Installation, inspection and maintenance instructions

Version 1 EN - 2024.09.18

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1. TelecomSteel's standard product range

At TelecomSteel A/S, we have more than 25 years of experience in the telecommunications industry - both as manufactures of steel and installation of telecommunications equipment in masts, on chimneys, on roofs, etc. Our standard products have been developed to ensure high quality, easy assembly and installation and short delivery times.

TelecomSteel's standard product range is tested and designed for installation throughout Denmark - base wind 27 m/s and terrain category 1.

TelecomSteel's standard product range is tested and approved in our test stand in relation to relevant antenna equipment and wind load as shown in the data sheets.

2. Prerequisites for assembly and installation

To ensure that the products work as intended, it is important that the products are:

- Installed/mounted on a load-bearing structure that is suitable for the purpose
- installed by professionally competent installers
- installed according to the data sheets and this installation guide

2.1. Load-bearing structures

It must always be ensured that TelecomSteel's products are installed on a load-bearing construction (masts, buildings, chimneys or other constructions) that are dimensioned for and suitable for carrying product and attached equipment. Load-bearing structures with a lot of vibration or obvious and/or constant oscillations should be statically calculated to ensure that they are suitable for installing products/brackets and attached equipment.

If the product is fixed directly in/on buildings or other structures, it must be ensured that the surface is stable and suitable for carrying products and equipment. Reference is made to the supplier of fixing elements for this purpose in relation to type, dimensioning and fixing.

2.2. Data sheets

A data sheet for all standard products is available on the TelecomSteel A/S website: www.telecomsteel.com

The data sheets contain important information about the products' performance, construction and maximum permissible load.

The information on the product's data sheet always takes precedence over information found elsewhere – including in this guide.

3. Installation and assembly

3.1. General

The products must be assembled and, as a general rule, oriented vertically (up/down) as shown on the data sheet, unless otherwise stated on the data sheet.

The information on the product's data sheet always takes precedence over information found elsewhere – including in this guide.

For all products, it applies that they must be mounted in the centre line of the pole/carrier tube so that the bearing surfaces are evenly loaded; see the sketches on the following pages.

3.2. Bolted joints

The products must be assembled/installed with the supplied bolt set, threaded rods or U-bolts:

- Each bolt comes with two (2) washers and two (2) nuts. A washer is placed under the bolt head and under the nut. The joint is secured with a lock nut.
- For threaded rods, four (4) nuts and two (2) washers are included. A washer is placed between the bracket and the first nut at each end of the threaded rod. Each nut is secured with a lock nut. Threaded rods must be installed so that there is a minimum of 10mm thread length after the nut.
- For U-braces, four (4) nuts and two (2) washers are included. A washer is placed between the bracket and the first nut on each leg of the U-bracket. Each nut is secured with a lock nut

All supplied bolts, threaded rods and U-bolts are hot-dip galvanized and are in strength class 8.8 or in stainless steel (AISI 304 or 316) and must be tightened with torque according to the data sheet.

If galvanized bolts, threaded rods or U-bolts are shortened, the end MUST be deburred and protected from rust with zinc-containing paint.

3.2.1. Tightening of bolted joints

During assembly, all bolts/nuts are first lightly tightened and checked that the bracket is seated correctly and that the bolts/nuts are correctly assembled and evenly utilised. Then tighten all joints evenly up to approx. 70% torque and check that the bracket is seated correctly. Finally, tighten the bolted joint with the specified torque according to the data sheet/torque table and install counter nuts, which are also tightened with torque according to the data sheet/torque table.

3.2.2. Bolt torque table

Galvanised / FZV / HDG

Tightening torque **HDG**	Block-joint (Dry/unlubricated)	Open joint (Dry/unlubricated)	Counter nut (Dry/unlubricated)
M10	47Nm	30Nm	47Nm
M12	81Nm	30Nm	81Nm
M16	197Nm	45Nm	197Nm

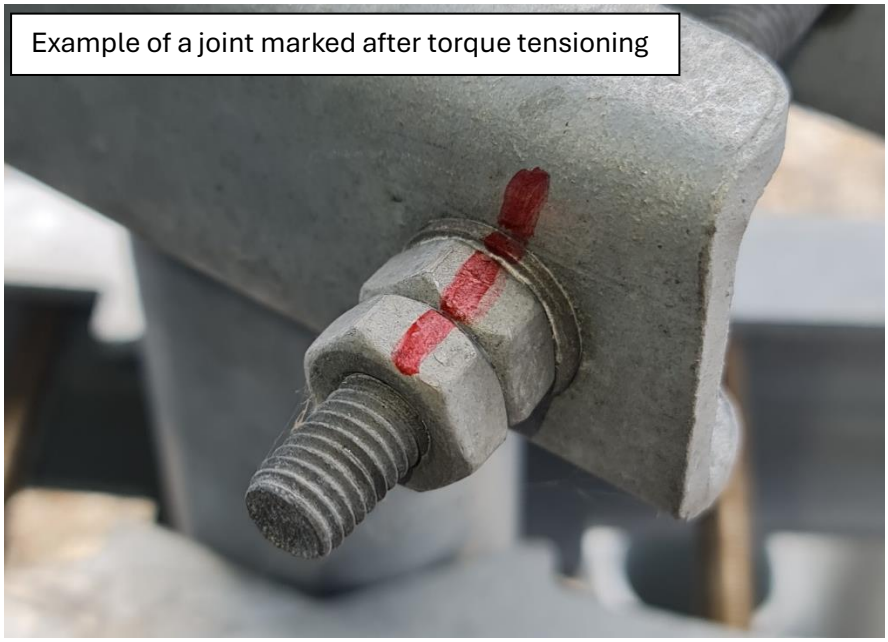
Stainless steel (AISI 304 / 316) / RF / SS

Tightening torque **SS**	Block-joint (oiled)	Open joint (oiled)	Counter nut (oiled)
M10	28Nm	28Nm	28Nm
M12	48Nm	30Nm	48Nm
M16	118Nm	45Nm	118Nm

Fastening components in stainless steel are prone to tearing during assembly - also known as cold welding - where the nut seizes. It is advisable to lightly oil the bolt/nut before assembly to reduce the risk of tearing.

