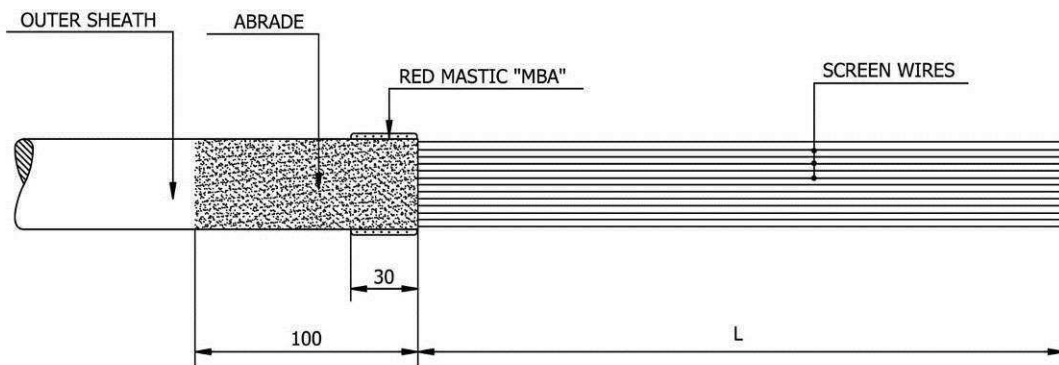


**OUTDOOR  
 TERMINATION**



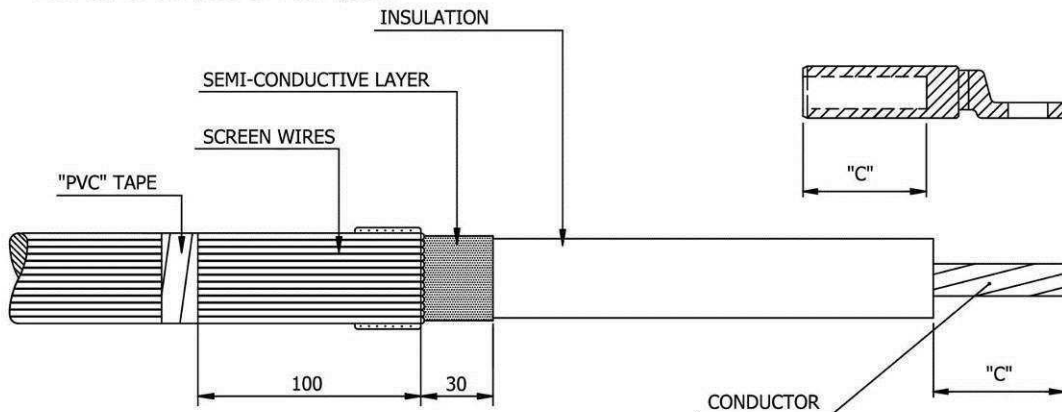
<b>type</b> ..MONO I/E ...	<b>denomination</b> INDOOR / OUTDOOR SINGLE CORE HEATSHRINKABLE TERMINATION			
<b>TYPE OF CABLE:</b>	Solid insulation (XLPE-HEPR)			
<b>SECTION:</b>	16 ÷ 1200 mm <sup>2</sup> Cu/Al			
<b>TYPE OF SCREEN:</b>	Copper wires			
<b>VOLTAGE:</b>	Max 36 kV			
<i>The company reserves the right to alter or modify the information in this document at any time in the light of technical or any other developments.</i>				
	<b>prepared by</b>	<b>checked by</b>	<b>approved by</b>	
	<b>first issue</b> 23.04.13	<b>rev.</b> 05.09.14	<b>IM1778AI</b>	

## 1. CABLE PREPARATION (COPPER WIRES SCREEN)

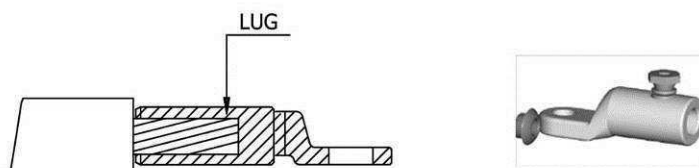


TYPE	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR
VOLTAGE U <sub>0</sub> /U (kV)	6/10	6/10	12/20	12/20	18/30	18/30
L (mm)	230	360	290	420	380	440

- 1.1 Prepare the cable and cut the exceeding length.
- 1.2 Remove the outer sheath for the length "L" (SEE TABLE).  
Abrade the outer sheath for 100mm and clean.
- 1.3 Apply a layer (20% overlap) of red mastic "MBA" for 30mm length from cut outer sheath as shown in the picture.  
Take half of one piece of "MBA" patch.



