

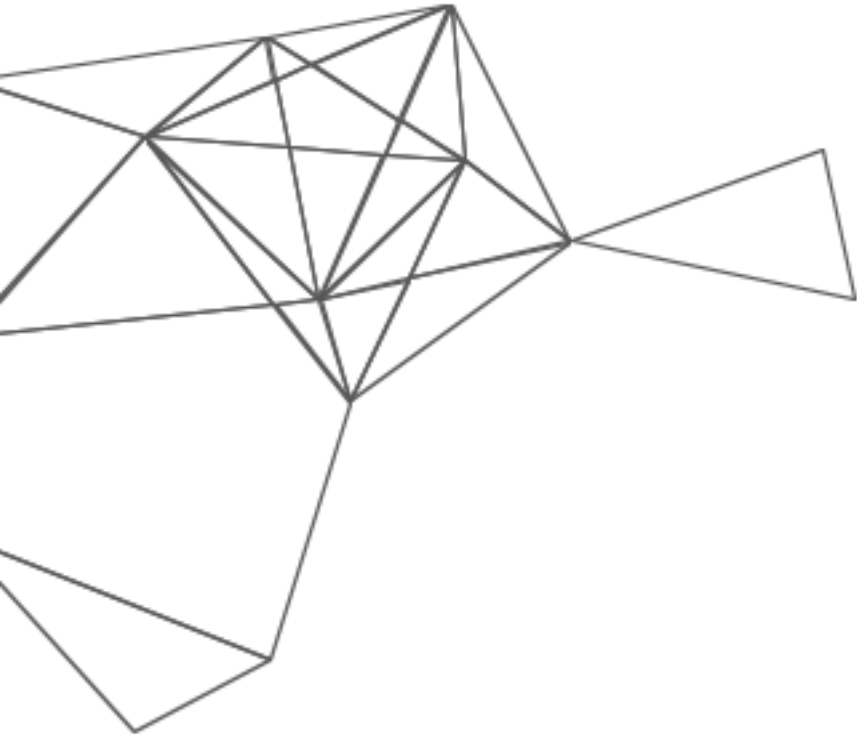


**THE FIRST
MONITORING
CHANNEL**



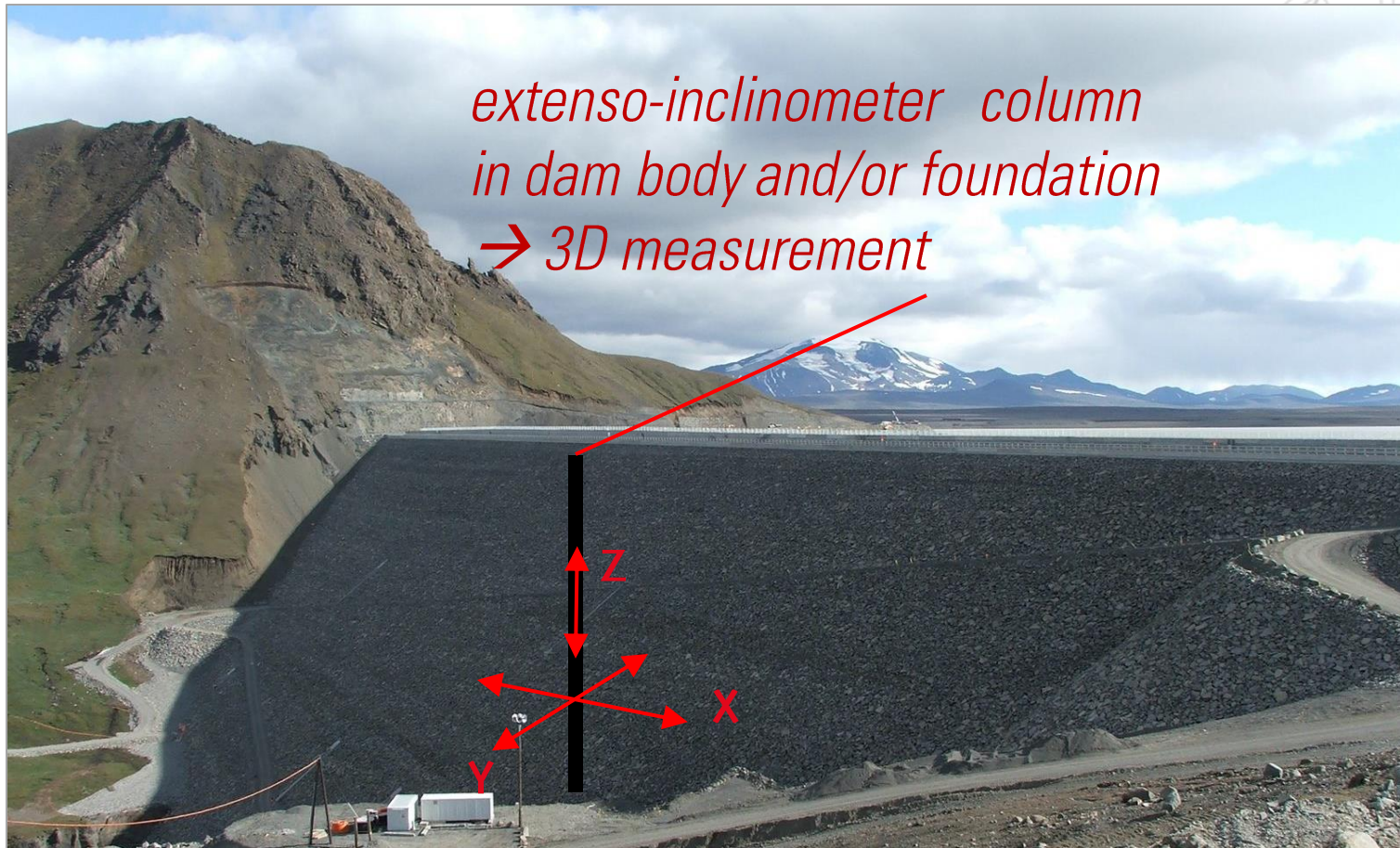
DEX-S IN PLACE
EXTENSO-INCLINOMETERS
FOR 3D BOREHOLE MONITORING

— WHY SISGEO DEVELOP IN-PLACE EXTENSO-INCLINOMETERS?

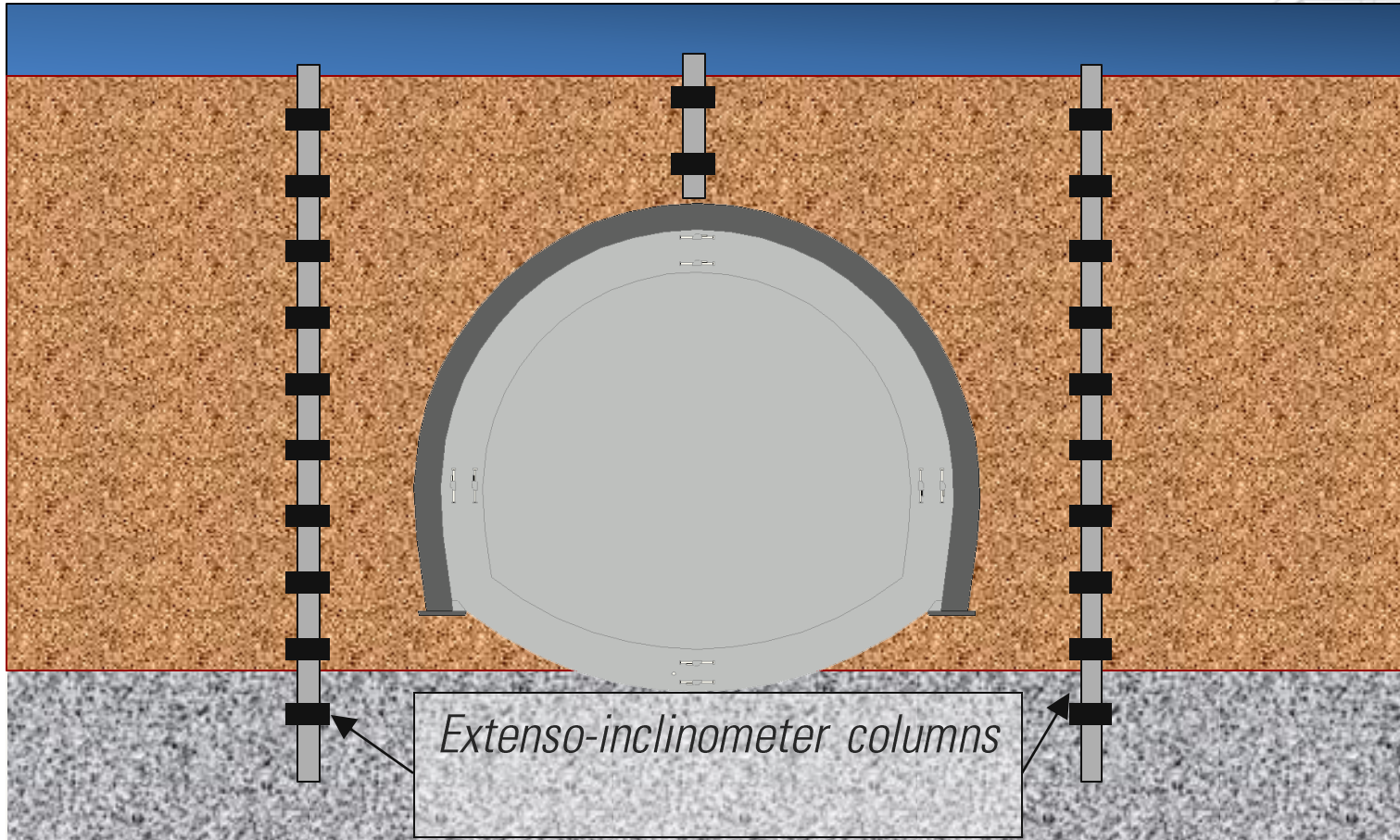


- *Automatic 3D monitoring of unattended boreholes*
- *High performances needed*
- *Cost-effective solution: single drilling for 3-D borehole monitoring*

