

# TECSUN<sup>®</sup> Photovoltaic Cable



**Prysmian**  
Group

Linking  
the Future



TECSUN<sup>®</sup> H1Z2Z2-K 1,5 KV DC

# BEST SOLAR CABLE ON THE MARKET TODAY

**TECSUN H1Z2Z2-K 1,5 kV has been on the market since 2003 without any changes to compounds or any customer claims due to insulation failure.**

**TECSUN H1Z2Z2-K 1,5 kV is produced in one Prysmian factory in Europe and sold worldwide.**

**18**

YEARS OF APPLICATION HISTORY

**1.5**

MILLION KILOMETERS DELIVERED WORLDWIDE

# TECSUN<sup>®</sup> most competitive features



## VDE certified

Only photovoltaic DC cable on the market according to EN 50618 with both VDE and TÜV certification.



## Water resistant

High resistance against water penetration. Suitable for permanent submersion in fresh (AD8) water.



## Direct burial

Since 2003 TECSUN has been suitable for direct burial in soil in the presence of water and aggressive earth conditions.



## Long lifetime

Operational lifetime of 300.000 hours corresponding to approximately 30 years.



## Non-discoloration

The red and blue cable versions have the same UV resistance and non-discoloration over time as the black version.

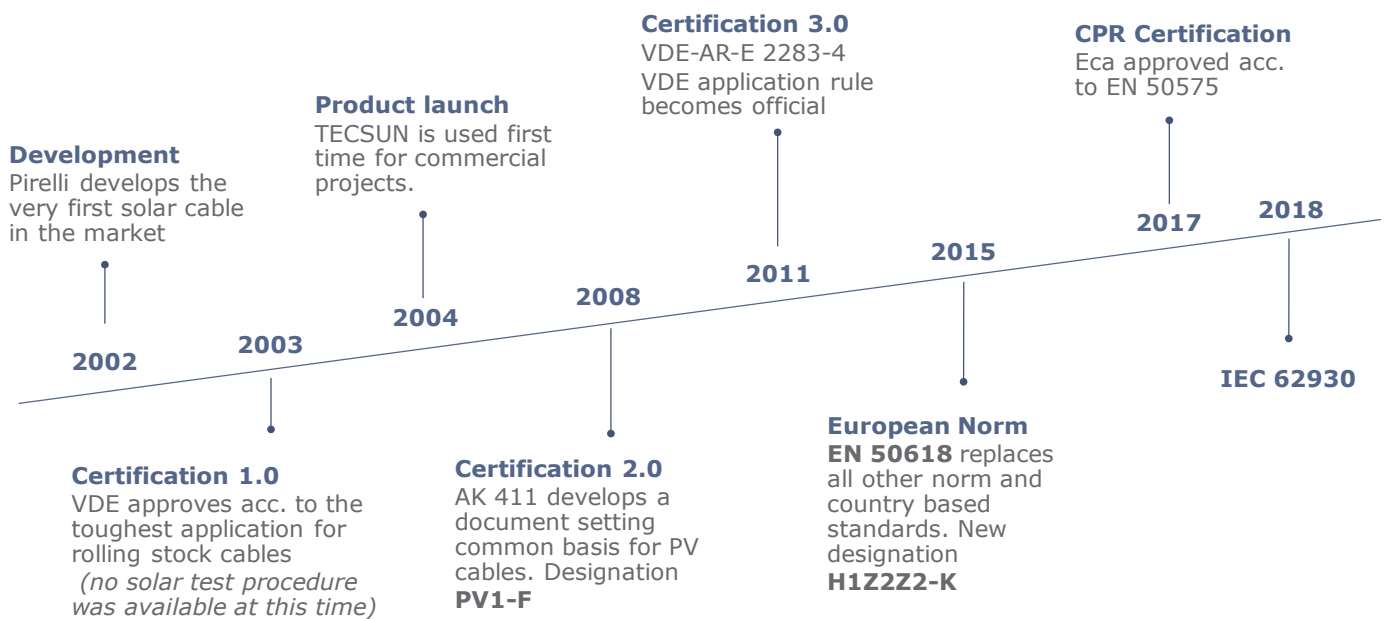


## 17 additional tests

In addition to standard tests required acc. to EN 50618, TECSUN has been tested for further properties to document its superior performance.