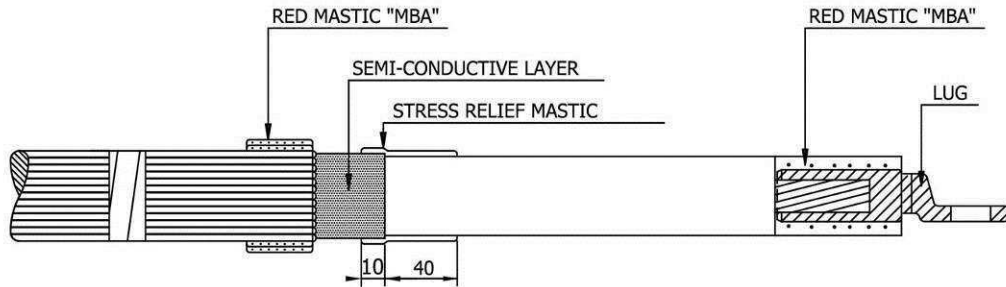
- 1.4 Fold back the copper screen wires and fix them at 100mm from cut sheath with "PVC" tape.
- 1.5 Remove the semi-conductive layer leaving 30mm out of the outer sheath taking care not to damage the insulation.
- 1.6 Bare the conductor for the length "C" mm. ("C"= inside depth of lug).



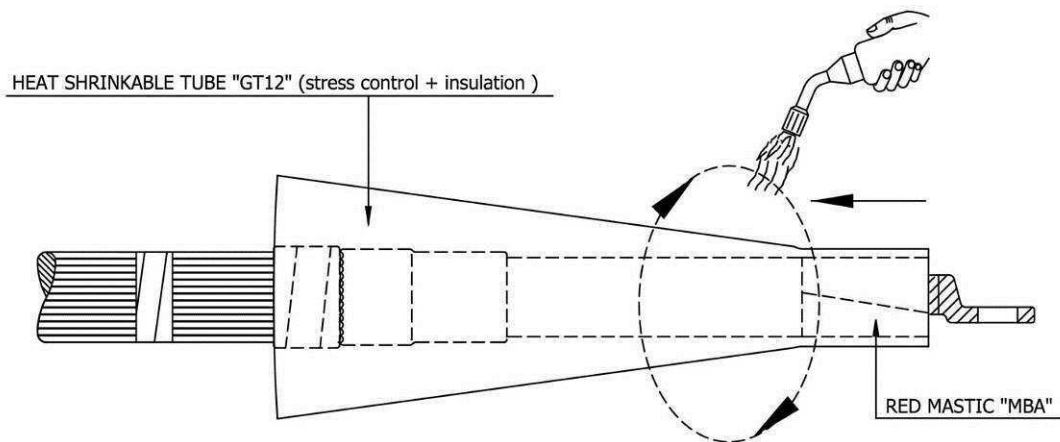
- 1.7 Position the lug and crimp it OR break the screws in case of bolted type.  
Fill the cavities with red mastic "MBA".

