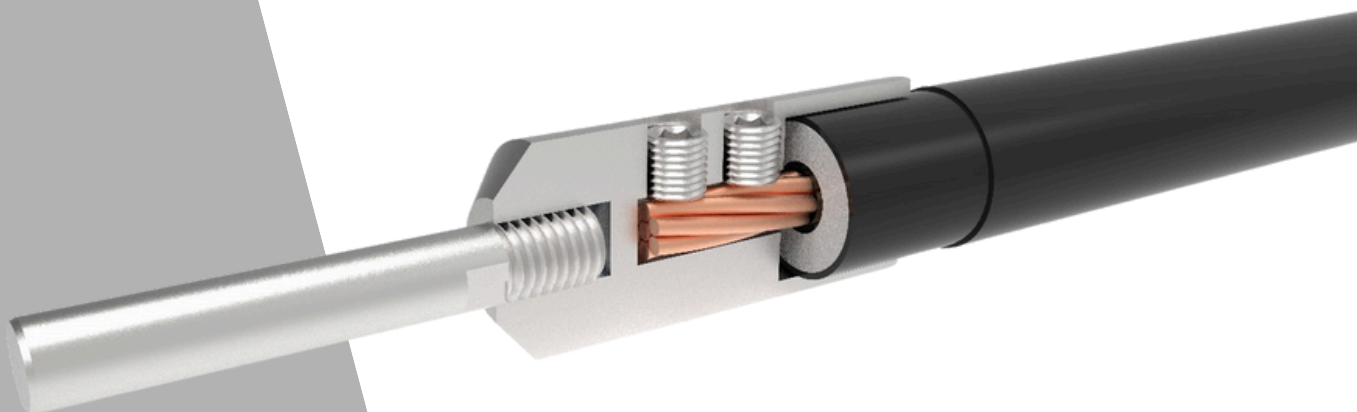




ASSEMBLY INSTRUCTIONS

OF **LIGHTNING PROTECTION GTI 75**
CONDUCTOR COVERED
WITH HIGH VOLTAGE ISOLATION



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Rules for using GTI cables – installation and safety guidelines

To ensure the full effectiveness of lightning protection systems and to maintain the integrity and durability of GTI insulated cables, the following installation and operating rules must be strictly observed:

1. **Verification of technical condition prior to installation**

Before installing the GTI cable, it is necessary to thoroughly check its technical condition. Make sure that the cable has no mechanical damage, such as crushing, cuts, or damage to the outer coating. If any defects are found, the cable must not be used for installation.

2. **Qualification requirements for contractors**

The installation of GTI cables should only be carried out by persons with appropriate qualifications and training in the construction and operation of lightning protection systems. It is recommended that personal protective equipment (PPE) appropriate to the environmental conditions and characteristics of the installation be used during installation work.

3. **Compliance with technical documentation**

The cable must be installed in accordance with the manufacturer's official instructions. Any deviations from the installation procedures or connecting the GTI cable to components not intended by the manufacturer are not permitted.

4. **Original components and warranty**

All components used in the GTI system must come from the manufacturer or be authorised by them. The use of non-original components may invalidate the warranty and reduce the effectiveness of the entire system.

5. **Compliance of masts with the PN-EN 1991-1-4 standard**

The manual covers insulated masts that have been tested for wind load resistance in accordance with European standard PN-EN 1991-1-4. Their use guarantees compliance with the structural requirements for external lightning protection systems.

6. **Prohibited activities**

- **Painting cables:** Do not apply any paint coatings to the surface of the GTI cable.
- **Working during a storm:** All installation work must be stopped in the event of a storm.

7. Security measures depending on the environment

Depending on the environmental conditions (e.g. presence of flammable substances or explosive atmospheres), additional fire and explosion protection measures must be implemented during the installation of the GTI cable.

8. Installation on flammable roofs

If GTI cables are installed on roofs made of combustible materials, special installation rules specified in PN-EN 62305 must be followed. This will prevent potential fire hazards during the operation of the lightning protection system.

9. Resistance to external factors and cleaning

The cables must not be exposed to prolonged contact with water. If they become dirty, they should only be cleaned with specialized chemical agents.

10. GTI cable extension

Do not extend the cable yourself without using the appropriate connector. A separation distance must be maintained at the connection point. Otherwise, the protective properties of the system may be compromised.

11. Connection zone – no conductive elements

There must be no grounded or conductive elements in the connection area. The required separation distance marked as 's' must be maintained in this area, in accordance with the PN-EN 62305 standard.

12. Function of the GTI cable in the lightning protection system

The GTI cable is used to ensure the required separation distances. Please note that due to its design, it does not provide magnetic shielding. Therefore, electromagnetic induction in auxiliary cables should be monitored and, if necessary, additional surge protection should be used.

13. Laying parallel cables

When running several cables in parallel, magnetic interference may occur. Therefore, it is recommended to maintain a distance of at least 200 mm from the point where the cable exits the support pipe on the further section of the cable.

14. Air-protection rod - protection zone

The high-voltage insulation (GTI) discharge cable should run entirely within the protective zone of the lightning rod. It must not come into contact with any part of the building structure or other elements of the discharge system.

15. Installation in a metal pipe

Installing the GTI cable in a metal pipe located behind the support pipe does not impair the functionality of the system, although the use of plastic pipes is recommended. In the case of grounded metal pipes, a distance greater than the separation distance 's' must be maintained from any conductive or grounded elements.

16. Installation on metal structures

The GTI cable can be laid on steel structures (cable ducts, rails, I-beams). Thanks to the high thermal expansion of metal, the resulting closed circuits do not generate significant electromagnetic interference and do not adversely affect the operation of the system.

17. Running equipotential bonding conductors

Avoid running equipotential bonding conductors directly parallel to the GTI conductor. If necessary, maintain a minimum distance greater than the separation value 's' (for solids), in accordance with PN-EN 62305-3. Improper routing may result in the formation of undesirable current loops.

GTI cable specifications

General description



Intended use

Insulated lightning protection cables are used to safely conduct atmospheric discharges (lightning) from elements exposed to direct strikes, such as roofs, masts or overhead lines, to ground. Thanks to the insulation used, this cable minimises the risk of sparking to nearby metal structures or electrical installations, increasing the safety of people and buildings. It is particularly useful where it is difficult to maintain adequate protective distances due to limited space on the roof.

Note: The cable must be installed in accordance with applicable regulations and manufacturer's recommendations, and should be periodically inspected for mechanical damage and connection integrity.

Definition of insulation clearance

If lightning current flows through a lightning conductor located at a distance less than the required insulation clearance from the protected object, the electric field intensity may increase and sparking may occur. Therefore, maintaining the necessary separation distances can prevent a fire from breaking out.

The method of calculating the insulation distance consists in counting individual sections from the lightning protection element protecting a given object (zone), through the nodes of the lightning protection system to the nearest earth conductor. The counted sections are multiplied by coefficients depending on the LPS class, the insulating material between the down conductor and the protected object, and the number of down conductors.

