



# AGF trim lance. Ground freezing using removable lances.



City tunnel Leipzig – soil freezing

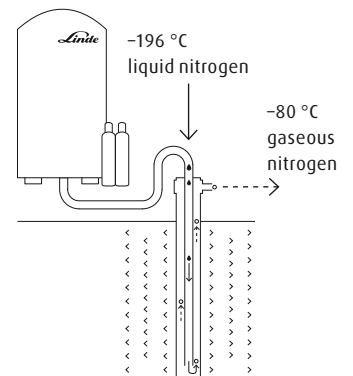
**Challenge** During tunnelling operations, unstable soil and loose sediment can pose a problem. The challenge lies in stabilising the ground so it will not collapse during excavation work and to ensure that progress will not be hampered by water ingress. One way of achieving this is by freezing critical areas with liquid nitrogen (LIN). This forms a frozen wall around the excavation work, increasing the static load-bearing capacity and the impermeability.

Freezing lances are often used for this purpose. These are inserted into the ground, and once the soil has been frozen and the ground stabilised with the LIN, a tunnel boring machine (TBM) can proceed to excavate the tunnel. However, these lances sometimes obstruct the TBM path and can interfere with the cutter head of the TBM if they collide. This may result in emergency stops to tunnelling work plus costly, time-consuming repair work which can delay the overall project timeline. This challenge could be resolved by removing the lances before they get in the way of the TBM. Timely removal would thus expedite the tunnelling process and avoid unnecessary costs and risks.

**Solution** Linde has developed a special removable freezing lance for tunnelling and pipe jacking applications such as these. If a TBM is approaching, these innovative lances are simply disconnected from the LIN supply and are actively defrosted. This thawing action is limited to a radius of a few millimetres around the lances. They can then be quickly and easily pulled from the ground with a crane. The frozen ground remains completely frozen and tunnelling work can continue safely.

These trim lances are designed for easy handling, optimum freezing capacity and rapid removal. They eliminate the risk of TBMs colliding with lances and, consequently, delays and repair costs associated with unplanned downtime.

**Innovation** These removable trim lances are part of a complete package for artificial ground freezing operations that also includes LIN supply, installation, handling support and safety instructions.



Ground-freezing process

**Conditions** The trim lance is used to freeze a specific area of ground. When a TBM approaches the frozen area, the trim lance is defrosted and removed.

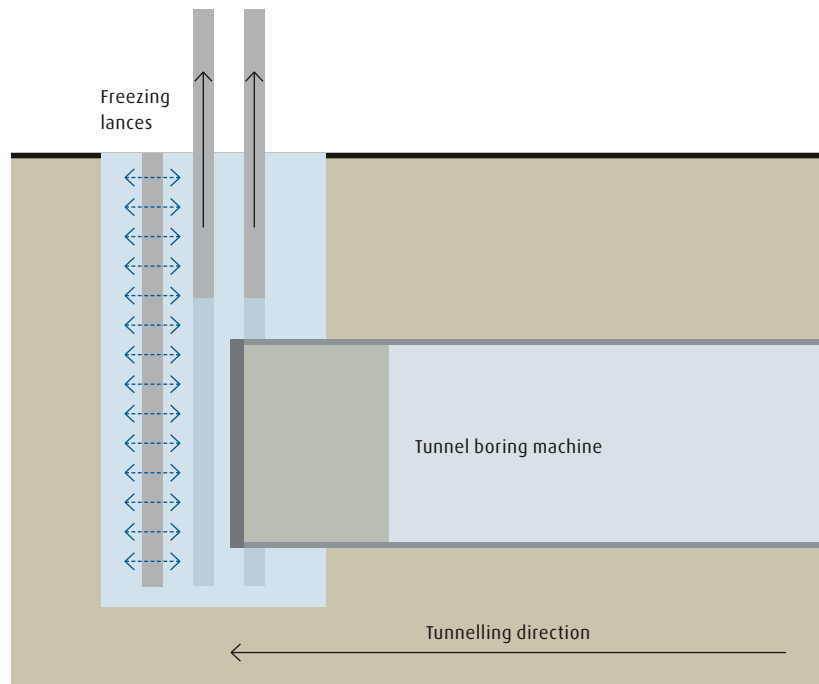
#### Key data

Ground condition:	Minimum water content: 10 vol.%
Lance material	PTFE
Length	Up to 50 m per lance
Diameter	76–80 mm per lance
Defrosting	Flushing with tempered fluid (max. 2 hours)
Pull-out	Clamp and withdraw by crane
Optional	Metal intersections feasible, e.g. with stainless steel
Safety	Application support, handling training and safety advice

#### Benefits at a glance

- Innovative lance offering easy handling, optimum freezing capacity and rapid withdrawal
- Benefit of Linde's in-depth knowledge and experience in ground-freezing applications
- Support in project set-up, installation and gas supply
- Assistance in positioning the lances for most effective freezing performance
- Customisation of lance installations to the individual ground-freezing requirements
- Support with LIN handling and safety instructions

#### How freezing lances work



Artificial ground freezing with removable freezing lances:  
Lances are removed when the tunnel boring machine approaches.

#### Questions?

For more information, go to: [www.linde-gas.com/AGF](http://www.linde-gas.com/AGF) or contact the AGF team at [info@linde.com](mailto:info@linde.com).

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