**Nexans**

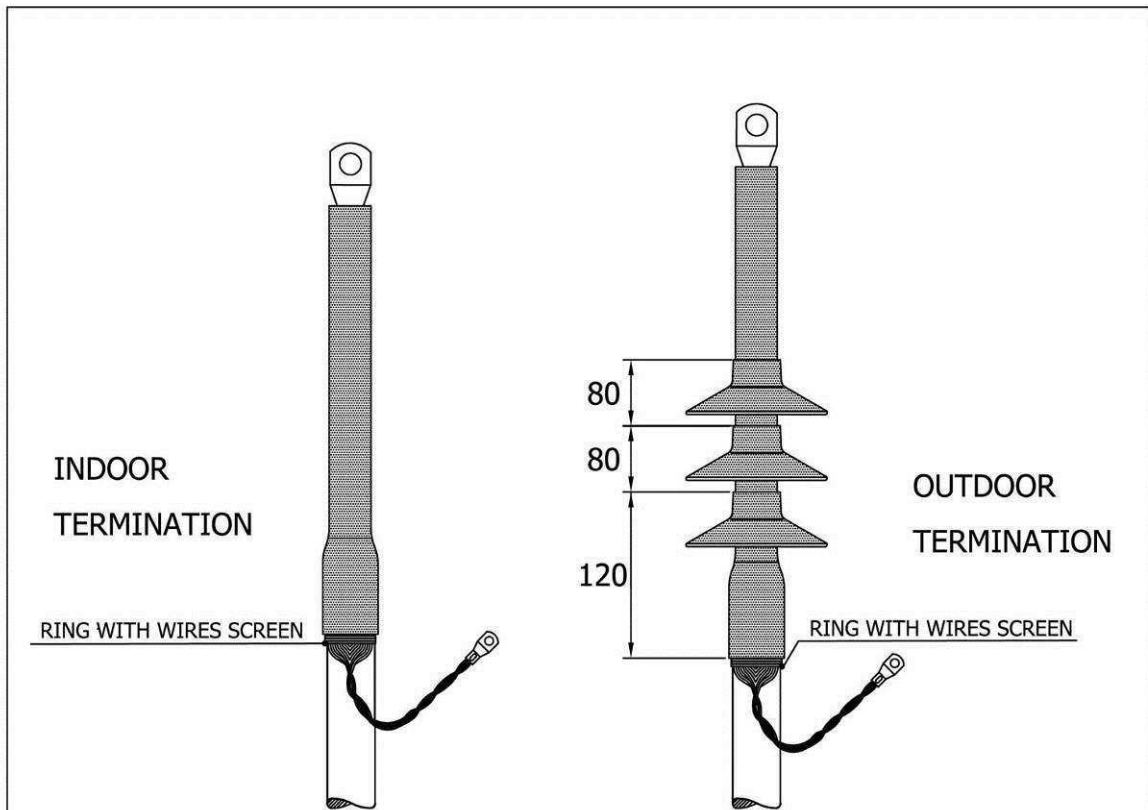
IM1778Ai Sheet 2/4



- 1.8 Apply a layer of red mastic "MBA" over the screen wires covering the previous layer of "MBA" tape.  
Use the remaining half of one piece of "MBA" patch used in the previous layer.
- 1.9 Apply one layer of stress relief mastic covering the semi-conductive layer for 10mm and the cable insulation for 40mm. (Lightly stretching it, 50% overlap).
- 1.10 Apply the red mastic patch "MBA" around the lug barrel.



- 1.11 Slide the red tube "GT12" (Stress control + insulation) till the TOP edge of red mastic "MBA" applied over the cable lug and start heatshrink from the top downwards.



- 1.12 Remove the PVC tape previously applied on the screen wires and split them into two parts; wrap the wires at the bottom of shrunk tube (one round) . making a ring. Twist the screen wires, cut straight and crimp OR screw the grounding lug.

### INDOOR TERMINATION IS FINISHED

- 1.13 Slide the first antitracking shed at 120mm from the bottom edge of shrunk tube and heatshrink. Slide all the remaining sheds and heatshrink. Different number of sheds and tail lengths available upon request.

### THE TERMINATIONS ARE READY TO BE ENERGIZED

**Nexans**

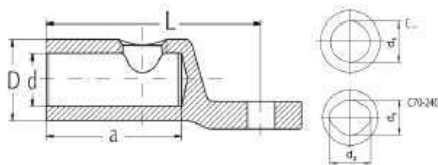
IM1778Ai Sheet 4/4



**Schraubkabelschuh, zentrisch  
mit 1 bis 4 Abreißkopfschrauben**  
*Mechanical Cable Lugs, centric  
with 1 to 4 shear-off-head bolts*



**C 95-240**



**Werkstoff:**

Verbinderkörper: Alu-Legierung  
Schrauben: Messing,  
galvanisch  
verzinkt, mit  
Innen- u. Außen-  
sechskant bzw.  
Alu-Legierung

**Material:**

Connector Body: high strength  
aluminum alloy  
Bolts: brass, tin-plated,  
with inner and  
outer hexagon or  
aluminum alloy

**Oberfläche:**

Verbinderkörper: galvanisch  
verzinkt

**Surface:**

Connector Body: tin-plated

**Zentrierringe:**

zur  
Leiterzentrierung  
liegen Zentrierringe  
bei.