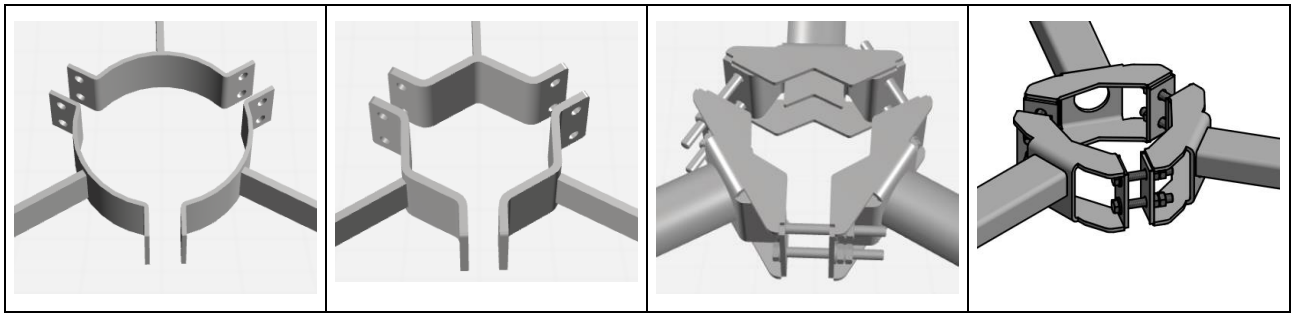
If the stainless-steel bolt assembly cold welds during assembly, the bolt, threaded rod or U-bolt and nut must be discarded and replaced with a new one. NOTE: A cold-welded bolt assembly will result in incorrectly high tightening torque.

Torque-tensioned bolted joints can be marked with a line of permanent marking lacquer, allowing visual inspection of the bolted joint without the use of tools.

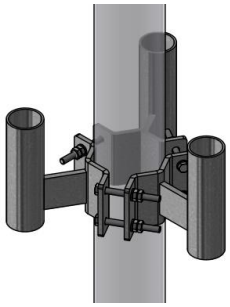
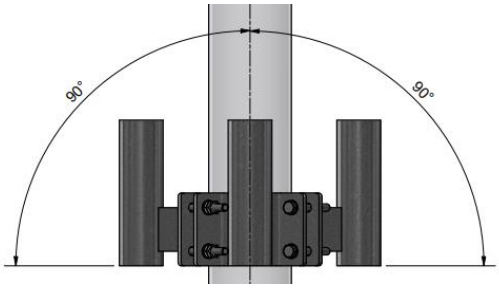
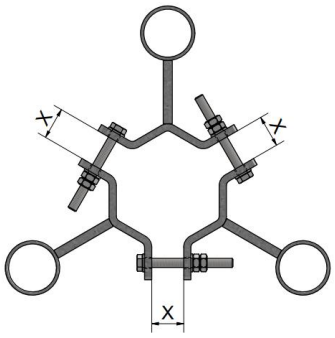
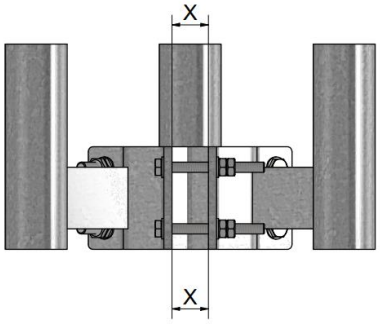


Example of a joint marked after torque tensioning

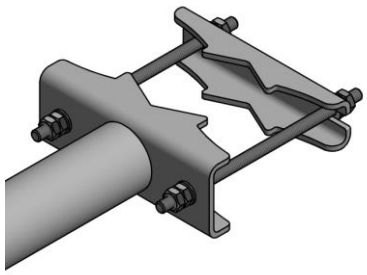
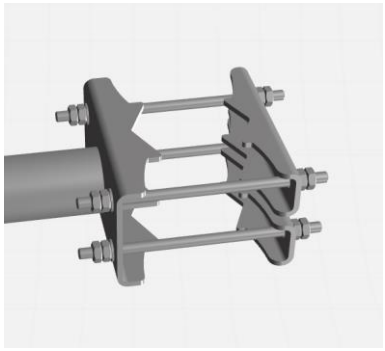
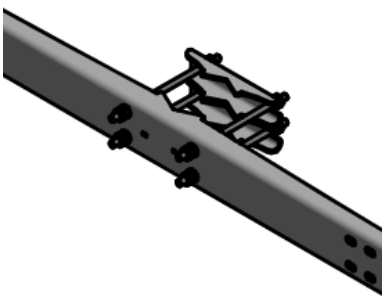
3.3. Three-piece collars



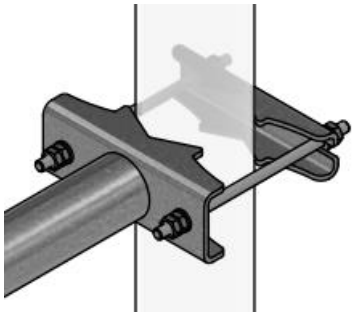
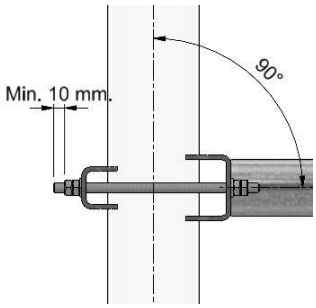
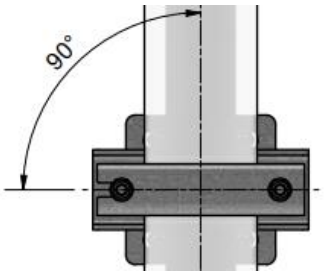
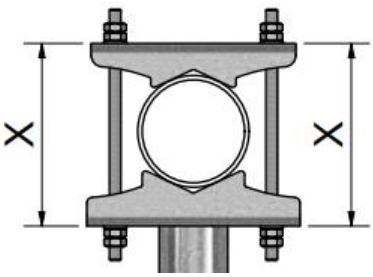
Three-piece collars come in several designs, but the assembly and installation principle is the same for all types.

