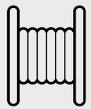


INSTALLATION GUIDE FOR BLOWING CABLES

1. Incoming inspection

Each cable reel should be checked before installation to avoid work with cable that has hidden defects. Recommended inspection steps:



Reel. Make sure the reel has no significant damage



Winding, cable surface. Check the cable surface for defects, make sure the winding is even



Cable design. Cut the cable on a length of at least 30 cm from the cable end and make sure the cable design has all the elements as per datasheet



Fibers. Make sure the color coding and fiber count correspond to the quality certificate and the datasheet



Cable printing. Check the cable printing. Make sure the length marking on the cable end corresponds to the data in the quality certificate and the order



Attenuation and fiber integrity. Check attenuation and length of each fiber, compare it with the data in the quality certificate

If there are any issues, please send your inquiry at orders@emcab.co and we'll be happy to help!

2. Safety

- All contractors should observe health and safety requirements and wear appropriate personal protective equipment.
- Prior to any installation work make sure that all areas (ducts, access chambers, joint boxes, etc.) are inspected and free from explosive gas or foul air and this shall be monitored during the course of any underground works.
- All the road guarding requirements, warning signs, cones, protection barriers and lighting shall be in place before work commences and throughout the time that work is taking place.
- Use the equipment in accordance with the instructions and only for its intended purpose.



3. Cable handling requirements



Bending. Observe the minimum bending radius specified in the datasheet



Torsion. Prevent torsion of more than 360° on a length of 4 m or shorter



Kinking. If you need to unwind some cable off a reel before installation, keep it straight to avoid damage on kinks



Tension. The tension applied to the cable shouldn't exceed the rated value in the datasheet



Crush. Crushing load should be minimized and shouldn't exceed the value specified in the datasheet. Crush is the usual cause of additional attenuation



Impact. Cable shouldn't be subject to impacts. Impact with energy more than specified in the datasheet can cause fibers' damage



Sharp corners and abrasive surfaces. Cable shouldn't be pulled through obstacles with sharp corners and abrasive surface, it can cause the outer jacket damage



Temperature ranges. Temperature ranges specified in the datasheet should be observed during operation, installation, storage and transportation of the cable



Chemically aggressive substances. Do not expose the cable to chemically aggressive substances



Unwinding. Don't unwind the cable by pulling. Unwind cable by rotation of a reel. Do not let the cable touch the surface of the ground, so that it does not get dirty and the jacket is not damaged



Tools. Use of special tools ensures reliable and safe handling of the cable

4. Preparation



Cable surface should be clean and free from dust and any other pollutions.



Inner surface of duct should be clean, free from dust and any other pollutions that can create additional friction. Also, there should be no obstacles in the duct and it should not be damaged. It's better to use a new duct. After several installations or dismantling by blowing, the duct surface becomes uneven, friction can be increased.



Duct joints should be even and sealed.



The blowing equipment should be clean and in working condition.



There should be enough duct lubricant and it should be inert to the cable and the duct.



The blowing machine must be set up to the parameters of the cable and the duct (diameters, maximum length, etc.).



The maximum pushing force must be determined using the crush test method specified in your blowing machine manual. A general description of this test is given below.

General description of the crush test

- Use a duct with one sealed end and a length of 5-6 meters.
- Clamp the cable in the traction unit. The pressing force must not damage the cable.
- Turn on the traction unit and start pushing the cable into the duct. When the cable stops after hitting the sealed end of the duct, the traction unit must stop pushing the cable. There must be no damage to the cable (jacket breakage, cable crushing).
- If the cable is not damaged, increase the pushing force and carry out the test again.
- If, after stopping the cable, the traction unit slips along the cable, then it is necessary to increase the pressing force and carry out the test again.
- Continue the test until the cable is damaged. In this case, the maximum pushing force was determined in the previous test.

5. Blowing

Blowing method is based on the principle of maintaining the cable in the suspended (dynamic) state while installing it into the duct due to an intense (turbulent) air flow. The weighted state of the cable significantly reduces the contact of the cable with the surface of the duct, reducing the frictional force. Simultaneously, a blown airflow, exhibiting aerodynamic properties, creates forces applied to the cable in the direction of its installation.

Generally, a blowing machine consists of a blowing head which feeds the cable and compressed air into the duct while a traction unit behind pushes the cable at the same time using either two driven nip wheels or caterpillar belts.