**Center rings:**

center rings are  
enclosed for  
centric conductor  
positioning

Die Verbinder sind mit Kontaktfett  
gefüllt und in Plastikfolie eingeschweißt.

Connector filled with compound  
and sealed in plastic.

Listen-Nr. Cat. no.	AL in mm <sup>2</sup> AL in mm <sup>2</sup>			CU in mm <sup>2</sup> CU in mm <sup>2</sup>		Anzahl der Schrau- ben Number of bolts	Maße in mm Dimensions mm				Laschen- bohrung mm Palm hole mm	Werkzeug Außen- & Innen- Sechskant Tool/ outer and inner hexagon
	rm(v) round stranded	re round solid	sm sector stranded	rm(v) round stranded	sm sector stranded		L	d <sub>1</sub>	D	a		
C 16-95 x 12	16-95	16-95	25-70	16-95	25-70	1	60	12,5	24	32	13	SW13 & SW6
C 16-95 x 16											17	
C 50-150 x 12	50-150	50-150	50-120	35-120	50-120	1	79	15,5	30	35	13	SW17 & SW6
C 50-150 x 16											17	
C 70-240 x 12	70-240	70-240	70-240	70-240	70-240	2	93,5	22 <sup>1)</sup>	35	56	13	SW19 & SW6
C 70-240 x 16											17	
C 95-240 x 12	95-240	95-240	95-185	95-240	95-185	2	95	20	33	56	13	SW19 & SW6
C 95-240 x 16											17	
C 120-300 x 12	120-300	120-300	120-240	120-300	120-240	2	105	25	38	67	13	SW22 & SW6
C 120-300 x 16											17	
C 185-400 x 12	185-400	185-240/400	185-300	185-400	185-300	3	120	26	42	82	13	SW22 & SW6
C 185-400 x 16											17	
C 300-500 x 12	300-500	300-500	300-400	300-500	300-400	3	130	34	52	94	13	SW24 & SW8
C 300-500 x 16											17	
C 300-500 x 20											21	
C 400-630 x 12	400-630	400-630	400-500	400-630	400-500	3	130	34	52	94	13	SW24 & SW8
C 400-630 x 16											17	
C 400-630 x 20											21	
C 630-1000 x 20	630-1000	630-1000		630-800		4	165	41	65	105	21	SW22 & SW8