Three-piece collar mounted on a pole	
The collars – and other brackets – must always be mounted perpendicular to the pole	
The distance between the individual clamping surfaces (X) must be the same at all joints all the way round. The difference between the joints must not exceed 3 mm.	
The distance in the top and bottom of each joint must be the same. The difference must not exceed 2mm.	

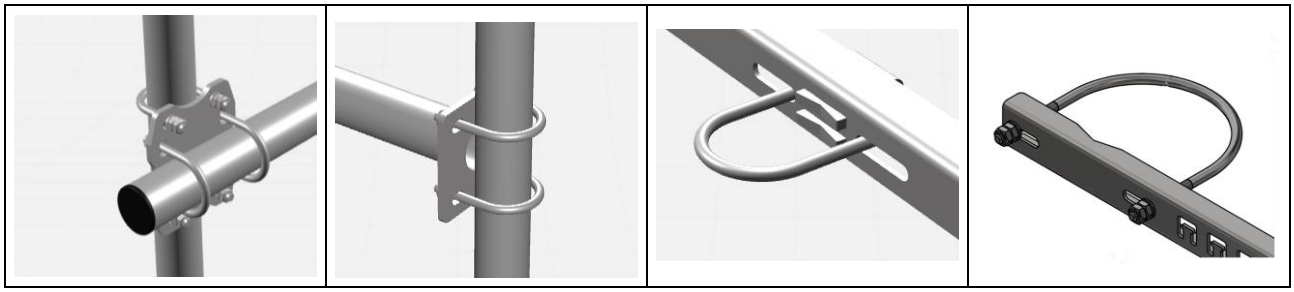
3.4. Two-piece collars and joints with threaded rods

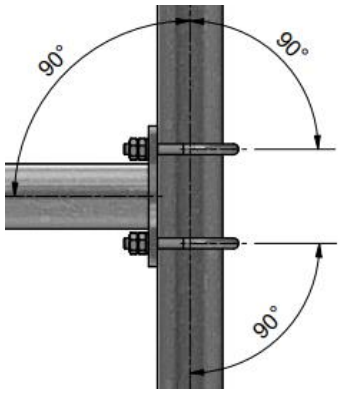
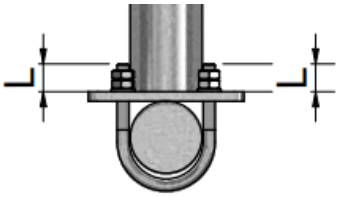
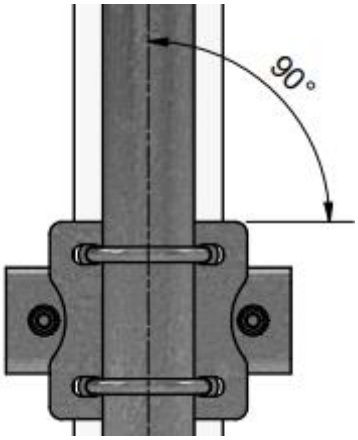
Two-piece collars are assembled with threaded rods. The assembly principle is the same for all types, regardless of whether there are one or two rear parts.

Carrier arm with two-piece collar mounted on pole **If the threaded rod is shortened, the end MUST be deburred and rust protected with zinc-containing paint.**	
The two-piece collar must be mounted perpendicular to the pole. The threaded rods should as well be perpendicular to the pole Threaded rods must be installed so that there is a minimum of 10mm thread length after the nut	
The rear part(s) must be perpendicular (transversely) to the pole	
It is important that the distance between the front and back (X) is the same on both sides. The difference must not exceed 2mm	

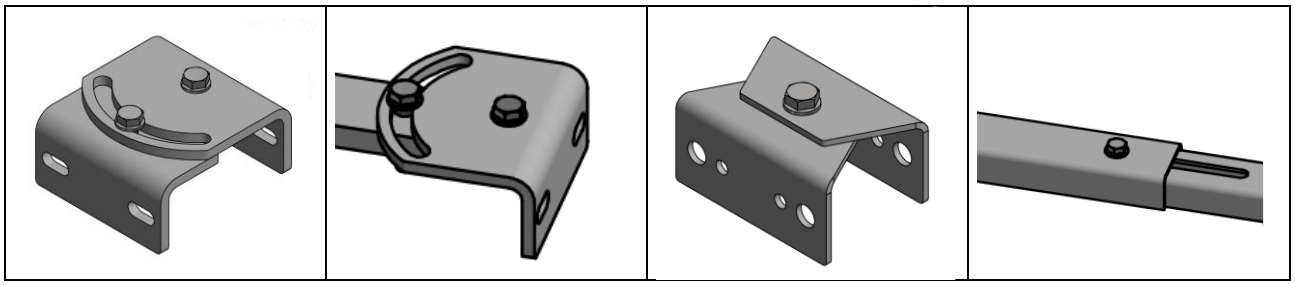
3.5. U-Bolts



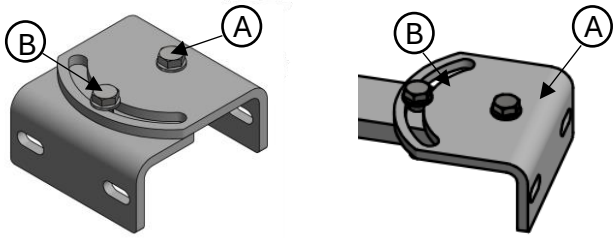
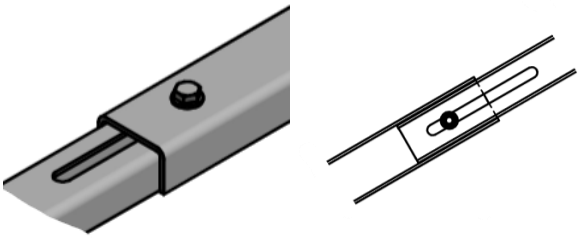
U-bolts are used in many standard and special products. The installation method is the same wherever they are used.

