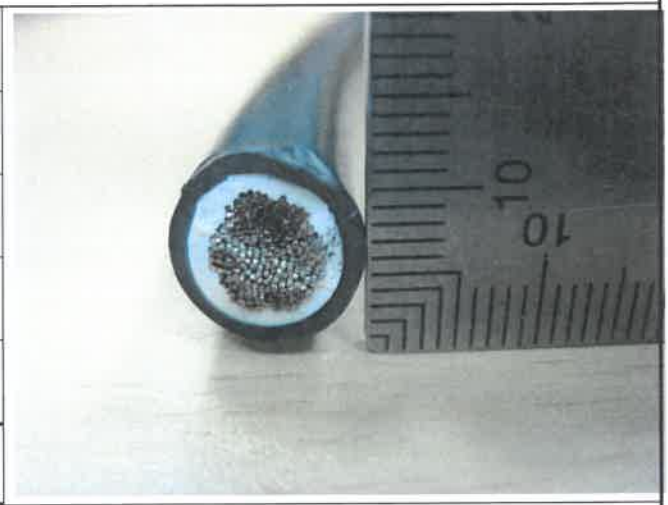
Prüfbericht-Nr.: *Test Report No.:*	**15083539 001**	**Auftrags-Nr.:** *Order No.:*	154089207	Seite 1 von 23 *Page 1 of 23*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	09.03.2015	
Auftraggeber: *Client:*	Wuxi Xinhongye Wire & Cable Co., Ltd. No. 17 Hexin Road, Xishan District, Wuxi, Jiangsu 214101, P.R. China			
Prüfgegenstand: *Test item:*	Electric Cables for Photovoltaic Systems			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	H1Z2Z2-K 1X1,5...35mm2			
Auftrags-Inhalt: *Order content:*	TÜV Mark Approval			
Prüfgrundlage: *Test specification:*	EN 50618:2014 Kabel und Leitungen - Leitungen für Photovoltaic Systeme *Electric cables for photovoltaik systems*			

Wareneingangsdatum: *Date of receipt:*	09.03.2015
Prüfmuster-Nr.: *Test sample No.:*	CTL15-024, CTL15-025
Prüfzeitraum: *Testing period:*	10.03.2015 – 07.08.2015
Ort der Prüfung: *Place of testing:*	See Other below for details
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass



geprüft von / *tested by*:

Datum *Date*	Name / Stellung *Name / Position*	Unterschrift *Signature*
02.09.2015	Jing Jixu/PE	Jing Jixu

kontrolliert von / *reviewed by*:

Datum *Date*	Name / Stellung *Name / Position*	Unterschrift *Signature*
22.09.2015	Jill Zhou/Reviewer	

Sonstiges / *Other*: Place of testing:
China National Centre for Quality Supervision and Test of Electric Wire and Cable
1000 Jungong Road, Shanghai 200093, P.R. China
See more information on page 3.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* 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*

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Liste der verwendeten Prüfmittel
List of used test equipment

Prüfmittel *Test equipment*	**Prüfmittel-Nr. / ID-Nr.** *Equipment No. / ID-No.*	**Nächste Kalibrierung** *Next calibration*
See attachment 1		

Produktbeschreibung
Product description

	Characteristics of cable					
	Code designation		H1Z2Z2-K			
	Trademark		WUXI XINHONGYE WIRE & CABLE CO., LTD			
	Rated Voltage AC		U_0/U AC: 1/1 kV			
	Rated voltage DC		1,5 kV DC (conductor-conductor and conductor-earth)			
	Cross section:	[mm²]	**1,5**	**25**		
	Outer dimension:	[mm]	4,8	11,2		
	Meas. wall thickness insulation:	[mm]	0,8	1,1		
	Min. wall thickness insulation:	[mm]	**0,7**	**0,9**		
	Meas. wall thickness sheath:	[mm]	0,9	1,2		
	Min. wall thickness sheath:	[mm]	**0,8**	**1,0**		
	Min. wall thickness compl. Insulation:	[mm]	1,5	1,9		
	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		Co-Extrusion			

Remarks:

All tests according to EN 50618:2014 in this report were performed to the complete cable H1Z2Z2-K 1X1,5mm² provided by the client with 300m.

