

Proefbelastingen houten palen

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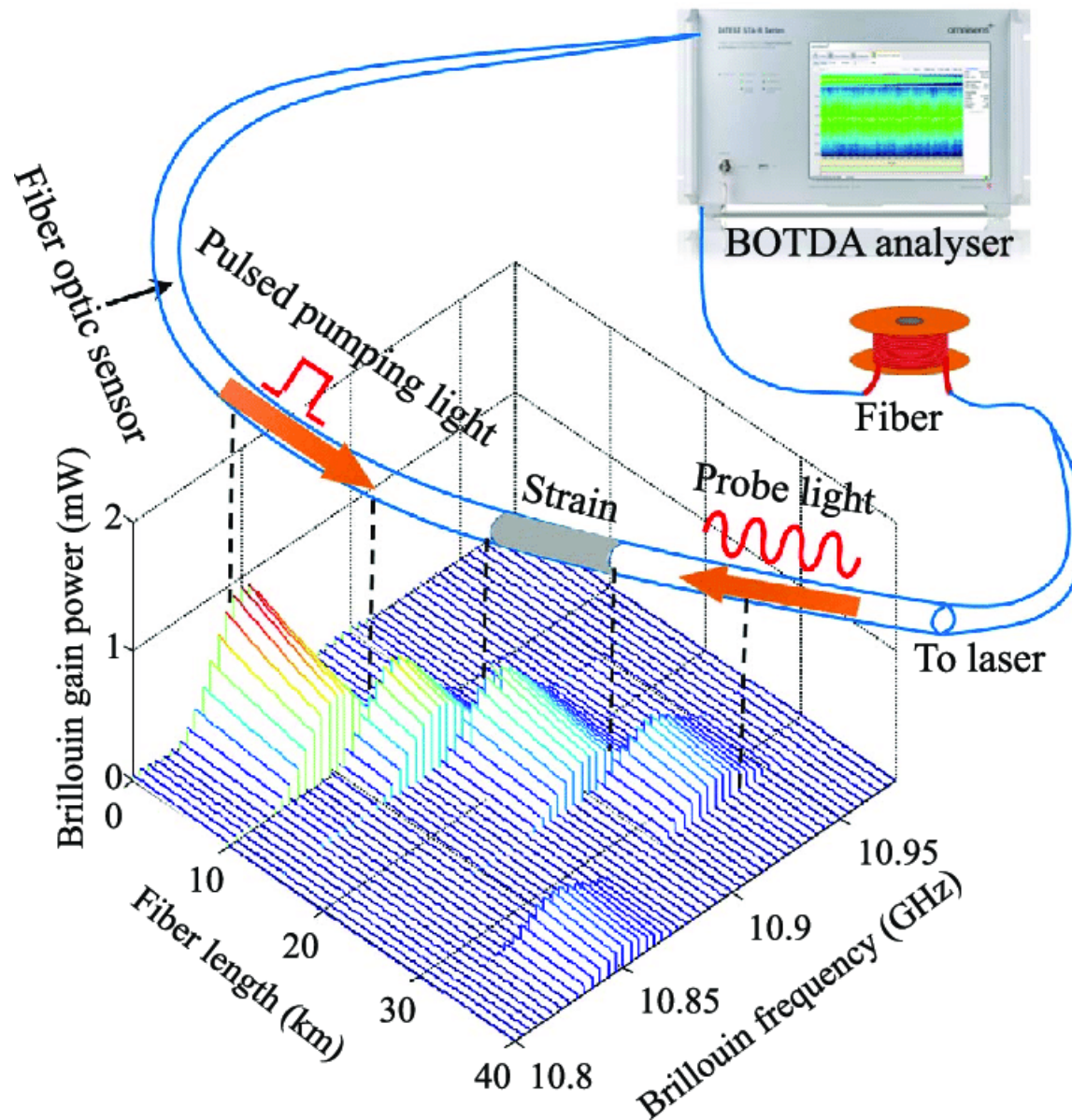
Gemeente Rotterdam

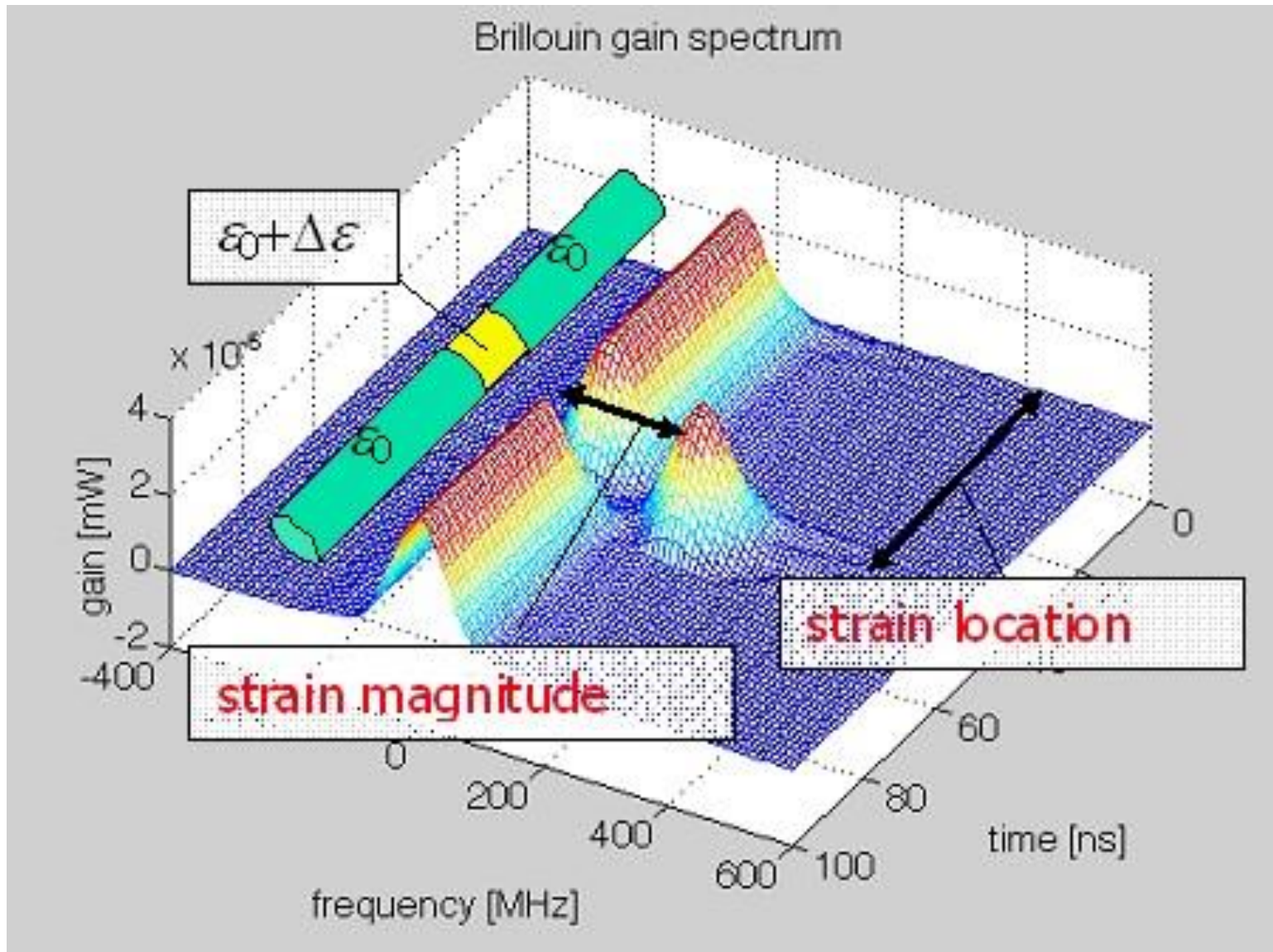
- **Glasvezelrekmetingen**
 - Werking
 - Overzicht meetvoorbeelden
- **Instrumentatie**
- **Heien**
- **Proefbelastingen**
 - Last-zakkingsgedrag
 - Kruipontwikkeling
 - Rekverloop
 - Normaalkrachtverloop
- **Spreading resultaten**
- **Conclusies**



- Leon Nicolas Brillouin
- [Brillouin, Léon](#) (1922). "*Diffusion de la lumière et des rayons X par un corps transparent homogène*". *Annales de Physique. EDP Sciences*. 9 (17): 88–122
- *Verstrooiingsfrequentie van licht in een medium is afhankelijk van rek*







Ontwikkeling BOTDR

▪ 2000

- Plaatsresolutie 1 m
- Rekresolutie 50 microstrain
- Meettijd 30 minuten
- Interrogator 300k

▪ 2017

- Plaatsresolutie 0,25 m
- Rekresolutie 6 microstrain
- Meettijd 1,5 minuten
- Interrogator 70k

▪ 2020

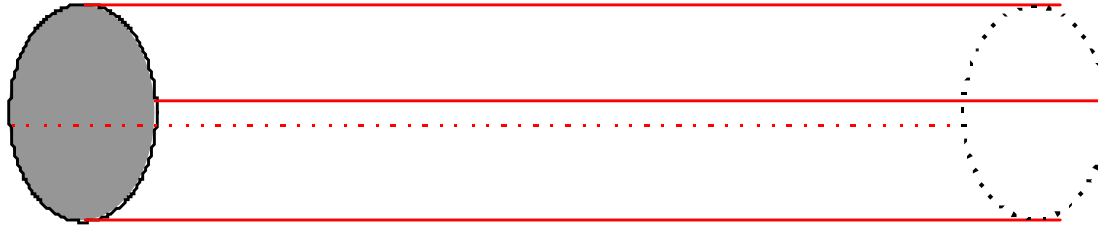
- Plaatsresolutie 0,05 m
- Rekresolutie 0,5 microstrain / 10 microstrain
- Meettijd 1 minuut / 5 seconden
- Interrogator 400k