U-bolts must be installed perpendicular to the pole they grip. The carrier arm must also be mounted perpendicular (90°) to the pole.	
U-bolts should be installed so that the 'legs' stick out equally far (L). The difference must not exceed 5mm.	
The bracket through which the U-bolt extends must be mounted perpendicular to the pole.	

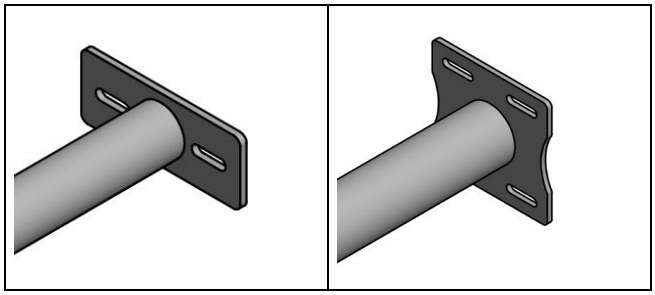
3.6. Swivels, tilt brackets and movable joints



Swivel joints, tilt brackets and movable joints are used where the antenna position or similar must be adjusted in the bracket.

Tilt brackets are assembled with both bolts slightly tightened so the angle can be adjusted. When the tilt position is as desired, tighten bolt 'B' to lock the position. Finally tighten the bolts as described in section '3.2.1. Tightening of bolted joints'	
Movable joints must <u>always</u> be assembled as shown in the illustration! The two U-rails must sit inside each other to ensure that they cannot be rotated in relation to each other.	

3.7. Bracket for wall mounting



Various standard products are supplied in a wall-mounted version.

When fixing product directly in/on buildings or other constructions, ensure that the base is stable and suitable for carrying both product and equipment.

Please refer to the supplier of fasteners for this purpose for type, dimensioning and fastening.

3.8. Poles

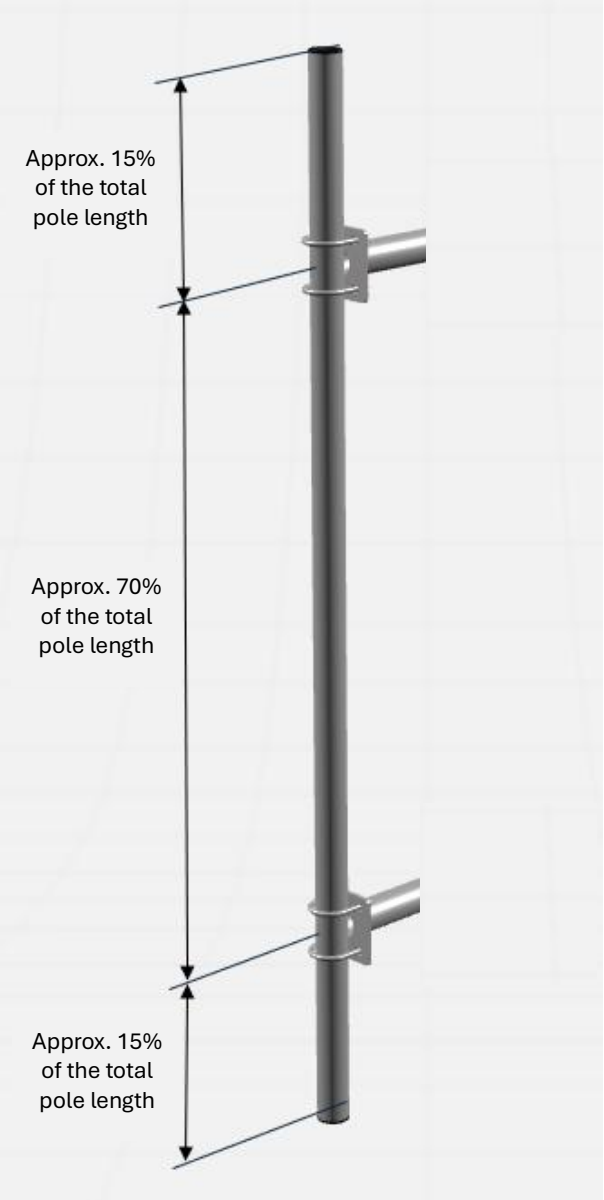
Poles in general

Poles are mounted so that the offset brackets supporting the pole are approx. 15% of the total length of the pole from the ends – see sketch.

This applies regardless of whether the pole is mounted on a hoop, a mast or a wall.

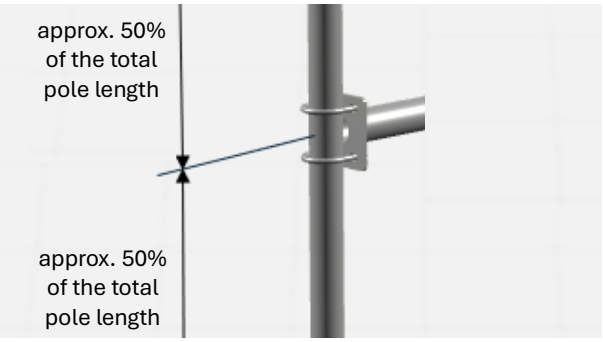
The pole should always be mounted vertically.

