



## DOUBLE SHIELD TBM

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# DOUBLE SHIELD UNIVERSAL TBM a new era in the mechanized boring

Carlo Grandori, who founded SELI Company in 1950, designed and patented in 1971 the Double Shield TBM type in cooperation with Robbins Company. Since then, SELI has altered the design of this kind of TBM on the strength of the experience developed during the construction on more than 800 km long tunnels.

In 2000, the design of Double Shield TBM was completely reviewed and improved with the introduction of the Double Shield Universal TBM concept which during its application developed in the following specific TBM types:

- DSU Ground Treatment - for tunnels in very weak rock where extended pre-treatment of the ground and the employment of pre-cast lining is required
- DSU Rock Support - for tunnels where NATM supports are foreseen and are generally followed by concrete, shotcrete or cast in situ lining
- DSU Compact - for small diameter and short tunnels.

This new generation of TBMs has meant taking a great step forward in the TBM technology and has allowed to increase the wide range of DS TBM applications as well as to maintain an excellent standard of productivity.

## DSU GROUND TREATMENT TBM TBMs go through extremely complex geologies too



DSU Ground Treatment TBM has been studied and manufactured for the construction of the Tunnel of Abdalajis East for the High speed Railway Project Cordoba – Malaga ( Spain ).

The characteristic of this kind of TBM which is employed jointly to precast lining, consists of the possibility to treat extensively rock formations by installing different drilling rigs either inside the TBM machine with the aim of drilling holes ahead of the face or behind the shields to bore holes through the gripper shield, the tail shield or if necessary through the lining too. Ground treatment before the boring allows to move forward the machine even when the rock conditions are extremely difficult. There are a lots of other tunnels under working where is employed this new type of TBM which during the study of TBM specifications results increasingly the most tempting one. Additionally, it can use for the muck material evacuation both rail and conveyor belt trains inside the tunnel.



## ROCK SUPPORT DSU TBM NATM Method



DSU Rock Support TBM has been conceived for the construction of East Side Access Tunnel of NY Metro (Manhattan). This kind of TBM allows the use of traditional supports according to the NATM method like rock bolts, centring and shot concrete, maintaining the main characteristics of DS TBM with regard to safety parameters (support systems are activated under the protection of the TBM tail shield). Unlike the open TBM, this one enables to install precast lining for crossing through fractured rock and/or fault zones, extending the applications of NATM methods to complex geological alignments. Additionally, it can use for the muck material evacuation both rail and conveyor belt train inside the tunnel.

## QUALITY AND SAFETY STANDARDS

SELI is certified according to UNI EN ISO 9001:2000 quality standards and its DS TBMs are CE certified and in general are designed and manufactured according to the more restricting safety standards.

All components and equipment that are part of the TBM are designed and selected to meet the best quality standard in the industry.

In particular:

- All structures and lifting equipment are dimensioned for heavy working conditions
- All hydraulic and electric components are from first class sub-suppliers
- The complete TBM is fully pre-assembled and tested in SELI workshop, than will be dismantled and delivered to the site.

## INTERFACE WITH BACK-UP

SELI Tecnologie design the TBM as part of a single system together with the Back-Up and the rolling stock.

The interface section between the TBM and Back-Up is fully tested in SELI Tecnologie workshop before the delivery to site.

## FIELD SERVICE

SELI Tecnologie provides experienced engineers and technicians for the TBM assembly and start up operation on site, as well as, upon request of the customer, it can put on disposal a complete team for the proper working of TBM, following the boring operation. SELI Tecnologie offers also a post-sale service for the supplying of spare parts and continuous assistance during the excavation.