

Let it shine.

On land or floating at sea, we have all the cables that'll bring sunshine to societies.



Prysmian
Group

Linking
the Future

CONNECTING THE WORLD. TODAY AND IN THE FUTURE.

**Prysmian Group is world leader
in the energy and telecom cables
and systems industry.**

**With 140 years' experience,
the Group is strongly positioned
in high-tech markets and offers
the widest possible range of
products, services, technologies
and know-how.**

140

YEARS OF
EXPERIENCE

25

R&D CENTRES
AROUND
THE WORLD



We specialise in underground and submarine cables and systems for power transmission and distribution, special cables for applications in many different industries, and medium and low voltage cables for the construction and infrastructure sectors.



For the telecommunications industry, the Group is the world's largest provider of cutting-edge cables and accessories for voice, video and data transmission, offering a comprehensive range of optical fibres, optical and copper cables and connectivity systems.



We are committed to environmental responsibility in our production processes, the protection of the global environment, and the responsible management of relations with the local communities in which we work.



For us, innovation means meeting the needs of our customers and communities by understanding their business drivers as quickly as they do. To do that, our team of over 900 Research & Development professionals is constantly looking to the future, predicting and identifying emerging trends in each of our industries and sectors. Acting on this intelligence from 25 R&D centres around the world, we're constantly close to our customers in their own local markets.



Solar Photovoltaic Cables

To meet an ever-growing need for power, the world is increasingly turning to renewable and sustainably sourced solar energy. Prysmian Group's cables are helping businesses in the renewable industry around the globe to convert this opportunity into reality. Our technologies – which cover cables used in photovoltaic plants – support the operations of contractors and developers, grid operators, transmission and distribution system operators and panel makers. Always aware of our responsibility to the planet, we are constantly driving innovation in our industry, aiming to help renewable industry partners deliver projects with benefits for the future of both our world and their businesses.

The choice of components is critical in any PV system. Good quality and properly sized cables provide optimized safety and longer-lasting systems.

Solar PV cables are often exposed to harsh environmental conditions: UV radiation, moisture, temperature fluctuations as well as wind, snow and rain. Inadequate or low-quality cables can deteriorate quickly, thus reducing a system's power generation capacity and, therefore, its revenues. Every KW lost in generation due to poor quality cables is a loss in terms of return on investment.

Cables are one of the first components of a system to show failures, causing power generation disruptions and implying high replacement costs related not only to the replacement of cables, but also, and mostly, to the works required and the possible collateral damages to panels or other components.



We have all the photovoltaic cables that you might need.

On land or floating at sea, with our cables you can bring sustainable sun power all the way from the solar panels, through the distribution grids and into the many homes and offices. Our one-stop-shop-strategy supports you with all that you need to feed societies with renewable energy. Let the sunshine in.

What we offer.

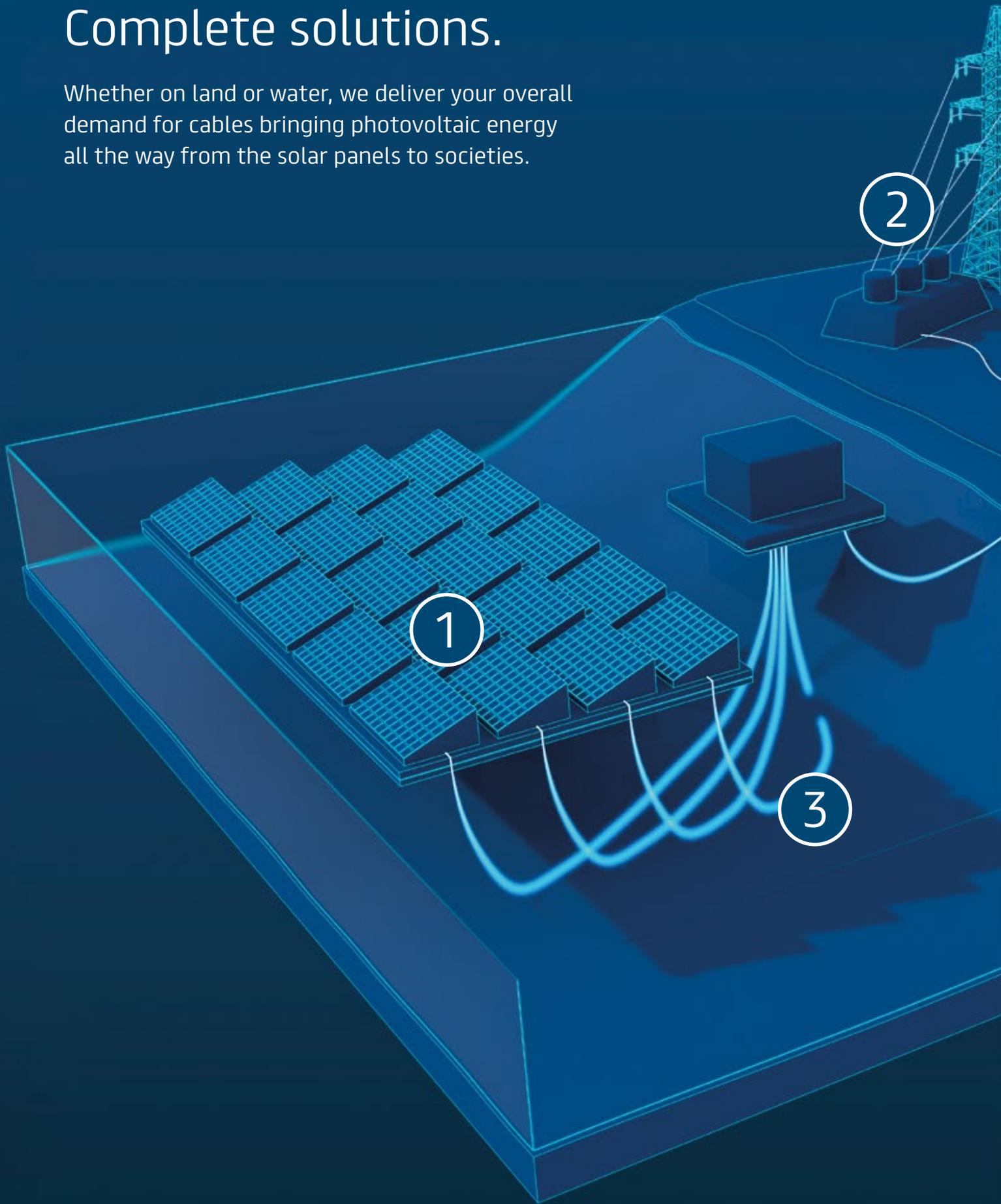
Prysmian Group offers complete cable solutions to enable the production and supply of solar photovoltaic power. In addition to the Solar PV cables, our cable portfolio includes low, medium and high voltage cables according to the most known standards of each region, as well as special cables for communication and control. In addition to cables, Prysmian offers electrical asset management solutions with PRY-CAM, the revolutionary technology for on-line, accurate and reliable partial discharge measurements, diagnosis and defect localization.

