

Work with the best

IFK VERLEGEFLUG

www.verlegeflug.at



Special preliminary remarks

IFK has specialised in the area of special ploughing technology for more than 20 years now and has always been a pioneer in expanding the areas of application or the introduction of new techniques. As such, we can today, for instance, lay pipes with a diameter of 315 mm or even up to 500 mm in the ploughing methods up to a depth of 2.50 m. In the electric area, for instance, we have laid three medium-voltage systems with a conductor cross section of 500 mm² and a systems clearance of 300 mm in one process at a depth of up to 2.20 m. In parallel to this, we have been active in the monitoring and documentation of the tractions occurring on the laying elements as well as the monitoring and documentation of the position and depth of the elements laid. The experience gained now allows the application of the ploughing technology for the particularly demanding laying of high-voltage cables. The ploughing method fulfils at least the requirement criteria of open construction, such as permanent monitoring and tractions, exact laying of the cables in the required form (triangle laying or next to one another), monitoring and documentation of the position and depth, use of bedding sand and thermally stable bedding material to the extent required, additional use of accompanying cables, LWL empty pipes, line warning strips, accompanying earth electrodes, etc.

The method can be used for earth classes of 2 to 5 and even services the earth class 6 for laying depths of up to a maximum of 2.50 also for depending territory forms.

General procedure description

1.1 Areas of application

The method can be used for all desired systems. In general, the requirements of the manufacturer as regards the permissible tractions, diameters and radii of curvature, laying temperatures, etc. must be observed and implemented in a special tool.

The systems can be laid side by side, in a triangle shape with clearance, etc.

1.2 Section preparation

The sections are set by the planning and pegged in nature on site or by us.

The section should be handed over in DXF or DWG format when documenting the laying data. These data are imported in our measurement and control system and allow recording the position and depth to create precise layout plans and cross sections.

All existing fittings are recorded and handled accordingly. The lowering of high-level fittings is possible by drawing the plough with subsequent resetting.



1.3 Cable/pipe preparation

The systems are laid out per system individually, laterally of the section with laying carts in the desired length. Corresponding excess handling lengths must be prepared for the following ploughing procedure (no excess cable/pipe lengths).

1.4 Ploughing

The cable/pipe insertion part of the laying plough is set in the start groove with the required laying depth of up to a maximum of 2.50 m. Subsequently, the systems are laid in the insert built in accordance with the special requirement criteria and the ploughing process can start. The performance features of the Föckersperger Special Laying Plough FSP 22, used with laying depths of up to 2.50 m and tractions of the winch vehicle of up to a maximum of 250t, allow very demanding constructions and use under difficult conditions.

Mandatory construction features:

- Cable/pipe-compliant and low-traction construction of the inserts:
The tractions arising during the ploughing process are only a couple of per cent of the cable/pipe traction requirement permissible. This results in the deflections required of the cables/pipes in very low transversal forces or surface pressures, on the one hand and, on the other hand, the traction monitoring of the cables/pipes or an emergency switch-off can be kept at a very low level.
- Single cable/pipe duct:
Every pipe/cable is conducted via its own low-friction channel. This avoids impermissible pressures of the individual cables/pipes amongst one another.

Alternative options.

- Laying of the cables/pipes in other configurations, e.g., next to one another or in a triangle shape with a distance.
- Electronic traction monitoring: the tractions occurring are monitored and recorded individually for every cable/pipe.
- Monitoring of the position and depth: the actual position or depth is monitored and documented permanently.
- Laying additional elements, such as LWL pipes, accompanying cables, accompanying earth electrodes, section warning stripes, etc. in the desired arrangement.



- Adding of bedding sand: the adding of bedding sand is possible, but not required for protection purposes of the cables/pipes. The surrounding of the cables is "sanded" in a natural way with partial fine insertion.
- Adding of thermally stable bedding material in accordance with the requirements.
- Laying of multiple systems.
- Laying of empty-pipe systems.

