TECSUN©
Photovoltaic Cable

Prysmian Group

Linking the Future

18 YEARS

TECSUN© 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© 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.

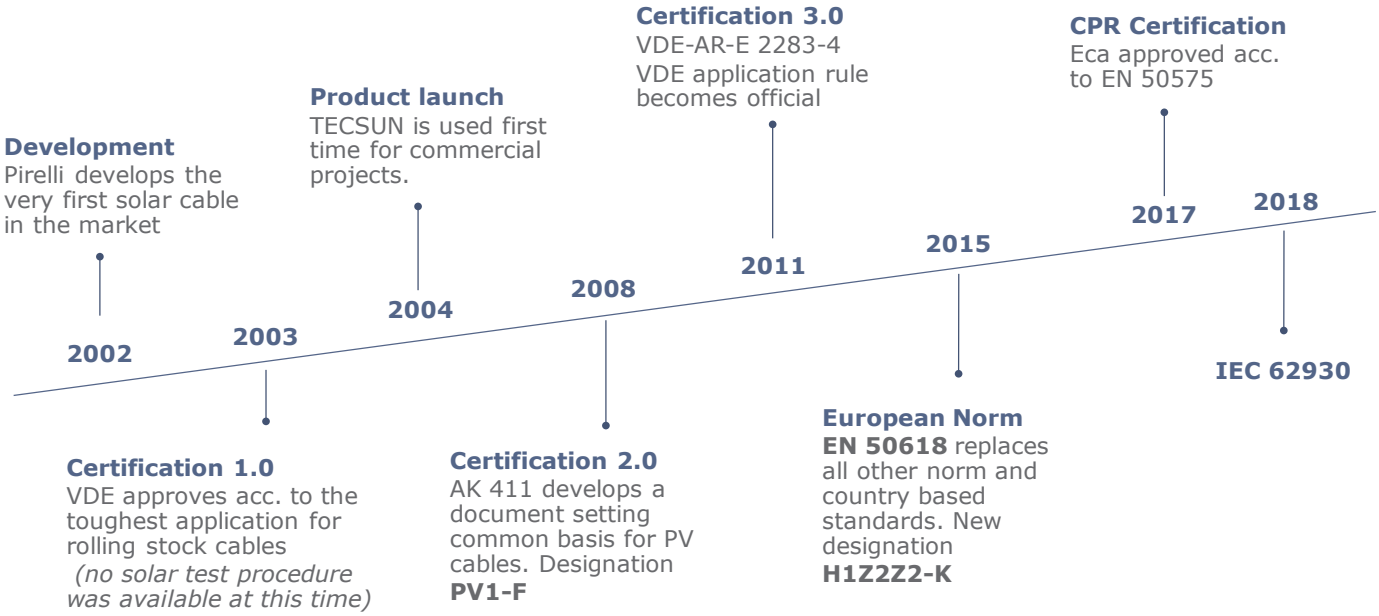
Direct burial
Since 2003 TECSUN has been suitable for direct burial in soil in the presence of water and aggressive earth conditions.

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.

Additional tests
In addition to standard tests required acc. to EN 50618, TECSUN has been tested for further 17 properties to document its superior performance.

TECSUN© 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

- **Especially for DC appliation**
  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 year 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.

Eca
CPR

TECSUN© 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 immersed in water.

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

18 years

OF APPLICATION HISTORY WITH NO CHANGE TO COMPOUNDS

DESIGN

Standards
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 colour sheath in black, blue and red.

Rated voltage
1,5 kV DC or 1.0 kV DC

TÜV certified
Approved according to EN 50618 with certificate no. 60103637

VDE certificied
Approved according to EN 50618 with <VDE> marking

TECSUN H1Z2Z2-K 1,5 kV						
Conductor cross-section mm²	Outer diamater min. mm	Outer diamater 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 mm²	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
- DC 1,5 kV or AC 1.0 kV

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)
- Dieletric strenght
- 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/mm² in operation
- Max. 50 N/mm² 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 EN 50618:
- Test acc. to EN 50396

Thermal properties

Conductor temperature
- Max. operating temperature at 90°C with 20.000 hours of operation at 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 operations 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

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 per EN 50305-9
- Low toxicity per EN 50305 (ITC < 3)
- CPR fire class Eca 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

Resistance to oil
Prysmian internal test
- 24 hours at 100°C acc. to VDE 0473-811-404, 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 acc. to 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

Sustainability
- Comply with the RoHS directive 2011/65/EU

TECSUN© 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, taking into account 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

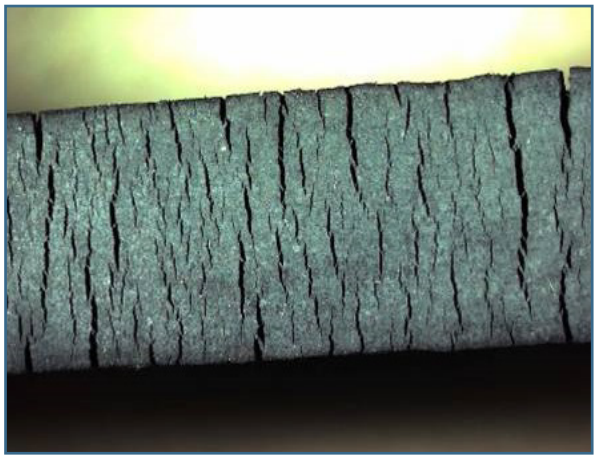
Conductor cross section mm²	Single cable free in air A	Single cable on surface A	Two cables touching, on surface A
1 x 1,5	30	29	24
1 x 2,5	41	39	33
1 x 4	55	52	44
1 x 6	70	67	57
1 x 10	98	93	79
1 x 16	132	125	107
1 x 25	176	167	142
1 x 35	218	207	176
1 x 50	276	262	221
1 x 70	347	330	278
1 x 95	416	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

