These instructions are written for qualified and experienced personnel. Please study them carefully before starting any work. Any liability or responsibility for the results of improper or unsafe installation practices is disclaimed. Please respect valid environmental regulations for assembly and waste disposal. Always make sure to use appropriate personal protection!

Installation Instructions 10000009884-02

About this document

This document provides a comprehensive overview of all necessary installation tasks for the HYBRIFLEX™ Solution. It includes a step-by-step-guide that explains how to handle and assemble all necessary HYBRIFLEX solution piece parts.

A typical HYBRIFLEX solution per site (max. configure tion) contains:

- **1 HYBRIFLEX riser cables**
- **Grounding Kits**
- **Clamps**

Note:

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Please respect valid environmental regulations for assembly and waste disposal.
Always use appropriate personal protection and observe all work safety and security precautions in accordance with local regulations during installation.

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Tools Required

- **Philips (cross) screwdriver**
- **Flat head screwdriver**
- **13 mm open-ended spanner**
- **19 mm open-ended spanner**
- **5 mm Allen key**
- **Standard pipe cutter**
- **Rip Tool HTRT-1-000**
- **JSTRIP-78-2**

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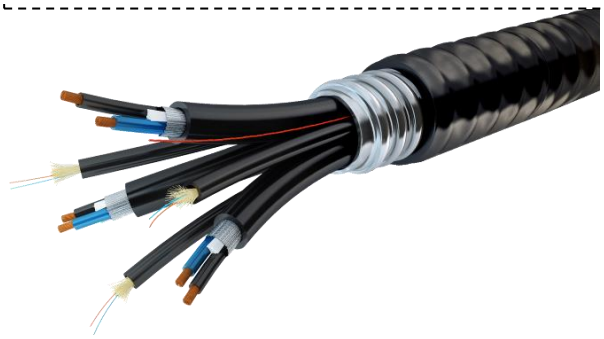
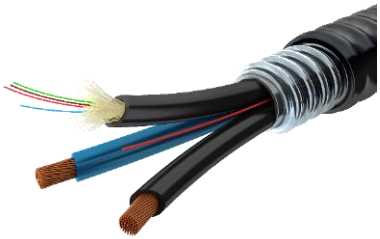
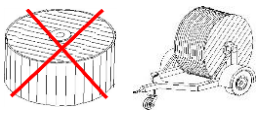


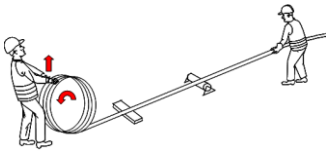


Handling Instruction for HYBRIFLEX™ RRH Cabling System

Please observe all safety and security precautions and local regulations during the whole installation process.

1. **Take care during HYBRIFLEX™ transportation and installation**
   - Do nothing which can deform the HYBRIFLEX™ cable
   - Make sure that the HYBRIFLEX™ cable is always clean
   - Always follow the installation instructions
2. **Transportation of the HYBRIFLEX™ drum**
   - If a crane is used a special hanger is necessary to avoid damage of the drum flanges
   - If fork lifts are used, the forks must be long enough to engage both flanges of the drum to avoid cable damage
   - The drum has to be secured carefully during transport
3. **Transport of the HYBRIFLEX™ drum on site**
   - Reels must be transported and handled in its upright position only
   - RFS recommends use of a cable drum trailer
4. **How to handle HYBRIFLEX™ cable rings**
   - The cable ring has to be rotated (like a drum) when pulling the cable, otherwise the cable will be twisted. If the twisted cable will be straightened afterwards the cable will be damaged in the twisted area
   - Lift up and rotate the cable ring
   - Protection from pipe rollers, wooden planks etc
   - Pull the cable step by step carefully – look always to the man who is handling the ring in order to see how much cable is available
5. **Check materials (Completeness and proper condition)**
   - Pre-connectorized HYBRIFLEX™ Cable assembly
   - HYBRISEAL™ Devices (SHRINK-FIT or COMPRESSION-FIT)
   - GKSPEED Earthing Kits (If applicable)
   - Clamps (If applicable)
   - Wallglands (If applicable)
6. **Unpack HYBRIFLEX™ Cable and prepare for hoisting**
   - Fix hoisting grip to main part of the HYBRIFLEX™ Cable
   - Fix individual DC- and F/O-cables (e.g. with insulation tape) to the hoisting rope
   - Make sure that the F/O connectors are mechanically protected during this process





