


Prüfbericht-Nr.: <i>Test Report No.:</i>	604105836 001	Auftrags-Nr.: <i>Order No.:</i>	244138376	Seite 1 von 21 <i>Page 1 of 21</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	28.04.2019		
Auftraggeber: <i>Client:</i>	ANTIK TECHNOLOGY (SHENZHEN) CO., LTD. 深圳市龙岗区园山街道保安社区马五路1号2栋301-A066				
Prüfgegenstand: <i>Test item:</i>	Electric Cables for Photovoltaic Systems				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	H1Z2Z2-K 1X1,5...35mm ²				
Auftrags-Inhalt: <i>Order content:</i>	TÜV mark approval				
Prüfgrundlage: <i>Test specification:</i>	EN 50618:2014 Kabel und Leitungen - Leitungen für Photovoltaic Systeme <i>Electric cables for photovoltaic systems</i>				
Wareneingangsdatum: <i>Date of receipt:</i>	30.10.2019				
Prüfmuster-Nr.: <i>Test sample No.:</i>	CTL19-084-3 CTL19-084-4				
Prüfzeitraum: <i>Testing period:</i>	01.11.2019 – 13.01.2020				
Ort der Prüfung: <i>Place of testing:</i>	See Other below for details				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:	kontrolliert von / reviewed by:				
06.08.2020 Kairy Wei / PE			06.08.2020 Kenny Shi / TC		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
Place of testing: Shanghai National Center of Testing and Inspection for Electric Cable and Wire Co., Ltd., 1000 jungong Road, Shanghai 200093, P.R. China					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

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Produktbeschreibung
Product description

Characteristics of cable					
Code designation	H1Z2Z2-K				
Trademark	-				
Rated Voltage AC	U ₀ /U AC: 1/1 kV				
Rated voltage DC	1,5 kV DC (conductor-conductor and conductor-earth)				
Cross section:	[mm ²]	1,5	35		
Outer dimension:	[mm]	5,2	14,0		
Meas. wall thickness insulation:	[mm]	0,9	1,4		
Min. wall thickness insulation:	[mm]	0,7	0,9		
Meas. wall thickness sheath:	[mm]	1,0	1,4		
Min. wall thickness sheath:	[mm]	0,8	1,1		
Min. wall thickness compl. Insulation:	[mm]	1,67	2,07		
Standard	EN 50618:2014				
Lower ambient temperature	-40 °C				
Upper ambient temperature	+90 °C				
Max temperature at conductor	+120°C @ 20.000 h (see enclosed Arrhenius curve)				
Material separation layer between conductor and insulation	—				
Material insulation	XLPE				
Material separation layer between insulation and sheath	—				
Material sheath	XLPE				
Extrusion type	Tandem Extrusion				

Remarks:

This test report is for alternative component of the cable H1Z2Z2-K 1X1,5...35 mm² for sheath material (FPV120-1) and insulation material (FPV120-2) from Linhai City Yadong Special Cable Material Factory.

All tests except Ref. No. 1.4 in Table B.1 were performed to the complete cable H1Z2Z2-K 1X1,5mm² and H1Z2Z2-K 1X35mm² with 100m.

This test report contains 21 pages and an attachment 1 with 1 page for testing equipment list.

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
5.1	CONDUCTOR		
5.1.1	Material		
	Number of cores:	1	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Single wires are of copper and tinned:	tinned copper wire	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Compliance with class 5 acc. to IEC 60228 <i>SEE TABLE 5.1.5</i>	class 5 conductors	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	There are no visible gaps in the continuous layer, when examined with normal or corrected vision.	no visible gaps	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.1.2	CONSTRUCTION		
	The class of the conductor must be class 5 in accordance to EN 60228		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	The maximum diameter of the wires in the conductor are be in accordance to EN 60228		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.1.3	SEPERATOR BETWEEN CONDUCTOR AND INSULATION		
	Separation layer of halogen free material between insulation and conductor		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
5.1.4	CHECK OF CONSTRUCTION		
	The construction must be checked in accordance of the requirements of 5.1.1, 5.1.2 and 5.1.3 including the requirements of EN 60228 for class 5 conductor	checked	
5.1.5	ELECTRICAL RESISTANCE		

