

gehrtec NUBBEL

EFFICIENT PREFABRICATED CABLE SYSTEM



Cabling system for outdoor and roof-mounted photovoltaic systems of all sizes.

The economical and safe option for connecting PV modules
with inverters for large-scale outdoor or roof-mounted systems

USER MANUAL

Introduction

Thank you for choosing the gehrtec-Nubbel system.

This product has been designed to meet the highest quality requirements. The product has also been used in large-scale systems that we have constructed and operated, meaning that numerous improvements have been integrated into the product, based on previous experience. We are convinced that we are therefore able to provide you with an especially high-quality product.

We constantly endeavour to offer our customers the best products at the best prices. For this reason we continually strive to further improve our products for the benefit of our customers.

We would be delighted if this product entirely fulfils or even exceeds your expectations.

We would be grateful to receive your qualified feedback, in order that we can further optimise our products.

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1. Safety instructions and general information

Duty of care on the part of the operator

The Nubbel cabling system has been developed and manufactured under consideration of a risk analysis and careful selection of materials and further technical specifications. It corresponds to the state-of-the-art and guarantees highest safety levels.

However, this level of safety can only be realised in the field if all of the necessary measures have been undertaken. It is part of the duty of care on the part of the installation firm and the operator of the system to plan for and check the realisation of these measures.

It is especially important for the installer and operator to ensure that:

- The Nubbel system is always installed and operated in accordance with the regulations for proper use
- The Nubbel system is only operated if it is in an optimal, functional condition.
- The special installation instructions of the module manufacturer and the corresponding auxiliary component manufacturers are observed.
- That all installation and maintenance work is undertaken by qualified and trained staff, all of whom must have fully and carefully read and understood these installation instructions and who must observe them during execution of all such work.
- That all applicable laws, directives and regulations to be observed by the installer or operator are maintained.

Basic safety instructions

- The area must be secured before beginning with the installation.
- Biological hazards from plants and animals must be evaluated. If necessary, undertake additional safety measures, for example, vaccinations.
- All persons who will be present during operations must have been previously trained.
- Modifications to the Nubbel system may only be carried out by qualified electricians.
- Required personal protective gear must be made available.
- Danger electrical current! The solar modules can generate voltages of up to 1,000 VCD in the cables (in certain cases, even higher voltages can be produced). For this reason, protective measures must be taken in relation to these voltages as soon as the solar modules are exposed to solar radiation.




Requirements of persons installing, using and maintaining gehrtec products

- All persons must be qualified and authorised.
- General and installation-specific safety training must be undertaken with all such persons before beginning any tasks.
- All persons must be acquainted with and understand these cabling instructions.

Special types of hazards

- Third-party adaptations to the Nubbel system may only be used after approval / release by the manufacturer of the system.
- Sharp profile ends which come into contact with the cable system must be equipped with edge protection, in order to avoid the risk of damaging the cable.

Safety and information signs

| Sign | Meaning | Explanation |
|---|---------|--|
|  | DANGER | "DANGER" designates safety information which can lead to death or serious injury if it is not observed. |
|  | CAUTION | "CAUTION" designates safety information which can lead to injuries and / or property damage if it is not observed. |
|  | NOTE | Notes contain information which are necessary for ensuring optimal installation and operation of the product. |

Safety instructions for installation

Read these instructions carefully before commencing with the installation work and observe the information contained herein during the installation process, as well as all applicable safety regulations and other applicable national regulations in the country of installation.

Prior to undertaking the installation, the installer is obliged to check for conformity of the specified safety measures with the current editions of such regulations and to observe any new regulations that may be applicable. The applicable work safety laws and regional national regulations of the relevant country are to be maintained for states outside of the European Union.

All general safety and relevant accident prevention regulations, especially relating to work outdoors, as well as all applicable environmental protection regulations are to be observed and maintained, in addition to the work safety measures detailed in these instructions.

Follow all of the instructions given in this document fully and unconditionally!

All generally accepted codes of practice must be applied in any case.



Caution!

Always observe the applicable standards and regulations at the site of installation.

Rules and regulations

The industrial safety act and subsequent directives as well as the rules and regulations set out by the professional trade association and fund for accidents at work must be observed for installation and operation in Germany.

We would like to especially point out the following hazards and measures for the elimination of risks:



General safety regulations

Decide on measures for the elimination of recognised hazards based on the risk assessment and instruct all persons involved.

Further information is available, amongst others, from: Industrial safety act, BGV A1 "Principles for prevention", BGV C22 "Construction work", occupational safety regulation, regulations for the handling of heavy loads.



Biological risks due to pathogenic germs

Ensure that industrial medicine checkups and vaccinations are carried out in accordance with the risk assessment.



Risk of injury!

Tools and materials must be in optimal condition.

Further information is available, amongst others, from: Biological agents regulation.

Lightning protection



The planning and construction of a lightning protection system must be carried out by experts.

The following directives are to be observed particularly:

DIN V VDE V 0185, 2002: Lightning protection, Part 2: Risk management: Assessment of risk for structural systems.