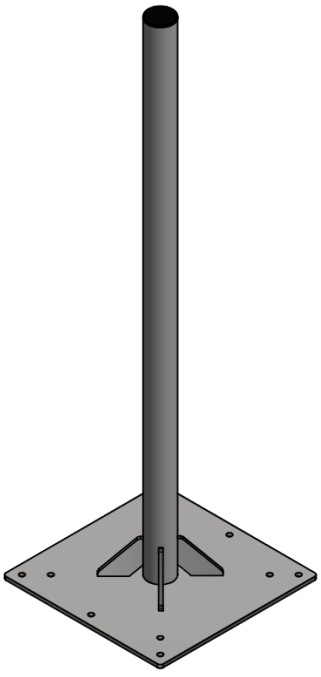
Pole length [mm]	15% [mm]	70% [mm]	15% [mm]
1.000	150	700	150
1.500	225	1.050	225
2.000	300	1.400	300
2.500	375	1.750	375
3.000	450	2.100	450
3.500	525	2.450	525
4.000	600	2.800	600



Additional offset brackets (optional)

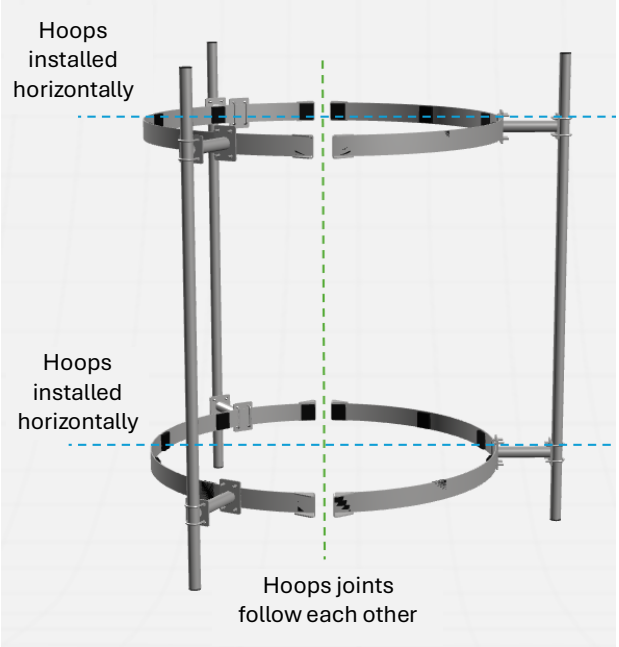
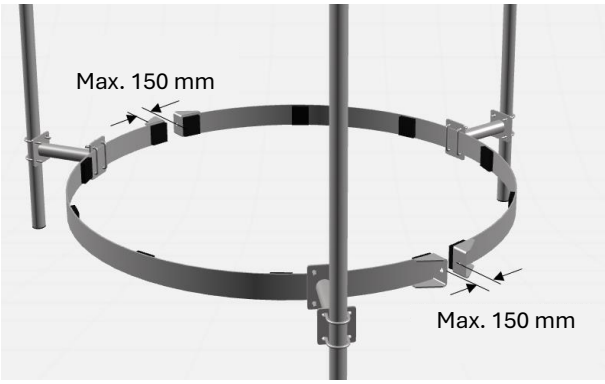
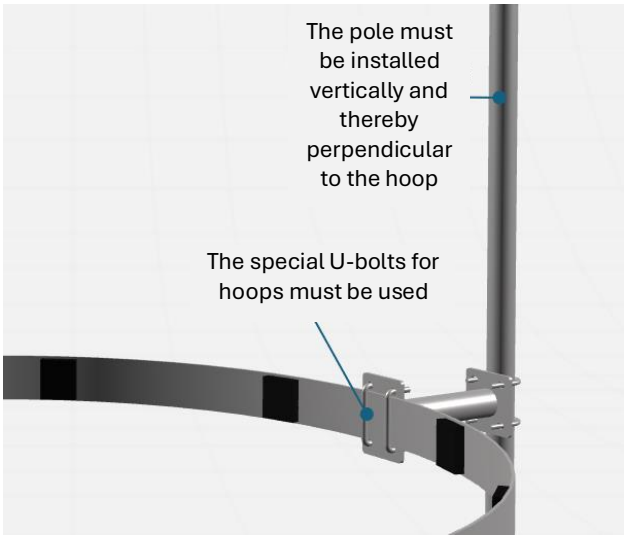
If an additional (third) offset bracket is fitted to support the pole, it must be placed in the centre of the pole / in the middle of the two other offset.



Pole extensions Pole extensions may only be mounted on top of an existing fixed clamed pole. The pole extension must be adjusted to vertical – in direct extension of the fixed pole. After adjusting the pole extension, tighten all 6 (six) bolts and tighten all counter nuts.	
Freestanding poles Freestanding poles must be mounted vertically. The base for the freestanding pole must be suitable for the purpose. Read more about fastening and substrates in section '2.1. Load-bearing structures'.	

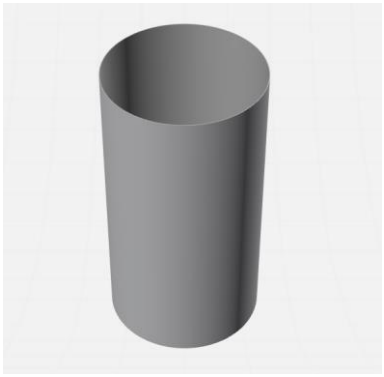
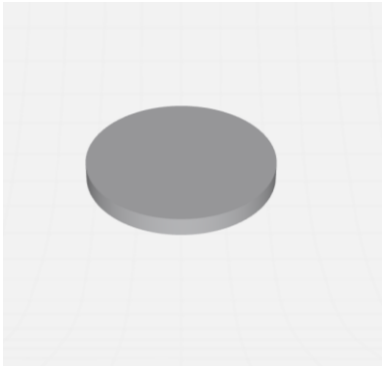
3.9. Hoops / barrel bands