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	The resistor of each conductor at 20°C must be in accordance with the requirements of EN 60228 for class 5 conductor		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Compliance must be checked by the test of clause 5 of EN 50395		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.2	INSULATION		
5.2.1	MATERIAL		
	The insulation must be crosslinked and fulfil the requirements of table B.1 in Annex B	XLPE in black	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.2.2	APPLICATION TO THE CONDUCTOR		
	Insulation extruded, smooth and consistently applied and possible to remove without damage to the insulation itself, to the conductor or to the tin coating.		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Compliance must be checked by inspection and by manual test		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.2.3	THICKNESS		
	For each piece of insulation, the average of the measured values, rounded to 0,1 mm have be not less than the specified value for each size of table 1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	The smallest value must not fall below 90% of the specified value by more than 0,1 mm. Compliance must be checked using by test of clause 4.1 of EN 50396		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.3	SHEATH		
	The sheath must be crosslinked and fulfil the requirements of table B.1 in Annex B	XLPE in black	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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5.3.2	APPLICATION		
	The sheath must be applied homogeneously by extrusion and halogen free material. The application of the sheath must give the finished cable a practically circular shape		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Separation layer of halogen free material between insulation and sheath		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
5.3.3	THICKNESS		
	For each piece of insulation, the average of the measured values, rounded to 0,1 mm must be less than the specified value for each size of table 1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	The smallest value must not fall below 85% of the specified value by more than 0,1 mm. Compliance must be checked using by test of clause 4.1 of EN 50396		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5.3.4	COLOUR		
	The colour of the sheath must be black, unless otherwise agreed between manufacturer and customer. The colour must be throughout for whole sheath.	black sheath	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6	MARKING		
6.1	GENERAL		
	The marking at the sheath must be by printing, embossing or indenting.	by printing	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.2	INDICATION OF ORIGIN		
	Cables are marked with		
	a) manufacturer's name or Trademark or identification number	DANYANG WINPOWER WIRE & CABLE MFG CO., LTD.	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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6.3	b) Code designation	H1Z2Z2-K	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.4	c) Nominal cross-sectional area of conductor	1,5...35mm ²	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.5	CONTINUITY OF MARKING		
	Spacing between the end of marking and the begin of the following identical marking does not exceed 550mm	=<550mm	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.6	The name CENELEC, in full or abbreviated, does not be marked on, or in, the cables		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
6.7.1	Marking is still legible after test of cl. 5.1 of EN 50396		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6.7.2	All markings are legible.		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
Table 2	TEST FOR CABLES TO EN 50618		
1	ELECTRICAL TEST		
1.1.1	Conductor resistance SEE CLAUSE 5.1.5 AND TABLE 5.1.5		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.2	No breakdown at high voltage test with		
	- AC 6,5kV, or	no breakdown	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	- DC 15kV		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>

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1.4	Insulation resistance		
1.4.1.2	- during test in water at 20°C Min. as stated in table 1 of this standard: [MOhm*km] <i>see table 8.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.4.2	- during test in water at 90°C Min. as stated in table 1 of this standard: [MOhm*km] <i>see table 8.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.5.1	During long term resistance of insulation to D.C. a stable progress has been identified, no breakdown of the test voltage: [V d.c.]	no breakdown	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.5.2	After long term resistance test no damage or cracks of the insulation have been visible.	no damage and visible cracks	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.6.2	Surface resistance of sheath min 10 GOhm: [Ohm]	1X1,5: 40GOhm 1X35: 40GOhm	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2	CONSTRUCTIONAL AND DIMENSIONAL TEST		
2.1	Conductor		
2.1.1	Maximum diameter of the conductor in accordance to EN 60228 clause 6.1 <i>SEE table 5.1.5</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2.1.2	Checking continuity of tin to clause 5.1.1 No visible gaps occurred	no visible gaps	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2.2	Wall thickness of insulation Not less than stated in clause 5.2.3 of this standard <i>SEE TABLE 5.2.3</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2.3	Wall thickness of sheath Not less than stated in clause 5.3.3 of this standard <i>SEE TABLE 5.3.3</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Measurement of overall dimensions Not less than stated in table 1 of this standard <i>SEE TABLE 5.3.4</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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	Mean value SEE TABLE 7.3.3		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2.4	Ovality max. 15% Not less than stated in clause 7.3.3 of this standard SEE TABLE 7.3.3		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2.5 2.5.1	Sheath colour Visual examination as stated in clause 7.3.1 of this standard	black	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
2.6 2.6.1	Sheath marking Visual examination and measurement as stated in clause 7.3.2 of this standard		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
3	Insulation material as stated in table B.1 of this standard		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
4	Sheath material as stated in table B.1 of this standard		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
5	COMPATIBILITY TEST ACCORDING TO EN 60811-401		
5.1	Test conditions: Duration of test 168 h Temperature 135 ± 2 °C		
5.2	Result in accordance to Table B.1 Lfd. No.: 1.7 of this standard SEE RESULT OF TABLE B1 No. 1.7		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
6	COLD IMPACT TEST ACCORDING TO EN 60811-506		
6.1	Test conditions as stated in annex C of this standard -40°C	-40° C, 16h mass of hammer: 1000g height: 100mm	
6.2	After the test no cracks are visible	no visible cracks	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
7	COLD BENDING TEST ACCORDING TO EN 60811-504 (Cable diameter ≤ 12,5 mm)		

