

Mounting instructions Vario-Top Size 2®

The Vario-Top cable duct system may only be installed outside of safety zones (refuges) according to EBO. The minimum clearance between cable duct system and track centerline will have to be determined dependent on the respective track speed on the basis of the Directives of DB AG currently in force.

Please take into account the fact that lateral or top snow loads are to be expected if the cable duct system is installed in excavations or on slopes with snow flow, snowdrift and the deployment of a snow plough. In these cases the planner will have to verify and ultimately decide if utilization of the pillar-mounted GRP cable duct system will be possible. In areas subject to falling rock, installation of the cable duct system is not permissible. Please also note that the cable duct system must not be subject to any loads that result from railroad traffic.

Installation

Preparing the Installation

Installation of the cable ducts will generally have to be carried out on the basis of the approved planning. Please instruct the installation staff properly.

As a matter of principle, all components should be inspected for damages prior to their installation. Only GRP profiles and steel components without any defects may be installed. Any modifications (e.g. extension of the cable duct profile) and repairs of GRP profiles or components will immediately render the warranty void.

Unloading of the components at the construction site or storage facility will be on the pallets supplied only, using suitable lifting devices or individually by hand. No liability whatsoever is assumed for consequential damages that result from improper handling of individual components.

Tools required

The following tools are required for installation:

- Piling rig with guide bush for IPE 100
- 2 ea. 19 mm open-end spanners (or box-end spanners)
- Offset screwdriver TX40
- Power drill
- 5.5 mm and 9.0 mm drill bits
- D 85 crown bit with centering drill (for cable outlet gland)
- Torque spanner
- Spirit level
- File
- Angle grinder, cutting disk or saw
- Zink repair spray
- Personal protective equipment PPE

Steel Props

The IPE 100 steel props are rammed in, buried or imbedded in concrete, dependent on the local ground conditions encountered on site. The minimum distance between steel props (cable duct) and track centerline will have to be determined dependent on the respective track speed on the basis of the Directives of DB AG currently in force.

We recommend adherence to a protruding length of 0.20 m.

The regular clamping depth is 1.30 m for standard ground of category 3. In case of deviations (e.g. sandy ground), adapt the clamping depth to the local conditions encountered on site.

Use a spacer gauge to properly space the steel props (6 m) and use appropriate equipment for ramming the props. Make sure that the props are aligned properly, are at the same level (height) and installed vertically. The standard length of the steel props is 1,500 mm. Longer props are marked accordingly at the flange (2,000 mm = 20 or 2,500 mm = 25).

The tolerance for the height difference between props is 2 mm max. !!!

If the distance between props is shortened, the cable duct profile and possibly the lid profile will have to be shortened accordingly.

We recommend utilization of a pneumatic pile driver GR40 with guide bush for IPE100 (weight approx. 40 kg) for ramming the props into the ground.

Please comply with the accident prevention stipulations for "Ramming" (VBG 41) and the operating instructions of the equipment manufacturer when operating the pile driver.

The manual pile driver is capable of operating in vertical, horizontal or inclined position. Set the compressor pressure to between 5 and 6 bar.

Position the pile driver on top of the pile to be rammed, align the pile to be rammed and slowly open the ball valve. Steady the pile until slightly rammed in and then continue without supporting the pile. On account of the strong vibrations encountered, do not hold on to the pile driver during operation.

Mounting structure

First align the height of the preassembled mounting structure (consisting of: 2 ea. connecting angles, 1 ea. connecting plate and 2 ea. mounting plates) and attach to the steel prop using M12x45 (ISO 4017) bolts (tighten to 90 Nm) and connecting angles. Then bolt the mounting plates to the connecting angles, using M12x45 (ISO 8677) bolts (tighten to 90 Nm). The slotted holes in the mounting structure allow for accurate adjustment in longitudinal and transverse direction and alignment of the height.

Use a hinged angle instead of a connecting angle (rigid) in case of vertical changes of slopes, e.g. at inclinations or downhill sections.