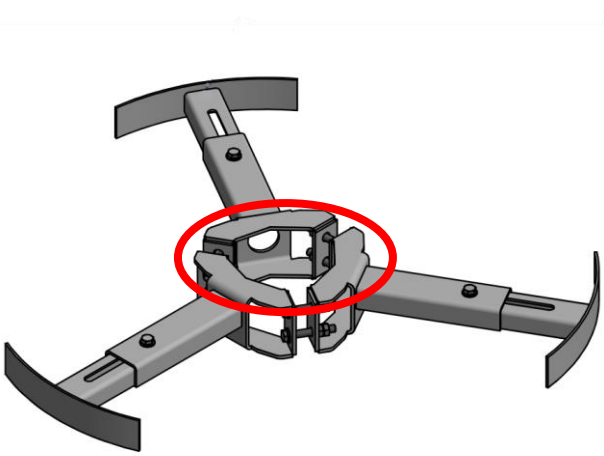
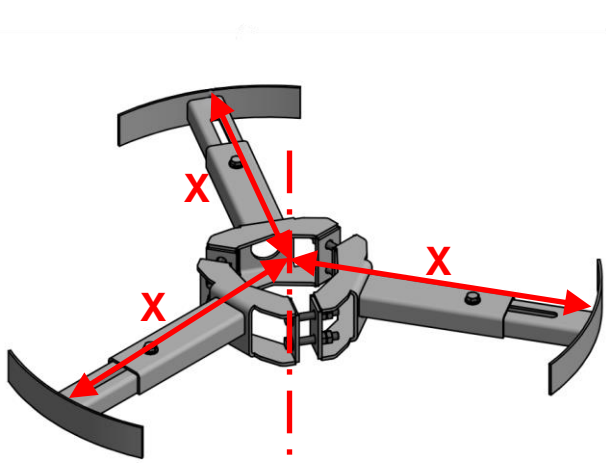
Hoops are used on existing circular structures.

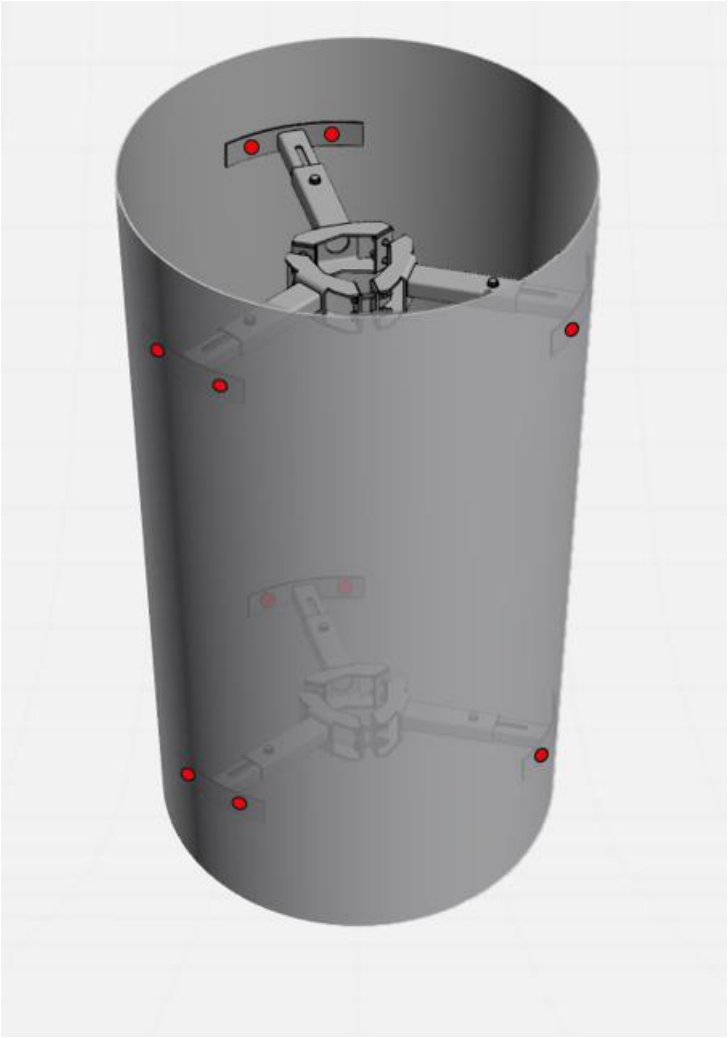
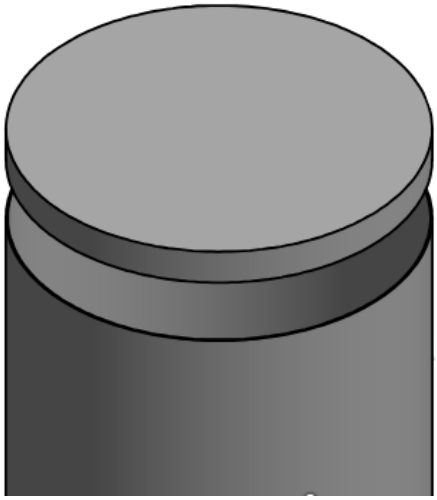
Hoops must always be installed horizontally. The hoop joints should follow each other.	
The distance between the flanges in the ends of the barrel band must not exceed 150mm The difference in the distance of the joints must not exceed 30mm.	
The supplied special U-bolts for hoops must be used to mount the offsets on the hoops.	