Waterleiding Evides 2001

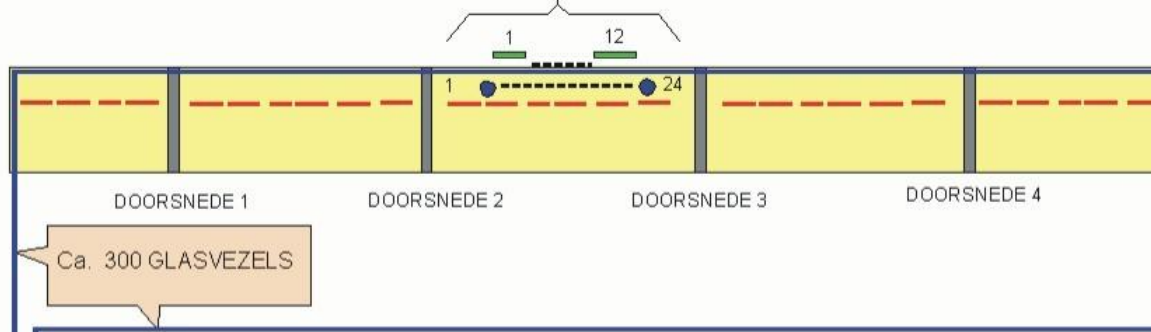


Sensor lay-out (BOTDR)