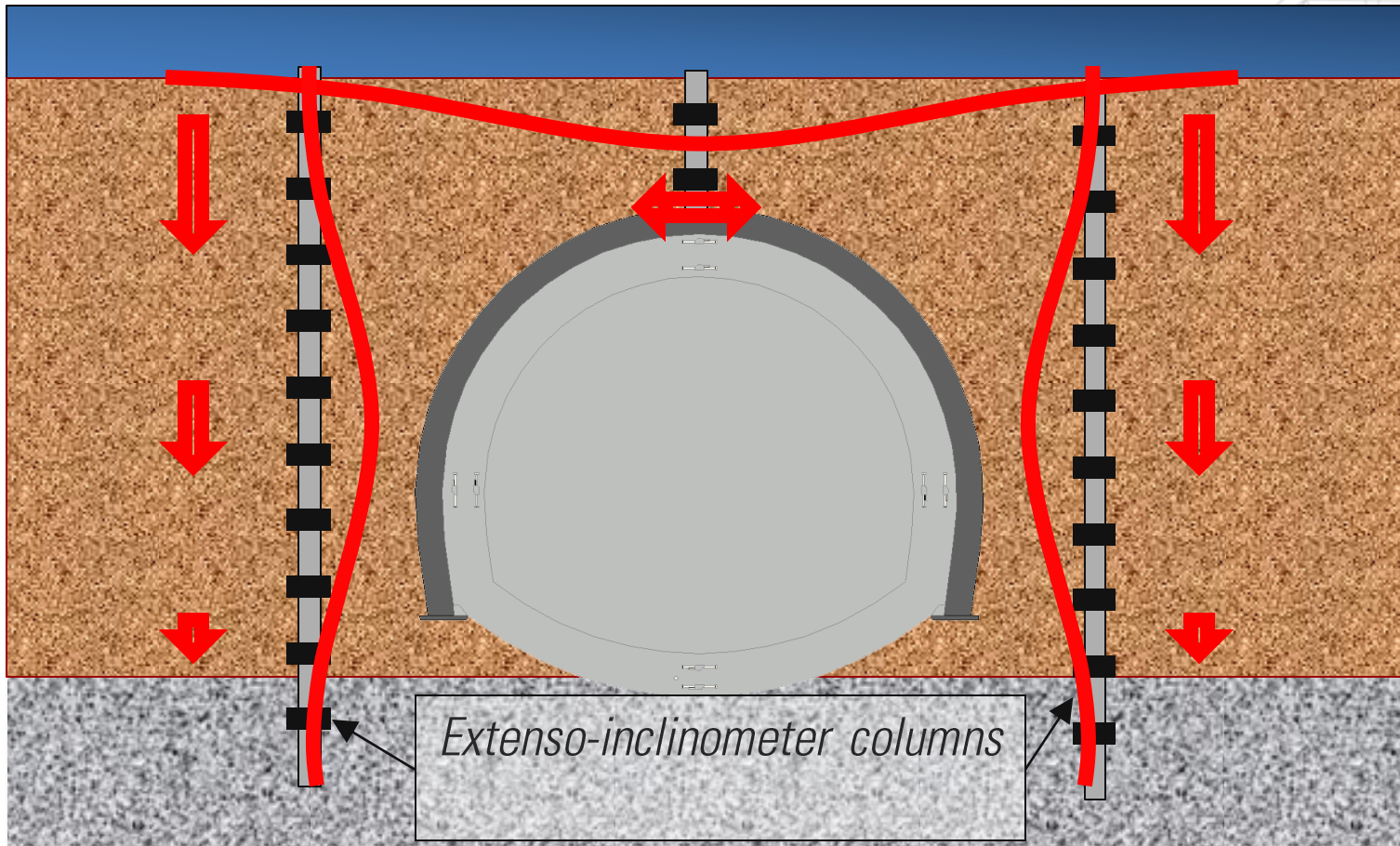
— EXAMPLE:
APPLICATION IN EARTHFILL / ROCKFILL DAM



— EXAMPLE:
APPLICATION IN TUNNELING

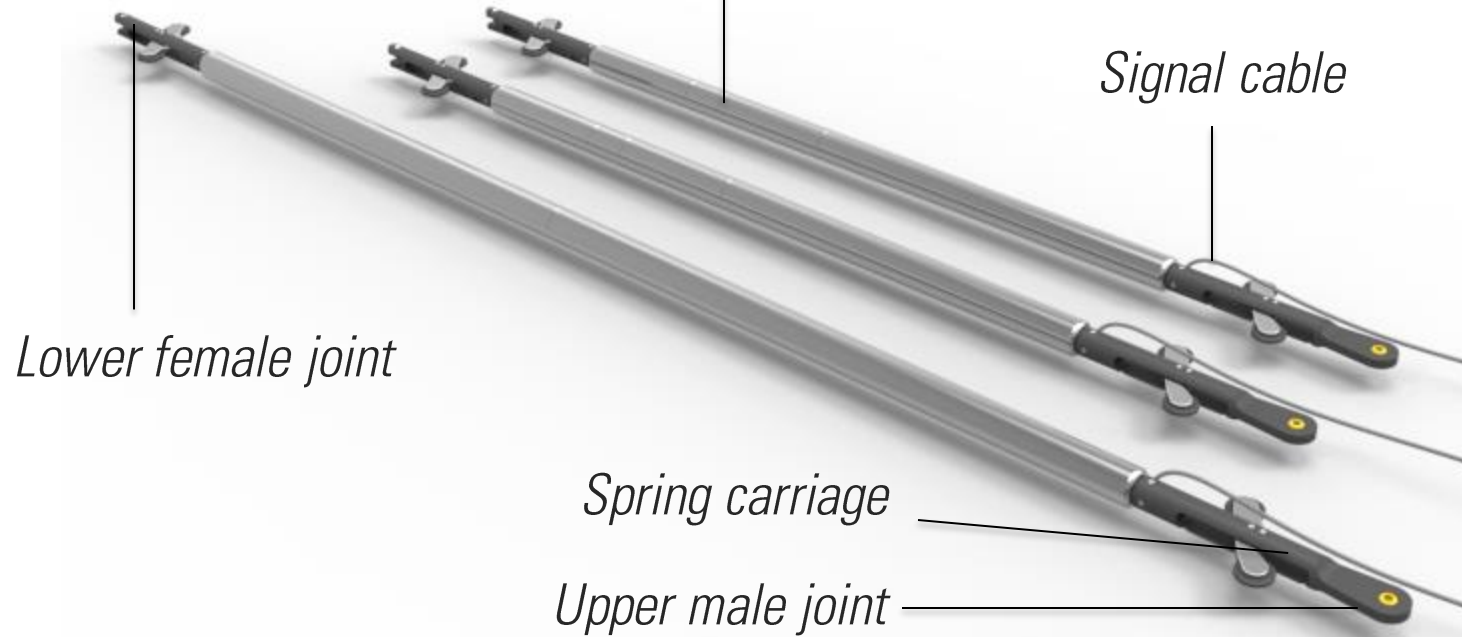


— EXAMPLE:
APPLICATION IN TUNNELING

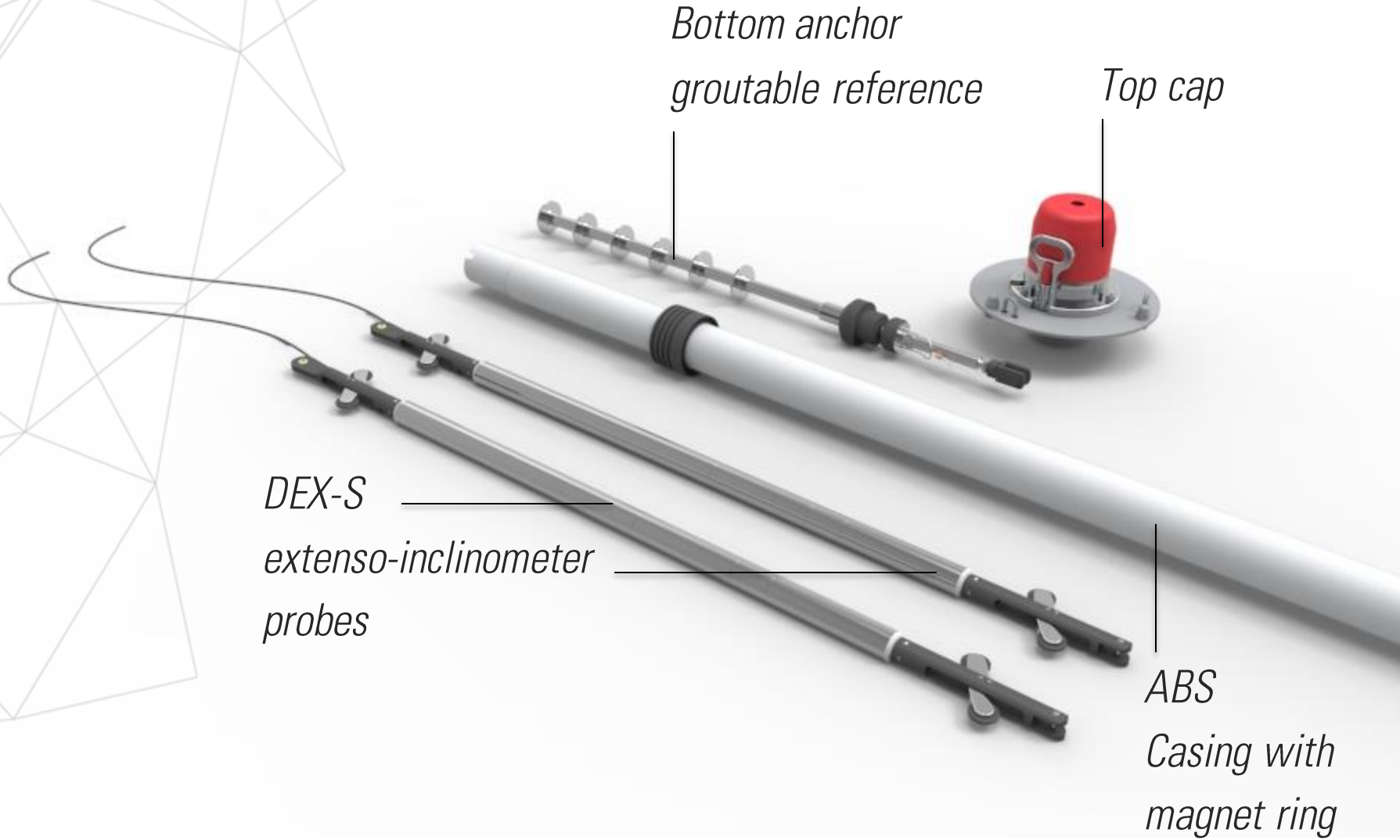


— WHAT IS A DEX-S IN PLACE EXTENSOMETER PROBE?