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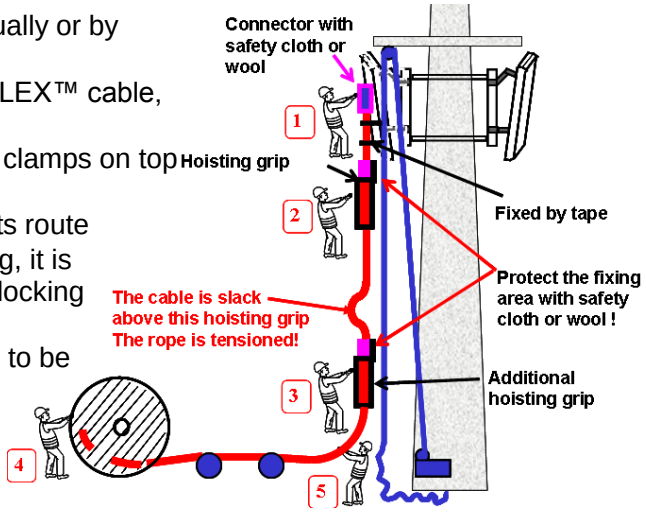
7. Hoist HYBRIFLEX™ Cable

- Depending on cable length and site conditions manually or by means of a winch
- Fix hoisting grip only to armored part of the HYBRIFLEX™ cable, never to the breakout cables
- Before removing hoisting grip install at least 3 cable clamps on top of the horizontal run to prevent cable from slipping
- Protect the connector end from objects obstructing its route
- If the distance to the connector (Worker 1) is too long, it is necessary to protect the hoisting grip from objects blocking its way
- If additional hoisting grips are necessary, they have to be protected too
- Watch out and slow the drum rotation down
- Watch this point - pull the cable and shape the bend manually



8. Check top length

- Check the required length of each pair of F/O and Power cable to the entrance of RRH, and then fix them with cable ties.
- If necessary adapt breakout-point and sealing to site constrains (See step 9)
- If necessary cut DC cable to length and wind up F/O cable over length

9. Clamping

- Install the remaining clamps
- Recommended / maximum clamp spacing:
  - ⇒ 7/8": 0.8m / 1.0m
  - ⇒ 1 ¼": 1.0m / 1.2m

10. Check bottom length

- Check the required length of each pair of F/O and Power cable to the entrance of RRH, and then fix them with cable ties.
- If necessary adapt breakout-point and sealing to site constrains (See step 9)
- If necessary cut DC cable to length and wind up F/O cable over length
- Over length handling can easily be done in the equipment room (e.g. 19" Rack for BBU)

11. Connection

- Connect top end F/O connectors and D/C cables to RRH´s
- Connect bottom end F/O connectors and D/C cables to BBU and power supply
- CAUTION: Handle F/O cables with care

12. Grounding

- Install GKSPEED Earthing kits according to the included installation instruction
- The use of the RFS J-STRIP is highly recommended
- RFS recommends three earthing points
  - ⇒ At the top end of the main cable
  - ⇒ At the transition from the vertical to the horizontal run
  - ⇒ Before entering the Building / Shelter / Outdoor housing of BBU

13. Adaptation of breakout length to site constrains

- Delivery pre-assembled

- Open COMPRESSION-FIT

- Move the body part beyond new cutting mark

- Cut the armor at the cutting mark and open the armor by using the rip cord

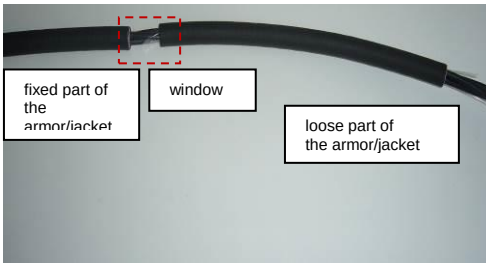
Caution:

The ripcord is placed outside of the stranded inner core of the HYBRIFLEX cable and may differ some degrees from the neutral position after cutting due to spring effect of the steel rip cord.
Therefore it is important to start the stripping process at the right rip cord position and follow carefully the ripcord during this procedure. Especially with the smaller sizes like ½" cable and for longer stripping lengths. The worst case is if the stripping process is done on the opposite of the rip cord position. It is technically obvious that in this case the ripcord has to go internally around (or through) the inner core and the risk of damaging a DC- or Fiber cable is high.
To avoid this kind of damage in the field, please make sure that the stripping process is done carefully.

To minimize this risk, during connectorization process the neutral position of the rip cord will be marked by a white line.

After strip back during connectorization a rip cord overlength of app 5cm will be fixed to the cable end in neutral position. The white mark is still visible.
During stripping process the rip cord should be carefully guided along the imaginary neutral line (dotted red line in picture aside)

As an additional safety measure (and in case the mark is not visible) the installer should cut circular through aluminium armor and jacket approximately 30 cm away from the end. Then he should move this piece of armor approximately 2 cm towards the F/O connectors. Through this "window" he can easily verify the neutral position of the ripcord. Observing this neutral position he can now cut in one step through the loose and the fixed part of the armor/jacket.



- Re-move armor and jacket

- Close COMPRESSION-FIT