

# INSTALLATION MANUAL

**HUBER+SUHNER AG**  
Fiber Optics  
MASTERLINE ultimate (MLU)  
DOC-0000463388 Rev B

August 30, 2017  
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## MASTERLINE ultimate

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**ABOUT THIS MANUAL**

This manual is intended for installation and service personnel who are involved in the planning, installation, operation and maintenance of HUBER+SUHNER MASTERLINE Fiber Optic Cable systems.

Please read the complete manual prior to unpacking and installation of the product.

This manual assumes that the installer has at least a basic experience and understanding of passive fiber optic equipment, as well as some familiarity with its operation. The information covered in this manual should be fully understood prior to installation.

**Safety**

The following general safety precautions must be observed during all phases of an installation. Failure to comply with these precautions, or with specific warnings elsewhere in this manual willfully violates the intended use of the product.

WARNING and DANGER statements have been strategically included in the text to alert personnel to possible hazards. The safety advice given must be closely followed.

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## EMPLOYED SYMBOLS

Read and understand the safety precautions and application advice given in this document. The following symbols are employed:



**Hazard Indication and Precautions**



**Mandatory Notice and Actions**

## GENERAL SAFETY PRECAUTIONS



**Working Safety Precautions**

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Installation of optical communication systems involves activities, which possibly pose a safety hazard to the installer. The installer is responsible for compliance with all applicable working safety standards and regulations like Occupational Health and Safety, Health and Safety at Work and others.

- Do not work in constricted or sealed areas
- Do not work on unstable workbenches
- Observe ladder safety rules
- Do not work in explosive areas



**Electrical Safety Precautions**

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Any part of an optical communications system as well as the completed system must fully comply with all applicable electrical safety standards and regulations like NFPA 70 (NEC), NESC, OSHA 1910, EN 60950, EN 61557 and others. This also includes compliance to local building and fire codes.

- As a fiber optic installer, do not work with or near electrically energized systems
- Only trained and qualified personnel is allowed to install and work with or near electrical equipment
- Protect de-energized electrical systems or components effectively against re-energizing
- Strictly adhere to applicable grounding and bonding regulations when building optical communications systems
- Exclude all unauthorized personnel from the immediate electrical hazard area



### **Eye Safety Precautions**

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Invisible laser radiation poses risks of serious eye injury. Always work in full conformance with applicable laser safety standards and regulations and use protective eye devices according to OSHA 1926.102 (b), EN 207, EN 208 and others.

- DO NOT look directly into a fiber end without verifying that the line being observed is completely de-energized
- DO NOT examine fiber ends using a microscope without verifying that the line being observed is completely de-energized
- Always use a fiber optic power meter to make certain the fiber is dark



### **Fiber Safety Precautions**

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Always work in full conformance with applicable materials safety standards and regulations like Occupational Health and Safety, Health and Safety at Work and others.

- Always follow the recommended safety practices when working with fibers
- Always wear safety glasses when working with fibers
- Use adhesive tape and sealed containers to trap loose pieces of fiber
- Do not let cut pieces of fiber stick into clothing or drop in the work area
- Do not allow fiber particles remain on clothing and in the working environment
- Exclude all food and drink from the working area
- Dispose of all fiber scraps and cut fiber pieces properly

## HANDLING OF CABLES



### **Cable Bending**

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Excessive cable bending invokes unacceptable fiber stress inside the cable and material degradation. This leads to increased cable link attenuation and to permanent cable damage.

- Always keep cable bend radius above specified limit: Refer to appropriate datasheet for details
- AVOID cable bends around sharp objects
- Use anti-kink devices to prevent kinks and loops in optical cables
- Use bend protection devices to avoid sharp bends in optical cables



### **Cable Crushing**

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Excessive cable crushing invokes unacceptable fiber bending inside the cable and material degradation. This leads to increased cable link attenuation and to permanent cable damage.

- Avoid cable crushing exceeding the acceptable limit: Refer to appropriate datasheet for details
- Avoid crushing optical cables between sharp objects
- DO NOT use cable ties to attach optical cables
- DO NOT use hose clamps to attach optical cables
- Avoid placing heavy objects on optical cables
- Avoid overriding optical cables by heavy vehicles
- Use cable conduits to protect optical cables from lateral pressure



### **Cable Pulling**

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Excessive cable tensile loading invokes unacceptable fiber stress inside the cable and material degradation. This leads to increased cable link attenuation and to permanent cable damage.

- Always keep tensile loads in optical cables below the specified limit at any time: Refer to appropriate datasheet for details
- DO NOT use winches without load limitation to pull optical cables
- DO NOT sharply twist optical cables to transmit pulling forces
- DO NOT use wire-rope clamps to transmit pulling forces
- AVOID stretching the jacket of optical cables

- Do not apply pulling forces at connectors
- Avoid dragging optical cables over sharp edges
- Use smooth turns on a mandrel with at least 20 times the cable diameter to transmit pulling forces
- To pull cabling system provided with protecting tube use eye of protecting tube to transmit pulling forces



### **Handling of cables at low temperature**

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Plastic materials become rigid and brittle at very low temperatures. This leads to permanent cable damage during improper handling.