<sup>1)</sup> Maß d<sub>2</sub> = 26

<sup>1)</sup> Dimension d<sub>2</sub> = 26

**Andere Laschenbohrungen auf Anfrage.**

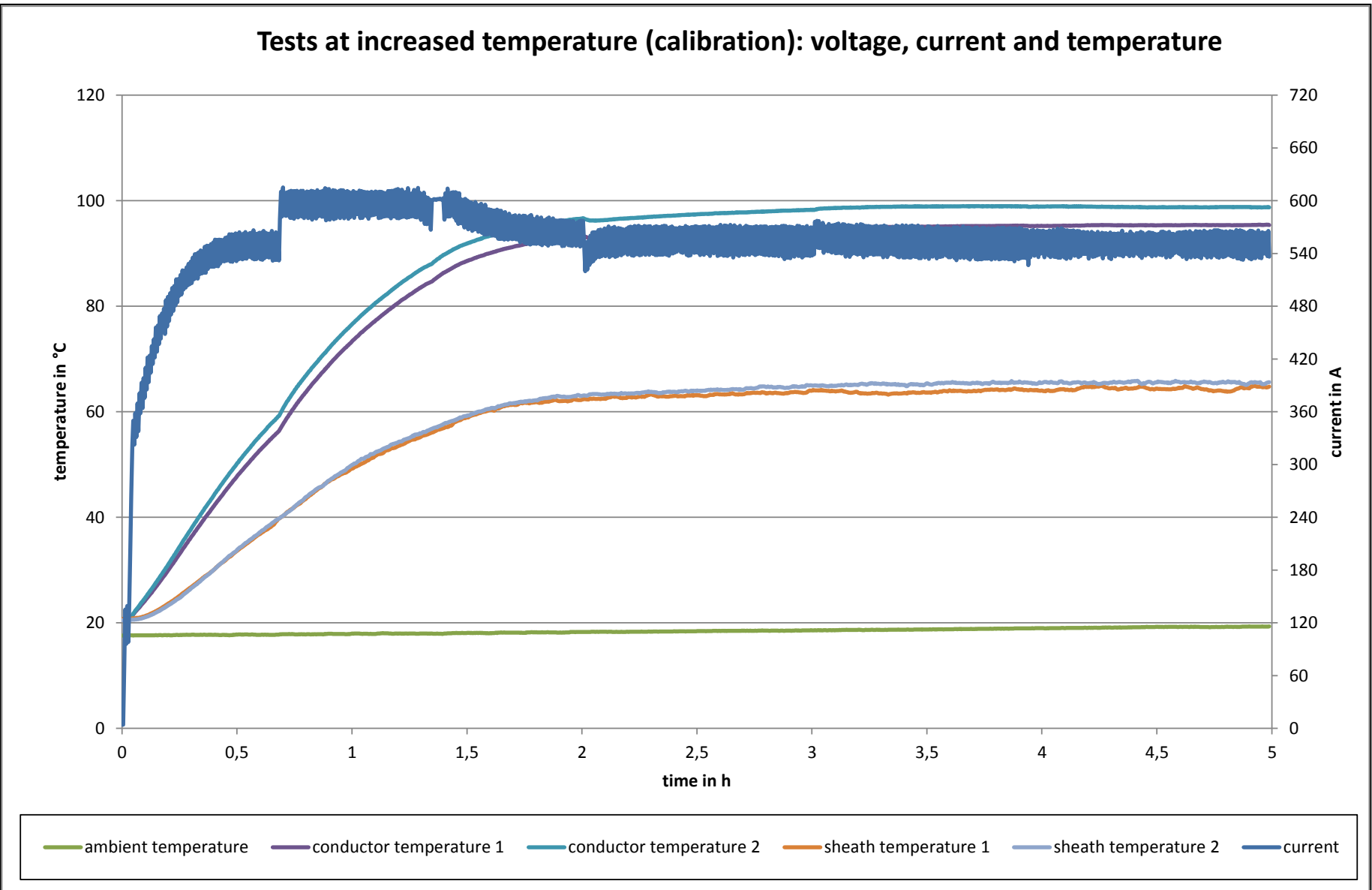
**Further palm holes on demand.**

Bitte technische Informationen auf Katalogseite D-0 beachten.

Please note technical information on catalogue page D-0.