# TECSUN<sup>®</sup> history of development



## Basic requirements to EN 50618

- Expected lifetime of 25 years
- 1,5 kV DC rated voltage
- 120°C ambient temperature
- Low Smoke Zero Halogen (LSOH)
- Flame retardant acc. to IEC 60332-1 (single cable)
- UV and ozone resistance

# Benefits beyond EN 50618

- **Specifically for DC application**  
Adheres to standard for DC application of PV single-core cables according to standard IEC 62930.
- **Resistance to cold temperatures**  
Suitable for operation at very low temperatures down to -40°C. Passed cold impact, bending and elongation tests at -40°C.
- **Robust sheathing**  
Tested for abrasion resistance according to sheath against sheath, sheath against metal, plastic and sandpaper.
- **Enhanced fire performance**  
CPR approved acc. to EN 50575 with fire class Eca or Dca. Tested for bunched cables acc. to EN 50305-9. Smoke emission with light transmission > 70% acc. to EN 61034-2. Halogen content acc. to EN 50525-1 and toxicity index < 3 acc. to EN 50305.
- **Long-term water resistance**  
Tested for long-term submersion in water at 90°C under 600V AC for 92 weeks with no insulation breakdown.
- **Resistance to oils and chemicals**  
Tested in saturated ammonia atmosphere for 30 days, immersed in mineral oil at 100°C for 24 hours and acid and alkaline solution for 7 days at 23°C.
- **Enhanced mechanical properties**  
Tested after ageing in oven for 10 days at 160°C (EN 50618 requires 7 days at 150°C).
- **5 years extra lifetime**  
At 90°C operating temperature and a permissible temperature of 120°C for 20.000 hours in operation the cable has a service lifetime of 300.000 hours corresponding to approx. 30 years.

# TECSUN<sup>®</sup>

## H1Z2Z2-K 1,5 kV

TECSUN (PV) H1Z2Z2-K is intended for use in photovoltaic power supply systems at nominal voltage rate of 1,5/1,5 kV DC either indoors or outdoors as well as in industrial and agriculture fields. It is suitable for installation as fixed or freely suspended or free movable. Installation in cable trays, conduits, in or on walls, directly buried or submerged in water.



**DESIGNED FOR CONNECTING  
SOLAR PANELS TO ARRAY BOXES  
OR INVERTERS IN FIELDS, ON  
ROOFTOPS OR IN WATER**

**Eca**  
CPR

**Dca**  
CPR

# 18 years

APPLICATION HISTORY  
WITH NO CHANGE TO  
COMPOUNDS

### CONSTRUCTION

#### Standard

According to EN 50618, EN 50575 and IEC 62930

#### Conductor

Electrolytic tinned copper, finely stranded class 5. in accordance with IEC 60228

#### Insulation

Cross-linked HEPR 120°C

#### Outer sheath

Cross-linked EVA rubber 120°C. Insulation and sheath are solidly bonded (Two-layer-insulation). Available with black, blue or red color sheath.

#### Rated voltage

1,5 kV DC or 1.0 kV DC

#### TÜV certified

Approved acc. to EN 50618 with certificate no. 60103637

#### VDE certified

Approved acc. to EN 50618 with <VDE> marking

## TECSUN H1Z2Z2-K 1,5 kV

Conductor cross-section mm <sup>2</sup>	Outer diameter min. mm	Outer diameter max. mm	Bending radius, fixed min. mm	Weight approx. Kg/km	CPR fire class	DoP number
1x1,5	4.4	5,0	15	40	Eca	1007351
1x2,5	4.8	5.4	17	50	Eca	1007351
1x4	5.3	5.9	18	70	Eca	1007351
1x6	5.8	6.4	20	80	Eca	1007351
1x10	7,0	7.6	23	130	Eca	1007351
1x16	9,0	9.8	30	200	Eca	1007351
1x25	10.4	11.2	34	290	Eca	1007351
1x35	11.7	12.5	50	400	Eca	1007351
1x50	13.5	14.5	58	550	Eca	1007351
1x70	15.5	16.5	66	750	Eca	1007351
1x95	17.7	18.7	75	970	Eca	1007351
1x120	19.2	20.4	82	1220	Eca	1007351
1x150	21.4	22.6	91	1510	Eca	1007351
1x185	23.7	25.1	101	1850	Eca	1007351
1x240	27.1	28.5	114	2400	Eca	1007351