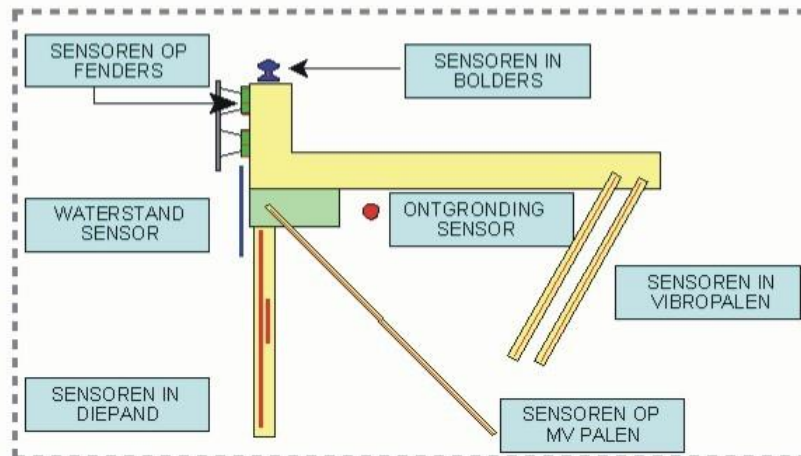
Monitoring Euromax kadeconstructie 2003

MONITORING VAN 24 BOLDERS EN 12 FENDERS

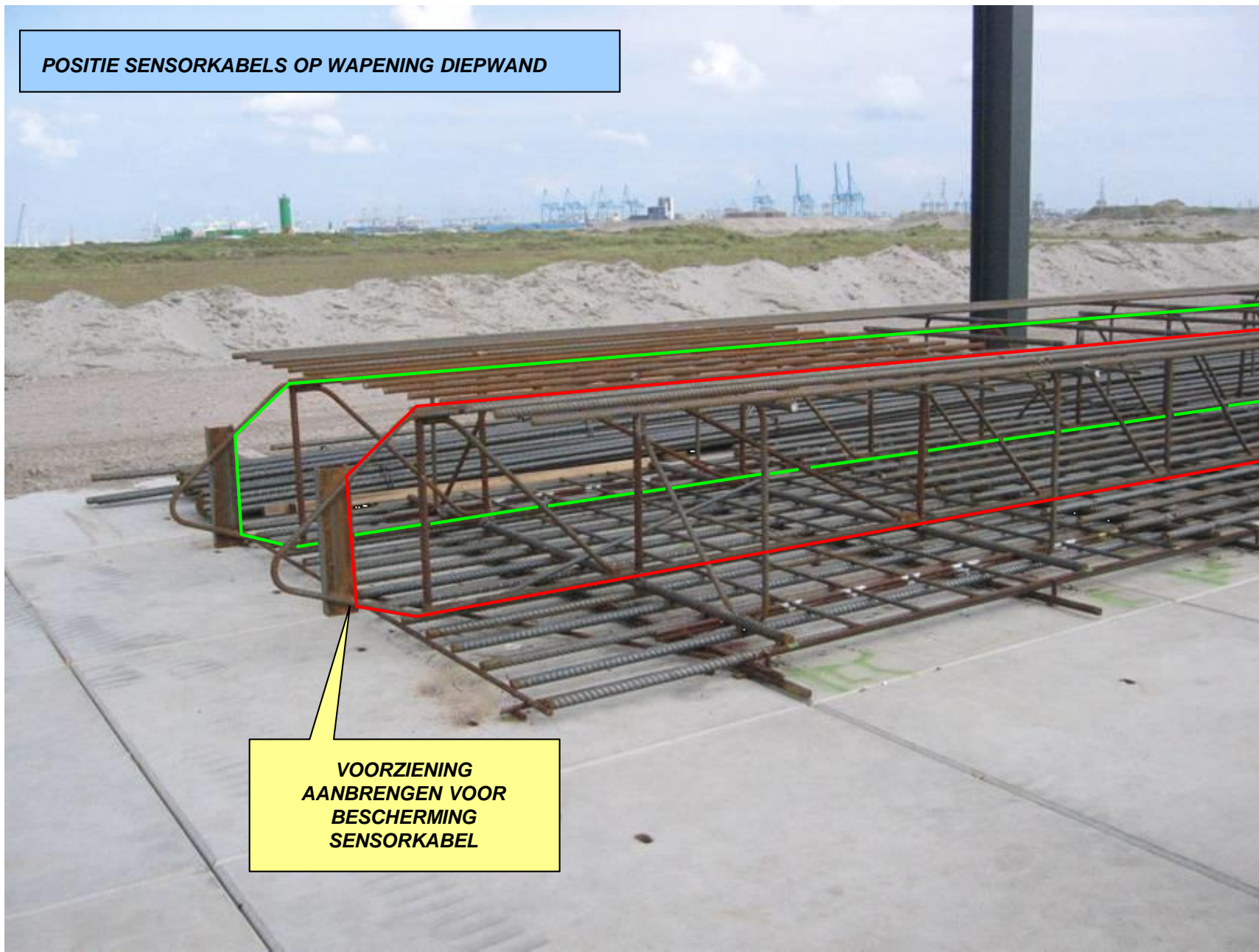


CENTRALE
UITLEZING
SENSOREN

World Wide Web
Communication

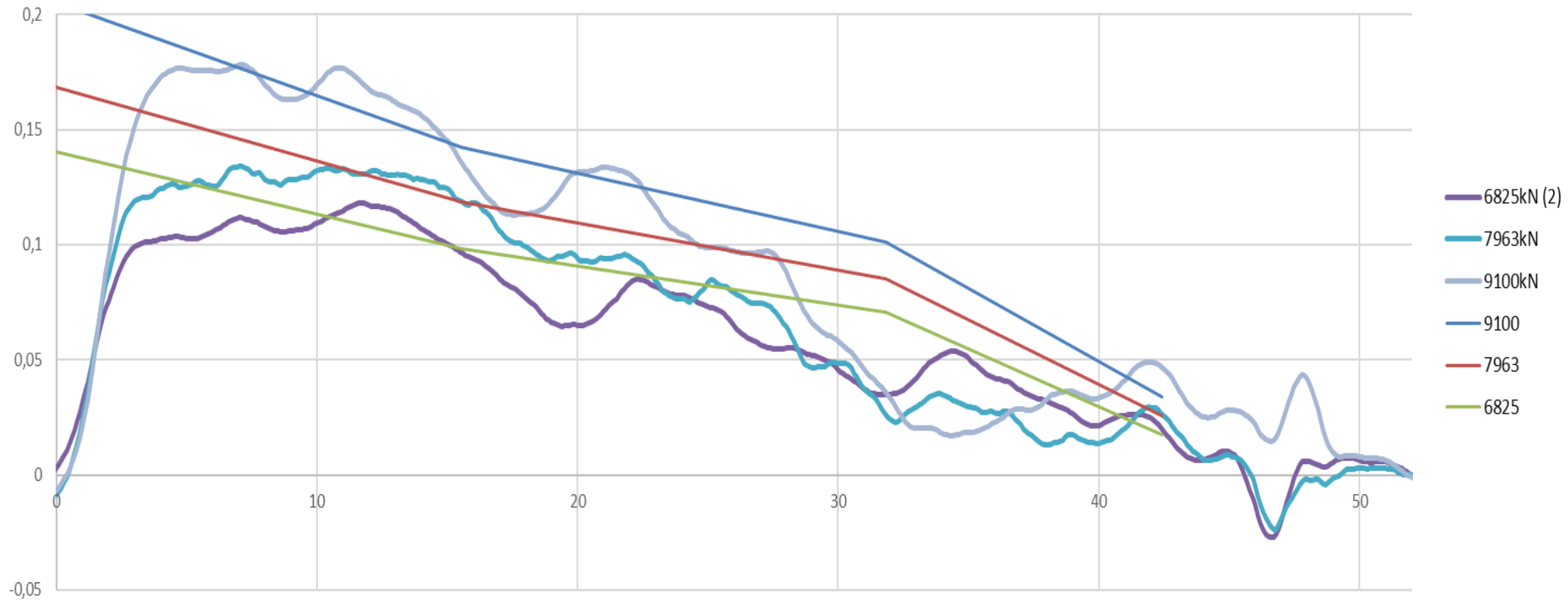


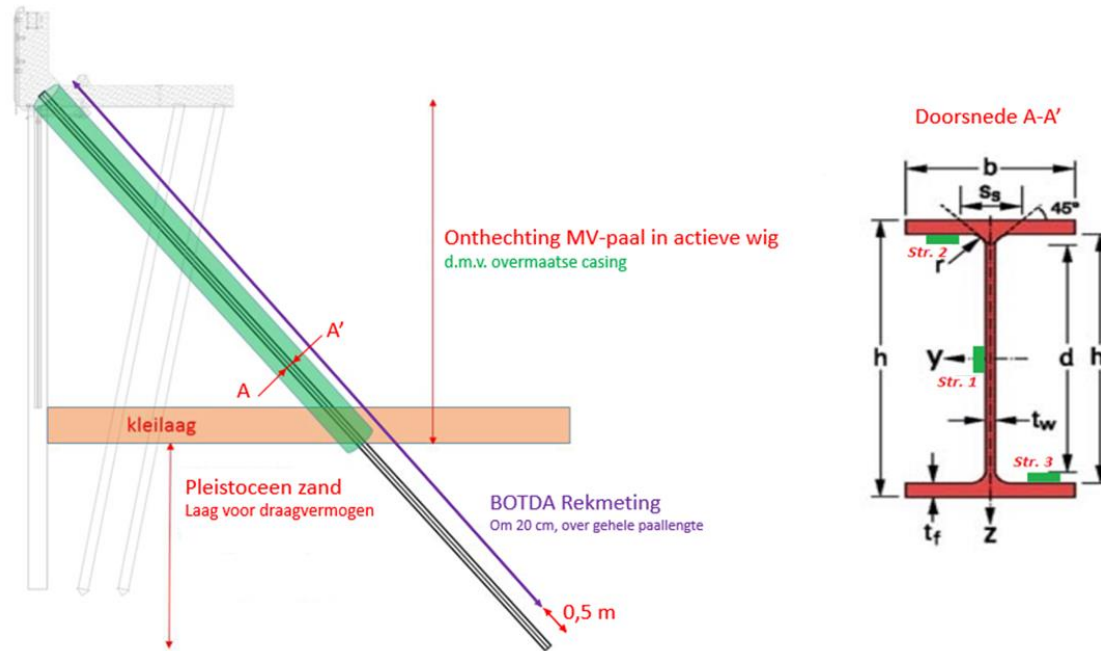
POSITIE SENSORKABELS OP WAPENING DIEPWAND



**VOORZIENING
AANBRENGEN VOOR
BESCHERMING
SENSORKABEL**

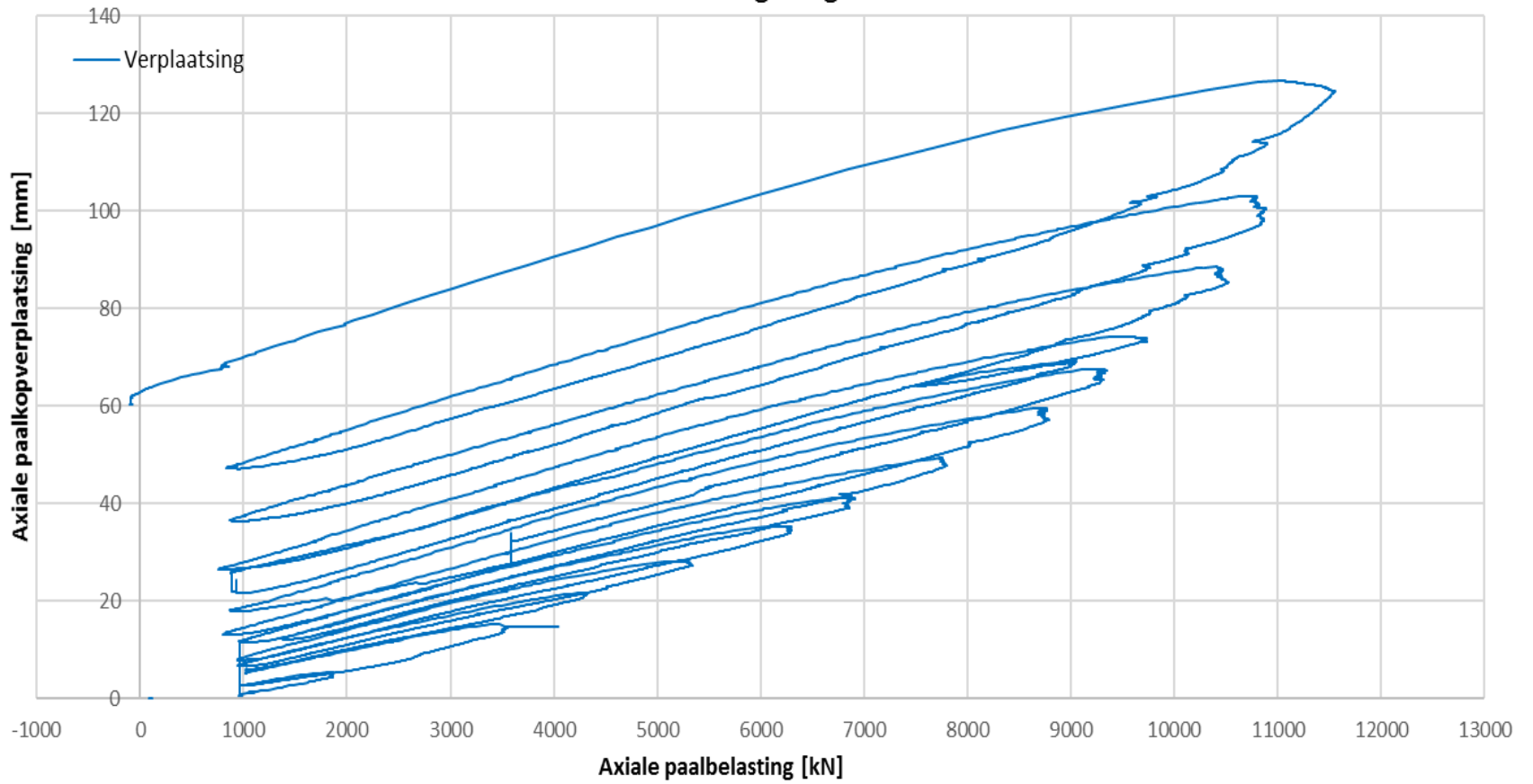
MV palen Euromax, proefbelasting BOTDR en rekstr.



