

ELECTRICAL INSTALLATION INSTRUCTIONS FOR

# OUTDOOR AREAS.



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# 1. ELECTRICAL INSTALLATION IN PRACTICE.

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Outdoor electrical installations are a particularly tricky process. Constant temperature changes, high UV radiation, high ozone levels, and mechanical wear eventually lead to material fatigue, which can lead to water ingress, and ultimately, plant failure.

Alongside the choice of suitable materials, what is also crucial for the durability of an installation is the utmost care and attention when handling system components. It is important to understand exactly what is happening and what impact an unprofessional installation can have.

## **AGING OF MATERIALS.**

Many users see the designation IP68 as a guarantee of the safety of their installation – regardless of the manner in which the materials are laid. This may well be the case for new products that are tested under laboratory conditions using theoretical guidelines, but this is only in an ideal situation.

## **BUT WHAT HAPPENS OVER TIME?**

All materials suffer some degree of aging over time, connectors, too! The sensitive areas are the seals in the vicinity of the connector face and the cable screw gland.

High temperatures due to direct sunlight, high UV concentrations, and other weather conditions, as well as chemicals, can cause significant wear on the seals. Not to be overlooked are mechanical stresses and biological influences (bacteria, fungi, and animals) as additional considerations. The cable can also be affected, particularly if there is any deviation from its specifications, which is unfortunately not an uncommon occurrence!

All materials change in structure through usage and over time. They tend to shrink and small cracks can begin to appear. The pressure in the sealed area drops as well. On this basis, it is only a matter of time before water finds its way into the connector.



## 2. ASSESSING THE IP SITUATION CORRECTLY.

Let us assume that a connector needs to be used out in the open to supply power to a luminaire. By definition, a decision is made in favor of protection class IP54 (splash-proof from all sides). However, when you take a closer look at the sealed area, you might soon realize that sometimes the cable is completely coated with water for extended periods of time. This is due to the small reservoir between the cable and the seal.

After a rain shower, this gap fills with water, which remains there. Over time, capillarity causes the water to penetrate the casing. This effect is naturally promoted by installing the connector or device connector vertically. Water repeatedly travels along the cable to the sealed area, which means that during rainy periods this area is often under water for weeks. Without measures to avoid this situation, the IP protection would have to be designed for IP68

(2 weeks)! The water that has penetrated also freezes in winter and helps accelerate the aging process in more adverse conditions.

Often, the user is not aware of the application conditions in extreme cases. Plug connections are laid in trays that fill up with rainwater during a heavy downpour (leaves can sometimes also block the drains) or are laid on the ground so they spend days under water.

A further phenomenon arises due to the capillarity of cables. If, for example, a cable is faulty in one place and water is able to penetrate, the water travels through the cable until it reaches the connector. This happens more quickly than you might think, and over great distances. But it is not just damage to the cable that can lead to this situation; poor assembly at the other end of the cable can contribute to the issue too.



**To prevent moisture from spreading through the cable system or from penetrating appliances, RST® connectors can be supplied with optional contact sealing (barrier seal).**

### DEGREE OF PROTECTION ACHIEVED

- + IP65 Water jets
- + IP66 Powerful water jets
- + IP67 Temporary immersion
- + IP68 Continuous immersion (for 2 hours at a water depth of 3 m)
- + IP69 High-pressure spray down

### 3. SITUATION ANALYSIS.

#### UNDERGROUND INSTALLATION

It is not possible to lay the system components directly in the ground. According to VDE 0100-520, connectors must be protected using suitable additional facilities and must be accessible for visual inspection, testing, and maintenance requirements. Installation pipes and floor boxes may be the solution in cases such as these. Ensure that water can drain by providing suitable drainage (e.g. gravel bed)! It is typically not a problem if components are covered with leaves, bark mulch, or stones as long as water is allowed to drain in accordance with the point "Installation position and additional protection from the weather".



#### FLEXIBLE INSTALLATION

If abrasion might occur (construction site lighting systems, event equipment, or similar temporary applications), wear of the pre-assembled cable and plug connections must be taken into consideration and must be monitored accordingly.

#### IMMERSION OF THE SYSTEM

The system components have been designed for outdoor use, with a focus on protection against spray water. The connector system is not intended for normal operation under water. Unplanned immersion is only possible as foreseen by the specification.



### HORIZONTAL INSTALLATION POSITION

If the system is to be used outside for an extended period of time, a horizontal position should be chosen to guarantee water drainage. If this configuration is not possible, an additional cover should be used for protection. The cable arrangement is just as important, the cable must be laid in such a way that any draining water is not routed to the cable screw gland, but drops off beforehand.



### ADDITIONAL PROTECTION FROM THE WEATHER

Installations that are exposed to the weather and outdoor conditions directly age a lot more quickly. The use of suitable measures can significantly increase their service life. In the sequence of events that lead to system failure, material fatigue comes first, ahead of water ingress. UV radiation, ozone, aggressive gases, salt spray, and high temperatures have the greatest impact on the material. Where possible, the components, including cables, should be protected from direct sunlight as often as possible. As a general rule, the user must ensure that all the components he uses are suitable for their intended application.

