



**User'S Manual – Reels and Cables
&
H1Z2Z2-K PV CABLES**

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Page No.	1/3

1. SCOPE

It includes the precautions to be taken to minimize the damages that may occur during the transportation, storage and laying and use of the reels and the applications to be made and general usage information for the cables for PV systems.

2. USING OF DRUMS

2.1. The reels should be placed on the pallets on their cheeks with a maximum of 3 rollers on top of each other.

2.2. During loading, if the reels are not palletized, they must be lifted from the iron bar inserted through the middle holes or by the help of chain or rope passed through the middle holes. More than one reel should not be lifted at the same time.

2.3. Reels should never be dropped from a height during unloading. First of all, they should be lowered with safe vehicles such as forklifts and cranes.

2.4. In the case of forklift use, the reels should be lifted by their cheeks and their forks should touch both sides of the reel. Under no circumstances should the reels be lifted on the guard boards.

2.5. The reels should be rolled in the direction of the cable winding only in short distances, the ground should be smooth and free of indentations.

2.6. While unwinding the cable from the reel, the lower end of the cable should be free, and the cable should be pulled with a force of 5 kg/mm without excessive tension. Cable unloading speed should not exceed 20 m/min.

The rotational speed of the reel and the pulling speed of the cable should be equal.

The diameter of the shaft to be passed through the hub in order to unload the reel must be 10 mm less than the diameter of the hub, be of a quality that will not warp, and be smooth.

The minimum bending radius of the cable should be greater than 12 times the cable diameter.

3. TRANSPORTATION OF CABLES

3.1. The reels should not be carried on their cheeks, but only in an upright position. Loading, downloading and transporting should be done by authorized persons.

3.2. The movement of the reels during transportation should be prevented by hammering wedges. Wedges should be placed under the reel cheeks.

3.3. The binding of the pulleys should be done with the ropes passed through the middle holes, not over their cheeks.

3.4. In case of loading more than one reel, the stacked reels must be of the same diameter and the cheek must touch the cheek.

4. STORAGE OF CABLES

4.1. The reels should not be stored on uneven, recessed floors.

4.2. It should not be stored in places where it is likely to be exposed to water and on soft surfaces. Cable ends must be closed in such a way that water does not enter.

4.3 Storage should not be done close to heat sources.

4.4. In long-term storage (more than 6 months), the reels should be stored in such a way that they are protected from effects such as sun, rain and wind.

4.5. Since the aging and deterioration rate of the reels varies depending on environmental effects, they should be checked and maintained during storage.

4.6. If the reels are to be stored for more than 2 years, it is recommended to keep them indoors.

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Release Date	08.11.2021
Rev.Date/ No	30.04.2024 /02
Page No.	2/3

5. CONTROL OF DRUMS AND CABLES

- 5.1. The cable reels should be visually inspected when they are delivered from the factory and lowered into the warehouse.
- 5.2. By looking at the top winding of the cable, it should be checked whether there are any bumps, scratches or tears.
- 5.3. If there is any damage on the reel or cable surface during transportation, the relevant persons should be contacted.
- 5.5. Checking whether the ends of the cable are closed in such a way that water does not enter, cross-section and quantity checks should also be made.

6. USER GUIDE AND INSTALLATION METHODS

SOLEN H1Z2Z2-K Solar cables conforming to European standard 'EN 50618' and international standard 'IEC 62930' are designed for installations in photovoltaic systems, solar parks, solar farms, rooftop solar systems and in interconnection of solar panels and inverter. They are intended for permanent use outdoor and indoor, for free movable, free hanging, and fixed installation. Installation also in conduits and trunkings on, in or under plaster as well as in appliances. Suitable for the application in/at equipment with protective insulation (protection class II).

Although DC cables nearly have 3-4% of a solar project cost, however it can have a significant impact on the solar power plant output. Improper design or poor cable selection can lead to safety hazards, reduced power output, and other performance issues that may affect the overall lifetime of a PV system.