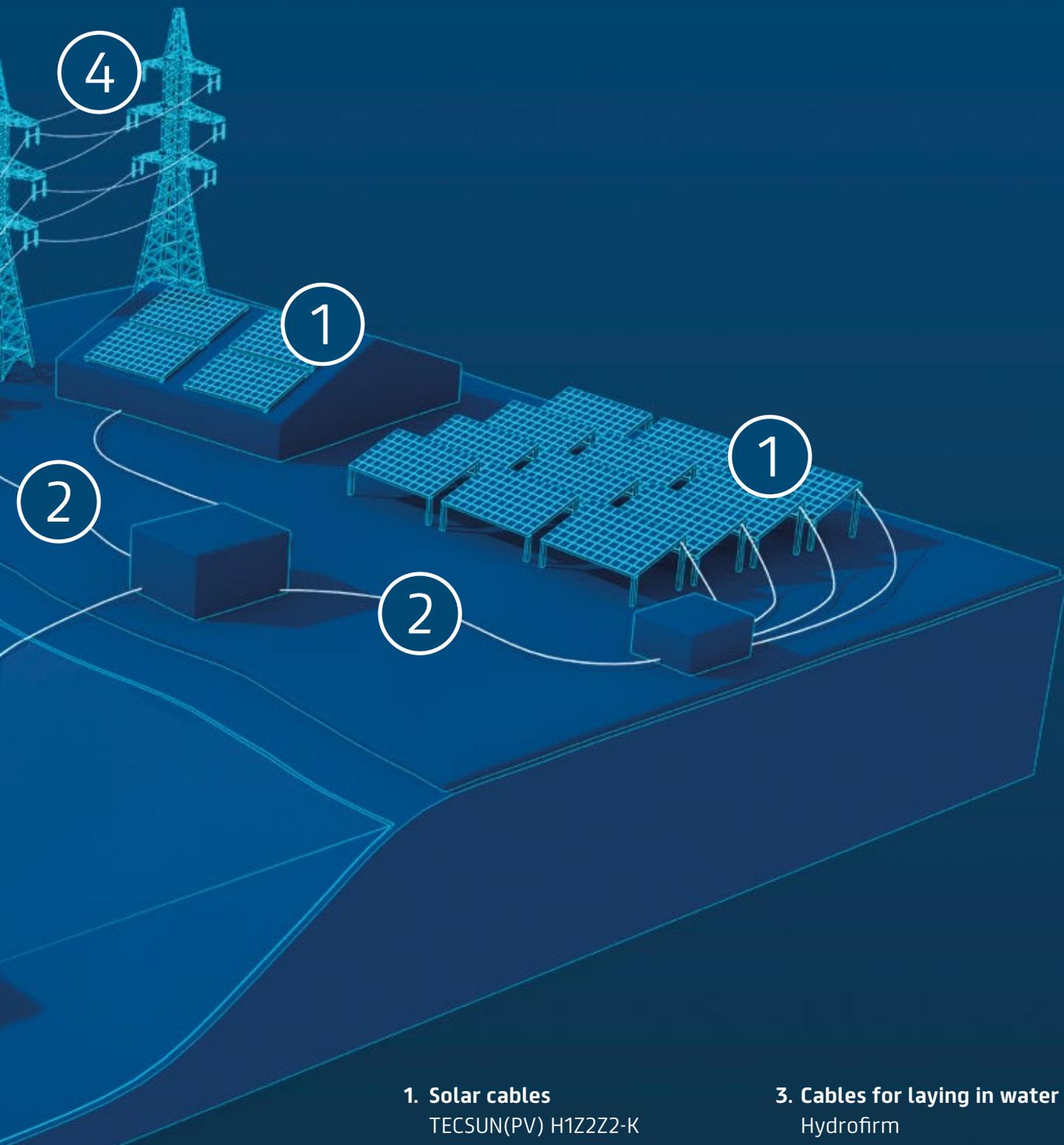
Global group, local force.

Prysmian Group is world leader in the energy and telecommunications cable systems industry. No matter how large, we are always present to serve both our global and our local customers and business partners. In order to offer bespoke and tailor-made solutions, we appreciate the importance of understanding local pre-conditions and special needs. This is why we believe that it is crucial to be present within local geographies, while being backed-up by the capacity that only a truly global group possesses.

Complete solutions.

Whether on land or water, we deliver your overall demand for cables bringing photovoltaic energy all the way from the solar panels to societies.





1. Solar cables

TECSUN(PV) H1Z2Z2-K
 TECSUN(PV) S3Z2Z2-K
 TECSUN(PV) ALU

2. Energy cables

Low voltage
 Medium voltage
 High voltage
 Extra-high voltage
 Accessories and components

3. Cables for laying in water

Hydrofirm
 TML
 Ozoflex
 Tecwater
 Protomont
 Protolon

4. Overhead Lines

One-stop shop.

We have a vast and unbridged photovoltaic cable offer that can be tailor-made to fit specific customer needs.

Solar cables

Reflecting our commitment to both innovation and sustainability, we offer a full range of quality photovoltaic products, renowned in the field for their easy installation, reliability and longevity attributes and complying with all major international standards.

Our technologies are hard at work across the renewables sector, supporting the operations of contractors, developers, grid operators, PV panel makers, PV power generation system integrators and even entire solar parks.



Water cables

To bring the electricity from water based solar farms to mainland, you need waterproof cables that can resist heavy seas. We offer a complete range of high performance and reliable solutions that ensure a long lifetime, compliance with the demanding off-shore environment. The reliability and service life of our submersible cables are thanks to our extensive know-how of the special operational conditions, gained from decades of close cooperation with significant manufacturers within both the submerged pumps and photovoltaic industries.



Energy cables

Prismian supports grid operators and utilities, industrial companies, and installers transmit and distribute renewable energy all over the world.

We design, produce and install high and extra high voltage underground and submarine cable systems, providing network components, value added engineering as well as monitoring and maintenance systems and services. We similarly design and produce low and medium voltage cables for use in distribution networks.



A buried treasure.

TECSUN – flawless since 2003 and suitable for direct burial.

TECSUN[®] features



VDE certified

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



Designed for DC application

Adheres to standard for DC application of PV single-core cables according to IEC 62930.



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.



Expected lifetime

Operational lifetime of 300,000 hours corresponding to approximately 30 years.



Red and blue outer sheath

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.