1.5 Monitoring equipment and documentation

1.5.1 Monitoring of the cable tractions

During non-monitored ploughing, faults in the cable/pipe supply may result in impermissible traction loads with concealed or open damage to the cables/pipes. For this reason, the tractions occurring in every cable/pipe are monitored individually and are included in an emergency switch-off. As only very small forces occur during the fault-free ploughing process, the emergency switch-off can be set to very low values. The ploughing of the cables/pipes is therefore a very careful and friendly laying method. The measurement values are saved and can also be viewed from the ploughing operator's position and in a mobile control position.

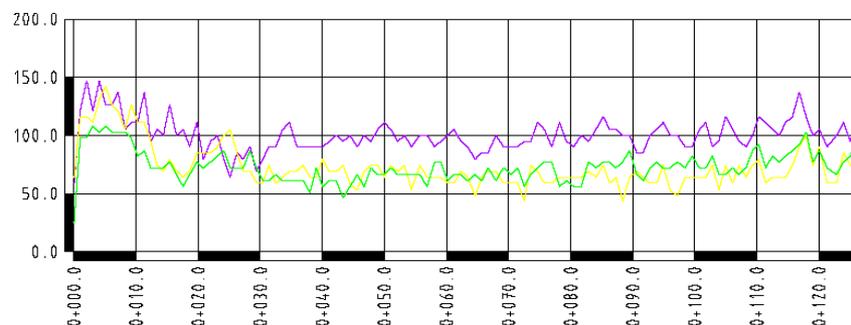
A switch-off is planned for in four ways:

- automatic emergency switch-off
- switch-off by ploughing operator
- switch-off by plough accompaniment and cable control
- switch-off from the mobile control position.

All data are compiled in the mobile control position. Via radio, corresponding control commands can also be issued to the ploughing operator. The documentation is used as a time/force chart or in the form of a table. By linking the data for the position determination with the cable tractions measured, we can also create a force/position chart. The data are recorded in cycles of seconds and can be mapped similar to a stock height plan. All data are also available in electronic form.

Kabelzugkräfte in kg

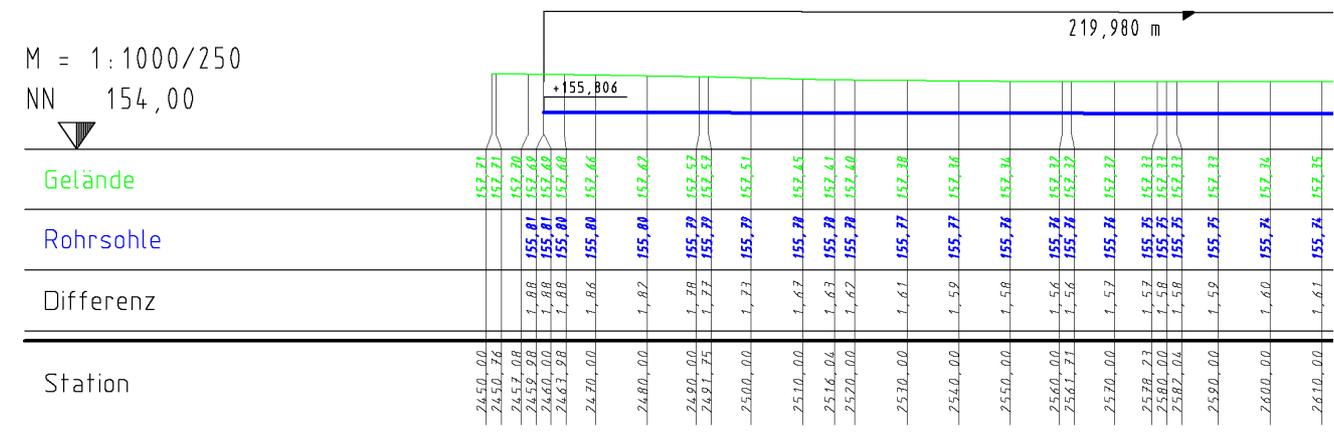
L1 ———
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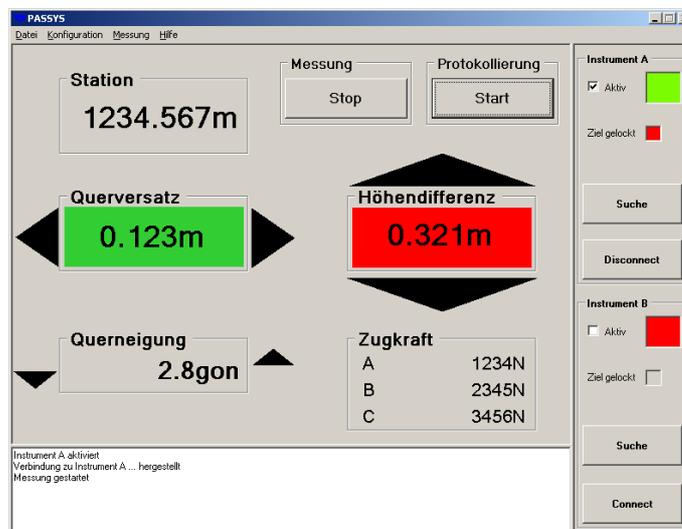
1.5.2 Monitoring of the laying depth

