Prüfbericht-Nr.: *Test Report No.:*	**50163017 001**	**Auftrags-Nr.:** *Order No.:*	1140035154	Seite 1 von 21 *Page 1 of 21*
Kunden-Referenz-Nr.: *Client Reference No.:*	442296	**Auftragsdatum:** *Order date:*	18.05.2017	
Auftraggeber: *Client:*	Changzhou Fengguo Jin'e Cable Co., Ltd. Henshan Bridge Town,Wujin District, Changzhou Furong Industrial Park, Changzhou, Jiangsu, P. R. China			
Prüfgegenstand: *Test item:*	Electric Cables for Photovoltaic Systems			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	H1Z2Z2-K 1X2,5...6mm2			
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:*	22.05.2017
Prüfmuster-Nr.: *Test sample No.:*	Engineering sample
Prüfzeitraum: *Testing period:*	19.06.2017 - 09.05.2018
Ort der Prüfung: *Place of testing:*	See Other below for details
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (China) Ltd.
Prüfergebnis*: *Test result*:*	Pass

geprüft von / *tested by*:			**kontrolliert von** / *reviewed by*:		
2018-07-09	Vivian Ren / PE	Vivian Ren	2018-07-11	Liu Bo / TC	Liu Bo
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:
Place of testing:National Quality Supervision and Testing Center for Cables and Wires (Jiangsu)
500 Lvyuan Road,Yixing, China

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*

Prüfbericht-Nr.: 50163017 001
Test Report No.:

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		
Following blank		

Produktbeschreibung
Product description

	Characteristics of cable					
	Code designation		H1Z2Z2-K			
	Trademark		Changzhou Fengguo Jin'e 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]	**2,5**	**4**	**6**	
	Outer dimension:	[mm]	5,6	6,6	7,0	
	Meas. wall thickness insulation:	[mm]	0,9	0,7	1,1	
	Specified value of thickness insulation:	[mm]	**0,7**	**0,7**	**0,7**	
	Meas. wall thickness sheath:	[mm]	1,0	0,8	0,9	
	Specified value of thickness sheath:	[mm]	**0,8**	**0,8**	**0,8**	
	Min. wall thickness compl. Insulation:	[mm]	-	-	-	
	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		Halogen free cross-linked polyolefin MG80027J（EN）-125			
	Material separation layer between insulation and sheath		—			
	Material sheath		Halogen free cross-linked polyolefin MG80027H（EN）-125			
	Extrusion type		Tandem Extrusion			

Remarks:

All tests according to EN 50618:2014 in this report were performed to the complete cable H1Z2Z2-K 1X2.5mm² with 300m.

All tests except Ref. No. 1.4 in Table B.1 were performed to the complete cable H1Z2Z2-K 1X6mm² with 100m.

Test of Ref. No. 15 in Table 2 was performed to the complete cable H1Z2Z2-K 1X4mm² with 30m.

This test report contains 21 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 wire	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 gaps	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	Halogen free cross-linked polyolefin in black	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	Halogen free cross-linked polyolefin 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	Changzhou Fengguo Jin'e 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	2,5...6mm2	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 and visible cracks	P ☒ F ☐ N/A ☐ N/T ☐
1.6.2	Surface resistance of sheath min 10 GOhm: [Ohm]	1X2,5: 1X10^9 Ω 1X6: 1,2X10^11 Ω	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: 100mm	
6.2	After the test no cracks are visible	no visible cracks	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 mandrel: 1X2,5: 25,7mm 1X6: 32,0mm	
7.2	After the test no cracks are visible	no visible cracks	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 %		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]	1X2,5: 300; 1X6: 299 1X2,5: 300; 1X6: 298	
13.2	Shrinkage after test max 2%: [%]	1X2,5: 0,3 1X6: 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: 1X2,5: 5,52mm 1X6: 6,92mm	
	Distance from the lower edge of the top support to the upper onset of charring > 50 mm: [mm]	1X2.5: 420mm 1X6: 380mm	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]	1X2.5: 495mm 1X6: 475mm	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%: [%]	1X2,5: 87 1X4: 97 1X6: 95	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]	1X2,5: 5,9 for insulation 4,9 for sheath 1X6: 5,1 for insulation 6,3 for sheath	P ☒ F ☐ N/A ☐ N/T ☐
	If ph-value min. 4,3 conductivity must be measured: [µS/mm]	1X2,5: 0,2 for insulation 0,4 for sheath 1X6: 0,4 for insulation 0,3 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): [%]	1X2,5: =<0,5 for both insulation and sheath 1X6: =<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%: [%]	1X2,5: =<0,02 for both insulation and sheath 1X6: =<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 1X125: insulation: 35; sheath: 20 H1Z2Z2-K 1X6: insulation: 20; sheath: 55	P ☒ F ☐ N/A ☐ N/T ☐
	Permanent elongation after cooling max. 25%: [%]	H1Z2Z2-K 1X1,5: insulation: 0; sheath: 0 H1Z2Z2-K 1X6: 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 1X2,5	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		
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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ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