To maximize performance and reliability of the DC cables and PV systems:

6.1. Our DC cables for PV systems are designed for continuous use in free running, free hanging, or fixed installations in indoor and outdoor environments, such as installation in pipes, ducts on, in or under plaster. They are also conditionally suitable for direct burial.

Necessary cautions should be taken to avoid physical damage of cables during installation.

6.2. Generally, follow given installation rules and methods in EN 50565-1 (User Manual for Low Voltage Harmonized Cables) and HD 60364-7-712 on low-voltage electrical installations – Part 7-712 (requirements for special installations or locations – photovoltaic (PV) systems) as common installation standards. Cable protection should comply with requirements of IEC 60364.

6.3. The voltage value of the cables is nominally 1.5 kV DC both between conductors and between conductors and earth. The maximum allowable operating voltage for the systems to which the cables are applied shall not exceed 1.8 kV.

The voltage value of the specified cables is $1/1(U_0/U)$ kV. The rated voltage in the DC system is expressed by the combination of two values of U_0/U expressed in (k)volts, where:

— U_0 , r.m.s. the value between any insulated conductor and earth.

— U , r.m.s. Value between any two phases.


6.4. Our solar cables can operate period of 20.000 hours at a maximum conductor temperature of 120 °C and a maximum ambient temperature of 90 °C. Their expected service life is minimum 25 years if the advised installation, use, and handling conditions are respected.

6.5. PV cables operating temperature is between -40°C and +90°C. In the event of a short circuit (maximum time 5 s), the maximum conductor temperature is +250°C.

6.6. For detailed technical characteristics, dimensions, current ratings, and short circuit currents refer to our technical data sheet.

6.7. The minimum recommended installation and laying temperature for PV cables is -25°C. Installation should be delayed if the ambient temperature is below -25°C. If installation is required, the cables should be kept in an environment with a temperature higher than 10°C for 24 hours.

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		Rev.Date/ No	30.04.2024 /02
		Page No.	3/3

- 6.8. Determine the ideal DC cable length and routing to minimize cable lengths to reduce power loss, voltage drop, and installation costs.
- 6.9. You require the choose right cross sectioned string cable and connectors to make your solar system is functioning properly and not allowing interruptions in the current. Use high-quality, compatible connectors to ensure secure and reliable connections between cables and other system components. Check cable clips, conduits, and trays to ensure they are securely fastened and provide adequate support.
- 6.10. Allowable bending radii of cables are minimum 4 times the outer diameter for fixed installations. For mobile systems and during installation, the bending radius should be a minimum of 12 times the outer diameter. Avoid cable curves, sharp bends and make sure cables run in straight lines rather than ovals.
- 6.11. Never tie the cables near a metal edge without using a suitable product. There is a high risk of damaging the cable sheath, which can cause short circuits and, in the worst case, a fire. Avoid exposed, sharp or pointed edges. Sharp or pointed edges can break the cables and subsequently cause short circuits.
- 6.12. Unwinding from the reel should be done within 2 hours at a slow and regular speed (approximately 20 m/min) without vibration.
- 6.13. Maximum pulling forces applied during installation as follows,
Maximum of 1.000 Newtons force should be applied, whatever the traction method used.
If the pulling force is applied on conductors : $F = 50 \times S$ N (Newtons)
If the pulling force is applied on over sheath : $F = 5 \times D^2$ N (Newtons)
where F : Force in Newtons, S : cross sectional area of conductor in mm², D: overall diameter in mm.
- 6.14. Periodically examine solar DC cables for damages or corrosions, paying attention to connections, insulation, and other key parameters. Keep cables free of dust, dirt, and debris to maintain optimal electrical conductivity and prevent potential damage. Implement a comprehensive monitoring system to track the performance of solar cables including main parameters like voltage, current, and temperature.

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