Stainless steel body with built-in sensors (extensometer, biaxial inclinometer, thermistor)



— DEX-S SYSTEM COMPONENTS



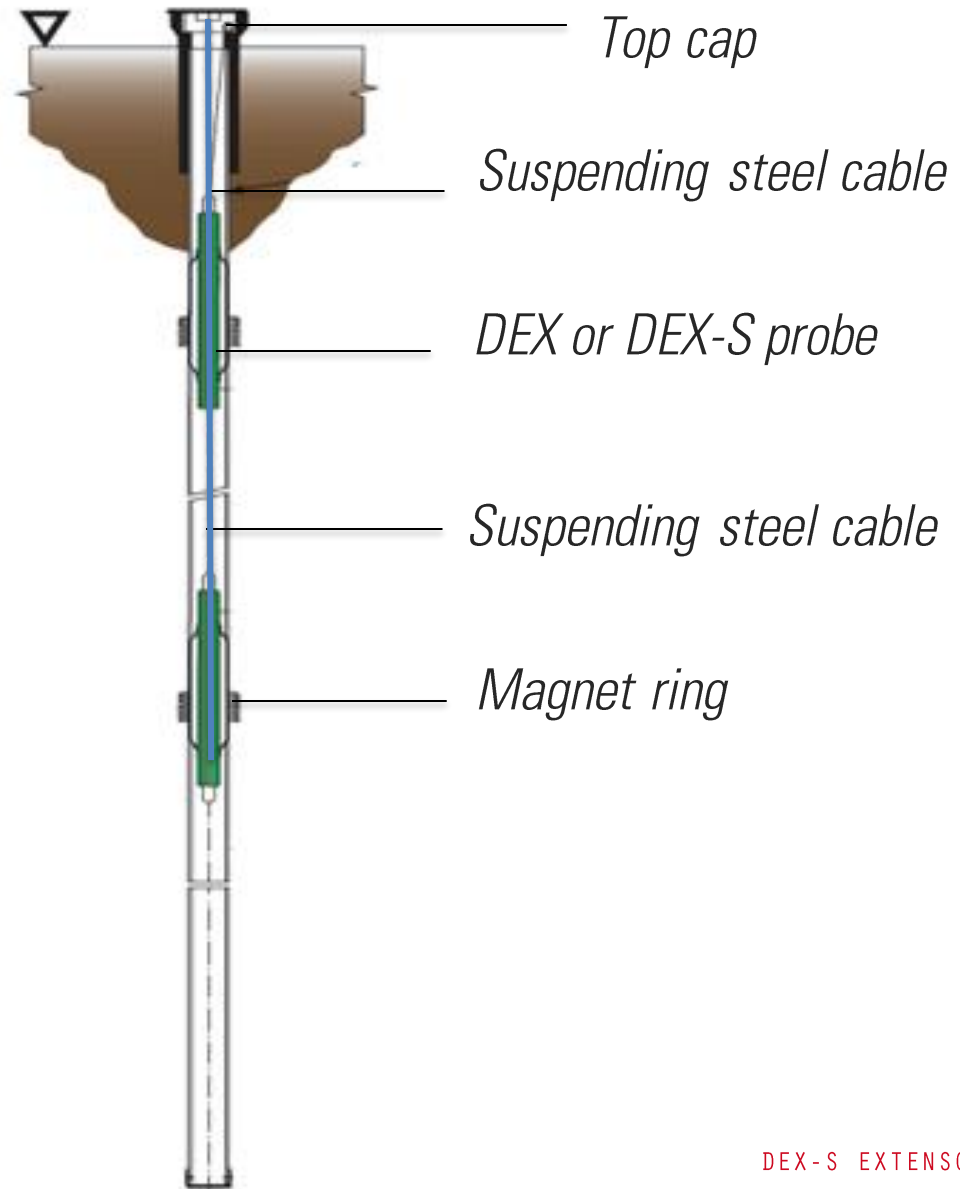
*Bottom anchor
groutable reference*

Top cap

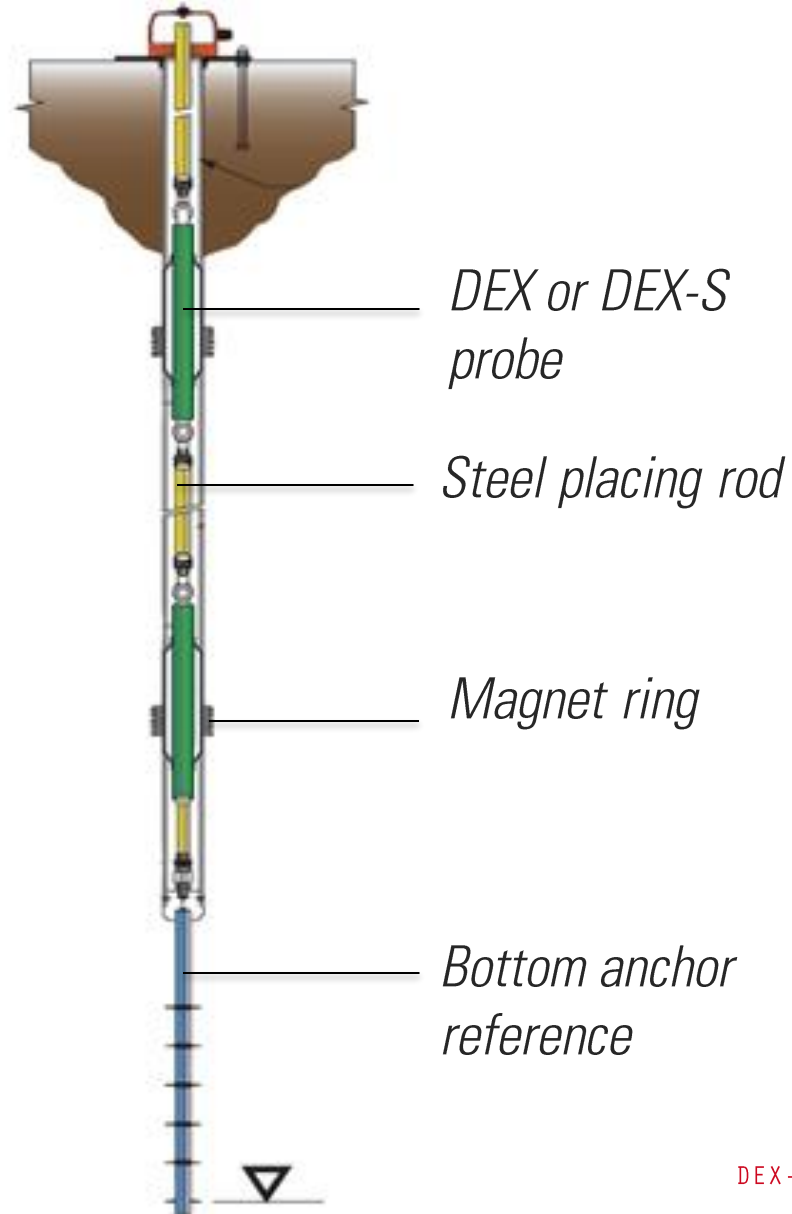
*DEX-S
extenso-inclinometer
probes*

*ABS
Casing with
magnet ring*

— INSTALLATION WITH UPPER REFERENCE



— INSTALLATION WITH BOTTOM REFERENCE



__ DEX AND DEX-S CASING

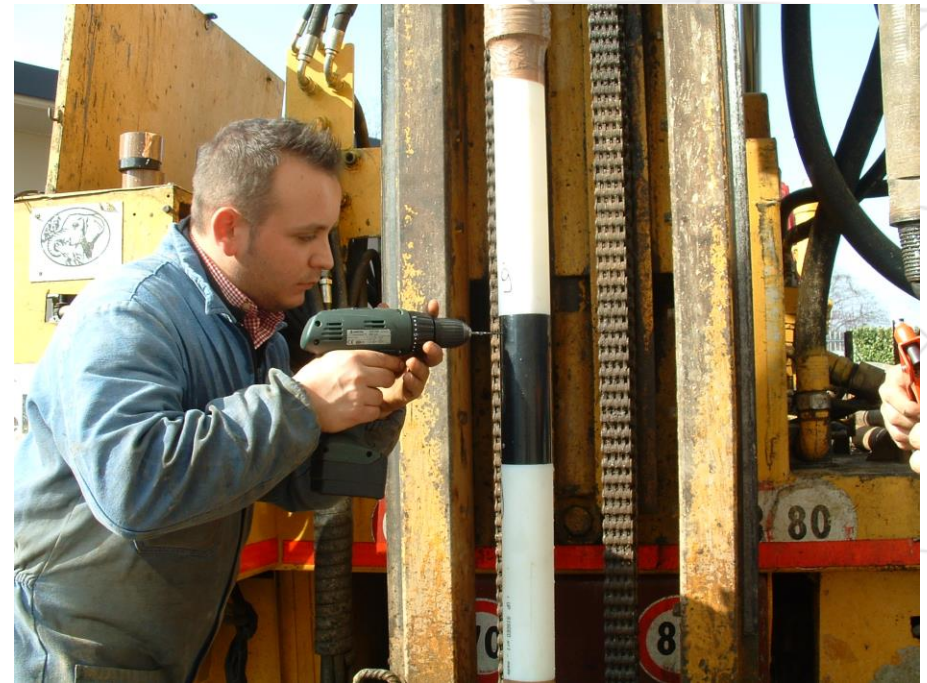