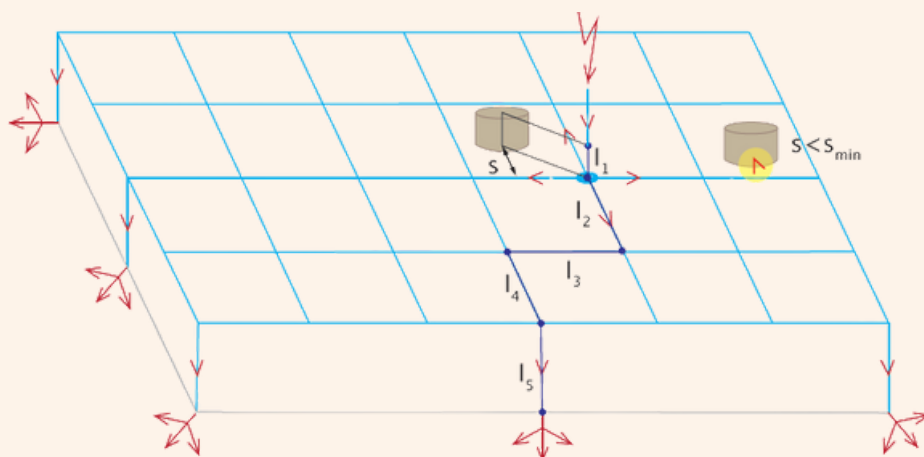
$$s = k_i/k_m \times (k_c1 \times l_1 + k_c2 \times l_2 + \dots + k_cn \times l_n)$$

s – minimum separation distance preventing spark jumps
l_i – length of the i-th section on the path from the lightning protection element protecting a given object to the nearest earth electrode

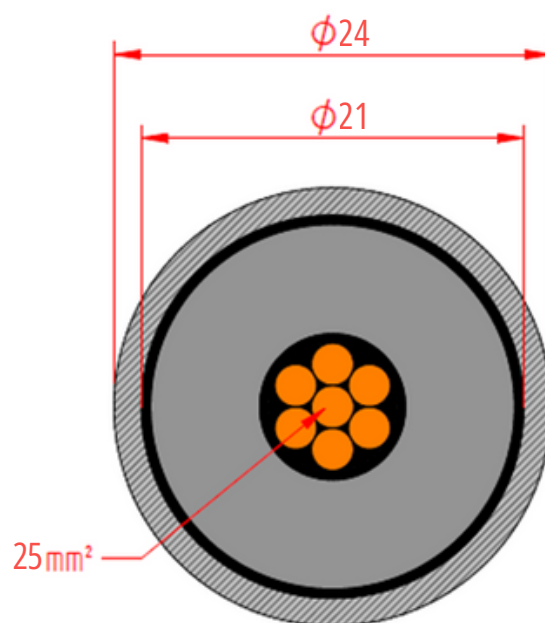
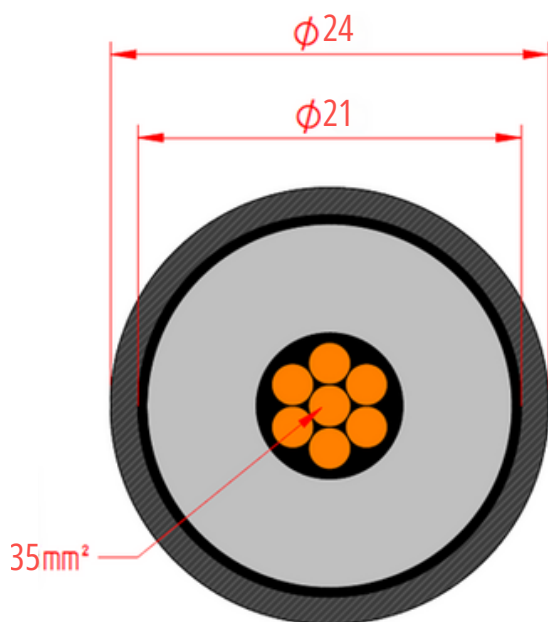
k_i – coefficient depending on the LPS class (0.1-LPS I; 0.075-LPS II; 0.05-LPS III; 0.05-LPS IV)

k_m – coefficient dependent on the insulation material (1-air; 0.5-concrete/brick)

k_c – coefficient dependent on the number of down conductors



Construction of an insulation cable GTI 75

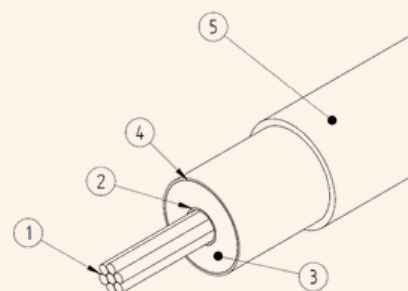


● GTI 75 Black 590019

NR	ELEMENT	MATERIAL	DIMENSION
1	Conductor	Multi-core copper cable	35mm ²
2	Insulation	Layer 1 – Semiconducting PE	Φ21mm
3		Layer 2 – Cross-linked PE	
4		Layer 3 – Semiconductive PE	
5	Sheath	PVC tyre (RAL 9011)	Φ24mm

● GTI 75 Grey 599119

NR	ELEMENT	MATERIAL	DIMENSION
1	Conductor	Multi-core copper cable	25mm ²
2	Insulation	Layer 1 – Semiconducting PE	Φ21mm
3		Layer 2 – Cross-linked PE	
4		Layer 3 – Semiconductive PE	
5	Sheath	PVC tyre (RAL 7035)	Φ24mm



Technical data

a) Possible length of insulated cable runs (590019, 599119) depending on LPS class:

MAXIMUM LENGTH OF INSULATED CABLE				
Number of insulated cables	LPS Class			
	I	II	III	IV
1	-	12,50 m	18,75 m	18,75 m
2	-	18,94 m	28,40 m	28,40 m

b) Insulation clearance value provided by cable 's'

Cable type	Equivalent air separation distance (ki=1) 's'	Equivalent solid separation distance (ki=0.5) 's'
GTI 75 BLACK	0,75 m	1,5 m
GTI 75 GREY	0,75 m	1,5 m

c) Maximum insulation strength against lightning current

Cable type	Lightning current carrying capacity (I imp)	Class according to IEC/TS 62561-8
GTI 75 BLACK	200 kA	H ₂
GTI 75 GREY	200 kA	H ₂

*d) Minimum bending radius
for insulated cables*

Cable type	Minimum bending radius r [mm]
GTI 75 BLACK	240
GTI 75 GREY	240

e) Temperature range

Cable type	Temperature range (permanent installation)	Operating temperature range
GTI 75 BLACK	-30°C ; +70°C	-5°C ; +40°C
GTI 75 GREY	-30°C ; +70°C	-5°C ; +40°C

f) The maximum tensile load on the cables is 1030 N.