All tests except Ref No. 1.4 in Table B.1 were performed to the complete cable H1Z2Z2-K 1X25mm² provided by the client with 100m.

Test of Ref. No. 15 in Table 2 was performed to the complete cable H1Z2Z2-K 1X2,5 mm² and H1Z2Z2-K 1X4 mm² provided by the client with 30m of each.

This test report contains 23 pages and an attachment 1 with 2 pages for testing equipment list.

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
5.1	**CONDUCTOR**		
5.1.1	**Material**		
	Number of cores:	1	P ☒ F ☐ N/A ☐ N/T ☐
	Single wires are of copper and tinned:	tinned copper wires	P ☒ F ☐ N/A ☐ N/T ☐
	Compliance with class 5 acc. to IEC 60228 *SEE TABLE 5.1.5*	class 5 conductors	P ☒ F ☐ N/A ☐ N/T ☐
	There are no visible gaps in the continuous layer, when examined with normal or corrected vision.	no visible gap	P ☒ F ☐ N/A ☐ N/T ☐
5.1.2	**CONSTRUCTION**		
	The class of the conductor must be class 5 in accordance to EN 60228		P ☒ F ☐ N/A ☐ N/T ☐
	The maximum diameter of the wires in the conductor are be in accordance to EN 60228		P ☒ F ☐ N/A ☐ N/T ☐
5.1.3	**SEPERATOR BETWEEN CONDUCTOR AND INSULATION**		
	Separation layer of halogen free material between insulation and conductor		P ☐ F ☐ N/A ☒ N/T ☐
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**		

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	The resistor of each conductor at 20°C must be in accordance with the requirements of EN 60228 for class 5 conductor		P ☒ F ☐ N/A ☐ N/T ☐
	Compliance must be checked by the test of clause 5 of EN 50395		P ☒ F ☐ N/A ☐ N/T ☐
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 white	P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
	Compliance must be checked by inspection and by manual test		P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
	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 ☒ F ☐ N/A ☐ N/T ☐
5.3	**SHEATH**		
	The sheath must be crosslinked and fulfil the requirements of table B.1 in Annex B	XLPE in black	P ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
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 ☒ F ☐ N/A ☐ N/T ☐
	Separation layer of halogen free material between insulation and sheath		P ☐ F ☐ N/A ☒ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
	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 ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
6	**MARKING**		
6.1	**GENERAL**		
	The marking at the sheath must be by printing, embossing or indenting.	by printing	P ☒ F ☐ N/A ☐ N/T ☐
6.2	**INDICATION OF ORIGIN**		
	Cables are marked with		
	a) manufacturer's name or Trademark or identification number	WUXI XINHONGYE WIRE & CABLE CO., LTD	P ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
6.3	b) Code designation	H1Z2Z2-K	P ☒ F ☐ N/A ☐ N/T ☐
6.4	c) Nominal cross-sectional area of conductor	1,5...35mm2	P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
6.6	The name CENELEC, in full or abbreviated, does not be marked on, or in, the cables		P ☐ F ☐ N/A ☒ N/T ☐
6.7.1	Marking is still legible after test of cl. 5.1 of EN 50396		P ☒ F ☐ N/A ☐ N/T ☐
6.7.2	All markings are legible.		P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
1.2	No breakdown at high voltage test with		
	- AC 6,5kV, or	no breakdown	P ☒ F ☐ N/A ☐ N/T ☐
	- DC 15kV		P ☐ F ☐ N/A ☒ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
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] *see table 8.1*		P ☒ F ☐ N/A ☐ N/T ☐
1.4.2	- during test in water at 90°C Min. as stated in table 1 of this standard: [MOhm*km] *see table 8.1*		P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
1.5.2	After long term resistance test no damage or cracks of the insulation have been visible.	no damage or visible cracks	P ☒ F ☐ N/A ☐ N/T ☐
1.6.2	Surface resistance of sheath min 10 GOhm: [Ohm]	65 GOhm for H1Z2Z2-K 1X1,5 10 GOhm for H1Z2Z2-K 1X25	P ☒ F ☐ N/A ☐ N/T ☐
2	**CONSTRUCTIONAL AND DIMENSIONAL TEST**		
2.1 **2.1.1**	Conductor Maximum diameter of the conductor in accordance to EN 60228 clause 6.1 *SEE table 5.1.5*		P ☒ F ☐ N/A ☐ N/T ☐
2.1.2	Checking continuity of tin to clause 5.1.1 No visible gaps occurred	no visible gaps	P ☒ F ☐ N/A ☐ N/T ☐
2.2	Wall thickness of insulation Not less than stated in clause 5.2.3 of this standard *SEE TABLE 5.2.3*		P ☒ F ☐ N/A ☐ N/T ☐
2.3	Wall thickness of sheath Not less than stated in clause 5.3.3 of this standard *SEE TABLE 5.3.3*		P ☒ F ☐ N/A ☐ N/T ☐
	Measurement of overall dimensions Not less than stated in table 1 of this standard *SEE TABLE 5.3.4*		P ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	Mean value *SEE TABLE 7.3.3*		P ☒ F ☐ N/A ☐ N/T ☐
2.4	Ovality max. 15% Not less than stated in clause 7.3.3 of this standard *SEE TABLE 7.3.3*		P ☒ F ☐ N/A ☐ N/T ☐
2.5 **2.5.1**	Sheath colour Visual examination as stated in clause 7.3.1 of this standard	black	P ☒ F ☐ N/A ☐ N/T ☐
2.6 **2.6.1**	Sheath marking Visual examination and measurement as stated in clause 7.3.2 of this standard		P ☒ F ☐ N/A ☐ N/T ☐
3	Insulation material as stated in table B.1 of this standard		P ☒ F ☐ N/A ☐ N/T ☐
4	Sheath material as stated in table B.1 of this standard		P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐
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: 100m	
6.2	After the test no cracks are visible	no visible crack	P ☒ F ☐ N/A ☐ N/T ☐
7	**COLD BENDING TEST ACCORDING TO EN 60811-504 (Cable diameter ≤ 12,5 mm)**		