- *ABS inclinometer casings*
- *One magnet rings for each DEX or DEX-S probe*

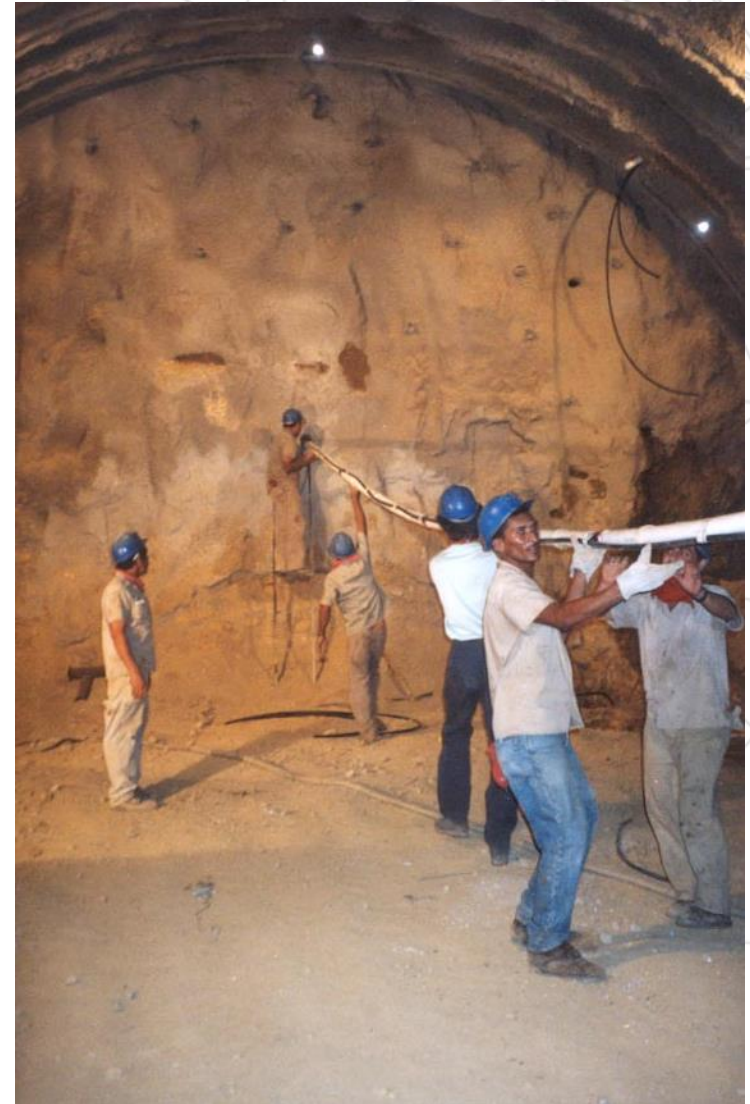
__ VERTICAL INSTALLATION OF DEX-S CASING



*Casing inserted step-by-step
into the borehole*

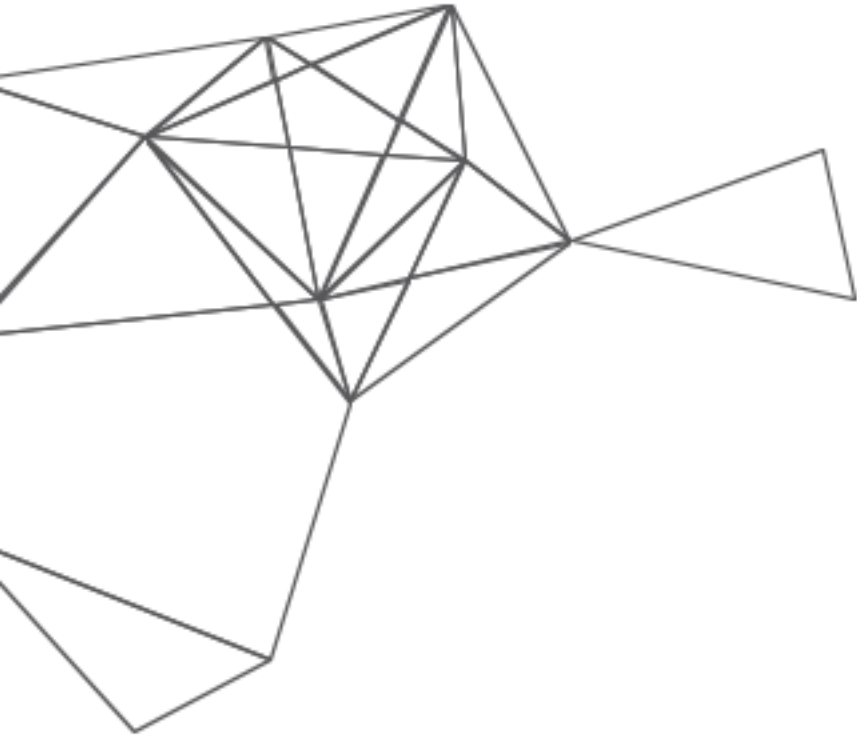


__ HORIZONTAL INSTALLATION OF DEX CASING

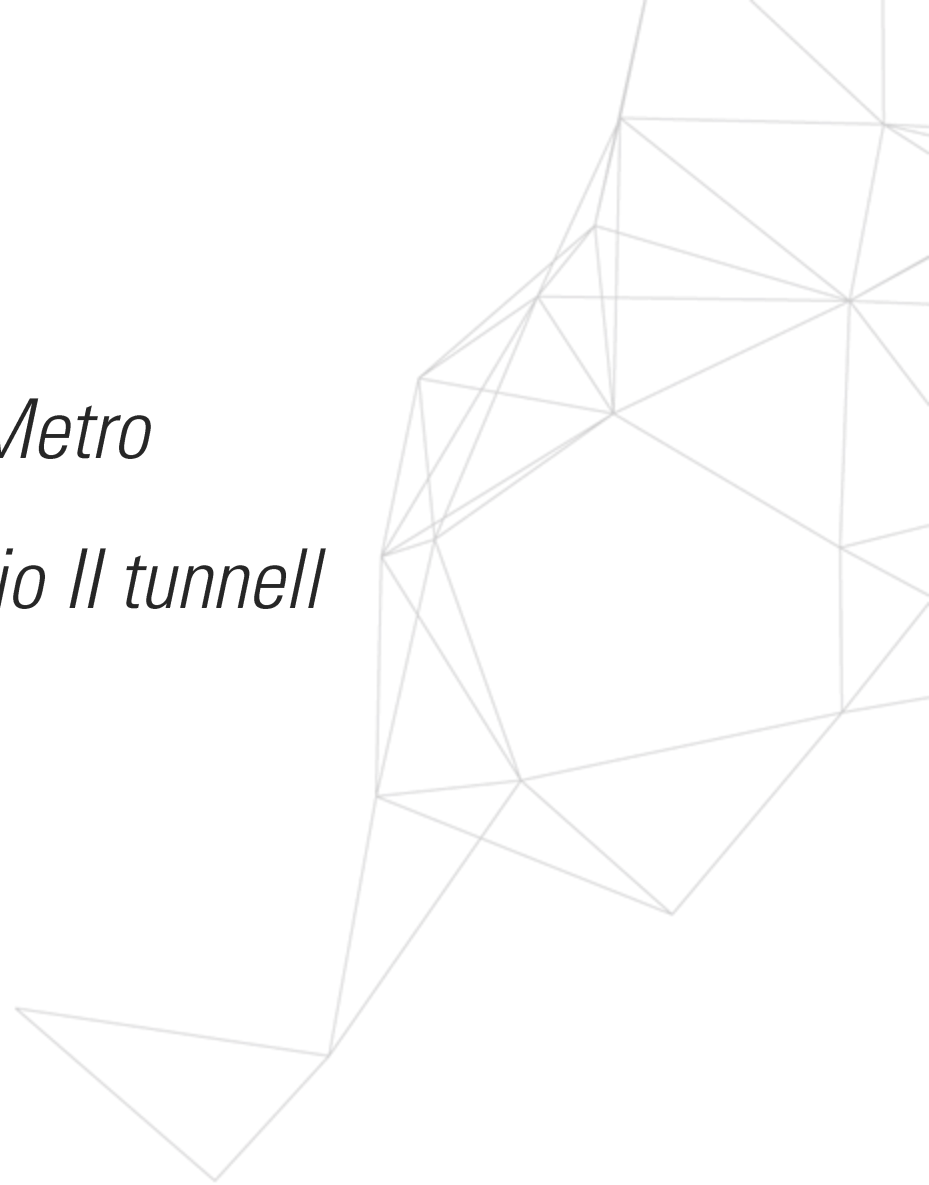


Commonly, the extenso-inclinometer tube is completely mounted outside borehole and then inserted in borehole and grouted.