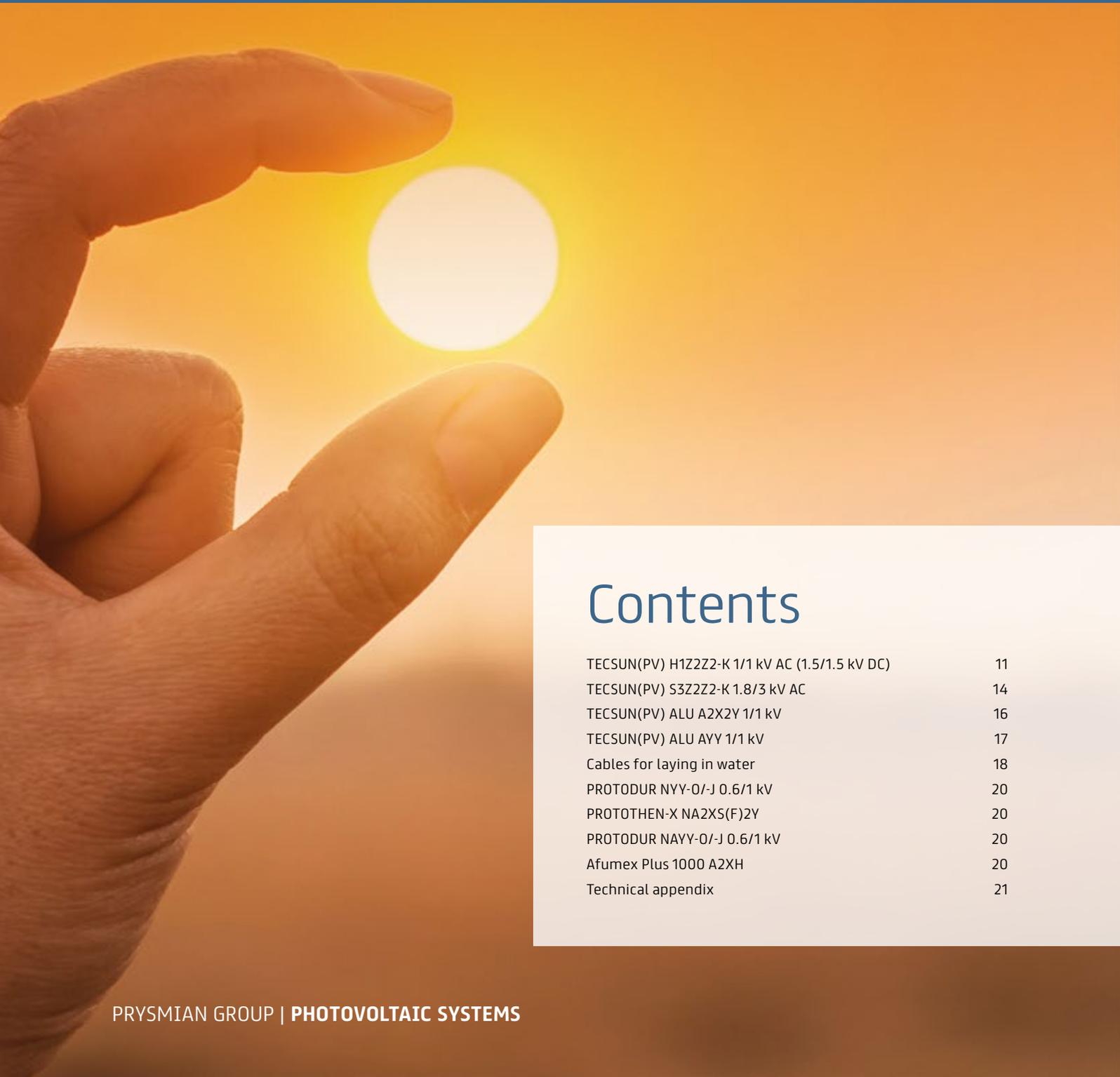


The TECSUN World Tour.

Did you know that already today there is 1 500 000 000 meters of TECSUN cables installed in the world! If you laid it all in one line, the cables would reach about 37.5 times around Earth.

Here are some examples where TECSUN was installed during the last two years:

Angola	400 MW	Poland	350 MW
Chile	300 MW	Portugal	250 MW
Egypt	400 MW	Spain	750 MW
Germany	1,900 MW	Ukraine	200 MW
Japan	100 MW	And the World Tour continues ...	
Kazakhstan	100 MW		
Mexico	370 MW		
Netherlands	750 MW		



Contents

TECSUN(PV) H1Z2Z2-K 1/1 kV AC (1.5/1.5 kV DC)	11
TECSUN(PV) S3Z2Z2-K 1.8/3 kV AC	14
TECSUN(PV) ALU A2X2Y 1/1 kV	16
TECSUN(PV) ALU AYY 1/1 kV	17
Cables for laying in water	18
PROTODUR NYY-0/-J 0.6/1 kV	20
PROTOTHEN-X NA2XS(F)2Y	20
PROTODUR NAYY-0/-J 0.6/1 kV	20
Afumex Plus 1000 A2XH	20
Technical appendix	21

TECSUN(PV) H1Z2Z2-K 1/1 kV AC (1.5/1.5 kV DC)



PV cables, rubber insulated, VDE and TÜV certified as per EN 50618.

Application

PRYSMIAN Solar cables TECSUN (PV) H1Z2Z2-K acc. to EN 50618, are intended for use in Photovoltaic Power Supply Systems at nominal voltage rate of 1.5/1.5kV DC. They are suitable for applications indoor and/or outdoor, in industrial and agriculture areas, in/at equipment with protective insulation (Protecting Class II), in explosion hazard areas (PRYSMIAN Internal Testing). They may be installed fixed, freely suspended or free movable, in cable trays, conduits, on and in walls.

Prysmian's additional internal tests are carried out at regular intervals - including the type tests according to EN50618 - in our own test laboratories and confirm the outstanding properties of the TECSUN (PV) H1Z2Z2-K.

In addition, we guarantee consistent quality for 20 years with the world's only VDE-certified solar cable.

TECSUN(PV) H1Z2Z2-K cables are suitable for direct burial (PRYSMIAN Internal Testing and successful installation in PV plants worldwide), where the corresponding guidelines for direct burial shall be considered.

TECSUN(PV) H1Z2Z2-K	
Global data	
Brand	TECSUN(PV)
Type designation	H1Z2Z2-K
Standard	EN 50618 IEC 62930
Certifications / Approvals	VDE Approval Mark (<VDE>) TÜV-Rheinland Certificate no. 60103637
Construction product regulation (CPR)	CPR acc. to DIN EN 50575, class and DoP-Code: see data table. DoP: see www.prysmiangroup.com/cpr
Design features	
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)
Outer sheath colour	Black, blue and red
Electrical parameters	
Rated voltage	AC: 1.0/1.0 kV
	DC: 1.5/1.5 kV
Max. permissible operating voltage	AC: 1.2/1.2 kV
	DC: 1.8/1.8 kV
Test voltage (5 min.)	AC: 6.5 kV
	DC: 15 kV

TECSUN(PV) H1Z2Z2-K	
Current carrying capacity description	According to EN 50618, table A-3
Electrical tests, acc. to EN 50618, table 2	<ul style="list-style-type: none"> 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
Electrical tests, PRYSMIAN internal test	<ul style="list-style-type: none"> AD8 (acc. to UL44 sec. 5.4 (>92 weeks)) Dielectric strength Insulation resistance at 120 °C in air
Chemical parameters	
Performance against fire, acc. to EN 50618, table 2	<ul style="list-style-type: none"> Single cable flame test per EN 60332-1-2 Low smoke emission per EN 61034-2 (Light transmittance > 70%) Halogen-free per EN 50525-1, annex B
Performance against fire, PRYSMIAN internal test	<ul style="list-style-type: none"> Multiple cable flame test per EN 50305-9 Low toxicity per EN 50305 (ITC < 3)
Resistance to oil, PRYSMIAN internal test, on sheath	24 h, 100 °C (meets VDE 0473-811-404, EN 60811-404)