3.10. Radomes

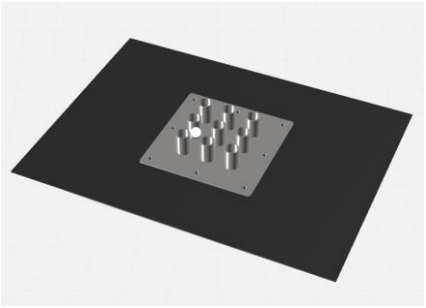
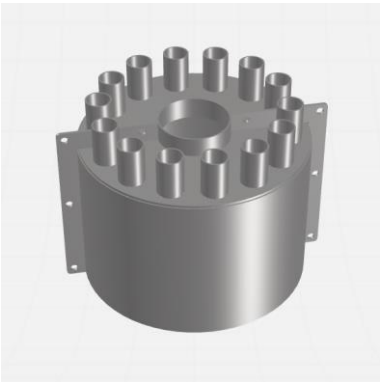
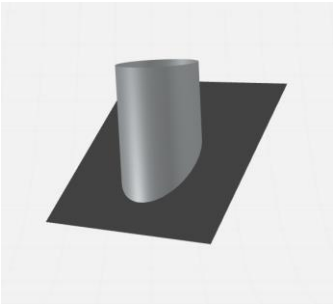
The radome is made of fiberglass and is mounted on a pole to cover antennas. The radome lid is made of aluzinc sheet metal. The radome and cover can be painted according to the customer's wishes.

Radome	Radome lid	Radome bracket
		

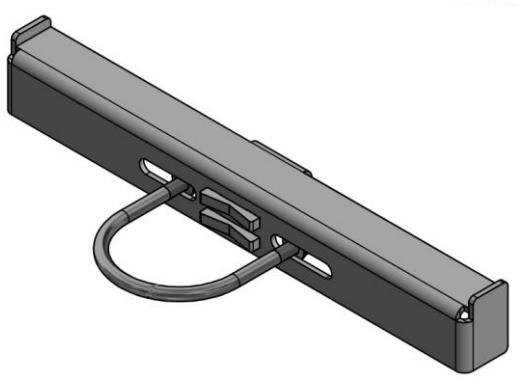
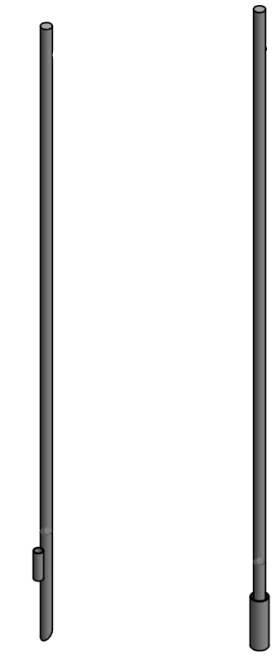
Install the Radome bracket on the pole (See section *3.3. Tre-piece collar)* The Radome bracket must be horizontal with the support arms perpendicular (90°) to the pole. Place one radome bracket at the top and one at the bottom of the radome. The radome brackets are placed approx. 15% of the total radome length from the top and bottom.	
The three arms of the radome bracket are adjusted according to the diameter of the radome so that the arms have the same length (X). The two U-rails must sit inside each other to prevent that they can rotate in relation to each other.	

Mount the radome over the two radome brackets and drill holes through both the radome and the bracket on site (red dots on the illustration – two holes per arm: 12 holes in total). Recommended Ø6,8mm metal drill bit. The holes in the fiberglass radome are then drilled to 10mm. M8 threads are tapped into the Ø6,8mm holes in the radome bracket. The radome is fixed with M8 set screws with shield washers Radomes with at length of 4 meters and above must be mounted with three (3) radome brackets.	
The radome lid is placed on top of the fixed radome and secured with self-tapping screws. Drill holes for the self-tapping screws on site.	

3.11. Feedthroughs

Feedthroughs – roof Please refer to Perform's installation guides, which can be found at: www.perform.dk/dk/downloads It is recommended to use an licensed roofer when working with roofs.	
Feedthroughs The stud points out of the construction. Two rubber seals are placed on opposite sides of the construction wall. Finger tighten the nut and the turn/tighten the nut another ¼ turn.	
Rocket cap Apply UV-resistant sealant on sealing surfaces against pole and rocket cap joint before assembly. Assemble the rocket cap around the pole and tighten the bolts according to datasheet There should be at least 20mm clearance between the rocket cap and the zinc cover to allow both to move independently.	
Goosenecks It is recommended to fix the gooseneck to the fixed structure.	
Zinc cover Must be centred on the pole. Please refer to Perform's installation guides, which can be found at: www.perform.dk/dk/downloads It is recommended to use an licensed roofer when working with roofs.	

3.12. Other products

Pole steps should be mounted horizontally and orientated as shown in the illustration. Tighten the U-bolt as described in section '3.2. bolted joints'. Follow the manufactures instructions when installing slide rails.	
The start spike and extensions spike are an aid to get the ground wire into the ground – it is NOT a ground spike. The start and extension spike are made of black iron, so they will rust away when left in the ground.	 Starting spear Extension spear

4. Hot-dip galvanizing / Galvanizing

TelecomSteel's standard product range is made of hot-dip galvanized steel that is hot-dip galvanized in accordance with DS/EN ISO 1461:2022. During hot-dip galvanizing, the finished products are immersed in 450°C liquid zinc to ensure an optimal chemical bond between the steel and the zinc. This provides optimal corrosion protection of the products.

Damages such as wounds in the galvanized surface can degrade and weaken the products. We therefore recommend an inspection immediately after the installation is complete and a possible repair with zinc-containing paint of the surface (see more under inspection and overhaul of galvanization)

Further information on hot-dip galvanizing and corrosion can be found at:
www.nordicgalvanizers.com

5. Customer specified products and solutions

TelecomSteel manufactures products according to customer drawings and specifications. The products are manufactured in accordance with EN1090.

Fastening elements (bolts, threaded rods, nuts, washers, glue anchors, etc.) are supplied according to customer specifications and must be installed according to the supplier's specifications.

Galvanizing/hot-dip galvanizing is carried out according to customer specifications, just as painted solutions are painted according to the customer's wishes and specifications.

Stainless steel solutions incl. fasteners are also made according to customer specifications.

Inspection and maintenance

6. Inspection and overhaul

TelecomSteel's standard product range is designed to have a long service life - at least 10 years in the Danish climate. To ensure the full functionality of the products throughout their lifetime, we recommend an inspection of the installation every 5 years to ensure that everything is in place and that the products have not been physically overloaded or exposed to abnormal environmental influences that degrades the products protective galvanization.