*g) Application in lightning
protection class (kc=1)*

Cable type	LPS lightning protection class
GTI 75 BLACK	II, III, IV
GTI 75 GREY	II, III, IV

h) Weight of the cable

Cable type	Weight of 1m
GTI 75 BLACK	0,6 kg
GTI 75 GREY	0,6 kg

i) Chemical properties

Cable type	Resistance to atmospheric factors (UV rays)	Fire class *
GTI 75 BLACK	Yes	F _{ca}
GTI 75 GREY	Yes	F _{ca}

The following materials are used in lightning protection systems: hot-dip galvanised steel, stainless steel, copper and aluminium. Connecting elements made of different metals can cause corrosion, i.e. an inevitable process of returning to the state in which they occur in ores. This can result in a break in the continuity of the lightning protection system and a loss of its effectiveness. The greater the difference in the electrochemical potentials of the connected elements, the faster the corrosion process.

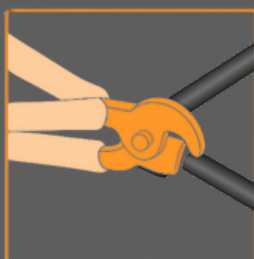
Material compatibility table:

Type of metal		Al	Pb	Cu	Zn	Inox	FeZn
Aluminum	Al	+	+	-	+	+	+
Lead	Pb	+	+	+	+	+	+
Copper	Cu	-	+	+	-	+	-
Zinc	Zn	+	+	-	+	+	+
Stainless steel	Inox	+	+	+	+	+	+
Hot-dip galvanized	FeZn	+	+	-	+	+	+

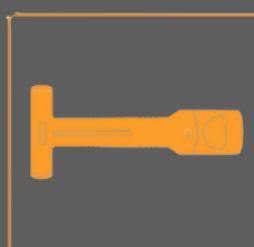
+	- metal compounds possible
-	- metal compounds prohibited



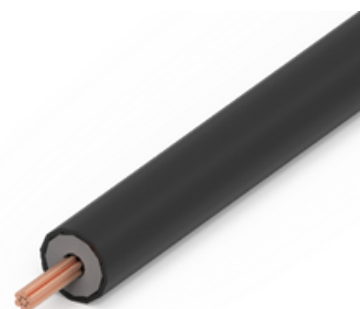
Method of installing insulated cable



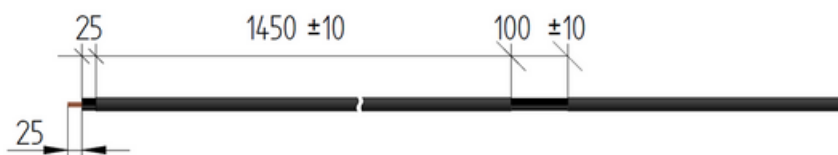
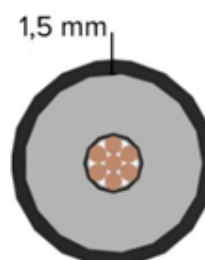
1. First, cut the required length of high-voltage cable



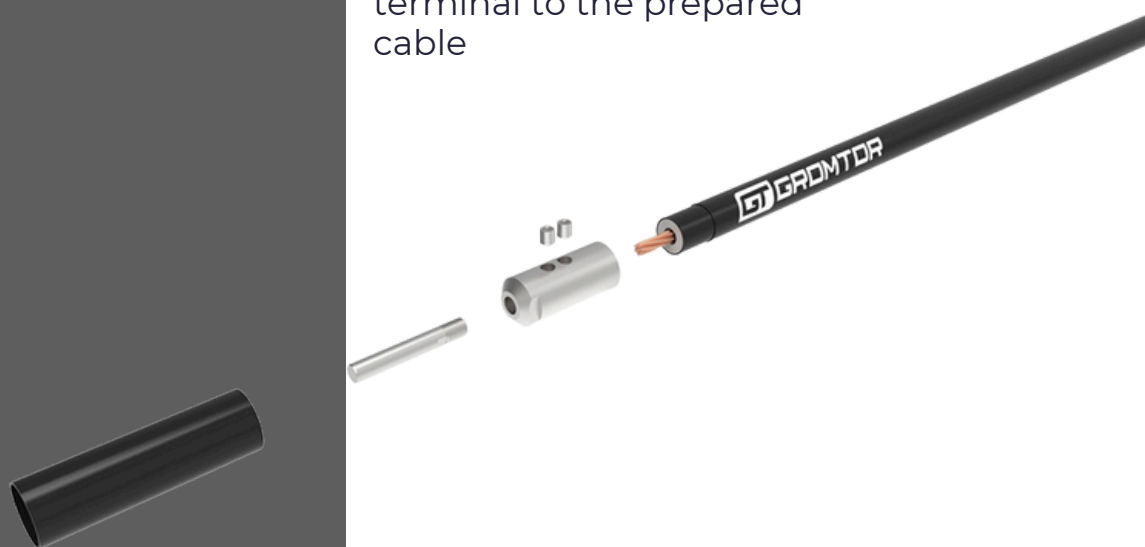
2. In the next step, use a wire stripper to remove the outer layer and insulation over a length of 25 mm. Be careful not to damage the core (copper wire).



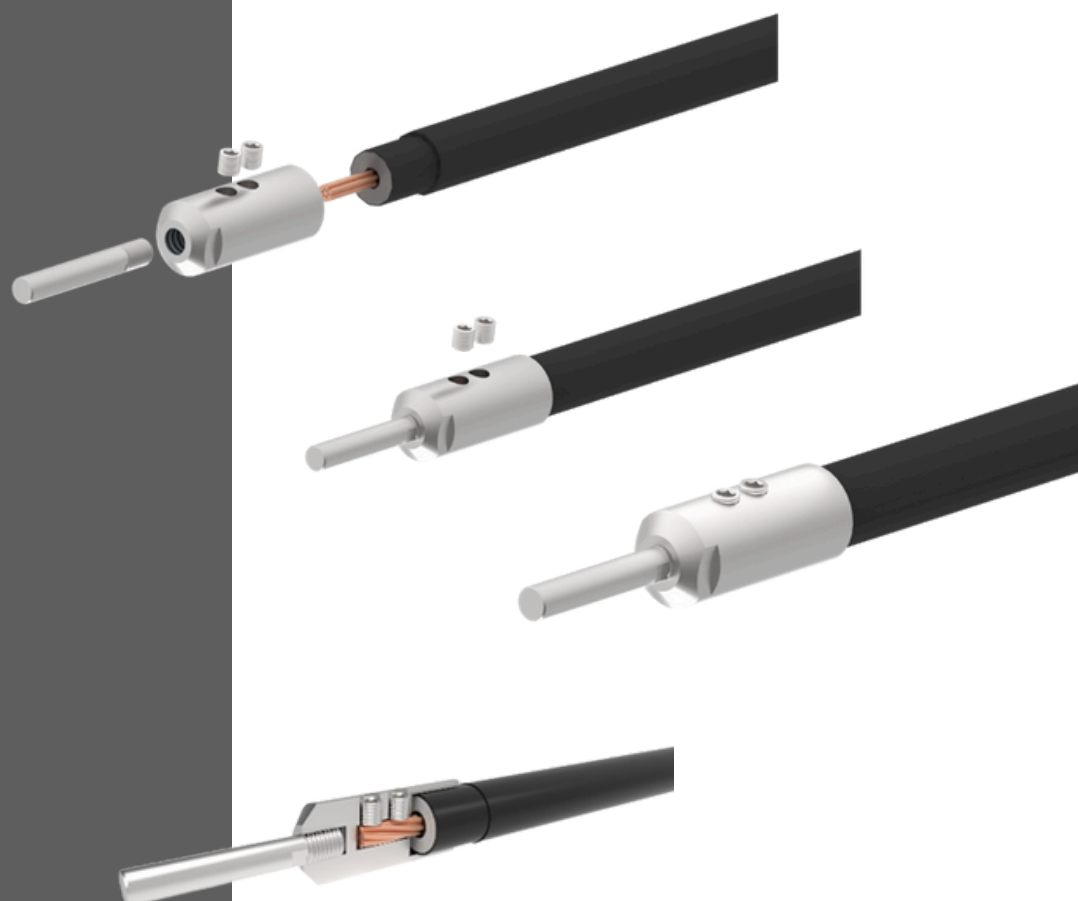
3. Finally, remove the top layer of the insulated cable, 25 mm in length, by cutting it. Be very careful not to damage the semiconductor layer. The same operation should be performed over a length of 100 mm in order to prepare the space for the potential equalisation clamp.