Cable Duct Profile and Lid Profile

Cable Duct Profile

After the mounting structure has been adjusted properly and bolted to the steel props, insert the cable duct into the plate (floating installation). Maintain an air gap of 3 mm at the joint. Secure the installed cable ducts in intervals of 30 m (on both sides) using grooved pins. The hole in the mounting plate serves as a drilling jig (5.5 mm drill bit). Mitering is not required for horizontal bends (typical railroad radii).

If obstacles such as e.g. overhead line masts or signal masts are detoured, the cable ducts and lid profiles will have to be cut to the required angle (mitered) at the joint with a diamond cutting disk equipped angle grinder.

A lowering kit is required for vertical deviations in order to ensure stress-free installation of the cable ducts.

If the pillar-mounted cable route is not connected to an underground cable duct or the like, an end cover will have to be installed at the end of the duct.

Stress-free installation of the cable ducts is mandatory !!!

No sharp edges are permissible at the inside or outside of the cable duct system.

Make sure and comply with the maximum permissible bending radii of the cables to be installed.

Lid Profile

Position and install the lid of 6 m length as follows:

Insert the mushroom head bolts (M8x16 4.8 DACROMET with flange, 5 ea. per 6 m of lid profile) into the bore in the lid from the top and thread 2 turns into the locking bar steadied from underneath (exploded view). Then rotate the locking bar in longitudinal direction of the lid. On straight cable ducts, position the first lid so that the lid center is aligned with the joint of the cable ducts (one lid connects to ducts). Then tighten the mushroom head bolt to 30 – 40 Nm, using a TX40 offset screwdriver.

Turning the mushroom head bolt will rotate the locking bar and allow it to engage in the lower part of the cable duct. The remaining lids are installed similar to the first one. Cut the last lid in two, using a diamond disc equipped angle grinder. The two lid halves are used to close the remaining open duct sections at the beginning and end of the cable route.

In bends (typical railroad radii), the lid may be positioned no further than 50 mm away from the joint of the cable ducts in order to ensure stress-free installation. The lid must be mitered in case of any change of direction of the cable duct system.

Make sure to maintain an air gap of 3 mm between lids !!!

Do not store the lids loosely and unprotected next to the installed cable duct system.

In order to ensure the stability of the cable duct system, it may be necessary to close the cable ducts with the lids (also empty cable ducts) and latch them in accordance with the installation instructions in case of unfair weather conditions (high snow loads, high wind force, etc.).

Lowering Kit

A specific mounting structure, also referred to as lowering kit, is required if the cable duct system is to be connected to an existing underground duct or if adaptations to the terrain are required.

The lowering kit is supplied loosely preassembled.

The mounting structure consists of a connecting angle, a hinged angle, and the mounting plates (upper plates).

Bolt the angles to the steel props, using the bolts supplied (M12x45 ISO 4017, tightening torque 90 Nm). Position the angle with the hinge pointing towards the underground duct or terrain protrusion, secure it and bolt it down. Then position the GRP duct loosely on the plate / push in and butt against the underground duct.

Next, position the stop angle on the plate with the rigid connecting angle and use a pencil to scribe the vertical cutting line for the miter joint on the duct. The reference point is the center of the steel prop. Mark the lines on both sides of the cable duct.

The ducts are then cut, using appropriate equipment. Drill the two mounting holes – dia. = 5.5 mm – (on the sides of the duct profile), using the plate as a drilling jig. Mounting plate and cable duct must lie flat when drilling the holes.

Then attach the GRP duct to the mounting plate on both sides with the hinged angles and secure with grooved pins DIN 1476 – ISO 8746. Installation of the first horizontal GRP duct may now be started.

The Vario-Top pillar-mounted system may not be used in tunnels!!!

Make sure to adhere to the specified gap clearance also when lowering the ducts.

Item 1 - M12'45 8.8 zinc-plated bolt (DIN EN 24017)

Item 2 – zinc-plated 13B washer (ISO 7089)

Item 3 – B12 zinc-plated lock washer (DIN 127)

Item 4 – M12 8.8 nut (DIN 24032)

Item 5 – M8' 16 4.8 Dacromat pan-head bolt

Item 6 – 255'30'5 zinc-plated lid latch

Item 7 – M12' 45 mushroom-head bolt (ISO 8677)

Mounting instructions for pillar-mounted system – Invatec GmbH, Rötstraße 4, D-74589 Satteldorf