Fittings that are installed in aggressive environments with high air pollution together with high humidity, in offshore areas or in an abrasive environment (e.g. sandblasting from wind and sand) will naturally cause greater degradation of the protective galvanization. When inspecting installations in these areas, the focus should be on damage to the galvanization and corrosion/rust.

6.1. Galvanized surface

Damage such as flaking and wounds in the galvanization surface will degrade and weaken the products.

We therefore recommend an inspection and a possible repair of the surface immediately after the installation is complete.

To assess damage and repair, use the chart below. As a general rule of thumb, damages up to 4 cm^2 in area can be repaired with zinc-containing paint.

6.2. Inspection and repair of damages in the galvanization

Damage	Size	Solution
Minor damages	< Ø5mm	Can be repaired immediately with zinc-containing paint / cold galvanization. These small damages will often heal themselves due to the self-healing properties of zinc.
	Scratch with a width < 3mm	
Medium damages	Area < 4cm^2	Must be repaired immediately with zinc-containing paint / cold galvanizing. The repair must include cleaning and sanitising where all impurities and rust are removed. Zinc-containing paint is then applied in more than one layer to a minimum layer of 100µ.
	Spots > Ø5mm	
	Scratches with a width > 3mm	
Large damages	4cm^2 < Area < 10 cm^2	The item must be sandblasted and metallized to a layer thickness that is at least 30µ above the requirements for minimum local zinc layer thickness. This is done by an approved galvanizing company.
Major damages	Area > 10cm^2	If the damage is larger than 10 cm^2, the item should be discarded or sent for re-galvanising.

Repair must be done with ZINC PAINT (e.g. Hempel zinkprimer 16490, Kema Zn 595 or similar).

Always pay attention to the paint manufacturer's safety instructions before starting the repair work. Always use protective equipment, read the safety instructions and technical data sheet referred to by the manufacturer.

6.3. Physical damages to brackets, back-parts, poles etc.

Physically overloading of the brackets can cause damages which will degrade or weaken the products.

When inspecting the products, you should start by looking at the overall condition of the entire installation, including whether everything is as it was originally installed. If this is not the case, it may be a sign that the installation has been physically overloaded or damaged in some other way. If the installation is dirty or soiled, it can be cleaned with regular household cleaning products.

When inspecting the products, look for physical damages such as:

- Deformation – e.g. bent pipes and fittings, bent threaded rods or bolts, impact marks
- Breakage – e.g. broken brackets or bolts
- Cracks in base metal (NOTE: Clean the fitting thoroughly if cracks are suspected, as dirt/dirt can look like cracks)

If the product has physical damages, it should be replaced immediately.

6.4. Bolted joints (bolts, threaded rods, U-bolts, washers, nuts)

All bolted joints are tightened to the specified torque (see the Product Data Sheet) during installation.

Bolt joints must be checked at each inspection by a random examination of 10% of the bolt joints distributed evenly over the various brackets. If loose bolts or nuts are found, the inspection is increased to 100%.

This part of the inspection is especially important during the first inspection of the installation where the structure is "settled".

If damaged bolts/threaded rods/U-braces or bolts/threaded rods/U-bolts with advanced rust are found, they must be replaced. Bolts/threaded rods/U-bolts must be replaced with the same size, type and strength class. Install the bolt assembly according to installation instructions.

Torqued bolted joints can be marked with a line of permanent marking paint to allow for visual inspection of the bolted joints (se example in section 3.2.2.)

7. Inspection form example

Area	Damage			Action if "yes"
Physical damages	Deformed product	No	Yes ->	Replace product
	Cracks in product	No	Yes ->	Replace product
	Fracture in product	No	Yes ->	Replace product
	Broken product	No	Yes ->	Replace product
Surface / finish	Holes in the galvanization	No	Yes ->	Damaged area < 4 cm^2: Repair with zinc-containing paint. See 'Repairing damage in galvanization'
				Damaged area > 4 cm^2: Replace product
	Galvanization peeling	No	Yes ->	Damaged area < 4 cm^2: Repair with zinc-containing paint. See 'Repairing damage in galvanization'
				Damaged area > 4 cm^2: Replace product
	Rust on the product	No	Yes ->	External rust: Clean the product
				Superficial rust: See above: 'Holes in the galvanization'
				Advanced rust in base material: Replace product
Bolts, threaded rods, U-bolts	Damages bolts, threaded rods or U-bolts	No	Yes ->	Replace bolts, threaded rods or U-bolts with equivalent
	Deformed or bent bolts, threaded rods or U-bolts	No	Yes ->	Replace bolts, threaded rods or U-bolts with equivalent
	Advanced rust in bolts, threaded rods or U-bolts	No	Yes ->	Replace bolts, threaded rods or U-bolts with equivalent
	Loos nuts, counter nuts or locknuts	No	Yes ->	Ensure correct product position and secure the product according to the installation instruction. 100% inspection of all bolted joints.
	Bolts, threaded rods or U-bolts used on products which are not installed as prescribed	No	Yes ->	Install the product according to data sheet / instruction with new bolts, threaded rods or U-bolts (incl. washers and nuts)
Plastic end cap	Missing end cap	No	Yes ->	Insert end cap in pole
	Damaged or cracked end cap	No	Yes ->	Replace end cap

8. Disposal

TelecomSteel's standard products are made from reuseable/recyclable material, supporting a circular society where nothing goes to waste.

Metal products

When the products have served their primary purpose, they must be disposed of by either handing the over to a municipal container site in the "Iron and metal" fraction or to a recycling company.

Radomes

Radomes are made of fiberglass and must be handed in at a recycling station. Contact the staff at the site before unloading so they can assess whether the product is going to 'Landfill' or 'Small combustible'.

For more information, please visit TelecomSteel A/S website www.telecomsteel.com or contact us at sales@telecomsteel.com.

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