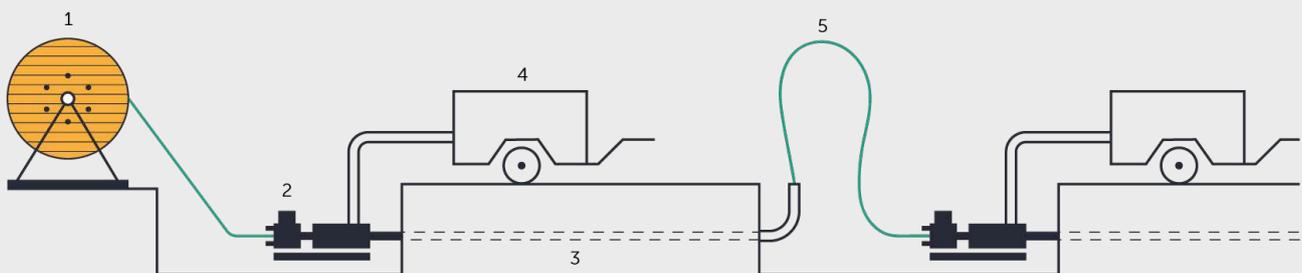
Installation and operation of blowing machine with auxiliary equipment must be performed as machine producer recommends.

A general method for blowing cable is outlined below:

- Turn on the traction unit and start pushing the cable into the duct.
- Make sure that the traction unit only pushes the cable, and does not wind it off the drum. Help unwinding the cable by hand.
- Increase cable speed up to the recommended speed by using the traction unit. The recommended speed depends on many factors (cable design, blowing machine, route configuration, etc.).
- When the speed starts to decrease, open the air inlet valve of the blowing machine to keep the recommended speed.
- If necessary, gradually adjust the air pressure and pushing force to keep the recommended speed.
- Do not exceed the maximum permissible air pressure and pushing force, so as not to damage the duct and the cable.
- At the end of the route, turn off the traction unit and close the air inlet valve of the blowing machine to stop the installation.

With cascade connection of the blowing machines, before each entry of the optical cable into the subsequent device, a technological reserve of the cable in the form of a half loop is organized, which allows to synchronize (adjust) the speed of supply of the optical cable if it was different on the previous machine. The radius of the half loop must not be less than the minimum bending radius of the optical cable.

Schematic diagram of the cascade installation of blowing machines



1 - Reel with unwinding system
2 - Blowing machine
3 - Duct

4 - Compressor
5 - Cable technological reserve

If you only have 1 blowing machine, then blow the cable sequentially into each section. Do not lay the cable blown through the section on the ground. Use film or tarpaulin to keep the cable clean.

Duct / Cable diameter table

Duct size (outer/inner diameter)	Recommended range of diameters	Permitted range of diameters
5/3.5 mm	from 2.2 to 2.7 mm	from 1.9 to 2.9 mm
7/4 mm	from 2.5 to 3.1 mm	from 2.2 to 3.3 mm
8/5 mm	from 3.2 to 3.9 mm	from 2.7 to 4.2 mm
10/6 mm	from 3.8 to 4.6 mm	from 3.3 to 5.0 mm
12/8 mm	from 5.1 to 6.2 mm	from 4.4 to 6.7 mm
14/10 mm	from 6.3 to 7.7 mm	from 5.5 to 8.4 mm
16/12 mm	from 7.6 to 9.3 mm	from 6.6 to 10.0 mm

Cable blowing recommendations

- It is better if the cable diameter is within the recommended range of diameters, because the blowing distance is greater in this case, than when the cable is outside the recommended range but within the permitted range (see the table above).
- It is advisable to blow the cable in such a way that the bends are at the end of the route. This increases the blowing distance.
- Ducts with a low friction liner or ribbed inner surface can also increase the blowing distance.
- If the cable entry is carried out during hot and sunny periods, the drums with the cable must be protected from sunlight before starting the installation. Heat-softened cable jacket can significantly worsen the slide along the duct. When installing large cable lengths to reduce friction, it is recommended to use a special air cooler.
- The end of the cable inserted into the duct must be sealed. At high pressure in the duct, air can get inside the cable and damage the jacket (it can stretch the jacket, leading to the formation of bubbles). This phenomenon is rare, but significantly reduces the blowing distance. For sealing, you need to heat the end of the cable with a heat gun or a lighter (about 1 cm). Then crimp the jacket with a special crimping tool. Or you can use a small amount of quick drying epoxy to form the cap. The cap diameter should not exceed the cable diameter.



6. Reels transportation and storage



✓ Always lift from the side!



✗ Never lift from the front or back!



✓ Always lift from the bottom!



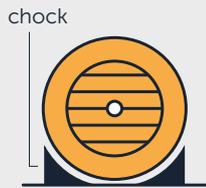
✗ Never lift from the hub or interior!



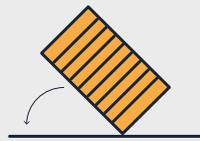
✓ Always use a steel bar when hoisting by crane!



✗ Never lift directly with the rigging when hoisting by crane!



✓ Always store reels upright and chock securely!



✗ Never store or put reels on their side!



✓ Reels can only be rolled by hands on a smooth flat surface of a shopfloor for a short distance!



✗ Reels cannot be rolled for transport purposes in open areas and on uneven surfaces!