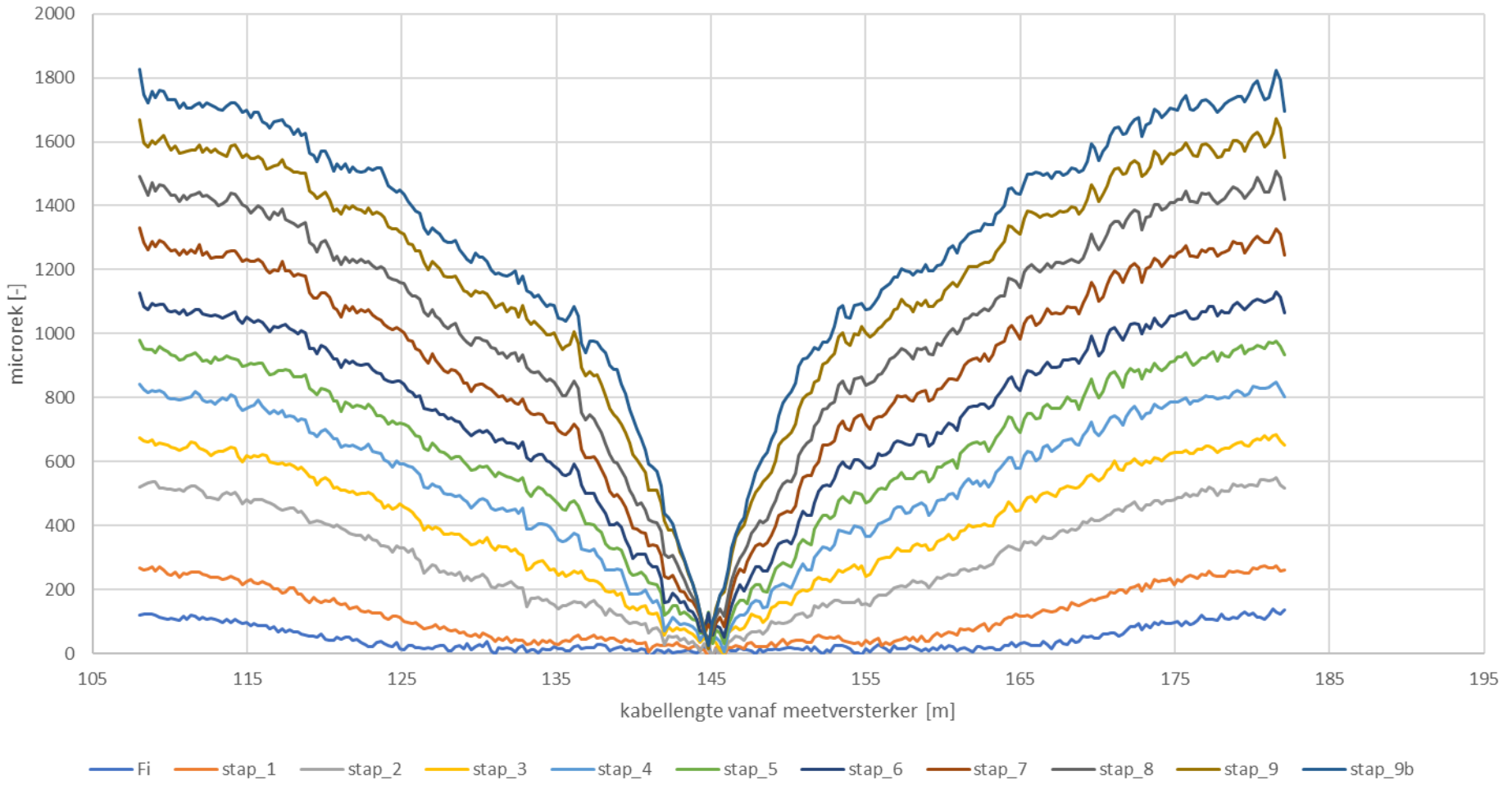




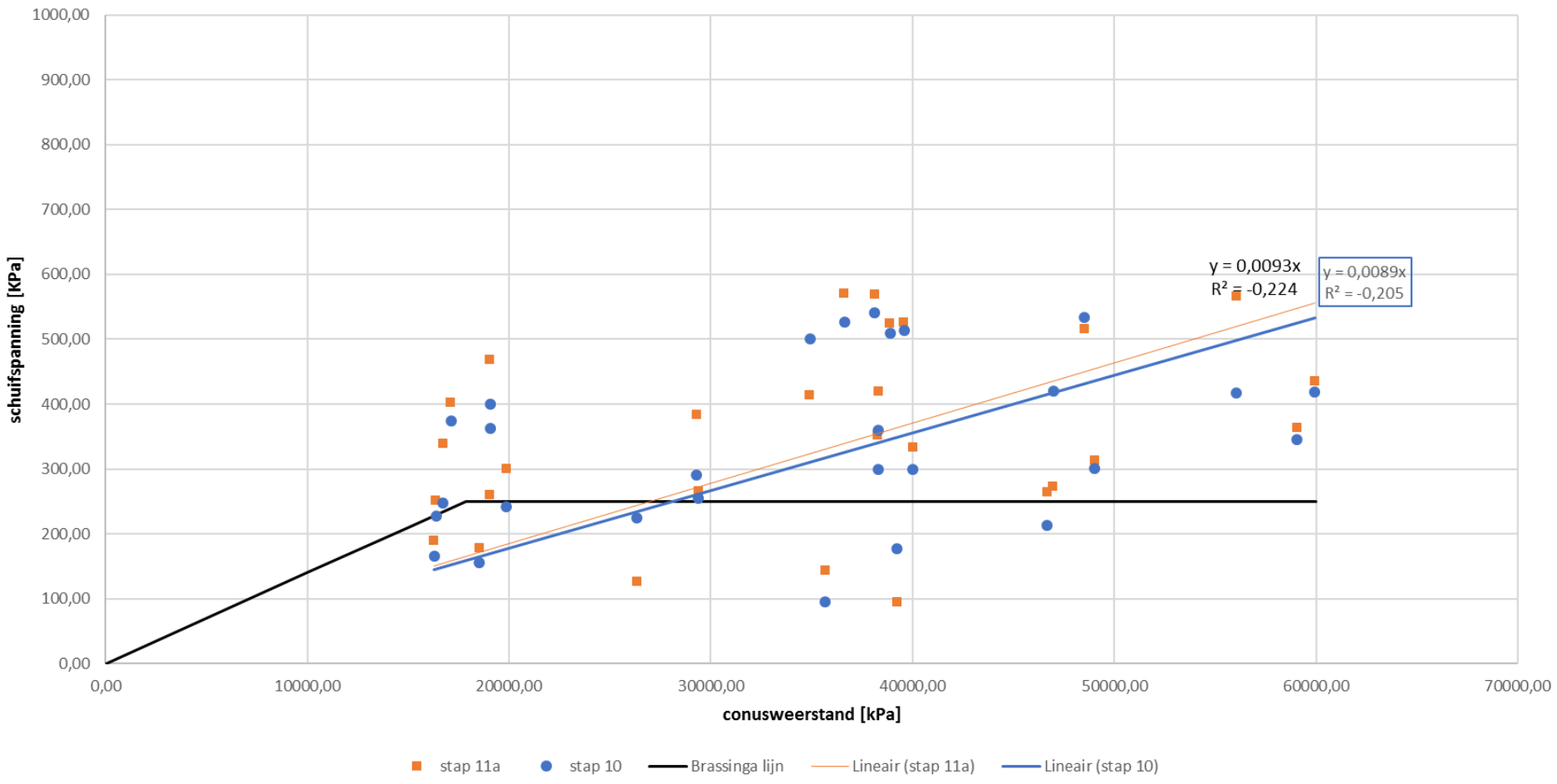
last vervormingsdiagram



glasvezel 1, einde belastingstappen

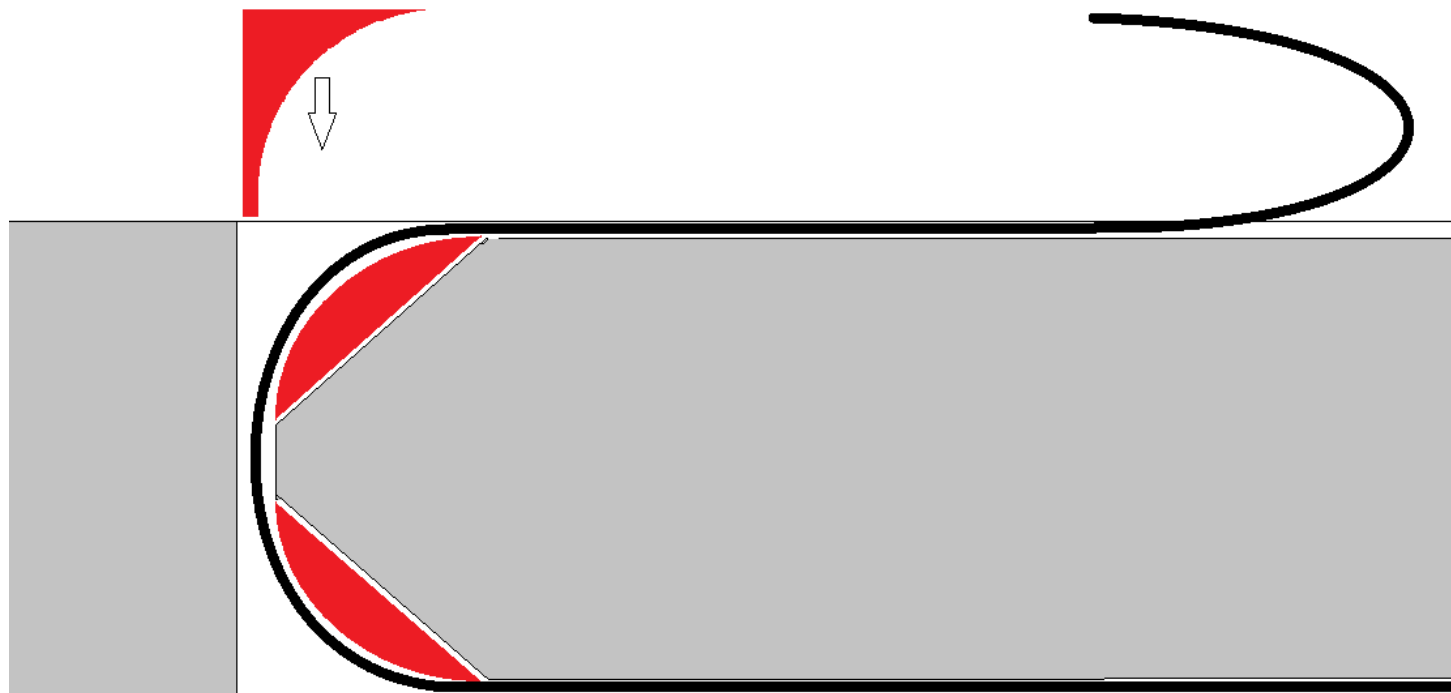


Conusweerstand en schuifspanning Eind belastingstap met MV-A-60B2



Houten palen Amsterdam Overamstel





-  uitgefreesd of uitgeboord
-  kunststof passtuk
-  hout van paaldoorsnede
-  glasvezel