TECSUN(PV) H1Z2Z2-K	
Weather resistance, acc. to EN 50618, annex E and table 2	<ul style="list-style-type: none"> UV resistance on sheath: tensile strength and elongation at break after 720h (360 Cycles) of exposure to UV lights acc. to EN 50289-4-17, method A Ozone resistance: per test type B (DIN EN 50396) AD7 (acc. to EN 50525-2-21 appendix E)
Weather resistance, PRYSMIAN internal test	<ul style="list-style-type: none"> Water Absorption (Gravimetric) per EN 60811-402. AD8 (acc. to EN 50525-2-21 appendix E)
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
Environmentally friendly	TECSUN(PV) cables comply with the RoHS directive 2011/65/EU of the European union.
Thermal parameters	
Max. operating temperature of the conductor	Max. 90 °C at conductor (lifetime acc. to Arrhenius-Diagram TECSUN = 30 years) 20,000 hours of operation at conductor temperature of 120 °C (and 60 °C ambient temperature) are permitted
Max. short circuit temperature of the conductor	250 °C (5 s.)
Ambient temperature (for fixed and flexible installation)	Installation and handling: -25 °C up to 60 °C In operation: -40 °C up to +60 °C
Resistance to cold, acc. to EN 50618, table 2	<ul style="list-style-type: none"> 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 h at 90 °C and 85% humidity (test acc. to EN 60068-2-78)

TECSUN(PV) H1Z2Z2-K	
Mechanical parameters	
Max. tensile load	15 N/mm ² in operation, 50 N/mm ² during installation
Min. bending radius	According to EN 50565-1
Abrasion resistance, PRYSMIAN internal testing	<ul style="list-style-type: none"> Acc. to DIN ISO 4649 against abrasive paper Sheath against sheath Sheath against metal Sheath against plastics
Shrinkage test, acc. to EN 50618, table 2	Maximum shrinkage < 2% (test acc. to EN 60811-503)
Pressure test at high temperature, PRYSMIAN internal testing	< 50% acc. to EN 60811-508
Dynamic penetration test, acc. to EN 50618, annex D	Meets requirements of EN 50618
Shore-hardness, PRYSMIAN internal testing	Type A: 85 acc. to DIN EN ISO 868
Durability of print, acc. to EN 50618	Test acc. to EN 50396
Rodent resistance	Safety can be optimized by utilizing protective hoses, or protective element, such as a metallic screen braid.

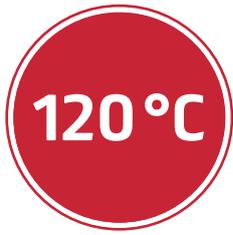
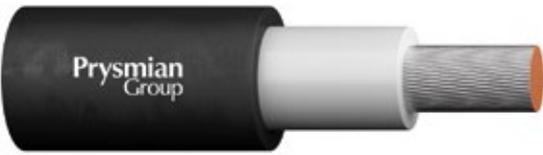
TECSUN(PV) H1Z2Z2-K													
Number of cores x cross section	Colour	Part number	Conductor diameter max. mm	Outer diameter mm		Bending radius fixed min. mm	Weight (approx.) kg/km	Permissible tensile force max. N	Conductor resistance at 20 °C max. Ω/km	Current carrying capacity for single cable*1 A		Short circuit current*2 kA	CPR fire class
				min.	max.					free in air	on surface		
1x1.5	black	20154830	1.6	4.5	5.1	15	35	23	13.7	30	29	0.21	D _{ca} -s2,d2
1x2.5	black	20154650	1.9	4.8	5.4	17	46	38	8.21	41	39	0.36	D _{ca} -s2,d2
1x2.5	red	20167176	1.9	4.8	5.4	17	46	38	8.21	41	39	0.36	D _{ca} -s2,d2
1x2.5	blue	20167177	1.9	4.8	5.4	17	46	38	8.21	41	39	0.36	D _{ca} -s2,d2
1x4	black	20149014	2.4	5.3	5.9	18	61	60	5.09	55	52	0.57	D _{ca} -s2,d2
1x4	red	20165491	2.4	5.3	5.9	18	61	60	5.09	55	52	0.57	D _{ca} -s2,d2
1x4	blue	20165492	2.4	5.3	5.9	18	61	60	5.09	55	52	0.57	D _{ca} -s2,d2
1x6	black	20149015	2.9	5.8	6.5	20	80	90	3.39	70	67	0.86	D _{ca} -s2,d2
1x6	red	20165493	2.9	5.8	6.5	20	80	90	3.39	70	67	0.86	D _{ca} -s2,d2
1x6	blue	20165494	2.9	5.8	6.5	20	80	90	3.39	70	67	0.86	D _{ca} -s2,d2
1x10	black	20149016	4	7	7.6	23	122	150	1.95	98	93	1.43	D _{ca} -s2,d2
1x10	red	20165495	4	7	7.6	23	122	150	1.95	98	93	1.43	D _{ca} -s2,d2
1x10	blue	20165496	4	7	7.6	23	122	150	1.95	98	93	1.43	D _{ca} -s2,d2
1x16	black	20154857	5.6	9	9.8	30	200	240	1.24	132	125	2.29	E _{ca}
1x16	red	20167178	5.6	9	9.8	30	200	240	1.24	132	125	2.29	E _{ca}
1x16	blue	20167179	5.6	9	9.8	30	200	240	1.24	132	125	2.29	E _{ca}
1x25	black	20154858	6.4	10.4	11.2	34	290	375	0.795	176	167	3.58	E _{ca}
1x35	black	20154859	7.5	11.7	12.5	50	400	525	0.565	218	207	5.01	E _{ca}
1x50	black	20154860	9	13.5	14.5	58	560	750	0.393	276	262	7.15	E _{ca}
1x70	black	20156711	10.8	15.5	16.5	66	750	1050	0.277	347	330	10.01	E _{ca}
1x95	black	20156712	12.6	17.7	18.7	75	970	1425	0.21	416	395	13.59	E _{ca}
1x120	black	20156713	14.2	19.2	20.4	82	1220	1800	0.164	488	464	17.16	E _{ca}
1x150	black	20156714	15.8	21.4	22.6	91	1500	2250	0.132	566	538	21.45	E _{ca}
1x185	black	20153870	17.4	23.7	25.1	101	1840	2775	0.108	644	612	26.46	E _{ca}
1x240	black	20157001	20.4	27.1	28.5	114	2400	3600	0.082	775	736	34.32	E _{ca}
1x300	black	20267011	22.9	29	32	132	3000	4500	0.0654	898	855	42.93	E _{ca}

*1 60 °C ambient temp. *2 1 s. from 90 °C to 250 °C.

Standard delivery length is 500 m. Other lengths are available on request. All cross sections are also available in red and blue colours.

Note: If required, TECSUN(PV) H1Z2Z2-K cables are also available with customized surface marking.

TECSUN(PV) S3Z2Z2-K 1.8/3 kV AC



Heat resistant cables, rubber insulated, for inverter-trafo interconnection.

Application

Halogen-free single core cables, sheathed, for junction boxes and inverters, with improved fire performance, increased heat resistance and suitable for direct burial. These cables are intended for use in photovoltaic power supply systems, at nominal voltage rate of 1.8/3 kV AC, as interconnection between central inverter and transformer station.