— SOME APPLICATIONS



- *Turin Metro*
- *Piscopio II tunnell*



TURIN METRO

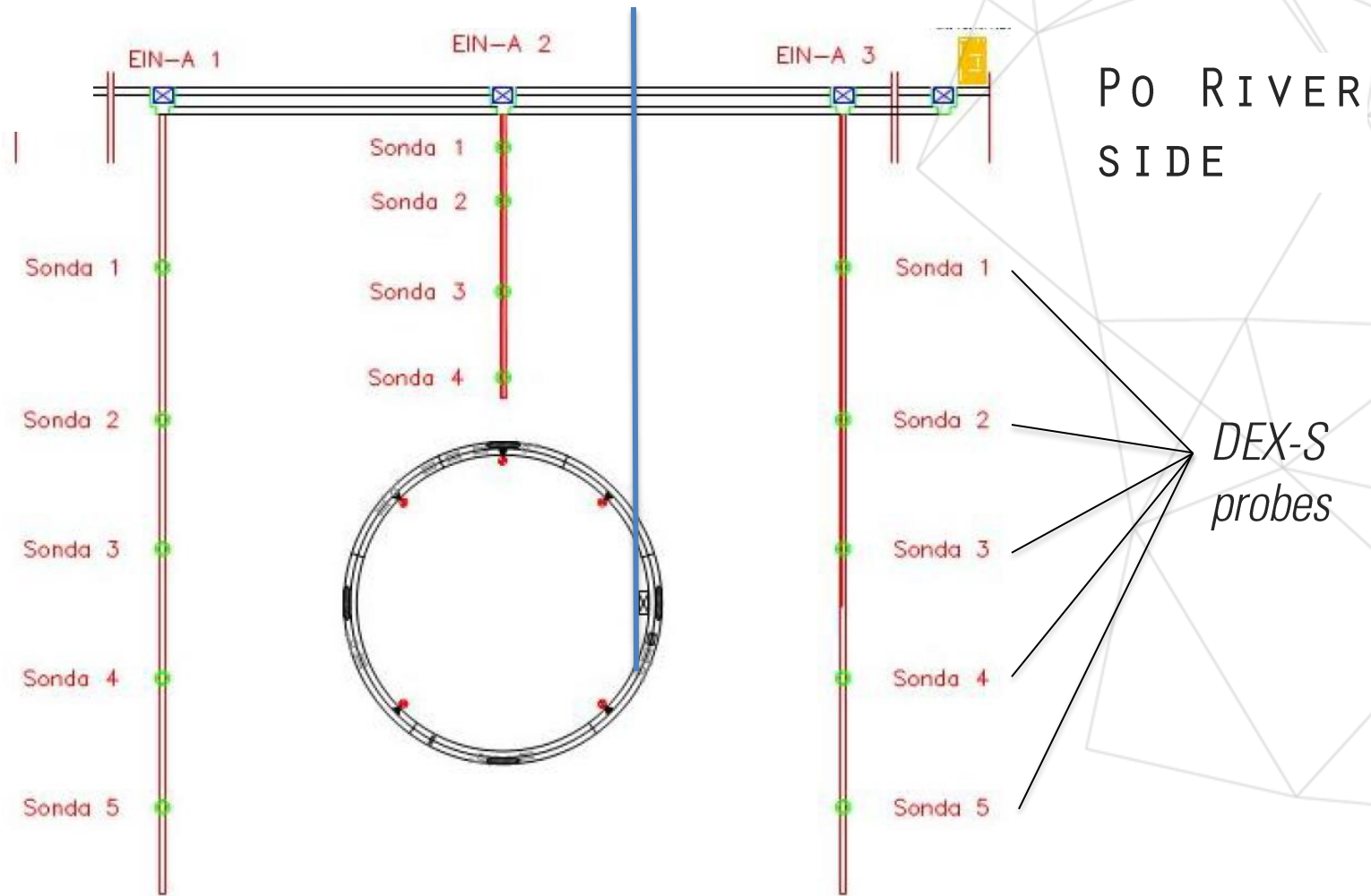
COURTESY OF GD TEST



TURIN METRO

COURTESY OF GD TEST

RAILWAY
SIDE



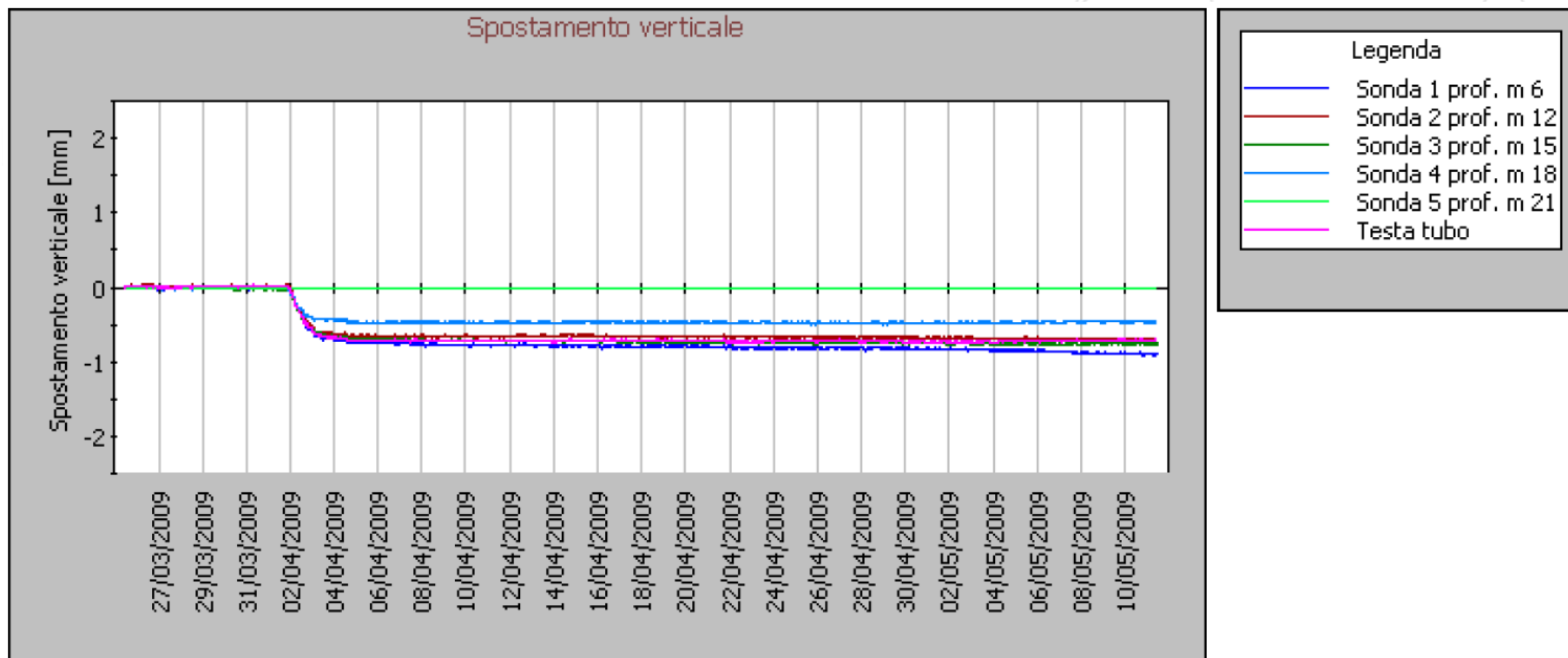
PO RIVER
SIDE

*DEX-S
probes*

TURIN METRO

COURTESY OF GD TEST

VERTICAL DISPLACEMENT FOR EACH PROBE



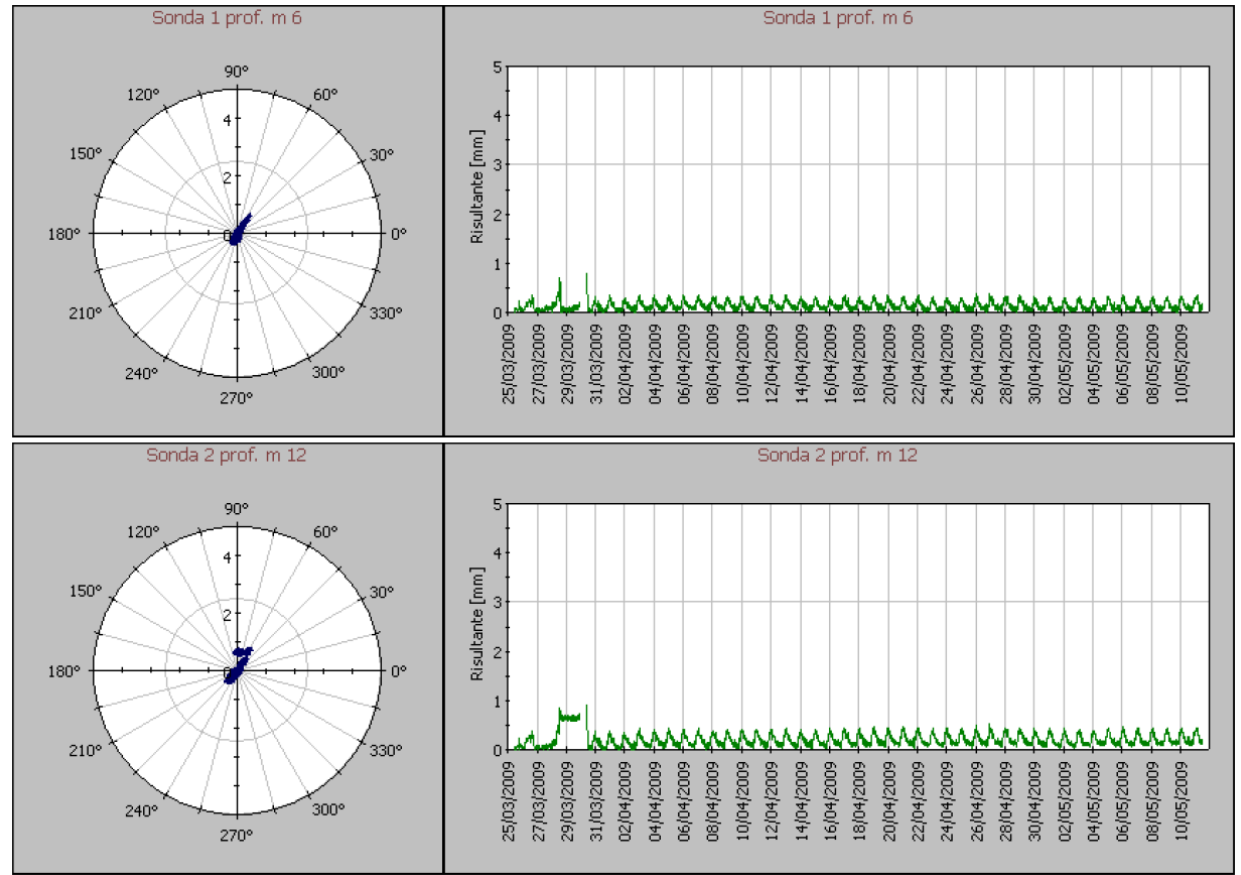
TURIN METRO

COURTESY OF GD TEST

TOTAL HORIZONTAL DISPLACEMENT FOR DEX 1 AND DEX 2

*Polar graphs:
0° is the TBM direction*

*Cartesian graphs:
Total displacement in mm/m*