H1Z2Z2-K 1X2,5 mm²

Table B.1 MECHANICAL CHARACTERISTICS							
Samples of insulation ..... ☐ test plate ☒ sleeve probe						black	
Samples of sheath ..... ☒ test plate ☐ sleeve probe						black	
INSULATION							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	-	-	-	-	-	12,9	-
After ageing in oven	-	-	-	-	-	14,1	+9
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	-	-	-	-	-	13,4	+4
	Values of elongation at break [%]:					Median %	Variation %
Before ageing	400	400	400	400	400	400	-
After ageing in oven	410	400	400	410	400	400	0
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	400	400	400	400	400	400	0
During cold elongation test	-	-	-	-	-	-	-
SHEATH							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	13,1	12,9	12,5	12,8	12,3	12,8	-
After ageing in oven	13,1	12,6	13,5	13,3	13,1	13,1	+2
After damp heat test	12,8	12,5	12,1	13,8	12,9	12,8	0
After storing in acid	9,3	10,1	11,4	12,2	12,2	11,4	-11
After storing in alkaline	11,1	11,9	10,7	12,3	12,0	11,9	-7
After storing UV Weathering	12,9	13,1	12,7	12,8	12,9	12,9	101
After test of mutual influence	14,6	13,6	16,4	14,9	12,8	14,6	+14
	Values of elongation at break [%]:					Median [%]	Variation [%]
Before ageing	220	240	220	200	200	220	-
After ageing in oven	200	200	200	200	220	200	-9
After damp heat test	260	240	240	200	220	240	+9
After storing in acid	240	220	260	260	240	240	+9
After storing in alkaline	240	240	240	220	220	240	+9
After storing UV Weathering	30	30	30	30	30	30	94
After test of mutual influence	220	220	200	200	200	200	-9
During cold elongation test	-	-	-	-	-	-	-

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H1Z2Z2-K 1X6mm²

Table B.1 MECHANICAL CHARACTERISTICS							
Samples of insulation ..... ☐test plate ☒ sleeve probe						black	
Samples of sheath ..... … ☒test plate ☐ sleeve probe						black	
INSULATION							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	-	-	-	-	-	17,3	-
After ageing in oven	-	-	-	-	-	19,1	+10
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	-	-	-	-	-	18,5	+7
	Values of elongation at break [%]:					Median %	Variation %
Before ageing	230	210	220	220	220	220	-
After ageing in oven	220	220	230	220	210	220	0
After damp heat test	-	-	-	-	-	-	-
After test of mutual influence	220	200	220	210	220	220	0
During cold elongation test	-	-	-	-	-	-	-
SHEATH							
	Values of tensile strength [N/mm²]:					Median [N/mm²]	Variation [%]
Before ageing	15,6	15,6	15,7	13,6	15,6	15,6	-
After ageing in oven	15,9	15,4	15,2	16,3	14,8	15,4	-1
After damp heat test	15,4	14,8	15,3	15,2	13,3	15,2	-3
After storing in acid	13,9	11,2	14,3	13,9	13,7	13,9	-11
After storing in alkaline	12,7	16,5	14,5	12,4	14,2	14,2	-9
After storing UV Weathering	15,2	12,9	13,2	14,6	16,3	14,6	94
After test of mutual influence	15,2	16,3	17,9	18,4	17,6	17,6	+13
	Values of elongation at break [%]:					Median [%]	Variation [%]
Before ageing	150	160	180	160	180	160	-
After ageing in oven	150	15,4	15,2	16,3	14,8	15,4	-6
After damp heat test	150	130	150	180	160	150	-6
After storing in acid	200	210	210	200	200	200	+25
After storing in alkaline	180	180	180	160	170	180	+13
After storing UV Weathering	150	150	150	150	170	150	94
After test of mutual influence	150	150	160	150	160	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 1X2,5mm²	**0,26**	0,24	**8,21**	7,32
H1Z2Z2-K 1X6mm²	**0,31**	0,29	**3,39**	2,96