Can be used indoor, outdoor, in explosion hazard areas, in industry and agriculture and are suitable for applications in/at equipment with protective insulation (protecting class II). To be considered as short and ground fault protection.

Also usable for unfused connections in switchgear and distribution boards up to 1000 V (DIN VDE 0100-520 and DIN VDE 0660-500) and in accumulator circuits (DIN 5510 part 5).

TECSUN(PV) cables are suitable for direct burial in ground (PRYSMIAN internal testing). The installation guidelines shall be taken in consideration.

TECSUN(PV) S3Z2Z2-K											
Number of cores x cross section	Colour	Part number	Conductor diameter max. mm	Outer diameter mm		Bending radius fixed min. mm	Weight (approx.) kg/km	Permissible tensile force max. N	Conductor resistance at 20 °C max. Ω/km	Current carrying capacity*1	Short circuit current**2
				min.	max.					A free in air	
1x25	black	20179993	6.3	13.2	14.4	87	380	375	0.795	176	3.58
1x35	black	20180776	7.4	14.3	15.5	93	470	525	0.565	218	5.01
1x50	black	20180777	8.9	15.6	17.1	103	640	750	0.393	276	7.15
1x70	black	20171198	10.6	17.1	19.1	115	820	1050	0.277	347	10.01
1x95	black	20180778	12.1	19.4	21.4	129	1060	1425	0.21	416	13.59
1x120	black	20179994	14.2	21.5	23.5	141	1320	1800	0.164	488	17.16
1x150	black	20180779	15.8	23.1	25.1	151	1590	2250	0.132	566	21.45
1x185	black	20180780	17.4	25.1	27.1	163	1910	2775	0.108	644	26.46
1x240	black	20170658	20.2	28	30	180	2450	3600	0.082	775	34.32
1x300	black	20182281	22.9	31	34	204	3030	4500	0.065	898	42.9

*1 Nominal current carrying capacity for single-core rubber cables installed free in air, at 90 °C operating temperature at the conductor and 30 °C ambient temperature.

**2 1 s. from 90 °C to 250 °C.

TECSUN(PV) S3Z2Z2-K	
Global data	
Brand	TECSUN(PV)
Type designation	S3Z2Z2-K
Standard	Based on DIN EN 50618
Design features	
Conductor	Tinned copper, finely stranded class 5 in accordance with IEC 60228
Insulation	Halogen-free, heat resistant, cross-linked elastomeric special compound, requirements based on DIN EN 50618 and DIN VDE 0250-606
Outer sheath	Halogen-free, heat resistant, cross-linked elastomeric special compound, requirements based on DIN EN 50618 and DIN VDE 0250-606
Outer sheath colour	Black
Electrical parameters	
Rated voltage	1.8/3 kV
Max. permissible operating voltage	AC: 2.1/3.6 kV DC: 2.7/5.4 kV
Test voltage	AC: 6.5 kV (5 min.)
Current carrying capacity description	According to DIN VDE 0298-4
Chemical parameters	
Reaction to fire	<ul style="list-style-type: none"> • Flame propagation, single cable, acc. to DIN EN 60332-1-2 • Flame propagation, bunched cables, acc. to DIN EN 60332-3-24 • Smoke emission, light transmittance $\geq 70\%$, acc. to DIN EN 61034-2 • Tests for corrosive acid gas emission and fluorine, acc. to DIN EN 60754-1 (pH ≥ 4.3, conductivity $\leq 2,5 \mu\text{S}/\text{mm}$) • Low toxicity in case of fire
Weather resistance	Weathering, ozone and UV resistance acc. to DIN EN 50618
Acid and alkaline resistance	According to DIN EN 50618

TECSUN(PV) S3Z2Z2-K	
Thermal parameters	
Max. operating temperature of the conductor	Rec. operating temp.: 90 °C Max. permissible operating temp.: 120 °C, for max. 20.000 hours
Max. short circuit temperature of the conductor	250 °C
Ambient temperature for fixed installation	-40 °C up to 90 °C
Ambient temperature in fully flexible operation	-40 °C up to 90 °C
Mechanical parameters	
Max. tensile load	15 N/mm ² in operation, 50 N/mm ² during installation
Torsional stress	Max. ± 150 °/m (only during installation)
Min. bending radius	According to DIN VDE 0298 part 3
Rodent resistance	Safety can be optimized by utilizing protective hoses, or protective element, such as a metallic screen braid.

TECSUN(PV) ALU A2X2Y 1/1 kV



Application

Cable for renewable energies. Laying: directly in ground, in tubes, free in air, indoors, in concrete and in water. Lead-free, UV-resistant.

TECSUN(PV) ALU A2X2Y	
Global data	
Brand	TECSUN(PV)
Type designation	A2X2Y
Standard	IEC 60502-1
Design features	
Conductor	Aluminium, acc. to DIN EN 60228
RE: solid circular, class 1 RM: stranded circular compacted, class 2 SE: solid sector shaped, class 1 SM: stranded sector shaped, class 2	
Insulation	Crosslinked polyethylen (XLPE)
Core identification	Colours of cores acc. to DIN VDE 0293-308 1 core: A2X2Y-0 black 3 cores: A2X2Y-J blue, brown, green/yellow 4 cores: A2X2Y-J green/yellow, brown, black, grey
Inner covering	Extruded or lapped (except for single core cables)

TECSUN(PV) ALU A2X2Y	
Outer sheath	Polyethylen (PE)
Outer sheath colour	Black
Electrical parameters	
Rated voltage	1/1 kV
Max. permissible operating voltage	AC: 1.2 kV
	DC: 1.8 kV
Chemical parameters	
Performance against fire	DIN EN 60332-1-2
Thermal parameters	
Max. operating temperature of the conductor	90 °C
Max. short circuit temperature of the conductor	250 °C
Ambient temperature for fixed installation min.	-20 °C
Laying temperature min.	-5 °C

TECSUN(PV) ALU A2X2Y					
Number of cores x cross section	Art. Des. 0/J	Permissible tensile force max. N	Conductor resistance at 20 °C max. Ω/km	Current carrying capacity A	
				laid in the ground*1	free in air*2
1x95 RM	-0	2850	0.32	238	252
1x120 RM	-0	3600	0.253	272	295
1x150 RM	-0	4500	0.206	305	339
1x185 RM	-0	5550	0.164	247	395
1x240 RM	-0	7200	0.125	404	472
1x300 RM	-0	9000	0.1	457	547
1x400 RM	-0	12000	0.0778	525	643
3x95 SE	-J	8550	0.32	234	234
3x120 SE	-J	10800	0.253	268	273
3x150 SE	-J	13500	0.206	300	311
3x185 SE	-J	16650	0.164	342	360
3x240 RE	-J	21600	0.125	398	427
4x95 SE	-J	11400	0.32	234	234
4x120 SE	-J	14400	0.253	268	273
4x150 SE	-J	18000	0.206	300	311
4x185 SE	-J	22200	0.164	342	360
4x240 SE	-J	28800	0.125	398	427

*1 During normal operation, ground temperature 20 °C, laying depth 0.7 m, thermal resistivity of the soil 1.0 Km/W (in case of partial drying out of the soil 2.5 Km/W), load factor 0.7.