Cable overheating 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 resistancy

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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UV
OZONE
HEAT
HUMIDITY
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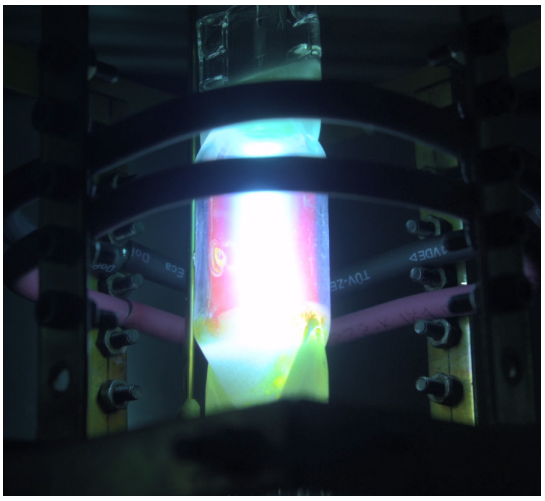

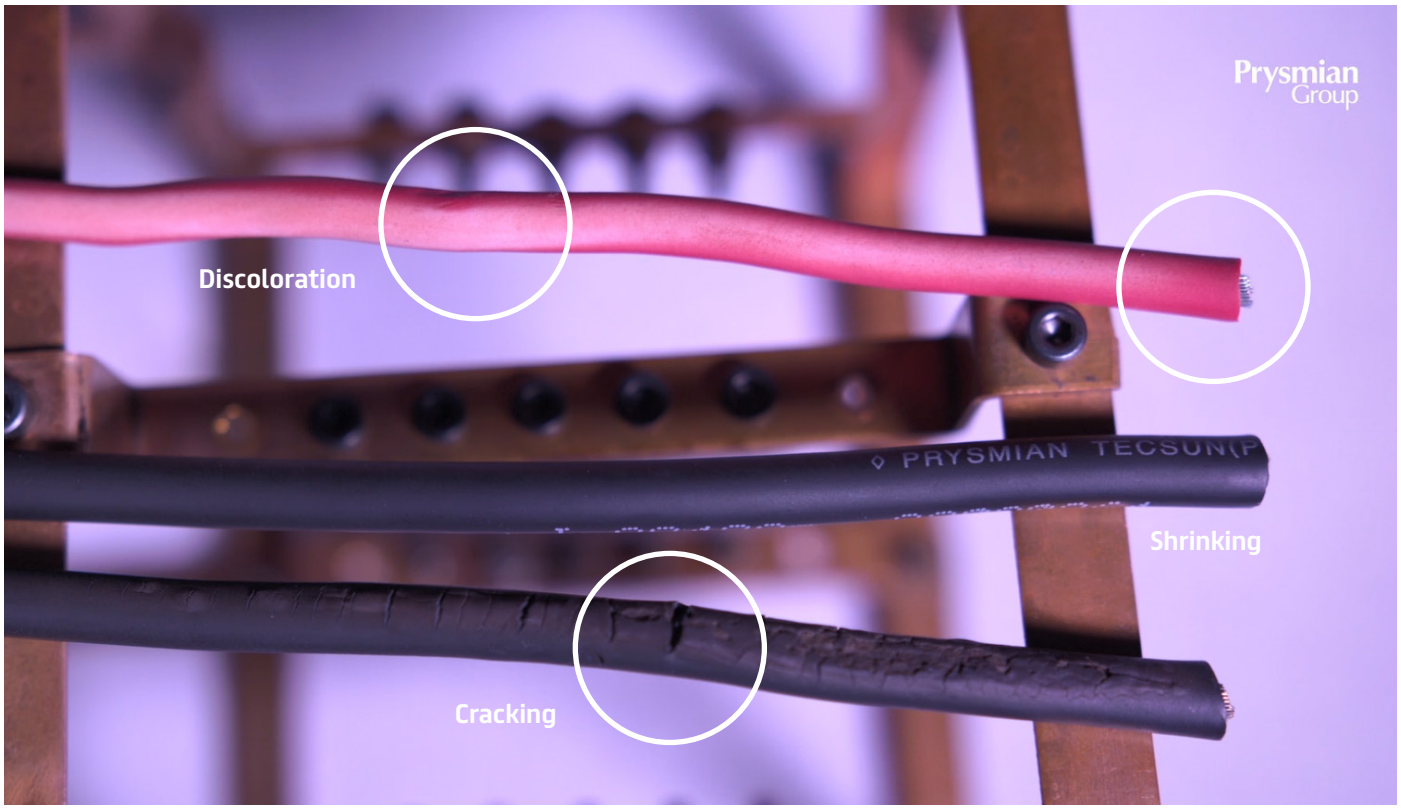
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Discoloration
PRYSMIAN TECSUN
Shrinking
Cracking

Prysmian Group

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