- DO NOT coil or uncoil optical cables below specified minimum installation temperature: Refer to appropriate datasheet for details
- AVOID deploying optical cables below specified minimum installation temperature
- AVOID relocating optical cables below specified minimum installation temperature
- Allow optical cables to reach specified minimum installation temperature before handling



### **Handling of cables at high temperature**

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Plastic materials become soft and stretchy at very high temperatures. This leads to permanent cable damage during improper handling.

- DO NOT coil or uncoil optical cables above specified maximum installation temperature: Refer to appropriate datasheet for details
- AVOID deploying optical cables above specified maximum installation temperature
- AVOID relocating optical cables above specified maximum installation temperature
- Allow optical cables to reach specified maximum installation temperature before handling

## HANDLING OF FIBER OPTIC CONNECTORS



### Fiber End cleaning Advice

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Contaminated fiber ends in connectors due to inappropriate connector cleaning may damage the optical interface of the connection. This leads to increased link attenuation, degraded return loss, increased Bit Error Rates or even catastrophic link failures.



**WARNING! Invisible Laser Radiation Hazard - Bears risk of serious injuries!**

- Do NOT look into a fiber end without verifying that the line is completely de-energized
- Do NOT examine fiber ends using a microscope without verifying that the line is completely de-energized
- Always clean fiber ends before connecting
- Follow approved fiber end cleaning procedures
- Use an accepted solvent and lint-free wipes
- Use purpose-built swabs to clean fiber optic adaptors
- Allow solvents to evaporate before connecting
- NEVER use metallic objects to clean fiber ends
- Always replace dust caps when disconnecting fiber ends

**INSTALLATION OF RRH SIDE OF ASSEMBLY**

**Step 1**

**MLU adaptor plate**

First fix the MASTERLINE Ultimate mounting bracket.

**Mast mounted**

The mounting bracket can be fixed to the antenna mast with standard hose clamps. The mounting bracket has provisions to support different size of hose clamps for different sizes of antenna poles.

**Wall mounted**

In case the MASTERLINE Ultimate is mounted onto a wall the mounting bracket can be fixed with anchors and screws. The mounting holes can be drilled with an electric drill according to the hole pattern shown on the right hand side.

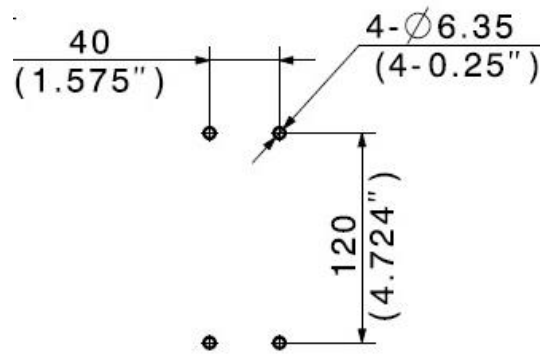
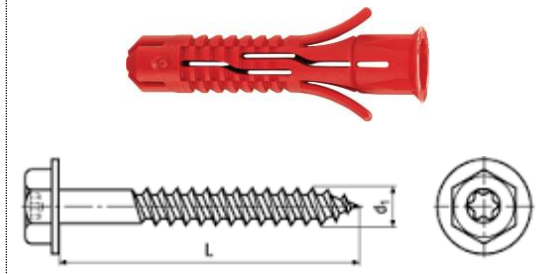
**Remark**

The mounting accessories are not shipped with the product and need to be ordered separately.

**Option mast mounted**



**Option wall mounted**



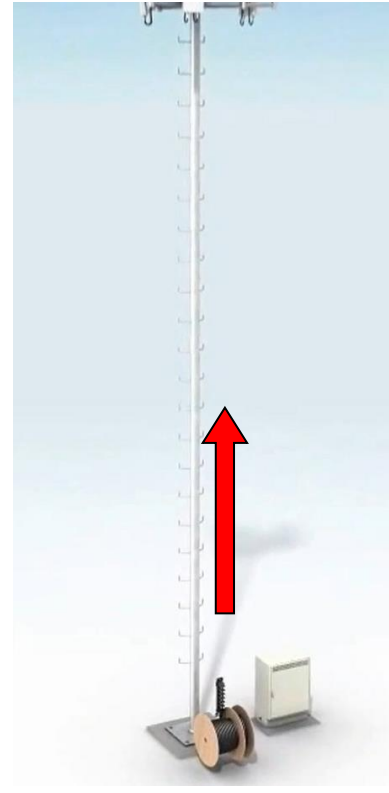


### Step 2

#### Unspooling

For longer length systems the MASTERLINE ULTIMATE is supplied on a double-flange reel which allows for easy and straight-forward unspooling while lifting the connector head up the mast at the same time.