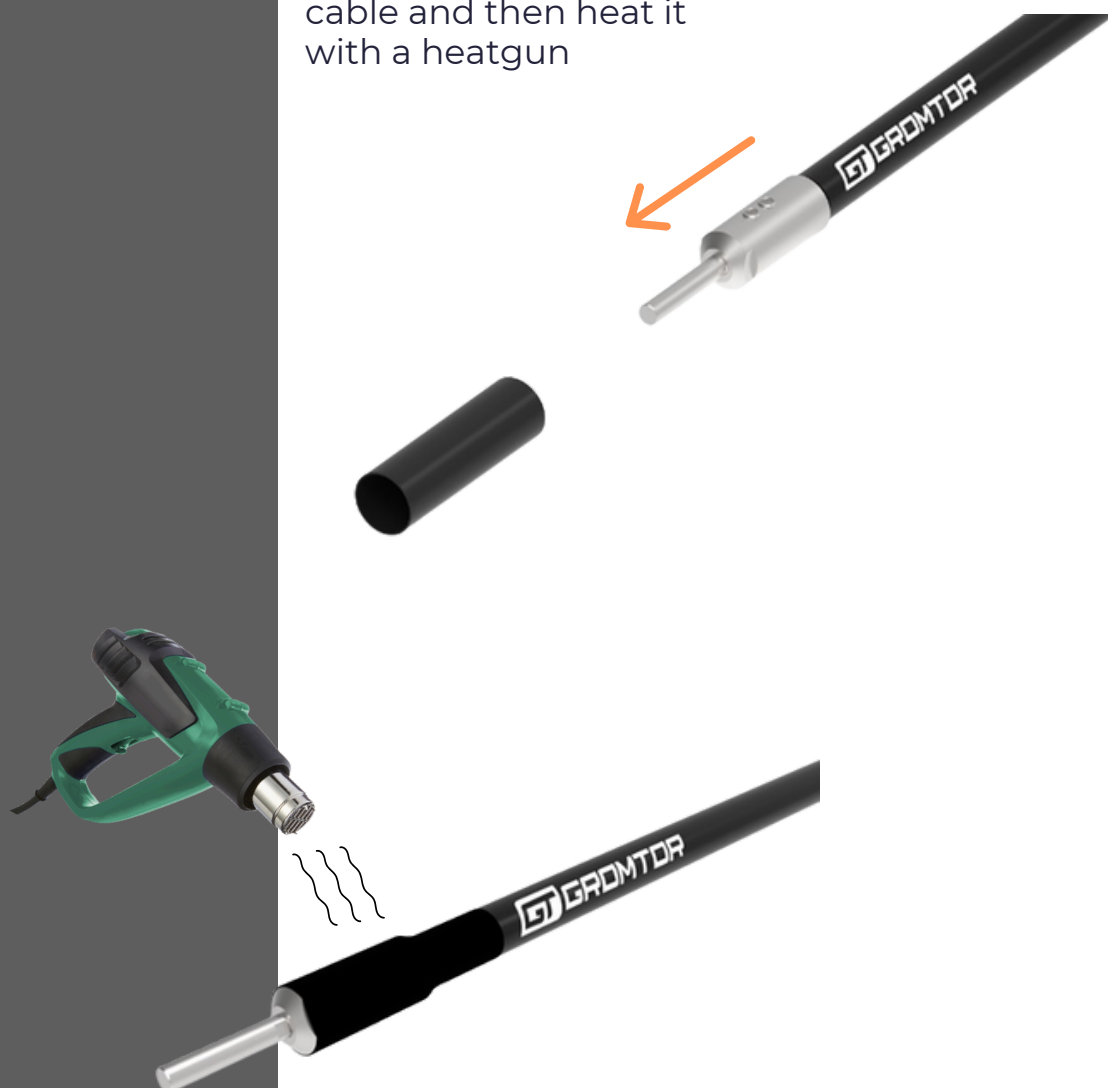
4. Connecting the terminal to the prepared cable



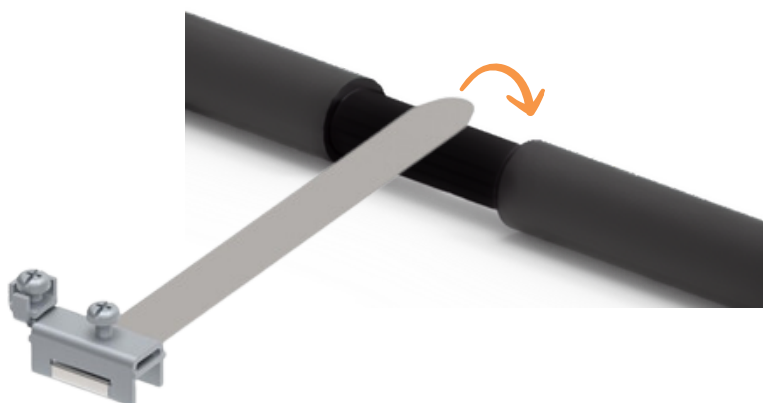
5. Connect the end piece to the cable and tighten it with two Allen screws.



