HELUKABEL®

»WHITE PAPER

RELIABLE WIRING OF PHOTOVOLTAIC SYSTEMS

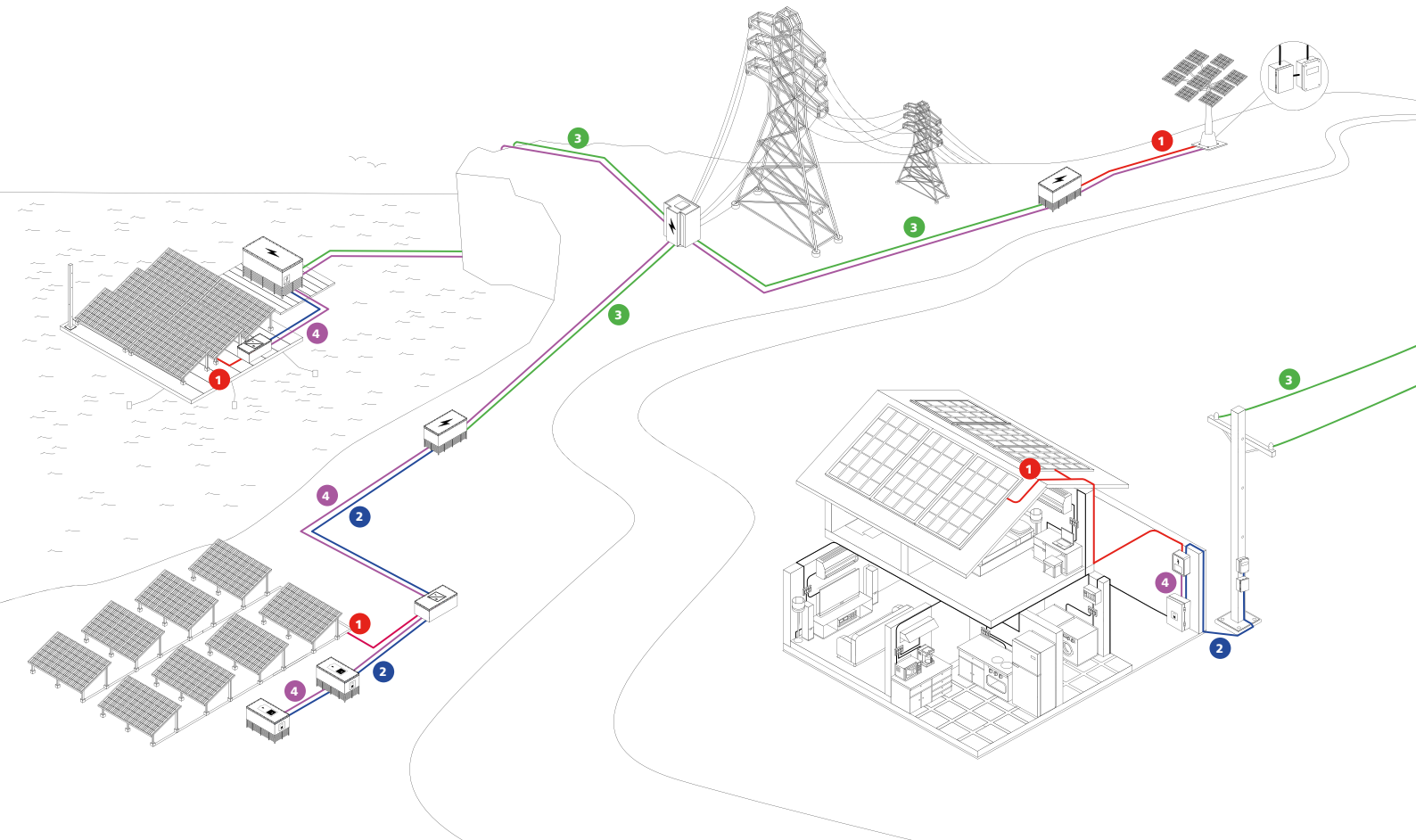
HELUKABEL®

» RELIABLE WIRING OF PHOTOVOLTAIC SYSTEMS

Requirements for Solar Cables: A Comprehensive Guide

Photovoltaic systems play a pivotal role in the global expansion of renewable energy. They can be found in residential buildings, industrial halls, office buildings, agricultural facilities, open spaces, and even floating on water surfaces. Special solar cables are used to interconnect the individual modules with each other, as well as with the inverter and other components. This white paper explains the characteristics that solar cables should possess and the requirements they need to fulfill.

1. String cables (DC)
2. Energy cables (AC)
3. Medium-voltage cables for grid feeding
4. Communication cables & plugs



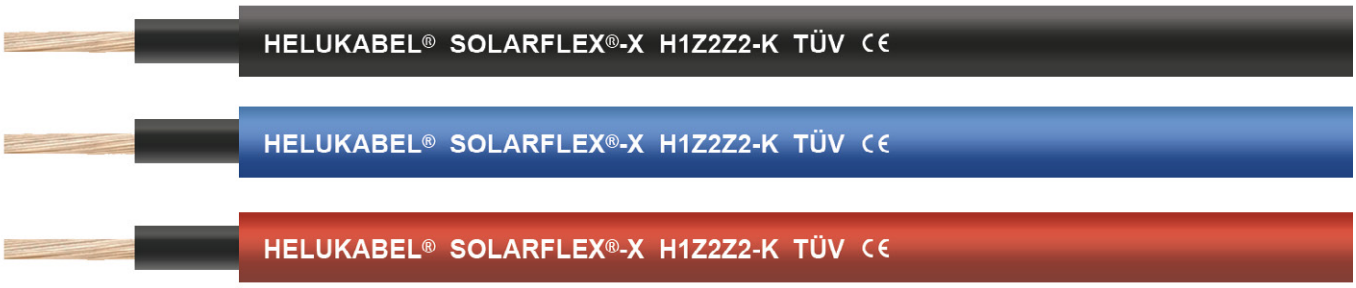
» Where Are Solar Cables Used?