Shorted lengths systems are supplied as an air coil and can easily be unwound prior to installation.



### Step 3

#### Pulling

Use the integrated pulling eye in the connector head to lift the cable up the mast without additional hoisting grips.



### Step 4

#### Hook-in MLU head to adaptor plate

The MLU connector head can be easily snapped-into the pre-mounted adaptor plate and firmly fixed with two screws at the bottom of the connector head.

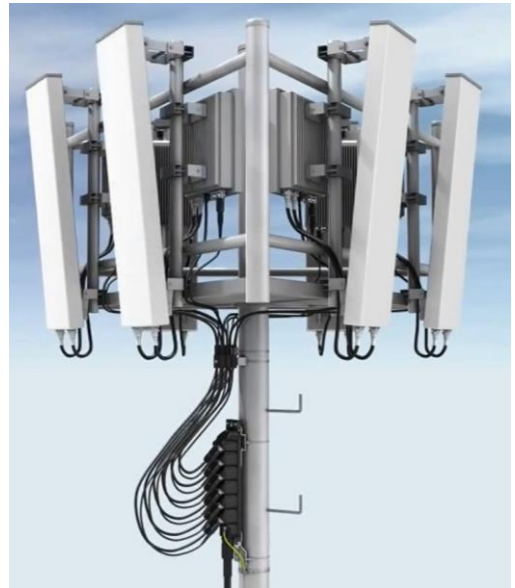


**Step 5****RRH connection**

The remote radios then are connected with fiber optic jumpers.

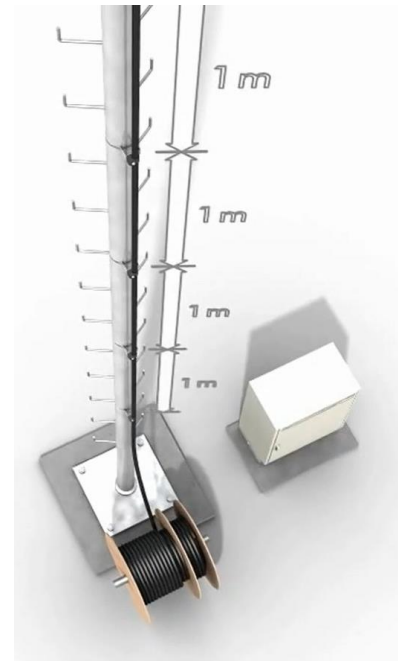
A variety of jumpers with various connector interfaces to the remote radio head are available from HUBER+SUHNER.

Refer to the datasheet or catalogue to select the corresponding jumper types.

**Step 6**

Fix cable with clamps to the mast. Recommended spacing between clamps is 1m.

Different types of cable clamps can be ordered separately from HUBER+SUHNER (for details refer to the catalogue).



### FEED CABLE INTO BASE STATION

#### Step 7

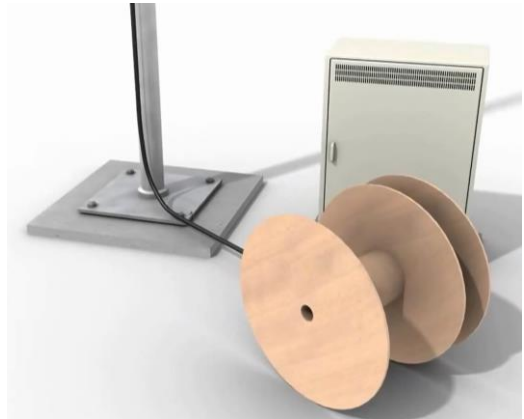
After unwinding the lower end of the assembly from the reel keep the pulling tube closed until the cable end is routed inside the cabinet.

The closed pulling tube prevents the connectors from being contaminated during handling.

Feed fiber optic cable through knock-out hole of the generic base frame (GBF) below the base station.

**Important:** Pull all cable over-length into the GBF for later storage with over length management box.

Leave a small loop of cable for over-length management (1-2m, be aware that minimum bending radius are maintained).



### CONNECT FIBER OPTIC IN BASE STATION

#### Step 8

Store fiber optic cable over-length inside the base station.

A box for over-length management is available from HUBER+SUHNER and can be ordered separately (e.g. H+S item 84103325).



#### Step 9

Open the sealed protection tube by pulling the rip-cord.



#### Step 10

Remove the protection tube from the fiber optic fan-outs.



**Step 11**

Remove the dust caps from the connectors and plug them into the base station.

Notice the numbering of the fan-outs to correctly allocate the channels.