DIN V VDE V 0185, 2002: Lightning protection, Part 3: Protection of structural systems and persons.

General information:

The configuration and commissioning of electrical cabling requires well-founded specialist knowledge.

Exclusion of liability

In accordance with product liability laws, Gehrlicher Solar AG is not subject to liability for loss, miscellaneous loss of assets, miscellaneous property and / or personal loss or costs occurred by yourself, any third-parties or your customers as a result of improper and therefore impermissible mounting, installation, commissioning, use or maintenance of the equipment. Improper in this case refers to tasks which, for example: do not comply with the specifications detailed in these installation and maintenance instructions.

For this reason, we wish to recommend once more, in your own interests, that these instructions are maintained.

Danger electrical current!

The solar modules can generate voltages of up to 1,000 VCD in the cables (in certain cases, even higher voltages can be produced).

For this reason, protective measures must be taken to protect against these voltages.



Only qualified electricians may carry out work on the systems.

2. Nubbel

The Nubbel types:



Connection double strand
Branch



Connection single strand
Branch



Single strand - Nubbel (=single-pole Nubbel strand)



Double strand - Nubbel (=double-pole Nubbel strand)

Polarities and colours

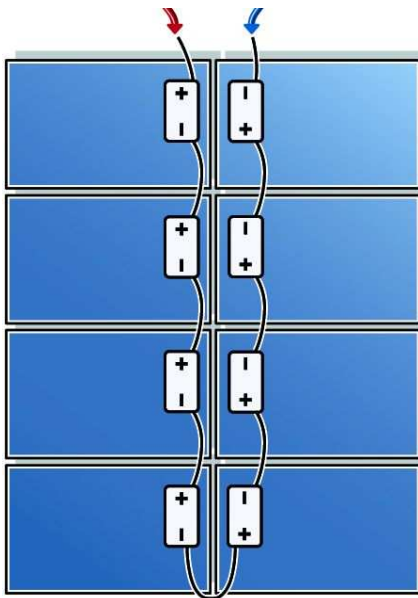
POSITIVE POLE = RED

NEGATIVE POLE = BLUE

Strings

The strings are connected to the inverter, whereby several strings can be connected in parallel.

A string is a series connection of modules.



Parallel connection of strings

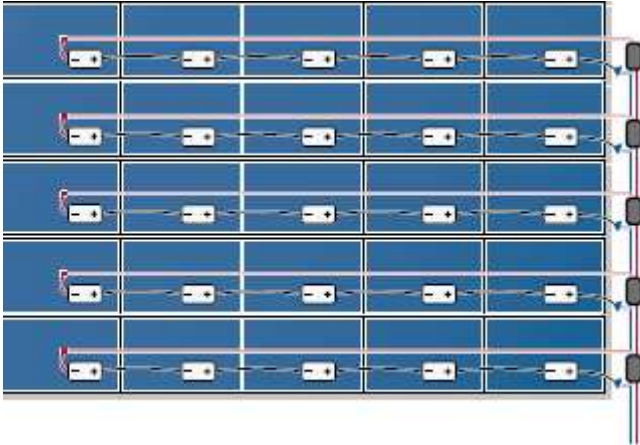
A Nubbel strand serves to make it as straightforward and reliable as possible to connect several strings in parallel.

If several strings are to be connected in parallel, then it is to be ensured that the same modules are used in each string and that the same number of modules are assigned within each string.

