ENERGYFLEX® H1Z2Z2-K

ENERGYFLEX 1kV 1x10 SVART (hvit merking)

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Energyflex® cables are designed to comply with the international standards of the solar plants.
They are dedicated to the photovoltaic system direct current (D.C.) side with a nominal D.C. voltage of 1.5 kV and a maximum D.C. voltage of 1.8 kV. These cables are suitable for permanent outdoor long-term use, under variable and harsh climate conditions. They are designed and tested to operate at a normal maximum conductor temperature of 90°C and for 20,000 hours up to 120°C. Therefore, the expected period use is 30 to 40 years under normal usage conditions (lifetime acc. to Arrhenius-Diagram).

BESKRIVELSE

ENERGYFLEX®er et produktsortiment konstruert i henhold til internasjonale standarder for solcelleanlegg. Kablene av typen H1Z2Z2-K egner seg for bruk mellom selve solcellepanelet og inverteren (DC-siden), og er egnet for spenninger opp til 1,5 kV (merkespenning) og maksimalt 1,8 kV. Kabelen kan benyttes til fast installasjon innendørs, men er spesielt konstruert for utendørs bruk, f.eks. på tak (vær- og UV-bestandig). Den er fleksibel og kan tilkobles flyttbart utstyr. Kablene er godkjent og testet for ledertemperatur opp til 90 grader C, og opp til 120 grader C i 20 000 timer. Forventet levetid er 30 til 40 år, eller lengre avhengig av belastning.

Standarder: EN 50618:2014

Design

1. **Leder:**
Fortinnet mangetrådet kobber klasse 5 i henhold til IEC 60228.

2. **Isolasjon:**
Halogenfri Polyolefin (hvit)

3. **Ytre kappe:**
- Halogenfri Polyolefin
- Svart farge

- Kappen har hvit merking som standard. Annen merkefarge er evt. spesifisert i produktnavnet.
- Merking i andre farger enn rød og hvit kan leveres på forespørsel

Merking

ENERGYFLEX® USE < HAR > H1Z2Z2-K 1 x S mm² 1.5/1.5 (1,8) kV DC Eca NEXANS 269 MADE IN FRANCE *xxx.m

*Yellow (Ink jet marking) for indicative metric marking (+/- 1.5%)

YTELSESERKLÆRING

Brannklasse: D_{ca}-s2,d2,a1
i henhold til EN50575:2014 +A1:2016

STANDARDER

Internasjonal EN 50618; IEC 62930

Brannklasse **D_{ca}-s2,d2,a1**	Leder fleksibilitet **Mangetrådet, klasse 5**	Halogenfri **IEC 60754-1/IEC 60754-2**	Normert spenning i 3 fase systemer Uo/U **1.0/1.0 (1.2) kV AC - 1.5/1.5 (1.8) kV DC**	Motstandsevne støt **Testmetode AG2 (middels hardt) i henhold til HD 60364-5-52**	Operating temp. **-40 .. 90 °C**	Max.conductor temp.in service **120 °C**	Korrosive gasser **IEC 60754-2**