### USE OF END CAPS

All open slots must be protected against the penetration of moisture, dirt and other contaminants. This applies not only when installing components, but also if they are stored outside or in humid rooms. Appropriate end caps securely seal the slots against foreign matter and moisture.

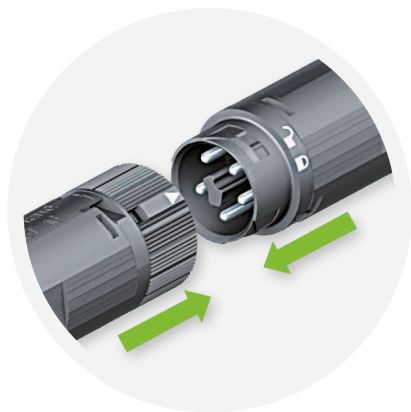
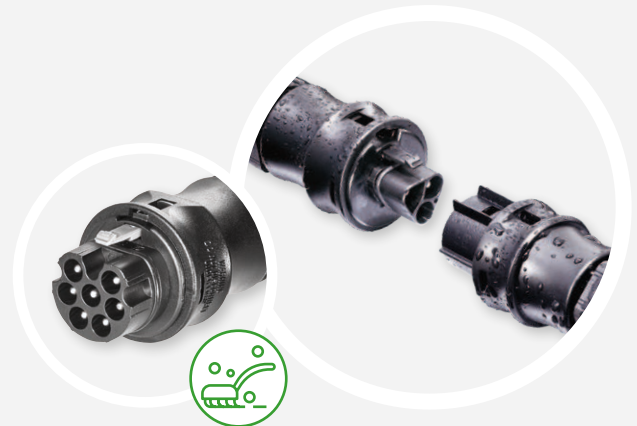


### HEAVY SOILING

Before connecting, it is essential that the contact area and sealing points are free from foreign bodies to ensure that the plug connection works. It is therefore recommended that any dirt or dust in the area of the connection is removed prior to disconnecting.

### MATING FORCES

In temperatures well below freezing, the mating forces increase due to hardening of the seal. This must be tested for individual applications to ensure proper function.



### TORQUE AND LOCKING

The cable screw glands must be tightened to the specified torque amount. All connections must be locked, and care must be taken to ensure that the connectors are in the correct final position relative to each other. Unlocking must be done manually or using a suitable screwdriver in accordance with the provided assembly instructions. "Over-tightening" soon leads to wear and ineffective connections.



Detailed assembly instructions can be found in our eShop under Downloads!

### MECHANICAL STRESSES

Avoid creating kinks in the cables in the area of the strain relief. The generally accepted guidelines for laying cables must be observed. Tensile forces on the contact points with solid conductors  $> 2.5 \text{ mm}^2$  are avoided by first bending the cable and then processing it further.

Mechanical bending in the area of the strain relief must be controlled using suitable measures (e.g. cable clamps).





## 4. CHOOSING THE RIGHT CABLE.

Selection of the appropriate cable plays a major role in safe and durable operation of the installation.

By default, we offer the low-cost H05VV cable, but its field of application is restricted to indoor areas only. This cable is not suitable for outdoor areas and constantly humid or wet rooms! The H05VV cable is preferred for use indoors where, even though soiling occurs, it is not normally humid, let alone wet. Protection from dust (IP 6X) is particularly important here. Temporary wetness for cleaning purposes, however, is permissible.

Outdoor installations without special demands can be implemented using H07RN-F rubber-sheathed cables. However, here too it is essential to check whether or not any additional action, such as laying inside installation pipes, is required. Often, little attention is paid to the maximum service temperature (ambient temperature plus inherent heat generated by the current flow). The H07RN-F (enhanced version) offers improved protection in this regard.

**Where the demands are higher (e.g. shipbuilding or solar technology) the selection of a suitable cable or even seal must be discussed with us.**



### H05VV-F PVC CABLE

Use inside dry rooms, not outdoors, not directly in the ground.

No UV resistance.

- **Minimum bending radius:**  
4 x outside diameter
- **Service temperature:**  
70 °C



### H07RN-F RUBBER-SHEATHED CABLE

Use inside dry, damp, and wet rooms, as well as outdoors, but not directly in the ground.

Limited UV resistance.

- **Minimum bending radius:**  
4 x outside diameter
- **Service temperature:**  
60 °C



### H07RN-F (ENHANCED VERSION) ENHANCED RUBBER-SHEATHED CABLE

Use inside dry, damp, and wet rooms, as well as outdoors due to UV and ozone resistance. The cable is halogen-free and flame-retardant. But do not lay the cable directly in the ground.

- **Minimum bending radius:**  
4 x outside diameter
- **Service temperature:**  
from -50 °C to +90 °C



## 5. VDE INFORMATION.

In accordance with installation regulation IEC 60364-5-52 (DIN VDE 0100-522.3), cable systems must be designed in such a way that damage caused by the ingress of water is avoided in all cases.

Cable systems must satisfy the required degree of protection. If water can accumulate or water condensation can occur, provisions for water drainage must be made prior to installation!

This particularly applies to sealing points in the area of the strain relief.

The longer the maintenance intervals are to be (e.g. areas where access is difficult or requires great effort), the better the components must be protected against weather conditions and moisture from the outset.