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7.1	Test conditions: Conditioning duration 16 h: Temperature -40 ± 2°C: Diameter of mandrel: [mm]	-40°C, 16h diameter of mandrel: 1X1,5: 16mm	
7.2	After the test no cracks are visible	no visible cracks	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
8	COLD ELONGATION TEST ACCORDING TO EN 60811-505 (Cable diameter > 12,5 mm)		
8.1	Test conditions: Conditioning duration 16 h Temperature -40 ± 2°C	H1Z2Z2-K 1X35 -40°C, 16h	
	Elongation at break min 30%: [%]	sheath: 47	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
9	OZONE RESISTANCE ON COMPLETE CABLE		
9.1	Method A: Temperature 25 ± 2°C Duration 24 h Ozone concentration (by volume) (250-300)*10E-4 %	diameter of mandrel: 1X1,5: 10,5mm 1X35: 28,0mm	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
9.2	Method B: Temperature 40 ± 2°C Relative humidity 55 ± 5 % Duration 72 h Ozone concentration (by volume) (150-250)*10E-6 %		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
9.3	After the test no cracks are visible	no visible crack	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
10	WEATHERING / UV RESISTANCE TEST (see annex E)		
10.1	Temperature during drying 65± 3 °C Relative humidity 65 % Power at wavelength betw. 300 to 400 nm 60 ± 2 W/m² Duration spraying/ drying 18 / 102 Min Duration 720 h After test conditioning the exposed five specimens at ambient temperature for 16h		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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10.2	Variation of tensile strength $\geq 70\%$ Variation of elongation at break $\geq 70\%$ <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
11	DYNAMIC PENETRATION TEST (annex D) <i>see table 7.4</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
12	DAMP HEAT TEST		
12.1	Temperature 90 °C Duration 1000 h Relative humidity min. 85 % Reconditioning period 16 to 24 h		
12.2	Variation of tensile strength max. - 30% <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Variation of elongation at break max. - 30% <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
13	SHRINKAGE		
13.1	Length of cable before test [mm] Length of cable after test: [mm]	1X1,5: 300; 1X35: 300 1X1,5: 296; 1X35: 296	
13.2	Shrinkage after test max 2%: [%]	1X1,5: 1 1X35: 1	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
14	TEST UNDER FIRE CONDITIONS		
14.1	Length of sample 600 \pm 25 mm Temperature during conditioning 23 \pm 5 °C Relative humidity during conditioning 50 \pm 20 % Duration of conditioning 16 h Overall diameter of test sample: [mm] Duration of flame application, depending on the diameter of the test sample 60 s	overall diameter: 1X1,5: 5,2mm 1X35: 13,8mm	
	Distance from the lower edge of the top support to the upper onset of charring > 50 mm: [mm]	1X1,5: 435mm 1X35: 430mm	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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	Charring does not extend downwards to a point greater than 540 mm from the lower edge of the top support: [mm]	1X1,5: 492mm 1X35: 496mm	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
15	SMOKE EMISSION OF COMPLETE CABLE ACCORDING TO EN 61034-2		
15.1	Test result light transmittance, min 60%: [%]	1X1,5: 91 1X35: 83	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
16	ASSESSMENT OF HALOGEN ACCORDING TO 50525-1 ANNEX B		
16.1	Determination of halogen		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Chloride, fluoride and bromide have been determined during test acc. to annex C (If yes, continue with phase 1)		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Phase 1		
	ph-value min. 4,3: [ph]	1X1,5: 5,1 for insulation 5,1 for sheath 1X35: 5,1 for insulation 5,2 for sheath	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	If ph-value min. 4,3 conductivity must be measured: [µS/mm]	1X1,5: 1 for insulation 1 for sheath 1X35: 1 for insulation 1 for sheath	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	If conductivity is > 2,5 µS/mm but < 10 µS/mm continue with phase 2, if conductivity is max. 2,5 µS/mm material is acceptable without phase 2		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
	Phase 2		
	Chlorine- and bromine content max. 0,5% (continue with phase 3): [%]	1X1,5: =<0,5 for both insulation and sheath 1X35: =<0,5 for both insulation and sheath	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Phase 3		