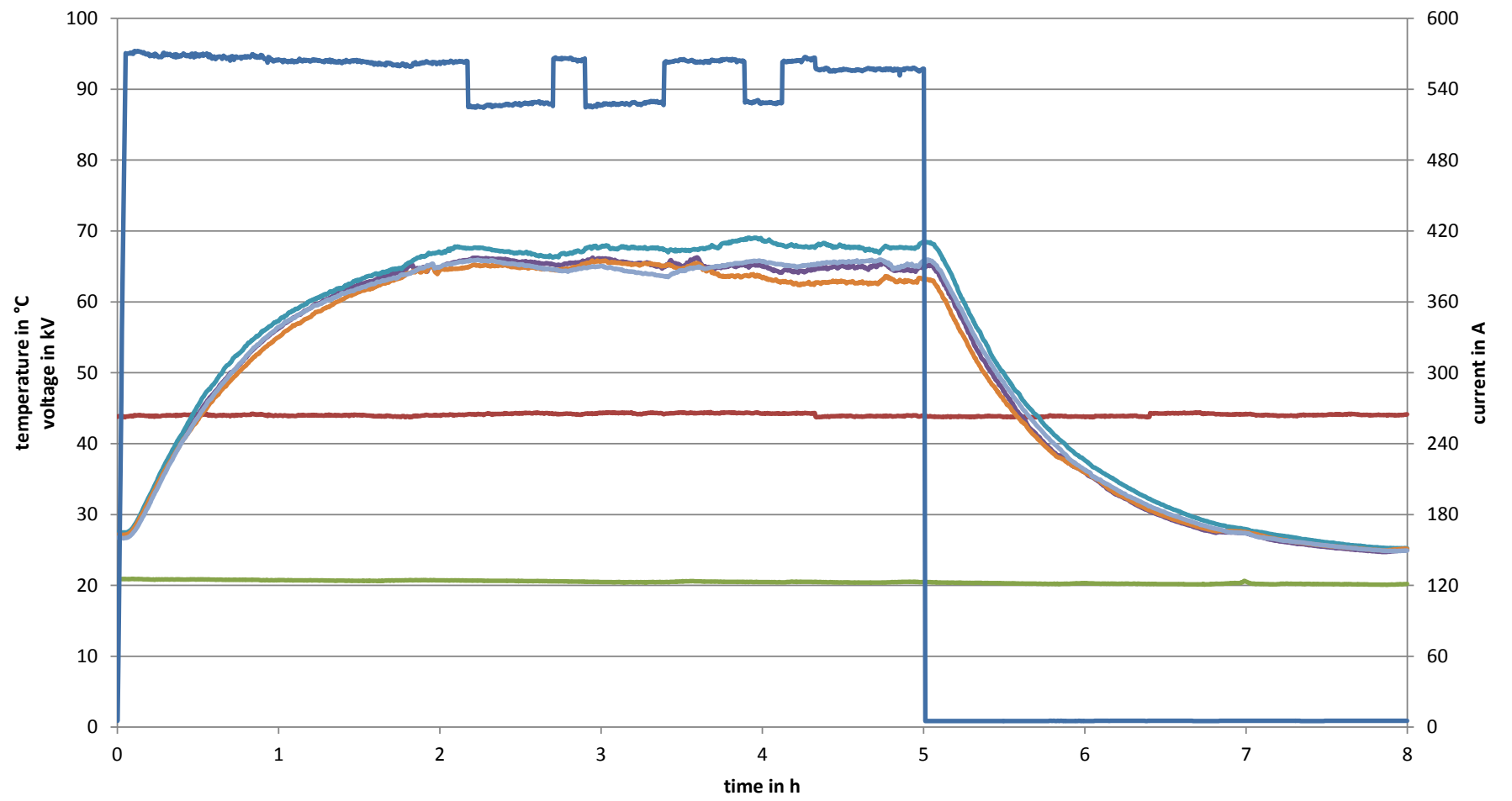
Nexans Power Accessories Germany GmbH • Ferdinand-Porsche Str. 12 • 95028 Hof/Saale • Tel.: +49 9281 8306-0  
E-Mail: kundenzentrum.hof@nexans.com • www.nexans-power-accessories.com

11-07-2012 Version 10





### Thermal-Cycle-Test in air (cycle 18): voltage, current and temperature



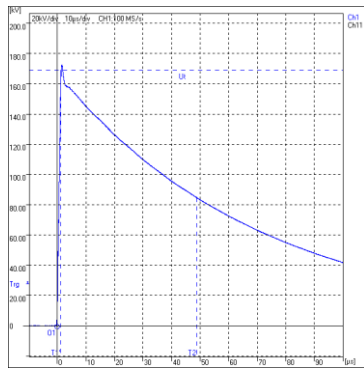
— voltage — ambient temperature — sheath temperature 1.1 — sheath temperature 2.1 — sheath temperature 1.2 — sheath temperature 2.2 — current

## Impulse Test 170 kV

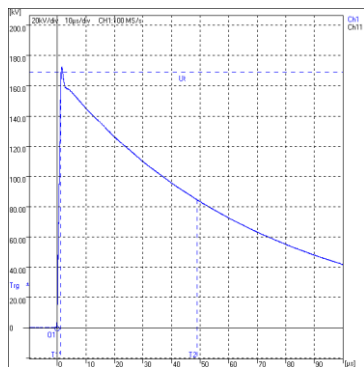
### LI – Lightning Impulse

No.	Comment	Ut [kV]	T1 [μs]	T2 [μs]
1	LI 100 % positiv	169,8	1,40	48,9
2	LI 100 % positiv	169,6	1,39	49,0
3	LI 100 % positiv	170,4	1,39	48,9
4	LI 100 % negativ	-169,1	1,40	49,0
5	LI 100 % negativ	-170,2	1,40	49,1
6	LI 100 % negativ	-170,0	1,40	49,1