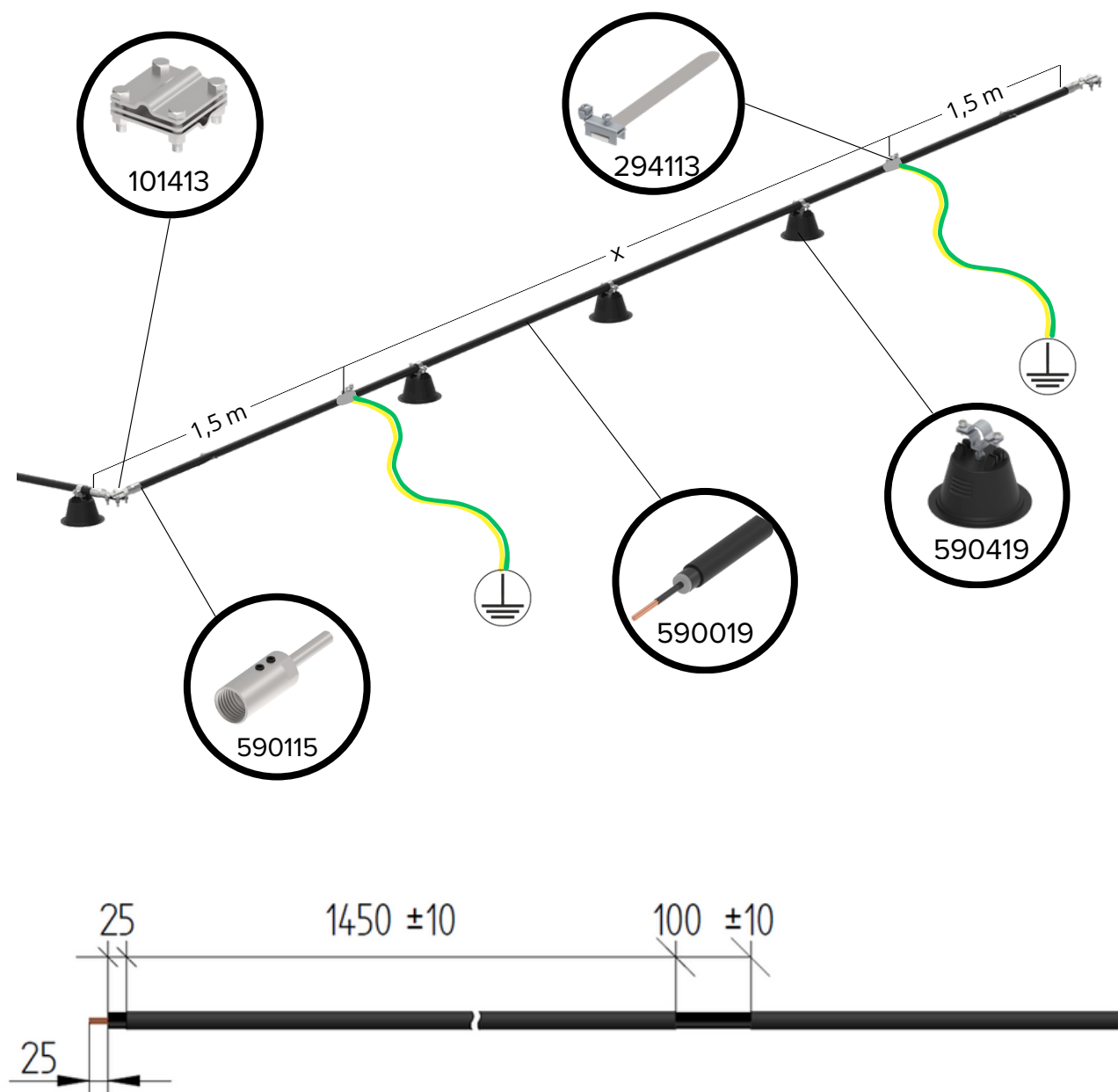
6. Place a heat-shrinkable sleeve over the end of the cable and then heat it with a heatgun



7. Installation of a clamp for potential equalization.

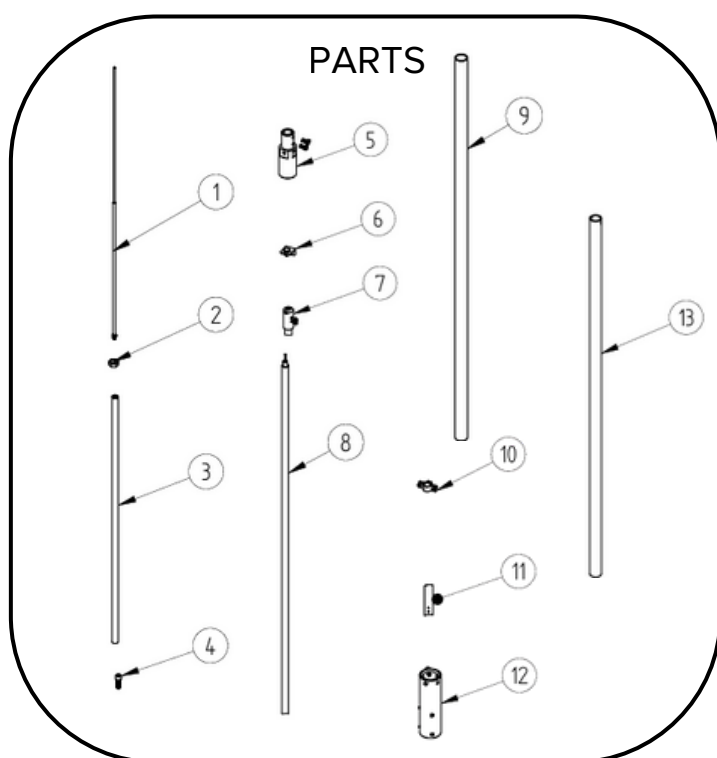
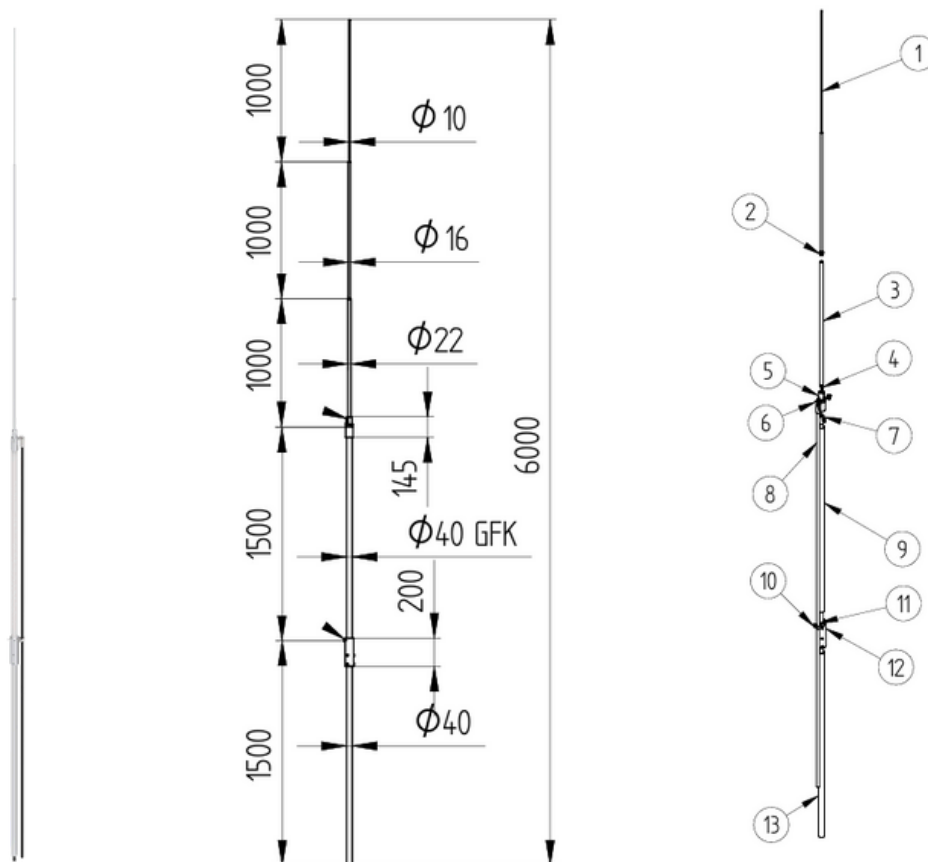