For non-monitored ploughing, obstacles in the ground, for instance, can result in lower depths. However, lower depths represent a safety and damage risk for high-voltage cables and must be avoided by all means.

By recording the section topography, the prescribed laying depths can be observed and monitored or documented. Lower depths are, of course, also recorded and must be rectified with the methods of open construction, e.g. when finding rock, erratic blocks, etc. The control of the depth is performed by the ploughing operator on the basis of visual information via the deviation of the depth from the target value and/or corresponding control commands from the mobile control position. The documentation can be issued digitally and/or in the form of length cross sections. The data are recorded every second.



The laying depths prescribed are monitored extremely precisely and checked via the mobile control position.

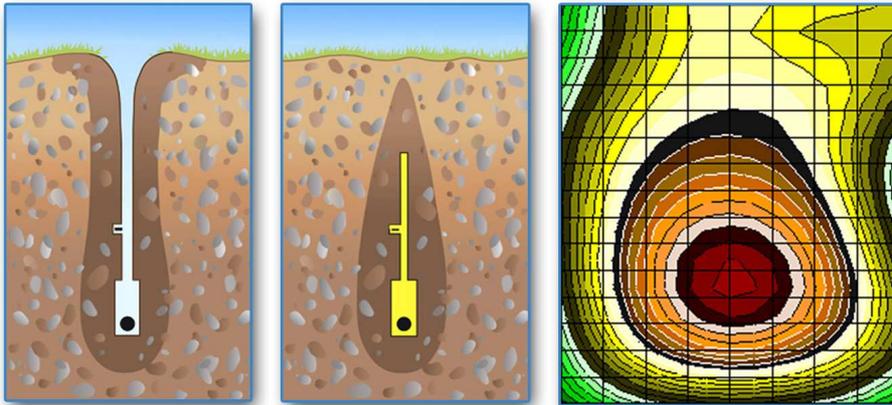


2. Laying plough information

2.1 Laying groove

After laying, when restoring the surface, the laying groove is closed to about half. The earth forms a cavity above the medium.

It is filled up with fine parts by the rain water dripping through. The laid medium now lies on the laying ground sanded in.