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EGENSKAPER

Konstruksjonsegenskaper	
Kappefarge	Black (blue or red stripe on request)
Leder fleksibilitet	Mangetrådet, klasse 5
Halogenfri	IEC 60754-1/IEC 60754-2
Farge	Svart
Ledermateriale	Fortinnet kobber (mangetrådet) kl. 5 i henhold til IEC 60228
Isolasjon	XLPE (PEX) i henhold til EN 60811 og EN 60216-1-2
Ytre kappe	XLPE (PEX) i henhold til EN 60811 og EN 60216-1-2
Dimensjonsegenskaper	
Nominell ytre diameter	7,1 mm
Nettovekt kg/km (ca.)	122 kg/km
Ytre diameter min.	6,8 mm
Ytre diameter maks.	7,4 mm
Antall ledere	1
Ledertverrsnitt	10 mm²
Nominell isolasjonstykkelse	0,7 mm
Nominell kappetykkelse	0,8 mm
Lederdiameter	4,0 mm
Elektriske egenskaper	
Maks. tillatt belastning nominelt	70 A
Normert spenning i 3 fase systemer Uo/U	1.0/1.0 (1.2) kV AC - 1.5/1.5 (1.8) kV DC
Maks ledermotstand DC v/ 20 °C	1,95 Ohm/km
Maks ledermotstand DC v/ 90 °C	2,330 Ohm/km
Strømføringsevne på kabelbane ved 60 °C	93 A
Strømføringsevne i luft ved 60 °C	98 A
Tillat kortslutningsstrøm leder i 1 s	1260 kA
Mekaniske egenskaper	
Strekkstyrke	150 N
Hyppig vridning	100 000 gjentakelser
Gjentatt bøying	100 000 gjentakelser med reversbøying
Motstandsevne støt	Testmetode AG2 (middels hardt) i henhold til HD 60364-5-52
Bruksegenskaper	
Driftstemperatur område	-40 .. 90 °C
Maks. tillatt ledertemperatur	120 °C
Forpakning	Trommel
Maks. ledertemperatur v/ kortslutning	250 °C
Korrosive gasser	IEC 60754-2
Irriterende avgasser	IEC 60754
Røyktetthet	IEC 61034-1-2
Motstandsdyktig mot Ozon	EN 50396:2005

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Bruksegenskaper	
Flammehemmende	IEC 60332-1
Værbestandig/-het	Meget god
Min. bøyeradius ferdig installert	23,4 mm
Termisk motstandsdyktighet	IEC 60216-1-2
RoHS konformitet	RoHS 2011/65/EU
Korrosive eller forurensende stoffer	Testmetode AF 3 (sporadisk) i henhold til HD 60364-5-52
Utendørs bruk (UV)	Testmetode AN 3 (høy solintensitet), permanent i henhold til EN 50565-1:2014
Motstandsdyktighet mot UV	EN 50289-4-17 metode A, i 720 timer. Nexans' test i 4000 timer.
Motstand mot vibrasjon	Testmetode AH 3 (harde industrielle forhold) i henhold til HD 60364-5-52
Vanntett	Passed 100 days 50°C water immersion test of EN 50525-2-21 annex D and E

STRØMFØRINGSEVNE

Omgivelsestemperatur = 60°C

Maksimal ledertemperatur = 120°C

TEKNISK INFORMASJON DEL 1 (ENGELSK)

Peroxide Crosslinked Material	Halogen Free Material

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Cable insulation and jacket are both based on crosslinked polymers. Crosslinking is performed using peroxide technology. It means that the polymer macromolecular chains are physically bound by chemical links. The peroxide crosslinking is one of the most efficient ways to crosslink because it allows a crosslinking on a melt polymer, leading to a homogeneous network and a high density of links among the material thickness.

Advantages

- Infusible material (no more melting),
- Increased resistance to ageing: better thermal ageing, UV resistance, better resistance to chemicals…,
- Better mechanical properties (impact, abrasion…),
- High integrity to support overload or short circuit.

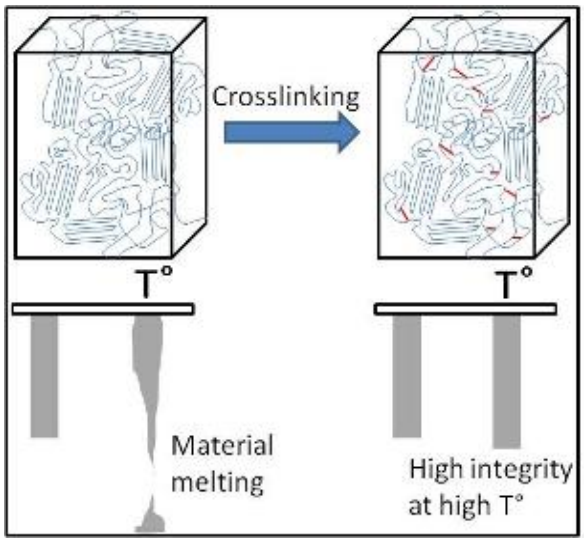

Fig: The peroxide molecule decomposition leads to the formation of chemical bonds between polymer chains. After crosslinking, a three-dimensional network is obtained. The polymer chains are no more capable to slip among themselves and an infusible material is obtained with improved properties.