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
7.1	Test conditions: Conditioning duration 16 h: Temperature -40 ± 2°C: Diameter of mandrel: [mm]	-40°C, 16h diameter of manderl: 24mm for H1Z2Z2-K 1X1,5 46mm for H1Z2Z2-K 1X25	
7.2	After the test no cracks are visible	no visible crack	P ☒ F ☐ N/A ☐ N/T ☐
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		
	Elongation at break min 30%: [%]		P ☐ F ☐ N/A ☒ N/T ☐
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 %		P ☐ F ☐ N/A ☒ N/T ☐
9.2	Method B: Temperature 40 ± 2°C Relative humidity 55 ± 5 % Duration 72 h Ozone concentration (by volume) (150-250)*10E-6 %	diameter of manderl: 9,8mm for H1Z2Z2-K 1X1,5 22,4mm for H1Z2Z2-K 1X25	P ☒ F ☐ N/A ☐ N/T ☐
9.3	After the test no cracks are visible	no visible crack	P ☒ F ☐ N/A ☐ N/T ☐
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 ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
10.2	Variation of tensile strength ≥ 70% Variation of elongation at break ≥ 70% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
11	DYNAMIC PENETRATION TEST (annex D) *see table 7.4*		P ☒ F ☐ N/A ☐ N/T ☐
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% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
	Variation of elongation at break max. - 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
13	**SHRINKAGE**		
13.1	Length of cable before test [mm] Length of cable after test: [mm]	300 298	
13.2	Shrinkage after test max 2%: [%]	1	P ☒ F ☐ N/A ☐ N/T ☐
14	**TEST UNDER FIRE CONDITIONS**		
14.1	Length of sample 600 ± 25 mm Temperature during conditioning 23 ± 5 °C Relative humidity during conditioning 50 ±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: 4,8 for H1Z2Z2-K 1X1,5 11,2 for H1Z2Z2-K 1X25	
	Distance from the lower edge of the top support to the upper onset of charring > 50 mm: [mm]	438 for H1Z2Z2-K 1X1,5 442 for H1Z2Z2-K 1X25	P ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	Charring does not extend downwards to a point greater than 540 mm from the lower edge of the top support: [mm]	495 for H1Z2Z2-K 1X1,5 501 for H1Z2Z2-K 1X25	P ☒ F ☐ N/A ☐ N/T ☐
15	**SMOKE EMISSION OF COMPLETE CABLE ACCORDING TO EN 61034-2**		
15.1	Test result light transmittance, min 60%: [%]	82% for H1Z2Z2-K 1X1,5 92% for H1Z2Z2-K 1X2,5 91% for H1Z2Z2-K 1X4 87% for H1Z2Z2-K 1X25	P ☒ F ☐ N/A ☐ N/T ☐
16	**ASSESSMENT OF HALOGEN ACCORDING TO 50525-1 ANNEX B**		
16.1	Determination of halogen		P ☒ F ☐ N/A ☐ N/T ☐
	Chloride, fluoride and bromide have been determined during test acc. to annex C (If yes, continue with phase 1)		P ☒ F ☐ N/A ☐ N/T ☐
	Phase 1		
	ph-value min. 4,3: [ph]	6,3 for insulation 5,4 for sheath	P ☒ F ☐ N/A ☐ N/T ☐
	If ph-value min. 4,3 conductivity must be measured: [µS/mm]	1 for insulation 1 for sheath	P ☒ F ☐ N/A ☐ N/T ☐
	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 ☐ F ☐ N/A ☒ N/T ☐
	Phase 2		
	Chlorine- and bromine content max. 0,5% (continue with phase 3): [%]	=<0,5 for both insulation and sheath	P ☒ F ☐ N/A ☐ N/T ☐
	Phase 3		