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	Flouride content max. 0,5%: [%]	1X1,5: =<0,02 for both insulation and sheath 1X35: =<0,02 for both insulation and sheath	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
Table B.1	REQUIREMENTS FOR INSULATION AND SHEATHING MATERIALS		
1	MECHANICAL CHARACTERISTICS		
1.1	Mechanical properties before ageing		
1.1.1	Determined median values for tensile strengt		
	- for insulation min. 8,0N/mm ² <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	- for sheath min. 8,0N/mm ² <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.1.2	Determined median values for elongation at break		
	- for insulation min. 125% <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	- for sheath min 125% <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.2	MECHANICAL PROPERTIES AFTER AGEING IN OVEN (150°C/168H)		
1.2.1	Test temperature: 150 ± 2°C Test duration: 168h		
1.2.2	Determined median values for tensile strength		
	- for insulation variation max. - 30% <i>SEE TABLE B.1</i>		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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	- for sheath variation max. - 30% SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.2.3	Determined median values for elongation at break		
1.2.3	- for insulation variation max. - 30% SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	- for sheath variation max. - 30% SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.3	HOT SET TEST IN OVEN ACCORDING TO EN 60811-507 (250°C / 15 MIN / 20N/cm2)		
1.3.2	Elongation under load max. 100%: [%]	H1Z2Z2-K 1X1,5: insulation: 33; sheath: 35 H1Z2Z2-K 1X35: insulation: 35; sheath: 28	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	Permanent elongation after cooling max. 25%: [%]	H1Z2Z2-K 1X1,5: insulation: 0; sheath: 0 H1Z2Z2-K 1X35: insulation: 0; sheath: 0	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.4	THERMAL ENDURANCE TEST ACCORDING TO EN 60216 PARTS 1 AND 2		
	The determined Arrhenius curve resulting from the test results of test according to IEC 60216-2 shows a thermal endurance of min. 20.000h at a temperature of 120°C. SEE ENCLOSURED ARRHENIUS-CALCULATION SHEET	Refer to test report 50272706 001	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.5	COLD ELONGATION TEST ACCORDING TO EN 60811-505		
1.5.1	Test conditions see EN 60811-505		
1.5.2	Elongation of break min. 30%: [%]		P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
1.6	SHEATH RESISTANCE AGAINST ACID AND ALKALINE SOLUTION ACCORDING TO EN 60811-404		

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1.6.1	Acid: N-Oxal-acid Alkaline solution: N-sodium hydroxide solution Temperature 23 C° Duration 168 h		
1.6.2	max. Variation of tensile strength $\pm 30\%$ SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.6.3	Min. Elongation at break $> 100\%$ SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.7	COMPATIBILITY TEST ACCORDING TO EN 60811-401		
1.7.1	Test conditions: Temperature 135 $\pm 2^{\circ}\text{C}$ Duration of treatment 168 h		
1.7.2	Variation of tensile strength insulation max. $\pm 30\%$ Variation of tensile strength sheath max. - 30% SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
1.7.3	Variation of elongation at break insulation max. $\pm 30\%$ Variation of elongation at break sheath max. - 30% SEE TABLE B.1		P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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Absatz	EN 50618:2014	Messergebnisse - Bemerkungen	Bewertung
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H1Z2Z2-K 1X1,5 mm²