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
2,5	**690**	1270	**0,69**	0,75
6	**500**	2470	**0,50**	1,64

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
1X2,5mm²	-	-	-	-	-	-	0,9	0,80	**0,53**
1X6mm²	-	-	-	-	-	-	1,1	0,98	**0,53**

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
1X2,5mm²	-	-	-	-	-	-	1,0	0,88	**0,58**
1X6mm²	-	-	-	-	-	-	0,9	0,79	**0,58**

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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]			
1X2,5mm²	5,736	5,558	5,663	5,543	5,673	5,602	5,6	-	3
1X6mm²	-	-	-	-	-	-	7,4	-	1

Table 7.4 Dynamic penetration test (Annex D)							
Nominal cross-sectional area of conductor: [mm²]	**2,5**	**6**					
Rated diameter of conductor according to table 2 of IEC 60719 (D_n): [mm]	1,95	3,0					
Minimum value of force (150 * $\sqrt{D_n}$): [N]	**209**	**260**					
Determined mean value of force: [N]	284	374					

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	110	**100**	817	6624	**5000**	409	**393**	**P**
sheath	106	**100**	709	6445	**5000**	408	**393**	**P**

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Thermal endurance graph for insulation material

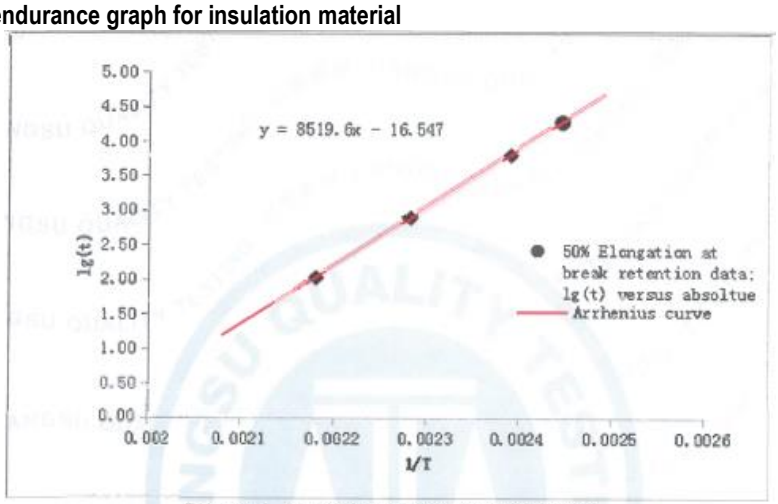

Figure 1 Arrhenius curve of Insulation

Remark: The value of t is equal to 20,000 h at lg(t)=4,30 ,so TI=136℃

Thermal endurance graph for sheath material

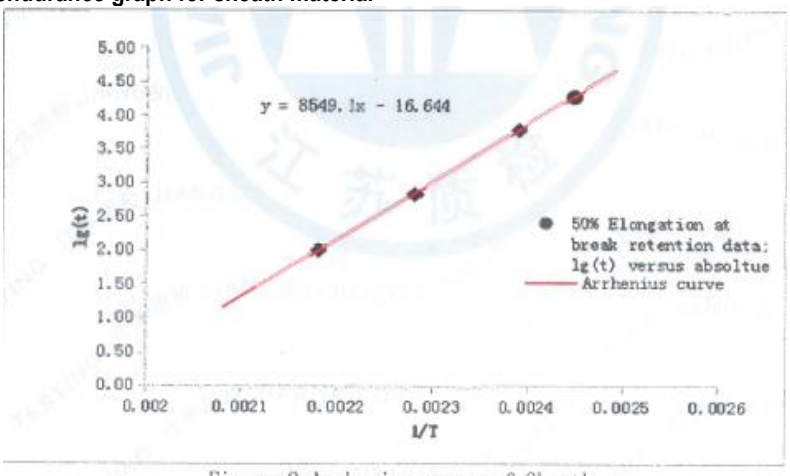

Figure 2 Arrhenius curve of Sheath

Remark: The value of t is equal to 20,000 h at lg(t)=4,30 ,so TI=135℃

End of test report

Measurement and Test Equipment List

Attachment:

Report No.: 50163017 001 **Order No.: 1140035154**

National Quality Supervision and Testing Center for Cables and Wires (Jiangsu)
500 Lvyuan Road,Yixing, China

Description	MTE Type/model Internal ID	Next Calibration Date
Digital micrometer	QF-7	2017-07-10
Steel rule	GZ-26	2018-03-22
Vernier caliper	KC-2	2018-05-26
Thickness gauge	DL-17	2017-12-01
Thickness gauge	DL-51	2018-05-27
Thickness gauge	DL-53	2018-04-27
Steel rule	GZ-15	2017-10-16