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	Flouride content max. 0,5%: [%]	0,02 for both insulation and sheath	P ☒ F ☐ N/A ☐ N/T ☐
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/mm² *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
	- for sheath min. 8,0N/mm² *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
1.1.2	Determined median values for elongation at break		
	- for insulation min. 125% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
	- for sheath min 125% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
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% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	- for sheath variation max. - 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
1.2.3	Determined median values for elongation at break		
1.2.3	- for insulation variation max. - 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
	- for sheath variation max. - 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
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: 15 sheath: 15 H1Z2Z2-K 1X25: insulation: 10 sheath: 8	P ☒ F ☐ N/A ☐ N/T ☐
	Permanent elongation after cooling max. 25%: [%]	H1Z2Z2-K 1X1,5: insulation: 0 sheath: 0 H1Z2Z2-K 1X25: insulation: 0 sheath: 0	P ☒ F ☐ N/A ☐ N/T ☐
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*	specimens obtained from the complete cable of H1Z2Z2-K 1X1,5	P ☒ F ☐ N/A ☐ N/T ☐
1.5	**COLD ELONGATION TEST ACCORDING TO EN 60811-505**		
1.5.1	Test conditions see EN 60811-505	OD<12,5mm	
1.5.2	Elongation of break min. 30%: [%]		P ☐ F ☐ N/A ☒ N/T ☐
1.6	**SHEATH RESISTANCE AGAINST ACID AND ALKALINE SOLUTION ACCORDING TO EN 60811-404**		

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
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 ± 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
1.6.3	Min. Elongation at break > 100% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
1.7	**COMPATIBILITY TEST ACCORDING TO EN 60811-401**		
1.7.1	Test conditions: Temperature 135 ± 2°C Duration of treatment 168 h		
1.7.2	Variation of tensile strength insulation max. ± 30% Variation of tensile strength sheath max. - 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐
1.7.3	Variation of elongation at break insulation max. ± 30% Variation of elongation at break sheath max. - 30% *SEE TABLE B.1*		P ☒ F ☐ N/A ☐ N/T ☐

Absatz *Clause*	**EN 50618:2014** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
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H1Z2Z2-K 1X1,5