*2 Air temperature 30 °C, load factor 1.0.

TECSUN(PV) ALU AYY 1/1 kV



Application

Cable for renewable energies. Laying: directly in ground, in tubes, free in air, indoors, in concrete and in water. Lead-free, UV-resistant.

TECSUN(PV) ALU AYY	
Global data	
Brand	TECSUN(PV)
Type designation	AYY
Standard	IEC 60502-1
Design features	
Conductor	Aluminium, acc. to DIN EN 60228
RE: solid circular, class 1 RM: stranded circular compacted, class 2 SE: solid sector shaped, class 1 SM: stranded sector shaped, class 2	
Insulation	Polyvinylchloride (PVC)
Core identification	Colours of cores acc. to DIN VDE 0293-308 1 core: AYY-0 black 3 cores: AYY-J blue, brown, green/yellow 4 cores: AYY-J green/yellow, brown, black, grey
Inner covering	Extruded or lapped (except for single core cables)

TECSUN(PV) ALU AYY	
Outer sheath	Polyvinylchloride (PVC)
Outer sheath colour	Black
Electrical parameters	
Rated voltage	1/1 kV
Max. permissible operating voltage	AC: 1.2 kV
	DC: 1.8 kV
Chemical parameters	
Performance against fire	DIN EN 60332-1-2
Thermal parameters	
Max. operating temperature of the conductor	70 °C
Max. short circuit temperature of the conductor	160 °C < = 300 mm ²
	140 °C > = 300 mm ²
Ambient temperature for fixed installation min.	-30 °C
Laying temperature min.	-5 °C

TECSUN(PV) ALU AYY							
Number of cores x cross section	Art. Des. O/J	Permissible tensile force max. N	Conductor resistance at 20 °C max. Ω/km	Current carrying capacity A			
				installation in air, trefoil*1	installation in air, flat spaced*2	laid in the ground*3	free in air*4
1x95 RM	-0	2850	0.32	205	259	222	-
1x120 RM	-0	3600	0.253	239	302	253	-
1x150 RM	-0	4500	0.206	273	345	284	-
1x185 RM	-0	5550	0.164	317	401	322	-
1x240 RM	-0	7200	0.125	378	479	375	-
1x300 RM	-0	9000	0.1	437	555	425	-
1x400 RM	-0	12000	0.0778	513	653	487	-
3x95 SE	-J	8550	0.32	-	-	215	186
3x120 SE	-J	10800	0.253	-	-	245	216
3x150 SE	-J	13500	0.206	-	-	275	246
3x185 SE	-J	16650	0.164	-	-	313	285
3x240 RE	-J	21600	0.125	-	-	364	338
4x95 SE	-J	11400	0.32	-	-	215	186
4x120 SE	-J	14400	0.253	-	-	245	216
4x150 SE	-J	18000	0.206	-	-	275	246
4x185 SE	-J	22200	0.164	-	-	313	285
4x240 SE	-J	28800	0.125	-	-	364	338

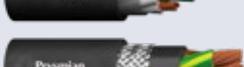
*1 Single core bundled: center distance: 1x cable diameter

*2 Single core side by side: center distance: 2x cable diameter

*3 Multicore: ground temperature 20 °C, laying depth 0.7 m, thermal resistivity of the soil 1.0 Km/W (in case of partial drying out of the soil 2.5 Km/W), load factor 0.7.

*4 Multicore: Air temperature 30 °C, load factor 1.0.

Cables for laying in water

Cable	Product line	Designation	Voltage range	Shape
Drinking water				
	TML	TML Type B	0.6/1 kV	○
		TML Type B	0.6/1 kV	◻
	HYDROFIRM(T)	S07BB-F	450/750 V	○
		S07BBH2-F	450/750 V	◻
		S1BB-F	0.6/1 kV	○
	POTAFLEX	S1BBH2-F	0.6/1 kV	◻
			0.6/1 kV	○
	HYDROFIRM(T) EMV-FC	S05BC4B-F	300/500 V	○
		S07BC4B-F	450/750 V	○
		S1BC4B-F	0.6/1 kV	○
	MS-HYDROFIRM(T)	(N)TSW	3.6/6 kV	○
Waste water				
	OZOFLEX (PLUS)	H07RN8-F	450/750 V	○
		S07HXHX	450/750 V	○
		S07RN8H2-F	450/750 V	◻
	OZOFLEX (FC+)	S07RC4N8-F	450/750 V	○
		S07HXCHX	450/750 V	○
	TECWATER	S1BN8-F	0.6/1 kV	○
		Li-09YSCH PiMF-100	100/100 V	○
		HYBRID	300/500 V	○
	TECWATER EMV-FC	S1BZ-F	0.6/1 kV	○
		S1BC4N8-F	0.6/1 kV	○
	MS-TECWATER	(N)TSW0EU	3.6/6 kV	○
	ATON	(N)TSCGECW0EU	3.6/6 kV – 6/10 kV	○
	ATON EMC	H07RN-F	450/750 V	○
		VSCCB	0.6/1 kV	○
	PROTOMONT	NSSH0EU	0.6/1 kV	○
		NSHX0EU	0.6/1 kV	○
		NSSH0EU / 3E	0.6/1 kV	○
	PROTOLON(ST)	(N)SSHCOEU	0.6/1 kV	○
		NTSW0EU	1.8/3 kV – 3.6/6 kV	○
		NTSCGEW0EU	1.8/3 kV – 18/30 kV	○
	PROTOLON(M)-F	NTSCGEW0EU / 3E	1.8/3 kV – 18/30 kV	○
		(N)TSCGEW0EU	1.8/3 kV – 18/30 kV	○
Hot water				
	HYDROFIRM	TGSH	450/750 V	○
		TGSH2G	450/750 V	○
		TGFLSH	450/750 V	◻
		TGFLSH2G	450/750 V	◻
	MS-HYDROFIRM	(N)TS-TGSH	3.6/6 kV	○

Approvals:



EX acc.
DIN EN 60079-14-9

Screen	Water temperature max.	Submersing depth max.	Cross section	Number of cores
-	60 °C	2,000 m	up to 185 mm ²	1 – 4
-	60 °C	2,000 m	up to 50 mm ²	3 – 4
-	60 °C	2,000 m	up to 400 mm ²	1 – 7
-	60 °C	2,000 m	up to 240 mm ²	3 – 4
-	60 °C	2,000 m	up to 500 mm ²	1 – 8
-	60 °C	2,000 m	up to 185 mm ²	3 – 4
-	50 °C	150 m	up to 2.5 mm ²	3 – 4
●	60 °C	500 m	up to 2.5 mm ²	1 – 4
●	60 °C	2,000 m	up to 70 mm ²	1 – 6
●	60 °C	2,000 m	up to 120 mm ²	3 – 4
-	60 °C	2,000 m	up to 70 mm ²	1 – 4
-	40 °C	2,000 m	up to 300 mm ²	1 – 12
-	40 °C	500 m	up to 300 mm ²	1 – 12
-	40 °C	500 m	up to 185 mm ²	3 – 4
●	40 °C	500 m	up to 95 mm ²	4 – 12
●	40 °C	500 m	up to 95 mm ²	4 – 12
-	40 °C	2,000 m	up to 500 mm ²	1 – 12
●	40 °C	500 m		4 x 2
●	40 °C	500 m	up to 1.5 mm ²	2 x 2 + 4
-	40 °C	500 m	up to 240 mm ²	1 – 4
●	40 °C	2,000 m	up to 300 mm ²	1 – 12
-	40 °C	2,000 m	up to 70 mm ²	1 – 4
●	40 °C	2,000 m	up to 240 mm ²	1 – 4
-	40 °C	500 m	up to 240 mm ²	1 – 12
●	40 °C	500 m	up to 240 mm ²	1 – 12
-	40 °C	2,000 m	up to 400 mm ²	1 – 24
-	40 °C	500 m	up to 400 mm ²	1 – 24
-	40 °C	500 m	up to 240 mm ²	4 – 5
●	40 °C	500 m	up to 240 mm ²	4
-	40 °C	500 m	up to 70 mm ²	1 – 4
●	40 °C	500 m	up to 240 mm ²	4
●	40 °C	500 m	up to 240 mm ²	4
●	40 °C	500 m	up to 240 mm ²	4
-	110 °C	2,000 m	up to 70 mm ²	1 – 12
-	120 °C	2,000 m	up to 70 mm ²	1 – 12
-	110 °C	2,000 m	up to 240 mm ²	3 – 4
-	120 °C	2,000 m	up to 240 mm ²	3 – 4
-	110 °C	2,000 m	up to 70 mm ²	1 – 4

Other cross sections and number of cores available upon request.

PROTODUR NYY-0/-J 0.6/1 kV



Distribution, connecting and installation cable. The laying can be in earth, in tube, free in air, indoors, in concrete and in water. It is also UV-resistant and flame retardant.

PROTODUR NYY-0/-J 0.6/1kV	
Brand	PROTODUR
Type designation	NYV
Standard	DIN VDE 0276-603, IEC 60502-1
Conductor	Bare copper
Insulation	Polyvinyl chloride (PVC)
Rated voltage	0.6/1 kV (600/1000V)
Max. permissible operating voltage	AC: 1.2 kV DC: 1.8 kV
Laying temperature min.	-5 °C
Max. operating temperature	70 °C
Short circuit temperature	160 °C <= 300 mm ² 140 °C >= 300 mm ²

PROTODUR NAYY-0/-J 0.6/1 kV



Distribution cable. The laying is possible directly in ground, in tubes, free in air, indoors, in concrete and in water. It is lead-free, UV-resistant and flame retardant.

PROTODUR NAYY-0/-J 0.6/1kV	
Brand	PROTODUR
Type designation	NAYV
Standard	DIN VDE 0276-603, IEC 60502-1
Conductor	Aluminium
Insulation	Polyvinyl chloride (PVC)
Rated voltage	0.6/1 kV (600/1000V)
Max. permissible operating voltage	AC: 1.2 kV DC: 1.8 kV
Laying temperature min.	-5 °C
Max. operating temperature	70 °C
Short circuit temperature	160 °C <= 300 mm ² 140 °C >= 300 mm ²

PROTOTHEN-X NA2XS(F)2Y



Distribution cable. Suitable to be laid direct burial, in ducts, in water, outdoor above ground and indoor. The ingress of water in case of a damaged outer sheath is limited by the longitudinal watertight screen area.

Protothen-X NA2XS(F)2Y			
Brand	PROTOTHEN-X		
Type designation	NA2XS(F)2Y		
Standard	DIN VDE 0276-620		
Conductor	Aluminium		
Insulation	Cross-linked polyethylene (XLPE)		
Rated voltage	6/10 kV	12/20 kV	18/30 kV
Max. permissible operating voltage AC	12 kV	24 kV	36 kV
Laying temperature min.	-20 °C		
Max. operating temperature	90 °C		
Short circuit temperature	250 °C		

Afumex Plus 1000 A2XH



Heat resistant distribution cable, especially for inverter-trafo interconnection. Suitable for installation in ground, air, conduits, tubes, rooms and at places with a high demand for safety for people and values.

Afumex Plus 1000 A2XH	
Brand	Afumex Plus 1000
Type designation	A2XH
Standard	Based on VDE 0276-604 & VDE certificate: VDE reg. no. 8335
Conductor	Aluminium
Insulation	Cross-linked polyethylene (XLPE)
Rated voltage	0.6/1 kV (600/1000V)
Max. permissible operating voltage	AC: 0.7/1.2 kV DC: 1.8/1.8
Laying temperature min.	-5 °C
Max. operating temperature	90 °C
Short circuit temperature	250 °C

Technical appendix

Electrical parameters	22
Mechanical parameters	23
Thermal parameters	24
Chemical parameters	25
Environmental conditions simulator	26
Installation instruction	27

Electrical parameters

Properties of TECSUN (PV) H1Z2Z2-K acc. to DIN EN 50618

Voltage rating

Voltage rating				
Rated voltage DC U_0/U	Rated voltage AC U_0/U	Max. permissible operating voltage DC U_0/U	Max. permissible operating voltage AC U_0/U	Test voltage
1.5/1.5 kV	1.0/1.0 kV	1.8/1.8 kV	1.2/1.2 kV	AC: 6.5 kV (5 min.) DC: 15 kV (5 min.)

Current carrying capacity

The current carrying capacity values (in ampere) for each installation method at an ambient temperature of 60 °C are according to EN 50618, table A3.

Current carrying capacity			
Number of cores x nominal cross section	Single cable free in air	Single cable on surface	Two loaded cables touching, on a surface
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

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 EN 50618, table A4. For installation in groups, the de-rating factors from HD60364-5-52 shall apply.

De-rating factors	
Ambient temperature (°C)	Reduction factor
Up to 60	1.00
70	0.92
80	0.84
90	0.75

Long-term immersion in water

TECSUN (PV) cables are tested for minimum 10 days completely immersed in water at 85 °C, with 1.8 kV DC voltage applied.



Mechanical parameters

Properties of TECSUN (PV) H1Z2Z2-K acc. to DIN EN 50618

Tensile load

The maximum tensile load on the TECSUN (PV) cables is equal to 15 N/mm² in operation and 50 N/mm² only during installation, according to HD 516, DIN VDE 0298-3 and DIN VDE 0298-300.

Bending radius

The minimum bending radius is indicated as the product of the overall diameter of the finished cable (D) and a factor (i.e. 3 x D). For TECSUN (PV) the minimum bending radius according to EN 50565-1, is 3 x D (for D ≤ 12 mm) or 4 x D (for D > 12 mm). Smaller bending radii than permitted can cause a reduced service lifetime.

Mechanical characteristics of insulation and sheathing materials

The properties of the materials (tensile strength and elongation at break) are tested before and after ageing. Hot-Set test and thermal endurance test are performed in addition.