WCDMS cable and wire construction measurement system	Y3-2106-4140	2018-06-05
QJ57P D.C.bridge	Y2-1174-2116	2017-10-13
High insulation resistance meter	Y3-1344-2536	2017-07-17
Voltage/Insulation tester	Y3-1343-2535	2017-12-29
Thermostatic bath device	Y3-1224-2270	2017-08-28
Voltage/Insulation tester	Y3-2257-4358	2018-04-20
Thermostatic bath device	Y3-2320-4421	2018-01-02
Computer-controlled electronic tensile tester	Y3-2310-4411	2018-06-11
Computer-controlled electronic tensile tester	Y3-1830-3573	2017-12-19
Heat ageing test chamber	Y3-2272-4373	2018-05-08
Heat ageing test chamber	Y3-2275-4376	2018-05-09
Heat ageing test chamber	Y3-2278-4379	2018-05-08
Heat ageing test chamber	Y3-2270-4371	2018-05-08

Measurement and Test Equipment List

Heat ageing test chamber	Y3-2268-4369	2018-05-08
Heat ageing test chamber	Y3-2271-4372	2018-05-08
Heat ageing test chamber	Y3-1425-2723	2018-07-23
Xeon lamp weather resistance test chamber	Y3-2255-4356	2018-04-20
Low temperature bending tester	Y3-1392-2595	2017-12-29
Low temperature test chamber	Y3-945-1659	2018-06-05
Heat ageing test chamber	Y3-1182-2124	2018-05-08
Hot set tester	Y3-709-1142	2018-01-02
Heat ageing test chamber	Y3-2277-4378	2018-05-08
Heat ageing test chamber	Y3-2269-4370	2018-05-08
Heat ageing test chamber	Y3-2273-4374	2018-05-08
Computer-controlled electronic tensile tester	Y3-1557-2999	2018-11-30
Heat ageing test chamber	Y3-1209-2220	2018-05-08
Multiple ion measuring instrument	Y3-1583-2915	2018-04-26
Electronic analytical balance	Y3-1339-2531	2017-11-29
Corrosion resistance tester	Y3-1861-3626	2017-08-04
Corrosion resistance tester	Y3-2296-4397	2018-06-11
Acidity meter	Y3-2224-4325	2017-12-14
Conductivity meter	Y3-2225-4326	2017-12-14
Low temperature test chamber	Y3-643-1049	2018-03-30
Low temperature impact tester	Y3-272-447	2018-05-26
Vertical fire tester	Y3-2132-4182	2017-12-29
Ozone ageing oven	Y3-2131-4181	2017-11-15
Smoke density tester	Y3-1859-3623	2017-06-29
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Vivian Ren

Date and Signature: _____