Example of correct installation:



In order to properly prepare the insulated cable for routing it inside the mast, outside or along the roof slope, remember the dimensions described above. When using potential equalisation clamps or a potential equalisation system used in the mast, cut the top layer of the cable at 10 cm intervals without damaging the semiconductor. A potential equalisation clamp, a plate mounted in masts, or a clamp from the connection kit is mounted on it.

GTI isolated air-termination rod for high-voltage insulated cable:

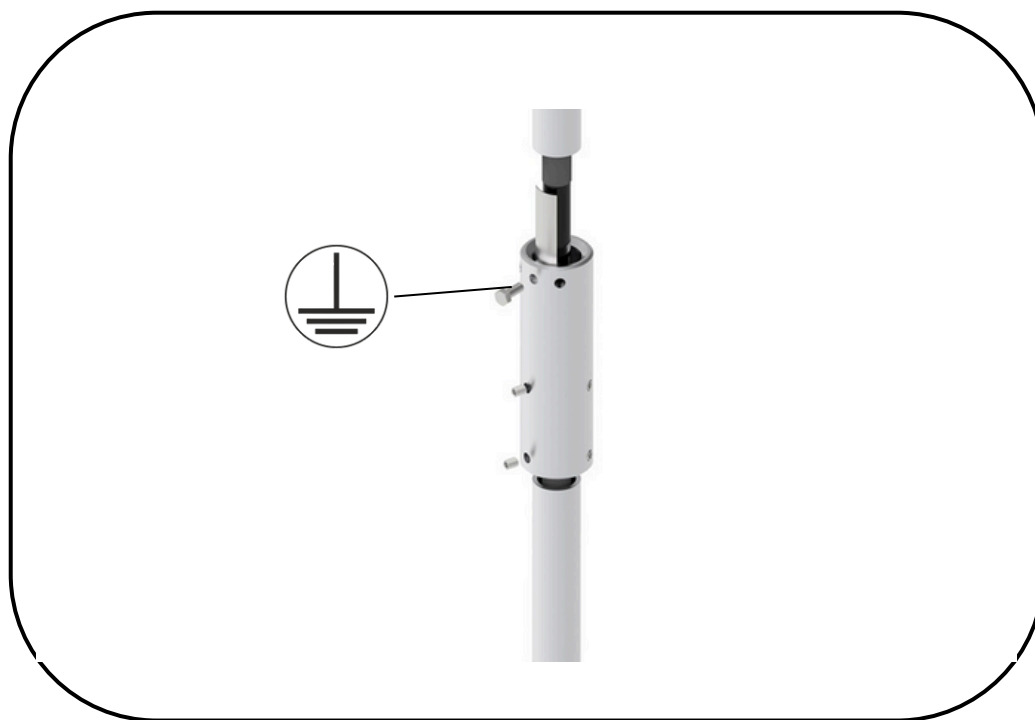


NUMBER	NAME	LENGTH [MM]	QUANT.
1	ROD Ø10/16	2000	1
2	DIN M16	-	1
3	ROD Ø22	1000	1
4	M10X30 ALLEN SREW	1	1
5	ADAPTER Ø50	145	2
6	GTI CONNECTOR ADAPTER	1	1
7	GTI CONNECTOR	2	2
8	GTI CONDUCTOR	1	1
9	GFK PIPE Ø40	1500	1
10	HOLDER FOR GTI CONDUCTOR	1	1
11	EQUIPOTENTIAL BONDING CLAMP	1	1
12	ADAPTER Ø60	200	1
13	PIPE Ø40	1500	2

Installation of the upper sleeve of a high-voltage mast together with a cable, pipe and aluminium rod:



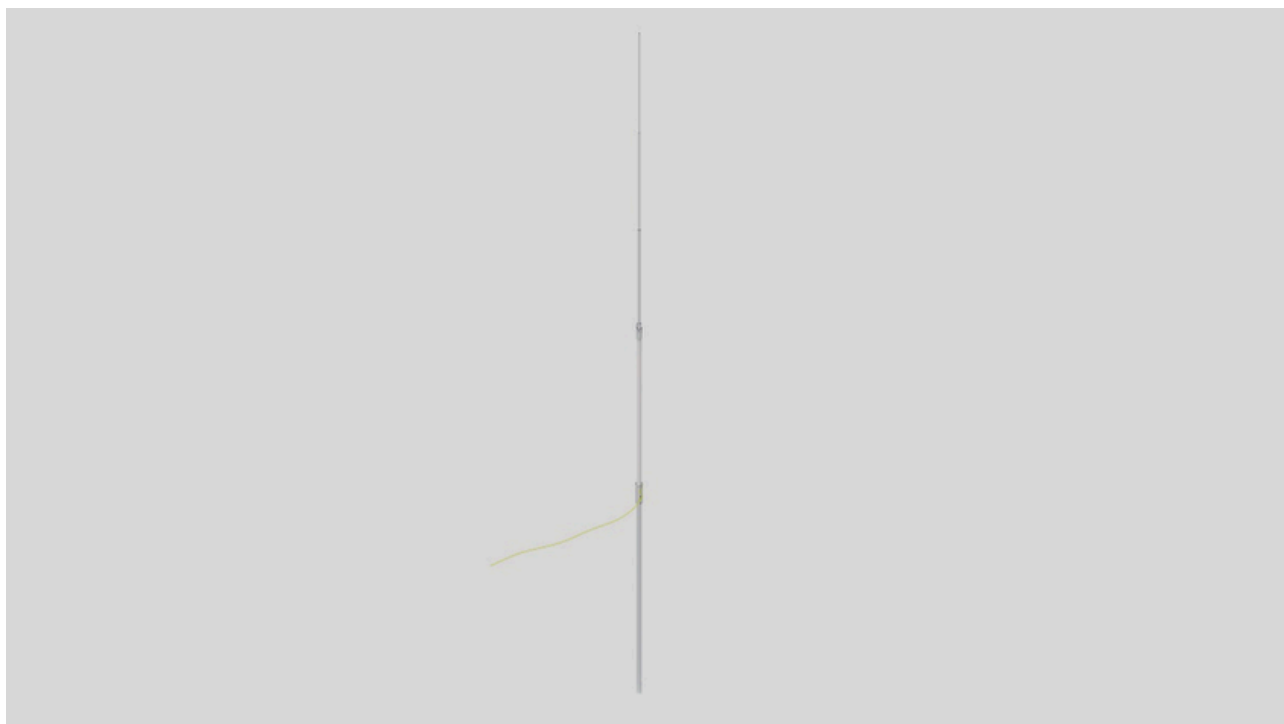
Installation of the lower sleeve of a high-voltage mast with a high-voltage cable, a potential equalisation plate, a GFK pipe and an aluminium pipe:



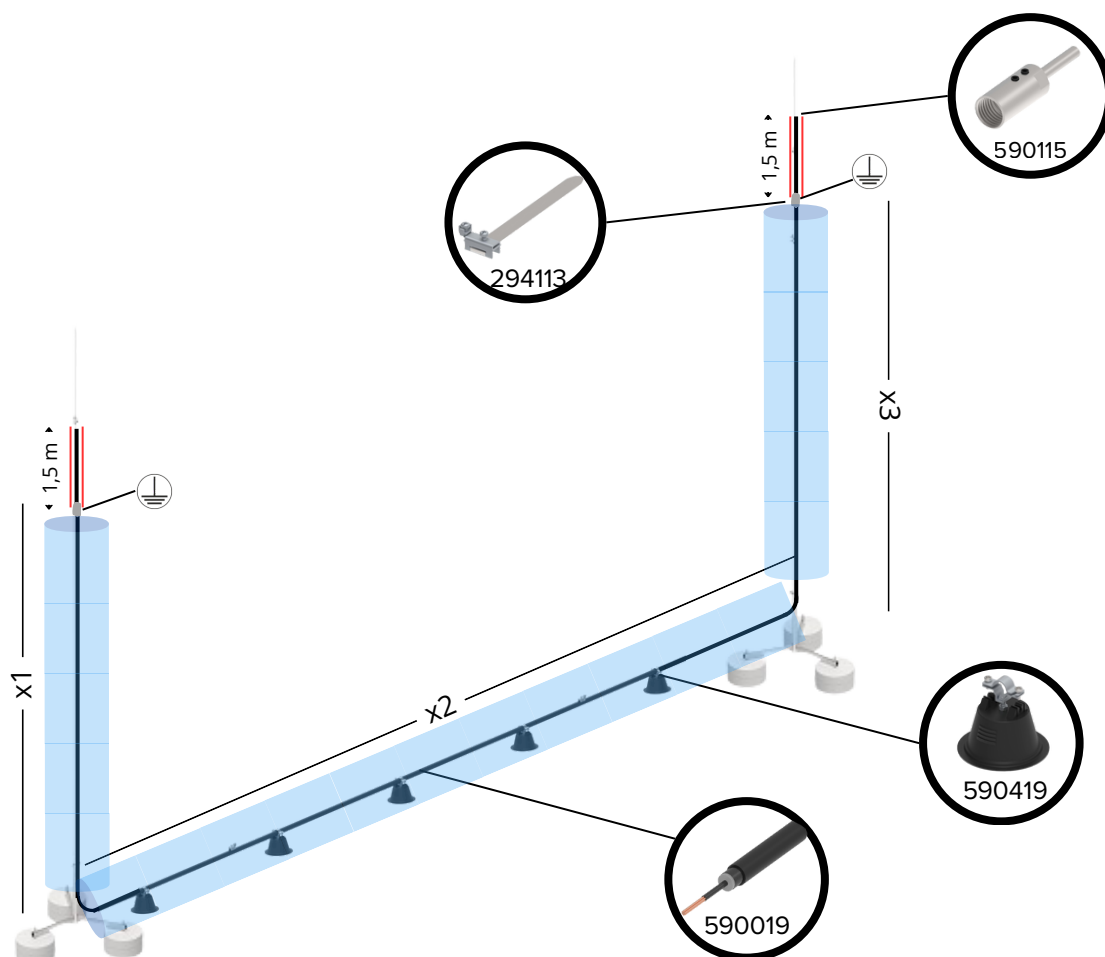
In accordance with previous recommendations, an insulated cable should be prepared for the potential equalisation plate. Potential equalisation of gti wire must be placed on the semiconductor. Page 13.

The minimum cable cross-section for potential equalisation is 6 mm².

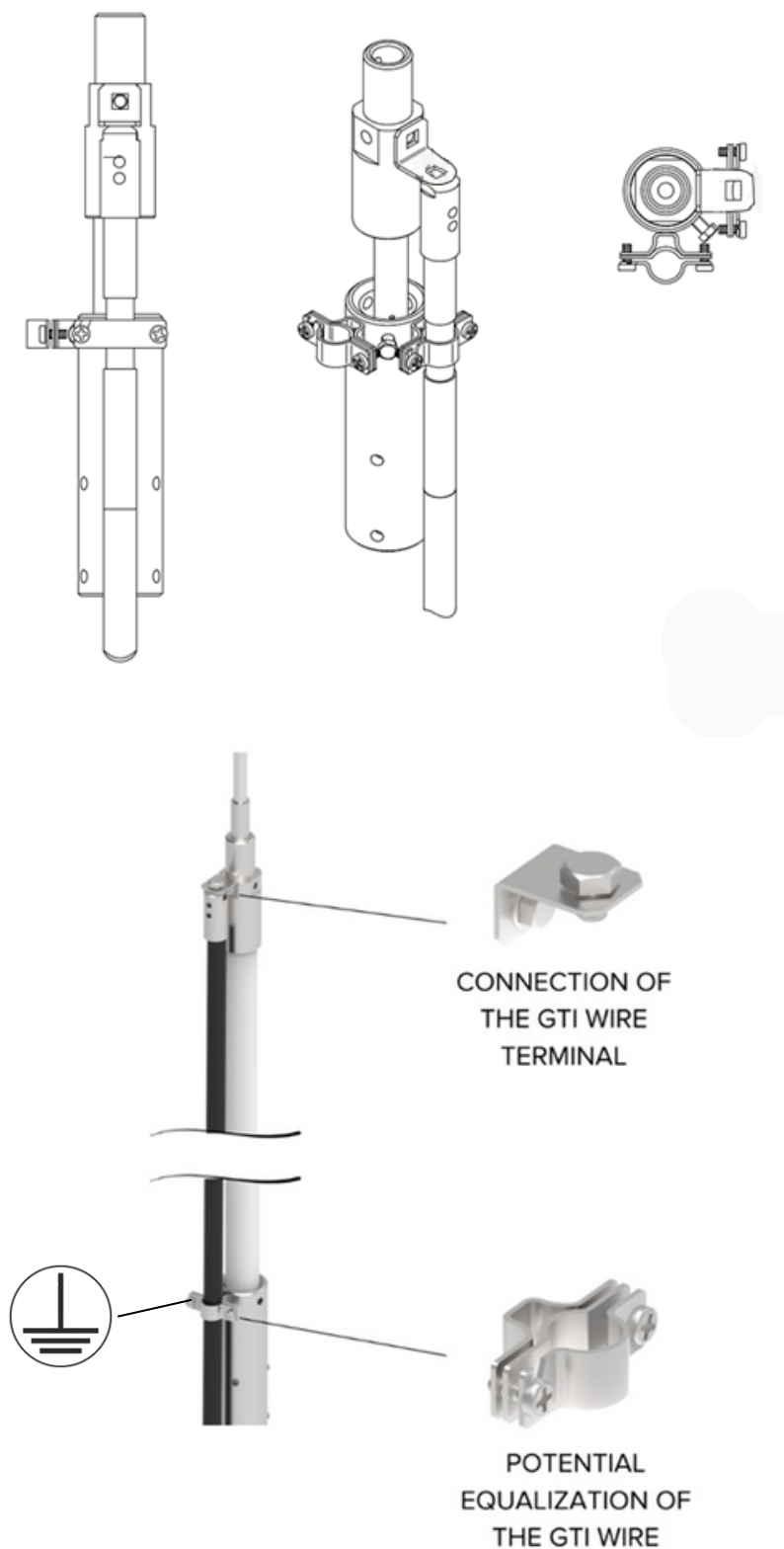
Example of a correctly assembled high-voltage mast:



Example of correct connection of high-voltage masts to each other:

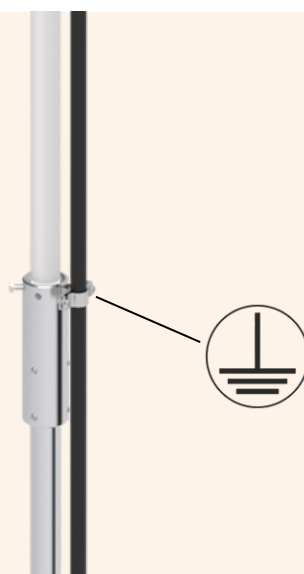
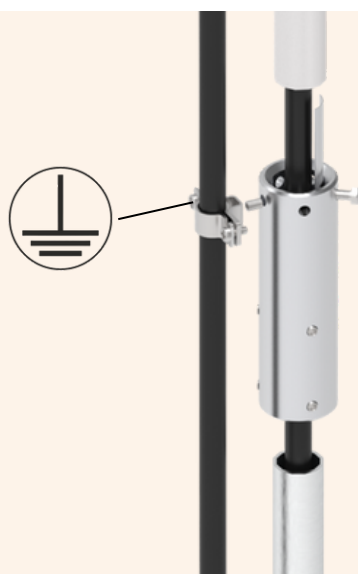


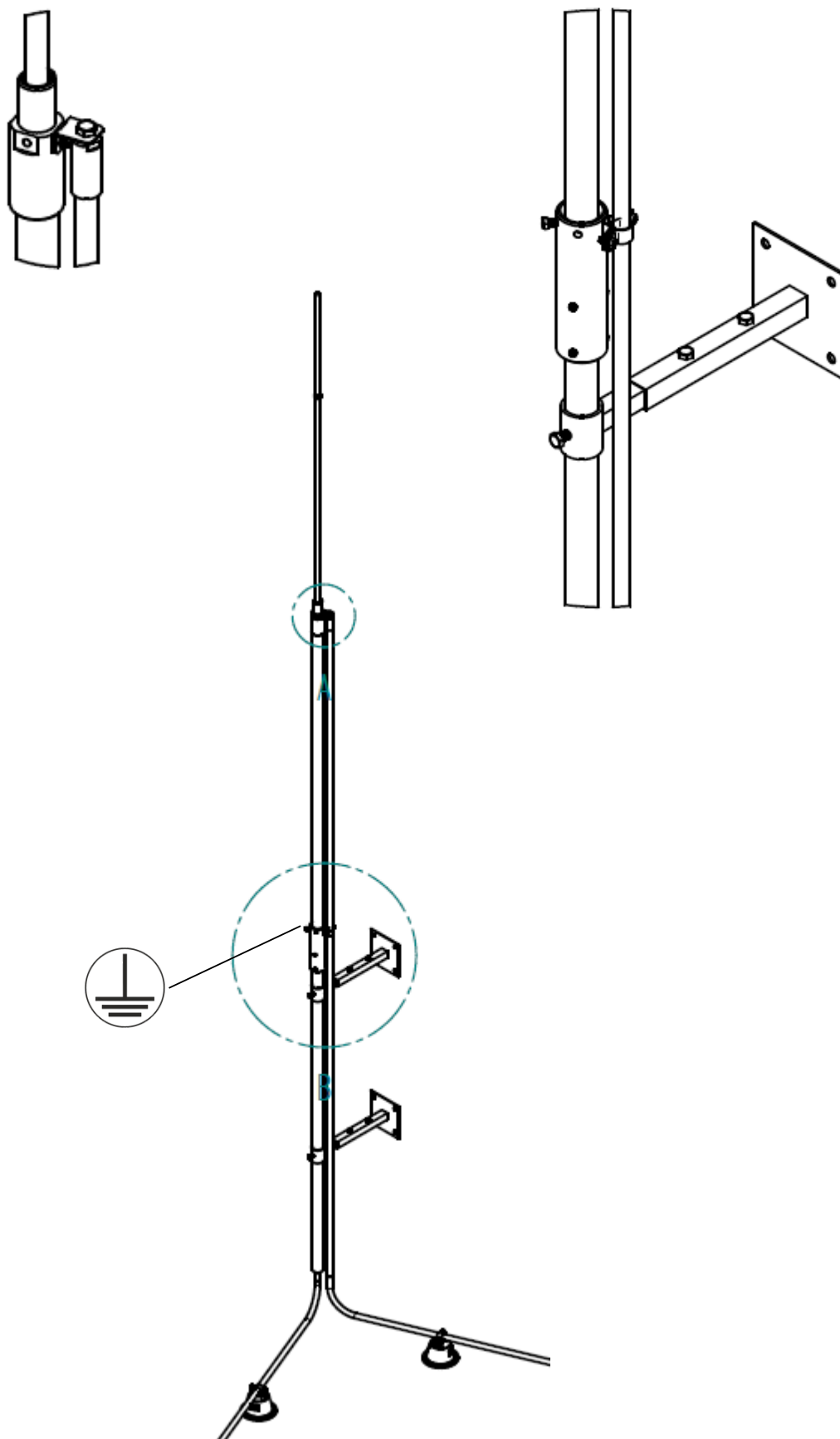
Details of connecting an additional insulated cable outside the mast using the GTI 590813 connection kit



Potential equalisation of gti wire must be placed on the semiconductor.

Example of running more than one insulated cable on a mast.







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