Solar cables are electrical wires that connect the modules of a photovoltaic system. Photovoltaic systems consist of a multitude of individual modules that convert solar energy into direct current (DC). In order to make it usable, the individual modules are connected in parallel or in series using cables. The solar cables used for this purpose are direct current cables. The same applies to the cable that connects the photovoltaic modules to the inverter. This device converts the generated direct current into grid-compatible alternating current.

» How Are Solar Cables Structured?

Previously, the requirements for solar cables were defined in the PV1-F standard. Acceptable conductors were identified with the respective abbreviation. Since 2015, the updated standard EN 50618 has been in effect. Suitable solar cables are now labeled as "H1Z2Z2-K". This imprint guarantees the cable possesses all the necessary characteristics for use in photovoltaic systems.

Solar cables are typically single-core conductors with a finely stranded, tinned copper wire. For both the conductor insulation and the outer jacket, specialized polymers have proven to be effective, as they offer superior properties compared to rubber or PVC, particularly in terms of durability. Depending on the plastic composition, the cables are suitable for various applications, including outdoor use and underground installation. The cross-section of a solar cable should typically be a minimum of 4 mm². The cables are available with cross-sections of up to 240 mm². For optimal energy generation, it is crucial to care-fully select appropriate cross-sections.



» What Requirements Must Solar Cables Meet?

Photovoltaic systems are exposed to high and low temperatures, various weather conditions, humidity, chemicals, and, of course, solar radiation, depending on their deployment location. Despite these challenging environmental conditions, they must function reliably in the long term: manufacturers and operators plan for a system lifespan of 20 to 30 years. Accordingly, high standards must be met by all installed components - and this applies to the wiring as well.

» According to EN 50618, solar cables should possess the following characteristics:

» Weather-, UV- and ozone resistant
Wind, weather, and the UV radiation of sunlight accelerate the aging of cables. Solar cables must therefore comply with the standards of DIN VDE 0283-618 and DIN EN 50618.

» Temperature resistant
When used outdoors, the cables may be exposed to extreme heat or cold. Therefore, solar cables are designed for a temperature range of -40 °C to +90 °C.

» Flame retardant and halogen-free
In case of a fire incident in a photovoltaic system, it is crucial that the cables used are highly flame-resistant and do not emit toxic gases when burning. Solar cables are therefore halogen-free according to DIN VDE 0482-754-1 / DIN EN 60754-1 / IEC 60754-1 and flame-retardant according to DIN VDE 0482-332-1-2 / DIN EN 60332-1-2 / IEC 60332-1-2.

» Dielectric strength
The direct current in photovoltaic systems can exceed 1,000 volts. Solar cables possess an exceptional level of voltage resistance. The test criteria for this are defined in DIN VDE 0283-618 / DIN EN 50618 Table 2.

» Mechanical strength
Even though solar cables are rarely moved in practice, they need to be resistant to abrasion and other mechanical stresses for long-term operation.

» For specialized applications, such as in agriculture, outdoor environments, or on water, solar cables with specific characteristics are available.

» Acid and alkali resistant
In the agricultural sector, solar cables may be exposed to ammonia, oxalic acid, caustic soda, or other chemicals. Therefore, the outer sheath must be acid- and alkali-resistant according to EN 60811-2-1.

» Rodent protection
Mice, rats, martens, and other rodents can damage the cables of photovoltaic systems, leading to disruptions and outages. To prevent this, solar cables are also available as a special variant with a specific rodent protection feature. This is a braided stainless steel mesh that is placed around the exterior of the cable.

» Floating PV certification
For floating photovoltaic systems, also known as floating farms, specific testing regulations apply under TÜV 2 PfG 2750. Cables used in these installations should therefore be appropriately certified.

» Summary

Solar cables are relatively simple in structure. However, in practice, they must meet high and diverse requirements. Simultaneously, they should ensure reliable operation of the photovoltaic system for approximately 20 to 30 years. Therefore, it is crucial that the cables used are of high quality and comply with all applicable standards and regulations.

HELUKABEL offers a specialized product range called SOLARFLEX-X H1Z2Z2-K, specifically designed for this application. These cables are certified as solar cables according to DIN EN 50618 and have undergone TÜV testing. This demonstrates the cables meet all the technical requirements for the connection of solar modules and inverters.

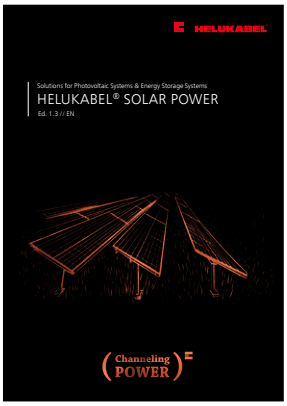
» CONTACT

We look forward to your request and remain available for any further questions.



Your contact person

Hanss Bruss
Senior Industry Specialist PV
Tel.: +49 7150 9209 728
hanss.bruss@helukabel.de



You can find an overview of our product portfolio in the brochure.
Solar power