Halogen based materials are widely used in cable industry with PVC and flame retardant additives. Halogens are a specific family of chemical elements: Fluorine (F), Chlorine (Cl), Bromine (Br), Iodine (I), Astatine (At).

These elements are well-known to bring high performances regarding fire retardancy. However, they generate during the burning phase a heavy dark smoke with the formation of highly toxic and corrosive gases. Our Energyflex® cables are totally free of these elements.

Halogen content by Ion Chromatography

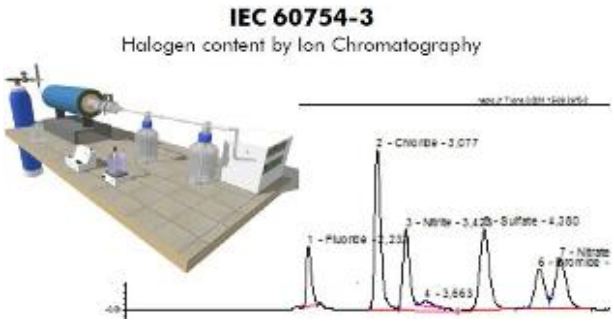

Fig:A piece of material is burned in a tube and the emitted gases are carried and trapped for analysis. For a precise dosage of these different halogen elements, ion chromatography allows to separate these elements and to quantify accurately the amount of each species.

Corrosivity of smoke

Fig: As seen before, a piece of material is burned and the gases are trapped in a liquid solution to measure the corrosivity of smoke. The pH and conductivity are measured and should be higher than respectively 4.3 and 10 µS/mm.

TEKNISK INFORMASJON DEL 2 (ENGELSK)

Long Term Thermal Endurance

Sunlight Resistance

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The cable ageing under thermal oxidation leads to the degradation of the polymer material. To predict or at least to estimate what could be the lifetime of a material under thermal ageing, one uses the Arrhenius procedure depicted in the IEC 60216-1 to 4. The main principle is to age the material at high temperatures and then, using the Arrhenius law, to estimate/predict the lifetime at operating temperature (120 or 90°C).

Arrhenius plot

Ageing was performed at 4 different temperatures: 135°C, 150°C, 165°C and 180°C. The line (linear plot) allows to predict the lifetime at 120 and 90°C. The red dots represent the main targets we are looking for, i.e. the 20000h@120°C, 25years@90°C and 40years@90°C. The more the extrapolated line is above the red dots, the more the lifetime is higher than the target.

The obtained extrapolation is well above the targets and thus the estimated lifetime is bigger than 40years@90°C.

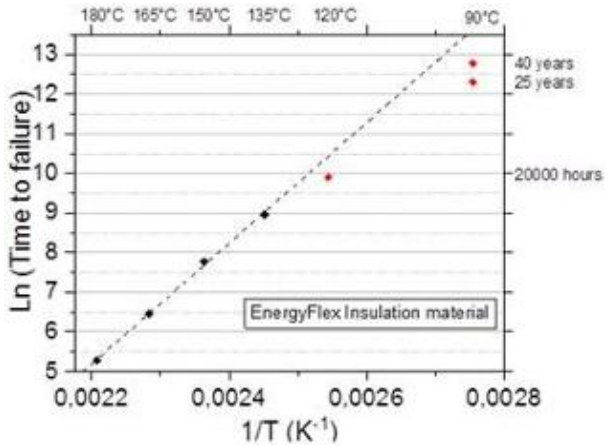

Fig: Arrhenius plot of the insulation material. The criterion to determine the time to failure is chosen as a loss of 50% of the initial elongation at break. At this stage, the cable has initiated it degradation but it is not fully degraded.

One of the main causes of material ageing regarding photovoltaic application is the exposure to UV (Ultra-Violet) light, also called photo-degradation. The cable ageing under UV light is due to the combination of the temperature and UV irradiation (harmful UV irradiation is mainly between wavelengths 300 and 400 nm on the earth surface).