Table B.1 MECHANICAL CHARACTERISTICS							
Samples of insulation ..... ☐test plate ☒ sleeve probe						white	
Samples of sheath ..... ☐test plate ☒ sleeve probe						black	
INSULATION							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	15,2	15,1	15,5	15,3	15,1	15,2	-
After ageing in oven	17,2	17,9	17,6	17,4	16,9	17,4	+15
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	15,9	16,2	16,1	16,3	16,2	16,2	+7
	Values of elongation at break [%]:					Median %	Variation %
Before ageing	180	190	170	180	180	180	-
After ageing in oven	170	150	170	160	160	160	-11
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	180	160	170	170	170	170	-6
During cold elongation test	-	-	-	-	-	-	-
SHEATH							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	17,0	16,6	16,8	16,4	16,6	16,6	-
After ageing in oven	18,2	18,5	18,4	18,6	18,2	18,4	+11
After damp heat test	15,9	16,1	15,7	15,3	15,6	15,7	-5
After storing in acid	15,0	15,7	15,8	15,3	15,5	15,5	-7
After storing in alkaline	15,3	15,7	15,8	15,9	16,0	15,8	-5
After storing UV Weathering	15,1	15,2	14,9	15,3	15,2	15,2	-8
After test of mutual influence	17,9	17,9	18,1	17,6	17,6	17,9	+8
	Values of elongation at break [%]:					Median [%]	Variation [%]
Before ageing	160	170	180	170	170	170	-
After ageing in oven	160	140	150	160	150	150	-12
After damp heat test	170	150	160	160	160	160	-6
After storing in acid	170	150	160	160	160	160	-6
After storing in alkaline	160	170	150	160	170	160	-6
After storing UV Weathering	170	150	160	160	160	160	-6
After test of mutual influence	170	150	160	160	160	160	-6
During cold elongation test	-	-	-	-	-	-	-

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H1Z2Z2-K 1X25

Table B.1 MECHANICAL CHARACTERISTICS							
Samples of insulation ..... ☒ test plate ☐ sleeve probe						white	
Samples of sheath ..... ☒ test plate ☐ sleeve probe						black	
INSULATION							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	13,3	13,6	13,2	13,7	13,9	13,6	-
After ageing in oven	16,1	15,9	15,3	16,2	15,8	15,9	+17
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	15,1	14,9	14,8	14,7	15,3	14,9	+10
	Values of elongation at break [%]:					Median %	Variation %
Before ageing	140	150	150	160	150	150	-
After ageing in oven	130	140	120	130	130	130	-13
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	140	150	130	140	140	140	-7
During cold elongation test	-	-	-	-	-	-	-
SHEATH							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	15,9	15,5	15,7	16,1	15,3	15,7	-
After ageing in oven	16,7	17,1	17,5	16,9	17,2	17,1	+9
After damp heat test	14,8	14,6	14,4	15,0	14,7	14,7	-6
After storing in acid	14,6	14,8	14,7	14,6	14,4	14,6	-7
After storing in alkaline	15,1	14,8	15,0	14,7	14,9	14,9	-5
After storing UV Weathering	14,4	13,9	14,1	14,4	14,7	14,4	-8
After test of mutual influence	16,2	16,6	16,1	16,6	16,8	16,6	+6
	Values of elongation at break [%]:					Median [%]	Variation [%]
Before ageing	150	170	160	160	160	160	-
After ageing in oven	140	150	130	140	140	140	-13
After damp heat test	140	150	160	150	150	150	-6
After storing in acid	140	150	160	150	150	150	-6
After storing in alkaline	150	160	140	150	150	150	-6
After storing UV Weathering	140	150	160	150	150	150	-6
After test of mutual influence	140	160	150	150	150	150	-6
During cold elongation test	-	-	-	-	-	-	-

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Table 5.1.5 COMPLIANCE OF CONDUCTOR WITH CLASS 5 OF IEC 60228

	Diameter of single wires		Resistance of conductor	
	Max. [mm]	Measured [mm]	Max. [Ω /km]	Measured [Ω/km]
H1Z2Z2-K 1X1,5	0,26	0,24	13,7	11,8
H1Z2Z2-K 1X25	0,41	0,40	0,795	0,731

Table 8.1 INSULATION RESISTANCE VALUE

Cross section	Insulation resistance at 20°C		Insulation resistance at 90°C	
mm²	Min. MΩ /km	Measured MΩ /km	Min. MΩ /km	Measured MΩ /km
1,5	859	3370	0,859	1,305
25	339	862	0,339	0,404

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 $tm \geq 0{,}9t_s$ - 0,1 mm
1X1,5	-	-	-	-	-	-	0,8	0,73	0,53
1X25	-	-	-	-	-	-	1,1	0,87	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 $tm \geq 0{,}85t_s$ - 0,1 mm
1X1,5	-	-	-	-	-	-	0,85	0,72	0,58
1X25	-	-	-	-	-	-	1,2	1,05	0,75

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Table 7.3.3 MEAN VALUES AND OVALITY OF CABLE