Table B.1 MECHANICAL CHARACTERISTICS							
Samples of insulation	<input type="checkbox"/> test plate	<input checked="" type="checkbox"/> sleeve probe			black		
Samples of sheath	<input type="checkbox"/> test plate	<input checked="" type="checkbox"/> sleeve probe			black		
INSULATION							
	Values of tensile strength [N/mm ²]:					Median [N/mm ²]	Variation [%]
Before ageing	18,6	17,7	17,5	18,1	18,2	18,1	-
After ageing in oven	19,9	19,5	19,6	20,2	19,1	19,6	+8
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	19,3	18,4	18,9	18,7	19,1	18,9	+4
	Values of elongation at break [%]:					Median %	Variation %
Before ageing	210	200	190	210	200	200	-
After ageing in oven	160	150	140	150	160	150	-25
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	180	160	170	160	170	170	-15
During cold elongation test	-	-	-	-	-	-	-
SHEATH							
	Values of tensile strength [N/mm ²]:					Median [N/mm ²]	Variation [%]
Before ageing	18,2	18,0	17,6	18,1	17,7	18,0	-
After ageing in oven	19,5	19,0	19,2	19,4	18,6	19,2	+7
After damp heat test	18,0	18,1	18,5	18,3	17,4	18,1	+1
After storing in acid	17,1	16,2	16,8	16,6	16,1	16,6	-8
After storing in alkaline	17,3	17,0	16,3	17,4	16,6	17,0	-6
After storing UV Weathering	16,3	15,3	16,6	15,9	16,2	16,2	-10
After test of mutual influence	18,7	18,3	18,9	18,0	18,4	18,4	+2
	Values of elongation at break [%]:					Median [%]	Variation [%]
Before ageing	170	150	170	160	160	160	-
After ageing in oven	150	140	130	140	150	140	-13
After damp heat test	160	140	150	140	150	150	-6
After storing in acid	160	140	150	140	150	150	-6
After storing in alkaline	160	150	140	150	140	150	-6
After storing UV Weathering	150	130	140	150	140	140	-13
After test of mutual influence	160	140	150	160	150	150	-6
During cold elongation test	-	-	-	-	-	-	-

H1Z2Z2-K 1X35mm²

**ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION**

Table B.1 MECHANICAL CHARACTERISTICS

Samples of insulation	<input checked="" type="checkbox"/> test plate	<input type="checkbox"/> sleeve probe	black
Samples of sheath	<input checked="" type="checkbox"/> test plate	<input type="checkbox"/> sleeve probe	black

INSULATION

	Values of tensile strength [N/mm ²]:					Median [N/mm ²]	Variation [%]
Before ageing	18,6	18,2	17,6	17,3	18,4	18,2	-
After ageing in oven	19,9	20,3	20,1	19,0	20,6	20,1	+10
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	19,8	19,1	19,7	19,3	18,7	19,3	+6
	Values of elongation at break [%]:					Median %	Variation %
Before ageing	170	160	150	160	170	160	-
After ageing in oven	150	130	140	150	140	140	-13
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	160	140	150	140	150	150	-6
During cold elongation test	-	-	-	-	-	-	-

SHEATH

	Values of tensile strength [N/mm ²]:					Median [N/mm ²]	Variation [%]
Before ageing	18,2	17,6	17,8	18,5	18,1	18,1	-
After ageing in oven	19,4	18,8	19,8	19,3	19,2	19,3	+7
After damp heat test	15,3	16,3	15,5	16,7	15,7	15,7	-13
After storing in acid	16,5	16,9	15,7	17,3	16,3	16,5	-9
After storing in alkaline	17,4	17,9	16,5	17,1	16,8	17,1	-6
After storing UV Weathering	16,3	16,1	15,3	16,7	16,5	16,3	-10
After test of mutual influence	18,6	19,0	18,4	18,9	19,5	18,9	+4
	Values of elongation at break [%]:					Median [%]	Variation [%]
Before ageing	170	160	150	160	160	160	-
After ageing in oven	160	140	150	140	130	140	-13
After damp heat test	150	140	130	150	140	140	-13
After storing in acid	140	160	150	130	150	150	-6
After storing in alkaline	150	140	160	160	150	150	-6
After storing UV Weathering	150	140	130	150	140	140	-13
After test of mutual influence	160	140	150	140	150	150	-6
During cold elongation test	-	-	-	-	-	-	-