## TECSUN H1Z2Z2-K 1,5 kV

Conductor cross-section mm <sup>2</sup>	Conductor diameter max. mm	Tensile force permitted max. N	Conductor resistance at 20°C max.Ω /km	Current carrying capacity at 60°C in air A	Current carrying capacity at 60°C on a surface A	Short circuit current 90-250°C kA
1x1,5	1.6	23	13.7	30	29	0.21
1x2,5	1.9	38	8.21	41	39	0.36
1x4	2.4	60	5.09	55	52	0.57
1x6	2.9	90	3.39	70	67	0.86
1x10	4,0	150	1.95	98	93	1.43
1x16	5.6	240	1.24	132	125	2.29
1x25	6.4	375	0.795	176	167	3.58
1x35	7.5	525	0.565	218	207	5.01
1x50	9,0	750	0.393	276	262	7.15
1x70	10.8	1050	0.277	347	330	10.01
1x95	12.6	1425	0.21	416	395	13.59
1x120	14.2	1800	0.164	488	464	17.16
1x150	15.8	2250	0.132	566	538	21.45
1x185	17.4	2775	0.108	644	612	26.46
1x240	20.4	3600	0.082	775	736	34.32

## Electrical properties



### Rated voltage

- 1,5 kV DC or 1.0 kV AC



### Max. operating voltage

- 1,8/1,8 kV DC or 1,2/1,2 kV AC



### Test voltage (5 min)

- 15 kV DC or 6,5 kV AC



### Current carrying capacity

- According to EN 50618, Table A-3



### Electrical tests

According to EN 50618, table 2:

- Conductor resistance
  - Voltage Test on completed cable (AC and DC)
  - Spark Test on insulation
  - Insulation resistance (at 20°C and 90°C in water)
  - Insulation long-term resistance to DC (10 days, in 85°C water, 1,8 kV DC)
  - Surface resistance of sheath
  - AD8 (acc. to UL44 sec. 5.4 (>92 weeks))
- Prysmian internal tests:
- Dielectric strength
  - Insulation resistance at 120°C in air



## Mechanical properties



### Bending radius

High flexibility with small bending radius

- Acc. to EN 50565-1



### Abrasion resistance

Prysmian internal tests:

- Sheath against abrasive paper acc. to DIN ISO 4649
- Sheath against sheath
- Sheath against metal
- Sheath against plastics



### Tensile load

- Max. 15 N/mm<sup>2</sup> in operation
- Max. 50 N/mm<sup>2</sup> during installation



### Shrinkage test

Acc. to EN 50618, Table 2:

- Maximum shrinkage <2% (test acc. to EN 60811-503)



### Pressure test at high temperature

Prysmian internal test

- <50% acc. to EN 60811-508



### Dynamic penetration test

Acc. to EN 50618, Annex D:

- Meets requirements of EN 50618



### Shore hardness

Prysmian internal test:

- Type A. 85 acc. to DIN EN ISO 868



### Durability of print

Easy identification and no discoloration acc. to standard EN 50618

- Test acc. to EN 50396



## Chemical properties



### Performance against fire

Acc. to EN 50618, Table 2:  
• Single Cable Flame Test acc. to EN 60332-1-2



• Low Smoke Emission acc. to EN 61034-2 with light transmittance > 70%  
• Halogen-free per EN 50525-1, Annex B  
Prysmian internal tests:

• Multiple Cable Flame Test acc. to EN 50305-9



• Low toxicity per EN 50305 (ITC < 3)  
• CPR fire class Eca or Dca (s2,d2,a1) acc. to EN 50575



### Acid and alkaline resistance

Acc. to EN 50618, Annex B:  
• 7 days, 23°C (N-Oxalic Acid, N-Sodium hydroxide) acc. to EN 60811-404



### Ammonia resistance

Prysmian internal test:  
• 30 days in saturated ammonia atmosphere



### Sustainability

• Comply with the RoHS directive 2011/65/EU



### Resistance to oil

Prysmian internal test on sheath:  
• 24 hours at 100°C acc. to VDE 0473-811-404 and EN 60811-404



### Weather resistance

Acc. to EN 50618, Annex E and Table 2.  
• UV resistance on sheath - tensile strength and elongation at break after 720 hours (360 cycles) of exposure to UV light acc. to EN 50289-4-17 method A  
• Ozone resistance acc. to test type B (DIN EN 50396)  
• AD8 acc. to DIN EN 50525-2-21 appendix E.



Prysmian internal test:

• Water absorption (Gravimetric) acc. to DIN EN 60811-402



## Thermal properties



### Conductor temperature

• Max. operating temperature at 90°C with 20.000 hours of operation temperature of 120°C



### Short circuit temperature

• Max. conductor temperature of 250°C (5 sec)



### Ambient temperature

• Installation and handling from -25°C up to 60°C  
• In operation from -40°C up to +90°C



### Resistance to cold

Acc. to EN 50618, Table 2:  
• Cold Bending Test at -40°C acc. to DIN EN 60811-504;  
• Cold Elongation Test at -40°C acc. to DIN EN 60811-505  
• Cold Impact Test at -40°C acc. to DIN EN 60811-506 and EN 50618 Annex C



### Damp-Heat Test

Acc. to EN 50618, Table 2:  
• 1.000 hours at 90°C and 85% humidity (test acc. to EN 60068-2-78)



# TECSUN<sup>®</sup> electrical properties

## Current Carrying Capacity

The current carrying capacity values (in ampere) for each installation method at an ambient temperature of 60°C are according to EN50618, Table A3.