Paaldiameters elke 0,5 m vastleggen



Vorboren bovenzandpakket



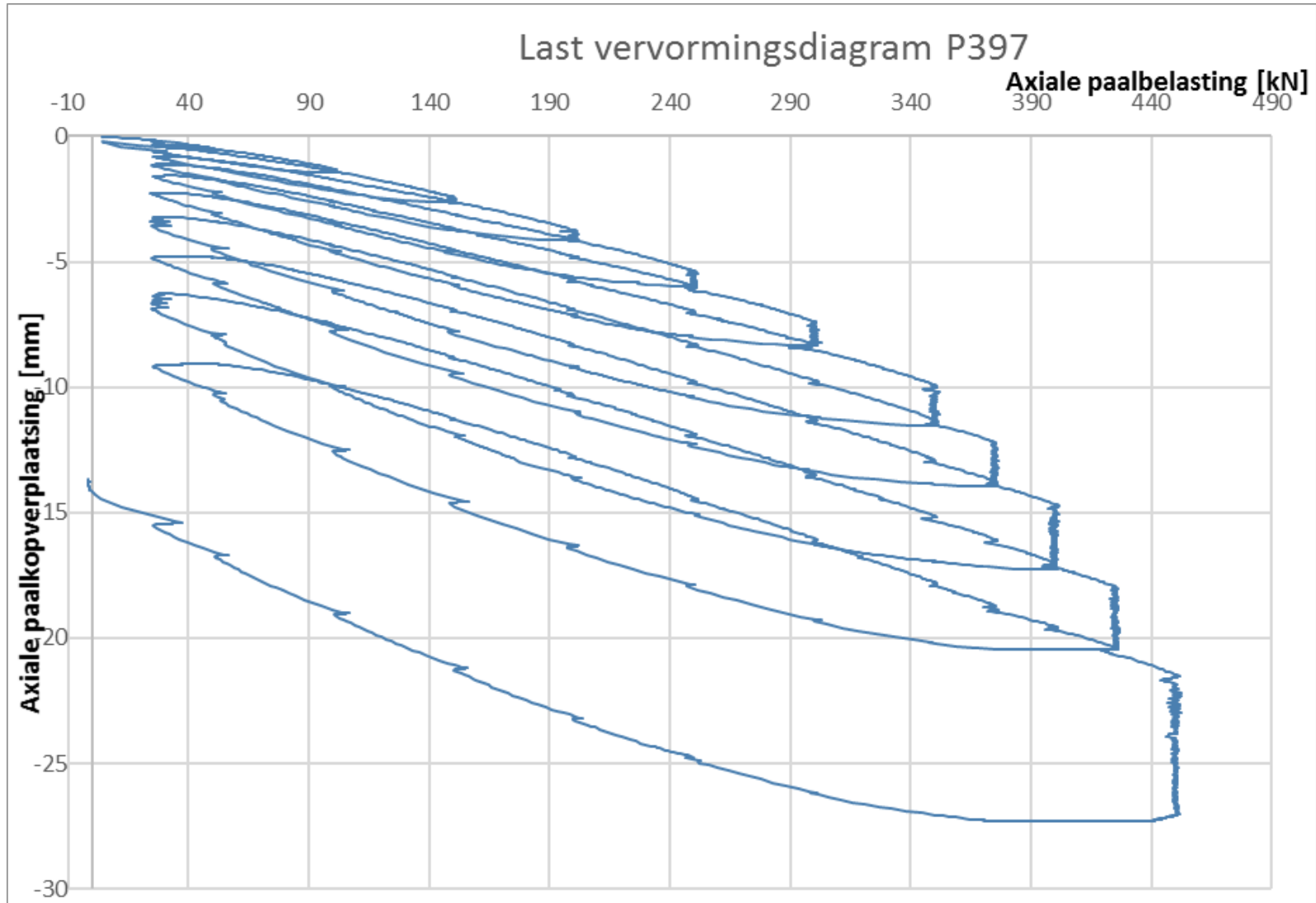
Heien met valgewicht (zoveel mogelijk authentiek)



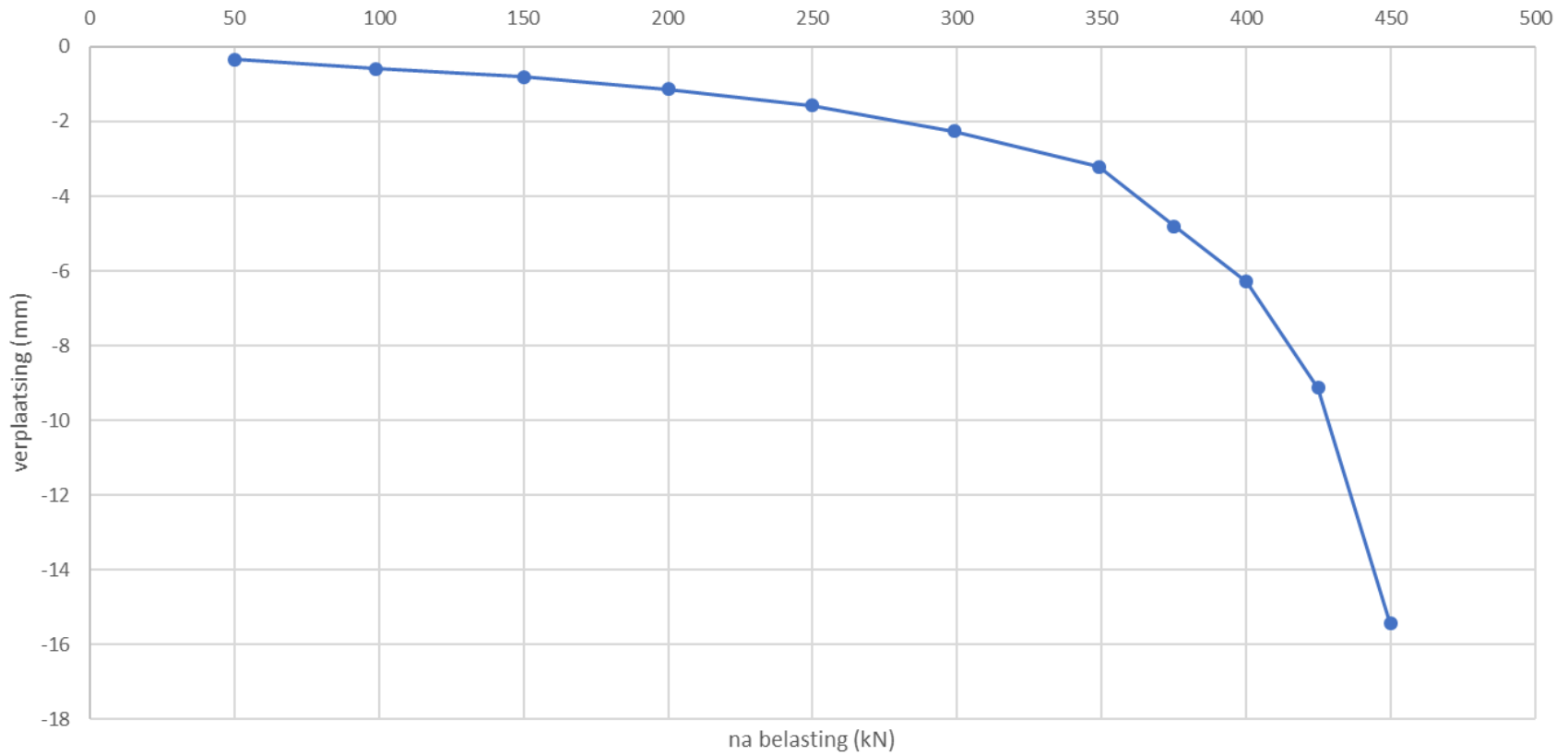
Proefopstelling (x2)