Table 5.1.5 COMPLIANCE OF CONDUCTOR WITH CLASS 5 OF IEC 60228

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	Diameter of single wires		Resistance of conductor	
	Max. [mm]	Measured [mm]	Max. [Ω /km]	Measured [Ω /km]
H1Z2Z2-K 1X1,5mm ²	0,26	0,25	13,7	11,6
H1Z2Z2-K 1X35mm ²	0,41	0,40	0,565	0,494

Table 8.1 INSULATION RESISTANCE VALUE

Cross section mm ²	Insulation resistance at 20°C		Insulation resistance at 90°C	
	Min. M Ω /km	Measured M Ω /km	Min. M Ω /km	Measured M Ω /km
1,5	860	3275	0,86	2,6
35	290	1330	0,29	1,9

Table 5.2.3 WALL THICKNESS OF INSULATION

Values of measured wall thickness not less than stated in clause 5.2.3 of this standard (smallest value shall be highlighted) [mm]							Average value [mm]	Minimum thickness of insulation [mm]	Smallest measured value not less than $t_m \geq 0,9t_s - 0,1$ mm
1X1,5mm ²	-	-	-	-	-	-	0,9	0,79	0,53
1X35mm ²	-	-	-	-	-	-	1,4	0,96	0,71

Table 5.3.3 WALL THICKNESS OF SHEATH

Values of measured wall thickness not less than stated in clause 5.3.3 of this standard (smallest value shall be highlighted) [mm]							Average value [mm]	Minimum thickness of sheath [mm]	Smallest measured value not less than $t_m \geq 0,85t_s - 0,1$ mm
1X1,5mm ²	-	-	-	-	-	-	1,0	0,88	0,58
1X35mm ²	-	-	-	-	-	-	1,4	1,11	0,84

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Table 7.3.3 MEAN VALUES AND OVALITY OF CABLE

Values of measured ovality not less than stated in clause 7.3.3 of this standard									
	Sample 1		Sample 2		Sample 3		Average value [mm]	Manufacturer spec. [mm]	Ovality [%]
	Value 1 [mm]	Value 2 [mm]	Value 1 [mm]	Value 2 [mm]	Value 1 [mm]	Value 2 [mm]			
1X1,5mm ²	-	-	-	-	-	-	5,2	-	2
1X35mm ²	-	-	-	-	-	-	14,0	-	5

Table 7.4 Dynamic penetration test (Annex D)

Nominal cross-sectional area of conductor: [mm ²]	1,5	35						
Rated diameter of conductor according to table 2 of IEC 60719 (D _n): [mm]	1,50	7,7						
Minimum value of force (150 * √D _n): [N]	184	416						
Determined mean value of force: [N]	469	>1000						

1.4 Thermal endurance properties

Testing method according to EN 60216-2

Test conditions

Temperature Index : 120

Selected exposure temperatures : 185°C, 165°C, 145°C

Elongation at break : 50 %

Test sample	Time to end-point at exposure temperature 185°C hour	Specified time (min.) h	Time to end-point at exposure temperature 165°C hour	Time to end-point at exposure temperature 145°C hour	Specified time (min.) h	Obtained absolute temperature K	Absolute temperature (min.) K	
insulation	136	100	851	5856	5000	407	393	P
sheath	136	100	844	6062	5000	407	393	P

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Thermal endurance graph for insulation material