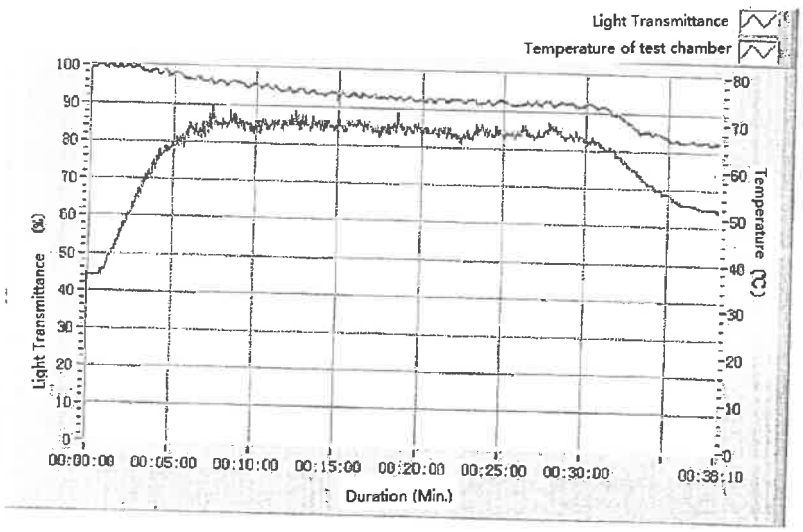
Values of measured ovality not less than stated in clause 7.3.3 of this standard

	Sample 1		Sample 2		Sample 3		Average value [mm]	Manufac-turer spec. [mm]	Ovality [%]
	Value 1 [mm]	Value 2 [mm]	Value 1 [mm]	Value 2 [mm]	Value 1 [mm]	Value 2 [mm]			
1X1,5	-	-	-	-	-	-	4,9	-	3
1X25	-	-	-	-	-	-	11,2	-	5

Table 7.4 Dynamic penetration test (Annex D)

Nominal cross-sectional area of conductor: [mm²]	**1,5**	**25**					
Rated diameter of conductor according to table 2 of IEC 60719 (D_n): [mm]	1,50	6,4					
Minimum value of force (150 * $\sqrt{D_n}$): [N]	184	379					
Determined mean value of force: [N]	417	939					

15 Smoke emission of complete cable



H1Z2Z2-K 1X1,5

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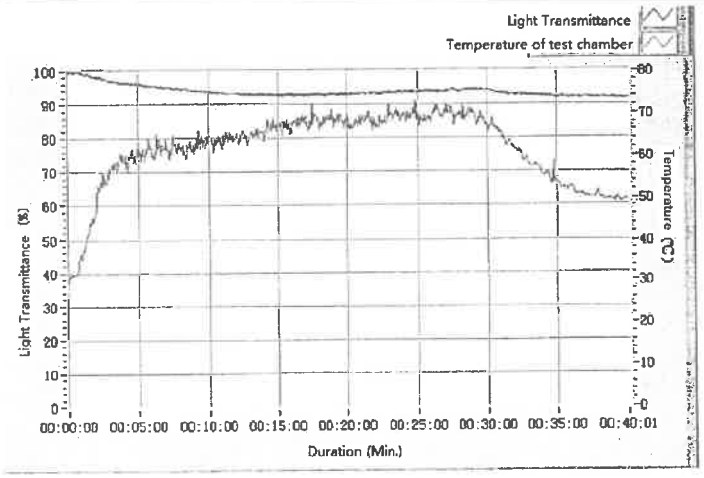
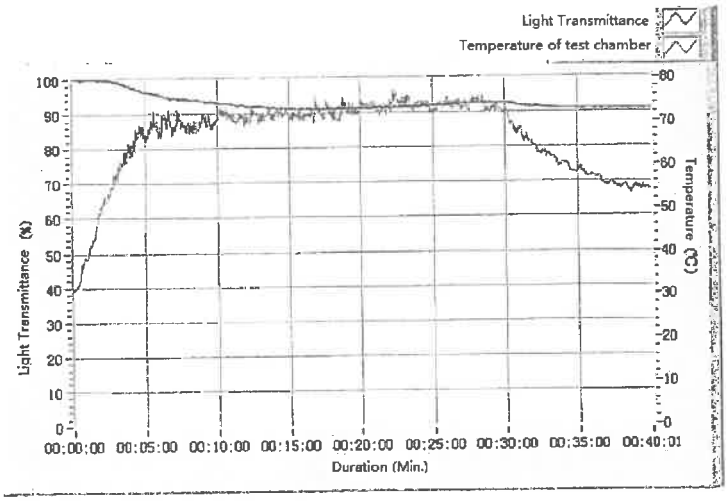
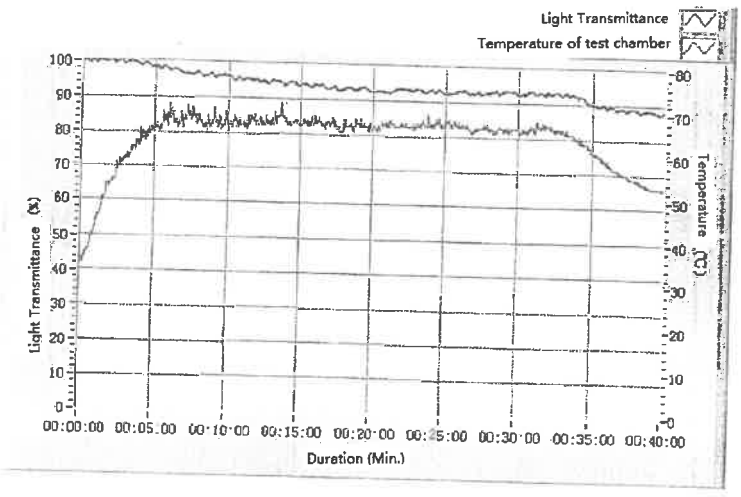