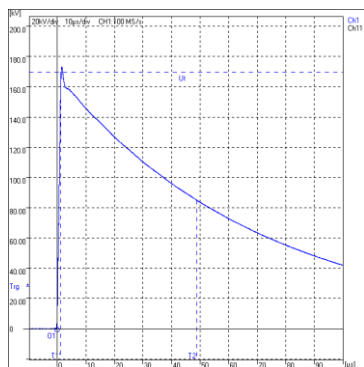
### LI-Lightning Impulse Pictures



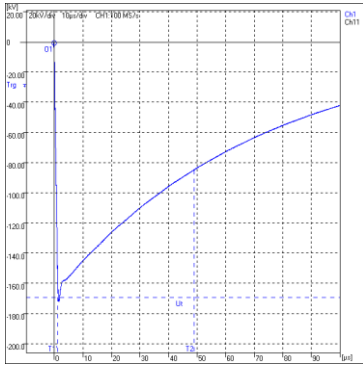
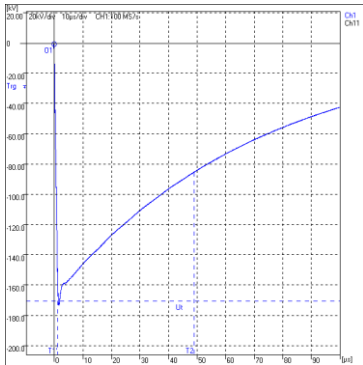
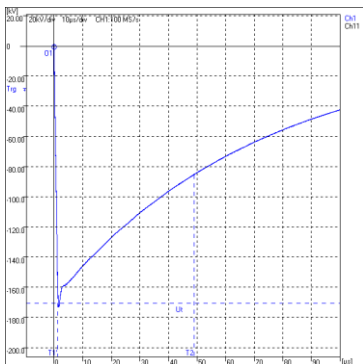
$U_t = 169,8$  kV  
 $T_1 = 1,40$  μs  
 $T_2 = 48,9$  μs



$U_t = 169,6$  kV  
 $T_1 = 1,39$  μs  
 $T_2 = 49,0$  μs



$U_t = 170,4$  kV  
 $T_1 = 1,39$  μs  
 $T_2 = 48,9$  μs

	<p> <math>U_t = -169,1 \text{ kV}</math>  <math>T_1 = 1,40 \text{ µs}</math>  <math>T_2 = 49,0 \text{ µs}</math> </p>
	<p> <math>U_t = -170,2 \text{ kV}</math>  <math>T_1 = 1,40 \text{ µs}</math>  <math>T_2 = 49,1 \text{ µs}</math> </p>
	<p> <math>U_t = -170,0 \text{ kV}</math>  <math>T_1 = 1,40 \text{ µs}</math>  <math>T_2 = 49,1 \text{ µs}</math> </p>

## Testing Laboratory

The testing laboratory of RWE Eurotest stands for non-proprietary and low-cost services – we offer our customers in utilities, medium-sized firms, industry, municipalities and cities tried and trusted services on all aspects of energy supply. Our know-how, competence and reliability are based on a successful tradition and many years of experience in testing and quality assurance. The consistent implementation of project-related teamwork and direct communication ensure flexibility and are your guarantee for attentive, personal advice and support – before, during and in particular after the realisation of your project.

One of the main requirements and key point of the internationally valid series of QM standards is monitoring the measurement and test equipment. This is why the measurement and test equipment has to be compared with the standards created for the relevant measurement parameters at regular intervals, in other words "calibrated". As part of our quality management, our measuring equipment is monitored and calibrated in-house, at regular intervals, against relevant standards. We naturally offer these services to our customers too.

Because our work begins and ends with your demands.

Incidentally: Our testing institute and calibration laboratory have been accredited according with DIN EN ISO/IEC 17025 by the DAkkS (national accreditation body for the Federal Republic of Germany) and their quality management systems have been certified according with DIN EN ISO 9001 by the VDE (Association for Electrical, Electronic & Information Technologies).

## Scope of accreditation

RWE Eurotest is accredited to carry out testing in the fields:

- High-voltage appliances and installations
- Low-voltage switchgear and control gear assemblies
- Cables
- Power cable accessories
- Pressed connectors and detachable cable clamps
- EMC-testing
- Oil-examinations
- Earthing systems
- Protective clothing against the thermal hazards of an electric arc

The detailed listing of the scope of accreditation is available at our homepage [www.rweeurotest.com](http://www.rweeurotest.com).