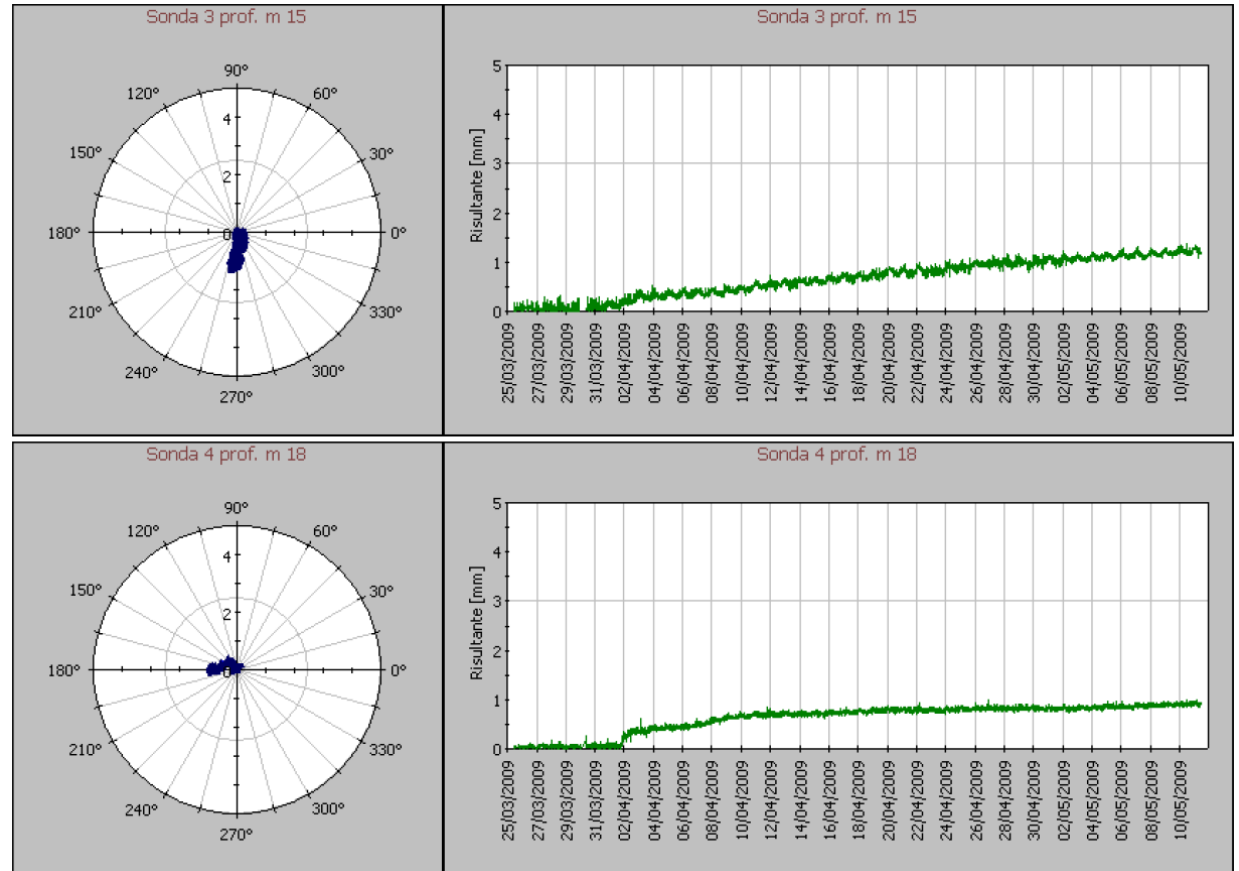
TURIN METRO

COURTESY OF GD TEST

TOTAL HORIZONTAL DISPLACEMENT FOR DEX 3 AND DEX 4

*Polar graphs:
0° is the TBM direction*

*Cartesian graphs:
Total displacement in mm/m*



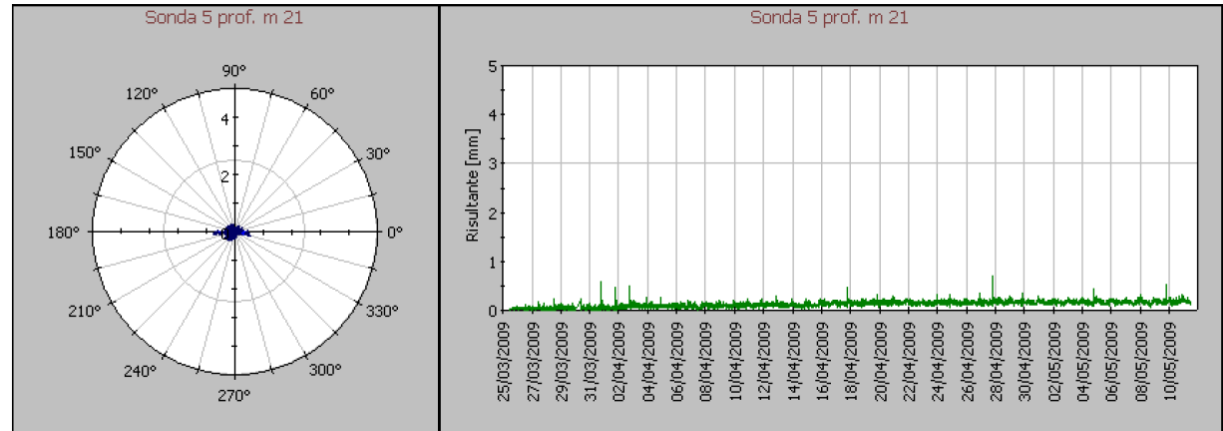
TURIN METRO

COURTESY OF GD TEST

TOTAL HORIZONTAL DISPLACEMENT FOR DEX 5

*Polar graphs:
0° is the TBM direction*

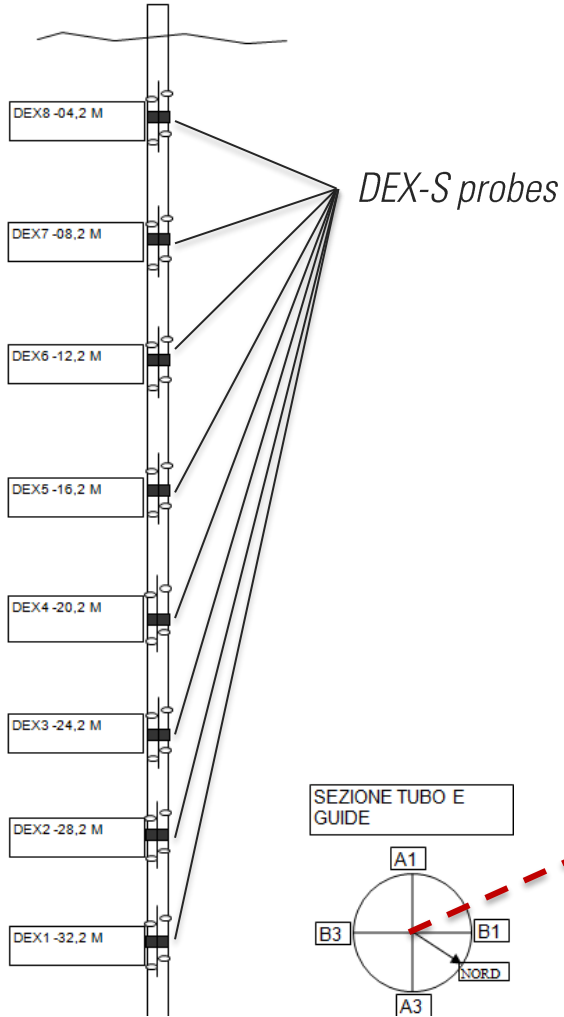
*Cartesian graphs:
Total displacement in mm/m*



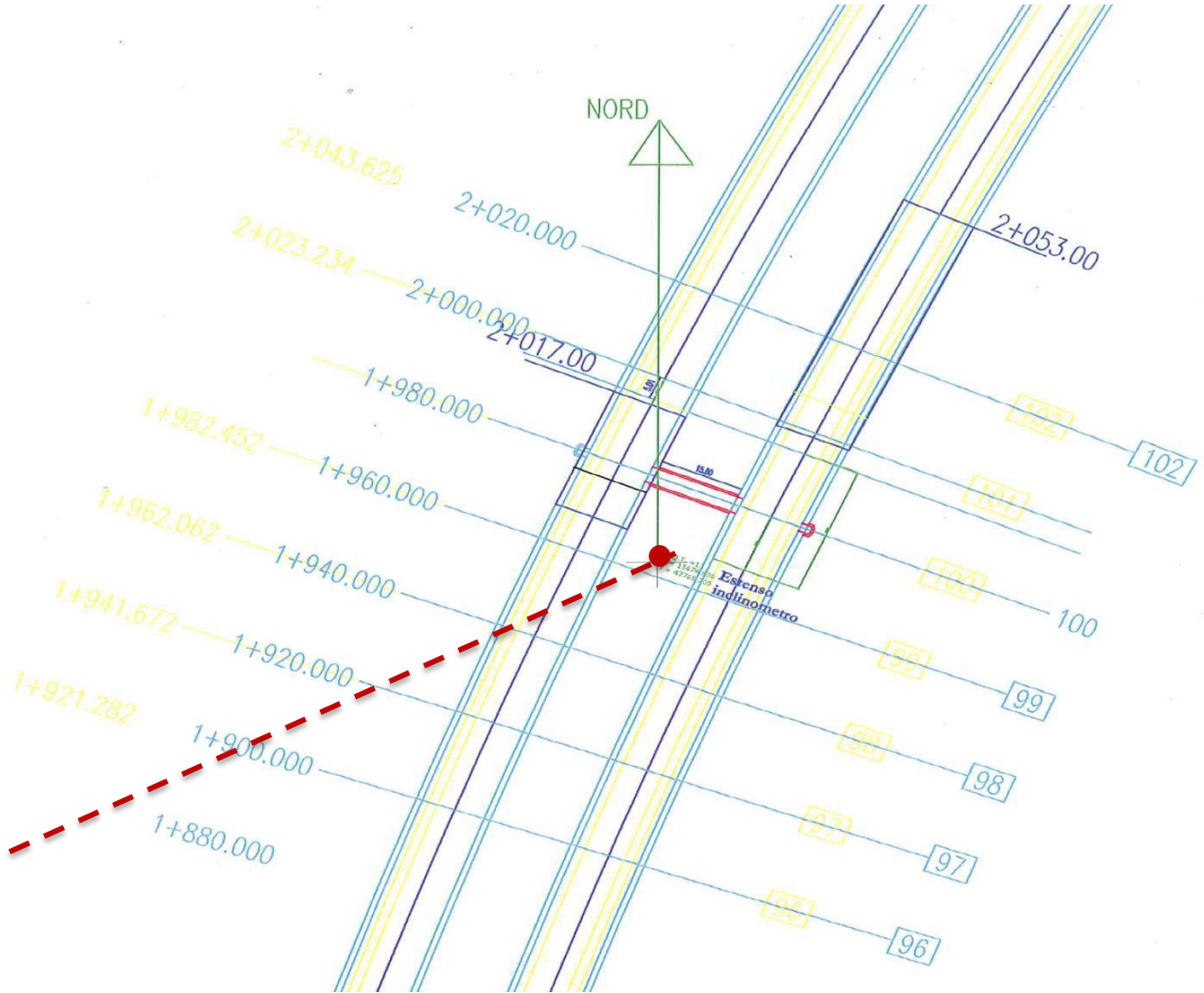
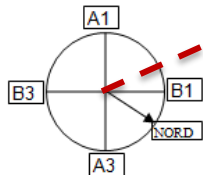
— PISCOPIO TUNNEL COURTESY OF ASTALDI SPA