## De-rating Factors

De-rating factors are used to properly calculate the current carrying capacity, considering the installation and operating conditions. In case of use at an ambient temperature greater than 60°C, please consider the de-rating factors indicated in EN50618, Table A4. For installation in groups, the de-rating factors from HD60364-5-52 apply.

### TECSUN H1Z2Z2-K 1,5 kV

Ambient temperature (°C)	Reduction factor
up to 60	1,00
70	0,92
80	0,84
90	0,75

### TECSUN H1Z2Z2-K 1,5 kV

Conductor cross section mm <sup>2</sup>	Single cable free in air A	Single cable on surface A	Two cables touching, on surface A
1 x 1,5	30	29	24
1 x 2,5	41	39	33
1 x 4	55	52	44
1 x 6	70	67	57
1 x 10	98	93	79
1 x 16	132	125	107
1 x 25	176	167	142
1 x 35	218	207	176
1 x 50	276	262	221
1 x 70	347	330	278
1 x 95	416	395	333
1 x 120	488	464	390
1 x 150	566	538	453
1 x 185	644	612	515
1 x 240	775	736	620

**18** years

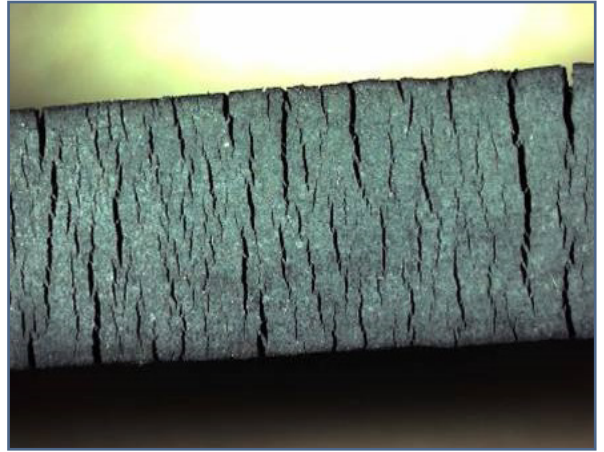
APPLICATION HISTORY

It's about being the PV Solar industry's trusted partner of choice and connecting solar energy to people across the globe – today and in the future.

# Ageing and misuse effects



Cable overheating effect



Ozone damage effect



Friction effect



Ozone damage effect



Cable handling misuse - bending radius too small



Installation misuse - violent pressure

# Environmental conditions simulator

**A weather chamber is a reliable instrument that artificially replicates the environmental conditions a solar PV cable may be exposed to.**

## **Ultra-violet (UV) exposure at 900 – 100 nm UV**

The insulation and outer sheath of cables used outdoors is well known to be prone to rapid degradation by ultra-violet exposure.

## **Heat up to 90°C**

Elevated temperature cause deterioration due to irreversible changes in chemical structure of insulation and sheath materials which lead to degradation of mechanical and electrical properties, and thus shortening of cable service life.

## **Humidity between 60 - 80 %**

During their operating service, solar cables can be exposed to wet environment. The presence of moisture in cables surroundings leads to eventual degradation of materials used and may affect properties and reliability of solar cables.

## **Ozone at 0,04 ppm**

Solar cables are exposed to ozone effects and other atmospheric influences. Light and oxygen penetrate the molecular chains of cable jacket causing them to split. This results in the formation of highly reactive radicals which continue to attach molecular structures.

*IN 15-20 MINUTES,  
OUR WEATHER SIMULATOR  
DEMONSTRATES HOW  
DIFFERENT PV CABLES  
HANDLE 15-20 YEARS OF  
WORKLOAD IN REAL LIFE*