Accelerated ageing

Our jacketing material presents no degradation after 1 month of weathering acc. to the EN 50289-4-17 method A.

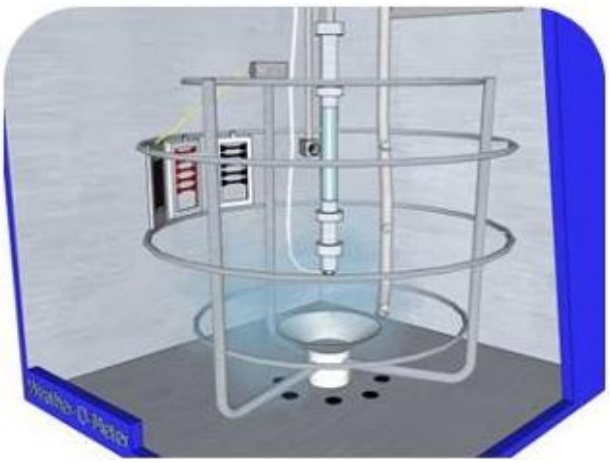

Fig: The Xenon lamp generates a spectrum close to the sunlight one. The samples are placed facing the lamp and are submitted to a specific irradiance and temperature to accelerate the UV ageing.

Beyond the standard

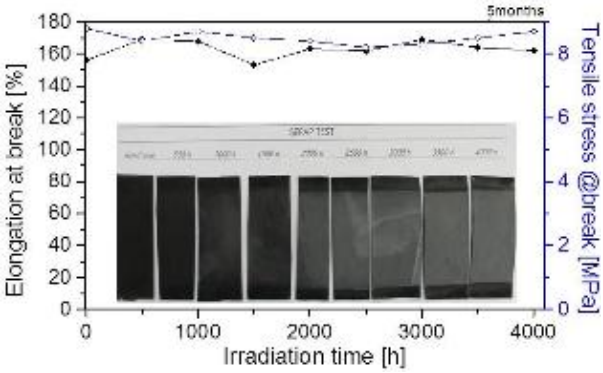

Fig: Here in our Nexans process, we exceed the test conditions of the EN (4000hours against 720h and 100W/m² against 43W/m² specified) and we see no change of the mechanical features.

TEKNISK INFORMASJON DEL 3 (ENGELSK)

Dynamic Mechanical Performances

Fire/Flame Retardancy

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No dynamic mechanical tests are found in the EN 50618 standard because the cables are intended to be used without any dynamic constraints.

As Energyflex® could be used for Tracker systems, we have performed additional tests:

- Cyclic torsion
- Cyclic bending

Dynamic behaviour

Dynamic/cyclic mechanical constraints lead to the conductor degradation (copper/aluminium braid degradation). In our case, the cable present very good dynamic properties and still transmit current after 100 000 cycles in both torsion and bending.

Fig: Torsion cycles: 50N ± 135° 100°/s

Fig: Reverse bending: 100N ± 45° 160°/s

Energyflex® cables are HFFR, i.e. Halogen Free Fire Retardant cables. The material is free of halogen and is capable to withstand a flame retardant test according to the EN 60332-1-2. It means that the cable presents a good resistance regarding the flame spread with a very good self-extinguishing behavior.

Resistance to flame test

The cable passes the EN 60332-1-2 where 600mm of cable are tested vertically. The flame is applied with a 45° angle and a 1kW burner.

IEC/EN 60332-1-1 & 1-2 & 1-3

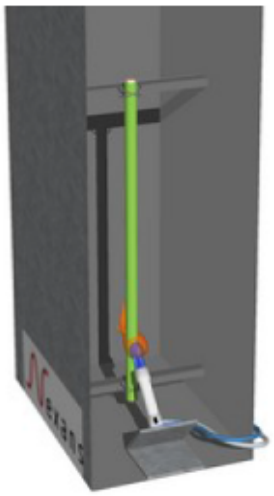

Fig: Picture of the flame test acc. to EN 60332-1. The flame is applied 1 to 8 minutes depending on the cable diameter. The test is compliant if after the flame application, the flame extinguishes with a burned length comprises between 50 and 540mm.

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INFORMASJON

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