Abrasion resistance

TECSUN (PV) cables are tested against several abrasive materials:

- Sheath against abrasive paper
- Sheath against sheath
- Sheath against metal
- Sheath against plastics

Additional tests

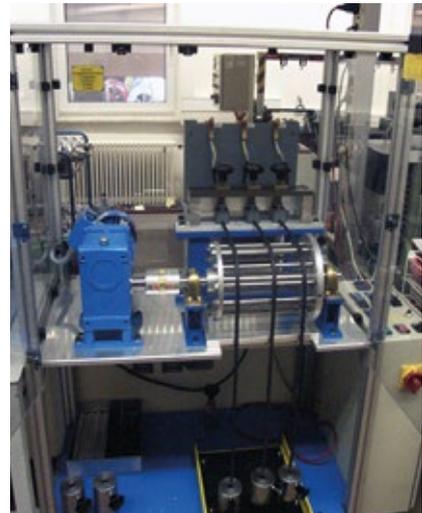
- Shrinkage test
- Pressure test at high temperature
- Dynamic penetration test
- Durability of print
- Shore-hardness



Tensile testing equipment.



Test against abrasive paper.



Test cage:
Sheath against metal/plastic.

Thermal parameters

Properties of TECSUN (PV) H1Z2Z2-K acc. to DIN EN 50618

Maximum temperature of the conductor during operation

TECSUN (PV) cables are designed to operate at 90 °C for a total lifetime equal to 30 years, according to Arrhenius-Diagram (EN 50618 requires a minimum of 25 years).

For a maximum of 20.000 hours (= 2.3 years) the cables can operate at a maximum conductor temperature of 120 °C.

Maximum temperature of the conductor during short circuit

The maximum permitted short-circuit temperature is 250 °C, for a duration of 5 seconds.

Ambient temperature

The temperature range on the surface of the cable during operation is from -40 °C to +90 °C. During installation and handling, the range is from -25 °C to +60 °C.

Resistance to cold

The following tests are performed on TECSUN (PV) cables:

- Cold impact at -40 °C
- Cold bending at -40 °C
- Cold elongation at -40 °C

Damp heat test

Mechanical properties of the materials are tested after a 1.000 hours conditioning at +90 °C and 85% relative humidity.



Test chamber (temperature range from -70 °C to +80 °C).



Test equipment for cold impact test.



Test equipment for cold bending.

Chemical parameters

Properties of TECSUN (PV) H1Z2Z2-K acc. to DIN EN 50618

Behaviour against fire

TECSUN (PV) cables are tested for flame propagation on single cable according to EN 60332-1-2 and on multiple cables according to EN 50305-9.

The smoke evolution is tested according to EN 61034-2, with Light transmittance > 70 %.

The cables are halogen-free according to EN 50525-1 - Annex B, and with a toxicity index < 3 (per EN 50305).

Oil resistance

In addition to the normative requirements, sheathing material is tested for 24 hours immersion in oil at 100 °C.

Weather resistance

External agents related to weather conditions (such as UV radiations, ozone and water) can degrade the rubber materials, causing a reduction of the performances of the cables.

Therefore TECSUN (PV) cables are tested in order to ensure:

- Ozone resistance: complete cable has no cracks after 72 hours at 40 °C, with 55% relative humidity and 2 ppm of ozone concentration
- UV resistance: tensile strength and elongation at break are measured after a conditioning of 720 hours (360 cycles) exposed to UV light.

Acid and alkaline resistance

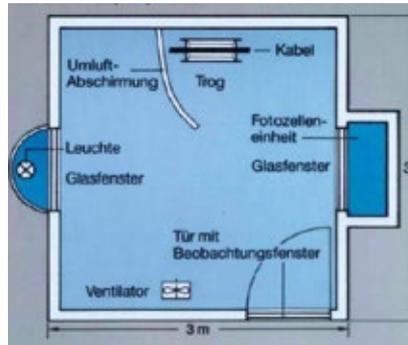
Resistance of the sheathing material against a 23 °C acid (N-Oxalic Acid) and alkaline solution (N-Sodium Hydroxide) is tested for 7 days.

Ammonia resistance

In addition to the normative requirements, TECSUN (PV) is tested for 30 days in saturated ammonia atmosphere.



Propagation of vertical flame on complete single cable (acc. to EN 60332-1-2).



Test chamber for evaluation of smoke evolution.



Test chamber for UV test.



Equipment for measuring light conductivity and pH-value (halogen free).



Test equipment for measuring corrosivity of gases (halogen free).



Test chamber for ozone test.

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 900–1000 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.

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



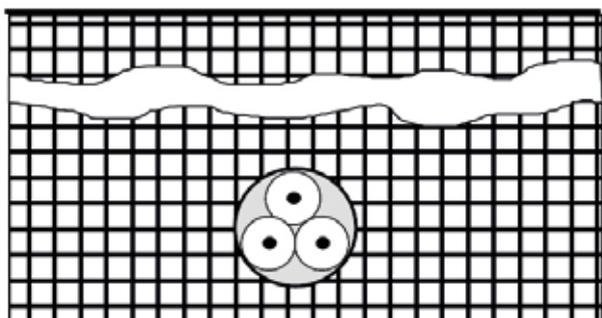
In 15–20 minutes, our weather simulator demonstrates how different PV cables handle 15–20 years of workload in real life.

Installation instruction

TECSUN(PV) – for direct burial in ground

The following instructions, in reference to VDE 0800-174 and VDE 0891-6, are intended to guide the direct burial in ground of TECSUN(PV) cables for photovoltaic application. These cables, as a matter of fact, cannot be installed under any given ground condition and the characteristics of the soil and few protection measures should be considered, in order to prevent damages to the cable and thus to guarantee a long life-time in service.

TECSUN (PV) cables shall not be used as power distribution connections for general supply of electrical appliances or consumers. The direct burial of TECSUN (PV) applies only to the use in PV systems.



General

- When a cable has to be buried directly in the ground, the soil conditions shall be carefully considered.
- In case of corrosive ground, extra protection for the cable is then requested and the cable supplier should be consulted.
- For each cable directly buried in the ground, an identification thread should be laid (acc. to EN 12613).
- In case of high probability of lightning strike, additional protection measures are highly recommended.

Laying

- The trench bottom must be made of the original or subsequently compacted soil and must be free of stones.
- Before laying the cable, a layer of approx. 5 cm shall be first filled with sand or fine-grained soil.
- The laying depth (depth of the trench bottom) must be at least 0.6 m.
- The burial depth can be disregarded in special cases, for example due to localized obstacles or if the ground conditions create significant impediments (and no objections are raised). When the minimum depth of 0.6 m is not met, the cable shall be especially protected (e.g. with cable ducts).
- The laying of underground cables longitudinally under driveways is permitted only in exceptional cases. In such cases the underground cables shall be protected with cable ducts.
- The laying of the cable shall be done manually. The aid of mechanical feeders (e.g. cable pulling machines) is not allowed.
- After laying the cable, an additional layer of stone-free material (ground or sand) shall be piled up, covering at least 5 cm above the cable and gently compacted.
- To avoid damages the buried cable shall be protected with additional covering, such as cable protective hood or plate.
- To fill up the cable trench, it shall be used material free of components which could chemically or mechanically be harmful to the cables.
- A mechanical compacting of the cable trench is not allowed.

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