**The weather chamber test highlights the most common faults in a photovoltaic cable such as:**

### **Discoloration**

Areas loose UV and ozone resistance

### **Cable shrinkage**

Connectors become loosely attached

### **Outer sheath cracks**

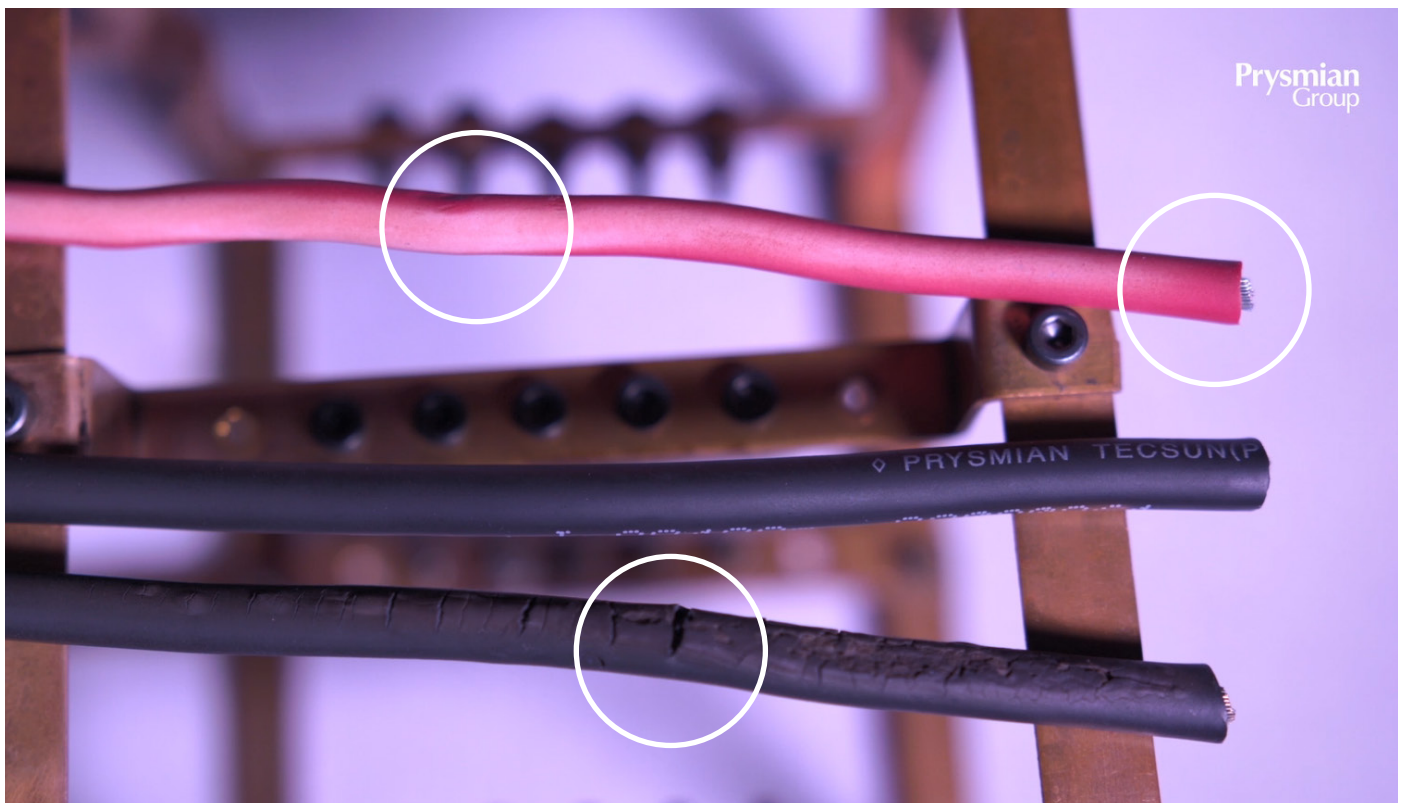
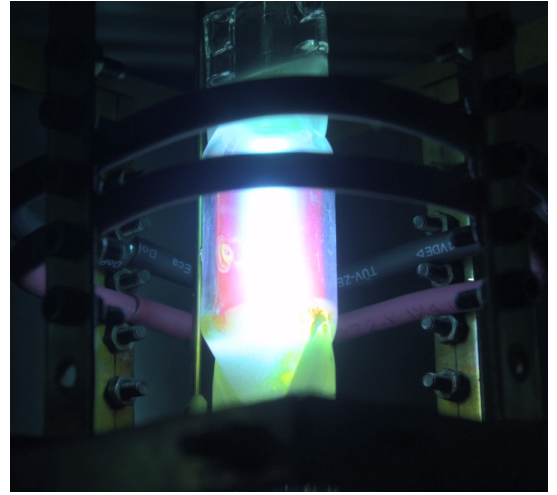
Humidity penetrates to insulation and cable conductor

### **Gap between sheath and insulation**

Humidity spreads longitudinally inside the cable and to connected equipment

[Watch video here](#)

See our live video of the simulator in use.



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