H1Z2Z2-K 1X2,5



H1Z2Z2-K 1X4



H1Z2Z2-K 1X25

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Table B.1

1.4 Thermal endurance properties

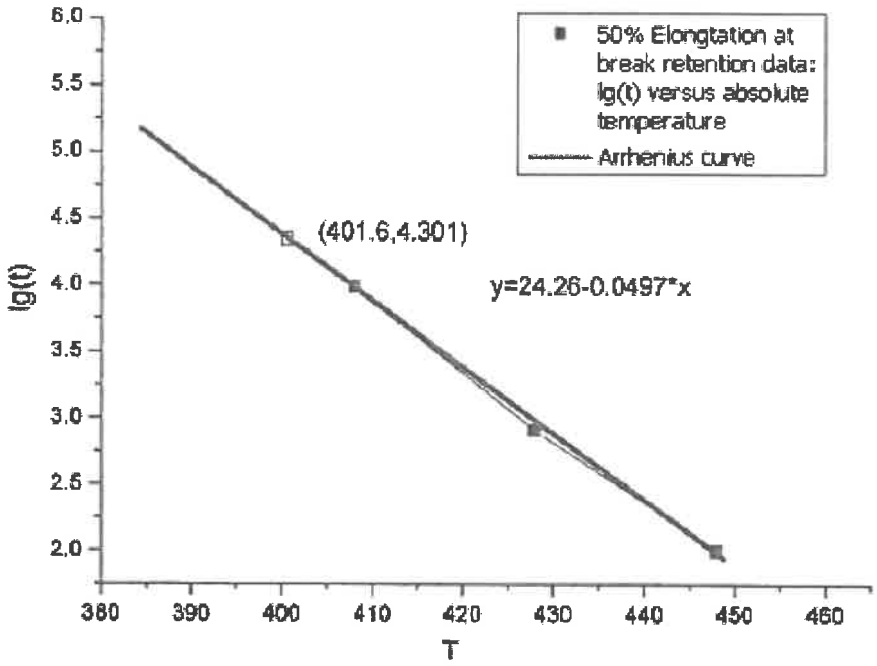
Testing method according to EN 60216-2

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	100	**100**	806	9794	**5000**	402	**393**	**P**
sheath	100	**100**	802	10800	**5000**	402	**393**	**P**