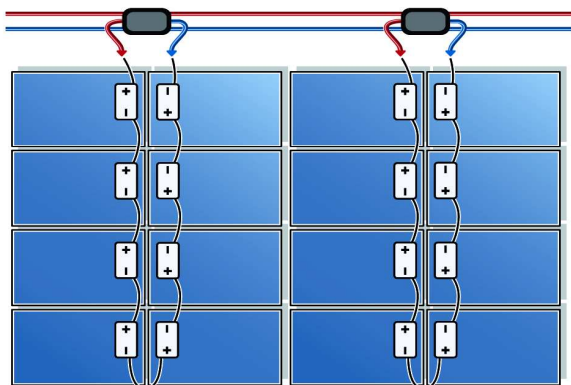


3. Typical interconnection options for roof-mounted modules

Example for interconnections with Nubbel double-strand

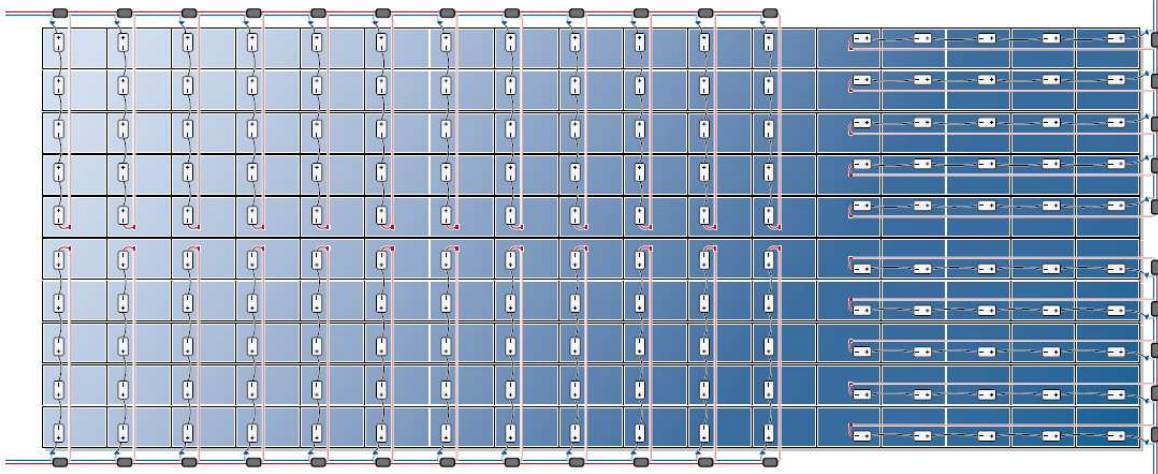


Simple interconnection on a roof surface



Simple interconnection on a roof surface

Example of a complex interconnection with Nubbel double-strand



Module type

Always use the same module type for use on a single Nubbel strand!

Tools

Standard electrician's tools are used to cable the modules.

4. Insulate the ends of the strands

The open cable ends must be insulated with suitable insulation material (shrinkable caps) by a qualified electrician.



← Possible shrinkable caps

NOT INCLUDED IN THE SCOPE OF DELIVERY:

Insulation material, cable for connecting various Nubbel strands and cable for connecting the Nubbel strands with the inverters.

Insulation of open strand ends

Use only suitable shrinkable caps for this purpose!!



Danger high voltages of over 1,000 volts!

5. Extension

If open cables are to be extended, then plug-and-socket connectors are to be used in accordance with the regulations.

Any extensions must be realised with approved plug-and-socket connectors!



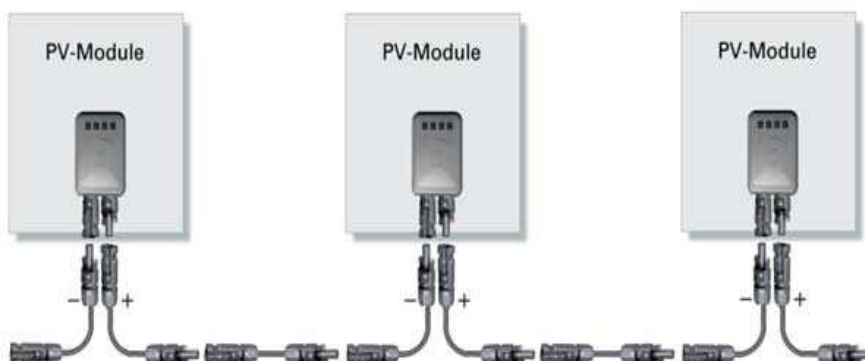
MC 3 connector (manufactured by Multikontakt)



MC 4 connector (manufactured by Multikontakt)

The connectors are to be plugged together. They are not intended to be subsequently disconnected from each other.

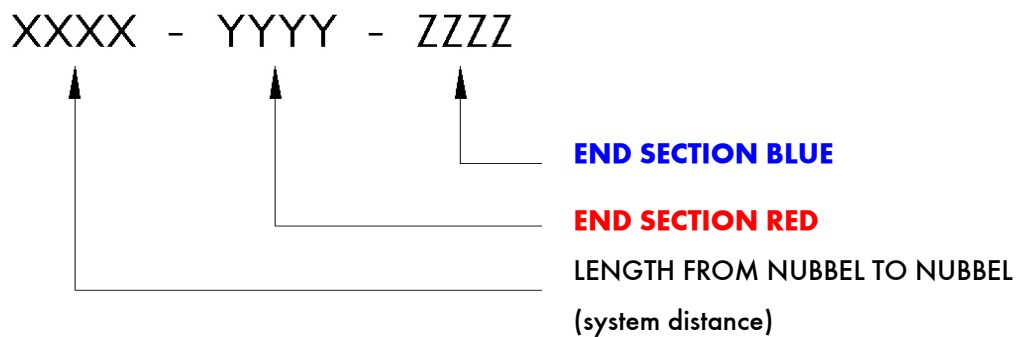
In the event that the connectors must be disconnected from each other in exceptional cases (e.g. exchanging of modules), then it is to be ensured that the electrical circuit is first switched off, in order that arcing is avoided in the area of the plug-and-socket connectors.



6. Routing of the cable

It must also be ensured that all of the cables to be laid are routed cleanly and tidily, insofar as the stand is switched off. Excessively sagging loops of cable are to be avoided.

7. Supply coding



2-4 places are possible on every 3 positions, always given in cm !

8. Guarantee

The current terms of guarantee can be downloaded from the Internet under www.gehrlicher.com or you can request them in written form through the usual distribution channels.

9. Contact

Addresses in Germany



Photo 1: The corporate locations

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