__ PISCOPIO TUNNEL COURTESY OF ASTALDI SPA



SEZIONE TUBO E GUIDE

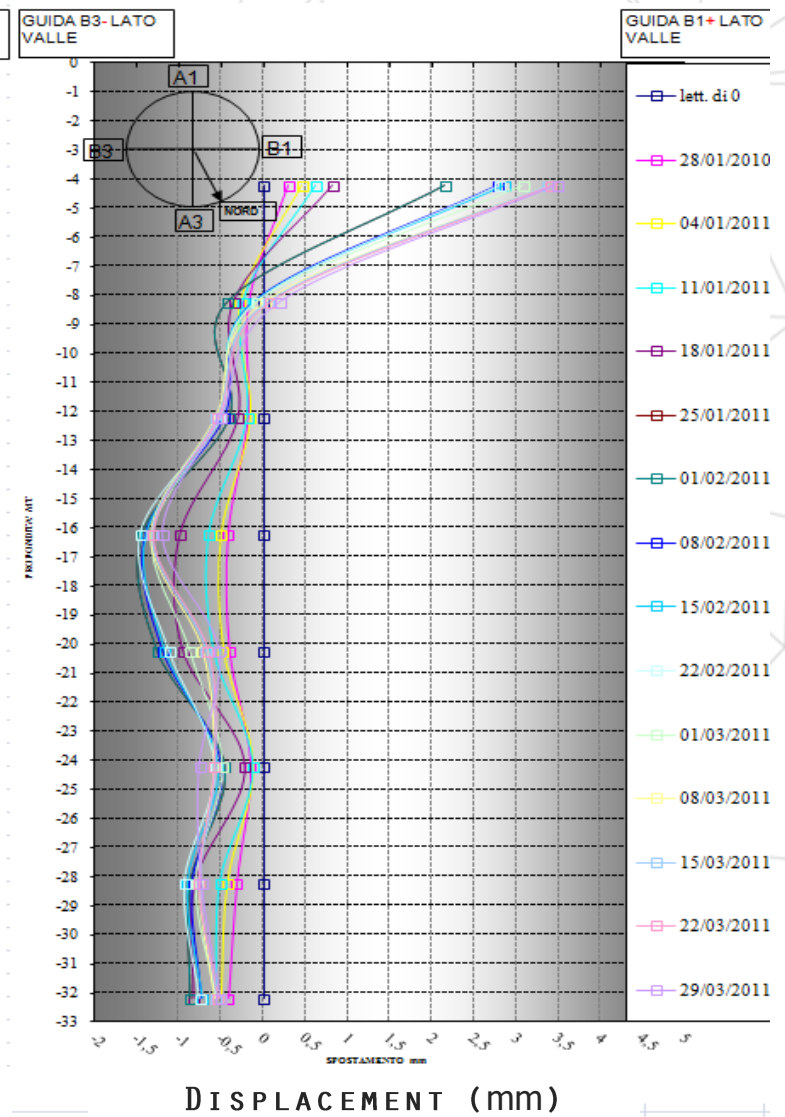
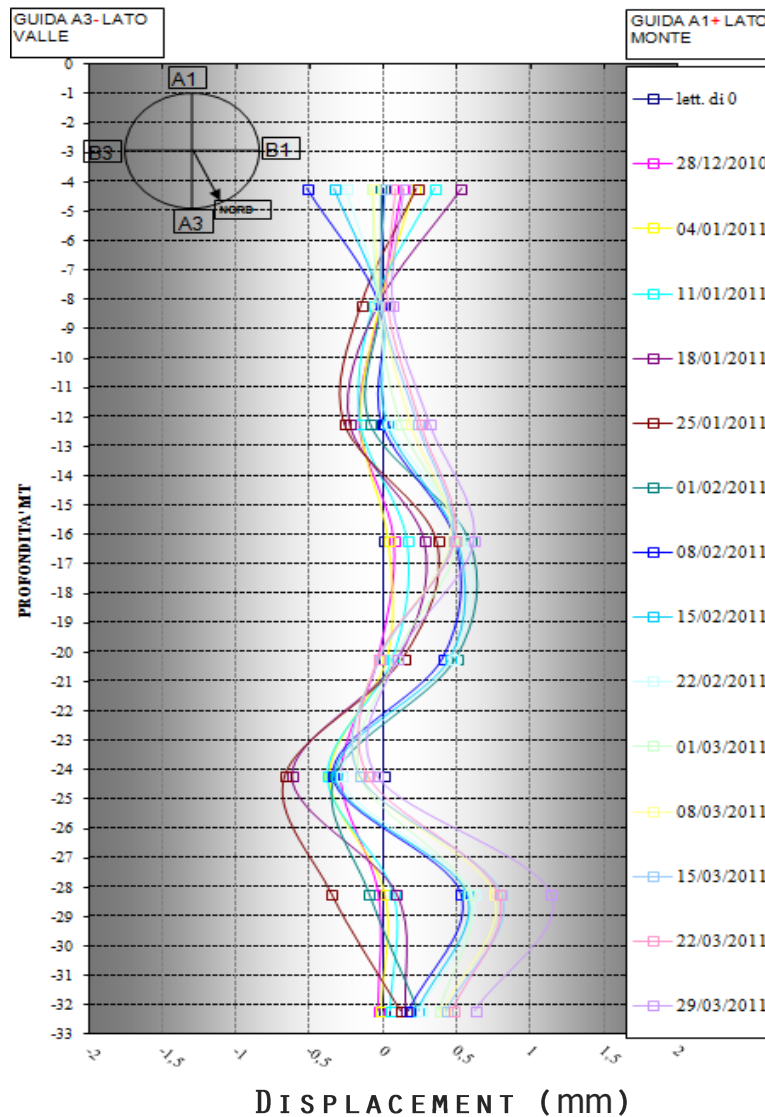


PISCOPIO TUNNEL (COURTESY OF ASTALDI SPA)

CUMULATIVE HORIZONTAL DISPLACEMENT

Left graph:
A1-A3 direction

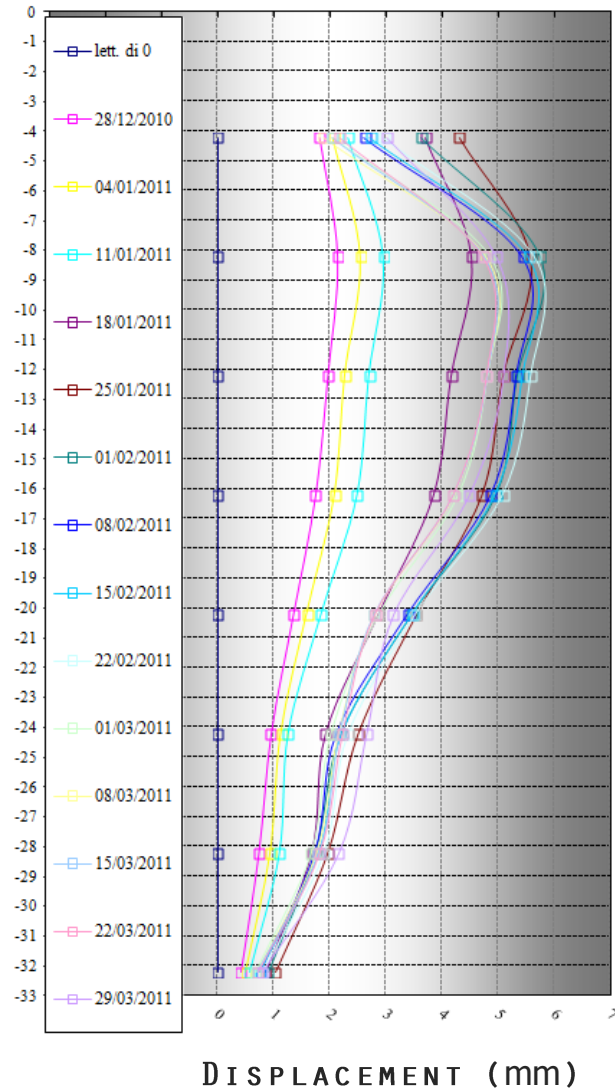
Right graph:
B1-B3 direction



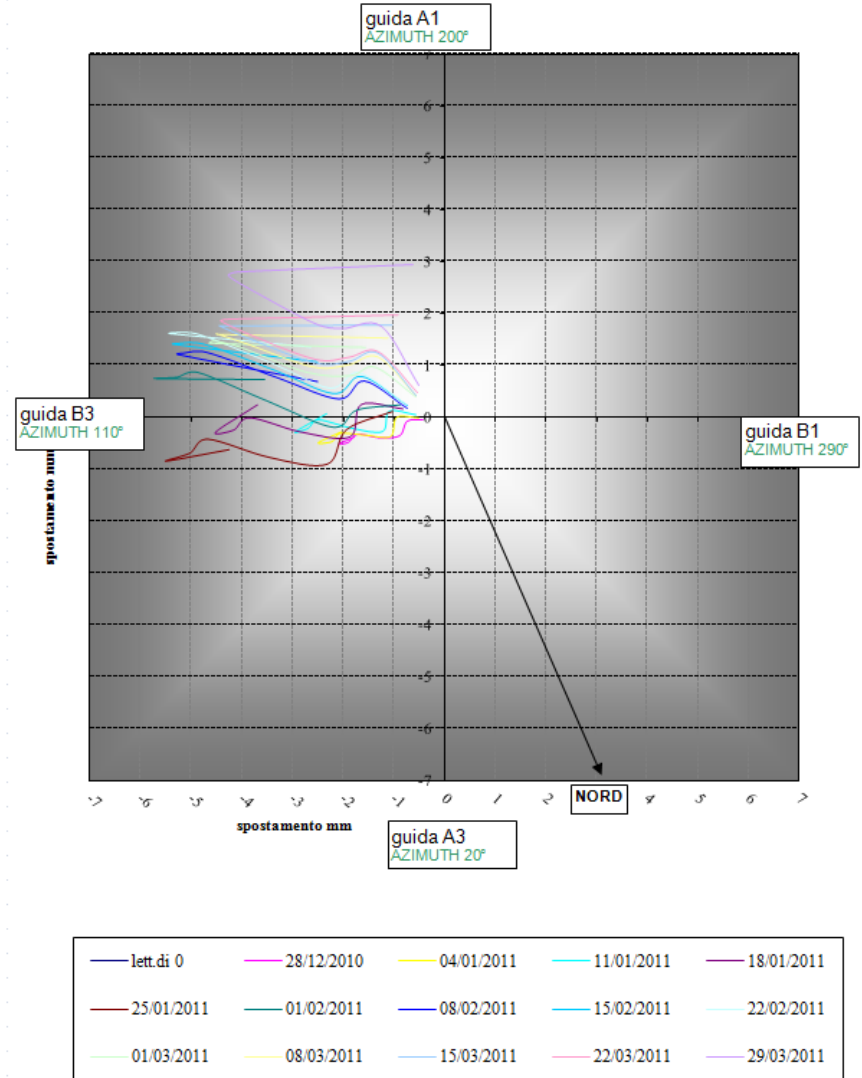
PISCOPIO TUNNEL (COURTESY OF ASTALDI SPA)