Thermal endurance graph for insulation material



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

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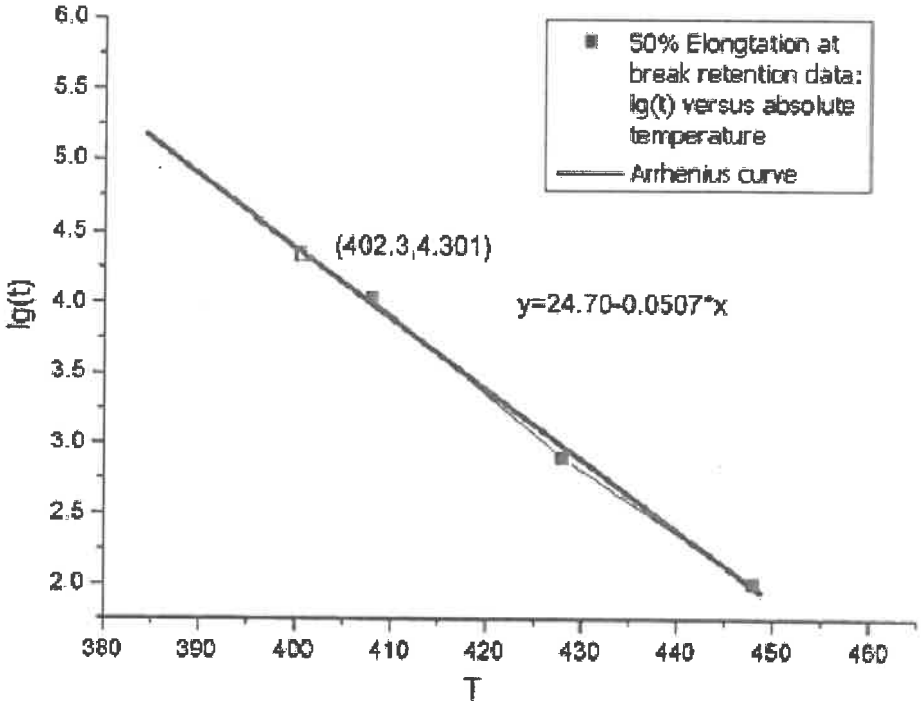
Thermal endurance graph for sheath material



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

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Equipment List

Equipment number	Equipment name	Cal. date	Next cal. date
JL0218	SevenMulti Multi-fuction tester	2015.01.20	2016.01.19
JL0311	DDS-308 conductivity meter	2015.04.15	2016.04.14
JL0319	2226 MICRO OHMMETER	2014.06.27	2015.06.26
JL0338	JSL-500N tensile-testing machine	2014.06.27	2015.06.26
ZJ0477	ZX-01C Ozone resistance test box	2015.04.09	2016.04.08
JL0405	PHS-3F PH value tester	2015.01.13	2016.01.12
JL0535	CMT4204 electronic universal test machine	2014.12.25	2015.12.24
JL0617	ZC90 Insulation resistance measurement apparatus	2014.09.15	2015.09.14
JL0970	Digital Micrometer	2014.06.04	2015.06.03
JL0997	Steel ruler	2013.08.27	2015.08.26
ZJ03011	WD 270B low temperature testing box	2014.08.25	2015.08.24
ZJ0365	KSM6/25/75cable dimension measurement system	2015.05.12	2016.05.11
ZJ0391	RL100 thermal ageing oven	2014.07.02	2015.07.01
ZJ0403	YDJ5/50 50KV A.C. Dielectric strength tester	2015.02.10	2016.02.09
ZJ0415	AHTS-2-2/5 A.C. Dielectric strength tester	2014.06.27	2015.06.26
ZJ0420	WS270JDamp heat test chamber	2014.11.21	2015.11.20
ZJ0441	RL100 thermal ageing oven	2014.12.03	2015.12.02
ZJ0461	HVDC 502-10 D.C. Dielectric strength tester	2015.01.09	2016.01.08
ZJ0475	Test system of smoke emission of complete cable	2015.03.27	2016.03.26
ZJ0493	SL-1 HCl and acidity measuring instruments	2014.04.28	2015.04.27
ZJ6180	Xenon TEST Chamber	2015.03.30	2016.03.29
ZJ6187	Test for a single vertical insulated cable system	2014.06.27	2015.06.26
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P. Jing Jixin
27.04.15

Equipment List

Equipment number	Equipment name	Cal. date	Next cal. date
JL0338	JSL-500N tensile-testing machine	2015.06.27	2016.06.26
ZJ6116	GHX-40 thermal ageing oven	2015.05.15	2016.05.14
ZJ6117	GHX-40 thermal ageing oven	2015.05.15	2016.05.14
ZJ6147	GHX-40 thermal ageing oven	2015.07.24	2016.07.23
	Following blank		

02.09.15