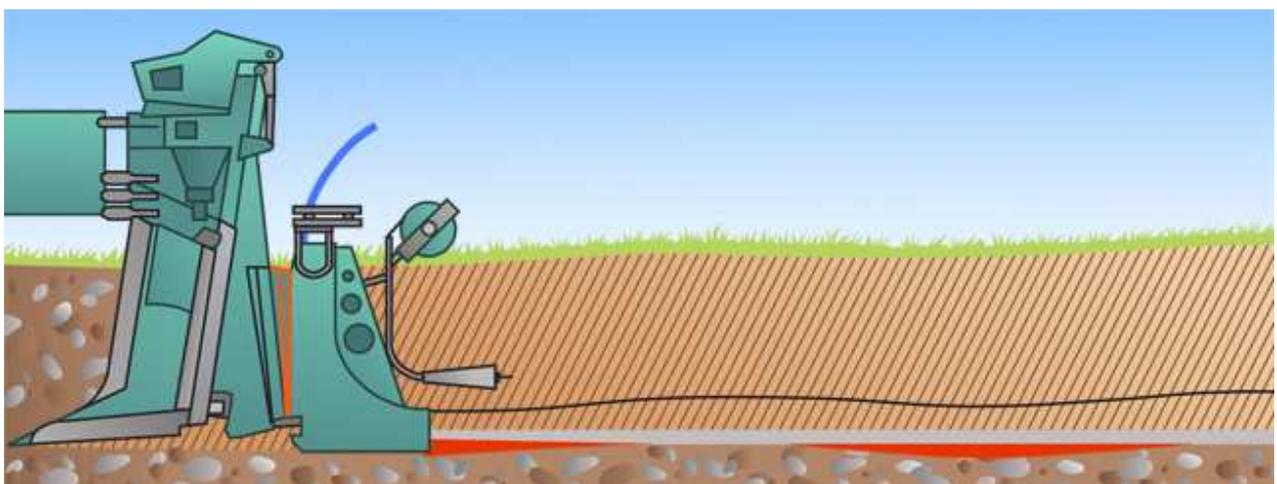


Measurement of the intrusion resistance with Proctornadel. The low intrusion resistance around the medium laid can be clearly seen.

Source: DI Markus Stangl

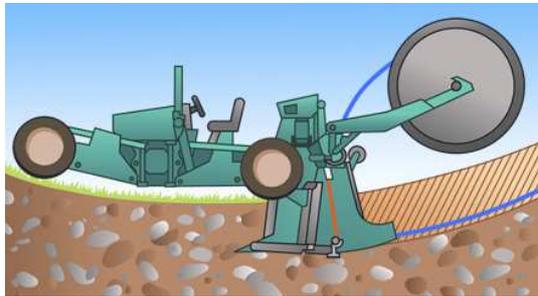
2.2 Cable/pipe laying

The sword end clears and forms the laying groove ground. The groove ground torn open is not always the desired cable bed. Upright stones represent a particularly dangerous laying ground. Thanks to the patented steering of Föckersperger, the entire cable insertion grinds over the laying ground under pressure. The roughened earth and the protruding stones are pressed down hard. The cable/pipe is now placed on the flattened groove ground.

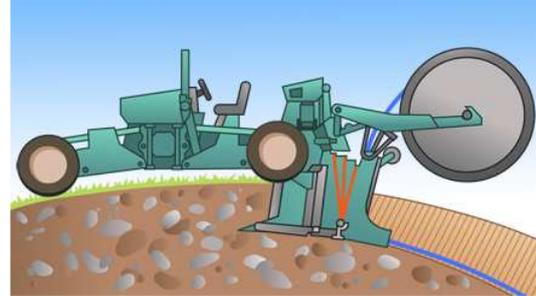


2.3 Insertion element and sword shoe

The insertion element automatically adjusts horizontally and vertically.



Laying through a cavity



Laying through a hilltop

The adjustable sword shoe controls the laying depth exactly and allows a quick depth adjustment.

2.4. Our services

- Ploughing low/medium and high-voltage systems up to 380kV.
- Pipes up to DA600.
- Up to 40 pipe elements in one procedure.
- Sanding device to sand in cables/pipes, if required.
- Laying depths of up to 2.50 m possible.
- Ploughing through waters of a depth of up to 1.50 m.
- Documentation of the laying data.
- Special requests possible at any time.

2.5. Your benefit

- Cost saving compared to conventional laying of up to 40 per cent.
- 20x faster than an excavator.
- Reduction of building pits, floor transport, damage to plants, surface usage.
- Simultaneous ploughing of several systems (cables, pipes, section warning strips) possible.
- Low traffic disruption; virtually no annoyance for locals.
- Theft, in particular of cables, is reduced.



2.6 Special building sites





References in pipeline construction:

Ploughing for EVN – Wasser, RAG, Wiengas, communities and waster water associations, many construction firms in Austria, such as Strabag, Swietelsky, Teerag – Asdag, and many more.

References in the energy sector:

Tiwag, Kelag, EVN, Salzburg AG, EON, ÖBB, Steweag, Feistritzwerke, Verbund, Wienstrom, RWE, etc.

We look forward to working with you

IFK VERLEGEPLUG

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