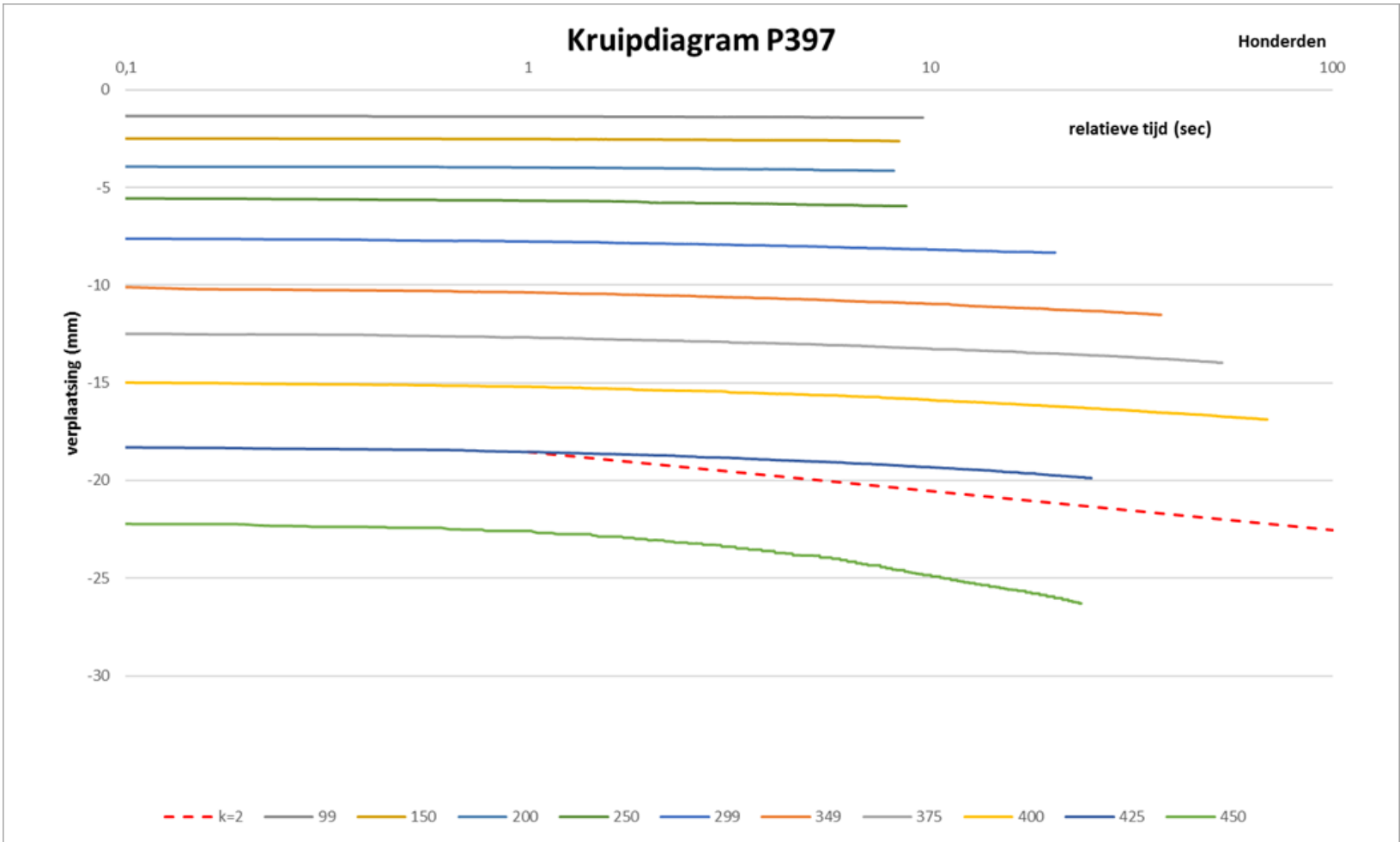




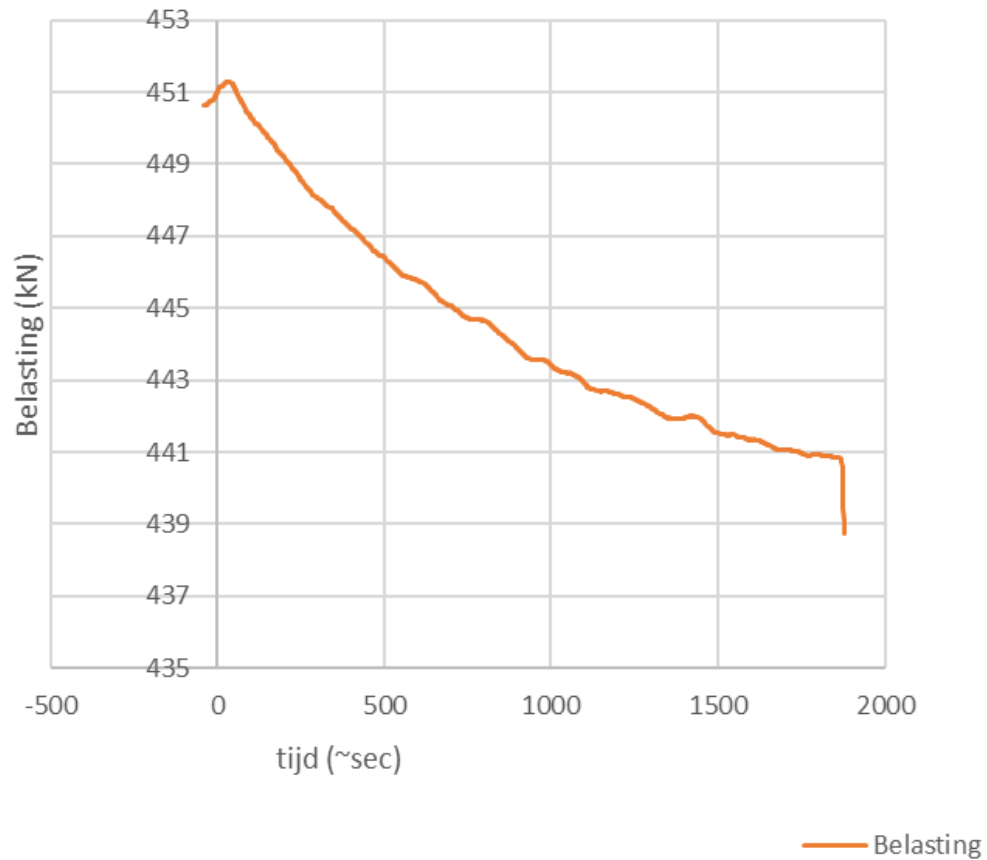


Blijvende verplaatsing bij Fi (25kN) P397

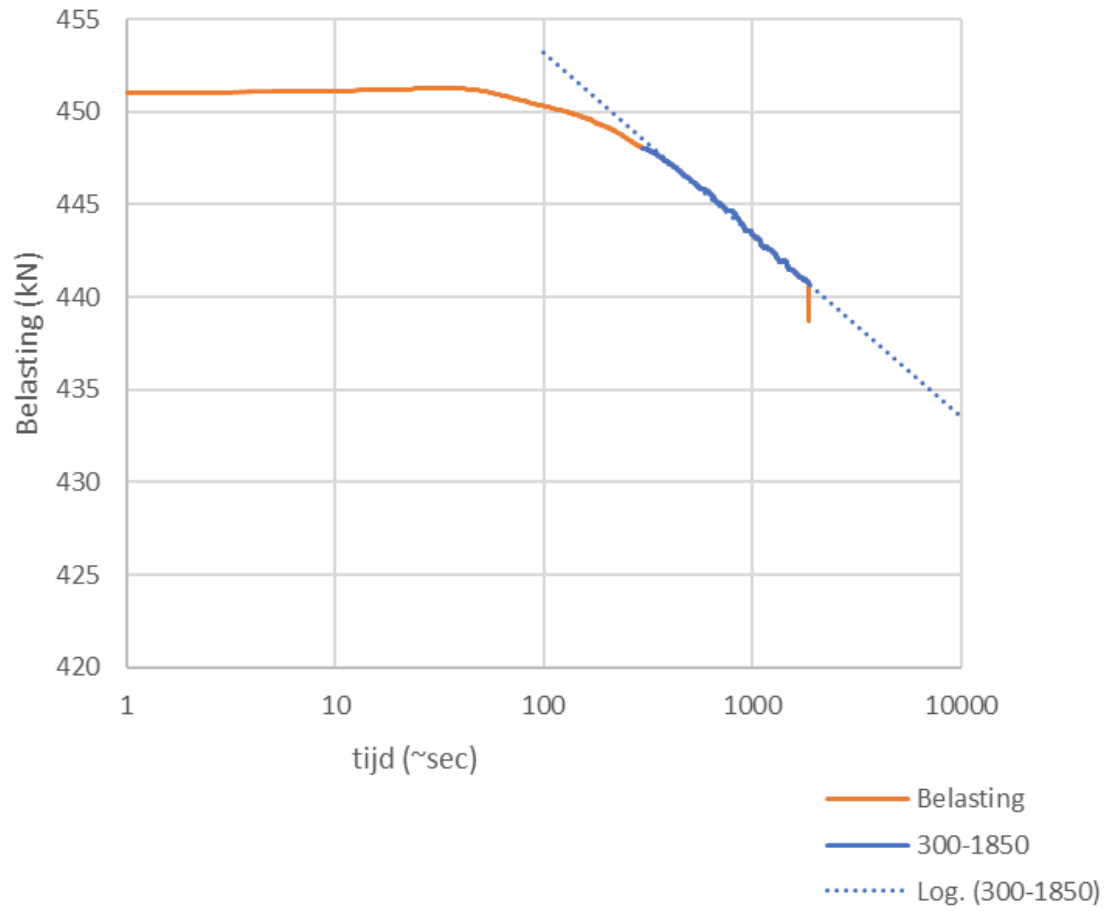




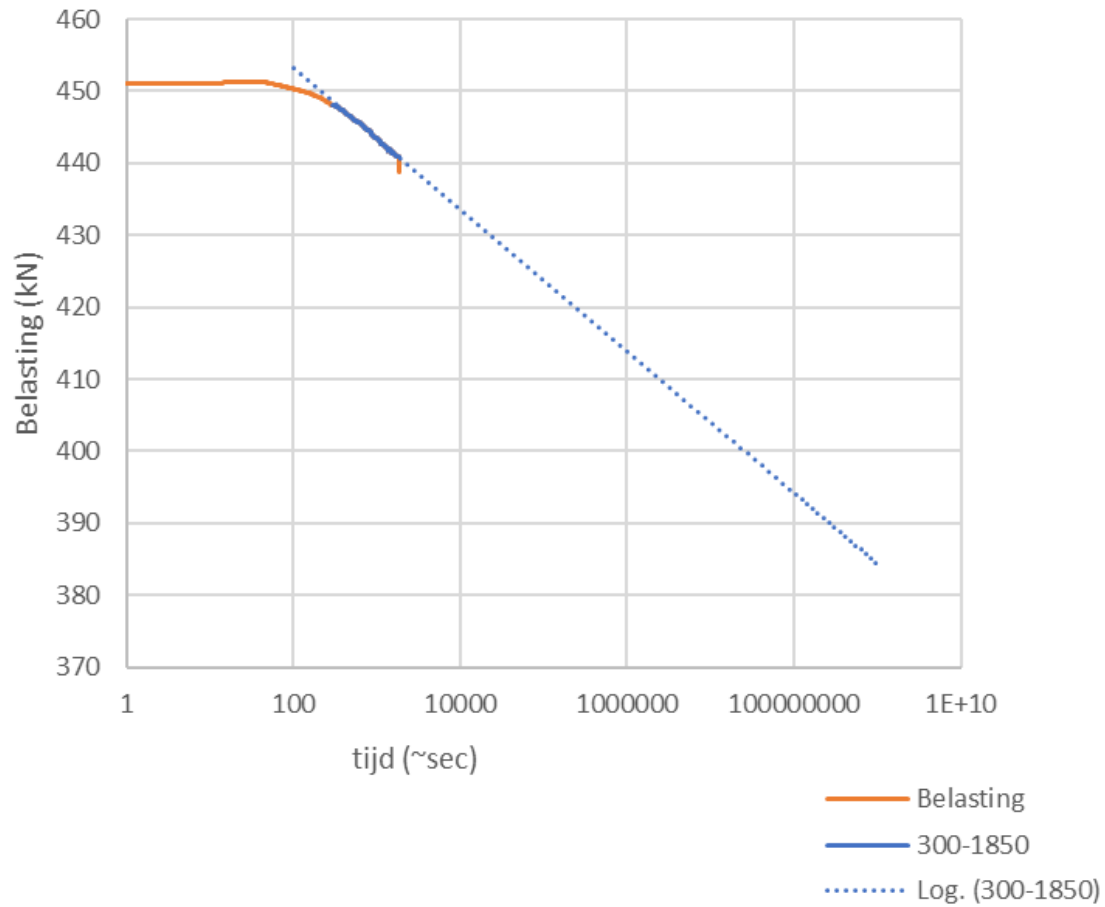
Relaxatiediagram P397



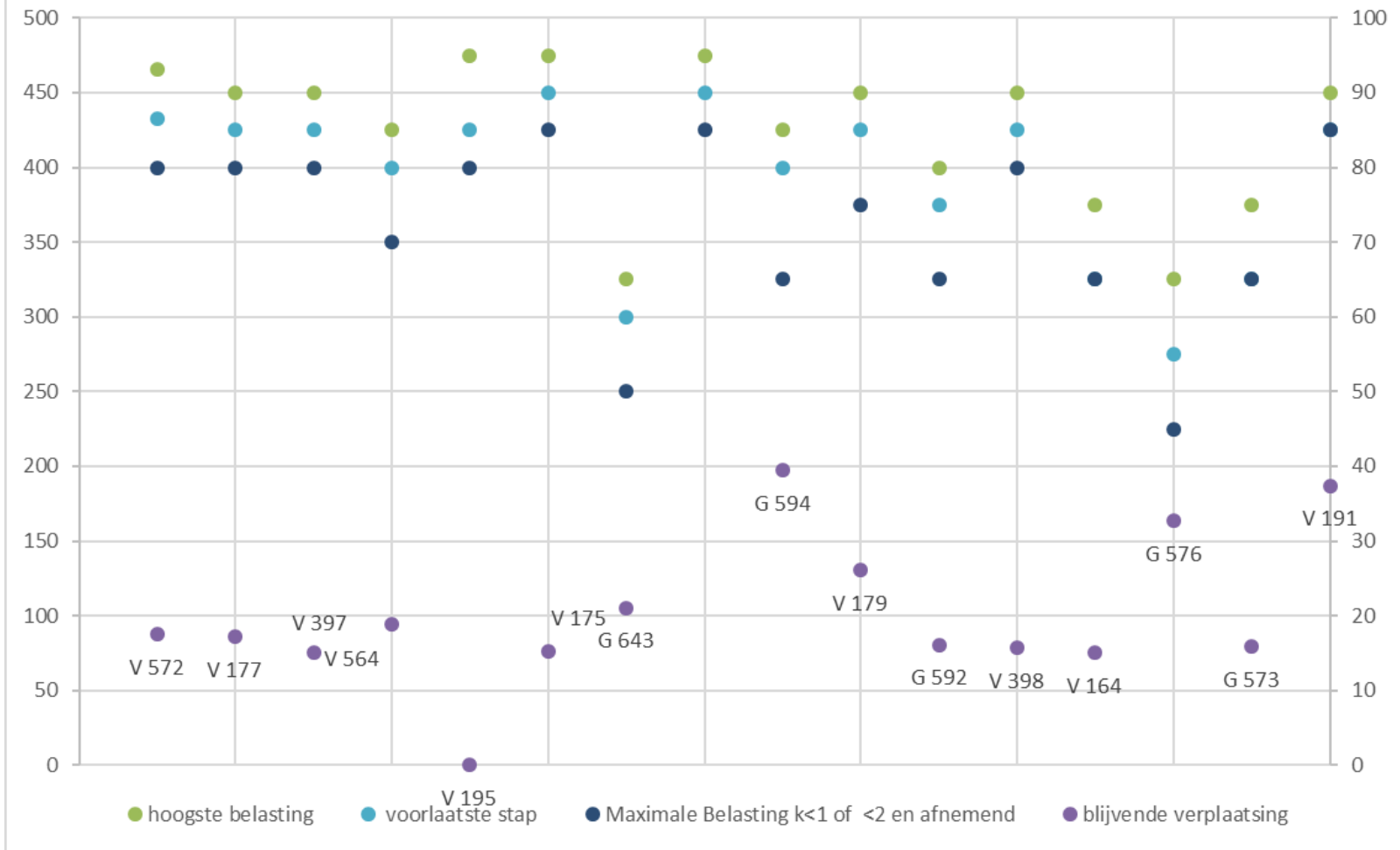
Relaxatiediagram P397