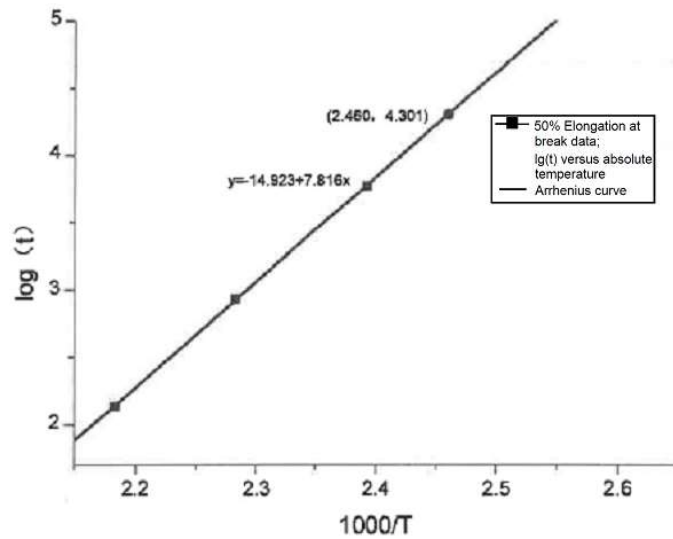


Figure1 The Arrhenius cure of the insulation

Remark: The value of t is equal to 20,000 h at $\lg(t)=4,30$

Thermal endurance graph for sheath material

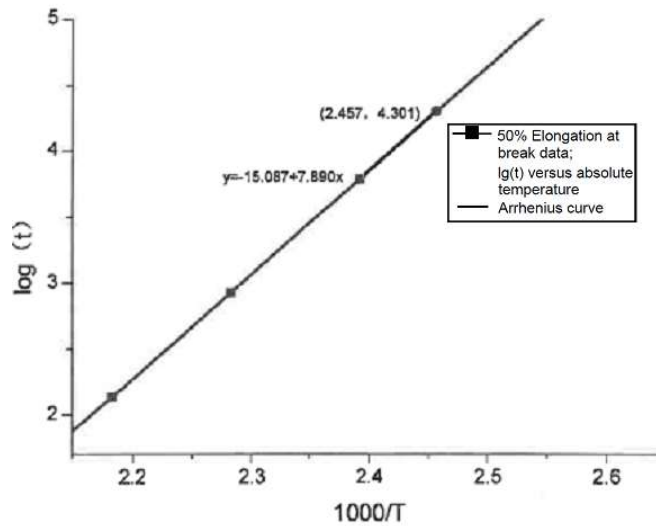


Figure2 The Arrhenius cure of the sheath

Remark: The value of t is equal to 20,000 h at $\lg(t)=4,30$

Reference No.

CTL19-084

Equipment List

No. of equipment	Name of equipment	Next calibration date
JL0218	Seven Multi Multi-fuction tester	2021-01-13
JL0311	DDS-308 Conductivity meter	2020-12-19
JL0319	MICRO OHMMETER	2020-06-19
JL0338	JSL-500N tensile-testing machine	2020-05-23
JL0354	ZC-90E Insulation resistance measurement apparatus	2020-07-16
JL0403	ZX-01C Ozone resistance test box	2021-11-11
JL0405	PH value tester	2020-01-24
JL0475	Damp heat test chamber	2020-08-06
JL0535	CMT4204 electronic universal test machine	2020-12-19
JL0727	Cable dimension measurement system	2020-10-09
JL0987	Digital Micrometer	2020-06-02
ZJ0330	Test system of smoke emission of complete cable	2020-03-20
ZJ0345	RYS Hot set test apparatus	2020-06-29
ZJ0403	YDJ5/50 50KV A.C. Dielectric strength tester	2020-01-31
ZJ0428	HVDC-5-10 D.C. Dielectric strength tester	2020-05-04
ZJ0433	RL100 thermal ageing oven	2020-10-31
ZJ0440	RL100 thermal ageing oven	2020-11-13
ZJ0441	RL100 thermal ageing oven	2020-11-26
ZJ0464	Xenon LIGHT TEST Chamber	2020-03-27
ZJ0473	Low temperature impact apparatus	2021-03-14
ZJ0477	CYLH-65C Ozone resistance test box	2020-04-11
ZJ0481	RL100 thermal ageing oven	2020-02-12
ZJ0493	SL-1 HCl and acidity measuring instruments	2020-04-22
ZJ0546	Pressure test at high temperature apparatus	2020-04-15
ZJ0551	RYS Hot set test apparatus	2021-04-20
ZJ6115	CHX-40 thermal ageing oven	2020-05-08
ZJ6130	CHX-40 thermal ageing oven	2020-07-16
ZJ6132	CHX-40 thermal ageing oven	2020-07-16
ZJ6146	CHX-40 thermal ageing oven	2020-07-18
ZJ6187	Test for a single vertical insulated cable system	2020-06-19
ZJ6334	Low temperature bending and tension apparatus	2021-12-05
ZJ6338	WD270C (-70°)low temperature testing box	2020-03-04
ZJ6370	DW-P103-10ACD1 D.C. Dielectric strength tester	2021-01-08
ZJ03012	Low temperature impact apparatus	2020-06-07