CUMULATIVE HORIZONTAL DISPLACEMENT

Left graph:
Cartesian total
cumulative
displacement



Right graph:
Polar total cumula
displacement



PISCOPIO TUNNEL (COURTESY OF ASTALDI SPA)

CUMULATIVE VERTICAL DISPLACEMENT

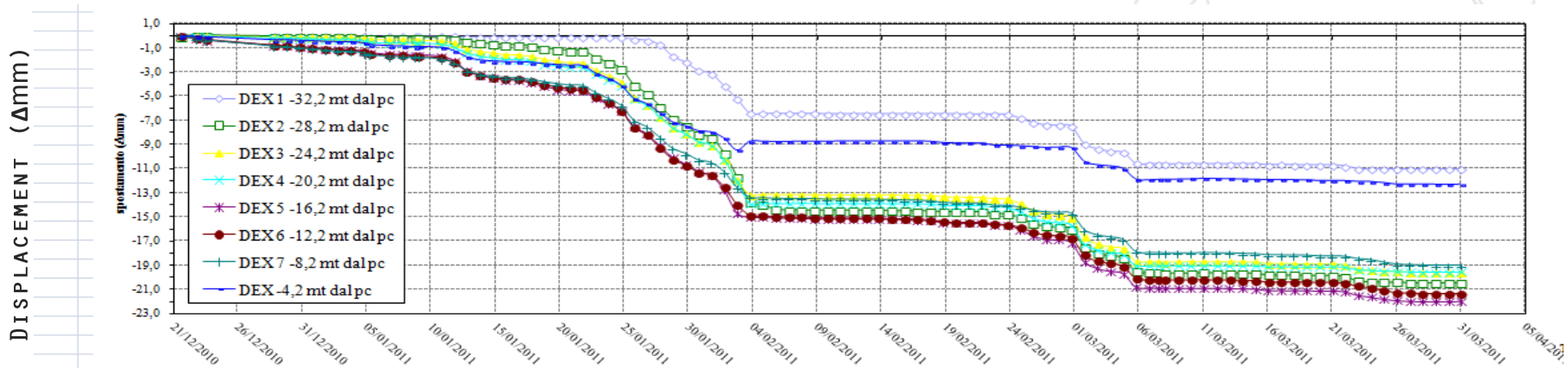
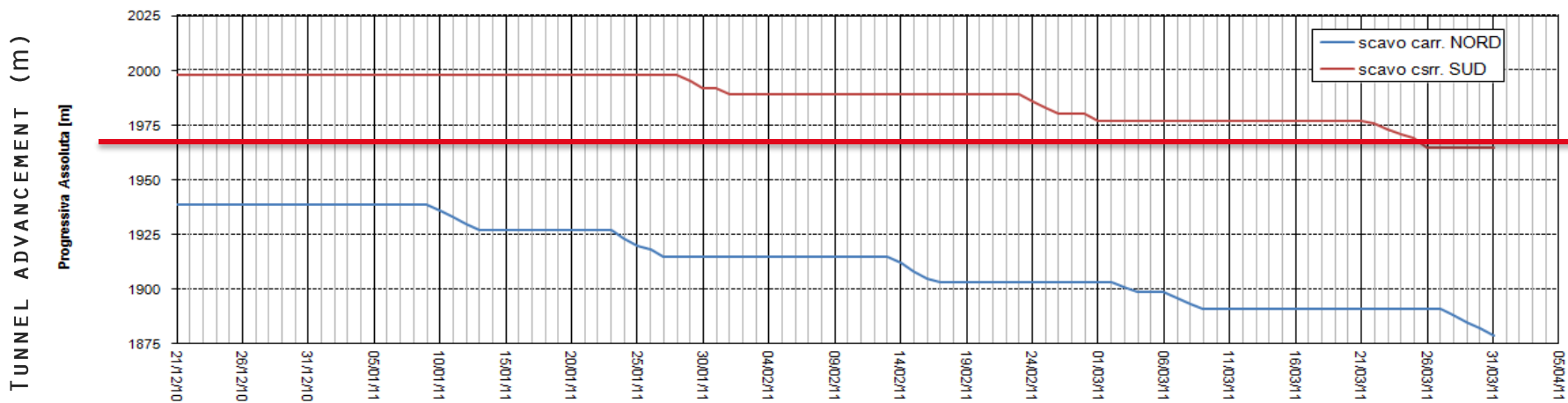


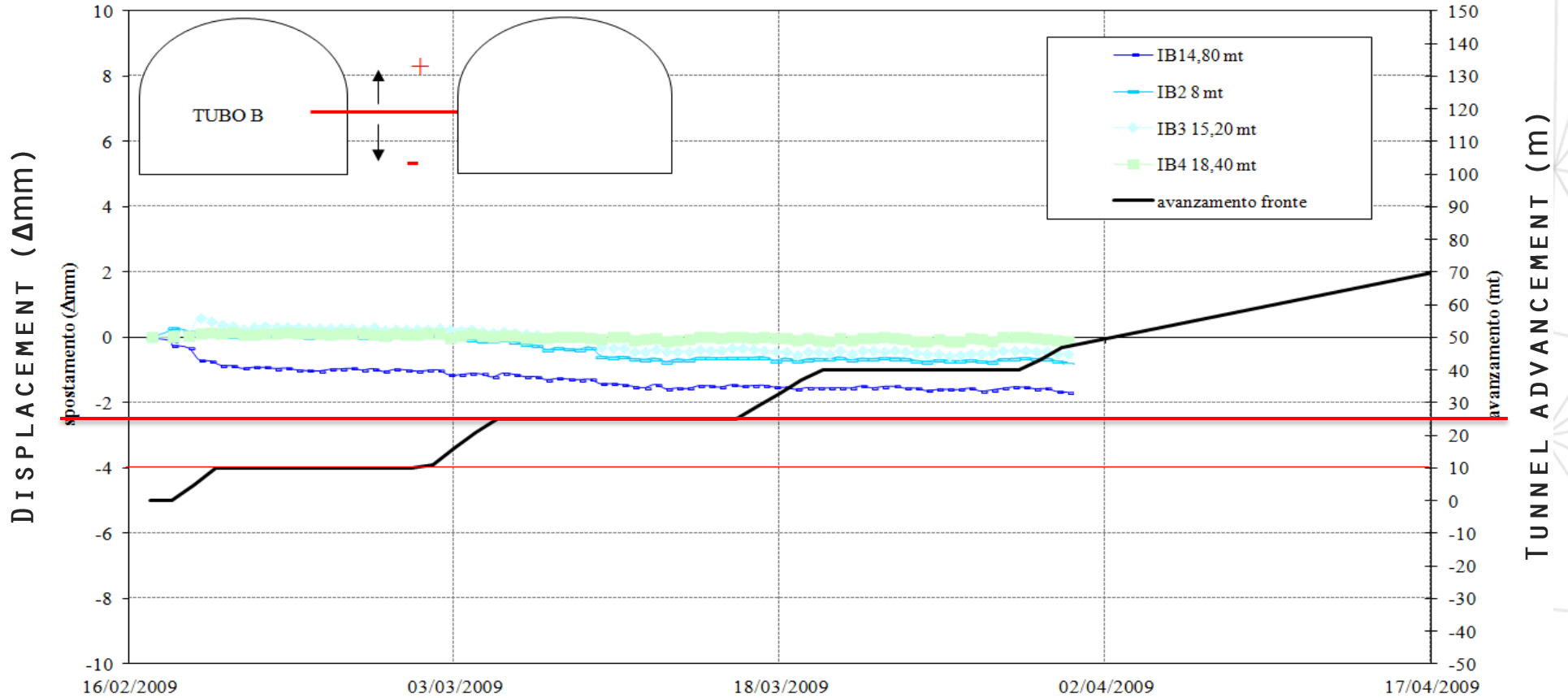
Diagramma Avanzamento Lavorazioni (fronte scavo - arco rovescio + murette - calotta)



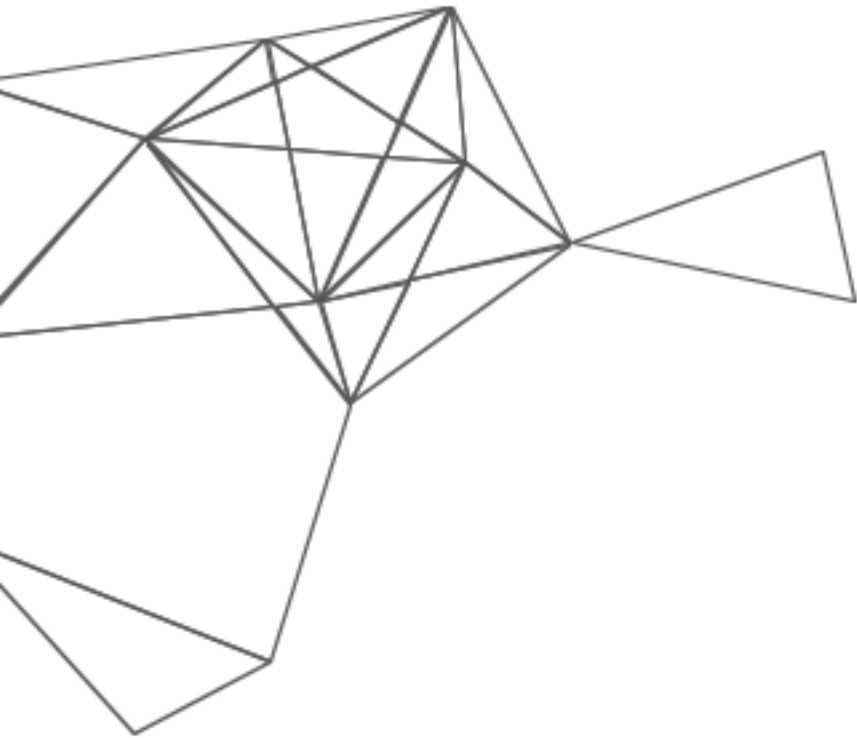
SANTA MARIA SUD TUNNEL COURTESY OF ASTALDI SPA

VERTICAL DISPLACEMENTS, TUBE B

INCLINOMETRI TUBO B - PROG. CORRISPONDENTE 10+642,11



— CONCLUSIONS



- *DEX-S is a good solution for automatic 3D monitoring of unattended boreholes*
- *High performances*
- *Clear and direct data output*
- *Cost-effective solution: single drilling for 3-D borehole monitoring*



THANKS FOR WATCHING

*For any further clarification
visit www.sisgeo.com
or email us: info@sisgeo.com*