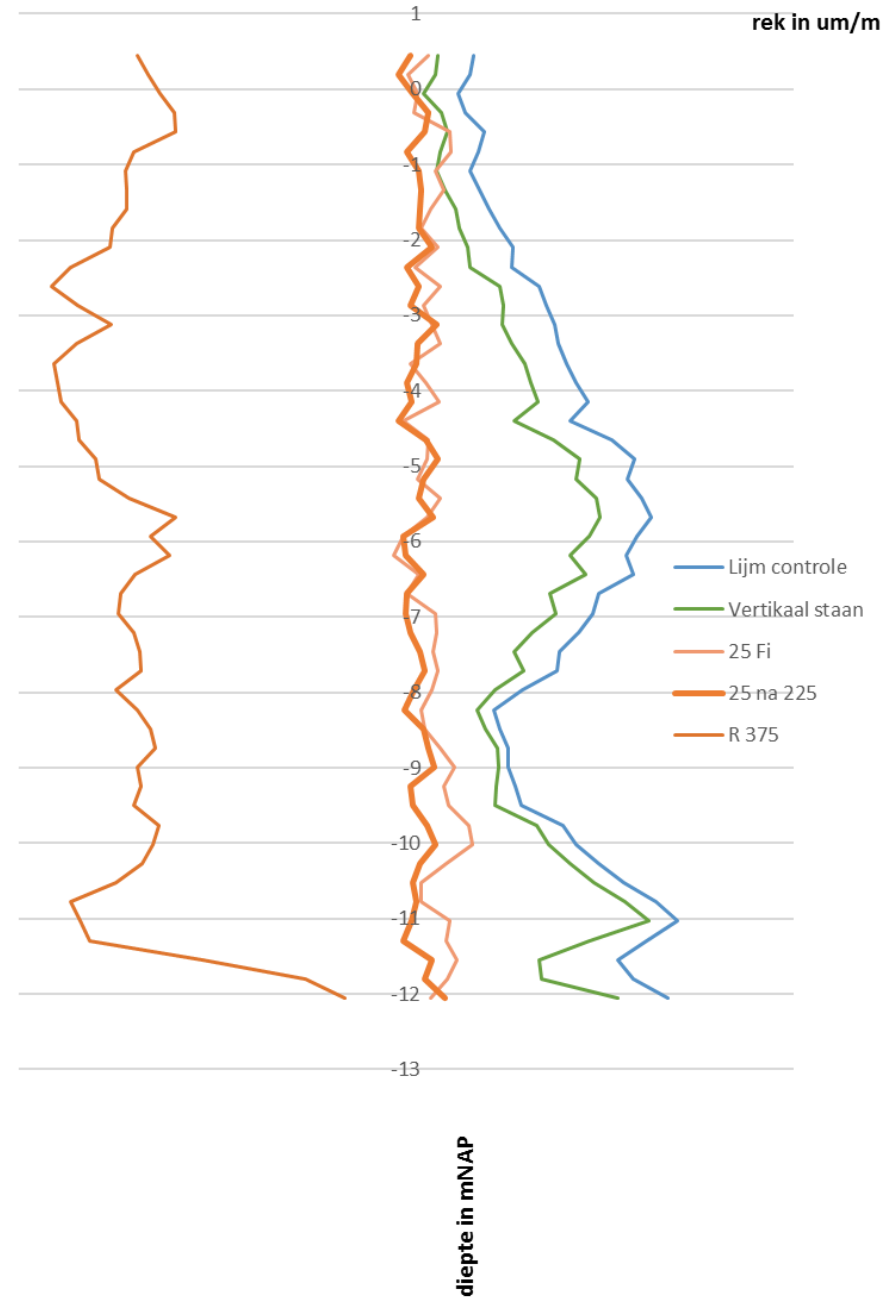
Relaxatiediagram P397



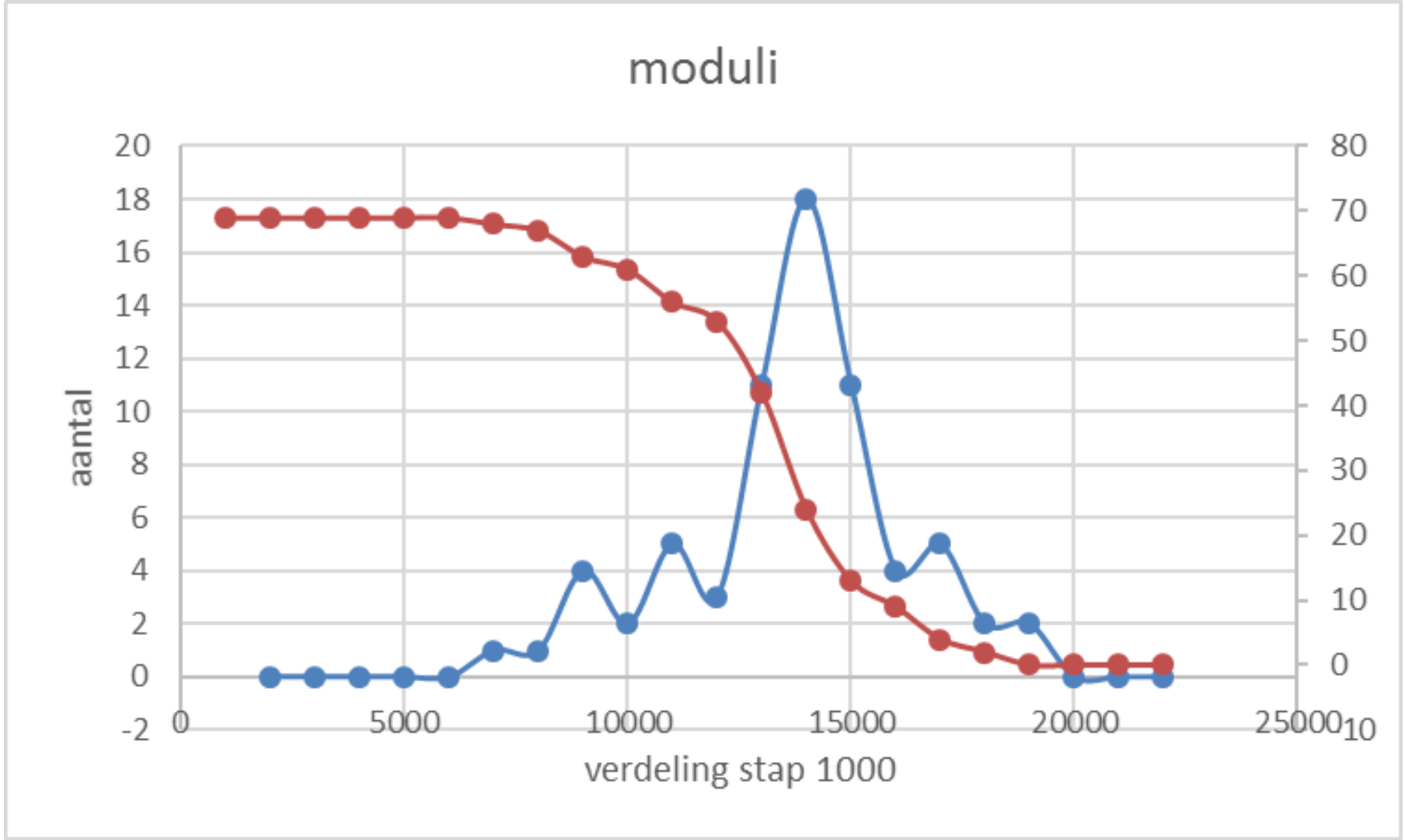
Proefbelasting Proeftuin



Paal 010164 N-Z

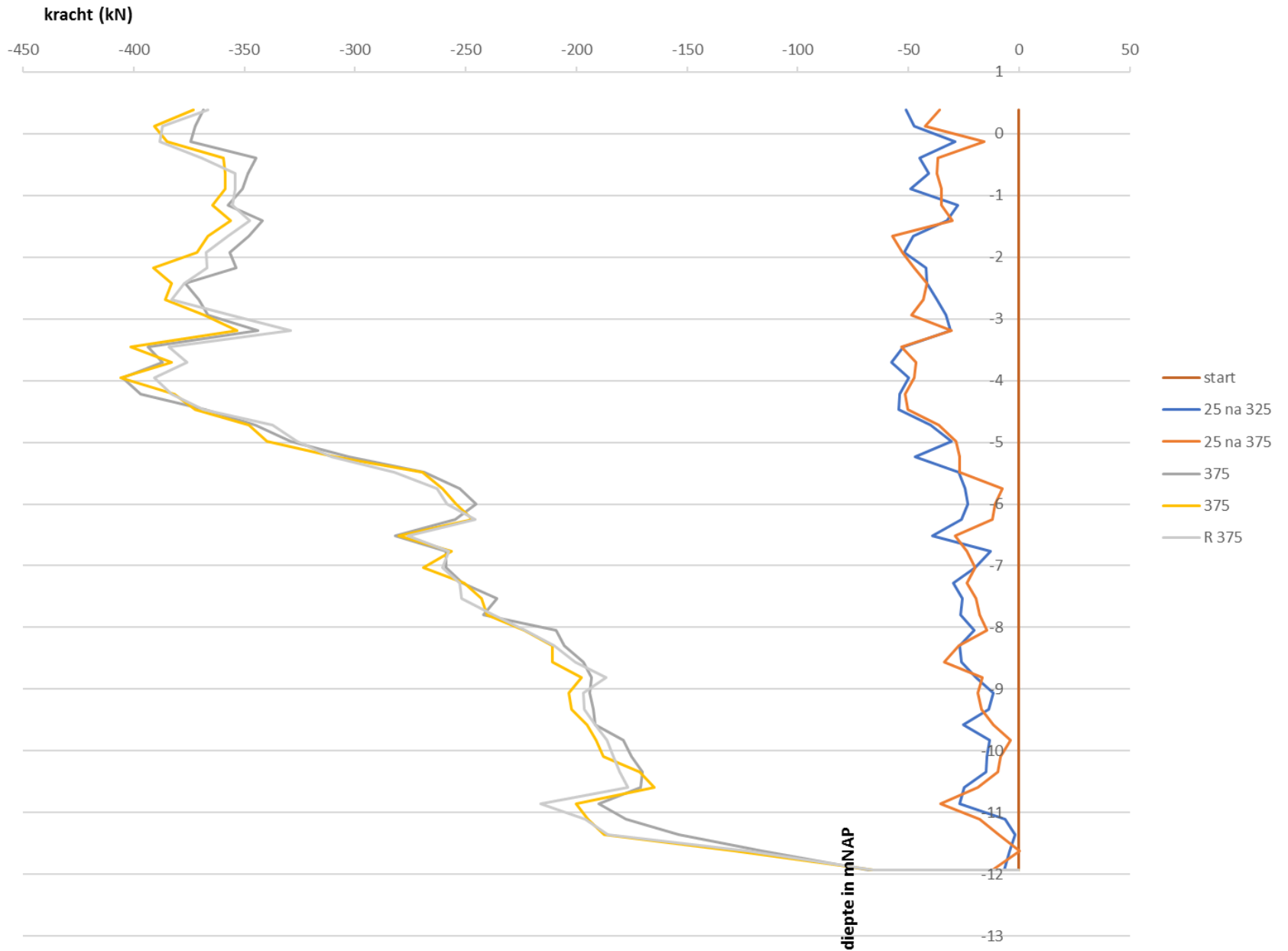


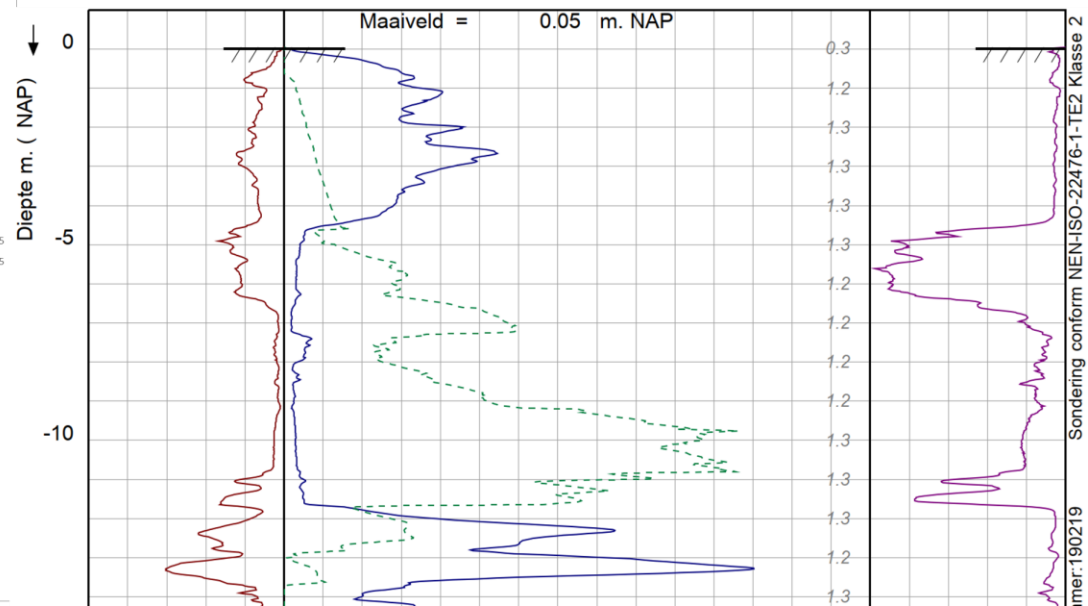
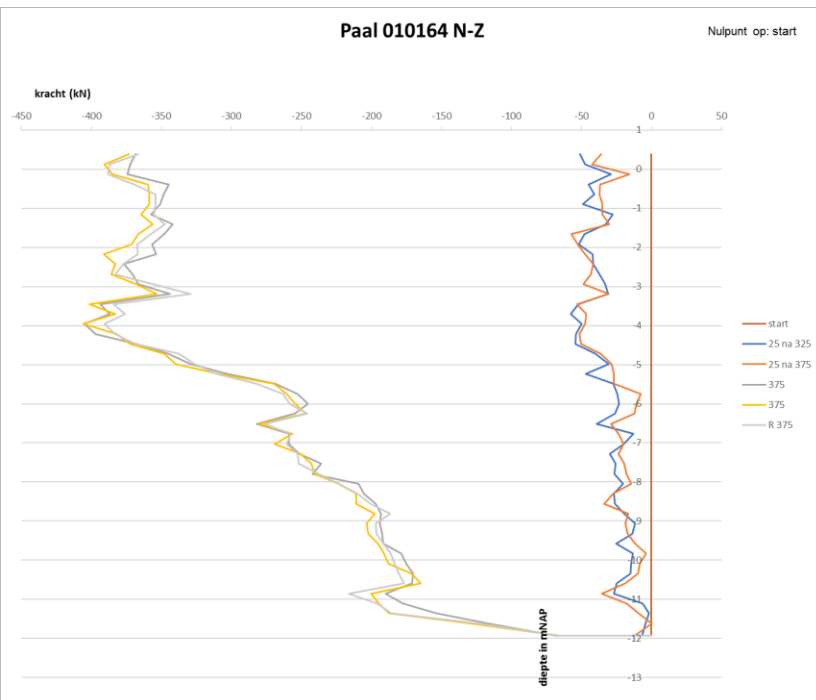
E-modulus hout (dynamisch)



Paal 010164 N-Z

Nulpunt op: start





- **Alfa-p = ?**
- **BOTDR / BOTDA techniek sterk verfijnd**
- **Bouwplaats is geen laboratorium maar:**
 - 27 palen geïnstrumenteerd
 - 26 palen BOTDA mogelijk 1 paal BOTDR (paalpunt gespleten)
- **Langetermijn monitoring mogelijk**



Welke proeven worden nog uitgevoerd?

- **Kleefontwikkeling**
- **Horizontale belasting**

